MOTT MACDONALD

The Christie Proposed Northern Pathology Development

Geotechnical and Geoenvironmental Desk Study

June 2025

This page left intentionally blank for pagination.

Mott MacDonald
3rd Floor
One Piccadilly Gardens
Manchester M1 1RG
United Kingdom

T +44 (0)161 914 8880
mottmac.com

The Christie Proposed Northern Pathology Development

Geotechnical and Geoenvironmental Desk Study

June 2025

Mott MacDonald Limited. Registered in England and Wales no. 1243967.
Registered office: 10 Fleet Place, London EC4M 7RB, United Kingdom

Issue and Revision Record

Revision	Date	Originator	Checker	Approver	Description
P01	June 2025	L Brooks S Musa	C Yu Li C Stanford	A Simpson	First issue
P02	July 2025	E Lythgoe	C Smith	A Simpson	Revised in response to comments.

Document reference: 100124912 | P01 | NTHPAT-MMD-XX-XX-RP-C-000001

This document is issued for the party which commissioned it and for specific purposes connected with the above-captioned project only. It should not be relied upon by any other party or used for any other purpose.

We accept no responsibility for the consequences of this document being relied upon by any other party, or being used for any other purpose, or containing any error or omission which is due to an error or omission in data supplied to us by other parties.

This document contains confidential information and proprietary intellectual property. It should not be shown to other parties without consent from us and from the party which commissioned it.

Contents

Executive summary 1

1 Introduction 3
1.1 Description of the Project 3
1.2 Purpose of this Report 4

2 Sources of Information and Desk Study 5
2.1 Sources of information 5
2.1.1 Topographic maps 5
2.1.2 Geological and hydrogeological maps, memoirs and borehole logs 5
2.1.3 Previous ground investigations and reports 5
2.1.4 Statutory services 5
2.1.5 Other 5
2.2 Limitations 6

3 Field Studies 7
3.1 Walkover Survey 7
3.2 Previous Ground Investigations 7
3.2.1 Paterson Building Ground Investigation 7
3.2.2 The Christie Imaging Centre Development (CASICD) Ground Investigation 7

4 Site Description 9
4.1 Site Location 9
4.2 Geography/Topography 10
4.2.1 Land Use 10
4.2.2 Site History 10
4.3 Geology 11
4.3.1 Borehole Records 12
4.3.2 Landslips 12
4.4 Natural Ground Hazards 12
4.5 Hydrology/hydrogeology 12
4.6 Environmental constraints 13
4.7 Mining and quarrying 13
4.8 Heritage and Archaeology 13
4.9 UXO risk 14
4.10 Waste/Landfill 14
4.11 Radon 14
4.12 Existing Building Information 14

5 Ground Conditions 15
5.1 General 15
5.2 Anticipated Strata 15
5.2.1 Made Ground 16
5.2.2 Devensian Till 17
5.2.3 Sandstone 17
5.2.4 Potential fault zone 18
5.2.5 Summary ground model 18
5.2.6 Summary of geotechnical parameters 19
5.3 Geo-environmental Laboratory Testing and Assessment 19
5.4 Groundwater and ground gas conditions 20
5.4.1 Groundwater 20
5.4.2 Ground gas 20

6 Preliminary Engineering Assessment 22
6.1 General 22
6.2 Foundations 22
6.3 Geotechnical constraints 22

7 Preliminary Contaminated Land Risk Assessment 23
7.1 Regulatory Context 23
7.2 Conceptual Site Model 24
7.2.1 Sources 24
7.2.2 Pathways 25
7.2.3 Receptors 25
7.2.4 Preliminary Conceptual Site Model 26

8 Geotechnical Risk Register 28

9 Conclusions and Recommendations 30
9.1 Geotechnical Risks 30
9.2 Contamination Risks 30
9.3 Recommendations 31
9.3.1 Ground Investigation 31

10 References 34

Appendices 35

A. Groundsure 36

B. Qualitative Contaminated Land Risk Assessment Methodology 37

C. Site Walkover 40

D. Zetica UXO Detailed Risk Assessment 43

E. Paterson Ground Investigation (CCG, 2019) 44

F. CASICD Interpretive Ground Investigation Report 45

G. Structural Calculations, Design of Modular Units (3E Consulting Engineers Ltd, 2008) 46

H. Factual Ground Investigation Report 47

Tables

Table 2.1: Existing Geotechnical Information 5
Table 4.1: Historical Land Use 10
Table 4.2: Summary of Natural Ground Hazards 12
Table 5.1: Indicative Ground Model 18
Table 5.2: Geotechnical parameters 19
Table 7.1: Preliminary Conceptual Site Model 26
Table 8.1: Geotechnical Risk Register 28

Figures

Figure 1.1: Site Location 3
Figure 4.1: Site Location Plan 9
Figure 4.2: Existing Site Plan 10
Figure 5.1: Christie Building geological cross section 16
Figure 9.1: Available Access for Ground Investigation 32
Figure C.1: Wilmslow Road pavement looking north 40
Figure C.2: Wilmslow Road pavement looking south 40
Figure C.3: Derek Crowther building entrance looking north 40
Figure C.4: Derek Crowther building entrance looking south 40
Figure C.5: Access Road looking east 41
Figure C.6: Access Road looking west 41
Figure C.7: South-west corner of Derek Crowther building, looking north 41
Figure C.8: West side of Derek Crowther building, displaying access to rooftop plant. 41
Figure C.9: Vegetation infringing on building footprint on the west side of Derek Crowther building 42

Figure C.10: North-east corner of Derek Crowther building, displaying limited access to northern perimeter 42
Figure C.11: Access Road looking west, halfway down road 42
Figure C.12: Derek Crowther building ground floor level raised above ground level 42

Executive summary

The existing Derek Crowther building at The Christie Hospital is formed of two storey modular units and is to be demolished. A new three storey building, the Proposed Northern Pathology Development, is to be constructed in its place to accommodate laboratory spaces, staff offices and plant space.

A link bridge is to be provided between the new and existing building that will cantilever from the proposed. The existing liquid nitrogen tank which is external to the existing Derek Crowther building, will be retained as part of the Proposed Northern Pathology Development.

The ground conditions on site are likely to comprise of Made Ground which is composed of material associated with current land use, overlying Till. The bedrock is comprised of the Wilmslow Sandstone Formation.

The primary geotechnical risks identified in this desk study are unconfirmed ground conditions due to lack of existing ground investigation data on the site and variable Made Ground.

A preliminary qualitative contamination risk assessment has been undertaken for the site, which indicates:

- The risk to site end users from site soils has been assessed to be low, as the site will be hardstanding on completion.
- The risks to construction workers have been assessed as moderate, due to the potential to come into contact with contaminated soil. This is to be mitigated by the Contractor through safe working methods, site-specific risk assessments and method statements under CDM.
- The risk to groundwater has been assessed as moderate to low due to production and vertical migration of leachates in unsaturated zone, vertical and horizontal movement within the saturated zone.
- The risk to above ground structures from potential ground gas has been assessed as very low.
- The risk to buried infrastructure have been assessed as moderate, however this is to be mitigated by the selection of appropriate concrete specification for the site.

Based on a review of the available information, it is recommended that a scheme specific ground investigation is undertaken to confirm the ground conditions and depth to bedrock across the site and to establish engineering properties for the underlying strata. Cable percussion boreholes with rotary follow-on is the primary recommended ground investigation technique to determine the stratigraphy and characteristics of the strata, including the depth to sandstone bedrock. Initially, this investigation will be undertaken in the east part of the site adjacent to the access road. Further investigation may be required once the existing building is demolished to determine the ground conditions across the site and refine the conceptual site model.

Groundwater monitoring installations are also recommended to characterise the groundwater regime beneath the site. Ground gas monitoring may be required, subject to the extent and composition of Made Ground encountered on site. The Till and sandstone bedrock are of low ground gas generation potential.

It is recommended that hand dug trial pits are undertaken around the north and west perimeter of the existing Derek Crowther building to establish the depth and composition of Made Ground and details of the adjacent boundary wall below ground construction.

It is recommended that a quantified risk assessment is undertaken following the procedures in Environment Agency Land Contamination: Risk Management (LCRM) guidance, in support of a method statement describing the measures to be applied during the construction phase. This minimises the potential formation of new migration pathways to controlled waters receptors and to classify excavated material for disposal purposes.

1 Introduction

1.1 Description of the Project

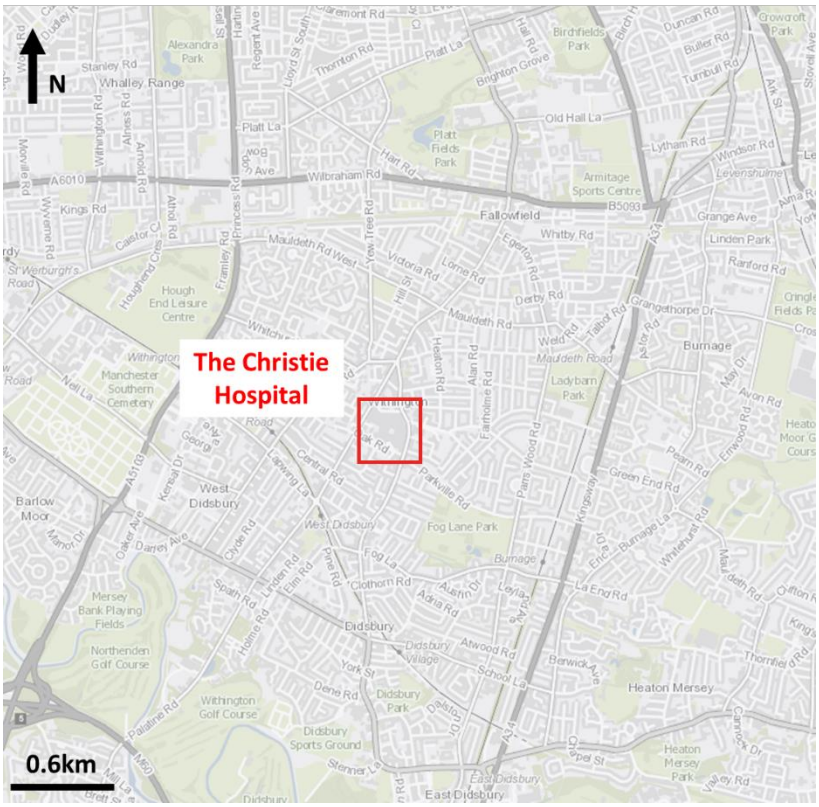
The existing Derek Crowther building at the Christie Hospital is formed of two storey modular units and is to be demolished. A new three storey building is to be constructed in its place to accommodate laboratory spaces, staff offices and plant space. The new development is referred to as the 'Proposed Northern Pathology Development'.

The proposed building incorporates isolated stairs and lift. These two elements are proposed to be utilised as cores to provide stability to the building. The rest of the superstructure is to be columns and slabs, which allow future flexibility. An additional link bridge will connect the new building to the existing main building. The current proposals utilise a piled foundation solution. It was noted that there are existing trees in close proximity to proposed red line boundary.

Mott MacDonald have been commissioned to provide Christie Charity works related to the development.

The Site is located on Wilmslow Road at the Northern end of The Christie Hospital, Greater Manchester, M20 4BX. The site is at easting and northing: 384887, 392661. Figure 1.1 shows the location of the Christie hospital within which the site of the Proposed Northern Pathology Development is located.

Figure 1.1: Site Location


N
The Christie Hospital
0.6km
Alexandra Park
Whalley Range
Platt La
Platt Fields Park
Wilbraham Rd
Old Hall La
Armitage Sports Centre
Fallowfield
Whitby Rd
Mauldeth Rd West
Mauldeth Rd
Hough End Leisure Centre
Manchester Southern Cemetery
Withington
West Didsbury
Fog Lane Park
Burnage
Ladybarn Park
Didsbury
Didsbury Village
Northenden Golf Course
Withington Golf Course
Didsbury Sports Ground
Didsbury Park
Heaton Mersey
Heaton Mersey Park
East Didsbury
Mersey Bank Playing Fields
Barlow Moor
Grange Ave
Linden Park
Ranford Rd
Grangethorpe Dr
Derby Rd
Victoria Rd
Lorne Rd
Egerton Rd
Heaton Rd
Alan Rd
Fairholme Rd
Parrs Wood Rd
Green End Rd
Parkville Rd
Central Rd
Clothorn Rd
Fog La
Atwood Rd
School La
Dene Rd
Stenner La
Chapel St
Valley Rd
Wilmslow Rd
Princess Rd
Kings Rd
Withington Rd
Almess Rd
Arnold Rd
Thornton Rd
Brighton Grove
Hall Rd
Birchfields Park
Duncan Rd
Buller Rd
Turnbull Rd
Lytham Rd
Windsor Rd
Grange Ave
Linden Park
Ranford Rd
Burnage
Avon Rd
Pecan Rd
Elmwood Rd
Whitehurst Rd
Maldeth Rd
Offton Rd
Thornfield Rd
Kingsway
Burnage La
La Eng Rd
Eric Dr
Leylia Dr
Alan Dr
Adria Rd
Alvin Dr
Atwood Rd
Berwick Ave
Cannock Dr
Crowcroft Park
Stovell Ave
Ash St
Levenshulme
Alma Rd
Yorkshire
Cringle Fields Pa
Cross
Heaton Moor G
Cours
Hillcrest Rd
Hill St
Whitchurch
Withington
Manchester Southern Cemetery
Neil La
Wellington Rd
Kenwal Dr
Oaker Ave
Darley Ave
Clyde Rd
Elm Rd
Spath Rd
Holme Rd
Palatine Rd
Mersey Bank Playing Fields
Northenden Golf Course
Withington Golf Course
Didsbury Sports Ground
Didsbury Park
Didsbury Village
Didsbury
West Didsbury
Fog Lane Park
Burnage
Ladybarn Park
Heaton Mersey
Heaton Mersey Park
East Didsbury
Barlow Moor
Manor Dr
Mauldeth Road
Mauldeth Road West
Wilbraham Rd
Platt La
Old Hall La
Armitage Sports Centre
Fallowfield
Whitby Rd

1.2 Purpose of this Report

The aims of this geotechnical and geoenvironmental desk study are to:

- Review and summarise the available existing geological and geotechnical information relating to the site. This includes a review of geological maps and publications, reports from previous ground investigations and a summary of historical development of the site.
- Summarise available information and identify site-specific geotechnical and geoenvironmental hazards and risks which may place constraints upon the proposed development site.
- Identify and evaluate all potential sources and impacts of any ground contamination, groundwater contamination and/or ground gas relevant to the site.
- Develop a preliminary conceptual site model (CSM), assessing potential risks from construction activities and ongoing planned activities on site.
- Provide recommendations for further assessment including indicative minimum key ground investigation requirements.

Mott MacDonald Restricted

2 Sources of Information and Desk Study

2.1 Sources of information

The following documents have been reviewed during the compilation of this desk study.

2.1.1 Topographic maps

Topographic imagery has been supplied by Groundsure [1], including an extract from:

- 1:1,250 Ordnance Survey MasterMap

2.1.2 Geological and hydrogeological maps, memoirs and borehole logs

Geological mapping has been supplied by Groundsure [1], including an extract from:

- Bedrock and superficial geology British Geological Survey 1:10,000 and 1:50,000 scale mapping

In addition, the British Geological Survey (BGS) borehole log database GeoIndex [2] has been used to provide information on the anticipated ground conditions.

2.1.3 Previous ground investigations and reports

A ground investigation for the Paterson Redevelopment Project [3] which is present on the hospital site to the south of the site has been reviewed and is contained in Appendix E.

A ground investigation was undertaken for The Christie Imaging Centre Development (CASICD) [4], which borders the site to the south. The outcome of this investigation is reported in a Ground Investigation Report (GIR), report no. CASICD-MMD-XX-XX-RP-C-00002. This report can be found in Appendix F.

Eighteen further exploratory hole locations are present within 200m of the site, shown in BGS GeoIndex, however they are all confidential and have not been reviewed.

Table 2.1: Existing Geotechnical Information

Title	Date
The Christie, Manchester Paterson Redevelopment Project Report No. CCG-C-18-10614	April 2019
The Christie Imaging Centre Development, Factual Report No. CASICD-GRM-XX-ZZ-RP-C-000001-P01	May 2024

2.1.4 Statutory services

A statutory services search will be conducted prior to any construction.

2.1.5 Other

- Various PDF datasets acquired for the scheme from Groundsure, report No. GS-WUK-MXS-KSH-5HI, dated 7th May 2024.
- BGS Lexicon of Named Rock Units: http://www.bgs.ac.uk/lexicon/
- BGS Memoir to Sheet 98, Geology of the Country around Stockport and Knutsford
- Magic Interactive Mapping: https://magic.defra.gov.uk/MagicMap.aspx
- Zetica UXO: https://zeticauxo.com/

- UK Health Security Agency, UK maps of radon: https://www.ukradon.org/information/ukmaps
- Structural calculations for the existing Modular Building (October 2008)

2.2 Limitations

This document has reviewed the above information related to the site extent. No guarantee can be given of its accuracy.

3 Field Studies

3.1 Walkover Survey

An initial structural site walkover was undertaken by a Mott MacDonald structural engineer on 29th April 2024 and 16th May 2024. Access inside the existing building was not permitted during the visit but it is understood to be used for stem cell research.

Most of the site footprint is occupied by the existing Derek Crowther building and an access road which runs east/west across the site. As such, there was limited opportunity to view the existing ground. There are some areas of soft landscaping around the east and north perimeter of the existing building however access was not made available to this area during the site walkovers. It was noted that there are existing trees in close proximity to proposed red line boundary.

Photos from the walkover are presented in the site walkover note presented in Appendix C.

3.2 Previous Ground Investigations

3.2.1 Paterson Building Ground Investigation

An intrusive ground investigation was previously undertaken for the Paterson Building on the hospital grounds, south of the site. A Factual Report was produced in April 2019 by CC Geotechnical Ltd on behalf of Ove Arup & Partners Ltd (Arup) and Interserve Construction Limited [3]. A Contamination Risk Assessment was also produced by Arup.

The ground investigation was undertaken by CC Geotechnical Ltd in January and February 2019 with the scope of the ground investigation comprising:

- 4No. cable percussion with rotary core follow-on boreholes
- 1No. window sample borehole
- 3No. machine excavated trial pits.
- 9No. hand dug foundation inspection pits.
- 3No. falling head permeability tests.
- 3No. combined gas and groundwater monitoring installations.
- Geotechnical & geo-environmental contamination testing.

The report is contained in Appendix E.

3.2.2 The Christie Advanced Imaging Centre Development (CASICD) Ground Investigation

An intrusive ground investigation was undertaken for the proposed Christie Imaging Centre Development, which borders the site to the south. An interpretive report of this investigation was reviewed in developing this desk study [4].

The ground investigation was undertaken by GRM Development Solutions Ltd in April and May 2024 with the scope of the ground investigation comprising:

- 4No. cable percussion with rotary core follow-on boreholes
- 3No. windowless sample boreholes
- 7No. hand dug foundation inspection pits.

- 2No. groundwater monitoring installations.
- Geotechnical testing.
- Geo-environmental contamination testing compassing of 12 soil, five soil leachate and six Waste Acceptance Criteria (WAC) tests.

The factual report is contained in Appendix H.

3.2.2.1 Summary of geo-environmental assessment

Following the ground investigation, a generic quantitative risk assessment (GQRA) was undertaken in accordance with relevant UK guidance such as the Environment Agency's LCRM guidance [20].

The GQRA concluded an overall low risk to relevant human health and controlled water receptors. However, it was noted that asbestos may be present within the existing building, including unmanaged those within existing basements, associated with the age of the current buildings on site, which date from the 1930s.

The risk posed by elevated ground gases is considered to be low, hence no specific ground gas protection measures are considered to be necessary in the construction of new buildings within the site.

Findings of the assessment concluded that a remediation strategy is not required for the development.

Based on the waste acceptance criteria test conducted on soils, it was considered likely that excavated soils could be disposed of in a non-hazardous landfill given only marginal failures in relation to inert waste requirements. However, it was recommended that any material disposal is discussed with a suitably qualified waste contractor to allow them to make their own assessment. Further details of the geo-environmental assessment are provided in Sections 5.3 and 5.4

4 Site Description

4.1 Site Location

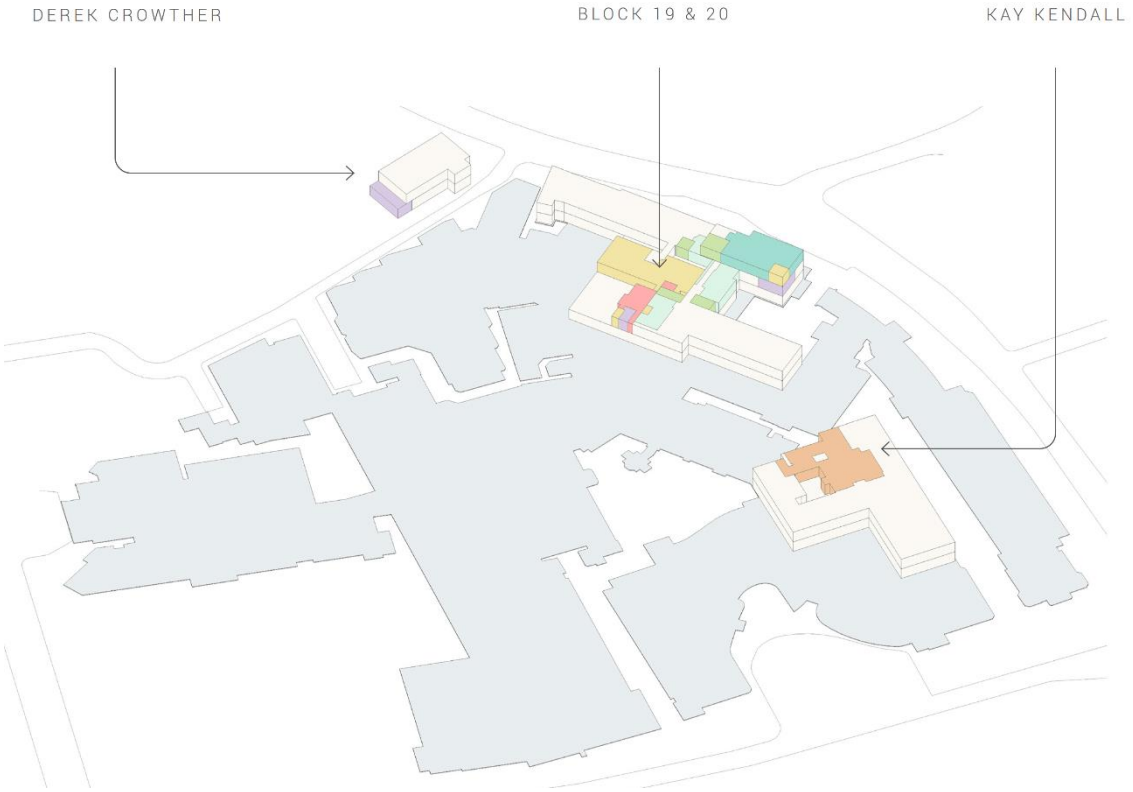
The Christie Hospital campus is located within Withington, Greater Manchester. The existing Derek Crowther building is situated in the north-east corner of the Christie Hospital campus. The site is bounded to the east by Wilmslow Road, shops and residential housing/gardens to the north and other hospital buildings to the south and west. The site location plan is shown within the red line boundary in Figure 4.1.

The existing Christie Derek Crowther building is formed of two storey modular units and is to be demolished and a new three storey building, the Proposed Northern Pathology Development, is to be constructed in its place in the north-east corner of the site with a new link bridge constructed between the new and existing building. The footprint of the proposed building will be larger than the existing but will not extend into the access road that runs east/west through the site.

It was noted that there are existing trees in close proximity to proposed red line boundary.

Figure 4.1: Site Location Plan (red line boundary shown indicatively)

Figure 4.2: Existing Site Plan



Source: Adapted from Day Architectural Appraisal Presentation

4.2 Geography/Topography

The site is relatively flat at approximately 35m above ordnance datum (AOD).

4.2.1 Land Use

The site is part of the Christie Hospital, described above in Section 4.1.

4.2.2 Site History

Historical mapping, provided by Groundsure [1], has been reviewed. The Groundsure report is included as Appendix A.

A summary of the historical development of the study area is presented in Table 4.1.

Table 4.1: Historical Land Use

Year (Scale)	Site History
1849 (1:10,560)	The site comprises of fields. A road is adjacent to the site, mostly following the present-day alignment of Wilmslow Road. Surrounding land use within 500m is agricultural / rural in nature, with no commercial / industrial land use of note.
1881 (1:2,500)	The site is now identified as being part of 'Tatton View', with a building immediately north of the site with trees in the site location. There have been residential developments in the surrounding area, making the area less rural / agricultural in nature. The present-day residential houses west of the site have been built.
1893 - 1922 (various)	Several buildings have been built on the site location, with a main building situated on the centre west of the site. Generally, little to no change off site.

Mott MacDonald Restricted

Year (Scale)	Site History
1934 (1:2,500)	'Christie Hospital & Holt Radium Institute' is constructed south of the site. A mortuary is shown in the central southern area of the site. There is further residential development off the site which is starting to resemble much of the present-day arrangement.
1957 - 1975 (various)	Hospital access road immediately south of the site is shown to be present. The mortuary is no longer named, and the building layout has changed. A telephone box is shown on the north east corner of the site and development of hospital building south of the site resembles much of the present-day layout. In 1958, buildings on the east area of the site have been demolished. There is nothing recorded on site of the existing modular building. In 1958, number 18 in the row of residential housing west of site has been demolished. Little to no further change on site and off site.
1993 (1:1,250)	The hospital access road now shown to have junction/access onto the site, potentially for use as a car park. Little to no further change on site and off site.
2000 (aerial image)	The car park is shown to be present on site. Gardens/trees to the west of the site in present-day location.
2001 (1:10,000)	Little to no further change on site and off site.
2009 (aerial image)	Modular building has been built in present-day location on the site. Little to no further change on site and off site.
2024 (1:10,1000)	Generally, little to no change on site and off site.

4.3 Geology

The BGS 1:10,000 and 1:50,000 scale geological maps, provided by Groundsure [1], have been reviewed and indicate the site to be underlain by superficial Devensian Till, underlain by the Wilmslow Sandstone Formation (part of the Sherwood Sandstone Group). The Chester Pebble Beds Formation is indicated to be present at the south-west of the site. Artificial ground is not shown to be present on the site, however, is likely to be present given the current/historical land use.

The BGS Lexicon states that the Devensian Till is likely to comprise *"unsorted and unstratified drift, generally over-consolidated, deposited directly by and underneath a glacier without subsequent reworking by water from the glacier. It consists of a mixture of clay, sand, gravel, and boulders varying widely in size and shape (diamicton)."* [5]

The BGS Lexicon states that the Wilmslow Sandstone Formation is likely to comprise *"red-brown to brick-red, fine to medium grained, generally pebble free, cross-bedded sandstones, with sporadic siltstones."* [5]

The BGS Lexicon states that the Chester Formation comprises of "*conglomerates and reddish brown, cross-bedded, pebbly sandstones with subordinate beds of red-brown mudstone."* [5]

The BGS 1:10,000 Map, provided by Groundsure [1], indicates the south west site boundary is bound by a normal fault trending northwest to southeast, down throwing to the northeast. The fault lines mark the boundary between the Wilmslow Sandstone and the Chester Formation. The Chester Formation is indicated to be dipping 10 degrees to the east.

The geological memoir for the area [6] describes the 'Keuper' Sandstone (previous obsolete name for the Sherwood Sandstone Group) as a fine to medium grained brown to buff sandstone. The memoir labels the fault on the south west of the site as the Cheadle Heath Fault, which is a continuation of the Pendleton Fault of Manchester.

The site is not located within a Coal Mining Reporting Area.

Mott MacDonald Restricted

4.3.1 Borehole Records

A ground investigation was undertaken for the Christie Advanced Imaging Centre Development which borders the site to the south. A separate ground investigation was undertaken for the Paterson Building, approximately 150m south of the site. A summary of the exploratory holes associated with the adjacent ground investigations is presented in Section 5.

A trial hole undertaken prior to the deployment of the existing Derek Crowther modular building, revealed car park construction overlying medium soft to firm brown clay. Further excavation showed this overlaid medium dense sand. The calculations state an assumed a bearing pressure of 100kN/m^2, in the absence of test data [7].

4.3.2 Landslips

There are no recorded landslips within 500m of the site boundary [1].

4.4 Natural Ground Hazards

Table 4.2 summarises the natural ground hazards across the site.

Table 4.2: Summary of Natural Ground Hazards

Hazard	Risk within site	Details/description
Shrink / swell	Very low	BGS records [1] indicate the whole site is classified as: Ground conditions predominantly low plasticity
Running sands	Very low	BGS records [1] indicate the whole site is classified as: Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly
Compressible ground	Negligible	BGS records [1] indicate the whole site is classified as: Compressible strata are not thought to occur
Collapsible ground	Very low	BGS records [1] indicate the whole site is classified as: Deposits with potential to collapse when loaded and saturated are unlikely to be present.
Landslide stability	Very low	BGS records [1] indicate the whole site is classified as: Slope instability problems are not likely to occur
Ground dissolution	Negligible	BGS records [1] indicate the whole site is classified as: Soluble rocks are either not thought to be present within the ground, or not prone to dissolution. Dissolution features are unlikely to be present.

4.5 Hydrology/hydrogeology

There are no water courses in the site area. Shaw Brook, a stream, is present 150m north of the site.

The site is not located within a designated Flood Zone so therefore, has a less than 1 in 1000 chance of river and coastal flooding. There is negligible risk of surface water flooding on the majority of the site – there is a 1 in 1000 year (depth greater than 1m) risk of surface flooding in the south west corner of the site. There is a 1 in 30 year (depth of 0.3 – 1m) risk of surface water flooding within 50m of the site. There is a moderate risk of groundwater flooding on site, with a moderate to high risk of groundwater flooding within 50m to the west of the site.

The superficial Till underlying the site is designated by the Environment Agency as Secondary Undifferentiated. Secondary Undifferentiated is defined as “Assigned where it is not possible to attribute either category A or B to a rock type. In general, these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type” [1].

The bedrock geology of the Wilmslow Sandstone and Chester Formation are designated as a Principal Aquifer. Principal Aquifers are defined by the Environment Agency as “Geology of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale” [1].

The site has a Secondary superficial aquifer - Medium Vulnerability classification [1].

According to MAGIC maps [16] the site area is not located within a Drinking Water Safeguard Zone (groundwater or surface water), Drinking Water Protected Area or designated Source Protection Zone 1, Zone 2 or Zone 3. There are no recorded groundwater or surface water abstractions within 1km of the site.

4.6 Environmental constraints

There are no designated environmentally sensitive sites within 0.5km of the site [1]. However, the site is located within a SSSI Impact Risk Zone.

4.7 Mining and quarrying

There are no active or closed surface or underground workings recorded on site or within 500m of the site. There are no recorded BritPits or Historical Mineral Planning Areas within 500m of the site. There are no coal mining or non-coal mining areas within 500m of the site [1].

There are two historical surface ground workings, identified from historical mapping, within 250m of the site:

- Water body – 163m south east
- Pond – 241m south west

4.8 Heritage and Archaeology

There are three listed buildings within 250m of the site:

- Red Lion Inn – Grade II listed, 83m north
- Milestone Adjacent to Withington Fire Station – Grade II listed, 129m north
- Church of St Paul – 214m north

The site is located within the Withington Conservation Area.

Greater Manchester Archaeological Advisory Service (GMAAS) have reviewed the Site and do not consider there to be any features of archaeological significance present on the Site. A Letter from GMAAS supporting this conclusion is submitted in support of the planning application.

4.9 UXO risk

An Unexploded Ordnance (UXO) risk map has been viewed through the Zetica website [8] which shows that the site is in an area with a moderate risk of unexploded bombs.

A detailed UXO Risk Assessment was undertaken by Zetica UXO, which assessed the site as being at low risk of Unexploded Ordnance [9]. The report concludes that no additional measures are considered essential to reduce the UXO risk on the site to as low as reasonably practicable.

4.10 Waste/Landfill

A review of Environment Agency and BGS datasets included within the Groundsure report, indicates that there are no recorded active or historical landfills located on site or within 500m of the site.

4.11 Radon

UK Health Security Agency radon maps [8] for the site identify that the site is in the lowest band of radon potential, with less than 1% of homes at or above the Action Level.

4.12 Existing Building Information

At the time of writing, civil and structural drawings of the existing modular building are not available. However, structural calculations for the substructure have been reviewed.

The calculations show a trial hole undertaken prior to deployment of the existing modular building, revealed car park construction overlying medium soft to firm brown clay. Further excavation showed this overlaid medium dense sand. No geotechnical or geoenvironmental test data was carried out on any samples recovered. The calculations note an assumed safe ground bearing pressure of 100kN/m^2 for the foundation design. No borehole logs were included in the information received.

The modular units are said to be founded on deep mass concrete pad foundations taken down to sand bearing strata. The foundations have concrete upstands which provide a contact point for the modular units to bear onto above ground level. The structural calculations are included as Appendix G.

5 Ground Conditions

5.1 General

The previous ground investigation information, primarily the 2024 ground investigation for the CASICD and the 2019 ground investigation for the Paterson Building (both adjacent to the southern site boundary), has been reviewed to give an understanding of the ground conditions in the area.

5.2 Anticipated Strata

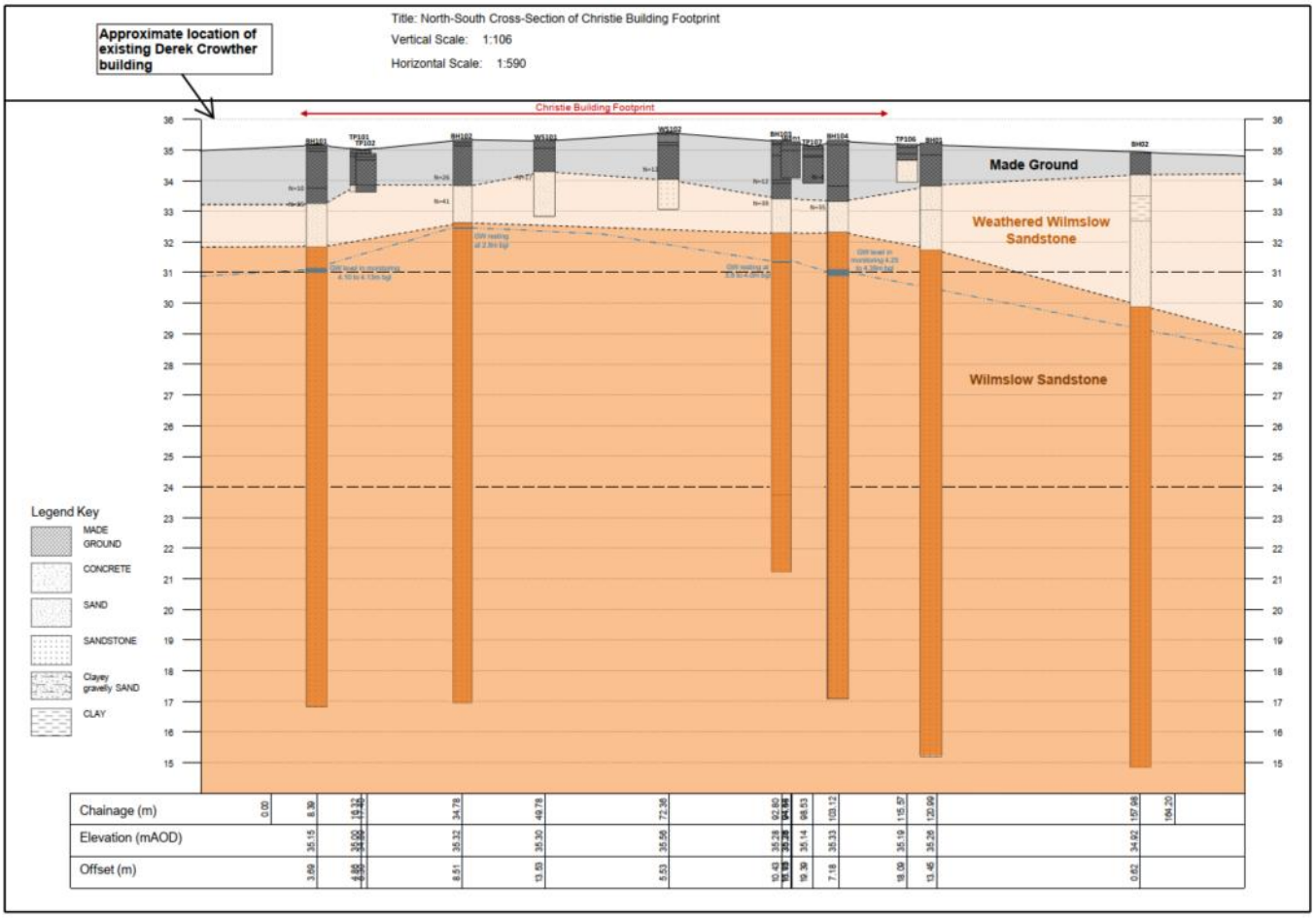
The following strata are anticipated to be found on site:

- Made Ground
- Devensian Till
- Wilmslow Sandstone Formation

A cross section of the Christie Building footprint using exploratory holes from the CASICD ground investigation is given in Figure 5.1 – the existing Derek Crowther building is located immediately to the north of this section.

It should be noted that Devensian Till was not identified in the CASICD ground investigation, so is not shown on the section in Figure 5.1, however was present in the Paterson Building ground investigation. Site specific ground investigation is required in order to confirm if Till is present on site.

Figure 5.1: Christie Building geological cross section



Source: Adapted from The Christie Advanced Scanning and Imaging Centre Development (CASICD) Ground Investigation Report, Mott MacDonald (2024), Report no. CASICD-MMD-XX-XX-RP-C-00002

5.2.1 Made Ground

Both the Paterson Building ground investigation and the CASICD ground investigation identified Made Ground to be present in all exploratory holes to depths of between 0.45m and 2.20m [34.72m AOD – 35.26m AOD].

In the Paterson GI, the Made Ground typically comprised a horizon of topsoil or tarmac/asphalt, overlying brown clayey, sandy gravel. The granular content typically comprised of brick, limestone, concrete and sandstone.

In the CASICD GI, the Made Ground varied across the site. The top layer was described as either tarmac or brick paving. Underneath the top layer, the Made Ground is typically described as medium dense gravelly sand or sandy gravel. The gravel is generally comprised of brick, limestone, tarmac and sandstone. In some locations, there are also 0.5m thick layers of soft to firm gravelly sandy clay underneath the sand. In BH103, a 0.1m thick layer of weak concrete was present at 1.3m BGL.

Organic material was also noted to be present. No visual or olfactory evidence of contamination was recorded in the exploratory hole logs.

Due to the nature of Made Ground and the site's history, the composition and thickness of the Made Ground on site may vary from these investigations.

6No. Particle Size Distribution tests were undertaken on granular Made Ground. The PSD tests on the granular Made Ground show 65-99% sand with the rest made of a small proportion of silt/clay/gravel. 2No. Particle Size Distribution tests were undertaken on cohesive Made Ground, which show 25-32% silt/clay, with the rest made up as sand and gravel.

5.2.2 Devensian Till

Devensian Till was present in the Paterson Building ground investigation to depths of between 2.20m BGL and 2.70m BGL [31.43m AOD - 33.06m AOD]. Till was not identified in the CASICD ground investigation.

The Till deposits typically comprised either clayey, silty, gravelly SAND or sandy, silty CLAY. The granular Till deposits were typically loose to medium dense with SPT N values of between 7 and 15. The cohesive Till deposits were typically firm to stiff with SPT N values of between 10 and 22. In-situ hand vane penetrometer readings were taken within the cohesive Till with reported values of between 50kPa and 110kPa.

3No. Particle Size Distribution tests were undertaken on granular Till deposits and 1No. test on cohesive Till deposits. The PSD tests on the granular Till deposits typically classified as clayey, silty, gravelly, fine to coarse grained SAND. The PSD test on the cohesive Till deposits classified as slightly sandy, slightly gravelly, silty CLAY.

1No. Atterberg limit tests was undertaken on granular Till deposits and 4No. tests on cohesive Till deposits. The test on the granular Till gave a Plasticity Index of 15%, the tests on the cohesive Till gave a range Plasticity Index results of 7-31%.

1No. consolidated undrained triaxial test with pore water pressure measurement was undertaken on the cohesive Till and the resulting shear strength parameters reported for cohesion was 11kPa and an angle of shearing resistance of 21.5°.

5.2.3 Sandstone

In the Paterson Building ground investigation, weathered sandstone was present to depths of between 3.50m BGL and 5.00m BGL [29.92m AOD - 31.76m AOD]. In the CASICD ground investigation, weathered sandstone was present to depths of between 1.50m BGL and 3.30m BGL [33.25 AOD – 33.82m AOD]. The weathered sandstone was typically recovered as medium dense to dense, fine to coarse red/brown sand. The sandstone recovery within the weathered zone was often non-intact.

In the CASICD ground investigation, beneath the weathered sandstone, the underlying competent sandstone was typically described as extremely weak to weak reddish/orangish brown fine to medium grained Sandstone. Generally, there are two - three discontinuity sets, described as widely spaced, sub-horizontal, planar, rough, open. Locally recovered as sand or with no recovery.

The CASICD ground investigation shows areas of low rock quality designation (RQD) values with depth in the sandstone. The results show areas with RQD values of <20, including areas of 0, between 9.80m BGL and 18.30m BGL [18.85m AOD - 22.8m AOD]. This correlates with log comments of core loss and heavily weathered descriptions.

Due to the location of the Paterson Building, the sandstone encountered during this GI is likely to be part of the Chester Formation, whereas the bedrock underlying CASICD and the site is anticipated to be the Wilmslow Sandstone Formation. The Wilmslow Sandstone Formation is typically finer grained and less pebbly than the Chester Formation, however the depth to bedrock is unlikely to vary significantly.

It is noted that the Sherwood Sandstone (Wilmslow and Chester Formation) in and around the area of Manchester can sometimes exhibit a completely weathered upper horizon, sometimes extending to significant depths.

In the Paterson and CASICD GIs, 49No. point load tests were undertaken on the core samples of sandstone and reported point load index values of between 0.01MPa and 0.32MPa with estimated uniaxial compressive strengths, where calculated, of between 1.18MPa and 6.31MPa. UCS tests on the sandstone reported values of between 0.84MPa and 13MPa for the sandstone. Using the CASICD GI, a site specific correlation of UCS = $24I_s(50)$ (axial) has been determined.

The Elastic Modulus and Poisons Ratio were also measured to be between 0.133GPA and 3.74GPA and between 0.25 and 0.32 respectively.

Several sandstone samples from the CASICD GI could be tested for UCS due to the sample being broken into short pieces before any testing has been done.

5.2.4 Potential fault zone

As mentioned in Section 4.3, there is an identified fault recorded in BGS mapping on the south west site boundary. In the CASICD GI, boreholes were located to identify where this fault zone might be present beneath the CASICD site.

Core recovery parameters, recorded as part of the CASICD GI, showed no evidence of a fault zone beneath the site. A notable drop in core recovery parameters would be anticipated should faulted bedrock be present. No such relationship was observed in the plots.

There are numerous reasons why the fault recorded in BGS mapping may not have been identified as part of the CASICD GI:

- The recorded fault may dip steeply beneath the site and may be present at depths greater than that investigated.
- The presence of the fault may have been obscured by poor core recovery in what is generally weak Sandstone.
- The mapped fault may not extend to rockhead and may be present at significant depth beneath the surface.

5.2.5 Summary ground model

A summary of the anticipated geology on site, based on the levels of the Paterson Building ground investigation, is included below in Table 5.1.

Table 5.1: Indicative Ground Model

Stratum	Depth to top of stratum (mbgl)	Elevation of top of stratum (mAOD)*	Thickness (m)
Made Ground**	0	34.72 – 35.26	0.45 - 2.20
Devensian Till*	0.70 – 2.20*	32.52 – 34.22*	0.50 - 2.20*
Weathered Sandstone	0.45 – 2.70	31.43 – 33.06	0.70 - 2.80
Extremely weak to weak Sandstone (Wilmslow Formation)	2.70 – 5.00	29.92 – 31.76	Not proven

*only present in Paterson GI - may not be present on site
**the thickness of the Made Ground shall be determined through a site-specific ground investigation.

5.2.6 Summary of geotechnical parameters

A summary of the geotechnical parameters, based on the testing in the Paterson Building and CASICD ground investigations, is included below in Table 5.2.

Site specific data is necessary before use of parameters in design.

Table 5.2: Geotechnical parameters

Stratum	γbulk (kN/m3)	cu (kPa)	φ (°)	c' (kPa)	UCS (MPa)
Made Ground (granular)**	19	-	34	0	-
Made Ground (cohesive)**	18	40	24	0	-
Devensian Till*	18	50 - 110	21.5*	11*	-
Weathered Sandstone	19	-	37	0	-
Sandstone	21.5	-	40	40	1.8

*based on Paterson Building results only
**parameters for Made Ground shall be confirmed through a site-specific ground investigation prior to their application in design

5.3 Geo-environmental Laboratory Testing and Assessment

The 2024 CASICD investigation conducted geo-environmental laboratory testing on 12 soil samples, five soil leachates. Six waste acceptance criteria (WAC) tests were also conducted. An Arup contamination risk assessment based on the 2019 ground investigation for the Paterson Building noted that 23no. soil samples were tested for a suite of contaminants, including the following: Antimony, arsenic, beryllium, cadmium, chromium (total), copper, lead, mercury, nickel, selenium, vanadium, zinc, chromium (VI) total cyanide, water soluble boron, total organic carbon and total phenols.

The results were compared against generic assessment criteria (GAC) for a commercial end-use with an organic matter content of 6%. Of the 23no. samples tested, there were no exceedances of the GAC, nor were there any notably elevated concentrations of contaminants.

As part of the CASICD ground investigation, targeted geo-environmental investigation was conducted in accordance with established procedures including; BS10175 (BSI, 2011 +A2:2017, BS5930 (BSI, 2015 +A1:2020) and LCRM guidance, Environment Agency, (2020+A2:2023).

Made Ground was encountered on-site during the CASICD ground investigation. It was composed of varying lithologies, including anthropogenic inclusions of brick, concrete, tarmacadam, and to lesser occurrences of asphalt, ceramic, and tile. No visual or olfactory evidence of contamination was recorded during the ground investigation fieldwork. The Made Ground encountered on the site is likely associated with backfilling of excavations during the construction of the existing Christie Hospital building.

Twelve soil samples collected from the CASICD ground investigation were tested for a suite of organic and inorganic determinants, including metals, phenols, cyanide, hydrocarbons, polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs), pH and asbestos.

A comparison of the available soil laboratory test results from the CASICD ground investigation against GAC for a commercial end-use with an organic matter content of 1%, identified no

exceedances of the GAC. No suspected asbestos containing materials were identified in the exploratory hole logs and laboratory screening confirmed that asbestos was absent in the soil samples tested.

Six selected soil samples were subjected to soil leachate testing. Leachate extract from soil recorded generally low-level exceedances of the UK Drinking Water Standards for several determinants including iron, ammoniacal nitrogen as N and phenol. These exceedances are not considered to pose an unacceptable risk to controlled waters.

Summary of the contaminated land risk assessment based on the CASICD ground investigation is presented in section 3.2.2.1.

5.4 Groundwater and ground gas conditions

5.4.1 Groundwater

No groundwater strikes were encountered within any of the exploratory holes in the Paterson Building ground investigation.

During the Paterson Building ground investigation, groundwater monitoring standpipes were installed in 3No. boreholes at 2.30mBGL, 3.00mBGL and 5.00mBGL. Groundwater was only recorded within the deepest standpipe with a standing water level of approximately 4.00mBGL.

During the CASICD ground investigation, groundwater level across the site was consistently recorded close to rockhead within the Wilmslow Sandstone, between 2.8m and 4.2mBGL. Groundwater monitoring standpipes were installed within two boreholes.

Two monitoring visits were reported (in April and May 2024), which gave the depth to groundwater between 4.10 and 4.39mBGL.

5.4.1.1 Permeability

3No. falling head tests were performed in the three boreholes in the Paterson Building ground investigation which included standpipe installations. The permeability test response zones were situated within the Devensian Till and Sherwood Sandstone Group. The falling head tests all indicated permeability of the order of 10^{-7} m/s.

5.4.2 Ground gas

Gas monitoring was carried out within 3No. monitoring installations in the Paterson Building ground investigation, and a total of 4No. monitoring visits were undertaken between 13th February 2019 and 4th March 2019. All the response zones were located within the Made Ground. The monitoring readings were taken during dry conditions and rising pressure trends, and therefore the recorded gas flow rates may not be at their highest.

The maximum methane (CH_4) and carbon dioxide (CO_2) concentrations recorded were 0.0% and 5.8% volume respectively.

It was recommended in the Arup Contamination Risk Assessment that the Paterson Building site is characterised as Characteristic Situation (CS) 1 with a very low hazard rating.

During the CASICD investigation, no ground gas monitoring was undertaken. This is due to the Made Ground soils' recorded low organic content (sand and gravel material are not degradable so cannot produce methane or carbon dioxide), the absence of putrescible materials and absence of olfactory or visual evidence of contamination.

The overall risk of the accumulation of elevated ground gas beneath the proposed development is considered low, based on the absence of any appreciable source of elevated ground gases within the Made Ground or from within the solid strata.

6 Preliminary Engineering Assessment

6.1 General

The existing Derek Crowther building at the Christie Hospital is formed of two storey modular units and is to be demolished. A new three storey building is to be constructed in its place to accommodate laboratory spaces, staff offices and plant space. The new development is referred to as the 'Proposed Northern Pathology Development'.

The proposed building incorporates isolated stairs and lift. These two elements are proposed to be utilised as cores to provide stability to the building. The rest of the superstructure is to be columns and slabs, which allow future flexibility. An additional link bridge will connect the new building to the existing main building. It was noted that there are existing trees in close proximity to proposed red line boundary. The existing liquid nitrogen tank which is external to the existing Derek Crowther building, will be retained as part of the Proposed Northern Pathology Development.

6.2 Foundations

Based on the anticipated ground conditions and building proposal, it is envisaged that a piled foundation solution will be required. Competent intact sandstone is likely to be the favoured bearing stratum for the proposed building, which is indicated to be present at a depth of approximately 2.70m - 5.00m BGL. This needs to be confirmed with site specific ground investigation.

6.3 Geotechnical constraints

The following constraints and engineering considerations have been identified:

- Composition and thickness of Made Ground is unknown.
- Depth to bedrock on the site is unknown.
- Weathering profile of the Wilmslow Formation is unknown.
- Presence of fault on the south west site boundary.
- Groundwater level on the site is unknown.

7 Preliminary Contaminated Land Risk Assessment

7.1 Regulatory Context

New development is regulated under the Town and Country Planning Act 1990. This regime provides a mechanism for the planning authority to enforce the proper investigation of a development site to ensure that once development has occurred, the site is suitable for its intended use. In England, the National Planning Policy Framework (NPPF) provides guidance on the implementation of contaminated land and pollution management requirements to address contamination risks associated with future site uses through the planning system. Paragraphs 196, 197 and 198 of the NPPF state the following:

- 196: Planning Policies and decisions should ensure that:

a) a site is suitable for its proposed use taking account of ground conditions and any risks arising from land instability and contamination. This includes risks arising from natural hazards or former activities such as mining, and any proposals for mitigation including land remediation (as well as potential impacts on the natural environment arising from that remediation);

b) after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990 [11]; and

c) adequate site investigation information, prepared by a competent person, is available to inform these assessments.

- 197: Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner.
- 198: Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and

c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.

This report adopts a strategy for the assessment of potential risks from land contamination in accordance with the requirements of the NPPF. Particular reference is made to CIRIA C552 [12] and the Environment Agency (EA) LCRM online guidance [13].

Following the procedures in LCRM, a key element of the Preliminary Risk Assessment is the development of a conceptual model which may be refined or revised as more information and understanding is obtained through the risk assessment process. The conceptual model is described in terms of the contaminant Sources, transport pathways and possible receptors that

may be present, and the potential 'Pollutant Linkages' between them, as defined in the relevant legislation and guidance.

. The contaminated land risk assessment methodology is detailed further in Appendix B.

7.2 Conceptual Site Model

The preceding Sections have summarised available information for the site and have been used to inform this Preliminary Risk Assessment. The Proposed Development will be the demolition of the existing Christie Derek Crowther and the construction of a new three storey building to accommodate Histology, Blood Sciences and Transfusion departments.

A key element of an environmental risk assessment is the development of a Conceptual Site Model (CSM) which is done by undertaking a Source – Pathway – Receptor analysis of the site:

- Sources (S) are potential or known contaminant sources e.g., arising from a former land use, specific pollution event.
- Pathways (P) are environmental systems through which a contaminant could migrate e.g., air, water.
- Receptors (R) are sensitive environmental receptors that could be adversely affected by a contaminant e.g., site end-users, groundwater.

Where a Source, relevant Pathway and Receptor are present, a pollutant linkage is considered to exist whereby there is a circumstance through which environmental harm could occur, and a potential environmental liability is considered to exist.

It is assumed that a robust Construction Environmental Management Plan (CEMP) will be adopted for any construction works, and as a result no contamination will occur during construction (e.g. fuel leaks and spills). Similarly, it is assumed that no contaminated material will be brought onto site for the proposed development, which may act as a potential contaminant source, with only clean, inert materials used.

Potential Sources, Pathways and Receptors identified for the site are presented below, with the Preliminary CSM for the site presented within Table 7.1.

7.2.1 Sources

The following sources are considered to potentially be present:

- S1: Made Ground on site – Made Ground is anticipated on site from historical buildings that have been demolished, and as the development platform for the existing above ground structures. The wider site area has been occupied by The Christie Hospital since the early 1930s (first mapped on 1934 mapping as 'Christie Hospital & Holt Radium Institute'), with Made Ground identified adjacent to the site associated with construction of the existing hospital structures. Given the age of the development, Made Ground may contain elevated concentrations of heavy metals, organic compounds (e.g., fuel oils / solvents) and asbestos.
- S2: Wilmslow Road surface water run-off – the site is located adjacent to Wilmslow Road, where elevated heavy metals and organic compounds (e.g., accidental fuel spills) from motorised road traffic may have entered surface water drainage systems and percolated towards the site.
- S3: Hazardous ground gases associated with underlying ground material – the site is anticipated to be underlain by Made Ground (of unknown composition), overlying superficial Glacial Till deposits which are underlain by sandstone bedrock of the Wilmslow Sandstone Formation and the Chester Formation. The Glacial Till and sandstone bedrock are not considered to be credible sources of hazardous ground gases, with the Made Ground

Mott MacDonald Restricted

potentially a credible source of hazardous ground gases (arising from degradable material potentially within it, and the potential historical spillage of organic compounds (e.g., petroleum hydrocarbon, chlorinated solvents)).

- S4: Underlying ground material – the site is anticipated to be underlain by Made Ground overlying Glacial Till and sandstone bedrock of the Wilmslow Sandstone Formation and the Chester Formation. The geochemical condition of these strata may potentially pose an aggressive environment to buried concrete and cementitious structures and services.

Note that Mott MacDonald Limited is not insured for, and therefore will not undertake surveys to identify asbestos contamination and will not provide guidance on the management and treatment of this item. Should the presence of asbestos contamination be suspected during development, Mott MacDonald Limited would recommend the appointment of a specialist contractor to address the issue and would not provide advice on risk or remedial measures.

7.2.2 Pathways

The following pathways are considered:

- P1: Human uptake pathways:
  - Ingestion of exposed soils
  - Dermal contact with exposed soils
  - Inhalation of soils/dust/volatised compounds
- P2: Overland flow
- P3: Horizontal and vertical percolation within the unsaturated zone
- P4: Horizontal and vertical migration within the saturated zone
- P5: Horizontal and vertical gas migration within the underlying ground material
- P6: Direct contact with construction materials.

7.2.3 Receptors

The following receptors are considered:

- R1: Site end-users e.g., hospital staff, visitors, pedestrians and cycle path users
- R2: Construction and maintenance workers. However, it should be noted that the Principal Contractor is duty bound under the CDM Regulations to undertake their own risk assessments with respect to site workers involved in the preparation and construction of the development.
- R3: Controlled waters – Glacial Till Secondary Undifferentiated aquifer and sandstone bedrock Principal Aquifer
- R4: Above ground structures
- R5: Buried concrete and cementitious structures.

7.2.4 Preliminary Conceptual Site Model

Table 7.1: Preliminary Conceptual Site Model

Sources	Pathways	Receptors	Consequences	Probabilities	Risks
S1: Made Ground on site	P1: Human uptake pathways: • Ingestion • Dermal contact • Inhalation	R1: Site end-users	Medium – exposure to contaminants within soil could adversely affect human health	Unlikely – The Proposed Development will cover the site in hardstanding, breaking the contaminant linkage pathways between the potential source and receptor. Should areas of soft landscaping be present, it is assumed that suitable clean material will be used. Furthermore, potential exposure duration from soft landscaping to receptors are short-term, particularly pedestrians and cycle path users which are passing traffic. The adjacent GI did not identify visual or olfactory evidence of contamination and no exceedance of the selected GAC were recorded.	Low
		R2: Construction and maintenance workers		Likely – Due to the nature of construction works, workers will likely encounter soil and potentially groundwater. The exposure probability will be mitigated by the Contractor through safe working methods	Moderate (unmitigated) – mitigated by the Contractor through safe working methods.
	P3: Horizontal and vertical percolation within the unsaturated zone P4: Horizontal and vertical migration within the saturated zone	R3: Controlled waters	Mild – Exposure to contaminants arising from Made Ground on site could have a mild adverse effect on water quality. Given the age of the development on site, mobile contaminants would likely have fully/largely leached away	Likely – Made Ground is anticipated sitewide to directly overlie the natural superficial Glacial Till and bedrock	Moderate / low
S2: Wilmslow Road surface water run-off	P2: Overland flow P3: Horizontal and vertical percolation within the unsaturated zone P4: Horizontal and vertical migration	R3: Controlled waters	Mild – Exposure to contaminants washed off from the adjacent road could have a mild adverse effect on water quality. These are likely to be mobile contaminants	Low likelihood – Surface water run-off will likely only occur during heavy precipitation events and drain into surface water drainage and highway drainage system, which will likely include oil water separators. The potential for migration onto site assumes there are cracks within the drainage system. The combination of the two events suggests a low likelihood	Low

Mott MacDonald Restricted

Sources	Pathways	Receptors	Consequences	Probabilities	Risks
	within the saturated zone				
S3: Hazardous ground gases associated with underlying ground material	P1: Human uptake pathways: ● Inhalation P5: Horizontal and vertical gas migration within the underlying ground material	R1: Site end-users	Medium – A build-up of hazardous ground gases could adversely affect human health.	Unlikely – Given the Proposed Development will be like the existing development currently on site. Ground gas monitoring undertaken as part of the 2019 GI for the adjacent Paterson Building recorded the presence of carbon dioxide in the 3no. borehole installations monitored. However, there is a low likelihood of a contaminant linkage pathway as it is assumed that hazardous ground gases are not posing an existing risk to the building on site currently. The Made Ground and natural deposits encountered during the CASICD GI are of low ground gas generation potential and no visual or olfactory evidence of contamination was recorded.	Low
		R2: Construction and maintenance workers		Likely – Due to the nature of construction works, workers will likely enter excavations or enclosed areas where a build-up of hazardous ground gases can occur. Historical ground gas monitoring undertaken as part of the 2019 GI for the adjacent Paterson Building did record the presence of carbon dioxide. This will be mitigated by the Contractor through safe working methods.	Moderate (unmitigated) – mitigated by the Contractor through safe working methods.
		R4: Above ground structures	Severe – A build-up of the hazardous ground gas methane within an enclosed structure can result in an explosive air mix	Unlikely – Whilst the building will be sat atop existing ground material, the natural geology is not considered credible sources of hazardous ground gases, and historical ground gas monitoring undertaken as part of the 2019 GI for the adjacent Paterson Building did not record the presence of methane. The Made Ground and natural deposits encountered during the CASICD GI are of low ground gas generation potential.	Very low
S4: Underlying ground material	P6: Direct contact	R5: Buried concrete and cementitious structures	Medium – Geochemical condition of ground materials can pose an aggressive environment for concrete / cementitious structures, adversely affecting the structural integrity of buried structures	Likely – Buried concrete / cementitious structures will be in direct contact with underlying ground material, to enable construction of the Proposed Development	Moderate (unmitigated) – to be mitigated by the selection of appropriate concrete specification for the site

Mott MacDonald Restricted

8 Geotechnical Risk Register

Based on the available information on the development, the geotechnical hazards associated are presented in Table 8.1.

Table 8.1: Geotechnical Risk Register

Risk ID	Hazard	Consequence	Qualitative Risk Rating	Mitigation	Post Mitigation Qualitative Risk Rating
GEO-01	Unknown/ unforeseen ground conditions	Ground conditions could adversely affect the design if different from assumptions. Risk of failure or excessive settlement of structures. Depth to bedrock unknown.	Medium risk	Undertake site specific ground investigation and geotechnical testing to define a suitable ground model and engineering properties.	Low risk
GEO-02	Variable Made Ground	Made Ground may be encountered and can offer poor founding material. Risk of failure or excessive settlement.	Medium risk	Undertake a site-specific ground investigation to determine the extent and engineering properties of any Made Ground.	Low risk
GEO-03	Please refer to Section 7 for the Preliminary Contaminated Land Risk Assessment.				
GEO-04	Unknown groundwater levels	Incorrect assumptions could lead to inappropriate design.	Medium risk	Undertake a site-specific ground investigation and include standpipe installation and groundwater monitoring as part of the scheme specific ground investigation to determine groundwater conditions.	Low risk
GEO-05	Ground obstructions	Potential for obstructions to be encountered e.g. historical foundations and/or pavement. Difficult excavation to form foundations. Impact on project cost and programme.	Medium risk	Undertake a site-specific ground investigation to determine the ground conditions.	Low risk

Mott MacDonald Restricted

Risk ID	Hazard	Consequence	Qualitative Risk Rating	Mitigation	Post Mitigation Qualitative Risk Rating
GEO-06	Buried services strike	Potential delays to programme, affect businesses or users served by any existing utility and safety risks to operatives.	High risk	1) Records of existing services should be obtained and consulted prior to intrusive GI and contractor to have in place suitable service avoidance techniques (e.g. inspection pits and PAS128 / CAT survey). 2) GPR survey to be undertaken. However, it should be noted that due to the historic modifications on the site, the services may not be within the top 1-2m to the current ground level. 3) All available services information/drawings for the site area to be passed to the Construction Contractor in pre-construction information. 4) Construction Contractor to satisfy themselves as to the adequacy of available information and make additional enquires as necessary.	Low risk
GEO-07	Ground aggressivity to concrete	Certain ground conditions containing sulphates, nitrates and chloride can be aggressive to concrete, causing foundations to fail.	Medium risk	Undertake a site-specific ground investigation and include laboratory testing assessing ground aggressivity to concrete.	Low risk
GEO-08	UXO	Potential delays to programme and safety risks to operatives.	High risk	The Zetica desk study and risk assessment concludes the site to have a low UXO hazard. The desk study for the site is included in Appendix D.	Low risk
GEO-09	Faults present south west of site	Movement of faults could impact design of structures and impact on construction. Weak material in fault zones could result in increased settlement or failure of foundations.	Medium risk	Undertake a site-specific ground investigation to establish areas that might be at risk.	Low risk

Mott MacDonald Restricted

9 Conclusions and Recommendations

9.1 Geotechnical Risks

Ground conditions are likely to comprise Made Ground associated with the historical and current development of the site, potentially underlain by Devensian Till. The superficial deposits are underlain by sandstone associated with the Wilmslow Sandstone Formation.

A geotechnical risk register has been produced as part of this report and the main risks and potential remediation and foundation options presented below:

- Unknown/unforeseen ground conditions, which are to be mitigated by undertaking scheme specific ground investigation and testing.
- Variable Made Ground, which is to be mitigated by undertaking scheme specific ground investigation and testing.
- Unknown groundwater levels, which is to be mitigated by undertaking scheme specific ground investigation and groundwater monitoring.

9.2 Contamination Risks

Reviewed information has identified the anticipated Made Ground underlying the site to be the primary source of contaminants, potentially containing elevated concentrations of heavy metals and organic compounds. Given the age of the development, asbestos may also be present within Made Ground and the buried services. Note that should the presence of asbestos contamination be suspected during development, Mott MacDonald Limited would recommend the appointment of a specialist contractor to address the issue and would not provide advice on risk or remedial measures.

Excluding asbestos, the Preliminary Conceptual Site Model has assessed the risk from Made Ground to site end-users as low, to construction and maintenance work as moderate (unmitigated) and to controlled waters as moderate / low. Risk to workers will be mitigated by the Contractor through safe working methods. It should be noted that the site will be a hospital building on completion of the works, therefore a final hardstanding surface will be present. This would therefore break the source-pathway-receptor linkage across the majority of the site. Soil within areas of soft landscaping, for example planters, should be proven not to pose an unacceptable risk to human health.

Surface water run-off from the adjacent Wilmslow Road may be a potential source of elevated heavy metals or organic compounds to controlled waters underlying the site. The risk has been assessed as low.

Hazardous ground gases may be generated within the existing Made Ground underlying the site, the depth and composition of which is unknown. The superficial Till and sandstone bedrock are not considered to be credible sources of hazardous ground gases, with Made Ground a source arising from degradable material potentially within. The risk to site end-users from ground gas has been assessed as low, to construction and maintenance workers as moderate (unmitigated) and to above ground structures as very low. The Principal Contractor is duty bound under the CDM Regulations to undertake their own risk assessments with respect to site workers involved in the preparation and construction of the development.

The underlying ground material may also provide an aggressive geochemical environment to buried concrete and cementitious structures and services. The risk has been assessed as

moderate (unmitigated), which will be mitigated by the selection of appropriate concrete specification for the site.

9.3 Recommendations

As a result of the identified geotechnical and geo-environmental risks, it is recommended that a targeted intrusive ground investigation is undertaken at the site to confirm the ground conditions and engineering properties of the strata specifically relating to the proposed development. This will then inform detailed design, initial waste characterisation of excavated soils and any remediation, if required.

9.3.1 Ground Investigation

The ground investigation should be carried out in accordance with BS 5930:2015+A1:2020 [17] and BS 10175:2011+A2:2017 [18].

Due to the constrained nature and existing buildings on the site, it is envisaged that the exploratory holes will need to be undertaken directly east of the current building on the yellow hatchings/pavement.

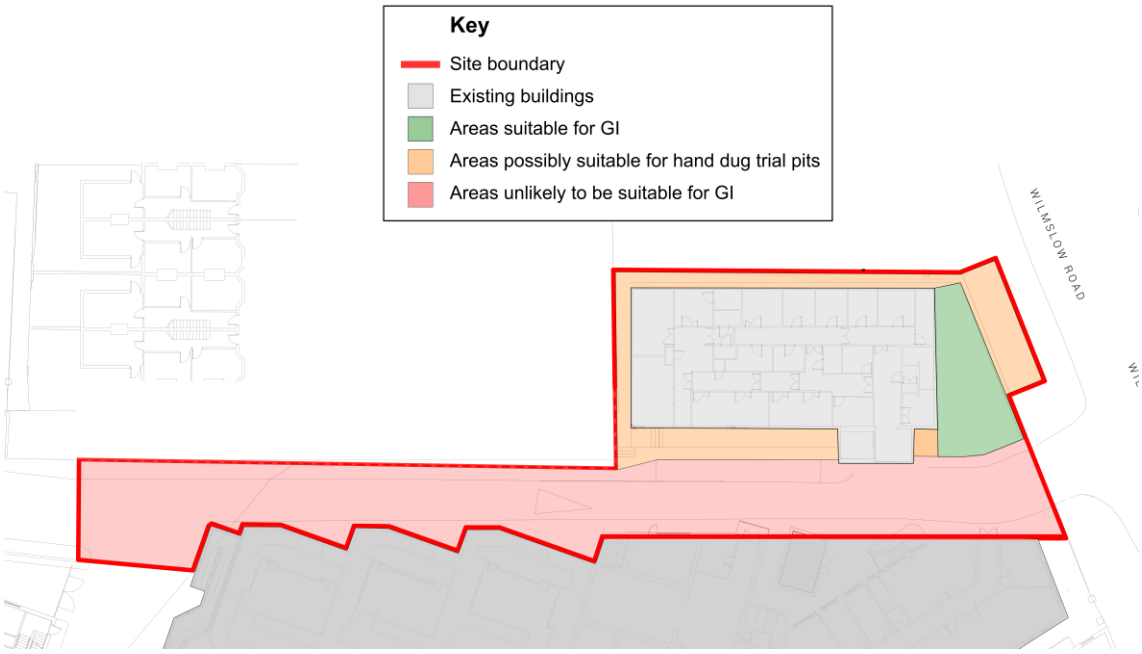
Figure 9.1 shows the anticipated available areas for site investigation. Site areas highlighted in green show the area suitable for GI. The orange area is deemed suitable for hand dug trial pits around the north and west perimeter of the existing Derek Crowther building to establish composition of the Made Ground and details of the adjacent boundary wall below ground construction. Areas highlighted in red are likely to be unsuitable for GI to maintain operation of the private access road.

The exact number and location of exploratory holes are to be developed at the next stage and should minimise disruption to existing buried services as far as reasonably practicable – feedback from Environmental Health is welcomed in relation to suitable locations for exploration.

The results of this targeted investigation will be reviewed in cognisance with the existing Paterson and CASICD Ground Investigations to better understand whether the ground conditions vary significantly across the wider site. There is a potential need for validation exploratory holes once the buildings have been demolished to confirm the ground conditions on the west of the site.

Groundwater monitoring installations are also recommended to characterise the groundwater regime beneath the site. Ground gas monitoring may be required, subject to the extent and composition of Made Ground encountered on site. The Till and sandstone bedrock are of low ground gas generation potential.

Figure 9.1: Available Access for Ground Investigation



Source: Mott MacDonald

The ground investigation scope may include:

- Cable percussion with rotary follow-on boreholes to investigate:
  - Stratigraphy and characteristics of the strata, including the depth to sandstone bedrock.
  - The strength and characteristics of the Made Ground/Till.
  - The strength and characteristics of the sandstone.
- Groundwater monitoring installations with response zones targeted to characterise the groundwater regime beneath the site.
- Depending on the composition of Made Ground encountered, ground gas monitoring installations with response zones targeted to characterise the gas regime beneath the site.
- Geotechnical laboratory testing of both soil and rock for the characterisation of the geotechnical properties of soil and rock to inform design.
- Selected geo-environmental soil and water samples collected during the GI should be laboratory tested at a UKAS accredited laboratory for the following suites of determinants:
  - Soil
    - Metals (antimony, arsenic, barium, beryllium, boron, cadmium, chromium (III & VI), copper, iron, lead, manganese, mercury, molybdenum, nickel, selenium, vanadium and zinc)
    - Asbestos (screen & quantification if present)
    - Cyanide, fraction of organic carbon, pH, sulphate, sulphur, loss on ignition, soil organic matter, total organic carbon and moisture content
    - Organic compounds (BTEX speciated, phenols speciated, polycyclic aromatic hydrocarbons (USEPA 16 speciated), total petroleum hydrocarbon criteria working group (aliphatic-aromatic split) and volatile organic carbons (speciated USEPA method 8260 target list)
  - Soil leachate

    - Metals (antimony, arsenic, barium, beryllium, boron, cadmium, calcium, chromium (III & VI), copper, iron, lead, magnesium, manganese, mercury, molybdenum, nickel, selenium, vanadium and zinc)
    - Ammoniacal nitrogen, chloride, cyanide, fluoride, pH, sulphate, hardness as $CaCO_3$ and dissolved organic carbon
    - Organic compounds (phenols speciated, polycyclic aromatic hydrocarbons (USEPA 16 speciated) and total petroleum hydrocarbon criteria working group (aliphatic-aromatic split)
  - Water
    - Metals (antimony, arsenic, barium, beryllium, boron, cadmium, calcium, chromium (III & VI), copper, iron, lead, magnesium, manganese, mercury, molybdenum, nickel, selenium, sodium, vanadium and zinc)
    - Dissolved organic carbon, ammoniacal nitrogen, chloride, cyanide, fluoride, nitrate, pH, sulphate, sulphur, hardness as $CaCO_3$, total dissolved solids and alkalinity (bicarbonate)
    - Organic compounds (phenols speciated, polycyclic aromatic hydrocarbons (USEPA 16 speciated), total petroleum hydrocarbon criteria working group (aliphatic-aromatic split) and volatile organic compounds (speciated USEPA method 8260 target list)
- In the event that soils need to be removed for off-site disposal, some Waste Acceptance Criteria (WAC) testing during the ground investigation may be beneficial, although landfilling of soils should be avoided where possible. Removal of materials from site, if required, should be discussed with a licensed waste carrier.
- Should any Made Ground or any natural soils with visual or olfactory evidence of contamination be encountered during wider geotechnical investigations then these should also be sent for laboratory chemical analyses.

10 References

1. PDF datasets for environmental and geological datasets (obtained from Groundsure report no. GS-WUK-MXS-KSH-5HI, May 2024)
2. British Geological Survey Onshore Geo Index: https://www.bgs.ac.uk/geoindex/ (Accessed May 2025)
3. CC Geotechnical Ltd (2019) Ground Investigation Report for site at The Christie, Manchester Paterson Redevelopment Project. CCG-C-18-10614
4. Mott MacDonald (2025) . The Christie Advanced Scanning and Imaging Centre Development (CASID)- Ground Investigation Report. Document reference: CASICD-MMD-XX-XX-RP-C-00002
5. British Geological Survey Lexicon of Named Rock Units: https://www.bgs.ac.uk/technologies/the-bgs-lexicon-of-named-rock-units/ (Accessed May 2024)
6. British Geological Survey (1963) Geology of the Country around Stockport and Knutsford - Memoir to Sheet 98: https://pubs.bgs.ac.uk/publications.html?pubID=B01555
7. 3E Consulting Engineers (2008) Structural Calculations for: Christie Hospital DCU Design of Modular Units
8. Zetica UXO: https://zeticauxo.com/ (Accessed May 2025)
9. Zetica UXO (2024) Detailed Unexploded Ordnance (UXO) Risk Assessment. Document reference: P14466-24-R1
10. UK Health Security Agency, UK maps of radon, available at https://www.ukradon.org/information/ukmaps (accessed May 2025)
11. Department for Environment Food & Rural Affairs. (2012) Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance.
12. Construction Industry Research and Information Association. (2001) *Contaminated land risk assessment A guide to good practice*. Basingstoke: Basingstoke Press.
13. Environment Agency. (2025) *Guidance Land contamination risk management (LCRM) How to assess and manage the risks from land contamination*. [Online] Available at: Land contamination risk management (LCRM) - GOV.UK (www.gov.uk) (Accessed: May 2025)
14. National House-Building Council, Environment Agency and Chartered Institute of Environmental Health. (2008) *Guidance for the Safe Development of Housing on Land Affected by Contamination, R&D66:2008 Volume 1*.
15. Department of the Environment. (1995) A Guide to Risk Assessment and Risk Management for Environmental Protection. London: Department of the Environment.
16. Mott MacDonald Ltd. (2023) *Christie CT Redevelopment Design Stage Report*. Document reference: P01 / CASICD-MMD-XX-ZZ-RP-S-000001.
17. British Standards Institution. (2020) BS 5930:2015+A1:2020, Code of Practice for Ground Investigations
18. British Standards Institution. (2017) BS 10175:2011+A2:2017, Code of Practice for Investigation of potentially contaminated sites
19. DEFRA. (2025). Magic Interactive Map. Retrieved from Magic: https://magic.defra.gov.uk/MagicMap.aspx (Accessed: May 2025)
20. EA,NHBC,CIEH (2008). Guidance for the Safe Development of Housing on Land Affected by Contamination

Appendices

A. Groundsure 36
B. Qualitative Contaminated Land Risk Assessment Methodology 37
C. Site Walkover 40
D. Zetica UXO Detailed Risk Assessment 43
E. Paterson Ground Investigation (CCG, 2019) 44
F. CASICD Interpretive Ground Investigation Report 45
G. Structural Calculations, Design of Modular Units (3E Consulting Engineers Ltd, 2008) 46
H. Factual Ground Investigation Report 47

A. Groundsure

Note that the red line boundary in the Groundsure report does not accurately represent the development red line boundary. However, this does not impact the results of the Groundsure report as the search radius generally extends 500m from the given red line boundary. For an accurate red line boundary, refer to Figure 4.1.

Groundsure LOCATION INTELLIGENCE

Enviro+Geo Insight

Christie Hospital

Order Details

Date: 07/05/2024

Your ref: 10033251

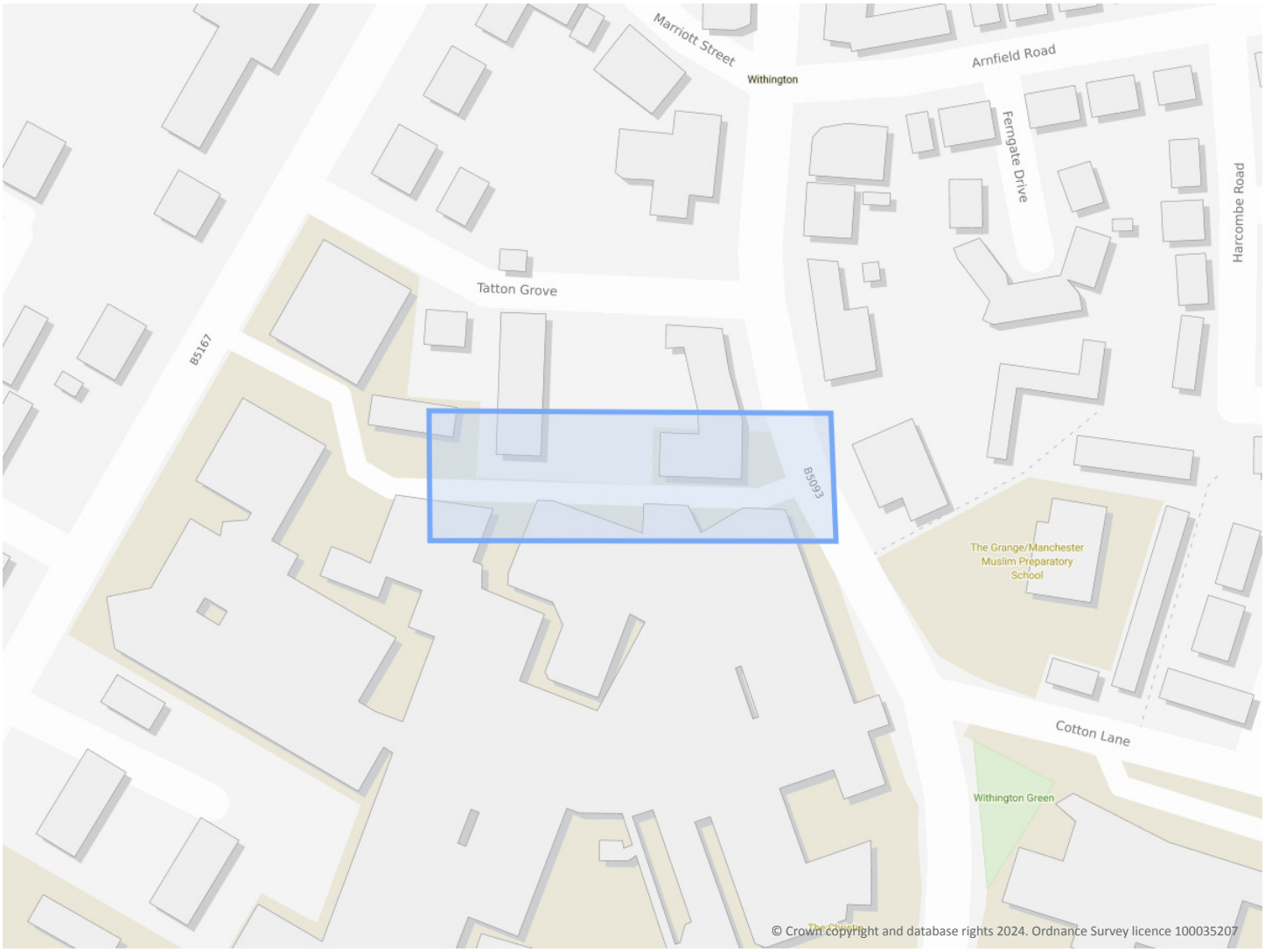
Our Ref: GS-WUK-MXS-KSH-5HI

Site Details

Location: 384859 392652

Area: 0.5 ha

Authority: Manchester City Council ↗



Summary of findings p. 2 >

Aerial image p. 9 >

OS MasterMap site plan p.13 >

Insight User Guide ↗

Contact us with any questions at:
info@groundsure.com ↗
01273 257 755

Certified B Corporation

Summary of findings

Page	Section	Past land use >	On site	0-50m	50-250m	250-500m	500-2000m
14 >	1.1 >	Historical industrial land uses >	3	0	13	5	-
15 >	1.2 >	Historical tanks >	0	3	0	0	-
16 >	1.3 >	Historical energy features >	0	2	6	4	-
17	1.4	Historical petrol stations	0	0	0	0	-
17 >	1.5 >	Historical garages >	0	0	3	4	-
17	1.6	Historical military land	0	0	0	0	-
Page	Section	Past land use - un-grouped >	On site	0-50m	50-250m	250-500m	500-2000m
18 >	2.1 >	Historical industrial land uses >	6	0	14	8	-
20 >	2.2 >	Historical tanks >	0	7	0	0	-
20 >	2.3 >	Historical energy features >	0	5	12	7	-
21	2.4	Historical petrol stations	0	0	0	0	-
22 >	2.5 >	Historical garages >	0	0	5	4	-
Page	Section	Waste and landfill >	On site	0-50m	50-250m	250-500m	500-2000m
23	3.1	Active or recent landfill	0	0	0	0	-
23	3.2	Historical landfill (BGS records)	0	0	0	0	-
24	3.3	Historical landfill (LA/mapping records)	0	0	0	0	-
24	3.4	Historical landfill (EA/NRW records)	0	0	0	0	-
24	3.5	Historical waste sites	0	0	0	0	-
24	3.6	Licensed waste sites	0	0	0	0	-
24 >	3.7 >	Waste exemptions >	0	0	7	4	-
Page	Section	Current industrial land use >	On site	0-50m	50-250m	250-500m	500-2000m
26 >	4.1 >	Recent industrial land uses >	1	1	8	-	-
27 >	4.2 >	Current or recent petrol stations >	0	0	0	1	-
27	4.3	Electricity cables	0	0	0	0	-
28	4.4	Gas pipelines	0	0	0	0	-
28	4.5	Sites determined as Contaminated Land	0	0	0	0	-

28	4.6	Control of Major Accident Hazards (COMAH)	0	0	0	0	-
28	4.7	Regulated explosive sites	0	0	0	0	-
28	4.8	Hazardous substance storage/usage	0	0	0	0	-
29	4.9	Historical licensed industrial activities (IPC)	0	0	0	0	-
29 >	4.10 >	Licensed industrial activities (Part A(1)) >	0	1	0	0	-
29 >	4.11 >	Licensed pollutant release (Part A(2)/B) >	0	0	0	3	-
30 >	4.12 >	Radioactive Substance Authorisations >	0	0	21	0	-
32	4.13	Licensed Discharges to controlled waters	0	0	0	0	-
33	4.14	Pollutant release to surface waters (Red List)	0	0	0	0	-
33	4.15	Pollutant release to public sewer	0	0	0	0	-
33	4.16	List 1 Dangerous Substances	0	0	0	0	-
33	4.17	List 2 Dangerous Substances	0	0	0	0	-
33 >	4.18 >	Pollution Incidents (EA/NRW) >	0	0	0	3	-
34	4.19	Pollution inventory substances	0	0	0	0	-
34	4.20	Pollution inventory waste transfers	0	0	0	0	-
34 >	4.21 >	Pollution inventory radioactive waste >	0	0	1	0	-

Page	Section	Hydrogeology >	On site	0-50m	50-250m	250-500m	500-2000m
36 >	5.1 >	Superficial aquifer >	Identified (within 500m)				
38 >	5.2 >	Bedrock aquifer >	Identified (within 500m)				
40 >	5.3 >	Groundwater vulnerability >	Identified (within 50m)				
41	5.4	Groundwater vulnerability- soluble rock risk	None (within 0m)				
41	5.5	Groundwater vulnerability- local information	None (within 0m)				
42 >	5.6 >	Groundwater abstractions >	0	0	0	0	1
43	5.7	Surface water abstractions	0	0	0	0	0
43	5.8	Potable abstractions	0	0	0	0	0
43	5.9	Source Protection Zones	0	0	0	0	-
44	5.10	Source Protection Zones (confined aquifer)	0	0	0	0	-

Page	Section	Hydrology >	On site	0-50m	50-250m	250-500m	500-2000m
45 >	6.1 >	Water Network (OS MasterMap) >	0	0	4	-	-

46	6.2	Surface water features	0	0	0	-	-
46 >	6.3 >	WFD Surface water body catchments >	1	-	-	-	-
47 >	6.4 >	WFD Surface water bodies >	0	0	0	-	-
47 >	6.5 >	WFD Groundwater bodies >	1	-	-	-	-
Page	Section	River and coastal flooding >	On site	0-50m	50-250m	250-500m	500-2000m
48	7.1	Risk of flooding from rivers and the sea	None (within 50m)				
49 >	7.2 >	Historical Flood Events >	0	0	2	-	-
49	7.3	Flood Defences	0	0	0	-	-
49	7.4	Areas Benefiting from Flood Defences	0	0	0	-	-
50	7.5	Flood Storage Areas	0	0	0	-	-
51	7.6	Flood Zone 2	None (within 50m)				
51	7.7	Flood Zone 3	None (within 50m)				
Page	Section	Surface water flooding >					
52 >	8.1 >	Surface water flooding >	1 in 30 year, 0.3m - 1.0m (within 50m)				
Page	Section	Groundwater flooding >					
54 >	9.1 >	Groundwater flooding >	High (within 50m)				
Page	Section	Environmental designations >	On site	0-50m	50-250m	250-500m	500-2000m
55	10.1	Sites of Special Scientific Interest (SSSI)	0	0	0	0	0
56	10.2	Conserved wetland sites (Ramsar sites)	0	0	0	0	0
56	10.3	Special Areas of Conservation (SAC)	0	0	0	0	0
56	10.4	Special Protection Areas (SPA)	0	0	0	0	0
56	10.5	National Nature Reserves (NNR)	0	0	0	0	0
57 >	10.6 >	Local Nature Reserves (LNR) >	0	0	0	0	1
57 >	10.7 >	Designated Ancient Woodland >	0	0	0	0	2
57	10.8	Biosphere Reserves	0	0	0	0	0
58	10.9	Forest Parks	0	0	0	0	0
58	10.10	Marine Conservation Zones	0	0	0	0	0
58 >	10.11 >	Green Belt >	0	0	0	0	1
58	10.12	Proposed Ramsar sites	0	0	0	0	0

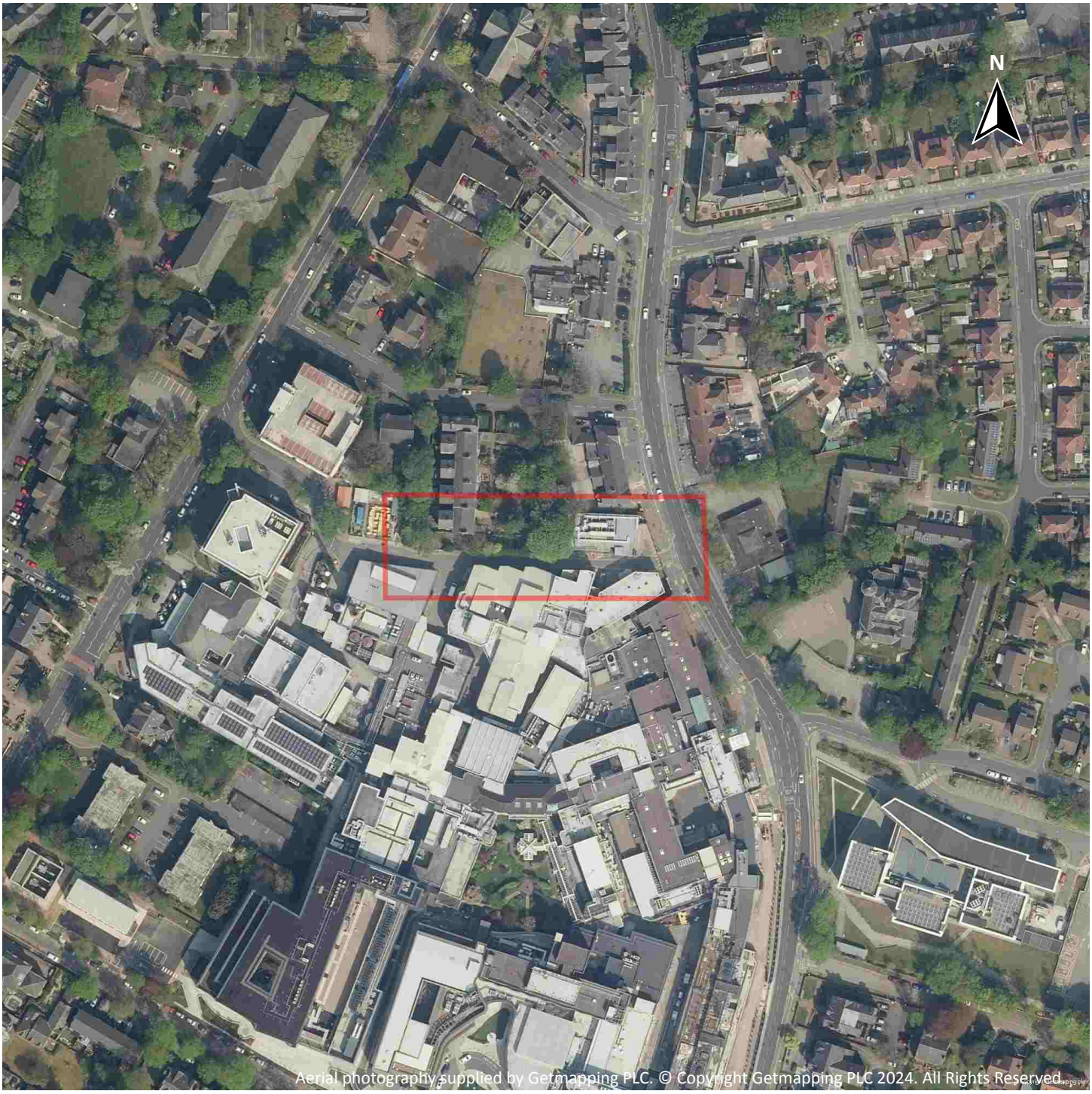
59	10.13	Possible Special Areas of Conservation (pSAC)	0	0	0	0	0
59	10.14	Potential Special Protection Areas (pSPA)	0	0	0	0	0
59	10.15	Nitrate Sensitive Areas	0	0	0	0	0
59	10.16	Nitrate Vulnerable Zones	0	0	0	0	0
60 >	10.17 >	SSSI Impact Risk Zones >	1	-	-	-	-
61	10.18	SSSI Units	0	0	0	0	0
Page	Section	Visual and cultural designations >	On site	0-50m	50-250m	250-500m	500-2000m
62	11.1	World Heritage Sites	0	0	0	-	-
63	11.2	Area of Outstanding Natural Beauty	0	0	0	-	-
63	11.3	National Parks	0	0	0	-	-
63 >	11.4 >	Listed Buildings >	0	0	3	-	-
64 >	11.5 >	Conservation Areas >	1	0	0	-	-
64	11.6	Scheduled Ancient Monuments	0	0	0	-	-
64	11.7	Registered Parks and Gardens	0	0	0	-	-
Page	Section	Agricultural designations >	On site	0-50m	50-250m	250-500m	500-2000m
65 >	12.1 >	Agricultural Land Classification >	Urban (within 250m)				
66	12.2	Open Access Land	0	0	0	-	-
66	12.3	Tree Felling Licences	0	0	0	-	-
66	12.4	Environmental Stewardship Schemes	0	0	0	-	-
66	12.5	Countryside Stewardship Schemes	0	0	0	-	-
Page	Section	Habitat designations	On site	0-50m	50-250m	250-500m	500-2000m
67	13.1	Priority Habitat Inventory	0	0	0	-	-
67	13.2	Habitat Networks	0	0	0	-	-
67	13.3	Open Mosaic Habitat	0	0	0	-	-
67	13.4	Limestone Pavement Orders	0	0	0	-	-
Page	Section	Geology 1:10,000 scale >	On site	0-50m	50-250m	250-500m	500-2000m
68 >	14.1 >	10k Availability >	Identified (within 500m)				
69	14.2	Artificial and made ground (10k)	0	0	0	0	-
70 >	14.3 >	Superficial geology (10k) >	1	0	2	1	-

71	14.4	Landslip (10k)	0	0	0	0	-
72 >	14.5 >	Bedrock geology (10k) >	2	0	2	2	-
73 >	14.6 >	Bedrock faults and other linear features (10k) >	1	0	1	1	-
Page	Section	**Geology 1:50,000 scale** >	On site	0-50m	50-250m	250-500m	500-2000m
74 >	15.1 >	50k Availability >	Identified (within 500m)				
75	15.2	Artificial and made ground (50k)	0	0	0	0	-
75	15.3	Artificial ground permeability (50k)	0	0	-	-	-
76 >	15.4 >	Superficial geology (50k) >	1	0	1	1	-
77 >	15.5 >	Superficial permeability (50k) >	Identified (within 50m)				
77	15.6	Landslip (50k)	0	0	0	0	-
77	15.7	Landslip permeability (50k)	None (within 50m)				
78 >	15.8 >	Bedrock geology (50k) >	2	0	0	2	-
79 >	15.9 >	Bedrock permeability (50k) >	Identified (within 50m)				
79 >	15.10 >	Bedrock faults and other linear features (50k) >	1	0	0	1	-
Page	Section	**Boreholes** >	On site	0-50m	50-250m	250-500m	500-2000m
80 >	16.1 >	BGS Boreholes >	0	0	39	-	-
Page	Section	**Natural ground subsidence** >					
83 >	17.1 >	Shrink swell clays >	Very low (within 50m)				
84 >	17.2 >	Running sands >	Very low (within 50m)				
85 >	17.3 >	Compressible deposits >	Negligible (within 50m)				
86 >	17.4 >	Collapsible deposits >	Very low (within 50m)				
87 >	17.5 >	Landslides >	Very low (within 50m)				
88 >	17.6 >	Ground dissolution of soluble rocks >	Negligible (within 50m)				
Page	Section	**Mining and ground workings** >	On site	0-50m	50-250m	250-500m	500-2000m
90	18.1	BritPits	0	0	0	0	-
91 >	18.2 >	Surface ground workings >	0	0	2	-	-
91	18.3	Underground workings	0	0	0	0	0
91	18.4	Underground mining extents	0	0	0	0	-
91	18.5	Historical Mineral Planning Areas	0	0	0	0	-

92	18.6	Non-coal mining	0	0	0	0	0
92 >	**18.7 >**	**JPB mining areas >**	Identified (within 0m)				
92	18.8	The Coal Authority non-coal mining	0	0	0	0	-
92	18.9	Researched mining	0	0	0	0	-
93	18.10	Mining record office plans	0	0	0	0	-
93	18.11	BGS mine plans	0	0	0	0	-
93	18.12	Coal mining	None (within 0m)				
93	18.13	Brine areas	None (within 0m)				
94	18.14	Gypsum areas	None (within 0m)				
94	18.15	Tin mining	None (within 0m)				
94	18.16	Clay mining	None (within 0m)				
Page	Section	Ground cavities and sinkholes	On site	0-50m	50-250m	250-500m	500-2000m
95	19.1	Natural cavities	0	0	0	0	-
95	19.2	Mining cavities	0	0	0	0	0
95	19.3	Reported recent incidents	0	0	0	0	-
95	19.4	Historical incidents	0	0	0	0	-
96	19.5	National karst database	0	0	0	0	-
Page	Section	**Radon >**					
97 >	**20.1 >**	**Radon >**	Less than 1% (within 0m)				
Page	Section	**Soil chemistry >**	On site	0-50m	50-250m	250-500m	500-2000m
99 >	**21.1 >**	**BGS Estimated Background Soil Chemistry >**	2	0	-	-	-
99	21.2	BGS Estimated Urban Soil Chemistry	0	0	-	-	-
99	21.3	BGS Measured Urban Soil Chemistry	0	0	-	-	-
Page	Section	**Railway infrastructure and projects >**	On site	0-50m	50-250m	250-500m	500-2000m
100	22.1	Underground railways (London)	0	0	0	-	-
100	22.2	Underground railways (Non-London)	0	0	0	-	-
101	22.3	Railway tunnels	0	0	0	-	-
101	22.4	Historical railway and tunnel features	0	0	0	-	-
101	22.5	Royal Mail tunnels	0	0	0	-	-

101	22.6	Historical railways	0	0	0	-	-
101	22.7	Railways	0	0	0	-	-
102	22.8	Crossrail 1	0	0	0	0	-
102	22.9	Crossrail 2	0	0	0	0	-
102 >	**22.10 >**	**HS2 >**	0	0	1	1	-

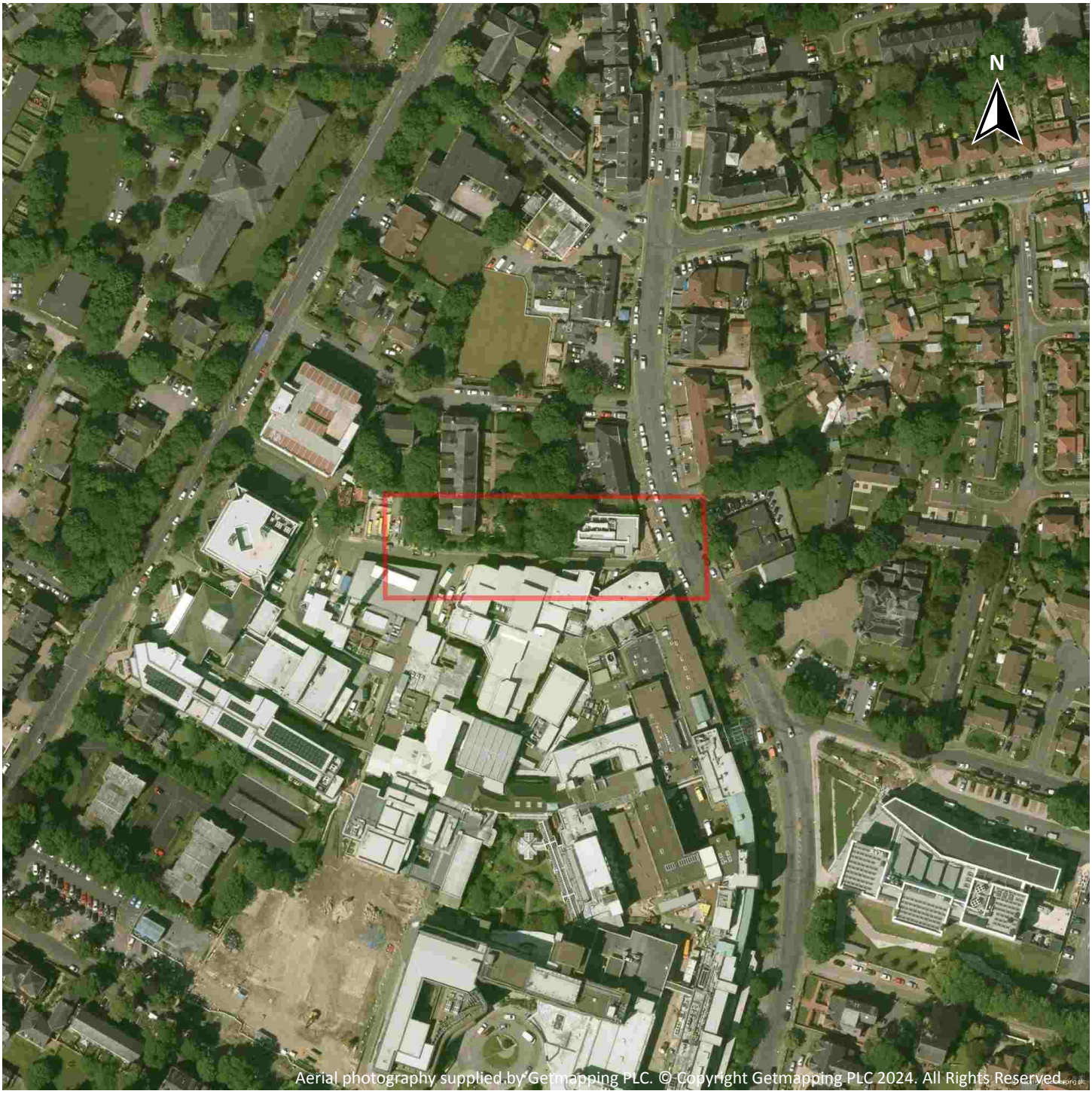
Recent aerial photograph



Capture Date: 22/04/2019

Site Area: 0.5ha

Recent site history - 2015 aerial photograph



Capture Date: 11/06/2015

Site Area: 0.5ha

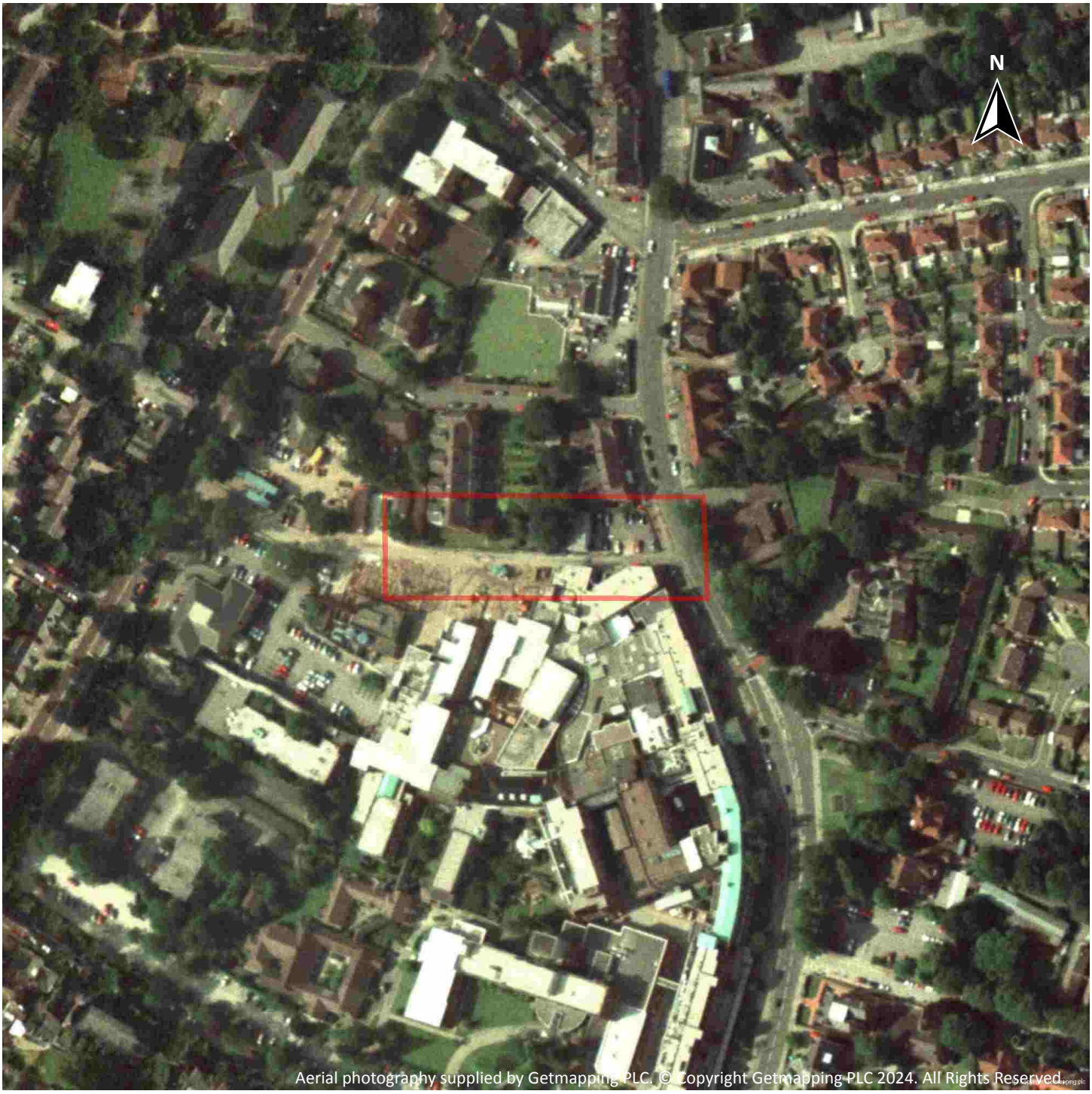
Recent site history - 2009 aerial photograph

Aerial photography supplied by Getmapping PLC. © Copyright Getmapping PLC 2024. All Rights Reserved.

Capture Date: 02/06/2009

Site Area: 0.5ha

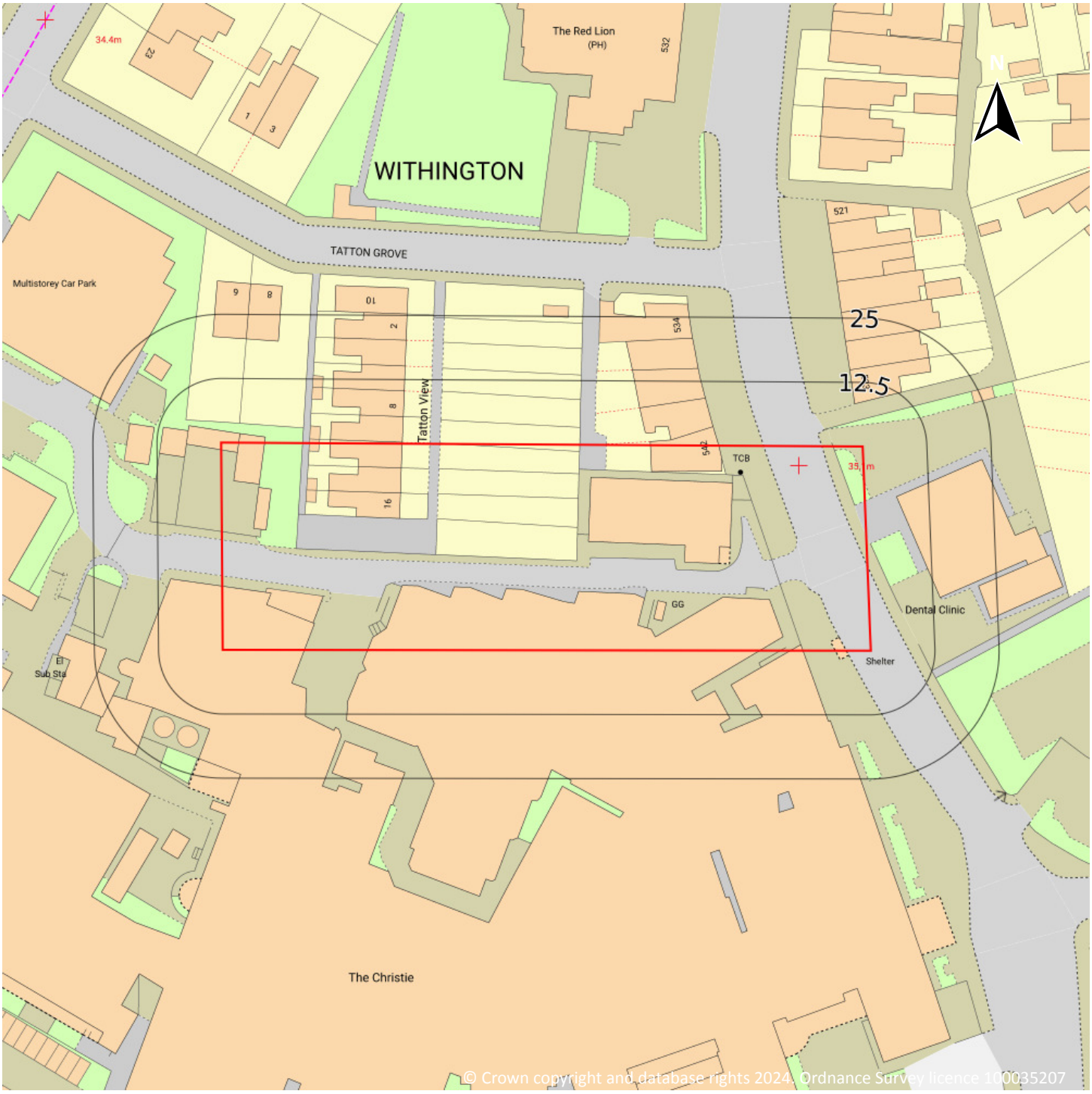
Recent site history - 2000 aerial photograph



Capture Date: 27/06/2000

Site Area: 0.5ha

OS MasterMap site plan



Site Area: 0.5ha

1 Past land use

1.1 Historical industrial land uses

Records within 500m	21

Potentially contaminative land use features digitised from historical Ordnance Survey mapping at 1:10,000 and 1:10,560 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use map on **page 14 >**

ID	Location	Land use	Dates present	Group ID
A	**On site**	**Hospital**	**1934 - 1966**	**866582**

ID	Location	Land use	Dates present	Group ID
A	**On site**	**Hospital**	**1988**	**915943**
A	**On site**	**Hospital**	**1978**	**937402**
C	65m NE	Electricity Substation	1923	837775
C	69m NE	Police Station	1905	832604
D	80m N	Electricity Substation	1916	837776
C	96m NE	Police Station	1923	963531
C	98m NE	Police Station	1916	853406
C	103m NE	Police Station	1892	893832
C	107m NE	Police Station	1911	967729
C	110m NE	Fire Station	1988	952196
C	110m NE	Police Station	1966	985287
C	112m NE	Police Station	1978	850586
C	126m NE	Fire Station	1966 - 1978	897537
E	127m SE	Hospital	1983	885335
E	127m SE	Hospital	1989	953034
G	273m SE	Nursery	1955	956141
4	282m S	Laundry	1916 - 1923	918549
G	283m SE	Nursery	1934 - 1938	979927
7	389m N	Police Station	1988	832603
8	479m SE	Laundry	1916 - 1923	867993

This data is sourced from Ordnance Survey / Groundsure.

1.2 Historical tanks

Records within 500m	**3**

Tank features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use map on **page 14 >**

ID	Location	Land use	Dates present	Group ID
B	15m SW	Tanks	1974 - 1997	125503
B	16m SW	Tanks	1984 - 1992	145189
B	21m SW	Unspecified Tank	1993 - 1997	128640

This data is sourced from Ordnance Survey / Groundsure.

1.3 Historical energy features

Records within 500m	**12**

Energy features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use map on **page 14 >**

ID	Location	Land use	Dates present	Group ID
B	21m W	Electricity Substation	1974 - 1997	84021
B	22m W	Electricity Substation	1984 - 1992	82514
D	92m N	Electricity Substation	1984 - 1997	70891
D	104m N	Electricity Transformers	1984	63458
D	109m N	Electricity Substation	1974	74354
1	140m SW	Electricity Substation	1984 - 1997	75794
F	237m S	Electricity Substation	1996	62382
F	238m S	Electricity Transformer	1974	63787
5	305m SW	Electricity Substation	1974 - 1996	75311
H	310m NE	Electricity Substation	1982 - 1992	75397
H	310m NE	Electricity Substation	1958	70944
6	353m NW	Electricity Substation	1992	77878

This data is sourced from Ordnance Survey / Groundsure.

1.4 Historical petrol stations

Records within 500m	0

Petrol stations digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

This data is sourced from Ordnance Survey / Groundsure.

1.5 Historical garages

Records within 500m	7

Garages digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use map on **page 14 >**

ID	Location	Land use	Dates present	Group ID
2	183m NW	Garage	1974 - 1984	24704
3	247m N	Garage	1974 - 1984	27274
F	249m S	Garage	1957	20354
F	295m S	Garage	1957	20355
I	478m N	Garage	1992	23071
I	479m N	Garage	1987	21412
I	480m N	Garage	1982	20697

This data is sourced from Ordnance Survey / Groundsure.

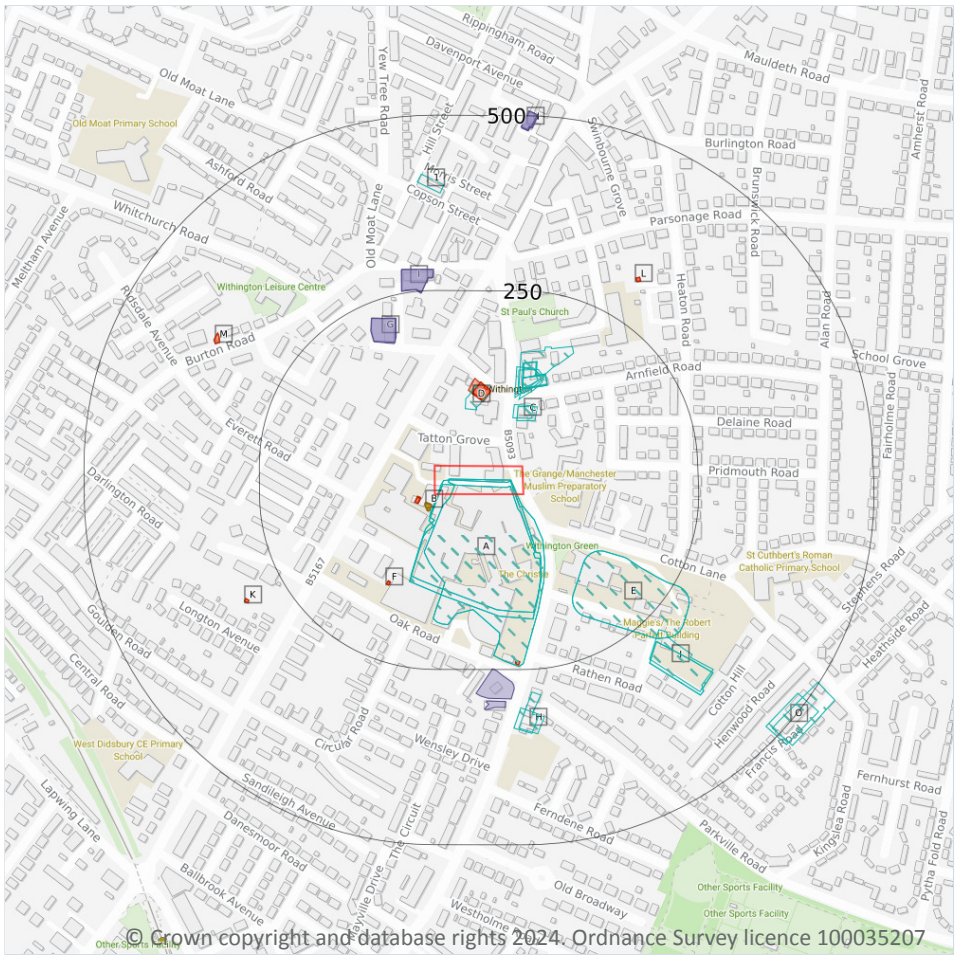
1.6 Historical military land

Records within 500m	0

Areas of military land digitised from multiple sources including the National Archives, local records, MOD records and verified other sources, intelligently grouped into contiguous features.

This data is sourced from Ordnance Survey / Groundsure / other sources.

2 Past land use - un-grouped



© Crown copyright and database rights 2024. Ordnance Survey licence 100035207

Site Outline

Search buffers in metres (m)

Historical industrial land uses

Historical tanks

Historical energy features

Historical garages

2.1 Historical industrial land uses

Records within 500m	28

Potentially contaminative land use features digitised from historical Ordnance Survey mapping at 1:10,000 and 10,560 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use - un-grouped map on **page 18 >**

ID	Location	Land Use	Date	Group ID
A	**On site**	**Hospital**	**1938**	**866582**
A	**On site**	**Hospital**	**1934**	**866582**
A	**On site**	**Hospital**	**1955**	**866582**

ID	Location	Land Use	Date	Group ID
A	**On site**	**Hospital**	**1978**	**937402**
A	**On site**	**Hospital**	**1966**	**866582**
A	**On site**	**Hospital**	**1988**	**915943**
C	65m NE	Electricity Substation	1923	837775
C	69m NE	Police Station	1905	832604
D	80m N	Electricity Substation	1916	837776
C	96m NE	Police Station	1923	963531
C	98m NE	Police Station	1916	853406
C	103m NE	Police Station	1892	893832
C	107m NE	Police Station	1911	967729
C	110m NE	Police Station	1966	985287
C	110m NE	Fire Station	1988	952196
C	112m NE	Police Station	1978	850586
C	126m NE	Fire Station	1966	897537
C	126m NE	Fire Station	1978	897537
E	127m SE	Hospital	1983	885335
E	127m SE	Hospital	1989	953034
J	273m SE	Nursery	1955	956141
H	282m S	Laundry	1923	918549
J	283m SE	Nursery	1938	979927
J	283m SE	Nursery	1934	979927
H	305m S	Laundry	1916	918549
1	389m N	Police Station	1988	832603
O	479m SE	Laundry	1916	867993
O	487m SE	Laundry	1923	867993

This data is sourced from Ordnance Survey / Groundsure.

2.2 Historical tanks

Records within 500m	7

Tank features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use - un-grouped map on **page 18 >**

ID	Location	Land Use	Date	Group ID
B	15m SW	Tanks	1993	125503
B	15m SW	Tanks	1997	125503
B	16m SW	Tanks	1974	125503
B	16m SW	Tanks	1984	145189
B	16m SW	Tanks	1992	145189
B	21m SW	Unspecified Tank	1993	128640
B	21m SW	Unspecified Tank	1997	128640

This data is sourced from Ordnance Survey / Groundsure.

2.3 Historical energy features

Records within 500m	24

Energy features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use - un-grouped map on **page 18 >**

ID	Location	Land Use	Date	Group ID
B	21m W	Electricity Substation	1993	84021
B	21m W	Electricity Substation	1997	84021
B	21m W	Electricity Substation	1974	84021
B	22m W	Electricity Substation	1984	82514
B	22m W	Electricity Substation	1992	82514
D	92m N	Electricity Substation	1984	70891
D	92m N	Electricity Substation	1992	70891

ID	Location	Land Use	Date	Group ID
D	94m N	Electricity Substation	1993	70891
D	94m N	Electricity Substation	1997	70891
D	104m N	Electricity Transformers	1984	63458
D	109m N	Electricity Substation	1974	74354
F	140m SW	Electricity Substation	1993	75794
F	140m SW	Electricity Substation	1997	75794
F	141m SW	Electricity Substation	1984	75794
F	141m SW	Electricity Substation	1992	75794
H	237m S	Electricity Substation	1996	62382
H	238m S	Electricity Transformer	1974	63787
K	305m SW	Electricity Substation	1974	75311
K	306m SW	Electricity Substation	1996	75311
L	310m NE	Electricity Substation	1982	75397
L	310m NE	Electricity Substation	1992	75397
L	310m NE	Electricity Substation	1958	70944
M	353m NW	Electricity Substation	1992	77878
M	353m NW	Electricity Substation	1992	77878

This data is sourced from Ordnance Survey / Groundsure.

2.4 Historical petrol stations

Records within 500m	0

Petrol stations digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

This data is sourced from Ordnance Survey / Groundsure.

2.5 Historical garages

Records within 500m	9

Garages digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use - un-grouped map on **page 18 >**

ID	Location	Land Use	Date	Group ID
G	183m NW	Garage	1974	24704
G	185m NW	Garage	1984	24704
I	247m N	Garage	1984	27274
I	248m N	Garage	1974	27274
H	249m S	Garage	1957	20354
H	295m S	Garage	1957	20355
N	478m N	Garage	1992	23071
N	479m N	Garage	1987	21412
N	480m N	Garage	1982	20697

This data is sourced from Ordnance Survey / Groundsure.

3 Waste and landfill

3.1 Active or recent landfill

Records within 500m	0

Active or recently closed landfill sites under Environment Agency/Natural Resources Wales regulation.

This data is sourced from the Environment Agency and Natural Resources Wales.

3.2 Historical landfill (BGS records)

Records within 500m	0

Landfill sites identified on a survey carried out on behalf of the DoE in 1973. These sites may have been closed or operational at this time.

This data is sourced from the British Geological Survey.

3.3 Historical landfill (LA/mapping records)

Records within 500m	0

Landfill sites identified from Local Authority records and high detail historical mapping.

This data is sourced from the Ordnance Survey/Groundsure and Local Authority records.

3.4 Historical landfill (EA/NRW records)

Records within 500m	0

Known historical (closed) landfill sites (e.g. sites where there is no PPC permit or waste management licence currently in force). This includes sites that existed before the waste licensing regime and sites that have been licensed in the past but where a licence has been revoked, ceased to exist or surrendered and a certificate of completion has been issued.

This data is sourced from the Environment Agency and Natural Resources Wales.

3.5 Historical waste sites

Records within 500m	0

Waste site records derived from Local Authority planning records and high detail historical mapping.

This data is sourced from Ordnance Survey/Groundsure and Local Authority records.

3.6 Licensed waste sites

Records within 500m	0

Active or recently closed waste sites under Environment Agency/Natural Resources Wales regulation.

This data is sourced from the Environment Agency and Natural Resources Wales.

3.7 Waste exemptions

Records within 500m	11

Activities involving the storage, treatment, use or disposal of waste that are exempt from needing a permit. Exemptions have specific limits and conditions that must be adhered to.

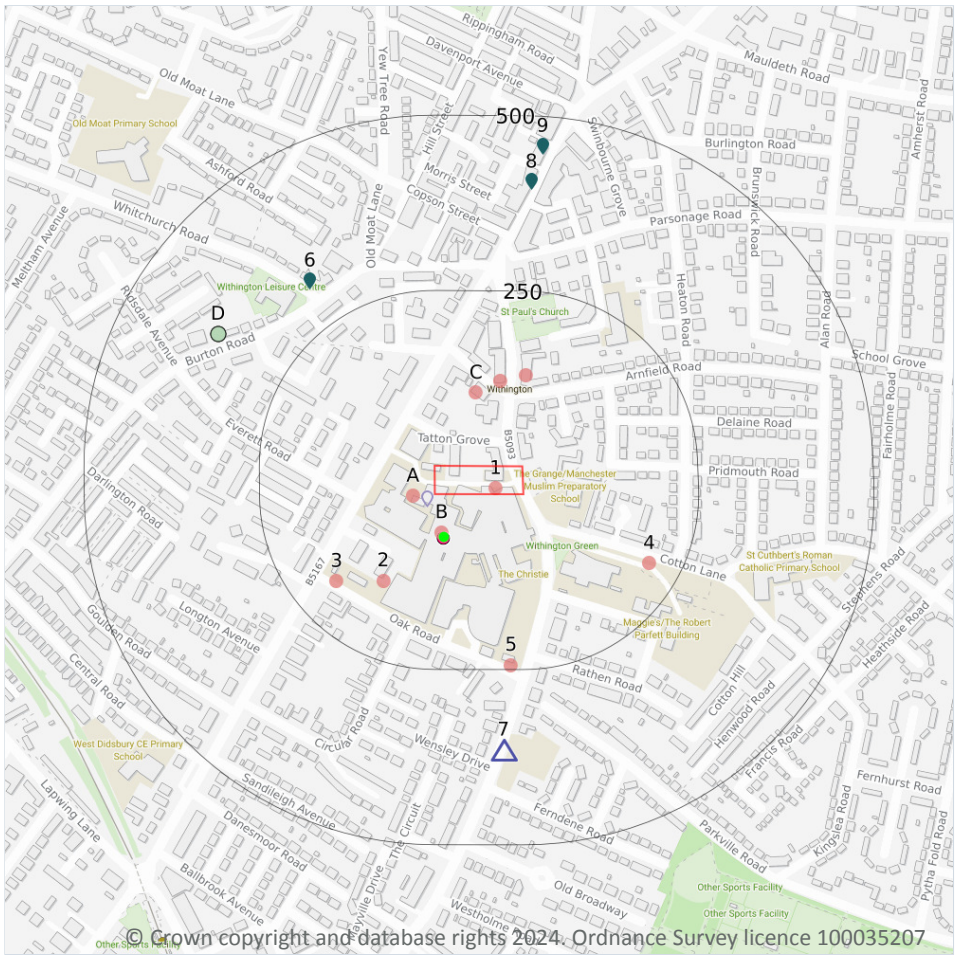
Features are displayed on the Waste and landfill map on **page 23 >**

ID	Location	Site	Reference	Category	Sub-Category	Description
A	55m SW	550, WILMSLOW ROAD, MANCHESTER, M20 4BX	WEX327395	Treating waste exemption	Not on a farm	Sorting and de-naturing of controlled drugs for disposal

ID	Location	Site	Reference	Category	Sub-Category	Description
A	55m SW	550, WILMSLOW ROAD, MANCHESTER, M20 4BX	WEX076137	Treating waste exemption	Not on a farm	Sorting and de-naturing of controlled drugs for disposal
A	55m SW	HCA International - The Christie Clinic, Pharmacy Department, 3rd Floor Oak Road Treatment Centre, Manchester, M20 4BX	WEX012986	Treating waste exemption	Not on a farm	Sorting and de-naturing of controlled drugs for disposal
A	56m SW	Christie Hospital NHS Trust Wilmslow Road Manchester Lancs M20 4BX	EPR/DF0931EC /A001	Treating waste exemption	Non-Agricultural Waste Only	Crushing waste fluorescent tubes
A	57m SW	The Christie Private Care Pharmacy Dept, Wilmslow Road, Manchester, M20 4BX	WEX166515	Treating waste exemption	Not on a farm	Sorting and de-naturing of controlled drugs for disposal
B	138m SE	555, WILMSLOW ROAD, MANCHESTER, M20 4GJ	WEX197684	Using waste exemption	Not on a farm	Use of waste in construction
B	138m SE	555, WILMSLOW ROAD, MANCHESTER, M20 4GJ	WEX197684	Storing waste exemption	Not on a farm	Storage of waste in a secure place
C	363m N	8, COPSON STREET, MANCHESTER, M20 3HE	WEX364185	Treating waste exemption	Not on a farm	Sorting and de-naturing of controlled drugs for disposal
C	363m N	8, COPSON STREET, MANCHESTER, M20 3HE	WEX092955	Treating waste exemption	Not on a farm	Sorting and de-naturing of controlled drugs for disposal
C	363m N	8, COPSON STREET, MANCHESTER, M20 3HE	WEX237730	Treating waste exemption	Not on a farm	Sorting and de-naturing of controlled drugs for disposal
1	421m N	Wilmslow Road Pharmacy, 480 Wilmslow Road, Withington, Manchester, M20 3BG	WEX327968	Treating waste exemption	Not on a farm	Sorting and de-naturing of controlled drugs for disposal

This data is sourced from the Environment Agency and Natural Resources Wales.

4 Current industrial land use



© Crown copyright and database rights 2024. Ordnance Survey licence 100035207

Site Outline

Search buffers in metres (m)

- Recent industrial land uses
- Current or recent petrol stations
- Part A(1) industrial activities
- Licensed pollutant release (Part A(2)/B)
- Radioactive Substance Authorisations
- Pollution Incidents (EA/NRW)
- Pollution inventory radioactive waste

4.1 Recent industrial land uses

Records within 250m	10

Current potentially contaminative industrial sites.

Features are displayed on the Current industrial land use map on **page 26 >**

ID	Location	Company	Address	Activity	Category
1	**On site**	**Gas Governor Station**	**Greater Manchester, M20**	**Gas Features**	**Infrastructure and Facilities**
A	32m W	Electricity Sub Station	Greater Manchester, M20	Electrical Features	Infrastructure and Facilities

ID	Location	Company	Address	Activity	Category
B	55m SW	The Christie Clinic	550, Wilmslow Road, Manchester, Greater Manchester, M20 4BX	Hospitals	Health Practitioners and Establishments
C	104m N	Electricity Sub Station	Greater Manchester, M20	Electrical Features	Infrastructure and Facilities
C	122m N	P C Centre Northwest Ltd	528, Wilmslow Road, Manchester, Greater Manchester, M20 4BT	Electrical Equipment Repair and Servicing	Repair and Servicing
C	130m NE	Withington Fire Station	507, Wilmslow Road, Manchester, Greater Manchester, M20 4AW	Fire Brigade Stations	Central and Local Government
2	144m SW	Electricity Sub Station	Greater Manchester, M20	Electrical Features	Infrastructure and Facilities
3	187m SW	Electricity Sub Station	Greater Manchester, M20	Electrical Features	Infrastructure and Facilities
4	205m SE	Electricity Sub Station	Greater Manchester, M20	Electrical Features	Infrastructure and Facilities
5	243m S	Electricity Sub Station	Greater Manchester, M20	Electrical Features	Infrastructure and Facilities

This data is sourced from Ordnance Survey.

4.2 Current or recent petrol stations

Records within 500m	**1**

Open, closed, under development and obsolete petrol stations.

Features are displayed on the Current industrial land use map on **page 26 >**

ID	Location	Company	Address	LPG	Status
7	364m S	OBSOLETE	568, Wilmslow Road, Withington, Manchester, Greater Manchester, M20 3DB	Not Applicable	Obsolete

This data is sourced from Experian.

4.3 Electricity cables

Records within 500m	**0**

High voltage underground electricity transmission cables.

This data is sourced from National Grid.

4.4 Gas pipelines

Records within 500m	0

High pressure underground gas transmission pipelines.

This data is sourced from National Grid.

4.5 Sites determined as Contaminated Land

Records within 500m	0

Contaminated Land Register of sites designated under Part 2a of the Environmental Protection Act 1990.

This data is sourced from Local Authority records.

4.6 Control of Major Accident Hazards (COMAH)

Records within 500m	0

Control of Major Accident Hazards (COMAH) sites. This data includes upper and lower tier sites, and includes a historical archive of COMAH sites and Notification of Installations Handling Hazardous Substances (NIHHS) records.

This data is sourced from the Health and Safety Executive.

4.7 Regulated explosive sites

Records within 500m	0

Sites registered and licensed by the Health and Safety Executive under the Manufacture and Storage of Explosives Regulations 2005 (MSER). The last update to this data was in April 2011.

This data is sourced from the Health and Safety Executive.

4.8 Hazardous substance storage/usage

Records within 500m	0

Consents granted for a site to hold certain quantities of hazardous substances at or above defined limits in accordance with the Planning (Hazardous Substances) Regulations 2015.

This data is sourced from Local Authority records.

4.9 Historical licensed industrial activities (IPC)

Records within 500m	0

Integrated Pollution Control (IPC) records of substance releases to air, land and water. This data represents a historical archive as the IPC regime has been superseded.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.10 Licensed industrial activities (Part A(1))

Records within 500m	1

Records of Part A(1) installations regulated under the Environmental Permitting (England and Wales) Regulations 2016 for the release of substances to the environment.

Features are displayed on the Current industrial land use map on **page 26 >**

ID	Location	Details	
A	13m W	Operator: THE CHRISTIE NHS FOUNDATION TRUST Installation Name: Energy Centre Process: MCP Permit Number: WE4919AB Original Permit Number: WE4919AB	EPR Reference: EPR/WE4919AB Issue Date: - Effective Date: 11/05/2022 Last date noted as effective: 23/11/2023 Status: Effective

This data is sourced from the Environment Agency and Natural Resources Wales.

4.11 Licensed pollutant release (Part A(2)/B)

Records within 500m	3

Records of Part A(2) and Part B installations regulated under the Environmental Permitting (England and Wales) Regulations 2016 for the release of substances to the environment.

Features are displayed on the Current industrial land use map on **page 26 >**

ID	Location	Address	Details	
6	318m NW	LMS Cleaners, 4 Withington Road, Withington, Manchester, M20 1FX	Process: Dry Cleaning Status: Historical Permit Permit Type: Part B	Enforcement: No Enforcement Notified Date of enforcement: No Enforcement Notified Comment: No Enforcement Notified
8	406m N	Gregory's Laundry And Drycleaners, 465 Wilmslow Road, Withington, Manchester, M20 3BG	Process: Dry Cleaning Status: Historical Permit Permit Type: Part B	Enforcement: No Enforcement Notified Date of enforcement: No Enforcement Notified Comment: No Enforcement Notified

ID	Location	Address	Details	
9	457m N	Johnsons Cleaners UK Ltd, 440-442 Wilslow Road, Withington, Manchester M14 5AG	Process: Dry Cleaning Status: Historical Permit Permit Type: Part B	Enforcement: No Enforcement Notified Date of enforcement: No Enforcement Notified Comment: No Enforcement Notified

This data is sourced from Local Authority records.

4.12 Radioactive Substance Authorisations

Records within 500m	**21**

Records of the storage, use, accumulation and disposal of radioactive substances regulated under the Radioactive Substances Act 1993.

Features are displayed on the Current industrial land use map on **page 26 >**

ID	Location	Address	Details	
B	62m SW	University Of Manchester, Christie Hospital,wilmslow Road, Manchester, M20 4BX	Operator: University Of Manchester Type: Keeping And Use Of Radioactive Materials (was Rsa60 Section 1). Permission number: BZ5701 Date of approval: 03/10/2005	Effective from: 03/10/2005 Last date of update: 06/01/2006 Status: Effective
B	62m SW	Christie Nhs Foundation Trust, Christie Hospital,wilmslow Road, Manchester, M20 4BX	Operator: Christie Nhs Foundation Trust Type: Keeping And Use Of Radioactive Materials (was Rsa60 Section 1). Permission number: AB1479 Date of approval: 10/11/1998	Effective from: 10/11/1998 Last date of update: 01/01/2015 Status: Superseded By Variation
B	62m SW	Christie Nhs Foundation Trust, Christie Hospital,wilmslow Road, Manchester, M20 4BX	Operator: Christie Nhs Foundation Trust Type: Keeping And Use Of Radioactive Materials (was Rsa60 Section 1). Permission number: AB1479 Date of approval: 27/04/2004	Effective from: 27/04/2004 Last date of update: 01/01/2015 Status: Superseded By Variation
B	62m SW	Christie Nhs Foundation Trust, Christie Hospital,wilmslow Road, Manchester, M20 4BX	Operator: Christie Nhs Foundation Trust Type: Keeping And Use Of Radioactive Materials (was Rsa60 Section 1). Permission number: AB1479 Date of approval: 03/02/2006	Effective from: 03/02/2006 Last date of update: 01/01/2015 Status: Superseded By Variation
B	62m SW	Christie Nhs Foundation Trust, Christie Hospital,wilmslow Road, Manchester, M20 4BX	Operator: Christie Nhs Foundation Trust Type: Keeping And Use Of Radioactive Materials (was Rsa60 Section 1). Permission number: AB1479 Date of approval: 31/05/2007	Effective from: 31/05/2007 Last date of update: 01/01/2015 Status: Superseded By Variation

ID	Location	Address	Details	
B	62m SW	Christie Nhs Foundation Trust, Christie Hospital,wilmslow Road, Manchester, M20 4BX	Operator: Christie Nhs Foundation Trust Type: Keeping And Use Of Radioactive Materials (was Rsa60 Section 1). Permission number: AB1479 Date of approval: 14/07/2008	Effective from: 14/07/2008 Last date of update: 01/01/2015 Status: Revoked/cancelled
B	62m SW	Christie Nhs Foundation Trust, Christie Hospital, Wilmslow Road, Manchester, M20 4BX	Operator: Christie Nhs Foundation Trust Type: Disposal Of Radioactive Waste (was Rsa60 Section 6). Permission number: AB9607 Date of approval: 31/03/1991	Effective from: 31/03/1991 Last date of update: 01/01/2015 Status: Superseded By Variation
B	62m SW	Christie Nhs Foundation Trust, Christie Hospital, Wilmslow Road, Manchester, M20 4BX	Operator: Christie Nhs Foundation Trust Type: Disposal Of Radioactive Waste (was Rsa60 Section 6). Permission number: AB9607 Date of approval: 20/06/1994	Effective from: 20/07/1994 Last date of update: 01/01/2015 Status: Superseded By Variation
B	62m SW	Christie Nhs Foundation Trust, Christie Hospital, Wilmslow Road, Manchester, M20 4BX	Operator: Christie Nhs Foundation Trust Type: Disposal Of Radioactive Waste (was Rsa60 Section 6). Permission number: AB9607 Date of approval: 10/11/1998	Effective from: 07/12/1998 Last date of update: 01/01/2015 Status: Superseded By Variation
B	62m SW	Christie Nhs Foundation Trust, Christie Hospital, Wilmslow Road, Manchester, M20 4BX	Operator: Christie Nhs Foundation Trust Type: Disposal Of Radioactive Waste (was Rsa60 Section 6). Permission number: AB9607 Date of approval: 17/08/2000	Effective from: 13/09/2000 Last date of update: 01/01/2015 Status: Superseded By Variation
B	62m SW	Christie Nhs Foundation Trust, Christie Hospital, Wilmslow Road, Manchester, M20 4BX	Operator: Christie Nhs Foundation Trust Type: Disposal Of Radioactive Waste (was Rsa60 Section 6). Permission number: AB9607 Date of approval: 01/12/2003	Effective from: 01/01/2004 Last date of update: 01/01/2015 Status: Superseded By Variation
B	62m SW	Christie Nhs Foundation Trust, Christie Hospital, Wilmslow Road, Manchester, M20 4BX	Operator: Christie Nhs Foundation Trust Type: Disposal Of Radioactive Waste (was Rsa60 Section 6). Permission number: AB9607 Date of approval: 07/04/2005	Effective from: 04/05/2005 Last date of update: 01/01/2015 Status: Superseded By Variation
B	62m SW	Christie Nhs Foundation Trust, Christie Hospital, Wilmslow Road, Manchester, M20 4BX	Operator: Christie Nhs Foundation Trust Type: Disposal Of Radioactive Waste (was Rsa60 Section 6). Permission number: AB9607 Date of approval: 03/02/2006	Effective from: 03/03/2006 Last date of update: 01/01/2015 Status: Superseded By Variation
B	62m SW	Christie Nhs Foundation Trust, Christie Hospital, Wilmslow Road, Manchester, M20 4BX	Operator: Christie Nhs Foundation Trust Type: Disposal Of Radioactive Waste (was Rsa60 Section 6). Permission number: AB9607 Date of approval: 31/05/2007	Effective from: 28/07/2007 Last date of update: 01/01/2015 Status: Superseded By Variation

ID	Location	Address	Details	
B	62m SW	Christie Nhs Foundation Trust, Christie Hospital, Wilmslow Road, Manchester, M20 4BX	Operator: Christie Nhs Foundation Trust Type: Disposal Of Radioactive Waste (was Rsa60 Section 6). Permission number: AB9607 Date of approval: 15/07/2008	Effective from: 15/07/2008 Last date of update: 01/01/2015 Status: Revoked/cancelled
B	62m SW	University Of Manchester, Christie Hospital, Wilmslow Road, Manchester, M20 4BX	Operator: University Of Manchester Type: Disposal Of Radioactive Waste (was Rsa60 Section 6). Permission number: BV6099 Date of approval: 08/09/2003	Effective from: 08/09/2003 Last date of update: 01/01/2015 Status: Revoked/cancelled
B	62m SW	University Of Manchester, Christie Hospital, Wilmslow Road, Manchester, M20 4BX	Operator: University Of Manchester Type: Disposal Of Radioactive Waste (was Rsa60 Section 6). Permission number: BZ5710 Date of approval: 15/09/2005	Effective from: 03/10/2005 Last date of update: 01/01/2015 Status: Superseded By Variation
B	62m SW	Christie Hospital, Wilmslow Road, Manchester, M20 4BX	Operator: The University of Manchester Type: Keeping And Use Of Radioactive Materials (was Rsa60 Section 1). Permission number: BZ5698 Date of approval: 03/10/2005	Effective from: - Last date of update: 01/01/2020 Status: Replaced
B	62m SW	Christie Hospital, Wilmslow Road, Manchester, M20 4BX	Operator: The University of Manchester Type: - Permission number: AB3598DE Date of approval: -	Effective from: 27/02/2019 Last date of update: 01/01/2020 Status: Issued
B	62m SW	Christie Hospital, Wilmslow Road, Manchester, M20 4BX	Operator: The University of Manchester Type: Disposal Of Radioactive Waste (was Rsa60 Section 6). Permission number: CD6748 Date of approval: 02/06/2009	Effective from: - Last date of update: 01/01/2020 Status: Replaced
B	62m SW	Christie Hospital, Wilmslow Road, Manchester, M20 4BX	Operator: The Christie NHS Foundation Trust Type: - Permission number: GP3593SX Date of approval: -	Effective from: 13/07/2018 Last date of update: 01/01/2020 Status: Issued

This data is sourced from the Environment Agency and Natural Resources Wales.

4.13 Licensed Discharges to controlled waters

Records within 500m	**0**

Discharges of treated or untreated effluent to controlled waters under the Water Resources Act 1991.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.14 Pollutant release to surface waters (Red List)

Records within 500m	0

Discharges of specified substances under the Environmental Protection (Prescribed Processes and Substances) Regulations 1991.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.15 Pollutant release to public sewer

Records within 500m	0

Discharges of Special Category Effluents to the public sewer.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.16 List 1 Dangerous Substances

Records within 500m	0

Discharges of substances identified on List I of European Directive E 2006/11/EC, and regulated under the Environmental Damage (Prevention and Remediation) Regulations 2015.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.17 List 2 Dangerous Substances

Records within 500m	0

Discharges of substances identified on List II of European Directive E 2006/11/EC, and regulated under the Environmental Damage (Prevention and Remediation) Regulations 2015.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.18 Pollution Incidents (EA/NRW)

Records within 500m	3

Records of substantiated pollution incidents. Since 2006 this data has only included category 1 (major) and 2 (significant) pollution incidents.

Features are displayed on the Current industrial land use map on **page 26 >**

ID	Location	Details	
D	361m NW	Incident Date: 02/04/2001 Incident Identification: 1406 Pollutant: Other Pollutant Pollutant Description: Other	Water Impact: Category 4 (No Impact) Land Impact: Category 3 (Minor) Air Impact: Category 4 (No Impact)
D	361m NW	Incident Date: 02/04/2001 Incident Identification: 1406 Pollutant: Specific Waste Materials:Other Pollutant Pollutant Description: Tyres:Other	Water Impact: Category 4 (No Impact) Land Impact: Category 3 (Minor) Air Impact: Category 4 (No Impact)
D	361m NW	Incident Date: 02/04/2001 Incident Identification: 1406 Pollutant: Specific Waste Materials Pollutant Description: Tyres	Water Impact: Category 4 (No Impact) Land Impact: Category 3 (Minor) Air Impact: Category 4 (No Impact)

This data is sourced from the Environment Agency and Natural Resources Wales.

4.19 Pollution inventory substances

Records within 500m	0

The pollution inventory (substances) includes reporting on annual emissions of certain regulated substances to air, controlled waters and land. A reporting threshold for each substance is also included. Where emissions fall below the reporting threshold, no value will be given. The data is given for the most recent complete year available.

This data is sourced from the Environment Agency and the Scottish Environment Protection Agency.

4.20 Pollution inventory waste transfers

Records within 500m	0

The pollution inventory (waste transfers) includes reporting on annual transfers and recovery/disposal of controlled wastes from a site. A reporting threshold for each waste type is also included. Where releases fall below the reporting threshold, no value will be given. The data is given for the most recent complete year available.

This data is sourced from the Environment Agency and the Scottish Environment Protection Agency.

4.21 Pollution inventory radioactive waste

Records within 500m	1

The pollution inventory (radioactive wastes) includes reporting on annual releases of radioactive substances from a site, including the means of release. Where releases fall below the reporting threshold, no value will be given. The data is given for the most recent complete year available.

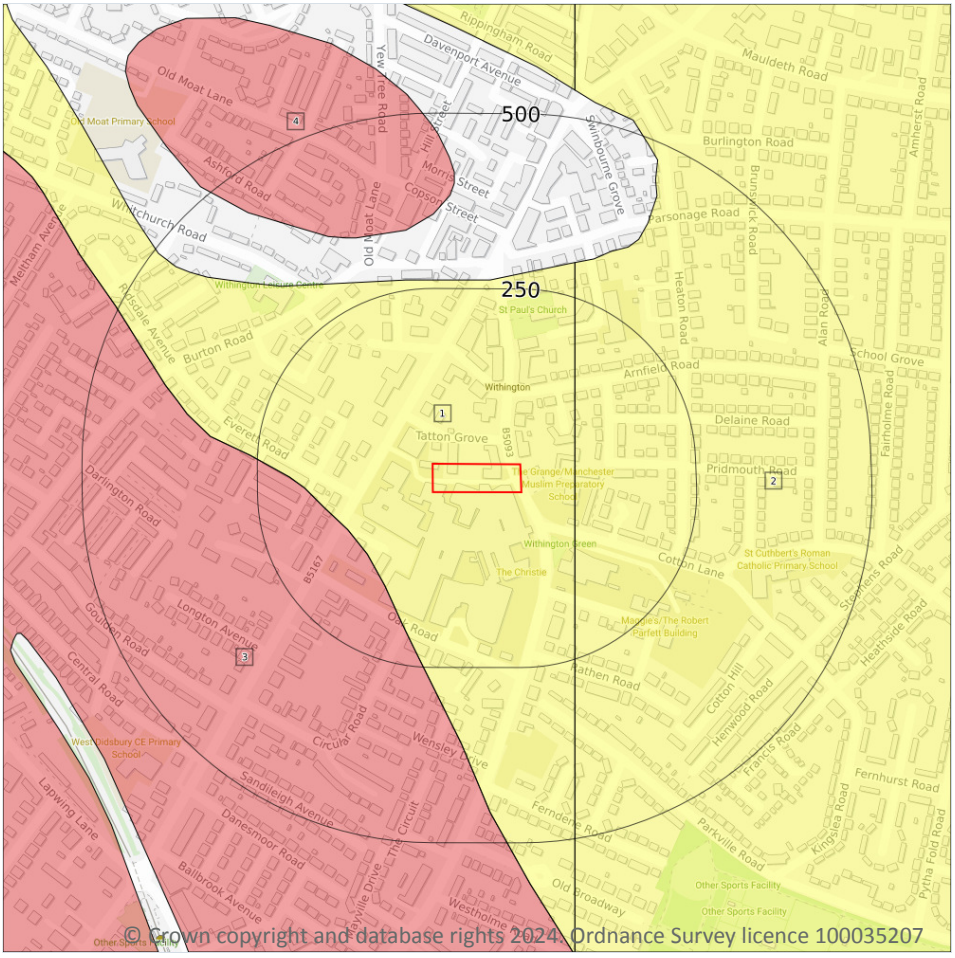
Features are displayed on the Current industrial land use map on **page 26 >**

ID: B, Location: 62m SW, Permit: GP3593SX
Operator: The Christie NHS Foundation Trust
Address: Christie Hospital, Wilmslow Road, Manchester M20 4BX
Releases:

Route	Substance	Quantity released
Wastewater	Yttrium 90	1.32GBq -
Wastewater	Technetium 99m	231.87GBq -
Wastewater	Iodine 123	5.6GBq -
Wastewater	Other Beta/Gamma	16.38GBq -
Air	Argon 41	- -
Wastewater	Iodine 131	649.29GBq -
Wastewater	Total Alpha	927MBq -
Wastewater	Total Beta/Gamma (Excl Tritium)	1742.08GBq -
Wastewater	Fluorine 18	129.55GBq -
Wastewater	Lutetium-177	708.1GBq -
Wastewater	Radium-223	927MBq -
Air	Tritium	- -

This data is sourced from the Environment Agency and the Scottish Environment Protection Agency.

5 Hydrogeology - Superficial aquifer



Site Outline

Search buffers in metres (m)

- Principal
- Secondary A
- Secondary B
- Secondary Undifferentiated
- Unproductive
- Unknown

5.1 Superficial aquifer

Records within 500m	4

Aquifer status of groundwater held within superficial geology.

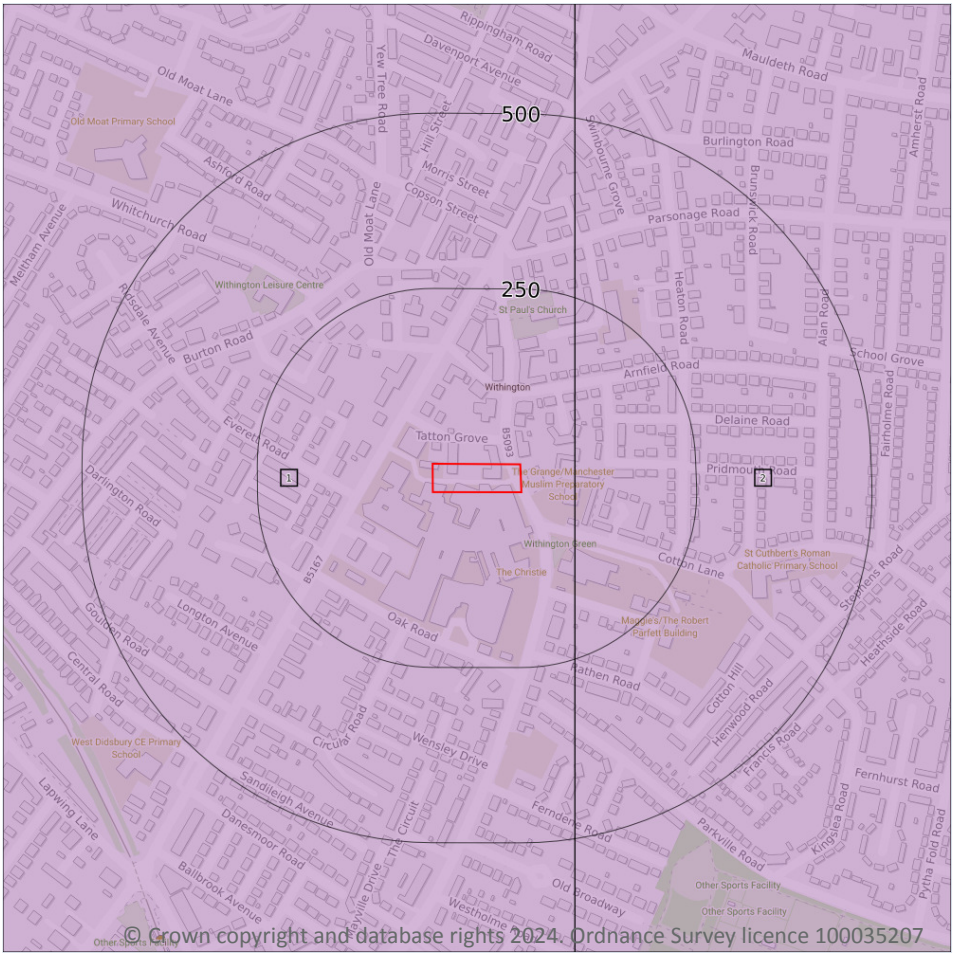
Features are displayed on the Hydrogeology map on **page 36 >**

ID	Location	Designation	Description
1	**On site**	**Secondary Undifferentiated**	**Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type**
2	76m E	Secondary Undifferentiated	Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type

ID	Location	Designation	Description
3	128m SW	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
4	335m N	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers

This data is sourced from the British Geological Survey, the Environment Agency and Natural Resources Wales.

Bedrock aquifer



5.2 Bedrock aquifer

Records within 500m	2

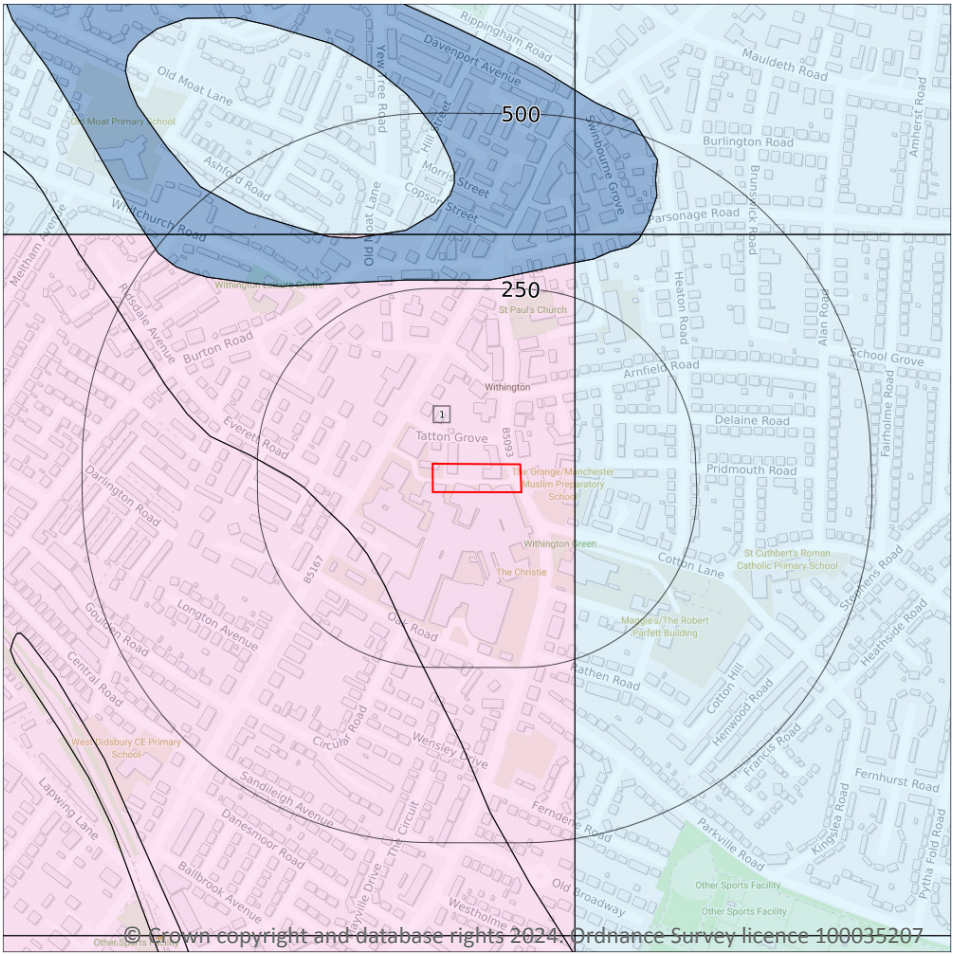
Aquifer status of groundwater held within bedrock geology.

Features are displayed on the Bedrock aquifer map on **page 38 >**

ID	Location	Designation	Description
1	**On site**	**Principal**	**Geology of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale. Generally principal aquifers were previously major aquifers**
2	76m E	Principal	Geology of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale. Generally principal aquifers were previously major aquifers

This data is sourced from the British Geological Survey, the Environment Agency and Natural Resources Wales.

Groundwater vulnerability



5.3 Groundwater vulnerability

Records within 50m	1

An assessment of the vulnerability of groundwater to a pollutant discharged at ground level based on the hydrological, geological, hydrogeological and soil properties within a one kilometre square grid. Groundwater vulnerability is described as High, Medium or Low as follows:

- High - Areas able to easily transmit pollution to groundwater. They are likely to be characterised by high leaching soils and the absence of low permeability superficial deposits.
- Medium - Intermediate between high and low vulnerability.
- Low - Areas that provide the greatest protection from pollution. They are likely to be characterised by low leaching soils and/or the presence of superficial deposits characterised by a low permeability.

Features are displayed on the Groundwater vulnerability map on **page 40 >**

ID	Location	Summary	Soil / surface	Superficial geology	Bedrock geology
1	On site	**Summary Classification: Secondary superficial aquifer - Medium Vulnerability Combined classification: Productive Bedrock Aquifer, Productive Superficial Aquifer**	**Leaching class: Low Infiltration value: >70% Dilution value: 300-550mm/year**	**Vulnerability: Medium Aquifer type: Secondary Thickness: 3-10m Patchiness value: >90% Recharge potential: High**	**Vulnerability: Low Aquifer type: Principal Flow mechanism: Mixed**

This data is sourced from the British Geological Survey, the Environment Agency and Natural Resources Wales.

5.4 Groundwater vulnerability- soluble rock risk

Records on site	0

This dataset identifies areas where solution features that enable rapid movement of a pollutant may be present within a 1km grid square.

This data is sourced from the British Geological Survey and the Environment Agency.

5.5 Groundwater vulnerability- local information

Records on site	0

This dataset identifies areas where additional local information affecting vulnerability is held by the Environment Agency. Further information can be obtained by contacting the Environment Agency local Area groundwater team through the Environment Agency National Customer Call Centre on 03798 506 506 or by email on enquiries@environment-agency.gov.uk ↗.

This data is sourced from the British Geological Survey and the Environment Agency.

Abstractions and Source Protection Zones

© Crown copyright and database rights 2024. Ordnance Survey licence 100035207

- Site Outline

Search buffers in metres (m)

- Source Protection Zone 1 — Inner catchment
- Source Protection Zone 2 — Outer catchment
- Source Protection Zone 3 — Total catchment
- Source Protection Zone 4 — Zone of Special Interest
- Source Protection Zone 1c — Inner catchment - confined aquifer
- Source Protection Zone 2c — Outer catchment - confined aquifer
- Source Protection Zone 3c — Total catchment - confined aquifer
- Drinking water abstraction licences
- Drinking water abstraction licences — Polygon features
- Drinking water abstraction licences — Linear features
- Groundwater abstraction licence (point)
- Groundwater abstraction licence (area)
- Groundwater abstraction licence (linear)
- Surface Water Abstractions (point)
- Surface Water Abstractions (area)
- Surface Water Abstractions (linear)

5.6 Groundwater abstractions

Records within 2000m	1

Licensed groundwater abstractions for sites extracting more than 20 cubic metres of water a day and includes active and historical records. The data may be for a single abstraction point, between two points (line data) or a larger area.

Features are displayed on the Abstractions and Source Protection Zones map on **page 42 >**

ID	Location	Details	
-	1804m E	Status: Historical Licence No: 2569013021 Details: Laundry Use Direct Source: Ground Water - North West Region Point: BURNAGE LANE, LEVENSHULME, MANCHESTER Data Type: Point Name: OCS GROUP UK LTD T/A CANNON Easting: 386720 Northing: 392830	Annual Volume (m^3): 91000 Max Daily Volume (m^3): 350 Original Application No: - Original Start Date: 19/03/2004 Expiry Date: 31/03/2014 Issue No: 2 Version Start Date: 17/01/2008 Version End Date: -

This data is sourced from the Environment Agency and Natural Resources Wales.

5.7 Surface water abstractions

Records within 2000m	**0**

Licensed surface water abstractions for sites extracting more than 20 cubic metres of water a day and includes active and historical records. The data may be for a single abstraction point, a stretch of watercourse or a larger area.

This data is sourced from the Environment Agency and Natural Resources Wales.

5.8 Potable abstractions

Records within 2000m	**0**

Licensed potable water abstractions for sites extracting more than 20 cubic metres of water a day and includes active and historical records. The data may be for a single abstraction point, a stretch of watercourse or a larger area.

This data is sourced from the Environment Agency and Natural Resources Wales.

5.9 Source Protection Zones

Records within 500m	**0**

Source Protection Zones define the sensitivity of an area around a potable abstraction site to contamination.

This data is sourced from the Environment Agency and Natural Resources Wales.

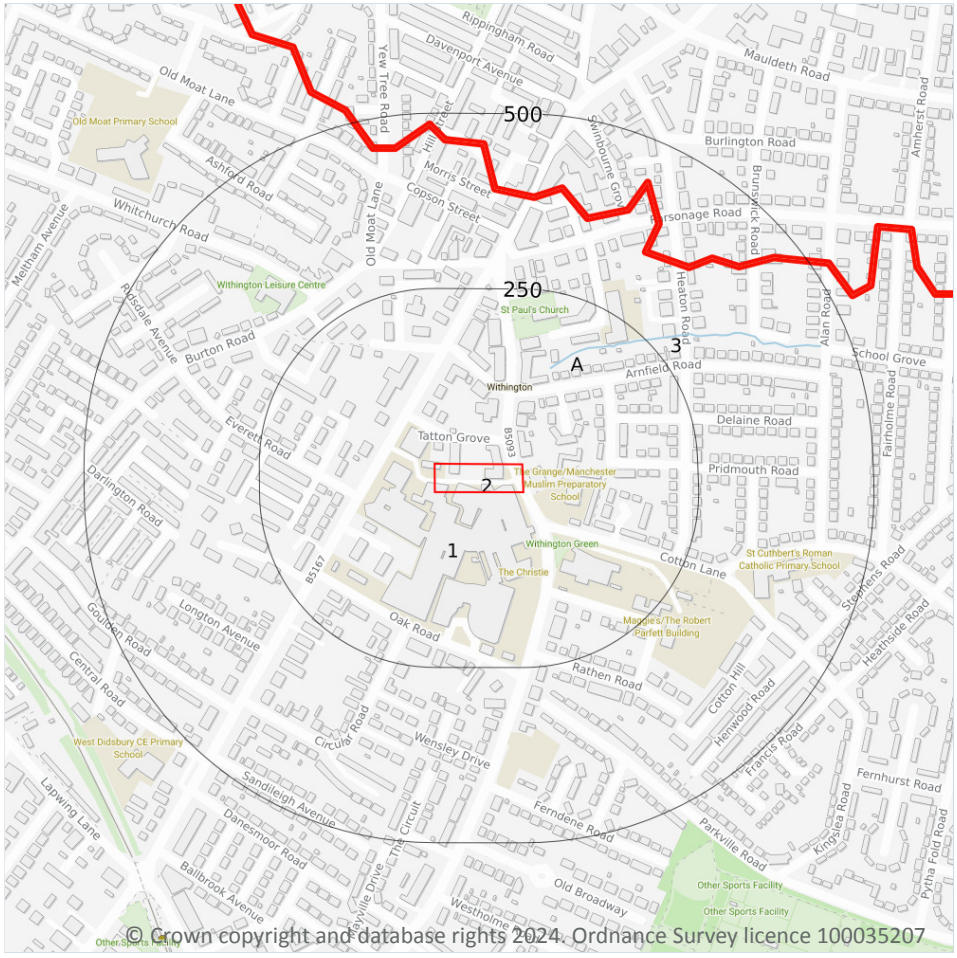
5.10 Source Protection Zones (confined aquifer)

Records within 500m	0

Source Protection Zones in the confined aquifer define the sensitivity around a deep groundwater abstraction to contamination. A confined aquifer would normally be protected from contamination by overlying geology and is only considered a sensitive resource if deep excavation/drilling is taking place.

This data is sourced from the Environment Agency and Natural Resources Wales.

6 Hydrology



© Crown copyright and database rights 2024. Ordnance Survey licence 100035207

Site Outline

Search buffers in metres (m)

Water Network (OS MasterMap)

Surface water features (wider than 5m)

Surface water features (narrower than 5m)

WFD River, canal and surface water transfer water bodies

WFD Lake water bodies

WFD Transitional and coastal water bodies

WFD Surface water body catchments boundaries

WFD Groundwater body boundaries

6.1 Water Network (OS MasterMap)

Records within 250m	4

Detailed water network of Great Britain showing the flow and precise central course of every river, stream, lake and canal.

Features are displayed on the Hydrology map on **page 45 >**

ID	Location	Type of water feature	Ground level	Permanence	Name
A	142m NE	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	Shaw Brook

ID	Location	Type of water feature	Ground level	Permanence	Name
A	191m NE	Inland river not influenced by normal tidal action.	Underground	Watercourse contains water year round (in normal circumstances)	Shaw Brook
A	192m NE	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	Shaw Brook
3	249m NE	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	Shaw Brook

This data is sourced from the Ordnance Survey.

6.2 Surface water features

Records within 250m	0

Covering rivers, streams and lakes (some overlap with OS MasterMap Water Network data in previous section) but additionally covers smaller features such as ponds. Rivers and streams narrower than 5m are represented as a single line. Lakes, ponds and rivers or streams wider than 5m are represented as polygons.

This data is sourced from the Ordnance Survey.

6.3 WFD Surface water body catchments

Records on site	1

The Water Framework Directive is an EU-led framework for the protection of inland surface waters, estuaries, coastal waters and groundwater through river basin-level management planning. In terms of surface water, these basins are broken down into smaller units known as management, operational and water body catchments.

Features are displayed on the Hydrology map on **page 45 >**

ID	Location	Type	Water body catchment	Water body ID	Operational catchment	Management catchment
1	**On site**	**River**	**Chorlton Brook (Princess Parkway to Mersey)**	**GB112069061040**	**Bollin Dean Mersey Upper**	**Mersey Upper**

This data is sourced from the Environment Agency and Natural Resources Wales.

6.4 WFD Surface water bodies

Records identified	1

Surface water bodies under the Directive may be rivers, lakes, estuary or coastal. To achieve the purpose of the Directive, environmental objectives have been set and are reported on for each water body. The progress towards delivery of the objectives is then reported on by the relevant competent authorities at the end of each six-year cycle. The river water body directly associated with the catchment listed in the previous section is detailed below, along with any lake, canal, coastal or artificial water body within 250m of the site. Click on the water body ID in the table to visit the EA Catchment Explorer to find out more about each water body listed.

Features are displayed on the Hydrology map on **page 45 >**

ID	Location	Type	Name	Water body ID	Overall rating	Chemical rating	Ecological rating	Year
-	1299m NW	River	Chorlton Brook (Princess Parkway to Mersey)	GB112069061040 ↗	Moderate	Fail	Moderate	2019

This data is sourced from the Environment Agency and Natural Resources Wales.

6.5 WFD Groundwater bodies

Records on site	1

Groundwater bodies are also covered by the Directive and the same regime of objectives and reporting detailed in the previous section is in place. Click on the water body ID in the table to visit the EA Catchment Explorer to find out more about each groundwater body listed.

Features are displayed on the Hydrology map on **page 45 >**

ID	Location	Name	Water body ID	Overall rating	Chemical rating	Quantitative	Year
2	**On site**	**Manchester and East Cheshire Permo-Triassic Sandstone Aquifers**	**GB41201G101100 ↗**	**Poor**	**Poor**	**Poor**	**2019**

This data is sourced from the Environment Agency and Natural Resources Wales.

7 River and coastal flooding

Site Outline

Search buffers in metres (m)

River and coastal flooding:

- High
- Medium
- Low
- Very Low
- Historical Flood Events
- Areas Used for Flood Storage
- Areas Benefiting from Flood Defences
- Flood Defences

7.1 Risk of flooding from rivers and the sea

Records within 50m	0

The chance of flooding from rivers and/or the sea in any given year, based on cells of 50m within the Risk of Flooding from Rivers and Sea (RoFRaS)/Flood Risk Assessment Wales (FRAW) models. Each cell is allocated one of four flood risk categories, taking into account flood defences and their condition. The risk categories for RoFRaS for rivers and the sea and FRAW for rivers are; Very low (less than 1 in 1000 chance in any given year), Low (less than 1 in 100 but greater than or equal to 1 in 1000 chance), Medium (less than 1 in 30 but greater than or equal to 1 in 100 chance) or High (greater than or equal to 1 in 30 chance). The risk categories for FRAW for the sea are; Very low (less than 1 in 1000 chance in any given year), Low (less than 1 in 200 but greater than or equal to 1 in 1000 chance), Medium (less than 1 in 30 but greater than or equal to 1 in 200 chance) or High (greater than or equal to 1 in 30 chance).

This data is sourced from the Environment Agency and Natural Resources Wales.

7.2 Historical Flood Events

Records within 250m	2

Records of historic flooding from rivers, the sea, groundwater and surface water. Records began in 1946 when predecessor bodies started collecting detailed information about flooding incidents, although limited details may be included on flooding incidents prior to this date. Takes into account the presence of defences, structures, and other infrastructure where they existed at the time of flooding, and includes flood extents that may have been affected by overtopping, breaches or blockages.

Features are displayed on the River and coastal flooding map on **page 48 >**

ID	Location	Event name	Date of flood	Flood source	Flood cause	Type of flood
1	161m NE	Shab	2000-11-16 2000-11-17	Unknown	Other	No data
2	199m NE	Ea01317_10 August 2004_Shaw Brook	2004-08-10 2004-08-11	Main river	Local drainage/surface water	Fluvial

This data is sourced from the Environment Agency and Natural Resources Wales.

7.3 Flood Defences

Records within 250m	0

Records of flood defences owned, managed or inspected by the Environment Agency and Natural Resources Wales. Flood defences can be structures, buildings or parts of buildings. Typically these are earth banks, stone and concrete walls, or sheet-piling that is used to prevent or control the extent of flooding.

This data is sourced from the Environment Agency and Natural Resources Wales.

7.4 Areas Benefiting from Flood Defences

Records within 250m	0

Areas that would benefit from the presence of flood defences in a 1 in 100 (1%) chance of flooding each year from rivers or 1 in 200 (0.5%) chance of flooding each year from the sea.

This data is sourced from the Environment Agency and Natural Resources Wales.

7.5 Flood Storage Areas

Records within 250m	0

Areas that act as a balancing reservoir, storage basin or balancing pond to attenuate an incoming flood peak to a flow level that can be accepted by the downstream channel or to delay the timing of a flood peak so that its volume is discharged over a longer period.

This data is sourced from the Environment Agency and Natural Resources Wales.

River and coastal flooding - Flood Zones

7.6 Flood Zone 2

Records within 50m	0

Areas of land at risk of flooding, when the presence of flood defences are ignored. Covering land between Flood Zone 3 (see next section) and the extent of the flooding from rivers or the sea with a 1 in 1000 (0.1%) chance of flooding each year.

This data is sourced from the Environment Agency and Natural Resources Wales.

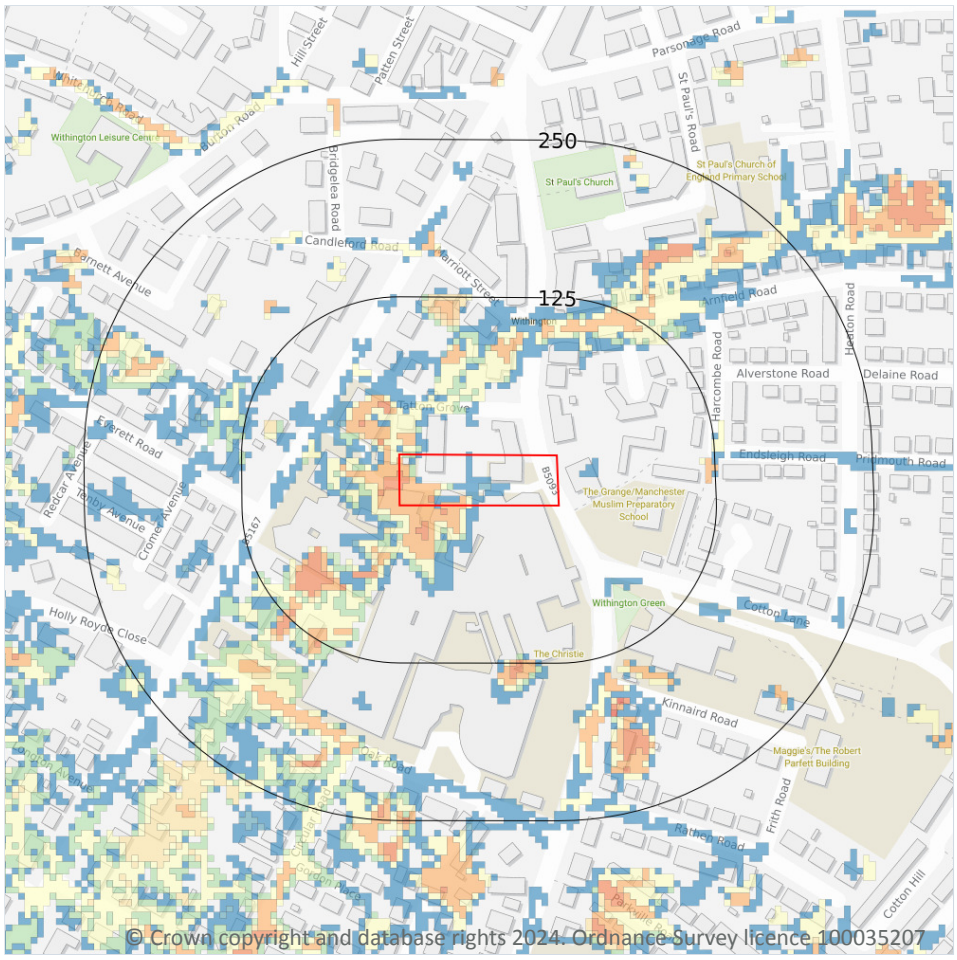
7.7 Flood Zone 3

Records within 50m	0

Areas of land at risk of flooding, when the presence of flood defences are ignored. Covering land with a 1 in 100 (1%) or greater chance of flooding each year from rivers or a 1 in 200 (0.5%) or greater chance of flooding each year from the sea.

This data is sourced from the Environment Agency and Natural Resources Wales.

8 Surface water flooding



Site Outline

Search buffers in metres (m)

1 in 1000 return period
- Depth between 0.1m - 0.3m
- Depth between 0.3m - 1.0m
- Depth greater than 1.0m

1 in 250 return period
- Depth between 0.1m - 0.3m
- Depth between 0.3m - 1.0m
- Depth greater than 1.0m

1 in 100 return period
- Depth between 0.1m - 0.3m
- Depth between 0.3m - 1.0m
- Depth greater than 1.0m

1 in 30 return period
- Depth between 0.1m - 0.3m
- Depth between 0.3m - 1.0m
- Depth greater than 1.0m

8.1 Surface water flooding

Highest risk on site	**1 in 30 year, 0.3m - 1.0m**
Highest risk within 50m	**1 in 30 year, 0.3m - 1.0m**

Ambiental Risk Analytics surface water (pluvial) FloodMap identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.

Features are displayed on the Surface water flooding map on **page 52 >**

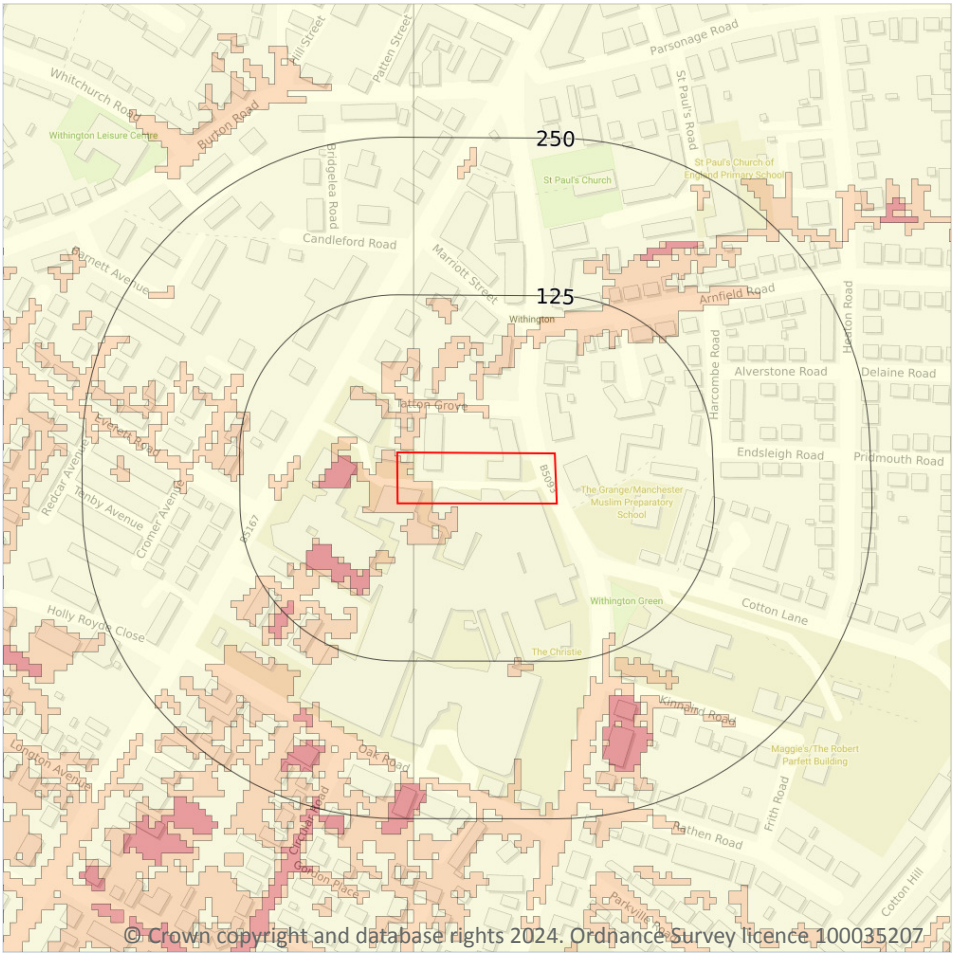
The data shown on the map and in the table above shows the highest likelihood of flood events happening at the site. Lower likelihood events may have greater flood depths and hence a greater potential impact on

a site. The table below shows the maximum flood depths for a range of return periods for the site.

Return period	Maximum modelled depth
1 in 1000 year	Between 0.3m and 1.0m
1 in 250 year	Between 0.3m and 1.0m
1 in 100 year	Between 0.3m and 1.0m
1 in 30 year	Between 0.3m and 1.0m

This data is sourced from Ambiental Risk Analytics.

9 Groundwater flooding



Site Outline

Search buffers in metres (m)

- High
- Moderate - High
- Moderate
- Low
- Negligible

9.1 Groundwater flooding

Highest risk on site	**Moderate-High**
Highest risk within 50m	**High**

Groundwater flooding is caused by unusually high groundwater levels. It occurs when the water table rises above the ground surface or within underground structures such as basements or cellars. Groundwater flooding tends to exhibit a longer duration than surface water flooding, possibly lasting for weeks or months, and as a result it can cause significant damage to property. This risk assessment is based on a 1 in 100 year return period and a 5m Digital Terrain Model (DTM).

Features are displayed on the Groundwater flooding map on **page 54 >**

This data is sourced from Ambiental Risk Analytics.

10 Environmental designations

© Crown copyright and database rights 2024. Ordnance Survey licence 100035207

Site Outline

Search buffers in metres (m)

Local Nature Reserves (LNR)

Designated Ancient Woodland

Green Belt

10.1 Sites of Special Scientific Interest (SSSI)

Records within 2000m	0

Sites providing statutory protection for the best examples of UK flora, fauna, or geological or physiographical features. Originally notified under the National Parks and Access to the Countryside Act 1949, SSSIs were re-notified under the Wildlife and Countryside Act 1981. Improved provisions for the protection and management of SSSIs were introduced by the Countryside and Rights of Way Act 2000 (in England and Wales) and (in Scotland) by the Nature Conservation (Scotland) Act 2004 and the Wildlife and Natural Environment (Scotland) Act 2010.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.2 Conserved wetland sites (Ramsar sites)

Records within 2000m	0

Ramsar sites are designated under the Convention on Wetlands of International Importance, agreed in Ramsar, Iran, in 1971. They cover all aspects of wetland conservation and wise use, recognizing wetlands as ecosystems that are extremely important for biodiversity conservation in general and for the well-being of human communities. These sites cover a broad definition of wetland; marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, and even some marine areas.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.3 Special Areas of Conservation (SAC)

Records within 2000m	0

Areas which have been identified as best representing the range and variety within the European Union of habitats and (non-bird) species listed on Annexes I and II to the Directive. SACs are designated under the EC Habitats Directive.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.4 Special Protection Areas (SPA)

Records within 2000m	0

Sites classified by the UK Government under the EC Birds Directive, SPAs are areas of the most important habitat for rare (listed on Annex I to the Directive) and migratory birds within the European Union.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.5 National Nature Reserves (NNR)

Records within 2000m	0

Sites containing examples of some of the most important natural and semi-natural terrestrial and coastal ecosystems in Great Britain. They are managed to conserve their habitats, provide special opportunities for scientific study or to provide public recreation compatible with natural heritage interests.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.6 Local Nature Reserves (LNR)

Records within 2000m	1

Sites managed for nature conservation, and to provide opportunities for research and education, or simply enjoying and having contact with nature. They are declared by local authorities under the National Parks and Access to the Countryside Act 1949 after consultation with the relevant statutory nature conservation agency.

Features are displayed on the Environmental designations map on **page 55 >**

ID	Location	Name	Data source
-	1957m SE	Heaton Mersey Common	Natural England

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.7 Designated Ancient Woodland

Records within 2000m	2

Ancient woodlands are classified as areas which have been wooded continuously since at least 1600 AD. This includes semi-natural woodland and plantations on ancient woodland sites. 'Wooded continuously' does not mean there is or has previously been continuous tree cover across the whole site, and not all trees within the woodland have to be old.

Features are displayed on the Environmental designations map on **page 55 >**

ID	Location	Name	Woodland Type
-	1635m NW	Hough End Clough	Ancient & Semi-Natural Woodland
-	1705m NW	Hough End Clough	Ancient & Semi-Natural Woodland

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.8 Biosphere Reserves

Records within 2000m	0

Biosphere Reserves are internationally recognised by UNESCO as sites of excellence to balance conservation and socioeconomic development between nature and people. They are recognised under the Man and the Biosphere (MAB) Programme with the aim of promoting sustainable development founded on the work of the local community.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.9 Forest Parks

Records within 2000m	0

These are areas managed by the Forestry Commission designated on the basis of recreational, conservation or scenic interest.

This data is sourced from the Forestry Commission.

10.10 Marine Conservation Zones

Records within 2000m	0

A type of marine nature reserve in UK waters established under the Marine and Coastal Access Act (2009). They are designated with the aim to protect nationally important, rare or threatened habitats and species.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.11 Green Belt

Records within 2000m	1

Areas designated to prevent urban sprawl by keeping land permanently open.

Features are displayed on the Environmental designations map on **page 55 >**

ID	Location	Name	Local Authority name
1	1562m SW	Merseyside and Greater Manchester	Manchester

This data is sourced from the Ministry of Housing, Communities and Local Government.

10.12 Proposed Ramsar sites

Records within 2000m	0

Ramsar sites are areas listed as a Wetland of International Importance under the Convention on Wetlands of International Importance especially as Waterfowl Habitat (the Ramsar Convention) 1971. The sites here supplied have a status of 'Proposed' having been identified for potential adoption under the framework.

This data is sourced from Natural England.

10.13 Possible Special Areas of Conservation (pSAC)

Records within 2000m	0

Special Areas of Conservation are areas which have been identified as best representing the range and variety within the European Union of habitats and (non-bird) species listed on Annexes I and II to the Directive. SACs are designated under the EC Habitats Directive. Those sites supplied here are those with a status of 'Possible' having been identified for potential adoption under the framework.

This data is sourced from Natural England and Natural Resources Wales.

10.14 Potential Special Protection Areas (pSPA)

Records within 2000m	0

Special Protection Areas (SPAs) are areas designated (or 'classified') under the European Union Wild Birds Directive for the protection of nationally and internationally important populations of wild birds. Those sites supplied here are those with a status of 'Potential' having been identified for potential adoption under the framework.

This data is sourced from Natural England.

10.15 Nitrate Sensitive Areas

Records within 2000m	0

Areas where nitrate concentrations in drinking water sources exceeded or was at risk of exceeding the limit of 50 mg/l set by the 1980 EC Drinking Water Directive. Voluntary agricultural measures as a means of reducing the levels of nitrate were introduced by DEFRA as MAFF, with payments being made to farmers who complied. The scheme was started as a pilot in 1990 in ten areas, later implemented within 32 areas. The scheme was closed to further new entrants in 1998, although existing agreements continued for their full term. All Nitrate Sensitive Areas fell within the areas designated as Nitrate Vulnerable Zones (NVZs) in 1996 under the EC Nitrate Directive (91/676/EEC).

This data is sourced from Natural England.

10.16 Nitrate Vulnerable Zones

Records within 2000m	0

Areas at risk from agricultural nitrate pollution designated under the EC Nitrate Directive (91/676/EEC). These are areas of land that drain into waters polluted by nitrates. Farmers operating within these areas have to follow mandatory rules to tackle nitrate loss from agriculture.

This data is sourced from Natural England and Natural Resources Wales.

SSSI Impact Zones and Units

Site Outline

Search buffers in metres (m)

SSSI Impact Risk Zones

SSSI Units

- Not recorded
- Favourable
- Unfavourable - Recovering
- Unfavourable - No change
- Unfavourable - Declining
- Partially destroyed
- Destroyed

10.17 SSSI Impact Risk Zones

Records on site	1

Developed to allow rapid initial assessment of the potential risks to SSSIs posed by development proposals. They define zones around each SSSI which reflect the particular sensitivities of the features for which it is notified and indicate the types of development proposal which could potentially have adverse impacts.

Features are displayed on the SSSI Impact Zones and Units map on **page 60 >**

ID	Location	Type of developments requiring consultation
1	On site	**Air pollution - Livestock & poultry units with floorspace > 500m², slurry lagoons & digestate stores > 4000m². Combustion - General combustion processes >50MW energy input. Incl: energy from waste incineration, other incineration, landfill gas generation plant, pyrolysis/gasification, anaerobic digestion, sewage treatment works, other incineration/ combustion.**

This data is sourced from Natural England.

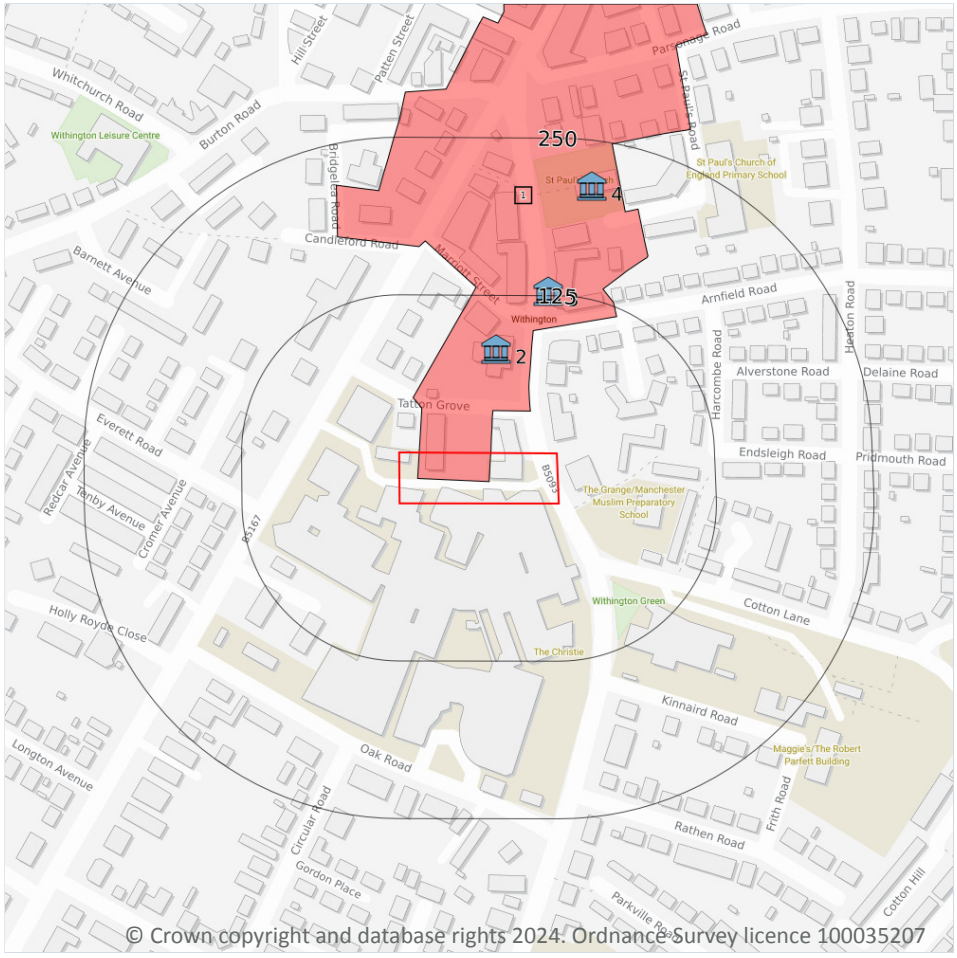
10.18 SSSI Units

Records within 2000m	0

Divisions of SSSIs used to record management and condition details. Units are the smallest areas for which Natural England gives a condition assessment, however, the size of units varies greatly depending on the types of management and the conservation interest.

This data is sourced from Natural England and Natural Resources Wales.

11 Visual and cultural designations



© Crown copyright and database rights 2024. Ordnance Survey licence 100035207

- Site Outline

Search buffers in metres (m)

- Listed buildings
- Conservation areas
- Conservation areas - no data
- National Parks
- Areas of Outstanding Natural Beauty
- Registered parks and gardens
- Scheduled Monuments
- World Heritage Sites

11.1 World Heritage Sites

Records within 250m	0

Sites designated for their globally important cultural or natural interest requiring appropriate management and protection measures. World Heritage Sites are designated to meet the UK's commitments under the World Heritage Convention.

This data is sourced from Historic England, Cadw and Historic Environment Scotland.

11.2 Area of Outstanding Natural Beauty

Records within 250m	0

Areas of Outstanding Natural Beauty (AONB) are conservation areas, chosen because they represent 18% of the finest countryside. Each AONB has been designated for special attention because of the quality of their flora, fauna, historical and cultural associations, and/or scenic views. The National Parks and Access to the Countryside Act of 1949 created AONBs and the Countryside and Rights of Way Act, 2000 added further regulation and protection. There are likely to be restrictions to some developments within these areas.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

11.3 National Parks

Records within 250m	0

In England and Wales, the purpose of National Parks is to conserve and enhance landscapes within the countryside whilst promoting public enjoyment of them and having regard for the social and economic well-being of those living within them. In Scotland National Parks have the additional purpose of promoting the sustainable use of the natural resources of the area and the sustainable social and economic development of its communities. The National Parks and Access to the Countryside Act 1949 established the National Park designation in England and Wales, and The National Parks (Scotland) Act 2000 in Scotland.

This data is sourced from Natural England, Natural Resources Wales and the Scottish Government.

11.4 Listed Buildings

Records within 250m	3

Buildings listed for their special architectural or historical interest. Building control in the form of 'listed building consent' is required in order to make any changes to that building which might affect its special interest. Listed buildings are graded to indicate their relative importance, however building controls apply to all buildings equally, irrespective of their grade, and apply to the interior and exterior of the building in its entirety, together with any curtilage structures.

Features are displayed on the Visual and cultural designations map on **page 62 >**

ID	Location	Name	Grade	Reference Number	Listed date
2	83m N	Red Lion Inn	II	1270511	03/10/1974
3	129m N	Milestone Adjacent To Withington Fire Station	II	1415631	24/10/2013
4	214m N	Church Of St Paul	II	1255027	20/06/1988

This data is sourced from Historic England, Cadw and Historic Environment Scotland.

11.5 Conservation Areas

Records within 250m	1

Local planning authorities are obliged to designate as conservation areas any parts of their own area that are of special architectural or historic interest, the character and appearance of which it is desirable to preserve or enhance. Designation of a conservation area gives broader protection than the listing of individual buildings. All the features within the area, listed or otherwise, are recognised as part of its character. Conservation area designation is the means of recognising the importance of all factors and of ensuring that planning decisions address the quality of the landscape in its broadest sense.

Features are displayed on the Visual and cultural designations map on **page 62 >**

ID	Location	Name	District	Date of designation
1	**On site**	**Withington**	**Manchester**	**01/07/1983**

This data is sourced from Historic England, Cadw and Historic Environment Scotland.

11.6 Scheduled Ancient Monuments

Records within 250m	0

A scheduled monument is an historic building or site that is included in the Schedule of Monuments kept by the Secretary of State for Digital, Culture, Media and Sport. The regime is set out in the Ancient Monuments and Archaeological Areas Act 1979. The Schedule of Monuments has c.20,000 entries and includes sites such as Roman remains, burial mounds, castles, bridges, earthworks, the remains of deserted villages and industrial sites. Monuments are not graded, but all are, by definition, considered to be of national importance.

This data is sourced from Historic England, Cadw and Historic Environment Scotland.

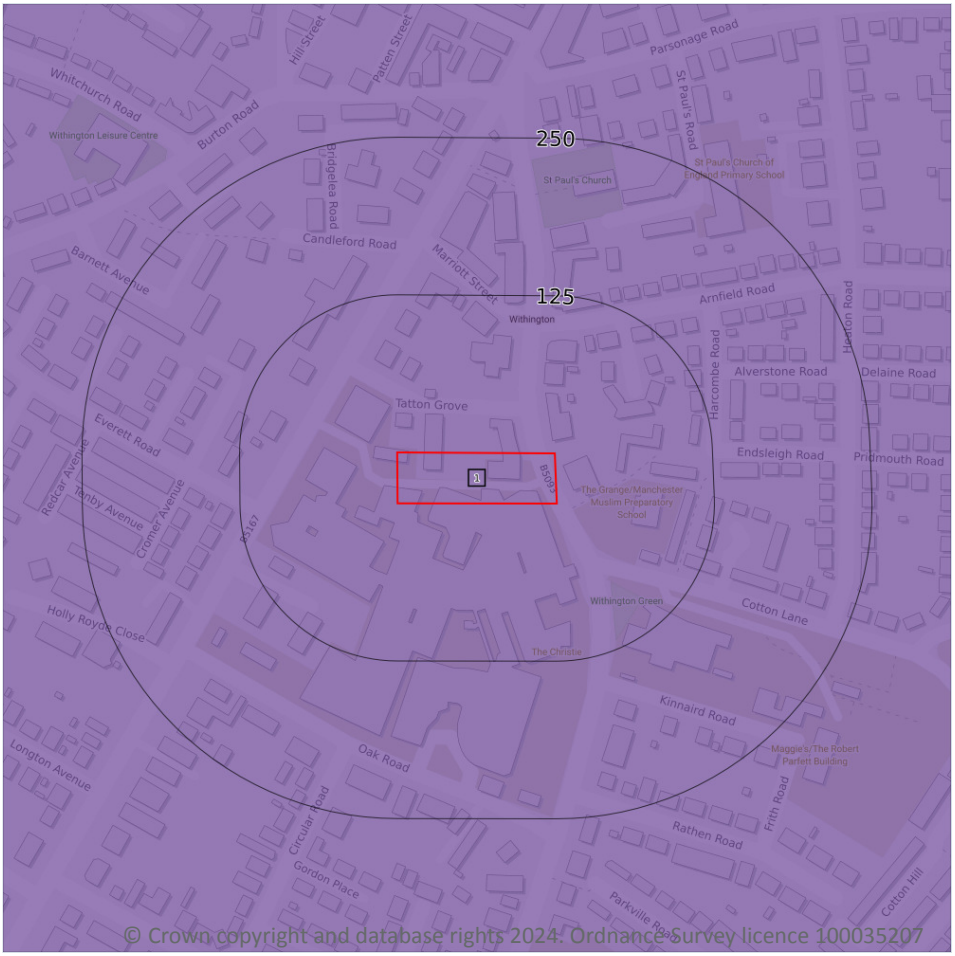
11.7 Registered Parks and Gardens

Records within 250m	0

Parks and gardens assessed to be of particular interest and of special historic interest. The emphasis being on 'designed' landscapes, rather than on planting or botanical importance. Registration is a 'material consideration' in the planning process, meaning that planning authorities must consider the impact of any proposed development on the special character of the landscape.

This data is sourced from Historic England, Cadw and Historic Environment Scotland.

12 Agricultural designations



Site Outline

Search buffers in metres (m)

- Grade 1 - excellent quality
- Grade 2 - very good quality
- Grade 3 - good to moderate quality
- Grade 3a - good quality
- Grade 3b - moderate quality
- Grade 4 - poor quality
- Grade 5 - very poor quality
- Non-agricultural land
- Urban land
- Exclusion land
- Tree felling licences
- Open Access land

12.1 Agricultural Land Classification

Records within 250m	1

Classification of the quality of agricultural land taking into consideration multiple factors including climate, physical geography and soil properties. It should be noted that the categories for the grading of agricultural land are not consistent across England, Wales and Scotland.

Features are displayed on the Agricultural designations map on **page 65 >**

ID	Location	Classification	Description
1	**On site**	**Urban**	-

This data is sourced from Natural England.

12.2 Open Access Land

Records within 250m	0

The Countryside and Rights of Way Act 2000 (CROW Act) gives a public right of access to land without having to use paths. Access land includes mountains, moors, heaths and downs that are privately owned. It also includes common land registered with the local council and some land around the England Coast Path. Generally permitted activities on access land are walking, running, watching wildlife and climbing.

This data is sourced from Natural England and Natural Resources Wales.

12.3 Tree Felling Licences

Records within 250m	0

Felling Licence Application (FLA) areas approved by Forestry Commission England. Anyone wishing to fell trees must ensure that a licence or permission under a grant scheme has been issued by the Forestry Commission before any felling is carried out or that one of the exceptions apply.

This data is sourced from the Forestry Commission.

12.4 Environmental Stewardship Schemes

Records within 250m	0

Environmental Stewardship covers a range of schemes that provide financial incentives to farmers, foresters and land managers to look after and improve the environment. The schemes identified may be historical schemes that have now expired, or may still be active.

This data is sourced from Natural England.

12.5 Countryside Stewardship Schemes

Records within 250m	0

Countryside Stewardship covers a range of schemes that provide financial incentives to farmers, foresters and land managers to look after and improve the environment. Main objectives are to improve the farmed environment for wildlife and to reduce diffuse water pollution.

This data is sourced from Natural England.

13 Habitat designations

13.1 Priority Habitat Inventory

Records within 250m	0

Habitats of principal importance as named under Natural Environment and Rural Communities Act (2006) Section 41.

This data is sourced from Natural England.

13.2 Habitat Networks

Records within 250m	0

Habitat networks for 18 priority habitat networks (based primarily, but not exclusively, on the priority habitat inventory) and areas suitable for the expansion of networks through restoration and habitat creation.

This data is sourced from Natural England.

13.3 Open Mosaic Habitat

Records within 250m	0

Sites verified as Open Mosaic Habitat. Mosaic habitats are brownfield sites that are identified under the UK Biodiversity Action Plan as a priority habitat due to the habitat variation within a single site, supporting an array of invertebrates.

This data is sourced from Natural England.

13.4 Limestone Pavement Orders

Records within 250m	0

Limestone pavements are outcrops of limestone where the surface has been worn away by natural means over millennia. These rocks have the appearance of paving blocks, hence their name. Not only do they have geological interest, they also provide valuable habitats for wildlife. These habitats are threatened due to their removal for use in gardens and water features. Many limestone pavements have been designated as SSSIs which affords them some protection. In addition, Section 34 of the Wildlife and Countryside Act 1981 gave them additional protection via the creation of Limestone Pavement Orders, which made it a criminal offence to remove any part of the outcrop. The associated Limestone Pavement Priority Habitat is part of the UK Biodiversity Action Plan priority habitat in England.

This data is sourced from Natural England.

14 Geology 1:10,000 scale - Availability

© Crown copyright and database rights 2024. Ordnance Survey licence 100035207

Site Outline

Search buffers in metres (m)

- Full coverage
- Partial coverage
- No coverage

14.1 10k Availability

Records within 500m	2

An indication on the coverage of 1:10,000 scale geology data for the site, the most detailed dataset provided by the British Geological Survey. Either 'Full', 'Partial' or 'No coverage' for each geological theme.

Features are displayed on the Geology 1:10,000 scale - Availability map on **page 68 >**

ID	Location	Artificial	Superficial	Bedrock	Mass movement	Sheet No.
1	**On site**	**Full**	**Full**	**Full**	**No coverage**	**SJ89SW**
2	76m E	Full	Full	Full	No coverage	SJ89SE

This data is sourced from the British Geological Survey.

Geology 1:10,000 scale - Artificial and made ground

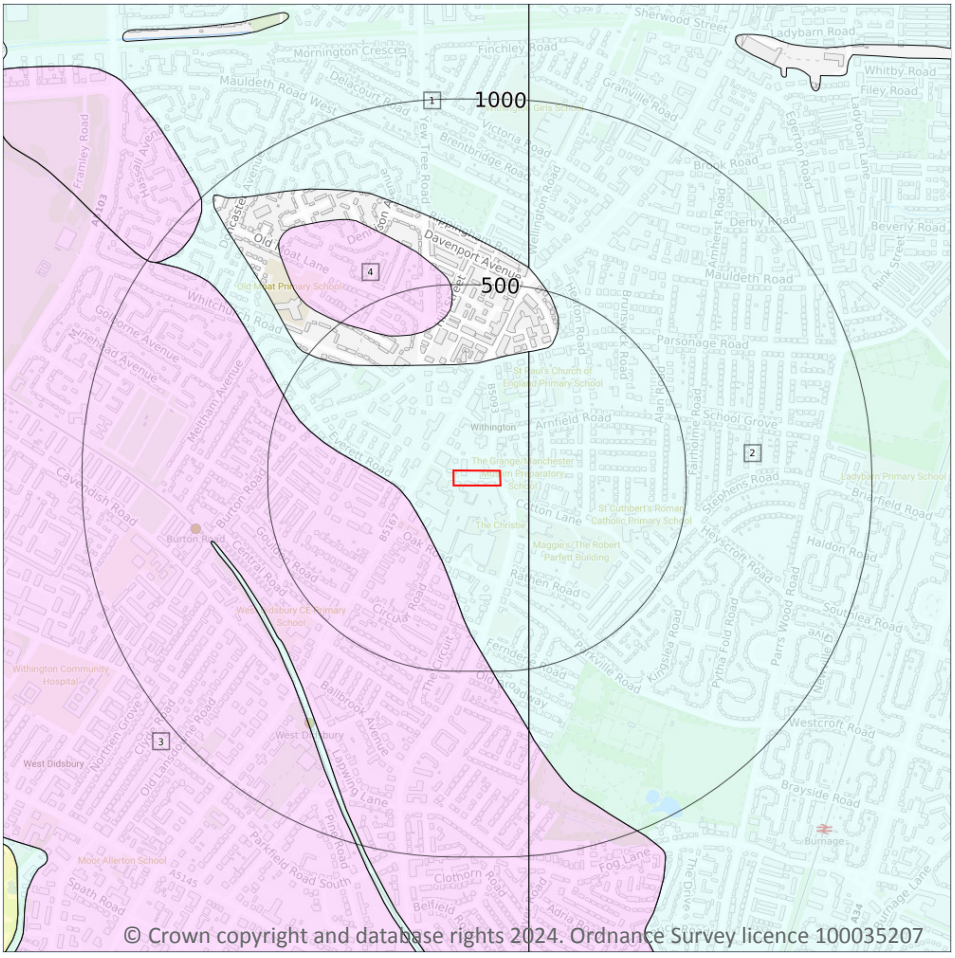
14.2 Artificial and made ground (10k)

Records within 500m	0

Details of made, worked, infilled, disturbed and landscaped ground at 1:10,000 scale. Artificial ground can be associated with potentially contaminated material, unpredictable engineering conditions and instability.

This data is sourced from the British Geological Survey.

Geology 1:10,000 scale - Superficial


1000
500
1
2
3
4
Withington
West Didsbury
Burton Road
Parsonage Road
Arnfield Road
Maudlith Road
Davenport Avenue
Old Moat Lane
Wellington Road
Ladybarn Road
Whitby Road
Filey Road
Beverly Road
Derby Road
Brook Road
Granville Road
Finchley Road
Mornington Crescent
Maulden Road West
Victoria Road
Brentbridge Road
Yew Tree Road
Cavendish Road
Meltham Avenue
Whitchurch Road
Gorsefield Avenue
Gorsefield Road
Central Road
Oak Road
Circus Road
Fendor Road
Parkville Road
Kingsley Road
Pythia Fold Road
Parrs Wood Road
Southlea Road
Haldon Road
Briarfield Road
Ladybarn Primary School
Stephens Road
School Grove
Fairholme Road
Alan Road
Lapwing Lane
Ballroom Avenue
Northern Grove
Old Lane
Parkfield Road South
Moor Allerton School
Withington Community Hospital
Westcroft Road
Brayside Road
Burnage
Clothorn Road
Fog Lane
Belfield Road
Adria Road
Thelwall Drive
Spath Road
A5145
A34
B5093
B5167
Sherwood Street
Whitworth Road
Egerton Road
Ladybarn Lane
Rink Street
Arthurs Road
Cotton Lane
Rowen Road
Maggie's The Robert Parfett Building
The Christie
St Cuthbert's Roman Catholic Primary School
The Grange Manchester Grammar Preparatory School
St Paul's Church of England Primary School
Old Moat Primary School
West Didsbury CE Primary School
Crown Lane
Tramley Road
Greenfield Avenue
Gorsefield Avenue
Old Lane
Northern Grove
Ballroom Avenue
Lapwing Lane
Parkfield Road South
Spath Road
Fog Lane
Clothorn Road
Belfield Road
Adria Road
Thelwall Drive
Burnage Lane
A34

ID	Location	LEX Code	Description	Rock description
4	382m N	GFICD-XSV	Glaciofluvial Ice Contact Deposits, Devensian - Sand And Gravel	Sand And Gravel

This data is sourced from the British Geological Survey.

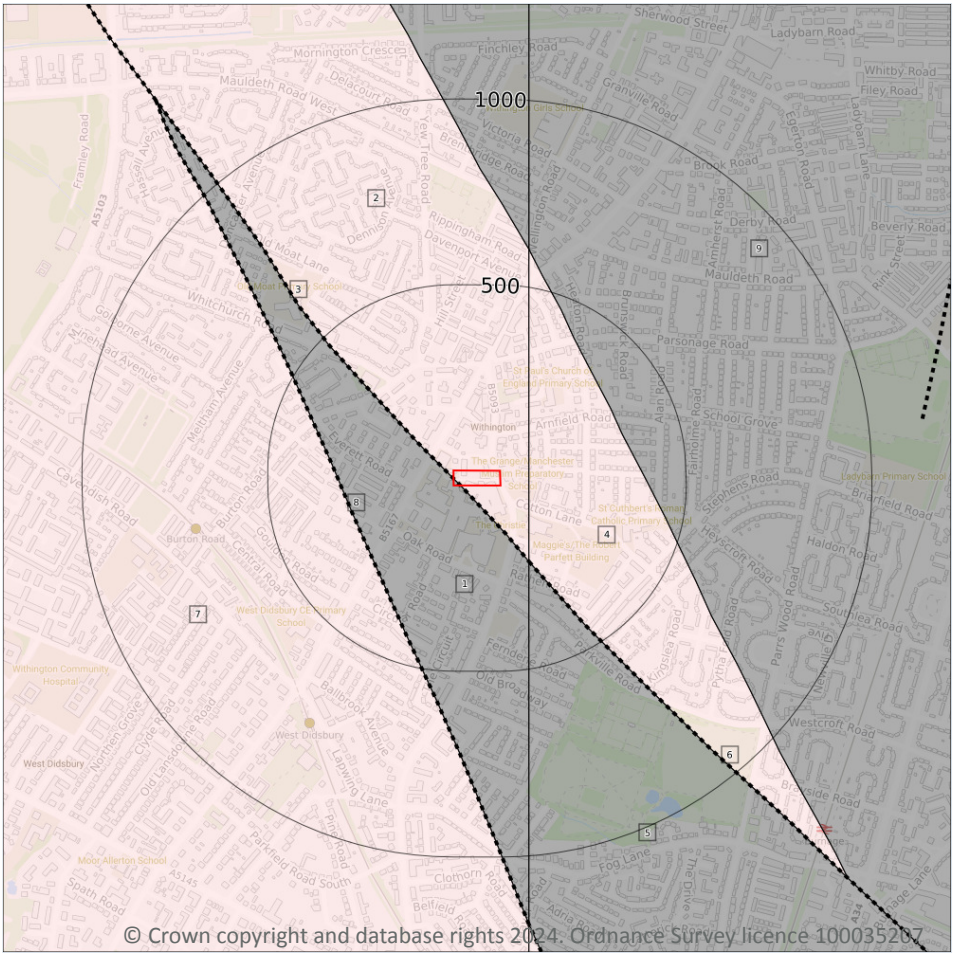
14.4 Landslip (10k)

Records within 500m	0

Mass movement deposits on BGS geological maps at 1:10,000 scale. Primarily superficial deposits that have moved down slope under gravity to form landslips. These affect bedrock, other superficial deposits and artificial ground.

This data is sourced from the British Geological Survey.

Geology 1:10,000 scale - Bedrock



Site Outline

Search buffers in metres (m)

Bedrock faults and other linear features (10k)

Bedrock geology (10k)
Please see table for more details.

14.5 Bedrock geology (10k)

Records within 500m **6**

Bedrock geology at 1:10,000 scale. The main mass of rocks forming the Earth and present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.

Features are displayed on the Geology 1:10,000 scale - Bedrock map on **page 72 >**

ID	Location	LEX Code	Description	Rock age
1	**On site**	**CPB-SDST**	**Chester Pebble Beds Formation - Sandstone**	**Early Triassic Epoch**
2	**On site**	**WLSF-SDST**	**Wilmslow Sandstone Formation - Sandstone**	**Early Triassic Epoch**
4	76m E	WLSF-SDST	Wilmslow Sandstone Formation - Sandstone	Early Triassic Epoch
5	218m SE	CPB-SDST	Chester Pebble Beds Formation - Sandstone	Early Triassic Epoch

ID	Location	LEX Code	Description	Rock age
7	279m SW	WLSF-SDST	Wilmslow Sandstone Formation - Sandstone	Early Triassic Epoch
9	341m NE	CPB-SDST	Chester Pebble Beds Formation - Sandstone	Early Triassic Epoch

This data is sourced from the British Geological Survey.

14.6 Bedrock faults and other linear features (10k)

Records within 500m	**3**

Linear features at the ground or bedrock surface at 1:10,000 scale of six main types; rock, fault, fold axis, mineral vein, alteration area or landform. Features are either observed or inferred, and relate primarily to bedrock.

Features are displayed on the Geology 1:10,000 scale - Bedrock map on **page 72 >**

ID	Location	Category	Description
3	**On site**	**FAULT**	**Normal fault, inferred; crossmarks on downthrow side**
6	218m SE	FAULT	Normal fault, inferred; crossmarks on downthrow side
8	279m SW	FAULT	Normal fault, inferred; crossmarks on downthrow side

This data is sourced from the British Geological Survey.

15 Geology 1:50,000 scale - Availability

Site Outline

Search buffers in metres (m)

Geological map tile

15.1 50k Availability

Records within 500m	1

An indication on the coverage of 1:50,000 scale geology data for the site. Either 'Full' or 'No coverage' for each geological theme.

Features are displayed on the Geology 1:50,000 scale - Availability map on **page 74 >**

ID	Location	Artificial	Superficial	Bedrock	Mass movement	Sheet No.
1	On site	No coverage	Full	Full	Full	EW098_stockport_v4

This data is sourced from the British Geological Survey.

Geology 1:50,000 scale - Artificial and made ground

15.2 Artificial and made ground (50k)

Records within 500m	0

Details of made, worked, infilled, disturbed and landscaped ground at 1:50,000 scale. Artificial ground can be associated with potentially contaminated material, unpredictable engineering conditions and instability.

This data is sourced from the British Geological Survey.

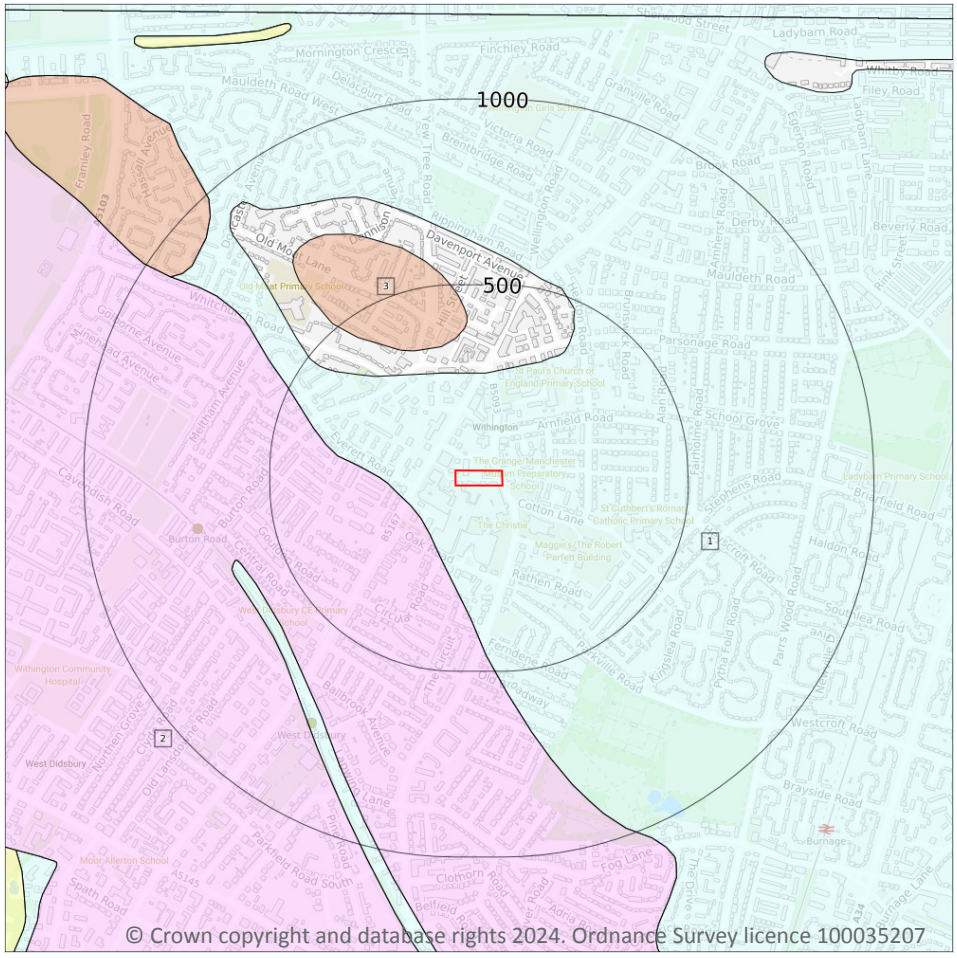
15.3 Artificial ground permeability (50k)

Records within 50m	0

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of any artificial deposits (the zone between the land surface and the water table).

This data is sourced from the British Geological Survey.

Geology 1:50,000 scale - Superficial



Site Outline

Search buffers in metres (m)

Landslip (50k)

Superficial geology (50k)
Please see table for more details.

15.4 Superficial geology (50k)

Records within 500m **3**

Superficial geological deposits at 1:50,000 scale. Also known as 'drift', these are the youngest geological deposits, formed during the Quaternary. They rest on older deposits or rocks referred to as bedrock.

Features are displayed on the Geology 1:50,000 scale - Superficial map on **page 76 >**

ID	Location	LEX Code	Description	Rock description
1	**On site**	**TILLD-DMTN**	**TILL, DEVENSIAN**	**DIAMICTON**
2	128m SW	GFSDD-XSV	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN	SAND AND GRAVEL
3	335m N	SSA-S	SHIRDLEY HILL SAND FORMATION	SAND

This data is sourced from the British Geological Survey.

15.5 Superficial permeability (50k)

Records within 50m	1

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of any superficial deposits (the zone between the land surface and the water table).

Location	Flow type	Maximum permeability	Minimum permeability
On site	**Mixed**	**High**	**Low**

This data is sourced from the British Geological Survey.

15.6 Landslip (50k)

Records within 500m	0

Mass movement deposits on BGS geological maps at 1:50,000 scale. Primarily superficial deposits that have moved down slope under gravity to form landslips. These affect bedrock, other superficial deposits and artificial ground.

This data is sourced from the British Geological Survey.

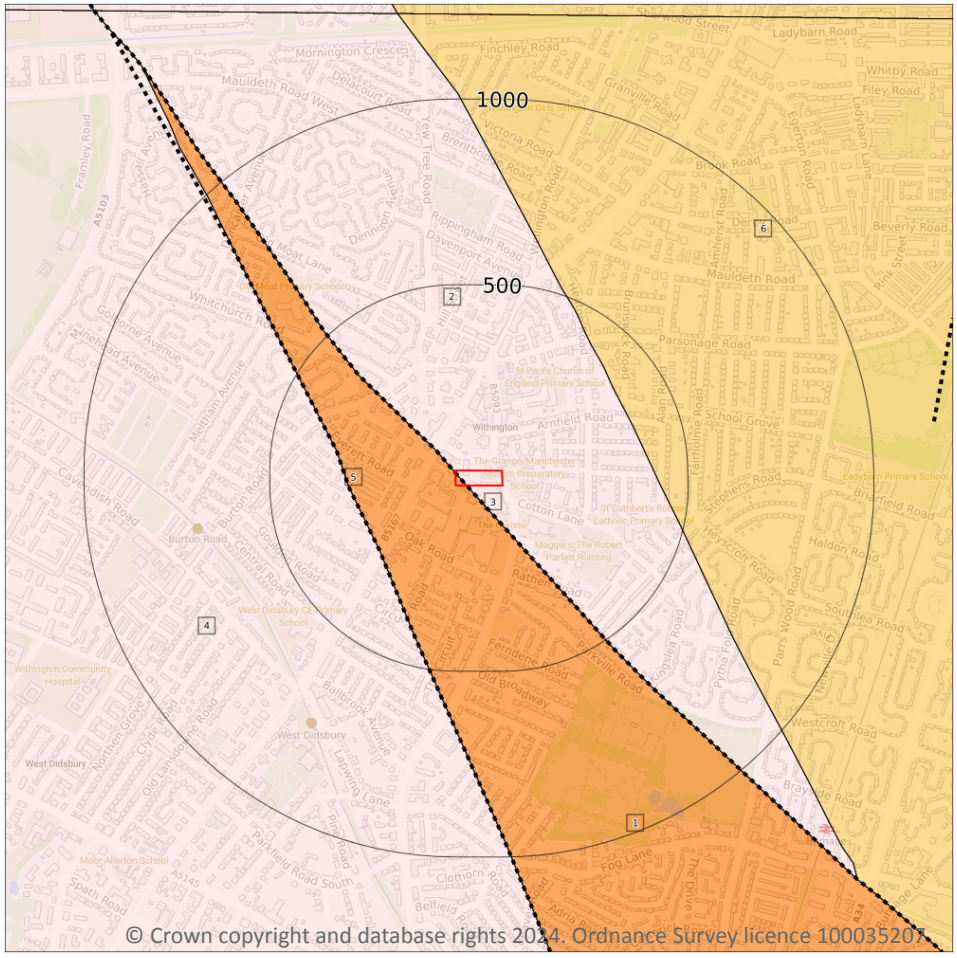
15.7 Landslip permeability (50k)

Records within 50m	0

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of any landslip deposits (the zone between the land surface and the water table).

This data is sourced from the British Geological Survey.

Geology 1:50,000 scale - Bedrock



Site Outline

Search buffers in metres (m)

Bedrock faults and other linear features (50k)

Bedrock geology (50k)
Please see table for more details.

15.8 Bedrock geology (50k)

Records within 500m **4**

Bedrock geology at 1:50,000 scale. The main mass of rocks forming the Earth and present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.

Features are displayed on the Geology 1:50,000 scale - Bedrock map on **page 78 >**

ID	Location	LEX Code	Description	Rock age
1	**On site**	**CHES-PESST**	**CHESTER FORMATION - SANDSTONE, PEBBLY (GRAVELLY)**	**OLENEKIAN**
2	**On site**	**WLSF-SDST**	**WILMSLOW SANDSTONE FORMATION - SANDSTONE**	**-**
4	261m SW	WLSF-SDST	WILMSLOW SANDSTONE FORMATION - SANDSTONE	-
6	368m NE	CHES-SDST	CHESTER FORMATION - SANDSTONE	OLENEKIAN

This data is sourced from the British Geological Survey.

15.9 Bedrock permeability (50k)

Records within 50m	2

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of bedrock (the zone between the land surface and the water table).

Location	Flow type	Maximum permeability	Minimum permeability
On site	**Mixed**	**High**	**Moderate**
On site	**Intergranular**	**High**	**High**

This data is sourced from the British Geological Survey.

15.10 Bedrock faults and other linear features (50k)

Records within 500m	2

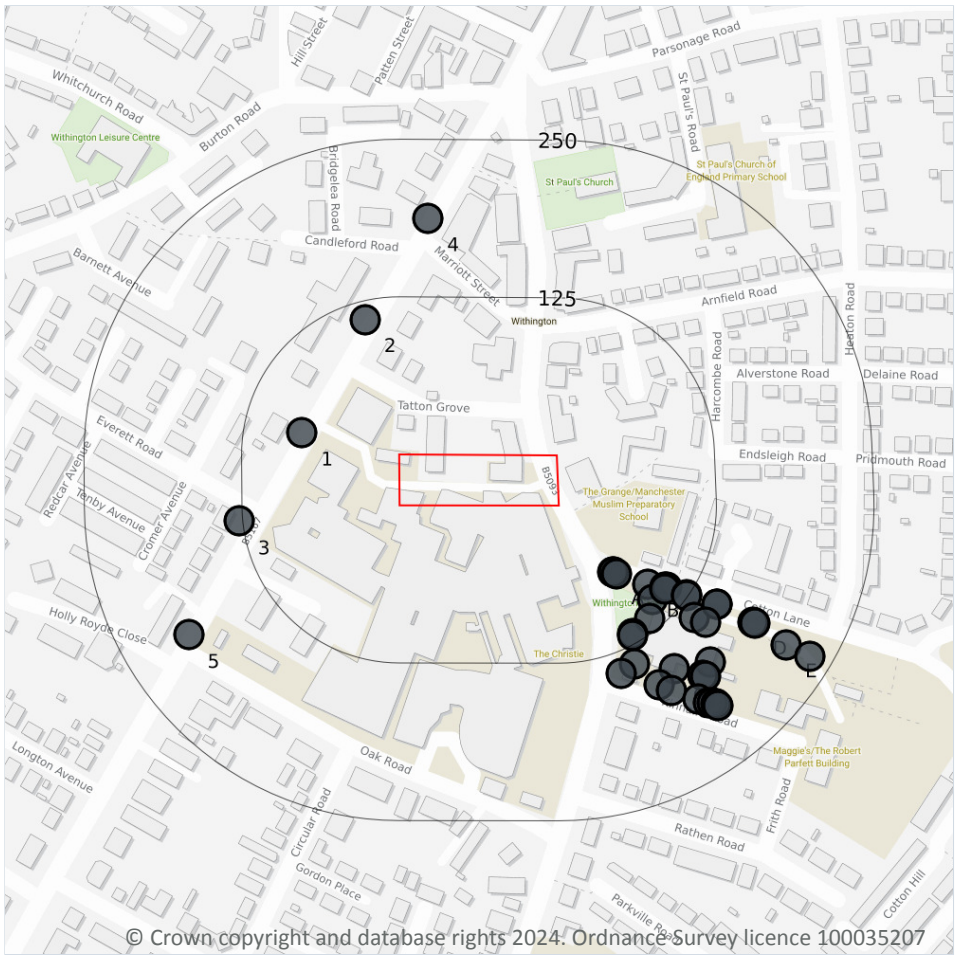
Linear features at the ground or bedrock surface at 1:50,000 scale of six main types; rock, fault, fold axis, mineral vein, alteration area or landform. Features are either observed or inferred, and relate primarily to bedrock.

Features are displayed on the Geology 1:50,000 scale - Bedrock map on **page 78 >**

ID	Location	Category	Description
3	**On site**	**FAULT**	**Fault, inferred**
5	261m SW	FAULT	Fault, inferred

This data is sourced from the British Geological Survey.

16 Boreholes



16.1 BGS Boreholes

Records within 250m	39

The Single Onshore Boreholes Index (SOBI); an index of over one million records of boreholes, shafts and wells from all forms of drilling and site investigation work held by the British Geological Survey. Covering onshore and nearshore boreholes dating back to at least 1790 and ranging from one to several thousand metres deep.

Features are displayed on the Boreholes map on **page 80 >**

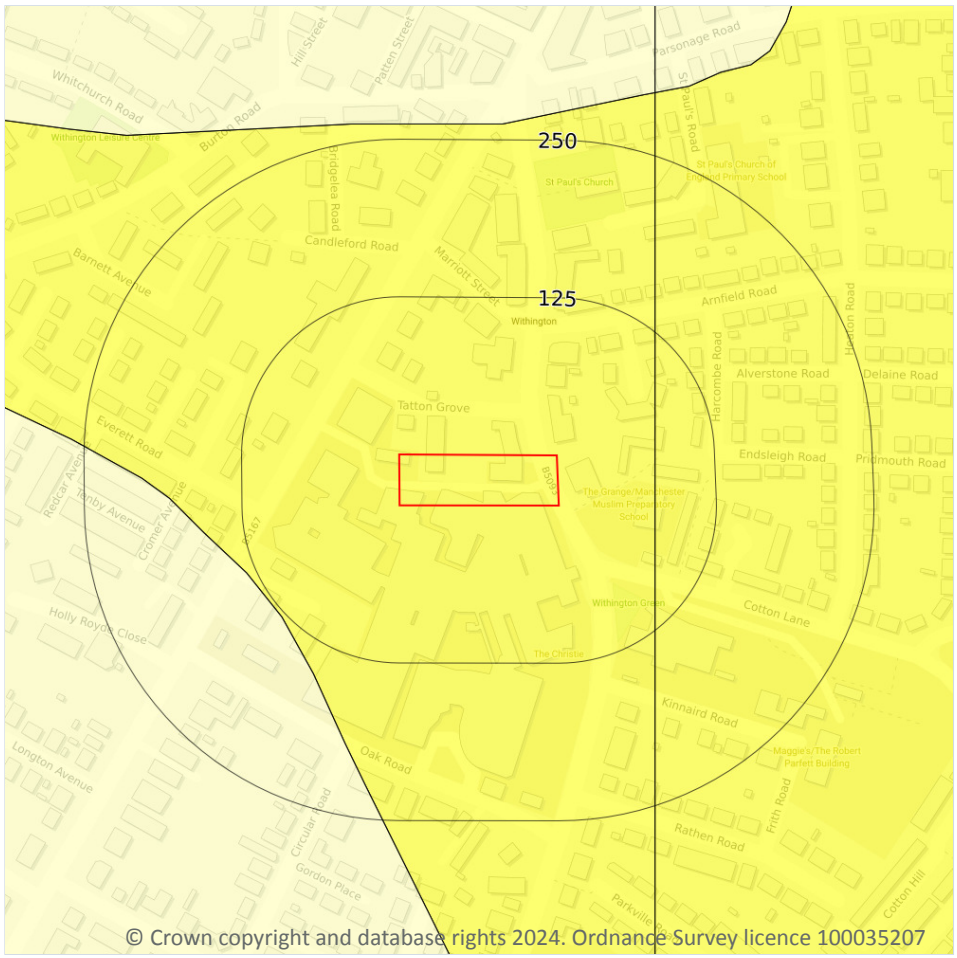
ID	Location	Grid reference	Name	Length	Confidential	Web link
A	67m SE	384966 392580	MSCP Christie Hospital GI TPG	-	Y	N/A
A	68m SE	384967 392580	MSCP Christie Hospital GI TPF	-	Y	N/A

ID	Location	Grid reference	Name	Length	Confidential	Web link
A	71m SE	384969 392578	MSCP Christie Hospital GI TPH	-	Y	N/A
1	79m W	384720 392690	PALATINE ROAD 8	-	Y	N/A
B	94m SE	384994 392570	MSCP Christie Hospital GI TPE	-	Y	N/A
B	105m SE	384998 392558	MSCP Christie Hospital GI TPA	-	Y	N/A
B	106m SE	385008 392568	MSCP Christie Hospital GI TPC	-	Y	N/A
B	107m SE	385009 392568	MSCP Christie Hospital GI TPB	-	Y	N/A
B	107m SE	385008 392566	MSCP Christie Hospital GI TPD	-	Y	N/A
2	110m NW	384770 392780	PALATINE ROAD 9	-	Y	N/A
B	115m SE	384996 392543	Manchester Cancer Research Centre BH03	-	Y	N/A
B	117m SE	384982 392531	Manchester Cancer Research Centre WS01	-	Y	N/A
B	119m SE	384982 392529	Manchester Cancer Research Centre SA03	-	Y	N/A
B	123m SE	385025 392562	MSCP Christie Hospital GI TP1	-	Y	N/A
B	124m SE	385025 392561	Manchester Cancer Research Centre WS03	-	Y	N/A
3	128m W	384670 392620	PALATINE ROAD 7	-	Y	N/A
B	139m SE	385031 392544	Manchester Cancer Research Centre CBR04	-	Y	N/A
B	139m SE	384984 392507	Manchester Cancer Research Centre CBR03	-	Y	N/A
B	142m SE	384973 392499	Manchester Cancer Research Centre BH02	-	Y	N/A
B	148m SE	385049 392554	MSCP Christie Hospital GI TP2	-	Y	N/A
B	148m SE	385049 392554	Manchester Cancer Research Centre CBR06	-	Y	N/A
B	149m SE	385040 392540	Manchester Cancer Research Centre BH06	-	Y	N/A
C	158m SE	385015 392503	Manchester Cancer Research Centre BH04	-	Y	N/A
C	163m SE	385003 392490	Manchester Cancer Research Centre WS02	-	Y	N/A
C	172m SE	385013 392486	Manchester Cancer Research Centre CBR05	-	Y	N/A
C	173m SE	385044 392508	Manchester Cancer Research Centre WS05	-	Y	N/A
C	176m SE	385038 392498	Manchester Cancer Research Centre BH05	-	Y	N/A
C	179m SE	385040 392497	Manchester Cancer Research Centre BH05A	-	Y	N/A
D	180m SE	385078 392540	Manchester Cancer Research Centre CBR08	-	Y	N/A
D	181m SE	385079 392539	MSCP Christie Hospital GI TP3	-	Y	N/A

ID	Location	Grid reference	Name	Length	Confidential	Web link
4	187m N	384820 392860	PALATINE ROAD 10	-	Y	N/A
C	189m SE	385034 392479	Manchester Cancer Research Centre CBR07	-	Y	N/A
C	196m SE	385042 392476	Manchester Cancer Research Centre SA02	-	Y	N/A
5	196m SW	384630 392530	PALATINE ROAD 6	-	Y	N/A
C	198m SE	385045 392476	Manchester Cancer Research Centre WS04	-	Y	N/A
C	201m SE	385048 392475	Manchester Cancer Research Centre SA02A	-	Y	N/A
C	203m SE	385050 392474	Manchester Cancer Research Centre CBR09	-	Y	N/A
E	211m SE	385104 392522	MSCP Christie Hospital GI TP4	-	Y	N/A
E	232m SE	385123 392513	MSCP Christie Hospital GI TP5	-	Y	N/A

This data is sourced from the British Geological Survey.

17 Natural ground subsidence - Shrink swell clays



Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

17.1 Shrink swell clays

Records within 50m	1

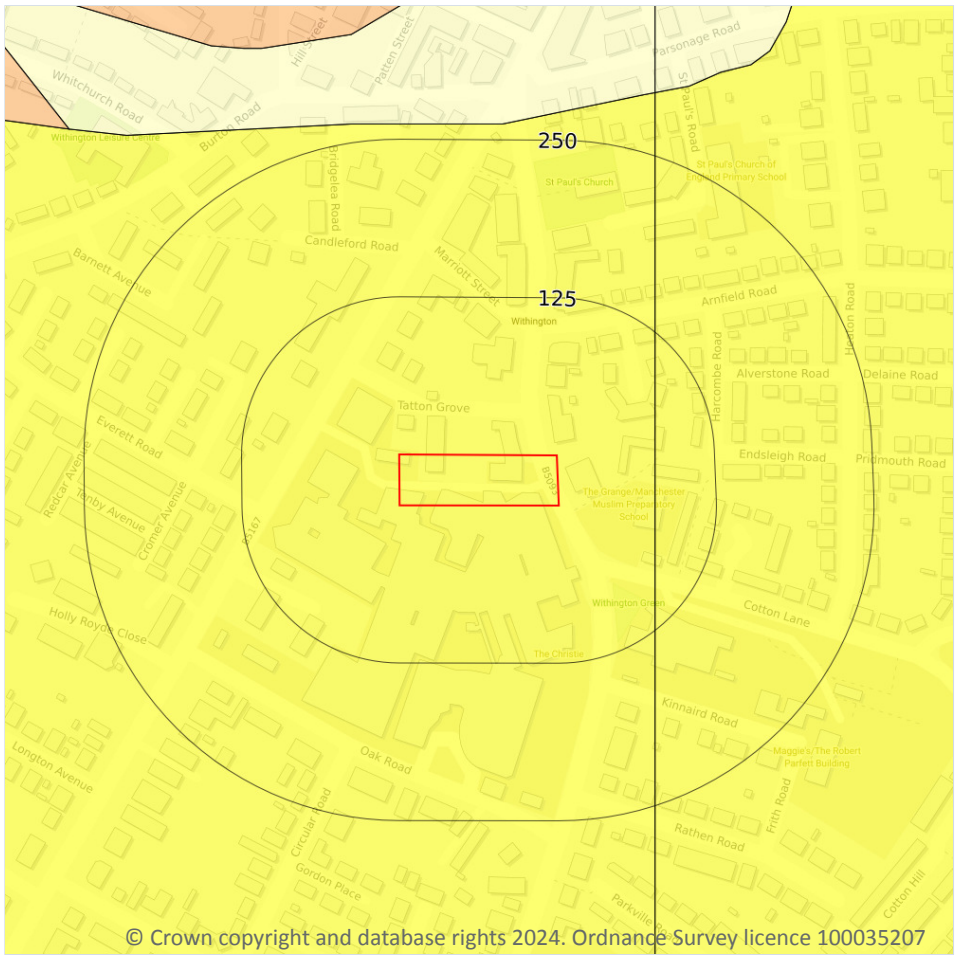
The potential hazard presented by soils that absorb water when wet (making them swell), and lose water as they dry (making them shrink). This shrink-swell behaviour is controlled by the type and amount of clay in the soil, and by seasonal changes in the soil moisture content (related to rainfall and local drainage).

Features are displayed on the Natural ground subsidence - Shrink swell clays map on **page 83 >**

Location	Hazard rating	Details
On site	**Very low**	**Ground conditions predominantly low plasticity.**

This data is sourced from the British Geological Survey.

Natural ground subsidence - Running sands



Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

17.2 Running sands

Records within 50m	1

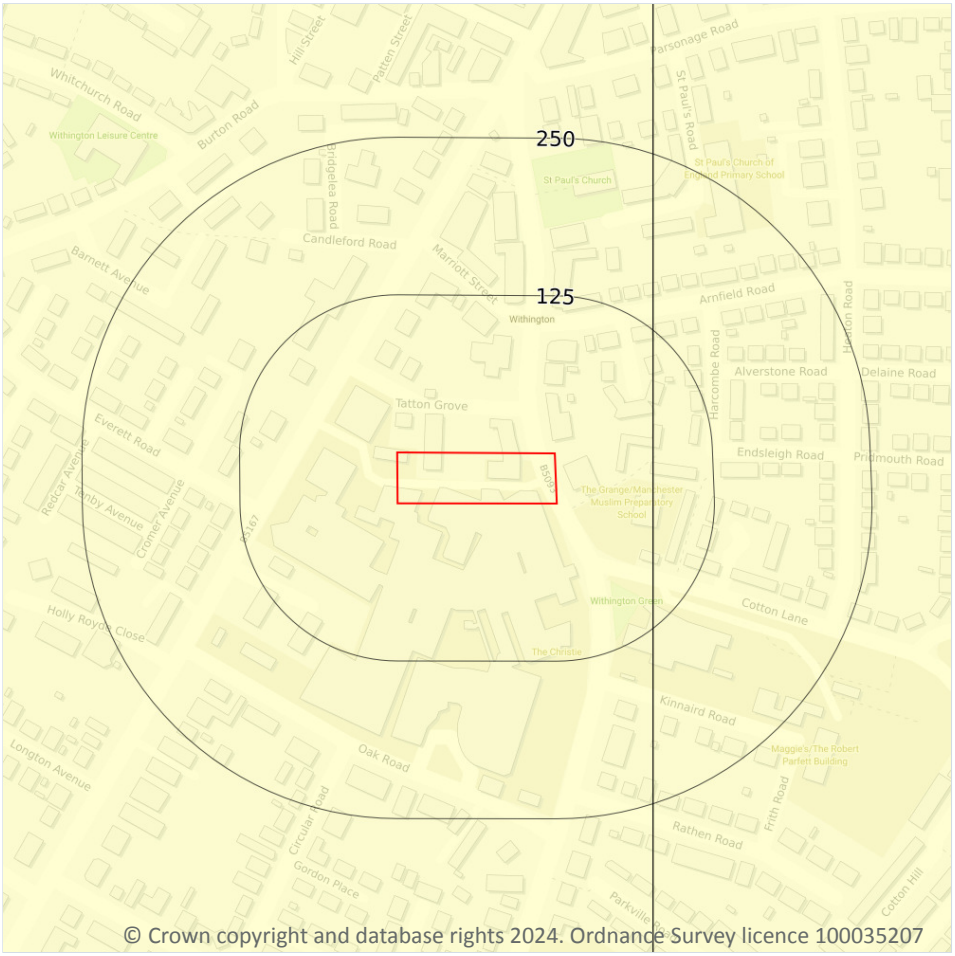
The potential hazard presented by rocks that can contain loosely-packed sandy layers that can become fluidised by water flowing through them. Such sands can 'run', removing support from overlying buildings and causing potential damage.

Features are displayed on the Natural ground subsidence - Running sands map on **page 84 >**

Location	Hazard rating	Details
On site	**Very low**	**Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.**

This data is sourced from the British Geological Survey.

Natural ground subsidence - Compressible deposits



Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

17.3 Compressible deposits

Records within 50m	1

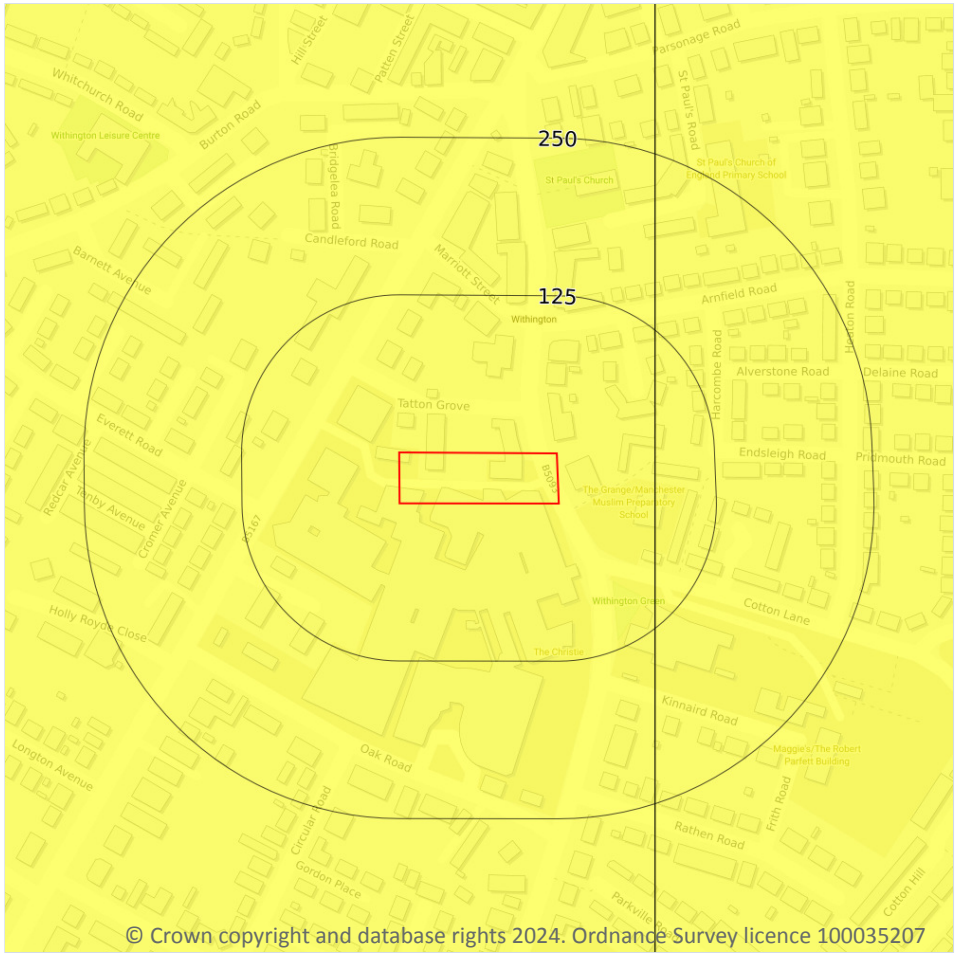
The potential hazard presented by types of ground that may contain layers of very soft materials like clay or peat and may compress if loaded by overlying structures, or if the groundwater level changes, potentially resulting in depression of the ground and disturbance of foundations.

Features are displayed on the Natural ground subsidence - Compressible deposits map on **page 85 >**

Location	Hazard rating	Details
On site	**Negligible**	**Compressible strata are not thought to occur.**

This data is sourced from the British Geological Survey.

Natural ground subsidence - Collapsible deposits



Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

17.4 Collapsible deposits

Records within 50m	1

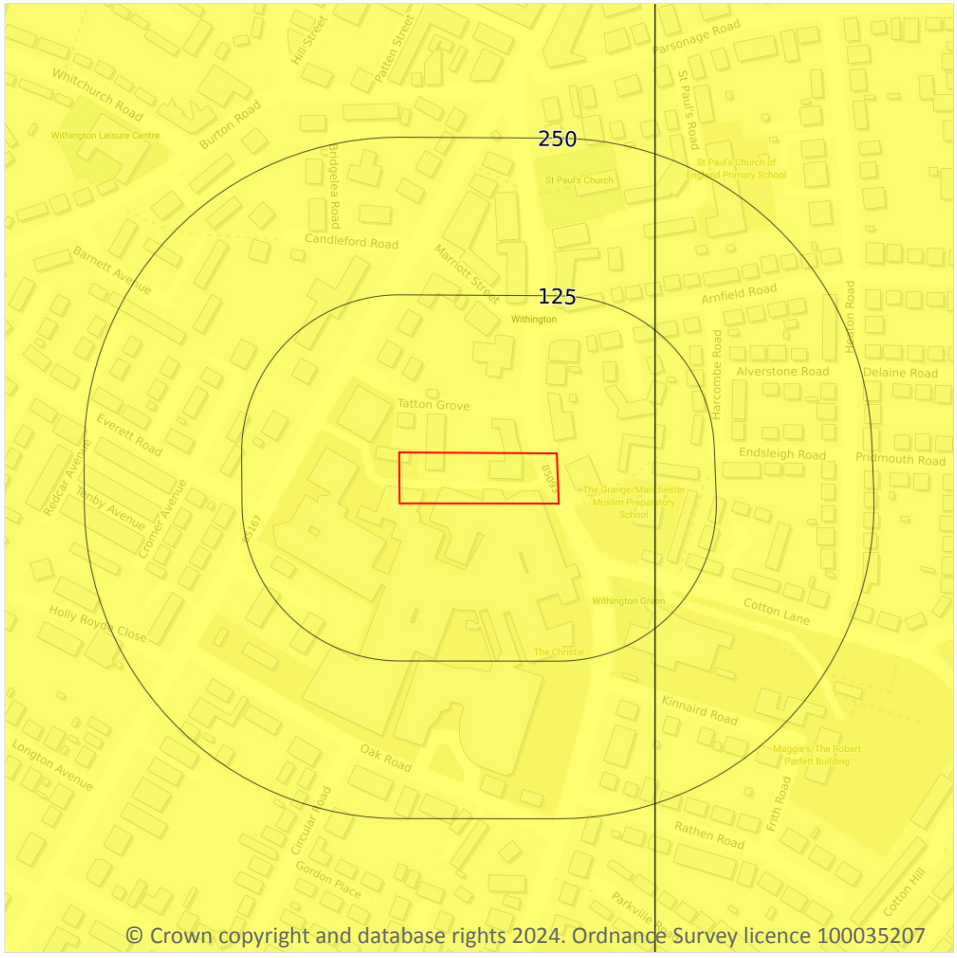
The potential hazard presented by natural deposits that could collapse when a load (such as a building) is placed on them or they become saturated with water.

Features are displayed on the Natural ground subsidence - Collapsible deposits map on **page 86 >**

Location	Hazard rating	Details
On site	**Very low**	**Deposits with potential to collapse when loaded and saturated are unlikely to be present.**

This data is sourced from the British Geological Survey.

Natural ground subsidence - Landslides



Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

17.5 Landslides

Records within 50m	1

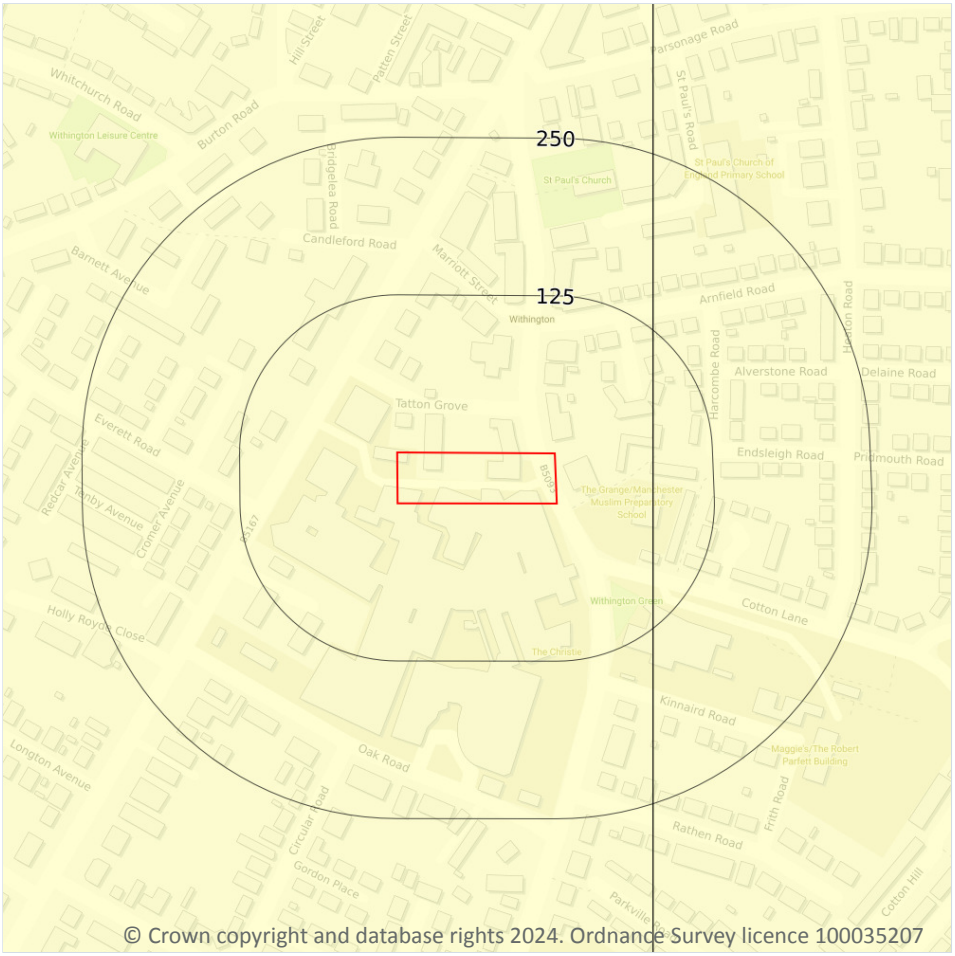
The potential for landsliding (slope instability) to be a hazard assessed using 1:50,000 scale digital maps of superficial and bedrock deposits, combined with information from the BGS National Landslide Database and scientific and engineering reports.

Features are displayed on the Natural ground subsidence - Landslides map on **page 87 >**

Location	Hazard rating	Details
On site	**Very low**	**Slope instability problems are not likely to occur but consideration to potential problems of adjacent areas impacting on the site should always be considered.**

This data is sourced from the British Geological Survey.

Natural ground subsidence - Ground dissolution of soluble rocks



Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

17.6 Ground dissolution of soluble rocks

Records within 50m	1

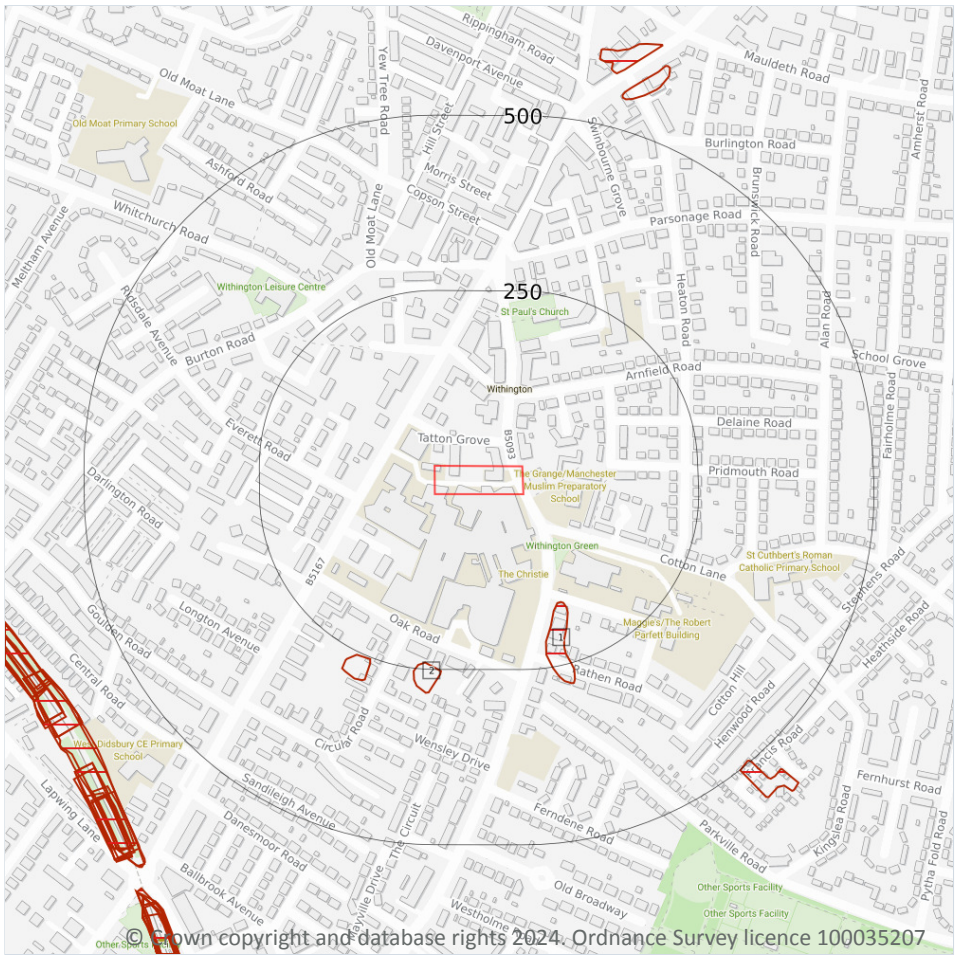
The potential hazard presented by ground dissolution, which occurs when water passing through soluble rocks produces underground cavities and cave systems. These cavities reduce support to the ground above and can cause localised collapse of the overlying rocks and deposits.

Features are displayed on the Natural ground subsidence - Ground dissolution of soluble rocks map on **page 88 >**

Location	Hazard rating	Details
On site	**Negligible**	**Soluble rocks are either not thought to be present within the ground, or not prone to dissolution. Dissolution features are unlikely to be present.**

This data is sourced from the British Geological Survey.

18 Mining and ground workings



© Crown copyright and database rights 2024. Ordnance Survey licence 100035207

Site Outline

Search buffers in metres (m)

- BritPits
- Surface ground workings
- Underground workings
- Underground mining extents
- Historical mineral planning areas
- TCA non-coal mining

Non Coal Mining

- Sporadic underground mining of restricted extent possible
- Localised small scale underground mining possible
- Small scale mining possible
- Underground mining known or likely within or in close proximity
- Underground mining known within or in very close proximity

18.1 BritPits

Records within 500m	0

BritPits (an abbreviation of British Pits) is a database maintained by the British Geological Survey of currently active and closed surface and underground mineral workings. Details of major mineral handling sites, such as wharfs and rail depots are also held in the database.

This data is sourced from the British Geological Survey.

18.2 Surface ground workings

Records within 250m	2

Historical land uses identified from Ordnance Survey mapping that involved ground excavation at the surface. These features may or may not have been subsequently backfilled.

Features are displayed on the Mining and ground workings map on **page 90 >**

ID	Location	Land Use	Year of mapping	Mapping scale
1	163m SE	Water Body	1851	1:10560
2	241m S	Pond	1851	1:10560

This is data is sourced from Ordnance Survey/Groundsure.

18.3 Underground workings

Records within 1000m	0

Historical land uses identified from Ordnance Survey mapping that indicate the presence of underground workings e.g. mine shafts.

This is data is sourced from Ordnance Survey/Groundsure.

18.4 Underground mining extents

Records within 500m	0

This data identifies underground mine workings that could present a potential risk, including adits and seam workings. These features have been identified from BGS Geological mapping and mine plans sourced from the BGS and various collections and sources.

This data is sourced from Groundsure.

18.5 Historical Mineral Planning Areas

Records within 500m	0

Boundaries of mineral planning permissions for England and Wales. This data was collated between the 1940s (and retrospectively to the 1930s) and the mid 1980s. The data includes permitted, withdrawn and refused permissions.

This data is sourced from the British Geological Survey.

18.6 Non-coal mining

Records within 1000m	0

The potential for historical non-coal mining to have affected an area. The assessment is drawn from expert knowledge and literature in addition to the digital geological map of Britain. Mineral commodities may be divided into seven general categories - vein minerals, chalk, oil shale, building stone, bedded ores, evaporites and 'other' commodities (including ball clay, jet, black marble, graphite and chert).

This data is sourced from the British Geological Survey.

18.7 JPB mining areas

Records on site	1

Areas which could be affected by former coal and other mining. This data includes some mine plans unavailable to the Coal Authority.

Location	Details
On site	**Whilst outside of an area where The Coal Authority have information on coal mining activities, Johnson Poole & Bloomer (JPB) may have information such as mining plans and maps held within their archive that have occurred within 1km of this property. Please note, the plans held by JPB may also relate to non-mining records. Further details and a quote for services (if appropriate) can be obtained by emailing this report to enquiries.gs@jpb.co.uk ↗.**

This data is sourced from Johnson Poole and Bloomer.

18.8 The Coal Authority non-coal mining

Records within 500m	0

This data provides an indication of the potential zone of influence of recorded underground non-coal mining workings. Any and all analysis and interpretation of Coal Authority Data in this report is made by Groundsure, and is in no way supported, endorsed or authorised by the Coal Authority. The use of the data is restricted to the terms and provisions contained in this report. Data reproduced in this report may be the copyright of the Coal Authority and permission should be sought from Groundsure prior to any re-use.

This data is sourced from The Coal Authority.

18.9 Researched mining

Records within 500m	0

This data indicates areas of potential mining identified from alternative or archival sources, including; BGS Geological paper maps, Lidar data, aerial photographs (from World War II onwards), archaeological data services, websites, Tithe maps, and various text/plans from collected books and reports. Some of this data is approximate and Groundsure have interpreted the resultant risk area and, where possible, specific areas

of risk have been captured.

This data is sourced from Groundsure.

18.10 Mining record office plans

Records within 500m	0

This dataset is representative of Mining Record Office and/or plan extents held by Groundsure and should be considered approximate. Where possible, plans have been located and any specific areas of risk they depict have been captured.

This data is sourced from Groundsure.

18.11 BGS mine plans

Records within 500m	0

This dataset is representative of BGS mine plans held by Groundsure and should be considered approximate. Where possible, plans have been located and any specific areas of risk they depict have been captured.

This data is sourced from Groundsure.

18.12 Coal mining

Records on site	0

Areas which could be affected by past, current or future coal mining.

This data is sourced from the Coal Authority.

18.13 Brine areas

Records on site	0

The Cheshire Brine Compensation District indicates areas that may be affected by salt and brine extraction in Cheshire and where compensation would be available where damage from this mining has occurred. Damage from salt and brine mining can still occur outside this district, but no compensation will be available.

This data is sourced from the Cheshire Brine Subsidence Compensation Board.

18.14 Gypsum areas

Records on site	0

Generalised areas that may be affected by gypsum extraction.

This data is sourced from British Gypsum.

18.15 Tin mining

Records on site	0

Generalised areas that may be affected by historical tin mining.

This data is sourced from Groundsure.

18.16 Clay mining

Records on site	0

Generalised areas that may be affected by kaolin and ball clay extraction.

This data is sourced from the Kaolin and Ball Clay Association (UK).

19 Ground cavities and sinkholes

19.1 Natural cavities

Records within 500m	0

Industry recognised national database of natural cavities. Sinkholes and caves are formed by the dissolution of soluble rock, such as chalk and limestone, gulls and fissures by cambering. Ground instability can result from movement of loose material contained within these cavities, often triggered by water.

This data is sourced from Stantec UK Ltd.

19.2 Mining cavities

Records within 1000m	0

Industry recognised national database of mining cavities. Degraded mines may result in hazardous subsidence (crown holes). Climatic conditions and water escape can also trigger subsidence over mine entrances and workings.

This data is sourced from Stantec UK Ltd.

19.3 Reported recent incidents

Records within 500m	0

This data identifies sinkhole information gathered from media reports and Groundsure's own records. This data goes back to 2014 and includes relative accuracy ratings for each event and links to the original data sources. The data is updated on a regular basis and should not be considered a comprehensive catalogue of all sinkhole events. The absence of data in this database does not mean a sinkhole definitely has not occurred during this time.

This data is sourced from Groundsure.

19.4 Historical incidents

Records within 500m	0

This dataset comprises an extract of 1:10,560, 1:10,000, 1:2,500 and 1:1,250 scale historical Ordnance Survey maps held by Groundsure, dating back to the 1840s. It shows shakeholes, deneholes and other 'holes' as noted on these maps. Dene holes are medieval chalk extraction pits, usually comprising a narrow shaft with a number of chambers at the base of the shaft. Shakeholes are an alternative name for suffusion sinkholes, most commonly found in the limestone landscapes of North Yorkshire but also extensively noted around the Brecon Beacons National Park.

Not all 'holes' noted on Ordnance Survey mapping will necessarily be present within this dataset.

This data is sourced from Groundsure.

19.5 National karst database

Records within 500m	0

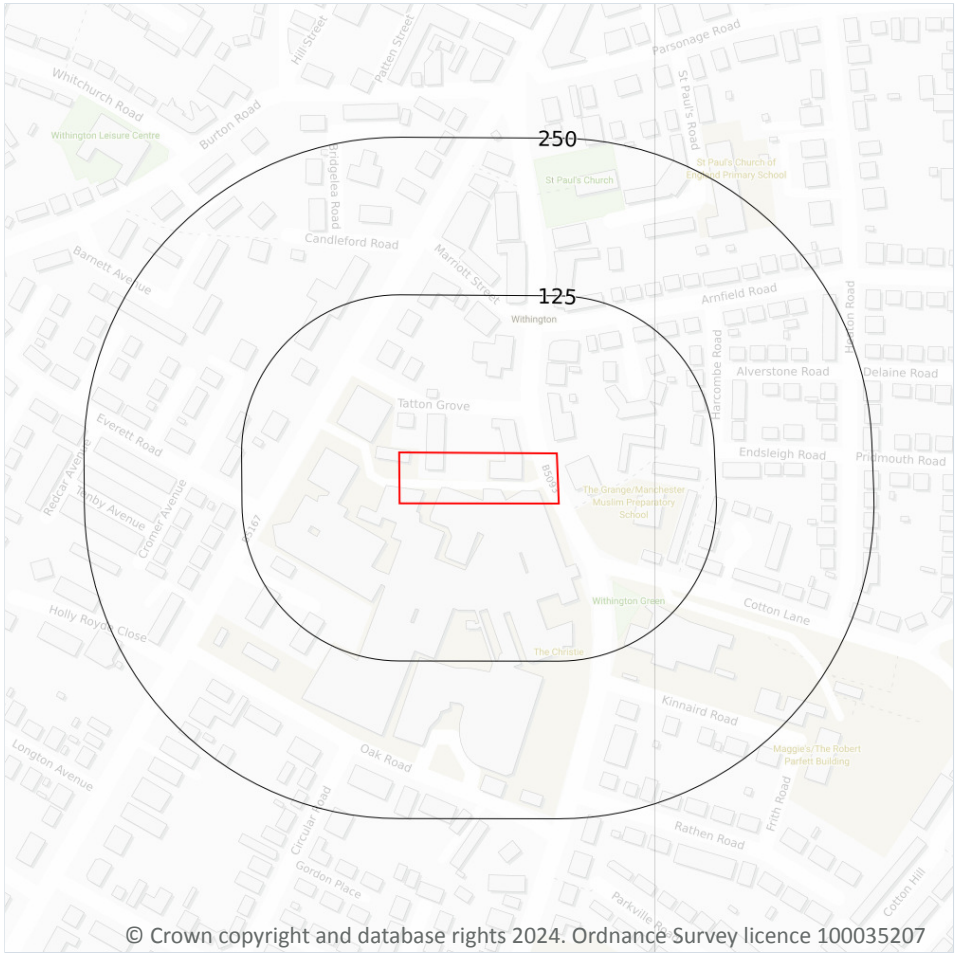
This is a comprehensive database of national karst information gathered from a wide range of sources. BGS have collected data on five main types of karst feature: Sinkholes, stream links, caves, springs, and incidences of associated damage to buildings, roads, bridges and other engineered works.

Since the database was set up in 2002 data covering most of the evaporite karst areas of the UK have now been added, along with data covering about 60% of the Chalk, and 35% of the Carboniferous Limestone outcrops. Many of the classic upland karst areas have yet to be included. Recorded so far are: Over 800 caves, 1300 stream sinks, 5600 springs, 10,000 sinkholes.

The database is not yet complete, and not all records have been verified. The absence of data does not mean that karst features are not present at a site. A reliability rating is included with each record.

This data is sourced from the British Geological Survey.

20 Radon



20.1 Radon

Records on site	1

The Radon Potential data classifies areas based on their likelihood of a property having a radon level at or above the Action Level in Great Britain. The dataset is intended for use at 1:50,000 scale and was derived from both geological assessments and indoor radon measurements (more than 560,000 records). A minimum 50m buffer should be considered when searching the maps, as the smallest detectable feature at this scale is 50m. The findings of this section should supersede any estimations derived from the Indicative Atlas of Radon in Great Britain (1:100,000 scale).

Features are displayed on the Radon map on **page 97 >**

Location	Estimated properties affected	Radon Protection Measures required
On site	**Less than 1%**	**None**

This data is sourced from the British Geological Survey and UK Health Security Agency.

21 Soil chemistry

21.1 BGS Estimated Background Soil Chemistry

Records within 50m	2

The estimated values provide the likely background concentration of the potentially harmful elements Arsenic, Cadmium, Chromium, Lead and Nickel in topsoil. The values are estimated primarily from rural topsoil data collected at a sample density of approximately 1 per 2 km^2. In areas where rural soil samples are not available, estimation is based on stream sediment data collected from small streams at a sampling density of 1 per 2.5 km^2; this is the case for most of Scotland, Wales and southern England. The stream sediment data are converted to soil-equivalent concentrations prior to the estimation.

Location	Arsenic	Bioaccessible Arsenic	Lead	Bioaccessible Lead	Cadmium	Chromium	Nickel
On site	**15 - 25 mg/kg**	**No data**	**100 - 200 mg/kg**	**60 - 120 mg/kg**	**1.8 mg/kg**	**60 - 90 mg/kg**	**30 - 45 mg/kg**
On site	**15 - 25 mg/kg**	**No data**	**100 - 200 mg/kg**	**60 - 120 mg/kg**	**1.8 mg/kg**	**60 - 90 mg/kg**	**30 - 45 mg/kg**

This data is sourced from the British Geological Survey.

21.2 BGS Estimated Urban Soil Chemistry

Records within 50m	0

Estimated topsoil chemistry of Arsenic, Cadmium, Chromium, Copper, Nickel, Lead, Tin and Zinc and bioaccessible Arsenic and Lead in 23 urban centres across Great Britain. These estimates are derived from interpolation of the measured urban topsoil data referred to above and provide information across each city between the measured sample locations (4 per km^2).

This data is sourced from the British Geological Survey.

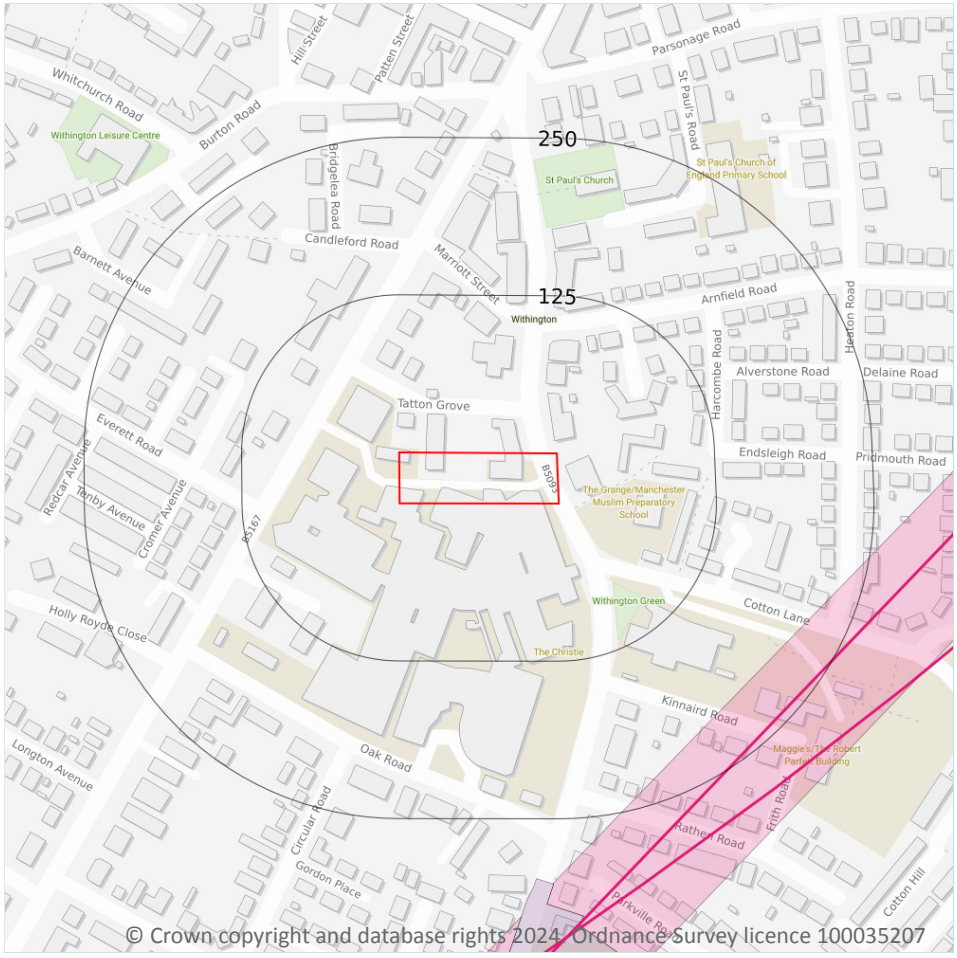
21.3 BGS Measured Urban Soil Chemistry

Records within 50m	0

The locations and measured total concentrations (mg/kg) of Arsenic, Cadmium, Chromium, Copper, Nickel, Lead, Tin and Zinc in urban topsoil samples from 23 urban centres across Great Britain. These are collected at a sample density of 4 per km^2.

This data is sourced from the British Geological Survey.

22 Railway infrastructure and projects



- Site Outline

Search buffers in metres (m)

- Crossrail 1 Stations
- Crossrail 1 Route
- Crossrail 2 Stations
- Crossrail 2 Route
- Crossrail 2 Worksites
- Crossrail 2 Safeguarding
- Crossrail 2 Headhouses
- Railway stations
- Active railways
- Active tunnels
- Abandoned railways
- Historic railways
- Historic tunnels
- Underground stations
- Underground Lines
- Royal Mail tunnels
- HS2 optimised route
- HS2 Stations
- HS2 Depots
- HS2 Surface Safeguarding
- HS2 Subsurface Safeguarding

22.1 Underground railways (London)

Records within 250m	0

Details of all active London Underground lines, including approximate tunnel roof depth and operational hours.

This data is sourced from publicly available information by Groundsure.

22.2 Underground railways (Non-London)

Records within 250m	0

Details of the Merseyrail system, the Tyne and Wear Metro and the Glasgow Subway. Not all parts of all systems are located underground. The data contains location information only and does not include a depth assessment.

This data is sourced from publicly available information by Groundsure.

22.3 Railway tunnels

Records within 250m	0

Railway tunnels taken from contemporary Ordnance Survey mapping.

This data is sourced from the Ordnance Survey.

22.4 Historical railway and tunnel features

Records within 250m	0

Railways and tunnels digitised from historical Ordnance Survey mapping as scales of 1:1,250, 1:2,500, 1:10,000 and 1:10,560.

This data is sourced from Ordnance Survey/Groundsure.

22.5 Royal Mail tunnels

Records within 250m	0

The Post Office Railway, otherwise known as the Mail Rail, is an underground railway running through Central London from Paddington Head District Sorting Office to Whitechapel Eastern Head Sorting Office. The line is 10.5km long. The data includes details of the full extent of the tunnels, the depth of the tunnel, and the depth to track level.

This data is sourced from Groundsure/the Postal Museum.

22.6 Historical railways

Records within 250m	0

Former railway lines, including dismantled lines, abandoned lines, disused lines, historic railways and razed lines.

This data is sourced from OpenStreetMap.

22.7 Railways

Records within 250m	0

Currently existing railway lines, including standard railways, narrow gauge, funicular, trams and light railways.

This data is sourced from Ordnance Survey and OpenStreetMap.

22.8 Crossrail 1

Records within 500m	0

The Crossrail railway project links 41 stations over 100 kilometres from Reading and Heathrow in the west, through underground sections in central London, to Shenfield and Abbey Wood in the east.

This data is sourced from publicly available information by Groundsure.

22.9 Crossrail 2

Records within 500m	0

Crossrail 2 is a proposed railway linking the national rail networks in Surrey and Hertfordshire via an underground tunnel through London.

This data is sourced from publicly available information by Groundsure.

22.10 HS2

Records within 500m	2

HS2 is a proposed high speed rail network running from London to Manchester and Leeds via Birmingham. Main civils construction on Phase 1 (London to Birmingham) of the project began in 2019, and it is currently anticipated that this phase will be fully operational by 2026. Construction on Phase 2a (Birmingham to Crewe) is anticipated to commence in 2021, with the service fully operational by 2027. Construction on Phase 2b (Crewe to Manchester and Birmingham to Leeds) is scheduled to begin in 2023 and be operational by 2033.

Features are displayed on the Railway infrastructure and projects map on **page 100 >**

Location	Track Type	Speed (mph)	Speed (km/h)	Status
243m SE	Tunnel	143mph	230kph	Section is scheduled for cancellation
284m SE	Tunnel	143mph	230kph	Section is scheduled for cancellation

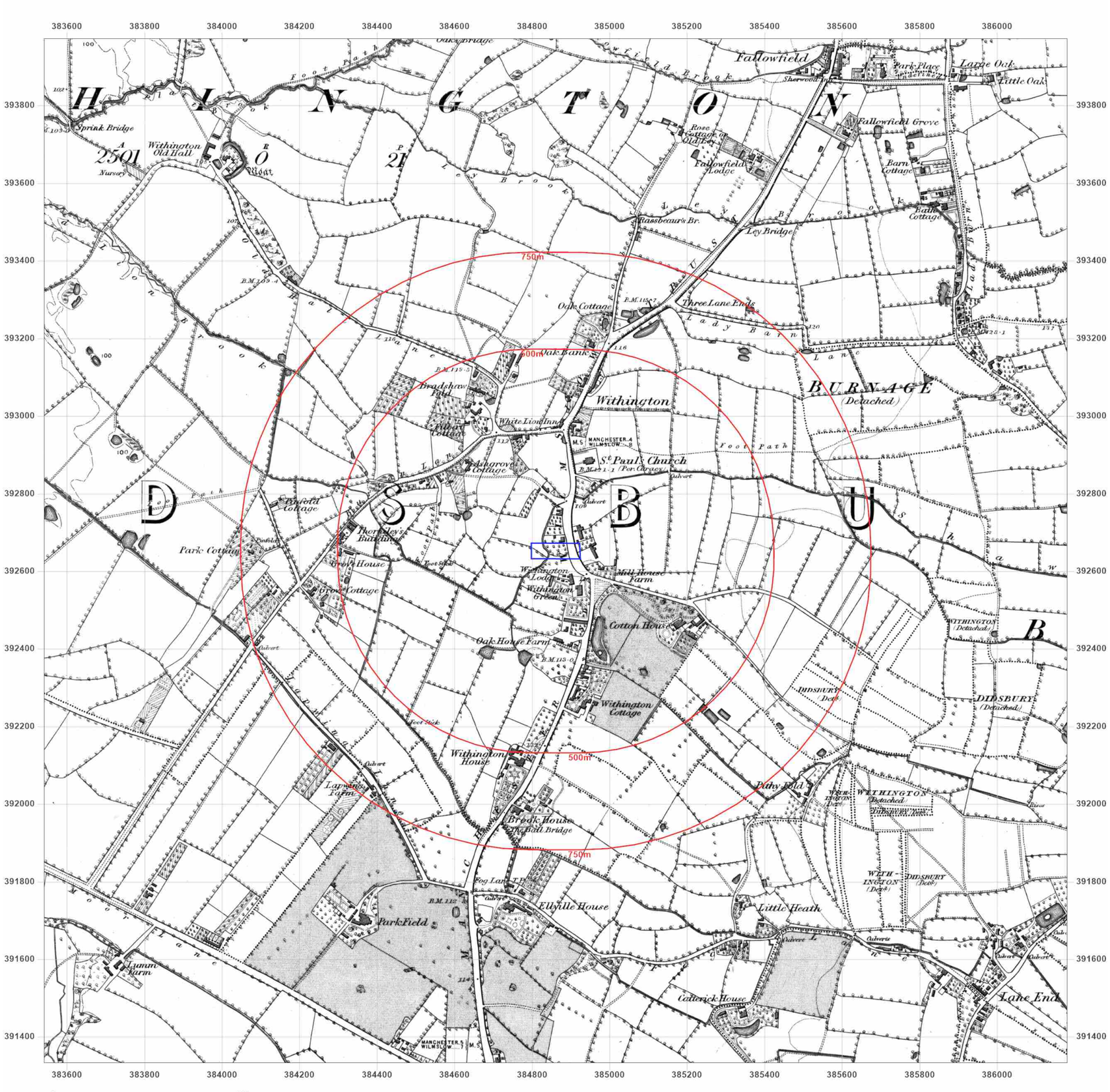
This data is sourced from HS2 ltd.

Data providers

Groundsure works with respected data providers to bring you the most relevant and accurate information. To find out who they are and their areas of expertise see https://www.groundsure.com/sources-reference ↗.

Terms and conditions

Groundsure's Terms and Conditions can be accessed at this link: www.groundsure.com/terms-and-conditions-april-2023/ ↗.



Groundsure INSIGHTS

Site Details:

Christie Hospital

Client Ref: 10033251
Report Ref: GS-9OR-GYQ-II7-XJS
Grid Ref: 384860, 392652

Map Name: County Series

Map date: **1849**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
S

Surveyed 1845
Revised 1849
Edition 1849
Copyright N/A
Levelled N/A

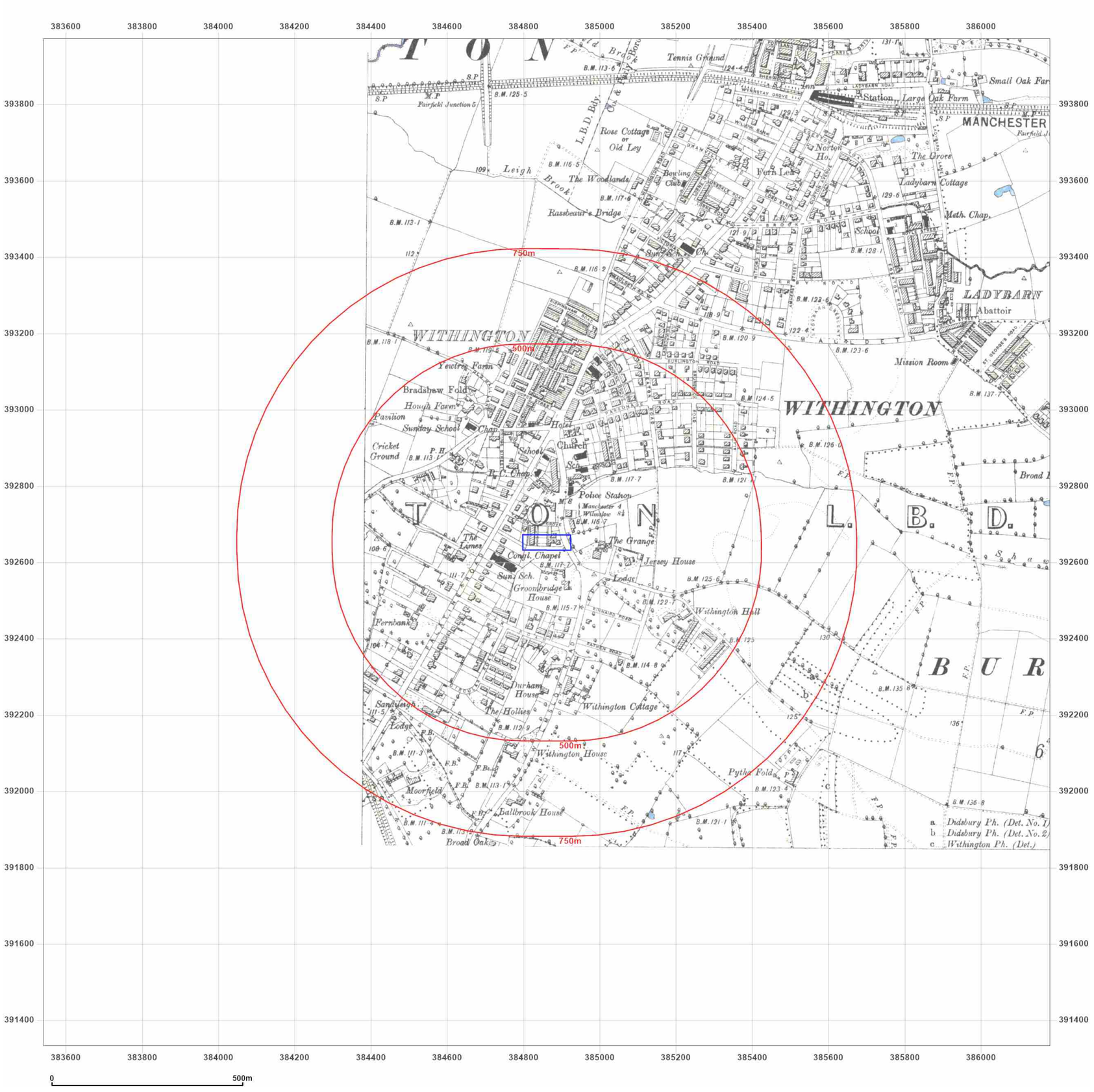
Powered by

Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2024 Ordnance Survey 100035207

Production date: 07 May 2024

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Groundsure INSIGHTS

Site Details:

Christie Hospital

Client Ref: 10033251
Report Ref: GS-9OR-GYQ-II7-XJS
Grid Ref: 384860, 392652

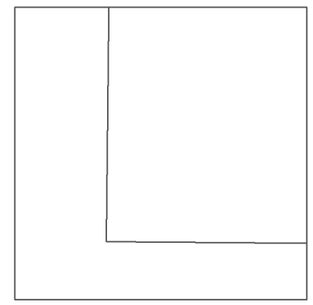
Map Name: County Series

Map date: **1892**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
S



Surveyed 1892
Revised 1892
Edition 1892
Copyright N/A
Levelled N/A

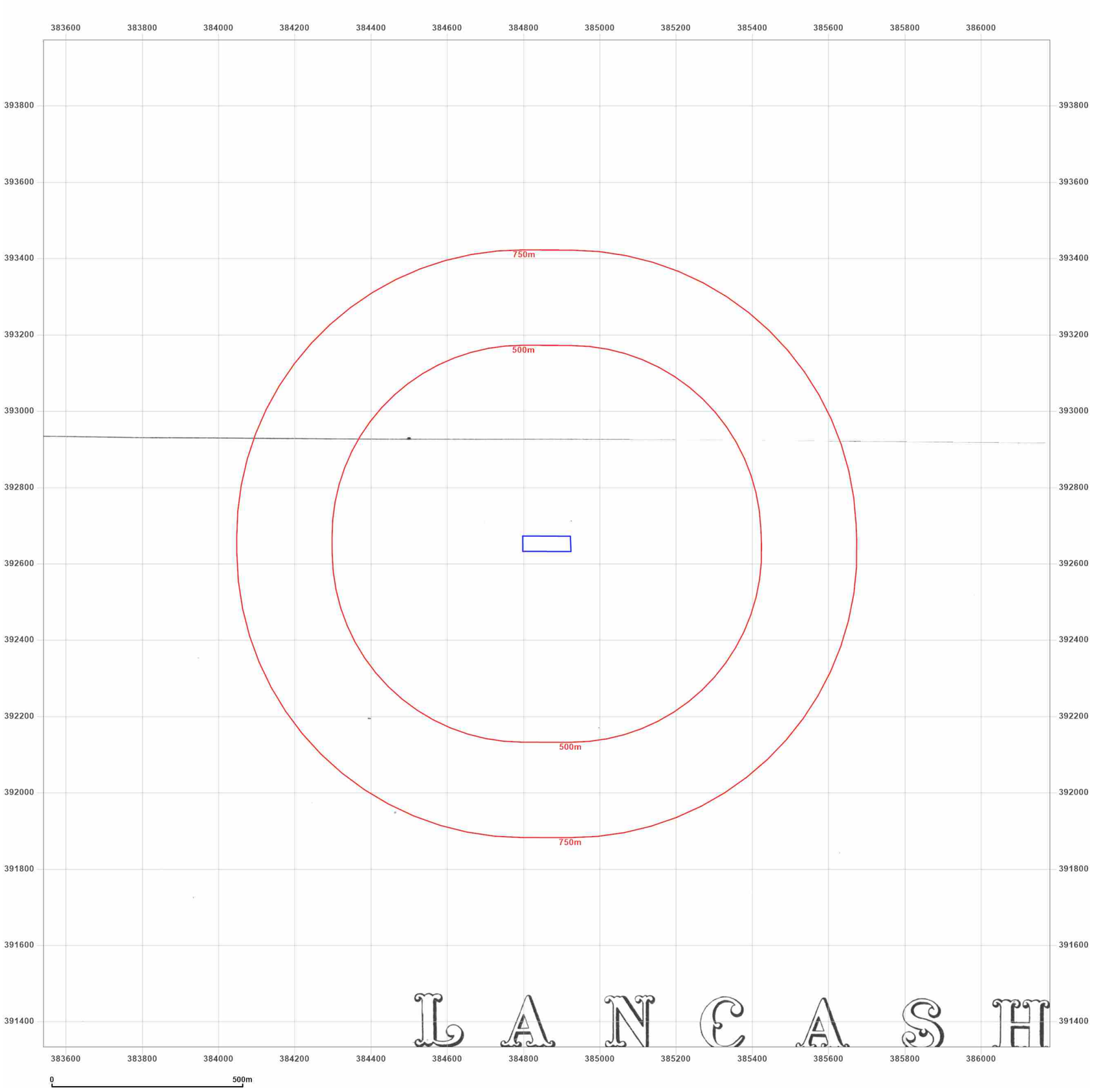
Powered by OS

Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2024 Ordnance Survey 100035207

Production date: 07 May 2024

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Groundsure INSIGHTS

Site Details:

Christie Hospital

Client Ref: 10033251
Report Ref: GS-9OR-GYQ-II7-XJS
Grid Ref: 384860, 392652

Map Name: County Series

Map date: **1897**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
S

Surveyed 1872
Revised 1897
Edition 1897
Copyright N/A
Levelled N/A

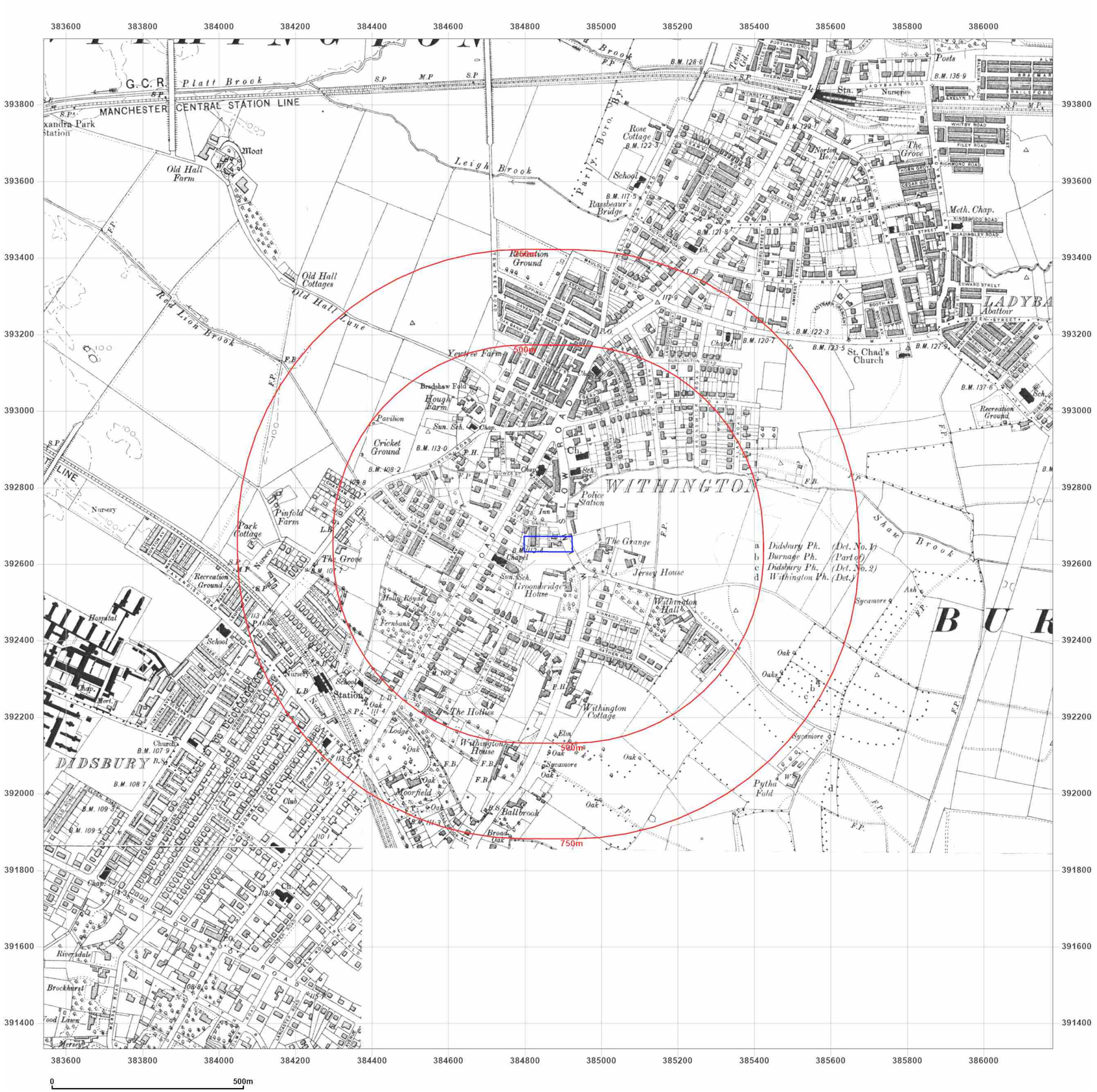
Powered by OS

Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2024 Ordnance Survey 100035207

Production date: 07 May 2024

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Groundsure INSIGHTS

Site Details:

Christie Hospital

Client Ref: 10033251
Report Ref: GS-9OR-GYQ-II7-XJS
Grid Ref: 384860, 392652

Map Name: County Series

Map date: **1905**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
S

Surveyed 1892
Revised 1905
Edition 1905
Copyright N/A
Levelled N/A

Surveyed 1892
Revised 1905
Edition 1905
Copyright N/A
Levelled N/A

Surveyed 1844
Revised 1905
Edition 1905
Copyright N/A
Levelled N/A

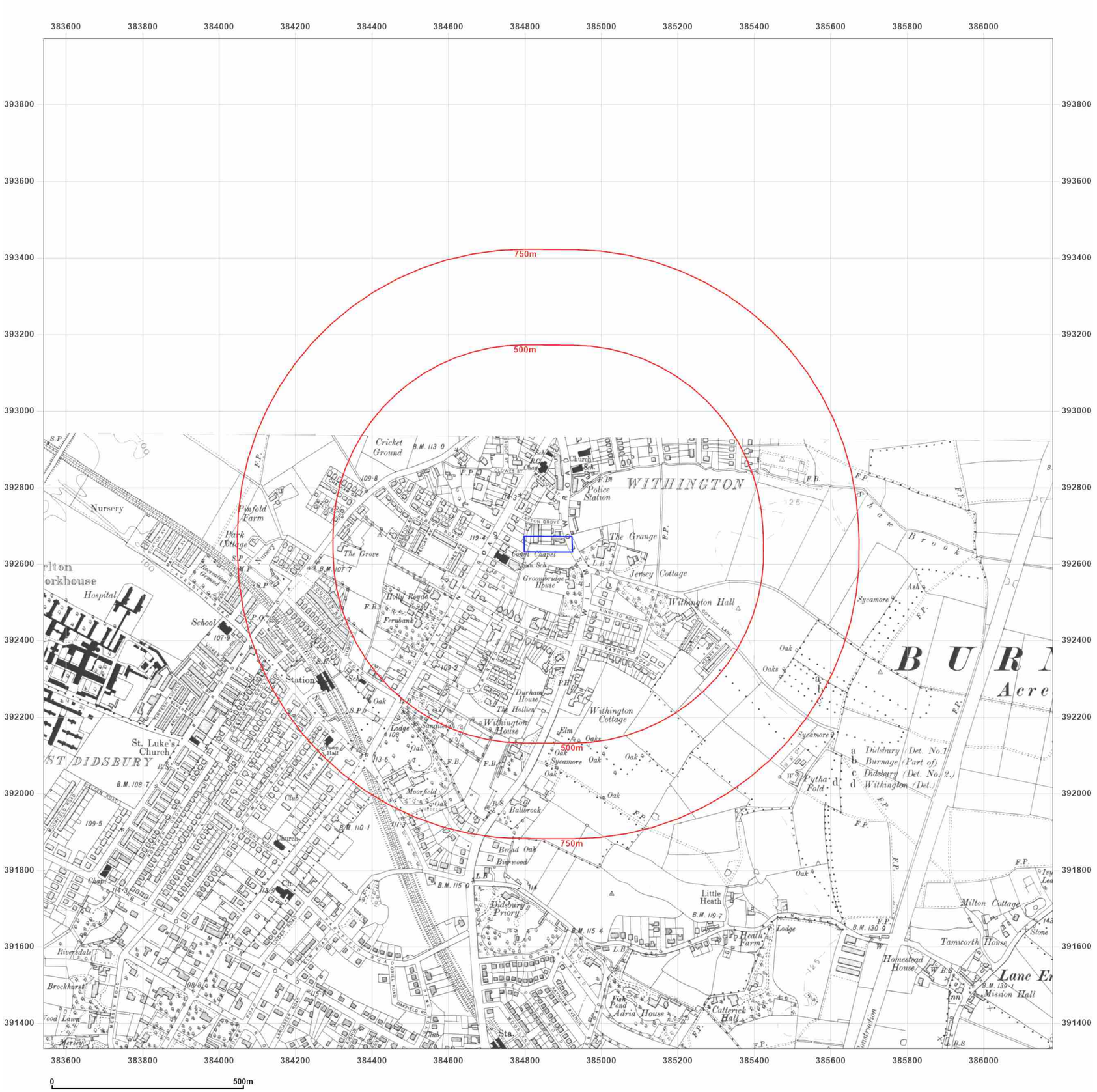
Powered by OS

Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2024 Ordnance Survey 100035207

Production date: 07 May 2024

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Groundsure INSIGHTS

Site Details:

Christie Hospital

Client Ref: 10033251
Report Ref: GS-9OR-GYQ-II7-XJS
Grid Ref: 384860, 392652

Map Name: County Series

Map date: **1911**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
S

Surveyed 1872
Revised 1908
Edition 1911
Copyright N/A
Levelled N/A

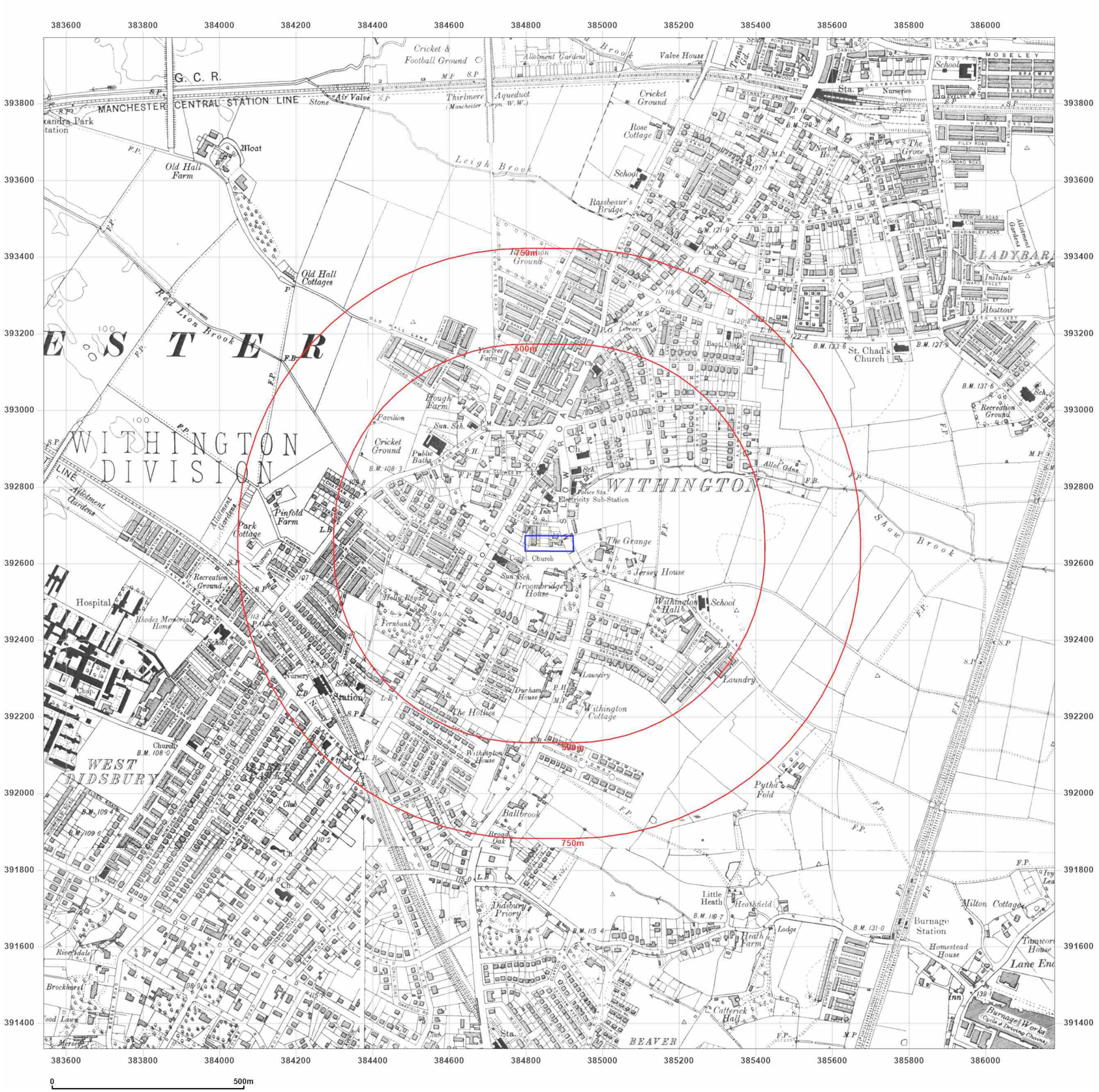
Powered by

Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2024 Ordnance Survey 100035207

Production date: 07 May 2024

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Groundsure INSIGHTS

Site Details:

Christie Hospital

Client Ref: 10033251
Report Ref: GS-9OR-GYQ-II7-XJS
Grid Ref: 384860, 392652

Map Name: County Series

Map date: **1923**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
S

Surveyed 1844
Revised 1916
Edition 1923
Copyright N/A
Levelled 1915

Surveyed 1844
Revised 1916
Edition 1923
Copyright N/A
Levelled 1915

Surveyed 1844
Revised 1916
Edition 1923
Copyright N/A
Levelled 1915

Surveyed 1844
Revised 1916
Edition 1923
Copyright N/A
Levelled 1915

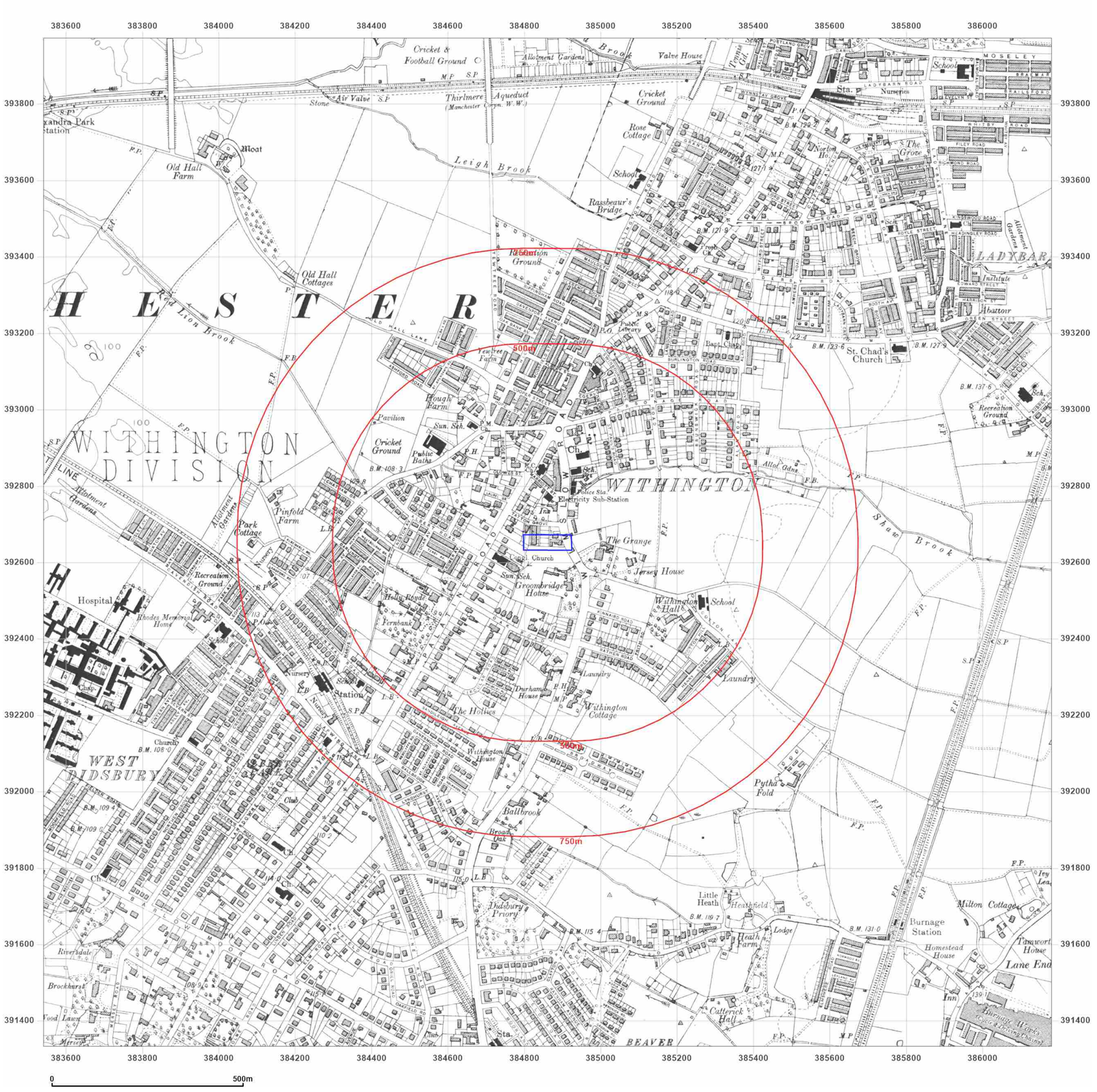
Powered by OS

Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2024 Ordnance Survey 100035207

Production date: 07 May 2024

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Groundsure INSIGHTS

Site Details:

Christie Hospital

Client Ref: 10033251
Report Ref: GS-9OR-GYQ-II7-XJS
Grid Ref: 384860, 392652

Map Name: County Series

Map date: **1923**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
S

Surveyed 1844
Revised 1916
Edition 1923
Copyright N/A
Levelled 1915

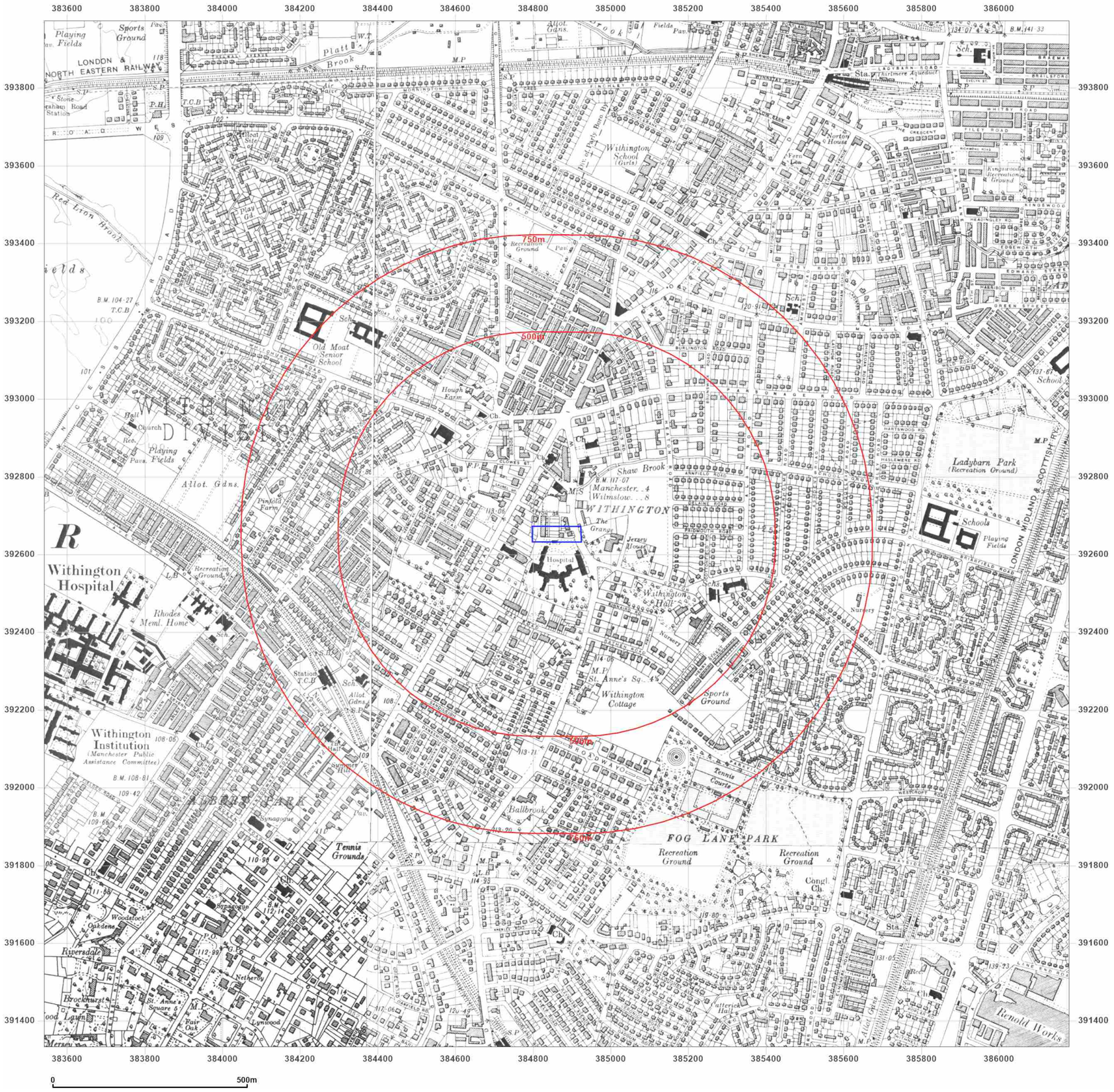
Powered by OS

Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2024 Ordnance Survey 100035207

Production date: 07 May 2024

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Groundsure INSIGHTS

Site Details:

Christie Hospital

Client Ref: 10033251
Report Ref: GS-9OR-GYQ-II7-XJS
Grid Ref: 384860, 392652

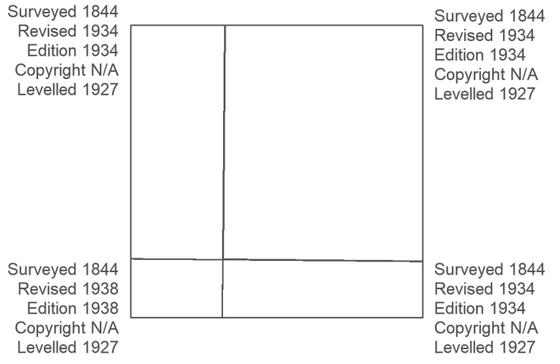
Map Name: County Series

Map date: **1934-1938**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
S



Powered by OS

Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2024 Ordnance Survey 100035207

Production date: 07 May 2024

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf

Groundsure INSIGHTS

Site Details:

Christie Hospital

Client Ref: 10033251
Report Ref: GS-9OR-GYQ-II7-XJS
Grid Ref: 384860, 392652

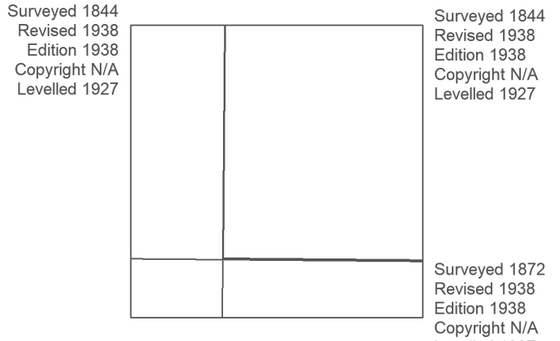
Map Name: County Series

Map date: **1938**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
S



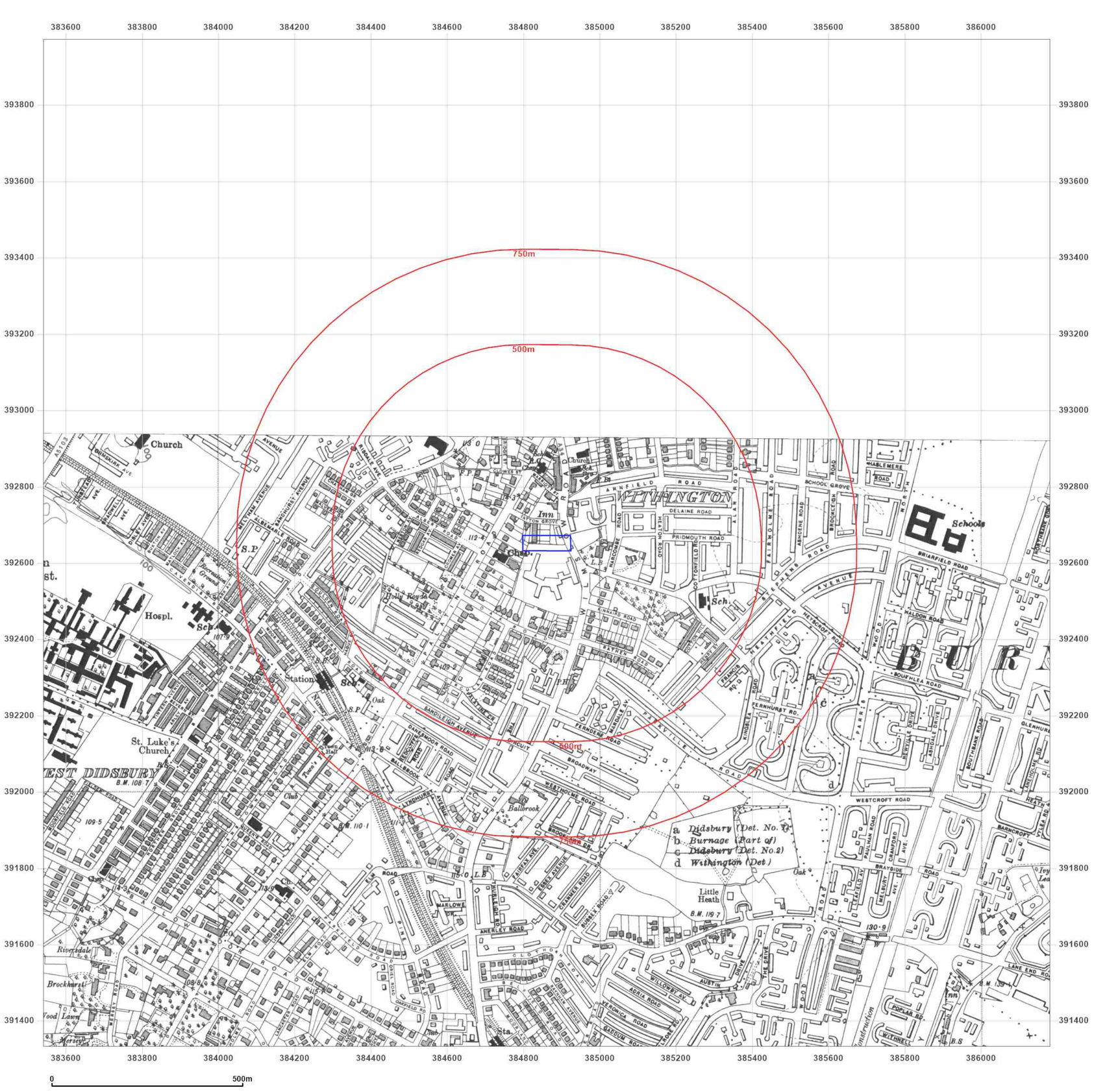
Powered by OS

Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2024 Ordnance Survey 100035207

Production date: 07 May 2024

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Site Details:

Christie Hospital

Client Ref: 10033251
Report Ref: GS-9OR-GYQ-II7-XJS
Grid Ref: 384860, 392652

Map Name: County Series

Map date: **1938**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
S

Surveyed 1872
Revised 1938
Edition 1938
Copyright N/A
Levelled N/A

Powered by OS

Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2024 Ordnance Survey 100035207

Production date: 07 May 2024

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf

Groundsure INSIGHTS

Site Details:

Christie Hospital

Client Ref: 10033251
Report Ref: GS-9OR-GYQ-II7-XJS
Grid Ref: 384860, 392652

Map Name: Provisional

Map date: **1955**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
S

Surveyed N/A
Revised 1955
Edition N/A
Copyright 1955
Levelled N/A

Surveyed N/A
Revised 1955
Edition N/A
Copyright 1955
Levelled N/A

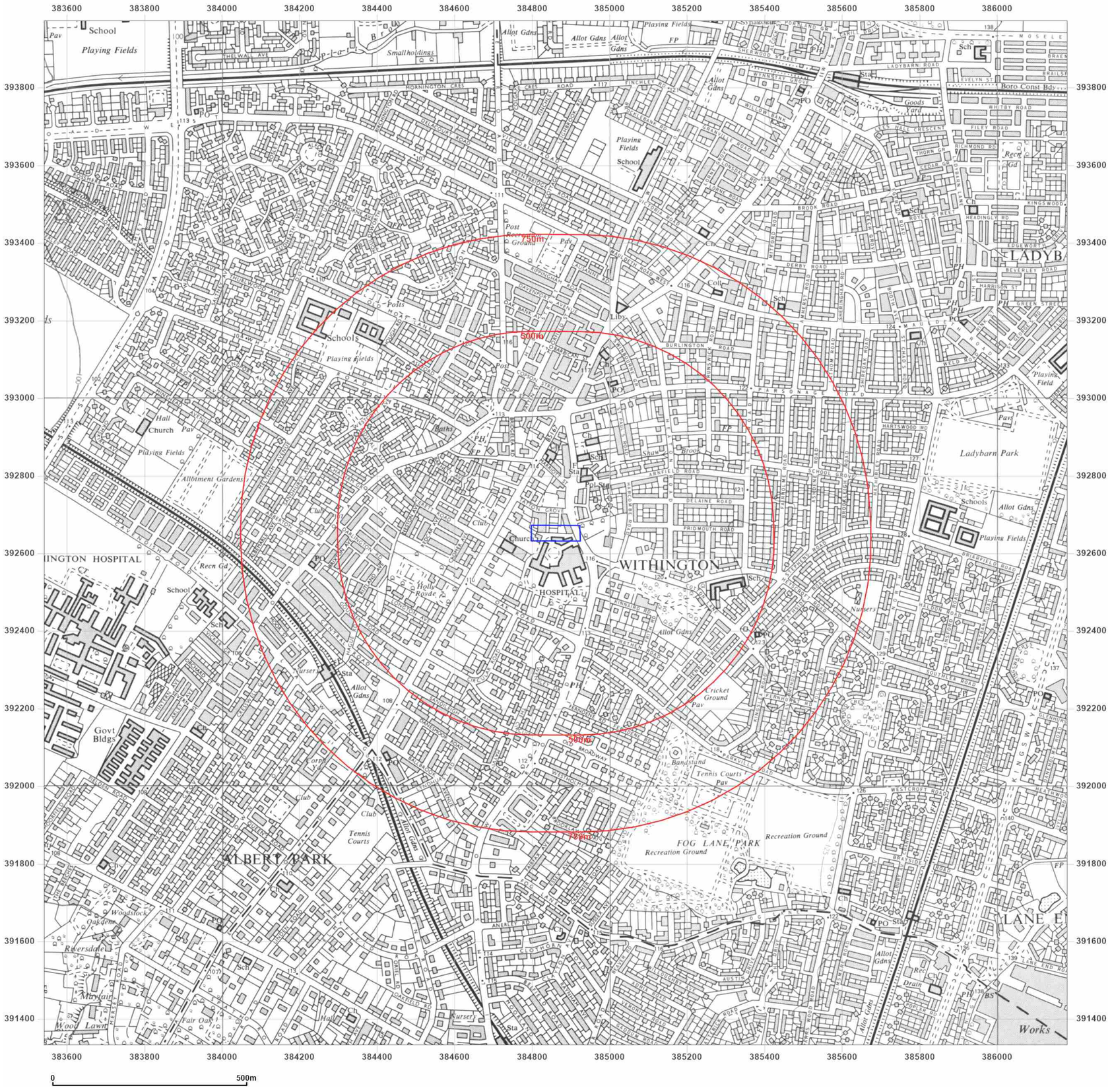
Powered by OS

Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2024 Ordnance Survey 100035207

Production date: 07 May 2024

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Groundsure INSIGHTS

Site Details:

Christie Hospital

Client Ref: 10033251
Report Ref: GS-9OR-GYQ-II7-XJS
Grid Ref: 384860, 392652

Map Name: Provisional
Map date: **1965-1966**
Scale: 1:10,560
Printed at: 1:10,560

N
W E
S

Surveyed 1966
Revised 1966
Edition N/A
Copyright 1966
Levelled N/A

Surveyed 1965
Revised 1965
Edition N/A
Copyright 1965
Levelled N/A

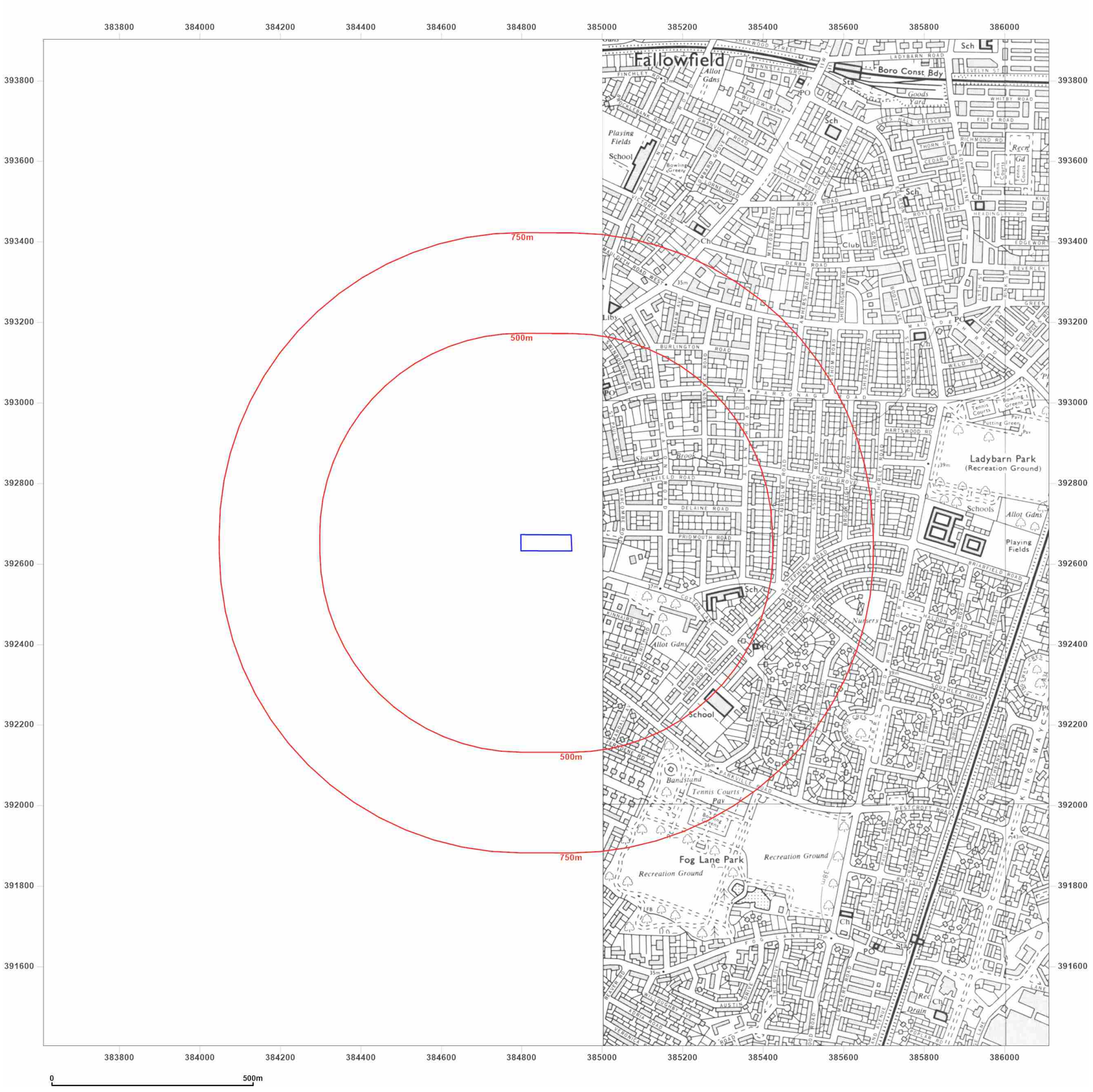
Powered by OS

Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2024 Ordnance Survey 100035207

Production date: 07 May 2024

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Groundsure INSIGHTS

Site Details:

Christie Hospital

Client Ref: 10033251
Report Ref: GS-9OR-GYQ-II7-XJS
Grid Ref: 384860, 392652

Map Name: National Grid

Map date: **1976**

Scale: 1:10,000

Printed at: 1:10,000

N
W E
S

Surveyed 1974
Revised 1975
Edition N/A
Copyright 1976
Levelled 1964

Powered by OS

Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2024 Ordnance Survey 100035207

Production date: 07 May 2024

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf

Groundsure INSIGHTS

Site Details:

Christie Hospital

Client Ref: 10033251
Report Ref: GS-9OR-GYQ-II7-XJS
Grid Ref: 384860, 392652

Map Name: National Grid

Map date: **1981-1983**

Scale: 1:10,000

Printed at: 1:10,000

N
W E
S

Surveyed 1977 Revised 1981 Edition N/A Copyright 1981 Levelled 1976		Surveyed 1981 Revised 1983 Edition N/A Copyright 1983 Levelled 1981

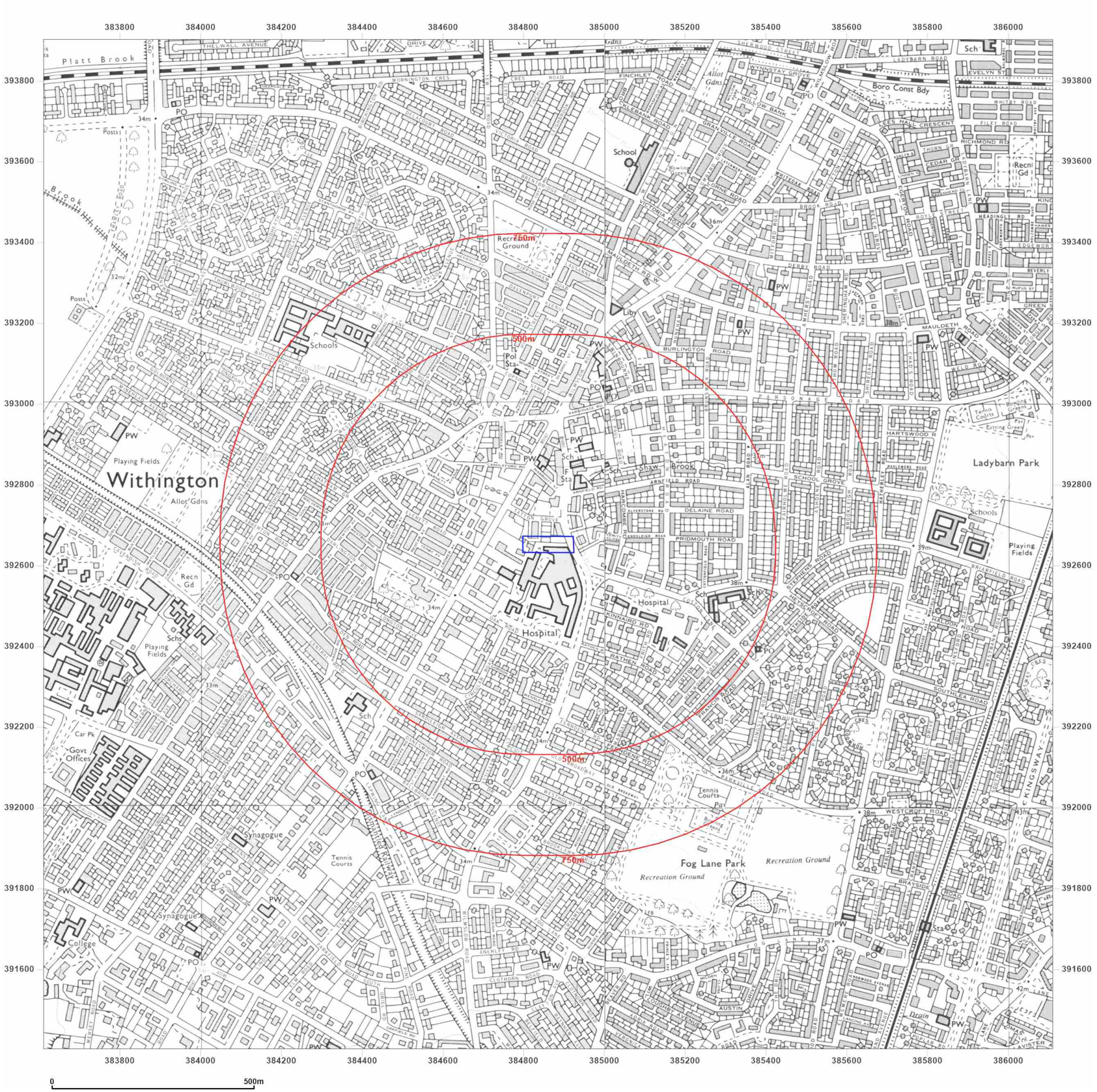
Powered by OS

Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2024 Ordnance Survey 100035207

Production date: 07 May 2024

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Groundsure INSIGHTS

Site Details:

Christie Hospital

Client Ref: 10033251
Report Ref: GS-9OR-GYQ-II7-XJS
Grid Ref: 384860, 392652

Map Name: National Grid

Map date: **1988-1989**

Scale: 1:10,000

Printed at: 1:10,000

N
W E
S

Surveyed 1985 Revised 1988 Edition N/A Copyright 1988 Levelled 1981	Surveyed 1986 Revised 1989 Edition N/A Copyright 1989 Levelled 1981

Powered by OS

Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2024 Ordnance Survey 100035207

Production date: 07 May 2024

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf

Groundsure INSIGHTS

Site Details:

Christie Hospital

Client Ref: 10033251
Report Ref: GS-9OR-GYQ-II7-XJS
Grid Ref: 384860, 392652

Map Name: National Grid

Map date: **2001**

Scale: 1:10,000

Printed at: 1:10,000

N
W E
S

2001

Powered by

Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2024 Ordnance Survey 100035207

Production date: 07 May 2024

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf

Groundsure INSIGHTS

Site Details:

Christie Hospital

Client Ref: 10033251
Report Ref: GS-9OR-GYQ-II7-XJS
Grid Ref: 384860, 392652

Map Name: National Grid

Map date: **2010**

Scale: 1:10,000

Printed at: 1:10,000

N
W E
S

2010

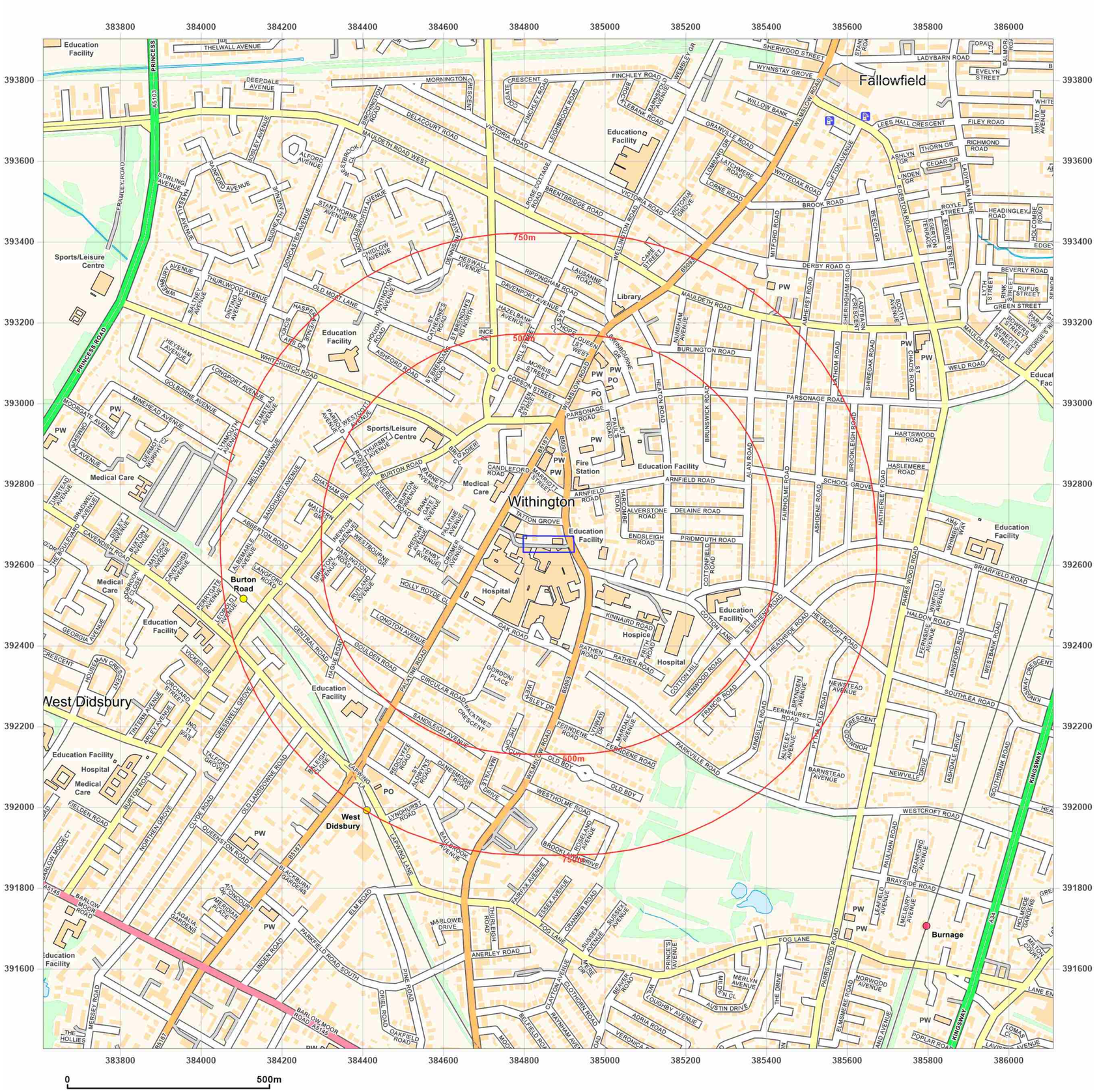
Powered by

Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2024 Ordnance Survey 100035207

Production date: 07 May 2024

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Groundsure INSIGHTS

Site Details:

Christie Hospital

Client Ref: 10033251
Report Ref: GS-9OR-GYQ-II7-XJS
Grid Ref: 384860, 392652

Map Name: National Grid

Map date: **2024**

Scale: 1:10,000

Printed at: 1:10,000

N
W E
S

2024

Powered by OS

Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2024 Ordnance Survey 100035207

Production date: 07 May 2024

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf

Groundsure INSIGHTS

Site Details:

Christie Hospital

Client Ref: 10033251
Report Ref: GS-9OR-GYQ-II7-XJS
Grid Ref: 384860, 392652

Map Name: County Series

Map date: **1881**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1881
Revised N/A
Edition 1881
Copyright N/A
Levelled N/A

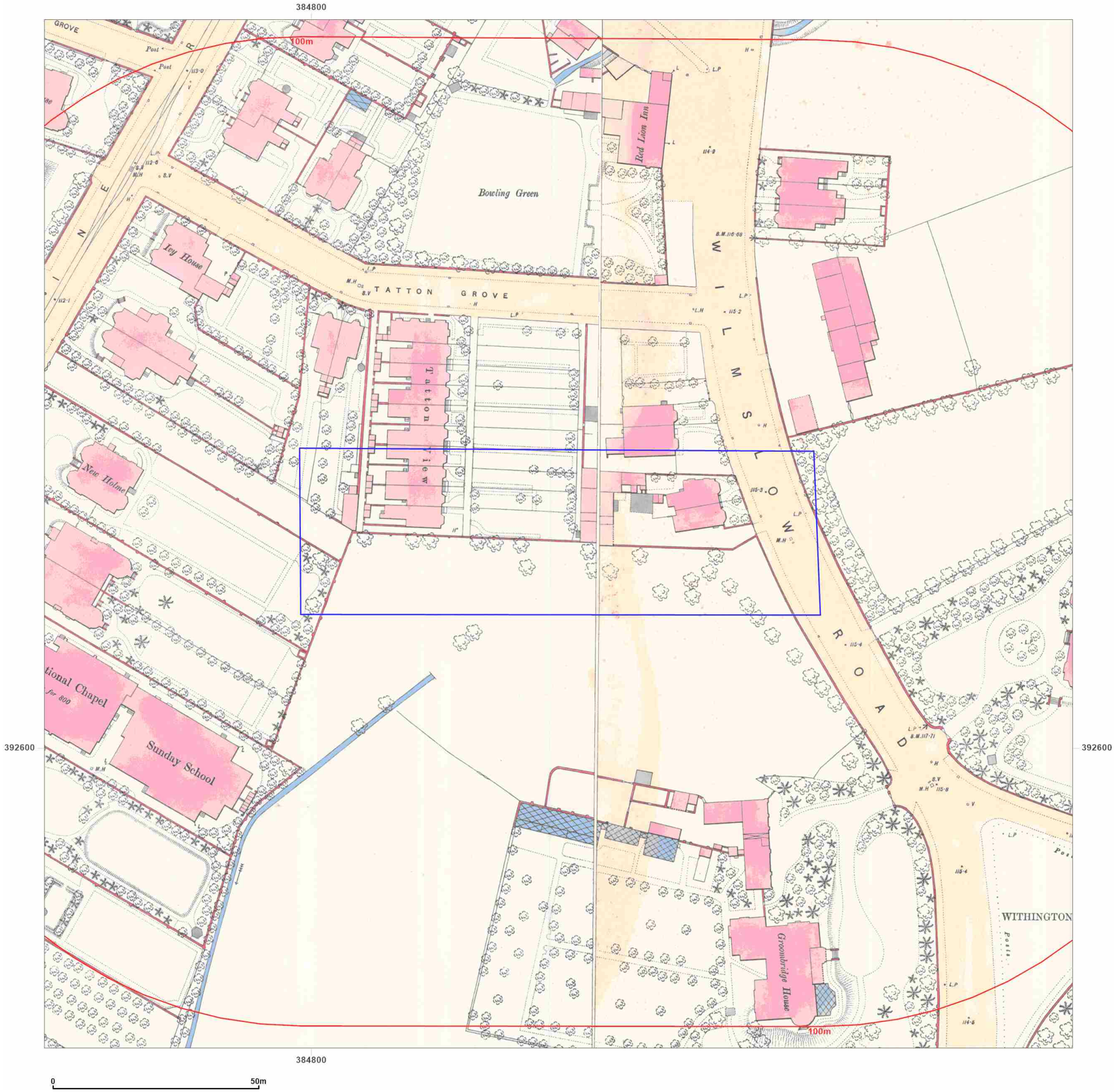
Powered by OS

Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2024 Ordnance Survey 100035207

Production date: 07 May 2024

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Groundsure INSIGHTS

Site Details:

Christie Hospital

Client Ref: 10033251
Report Ref: GS-9OR-GYQ-II7-XJS
Grid Ref: 384860, 392652

Map Name: County Series Town Plan

Map date: **1893**

Scale: 1:500

Printed at: 1:1,000

N
W E
S

Surveyed 1893
Revised N/A
Edition 1893
Copyright N/A
Levelled N/A

Surveyed 1893
Revised N/A
Edition 1893
Copyright N/A
Levelled N/A

Powered by OS

Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2024 Ordnance Survey 100035207

Production date: 07 May 2024

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf

Groundsure INSIGHTS

Site Details:

Christie Hospital

Client Ref: 10033251
Report Ref: GS-9OR-GYQ-II7-XJS
Grid Ref: 384860, 392652

Map Name: County Series

Map date: **1894**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1894
Revised N/A
Edition 1894
Copyright N/A
Levelled N/A

Powered by OS

Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2024 Ordnance Survey 100035207

Production date: 07 May 2024

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf

Groundsure INSIGHTS

Site Details:

Christie Hospital

Client Ref: 10033251
Report Ref: GS-9OR-GYQ-II7-XJS
Grid Ref: 384860, 392652

Map Name: County Series

Map date: **1907**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1891
Revised 1905
Edition 1907
Copyright N/A
Levelled N/A

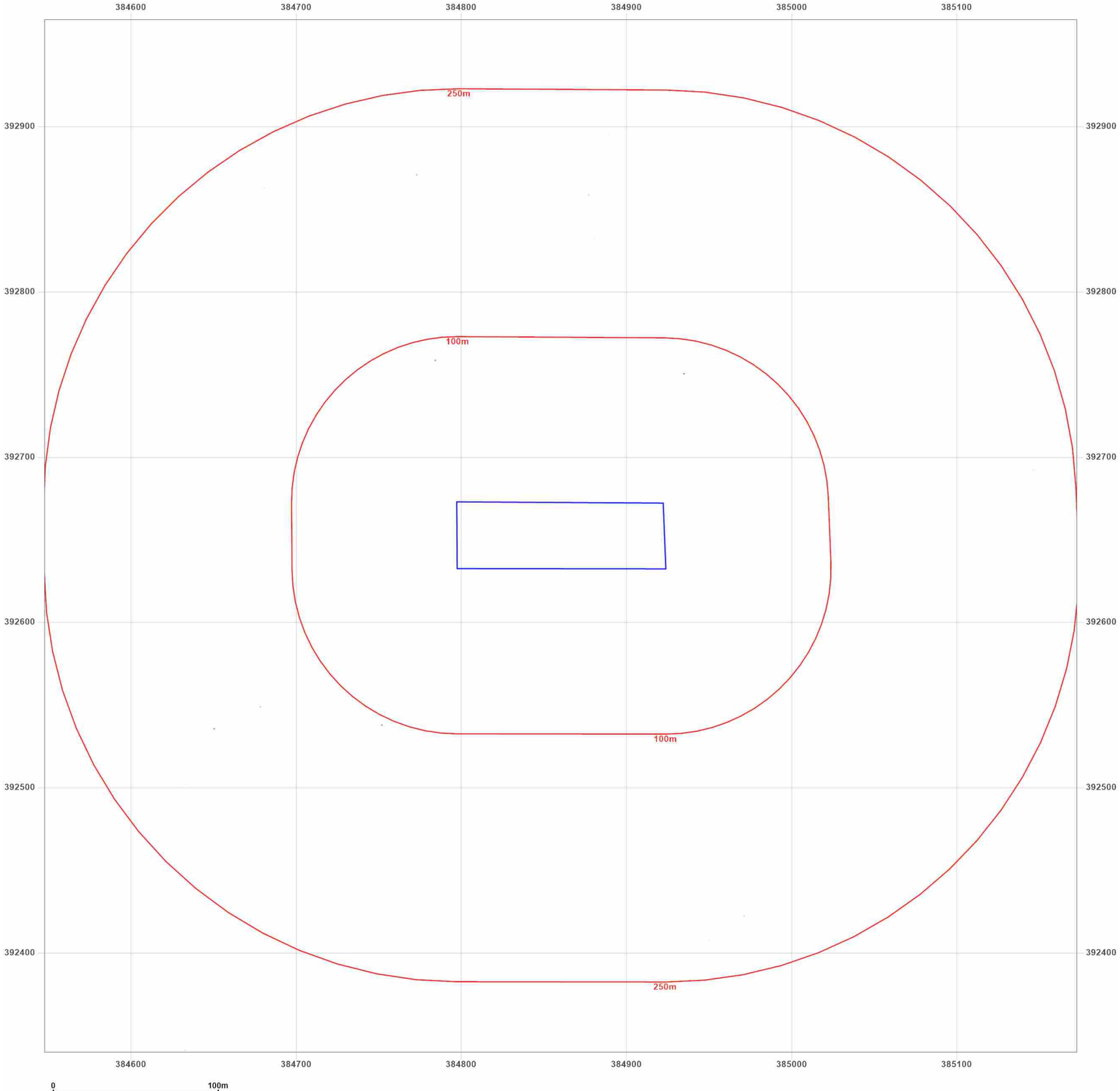
Powered by OS

Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2024 Ordnance Survey 100035207

Production date: 07 May 2024

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Groundsure INSIGHTS

Site Details:

Christie Hospital

Client Ref: 10033251
Report Ref: GS-9OR-GYQ-II7-XJS
Grid Ref: 384860, 392652

Map Name: County Series

Map date: **1910**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1910
Revised 1908
Edition 1910
Copyright N/A
Levelled N/A

Powered by

Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2024 Ordnance Survey 100035207

Production date: 07 May 2024

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf

Groundsure INSIGHTS

Site Details:

Christie Hospital

Client Ref: 10033251
Report Ref: GS-9OR-GYQ-II7-XJS
Grid Ref: 384860, 392652

Map Name: County Series

Map date: **1922**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1922
Revised 1916
Edition 1922
Copyright N/A
Levelled 1915

Powered by OS

Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2024 Ordnance Survey 100035207

Production date: 07 May 2024

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf

Groundsure INSIGHTS

Site Details:

Christie Hospital

Client Ref: 10033251
Report Ref: GS-9OR-GYQ-II7-XJS
Grid Ref: 384860, 392652

Map Name: County Series

Map date: **1934**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1873
Revised 1934
Edition N/A
Copyright N/A
Levelled 1927

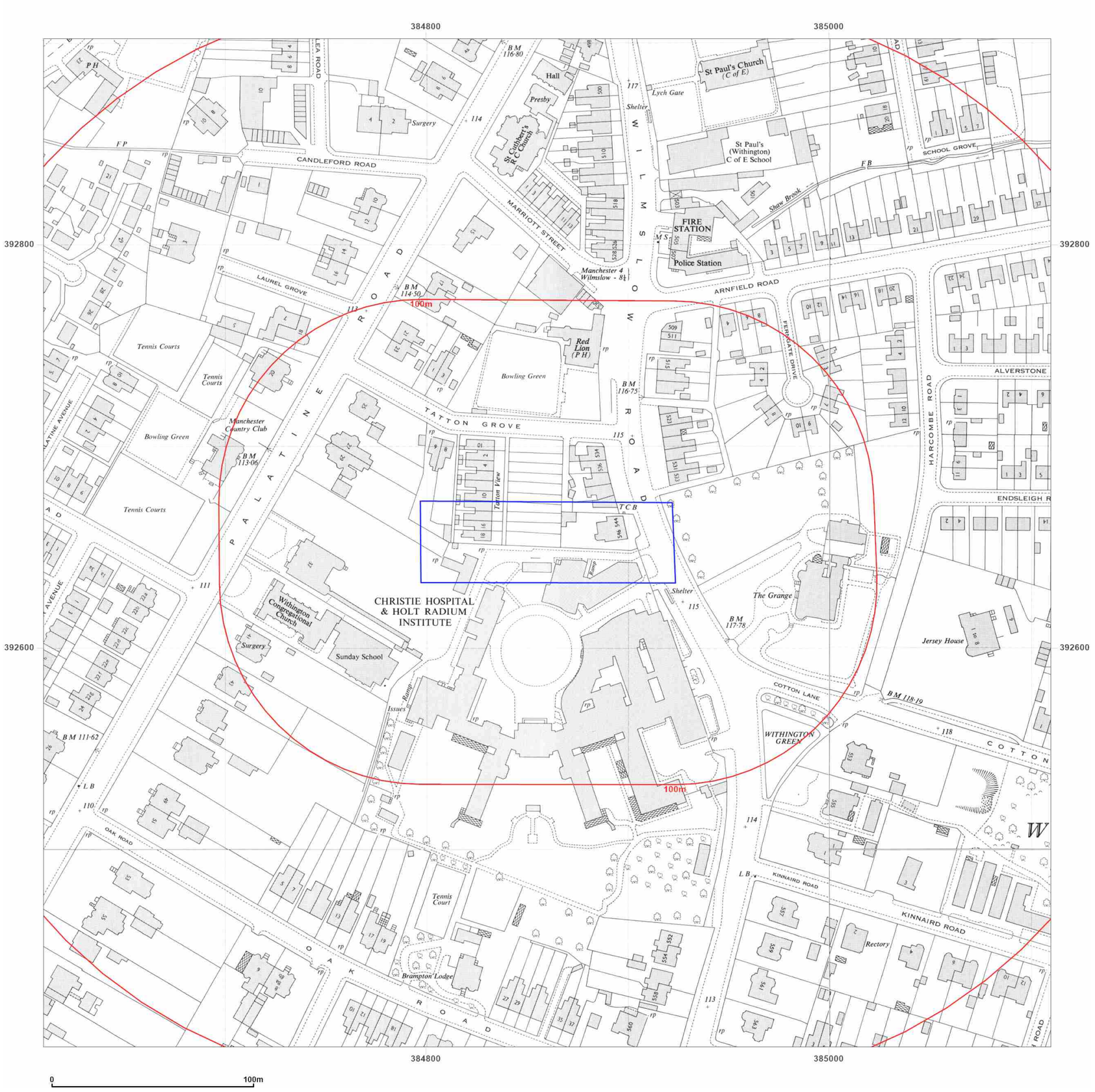
Powered by

Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2024 Ordnance Survey 100035207

Production date: 07 May 2024

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Groundsure INSIGHTS

Site Details:

Christie Hospital

Client Ref: 10033251
Report Ref: GS-9OR-GYQ-II7-XJS
Grid Ref: 384860, 392652

Map Name: National Grid

Map date: **1957**

Scale: 1:1,250

Printed at: 1:2,000

N
W E
S

Surveyed 1957 Revised 1957 Edition N/A Copyright 1957 Levelled 1927		Surveyed 1957 Revised 1957 Edition N/A Copyright 1957 Levelled 1948
Surveyed 1957 Revised 1957 Edition N/A Copyright 1957 Levelled 1927		Surveyed 1957 Revised 1957 Edition N/A Copyright 1957 Levelled 1949

Powered by OS

Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2024 Ordnance Survey 100035207

Production date: 07 May 2024

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf

Groundsure INSIGHTS

Site Details:

Christie Hospital

Client Ref: 10033251
Report Ref: GS-9OR-GYQ-II7-XJS
Grid Ref: 384860, 392652

Map Name: National Grid

Map date: **1957**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1957
Revised 1957
Edition N/A
Copyright 1958
Levelled 1948

Surveyed 1957
Revised 1957
Edition N/A
Copyright 1959
Levelled 1949

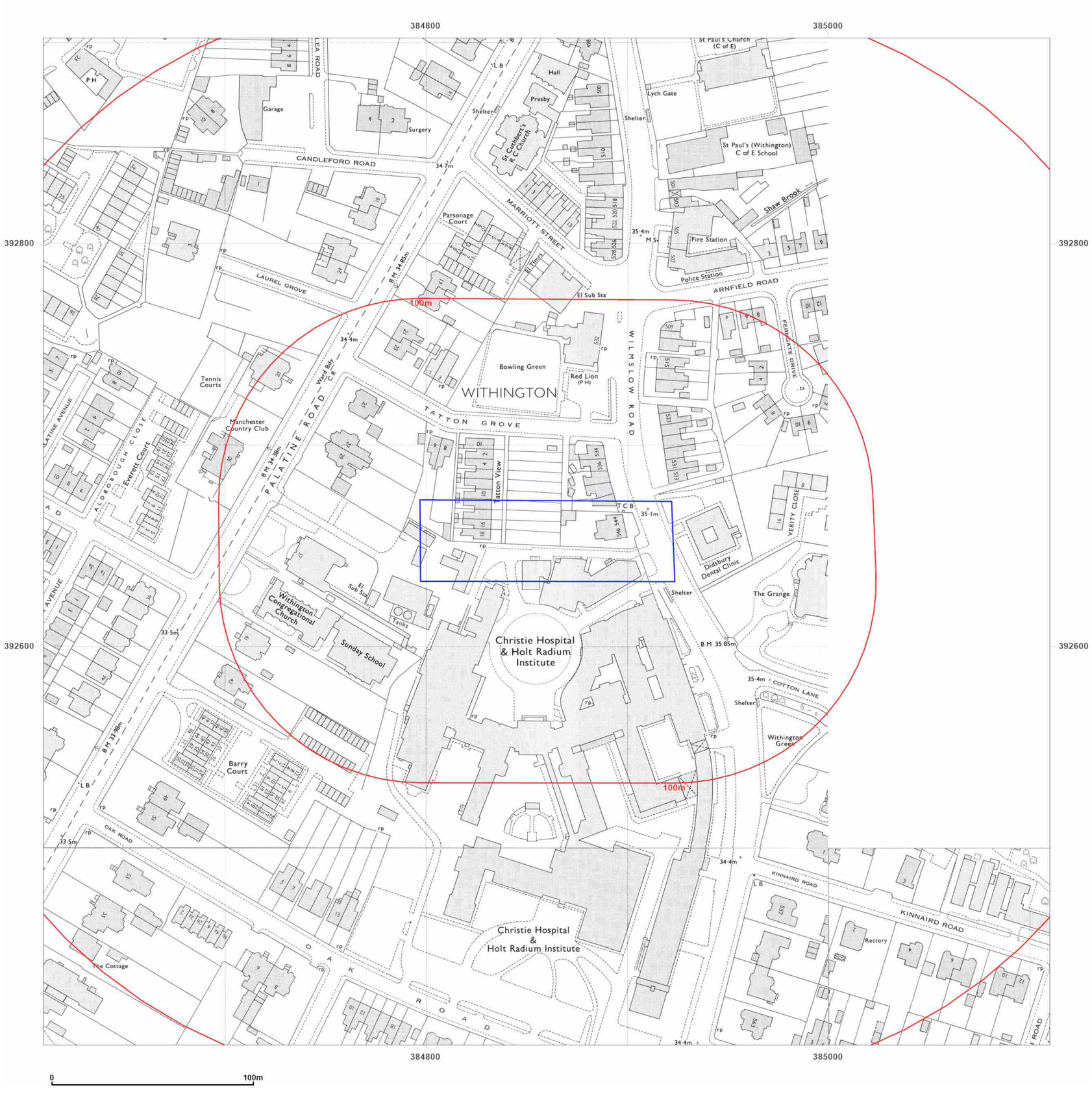
Powered by OS

Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2024 Ordnance Survey 100035207

Production date: 07 May 2024

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Groundsure INSIGHTS

Site Details:

Christie Hospital

Client Ref: 10033251
Report Ref: GS-9OR-GYQ-II7-XJS
Grid Ref: 384860, 392652

Map Name: National Grid

Map date: **1974-1975**

Scale: 1:1,250

Printed at: 1:2,000

N
W E
S

Surveyed 1957 Revised 1973 Edition N/A Copyright 1974 Levelled 1958	
Surveyed 1957 Revised 1973 Edition N/A Copyright 1974 Levelled 1958	Surveyed 1957 Revised 1974 Edition N/A Copyright 1975 Levelled 1958

Powered by OS

Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2024 Ordnance Survey 100035207

Production date: 07 May 2024

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf

Groundsure INSIGHTS

Site Details:

Christie Hospital

Client Ref: 10033251
Report Ref: GS-9OR-GYQ-II7-XJS
Grid Ref: 384860, 392652

Map Name: National Grid

Map date: **1982-1984**

Scale: 1:1,250

Printed at: 1:2,000

N
W E
S

Surveyed 1958 Revised 1984 Edition N/A Copyright 1984 Levelled 1958		Surveyed 1958 Revised 1982 Edition N/A Copyright 1982 Levelled 1958
		Surveyed 1958 Revised 1982 Edition N/A Copyright 1982 Levelled 1958

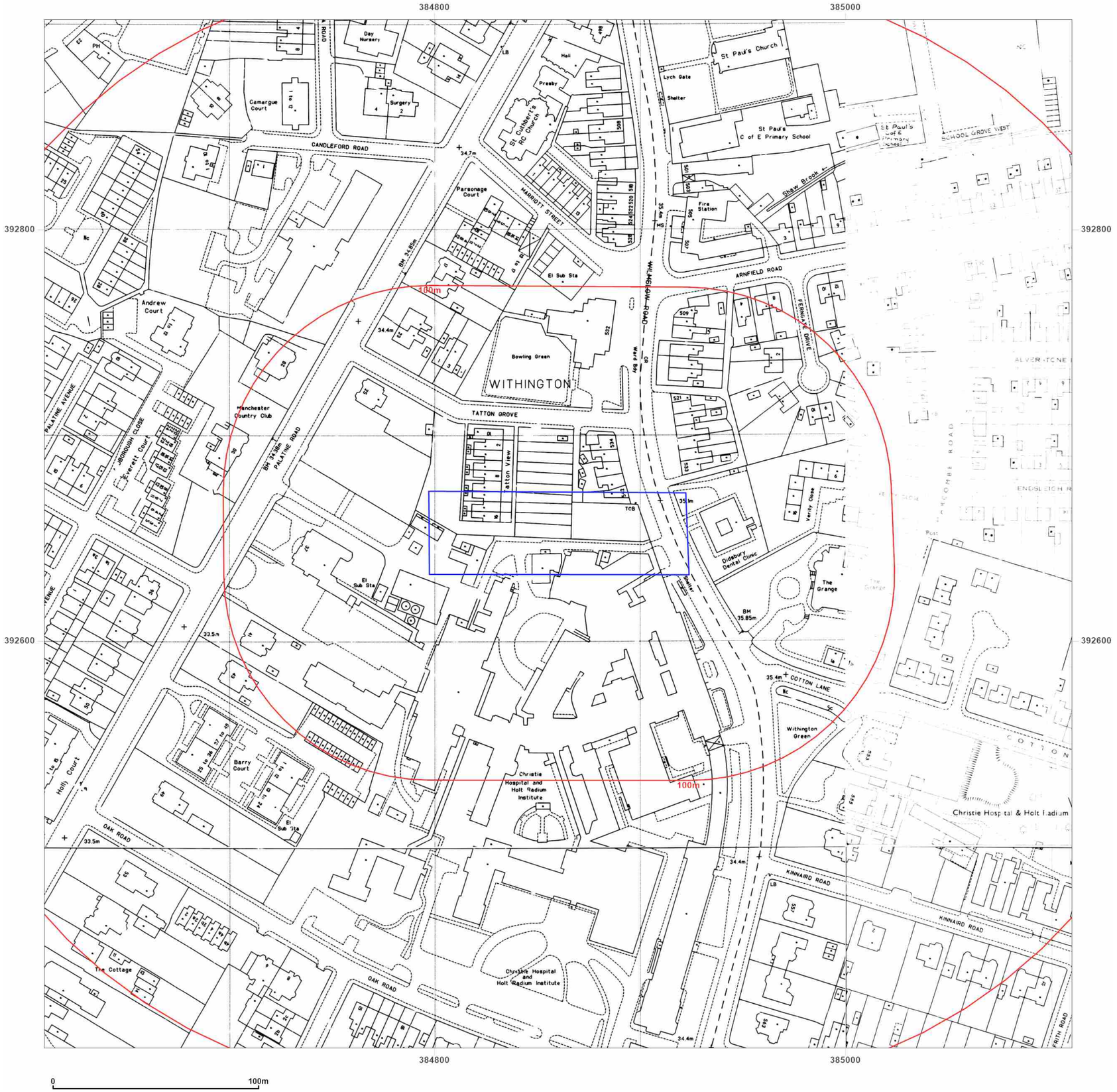
Powered by OS

Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2024 Ordnance Survey 100035207

Production date: 07 May 2024

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Groundsure INSIGHTS

Site Details:

Christie Hospital

Client Ref: 10033251
Report Ref: GS-9OR-GYQ-II7-XJS
Grid Ref: 384860, 392652

Map Name: National Grid

Map date: **1988-1992**

Scale: 1:1,250

Printed at: 1:2,000

N
W E
S

Surveyed 1992 Revised 1992 Edition N/A Copyright 1992 Levelled N/A		Surveyed N/A Revised N/A Edition N/A Copyright 1988 Levelled 1958
Surveyed 1992 Revised 1992 Edition N/A Copyright 1992 Levelled N/A		Surveyed 1992 Revised 1992 Edition N/A Copyright 1992 Levelled N/A

Powered by OS

Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2024 Ordnance Survey 100035207

Production date: 07 May 2024

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf

Groundsure INSIGHTS

Site Details:

Christie Hospital

Client Ref: 10033251
Report Ref: GS-9OR-GYQ-II7-XJS
Grid Ref: 384860, 392652

Map Name: National Grid

Map date: **1992**

Scale: 1:1,250

Printed at: 1:2,000

N
W E
S

Surveyed 1957 Revised 1973 Edition N/A Copyright 1992 Levelled N/A		Surveyed 1992 Revised 1992 Edition N/A Copyright 1992 Levelled N/A
		Surveyed 1992 Revised 1992 Edition N/A Copyright 1992 Levelled N/A

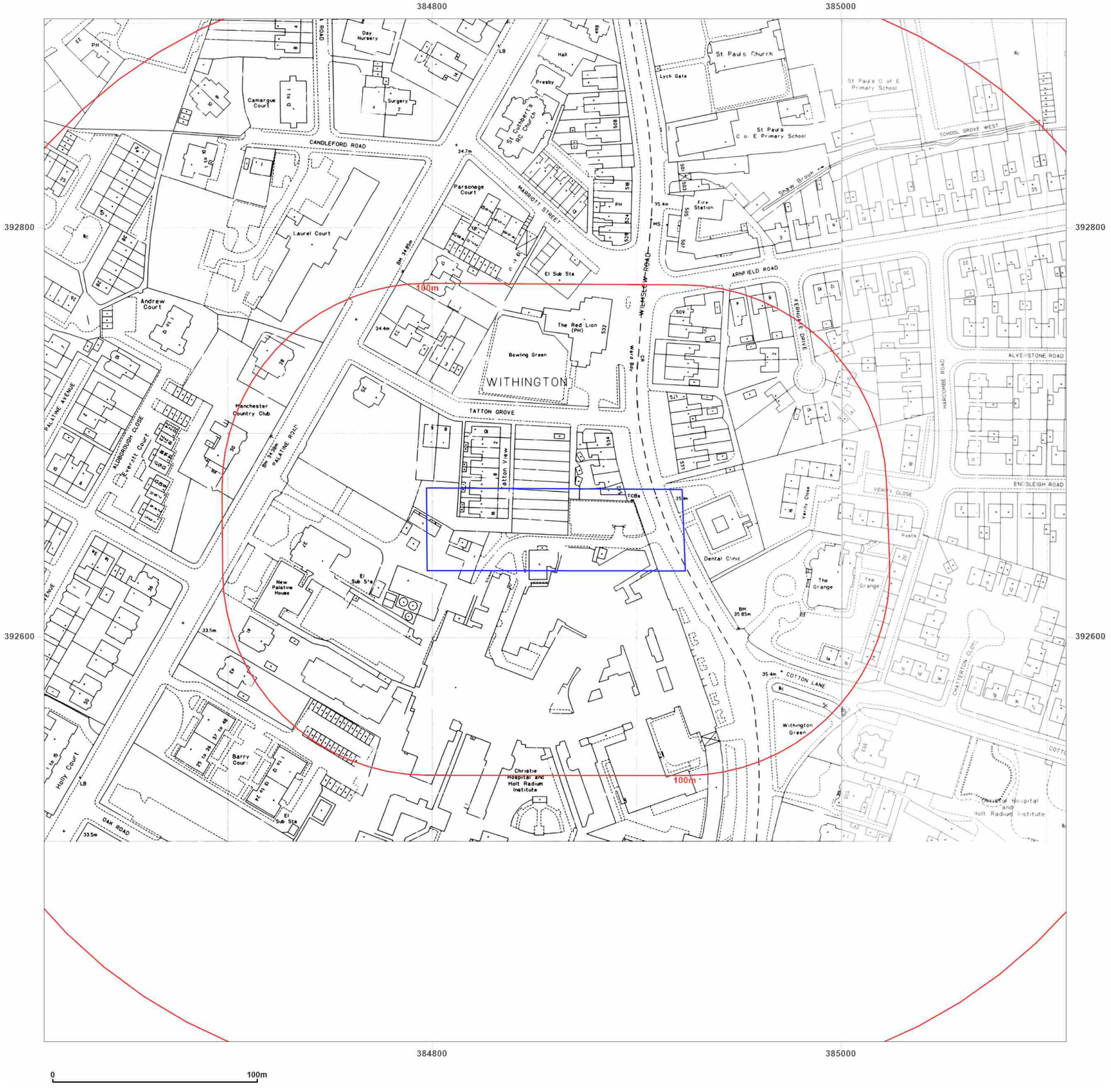
Powered by OS

Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2024 Ordnance Survey 100035207

Production date: 07 May 2024

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Groundsure INSIGHTS

Site Details:

Christie Hospital

Client Ref: 10033251
Report Ref: GS-9OR-GYQ-II7-XJS
Grid Ref: 384860, 392652

Map Name: National Grid

Map date: **1992-1993**

Scale: 1:1,250

Printed at: 1:2,000

N W E S

Surveyed 1993 Revised 1993 Edition N/A Copyright 1993 Levelled N/A	Surveyed 1992 Revised 1992 Edition N/A Copyright 1992 Levelled N/A

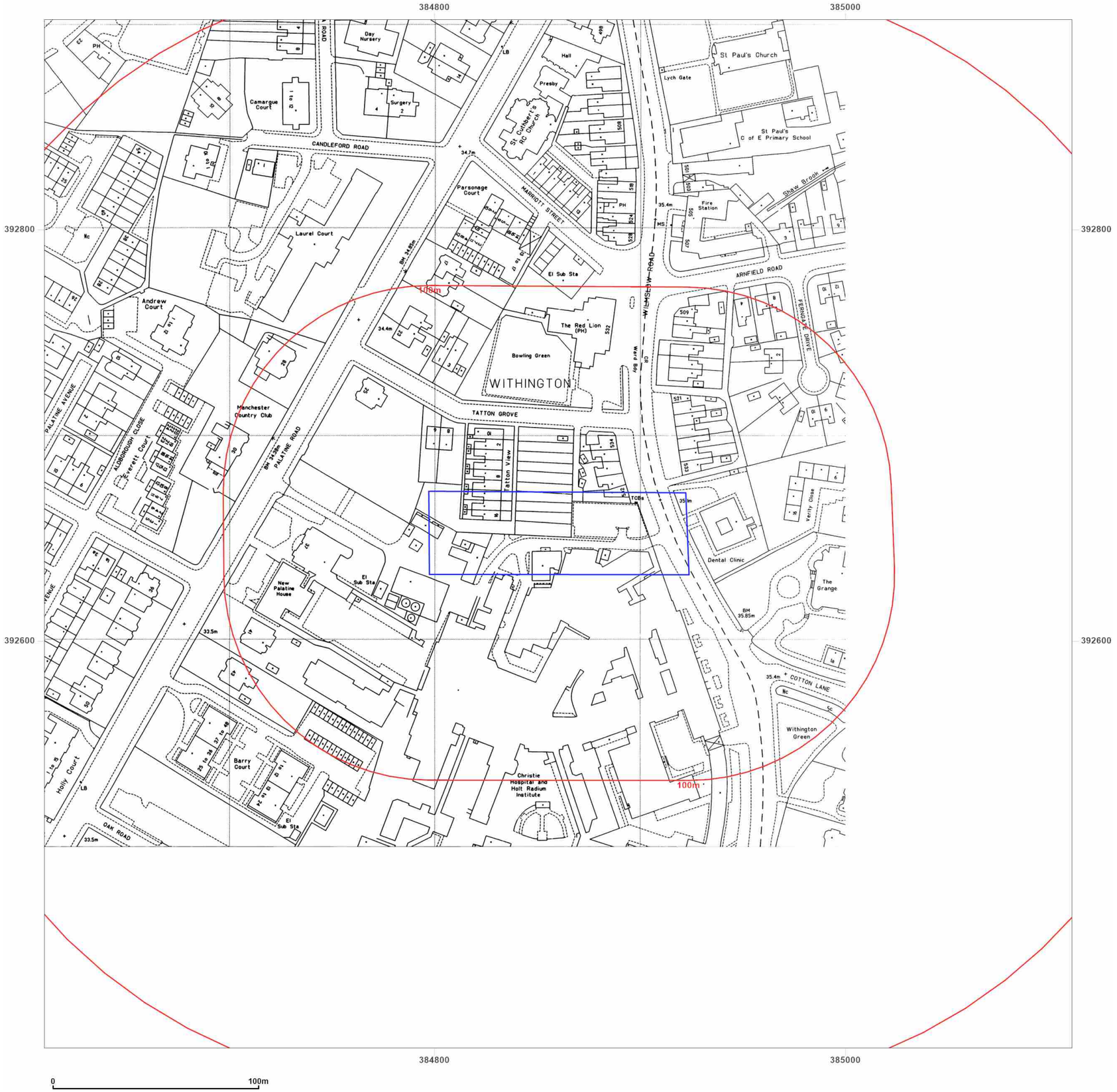
Powered by OS

Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2024 Ordnance Survey 100035207

Production date: 07 May 2024

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Groundsure INSIGHTS

Site Details:

Christie Hospital

Client Ref: 10033251
Report Ref: GS-9OR-GYQ-II7-XJS
Grid Ref: 384860, 392652

Map Name: National Grid

Map date: **1993**

Scale: 1:1,250

Printed at: 1:2,000

N
W E
S

Surveyed 1993
Revised 1993
Edition N/A
Copyright 1993
Levelled N/A

Powered by

Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2024 Ordnance Survey 100035207

Production date: 07 May 2024

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf

Groundsure INSIGHTS

Site Details:

Christie Hospital

Client Ref: 10033251
Report Ref: GS-9OR-GYQ-II7-XJS
Grid Ref: 384860, 392652

Map Name: LandLine
Map date: **2003**
Scale: 1:1,250
Printed at: 1:1,250

N
W E
S

2003

Powered by

Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2024 Ordnance Survey 100035207

Production date: 07 May 2024

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf

B. Qualitative Contaminated Land Risk Assessment Methodology

The following classification published by the NHBC, EA and CIEH's *Guidance for the Safe Development of Housing on Land Affected by Contamination* (2008)[1] has been developed from the Department of the Environment's guidance *A Guide to Risk Assessment and Risk Management for Environmental Protection* (1995)[2]. The methodology differs from that presented in *Contaminated land risk assessment A guide to good practice* (CIRIA, 2001)[3], particularly in terms of the definitions of classification of consequence, which include a consideration of immediacy of hazards.

The key to the classification is that the designation of risk is based upon the consideration of both:

- The magnitude of the potential consequence (i.e., severity) which considers both the potential severity of the hazard and the sensitivity of the receptor
- The magnitude of probability (i.e., likelihood) which considers both the presence of the hazard and receptor and the integrity of the pathway.

The potential consequences of contamination risks occurring at this site are classified in accordance with Table B.1.

Table B.1: Classification of Consequence

Classification	Definition
Severe	Highly elevated concentrations likely to result in "significant harm" to human health as defined by the EPA 1990, Part 2A, if exposure occurs. Equivalent to EA Category 1 pollution incident including persistent and/or extensive effects on water quality; leading to closure of a potable abstraction point; major impact on amenity value or major damage to agriculture or commerce. Major damage to aquatic or other ecosystems, which is likely to result in a substantial adverse change in its functioning or harm to a species of special interest that endangers the long-term maintenance of the population. Catastrophic damage to crops, buildings or property.
Medium	Elevated concentrations which could result in "significant harm" to human health as defined by the EPA 1990, Part 2A if exposure occurs. Equivalent to EA Category 2 pollution incident including significant effect on water quality; notification required to abstractors; reduction in amenity value or significant damage to agriculture or commerce. Significant damage to aquatic or other ecosystems, which may result in a substantial adverse change in its functioning or harm to a species of special interest that may endanger the long-term maintenance of the population. Significant damage to crops, buildings or property.
Mild	Exposure to human health unlikely to lead to "significant harm". Equivalent to EA Category 3 pollution incident including minimal or short-lived effect on water quality; marginal effect on amenity value, agriculture or commerce.

[1] NHBC, EA and CIEH. (2008) *Guidance for the Safe Development of Housing on Land Affected by Contamination, R&D66:2008 Volume 1*.

[2] Department of the Environment. (1995) *A Guide to Risk Assessment and Risk Management for Environmental Protection*. London: Department of the Environment.

[3] CIRIA. (2001) *Contaminated land risk assessment A guide to good practice*. Basingstoke: Basingstoke Press.

Classification	Definition
	Minor or short-lived damage to aquatic or other ecosystems, which is unlikely to result in a substantial adverse change in its functioning or harm to a species of special interest that would endanger the long-term maintenance of the population. Minor damage to crops, buildings or property.
Minor	No measurable effect on humans. Equivalent to insubstantial pollution incident with no observed effect on water quality or ecosystems. Repairable effects of damage to buildings, structures and services.

Source: NHBC, EA and CIEH (2008) Table A4.3.

The probability of contamination risks occurring at the site is classified in accordance with Table B.2. Note: A pollution linkage must first be established before probability is classified. If there is no pollution linkage, then there is no potential risk and no need to apply tests for probability and consequence.

Table B.2: Classification of Probability

Classification	Definition
High likelihood	There is a pollutant linkage and an event that either appears very likely in the short term or almost inevitable over the longer term, or there is evidence at the receptor of harm or pollution.
Likely	There is a pollutant linkage, and all elements are present and in the right place which means it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long-term.
Low likelihood	There is a pollutant linkage, and circumstances are possible under which an event would occur. However, it is by no means certain that even over a longer period such event would take place, and it is less likely in the shorter term.
Unlikely	There is a pollutant linkage, but circumstances are such that it is improbable that an event would occur even in the very long-term.

Source: NHBC, EA and CIEH (2008) Table A4.4.

For each possible pollution linkage (source – pathway – receptor) identified, the potential risk can be evaluated based upon the following probability x consequence matrix shown in Table B.3.

Table B.3: Qualitative Contamination Risk Matrix

		Consequence			
		Severe	**Medium**	**Mild**	**Minor**
Probability	**High likelihood**	Very High risk	High risk	Moderate risk	Low risk
	Likely	High risk	Moderate risk	Moderate / Low risk	Low risk
	Low likelihood	Moderate risk	Moderate / Low risk	Low risk	Very Low risk
	Unlikely	Moderate / Low risk	Low risk	Very Low risk	Very Low risk

Source: NHBC, EA and CIEH (2008) Table 1.8.

NHBC, EA and CIEH (2008) presents descriptions of these risk levels which are reproduced in Table B.4. The risks apply to each pollutant linkage, not simply to each hazard or receptor.

Table B.4: Description of Risk Levels

Term	Description
Very High risk	There is a high probability that severe harm could arise to a designated receptor from an identified hazard at the site without remediation action.
High risk	Harm is likely to arise to a designated receptor from an identified hazard at the site without remediation action.

Term	Description
Moderate risk	It is possible that without appropriate remediation action harm could arise to a to a designated receptor. It is relatively unlikely that any such harm would be severe, and if any harm were to occur it is more likely that such harm would be mild.
Low risk	It is possible that harm could arise to a designated receptor from identified hazard. It is likely that, at worst, if any harm was realised the effects would be mild.
Very Low risk	The presence of an identifies hazard does not give rise to the potential to cause harm to a designated receptor.

Source: NHBC, EA and CIEH (2008) Table1.9.

C. Site Walkover

Figure C.1: Wilmslow Road pavement looking north

Source: Mott MacDonald site visit on 16th May 2024.

Figure C.2: Wilmslow Road pavement looking south

Source: Mott MacDonald site visit on 16th May 2024.

Figure C.3: Derek Crowther building entrance looking north

Source: Mott MacDonald site visit on 16th May 2024.

Figure C.4: Derek Crowther building entrance looking south

Source: Mott MacDonald site visit on 16th May 2024.

Figure C.5: Access Road looking east

Source: Mott MacDonald site visit on 16th May 2024.

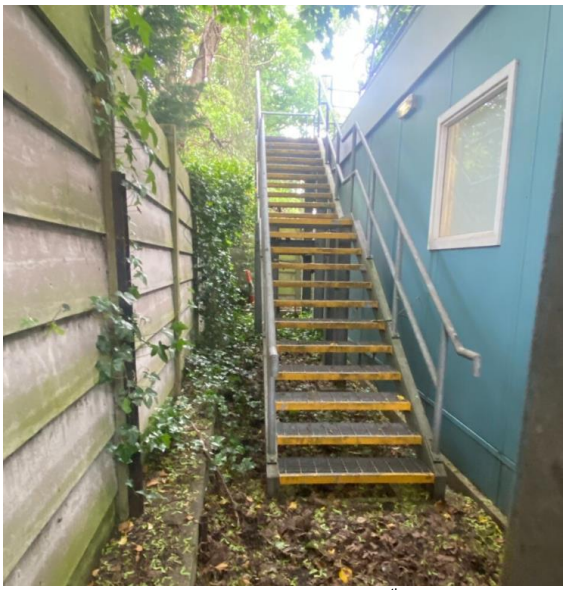
Figure C.6: Access Road looking west

Source: Mott MacDonald site visit on 16th May 2024.

Figure C.7: South-west corner of Derek Crowther building, looking north

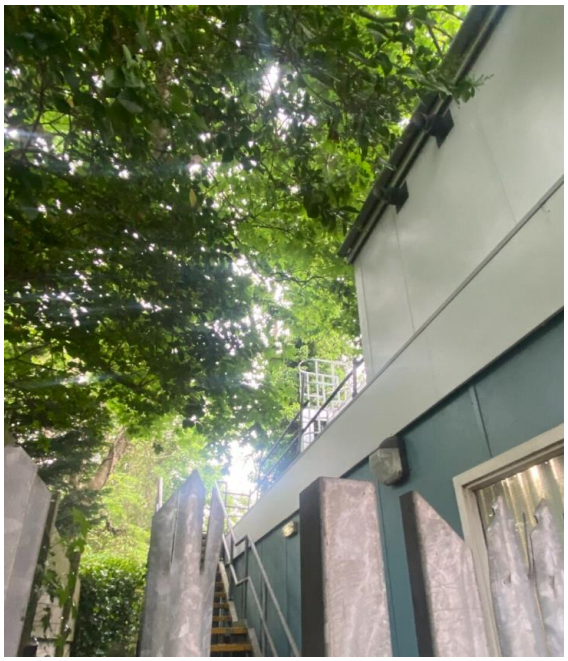
Source: Mott MacDonald site visit on 16th May 2024.

Figure C.8: West side of Derek Crowther building, displaying access to rooftop plant.



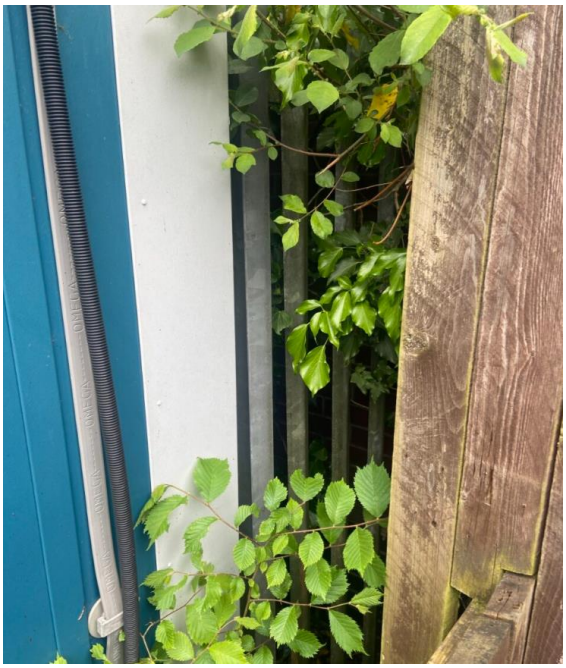
Source: Mott MacDonald site visit on 16th May 2024.

Figure C.9: Vegetation infringing on building footprint on the west side of Derek Crowther building



Source: Mott MacDonald site visit on 16th May 2024.

Figure C.10: North-east corner of Derek Crowther building, displaying limited access to northern perimeter



Source: Mott MacDonald site visit on 16th May 2024.

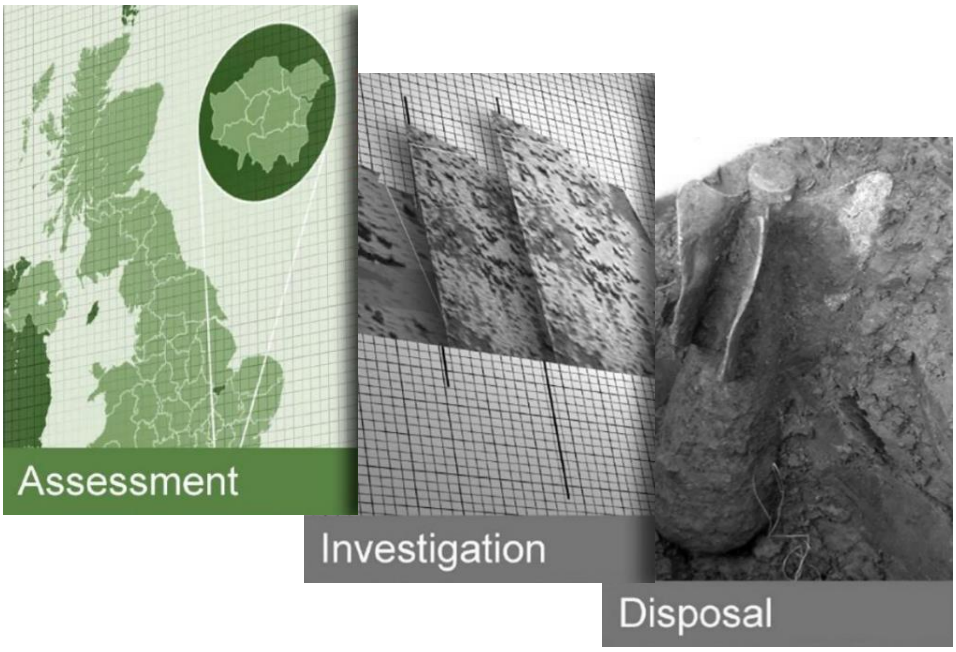
Figure C.11: Access Road looking west, halfway down road

Source: Mott MacDonald site visit on 16th May 2024.

Figure C.12: Derek Crowther building ground floor level raised above ground level

Source: Mott MacDonald site visit on 16th May 2024.

D. Zetica UXO Detailed Risk Assessment



UXO Desk Study & Risk Assessment

Document Ref.	**P14466-24-R1**
Revision	**A**
Project Title	**Christie NHS Foundation Trust**
Client	**Mott MacDonald**
Date	**20th May 2024**

Drafted by	**Ross Sykes**
Checked by	**James Major**
Authorised by	**Stefan Lang**

UXO DESK STUDY & RISK ASSESSMENT

EXECUTIVE SUMMARY

Key findings: No significant sources of Unexploded Ordnance (UXO) hazard have been identified.

Key actions: Proceed with works. An UXO awareness briefing is prudent for staff involved in excavations.

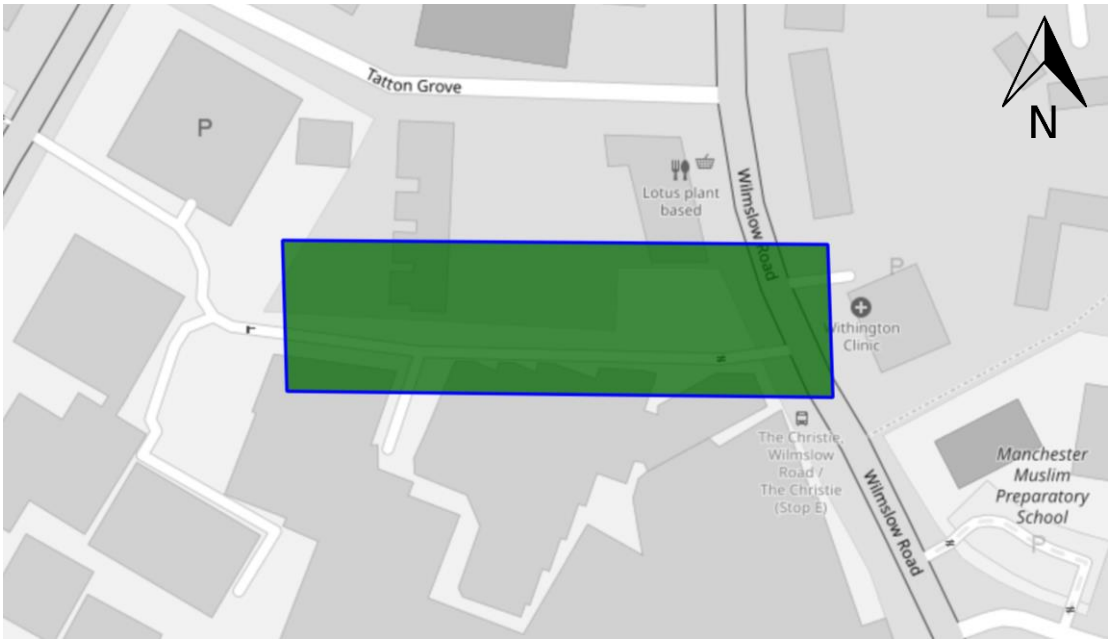
UXO hazard assessment

No records have been found indicating that the Site was bombed and no other significant sources of UXO hazard have been identified on the Site.

Given this, it is considered that the Site has a low UXO hazard level, as shown in the following Figure, reproduced as Figure 3 in the main report.

The UXO hazard zone plan of the Site is also given in the accompanying P14466-24-R1-MAP01-A.

UXO hazard zone plan of the Site



Source: OpenStreetMap *Not to Scale*

Legend	Very Low		Low		Moderate	
	High		Very High		Site boundary	

The main findings of the report are summarised below.

- No records of military activity on the Site during World War One (WWI) or World War Two (WWII) have been found.
- During WWII the main strategic targets in the vicinity of the Site included Salford Docks, warehouses and wharves along the Manchester Ship Canal, the Fairey Aviation aircraft works, and Crosley Brothers Ltd engine works.
- No records have been found indicating that the Site was bombed during WWII. Records indicate that the nearest bomb was an Oil Bomb (OB) which fell approximately 50m south of the Site on the 1st October 1940.

- There were 29No. Heavy Anti-Aircraft (HAA) and Rocket AA (ZAA) batteries within 10km of the Site during WWII. The potential for an Unexploded AA (UXAA) shell to have fallen on the Site cannot be discounted.

Proposed works

It is understood works are associated with the construction of a new 3-storey building. Works will comprise demolitions of the existing modular building, removal of its foundations, and the removal of tree roots encroaching onto the Site.

Future works on the Site may also include excavations, boreholes, and piling.

Risk assessment

The Table below, reproduced as Table 3 in the main report, provides a UXO risk assessment for the proposed works on the Site.

Further details on the risk assessment methodology are given in Section 7.2 of the main report.

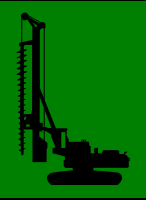
UXO risk assessment for the Site

Potential UXO Hazard	Anticipated Works	PE	PD	P = PE x PD	Likelihood	Severity	Risk Rating	UXO Risk
UXB	Excavations	1	1	1	1	5	5	Low
	Boreholes/Piling	1	1	1	1	4	4	Low
Other UXO	Excavations	1	1	1	1	4	4	Low
	Boreholes/Piling	1	1	1	1	3	3	Low
PE = Probability of Encounter; PD = Probability of Detonation; P = Likelihood								

Risk mitigation plan

The Table below, reproduced as Table 4 in the main report, summarises the UXO risk for proposed works on the Site and recommended actions.

Summary of UXO risk and mitigation recommendations

Proposed Works	UXO Risk	Recommended Mitigation
Excavations		**Proceed with works** – an UXO awareness briefing is prudent for staff involved in excavations.
Boreholes/Piling		**Proceed with works**

In summary, no additional measures are considered essential to reduce the UXO risk on the Site to As Low As Reasonably Practicable (ALARP). An UXO awareness briefing for staff involved in excavations is always prudent.

What do I do next?

If you have any comments or require further assistance, contact us and we can help.

	01993 886682		uxo@zetica.com		zeticauxo.com

If you have requirements to identify other buried hazards (such as mapping utilities or obstructions) we can provide these surveys.

If proposed works on the Site change, or additional works are planned, contact Zetica for a re-assessment of the UXO risk and the risk mitigation requirements.

CONTENTS

ABBREVIATIONS **VI**

1 INTRODUCTION **1**

1.1 Project outline

1.2 Sources of information

1.3 Data confidence level

2 THE SITE **3**

2.1 Site location

3 MILITARY ACTIVITY **5**

3.1 Defences

3.2 Military airfields

3.3 Aircraft crashes

3.4 Explosives factories, munitions depots, and disposal areas

3.5 Firing ranges and military training areas

4 BOMBING **7**

4.1 WWI bombing

4.2 WWII bombing

5 POST-WWII EXPLOSIVE ORDNANCE CLEARANCE (EOC) ACTIVITIES **12**

5.1 EOC tasks

6 UXO HAZARD ASSESSMENT **13**

6.1 UXO hazard level

7 UXO RISK ASSESSMENT **14**

7.1 Proposed works

7.2 Risk assessment methodology

7.3 UXO risk level

8 RISK MITIGATION PLAN **16**

8.1 UXO risk summary

8.2 Risk mitigation techniques

8.3 What do I do next?

APPENDICES **17**

Appendix 1 Anticipated ordnance types

Appendix 2 Sources of UXO hazard

Appendix 3 Recent UXO finds

Appendix 4 Glossary and definitions

Appendix 5 Bibliography

Appendix 6 General Notes

Figures, plates, & tables

Figure 1 Site location map 3
Figure 2 Compiled bomb impact map for the vicinity of the Site 9
Figure 3 UXO hazard zone plan of the Site 13

Plate 1 Recent aerial photograph of the Site 4
Plate 2 Aerial photograph, 7th May 1946 10

Table 1 Bombing statistics 8
Table 2 Estimated average maximum bomb penetration depths 11
Table 3 UXO risk assessment for the Site 15
Table 4 Summary of UXO risk and mitigation recommendations 16

Accompanying GIS data

P14466-24-R1-MAP01-A (UXO Desk Study)

ABBREVIATIONS

AA	Anti-Aircraft
AAP	Aircraft Acceptance Park
AFEE	Airborne Forces Experimental Establishment
ALARP	As Low As Reasonably Practicable
AOP	Air Observation Post
AP	Anti-Personnel
ARP	Air Raid Precaution
AXO	Abandoned Explosive Ordnance
BGS	British Geological Survey
CIRIA	Construction Industry Research and Information Association
CLE	Central Landing Establishment
CLS	Central Landing School
DCLG	Department of Communities and Local Government
EO	Explosive Ordnance
EOC	Explosive Ordnance Clearance
EOR	Explosive Ordnance Reconnaissance
ERW	Explosive Remnants of War
ESA	Explosive Substances and Articles
FPP	Ferry Pilots Pool
HAA	Heavy Anti-Aircraft
HE	High Explosive
HER	Historic Environment Record
IB	Incendiary Bomb
IWM	Imperial War Museum
LAA	Light Anti-Aircraft
MoD	Ministry of Defence
NAF	National Aircraft Factory
NARA	National Archives & Records Administration
NCAP	National Collection of Aerial Photography
OB	Oil Bomb
OSNGR	Ordnance Survey National Grid Reference
PM	Parachute Mine
RAF	Royal Air Force
RAuxAF	Royal Auxiliary Air Force
RE	Royal Engineers
RFC	Royal Flying Corps
UK	United Kingdom
UXAA	Unexploded Anti-Aircraft
UXB	Unexploded Bomb
UXO	Unexploded Ordnance
UXPM	Unexploded Parachute Mine
WO	War Office
WWI	World War One
WWII	World War Two
ZAA	Rocket Anti-Aircraft

UXO DESK STUDY & RISK ASSESSMENT

Please read: Zetica has colour coded each paragraph. Paragraphs with black text on a white background provide site-specific information or information specifically researched as part of this project.

Boxed paragraphs in a dark green text with a green background provide general information and, where appropriate, links to online resources giving further detail. These are all available at www.zeticauxo.com. If you cannot gain access to these resources, Zetica can forward them on request.

1 INTRODUCTION

1.1 Project outline

Zetica Ltd was commissioned by Mott MacDonald to carry out a detailed Unexploded Ordnance (UXO) Desk Study and Risk Assessment for an area of approximately 0.5 hectares (ha) off Wilmslow Road, in Manchester, Greater Manchester (the 'Site').

The aim of this report is to gain a fair and representative view of the potential UXO hazard on or affecting the Site in accordance with the Construction Industry Research and Information Association (CIRIA) C681 'Unexploded Ordnance (UXO), a Guide for the Construction Industry'.

Where appropriate, this hazard assessment includes:

- Likelihood of ordnance being present.
- Type of ordnance (size, filling, fuze mechanisms).
- Quantity of ordnance.
- Potential for live ordnance.
- Probable location.
- Ordnance condition.

It should be noted that some military activity providing a source of UXO hazard may not be recorded and therefore there cannot be any guarantee that all UXO hazards affecting the Site have been identified in this report.

1.2 Sources of information

Zetica Ltd researched the World War One (WWI)/World War Two (WWII) bombing and military history of the Site and its surrounding area using a range of information sources. The main sources of information are detailed in the following sections and referenced at the end of this report.

1.2.1 Zetica Ltd records

Zetica Ltd's in-house records were consulted, including the Zetica Ltd bomb risk maps (https://zeticauxo.com/guidance/risk-maps/), previous requests for information from government bodies, reference books, and archive materials from past work in the region.

Relevant documents have been cited in the bibliography of this report.

1.2.2 Historical records, maps, and drawings

Numerous reference documents including historical maps, aerial photographs and drawings have been consulted from sources such as the National Archives, the US National Archives & Records Administration (NARA), the Imperial War Museum (IWM), Historic England, National Collection of Aerial Photography (NCAP), the Defence of Britain Project, and relevant archaeological bodies.

The British Geological Survey (BGS) was consulted for borehole information.

1.2.3 Local records

Manchester City Council, the Greater Manchester County Record Office, Manchester Central Library Archive, Manchester University, local historical groups, and the Greater Manchester Historic Environment Record (HER) were consulted for records.

1.3 Data confidence level

In general, there is a high level of confidence in the researched information sources used for this report. Further detail is given in the text of the report where appropriate.

Definitions of data confidence level		
Data Confidence Level		**Definition**
	Low	There are very few sources of information, and/or those available are lacking in detail.
	Moderate	There is a limited range of available sources of information, a key source of information is missing, and/or some sources may be contradictory or lacking in detail.
✓	**High**	There is a wide range of available sources of information, which are detailed and corroborate each other.

2 THE SITE

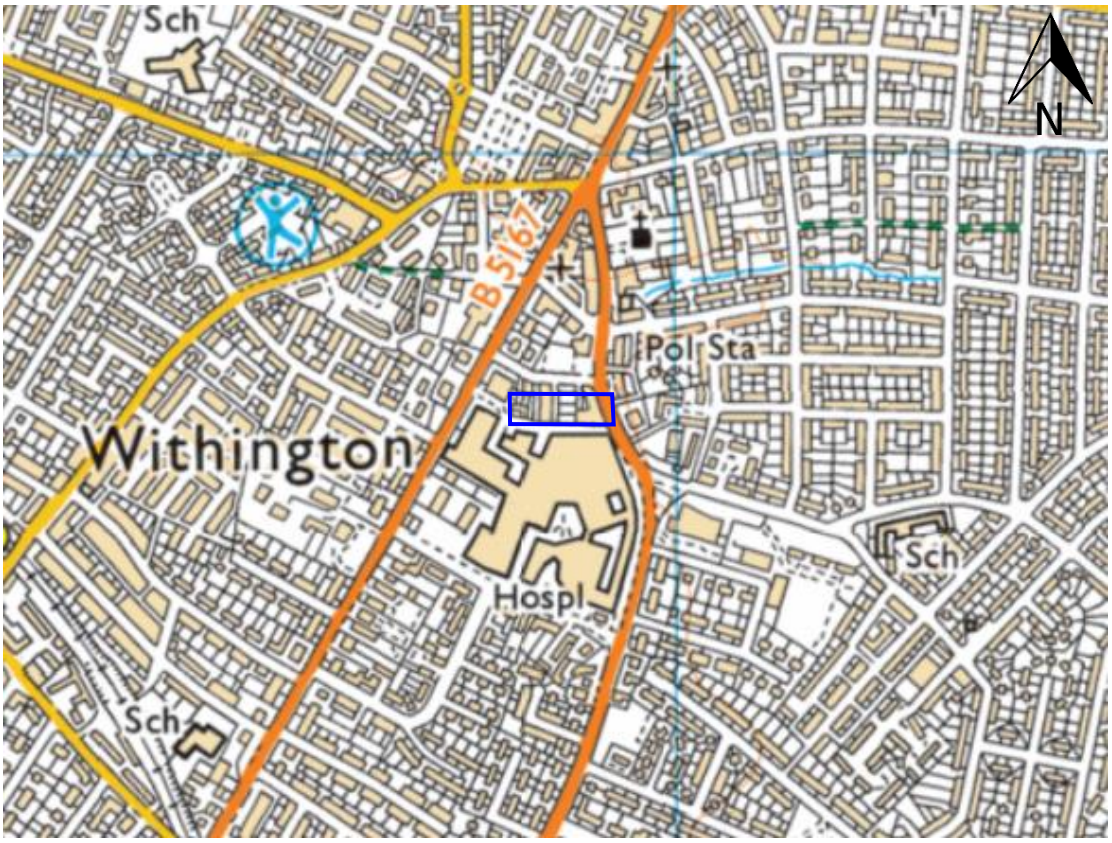
2.1 Site location

The Site is centred on Ordnance Survey National Grid Reference (OSNGR) SJ 848926. It is located approximately 5.3km south-southeast of central Manchester.

The Site comprises hardstanding, open ground, residential buildings, buildings associated with Christie Hospital, and is crossed by Wilmslow Road. It is bounded to the north by residential and commercial buildings, open ground and hardstanding, and Wilmslow Road, to the east by Withington Dental Care Centre and Wilmslow Road, to the south by Christie Hospital and Wilmslow Road, and to the west by Christie Hospital.

Figure 1 is a Site location map and Plate 1 is a recent aerial photograph of the Site.

Figure 1 Site location map



Source: © Crown Copyright 2024. Reproduced by permission of Ordnance Survey *Not to Scale*

Legend	Site boundary

Plate 1 Recent aerial photograph of the Site

Source: Google Earth *Not to Scale*

Legend	Site boundary

3 MILITARY ACTIVITY

The following sections outline the recorded military activity in the vicinity of the Site. The potential UXO hazard from WWI and WWII bombing is detailed in Section 4.

3.1 Defences

For further information on military defences, and the potential UXO hazards associated with them, follow the links below:

- Anti-Aircraft Guns
- Anti-Invasion Defences
- Barrage Balloons
- Bombing Decoys
- Home Guard
- Mined Locations
- Mortar & Gun Emplacements
- Pillboxes

No military defences have been identified on the Site. The nearest are described below.

3.1.1 Anti-Aircraft (AA) guns

During WWI there were 9No. AA batteries recorded within 10km of the Site. The nearest was located at Hough End (SD 825935), approximately 2.4km west-northwest of the Site. It was armed with 1No. 6-pdr gun.

During WWII there were 29No. Heavy AA (HAA) and Rocket AA (ZAA) batteries recorded within 10km of the Site. The nearest was located at Hough Ends Playing Fields (SJ 831934), approximately 1.8km northwest of the Site. It was initially armed with 4No. 4.5" guns.

Potential UXO hazard

Given the number of AA gun batteries in the surrounding area, the potential for an Unexploded AA (UXAA) shell to have fallen on the Site unnoticed, whilst unlikely, cannot be totally discounted.

3.2 Military airfields

For further information on military airfields, and the potential UXO hazards associated with them, follow the link below:

- Military Airfields

No records of any military airfields on or in close proximity to the Site have been found.

During WWI, the nearest operational airfield was Alexandra Park Aerodrome, approximately 0.8km northwest of the Site.

Alexandra Park Aerodrome operated as an Aircraft Acceptance Park (AAP) and was used for the testing and delivery of Royal Flying Corps (RFC) aircraft manufactured at works in Manchester, such as the Avro Works at Trafford Park, approximately 6.4km northwest of the Site, and National Aircraft Factory (NAF) No.2 at Heaton Chapel, approximately 2.3km east of the Site.

After WWI Alexandra Park Aerodrome reverted to civilian use.

During WWII, the nearest operational airfield was Royal Air Force (RAF) Ringway, approximately 7.3km southwest of the Site.

RAF Ringway was home to the Central Landing School (CLS), later Central Landing Establishment (CLE), focused on parachute training, glider training, and developmental work. In 1942 the CLE was renamed the Airborne Forces Experimental Establishment (AFEE).

In June 1942 the AFEE departed RAF Ringway and the Parachute Training School, formed in February 1942, remained at RAF Ringway for the duration of WWII.

The Fairey Aviation Company and Avro, established aircraft production facilities at RAF Ringway and used the airfield for testing. RAF Ringway was also home to No. 3 (later No. 13) Ferry Pilots Pool (FPP), responsible for delivering aircraft to facilities around the United Kingdom (UK).

After WWII, Ringway airport re-opened for civil use, whilst also accommodating 2No. Royal Auxiliary Air Force (RAuxAF) squadrons and 1No. Air Observation Post (AOP) flight. In 1957, all military activity ceased at RAF Ringway.

RAF Ringway is now known as Manchester International Airport.

Military airfields are not considered to provide a source of UXO hazard to the Site.

3.3 Aircraft crashes

For further information on military aircraft crashes, and the potential UXO hazards associated with them, follow the link below:

- Aircraft Crashes

No records of any aircraft crashes on or in close proximity to the Site have been found.

3.4 Explosives factories, munitions depots, and disposal areas

For further information on explosives factories, munitions depots and disposal areas, and the potential UXO hazards associated with them, follow the links below:

- Explosives Factories
- Munitions Depots
- Munitions Disposal Areas

No records of any explosives factories, munitions depots or munitions disposal areas on or in close proximity to the Site have been found.

3.5 Firing ranges and military training areas

For further information on firing ranges and military training areas, and the potential UXO hazards associated with them, follow the links below:

- Artillery Ranges
- Bombing Ranges
- Military Training Areas
- Small Arms Ranges

No records of any firing ranges or military training areas on or in close proximity to the Site have been found.

4 BOMBING

4.1 WWI bombing

For further information on WWI bombing in the UK, and the potential UXO hazard associated with it, see Appendix 2.1 or use the following link.

- WWI Bombing

No records have been found indicating that the Site was bombed during WWI.

4.2 WWII bombing

For further information on WWII bombing in the UK, and the potential UXO hazard associated with it, see Appendix 2.2 or use the following link.

- WWII Bombing

No records have been found indicating that the Site was bombed during WWII. Details of WWII bombing in the vicinity of the Site are provided in the following sections.

4.2.1 Bombing in Manchester

Air raids on Manchester began in August 1940 and continued until 1945. The heaviest raid on the city occurred between the 22nd and 24th December 1940, the 'Manchester Blitz', during which more than 400No. High Explosive (HE) bombs and 30,000No. Incendiary Bombs (IB) fell on the city, approximately 5.3km north of the Site.

More than 1,710No. HE bombs and 115No. Parachute Mines (PM) fell across the Manchester region during WWII. Bombing was concentrated on central Manchester, approximatley 5.3km north-northwest of the Site, Salford Docks, and major industrial works at Trafford Park, approximately 5.3km northwest of the Site.

Bombing densities generally decreased away from the city centre and far less damage was sustained by properties in these areas.

4.2.2 Strategic targets

From prior to the declaration of war in 1939, Britain was subjected to reconnaissance flights by the Luftwaffe which was building up a photographic record of potential targets.

The Site was located in an area which contained numerous strategic targets, including Salford Docks, warehouses and wharves along the Manchester Ship Canal, the Fairey Aviation aircraft works, and Crosley Brothers Ltd engine works.

The nearest identified Luftwaffe target was the Fairey Aviation aircraft works and the Crosley Brothers Ltd engine works, approximately 2.3km east of the Site.

4.2.3 Bombing densities and incidents

Table 1 gives details of the overall bombing statistics recorded for the Local Authority Districts of the Site (highlighted by bold text) and surrounding districts. These were categorised as Rural Districts (RD), Urban Districts (UD), Municipal Boroughs (MB), Metropolitan Boroughs (MetB), and County Boroughs (CB). WWII bomb density levels are defined below:

<5 bombs per 405ha is a Very Low regional bombing density.

5-15 bombs per 405ha is Low.

15-50 bombs per 405ha is Moderate.

50-250 bombs per 405ha is High.

>250 bombs per 405ha is Very High.

Official UK bombing statistics have been compiled from both British and German sources. There were differences in the way the figures were originally reported and collated which has led to discrepancies in the summary data.

Note that Table 1 excludes the figures for IBs. Discrepancies between the below list and other records, such as bomb clearance records, demonstrate that this data is likely to under-represent actual bombing.

Table 1 Bombing statistics

Area	Bombs Recorded				
	High Explosive	Parachute Mines	Other	Total	Bombs per 405ha (1000 acres)
Manchester CB	**712**	**18**	**7**	**737**	**27.0**
Stretford MB	456	64	0	520	147.3
Stockport CB	76	1	3	80	10.0

It should be noted that during WWII, many Unexploded Bombs (UXBs) were mapped and subsequently removed as and when conditions and demands on Bomb Disposal teams allowed. Their removal was not always accurately recorded and sometimes records were later destroyed. In practice, most UXBs were probably removed and only a much smaller number were actually registered as officially abandoned bombs.

Details of the nearest recorded bombing incidents to the Site are given in the following section.

1st October 1940

1No. Oil Bomb (OB) fell on the forecourt of Christie Hospital & Holt Radium Institute, approximately 50m south of the Site.

1No. HE bomb fell on land off Wilmslow Road, approximately 80m north-northeast of the Site.

3No. HE bombs fell on Wilmslow Road, between approximately 0.1km and 0.3km north of the Site.

1No. HE bomb fell on Morris Street, approximately 0.4km north of the Site.

1No. OB fell on land south of Withington Cottage, approximately 0.4km south of the Site.

1No. HE bomb fell on Moorfield Street, approximately 0.4km north of the Site.

1No. HE bomb fell on Oak Bank Avenue, approximately 0.5km north of the Site.

2nd January 1941

1No. PM fell on the ground of St Paul's Church, approximately 0.2km north of the Site. This was recorded as an Unexploded Parachute Mine (UXPM).

10th September 1941

1No. HE bomb fell on Danesmoor Road, approximately 0.6km southwest of the Site.

1st February 1941

1No. PM fell Burton Road, approximately 0.3km west-northwest of the Site.

11th – 12th March 1941

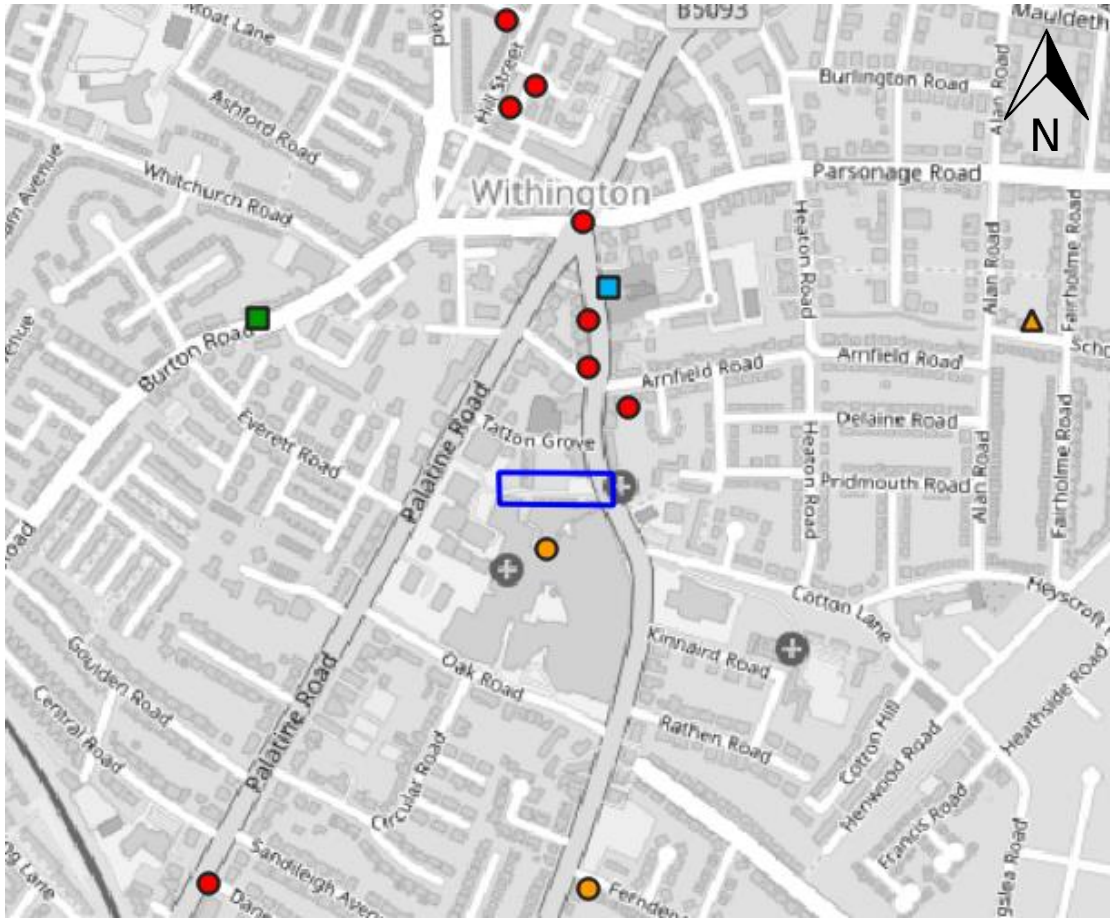
1No. IB fell on Fairholme Road, approximately 0.5km east-northeast of the Site.

Figure 2 is a map showing the approximate location of recorded bomb impacts in the immediate vicinity of the Site. IBs shown are indicative of larger numbers of similar devices that fell within the given area.

The map has been compiled from different sources, including air raid incident reports, historical aerial photographs, and bomb census maps.

The bomb map is also given in the accompanying P14466-24-R1-MAP01-A.

Figure 2 Compiled bomb impact map for the vicinity of the Site

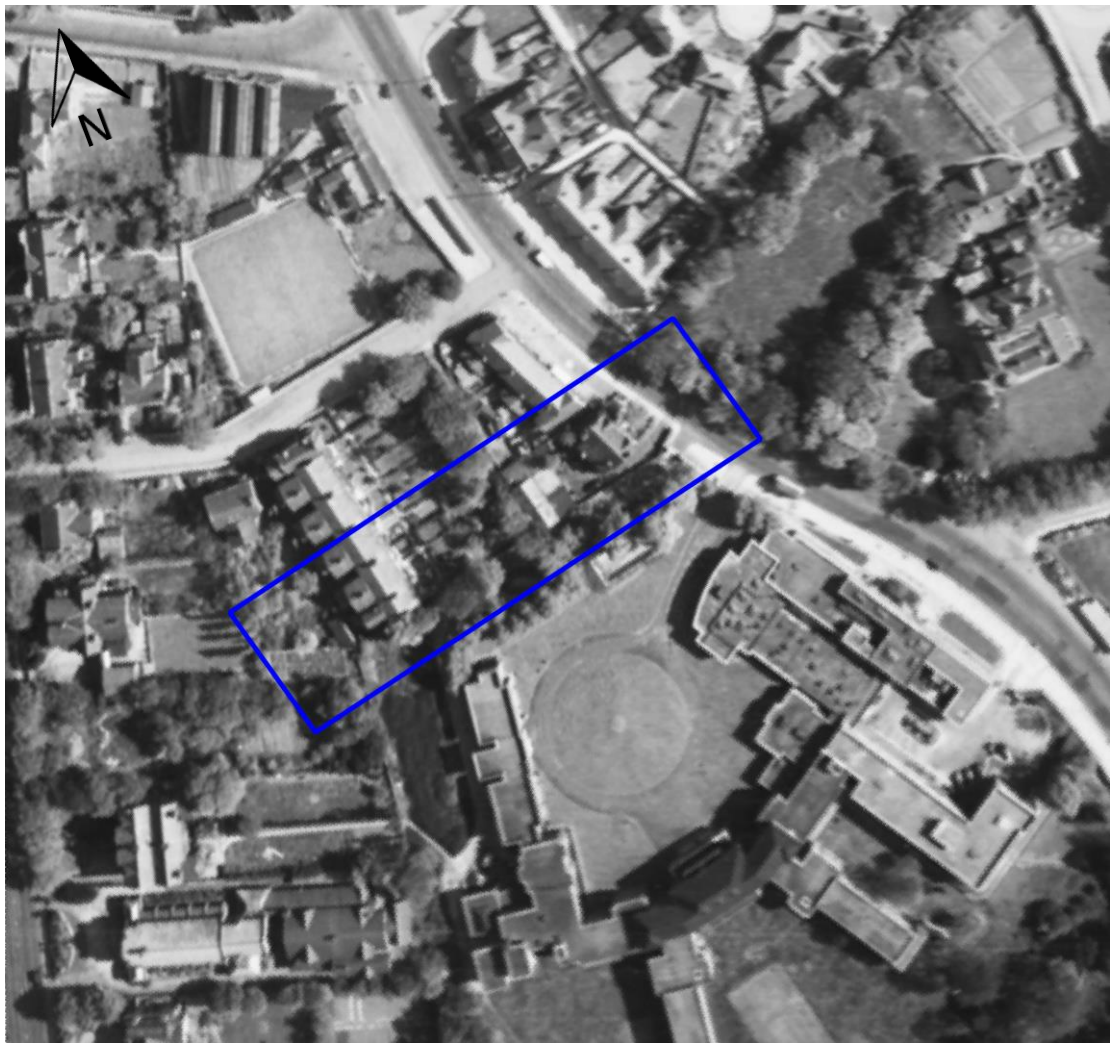


Source: OpenStreetMap *Not to Scale*

Legend			
	Site boundary	HE	PM
	UXPM	OB	IB

Plate 2 is an aerial photograph dated the 7th May 1946. No bomb damage has been identified on or in the vicinity of the Site.

Plate 2 Aerial photograph, 7th May 1946



Source: Historic England *Not to Scale*

Legend	Site boundary

Potential UXO hazard

No records have been found indicating that the Site was bombed and no bomb damage has been identified on the Site on historical aerial photography.

WWII bombing is not considered to provide a significant source of UXO hazard to the Site.

4.2.4 Abandoned bombs

No records have been found indicating that any officially abandoned bombs are located on the Site.

4.2.5 Bomb penetration depths

At the time of writing, no Site-specific ground investigation data was provided.

Information provided by the Client, BGS 1:50,000 Sheet 98 Stockport (Solid & Drift) and BGS borehole records from nearby investigations have been consulted to get an indicative overview of the Site geology.

The WWII geology of the Site is understood to consist of Made Ground, over Devensian Till, overlying sandstone of the Chester Formation.

Table 2 provides an estimate of average maximum bomb penetration depths for the Site assuming WWII ground conditions of 1m of Made Ground (modelled as gravel), over 1.5m of sand, overlying more than 20m of sandstone (modelled as soft rock).

Table 2 Estimated average maximum bomb penetration depths

Estimated average bomb penetration depths for anticipated geology		
Bomb Weight	50kg	2.4m
	250kg	5.0m
	500kg	10.5m

These calculations can be refined on receipt of Site-specific information.

The estimated bomb penetration depths given in Table 2 are from the WWII ground level and are based on the following assumptions:

a) High-level release of the bomb resulting in an impact velocity of 260m/s (>5,000m altitude).

b) A strike angle of 10 to 15 ° to the vertical.

c) That the bomb is stable, both in flight and on penetration.

d) That no retarding units are fitted to the bomb.

e) That the soil type is homogenous.

Assuming the above, a bomb will enter the ground and travel on the same trajectory until momentum is nearly lost. The bomb will then turn abruptly to the horizontal before coming to rest. The horizontal distance between the centre of the entry hole and the centre of the bomb at rest is known as the 'offset'. A marked horizontal movement from the original line of entry is common.

Low-level attacks may have an impact angle of 45° or more, which will frequently lead to a much greater amount of offset movement during soil penetration.

The average offset is one third of the penetration depth. If hardstanding or Made Ground were present during WWII, bomb penetration depths would have been significantly reduced but offset distances may have been up to four times greater.

5 POST-WWII EXPLOSIVE ORDNANCE CLEARANCE (EOC) ACTIVITIES

Based on data from 1939 to 1945, War Office (WO) statistics indicate that 200,195No. HE bombs exploded within Great Britain. Additionally, 25,195No. HE bombs (approximately 11%) were recorded as UXBs. However, records from the Royal Engineers (RE) who were responsible for bomb disposal at the time indicate that by 27th February 1946, more than 45,000No. UXBs were disposed of.

On average, 8.5% of UXBs later self-exploded. In some cases, the bombs had delayed action fuzes or were never intended to explode, their purpose being to cause inconvenience and fear. Given the discrepancy in records and the fact that UXBs are still being found unexpectedly, it is clear that the original figures are understated and provide only an approximation of the number of potential UXBs in the UK.

WO statistics also show that between October 1940 and May 1941 most UXBs (93%) were either 50kg or 250kg. It should be noted that details of the recovery and size of the UXB were not always accurately reported.

The larger WWII UXBs are often difficult to recover due to both penetration depths and the presence of two or more fuzes, combined with more sensitive fillings of explosive mixtures including Amatol and Trialen.

5.1 EOC tasks

Zetica holds the following records of post-WWII EOC tasks having taken place in the vicinity of the Site.

31st October 2012

1No. WWI shell was discovered at a property on Burton Road, approximately 0.6km west of the Site. It was made safe and removed.

6 UXO HAZARD ASSESSMENT

6.1 UXO hazard level

Definitions of UXO Hazard Level for a Site	
Hazard Level	**Definition**
Very Low	There is positive evidence that UXO is not present, e.g. through physical constraints or removal.
Low	There is no positive evidence that UXO is present, but its occurrence cannot be totally discounted.
Moderate	There is positive evidence that ordnance was present or that other uncharted ordnance may be present as UXO.
High	There is positive evidence that UXO is present.
Very High	As high, but requires immediate or special attention due to the potential hazard.

No records have been found indicating that the Site was bombed and no other significant sources of UXO hazard have been identified on the Site.

Given this, it is considered that the Site has a low UXO hazard level, as shown in Figure 3.

The UXO hazard zone plan of the Site is also given in the accompanying P14466-24-R1-MAP01-A.

Figure 3 UXO hazard zone plan of the Site

Source: OpenStreetMap *Not to Scale*

Legend	Very Low		Low		Moderate	
	High		Very High		Site boundary	

7 UXO RISK ASSESSMENT

7.1 Proposed works

It is understood works are associated with the construction of a new 3-storey building. Works will comprise demolitions of the existing modular building, removal of its foundations, and the removal of tree roots encroaching onto the Site.

Future works on the Site may also include excavations, boreholes, and piling.

7.2 Risk assessment methodology

A UXO risk assessment has been undertaken for the proposed works, taking into consideration the identified UXO hazard(s).

Firstly, the probability of encountering UXO (PE) has been considered and rated for the proposed construction techniques, as detailed below.

Probability of Encounter (PE)	Rating
Frequent, highly likely, almost certain.	5
Probable, more likely to happen than not.	4
Occasional, increased chance or probability.	3
Remote, unlikely to happen but could.	2
Improbable, highly unlikely.	1
Impossible	0

Secondly, the probability of detonating an item of UXO (PD) has been considered and rated for the proposed construction techniques, as detailed below.

Probability of Detonation (PD)	Rating
Frequent, highly likely, almost certain.	5
Probable, more likely to happen than not.	4
Occasional, increased chance or probability.	3
Remote, unlikely to happen but could.	2
Improbable, highly unlikely.	1
Impossible	0

Next, the probability of encountering and detonating the UXO (PE x PD) have been used to generate an overall likelihood rating (P).

P = PE x PD	LIKELIHOOD of Encounter and Detonation	Rating
21 to 25	Frequent, highly likely, almost certain.	5
16 to 20	Probable, more likely to happen than not.	4
6 to 15	Occasional, increased chance or probability.	3
2 to 5	Remote, unlikely to happen but could.	2
1	Improbable, highly unlikely.	1
0	Impossible	0
P ranges from 25, a certainty of UXO being encountered and detonated on the Site by engineering activity, to 0, a certainty that UXO does not occur on the Site and will not be detonated by engineering activity.		

The likelihood of encountering and detonating UXO during site works (P) is multiplied by the severity (S) of such an event occurring (P x S), to provide a risk level using the following matrix.

Severity (S)	Rating
Multiple fatalities	5
Major injury, long term health issues, single fatality.	4
Minor injury, short term health issues, no fatalities.	3
First aid case but no lost time or ill health.	2
Minor injuries, no first aid.	1
No injuries.	0

UXO Risk Matrix							
	SEVERITY (S)						
LIKELIHOOD (P)		5	4	3	2	1	0
	5	25	20	15	10	5	0
	4	20	16	12	8	4	0
	3	15	12	9	6	3	0
	2	10	8	6	4	2	0
	1	5	4	3	2	1	0
	0	0	0	0	0	0	0

7.3 UXO risk level

The UXO risk assessment for proposed works on the Site is given in Table 3.

Table 3 UXO risk assessment for the Site

Potential UXO Hazard	Anticipated Works	PE	PD	P = PE x PD	Likelihood	Severity	Risk Rating	UXO Risk
UXB	Excavations	1	1	1	1	5	5	Low
	Boreholes/Piling	1	1	1	1	4	4	Low
Other UXO	Excavations	1	1	1	1	4	4	Low
	Boreholes/Piling	1	1	1	1	3	3	Low
PE = Probability of Encounter; PD = Probability of Detonation; P = Likelihood								

8 RISK MITIGATION PLAN

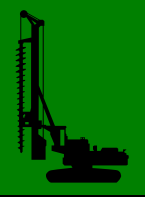
Key findings: No significant sources of UXO hazard have been identified.

Key actions: Proceed with works. An UXO awareness briefing is prudent for staff involved in excavations.

8.1 UXO risk summary

Table 4 summarises the UXO risk for proposed works on the Site and recommended actions.

Table 4 Summary of UXO risk and mitigation recommendations

Proposed Works	UXO Risk	Recommended Mitigation
Excavations		**Proceed with works** – an UXO awareness briefing is prudent for staff involved in excavations.
Boreholes/Piling		**Proceed with works**

In summary, no additional measures are considered essential to reduce the UXO risk on the Site to As Low As Reasonably Practicable (ALARP). An UXO awareness briefing for staff involved in excavations is always prudent.

8.2 Risk mitigation techniques

8.2.1 UXO awareness briefing

It is prudent that all staff involved in intrusive works are provided with a formal UXO awareness briefing.

The briefing should offer some recognition skills for typical UXO, and suitably sensitise staff to be vigilant during site works.

An UXO awareness briefing ensures that in the unlikely event that UXO is encountered:

- All site staff take appropriate action.
- A support mechanism and points of contact are established.
- The likelihood of harm to people or property is reduced.
- Significant delays to site work are prevented.

8.3 What do I do next?

If you have any comments or require further assistance, contact us and we can help.

	01993 886682		uxo@zetica.com		zeticauxo.com

If you have requirements to identify other buried hazards (such as mapping utilities or obstructions) we can provide these surveys.

If proposed works on the Site change, or additional works are planned, contact Zetica for a re-assessment of the UXO risk and the risk mitigation requirements.

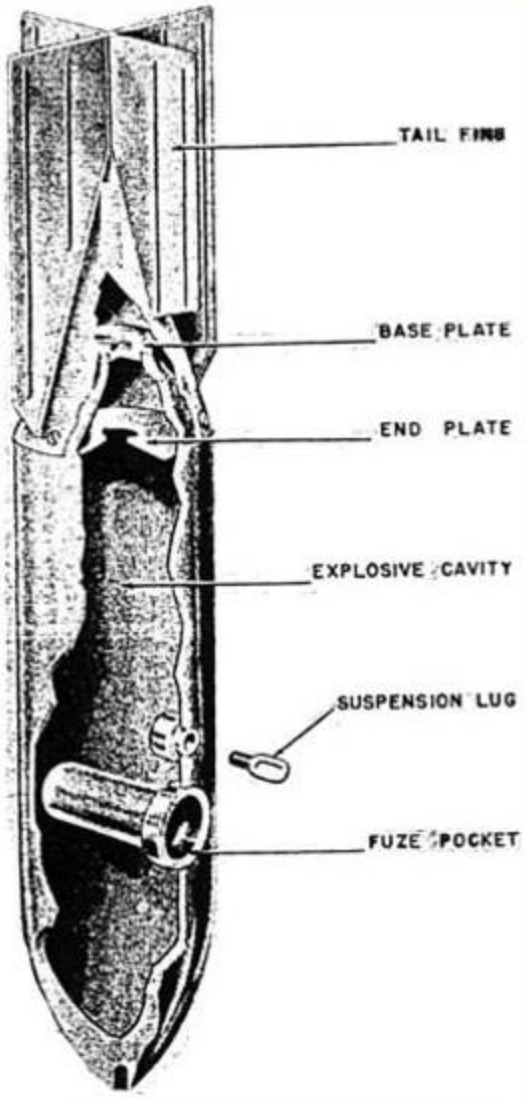
APPENDICES

Appendix 1 Anticipated ordnance types

For a more comprehensive set of ordnance data sheets, see https://zeticauxo.com/guidance/ordnance-data-sheets/.

Information Data Sheet

50kg High Explosive Bomb



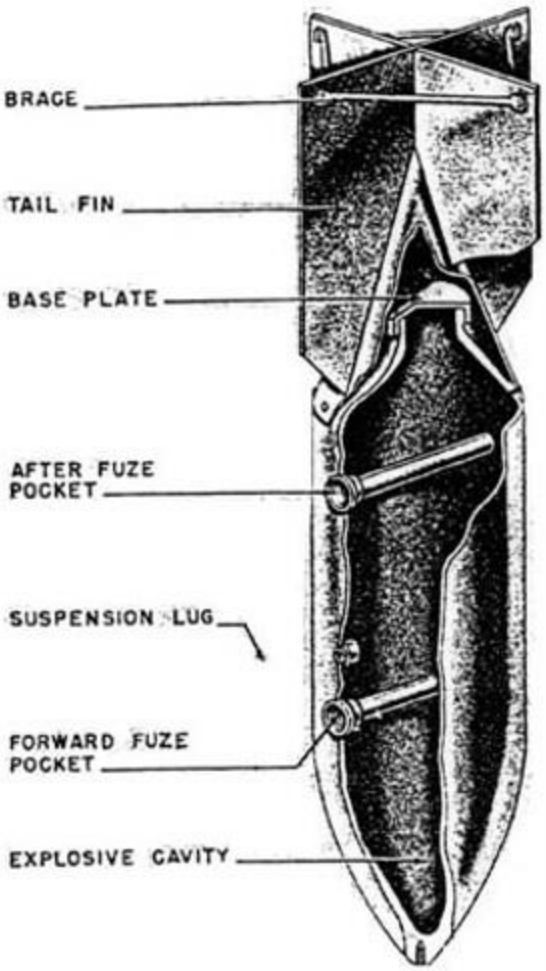
Specifications

Description	Cylindrical with pointed nose and four-fin tail	Function	General Purpose (Blast and Fragmentation)
Dimensions	Total 1090mm x 280mm (42.9" x 11") Body 766mm x 200mm (30.2" x 7.9")	Activation by	Impact, Time, or Tamper fuze
Material	Steel	Variations	Minor variations in length

Information is accurate for indicative purposes. Photographs used are in the public domain. Any use of copyrighted © material is unintentional.

Information Data Sheet

250kg High Explosive Bomb



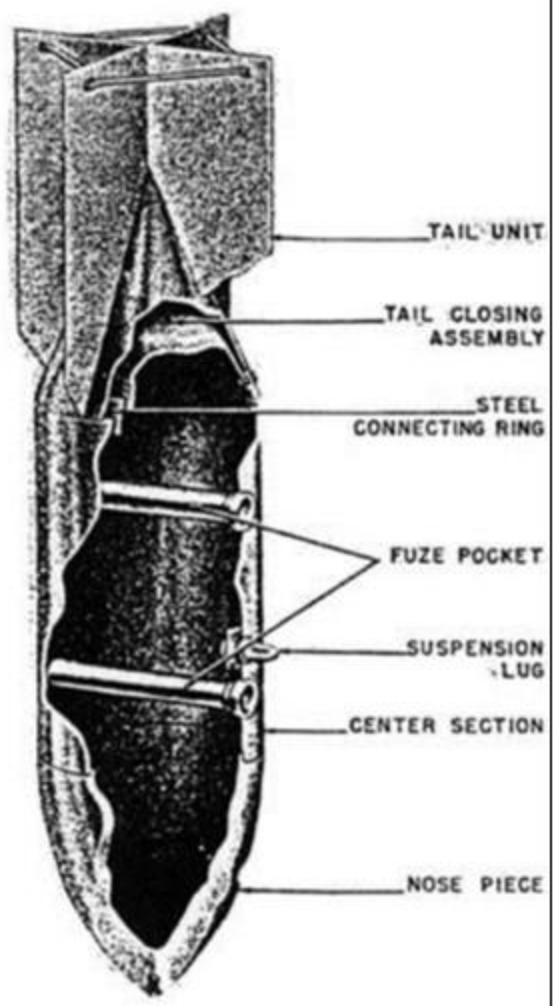
Specifications

Description	Cylindrical with pointed nose and braced four-fin tail	**Function**	General Purpose (Blast and Fragmentation)
Dimensions	**Total** 1640mm x 512mm (64.6" x 20.2") **Body** 1172mm x 368mm (46" x 14.5")	**Activation by**	Impact, Time, or Tamper fuze
Material	Steel	**Variations**	Minor variations in length

Information is accurate for indicative purposes. Photographs used are in the public domain. Any use of copyrighted © material is unintentional.

Information Data Sheet

500kg High Explosive Bomb



Specifications

Description	Cylindrical with pointed nose and braced or ring-bound four-fin tail	**Function**	General Purpose (Blast and Fragmentation)
Dimensions	**Total** 1957mm x 640mm (77" x 25.2") **Body** 1423mm x 470mm (56" x 18.5")	**Activation by**	Impact, Time, or Tamper fuze
Material	Steel body, Steel or Magnesium Alloy tail	**Variations**	Minor variations in length

Information is accurate for indicative purposes. Photographs used are in the public domain. Any use of copyrighted © material is unintentional.

Information Data Sheet

Anti-Aircraft Shells

3" AA Shell

3.7" AA Shell

3.7" AA Shell

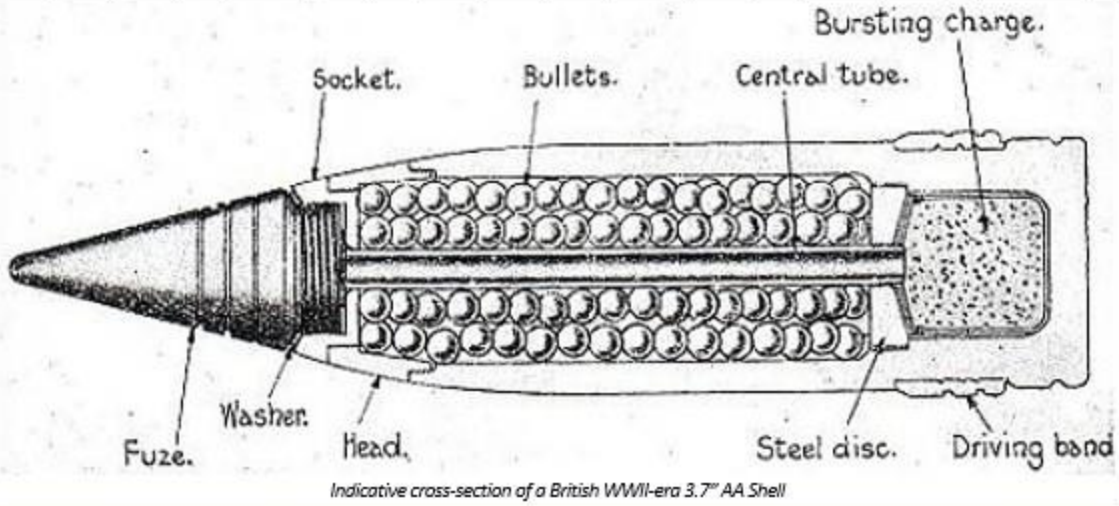
4.5" AA Shell

AA Nose Fuze

Anti-Aircraft (AA) guns are artillery pieces designed to engage aircraft. They may be classed as Heavy AA (HAA) or Light AA (LAA). HAA shells are typically streamlined, made of steel, and equipped with driving bands. They usually carry a High Explosive (HE) or shrapnel filling and use time or proximity fuzes. LAA guns are often autocannons. Indicative specifications for common British HAA shells are given below.

Specifications

Shell	Dimensions	Shell	Dimensions	Shell	Dimensions
6-pdr (c. WWI)	307mm x 57mm (12.1" x 2.2")	13-pdr (c. WWI)	294mm x 76mm (11.6" x 3")	3.7" (c. WWII)	675mm x 94mm (26.6" x 3.7")
75mm (c. WWI)	350mm x 75mm (13.8" x 3")	3" (c. WWI)	420mm x 76mm (16.5" x 3")	4.5" (c. WWII)	695mm x 113mm (27.4" x 4.5")
12-pdr (c. WWI)	445mm x 102mm (17.5" x 4")	4" (c. WWI)	445mm x 102mm (17.5" x 4")	5.25" (c. WWII)	782mm x 133mm (30.8" x 5.25")



Indicative cross-section of a British WWII-era 3.7" AA Shell

Information is accurate for indicative purposes. Photographs used are in the public domain. Any use of copyrighted © material is unintentional.

Appendix 2 Sources of UXO hazard

The sections below provide background information on the potential sources of UXO hazard affecting the Site. For a more comprehensive set of UXO information sheets, see https://zeticauxo.com/guidance/uxo-hazard-sources/.

Appendix 2.1 WWI bombing

Information Data Sheet

Category World War One (WWI) Bombing

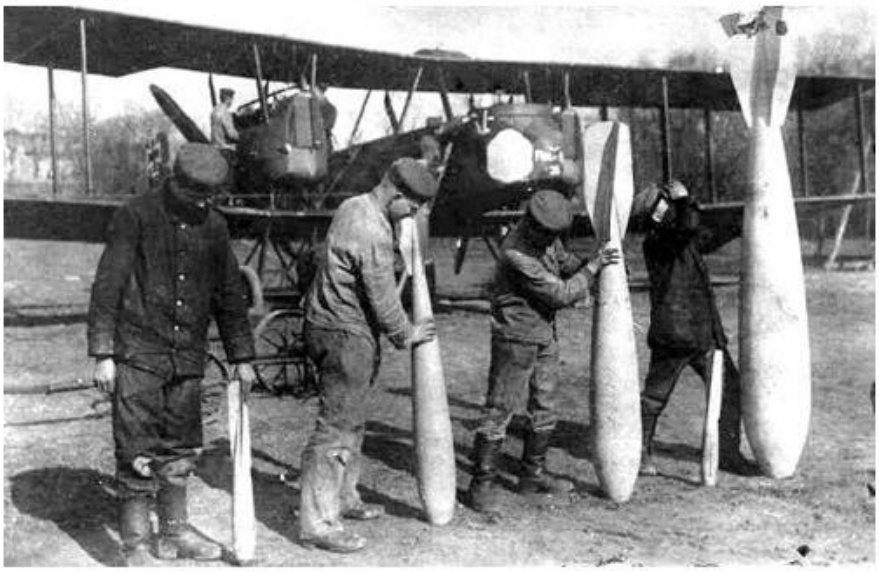
Description:

During WWI, significant bombing took place across some areas of the UK. An estimated 9,000No. German bombs were dropped on Britain during the course of 51No. airship and 52No. aircraft raids. It was the first time that strategic aerial bombardment had been used.

Nearly 100No. air raids were carried out on London and Southeast England, over 40No. of which were by Zeppelin airships. Areas along the East Coast was also targeted regularly due to their proximity to the European continent. Bombing raids further inland were rare and West England and Wales were out of reach for German aircraft of the time.

Aerial bombing during WWI initially relied on visual aiming, with bombsights not developed until later in the war. The inaccuracy inherent in this method meant that bombs often fell some way from their intended targets.

The first recorded raid against England occurred on the 21st December 1914 when 2No. High Explosive (HE) bombs fell near the Admiralty Pier at Dover. Zeppelin raids intensified during 1915 and 1916, with aircraft raids becoming more frequent after 1917. The last raid of WWI took place on the 19th May 1918, when 38 Gotha and 3 Giant aircraft bombed London and surrounding districts, dropping a total of more than 2,500lbs of bombs.



A variety of WWI German bombs

Hazard:

The potential of coming across an Unexploded Bomb (UXB) from WWI is far less likely than an UXB from World War Two (WWII), given the lower bombing densities during raids in WWI.

Some areas which were subjected to sustained bombing raids recorded a higher number of UXBs. In these areas, where there has been no significant development for the last century, the potential of a UXB remaining from WWI cannot be totally discounted.

Appendix 2.2 WWII bombing

Information Data Sheet

Category World War Two (WWII) Bombing

Description:

Bombing raids began in summer 1940 and continued until the end of WWII. Bombing densities generally increased towards major cities, such as London, Birmingham, Coventry, and Hull, or strategic targets such as docks, harbours, industrial areas, and airfields. Coastal towns, such as Eastbourne, and cathedral cities, such as Canterbury were also heavily targeted.

The German bombing campaign saw the extensive use of both High Explosive (HE) bombs and Incendiary Bombs (IBs). 50kg and 250kg HE bombs were most commonly used, although 500kg were also used to a lesser extent. More rarely 1,000kg, 1,400kg and 1,800kg bombs were dropped. HE bombs tended to contain about half of their weight in explosives and were fitted with one or two fuzes. Not all HE bombs were intended to explode on impact and some contained timing mechanisms where detonation could occur more than 70 hours after impact.

Incendiary devices ranged from small 1kg thermite filled, magnesium bodied IBs, to 250kg and 500kg Oil Bombs (OB). Occasionally IBs were fitted with a bursting charge which exploded after the bomb had been alight for a few minutes, causing burning debris to be scattered over a greater area. Large OBs were similar in appearance to HE bombs, although their design was sufficiently different to warrant a specially trained unit of the Royal Engineer (RE) to deal with their disposal.

Variety of WWII bombs

Anti-Personnel (AP) bombs and Parachute Mines (PMs) were also deployed. The most common AP bombs were 1kg and 2kg, which could inflict injury across an area up to 150m away from the impact. PMs could be up to 4m in length and were typically detonated either magnetically or by noise/vibration. Anti-shipping PMs were commonly dropped over navigable rivers, dockland areas, and coastlines. Whilst the Royal Navy (RN) was responsible for ensuring that anti-shipping PMs were made safe, their removal and disposal was still the responsibility of the RE.

In 1944, new offensive weapons were introduced. The Flying Bomb (V1), a pilotless guided missile, exploded on impact and could cause significant damage. The Long Range Rocket (V2), a ballistic missile rocket, travelled at such speed that no one could see or hear its approach.

WWII bomb targeting was inaccurate, especially in the first year of the war. A typical bomb load of 50kg HE bombs mixed with IBs aimed at a specific location might not just miss the intended target but could fall a considerable distance away.

Local Civil Defence authorities in urban areas typically had a comprehensive system for reporting bomb incidents and dealing with Unexploded Bombs (UXB). In more rural and coastal areas where fewer bombing raids occurred, it is known that Air Raid Precaution (ARP) records under-represent the number and frequency of bombs falling. Bombs could be released as part of 'tip and run' raids where bomber crews would drop their bombs to avoid Anti-Aircraft (AA) fire or Allied fighter aircraft, on route to and from other strategic targets. Bombs dropped as a result of poor targeting or 'tip and run' raids often went unrecorded or were recorded as 'fell in open country' or 'fell in the sea'. The Luftwaffe are thought to have dropped approximately 75,000 tons of bombs on Britain throughout WWII and an estimated 11% of all bombs dropped during the war failed to detonate.

Removal of an UXB

Hazard:

The potential for a UXB hazard to exist on a site depends on a variety of factors:

- Were their strategic targets in the surrounding area?
- Was the site bombed and how heavy were the raids?
- Could an UXB impact have been missed, masked by rubble or debris?

Even in rural areas, the potential for UXBs cannot be totally discounted and therefore it is essential that detailed local bombing records are obtained when assessing the UXB hazard on any site.

Appendix 2.3 Anti-Aircraft defences

Information Data Sheet

Category Anti-Aircraft (AA) Defences

Description:

As aerial bombardment first began during World War One (WWI), AA gun batteries were gradually established throughout much of England to counter German bombing raids. By June 1916, there were approximately 271No. AA guns and 258No. searchlight installations defending London alone.

Common WWI AA defences included 3", 75mm, 6-pounder (pdr), and 1pdr guns. Many of these guns were mobile and would follow the course of an airship, firing from areas of open land.

During WWI, Unexploded AA (UXAA) shells, could land up to 13km from the firing point, although they more typically fell within 10km.

WWI 3-pdr mobile Vickers AA gun

WWII 3.7" static AA gun

During World War Two (WWII), AA gun batteries were used extensively to counter the threat posed by enemy aircraft. AA shells could be distributed over a wide area and could land up to 27km from the firing point, although they more typically fell within 15km.

3No. types of AA batteries existed:

- Heavy AA (HAA) – typically 3.7", 4.5", and 5.25" calibre guns designed to engage high flying bomber aircraft. These tended to be permanent gun emplacements.
- Light AA (LAA) – typically used 40mm shells and machine gun ammunition and designed to counter low flying aircraft. These were often mobile and were moved periodically.
- Rocket AA (ZAA) – fired 3" or 3.7" AA rockets with a maximum altitude of 5,800m and a ground range of 9km. These tended to be permanent gun emplacements.

Hazard:

AA batteries had munitions stores which stored shells for the batteries and Small Arms Ammunition (SAA) for troops manning the position. Such stores were typically removed at the end of WWII, although some disposal may have occurred in the immediate vicinity of the gun battery.

In areas heavily protected by AA batteries, it is prudent to consider the potential for UXAA shells in the area surrounding a battery, taking into consideration the likely extent within which shells would have fallen. Finding an UXAA shell immediately adjacent to a former gun battery is less likely.

Appendix 3 Recent UXO finds

Information Data Sheet

Category Recent UXO Finds

UXO finds in the UK are a regular occurrence, although they almost never result in an accidental detonation.

Explosives rarely lose effectiveness with age. In some instances, mechanisms such as fuzes and gaines can become more sensitive and more prone to detonation, regardless of whether the device has been submersed in water or embedded in silt, clay, or similar materials.

Zetica Ltd, and other commercial EOD companies, uncover and make safe thousands of items of UXO each year, though details are rarely made public knowledge.

Publicly recorded discoveries also occur regularly, as shown by the list of recent significant UXO finds in the UK below. Click here to keep up to date with the latest UXO finds.

On the 26th February 2021, a 1,000kg German "Hermann" UXB was discovered by builders at Exeter University campus (see below). It was investigated and detonated in-situ following the evacuation of nearby properties and University halls of residence.

1,000kg German UXB discovered in Exeter, 2021

On the 29th March 2021, 1No. 250lb UXB was discovered on the seabed near Hinkley Point C harbour, Bristol. A maritime exclusion was imposed while the item was investigated and then destroyed in a controlled explosion.

On the 1st June 2021, a cache of approximately 100No. WWII-era hand grenades were found in a Nottinghamshire forest, a possible relic from nearby WWII camps. They were destroyed.

On the 24th July 2021, 1No. 500lb British UXB was uncovered during construction works in Goole, East Yorkshire. Reports indicated that the UXB had been jettisoned by a Lancaster bomber aircraft prior to crashing nearby in WWII. The item was investigated and destroyed.

On the 18th August 2021, 1No. UXB was found by construction workers on a Site in Earl Sterndale, Derbyshire. Upon inspection the UXB was deemed to be dangerous, and a controlled detonation was undertaken.

On the 10th September 2021, EOD teams destroyed 25No. mortar bombs which had been washed up onto beaches around Nairn and Ardersier in Morayshire. These beaches had been used during WWII for training prior to the D-Day landings in Normandy.

Mortar bombs found on beaches in Nairn and Ardersier, 2021

On the 15th December 2021, approximately 200No. artillery shells were discovered at a construction site located within the former Royal Ordnance Factory at Swynnerton in Staffordshire. The shells were removed and destroyed.

On the 2nd January 2022, 1No. heavily deteriorated 105mm artillery shell was discovered by dogwalkers on a beach in Cumbria. This may have originated on one of the several offshore ranges which have been operational along the nearby coastline since WWII.

Between the 24th and 27th January 2022, 5No. empty artillery shells were uncovered at a construction site in Manchester. These were likely linked to a shell-production factory which had been active on the site during WWII.

On the 14th July 2022, 1No. 2" mortar bomb and several Small Arms Ammunition rounds were discovered on a beach near Ardnamurchan. An EOD team disposed of the items.

On the 28th November 2022, 45No. Self-Igniting Phosphorus grenades were discovered during construction works at a school in Swindon. They were disposed of by an EOD team.

On the 5th December 2022, 1No. UXB was discovered during construction at Biggin Hill Airport. An EOD team removed the UXB for safe disposal.

On the 7th February 2023 1No. 250kg bomb was found during dredging works in the River Yare, Great Yarmouth. It detonated unplanned whilst being disarmed by an Army EOD team.

On the 17th April 2023, 1No. unexploded mortar bomb was discovered at Cavenham Heath Nature Reserve. It was destroyed in a controlled explosion by an EOD team. This followed 2No. other similar discoveries on the 7th March and 12th March in the same stretch of canal.

On the 27th July 2023, 1No. 250kg WWII bomb was discovered off the coast of Guernsey by a recreational diver. It was detonated in situ by a Royal Navy EOD diver team.

Appendix 4 Glossary and definitions

Abandoned Explosive Ordnance (AXO)	Explosive ordnance that has not been used during an armed conflict, that has been left behind or disposed of by a party to an armed conflict, and which is no longer under control of that party. Abandoned explosive ordnance may or may not have been primed, fuzed, armed or otherwise prepared for use.
Demil	Derived from the term 'Demilitarisation', demil refers to the break down and the recycling or disposal of ordnance components.
Detonation	The high-speed chemical breakdown of an energetic material producing heat, pressure, flame, and a shock wave.
Device	Any component, sub-assembly or completed ordnance, which may or may not have an explosive risk. It can apply to detonators, primers, gaines, fuzes, shells, or bombs.
Explosive	Compounds forming energetic materials that under certain conditions chemically react, rapidly producing gas, heat, and pressure. These are extremely dangerous and should only be handled by qualified professionals.
Explosive Ordnance (EO)	All munitions containing explosives, nuclear fission or fusion materials, and biological and chemical agents. This includes bombs and warheads, missiles, artillery, mortar, rocket, Small Arms Ammunition, mines, torpedoes, depth charges, pyrotechnics, cluster bombs and dispensers, cartridge and propellant devices, electro-explosive devices, clandestine and improvised explosive devices, and all related items/components which are explosive in nature.
Explosive Ordnance Clearance (EOC)	The operation of ordnance detection, investigation, identification, and removal, with Explosive Ordnance Disposal being a separate operation.
Explosive Ordnance Disposal (EOD)	The detection, identification, on-site evaluation, rendering safe, recovery, and final disposal of Unexploded Ordnance.
Explosive Ordnance Reconnaissance (EOR)	The detection, identification, and on-site evaluation of Unexploded Ordnance before Explosive Ordnance Disposal.
Explosive Remnants of War (ERW)	Unexploded Ordnance and Abandoned Explosive Ordnance, excluding landmines.
Explosive Substances & Articles (ESA)	Explosive substances are solid or liquid substances (or a mixture) which are either: capable by a chemical reaction of producing gas at a speed, temperature, and pressure to cause damage to the surroundings; or designed to produce an effect by heat, light, sound, gas, or smoke (or a combination) as a result of a non-detonative, self-sustaining, exothermic reaction. One or more explosive substances form an explosive article.

Fuze	The part of an explosive device that initiates the main explosive charge to function. In common usage, the word fuze is used indiscriminately, but when being specific (and especially in a military context), fuze is used to mean a more complicated device, such as a device within military ordnance.
Gaine	Small explosive charge that is sometimes placed between the detonator and the main charge to ensure ignition.
Geophysical survey	A range of methods that can be used to detect objects or identify ground conditions without the need for intrusive methods (such as excavation or drilling). This is particularly suited to ordnance, as disturbance of ordnance is to be avoided where possible.
High Explosive (HE)	Secondary explosives (commonly known as HE) make up the main charge or filling of an ordnance device. They are usually less sensitive than primary explosives. Examples of secondary explosives are Nitro-glycerine (NG), Trinitrotoluene (TNT), Amatol (Ammonium nitrate and TNT), gunpowder, and Cyclotrimethylenetrinitramine (RDX).
Land Service Ammunition (LSA)	Items of ordnance thrown, propelled, or placed during land warfare, to include grenades, mortar bombs, projectiles, rockets, and landmines.
Munition	The complete device charged with explosives, propellants, pyrotechnics, initiating composition, or nuclear, biological, or chemical material for use in military operations, including demolitions. This includes those munitions that have been modified for use in training, ceremonial, or non-operational purposes. These fall into three distinct categories: inert (contain no explosives), live (contain explosives and have not been fired), and blind (have fired but failed to function as intended.)
Primary Explosive	Explosives used to initiate less sensitive explosives and usually extremely sensitive to friction, heat, and pressure. Primary explosives are commonly found in detonators. Examples of primary explosives are lead azide, lead styphnate, and mercury fulminate.
Propellants	Provide ordnance with the ability to travel in a controlled manner and deliver the ordnance to a predetermined target. Propellants burn rapidly producing gas, pressure, and flame. Although usually in solid form they can be produced in liquid form. Examples of propellants are ballistite, often in flake form, and cordite, often in string form.
Pyrotechnic	An explosive article or substance designed to produce an effect by heat, light, sound, gas, or smoke (or a combination), as a result of non-detonative, self-sustaining, exothermic chemical reactions.
Small Arms Ammunition (SAA)	Projectiles around 12mm or less in calibre and no longer than approximately 100mm. They are fired from a variety of weapons, including rifles, pistols, shotguns, and machine guns.

Unexploded Anti-Aircraft (UXAA) Shell	Ordnance containing High Explosives, although they can also contain pyrotechnic compounds that produce smoke. They ranged from 2" to 5.25" calibre, although most common were 3.7" and 4.5" HE shells.
Unexploded Bomb (UXB)	A common term for unexploded air-dropped munitions.
Unexploded Ordnance (UXO)	Explosive ordnance that has been primed, fuzed, armed, or prepared for use and subsequently fired, dropped, launched, projected, or placed in such a manner as to present a hazard to operations, persons, or objects, and remains unexploded either by malfunction or design.
V1	The Vergeltungswaffe-1, also designated Fieseler Fi 103/FZG-76, known colloquially in English as the Flying Bomb, Pilotless Aircraft, Buzz Bomb, or Doodlebug, was the first guided missile used in WWII and the forerunner of today's cruise missile.
V2	The Vergeltungswaffe 2 ('Reprisal Weapon 2') was the first ballistic missile. It was used primarily against Belgian and British targets during the later stages of WWII. It was also the first man-made object launched into space, during test flights in 1944.

Appendix 5 Bibliography

Bulloch G, Steeds J E, Green K, Sainsbury M G, Brockwell J S & Slade N J, Land Contamination: Technical Guidance on Special Sites: MoD Land

Bulloch G, Steeds J E, Green K, Sainsbury M G, Brockwell J S & Slade N J, R&D Technical Report P5-042/TR/03, Land Contamination: Technical Guidance on Special Sites: Explosives Manufacturing & Processing Sites

CIRIA, Unexploded Ordnance (UXO), a Guide for the Construction Industry, 2009

Clarke N J, Luftwaffe Target Reconnaissance, German Aerial Photography 1939-1942, 1996

Cocroft W D, Dangerous Energy, 2000

Cocroft W D, Thomas R J, Cold War, 2003

Delve K, The Military Airfields of Northern England, 2006

Department of the Environment, Sampling Strategies for Contaminated Land, Department of the Environment: Contaminated Land Research Report, CLR Report No. 4, 1994

Dobinson C S, Twentieth Century Fortifications in England, Vols I – XI, Council for British Archaeology, 1996

Dobinson C S, Fields of Deception, Britain's Bombing Decoys of World War II, 2000

Dobinson C S, AA Command, 2001

Freethy R, Lancashire 1939-1945: The Secret War, 2005

Hardy C, Manchester at War, 2005

Hayes C, Our Blitz: Red Skies over Manchester, 1999

Morris J, German Air Raids on Britain 1914-1918, 1993

O'Neill J, Manchester in the Great War, 2014

Phythian G, Blitz Britain: Manchester and Salford, 2015

Price A, Blitz on Britain 1939-45, 2000

Ramsey W, The Blitz Then and Now, Vol 1, 1987

Ramsey W, The Blitz Then and Now, Vol 2, 1988

Ramsey W, The Blitz Then and Now, Vol 3, 1990

Smith P J C, Luftwaffe Over Manchester: The Blitz Years 1940-1944, 2003

Zetica, ZeticaUXO Handbook: a guide to dealing with UXO during construction, 2018

Appendix 6 General Notes

1. This report has been prepared in relation to the specific requirement of the contract or commission.
2. The report should not be used by third parties without prior consultation with Zetica Ltd. The copyright for this report remains with Zetica Ltd.
3. No part of this report may be reproduced, published or amended without prior written consent from Zetica Ltd.
4. The report refers to the conditions of the Site at the time of investigation/reporting. Zetica Ltd cannot accept liability for subsequent changes of Site conditions.
5. Zetica Ltd may have relied on externally provided information. Zetica Ltd cannot be held responsible for the accuracy of such information or data supplied.
6. The report has been written utilising relevant guidance and legislation in use at the time of report compilation. Subsequent improvement in techniques, changes in legislation or in site conditions may render parts of this report obsolete. If the report is utilised after such changes have occurred or at a time in excess of 1 year of the issue date, it would be prudent to contact Zetica Ltd to reassess the report under a new contract (see pg. ii).

zeticauxo

Established for over 33 years, Zetica's services include

- ☑ Desk studies
- ☑ Unexploded ordnance risk assessments and risk mitigation
- ☑ Utility services detection
- ☑ Environmental and engineering geophysical surveys
- ☑ Transport infrastructure surveys
- ☑ Pipeline & cable route surveys
- ☑ Intrusive ground investigations

More details are available at

www.zetica.com

E. Paterson Ground Investigation (CCG, 2019)

CCG-C-18-10614

GROUND INVESTIGATION REPORT FOR SITE AT

THE CHRISTIE, MANCHESTER

PATERSON REDEVELOPMENT PROJECT

APRIL 2019

Prepared by:

CC GEOTECHNICAL LTD

Unit 1 Deltic Way
Knowsley Industrial Estate
Liverpool
Merseyside
L33 7BA

Telephone: 0151 545 2750
Facsimile: 0151 548 7892

Consulting Engineers:

OVE ARUP & PARTNERS LTD

9th Floor, 3 St Paul's Place
Norfolk Street
Sheffield, S1 2JE

Telephone: 0114 283 3686

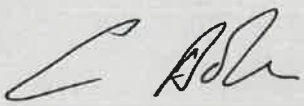
Prepared for:

INTERSERVE CONSTRUCTION LTD

Woodhouse Drive
Wigan
WN6 7NT

Telephone: 01942 236 434

DOCUMENT CONTROL FORM

Client:	**INTERSERVE CONSTRUCTION LTD**
Project Title:	GROUND INVESTIGATION FOR SITE AT THE CHRISTIE, MANCHESTER: PATERSON REDEVELOPMENT PROJECT
Reference Number:	CCG-C-18-10614
Main Author:	Daniel O'Regan BSc(Hons) PIEMA
Signature:	
Reviewed by:	Chris Bolan CEng MICE CEnv
Signature:	
Approved for Issue by:	Chris Bolan CEng MICE CEnv
Signature	
	For and behalf of CC GEOTECHNICAL LTD
Date:	March 2019
Revision Number:	0
Comments:	
Status:	Final
Distribution:	**INTERSERVE CONSTRUCTION LTD** **ARUP**

This document has been prepared by *CC GEOTECHNICAL LTD* within the terms of the contract, scope of work, and resources agreed in writing with the client. The limitations of liability of *CC GEOTECHNICAL LTD* for the contents of this document have been agreed with the Client, as set out in the terms and conditions of offer and related contract documentation.

This document is intended for the sole use of the client indicated above and *CC GEOTECHNICAL LTD* accepts no responsibility of whatever nature to third parties to whom this document or any part of this document is made known. Any such party relies upon that information at their own risk.

The findings and opinions provided in this document are made in good faith and are subject to the limitations imposed by employing site assessment methods and techniques, appropriate to the time of investigation and within the limitations and constraints defined in this document. The findings and opinions are relevant to the dates when the assessment was undertaken, but should not necessarily be relied upon to represent conditions at a substantially later date. In particular, seasonal groundwater levels, with the effects of precipitation, may affect the conditions found during the investigation. The report should be read in conjunction with the Notes on Limitations included herein.

Where opinions expressed in this report are based on current available guidance and legislation, no liability can be accepted by *CC GEOTECHNICAL LTD* for the effects of any future changes to such guidelines and legislation. Additional information, improved practices, new guidance, changes in legislation, or amendments to design proposals, may necessitate this report having to be reviewed in whole or in part after that date.

Factual data has largely been obtained from enquiries with third parties, the results of which are relied on unless indicated to be inaccurate by contradictory information. Further assessment, investigation, construction activities, could not have been taken into account in the preparation of the report. Where such information might impact upon stated opinions, *CC GEOTECHNICAL LTD* reserves the right to modify such opinions expressed herein.

The findings and opinions conveyed, via this report, are based on information obtained from a variety of sources as detailed in this report, and which *CC GEOTECHNICAL LTD* assumes to be reliable, but has not been independently confirmed. Therefore, *CC GEOTECHNICAL LTD* cannot and does not guarantee the authenticity or reliability of third party information it has referred to.

CC GEOTECHNICAL LTD possesses a non-exclusive and non-transferable Ordnance Survey Licence, but does not possess any right to sub-license any of the rights granted by this licence to any party. Under the terms of *CC GEOTECHNICAL LTD's* Ordnance Survey Licence, copying of figures containing Ordnance Survey data or using figures for any purpose other than as part of this report is not permitted.

1.0 INTRODUCTION

CC GEOTECHNICAL LTD **(*CCG*)** was commissioned by ***OVE ARUP & PARTNERS LTD (ARUP)*** acting as The Engineer, on behalf of The Client ***INTERSERVE CONSTRUCTION LIMITED***, to carry out ground investigation works for The Christie NHS Foundation Trust (The Christie) in connection with the Paterson Redevelopment project, at The Christie, Manchester, where it is proposed the existing Paterson building be demolished and replaced with the construction of a new medium-rise research building with an associated new basement structure.

The purpose of the Ground Investigation was to obtain geotechnical and geoenvironmental data relevant to the selection and design of foundation and substructure elements of the proposed development.

The investigation works were carried out in accordance with the Ground Investigation Specification – 263083-00 – P02 – September 2018 – issued by ***ARUP***.

This factual report is a compilation of the findings of the investigation and associated testing.

It must be borne in mind that the data and/or opinions contained in this report should be read in conjunction with the Notes on Limitations, given in Appendix J.

2.0 SITE LOCATION AND DESCRIPTION

This site is situated within the grounds of The Christie complex, off Wilmslow Road, Manchester, M20 3DB, centred at Ordnance Survey National Grid Reference SJ 84924 92461. Site location plans are presented on ***ARUP*** Drawings Figure 1 - 3 in Appendix A.

The site is currently occupied by the existing 4-storey Paterson Building, which has suffered fire damage on the upper floors.

The site investigation works were carried out over two distinct areas – adjacent to the eastern and western elevations of the Paterson Building. No works were carried out within the existing building footprint.

3.0 DOCUMENTED GEOLOGY

The natural geology prevailing at the site was researched by reference to BGS records. These indicate that the site is underlain by drift deposits of Glacial Till. The solid geology comprises Chester Formation - Sandstone. Sedimentary Bedrock formed approximately in the Triassic Period. Given the history of development of the site it was known that made ground would be present at the surface of the site.

4.0 SCOPE OF INVESTIGATION

The fieldwork was planned in accordance with BS10175: 2013 and was carried out in accordance with BS10175: 2013 and BS5930: 2015, insofar as they related to the scope of the investigation. Investigation works were carried out in January / February 2019 and comprised:

- The sinking of 4nr boreholes (BH01-BH04) to rockhead by cable percussion methods, and further advanced by rotary coring methods in the bedrock to depths of up to 25.0mbgl.

  Logs of the boreholes annotated with SPT "N" values, disturbed sampling details, TCR, SCR, RQD, and I_f values, and standpipe construction details are given in Appendix B.

  Photographs of rock cores are presented in Appendix F.

- The sinking of a single borehole (WS01) to rockhead by dynamic sampling methods to a depth of 2.4mbgl.

  A log of the borehole annotated with SPT "N" values and sampling details, is given in Appendix B.

- The mechanical excavation of 3nr trial pits (TP01-TP03) to depths of 2.9mbgl.

  Logs of the trial pits are given in Appendix C.

- The manual excavation of 9nr foundation observation pits (OP01-OP09) to determine the existing foundation depths and projections.

  Sketches of the observation pits are presented in Appendix D.

- The determination of permeability values by insitu variable head tests (both falling and rising head test methods) carried out in accordance with both BS EN ISO 5930:1999 and BS EN ISO 22282:2012.

  The test worksheets are presented in Appendix E.

The layout of the investigation is presented on ***CCG*** Drawings 1 - 3 in Appendix A.

5.0 LABORATORY TESTING

5.1 Soil & Rock Engineering Testing

The following programme of soil and rock engineering testing was undertaken:

- Determination of soil moisture content in accordance with BS 1377: Part 2: 1990 – 8nr tests.
- Determination of Atterberg Limits in accordance with BS 1377: Part 2: 1990 - 5nr tests.
- Determination of particle size distribution by wet sieving in accordance with BS 1377: Part 2: 1990 - 4nr tests
- Determination of sedimentation distribution by pipette in accordance with BS 1377: Part 2: 1990 - 3nr tests.
- Determination of unconsolidated undrained triaxial compression with measurement of pore pressure in accordance with BS 1377: Part 7: 1990 - 1nr test.
- Determination of point load strength of rock in accordance with ISRM 1985: Suggested method - 24nr tests
- Determination of Uniaxial Compressive Strength of rock in accordance with ISRM 2007: Suggested Method - 3nr tests
- Determination of Unconfined Compressive Strength with Youngs Modulus & Poissons Ratio of rock in accordance with ISRM 1981: Suggested Method – 3nr tests

The engineering testing was largely carried out in the UKAS accredited laboratory of ***CCG***. The test results are presented in Appendix G.

5.2 Chemical Analyses

The following programme of chemical analyses was undertaken at a UKAS/MCERTs laboratory as detailed within the specification and listed hereunder:

Suite E1 (General) - 7nr soil samples analysed:

- Arsenic
- Cadmium
- Chromium (total)
- Copper
- Lead
- Mercury
- Nickel
- Selenium
- Zinc
- Antimony
- Beryllium
- Vanadium
- Cyanide (total)
- pH
- Boron (water soluble)
- Phenols (total)
- Total Organic Carbon

Suite E2a - 8nr soil samples analysed:

- Asbestos I.D (soil only)

Suite H - 1nr soil sample analysed:

- Waste acceptance (total soils)

The soil chemical test results are presented in Appendix H.

6.0 GAS & GROUNDWATER MONITORING

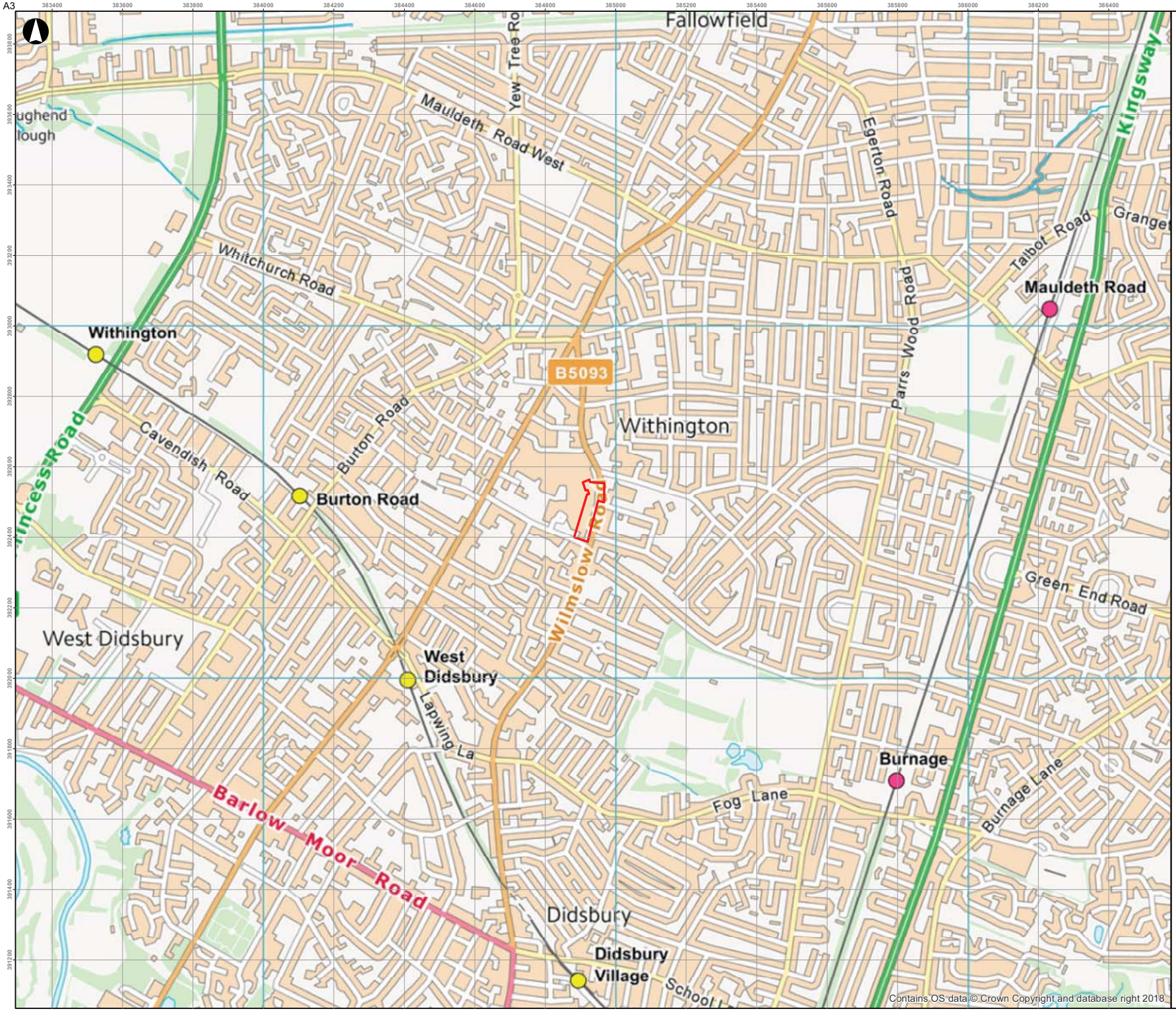
Monitoring standpipe wells were installed in 3nr boreholes (BH01, BH02 & BH04). Each installation was periodically monitored for flow rate and composition of ground gas using a LMsXi infra-red analyser. Immediately following monitoring for gases, the standing water levels were recorded by electronic dipmeter.

The results of the gas and groundwater monitoring, together with calibration certificates of the instruments are given in Appendix I.

APPENDIX A

DRAWINGS

A3



Legend

Site Boundary

Issue	Date	By	Chkd	Appd
P0	2018-08-10	PST	HB	JH

Metres

0 137.5 275 550

ARUP

Arup
6th Floor, 3 Piccadilly Place,
Manchester
M1 3BN
United Kingdom

Client

Interserve Construction Limited

Job Title

Paterson Redevelopment Building

Site location

Scale at A3

1:10,000

Job No	Drawing Status
263083-00	**Preliminary**

Drawing No	Issue
Figure 1	**P0**

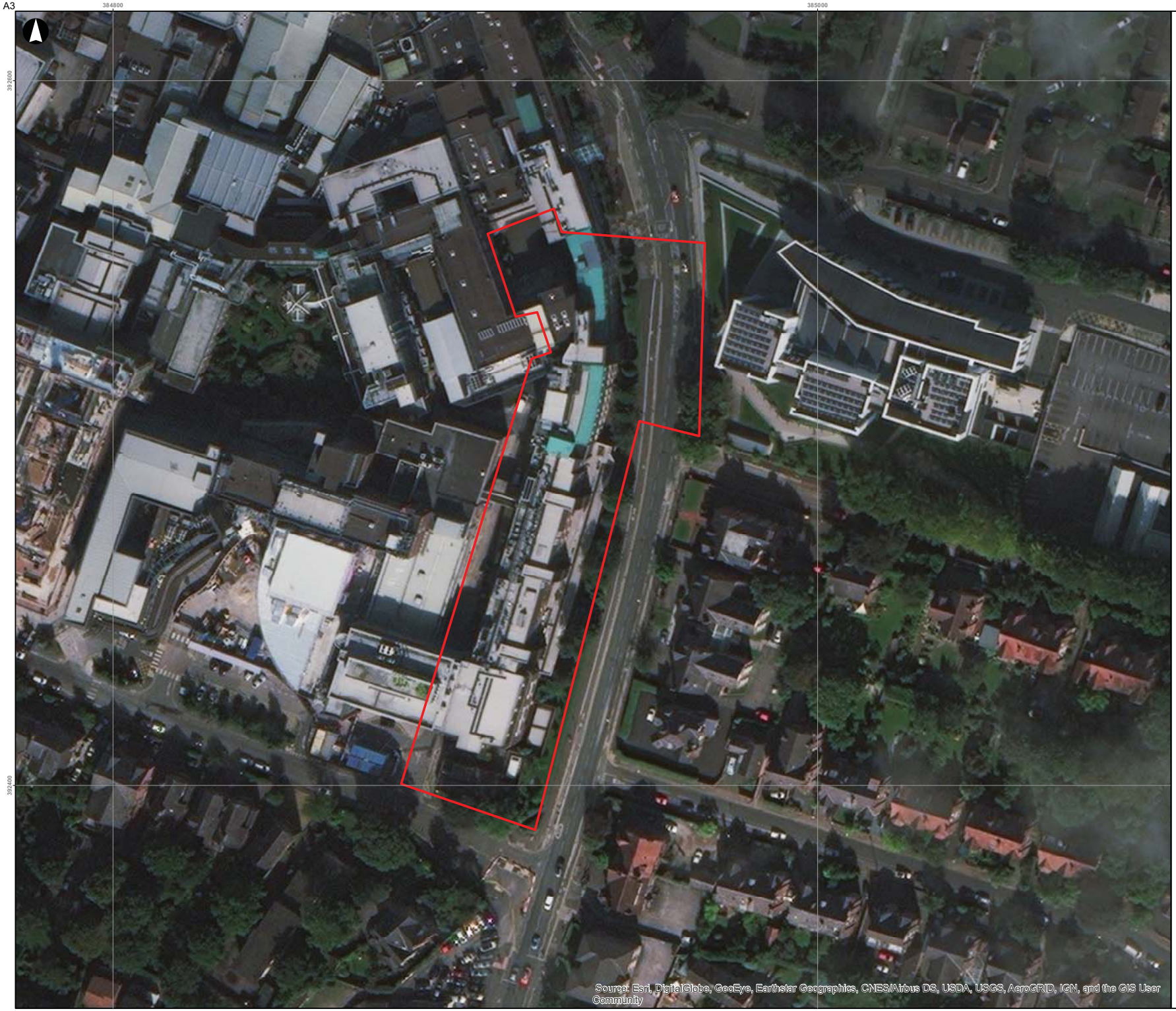
17/08/2018 11:49:27

\\GlobalEuropeManchesterUobs\260000\263083-00\4 Internal Project Data\4-03 Drawings\C_Civil\CG_Geotechnics\GIS_Paterson redevelopment_Quick.mxd

Template A3: Version 2

© Arup

A3



Legend

Site Boundary

Issue	Date	By	Chkd	Appd
P0	2018-08-10	PST	HB	JH

Metres

0 12.5 25 50

ARUP

Arup
6th Floor, 3 Piccadilly Place,
Manchester
M1 3BN
United Kingdom

Client

Interserve Construction Limited

Job Title

Paterson Redevelopment Building

Site boundary

Scale at A3

1:1,000

Job No	Drawing Status
263083-00	**Preliminary**

Drawing No	Issue
Figure 2	**P0**

17/08/2018 11:48:33

\\GlobalEuropeManchester\Jobs\260000\263083-00\4 Internal Project Data\4-03 Drawings\C_Civil\CG_Geotechnics\GIS_Paterson redevelopment_Quick.mxd

Template A3: Version 2

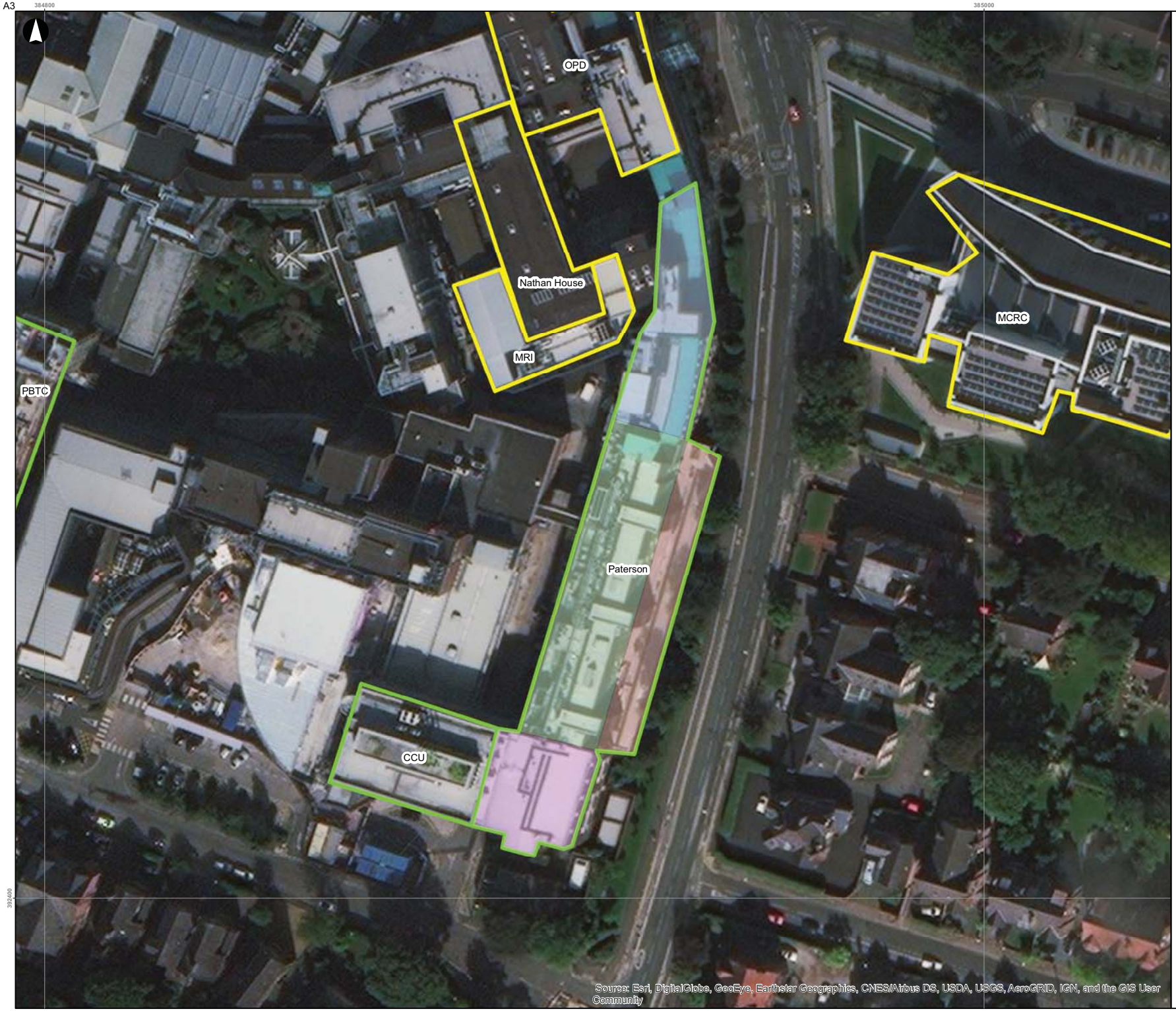
© Arup

A3

384800

385000

395400



Legend

Phase

- 1 & 2
- 3 & 4
- 5 & 6
- 7

The Christie buildings. Data

- No
- Yes

Issue	Date	By	Chkd	Appd
P0	2018-08-20	PST	PST	PST

Metres

0 10 20 40

ARUP

Client

Interserve Construction Limited

Job Title

Paterson Redevelopment Building

Phases of construction

Scale at A3

1:750

Job No	Drawing Status
263083-00	**Preliminary**

Drawing No	Issue
Figure 3	**P0**

20/08/2018 11:58:43

\\GlobalEuropeManchesterUobs\260000\263083-00\4 Internal Project Data\4-03 Drawings\C_Civil\CG_Geotechnics\GIS_Paterson redevelopment_Quick.mxd

Template A3: Version 2

© Arup

Key:
Cable Percussion / Rotary Borehole

Dynamic Sampling Borehole

Foundation Observation Pit

Trial Pit

WS01

BH01

BH02

TP01

TP02

DP01

DP02

DP03

DP04
(Carried out by PP O'Connor)

DP05

DP06

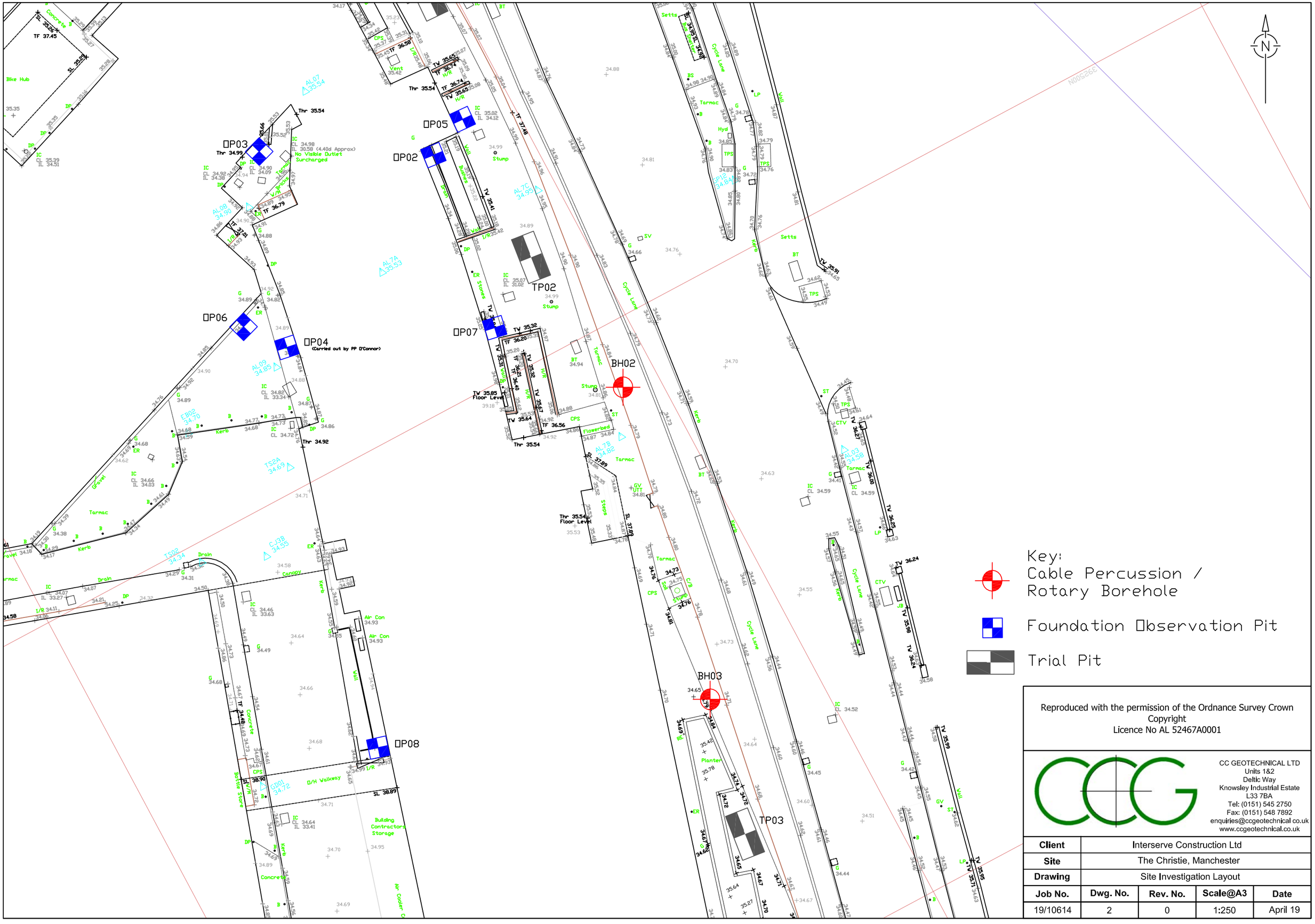
DP07

Wilmslow Road

Reproduced with the permission of the Ordnance Survey Crown Copyright
Licence No AL 52467A0001

CC GEOTECHNICAL LTD
Units 1&2
Deltic Way
Knowsley Industrial Estate
L33 7BA
Tel: (0151) 545 2750
Fax: (0151) 548 7892
enquiries@ccgeotechnical co.uk
www.ccgeotechnical.co.uk

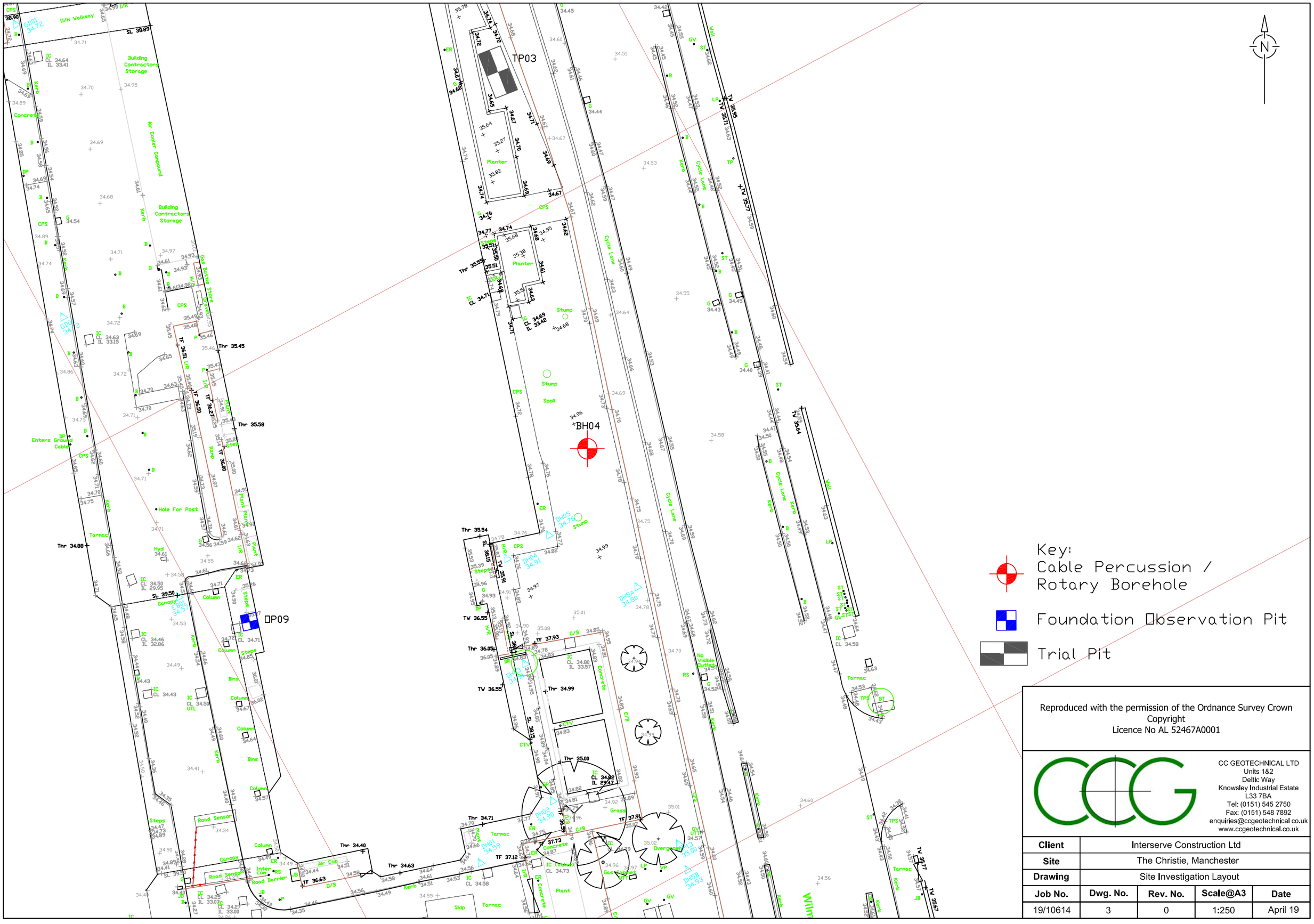
Client	Interserve Construction Ltd			
Site	The Christie, Manchester			
Drawing	Site Investigation Layout			
Job No.	Dwg. No.	Rev. No.	Scale@A3	Date
19/10614	1	0	1:250	April 19



Reproduced with the permission of the Ordnance Survey Crown Copyright
Licence No AL 52467A0001

CC GEOTECHNICAL LTD
Units 1&2
Deltic Way
Knowsley Industrial Estate
L33 7BA
Tel: (0151) 545 2750
Fax: (0151) 548 7892
enquiries@ccgeotechnical co.uk
www.ccgeotechnical.co.uk

Client	Interserve Construction Ltd			
Site	The Christie, Manchester			
Drawing	Site Investigation Layout			
Job No.	Dwg. No.	Rev. No.	Scale@A3	Date
19/10614	2	0	1:250	April 19



Reproduced with the permission of the Ordnance Survey Crown Copyright
Licence No AL 52467A0001

CC GEOTECHNICAL LTD
Units 1&2
Deltic Way
Knowsley Industrial Estate
L33 7BA
Tel: (0151) 545 2750
Fax: (0151) 548 7892
enquiries@ccgeotechnical co.uk
www.ccgeotechnical.co.uk

Client	Interserve Construction Ltd			
Site	The Christie, Manchester			
Drawing	Site Investigation Layout			
Job No.	Dwg. No.	Rev. No.	Scale@A3	Date
19/10614	3	0	1:250	April 19

APPENDIX B

BOREHOLE LOG SHEETS

CCG	Contract Name: The Christie, Manchester		Client: Interserve Construction Ltd		Borehole ID: **BH01**
	Contract Number: CCG-C-18-10614	Date Started: 24-01-2019	Logged By: LT	Checked By: CB	Status: FINAL — Sheet 1 of 3
Cable Percussion Borehole Log	Easting: 384946.8	Northing: 392535.6	Ground Level: 35.26mAOD	Plant Used: DANDO 3000	Rig Crew: AH/DB DB/AH — Scale: 1:50
Weather:		Termination:		SPT Hammer: CCG6 Energy Ratio: 68%	

Samples & In Situ Testing						Strata Details				Groundwater	
Depth	Sample ID	Test Result	TCR	SCR	RQD	Fracture	Water	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
									(0.40)		SUB-BASE		
0.50	B							34.86	0.40		Brown very gravelly very silty slightly sandy CLAY, with rootlets. Gravel is sub-angular to sub-rounded to sub-angular brick and sandstone (MADE GROUND)		
1.00	B								(1.00)				
		SPT(S)N=11 (1,2/2,3,3,3)						33.86	1.40				
1.50	B										Medium dense clayey silty gravelly fine to coarse grained SAND. Gravel is fine to medium sub-angular to sub-rounded sandstone		
2.00	B	SPT(S)N=15 (2,3/3,4,4,4)							(0.80)				
								33.06	2.20				
2.50	B										Red/orange weathered SANDSTONE, recovered as fine to coarse sand		
		SPT(S)100 (17,8/100 for 95mm)							(1.30)				
								31.76	3.50				
						45					Very weak to weak reddish brown fine to medium grained thickly laminated SANDSTONE. Moderately weathered. Recovered locally as sandy gravel. Discontinuities are extremely close to medium spaced, horizontal, clean, rough and tight to open		
3.50 - 5.00	98	33	7			110					NO RECOVERY - 3.50-3.53mbgl NON-INTACT. RECOVERED AS VERY GRAVELLY SAND - 3.53-3.82mbgl NON-INTACT. RECOVERED AS GRAVEL - 3.95-4.25mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 4.36-4.62mbgl		
						33					NON-INTACT. RECOVERED AS SANDY GRAVEL - 4.70-4.78mbgl		
						80					NON-INTACT. RECOVERED AS GRAVEL - 4.84-4.92mbgl		
						80					NO RECOVERY - 5.00-5.07mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 5.07-5.73mbgl		
5.00 - 6.50	95	65	28			19 70 200							
						140					NO RECOVERY - 6.50-6.61mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 6.75-7.27mbgl		
6.50 - 8.00	93	54	25			41 75 131					NON-INTACT. RECOVERED AS GRAVEL - 7.72-7.89mbgl		
						80					NO RECOVERY - 8.00-8.04mbgl NON-INTACT. RECOVERED AS GRAVEL - 8.12-8.28mbgl		
						47 55 70 63 88					NON-INTACT. RECOVERED AS GRAVEL - 8.37-8.39mbgl		
8.00 - 9.50	97	73	27			119					NON-INTACT. RECOVERED AS SANDY GRAVEL - 8.92-9.12mbgl		
						36					NO RECOVERY - 9.50-9.60mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 9.65-9.70mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 9.77-10.04mbgl		
						50 70							
											Continued next sheet		

Start & End of Shift Observations					Borehole Diameter		Casing Diameter	
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)

Chiselling			
From (m)	To (m)	Duration	Remarks

Installation			
Top (m)	Base (m)	Type	Dia (mm)
0.00	0.50	PLAIN	
0.50	2.30	SLOTTED	

Remarks:

1 hour hand excavating 1.20mbgl service avoidance pit
1 hour set up of falling head permeability test
1 hour carrying out falling head permeability test
Permeability test carried out at 2.00mbgl

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

	Contract Name: The Christie, Manchester		Client: Interserve Construction Ltd		Borehole ID: **BH01**
	Contract Number: CCG-C-18-10614	Date Started: 24-01-2019	Loggged By: LT	Checked By: CB	Status: FINAL
					Sheet 2 of 3
Rotary Core Drilling Log	Easting: 384946.8	Northing: 392535.6	Ground Level: 35.26mAOD	Plant Used: DANDO 3000	Rig Crew: AH/DB DB/AH
					Scale: 1:50
Weather:		Termination:		SPT Hammer: CCG6 Energy Ratio: 68%	

Samples & In Situ Testing						Strata Details				Groundwater	
Depth	TCR	SCR	RQD	Fracture Spacing	Water Added	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
9.50 - 11.00	93	36	17	140 80					NON-INTACT. RECOVERED AS SANDY GRAVEL - 10.18-10.69mbgl		
11.00 - 12.50	95	46	17	60 61 130 42					NON-INTACT. RECOVERED AS VERY CLAYEY SAND - 11.13-11.33mbgl INCLUSION OF WEATHERED MUDSTONE - 11.30mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 11.50-11.78mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 11.95-12.15mbgl		
12.50 - 14.00	97	31	7	26					NO RECOVERY - 12.50-12.55mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 12.55-13.61mbgl		
14.00 - 15.50	97	55	25	130 33 84 145			(16.50)		NO RECOVERY - 14.00-14.05mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 14.18-14.30mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 14.97-15.50mbgl		
15.50 - 17.00	94	60	43	86 160 225 270 90					NO RECOVERY - 15.50-15.59mbgl NON-INTACT. RECOVERED AS GRAVEL - 16.07-16.21mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 16.48-16.91mbgl		
17.00 - 18.50	91	39	29	120 180 35					NO RECOVERY - 17.00-17.14mbgl NON-INTACT. RECOVERED AS GRAVEL - 17.26-17.64mbgl NON-INTACT. RECOVERED AS CLAYEY SANDY GRAVEL - 17.82-18.28mbgl INCLUSION OF WEATHERED MUDSTONE - 18.00mbgl		
18.50 - 20.00	98	69	60	165 35 153 315					NON-INTACT. RECOVERED AS SANDY GRAVEL - 18.50-18.79mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 19.17-19.39mbgl		

Continued next sheet

Start & End of Shift Observations					Borehole Diameter		Casing Diameter	
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)

Flush Information					Installation			
Top (m)	Base (m)	Flush Type	Return	Flush Colour	Top (m)	Base (m)	Type	Dia (mm)
					0.00 0.50	0.50 2.30	PLAIN SLOTTED	

Remarks:

1 hour hand excavating 1.20mbgl service avoidance pit
1 hour set up of falling head permeability test
1 hour carrying out falling head permeability test
Permeability test carried out at 2.00mbgl

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Fracture spacing reported in mm as min, Average and Max values. TCR, SCR and RQD reported in %

	Contract Name: The Christie, Manchester		Client: Interserve Construction Ltd		Borehole ID: **BH01**
	Contract Number: CCG-C-18-10614	Date Started: 24-01-2019	Loggged By: LT	Checked By: CB	Status: FINAL
Rotary Core Drilling Log	Easting: 384946.8	Northing: 392535.6	Ground Level: 35.26mAOD	Plant Used: DANDO 3000	Rig Crew: AH/DB DB/AH
					Sheet 3 of 3
					Scale: 1:50

Weather: | Termination: | SPT Hammer: CCG6 Energy Ratio: 68%

Samples & In Situ Testing						Strata Details				Groundwater	
Depth	TCR	SCR	RQD	Fracture Spacing	Water Added	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
						15.26	20.00		Very weak to weak reddish brown fine to medium grained thickly laminated SANDSTONE. Moderately weathered. Recovered locally as sandy gravel. Discontinuities are extremely close to medium spaced, horizontal, clean, rough and tight to open		
									End of Borehole at 20.00m		

20 21 22 23 24 25 26 27 28 29

Start & End of Shift Observations					Borehole Diameter		Casing Diameter	
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)

Flush Information					Installation			
Top (m)	Base (m)	Flush Type	Return	Flush Colour	Top (m)	Base (m)	Type	Dia (mm)
					0.00	0.50	PLAIN	
					0.50	2.30	SLOTTED	

Remarks:
1 hour hand excavating 1.20mbgl service avoidance pit
1 hour set up of falling head permeability test
1 hour carrying out falling head permeability test
Permeability test carried out at 2.00mbgl

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Fracture spacing reported in mm as min, Average and Max values. TCR, SCR and RQD reported in %

	Contract Name: The Christie, Manchester		Client: Interserve Construction Ltd		Borehole ID: **BH02**
	Contract Number: CCG-C-18-10614	Date Started: 24-01-2019	Logged By: LT	Checked By: CB	Status: FINAL
					Sheet 1 of 3
Cable Percussion Borehole Log	Easting: 384944.8	Northing: 392496.5	Ground Level: 34.92mAOD	Plant Used: DANDO 3000	Rig Crew: AH/DB DB/AH
					Scale: 1:50
Weather:		Termination:		SPT Hammer: CCG6 Energy Ratio: 68%	

Samples & In Situ Testing						Strata Details				Groundwater	
Depth	Sample ID	Test Result	TCR	SCR	RQD	Fracture	Water	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
0.50	B								(0.70)		Brown silty sandy gravelly organic CLAY. Gravel is fine to coarse sub-angular to sub-rounded brick and sandstone (MADE GROUND)		
								34.22	0.70				
1.00	B	SPT(S)N=7 (1,0/1,2,2,2)							(0.70)		Loose brown fine to coarse SAND, with frequent clay lenses		
1.50	B							33.52	1.40				
									(0.80)		Stiff brown very sandy silty CLAY		
		SPT(S)N=50 (2,3/50 for 235mm)						32.72	2.20				
2.50	B										Red/brown weathered SANDSTONE, recovered as fine to coarse grained sand		
		SPT(S)100 (25 for 85mm/100 for 90mm)											
3.50 - 5.00	0		0	0					(2.80)		NO RECOVERY - 3.50-5.71mbgl		
								29.92	5.00				
5.00 - 6.50	53		0	0							Very weak reddish brown fine to medium grained thickly laminated SANDSTONE. Moderately weathered. Recovered locally as sandy gravel. Discontinuities are closely spaced, horizontal, clean, rough and tight to open SPT @ 5.00mbgl = 100 (25 for 25mm / 65, 35 for 20mm) NON-INTACT. RECOVERED AS VERY SANDY GRAVEL - 5.71-6.50mbgl		
6.50 - 8.00	85		22	7		110 55					NO RECOVERY - 6.50-6.73mbgl NON-INTACT. RECOVERED AS VERY SANDY GRAVEL - 6.73-7.38mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 7.49-7.53mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 7.76-8.00mbgl		
8.00 - 9.50	97		50	30		90 47 72 138 162					NO RECOVERY - 8.00-8.05mbgl NON-INTACT. RECOVERED AS SANDY GRASVEL - 8.05-8.40mbgl NON-INTACT. RECOVERED AS GRAVEL - 8.49-8.60mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 8.77-8.95mbgl		
											NON-INTACT. RECOVERED AS GRAVELLY SAND - 9.50-9.97mbgl		
											Continued next sheet		

Start & End of Shift Observations				
Date	Time	Depth (m)	Casing (m)	Water (m)

Borehole Diameter	
Depth (m)	Dia (mm)

Casing Diameter	
Depth (m)	Dia (mm)

Remarks:

1 hour hand excavating 1.20mbgl service avoidance pit
1 hour setting up permeability test
1 hour carrying out falling head permeability test
Falling head permeability test carried out at 3.30mbgl

Chiselling			
From (m)	To (m)	Duration	Remarks

Installation			
Top (m)	Base (m)	Type	Dia (mm)
0.00	3.50	PLAIN	
3.50	5.00	SLOTTED	

Water Strikes					
Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

	Contract Name: The Christie, Manchester		Client: Interserve Construction Ltd		Borehole ID: **BH02**
	Contract Number: CCG-C-18-10614	Date Started: 24-01-2019	Loggged By: LT	Checked By: CB	Status: FINAL
Rotary Core Drilling Log	Easting: 384944.8	Northing: 392496.5	Ground Level: 34.92mAOD	Plant Used: DANDO 3000	Rig Crew: AH/DB DB/AH
					Sheet 2 of 3
					Scale: 1:50

Weather: | Termination: | SPT Hammer: CCG6 Energy Ratio: 68%

Samples & In Situ Testing						Strata Details				Groundwater	
Depth	TCR	SCR	RQD	Fracture Spacing	Water Added	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
9.50 - 11.00	100	43	29	34 85 140 150					NON-INTACT. RECOVERED AS SANDY GRAVEL - 10.19-10.38mbgl		
11.00 - 12.50	93	66	11	37 21 69 159					NON-INTACT. RECOVERED AS GRAVEL - 10.94-11.00mbgl NO RECOVERY - 11.00-11.11mbgl NON-INTACT. RECOVERED AS GRASVEL - 11.11-11.17mbgl NON-INTACT. RECOVERED AS GRAVEL - 11.39-11.60mbgl		
12.50 - 14.00	97	57	21	38 106 110 47					NON-INTACT. RECOVERED AS GRAVEL - 13.52-13.76mbgl		
14.00 - 15.50	97	74	26	70 49 85 140 53			(15.00)		NO RECOVERY - 14.00-14.05mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 14.12-14.16mbgl NON-INTACT. RECOVERED AS SAND - 15.10-15.19mbgl		
15.50 - 17.00	90	71	8	34 79 125					NO RECOVERY - 15.50-15.65mbgl		
17.00 - 18.50	93	67	0	24 557 87 60 88 90					NO RECOVERY - 17.00-17.10mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 17.84-18.06mbgl		
18.50 - 20.00	95	31	8	120 100					NO RECOVERY - 18.50-18.58mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 18.58-18.99mbgl NON-INTACT. RECOVERED AS SLIGHTLY SANDY SLIGHTLY GRAVELLY SILTY CLAY - 19.11-19.41mbgl INCLUSION OF CLAY (MARL) - 19.20mbgl NON-INTACT. RECOVERED AS GRAVELLY SAND - 19.54-19.83mbgl		
									Continued next sheet		

Start & End of Shift Observations					Borehole Diameter		Casing Diameter	
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)

Flush Information					Installation			
Top (m)	Base (m)	Flush Type	Return	Flush Colour	Top (m)	Base (m)	Type	Dia (mm)
					0.00 3.50	3.50 5.00	PLAIN SLOTTED	

Remarks:
1 hour hand excavating 1.20mbgl service avoidance pit
1 hour setting up permeability test
1 hour carrying out falling head permeability test
Falling head permeability test carried out at 3.30mbgl

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Fracture spacing reported in mm as min, Average and Max values. TCR, SCR and RQD reported in %

	Contract Name: The Christie, Manchester		Client: Interserve Construction Ltd		Borehole ID: **BH02**
	Contract Number: CCG-C-18-10614	Date Started: 24-01-2019	Loggged By: LT	Checked By: CB	Status: FINAL
Rotary Core Drilling Log	Easting: 384944.8	Northing: 392496.5	Ground Level: 34.92mAOD	Plant Used: DANDO 3000	Rig Crew: AH/DB DB/AH
					Sheet 3 of 3
					Scale: 1:50

Weather: | Termination: | SPT Hammer: CCG6 Energy Ratio: 68%

Samples & In Situ Testing						Strata Details				Groundwater	
Depth	TCR	SCR	RQD	Fracture Spacing	Water Added	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
						14.92	20.00		*NON-INTACT. RECOVERED AS GRAVEL - 19.93-20.00mbgl* End of Borehole at 20.00m		

20 21 22 23 24 25 26 27 28 29

Start & End of Shift Observations					Borehole Diameter		Casing Diameter	
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)

Flush Information					Installation			
Top (m)	Base (m)	Flush Type	Return	Flush Colour	Top (m)	Base (m)	Type	Dia (mm)
					0.00	3.50	PLAIN	
					3.50	5.00	SLOTTED	

Remarks:

1 hour hand excavating 1.20mbgl service avoidance pit
1 hour setting up permeability test
1 hour carrying out falling head permeability test
Falling head permeability test carried out at 3.30mbgl

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Fracture spacing reported in mm as min, Average and Max values. TCR, SCR and RQD reported in %

CCG	Contract Name: The Christie, Manchester		Client: Interserve Construction Ltd		Borehole ID: **BH03**
	Contract Number: CCG-C-18-10614	Date Started: 22-01-2019	Logged By: LT	Checked By: CB	Status: FINAL — Sheet 1 of 3
Cable Percussion Borehole Log	Easting: 384939.8	Northing: 392468.4	Ground Level: 34.72mAOD	Plant Used: DANDO 3000	Rig Crew: AH/LN DB/AH — Scale: 1:50
Weather:		Termination:		SPT Hammer: CCG6 Energy Ratio: 68%	

Samples & In Situ Testing							Strata Details				Groundwater	
Depth	Sample ID	Test Result	TCR	SCR	RQD	Fracture	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
							34.52	0.20		Brown silty sandy gravelly organic CLAY. Gravel is fine to coarse sub-angular to sub-rounded brick and sandstone (MADE GROUND)		
0.50	B						34.32	0.40		Yellow/white sand SUB-BASE		
								(0.40)		Brown slightly gravelly fine to coarse SAND. Gravel is fine to coarse sub-angular brick (MADE GROUND)		
							33.92	0.80				
1.00	B									Brown slightly sandy GRAVEL. Gravel is fine to coarse angular to sub-rounded concrete, brick and sandstone (MADE GROUND)		
		SPT(S)N=11 (1,2/2,3,3,3)										
1.50	B							(1.40)				
		SPT(S)N=15 (2,2/3,4,4,4)										
							32.52	2.20		Brown silty clayey fine to medium grained SAND		
2.50	B							(0.50)				
							32.02	2.70		Red/brown weathered SANDSTONE, recovered as fine to medium grained sand		
		SPT(S)100 (18,7/100 for 140mm)										
3.50	B							(1.80)				
		SPT(S)100 (50 for 110mm/100 for 50mm)										
							30.22	4.50		Very weak reddish brown fine to medium grained thickly laminated SANDSTONE. Moderately weathered. Recovered locally as sandy gravel. Discontinuities are very close to medium spaced, horizontal with occasional drilling-induced vertical fractures, clean, rough and tight to open		
4.50 - 6.00	70	19	0	44 41						NO RECOVERY - 4.50-4.95mbgl NON-INTACT. RECOVERED AS VERY GRAVELLY SAND - 5.06-5.61mbgl NON-INTACT. RECOVERED AS VERY SANDY GRAVEL - 5.74-5.95mbgl		
6.00 - 7.50	97	75	39	41 90 130 38 9 165						NON-INTACT. RECOVERED AS GRAVEL - 6.25-6.34mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 6.43-6.50mbgl NON-INTACT. RECOVERED AS GRAVEL - 6.79-6.91mbgl		
7.50 - 9.00	97	57	52	55 97 160						NO RECOVERY - 7.46-7.55mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 7.55-7.64mbgl NON-INTACT. RECOVERED AS GRAVEL - 7.94-8.17mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 8.57-8.71mbgl NON-INTACT. RECOVERED AS GRAVEL - 8.87-9.11mbgl		
9.00 - 10.50	99	62	34	50 60						NON-INTACT. RECOVERED AS GRAVEL - 9.40-9.62mbgl		
	TCR	SCR	RQD	Fracture	Water					Continued next sheet		

Start & End of Shift Observations					Borehole Diameter		Casing Diameter	
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)

Chiselling			
From (m)	To (m)	Duration	Remarks

Installation			
Top (m)	Base (m)	Type	Dia (mm)

Remarks:

1 hour hand excavating 1.20mbgl service avoidance pit

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

	Contract Name: The Christie, Manchester		Client: Interserve Construction Ltd		Borehole ID: **BH03**
	Contract Number: CCG-C-18-10614	Date Started: 22-01-2019	Loggged By: LT	Checked By: CB	Status: FINAL — Sheet 2 of 3
Rotary Core Drilling Log	Easting: 384939.8	Northing: 392468.4	Ground Level: 34.72mAOD	Plant Used: DANDO 3000	Rig Crew: AH/LN DB/AH — Scale: 1:50
Weather:		Termination:		SPT Hammer: CCG6 Energy Ratio: 68%	

Samples & In Situ Testing						Strata Details				Groundwater	
Depth	TCR	SCR	RQD	Fracture Spacing	Water Added	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
				72					NON-INTACT. RECOVERED AS GRAVEL - 9.89-10.09mbgl		
10.50 - 12.00	93	46	19	27 86 165 80					NON-INTACT. RECOVERED AS SANDY GRAVEL - 10.43-10.50mbgl NO RECOVERY - 10.50-10.60mbgl NON-INTACT. RECOVERED AS SLIGHTLY SANDY GRAVEL - 10.60-10.69mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 11.29-11.74mbgl NON-INTACT. RECOVERED AS GRAVEL - 11.82-12.00mbgl		
12.00 - 13.50	83	70	41	50 69 109 132					NO RECOVERY - 12.00-12.25mbgl NON-INTACT. RECOVERED AS GRAVEL - 12.44-12.52mbgl		
13.50 - 15.00	81	63	16	13 59 141			(20.50)		NO RECOVERY - 13.50-13.79mbgl NON-INTACT. RECOVERED AS GRAVEL - 13.79-13.87mbgl NON-INTACT. RECOVERED AS GRAVEL - 14.94-15.00mbgl NO RECOVERY - 15.00-15.20mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 15.20-15.79mbgl		
15.00 - 16.50	87	19	0	44					NON-INTACT. RECOVERED AS VERY SILTY VERY SANDY GRAVEL - 15.97-16.50mbgl		
16.50 - 18.00	0	0	0						NO RECOVERY - 16.50-20.08mbgl Brown clayey MUDSTONE - Drillers Description		
18.00 - 19.00	0	0	0								
19.00 - 20.00	0	0	0								
									Continued next sheet		

Start & End of Shift Observations					Borehole Diameter		Casing Diameter	
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)

Flush Information					Installation			
Top (m)	Base (m)	Flush Type	Return	Flush Colour	Top (m)	Base (m)	Type	Dia (mm)

Remarks:

1 hour hand excavating 1.20mbgl service avoidance pit

Water Strikes					
Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Fracture spacing reported in mm as min, Average and Max values. TCR, SCR and RQD reported in %

	Contract Name: The Christie, Manchester		Client: Interserve Construction Ltd		Borehole ID: **BH03**
	Contract Number: CCG-C-18-10614	Date Started: 22-01-2019	Loggged By: LT	Checked By: CB	Status: FINAL
Rotary Core Drilling Log	Easting: 384939.8	Northing: 392468.4	Ground Level: 34.72mAOD	Plant Used: DANDO 3000	Rig Crew: AH/LN DB/AH
					Sheet 3 of 3
					Scale: 1:50

Weather: | Termination: | SPT Hammer: CCG6 Energy Ratio: 68%

Samples & In Situ Testing						Strata Details				Groundwater	
Depth	TCR	SCR	RQD	Fracture Spacing	Water Added	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
20.00 - 21.00	92	33	20	62 170 201					NON-INTACT. RECOVERED AS GRAVEL - 20.08-20.15mbgl NON-INTACT. RECOVERED AS GRAVEL - 20.66-21.00mbgl		
21.00 - 22.50	81	49	35	92 153 305					NO RECOVERY - 21.00-21.29mbgl NON-INTACT. RECOVERED AS VERY SILTY VERY SANDY GRAVEL - 21.90-22.35mbgl		
22.50 - 24.00	97	69	57	110 53 45 134 245					NON-INTACT. RECOVERED AS GRAVEL - 22.46-22.60mbgl NON-INTACT. RECOVERED AS GRAVEL - 22.96-23.06mbgl MUDSTONE CLAST - 23.10mbgl		
24.00 - 25.00	89	44	10	30 79					NON-INTACT. RECOVERED AS VERY SANDY GRAVEL - 24.00-24.27mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 24.51-24.63mbgl NO RECOVERY - 24.89-25.00mbgl		
						9.72	25.00		End of Borehole at 25.00m		

Start & End of Shift Observations					Borehole Diameter		Casing Diameter	
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)

Flush Information					Installation			
Top (m)	Base (m)	Flush Type	Return	Flush Colour	Top (m)	Base (m)	Type	Dia (mm)

Remarks:
1 hour hand excavating 1.20mbgl service avoidance pit

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Fracture spacing reported in mm as min, Average and Max values. TCR, SCR and RQD reported in %

Contract Name: The Christie, Manchester			Client: Interserve Construction Ltd	Borehole ID: **BH04**
Contract Number: CCG-C-18-10614	Date Started: 18-01-2019	Logged By: DO	Checked By: CB	Status: FINAL
Cable Percussion Borehole Log	Easting: 384930.1	Northing: 392430.7	Ground Level: 34.93mAOD	Plant Used: Dando 150 S/A Rig
Rig Crew: AH/LN DB/AH	Scale: 1:50	Sheet 1 of 3		
Weather:	Termination:	SPT Hammer: CCG6 Energy Ratio: 68%		

Depth	Sample ID	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
0.50	B					Brown slightly silty sandy GRAVEL with occasional pockets of clay. Gravel is fine to coarse angular to sub-angular brick (MADE GROUND)		
0.50	ES			(1.30)				
1.00	B							
1.00	ES	SPT(S)N=11 (1,2/2,3,3,3)						
			33.63	1.30		Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY. Gravel is fine to medium sub-angular to sub-rounded sandstone		
1.50	B							
1.50	ES							
2.00 - 2.45	UT							
2.50	B			(2.20)				
		SPT(S)N=22 (3,4/5,5,6,6)						
3.50	B		31.43	3.50		Red weathered SANDSTONE		
		SPT(C)100 (25 for 75mm/100 for 50mm)						
				(1.50)				
4.50	B							
			29.93	5.00		Very weak reddish brown fine to medium grained thickly laminated SANDSTONE. Moderately weathered. Recovered locally as sandy gravel. Discontinuities are very close to medium spaced, horizontal, clean, rough and tight to wide		

	TCR	SCR	RQD	Fracture	Water
5.00 - 6.50	72	56	19	27 51 92 170	
6.50 - 8.00	61	31	15	93 114 60	
8.00 - 9.50	79	70	20	50 80 181 68	

NO RECOVERY - 5.00-5.42mbgl
NON-INTACT. RECOVERED AS GRAVEL - 5.42-5.52mbgl
NON-INTACT. RECOVERED AS GRAVEL - 5.61-5.67mbgl
NO RECOVERY - 6.50-7.09mbgl
NON-INTACT. RECOVERED AS SANDY GRAVEL - 7.09-7.14mbgl
NON-INTACT. RECOVERED AS SANDY GRAVEL - 7.34-7.53mbgl
NON-INTACT. RECOVERED AS SANDY GRAVEL - 7.77-7.94mbgl
NO RECOVERY - 8.00-8.31mbgl
NON-INTACT. RECOVERED AS GRAVEL - 9.11-9.18mbgl
NO RECOVERY - 9.50-9.91mbgl

Continued next sheet

Start & End of Shift Observations

Date	Time	Depth (m)	Casing (m)	Water (m)

Borehole Diameter

Depth (m)	Dia (mm)

Casing Diameter

Depth (m)	Dia (mm)

Remarks:

1 hour hand excavating 1.20mbgl service avoidance pit
1 hour set up of falling head permeability test
1 hour carrying out falling head permeability test
Permeability test carried out at 2.50mbgl

Chiselling

From (m)	To (m)	Duration	Remarks

Installation

Top (m)	Base (m)	Type	Dia (mm)
0.00	1.50	PLAIN	
1.50	3.00	SLOTTED	

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
			0		Borehole dry

Contract Name: The Christie, Manchester			Client: Interserve Construction Ltd		Borehole ID: **BH04**
Contract Number: CCG-C-18-10614	Date Started: 18-01-2019	Loggged By: DO	Checked By: CB	Status: FINAL	Sheet 2 of 3
Rotary Core Drilling Log	Easting: 384930.1	Northing: 392430.7	Ground Level: 34.93mAOD	Plant Used: Dando 150 S/A Rig	Rig Crew: AH/LN DB/AH	Scale: 1:50
Weather:	Termination:		SPT Hammer: CCG6 Energy Ratio: 68%		

Samples & In Situ Testing						Strata Details				Groundwater	
Depth	TCR	SCR	RQD	Fracture Spacing	Water Added	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
9.50 - 11.00	73	35	0	50 50 54 31					NON-INTACT. RECOVERED AS GRAVEL - 9.91-10.07mbgl NON-INTACT. RECOVERED AS GRAVEL - 10.12-10.21mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 10.35-10.54mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 10.668-10.89mbgl		
11.00 - 12.50	97	31	14	90 20					NON-INTACT. RECOVERED AS SANDY GRAVEL - 11.15-11.30mbgl NON-INTACT. RECOVERED AS SLIGHTLY SANDY SLIGHTLY GRAVELLY SILTY CLAY - 11.39-12.11mbgl INCLUSION OF CLAY (MARL) - 11.80mbgl		
12.50 - 14.00	98	69	33	48 11 183 60					NON-INTACT. RECOVERED AS SANDY GRAVEL - 12.39-12.57 NON-INTACT. RECOVERED AS SANDY GRAVEL - 13.14-13.23mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 13.53-14.00mbgl		
14.00 - 15.50	91	13	0	21 60			(15.00)		NO RECOVERY - 14.00-14.14mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 14.14-14.80mbgl NON-INTACT. RECOVERED AS GRAVEL - 14.89-15.40mbgl NON-INTACT. RECOVERED AS GRAVEL - 15.46-15.85mbgl		
15.50 - 17.00	92	71	45	59 111 290 66 60					NO RECOVERY - 15.50-15.62mbgl NON-INTACT. RECOVERED AS GRAVEL - 15.62-15.66mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 16.55-16.61mbgl NON-INTACT. RECOVERED AS GRAVEL - 16.83-17.00mbgl		
17.00 - 18.50	96	67	41	39 33 77 155 41 108 140					NON-INTACT. RECOVERED AS SANDY GRAVEL - 17.06-17.14mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 17.28-17.34mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 17.80-17.85mbgl		
18.50 - 20.00	96	71	56	107 156 216 70					NON-INTACT. RECOVERED AS SANDY GRAVEL - 18.71-19.02mbgl NON-INTACT. RECOVERED AS SLIGHTLY SANDY GRAVEL - 19.65-19.75mbgl NON-INTACT. RECOVERED AS GRAVEL - 19.82-20.00mbgl		
									Continued next sheet		

10 11 12 13 14 15 16 17 18 19

Start & End of Shift Observations					Borehole Diameter		Casing Diameter	
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)

Flush Information					Installation			
Top (m)	Base (m)	Flush Type	Return	Flush Colour	Top (m)	Base (m)	Type	Dia (mm)
					0.00 1.50	1.50 3.00	PLAIN SLOTTED	

Remarks:

1 hour hand excavating 1.20mbgl service avoidance pit
1 hour set up of falling head permeability test
1 hour carrying out falling head permeability test
Permeability test carried out at 2.50mbgl

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
			0		Borehole dry

Fracture spacing reported in mm as min, Average and Max values. TCR, SCR and RQD reported in %

Contract Name: The Christie, Manchester		Client: Interserve Construction Ltd		Borehole ID: **BH04**
Contract Number: CCG-C-18-10614	Date Started: 18-01-2019	Loggged By: DO	Checked By: CB	Status: FINAL
Rotary Core Drilling Log	Easting: 384930.1	Northing: 392430.7	Ground Level: 34.93mAOD	Plant Used: Dando 150 S/A Rig
Rig Crew: AH/LN DB/AH	Scale: 1:50	Sheet 3 of 3		
Weather:	Termination:	SPT Hammer: CCG6 Energy Ratio: 68%		

Samples & In Situ Testing						Strata Details				Groundwater	
Depth	TCR	SCR	RQD	Fracture Spacing	Water Added	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
						14.93	20.00		Very weak reddish brown fine to medium grained thickly laminated SANDSTONE. Moderately weathered. Recovered locally as sandy gravel. Discontinuities are very close to medium spaced, horizontal, clean, rough and tight to wide		
									End of Borehole at 20.00m		

20 21 22 23 24 25 26 27 28 29

Start & End of Shift Observations				
Date	Time	Depth (m)	Casing (m)	Water (m)

Borehole Diameter	
Depth (m)	Dia (mm)

Casing Diameter	
Depth (m)	Dia (mm)

Flush Information				
Top (m)	Base (m)	Flush Type	Return	Flush Colour

Installation			
Top (m)	Base (m)	Type	Dia (mm)
0.00	1.50	PLAIN	
1.50	3.00	SLOTTED	

Remarks:

1 hour hand excavating 1.20mbgl service avoidance pit
1 hour set up of falling head permeability test
1 hour carrying out falling head permeability test
Permeability test carried out at 2.50mbgl

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
			0		Borehole dry

Fracture spacing reported in mm as min, Average and Max values. TCR, SCR and RQD reported in %

CCG	Contract Name: The Christie, Manchester		Client: Interserve Construction Ltd		Borehole ID: **WS01**
	Contract Number: CCG-C-18-10614	Date Started: 17-01-2019	Logged By: DO	Checked By: CB	Status: FINAL
Dynamic Sampling Borehole Log	Easting: 384942.0	Northing: 392561.7	Ground Level: 35.38mAOD	Plant Used: Dando Terrier Rig	Rig Crew: LN/DB
					Sheet 1 of 1
					Scale: 1:25

Weather: Dry | Termination: | SPT Hammer: N/R, Energy Ratio: N/R

Samples & In Situ Testing			Strata Details				Groundwater	
Depth	Sample ID	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
0.00 - 1.00	U			(0.30)		Light brown sandy GRAVEL. Gravel is fine to coarse sub-angular limestone (MADE GROUND)		
0.20	ES		35.08	0.30				
0.50	B					Dark brown slightly silty slightly gravely fine to medium grained SAND. Gravel is fine to coarse sub-angular to sub-rounded sandstone		
0.50	ES			(0.70)				
1.00 - 2.00	U		34.38	1.00		Firm brownish grey slightly gravelly slightly sandy silty CLAY. Gravel is fine to medium sub-rounded sandstone		
		HVP=50						
		SPT(S)N=10 (1,1/2,3,3,2)		(0.40)				
		HVP=50						
			33.98	1.40		Brown slightly silty slightly gravelly fine to medium grained SAND. Gravel is fine to coarse sub-angular sandstone		
				(1.00)				
2.00 - 2.40	U	SPT(S)N=50 (8,7/50 for 225mm)						
			32.98	2.40		End of Borehole at 2.40m		

1 2 3 4 5

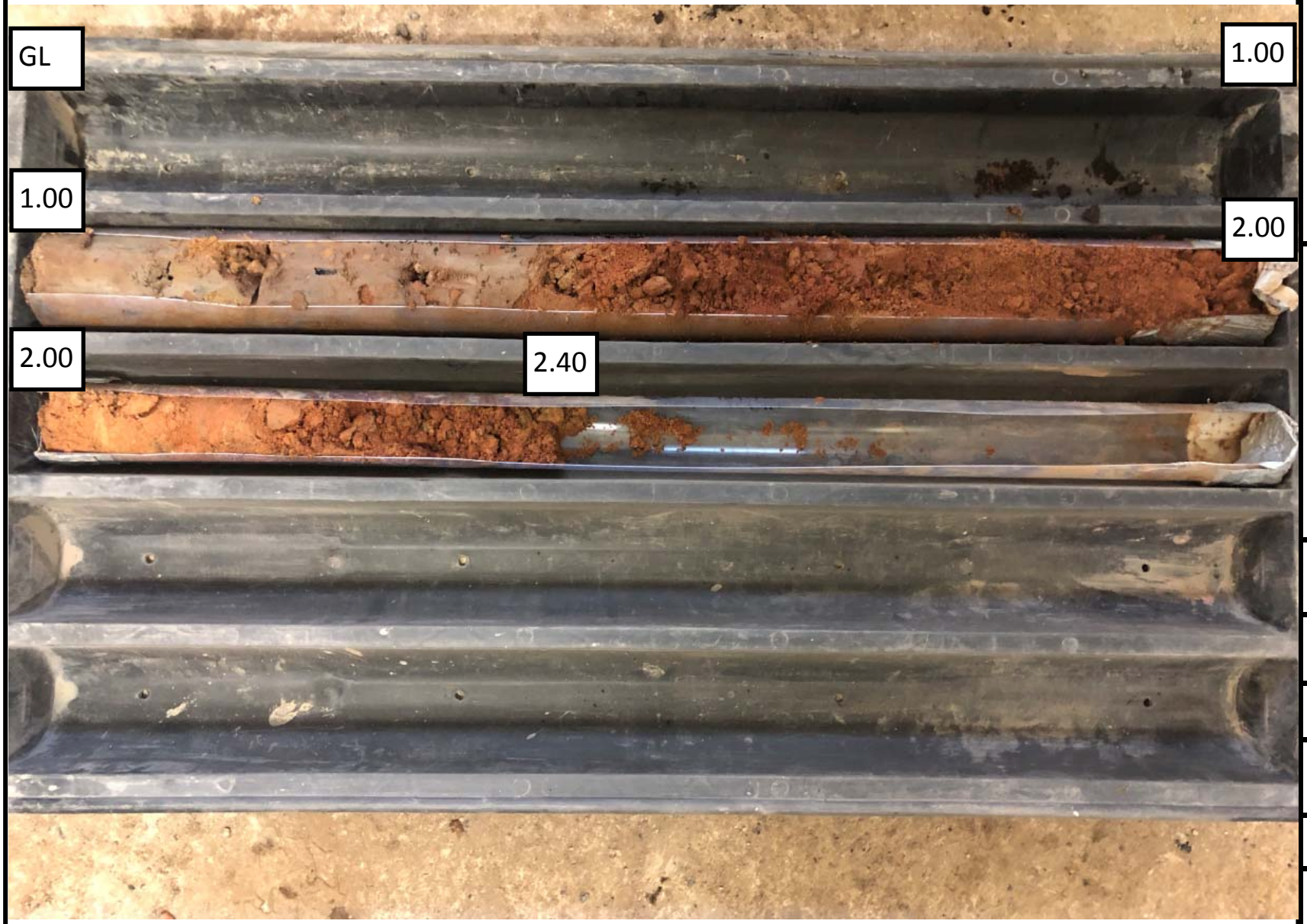
Start & End of Shift Observations					Borehole Diameter		Casing Diameter	
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)

Remarks:
1 hour hand excavating 1.20mbgl service avoidance pit

Chiselling				Installation			
From (m)	To (m)	Duration	Remarks	Top (m)	Base (m)	Type	Dia (mm)

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks



Notes:

Recovered undisturbed soils from WS01.

Service pit carried out within upper meter.

CC GEOTECHNICAL LIMITED
UNIT 1 DELTIC WAY
KNOWSLEY INDUSTRIAL ESTATE
LIVERPOOL
L33 7BA
0151 545 2750

Client:
INTERSERVE CONSTRUCTION LTD

Project:
The Christie, Manchester

Title:
Recovered soils from WS01

Scale:	Issue:
N/A	1
Drawn by:	Date:
DO	01/04/19
Project No.	Plate No.
CCG-C-18-10614	WS01-1

CC GEOTECHNICAL LIMITED

APPENDIX C

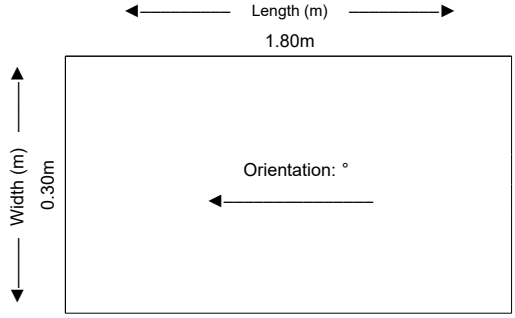
TRIAL PIT LOGS

	Contract Name: The Christie, Manchester		Client: Interserve Construction Ltd		Trial Pit ID: TP01
	Contract Number: CCG-C-18-10614	Date Started: 17-01-2019	Logged By: DE	Checked By: CB	Status: FINAL — Sheet 1 of 1
Trial Pit Log	Easting: 384948.1	Northing: 392529.5	Ground Level: 35.12mAOD	Plant Used: Tracked Excavator	Date Printed: 03-03-2019 — Scale: 1:25
Weather: Dry		Hole Termination: Terminated on Sandstone		Stability:	

Samples & In Situ Testing			Strata Details					
Depths	Sample ID	Test Result	Reduced Level	Depth (m) (Thickness)	Legend	Strata Description	Water	Backfill
			35.02	0.10		Topsoil		
0.30	ES			(0.50)		Brown very sandy slightly silty GRAVEL with frequent rootlets. Gravels are fine to coarse sub-angular brick, concrete and mortar (MADE GROUND).		
0.50	B							
0.50	ES		34.52	0.60		Brown gravelly slightly clayey slightly silty fine to coarse SAND with occasional rootlets. Gravels are fine to coarse sub-angular brick (MADE GROUND).		
1.00	B			(0.70)				
1.00	ES							1
			33.82	1.30		Brown very clayey slightly gravelly slightly silty fine to medium grained SAND. Gravels are fine to coarse sub-rounded quartz and sandstone.		
1.50	B			(0.60)				
			33.22	1.90		Red slightly gravelly slightly silty fine to medium grained SAND. Gravels are fine to coarse sub-angular sandstone.		
2.00	B			(0.70)				2
2.50	B							
			32.52	2.60		Red weathered SANDSTONE.		
			32.42	2.70		End of Trial Pit at 2.70m		
								3

Dimensions:

Final Depth: 2.70m



Inclination: °

General Remarks:

Water Strikes					
Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
			0		Trial pit dry

Notes:

CC GEOTECHNICAL LIMITED
UNIT 1 DELTIC WAY
KNOWSLEY INDUSTRIAL ESTATE
LIVERPOOL
L33 7BA
0151 545 2750

Client:
INTERSERVE CONSTRUCTION LTD

Project:
The Christie, Manchester

Title:
Trial Pit Excavations - TP1

Scale:	Issue:
N/A	1
Drawn by:	Date:
DO	01/04/19
Project No.	Plate No.
CCG-C-18-10614	TP1-1

CC GEOTECHNICAL LIMITED

Notes:

CC GEOTECHNICAL LIMITED
UNIT 1 DELTIC WAY
KNOWSLEY INDUSTRIAL ESTATE
LIVERPOOL
L33 7BA
0151 545 2750

Client:
INTERSERVE CONSTRUCTION LTD

Project:
The Christie, Manchester

Title:
Trial Pit Excavations - TP1

Scale:	Issue:
N/A	1
Drawn by:	Date:
DO	01/04/19
Project No.	Plate No.
CCG-C-18-10614	TP1-2

CC GEOTECHNICAL LIMITED

Notes:

CC GEOTECHNICAL LIMITED
UNIT 1 DELTIC WAY
KNOWSLEY INDUSTRIAL ESTATE
LIVERPOOL
L33 7BA
0151 545 2750

Client:
INTERSERVE CONSTRUCTION LTD

Project:
The Christie, Manchester

Title:
Trial Pit Excavations - TP1

Scale:	Issue:
N/A	1
Drawn by:	Date:
DO	01/04/19
Project No.	Plate No.
CCG-C-18-10614	TP1-3

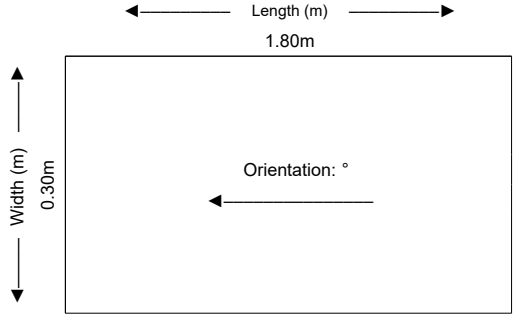
CC GEOTECHNICAL LIMITED

	Contract Name: The Christie, Manchester		Client: Interserve Construction Ltd		Trial Pit ID: TP02
	Contract Number: CCG-C-18-10614	Date Started: 17-01-2019	Logged By: DE	Checked By: CB	Status: FINAL
					Sheet 1 of 1
Trial Pit Log	Easting: 384946.6	Northing: 392505.6	Ground Level: 34.79mAOD	Plant Used: Tracked Excavator	Date Printed: 03-03-2019
					Scale: 1:25
Weather: Dry		Hole Termination:		Stability:	

Samples & In Situ Testing			Strata Details					
Depths	Sample ID	Test Result	Reduced Level	Depth (m) (Thickness)	Legend	Strata Description	Water	Backfill
			34.69	0.10		Topsoil		
0.30	ES					Brown sandy slightly silty GRAVEL with frequent rootlets. Gravels are fine to coarse sub-angular brick, concrete and mortar (MADE GROUND).		
0.50	B			(0.70)				
0.50	ES							
			33.99	0.80		Brown gravelly slightly silty fine to medium grained SAND with occasional rootlets. Gravels are fine to coarse sub-angular to sub-rounded brick and concrete (MADE GROUND).		
1.00	B							1
1.00	ES			(0.60)				
			33.39	1.40		Firm brown slightly sandy slightly gravelly silty CLAY with frequent laminations of sand. Gravel is fine to medium sub-rounded sandstone		
1.50	B							
		HVP=60kPa						
2.00	B							2
				(1.35)				
		HVP=90kPa						
			32.04	2.75		Red slightly clayey slightly gravely slightly silty fine to medium grained SAND. Gravels are fine to coarse sub-angular sandstone		
2.80	B		31.89	2.90		End of Trial Pit at 2.90m		
								3

Dimensions:

Final Depth: 2.90m



Inclination: °

General Remarks:

Water Strikes					
Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
			0		Trial pit dry

Notes:

CC GEOTECHNICAL LIMITED
UNIT 1 DELTIC WAY
KNOWSLEY INDUSTRIAL ESTATE
LIVERPOOL
L33 7BA
0151 545 2750

Client:
INTERSERVE CONSTRUCTION LTD

Project:
The Christie, Manchester

Title:
Trial Pit Excavations - TP2

Scale:	Issue:
N/A	1
Drawn by:	Date:
DO	01/04/19
Project No.	Plate No.
CCG-C-18-10614	TP2-1

CC GEOTECHNICAL LIMITED

Notes:

CC GEOTECHNICAL LIMITED
UNIT 1 DELTIC WAY
KNOWSLEY INDUSTRIAL ESTATE
LIVERPOOL
L33 7BA
0151 545 2750

Client:
INTERSERVE CONSTRUCTION LTD

Project:
The Christie, Manchester

Title:
Trial Pit Excavations - TP2

Scale:	Issue:
N/A	1
Drawn by:	Date:
DO	01/04/19
Project No.	Plate No.
CCG-C-18-10614	TP2-2

CC GEOTECHNICAL LIMITED

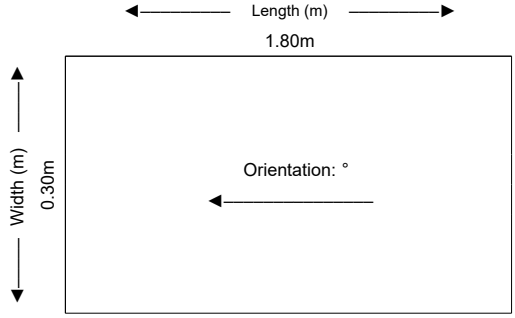
CCG	Contract Name: The Christie, Manchester		Client: Interserve Construction Ltd		Trial Pit ID: TP03
	Contract Number: CCG-C-18-10614	Date Started: 17-01-2019	Logged By: DE	Checked By: CB	Status: FINAL — Sheet 1 of 1
Trial Pit Log	Easting: 384936.3	Northing: 392444.6	Ground Level: 34.64mAOD	Plant Used: Tracked Excavator	Date Printed: 03-03-2019 — Scale: 1:25
Weather: Dry	Hole Termination:		Stability:		

Samples & In Situ Testing			Strata Details				Water	Backfill
Depths	Sample ID	Test Result	Reduced Level	Depth (m) (Thickness)	Legend	Strata Description		
			34.53	0.10		Topsoil		
0.30	ES					Brown very sandy slightly silty GRAVEL. Gravels are fine to coarse sub-angular brick and concrete (MADE GROUND).		
0.50	B							
0.50	ES							
				(1.30)				
1.00	B							
1.00	ES							
			33.24	1.40				
1.50	B					Firm becoming stiff brown slightly gravelly slightly sandy silty CLAY, with occasional sand laminations. Gravel is fine to medium sub-rounded sandstone.		
		HVP=60kPa						
2.00	B							
				(1.50)				
		HVP=110kPa						
2.80	B							
			31.74	2.90		End of Trial Pit at 2.90m		

1 2 3

Dimensions:

Final Depth: 2.90m



Inclination: °

General Remarks:

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
			0		Trial pit dry

Notes:

CC GEOTECHNICAL LIMITED
UNIT 1 DELTIC WAY
KNOWSLEY INDUSTRIAL ESTATE
LIVERPOOL
L33 7BA
0151 545 2750

Client:
INTERSERVE CONSTRUCTION LTD

Project:
The Christie, Manchester

Title:
Trial Pit Excavations - TP3

Scale:	Issue:
N/A	1
Drawn by:	Date:
DO	01/04/19
Project No.	Plate No.
CCG-C-18-10614	TP3-1

CC GEOTECHNICAL LIMITED

Notes:

CC GEOTECHNICAL LIMITED
UNIT 1 DELTIC WAY
KNOWSLEY INDUSTRIAL ESTATE
LIVERPOOL
L33 7BA
0151 545 2750

Client:
INTERSERVE CONSTRUCTION LTD

Project:
The Christie, Manchester

Title:
Trial Pit Excavations - TP3

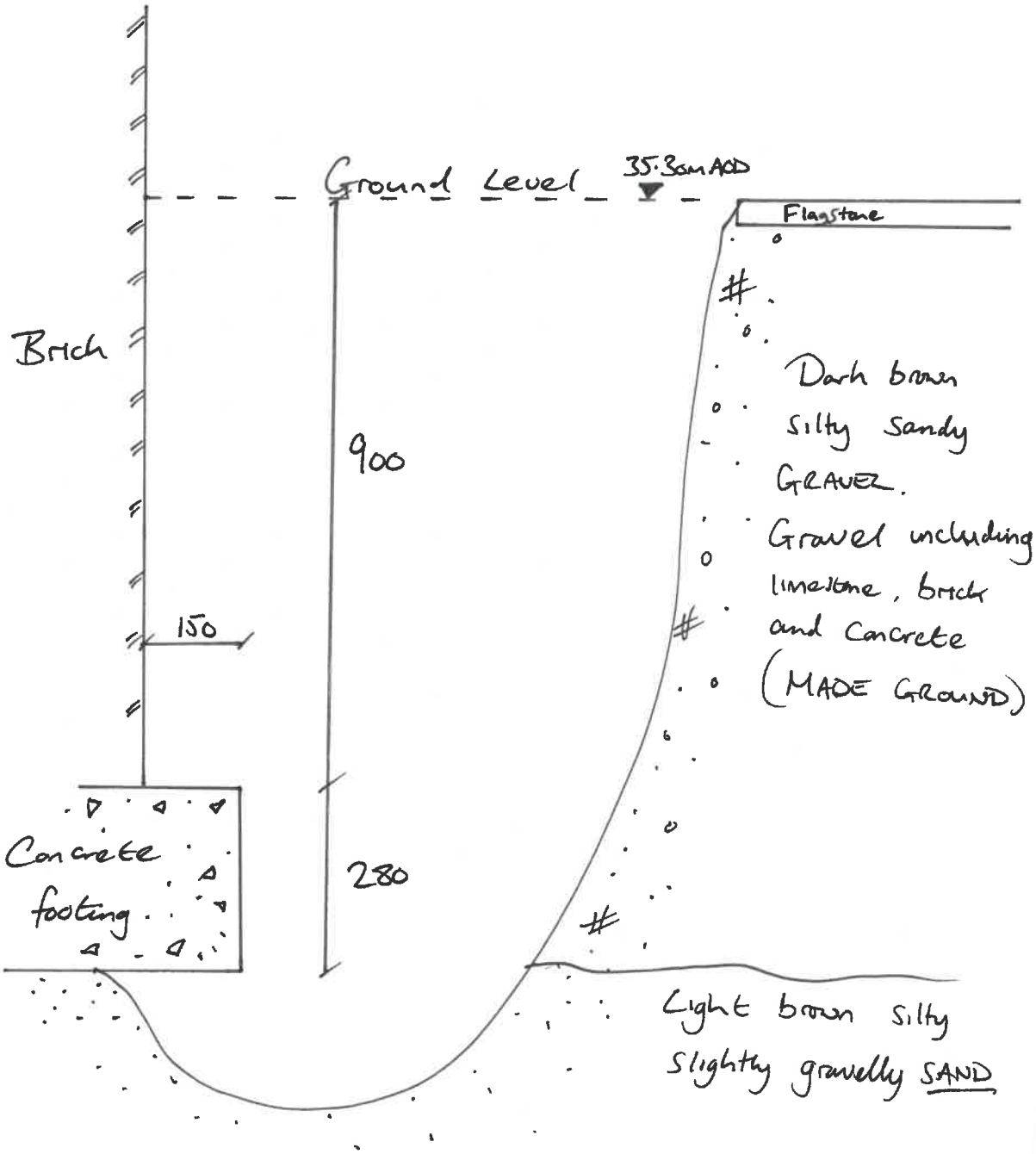
Scale:	Issue:
N/A	1
Drawn by:	Date:
DO	01/04/19
Project No.	Plate No.
CCG-C-18-10614	TP3-2

CC GEOTECHNICAL LIMITED

APPENDIX D

FOUNDATION INSPECTION PIT SKETCHES

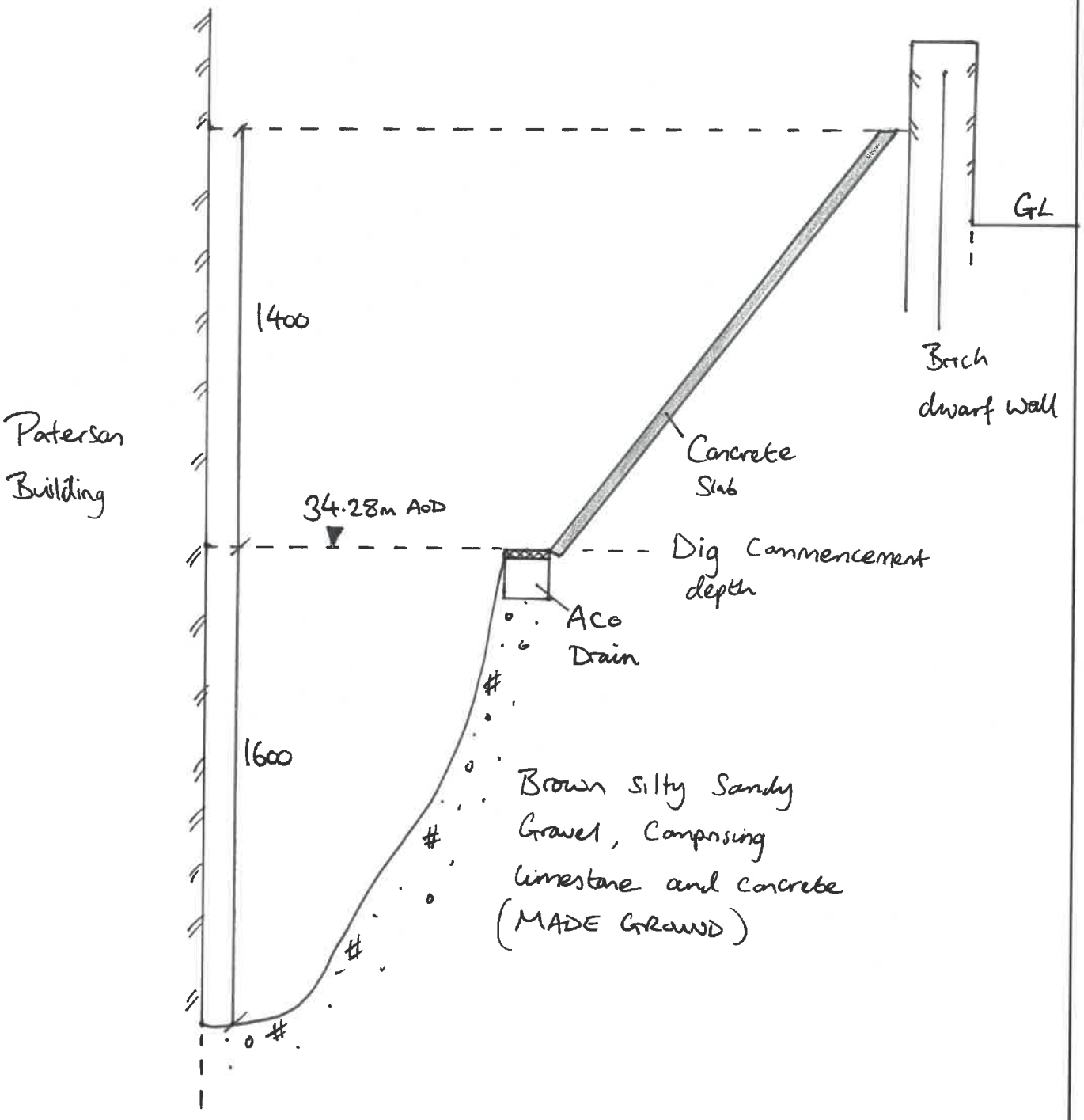
OP01



Notes - Dimensions = mm
- Pit dry
- Scale 1:100

CC GEOTECHNICAL LTD Consulting Geotechnical and Geoenvironmental Engineers Tel: (0151) 545 2750 Fax: (0151) 548 7892	**Project**	PATERSON REDEVELOPMENT PROJECT		
	Drawing	FOUNDATION OBSERVATION PIT		
	Scale	AS SHOWN		
	Date	Mar-19	**Number**	19/10614

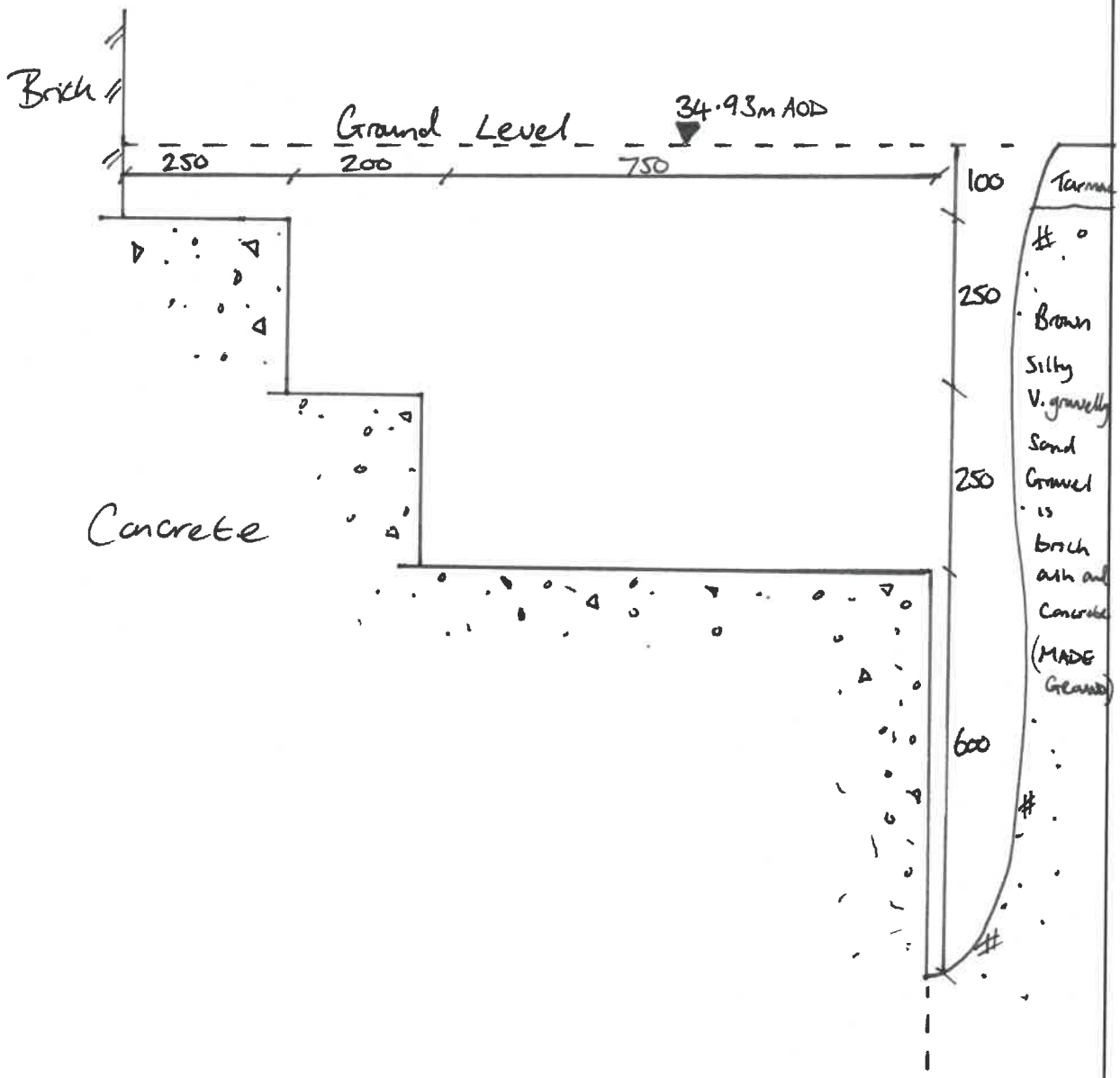
OP02



Notes - Dimensions = mm
- Pit dry
- Scale 1:200

CC GEOTECHNICAL LTD Consulting Geotechnical and Geoenvironmental Engineers Tel: (0151) 545 2750 Fax: (0151) 548 7892	**Project**	PATERSON REDEVELOPMENT PROJECT		
	Drawing	FOUNDATION OBSERVATION PIT		
	Scale	AS SHOWN		
	Date	Mar-19	**Number**	19/10614

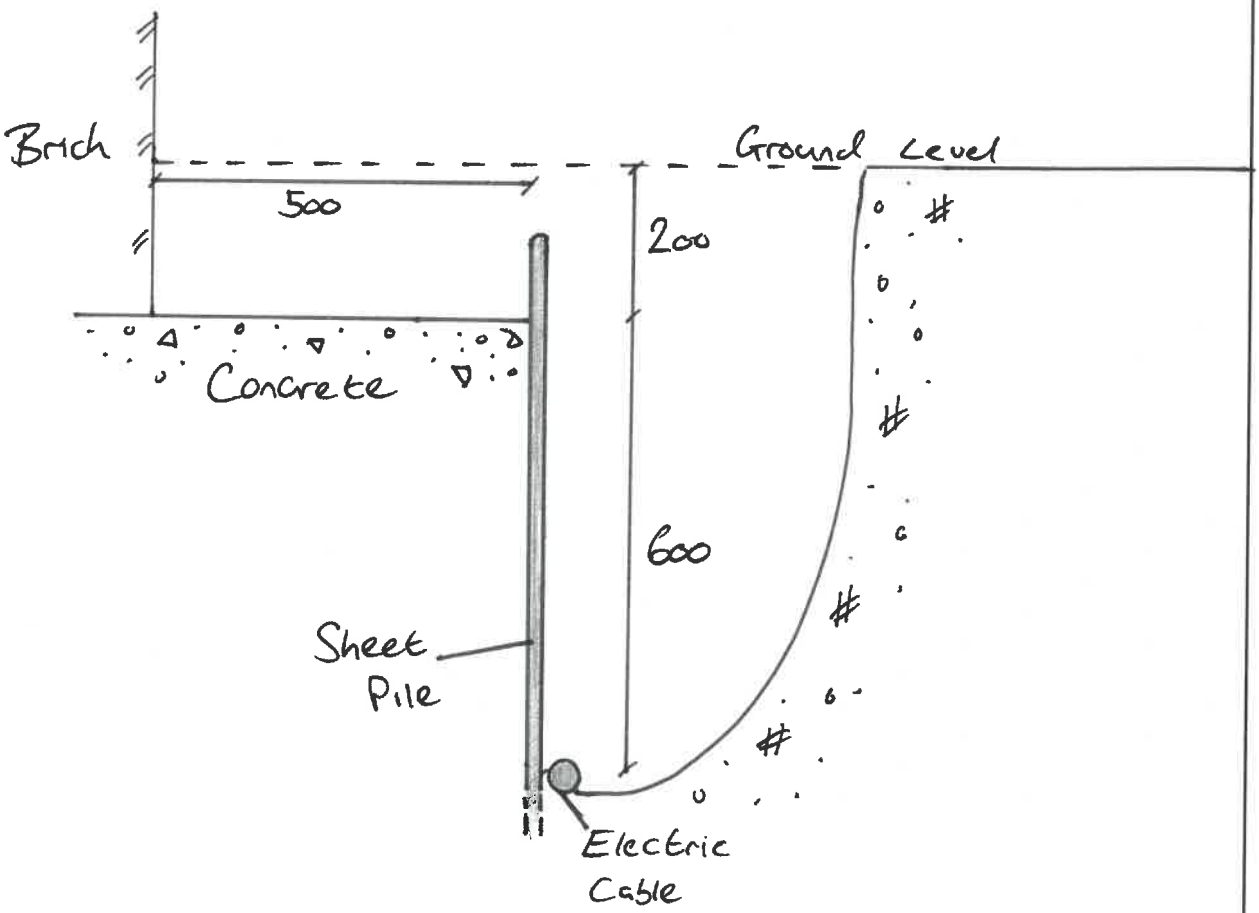
OP03



Notes
- Dimensions = mm
- Pit dry
- Unable to extend pit due to services
- Scale 1:100

CC GEOTECHNICAL LTD Consulting Geotechnical and Geoenvironmental Engineers Tel: (0151) 545 2750 Fax: (0151) 548 7892	**Project**	PATERSON REDEVELOPMENT PROJECT	
	Drawing	FOUNDATION OBSERVATION PIT	
	Scale	AS SHOWN	
	Date	Mar-19	**Number** 19/10614

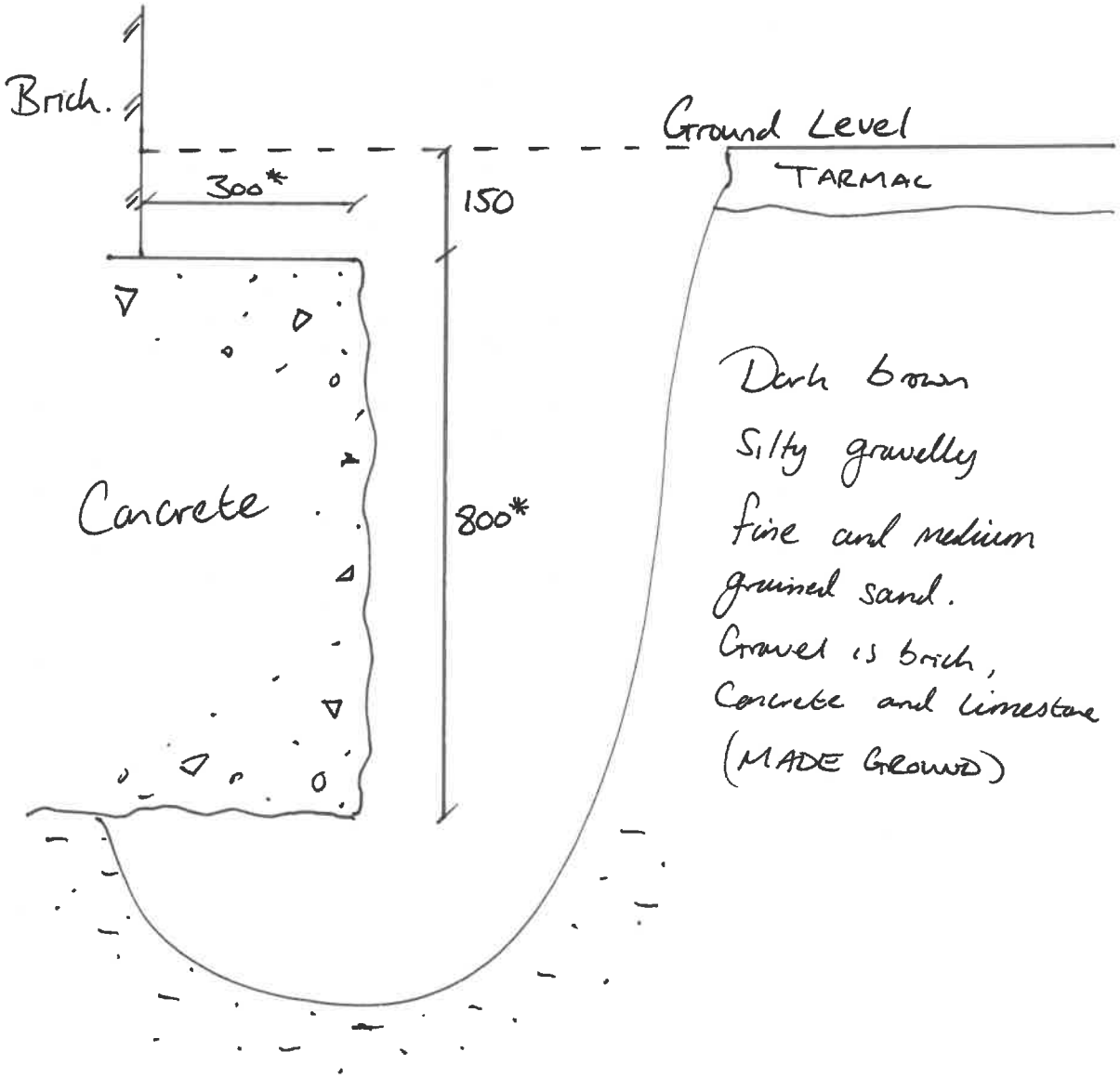
OP05



Notes - Dimensions in mm
- Pit dry
- Unable to advance due to sheet pile & services.
- Scale 1:100

CC GEOTECHNICAL LTD Consulting Geotechnical and Geoenvironmental Engineers Tel: (0151) 545 2750 Fax: (0151) 548 7892	**Project**	PATERSON REDEVELOPMENT PROJECT		
	Drawing	FOUNDATION OBSERVATION PIT		
	Scale	AS SHOWN		
	Date	Mar-19	**Number**	19/10614

OP06

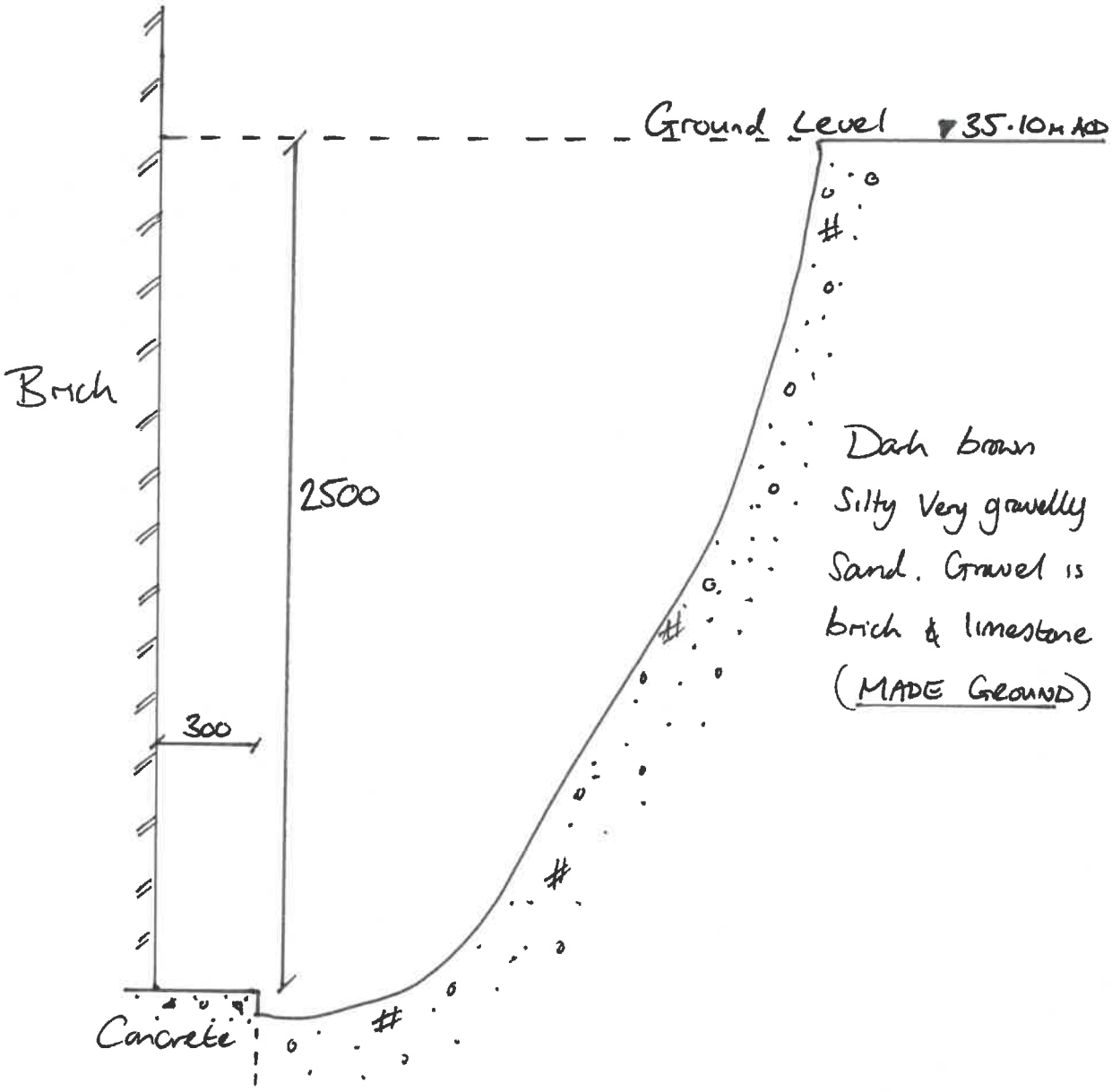


Notes - Dimensions = mm
- Pit dry
- Foundation projection varies from 200mm - 600mm across dig.
- Foundation thickness varies from 700mm - 900mm across dig.
- Scale 1:100

CC GEOTECHNICAL LTD
Consulting Geotechnical and Geoenvironmental Engineers
Tel: (0151) 545 2750 Fax: (0151) 548 7892

Project	PATERSON REDEVELOPMENT PROJECT		
Drawing	FOUNDATION OBSERVATION PIT		
Scale	AS SHOWN		
Date	Mar-19	**Number**	19/10614

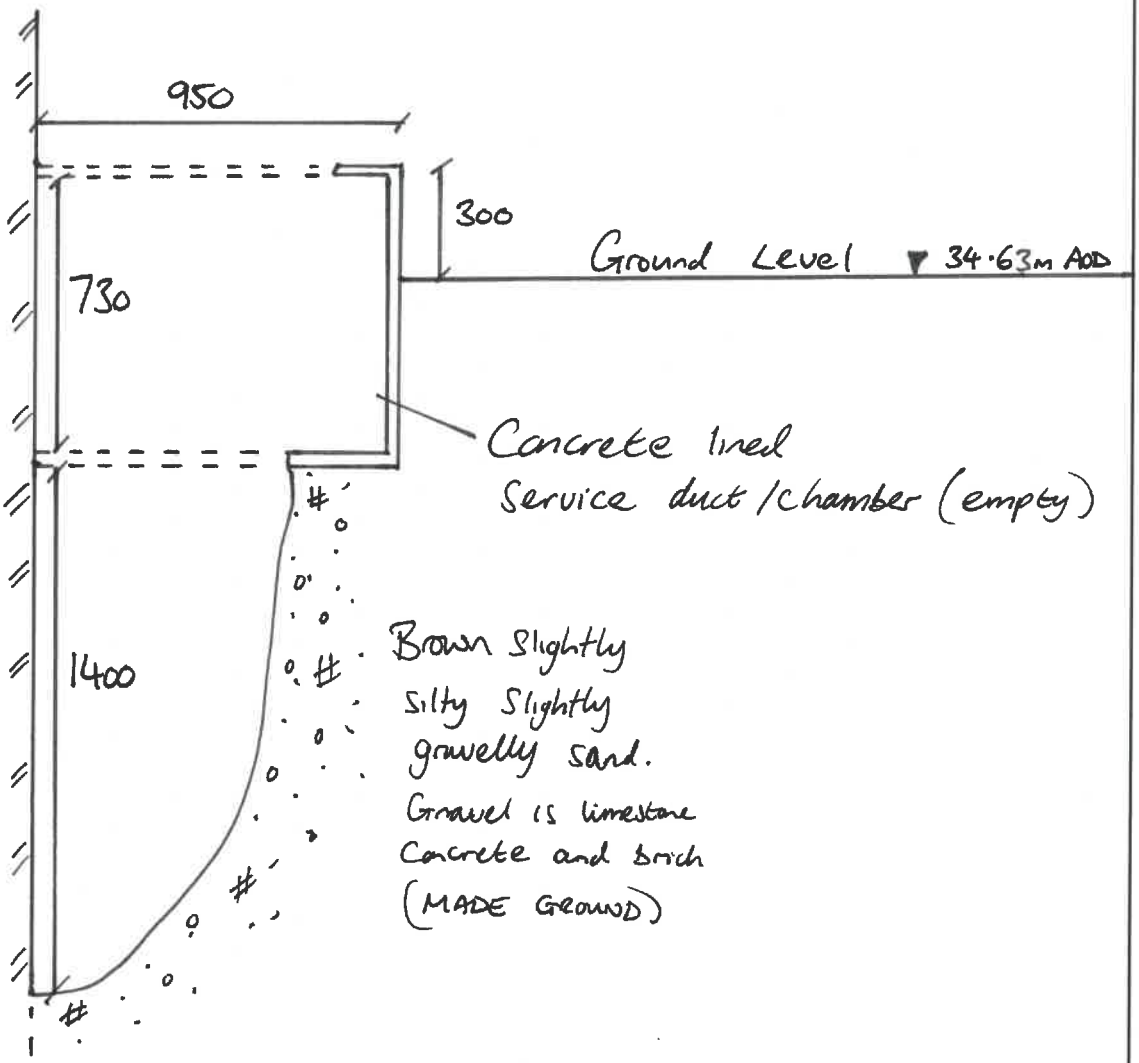
OP07



Notes
- Dimensions = mm
- Pit dry
- Unable to prove foundation thickness
- Scale 1:200

CC GEOTECHNICAL LTD Consulting Geotechnical and Geoenvironmental Engineers Tel: (0151) 545 2750 Fax: (0151) 548 7892	**Project**	PATERSON REDEVELOPMENT PROJECT		
	Drawing	FOUNDATION OBSERVATION PIT		
	Scale	AS SHOWN		
	Date	Mar-19	**Number**	19/10614

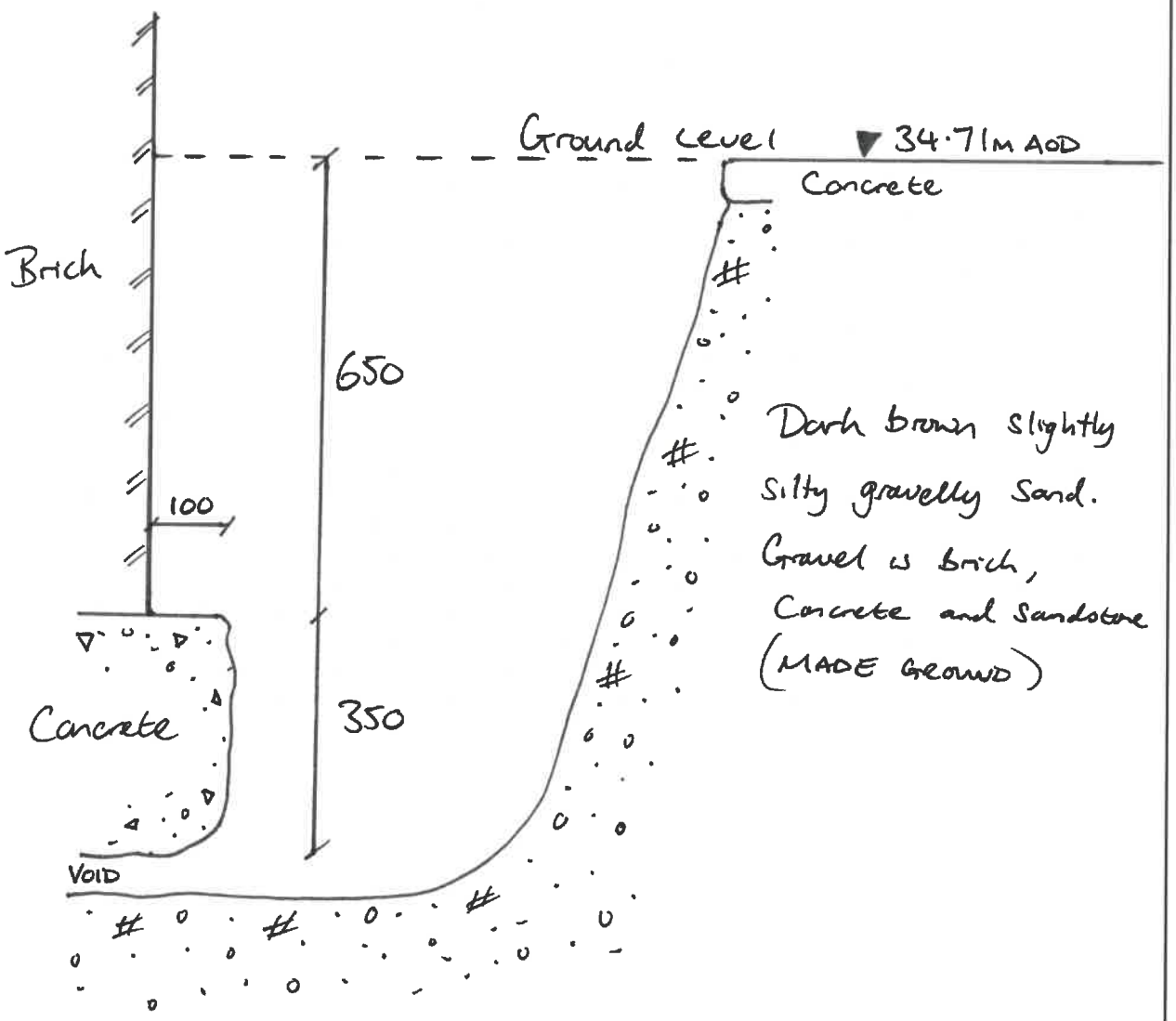
OP08



Notes - Dimensions = mm
- Pit dry
- Foundation not encountered
- Scale 1:200

CC GEOTECHNICAL LTD Consulting Geotechnical and Geoenvironmental Engineers Tel: (0151) 545 2750 Fax: (0151) 548 7892	**Project**	PATERSON REDEVELOPMENT PROJECT	
	Drawing	FOUNDATION OBSERVATION PIT	
	Scale	AS SHOWN	
	Date	Mar-19	**Number** 19/10614

OP09



Notes - Dimensions = mm
- Pit Dry
- Small Void noted under foundation
- Scale 1:100

CC GEOTECHNICAL LTD Consulting Geotechnical and Geoenvironmental Engineers Tel: (0151) 545 2750 Fax: (0151) 548 7892	**Project**	PATERSON REDEVELOPMENT PROJECT	
	Drawing	FOUNDATION OBSERVATION PIT	
	Scale	AS SHOWN	
	Date	Mar-19	**Number** 19/10614

APPENDIX E

INSITU SOIL PERMEABILITY TESTS

FALLING HEAD TEST

CCG-C-18-10614
Christie Hospital: BH01

CC GEOTECHNICAL LTD

Details of test Section	Situation B - BS5930	Ground Level (mAOD)	
Height of standpipe	N/A	Filter Length	N/A
Depth below top of standpipe to response zone	N/A	Casing Elevation (mAOD)	N/A
		Borehole Diameter (m)	0.150
Initial depth to water (mbgl)	0.200	Standpipe Diameter:	N/A
Depth of Casing (mbgl)	2.000	Casing Diameter	150mm

Ref: BS5930:1999

Strata: 0.40: Grey sandy GRAVEL (SUBBASE)
1.40: Brown very gravelly very silty CLAY. Gravel is brick and sandstone - MADE GROUND
2.20: Firm to stiff brown very silty very sandy CLAY

Time Elapsed t (mins)	Depth at Time t From top of casing (m)	Head at Time t	Head Ratio (H/Ho)
0	0.200	1.800	1.000
1	0.210	1.790	0.994
2	0.220	1.780	0.989
3	0.220	1.780	0.989
4	0.220	1.780	0.989
5	0.220	1.780	0.989
10	0.220	1.780	0.989
15	0.230	1.770	0.983
20	0.230	1.770	0.983
30	0.230	1.770	0.983
40	0.230	1.770	0.983
50	0.240	1.760	0.978
60	0.240	1.760	0.978

Permeability:

K= A/FT

K= **1.97E-07** m/s

Where:

A= Cross sectional area of BH (m2)
0.018
F= Intake Factor (m) see BS5930
0.4125
T= Basic time Lag (s)
222000 (by extrapolation)

Notes:
Test carried out under Test B of Section 4 - BS 5930:1999+A2:2010

Calcs by:	Checked by:	Job Number:
DO	CB	18-10614

FALLING HEAD TEST

CCG-C-18-10614
Christie Hospital: BH02

CC GEOTECHNICAL LTD

Details of test Section	Situation B - BS5930	Ground Level (mAOD)	
Height of standpipe	N/A	Filter Length	N/A
Depth below top of standpipe to response zone	N/A	Casing Elevation (mAOD)	N/A
		Borehole Diameter (m)	0.150
Initial depth to water (mbgl)	0.130	Standpipe Diameter:	N/A
Depth of Casing (mbgl)	3.300	Casing Diameter	150mm

Ref: BS5930:1999

Strata:
0.70: Brown very gravelly very silty CLAY. Gravel is brick and sandstone - MADE GROUND
1.40: Brown fine to coarse SAND, with frequent clay lenses
2.20: Stiff brown very sandy silty CLAY
3.50: Weathered SANDSTONE (continuing)

Time Elapsed t (mins)	Depth at Time t From top of casing (m)	Head at Time t	Head Ratio (H/Ho)
0	0.130	3.170	1.000
1	0.140	3.160	0.997
2	0.140	3.160	0.997
3	0.140	3.160	0.997
4	0.140	3.160	0.997
5	0.150	3.150	0.994
10	0.150	3.150	0.994
15	0.160	3.140	0.991
20	0.160	3.140	0.991
30	0.160	3.140	0.991
40	0.160	3.140	0.991
50	0.160	3.140	0.991
60	0.170	3.130	0.987

Permeability:

K= A/FT

K= **7.38E-08** m/s

Where:

A= Cross sectional area of BH (m2)
0.018
F= Intake Factor (m) see BS5930
0.4125
T= Basic time Lag (s)
591600 (by extrapolation)

Notes:
Test carried out under Test B of Section 4 - BS 5930:1999+A2:2010

Calcs by:	Checked by:	Job Number:
DO	CB	18-10614

FALLING HEAD TEST

CCG-C-18-10614
Christie Hospital: BH04

CC GEOTECHNICAL LTD

Details of test Section	Situation B - BS5930	Ground Level (mAOD)	
Height of standpipe	N/A	Filter Length	N/A
Depth below top of standpipe to response zone	N/A	Casing Elevation (mAOD)	N/A
		Borehole Diameter (m)	0.150
Initial depth to water (mbgl)	0.340	Standpipe Diameter:	N/A
Depth of Casing (mbgl)	2.500	Casing Diameter	150mm

Ref: BS5930:1999

Strata: 1.30: Brown very gravelly very silty CLAY. Gravel is brick and sandstone - MADE GROUND
3.50: Stiff brown very sandy silty CLAY
5.00: Weathered SANDSTONE (continuing)

Time Elapsed t (mins)	Depth at Time t From top of casing (m)	Head at Time t	Head Ratio (H/Ho)
0	0.340	2.160	1.000
1	0.346	2.154	0.997
2	0.347	2.153	0.997
3	0.348	2.152	0.996
4	0.349	2.151	0.996
5	0.350	2.150	0.995
10	0.351	2.149	0.995
15	0.352	2.148	0.994
20	0.355	2.145	0.993
30	0.360	2.140	0.991
40	0.365	2.135	0.988
50	0.370	2.130	0.986
60	0.375	2.125	0.984

Permeability:

K= A/FT

K= **2.68E-07** m/s

Where:

A= Cross sectional area of BH (m2)
0.018
F= Intake Factor (m) see BS5930
0.4125
T= Basic time Lag (s)
162600 (by extrapolation)

Notes:
Test carried out under Test B of Section 4 - BS 5930:1999+A2:2010

Calcs by:	Checked by:	Job Number:
DO	CB	18-10614

CCG-C-18-10614:
The Chrisite, Manchester:
BH02

VARIABLE HEAD TEST

CC GEOTECHNICAL LTD

Test Scenario	Situation D - BS5930	Depth to top of test section	3.50mbgl
Type of Test	Rising Head	Standing water level	3.58mbgl
		Drawdown level	4.72mbgl
Diameter of test section (m)	0.09	Soil / rock description	Weathered Sandstone
Length of test section (m)	1.50		

Ref:
BS 22282:2012
BS 5930:1999

Time Elapsed t (mins)	Depth of groundwater (mbgl)	Head at Time (t)	Head Ratio (H/Ho)
0.0	4.720	1.140	1.000
0.5	4.490	0.910	0.798
1.0	4.320	0.740	0.649
1.5	4.110	0.530	0.465
1.5	3.980	0.400	0.351
2.5	3.880	0.300	0.263
3.0	3.820	0.240	0.211

Permeability:

K= A/FT

K= 7.45E-06 m/s

Where:

A= Cross sectional area of BH (m2)
0.002

F= Intake Factor (m) see BS5930
2.685

T= Basic time Lag (s)
100

Notes:
Test carried out under Test D of Section 4 - BS 5930:1999

Client:	**Interserve Construction Ltd**	**Calcs by:**	**Checked by:**	**Job Number:**
		DO	**CB**	**18/10614**

APPENDIX F

ROCK CORE PHOTOGRAPHS

CCG REF: CCG-C-18-10614
SITE: THE CHRISTIE,
MANCHESTER
CLIENT: INTERSERVE
BH1 3.5-6.5mbgl
KATUN
3.5
5.0
5.0
6.5

CCG REF: CCG-C-18-10614
SITE: THE CHRISTIE,
MANCHESTER
CLIENT: INTERSERVE
BH1 6.5-9.5mbgl
KATUN
6.5
8.0
8.0
9.5

CCG REF: CCG-C-18-10614
SITE: THE CHRISTIE,
MANCHESTER
CLIENT: INTERSERVE
BH1 9.5-12.5mbgl
KATUN
9.5
11.0
11.0
12.5

CCG REF: CCG-C-18-10614
SITE: THE CHRISTIE,
MANCHESTER
CLIENT: INTERSERVE
BH1 12.5-15.5mbgl
KATUN
12.5
14.0
14.0
15.5

CCG REF: CCG-C-18-10614
SITE: THE CHRISTIE,
MANCHESTER
CLIENT: INTERSERVE
BH1 15.5-18.5mbgl
KATUN
15.5
17.0
17.0
18.5

CCG REF: CCG-C-18-10614
SITE: THE CHRISTIE,
MANCHESTER
CLIENT: INTERSERVE
BH1 18.5-20.0mbgl
KATUN
18.5
20.0

CCG REF: CCG-C-18-10614
SITE: THE CHRISTIE,
MANCHESTER
CLIENT: INTERSERVE
BH2 5.0-8.0mbgl
5.0
6.5
6.5
8.0

CCG REF: CCG-C-18-10614
SITE: THE CHRISTIE,
MANCHESTER
CLIENT: INTERSERVE
BH2 8.0-11.0mbgl
KATUN
8.0
9.5
9.5
11.0

CCG REF: CCG-C-18-10614
SITE: THE CHRISTIE,
MANCHESTER
CLIENT: INTERSERVE
BH2 11.0-14.0mbgl
11.0
12.5
12.5
14.0

CCG REF: CCG-C-18-10614
SITE: THE CHRISTIE,
MANCHESTER
CLIENT: INTERSERVE
BH2 14.0-17.0mbgl
14.0
15.5
15.5
17.0

CCG REF: CCG-C-18-10614
SITE: THE CHRISTIE,
MANCHESTER
CLIENT: INTERSERVE
BH2 17.0-20.0mbgl
17.0
18.5
18.5
20.0

CCG REF: CCG-C-18-10614
SITE: THE CHRISTIE,
MANCHESTER
CLIENT: INTERSERVE
BH3 4.5-7.5mbgl
4.5
6.0
6.0
7.5

CCG REF: CCG-C-18-10614
SITE: THE CHRISTIE,
MANCHESTER
CLIENT: INTERSERVE
BH3 7.5-10.5mbgl
KATUN
7.5
9.0
9.0
10.5

CCG REF: CCG-C-18-10614
SITE: THE CHRISTIE,
MANCHESTER
CLIENT: INTERSERVE
BH3 10.5-13.5mbgl
KATUN
10.5
12.0
12.0
13.5

CCG REF: CCG-C-18-10614
SITE: THE CHRISTIE,
MANCHESTER
CLIENT: INTERSERVE
BH3 13.5-16.5mbgl
KATUN
13.5
15.0
15.0
16.5

CCG REF: CCG-C-18-10614
SITE: THE CHRISTIE,
MANCHESTER
CLIENT: INTERSERVE
BH3 20.0-22.5mbgl
KATUN
20.0
21.0
21.0
22.5

CCG REF: CCG-C-18-10614
SITE: THE CHRISTIE,
MANCHESTER
CLIENT: INTERSERVE
BH3 22.5-25.0mbgl
KATUN
22.5
24.0
24.0
25.0

CCG REF: CCG-C-18-10614
SITE: THE CHRISTIE,
MANCHESTER
CLIENT: INTERSERVE
BH4 5.0-8.0mbgl
KATUN
5.0
6.5
6.5
8.0

CCG REF: CCG-C-18-10614
SITE: THE CHRISTIE,
MANCHESTER
CLIENT: INTERSERVE
BH4 8.0-11.0mbgl
8.0
9.5
9.5
11.0

CCG REF: CCG-C-18-10614
SITE: THE CHRISTIE,
MANCHESTER
CLIENT: INTERSERVE
BH4 11.0-14.0mbgl
KATUN
11.0
12.5
12.5
14.0

CCG REF: CCG-C-18-10614
SITE: THE CHRISTIE,
MANCHESTER
CLIENT: INTERSERVE
BH4 14.0-17.0mbgl
KATUN
14.0
15.5
15.5
17.0

CCG REF: CCG-C-18-10614
SITE: THE CHRISTIE,
MANCHESTER
CLIENT: INTERSERVE
BH4 17.0-20.0mbgl
KATUN
17.0
18.5
18.5
20.0

APPENDIX G

SOIL & ROCK ENGINEERING TEST RESULTS

Units 1 & 2
Deltic Place
Deltic Way
Knowsley Industrial Estate
Liverpool
L33 7BU

Telephone: (0151) 545 2750
Fax: (0151) 548 7892
Email: enquiries@ccgeotechnical.com
www.ccgeotechnical.com

CC GEOTECHNICAL LTD
Consulting Geoenvironmental and Geotechnical Engineers

LABORATORY REPORT

CONTRACT NUMBER: CCG-C-18-10614

CONTRACT TITLE: THE CHRISTIE, MANCHESTER

CLIENT: INTERSERVE

DATE RECEIVED: 22/01/19
DATE COMMENCED: 22/01/19
DATE COMPLETED: 12/04/19
REPORT DATE: 12/04/19

Test Description	Qty
Determination of Moisture Content BS 1377-2:1990 (a)	8
Particle Size Distribution BS 1377-2:1990 (a)	4
Sedimentation by Pipette BS 1377-2:1990 (#)	4
Determination of Liquid & Plastic Limits BS 1377-2:1990 (a)	8
Uniaxial Compressive Strength ISRM Vol 16 No 2, pp 135-140 (2007) (s)	3
Point Load test ISRM 1985: Suggested Method	24
Consolidated undrained triaxial compression test BS 1377-8:1990 (s)	1
Deformability in uniaxial compression ISRM 1985: Suggested Method	3

Notes: Observations and interpretations are not accredited by UKAS
# denotes non-accredited test
a denotes UKAS accredited test
s denotes test undertaken by approved subcontractor

This report is issued in accordance with the requirements of the United kingdom Accreditation Services and EN ISO/IEC 17025:2005. The results reported herein relate only to the material supplied to the laboratory. This report shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved Signatories: Chris Bolan (Managing Director) – Daniel Kerfoot (Laboratory Manager)

SUMMARY OF LABORATORY SOIL TEST RESULTS

BH / TP / WS Number	Sample Type	Depth From (m)	Depth To (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Shear Strength (kN/m^2)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 0.425mm (%)	Soil Classification	UKAS accredited test (Y/N)	Description / Test Method Samples described in accordance with BS EN ISO 14688-2 2004
BH01	BD	1.50	1.50	19	-	-	-	28	13	15	67	CL	Y	Brown clayey silty gravelly fine to coarse grained SAND. Gravel is fine to medium subangular to subrounded sandstone. (BS1377Pt2:3.2,4.4,5,9.2,9.4)

SITE: THE CHRISTIE, MANCHESTER (CCG-C-18-10614) DATE: 11.02.19

CLIENT: INTERSERVE

UKAS TESTING 4514

Key:- BD = Bulk Disturbed; SD = Small Disturbed; U100 = Undisturbed 100mm; WS = Window Sample
CL = Low Plasticity; CI = Intermediate; CH = High; CV = Very high; CE = Extremely high; NP = Non-plastic
(* Denotes Hand Shear Vane test result)
Sample description not accredited by UKAS

SUMMARY OF LABORATORY SOIL TEST RESULTS

BH / TP / WS Number	Sample Type	Depth From (m)	Depth To (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Shear Strength (kN/m^2)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 0.425mm (%)	Soil Classification	UKAS accredited test (Y/N)	Description / Test Method Samples described in accordance with BS EN ISO 14688-2 2004
BH02	BD	2.50	2.50	29	-	-	-	-	-	-	97	NP	Y	Brown silty fine to medium grained SAND. (BS1377Pt2:3.2,4.4,5,9.2,9.4)

SITE: THE CHRISTIE, MANCHESTER (CCG-C-18-10614) DATE: 11.02.19

CLIENT: INTERSERVE

UKAS TESTING 4514

Key:- BD = Bulk Disturbed; SD = Small Disturbed; U100 = Undisturbed 100mm; WS = Window Sample
CL = Low Plasticity; CI = Intermediate; CH = High; CV = Very high; CE = Extremely high; NP = Non-plastic
(* Denotes Hand Shear Vane test result)
Sample description not accredited by UKAS

SUMMARY OF LABORATORY SOIL TEST RESULTS

BH / TP / WS Number	Sample Type	Depth From (m)	Depth To (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Shear Strength (kN/m^2)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 0.425mm (%)	Soil Classification	UKAS accredited test (Y/N)	Description / Test Method Samples described in accordance with BS EN ISO 14688-2 2004
BH03	BD	2.50	2.50	11	-	-	-	-	-	-	97	NP	Y	Brown silty fine to medium grained SAND. (BS1377Pt2:3.2,4.4,5)
BH03	BD	3.50	3.50	34	-	-	-	-	-	-	99	NP	Y	Brown silty slightly clayey fine to medium grained SAND. (BS1377Pt2:3.2,4.4,5,9.2,9.4)

SITE: THE CHRISTIE, MANCHESTER (CCG-C-18-10614) DATE: 11.02.19

CLIENT: INTERSERVE

UKAS TESTING 4514

Key:- BD = Bulk Disturbed; SD = Small Disturbed; U100 = Undisturbed 100mm; WS = Window Sample
CL = Low Plasticity; CI = Intermediate; CH = High; CV = Very high; CE = Extremely high; NP = Non-plastic
(* Denotes Hand Shear Vane test result)
Sample description not accredited by UKAS

SUMMARY OF LABORATORY SOIL TEST RESULTS

BH / TP / WS Number	Sample Type	Depth From (m)	Depth To (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Shear Strength (kN/m^2)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 0.425mm (%)	Soil Classification	UKAS accredited test (Y/N)	Description / Test Method Samples described in accordance with BS EN ISO 14688-2 2004
BH04	U100	2.00	2.45	27	-	-	-	51	20	31	91	CH	Y	Brown slightly sandy slightly gravelly silty CLAY. Gravel is fine to medium subangular to subrounded sandstone. (BS1377Pt2:3.2,4.4,5,9.2,9.4)

SITE: THE CHRISTIE, MANCHESTER (CCG-C-18-10614) DATE: 11.02.19

CLIENT: INTERSERVE

UKAS TESTING 4514

Key:- BD = Bulk Disturbed; SD = Small Disturbed; U100 = Undisturbed 100mm; WS = Window Sample
CL = Low Plasticity; CI = Intermediate; CH = High; CV = Very high; CE = Extremely high; NP = Non-plastic
(* Denotes Hand Shear Vane test result)
Sample description not accredited by UKAS

SUMMARY OF LABORATORY SOIL TEST RESULTS

BH / TP / WS Number	Sample Type	Depth From (m)	Depth To (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Shear Strength (kN/m^2)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 0.425mm (%)	Soil Classification	UKAS accredited test (Y/N)	Description / Test Method Samples described in accordance with BS EN ISO 14688-2 2004
TP02	BD	2.00	2.00	12	-	-	-	28	14	14	93	CL	Y	Brown slightly sandy slightly gravelly silty CLAY. Gravel is fine to medium subrounded sandstone. (BS1377Pt2:3.2,4.4,5)
TP03	BD	2.00	2.00	34	-	-	-	29	14	15	95	CL	Y	Brown slightly sandy slightly gravelly silty CLAY. Gravel is fine to medium subrounded sandstone. (BS1377Pt2:3.2,4.4,5)

SITE: THE CHRISTIE, MANCHESTER (CCG-C-18-10614) DATE: 11.02.19

CLIENT: INTERSERVE

UKAS TESTING 4514

Key:- BD = Bulk Disturbed; SD = Small Disturbed; U100 = Undisturbed 100mm; WS = Window Sample
CL = Low Plasticity; CI = Intermediate; CH = High; CV = Very high; CE = Extremely high; NP = Non-plastic
(* Denotes Hand Shear Vane test result)
Sample description not accredited by UKAS

SUMMARY OF LABORATORY SOIL TEST RESULTS

BH / TP / WS Number	Sample Type	Depth From (m)	Depth To (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Shear Strength (kN/m^2)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 0.425mm (%)	Soil Classification	UKAS accredited test (Y/N)	Description / Test Method Samples described in accordance with BS EN ISO 14688-2 2004
WS01	U80	1.00	1.40	12	-	-	-	20	13	7	95	CL	Y	Brown slightly sandy slightly gravelly silty CLAY. Gravel is fine to medium subrounded sandstone. (BS1377Pt2:3.2,4.4,5)

SITE: THE CHRISTIE, MANCHESTER (CCG-C-18-10614) DATE: 11.02.19

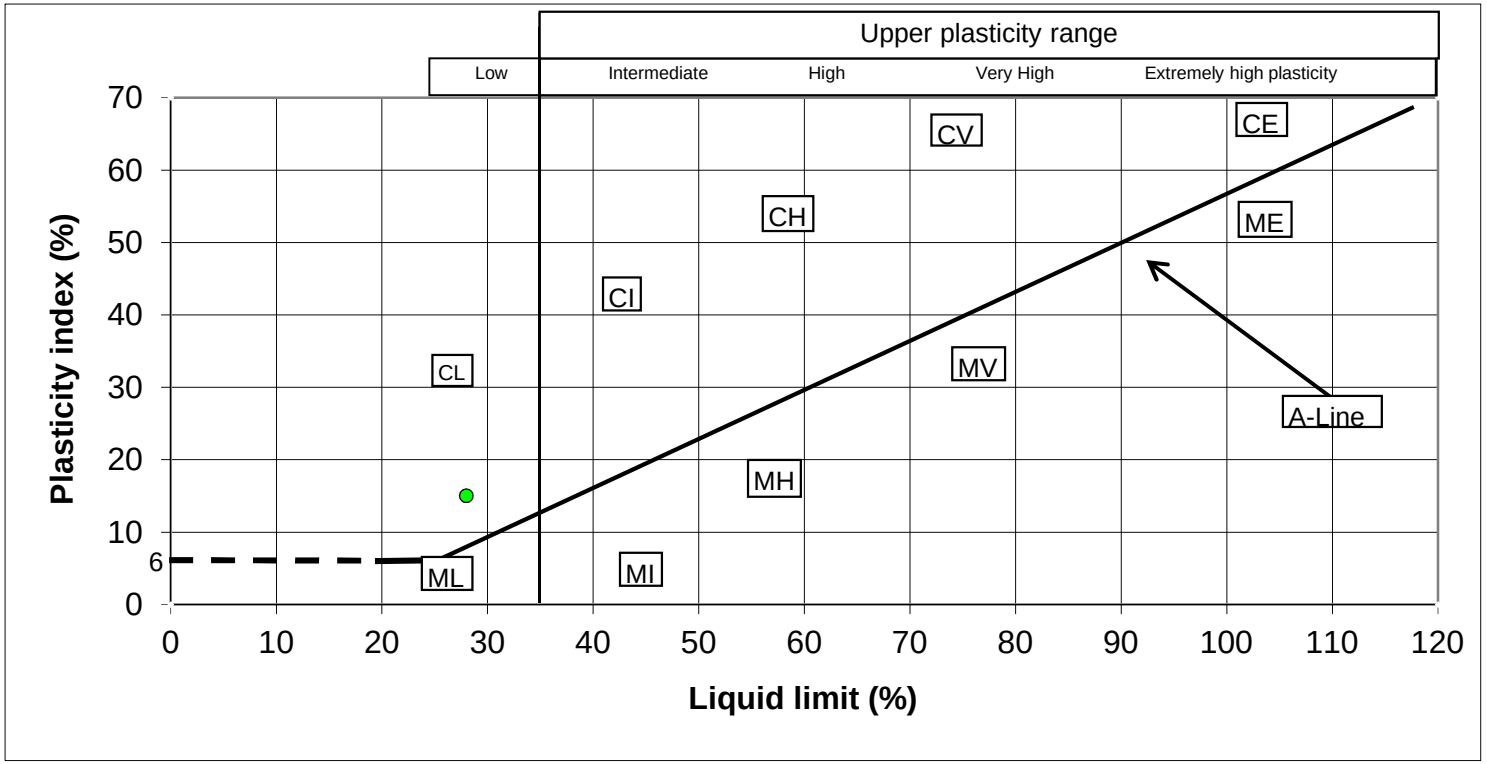
CLIENT: INTERSERVE

UKAS TESTING 4514

Key:- BD = Bulk Disturbed; SD = Small Disturbed; U100 = Undisturbed 100mm; WS = Window Sample
CL = Low Plasticity; CI = Intermediate; CH = High; CV = Very high; CE = Extremely high; NP = Non-plastic
(* Denotes Hand Shear Vane test result)
Sample description not accredited by UKAS

ATTERBERG TEST RESULT SHEET
BS 1377:Part 2:1990:cl 4.4,5

SILT (M-SOIL), M plots below A-Line , CLAY,C, plots above A-Line, M and C may be combined as FINE SOIL, F.



BH	Sample Depth	Liquid limit	Plasticity index
BH01	1.50	28.0	15.0

UKAS TESTING
4514

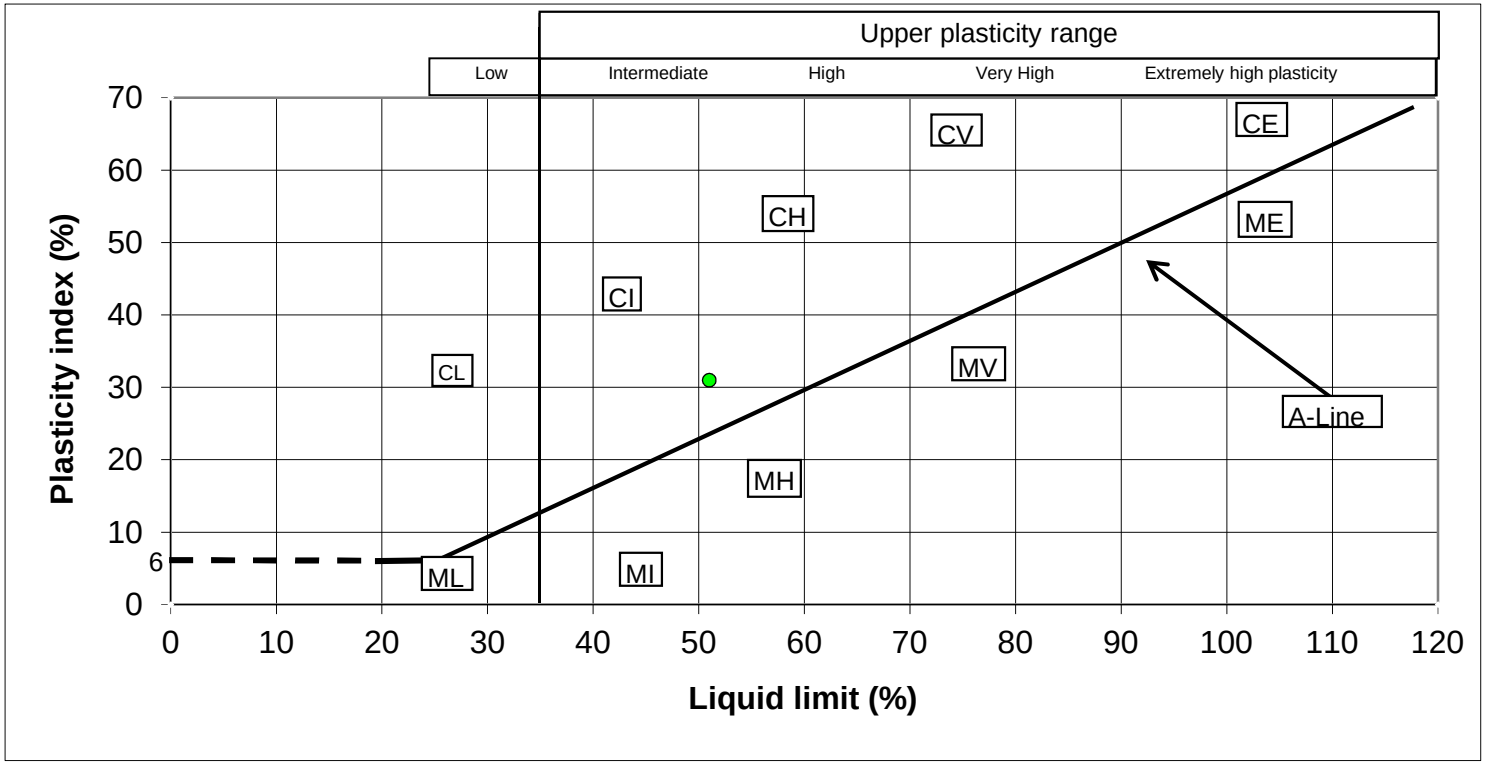
APPROVED BY	DK

CLIENT: INTERSERVE	SITE: THE CHRISTIE, MANCHESTER (CCG-C-18-10614)

ATTERBERG TEST RESULT SHEET

BS 1377:Part 2:1990:cl 4.4,5

SILT (M-SOIL), M plots below A-Line , CLAY,C, plots above A-Line, M and C may be combined as FINE SOIL, F.



BH	Sample Depth	Liquid limit	Plasticity index
BH04	2.0-2.45	51.0	31.0

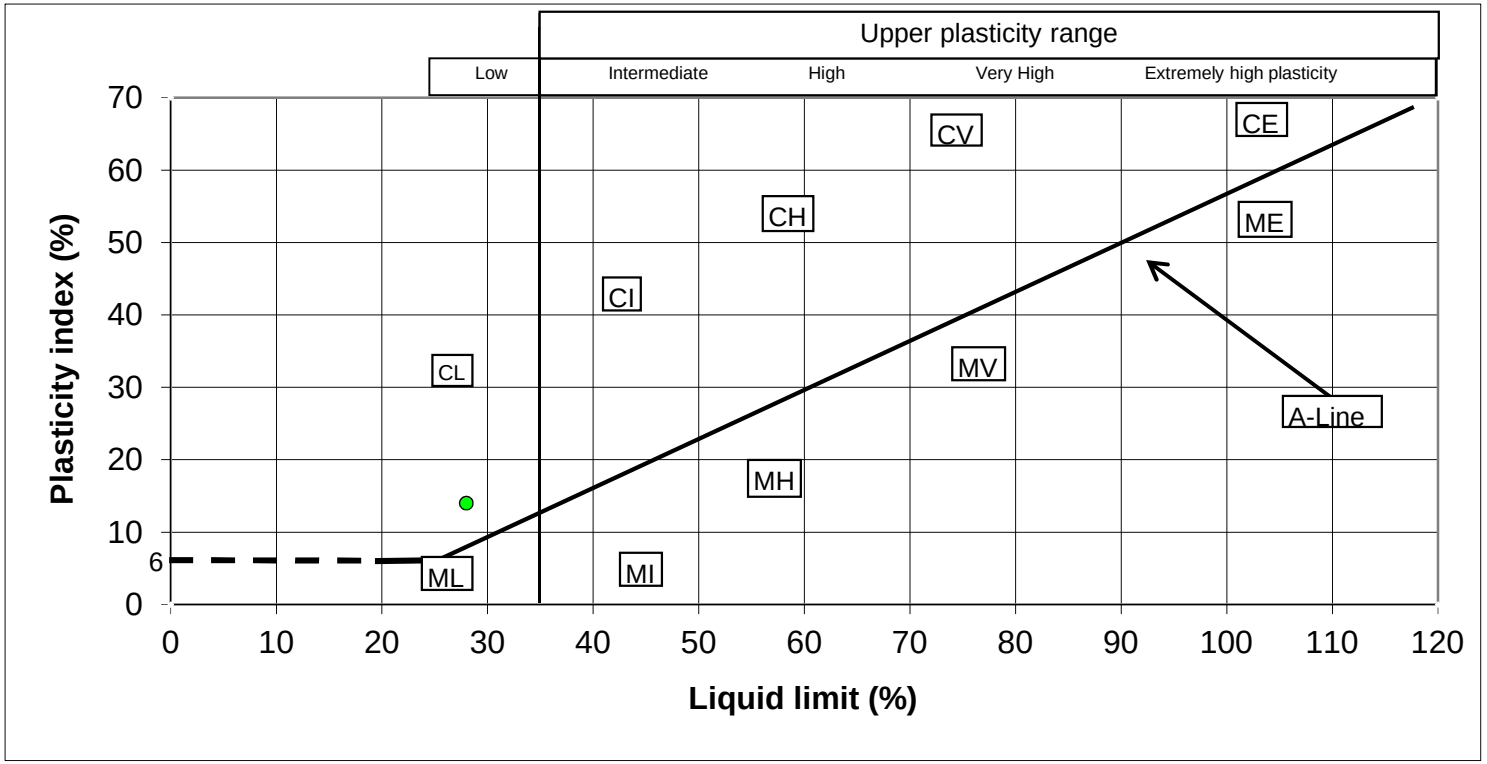
UKAS TESTING
4514

APPROVED BY	DK

CLIENT: INTERSERVE	SITE: THE CHRISTIE, MANCHESTER (CCG-C-18-10614)

ATTERBERG TEST RESULT SHEET
BS 1377:Part 2:1990:cl 4.4,5

SILT (M-SOIL), M plots below A-Line , CLAY,C, plots above A-Line, M and C may be combined as FINE SOIL, F.



BH	Sample Depth	Liquid limit	Plasticity index
TP02	2.00	28.0	14.0

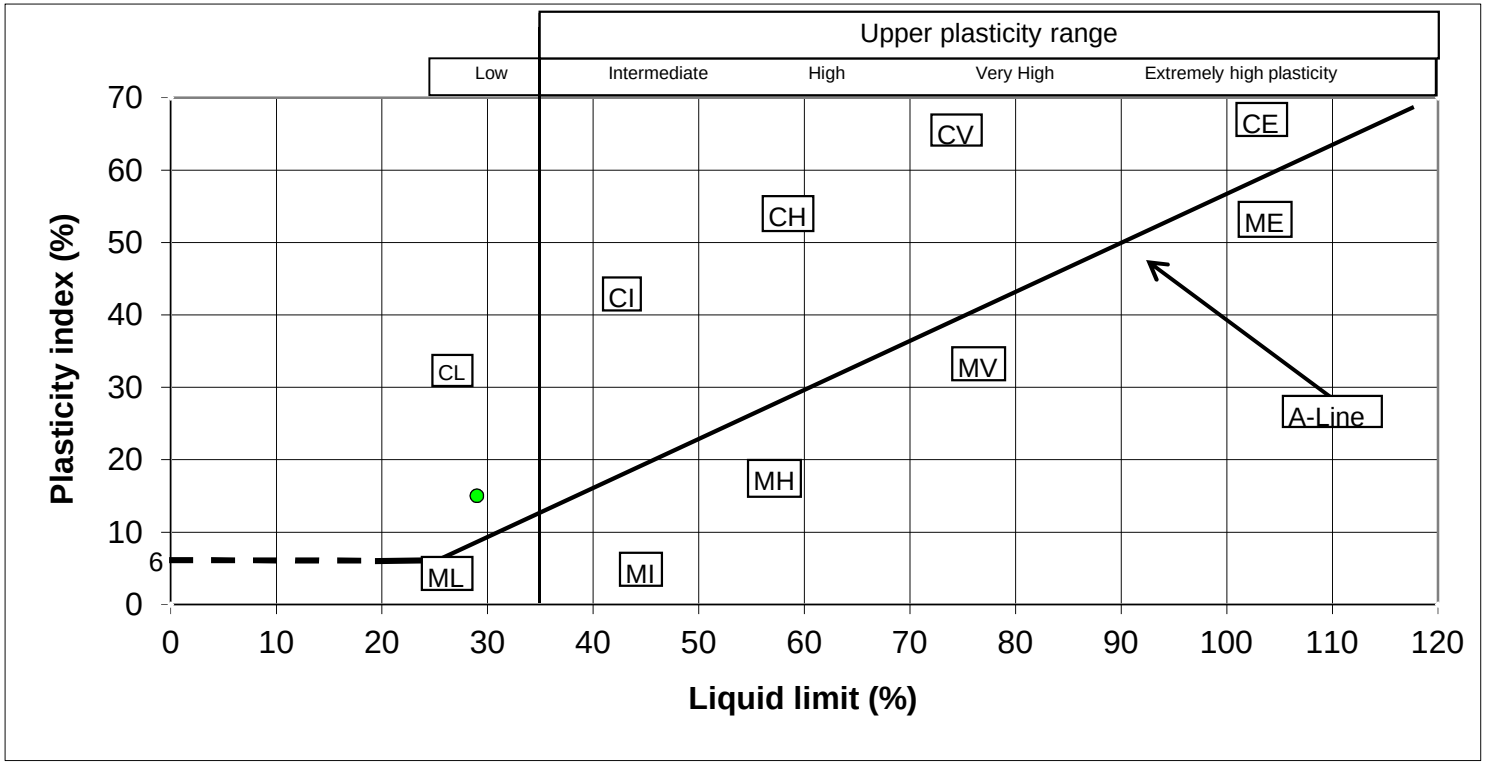
UKAS TESTING
4514

APPROVED BY	DK

CLIENT: INTERSERVE	SITE: THE CHRISTIE, MANCHESTER (CCG-C-18-10614)

ATTERBERG TEST RESULT SHEET
BS 1377:Part 2:1990:cl 4.4,5

SILT (M-SOIL), M plots below A-Line , CLAY,C, plots above A-Line, M and C may be combined as FINE SOIL, F.



BH	Sample Depth	Liquid limit	Plasticity index
TP03	2.00	29.0	15.0

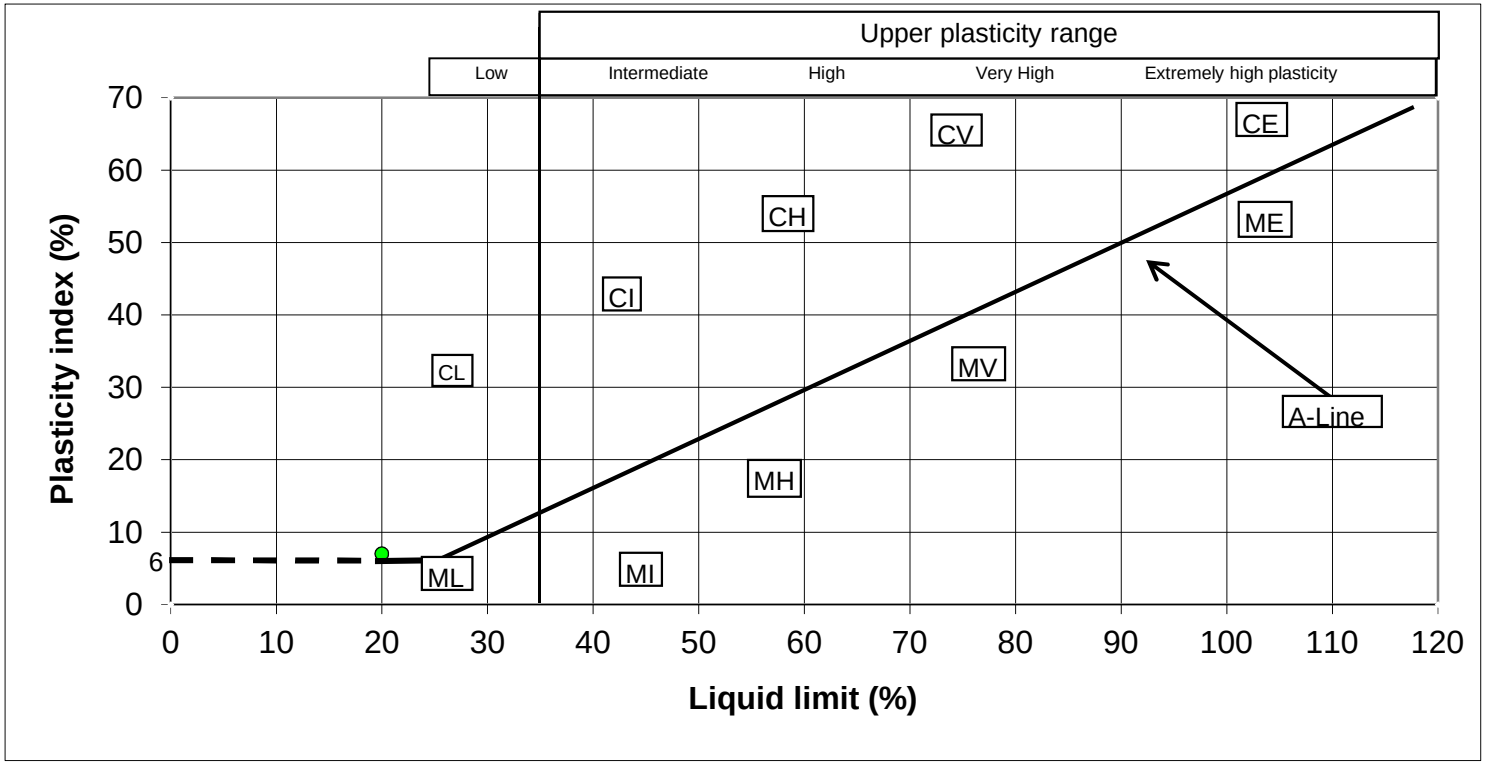
UKAS TESTING
4514

APPROVED BY	DK

CLIENT: INTERSERVE	SITE: THE CHRISTIE, MANCHESTER (CCG-C-18-10614)

ATTERBERG TEST RESULT SHEET
BS 1377:Part 2:1990:cl 4.4,5

SILT (M-SOIL), M plots below A-Line , CLAY,C, plots above A-Line, M and C may be combined as FINE SOIL, F.



BH	Sample Depth	Liquid limit	Plasticity index
WS01	1.0-2.0	20.0	7.0

UKAS TESTING
4514

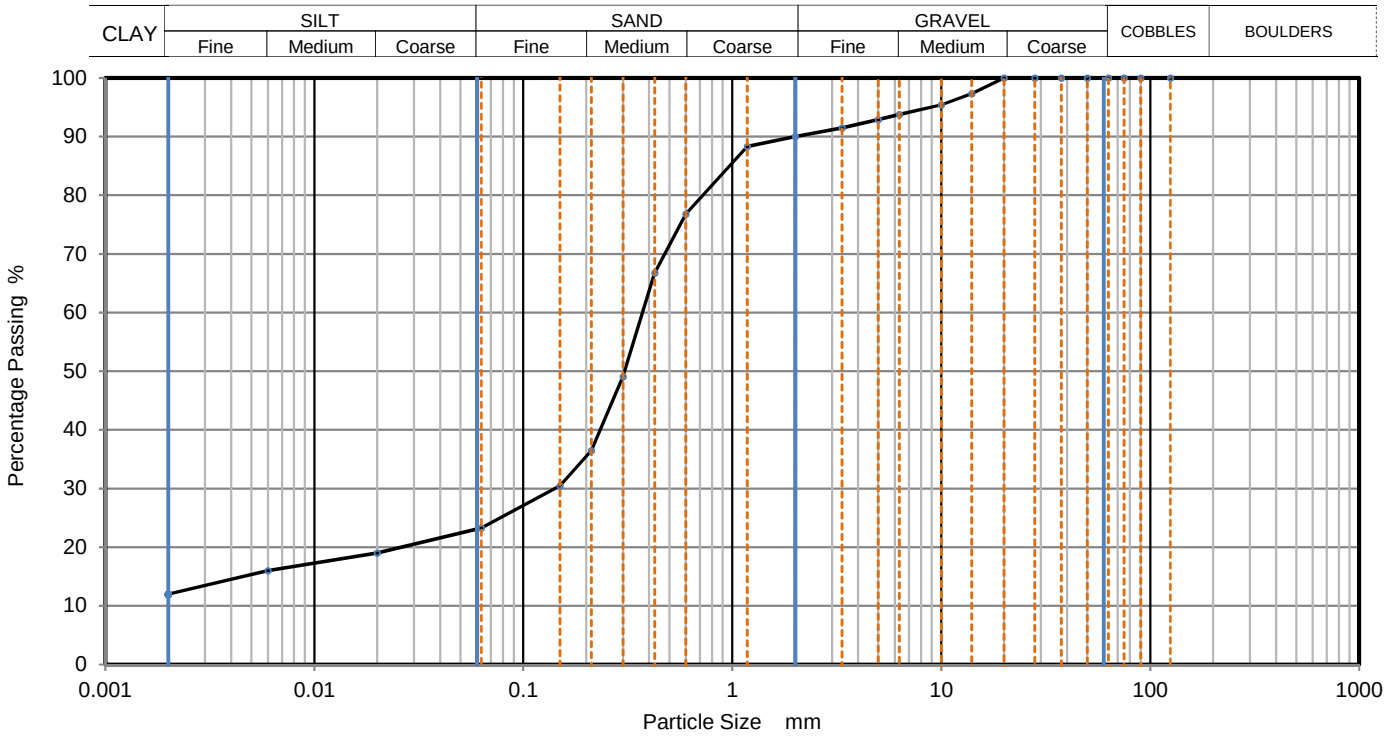
APPROVED BY	DK

CLIENT: INTERSERVE	SITE: THE CHRISTIE, MANCHESTER (CCG-C-18-10614)

CC Geotechnical Ltd
Tel: 0151 545 2750
e: lab@ccgeotechnical.com

PARTICLE SIZE DISTRIBUTION

				Job Ref	CCG-C-18-10614
				Borehole/Pit No.	BH01
Site Name	THE CHRISTIE, MANCHESTER			Sample No.	3
Specimen Description	Brown clayey silty gravelly fine to coarse grained SAND. Gravel is fine to medium subangular to subrounded sandstone			Depth, m	1.50
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	WET SIEVE & PIPETTE			KeyLAB ID	



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0200	19
90	100	0.0060	16
75	100	0.0020	12
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	97		
10	95		
6.3	94		
5	93		
3.35	91		
2	90		
1.18	88		
0.6	77		
0.425	67		
0.3	49		
0.212	36		
0.15	30		
0.063	23		

Dry Mass of sample, g: 1611

Sample Proportions	% dry mass
Very coarse	0
Gravel	10
Sand	67
Silt	11
Clay	12

Grading Analysis		
D_{100}	mm	
D_{60}	mm	
D_{30}	mm	
D_{10}	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

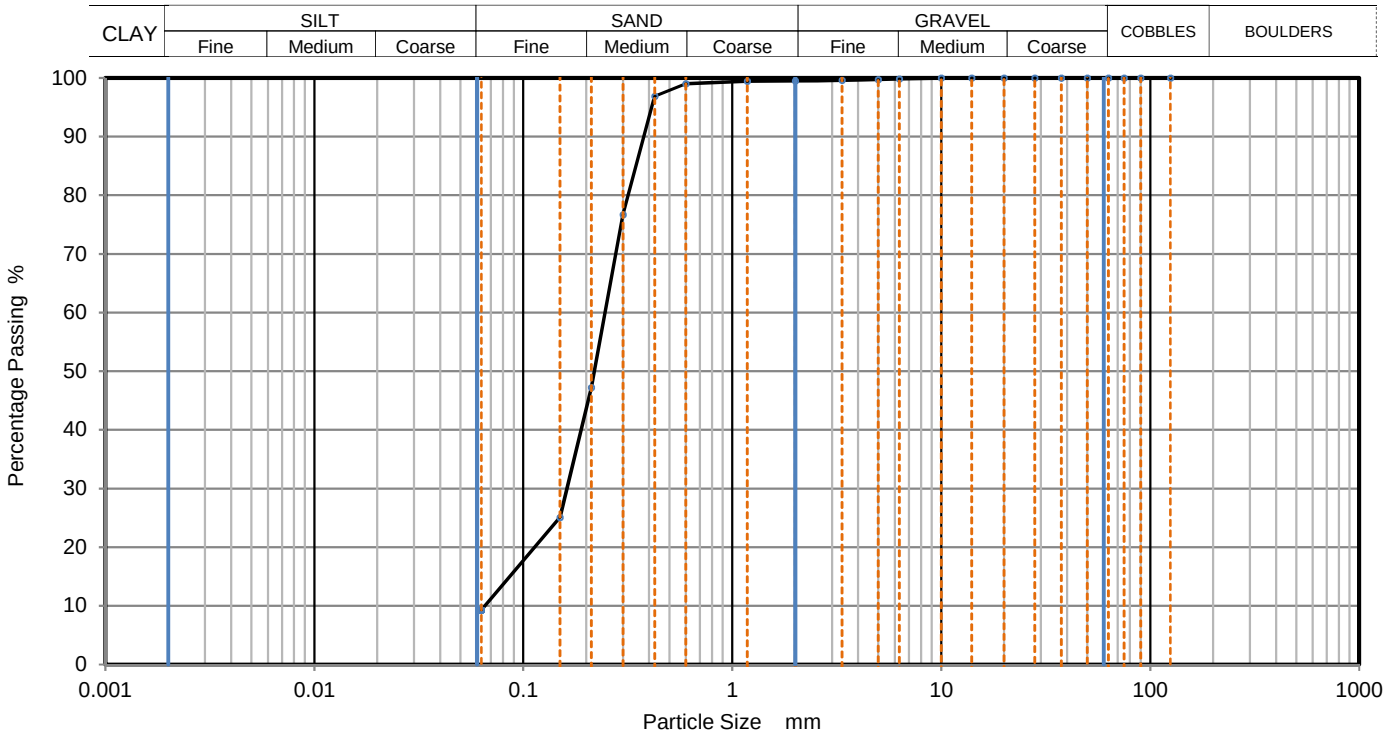
Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	Fig
MH	DK	DK	11/02/2019 10:29	Sheet

CC Geotechnical Ltd
Tel: 0151 545 2750
e: lab@ccgeotechnical.com

PARTICLE SIZE DISTRIBUTION

				Job Ref	CCG-C-18-10614
				Borehole/Pit No.	BH02
Site Name	THE CHRISTIE, MANCHESTER			Sample No.	5
Specimen Description	Brown silty fine to medium grained SAND			Depth, m	2.50
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	WET SIEVE			KeyLAB ID	



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	99		
0.6	99		
0.425	97		
0.3	77		
0.212	47		
0.15	25		
0.063	9		

Dry Mass of sample, g	728

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	91
Fines <0.063mm	9

Grading Analysis		
D_{100}	mm	
D_{60}	mm	
D_{30}	mm	
D_{10}	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

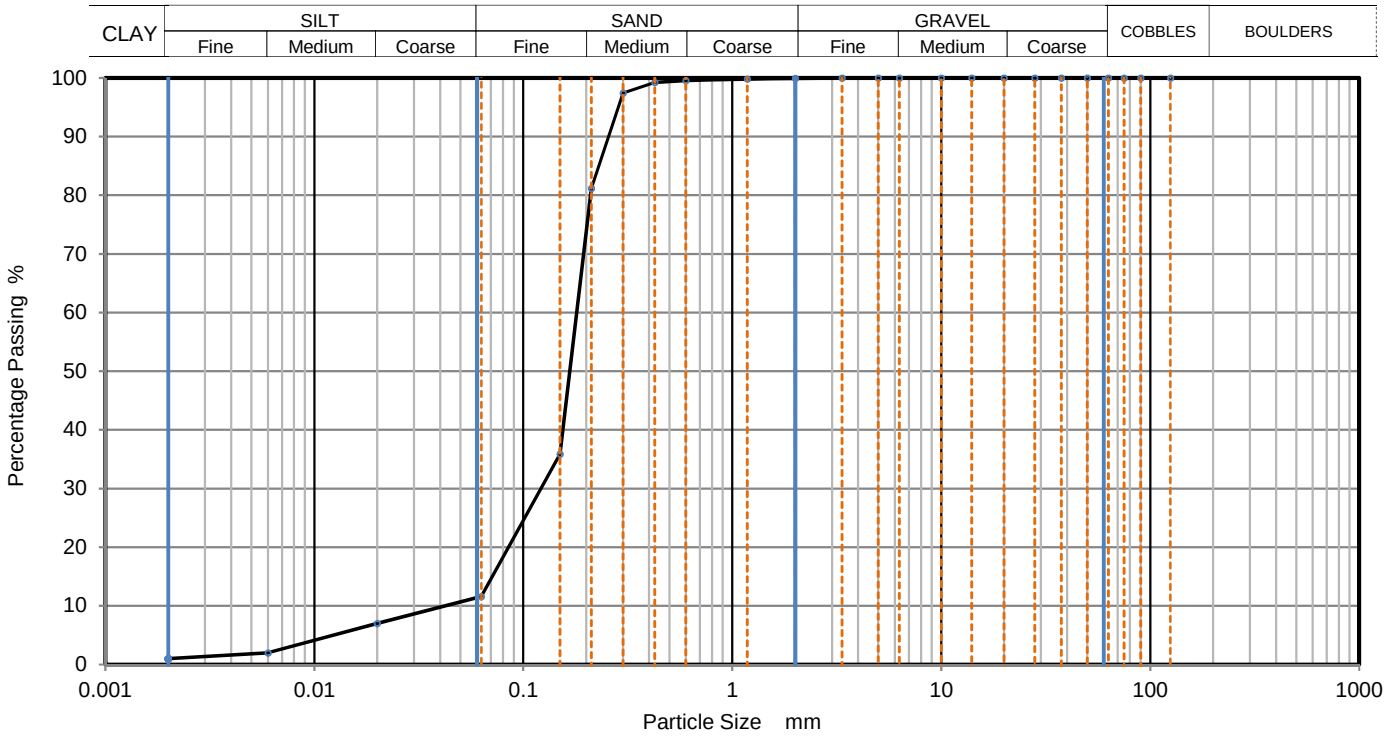
Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	Fig
MH	DK	DK	11/02/2019 10:35	Sheet

CC Geotechnical Ltd
Tel: 0151 545 2750
e: lab@ccgeotechnical.com

PARTICLE SIZE DISTRIBUTION

				Job Ref	CCG-C-18-10614
				Borehole/Pit No.	BH03
Site Name	THE CHRISTIE, MANCHESTER			Sample No.	7
Specimen Description	Brown silty slightly clayey fine to medium grained SAND			Depth, m	3.50
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	WET SIEVE & PIPETTE			KeyLAB ID	



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0200	7
90	100	0.0060	2
75	100	0.0020	1
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100		
0.425	99		
0.3	97		
0.212	81		
0.15	36		
0.063	12		

Dry Mass of sample, g	885

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	88
Silt	11
Clay	1

Grading Analysis		
D_{100}	mm	
D_{60}	mm	
D_{30}	mm	
D_{10}	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

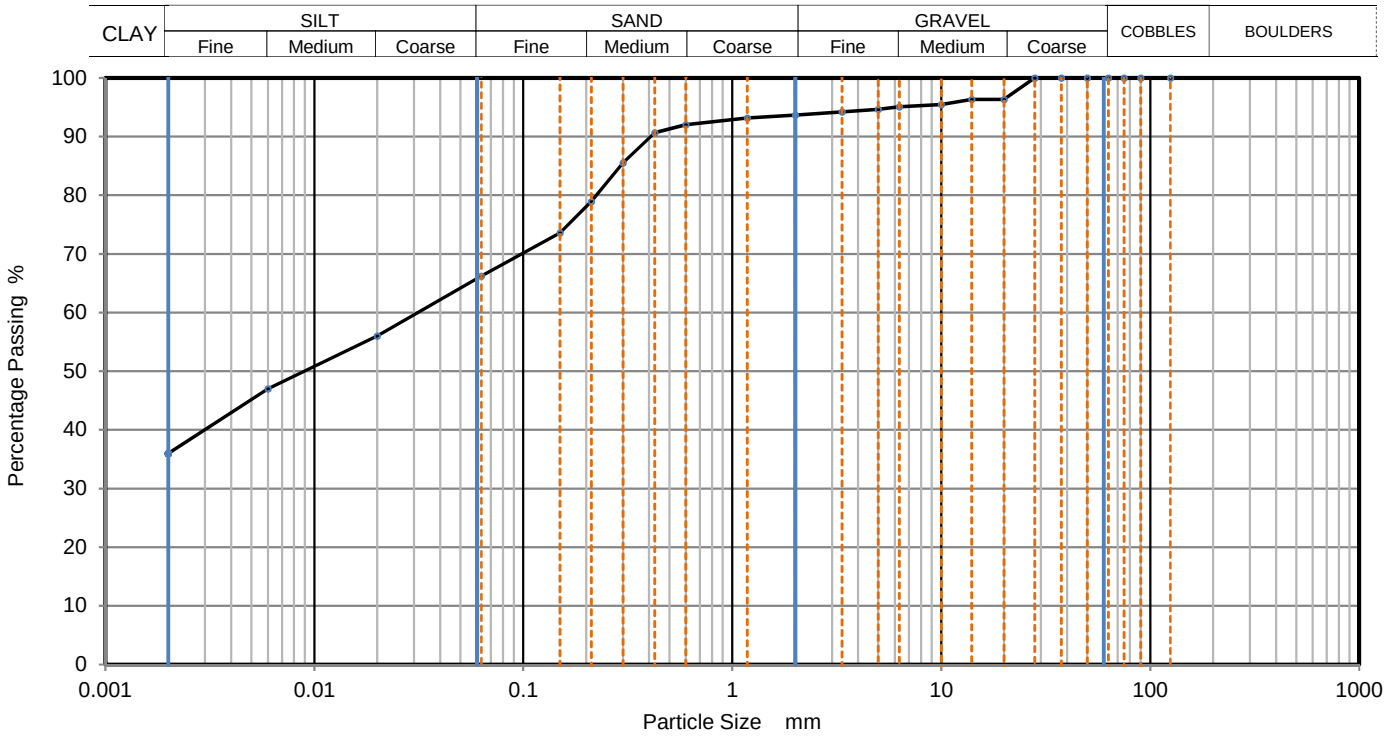
Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	Fig
MH	DK	DK	11/02/2019 10:46	Sheet

CC Geotechnical Ltd
Tel: 0151 545 2750
e: lab@ccgeotechnical.com

PARTICLE SIZE DISTRIBUTION

Job Ref	CCG-C-18-10614		
Borehole/Pit No.	BH04		
Site Name	THE CHRISTIE, MANCHESTER	Sample No.	4
Specimen Description	Brown slightly sandy slightly gravelly silty CLAY. Gravel is fine to coarse subrounded to subangular sandstone	Depth, m	2.00-2.45
Specimen Reference	Specimen Depth: m	Sample Type	B
Test Method	WET SIEVE & PIPETTE	KeyLAB ID	



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0200	56
90	100	0.0060	47
75	100	0.0020	36
63	100		
50	100		
37.5	100		
28	100		
20	96		
14	96		
10	95		
6.3	95		
5	95		
3.35	94		
2	94		
1.18	93		
0.6	92		
0.425	91		
0.3	86		
0.212	79		
0.15	74		
0.063	66		

Dry Mass of sample, g: 1481

Sample Proportions	% dry mass
Very coarse	0
Gravel	6
Sand	28
Silt	30
Clay	36

Grading Analysis	
D_{100} mm	
D_{60} mm	
D_{30} mm	
D_{10} mm	
Uniformity Coefficient	
Curvature Coefficient	

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	Fig
MH	DK	DK	11/02/2019 10:55	Sheet

POINT LOAD TEST RESULTS

ISRM 1985: Suggested Method

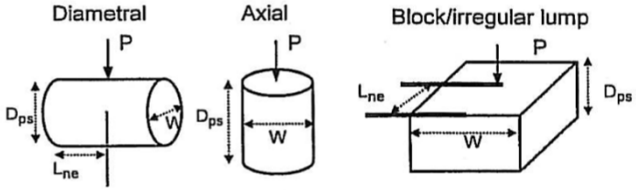
PROJECT No.:- CCG-C-18-10614 SITE:- TH E CHRISTIE, MANCHESTER DATE: 21.02.19

Borehole Number	Depth (m)	Type of Test* a	d	i	Width (W) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MPa)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MPa)	Estimated Uniaxial Compressive Strength (MPa)	Water Content (NAT/SAT)	Orientation to plane of weakness
BH01	6.60	a			85	74	1.50	89	0.19	1.30	0.24	4.87	NAT	p
BH01	9.15	a			85	55	1.30	77	0.22	1.22	0.27	5.31	NAT	p
BH01	9.45	a			85	44	1.20	69	0.25	1.16	0.29	5.83	NAT	p
BH01	11.85	a			85	68	1.40	86	0.19	1.27	0.24	4.85	NAT	p
BH01	15.60	a			85	80	1.20	93	0.14	1.32	0.18	3.67	NAT	p
BH01	15.85	a			85	53	1.40	76	0.24	1.21	0.29	5.88	NAT	p
BH01	19.60	a			85	67	1.80	85	0.25	1.27	0.32	6.31	NAT	p
BH01	19.60	a			85	80	2.00	93	0.23	1.32	0.31	6.11	NAT	p

*NOTE- a = axial ; d = diametral ; i = irregular lump or block (see diagrams, right, for details)
p = perpendicular; l = parallel, u = unkown

DIA. KEY- P = load ; Dps = platen seperation ;
W = width of shortest dimension perpendicular to load ;
Lne = length from platens to nearest free end

UKAS TESTING 4514



TESTED BY: JE APPROVED BY: DK

POINT LOAD TEST RESULTS

ISRM 1985: Suggested Method

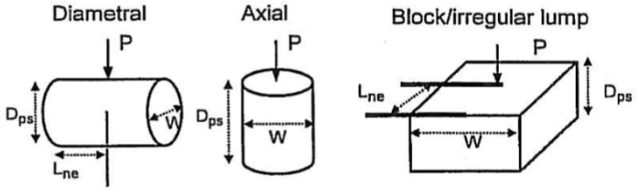
PROJECT No.:- CCG-C-18-10614 SITE:- TH E CHRISTIE, MANCHESTER DATE: 21.02.19

Borehole Number	Depth (m)	Type of Test* a	d	i	Width (W) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MPa)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MPa)	Estimated Uniaxial Compressive Strength (MPa)	Water Content (NAT/SAT)	Orientation to plane of weakness
BH02	6.40	a			85	65	0.70	84	0.10	1.26	0.13	2.51	NAT	p
BH02	10.00	a			85	62	0.80	82	0.12	1.25	0.15	2.98	NAT	p
BH02	11.70	a			85	47	0.80	71	0.16	1.17	0.18	3.69	NAT	p
BH02	14.55	a			85	54	0.90	76	0.15	1.21	0.19	3.73	NAT	p

*NOTE- a = axial ; d = diametral ; i = irregular lump or block (see diagrams, right, for details)
p = perpendicular; l = parallel, u = unkown

DIA. KEY- P = load ; Dps = platen seperation ;
W = width of shortest dimension perpendicular to load ;
Lne = length from platens to nearest free end

UKAS TESTING 4514



TESTED BY: JE APPROVED BY: DK

POINT LOAD TEST RESULTS

ISRM 1985: Suggested Method

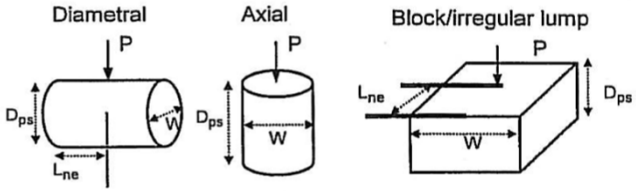
PROJECT No.:- CCG-C-18-10614 SITE:- TH E CHRISTIE, MANCHESTER DATE: 21.02.19

Borehole Number	Depth (m)	Type of Test* a	d	i	Width (W) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MPa)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MPa)	Estimated Uniaxial Compressive Strength (MPa)	Water Content (NAT/SAT)	Orientation to plane of weakness
BH03	8.20	a			85	63	0.80	83	0.12	1.25	0.15	2.94	NAT	p
BH03	11.90	a			85	58	0.30	79	0.05	1.23	0.06	1.18	NAT	p
BH03	23.75	a			85	47	0.40	71	0.08	1.17	0.09	1.85	NAT	p
BH03	23.45	a			85	54	0.90	76	0.15	1.21	0.19	3.73	NAT	p
BH03	14.90	a			85	63	0.70	83	0.10	1.25	0.13	2.57	NAT	p
BH03	20.50	a			85	51	0.70	74	0.13	1.20	0.15	3.03	NAT	p

*NOTE- a = axial ; d = diametral ; i = irregular lump or block (see diagrams, right, for details)
p = perpendicular; l = parallel, u = unkown

DIA. KEY- P = load ; Dps = platen seperation ;
W = width of shortest dimension perpendicular to load ;
Lne = length from platens to nearest free end

UKAS TESTING 4514



TESTED BY: JE APPROVED BY: DK

POINT LOAD TEST RESULTS

ISRM 1985: Suggested Method

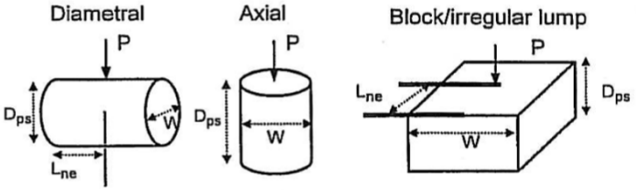
PROJECT No.:- CCG-C-18-10614 SITE:- TH E CHRISTIE, MANCHESTER DATE: 21.02.19

Borehole Number	Depth (m)	Type of Test* a	d	i	Width (W) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MPa)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MPa)	Estimated Uniaxial Compressive Strength (MPa)	Water Content (NAT/SAT)	Orientation to plane of weakness
BH04	6.30	a			85	62	1.10	82	0.16	1.25	0.20	4.09	NAT	p
BH04	8.45	a			85	58	0.90	79	0.14	1.23	0.18	3.53	NAT	p
BH04	12.45	a			85	43	0.30	68	0.06	1.15	0.07	1.48	NAT	p
BH04	12.30	a			85	63	0.40	83	0.06	1.25	0.07	1.47	NAT	p
BH04	16.20	a			85	78	1.60	92	0.19	1.31	0.25	4.98	NAT	p
BH04	16.70	a			85	55	1.10	77	0.18	1.22	0.22	4.49	NAT	p

*NOTE- a = axial ; d = diametral ; i = irregular lump or block (see diagrams, right, for details)
p = perpendicular; l = parallel, u = unkown

DIA. KEY- P = load ; Dps = platen seperation ;
W = width of shortest dimension perpendicular to load ;
Lne = length from platens to nearest free end

UKAS TESTING 4514



TESTED BY: JE APPROVED BY: DK

TEST REPORT

UNIAXIAL COMPRESSIVE STRENGTH

In accordance with ISRM Vol 16 No 2, pp 135-140 (1979)

PROJECT:	**THE CHRISTIE, MANCHESTER**
CLIENT:	**INTERSERVE**
CCG REF:	**CCG-C-18-10614**
Sample ref:	BH01 19.80mbgl
Date of coring:	24.01.19
Sampled by:	DB/AH
Sample description:	SANDSTONE

TEST DATA

Specimen Height (mm):	170
Specimen Diameter (mm):	85
L/D ratio:	2:1
Mode of failure:	AXIAL CLEAVAGE
Test duration:	4m 31s
Maximum load at failure (kN):	21.5
Compressive strength (N/mm2):	**3.8**

Test date:	25.02.19
Tested by:	**JE**
Report prepared by:	**DK**
Report approved by:	**DK**

SOIL ENGINEERING

TEST REPORT

UKAS TESTING 1265

Serial number: LT1792 Date of issue: 09/04/2019

Issued by Soil Engineering Geoservices Limited,
Parkside Lane,
Dewsbury Road,
Leeds
LS11 5SX.
Tel: 0113 2711111
Fax: 0113 2760472
Email: enquiries@soil-engineering.co.uk

Authorised signatory

P. Rodgers		(Technical Manager)
K. A. Walker		(Laboratory Manager)
S. Harper	√	(Laboratory Production Manager)

Customer name	CC Geotechnical Limited
Address	Units 1 & 2 Deltic Place Knowsley Industrial Estate Liverpool Merseyside L33 7BU
Contract name	The Christie, Manchester
Your reference	18/10614
Dates of receipt of samples	30/01/2019
Dates of testing	26/02/2019 to 20/03/2019

Sampling was not performed by the Laboratory of Soil Engineering.

Testing was performed on 6 number of samples received in good condition.

Opinions and interpretations expressed herein are outside the scope of our UKAS accreditation.

Results reported relate only to the samples tested.

Tests marked 'Not UKAS' in this report are not included in the UKAS accreditation schedule for our laboratory. These results will appear in italics on any summary of tests.

Samples will be retained for 28 days from date of issue of this report and then be disposed of, unless we receive written instruction to the contrary

This test report shall not be reproduced except in full without the written permission of Soil Engineering Geoservices Limited.

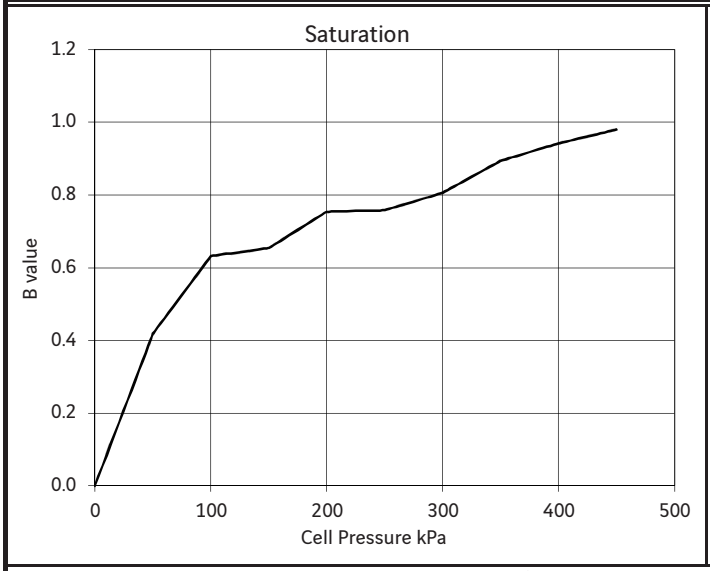
Key to Laboratory Summary Sheets

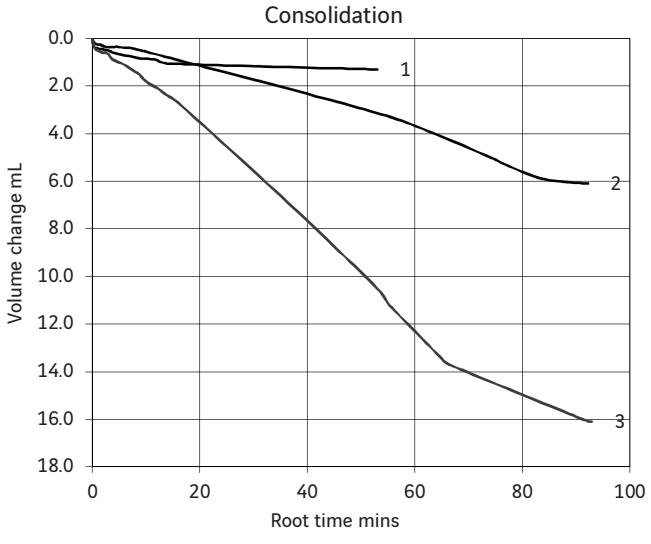
Common to all summaries				
Sample Type	U	Undisturbed sample	D	Small disturbed sample
	P	Piston sample	B	Bulk disturbed sample
	TW	Thin walled sample	BLK	Block sample
	L	Liner sample	C	Rock core
	AMAL	Amalgamated sample		
Test status	Any result in *italics* indicates a test that is not within the scope of the UKAS accreditation for this laboratory.			
Summary of Laboratory Soil Tests: Index / Classification Tests				
Particle density	p	Small pyknometer method	g	Gas jar method
Plastic index	N/P	Non plastic, although liquid limit will have been determined if requested		
Particle size (PSD)	1	Following value in silt column denotes combined clay and silt fraction		
	p	Following value in clay column denotes sedimentation by pipette, else sedimentation is by hydrometer.		
Summary of Laboratory Soil Tests: Strength and Permeability Tests				
Triaxial	UU	Single stage unconsolidated quick undrained	UUM	Multi stage unconsolidated quick undrained
	UU3	Set of 3 unconsolidated quick undrained	CU	Single stage consolidated undrained
	CUM	Multi stage consolidated undrained	CU3	Set of 3 consolidated undrained
	CD	Single stage consolidated drained	CDM	Multi stage consolidated drained
	CD3	Set of 3 consolidated drained		
	Note that single stage tests are reported assuming f = 0 for total stress and c' = 0 for effective stress			
Consol	Oed	One-dimensional oedometer	Hyd	Hydraulic cell consolidation
	m_v	coefficient of compressibility quoted for p0 to p0 + 100kPa, where determined		
Permeability	C	Constant head permeability	T	Triaxial permeability
Shearbox	SSB	Small shear box	LSB	Large shear box
	p	Peak value	r	Residual value
	RS	Ring shear		
Summary of Laboratory Soil Re-Use Test				
MCV	s	MCV value at natural or specified moisture content	int	Intercept of calibration line in MCV calibration
Summary of Laboratory Rock Strength Tests				
Point Load Type	D	Diametral	A	Axial
(Combination of)	I	Irregular lump	B	Block
	L	Test performed parallel to planes of weakness		
	P	Test performed perpendicular to planes of weakness		
	X	Invalid failure of point load (not broken between points of load application)		
Summary of Laboratory Rock Materials Tests				
Ten% fines	w	Soaked test	d	Dry test
Point Load Index Result				
Point Load Type	D	Diametral	A	Axial
(Combination of)	I	Irregular lump	B	Block
	L	Parallel to planes of weakness	P	Perpendicular to planes of weakness
	X	Invalid failure of point load (not broken between points of load application)		
Dimensions	W	Diameter of core or average smallest width perpendicular to axis of loading in a block or irregular lump		
	D	Distance between platens when just in contact with specimen		
	D'	Distance between platens at point of failure		
	De	Equivalent core diameter	Is	P/De^2
	Is(50)	F x Is	F	$(De/50)^{0.45}$
	Is(50) point load strength index corrected for a diametral test of core diameter 50mm			
	For Axial/Lump tests $De^2 = (4/Pi) \times (W \times D')$		For Diametral tests $De^2 = D \times D'$	

Important note: summary sheets are provided for convenience and in no way replace individual test result sheets which shall, without exception, be regarded as the definitive result.

Project Name	The Christie, Manchester	**Consolidated Undrained Triaxial Compression With Pore Water Pressure Measurement**	Hole ID BH04
Project No.	LT1792		Sample Depth 2.00m
Engineer	CCG		Sample Number
Employer	CC Geotechnical Ltd	In-House Method based on K H Head: Manual of Soils Testing, Vol 3	Sample Type U
Description	Reddish brown slighlty gravelly CLAY.		Specimen Depth 2.00m
			Specimen Number 1

SPECIMEN INITIAL DIMENSIONS				
Test number		1	2	3
Specimen diameter	mm	103.97	106.01	108.12
Specimen length	mm	171.63	164.94	158.15
Density	Mg/m^3	2.11	2.15	2.16
Moisture content	%	19	21	21
Dry density	Mg/m^3	1.78	1.78	1.79
SATURATION STAGE				
Initial pore water pressure	kPa	0.6		
Saturated pore water pressure	kPa	435.6		
Final cell pressure	kPa	450		
B value		0.98		
CONSOLIDATION STAGE				
Cell pressure	kPa	450	470	510
Back pressure	kPa	430	430	430
Effective cell pressure	kPa	20	40	80
Initial pore water pressure	kPa	0	438.4	463.8
Final pore water pressure	kPa	428.4	428.2	428.6
Pore pressure dissipation	%	99.6	121.4	104.1
c_{vi}	m^2/year	18.12	0.94	1.15
m_{vi}	m^2/MN	0.00	0.41	0.32
SPECIMEN AFTER CONSOLIDATION				
Density	Mg/m^3	2.15	2.16	2.17
Moisture content	%	21	21	20
Dry density	Mg/m^3	1.78	1.79	1.81





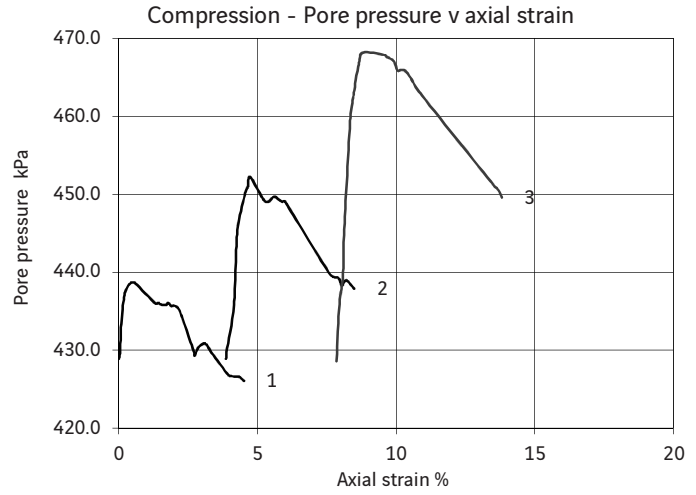
Remarks: Specimen orientation Vertical
Specimen condition for test Undisturbed
Saturation with 50kPa increments with a differential pressure of 10kPa
Drainage from both ends

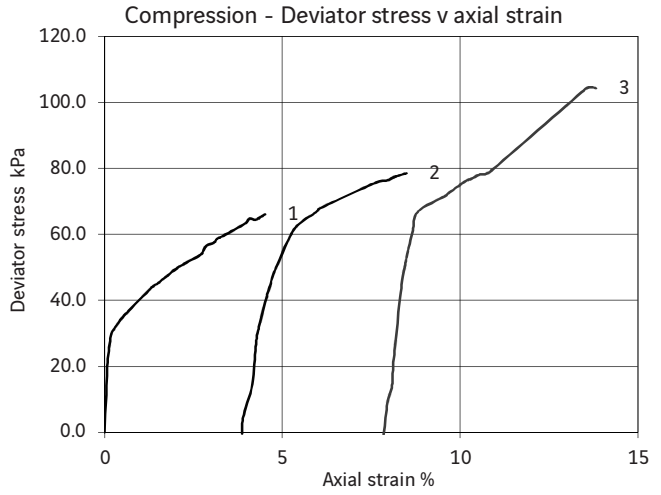
Approved by:	Leeds Laboratory		SOIL ENGINEERING
Steve Harper		Print date 22/03/2019	
	Revision No. 2.03	Issue Date 21/11/2012	Part of the Bachy Soletanche Group

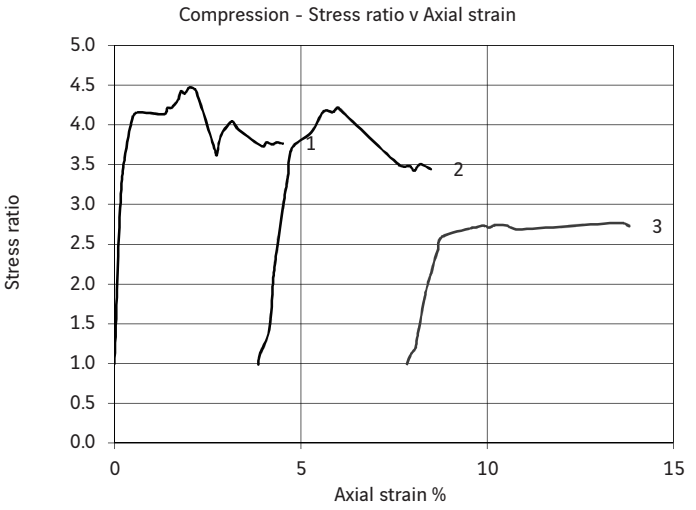
Project Name	The Christie, Manchester	**Consolidated Undrained Triaxial Compression With Pore Water Pressure Measurement**	Hole ID: BH04
Project No.	LT1792		Sample Depth: 2.00m
Engineer	CCG		Sample Number:
Employer	CC Geotechnical Ltd	In-House Method based on K H Head: Manual of Soils Testing, Vol 3	Sample Type: U
Description	Reddish brown slighlty gravelly CLAY.		Specimen Depth: 2.00m
			Specimen Number: 1

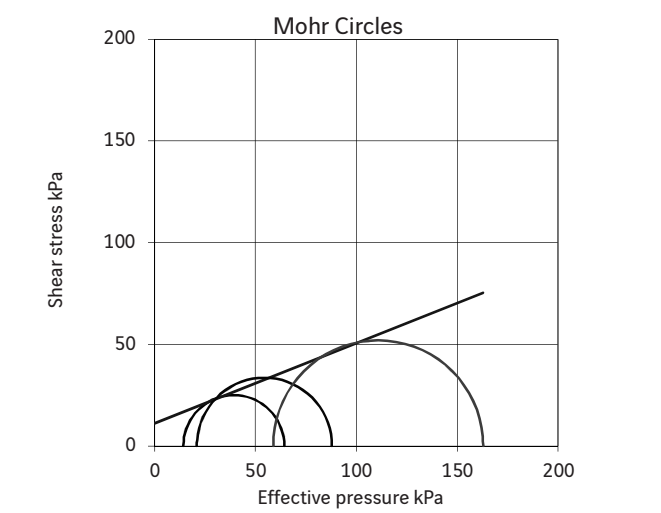
COMPRESSION STAGE					
Test number			1	2	3
Cell pressure		kPa	450	470	510
Initial pore water pressure		kPa	429	429	429
Initial effective pressure		kPa	20	40	80
Failure conditions at			Maximum stress ratio		
Axial strain at failure		%	2.0	6.0	13.5
Maximum deviator stress	$\sigma_1-\sigma_3$	kPa	50	67	104
Pore water pressure at failure	σ	kPa	436	449	451
Effective major principal stress	σ_1'	kPa	63.96	88.21	162.87
Effective minor principal stress	σ_3'	kPa	14.30	20.90	58.80
Effective principal stress ratio			4.47	4.22	2.77
Membrane correction		kPa	0.20	0.52	0.99
Filter drain correction not applicable		kPa	0.0	0.0	0.0
Pore pressure coefficient			0.15	0.31	0.22

SHEAR STRENGTH PARAMETERS	c'	11	kPa	φ'	21.5	°





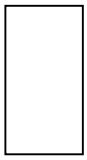




Approved by:	Leeds Laboratory		
Steve Harper		Print date 22/03/2019	SOIL ENGINEERING
	Revision No. 2.03	Issue Date 21/11/2012	Part of the Bachy Soletanche Group

Project Name	The Christie, Manchester	**Consolidated Undrained Triaxial Compression With Pore Water Pressure Measurement**	Hole ID: BH04
Project No.	LT1792		Sample Depth: 2.00m
Engineer	CCG		Sample Number:
Employer	CC Geotechnical Ltd	In-House Method based on K H Head: Manual of Soils Testing, Vol 3	Sample Type: U
Description	Reddish brown slighlty gravelly CLAY.		Specimen Depth: 2.00m
			Specimen Number: 1

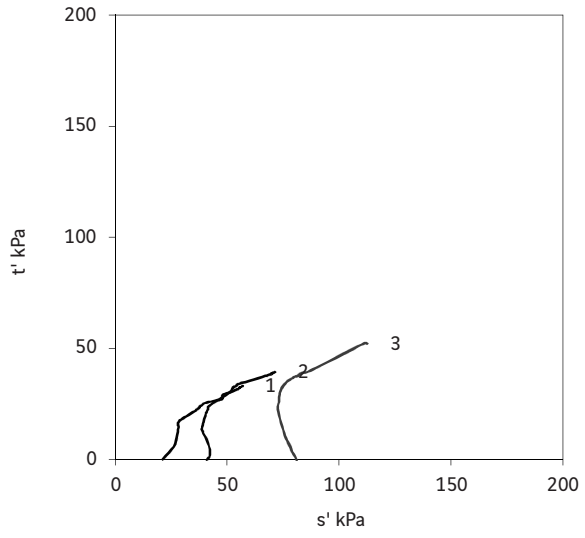
SPECIMEN AFTER TEST

Test number		1		
Mode of failure		Compound 		
Final moisture content	%	21	21	20
Final bulk density	Mg/m^3	2.15	2.16	2.17
Final dry density	Mg/m^3	1.78	1.79	1.81

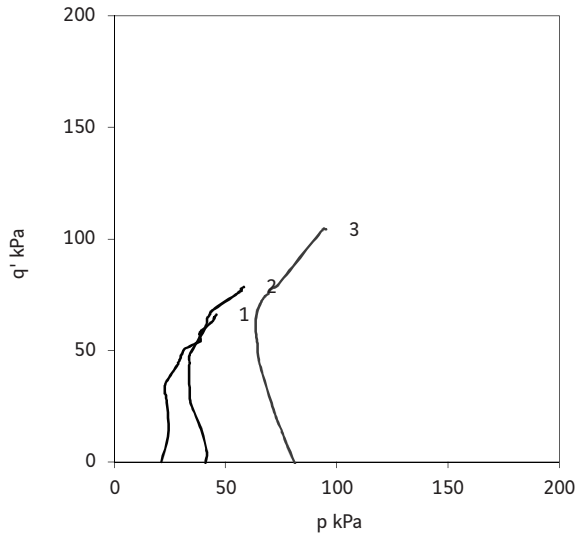
ADDITIONAL SPECIMEN DETAILS

Rate of strain	%/hour	0.16	0.25	0.25
Failure criterion		Maximum stress ratio		

MIT Stress field



Cambridge Stress field



REMARKS

Approved by:	Leeds Laboratory		SOIL ENGINEERING
Steve Harper		Print date 22/03/2019	
	Revision No. 2.03	Issue Date 21/11/2012	Part of the Bachy Soletanche Group

Project Name	The Christie, Manchester
Project No.	LT1792
Engineer	CC Geotechnical
Employer	CC Geotechnical

Summary Of Laboratory Rock Strength Tests

Hole ID	Sample depth m	Sample no.	Sample type	Specimen depth m	Specimen no.	Water Content	Bulk Density	Dry Density	Particle density	Point load			UCS	Brazil	Porosity	Elastic Modulus	Posissons Ratio
										Type	Is	Is50					
						%	kg/m³	kg/m³	Mg/m³		MN/m²	MN/m²	MN/m²	MN/m²	%	GPa	
BH1	9.25		C	9.25	02	13.2	2130	1880					9.39				
BH1	15.80		C	15.80	01	16.1	2130	1830					9.89			3.74 Ave	0.25
BH3	23.55		C	23.55	01	14	2170	1910					1.25			1.09 Ave	0.26
BH4	12.40		C	12.40	01	11.8	2250	2010					5.65			0.52 Ave	0.32
BH4	16.40		C	16.40	02	11.7	2200	1970					13				

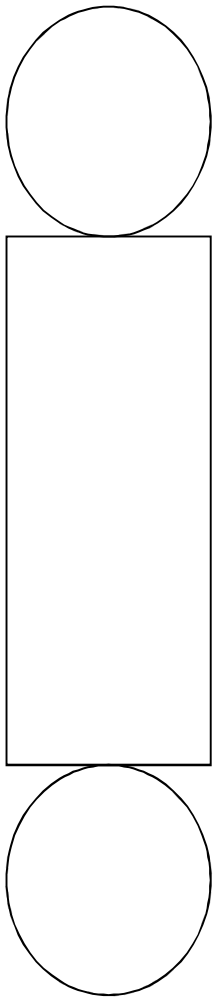
Approved by:	Leeds Laboratory		
Kevin Walker		Print date 09/04/2019	SOIL ENGINEERING
Revision No. 2.03	Issue Date 20/11/2012		Part of the Bachy Soletanche Group

Project Name	The Christie, Manchester	**Uniaxial Compressive Strength**	Hole ID BH1
Project No.	LT1792		Sample Depth 9.25m
Engineer	CC Geotechnical		Sample Number
Employer	CC Geotechnical	I.S.R.M. Suggested Methods 2007 for Determination of Uniaxial Compressive Strength Part 1	Sample Type C
Description	Thinly laminated brown SANDSTONE.		Specimen Depth 9.25m
			Specimen Number 2

Date and method of sampling	Not supplied
Storage history and environment	Not recorded

Sample details				Mean
Length	mm	179.94	179.55	179.7
Diameter (top)	mm	86.15	86.25	86.3
Diameter (middle)	mm	86.57	86.34	Length/diameter ratio
Diameter (base)	mm	86.40	86.20	2.1
Area	mm2	5849.4		
Mass	g	2233.76		
Test details				
Test duration	min	03:49		
Failure load	kN	54.9		
Stress rate	kN/min	14.4		
U.C.S.	MPa	9.39		
Mode of failure		Shear		
Loading axis relative to anisotropy		72 DEG TO BEDDING		
Machine type used in test		Controls 1300 / Automax 5		
Date of test		26/02/2019		
Additional specimen details				
Moisture content	%	13.2		
Bulk density	kg/m3	2130		
Dry density	kg/m3	1880		

Failure sketch



Test Remarks

Tested on specimen with length to diameter ratio outside 2.5-3.0 recommendation.

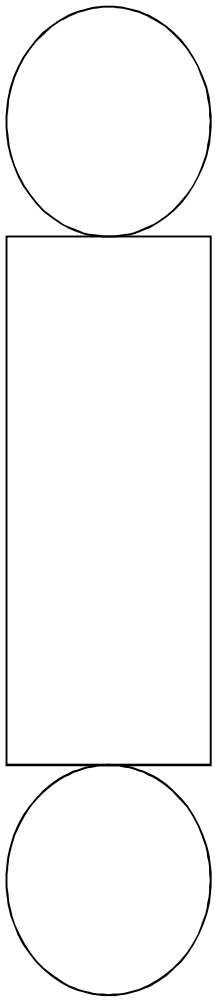
Specimen Remarks

Project Name	The Christie, Manchester	**Uniaxial Compressive Strength**	Hole ID BH4
Project No.	LT1792		Sample Depth 16.40m
Engineer	CC Geotechnical		Sample Number
Employer	CC Geotechnical	I.S.R.M. Suggested Methods 2007 for Determination of Uniaxial Compressive Strength Part 1	Sample Type C
Description	Thinly laminated brown SANDSTONE.		Specimen Depth 16.40m
			Specimen Number 2

Date and method of sampling	Not supplied
Storage history and environment	Not recorded

Sample details				Mean
Length	mm	240.36	240.06	240.2
Diameter (top)	mm	86.42	86.52	86.3
Diameter (middle)	mm	86.05	85.91	Length/diameter ratio
Diameter (base)	mm	86.54	86.11	2.8
Area	mm2	5849.4		
Mass	g	3092.3		
Test details				
Test duration	min	10:17		
Failure load	kN	76.0		
Stress rate	kN/min	7.4		
U.C.S.	MPa	13		
Mode of failure		Irregular		
Loading axis relative to anisotropy				
Machine type used in test		Controls 1300 / Automax 5		
Date of test		26/02/2019		
Additional specimen details				
Moisture content	%	11.7		
Bulk density	kg/m3	2200		
Dry density	kg/m3	1970		

Failure sketch



Test Remarks

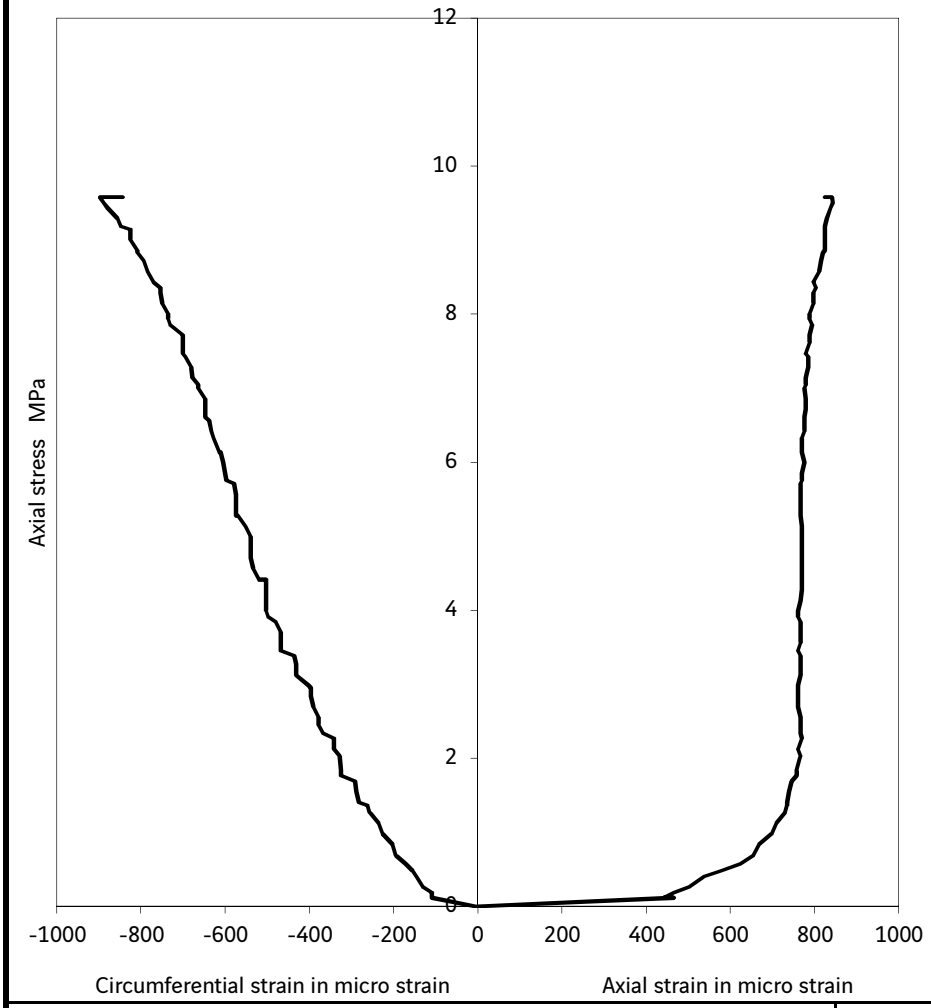
Specimen Remarks

Approved by:	Leeds Laboratory		
Kevin Walker		Print date 09/04/2019	SOIL ENGINEERING
	Revision No. 2.06	Issue Date 20/11/2012	Part of the Bachy Soletanche Group

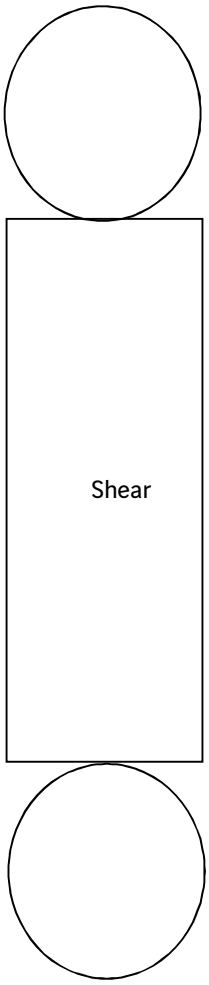
Project Name	The Christie, Manchester	**Unconfined Compressive Strength With Youngs Modulus And Poissons Ratio**	Hole ID BH1
Project No.	LT1792		Sample Depth 15.80m
Engineer	CC Geotechnical		Sample Number
Employer	CC Geotechnical	I.S.R.M. Suggested methods 1981	Sample Type C
Description	Thinly laminated brown SANDSTONE.		Specimen Depth 15.80m
			Specimen Number 1

Date and method of sampling	Details not supplied
Storage history and environment	Details not supplied

Graph of stress strain curves



Failure sketch



Moisture content	%	16.1	Stress rate	MPa/s	0.02	Tangent modulus	Et	280	GPa	50 % stress
Length	mm	194.51	Test duration	min	07:39	Average modulus	Eave	3.74	GPa	0.9-12 % stress
Diameter	mm	85.37	U.C.S.	MPa	9.89	Secant modulus	Esec	15.3	GPa	0-50 % stress
Mass	g	2367.01	Type of machine	Controls 1300 / Automax 5		Poissons ratio	v	0.247		
Bulk density	kg/m3	2130				(Determined using Average modulus)				
Dry density	kg/m3	1830								
Date		26/02/2019								

Test remarks: Loading axis relative to anisotropy: 70deg to bedding
Tested on specimen with length to diameter ratio outside 2.5-3.0 recommendation.

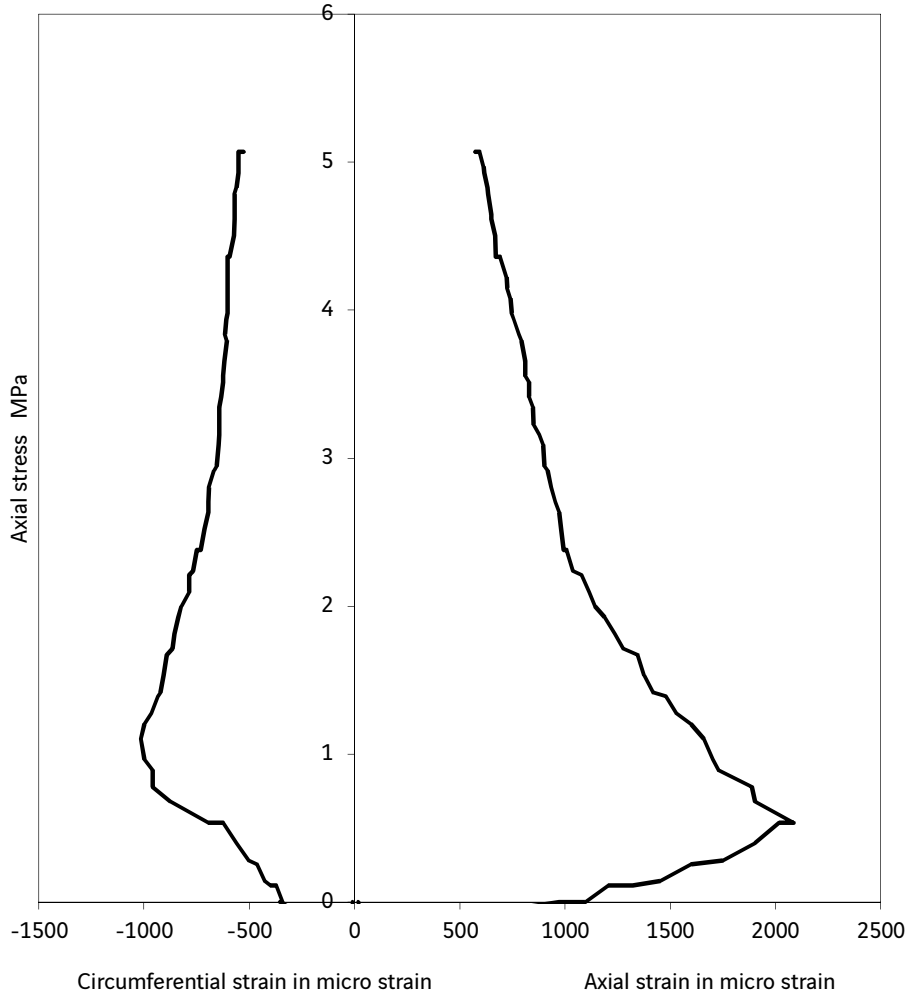
Specimen remarks:

Approved by: Ian Linton	Leeds Laboratory	Print date 09/04/2019	SOIL ENGINEERING Part of the Bachy Soletanche Group
	Revision No. 2.06	Issue Date 20/11/2012	

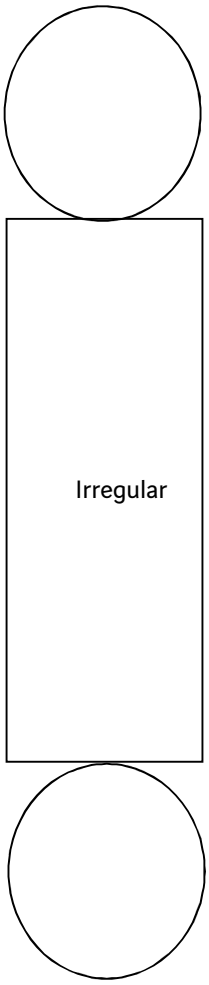
Project Name	The Christie, Manchester	**Unconfined Compressive Strength With Youngs Modulus And Poissons Ratio**	Hole ID BH3
Project No.	LT1792		Sample Depth 23.55m
Engineer	CC Geotechnical		Sample Number
Employer	CC Geotechnical	I.S.R.M. Suggested methods 1981	Sample Type C
Description	Thinly laminated brown SANDSTONE.		Specimen Depth 23.55m
			Specimen Number 1

Date and method of sampling	Details not supplied
Storage history and environment	Details not supplied

Graph of stress strain curves



Failure sketch



Moisture content	%	14	Stress rate	MPa/s	0.01	Tangent modulus	Et	1.09	GPa	50 % stress
Length	mm	216.65	Test duration	min	01:41	Average modulus	Eave	1.09	GPa	12-93 % stress
Diameter	mm	85.91	U.C.S.	MPa	1.25	Secant modulus	Esec	1.19	GPa	0-50 % stress
Mass	g	2730.40	Type of machine	Controls 1300 / Automax 5		Poissons ratio	v	0.258		
Bulk density	kg/m3	2170				(Determined using Average modulus)				
Dry density	kg/m3	1910								
Date		26/02/2019								

Test remarks: Loading axis relative to anisotropy: 70deg to bedding

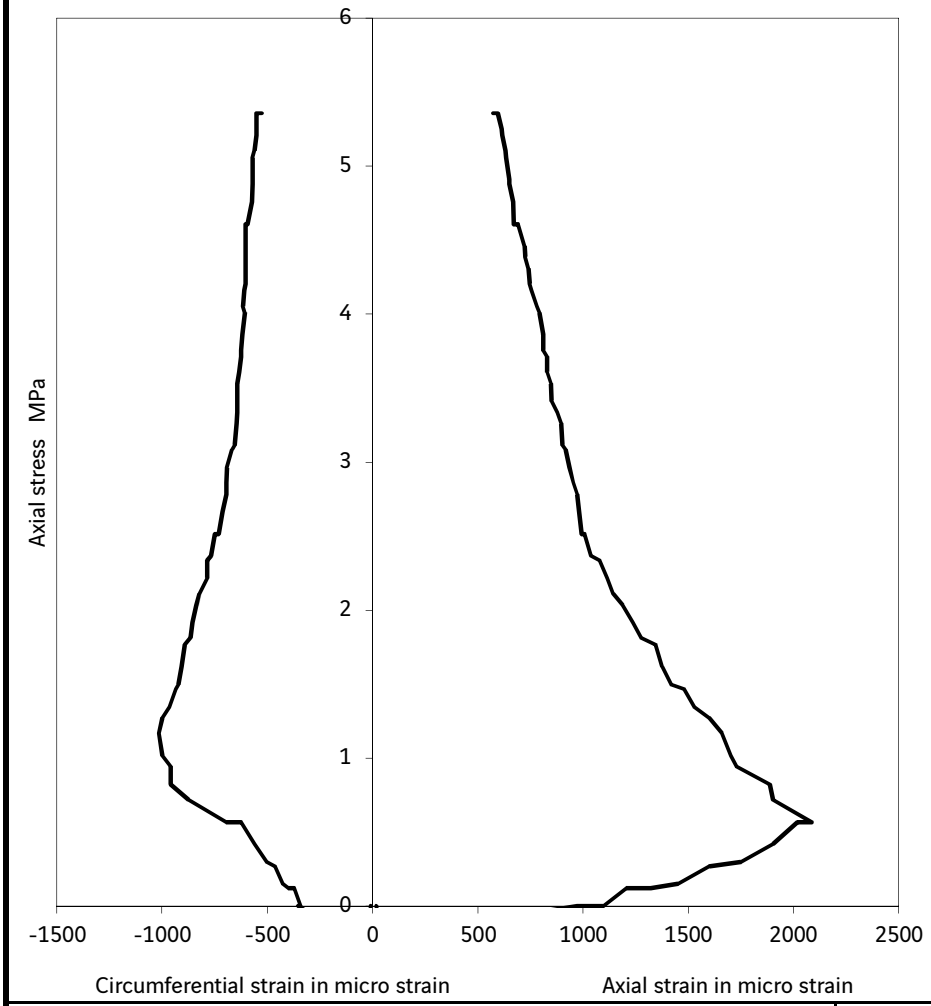
Specimen remarks:

Approved by:	Leeds Laboratory		
Ian Linton		Print date 09/04/2019	SOIL ENGINEERING
	Revision No. 2.06	Issue Date 20/11/2012	Part of the Bachy Soletanche Group

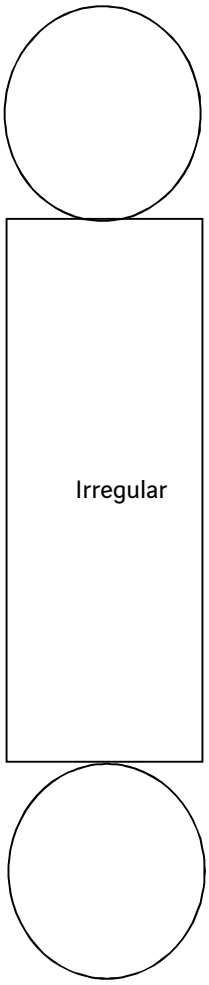
Project Name	The Christie, Manchester	**Unconfined Compressive Strength With Youngs Modulus And Poissons Ratio**	Hole ID BH4
Project No.	LT1792		Sample Depth 12.40m
Engineer	CC Geotechnical		Sample Number
Employer	CC Geotechnical	I.S.R.M. Suggested methods 1981	Sample Type C
Description	Thinly laminated brown SANDSTONE.		Specimen Depth 12.40m
			Specimen Number 1

Date and method of sampling	Details not supplied
Storage history and environment	Details not supplied

Graph of stress strain curves



Failure sketch



Moisture content	%	11.8	Stress rate	MPa/s	0.02	Tangent modulus	Et	4.18	GPa	50 % stress
Length	mm	169.71	Test duration	min	05:50	Average modulus	Eave	0.520	GPa	0-8 % stress
Diameter	mm	83.58	U.C.S.	MPa	5.65	Secant modulus	Esec	2.77	GPa	0-50 % stress
Mass	g	2092.43	Type of machine	Controls 1300 / Automax 5		Poissons ratio	v	0.324		
Bulk density	kg/m3	2250				(Determined using Average modulus)				
Dry density	kg/m3	2010								
Date		26/02/2019								

Test remarks: Loading axis relative to anisotropy: 74deg to bedding
Tested on specimen with length to diameter ratio outside 2.5-3.0 recommendation.

Specimen remarks:

Approved by: Ian Linton	Leeds Laboratory	Print date 09/04/2019	SOIL ENGINEERING Part of the Bachy Soletanche Group
	Revision No. 2.06	Issue Date 20/11/2012	

APPENDIX H

CHEMICAL TEST CERTIFICATES

Unit A2
Windmill Road
Ponswood Industrial Estate
St Leonards on Sea
East Sussex
TN38 9BY
Telephone: (01424) 718618

cs@elab-uk.co.uk
info@elab-uk.co.uk

2683

THE ENVIRONMENTAL LABORATORY LTD

Analytical Report Number:	19-21453
Issue:	1
Date of Issue:	29/01/2019
Contact:	Daniel O'Regan
Customer Details:	CC Geotechnical Ltd Unit 1 & 2 Deltic Place Deltic Way Liverpool Merseyside L33 7BA
Quotation No:	Q14-00045
Order No:	Not Supplied
Customer Reference:	CCG-C-18-10614
Date Received:	21/01/2019
Date Approved:	29/01/2019
Details:	The Christie Hospital, Manchester
Approved by:	[redacted]

John Wilson, Operations Ma

Any comments, opinions or interpretations expressed herein are outside the scope of UKAS accreditation (Accreditation Number 2683)

Sample Summary

Report No.: 19-21453

Elab No.	Client's Ref.	Date Sampled	Date Scheduled	Description	Deviations
163214	TP1 0.30	17/01/2019	23/01/2019	Silty loam	
163215	TP1 0.50	17/01/2019	23/01/2019		
163216	TP1 1.00	17/01/2019	23/01/2019	Sandy silty loam	
163217	TP2 0.30	17/01/2019	23/01/2019	Sandy silty loam	
163218	TP2 0.50	17/01/2019	23/01/2019	Sandy silty loam	
163219	TP2 1.00	17/01/2019	23/01/2019		
163220	TP3 0.30	17/01/2019	23/01/2019		
163221	TP3 0.50	17/01/2019	23/01/2019	Sandy silty loam	
163222	TP3 1.00	17/01/2019	23/01/2019	Sandy silty loam	

Results Summary

Report No.: 19-21453

			ELAB Reference	163214	163216	163217	163218	163221	163222
			Customer Reference						
			Sample ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sample Location	TP1	TP1	TP2	TP2	TP3	TP3
			Sample Depth (m)	0.30	1.00	0.30	0.50	0.50	1.00
			Sampling Date	17/01/2019	17/01/2019	17/01/2019	17/01/2019	17/01/2019	17/01/2019
Determinand	**Codes**	**Units**	**LOD**						
Metals									
Antimony	N	mg/kg	2.5	n/t	< 2.5	n/t	3.6	< 2.5	n/t
Arsenic	M	mg/kg	1	n/t	7.7	n/t	37.0	18.5	n/t
Beryllium	U	mg/kg	1	n/t	< 1.0	n/t	1.1	1.1	n/t
Cadmium	M	mg/kg	0.5	n/t	< 0.5	n/t	< 0.5	< 0.5	n/t
Chromium	M	mg/kg	5	n/t	16.0	n/t	18.2	20.2	n/t
Copper	M	mg/kg	5	n/t	25.4	n/t	59.9	44.7	n/t
Lead	M	mg/kg	5	n/t	47.6	n/t	181	185	n/t
Mercury	M	mg/kg	0.5	n/t	< 0.5	n/t	0.7	< 0.5	n/t
Nickel	M	mg/kg	5	n/t	15.0	n/t	19.6	22.5	n/t
Selenium	M	mg/kg	1	n/t	< 1.0	n/t	< 1.0	< 1.0	n/t
Vanadium	M	mg/kg	5	n/t	22.1	n/t	27.1	27.1	n/t
Zinc	M	mg/kg	5	n/t	55.7	n/t	138	81.1	n/t
Anions									
Water Soluble Sulphate	M	g/l	0.02	< 0.02	n/t	< 0.02	n/t	n/t	< 0.02
Inorganics									
Hexavalent Chromium	N	mg/kg	0.8	n/t	< 0.8	n/t	< 0.8	< 0.8	n/t
Total Cyanide	M	mg/kg	1	n/t	< 1.0	n/t	< 1.0	< 1.0	n/t
Water Soluble Boron	N	mg/kg	0.5	n/t	0.6	n/t	< 0.5	< 0.5	n/t
Miscellaneous									
pH	M	pH units	0.1	7.6	7.9	7.8	7.7	7.9	8.0
Total Organic Carbon	N	%	0.01	n/t	0.74	n/t	1.2	1.6	n/t
Phenols									
Total Phenols	N	mg/kg	6	n/t	< 6	n/t	< 6	< 6	n/t

Tests marked N are not UKAS accredited.

Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonards on Sea, East Sussex, TN38 9BY
Tel: +44 (0)1424 718618, Email: info@elab-uk.co.uk, Web: www.elab-uk.co.uk

Results Summary

Report No.: 19-21453

Asbestos Results

Analytical result only applies to the sample as submitted by the client. Any comments, opinions or interpretations (marked #)
in this report are outside UKAS accreditation (Accreditation No2683). They are subjective comments only which must be verified by the client.

Elab No	Depth (m)	Clients Reference	Description of Sample Matrix #	Asbestos Identification	Gravimetric Analysis Total (%)	Gravimetric Analysis by ACM Type (%)	Free Fibre Analysis (%)	Total Asbestos (%)
163215	0.50	TP1	Brown sandy soil, brick, stones	No asbestos detected	n/t	n/t	n/t	n/t
163219	1.00	TP2	Brown soil, stones, clinker	No asbestos detected	n/t	n/t	n/t	n/t
163220	0.30	TP3	Brown soil, stones, clinker	No asbestos detected	n/t	n/t	n/t	n/t

Method Summary

Report No.: 19-21453

Parameter	Codes	Analysis Undertaken On	Date Tested	Method Number	Technique
Soil					
Hexavalent chromium	N	As submitted sample	25/01/2019	110	Colorimetry
pH	M	Air dried sample	28/01/2019	113	Electromeric
Aqua regia extractable metals	M	Air dried sample	25/01/2019	118	ICPMS
Phenols in solids	N	As submitted sample	25/01/2019	121	HPLC
Water soluble anions	M	Air dried sample	25/01/2019	172	Ion Chromatography
Water soluble boron	N	Air dried sample	25/01/2019	202	Colorimetry
Total cyanide	M	As submitted sample	28/01/2019	204	Colorimetry
Total organic carbon/Total sulphur	N	Air dried sample	28/01/2019	210	IR
Asbestos identification	U	Air dried sample	28/01/2019	PMAN	Microscopy

Tests marked N are not UKAS accredited

Report Information

Report No.: 19-21453

Key

U	hold UKAS accreditation
M	hold MCERTS and UKAS accreditation
N	do not currently hold UKAS accreditation
^	MCERTS accreditation not applicable for sample matrix
*	UKAS accreditation not applicable for sample matrix
S	Subcontracted to approved laboratory UKAS Accredited for the test
SM	Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test
NS	Subcontracted to approved laboratory. UKAS accreditation is not applicable.
I/S	Insufficient Sample
U/S	Unsuitable sample
n/t	Not tested
<	means "less than"
>	means "greater than"

Soil sample results are expressed on an air dried basis (dried at < 30°C)
ELAB are unable to provide an interpretation or opinion on the content of this report.
The results relate only to the items tested
PCB congener results may include any coeluting PCBs
Uncertainty of measurement for the determinands tested are available upon request

Deviation Codes

a	No date of sampling supplied
b	No time of sampling supplied (Waters Only)
c	Sample not received in appropriate containers
d	Sample not received in cooled condition
e	The container has been incorrectly filled
f	Sample age exceeds stability time (sampling to receipt)
g	Sample age exceeds stability time (sampling to analysis)

Where a sample has a deviation code, the applicable test result may be invalid.

Sample Retention and Disposal

All soil samples will be retained for a period of one month
All water samples will be retained for 7 days following the date of the test report
Charges may apply to extended sample storage

Unit A2
Windmill Road
Ponswood Industrial Estate
St Leonards on Sea
East Sussex
TN38 9BY
Telephone: (01424) 718618

cs@elab-uk.co.uk
info@elab-uk.co.uk

2683

THE ENVIRONMENTAL LABORATORY LTD

Analytical Report Number:	19-21472
Issue:	1
Date of Issue:	29/01/2019
Contact:	Daniel O'Regan
Customer Details:	CC Geotechnical Ltd Unit 1 & 2 Deltic Place Deltic Way Liverpool Merseyside L33 7BA
Quotation No:	Q14-00045
Order No:	Not Supplied
Customer Reference:	CCG-C-18-10614
Date Received:	24/01/2019
Date Approved:	29/01/2019
Details:	The Christie Hospital, Manchester
Approved by:	[redacted]

John Wilson, Operations Manager

Any comments, opinions or interpretations expressed herein are outside the scope of UKAS accreditation (Accreditation Number 2683)

Sample Summary

Report No.: 19-21472

Elab No.	Client's Ref.	Date Sampled	Date Scheduled	Description	Deviations
163321	WS1 0.20	17/01/2019	24/01/2019	Sandy silty loam	
163322	WS1 0.50	17/01/2019	24/01/2019		

Results Summary

Report No.: 19-21472

ELAB Reference	163321
Customer Reference	
Sample ID	
Sample Type	SOIL
Sample Location	WS1
Sample Depth (m)	0.20
Sampling Date	17/01/2019

Determinand	Codes	Units	LOD	
Anions				
Water Soluble Sulphate	M	g/l	0.02	0.05
Miscellaneous				
pH	M	pH units	0.1	8.3

2683

Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonards on Sea, East Sussex, TN38 9BY
Tel: +44 (0)1424 718618, Email: info@elab-uk.co.uk, Web: www.elab-uk.co.uk

Results Summary

Report No.: 19-21472

Asbestos Results

Analytical result only applies to the sample as submitted by the client. Any comments, opinions or interpretations (marked #)
in this report are outside UKAS accreditation (Accreditation No2683). They are subjective comments only which must be verified by the client.

Elab No	Depth (m)	Clients Reference	Description of Sample Matrix #	Asbestos Identification	Gravimetric Analysis Total (%)	Gravimetric Analysis by ACM Type (%)	Free Fibre Analysis (%)	Total Asbestos (%)
163322	0.50	WS1	Brown sandy soil, stones, concrete,	No asbestos detected	n/t	n/t	n/t	n/t

Method Summary

Report No.: 19-21472

Parameter	Codes	Analysis Undertaken On	Date Tested	Method Number	Technique
Soil					
pH	M	Air dried sample	28/01/2019	113	Electromeric
Water soluble anions	M	Air dried sample	25/01/2019	172	Ion Chromatography
Asbestos identification	U	Air dried sample	25/01/2019	PMAN	Microscopy

Report Information

Report No.: 19-21472

Key

U	hold UKAS accreditation
M	hold MCERTS and UKAS accreditation
N	do not currently hold UKAS accreditation
^	MCERTS accreditation not applicable for sample matrix
*	UKAS accreditation not applicable for sample matrix
S	Subcontracted to approved laboratory UKAS Accredited for the test
SM	Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test
NS	Subcontracted to approved laboratory. UKAS accreditation is not applicable.
I/S	Insufficient Sample
U/S	Unsuitable sample
n/t	Not tested
<	means "less than"
>	means "greater than"

Soil sample results are expressed on an air dried basis (dried at < 30°C)
ELAB are unable to provide an interpretation or opinion on the content of this report.
The results relate only to the items tested
PCB congener results may include any coeluting PCBs
Uncertainty of measurement for the determinands tested are available upon request

Deviation Codes

a	No date of sampling supplied
b	No time of sampling supplied (Waters Only)
c	Sample not received in appropriate containers
d	Sample not received in cooled condition
e	The container has been incorrectly filled
f	Sample age exceeds stability time (sampling to receipt)
g	Sample age exceeds stability time (sampling to analysis)

Where a sample has a deviation code, the applicable test result may be invalid.

Sample Retention and Disposal

All soil samples will be retained for a period of one month
All water samples will be retained for 7 days following the date of the test report
Charges may apply to extended sample storage

Unit A2
Windmill Road
Ponswood Industrial Estate
St Leonards on Sea
East Sussex
TN38 9BY
Telephone: (01424) 718618

cs@elab-uk.co.uk
info@elab-uk.co.uk

2683

THE ENVIRONMENTAL LABORATORY LTD

Analytical Report Number:	19-21509
Issue:	2. Replaces Analytical Report number 19-21509; issue no.1
Date of Issue:	30/01/2019
Contact:	Daniel O'Regan
Customer Details:	CC Geotechnical Ltd Unit 1 & 2 Deltic Place Deltic Way Liverpool Merseyside L33 7BA
Quotation No:	Q14-00045
Order No:	Not Supplied
Customer Reference:	CCG-C-18-10614
Date Received:	28/01/2019
Date Approved:	30/01/2019
Details:	The Christie Hospital, Manchester
Approved by:	[redacted]

John Wilson, Operations Manag

Any comments, opinions or interpretations expressed herein are outside the scope of UKAS accreditation (Accreditation Number 2683)

Sample Summary

Report No.: 19-21509

Elab No.	Client's Ref.	Date Sampled	Date Scheduled	Description	Deviations
163572	BH04 0.50	21/01/2019	28/01/2019		
163573	BH04 1.00	21/01/2019	28/01/2019	Silty loam	
163574	BH04 1.50	21/01/2019	28/01/2019	Silty clayey loam	

Results Summary

Report No.: 19-21509

			ELAB Reference	163573	163574
			Customer Reference		
			Sample ID		
			Sample Type	SOIL	SOIL
			Sample Location	BH04	BH04
			Sample Depth (m)	1.00	1.50
			Sampling Date	21/01/2019	21/01/2019
Determinand	**Codes**	**Units**	**LOD**		
Metals					
Antimony	N	mg/kg	2.5	3.6	n/t
Arsenic	M	mg/kg	1	27.5	n/t
Beryllium	U	mg/kg	1	1.3	n/t
Cadmium	M	mg/kg	0.5	0.9	n/t
Chromium	M	mg/kg	5	49.7	n/t
Copper	M	mg/kg	5	223	n/t
Lead	M	mg/kg	5	224	n/t
Mercury	M	mg/kg	0.5	0.7	n/t
Nickel	M	mg/kg	5	33.5	n/t
Selenium	M	mg/kg	1	< 1.0	n/t
Vanadium	M	mg/kg	5	39.2	n/t
Zinc	M	mg/kg	5	251	n/t
Anions					
Water Soluble Sulphate	M	g/l	0.02	n/t	0.05
Inorganics					
Hexavalent Chromium	N	mg/kg	0.8	< 0.8	n/t
Total Cyanide	M	mg/kg	1	< 1.0	n/t
Water Soluble Boron	N	mg/kg	0.5	0.6	n/t
Miscellaneous					
pH	M	pH units	0.1	7.5	7.6
Total Organic Carbon	N	%	0.01	3.1	n/t
Phenols					
Total Phenols	N	mg/kg	6	< 6	n/t

Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonards on Sea, East Sussex, TN38 9BY
Tel: +44 (0)1424 718618, Email: info@elab-uk.co.uk, Web: www.elab-uk.co.uk

Results Summary

Report No.: 19-21509

Asbestos Results

Analytical result only applies to the sample as submitted by the client. Any comments, opinions or interpretations (marked #)
in this report are outside UKAS accreditation (Accreditation No2683). They are subjective comments only which must be verified by the client.

Elab No	Depth (m)	Clients Reference	Description of Sample Matrix #	Asbestos Identification	Gravimetric Analysis Total (%)	Gravimetric Analysis by ACM Type (%)	Free Fibre Analysis (%)	Total Asbestos (%)
163572	0.50	BH04	brown sandy soil with stones, clinker and twigs	No asbestos detected	n/t	n/t	n/t	n/t

Method Summary

Report No.: 19-21509

Parameter	Codes	Analysis Undertaken On	Date Tested	Method Number	Technique
Soil					
Hexavalent chromium	N	As submitted sample	29/01/2019	110	Colorimetry
pH	M	Air dried sample	29/01/2019	113	Electromeric
Aqua regia extractable metals	M	Air dried sample	29/01/2019	118	ICPMS
Phenols in solids	N	As submitted sample	29/01/2019	121	HPLC
Water soluble anions	M	Air dried sample	29/01/2019	172	Ion Chromatography
Water soluble boron	N	Air dried sample	29/01/2019	202	Colorimetry
Total cyanide	M	As submitted sample	29/01/2019	204	Colorimetry
Total organic carbon/Total sulphur	N	Air dried sample	30/01/2019	210	IR
Asbestos identification	U	Air dried sample	29/01/2019	PMAN	Microscopy

Tests marked N are not UKAS accredited

Report Information

Report No.: 19-21509

Key

U	hold UKAS accreditation
M	hold MCERTS and UKAS accreditation
N	do not currently hold UKAS accreditation
^	MCERTS accreditation not applicable for sample matrix
*	UKAS accreditation not applicable for sample matrix
S	Subcontracted to approved laboratory UKAS Accredited for the test
SM	Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test
NS	Subcontracted to approved laboratory. UKAS accreditation is not applicable.
I/S	Insufficient Sample
U/S	Unsuitable sample
n/t	Not tested
<	means "less than"
>	means "greater than"

Soil sample results are expressed on an air dried basis (dried at < 30°C)
ELAB are unable to provide an interpretation or opinion on the content of this report.
The results relate only to the items tested
PCB congener results may include any coeluting PCBs
Uncertainty of measurement for the determinands tested are available upon request

Deviation Codes

a	No date of sampling supplied
b	No time of sampling supplied (Waters Only)
c	Sample not received in appropriate containers
d	Sample not received in cooled condition
e	The container has been incorrectly filled
f	Sample age exceeds stability time (sampling to receipt)
g	Sample age exceeds stability time (sampling to analysis)

Where a sample has a deviation code, the applicable test result may be invalid.

Sample Retention and Disposal

All soil samples will be retained for a period of one month
All water samples will be retained for 7 days following the date of the test report
Charges may apply to extended sample storage

Unit A2
Windmill Road
Ponswood Industrial Estate
St Leonards on Sea
East Sussex
TN38 9BY
Telephone: (01424) 718618

cs@elab-uk.co.uk
info@elab-uk.co.uk

2683

THE ENVIRONMENTAL LABORATORY LTD

Analytical Report Number:	19-21557
Issue:	1
Date of Issue:	05/02/2019
Contact:	Daniel O'Regan
Customer Details:	CC Geotechnical Ltd Unit 1 & 2 Deltic Place Deltic Way Liverpool Merseyside L33 7BA
Quotation No:	Q14-00045
Order No:	Not Supplied
Customer Reference:	CCG-C-18-10614
Date Received:	30/01/2019
Date Approved:	05/02/2019
Details:	The Christie Hospital, Manchester
Approved by:	[redacted]

Mike Varley, Technical Ma

Any comments, opinions or interpretations expressed herein are outside the scope of UKAS accreditation (Accreditation Number 2683)

Sample Summary

Report No.: 19-21557

Elab No.	Client's Ref.	Date Sampled	Date Scheduled	Description	Deviations
163810	BH01 0.50	25/01/2019	30/01/2019		
163811	BH01 1.00	25/01/2019	30/01/2019	Sandy silty loam	
163812	BH01 1.50	25/01/2019	30/01/2019	Sandy loam	

Results Summary

Report No.: 19-21557

			ELAB Reference	163811	163812
			Customer Reference		
			Sample ID		
			Sample Type	SOIL	SOIL
			Sample Location	BH01	BH01
			Sample Depth (m)	1.00	1.50
			Sampling Date	25/01/2019	25/01/2019
Determinand	**Codes**	**Units**	**LOD**		
Metals					
Antimony	N	mg/kg	2.5	4.7	n/t
Arsenic	M	mg/kg	1	19.0	n/t
Beryllium	U	mg/kg	1	< 1.0	n/t
Cadmium	M	mg/kg	0.5	1.0	n/t
Chromium	M	mg/kg	5	23.2	n/t
Copper	M	mg/kg	5	50.7	n/t
Lead	M	mg/kg	5	160	n/t
Mercury	M	mg/kg	0.5	0.8	n/t
Nickel	M	mg/kg	5	19.5	n/t
Selenium	M	mg/kg	1	< 1.0	n/t
Vanadium	M	mg/kg	5	28.4	n/t
Zinc	M	mg/kg	5	153	n/t
Anions					
Water Soluble Sulphate	M	g/l	0.02	n/t	0.06
Inorganics					
Hexavalent Chromium	N	mg/kg	0.8	< 0.8	n/t
Total Cyanide	M	mg/kg	1	< 1.0	n/t
Water Soluble Boron	N	mg/kg	0.5	< 0.5	n/t
Miscellaneous					
pH	M	pH units	0.1	9.3	8.4
Total Organic Carbon	N	%	0.01	1.9	n/t
Phenols					
Total Phenols	N	mg/kg	6	< 6	n/t

Tests marked N are not UKAS accredited.

2683

Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonards on Sea, East Sussex, TN38 9BY
Tel: +44 (0)1424 718618, Email: info@elab-uk.co.uk, Web: www.elab-uk.co.uk

Results Summary

Report No.: 19-21557

Asbestos Results

Analytical result only applies to the sample as submitted by the client. Any comments, opinions or interpretations (marked #)
in this report are outside UKAS accreditation (Accreditation No2683). They are subjective comments only which must be verified by the client.

Elab No	Depth (m)	Clients Reference	Description of Sample Matrix #	Asbestos Identification	Gravimetric Analysis Total (%)	Gravimetric Analysis by ACM Type (%)	Free Fibre Analysis (%)	Total Asbestos (%)
163810	0.50	BH01	Brown sandy soil,stones	No asbestos detected	n/t	n/t	n/t	n/t

Method Summary

Report No.: 19-21557

Parameter	Codes	Analysis Undertaken On	Date Tested	Method Number	Technique
Soil					
Hexavalent chromium	N	As submitted sample	01/02/2019	110	Colorimetry
pH	M	Air dried sample	04/02/2019	113	Electromeric
Aqua regia extractable metals	M	Air dried sample	01/02/2019	118	ICPMS
Phenols in solids	N	As submitted sample	31/01/2019	121	HPLC
Water soluble anions	M	Air dried sample	01/02/2019	172	Ion Chromatography
Water soluble boron	N	Air dried sample	01/02/2019	202	Colorimetry
Total cyanide	M	As submitted sample	01/02/2019	204	Colorimetry
Total organic carbon/Total sulphur	N	Air dried sample	04/02/2019	210	IR
Asbestos identification	U	Air dried sample	01/02/2019	PMAN	Microscopy

Tests marked N are not UKAS accredited

Report Information

Report No.: 19-21557

Key

U	hold UKAS accreditation
M	hold MCERTS and UKAS accreditation
N	do not currently hold UKAS accreditation
^	MCERTS accreditation not applicable for sample matrix
*	UKAS accreditation not applicable for sample matrix
S	Subcontracted to approved laboratory UKAS Accredited for the test
SM	Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test
NS	Subcontracted to approved laboratory. UKAS accreditation is not applicable.
I/S	Insufficient Sample
U/S	Unsuitable sample
n/t	Not tested
<	means "less than"
>	means "greater than"

Soil sample results are expressed on an air dried basis (dried at < 30°C)
ELAB are unable to provide an interpretation or opinion on the content of this report.
The results relate only to the items tested
PCB congener results may include any coeluting PCBs
Uncertainty of measurement for the determinands tested are available upon request

Deviation Codes

a	No date of sampling supplied
b	No time of sampling supplied (Waters Only)
c	Sample not received in appropriate containers
d	Sample not received in cooled condition
e	The container has been incorrectly filled
f	Sample age exceeds stability time (sampling to receipt)
g	Sample age exceeds stability time (sampling to analysis)

Where a sample has a deviation code, the applicable test result may be invalid.

Sample Retention and Disposal

All soil samples will be retained for a period of one month
All water samples will be retained for 7 days following the date of the test report
Charges may apply to extended sample storage

Unit A2
Windmill Road
Ponswood Industrial Estate
St Leonards on Sea
East Sussex
TN38 9BY
Telephone: (01424) 718618

cs@elab-uk.co.uk
info@elab-uk.co.uk

2683

THE ENVIRONMENTAL LABORATORY LTD

Analytical Report Number:	19-21558
Issue:	1
Date of Issue:	05/02/2019
Contact:	Daniel O'Regan
Customer Details:	CC Geotechnical Ltd Unit 1 & 2 Deltic Place Deltic Way Liverpool Merseyside L33 7BA
Quotation No:	Q14-00045
Order No:	Not Supplied
Customer Reference:	CCG-C-18-10614
Date Received:	30/01/2019
Date Approved:	05/02/2019
Details:	The Christie Hospital, Manchester
Approved by:	[redacted]

Mike Varley, Technical Manager

Any comments, opinions or interpretations expressed herein are outside the scope of UKAS accreditation (Accreditation Number 2683)

Sample Summary

Report No.: 19-21558

Elab No.	Client's Ref.	Date Sampled	Date Scheduled	Description	Deviations
163813	BH02 0.50	25/01/2019	30/01/2019		
163814	BH02 1.00	25/01/2019	30/01/2019	Silty loam	
163815	BH02 1.50	25/01/2019	30/01/2019	Sandy silty loam	

Results Summary

Report No.: 19-21558

			ELAB Reference	163814	163815
			Customer Reference		
			Sample ID		
			Sample Type	SOIL	SOIL
			Sample Location	BH02	BH02
			Sample Depth (m)	1.00	1.50
			Sampling Date	25/01/2019	25/01/2019
Determinand	**Codes**	**Units**	**LOD**		
Metals					
Antimony	N	mg/kg	2.5	6.3	n/t
Arsenic	M	mg/kg	1	16.2	n/t
Beryllium	U	mg/kg	1	1.3	n/t
Cadmium	M	mg/kg	0.5	< 0.5	n/t
Chromium	M	mg/kg	5	29.3	n/t
Copper	M	mg/kg	5	56.0	n/t
Lead	M	mg/kg	5	201	n/t
Mercury	M	mg/kg	0.5	0.5	n/t
Nickel	M	mg/kg	5	19.9	n/t
Selenium	M	mg/kg	1	< 1.0	n/t
Vanadium	M	mg/kg	5	34.4	n/t
Zinc	M	mg/kg	5	89.3	n/t
Anions					
Water Soluble Sulphate	M	g/l	0.02	n/t	< 0.02
Inorganics					
Hexavalent Chromium	N	mg/kg	0.8	< 0.8	n/t
Total Cyanide	M	mg/kg	1	< 1.0	n/t
Water Soluble Boron	N	mg/kg	0.5	< 0.5	n/t
Miscellaneous					
pH	M	pH units	0.1	7.8	7.5
Total Organic Carbon	N	%	0.01	2.5	n/t
Phenols					
Total Phenols	N	mg/kg	6	< 6	n/t

2683

Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonards on Sea, East Sussex, TN38 9BY
Tel: +44 (0)1424 718618, Email: info@elab-uk.co.uk, Web: www.elab-uk.co.uk

Results Summary

Report No.: 19-21558

Asbestos Results

Analytical result only applies to the sample as submitted by the client. Any comments, opinions or interpretations (marked #)
in this report are outside UKAS accreditation (Accreditation No2683). They are subjective comments only which must be verified by the client.

Elab No	Depth (m)	Clients Reference	Description of Sample Matrix #	Asbestos Identification	Gravimetric Analysis Total (%)	Gravimetric Analysis by ACM Type (%)	Free Fibre Analysis (%)	Total Asbestos (%)
163813	0.50	BH02	Brown sandy soil	No asbestos detected	n/t	n/t	n/t	n/t

Method Summary

Report No.: 19-21558

Parameter	Codes	Analysis Undertaken On	Date Tested	Method Number	Technique
Soil					
Hexavalent chromium	N	As submitted sample	01/02/2019	110	Colorimetry
pH	M	Air dried sample	04/02/2019	113	Electromeric
Aqua regia extractable metals	M	Air dried sample	01/02/2019	118	ICPMS
Phenols in solids	N	As submitted sample	31/01/2019	121	HPLC
Water soluble anions	M	Air dried sample	01/02/2019	172	Ion Chromatography
Water soluble boron	N	Air dried sample	01/02/2019	202	Colorimetry
Total cyanide	M	As submitted sample	01/02/2019	204	Colorimetry
Total organic carbon/Total sulphur	N	Air dried sample	04/02/2019	210	IR
Asbestos identification	U	Air dried sample	01/02/2019	PMAN	Microscopy

Tests marked N are not UKAS accredited

Report Information

Report No.: 19-21558

Key

U	hold UKAS accreditation
M	hold MCERTS and UKAS accreditation
N	do not currently hold UKAS accreditation
^	MCERTS accreditation not applicable for sample matrix
*	UKAS accreditation not applicable for sample matrix
S	Subcontracted to approved laboratory UKAS Accredited for the test
SM	Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test
NS	Subcontracted to approved laboratory. UKAS accreditation is not applicable.
I/S	Insufficient Sample
U/S	Unsuitable sample
n/t	Not tested
<	means "less than"
>	means "greater than"

Soil sample results are expressed on an air dried basis (dried at < 30°C)
ELAB are unable to provide an interpretation or opinion on the content of this report.
The results relate only to the items tested
PCB congener results may include any coeluting PCBs
Uncertainty of measurement for the determinands tested are available upon request

Deviation Codes

a	No date of sampling supplied
b	No time of sampling supplied (Waters Only)
c	Sample not received in appropriate containers
d	Sample not received in cooled condition
e	The container has been incorrectly filled
f	Sample age exceeds stability time (sampling to receipt)
g	Sample age exceeds stability time (sampling to analysis)

Where a sample has a deviation code, the applicable test result may be invalid.

Sample Retention and Disposal

All soil samples will be retained for a period of one month
All water samples will be retained for 7 days following the date of the test report
Charges may apply to extended sample storage

Unit A2
Windmill Road
Ponswood Industrial Estate
St Leonards on Sea
East Sussex
TN38 9BY
Telephone: (01424) 718618

cs@elab-uk.co.uk
info@elab-uk.co.uk

UKAS TESTING 2683

mCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

THE ENVIRONMENTAL LABORATORY LTD

Analytical Report Number:	19-21559
Issue:	1
Date of Issue:	05/02/2019
Contact:	Daniel O'Regan
Customer Details:	CC Geotechnical Ltd Unit 1 & 2 Deltic Place Deltic Way Liverpool Merseyside L33 7BA
Quotation No:	Q14-00045
Order No:	Not Supplied
Customer Reference:	CCG-C-18-10614
Date Received:	30/01/2019
Date Approved:	05/02/2019
Details:	The Christie Hospital, Manchester
Approved by:	[redacted]

Mike Varley, Technical Manager

Any comments, opinions or interpretations expressed herein are outside the scope of UKAS accreditation (Accreditation Number 2683)

Sample Summary

Report No.: 19-21559

Elab No.	Client's Ref.	Date Sampled	Date Scheduled	Description	Deviations
163816	BH03 0.50	25/01/2019	30/01/2019		
163817	BH03 1.00	25/01/2019	30/01/2019	Silty loam	
163818	BH03 1.50	25/01/2019	30/01/2019		
163819	BH03 2.50	25/01/2019	30/01/2019	Sandy loam	

Results Summary

Report No.: 19-21559

			ELAB Reference	163817	163819
			Customer Reference		
			Sample ID		
			Sample Type	SOIL	SOIL
			Sample Location	BH03	BH03
			Sample Depth (m)	1.00	2.50
			Sampling Date	25/01/2019	25/01/2019
Determinand	**Codes**	**Units**	**LOD**		
Metals					
Antimony	N	mg/kg	2.5	< 2.5	n/t
Arsenic	M	mg/kg	1	16.9	n/t
Beryllium	U	mg/kg	1	< 1.0	n/t
Cadmium	M	mg/kg	0.5	0.9	n/t
Chromium	M	mg/kg	5	26.7	n/t
Copper	M	mg/kg	5	65.0	n/t
Lead	M	mg/kg	5	200	n/t
Mercury	M	mg/kg	0.5	< 0.5	n/t
Nickel	M	mg/kg	5	22.5	n/t
Selenium	M	mg/kg	1	< 1.0	n/t
Vanadium	M	mg/kg	5	29.3	n/t
Zinc	M	mg/kg	5	195	n/t
Anions					
Water Soluble Sulphate	M	g/l	0.02	n/t	0.14
Inorganics					
Hexavalent Chromium	N	mg/kg	0.8	< 0.8	n/t
Total Cyanide	M	mg/kg	1	< 1.0	n/t
Water Soluble Boron	N	mg/kg	0.5	0.7	n/t
Miscellaneous					
pH	M	pH units	0.1	8.6	8.0
Total Organic Carbon	N	%	0.01	2.3	n/t
Phenols					
Total Phenols	N	mg/kg	6	< 6	n/t

Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonards on Sea, East Sussex, TN38 9BY
Tel: +44 (0)1424 718618, Email: info@elab-uk.co.uk, Web: www.elab-uk.co.uk

Results Summary

Report No.: 19-21559

Asbestos Results

Analytical result only applies to the sample as submitted by the client. Any comments, opinions or interpretations (marked #)
in this report are outside UKAS accreditation (Accreditation No2683). They are subjective comments only which must be verified by the client.

Elab No	Depth (m)	Clients Reference	Description of Sample Matrix #	Asbestos Identification	Gravimetric Analysis Total (%)	Gravimetric Analysis by ACM Type (%)	Free Fibre Analysis (%)	Total Asbestos (%)
163816	0.50	BH03	Brown sandy soil,Stones,brick	No asbestos detected	n/t	n/t	n/t	n/t

Method Summary

Report No.: 19-21559

Parameter	Codes	Analysis Undertaken On	Date Tested	Method Number	Technique
Soil					
Hexavalent chromium	N	As submitted sample	01/02/2019	110	Colorimetry
pH	M	Air dried sample	04/02/2019	113	Electromeric
Aqua regia extractable metals	M	Air dried sample	01/02/2019	118	ICPMS
Phenols in solids	N	As submitted sample	31/01/2019	121	HPLC
Water soluble anions	M	Air dried sample	01/02/2019	172	Ion Chromatography
Water soluble boron	N	Air dried sample	01/02/2019	202	Colorimetry
Total cyanide	M	As submitted sample	01/02/2019	204	Colorimetry
Total organic carbon/Total sulphur	N	Air dried sample	04/02/2019	210	IR
Asbestos identification	U	Air dried sample	01/02/2019	PMAN	Microscopy

Tests marked N are not UKAS accredited

Report Information

Report No.: 19-21559

Key

U	hold UKAS accreditation
M	hold MCERTS and UKAS accreditation
N	do not currently hold UKAS accreditation
^	MCERTS accreditation not applicable for sample matrix
*	UKAS accreditation not applicable for sample matrix
S	Subcontracted to approved laboratory UKAS Accredited for the test
SM	Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test
NS	Subcontracted to approved laboratory. UKAS accreditation is not applicable.
I/S	Insufficient Sample
U/S	Unsuitable sample
n/t	Not tested
<	means "less than"
>	means "greater than"

Soil sample results are expressed on an air dried basis (dried at < 30°C)
ELAB are unable to provide an interpretation or opinion on the content of this report.
The results relate only to the items tested
PCB congener results may include any coeluting PCBs
Uncertainty of measurement for the determinands tested are available upon request

Deviation Codes

a	No date of sampling supplied
b	No time of sampling supplied (Waters Only)
c	Sample not received in appropriate containers
d	Sample not received in cooled condition
e	The container has been incorrectly filled
f	Sample age exceeds stability time (sampling to receipt)
g	Sample age exceeds stability time (sampling to analysis)

Where a sample has a deviation code, the applicable test result may be invalid.

Sample Retention and Disposal

All soil samples will be retained for a period of one month
All water samples will be retained for 7 days following the date of the test report
Charges may apply to extended sample storage

APPENDIX I

GAS / GROUNDWATER MONITORING RESULTS & CALIBRATION CERTIFICATES

GAS AND WATER MONITORING RESULTS

	Date:	13-Feb-19	21-Feb-19	28-Feb-19	04-Mar-19								
	Visit Number	1	2	3	4								
	Atmos Press mb	1025	1020	1011	989								
	Pressure Trend	Rising	Rising	Steady	Rising								
	Air Temp °C	10	13	7	9								
	Cloud cover	Overcast	Partial	Overcast	Overcast								
	Wind velocity	Light	Light	Light	Light								
	Precipitation	Dry	Dry	Dry	Dry								
	State of Ground	Dry	Dry	Dry	Dry								
BH1	CH_4 (%) (max/steady):	0.0	0.0	0.0	0.0								
	CO_2 (%) (max/steady):	0.4	0.9	0.4	0.6								
	O_2 (%) (max/steady):	19.6	18.3	19.9	19.7								
	H_2S (ppm) (max/steady):	0.0	0.0	0.0	0.0								
	CO (ppm) (max/steady):	0.0	0.0	0.0	0.0								
	PID (ppm) (max/steady)	0.0	0.0	0.0	0.0								
	Flow (l/hr) (max/steady)	<0.1	<0.1	<0.1	<0.1								
	Water Level / depth to base (m):	Dry	Dry	Dry	Dry								
BH2	CH_4 (%) (max/steady):	0.0	0.0	0.0	0.0								
	CO_2 (%) (max/steady):	1.6	2.9	2.2	4.7								
	O_2 (%) (max/steady):	17.4	14.4	16.4	14.2								
	H_2S (ppm) (max/steady):	0.0	0.0	0.0	0.0								
	CO (ppm) (max/steady):	0.0	0.0	0.0	0.0								
	PID (ppm) (max/steady)	0.0	0.0	0.0	0.0								
	Flow (l/hr) (max/steady)	<0.1	<0.1	<0.1	<0.1								
	Water Level / depth to base (m):	4.00	3.94	3.94	3.95								
BH4	CH_4 (%) (max/steady):	0.0	0.0	0.0	0.0								
	CO_2 (%) (max/steady):	5.8	4.8	3.4	3.8								
	O_2 (%) (max/steady):	13.1	10.8	16.2	15.9								
	H_2S (ppm) (max/steady):	0.0	0.0	0.0	0.0								
	CO (ppm) (max/steady):	0.0	0.0	0.0	0.0								
	PID (ppm) (max/steady)	0.0	0.0	0.0	0.0								
	Flow (l/hr) (max/steady)	<0.1	<0.1	<0.1	<0.1								
	Water Level / depth to base (m):	Dry	Dry	Dry	Dry								

Job No: CCG-C-18-10614 | **Site: The Christie, Manchester**

Instrument: **GSXI**

TEST DATE AND CONDITIONS		
Date	20/06/2018	
Atmospheric Pressure	1000	mB
Ambient Temperature	23.4	°C
Environics Serial No.	5089	

GAS DATA LTD
Unit 4, Fairfield Court
Seven Stars Estate
Wheler Rd
Coventry
CV3 4LJ
Tel 02476303311 Fax 02476307711

GFM436 Final Inspection & Calibration Check Certificate

Customer	C C Geotechnical
Certificate Number	120242
Order Number	319979

Serial Number	12220
Software Version	G436-00.0027/0009

Recalibration DUE Date
20/06/2019

Instrument Checks					
Keyboard	✓		Display Contrast	✓	
Pump Flow In	450	*Accept > 200 cc/min*	Pump Flow @ -200mB	250	*Accept > 200 cc/min*
Clock Set / Running	✓		Labels Fitted	✓	

Gas Checks						
Sensor	CH_4		CO_2		O_2	
	Instrument Gas Readings %	True Gas Value %	Instrument Gas Readings %	True Gas Value %	Instrument Gas Readings %	True Gas Value %
	60.1	60	40.3	40	20.9	20.9
	Accept ±3.0		*Accept ±3.0*		*Accept ±0.5*	
	4.9	5	5	5	6	6
	Accept ±0.3		*Accept ±0.3*		*Accept ±0.3*	
Zero Reading 100% N2	0	0	0	0	0	0
	Accept ±0.0		*Accept ±0.0*		*Accept ±0.1*	

Optional Gas Checks						
Applied Gas & Range		Concentration Tested @ (ppm)	Instrument Readings *(ppm)*			
Gas Type	Range *(ppm)*		Zero Reading		Instrument Gas Reading	
H2S	5000	*1500*	0	*Accept ±0.0*	1500	*Accept ±5.0*
CO	2000	*1000*	0	*Accept ±0.0*	1003	*Accept ±5.0*
				Accept ±0.0		*Accept ±5.0*
				Accept ±0.0		*Accept ±5.0*
Hexane	*2.0%*	2.0%	0	*Accept ±0.0*	1.99	*Accept ±10.0*

Cross Gas Effects									
Applied Gas *(ppm)*		Instrument Readings *(ppm)*							
Gas Type	Concentration	Toxic 1:	H2S	Toxic 2:	CO	Toxic 3:			
H2S	*1500*	1500		0					
CO	*1000*	90		1003					
Hexane	*2.0%*	0		0					

Pressure Checks			
Atmospheric Pressure [AP] *(mB)*			
Current Atmospheric Pressure (mB)		Instrument Atmospheric Pressure Reading (mB)	
AP Open Ports		1000	*Accept ±2.0*
AP Port (Internal)	*+800 mB*	800	*Accept ±5.0*
	+1200mb	1200	*Accept ±5.0*

Flow Checks					
Borehole Flow			Differential Pressure		
Applied Reading *(l/h)*	Instrument Reading *(l/h)*		Applied Pressure *(Pa)*	Instrument Reading *(Pa)*	
-30	-30.9	*Accept ±3.0*	-452	-482	*Accept ±50*
-3	-3.1	*Accept ±1.0*	-19	-22	*Accept ±6.0*
0	0	*Accept ±0.0*	0	0	*Accept ±0.5*
3	3	*Accept ±0.5*	16	17	*Accept ±3.0*
30	30.9	*Accept ±3.0*	339	359	*Accept ±50*
60	61.3	*Accept ±6.0*	1023	1070	*Accept ±130*
90	91.1	*Accept ±9.0*	1998	O/R	*Accept ±250*

Temperature Checks		
Calibration Temperature Applied Temperature ^{0}C	Instrument Temperature Reading ^{0}C	
-10	-10	*Accept ±2.0*
0	0	*Accept ±1.0*
30	30	*Accept ±1.0*
60	60	*Accept ±1.0*
100	100.5	*Accept ±1.0*

Technician:	Date Tested:
Les Treece	*20/06/19*

The instrument identified by the serial number stated above has been tested by Gas Data personnel for calibration accuracy on the date and under the ambient conditions stated. Gas Data Ltd internal BS EN ISO9001:2015 compliant workshop procedures were followed to apply known calibration test gases, gas flow rates, pressures and temperatures of the values stated. The results displayed on the instrument at each stage are recorded above.

Gas Data Ltd is certified to BS EN ISO9001:2015. Certificate NQA 8374. Valid until 22/03/2019

APPENDIX J

NOTES ON LIMITATIONS

Notes on Limitations
For
Geoenvironmental and Geotechnical Consultancy Services

General

This document has been prepared by CC GEOTECHNICAL LTD within the terms of the contract, scope of work, and resources agreed in writing with the client. The limitations of liability of CC GEOTECHNICAL LTD for the contents of this document have been agreed with the Client, as set out in the terms and conditions of offer and related contract documentation.

This document is intended for the sole use of the client indicated above and CC GEOTECHNICAL LTD accepts no responsibility of whatever nature to third parties to whom this document or any part of this document is made known. Any such party relies upon that information at their own risk.

The findings and opinions provided in this document are made in good faith and are subject to the limitations imposed by employing site assessment methods and techniques, appropriate to the time of investigation and within the limitations and constraints defined in this document.

The findings and opinions are relevant to the dates when the assessment was undertaken, but should not necessarily be relied upon to represent conditions at a substantially later date. In particular, seasonal groundwater levels, with the effects of precipitation, may affect the conditions found during the investigation. The report should be read in conjunction with the further Notes on Limitations included in Appendix A.

Where opinions expressed in this report are based on current available guidance and legislation, no liability can be accepted by CC GEOTECHNICAL LTD for the effects of any future changes to such guidelines and legislation. Additional information, improved practices, new guidance, changes in legislation, or amendments to design proposals, may necessitate this report having to be reviewed in whole or in part after that date. Opinions and interpretations are not accredited by UKAS.

Factual data contained in this report may have been obtained from enquiries with reputable third parties, the results of which are relied on unless indicated to be inaccurate by contradictory information.

CC GEOTECHNICAL LTD possesses a non-exclusive and non-transferable Ordnance Survey Licence, but does not possess any right to sub-license any of the rights granted by this licence to any party. Under the terms of CC GEOTECHNICAL LTD`s Ordnance Survey Licence, copying of figures containing Ordnance Survey data or using figures for any purpose other than as part of this report is not permitted.

CC GEOTECHNICAL LTD has prepared this report solely for the use of the Client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought form CC GEOTECNICAL and a charge may be levied against such approval.

CC GEOTECHNICAL LTD accepts no responsibility or liability for:

1. the consequences of this document being used for any purpose or project other than for which it was commissioned

and/or

2. the consequences of use of this document by any party with whom an agreement has not been executed.

Phase I Environmental Audits / Desk Studies

The work undertaken to provide the basis of a Phase 1 Desk Study report comprises a study of available documented information from a variety of sources (including the client), together with (where appropriate) a brief walk over inspection of the site and meetings and discussions with relevant authorities and other interested parties. The opinions given in a Desk Study report have been dictated by finite data on which they are based and are relevant only to the purpose for which the report was commissioned. The information reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in the report, CC GEOTECHNICAL LTD reserves the right to review such information and to modify the opinions accordingly.

It should be noted that any risks identified in this report are perceived risks based on the information reviewed; actual risks can only be assessed following a physical investigation of the site.

Phase II Environmental Audits

The investigation of the site has been carried out with the intention of providing sufficient information concerning the type and degree of contamination, and ground and groundwater conditions to allow a reasonable risk assessment to be made. The objectives of the investigation have been limited to establishing the risks associated to potential human targets, building materials, the environment (including adjacent land), and surface and groundwater.

The amount of exploratory work and chemical testing undertaken may have been restricted by the timescale available, and the locations of the exploratory holes may have been restricted to areas unoccupied by the building(s) on the site, and further restricted by the existence of buried services. A more comprehensive investigation may be required if the site is to be redeveloped as, in addition to risk assessment, a number of important engineering and environmental issues may need to be resolved.

For those reasons, if costs have been included in relation to site remediation these must be considered as tentative only and must, in any event, be confirmed by a qualified quantity surveyor.

The exploratory holes undertaken, investigate only a small volume of the ground in relation to the size of the site, and can only provide a general indication of site conditions. The number of sampling points and the methods of sampling and testing do not preclude the existence of localised “hotspots” of contamination where concentrations may be significantly higher than those actually encountered.

Geoenvironmental Ground Investigations

The investigation of the site has been carried out to provide sufficient information within the agreed scope of the investigation, under the general headings of type and degree of contamination, geotechnical characteristics, and ground and groundwater conditions, to provide a reasonable assessment of the environmental risks together with engineering and development implications.

If costs have been included in relation to the site remediation, these must be confirmed by a qualified quantity surveyor.

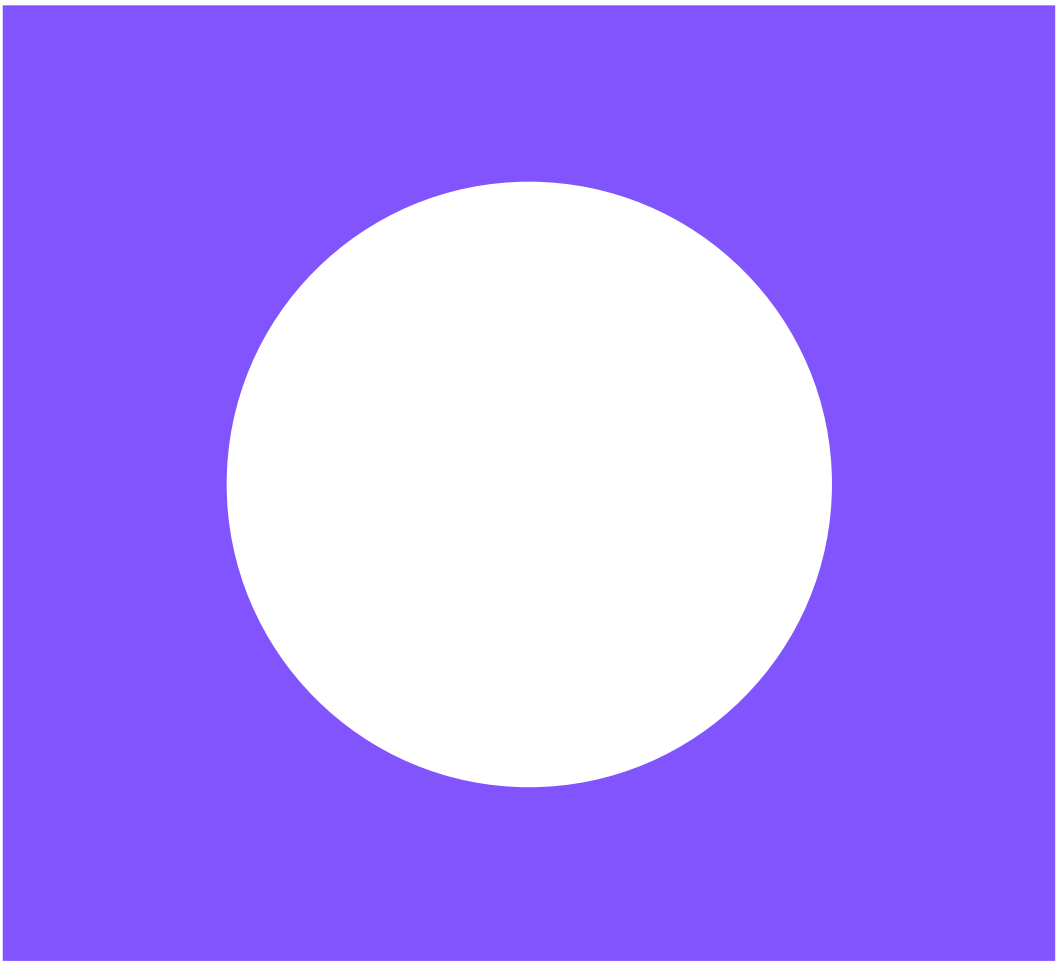
The exploratory holes undertaken, investigate only a small volume of the ground in relation to the size of the site, and can only provide a general indication of the site conditions. The opinions provided and recommendations given in this report are based on the ground conditions apparent at the site of each of the exploratory holes. There may be ground conditions present on the site which have not been disclosed by this investigation, and which have therefore not been taken into account in this report.

The comments made on groundwater conditions are based on observations made at the time that site work was carried out. It should be noted that groundwater levels will vary owing to seasonal, tidal, weather, or other effects.

The risk assessment and opinions provided, inter alia, take into consideration currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values.

F. CASICD Interpretive Ground Investigation Report

MOTT MACDONALD



The Christie Advanced Scanning and Imagine Centre Development (CASICD)

Ground Investigation Report

February 2025

This page left intentionally blank for pagination.

Mott MacDonald
4th Floor
9 Portland Street
Manchester M1 3BE
United Kingdom

T +44 (0)161 914 8880
mottmac.com

The Christie Advanced Scanning and Imagine Centre Development (CASICD)

Ground Investigation Report

February 2025

Mott MacDonald Limited. Registered in England and Wales no. 1243967.
Registered office: 10 Fleet Place, London EC4M 7RB, United Kingdom

Issue and Revision Record

Revision	Date	Originator	Checker	Approver	Description
P01	13.03.25	A. Ecclestone S. Shanks	C.Y Li C. Stanford C. Smith	A. Simpson	First issue

Document reference: CASICD-MMD-XX-XX-RP-C-00002

This document is issued for the party which commissioned it and for specific purposes connected with the above-captioned project only. It should not be relied upon by any other party or used for any other purpose.

We accept no responsibility for the consequences of this document being relied upon by any other party, or being used for any other purpose, or containing any error or omission which is due to an error or omission in data supplied to us by other parties.

This document contains confidential information and proprietary intellectual property. It should not be shown to other parties without consent from us and from the party which commissioned it.

Contents

Executive Summary 1

1 Introduction 3
1.1 Site Location and Description 3
1.2 Development Proposals 4
1.3 Report Objectives and Scope 5
1.4 Geotechnical Category 5

2 Existing Information 6
2.1 Historical Ground Investigations 6
2.1.1 2019 CC Geotechnical Ground Investigation 6

3 Generic Quantitative Risk Assessment 8
3.1 Legislative Context 8
3.1.1 Summary of Potential Source-Pathway-Receptor Linkages 9
3.1.2 Planning Conditions 10
3.2 Generic Assessment Criteria 10
3.2.1 Human Health Criteria 10
3.2.2 Controlled Waters Criteria 11
3.2.3 Factual Summary 11
3.2.4 Deviating Samples 11
3.2.5 Visual/Olfactory Evidence of Contamination 11
3.3 Human Health Assessment 12
3.3.1 Soil Analyses and Screening 12
3.3.2 Soil Leachate Analyses and Screening 12
3.4 Groundwater 13
3.5 Ground Gas Risk 14
3.5.1 General 14
3.5.2 Ground Gas Risks to Construction Workers 14
3.6 Revised Conceptual Site Model and Risk Assessment 14
3.7 Risk Estimation & Risk Evaluation 17
3.7.1 Overview 17
3.7.2 Assumptions 18
3.8 Waste and Material Management 18
3.8.1 Preliminary Waste Classification for Off-site Disposal 18
3.8.2 European Waste Catalogue Codes 18
3.8.3 HazWasteOnline Assessment 19
3.8.4 Waste Acceptance Criteria 19

4 Field and Laboratory Studies 21
4.1 Rationale for Ground Investigation 21
4.2 Summary of In-Situ Testing 22
4.2.1 Standard Penetration Tests 22
4.3 Summary of Geotechnical Laboratory Testing 23
4.4 Summary of Geo-environmental Laboratory Testing 24
4.5 Groundwater Monitoring 24

5 Ground Summary 25
5.1 Ground Model 25
5.2 Groundwater 25
5.3 Ground Aggressivity 25

6 Geotechnical Parameters 27
6.1 Made Ground 27
6.1.1 Bulk Unit Weight 27
6.1.2 Angle of Shearing Resistance 27
6.1.3 Effective Cohesion 27
6.1.4 Undrained Shear Strength (Cohesive Made Ground) 27
6.1.5 Young's Modulus 28
6.2 Weathered Wilmslow Sandstone 29
6.2.1 Bulk Unit Weight 29
6.2.2 Angle of Shearing Resistance 29
6.2.3 Drained Young's Modulus 29
6.3 Wilmslow Sandstone 30
6.3.1 Bulk Unit Weight 30
6.3.2 Unconfined Compressive Strength 30
6.3.3 Effective Angle of Shearing Resistance and Effective Cohesion 31
6.3.4 Rock Mass Young's Modulus 32
6.4 Summary of Characteristic Geotechnical Parameters 33

7 Engineering Assessment 34
7.1 Foundation Assessment 34
7.2 Subsurface Concrete 34
7.3 Excavatability and Subsurface Obstructions 34
7.3.1 Subsurface Obstructions 34
7.3.2 Excavatability 34
7.4 Variable Made Ground 35
7.5 Groundwater 36
7.6 Potential Fault Zone 36

8 Geotechnical Risk Register 37

9 Conclusions and Recommendations 40
9.1 Conclusions 40
9.1.1 Geotechnical 40
9.1.2 Geo-environmental Conclusions 40
9.2 Recommendations 41
9.2.1 Geotechnical 41
9.2.2 Geo-environmental 42

10 References 43

Appendices 45

A. Proposed Scheme Layout 46

B. Ground Model Cross Sections 47

C. Geotechnical Plots 48

D. 2024 GRM Ground Investigation Factual Report 57

E. 2019 CC Geotechnical Ground Investigation Report 58

F. Contaminated Land Risk Assessment Methodology 59

G. Tabulated Soil Chemical Analysis Screening 62
G.1 Soil Screening 62
G.2 Soil Leachate Screening 63

H. HazWasteOnline™ Classification Report 64

I. Detailed UXO Desk Study 65

Tables

Table 2.1: Summary of Relevant Site Background Information 6
Table 2.2: Summary of Ground Conditions – 2019 CC Geotechnical Ground Investigation 7
Table 3.1: Exceedances of GAC (Soil Leachate Analyses) 13
Table 3.2: Revised Conceptual Site Model 16
Table 3.3: EWC Codes for Anticipated Waste 19
Table 4.1: Geotechnical Risks and GI Undertaken 21

Table 4.2: Summary of 2024 Scheme Specific Ground Investigation 21
Table 4.3: Summary of SPT Results 23
Table 4.4: Summary of Geotechnical Laboratory Testing 23
Table 4.5: Summary of Geo-environmental Laboratory Testing 24
Table 5.1: Ground Model 25
Table 5.2: Ground Aggressivity Summary 26
Table 6.1: Characteristic Geotechnical Parameters 33
Table 8.1: Geotechnical Risk Register 38
Table F.1: Classification of Consequence 59
Table F.2: Classification of Probability 60
Table F.3: Overall Contamination Risk Matrix 60
Table F.4: Definition of Risk Categories and Likely Actions Required 61

Figures

Figure 1.1: Site Location Plan 3
Figure 1.2: Site Map 4
Figure 1.3: Basement extents to be demolished 4
Figure 4.1: Exploratory Hole Plan 22
Figure 4.2: SPT N with Depth 23
Figure 4.3: SPT N with Elevation 23
Figure 6.1: SPT Correlated Undrained Shear Strength in Cohesive Made Ground 28
Figure 6.2: UCS with Elevation 31
Figure 7.1: Excavatability for Wilmslow Sandstone 35

Figures – Appendices

Figure C.1: SPTs with Elevation 48
Figure C.2: Particle Size Distribution – Made Ground 49
Figure C.3: Particle Size Distribution – Weathered Wilmslow Sandstone 50
Figure C.4: Moisture Content with Elevation 52
Figure C.5: Core Recovery Parameters with Depth 54

Executive Summary

Mott MacDonald has been commissioned to produce this Ground Investigation Report (GIR) as part of Civil and Structural (C&S) design services through RIBA Stage 3 through IHP for the proposals to demolish existing hospital buildings and re-construct a new CT department.

The 2024 site-specific ground investigation works, along with the 2019 ground investigation for the nearby Paterson Building, found a consistent ground profile across the site. A 0.5 – 2.0m thick layer of Made Ground, comprising predominantly medium dense dark brown SAND, was encountered at the surface. Locally, cohesive Made Ground of soft to firm dark brown gravelly sandy CLAY was encountered. A layer of Weathered Wilmslow Sandstone, comprising medium dense to dense orangish and reddish brown gravelly fine to coarse SAND, of approximately 1.4m thick was recorded beneath the Made Ground. The Weathered Wilmslow Sandstone on-site was underlain by competent Wilmslow Sandstone from approximately 3m bgl. The Wilmslow Sandstone on site was described as extremely weak to weak reddish and orangish brown fine to coarse grained SANDSTONE, locally recovered as sand. Groundwater monitoring and strikes during ground investigation recorded groundwater level between 2.8m and 4.4m bgl, just below competent rockhead within the Wilmslow Sandstone.

Characteristic geotechnical parameters were derived for all strata encountered using data from ground investigations as well as published correlations and advice from standards. The derivation of all parameters is discussed in Section 6 and these parameters are summarised in Table 6.1.

The findings of the ground investigation were used to update the likelihood of risks originally identified in the Geotechnical and Geo-environmental Desk Study. The main residual risks include Variable Made Ground, Obstructions within Made Ground, Buried Services beneath the site and a recorded Fault present southwest of the site. Although no evidence of the fault was identified during ground investigation works, the risk of this fault cannot be ruled out at this stage.

Based on the ground profile encountered and the derived geotechnical parameters, it is anticipated that a piled foundation solution will be required for the new four-storey building. Concrete of Design Sulphate Class DS-1 and ACEC class AC-1 would be appropriate for subsurface concrete at the site. The excavatability of Wilmslow Sandstone on site can be described primarily as “Hard Digging” and “Easy Ripping”.

The Generic Quantitative Risk Assessment (GQRA) has concluded an overall low risk to relevant human health and controlled waters receptors. As described above in relation to residual risks; it should be noted that asbestos may be present within the existing building, including unmanaged asbestos within existing basements, associated with the age of the current buildings on site, which date from the 1930s. Note that should the presence of asbestos contamination be suspected during development, Mott MacDonald Limited would recommend the appointment of a specialist contractor to address the issue and would not provide advice on risk or remedial measures.

The risk posed by elevated ground gases is considered to be low and no specific ground gas preclusion measures are considered to be necessary in the construction of new buildings within the Site. The potential risk from ground gases to construction workers working in excavations and other confined spaces will be dealt with by the Contractor, in accordance with Confined Spaces Regulations.

The majority of the Made Ground deposits analysed are likely to be suitable for removal to inert landfill. It is recommended that a suitable waste contractor is engaged to discuss options for disposal if construction works require removal of soils from site. Additional analysis may be required on specific soils to suit the requirements of the receiving waste transfer facility.

Based on the findings in this assessment, a remediation strategy is not required for the development.

A verification report will be produced on completion of site earthworks and submitted to the Council for acknowledgement and review. The verification report will follow the Environment Agency's LCRM guidance and will include; Details of any materials brought onto site including their source location, nature and any testing data obtained to demonstrate suitability for use, Confirmation that no unexpected contamination was encountered. All locations, methodology and testing undertaken to investigate unexpected contamination (if encountered). Details on any mitigation measures implemented for unexpected contamination.

1 Introduction

Mott MacDonald has been commissioned to provide Civil and Structural (C&S) design services through RIBA Stage 3 through IHP for the proposals to demolish existing hospital buildings and re-construct a new CT department. As part of these services, Mott MacDonald have previously scoped a scheme-specific Ground Investigation, the results of which are discussed in this Ground Investigation Report (GIR).

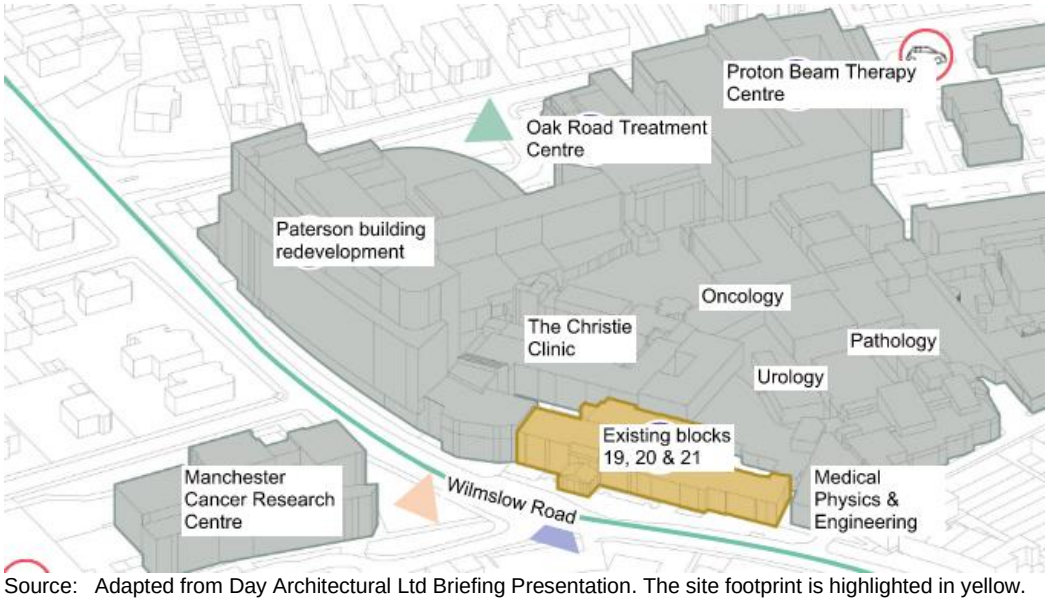
1.1 Site Location and Description

The Christie Hospital campus is in Withington, Greater Manchester and is bordered by Wilmslow Road (including a cycle lane) to the East. The development site consists of existing Blocks 19 and 20 which are to be demolished along with the partial demolition of Block 21 and are to be replaced with a new CT department. The site is surrounded on three sides by existing hospital buildings. An access road is present adjacent to the northern boundary of the site, connecting Wilmslow Road with Palatine Road, to the west of the site. The site plan is shown below in Figure 1.1 and Figure 1.2.

Figure 1.1: Site Location Plan

Source: Day Architectural Ltd

Figure 1.2: Site Map



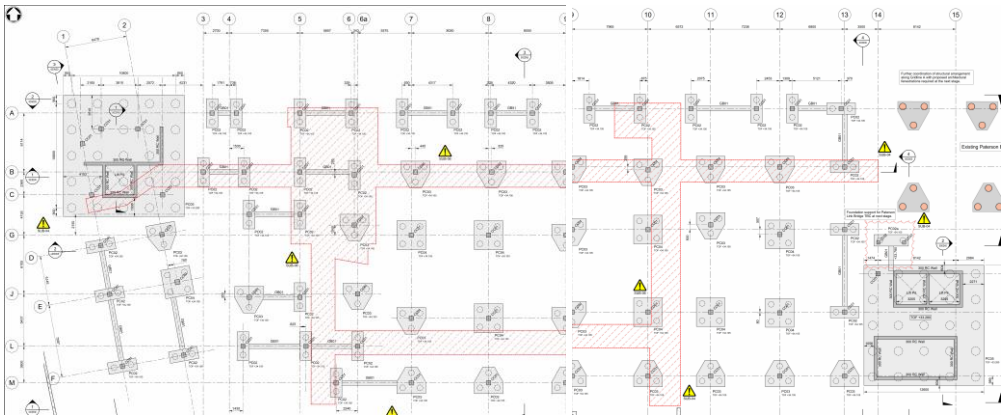
Source: Adapted from Day Architectural Ltd Briefing Presentation. The site footprint is highlighted in yellow.

1.2 Development Proposals

The Christie Advanced Scanning and Imagine Centre Development (CASICD) seeks to demolish part of the existing two and three storey hospital (Blocks 19 and 20 and part of Block 21) and construct a new principally three-storey building with a level of plant above and additional plant equipment on the roof and a CT scanner, X-ray facility and associated accommodation at ground floor level. Levels 01 and 02 are anticipated to be ward accommodation, however the current proposals are for these levels to be built on a 'shell and core' basis at this stage.

Lateral stability is to be provided through reinforced concrete cores at the north and south ends of the building. There is an existing basement that is used as a conduit for services to feed the wider site. The basement will be demolished, and services rerouted as part of the proposed development (see demolition extents below in Figure 1.3).

Figure 1.3: Basement extents to be demolished



Source: Mott MacDonald

Mott MacDonald have been commissioned to provide Civil and Structural (C&S) design services for RIBA Stage 3 through IHP.

1.3 Report Objectives and Scope

This report aims to provide sufficient information to support discharge of the planning condition 4)a, relating to land contamination for the proposed development on Site (planning application ref: 138282/FO/2023, dated 10th October 2023). Should remediation be required, a remediation strategy will be produced to support discharge of the associated planning condition. The planning condition 4)b, relating to verification reporting, will be complied with as the development progresses.

The objectives of this report are to:

- Review previously compiled information from the geotechnical and geo-environmental desk study and relevant historical ground investigation data;
- Present the findings from the scheme-specific 2024 ground investigation at the site;
- Determine the characteristic geotechnical parameters following analysis of in-situ and laboratory data;
- Present the geotechnical risks associated with the site considering the proposed development;
- Develop a Generic Quantitative Risk Assessment (GQRA);
- Develop a representative conceptual site model; and
- Provide high-level engineering considerations in relation to the proposed development.

1.4 Geotechnical Category

The proposed structures are likely to be classified according to BS EN 1997-2004 [1] as Geotechnical Category 2 structures, i.e:

“conventional types of structure or foundations with no exceptional risk posed by difficult ground or abnormal loading conditions. Design for Geotechnical Category 2 structures should normally include quantitative geotechnical data and analysis to ensure that the fundamental requirements are satisfied.”

2 Existing Information

A summary of relevant geotechnical and geo-environmental background information, taken from the Geotechnical and Geo-environmental Desk Study (CASICD-MMD-XX-XX-RP-C-00001) [2], is presented in Table 2.1.

Table 2.1: Summary of Relevant Site Background Information

Aspect	Description
Site Use	The site comprises three existing blocks surrounded by existing hospital buildings. Access is via an road along the northern boundary of the site that connects Palatine Road and Wilmslow Road.
Site History	Prior to the hospital being constructed on the site in 1934, the northern half of the site comprised undeveloped field with the southern half part of the Withington Green and Lodge landscape garden, yard and buildings. Later the entire site was located within the grounds of Groombridge House. The hospital was originally named the 'Christie Hospital & Holt Radium Institute'.
Published Geology	The BGS does not record artificial ground as being present beneath the site. BGS 1:10,000 scale superficial deposit mapping records Glacial Till across the site. BGS 1:10,000 scale bedrock deposit mapping records the site as being entirely underlain by Sandstone of the Wilmslow Sandstone Formation. Linear mapping records a northwest-southeast trending fault approximately 25-50m southwest of the site. Bedrock northeast of the fault (including that which underlies the site) is recorded as being downthrown. Bedrock in the area is recorded as dipping approximately 10° east.
Hydrology	There are no watercourse mapped within the site boundary. Historical mapping recorded a culverted watercourse approximately 60m west of the site. Shaw Brook is recorded 180m north of the site/
Hydrogeology	Glacial Till recorded as underlying the site is designated a Secondary Undifferentiated Aquifer. The Wilmslow Sandstone Formation is designated a Principal Aquifer by the Environment Agency (EA).
Mining and Ground Workings	There are no recorded underground or surface workings within 500m of the site. The site does not lie within a Coal Mining Reporting Area. Two historical surface ground workings are recorded within 250m of the site. A waterbody was present 85m southeast of the site and a pond 200m southwest.
Radon	The site lies within an area where less than 1% of the homes are estimated to be at or above the radon action level (UK Health Security Agency, 2022). No radon protective measures are considered necessary for construction of new buildings.
Radioactive Substances	The Christie NHS Foundation and the University of Manchester have historically held permissions to store, use and dispose of radioactive materials across the wider Christie Hospital site.
Unexploded Ordnance (UXO) Risk	UXO risk mapping recorded a moderate risk of unexploded bombs at the site. A subsequent detailed desk study recorded a low risk from unexploded ordnance hazard and recommended no further mitigation measures. This detailed desk study is presented in Appendix H.
Sensitive Land Uses	There are no designated environmentally sensitive sites within 500m of the site. The site does, however, fall within an SSSI Impact Risk Zone. Based upon the nature of the proposed developments, it is unlikely that the developments will require consultation.

2.1 Historical Ground Investigations

There are no freely available BGS borehole records within, or in close proximity to, the site.

2.1.1 2019 CC Geotechnical Ground Investigation

A ground investigation was undertaken, adjacent to the site, in 2019 by CC Geotechnical Limited [3]. This ground investigation was carried out as part of the redevelopment of the

Paterson building. The investigation comprised four cable percussive boreholes with rotary follow to depths of up to 25m bgl, one windowless sample borehole to 2.4m bgl, three machine-dug trial pits to 2.9m bgl and nine hand-dug foundation pits.

A summary of the ground conditions encountered during the 2019 CC Geotechnical ground investigation of the Paterson building, immediately south of the site, is presented in Table 2.2.

Table 2.2: Summary of Ground Conditions – 2019 CC Geotechnical Ground Investigation

Stratum	Depth to top of stratum (m bgl) [Elevation, m AOD]	Thickness (m)	Typical Description
Made Ground	0 [34.7 – 35.3]	0.7 – 2.2	Horizon of Topsoil overlying brown clayey, sandy GRAVEL of brick, limestone, concrete and sandstone with organic matter present locally.
Devensian Till	0.70 – 2.20 [32.5 – 34.2]	0.5 – 2.2	Loose to medium dense clayey, silty gravelly SAND and firm to stiff sandy silty CLAY.
Weathered Sandstone	2.20 – 2.70 [31.4 – 33.1]	1.3 – 2.8	Fine to coarse red/brown SAND.
Wilmslow Formation Sandstone	3.50 – 5.00 [29.9 – 31.8]	Not proven	Very weak to weak reddish brown fine to medium grained thickly laminated SANDSTONE. Moderately weathered. Recovered locally as sandy gravel. Discontinuities are extremely close to medium spaced horizontal, clean, rough, tight to open.

Further information from this ground investigation, including ground and groundwater conditions, laboratory tests and in-situ tests has been included throughout this report where appropriate. As this data was collected adjacent to, but not directly on, the site, it may not entirely accurately reflect site conditions. Therefore, information from this investigation has been reviewed only to supplement that obtained from the on-site investigation.

3 Generic Quantitative Risk Assessment

3.1 Legislative Context

New development is regulated under the Town and Country Planning Act 1990. This regime provides a mechanism for the planning authority to enforce the proper investigation of a development site to ensure that once development has occurred, the site is suitable for its intended use. In England, the National Planning Policy Framework (NPPF) provides guidance on the implementation of contaminated land and pollution management requirements to address contamination risks associated with future site uses through the planning system. Paragraphs 189, 190 and 191 of the NPPF (C.a.L Government, 2023) state the following:

189: Planning Policies and decisions should ensure that:

a. a site is suitable for its proposed use taking account of ground conditions and any risks arising from land instability and contamination. This includes risks arising from natural hazards or former activities such as mining, and any proposals for mitigation including land remediation (as well as potential impacts on the natural environment arising from that remediation);
b. after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990; and
c. adequate site investigation information, prepared by a competent person, is available to inform these assessments.

190: Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner.

191: Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a. mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;
b. identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and
c. limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.

The primary regulatory regime, under which contaminated land in the UK is managed, is Part IIA of the Environmental Protection Act (EPA), 1990 (DEFRA, 2012), although numerous other subsidiary Regulations are also relevant. This report adopts a strategy for the assessment of potential land contamination based on current guidance documents related to Part II A of the EPA. Particular reference is made to R&D66:2008 (R&D 66, 2008) and the Environment Agency (EA's) Land Contamination Risk Management (LCRM) online guidance (Environment Agency, 2023) [4].

Following the procedures in LCRM, a key element of the Preliminary Risk Assessment is the development of a conceptual model which may be refined or revised as more information and understanding is obtained through the risk assessment process. The conceptual model is described in terms of the contaminant Sources, transport Pathways and possible Receptors that

may be present, and the potential 'Pollutant Linkages' between them, as defined in the relevant legislation and guidance.

Preliminary qualitative risk assessment is part of a phased approach as set out in UK guidance including R&D66:2008 (R&D 66, 2008) and EA LCRM (Environment Agency, 2023), the first stage requires development of a conceptual site model (CSM) that takes into consideration the environmental site setting and identifies potential contaminant sources, pathways and receptors. This allows potential pollutant linkages to be identified. The qualitative risk assessment follows on from this and both are presented in the sections below. The methodology is detailed further in Appendix F.

3.1.1 Summary of Potential Source-Pathway-Receptor Linkages

The 2023 Mott MacDonald Desk Study identified potential sources of contamination beneath the site, including potential pathways to the relevant receptors identified:

- S1: Made Ground on site – the site has been occupied by The Christie Hospital since the early 1930s (first mapped on 1934 mapping as 'Christie Hospital & Holt Radium Institute'). Made Ground is anticipated on site as the development platform for the above ground structures, as well as the material within which the existing basements are constructed in. Given the age of the development, Made Ground may contain elevated concentrations of heavy metals and organic compounds (e.g., fuel oils / solvents) (excluding asbestos).
- S2: Wilmslow Road surface water run-off – the site is located adjacent to Wilmslow Road, where elevated heavy metals and organic compounds (e.g., accidental fuel spills) from motorised road traffic may have entered surface water drainage systems and percolated towards the site.
- S3: Hazardous ground gases associated with underlying ground material – the site is anticipated to be underlain by Made Ground, overlying superficial Glacial Till deposits which is underlain by sandstone bedrock of the Wilmslow Sandstone Formation and the Chester Formation. The Glacial Till and sandstone bedrock are not considered to be credible sources of hazardous ground gases, with the Made Ground potentially a credible source of hazardous ground gases (arising from degradable material potentially within it, and the potential historical spillage of organic compounds (e.g., petroleum hydrocarbon, chlorinated solvents)).
- S4: Underlying ground material – the site is anticipated to be underlain by Made Ground overlying Glacial Till and sandstone bedrock of the Wilmslow Sandstone Formation and the Chester Formation. The geochemical condition of these strata may potentially pose an aggressive environment to buried concrete and cementitious structures and services.
- S5: Asbestos - the buildings on site have occupied the site since the early 1930s (first mapped on 1934 mapping), where asbestos would likely have been used during construction. Mott MacDonald Limited's Design Stage Report [5] mentions the presence of unmanaged asbestos within existing basements on site. Given the age of the development, asbestos is also potentially present within Made Ground on site.

The following pathways were considered:

- P1: Human uptake pathways:
  - Ingestion of exposed soils
  - Dermal contact with exposed soils
  - Inhalation of soils/dust/volatised compounds
- P2: Overland flow
- P3: Horizontal and vertical percolation within the unsaturated zone

- P4: Horizontal and vertical migration within the saturated zone
- P5: Horizontal and vertical gas migration within the underlying ground material
- P6: Direct contact.

The following receptors were considered:

- R1: Site end users e.g., hospital staff, visitors, pedestrians and cycle path users
- R2: Controlled waters – Glacial Till Secondary Undifferentiated aquifer and sandstone bedrock Principal Aquifer
- R3: Above ground structures
- R4: Buried concrete and cementitious structures.

Therefore, intrusive ground investigations (GI) were designed and implemented to assess the potential impacts on receptors. A review of the risks, based on the results of the GI, is presented in the following sections.

3.1.2 Planning Conditions

The Manchester City Council planning conditions (planning reference: 138282/FO/2023, dated 10 October 2023) include the following conditions relating to land contamination:

4) a) The measures for investigating the site identified in the Geo Technical and Geo Environmental Phase I desk study (Mott MacDonald), received on 10 October 2023, shall be carried out before construction commences and a report prepared outlining what measures, if any, are required to remediate the land (the Site Investigation Report and/or Remediation Strategy) shall be submitted to and approved in writing by the City Council as local planning authority. When the development commences, the development shall be carried out in accordance with the previously agreed Remediation Strategy.
In the event that ground contamination, groundwater contamination and/or ground gas, not previously identified, are found to be present on the site at any time before the development in each phase is occupied, then development shall cease and/or the development shall not be occupied until, a report outlining what measures, if any, are required to remediate the land (the Revised Remediation Strategy) is submitted to and approved in writing by the City Council as local planning authority and the development shall be carried out in accordance with the Revised Remediation Strategy, which shall take precedence over any Remediation Strategy or earlier Revised Remediation Strategy.

b) Prior to the occupation of the development hereby approved, a Contaminated Land Verification Report shall be submitted to and be approved by the City Council as local planning authority.

3.2 Generic Assessment Criteria

3.2.1 Human Health Criteria

The risks to human health from Site soils have been assessed by comparison of laboratory soil testing results with Generic Screening Criteria (GSC) established using the UK Contaminated Land Exposure Assessment (CLEA) framework (Nathanail C. e., 2015) and CL:AIRE (CL:AIRE, 2010). Further information on the methodology is presented in Appendix F.

GSC have been developed for exposure pathways relevant to a range of generic land use categories. The proposed development will primarily comprise demolition of existing structures

with redevelopment of new buildings, as detailed in Section 1.2.. Therefore, the selected GSC for human health criteria is “Commercial”.

Each generic land use scenario has different screening criteria which are dependent on the soil organic matter (SOM). GSC have been derived for SOM contents of 1.0% (most conservative), 2.5% and 6.0% (least conservative). The GSC for SOM of 6.0% have been used to assess the results on a conservative basis due to the range of values of SOM observed (1.89% to 12.01%).

The complete set of laboratory chemical test results are included within the GI Factual Report, included within Appendix D, with the summary screened results included in Appendix G.

3.2.2 Controlled Waters Criteria

Laboratory soil leachate and groundwater data has been compared with UK Drinking Water Standards (DWS) in consideration of the underlying superficial deposits (Secondary (undifferentiated) aquifer within the Glacial Till) and sandstone bedrock geology (Principal Aquifer). Based on the conditions encountered within the GI, where relatively thin granular and cohesive Made Ground generally overlying weathered sedimentary bedrock, no pervasive shallow groundwater body is anticipated beneath the site and no Glacial Till has been recorded, however the results have been considered in relation for the potential for this superficial aquifer to exist in proximity of the site. In addition, no surface watercourses were recorded within 250m of the site. As such, the most relevant receptor in relation to the water environment is considered to be the underlying bedrock aquifer. In the absence of any UK DWS, we have reverted to the World Health Organisation’s (WHO) Guidelines for Drinking Water Quality (4th Edition incorporating first addendum, 2017), and finally in the absence of these guidelines we have reverted to the laboratory limits of detection (LOD). No relevant surface water receptor has been identified in relation to the site, as such surface water is not considered further in this assessment.

3.2.3 Factual Summary

A factual summary of the recent ground investigation contamination data is presented in the following sections. The results have been compared to relevant human health and controlled waters GAC.

3.2.4 Deviating Samples

A number of soil samples were recorded by the testing laboratory as deviating due to exceedance of holding time. The deviations were in relation to pH, cyanide, phenol and hydrocarbon analyses. Details of the deviating tests are included in the Factual Report [6]. The deviating samples are not considered to detract from the overall determination of risk within their respective assessments given no significant time had elapsed between sampling and laboratory receipt and, as such, all results have been utilised.

3.2.5 Visual/Olfactory Evidence of Contamination

During the GI, visual evidence of contamination recorded include the anthropogenic inclusions (all within Made Ground) of asphalt/tarmac/bituminous material.

A “mild to moderate organic odour” was recorded within the hand-dug inspection pit in WS102 (beneath the internal concrete floor slab) within Made Ground described as, “very dark brown slightly gravelly fine to coarse sand” with extraneous fragments including brick and concrete between approximately 0.70m and 1.50m bgl. No other visual or olfactory evidence of contamination was identified during the ground investigations. The typical make up of anthropogenic inclusions recorded within Made Ground and the limited visual or olfactory

evidence of hydrocarbon contamination encountered does not suggest a significant source of contamination to be present on Site.

3.3 Human Health Assessment

3.3.1 Soil Analyses and Screening

Soil laboratory testing has been undertaken within samples of the shallow Made Ground retrieved from the exploratory holes and trial pits, as detailed in Table 4.5, and the results compared to the GAC described in Section 3.2.1. No exceedances of human health screening guidelines were recorded within the samples analysed. The laboratory certificates are included within the factual report and screening of the test results is presented in Appendix G.

3.3.1.1 Interpretation

As above, no exceedances of the GAC were recorded including total petroleum hydrocarbons (TPH). TPH was recorded above the laboratory LOD in four samples, although the majority of these recorded total aliphatic and aromatic concentrations <200mg/kg. BH103A recorded total aliphatic and aromatic concentrations of 1,900mg/kg, primarily within the heavy end aromatic fractions (C16-C21 and greater) typically associated with diesel and heavy fuel oils. No specific source or free-phase product was recorded within BH103A at this depth, although hydrocarbon concentrations may be derived from the tarmacadam recorded throughout the Made Ground at this location, coinciding with slightly higher polycyclic aromatic hydrocarbons (PAH) in this sample than recorded at other locations, which may also be due to the presence of tarmacadam within the sample. Historical mapping indicated that this location was approximately adjacent to the former Groombridge House, prior to development of the hospital, and no specific source from previous site use was indicated. Additionally, the trial pit and borehole logs did not record the presence of any soil constituents which may be considered to represent an overt source of contamination. As such, no significant source has been identified and therefore the potential for human health pollutant linkages to be present is considered to be low.

3.3.1.2 Asbestos

All soil samples retrieved from the shallow Made Ground from the GI were screened for asbestos. No suspected asbestos containing materials were identified in the exploratory hole logs and the laboratory screening did not detect any asbestos fibres within the soil samples analysed.

As detailed within the Design Stage Report [5], asbestos may be present within the existing building including unmanaged asbestos within existing basements associated with the age of the current buildings on site, which date from the 1930s. Note that should the presence of asbestos contamination be suspected during development, Mott MacDonald Limited would recommend the appointment of a specialist contractor to address the issue and would not provide advice on risk or remedial measures.

3.3.2 Soil Leachate Analyses and Screening

Soil leachate laboratory testing has been undertaken within samples of the shallow Made Ground retrieved from the boreholes and trial pits, as detailed in Table 4.5, and the results compared to the standards outlined in Section 3.2.2. Exceedances of the screening values are presented in Table 3.1. The laboratory certificates are included within the factual report and screening of the test results is presented in Appendix G.

Table 3.1: Exceedances of GAC (Soil Leachate Analyses)

Determinant	Location	Sample Depth (m)	Strata	Concentration Measured (µg/l)	UK DWS (µg/l)	WHO (µg/l)	LOD* (µg/l)
Iron	BH102	0.30	MG	1,200	200	-	-
	TP101	0.40	MG	380			
	WS101	0.80	MG	12,000			
Lead	WS101	0.80	MG	41	10	10	-
Manganese	WS101	0.80	MG	210	50	400	-
Phenol	BH102	0.30	MG	7.42	0.5	-	-
	BH103	1.40	MG	17			
	BH104	1.50	MG	18.3			
	TP101	0.40	MG	12.9			
	WS101	0.80	MG	8.52			

Note: MG – Made Ground
* LOD value noted only where utilised in lieu of UK DWS or WHO value

3.3.2.1 Interpretation

The soil leachate analyses identified concentrations of heavy metals and phenol in exceedance of UK DWS (and corresponding WHO guideline in relation to lead). All other determinants were below their respective assessment criteria. No specific source of the potentially leachable concentrations was identified within the Made Ground. A number of samples also recorded concentrations <LOD and it is likely that the concentrations are due to the inherent variability of Made Ground deposits.

It is broadly accepted that soil leachate analysis is a much more aggressive process than would typically occur in nature, and results are generally an over-estimation of the availability of contaminants to dissolve. Additionally, no preferential pathways for the migration of the potentially leachable exceedances identified are anticipated to be created by the site development works. The completed development will also be primarily surfaced by new buildings and otherwise by hardstanding, also incorporating surface water drainage which will further reduce the ingress of surface water and the potential for leachate generation. Additionally, it is anticipated that a proportion of Made Ground will be excavated and removed from site during the redevelopment works to facilitate new foundations, thereby removing a potential source of contamination

The desk study did not identify any groundwater abstractions (>20m^3/day) within the site or vicinity and given the urban setting of the site, it is considered unlikely the groundwater would be utilised as a drinking water source. As such, it is considered unlikely that the potentially leachable concentrations identified in exceedance of UK DWS (and WHO) would impact superficial groundwater within Glacial Till deposits (where present) or the underlying groundwater body within the solid strata.

3.4 Groundwater

Groundwater monitoring standpipes were installed within BH101 and BH104, with response zones within the solid strata. The GI Factual Report records two visits between April and May 2024, neither of which obtained groundwater samples due to slow groundwater recharge within the monitoring installations.

3.5 Ground Gas Risk

3.5.1 General

Previous GI undertaken for the Paterson Building adjacent to the south of the site, as detailed in Section 2.1.1, included ground gas monitoring of the Made Ground deposits on four occasions, which did not record the presence of any elevated ground gases. It was noted that the visits generally took place during dry conditions with rising atmospheric pressure conditions.

The underlying Wilmslow Sandstone bedrock is considered to be of low gas generation potential.

Due to the Made Ground soils' recorded low organic content (sand and gravel material not degradable so cannot produce methane or carbon dioxide), the absence of putrescible material reported in the exploratory hole logs and no recorded olfactory or visual evidence of contamination, no ground gas monitoring was undertaken as part of the recent GI. Furthermore, a volume of Made Ground is anticipated to be removed to facilitate construction of the new foundations.

The overall risk of the accumulation of elevated ground gas beneath the proposed development is considered low, based on the absence of any appreciable source of elevated ground gases within the Made Ground or from within the solid strata. A proportion of the Made Ground will also be excavated and removed from site to facilitate the foundation construction during the redevelopment works. Additionally, no appreciable off-site source of potentially elevated ground gases was considered to be present from both the desktop researches and the results of previous GI immediately to the south of the site.

No specific gas protection measures are considered necessary for the Site (Characteristic Situation 1, in accordance with BS8485:2015+A1:2019),

3.5.2 Ground Gas Risks to Construction Workers

The potential risk from ground gases to construction workers working in excavations and other confined spaces will be dealt with by the Contractor, in accordance with Confined Spaces Regulations.

3.6 Revised Conceptual Site Model and Risk Assessment

The preceding Sections have summarised available information for the Site and have been used to inform this Generic Quantitative Risk Assessment (GQRA). The proposed development will include the partial demolition of the existing site structures and construction of new buildings, as detailed in Section 1.2.

A key element of an environmental risk assessment is the development of a Conceptual Site Model (CSM) which is done by undertaking a Source-Pathway-Receptor analysis of the Site:

- Sources (S) are potential or known contaminant sources e.g. a former land use
- Pathways (P) are environmental systems through which a contaminant could migrate e.g. air
- Receptors (R) are sensitive environmental receptors that could be adversely affected by a contaminant e.g. Site end-users

Where a source, relevant pathway and receptor are present, a pollutant linkage is considered to exist whereby there is a circumstance through which environmental harm could occur, and a potential environmental liability is considered to exist.

The CSM will assess potential pollutant linkages through both the construction phase and the ongoing end-use of the proposed development.

The sources, pathways and receptors identified (and revised as required) in relation to the site are presented below, with the revised CSM for the Site presented in Table 3.2.

Table 3.2: Revised Conceptual Site Model

Source	Pathway	Receptors	Risk	Comment
S1: Potentially leachable heavy metals and phenol identified at concentrations in exceedance of UK DWS and WHO screening values within shallow Made Ground deposits	**P1**: Horizontal and vertical percolation within the unsaturated zone **P2**: Horizontal and vertical migration within the saturated zone	**R1:** Controlled waters	Probability: Low likelihood Consequence: Mild Risk: **Low Risk**	Exceedances of potentially leachable contaminants were recorded above the UK DWS (and WHO) screening values. No preferential pathways for the migration of the potentially leachable exceedances are anticipated to be created by the site development works. The completed development will also be surfaced by hardstanding and incorporate surface water drainage, further reducing the ingress of surface water and the potential for leachate generation. It is considered unlikely that the potentially leachable concentrations identified in exceedance of UK DWS (and WHO) would impact controlled waters, specifically the underlying Secondary Undifferentiated aquifer within the glacial till deposits and sandstone bedrock Principal Aquifer.
		R2: Buried concrete and cementitious structures	Probability: Unlikely Consequence: Mild Risk: **Low Risk**	Buried concrete / cementitious structures will be in direct contact with underlying ground material(s). The risk to buried concrete has been assessed in accordance with the guidance presented in BRE Special Digest: 2005. Indicative Design Sulphate and ACEC Classes are presented in Section 5.3 of this report. The section concludes DS-1, AC-1 suitable, therefore likely a low risk.

* Mott MacDonald Limited's Design Stage Report mentions the presence of unmanaged asbestos within existing basements on site. Mott MacDonald Ltd is not insured for surveys or to provide guidance to identify and treat asbestos. As the presence of asbestos was previously identified to be present on site, it is recommended that the advice of an asbestos specialist is sought to advise on potential risk and remediation requirements.

It is assumed that a robust Construction Environmental Management Plan (CEMP) will be adopted for the construction works, and as a result, no contamination will occur during construction (e.g. fuel leaks and spills). It is assumed that no contaminated material will be brought onto Site for the proposed development which may act as a potential contaminant source, with only clean, inert materials used. As a minimum, the CEMP will include the following measures:

- Adherence to DEFRA and EA Pollution prevention for businesses guidance (DEFRA & EA, 2023);
- Use of plant nappies beneath all static plant containing hydrocarbons;
- Storage of fuels and oils in bunded areas or double skinned containers;
- Regular inspection of plant and equipment for wear, damage and/or leaks;
- Provision of spill kits;
- Maintaining 10m distance between any soil stockpiles and watercourses;
- Use of silt fencing around material stockpiles and between the working area and watercourses; and
- Covering and/or seeding soil stockpiles to minimise erosion.
- Dust suppression.

It is anticipated that some Made Ground deposits will be removed from beneath the proposed structures during construction. It should be noted that the following does not provide an assessment of risk associated with asbestos or radon, both which should be assessed by a suitably qualified specialist. Furthermore, the CSM is based on the proposed development works as presented in Appendix A. Should the development proposals change, the contamination risk assessment and CSM should be reviewed.

3.7 Risk Estimation & Risk Evaluation

3.7.1 Overview

The GI has not recorded visual or olfactory evidence of contamination on Site. Whilst anthropogenic inclusions were recorded within Made Ground, these, along with the general descriptions of encountered Made Ground and the underlying natural ground material, do not suggest a significant source of contamination is present. The proposed works will be under hardcover/hardstanding on completion, therefore the pathway to human receptors will be broken.

With respect to site workers involved in the preparation and construction of the development, the Principal Contractor is duty bound under the CDM Regulations to undertake their own risk assessments with respect to their employees. Access to the construction works will be controlled and the works will be inaccessible to members of the public, with a robust CEMP be adopted for the construction works.

There were no exceedances of the selected “Commercial” GSC recorded in soil. Made Ground and natural deposits encountered during the GI are considered to be of low ground gas generation potential. The recorded soil leachate exceedance of the water quality standard thresholds is considered to be generally low-level and slightly above (generally within an order of magnitude) of the respective threshold.

Given the reasons mentioned in the respective previous sub-sections, the observed soil leachate exceedances of the water quality standards for iron, lead, manganese and phenol in relation to the proposed development and site setting is not considered to represent a

significant contamination risk to receptors, nor a new contaminant source or worsen existing site conditions.

Based on above, the risk assessment concludes that the risks to identified receptors are low to very low, therefore no specific remediation measures are proposed.

3.7.2 Assumptions

The following assumptions are made as part of the development of the CSM and risk assessment:

- It is assumed that a robust construction environmental management plan (CEMP) will be adopted during construction works to ensure control of dust emissions, surface run-off and suitable storage of materials (including excavated material) during construction work. Furthermore, no contamination will occur as a result of leaks and spills during construction.
- An Unexpected Contamination Protocol will be in place during works, and works should cease should any unexpected contamination be uncovered during works and advice sought from a geo-environmental specialist.
- Best practices should be adopted and followed for construction works.
- It is assumed that no changes are made to the existing arrangements for the delivery and storage of chemicals on site. These are not considered in this assessment.
- It is assumed that the proposed infrastructure will be well maintained.

3.8 Waste and Material Management

3.8.1 Preliminary Waste Classification for Off-site Disposal

An assessment of the laboratory soil results has been conducted using HazWasteOnline™ software (One Touch Data Limited, 2023) in accordance with Landfill Regulations 2002 (Landfill (England and Wales) Regulations, 2002) (as amended) and the waste classification and assessment technical guidance WM3 (NRW, SEPA & EA, 2021).

It is the responsibility of the producer to ensure that all waste created on Site undergoes basic characterisation prior to disposal in an appropriate landfill, and an indication of the likely classification is provided in the following sub-sections.

3.8.2 European Waste Catalogue Codes

The European Waste Catalogue (EWC) classifies waste in accordance with the Hazardous Waste (England and Wales) Regulations 2005 (Hazardous Waste (England and Wales) Regulations, 2005) (as amended). The waste is allotted an EWC code and named as a non-hazardous, hazardous absolute, or mirror entry. An absolute entry represents a material that is hazardous based on its description, regardless of its chemical composition, whereas mirror entries may be hazardous only if hazardous substances are present above certain thresholds. Non-hazardous entries are also classified based on their description, regardless of their chemical composition. The Landfill (England and Wales) Regulations 2002 define waste as inert if:

- *a) it does not undergo any significant physical, chemical or biological transformations;*
- *b) it does not dissolve, burn or otherwise physically or chemically react, biodegrade or adversely affect other matter with which it comes into contact in a way likely to give rise to environmental pollution or harm to human health; and*

- *c) its total leachability and pollutant content and the ecotoxicity of its leachate are insignificant and, in particular, do not endanger the quality of any surface water or groundwater'*

The wastes expected to be generated during the construction works on Site, together with their EWC code are included in Table 3.3. This is a non-exhaustive list for guidance only, and the waste producer should record EWC codes for different waste types as they are generated on Site in the Site Waste Management Plan, and on waste transfer or consignment notes.

Table 3.3: EWC Codes for Anticipated Waste

Site Material	EWC Code	EWC Description	Waste Disposal Classification
Made Ground – bituminous mixtures	17 03	Bituminous mixtures containing coal tar or bituminous mixtures other than those mentioned in 17 03 01	TBC
Made Ground – of mixed lithologies	17 05 04	Soil and stones other than those mentioned in 17 05 03	Mirror non-hazardous
Made Ground – of mixed lithologies	17 05 03	Soil and stones containing hazardous substances	Mirror hazardous
Natural deposits – Glacial Till / weathered sandstone and sandstone bedrock	17 05 04	Soil and stones other than those mentioned in 17 05 03	Mirror non-hazardous

3.8.3 HazWasteOnline Assessment

Construction works associated with the proposed scheme are anticipated to generate a volume of excavated soil. Surplus excavated Made Ground and/or excavated material assessed as unsuitable for reuse will be permanently removed from the site. The Made Ground soil samples collected during the GRM 2024 GI have been assessed using HazWasteOnline™ (One Touch Data Limited, 2023) software (Waste Classification Report No. V46ZU-N5QSU-SRBNH) to provide an indication of the likely waste classification of the excavated soils on-site (in-accordance with guidance given in WM3). The majority of samples were recorded as 'non-hazardous'. Two samples, BH103A at 0.10m depth and BH104 at 0.30m depth were recorded as 'hazardous' under code HP7 (carcinogenic "waste which induces cancer or increases its incidence") due to the presence of TPH at respective concentrations of 1,900mg/kg and 2,100mg/kg. No evidence of free-phase hydrocarbons was noted at each of these locations and no hydrocarbon odours or staining was noted. It is possible that these results are due to the presence of asphalt, which is recorded in the Made Ground each of these samples were taken from.

The full HazWasteOnline™ report is presented in Appendix H.

It is the responsibility of the waste producer to ensure that all waste created on site undergoes basic characterisation prior to disposal to an appropriately permitted landfill.

3.8.4 Waste Acceptance Criteria

Six WAC tests were completed within samples of the Made Ground between 0.30m and 1.10m bgl. Based on the hazard assessment above and the results of the WAC testing, the majority of samples could be considered 'non hazardous'. However, the following was noted in relation to the WAC analyses:

- BH104, 0.30m: fails inert & stable non-reactive hazardous waste (SNRHW) WAC due to total organic carbon (TOC) >5.0%, recorded as 5.1%.

- TP102, 0.30m: fails inert WAC due to Mineral Oil >C10 to C40 >500mg/kg, recorded as 572mg/kg.
- TP107, 0.40m: fails inert WAC due to TOC >3.0%, recorded as 3.6%.
- WS102, 0.80m: possibly categorised as ‘stable non-reactive hazardous waste’ due to arsenic >2mg/kg, recorded as 3.9mg/kg.

Taking the above into account, it is considered likely that the soils could be disposed of in a non-hazardous landfill given the marginal failures in relation to inert waste requirements. However, it is recommended that any material disposal is discussed with a suitably qualified waste contractor to allow them to make their own assessment.

It is recommended that a waste contractor is contacted to discuss options for disposal. Additional analysis may be required on specific soils.

4 Field and Laboratory Studies

4.1 Rationale for Ground Investigation

The scheme-specific ground investigation was undertaken by GRM Development Solutions between February and April 2024 to address the geotechnical and geo-environmental risks identified in the Geotechnical and Geo-environmental Desk Study (CASICD-MMD-XX-XX-RP-C-00001) [2]. Table 4.1 identifies the main geological risk and/or the known areas of additional data requirements targeted as part of this investigation as well as the ground investigation undertaken to address these.

Table 4.1: Geotechnical Risks and GI Undertaken

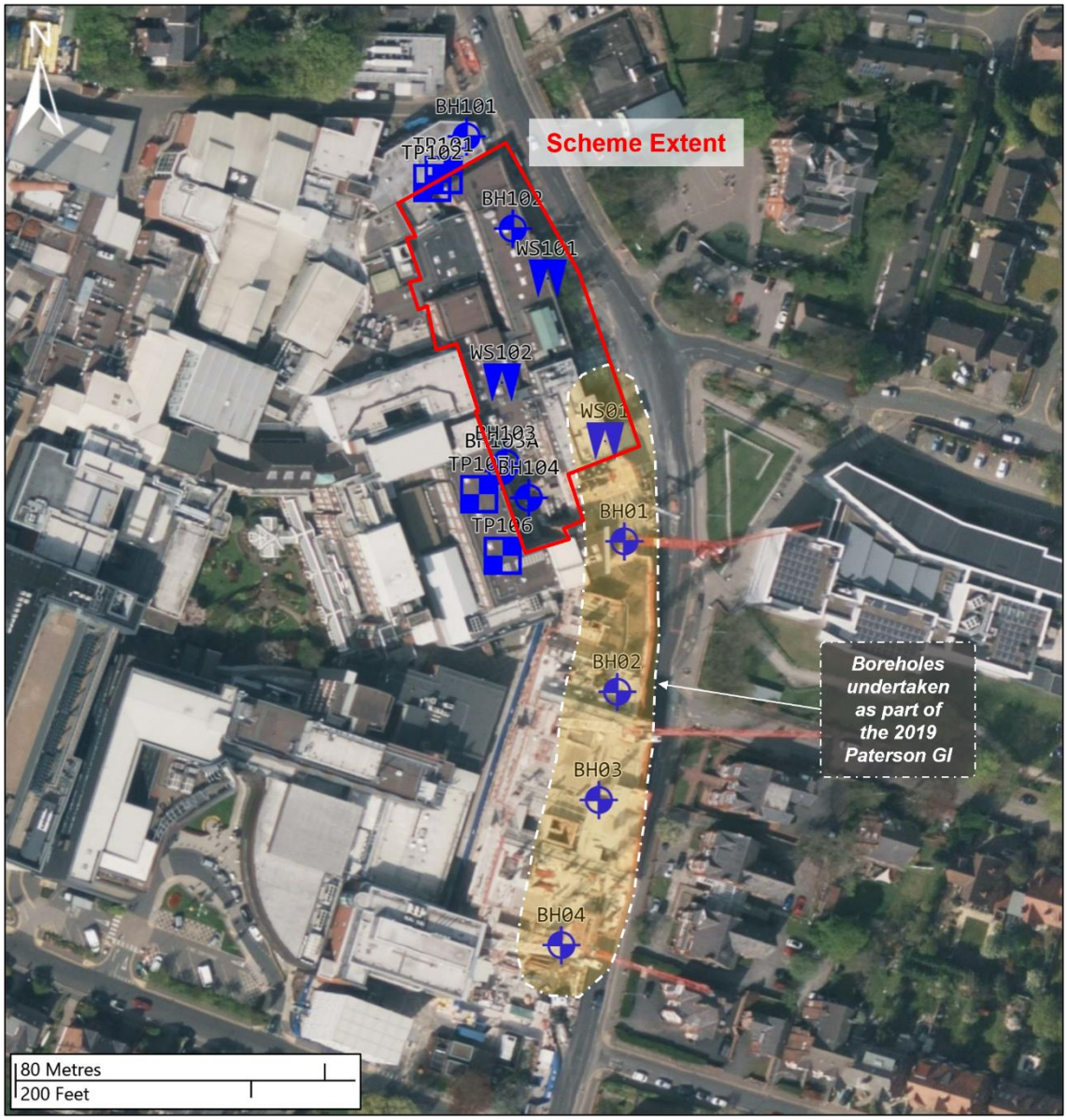
Geotechnical Risks	GI Undertaken
Unknown/unforeseen Ground Conditions (GEO-01)	• Intrusive investigation comprising dynamic sampling with rotary core follow-on, windowless sampling and trial pitting. • Sampling for geotechnical testing to assess properties of underlying bedrock and characteristics of Made Ground.
Variable Made Ground (GEO-02)	• Sampling for geotechnical and geo-environmental testing to assess characteristics of Made Ground. • In-situ testing including Standard Penetration Tests (SPTs).
Unknown Groundwater Levels (GEO-04)	• Groundwater monitoring in two boreholes.
Ground Obstructions (GEO-05)	• Intrusive investigation covering the areas for the proposed developments.
Ground Aggressivity to Concrete (GEO-07)	• Sampling for geotechnical and geo-environmental testing to assess characteristics of Made Ground.
Faults present southwest of the Site (GEO-09)	• Intrusive investigation to identify potential fault zone.

A summary of the ground investigation works undertaken between February and April 2024 is presented in Table 4.2. Exploratory hole locations from these ground investigation works, along with those performed as part of the Paterson building redevelopment in 2019, are presented in Figure 4.1.

Table 4.2: Summary of 2024 Scheme Specific Ground Investigation

Technique	Quantity	Completed Depths (m)	Exploratory Hole IDs
Cable Percussion with Rotary Core follow-on	4	14.0 – 18.3	BH101 – 104
Windowless Sampling	3	0.6 – 2.4	WS101 – 103
Trial Pits	7	1.2 – 1.3	TP101 – 107

Figure 4.1: Exploratory Hole Plan



Source: Bing aerial imagery with permission from Microsoft Corporation taken from OpenGround Cloud.

4.2 Summary of In-Situ Testing

4.2.1 Standard Penetration Tests

SPTs were undertaken in all cable percussive boreholes and windowless sampler boreholes from the base of the inspection pits and at approximately 1m intervals thereafter to a depth where SPT values exceed 100/300mm or 50/150mm. The results of SPTs are summarised below in Table 4.3 and presented in Figure 4.2 and Figure 4.3. Appendix The results of standard penetration testing are recorded in full on borehole logs in Appendix D.

Table 4.3: Summary of SPT Results

Stratum	Standard Penetration Test	
	Number of Tests	Range of N Values
Made Ground	5	4 – 26
Weathered Wilmslow Sandstone	9	17 – Refusal
Wilmslow Sandstone	2	Refusal

Figure 4.2: SPT N with Depth

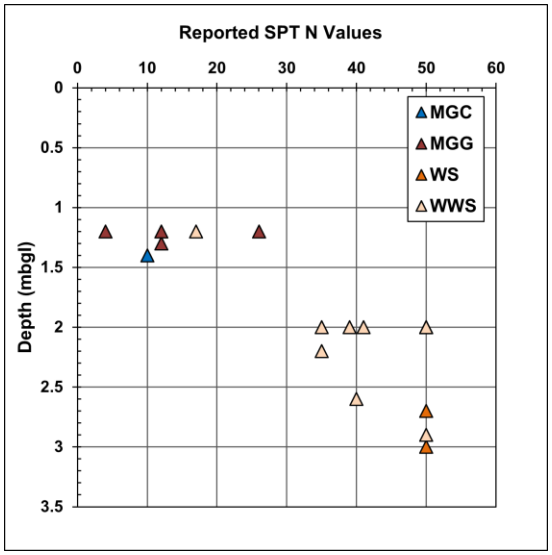
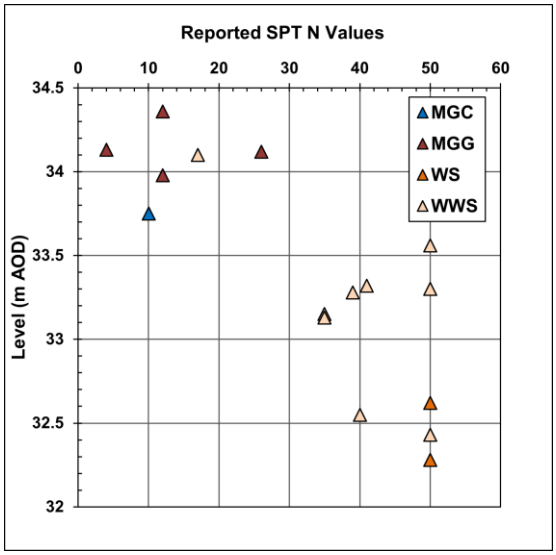


Figure 4.3: SPT N with Elevation



MGC: Cohesive Made Ground, MGG: Granular Made Ground, WS: Wilmslow Sandstone, WWS: Weathered Wilmslow Sandstone.

4.3 Summary of Geotechnical Laboratory Testing

The following geotechnical laboratory testing was scheduled by Mott MacDonald and undertaken by GEOLABS and CTS Group (BRE Testing). Plots of geotechnical testing results are presented in Appendix C, with the full results presented in the Factual Report in Appendix D. Table 4.4 summarises the geotechnical laboratory testing undertaken.

Table 4.4: Summary of Geotechnical Laboratory Testing

Laboratory Test	Made Ground		Weathered Wilmslow Sandstone	Wilmslow Sandstone
	Granular	Cohesive		
Moisture Content	11	4	-	-
Atterberg Limits	-	2	-	-
Particle Size Distribution	5	2	6	-
BRE – pH and Sulphate contents	19	3	-	-
Point Load Index	-	-	-	5
Uniaxial Compressive Strength	-	-	-	7

4.4 Summary of Geo-environmental Laboratory Testing

As part of the ground investigation at the site, targeted geo-environmental testing was conducted in accordance with established procedures including BS10175 (2011+A2:2017) Code of Practice for the Investigation of Potentially Contaminated Sites [7], BS5930:2015 +A1:2020 [8] and Environment Agency Land Contamination Risk Management (LCRM) guidance [4] to determine the presence and degree of contamination. The exploratory investigation did not target any specific contamination sources at the site, but instead comprised non-targeted assessment of ground conditions. Considering the area of the site for the proposed development, the number and location of the exploratory holes were appropriate to determine the representative ground conditions (including potential contamination), beneath the proposed development footprint.

Disturbed environmental soil samples and groundwater samples were collected in appropriate containers and sent to CTS Group (UKAS Accredited Laboratory, No. 4161) for chemical testing. Soil, soil leachate and groundwater testing was undertaken to determine the concentrations of various inorganic and organic contaminants. The scope of laboratory testing on retrieved samples is outlined in Table 4.5.

Table 4.5: Summary of Geo-environmental Laboratory Testing

Laboratory Test	Number of Samples	Rationale
Comprehensive Soil Suite	12	To identify potential contaminants of concern associated with the current and historical operation/maintenance of the hospital, and inform the risk to human health and the classification of waste.
Comprehensive Soil Leachate Suite	5	To identify potential contaminants of concern associated with the current and historical operation/maintenance of the hospital, and inform the risk to controlled waters.
Waste Acceptance Criteria (WAC)	6	WAC testing to identify requirement for disposal of materials to appropriate land fill.

Testing suites comprised the following:

- Comprehensive Soil Suite: Antimony, Arsenic, Asbestos Screen, Barium, Beryllium, Boron, Benzene, Toluene, Ethylbenzene and Xylene (BTEX) (speciated), Cadmium, Chromium (III), Chromium (VI), Copper, Cyanide (Free), Fraction of Organic Carbon, Iron, Lead, Manganese, Total Mercury, Molybdenum, Nickel, pH, Phenols (speciated), Polyaromatic Hydrocarbons (USEPA 16 speciated), Selenium, Sulphate (Water soluble), Sulphur (Total), Total Petroleum Hydrocarbons – CWG Bands (ali/aro split), Vanadium, Volatile Organic Compounds (VOCs), Zinc.
- Comprehensive Soil Leachate Suite: Ammoniacal Nitrogen, Antimony, Arsenic, Barium, Beryllium, Boron, Cadmium, Calcium, Chloride, Chromium (III), Chromium (VI), Copper, Cyanide (Free), Cyanide (complex), Dissolved Organic Carbon, Fluoride, Iron, Lead, Magnesium, Manganese, Mercury, Molybdenum, Nickel, pH, Phenols (speciated), Selenium, Sulphate, Vanadium, Zinc.

4.5 Groundwater Monitoring

Five rounds of groundwater and monitoring was undertaken in April and May 2025 across two boreholes (BH101 and BH104) following the completion of intrusive works. From these five rounds, full data from just two of these rounds of groundwater monitoring was made available. This available data recorded groundwater level in the Wilmslow Sandstone between 3.2mbgl and 4.4m bgl, close to the boundary between the Weathered Wilmslow Sandstone and the competent Wilmslow Sandstone underlying it.

Groundwater strikes were recorded within the Wilmslow Sandstone in BH102 and BH103 (boreholes without groundwater monitoring) at 2.8m bgl and 3.9m bgl respectively. These groundwater strikes were encountered less than 1m below the boundary between the Weathered Wilmslow Sandstone and the competent Wilmslow Sandstone.

5 Ground Summary

5.1 Ground Model

A ground model has been created for the site of the proposed Christie building redevelopment based upon the findings of the 2024 scheme-specific ground investigation and also relevant information from the 2019 ground investigation for the Paterson building redevelopment, adjacent to the site. This ground model is presented in a tabulated for in Table 5.1 and a cross-section is presented in Appendix B.

Table 5.1: Ground Model

Strata	Typical Thickness (m) [range]	Typical Top of Strata Depth (m bgl) [Elevation (m AOD)]	Typical Description	Strata Distribution
Made Ground	1.4 [0.5 – 2.0]	0.0 [35.2]	Predominantly granular: Loose to medium dense dark brown silty gravelly subrounded to subangular fine to coarse SAND with brick, concrete, limestone and tile fragments Locally cohesive: Soft to firm dark brown gravelly sandy CLAY with brick and concrete fragments. Locally stiff.	Site-wide. Locally tarmacadam, hardstanding, gravel.
Weathered Wilmslow Sandstone	1.4 [1.0 – 1.4]	1.4 [33.8]	Medium dense to dense orangish and reddish brown gravelly fine to coarse SAND.	Site-wide.
Wilmslow Sandstone	Thickness not proven, 15m+	2.8 [32.4]	Extremely weak to weak reddish and orangish brown fine to coarse grained SANDSTONE, locally poorly cemented or recovered as sand.	Heavily weathered in BH103 from 11.5 to 14.0m bgl. Recorded in drillers logs as potential fault zone.

5.2 Groundwater

Groundwater was consistently encountered within the Wilmslow Sandstone close to rockhead across all exploratory holes that reached bedrock. Groundwater strikes and monitoring data suggests that groundwater level is between 2.8m and 4.4m bgl within competent Wilmslow Sandstone close to the overlying Weathered Wilmslow Sandstone.

Groundwater strikes were encountered in two locations, BH102 and BH103 at 2.8m and 3.9m respectively.

5.3 Ground Aggressivity

High levels of sulphates and acids in the ground can result in damage to buried concrete, posing a risk to proposed foundations on site. The site is characterised as being brownfield with mobile waters.

Chemical tests of BRE SD1 Suite D were carried out on 10 soil samples, from the footprint of the Christie Building, as part of the 2024 GI. Testing was undertaken in accordance with BRE Special Digest 1 [9]. Twelve geo-environmental samples were also tested for pH and sulphate contents as part of the comprehensive soil suite testing. The results from this have also been used to inform a suitable concrete design class for any foundations.

Table 5.2: Ground Aggressivity Summary

Strata	Number of Results	Characteristic Value (BRE Special Digest 1:2005)		Design Sulphate Class (DS)	Aggressive Chemical Environment for Concrete Class (ACEC)
		Water Soluble Sulphate (mg/l)	pH		
Granular Made Ground	19	58 (<10 – 63)	7.4 (7.3 – 9.0)	DS-1	AC-1
Cohesive Made Ground	3	11 (<10 – 11)	7.6 (7.4 – 7.9)	DS-1	AC-1

6 Geotechnical Parameters

The geotechnical parameters presented in this section are characteristics of the ground conditions on site based upon the available data from the 2024 scheme-specific GI and the 2019 Paterson building GI. They should be used to inform design parameters at the next stage that consider relevant foundation designs, loadings and associated factors of safety.

6.1 Made Ground

6.1.1 Bulk Unit Weight

The unsaturated bulk unit weight of each type of Made Ground encountered has been estimated using Figure 1 from BS8004:2015 [10].

- Cohesive Made Ground: 18kN/m^3 based upon engineering descriptions from the 2024 and 2019 GI's of soft to firm CLAY. Assumed that the Cohesive Made Ground is above the groundwater table based upon groundwater monitoring from the 2024 GI.
- Granular Made Ground: 19kN/m^3 based upon engineering descriptions from the 2024 and 2019 GI's of loose to medium dense GRAVEL. Assumed that the Granular Made Ground is above the groundwater table based upon groundwater monitoring from the 2024 GI.

6.1.2 Angle of Shearing Resistance

6.1.2.1 Granular Made Ground

The critical angle of shearing resistance, φ'_{cv}, has been estimated for Granular Made Ground using Equation 4 from BS8004:2015:

$$\varphi'_{pk,k} = 30° + \varphi'_{ang} + \varphi'_{PSD} + \varphi'_{dil}$$

Where φ'_{ang} is the contribution from the angularity of particles and φ'_{PSD} is the contribution from the particle size distribution. Based upon limited engineering descriptions of angularity of sub-angular to sub-rounded, a φ'_{ang} of 2° is applicable. Five particle size distribution test performed on Granular Made Ground as part of the 2024 GI, presented in Figure C.2, indicate that the material is generally evenly graded (Uniformity Coefficient, C_u, between 2 and 6). This indicates that a φ'_{PSD} of 2° is applicable. Considering the lower bound of the SPT value is 4, φ'_{dil} of 0° will be used. Therefore, a characteristic φ'_{p} of 34° is appropriate.

6.1.2.2 Cohesive Made Ground

An angle of shearing resistance, φ'_{cv}, of 24° has been estimated for Cohesive Made Ground, using Table 2 from BS8004:2015. As only one measurement of plasticity index (3%) was obtained as part of the 2024 GI, a more conservative plasticity index of 30% is appropriate.

6.1.3 Effective Cohesion

Effective cohesion, c', is estimated from BS8004:2015, Section 4.3.1.4.9 and a characteristic value of 0kPa is considered applicable.

6.1.4 Undrained Shear Strength (Cohesive Made Ground)

The undrained shear strength, c_u, of encountered Cohesive Made Ground has been derived from in-situ testing results and correlations from literature. Cohesive Made Ground on site was

described as soft to firm CLAY. Soft clay typically possesses an undrained shear strength of 20 – 40kPa. Firm clay possesses undrained shear strength of 40 – 75kPa.

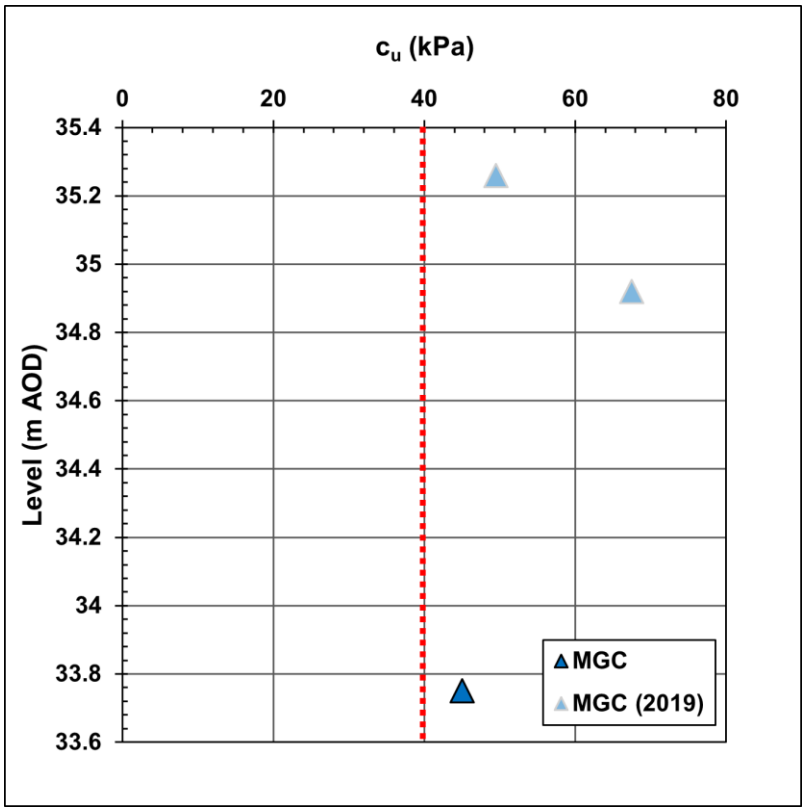
The SPT results in cohesive Made Ground have been used to assess the undrained shear strength using the following relationship from Stroud and Butler (1973) detailed in CIRIA R143 [11]:

$$c_u = f_1 N_{60}$$

Where f_1 is a correlation factor relating to the plasticity of the clay. A correlation factor f_1 of 4.5 has been adopted based upon Figure 31 from CIRIA R143 (1995) assuming a conservative plasticity index of 30%. A plot of SPT correlated undrained shear strength with elevation is presented in Figure 6.1. This correlation indicates undrained shear strengths of 45 – 68kPa. There is no clear relationship between correlated undrained shear strength and depth.

Based upon the SPT correlated undrained shear strength and the engineering descriptions of soft to firm CLAY, a characteristic undrained shear strength of 40kPa is appropriate across Cohesive Made Ground.

Figure 6.1: SPT Correlated Undrained Shear Strength in Cohesive Made Ground



Assuming a correlation factor, f_1 of 4.5. Line in red shows an appropriate characteristic c_u in cohesive Made Ground.

6.1.5 Young's Modulus

6.1.5.1 Undrained Young's Modulus (Cohesive Made Ground)

The undrained Young's Modulus, E_u, of Cohesive Made Ground has been estimated using in-situ and correlations from literature.

The relationship between undrained shear strength, previously estimated from in-situ testing, and undrained Young's Modulus is given in Figure 2.33 from Foundation Design and Construction [12]. Assuming a conservative plasticity index of 30%, a E_u/c_u ratio of 400 is appropriate.

6.1.5.2 Drained Young's Modulus (Granular Made Ground)

The drained Young's Modulus, E', of Granular Made Ground has been estimated using in-situ testing results and correlations from literature.

The SPT results in Granular Made Ground, presented in Figure C.1, have been used to estimate the drained Young's Modulus using the following relationship from Stroud (1989) detailed in CIRIA R143 [11]:

$$\frac{E'}{N_{60}} = 1\ (MPa)$$

Six SPTs were performed in Granular Made Ground across the 2019 and 2024 GIs. The SPT results ranged between 4 and 26 with average of 13. Adopting a characteristic values of 10, it can be estimated that the drained Young's Modulus of the Granular Made Ground is approximately 10MPa.

6.2 Weathered Wilmslow Sandstone

6.2.1 Bulk Unit Weight

As no laboratory testing was undertaken measuring the density of Weathered Wilmslow Sandstone, the unsaturated bulk unit weight has been estimated using engineering descriptions and in-situ testing from the 2024 and 2019 investigations. Using Figure 1 from BS8004:2015, a bulk unit weight of approximately 19kN/m^3 is anticipated based upon engineering descriptions of medium dense to dense SAND and SPT 'N values' between 17 and 50 (Refusal).

6.2.2 Angle of Shearing Resistance

The critical angle of shearing resistance, φ'_{cv}, has been estimated for Weathered Wilmslow Sandstone using Equation 4 from BS8004:2015:

$$\varphi'_{pk,k} = 30° + \varphi'_{ang} + \varphi'_{PSD} + \varphi'_{dil}$$

Where φ'_{ang} is the contribution from the angularity of particles and φ'_{PSD} is the contribution from the particle size distribution. Based upon limited engineering descriptions of angularity of sub-angular to sub-rounded, a φ'_{ang} of 2° is applicable. Six particle size distribution test performed on Granular Made Ground as part of the 2024 GI, presented in Figure C.2, indicate that the material is generally evenly graded (Uniformity Coefficient, C_u, around 4). This indicates that a φ'_{PSD} of 2° is applicable. Given that the SPT 'N' ranges from 17 to over 50 and is generally greater than 35, with a density index exceeding 65%, φ'_{dil} of 3° will be used Therefore, a characteristic $\varphi'_{pk,k}$ of 37° is appropriate.

6.2.3 Drained Young's Modulus

The drained Young's Modulus, E', of Weathered Wilmslow Sandstone has been estimated using in-situ testing results and correlations from literature.

The SPT results in Weathered Wilmslow Sandstone from the 2024 and 2019 ground investigations, presented in Figure C.1, have been used to estimate the drained Young's Modulus using the following relationship from Stroud (1989) detailed in CIRIA R143 (1995):

$$\frac{E'}{N_{60}} = 1\ (MPa)$$

Ten SPTs were performed in Weathered Wilmslow Sandstone across the 2019 and 2024 GIs. The SPT results ranged between 15 and 50 (refusal). Adopting a characteristic values of 35, it can be estimated that the drained Young's Modulus of the Weathered Wilmslow Sandstone is approximately 35MPa.

6.3 Wilmslow Sandstone

6.3.1 Bulk Unit Weight

Laboratory measurements of bulk and dry density were undertaken as part of UCS testing. As the groundwater level is recorded to lie close to rockhead, the bulk unit weight is more appropriate for use in design than the dry unit weight. From these measurements of density, the bulk unit weight of the Wilmslow Sandstone was found to range between 19.7kN/m^3 and 21.7kN/m^3.

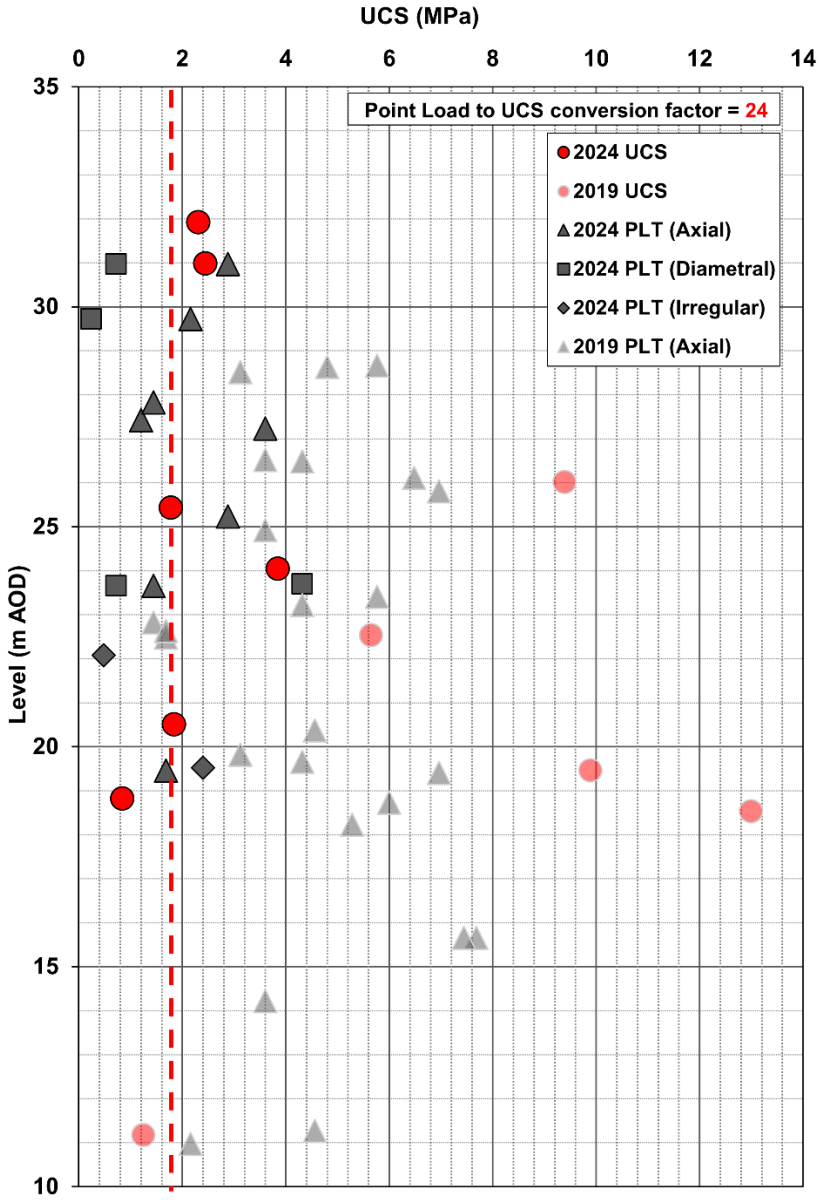
6.3.2 Unconfined Compressive Strength

UCS testing was undertaken as part of both the 2024 and 2019 GI's. The results of UCS testing in the 2024 GI ranged between 0.85MPa and 3.85MPa. These results are lower than those obtained as part of the 2019 GI which ranged between 1.25MPa and 9.95MPa.

A conversion factor of 24 was adopted between I_{s50} from point load testing and UCS. This conversion factor is similar to that adopted in the 2019 investigation and values presented in literature [13]. This conversion factor falls within the range of ratios between UCS and PLT results from the 2019 and 2024 GIs at similar depths.

A plot of UCS and PLT-correlated UCS with elevation is presented in Figure 6.2. This plot does not illustrate a clear relationship between UCS and depth. Therefore an approximate UCS of 1.8MPa is considered characteristic throughout the Wilmslow Sandstone encountered on site.

Figure 6.2: UCS with Elevation



6.3.3 Effective Angle of Shearing Resistance and Effective Cohesion

The angle of shearing resistance, φ', of the Wilmslow Sandstone has been estimated using RSData. The plastic behaviour of the Wilmslow Sandstone was defined by the following:

- UCS: 1.8MPa – mean value from geotechnical testing.
- Geological Strength Index, GSI: ~40 – based upon field descriptions of intersecting joint sets and close bedding.
- Material constant, m_i: 15 – typical range for sandstones 13 – 21.
- Disturbance factor, D: 0

Using Hoek-Brown generalised fit, an effective angle of shearing resistance of 31° with an effective cohesion of 0.1MPa was calculated in RSData.

Effective stress parameters for rock have been determined based on published chart from Yates (Quarterly Journal of Engineeeing Geology 1992, V25, p107-113). For the existing confining pressure of 0.1MPa and UCS range of 1.8, the following can be determined c' = 40kPa and φ' = 42°. Hence an angle of shearing resistance of 40° with c' of 40kPa is suggested.

6.3.4 Rock Mass Young's Modulus

Across nine samples, the measured Young's Modulus ranged from 133 MPa to 3.74 GPa, with an average of 859 MPa. From ground level to 10 meters below ground level, the Young's Modulus ranges between 133 MPa and 239 MPa. A characteristic rock mass Young's Modulus of 180MPa is appropriate.

6.4 Summary of Characteristic Geotechnical Parameters

Table 6.1: Characteristic Geotechnical Parameters

Strata	Bulk Unit Weight, γ_{bulk} (kN/m^3)	Effective Angle of Shearing Resistance, φ' (°)	Effective Cohesion, c' (kPa)	Undrained Shear Strength, c_u (kPa)	Young's Modulus, E'/$\underline{E_u}$/(E_m) (MPa) *Assuming Axial Strain ~10^{-1}%*	Uniaxial Compressive Strength, UCS (MPa)
Cohesive Made Ground	18	24	0	40	$E_u = 400c_u$	-
Granular Made Ground	19	34	-	-	10	-
Weathered Wilmslow Sandstone	19	37	-	-	35	-
Wilmslow Sandstone	21.5	40	40	-	180	1.8

7 Engineering Assessment

7.1 Foundation Assessment

Based on the ground conditions outlined in Section 5, the geotechnical parameters encountered in Section 6 and the development proposals outlined in Section 1.2, it is anticipated that a piled foundation solution will be required for the new four-storey building.

At this stage, the proposed loadings are not known but it can be assumed that any proposed piles will terminate in Wilmslow Sandstone.

7.2 Subsurface Concrete

Concentrations of sulphate and values of pH were obtained from samples of Made Ground retrieved during the 2023 ground investigation works. Results of the testing, in accordance with BRE Special Digest 1 [9] are discussed in full in Section 5.2.

Results indicate that concrete of Design Sulphate Class DS-1 and ACEC class AC-1 would be appropriate for subsurface concrete at the site.

7.3 Excavatability and Subsurface Obstructions

7.3.1 Subsurface Obstructions

Obstructions may be present in Made Ground across the site in the form of cobbles, boulder of mixed lithologies, hardstanding, existing services and historical buried foundations. Only one obstruction was encountered during the 2024 ground investigation works.

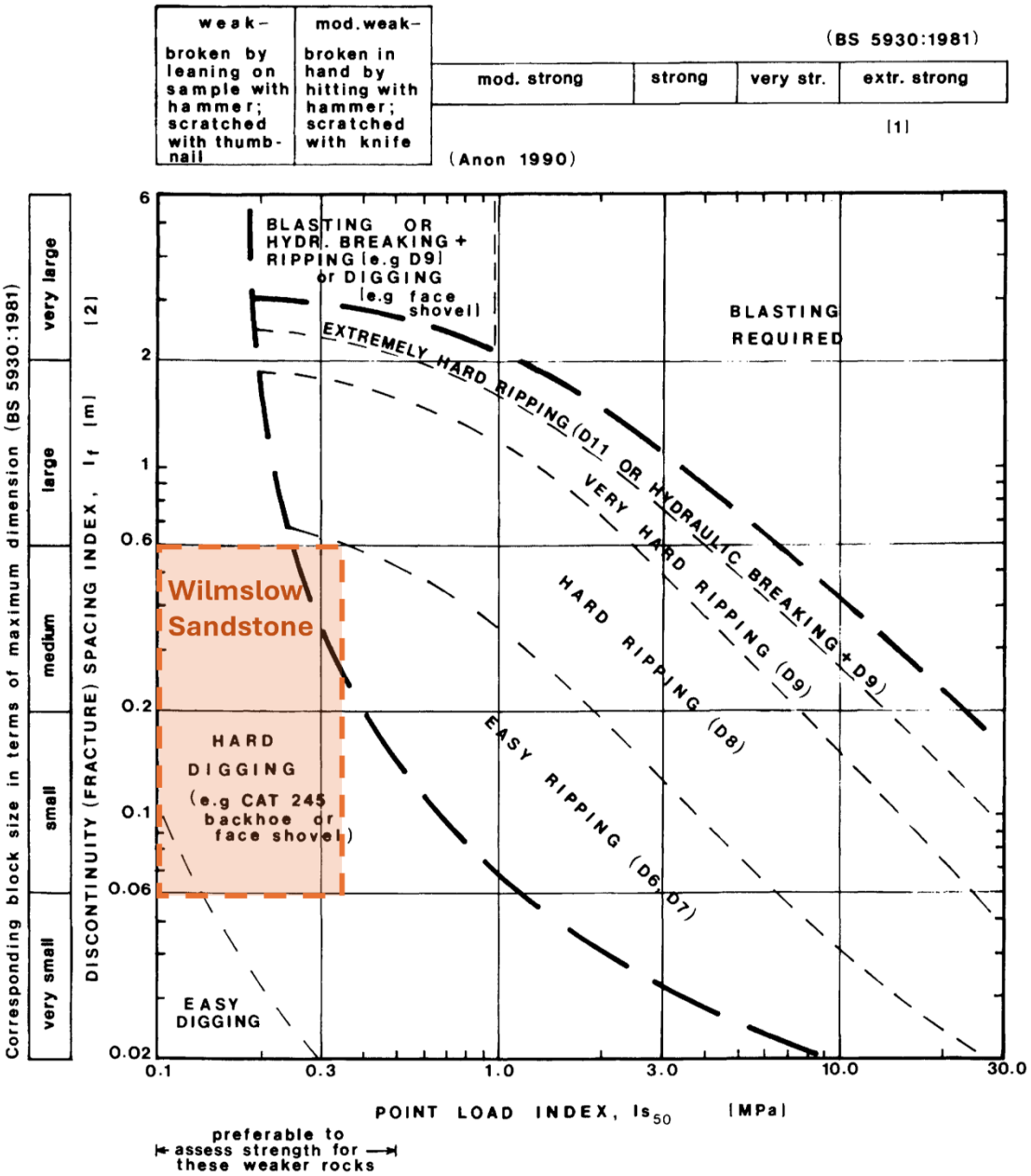
It is anticipated that some of the existing Made Ground is to be excavated as part of the proposed works. Should obstructions be encountered at shallow depths in the Made Ground during construction, removal will be required.

7.3.2 Excavatability

An excavatability assessment has been carried out according to the excavatability chart from Pettifer and Fookes [14] presented in Figure 8.1. The assessment of excavatability considered field descriptions of discontinuity spacing and point load index/field descriptions of rock strength.

The ranges presented on Figure 7.1 indicate that the Wilmslow Sandstone on site can be described primarily as “Hard Digging” and “Easy Ripping” with localised areas of “Easy Digging” and “Hard Ripping”.

Figure 7.1: Excavatability for Wilmslow Sandstone



Source: Quarterly Journal of Engineering Geology, Pettifer and Fookes, 1994.

7.4 Variable Made Ground

Intrusive ground investigation works identified variable Made Ground across the site with Cohesive and Granular Made Ground recorded in close proximity to one another. Consequently, differences in Made Ground across the footprint of the development proposals may lead to variations in geotechnical properties that complicates design if Made Ground isn't to be excavated and replaced.

Logging of excavation works during construction shall be undertaken to ensure that the materials and properties accounted for in design are correct.

7.5 Groundwater

During the ground investigation works, groundwater level across the site was consistently recorded close to rockhead within the Wilmslow Sandstone, between 2.8m and 4.2m bgl. Therefore groundwater level should be assumed to lie at approximately 3m bgl in design.

This relatively shallow groundwater level may result in the flooding of excavations. The contractor should be made aware of this risk during constructions. The contractor shall also remain vigilant for changes in groundwater levels and employ suitable groundwater controls where appropriate.

7.6 Potential Fault Zone

The Geotechnical and Geo-environmental Desk Study (CASICD-MMD-XX-XX-RP-C-00001) identified a fault recorded in BGS mapping southwest of the site. Scheme-specific ground investigation at the site aimed to identify where this fault zone might be present beneath the site.

Core recovery parameters, recorded as part of the 2024 ground investigation works and presented in Figure C.5, showed no evidence of a fault zone beneath the site. A notable drop in core recovery parameters would be anticipated should faulted bedrock be present. No such relationship was observed in the plots presented in Figure C.5.

There are numerous reasons why the fault recorded in BGS mapping southwest of the site may not have been identified as part of the 2024 ground investigation works:

- The recorded fault may dip steeply beneath the site and may be present at depths greater than that investigated.
- The presence of the fault may have been obscured by poor core recovery in what is generally weak Sandstone.
- The mapped fault may not extend to rockhead and may be present at significant depth beneath the surface.

8 Geotechnical Risk Register

Based on the findings of the 2024 ground investigation, the geotechnical risk register presented in the Geotechnical and Geo-environmental Desk Study (CASICD-MMD-XX-XX-RP-C-000001) has been updated. The updated geotechnical risk register is presented in Table 8.1.

Table 8.1: Geotechnical Risk Register

Risk ID	Hazard	Consequence	Risk Rating (Pre-GI)	Mitigation Measures Undertaken / Further Actions to be Undertaken	Current Risk Rating (Post-GI)
GEO-01	Unknown/ unforeseen ground conditions	Ground conditions could adversely affect the design if different from assumptions. Risk of failure or excessive settlement of structures	Medium risk	A site-specific ground investigation has been undertaken, along with geotechnical testing, to produce a detailed ground model presented in Table 5.1 and Appendix B. Characteristic geotechnical parameters to be used in design have been presented in Section 6 and Table 6.1. Detailed ground model and characteristic geotechnical parameters shall be used to inform design.	Low risk
GEO-02	Variable Made Ground	Made Ground may be encountered and can offer poor founding material. Risk of failure or excessive settlement.	Medium risk	A site-specific ground investigation has been undertaken, along with geotechnical testing, to characterise and establish typical geotechnical properties of Made Ground encountered on site. During ground investigation works, Made Ground of varied nature and properties was encountered. Therefore the risk of variable Made Ground remains. Logging of excavation works during construction to ensure that the materials and properties accounted for in design are correct.	Medium risk
GEO-03	Contaminated Made Ground	Potential for contaminants of concern to be present in Made Ground. Human health risks to staff working with site won materials.	Medium risk	Site-specific ground investigation undertaken and appropriate geo-environmental sampling and testing undertaken. Contaminated land risk assessment produced for the site. No exceedances of human health screening guidelines were recorded within the samples analysed. An absence of any appreciable source of elevated ground gases within the Made Ground or from within the solid strata. The Contractor should ensure standard health and safety procedures are in place and best practices are followed during construction and maintenance works.	Low risk
GEO-04	Unknown groundwater levels	Incorrect assumptions could lead to inappropriate design.	Medium risk	As part of site-specific ground investigation works, groundwater strikes were recorded and groundwater monitoring was undertaken. During the monitoring period, groundwater level was recorded to be broadly consistent close to rockhead (2.8m to 4.2m bgl). Data from the groundwater monitoring can be used to inform design. During excavation works, the contractor shall be made aware of potentially shallow groundwater and remain vigilant for changes in groundwater levels and employ suitable control measures where appropriate.	Low risk
GEO-05	Ground obstructions	Potential for obstructions to be encountered e.g. historical foundations and/or basement structure. Difficult excavation to form foundations. Impact on project cost and programme.	High risk	During ground investigation works, obstructions were recorded when encountered. Only one obstruction was encountered in BH103A at approximately 1.2m bgl. The nature of this obstruction is unknown.	Medium risk

Risk ID	Hazard	Consequence	Risk Rating (Pre-GI)	Mitigation Measures Undertaken / **Further Actions to be Undertaken**	Current Risk Rating (Post-GI)
				The contractor shall be made aware of the potential for obstructions within Made Ground close to the surface. Where significant obstructions, such as buried historical foundations, are encountered the designer shall be informed.	
GEO-06	Buried services strike	Potential delays to programme, affect businesses or users served by any existing utility and safety risks to operatives.	High risk	A PAS128 survey was undertaken as part of the ground investigation works. The results of which are presented in the appendices of the factual report (Appendix D). Although a utilities survey has been undertaken, the contractor shall be aware that buried service strike remains possible and a competent person shall clear any excavation area prior to breaking ground.	Medium risk
GEO-07	Ground aggressivity to concrete	Certain ground conditions containing sulphates, nitrates and chloride can be aggressive to concrete, causing foundations to fail.	Medium risk	Geo-environmental testing (including BRE Suite D testing) was performed on samples of Made Ground at the site. The results of testing, presented in Table 5.2, record largely low sulphate concentrations. The results of testing shall be used to inform an appropriate class of concrete to be specified in design.	Low risk
GEO-08	UXO	Potential delays to programme and safety risks to operatives.	High risk	A detailed desk study for the site has been undertaken by Zetica UXO Ltd and is presented in Appendix H. The desk study reports a low risk of UXO hazard and states that additional further mitigation measures are not required.	Low risk
GEO-09	Faults present southwest of the site	Movement of faults could impact design of structures and impact on construction.	Medium risk	No evidence of a fault zone was encountered during the site-specific ground investigation works. No distinct areas of poor core recovery were identified on plots presented in Figure C.5. Although not identified as part of these ground investigation works, the contractor shall be made aware of potentially faulted bedrock and should remain vigilant for areas of non-competent bedrock at depth during piling.	Low risk

9 Conclusions and Recommendations

9.1 Conclusions

9.1.1 Geotechnical

9.1.1.1 Ground Conditions

The ground profile across the site is broadly consistent, with a 0.5 – 2.0m thick layer of Made Ground at the surface. This Made Ground was observed to be predominantly granular loose to medium dense dark brown SAND with fragments of brick, concrete, limestone and tile. Locally cohesive Made Ground of soft to firm dark brown gravelly sandy CLAY with brick and concrete fragments was encountered. This Made Ground was underlain by a layer of Weathered Wilmslow Sandstone typically 1.4m thick. This layer is typically medium dense to dense orangish and reddish brown gravelly fine to coarse SAND. Approximately 3m bgl, competent bedrock of Wilmslow Sandstone is present beneath the layer of Weathered Wilmslow Sandstone. The Wilmslow Sandstone on site was described as extremely weak to weak reddish and orangish brown fine to coarse grained SANDSTONE, locally recovered as sand. Groundwater monitoring and strikes during ground investigation recorded groundwater level between 2.8m and 4.4m bgl, just below competent rockhead within the Wilmslow Sandstone.

9.1.1.2 Geotechnical Risks

The production of a detailed ground model and the undertaking of groundwater monitoring has reduced the anticipated risk level for a number of geotechnical risks

- Variable Made Ground: During ground investigation works, Made Ground of varied nature and properties was encountered. Although the Made Ground encountered was primarily granular, locally cohesive Made Ground was encountered. This may result in design assumptions not matching conditions in reality and issues such as differential settlement.
- Ground Obstructions: Although only one obstruction was encountered during ground investigation works, there remains the possibility of obstructions, including historical foundations, being encountered during construction.
- Buried Services Strike: Numerous buried services were identified as part of the utilities survey undertaken. Despite this survey, a buried service strike remains possible.
- Fault Present Southwest of the Site: Although no clear evidence of faulted bedrock was encountered during the ground investigation works on site, there remains a possibility that a fault is present beneath the site.

9.1.2 Geo-environmental Conclusions

The GQRA has assessed the identified pollutant linkages at the site as low risk overall.

9.1.2.1 Human Health

No exceedances of human health GAC were recorded within the soil samples analysed when assessed against relevant “Commercial” land use criteria. No asbestos was identified in any of the samples tested. The risk to human health from the identified soil conditions is concluded to be low.

As detailed within the Design Stage Report [5], asbestos may be present within the existing building including unmanaged asbestos within existing basements associated with the age of

the current buildings on site, which date from the 1930s. Note that should the presence of asbestos contamination be suspected during development, Mott MacDonald Limited would recommend the appointment of a specialist contractor to address the issue and would not provide advice on risk or remedial measures.

9.1.2.2 Water Environment

Soil leachate testing identified limited exceedances of water quality standards due to the presence of heavy metals and phenol within the shallow Made Ground deposits. The overall risk to the water environment is concluded to be low.

9.1.2.3 Ground Gas

The risk posed by elevated ground gases is considered to be low based on the following conditions encountered during ground investigation:

- Previous GI immediately to the south of the site did not record any significantly elevated ground gases or flow rates. No additional off-site potential sources were identified.
- The Made Ground recorded within the GI on site did note record any constituents which would be considered to represent a source of elevated ground gases. The sedimentary solid strata are not considered to represent a source of elevated ground gases.
- A proportion of Made Ground is anticipated to be removed from the site during development works to facilitate foundation construction.

As such, no specific ground gas preclusion measures are required.

The potential risk from ground gases to construction workers working in excavations and other confined spaces will be dealt with by the Contractor, in accordance with Confined Spaces Regulations.

9.1.2.4 Waste Considerations

The majority of the Made Ground deposits analysed are likely to be suitable for removal to inert landfill. Waste considerations are detailed in Section 3.8. It is recommended that a suitable waste contractor is engaged to discuss options for disposal if construction works require removal of soils from site. Additional analysis may be required on specific soils to suit the requirements of the receiving waste transfer facility.

9.2 Recommendations

9.2.1 Geotechnical

The geotechnical recommendations are summarised as follows:

- During construction, any excavations are to be logged to ensure that the materials and properties accounted for in design are correct. If unexpected conditions are encountered during construction, design parameter should be verified through in-situ testing. Very soft Cohesive Made Ground or very loose Granular Made Ground may require excavation and replacement.
- The contractor shall ensure that they have consulted all available pre-construction information including utility plans to reduce the risk of buried service strikes.
- Any encountered subsurface obstructions should be excavated and replaced with appropriate fill material.

9.2.2 Geo-environmental

The geo-environmental recommendations are summarised as follows:

- While it is not considered that any materials generated on site are being considered for reuse, it should be recognised that any material reuse should be undertaken under the requirements of Environment Agency WM3 guidance.
  - It is recommended that a waste contractor is contacted to discuss appropriate options for disposal if construction works require removal of soils from site.
- Based on the site's history, there is the potential for contamination to be encountered during the development works which has not been identified in the course of the ground investigations. An unexpected contamination protocol should be produced and adhered to throughout the development works.
- Construction and maintenance works should use site specific risk assessments and method statements and, where necessary, the use of personal protective equipment (PPE).
- No significant shallow groundwater in anticipated to be encountered during construction works, however should appreciable quantities be encountered, suitable dewatering provision should be made, and appropriate disposal measures considered to mitigate the risk to the water environment.
- For new fresh water supply pipes, a water supply pipe risk assessment should be undertaken in accordance with UKWIR guidance in order to select an appropriate water supply pipe material for the development.
- Based on the findings in this assessment, a remediation strategy is not required for the development.
- A verification report will be produced on completion of site earthworks and submitted to the Council for acknowledgement and review. The verification report will follow the Environment Agency's LCRM guidance and will include;
  Details of any materials brought onto site including their source location, nature and any testing data obtained to demonstrate suitability for use, Confirmation that no unexpected contamination was encountered. All locations, methodology and testing undertaken to investigate unexpected contamination (if encountered). Details on any mitigation measures implemented for unexpected contamination.

10 References

[1] British Standards Instistution, “BS EN 1997-1:2004, Eurocode 7 Part 1 - Geotechnical design. General rules,” 2013.

[2] Mott MacDonald, “Geotechnical and Geo-environmental Desk Study (CASICD-MMD-XX-XX-RP-C-00002),” 2023.

[3] CC Geotechnical Ltd, “Ground Investigation Report for site at The Christie, Manchester - Paterson Redevelopment Project,” 2019.

[4] Environment Agency, “Land Contamination Risk Management (LCRM),” 2023.

[5] Mott MacDonald, “Christie CT Redevelopment Design Stage Report, ref: 01 / CASICD-MMD-XX-ZZ-RP-S-000001,” 2023.

[6] GRM Development Solutions, “CASICD - The Christie Radiology Village, Factual Ground Investigation Report (CASICD-GRM-XX-ZZ-RP-C-000001-P01),” 2024.

[7] British Standards Institution, “BS 10175:2011+A2:2017 Code of practice for the investigation of potentially contaminated sites,” 2017.

[8] British Standards Institution, “BS5930:2015+A1:2020, Code of Practice for Site Investigations,” 2020.

[9] BRE Construction Division, “Special Digest 1:2005 Third Edition, Concrete in Aggressive Ground,” 2005.

[10] British Standards Institution, “BS 8004:2015 - Code of Practice for Foundations,” 2015.

[11] C. R. I. Clayton, “CIRIA R143 - The Standard Penetration Test (SPT): Methods and Use.,” 1995.

[12] M. J. Tomlinson, Foundation Design and Construction. 7th Edition, Pearson Education Ltd, 2001.

[13] M. Alitalesh, M. Mollaali and M. Yazdani, “Correlation between uniaxial strength and point load index of rocks,” *Japanese Geotechnical Society Special Publication - The 15th Asian Regional Conference on Soil Mechanics and Geotechnical Engineering,* pp. 504-507, 2016.

[14] G. S. Pettifer and P. G. Fookes, “A revision of the graphical method for assessing the excavatability of rock,” *Quarterly Journal of Engineering Geology,* pp. 145-164, 1994.

[15] NHBC, EA, CIEH, Guidance for the Safe Development of Housing on Land Affected by Contamination, R&D Publications 66: 2008, 2008.

[16] British Standard, “BS 8485 'Code of Practice for the Characterisation and Remediation from Ground Gas in Affected Developments’”.

[17] British Standard, “Guidance on Investigations for Ground Gas – Permanent Gases and Volatile Organic Compounds (VOCs),” 2013.

[18] British Standards Institution, “BS EN 1997-2:2007, Eurocode 7 Part 2 - Geotechnical design. Ground investigation and testing”.

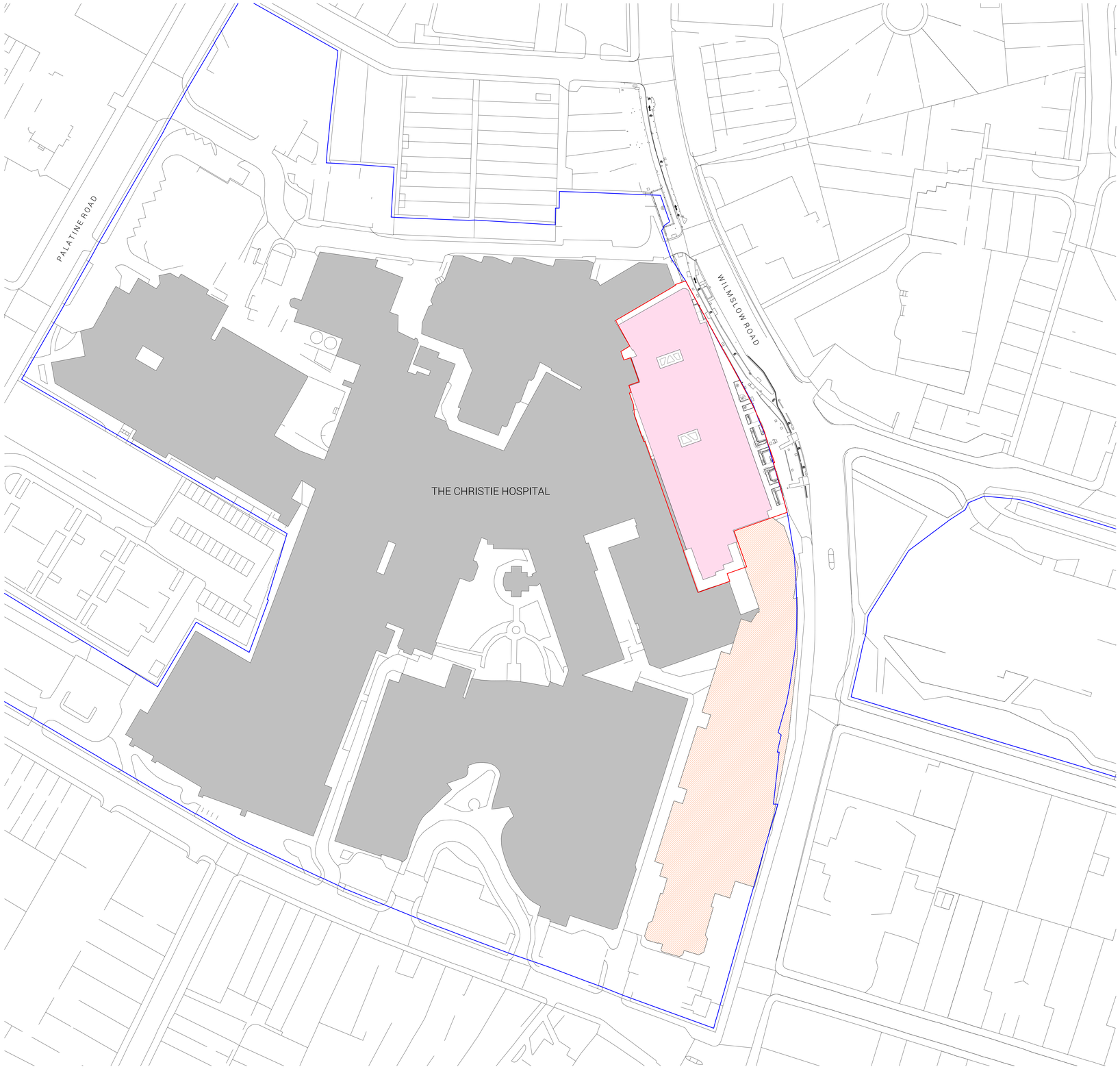
[19] CIRIA, “C552, Contaminated Land Risk Assessment - A Guide to Good Practice,” 2001.

Appendices

A. Proposed Scheme Layout 46
B. Ground Model Cross Sections 47
C. Geotechnical Plots 48
D. 2024 GRM Ground Investigation Factual Report 57
E. 2019 CC Geotechnical Ground Investigation Report 58
F. Contaminated Land Risk Assessment Methodology 59
G. Tabulated Soil Chemical Analysis Screening 62

A. Proposed Scheme Layout

Source: DAY Architecture



LEGEND

- Site boundary line
- Other land owned by the Trust
- Location of new Paterson Cancer Research Centre
- Proposed Building

Proposed Site Location Plan
1 : 500

GENERAL NOTES:

DAY Architectural Ltd accepts no responsibility for any costs, losses or claims whatsoever arising from these drawings, specifications and related documents unless there is full compliance with the Client or any unauthorised user of the following:

1. All boundaries, dimensions and levels are to be checked on site before construction and any discrepancies reported to the Architect / Designer.
2. Partial Service: Any discrepancies with site or other information is to be advised to the Architect / Designer and direction and / or instruction to be issued before any work proceeds in affected area.
3. Block and site plans are reproduced under license from the Ordnance Survey.
4. Do not scale this drawing.
5. For the purpose of coordination, all relevant parties must check this information prior to implementation and report any discrepancies to the Architect / Designer.

N

0m 20m
5m 50m

REV	DESCRIPTION	DATE	REV BY
P03	Planning Issue	15.09.2023	JAK
P02	Draft Planning Issue for Trust/Planning Consultant comment	25.08.2023	SB
P01	For Trust/Planning Consultant Review	28.07.2023	SB

CLIENT
The Christie NHS Foundation Trust

PROJECT
Advanced Scanning & Imaging Centre Development

DRAWING
Proposed Site Plan

SCALE
As indicated @ A0

FIRST ISSUED
28/07/23

PROJECT	CLIENT REF	DRAWN BY	CHECKED BY
1282-21	CASICD	SB	JK

ORIGIN	VOLUME	LEVEL	TYPE	ROLE	NUMBER	REVISION
DAY	XX	ZZ	DR	A	090003	P03

DRAWING STATUS
S3 - PLANNING

Information contained on this drawing is the sole copyright of DAY Architectural Ltd. and is not to be reproduced without their permission.

DAY Architectural Ltd.
Studio 1, Lancaster Buildings
77 Deansgate, Manchester, M3 2BW

T: 0161 834 9703
W: www.day-architectural.com

B. Ground Model Cross Sections

Project Id: 100114293

Project Title: HEA The Christie CT Redevelopment

Location: Manchester

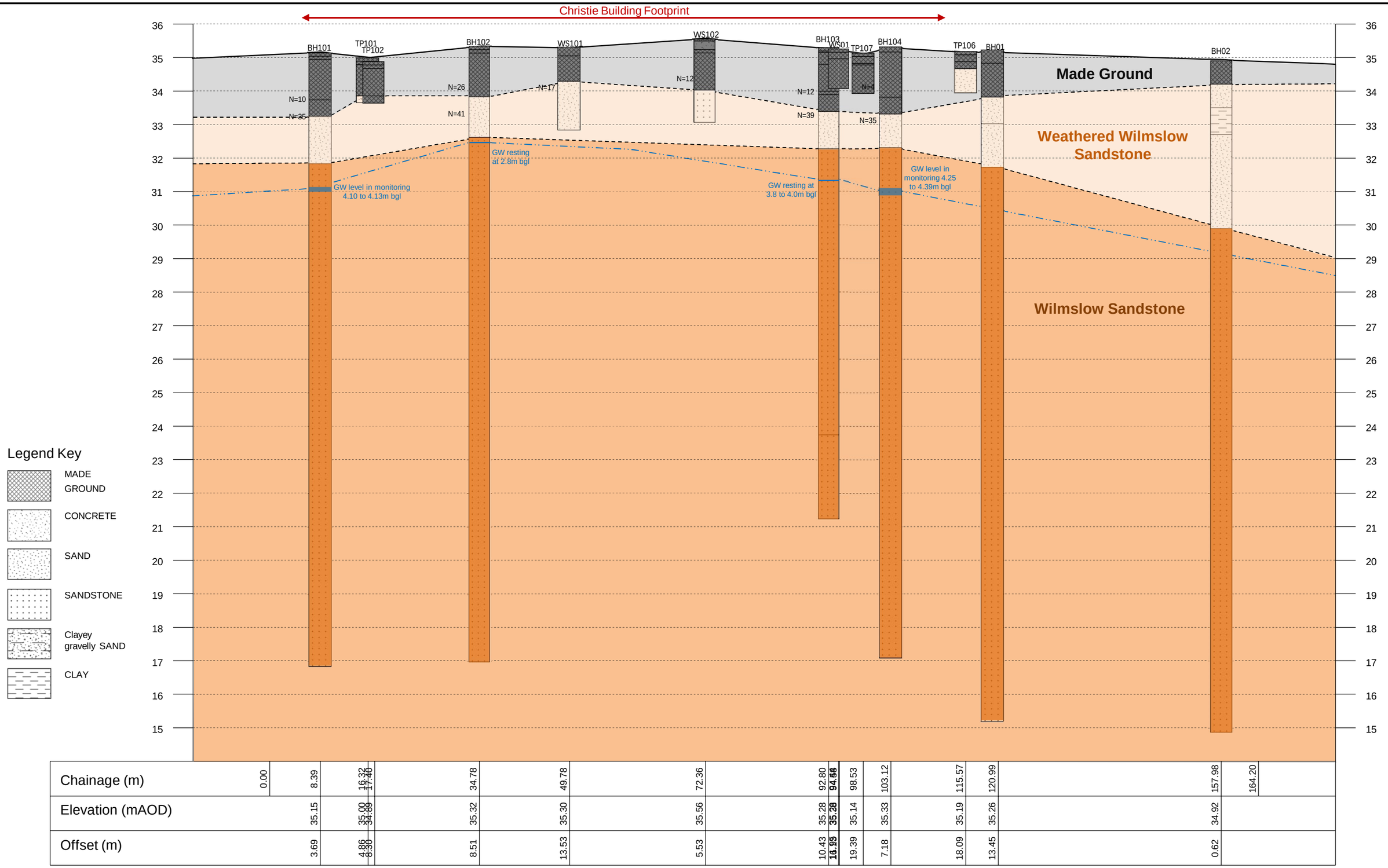
Client: IHP

Title: North-South Cross-Section of Christie Building Footprint

Vertical Scale: 1:106

Horizontal Scale: 1:590

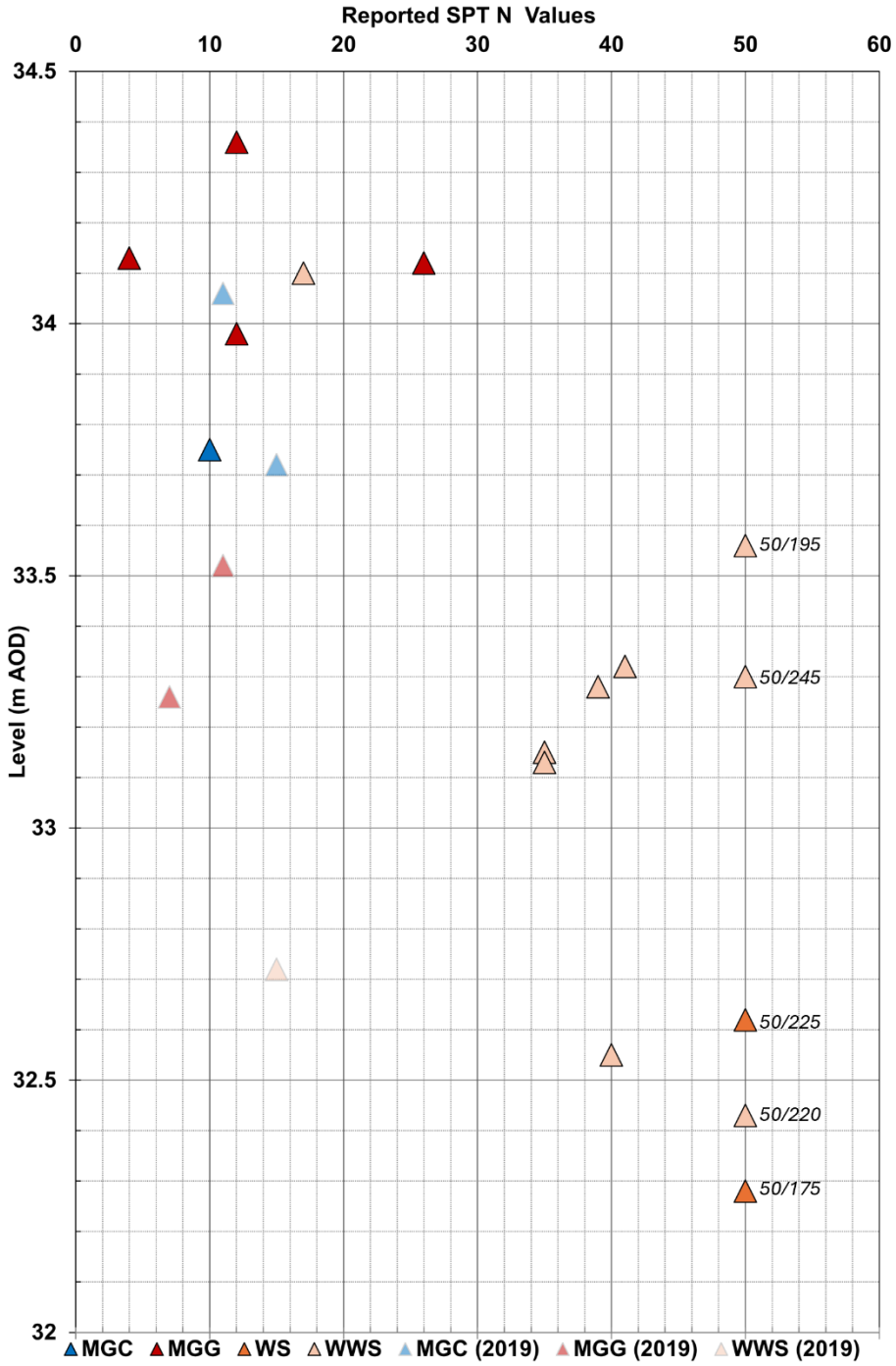
Engineer: Mott MacDonald



| | | |

C. Geotechnical Plots

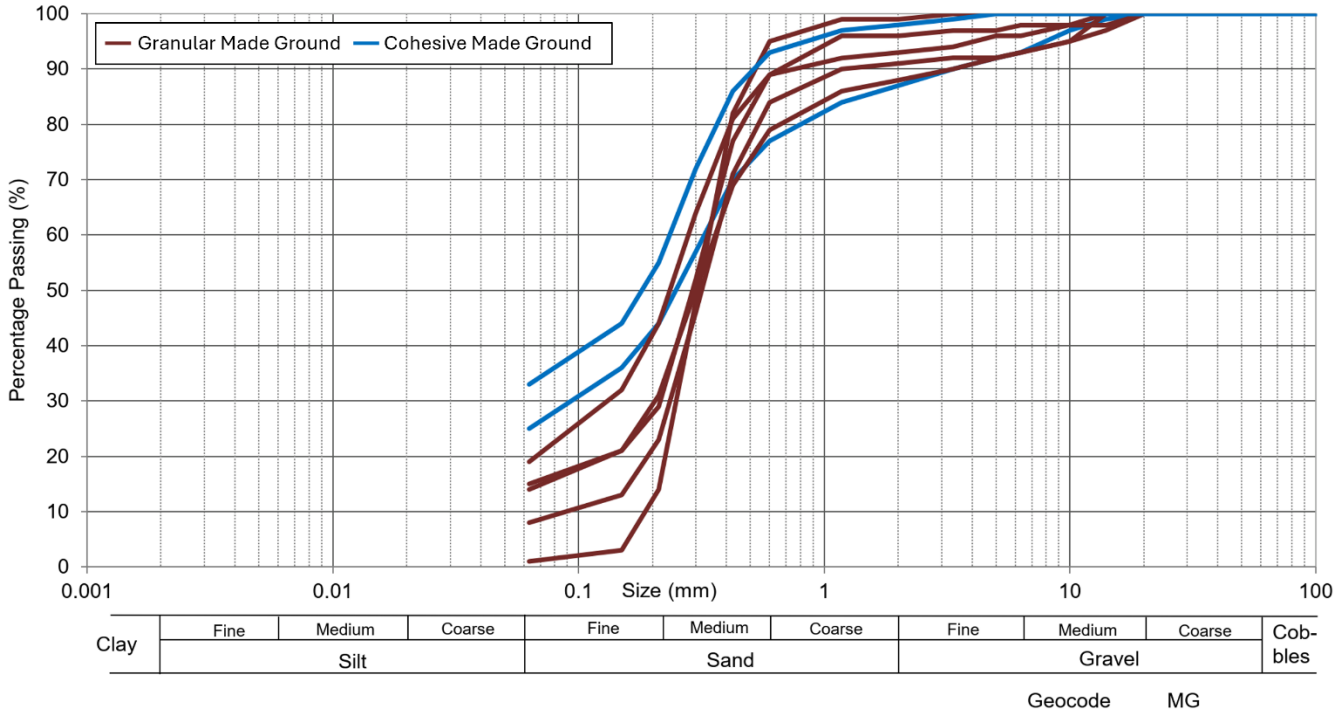
Figure C.1: SPTs with Elevation



Note: This plot includes the historical information from the 2019 ground investigation works for the Paterson Building redevelopments, adjacent to the Christie Building.

Figure C.2: Particle Size Distribution – Made Ground

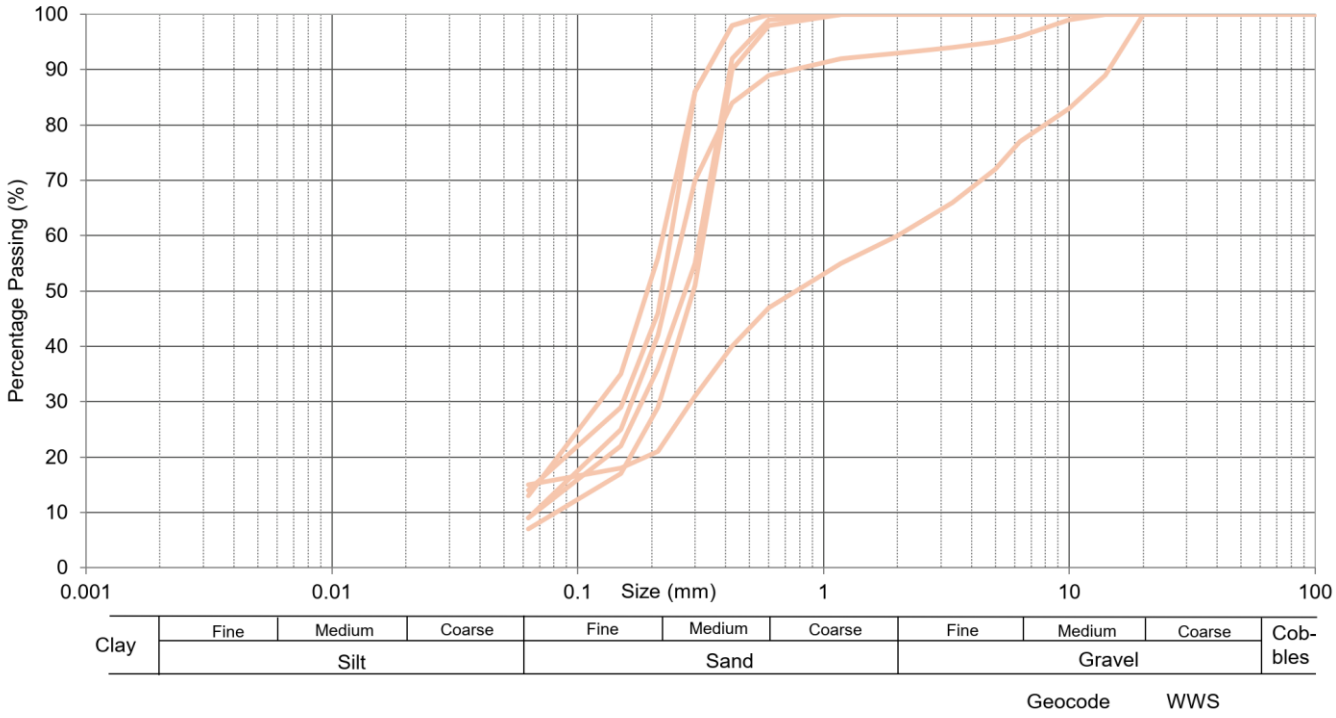
MOTT MACDONALD	Particle Size Distribution				Figure No.
Project ID:	**100114293**	Project Title:	**HEA The Christie CT Redevelopment**	Drawn By:	
Location:	**Manchester**			Client:	



Date:		Comments/Notes:
Draft Status:		

Figure C.3: Particle Size Distribution – Weathered Wilmslow Sandstone

MOTT MACDONALD	Particle Size Distribution				Figure No.
Project ID:	**100114293**	Project Title:	**HEA The Christie CT Redevelopment**	Drawn By:	
Location:	**Manchester**			Client:	



Date:		Comments/Notes:
Draft Status:		

Figure C.4: Moisture Content with Elevation

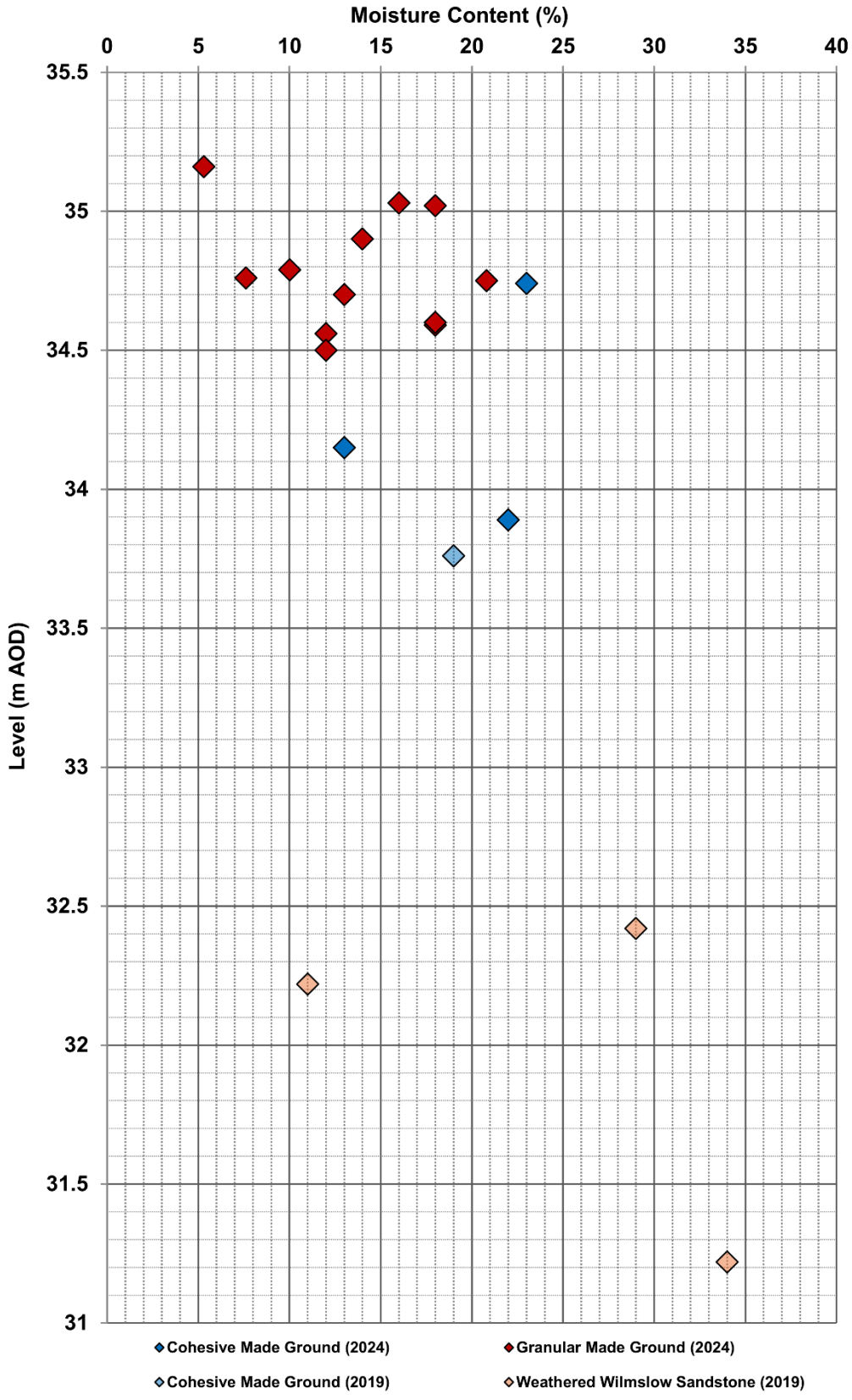
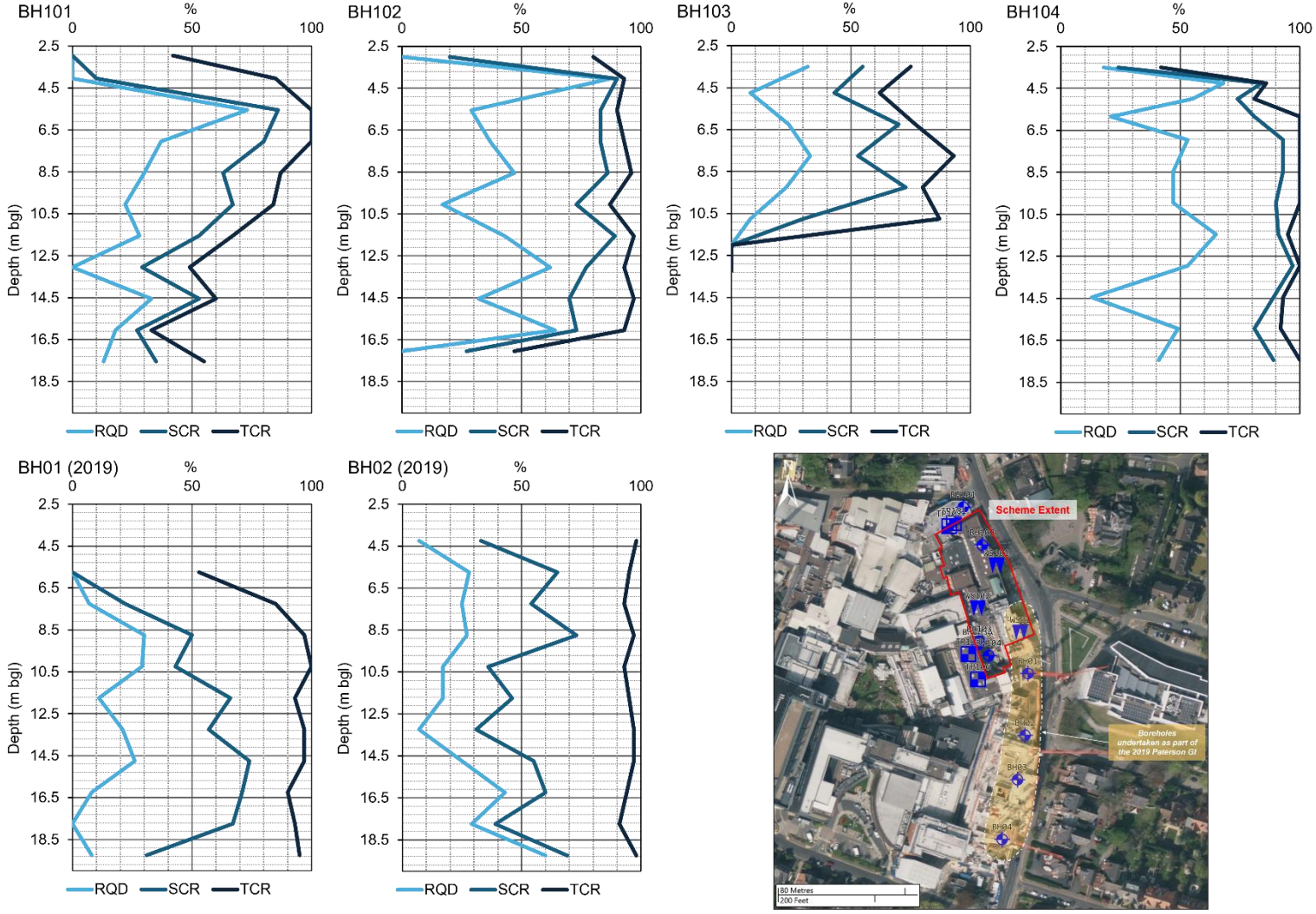


Figure C.5: Core Recovery Parameters with Depth



D. 2024 GRM Ground Investigation Factual Report

Report type:	Factual Ground Investigation Report
Site:	CASICD – The Christie Radiology Village
Client:	Integrated Health Projects (VINCI)
GRM Ref:	GRM/P10525/FAC.1
Naming Convention Ref:	CASICD-GRM-XX-ZZ-RP-C-000001-P01
Date:	May 2024

CASICD - THE CHRISTIE RADIOLOGY VILLAGE,

FACTUAL GROUND INVESTIGATION REPORT
Naming Convention reference: CASICD-GRM-XX-ZZ-RP-C-000001-P01
FOR
INTEGRATED HEALTH PROJECTS (VINCI)

GRM Project Ref:
P10525

Date:
May 2024

Prepared for:
VINCI Construction UK Limited
Ditton Road,
Widnes
WA8 0PG

This report has been prepared in accordance with GRM's Accredited Quality Procedures

If you have any queries regarding this report please contact the project manager in the first instance.

Project Manager:	Reviewed by:	Approved by:
Richard Hodgkinson BSc FGS (Senior Geotechnical Engineer) richard.hodgkinson@grm-uk.com	**Paul Wardle** BSc MA FGS (Acting Principal Geologist) paul.wardle@grm-uk.com	**Geoff Beckett** FGS CGeol (Director) geoff.beckett@grm-uk.com
When required in-house geological, geotechnical, environmental, structural and civil staff helped to produce this document.		
Issue	**Description of Revision**	**Signature**
P01	Draft for comment	RJH

Constructionline Silver Member

AGS

ISO 9001 CERTIFIED

TABLE OF CONTENTS

1 INTRODUCTION....2
2 PHASE II GROUND INVESTIGATION....3
3 LABORATORY ANALYSES....7
4 CONCLUSIONS....7

APPENDICES

General Appraisal Comments and Standard Limitations	Appendix A
Site Location and Boundary Plan	Appendix B
Outline Development Plan	Appendix C
Exploratory Hole Location Plan	Appendix D
Exploratory Hole Logs	Appendix E
Foundation Pit Diagrams and Photographs	Appendix F
PAS128 Survey	Appendix G
Rock Core Photos	Appendix H
Gas and Groundwater Monitoring Results	Appendix I
Chemical Analysis Results	Appendix J
Geotechnical Test Results	Appendix K

1 INTRODUCTION

1.1 PREAMBLE

GRM Development Solutions Limited (GRM) has been appointed by Integrated Health Projects - VINCI (Client) to undertake a Phase II Site Investigation to determine the ground conditions for the proposed Christie Radiology Village development. The projects Investigation Supervising Engineer is Mott MacDonald. The works reported within this document comprise the intrusive ground investigation, geotechnical testing and chemical analysis, and the post fieldwork gas and groundwater monitoring.

Client supplied information:

- Ground Investigation Specification by Mott MacDonald ref: 10014293 | P01 | CASCID-MMD-XX-ZZ-SP-C-000001, dated December 2023.
- The Christie Advanced Scanning and Imaging Centre Development Borehole Location and Constraints Plan ref: CASICD-MMD-XX-ZZ-DR-C-000002-P02.
- The Christie CT Development Bill of Quantities ref: CASICD-MMD-XX-ZZ-BQ-C-00001, dated December 2023.
- Designers' Hazard Elimination and Management Record ref: CASICD-MMD-XX-XX-HS-C-000001.
- UXO Desk Study and Risk Assessment by Zetica – The Christie NHS Foundation Trust, dated December 2023.

GRM Standard Limitations of Reporting are provided in Appendix A of this report.

A Site Location and Boundary Plan is presented in Appendix B.

The site is proposed to be re-developed, with the existing hospital buildings being decommissioned and demolished, and a new multi-storey hospital building constructed within a similar footprint.

An outline development footprint plan, on which this report is based, is presented in Appendix C.

2 PHASE II GROUND INVESTIGATION

2.1 FIELDWORK

The ground investigation fieldwork was conducted in several phases due to the logistical challenges of operating in a live hospital site;

- The rotary boreholes BH101, BH102, BH103, BH103A and BH104 and Trial pits TP101, TP102, TP104, TP106 and TP107 were undertaken between the 15th February and 18th March 2024.
- TP103 and TP105 undertaken in the small courtyard, and accessed through a waiting room were undertaken on Sunday 17th March 2024 due to the potential noise disturbance from breaking out hardstanding.
- WS101, WS02 and WS103 were undertaken on Sunday 28th April 2024, due to the logistics of working inside the hospital.

The groundwater/gas monitoring visits continued after the fieldwork.

A total of 14no. exploratory holes (7no. hand dug trial pits and 3no. windowless sample boreholes, and 4no. rotary boreholes) were progressed, to depths ranging between 0.60m (WS103) and 18.30m (BH101) below existing ground level (begl).

During the drilling of BH103, the rock strata encountered below 11.50m begl, was found to be locally softer and highly fractured, and is believed to represent a fault zone. Below this depth, no sample recovery for logging was possible, as recirculating water flush was used, with all the flush lost down the fractures. The issues encountered, resulted in the core barrel and casing being lost down the hole, with the location abandoned at 14.0m begl depth, as no further progress could be made.

The Exploratory Hole Location Plan (Specification document from Mott MacDonald) and Exploratory Hole Logs are presented in Appendix D and Appendix E respectively.

The Foundation Pit Diagrams and Photographs are presented in Appendix F.

The positioning and target depth of the exploratory holes was specified by the Investigation Supervisor.

Two monitoring standpipes were installed during the site works within BH101 and BH104, with the response zones specified by Mott MacDonald, upon completion of each location.

A PAS128 compliant survey was undertaken simultaneously with the investigation works, and provided buried services clearance at each investigation location. Where possible, the locations were also surveyed with GPS to provide coordinates. Locally in

the small courtyard where TP103, TP104 and TP105 were undertaken the GPS was not possible due to the enclosed setting, and no line of sight back to a known station.

The PAS128 survey, is presented in Appendix G.

2.1.1 Logging and Sampling

During the fieldwork, the recovered rock cores were placed in core boxes, and transported back to the GRM main office for logging and storage. During logging, the plastic core liner was split to enable detailed logging and sub-sampling for laboratory testing and core photographs to be taken.

A selection of rock core photographs is presented in Appendix H.

The cores will be held at the GRM office and available for inspection, for a minimum of 30 days after the issuing of the final factual report.

The soils generated by the trial pits and boreholes were logged on site in accordance with BS EN 1997-2 Eurocode 7: Geotechnical Design – Part 2: Ground Investigation and Testing.

Soil samples were delivered to the laboratory, with the scheduling of the testing by the project consultant (Mott MacDonald).

2.2 PROVEN GROUND

The following ground conditions were encountered during the investigation fieldwork:

- Made Ground
- Wilmslow Sandstone Formation

2.2.1 Made Ground

Made ground was encountered in all exploratory holes, to depths of between 0.2m and 4m begl.

The made ground was not fully penetrated in 4no. exploratory holes (TP102, TP104, TP105 and TP107), which all terminated at the specified target depth of 1.20m begl.

Types of made ground observed were;

- Hardstanding materials of concrete, tarmac/asphalt and brick pavers.
- Aggregates e.g. bedding sand, type 1 MOT and other gravel products.

- reworked natural soils, with gravels of chert, brick, tarmac, sandstone, mudstone, limestone and quartzite.

2.2.2 Wilmslow Sandstone Formation

Strata of the Wilmslow Sandstone Formation were encountered in some exploratory holes but were not fully penetrated.

These strata initially comprised of a more weathered zone, comprising; medium dense and dense orangish brown slightly clayey slightly gravelly SAND. Gravel comprises fine to coarse subangular sandstone.

The weathered zone was underlain by more competent rock quality strata, which generally comprised; extremely weak to weak orangish brown medium to coarse grained SANDSTONE.

Fractures within these strata were observed to fall into the following categories:

- Sub-horizontal closely spaced, planar smooth.
- Sub-horizontal widely spaced, planar rough, with some clayey gravelly infill.
- Sub-vertical, widely spaced, open rough with no infill.

Where encountered, zones of core loss and poor recovery within these strata are considered to be the result of both locally heavily fractured strata, and the anticipated location of a geological fault.

2.3 CONTAMINATION OBSERVATIONS

A mild to moderate organic odour was noted while advancing the service inspection pit in WS102 (inside the existing hospital), within the made ground soils.

2.4 GROUNDWATER

The exploratory techniques used were rapid and may have masked smaller water seepages.

During the investigation works, standing groundwater was encountered in the rotary boreholes at between 2.60 and 3.80m begl.

To date, two groundwater monitoring visits have been conducted and the results of the monitoring are reported in Appendix I.

2.5 SCHEDULING OF LABORATORY TESTING

GRM issued draft exploratory holes logs and blank chain of custody forms to Mott MacDonald following the completion of each exploratory hole location. The completed forms were returned to GRM, specifying the required laboratory testing.

Any sample deviations due to holding time exceedances, are outside of GRMs control.

3 LABORATORY ANALYSES

All AGS data for the laboratory testing results will be provided separately, and issued electronically to the Client for distribution.

3.1 CHEMICAL LABORATORY ANALYSIS

Chemical laboratory analyses were specified by Mott MacDonald and was undertaken by Construction Testing Services Ltd.

The chemical analysis results are presented in Appendix J.

Samples not used for testing will be stored for 30 days after issue of this report and then disposed of, unless the Client requests in writing that they be kept.

3.2 GEOTECHNICAL LABORATORY TESTING

Geotechnical testing on both soil and rock samples was specified by Mott MacDonald and was undertaken by Simtec and Geolabs Ltd.

The deformability of rock core testing could not be undertaken due to the nature of the samples recovered, i.e. the fracture state resulting in variability of the cylinder sidewalls, and reduced width to length ratio available.

The geotechnical test results are presented in Appendix K.

4 CONCLUSIONS

The investigation works have been undertaken in accordance with the specification, and supervising engineers instructions.

We trust this is sufficient for your current requirements.

If you have any queries, please contact the project manager in the first instance.

APPENDIX A

GENERAL APPRAISAL COMMENTS

i INFORMATION SOURCES

Where available the following sources have been used for the identification and assessment of potential ground hazards:

- Relevant British Standards
- British Geological Survey (BGS) Geology Map Scale 1:10,000 for local area
- British Geological Survey (BGS) Geology Map Scale 1:50,000/1:63,320
- BGS Memoir
- BGS Borehole Records: https://mapapps2.bgs.ac.uk/geoindex/home.html
- BGS online viewer: https://geologyviewer.bgs.ac.uk
- Magic Groundwater Vulnerability Maps
- Historical Ordnance Survey (OS) Maps
- Environmental Data Report
- Environment Agency Website: http://www.environment-agency.gov.uk/
- Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites, UKWIR, 2010.
- Coal Authority Records / Coal Mining Report
- DEFRA/Environment Agency Contaminated Land publications and DoE Industry Profiles
- BRE Guide BR211 (2023), 'Radon: Guidance on protective measures for new buildings (including supplementary advice for extensions, conversions and refurbishment projects)'
- UK HSA Radon Maps: https://www.ukradon.org/information/ukmaps
- CIRIA C665 'Assessing risks posed by hazardous ground gases to buildings'
- BS8485:2015 +A1: 2019, 'Code of Practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings'
- Other technical references used throughout this document are detailed in the text.

ii CONTAMINANTS OF CONCERN

The DoE Industry Profiles are normally used to assess likely contaminants from past land use and potential nearby industrial sources. For land uses where no profile is available, likely contaminants of concern are selected by GRM based on past experience of similar sites, a general screening suite of contaminants covered by CLEA and common contaminants from the Industry Profiles.

- Arsenic
- Cadmium
- Chromium
- Lead
- Mercury
- Selenium
- Copper
- Nickel
- Zinc
- Phenols
- cyanide (total)
- pH
- Water soluble sulphate
- PAH (polycyclic aromatic hydrocarbons)

Asbestos and PCBs are listed in the vast majority of profiles. PCBs are listed as the profiles expect electricity substations and switch boxes on all industrial sites. There is the potential for asbestos containing material to be mixed up with made ground, following any demolition works.

iii CONCEPTUAL MODEL METHODOLOGY

The consideration of contamination is based upon the principles of risk assessment, using the 'source-pathway-receptor' model in order to establish the presence, or potential presence, of a pollutant linkage.

To create a risk, contamination must have the potential to cause harm to susceptible targets or receptors such as humans, the water environment or the built environment. The potential for harm to occur requires three conditions to be satisfied to form a pollutant linkage:

- The presence of substances that may cause harm (SOURCE).
- The presence of a target which may be harmed (RECEPTOR).
- The existence of a plausible migration route between the source and the receptor (PATHWAY).

In the absence of a plausible pollutant linkage there is no risk. Where a potential linkage is identified in order for it not to pose a risk to the identified receptor it must be broken.

iv INTRUSIVE INVESTIGATION SAMPLING METHODOLOGY

The ground investigation (including fieldwork, sampling, monitoring and laboratory analyses) has been designed to identify and assess potential ground related problems and to allow cost effective solutions to be advised. It has been planned on the basis of the desk study, site inspection and the proposed development layout (where available). All fieldwork and soil descriptions were carried out in general accordance with relevant British Standards.

The exploratory holes have been positioned and advanced to depths to determine the general ground/groundwater/gas conditions below the site. A general grid pattern has been adopted, where possible, to provide sufficient information based on the current proposed layout scheme. Some holes have been targeted at particular hazards identified in the Phase I assessment. The resultant exploratory hole density is considered to be commensurate with the complexity of the site conditions and detail of information required for this phase of the investigation.

v GROUND GAS RISK ASSESSMENT METHODOLOGY

Gas monitoring programmes undertaken by GRM are designed to broadly comply with the recommendations outlined in CIRIA Report C665 'Assessing risks posed by hazardous ground gas to buildings' (2007) and BS8576 'Guidance on Investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs) (2013).

To assess the risks posed by ground gases such as radon, carbon dioxide and methane, the relevant current guidance has been used. For radon the site has been assessed following the guidelines in 'Radon: guidance on protective measures for new dwellings (including supplementary advice for extensions, conversions and refurbishment projects) (BR211: 2023)'. For methane and carbon dioxide the primary guidance document used to determine if protection measures are required is *BS8485:2015 Code of practice for the design of protective measures from methane and carbon dioxide ground gases for new buildings*. This uses hazardous gas flow rates (Q_{hg}), which are gas concentrations multiplied by borehole flow rates, to derive a Gas Flow Rate (GSV) for the site. The gas regime is then determined based on the GSV and other limiting factors such as gas concentrations.

Where flow is not recorded during the monitoring a default flow rate of 0.1l/hr will be used in the assessment to produce a positive result.

vi HUMAN HEALTH RISK ASSESSMENT METHODOLOGY

Guidance contained in the Environment Agency's CLEA Reports has been used to assess the risks posed to human health.

For residential developments that include domestic gardens the default Tier 1 Assessment Criteria (TAC) for 'residential land with plant uptake' are used, i.e. a female with a start age class of one and an end age class of six. All pathways are considered including the consumption of home-grown vegetables.

For residential developments that do not include domestic gardens the default Tier 1 Assessment Criteria (TAC) for 'residential land without plant uptake' are used, i.e. a female with a start age class of one and an end age class of six. All pathways are considered except the consumption of home-grown vegetables. For commercial/industrial developments the default Tier 1 Assessment Criteria (TAC) for 'commercial/industrial' are used, i.e. a female with a start age class of sixteen and an end age class of eighteen. All pathways are considered except the consumption of home-grown vegetables.

The TAC used by GRM include Category 4 Screening Levels (C4SLs) published by DEFRA, values calculated by GRM using the CLEA v1.071 risk assessment, and values and Suitable for Use Levels (S4UL) developed by LQM/CIEH. The TAC used in the assessment are selected based on the lowest site specific SOM values returned as part of the chemical analysis.

Where soil chemical analysis results are found to exceed the TAC, Site-Specific Risk Assessments may be undertaken using the CLEA v1.071 risk assessment software using the age classes and pathways described above.

vii RISK TO SITE WORKERS – GENERAL COMMENTS

The risks to site workers are similar to those posed to site end users, although likely to be less severe due to the site workers' shorter exposure to the identified contamination. However, site workers (particularly groundworkers) are more likely to come into direct contact with contaminated soils due to the nature of their work. On this basis ground and construction workers should be provided with basic Personal Protective Equipment based on the site's general health and safety risk assessment, but including as a minimum safety footwear, gloves and overalls.

A site specific risk assessment should be carried out for all hazards identified within the ground investigation in accordance with current health and safety legislation. This assessment should identify any measures required to further reduce risks i.e. providing further Personal Protective Equipment, welfare facilities and if necessary preventing access to certain areas.

Demolition and dismantling of existing structures on the site must be carried out to a safe and acceptable standard, in accordance with current UK guidance and best practice. Whilst not ground related, asbestos and hazardous substances surveys should be conducted prior to any demolition.

Any unusual colours, odours and suspicious ground should be reported immediately to site management and then GRM.

Whilst this appraisal has considered the long-term effects of contamination, GRM can also help during the formulation of Health and Safety documentation, if required.

viii CONTROLLED WATERS RISK ASSESSMENT METHODOLOGY

Where the desk study and fieldwork do not reveal a potential source of contamination no leachate or groundwater testing will be performed. Where a potential source is identified the testing will comprise leachate testing on the material considered most likely to pose a risk, groundwater testing will be undertaken if water is present at shallow depth.

The UK Drinking Water Standards (UKDWS) or Environmental Quality Standards (EQS) are usually adopted for comparison with the leachate/groundwater test results. When the most sensitive receptor is considered to be the aquifer (groundwater) UKDWS will be adopted as the Initial Tier 1 screening values.

Where the most sensitive receptor is a surface water feature the EQS values will be used as Initial Tier I Screening values.

ix CONSTRUCTION MATERIALS RISK ASSESSMENT METHODOLOGY

The 'screening levels' adopted for the assessment of risk to construction materials are taken from the following documents:

- UK Water Industry Research (UKWIR) Contamination thresholds for sub-surface water pipes, for the protection of buried pipes.
- Building Research Establishment (BRE) Special Digest SD1 (2005), 'Concrete in Aggressive Ground', for the protection of buried concrete.

x WASTE DISPOSAL, SITE WASTE MANAGEMENT PLANS AND MATERIAL MANAGEMENT PLANS

Under current Waste Management Regulations, waste soil materials produced from the site will require characterisation to enable it to be disposed of correctly.

The chemical analysis results included in this report should be provided to the relevant landfill operators to establish the characterisation of the waste, confirm its suitability for landfill disposal and provide estimated costings. If material is classified as hazardous, then the site will need to be registered with the Environment Agency prior to the movement of the waste. Depending on the receiving landfill's current permit, further chemical analysis, incorporating Waste Acceptance Criteria (WAC) leachate analysis, may be required.

All materials removed from the site will be classified as 'waste' and therefore must be removed by a suitably licensed carrier of waste. This applies whether or not the waste is contaminated. All waste removed to landfill will attract Landfill Tax.

The developer/builder is likely to be classed as the waste producer and therefore, has a duty of care to ensure that all waste is disposed of appropriately. This includes ensuring the waste carrier is licensed and disposes of the waste to a suitably licensed landfill site. They are also required to keep a paper trail from 'cradle to grave' including copies of the waste disposal tickets.

Efficient materials management on site is recommended as it can lead to significant cost savings when compared to the traditional side casting or single stockpile of arisings. GRM can assist in the production of Material Management Plans under the CL:AIRE Definition of Waste: Code of Practice. The DoWCoP enables:

- The direct transfer and re-use of clean naturally occurring soil materials between sites, and
- The re-use of both contaminated and uncontaminated materials on their site of origin and between sites within defined Cluster projects.

GRM can also undertake the role of Qualified Person and submit the DoW CoP project Declaration.

Likewise making the site as volume neutral as possible will reduce the costs of development. Whilst not a statutory requirement, Site Waste Management Plans allow better waste management practices, help to reduce the amount of waste produced and identify best environmental disposal options. Implementing a Site Waste Management Plan (SWMP) can reduce costs (increasing business profits) and maximise resource efficiency.

xi GEOTECHNICAL ASSESSMENT GENERAL COMMENTS

Where finished floor levels of proposed structures have not been provided by the Client, then for the purposes of initial assessment, GRM will assume that finished levels will not vary appreciably from the existing ground levels. If the depths of any underground engineering works (i.e. sewers, pumping stations etc.) are unknown they will not be taken in to account in the assessment and it will be assumed that any such works will not compromise foundation or ground stability.

Should the development proposals or finished levels be different from these assumptions then the comments/recommendations in the Geotechnical Assessment may require revising.

It should be noted that the results of window sampling and/or cable percussive boreholes may not give a true indication of a soils actual engineering properties (i.e. stability, mass structure etc). GRM consider that that prior to development trial pitting should be undertaken to confirm the recommendations in the Geotechnical Assessment.

xii GEOTECHNICAL ASSESSMENT – ENGINEERING GROUND TREATMENT

Near surface soils have the potential to be disturbed by weathering and site traffic. Precautions should always be taken to avoid this, as excessive disturbance may leads to more onerous floor slab designs, road cap thickness and increased amounts of off-site disposal etc.

Near surface soils may need treatment or reinforcing to allow safe movement of construction plant and labour. An assessment by the contractor should be undertaken once the type of machinery/plant needed to complete the development is known.

xiii GEOTECHNICAL ASSESSMENT – EXCAVATIONS

Excavation instability (over-break) can result in damage to existing services or structures (e.g. foundations, roads or boundary walls/fences) both on and off-site, as well as increased foundation concrete costs. In order to minimise this, all excavations deeper than 1.2m deep (or any excavation within 1.5m of any existing structure or service) should be supported. Full support should be provided to the full depth of all near vertically sided excavations in made ground, soft and very soft clays and granular soils. A reduction to intermediate support should be acceptable within firm and stiffer natural clays.

Wherever possible, man entry into excavations should be prevented; however, where this is not possible, entry to, and time spent in, excavations should be kept to a minimum.

The build program should be tailored to reflect the impact that deep excavations through potentially unstable strata can have on adjacent properties, so that they are not undermined.

All excavations on site should be in accordance with HSE guidelines and stability should be practically maintained at all times. Reference should be made to HSE construction information sheet No. 8 (Revision 1) ‘Safety in Excavations’.

Care should be taken to ensure that falls from excavation faces do not adversely affect the integrity of foundation concrete.

If contaminated water enters excavations it should be removed and transported to an appropriate treatment facility by a suitably licensed carrier before construction begins.

xiv GEOTECHNICAL ASSESSMENT – SUBSTRUCTURES

Where practicable, existing buried construction should be fully removed; however, if this is not practicable all new foundations should be carried down to fully penetrate it and it should be broken well away from all new structures.

There may be existing structures and/or infrastructure in close proximity to the proposed development. New build foundations may be constructed next to pavements with existing underground services beneath them, or excavations may be required near existing footings associated with adjacent properties. These potential hazards need to be taken into consideration when designing foundations and the groundworker needs to be made aware of their potential impact during the redevelopment works. Foundations close to existing underground services or buildings may require alternative foundation techniques (such as piling) to protect the integrity of these structures.

The contractor for the works should carry them out in such a fashion so as to not cause excessive overbreak, concrete usage or undermine existing buildings/roads/ services that are to be retained.

xv GEOTECHNICAL ASSESSMENT – SOAKAWAYS

Soakaway testing in trial pits by GRM is broadly carried out in accordance with BRE DG 365 (2016). The testing comprises the excavation of a test pit to a suitable depth, and the placement of water into the pit. The level of water present is then monitored over time. For borehole installations, the permeability testing (falling head/rising head) is undertaken in accordance with BS5930.

If it is decided to proceed with the use of soakaway drainage, then the following general points should be noted:

- Soakaways should not be placed so that water can be discharged through potentially contaminated made ground.
- The Environment Agency may require soakaways to be sealed systems such that only roof run off falls to soakaway.
- Interceptors are likely to be required for soakaways for highway drainage. The adopting authority for the highways should be consulted at the earliest opportunity regarding the use of soakaways for highways drainage.
- Consideration of site levels and slopes should be taken into account during the design.
- The construction of all soakaways should be in accordance with the current building regulations.
- Soakaways should not be placed within 5m of a proposed building.
- Placement of soakaways needs to be considered so as to avoid ponding of water down slope.
- The base of a soakaway should not be below the highest recorded water level.
- The Environment Agency prefer 1m of dry soil to be present between the base of a soakaway and the water table to provide attenuation for contamination.

xvi GEOTECHNICAL ASSESSMENT – FOUNDATIONS

If soft or hard spots are encountered during foundation excavation then they should be replaced with suitably compacted material or the footings deepened to suitable strata, to avoid differential settlement.

If strata of differing bearing character (e.g. sand and clay) are encountered at foundation levels within the excavations for a single plot then the excavation depths should be altered as appropriate to ensure the foundations rest on a single stratum, or strata that will not induce differential settlement. Where this is impractical then GRM should be contacted to assess a reinforced concrete detail or an alternative foundation solution (e.g. piles or vibro-replacement).

NOTES ON LIMITATIONS

General

GRM Development Solutions Limited has prepared this report solely for the use of the Client and those parties with whom a warranty agreement had been executed, or with whom an assignment had been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from GRM Development Solutions Limited; a charge may be levied against such approval.

GRM Development Solutions Limited accepts no responsibility or liability for:

a) the consequences of this document being used for any purpose or project other than for which it was commissioned, and

b) the consequences of this document being used by any third party with whom an agreement has not been executed.

Phase I Environmental Audits/ Desk Studies

The work undertaken to provide the basis of this report comprised a study of available documented information from a variety of sources (including the Client), together with (where appropriate) a brief walk over inspection of the site and meetings and discussions with relevant authorities and other interested parties. The opinions given in this report have been dictated by the finite data on which they are based and are relevant only to the purpose for which the report was commissioned. The information reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in this report, GRM Development Solutions Limited reserves the right to review such information and as considered necessary and appropriate to modify the opinions accordingly. It should be noted that any risks identified in a Phase 1 report are perceived risks based on the information reviewed; actual risks can only be assessed following a physical investigation of the site.

Phase II Environmental Audits (Contamination Investigations)

The investigation of the site has been carried out to provide sufficient information concerning the type and degree of contamination, ground and groundwater conditions to allow a reasonable risk assessment to be made. The objectives of the investigation have been limited to establishing the risks associated with potential human targets, building materials, and controlled waters.

The amount of exploratory work and chemical testing undertaken has necessarily been restricted by the short timescale available, and the locations of exploratory holes have been restricted to the areas unoccupied by the building(s) on the site and by buried services. A more comprehensive investigation may be required if the site is to be redeveloped as, in addition to risk assessment, a number of important engineering and environmental issues need to be resolved.

For these reasons if costs have been included in relation to site remediation these must be considered as provisional only and must, in any event, be confirmed by a commercial adviser.

The exploratory holes undertaken, which investigate only a small volume of the ground in relation to the size of the site, can only provide a general indication of site conditions. Whilst exploratory testing is intended to gain an accurate representation of the site, the very nature of sampling and testing is such that it cannot ensure that all localised conditions are detected

The risk assessment and opinions provided take in to consideration, inter alia, currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values.

Phase II Geo-environmental Investigations (Combined Geotechnical and Contamination Investigations)

The investigation of the site has been carried out to provide sufficient information concerning the type and degree of contamination, geotechnical characteristics, and ground and groundwater conditions to provide a reasonable assessment of the environment risks together with engineering and development implications. If costs have been included in relation to site development a commercial adviser must confirm these.

The exploratory holes undertaken, which investigate only a small volume of the ground in relation to the size of the site, can only provide a general indication of site conditions. The opinions provided and recommendations given in this report are based on the ground conditions apparent at the site for each of the exploratory holes. There may be exceptional ground conditions elsewhere on the site which have not been disclosed by this investigation and which have therefore not been taken into account in this report.

The comments made on groundwater conditions are based on observations made at the time the site work was conducted. It should be noted that groundwater levels will vary owing to seasonal, tidal and weather related effects.

The scope of the investigation was selected on the basis of the specific development proposed by the Client and may be inappropriate to another form of development or scheme.

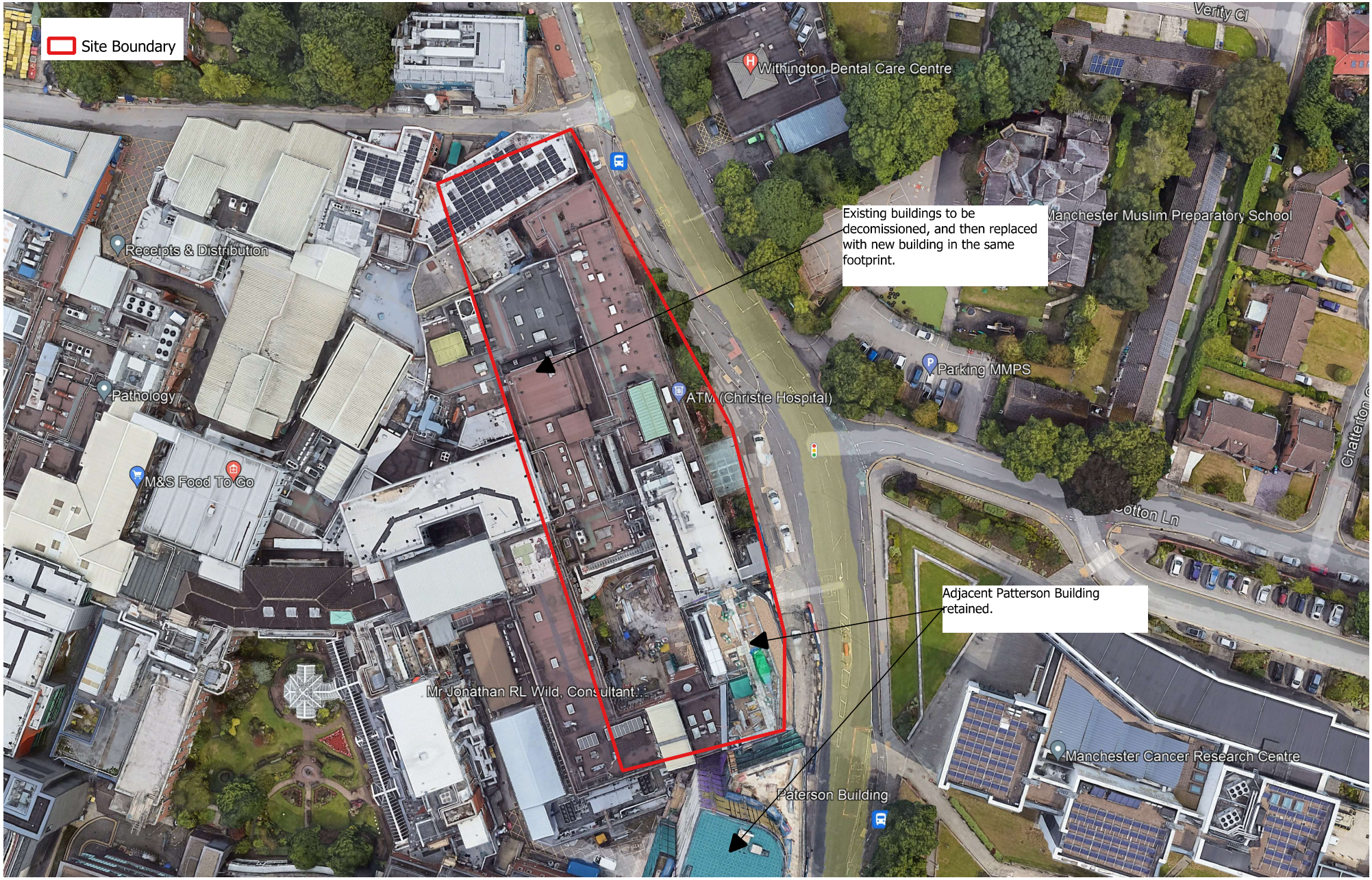
The risk assessment and opinions provided take in to consideration, inter alia, currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values.

APPENDIX B

NOTES: Notes	CLIENT: IHP VINCI	PROJECT No: P10525	DATE: MAY 2024	DESIGN/DRAWN: RJH
	PROJECT: CASICD - THE RADIOLOGY VILLAGE	DRAWING NUMBER: 001	ISSUE: A	
	TITLE: SITE LOCATION PLAN	© GRM Development Solutions Ltd © Crown Copyright. AL 100014100		

GRM Development Solutions Ltd
Tel: 01283 551 249
mail@grm-uk.comwww.grm-uk.com

APPENDIX C



NOTES:
Notes

CLIENT: IHP VINCI

PROJECT: CASICD - THE RADIOLOGY VILLAGE

TITLE: DEVELOPMENT PROPOSAL

PROJECT No: P10525

DATE: MAY 2024

DESIGN/DRAWN: RJH

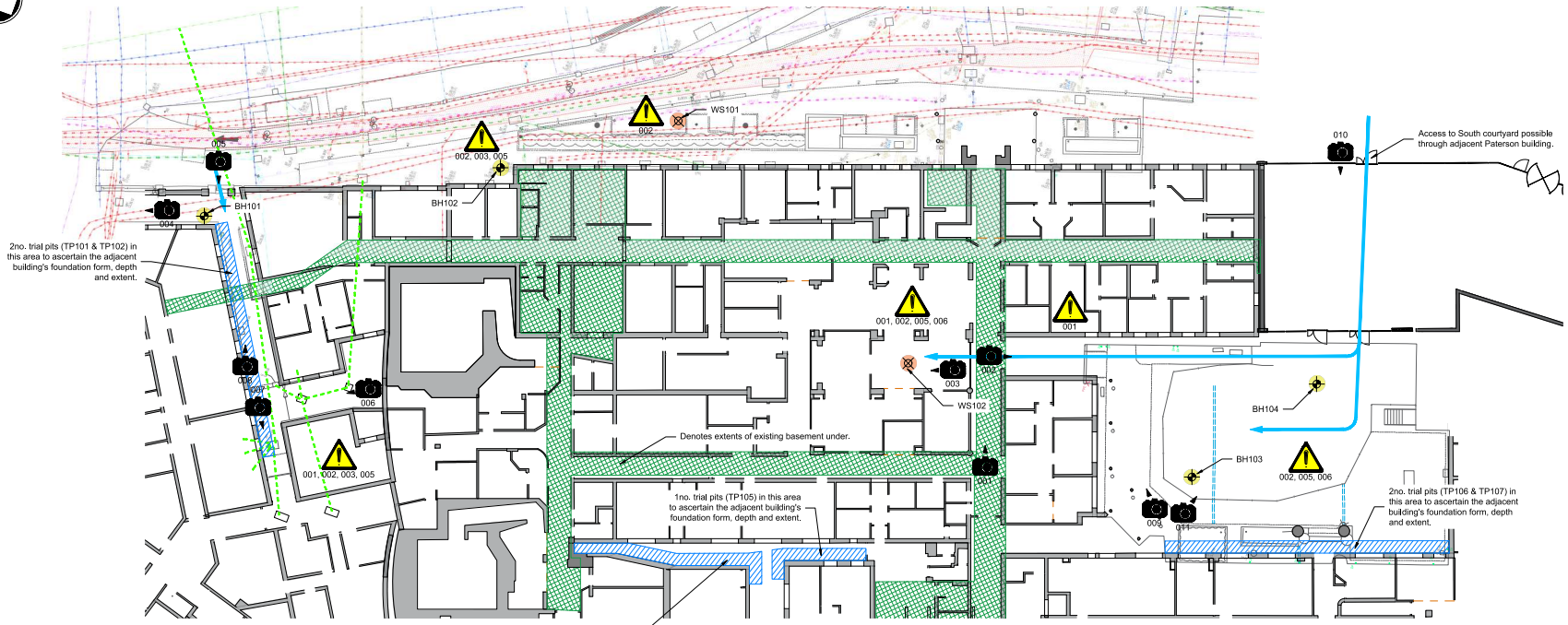
DRAWING NUMBER: 002

ISSUE: A

© GRM Development Solutions Ltd © Crown Copyright. AL 100014100

GRM Development Solutions Ltd
Tel: 01283 551 249
mail@grm-uk.comwww.grm-uk.com

APPENDIX D



Ground Floor Constraints Plan

1:200

Exploratory Hole Schedule

Borehole ID	Type	Depth (m)	Groundwater monitoring required?	Easting	Northing
BH101	DS + RC	18	Yes	E384907	N392636
BH102	DS + RC	18	No	E384919	N392615
BH103	DS + RC	18	Yes	E384914	N392553
BH104	DS + RC	18	No	E384925	N392547
WS101	WS	5	No	E384927	N392603
WS102	WS	5	No	E384915	N392579
WS103	WS	5	No	E384909	N392608
TP101	HDTP	1.2	No	-	-
TP102	HDTP	1.2	No	-	-
TP103	HDTP	1.2	No	-	-
TP104	HDTP	1.2	No	-	-
TP105	HDTP	1.2	No	-	-
TP106	HDTP	1.2	No	-	-
TP107	HDTP	1.2	No	-	-

Photo 001

Photo 002

Photo 003

Photo 004

Photo 005

Photo 006

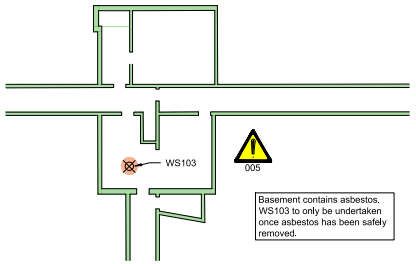
Photo 007

Photo 008

Photo 009

Photo 010

Photo 011



Basement Level Plan Extract

1:200

Health, Safety & Environment Information

XXX

Notes below are additional to hazards/risks normally associated with this type of work.

Ref.	Hazard	Activity / Process
001	Collapse of existing basement under external areas.	Temporary works Contractor to verify that existing basement is not overloaded when transporting Ground Investigation equipment.
002	Clash with existing services.	Sub-contractor to take full responsibility for utility plans and verify position of additional drainage prior to commencement of works.
003	UXO.	Pre-Desk Study showed site to be moderate risk, detailed desk study to be undertaken prior to GI to inform risk.
004	Working adjacent to the public highway.	Appropriate segregation to be used and agreed with Trust/council.
005	Contaminated ground.	Asbestos known to be present in the basement. Contractor to be vigilant on site for potential asbestos or other contaminants in ground.
006	Working in a live hospital.	Noise/vibration and general disruption to be kept to a minimum and agreed with the NHS Trust prior to commencing work. Appropriate segregation to be used around investigations.

Ground Investigation Requirements

Requirements for the ground investigation are outlined below. Note that a full specification for the works will be produced prior to undertaking the investigation.
This drawing should be read in conjunction with the Geotechnical and Geoenvironmental Desk Study CASIDC-MMD-XX-XX-RP-C-000001.
An indicative ground model has been produced based on the adjacent Paterson Development Ground Investigation:

Stratum	Depth to top of stratum (mBGL)	Elevation at top of stratum (mAOD)	Thickness (m)
Made ground	0	34.72-35.26	0.70-2.20
Devensian till	0.70-2.20	32.52-34.22	0.50-2.20
Weathered sandstone	2.20-2.70	31.43-33.06	1.30-2.80
Very weak to weak sandstone (Wilmslow Formation)	3.50-5.00	29.92-31.76	Not proven

- Made ground samples required from all exploratory hole locations for contamination testing.
- Exploratory holes required to a depth of 18m below ground level. DS + RC refers to Dynamic Sampling borehole with Rotary Coring follow-on, WS refers to Window Sample and HDTP refers to Hand-Dug Trial Pit.
- GI Sub-Contractor to advise whether there is scope for other suitable borehole locations within the footprint of the building. GI Sub-Contractor to agree methodology and date/time of exploratory holes with NHS Trust prior to undertaking the works.
- CAT Scan and hand dug trial pits required to a depth of 1.2m at all exploratory hole locations to identify any buried services and/or foundations of adjacent buildings.
- Trial pits to be undertaken in the locations highlighted to determine the extent of existing foundations. Dimensioned sketches to be provided to Structural Engineer.
- If invasive species are seen on site the Contractor is to make the Principal Designer and Investigation Supervisor aware. Risk of invasive species is low due to the site being located in an urban area.

1:200 0 10m 20m

© Mott MacDonald

This document is issued for the party which commissioned it and for specific purposes connected with the captioned project only. It should not be relied upon by any other party or used for any other purpose.
We accept no responsibility for the consequences of this document being relied upon by any other party, or being used for any other purpose, or containing any error or omission which is due to an error or omission in data supplied to us by other parties.

C:\Users\UFT90454\Mott MacDonald\The Christie CT Redevelopment - P23 Input - Do\Develop\C Civil Engineer\DR Drawing Renditions\Borehole Location Plan\CASICD-MMD-XX-ZZ-DR-C-000002\Christie Utilities Overlay.dwg Dec 4, 2023 - 3:42PM UFT90454

Notes

1. Do not scale from this drawing
2. All utilities shown are taken from "59603 Utility Survey (23-03-23)", with the exception of the lined indicating "Indicative combined sewer location" as shown in the below key, which is only shown in the approximate position based on recieved CCTV information.
3. Boreholes are shown in approximate required position only, the sub-contractor shall be responsible for ensuring that the proposed borehole locations are suitable and do not disrupt any live services or other ground obstructions below.
4. Temporary works contractor to verify that the existing basement is not overloaded when transporting ground investigation equipment.
5. Proposed access routes are to be agreed with the Trust prior to commencement of works. No consideration has been made to storage or site compound areas.

Key to symbols

- British Telecom
- Vodafone
- Virgin Media
- GTT Fibre Optic
- ZAYO
- Empty Ducting
- Earth Cable
- Electricity Cables
- Gas Pipes
- Sewer Combined
- Sewer Foul
- Sewer Surface Water
- Traffic Light Cables
- Unidentified GPR or electro location trace
- Water Pipe
- End of trace
- Multiple Electric Ducts
- Red line boundary
- Extents of basement below
- Trial pits location plan
- Proposed indicative borehole location
- Proposed window sample location
- Indicative combined sewer location
- Proposed access route to South courtyard

Reference drawings

Existing ground floor and basement level plans taken from 1282-21-DAY-XX-00-DR-A-03-0001 and 1282-21-DAY-XX-BA-DR-A-03-0000 respectively.

Paterson Building ground floor general arrangement plan taken from BDP architectural Revit model PRP-BDP-Z01-XX-M3-A-0002.

Utility survey taken from 59603 Utility Survey (23-03-23).dwg

Indicative combined sewer locations shown by a lime green dashed line and associated manholes are taken from NRCWWS CCTV Drain survey dated Oct 2023.

Rev	Date	Drawn	Description	Ch'k'd	App'd
P02	04.12.2023	M Ufton	Updated following subcontractor comment	CS	AS
P01	14.11.2023	M Ufton	Issued for sub-contractor comment	CS	AS

Status Stamp

PRELIMINARY

MOTT MACDONALD

Mott MacDonald
7th Floor
26 Whitehall Road
Leeds LS12 1BE
United Kingdom

T +44 (0)113 394 6700
W www.mottmac.com

Client

The Christie NHS Foundation Trust

Title

The Christie Advanced Scanning & Imaging Centre Development Borehole Location & Constraints Plan

Designed	I Sonara	IS	Eng check	M Wild	MW
Drawn	M Ufton	MU	Coordination	C Smith	CS
Dwg check	C Smith	CS	Approved	A Simpson	AS

MMD Project Number	Scale at A1	Security
100114293	1:200	STD

Suitability Description	Suit. Code
Suitable for Review and Comment	S3

Drawing Number	Revision
CASICD-MMD-XX-ZZ-DR-C-000002	P02

APPENDIX E

GRM Development Solutions Ltd
Laurus House,
First Avenue, Centrum 100,
Burton-on-Trent, DE14 2WH
Tel (HQ): 01283 551249
Email: info@grm-uk.com

Cable-Percussion Borehole

Borehole No. **BH101**

Sheet 1 of 3

Site Name: CASICD - Christie Hospital, Wilmslow, Manchester

Ground Level (mAOD) 35.15

Client: IHP Projects (VINCI)

GRM Project Ref: P10525

Coordinates 384906 E, 392641 N

Install	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	SPT Value		Depth (m)	Level (m)	Legend	Stratum Description
						0.10	35.05		Tarmacadam/asphalt.
		0.30 - 0.40	ES			0.20	34.95		MADE GROUND
		0.40 - 0.50	B						Medium dense, light brown, slightly sandy GRAVEL. Sand is fine to coarse. Gravel is fine to coarse, subangular limestone and quartzite. MADE GROUND
		1.00 - 1.10	ES						Soft, dark brown, slightly sandy, gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded brick, tarmacadam/ asphalt, limestone and brick. MADE GROUND
		1.40	C	N=10 (2,3/2,3,2,3)		1.40	33.75		
		1.50 - 1.60	ES						Firm, light grey and orangish-brown, sandy, gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, angular and subangular mudstone, sandstone, chert and brick. MADE GROUND
		1.90 - 2.00	D			1.90	33.25		
		2.00	C	N=35 (6,8/7,8,9,11)					Medium dense to dense, orangish-brown SAND. Sand is fine to coarse. WEATHERED WILMSLOW SANDSTONE FORMATION
		2.30 - 2.40	D						
		~~2.60~~	~~C~~	~~40 (11,13/40 for 185mm)~~					
		2.60 - 3.30	42	0	0				*... No recovery 2.60-3.10m.*
		3.30 - 4.80	85	10	0	3.30	31.85		Extremely weak reddish brown medium to coarse grained SANDSTONE, locally recovered as sand. Discontinuities; No.1 - sub-horizontal closely spaced, planar rough and open. No.2 - sub-vertical up to 60 degrees, planar rough, very widely spaced. No.3 - sub-horizonal, widely spaced, planar rough, with clayey fine to coarse gravel infill. WILMSLOW SANDSTONE FORMATION
		4.80 - 6.30	100	86	73				
		6.30 - 7.80	100	80	37				

Crew: MACKLIN GEOTECH **Logger:** AM / AW

Equipment: Comacchio 205

Groundwater Remarks:
Groundwater standing at 2.60m.

General Remarks:

Chiselling Details

Depth Top	Duration	Remarks

Casing Diameter by Depth

Depth Base	Diameter	Remarks
3.50	150	

Hole Started: 11/03/2024 **Hole Complete:** 13/03/2024 **Version:** FINAL **Scale:** 1:45

GRM Development Solution Ltd,
Tel (HQ): 01283 551249
Email: info@grm-uk.com
Web: www.grm-uk.com

Rotary Core Log

Borehole No.
BH101
Sheet 2 of 3

Site Name: CASICD - Christie Hospital, Wilmslow, Manchester

Ground Level (mAOD)
35.15

Client: IHP Projects (VINCI)

GRM Project Ref: P10525

Coordinates
384906 E
392641 N

Install	Water Strikes	Depth (m)	Coring TCR	Coring SCR	Coring RQD	FI	Depth (m)	Level (m)	Legend	Stratum Description
		7.80 - 9.30	87	63	30					Extremely weak reddish brown medium to coarse grained SANDSTONE, locally recovered as sand. Discontinuities; No.1 - sub-horizontal closely spaced, planar rough and open. No.2 - sub-vertical up to 60 degrees, planar rough, very widely spaced. No.3 - sub-horizonal, widely spaced, planar rough, with clayey fine to coarse gravel infill. WILMSLOW SANDSTONE FORMATION
		9.30 - 10.80	84	67	22					*... Locally recovered as sand.* *... moderately strong and light brown.*
		10.80 - 12.30	67	53	28					
		12.30 - 13.80	49	29	0					*... Locally grading to a mudstone* *... No recovery 13.50-13.80m.*
		13.80 - 15.30	60	53	33					*... Locally greyish yellow.* *... No recovery 15.0-15.40m.*

9 10 11 12 13 14 15 16

Crew: MACKLIN GEOTECH | **Equipment:** Comacchio 205 | **Logger:** AM / AW

General Remarks:

Groundwater Remarks:
Groundwater standing at 2.60m.

Hole Started: 11/03/2024 | **Hole Complete:** 13/03/2024 | **Version:** FINAL | **Scale:** 1:45

GRM Development Solution Ltd,
Tel (HQ): 01283 551249
Email: info@grm-uk.com
Web: www.grm-uk.com

Rotary Core Log

Borehole No.
BH101
Sheet 3 of 3

Site Name: CASICD - Christie Hospital, Wilmslow, Manchester

Ground Level (mAOD)
35.15

Client: IHP Projects (VINCI)

GRM Project Ref: P10525

Coordinates
384906 E
392641 N

Install	Water Strikes	Depth (m)	Coring TCR	Coring SCR	Coring RQD	FI	Depth (m)	Level (m)	Legend	Stratum Description
		15.30 - 16.80	33	27	18					Extremely weak reddish brown medium to coarse grained SANDSTONE, locally recovered as sand. Discontinuities; No.1 - sub-horizontal closely spaced, planar rough and open. No.2 - sub-vertical up to 60 degrees, planar rough, very widely spaced. No.3 - sub-horizonal, widely spaced, planar rough, with clayey fine to coarse gravel infill. WILMSLOW SANDSTONE FORMATION
		16.80 - 18.30	55	35	13					... *No recovery 16.50-16.80m.* ... *No recovery 16.80-17.25m.*
							18.30	16.85		End of Borehole at 18.300m

17 18 19 20 21 22 23 24

Crew: MACKLIN GEOTECH | **Equipment:** Comacchio 205 | **Logger:** AM / AW

General Remarks:

Groundwater Remarks:
Groundwater standing at 2.60m.

Hole Started: 11/03/2024 | **Hole Complete:** 13/03/2024 | **Version:** FINAL | **Scale:** 1:45

GRM Development Solutions Ltd
Laurus House,
First Avenue, Centrum 100,
Burton-on-Trent, DE14 2WH
Tel (HQ): 01283 551249
Email: info@grm-uk.com

Cable-Percussion Borehole

Borehole No. **BH102**

Sheet 1 of 3

Site Name: CASICD - Christie Hospital, Wilmslow, Manchester

Ground Level (mAOD) 35.32

Client: IHP Projects (VINCI)

GRM Project Ref: P10525

Coordinates 384918 E, 392617 N

Install	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	SPT Value		Depth (m)	Level (m)	Legend	Stratum Description
						0.10	35.22		Brick paving.
		0.30 - 0.40	ES			0.20	35.12		MADE GROUND
		0.50 - 0.60	B						Medium dense, light brown, gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular limestone, tarmacadam/asphalt and brick. MADE GROUND
		1.20	C	N=26 (3,3/4,7,7,8)					Medium dense, dark brown, slightly gravelly, clayey SAND. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded limestone, sandstone and brick. MADE GROUND
						1.50	33.82		Medium dense to dense, reddish-brown SAND. Sand is fine to coarse. WEATHERED WILMSLOW SANDSTONE FORMATION
		1.90 - 2.00	D						
		2.00	C	N=41 (5,7/9,10,10,12)					
		2.50 - 2.60	D						
		2.70	C	50 (11,13/50 for 225mm)		2.70	32.62		Extremely weak to weak, orangish brown medium to coarse grained SANDSTONE, locally recovered as sand. Discontinuities; No.1 - sub-horizontal up to 15 degrees, closely spaced, planar smooth to rough, locally some soft clay infill. No.2 - sub-horizontal 20-60 degrees, widely spaced, planar rough open and no infill. WILMSLOW SANDSTONE FORMATION
		2.70 - 3.30	80	20	0				
		3.30 - 4.80	93	90	87				
		4.80 - 6.30	90	83	29				
									... Becomes weak to medium strong.
		6.30 - 7.80	93	83	37				
									... colour locally becomes light brown.

Crew: MACKLIN GEOTECH

Logger: AM / AW

Equipment: Comacchio 205

Groundwater Remarks:
Groundwater standing at 2.80m.

General Remarks:

Chiselling Details

Depth Top	Duration	Remarks

Casing Diameter by Depth

Depth Base	Diameter	Remarks
3.50	150	

Hole Started: 07/03/2024

Hole Complete: 11/03/2024

Version: FINAL

Scale: 1:45

GRM Development Solution Ltd,
Tel (HQ): 01283 551249
Email: info@grm-uk.com
Web: www.grm-uk.com

Rotary Core Log

Borehole No.
BH102
Sheet 2 of 3

Site Name: CASICD - Christie Hospital, Wilmslow, Manchester

Ground Level (mAOD)
35.32

Client: IHP Projects (VINCI)

GRM Project Ref: P10525

Coordinates
384918 E
392617 N

Install	Water Strikes	Depth (m)	Coring TCR	Coring SCR	Coring RQD	FI	Depth (m)	Level (m)	Legend	Stratum Description
		7.80 - 9.30	96	86	47					Extremely weak to weak, orangish brown medium to coarse grained SANDSTONE, locally recovered as sand. Discontinuities; No.1 - sub-horizontal up to 15 degrees, closely spaced, planar smooth to rough, locally some soft clay infill. No.2 - sub-horizontal 20-60 degrees, widely spaced, planar rough open and no infill. WILMSLOW SANDSTONE FORMATION
		9.30 - 10.80	87	73	17					
		10.80 - 12.30	97	89	43					
		12.30 - 13.80	93	77	62					*... Becomes medium strong light brown sandstone.*
		13.80 - 15.30	97	70	32					
										... Locally grading to mudstone.

9 10 11 12 13 14 15 16

Crew: MACKLIN GEOTECH | **Equipment:** Comacchio 205 | **Logger:** AM / AW

General Remarks:

Groundwater Remarks:
Groundwater standing at 2.80m.

Hole Started: 07/03/2024 | **Hole Complete:** 11/03/2024 | **Version:** FINAL | **Scale:** 1:45

GRM Development Solution Ltd,
Tel (HQ): 01283 551249
Email: info@grm-uk.com
Web: www.grm-uk.com

Rotary Core Log

Borehole No.
BH102
Sheet 3 of 3

Site Name: CASICD - Christie Hospital, Wilmslow, Manchester

Ground Level (mAOD)
35.32

Client: IHP Projects (VINCI)

GRM Project Ref: P10525

Coordinates
384918 E
392617 N

Install	Water Strikes	Depth (m)	Coring TCR	Coring SCR	Coring RQD	FI	Depth (m)	Level (m)	Legend	Stratum Description
		15.30 - 16.80	93	73	64					Extremely weak to weak, orangish brown medium to coarse grained SANDSTONE, locally recovered as sand. Discontinuities; No.1 - sub-horizontal up to 15 degrees, closely spaced, planar smooth to rough, locally some soft clay infill. No.2 - sub-horizontal 20-60 degrees, widely spaced, planar rough open and no infill. WILMSLOW SANDSTONE FORMATION
		16.80 - 18.30	47	27	0					... *No recovery 16.80-17.60m.*
							18.30	17.02		End of Borehole at 18.200m

17
18
19
20
21
22
23
24

Crew: MACKLIN GEOTECH
Equipment: Comacchio 205
Logger: AM / AW

General Remarks:

Groundwater Remarks:
Groundwater standing at 2.80m.

Hole Started: 07/03/2024
Hole Complete: 11/03/2024
Version: FINAL
Scale: 1:45

GRM Development Solutions Ltd
Laurus House,
First Avenue, Centrum 100,
Burton-on-Trent, DE14 2WH
Tel (HQ): 01283 551249
Email: info@grm-uk.com

Cable-Percussion Borehole

Borehole No. **BH103**

Sheet 1 of 2

Site Name: CASICD - Christie Hospital, Wilmslow, Manchester

Ground Level (mAOD) 35.28

Client: IHP Projects (VINCI)

GRM Project Ref: P10525

Coordinates 384916 E, 392556 N

Install	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	SPT Value	Depth (m)	Level (m)	Legend	Stratum Description
					0.10	35.18		TARMACADAM
		0.20 - 0.30	ES		0.15	35.13		MADE GROUND
								Dense grey brown sandy fine to coarse GRAVEL of limestone and sandstone - Type 1 MOT.
					0.60	34.68		MADE GROUND
		0.70 - 0.80	ES					Medium dense dark brown gravelly fine to coarse SAND. Gravel is angular to coarse concrete fragments, quartzite, with brick and tile fragments.
								MADE GROUND
		1.30	S	N=12 (3,3/3,3,3,3)	1.30	33.98		Medium dense orange brown slightly gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse angular to subangular brick fragments and quartzite.
		1.40 - 1.50	ES		1.40	33.88		MADE GROUND
								weak CONCRETE.
		1.90 - 2.00	D		1.90	33.38		MADE GROUND
		2.00	S	N=39 (4,6/8,8,11,12)				Medium dense brown and red brown gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse angular to subangular brick and concrete fragments, and occasional sandstone.
		2.50 - 2.60	D					MADE GROUND
								Medium dense brownish red fine to coarse SAND. WEATHERED WILMSLOW SANDSTONE FORMATION
		3.00	C	50 (25 for 140mm/50 for 175mm)	3.00	32.28		*... Becomes dense from 2.0m*
		3.00 - 4.00	75	55 32				Extremely weak to weak, reddish brown silty fine to coarse grained SANDSTONE, locally poorly cemented and friable, with thin interbeds of very silty partings. Discontinuities: no.1 - generally horizontal to sub-horizontal, very closely and closely spaced, planar rough, locally with soft silt infill, generally open. No. 2 - sub-vertical 70-80 degrees, widely spaced, open rough and undulating, no infill.
								WILMSLOW SANDSTONE FORMATION
								... window sample barrel and SPT refusal at 3.0m
		4.00 - 5.50	62	43 8				*... No recovery 3.0-3.20m.*
								... Non-intact - recovered as a coarse angular gravel.
								... Locally and silty sand.
								... No recovery 4.0-4.60m.
								... Non-intact, recovered as gravel.
		5.50 - 7.00	77	70 24				*... No recovery 5.5-5.90m.*
								... locally interbeds of pale brown coarse sandstone.
		7.00 - 8.50	93	53 33				*... No recovery 7.0-7.10m.*

Crew: MACKLIN GEOTECH **Logger:** AM / RJH

Equipment: Comacchio 205

Groundwater Remarks:
Groundwater standing at 3.80-4.0m begl.

General Remarks:
Location moved circa 2m from BH103A (original location), due to obstruction encountered.

Chiselling Details

Depth Top	Duration	Remarks

Casing Diameter by Depth

Depth Base	Diameter	Remarks
3.50	150	

Hole Started: 27/02/2024 **Hole Complete:** 04/03/2024 **Version:** FINAL **Scale:** 1:45

GRM Development Solution Ltd,
Tel (HQ): 01283 551249
Email: info@grm-uk.com
Web: www.grm-uk.com

Rotary Core Log

Borehole No.
BH103
Sheet 2 of 2

Site Name: CASICD - Christie Hospital, Wilmslow, Manchester

Ground Level (mAOD)
35.28

Client: IHP Projects (VINCI)

GRM Project Ref: P10525

Coordinates
384916 E
392556 N

Install	Water Strikes	Depth (m)	Coring TCR	Coring SCR	Coring RQD	FI	Depth (m)	Level (m)	Legend	Stratum Description
										Extremely weak to weak, reddish brown silty fine to coarse grained SANDSTONE, locally poorly cemented and friable, with thin interbeds of very silty partings. Discontinuities: no.1 - generally horizontal to sub-horizontal, very closely and closely spaced, planar rough, locally with soft silt infill, generally open. No. 2 - sub-vertical 70-80 degrees, widely spaced, open rough and undulating, no infill. WILMSLOW SANDSTONE FORMATION
		8.50 - 10.00	80	73	23					*... No recovery 8.50-8.70m.*
		10.00 - 11.50	87	30	8					*... No recovery 10.0-10.20m.* *... becomes pale reddish brown.* *... one joint with polished internal surface and grey gleying with some soft clay.*
		11.50 - 12.50	0	0	0		11.50	23.78		No core recovery - heavily weathered sandstone, possible fault zone. WILMSLOW SANDSTONE FORMATION
		12.50 - 14.00	0	0	0					
							14.00	21.28		End of Borehole at 14.000m

9 10 11 12 13 14 15 16

Crew: MACKLIN GEOTECH | **Equipment:** Comacchio 205 | **Logger:** AM / RJH

General Remarks:
Location moved circa 2m from BH103A (original location), due to obstruction encountered.

Groundwater Remarks:
Groundwater standing at 3.80-4.0m begl.

Hole Started:	27/02/2024	Hole Complete:	04/03/2024	Version:	FINAL	Scale:	1:45

GRM Development Solutions Ltd
Laurus House,
First Avenue, Centrum 100,
Burton-on-Trent, DE14 2WH
Tel (HQ): 01283 551249
Email: info@grm-uk.com

Cable-Percussion Borehole

Borehole No.
BH103A
Sheet 1 of 1

Site Name: CASICD - Christie Hospital, Wilmslow, Manchester

Ground Level (mAOD) 35.26

Client: IHP Projects (VINCI)

GRM Project Ref: P10525

Coordinates 384915 E, 392554 N

Install	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	SPT Value	Depth (m)	Level (m)	Legend	Stratum Description
		0.10 - 0.20	ES		0.10	35.16		TARMACADAM MADE GROUND
					0.30	34.96		Loose dark grey sandy GRAVEL. Sand is fine to coarse. Gravel is fine to coarse angular to subangular brick fragments, tarmac, sandstone, quartzite, and concrete fragments. MADE GROUND
								Medium dense reddish brown silty SAND. Sand is fine to coarse. MADE GROUND
					1.20	34.06		End of Borehole at 1.200m

Crew: MACKLIN GEOTECH **Logger:** AM

Equipment: Comacchio 205

Groundwater Remarks:
No Groundwater encountered.

General Remarks:
Obstruction encountered at 1.20m within inspection pit, therefore abandoned.

Chiselling Details

Depth Top	Duration	Remarks

Casing Diameter by Depth

Depth Base	Diameter	Remarks

Hole Started: 26/02/2024 **Hole Complete:** 26/02/2024 **Version:** FINAL **Scale:** 1:45

GRM Development Solutions Ltd
Laurus House,
First Avenue, Centrum 100,
Burton-on-Trent, DE14 2WH
Tel (HQ): 01283 551249
Email: info@grm-uk.com

Cable-Percussion Borehole

Borehole No. **BH104**

Sheet 1 of 3

Site Name: CASICD - Christie Hospital, Wilmslow, Manchester

Ground Level (mAOD) 35.33

Client: IHP Projects (VINCI)

GRM Project Ref: P10525

Coordinates 384922 E, 392547 N

Install	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	SPT Value	Depth (m)	Level (m)	Legend	Stratum Description
		0.30 - 0.40	ES		0.15	35.18		Tarmacadam/asphalt. MADE GROUND
		0.50 - 0.60	B					Medium dense, brown, slightly clayey ,gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse angular to subangular brick, concrete and tarmacadam/asphalt. Occasional clay clods. MADE GROUND
		1.20	C	N=4 (1,0/1,1,1,1)				
		1.60 - 1.70	ES		1.50	33.83		Firm to stiff, dark brown, slightly gravelly, sandy CLAY. Sand is fine to coarse. Gravel is fine to medium, subangular to subrounded chert, mudstone, sandstone and rare brick. MADE GROUND
		2.10 - 2.20	D		2.00	33.33		Medium dense to dense, reddish-brown SAND. Sand is fine to coarse. WEATHERED WILMSLOW SANDSTONE FORMATION
		2.20	C	N=35 (2,3/5,8,9,13)				*Becoming orangish-brown from 2.60m.*
		2.80 - 2.90	D					
		2.90	C	50 (5,14/50 for 220mm)				
		3.00 - 4.00	42	24 / 18	3.00	32.33		Extremely weak to weak, becomes weak to medium strong with depth, orangish brown, medium to coarse grained SANDSTONE. Joint set 1 is sub-horizontal, widely spaced, planar rough with no infill. Joint set 2 is sub-vertical up to 65 degrees, very widely spaced with clay infill. Joint set 3 is sub-horizontal up to 10 degrees, moderately widely spaced, planar rough with sandy, clayey, mica rich infill. WILMSLOW SANDSTONE FORMATION
		4.00 - 4.50	86	84 / 68				*... No recovery 3.00-3.56m.*
		4.50 - 5.50	81	74 / 55				*... No recovery 3.80-4.25m.*
		5.50 - 6.20	100	81 / 21				*... No recovery 4.50-4.85m.*
		6.20 - 7.70	100	93 / 53				*Becoming weak to locally medium strong at 7.00m.*

Crew: MACKLIN GEOTECH **Logger:** AW

Equipment: Comacchio 205

Groundwater Remarks:
Groundwater standing at 3.80m.

General Remarks:

Chiselling Details

Depth Top	Duration	Remarks

Casing Diameter by Depth

Depth Base	Diameter	Remarks
3.50	150	

Hole Started: 05/03/2024 **Hole Complete:** 07/03/2024 **Version:** FINAL **Scale:** 1:45

GRM Development Solution Ltd,
Tel (HQ): 01283 551249
Email: info@grm-uk.com
Web: www.grm-uk.com

Rotary Core Log

Borehole No.
BH104
Sheet 2 of 3

Site Name: CASICD - Christie Hospital, Wilmslow, Manchester

Ground Level (mAOD)
35.33

Client: IHP Projects (VINCI)

GRM Project Ref: P10525

Coordinates
384922 E
392547 N

Install	Water Strikes	Depth (m)	Coring TCR	Coring SCR	Coring RQD	FI	Depth (m)	Level (m)	Legend	Stratum Description
		7.70 - 9.20	100	93	47					Extremely weak to weak, becomes weak to medium strong with depth, orangish brown, medium to coarse grained SANDSTONE. Joint set 1 is sub-horizontal, widely spaced, planar rough with no infill. Joint set 2 is sub-vertical up to 65 degrees, very widely spaced with clay infill. Joint set 3 is sub-horizontal up to 10 degrees, moderately widely spaced, planar rough with sandy, clayey, mica rich infill. WILMSLOW SANDSTONE FORMATION
		9.20 - 10.70	100	90	47					
		10.70 - 12.20	95	91	65					
		12.20 - 13.70	100	97	53					
		13.70 - 15.20	93	89	13					
		15.20 - 16.70	92	81	49					

9 10 11 12 13 14 15 16

Crew: MACKLIN GEOTECH | **Equipment:** Comacchio 205 | **Logger:** AW

General Remarks:

Groundwater Remarks:
Groundwater standing at 3.80m.

Hole Started: 05/03/2024 | **Hole Complete:** 07/03/2024 | **Version:** FINAL | **Scale:** 1:45

GRM Development Solution Ltd,
Tel (HQ): 01283 551249
Email: info@grm-uk.com
Web: www.grm-uk.com

Rotary Core Log

Borehole No.
BH104
Sheet 3 of 3

Site Name: CASICD - Christie Hospital, Wilmslow, Manchester

Ground Level (mAOD)
35.33

Client: IHP Projects (VINCI)

GRM Project Ref: P10525

Coordinates
384922 E
392547 N

Install	Water Strikes	Depth (m)	Coring TCR	Coring SCR	Coring RQD	FI	Depth (m)	Level (m)	Legend	Stratum Description
										Extremely weak to weak, becomes weak to medium strong with depth, orangish brown, medium to coarse grained SANDSTONE. Joint set 1 is sub-horizontal, widely spaced, planar rough with no infill. Joint set 2 is sub-vertical up to 65 degrees, very widely spaced with clay infill. Joint set 3 is sub-horizontal up to 10 degrees, moderately widely spaced, planar rough with sandy, clayey, mica rich infill. WILMSLOW SANDSTONE FORMATION
		16.70 - 18.20	100	89	41					*Becomes light brown in colour 16.60-16.65m.* *Becomes light brown in colour 17.20-17.25m.*
							18.20	17.13		End of Borehole at 18.200m

17 18 19 20 21 22 23 24

Crew: MACKLIN GEOTECH | **Equipment:** Comacchio 205 | **Logger:** AW

General Remarks:

Groundwater Remarks:
Groundwater standing at 3.80m.

Hole Started:	05/03/2024	Hole Complete:	07/03/2024	Version:	FINAL	Scale:	1:45

GRM Development Solutions Ltd
Laurus House,
First Avenue, Centrum 100,
Burton-on-Trent, DE14 2WH
Tel (HQ): 01283 551249
Email: info@grm-uk.com

Windowless Sample Borehole

Borehole No WS101
Sheet 1 of 1

Site Name: CASICD - Christie Hospital, Wilmslow, Manchester

Ground Level (mAOD) 35.30

Client: IHP Projects (VINCI)

GRM Project Ref: P10525

Coordinates 384927 E, 392604 N

Installation/ Backfill	Water Strike	Samples/Tests: Depth	Type	SPT Result	Depth (m)	Level (m)	Legend	Stratum Description
		0.30	ES		0.25	35.05		Brick pavers laid on sharp sand. MADE GROUND
		0.80	ES					Medium dense dark brown slightly clayey gravelly fine to coarse SAND with low cobble content. Gravel and cobbles are sandstone, brick fragments, concrete and quartzite. MADE GROUND
		1.20 - 1.65 1.20	D C	N=17 (3,3/3,4,5,5)	1.00	34.30		Dense dark red slightly clayey gravelly SAND, grading to very weak poorly cemented sandstone. WEATHERED WILMSLOW SANDSTONE FORMATION
		2.00 - 2.45 2.00	D C	N=50 (7,7/50 for 245mm)				
					2.45	32.85		End of Borehole at 2.450m

Crew: Macklin Geotechnical | **Logger:** RJH | **Weather:**

Equipment: Archway

Reason for termination of borehole: Refusal on very dense sand.

Groundwater Remarks:
No groundwater encountered.

General Remarks:

Hole Started:	Hole Complete:	Version:	Scale:
28/04/2024	28/04/2024	FINAL	1:31

GRM Development Solutions Ltd
Laurus House,
First Avenue, Centrum 100,
Burton-on-Trent, DE14 2WH
Tel (HQ): 01283 551249
Email: info@grm-uk.com

Windowless Sample Borehole

Borehole No WS102
Sheet 1 of 1

Site Name: CASICD - Christie Hospital, Wilmslow, Manchester

Ground Level (mAOD) 35.56

Client: IHP Projects (VINCI)

GRM Project Ref: P10525

Coordinates 384915 E, 392577 N

Installation/ Backfill	Water Strike	Samples/Tests: Depth	Type	SPT Result	Depth (m)	Level (m)	Legend	Stratum Description
					0.05	35.51		Heavy duty lino and adhesive. MADE GROUND
					0.30	35.26		Floor screen over reinforced gravelly concrete and membrane. One layer of 8mm mesh at 0.20m begl.
		0.45	ES		0.40	35.16		MADE GROUND
								Type 1 MOT sub-base. MADE GROUND
		0.80	ES					Medium dense very dark brown slightly gravelly fine to coarse SAND. Gravel is angular coarse brick fragments and concrete. Organic odour below 0.70m begl. MADE GROUND
		1.20 - 1.65 1.20	D C	N=12 (3,3/2,3,4,3)				
					1.50	34.06		Medium dense brownish red and grey slightly gravelly fine to coarse SAND. Gravel is coarse angular sandstone. WEATHERED WILMSLOW SANDSTONE FORMATION
		2.00 - 2.45 2.00	D C	50 (10,13/50 for 195mm)				
					2.45	33.11		End of Borehole at 2.450m

Crew: Macklin Geotechnical | **Logger:** RJH | **Weather:**

Equipment: Archway

Reason for termination of borehole: Refusal on very dense sand.

Groundwater Remarks:
No groundwater encountered.

General Remarks:
Undertaken inside in small waiting room.

Hole Started:	Hole Complete:	Version:	Scale:
28/04/2024	28/04/2024	FINAL	1:31

GRM Development Solutions Ltd
Laurus House,
First Avenue, Centrum 100,
Burton-on-Trent, DE14 2WH
Tel (HQ): 01283 551249
Email: info@grm-uk.com

Windowless Sample Borehole

Borehole No WS103
Sheet 1 of 1

Site Name: CASICD - Christie Hospital, Wilmslow, Manchester

Ground Level (mAOD)

Client: IHP Projects (VINCI)

GRM Project Ref: P10525

Coordinates E N

Installation/ Backfill	Water Strike	Samples/Tests: Depth	Samples/Tests: Type	Samples/Tests: SPT Result	Depth (m)	Level (m)	Legend	Stratum Description
					0.15			Wooden floor. MADE GROUND
					0.45			Concrete MADE GROUND
					0.60			Extremely weak reddish brown fine to coarse SANDSTONE. WILMSLOW SANDSTONE FORMATION
								End of Borehole at 0.600m

1 2 3 4 5

Crew: GRM / DSUK **Logger:** RJH **Weather:**

Equipment: Concrete coring and hand digging tools.

Reason for termination of borehole: Refusal on rock.

Groundwater Remarks:
No groundwater encountered.

General Remarks:
Undertaken in basement. Unable to survey X,Y,Z coordinates.

Hole Started:	28/04/2024	Hole Complete:	28/04/2024	Version:	FINAL	Scale:	1:31

GRM Development Solutions Ltd
Laurus House,
First Avenue, Centrum 100,
Burton-on-Trent, DE14 2WH
Tel (HQ): 01283 551249
Email: info@grm-uk.com

Trial Pit Log

Trial Pit No TP101
Sheet 1 of 1

Site Name: CASICD - Christie Hospital, Wilmslow, Manchester

Ground Level (mAOD) 35.00

Client: IHP Projects (VINCI)

GRM Project Ref: P10525

Coordinates 384900 E 392631 N

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.10	34.90		Tarmacadam/asphalt. MADE GROUND
				0.20	34.80		Medium dense, yellowish-brown, slightly sandy GRAVEL. Sand is fine to coarse. Gravel is fine to coarse, subangular limestone, quartzite and concrete. MADE GROUND
	0.40 - 0.50	ES					
	0.60 - 0.70	B					Northern end of the pit: Medium dense, orangish-brown, slightly gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded quartzite and limestone. MADE GROUND
							Southern end of pit: Medium dense, dark brown, slightly clayey, gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular sandstone, brick, quartzite, limestone and tarmacadam/asphalt between 0.20m and 1.10m.
				1.10	33.90		
	1.20 - 1.30	D					Medium dense, light brown, slightly gravelly, clayey SAND. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded sandstone. WEATHERED WILMSLOW SANDSTONE FORMATION
				1.30	33.70		End of Pit at 1.300m

1
2
3
4

Date Excavated: 05/03/2024
Date Backfilled: 05/03/2024
Shoring: None.
Stability: Stable during excavation.
Plant Used: Hand tools.
Logged by: AW

Groundwater Observations:
No groundwater encountered.

Trial Pit Dimensions (m):
0.50 × 0.60

Reason for termination of Trial Pit:
Target depth reached.

General Remarks:

Relative density is approximate and determined by observation only.

Version: FINAL

Scale: 1:25

GRM Development Solutions Ltd
Laurus House,
First Avenue, Centrum 100,
Burton-on-Trent, DE14 2WH
Tel (HQ): 01283 551249
Email: info@grm-uk.com

Trial Pit Log

Trial Pit No TP102
Sheet 1 of 1

Site Name: CASICD - Christie Hospital, Wilmslow, Manchester

Ground Level (mAOD) 34.89

Client: IHP Projects (VINCI)

GRM Project Ref: P10525

Coordinates 384897 E, 392629 N

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.10	34.79		Tarmacadam/asphalt. MADE GROUND
	0.30 - 0.40	ES		0.20	34.69		Medium dense, light yellowish-brown, slightly sandy GRAVEL. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular limestone, quartzite and concrete. MADE GROUND
							Northern side of pit: Medium dense, light orangish-brown, slightly gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded tarmacadam/asphalt and limestone. MADE GROUND
							Southern side of pit: Medium dense, dark brown, slightly gravelly, clayey SAND. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded brick, limestone, tarmacadam/asphalt between 0.20m and 1.00m.
	1.00 - 1.10	D		1.00	33.89		
				1.20	33.69		Soft, light brownish-grey, slightly sandy, gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded limestone and tarmacadam/ asphalt. MADE GROUND
							End of Pit at 1.200m

1
2
3
4

Date Excavated: 04/03/2024
Date Backfilled: 04/03/2024
Shoring: None.
Stability: Stable during excavation.
Plant Used: Hand tools.
Logged by: AW

Groundwater Observations:
Recovered damp between 0.70m and 0.80m.

Trial Pit Dimensions (m):
0.60 × 0.60

Reason for termination of Trial Pit:
Target depth reached.

General Remarks:

Relative density is approximate and determined by observation only.

Version: FINAL

Scale: 1:25

GRM Development Solutions Ltd
Laurus House,
First Avenue, Centrum 100,
Burton-on-Trent, DE14 2WH
Tel (HQ): 01283 551249
Email: info@grm-uk.com

Trial Pit Log

Trial Pit No TP103
Sheet 1 of 1

Site Name: CASICD - Christie Hospital, Wilmslow, Manchester

Ground Level (mAOD)

Client: IHP Projects (VINCI)

GRM Project Ref: P10525

Coordinates E N

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.05			Pale grey coarse angular GRAVEL of limestone. MADE GROUND
				0.10			Concrete slab. MADE GROUND
	0.30 - 0.40	ES					Medium dense orange brown gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse angular to subrounded brick fragments, tarmac, quartzite and large quartz crystals. MADE GROUND
				0.60			Medium dense orange brown slightly gravelly fine to coarse SAND. Gravel is coarse rounded quartzite. WEATHERED WILMSLOW SANDSTONE FORMATION
	0.80	B					
				1.20			End of Pit at 1.200m

1 2 3 4

Date Excavated: 17/03/2024
Date Backfilled:
Shoring: None.
Stability: Stable during excavation.
Plant Used: Hand tools.
Logged by: RJH

Groundwater Observations:
No groundwater encountered.

Trial Pit Dimensions (m):
0.50 × 0.60

Reason for termination of Trial Pit:
Target depth reached.

General Remarks: Enclosed courtyard, enable to survey X,Y,Z coordinates.

Relative density is approximate and determined by observation only.

Version: FINAL

Scale: 1:25

GRM Development Solutions Ltd
Laurus House,
First Avenue, Centrum 100,
Burton-on-Trent, DE14 2WH
Tel (HQ): 01283 551249
Email: info@grm-uk.com

Trial Pit Log

Trial Pit No TP104
Sheet 1 of 1

Site Name: CASICD - Christie Hospital, Wilmslow, Manchester

Ground Level (mAOD)

Client: IHP Projects (VINCI)

GRM Project Ref: P10525

Coordinates E N

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.10			Loose, light grey and brown GRAVEL. Gravel is fine to medium, subangular to subrounded limestone and quartzite. MADE GROUND
	0.30 - 0.40	ES		0.20			Paving slab. MADE GROUND
	0.50 - 0.60	B					Loose to medium dense, dark brown, slightly gravelly, clayey SAND. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular brick, concrete, limestone and quartzite. Rare concrete cobbles. MADE GROUND
	0.70 - 0.80	D		0.60			Medium dense, light brown, slightly gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded quartzite, concrete and sandstone. MADE GROUND
				1.20			End of Pit at 1.200m

1
2
3
4

Date Excavated: 08/03/2024
Date Backfilled: 08/03/2024
Shoring: None.
Stability: Stable during excavation.
Plant Used: Hand tools.
Logged by: AW

Groundwater Observations:
No groundwater encountered.

Trial Pit Dimensions (m):
0.40 × 0.50

Reason for termination of Trial Pit:
Target depth reached.

General Remarks: Enclosed courtyard, enable to survey X,Y,Z coordinates.

Relative density is approximate and determined by observation only.

Version: FINAL

Scale: 1:25

GRM Development Solutions Ltd
Laurus House,
First Avenue, Centrum 100,
Burton-on-Trent, DE14 2WH
Tel (HQ): 01283 551249
Email: info@grm-uk.com

Trial Pit Log

Trial Pit No TP105
Sheet 1 of 1

Site Name: CASICD - Christie Hospital, Wilmslow, Manchester

Ground Level (mAOD)

Client: IHP Projects (VINCI)

GRM Project Ref: P10525

Coordinates E N

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.15			2x slabs of concrete. MADE GROUND
				0.30			broken concrete gravel and COBBLES. MADE GROUND
	0.50	ES					Medium dense brown slightly clayey gravelly fine to coarse SAND with low cobble content. Cobbles are whole bricks and fragments. MADE GROUND
	0.80	B					
				1.20			End of Pit at 1.200m

1
2
3
4

Date Excavated: 17/03/2024
Date Backfilled:
Shoring: None.
Stability: Stable during excavation.
Plant Used: Hand tools.
Logged by: RJH

Groundwater Observations:
No groundwater encountered.

Trial Pit Dimensions (m):
0.50 × 0.60

Reason for termination of Trial Pit:
Target depth reached.

General Remarks: Enclosed courtyard, enable to survey X,Y,Z coordinates.

Relative density is approximate and determined by observation only.

Version: FINAL

Scale: 1:25

GRM Development Solutions Ltd
Laurus House,
First Avenue, Centrum 100,
Burton-on-Trent, DE14 2WH
Tel (HQ): 01283 551249
Email: info@grm-uk.com

Trial Pit Log

Trial Pit No TP106
Sheet 1 of 1

Site Name: CASICD - Christie Hospital, Wilmslow, Manchester

Ground Level (mAOD) 35.19

Client: IHP Projects (VINCI)

GRM Project Ref: P10525

Coordinates 384915 E, 392532 N

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.10	35.09		Paving slab. MADE GROUND
				0.30	34.89		Medium dense, grey and light yellow, sandy GRAVEL. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular brick, tarmacadam/asphalt, limestone and ceramic. MADE GROUND
	0.40	ES					
	0.50 - 0.60	B		0.50	34.69		Medium dense, reddish-brown and dark grey, gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular, brick, limestone, ceramic and plastic. MADE GROUND
							Dense, reddish-brown SAND. Sand is fine to coarse. WEATHERED WILMSLOW SANDSTONE FORMATION
				1.20	33.99		End of Pit at 1.200m

1
2
3
4

Date Excavated: 27/02/2024
Date Backfilled: 27/02/2024
Shoring: None.
Stability: Stable during excavation.
Plant Used: Hand tools.
Logged by: AW

Groundwater Observations:
No groundwater encountered.

Trial Pit Dimensions (m):
0.50 × 0.60

Reason for termination of Trial Pit:
Target depth reached.

General Remarks:

Relative density is approximate and determined by observation only.

Version: FINAL

Scale: 1:25

GRM Development Solutions Ltd
Laurus House,
First Avenue, Centrum 100,
Burton-on-Trent, DE14 2WH
Tel (HQ): 01283 551249
Email: info@grm-uk.com

Trial Pit Log

Trial Pit No TP107
Sheet 1 of 1

Site Name: CASICD - Christie Hospital, Wilmslow, Manchester

Ground Level (mAOD) 35.14

Client: IHP Projects (VINCI)

GRM Project Ref: P10525

Coordinates 384909 E, 392548 N

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.10	35.04		Brick paving. MADE GROUND
				0.30	34.84		Medium dense, light yellowish-brown, slightly gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded quartzite and limestone.
	0.40	ES		0.35	34.79		MADE GROUND
							Brick. MADE GROUND
	0.70	B					Medium dense, dark brown, clayey, gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular brick, limestone, quartzite and concrete. MADE GROUND
				1.20	33.94		End of Pit at 1.200m

1
2
3
4

Date Excavated: 27/02/2024
Date Backfilled: 28/02/2024
Shoring: None.
Stability: Stable during excavation.
Plant Used: Hand tools.
Logged by: AW

Groundwater Observations:
No groundwater encountered.

Trial Pit Dimensions (m):
0.40 × 0.50

Reason for termination of Trial Pit:
Target depth reached.

General Remarks:

Relative density is approximate and determined by observation only.

Version: FINAL

Scale: 1:25

APPENDIX F

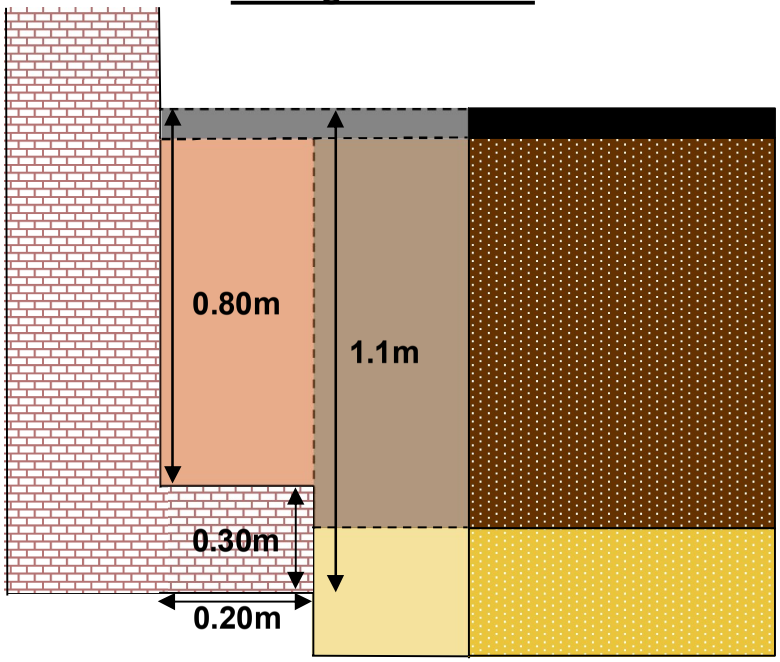
Facing Westwards

Tarmac/Asphalt. GL-0.10m

0.10-0.20m Medium dense yellowish Brown sligthly sandy GRAVEL.
MADE GROUND

0.20-1.10m Medium dense, dark brown, slightly clayey, gravelly SAND.
MADE GROUND.

1.10-1.30m Medium dense, light brown, slightly gravelly, clayey SAND.
WEATHERED WILMSLOW SANDSTONE FORMATION



Foundations observed:
Foundation slab encountered at 0.80m depth begl with a thickness of 0.30m extending 0.20m outwards from beneath the building.

DO NOT SCALE

NOTES:

GRM Development Solutions Ltd
Laurus House, First Ave, Centrum 100,
Burton-on-Trent, Staffordshire
Tel: 01283 551 249
info@grm-uk.com www.grm-uk.com

CLIENT:
Integrated Health Projects - VINCI

PROJECT:
Christie Hospital CASICD (Manchester)

TITLE:
Foundation Inspection Pit TP101

SCALE@SIZE :	ISSUE:
NTS	FINAL
DESIGN/DRAWN by :	DATE:
AW	15/3/24
PROJECT No:	DRAWING No:
P10525	001

© GRM Development Solutions Ltd
© Crown Copyright. AL 100014100

Facing Westwards

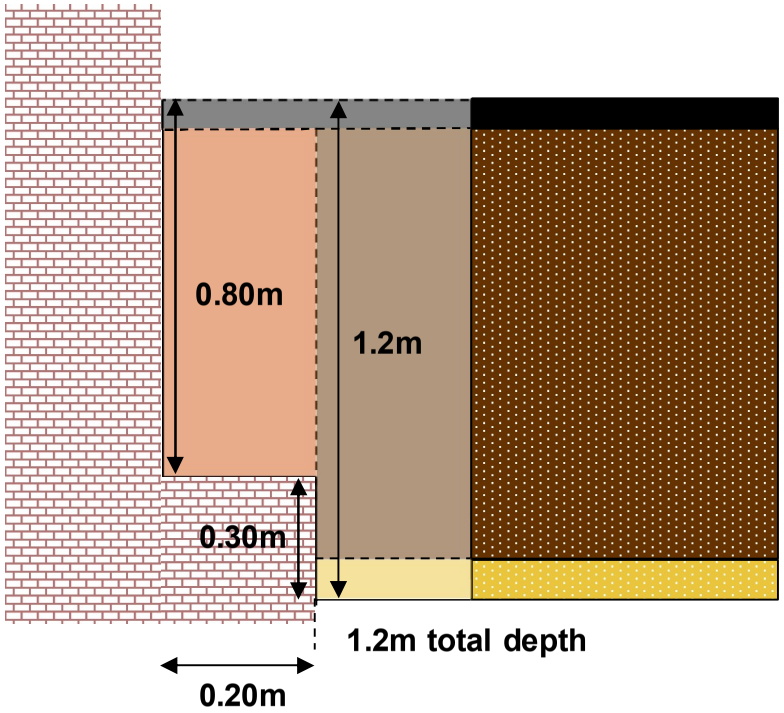
GL-0.10m Tarmac/Asphalt.

0.10-0.20m Medium dense yellowish brown slightly sandy GRAVEL.
MADE GROUND

Medium dense, orangish-brown, slightly gravelly SAND.
MADE GROUND.

0.20-1.0m Medium dense, dark brown, slightly clayey, gravelly SAND.
MADE GROUND.

1.0-1.20m Soft, light brownish-grey, slightly sandy, gravelly CLAY.
MADE GROUND



Foundations observed:
Foundation slab encountered at 0.80m depth begl base of the is slab not seen, slab extending 0.20m outwards from beneath the building.

DO NOT SCALE

NOTES:

GRM Development Solutions Ltd
Laurus House, First Ave, Centrum 100,
Burton-on-Trent, Staffordshire
Tel: 01283 551 249
info@grm-uk.com www.grm-uk.com

CLIENT:
Integrated Health Projects - VINCI

PROJECT:
Christie Hospital CASICD (Manchester)

TITLE:
Foundation Inspection Pit TP102

SCALE@SIZE :	ISSUE:
NTS	FINAL
DESIGN/DRAWN by :	DATE:
AW	15/3/24
PROJECT No:	DRAWING No:
P10525	002

© GRM Development Solutions Ltd
© Crown Copyright. AL 100014100

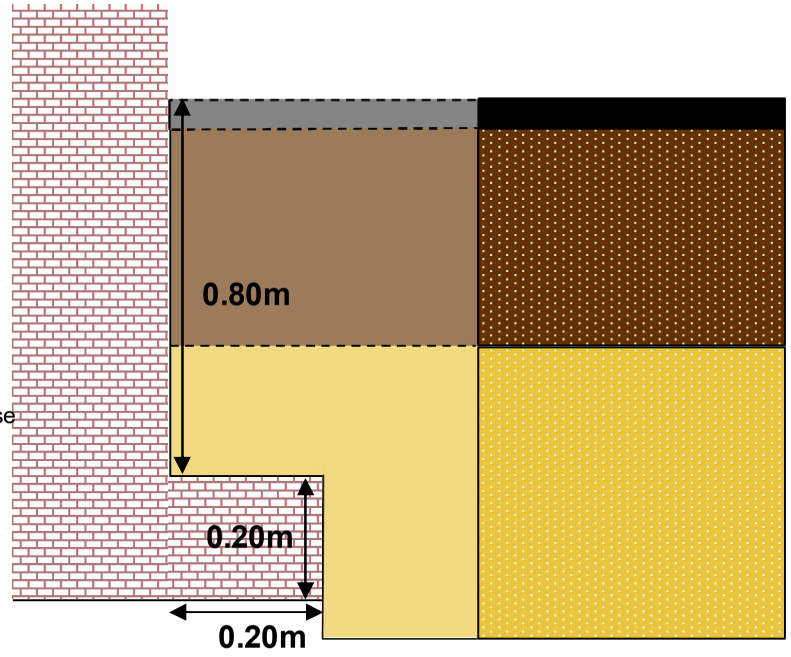
Facing Westwards

GL-0.10m Limestone gravel and concrete slab. MADEGROUND

0.05-0.10m Concrete Slab MADE GROUND.

0.10-0.60m Medium dense orange brown gravelly SAND. MADEGROUND

0.60-1.20m Medium dense orange brown slightly gravelly fine to coarse SAND. WEATHERED WILMSLOW SANDSTONE FORMATION



1.2m total depth begl

Foundations observed:
Foundation slab encountered at 0.80m depth begl the slab is 0.20m thick extending 0.20m outwards from beneath the building.

DO NOT SCALE

NOTES:

GRM Development Solutions Ltd
Laurus House, First Ave, Centrum 100,
Burton-on-Trent, Staffordshire
Tel: 01283 551 249
info@grm-uk.com www.grm-uk.com

CLIENT:
Integrated Health Projects - VINCI

PROJECT:
Christie Hospital CASICD (Manchester)

TITLE:
Foundation Inspection Pit TP103

SCALE@SIZE :	ISSUE:
NTS	FINAL
DESIGN/DRAWN by :	DATE:
AW	15/3/24
PROJECT No:	DRAWING No:
P10525	003

© GRM Development Solutions Ltd
© Crown Copyright. AL 100014100

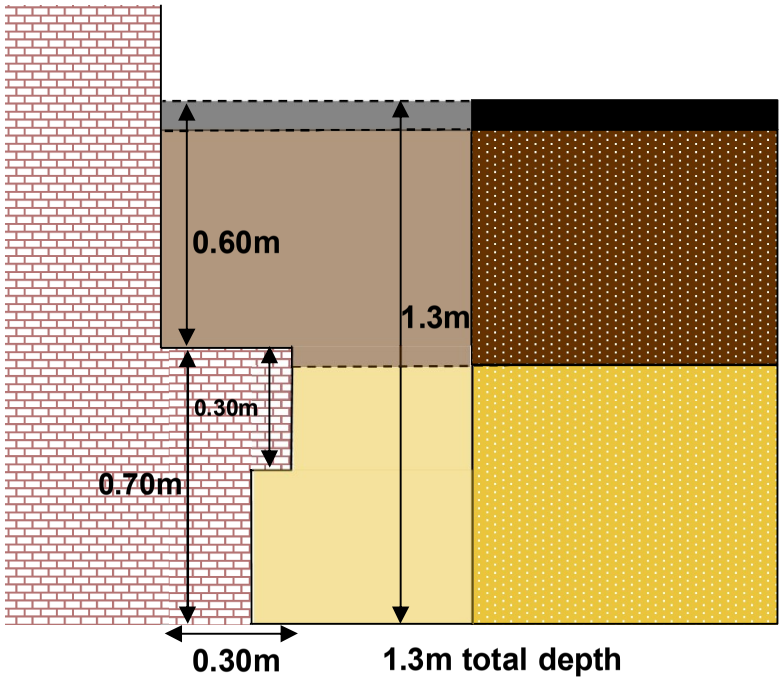
Facing Westwards

GL – 0.10m Loose light grey GRAVEL of limestone. MADE GROUND

0.10-0.20m Paving slabs. MADE GROUND

0.20-0.60m Loose to medium dense, dark brown, slightly gravelly, clayey SAND. MADE GROUND

0.60-1.20m Medium dense, light brown, slightly gravelly SAND. MADE GROUND



Foundations observed:
Foundation slab encountered at 0.60m depth begl with a thickness of 0.30m and extends 0.30m outwards from beneath the building above. Cement foundations continue sloping away towards the building base not seen.

DO NOT SCALE

NOTES:

GRM Development Solutions Ltd
Laurus House, First Ave, Centrum 100,
Burton-on-Trent, Staffordshire
Tel: 01283 551 249
info@grm-uk.com www.grm-uk.com

CLIENT:
Integrated Health Projects - VINCI

PROJECT:
Christie Hospital CASICD (Manchester)

TITLE:
Foundation Inspection Pit TP104

SCALE@SIZE :	ISSUE:
NTS	FINAL
DESIGN/DRAWN by :	DATE:
AW	15/3/24
PROJECT No:	DRAWING No:
P10525	004

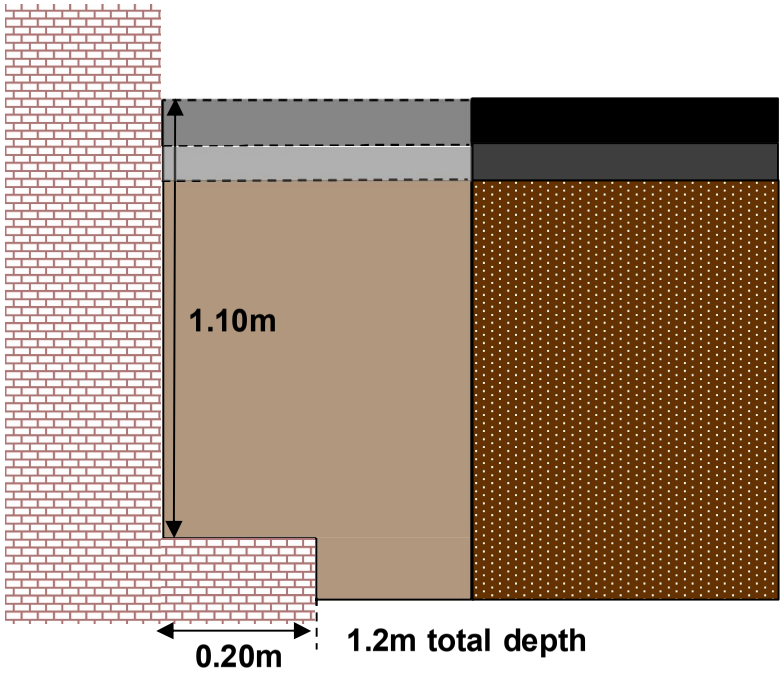
© GRM Development Solutions Ltd
© Crown Copyright. AL 100014100

Facing Westwards

GL-0.15m 2x concrete slabs.
MADE GROUND

0.15-0.30 Broken concrete gravel and COBBLES.
MADE GROUND

0.30-1.20m Medium dense brown slightly clayey gravelly fine to coarse SAND with low cobble content. Cobbles are whole bricks and fragments.
MADE GROUND



Ground Level

1.2m total depth

Foundations observed:
Foundation slab encountered at 1.10m depth begl base of the is slab not seen, slab extending 0.20m outwards from beneath the building.

DO NOT SCALE

NOTES:

GRM Development Solutions Ltd
Laurus House, First Ave, Centrum 100,
Burton-on-Trent, Staffordshire
Tel: 01283 551 249
info@grm-uk.com www.grm-uk.com

CLIENT:
Integrated Health Projects - VINCI

PROJECT:
Christie Hospital CASICD (Manchester)

TITLE:
Foundation Inspection Pit TP105

SCALE@SIZE :	ISSUE:
NTS	FINAL
DESIGN/DRAWN by :	DATE:
AW	15/3/24
PROJECT No:	DRAWING No:
P10525	005

© GRM Development Solutions Ltd
© Crown Copyright. AL 100014100

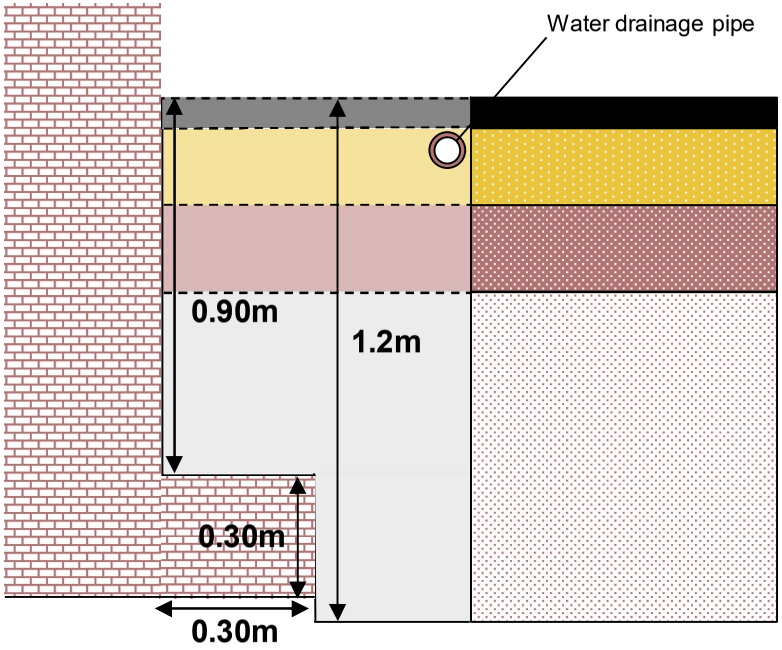
Facing Westwards

GL-0.10m Paving slab.
MADE GROUND

0.10-0.30 Medium dense, grey and light yellow, sandy GRAVEL.
MADE GROUND.

0.30-0.50m Medium dense, reddish-brown and dark grey, gravelly SAND.
MADE GROUND.

0.50-1.20 Dense, reddish-brown SAND. Sand is fine to coarse.
WEATHERED WILMSLOW SANDSTONE FORMATION



Foundations observed:
Foundation slab encountered at 0.90m depth begl with a thickness of 0.30m extending 0.30cm outwards from beneath the building.

DO NOT SCALE

NOTES:

GRM Development Solutions Ltd
Laurus House, First Ave, Centrum 100,
Burton-on-Trent, Staffordshire
Tel: 01283 551 249
info@grm-uk.com www.grm-uk.com

CLIENT:
Integrated Health Projects - VINCI

PROJECT:
Christie Hospital CASICD (Manchester)

TITLE:
Foundation Inspection Pit TP106

SCALE@SIZE :	ISSUE:
NTS	FINAL
DESIGN/DRAWN by :	DATE:
AW	15/3/24
PROJECT No:	DRAWING No:
P10525	006

© GRM Development Solutions Ltd
© Crown Copyright. AL 100014100

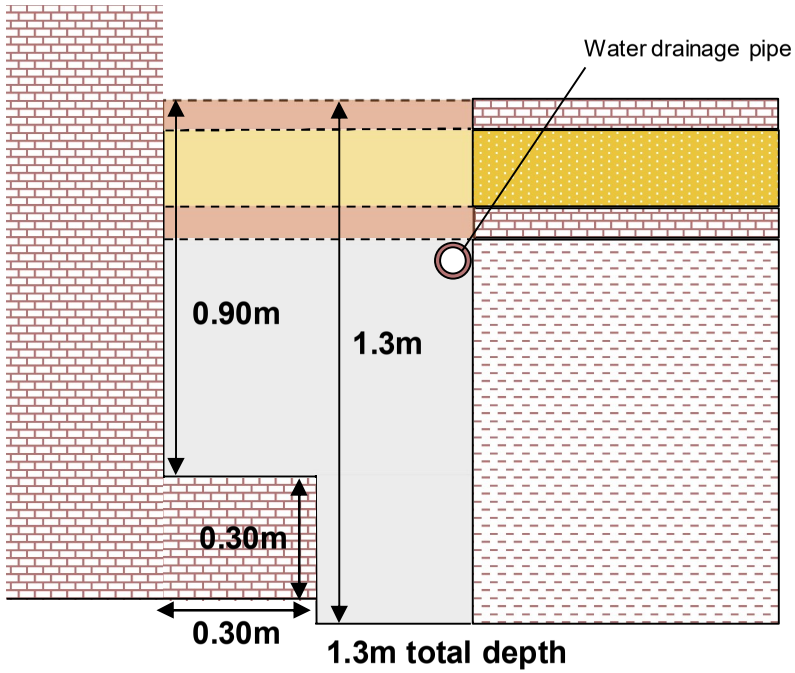
Facing Westwards

GL-0.10m Brick paving.
MADE GROUND

0.10-0.30m Medium dense, light yellowish-brown, slightly gravelly SAND.
MADE GROUND.

0.30-0.35m Crushed brick fragments.
MADE GROUND

0.35-1.20m Medium dense, dark brown, clayey, gravelly SAND.
MADE GROUND.



Foundations observed:
Foundation slab encountered at 0.90m depth begl with a thickness of 0.30m extending 0.30m outwards from beneath the building.

DO NOT SCALE

NOTES:

GRM Development Solutions Ltd
Laurus House, First Ave, Centrum 100,
Burton-on-Trent, Staffordshire
Tel: 01283 551 249
info@grm-uk.com www.grm-uk.com

CLIENT:
Integrated Health Projects - VINCI

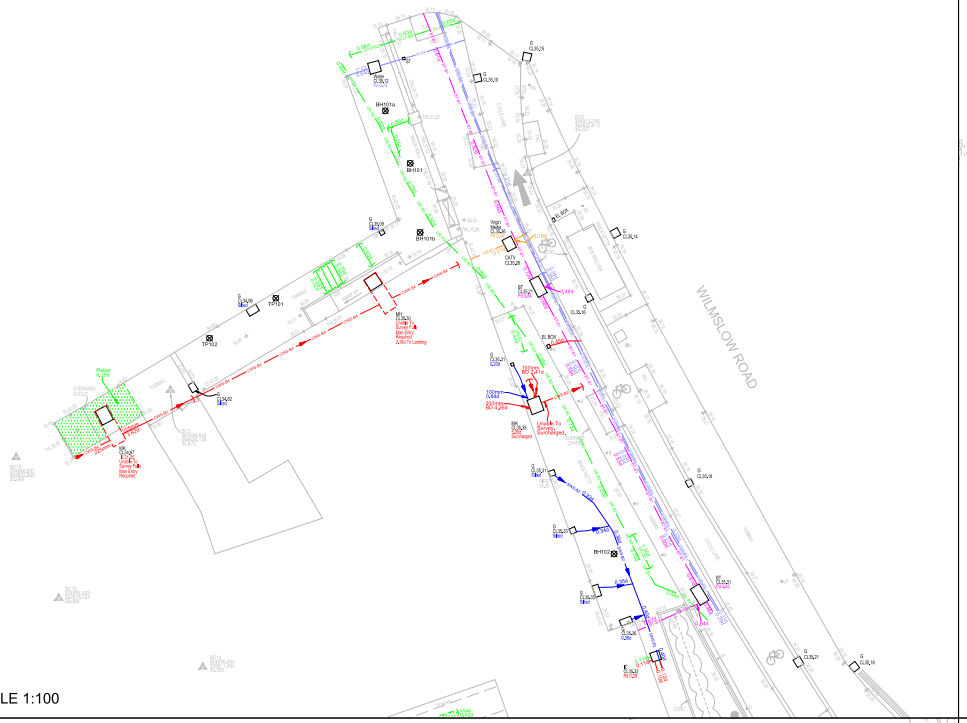
PROJECT:
Christie Hospital CASICD (Manchester)

TITLE:
Foundation Inspection Pit TP107

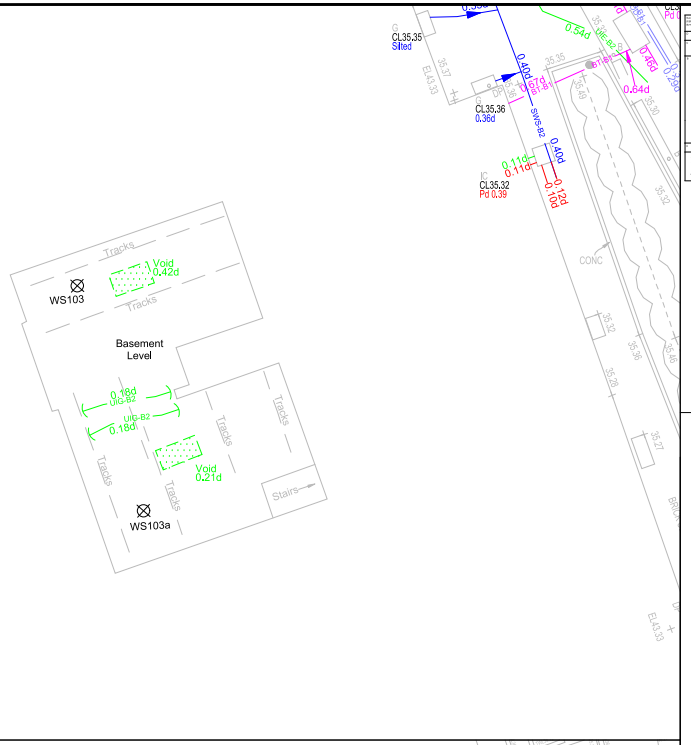
SCALE@SIZE :	ISSUE:
NTS	FINAL
DESIGN/DRAWN by :	DATE:
AW	15/3/24
PROJECT No:	DRAWING No:
P10525	007

© GRM Development Solutions Ltd
© Crown Copyright. AL 100014100

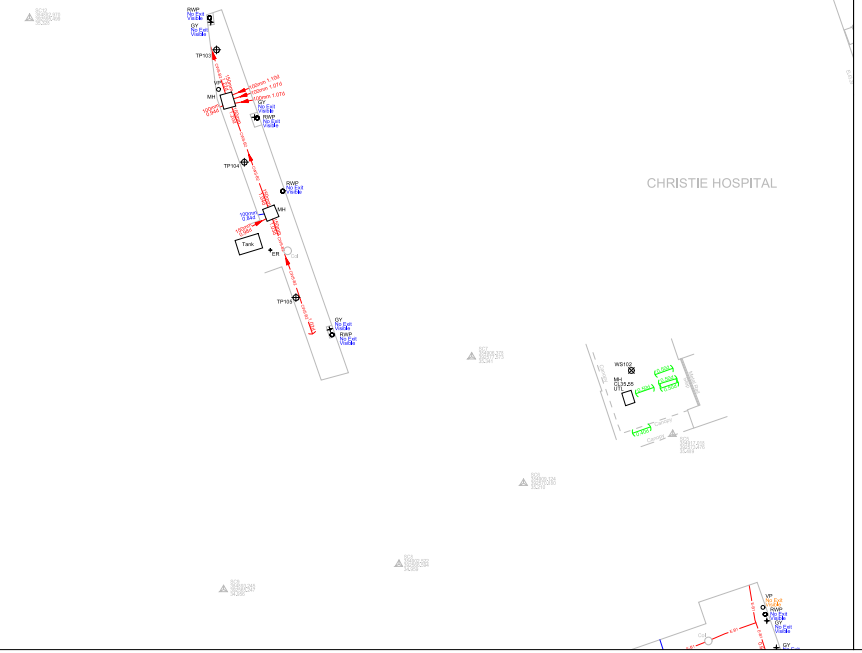
APPENDIX G



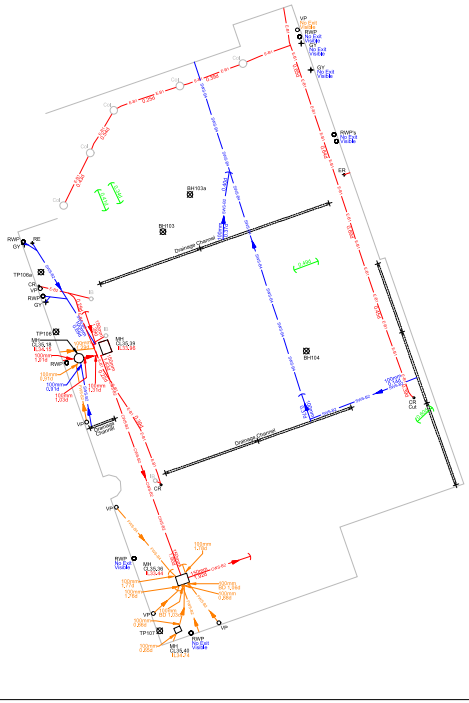
01
SCALE 1:100



02
SCALE 1:50



03
SCALE 1:100



04
SCALE 1:100

PAS 128:2022 Quality & Confidence Levels

QUALITY LEVEL	QUALITY SUB-LEVEL	METHOD	DEPTH	ACCURACY	ACCURACY SUB-LEVEL	
A	A	Trial	Trial	Trial	Trial	
B	B	Trial	Trial	Trial	Trial	
C	C	Trial	Trial	Trial	Trial	
D	D	Trial	Trial	Trial	Trial	

GENERAL NOTES

1. THIS DRAWING PLAN [WITHIN LIMITS] IS BASED ON TOPOGRAPHIC SURVEY DATA WHICH MAY HAVE BEEN CREATED BY OTHERS AND SUPPLIED TO US FOR THE PURPOSES OF PRESENTING OUR SURVEY OUTPUT, WE CANNOT BE HELD RESPONSIBLE FOR THE CONTENT, COMPLETENESS AND ACCURACY OF DATA SUPPLIED BY OTHERS.

2. THIS DRAWING IS TO BE VIEWED IN CONJUNCTION WITH:
DRAWING TITLE AND NUMBER
ALSO ANY OTHER RELEVANT DRAWINGS/DOCUMENTS AND WITH RELEVANT STATUTORY RECORDS

3. DO NOT SCALE FROM THIS DRAWING.

4. NO ALLOWANCE HAS BEEN MADE FOR SUB SURFACE ENTRY INTO MANHOLES OR OTHER CHAMBERS. ALL MANHOLE COVERS AND CHAMBERS ARE TO BE REFERRED TO CENTRE, INVERTS AND ROUTES ARE TAKEN FROM GROUND LEVEL AND ARE TO TAKEN AS APPROXIMATE ONLY, ALL DRAIN ROUTES ARE PLOTTED USING DIRECT LINES UNLESS STRUCTURE DETAIL.

5. THE CONTRACTOR IS TO CHECK AND VERIFY ALL DIMENSIONS AND LEVELS BEFORE COMMENCING ANY WORK.

6. SOME SERVICES SHOWN ON THIS DRAWING MAY BE ASSUMED ROUTES (CLAIM AND SO, NORMALLY TIP OF UNKNOWN CONDITION, CONTRACTORS SHOULD ASSUME THAT SERVICES WILL BE FOUND WITHIN AND TAKE PARTICULAR CARE DURING EXCAVATION WORKS.

7. EXACT THERE BE ANY CHANGE IN DETAILS BETWEEN THE DETAILS SHOWN ON THE DRAWING AND THE ACTUAL SITE CONDITIONS, THIS SHOULD BE REPORTED IMMEDIATELY TO ENABLE THE PLAN TO BE AMENDED PRIOR TO CONSTRUCTION WORKS.

8. IT IS IMPORTANT TO NOTE THAT THE SAME ACCURACIES APPLIED BY THE PLOTTING SCALE ARE EQUALLY APPLICABLE TO DIGITAL DATA SUPPLIED FOR CAD.

9. EVERY EFFORT IS MADE TO IDENTIFY ALL VISIBLE ABOVE GROUND FEATURES, HOWEVER, IT IS NOT ALWAYS POSSIBLE TO DO SO. THE EXTENT OF THE SURVEY IS THE LINE OF SURVEY, WHILE FEATURES IN THE VICINITY OF THE BOUNDARIES, AS SHOWN ON THIS SURVEY, MAY NOT REPRESENT THE EXTENT OF LEGALLY DEFINED BOUNDARIES.

10. THE SURVEY HAS BEEN BASED OUT TO TARGET MARKERS IN BOREHOLE LOCATIONS, HOWEVER SOME ERRORS MAY BE PRESENT.

11. EVERY EFFORT HAS BEEN MADE TO AVOID TEXT OVERWRITING WHEN PLOTTING THE UTILITY SURVEY, NO LEVEL INFORMATION SHOULD BE TAKEN FROM THE DRAWING AS SOME TEXT MAY HAVE BEEN MOVED OR OMITTED.

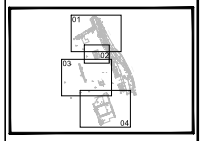
UTILITY & DRAINAGE LEGEND

ADDITIONAL SERVICE INFORMATION

UTILITIES ABBREVIATIONS

SERVICE LOCATION

TO BE USED IN CONJUNCTION WITH UKUG_UTILITIES.CBT FILE



CLIENT
GRM DEVELOPMENT SOLUTIONS

PROJECT TITLE
CHRISTIE HOSPITAL, WILMSLOW
MANCHESTER, M20 4BX

DRAWING DETAIL
UTILITY CLEARANCE SURVEY

DRAWING STATUS
INFORMATION

UK LAND & UNDERGROUND SURVEYS LTD

DRAWN	JP	DATE	28/04/2024
PROJECT ENGINEER	JP	SCALE	SEE INSET (WHEN PLOTTED @ A0)
CHECKED	MAJ		
APPROVED	MAJ		

DESCRIPTION	REV	DATE	DRWN	CHKD	APPR

DRAWING NUMBER: UKUG_2428_01_UTILITY
SHEET NUMBER: 1 OF 1

ALWAYS USE SAFE DIGGING PRACTICES. ALWAYS CONSULT A TRAINED AND COMPETENT PERSON TO CHECK YOUR EXCAVATION AREA BEFORE BREAKING GROUND

AVAILABILITY OF RECORD DRAWINGS
(RIGHT HAND SIDE OF ROAD FACING DIRECTION OF SURVEY)
(N/A = NOT AFFECTED)

TYPE	AVAILABLE	TYPE	AVAILABLE	TYPE	AVAILABLE	TYPE	AVAILABLE
WATER	NO	GAS	NO	SW	NO	FO	NO
ELEC	NO	TEL	NO	FOUL	NO	CCTV	NO
HV	NO			COMB	NO		
LV	NO			HIGHWAY	NO		

APPENDIX H

GRM
PHOTOGRAPHIC BOARD
Laurus House, First Avenue
Centrum 100, Burton on Trent
DE14 2WH
01283 551249
info@grm-uk.com
www.grm-uk.com
PROJECT NAME
CASCID - christie Hosp
BOX NO.
DATE
MARCH 24
PROJECT NO.
P10525
HOLE NO.
BH101
DEPTH FROM
2·60
M
DEPTH TO
4·80
M
Grey Scale
Colour Control Patches
Blue
Cyan
Green
Yellow
Red
Magenta
White
3/Colour
Black
0.0m
0.1m
0.2m
0.3m
0.4m
0.5m
0.6m
0.7m
0.8m
0.9m
1.0m
2·60
3·30
4·80

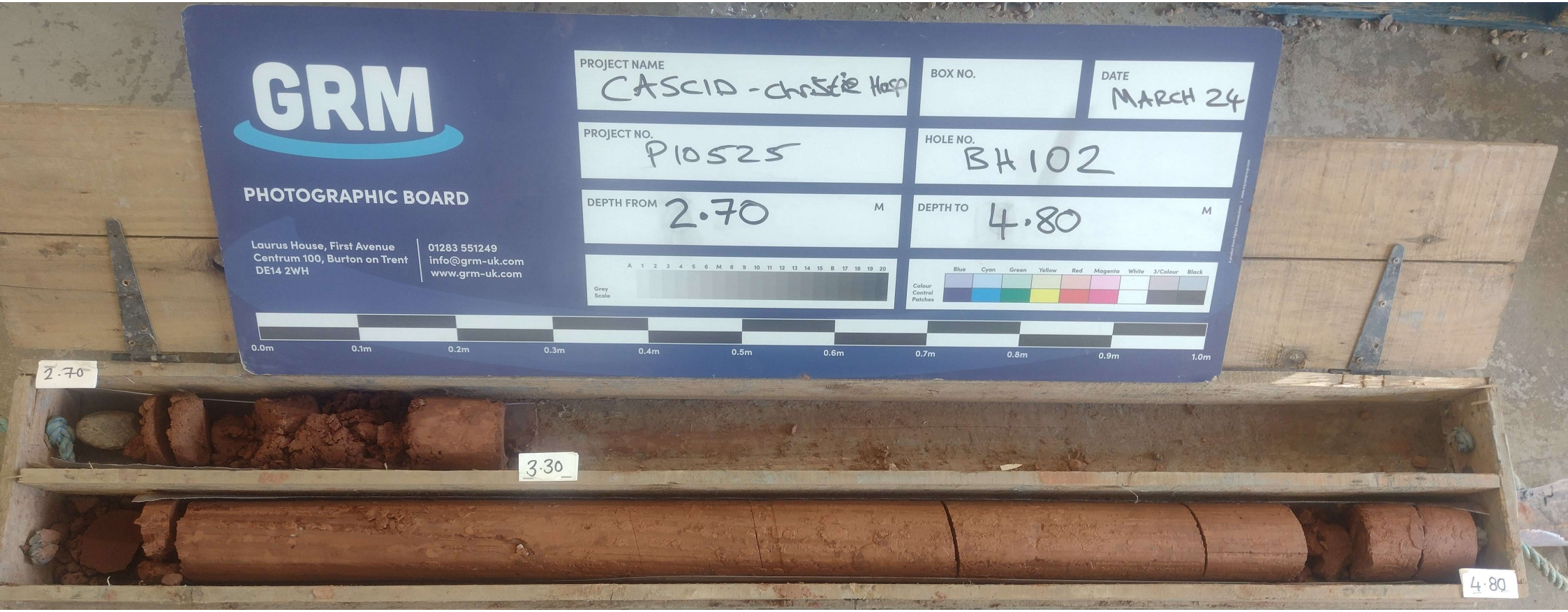
GRM
PHOTOGRAPHIC BOARD
Laurus House, First Avenue
Centrum 100, Burton on Trent
DE14 2WH
01283 551249
info@grm-uk.com
www.grm-uk.com
PROJECT NAME
CASCID - Christie Hosp
BOX NO.
DATE
MARCH 24
PROJECT NO.
P10525
HOLE NO.
BH101
DEPTH FROM
4·80
M
DEPTH TO
7·80
M
Grey Scale
Colour Control Patches
Blue
Cyan
Green
Yellow
Red
Magenta
White
3/Colour
Black
0.0m
0.1m
0.2m
0.3m
0.4m
0.5m
0.6m
0.7m
0.8m
0.9m
1.0m
6·30

GRM
PHOTOGRAPHIC BOARD
Laurus House, First Avenue
Centrum 100, Burton on Trent
DE14 2WH
01283 551249
info@grm-uk.com
www.grm-uk.com
PROJECT NAME
CASCID - christie Hosp
BOX NO.
DATE
MARCH 24
PROJECT NO.
P10525
HOLE NO.
BH101
DEPTH FROM
7·80
M
DEPTH TO
10·80
M
A 1 2 3 4 5 6 M 8 9 10 11 12 13 14 15 B 17 18 19 20
Grey Scale
Blue Cyan Green Yellow Red Magenta White 3/Colour Black
Colour Control Patches
0.0m 0.1m 0.2m 0.3m 0.4m 0.5m 0.6m 0.7m 0.8m 0.9m 1.0m
9.30
10·8

GRM
PHOTOGRAPHIC BOARD
Laurus House, First Avenue
Centrum 100, Burton on Trent
DE14 2WH
01283 551249
info@grm-uk.com
www.grm-uk.com
PROJECT NAME
CASCID - Christie Hosp
BOX NO.
DATE
MARCH 24
PROJECT NO.
P10525
HOLE NO.
BH101
DEPTH FROM
10·80
M
DEPTH TO
13·80
M
Grey Scale
Colour Control Patches
Blue
Cyan
Green
Yellow
Red
Magenta
White
3/Colour
Black
0.0m
0.1m
0.2m
0.3m
0.4m
0.5m
0.6m
0.7m
0.8m
0.9m
1.0m
12·30
13·80

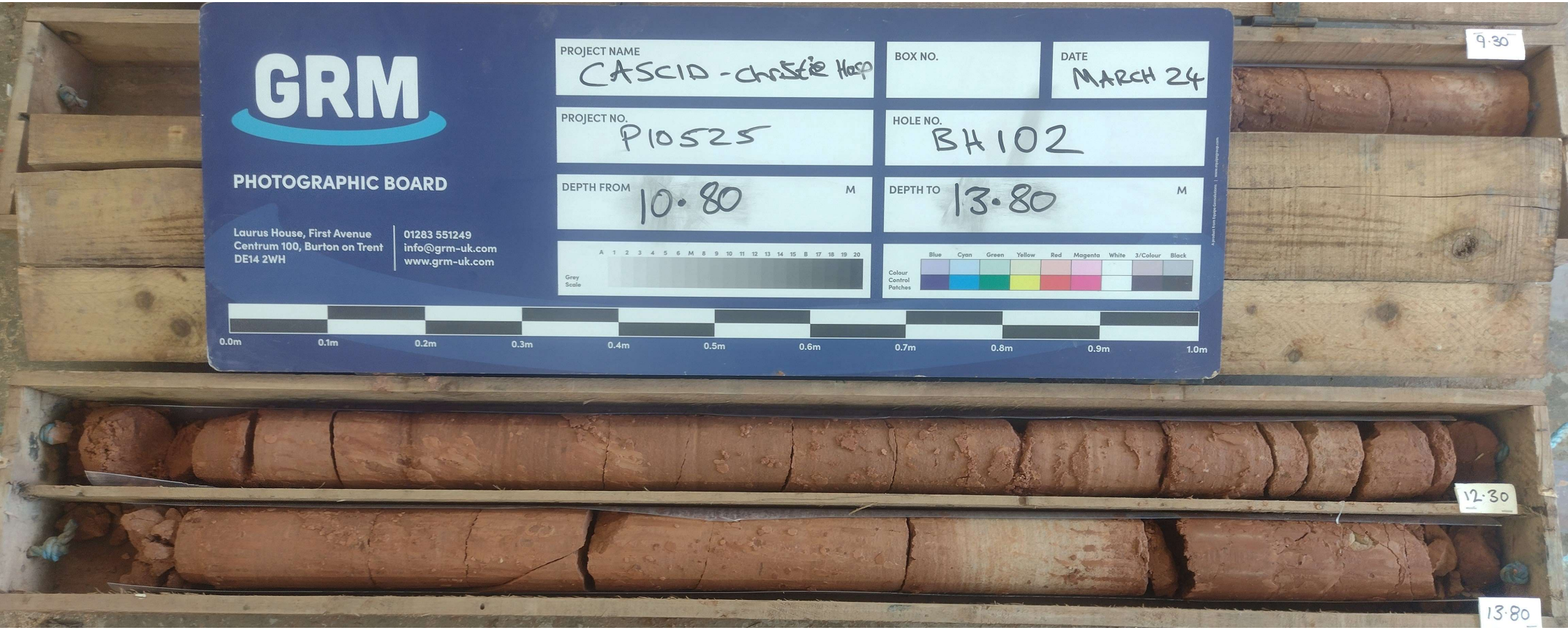
GRM
PHOTOGRAPHIC BOARD
Laurus House, First Avenue
Centrum 100, Burton on Trent
DE14 2WH
01283 551249
info@grm-uk.com
www.grm-uk.com
PROJECT NAME
CASCID - Christie Hasp
BOX NO.
DATE
MARCH 24
PROJECT NO.
P10525
HOLE NO.
BH101
DEPTH FROM
13.80
M
DEPTH TO
16.80
M
Grey Scale
Colour Control Patches
Blue
Cyan
Green
Yellow
Red
Magenta
White
3/Colour
Black
0.0m
0.1m
0.2m
0.3m
0.4m
0.5m
0.6m
0.7m
0.8m
0.9m
1.0m
15.30
16.80

GRM
PHOTOGRAPHIC BOARD
Laurus House, First Avenue
Centrum 100, Burton on Trent
DE14 2WH
01283 551249
info@grm-uk.com
www.grm-uk.com
PROJECT NAME
CASCID - Christie Hosp
BOX NO.
DATE
MARCH 24
PROJECT NO.
P10525
HOLE NO.
BH101
DEPTH FROM
16.80
M
DEPTH TO
18.30
M
A 1 2 3 4 5 6 M 8 9 10 11 12 13 14 15 B 17 18 19 20
Grey Scale
Blue Cyan Green Yellow Red Magenta White 3/Colour Black
Colour Control Patches
0.0m 0.1m 0.2m 0.3m 0.4m 0.5m 0.6m 0.7m 0.8m 0.9m 1.0m
1830


GRM
PHOTOGRAPHIC BOARD
Laurus House, First Avenue
Centrum 100, Burton on Trent
DE14 2WH
01283 551249
info@grm-uk.com
www.grm-uk.com
PROJECT NAME
CASCID - Christie Hosp
BOX NO.
DATE
MARCH 24
PROJECT NO.
P10525
HOLE NO.
BH102
DEPTH FROM
2.70
M
DEPTH TO
4.80
M
Grey Scale
Colour Control Patches
Blue
Cyan
Green
Yellow
Red
Magenta
White
3/Colour
Black
0.0m
0.1m
0.2m
0.3m
0.4m
0.5m
0.6m
0.7m
0.8m
0.9m
1.0m
2.70
3.30
4.80

GRM
PHOTOGRAPHIC BOARD
Laurus House, First Avenue
Centrum 100, Burton on Trent
DE14 2WH
01283 551249
info@grm-uk.com
www.grm-uk.com
PROJECT NAME
CASCID - Chrissie Hasp
BOX NO.
DATE
MARCH 24
PROJECT NO.
P10525
HOLE NO.
BH102
DEPTH FROM
4.80
M
DEPTH TO
7.80
M
Grey Scale
Colour Control Patches
Blue
Cyan
Green
Yellow
Red
Magenta
White
3/Colour
Black
0.0m
0.1m
0.2m
0.3m
0.4m
0.5m
0.6m
0.7m
0.8m
0.9m
1.0m
4.80
6.30
7.80

GRM
PHOTOGRAPHIC BOARD
Laurus House, First Avenue
Centrum 100, Burton on Trent
DE14 2WH
01283 551249
info@grm-uk.com
www.grm-uk.com
PROJECT NAME
CASCID - christie Hosp
BOX NO.
DATE
MARCH 24
PROJECT NO.
P10525
HOLE NO.
BH102
DEPTH FROM
7.80
M
DEPTH TO
10.80
M
Grey Scale
Colour Control Patches
Blue
Cyan
Green
Yellow
Red
Magenta
White
3/Colour
Black
0.0m
0.1m
0.2m
0.3m
0.4m
0.5m
0.6m
0.7m
0.8m
0.9m
1.0m
9.30
10.80


GRM
PHOTOGRAPHIC BOARD
Laurus House, First Avenue
Centrum 100, Burton on Trent
DE14 2WH
01283 551249
info@grm-uk.com
www.grm-uk.com
PROJECT NAME
CASCID - Christie Hosp
BOX NO.
DATE
MARCH 24
PROJECT NO.
P10525
HOLE NO.
BH102
DEPTH FROM
10.80
M
DEPTH TO
13.80
M
Grey Scale
Colour Control Patches
Blue
Cyan
Green
Yellow
Red
Magenta
White
3/Colour
Black
0.0m
0.1m
0.2m
0.3m
0.4m
0.5m
0.6m
0.7m
0.8m
0.9m
1.0m
9.30
12.30
13.80

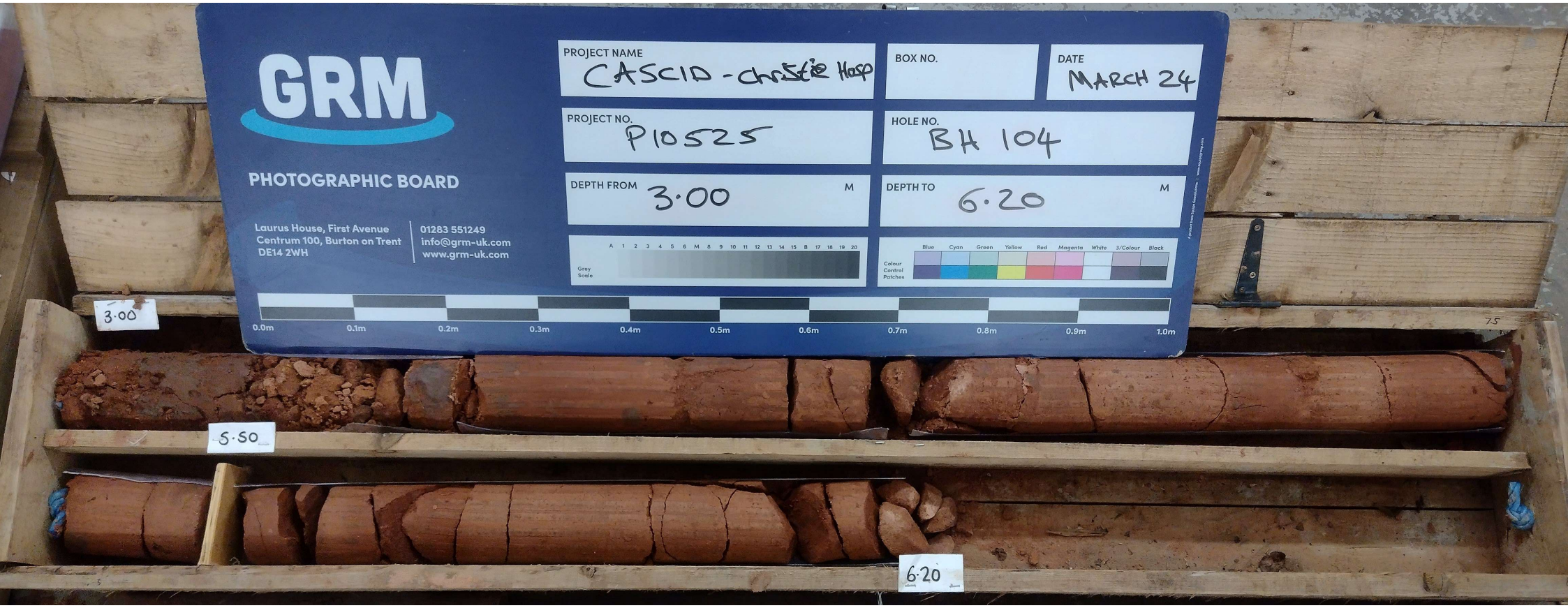
GRM
PHOTOGRAPHIC BOARD
Laurus House, First Avenue
Centrum 100, Burton on Trent
DE14 2WH
01283 551249
info@grm-uk.com
www.grm-uk.com
PROJECT NAME
CASCID - Christie Hosp
BOX NO.
DATE
MARCH 24
PROJECT NO.
P10525
HOLE NO.
BH102
DEPTH FROM
13.80
M
DEPTH TO
16.80
M
A 1 2 3 4 5 6 M 8 9 10 11 12 13 14 15 B 17 18 19 20
Grey Scale
Blue Cyan Green Yellow Red Magenta White 3/Colour Black
Colour Control Patches
0.0m 0.1m 0.2m 0.3m 0.4m 0.5m 0.6m 0.7m 0.8m 0.9m 1.0m
15.30
16.80

GRM
PHOTOGRAPHIC BOARD
Laurus House, First Avenue
Centrum 100, Burton on Trent
DE14 2WH
01283 551249
info@grm-uk.com
www.grm-uk.com
PROJECT NAME
CASCID - christie Hosp
BOX NO.
DATE
MARCH 24
PROJECT NO.
P10525
HOLE NO.
BH102
DEPTH FROM
16.80
M
DEPTH TO
18.30
M
A 1 2 3 4 5 6 M 8 9 10 11 12 13 14 15 B 17 18 19 20
Grey Scale
Blue Cyan Green Yellow Red Magenta White 3/Colour Black
Colour Control Patches
0.0m 0.1m 0.2m 0.3m 0.4m 0.5m 0.6m 0.7m 0.8m 0.9m 1.0m
15.30
16.8

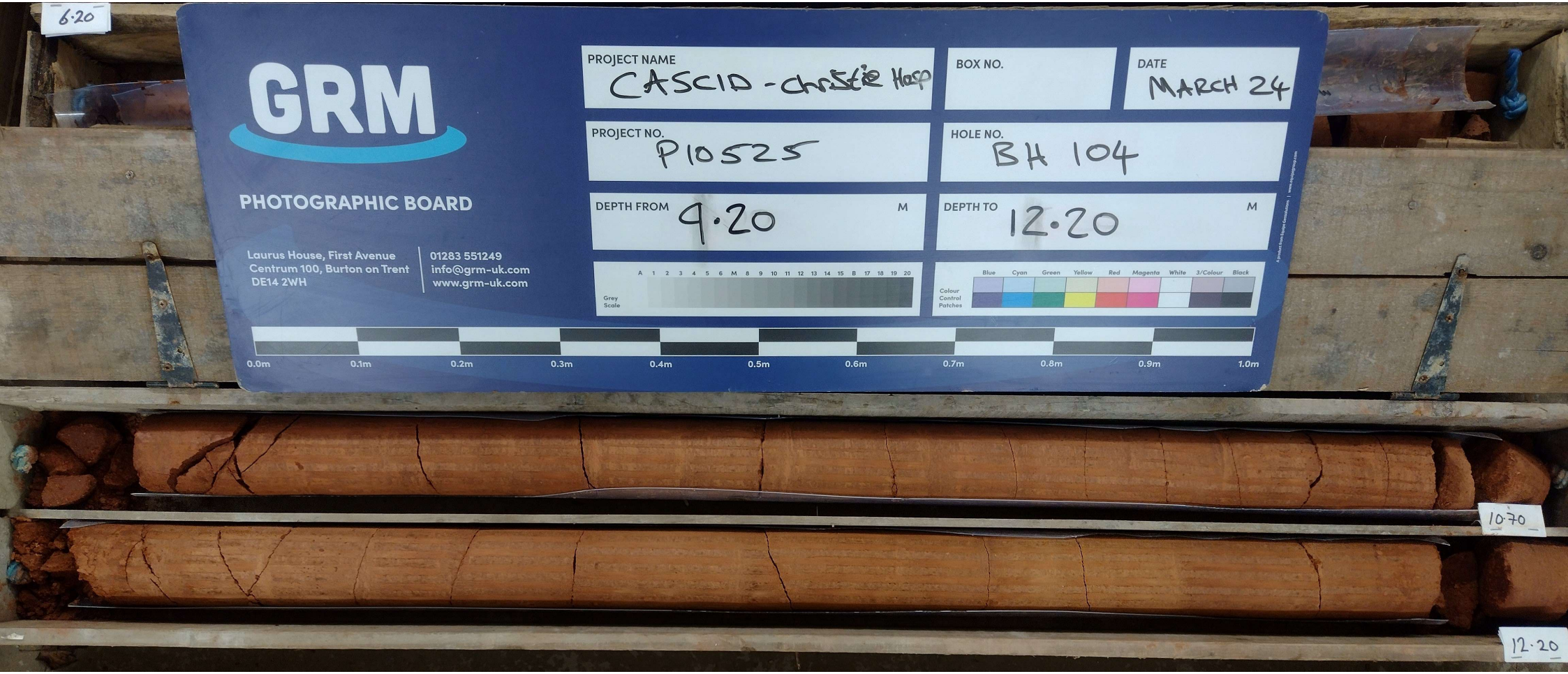
GRM
Laurus House, First Avenue
Centrum 100, Burton on Trent
DE14 2WH
01283 551249
info@grm-uk.com
www.grm-uk.com
PROJECT NAME
CASCID - chalk
PROJECT NO.
P10525
ENGINEER
Matt M
CLIENT
IHP VINCI
LOCATION I.D.
BH103
DATE
06.03.24
DEPTH FROM
3.00
M TO
5.50
M
Grey Scale
Colour Control Patches
3.00
AZCL
4.00
AZCL
5.50

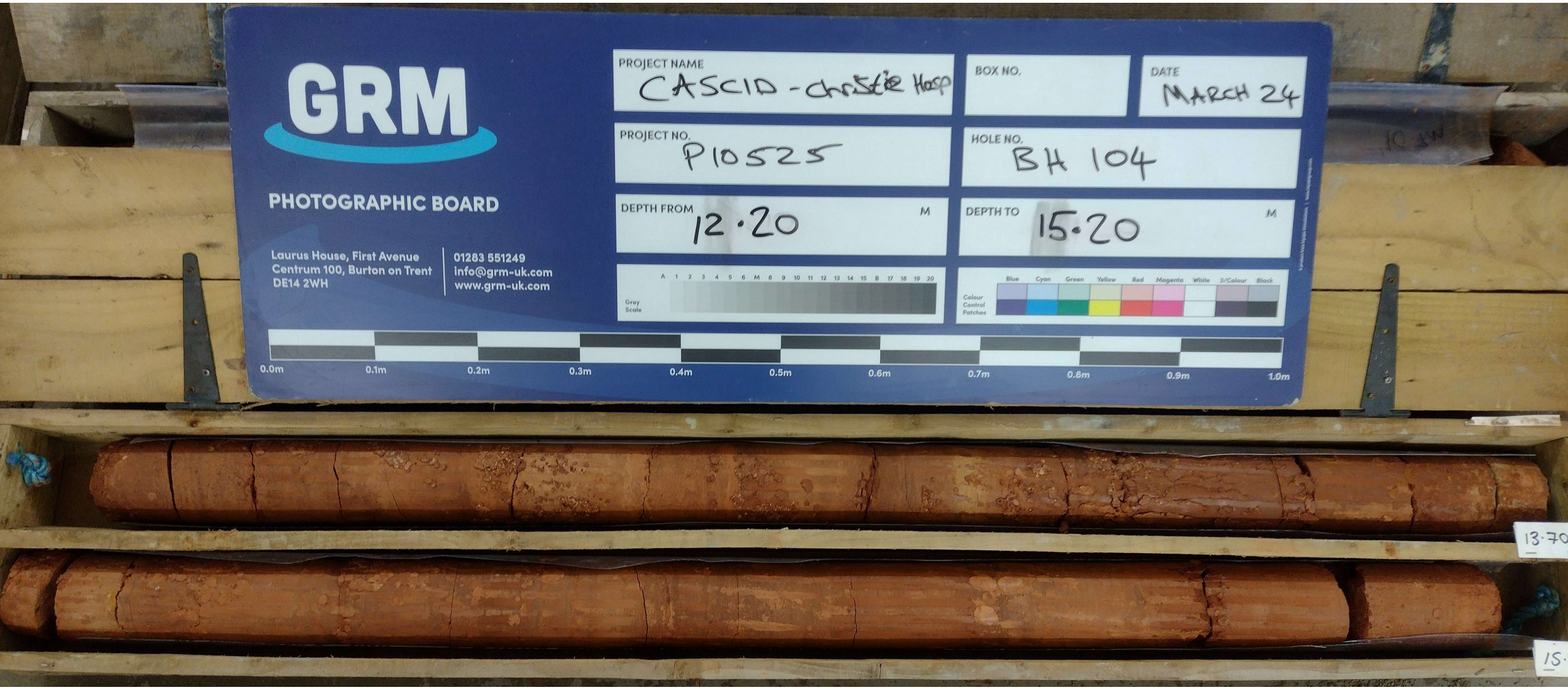
GRM
Laurus House, First Avenue
Centrum 100, Burton on Trent
DE14 2WH
01283 551249
info@grm-uk.com
www.grm-uk.com
PROJECT NAME
CASCID - chalkie
PROJECT NO.
P10525
ENGINEER
Mott M
CLIENT
IHP VINCI
LOCATION I.D.
BH103
DATE
06.03.24
DEPTH FROM
5.50
M TO
8.50
M
Grey Scale
Colour Control Patches
Blue
Cyan
Green
Yellow
Red
Magenta
White
3/Colour
Black
0.0m
0.1m
0.2m
0.3m
0.4m
0.5m
5.50
AZCL
7.00
AZCL
8.5

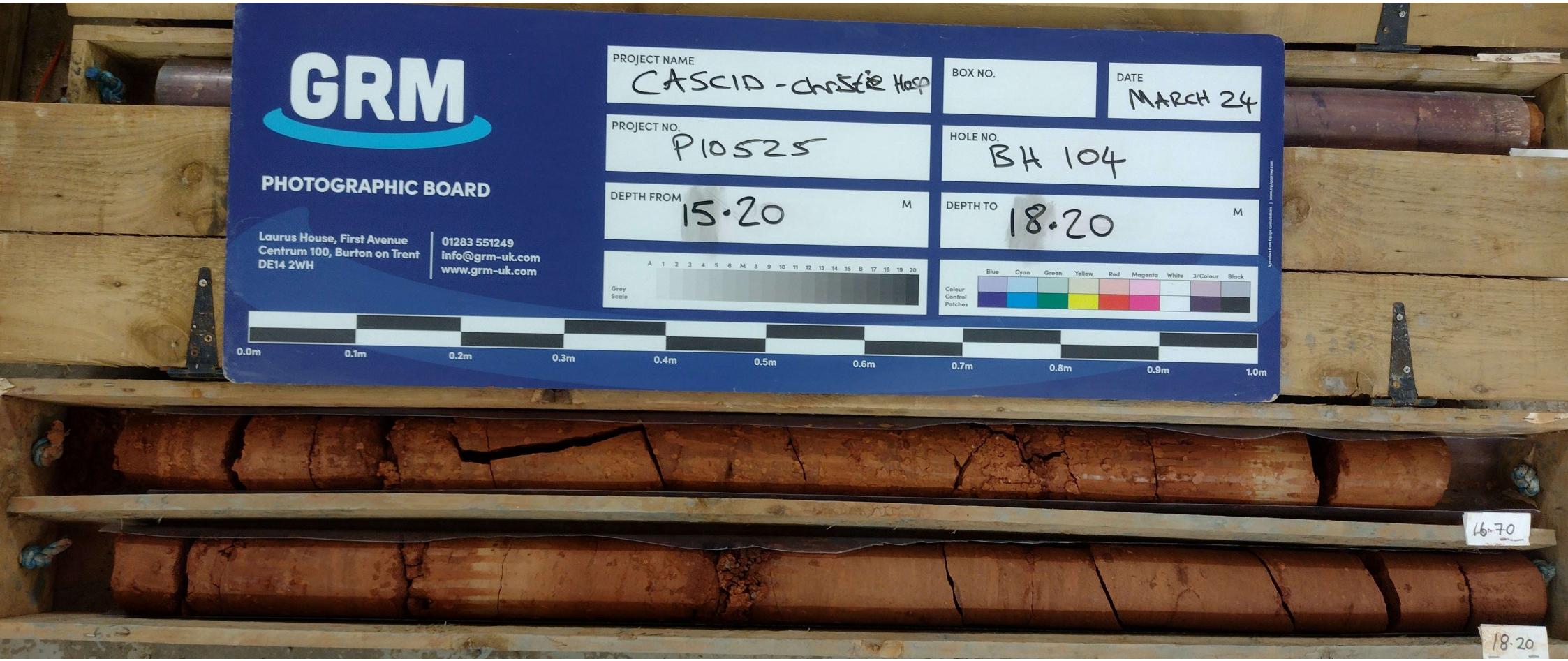
GRM
Laurus House, First Avenue
Centrum 100, Burton on Trent
DE14 2WH
01283 551249
info@grm-uk.com
www.grm-uk.com
PROJECT NAME
CASCID - Choistle
PROJECT NO.
P10525
ENGINEER
Matt M
CLIENT
IHP VINCI
LOCATION I.D.
BH103
DATE
06.03.24
DEPTH FROM
8.50
M TO
11.50
M
Grey Scale
Colour Control Patches
8.50
AZCL
AZCL


GRM
PHOTOGRAPHIC BOARD
Laurus House, First Avenue
Centrum 100, Burton on Trent
DE14 2WH
01283 551249
info@grm-uk.com
www.grm-uk.com
PROJECT NAME
CASCID - christie Hosp
BOX NO.
DATE
MARCH 24
PROJECT NO.
P10525
HOLE NO.
BH 104
DEPTH FROM
3·00
M
DEPTH TO
6·20
M
Grey Scale
Colour Control Patches
Blue
Cyan
Green
Yellow
Red
Magenta
White
3/Colour
Black
0.0m
0.1m
0.2m
0.3m
0.4m
0.5m
0.6m
0.7m
0.8m
0.9m
1.0m
3·00
5·50
6·20

3·00
GRM
PHOTOGRAPHIC BOARD
Laurus House, First Avenue
Centrum 100, Burton on Trent
DE14 2WH
01283 551249
info@grm-uk.com
www.grm-uk.com
PROJECT NAME
CASCID - Christie Hosp
BOX NO.
DATE
MARCH 24
PROJECT NO.
P10525
HOLE NO.
BH 104
DEPTH FROM
6·20
M
DEPTH TO
9·20
M
A 1 2 3 4 5 6 M 8 9 10 11 12 13 14 15 B 17 18 19 20
Grey Scale
Blue Cyan Green Yellow Red Magenta White 3/Colour Black
Colour Control Patches
0.0m 0.1m 0.2m 0.3m 0.4m 0.5m 0.6m 0.7m 0.8m 0.9m 1.0m
7·70
9·20


6.20
GRM
PHOTOGRAPHIC BOARD
Laurus House, First Avenue
Centrum 100, Burton on Trent
DE14 2WH
01283 551249
info@grm-uk.com
www.grm-uk.com
PROJECT NAME
CASCID - christie Hosp
BOX NO.
DATE
MARCH 24
PROJECT NO.
P10525
HOLE NO.
BH 104
DEPTH FROM
9.20
M
DEPTH TO
12.20
M
A 1 2 3 4 5 6 M 8 9 10 11 12 13 14 15 B 17 18 19 20
Grey Scale
Blue Cyan Green Yellow Red Magenta White 3/Colour Black
Colour Control Patches
0.0m 0.1m 0.2m 0.3m 0.4m 0.5m 0.6m 0.7m 0.8m 0.9m 1.0m
10.70
12.20


GRM
PHOTOGRAPHIC BOARD
Laurus House, First Avenue
Centrum 100, Burton on Trent
DE14 2WH
01283 551249
info@grm-uk.com
www.grm-uk.com
PROJECT NAME
CASCID - christie Hosp
BOX NO.
DATE
MARCH 24
PROJECT NO.
P10525
HOLE NO.
BH 104
DEPTH FROM
12·20
M
DEPTH TO
15·20
M
Grey Scale
A 1 2 3 4 5 6 M 8 9 10 11 12 13 14 15 B 17 18 19 20
Colour Control Patches
Blue Cyan Green Yellow Red Magenta White 3/Colour Black
0.0m 0.1m 0.2m 0.3m 0.4m 0.5m 0.6m 0.7m 0.8m 0.9m 1.0m
13·70
15·


GRM
PHOTOGRAPHIC BOARD
Laurus House, First Avenue
Centrum 100, Burton on Trent
DE14 2WH
01283 551249
info@grm-uk.com
www.grm-uk.com
PROJECT NAME
CASCID - christie Hosp
BOX NO.
DATE
MARCH 24
PROJECT NO.
P10525
HOLE NO.
BH 104
DEPTH FROM
15·20
M
DEPTH TO
18·20
M
Grey Scale
A 1 2 3 4 5 6 M 8 9 10 11 12 13 14 15 B 17 18 19 20
Colour Control Patches
Blue Cyan Green Yellow Red Magenta White 3/Colour Black
0.0m 0.1m 0.2m 0.3m 0.4m 0.5m 0.6m 0.7m 0.8m 0.9m 1.0m
16·70
18·20

APPENDIX I

In-Situ Gas Monitoring Results

Project Name:	CASICD Christie Hospital
Project Number:	P10525
Client:	IHP
Date:	05.04.2024
Weather:	Dry
Atmospheric Pressure (mb):	*Number
Pressure Trend:	
Equipment:	
Operator:	Liam Press

Ground Gases														Groundwater	
Well ID	Response Zone (mbegl)			Methane (%v/v)		Carbon Dioxide (%v/v)		Oxygen (%v/v)		Gas Flow (l/h)		PID Reading (ppm)		Depth to Groundwater (mbegl)	Total Well Depth (mbegl)
	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady	Peak	Steady		
BH101	3.0	8.0	NAT											4.10	7.80
BH104	3.0	8.0	NAT											4.25	8.01

Comments: Both locations bailed; with BH101 having very slow recharge, BH104 recharging at 1cm every 4 seconds.

Notes

L.E.L.	Lower Explosive Limit (100% L.E.L.'= 5% Flammable Gas)	Highlighted cell for following conditions:	
N.D.	Not Detected	a.	Methane ≥1% v/v
N.R.	Not Recorded	b.	Carbon Dioxide ≥5% v/v
PID	Photo-Ionising Detector	MG	Made Ground
%	By volume	NS	Natural Strata

In-Situ Gas Monitoring Results

Project Name:	CASICD Christie Hospital
Project Number:	P10525
Client:	IHP
Date:	08.05.2024
Weather:	
Atmospheric Pressure (mb):	*Number
Pressure Trend:	
Equipment:	
Operator:	

Ground Gases														Groundwater	
Well ID	Response Zone (mbegl)			Methane (%v/v)		Carbon Dioxide (%v/v)		Oxygen (%v/v)		Gas Flow (l/h)		PID Reading (ppm)		Depth to Groundwater (mbegl)	Total Well Depth (mbegl)
	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady	Peak	Steady		
BH101	3.0	8.0	NAT											4.13	7.63
BH104	3.0	8.0	NAT											4.39	8.04

Comments:

Notes

L.E.L.	Lower Explosive Limit (100% L.E.L.'= 5% Flammable Gas)	Highlighted cell for following conditions:	
N.D.	Not Detected	a.	Methane ≥1% v/v
N.R.	Not Recorded	b.	Carbon Dioxide ≥5% v/v
PID	Photo-Ionising Detector	MG	Made Ground
%	By volume	NS	Natural Strata

APPENDIX J

4161

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

GRM Development Solutions
Laurus House
First Avenue
Centrum 100
Burton Upon Trent
DE14 2WH

Analytical Test Report: L24/01949/GRM - 24-42528-A

Your Project Reference:	**CASCID-Christie Hospital, Manchester P10525**		
Your Order Number:	P10525	Samples Received / Instructed:	07/03/2024 / 07/03/2024
Report Issue Number:	1	Sample Tested:	07/03 to 26/03/2024
Samples Analysed:	4 soil samples	Report issued:	26/03/2024

Signed

James Gane
Analytical Services Manager
CTS Group

Notes:

General
26/03/2024 report amended to show extra testing

Please refer to Methodologies page for details pertaining to the analytical methods undertaken.

Samples will be retained for 14 days after issue of this report with the exception of the asbestos test portion which is held for 6 months unless otherwise requested.

Moisture Content was determined in accordance with CTS method statement MS - CL - Sample Prep, oven dried at <30˚C.

Moisture Content is reported as a percentage of the dry mass of soil, this calculation is in accordance with BS1377, Part 2, 1990, Clause 3.2

Stone Content was determined in accordance with CTS method statement MS - CL - Sample Prep and refers to the percentage of stones retained on a 10mm BS test sieve.

Where specification limits are included these are for guidance only. Where a measured value has been highlighted this is not implying acceptance or failure and certainty of measurement values have not been taken into account.

Uncertainty of measurement values are available on request.

Samples were supplied by customer, results apply to the samples as received.

Asbestos

Please note: Where futher analaysis is required samples identified as containing asbestos are screened and tested on an as recevied basis. No correction is made for moisture content and these results are not covered by our accrediation

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation

WAC Testing

Samples were leached in accordance with BS EN 12457-2: 2002.

Eluate Results are reported as L/S 10. These results have been calculated in accordance with BS EN 12457-2:2002.

Comparative values are taken from the Council Decision Annex - CRITERIA AND PROCEDURES FOR THE ACCEPTANCE OF WASTE AT LANDFILLS, (2003/33/EC).

Deviating Samples

On receipt samples are compared against our sample holding and handling protocols, where any deviations have been noted these are reported on our deviating sample page (if present)

Accreditation Key

UKAS = UKAS Accreditation, MCERTS = MCERTS Accreditation, u = Unaccredited, subUKAS - Subcontracted to a laboratory UKAS accredited for this test

MCERTS Accreditation only covers the SAND, CLAY and LOAM matrices

Date of Issue: 18.03.2024

Issued by: J. Gane

Issue No: 4

Rev No: 6

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42528-A

Project Reference - CASCID-Christie Hospital, Manchester
P10525

Analytical Test Results - Solid

Lab Reference			345250	345251	345252
Client Sample ID			-	-	-
Client Sample Location			BH104	BH103A	BH103
Client Sample Type			ES	ES	ES
Client Sample Number			-	-	-
Depth - Top (m)			0.30	0.10	0.70
Depth - Bottom (m)			0.40	0.20	0.80
Date of Sampling			27/02/2024	27/02/2024	27/02/2024
Time of Sampling			-	-	-
Sample Matrix			Sand	Sand	Sand
Determinant	**Units**	**Accreditation**			
Antimony	(mg/kg)	u	< 3.5	< 3.5	< 3.5
Arsenic	(mg/kg)	MCERTS	28	11	10
Barium	(mg/kg)	MCERTS	560	290	110
Beryllium	(mg/kg)	MCERTS	1.3	1.1	0.6
Boron (w/s)	(mg/kg)	u	< 2.5	< 2.5	< 2.5
Cadmium	(mg/kg)	MCERTS	1.1	0.7	0.5
Chromium (III)	(mg/kg)	u	6.5	11	6.4
Chromium (Total)	(mg/kg)	UKAS	7.5	12	7.4
Copper	(mg/kg)	MCERTS	120	46	29
Iron	(mg/kg)	u	39000	28000	16000
Lead	(mg/kg)	MCERTS	2100	56	110
Manganese	(mg/kg)	MCERTS	650	490	300
Mercury	(mg/kg)	UKAS	< 2.5	< 2.5	< 2.5
Mercury (Total, Low Level)	(mg/kg)	u	1.1	0.1	< 0.1
Molybdenum	(mg/kg)	u	3.1	2.4	< 2.0
Nickel	(mg/kg)	MCERTS	24	33	14
Selenium	(mg/kg)	u	< 8.0	< 8.0	< 8.0
Vanadium	(mg/kg)	UKAS	31	35	19
Zinc	(mg/kg)	MCERTS	250	55	50
Phenol	(mg/kg)	MCERTS	< 0.20	< 0.20	< 0.20
Cresols	(mg/kg)	MCERTS	< 0.20	< 0.20	< 0.20
Xylenols	(mg/kg)	MCERTS	< 0.20	< 0.20	< 0.20
Trimethyl Phenols	(mg/kg)	UKAS	< 0.20	< 0.20	< 0.20
Total Phenols (via HPLC)	(mg/kg)	UKAS	< 0.80	< 0.80	< 0.80
Cyanide (Free)	(mg/kg)	u	< 1.0	< 1.0	< 1.0
Chromium (Hexavalent)	(mg/kg)	u	< 1.0	< 1.0	< 1.0
pH	pH Units	MCERTS	8.5	9.0	8.3
Sulphate (Water soluble as SO_4)	(mg/l)	u	34	61	14
Sulphur (Total)	(%)	UKAS	0.06	0.20	0.02
Acenaphthene	(mg/kg)	MCERTS	< 0.02	< 0.20	0.03
Acenaphthylene	(mg/kg)	UKAS	< 0.02	0.96	0.11
Anthracene	(mg/kg)	UKAS	0.05	1.1	0.33
Benzo (a) anthracene	(mg/kg)	MCERTS	0.04	2.7	0.95
Benzo (a) pyrene	(mg/kg)	MCERTS	0.05	4.4	0.88
Benzo (b) fluoranthene	(mg/kg)	MCERTS	0.07	5.2	1.1
Benzo (g, h, i) perylene	(mg/kg)	MCERTS	0.06	4.9	0.49
Benzo (k) fluoranthene	(mg/kg)	MCERTS	0.03	1.9	0.43
Chrysene	(mg/kg)	MCERTS	0.05	2.9	1.0
Dibenzo (a,h) anthracene	(mg/kg)	MCERTS	< 0.02	0.63	0.10
Fluoranthene	(mg/kg)	MCERTS	0.07	4.7	2.2
Fluorene	(mg/kg)	MCERTS	< 0.02	< 0.20	0.04
Indeno (1, 2, 3,-cd) pyrene	(mg/kg)	MCERTS	0.06	4.5	0.52
Naphthalene	(mg/kg)	MCERTS	< 0.02	< 0.20	0.02

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42528-A

Project Reference - CASCID-Christie Hospital, Manchester P10525

Analytical Test Results - Solid

Lab Reference			345250	345251	345252
Client Sample ID			-	-	-
Client Sample Location			BH104	BH103A	BH103
Client Sample Type			ES	ES	ES
Client Sample Number			-	-	-
Depth - Top (m)			0.30	0.10	0.70
Depth - Bottom (m)			0.40	0.20	0.80
Date of Sampling			27/02/2024	27/02/2024	27/02/2024
Time of Sampling			-	-	-
Sample Matrix			Sand	Sand	Sand
Determinant	**Units**	**Accreditation**			
Phenanthrene	(mg/kg)	MCERTS	0.05	1.2	1.2
Pyrene	(mg/kg)	MCERTS	0.07	4.7	2.2
Total PAH (Sum of USEPA 16)	(mg/kg)	UKAS	0.71	40	12
FOC	-	UKAS	0.051	0.070	0.022
Asbestos	-	UKAS	No asbestos detected	No asbestos detected	No asbestos detected

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42528-A

Project Reference - CASCID-Christie Hospital, Manchester P10525

Analytical Test Results - Chemical Analysis

Lab Reference			345251	345252
Client Sample ID			-	-
Client Sample Location			BH103A	BH103
Client Sample Type			ES	ES
Client Sample Number			-	-
Depth - Top (m)			0.10	0.70
Depth - Bottom (m)			0.20	0.80
Date of Sampling			27/02/2024	27/02/2024
Time of Sampling			-	-
Sample Matrix			Sand	Sand
Determinant	**Units**	**Accreditation**		
Water soluble sulphate (as SO_4)	(mg/l)	u	61	14
Acid Soluble Sulphate	(%)	u	0.06	< 0.01
Total Sulphur	(%)	UKAS	0.20	0.02
pH Value	pH Units	MCERTS	9.0	8.3

7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42528-A

Project Reference - CASCID-Christie Hospital, Manchester P10525

Analytical Test Results - VPH / EPH

Lab Reference			345250	345251	345252
Client Sample ID			-	-	-
Client Sample Location			BH104	BH103A	BH103
Client Sample Type			ES	ES	ES
Client Sample Number			-	-	-
Depth - Top (m)			0.30	0.10	0.70
Depth - Bottom (m)			0.40	0.20	0.80
Date of Sampling			27/02/2024	27/02/2024	27/02/2024
Time of Sampling			-	-	-
Sample Matrix			Sand	Sand	Sand
Determinant	**Units**	**Accreditation**			
Aliphatic >C_5 to C_6 [HS_MS_1D_AL]	(mg/kg)	MCERTS	< 0.06	< 0.06	< 0.06
Aliphatic >C_6 to C_8 [HS_MS_1D_AL]	(mg/kg)	MCERTS	< 0.06	< 0.06	< 0.06
Aliphatic >C_8 to C_{10} [HS_MS_1D_AL]	(mg/kg)	MCERTS	< 0.06	< 0.06	< 0.06
Aliphatic >C_{10} to C_{12} [EH_CU_1D_AL]	(mg/kg)	u	< 10	< 10	< 10
Aliphatic >C_{12} to C_{16} [EH_CU_1D_AL]	(mg/kg)	u	< 10	< 10	< 10
Aliphatic >C_{16} to C_{21} [EH_CU_1D_AL]	(mg/kg)	u	< 10	41	< 10
Aliphatic >C_{21} to C_{35} [EH_CU_1D_AL]	(mg/kg)	u	< 20	610	38
Aliphatic >C_{35} to C_{44} [EH_CU_1D_AL]	(mg/kg)	u	< 15	320	68
Aromatic >C_5 to C_7 [HS_MS_1D_AR]	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Aromatic >C_7 to C_8 [HS_MS_1D_AR]	(mg/kg)	MCERTS	< 0.01	0.01	< 0.01
Aromatic >C_8 to C_{10} [HS_MS_1D_AR]	(mg/kg)	MCERTS	< 0.06	< 0.06	< 0.06
Aromatic >C_{10} to C_{12} [EH_CU_1D_AR]	(mg/kg)	u	< 10	< 10	< 10
Aromatic >C_{12} to C_{16} [EH_CU_1D_AR]	(mg/kg)	u	< 10	12	< 10
Aromatic >C_{16} to C_{21} [EH_CU_1D_AR]	(mg/kg)	u	< 10	81	< 10
Aromatic >C_{21} to C_{35} [EH_CU_1D_AR]	(mg/kg)	u	31	1200	64
Aromatic >C_{35} to C_{44} [EH_CU_1D_AR]	(mg/kg)	u	< 15	930	100
Total >C_5 to C_{35} [EH_CU+HS_1D_Total]	(mg/kg)	u	< 50	1900	100
Benzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Toluene	(mg/kg)	MCERTS	< 0.01	0.01	< 0.01
Ethylbenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
m&p Xylene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02
o-Xylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
MTBE	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01

4161

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42528-A

Project Reference - CASCID-Christie Hospital, M

Analytical Test Results - VOC

Lab Reference			345250	345251	345252
Client Sample ID			-	-	-
Client Sample Location			BH104	BH103A	BH103
Client Sample Type			ES	ES	ES
Client Sample Number			-	-	-
Depth - Top (m)			0.30	0.10	0.70
Depth - Bottom (m)			0.40	0.20	0.80
Date of Sampling			27/02/2024	27/02/2024	27/02/2024
Time of Sampling			-	-	-
Sample Matrix			Sand	Sand	Sand
Determinant	**Units**	**Accreditation**			
Benzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Toluene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Ethylbenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
m&p Xylene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02
o-Xylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Dichlorodifluoromethane	(mg/kg)	UKAS	< 0.05	< 0.05	< 0.05
Chloromethane	(mg/kg)	UKAS	< 0.02	< 0.02	< 0.02
Vinyl Chloride	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02
Bromomethane	(mg/kg)	u	< 0.05	< 0.05	< 0.05
Chloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Trichlorofluoromethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,1-Dichloroethylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Dichloromethane	(mg/kg)	u	< 0.10	< 0.10	< 0.10
MTBE	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
trans-1,2,-dichloroethylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,1-Dichloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
2,2-Dichloropropane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
cis--1,2,-dichloroethylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Bromochloromethane	(mg/kg)	MCERTS	< 0.05	< 0.05	< 0.05
Chloroform	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,1,1-Trichloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,1-Dichloropropene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Carbon Tetrachloride	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,2-dichloroethane	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02
Trichloroethylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,2-Dichloropropane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Dibromomethane	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02
Bromodichloromethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
cis-1,2-dichloropropylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
trans-1,3-dichloropropylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,1,2-Trichloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,3-Dichloropropane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Tetrachloroethylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Chlorodibromomethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,2-Dibromoethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Chlorobenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,1,1,2-tetrachloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Styrene	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01
Isopropylbenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Bromoform	(mg/kg)	MCERTS	< 0.05	< 0.05	< 0.05
1,1,2,2-Tetrachloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,2,3-Trichloropropane	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02
n-Propylbenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Bromobenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,3,5-Trimethylbenzene	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01
2-chlorotoluene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
4-chlorotoluene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
tert-butylbenzene	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01
1,2,4-trimethylbenzene	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01
sec-Butylbenzene	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01
4-Isopropyltoluene (P-Cymene)	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01
1,3-Dichlorobenzene	(mg/kg)	u	< 0.01	< 0.01	< 0.01
1,4-Dichlorobenzene	(mg/kg)	u	< 0.01	< 0.01	< 0.01
n-Butylbenzene	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01
1,2-Dichlorobenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,2-Dibromo-3-chloropropane	(mg/kg)	u	< 0.05	< 0.05	< 0.05
1,2,4-Trichlorobenzene	(mg/kg)	u	< 0.05	< 0.05	< 0.05
Hexachlorobutadiene	(mg/kg)	u	< 0.05	< 0.05	< 0.05
Naphthalene	(mg/kg)	u	< 0.05	< 0.05	< 0.05
1,2,3-Trichlorobenzene	(mg/kg)	u	< 0.05	< 0.05	< 0.05

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42528-A

Project Reference - CASCID-Christie Hospital, Manchester P10525

Certificate Of Analysis - WAC Suite

Lab Reference	345250
Client Sample ID	-
Client Sample Location	BH104
Client Sample Type	ES
Client Sample Number	-
Depth - Top (m)	0.3
Depth - Bottom (m)	0.4
Date of Sampling	27/02/2024
Time of Sampling	-
Sample Description	Made Ground- dark greyish brown slightly clayey gravelly silty sand with occasional brick fragments slag bituminous material
Sample Matrix	Sand
Moisture Content (%)	16
Stone content (%)	16

			Determined Result	Inert Waste Landfill	Stable non reactive hazardous waste in a non hazardous landfill	Hazardous Waste Landfill
Solid Analysis						
Total Organic Carbon	%	MCERTS	5.1	3.0	5.0	6.0
Loss on Ignition	%	UKAS	3.0	-	-	10.0
BTEX	mg/kg	MCERTS	< 0.06	6.00	-	-
PCB's (7 Congeners)	mg/kg	u	< 0.028	1.00	-	-
Mineral Oil (>C_{10} to C_{40}) [EH_1D_Total]	mg/kg	MCERTS	91	500	-	-
PAH	mg/kg	u	0.7	100	-	-
pH	units	MCERTS	8.5	-	> 6	-
Eluate Analysis						
Arsenic	mg/kg	u	0.10	0.50	2	25
Barium	mg/kg	u	< 0.05	20	100	300
Cadmium	mg/kg	u	< 0.03	0.04	1	5
Chromium (total)	mg/kg	u	0.04	0.5	10	70
Copper	mg/kg	u	< 0.01	2.0	50	100
Mercury	mg/kg	u	< 0.01	0.01	0.2	2
Molybdenum	mg/kg	u	< 0.03	0.5	10.0	30
Nickel	mg/kg	u	< 0.03	0.4	10.0	40
Lead	mg/kg	u	0.05	0.5	10.0	50
Antimony	mg/kg	u	< 0.03	0.06	0.7	5
Selenium	mg/kg	u	< 0.01	0.1	0.5	7
Zinc	mg/kg	u	< 0.05	4	50	200
Chloride	mg/kg	u	200	800	15000	25000
Fluoride	mg/kg	u	2	10	150	500
Sulphate (as SO_4)	mg/kg	u	48	1000	20000	50000
Total Dissolved Solids	mg/kg	u	1100	4000	60000	100000
Phenol Index	mg/kg	u	< 1.0	1	-	-
Dissolved Organic Carbon	mg/kg	u	23.0	500	800	1000

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42528-A

Project Reference - CASCID-Christie Hospital, Manchester P10525

Certificate Of Analysis - WAC Suite

Lab Reference	345252
Client Sample ID	-
Client Sample Location	BH103
Client Sample Type	ES
Client Sample Number	-
Depth - Top (m)	0.7
Depth - Bottom (m)	0.8
Date of Sampling	27/02/2024
Time of Sampling	-
Sample Description	Made Ground- dark brown clayey slightly gravelly silty sand with occasional slag
Sample Matrix	Sand
Moisture Content (%)	12
Stone content (%)	< 0.1

			Determined Result	Inert Waste Landfill	Stable non reactive hazardous waste in a non hazardous landfill	Hazardous Waste Landfill
Solid Analysis						
Total Organic Carbon	%	MCERTS	2.2	3.0	5.0	6.0
Loss on Ignition	%	UKAS	2.2	-	-	10.0
BTEX	mg/kg	MCERTS	< 0.06	6.00	-	-
PCB's (7 Congeners)	mg/kg	u	< 0.028	1.00	-	-
Mineral Oil (>C_{10} to C_{40}) [EH_1D_Total]	mg/kg	MCERTS	56	500	-	-
PAH	mg/kg	u	12	100	-	-
pH	units	MCERTS	8.3	-	> 6	-
Eluate Analysis						
Arsenic	mg/kg	u	0.07	0.50	2	25
Barium	mg/kg	u	< 0.05	20	100	300
Cadmium	mg/kg	u	< 0.03	0.04	1	5
Chromium (total)	mg/kg	u	< 0.03	0.5	10	70
Copper	mg/kg	u	< 0.01	2.0	50	100
Mercury	mg/kg	u	< 0.01	0.01	0.2	2
Molybdenum	mg/kg	u	< 0.03	0.5	10.0	30
Nickel	mg/kg	u	< 0.03	0.4	10.0	40
Lead	mg/kg	u	< 0.05	0.5	10.0	50
Antimony	mg/kg	u	< 0.03	0.06	0.7	5
Selenium	mg/kg	u	< 0.01	0.1	0.5	7
Zinc	mg/kg	u	< 0.05	4	50	200
Chloride	mg/kg	u	< 1	800	15000	25000
Fluoride	mg/kg	u	4	10	150	500
Sulphate (as SO_4)	mg/kg	u	< 10	1000	20000	50000
Total Dissolved Solids	mg/kg	u	440	4000	60000	100000
Phenol Index	mg/kg	u	< 1.0	1	-	-
Dissolved Organic Carbon	mg/kg	u	32.0	500	800	1000

7 - 11 Harding Street
Leicester
LE1 4DH

S **L24/01949/GRM - 24-42528-A**

\# **Project Reference - CASCID-Christie Hospital, Manchester P10525**

Analytical Test Results - 2:1 Leachate Suite

DE	**Lab Reference**		**345253**
	Client Sample ID		-
	Client Sample Location		BH103
	Client Sample Type		ES
	Client Sample Number		-
	Depth - Top (m)		1.40
	Depth - Bottom (m)		1.50
	Date of Sampling		27/02/2024
	Time of Sampling		-
	Sample Matrix		Leachate
	Determinant	**Units**	**Accreditation**	
EN	Boron	(mg/l)	u	0.029
EN	Calcium	(mg/l)	u	48
EN	Iron	(mg/l)	u	< 0.010
EN	Antimony	(µg/l)	u	< 2.5
EN	Arsenic	(µg/l)	u	3
EN	Barium	(µg/l)	u	< 5
EN	Beryllium	(µg/l)	u	< 1
EN	Boron	(µg/l)	u	29
SU	Cadmium (LL)	(µg/l)	u	< 0.25
EN	Chromium	(µg/l)	u	< 3
EN	Chromium (III)	(µg/l)	u	< 20
EN	Copper	(µg/l)	u	< 1
EN	Lead	(µg/l)	u	< 5
EN	Magnesium	(µg/l)	u	68
EN	Manganese	(µg/l)	u	< 5
EN	Mercury	(µg/l)	u	< 0.20
EN	Molydenum	(µg/l)	u	5.7
EN	Nickel	(µg/l)	u	< 3
EN	Selenium	(µg/l)	u	< 1
EN	Vanadium	(µg/l)	u	30.5
EN	Zinc	(µg/l)	u	< 5
EN	pH	pH Units	u	11
EN	Cyanide (Free)	(mg/l)	u	< 0.5
EN	Cyanide (Complex)	(mg/l)	u	< 0.5
EN	Cyanide (Total)	(mg/l)	u	< 0.5
EN	Chromium (Hexavalent)	(mg/l)	u	< 0.02
EN	Chloride	(mg/l)	u	30
EN	Fluoride	(mg/l)	u	0.50
EN	Sulphate (As SO_4)	(mg/l)	u	39
EN	Ammonium (As N)	(mg/l)	u	< 0.02
EN	Phenol	(µg/l)	u	17.0
EN	Cresols	(µg/l)	u	0.81
EN	Xylenols	(µg/l)	u	< 0.20
EN	Trimethyl Phenols	(µg/l)	u	< 0.50
EN	Phenols (Total)	(µg/l)	u	18.0

7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42528-A

Project Reference - CASCID-Christie Hospital, Manchester P10525

Sample Descriptions

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Description	Moisture Content (%)	Stone Content (%)	Passing 2mm test sieve (%)
345250	-	BH104	ES	-	Made Ground- dark greyish brown slightly clayey gravelly silty sand with occasional brick fragments slag bituminous material	16	16	82
345251	-	BH103A	ES	-	Made Ground- black very gravelly silty sand with frequent slag bituminous material brick fragments	5.3	55	20
345252	-	BH103	ES	-	Made Ground- dark brown clayey slightly gravelly silty sand with occasional slag	12	< 0.1	83

4161

7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42528-A

Project Reference - CASCID-Christie Hospital, Manchester P10525

Sample Comments

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Comments
345250	-	BH104	ES	-	VPH/BTEX - Sample taken from container with headspace.
345251	-	BH103A	ES	-	PAHAR 1:10 Dilution VPH/BTEX - Sample taken from container with headspace. VOC - Sample taken from container with headspace.
345252	-	BH103	ES	-	VPH/BTEX - Sample taken from container with headspace. VOC - Sample taken from container with headspace.

L24/01949/GRM - 24-42528-A

Project Reference - CASCID-Christie Hospital, Manchester P10525

Analysis Methodologies

Test Code	Test Name / Reference	Sample condition for analysis	Sample Preperation	Test Details
ANIONSL	MS - CL - Anions by Aquakem	As received	-	Determination of Anions (inc Sulphate, chloride etc.) in leachate samples by Aquakem
ANIONSS	MS - CL - Anions by Aquakem (2:1Extract)	Oven dried	Passing 2mm test sieve	Determination of Anions (inc Sulphate, chloride etc.) in soils by Aquakem. Analysis is based on a 2:1 water to soil extraction ratio
EPHS	MS - CL - EPH in Soil	As received	Passing 10mm test sieve	Determination of Extractable Petroleum Hydrocarbons in soils via GC-MS
PCB7S	MS - CL - PCB Soils	As received	Passing 10mm test sieve	Determination of PCB's (7 congeners) in soils via GC-MS
PAHASRDS	MS - CL - PAH (As Received)	As received	Passing 10mm test sieve	Determination of Polyaromatic hydrocarbons in soil via GC-MS
CWGS	MS - CL - VPH & MS - CL - EPH	As received	Passing 10mm test sieve	Determination of TPH CWG (Volatile Petroleum Hydrocarbons and Extractable Petroleum Hydrocarbons) in soils via Headspace-GC-MS and GC-MS respectively
WACTOCS	MS - CL - TOC Eltra (WAC)	Air dried	Passing 10mm test sieve	Determination of Total Organic Carbon in soil as part of a WAC test
TOCS	MS - CL - TOC Eltra	Air Dried	Passing 10mm test sieve	Determination of Total Organic Carbon in soils
TPHS	MS - CL - TPH (GC-FID)	As received	Passing 10mm test sieve	Determination of Total Petroleum Hydrocarbons in soil using GC-FID
WACSKALAR	MS - CL - Phenols by Skalar (WAC)	As received	BSEN:12457 Leaching	Determination of Total Phenols within leachate as part of a WAC test using a Skalar Segmented flow analyser
VOCS	MS - CL - VOC and MBTEX	As received	Passing 10mm test sieve	Determination of VOCs (inc BTEX) in soils via Headspace-GC-MS
VPHS	MS - CL - VPH	As received	Passing 10mm test sieve	Determination of VPH in soils via Headspace-GC-MS
WSBORONS	MS - CL - WS Boron	Air dried	Passing 10mm test sieve	Determination of Water soluble Boron in soils via ICP
SKALARCNL	MS - CL - Cyanide by Skalar - Leachate	As received	BSEN:12457 Leaching	Determination of cyanide (total / free / complex) in leachates using a Skalar segmented flow analyser
SKALARCNS	MS - CL - Cyanide by Skalar	As received	Passing 10mm test sieve	Determination of cyanide (total / free / complex) in soil using a Skalar segmented flow analyser
WACDOC	MS - CL - DOC (WAC)	As received	BSEN:12457 Leaching	Determination of dissolved organic carbon in a leachate as part of a WAC test
SKALARHCL	MS - CL - Hexavalent Cr by Skalar - L	As received	BSEN:12457 Leaching	Determination of hexavalent chromium in leachate using Skalar segmented flow analyser
SKALARHCS	MS - CL - Hexavalent Chromium by Skalar	As received	Passing 10mm test sieve	Determination of hexavalent chromium in soil using Skalar segmented flow analyser
WACMETALS	MS - CL - ICP - Metals in Waters (WAC)	As received	BSEN:12457 Leaching	Determination of metals in a leachate as part of a WAC test via ICP
ICPMETL	MS - CL - ICP Metals in Waters	As received	BSEN:12457 Leaching	Determination of metals in leachates via ICP
ICPMETS	MS - CL - ICP Metals	Air dried	Passing 10mm test sieve	Determination of metals in soils via ICP
PHL	MS - CL - pH in Waters	As received	BSEN:12457 Leaching	Determination of pH in leachates using a pH probe

7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42528-A

Project Reference - CASCID-Christie Hospital, Manchester P10525

Analysis Methodologies

Test Code	Test Name / Reference	Sample condition for analysis	Sample Preperation	Test Details
WACPHS	MS - CL - pH in Soils (WAC)	As received	BSEN:12457 Leaching	Determination of pH in soils as part of a WAC test via pH probe
PHS	MS - CL - pH in Soils	As received	Passing 10mm test sieve	Determination of pH in soils using a pH probe (using a 1:3 soil to water extraction)
PHOHHPLCL	MS - CL - Phenol Waters by HPLC	As received	BSEN:12457 Leaching	Determination of speciated phenols in leachates using HPLC
PHOHHPLCS	MS - CL - Phenols by HPLC (soil)	As received	Passing 10mm test sieve	Determination of speciated phenols in soil using HPLC
WACANIONS	MS - CL - Anions by Aquakem (WAC)	As received	BSEN:12457 Leaching	Determination of sulphate, chloride and fluoride in a leachate as part of a WAC test using a Aquakem analyser
TDSL	MS-CL-Conductivity in Water(TDS by Calc)	As received	BSEN:12457 Leaching	Determination of total dissolved solids in leachates (by calculation)
ASSO4S	MS - CL - Acid Soluble Sulphate	Oven Dried	Passing 2mm test sieve	Determination of total sulphate in soils by acid extraction followed by ICP analysis
ASB	MS - AS - Asbestos	-	-	Fibre identification is in accordance with in house documented methods which are based on the procedure documented in the HSE Document HSG 248 "Asbestos: The analysts guide for sampling, analysis and clearance procedures"
ENLEACHP	BS EN 12457-2	As Received	-	Leaching in accordance with BSEN 12457-2 (10:1 Ratio)
ENLEACHP2	BS EN 12457-3	As Received	-	Leaching in accordance with BSEN 12457-3
SAMPLEPREP	MS - CL - Sample Preparation	-	-	Preparation of samples (including determination of moisture content) to allow for subsequent analysis
SUBCON-ENV	Subcontract - ENV Lab	-	-	Subcontract testing
1377LOI	BS1377 LoI	Oven dried	Passing 2mm test sieve	Testing was in accordance with BS 1377: Part 3: 2018 + A1 :2021 Clause 6. Determination of the mass loss on ignition. Some information required by BS1377: 2016: Part 1 has not been reported. This information is available on request.
1377TS-ELT	BS1377 Total Sulphur Content by HTC	Oven dried	BS1377 : Part 1 : 2016	Total Sulphur Content testing of Soil in accordance with BS 1377 : Part 3 : 2018 + A1 : 2021 Clause 7.10 (using Eltra CS-800 Analyser)

L24/01949/GRM - 24-42528-A

Project Reference - CASCID-Christie Hospital, Manchester P10525

Sample Deviations

Deviations are listed below against each sample and associated test method, where deviation(s) are noted it means data may not be representative of the sample at the time of sampling and it is possible that results provided may be compromised.

Observations on receipt

A - No date of sampling provided
C - Received in inappropriate container
H - Contains headspace
T - Temperature on receipt exceeds storage temperature
R - Sample(s) received with less than 96 hours for testing to commence/complete, any result formally classed as deviating will be marked with an X against the applicable test (i.e. RX)

Observations whilst in laboratory

X - Exceeds sampling to extraction or analysis timescales

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Test	Deviations
345250	-	BH104	ES	-	MS - CL - Cyanide by Skalar	RX
345250	-	BH104	ES	-	MS - CL - EPH in Soil	RX
345250	-	BH104	ES	-	MS - CL - PAH (As Received)	RX
345250	-	BH104	ES	-	MS - CL - Phenols by HPLC (soil)	RX
345250	-	BH104	ES	-	MS - CL - TPH (GC-FID)	RX
345250	-	BH104	ES	-	MS - CL - VOC and MBTEX	RX
345250	-	BH104	ES	-	MS - CL - VPH	RX
345250	-	BH104	ES	-	MS - CL - pH in Soils	RX
345250	-	BH104	ES	-	MS - CL - pH in Soils (WAC)	RX
345251	-	BH103A	ES	-	MS - CL - Cyanide by Skalar	RX
345251	-	BH103A	ES	-	MS - CL - EPH in Soil	RX
345251	-	BH103A	ES	-	MS - CL - PAH (As Received)	RX
345251	-	BH103A	ES	-	MS - CL - Phenols by HPLC (soil)	RX
345251	-	BH103A	ES	-	MS - CL - VOC and MBTEX	RX
345251	-	BH103A	ES	-	MS - CL - VPH	RX
345251	-	BH103A	ES	-	MS - CL - pH in Soils	RX
345252	-	BH103	ES	-	MS - CL - Cyanide by Skalar	RX
345252	-	BH103	ES	-	MS - CL - EPH in Soil	RX
345252	-	BH103	ES	-	MS - CL - PAH (As Received)	RX
345252	-	BH103	ES	-	MS - CL - Phenols by HPLC (soil)	RX
345252	-	BH103	ES	-	MS - CL - TPH (GC-FID)	RX
345252	-	BH103	ES	-	MS - CL - VOC and MBTEX	RX
345252	-	BH103	ES	-	MS - CL - VPH	RX
345252	-	BH103	ES	-	MS - CL - pH in Soils	RX
345252	-	BH103	ES	-	MS - CL - pH in Soils (WAC)	RX

L24/01949/GRM - 24-42528-A

Project Reference - CASCID-Christie Hospital, Manchester P10525

HWOL TPH Acronym Index

Acronym	Description
HS	Headspace Analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
Total	Aliphatics and Aromatics
AL	Aliphatics Only
AR	Aromatics Only
2D	GC-GC - Double Coil Gas Chromatography
#1	EH_Total but with humics mathmatically subtracted
#2	EH_Total but with fatty acids mathmatically subtracted
_	Operator - underscore to separate acronyms (except for +)
+	Operator to indicate cumlative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry

4161

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

GRM Development Solutions
Laurus House
First Avenue
Centrum 100
Burton Upon Trent
DE14 2WH

Analytical Test Report: L24/01949/GRM - 24-42792

Your Project Reference:	**P10525 CASCID - Christie Hospital, Manchester**		
Your Order Number:	P10525	Samples Received / Instructed:	12/03/2024 / 12/03/2024
Report Issue Number:	1	Sample Tested:	12/03 to 26/03/2024
Samples Analysed:	5 soil samples	Report issued:	26/03/2024

Signed

James Gane
Analytical Services Manager
CTS Group

Notes:

General

Please refer to Methodologies page for details pertaining to the analytical methods undertaken.

Samples will be retained for 14 days after issue of this report with the exception of the asbestos test portion which is held for 6 months unless otherwise requested.

Moisture Content was determined in accordance with CTS method statement MS - CL - Sample Prep, oven dried at <30˚C.

Moisture Content is reported as a percentage of the dry mass of soil, this calculation is in accordance with BS1377, Part 2, 1990, Clause 3.2

Stone Content was determined in accordance with CTS method statement MS - CL - Sample Prep and refers to the percentage of stones retained on a 10mm BS test sieve.

Where specification limits are included these are for guidance only. Where a measured value has been highlighted this is not implying acceptance or failure and certainty of measurement values have not been taken into account.

Uncertainty of measurement values are available on request.

Samples were supplied by customer, results apply to the samples as received.

Asbestos

Please note: Where futher analaysis is required samples identified as containing asbestos are screened and tested on an as recevied basis. No correction is made for moisture content and these results are not covered by our accrediation

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation

WAC Testing

Samples were leached in accordance with BS EN 12457-2: 2002.

Eluate Results are reported as L/S 10. These results have been calculated in accordance with BS EN 12457-2:2002.

Comparative values are taken from the Council Decision Annex - CRITERIA AND PROCEDURES FOR THE ACCEPTANCE OF WASTE AT LANDFILLS, (2003/33/EC).

Deviating Samples

On receipt samples are compared against our sample holding and handling protocols, where any deviations have been noted these are reported on our deviating sample page (if present)

Accreditation Key

UKAS = UKAS Accreditation, MCERTS = MCERTS Accreditation, u = Unaccredited, subUKAS - Subcontracted to a laboratory UKAS accredited for this test

MCERTS Accreditation only covers the SAND, CLAY and LOAM matrices

Date of Issue: 18.03.2024

Issued by: J. Gane

Issue No: 4

Rev No: 6

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42792

Project Reference - P10525 CASCID - Christie Hospital, Manchester

Analytical Test Results - Solid

Lab Reference			346673	346674	346676
Client Sample ID			-	-	-
Client Sample Location			TP106	TP107	TP101
Client Sample Type			ES	ES	ES
Client Sample Number			-	-	-
Depth - Top (m)			0.40	0.40	0.40
Depth - Bottom (m)			0.40	0.40	0.50
Date of Sampling			27/02/2024	27/02/2024	27/02/2024
Time of Sampling			-	-	-
Sample Matrix			Sand	Clay	Sand
Determinant	**Units**	**Accreditation**			
Antimony	(mg/kg)	u	< 3.5	< 3.5	< 3.5
Arsenic	(mg/kg)	MCERTS	< 10	78	14
Barium	(mg/kg)	MCERTS	100	280	110
Beryllium	(mg/kg)	MCERTS	0.5	1.2	0.8
Boron (w/s)	(mg/kg)	u	< 2.5	< 2.5	< 2.5
Cadmium	(mg/kg)	MCERTS	0.5	1.2	0.7
Chromium (III)	(mg/kg)	u	5.0	8.2	6.9
Chromium (Total)	(mg/kg)	UKAS	6.0	9.2	7.9
Copper	(mg/kg)	MCERTS	32	210	49
Iron	(mg/kg)	u	17000	33000	21000
Lead	(mg/kg)	MCERTS	330	590	92
Manganese	(mg/kg)	MCERTS	240	880	380
Mercury	(mg/kg)	UKAS	< 2.5	< 2.5	< 2.5
Mercury Total (Low Level)	(mg/kg)	u	< 0.1	0.5	< 0.1
Molybdenum	(mg/kg)	u	< 2.0	< 2.0	< 2.0
Nickel	(mg/kg)	MCERTS	13	27	14
Selenium	(mg/kg)	u	< 8.0	< 8.0	< 8.0
Vanadium	(mg/kg)	UKAS	21	31	26
Zinc	(mg/kg)	MCERTS	66	360	52
Phenol	(mg/kg)	MCERTS	< 0.20	< 0.20	< 0.20
Cresols	(mg/kg)	MCERTS	< 0.20	< 0.20	< 0.20
Xylenols	(mg/kg)	MCERTS	< 0.20	< 0.20	< 0.20
Trimethyl Phenols	(mg/kg)	UKAS	< 0.20	< 0.20	< 0.20
Total Phenols (via HPLC)	(mg/kg)	UKAS	< 0.80	< 0.80	< 0.80
Cyanide (Free)	(mg/kg)	u	< 1.0	< 1.0	< 1.0
Chromium (Hexavalent)	(mg/kg)	u	< 1.0	< 1.0	< 1.0
pH	pH Units	MCERTS	8.5	7.9	7.3
Sulphate (Water soluble as SO_4)	(mg/l)	u	< 10	< 10	< 10
Sulphur (Total)	(%)	UKAS	0.02	0.01	0.02
Acenaphthene	(mg/kg)	MCERTS	0.02	0.04	< 0.02
Acenaphthylene	(mg/kg)	UKAS	< 0.02	< 0.02	< 0.02
Anthracene	(mg/kg)	UKAS	0.06	0.06	< 0.02
Benzo (a) anthracene	(mg/kg)	MCERTS	0.28	0.24	0.07
Benzo (a) pyrene	(mg/kg)	MCERTS	0.30	0.25	0.07
Benzo (b) fluoranthene	(mg/kg)	MCERTS	0.34	0.30	0.12
Benzo (g, h, i) perylene	(mg/kg)	MCERTS	0.20	0.17	0.06
Benzo (k) fluoranthene	(mg/kg)	MCERTS	0.12	0.10	0.03
Chrysene	(mg/kg)	MCERTS	0.38	0.37	0.10
Dibenzo (a,h) anthracene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02
Fluoranthene	(mg/kg)	MCERTS	0.62	0.58	0.14
Fluorene	(mg/kg)	MCERTS	< 0.02	0.03	< 0.02
Indeno (1, 2, 3,-cd) pyrene	(mg/kg)	MCERTS	0.17	0.15	0.07
Naphthalene	(mg/kg)	MCERTS	0.04	0.11	< 0.02

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42792

Project Reference - P10525 CASCID - Christie Hospital, Manchester

Analytical Test Results - Solid

Lab Reference			346673	346674	346676
Client Sample ID			-	-	-
Client Sample Location			TP106	TP107	TP101
Client Sample Type			ES	ES	ES
Client Sample Number			-	-	-
Depth - Top (m)			0.40	0.40	0.40
Depth - Bottom (m)			0.40	0.40	0.50
Date of Sampling			27/02/2024	27/02/2024	27/02/2024
Time of Sampling			-	-	-
Sample Matrix			Sand	Clay	Sand
Determinant	**Units**	**Accreditation**			
Phenanthrene	(mg/kg)	MCERTS	0.43	0.46	0.07
Pyrene	(mg/kg)	MCERTS	0.63	0.60	0.15
Total PAH (Sum of USEPA 16)	(mg/kg)	UKAS	3.7	3.5	1.0
FOC	-	UKAS	0.011	0.036	0.033
Asbestos	-	UKAS	No asbestos detected	No asbestos detected	No asbestos detected

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42792

Project Reference - P10525 CASCID - Christie Hospital, Manchester

Analytical Test Results - Chemical Analysis

Lab Reference			346673	346675	346676
Client Sample ID			-	-	-
Client Sample Location			TP106	TP102	TP101
Client Sample Type			ES	ES	ES
Client Sample Number			-	-	-
Depth - Top (m)			0.40	0.30	0.40
Depth - Bottom (m)			0.40	0.40	0.50
Date of Sampling			27/02/2024	27/02/2024	27/02/2024
Time of Sampling			-	-	-
Sample Matrix			Sand	Sand	Sand
Determinant	**Units**	**Accreditation**			
Water soluble sulphate (as SO_4)	(mg/l)	u	< 10	< 10	< 10
Acid Soluble Sulphate	(%)	u	0.02	0.02	0.02
Total Sulphur	(%)	UKAS	0.02	0.02	0.02
pH Value	pH Units	MCERTS	8.5	7.6	7.3

7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42792

Project Reference - P10525 CASCID - Christie Hospital, Manchester

Analytical Test Results - VPH / EPH

Lab Reference			346673	346674	346676
Client Sample ID			-	-	-
Client Sample Location			TP106	TP107	TP101
Client Sample Type			ES	ES	ES
Client Sample Number			-	-	-
Depth - Top (m)			0.40	0.40	0.40
Depth - Bottom (m)			0.40	0.40	0.50
Date of Sampling			27/02/2024	27/02/2024	27/02/2024
Time of Sampling			-	-	-
Sample Matrix			Sand	Clay	Sand
Determinant	**Units**	**Accreditation**			
Aliphatic >C_5 to C_6 [HS_MS_1D_AL]	(mg/kg)	MCERTS	< 0.06	< 0.06	< 0.06
Aliphatic >C_6 to C_8 [HS_MS_1D_AL]	(mg/kg)	MCERTS	< 0.06	< 0.06	< 0.06
Aliphatic >C_8 to C_{10} [HS_MS_1D_AL]	(mg/kg)	MCERTS	< 0.06	< 0.06	< 0.06
Aliphatic >C_{10} to C_{12} [EH_CU_1D_AL]	(mg/kg)	u	< 10	< 10	< 10
Aliphatic >C_{12} to C_{16} [EH_CU_1D_AL]	(mg/kg)	u	< 10	< 10	< 10
Aliphatic >C_{16} to C_{21} [EH_CU_1D_AL]	(mg/kg)	u	< 10	< 10	< 10
Aliphatic >C_{21} to C_{35} [EH_CU_1D_AL]	(mg/kg)	u	< 20	< 20	31
Aliphatic >C_{35} to C_{44} [EH_CU_1D_AL]	(mg/kg)	u	< 15	< 15	27
Aromatic >C_5 to C_7 [HS_MS_1D_AR]	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Aromatic >C_7 to C_8 [HS_MS_1D_AR]	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Aromatic >C_8 to C_{10} [HS_MS_1D_AR]	(mg/kg)	MCERTS	< 0.06	< 0.06	< 0.06
Aromatic >C_{10} to C_{12} [EH_CU_1D_AR]	(mg/kg)	u	< 10	< 10	< 10
Aromatic >C_{12} to C_{16} [EH_CU_1D_AR]	(mg/kg)	u	< 10	< 10	< 10
Aromatic >C_{16} to C_{21} [EH_CU_1D_AR]	(mg/kg)	u	< 10	< 10	< 10
Aromatic >C_{21} to C_{35} [EH_CU_1D_AR]	(mg/kg)	u	< 20	< 20	61
Aromatic >C_{35} to C_{44} [EH_CU_1D_AR]	(mg/kg)	u	< 15	< 15	75
Total >C_5 to C_{35} [EH_CU+HS_1D_Total]	(mg/kg)	u	< 50	< 50	92
Benzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Toluene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Ethylbenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
m&p Xylene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02
o-Xylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
MTBE	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01

4161

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42792

Project Reference - P10525 CASCID - Christie Hc

Analytical Test Results - VOC

Lab Reference			346673	346674	346676
Client Sample ID			-	-	-
Client Sample Location			TP106	TP107	TP101
Client Sample Type			ES	ES	ES
Client Sample Number			-	-	-
Depth - Top (m)			0.40	0.40	0.40
Depth - Bottom (m)			0.40	0.40	0.50
Date of Sampling			27/02/2024	27/02/2024	27/02/2024
Time of Sampling			-	-	-
Sample Matrix			Sand	Clay	Sand
Determinant	**Units**	**Accreditation**			
Benzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Toluene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Ethylbenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
m&p Xylene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02
o-Xylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Dichlorodifluoromethane	(mg/kg)	UKAS	< 0.05	< 0.05	< 0.05
Chloromethane	(mg/kg)	UKAS	< 0.02	< 0.02	< 0.02
Vinyl Chloride	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02
Bromomethane	(mg/kg)	u	< 0.05	< 0.05	< 0.05
Chloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Trichlorofluoromethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,1-Dichloroethylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Dichloromethane	(mg/kg)	u	< 0.10	< 0.10	< 0.10
MTBE	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
trans-1,2,-dichloroethylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,1-Dichloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
2,2-Dichloropropane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
cis--1,2,-dichloroethylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Bromochloromethane	(mg/kg)	MCERTS	< 0.05	< 0.05	< 0.05
Chloroform	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,1,1-Trichloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,1-Dichloropropene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Carbon Tetrachloride	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,2-dichloroethane	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02
Trichloroethylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,2-Dichloropropane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Dibromomethane	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02
Bromodichloromethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
cis-1,2-dichloropropylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
trans-1,3-dichloropropylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,1,2-Trichloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,3-Dichloropropane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Tetrachloroethylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Chlorodibromomethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,2-Dibromoethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Chlorobenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,1,1,2-tetrachloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Styrene	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01
Isopropylbenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Bromoform	(mg/kg)	MCERTS	< 0.05	< 0.05	< 0.05
1,1,2,2-Tetrachloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,2,3-Trichloropropane	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02
n-Propylbenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Bromobenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,3,5-Trimethylbenzene	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01
2-chlorotoluene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
4-chlorotoluene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
tert-butylbenzene	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01
1,2,4-trimethylbenzene	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01
sec-Butylbenzene	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01
4-Isopropyltoluene (P-Cymene)	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01
1,3-Dichlorobenzene	(mg/kg)	u	< 0.01	< 0.01	< 0.01
1,4-Dichlorobenzene	(mg/kg)	u	< 0.01	< 0.01	< 0.01
n-Butylbenzene	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01
1,2-Dichlorobenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,2-Dibromo-3-chloropropane	(mg/kg)	u	< 0.05	< 0.05	< 0.05
1,2,4-Trichlorobenzene	(mg/kg)	u	< 0.05	< 0.05	< 0.05
Hexachlorobutadiene	(mg/kg)	u	< 0.05	< 0.05	< 0.05
Naphthalene	(mg/kg)	u	< 0.05	< 0.05	< 0.05
1,2,3-Trichlorobenzene	(mg/kg)	u	< 0.05	< 0.05	< 0.05

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42792

Project Reference - P10525 CASCID - Christie Hospital, Manchester

Certificate Of Analysis - WAC Suite

Lab Reference	346674
Client Sample ID	-
Client Sample Location	TP107
Client Sample Type	ES
Client Sample Number	-
Depth - Top (m)	0.4
Depth - Bottom (m)	0.4
Date of Sampling	27/02/2024
Time of Sampling	-
Sample Description	Brown slightly gravelly very sandy silty clay
Sample Matrix	Clay
Moisture Content (%)	23
Stone content (%)	1.7

			Determined Result	Inert Waste Landfill	Stable non reactive hazardous waste in a non hazardous landfill	Hazardous Waste Landfill
Solid Analysis						
Total Organic Carbon	%	MCERTS	3.6	3.0	5.0	6.0
Loss on Ignition	%	UKAS	3.7	-	-	10.0
BTEX	mg/kg	MCERTS	< 0.06	6.00	-	-
PCB's (7 Congeners)	mg/kg	u	< 0.028	1.00	-	-
Mineral Oil (>C_{10} to C_{40}) [EH_1D_Total]	mg/kg	MCERTS	132	500	-	-
PAH	mg/kg	u	3.6	100	-	-
pH	units	MCERTS	7.9	-	> 6	-
Eluate Analysis						
Arsenic	mg/kg	u	0.14	0.50	2	25
Barium	mg/kg	u	0.07	20	100	300
Cadmium	mg/kg	u	< 0.03	0.04	1	5
Chromium (total)	mg/kg	u	< 0.03	0.5	10	70
Copper	mg/kg	u	< 0.01	2.0	50	100
Mercury	mg/kg	u	< 0.01	0.01	0.2	2
Molybdenum	mg/kg	u	< 0.03	0.5	10.0	30
Nickel	mg/kg	u	< 0.03	0.4	10.0	40
Lead	mg/kg	u	< 0.05	0.5	10.0	50
Antimony	mg/kg	u	< 0.03	0.06	0.7	5
Selenium	mg/kg	u	< 0.01	0.1	0.5	7
Zinc	mg/kg	u	< 0.05	4	50	200
Chloride	mg/kg	u	< 1	800	15000	25000
Fluoride	mg/kg	u	2	10	150	500
Sulphate (as SO_4)	mg/kg	u	23	1000	20000	50000
Total Dissolved Solids	mg/kg	u	520	4000	60000	100000
Phenol Index	mg/kg	u	< 1.0	1	-	-
Dissolved Organic Carbon	mg/kg	u	29.0	500	800	1000

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42792

Project Reference - P10525 CASCID - Christie Hospital, Manchester

Certificate Of Analysis - WAC Suite

Lab Reference	346675
Client Sample ID	-
Client Sample Location	TP102
Client Sample Type	ES
Client Sample Number	-
Depth - Top (m)	0.3
Depth - Bottom (m)	0.4
Date of Sampling	27/02/2024
Time of Sampling	-
Sample Description	Made Ground- mottled reddish brown slightly gravelly slightly clayey silty sand with occasional brick fragments
Sample Matrix	Sand
Moisture Content (%)	18
Stone content (%)	17

			Determined Result	Inert Waste Landfill	Stable non reactive hazardous waste in a non hazardous landfill	Hazardous Waste Landfill
Solid Analysis						
Total Organic Carbon	%	MCERTS	3.2	3.0	5.0	6.0
Loss on Ignition	%	UKAS	3.6	-	-	10.0
BTEX	mg/kg	MCERTS	< 0.06	6.00	-	-
PCB's (7 Congeners)	mg/kg	u	< 0.028	1.00	-	-
Mineral Oil (>C_{10} to C_{40}) [EH_1D_Total]	mg/kg	MCERTS	572	500	-	-
PAH	mg/kg	u	1.3	100	-	-
pH	units	MCERTS	7.6	-	> 6	-
Eluate Analysis						
Arsenic	mg/kg	u	< 0.03	0.50	2	25
Barium	mg/kg	u	0.05	20	100	300
Cadmium	mg/kg	u	< 0.03	0.04	1	5
Chromium (total)	mg/kg	u	< 0.03	0.5	10	70
Copper	mg/kg	u	< 0.01	2.0	50	100
Mercury	mg/kg	u	< 0.01	0.01	0.2	2
Molybdenum	mg/kg	u	0.04	0.5	10.0	30
Nickel	mg/kg	u	< 0.03	0.4	10.0	40
Lead	mg/kg	u	< 0.05	0.5	10.0	50
Antimony	mg/kg	u	< 0.03	0.06	0.7	5
Selenium	mg/kg	u	< 0.01	0.1	0.5	7
Zinc	mg/kg	u	< 0.05	4	50	200
Chloride	mg/kg	u	< 1	800	15000	25000
Fluoride	mg/kg	u	1	10	150	500
Sulphate (as SO_4)	mg/kg	u	24	1000	20000	50000
Total Dissolved Solids	mg/kg	u	680	4000	60000	100000
Phenol Index	mg/kg	u	< 1.0	1	-	-
Dissolved Organic Carbon	mg/kg	u	71.0	500	800	1000

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

S **L24/01949/GRM - 24-42792**

\# **Project Reference - P10525 CASCID - Christie Hospital, Manchester**

Analytical Test Results - 2:1 Leachate Suite

DE	Lab Reference			346676	346677
	Client Sample ID			-	-
	Client Sample Location			TP101	BH104
	Client Sample Type			ES	ES
	Client Sample Number			-	-
	Depth - Top (m)			0.40	1.50
	Depth - Bottom (m)			0.50	1.70
	Date of Sampling			27/02/2024	27/02/2024
	Time of Sampling			-	-
	Sample Matrix			Leachate	Leachate
	Determinant	**Units**	**Accreditation**		
EN	Boron	(mg/l)	u	0.006	0.022
EN	Calcium	(mg/l)	u	46	8.3
EN	Iron	(mg/l)	u	0.38	< 0.010
EN	Antimony	(µg/l)	u	3.3	< 2.5
EN	Arsenic	(µg/l)	u	< 3	< 3
EN	Barium	(µg/l)	u	26	28
EN	Beryllium	(µg/l)	u	< 1	< 1
EN	Boron	(µg/l)	u	6	22
SU	Cadmium (LL)	(µg/l)	u	< 0.25	< 0.25
EN	Chromium	(µg/l)	u	< 3	< 3
EN	Chromium (III)	(µg/l)	u	< 20	< 20
EN	Copper	(µg/l)	u	3	< 1
EN	Lead	(µg/l)	u	< 5	< 5
EN	Magnesium	(µg/l)	u	870	790
EN	Manganese	(µg/l)	u	< 5	21
SU	Mercury (LL)	(µg/l)	u	< 0.20	< 0.20
EN	Molydenum	(µg/l)	u	14	4.4
EN	Nickel	(µg/l)	u	< 3	< 3
EN	Selenium	(µg/l)	u	< 1	< 1
EN	Vanadium	(µg/l)	u	49.0	< 2.50
EN	Zinc	(µg/l)	u	< 5	120
EN	pH	pH Units	u	7.8	7.9
EN	Cyanide (Free)	(mg/l)	u	< 0.5	< 0.5
EN	Cyanide (Complex)	(mg/l)	u	< 0.5	< 0.5
EN	Cyanide (Total)	(mg/l)	u	< 0.5	< 0.5
EN	Chromium (Hexavalent)	(mg/l)	u	< 0.02	< 0.02
EN	Chloride	(mg/l)	u	2.4	0.72
EN	Fluoride	(mg/l)	u	0.47	0.13
EN	Sulphate (As SO_4)	(mg/l)	u	< 10	< 10
EN	Ammonium (As N)	(mg/l)	u	0.39	< 0.02
EN	Phenol	(µg/l)	u	12.9	18.3
EN	Cresols	(µg/l)	u	0.34	0.91
EN	Xylenols	(µg/l)	u	< 0.20	< 0.20
EN	Trimethyl Phenols	(µg/l)	u	< 0.50	< 0.50
EN	Phenols (Total)	(µg/l)	u	13.2	19.4

4161

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42792

Project Reference - P10525 CASCID - Christie Hospital, Manchester

Sample Descriptions

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Description	Moisture Content (%)	Stone Content (%)	Passing 2mm test sieve (%)
346673	-	TP106	ES	-	Mottled reddish brown gravelly slightly clayey silty sand	10	28	66
346674	-	TP107	ES	-	Brown slightly gravelly very sandy silty clay	23	1.7	81
346675	-	TP102	ES	-	Made Ground- mottled reddish brown slightly gravelly slightly clayey silty sand with occasional brick fragments	18	17	72
346676	-	TP101	ES	-	Made Ground- mottled reddish brown slightly gravelly slightly clayey silty sand with occasional brick fragments	18	13	89

7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42792

Project Reference - P10525 CASCID - Christie Hospital, Manchester

Sample Comments

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Comments
346673	-	TP106	ES	-	VOC - Sample taken from container with headspace. VPH/BTEX - Sample taken from container with headspace.
346674	-	TP107	ES	-	VOC - Sample taken from container with headspace. VPH/BTEX - Sample taken from container with headspace.
346675	-	TP102	ES	-	VPH/BTEX - Sample taken from container with headspace.
346676	-	TP101	ES	-	VOC - Sample taken from container with headspace. VPH/BTEX - Sample taken from container with headspace.

7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42792

Project Reference - P10525 CASCID - Christie Hospital, Manchester

Analysis Methodologies

Test Code	Test Name / Reference	Sample condition for analysis	Sample Preperation	Test Details
ANIONSL	MS - CL - Anions by Aquakem	As received	-	Determination of Anions (inc Sulphate, chloride etc.) in leachate samples by Aquakem
ANIONSS	MS - CL - Anions by Aquakem (2:1Extract)	Oven dried	Passing 2mm test sieve	Determination of Anions (inc Sulphate, chloride etc.) in soils by Aquakem. Analysis is based on a 2:1 water to soil extraction ratio
EPHS	MS - CL - EPH in Soil	As received	Passing 10mm test sieve	Determination of Extractable Petroleum Hydrocarbons in soils via GC-MS
PCB7S	MS - CL - PCB Soils	As received	Passing 10mm test sieve	Determination of PCB's (7 congeners) in soils via GC-MS
PAHASRDS	MS - CL - PAH (As Received)	As received	Passing 10mm test sieve	Determination of Polyaromatic hydrocarbons in soil via GC-MS
CWGS	MS - CL - VPH & MS - CL - EPH	As received	Passing 10mm test sieve	Determination of TPH CWG (Volatile Petroleum Hydrocarbons and Extractable Petroleum Hydrocarbons) in soils via Headspace-GC-MS and GC-MS respectively
WACTOCS	MS - CL - TOC Eltra (WAC)	Air dried	Passing 10mm test sieve	Determination of Total Organic Carbon in soil as part of a WAC test
TOCS	MS - CL - TOC Eltra	Air Dried	Passing 10mm test sieve	Determination of Total Organic Carbon in soils
TPHS	MS - CL - TPH (GC-FID)	As received	Passing 10mm test sieve	Determination of Total Petroleum Hydrocarbons in soil using GC-FID
WACSKALAR	MS - CL - Phenols by Skalar (WAC)	As received	BSEN:12457 Leaching	Determination of Total Phenols within leachate as part of a WAC test using a Skalar Segmented flow analyser
VOCS	MS - CL - VOC and MBTEX	As received	Passing 10mm test sieve	Determination of VOCs (inc BTEX) in soils via Headspace-GC-MS
VPHS	MS - CL - VPH	As received	Passing 10mm test sieve	Determination of VPH in soils via Headspace-GC-MS
WSBORONS	MS - CL - WS Boron	Air dried	Passing 10mm test sieve	Determination of Water soluble Boron in soils via ICP
SKALARCNL	MS - CL - Cyanide by Skalar - Leachate	As received	BSEN:12457 Leaching	Determination of cyanide (total / free / complex) in leachates using a Skalar segmented flow analyser
SKALARCNS	MS - CL - Cyanide by Skalar	As received	Passing 10mm test sieve	Determination of cyanide (total / free / complex) in soil using a Skalar segmented flow analyser
WACDOC	MS - CL - DOC (WAC)	As received	BSEN:12457 Leaching	Determination of dissolved organic carbon in a leachate as part of a WAC test
SKALARHCL	MS - CL - Hexavalent Cr by Skalar - L	As received	BSEN:12457 Leaching	Determination of hexavalent chromium in leachate using Skalar segmented flow analyser
SKALARHCS	MS - CL - Hexavalent Chromium by Skalar	As received	Passing 10mm test sieve	Determination of hexavalent chromium in soil using Skalar segmented flow analyser
WACMETALS	MS - CL - ICP - Metals in Waters (WAC)	As received	BSEN:12457 Leaching	Determination of metals in a leachate as part of a WAC test via ICP
ICPMETL	MS - CL - ICP Metals in Waters	As received	BSEN:12457 Leaching	Determination of metals in leachates via ICP
ICPMETS	MS - CL - ICP Metals	Air dried	Passing 10mm test sieve	Determination of metals in soils via ICP
PHL	MS - CL - pH in Waters	As received	BSEN:12457 Leaching	Determination of pH in leachates using a pH probe

7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42792

Project Reference - P10525 CASCID - Christie Hospital, Manchester

Analysis Methodologies

Test Code	Test Name / Reference	Sample condition for analysis	Sample Preperation	Test Details
WACPHS	MS - CL - pH in Soils (WAC)	As received	BSEN:12457 Leaching	Determination of pH in soils as part of a WAC test via pH probe
PHS	MS - CL - pH in Soils	As received	Passing 10mm test sieve	Determination of pH in soils using a pH probe (using a 1:3 soil to water extraction)
PHOHHPLCL	MS - CL - Phenol Waters by HPLC	As received	BSEN:12457 Leaching	Determination of speciated phenols in leachates using HPLC
PHOHHPLCS	MS - CL - Phenols by HPLC (soil)	As received	Passing 10mm test sieve	Determination of speciated phenols in soil using HPLC
WACANIONS	MS - CL - Anions by Aquakem (WAC)	As received	BSEN:12457 Leaching	Determination of sulphate, chloride and fluoride in a leachate as part of a WAC test using a Aquakem analyser
TDSL	MS-CL-Conductivity in Water(TDS by Calc)	As received	BSEN:12457 Leaching	Determination of total dissolved solids in leachates (by calculation)
ASSO4S	MS - CL - Acid Soluble Sulphate	Oven Dried	Passing 2mm test sieve	Determination of total sulphate in soils by acid extraction followed by ICP analysis
ASB	MS - AS - Asbestos	-	-	Fibre identification is in accordance with in house documented methods which are based on the procedure documented in the HSE Document HSG 248 "Asbestos: The analysts guide for sampling, analysis and clearance procedures"
ENLEACHP	BS EN 12457-2	As Received	-	Leaching in accordance with BSEN 12457-2 (10:1 Ratio)
ENLEACHP2	BS EN 12457-3	As Received	-	Leaching in accordance with BSEN 12457-3
SAMPLEPREP	MS - CL - Sample Preparation	-	-	Preparation of samples (including determination of moisture content) to allow for subsequent analysis
SUBCON-ENV	Subcontract - ENV Lab	-	-	Subcontract testing
1377LOI	BS1377 LoI	Oven dried	Passing 2mm test sieve	Testing was in accordance with BS 1377: Part 3: 2018 + A1 :2021 Clause 6. Determination of the mass loss on ignition. Some information required by BS1377: 2016: Part 1 has not been reported. This information is available on request.
1377TS-ELT	BS1377 Total Sulphur Content by HTC	Oven dried	BS1377 : Part 1 : 2016	Total Sulphur Content testing of Soil in accordance with BS 1377 : Part 3 : 2018 + A1 : 2021 Clause 7.10 (using Eltra CS-800 Analyser)

7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42792

Project Reference - P10525 CASCID - Christie Hospital, Manchester

Sample Deviations

Deviations are listed below against each sample and associated test method, where deviation(s) are noted it means data may not be representative of the sample at the time of sampling and it is possible that results provided may be compromised.

Observations on receipt

A - No date of sampling provided
C - Received in inappropriate container
H - Contains headspace
T - Temperature on receipt exceeds storage temperature
R - Sample(s) received with less than 96 hours for testing to commence/complete, any result formally classed as deviating will be marked with an X against the applicable test (i.e. RX)

Observations whilst in laboratory

X - Exceeds sampling to extraction or analysis timescales

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Test	Deviations
346673	-	TP106	ES	-	MS - CL - Cyanide by Skalar	RX
346673	-	TP106	ES	-	MS - CL - EPH in Soil	RX
346673	-	TP106	ES	-	MS - CL - PAH (As Received)	RX
346673	-	TP106	ES	-	MS - CL - Phenols by HPLC (soil)	RX
346673	-	TP106	ES	-	MS - CL - VOC and MBTEX	RX
346673	-	TP106	ES	-	MS - CL - VPH	RX
346673	-	TP106	ES	-	MS - CL - pH in Soils	RX
346674	-	TP107	ES	-	MS - CL - Cyanide by Skalar	RX
346674	-	TP107	ES	-	MS - CL - EPH in Soil	RX
346674	-	TP107	ES	-	MS - CL - PAH (As Received)	RX
346674	-	TP107	ES	-	MS - CL - Phenols by HPLC (soil)	RX
346674	-	TP107	ES	-	MS - CL - TPH (GC-FID)	RX
346674	-	TP107	ES	-	MS - CL - VOC and MBTEX	RX
346674	-	TP107	ES	-	MS - CL - VPH	RX
346674	-	TP107	ES	-	MS - CL - pH in Soils	RX
346674	-	TP107	ES	-	MS - CL - pH in Soils (WAC)	RX
346675	-	TP102	ES	-	MS - CL - PAH (As Received)	RX
346675	-	TP102	ES	-	MS - CL - TPH (GC-FID)	RX
346675	-	TP102	ES	-	MS - CL - VPH	RX
346675	-	TP102	ES	-	MS - CL - pH in Soils	RX
346675	-	TP102	ES	-	MS - CL - pH in Soils (WAC)	RX
346676	-	TP101	ES	-	MS - CL - Cyanide by Skalar	RX
346676	-	TP101	ES	-	MS - CL - EPH in Soil	RX
346676	-	TP101	ES	-	MS - CL - PAH (As Received)	RX
346676	-	TP101	ES	-	MS - CL - Phenols by HPLC (soil)	RX
346676	-	TP101	ES	-	MS - CL - VOC and MBTEX	RX
346676	-	TP101	ES	-	MS - CL - VPH	RX
346676	-	TP101	ES	-	MS - CL - pH in Soils	RX

L24/01949/GRM - 24-42792

Project Reference - P10525 CASCID - Christie Hospital, Manchester

HWOL TPH Acronym Index

Acronym	Description
HS	Headspace Analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
Total	Aliphatics and Aromatics
AL	Aliphatics Only
AR	Aromatics Only
2D	GC-GC - Double Coil Gas Chromatography
#1	EH_Total but with humics mathmatically subtracted
#2	EH_Total but with fatty acids mathmatically subtracted
_	Operator - underscore to separate acronyms (except for +)
+	Operator to indicate cumlative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry

7 - 11 Harding Street
Leicester
LE1 4DH

GRM Development Solutions
Laurus House
First Avenue
Centrum 100
Burton Upon Trent
DE14 2WH

Analytical Test Report: L24/02224/GRM - 24-42845

Your Project Reference:	**P10525 CASCID - Christie Hospital, Manchester**		
Your Order Number:	P10525	Samples Received / Instructed:	13/03/2024 / 13/03/2024
Report Issue Number:	1	Sample Tested:	13/03 to 28/03/2024
Samples Analysed:	4 soil samples	Report issued:	28/03/2024

Signed

James Gane
Analytical Services Manager
CTS Group

Notes:

General

Please refer to Methodologies page for details pertaining to the analytical methods undertaken.

Samples will be retained for 14 days after issue of this report with the exception of the asbestos test portion which is held for 6 months unless otherwise requested.

Moisture Content was determined in accordance with CTS method statement MS - CL - Sample Prep, oven dried at <30˚C.

Moisture Content is reported as a percentage of the dry mass of soil, this calculation is in accordance with BS1377, Part 2, 1990, Clause 3.2

Stone Content was determined in accordance with CTS method statement MS - CL - Sample Prep and refers to the percentage of stones retained on a 10mm BS test sieve.

Where specification limits are included these are for guidance only. Where a measured value has been highlighted this is not implying acceptance or failure and certainty of measurement values have not been taken into account.

Uncertainty of measurement values are available on request.

Samples were supplied by customer, results apply to the samples as received.

Asbestos

Please note: Where futher analaysis is required samples identified as containing asbestos are screened and tested on an as recevied basis. No correction is made for moisture content and these results are not covered by our accrediation

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation

WAC Testing

Samples were leached in accordance with BS EN 12457-2: 2002.

Eluate Results are reported as L/S 10. These results have been calculated in accordance with BS EN 12457-2:2002.

Comparative values are taken from the Council Decision Annex - CRITERIA AND PROCEDURES FOR THE ACCEPTANCE OF WASTE AT LANDFILLS, (2003/33/EC).

Deviating Samples

On receipt samples are compared against our sample holding and handling protocols, where any deviations have been noted these are reported on our deviating sample page (if present)

Accreditation Key

UKAS = UKAS Accreditation, MCERTS = MCERTS Accreditation, u = Unaccredited, subUKAS - Subcontracted to a laboratory UKAS accredited for this test

MCERTS Accreditation only covers the SAND, CLAY and LOAM matrices

Date of Issue: 18.03.2024

Issued by: J. Gane

Issue No: 4

Rev No: 6

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/02224/GRM - 24-42845

Project Reference - P10525 CASCID - Christie Hospital, Manchester

Analytical Test Results - Solid

Lab Reference			346893	346895	346896
Client Sample ID			-	-	-
Client Sample Location			BH101	BH102	TP104
Client Sample Type			ES	ES	ES
Client Sample Number			-	-	-
Depth - Top (m)			1.00	0.30	0.30
Depth - Bottom (m)			1.10	0.40	0.40
Date of Sampling			11/03/2024	11/03/2024	11/03/2024
Time of Sampling			-	-	-
Sample Matrix			Clay	Sand	Sand
Determinant	**Units**	**Accreditation**			
Antimony	(mg/kg)	u	< 3.5	< 3.5	< 3.5
Arsenic	(mg/kg)	MCERTS	< 10	18	13
Barium	(mg/kg)	MCERTS	77	240	950
Beryllium	(mg/kg)	MCERTS	0.4	1.0	0.8
Boron (w/s)	(mg/kg)	u	< 2.5	< 2.5	< 2.5
Cadmium	(mg/kg)	MCERTS	0.8	0.7	0.9
Chromium (III)	(mg/kg)	u	8.6	6.0	12
Chromium (Total)	(mg/kg)	UKAS	9.6	7.0	13
Copper	(mg/kg)	MCERTS	35	48	90
Iron	(mg/kg)	u	31000	31000	29000
Lead	(mg/kg)	MCERTS	50	130	210
Manganese	(mg/kg)	MCERTS	810	660	320
Mercury	(mg/kg)	UKAS	< 2.5	< 2.5	< 2.5
Mercury Total (low level)	(mg/kg)	u	0.1	0.1	< 0.1
Molybdenum	(mg/kg)	u	< 2.0	< 2.0	< 2.0
Nickel	(mg/kg)	MCERTS	23	17	23
Selenium	(mg/kg)	u	< 8.0	< 8.0	< 8.0
Vanadium	(mg/kg)	UKAS	25	27	33
Zinc	(mg/kg)	MCERTS	55	59	370
Phenol	(mg/kg)	MCERTS	< 0.20	< 0.20	< 0.20
Cresols	(mg/kg)	MCERTS	< 0.20	< 0.20	< 0.20
Xylenols	(mg/kg)	MCERTS	< 0.20	< 0.20	< 0.20
Trimethyl Phenols	(mg/kg)	UKAS	< 0.20	< 0.20	< 0.20
Total Phenols (via HPLC)	(mg/kg)	UKAS	< 0.80	< 0.80	< 0.80
Cyanide (Free)	(mg/kg)	u	< 1.0	< 1.0	< 1.0
Chromium (Hexavalent)	(mg/kg)	u	< 1.0	< 1.0	< 1.0
pH	pH Units	MCERTS	7.5	7.9	7.9
Sulphate (Water soluble as SO_4)	(mg/l)	u	11	10	< 10
Sulphur (Total)	(%)	UKAS	0.03	0.02	0.02
Acenaphthene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02
Acenaphthylene	(mg/kg)	UKAS	< 0.02	< 0.02	< 0.02
Anthracene	(mg/kg)	UKAS	0.03	< 0.02	0.03
Benzo (a) anthracene	(mg/kg)	MCERTS	0.14	0.04	0.11
Benzo (a) pyrene	(mg/kg)	MCERTS	0.16	0.03	0.10
Benzo (b) fluoranthene	(mg/kg)	MCERTS	0.27	0.06	0.12
Benzo (g, h, i) perylene	(mg/kg)	MCERTS	0.13	0.03	0.08
Benzo (k) fluoranthene	(mg/kg)	MCERTS	0.08	< 0.02	0.03
Chrysene	(mg/kg)	MCERTS	0.16	0.05	0.12
Dibenzo (a,h) anthracene	(mg/kg)	MCERTS	0.02	< 0.02	< 0.02

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/02224/GRM - 24-42845

Project Reference - P10525 CASCID - Christie Hospital, Manchester

Analytical Test Results - Solid

Lab Reference			346893	346895	346896
Client Sample ID			-	-	-
Client Sample Location			BH101	BH102	TP104
Client Sample Type			ES	ES	ES
Client Sample Number			-	-	-
Depth - Top (m)			1.00	0.30	0.30
Depth - Bottom (m)			1.10	0.40	0.40
Date of Sampling			11/03/2024	11/03/2024	11/03/2024
Time of Sampling			-	-	-
Sample Matrix			Clay	Sand	Sand
Determinant	**Units**	**Accreditation**			
Fluoranthene	(mg/kg)	MCERTS	0.20	0.07	0.19
Fluorene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02
Indeno (1, 2, 3,-cd) pyrene	(mg/kg)	MCERTS	0.18	0.04	0.12
Naphthalene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02
Phenanthrene	(mg/kg)	MCERTS	0.12	0.03	0.12
Pyrene	(mg/kg)	MCERTS	0.23	0.07	0.18
Total PAH (Sum of USEPA 16)	(mg/kg)	UKAS	1.8	0.60	1.3
FOC	-	UKAS	0.016	0.038	0.036
Asbestos	-	UKAS	No asbestos detected	No asbestos detected	No asbestos detected

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/02224/GRM - 24-42845

Project Reference - P10525 CASCID - Christie Hospital, Manchester

Analytical Test Results - Chemical Analysis

Lab Reference			346894	346895	346896
Client Sample ID			-	-	-
Client Sample Location			BH101	BH102	TP104
Client Sample Type			ES	ES	ES
Client Sample Number			-	-	-
Depth - Top (m)			1.50	0.30	0.30
Depth - Bottom (m)			1.60	0.40	0.40
Date of Sampling			11/03/2024	11/03/2024	11/03/2024
Time of Sampling			-	-	-
Sample Matrix			Clay	Sand	Sand
Determinant	**Units**	**Accreditation**			
Water soluble sulphate (as SO_4)	(mg/l)	u	11	10	< 10
Acid Soluble Sulphate	(%)	u	< 0.01	0.02	0.01
Total Sulphur	(%)	UKAS	0.01	0.02	0.02
pH Value	pH Units	MCERTS	7.4	7.9	7.9

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/02224/GRM - 24-42845

Project Reference - P10525 CASCID - Christie Hospital, Manchester

Analytical Test Results - VPH / EPH

Lab Reference			346893	346895	346896
Client Sample ID			-	-	-
Client Sample Location			BH101	BH102	TP104
Client Sample Type			ES	ES	ES
Client Sample Number			-	-	-
Depth - Top (m)			1.00	0.30	0.30
Depth - Bottom (m)			1.10	0.40	0.40
Date of Sampling			11/03/2024	11/03/2024	11/03/2024
Time of Sampling			-	-	-
Sample Matrix			Clay	Sand	Sand
Determinant	**Units**	**Accreditation**			
Aliphatic >C_5 to C_6 [HS_MS_1D_AL]	(mg/kg)	MCERTS	< 0.06	< 0.06	< 0.06
Aliphatic >C_6 to C_8 [HS_MS_1D_AL]	(mg/kg)	MCERTS	< 0.06	< 0.06	< 0.06
Aliphatic >C_8 to C_{10} [HS_MS_1D_AL]	(mg/kg)	MCERTS	< 0.06	< 0.06	< 0.06
Aliphatic >C_{10} to C_{12} [EH_CU_1D_AL]	(mg/kg)	u	< 10	< 10	< 10
Aliphatic >C_{12} to C_{16} [EH_CU_1D_AL]	(mg/kg)	u	< 10	< 10	< 10
Aliphatic >C_{16} to C_{21} [EH_CU_1D_AL]	(mg/kg)	u	< 10	< 10	< 10
Aliphatic >C_{21} to C_{35} [EH_CU_1D_AL]	(mg/kg)	u	< 20	< 20	< 20
Aliphatic >C_{35} to C_{44} [EH_CU_1D_AL]	(mg/kg)	u	< 15	< 15	< 15
Aromatic >C_5 to C_7 [HS_MS_1D_AR]	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Aromatic >C_7 to C_8 [HS_MS_1D_AR]	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Aromatic >C_8 to C_{10} [HS_MS_1D_AR]	(mg/kg)	MCERTS	< 0.06	< 0.06	< 0.06
Aromatic >C_{10} to C_{12} [EH_CU_1D_AR]	(mg/kg)	u	< 10	< 10	< 10
Aromatic >C_{12} to C_{16} [EH_CU_1D_AR]	(mg/kg)	u	< 10	< 10	< 10
Aromatic >C_{16} to C_{21} [EH_CU_1D_AR]	(mg/kg)	u	< 10	< 10	< 10
Aromatic >C_{21} to C_{35} [EH_CU_1D_AR]	(mg/kg)	u	24	< 20	< 20
Aromatic >C_{35} to C_{44} [EH_CU_1D_AR]	(mg/kg)	u	33	22	25
Total >C_5 to C_{35} [EH_CU+HS_1D_Total]	(mg/kg)	u	< 50	< 50	< 50
Benzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Toluene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Ethylbenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
m&p Xylene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02
o-Xylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
MTBE	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01

7 - 11 Harding Street
Leicester
LE1 4DH

L24/02224/GRM - 24-42845

Project Reference - P10525 CASCID - Christie H

Analytical Test Results - VOC

Lab Reference			346893	346895	346896
Client Sample ID			-	-	-
Client Sample Location			BH101	BH102	TP104
Client Sample Type			ES	ES	ES
Client Sample Number			-	-	-
Depth - Top (m)			1.00	0.30	0.30
Depth - Bottom (m)			1.10	0.40	0.40
Date of Sampling			11/03/2024	11/03/2024	11/03/2024
Time of Sampling			-	-	-
Sample Matrix			Clay	Sand	Sand
Determinant	**Units**	**Accreditation**			
Benzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Toluene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Ethylbenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
m&p Xylene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02
o-Xylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Dichlorodifluoromethane	(mg/kg)	UKAS	< 0.05	< 0.05	< 0.05
Chloromethane	(mg/kg)	UKAS	< 0.02	< 0.02	< 0.02
Vinyl Chloride	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02
Bromomethane	(mg/kg)	u	< 0.05	< 0.05	< 0.05
Chloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Trichlorofluoromethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,1-Dichloroethylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Dichloromethane	(mg/kg)	u	< 0.10	< 0.10	< 0.10
MTBE	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
trans-1,2,-dichloroethylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,1-Dichloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
2,2-Dichloropropane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
cis--1,2,-dichloroethylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Bromochloromethane	(mg/kg)	MCERTS	< 0.05	< 0.05	< 0.05
Chloroform	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,1,1-Trichloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,1-Dichloropropene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Carbon Tetrachloride	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,2-dichloroethane	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02
Trichloroethylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,2-Dichloropropane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Dibromomethane	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02
Bromodichloromethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
cis-1,2-dichloropropylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
trans-1,3-dichloropropylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,1,2-Trichloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,3-Dichloropropane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Tetrachloroethylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Chlorodibromomethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,2-Dibromoethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Chlorobenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,1,1,2-tetrachloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Styrene	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01
Isopropylbenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Bromoform	(mg/kg)	MCERTS	< 0.05	< 0.05	< 0.05
1,1,2,2-Tetrachloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,2,3-Trichloropropane	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02
n-Propylbenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Bromobenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,3,5-Trimethylbenzene	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01
2-chlorotoluene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
4-chlorotoluene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
tert-butylbenzene	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01
1,2,4-trimethylbenzene	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01
sec-Butylbenzene	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01
4-Isopropyltoluene (P-Cymene)	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01
1,3-Dichlorobenzene	(mg/kg)	u	< 0.01	< 0.01	< 0.01
1,4-Dichlorobenzene	(mg/kg)	u	< 0.01	< 0.01	< 0.01
n-Butylbenzene	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01
1,2-Dichlorobenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,2-Dibromo-3-chloropropane	(mg/kg)	u	< 0.05	< 0.05	< 0.05
1,2,4-Trichlorobenzene	(mg/kg)	u	< 0.05	< 0.05	< 0.05
Hexachlorobutadiene	(mg/kg)	u	< 0.05	< 0.05	< 0.05
Naphthalene	(mg/kg)	u	< 0.05	< 0.05	< 0.05
1,2,3-Trichlorobenzene	(mg/kg)	u	< 0.05	< 0.05	< 0.05

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/02224/GRM - 24-42845

Project Reference - P10525 CASCID - Christie Hospital, Manchester

Certificate Of Analysis - WAC Suite

Lab Reference	346893
Client Sample ID	-
Client Sample Location	BH101
Client Sample Type	ES
Client Sample Number	-
Depth - Top (m)	1
Depth - Bottom (m)	1.1
Date of Sampling	11/03/2024
Time of Sampling	-
Sample Description	Dark brown slightly gravelly sandy silty clay
Sample Matrix	Clay
Moisture Content (%)	13
Stone content (%)	12

			Determined Result	Inert Waste Landfill	Stable non reactive hazardous waste in a non hazardous landfill	Hazardous Waste Landfill
Solid Analysis						
Total Organic Carbon	%	MCERTS	1.6	3.0	5.0	6.0
Loss on Ignition	%	UKAS	2.6	-	-	10.0
BTEX	mg/kg	MCERTS	< 0.06	6.00	-	-
PCB's (7 Congeners)	mg/kg	u	< 0.028	1.00	-	-
Mineral Oil (>C_{10} to C_{40}) [EH_1D_Total]	mg/kg	MCERTS	75	500	-	-
PAH	mg/kg	u	1.8	100	-	-
pH	units	MCERTS	7.5	-	> 6	-
Eluate Analysis						
Arsenic	mg/kg	u	< 0.03	0.50	2	25
Barium	mg/kg	u	< 0.05	20	100	300
Cadmium	mg/kg	u	< 0.03	0.04	1	5
Chromium (total)	mg/kg	u	< 0.03	0.5	10	70
Copper	mg/kg	u	0.01	2.0	50	100
Mercury	mg/kg	u	< 0.01	0.01	0.2	2
Molybdenum	mg/kg	u	< 0.03	0.5	10.0	30
Nickel	mg/kg	u	< 0.03	0.4	10.0	40
Lead	mg/kg	u	< 0.05	0.5	10.0	50
Antimony	mg/kg	u	< 0.03	0.06	0.7	5
Selenium	mg/kg	u	< 0.01	0.1	0.5	7
Zinc	mg/kg	u	< 0.05	4	50	200
Chloride	mg/kg	u	66	800	15000	25000
Fluoride	mg/kg	u	6	10	150	500
Sulphate (as SO_4)	mg/kg	u	< 10	1000	20000	50000
Total Dissolved Solids	mg/kg	u	330	4000	60000	100000
Phenol Index	mg/kg	u	< 1.0	1	-	-
Dissolved Organic Carbon	mg/kg	u	26.0	500	800	1000

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

S **L24/02224/GRM - 24-42845**

\# **Project Reference - P10525 CASCID - Christie Hospital, Manchester**

Analytical Test Results - 2:1 Leachate Suite

DE	Lab Reference			346895
	Client Sample ID			-
	Client Sample Location			BH102
	Client Sample Type			ES
	Client Sample Number			-
	Depth - Top (m)			0.30
	Depth - Bottom (m)			0.40
	Date of Sampling			11/03/2024
	Time of Sampling			-
	Sample Matrix			Leachate
	Determinant	**Units**	**Accreditation**	
EN	Boron	(mg/l)	u	0.005
EN	Calcium	(mg/l)	u	27
EN	Iron	(mg/l)	u	1.2
EN	Antimony	(µg/l)	u	< 2.5
EN	Arsenic	(µg/l)	u	< 3
EN	Barium	(µg/l)	u	16
EN	Beryllium	(µg/l)	u	< 1
EN	Boron	(µg/l)	u	5
SU	Cadmium (LL)	(µg/l)	u	< 0.25
EN	Chromium	(µg/l)	u	< 3
EN	Chromium (III)	(µg/l)	u	< 20
EN	Copper	(µg/l)	u	< 1
EN	Lead	(µg/l)	u	< 5
EN	Magnesium	(µg/l)	u	1600
EN	Manganese	(µg/l)	u	20
SU	Mercury (LL)	(µg/l)	u	< 0.20
EN	Molydenum	(µg/l)	u	< 2.5
EN	Nickel	(µg/l)	u	< 3
EN	Selenium	(µg/l)	u	< 1
EN	Vanadium	(µg/l)	u	20.2
EN	Zinc	(µg/l)	u	< 5
EN	pH	pH Units	u	7.9
EN	Cyanide (Free)	(mg/l)	u	< 0.5
EN	Cyanide (Complex)	(mg/l)	u	< 0.5
EN	Cyanide (Total)	(mg/l)	u	< 0.5
EN	Chromium (Hexavalent)	(mg/l)	u	< 0.02
EN	Chloride	(mg/l)	u	1.6
EN	Fluoride	(mg/l)	u	0.61
EN	Sulphate (As SO_4)	(mg/l)	u	< 10
EN	Ammonium (As N)	(mg/l)	u	< 0.02
EN	Phenol	(µg/l)	u	7.42
EN	Cresols	(µg/l)	u	< 0.20
EN	Xylenols	(µg/l)	u	< 0.20
EN	Trimethyl Phenols	(µg/l)	u	< 0.50
EN	Phenols (Total)	(µg/l)	u	7.55

7 - 11 Harding Street
Leicester
LE1 4DH

L24/02224/GRM - 24-42845

Project Reference - P10525 CASCID - Christie Hospital, Manchester

Analytical Test Results - 2:1 Leachate Suite

Lab Reference		
Client Sample ID		
Client Sample Location		
Client Sample Type		
Client Sample Number		
Depth - Top (m)		
Depth - Bottom (m)		
Date of Sampling		
Time of Sampling		
Sample Matrix		
Determinant	**Units**	**Accreditation**
Boron	(mg/l)	u
Calcium	(mg/l)	u
Iron	(mg/l)	u
Antimony	(µg/l)	u
Arsenic	(µg/l)	u
Barium	(µg/l)	u
Beryllium	(µg/l)	u
Boron	(µg/l)	u
Cadmium (LL)	(µg/l)	u
Chromium	(µg/l)	u
Chromium (III)	(µg/l)	u
Copper	(µg/l)	u
Lead	(µg/l)	u
Magnesium	(µg/l)	u
Manganese	(µg/l)	u
Mercury (LL)	(µg/l)	u
Molydenum	(µg/l)	u
Nickel	(µg/l)	u
Selenium	(µg/l)	u
Vanadium	(µg/l)	u
Zinc	(µg/l)	u
pH	pH Units	u
Cyanide (Free)	(mg/l)	u
Cyanide (Complex)	(mg/l)	u
Cyanide (Total)	(mg/l)	u
Chromium (Hexavalent)	(mg/l)	u
Chloride	(mg/l)	u
Fluoride	(mg/l)	u
Sulphate (As SO_4)	(mg/l)	u
Ammonium (As N)	(mg/l)	u
Phenol	(µg/l)	u
Cresols	(µg/l)	u
Xylenols	(µg/l)	u
Trimethyl Phenols	(µg/l)	u
Phenols (Total)	(µg/l)	u

7 - 11 Harding Street
Leicester
LE1 4DH

L24/02224/GRM - 24-42845

Project Reference - P10525 CASCID - Christie Hospital, Manchester

Sample Descriptions

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Description	Moisture Content (%)	Stone Content (%)	Passing 2mm test sieve (%)
346893	-	BH101	ES	-	Dark brown slightly gravelly sandy silty clay	13	12	67
346894	-	BH101	ES	-	Mottled brown silty clay	-	-	100
346895	-	BH102	ES	-	Dark brown clayey silty loamy sand	18	2.5	71
346896	-	TP104	ES	-	Dark brown slightly clayey silty sand with frequent brick fragments	14	< 0.1	81

7 - 11 Harding Street
Leicester
LE1 4DH

L24/02224/GRM - 24-42845

Project Reference - P10525 CASCID - Christie Hospital, Manchester

Sample Comments

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Comments
346893	-	BH101	ES	-	VOC - Sample taken from container with headspace. VPH/BTEX - Sample taken from container with headspace.
346894	-	BH101	ES	-	
346895	-	BH102	ES	-	VOC - Sample taken from container with headspace. VPH/BTEX - Sample taken from container with headspace.
346896	-	TP104	ES	-	VOC - Sample taken from container with headspace. VPH/BTEX - Sample taken from container with headspace.

7 - 11 Harding Street
Leicester
LE1 4DH

L24/02224/GRM - 24-42845

Project Reference - P10525 CASCID - Christie Hospital, Manchester

Analysis Methodologies

Test Code	Test Name / Reference	Sample condition for analysis	Sample Preperation	Test Details
ANIONSL	MS - CL - Anions by Aquakem	As received	-	Determination of Anions (inc Sulphate, chloride etc.) in leachate samples by Aquakem
ANIONSS	MS - CL - Anions by Aquakem (2:1Extract)	Oven dried	Passing 2mm test sieve	Determination of Anions (inc Sulphate, chloride etc.) in soils by Aquakem. Analysis is based on a 2:1 water to soil extraction ratio
EPHS	MS - CL - EPH in Soil	As received	Passing 10mm test sieve	Determination of Extractable Petroleum Hydrocarbons in soils via GC-MS
PCB7S	MS - CL - PCB Soils	As received	Passing 10mm test sieve	Determination of PCB's (7 congeners) in soils via GC-MS
PAHASRDS	MS - CL - PAH (As Received)	As received	Passing 10mm test sieve	Determination of Polyaromatic hydrocarbons in soil via GC-MS
CWGS	MS - CL - VPH & MS - CL - EPH	As received	Passing 10mm test sieve	Determination of TPH CWG (Volatile Petroleum Hydrocarbons and Extractable Petroleum Hydrocarbons) in soils via Headspace-GC-MS and GC-MS respectively
WACTOCS	MS - CL - TOC Eltra (WAC)	Air dried	Passing 10mm test sieve	Determination of Total Organic Carbon in soil as part of a WAC test
TOCS	MS - CL - TOC Eltra	Air Dried	Passing 10mm test sieve	Determination of Total Organic Carbon in soils
TPHS	MS - CL - TPH (GC-FID)	As received	Passing 10mm test sieve	Determination of Total Petroleum Hydrocarbons in soil using GC-FID
WACSKALAR	MS - CL - Phenols by Skalar (WAC)	As received	BSEN:12457 Leaching	Determination of Total Phenols within leachate as part of a WAC test using a Skalar Segmented flow analyser
VOCS	MS - CL - VOC and MBTEX	As received	Passing 10mm test sieve	Determination of VOCs (inc BTEX) in soils via Headspace-GC-MS
VPHS	MS - CL - VPH	As received	Passing 10mm test sieve	Determination of VPH in soils via Headspace-GC-MS
WSBORONS	MS - CL - WS Boron	Air dried	Passing 10mm test sieve	Determination of Water soluble Boron in soils via ICP
SKALARCNL	MS - CL - Cyanide by Skalar - Leachate	As received	BSEN:12457 Leaching	Determination of cyanide (total / free / complex) in leachates using a Skalar segmented flow analyser
SKALARCNS	MS - CL - Cyanide by Skalar	As received	Passing 10mm test sieve	Determination of cyanide (total / free / complex) in soil using a Skalar segmented flow analyser
WACDOC	MS - CL - DOC (WAC)	As received	BSEN:12457 Leaching	Determination of dissolved organic carbon in a leachate as part of a WAC test
SKALARHCL	MS - CL - Hexavalent Cr by Skalar - L	As received	BSEN:12457 Leaching	Determination of hexavalent chromium in leachate using Skalar segmented flow analyser
SKALARHCS	MS - CL - Hexavalent Chromium by Skalar	As received	Passing 10mm test sieve	Determination of hexavalent chromium in soil using Skalar segmented flow analyser
WACMETALS	MS - CL - ICP - Metals in Waters (WAC)	As received	BSEN:12457 Leaching	Determination of metals in a leachate as part of a WAC test via ICP
ICPMETL	MS - CL - ICP Metals in Waters	As received	BSEN:12457 Leaching	Determination of metals in leachates via ICP

7 - 11 Harding Street
Leicester
LE1 4DH

L24/02224/GRM - 24-42845

Project Reference - P10525 CASCID - Christie Hospital, Manchester

Analysis Methodologies

Test Code	Test Name / Reference	Sample condition for analysis	Sample Preperation	Test Details
ICPMETS	MS - CL - ICP Metals	Air dried	Passing 10mm test sieve	Determination of metals in soils via ICP
PHL	MS - CL - pH in Waters	As received	BSEN:12457 Leaching	Determination of pH in leachates using a pH probe
WACPHS	MS - CL - pH in Soils (WAC)	As received	BSEN:12457 Leaching	Determination of pH in soils as part of a WAC test via pH probe
PHS	MS - CL - pH in Soils	As received	Passing 10mm test sieve	Determination of pH in soils using a pH probe (using a 1:3 soil to water extraction)
PHOHHPLCL	MS - CL - Phenol Waters by HPLC	As received	BSEN:12457 Leaching	Determination of speciated phenols in leachates using HPLC
PHOHHPLCS	MS - CL - Phenols by HPLC (soil)	As received	Passing 10mm test sieve	Determination of speciated phenols in soil using HPLC
WACANIONS	MS - CL - Anions by Aquakem (WAC)	As received	BSEN:12457 Leaching	Determination of sulphate, chloride and fluoride in a leachate as part of a WAC test using a Aquakem analyser
TDSL	MS-CL-Conductivity in Water(TDS by Calc)	As received	BSEN:12457 Leaching	Determination of total dissolved solids in leachates (by calculation)
ASSO4S	MS - CL - Acid Soluble Sulphate	Oven Dried	Passing 2mm test sieve	Determination of total sulphate in soils by acid extraction followed by ICP analysis
ASB	MS - AS - Asbestos	-	-	Fibre identification is in accordance with in house documented methods which are based on the procedure documented in the HSE Document HSG 248 "Asbestos: The analysts guide for sampling, analysis and clearance procedures"
ENLEACHP	BS EN 12457-2	As Received	-	Leaching in accordance with BSEN 12457-2 (10:1 Ratio)
ENLEACHP2	BS EN 12457-3	As Received	-	Leaching in accordance with BSEN 12457-3
SAMPLEPREP	MS - CL - Sample Preparation	-	-	Preparation of samples (including determination of moisture content) to allow for subsequent analysis
SUBCON-ENV	Subcontract - ENV Lab	-	-	Subcontract testing
1377LOI	BS1377 LoI	Oven dried	Passing 2mm test sieve	Testing was in accordance with BS 1377: Part 3: 2018 + A1 :2021 Clause 6. Determination of the mass loss on ignition. Some information required by BS1377: 2016: Part 1 has not been reported. This information is available on request.
1377TS-ELT	BS1377 Total Sulphur Content by HTC	Oven dried	BS1377 : Part 1 : 2016	Total Sulphur Content testing of Soil in accordance with BS 1377 : Part 3 : 2018 + A1 : 2021 Clause 7.10 (using Eltra CS-800 Analyser)

7 - 11 Harding Street
Leicester
LE1 4DH

L24/02224/GRM - 24-42845

Project Reference - P10525 CASCID - Christie Hospital, Manchester

Sample Deviations

Deviations are listed below against each sample and associated test method, where deviation(s) are noted it means data may not be representative of the sample at the time of sampling and it is possible that results provided may be compromised.

Observations on receipt

A - No date of sampling provided
C - Received in inappropriate container
H - Contains headspace
T - Temperature on receipt exceeds storage temperature
R - Sample(s) received with less than 96 hours for testing to commence/complete, any result formally classed as deviating will be marked with an X against the applicable test (i.e. RX)

Observations whilst in laboratory

X - Exceeds sampling to extraction or analysis timescales

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Test	Deviations
346893	-	BH101	ES	-	MS - CL - Phenols by HPLC (soil)	X
346895	-	BH102	ES	-	MS - CL - Phenols by HPLC (soil)	X
346896	-	TP104	ES	-	MS - CL - Phenols by HPLC (soil)	X

7 - 11 Harding Street
Leicester
LE1 4DH

L24/02224/GRM - 24-42845

Project Reference - P10525 CASCID - Christie Hospital, Manchester

HWOL TPH Acronym Index

Acronym	Description
HS	Headspace Analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
Total	Aliphatics and Aromatics
AL	Aliphatics Only
AR	Aromatics Only
2D	GC-GC - Double Coil Gas Chromatography
#1	EH_Total but with humics mathmatically subtracted
#2	EH_Total but with fatty acids mathmatically subtracted
_	Operator - underscore to separate acronyms (except for +)
+	Operator to indicate cumlative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry

7 - 11 Harding Street
Leicester
LE1 4DH

GRM Development Solutions
Laurus House
First Avenue
Centrum 100
Burton Upon Trent
DE14 2WH

Analytical Test Report: L24/02431/GRM - 24-43078 - Amendment A

Your Project Reference:	**P10525 CASCID Christie Hospital Manchester**		
Your Order Number:	P10525	Samples Received / Instructed:	19/03/2024 / 19/03/2024
Report Issue Number:	2	Sample Tested:	19/03 to 03/04/2024
Samples Analysed:	2 soil samples	Report issued:	05/04/2024

Signed

James Gane
Analytical Services Manager
CTS Group

Notes:

Amendment A 05/04/2024 - Report amended to include updated reporting limit

General

Please refer to Methodologies page for details pertaining to the analytical methods undertaken.

Samples will be retained for 14 days after issue of this report with the exception of the asbestos test portion which is held for 6 months unless otherwise requested.

Moisture Content was determined in accordance with CTS method statement MS - CL - Sample Prep, oven dried at <30˚C.

Moisture Content is reported as a percentage of the dry mass of soil, this calculation is in accordance with BS1377, Part 2, 1990, Clause 3.2

Stone Content was determined in accordance with CTS method statement MS - CL - Sample Prep and refers to the percentage of stones retained on a 10mm BS test sieve.

Where specification limits are included these are for guidance only. Where a measured value has been highlighted this is not implying acceptance or failure and certainty of measurement values have not been taken into account.

Uncertainty of measurement values are available on request.

Samples were supplied by customer, results apply to the samples as received.

Asbestos

Please note: Where futher analaysis is required samples identified as containing asbestos are screened and tested on an as recevied basis. No correction is made for moisture content and these results are not covered by our accrediation

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation

Deviating Samples

On receipt samples are compared against our sample holding and handling protocols, where any deviations have been noted these are reported on our deviating sample page (if present)

Accreditation Key

UKAS = UKAS Accreditation, MCERTS = MCERTS Accreditation, u = Unaccredited, subUKAS - Subcontracted to a laboratory UKAS accredited for this test

MCERTS Accreditation only covers the SAND, CLAY and LOAM matrices

Date of Issue: 18.03.2024

Issued by: J. Gane

Issue No: 4

Rev No: 6

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/02431/GRM - 24-43078 - Amendment A

Project Reference - P10525 CASCID Christie Hospital Manchester

Analytical Test Results - Solid

Lab Reference			347803
Client Sample ID			-
Client Sample Location			TP105
Client Sample Type			ES
Client Sample Number			-
Depth - Top (m)			0.50
Depth - Bottom (m)			0.50
Date of Sampling			17/03/2024
Time of Sampling			-
Sample Matrix			Sand
Determinant	**Units**	**Accreditation**	
Antimony	(mg/kg)	u	< 3.5
Arsenic	(mg/kg)	MCERTS	26
Barium	(mg/kg)	MCERTS	120
Beryllium	(mg/kg)	MCERTS	0.7
Boron (w/s)	(mg/kg)	u	< 2.5
Cadmium	(mg/kg)	MCERTS	0.7
Chromium (III)	(mg/kg)	u	5.4
Chromium (Total)	(mg/kg)	UKAS	6.4
Copper	(mg/kg)	MCERTS	63
Iron	(mg/kg)	u	34000
Lead	(mg/kg)	MCERTS	450
Manganese	(mg/kg)	MCERTS	590
Mercury	(mg/kg)	UKAS	< 2.5
Mercury (Total, Low level)	(mg/kg)	u	0.2
Molybdenum	(mg/kg)	u	2.8
Nickel	(mg/kg)	MCERTS	21
Selenium	(mg/kg)	u	< 8.0
Vanadium	(mg/kg)	UKAS	32
Zinc	(mg/kg)	MCERTS	73
Phenol	(mg/kg)	MCERTS	< 0.20
Cresols	(mg/kg)	MCERTS	< 0.20
Xylenols	(mg/kg)	MCERTS	< 0.20
Trimethyl Phenols	(mg/kg)	UKAS	< 0.20
Total Phenols (via HPLC)	(mg/kg)	UKAS	< 0.80
Cyanide (Free)	(mg/kg)	u	< 1.0
Chromium (Hexavalent)	(mg/kg)	u	< 1.0
pH	pH Units	MCERTS	7.8
Sulphate (Water soluble as SO_4)	(mg/l)	u	29
Sulphur (Total)	(%)	UKAS	0.01
Acenaphthene	(mg/kg)	MCERTS	< 0.02
Acenaphthylene	(mg/kg)	UKAS	< 0.02
Anthracene	(mg/kg)	UKAS	< 0.02
Benzo (a) anthracene	(mg/kg)	MCERTS	< 0.02
Benzo (a) pyrene	(mg/kg)	MCERTS	< 0.02
Benzo (b) fluoranthene	(mg/kg)	MCERTS	< 0.02
Benzo (g, h, i) perylene	(mg/kg)	MCERTS	< 0.02
Benzo (k) fluoranthene	(mg/kg)	MCERTS	< 0.02
Chrysene	(mg/kg)	MCERTS	< 0.02
Dibenzo (a,h) anthracene	(mg/kg)	MCERTS	< 0.02

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/02431/GRM - 24-43078 - Amendment A

Project Reference - P10525 CASCID Christie Hospital Manchester

Analytical Test Results - Solid

Lab Reference			347803
Client Sample ID			-
Client Sample Location			TP105
Client Sample Type			ES
Client Sample Number			-
Depth - Top (m)			0.50
Depth - Bottom (m)			0.50
Date of Sampling			17/03/2024
Time of Sampling			-
Sample Matrix			Sand
Determinant	**Units**	**Accreditation**	
Fluoranthene	(mg/kg)	MCERTS	< 0.02
Fluorene	(mg/kg)	MCERTS	< 0.02
Indeno (1, 2, 3,-cd) pyrene	(mg/kg)	MCERTS	< 0.02
Naphthalene	(mg/kg)	MCERTS	< 0.02
Phenanthrene	(mg/kg)	MCERTS	< 0.02
Pyrene	(mg/kg)	MCERTS	< 0.02
Total PAH (Sum of USEPA 16)	(mg/kg)	UKAS	< 0.32
FOC	-	UKAS	0.038
Asbestos	-	UKAS	No asbestos detected

7 - 11 Harding Street
Leicester
LE1 4DH

L24/02431/GRM - 24-43078 - Amendment A

Project Reference - P10525 CASCID Christie Hospital Manchester

Analytical Test Results - Chemical Analysis

Lab Reference			347802
Client Sample ID			-
Client Sample Location			TP103
Client Sample Type			ES
Client Sample Number			-
Depth - Top (m)			0.30
Depth - Bottom (m)			0.40
Date of Sampling			17/03/2024
Time of Sampling			-
Sample Matrix			Sand
Determinant	**Units**	**Accreditation**	
Water soluble sulphate (as SO_4)	(mg/l)	u	< 10
Acid Soluble Sulphate	(%)	u	0.03
Total Sulphur	(%)	UKAS	0.02
pH Value	pH Units	MCERTS	8.7

7 - 11 Harding Street
Leicester
LE1 4DH

L24/02431/GRM - 24-43078 - Amendment A

Project Reference - P10525 CASCID Christie Hospital Manchester

Analytical Test Results - VPH / EPH

Lab Reference			**347803**
Client Sample ID			-
Client Sample Location			TP105
Client Sample Type			ES
Client Sample Number			-
Depth - Top (m)			0.50
Depth - Bottom (m)			0.50
Date of Sampling			17/03/2024
Time of Sampling			-
Sample Matrix			Sand
Determinant	**Units**	**Accreditation**	
Aliphatic >C_5 to C_6 [HS_MS_1D_AL]	(mg/kg)	MCERTS	< 0.06
Aliphatic >C_6 to C_8 [HS_MS_1D_AL]	(mg/kg)	MCERTS	< 0.06
Aliphatic >C_8 to C_{10} [HS_MS_1D_AL]	(mg/kg)	MCERTS	< 0.06
Aliphatic >C_{10} to C_{12} [EH_CU_1D_AL]	(mg/kg)	u	< 10
Aliphatic >C_{12} to C_{16} [EH_CU_1D_AL]	(mg/kg)	u	< 10
Aliphatic >C_{16} to C_{21} [EH_CU_1D_AL]	(mg/kg)	u	< 10
Aliphatic >C_{21} to C_{35} [EH_CU_1D_AL]	(mg/kg)	u	< 20
Aliphatic >C_{35} to C_{44} [EH_CU_1D_AL]	(mg/kg)	u	< 15
Aromatic >C_5 to C_7 [HS_MS_1D_AR]	(mg/kg)	MCERTS	< 0.01
Aromatic >C_7 to C_8 [HS_MS_1D_AR]	(mg/kg)	MCERTS	< 0.01
Aromatic >C_8 to C_{10} [HS_MS_1D_AR]	(mg/kg)	MCERTS	< 0.06
Aromatic >C_{10} to C_{12} [EH_CU_1D_AR]	(mg/kg)	u	< 10
Aromatic >C_{12} to C_{16} [EH_CU_1D_AR]	(mg/kg)	u	< 10
Aromatic >C_{16} to C_{21} [EH_CU_1D_AR]	(mg/kg)	u	< 10
Aromatic >C_{21} to C_{35} [EH_CU_1D_AR]	(mg/kg)	u	< 20
Aromatic >C_{35} to C_{44} [EH_CU_1D_AR]	(mg/kg)	u	< 15
Total >C_5 to C_{35} [EH_CU+HS_1D_Total]	(mg/kg)	u	< 50
Benzene	(mg/kg)	MCERTS	< 0.01
Toluene	(mg/kg)	MCERTS	< 0.01
Ethylbenzene	(mg/kg)	MCERTS	< 0.01
m&p Xylene	(mg/kg)	MCERTS	< 0.02
o-Xylene	(mg/kg)	MCERTS	< 0.01
MTBE	(mg/kg)	MCERTS	< 0.01

4161

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/02431/GRM - 24-43078 - Amendment A

Project Reference - P10525 CASCID Christie Hospital Manchester

Analytical Test Results - VOC

Lab Reference			347803
Client Sample ID			-
Client Sample Location			TP105
Client Sample Type			ES
Client Sample Number			-
Depth - Top (m)			0.50
Depth - Bottom (m)			0.50
Date of Sampling			17/03/2024
Time of Sampling			-
Sample Matrix			Sand
Determinant	**Units**	**Accreditation**	
Benzene	(mg/kg)	MCERTS	< 0.01
Toluene	(mg/kg)	MCERTS	< 0.01
Ethylbenzene	(mg/kg)	MCERTS	< 0.01
m&p Xylene	(mg/kg)	MCERTS	< 0.02
o-Xylene	(mg/kg)	MCERTS	< 0.01
Dichlorodifluoromethane	(mg/kg)	UKAS	< 0.05
Chloromethane	(mg/kg)	UKAS	< 0.02
Vinyl Chloride	(mg/kg)	MCERTS	< 0.02
Bromomethane	(mg/kg)	u	< 0.05
Chloroethane	(mg/kg)	MCERTS	< 0.01
Trichlorofluoromethane	(mg/kg)	MCERTS	< 0.01
1,1-Dichloroethylene	(mg/kg)	MCERTS	< 0.01
Dichloromethane	(mg/kg)	u	< 0.10
MTBE	(mg/kg)	MCERTS	< 0.01
trans-1,2,-dichloroethylene	(mg/kg)	MCERTS	< 0.01
1,1-Dichloroethane	(mg/kg)	MCERTS	< 0.01
2,2-Dichloropropane	(mg/kg)	MCERTS	< 0.01
cis--1,2,-dichloroethylene	(mg/kg)	MCERTS	< 0.01
Bromochloromethane	(mg/kg)	MCERTS	< 0.05
Chloroform	(mg/kg)	MCERTS	< 0.01
1,1,1-Trichloroethane	(mg/kg)	MCERTS	< 0.01
1,1-Dichloropropene	(mg/kg)	MCERTS	< 0.01
Carbon Tetrachloride	(mg/kg)	MCERTS	< 0.01
1,2-dichloroethane	(mg/kg)	MCERTS	< 0.02
Trichloroethylene	(mg/kg)	MCERTS	< 0.01
1,2-Dichloropropane	(mg/kg)	MCERTS	< 0.01
Dibromomethane	(mg/kg)	MCERTS	< 0.02
Bromodichloromethane	(mg/kg)	MCERTS	< 0.01
cis-1,2-dichloropropylene	(mg/kg)	MCERTS	< 0.01
trans-1,3-dichloropropylene	(mg/kg)	MCERTS	< 0.01
1,1,2-Trichloroethane	(mg/kg)	MCERTS	< 0.01
1,3-Dichloropropane	(mg/kg)	MCERTS	< 0.01
Tetrachloroethylene	(mg/kg)	MCERTS	< 0.01
Chlorodibromomethane	(mg/kg)	MCERTS	< 0.01
1,2-Dibromoethane	(mg/kg)	MCERTS	< 0.01
Chlorobenzene	(mg/kg)	MCERTS	< 0.01
1,1,1,2-tetrachloroethane	(mg/kg)	MCERTS	< 0.01
Styrene	(mg/kg)	UKAS	< 0.01
Isopropylbenzene	(mg/kg)	MCERTS	< 0.01
Bromoform	(mg/kg)	MCERTS	< 0.05
1,1,2,2-Tetrachloroethane	(mg/kg)	MCERTS	< 0.01
1,2,3-Trichloropropane	(mg/kg)	MCERTS	< 0.02
n-Propylbenzene	(mg/kg)	MCERTS	< 0.01
Bromobenzene	(mg/kg)	MCERTS	< 0.01
1,3,5-Trimethylbenzene	(mg/kg)	UKAS	< 0.01
2-chlorotoluene	(mg/kg)	MCERTS	< 0.01
4-chlorotoluene	(mg/kg)	MCERTS	< 0.01
tert-butylbenzene	(mg/kg)	UKAS	< 0.01
1,2,4-trimethylbenzene	(mg/kg)	UKAS	< 0.01
sec-Butylbenzene	(mg/kg)	UKAS	< 0.01
4-Isopropyltoluene (P-Cymene)	(mg/kg)	UKAS	< 0.01
1,3-Dichlorobenzene	(mg/kg)	u	< 0.01
1,4-Dichlorobenzene	(mg/kg)	u	< 0.01
n-Butylbenzene	(mg/kg)	UKAS	< 0.01
1,2-Dichlorobenzene	(mg/kg)	MCERTS	< 0.01
1,2-Dibromo-3-chloropropane	(mg/kg)	u	< 0.05
1,2,4-Trichlorobenzene	(mg/kg)	u	< 0.05
Hexachlorobutadiene	(mg/kg)	u	< 0.05
Naphthalene	(mg/kg)	u	< 0.05

4161

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/02431/GRM - 24-43078 - Amendment A

Project Reference - P10525 CASCID Christie Hospital Manchester

Analytical Test Results - VOC

Lab Reference			347803
Client Sample ID			-
Client Sample Location			TP105
Client Sample Type			ES
Client Sample Number			-
Depth - Top (m)			0.50
Depth - Bottom (m)			0.50
Date of Sampling			17/03/2024
Time of Sampling			-
Sample Matrix			Sand
Determinant	**Units**	**Accreditation**	
1,2,3-Trichlorobenzene	(mg/kg)	u	< 0.05

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/02431/GRM - 24-43078 - Amendment A

Project Reference - P10525 CASCID Christie Hospital Manchester

Sample Descriptions

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Description	Moisture Content (%)	Stone Content (%)	Passing 2mm test sieve (%)
347802	-	TP103	ES	-	Dark greyish brown gravelly silty sand	-	-	74
347803	-	TP105	ES	-	Brown gravelly silty sand	13	< 0.1	87

7 - 11 Harding Street
Leicester
LE1 4DH

L24/02431/GRM - 24-43078 - Amendment A

Project Reference - P10525 CASCID Christie Hospital Manchester

Sample Comments

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Comments
347802	-	TP103	ES	-	
347803	-	TP105	ES	-	VOC - Sample taken from container with headspace. VPH/BTEX - Sample taken from container with headspace.

7 - 11 Harding Street
Leicester
LE1 4DH

L24/02431/GRM - 24-43078 - Amendment A

Project Reference - P10525 CASCID Christie Hospital Manchester

Analysis Methodologies

Test Code	Test Name / Reference	Sample condition for analysis	Sample Preperation	Test Details
ANIONSS	MS - CL - Anions by Aquakem (2:1Extract)	Oven dried	Passing 2mm test sieve	Determination of Anions (inc Sulphate, chloride etc.) in soils by Aquakem. Analysis is based on a 2:1 water to soil extraction ratio
EPHS	MS - CL - EPH in Soil	As received	Passing 10mm test sieve	Determination of Extractable Petroleum Hydrocarbons in soils via GC-MS
PAHASRDS	MS - CL - PAH (As Received)	As received	Passing 10mm test sieve	Determination of Polyaromatic hydrocarbons in soil via GC-MS
CWGS	MS - CL - VPH & MS - CL - EPH	As received	Passing 10mm test sieve	Determination of TPH CWG (Volatile Petroleum Hydrocarbons and Extractable Petroleum Hydrocarbons) in soils via Headspace-GC-MS and GC-MS respectively
TOCS	MS - CL - TOC Eltra	Air Dried	Passing 10mm test sieve	Determination of Total Organic Carbon in soils
VOCS	MS - CL - VOC and MBTEX	As received	Passing 10mm test sieve	Determination of VOCs (inc BTEX) in soils via Headspace-GC-MS
VPHS	MS - CL - VPH	As received	Passing 10mm test sieve	Determination of VPH in soils via Headspace-GC-MS
WSBORONS	MS - CL - WS Boron	Air dried	Passing 10mm test sieve	Determination of Water soluble Boron in soils via ICP
SKALARCNS	MS - CL - Cyanide by Skalar	As received	Passing 10mm test sieve	Determination of cyanide (total / free / complex) in soil using a Skalar segmented flow analyser
SKALARHCS	MS - CL - Hexavalent Chromium by Skalar	As received	Passing 10mm test sieve	Determination of hexavalent chromium in soil using Skalar segmented flow analyser
ICPMETS	MS - CL - ICP Metals	Air dried	Passing 10mm test sieve	Determination of metals in soils via ICP
PHS	MS - CL - pH in Soils	As received	Passing 10mm test sieve	Determination of pH in soils using a pH probe (using a 1:3 soil to water extraction)
PHOHHPLCS	MS - CL - Phenols by HPLC (soil)	As received	Passing 10mm test sieve	Determination of speciated phenols in soil using HPLC
ASSO4S	MS - CL - Acid Soluble Sulphate	Oven Dried	Passing 2mm test sieve	Determination of total sulphate in soils by acid extraction followed by ICP analysis
ASB	MS - AS - Asbestos	-	-	Fibre identification is in accordance with in house documented methods which are based on the procedure documented in the HSE Document HSG 248 "Asbestos: The analysts guide for sampling, analysis and clearance procedures"
SAMPLEPREP	MS - CL - Sample Preparation	-	-	Preparation of samples (including determination of moisture content) to allow for subsequent analysis
SUBCON-ENV	Subcontract - ENV Lab	-	-	Subcontract testing
1377TS-ELT	BS1377 Total Sulphur Content by HTC	Oven dried	BS1377 : Part 1 : 2016	Total Sulphur Content testing of Soil in accordance with BS 1377 : Part 3 : 2018 + A1 : 2021 Clause 7.10 (using Eltra CS-800 Analyser)

7 - 11 Harding Street
Leicester
LE1 4DH

L24/02431/GRM - 24-43078 - Amendment A

Project Reference - P10525 CASCID Christie Hospital Manchester

HWOL TPH Acronym Index

Acronym	Description
HS	Headspace Analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
Total	Aliphatics and Aromatics
AL	Aliphatics Only
AR	Aromatics Only
2D	GC-GC - Double Coil Gas Chromatography
#1	EH_Total but with humics mathmatically subtracted
#2	EH_Total but with fatty acids mathmatically subtracted
_	Operator - underscore to separate acronyms (except for +)
+	Operator to indicate cumlative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

GRM Development Solutions
Laurus House
First Avenue
Centrum 100
Burton Upon Trent
DE14 2WH

Analytical Test Report: L24/02431/GRM - 24-43078

Your Project Reference:	**P10525 CASCID Christie Hospital Manchester**		
Your Order Number:	P10525	Samples Received / Instructed:	19/03/2024 / 19/03/2024
Report Issue Number:	2	Sample Tested:	19/03 to 03/04/2024
Samples Analysed:	2 soil samples	Report issued:	03/04/2024

Signed

James Gane
Analytical Services Manager
CTS Group

Notes:

General

Please refer to Methodologies page for details pertaining to the analytical methods undertaken.

Samples will be retained for 14 days after issue of this report with the exception of the asbestos test portion which is held for 6 months unless otherwise requested.

Moisture Content was determined in accordance with CTS method statement MS - CL - Sample Prep, oven dried at <30˚C.

Moisture Content is reported as a percentage of the dry mass of soil, this calculation is in accordance with BS1377, Part 2, 1990, Clause 3.2

Stone Content was determined in accordance with CTS method statement MS - CL - Sample Prep and refers to the percentage of stones retained on a 10mm BS test sieve.

Where specification limits are included these are for guidance only. Where a measured value has been highlighted this is not implying acceptance or failure and certainty of measurement values have not been taken into account.

Uncertainty of measurement values are available on request.

Samples were supplied by customer, results apply to the samples as received.

Asbestos

Please note: Where futher analaysis is required samples identified as containing asbestos are screened and tested on an as recevied basis. No correction is made for moisture content and these results are not covered by our accrediation

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation

Deviating Samples

On receipt samples are compared against our sample holding and handling protocols, where any deviations have been noted these are reported on our deviating sample page (if present)

Accreditation Key

UKAS = UKAS Accreditation, MCERTS = MCERTS Accreditation, u = Unaccredited, subUKAS - Subcontracted to a laboratory UKAS accredited for this test

MCERTS Accreditation only covers the SAND, CLAY and LOAM matrices

Date of Issue: 18.03.2024

Issued by: J. Gane

Issue No: 4

Rev No: 6

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/02431/GRM - 24-43078

Project Reference - P10525 CASCID Christie Hospital Manchester

Analytical Test Results - Solid

Lab Reference			347803
Client Sample ID			-
Client Sample Location			TP105
Client Sample Type			ES
Client Sample Number			-
Depth - Top (m)			0.50
Depth - Bottom (m)			0.50
Date of Sampling			17/03/2024
Time of Sampling			-
Sample Matrix			Sand
Determinant	**Units**	**Accreditation**	
Antimony	(mg/kg)	u	< 3.5
Arsenic	(mg/kg)	MCERTS	26
Barium	(mg/kg)	MCERTS	120
Beryllium	(mg/kg)	MCERTS	0.7
Boron (w/s)	(mg/kg)	u	< 2.5
Cadmium	(mg/kg)	MCERTS	0.7
Chromium (III)	(mg/kg)	u	5.4
Chromium (Total)	(mg/kg)	UKAS	6.4
Copper	(mg/kg)	MCERTS	63
Iron	(mg/kg)	u	34000
Lead	(mg/kg)	MCERTS	450
Manganese	(mg/kg)	MCERTS	590
Mercury	(mg/kg)	UKAS	< 2.5
Mercury (Total, Low level)	(mg/kg)	u	< 1.0
Molybdenum	(mg/kg)	u	2.8
Nickel	(mg/kg)	MCERTS	21
Selenium	(mg/kg)	u	< 8.0
Vanadium	(mg/kg)	UKAS	32
Zinc	(mg/kg)	MCERTS	73
Phenol	(mg/kg)	MCERTS	< 0.20
Cresols	(mg/kg)	MCERTS	< 0.20
Xylenols	(mg/kg)	MCERTS	< 0.20
Trimethyl Phenols	(mg/kg)	UKAS	< 0.20
Total Phenols (via HPLC)	(mg/kg)	UKAS	< 0.80
Cyanide (Free)	(mg/kg)	u	< 1.0
Chromium (Hexavalent)	(mg/kg)	u	< 1.0
pH	pH Units	MCERTS	7.8
Sulphate (Water soluble as SO_4)	(mg/l)	u	29
Sulphur (Total)	(%)	UKAS	0.01
Acenaphthene	(mg/kg)	MCERTS	< 0.02
Acenaphthylene	(mg/kg)	UKAS	< 0.02
Anthracene	(mg/kg)	UKAS	< 0.02
Benzo (a) anthracene	(mg/kg)	MCERTS	< 0.02
Benzo (a) pyrene	(mg/kg)	MCERTS	< 0.02
Benzo (b) fluoranthene	(mg/kg)	MCERTS	< 0.02
Benzo (g, h, i) perylene	(mg/kg)	MCERTS	< 0.02
Benzo (k) fluoranthene	(mg/kg)	MCERTS	< 0.02
Chrysene	(mg/kg)	MCERTS	< 0.02
Dibenzo (a,h) anthracene	(mg/kg)	MCERTS	< 0.02
Fluoranthene	(mg/kg)	MCERTS	< 0.02
Fluorene	(mg/kg)	MCERTS	< 0.02
Indeno (1, 2, 3,-cd) pyrene	(mg/kg)	MCERTS	< 0.02
Naphthalene	(mg/kg)	MCERTS	< 0.02

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/02431/GRM - 24-43078

Project Reference - P10525 CASCID Christie Hospital Manchester

Analytical Test Results - Solid

Lab Reference			347803
Client Sample ID			-
Client Sample Location			TP105
Client Sample Type			ES
Client Sample Number			-
Depth - Top (m)			0.50
Depth - Bottom (m)			0.50
Date of Sampling			17/03/2024
Time of Sampling			-
Sample Matrix			Sand
Determinant	**Units**	**Accreditation**	
Phenanthrene	(mg/kg)	MCERTS	< 0.02
Pyrene	(mg/kg)	MCERTS	< 0.02
Total PAH (Sum of USEPA 16)	(mg/kg)	UKAS	< 0.32
FOC	-	UKAS	0.038
Asbestos	-	UKAS	No asbestos detected

4161

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/02431/GRM - 24-43078

Project Reference - P10525 CASCID Christie Hospital Manchester

Analytical Test Results - Chemical Analysis

Lab Reference			347802
Client Sample ID			-
Client Sample Location			TP103
Client Sample Type			ES
Client Sample Number			-
Depth - Top (m)			0.30
Depth - Bottom (m)			0.40
Date of Sampling			17/03/2024
Time of Sampling			-
Sample Matrix			Sand
Determinant	**Units**	**Accreditation**	
Water soluble sulphate (as SO_4)	(mg/l)	u	< 10
Acid Soluble Sulphate	(%)	u	0.03
Total Sulphur	(%)	UKAS	0.02
pH Value	pH Units	MCERTS	8.7

7 - 11 Harding Street
Leicester
LE1 4DH

L24/02431/GRM - 24-43078

Project Reference - P10525 CASCID Christie Hospital Manchester

Analytical Test Results - VPH / EPH

Lab Reference			347803
Client Sample ID			-
Client Sample Location			TP105
Client Sample Type			ES
Client Sample Number			-
Depth - Top (m)			0.50
Depth - Bottom (m)			0.50
Date of Sampling			17/03/2024
Time of Sampling			-
Sample Matrix			Sand
Determinant	**Units**	**Accreditation**	
Aliphatic >C_5 to C_6 [HS_MS_1D_AL]	(mg/kg)	MCERTS	< 0.06
Aliphatic >C_6 to C_8 [HS_MS_1D_AL]	(mg/kg)	MCERTS	< 0.06
Aliphatic >C_8 to C_{10} [HS_MS_1D_AL]	(mg/kg)	MCERTS	< 0.06
Aliphatic >C_{10} to C_{12} [EH_CU_1D_AL]	(mg/kg)	u	< 10
Aliphatic >C_{12} to C_{16} [EH_CU_1D_AL]	(mg/kg)	u	< 10
Aliphatic >C_{16} to C_{21} [EH_CU_1D_AL]	(mg/kg)	u	< 10
Aliphatic >C_{21} to C_{35} [EH_CU_1D_AL]	(mg/kg)	u	< 20
Aliphatic >C_{35} to C_{44} [EH_CU_1D_AL]	(mg/kg)	u	< 15
Aromatic >C_5 to C_7 [HS_MS_1D_AR]	(mg/kg)	MCERTS	< 0.01
Aromatic >C_7 to C_8 [HS_MS_1D_AR]	(mg/kg)	MCERTS	< 0.01
Aromatic >C_8 to C_{10} [HS_MS_1D_AR]	(mg/kg)	MCERTS	< 0.06
Aromatic >C_{10} to C_{12} [EH_CU_1D_AR]	(mg/kg)	u	< 10
Aromatic >C_{12} to C_{16} [EH_CU_1D_AR]	(mg/kg)	u	< 10
Aromatic >C_{16} to C_{21} [EH_CU_1D_AR]	(mg/kg)	u	< 10
Aromatic >C_{21} to C_{35} [EH_CU_1D_AR]	(mg/kg)	u	< 20
Aromatic >C_{35} to C_{44} [EH_CU_1D_AR]	(mg/kg)	u	< 15
Total >C_5 to C_{35} [EH_CU+HS_1D_Total]	(mg/kg)	u	< 50
Benzene	(mg/kg)	MCERTS	< 0.01
Toluene	(mg/kg)	MCERTS	< 0.01
Ethylbenzene	(mg/kg)	MCERTS	< 0.01
m&p Xylene	(mg/kg)	MCERTS	< 0.02
o-Xylene	(mg/kg)	MCERTS	< 0.01
MTBE	(mg/kg)	MCERTS	< 0.01

4161

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/02431/GRM - 24-43078

Project Reference - P10525 CASCID Christie Hos

Analytical Test Results - VOC

Lab Reference			347803
Client Sample ID			-
Client Sample Location			TP105
Client Sample Type			ES
Client Sample Number			-
Depth - Top (m)			0.50
Depth - Bottom (m)			0.50
Date of Sampling			17/03/2024
Time of Sampling			-
Sample Matrix			Sand
Determinant	**Units**	**Accreditation**	
Benzene	(mg/kg)	MCERTS	< 0.01
Toluene	(mg/kg)	MCERTS	< 0.01
Ethylbenzene	(mg/kg)	MCERTS	< 0.01
m&p Xylene	(mg/kg)	MCERTS	< 0.02
o-Xylene	(mg/kg)	MCERTS	< 0.01
Dichlorodifluoromethane	(mg/kg)	UKAS	< 0.05
Chloromethane	(mg/kg)	UKAS	< 0.02
Vinyl Chloride	(mg/kg)	MCERTS	< 0.02
Bromomethane	(mg/kg)	u	< 0.05
Chloroethane	(mg/kg)	MCERTS	< 0.01
Trichlorofluoromethane	(mg/kg)	MCERTS	< 0.01
1,1-Dichloroethylene	(mg/kg)	MCERTS	< 0.01
Dichloromethane	(mg/kg)	u	< 0.10
MTBE	(mg/kg)	MCERTS	< 0.01
trans-1,2,-dichloroethylene	(mg/kg)	MCERTS	< 0.01
1,1-Dichloroethane	(mg/kg)	MCERTS	< 0.01
2,2-Dichloropropane	(mg/kg)	MCERTS	< 0.01
cis--1,2,-dichloroethylene	(mg/kg)	MCERTS	< 0.01
Bromochloromethane	(mg/kg)	MCERTS	< 0.05
Chloroform	(mg/kg)	MCERTS	< 0.01
1,1,1-Trichloroethane	(mg/kg)	MCERTS	< 0.01
1,1-Dichloropropene	(mg/kg)	MCERTS	< 0.01
Carbon Tetrachloride	(mg/kg)	MCERTS	< 0.01
1,2-dichloroethane	(mg/kg)	MCERTS	< 0.02
Trichloroethylene	(mg/kg)	MCERTS	< 0.01
1,2-Dichloropropane	(mg/kg)	MCERTS	< 0.01
Dibromomethane	(mg/kg)	MCERTS	< 0.02
Bromodichloromethane	(mg/kg)	MCERTS	< 0.01
cis-1,2-dichloropropylene	(mg/kg)	MCERTS	< 0.01
trans-1,3-dichloropropylene	(mg/kg)	MCERTS	< 0.01
1,1,2-Trichloroethane	(mg/kg)	MCERTS	< 0.01
1,3-Dichloropropane	(mg/kg)	MCERTS	< 0.01
Tetrachloroethylene	(mg/kg)	MCERTS	< 0.01
Chlorodibromomethane	(mg/kg)	MCERTS	< 0.01
1,2-Dibromoethane	(mg/kg)	MCERTS	< 0.01
Chlorobenzene	(mg/kg)	MCERTS	< 0.01
1,1,1,2-tetrachloroethane	(mg/kg)	MCERTS	< 0.01
Styrene	(mg/kg)	UKAS	< 0.01
Isopropylbenzene	(mg/kg)	MCERTS	< 0.01
Bromoform	(mg/kg)	MCERTS	< 0.05
1,1,2,2-Tetrachloroethane	(mg/kg)	MCERTS	< 0.01
1,2,3-Trichloropropane	(mg/kg)	MCERTS	< 0.02
n-Propylbenzene	(mg/kg)	MCERTS	< 0.01
Bromobenzene	(mg/kg)	MCERTS	< 0.01
1,3,5-Trimethylbenzene	(mg/kg)	UKAS	< 0.01
2-chlorotoluene	(mg/kg)	MCERTS	< 0.01
4-chlorotoluene	(mg/kg)	MCERTS	< 0.01
tert-butylbenzene	(mg/kg)	UKAS	< 0.01
1,2,4-trimethylbenzene	(mg/kg)	UKAS	< 0.01
sec-Butylbenzene	(mg/kg)	UKAS	< 0.01
4-Isopropyltoluene (P-Cymene)	(mg/kg)	UKAS	< 0.01
1,3-Dichlorobenzene	(mg/kg)	u	< 0.01
1,4-Dichlorobenzene	(mg/kg)	u	< 0.01
n-Butylbenzene	(mg/kg)	UKAS	< 0.01
1,2-Dichlorobenzene	(mg/kg)	MCERTS	< 0.01
1,2-Dibromo-3-chloropropane	(mg/kg)	u	< 0.05
1,2,4-Trichlorobenzene	(mg/kg)	u	< 0.05
Hexachlorobutadiene	(mg/kg)	u	< 0.05
Naphthalene	(mg/kg)	u	< 0.05
1,2,3-Trichlorobenzene	(mg/kg)	u	< 0.05

4161

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/02431/GRM - 24-43078

Project Reference - P10525 CASCID Christie Hospital Manchester

Sample Descriptions

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Description	Moisture Content (%)	Stone Content (%)	Passing 2mm test sieve (%)
347802	-	TP103	ES	-	Dark greyish brown gravelly silty sand	-	-	74
347803	-	TP105	ES	-	Brown gravelly silty sand	13	< 0.1	87

7 - 11 Harding Street
Leicester
LE1 4DH

L24/02431/GRM - 24-43078

Project Reference - P10525 CASCID Christie Hospital Manchester

Sample Comments

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Comments
347802	-	TP103	ES	-	
347803	-	TP105	ES	-	VOC - Sample taken from container with headspace. VPH/BTEX - Sample taken from container with headspace.

L24/02431/GRM - 24-43078

Project Reference - P10525 CASCID Christie Hospital Manchester

Analysis Methodologies

Test Code	Test Name / Reference	Sample condition for analysis	Sample Preperation	Test Details
ANIONSS	MS - CL - Anions by Aquakem (2:1Extract)	Oven dried	Passing 2mm test sieve	Determination of Anions (inc Sulphate, chloride etc.) in soils by Aquakem. Analysis is based on a 2:1 water to soil extraction ratio
EPHS	MS - CL - EPH in Soil	As received	Passing 10mm test sieve	Determination of Extractable Petroleum Hydrocarbons in soils via GC-MS
PAHASRDS	MS - CL - PAH (As Received)	As received	Passing 10mm test sieve	Determination of Polyaromatic hydrocarbons in soil via GC-MS
CWGS	MS - CL - VPH & MS - CL - EPH	As received	Passing 10mm test sieve	Determination of TPH CWG (Volatile Petroleum Hydrocarbons and Extractable Petroleum Hydrocarbons) in soils via Headspace-GC-MS and GC-MS respectively
TOCS	MS - CL - TOC Eltra	Air Dried	Passing 10mm test sieve	Determination of Total Organic Carbon in soils
VOCS	MS - CL - VOC and MBTEX	As received	Passing 10mm test sieve	Determination of VOCs (inc BTEX) in soils via Headspace-GC-MS
VPHS	MS - CL - VPH	As received	Passing 10mm test sieve	Determination of VPH in soils via Headspace-GC-MS
WSBORONS	MS - CL - WS Boron	Air dried	Passing 10mm test sieve	Determination of Water soluble Boron in soils via ICP
SKALARCNS	MS - CL - Cyanide by Skalar	As received	Passing 10mm test sieve	Determination of cyanide (total / free / complex) in soil using a Skalar segmented flow analyser
SKALARHCS	MS - CL - Hexavalent Chromium by Skalar	As received	Passing 10mm test sieve	Determination of hexavalent chromium in soil using Skalar segmented flow analyser
ICPMETS	MS - CL - ICP Metals	Air dried	Passing 10mm test sieve	Determination of metals in soils via ICP
PHS	MS - CL - pH in Soils	As received	Passing 10mm test sieve	Determination of pH in soils using a pH probe (using a 1:3 soil to water extraction)
PHOHHPLCS	MS - CL - Phenols by HPLC (soil)	As received	Passing 10mm test sieve	Determination of speciated phenols in soil using HPLC
ASSO4S	MS - CL - Acid Soluble Sulphate	Oven Dried	Passing 2mm test sieve	Determination of total sulphate in soils by acid extraction followed by ICP analysis
ASB	MS - AS - Asbestos	-	-	Fibre identification is in accordance with in house documented methods which are based on the procedure documented in the HSE Document HSG 248 "Asbestos: The analysts guide for sampling, analysis and clearance procedures"
SAMPLEPREP	MS - CL - Sample Preparation	-	-	Preparation of samples (including determination of moisture content) to allow for subsequent analysis
SUBCON-ENV	Subcontract - ENV Lab	-	-	Subcontract testing
1377TS-ELT	BS1377 Total Sulphur Content by HTC	Oven dried	BS1377 : Part 1 : 2016	Total Sulphur Content testing of Soil in accordance with BS 1377 : Part 3 : 2018 + A1 : 2021 Clause 7.10 (using Eltra CS-800 Analyser)

7 - 11 Harding Street
Leicester
LE1 4DH

L24/02431/GRM - 24-43078

Project Reference - P10525 CASCID Christie Hospital Manchester

HWOL TPH Acronym Index

Acronym	Description
HS	Headspace Analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
Total	Aliphatics and Aromatics
AL	Aliphatics Only
AR	Aromatics Only
2D	GC-GC - Double Coil Gas Chromatography
#1	EH_Total but with humics mathmatically subtracted
#2	EH_Total but with fatty acids mathmatically subtracted
_	Operator - underscore to separate acronyms (except for +)
+	Operator to indicate cumlative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry

4161

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

GRM Development Solutions
Laurus House
First Avenue
Centrum 100
Burton Upon Trent
DE14 2WH

Analytical Test Report: L24/03842/GRM - 24-44683

Your Project Reference:	**CASID-Christie Hospital, Manchaster**		
Your Order Number:	P10525	Samples Received / Instructed:	30/04/2024 / 01/05/2024
Report Issue Number:	1	Sample Tested:	01/05 to 21/05/2024
Samples Analysed:	4 soil samples	Report issued:	21/05/2024

Signed

James Gane
Analytical Services Manager
CTS Group

Notes:

General

Please refer to Methodologies page for details pertaining to the analytical methods undertaken.

Samples will be retained for 14 days after issue of this report with the exception of the asbestos test portion which is held for 6 months unless otherwise requested.

Moisture Content was determined in accordance with CTS method statement MS - CL - Sample Prep, oven dried at <30˚C.

Moisture Content is reported as a percentage of the dry mass of soil, this calculation is in accordance with BS1377, Part 2, 1990, Clause 3.2

Stone Content was determined in accordance with CTS method statement MS - CL - Sample Prep and refers to the percentage of stones retained on a 10mm BS test sieve.

Where specification limits are included these are for guidance only. Where a measured value has been highlighted this is not implying acceptance or failure and certainty of measurement values have not been taken into account.

Uncertainty of measurement values are available on request.

Samples were supplied by customer, results apply to the samples as received.

Asbestos

Please note: Where futher analaysis is required samples identified as containing asbestos are screened and tested on an as recevied basis. No correction is made for moisture content and these results are not covered by our accrediation

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation

WAC Testing

Samples were leached in accordance with BS EN 12457-2: 2002.

Eluate Results are reported as L/S 10. These results have been calculated in accordance with BS EN 12457-2:2002.

Comparative values are taken from the Council Decision Annex - CRITERIA AND PROCEDURES FOR THE ACCEPTANCE OF WASTE AT LANDFILLS, (2003/33/EC).

Deviating Samples

On receipt samples are compared against our sample holding and handling protocols, where any deviations have been noted these are reported on our deviating sample page (if present)

Accreditation Key

UKAS = UKAS Accreditation, MCERTS = MCERTS Accreditation, u = Unaccredited, subUKAS - Subcontracted to a laboratory UKAS accredited for this test, subMCERTS - Subcontracted to a laboratory MCERTS accredited for this test

MCERTS Accreditation only covers the SAND, CLAY and LOAM matrices

Date of Issue: 13.05.2024

Issued by: J. Gane

Issue No: 4

Rev No: 9

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/03842/GRM - 24-44683

Project Reference - CASID-Christie Hospital, Manchaster

Analytical Test Results - Solid

Lab Reference			360713	360715
Client Sample ID			-	-
Client Sample Location			WS101	WS102
Client Sample Type			ES	ES
Client Sample Number			-	-
Depth - Top (m)			0.80	0.80
Depth - Bottom (m)			0.80	0.80
Date of Sampling			28/04/2024	28/04/2024
Time of Sampling			-	-
Sample Matrix			Sand	Sand
Determinant	**Units**	**Accreditation**		
Antimony	(mg/kg)	u	< 3.5	< 3.5
Arsenic	(mg/kg)	MCERTS	13	290
Barium	(mg/kg)	MCERTS	170	140
Beryllium	(mg/kg)	MCERTS	0.7	< 4.0
Boron (w/s)	(mg/kg)	u	< 2.5	< 2.5
Cadmium	(mg/kg)	MCERTS	0.6	0.5
Chromium (III)	(mg/kg)	u	7.5	2.7
Chromium (Total)	(mg/kg)	UKAS	8.5	3.7
Copper	(mg/kg)	MCERTS	46	41
Iron	(mg/kg)	u	25000	18000
Lead	(mg/kg)	MCERTS	56	190
Manganese	(mg/kg)	MCERTS	580	390
Mercury	(mg/kg)	UKAS	< 2.5	< 2.5
Mercury (Total, Low Level)	(mg/kg)	u	< 0.1	0.2
Molybdenum	(mg/kg)	u	< 2.0	< 40.0
Nickel	(mg/kg)	MCERTS	18	12
Selenium	(mg/kg)	u	< 8.0	< 8.0
Vanadium	(mg/kg)	UKAS	8.4	11
Zinc	(mg/kg)	MCERTS	56	61
Phenol	(mg/kg)	MCERTS	< 0.20	< 0.20
Cresols	(mg/kg)	MCERTS	< 0.20	< 0.20
Xylenols	(mg/kg)	MCERTS	< 0.20	< 0.20
Trimethyl Phenols	(mg/kg)	UKAS	< 0.20	< 0.20
Total Phenols (via HPLC)	(mg/kg)	UKAS	< 0.80	< 0.80
Cyanide (Free)	(mg/kg)	u	< 1.0	< 1.0
Chromium (Hexavalent)	(mg/kg)	u	< 1.0	< 1.0
pH	pH Units	MCERTS	7.6	8.1
Sulphate (Water soluble as SO_4)	(mg/l)	u	< 10	63
Sulphur (Total)	(%)	UKAS	< 0.01	0.02
Acenaphthene	(mg/kg)	MCERTS	< 0.02	0.87
Acenaphthylene	(mg/kg)	UKAS	< 0.02	< 0.20
Anthracene	(mg/kg)	UKAS	< 0.02	1.1
Benzo (a) anthracene	(mg/kg)	MCERTS	< 0.02	4.4
Benzo (a) pyrene	(mg/kg)	MCERTS	< 0.02	2.8
Benzo (b) fluoranthene	(mg/kg)	MCERTS	< 0.02	3.2
Benzo (g, h, i) perylene	(mg/kg)	MCERTS	< 0.02	1.5
Benzo (k) fluoranthene	(mg/kg)	MCERTS	< 0.02	1.3
Chrysene	(mg/kg)	MCERTS	< 0.02	4.2
Dibenzo (a,h) anthracene	(mg/kg)	MCERTS	< 0.02	0.29
Fluoranthene	(mg/kg)	MCERTS	< 0.02	13
Fluorene	(mg/kg)	MCERTS	< 0.02	0.60
Indeno (1, 2, 3,-cd) pyrene	(mg/kg)	MCERTS	< 0.02	1.1
Naphthalene	(mg/kg)	MCERTS	< 0.02	0.53

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/03842/GRM - 24-44683

Project Reference - CASID-Christie Hospital, Manchaster

Analytical Test Results - Solid

Lab Reference			360713	360715
Client Sample ID			-	-
Client Sample Location			WS101	WS102
Client Sample Type			ES	ES
Client Sample Number			-	-
Depth - Top (m)			0.80	0.80
Depth - Bottom (m)			0.80	0.80
Date of Sampling			28/04/2024	28/04/2024
Time of Sampling			-	-
Sample Matrix			Sand	Sand
Determinant	**Units**	**Accreditation**		
Phenanthrene	(mg/kg)	MCERTS	< 0.02	8.5
Pyrene	(mg/kg)	MCERTS	< 0.02	12
Total PAH (Sum of USEPA 16)	(mg/kg)	UKAS	< 0.32	56
FOC	-	UKAS	0.027	0.019
Asbestos	-	UKAS	No asbestos detected	No asbestos detected

7 - 11 Harding Street
Leicester
LE1 4DH

L24/03842/GRM - 24-44683

Project Reference - CASID-Christie Hospital, Manchaster

Analytical Test Results - Chemical Analysis

Lab Reference			360712	360714
Client Sample ID			-	-
Client Sample Location			WS101	WS102
Client Sample Type			ES	ES
Client Sample Number			-	-
Depth - Top (m)			0.30	0.45
Depth - Bottom (m)			0.30	0.45
Date of Sampling			28/04/2024	28/04/2024
Time of Sampling			-	-
Sample Matrix			Sand	Sand
Determinant	**Units**	**Accreditation**		
Water soluble sulphate (as SO_4)	(mg/l)	u	< 10	48
Acid Soluble Sulphate	(%)	u	< 0.01	0.02
Total Sulphur	(%)	UKAS	< 0.01	0.01
pH Value	pH Units	MCERTS	7.5	7.8

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

4161

L24/03842/GRM - 24-44683

Project Reference - CASID-Christie Hospital, Manchaster

Analytical Test Results - VPH / EPH

Lab Reference			360713	360715
Client Sample ID			-	-
Client Sample Location			WS101	WS102
Client Sample Type			ES	ES
Client Sample Number			-	-
Depth - Top (m)			0.80	0.80
Depth - Bottom (m)			0.80	0.80
Date of Sampling			28/04/2024	28/04/2024
Time of Sampling			-	-
Sample Matrix			Sand	Sand
Determinant	**Units**	**Accreditation**		
Benzene	(mg/kg)	MCERTS	< 0.01	< 0.01
Toluene	(mg/kg)	MCERTS	< 0.01	< 0.01
Ethylbenzene	(mg/kg)	MCERTS	< 0.01	< 0.01
m&p Xylene	(mg/kg)	MCERTS	< 0.02	< 0.02
o-Xylene	(mg/kg)	MCERTS	< 0.01	< 0.01
MTBE	(mg/kg)	MCERTS	< 0.01	< 0.01
Aliphatic >C_5 to C_6 [HS_MS_1D_AL]	(mg/kg)	MCERTS	< 0.06	< 0.06
Aliphatic >C_6 to C_8 [HS_MS_1D_AL]	(mg/kg)	MCERTS	< 0.06	< 0.06
Aliphatic >C_8 to C_{10} [HS_MS_1D_AL]	(mg/kg)	MCERTS	< 0.06	< 0.06
Aliphatic >C_{10} to C_{12} [EH_CU_1D_AL]	(mg/kg)	u	< 10	< 10
Aliphatic >C_{12} to C_{16} [EH_CU_1D_AL]	(mg/kg)	u	< 10	< 10
Aliphatic >C_{16} to C_{21} [EH_CU_1D_AL]	(mg/kg)	u	< 10	< 10
Aliphatic >C_{21} to C_{35} [EH_CU_1D_AL]	(mg/kg)	u	< 20	< 20
Aliphatic >C_{35} to C_{44} [EH_CU_1D_AL]	(mg/kg)	u	23	< 15
Aromatic >C_5 to C_7 [HS_MS_1D_AR]	(mg/kg)	MCERTS	< 0.01	< 0.01
Aromatic >C_7 to C_8 [HS_MS_1D_AR]	(mg/kg)	MCERTS	< 0.01	< 0.01
Aromatic >C_8 to C_{10} [HS_MS_1D_AR]	(mg/kg)	MCERTS	< 0.06	< 0.06
Aromatic >C_{10} to C_{12} [EH_CU_1D_AR]	(mg/kg)	u	< 10	< 10
Aromatic >C_{12} to C_{16} [EH_CU_1D_AR]	(mg/kg)	u	< 10	< 10
Aromatic >C_{16} to C_{21} [EH_CU_1D_AR]	(mg/kg)	u	< 10	28
Aromatic >C_{21} to C_{35} [EH_CU_1D_AR]	(mg/kg)	u	49	80
Aromatic >C_{35} to C_{44} [EH_CU_1D_AR]	(mg/kg)	u	95	57
Total >C_5 to C_{35} [EH_CU+HS_1D_Total]	(mg/kg)	u	< 50	110

4161

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/03842/GRM - 24-44683

Project Reference - CASID-Christie Hospital, Ma

Analytical Test Results - VOC

Lab Reference			360713	360715
Client Sample ID			-	-
Client Sample Location			WS101	WS102
Client Sample Type			ES	ES
Client Sample Number			-	-
Depth - Top (m)			0.80	0.80
Depth - Bottom (m)			0.80	0.80
Date of Sampling			28/04/2024	28/04/2024
Time of Sampling			-	-
Sample Matrix			Sand	Sand
Determinant	**Units**	**Accreditation**		
Benzene	(mg/kg)	MCERTS	< 0.01	< 0.01
Toluene	(mg/kg)	MCERTS	< 0.01	< 0.01
Ethylbenzene	(mg/kg)	MCERTS	< 0.01	< 0.01
m&p Xylene	(mg/kg)	MCERTS	< 0.02	< 0.02
o-Xylene	(mg/kg)	MCERTS	< 0.01	< 0.01
Dichlorodifluoromethane	(mg/kg)	UKAS	< 0.05	< 0.05
Chloromethane	(mg/kg)	UKAS	< 0.02	< 0.02
Vinyl Chloride	(mg/kg)	MCERTS	< 0.02	< 0.02
Bromomethane	(mg/kg)	u	< 0.05	< 0.05
Chloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01
Trichlorofluoromethane	(mg/kg)	MCERTS	< 0.01	< 0.01
1,1-Dichloroethylene	(mg/kg)	MCERTS	< 0.01	< 0.01
Dichloromethane	(mg/kg)	u	0.13	0.11
MTBE	(mg/kg)	MCERTS	< 0.01	< 0.01
trans-1,2,-dichloroethylene	(mg/kg)	MCERTS	< 0.01	< 0.01
1,1-Dichloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01
2,2-Dichloropropane	(mg/kg)	MCERTS	< 0.01	< 0.01
cis--1,2,-dichloroethylene	(mg/kg)	MCERTS	< 0.01	< 0.01
Bromochloromethane	(mg/kg)	MCERTS	< 0.05	< 0.05
Chloroform	(mg/kg)	MCERTS	< 0.01	< 0.01
1,1,1-Trichloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01
1,1-Dichloropropene	(mg/kg)	MCERTS	< 0.01	< 0.01
Carbon Tetrachloride	(mg/kg)	MCERTS	< 0.01	< 0.01
1,2-dichloroethane	(mg/kg)	MCERTS	< 0.02	< 0.02
Trichloroethylene	(mg/kg)	MCERTS	< 0.01	< 0.01
1,2-Dichloropropane	(mg/kg)	MCERTS	< 0.01	< 0.01
Dibromomethane	(mg/kg)	MCERTS	< 0.02	< 0.02
Bromodichloromethane	(mg/kg)	MCERTS	< 0.01	< 0.01
cis-1,2-dichloropropylene	(mg/kg)	MCERTS	< 0.01	< 0.01
trans-1,3-dichloropropylene	(mg/kg)	MCERTS	< 0.01	< 0.01
1,1,2-Trichloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01
1,3-Dichloropropane	(mg/kg)	MCERTS	< 0.01	< 0.01
Tetrachloroethylene	(mg/kg)	MCERTS	< 0.01	< 0.01
Chlorodibromomethane	(mg/kg)	MCERTS	< 0.01	< 0.01
1,2-Dibromoethane	(mg/kg)	MCERTS	< 0.01	< 0.01
Chlorobenzene	(mg/kg)	MCERTS	< 0.01	< 0.01
1,1,1,2-tetrachloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01
Styrene	(mg/kg)	UKAS	< 0.01	< 0.01
Isopropylbenzene	(mg/kg)	MCERTS	< 0.01	< 0.01
Bromoform	(mg/kg)	MCERTS	< 0.05	< 0.05
1,1,2,2-Tetrachloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01
1,2,3-Trichloropropane	(mg/kg)	MCERTS	< 0.02	< 0.02
n-Propylbenzene	(mg/kg)	MCERTS	< 0.01	< 0.01
Bromobenzene	(mg/kg)	MCERTS	< 0.01	< 0.01
1,3,5-Trimethylbenzene	(mg/kg)	UKAS	< 0.01	< 0.01
2-chlorotoluene	(mg/kg)	MCERTS	< 0.01	< 0.01
4-chlorotoluene	(mg/kg)	MCERTS	< 0.01	< 0.01
tert-butylbenzene	(mg/kg)	UKAS	< 0.01	< 0.01
1,2,4-trimethylbenzene	(mg/kg)	UKAS	< 0.01	< 0.01
sec-Butylbenzene	(mg/kg)	UKAS	< 0.01	< 0.01
4-Isopropyltoluene (P-Cymene)	(mg/kg)	UKAS	< 0.01	< 0.01
1,3-Dichlorobenzene	(mg/kg)	u	< 0.01	< 0.01
1,4-Dichlorobenzene	(mg/kg)	u	< 0.01	< 0.01
n-Butylbenzene	(mg/kg)	UKAS	< 0.01	< 0.01
1,2-Dichlorobenzene	(mg/kg)	MCERTS	< 0.01	< 0.01
1,2-Dibromo-3-chloropropane	(mg/kg)	u	< 0.05	< 0.05
1,2,4-Trichlorobenzene	(mg/kg)	u	< 0.05	< 0.05
Hexachlorobutadiene	(mg/kg)	u	< 0.05	< 0.05
Naphthalene	(mg/kg)	u	< 0.05	0.05
1,2,3-Trichlorobenzene	(mg/kg)	u	< 0.05	< 0.05

4161

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/03842/GRM - 24-44683

Project Reference - CASID-Christie Hospital, Manchaster

Certificate Of Analysis - WAC Suite

Lab Reference	360715
Client Sample ID	-
Client Sample Location	WS102
Client Sample Type	ES
Client Sample Number	-
Depth - Top (m)	0.8
Depth - Bottom (m)	0.8
Date of Sampling	28/04/2024
Time of Sampling	-
Sample Description	Brown slightly gravelly silty sand
Sample Matrix	Sand
Moisture Content (%)	7.6
Stone content (%)	30

			Determined Result	Inert Waste Landfill	Stable non reactive hazardous waste in a non hazardous landfill	Hazardous Waste Landfill
Solid Analysis						
Total Organic Carbon	%	MCERTS	1.9	3.0	5.0	6.0
Loss on Ignition	%	UKAS	2.4	-	-	10.0
BTEX	mg/kg	MCERTS	< 0.06	6.00	-	-
PCB's (7 Congeners)	mg/kg	u	< 0.028	1.00	-	-
Mineral Oil (>C_{10} to C_{40}) [EH_1D_Total]	mg/kg	MCERTS	185	500	-	-
PAH	mg/kg	u	57	100	-	-
pH	units	MCERTS	8.1	-	> 6	-
Eluate Analysis						
Arsenic	mg/kg	u	3.90	0.50	2	25
Barium	mg/kg	u	< 0.05	20	100	300
Cadmium	mg/kg	u	< 0.03	0.04	1	5
Chromium (total)	mg/kg	u	< 0.03	0.5	10	70
Copper	mg/kg	u	< 0.01	2.0	50	100
Mercury	mg/kg	u	< 0.01	0.01	0.2	2
Molybdenum	mg/kg	u	< 0.03	0.5	10.0	30
Nickel	mg/kg	u	< 0.03	0.4	10.0	40
Lead	mg/kg	u	< 0.05	0.5	10.0	50
Antimony	mg/kg	u	< 0.03	0.06	0.7	5
Selenium	mg/kg	u	< 0.01	0.1	0.5	7
Zinc	mg/kg	u	< 0.05	4	50	200
Chloride	mg/kg	u	3	800	15000	25000
Fluoride	mg/kg	u	10	10	150	500
Sulphate (as SO_4)	mg/kg	u	87	1000	20000	50000
Total Dissolved Solids	mg/kg	u	770	4000	60000	100000
Phenol Index	mg/kg	u	< 1.0	1	-	-
Dissolved Organic Carbon	mg/kg	u	28.0	500	800	1000

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/03842/GRM - 24-44683

Project Reference - CASID-Christie Hospital, Manchaster

Analytical Test Results - 2:1 Leachate Suite

Lab Reference			360713
Client Sample ID			-
Client Sample Location			WS101
Client Sample Type			ES
Client Sample Number			-
Depth - Top (m)			0.80
Depth - Bottom (m)			0.80
Date of Sampling			28/04/2024
Time of Sampling			-
Sample Matrix			Leachate
Determinant	**Units**	**Accreditation**	
Boron	(mg/l)	u	0.015
Calcium	(mg/l)	u	11
Iron	(mg/l)	u	12
Antimony	(µg/l)	u	< 2.5
Arsenic	(µg/l)	u	4
Barium	(µg/l)	u	120
Beryllium	(µg/l)	u	< 1
Boron	(µg/l)	u	15
Cadmium (LL)	(µg/l)	u	0.83
Cadmium	(µg/l)	u	< 3
Chromium	(µg/l)	u	19
Chromium (III)	(µg/l)	u	< 20
Copper	(µg/l)	u	8
Lead	(µg/l)	u	41
Magnesium	(µg/l)	u	2300
Manganese	(µg/l)	u	210
Mercury (LL)	(µg/l)	u	< 0.20
Mercury	(µg/l)	u	< 1
Molydenum	(µg/l)	u	< 2.5
Nickel	(µg/l)	u	< 3
Selenium	(µg/l)	u	< 1
Vanadium	(µg/l)	u	57.4
Zinc	(µg/l)	u	27
Phenol	(µg/l)	u	8.52
pH	pH Units	u	8.1
Cyanide (Free)	(mg/l)	u	< 0.5
Cyanide (Complex)	(mg/l)	u	< 0.5
Cyanide (Total)	(mg/l)	u	< 0.5
Chromium (Hexavalent)	(mg/l)	u	0.02
Chloride	(mg/l)	u	4.9
Fluoride	(mg/l)	u	0.53
Sulphate (As SO_4)	(mg/l)	u	< 10
Cresols	(µg/l)	u	0.49
Xylenols	(µg/l)	u	< 0.20
Trimethyl Phenols	(µg/l)	u	< 0.50
Phenols (Total)	(µg/l)	u	9.01
Ammonium (As N)	(mg/l)	u	< 0.02

7 - 11 Harding Street
Leicester
LE1 4DH

L24/03842/GRM - 24-44683

Project Reference - CASID-Christie Hospital, Manchaster

Sample Descriptions

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Description	Moisture Content (%)	Stone Content (%)	Passing 2mm test sieve (%)
360712	-	WS101	ES	-	Brown slightly gravelly silty sand	-	-	85
360713	-	WS101	ES	-	Brown slightly gravelly slightly clayey silty sand	12	< 0.1	90
360714	-	WS102	ES	-	Brown slightly gravelly silty sand	-	-	95
360715	-	WS102	ES	-	Brown slightly gravelly silty sand	7.6	30	89

7 - 11 Harding Street
Leicester
LE1 4DH

L24/03842/GRM - 24-44683

Project Reference - CASID-Christie Hospital, Manchaster

Sample Comments

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Comments
360712	-	WS101	ES	-	
360713	-	WS101	ES	-	VPH/BTEX - Sample taken from container with headspace.
360714	-	WS102	ES	-	
360715	-	WS102	ES	-	VPH/BTEX - Sample taken from container with headspace.

7 - 11 Harding Street
Leicester
LE1 4DH

L24/03842/GRM - 24-44683

Project Reference - CASID-Christie Hospital, Manchaster

Analysis Methodologies

Test Code	Test Name / Reference	Sample condition for analysis	Sample Preperation	Test Details
ANIONSL	MS - CL - Anions by Aquakem	As received	-	Determination of Anions (inc Sulphate, chloride etc.) in leachate samples by Aquakem
ANIONSS	MS - CL - Anions by Aquakem (2:1Extract)	Oven dried	Passing 2mm test sieve	Determination of Anions (inc Sulphate, chloride etc.) in soils by Aquakem. Analysis is based on a 2:1 water to soil extraction ratio
EPHS	MS - CL - EPH in Soil	As received	Passing 10mm test sieve	Determination of Extractable Petroleum Hydrocarbons in soils via GC-FID
PCB7S	MS - CL - PCB Soils	As received	Passing 10mm test sieve	Determination of PCB's (7 congeners) in soils via GC-MS
PAHASRDS	MS - CL - PAH (As Received)	As received	Passing 10mm test sieve	Determination of Polyaromatic hydrocarbons in soil via GC-MS
CWGS	Calculation from VPH-S and EPH-S	As received	Passing 10mm test sieve	Determination of TPH CWG (Volatile Petroleum Hydrocarbons and Extractable Petroleum Hydrocarbons) in soils via Headspace-GC-MS and GC-GC-FID respectively
WACTOCS	MS - CL - TOC Eltra (WAC)	Air dried	Passing 10mm test sieve	Determination of Total Organic Carbon in soil as part of a WAC test
TOCS	MS - CL - TOC Eltra	Air Dried	Passing 10mm test sieve	Determination of Total Organic Carbon in soils
TPHS	MS - CL - TPH (GC-FID)	As received	Passing 10mm test sieve	Determination of Total Petroleum Hydrocarbons in soil using GC-FID
WACSKALAR	MS - CL - Phenols by Skalar (WAC)	As received	BSEN:12457 Leaching	Determination of Total Phenols within leachate as part of a WAC test using a Skalar Segmented flow analyser
VOCS	MS - CL - VOC and MBTEX	As received	Passing 10mm test sieve	Determination of VOCs (inc BTEX) in soils via Headspace-GC-MS
VPHS	MS - CL - VPH	As received	Passing 10mm test sieve	Determination of VPH in soils via Headspace-GC-MS
WSBORONS	MS - CL - WS Boron	Air dried	Passing 10mm test sieve	Determination of Water soluble Boron in soils via ICP
SKALARCNL	MS - CL - Cyanide by Skalar - Leachate	As received	BSEN:12457 Leaching	Determination of cyanide (total / free / complex) in leachates using a Skalar segmented flow analyser
SKALARCNS	MS - CL - Cyanide by Skalar	As received	Passing 10mm test sieve	Determination of cyanide (total / free / complex) in soil using a Skalar segmented flow analyser
WACDOC	MS - CL - DOC (WAC)	As received	BSEN:12457 Leaching	Determination of dissolved organic carbon in a leachate as part of a WAC test
SKALARHCL	MS - CL - Hexavalent Cr by Skalar - L	As received	BSEN:12457 Leaching	Determination of hexavalent chromium in leachate using Skalar segmented flow analyser
SKALARHCS	MS - CL - Hexavalent Chromium by Skalar	As received	Passing 10mm test sieve	Determination of hexavalent chromium in soil using Skalar segmented flow analyser
WACMETALS	MS - CL - ICP - Metals in Waters (WAC)	As received	BSEN:12457 Leaching	Determination of metals in a leachate as part of a WAC test via ICP
ICPMETL	MS - CL - ICP Metals in Waters	As received	BSEN:12457 Leaching	Determination of metals in leachates via ICP
ICPMETS	MS - CL - ICP Metals	Air dried	Passing 10mm test sieve	Determination of metals in soils via ICP
PHL	MS - CL - pH in Waters	As received	BSEN:12457 Leaching	Determination of pH in leachates using a pH probe

4161

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/03842/GRM - 24-44683

Project Reference - CASID-Christie Hospital, Manchaster

Analysis Methodologies

Test Code	Test Name / Reference	Sample condition for analysis	Sample Preperation	Test Details
WACPHS	MS - CL - pH in Soils (WAC)	As received	BSEN:12457 Leaching	Determination of pH in soils as part of a WAC test via pH probe
PHS	MS - CL - pH in Soils	As received	Passing 10mm test sieve	Determination of pH in soils using a pH probe (using a 1:3 soil to water extraction)
PHOHHPLCL	MS - CL - Phenol Waters by HPLC	As received	BSEN:12457 Leaching	Determination of speciated phenols in leachates using HPLC
PHOHHPLCS	MS - CL - Phenols by HPLC (soil)	As received	Passing 10mm test sieve	Determination of speciated phenols in soil using HPLC
WACANIONS	MS - CL - Anions by Aquakem (WAC)	As received	BSEN:12457 Leaching	Determination of sulphate, chloride and fluoride in a leachate as part of a WAC test using a Aquakem analyser
TDSL	MS-CL-Conductivity in Water(TDS by Calc)	As received	BSEN:12457 Leaching	Determination of total dissolved solids in leachates (by calculation)
ASSO4S	MS - CL - Acid Soluble Sulphate	Oven Dried	Passing 2mm test sieve	Determination of total sulphate in soils by acid extraction followed by ICP analysis
ASB	MS - AS - Asbestos	-	-	Fibre identification is in accordance with in house documented methods which are based on the procedure documented in the HSE Document HSG 248 "Asbestos: The analysts guide for sampling, analysis and clearance procedures"
ENLEACHP	BS EN 12457-2	As Received	-	Leaching in accordance with BSEN 12457-2 (10:1 Ratio)
ENLEACHP2	BS EN 12457-3	As Received	-	Leaching in accordance with BSEN 12457-3
SAMPLEPREP	MS - CL - Sample Preparation	-	-	Preparation of samples (including determination of moisture content) to allow for subsequent analysis
SUBCON-ENV	Subcontract - ENV Lab	-	-	Subcontract testing
1377LOI	BS1377 LoI	Oven dried	Passing 2mm test sieve	Testing was in accordance with BS 1377: Part 3: 2018 + A1 :2021 Clause 6. Determination of the mass loss on ignition. Some information required by BS1377: 2016: Part 1 has not been reported. This information is available on request.
1377TS-ELT	BS1377 Total Sulphur Content by HTC	Oven dried	BS1377 : Part 1 : 2016	Total Sulphur Content testing of Soil in accordance with BS 1377 : Part 3 : 2018 + A1 : 2021 Clause 7.10 (using Eltra CS-800 Analyser)

7 - 11 Harding Street
Leicester
LE1 4DH

L24/03842/GRM - 24-44683

Project Reference - CASID-Christie Hospital, Manchaster

HWOL TPH Acronym Index

Acronym	Description
HS	Headspace Analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
Total	Aliphatics and Aromatics
AL	Aliphatics Only
AR	Aromatics Only
2D	GC-GC - Double Coil Gas Chromatography
#1	EH_Total but with humics mathmatically subtracted
#2	EH_Total but with fatty acids mathmatically subtracted
_	Operator - underscore to separate acronyms (except for +)
+	Operator to indicate cumlative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry

APPENDIX K

GEOLABS Limited
Bucknalls Lane
Garston
Watford
Hertfordshire
WD25 9XX

Tel: +44(0) 1923 892 190
Fax: +44(0) 1923 892 191
email: admin@geolabs.co.uk
web: www.geolabs.co.uk

Simtec Material Testing
72, 113, 114, 116 The Burrows
East Goscote
Leicester

LE7 3XD

11 April 2024
Report No : GEO/40186/01

For the attention of Charlie Needham / Rob McGoff

Date samples received	26/03/2024
Date written instructions received	26/03/2024
Date testing commenced	27/03/2024
Date of sample disposal	**09/05/2024**

Our ref **GEO / 40186**
Your Ref **11359**

Project **CASCID - CHRISTIE HOSPITAL, MANCHESTER**

Further to your instructions we have pleasure in enclosing the results of the tests you requested in the attached figures.

LABORATORY TEST REPORT

Item No	Test Quantity	Description
1	2	Point Load Strength Index

Any opinions or interpretations expressed herein are outside the scope of UKAS accreditation. All results contained in this report are provisional unless signed by an approved signatory. The results contained in this report relate only to samples received in the laboratory and are tested 'as received' unless otherwise stated. This report should not be reproduced, except in full, without the written approval of the laboratory. The results reported are applicable only to the test items received by the laboratory.

All the necessary data required by the documented test procedures has been recorded and will be stored for a period of not less than 6 years. This data will be issued to yourselves at your request. All samples will be disposed of after the date shown above. Written confirmation will be required to retain the samples beyond this period and a storage charge may be applied.

We trust that the above meets your requirements and should you require any further information or assistance, please do not hesitate to contact us.

Yours faithfully

[redacted]ed

"Geolabs" and the Geolabs logo are registered trademarks in the name of Geolabs Limited
Registered Office: Bucknalls Lane Garston Watford Hertfordshire WD25 9XX Registered in England and Wales No: 3177641

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006 In-house Technical Procedure TP35

DETERMINATION OF POINT LOAD STRENGTH ON ROCK

Sample details			Point Load test											
Borehole Ref.	Depth (m)	Description	D. Tested	Test type & Direction		Sample width W (mm)	Platen separation (mm) Start D	Platen separation (mm) End D'	Water Content (%)	Equiv. Diameter D_e (mm)	Failure Load P (kN)	I_s P/De^2 (MPa)	Correction Factor F	Point Load Index $I_{s(50)}$ (MPa)
BH101 (11359/20861)	5.95-6.05	Extremely weak reddish brown fine to medium grained SANDSTONE. Fresh to slightly weathered	10/04/24	D	L	84.7	81.8	79.6		80.7	0.14	0.02	1.24	0.02
BH101 (11359/20865)	10.25-10.35	Extremely weak reddish brown fine to medium grained SANDSTONE. Fresh to slightly weathered	10/04/24	D	L	84.5	82.2	80.1		81.1	0.03	0.01	1.24	0.01

(*) Sample failed on weakness

Test type and direction: **D** - Diametral **A** - Axial **B** - Block **I** - Irregular lump **P** - Perpendicular to planes of weakness **U** - Random or unknown orientation **L** - Parallel to planes of weakness

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 11/04/2024

Project Number:

GEO / 40186

Project Name:

CASCID - CHRISTIE HOSPITAL, MANCHESTER

11359

GEOLABS®

UKAS TESTING 1982

TESTING RESTRICTION

The following tests have been scheduled on the below project. Those listed **CANNOT** be performed for the reason stated. If alternative samples are available for the restricted tests, please supply details.

Sample details				
Borehole Ref.	Depth (m)	Description	Tests restricted	Reason for restriction and comments
BH101 (11359/20860)	5.50-5.75	n/a	UCS w/ YM	Sample not received.
BH101 (11359/20861)	5.95-6.05	n/a	UCS w/ YM	Sample too short and broken into pieces before any testing has been done.
BH101 (11359/20865)	10.25-10.35	n/a	UCS w/ YM	Sample too short and broken into pieces before any testing has been done.

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 11/04/2024

Project Number:

GEO / 40186

Project Name:

CASCID - CHRISTIE HOSPITAL, MANCHESTER

11359

GEOLABS®

GEOLABS Limited
Bucknalls Lane
Garston
Watford
Hertfordshire
WD25 9XX
Tel: +44(0) 1923 892 190
Fax: +44(0) 1923 892 191
email: admin@geolabs.co.uk
web: www.geolabs.co.uk

Simtec Material Testing
72, 113, 114, 116 The Burrows
East Goscote
Leicester

LE7 3XD

11 April 2024
Report No : GEO/40187/01

For the attention of Charlie Needham / Rob McGoff

Date samples received	26/03/2024
Date written instructions received	26/03/2024
Date testing commenced	27/03/2024
Date of sample disposal	**09/05/2024**

Our ref **GEO / 40187**
Your Ref **11360**

Project **CASCID - CHRISTIE HOSPITAL, MANCHESTER**

Further to your instructions we have pleasure in enclosing the results of the tests you requested in the attached figures.

LABORATORY TEST REPORT

Item No	Test Quantity	Description
1	2	Unconfined Compressive Strength with Deformability
2	1	Point Load Strength Index

Any opinions or interpretations expressed herein are outside the scope of UKAS accreditation. All results contained in this report are provisional unless signed by an approved signatory. The results contained in this report relate only to samples received in the laboratory and are tested 'as received' unless otherwise stated. This report should not be reproduced, except in full, without the written approval of the laboratory. The results reported are applicable only to the test items received by the laboratory.

All the necessary data required by the documented test procedures has been recorded and will be stored for a period of not less than 6 years. This data will be issued to yourselves at your request. All samples will be disposed of after the date shown above. Written confirmation will be required to retain the samples beyond this period and a storage charge may be applied.

We trust that the above meets your requirements and should you require any further information or assistance, please do not hesitate to contact us.

Yours faithfully
on behalf of **GEOLABS Limited**

[redacted]
I Tabios
Laboratory Manager

"Geolabs" and the Geolabs logo are registered trademarks in the name of Geolabs Limited
Registered Office: Bucknalls Lane Garston Watford Hertfordshire WD25 9XX Registered in England and Wales No: 3177641

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

UNIAXIAL COMPRESSIVE STRENGTH OF ROCK MATERIALS

Sample details					Density		Uniaxial Compression Test (LF0879C (1000kN) compression frame used)							
							Mean after prep.							
Borehole Ref.	Depth (m)	Description	MC (%)	Degree of Saturation (%)	Bulk (Mg/m³)	Dry (Mg/m³)	Diameter (mm)	Height (mm)	H/D Ratio	Load at Failure (kN)	UCS (MPa) 3 sig. fig.	Failure Sketch	D. Tested	Remarks
BH102 (11360/20869)	3.40-3.55	Very weak thinly laminated reddish brown fine grained SANDSTONE. Fresh to slightly weathered	14	77.8	2.17	1.90	84.90	125.60	1.5	13.1	2.31		10/04/24	Non-standard test as samples does not meet the required height to diameter ratio.
BH102 (11360/20876)	16.50-16.70	Extremely weak thinly laminated reddish brown fine grained SANDSTONE. Fresh to slightly weathered	16	78.9	2.13	1.84	84.30	173.20	2.1	4.7	0.842		10/04/24	

Note: The dimensional requirements of flatness (<0.02 mm), perpendicularity (<0.05 / 50 mm) and straightness (0.3 mm deviation) are all met. Specific Gravity used for Degree of Saturation is assumed unless specified by the client.

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 11/04/2024

Project Number:

GEO / 40187

Project Name:

CASCID - CHRISTIE HOSPITAL, MANCHESTER

11360

GEOLABS®

UKAS TESTING 1982

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

UNCONFINED COMPRESSIVE STRENGTH WITH YOUNG'S MODULUS

Borehole Ref.:	BH102 (11360/20869)
Sample Ref.:	-
Depth (m):	3.40-3.55

Description:
Very weak thinly laminated reddish brown fine grained SANDSTONE. Fresh to slightly weathered

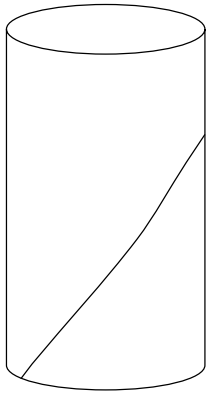
LF0879C (1000kN) compression frame used

Diameter	84.90 mm
Height	125.60 mm
Bulk Density	2.17 Mg/m³
Dry Density	1.90 Mg/m³
Water Content	14 %

Degree of Saturation: 77.8 % Specific Gravity: 2.9 Mg/m³ (Assumed)

Failure Sketch

Mode of failure: Diagonal shearing



Solid lines for material failures.
Dashed lines for apparent weakness failure.

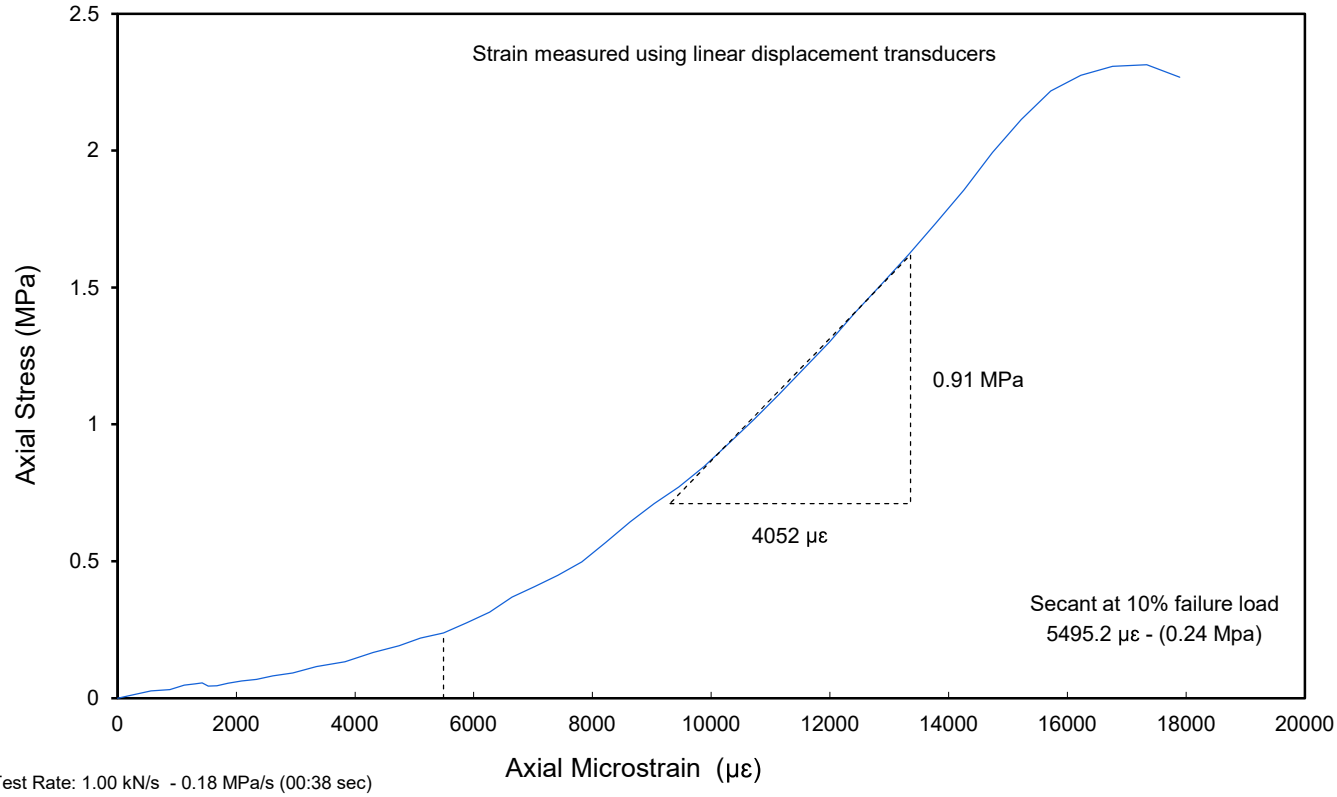
Date tested: 10/04/2024

Angle of foliation/Axis of loading: n/a
Angle of shear plane/Axis of loading: n/a

Sample type	C

Test results

Unconfined Compressive Strength Maximum load (kN): 13.10	2.31 MPa
Young's Modulus (tangential at 50% failure load)	0.224 GPa
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 10% failure load)	0.0434 GPa
Poisson's Ratio (secant at 10% failure load)	n/a



Test Rate: 1.00 kN/s - 0.18 MPa/s (00:38 sec)

Remarks: Non-standard test as samples does not meet the required height to diameter ratio.

Note: The dimensional requirements of Flatness (<0.02 mm), Perpendicularity (<0.05 / 50 mm) and Straightness (0.3 mm deviation) are all met.

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 11/04/2024

Project Number:

GEO / 40187

Project Name:

CASCID - CHRISTIE HOSPITAL, MANCHESTER

11360

GEOLABS®

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

UNCONFINED COMPRESSIVE STRENGTH WITH YOUNG'S MODULUS

Borehole Ref.:	BH102 (11360/20876)
Sample Ref.:	-
Depth (m):	16.50-16.70

Description:
Extremely weak thinly laminated reddish brown fine grained SANDSTONE.
Fresh to slightly weathered

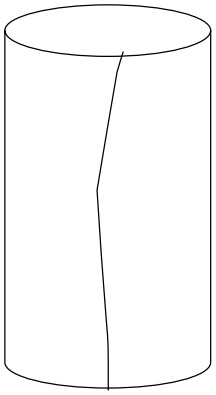
LF0879C (1000kN) compression frame used

Diameter	84.30 mm
Height	173.20 mm
Bulk Density	2.13 Mg/m³
Dry Density	1.84 Mg/m³
Water Content	16 %

Degree of Saturation: 78.9 % Specific Gravity: 2.9 Mg/m³ (Assumed)

Failure Sketch

Mode of failure: Axial splitting



Solid lines for material failures.
Dashed lines for apparent weakness failure.

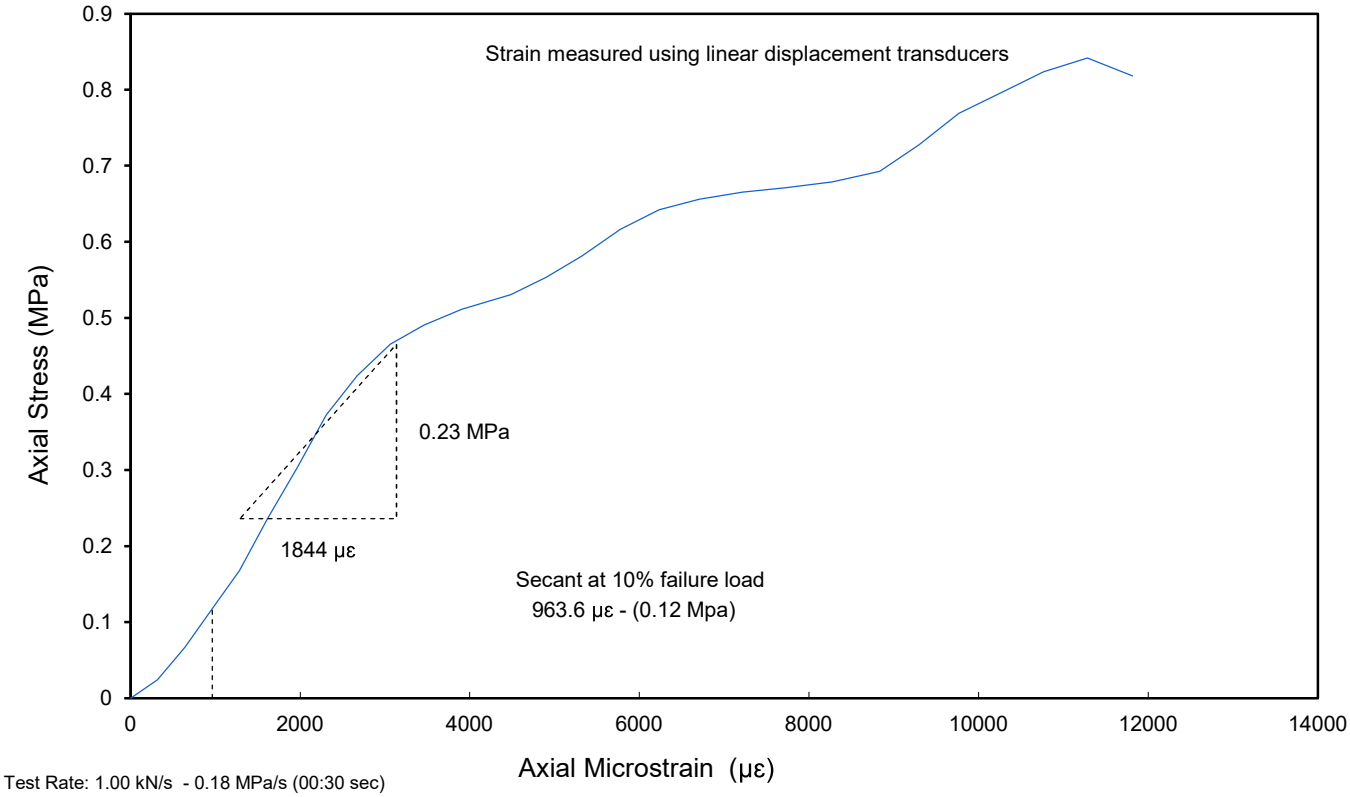
Date tested: 10/04/2024

Angle of foliation/Axis of loading: n/a
Angle of shear plane/Axis of loading: n/a

Sample type	C

Test results

Unconfined Compressive Strength Maximum load (kN): 4.70	0.842 MPa
Young's Modulus (tangential at 50% failure load)	0.124 GPa
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 10% failure load)	0.122 GPa
Poisson's Ratio (secant at 10% failure load)	n/a



Test Rate: 1.00 kN/s - 0.18 MPa/s (00:30 sec)

Note: The dimensional requirements of Flatness (<0.02 mm), Perpendicularity (<0.05 / 50 mm) and Straightness (0.3 mm deviation) are all met.

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 11/04/2024

Project Number:

GEO / 40187

Project Name:

CASCID - CHRISTIE HOSPITAL, MANCHESTER

11360

GEOLABS®

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006 In-house Technical Procedure TP35

DETERMINATION OF POINT LOAD STRENGTH ON ROCK

Sample details			Point Load test										
Borehole Ref.	Depth (m)	Description	D. Tested	Test type & Direction		Sample width W (mm)	Platen separation (mm) Start D	Platen separation (mm) End D'	Water Content (%)	Equiv. Diameter D_e (mm)	Failure Load P (kN)	I_s P/De^2 (MPa)	Correction Factor F	Point Load Index $I_{s(50)}$ (MPa)
BH102 (11360/20873)	8.30-8.45	Extremely weak thinly laminated reddish brown fine grained SANDSTONE. Fresh to slightly weathered	10/04/24	D	L	85.1	83.3	81.5		82.4	0.24	0.04	1.25	0.05

(*) Sample failed on weakness

Test type and direction: **D** - Diametral **A** - Axial **B** - Block **I** - Irregular lump **P** - Perpendicular to planes of weakness **U** - Random or unknown orientation **L** - Parallel to planes of weakness

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 11/04/2024

Project Number:

GEO / 40187

Project Name:

CASCID - CHRISTIE HOSPITAL, MANCHESTER

11360

GEOLABS®

UKAS TESTING 1982

TESTING RESTRICTION

The following tests have been scheduled on the below project. Those listed **CANNOT** be performed for the reason stated. If alternative samples are available for the restricted tests, please supply details.

Sample details				
Borehole Ref.	Depth (m)	Description	Tests restricted	Reason for restriction and comments
BH102 (11360/20873)	8.30-8.45	n/a	UCS w/ YM	Sample broken into short pieces before any testing has been done.

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 11/04/2024

Project Number:

GEO / 40187

Project Name:

CASCID - CHRISTIE HOSPITAL, MANCHESTER

11360

GEOLABS®

GEOLABS Limited
Bucknalls Lane
Garston
Watford
Hertfordshire
WD25 9XX

Tel: +44(0) 1923 892 190
Fax: +44(0) 1923 892 191
email: admin@geolabs.co.uk
web: www.geolabs.co.uk

Simtec Material Testing
72, 113, 114, 116 The Burrows
East Goscote
Leicester

LE7 3XD

11 April 2024
Report No : GEO/40185/01

For the attention of Charlie Needham / Rob McGoff

Date samples received	26/03/2024
Date written instructions received	26/03/2024
Date testing commenced	27/03/2024
Date of sample disposal	**09/05/2024**

Our ref **GEO / 40185**
Your Ref **11358**

Project **CASCID - CHRISTIE HOSPITAL, MANCHESTER**

Further to your instructions we have pleasure in enclosing the results of the tests you requested in the attached figures.

LABORATORY TEST REPORT

Item No	Test Quantity	Description
1	3	Unconfined Compressive Strength with Deformability
2	2	Point Load Strength Index

Any opinions or interpretations expressed herein are outside the scope of UKAS accreditation. All results contained in this report are provisional unless signed by an approved signatory. The results contained in this report relate only to samples received in the laboratory and are tested 'as received' unless otherwise stated. This report should not be reproduced, except in full, without the written approval of the laboratory. The results reported are applicable only to the test items received by the laboratory.

All the necessary data required by the documented test procedures has been recorded and will be stored for a period of not less than 6 years. This data will be issued to yourselves at your request. All samples will be disposed of after the date shown above. Written confirmation will be required to retain the samples beyond this period and a storage charge may be applied.

We trust that the above meets your requirements and should you require any further information or assistance, please do not hesitate to contact us.

Yours faithfully

[redacted]

Laboratory Manager

"Geolabs" and the Geolabs logo are registered trademarks in the name of Geolabs Limited
Registered Office: Bucknalls Lane Garston Watford Hertfordshire WD25 9XX Registered in England and Wales No: 3177641

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

UNIAXIAL COMPRESSIVE STRENGTH OF ROCK MATERIALS

Sample details					Density		Uniaxial Compression Test (LF0879C (1000kN) compression frame used)							
							Mean after prep.							
Borehole Ref.	Depth (m)	Description	MC (%)	Degree of Saturation (%)	Bulk (Mg/m³)	Dry (Mg/m³)	Diameter (mm)	Height (mm)	H/D Ratio	Load at Failure (kN)	UCS (MPa) 3 sig. fig.	Failure Sketch	D. Tested	Remarks
BH104 (11358/20848)	4.30-4.40	Very weak reddish brown fine to medium grained SANDSTONE. Fresh to slightly weathered	11	51.9	2.01	1.82	86.50	93.90	1.1	14.4	2.45		10/04/24	Non-standard test as the sample does not meet the required height to diameter ratio.
BH104 (11358/20853)	11.20-11.38	Very weak reddish brown fine to medium grained SANDSTONE. Fresh to slightly weathered	15	75.3	2.11	1.83	85.50	138.90	1.6	22.1	3.85		10/04/24	Non-standard test as the sample does not meet the required height to diameter ratio.
BH104 (11358/20855)	14.75-14.90	Very weak reddish brown fine to medium grained SANDSTONE. Fresh to slightly weathered	13	78.5	2.21	1.95	84.90	115.10	1.4	10.4	1.84		10/04/24	Non-standard test as the sample does not meet the required height to diameter ratio.

Note: The dimensional requirements of flatness (<0.02 mm), perpendicularity (<0.05 / 50 mm) and straightness (0.3 mm deviation) are all met. Specific Gravity used for Degree of Saturation is assumed unless specified by the client.

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 11/04/2024

Project Number:

GEO / 40185

Project Name:

CASCID - CHRISTIE HOSPITAL, MANCHESTER

11358

GEOLABS®

UKAS TESTING 1982

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

UNCONFINED COMPRESSIVE STRENGTH WITH YOUNG'S MODULUS

Borehole Ref.:	BH104 (11358/20848)
Sample Ref.:	-
Depth (m):	4.30-4.40

Description:
Very weak reddish brown fine to medium grained SANDSTONE. Fresh to slightly weathered

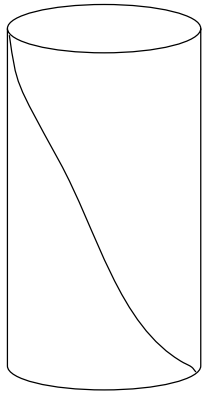
LF0879C (1000kN) compression frame used

Diameter	86.50 mm
Height	93.90 mm
Bulk Density	2.01 Mg/m³
Dry Density	1.82 Mg/m³
Water Content	11 %

Degree of Saturation: 51.9 % Specific Gravity: 2.9 Mg/m³ (Assumed)

Failure Sketch

Mode of failure: Diagonal shearing



Solid lines for material failures.
Dashed lines for apparent weakness failure.

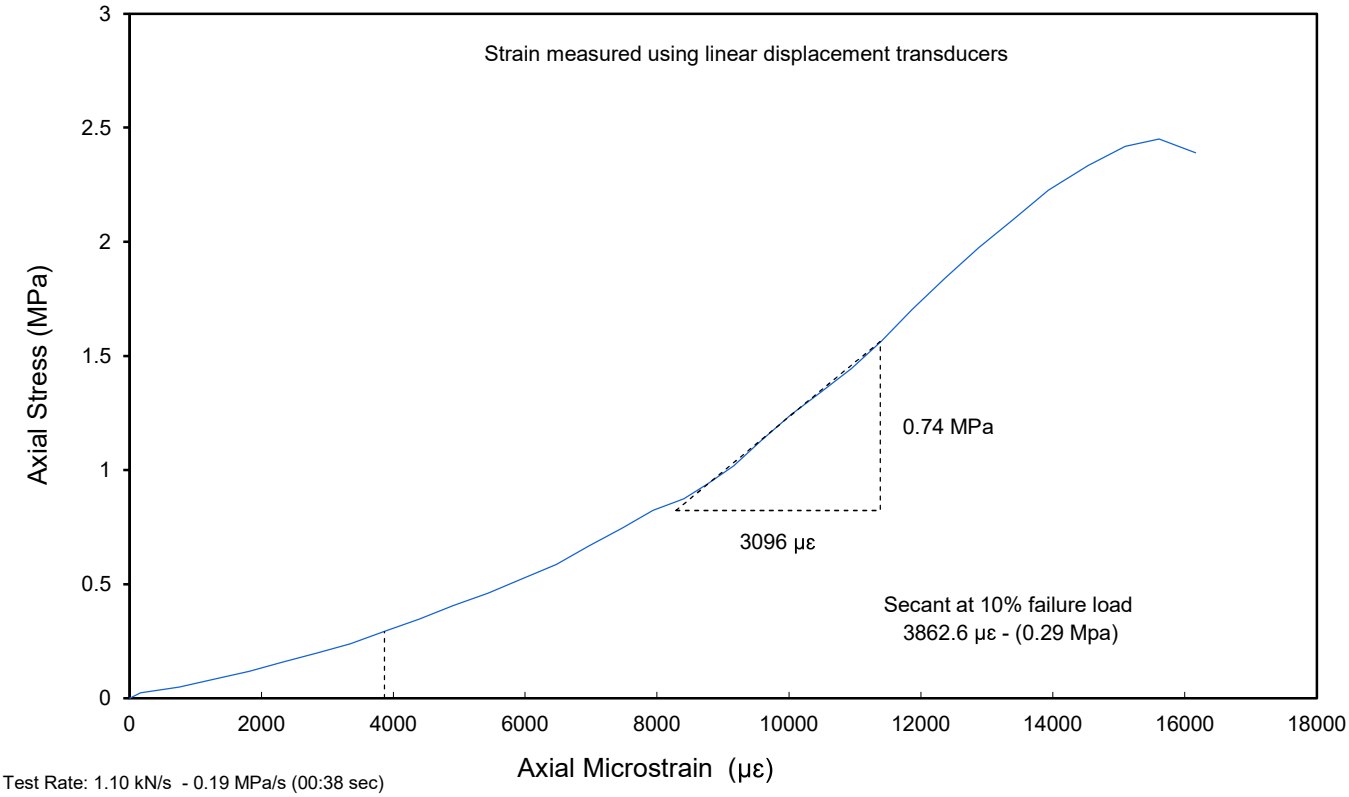
Date tested: 10/04/2024

Angle of foliation/Axis of loading: n/a
Angle of shear plane/Axis of loading: n/a

Sample type	C

Test results

Unconfined Compressive Strength Maximum load (kN): 14.40	2.45 MPa
Young's Modulus (tangential at 50% failure load)	0.239 GPa
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 10% failure load)	0.0757 GPa
Poisson's Ratio (secant at 10% failure load)	n/a



Test Rate: 1.10 kN/s - 0.19 MPa/s (00:38 sec)

Remarks: Non-standard test as the sample does not meet the required height to diameter ratio.

Note: The dimensional requirements of Flatness (<0.02 mm), Perpendicularity (<0.05 / 50 mm) and Straightness (0.3 mm deviation) are all met.

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 11/04/2024

Project Number:

GEO / 40185

Project Name:

CASCID - CHRISTIE HOSPITAL, MANCHESTER

11358

GEOLABS®

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

UNCONFINED COMPRESSIVE STRENGTH WITH YOUNG'S MODULUS

Borehole Ref.:	BH104 (11358/20853)
Sample Ref.:	-
Depth (m):	11.20-11.38

Description:
Very weak reddish brown fine to medium grained SANDSTONE. Fresh to slightly weathered

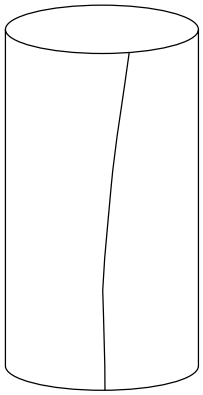
LF0879C (1000kN) compression frame used

Diameter	85.50 mm
Height	138.90 mm
Bulk Density	2.11 Mg/m³
Dry Density	1.83 Mg/m³
Water Content	15 %

Degree of Saturation: 75.3 % Specific Gravity: 2.9 Mg/m³ (Assumed)

Failure Sketch

Mode of failure: Axial splitting



Solid lines for material failures.
Dashed lines for apparent weakness failure.

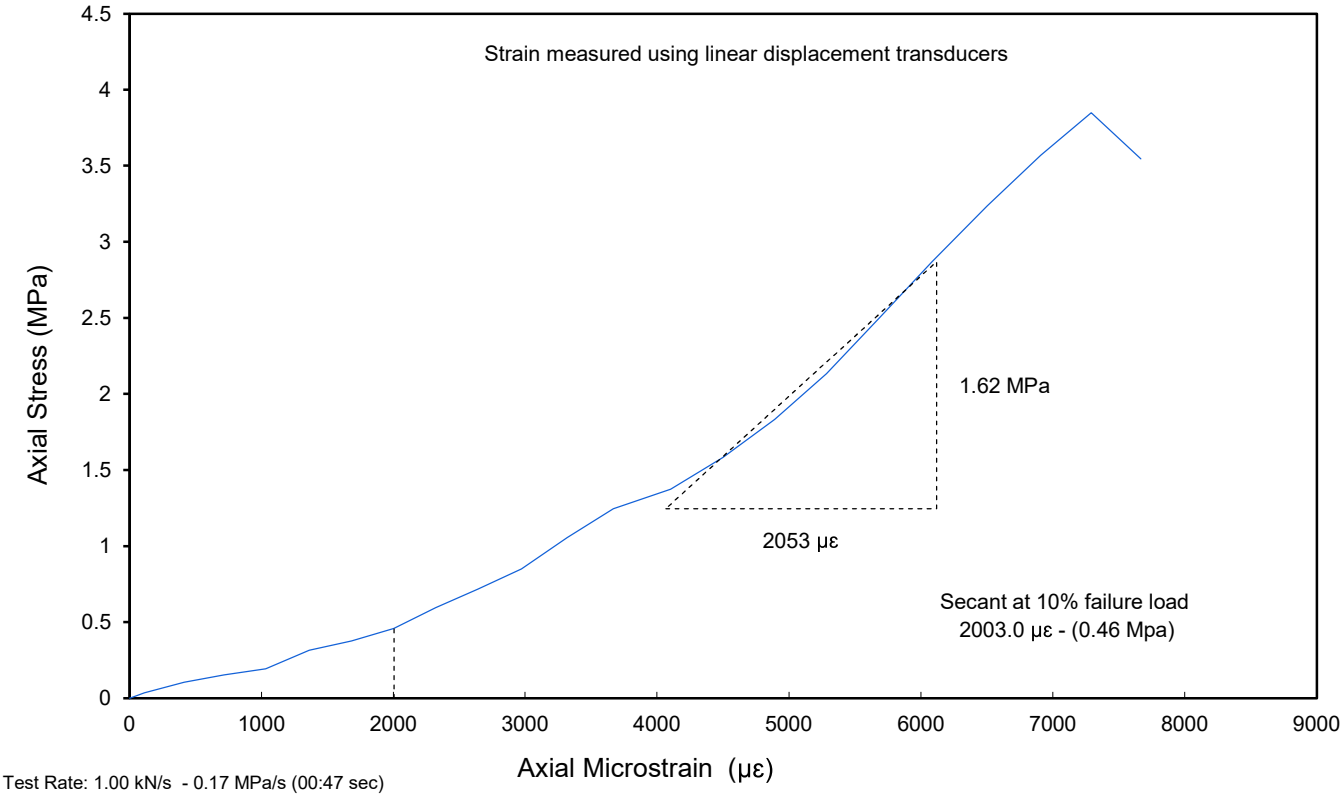
Date tested: 10/04/2024

Angle of foliation/Axis of loading: n/a
Angle of shear plane/Axis of loading: n/a

Sample type	C

Test results

Unconfined Compressive Strength Maximum load (kN): 22.10	3.85 MPa
Young's Modulus (tangential at 50% failure load)	0.791 GPa
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 10% failure load)	0.228 GPa
Poisson's Ratio (secant at 10% failure load)	n/a



Test Rate: 1.00 kN/s - 0.17 MPa/s (00:47 sec)

Remarks: Non-standard test as the sample does not meet the required height to diameter ratio.

Note: The dimensional requirements of Flatness (<0.02 mm), Perpendicularity (<0.05 / 50 mm) and Straightness (0.3 mm deviation) are all met.

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 11/04/2024

Project Number:

GEO / 40185

Project Name:

CASCID - CHRISTIE HOSPITAL, MANCHESTER

11358

GEOLABS®

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

UNCONFINED COMPRESSIVE STRENGTH WITH YOUNG'S MODULUS

Borehole Ref.:	BH104 (11358/20855)
Sample Ref.:	-
Depth (m):	14.75-14.90

Description:
Very weak reddish brown fine to medium grained SANDSTONE. Fresh to slightly weathered

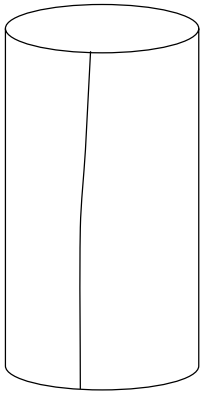
LF0879C (1000kN) compression frame used

Diameter	84.90 mm
Height	115.10 mm
Bulk Density	2.21 Mg/m³
Dry Density	1.95 Mg/m³
Water Content	13 %

Degree of Saturation: 78.5 % Specific Gravity: 2.9 Mg/m³ (Assumed)

Failure Sketch

Mode of failure: Axial splitting



Solid lines for material failures.
Dashed lines for apparent weakness failure.

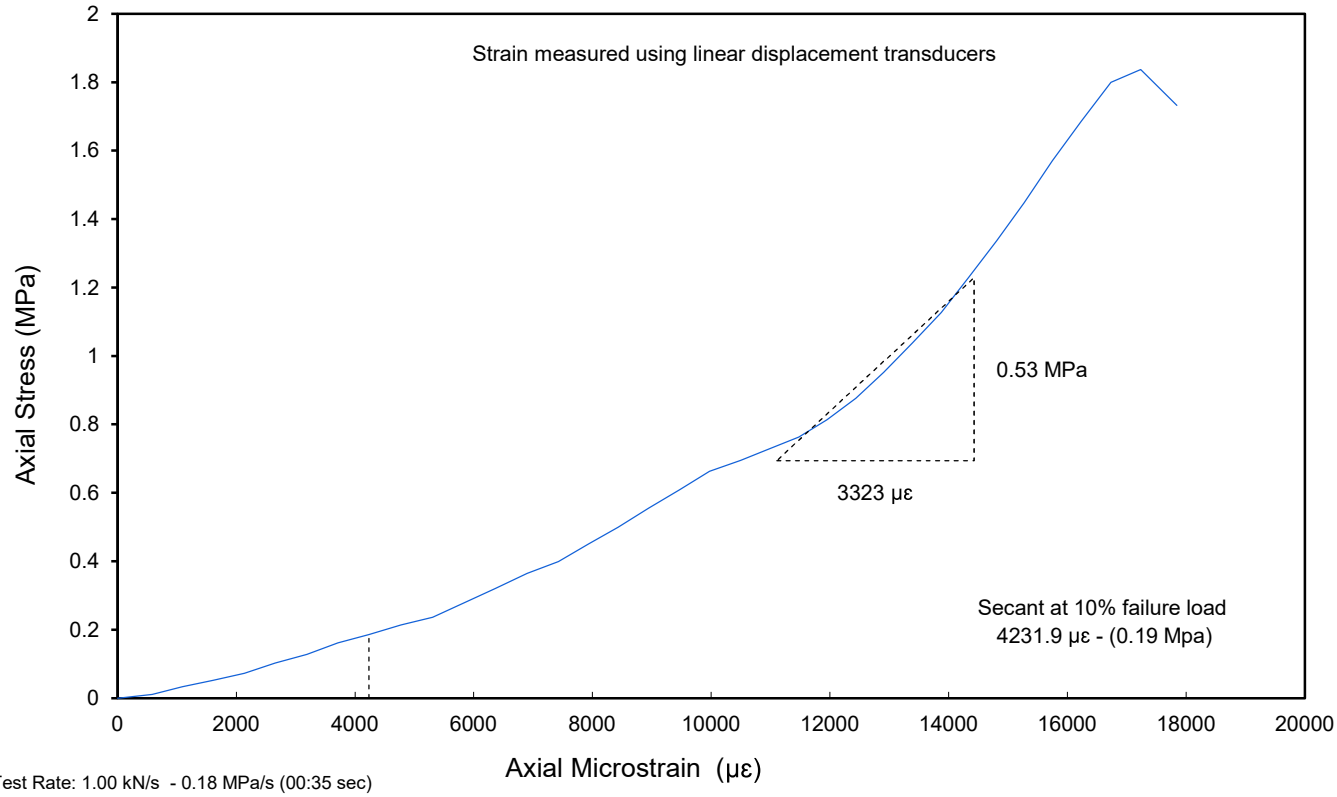
Angle of foliation/Axis of loading: n/a
Angle of shear plane/Axis of loading: n/a

Sample type	C

Date tested: 10/04/2024

Test results

Unconfined Compressive Strength Maximum load (kN): 10.40	1.84 MPa
Young's Modulus (tangential at 50% failure load)	0.161 GPa
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 10% failure load)	0.044 GPa
Poisson's Ratio (secant at 10% failure load)	n/a



Test Rate: 1.00 kN/s - 0.18 MPa/s (00:35 sec)

Remarks: Non-standard test as the sample does not meet the required height to diameter ratio.

Note: The dimensional requirements of Flatness (<0.02 mm), Perpendicularity (<0.05 / 50 mm) and Straightness (0.3 mm deviation) are all met.

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 11/04/2024

Project Number:

GEO / 40185

Project Name:

CASCID - CHRISTIE HOSPITAL, MANCHESTER

11358

GEOLABS®

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006 In-house Technical Procedure TP35

DETERMINATION OF POINT LOAD STRENGTH ON ROCK

Sample details			Point Load test											
Borehole Ref.	Depth (m)	Description	D. Tested	Test type & Direction		Sample width W (mm)	Platen separation (mm) Start D	Platen separation (mm) End D'	Water Content (%)	Equiv. Diameter D_e (mm)	Failure Load P (kN)	I_s P/De^2 (MPa)	Correction Factor F	Point Load Index $I_{s(50)}$ (MPa)
BH104 (11358/20849)	7.10-7.20	Very weak reddish brown fine to medium grained SANDSTONE. Fresh to slightly weathered	10/04/24	A	P	85.4	57.8	56.2		78.2	0.79	0.13	1.22	0.16
BH104 (11358/20890)	17.10-17.30	Extremely weak reddish brown fine to medium grained SANDSTONE. Fresh to slightly weathered	10/04/24	D	L	85.0	80.8	78.4		79.6	0.08	0.01	1.23	0.01

(*) Sample failed on weakness

Test type and direction: **D** - Diametral **A** - Axial **B** - Block **I** - Irregular lump **P** - Perpendicular to planes of weakness **U** - Random or unknown orientation **L** - Parallel to planes of weakness

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 11/04/2024

Project Number:

GEO / 40185

Project Name:

CASCID - CHRISTIE HOSPITAL, MANCHESTER

11358

GEOLABS

UKAS TESTING 1982

TESTING RESTRICTION

The following tests have been scheduled on the below project. Those listed **CANNOT** be performed for the reason stated. If alternative samples are available for the restricted tests, please supply details.

Sample details				
Borehole Ref.	Depth (m)	Description	Tests restricted	Reason for restriction and comments
BH104 (11358/20849)	7.10-7.20	Very weak reddish brown fine to medium grained SANDSTONE. Fresh to slightly weathered	UCS w/ YM	Sample broken into short pieces before any testing has been done.
BH104 (11358/20890)	17.10-17.30	Extremely weak reddish brown fine to medium grained SANDSTONE. Fresh to slightly weathered	UCS w/ YM	Sample broken into short pieces before any testing has been done.

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 11/04/2024

Project Number:

GEO / 40185

Project Name:

CASCID - CHRISTIE HOSPITAL, MANCHESTER

11358

GEOLABS®

GRM Development Solutions Ltd
Laurus House First Avenue, Centrum
100, Burton-on-Trent, Staffordshire,
DE14 2WH

UKAS TESTING
10108

SIMTEC
CONSTRUCTION MATERIALS TESTING
A PHOENIX GROUP COMPANY

Unit 116, The Burrows, East Goscote Ind Est
East Goscote, Leicestershire, LE7 3XD
t: 0116 3196100 e: info@simtec-mt.co.uk

Analytical Test Report: CERT084b-SM10947-PIP-1

Your Project Reference:	**P10525 - CASCID-Christie Hospital, Manchester**		
Your Order Number:	P10525	Testing Received / Instructed:	12/03/2024
Report Issue Number:	1	Sample Tested:	12/03/2024 to 25/03/2024
Samples Analysed:	7 soil Samples	Report issued:	25/03/2024

[redacted]
Simtec Materials Testing Ltd

Notes:

Samples will be retained for 14 days after issue of this report unless otherwise requested.

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

Some information required by BS1377 is not included in the report. The information will be provided if requested.

A certificate of sampling was not supplied

Samples were supplied by customer, results apply to the samples as received.

Within the report any information provided by the client is identified with a '#'

Where specification limits are included these are for guidance only. Where a measured value has been highlighted this is not implying acceptance or failure and certainty of measurement values have not been taken into account.

Accreditation Key

UKAS = UKAS Accreditation, u = Unaccredited

Date of Issue: 25.03.2024

Issued by: RM

Issue No: 01

Rev No: 01

SIMTEC
CONSTRUCTION MATERIALS TESTING
A PHOENIX GROUP COMPANY

CERT084b-SM10947-PIP-1

Project Reference - P10525 - CASCID-Christie Hospital, Manchester

Analytical Test Results - Soil

Unit 116, The Burrows, East Goscote Ind Est
East Goscote, Leicestershire, LE7 3XD
t: 0116 3196100 e: info@simtec-mt.co.uk

Lab Reference		19757	19758	19759	19760	19761
Client Sample ID (#)		-	-	-	-	-
Client Sample Location (#)		TP101	TP102	TP106	TP107	BH103
Client Sample Type (#)		B	D	B	B	B
Depth - Top (m) (#)		0.6	1.00	0.50	0.70	1.90
Depth - Bottom (m) (#)		0.7	1.10	0.60	0.70	2.00
Date of Sampling (#)		Not supplied	Not supplied	Not supplied	Not supplied	Not supplied
Sample type		Bulk	Disturbed	Bulk	Bulk	Bulk
Sample Description		Brown slightly gravelly clayey silty SAND	Brown slightly gravelly silty clayey SAND	Red slightly gravelly slightly silty SAND	Brown slightly gravelly clayey silty SAND	Red slightly silty SAND
Determinant	**Units**					
BS1377 PSD						
125.0	(% Passing)	100	100	100	100	100
90.0	(% Passing)	100	100	100	100	100
75.0	(% Passing)	100	100	100	100	100
63.0	(% Passing)	100	100	100	100	100
50.0	(% Passing)	100	100	100	100	100
37.5	(% Passing)	100	100	100	100	100
28.0	(% Passing)	100	100	100	100	100
20.0	(% Passing)	100	100	100	100	100
14.0	(% Passing)	100	100	100	97	100
10.0	(% Passing)	98	100	99	95	100
6.3	(% Passing)	96	100	96	93	100
5.0	(% Passing)	96	100	95	92	100
3.35	(% Passing)	94	99	94	90	100
2.00	(% Passing)	93	98	93	88	100
1.18	(% Passing)	92	97	92	86	100
0.600	(% Passing)	89	93	89	79	99
0.425	(% Passing)	81	86	84	69	92
0.300	(% Passing)	64	72	70	50	55
0.212	(% Passing)	44	55	42	31	36
0.150	(% Passing)	32	44	25	21	22
0.063	(% Passing)	19	33	9.0	14	9.0
0.02	(% Passing)	13	27	5.5	12	5.3
0.006	(% Passing)	9.8	22	3.8	9.4	3.8
0.002	(% Passing)	7.0	18	2.6	6.9	2.4
PSD test Method	-	Wet Sieve	Wet Sieve	Wet Sieve	Wet Sieve	Wet Sieve
Sedimentation was pretreated	-	No	No	No	No	No

CERT084b-SM10947-PIP-1

Project Reference - P10525 - CASCID-Chr

Analytical Test Results - Soil

Lab Reference		19762	19763
Client Sample ID (#)			
Client Sample Location (#)		BH103	BH104
Client Sample Type (#)		D	D
Depth - Top (m) (#)		2.50	2.80
Depth - Bottom (m) (#)		2.60	2.90
Date of Sampling (#)		Not supplied	Not supplied
Sample type		Disturbed	Disturbed
Sample Description		Red slightly silty SAND	Brown silty SAND and GRAVEL
Determinant	**Units**		
BS1377 PSD			
125.0	(% Passing)	100	100
90.0	(% Passing)	100	100
75.0	(% Passing)	100	100
63.0	(% Passing)	100	100
50.0	(% Passing)	100	100
37.5	(% Passing)	100	100
28.0	(% Passing)	100	100
20.0	(% Passing)	100	100
14.0	(% Passing)	100	89
10.0	(% Passing)	100	83
6.3	(% Passing)	100	77
5.0	(% Passing)	100	72
3.35	(% Passing)	100	66
2.00	(% Passing)	100	60
1.18	(% Passing)	100	55
0.600	(% Passing)	98	47
0.425	(% Passing)	90	40
0.300	(% Passing)	51	31
0.212	(% Passing)	29	21
0.150	(% Passing)	17	18
0.063	(% Passing)	7.0	15
0.02	(% Passing)	4.2	9.6
0.006	(% Passing)	3.0	5.9
0.002	(% Passing)	1.8	4.1
PSD test Method	-	Wet Sieve	Wet Sieve
Sedimentation was pretreated	-	No	No

SIMTEC CONSTRUCTION MATERIALS TESTING
A PIENAA GROUP COMPANY

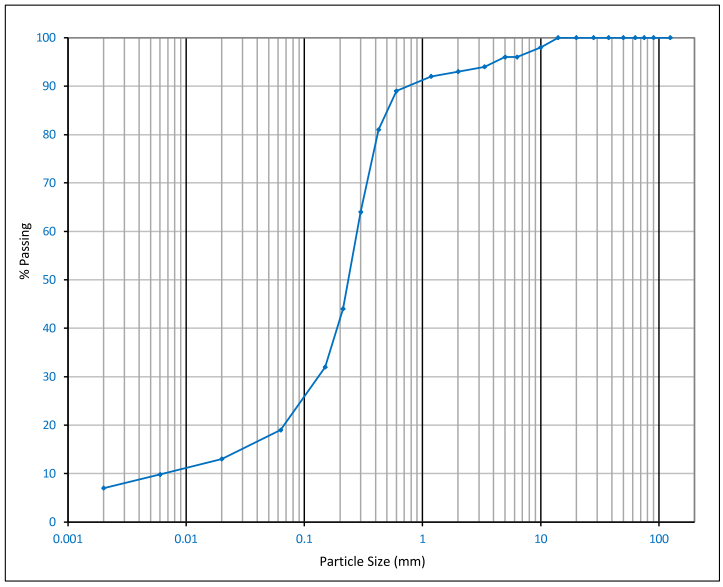
Unit 116, The Burrows, East Goscote Ind Est
East Goscote, Leicestershire, LE7 3XD
t: 0116 3196100 e: info@simtec-mt.co.uk

CERT084b-SM10947-PIP-1

Project Reference - P10525 - CASCID-Christie Hospital, Manchester

Material Analysis Results

Lab Reference	**19757**
Client Sample ID (#)	-
Client Sample Location (#)	TP101
Client Sample Type (#)	B
Depth - Top (m) (#)	0.60
Depth - Bottom (m) (#)	0.70
Date of Sampling (#)	Not supplied
Sample type	Bulk
Sample Description	Brown slightly gravelly clayey silty SAND



Specification:

Sieve Size (mm)	Upper Limit (%)	Lower Limit (%)	Passing (%)	
125			100	Cobbles
90			100	
75			100	
63			100	0
50			100	Gravel
37.5			100	
28			100	
20			100	
14			100	
10			98	
6.3			96	
5			96	
3.35			94	6
2			93	Sand
1.18			92	
0.6			89	
0.425			81	
0.3			64	
0.212			44	
0.15			32	
0.063			19	75
0.02			13	Silt
0.006			10	
0.002			7	12
				Clay 7

NOTES :

SIMTEC CONSTRUCTION MATERIALS TESTING
A PIERMA GROUP COMPANY

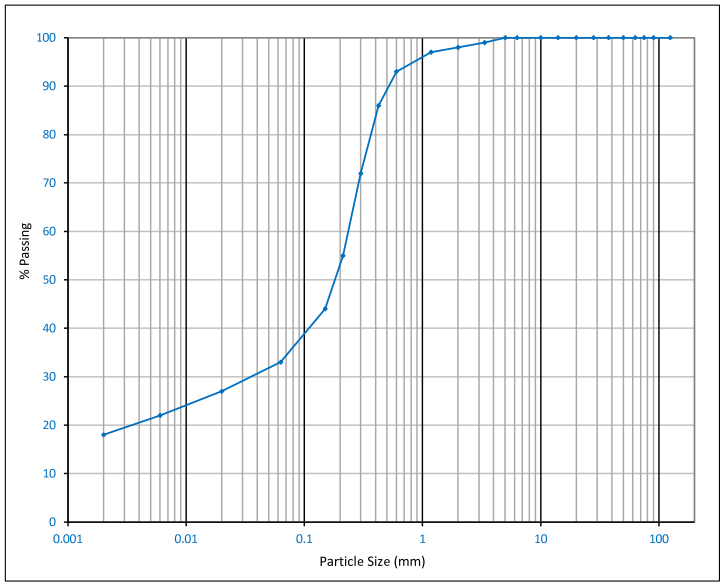
Unit 116, The Burrows, East Goscote Ind Est
East Goscote, Leicestershire, LE7 3XD
t: 0116 3196100 e: info@simtec-mt.co.uk

CERT084b-SM10947-PIP-1

Project Reference - P10525 - CASCID-Christie Hospital, Manchester

Material Analysis Results

Lab Reference	**19758**
Client Sample ID (#)	-
Client Sample Location (#)	TP102
Client Sample Type (#)	D
Depth - Top (m) (#)	1.00
Depth - Bottom (m) (#)	1.10
Date of Sampling (#)	Not supplied
Sample type	Disturbed
Sample Description	Brown slightly gravelly silty clayey SAND



Specification:

Sieve Size (mm)	Upper Limit (%)	Lower Limit (%)	Passing (%)	
125			100	Cobbles
90			100	
75			100	
63			100	0
50			100	Gravel
37.5			100	
28			100	
20			100	
14			100	
10			100	
6.3			100	
5			100	
3.35			99	1
2			98	Sand
1.18			97	
0.6			93	
0.425			86	
0.3			72	
0.212			55	
0.15			44	
0.063			33	66
0.02			27	Silt
0.006			22	
0.002			18	15
				Clay 18

NOTES :

SIMTEC
CONSTRUCTION MATERIALS TESTING

Unit 116, The Burrows, East Goscote Ind Est
East Goscote, Leicestershire, LE7 3XD
t: 0116 3196100 e: info@simtec-mt.co.uk

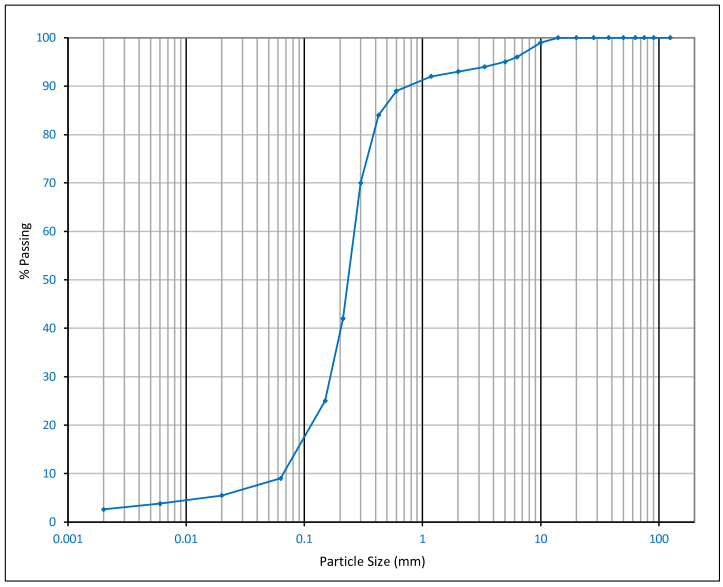
CERT084b-SM10947-PIP-1

Project Reference - P10525 - CASCID-Christie Hospital, Manchester

Material Analysis Results

Lab Reference	**19759**

Client Sample ID (#)	-
Client Sample Location (#)	TP106
Client Sample Type (#)	B
Depth - Top (m) (#)	0.50
Depth - Bottom (m) (#)	0.60
Date of Sampling (#)	Not supplied
Sample type	Bulk
Sample Description	Red slightly gravelly slightly silty SAND



Specification:

Sieve Size (mm)	Upper Limit (%)	Lower Limit (%)	Passing (%)	
125			100	Cobbles
90			100	
75			100	
63			100	0
50			100	Gravel
37.5			100	
28			100	
20			100	
14			100	
10			99	
6.3			96	
5			95	
3.35			94	6
2			93	Sand
1.18			92	
0.6			89	
0.425			84	
0.3			70	
0.212			42	
0.15			25	
0.063			9	85
0.02			6	Silt
0.006			4	
0.002			3	6
				Clay 3

NOTES :

SIMTEC
CONSTRUCTION MATERIALS TESTING
Unit 116, The Burrows, East Goscote Ind Est
East Goscote, Leicestershire, LE7 3XD
t: 0116 3196100 e: info@simtec-mt.co.uk

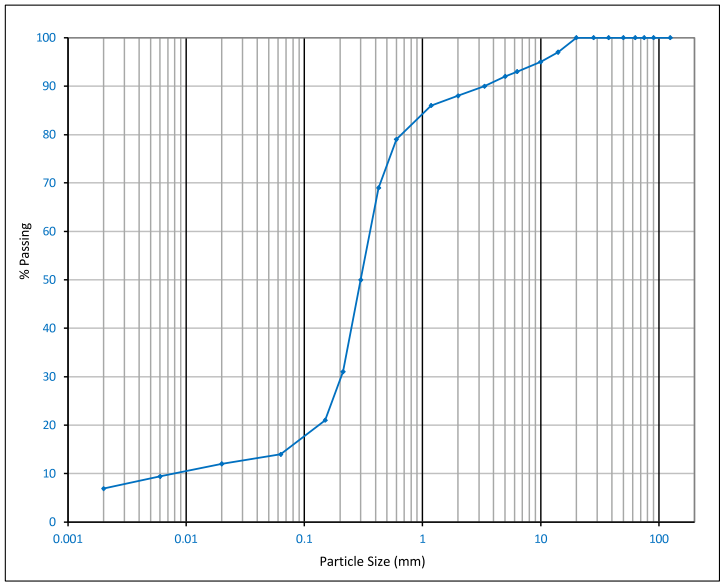
CERT084b-SM10947-PIP-1

Project Reference - P10525 - CASCID-Christie Hospital, Manchester

Material Analysis Results

Lab Reference	**19760**

Client Sample ID (#)	-
Client Sample Location (#)	TP107
Client Sample Type (#)	B
Depth - Top (m) (#)	2.50
Depth - Bottom (m) (#)	2.60
Date of Sampling (#)	Not supplied
Sample type	Bulk
Sample Description	Brown slightly gravelly clayey silty SAND



Specification:

Sieve Size (mm)	Upper Limit (%)	Lower Limit (%)	Passing (%)	
125			100	Cobbles
90			100	
75			100	
63			100	0
50			100	Gravel
37.5			100	
28			100	
20			100	
14			97	
10			95	
6.3			93	
5			92	
3.35			90	10
2			88	Sand
1.18			86	
0.6			79	
0.425			69	
0.3			50	
0.212			31	
0.15			21	
0.063			14	76
0.02			12	Silt
0.006			9	
0.002			7	7
				Clay 7

NOTES :

SIMTEC CONSTRUCTION MATERIALS TESTING
A PIERMA GROUP COMPANY

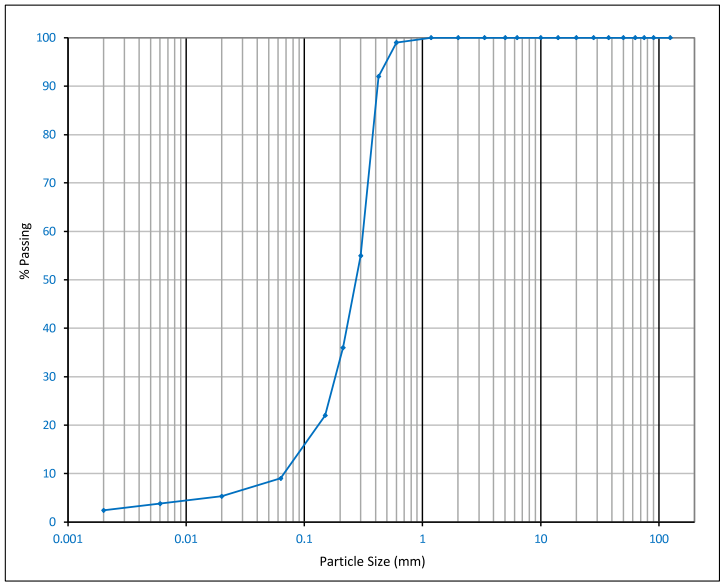
Unit 116, The Burrows, East Goscote Ind Est
East Goscote, Leicestershire, LE7 3XD
t: 0116 3196100 e: info@simtec-mt.co.uk

CERT084b-SM10947-PIP-1

Project Reference - P10525 - CASCID-Christie Hospital, Manchester

Material Analysis Results

Lab Reference	**19761**
Client Sample ID (#)	-
Client Sample Location (#)	BH103
Client Sample Type (#)	D
Depth - Top (m) (#)	1.90
Depth - Bottom (m) (#)	2.00
Date of Sampling (#)	Not supplied
Sample type	Disturbed
Sample Description	Red slightly silty SAND



Specification:

Sieve Size (mm)	Upper Limit (%)	Lower Limit (%)	Passing (%)	
125			100	Cobbles
90			100	
75			100	
63			100	0
50			100	Gravel
37.5			100	
28			100	
20			100	
14			100	
10			100	
6.3			100	
5			100	
3.35			100	0
2			100	Sand
1.18			100	
0.6			99	
0.425			92	
0.3			55	
0.212			36	
0.15			22	
0.063			9	91
0.02			5	Silt
0.006			4	
0.002			2	7
				Clay 2

NOTES :

SIMTEC
CONSTRUCTION MATERIALS TESTING

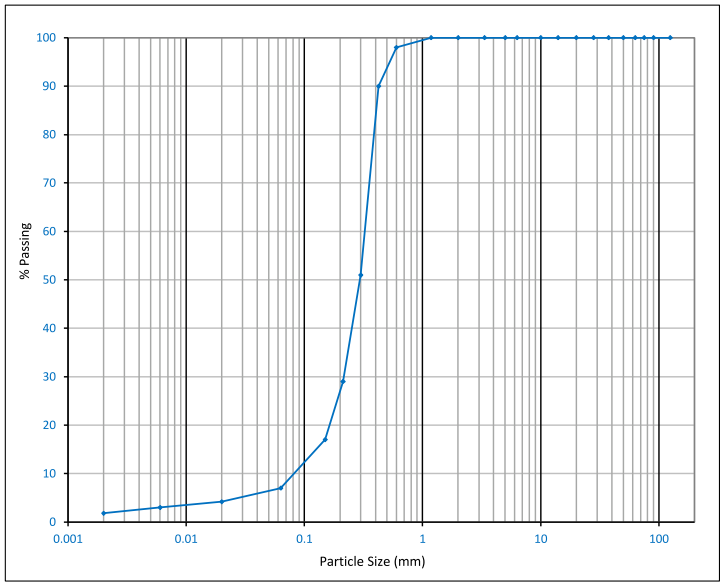
Unit 116, The Burrows, East Goscote Ind Est
East Goscote, Leicestershire, LE7 3XD
t: 0116 3196100 e: info@simtec-mt.co.uk

CERT084b-SM10947-PIP-1

Project Reference - P10525 - CASCID-Christie Hospital, Manchester

Material Analysis Results

Lab Reference	**19762**
Client Sample ID (#)	-
Client Sample Location (#)	BH103
Client Sample Type (#)	D
Depth - Top (m) (#)	2.50
Depth - Bottom (m) (#)	2.60
Date of Sampling (#)	Not supplied
Sample type	Disturbed
Sample Description	Red Slightly silty SAND



Specification:

Sieve Size (mm)	Upper Limit (%)	Lower Limit (%)	Passing (%)	
125			100	Cobbles
90			100	
75			100	
63			100	0
50			100	Gravel
37.5			100	
28			100	
20			100	
14			100	
10			100	
6.3			100	
5			100	
3.35			100	0
2			100	Sand
1.18			100	
0.6			98	
0.425			90	
0.3			51	
0.212			29	
0.15			17	
0.063			7	93
0.02			4	Silt
0.006			3	
0.002			2	5
				Clay 2

NOTES :

SIMTEC CONSTRUCTION MATERIALS TESTING
A PIENAA GROUP COMPANY

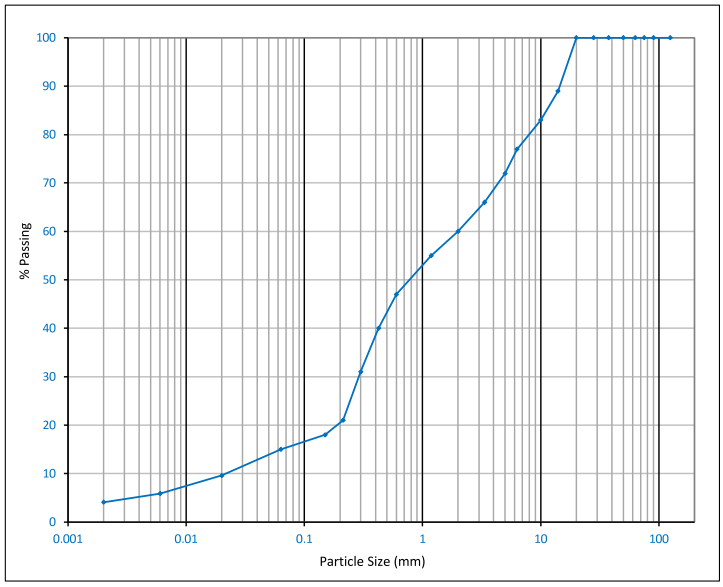
Unit 116, The Burrows, East Goscote Ind Est
East Goscote, Leicestershire, LE7 3XD
t: 0116 3196100 e: info@simtec-mt.co.uk

CERT084b-SM10947-PIP-1

Project Reference - P10525 - CASCID-Christie Hospital, Manchester

Material Analysis Results

Lab Reference	**19762**
Client Sample ID (#)	-
Client Sample Location (#)	BH104
Client Sample Type (#)	D
Depth - Top (m) (#)	2.80
Depth - Bottom (m) (#)	2.90
Date of Sampling (#)	Not supplied
Sample type	Disturbed
Sample Description	Brown silty SAND and GRAVEL



Specification:

Sieve Size (mm)	Upper Limit (%)	Lower Limit (%)	Passing (%)	
125			100	Cobbles
90			100	
75			100	
63			100	0
50			100	Gravel
37.5			100	
28			100	
20			100	
14			89	
10			83	
6.3			77	
5			72	
3.35			66	34
2			60	Sand
1.18			55	
0.6			47	
0.425			40	
0.3			31	
0.212			21	
0.15			18	
0.063			15	51
0.02			10	Silt
0.006			6	
0.002			4	11
				Clay 4

NOTES :

Unit 116, The Burrows, East Goscote Ind Est
East Goscote, Leicestershire, LE7 3XD
t: 0116 3196100 e: info@simtec-mt.co.uk

CERT084b-SM10947-PIP-1

Project Reference - P10525 - CASCID-Christie Hospital, Manchester

Analysis Methodologies

Determinant	Details and Test method used
BS1377 PSD	1377 Particle Size Distribution 1. Sample preparation was in accordance with BS1377:Part 1:2016. 2. Testing was in accordance with BS1377:Part 2:1990 clause 9.2 wet sieving method
BS1377 Sedimentation by pipette	1377 Particle Size Distribution Sedimentation 1. Sample preparation was in accordance with BS1377:Part 1:2016. 2. Testing was in accordance with BS1377:Part 2:1990 clause 9.4 sedimentation by pipette method.

GRM Development Solutions Ltd
Laurus House First Avenue, Centrum
100, Burton-on-Trent, Staffordshire,
DE14 2WH

UKAS TESTING
10108

SIMTEC
CONSTRUCTION MATERIALS TESTING
A PHOENIX GROUP COMPANY

Unit 116, The Burrows, East Goscote Ind Est
East Goscote, Leicestershire, LE7 3XD
t: 0116 3196100 e: info@simtec-mt.co.uk

Analytical Test Report: CERT084b-SM11106-PIP-1

Your Project Reference:	**P10525 - CASCID-Christie Hospital, Manchester**		
Your Order Number:	P10525	Testing Received / Instructed:	18/03/2024
Report Issue Number:	1	Sample Tested:	18/03/2024 to 25/03/2024
Samples Analysed:	5 soil Samples	Report issued:	25/03/2024

[redacted]
Simtec Materials Testing Ltd

Notes:

Samples will be retained for 14 days after issue of this report unless otherwise requested.

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

Some information required by BS1377 is not included in the report. The information will be provided if requested.

A certificate of sampling was not supplied

Samples were supplied by customer, results apply to the samples as received.

Within the report any information provided by the client is identified with a '#'

Where specification limits are included these are for guidance only. Where a measured value has been highlighted this is not implying acceptance or failure and certainty of measurement values have not been taken into account.

Accreditation Key

UKAS = UKAS Accreditation, u = Unaccredited

Date of Issue: 25.03.2024

Issued by: RM

Issue No: 01

Rev No: 01

SIMTEC
CONSTRUCTION MATERIALS TESTING
A PHENNA GROUP COMPANY

CERT084b-SM11106-PIP-1

Project Reference - P10525 - CASCID-Christie Hospital, Manchester

Analytical Test Results - Soil

Unit 116, The Burrows, East Goscote Ind Est
East Goscote, Leicestershire, LE7 3XD
t: 0116 3196100 e: info@simtec-mt.co.uk

Lab Reference		20302	20303	20304	20305	20306
Client Sample ID (#)		-	-	-	-	-
Client Sample Location (#)		BH101	BH101	BH102	BH102	TP104
Client Sample Type (#)		B	D	B	D	D
Depth - Top (m) (#)		0.4	2.30	0.50	2.50	0.70
Depth - Bottom (m) (#)		0.5	2.40	0.60	2.60	0.80
Date of Sampling (#)		Not supplied	Not supplied	Not supplied	Not supplied	Not supplied
Sample type		Bulk	Disturbed	Bulk	Disturbed	Disturbed
Sample Description		Brown slightly gravelly slightly clayey silty SAND	Red silty SAND	Brown slightly gravelly slightly clayey slightly silty SAND	Red slightly silty SAND	Brown slightly silty SAND
Determinant	**Units**					
BS1377 PSD						
125.0	(% Passing)	100	100	100	100	100
90.0	(% Passing)	100	100	100	100	100
75.0	(% Passing)	100	100	100	100	100
63.0	(% Passing)	100	100	100	100	100
50.0	(% Passing)	100	100	100	100	100
37.5	(% Passing)	100	100	100	100	100
28.0	(% Passing)	100	100	100	100	100
20.0	(% Passing)	100	100	100	100	100
14.0	(% Passing)	99	100	98	100	100
10.0	(% Passing)	97	100	98	100	95
6.3	(% Passing)	93	100	98	100	93
5.0	(% Passing)	92	100	97	100	92
3.35	(% Passing)	90	100	97	100	92
2.00	(% Passing)	87	100	96	100	91
1.18	(% Passing)	84	100	96	100	90
0.600	(% Passing)	77	100	89	100	84
0.425	(% Passing)	70	98	77	98	71
0.300	(% Passing)	57	86	52	86	46
0.212	(% Passing)	44	56	29	46	23
0.150	(% Passing)	36	35	21	29	13
0.063	(% Passing)	25	13	15	14	8.0
0.02	(% Passing)	16	8.2	12	9.0	5.0
0.006	(% Passing)	11	6.0	9.8	6.0	4.4
0.002	(% Passing)	7.3	4.2	7.3	4.2	3.1
PSD test Method	-	Wet Sieve	Wet Sieve	Wet Sieve	Wet Sieve	Wet Sieve
Sedimentation was pretreated	-	No	No	No	No	No

SIMTEC CONSTRUCTION MATERIALS TESTING
A PIENAA GROUP COMPANY

Unit 116, The Burrows, East Goscote Ind Est
East Goscote, Leicestershire, LE7 3XD
t: 0116 3196100 e: info@simtec-mt.co.uk

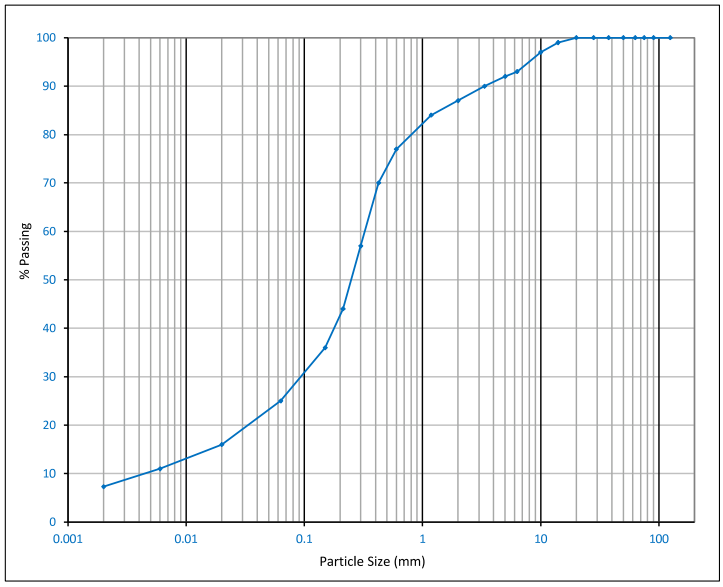
CERT084b-SM11106-PIP-1

Project Reference - P10525 - CASCID-Christie Hospital, Manchester

Material Analysis Results

Lab Reference	**20302**

Client Sample ID (#)	-
Client Sample Location (#)	BH101
Client Sample Type (#)	B
Depth - Top (m) (#)	0.40
Depth - Bottom (m) (#)	0.50
Date of Sampling (#)	Not supplied
Sample type	Bulk
Sample Description	Brown slightly gravelly slightly clayey silty SAND



Specification:

Sieve Size (mm)	Upper Limit (%)	Lower Limit (%)	Passing (%)	
125			100	Cobbles
90			100	
75			100	
63			100	0
50			100	Gravel
37.5			100	
28			100	
20			100	
14			99	
10			97	
6.3			93	
5			92	
3.35			90	10
2			87	Sand
1.18			84	
0.6			77	
0.425			70	
0.3			57	
0.212			44	
0.15			36	
0.063			25	65
0.02			16	Silt
0.006			11	
0.002			7	18
				Clay 7

NOTES :

SIMTEC CONSTRUCTION MATERIALS TESTING
A PIERMA GROUP COMPANY

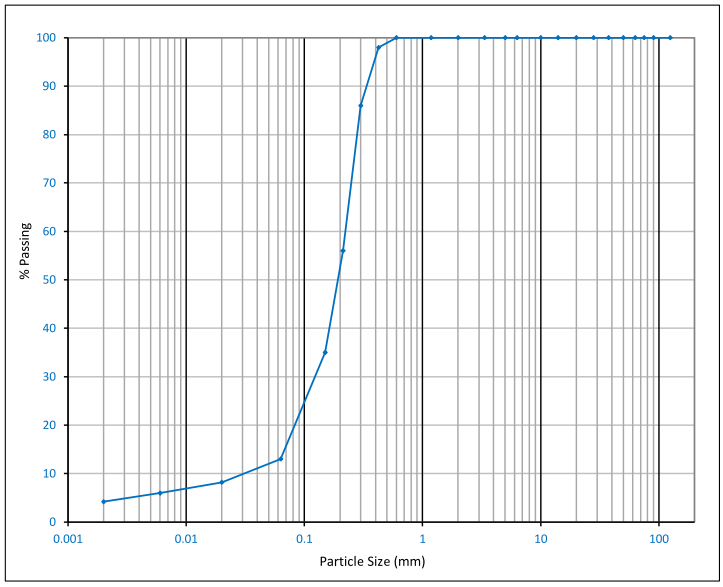
Unit 116, The Burrows, East Goscote Ind Est
East Goscote, Leicestershire, LE7 3XD
t: 0116 3196100 e: info@simtec-mt.co.uk

CERT084b-SM11106-PIP-1

Project Reference - P10525 - CASCID-Christie Hospital, Manchester

Material Analysis Results

Lab Reference	**20303**
Client Sample ID (#)	-
Client Sample Location (#)	BH101
Client Sample Type (#)	D
Depth - Top (m) (#)	2.30
Depth - Bottom (m) (#)	2.40
Date of Sampling (#)	Not supplied
Sample type	Disturbed
Sample Description	Red silty SAND



Specification:

Sieve Size (mm)	Upper Limit (%)	Lower Limit (%)	Passing (%)	
125			100	Cobbles
90			100	
75			100	
63			100	0
50			100	Gravel
37.5			100	
28			100	
20			100	
14			100	
10			100	
6.3			100	
5			100	
3.35			100	0
2			100	Sand
1.18			100	
0.6			100	
0.425			98	
0.3			86	
0.212			56	
0.15			35	
0.063			13	87
0.02			8	Silt
0.006			6	
0.002			4	9
				Clay 4

NOTES :

SIMTEC
CONSTRUCTION MATERIALS TESTING

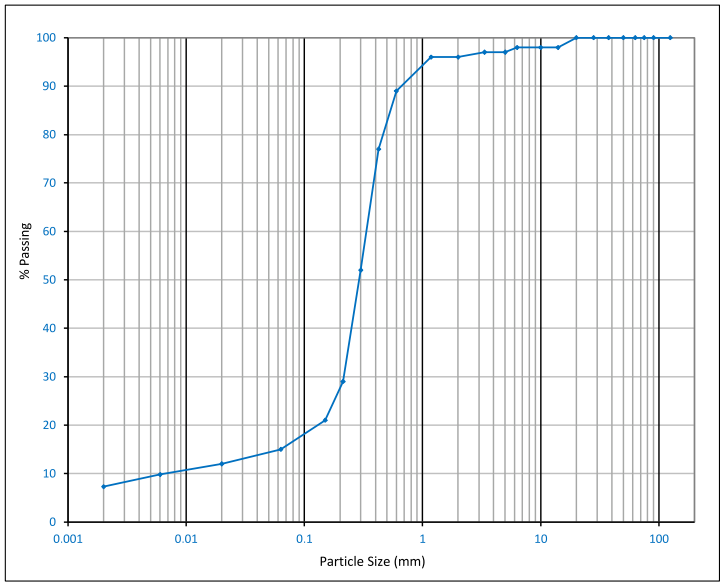
Unit 116, The Burrows, East Goscote Ind Est
East Goscote, Leicestershire, LE7 3XD
t: 0116 3196100 e: info@simtec-mt.co.uk

CERT084b-SM11106-PIP-1

Project Reference - P10525 - CASCID-Christie Hospital, Manchester

Material Analysis Results

Lab Reference	**20304**
Client Sample ID (#)	-
Client Sample Location (#)	BH102
Client Sample Type (#)	B
Depth - Top (m) (#)	0.50
Depth - Bottom (m) (#)	0.60
Date of Sampling (#)	Not supplied
Sample type	Bulk
Sample Description	Brown slightly gravelly slightly clayey slightly silty SAND



Specification:

Sieve Size (mm)	Upper Limit (%)	Lower Limit (%)	Passing (%)	
125			100	Cobbles
90			100	
75			100	
63			100	0
50			100	Gravel
37.5			100	
28			100	
20			100	
14			98	
10			98	
6.3			98	
5			97	
3.35			97	3
2			96	Sand
1.18			96	
0.6			89	
0.425			77	
0.3			52	
0.212			29	
0.15			21	
0.063			15	82
0.02			12	Silt
0.006			10	
0.002			7	8
				Clay 7

NOTES :

SIMTEC CONSTRUCTION MATERIALS TESTING
A PIERNA GROUP COMPANY

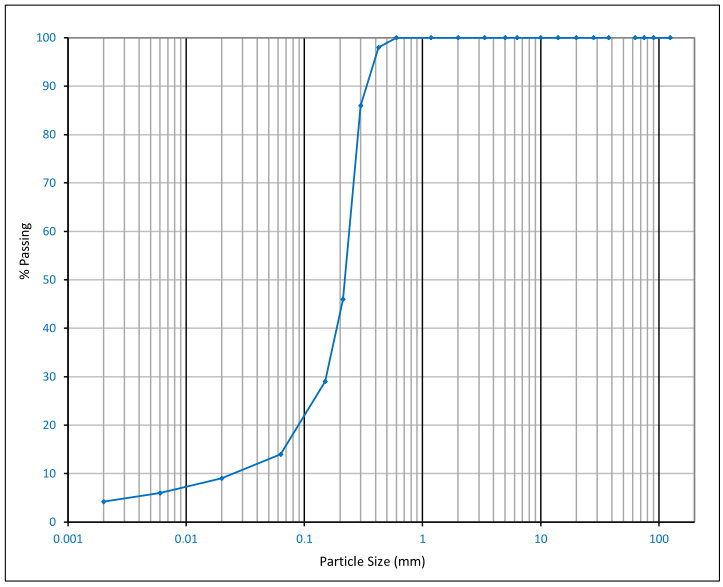
Unit 116, The Burrows, East Goscote Ind Est
East Goscote, Leicestershire, LE7 3XD
t: 0116 3196100 e: info@simtec-mt.co.uk

CERT084b-SM11106-PIP-1

Project Reference - P10525 - CASCID-Christie Hospital, Manchester

Material Analysis Results

Lab Reference	**20305**
Client Sample ID (#)	-
Client Sample Location (#)	BH102
Client Sample Type (#)	D
Depth - Top (m) (#)	2.50
Depth - Bottom (m) (#)	2.60
Date of Sampling (#)	Not supplied
Sample type	Disturbed
Sample Description	Red slightly silty SAND



Specification:

Sieve Size (mm)	Upper Limit (%)	Lower Limit (%)	Passing (%)	
125			100	Cobbles
90			100	
75			100	
63			100	0
50			1000	Gravel
37.5			100	
28			100	
20			100	
14			100	
10			100	
6.3			100	
5			100	
3.35			100	0
2			100	Sand
1.18			100	
0.6			100	
0.425			98	
0.3			86	
0.212			46	
0.15			29	
0.063			14	86
0.02			9	Silt
0.006			6	
0.002			4	10
				Clay 4

NOTES :

SIMTEC CONSTRUCTION MATERIALS TESTING
A PIENAA GROUP COMPANY

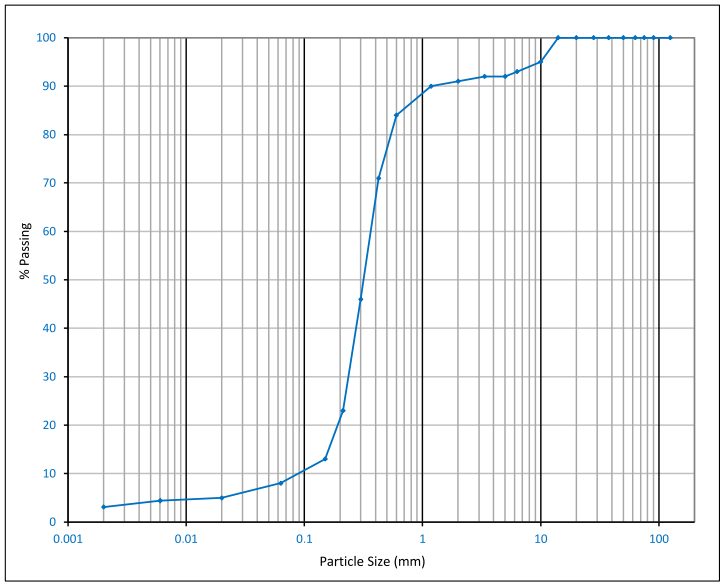
Unit 116, The Burrows, East Goscote Ind Est
East Goscote, Leicestershire, LE7 3XD
t: 0116 3196100 e: info@simtec-mt.co.uk

CERT084b-SM11106-PIP-1

Project Reference - P10525 - CASCID-Christie Hospital, Manchester

Material Analysis Results

Lab Reference	**20306**
Client Sample ID (#)	-
Client Sample Location (#)	TP104
Client Sample Type (#)	D
Depth - Top (m) (#)	0.70
Depth - Bottom (m) (#)	0.80
Date of Sampling (#)	Not supplied
Sample type	Disturbed
Sample Description	Brown slightly silty SAND



Specification:

Sieve Size (mm)	Upper Limit (%)	Lower Limit (%)	Passing (%)	
125			100	Cobbles
90			100	
75			100	
63			100	0
50			100	Gravel
37.5			100	
28			100	
20			100	
14			100	
10			95	
6.3			93	
5			92	
3.35			92	8
2			91	Sand
1.18			90	
0.6			84	
0.425			71	
0.3			46	
0.212			23	
0.15			13	
0.063			8	84
0.02			5	Silt
0.006			4	
0.002			3	5
				Clay 3

NOTES :

Unit 116, The Burrows, East Goscote Ind Est
East Goscote, Leicestershire, LE7 3XD
t: 0116 3196100 e: info@simtec-mt.co.uk

CERT084b-SM11106-PIP-1

Project Reference - P10525 - CASCID-Christie Hospital, Manchester

Analysis Methodologies

Determinant	Details and Test method used
BS1377 PSD	1377 Particle Size Distribution 1. Sample preparation was in accordance with BS1377:Part 1:2016. 2. Testing was in accordance with BS1377:Part 2:1990 clause 9.2 wet sieving method
BS1377 Sedimentation by pipette	1377 Particle Size Distribution Sedimentation 1. Sample preparation was in accordance with BS1377:Part 1:2016. 2. Testing was in accordance with BS1377:Part 2:1990 clause 9.4 sedimentation by pipette method.

GRM Development Solutions Ltd
Laurus House First Avenue, Centrum
100, Burton -on-Trent, Staffordshire

UKAS TESTING
10108

SIMTEC
CONSTRUCTION MATERIALS TESTING
A PHOENIX GROUP COMPANY

Unit 116, The Burrows, East Goscote Ind Est
East Goscote, Leicestershire, LE7 3XD
t: 0116 3196100 e: info@simtec-mt.co.uk

Analytical Test Report: **CERT084b-SM11247-PIP-1**

Your Project Reference:	**P10525 - CASCID-Christie Hospital, Manchester**		
Your Order Number:	P10525	Testing Received / Instructed:	24/03/2024
Report Issue Number:	1	Sample Tested:	25/032024 to 27/03/2024
Samples Analysed:	1 Soil Sample	Report issued:	25/04/2024

[redacted]
Simtec Material Testing

Notes:

Samples will be retained for 14 days after issue of this report unless otherwise requested.

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

Some information required by BS1377 is not included in the report. The information will be provided if requested.

A certificate of sampling was not supplied

Samples were supplied by customer, results apply to the samples as received.

Within the report any information provided by the client is identified with a '#'

Accreditation Key

UKAS = UKAS Accreditation, u = Unaccredited

Date of Issue: 18.08.2022

Issued by: RM

Issue No: 1

Rev No: 1

SIMTEC
CONSTRUCTION MATERIALS TESTING
A PHOENIX GROUP COMPANY

Unit 116, The Burrows, East Goscote Ind Est
East Goscote, Leicestershire, LE7 3XD
t: 0116 3196100 e: info@simtec-mt.co.uk

CERT084b-SM11247-PIP-1

Project Reference - P10525 - CASCID-Christie Hospital, Manchester

Analytical Test Results - Soil

Lab Reference		**20561**
Client Sample ID (#)		-
Client Sample Location (#)		TP105
Client Sample Type (#)		B
Depth - Top (m) (#)		0.8
Depth - Bottom (m) (#)		0.8
Date of Sampling (#)		17/03/2024
Sample type		Bulk - Disturbed
Sample Description		Brown SAND
Determinant	**Units**	
BS1377 PSD		
125.0	(% Passing)	100
90.0	(% Passing)	100
75.0	(% Passing)	100
63.0	(% Passing)	100
50.0	(% Passing)	100
37.5	(% Passing)	100
28.0	(% Passing)	100
20.0	(% Passing)	100
14.0	(% Passing)	100
10.0	(% Passing)	100
6.3	(% Passing)	100
5.0	(% Passing)	100
3.35	(% Passing)	100
2.00	(% Passing)	99
1.18	(% Passing)	99
0.600	(% Passing)	95
0.425	(% Passing)	82
0.300	(% Passing)	48
0.212	(% Passing)	14
0.150	(% Passing)	3.0
0.063	(% Passing)	1.0
0.02	(% Passing)	0.3
0.006	(% Passing)	0.2
0.002	(% Passing)	0.1
PSD test Method	-	Wet sieving
Sedimentation was pretreated	-	no

SIMTEC CONSTRUCTION MATERIALS TESTING
A PIETRO GROUP COMPANY

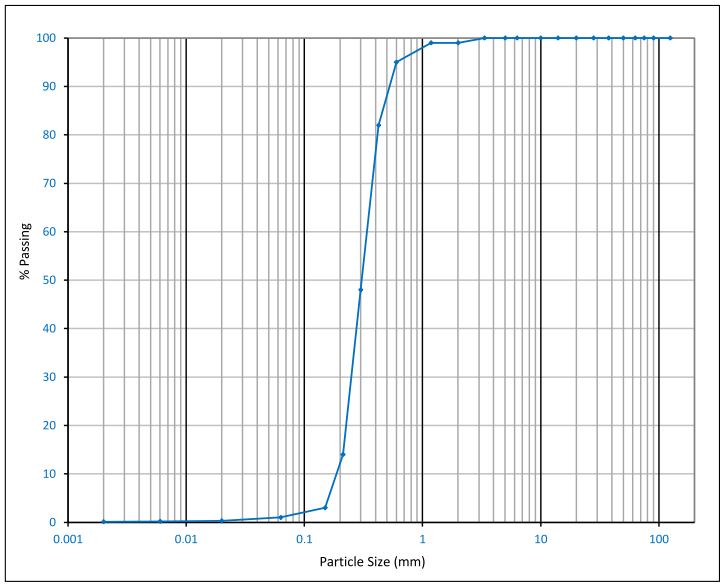
Unit 116, The Burrows, East Goscote Ind Est
East Goscote, Leicestershire, LE7 3XD
t: 0116 3196100 e: info@simtec-mt.co.uk

CERT084b-SM11247-PIP-1

Project Reference - P10525 - CASCID-Christie Hospital, Manchester

Analytical Test Results - Soil

Lab Reference	**20561**
Client Sample ID (#)	-
Client Sample Location (#)	TP105
Client Sample Type (#)	B
Depth - Top (m) (#)	0.80
Depth - Bottom (m) (#)	0.80
Date of Sampling (#)	17/03/2024
Sample type	Bulk - Disturbed
Sample Description	Brown SAND



Specification:

Sieve Size (mm)	Upper Limit (%)	Lower Limit (%)	Passing (%)	
125			100	Cobbles
90			100	
75			100	
63			100	0
50			100	Gravel
37.5			100	
28			100	
20			100	
14			100	
10			100	
6.3			100	
5			100	
3.35			100	0
2			99	Sand
1.18			99	
0.6			95	
0.425			82	
0.3			48	
0.212			14	
0.15			3	
0.063			1	99
0.02			0	Silt
0.006			0	
0.002			0	1
				Clay 0

NOTES :

Unit 116, The Burrows, East Goscote Ind Est
East Goscote, Leicestershire, LE7 3XD
t: 0116 3196100 e: info@simtec-mt.co.uk

CERT084b-SM11247-PIP-1

Project Reference - P10525 - CASCID-Christie Hospital, Manchester

Analysis Methodologies

Determinant	Details and Test method used
BS1377 PSD	1377 Particle Size Distribution 1. Sample preparation was in accordance with BS1377:Part 1:2016. 2. Testing was in accordance with BS1377:Part 2:1990 clause 9.2 wet sieving method
BS1377 Sedimentation by pipette	1377 Particle Size Distribution Sedimentation 1. Sample preparation was in accordance with BS1377:Part 1:2016. 2. Testing was in accordance with BS1377:Part 2:1990 clause 9.4 sedimentation by pipette method.

LABORATORY REPORT

Contract Number: PSL24/2235

Report Date: 05 April 2024

Client's Reference:

Client Name: Simtec - Leicester
116 The Burrows
East Goscote
Leicester
LE7 3XD

For the attention of: Charlie Needham/Rob McGoff

Contract Title: CASCID - Chrisite Hospital, Manchester

Date Received: 27/3/2024
Date Commenced: 27/3/2024
Date Completed: 5/4/2024

Notes: Opinions and Interpretations are outside the UKAS Accreditation

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

Checked and Approved Signatories:

[redacted]

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

SUMMARY OF POINT LOAD TEST RESULTS

ISRM Suggested Methods : 2007

Borehole Number	Depth (m)	Test Type	Orientation	Dimensions (mm)		Area	D_e^2	D_e	Failure Load (P)		I_s	Corr Fac	I_{s50}	Failure Type	Remarks
			Par / Perp	W	D	(mm2)		(mm)	(Mpa)	(kN)	(MPa)	F	(MPa)		
BH104 (11358/20850)	7.50	A	Perp	83	34	2822	3593.08	59.94	-	0.20	0.06	1.085	0.06	Valid	
BH104 (11358/20851)	8.10	A	Perp	84	68	5712	7272.74	85.28	-	0.87	0.12	1.272	0.15	Valid	
BH104 (11358/20852)	10.10	A	Perp	84	79	6636	8449.22	91.92	-	0.74	0.09	1.315	0.12	Valid	
BH104 (11358/20854)	13.25	I	Par	84	39	3276	4171.13	64.58	-	0.07	0.02	1.122	0.02	Valid	
BH104 (11358/20856)	15.87	A	Perp	83	53	4399	5600.98	74.84	-	0.34	0.06	1.199	0.07	Valid	

Note All testing carried out on samples at as received water content

Par = parallel, Perp = perpendicular, U = Random

A = Axial, D = Diametral, I = Irregular

UKAS TESTING 4043

PSL PROFESSIONAL SOILS LABORATORY A PHENNA GROUP COMPANY

CASCID - Chrisite Hospital, Manchester

Contract No:

PSL24/2235

Client Ref:

LABORATORY REPORT

Contract Number: PSL24/2236

Report Date: 05 April 2024

Client's Reference:

Client Name: Simtec - Leicester
116 The Burrows
East Goscote
Leicester
LE7 3XD

For the attention of: Charlie Needham/Rob McGoff

Contract Title: CASCID - Chrisite Hospital, Manchester

Date Received: 27/3/2024
Date Commenced: 27/3/2024
Date Completed: 5/4/2024

Notes: Opinions and Interpretations are outside the UKAS Accreditation

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

Checked and Approved Signatories:

[redacted]

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

SUMMARY OF POINT LOAD TEST RESULTS

ISRM Suggested Methods : 2007

Borehole Number	Depth (m)	Test Type	Orientation	Dimensions (mm)		Area	D_e^2	D_e	Failure Load (P)		I_s	Corr Fac	I_{s50}	Failure Type	Remarks
			Par / Perp	W	D	(mm2)		(mm)	(Mpa)	(kN)	(MPa)	F	(MPa)		
BH101 (11359/20862)	6.10	A	Perp	84	41	3444	4385.04	66.22	-	0.18	0.04	1.135	0.05	Valid	
BH101 (11359/20863)	9.30	A	Perp	84	79	6636	8449.22	91.92	-	0.80	0.09	1.315	0.12	Valid	
BH101 (11359/20864)	9.90	I	Perp	75	34	2550	3246.76	56.98	-	0.12	0.04	1.061	0.04	Valid	
BH101 (11359/20866)	11.45	A	Perp	85	50	4250	5411.27	73.56	-	0.56	0.10	1.190	0.12	Valid	
BH101 (11359/20867)	13.45	A	Perp	83	60	4980	6340.73	79.63	-	0.48	0.08	1.233	0.09	Valid	
BH101 (11359/20868)	16.20	A	Perp	85	66	5610	7142.87	84.52	-	0.27	0.04	1.266	0.05	Valid	

Note All testing carried out on samples at as received water content

Par = parallel, Perp = perpendicular, U = Random

A = Axial, D = Diametral, I = Irregular

UKAS TESTING 4043

PSL PROFESSIONAL SOILS LABORATORY A PHENNA GROUP COMPANY

CASCID - Chrisite Hospital, Manchester

Contract No:

PSL24/2236

Client Ref:

SUMMARY OF POINT LOAD TEST RESULTS

ISRM Suggested Methods : 2007

Borehole Number	Depth (m)	Test Type	Orientation	Dimensions (mm)		D_e^2	D_e	Failure Load		I_s	Corr Fac	I_{s50}	Failure Type	Remarks
			Par / Perp	L	D		(mm)	(Mpa)	(kN)	(MPa)	F	(MPa)		
BH101 (11359/20866)	11.45	D	Par	-	85	7225	85.00	-	1.00	0.138	1.270	0.18	Valid	

Note All testing carried out on samples at as received water content

Par = parallel, Perp = perpendicular, U = Random

UKAS TESTING 4043

PSL PROFESSIONAL SOILS LABORATORY A PHENNA GROUP COMPANY

CASCID - Chrisite Hospital, Manchester

Contract No:

PSL24/2236

Client Ref:

LABORATORY REPORT

Contract Number: PSL24/2237

Report Date: 05 April 2024

Client's Reference:

Client Name: Simtec - Leicester
116 The Burrows
East Goscote
Leicester
LE7 3XD

For the attention of: Charlie Needham/Rob McGoff

Contract Title: CASCID - Chrisite Hospital, Manchester

Date Received: 27/3/2024
Date Commenced: 27/3/2024
Date Completed: 5/4/2024

Notes: Opinions and Interpretations are outside the UKAS Accreditation

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

Checked and Approved Signatories:

[redacted]

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

SUMMARY OF POINT LOAD TEST RESULTS

ISRM Suggested Methods : 2007

Borehole Number	Depth (m)	Test Type	Orientation	Dimensions (mm)		Area	D_e^2	D_e	Failure Load (P)		I_s	Corr Fac	I_{s50}	Failure Type	Remarks
			Par / Perp	W	D	(mm2)		(mm)	(Mpa)	(kN)	(MPa)	F	(MPa)		
BH102 (11360/20870)	4.35	A	Perp	85	59	5015	6385.30	79.91	-	0.61	0.10	1.235	0.12	Valid	
BH102 (11360/20871)	5.60	A	Perp	84	53	4452	5668.46	75.29	-	0.43	0.08	1.202	0.09	Valid	
BH102 (11360/20872)	7.90	A	Perp	84	57	4788	6096.27	78.08	-	0.26	0.04	1.222	0.05	Valid	
BH102 (11360/20874)	11.66	A	Perp	84	58	4872	6203.22	78.76	-	0.30	0.05	1.227	0.06	Valid	
BH102 (11360/20875)	15.80	I	Perp	84	63	5292	6737.98	82.09	-	0.53	0.08	1.250	0.10	Valid	

Note All testing carried out on samples at as received water content

Par = parallel, Perp = perpendicular, U = Random

A = Axial, D = Diametral, I = Irregular

UKAS TESTING 4043

PSL PROFESSIONAL SOILS LABORATORY A PHENNA GROUP COMPANY

CASCID - Chrisite Hospital, Manchester

Contract No:

PSL24/2237

Client Ref:

SUMMARY OF POINT LOAD TEST RESULTS

ISRM Suggested Methods : 2007

Borehole Number	Depth (m)	Test Type	Orientation	Dimensions (mm)		D_e^2	D_e	Failure Load		I_s	Corr Fac	I_{s50}	Failure Type	Remarks
			Par / Perp	L	D		(mm)	(Mpa)	(kN)	(MPa)	F	(MPa)		
BH102 (11360/20870)	4.35	D	Par	-	85	7225	85.00	-	0.17	0.024	1.270	0.03	Valid	
BH102 (11360/20871)	5.60	D	Par	-	84	7056	84.00	-	0.08	0.011	1.263	0.01	Valid	
BH102 (11360/20874)	11.66	D	Par	-	84	7056	84.00	-	0.16	0.023	1.263	0.03	Valid	

Note All testing carried out on samples at as received water content

Par = parallel, Perp = perpendicular, U = Random

UKAS TESTING 4043

PSL PROFESSIONAL SOILS LABORATORY A PHENNA GROUP COMPANY

CASCID - Chrisite Hospital, Manchester

Contract No:

PSL24/2237

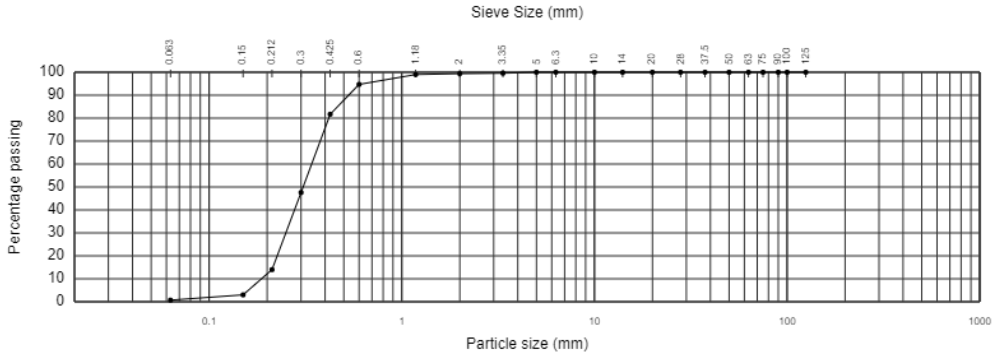
Client Ref:

TEST REPORT: DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Tested in accordance with BS 1377 - 2 : 1990, Method 9.2 Washing & Dry Sieving and BS 1377 - 2 : 1990, Method 3.2

REPORT NUMBER:	C4002211 / 11247.1.1.1		
SAMPLE NUMBER:	20561	CLIENT:	GRM Development Solutions Ltd
CLIENT REF:	TP105 0.80m	ADDRESS:	Laurus House First Avenue, Centrum 100, Burton-on-Trent, Staffordshire, DE14 2WH
DATE SAMPLED:	17/03/2024	SITE:	P10525 - CASCID-Christie Hospital, Manchester
SAMPLED BY:	Client	SOURCE / SUPPLIER:	Unknown, Unknown
DATE RECEIVED:	21/03/2024	MATERIAL DESCRIPTION:	Brown SAND
DATE COMPLETED:	05/04/2024	PROPOSED CLASSIFICATION:	Class 1B
TESTED BY:	Jacob Haywood	LOCATION:	TP105, TP, 0.80, B, 0.80
TYPE OF SAMPLE:	Disturbed	PREPARATION METHOD:	BS 1377:Part 1:2016 clause 8.3 & 8.4.5
VARIATIONS:	No variations	SAMPLING PLAN:	Client Provided
METHOD OF SAMPLING:	Sampled by client	LOCATION AND ORIENTATION WITHIN SAMPLE:	
ENVIRONMENTAL CONDITIONS:			

RESULT **Test Location: Simtec East Goscote**



Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse		
0.020	0.063	0.20	0.63	2.0	6.3	20	63	200
SILT/CLAY	SAND			GRAVEL			COBBLE	BOULDERS

Percentage BOULDERS: 0%
Percentage COBBLES: 0%
Percentage GRAVEL: 1%
Percentage SAND: 99%
Percentage SILT/CLAY: 1%

Applied Specification: Class 1B - Specification for Highway Works (2016) Table 6/2 Earthworks Materials - Class 1B

This certificate only confirms the material has met the relevant grading requirements of the material specification

SIEVE ANALYSIS

Particle Diameter mm	Passing %	Specification Limits
125	100	100 - 100
100	100	
90	100	
75	100	
63	100	
50	100	
37.5	100	
28	100	
20	100	
14	100	
10	100	
6.3	100	
5	100	
3.35	100	
2	99	
1.18	99	
0.6	95	
0.425	82	
0.3	48	
0.212	14	
0.15	3	
0.063	1	0 - 15

Decision Rule: For a test performed according to published method BS 1377-2: 1990 , with bias consistent with the published method values, and no additional influences being identified... PASS: when percentage passing stated sieve size is within the tolerances stated in specification, FAIL: otherwise.

Remarks:
Test results reported relate only to the items tested.
This report shall not be reproduced except in full without approval of the Laboratory.
Opinions and interpretations expressed herein are outside the scope of UKAS Accreditation.The laboratory does not apply a conformity statement to test reports as standard, unless specifically requested by the customer.

For and on behalf of Simtec
Robert McGoff - Laboratory Supervisor

[redacted]

Approved Signatory
Report date 10-Apr-24

UKAS TESTING
10108

Report Format: PSDsoil/TP02/Rep Issue 1 Rev 0 05/17

116 The Burrows,
East Goscote,
Leicester LE7 3XD

0116 319 6100
info@simtec-mt.co.uk
www.simtec-mt.co.uk

END OF REPORT

E. 2019 CC Geotechnical Ground Investigation Report

CCG-C-18-10614

GROUND INVESTIGATION REPORT FOR SITE AT

THE CHRISTIE, MANCHESTER

PATERSON REDEVELOPMENT PROJECT

APRIL 2019

Prepared by:

CC GEOTECHNICAL LTD

Unit 1 Deltic Way
Knowsley Industrial Estate
Liverpool
Merseyside
L33 7BA

Telephone: 0151 545 2750
Facsimile: 0151 548 7892

Consulting Engineers:

OVE ARUP & PARTNERS LTD

9th Floor, 3 St Paul's Place
Norfolk Street
Sheffield, S1 2JE

Telephone: 0114 283 3686

Prepared for:

INTERSERVE CONSTRUCTION LTD

Woodhouse Drive
Wigan
WN6 7NT

Telephone: 01942 236 434

DOCUMENT CONTROL FORM	
Client:	**INTERSERVE CONSTRUCTION LTD**
Project Title:	GROUND INVESTIGATION FOR SITE AT THE CHRISTIE, MANCHESTER: PATERSON REDEVELOPMENT PROJECT
Reference Number:	CCG-C-18-10614
Main Author:	Daniel O'Regan BSc(Hons) PIEMA
Signature:	[redacted]
Reviewed by:	
Signature:	
Approved for Issue by:	
Signature	
Date:	
Revision Number:	
Comments:	
Status:	Final
Distribution:	**INTERSERVE CONSTRUCTION LTD** **ARUP**

This document has been prepared by *CC GEOTECHNICAL LTD* within the terms of the contract, scope of work, and resources agreed in writing with the client. The limitations of liability of *CC GEOTECHNICAL LTD* for the contents of this document have been agreed with the Client, as set out in the terms and conditions of offer and related contract documentation.

This document is intended for the sole use of the client indicated above and *CC GEOTECHNICAL LTD* accepts no responsibility of whatever nature to third parties to whom this document or any part of this document is made known. Any such party relies upon that information at their own risk.

The findings and opinions provided in this document are made in good faith and are subject to the limitations imposed by employing site assessment methods and techniques, appropriate to the time of investigation and within the limitations and constraints defined in this document. The findings and opinions are relevant to the dates when the assessment was undertaken, but should not necessarily be relied upon to represent conditions at a substantially later date. In particular, seasonal groundwater levels, with the effects of precipitation, may affect the conditions found during the investigation. The report should be read in conjunction with the Notes on Limitations included herein.

Where opinions expressed in this report are based on current available guidance and legislation, no liability can be accepted by *CC GEOTECHNICAL LTD* for the effects of any future changes to such guidelines and legislation. Additional information, improved practices, new guidance, changes in legislation, or amendments to design proposals, may necessitate this report having to be reviewed in whole or in part after that date.

Factual data has largely been obtained from enquiries with third parties, the results of which are relied on unless indicated to be inaccurate by contradictory information. Further assessment, investigation, construction activities, could not have been taken into account in the preparation of the report. Where such information might impact upon stated opinions, *CC GEOTECHNICAL LTD* reserves the right to modify such opinions expressed herein.

The findings and opinions conveyed, via this report, are based on information obtained from a variety of sources as detailed in this report, and which *CC GEOTECHNICAL LTD* assumes to be reliable, but has not been independently confirmed. Therefore, *CC GEOTECHNICAL LTD* cannot and does not guarantee the authenticity or reliability of third party information it has referred to.

CC GEOTECHNICAL LTD possesses a non-exclusive and non-transferable Ordnance Survey Licence, but does not possess any right to sub-license any of the rights granted by this licence to any party. Under the terms of *CC GEOTECHNICAL LTD's* Ordnance Survey Licence, copying of figures containing Ordnance Survey data or using figures for any purpose other than as part of this report is not permitted.

1.0 INTRODUCTION

CC GEOTECHNICAL LTD **(*CCG*)** was commissioned by ***OVE ARUP & PARTNERS LTD (ARUP)*** acting as The Engineer, on behalf of The Client ***INTERSERVE CONSTRUCTION LIMITED***, to carry out ground investigation works for The Christie NHS Foundation Trust (The Christie) in connection with the Paterson Redevelopment project, at The Christie, Manchester, where it is proposed the existing Paterson building be demolished and replaced with the construction of a new medium-rise research building with an associated new basement structure.

The purpose of the Ground Investigation was to obtain geotechnical and geoenvironmental data relevant to the selection and design of foundation and substructure elements of the proposed development.

The investigation works were carried out in accordance with the Ground Investigation Specification – 263083-00 – P02 – September 2018 – issued by ***ARUP***.

This factual report is a compilation of the findings of the investigation and associated testing.

It must be borne in mind that the data and/or opinions contained in this report should be read in conjunction with the Notes on Limitations, given in Appendix J.

2.0 SITE LOCATION AND DESCRIPTION

This site is situated within the grounds of The Christie complex, off Wilmslow Road, Manchester, M20 3DB, centred at Ordnance Survey National Grid Reference SJ 84924 92461. Site location plans are presented on ***ARUP*** Drawings Figure 1 - 3 in Appendix A.

The site is currently occupied by the existing 4-storey Paterson Building, which has suffered fire damage on the upper floors.

The site investigation works were carried out over two distinct areas – adjacent to the eastern and western elevations of the Paterson Building. No works were carried out within the existing building footprint.

3.0 DOCUMENTED GEOLOGY

The natural geology prevailing at the site was researched by reference to BGS records. These indicate that the site is underlain by drift deposits of Glacial Till. The solid geology comprises Chester Formation - Sandstone. Sedimentary Bedrock formed approximately in the Triassic Period. Given the history of development of the site it was known that made ground would be present at the surface of the site.

4.0 SCOPE OF INVESTIGATION

The fieldwork was planned in accordance with BS10175: 2013 and was carried out in accordance with BS10175: 2013 and BS5930: 2015, insofar as they related to the scope of the investigation. Investigation works were carried out in January / February 2019 and comprised:

- The sinking of 4nr boreholes (BH01-BH04) to rockhead by cable percussion methods, and further advanced by rotary coring methods in the bedrock to depths of up to 25.0mbgl.

  Logs of the boreholes annotated with SPT "N" values, disturbed sampling details, TCR, SCR, RQD, and I_f values, and standpipe construction details are given in Appendix B.

  Photographs of rock cores are presented in Appendix F.

- The sinking of a single borehole (WS01) to rockhead by dynamic sampling methods to a depth of 2.4mbgl.

  A log of the borehole annotated with SPT "N" values and sampling details, is given in Appendix B.

- The mechanical excavation of 3nr trial pits (TP01-TP03) to depths of 2.9mbgl.

  Logs of the trial pits are given in Appendix C.

- The manual excavation of 9nr foundation observation pits (OP01-OP09) to determine the existing foundation depths and projections.

  Sketches of the observation pits are presented in Appendix D.

- The determination of permeability values by insitu variable head tests (both falling and rising head test methods) carried out in accordance with both BS EN ISO 5930:1999 and BS EN ISO 22282:2012.

  The test worksheets are presented in Appendix E.

The layout of the investigation is presented on ***CCG*** Drawings 1 - 3 in Appendix A.

5.0 LABORATORY TESTING

5.1 Soil & Rock Engineering Testing

The following programme of soil and rock engineering testing was undertaken:

- Determination of soil moisture content in accordance with BS 1377: Part 2: 1990 – 8nr tests.
- Determination of Atterberg Limits in accordance with BS 1377: Part 2: 1990 - 5nr tests.
- Determination of particle size distribution by wet sieving in accordance with BS 1377: Part 2: 1990 - 4nr tests
- Determination of sedimentation distribution by pipette in accordance with BS 1377: Part 2: 1990 - 3nr tests.
- Determination of unconsolidated undrained triaxial compression with measurement of pore pressure in accordance with BS 1377: Part 7: 1990 - 1nr test.
- Determination of point load strength of rock in accordance with ISRM 1985: Suggested method - 24nr tests
- Determination of Uniaxial Compressive Strength of rock in accordance with ISRM 2007: Suggested Method - 3nr tests
- Determination of Unconfined Compressive Strength with Youngs Modulus & Poissons Ratio of rock in accordance with ISRM 1981: Suggested Method – 3nr tests

The engineering testing was largely carried out in the UKAS accredited laboratory of ***CCG***. The test results are presented in Appendix G.

5.2 Chemical Analyses

The following programme of chemical analyses was undertaken at a UKAS/MCERTs laboratory as detailed within the specification and listed hereunder:

Suite E1 (General) - 7nr soil samples analysed:

- Arsenic
- Cadmium
- Chromium (total)
- Copper
- Lead
- Mercury
- Nickel
- Selenium
- Zinc
- Antimony
- Beryllium
- Vanadium
- Cyanide (total)
- pH
- Boron (water soluble)
- Phenols (total)
- Total Organic Carbon

Suite E2a - 8nr soil samples analysed:

- Asbestos I.D (soil only)

Suite H - 1nr soil sample analysed:

- Waste acceptance (total soils)

The soil chemical test results are presented in Appendix H.

6.0 GAS & GROUNDWATER MONITORING

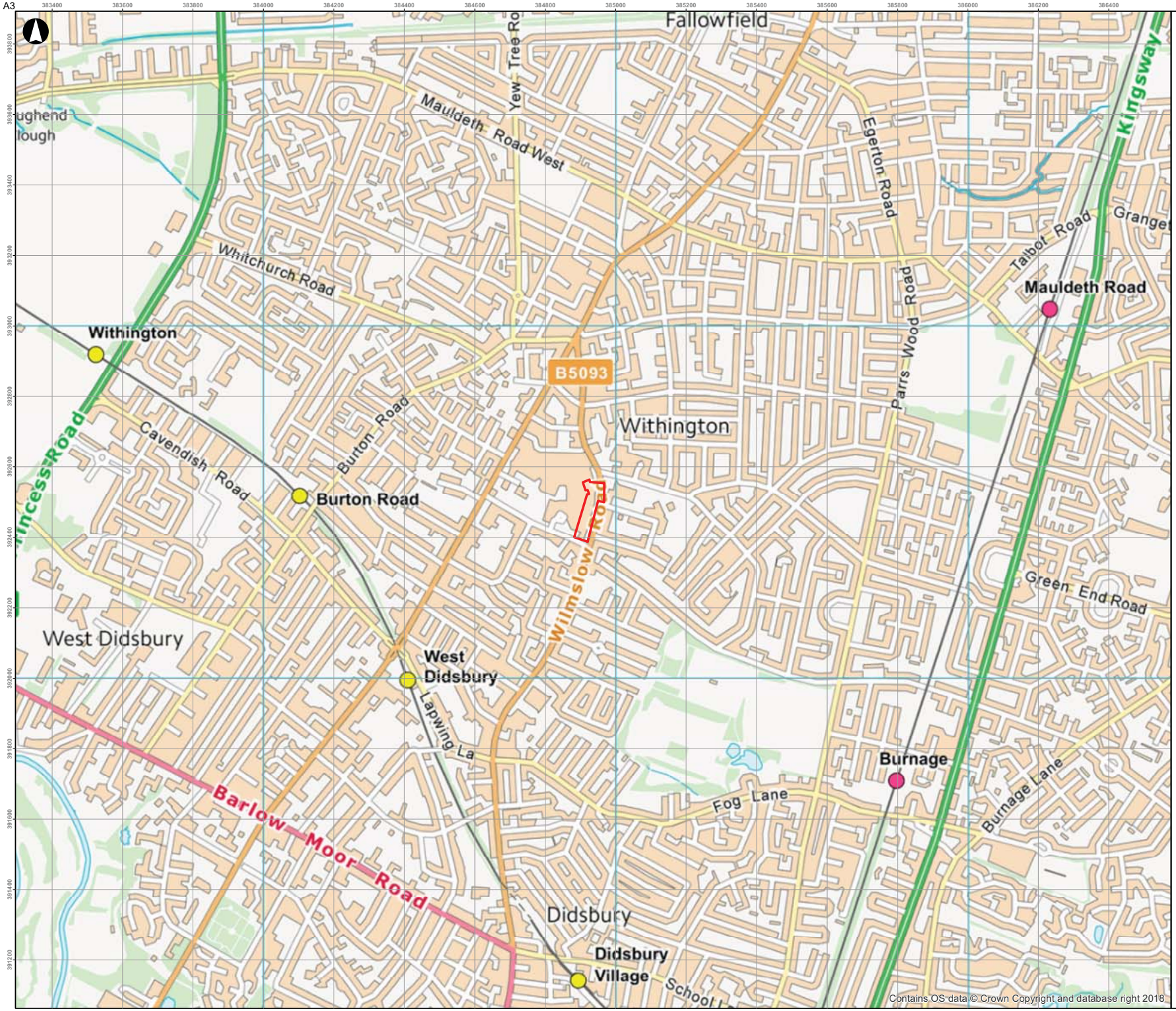
Monitoring standpipe wells were installed in 3nr boreholes (BH01, BH02 & BH04). Each installation was periodically monitored for flow rate and composition of ground gas using a LMsXi infra-red analyser. Immediately following monitoring for gases, the standing water levels were recorded by electronic dipmeter.

The results of the gas and groundwater monitoring, together with calibration certificates of the instruments are given in Appendix I.

APPENDIX A

DRAWINGS

A3



Legend

Site Boundary

Issue	Date	By	Chkd	Appd
P0	2018-08-10	PST	HB	JH

Metres

0 137.5 275 550

ARUP

Arup
6th Floor, 3 Piccadilly Place,
Manchester
M1 3BN
United Kingdom

Client

Interserve Construction Limited

Job Title

Paterson Redevelopment Building

Site location

Scale at A3

1:10,000

Job No	Drawing Status
263083-00	**Preliminary**

Drawing No	Issue
Figure 1	**P0**

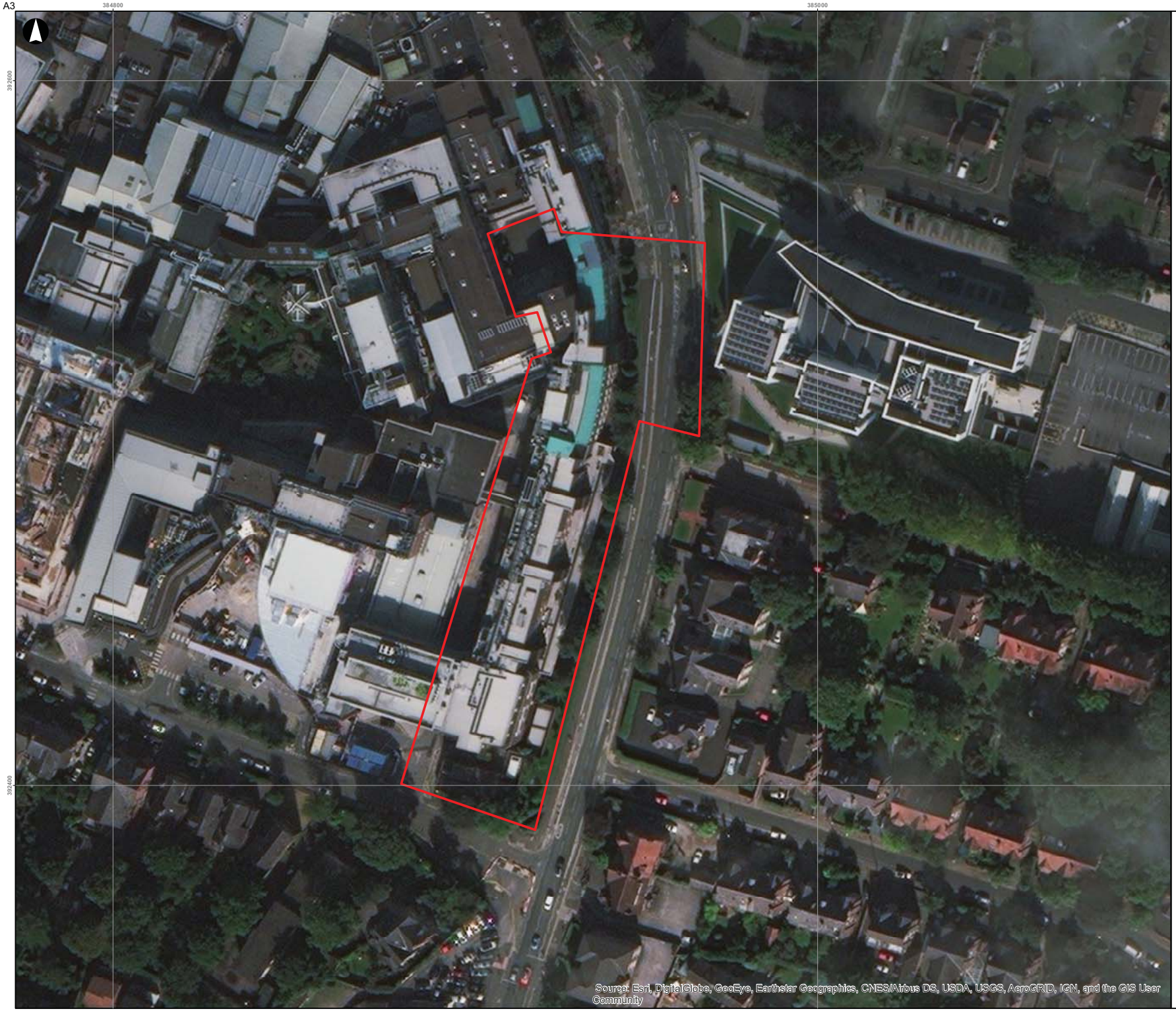
17/08/2018 11:49:27

\\GlobalEuropeManchesterUobs\260000\263083-00\4 Internal Project Data\4-03 Drawings\C_Civil\CG_Geotechnics\GIS_Paterson redevelopment_Quick.mxd

Template A3: Version 2

© Arup

A3



Legend

Site Boundary

Issue	Date	By	Chkd	Appd
P0	2018-08-10	PST	HB	JH

Metres

0 12.5 25 50

ARUP

Arup
6th Floor, 3 Piccadilly Place,
Manchester
M1 3BN
United Kingdom

Client

Interserve Construction Limited

Job Title

Paterson Redevelopment Building

Site boundary

Scale at A3

1:1,000

Job No	Drawing Status
263083-00	**Preliminary**

Drawing No	Issue
Figure 2	**P0**

17/08/2018 11:48:33

\\GlobalEuropeManchester\Jobs\260000\263083-00\4 Internal Project Data\4-03 Drawings\C_Civil\CG_Geotechnics\GIS_Paterson redevelopment_Quick.mxd

Template A3: Version 2

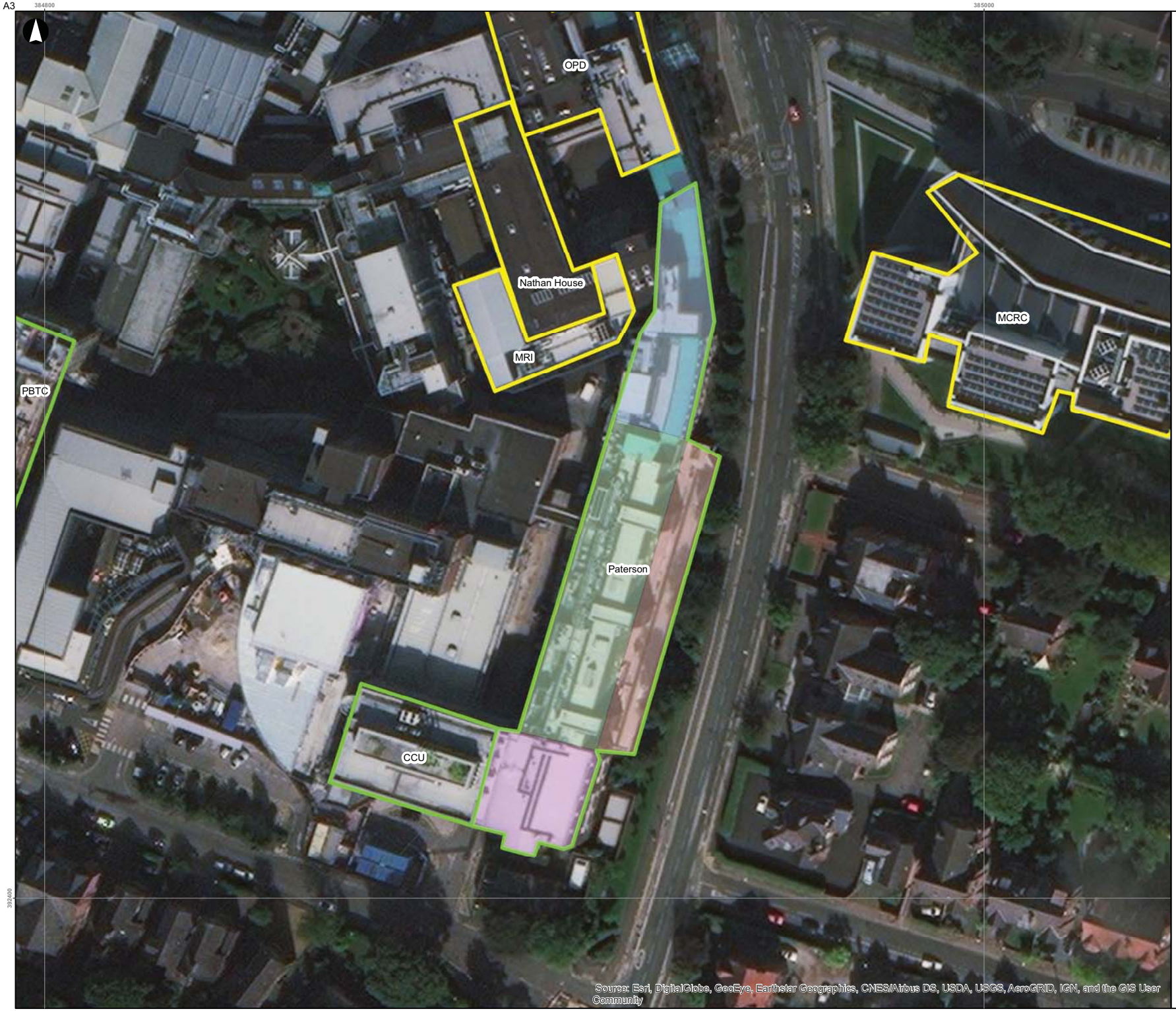
© Arup

A3

384800

385000

395400



Legend

Phase

- 1 & 2
- 3 & 4
- 5 & 6
- 7

The Christie buildings. Data

- No
- Yes

Issue	Date	By	Chkd	Appd
P0	2018-08-20	PST	PST	PST

Metres

0 10 20 40

ARUP

Client

Interserve Construction Limited

Job Title

Paterson Redevelopment Building

Phases of construction

Scale at A3

1:750

Job No	Drawing Status
263083-00	**Preliminary**

Drawing No	Issue
Figure 3	**P0**

20/08/2018 11:58:43

\\GlobalEuropeManchesterUobs\260000\263083-00\4 Internal Project Data\4-03 Drawings\C_Civil\CG_Geotechnics\GIS_Paterson redevelopment_Quick.mxd

Template A3: Version 2

© Arup

Key:
Cable Percussion / Rotary Borehole

Dynamic Sampling Borehole

Foundation Observation Pit

Trial Pit

WS01

BH01

BH02

TP01

TP02

DP01

DP02

DP03

DP04
(Carried out by PP O'Connor)

DP05

DP06

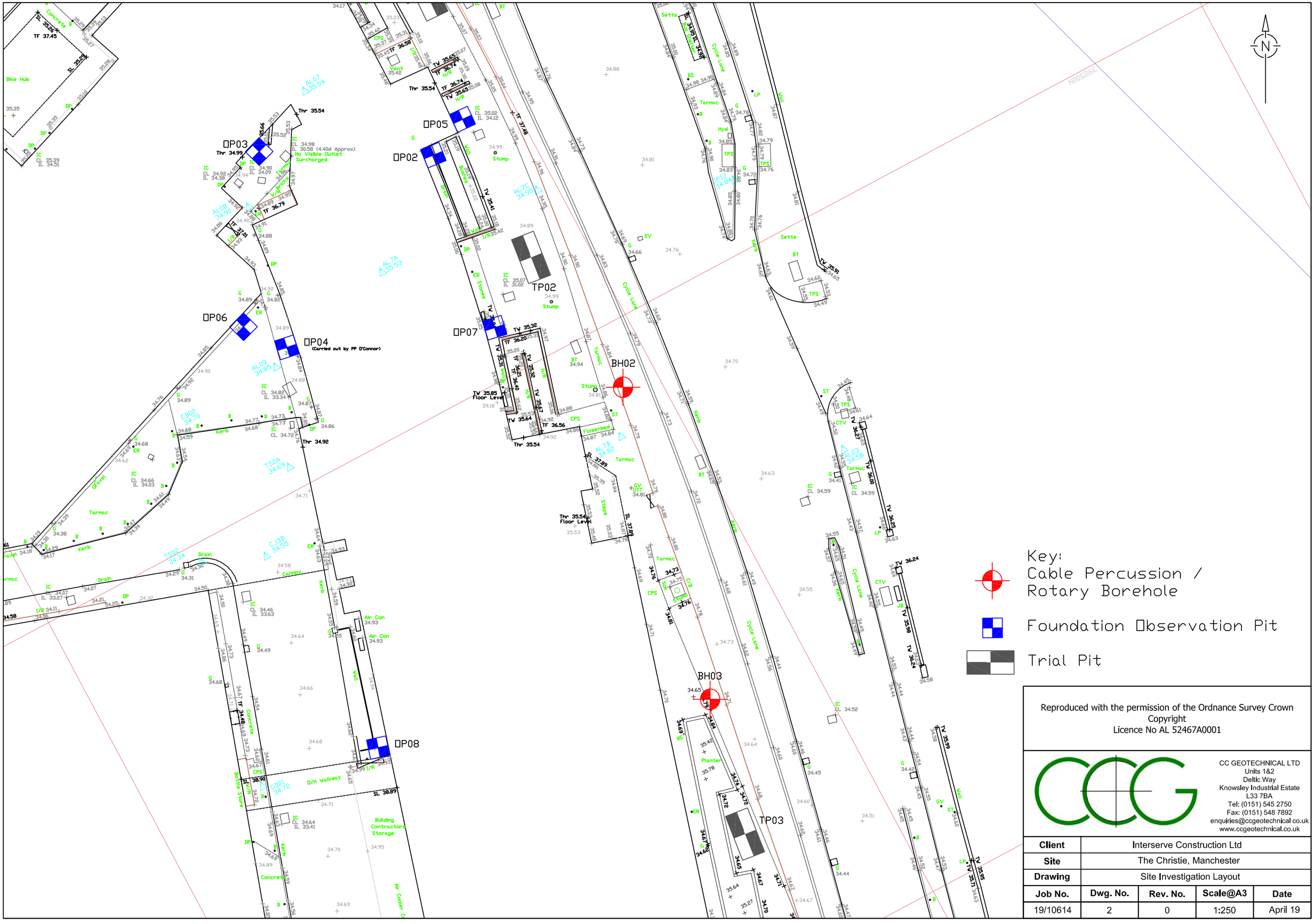
DP07

Wilmslow Road

Reproduced with the permission of the Ordnance Survey Crown Copyright
Licence No AL 52467A0001

CC GEOTECHNICAL LTD
Units 1&2
Deltic Way
Knowsley Industrial Estate
L33 7BA
Tel: (0151) 545 2750
Fax: (0151) 548 7892
enquiries@ccgeotechnical co.uk
www.ccgeotechnical.co.uk

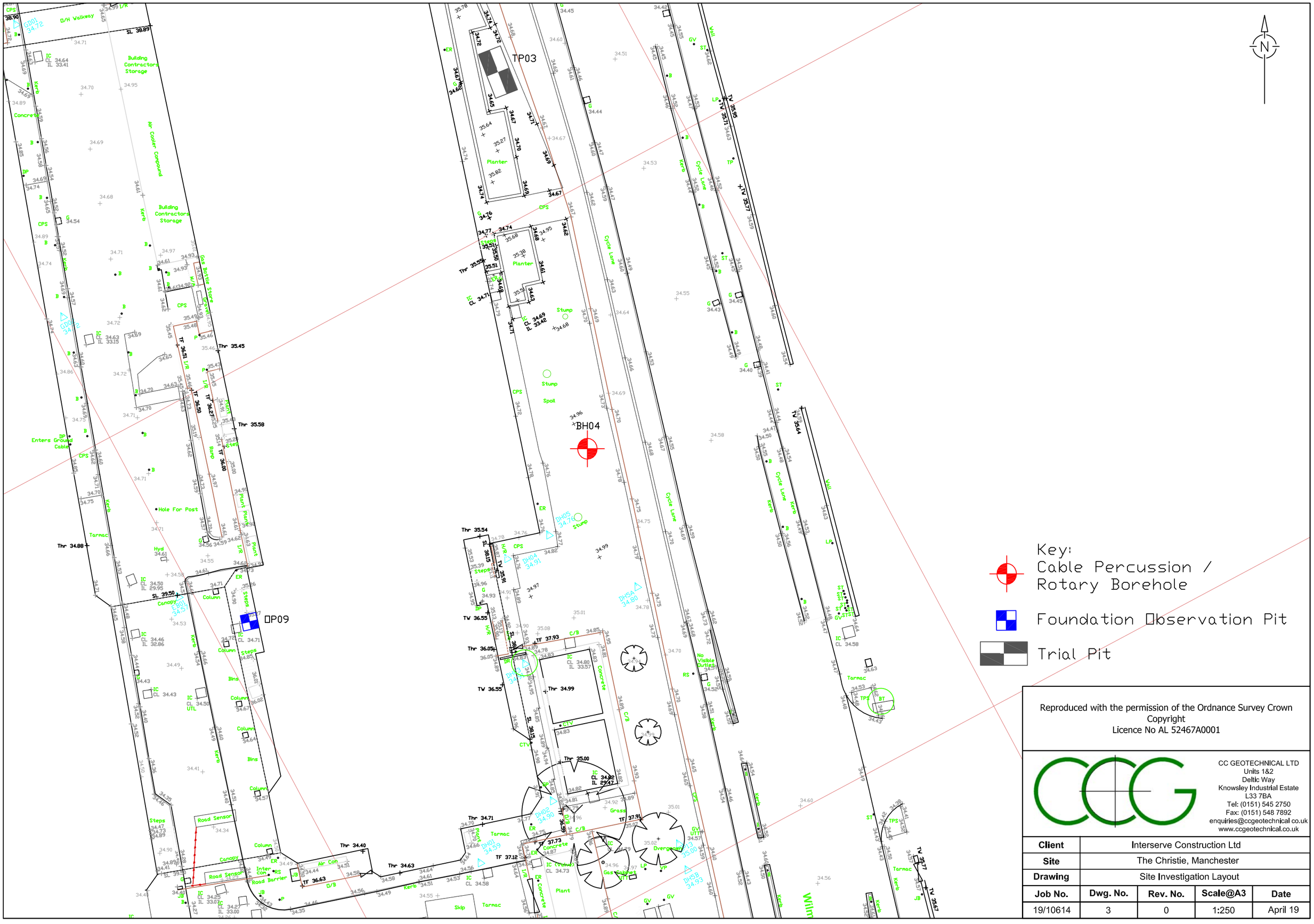
Client	Interserve Construction Ltd			
Site	The Christie, Manchester			
Drawing	Site Investigation Layout			
Job No.	Dwg. No.	Rev. No.	Scale@A3	Date
19/10614	1	0	1:250	April 19



Reproduced with the permission of the Ordnance Survey Crown Copyright
Licence No AL 52467A0001

CC GEOTECHNICAL LTD
Units 1&2
Deltic Way
Knowsley Industrial Estate
L33 7BA
Tel: (0151) 545 2750
Fax: (0151) 548 7892
enquiries@ccgeotechnical co.uk
www.ccgeotechnical.co.uk

Client	Interserve Construction Ltd			
Site	The Christie, Manchester			
Drawing	Site Investigation Layout			
Job No.	Dwg. No.	Rev. No.	Scale@A3	Date
19/10614	2	0	1:250	April 19



Reproduced with the permission of the Ordnance Survey Crown Copyright
Licence No AL 52467A0001

CC GEOTECHNICAL LTD
Units 1&2
Deltic Way
Knowsley Industrial Estate
L33 7BA
Tel: (0151) 545 2750
Fax: (0151) 548 7892
enquiries@ccgeotechnical co.uk
www.ccgeotechnical.co.uk

Client	Interserve Construction Ltd			
Site	The Christie, Manchester			
Drawing	Site Investigation Layout			
Job No.	Dwg. No.	Rev. No.	Scale@A3	Date
19/10614	3	0	1:250	April 19

APPENDIX B

BOREHOLE LOG SHEETS

CCG	Contract Name: The Christie, Manchester		Client: Interserve Construction Ltd		Borehole ID: **BH01**
	Contract Number: CCG-C-18-10614	Date Started: 24-01-2019	Logged By: LT	Checked By: CB	Status: FINAL — Sheet 1 of 3
Cable Percussion Borehole Log	Easting: 384946.8	Northing: 392535.6	Ground Level: 35.26mAOD	Plant Used: DANDO 3000	Rig Crew: AH/DB DB/AH — Scale: 1:50
Weather:		Termination:		SPT Hammer: CCG6 Energy Ratio: 68%	

Samples & In Situ Testing						Strata Details				Groundwater	
Depth	Sample ID	Test Result	TCR	SCR	RQD	Fracture	Water	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
									(0.40)		SUB-BASE		
0.50	B							34.86	0.40		Brown very gravelly very silty slightly sandy CLAY, with rootlets. Gravel is sub-angular to sub-rounded to sub-angular brick and sandstone (MADE GROUND)		
1.00	B								(1.00)				
		SPT(S)N=11 (1,2/2,3,3,3)						33.86	1.40				
1.50	B										Medium dense clayey silty gravelly fine to coarse grained SAND. Gravel is fine to medium sub-angular to sub-rounded sandstone		
2.00	B	SPT(S)N=15 (2,3/3,4,4,4)							(0.80)				
								33.06	2.20				
2.50	B										Red/orange weathered SANDSTONE, recovered as fine to coarse sand		
		SPT(S)100 (17,8/100 for 95mm)							(1.30)				
								31.76	3.50				
						45					Very weak to weak reddish brown fine to medium grained thickly laminated SANDSTONE. Moderately weathered. Recovered locally as sandy gravel. Discontinuities are extremely close to medium spaced, horizontal, clean, rough and tight to open		
3.50 - 5.00	98	33	7			110					NO RECOVERY - 3.50-3.53mbgl NON-INTACT. RECOVERED AS VERY GRAVELLY SAND - 3.53-3.82mbgl NON-INTACT. RECOVERED AS GRAVEL - 3.95-4.25mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 4.36-4.62mbgl		
						33					NON-INTACT. RECOVERED AS SANDY GRAVEL - 4.70-4.78mbgl		
						80					NON-INTACT. RECOVERED AS GRAVEL - 4.84-4.92mbgl		
						80					NO RECOVERY - 5.00-5.07mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 5.07-5.73mbgl		
5.00 - 6.50	95	65	28			19 70 200							
						140					NO RECOVERY - 6.50-6.61mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 6.75-7.27mbgl		
6.50 - 8.00	93	54	25			41 75 131					NON-INTACT. RECOVERED AS GRAVEL - 7.72-7.89mbgl		
						80					NO RECOVERY - 8.00-8.04mbgl NON-INTACT. RECOVERED AS GRAVEL - 8.12-8.28mbgl		
						47 55 70 63 88					NON-INTACT. RECOVERED AS GRAVEL - 8.37-8.39mbgl		
8.00 - 9.50	97	73	27			119					NON-INTACT. RECOVERED AS SANDY GRAVEL - 8.92-9.12mbgl		
						36					NO RECOVERY - 9.50-9.60mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 9.65-9.70mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 9.77-10.04mbgl		
						50 70							
											Continued next sheet		

Start & End of Shift Observations					Borehole Diameter		Casing Diameter	
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)

Chiselling			
From (m)	To (m)	Duration	Remarks

Installation			
Top (m)	Base (m)	Type	Dia (mm)
0.00	0.50	PLAIN	
0.50	2.30	SLOTTED	

Remarks:

1 hour hand excavating 1.20mbgl service avoidance pit
1 hour set up of falling head permeability test
1 hour carrying out falling head permeability test
Permeability test carried out at 2.00mbgl

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

	Contract Name: The Christie, Manchester		Client: Interserve Construction Ltd		Borehole ID: **BH01**
	Contract Number: CCG-C-18-10614	Date Started: 24-01-2019	Loggged By: LT	Checked By: CB	Status: FINAL
					Sheet 2 of 3
Rotary Core Drilling Log	Easting: 384946.8	Northing: 392535.6	Ground Level: 35.26mAOD	Plant Used: DANDO 3000	Rig Crew: AH/DB DB/AH
					Scale: 1:50
Weather:		Termination:		SPT Hammer: CCG6 Energy Ratio: 68%	

Samples & In Situ Testing						Strata Details				Groundwater	
Depth	TCR	SCR	RQD	Fracture Spacing	Water Added	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
9.50 - 11.00	93	36	17	140 80					NON-INTACT. RECOVERED AS SANDY GRAVEL - 10.18-10.69mbgl		
11.00 - 12.50	95	46	17	60 61 130 42					NON-INTACT. RECOVERED AS VERY CLAYEY SAND - 11.13-11.33mbgl INCLUSION OF WEATHERED MUDSTONE - 11.30mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 11.50-11.78mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 11.95-12.15mbgl		
12.50 - 14.00	97	31	7	26					NO RECOVERY - 12.50-12.55mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 12.55-13.61mbgl		
14.00 - 15.50	97	55	25	130 33 84 145			(16.50)		NO RECOVERY - 14.00-14.05mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 14.18-14.30mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 14.97-15.50mbgl		
15.50 - 17.00	94	60	43	86 160 225 270 90					NO RECOVERY - 15.50-15.59mbgl NON-INTACT. RECOVERED AS GRAVEL - 16.07-16.21mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 16.48-16.91mbgl		
17.00 - 18.50	91	39	29	120 180 35					NO RECOVERY - 17.00-17.14mbgl NON-INTACT. RECOVERED AS GRAVEL - 17.26-17.64mbgl NON-INTACT. RECOVERED AS CLAYEY SANDY GRAVEL - 17.82-18.28mbgl INCLUSION OF WEATHERED MUDSTONE - 18.00mbgl		
18.50 - 20.00	98	69	60	165 35 153 315					NON-INTACT. RECOVERED AS SANDY GRAVEL - 18.50-18.79mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 19.17-19.39mbgl		

Continued next sheet

Start & End of Shift Observations					Borehole Diameter		Casing Diameter	
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)

Flush Information					Installation			
Top (m)	Base (m)	Flush Type	Return	Flush Colour	Top (m)	Base (m)	Type	Dia (mm)
					0.00 0.50	0.50 2.30	PLAIN SLOTTED	

Remarks:

1 hour hand excavating 1.20mbgl service avoidance pit
1 hour set up of falling head permeability test
1 hour carrying out falling head permeability test
Permeability test carried out at 2.00mbgl

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Fracture spacing reported in mm as min, Average and Max values. TCR, SCR and RQD reported in %

	Contract Name: The Christie, Manchester		Client: Interserve Construction Ltd		Borehole ID: **BH01**
	Contract Number: CCG-C-18-10614	Date Started: 24-01-2019	Loggged By: LT	Checked By: CB	Status: FINAL
Rotary Core Drilling Log	Easting: 384946.8	Northing: 392535.6	Ground Level: 35.26mAOD	Plant Used: DANDO 3000	Rig Crew: AH/DB DB/AH
					Sheet 3 of 3
					Scale: 1:50

Weather: | Termination: | SPT Hammer: CCG6 Energy Ratio: 68%

Samples & In Situ Testing						Strata Details				Groundwater	
Depth	TCR	SCR	RQD	Fracture Spacing	Water Added	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
						15.26	20.00		Very weak to weak reddish brown fine to medium grained thickly laminated SANDSTONE. Moderately weathered. Recovered locally as sandy gravel. Discontinuities are extremely close to medium spaced, horizontal, clean, rough and tight to open		
									End of Borehole at 20.00m		

20 21 22 23 24 25 26 27 28 29

Start & End of Shift Observations					Borehole Diameter		Casing Diameter	
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)

Flush Information					Installation			
Top (m)	Base (m)	Flush Type	Return	Flush Colour	Top (m)	Base (m)	Type	Dia (mm)
					0.00	0.50	PLAIN	
					0.50	2.30	SLOTTED	

Remarks:
1 hour hand excavating 1.20mbgl service avoidance pit
1 hour set up of falling head permeability test
1 hour carrying out falling head permeability test
Permeability test carried out at 2.00mbgl

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Fracture spacing reported in mm as min, Average and Max values. TCR, SCR and RQD reported in %

	Contract Name: The Christie, Manchester		Client: Interserve Construction Ltd		Borehole ID: **BH02**
	Contract Number: CCG-C-18-10614	Date Started: 24-01-2019	Logged By: LT	Checked By: CB	Status: FINAL
					Sheet 1 of 3
Cable Percussion Borehole Log	Easting: 384944.8	Northing: 392496.5	Ground Level: 34.92mAOD	Plant Used: DANDO 3000	Rig Crew: AH/DB DB/AH
					Scale: 1:50
Weather:		Termination:		SPT Hammer: CCG6 Energy Ratio: 68%	

Samples & In Situ Testing						Strata Details				Groundwater	
Depth	Sample ID	Test Result	TCR	SCR	RQD	Fracture	Water	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
0.50	B								(0.70)		Brown silty sandy gravelly organic CLAY. Gravel is fine to coarse sub-angular to sub-rounded brick and sandstone (MADE GROUND)		
								34.22	0.70				
1.00	B	SPT(S)N=7 (1,0/1,2,2,2)							(0.70)		Loose brown fine to coarse SAND, with frequent clay lenses		
1.50	B							33.52	1.40				
									(0.80)		Stiff brown very sandy silty CLAY		
		SPT(S)N=50 (2,3/50 for 235mm)						32.72	2.20				
2.50	B										Red/brown weathered SANDSTONE, recovered as fine to coarse grained sand		
		SPT(S)100 (25 for 85mm/100 for 90mm)											
3.50 - 5.00	0		0	0					(2.80)		NO RECOVERY - 3.50-5.71mbgl		
								29.92	5.00				
5.00 - 6.50	53		0	0							Very weak reddish brown fine to medium grained thickly laminated SANDSTONE. Moderately weathered. Recovered locally as sandy gravel. Discontinuities are closely spaced, horizontal, clean, rough and tight to open SPT @ 5.00mbgl = 100 (25 for 25mm / 65, 35 for 20mm) NON-INTACT. RECOVERED AS VERY SANDY GRAVEL - 5.71-6.50mbgl		
6.50 - 8.00	85		22	7		110 55					NO RECOVERY - 6.50-6.73mbgl NON-INTACT. RECOVERED AS VERY SANDY GRAVEL - 6.73-7.38mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 7.49-7.53mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 7.76-8.00mbgl		
8.00 - 9.50	97		50	30		90 47 72 138 162					NO RECOVERY - 8.00-8.05mbgl NON-INTACT. RECOVERED AS SANDY GRASVEL - 8.05-8.40mbgl NON-INTACT. RECOVERED AS GRAVEL - 8.49-8.60mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 8.77-8.95mbgl		
											NON-INTACT. RECOVERED AS GRAVELLY SAND - 9.50-9.97mbgl		
											Continued next sheet		

Start & End of Shift Observations				
Date	Time	Depth (m)	Casing (m)	Water (m)

Borehole Diameter	
Depth (m)	Dia (mm)

Casing Diameter	
Depth (m)	Dia (mm)

Remarks:

1 hour hand excavating 1.20mbgl service avoidance pit
1 hour setting up permeability test
1 hour carrying out falling head permeability test
Falling head permeability test carried out at 3.30mbgl

Chiselling			
From (m)	To (m)	Duration	Remarks

Installation			
Top (m)	Base (m)	Type	Dia (mm)
0.00	3.50	PLAIN	
3.50	5.00	SLOTTED	

Water Strikes					
Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

	Contract Name: The Christie, Manchester		Client: Interserve Construction Ltd		Borehole ID: **BH02**
	Contract Number: CCG-C-18-10614	Date Started: 24-01-2019	Loggged By: LT	Checked By: CB	Status: FINAL
Rotary Core Drilling Log	Easting: 384944.8	Northing: 392496.5	Ground Level: 34.92mAOD	Plant Used: DANDO 3000	Rig Crew: AH/DB DB/AH
					Sheet 2 of 3
					Scale: 1:50

Weather: | Termination: | SPT Hammer: CCG6 Energy Ratio: 68%

Samples & In Situ Testing						Strata Details				Groundwater	
Depth	TCR	SCR	RQD	Fracture Spacing	Water Added	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
9.50 - 11.00	100	43	29	34 85 140 150					NON-INTACT. RECOVERED AS SANDY GRAVEL - 10.19-10.38mbgl		
11.00 - 12.50	93	66	11	37 21 69 159					NON-INTACT. RECOVERED AS GRAVEL - 10.94-11.00mbgl NO RECOVERY - 11.00-11.11mbgl NON-INTACT. RECOVERED AS GRASVEL - 11.11-11.17mbgl NON-INTACT. RECOVERED AS GRAVEL - 11.39-11.60mbgl		
12.50 - 14.00	97	57	21	38 106 110 47					NON-INTACT. RECOVERED AS GRAVEL - 13.52-13.76mbgl		
14.00 - 15.50	97	74	26	70 49 85 140 53			(15.00)		NO RECOVERY - 14.00-14.05mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 14.12-14.16mbgl NON-INTACT. RECOVERED AS SAND - 15.10-15.19mbgl		
15.50 - 17.00	90	71	8	34 79 125					NO RECOVERY - 15.50-15.65mbgl		
17.00 - 18.50	93	67	0	24 557 87 60 88 90					NO RECOVERY - 17.00-17.10mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 17.84-18.06mbgl		
18.50 - 20.00	95	31	8	120 100					NO RECOVERY - 18.50-18.58mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 18.58-18.99mbgl NON-INTACT. RECOVERED AS SLIGHTLY SANDY SLIGHTLY GRAVELLY SILTY CLAY - 19.11-19.41mbgl INCLUSION OF CLAY (MARL) - 19.20mbgl NON-INTACT. RECOVERED AS GRAVELLY SAND - 19.54-19.83mbgl		
									Continued next sheet		

Start & End of Shift Observations					Borehole Diameter		Casing Diameter	
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)

Flush Information					Installation			
Top (m)	Base (m)	Flush Type	Return	Flush Colour	Top (m)	Base (m)	Type	Dia (mm)
					0.00 3.50	3.50 5.00	PLAIN SLOTTED	

Remarks:
1 hour hand excavating 1.20mbgl service avoidance pit
1 hour setting up permeability test
1 hour carrying out falling head permeability test
Falling head permeability test carried out at 3.30mbgl

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Fracture spacing reported in mm as min, Average and Max values. TCR, SCR and RQD reported in %

	Contract Name: The Christie, Manchester		Client: Interserve Construction Ltd		Borehole ID: **BH02**
	Contract Number: CCG-C-18-10614	Date Started: 24-01-2019	Loggged By: LT	Checked By: CB	Status: FINAL
Rotary Core Drilling Log	Easting: 384944.8	Northing: 392496.5	Ground Level: 34.92mAOD	Plant Used: DANDO 3000	Rig Crew: AH/DB DB/AH
					Sheet 3 of 3
					Scale: 1:50

Weather: | Termination: | SPT Hammer: CCG6 Energy Ratio: 68%

Samples & In Situ Testing						Strata Details				Groundwater	
Depth	TCR	SCR	RQD	Fracture Spacing	Water Added	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
						14.92	20.00		*NON-INTACT. RECOVERED AS GRAVEL - 19.93-20.00mbgl* End of Borehole at 20.00m		

20 21 22 23 24 25 26 27 28 29

Start & End of Shift Observations					Borehole Diameter		Casing Diameter	
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)

Flush Information					Installation			
Top (m)	Base (m)	Flush Type	Return	Flush Colour	Top (m)	Base (m)	Type	Dia (mm)
					0.00	3.50	PLAIN	
					3.50	5.00	SLOTTED	

Remarks:

1 hour hand excavating 1.20mbgl service avoidance pit
1 hour setting up permeability test
1 hour carrying out falling head permeability test
Falling head permeability test carried out at 3.30mbgl

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Fracture spacing reported in mm as min, Average and Max values. TCR, SCR and RQD reported in %

CCG	Contract Name: The Christie, Manchester		Client: Interserve Construction Ltd		Borehole ID: **BH03**
	Contract Number: CCG-C-18-10614	Date Started: 22-01-2019	Logged By: LT	Checked By: CB	Status: FINAL — Sheet 1 of 3
Cable Percussion Borehole Log	Easting: 384939.8	Northing: 392468.4	Ground Level: 34.72mAOD	Plant Used: DANDO 3000	Rig Crew: AH/LN DB/AH — Scale: 1:50
Weather:		Termination:		SPT Hammer: CCG6 Energy Ratio: 68%	

Samples & In Situ Testing							Strata Details				Groundwater	
Depth	Sample ID	Test Result	TCR	SCR	RQD	Fracture	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
							34.52	0.20		Brown silty sandy gravelly organic CLAY. Gravel is fine to coarse sub-angular to sub-rounded brick and sandstone (MADE GROUND)		
0.50	B						34.32	0.40		Yellow/white sand SUB-BASE		
								(0.40)		Brown slightly gravelly fine to coarse SAND. Gravel is fine to coarse sub-angular brick (MADE GROUND)		
							33.92	0.80				
1.00	B									Brown slightly sandy GRAVEL. Gravel is fine to coarse angular to sub-rounded concrete, brick and sandstone (MADE GROUND)		
		SPT(S)N=11 (1,2/2,3,3,3)										
1.50	B							(1.40)				
		SPT(S)N=15 (2,2/3,4,4,4)										
							32.52	2.20		Brown silty clayey fine to medium grained SAND		
2.50	B							(0.50)				
							32.02	2.70		Red/brown weathered SANDSTONE, recovered as fine to medium grained sand		
		SPT(S)100 (18,7/100 for 140mm)										
3.50	B							(1.80)				
		SPT(S)100 (50 for 110mm/100 for 50mm)										
							30.22	4.50		Very weak reddish brown fine to medium grained thickly laminated SANDSTONE. Moderately weathered. Recovered locally as sandy gravel. Discontinuities are very close to medium spaced, horizontal with occasional drilling-induced vertical fractures, clean, rough and tight to open		
4.50 - 6.00	70	19	0	44 41						NO RECOVERY - 4.50-4.95mbgl NON-INTACT. RECOVERED AS VERY GRAVELLY SAND - 5.06-5.61mbgl NON-INTACT. RECOVERED AS VERY SANDY GRAVEL - 5.74-5.95mbgl		
6.00 - 7.50	97	75	39	41 90 130 38 9 165						NON-INTACT. RECOVERED AS GRAVEL - 6.25-6.34mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 6.43-6.50mbgl NON-INTACT. RECOVERED AS GRAVEL - 6.79-6.91mbgl		
7.50 - 9.00	97	57	52	55 97 160						NO RECOVERY - 7.46-7.55mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 7.55-7.64mbgl NON-INTACT. RECOVERED AS GRAVEL - 7.94-8.17mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 8.57-8.71mbgl NON-INTACT. RECOVERED AS GRAVEL - 8.87-9.11mbgl		
9.00 - 10.50	99	62	34	50 60						NON-INTACT. RECOVERED AS GRAVEL - 9.40-9.62mbgl		
	TCR	SCR	RQD	Fracture	Water					Continued next sheet		

Start & End of Shift Observations					Borehole Diameter		Casing Diameter	
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)

Chiselling			
From (m)	To (m)	Duration	Remarks

Installation			
Top (m)	Base (m)	Type	Dia (mm)

Remarks:

1 hour hand excavating 1.20mbgl service avoidance pit

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

	Contract Name: The Christie, Manchester		Client: Interserve Construction Ltd		Borehole ID: **BH03**
	Contract Number: CCG-C-18-10614	Date Started: 22-01-2019	Loggged By: LT	Checked By: CB	Status: FINAL — Sheet 2 of 3
Rotary Core Drilling Log	Easting: 384939.8	Northing: 392468.4	Ground Level: 34.72mAOD	Plant Used: DANDO 3000	Rig Crew: AH/LN DB/AH — Scale: 1:50
Weather:		Termination:		SPT Hammer: CCG6 Energy Ratio: 68%	

Samples & In Situ Testing						Strata Details				Groundwater	
Depth	TCR	SCR	RQD	Fracture Spacing	Water Added	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
				72					NON-INTACT. RECOVERED AS GRAVEL - 9.89-10.09mbgl		
10.50 - 12.00	93	46	19	27 86 165 80					NON-INTACT. RECOVERED AS SANDY GRAVEL - 10.43-10.50mbgl NO RECOVERY - 10.50-10.60mbgl NON-INTACT. RECOVERED AS SLIGHTLY SANDY GRAVEL - 10.60-10.69mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 11.29-11.74mbgl NON-INTACT. RECOVERED AS GRAVEL - 11.82-12.00mbgl		
12.00 - 13.50	83	70	41	50 69 109 132					NO RECOVERY - 12.00-12.25mbgl NON-INTACT. RECOVERED AS GRAVEL - 12.44-12.52mbgl		
13.50 - 15.00	81	63	16	13 59 141			(20.50)		NO RECOVERY - 13.50-13.79mbgl NON-INTACT. RECOVERED AS GRAVEL - 13.79-13.87mbgl NON-INTACT. RECOVERED AS GRAVEL - 14.94-15.00mbgl NO RECOVERY - 15.00-15.20mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 15.20-15.79mbgl		
15.00 - 16.50	87	19	0	44					NON-INTACT. RECOVERED AS VERY SILTY VERY SANDY GRAVEL - 15.97-16.50mbgl		
16.50 - 18.00	0	0	0						NO RECOVERY - 16.50-20.08mbgl Brown clayey MUDSTONE - Drillers Description		
18.00 - 19.00	0	0	0								
19.00 - 20.00	0	0	0								
									Continued next sheet		

Start & End of Shift Observations					Borehole Diameter		Casing Diameter	
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)

Flush Information					Installation			
Top (m)	Base (m)	Flush Type	Return	Flush Colour	Top (m)	Base (m)	Type	Dia (mm)

Remarks:

1 hour hand excavating 1.20mbgl service avoidance pit

Water Strikes					
Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Fracture spacing reported in mm as min, Average and Max values. TCR, SCR and RQD reported in %

	Contract Name: The Christie, Manchester		Client: Interserve Construction Ltd		Borehole ID: **BH03**
	Contract Number: CCG-C-18-10614	Date Started: 22-01-2019	Loggged By: LT	Checked By: CB	Status: FINAL
Rotary Core Drilling Log	Easting: 384939.8	Northing: 392468.4	Ground Level: 34.72mAOD	Plant Used: DANDO 3000	Rig Crew: AH/LN DB/AH
					Sheet 3 of 3
					Scale: 1:50

Weather: | Termination: | SPT Hammer: CCG6 Energy Ratio: 68%

Samples & In Situ Testing						Strata Details				Groundwater	
Depth	TCR	SCR	RQD	Fracture Spacing	Water Added	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
20.00 - 21.00	92	33	20	62 170 201					NON-INTACT. RECOVERED AS GRAVEL - 20.08-20.15mbgl NON-INTACT. RECOVERED AS GRAVEL - 20.66-21.00mbgl		
21.00 - 22.50	81	49	35	92 153 305					NO RECOVERY - 21.00-21.29mbgl NON-INTACT. RECOVERED AS VERY SILTY VERY SANDY GRAVEL - 21.90-22.35mbgl		
22.50 - 24.00	97	69	57	110 53 45 134 245					NON-INTACT. RECOVERED AS GRAVEL - 22.46-22.60mbgl NON-INTACT. RECOVERED AS GRAVEL - 22.96-23.06mbgl MUDSTONE CLAST - 23.10mbgl		
24.00 - 25.00	89	44	10	30 79					NON-INTACT. RECOVERED AS VERY SANDY GRAVEL - 24.00-24.27mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 24.51-24.63mbgl NO RECOVERY - 24.89-25.00mbgl		
						9.72	25.00		End of Borehole at 25.00m		

Start & End of Shift Observations					Borehole Diameter		Casing Diameter	
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)

Flush Information					Installation			
Top (m)	Base (m)	Flush Type	Return	Flush Colour	Top (m)	Base (m)	Type	Dia (mm)

Remarks:
1 hour hand excavating 1.20mbgl service avoidance pit

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Fracture spacing reported in mm as min, Average and Max values. TCR, SCR and RQD reported in %

Contract Name: The Christie, Manchester			Client: Interserve Construction Ltd	Borehole ID: **BH04**
Contract Number: CCG-C-18-10614	Date Started: 18-01-2019	Logged By: DO	Checked By: CB	Status: FINAL
Cable Percussion Borehole Log	Easting: 384930.1	Northing: 392430.7	Ground Level: 34.93mAOD	Plant Used: Dando 150 S/A Rig
Rig Crew: AH/LN DB/AH	Scale: 1:50	Sheet 1 of 3		
Weather:	Termination:	SPT Hammer: CCG6 Energy Ratio: 68%		

Depth	Sample ID	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
0.50	B					Brown slightly silty sandy GRAVEL with occasional pockets of clay. Gravel is fine to coarse angular to sub-angular brick (MADE GROUND)		
0.50	ES			(1.30)				
1.00	B							
1.00	ES	SPT(S)N=11 (1,2/2,3,3,3)						
			33.63	1.30		Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY. Gravel is fine to medium sub-angular to sub-rounded sandstone		
1.50	B							
1.50	ES							
2.00 - 2.45	UT							
2.50	B			(2.20)				
		SPT(S)N=22 (3,4/5,5,6,6)						
3.50	B		31.43	3.50		Red weathered SANDSTONE		
		SPT(C)100 (25 for 75mm/100 for 50mm)						
				(1.50)				
4.50	B							
			29.93	5.00		Very weak reddish brown fine to medium grained thickly laminated SANDSTONE. Moderately weathered. Recovered locally as sandy gravel. Discontinuities are very close to medium spaced, horizontal, clean, rough and tight to wide		

	TCR	SCR	RQD	Fracture	Water
5.00 - 6.50	72	56	19	27 51 92 170	
6.50 - 8.00	61	31	15	93 114 60	
8.00 - 9.50	79	70	20	50 80 181 68	

NO RECOVERY - 5.00-5.42mbgl
NON-INTACT. RECOVERED AS GRAVEL - 5.42-5.52mbgl
NON-INTACT. RECOVERED AS GRAVEL - 5.61-5.67mbgl
NO RECOVERY - 6.50-7.09mbgl
NON-INTACT. RECOVERED AS SANDY GRAVEL - 7.09-7.14mbgl
NON-INTACT. RECOVERED AS SANDY GRAVEL - 7.34-7.53mbgl
NON-INTACT. RECOVERED AS SANDY GRAVEL - 7.77-7.94mbgl
NO RECOVERY - 8.00-8.31mbgl
NON-INTACT. RECOVERED AS GRAVEL - 9.11-9.18mbgl
NO RECOVERY - 9.50-9.91mbgl

Continued next sheet

Start & End of Shift Observations

Date	Time	Depth (m)	Casing (m)	Water (m)

Borehole Diameter

Depth (m)	Dia (mm)

Casing Diameter

Depth (m)	Dia (mm)

Remarks:

1 hour hand excavating 1.20mbgl service avoidance pit
1 hour set up of falling head permeability test
1 hour carrying out falling head permeability test
Permeability test carried out at 2.50mbgl

Chiselling

From (m)	To (m)	Duration	Remarks

Installation

Top (m)	Base (m)	Type	Dia (mm)
0.00	1.50	PLAIN	
1.50	3.00	SLOTTED	

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
			0		Borehole dry

Contract Name: The Christie, Manchester			Client: Interserve Construction Ltd		Borehole ID: **BH04**
Contract Number: CCG-C-18-10614	Date Started: 18-01-2019	Loggged By: DO	Checked By: CB	Status: FINAL	Sheet 2 of 3
Rotary Core Drilling Log	Easting: 384930.1	Northing: 392430.7	Ground Level: 34.93mAOD	Plant Used: Dando 150 S/A Rig	Rig Crew: AH/LN DB/AH	Scale: 1:50
Weather:	Termination:		SPT Hammer: CCG6 Energy Ratio: 68%		

Samples & In Situ Testing						Strata Details				Groundwater	
Depth	TCR	SCR	RQD	Fracture Spacing	Water Added	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
9.50 - 11.00	73	35	0	50 50 54 31					NON-INTACT. RECOVERED AS GRAVEL - 9.91-10.07mbgl NON-INTACT. RECOVERED AS GRAVEL - 10.12-10.21mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 10.35-10.54mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 10.668-10.89mbgl		
11.00 - 12.50	97	31	14	90 20					NON-INTACT. RECOVERED AS SANDY GRAVEL - 11.15-11.30mbgl NON-INTACT. RECOVERED AS SLIGHTLY SANDY SLIGHTLY GRAVELLY SILTY CLAY - 11.39-12.11mbgl INCLUSION OF CLAY (MARL) - 11.80mbgl		
12.50 - 14.00	98	69	33	48 11 183 60					NON-INTACT. RECOVERED AS SANDY GRAVEL - 12.39-12.57 NON-INTACT. RECOVERED AS SANDY GRAVEL - 13.14-13.23mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 13.53-14.00mbgl		
14.00 - 15.50	91	13	0	21 60			(15.00)		NO RECOVERY - 14.00-14.14mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 14.14-14.80mbgl NON-INTACT. RECOVERED AS GRAVEL - 14.89-15.40mbgl NON-INTACT. RECOVERED AS GRAVEL - 15.46-15.85mbgl		
15.50 - 17.00	92	71	45	59 111 290 66 60					NO RECOVERY - 15.50-15.62mbgl NON-INTACT. RECOVERED AS GRAVEL - 15.62-15.66mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 16.55-16.61mbgl NON-INTACT. RECOVERED AS GRAVEL - 16.83-17.00mbgl		
17.00 - 18.50	96	67	41	39 33 77 155 41 108 140					NON-INTACT. RECOVERED AS SANDY GRAVEL - 17.06-17.14mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 17.28-17.34mbgl NON-INTACT. RECOVERED AS SANDY GRAVEL - 17.80-17.85mbgl		
18.50 - 20.00	96	71	56	107 156 216 70					NON-INTACT. RECOVERED AS SANDY GRAVEL - 18.71-19.02mbgl NON-INTACT. RECOVERED AS SLIGHTLY SANDY GRAVEL - 19.65-19.75mbgl NON-INTACT. RECOVERED AS GRAVEL - 19.82-20.00mbgl		
									Continued next sheet		

10 11 12 13 14 15 16 17 18 19

Start & End of Shift Observations					Borehole Diameter		Casing Diameter	
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)

Flush Information					Installation			
Top (m)	Base (m)	Flush Type	Return	Flush Colour	Top (m)	Base (m)	Type	Dia (mm)
					0.00 1.50	1.50 3.00	PLAIN SLOTTED	

Remarks:

1 hour hand excavating 1.20mbgl service avoidance pit
1 hour set up of falling head permeability test
1 hour carrying out falling head permeability test
Permeability test carried out at 2.50mbgl

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
			0		Borehole dry

Fracture spacing reported in mm as min, Average and Max values. TCR, SCR and RQD reported in %

Contract Name: The Christie, Manchester		Client: Interserve Construction Ltd		Borehole ID: **BH04**
Contract Number: CCG-C-18-10614	Date Started: 18-01-2019	Loggged By: DO	Checked By: CB	Status: FINAL
Rotary Core Drilling Log	Easting: 384930.1	Northing: 392430.7	Ground Level: 34.93mAOD	Plant Used: Dando 150 S/A Rig
Rig Crew: AH/LN DB/AH	Scale: 1:50	Sheet 3 of 3		
Weather:	Termination:	SPT Hammer: CCG6 Energy Ratio: 68%		

Samples & In Situ Testing						Strata Details				Groundwater	
Depth	TCR	SCR	RQD	Fracture Spacing	Water Added	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
						14.93	20.00		Very weak reddish brown fine to medium grained thickly laminated SANDSTONE. Moderately weathered. Recovered locally as sandy gravel. Discontinuities are very close to medium spaced, horizontal, clean, rough and tight to wide		
									End of Borehole at 20.00m		

20 21 22 23 24 25 26 27 28 29

Start & End of Shift Observations				
Date	Time	Depth (m)	Casing (m)	Water (m)

Borehole Diameter	
Depth (m)	Dia (mm)

Casing Diameter	
Depth (m)	Dia (mm)

Flush Information				
Top (m)	Base (m)	Flush Type	Return	Flush Colour

Installation			
Top (m)	Base (m)	Type	Dia (mm)
0.00	1.50	PLAIN	
1.50	3.00	SLOTTED	

Remarks:

1 hour hand excavating 1.20mbgl service avoidance pit
1 hour set up of falling head permeability test
1 hour carrying out falling head permeability test
Permeability test carried out at 2.50mbgl

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
			0		Borehole dry

Fracture spacing reported in mm as min, Average and Max values. TCR, SCR and RQD reported in %

CCG	Contract Name: The Christie, Manchester		Client: Interserve Construction Ltd		Borehole ID: **WS01**
	Contract Number: CCG-C-18-10614	Date Started: 17-01-2019	Logged By: DO	Checked By: CB	Status: FINAL
Dynamic Sampling Borehole Log	Easting: 384942.0	Northing: 392561.7	Ground Level: 35.38mAOD	Plant Used: Dando Terrier Rig	Rig Crew: LN/DB
					Sheet 1 of 1
					Scale: 1:25

Weather: Dry | Termination: | SPT Hammer: N/R, Energy Ratio: N/R

Samples & In Situ Testing			Strata Details				Groundwater	
Depth	Sample ID	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
0.00 - 1.00	U			(0.30)		Light brown sandy GRAVEL. Gravel is fine to coarse sub-angular limestone (MADE GROUND)		
0.20	ES		35.08	0.30				
0.50	B					Dark brown slightly silty slightly gravely fine to medium grained SAND. Gravel is fine to coarse sub-angular to sub-rounded sandstone		
0.50	ES			(0.70)				
1.00 - 2.00	U		34.38	1.00		Firm brownish grey slightly gravelly slightly sandy silty CLAY. Gravel is fine to medium sub-rounded sandstone		
		HVP=50						
		SPT(S)N=10 (1,1/2,3,3,2)		(0.40)				
		HVP=50						
			33.98	1.40		Brown slightly silty slightly gravelly fine to medium grained SAND. Gravel is fine to coarse sub-angular sandstone		
				(1.00)				
2.00 - 2.40	U	SPT(S)N=50 (8,7/50 for 225mm)						
			32.98	2.40		End of Borehole at 2.40m		

1 2 3 4 5

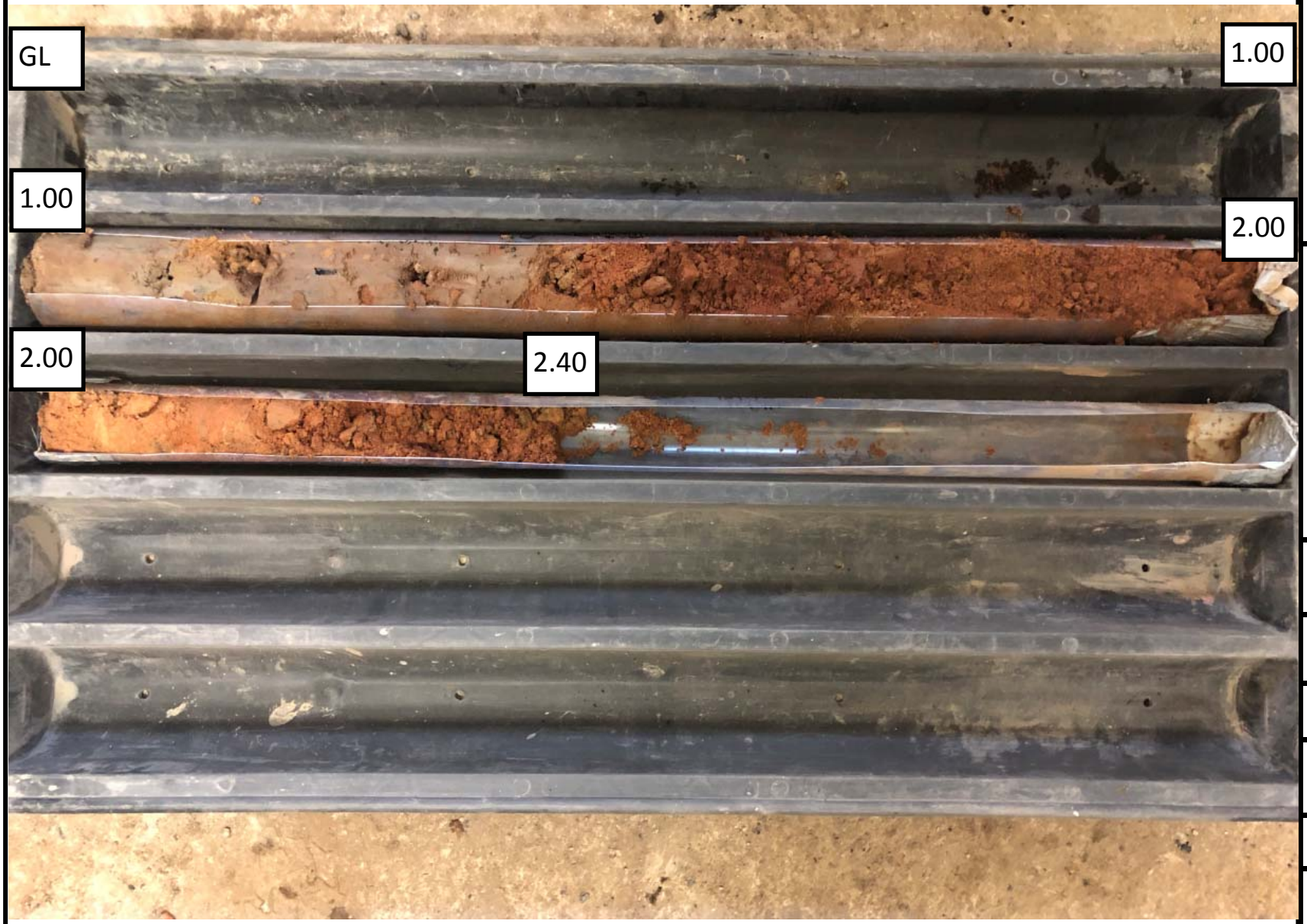
Start & End of Shift Observations					Borehole Diameter		Casing Diameter	
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)

Remarks:
1 hour hand excavating 1.20mbgl service avoidance pit

Chiselling				Installation			
From (m)	To (m)	Duration	Remarks	Top (m)	Base (m)	Type	Dia (mm)

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks



Notes:

Recovered undisturbed soils from WS01.

Service pit carried out within upper meter.

CC GEOTECHNICAL LIMITED
UNIT 1 DELTIC WAY
KNOWSLEY INDUSTRIAL ESTATE
LIVERPOOL
L33 7BA
0151 545 2750

Client:
INTERSERVE CONSTRUCTION LTD

Project:
The Christie, Manchester

Title:
Recovered soils from WS01

Scale:	Issue:
N/A	1
Drawn by:	Date:
DO	01/04/19
Project No.	Plate No.
CCG-C-18-10614	WS01-1

CC GEOTECHNICAL LIMITED

APPENDIX C

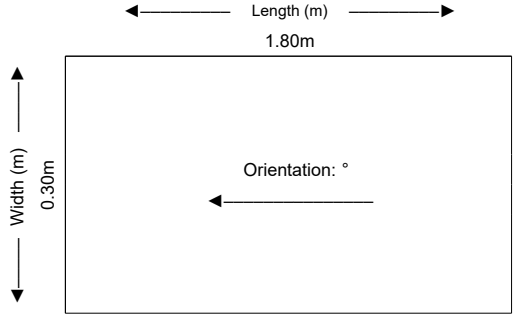
TRIAL PIT LOGS

	Contract Name: The Christie, Manchester		Client: Interserve Construction Ltd		Trial Pit ID: TP01
	Contract Number: CCG-C-18-10614	Date Started: 17-01-2019	Logged By: DE	Checked By: CB	Status: FINAL — Sheet 1 of 1
Trial Pit Log	Easting: 384948.1	Northing: 392529.5	Ground Level: 35.12mAOD	Plant Used: Tracked Excavator	Date Printed: 03-03-2019 — Scale: 1:25
Weather: Dry		Hole Termination: Terminated on Sandstone		Stability:	

Samples & In Situ Testing			Strata Details					
Depths	Sample ID	Test Result	Reduced Level	Depth (m) (Thickness)	Legend	Strata Description	Water	Backfill
			35.02	0.10		Topsoil		
0.30	ES			(0.50)		Brown very sandy slightly silty GRAVEL with frequent rootlets. Gravels are fine to coarse sub-angular brick, concrete and mortar (MADE GROUND).		
0.50	B							
0.50	ES		34.52	0.60		Brown gravelly slightly clayey slightly silty fine to coarse SAND with occasional rootlets. Gravels are fine to coarse sub-angular brick (MADE GROUND).		
1.00	B			(0.70)				
1.00	ES							1
			33.82	1.30		Brown very clayey slightly gravelly slightly silty fine to medium grained SAND. Gravels are fine to coarse sub-rounded quartz and sandstone.		
1.50	B			(0.60)				
			33.22	1.90		Red slightly gravelly slightly silty fine to medium grained SAND. Gravels are fine to coarse sub-angular sandstone.		
2.00	B			(0.70)				2
2.50	B							
			32.52	2.60		Red weathered SANDSTONE.		
			32.42	2.70		End of Trial Pit at 2.70m		
								3

Dimensions:

Final Depth: 2.70m



Inclination: °

General Remarks:

Water Strikes					
Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
			0		Trial pit dry

Notes:

CC GEOTECHNICAL LIMITED
UNIT 1 DELTIC WAY
KNOWSLEY INDUSTRIAL ESTATE
LIVERPOOL
L33 7BA
0151 545 2750

Client:
INTERSERVE CONSTRUCTION LTD

Project:
The Christie, Manchester

Title:
Trial Pit Excavations - TP1

Scale:	Issue:
N/A	1
Drawn by:	Date:
DO	01/04/19
Project No.	Plate No.
CCG-C-18-10614	TP1-1

CC GEOTECHNICAL LIMITED

Notes:

CC GEOTECHNICAL LIMITED
UNIT 1 DELTIC WAY
KNOWSLEY INDUSTRIAL ESTATE
LIVERPOOL
L33 7BA
0151 545 2750

Client:
INTERSERVE CONSTRUCTION LTD

Project:
The Christie, Manchester

Title:
Trial Pit Excavations - TP1

Scale:	Issue:
N/A	1
Drawn by:	Date:
DO	01/04/19
Project No.	Plate No.
CCG-C-18-10614	TP1-2

CC GEOTECHNICAL LIMITED

Notes:

CC GEOTECHNICAL LIMITED
UNIT 1 DELTIC WAY
KNOWSLEY INDUSTRIAL ESTATE
LIVERPOOL
L33 7BA
0151 545 2750

Client:
INTERSERVE CONSTRUCTION LTD

Project:
The Christie, Manchester

Title:
Trial Pit Excavations - TP1

Scale:	Issue:
N/A	1
Drawn by:	Date:
DO	01/04/19
Project No.	Plate No.
CCG-C-18-10614	TP1-3

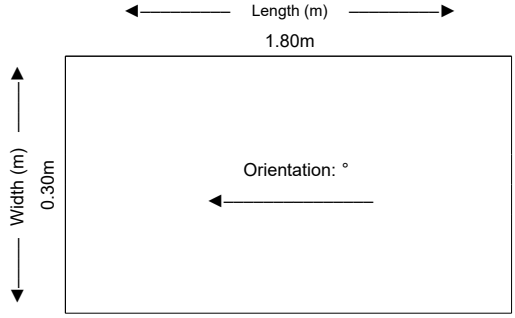
CC GEOTECHNICAL LIMITED

	Contract Name: The Christie, Manchester		Client: Interserve Construction Ltd		Trial Pit ID: TP02
	Contract Number: CCG-C-18-10614	Date Started: 17-01-2019	Logged By: DE	Checked By: CB	Status: FINAL
					Sheet 1 of 1
Trial Pit Log	Easting: 384946.6	Northing: 392505.6	Ground Level: 34.79mAOD	Plant Used: Tracked Excavator	Date Printed: 03-03-2019
					Scale: 1:25
Weather: Dry		Hole Termination:		Stability:	

Samples & In Situ Testing			Strata Details					
Depths	Sample ID	Test Result	Reduced Level	Depth (m) (Thickness)	Legend	Strata Description	Water	Backfill
			34.69	0.10		Topsoil		
0.30	ES					Brown sandy slightly silty GRAVEL with frequent rootlets. Gravels are fine to coarse sub-angular brick, concrete and mortar (MADE GROUND).		
0.50	B			(0.70)				
0.50	ES							
			33.99	0.80		Brown gravelly slightly silty fine to medium grained SAND with occasional rootlets. Gravels are fine to coarse sub-angular to sub-rounded brick and concrete (MADE GROUND).		
1.00	B							1
1.00	ES			(0.60)				
			33.39	1.40		Firm brown slightly sandy slightly gravelly silty CLAY with frequent laminations of sand. Gravel is fine to medium sub-rounded sandstone		
1.50	B							
		HVP=60kPa						
2.00	B							2
				(1.35)				
		HVP=90kPa						
			32.04	2.75		Red slightly clayey slightly gravely slightly silty fine to medium grained SAND. Gravels are fine to coarse sub-angular sandstone		
2.80	B		31.89	2.90		End of Trial Pit at 2.90m		
								3

Dimensions:

Final Depth: 2.90m



Inclination: °

General Remarks:

Water Strikes					
Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
			0		Trial pit dry

Notes:

CC GEOTECHNICAL LIMITED
UNIT 1 DELTIC WAY
KNOWSLEY INDUSTRIAL ESTATE
LIVERPOOL
L33 7BA
0151 545 2750

Client:
INTERSERVE CONSTRUCTION LTD

Project:
The Christie, Manchester

Title:
Trial Pit Excavations - TP2

Scale:	Issue:
N/A	1
Drawn by:	Date:
DO	01/04/19
Project No.	Plate No.
CCG-C-18-10614	TP2-1

CC GEOTECHNICAL LIMITED

Notes:

CC GEOTECHNICAL LIMITED
UNIT 1 DELTIC WAY
KNOWSLEY INDUSTRIAL ESTATE
LIVERPOOL
L33 7BA
0151 545 2750

Client:
INTERSERVE CONSTRUCTION LTD

Project:
The Christie, Manchester

Title:
Trial Pit Excavations - TP2

Scale:	Issue:
N/A	1
Drawn by:	Date:
DO	01/04/19
Project No.	Plate No.
CCG-C-18-10614	TP2-2

CC GEOTECHNICAL LIMITED

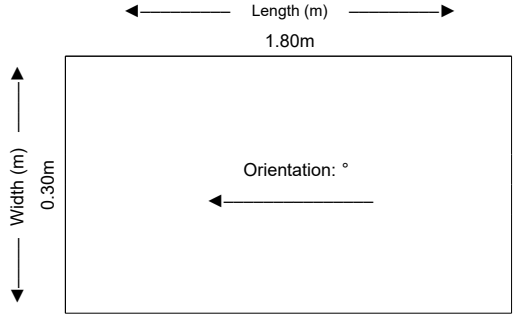
CCG	Contract Name: The Christie, Manchester		Client: Interserve Construction Ltd		Trial Pit ID: TP03
	Contract Number: CCG-C-18-10614	Date Started: 17-01-2019	Logged By: DE	Checked By: CB	Status: FINAL — Sheet 1 of 1
Trial Pit Log	Easting: 384936.3	Northing: 392444.6	Ground Level: 34.64mAOD	Plant Used: Tracked Excavator	Date Printed: 03-03-2019 — Scale: 1:25
Weather: Dry	Hole Termination:		Stability:		

Samples & In Situ Testing			Strata Details				Water	Backfill
Depths	Sample ID	Test Result	Reduced Level	Depth (m) (Thickness)	Legend	Strata Description		
			34.53	0.10		Topsoil		
0.30	ES					Brown very sandy slightly silty GRAVEL. Gravels are fine to coarse sub-angular brick and concrete (MADE GROUND).		
0.50	B							
0.50	ES							
				(1.30)				
1.00	B							
1.00	ES							
			33.24	1.40				
1.50	B					Firm becoming stiff brown slightly gravelly slightly sandy silty CLAY, with occasional sand laminations. Gravel is fine to medium sub-rounded sandstone.		
		HVP=60kPa						
2.00	B							
				(1.50)				
		HVP=110kPa						
2.80	B							
			31.74	2.90		End of Trial Pit at 2.90m		

1 2 3

Dimensions:

Final Depth: 2.90m



Inclination: °

General Remarks:

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
			0		Trial pit dry

Notes:

CC GEOTECHNICAL LIMITED
UNIT 1 DELTIC WAY
KNOWSLEY INDUSTRIAL ESTATE
LIVERPOOL
L33 7BA
0151 545 2750

Client:
INTERSERVE CONSTRUCTION LTD

Project:
The Christie, Manchester

Title:
Trial Pit Excavations - TP3

Scale:	Issue:
N/A	1
Drawn by:	Date:
DO	01/04/19
Project No.	Plate No.
CCG-C-18-10614	TP3-1

CC GEOTECHNICAL LIMITED

Notes:

CC GEOTECHNICAL LIMITED
UNIT 1 DELTIC WAY
KNOWSLEY INDUSTRIAL ESTATE
LIVERPOOL
L33 7BA
0151 545 2750

Client:
INTERSERVE CONSTRUCTION LTD

Project:
The Christie, Manchester

Title:
Trial Pit Excavations - TP3

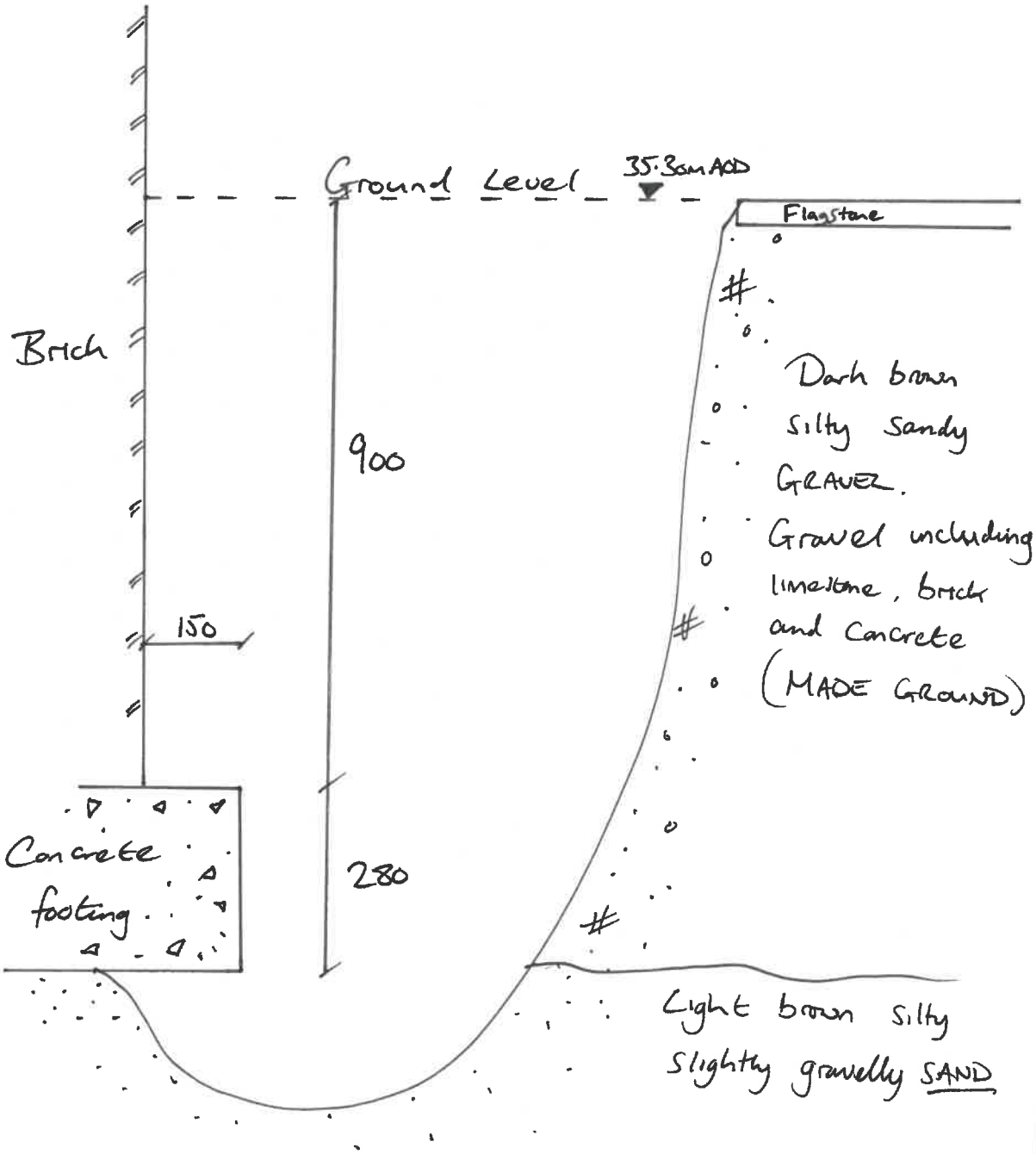
Scale:	Issue:
N/A	1
Drawn by:	Date:
DO	01/04/19
Project No.	Plate No.
CCG-C-18-10614	TP3-2

CC GEOTECHNICAL LIMITED

APPENDIX D

FOUNDATION INSPECTION PIT SKETCHES

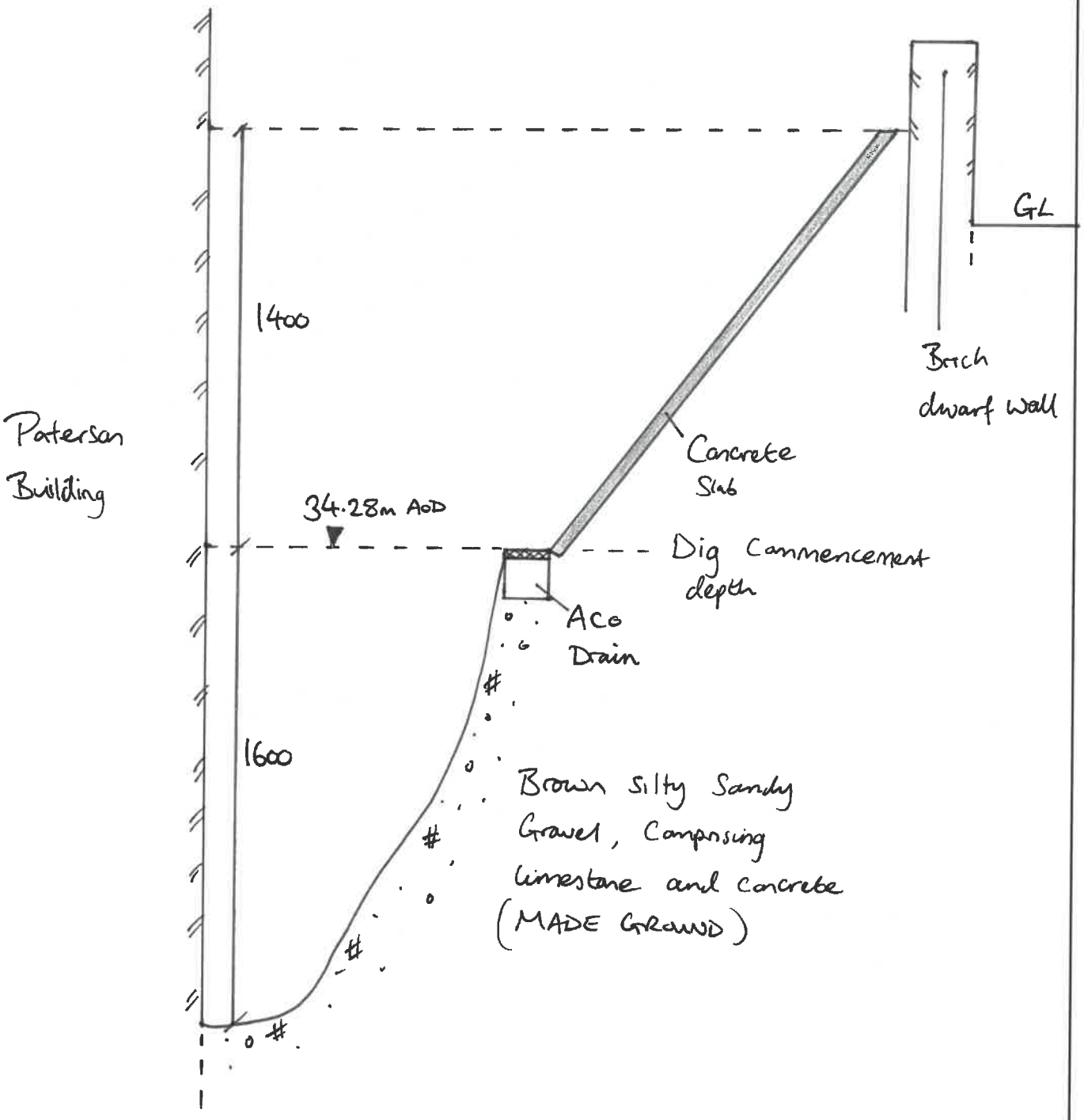
OP01



Notes - Dimensions = mm
- Pit dry
- Scale 1:100

CC GEOTECHNICAL LTD Consulting Geotechnical and Geoenvironmental Engineers Tel: (0151) 545 2750 Fax: (0151) 548 7892	**Project**	PATERSON REDEVELOPMENT PROJECT		
	Drawing	FOUNDATION OBSERVATION PIT		
	Scale	AS SHOWN		
	Date	Mar-19	**Number**	19/10614

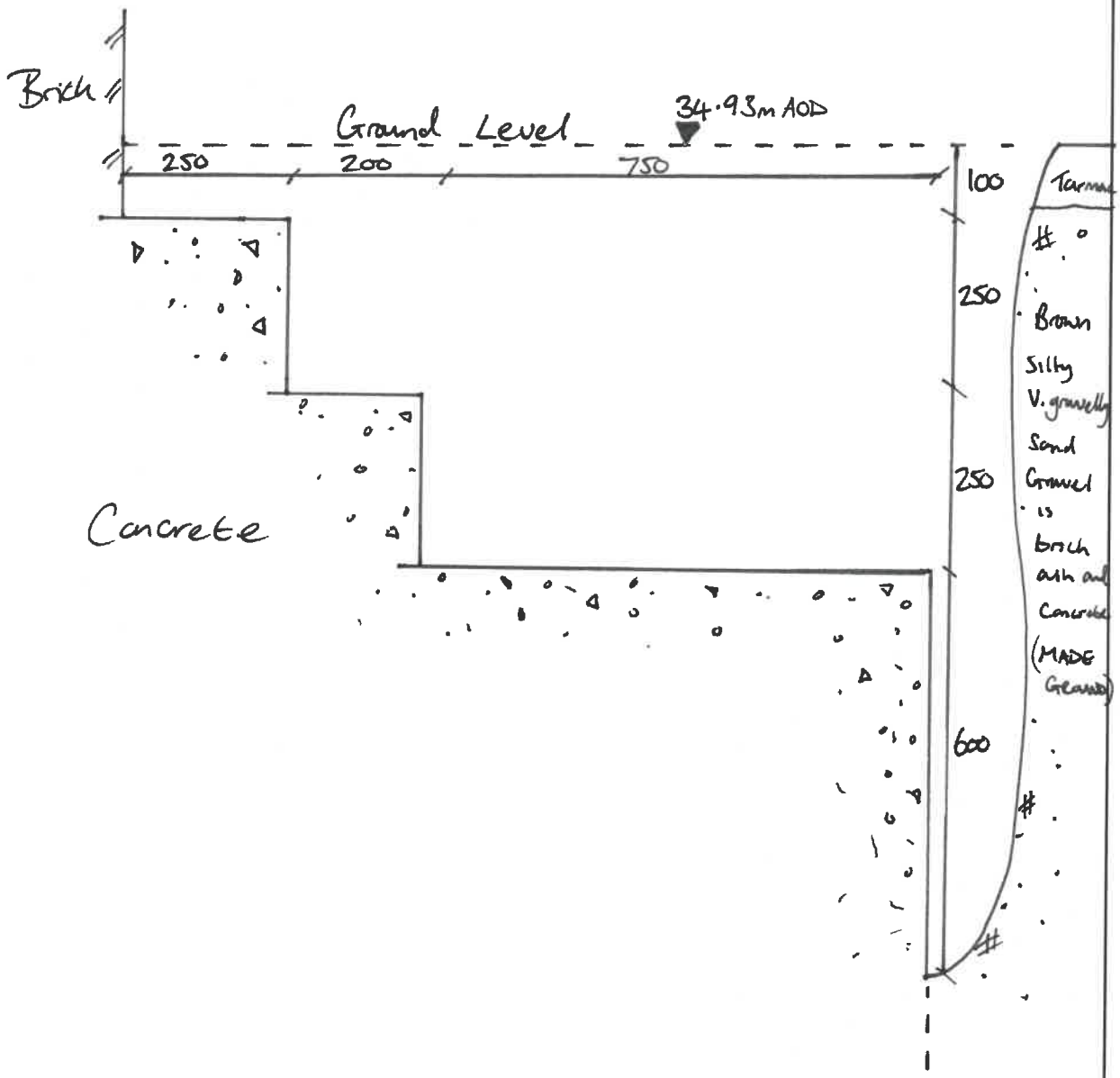
OP02



Notes - Dimensions = mm
- Pit dry
- Scale 1:200

CC GEOTECHNICAL LTD Consulting Geotechnical and Geoenvironmental Engineers Tel: (0151) 545 2750 Fax: (0151) 548 7892	**Project**	PATERSON REDEVELOPMENT PROJECT		
	Drawing	FOUNDATION OBSERVATION PIT		
	Scale	AS SHOWN		
	Date	Mar-19	**Number**	19/10614

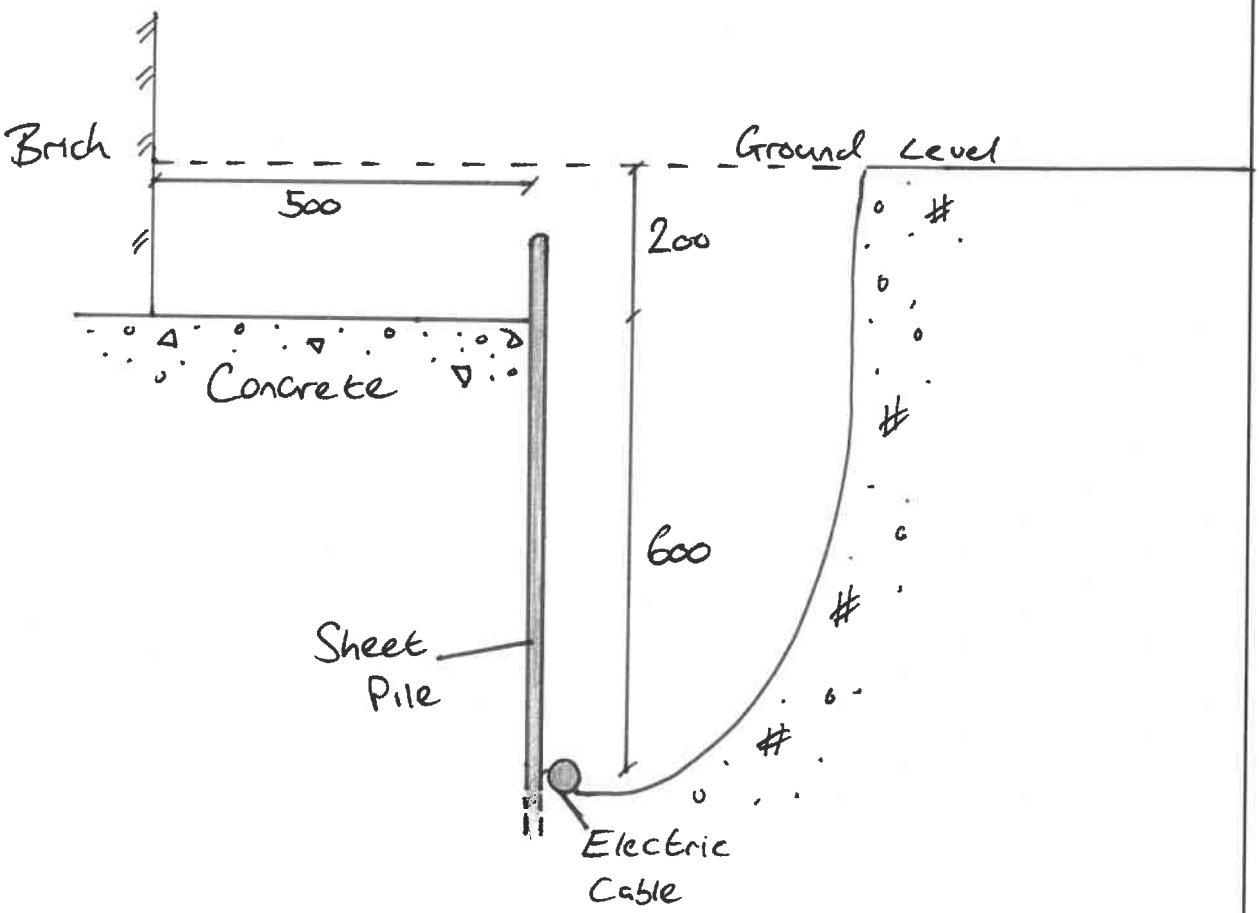
OP03



Notes
- Dimensions = mm
- Pit dry
- Unable to extend pit due to services
- Scale 1:100

CC GEOTECHNICAL LTD Consulting Geotechnical and Geoenvironmental Engineers Tel: (0151) 545 2750 Fax: (0151) 548 7892	**Project**	PATERSON REDEVELOPMENT PROJECT	
	Drawing	FOUNDATION OBSERVATION PIT	
	Scale	AS SHOWN	
	Date	Mar-19	**Number** 19/10614

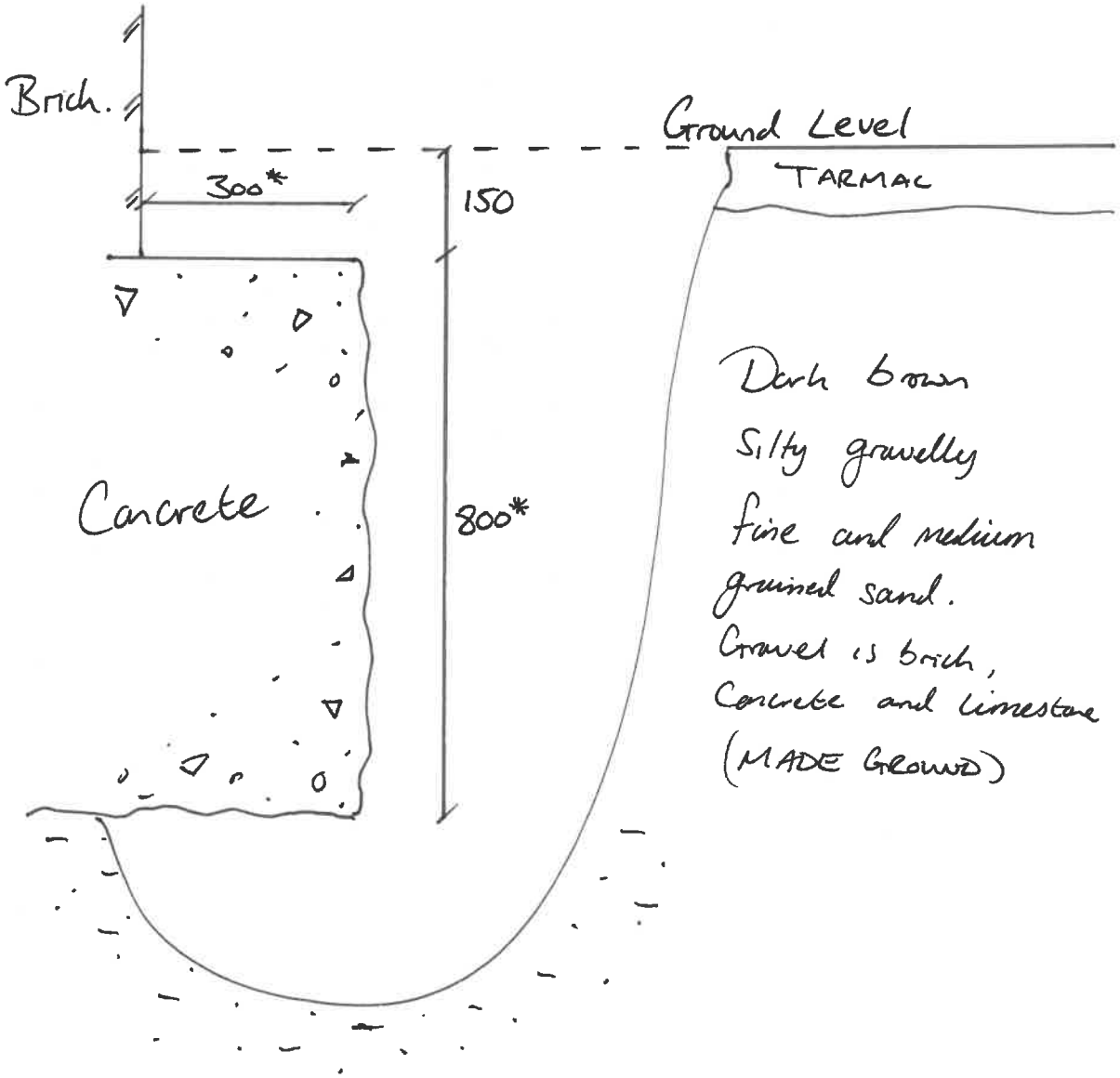
OP05



Notes - Dimensions in mm
- Pit dry
- Unable to advance due to sheet pile & services.
- Scale 1:100

CC GEOTECHNICAL LTD Consulting Geotechnical and Geoenvironmental Engineers Tel: (0151) 545 2750 Fax: (0151) 548 7892	**Project**	PATERSON REDEVELOPMENT PROJECT		
	Drawing	FOUNDATION OBSERVATION PIT		
	Scale	AS SHOWN		
	Date	Mar-19	**Number**	19/10614

OP06

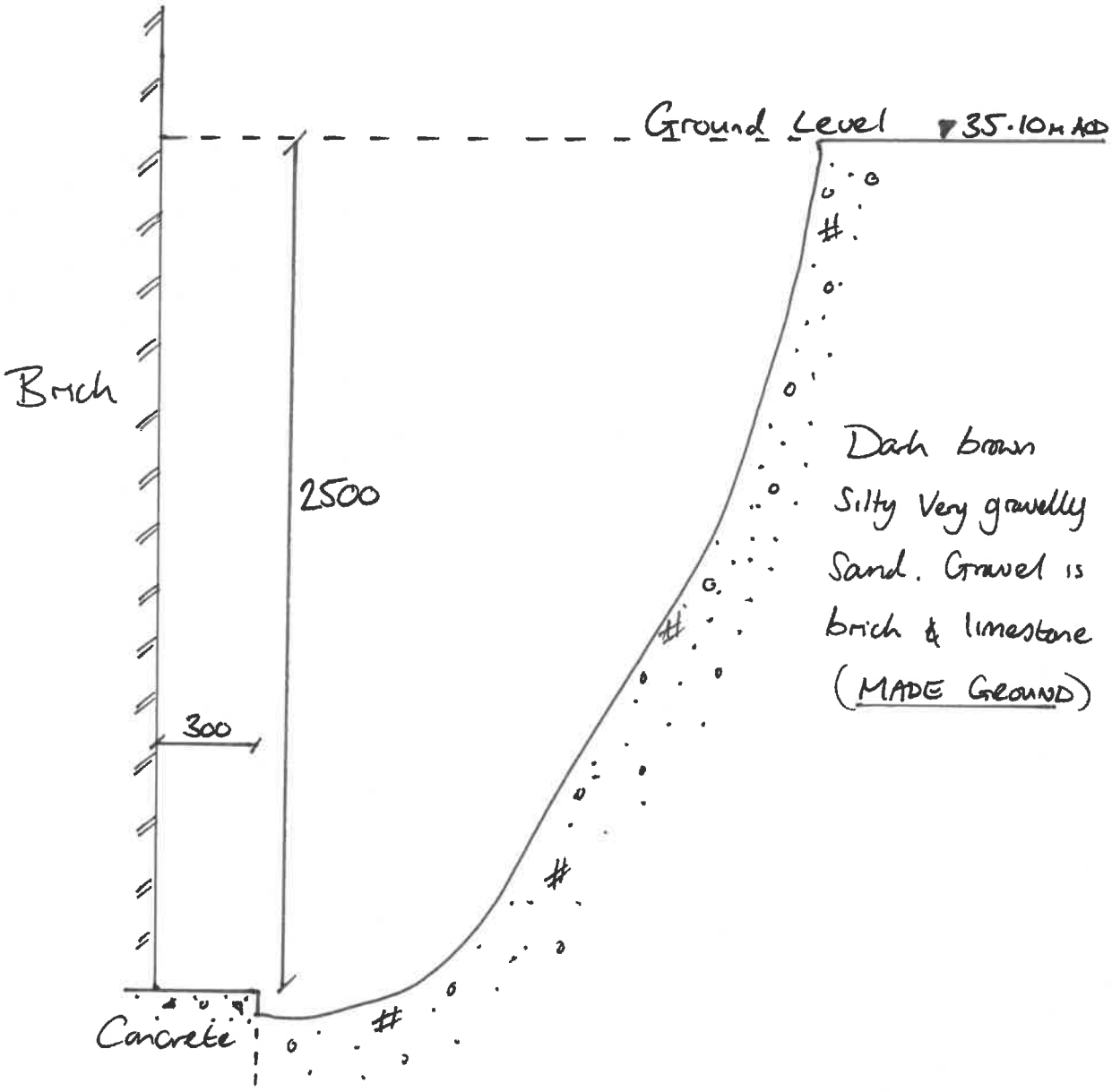


Notes - Dimensions = mm
- Pit dry
- Foundation projection varies from 200mm - 600mm across dig.
- Foundation thickness varies from 700mm - 900mm across dig.
- Scale 1:100

CC GEOTECHNICAL LTD
Consulting Geotechnical and Geoenvironmental Engineers
Tel: (0151) 545 2750 Fax: (0151) 548 7892

Project	PATERSON REDEVELOPMENT PROJECT		
Drawing	FOUNDATION OBSERVATION PIT		
Scale	AS SHOWN		
Date	Mar-19	**Number**	19/10614

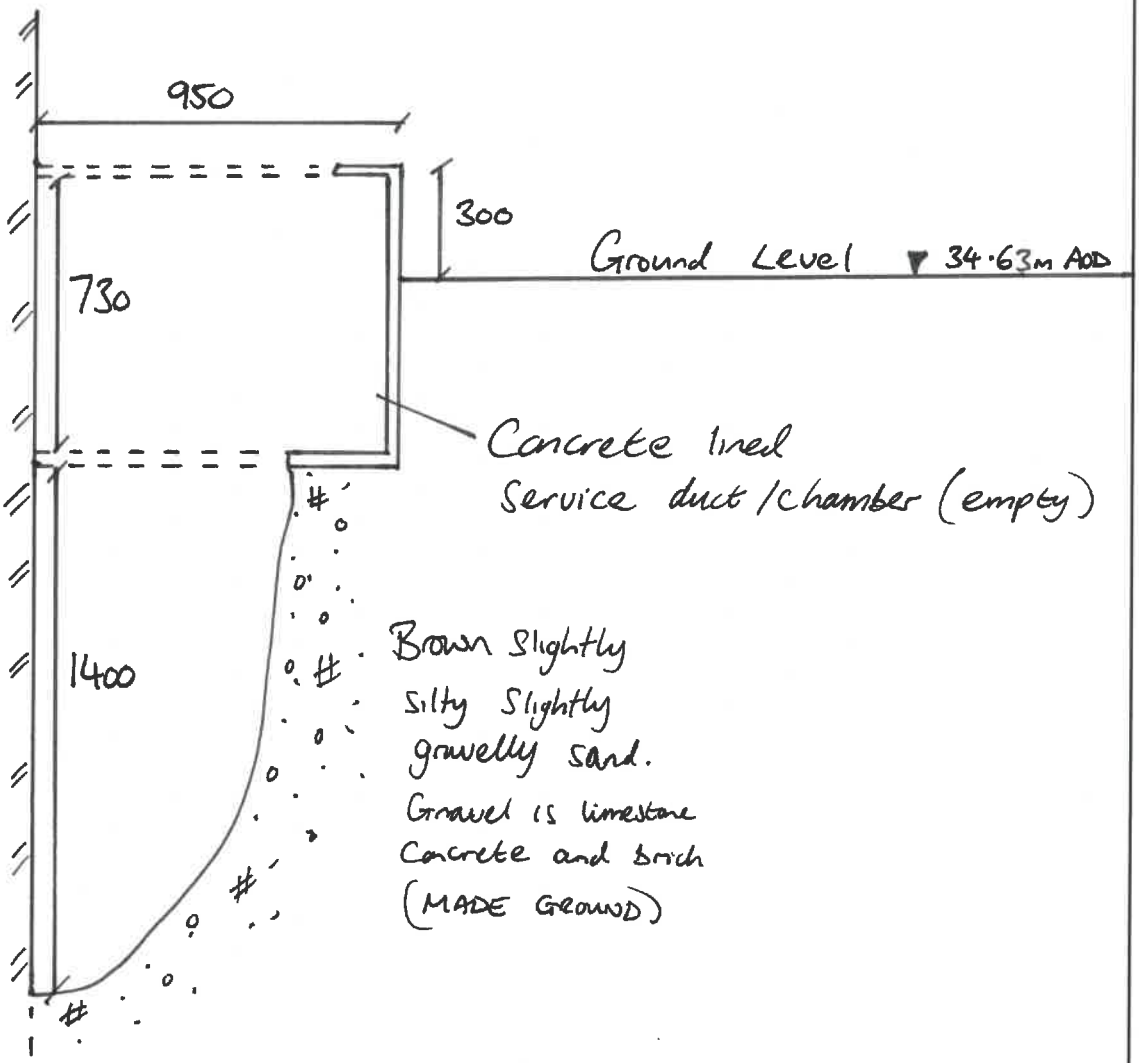
OP07



Notes
- Dimensions = mm
- Pit dry
- Unable to prove foundation thickness
- Scale 1:200

CC GEOTECHNICAL LTD Consulting Geotechnical and Geoenvironmental Engineers Tel: (0151) 545 2750 Fax: (0151) 548 7892	**Project**	PATERSON REDEVELOPMENT PROJECT		
	Drawing	FOUNDATION OBSERVATION PIT		
	Scale	AS SHOWN		
	Date	Mar-19	**Number**	19/10614

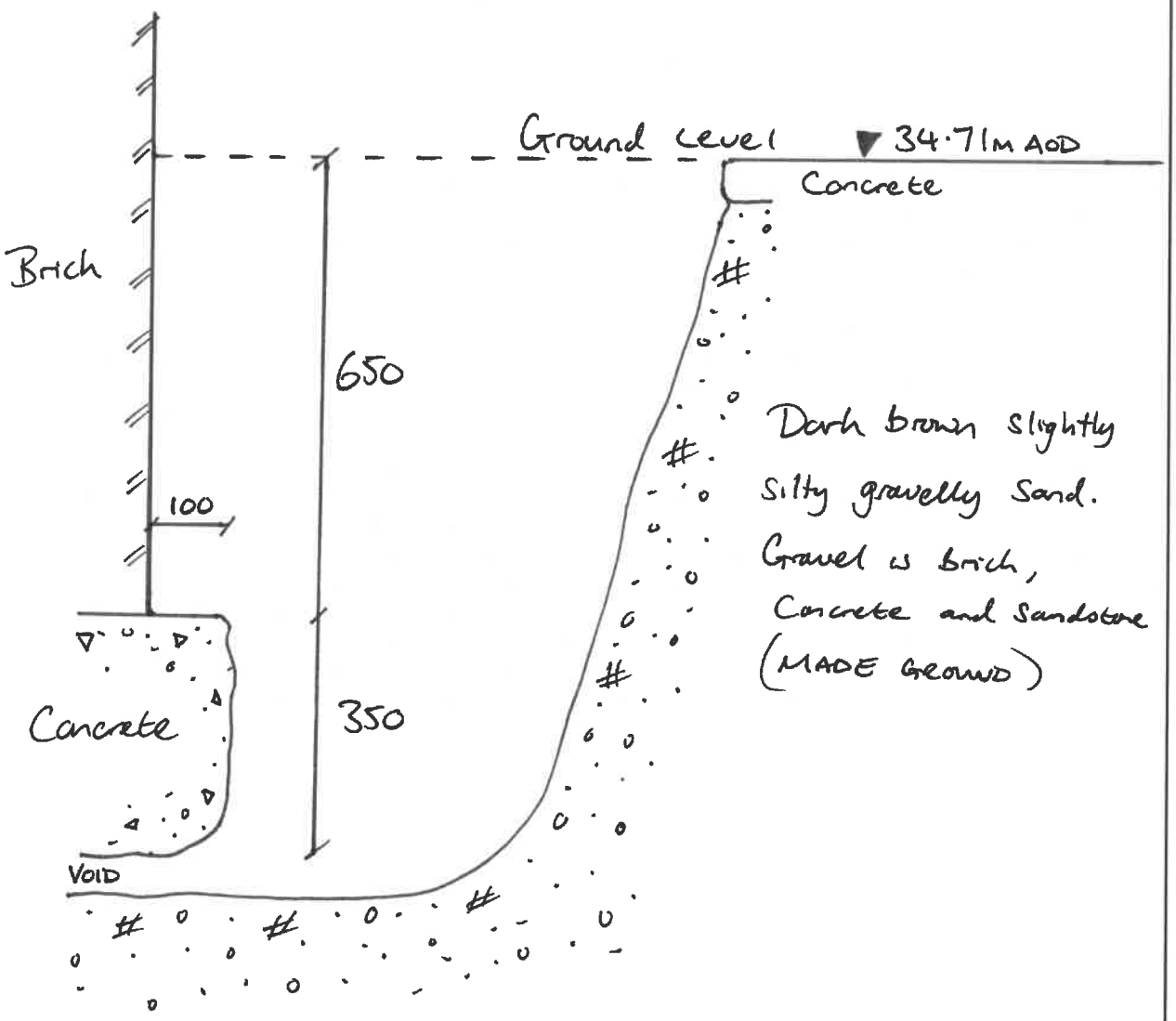
OP08



Notes - Dimensions = mm
- Pit dry
- Foundation not encountered
- Scale 1:200

CC GEOTECHNICAL LTD Consulting Geotechnical and Geoenvironmental Engineers Tel: (0151) 545 2750 Fax: (0151) 548 7892	**Project**	PATERSON REDEVELOPMENT PROJECT	
	Drawing	FOUNDATION OBSERVATION PIT	
	Scale	AS SHOWN	
	Date	Mar-19	**Number** 19/10614

OP09



Notes - Dimensions = mm
- Pit Dry
- Small Void noted under foundation
- Scale 1:100

CC GEOTECHNICAL LTD Consulting Geotechnical and Geoenvironmental Engineers Tel: (0151) 545 2750 Fax: (0151) 548 7892	**Project**	PATERSON REDEVELOPMENT PROJECT	
	Drawing	FOUNDATION OBSERVATION PIT	
	Scale	AS SHOWN	
	Date	Mar-19	**Number** 19/10614

APPENDIX E

INSITU SOIL PERMEABILITY TESTS

FALLING HEAD TEST

CCG-C-18-10614
Christie Hospital: BH01

CC GEOTECHNICAL LTD

Details of test Section	Situation B - BS5930	Ground Level (mAOD)	
Height of standpipe	N/A	Filter Length	N/A
Depth below top of standpipe to response zone	N/A	Casing Elevation (mAOD)	N/A
		Borehole Diameter (m)	0.150
Initial depth to water (mbgl)	0.200	Standpipe Diameter:	N/A
Depth of Casing (mbgl)	2.000	Casing Diameter	150mm

Ref: BS5930:1999

Strata: 0.40: Grey sandy GRAVEL (SUBBASE)
1.40: Brown very gravelly very silty CLAY. Gravel is brick and sandstone - MADE GROUND
2.20: Firm to stiff brown very silty very sandy CLAY

Time Elapsed t (mins)	Depth at Time t From top of casing (m)	Head at Time t	Head Ratio (H/Ho)
0	0.200	1.800	1.000
1	0.210	1.790	0.994
2	0.220	1.780	0.989
3	0.220	1.780	0.989
4	0.220	1.780	0.989
5	0.220	1.780	0.989
10	0.220	1.780	0.989
15	0.230	1.770	0.983
20	0.230	1.770	0.983
30	0.230	1.770	0.983
40	0.230	1.770	0.983
50	0.240	1.760	0.978
60	0.240	1.760	0.978

Permeability:

K= A/FT

K= **1.97E-07** m/s

Where:

A= Cross sectional area of BH (m2)
0.018
F= Intake Factor (m) see BS5930
0.4125
T= Basic time Lag (s)
222000 (by extrapolation)

Notes:
Test carried out under Test B of Section 4 - BS 5930:1999+A2:2010

Calcs by:	Checked by:	Job Number:
DO	CB	18-10614

FALLING HEAD TEST

CCG-C-18-10614
Christie Hospital: BH02

CC GEOTECHNICAL LTD

Details of test Section	Situation B - BS5930	Ground Level (mAOD)	
Height of standpipe	N/A	Filter Length	N/A
Depth below top of standpipe to response zone	N/A	Casing Elevation (mAOD)	N/A
		Borehole Diameter (m)	0.150
Initial depth to water (mbgl)	0.130	Standpipe Diameter:	N/A
Depth of Casing (mbgl)	3.300	Casing Diameter	150mm

Ref: BS5930:1999

Strata:
0.70: Brown very gravelly very silty CLAY. Gravel is brick and sandstone - MADE GROUND
1.40: Brown fine to coarse SAND, with frequent clay lenses
2.20: Stiff brown very sandy silty CLAY
3.50: Weathered SANDSTONE (continuing)

Time Elapsed t (mins)	Depth at Time t From top of casing (m)	Head at Time t	Head Ratio (H/Ho)
0	0.130	3.170	1.000
1	0.140	3.160	0.997
2	0.140	3.160	0.997
3	0.140	3.160	0.997
4	0.140	3.160	0.997
5	0.150	3.150	0.994
10	0.150	3.150	0.994
15	0.160	3.140	0.991
20	0.160	3.140	0.991
30	0.160	3.140	0.991
40	0.160	3.140	0.991
50	0.160	3.140	0.991
60	0.170	3.130	0.987

Permeability:

K= A/FT

K= **7.38E-08** m/s

Where:

A= Cross sectional area of BH (m2)
0.018
F= Intake Factor (m) see BS5930
0.4125
T= Basic time Lag (s)
591600 (by extrapolation)

Notes:
Test carried out under Test B of Section 4 - BS 5930:1999+A2:2010

Calcs by:	Checked by:	Job Number:
DO	CB	18-10614

FALLING HEAD TEST

CCG-C-18-10614
Christie Hospital: BH04

CC GEOTECHNICAL LTD

Details of test Section	Situation B - BS5930	Ground Level (mAOD)	
Height of standpipe	N/A	Filter Length	N/A
Depth below top of standpipe to response zone	N/A	Casing Elevation (mAOD)	N/A
		Borehole Diameter (m)	0.150
Initial depth to water (mbgl)	0.340	Standpipe Diameter:	N/A
Depth of Casing (mbgl)	2.500	Casing Diameter	150mm

Ref: BS5930:1999

Strata: 1.30: Brown very gravelly very silty CLAY. Gravel is brick and sandstone - MADE GROUND
3.50: Stiff brown very sandy silty CLAY
5.00: Weathered SANDSTONE (continuing)

Time Elapsed t (mins)	Depth at Time t From top of casing (m)	Head at Time t	Head Ratio (H/Ho)
0	0.340	2.160	1.000
1	0.346	2.154	0.997
2	0.347	2.153	0.997
3	0.348	2.152	0.996
4	0.349	2.151	0.996
5	0.350	2.150	0.995
10	0.351	2.149	0.995
15	0.352	2.148	0.994
20	0.355	2.145	0.993
30	0.360	2.140	0.991
40	0.365	2.135	0.988
50	0.370	2.130	0.986
60	0.375	2.125	0.984

Permeability:

K= A/FT

K= **2.68E-07** m/s

Where:

A= Cross sectional area of BH (m2)
0.018
F= Intake Factor (m) see BS5930
0.4125
T= Basic time Lag (s)
162600 (by extrapolation)

Notes:
Test carried out under Test B of Section 4 - BS 5930:1999+A2:2010

Calcs by:	Checked by:	Job Number:
DO	CB	18-10614

CCG-C-18-10614:
The Chrisite, Manchester:
BH02

VARIABLE HEAD TEST

CC GEOTECHNICAL LTD

Test Scenario	Situation D - BS5930	Depth to top of test section	3.50mbgl
Type of Test	Rising Head	Standing water level	3.58mbgl
		Drawdown level	4.72mbgl
Diameter of test section (m)	0.09	Soil / rock description	Weathered Sandstone
Length of test section (m)	1.50		

Ref:
BS 22282:2012
BS 5930:1999

Time Elapsed t (mins)	Depth of groundwater (mbgl)	Head at Time (t)	Head Ratio (H/Ho)
0.0	4.720	1.140	1.000
0.5	4.490	0.910	0.798
1.0	4.320	0.740	0.649
1.5	4.110	0.530	0.465
1.5	3.980	0.400	0.351
2.5	3.880	0.300	0.263
3.0	3.820	0.240	0.211

Permeability:

K= A/FT

K= 7.45E-06 m/s

Where:

A= Cross sectional area of BH (m2)
0.002

F= Intake Factor (m) see BS5930
2.685

T= Basic time Lag (s)
100

Notes:
Test carried out under Test D of Section 4 - BS 5930:1999

Client:	**Interserve Construction Ltd**	**Calcs by:**	**Checked by:**	**Job Number:**
		DO	**CB**	**18/10614**

APPENDIX F

ROCK CORE PHOTOGRAPHS

CCG REF: CCG-C-18-10614
SITE: THE CHRISTIE,
MANCHESTER
CLIENT: INTERSERVE
BH1 3.5-6.5mbgl
KATUN
3.5
5.0
5.0
6.5

CCG REF: CCG-C-18-10614
SITE: THE CHRISTIE,
MANCHESTER
CLIENT: INTERSERVE
BH1 6.5-9.5mbgl
KATUN
6.5
8.0
8.0
9.5

CCG REF: CCG-C-18-10614
SITE: THE CHRISTIE,
MANCHESTER
CLIENT: INTERSERVE
BH1 9.5-12.5mbgl
KATUN
9.5
11.0
11.0
12.5

CCG REF: CCG-C-18-10614
SITE: THE CHRISTIE,
MANCHESTER
CLIENT: INTERSERVE
BH1 12.5-15.5mbgl
KATUN
12.5
14.0
14.0
15.5

CCG REF: CCG-C-18-10614
SITE: THE CHRISTIE,
MANCHESTER
CLIENT: INTERSERVE
BH1 15.5-18.5mbgl
KATUN
15.5
17.0
17.0
18.5

CCG REF: CCG-C-18-10614
SITE: THE CHRISTIE,
MANCHESTER
CLIENT: INTERSERVE
BH1 18.5-20.0mbgl
KATUN
18.5
20.0

CCG REF: CCG-C-18-10614
SITE: THE CHRISTIE,
MANCHESTER
CLIENT: INTERSERVE
BH2 5.0-8.0mbgl
5.0
6.5
6.5
8.0

CCG REF: CCG-C-18-10614
SITE: THE CHRISTIE,
MANCHESTER
CLIENT: INTERSERVE
BH2 8.0-11.0mbgl
KATUN
8.0
9.5
9.5
11.0

CCG REF: CCG-C-18-10614
SITE: THE CHRISTIE,
MANCHESTER
CLIENT: INTERSERVE
BH2 11.0-14.0mbgl
11.0
12.5
12.5
14.0

CCG REF: CCG-C-18-10614
SITE: THE CHRISTIE,
MANCHESTER
CLIENT: INTERSERVE
BH2 14.0-17.0mbgl
14.0
15.5
15.5
17.0

CCG REF: CCG-C-18-10614
SITE: THE CHRISTIE,
MANCHESTER
CLIENT: INTERSERVE
BH2 17.0-20.0mbgl
17.0
18.5
18.5
20.0

CCG REF: CCG-C-18-10614
SITE: THE CHRISTIE,
MANCHESTER
CLIENT: INTERSERVE
BH3 4.5-7.5mbgl
4.5
6.0
6.0
7.5

CCG REF: CCG-C-18-10614
SITE: THE CHRISTIE,
MANCHESTER
CLIENT: INTERSERVE
BH3 7.5-10.5mbgl
KATUN
7.5
9.0
9.0
10.5

CCG REF: CCG-C-18-10614
SITE: THE CHRISTIE,
MANCHESTER
CLIENT: INTERSERVE
BH3 10.5-13.5mbgl
KATUN
10.5
12.0
12.0
13.5

CCG REF: CCG-C-18-10614
SITE: THE CHRISTIE,
MANCHESTER
CLIENT: INTERSERVE
BH3 13.5-16.5mbgl
KATUN
13.5
15.0
15.0
16.5

CCG REF: CCG-C-18-10614
SITE: THE CHRISTIE,
MANCHESTER
CLIENT: INTERSERVE
BH3 20.0-22.5mbgl
KATUN
20.0
21.0
21.0
22.5

CCG REF: CCG-C-18-10614
SITE: THE CHRISTIE,
MANCHESTER
CLIENT: INTERSERVE
BH3 22.5-25.0mbgl
KATUN
22.5
24.0
24.0
25.0

CCG REF: CCG-C-18-10614
SITE: THE CHRISTIE,
MANCHESTER
CLIENT: INTERSERVE
BH4 5.0-8.0mbgl
KATUN
5.0
6.5
6.5
8.0

CCG REF: CCG-C-18-10614
SITE: THE CHRISTIE,
MANCHESTER
CLIENT: INTERSERVE
BH4 8.0-11.0mbgl
8.0
9.5
9.5
11.0

CCG REF: CCG-C-18-10614
SITE: THE CHRISTIE,
MANCHESTER
CLIENT: INTERSERVE
BH4 11.0-14.0mbgl
KATUN
11.0
12.5
12.5
14.0

CCG REF: CCG-C-18-10614
SITE: THE CHRISTIE,
MANCHESTER
CLIENT: INTERSERVE
BH4 14.0-17.0mbgl
KATUN
14.0
15.5
15.5
17.0

CCG REF: CCG-C-18-10614
SITE: THE CHRISTIE,
MANCHESTER
CLIENT: INTERSERVE
BH4 17.0-20.0mbgl
KATUN
17.0
18.5
18.5
20.0

APPENDIX G

SOIL & ROCK ENGINEERING TEST RESULTS

Units 1 & 2
Deltic Place
Deltic Way
Knowsley Industrial Estate
Liverpool
L33 7BU

Telephone: (0151) 545 2750
Fax: (0151) 548 7892
Email: enquiries@ccgeotechnical.com
www.ccgeotechnical.com

CC GEOTECHNICAL LTD
Consulting Geoenvironmental and Geotechnical Engineers

LABORATORY REPORT

CONTRACT NUMBER: CCG-C-18-10614

CONTRACT TITLE: THE CHRISTIE, MANCHESTER

CLIENT: INTERSERVE

DATE RECEIVED: 22/01/19
DATE COMMENCED: 22/01/19
DATE COMPLETED: 12/04/19
REPORT DATE: 12/04/19

Test Description	Qty
Determination of Moisture Content BS 1377-2:1990 (a)	8
Particle Size Distribution BS 1377-2:1990 (a)	4
Sedimentation by Pipette BS 1377-2:1990 (#)	4
Determination of Liquid & Plastic Limits BS 1377-2:1990 (a)	8
Uniaxial Compressive Strength ISRM Vol 16 No 2, pp 135-140 (2007) (s)	3
Point Load test ISRM 1985: Suggested Method	24
Consolidated undrained triaxial compression test BS 1377-8:1990 (s)	1
Deformability in uniaxial compression ISRM 1985: Suggested Method	3

Notes: Observations and interpretations are not accredited by UKAS
# denotes non-accredited test
a denotes UKAS accredited test
s denotes test undertaken by approved subcontractor

This report is issued in accordance with the requirements of the United kingdom Accreditation Services and EN ISO/IEC 17025:2005. The results reported herein relate only to the material supplied to the laboratory. This report shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved Signatories: Chris Bolan (Managing Director) – Daniel Kerfoot (Laboratory Manager)

SUMMARY OF LABORATORY SOIL TEST RESULTS

BH / TP / WS Number	Sample Type	Depth From (m)	Depth To (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Shear Strength (kN/m^2)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 0.425mm (%)	Soil Classification	UKAS accredited test (Y/N)	Description / Test Method Samples described in accordance with BS EN ISO 14688-2 2004
BH01	BD	1.50	1.50	19	-	-	-	28	13	15	67	CL	Y	Brown clayey silty gravelly fine to coarse grained SAND. Gravel is fine to medium subangular to subrounded sandstone. (BS1377Pt2:3.2,4.4,5,9.2,9.4)

SITE: THE CHRISTIE, MANCHESTER (CCG-C-18-10614) DATE: 11.02.19

CLIENT: INTERSERVE

UKAS TESTING 4514

Key:- BD = Bulk Disturbed; SD = Small Disturbed; U100 = Undisturbed 100mm; WS = Window Sample
CL = Low Plasticity; CI = Intermediate; CH = High; CV = Very high; CE = Extremely high; NP = Non-plastic
(* Denotes Hand Shear Vane test result)
Sample description not accredited by UKAS

SUMMARY OF LABORATORY SOIL TEST RESULTS

BH / TP / WS Number	Sample Type	Depth From (m)	Depth To (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Shear Strength (kN/m^2)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 0.425mm (%)	Soil Classification	UKAS accredited test (Y/N)	Description / Test Method Samples described in accordance with BS EN ISO 14688-2 2004
BH02	BD	2.50	2.50	29	-	-	-	-	-	-	97	NP	Y	Brown silty fine to medium grained SAND. (BS1377Pt2:3.2,4.4,5,9.2,9.4)

SITE: THE CHRISTIE, MANCHESTER (CCG-C-18-10614) DATE: 11.02.19

CLIENT: INTERSERVE

UKAS TESTING 4514

Key:- BD = Bulk Disturbed; SD = Small Disturbed; U100 = Undisturbed 100mm; WS = Window Sample
CL = Low Plasticity; CI = Intermediate; CH = High; CV = Very high; CE = Extremely high; NP = Non-plastic
(* Denotes Hand Shear Vane test result)
Sample description not accredited by UKAS

SUMMARY OF LABORATORY SOIL TEST RESULTS

BH / TP / WS Number	Sample Type	Depth From (m)	Depth To (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Shear Strength (kN/m^2)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 0.425mm (%)	Soil Classification	UKAS accredited test (Y/N)	Description / Test Method Samples described in accordance with BS EN ISO 14688-2 2004
BH03	BD	2.50	2.50	11	-	-	-	-	-	-	97	NP	Y	Brown silty fine to medium grained SAND. (BS1377Pt2:3.2,4.4,5)
BH03	BD	3.50	3.50	34	-	-	-	-	-	-	99	NP	Y	Brown silty slightly clayey fine to medium grained SAND. (BS1377Pt2:3.2,4.4,5,9.2,9.4)

SITE: THE CHRISTIE, MANCHESTER (CCG-C-18-10614) DATE: 11.02.19

CLIENT: INTERSERVE

UKAS TESTING 4514

Key:- BD = Bulk Disturbed; SD = Small Disturbed; U100 = Undisturbed 100mm; WS = Window Sample
CL = Low Plasticity; CI = Intermediate; CH = High; CV = Very high; CE = Extremely high; NP = Non-plastic
(* Denotes Hand Shear Vane test result)
Sample description not accredited by UKAS

SUMMARY OF LABORATORY SOIL TEST RESULTS

BH / TP / WS Number	Sample Type	Depth From (m)	Depth To (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Shear Strength (kN/m^2)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 0.425mm (%)	Soil Classification	UKAS accredited test (Y/N)	Description / Test Method Samples described in accordance with BS EN ISO 14688-2 2004
BH04	U100	2.00	2.45	27	-	-	-	51	20	31	91	CH	Y	Brown slightly sandy slightly gravelly silty CLAY. Gravel is fine to medium subangular to subrounded sandstone. (BS1377Pt2:3.2,4.4,5,9.2,9.4)

SITE: THE CHRISTIE, MANCHESTER (CCG-C-18-10614) DATE: 11.02.19

CLIENT: INTERSERVE

UKAS TESTING 4514

Key:- BD = Bulk Disturbed; SD = Small Disturbed; U100 = Undisturbed 100mm; WS = Window Sample
CL = Low Plasticity; CI = Intermediate; CH = High; CV = Very high; CE = Extremely high; NP = Non-plastic
(* Denotes Hand Shear Vane test result)
Sample description not accredited by UKAS

SUMMARY OF LABORATORY SOIL TEST RESULTS

BH / TP / WS Number	Sample Type	Depth From (m)	Depth To (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Shear Strength (kN/m^2)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 0.425mm (%)	Soil Classification	UKAS accredited test (Y/N)	Description / Test Method Samples described in accordance with BS EN ISO 14688-2 2004
TP02	BD	2.00	2.00	12	-	-	-	28	14	14	93	CL	Y	Brown slightly sandy slightly gravelly silty CLAY. Gravel is fine to medium subrounded sandstone. (BS1377Pt2:3.2,4.4,5)
TP03	BD	2.00	2.00	34	-	-	-	29	14	15	95	CL	Y	Brown slightly sandy slightly gravelly silty CLAY. Gravel is fine to medium subrounded sandstone. (BS1377Pt2:3.2,4.4,5)

SITE: THE CHRISTIE, MANCHESTER (CCG-C-18-10614) DATE: 11.02.19

CLIENT: INTERSERVE

UKAS TESTING 4514

Key:- BD = Bulk Disturbed; SD = Small Disturbed; U100 = Undisturbed 100mm; WS = Window Sample
CL = Low Plasticity; CI = Intermediate; CH = High; CV = Very high; CE = Extremely high; NP = Non-plastic
(* Denotes Hand Shear Vane test result)
Sample description not accredited by UKAS

SUMMARY OF LABORATORY SOIL TEST RESULTS

BH / TP / WS Number	Sample Type	Depth From (m)	Depth To (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Shear Strength (kN/m^2)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 0.425mm (%)	Soil Classification	UKAS accredited test (Y/N)	Description / Test Method Samples described in accordance with BS EN ISO 14688-2 2004
WS01	U80	1.00	1.40	12	-	-	-	20	13	7	95	CL	Y	Brown slightly sandy slightly gravelly silty CLAY. Gravel is fine to medium subrounded sandstone. (BS1377Pt2:3.2,4.4,5)

SITE: THE CHRISTIE, MANCHESTER (CCG-C-18-10614) DATE: 11.02.19

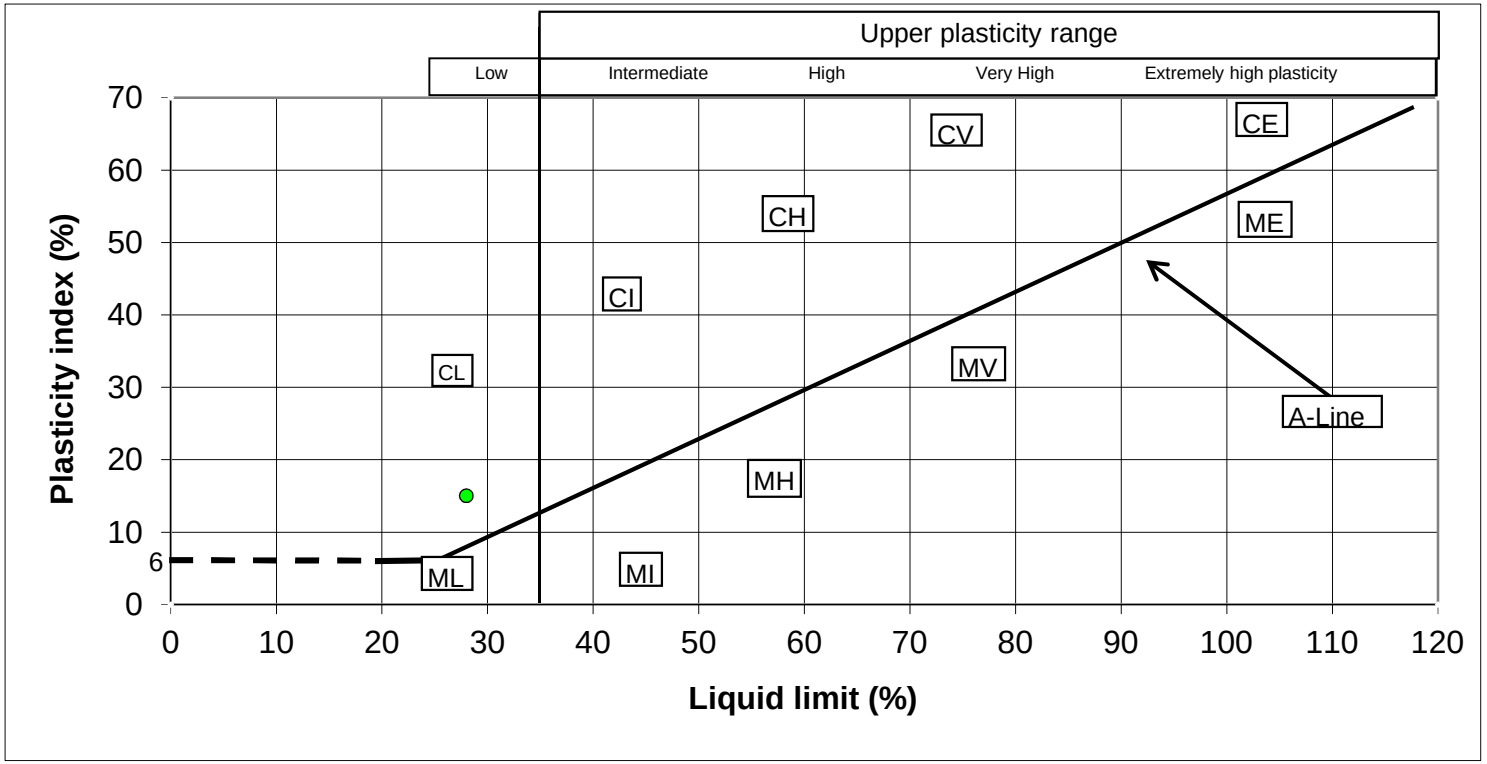
CLIENT: INTERSERVE

UKAS TESTING 4514

Key:- BD = Bulk Disturbed; SD = Small Disturbed; U100 = Undisturbed 100mm; WS = Window Sample
CL = Low Plasticity; CI = Intermediate; CH = High; CV = Very high; CE = Extremely high; NP = Non-plastic
(* Denotes Hand Shear Vane test result)
Sample description not accredited by UKAS

ATTERBERG TEST RESULT SHEET
BS 1377:Part 2:1990:cl 4.4,5

SILT (M-SOIL), M plots below A-Line , CLAY,C, plots above A-Line, M and C may be combined as FINE SOIL, F.



BH	Sample Depth	Liquid limit	Plasticity index
BH01	1.50	28.0	15.0

UKAS TESTING
4514

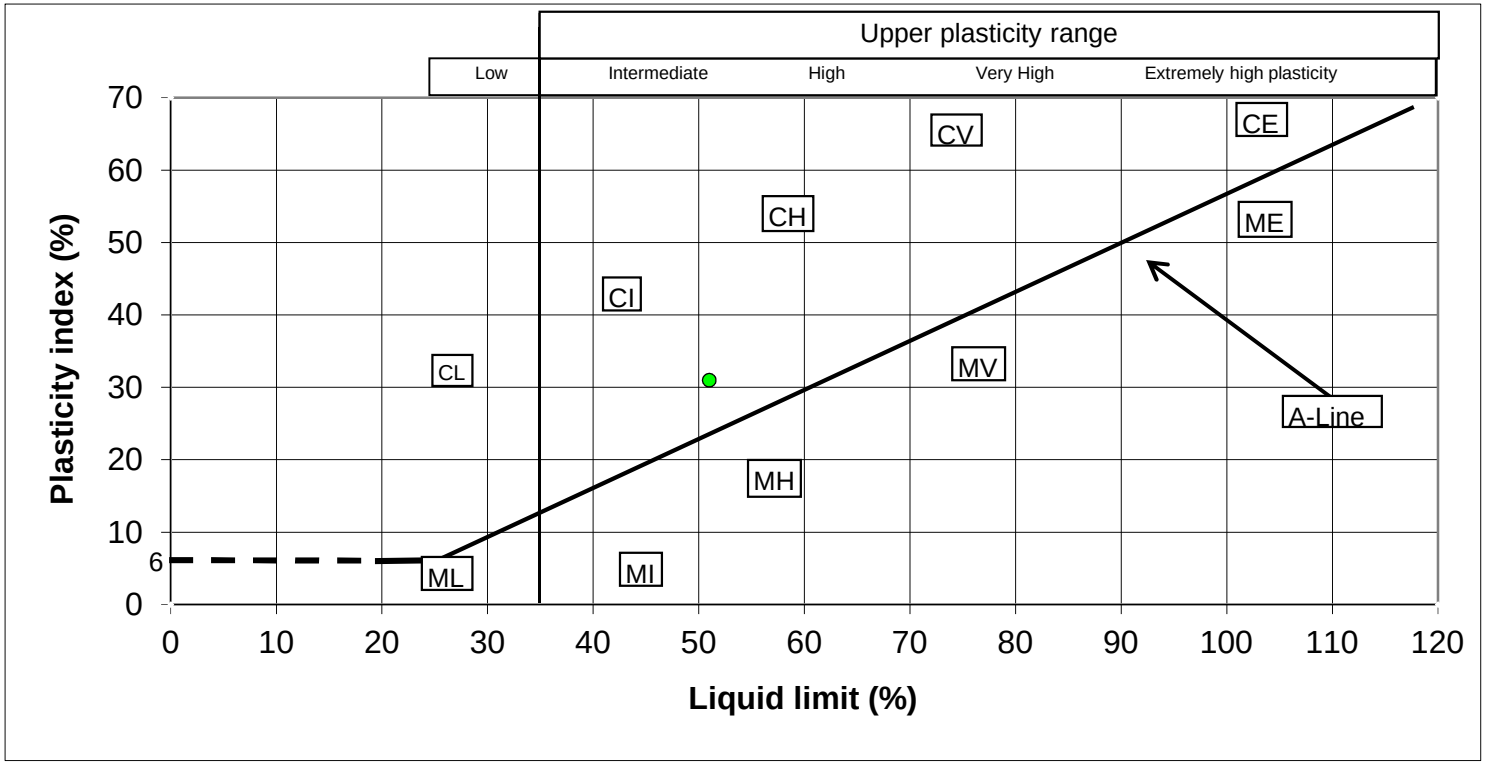
APPROVED BY	DK

CLIENT: INTERSERVE	SITE: THE CHRISTIE, MANCHESTER (CCG-C-18-10614)

ATTERBERG TEST RESULT SHEET

BS 1377:Part 2:1990:cl 4.4,5

SILT (M-SOIL), M plots below A-Line , CLAY,C, plots above A-Line, M and C may be combined as FINE SOIL, F.



BH	Sample Depth	Liquid limit	Plasticity index
BH04	2.0-2.45	51.0	31.0

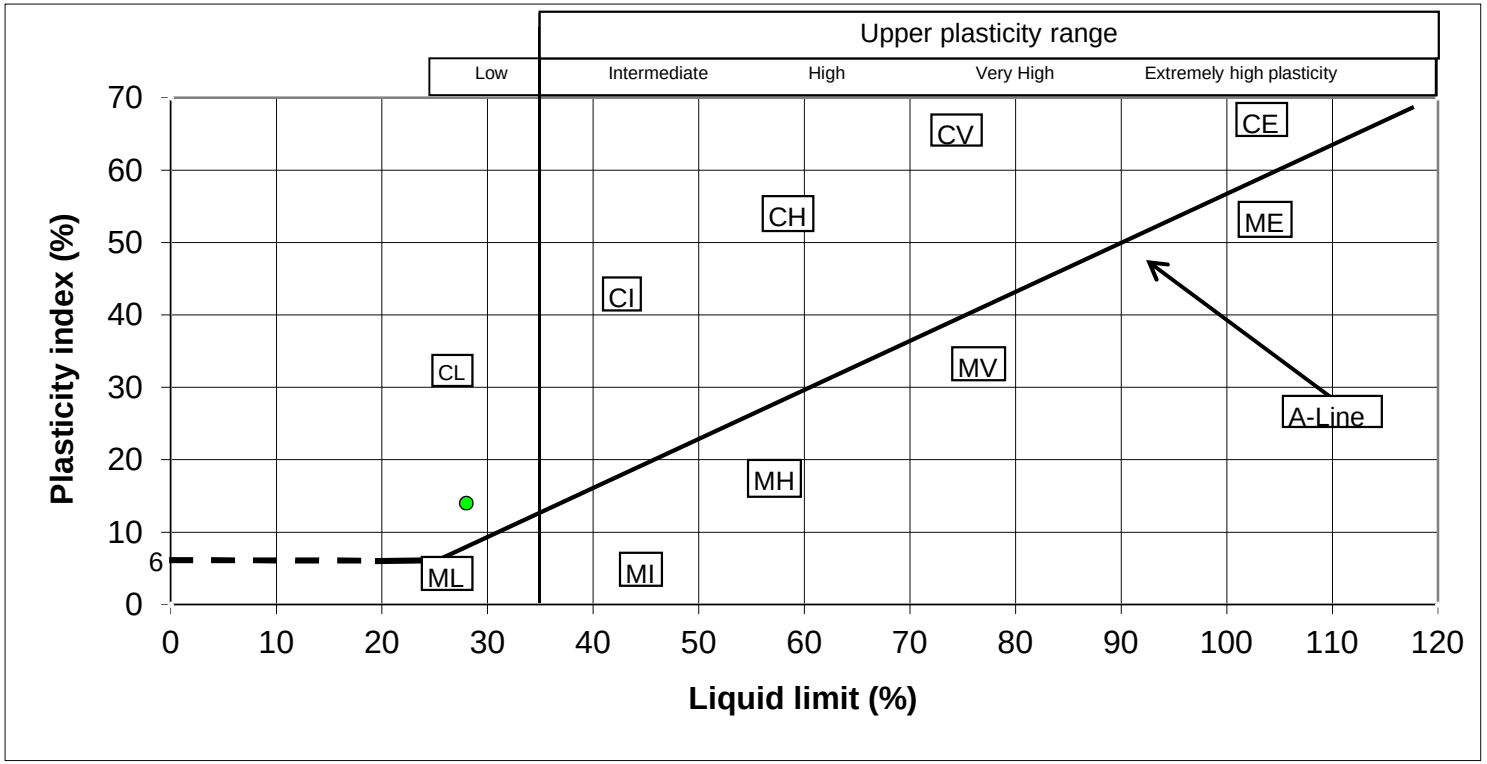
UKAS TESTING
4514

APPROVED BY	DK

CLIENT: INTERSERVE	SITE: THE CHRISTIE, MANCHESTER (CCG-C-18-10614)

ATTERBERG TEST RESULT SHEET
BS 1377:Part 2:1990:cl 4.4,5

SILT (M-SOIL), M plots below A-Line , CLAY,C, plots above A-Line, M and C may be combined as FINE SOIL, F.



BH	Sample Depth	Liquid limit	Plasticity index
TP02	2.00	28.0	14.0

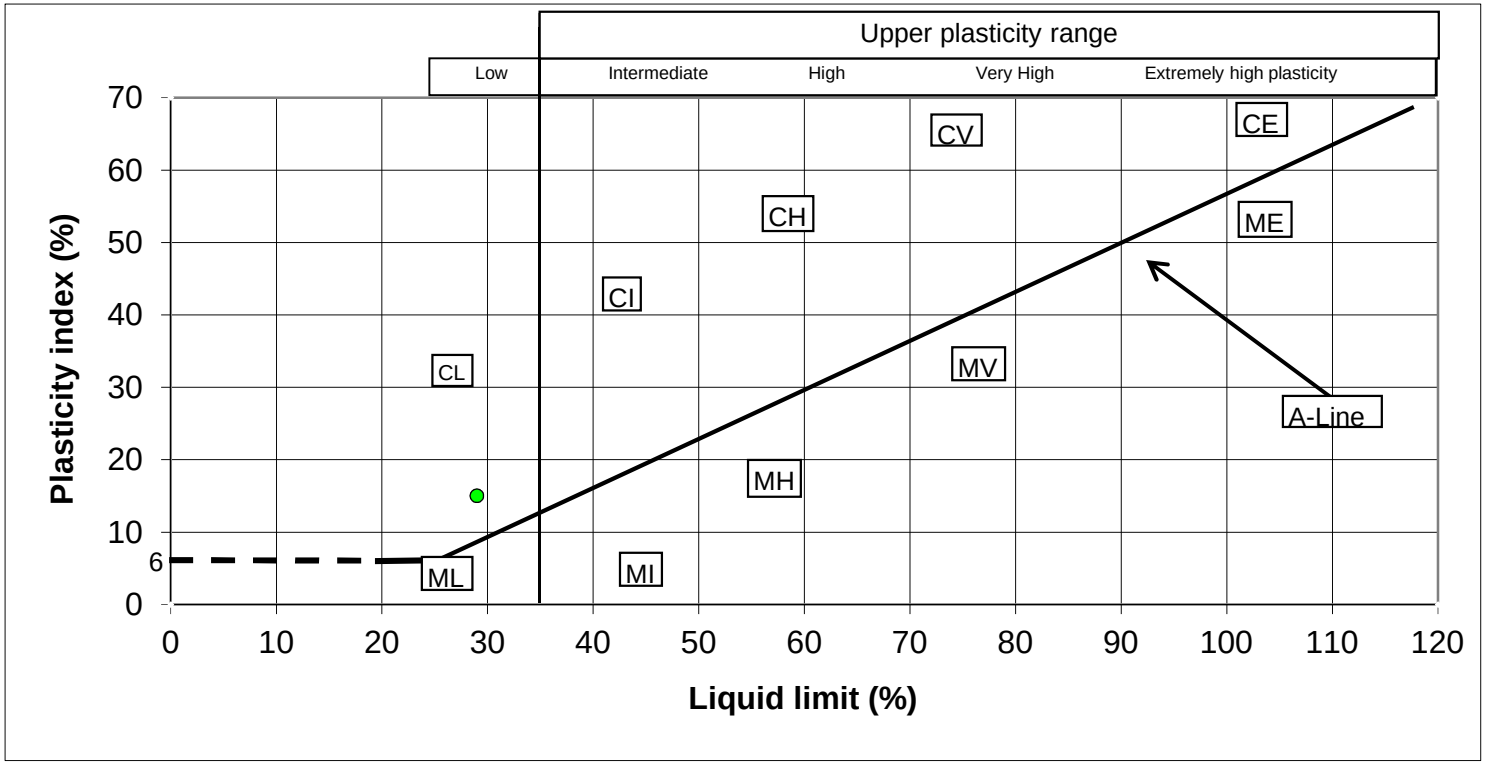
UKAS TESTING
4514

APPROVED BY	DK

CLIENT: INTERSERVE	SITE: THE CHRISTIE, MANCHESTER (CCG-C-18-10614)

ATTERBERG TEST RESULT SHEET
BS 1377:Part 2:1990:cl 4.4,5

SILT (M-SOIL), M plots below A-Line , CLAY,C, plots above A-Line, M and C may be combined as FINE SOIL, F.



BH	Sample Depth	Liquid limit	Plasticity index
TP03	2.00	29.0	15.0

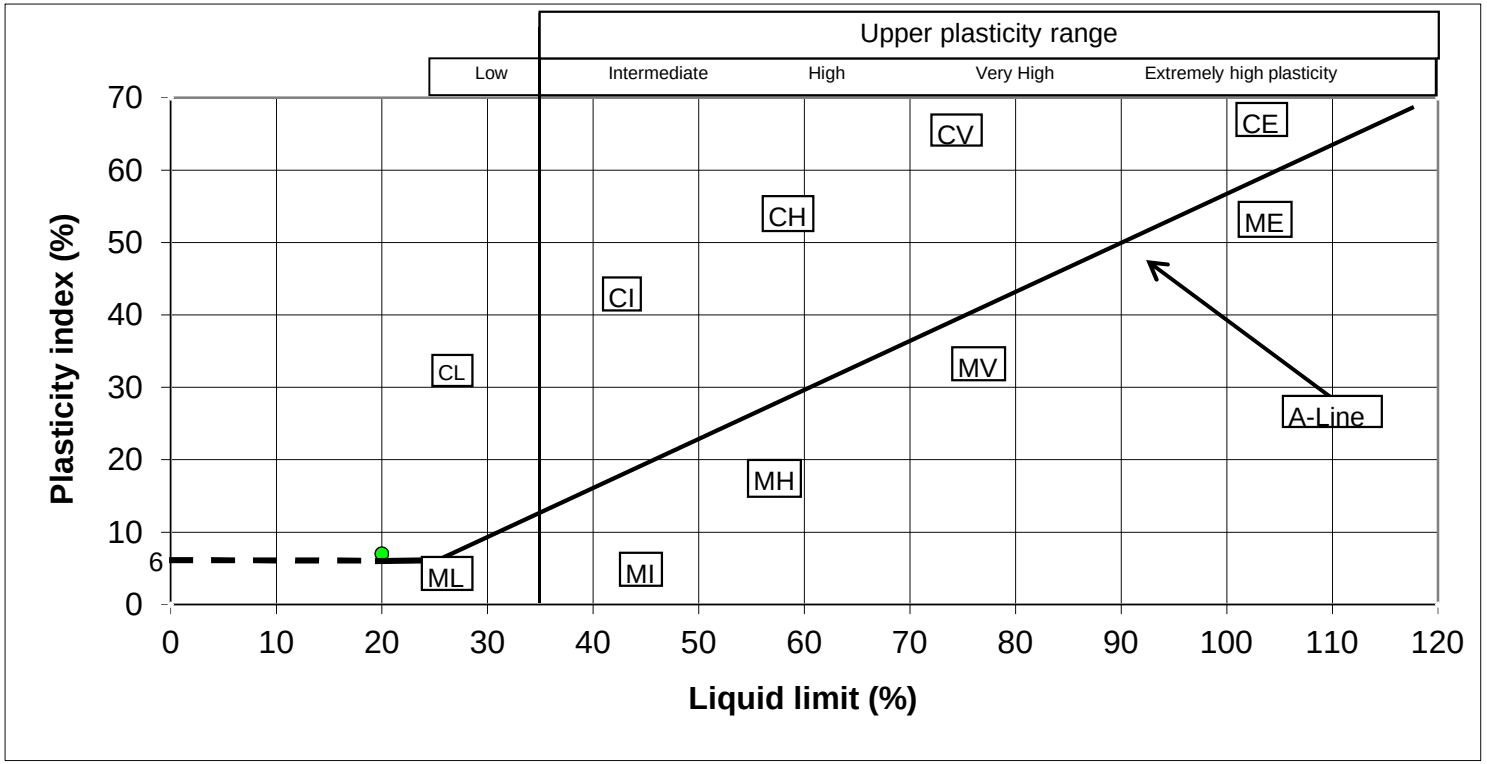
UKAS TESTING
4514

APPROVED BY	DK

CLIENT: INTERSERVE	SITE: THE CHRISTIE, MANCHESTER (CCG-C-18-10614)

ATTERBERG TEST RESULT SHEET
BS 1377:Part 2:1990:cl 4.4,5

SILT (M-SOIL), M plots below A-Line , CLAY,C, plots above A-Line, M and C may be combined as FINE SOIL, F.



BH	Sample Depth	Liquid limit	Plasticity index
WS01	1.0-2.0	20.0	7.0

UKAS TESTING
4514

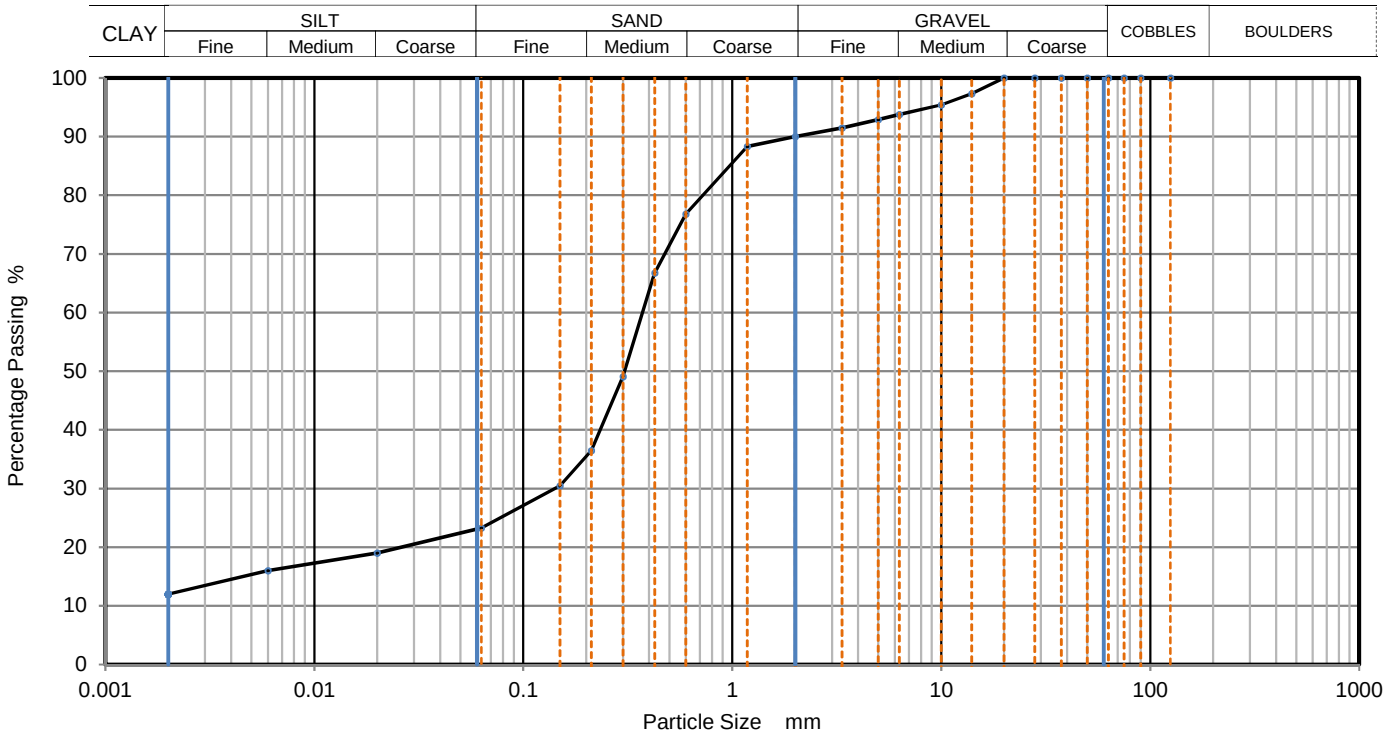
APPROVED BY	DK

CLIENT: INTERSERVE	SITE: THE CHRISTIE, MANCHESTER (CCG-C-18-10614)

CC Geotechnical Ltd
Tel: 0151 545 2750
e: lab@ccgeotechnical.com

PARTICLE SIZE DISTRIBUTION

				Job Ref	CCG-C-18-10614
				Borehole/Pit No.	BH01
Site Name	THE CHRISTIE, MANCHESTER			Sample No.	3
Specimen Description	Brown clayey silty gravelly fine to coarse grained SAND. Gravel is fine to medium subangular to subrounded sandstone			Depth, m	1.50
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	WET SIEVE & PIPETTE			KeyLAB ID	



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0200	19
90	100	0.0060	16
75	100	0.0020	12
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	97		
10	95		
6.3	94		
5	93		
3.35	91		
2	90		
1.18	88		
0.6	77		
0.425	67		
0.3	49		
0.212	36		
0.15	30		
0.063	23		

Dry Mass of sample, g: 1611

Sample Proportions	% dry mass
Very coarse	0
Gravel	10
Sand	67
Silt	11
Clay	12

Grading Analysis		
D_{100}	mm	
D_{60}	mm	
D_{30}	mm	
D_{10}	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

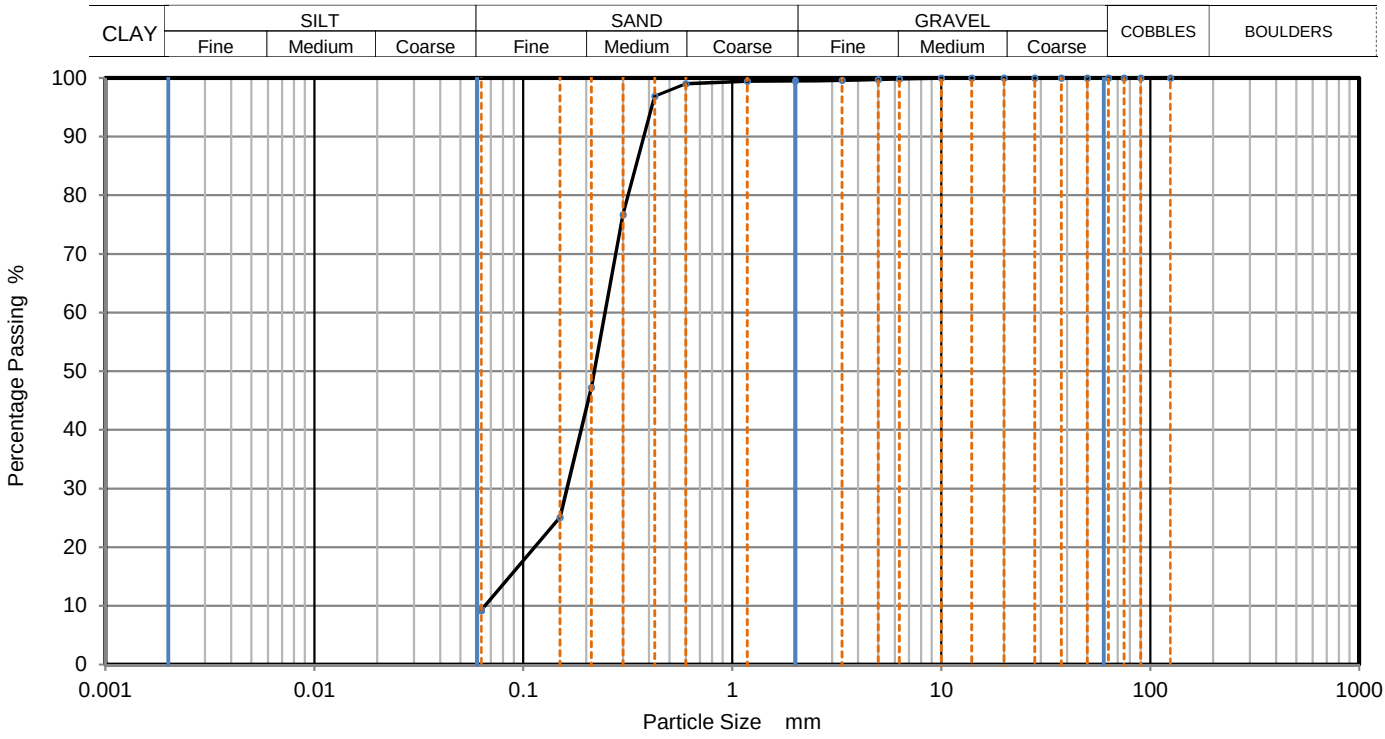
Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	Fig
MH	DK	DK	11/02/2019 10:29	Sheet

CC Geotechnical Ltd
Tel: 0151 545 2750
e: lab@ccgeotechnical.com

PARTICLE SIZE DISTRIBUTION

				Job Ref	CCG-C-18-10614
				Borehole/Pit No.	BH02
Site Name	THE CHRISTIE, MANCHESTER			Sample No.	5
Specimen Description	Brown silty fine to medium grained SAND			Depth, m	2.50
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	WET SIEVE			KeyLAB ID	



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	99		
0.6	99		
0.425	97		
0.3	77		
0.212	47		
0.15	25		
0.063	9		

Dry Mass of sample, g	728

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	91
Fines <0.063mm	9

Grading Analysis		
D_{100}	mm	
D_{60}	mm	
D_{30}	mm	
D_{10}	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

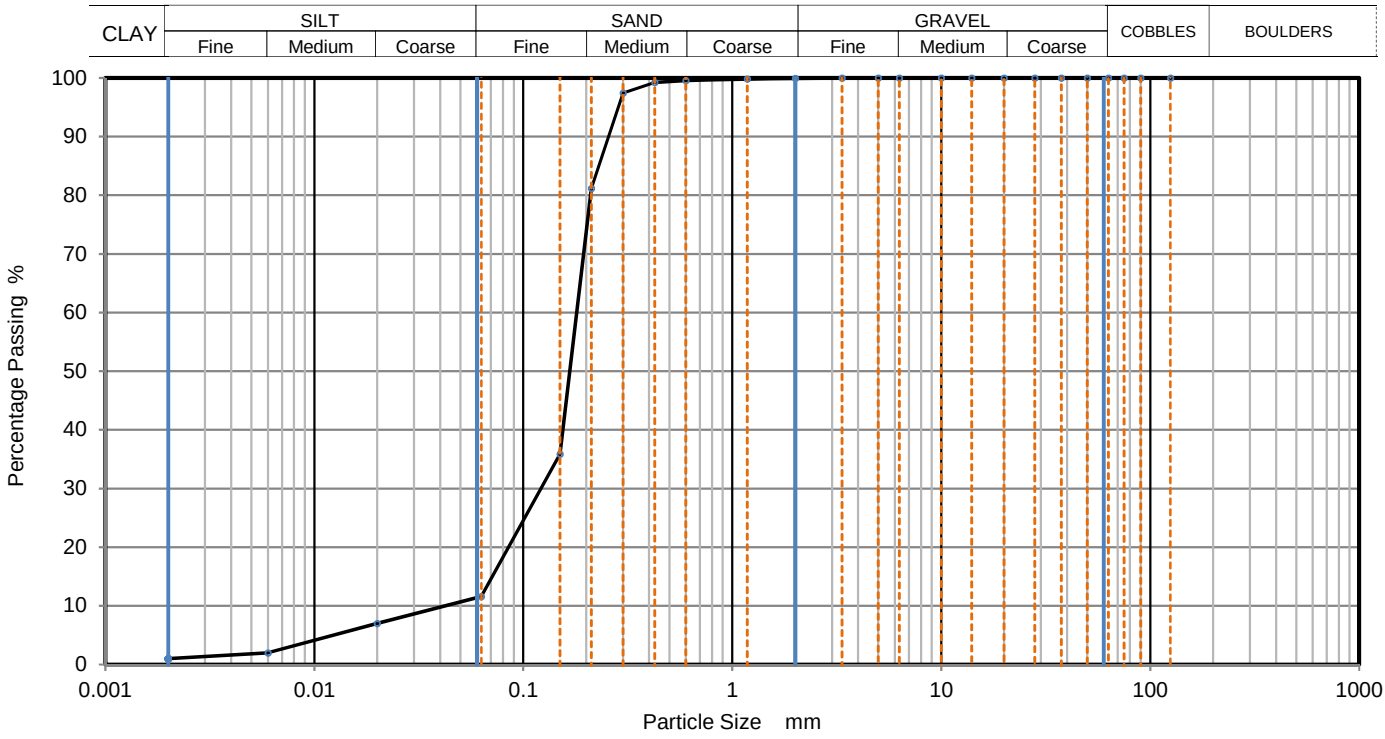
Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	Fig
MH	DK	DK	11/02/2019 10:35	Sheet

CC Geotechnical Ltd
Tel: 0151 545 2750
e: lab@ccgeotechnical.com

PARTICLE SIZE DISTRIBUTION

				Job Ref	CCG-C-18-10614
				Borehole/Pit No.	BH03
Site Name	THE CHRISTIE, MANCHESTER			Sample No.	7
Specimen Description	Brown silty slightly clayey fine to medium grained SAND			Depth, m	3.50
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	WET SIEVE & PIPETTE			KeyLAB ID	



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0200	7
90	100	0.0060	2
75	100	0.0020	1
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100		
0.425	99		
0.3	97		
0.212	81		
0.15	36		
0.063	12		

Dry Mass of sample, g	885

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	88
Silt	11
Clay	1

Grading Analysis		
D_{100}	mm	
D_{60}	mm	
D_{30}	mm	
D_{10}	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

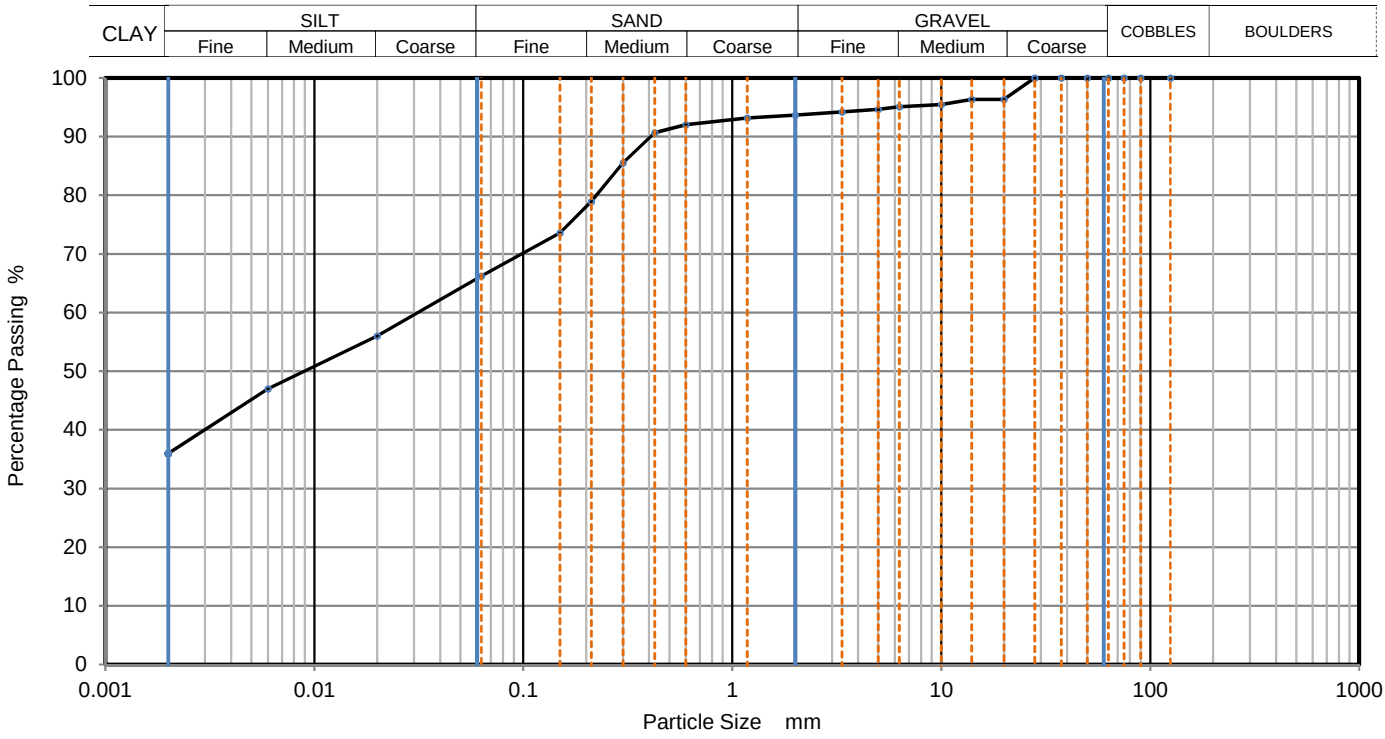
Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	Fig
MH	DK	DK	11/02/2019 10:46	Sheet

CC Geotechnical Ltd
Tel: 0151 545 2750
e: lab@ccgeotechnical.com

PARTICLE SIZE DISTRIBUTION

Job Ref	CCG-C-18-10614		
Borehole/Pit No.	BH04		
Site Name	THE CHRISTIE, MANCHESTER	Sample No.	4
Specimen Description	Brown slightly sandy slightly gravelly silty CLAY. Gravel is fine to coarse subrounded to subangular sandstone	Depth, m	2.00-2.45
Specimen Reference	Specimen Depth: m	Sample Type	B
Test Method	WET SIEVE & PIPETTE	KeyLAB ID	



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0200	56
90	100	0.0060	47
75	100	0.0020	36
63	100		
50	100		
37.5	100		
28	100		
20	96		
14	96		
10	95		
6.3	95		
5	95		
3.35	94		
2	94		
1.18	93		
0.6	92		
0.425	91		
0.3	86		
0.212	79		
0.15	74		
0.063	66		

Dry Mass of sample, g: 1481

Sample Proportions	% dry mass
Very coarse	0
Gravel	6
Sand	28
Silt	30
Clay	36

Grading Analysis	
D_{100} mm	
D_{60} mm	
D_{30} mm	
D_{10} mm	
Uniformity Coefficient	
Curvature Coefficient	

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	Fig
MH	DK	DK	11/02/2019 10:55	Sheet

POINT LOAD TEST RESULTS

ISRM 1985: Suggested Method

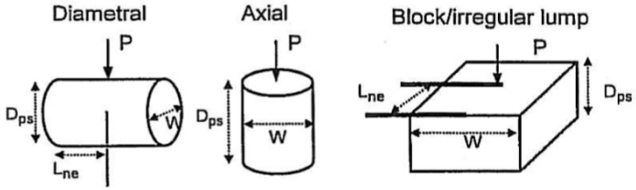
PROJECT No.:- CCG-C-18-10614 SITE:- TH E CHRISTIE, MANCHESTER DATE: 21.02.19

Borehole Number	Depth (m)	Type of Test* a	d	i	Width (W) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MPa)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MPa)	Estimated Uniaxial Compressive Strength (MPa)	Water Content (NAT/SAT)	Orientation to plane of weakness
BH01	6.60	a			85	74	1.50	89	0.19	1.30	0.24	4.87	NAT	p
BH01	9.15	a			85	55	1.30	77	0.22	1.22	0.27	5.31	NAT	p
BH01	9.45	a			85	44	1.20	69	0.25	1.16	0.29	5.83	NAT	p
BH01	11.85	a			85	68	1.40	86	0.19	1.27	0.24	4.85	NAT	p
BH01	15.60	a			85	80	1.20	93	0.14	1.32	0.18	3.67	NAT	p
BH01	15.85	a			85	53	1.40	76	0.24	1.21	0.29	5.88	NAT	p
BH01	19.60	a			85	67	1.80	85	0.25	1.27	0.32	6.31	NAT	p
BH01	19.60	a			85	80	2.00	93	0.23	1.32	0.31	6.11	NAT	p

*NOTE- a = axial ; d = diametral ; i = irregular lump or block (see diagrams, right, for details)
p = perpendicular; l = parallel, u = unkown

DIA. KEY- P = load ; Dps = platen seperation ;
W = width of shortest dimension perpendicular to load ;
Lne = length from platens to nearest free end

UKAS TESTING 4514



TESTED BY: JE APPROVED BY: DK

POINT LOAD TEST RESULTS

ISRM 1985: Suggested Method

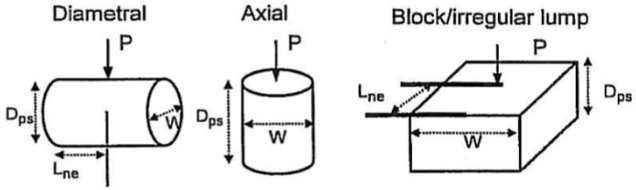
PROJECT No.:- CCG-C-18-10614 SITE:- TH E CHRISTIE, MANCHESTER DATE: 21.02.19

Borehole Number	Depth (m)	Type of Test* a	d	i	Width (W) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MPa)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MPa)	Estimated Uniaxial Compressive Strength (MPa)	Water Content (NAT/SAT)	Orientation to plane of weakness
BH02	6.40	a			85	65	0.70	84	0.10	1.26	0.13	2.51	NAT	p
BH02	10.00	a			85	62	0.80	82	0.12	1.25	0.15	2.98	NAT	p
BH02	11.70	a			85	47	0.80	71	0.16	1.17	0.18	3.69	NAT	p
BH02	14.55	a			85	54	0.90	76	0.15	1.21	0.19	3.73	NAT	p

*NOTE- a = axial ; d = diametral ; i = irregular lump or block (see diagrams, right, for details)
p = perpendicular; l = parallel, u = unkown

DIA. KEY- P = load ; Dps = platen seperation ;
W = width of shortest dimension perpendicular to load ;
Lne = length from platens to nearest free end

UKAS TESTING 4514



TESTED BY: JE APPROVED BY: DK

POINT LOAD TEST RESULTS

ISRM 1985: Suggested Method

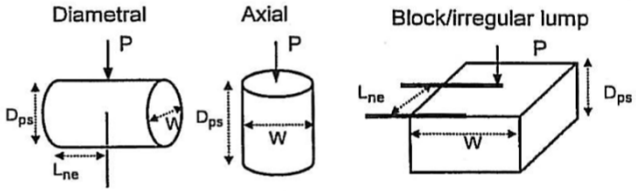
PROJECT No.:- CCG-C-18-10614 SITE:- TH E CHRISTIE, MANCHESTER DATE: 21.02.19

Borehole Number	Depth (m)	Type of Test* a	d	i	Width (W) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MPa)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MPa)	Estimated Uniaxial Compressive Strength (MPa)	Water Content (NAT/SAT)	Orientation to plane of weakness
BH03	8.20	a			85	63	0.80	83	0.12	1.25	0.15	2.94	NAT	p
BH03	11.90	a			85	58	0.30	79	0.05	1.23	0.06	1.18	NAT	p
BH03	23.75	a			85	47	0.40	71	0.08	1.17	0.09	1.85	NAT	p
BH03	23.45	a			85	54	0.90	76	0.15	1.21	0.19	3.73	NAT	p
BH03	14.90	a			85	63	0.70	83	0.10	1.25	0.13	2.57	NAT	p
BH03	20.50	a			85	51	0.70	74	0.13	1.20	0.15	3.03	NAT	p

*NOTE- a = axial ; d = diametral ; i = irregular lump or block (see diagrams, right, for details)
p = perpendicular; l = parallel, u = unkown

DIA. KEY- P = load ; Dps = platen seperation ;
W = width of shortest dimension perpendicular to load ;
Lne = length from platens to nearest free end

UKAS TESTING 4514



TESTED BY: JE APPROVED BY: DK

POINT LOAD TEST RESULTS

ISRM 1985: Suggested Method

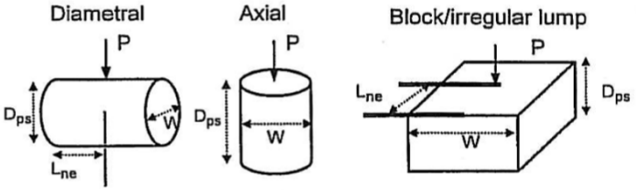
PROJECT No.:- CCG-C-18-10614 SITE:- TH E CHRISTIE, MANCHESTER DATE: 21.02.19

Borehole Number	Depth (m)	Type of Test* a	d	i	Width (W) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MPa)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MPa)	Estimated Uniaxial Compressive Strength (MPa)	Water Content (NAT/SAT)	Orientation to plane of weakness
BH04	6.30	a			85	62	1.10	82	0.16	1.25	0.20	4.09	NAT	p
BH04	8.45	a			85	58	0.90	79	0.14	1.23	0.18	3.53	NAT	p
BH04	12.45	a			85	43	0.30	68	0.06	1.15	0.07	1.48	NAT	p
BH04	12.30	a			85	63	0.40	83	0.06	1.25	0.07	1.47	NAT	p
BH04	16.20	a			85	78	1.60	92	0.19	1.31	0.25	4.98	NAT	p
BH04	16.70	a			85	55	1.10	77	0.18	1.22	0.22	4.49	NAT	p

*NOTE- a = axial ; d = diametral ; i = irregular lump or block (see diagrams, right, for details)
p = perpendicular; l = parallel, u = unkown

DIA. KEY- P = load ; Dps = platen seperation ;
W = width of shortest dimension perpendicular to load ;
Lne = length from platens to nearest free end

UKAS TESTING 4514



TESTED BY: JE APPROVED BY: DK

TEST REPORT

UNIAXIAL COMPRESSIVE STRENGTH

In accordance with ISRM Vol 16 No 2, pp 135-140 (1979)

PROJECT:	**THE CHRISTIE, MANCHESTER**
CLIENT:	**INTERSERVE**
CCG REF:	**CCG-C-18-10614**
Sample ref:	BH01 19.80mbgl
Date of coring:	24.01.19
Sampled by:	DB/AH
Sample description:	SANDSTONE

TEST DATA

Specimen Height (mm):	170
Specimen Diameter (mm):	85
L/D ratio:	2:1
Mode of failure:	AXIAL CLEAVAGE
Test duration:	4m 31s
Maximum load at failure (kN):	21.5
Compressive strength (N/mm2):	**3.8**

Test date:	25.02.19
Tested by:	**JE**
Report prepared by:	**DK**
Report approved by:	**DK**

SOIL ENGINEERING

TEST REPORT

UKAS TESTING 1265

Serial number: LT1792 Date of issue: 09/04/2019

Issued by Soil Engineering Geoservices Limited,
Parkside Lane,
Dewsbury Road,
Leeds
LS11 5SX.
Tel: 0113 2711111
Fax: 0113 2760472
Email: enquiries@soil-engineering.co.uk

Authorised signatory

P. Rodgers		(Technical Manager)
K. A. Walker		(Laboratory Manager)
S. Harper	√	(Laboratory Production Manager)

Customer name	CC Geotechnical Limited
Address	Units 1 & 2 Deltic Place Knowsley Industrial Estate Liverpool Merseyside L33 7BU
Contract name	The Christie, Manchester
Your reference	18/10614
Dates of receipt of samples	30/01/2019
Dates of testing	26/02/2019 to 20/03/2019

Sampling was not performed by the Laboratory of Soil Engineering.

Testing was performed on 6 number of samples received in good condition.

Opinions and interpretations expressed herein are outside the scope of our UKAS accreditation.

Results reported relate only to the samples tested.

Tests marked 'Not UKAS' in this report are not included in the UKAS accreditation schedule for our laboratory. These results will appear in italics on any summary of tests.

Samples will be retained for 28 days from date of issue of this report and then be disposed of, unless we receive written instruction to the contrary

This test report shall not be reproduced except in full without the written permission of Soil Engineering Geoservices Limited.

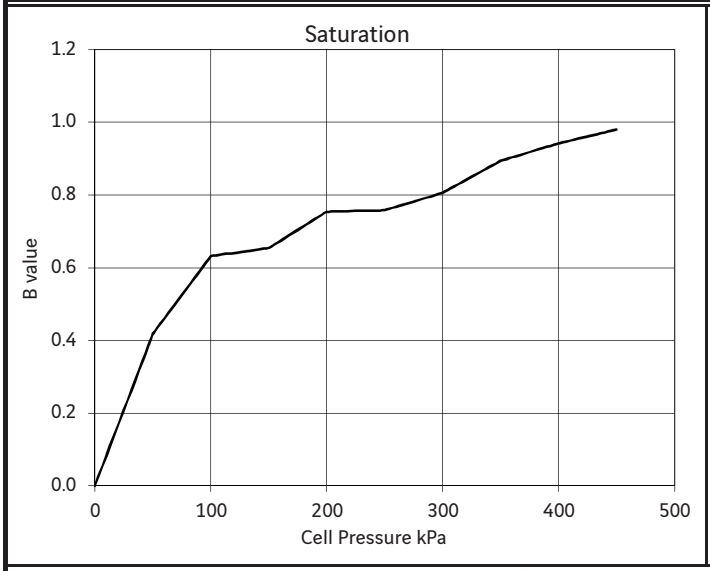
Key to Laboratory Summary Sheets

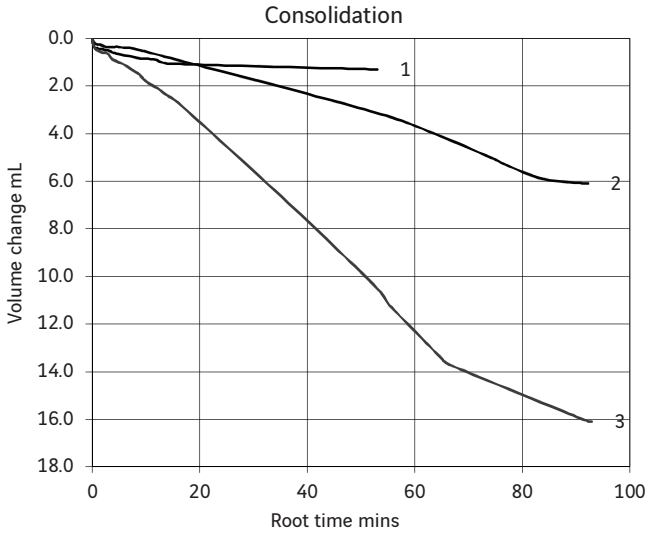
Common to all summaries				
Sample Type	U	Undisturbed sample	D	Small disturbed sample
	P	Piston sample	B	Bulk disturbed sample
	TW	Thin walled sample	BLK	Block sample
	L	Liner sample	C	Rock core
	AMAL	Amalgamated sample		
Test status	Any result in *italics* indicates a test that is not within the scope of the UKAS accreditation for this laboratory.			
Summary of Laboratory Soil Tests: Index / Classification Tests				
Particle density	p	Small pyknometer method	g	Gas jar method
Plastic index	N/P	Non plastic, although liquid limit will have been determined if requested		
Particle size (PSD)	1	Following value in silt column denotes combined clay and silt fraction		
	p	Following value in clay column denotes sedimentation by pipette, else sedimentation is by hydrometer.		
Summary of Laboratory Soil Tests: Strength and Permeability Tests				
Triaxial	UU	Single stage unconsolidated quick undrained	UUM	Multi stage unconsolidated quick undrained
	UU3	Set of 3 unconsolidated quick undrained	CU	Single stage consolidated undrained
	CUM	Multi stage consolidated undrained	CU3	Set of 3 consolidated undrained
	CD	Single stage consolidated drained	CDM	Multi stage consolidated drained
	CD3	Set of 3 consolidated drained		
	Note that single stage tests are reported assuming f = 0 for total stress and c' = 0 for effective stress			
Consol	Oed	One-dimensional oedometer	Hyd	Hydraulic cell consolidation
	m_v	coefficient of compressibility quoted for p0 to p0 + 100kPa, where determined		
Permeability	C	Constant head permeability	T	Triaxial permeability
Shearbox	SSB	Small shear box	LSB	Large shear box
	p	Peak value	r	Residual value
	RS	Ring shear		
Summary of Laboratory Soil Re-Use Test				
MCV	s	MCV value at natural or specified moisture content	int	Intercept of calibration line in MCV calibration
Summary of Laboratory Rock Strength Tests				
Point Load Type	D	Diametral	A	Axial
(Combination of)	I	Irregular lump	B	Block
	L	Test performed parallel to planes of weakness		
	P	Test performed perpendicular to planes of weakness		
	X	Invalid failure of point load (not broken between points of load application)		
Summary of Laboratory Rock Materials Tests				
Ten% fines	w	Soaked test	d	Dry test
Point Load Index Result				
Point Load Type	D	Diametral	A	Axial
(Combination of)	I	Irregular lump	B	Block
	L	Parallel to planes of weakness	P	Perpendicular to planes of weakness
	X	Invalid failure of point load (not broken between points of load application)		
Dimensions	W	Diameter of core or average smallest width perpendicular to axis of loading in a block or irregular lump		
	D	Distance between platens when just in contact with specimen		
	D'	Distance between platens at point of failure		
	De	Equivalent core diameter	Is	P/De^2
	Is(50)	F x Is	F	$(De/50)^{0.45}$
	Is(50) point load strength index corrected for a diametral test of core diameter 50mm			
	For Axial/Lump tests $De^2 = (4/Pi) \times (W \times D')$		For Diametral tests $De^2 = D \times D'$	

Important note: summary sheets are provided for convenience and in no way replace individual test result sheets which shall, without exception, be regarded as the definitive result.

Project Name	The Christie, Manchester	**Consolidated Undrained Triaxial Compression With Pore Water Pressure Measurement**	Hole ID BH04
Project No.	LT1792		Sample Depth 2.00m
Engineer	CCG		Sample Number
Employer	CC Geotechnical Ltd	In-House Method based on K H Head: Manual of Soils Testing, Vol 3	Sample Type U
Description	Reddish brown slighlty gravelly CLAY.		Specimen Depth 2.00m
			Specimen Number 1

SPECIMEN INITIAL DIMENSIONS				
Test number		1	2	3
Specimen diameter	mm	103.97	106.01	108.12
Specimen length	mm	171.63	164.94	158.15
Density	Mg/m^3	2.11	2.15	2.16
Moisture content	%	19	21	21
Dry density	Mg/m^3	1.78	1.78	1.79
SATURATION STAGE				
Initial pore water pressure	kPa	0.6		
Saturated pore water pressure	kPa	435.6		
Final cell pressure	kPa	450		
B value		0.98		
CONSOLIDATION STAGE				
Cell pressure	kPa	450	470	510
Back pressure	kPa	430	430	430
Effective cell pressure	kPa	20	40	80
Initial pore water pressure	kPa	0	438.4	463.8
Final pore water pressure	kPa	428.4	428.2	428.6
Pore pressure dissipation	%	99.6	121.4	104.1
c_{vi}	m^2/year	18.12	0.94	1.15
m_{vi}	m^2/MN	0.00	0.41	0.32
SPECIMEN AFTER CONSOLIDATION				
Density	Mg/m^3	2.15	2.16	2.17
Moisture content	%	21	21	20
Dry density	Mg/m^3	1.78	1.79	1.81





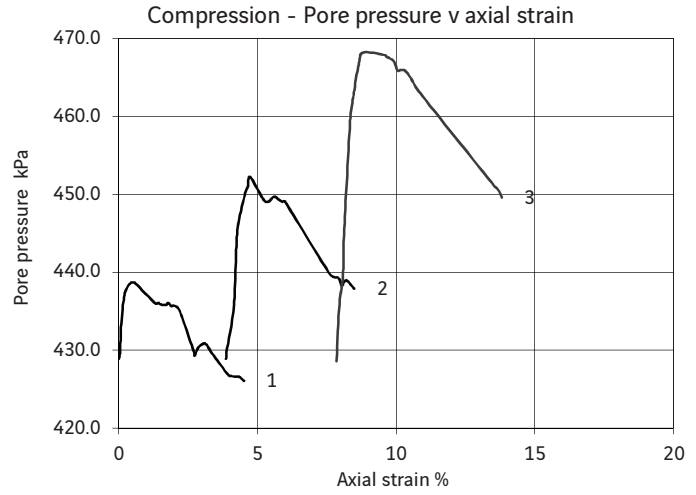
Remarks: Specimen orientation Vertical
Specimen condition for test Undisturbed
Saturation with 50kPa increments with a differential pressure of 10kPa
Drainage from both ends

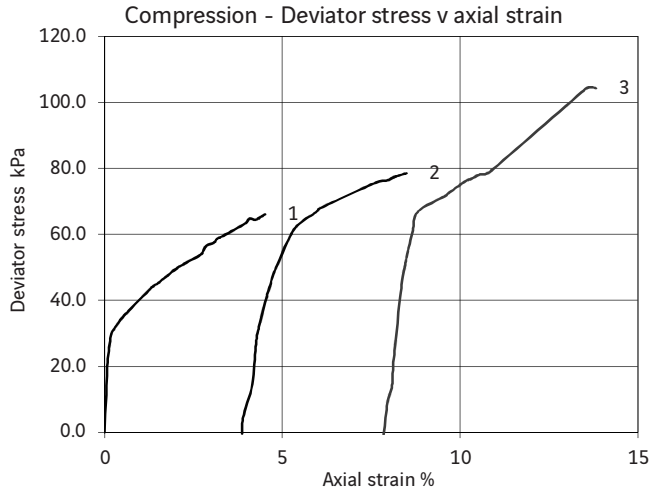
Approved by:	Leeds Laboratory		SOIL ENGINEERING
Steve Harper		Print date 22/03/2019	
	Revision No. 2.03	Issue Date 21/11/2012	Part of the Bachy Soletanche Group

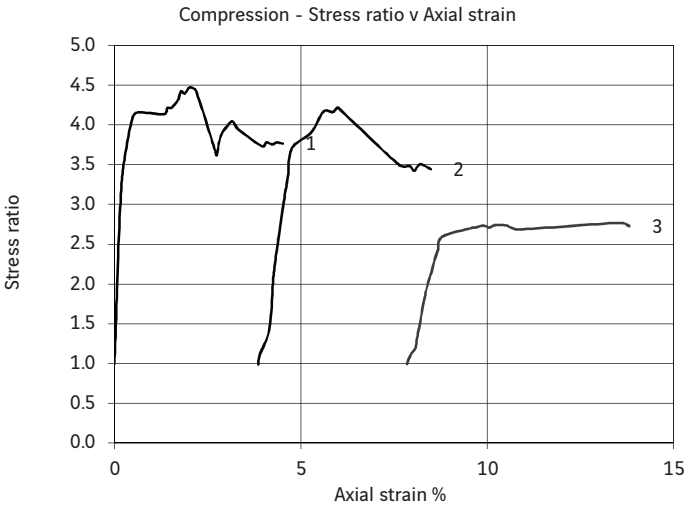
Project Name	The Christie, Manchester	**Consolidated Undrained Triaxial Compression With Pore Water Pressure Measurement**	Hole ID: BH04
Project No.	LT1792		Sample Depth: 2.00m
Engineer	CCG		Sample Number:
Employer	CC Geotechnical Ltd	In-House Method based on K H Head: Manual of Soils Testing, Vol 3	Sample Type: U
Description	Reddish brown slighlty gravelly CLAY.		Specimen Depth: 2.00m
			Specimen Number: 1

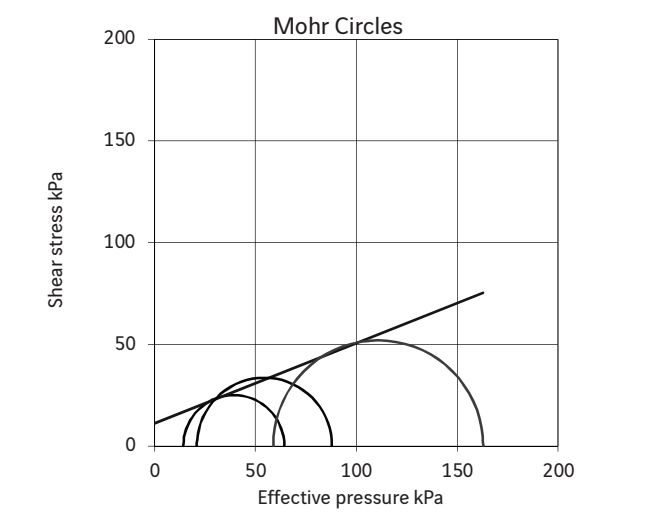
COMPRESSION STAGE					
Test number			1	2	3
Cell pressure		kPa	450	470	510
Initial pore water pressure		kPa	429	429	429
Initial effective pressure		kPa	20	40	80
Failure conditions at			Maximum stress ratio		
Axial strain at failure		%	2.0	6.0	13.5
Maximum deviator stress	$\sigma_1-\sigma_3$	kPa	50	67	104
Pore water pressure at failure	σ	kPa	436	449	451
Effective major principal stress	σ_1'	kPa	63.96	88.21	162.87
Effective minor principal stress	σ_3'	kPa	14.30	20.90	58.80
Effective principal stress ratio			4.47	4.22	2.77
Membrane correction		kPa	0.20	0.52	0.99
Filter drain correction not applicable		kPa	0.0	0.0	0.0
Pore pressure coefficient			0.15	0.31	0.22

SHEAR STRENGTH PARAMETERS	c'	11	kPa	φ'	21.5	°





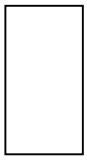




Approved by:	Leeds Laboratory		
Steve Harper		Print date 22/03/2019	SOIL ENGINEERING
	Revision No. 2.03	Issue Date 21/11/2012	Part of the Bachy Soletanche Group

Project Name	The Christie, Manchester	**Consolidated Undrained Triaxial Compression With Pore Water Pressure Measurement**	Hole ID: BH04
Project No.	LT1792		Sample Depth: 2.00m
Engineer	CCG		Sample Number:
Employer	CC Geotechnical Ltd	In-House Method based on K H Head: Manual of Soils Testing, Vol 3	Sample Type: U
Description	Reddish brown slighlty gravelly CLAY.		Specimen Depth: 2.00m
			Specimen Number: 1

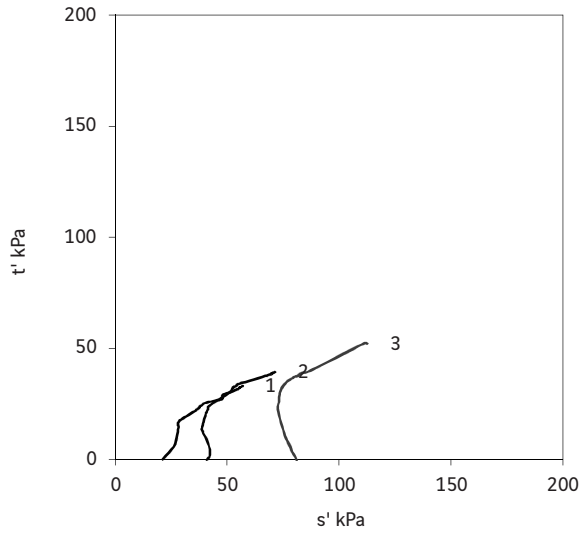
SPECIMEN AFTER TEST

Test number		1		
Mode of failure		Compound 		
Final moisture content	%	21	21	20
Final bulk density	Mg/m^3	2.15	2.16	2.17
Final dry density	Mg/m^3	1.78	1.79	1.81

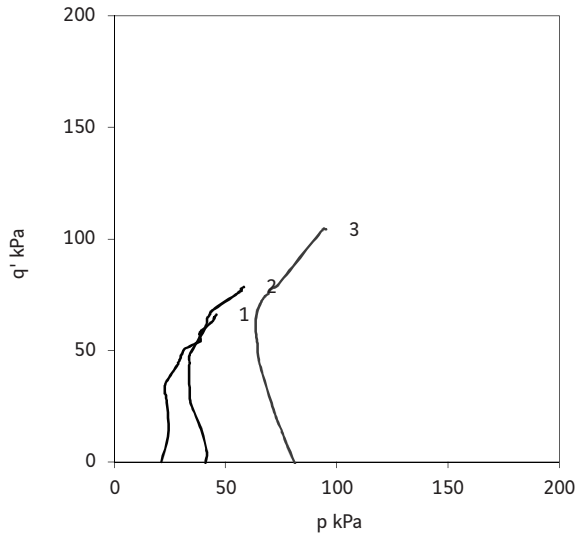
ADDITIONAL SPECIMEN DETAILS

Rate of strain	%/hour	0.16	0.25	0.25
Failure criterion		Maximum stress ratio		

MIT Stress field



Cambridge Stress field



REMARKS

Approved by:	Leeds Laboratory		SOIL ENGINEERING
Steve Harper		Print date 22/03/2019	
	Revision No. 2.03	Issue Date 21/11/2012	Part of the Bachy Soletanche Group

Project Name	The Christie, Manchester
Project No.	LT1792
Engineer	CC Geotechnical
Employer	CC Geotechnical

Summary Of Laboratory Rock Strength Tests

Hole ID	Sample depth m	Sample no.	Sample type	Specimen depth m	Specimen no.	Water Content	Bulk Density	Dry Density	Particle density	Point load			UCS	Brazil	Porosity	Elastic Modulus	Posissons Ratio
										Type	Is	Is50					
						%	kg/m³	kg/m³	Mg/m³		MN/m²	MN/m²	MN/m²	MN/m²	%	GPa	
BH1	9.25		C	9.25	02	13.2	2130	1880					9.39				
BH1	15.80		C	15.80	01	16.1	2130	1830					9.89			3.74 Ave	0.25
BH3	23.55		C	23.55	01	14	2170	1910					1.25			1.09 Ave	0.26
BH4	12.40		C	12.40	01	11.8	2250	2010					5.65			0.52 Ave	0.32
BH4	16.40		C	16.40	02	11.7	2200	1970					13				

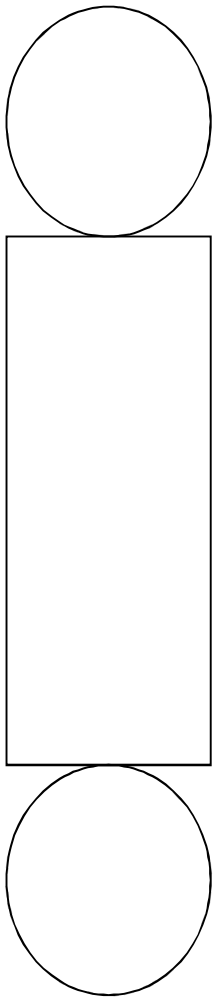
Approved by:	Leeds Laboratory		
Kevin Walker		Print date 09/04/2019	SOIL ENGINEERING
Revision No. 2.03	Issue Date 20/11/2012		Part of the Bachy Soletanche Group

Project Name	The Christie, Manchester	**Uniaxial Compressive Strength**	Hole ID BH1
Project No.	LT1792		Sample Depth 9.25m
Engineer	CC Geotechnical		Sample Number
Employer	CC Geotechnical	I.S.R.M. Suggested Methods 2007 for Determination of Uniaxial Compressive Strength Part 1	Sample Type C
Description	Thinly laminated brown SANDSTONE.		Specimen Depth 9.25m
			Specimen Number 2

Date and method of sampling	Not supplied
Storage history and environment	Not recorded

Sample details				Mean
Length	mm	179.94	179.55	179.7
Diameter (top)	mm	86.15	86.25	86.3
Diameter (middle)	mm	86.57	86.34	Length/diameter ratio
Diameter (base)	mm	86.40	86.20	2.1
Area	mm2	5849.4		
Mass	g	2233.76		
Test details				
Test duration	min	03:49		
Failure load	kN	54.9		
Stress rate	kN/min	14.4		
U.C.S.	MPa	9.39		
Mode of failure		Shear		
Loading axis relative to anisotropy		72 DEG TO BEDDING		
Machine type used in test		Controls 1300 / Automax 5		
Date of test		26/02/2019		
Additional specimen details				
Moisture content	%	13.2		
Bulk density	kg/m3	2130		
Dry density	kg/m3	1880		

Failure sketch



Test Remarks

Tested on specimen with length to diameter ratio outside 2.5-3.0 recommendation.

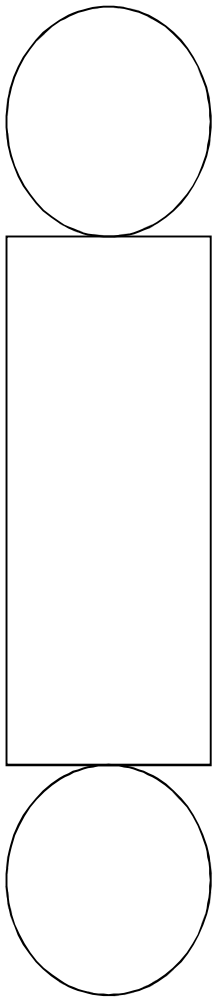
Specimen Remarks

Project Name	The Christie, Manchester	**Uniaxial Compressive Strength**	Hole ID BH4
Project No.	LT1792		Sample Depth 16.40m
Engineer	CC Geotechnical		Sample Number
Employer	CC Geotechnical	I.S.R.M. Suggested Methods 2007 for Determination of Uniaxial Compressive Strength Part 1	Sample Type C
Description	Thinly laminated brown SANDSTONE.		Specimen Depth 16.40m
			Specimen Number 2

Date and method of sampling	Not supplied
Storage history and environment	Not recorded

Sample details				Mean
Length	mm	240.36	240.06	240.2
Diameter (top)	mm	86.42	86.52	86.3
Diameter (middle)	mm	86.05	85.91	Length/diameter ratio
Diameter (base)	mm	86.54	86.11	2.8
Area	mm2	5849.4		
Mass	g	3092.3		
Test details				
Test duration	min	10:17		
Failure load	kN	76.0		
Stress rate	kN/min	7.4		
U.C.S.	MPa	13		
Mode of failure		Irregular		
Loading axis relative to anisotropy				
Machine type used in test		Controls 1300 / Automax 5		
Date of test		26/02/2019		
Additional specimen details				
Moisture content	%	11.7		
Bulk density	kg/m3	2200		
Dry density	kg/m3	1970		

Failure sketch



Test Remarks

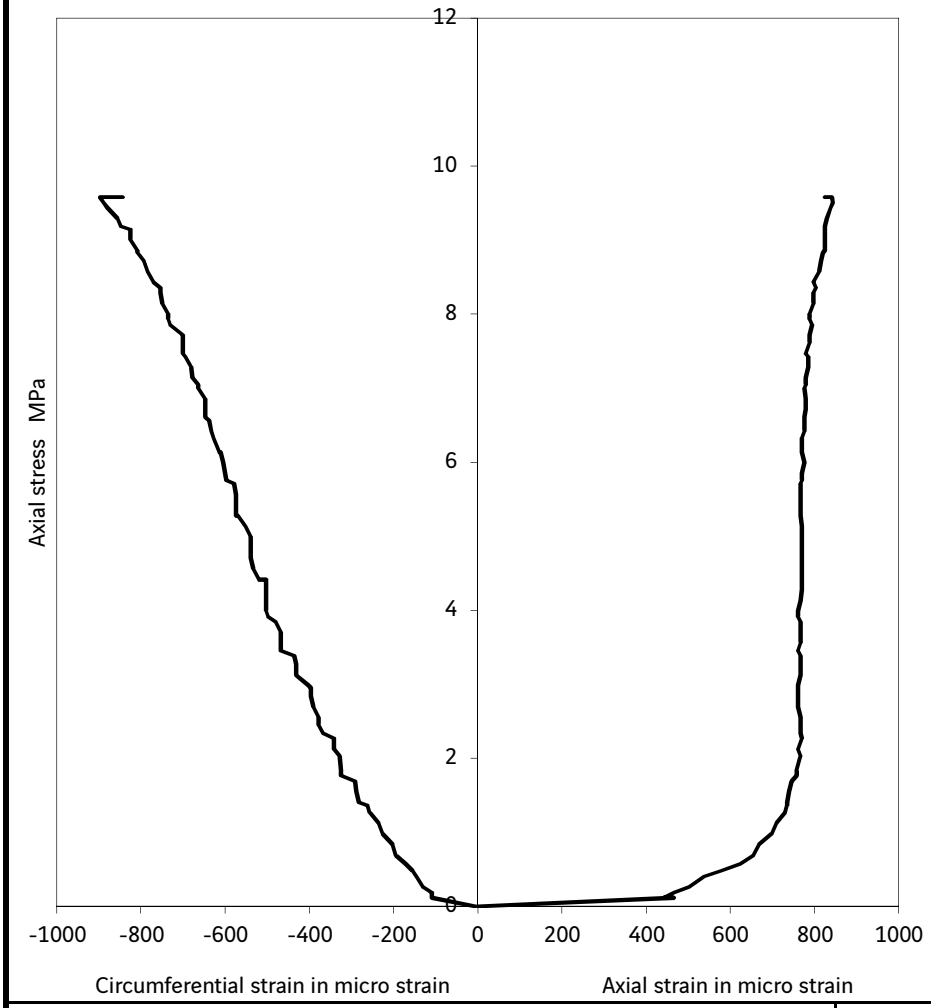
Specimen Remarks

Approved by:	Leeds Laboratory		
Kevin Walker		Print date 09/04/2019	SOIL ENGINEERING
	Revision No. 2.06	Issue Date 20/11/2012	Part of the Bachy Soletanche Group

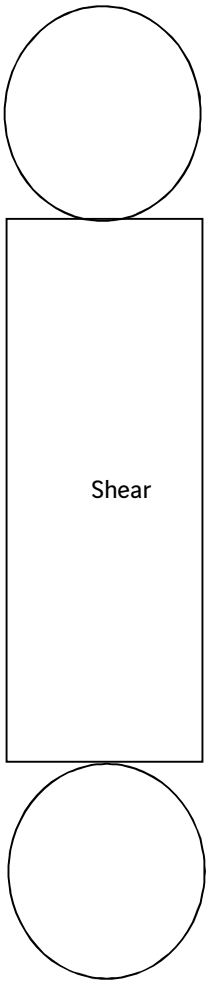
Project Name	The Christie, Manchester	**Unconfined Compressive Strength With Youngs Modulus And Poissons Ratio**	Hole ID BH1
Project No.	LT1792		Sample Depth 15.80m
Engineer	CC Geotechnical		Sample Number
Employer	CC Geotechnical	I.S.R.M. Suggested methods 1981	Sample Type C
Description	Thinly laminated brown SANDSTONE.		Specimen Depth 15.80m
			Specimen Number 1

Date and method of sampling	Details not supplied
Storage history and environment	Details not supplied

Graph of stress strain curves



Failure sketch



Moisture content	%	16.1	Stress rate	MPa/s	0.02	Tangent modulus	Et	280	GPa	50 % stress
Length	mm	194.51	Test duration	min	07:39	Average modulus	Eave	3.74	GPa	0.9-12 % stress
Diameter	mm	85.37	U.C.S.	MPa	9.89	Secant modulus	Esec	15.3	GPa	0-50 % stress
Mass	g	2367.01	Type of machine	Controls 1300 / Automax 5		Poissons ratio	v	0.247		
Bulk density	kg/m3	2130				(Determined using Average modulus)				
Dry density	kg/m3	1830								
Date		26/02/2019								

Test remarks: Loading axis relative to anisotropy: 70deg to bedding
Tested on specimen with length to diameter ratio outside 2.5-3.0 recommendation.

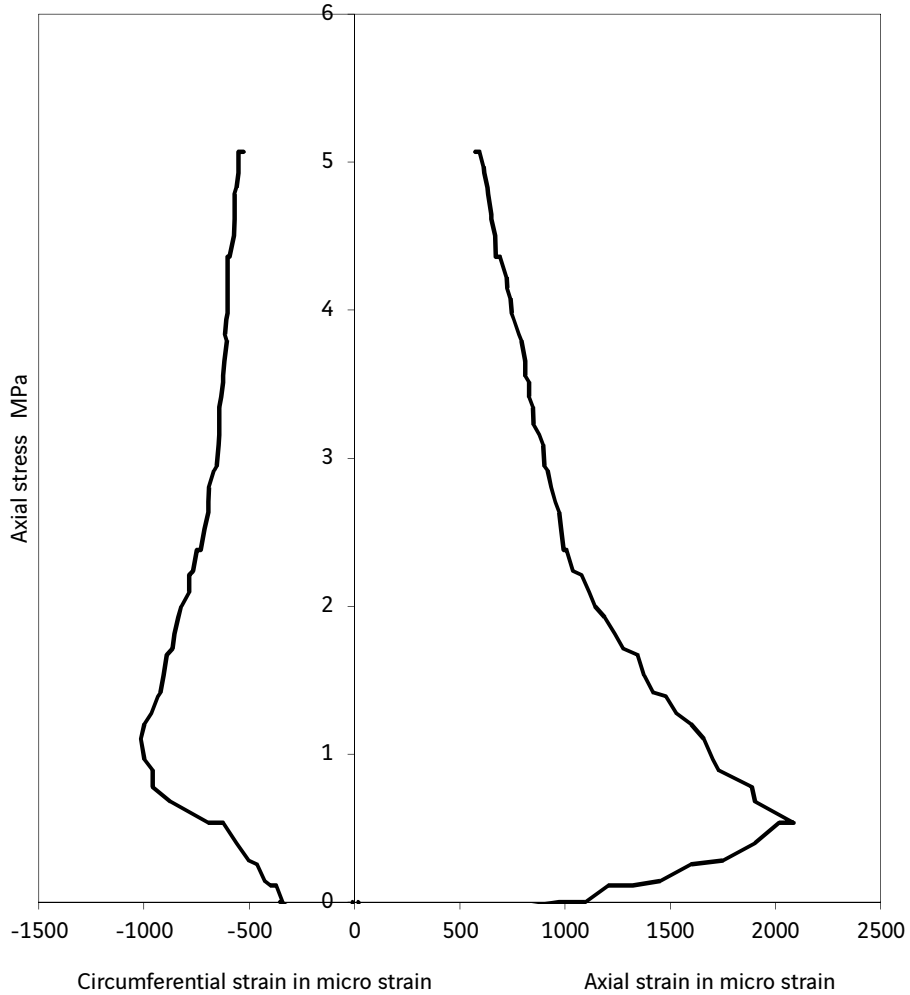
Specimen remarks:

Approved by: Ian Linton	Leeds Laboratory	Print date 09/04/2019	SOIL ENGINEERING Part of the Bachy Soletanche Group
	Revision No. 2.06	Issue Date 20/11/2012	

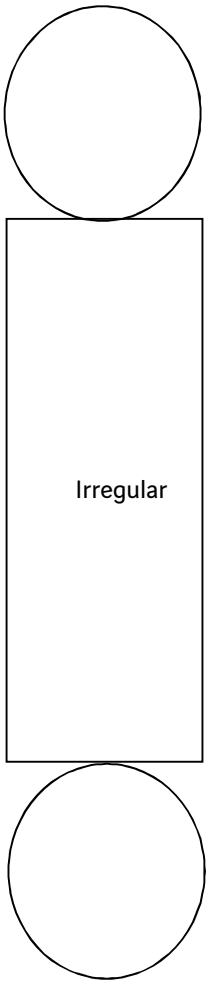
Project Name	The Christie, Manchester	**Unconfined Compressive Strength With Youngs Modulus And Poissons Ratio**	Hole ID BH3
Project No.	LT1792		Sample Depth 23.55m
Engineer	CC Geotechnical		Sample Number
Employer	CC Geotechnical	I.S.R.M. Suggested methods 1981	Sample Type C
Description	Thinly laminated brown SANDSTONE.		Specimen Depth 23.55m
			Specimen Number 1

Date and method of sampling	Details not supplied
Storage history and environment	Details not supplied

Graph of stress strain curves



Failure sketch



Moisture content	%	14	Stress rate	MPa/s	0.01	Tangent modulus	Et	1.09	GPa	50 % stress
Length	mm	216.65	Test duration	min	01:41	Average modulus	Eave	1.09	GPa	12-93 % stress
Diameter	mm	85.91	U.C.S.	MPa	1.25	Secant modulus	Esec	1.19	GPa	0-50 % stress
Mass	g	2730.40	Type of machine	Controls 1300 / Automax 5		Poissons ratio	v	0.258		
Bulk density	kg/m3	2170				(Determined using Average modulus)				
Dry density	kg/m3	1910								
Date		26/02/2019								

Test remarks: Loading axis relative to anisotropy: 70deg to bedding

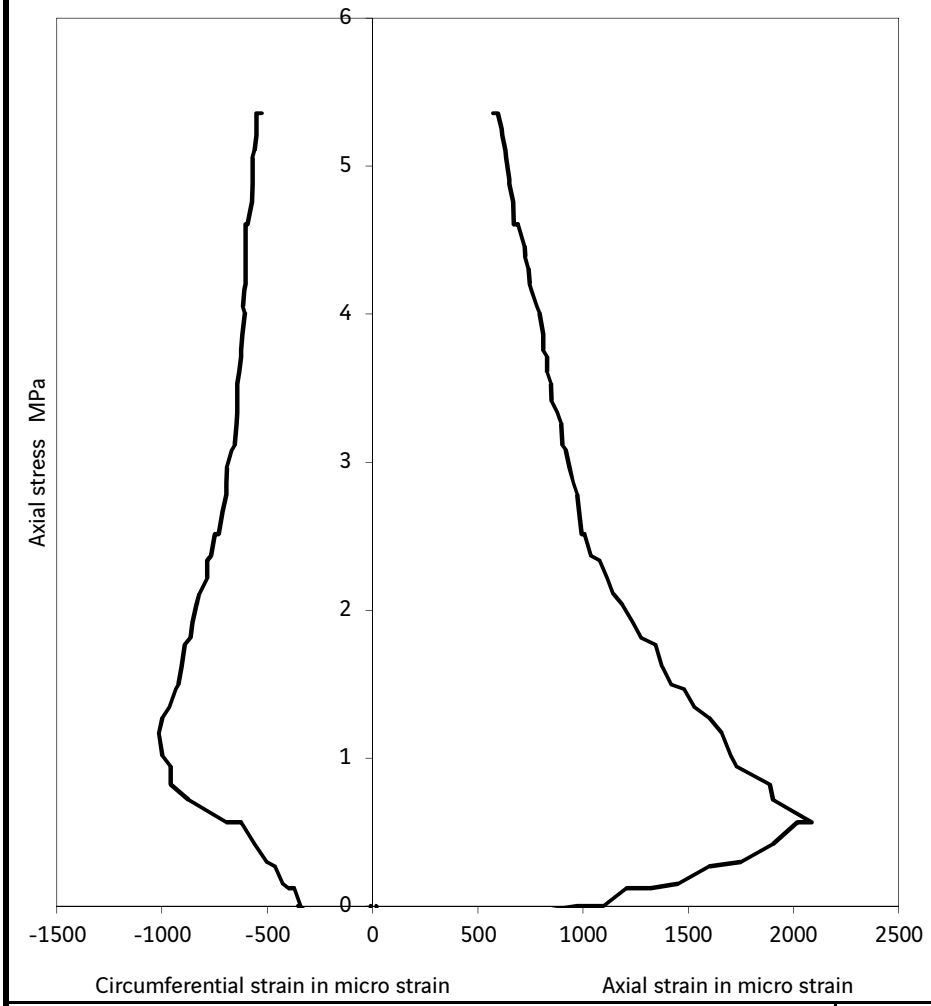
Specimen remarks:

Approved by:	Leeds Laboratory		
Ian Linton		Print date 09/04/2019	SOIL ENGINEERING
	Revision No. 2.06	Issue Date 20/11/2012	Part of the Bachy Soletanche Group

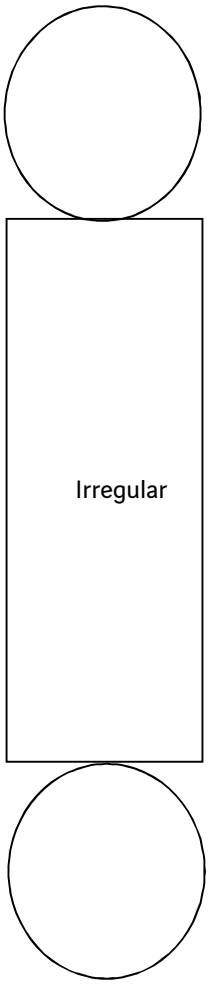
Project Name	The Christie, Manchester	**Unconfined Compressive Strength With Youngs Modulus And Poissons Ratio**	Hole ID BH4
Project No.	LT1792		Sample Depth 12.40m
Engineer	CC Geotechnical		Sample Number
Employer	CC Geotechnical	I.S.R.M. Suggested methods 1981	Sample Type C
Description	Thinly laminated brown SANDSTONE.		Specimen Depth 12.40m
			Specimen Number 1

Date and method of sampling	Details not supplied
Storage history and environment	Details not supplied

Graph of stress strain curves



Failure sketch



Moisture content	%	11.8	Stress rate	MPa/s	0.02	Tangent modulus	Et	4.18	GPa	50 % stress
Length	mm	169.71	Test duration	min	05:50	Average modulus	Eave	0.520	GPa	0-8 % stress
Diameter	mm	83.58	U.C.S.	MPa	5.65	Secant modulus	Esec	2.77	GPa	0-50 % stress
Mass	g	2092.43	Type of machine	Controls 1300 / Automax 5		Poissons ratio	v	0.324		
Bulk density	kg/m3	2250				(Determined using Average modulus)				
Dry density	kg/m3	2010								
Date		26/02/2019								

Test remarks: Loading axis relative to anisotropy: 74deg to bedding
Tested on specimen with length to diameter ratio outside 2.5-3.0 recommendation.

Specimen remarks:

Approved by: Ian Linton	Leeds Laboratory	Print date 09/04/2019	SOIL ENGINEERING Part of the Bachy Soletanche Group
	Revision No. 2.06	Issue Date 20/11/2012	

APPENDIX H

CHEMICAL TEST CERTIFICATES

Unit A2
Windmill Road
Ponswood Industrial Estate
St Leonards on Sea
East Sussex
TN38 9BY
Telephone: (01424) 718618

cs@elab-uk.co.uk
info@elab-uk.co.uk

2683

THE ENVIRONMENTAL LABORATORY LTD

Analytical Report Number:	19-21453
Issue:	1
Date of Issue:	29/01/2019
Contact:	Daniel O'Regan
Customer Details:	CC Geotechnical Ltd Unit 1 & 2 Deltic Place Deltic Way Liverpool Merseyside L33 7BA
Quotation No:	Q14-00045
Order No:	Not Supplied
Customer Reference:	CCG-C-18-10614
Date Received:	21/01/2019
Date Approved:	29/01/2019
Details:	The Christie Hospital, Manchester
Approved by:	[redacted]

John Wilson, Operations Manager

Any comments, opinions or interpretations expressed herein are outside the scope of UKAS accreditation (Accreditation Number 2683)

Sample Summary

Report No.: 19-21453

Elab No.	Client's Ref.	Date Sampled	Date Scheduled	Description	Deviations
163214	TP1 0.30	17/01/2019	23/01/2019	Silty loam	
163215	TP1 0.50	17/01/2019	23/01/2019		
163216	TP1 1.00	17/01/2019	23/01/2019	Sandy silty loam	
163217	TP2 0.30	17/01/2019	23/01/2019	Sandy silty loam	
163218	TP2 0.50	17/01/2019	23/01/2019	Sandy silty loam	
163219	TP2 1.00	17/01/2019	23/01/2019		
163220	TP3 0.30	17/01/2019	23/01/2019		
163221	TP3 0.50	17/01/2019	23/01/2019	Sandy silty loam	
163222	TP3 1.00	17/01/2019	23/01/2019	Sandy silty loam	

Results Summary

Report No.: 19-21453

			ELAB Reference	163214	163216	163217	163218	163221	163222
			Customer Reference						
			Sample ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sample Location	TP1	TP1	TP2	TP2	TP3	TP3
			Sample Depth (m)	0.30	1.00	0.30	0.50	0.50	1.00
			Sampling Date	17/01/2019	17/01/2019	17/01/2019	17/01/2019	17/01/2019	17/01/2019
Determinand	**Codes**	**Units**	**LOD**						
Metals									
Antimony	N	mg/kg	2.5	n/t	< 2.5	n/t	3.6	< 2.5	n/t
Arsenic	M	mg/kg	1	n/t	7.7	n/t	37.0	18.5	n/t
Beryllium	U	mg/kg	1	n/t	< 1.0	n/t	1.1	1.1	n/t
Cadmium	M	mg/kg	0.5	n/t	< 0.5	n/t	< 0.5	< 0.5	n/t
Chromium	M	mg/kg	5	n/t	16.0	n/t	18.2	20.2	n/t
Copper	M	mg/kg	5	n/t	25.4	n/t	59.9	44.7	n/t
Lead	M	mg/kg	5	n/t	47.6	n/t	181	185	n/t
Mercury	M	mg/kg	0.5	n/t	< 0.5	n/t	0.7	< 0.5	n/t
Nickel	M	mg/kg	5	n/t	15.0	n/t	19.6	22.5	n/t
Selenium	M	mg/kg	1	n/t	< 1.0	n/t	< 1.0	< 1.0	n/t
Vanadium	M	mg/kg	5	n/t	22.1	n/t	27.1	27.1	n/t
Zinc	M	mg/kg	5	n/t	55.7	n/t	138	81.1	n/t
Anions									
Water Soluble Sulphate	M	g/l	0.02	< 0.02	n/t	< 0.02	n/t	n/t	< 0.02
Inorganics									
Hexavalent Chromium	N	mg/kg	0.8	n/t	< 0.8	n/t	< 0.8	< 0.8	n/t
Total Cyanide	M	mg/kg	1	n/t	< 1.0	n/t	< 1.0	< 1.0	n/t
Water Soluble Boron	N	mg/kg	0.5	n/t	0.6	n/t	< 0.5	< 0.5	n/t
Miscellaneous									
pH	M	pH units	0.1	7.6	7.9	7.8	7.7	7.9	8.0
Total Organic Carbon	N	%	0.01	n/t	0.74	n/t	1.2	1.6	n/t
Phenols									
Total Phenols	N	mg/kg	6	n/t	< 6	n/t	< 6	< 6	n/t

Tests marked N are not UKAS accredited.

Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonards on Sea, East Sussex, TN38 9BY
Tel: +44 (0)1424 718618, Email: info@elab-uk.co.uk, Web: www.elab-uk.co.uk

Results Summary

Report No.: 19-21453

Asbestos Results

Analytical result only applies to the sample as submitted by the client. Any comments, opinions or interpretations (marked #)
in this report are outside UKAS accreditation (Accreditation No2683). They are subjective comments only which must be verified by the client.

Elab No	Depth (m)	Clients Reference	Description of Sample Matrix #	Asbestos Identification	Gravimetric Analysis Total (%)	Gravimetric Analysis by ACM Type (%)	Free Fibre Analysis (%)	Total Asbestos (%)
163215	0.50	TP1	Brown sandy soil, brick, stones	No asbestos detected	n/t	n/t	n/t	n/t
163219	1.00	TP2	Brown soil, stones, clinker	No asbestos detected	n/t	n/t	n/t	n/t
163220	0.30	TP3	Brown soil, stones, clinker	No asbestos detected	n/t	n/t	n/t	n/t

Method Summary

Report No.: 19-21453

Parameter	Codes	Analysis Undertaken On	Date Tested	Method Number	Technique
Soil					
Hexavalent chromium	N	As submitted sample	25/01/2019	110	Colorimetry
pH	M	Air dried sample	28/01/2019	113	Electromeric
Aqua regia extractable metals	M	Air dried sample	25/01/2019	118	ICPMS
Phenols in solids	N	As submitted sample	25/01/2019	121	HPLC
Water soluble anions	M	Air dried sample	25/01/2019	172	Ion Chromatography
Water soluble boron	N	Air dried sample	25/01/2019	202	Colorimetry
Total cyanide	M	As submitted sample	28/01/2019	204	Colorimetry
Total organic carbon/Total sulphur	N	Air dried sample	28/01/2019	210	IR
Asbestos identification	U	Air dried sample	28/01/2019	PMAN	Microscopy

Tests marked N are not UKAS accredited

Report Information

Report No.: 19-21453

Key

U	hold UKAS accreditation
M	hold MCERTS and UKAS accreditation
N	do not currently hold UKAS accreditation
^	MCERTS accreditation not applicable for sample matrix
*	UKAS accreditation not applicable for sample matrix
S	Subcontracted to approved laboratory UKAS Accredited for the test
SM	Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test
NS	Subcontracted to approved laboratory. UKAS accreditation is not applicable.
I/S	Insufficient Sample
U/S	Unsuitable sample
n/t	Not tested
<	means "less than"
>	means "greater than"

Soil sample results are expressed on an air dried basis (dried at < 30°C)
ELAB are unable to provide an interpretation or opinion on the content of this report.
The results relate only to the items tested
PCB congener results may include any coeluting PCBs
Uncertainty of measurement for the determinands tested are available upon request

Deviation Codes

a	No date of sampling supplied
b	No time of sampling supplied (Waters Only)
c	Sample not received in appropriate containers
d	Sample not received in cooled condition
e	The container has been incorrectly filled
f	Sample age exceeds stability time (sampling to receipt)
g	Sample age exceeds stability time (sampling to analysis)

Where a sample has a deviation code, the applicable test result may be invalid.

Sample Retention and Disposal

All soil samples will be retained for a period of one month
All water samples will be retained for 7 days following the date of the test report
Charges may apply to extended sample storage

Unit A2
Windmill Road
Ponswood Industrial Estate
St Leonards on Sea
East Sussex
TN38 9BY
Telephone: (01424) 718618

cs@elab-uk.co.uk
info@elab-uk.co.uk

2683

THE ENVIRONMENTAL LABORATORY LTD

Analytical Report Number:	19-21472
Issue:	1
Date of Issue:	29/01/2019
Contact:	Daniel O'Regan
Customer Details:	CC Geotechnical Ltd Unit 1 & 2 Deltic Place Deltic Way Liverpool Merseyside L33 7BA
Quotation No:	Q14-00045
Order No:	Not Supplied
Customer Reference:	CCG-C-18-10614
Date Received:	24/01/2019
Date Approved:	29/01/2019
Details:	The Christie Hospital, Manchester
Approved by:	[redacted]

John Wilson, Operations Manager

Any comments, opinions or interpretations expressed herein are outside the scope of UKAS accreditation (Accreditation Number 2683)

Sample Summary

Report No.: 19-21472

Elab No.	Client's Ref.	Date Sampled	Date Scheduled	Description	Deviations
163321	WS1 0.20	17/01/2019	24/01/2019	Sandy silty loam	
163322	WS1 0.50	17/01/2019	24/01/2019		

Results Summary

Report No.: 19-21472

ELAB Reference	163321
Customer Reference	
Sample ID	
Sample Type	SOIL
Sample Location	WS1
Sample Depth (m)	0.20
Sampling Date	17/01/2019

Determinand	Codes	Units	LOD	
Anions				
Water Soluble Sulphate	M	g/l	0.02	0.05
Miscellaneous				
pH	M	pH units	0.1	8.3

2683

Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonards on Sea, East Sussex, TN38 9BY
Tel: +44 (0)1424 718618, Email: info@elab-uk.co.uk, Web: www.elab-uk.co.uk

Results Summary

Report No.: 19-21472

Asbestos Results

Analytical result only applies to the sample as submitted by the client. Any comments, opinions or interpretations (marked #)
in this report are outside UKAS accreditation (Accreditation No2683). They are subjective comments only which must be verified by the client.

Elab No	Depth (m)	Clients Reference	Description of Sample Matrix #	Asbestos Identification	Gravimetric Analysis Total (%)	Gravimetric Analysis by ACM Type (%)	Free Fibre Analysis (%)	Total Asbestos (%)
163322	0.50	WS1	Brown sandy soil, stones, concrete,	No asbestos detected	n/t	n/t	n/t	n/t

Method Summary

Report No.: 19-21472

Parameter	Codes	Analysis Undertaken On	Date Tested	Method Number	Technique
Soil					
pH	M	Air dried sample	28/01/2019	113	Electromeric
Water soluble anions	M	Air dried sample	25/01/2019	172	Ion Chromatography
Asbestos identification	U	Air dried sample	25/01/2019	PMAN	Microscopy

Report Information

Report No.: 19-21472

Key

U	hold UKAS accreditation
M	hold MCERTS and UKAS accreditation
N	do not currently hold UKAS accreditation
^	MCERTS accreditation not applicable for sample matrix
*	UKAS accreditation not applicable for sample matrix
S	Subcontracted to approved laboratory UKAS Accredited for the test
SM	Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test
NS	Subcontracted to approved laboratory. UKAS accreditation is not applicable.
I/S	Insufficient Sample
U/S	Unsuitable sample
n/t	Not tested
<	means "less than"
>	means "greater than"

Soil sample results are expressed on an air dried basis (dried at < 30°C)
ELAB are unable to provide an interpretation or opinion on the content of this report.
The results relate only to the items tested
PCB congener results may include any coeluting PCBs
Uncertainty of measurement for the determinands tested are available upon request

Deviation Codes

a	No date of sampling supplied
b	No time of sampling supplied (Waters Only)
c	Sample not received in appropriate containers
d	Sample not received in cooled condition
e	The container has been incorrectly filled
f	Sample age exceeds stability time (sampling to receipt)
g	Sample age exceeds stability time (sampling to analysis)

Where a sample has a deviation code, the applicable test result may be invalid.

Sample Retention and Disposal

All soil samples will be retained for a period of one month
All water samples will be retained for 7 days following the date of the test report
Charges may apply to extended sample storage

Unit A2
Windmill Road
Ponswood Industrial Estate
St Leonards on Sea
East Sussex
TN38 9BY
Telephone: (01424) 718618

cs@elab-uk.co.uk
info@elab-uk.co.uk

2683

THE ENVIRONMENTAL LABORATORY LTD

Analytical Report Number:	19-21509
Issue:	2. Replaces Analytical Report number 19-21509; issue no.1
Date of Issue:	30/01/2019
Contact:	Daniel O'Regan
Customer Details:	CC Geotechnical Ltd Unit 1 & 2 Deltic Place Deltic Way Liverpool Merseyside L33 7BA
Quotation No:	Q14-00045
Order No:	Not Supplied
Customer Reference:	CCG-C-18-10614
Date Received:	28/01/2019
Date Approved:	30/01/2019
Details:	The Christie Hospital, Manchester

Approved by:

John Wilson, Operations Ma [redacted]

Any comments, opinions or interpretations expressed herein are outside the scope of UKAS accreditation (Accreditation Number 2683)

Sample Summary

Report No.: 19-21509

Elab No.	Client's Ref.	Date Sampled	Date Scheduled	Description	Deviations
163572	BH04 0.50	21/01/2019	28/01/2019		
163573	BH04 1.00	21/01/2019	28/01/2019	Silty loam	
163574	BH04 1.50	21/01/2019	28/01/2019	Silty clayey loam	

Results Summary

Report No.: 19-21509

			ELAB Reference	163573	163574
			Customer Reference		
			Sample ID		
			Sample Type	SOIL	SOIL
			Sample Location	BH04	BH04
			Sample Depth (m)	1.00	1.50
			Sampling Date	21/01/2019	21/01/2019
Determinand	**Codes**	**Units**	**LOD**		
Metals					
Antimony	N	mg/kg	2.5	3.6	n/t
Arsenic	M	mg/kg	1	27.5	n/t
Beryllium	U	mg/kg	1	1.3	n/t
Cadmium	M	mg/kg	0.5	0.9	n/t
Chromium	M	mg/kg	5	49.7	n/t
Copper	M	mg/kg	5	223	n/t
Lead	M	mg/kg	5	224	n/t
Mercury	M	mg/kg	0.5	0.7	n/t
Nickel	M	mg/kg	5	33.5	n/t
Selenium	M	mg/kg	1	< 1.0	n/t
Vanadium	M	mg/kg	5	39.2	n/t
Zinc	M	mg/kg	5	251	n/t
Anions					
Water Soluble Sulphate	M	g/l	0.02	n/t	0.05
Inorganics					
Hexavalent Chromium	N	mg/kg	0.8	< 0.8	n/t
Total Cyanide	M	mg/kg	1	< 1.0	n/t
Water Soluble Boron	N	mg/kg	0.5	0.6	n/t
Miscellaneous					
pH	M	pH units	0.1	7.5	7.6
Total Organic Carbon	N	%	0.01	3.1	n/t
Phenols					
Total Phenols	N	mg/kg	6	< 6	n/t

Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonards on Sea, East Sussex, TN38 9BY
Tel: +44 (0)1424 718618, Email: info@elab-uk.co.uk, Web: www.elab-uk.co.uk

Results Summary

Report No.: 19-21509

Asbestos Results

Analytical result only applies to the sample as submitted by the client. Any comments, opinions or interpretations (marked #)
in this report are outside UKAS accreditation (Accreditation No2683). They are subjective comments only which must be verified by the client.

Elab No	Depth (m)	Clients Reference	Description of Sample Matrix #	Asbestos Identification	Gravimetric Analysis Total (%)	Gravimetric Analysis by ACM Type (%)	Free Fibre Analysis (%)	Total Asbestos (%)
163572	0.50	BH04	brown sandy soil with stones, clinker and twigs	No asbestos detected	n/t	n/t	n/t	n/t

Method Summary

Report No.: 19-21509

Parameter	Codes	Analysis Undertaken On	Date Tested	Method Number	Technique
Soil					
Hexavalent chromium	N	As submitted sample	29/01/2019	110	Colorimetry
pH	M	Air dried sample	29/01/2019	113	Electromeric
Aqua regia extractable metals	M	Air dried sample	29/01/2019	118	ICPMS
Phenols in solids	N	As submitted sample	29/01/2019	121	HPLC
Water soluble anions	M	Air dried sample	29/01/2019	172	Ion Chromatography
Water soluble boron	N	Air dried sample	29/01/2019	202	Colorimetry
Total cyanide	M	As submitted sample	29/01/2019	204	Colorimetry
Total organic carbon/Total sulphur	N	Air dried sample	30/01/2019	210	IR
Asbestos identification	U	Air dried sample	29/01/2019	PMAN	Microscopy

Tests marked N are not UKAS accredited

Report Information

Report No.: 19-21509

Key

U	hold UKAS accreditation
M	hold MCERTS and UKAS accreditation
N	do not currently hold UKAS accreditation
^	MCERTS accreditation not applicable for sample matrix
*	UKAS accreditation not applicable for sample matrix
S	Subcontracted to approved laboratory UKAS Accredited for the test
SM	Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test
NS	Subcontracted to approved laboratory. UKAS accreditation is not applicable.
I/S	Insufficient Sample
U/S	Unsuitable sample
n/t	Not tested
<	means "less than"
>	means "greater than"

Soil sample results are expressed on an air dried basis (dried at < 30°C)
ELAB are unable to provide an interpretation or opinion on the content of this report.
The results relate only to the items tested
PCB congener results may include any coeluting PCBs
Uncertainty of measurement for the determinands tested are available upon request

Deviation Codes

a	No date of sampling supplied
b	No time of sampling supplied (Waters Only)
c	Sample not received in appropriate containers
d	Sample not received in cooled condition
e	The container has been incorrectly filled
f	Sample age exceeds stability time (sampling to receipt)
g	Sample age exceeds stability time (sampling to analysis)

Where a sample has a deviation code, the applicable test result may be invalid.

Sample Retention and Disposal

All soil samples will be retained for a period of one month
All water samples will be retained for 7 days following the date of the test report
Charges may apply to extended sample storage

Unit A2
Windmill Road
Ponswood Industrial Estate
St Leonards on Sea
East Sussex
TN38 9BY
Telephone: (01424) 718618

cs@elab-uk.co.uk
info@elab-uk.co.uk

2683

THE ENVIRONMENTAL LABORATORY LTD

Analytical Report Number:	19-21557
Issue:	1
Date of Issue:	05/02/2019
Contact:	Daniel O'Regan
Customer Details:	CC Geotechnical Ltd Unit 1 & 2 Deltic Place Deltic Way Liverpool Merseyside L33 7BA
Quotation No:	Q14-00045
Order No:	Not Supplied
Customer Reference:	CCG-C-18-10614
Date Received:	30/01/2019
Date Approved:	05/02/2019
Details:	The Christie Hospital, Manchester
Approved by:	[redacted]

Mike Varley, Technical Manager

Any comments, opinions or interpretations expressed herein are outside the scope of UKAS accreditation (Accreditation Number 2683)

Sample Summary

Report No.: 19-21557

Elab No.	Client's Ref.	Date Sampled	Date Scheduled	Description	Deviations
163810	BH01 0.50	25/01/2019	30/01/2019		
163811	BH01 1.00	25/01/2019	30/01/2019	Sandy silty loam	
163812	BH01 1.50	25/01/2019	30/01/2019	Sandy loam	

Results Summary

Report No.: 19-21557

			ELAB Reference	163811	163812
			Customer Reference		
			Sample ID		
			Sample Type	SOIL	SOIL
			Sample Location	BH01	BH01
			Sample Depth (m)	1.00	1.50
			Sampling Date	25/01/2019	25/01/2019
Determinand	**Codes**	**Units**	**LOD**		
Metals					
Antimony	N	mg/kg	2.5	4.7	n/t
Arsenic	M	mg/kg	1	19.0	n/t
Beryllium	U	mg/kg	1	< 1.0	n/t
Cadmium	M	mg/kg	0.5	1.0	n/t
Chromium	M	mg/kg	5	23.2	n/t
Copper	M	mg/kg	5	50.7	n/t
Lead	M	mg/kg	5	160	n/t
Mercury	M	mg/kg	0.5	0.8	n/t
Nickel	M	mg/kg	5	19.5	n/t
Selenium	M	mg/kg	1	< 1.0	n/t
Vanadium	M	mg/kg	5	28.4	n/t
Zinc	M	mg/kg	5	153	n/t
Anions					
Water Soluble Sulphate	M	g/l	0.02	n/t	0.06
Inorganics					
Hexavalent Chromium	N	mg/kg	0.8	< 0.8	n/t
Total Cyanide	M	mg/kg	1	< 1.0	n/t
Water Soluble Boron	N	mg/kg	0.5	< 0.5	n/t
Miscellaneous					
pH	M	pH units	0.1	9.3	8.4
Total Organic Carbon	N	%	0.01	1.9	n/t
Phenols					
Total Phenols	N	mg/kg	6	< 6	n/t

Tests marked N are not UKAS accredited.

2683

Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonards on Sea, East Sussex, TN38 9BY
Tel: +44 (0)1424 718618, Email: info@elab-uk.co.uk, Web: www.elab-uk.co.uk

Results Summary

Report No.: 19-21557

Asbestos Results

Analytical result only applies to the sample as submitted by the client. Any comments, opinions or interpretations (marked #)
in this report are outside UKAS accreditation (Accreditation No2683). They are subjective comments only which must be verified by the client.

Elab No	Depth (m)	Clients Reference	Description of Sample Matrix #	Asbestos Identification	Gravimetric Analysis Total (%)	Gravimetric Analysis by ACM Type (%)	Free Fibre Analysis (%)	Total Asbestos (%)
163810	0.50	BH01	Brown sandy soil,stones	No asbestos detected	n/t	n/t	n/t	n/t

Method Summary

Report No.: 19-21557

Parameter	Codes	Analysis Undertaken On	Date Tested	Method Number	Technique
Soil					
Hexavalent chromium	N	As submitted sample	01/02/2019	110	Colorimetry
pH	M	Air dried sample	04/02/2019	113	Electromeric
Aqua regia extractable metals	M	Air dried sample	01/02/2019	118	ICPMS
Phenols in solids	N	As submitted sample	31/01/2019	121	HPLC
Water soluble anions	M	Air dried sample	01/02/2019	172	Ion Chromatography
Water soluble boron	N	Air dried sample	01/02/2019	202	Colorimetry
Total cyanide	M	As submitted sample	01/02/2019	204	Colorimetry
Total organic carbon/Total sulphur	N	Air dried sample	04/02/2019	210	IR
Asbestos identification	U	Air dried sample	01/02/2019	PMAN	Microscopy

Tests marked N are not UKAS accredited

Report Information

Report No.: 19-21557

Key

U	hold UKAS accreditation
M	hold MCERTS and UKAS accreditation
N	do not currently hold UKAS accreditation
^	MCERTS accreditation not applicable for sample matrix
*	UKAS accreditation not applicable for sample matrix
S	Subcontracted to approved laboratory UKAS Accredited for the test
SM	Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test
NS	Subcontracted to approved laboratory. UKAS accreditation is not applicable.
I/S	Insufficient Sample
U/S	Unsuitable sample
n/t	Not tested
<	means "less than"
>	means "greater than"

Soil sample results are expressed on an air dried basis (dried at < 30°C)
ELAB are unable to provide an interpretation or opinion on the content of this report.
The results relate only to the items tested
PCB congener results may include any coeluting PCBs
Uncertainty of measurement for the determinands tested are available upon request

Deviation Codes

a	No date of sampling supplied
b	No time of sampling supplied (Waters Only)
c	Sample not received in appropriate containers
d	Sample not received in cooled condition
e	The container has been incorrectly filled
f	Sample age exceeds stability time (sampling to receipt)
g	Sample age exceeds stability time (sampling to analysis)

Where a sample has a deviation code, the applicable test result may be invalid.

Sample Retention and Disposal

All soil samples will be retained for a period of one month
All water samples will be retained for 7 days following the date of the test report
Charges may apply to extended sample storage

Unit A2
Windmill Road
Ponswood Industrial Estate
St Leonards on Sea
East Sussex
TN38 9BY
Telephone: (01424) 718618

cs@elab-uk.co.uk
info@elab-uk.co.uk

2683

THE ENVIRONMENTAL LABORATORY LTD

Analytical Report Number:	19-21558
Issue:	1
Date of Issue:	05/02/2019
Contact:	Daniel O'Regan
Customer Details:	CC Geotechnical Ltd Unit 1 & 2 Deltic Place Deltic Way Liverpool Merseyside L33 7BA
Quotation No:	Q14-00045
Order No:	Not Supplied
Customer Reference:	CCG-C-18-10614
Date Received:	30/01/2019
Date Approved:	05/02/2019
Details:	The Christie Hospital, Manchester
Approved by:	[redacted]

Mike Varley, Technical Manager

Any comments, opinions or interpretations expressed herein are outside the scope of UKAS accreditation (Accreditation Number 2683)

Sample Summary

Report No.: 19-21558

Elab No.	Client's Ref.	Date Sampled	Date Scheduled	Description	Deviations
163813	BH02 0.50	25/01/2019	30/01/2019		
163814	BH02 1.00	25/01/2019	30/01/2019	Silty loam	
163815	BH02 1.50	25/01/2019	30/01/2019	Sandy silty loam	

Results Summary

Report No.: 19-21558

			ELAB Reference	163814	163815
			Customer Reference		
			Sample ID		
			Sample Type	SOIL	SOIL
			Sample Location	BH02	BH02
			Sample Depth (m)	1.00	1.50
			Sampling Date	25/01/2019	25/01/2019
Determinand	**Codes**	**Units**	**LOD**		
Metals					
Antimony	N	mg/kg	2.5	6.3	n/t
Arsenic	M	mg/kg	1	16.2	n/t
Beryllium	U	mg/kg	1	1.3	n/t
Cadmium	M	mg/kg	0.5	< 0.5	n/t
Chromium	M	mg/kg	5	29.3	n/t
Copper	M	mg/kg	5	56.0	n/t
Lead	M	mg/kg	5	201	n/t
Mercury	M	mg/kg	0.5	0.5	n/t
Nickel	M	mg/kg	5	19.9	n/t
Selenium	M	mg/kg	1	< 1.0	n/t
Vanadium	M	mg/kg	5	34.4	n/t
Zinc	M	mg/kg	5	89.3	n/t
Anions					
Water Soluble Sulphate	M	g/l	0.02	n/t	< 0.02
Inorganics					
Hexavalent Chromium	N	mg/kg	0.8	< 0.8	n/t
Total Cyanide	M	mg/kg	1	< 1.0	n/t
Water Soluble Boron	N	mg/kg	0.5	< 0.5	n/t
Miscellaneous					
pH	M	pH units	0.1	7.8	7.5
Total Organic Carbon	N	%	0.01	2.5	n/t
Phenols					
Total Phenols	N	mg/kg	6	< 6	n/t

2683

Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonards on Sea, East Sussex, TN38 9BY
Tel: +44 (0)1424 718618, Email: info@elab-uk.co.uk, Web: www.elab-uk.co.uk

Results Summary

Report No.: 19-21558

Asbestos Results

Analytical result only applies to the sample as submitted by the client. Any comments, opinions or interpretations (marked #)
in this report are outside UKAS accreditation (Accreditation No2683). They are subjective comments only which must be verified by the client.

Elab No	Depth (m)	Clients Reference	Description of Sample Matrix #	Asbestos Identification	Gravimetric Analysis Total (%)	Gravimetric Analysis by ACM Type (%)	Free Fibre Analysis (%)	Total Asbestos (%)
163813	0.50	BH02	Brown sandy soil	No asbestos detected	n/t	n/t	n/t	n/t

Method Summary

Report No.: 19-21558

Parameter	Codes	Analysis Undertaken On	Date Tested	Method Number	Technique
Soil					
Hexavalent chromium	N	As submitted sample	01/02/2019	110	Colorimetry
pH	M	Air dried sample	04/02/2019	113	Electromeric
Aqua regia extractable metals	M	Air dried sample	01/02/2019	118	ICPMS
Phenols in solids	N	As submitted sample	31/01/2019	121	HPLC
Water soluble anions	M	Air dried sample	01/02/2019	172	Ion Chromatography
Water soluble boron	N	Air dried sample	01/02/2019	202	Colorimetry
Total cyanide	M	As submitted sample	01/02/2019	204	Colorimetry
Total organic carbon/Total sulphur	N	Air dried sample	04/02/2019	210	IR
Asbestos identification	U	Air dried sample	01/02/2019	PMAN	Microscopy

Tests marked N are not UKAS accredited

Report Information

Report No.: 19-21558

Key

U	hold UKAS accreditation
M	hold MCERTS and UKAS accreditation
N	do not currently hold UKAS accreditation
^	MCERTS accreditation not applicable for sample matrix
*	UKAS accreditation not applicable for sample matrix
S	Subcontracted to approved laboratory UKAS Accredited for the test
SM	Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test
NS	Subcontracted to approved laboratory. UKAS accreditation is not applicable.
I/S	Insufficient Sample
U/S	Unsuitable sample
n/t	Not tested
<	means "less than"
>	means "greater than"

Soil sample results are expressed on an air dried basis (dried at < 30°C)
ELAB are unable to provide an interpretation or opinion on the content of this report.
The results relate only to the items tested
PCB congener results may include any coeluting PCBs
Uncertainty of measurement for the determinands tested are available upon request

Deviation Codes

a	No date of sampling supplied
b	No time of sampling supplied (Waters Only)
c	Sample not received in appropriate containers
d	Sample not received in cooled condition
e	The container has been incorrectly filled
f	Sample age exceeds stability time (sampling to receipt)
g	Sample age exceeds stability time (sampling to analysis)

Where a sample has a deviation code, the applicable test result may be invalid.

Sample Retention and Disposal

All soil samples will be retained for a period of one month
All water samples will be retained for 7 days following the date of the test report
Charges may apply to extended sample storage

Unit A2
Windmill Road
Ponswood Industrial Estate
St Leonards on Sea
East Sussex
TN38 9BY
Telephone: (01424) 718618

cs@elab-uk.co.uk
info@elab-uk.co.uk

THE ENVIRONMENTAL LABORATORY LTD

Analytical Report Number:	19-21559
Issue:	1
Date of Issue:	05/02/2019
Contact:	Daniel O'Regan
Customer Details:	CC Geotechnical Ltd Unit 1 & 2 Deltic Place Deltic Way Liverpool Merseyside L33 7BA
Quotation No:	Q14-00045
Order No:	Not Supplied
Customer Reference:	CCG-C-18-10614
Date Received:	30/01/2019
Date Approved:	05/02/2019
Details:	The Christie Hospital, Manchester
Approved by:	[redacted]

Mike Varley, Technical Manager

Any comments, opinions or interpretations expressed herein are outside the scope of UKAS accreditation (Accreditation Number 2683)

Sample Summary

Report No.: 19-21559

Elab No.	Client's Ref.	Date Sampled	Date Scheduled	Description	Deviations
163816	BH03 0.50	25/01/2019	30/01/2019		
163817	BH03 1.00	25/01/2019	30/01/2019	Silty loam	
163818	BH03 1.50	25/01/2019	30/01/2019		
163819	BH03 2.50	25/01/2019	30/01/2019	Sandy loam	

Results Summary

Report No.: 19-21559

			ELAB Reference	163817	163819
			Customer Reference		
			Sample ID		
			Sample Type	SOIL	SOIL
			Sample Location	BH03	BH03
			Sample Depth (m)	1.00	2.50
			Sampling Date	25/01/2019	25/01/2019
Determinand	**Codes**	**Units**	**LOD**		
Metals					
Antimony	N	mg/kg	2.5	< 2.5	n/t
Arsenic	M	mg/kg	1	16.9	n/t
Beryllium	U	mg/kg	1	< 1.0	n/t
Cadmium	M	mg/kg	0.5	0.9	n/t
Chromium	M	mg/kg	5	26.7	n/t
Copper	M	mg/kg	5	65.0	n/t
Lead	M	mg/kg	5	200	n/t
Mercury	M	mg/kg	0.5	< 0.5	n/t
Nickel	M	mg/kg	5	22.5	n/t
Selenium	M	mg/kg	1	< 1.0	n/t
Vanadium	M	mg/kg	5	29.3	n/t
Zinc	M	mg/kg	5	195	n/t
Anions					
Water Soluble Sulphate	M	g/l	0.02	n/t	0.14
Inorganics					
Hexavalent Chromium	N	mg/kg	0.8	< 0.8	n/t
Total Cyanide	M	mg/kg	1	< 1.0	n/t
Water Soluble Boron	N	mg/kg	0.5	0.7	n/t
Miscellaneous					
pH	M	pH units	0.1	8.6	8.0
Total Organic Carbon	N	%	0.01	2.3	n/t
Phenols					
Total Phenols	N	mg/kg	6	< 6	n/t

Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonards on Sea, East Sussex, TN38 9BY
Tel: +44 (0)1424 718618, Email: info@elab-uk.co.uk, Web: www.elab-uk.co.uk

Results Summary

Report No.: 19-21559

Asbestos Results

Analytical result only applies to the sample as submitted by the client. Any comments, opinions or interpretations (marked #)
in this report are outside UKAS accreditation (Accreditation No2683). They are subjective comments only which must be verified by the client.

Elab No	Depth (m)	Clients Reference	Description of Sample Matrix #	Asbestos Identification	Gravimetric Analysis Total (%)	Gravimetric Analysis by ACM Type (%)	Free Fibre Analysis (%)	Total Asbestos (%)
163816	0.50	BH03	Brown sandy soil,Stones,brick	No asbestos detected	n/t	n/t	n/t	n/t

Method Summary

Report No.: 19-21559

Parameter	Codes	Analysis Undertaken On	Date Tested	Method Number	Technique
Soil					
Hexavalent chromium	N	As submitted sample	01/02/2019	110	Colorimetry
pH	M	Air dried sample	04/02/2019	113	Electromeric
Aqua regia extractable metals	M	Air dried sample	01/02/2019	118	ICPMS
Phenols in solids	N	As submitted sample	31/01/2019	121	HPLC
Water soluble anions	M	Air dried sample	01/02/2019	172	Ion Chromatography
Water soluble boron	N	Air dried sample	01/02/2019	202	Colorimetry
Total cyanide	M	As submitted sample	01/02/2019	204	Colorimetry
Total organic carbon/Total sulphur	N	Air dried sample	04/02/2019	210	IR
Asbestos identification	U	Air dried sample	01/02/2019	PMAN	Microscopy

Tests marked N are not UKAS accredited

Report Information

Report No.: 19-21559

Key

U	hold UKAS accreditation
M	hold MCERTS and UKAS accreditation
N	do not currently hold UKAS accreditation
^	MCERTS accreditation not applicable for sample matrix
*	UKAS accreditation not applicable for sample matrix
S	Subcontracted to approved laboratory UKAS Accredited for the test
SM	Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test
NS	Subcontracted to approved laboratory. UKAS accreditation is not applicable.
I/S	Insufficient Sample
U/S	Unsuitable sample
n/t	Not tested
<	means "less than"
>	means "greater than"

Soil sample results are expressed on an air dried basis (dried at < 30°C)
ELAB are unable to provide an interpretation or opinion on the content of this report.
The results relate only to the items tested
PCB congener results may include any coeluting PCBs
Uncertainty of measurement for the determinands tested are available upon request

Deviation Codes

a	No date of sampling supplied
b	No time of sampling supplied (Waters Only)
c	Sample not received in appropriate containers
d	Sample not received in cooled condition
e	The container has been incorrectly filled
f	Sample age exceeds stability time (sampling to receipt)
g	Sample age exceeds stability time (sampling to analysis)

Where a sample has a deviation code, the applicable test result may be invalid.

Sample Retention and Disposal

All soil samples will be retained for a period of one month
All water samples will be retained for 7 days following the date of the test report
Charges may apply to extended sample storage

APPENDIX I

GAS / GROUNDWATER MONITORING RESULTS & CALIBRATION CERTIFICATES

GAS AND WATER MONITORING RESULTS

	Date:	13-Feb-19	21-Feb-19	28-Feb-19	04-Mar-19								
	Visit Number	1	2	3	4								
	Atmos Press mb	1025	1020	1011	989								
	Pressure Trend	Rising	Rising	Steady	Rising								
	Air Temp °C	10	13	7	9								
	Cloud cover	Overcast	Partial	Overcast	Overcast								
	Wind velocity	Light	Light	Light	Light								
	Precipitation	Dry	Dry	Dry	Dry								
	State of Ground	Dry	Dry	Dry	Dry								
BH1	CH_4 (%) (max/steady):	0.0	0.0	0.0	0.0								
	CO_2 (%) (max/steady):	0.4	0.9	0.4	0.6								
	O_2 (%) (max/steady):	19.6	18.3	19.9	19.7								
	H_2S (ppm) (max/steady):	0.0	0.0	0.0	0.0								
	CO (ppm) (max/steady):	0.0	0.0	0.0	0.0								
	PID (ppm) (max/steady)	0.0	0.0	0.0	0.0								
	Flow (l/hr) (max/steady)	<0.1	<0.1	<0.1	<0.1								
	Water Level / depth to base (m):	Dry	Dry	Dry	Dry								
BH2	CH_4 (%) (max/steady):	0.0	0.0	0.0	0.0								
	CO_2 (%) (max/steady):	1.6	2.9	2.2	4.7								
	O_2 (%) (max/steady):	17.4	14.4	16.4	14.2								
	H_2S (ppm) (max/steady):	0.0	0.0	0.0	0.0								
	CO (ppm) (max/steady):	0.0	0.0	0.0	0.0								
	PID (ppm) (max/steady)	0.0	0.0	0.0	0.0								
	Flow (l/hr) (max/steady)	<0.1	<0.1	<0.1	<0.1								
	Water Level / depth to base (m):	4.00	3.94	3.94	3.95								
BH4	CH_4 (%) (max/steady):	0.0	0.0	0.0	0.0								
	CO_2 (%) (max/steady):	5.8	4.8	3.4	3.8								
	O_2 (%) (max/steady):	13.1	10.8	16.2	15.9								
	H_2S (ppm) (max/steady):	0.0	0.0	0.0	0.0								
	CO (ppm) (max/steady):	0.0	0.0	0.0	0.0								
	PID (ppm) (max/steady)	0.0	0.0	0.0	0.0								
	Flow (l/hr) (max/steady)	<0.1	<0.1	<0.1	<0.1								
	Water Level / depth to base (m):	Dry	Dry	Dry	Dry								

Job No: CCG-C-18-10614 | **Site: The Christie, Manchester**

Instrument: **GSXI**

TEST DATE AND CONDITIONS		
Date	20/06/2018	
Atmospheric Pressure	1000	mB
Ambient Temperature	23.4	°C
Environics Serial No.	5089	

GAS DATA LTD
Unit 4, Fairfield Court
Seven Stars Estate
Wheler Rd
Coventry
CV3 4LJ
Tel 02476303311 Fax 02476307711

GFM436 Final Inspection & Calibration Check Certificate

Customer	C C Geotechnical
Certificate Number	120242
Order Number	319979

Serial Number	12220
Software Version	G436-00.0027/0009

Recalibration DUE Date
20/06/2019

Instrument Checks					
Keyboard	✓		Display Contrast	✓	
Pump Flow In	450	*Accept > 200 cc/min*	Pump Flow @ -200mB	250	*Accept > 200 cc/min*
Clock Set / Running	✓		Labels Fitted	✓	

Gas Checks						
Sensor	CH_4		CO_2		O_2	
	Instrument Gas Readings %	True Gas Value %	Instrument Gas Readings %	True Gas Value %	Instrument Gas Readings %	True Gas Value %
	60.1	60	40.3	40	20.9	20.9
	Accept ±3.0		*Accept ±3.0*		*Accept ±0.5*	
	4.9	5	5	5	6	6
	Accept ±0.3		*Accept ±0.3*		*Accept ±0.3*	
Zero Reading 100% N2	0	0	0	0	0	0
	Accept ±0.0		*Accept ±0.0*		*Accept ±0.1*	

Optional Gas Checks						
Applied Gas & Range		Concentration Tested @ (ppm)	Instrument Readings *(ppm)*			
Gas Type	Range *(ppm)*		Zero Reading		Instrument Gas Reading	
H2S	5000	*1500*	0	*Accept ±0.0*	1500	*Accept ±5.0*
CO	2000	*1000*	0	*Accept ±0.0*	1003	*Accept ±5.0*
				Accept ±0.0		*Accept ±5.0*
				Accept ±0.0		*Accept ±5.0*
Hexane	*2.0%*	2.0%	0	*Accept ±0.0*	1.99	*Accept ±10.0*

Cross Gas Effects									
Applied Gas *(ppm)*		Instrument Readings *(ppm)*							
Gas Type	Concentration	Toxic 1:	H2S	Toxic 2:	CO	Toxic 3:			
H2S	*1500*	1500		0					
CO	*1000*	90		1003					
Hexane	*2.0%*	0		0					

Pressure Checks			
Atmospheric Pressure [AP] *(mB)*			
Current Atmospheric Pressure (mB)		Instrument Atmospheric Pressure Reading (mB)	
AP Open Ports		1000	*Accept ±2.0*
AP Port (Internal)	*+800 mB*	800	*Accept ±5.0*
	+1200mb	1200	*Accept ±5.0*

Flow Checks					
Borehole Flow			Differential Pressure		
Applied Reading *(l/h)*	Instrument Reading *(l/h)*		Applied Pressure *(Pa)*	Instrument Reading *(Pa)*	
-30	-30.9	*Accept ±3.0*	-452	-482	*Accept ±50*
-3	-3.1	*Accept ±1.0*	-19	-22	*Accept ±6.0*
0	0	*Accept ±0.0*	0	0	*Accept ±0.5*
3	3	*Accept ±0.5*	16	17	*Accept ±3.0*
30	30.9	*Accept ±3.0*	339	359	*Accept ±50*
60	61.3	*Accept ±6.0*	1023	1070	*Accept ±130*
90	91.1	*Accept ±9.0*	1998	O/R	*Accept ±250*

Temperature Checks		
Calibration Temperature Applied Temperature ^{0}C	Instrument Temperature Reading ^{0}C	
-10	-10	*Accept ±2.0*
0	0	*Accept ±1.0*
30	30	*Accept ±1.0*
60	60	*Accept ±1.0*
100	100.5	*Accept ±1.0*

Technician:	Date Tested:
Les Treece	*20/06/19*

The instrument identified by the serial number stated above has been tested by Gas Data personnel for calibration accuracy on the date and under the ambient conditions stated. Gas Data Ltd internal BS EN ISO9001:2015 compliant workshop procedures were followed to apply known calibration test gases, gas flow rates, pressures and temperatures of the values stated. The results displayed on the instrument at each stage are recorded above.

Gas Data Ltd is certified to BS EN ISO9001:2015. Certificate NQA 8374. Valid until 22/03/2019

APPENDIX J

NOTES ON LIMITATIONS

Notes on Limitations
For
Geoenvironmental and Geotechnical Consultancy Services

General

This document has been prepared by CC GEOTECHNICAL LTD within the terms of the contract, scope of work, and resources agreed in writing with the client. The limitations of liability of CC GEOTECHNICAL LTD for the contents of this document have been agreed with the Client, as set out in the terms and conditions of offer and related contract documentation.

This document is intended for the sole use of the client indicated above and CC GEOTECHNICAL LTD accepts no responsibility of whatever nature to third parties to whom this document or any part of this document is made known. Any such party relies upon that information at their own risk.

The findings and opinions provided in this document are made in good faith and are subject to the limitations imposed by employing site assessment methods and techniques, appropriate to the time of investigation and within the limitations and constraints defined in this document.

The findings and opinions are relevant to the dates when the assessment was undertaken, but should not necessarily be relied upon to represent conditions at a substantially later date. In particular, seasonal groundwater levels, with the effects of precipitation, may affect the conditions found during the investigation. The report should be read in conjunction with the further Notes on Limitations included in Appendix A.

Where opinions expressed in this report are based on current available guidance and legislation, no liability can be accepted by CC GEOTECHNICAL LTD for the effects of any future changes to such guidelines and legislation. Additional information, improved practices, new guidance, changes in legislation, or amendments to design proposals, may necessitate this report having to be reviewed in whole or in part after that date. Opinions and interpretations are not accredited by UKAS.

Factual data contained in this report may have been obtained from enquiries with reputable third parties, the results of which are relied on unless indicated to be inaccurate by contradictory information.

CC GEOTECHNICAL LTD possesses a non-exclusive and non-transferable Ordnance Survey Licence, but does not possess any right to sub-license any of the rights granted by this licence to any party. Under the terms of CC GEOTECHNICAL LTD`s Ordnance Survey Licence, copying of figures containing Ordnance Survey data or using figures for any purpose other than as part of this report is not permitted.

CC GEOTECHNICAL LTD has prepared this report solely for the use of the Client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought form CC GEOTECNICAL and a charge may be levied against such approval.

CC GEOTECHNICAL LTD accepts no responsibility or liability for:

1. the consequences of this document being used for any purpose or project other than for which it was commissioned

and/or

2. the consequences of use of this document by any party with whom an agreement has not been executed.

Phase I Environmental Audits / Desk Studies

The work undertaken to provide the basis of a Phase 1 Desk Study report comprises a study of available documented information from a variety of sources (including the client), together with (where appropriate) a brief walk over inspection of the site and meetings and discussions with relevant authorities and other interested parties. The opinions given in a Desk Study report have been dictated by finite data on which they are based and are relevant only to the purpose for which the report was commissioned. The information reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in the report, CC GEOTECHNICAL LTD reserves the right to review such information and to modify the opinions accordingly.

It should be noted that any risks identified in this report are perceived risks based on the information reviewed; actual risks can only be assessed following a physical investigation of the site.

Phase II Environmental Audits

The investigation of the site has been carried out with the intention of providing sufficient information concerning the type and degree of contamination, and ground and groundwater conditions to allow a reasonable risk assessment to be made. The objectives of the investigation have been limited to establishing the risks associated to potential human targets, building materials, the environment (including adjacent land), and surface and groundwater.

The amount of exploratory work and chemical testing undertaken may have been restricted by the timescale available, and the locations of the exploratory holes may have been restricted to areas unoccupied by the building(s) on the site, and further restricted by the existence of buried services. A more comprehensive investigation may be required if the site is to be redeveloped as, in addition to risk assessment, a number of important engineering and environmental issues may need to be resolved.

For those reasons, if costs have been included in relation to site remediation these must be considered as tentative only and must, in any event, be confirmed by a qualified quantity surveyor.

The exploratory holes undertaken, investigate only a small volume of the ground in relation to the size of the site, and can only provide a general indication of site conditions. The number of sampling points and the methods of sampling and testing do not preclude the existence of localised “hotspots” of contamination where concentrations may be significantly higher than those actually encountered.

Geoenvironmental Ground Investigations

The investigation of the site has been carried out to provide sufficient information within the agreed scope of the investigation, under the general headings of type and degree of contamination, geotechnical characteristics, and ground and groundwater conditions, to provide a reasonable assessment of the environmental risks together with engineering and development implications.

If costs have been included in relation to the site remediation, these must be confirmed by a qualified quantity surveyor.

The exploratory holes undertaken, investigate only a small volume of the ground in relation to the size of the site, and can only provide a general indication of the site conditions. The opinions provided and recommendations given in this report are based on the ground conditions apparent at the site of each of the exploratory holes. There may be ground conditions present on the site which have not been disclosed by this investigation, and which have therefore not been taken into account in this report.

The comments made on groundwater conditions are based on observations made at the time that site work was carried out. It should be noted that groundwater levels will vary owing to seasonal, tidal, weather, or other effects.

The risk assessment and opinions provided, inter alia, take into consideration currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values.

F. Contaminated Land Risk Assessment Methodology

The following classification published by the NHBC, EA, and CIEH [15] has been developed from *DOE Guide to Risk Assessment and Risk Management for Environmental Protection and the Statutory Guidance on Contaminated Land* (Defra September 2006). The methodology differs from that presented in *Contaminated Land Risk Assessment, A Guide to Good Practice* (CIRIA C552, 2001), particularly in terms of the definitions of classification of consequence, which include a consideration of immediacy of hazards.

The key to the classification is that the designation of risk is based upon the consideration of both:

the magnitude of the potential consequence (i.e. severity).

[takes into account both the potential severity of the hazard and the sensitivity of the receptor]

the magnitude of probability (i.e. likelihood).

[takes into account both the presence of the hazard and receptor and the integrity of the pathway]

The potential consequences of contamination risks occurring at this Site are classified in accordance with Table F.1 below:

Table F.1: Classification of Consequence

Classification	Definition of Consequence
Severe	Highly elevated concentrations likely to result in “significant harm” to human health as defined by the EPA 1990, Part 2A, if exposure occurs.
	Equivalent to EA Category 1 pollution incident including persistent and/or extensive effects on water quality; leading to closure of a potable abstraction point; major impact on amenity value or major damage to agriculture or commerce.
	Major damage to aquatic or other ecosystems, which is likely to result in a substantial adverse change in its functioning or harm to a species of special interest that endangers the long-term maintenance of the population.
	Catastrophic damage to crops, buildings or property.
Medium	Elevated concentrations which could result in “significant harm” to human health as defined by the EPA 1990, Part 2A if exposure occurs.
	Equivalent to EA Category 2 pollution incident including significant effect on water quality; notification required to abstractors; reduction in amenity value or significant damage to agriculture or commerce.
	Significant damage to aquatic or other ecosystems, which may result in a substantial adverse change in its functioning or harm to a species of special interest that may endanger the long-term maintenance of the population.
	Significant damage to crops, buildings or property.
Mild	Exposure to human health unlikely to lead to “significant harm”.
	Equivalent to EA Category 3 pollution incident including minimal or short lived effect on water quality; marginal effect on amenity value, agriculture or commerce.

Classification	Definition of Consequence
	Minor or short lived damage to aquatic or other ecosystems, which is unlikely to result in a substantial adverse change in its functioning or harm to a species of special interest that would endanger the long-term maintenance of the population. Minor damage to crops, buildings or property.
Minor	No measurable effect on humans. Equivalent to insubstantial pollution incident with no observed effect on water quality or ecosystems. Repairable effects of damage to buildings, structures and services.

Source: R&D 66:2008

The probability of contamination risks occurring at this Site will be classified in accordance with Table F.2 below from the CIRIA guidance. Note: A pollution linkage must first be established before probability is classified. If there is no pollution linkage then there is no potential risk. If there is no pollution linkage then there is no need to apply tests for probability and consequence

Table F.2: Classification of Probability

Classification	Definition of Probability
High Likelihood	There is pollutant linkage and an event would appear very likely in the short-term and almost inevitable over the long-term, or there is evidence at the receptor of harm or pollution.
Likely	There is pollutant linkage and all the elements are present and in the right place which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short-term and likely over the long-term.
Low Likelihood	There is pollutant linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a long period such an event would take place, and is less likely in the shorter term.
Unlikely	There is pollutant linkage but circumstances are such that it is improbable that an event would occur even in the very long-term.

Source: R&D 66:2008

For each possible pollution linkage (source-pathway-receptor) identified, the potential risk can be evaluated based upon the following probability x consequence matrix shown in Table F.3.

Table F.3: Overall Contamination Risk Matrix

		Consequence			
		Severe	**Medium**	**Mild**	**Minor**
Probability	High likelihood	Very high risk	High risk	Moderate risk	Low risk
	Likely	High risk	Moderate risk	Moderate / Low risk	Low risk
	Low likelihood	Moderate risk	Moderate / Low risk	Low risk	Very low risk
	Unlikely	Moderate / Low risk	Low risk	Very low risk	Very low risk

Source: R&D 66:2008

R&D 66 [15] presents definitions of the risk categories, together with the investigatory and remedial actions that are likely to be necessary in each case. These definitions are reproduced

in Table F.4. These risk categories apply to each pollutant linkage, not simply to each hazard or receptor.

Table F.4: Definition of Risk Categories and Likely Actions Required

Risk Category	Definition and likely actions required
Very high	There is a high probability that severe harm could arise to a designated receptor from an identified hazard at the site without remediation action OR there is evidence that severe harm to a designated receptor is already occurring. Realisation of that risk is likely to present a substantial liability to be site owner/or occupier. Investigation is required as a matter of urgency and remediation works likely to follow in the short-term.
High	Harm is likely to arise to a designated receptor from an identified hazard at the site without remediation action. Realisation of the risk is likely to present a substantial liability to the site owner/or occupier. Investigation is required as a matter of urgency to clarify the risk. Remediation works may be necessary in the short-term and are likely over the longer term.
Moderate	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, and if any harm were to occur it is more likely, that the harm would be relatively mild. Further investigative work is normally required to clarify the risk and to determine the potential liability to site owner/occupier. Some remediation works may be required in the longer term.
Low	It is possible that harm could arise to a designated receptor from identified hazard, but it is likely at worst, that this harm if realised would normally be mild. It is unlikely that the site owner/or occupier would face substantial liabilities from such a risk. Further investigative work (which is likely to be limited) to clarify the risk may be required. Any subsequent remediation works are likely to be relatively limited.
Very low	It is a low possibility that harm could arise to a designated receptor, but it is likely at worst, that this harm if realised would normally be mild or minor.
No potential risk	There is no potential risk if no pollution linkage has been established.

Source: R&D 66:2008

G. Tabulated Soil Chemical Analysis Screening

G.1 Soil Screening

The Christie CT
Redevelopment
Soil Laboratory Screening

Determinant Name	Units	GSV Commercial 6% SOM	BH101	BH102	BH103	BH103A	BH104
			1.00	0.30	0.70	0.10	0.30
			11/03/2024	11/03/2024	27/02/2024	27/02/2024	27/02/2024
			MG	MG	MG	MG	MG
Metals							
Antimony	mg/kg	7400	< 3.5	< 3.5	< 3.5	< 3.5	< 3.5
Arsenic	mg/kg	640	< 10	18	10	11	28
Barium	mg/kg	22000	77	240	110	290	560
Beryllium	mg/kg	12	0.4	1	0.6	1.1	1.3
Boron, Water Soluble	mg/kg	240000	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5
Cadmium	mg/kg	190	0.8	0.7	0.5	0.7	1.1
Chromium III	mg/kg	8600	8.6	6	6.4	11	6.5
Chromium (Total)	mg/kg	-	9.6	7	7.4	12	7.5
Chromium (Hexavalent)	mg/kg	33	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	mg/kg	68000	35	48	29	46	120
Iron	mg/kg	-	31000	31000	16000	28000	39000
Lead	mg/kg	2300	50	130	110	56	2100
Manganese	mg/kg	-	810	660	300	490	650
Mercury	mg/kg	58	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5
Mercury (Total, Low Level)	mg/kg	-	0.1	0.1	< 0.1	0.1	1.1
Molybdenum	mg/kg	18000	< 2.0	< 2.0	< 2.0	2.4	3.1
Nickel	mg/kg	980	23	17	14	33	24
Selenium	mg/kg	12000	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0
Vanadium	mg/kg	9000	25	27	19	35	31
Zinc	mg/kg	730000	55	59	50	55	250
Inorganics							
pH	pH	-	7.5	7.9	8.3	9	8.5
Cyanide, Free	mg/kg	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Fraction of Organic Carbon	-	-	0.016	0.038	0.022	0.07	0.051
SOM *(MM Calculated)*	%	-	2.76	6.55	3.79	12.07	8.79
Sulphate Aqueous Extract as SO4	mg/l	-	11	10	14	61	34
Sulphur as S, Total	%	-	0.03	0.02	0.02	0.2	0.06
Petroleum Hydrocarbons							
Aliphatic C5-C6	mg/kg	12000	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
Aliphatic C6-C8	mg/kg	40000	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
Aliphatic C8-C10	mg/kg	11000	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
Aliphatic C10-C12	mg/kg	47000	< 10	< 10	< 10	< 10	< 10
Aliphatic C12-C16	mg/kg	90000	< 10	< 10	< 10	< 10	< 10
Aliphatic C16-C21	mg/kg	1800000	< 10	< 10	< 10	41	< 10
Aliphatic C21-C35	mg/kg	1800000	< 20	< 20	38	610	< 20
Aliphatic C35-C44	mg/kg	1800000	< 15	< 15	68	320	< 15
Aromatic C5-C7	mg/kg	86000	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	mg/kg	180000	< 0.01	< 0.01	< 0.01	0.01	< 0.01
Aromatic C8-C10	mg/kg	17000	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
Aromatic C10-C12	mg/kg	34000	< 10	< 10	< 10	< 10	< 10
Aromatic C12-C16	mg/kg	38000	< 10	< 10	< 10	12	< 10
Aromatic C16-C21	mg/kg	28000	< 10	< 10	< 10	81	< 10
Aromatic C21-C35	mg/kg	28000	< 20	< 20	64	1200	31
Aromatic C35-C44	mg/kg	28000	< 15	< 15	100	930	< 15

The Christie CT
Redevelopment
Soil Laboratory Screening

Determinant Name	Units	GSV Commercial 6% SOM	BH101	BH102	BH103	BH103A	BH104
			1.00	0.30	0.70	0.10	0.30
			11/03/2024	11/03/2024	27/02/2024	27/02/2024	27/02/2024
			MG	MG	MG	MG	MG
Total Ali/Aro C5-C35	mg/kg	-	< 50	< 50	100	1900	< 50
Benzene	mg/kg	90	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Toluene	mg/kg	180000	< 0.01	< 0.01	< 0.01	0.01	< 0.01
Ethylbenzene	mg/kg	25000	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
m&p Xylene	mg/kg	43000	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
o-Xylene	mg/kg	33000	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
MTBE	mg/kg	22000	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
PAHs							
Acenaphthene	mg/kg	100000	< 0.02	< 0.02	0.03	< 0.20	< 0.02
Acenaphthylene	mg/kg	100000	< 0.02	< 0.02	0.11	0.96	< 0.02
Anthracene	mg/kg	540000	0.03	< 0.02	0.33	1.1	0.05
Benzo(a)anthracene	mg/kg	180	0.14	0.04	0.95	2.7	0.04
Benzo(a)pyrene	mg/kg	36	0.16	0.03	0.88	4.4	0.05
Benzo(b)fluoranthene	mg/kg	45	0.27	0.06	1.1	5.2	0.07
Benzo(g,h,i)perylene	mg/kg	4000	0.13	0.03	0.49	4.9	0.06
Benzo(k)fluoranthene	mg/kg	1200	0.08	< 0.02	0.43	1.9	0.03
Chrysene	mg/kg	350	0.16	0.05	1	2.9	0.05
Dibenzo(a,h)anthracene	mg/kg	3.6	0.02	< 0.02	0.1	0.63	< 0.02
Fluoranthene	mg/kg	23000	0.2	0.07	2.2	4.7	0.07
Fluorene	mg/kg	71000	< 0.02	< 0.02	0.04	< 0.20	< 0.02
Indeno(1,2,3-c,d)pyrene	mg/kg	510	0.18	0.04	0.52	4.5	0.06
Naphthalene	mg/kg	1100	< 0.02	< 0.02	0.02	< 0.20	< 0.02
Phenanthrene	mg/kg	23000	0.12	0.03	1.2	1.2	0.05
Pyrene	mg/kg	54000	0.23	0.07	2.2	4.7	0.07
PAH Total	mg/kg	-	1.8	0.6	12	40	0.71
Phenols							
Phenol	mg/kg	1300	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Cresols	mg/kg	-	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Xylenols	mg/kg	-	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Trimethyl Phenols	mg/kg	-	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Total Phenols (via HPLC)	mg/kg	-	< 0.80	< 0.80	< 0.80	< 0.80	< 0.80
VOCs							
1,1,1,2-tetrachloroethane	mg/kg	560	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1,1-Trichloroethane	mg/kg	3000	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1,2,2-Tetrachloroethane	mg/kg	1100	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1,2-Trichloroethane	mg/kg	3000	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1-Dichloroethane	mg/kg	24	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1-Dichloroethylene	mg/kg	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1-Dichloropropene	mg/kg	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2,3-Trichlorobenzene	mg/kg	590	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,2,3-Trichloropropane	mg/kg	-	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
1,2,4-Trichlorobenzene	mg/kg	1300	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,2,4-trimethylbenzene	mg/kg	210	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2-Dibromo-3-chloropropane	mg/kg	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,2-Dibromoethane	mg/kg	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

The Christie CT
Redevelopment
Soil Laboratory Screening

Determinant Name	Units	GSV Commercial 6% SOM	BH101	BH102	BH103	BH103A	BH104
			1.00	0.30	0.70	0.10	0.30
			11/03/2024	11/03/2024	27/02/2024	27/02/2024	27/02/2024
			MG	MG	MG	MG	MG
1,2-Dichlorobenzene	mg/kg	11000	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2-dichloroethane	mg/kg	1.7	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
1,2-Dichloropropane	mg/kg	11	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,3,5-Trimethylbenzene	mg/kg	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,3-Dichlorobenzene	mg/kg	170	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,3-Dichloropropane	mg/kg	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,4-Dichlorobenzene	mg/kg	21000	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2,2-Dichloropropane	mg/kg	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2-chlorotoluene	mg/kg	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
4-chlorotoluene	mg/kg	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
4-Isopropyltoluene (P-Cymene)	mg/kg	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzene	mg/kg	90	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Bromobenzene	mg/kg	490	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Bromochloromethane	mg/kg	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bromodichloromethane	mg/kg	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Bromoform	mg/kg	3000	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bromomethane	mg/kg	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Carbon Tetrachloride	mg/kg	14	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chlorobenzene	mg/kg	290	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chlorodibromomethane	mg/kg	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chloroethane	mg/kg	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chloroform	mg/kg	350	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chloromethane	mg/kg	1.5	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
cis--1,2,-dichloroethylene	mg/kg	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
cis-1,2-dichloropropylene	mg/kg	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibromomethane	mg/kg	-	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dichlorodifluoromethane	mg/kg	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dichloromethane	mg/kg	530	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Ethylbenzene	mg/kg	27000	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Hexachlorobutadiene	mg/kg	120	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Isopropylbenzene	mg/kg	7300	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
m&p Xylene	mg/kg	30000	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
MTBE	mg/kg	22000	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Naphthalene	mg/kg	1100	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
n-Butylbenzene	mg/kg	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
n-Propylbenzene	mg/kg	20000	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
o-Xylene	mg/kg	33000	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
sec-Butylbenzene	mg/kg	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Styrene	mg/kg	11000	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
tert-butylbenzene	mg/kg	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Tetrachloroethylene	mg/kg	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Toluene	mg/kg	180000	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
trans-1,2,-dichloroethylene	mg/kg	76	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
trans-1,3-dichloropropylene	mg/kg	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

The Christie CT
Redevelopment
Soil Laboratory Screening

Determinant Name	Units	GSV Commercial 6% SOM	BH101	BH102	BH103	BH103A	BH104
			1.00	0.30	0.70	0.10	0.30
			11/03/2024	11/03/2024	27/02/2024	27/02/2024	27/02/2024
			MG	MG	MG	MG	MG
Trichloroethylene	mg/kg	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Trichlorofluoromethane	mg/kg	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Vinyl Chloride	mg/kg	0.12	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02

The Christie CT
Redevelopment
Soil Laboratory Screening

		GSV Commercial 6% SOM	BH101	BH102	BH103	BH103A	BH104
			1.00	0.30	0.70	0.10	0.30
			11/03/2024	11/03/2024	27/02/2024	27/02/2024	27/02/2024
Determinant Name	Units		MG	MG	MG	MG	MG
Asbestos & Misc							
Asbestos	-	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

The Christie CT
Redevelopment
Soil Laboratory Screening

Determinant Name	Units	GSV Commercial 6% SOM	TP101	TP104	TP105	TP106	TP107
			0.40	0.30	0.50	0.40	0.40
			27/02/2024	11/03/2024	17/03/2024	27/02/2024	27/02/2024
			MG	MG	MG	MG	MG
Metals							
Antimony	mg/kg	7400	< 3.5	< 3.5	< 3.5	< 3.5	< 3.5
Arsenic	mg/kg	640	14	13	26	< 10	78
Barium	mg/kg	22000	110	950	120	100	280
Beryllium	mg/kg	12	0.8	0.8	0.7	0.5	1.2
Boron, Water Soluble	mg/kg	240000	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5
Cadmium	mg/kg	190	0.7	0.9	0.7	0.5	1.2
Chromium III	mg/kg	8600	6.9	12	5.4	5	8.2
Chromium (Total)	mg/kg	-	7.9	13	6.4	6	9.2
Chromium (Hexavalent)	mg/kg	33	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	mg/kg	68000	49	90	63	32	210
Iron	mg/kg	-	21000	29000	34000	17000	33000
Lead	mg/kg	2300	92	210	450	330	590
Manganese	mg/kg	-	380	320	590	240	880
Mercury	mg/kg	58	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5
Mercury (Total, Low Level)	mg/kg	-	< 0.1	< 0.1	0.2	< 0.1	0.5
Molybdenum	mg/kg	18000	< 2.0	< 2.0	2.8	< 2.0	< 2.0
Nickel	mg/kg	980	14	23	21	13	27
Selenium	mg/kg	12000	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0
Vanadium	mg/kg	9000	26	33	32	21	31
Zinc	mg/kg	730000	52	370	73	66	360
Inorganics							
pH	pH	-	7.3	7.9	7.8	8.5	7.9
Cyanide, Free	mg/kg	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Fraction of Organic Carbon	-	-	0.033	0.036	0.038	0.011	0.036
SOM *(MM Calculated)*	%	-	5.69	6.21	6.55	1.90	6.21
Sulphate Aqueous Extract as SO4	mg/l	-	< 10	< 10	29	< 10	< 10
Sulphur as S, Total	%	-	0.02	0.02	0.01	0.02	0.01
Petroleum Hydrocarbons							
Aliphatic C5-C6	mg/kg	12000	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
Aliphatic C6-C8	mg/kg	40000	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
Aliphatic C8-C10	mg/kg	11000	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
Aliphatic C10-C12	mg/kg	47000	< 10	< 10	< 10	< 10	< 10
Aliphatic C12-C16	mg/kg	90000	< 10	< 10	< 10	< 10	< 10
Aliphatic C16-C21	mg/kg	1800000	< 10	< 10	< 10	< 10	< 10
Aliphatic C21-C35	mg/kg	1800000	31	< 20	< 20	< 20	< 20
Aliphatic C35-C44	mg/kg	1800000	27	< 15	< 15	< 15	< 15
Aromatic C5-C7	mg/kg	86000	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	mg/kg	180000	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	mg/kg	17000	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
Aromatic C10-C12	mg/kg	34000	< 10	< 10	< 10	< 10	< 10
Aromatic C12-C16	mg/kg	38000	< 10	< 10	< 10	< 10	< 10
Aromatic C16-C21	mg/kg	28000	< 10	< 10	< 10	< 10	< 10
Aromatic C21-C35	mg/kg	28000	61	< 20	< 20	< 20	< 20
Aromatic C35-C44	mg/kg	28000	75	< 15	< 15	< 15	< 15

The Christie CT
Redevelopment
Soil Laboratory Screening

Determinant Name	Units	GSV Commercial 6% SOM	TP101	TP104	TP105	TP106	TP107
			0.40	0.30	0.50	0.40	0.40
			27/02/2024	11/03/2024	17/03/2024	27/02/2024	27/02/2024
			MG	MG	MG	MG	MG
Total Ali/Aro C5-C35	mg/kg	-	92	< 50	< 50	< 50	< 50
Benzene	mg/kg	90	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Toluene	mg/kg	180000	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Ethylbenzene	mg/kg	25000	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
m&p Xylene	mg/kg	43000	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
o-Xylene	mg/kg	33000	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
MTBE	mg/kg	22000	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
PAHs							
Acenaphthene	mg/kg	100000	< 0.02	< 0.02	< 0.02	0.02	0.04
Acenaphthylene	mg/kg	100000	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Anthracene	mg/kg	540000	< 0.02	0.03	< 0.02	0.06	0.06
Benzo(a)anthracene	mg/kg	180	0.07	0.11	< 0.02	0.28	0.24
Benzo(a)pyrene	mg/kg	36	0.07	0.1	< 0.02	0.3	0.25
Benzo(b)fluoranthene	mg/kg	45	0.12	0.12	< 0.02	0.34	0.3
Benzo(g,h,i)perylene	mg/kg	4000	0.06	0.08	< 0.02	0.2	0.17
Benzo(k)fluoranthene	mg/kg	1200	0.03	0.03	< 0.02	0.12	0.1
Chrysene	mg/kg	350	0.1	0.12	< 0.02	0.38	0.37
Dibenzo(a,h)anthracene	mg/kg	3.6	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Fluoranthene	mg/kg	23000	0.14	0.19	< 0.02	0.62	0.58
Fluorene	mg/kg	71000	< 0.02	< 0.02	< 0.02	< 0.02	0.03
Indeno(1,2,3-c,d)pyrene	mg/kg	510	0.07	0.12	< 0.02	0.17	0.15
Naphthalene	mg/kg	1100	< 0.02	< 0.02	< 0.02	0.04	0.11
Phenanthrene	mg/kg	23000	0.07	0.12	< 0.02	0.43	0.46
Pyrene	mg/kg	54000	0.15	0.18	< 0.02	0.63	0.6
PAH Total	mg/kg	-	1	1.3	< 0.32	3.7	3.5
Phenols							
Phenol	mg/kg	1300	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Cresols	mg/kg	-	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Xylenols	mg/kg	-	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Trimethyl Phenols	mg/kg	-	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Total Phenols (via HPLC)	mg/kg	-	< 0.80	< 0.80	< 0.80	< 0.80	< 0.80
VOCs							
1,1,1,2-tetrachloroethane	mg/kg	560	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1,1-Trichloroethane	mg/kg	3000	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1,2,2-Tetrachloroethane	mg/kg	1100	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1,2-Trichloroethane	mg/kg	3000	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1-Dichloroethane	mg/kg	24	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1-Dichloroethylene	mg/kg	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1-Dichloropropene	mg/kg	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2,3-Trichlorobenzene	mg/kg	590	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,2,3-Trichloropropane	mg/kg	-	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
1,2,4-Trichlorobenzene	mg/kg	1300	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,2,4-trimethylbenzene	mg/kg	210	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2-Dibromo-3-chloropropane	mg/kg	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,2-Dibromoethane	mg/kg	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

The Christie CT
Redevelopment
Soil Laboratory Screening

Determinant Name	Units	GSV Commercial 6% SOM	TP101	TP104	TP105	TP106	TP107
			0.40	0.30	0.50	0.40	0.40
			27/02/2024	11/03/2024	17/03/2024	27/02/2024	27/02/2024
			MG	MG	MG	MG	MG
1,2-Dichlorobenzene	mg/kg	11000	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2-dichloroethane	mg/kg	1.7	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
1,2-Dichloropropane	mg/kg	11	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,3,5-Trimethylbenzene	mg/kg	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,3-Dichlorobenzene	mg/kg	170	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,3-Dichloropropane	mg/kg	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,4-Dichlorobenzene	mg/kg	21000	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2,2-Dichloropropane	mg/kg	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2-chlorotoluene	mg/kg	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
4-chlorotoluene	mg/kg	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
4-Isopropyltoluene (P-Cymene)	mg/kg	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzene	mg/kg	90	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Bromobenzene	mg/kg	490	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Bromochloromethane	mg/kg	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bromodichloromethane	mg/kg	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Bromoform	mg/kg	3000	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bromomethane	mg/kg	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Carbon Tetrachloride	mg/kg	14	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chlorobenzene	mg/kg	290	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chlorodibromomethane	mg/kg	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chloroethane	mg/kg	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chloroform	mg/kg	350	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chloromethane	mg/kg	1.5	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
cis--1,2,-dichloroethylene	mg/kg	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
cis-1,2-dichloropropylene	mg/kg	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibromomethane	mg/kg	-	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dichlorodifluoromethane	mg/kg	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dichloromethane	mg/kg	530	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Ethylbenzene	mg/kg	27000	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Hexachlorobutadiene	mg/kg	120	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Isopropylbenzene	mg/kg	7300	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
m&p Xylene	mg/kg	30000	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
MTBE	mg/kg	22000	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Naphthalene	mg/kg	1100	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
n-Butylbenzene	mg/kg	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
n-Propylbenzene	mg/kg	20000	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
o-Xylene	mg/kg	33000	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
sec-Butylbenzene	mg/kg	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Styrene	mg/kg	11000	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
tert-butylbenzene	mg/kg	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Tetrachloroethylene	mg/kg	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Toluene	mg/kg	180000	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
trans-1,2,-dichloroethylene	mg/kg	76	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
trans-1,3-dichloropropylene	mg/kg	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

The Christie CT
Redevelopment
Soil Laboratory Screening

		GSV Commercial 6% SOM	TP101	TP104	TP105	TP106	TP107
			0.40	0.30	0.50	0.40	0.40
			27/02/2024	11/03/2024	17/03/2024	27/02/2024	27/02/2024
Determinant Name	Units		MG	MG	MG	MG	MG
Trichloroethylene	mg/kg	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Trichlorofluoromethane	mg/kg	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Vinyl Chloride	mg/kg	0.12	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02

The Christie CT
Redevelopment
Soil Laboratory Screening

		GSV Commercial 6% SOM	TP101	TP104	TP105	TP106	TP107
			0.40	0.30	0.50	0.40	0.40
			27/02/2024	11/03/2024	17/03/2024	27/02/2024	27/02/2024
Determinant Name	Units		MG	MG	MG	MG	MG
Asbestos & Misc							
Asbestos	-	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

The Christie CT
Redevelopment
Soil Laboratory Screening

		GSV Commercial 6% SOM	WS101	WS102
			0.80	0.80
			28/04/2024	28/04/2024
Determinant Name	Units		MG	MG
Metals				
Antimony	mg/kg	7400	< 3.5	< 3.5
Arsenic	mg/kg	640	13	290
Barium	mg/kg	22000	170	140
Beryllium	mg/kg	12	0.7	< 4.0
Boron, Water Soluble	mg/kg	240000	< 2.5	< 2.5
Cadmium	mg/kg	190	0.6	0.5
Chromium III	mg/kg	8600	7.5	2.7
Chromium (Total)	mg/kg	-	8.5	3.7
Chromium (Hexavalent)	mg/kg	33	< 1.0	< 1.0
Copper	mg/kg	68000	46	41
Iron	mg/kg	-	25000	18000
Lead	mg/kg	2300	56	190
Manganese	mg/kg	-	580	390
Mercury	mg/kg	58	< 2.5	< 2.5
Mercury (Total, Low Level)	mg/kg	-	< 0.1	0.2
Molybdenum	mg/kg	18000	< 2.0	< 40.0
Nickel	mg/kg	980	18	12
Selenium	mg/kg	12000	< 8.0	< 8.0
Vanadium	mg/kg	9000	8.4	11
Zinc	mg/kg	730000	56	61
Inorganics				
pH	pH	-	7.6	8.1
Cyanide, Free	mg/kg	-	< 1.0	< 1.0
Fraction of Organic Carbon	-	-	0.027	0.019
SOM *(MM Calculated)*	%	-	4.66	3.28
Sulphate Aqueous Extract as SO4	mg/l	-	< 10	63
Sulphur as S, Total	%	-	< 0.01	0.02
Petroleum Hydrocarbons				
Aliphatic C5-C6	mg/kg	12000	< 0.06	< 0.06
Aliphatic C6-C8	mg/kg	40000	< 0.06	< 0.06
Aliphatic C8-C10	mg/kg	11000	< 0.06	< 0.06
Aliphatic C10-C12	mg/kg	47000	< 10	< 10
Aliphatic C12-C16	mg/kg	90000	< 10	< 10
Aliphatic C16-C21	mg/kg	1800000	< 10	< 10
Aliphatic C21-C35	mg/kg	1800000	< 20	< 20
Aliphatic C35-C44	mg/kg	1800000	23	< 15
Aromatic C5-C7	mg/kg	86000	< 0.01	< 0.01
Aromatic C7-C8	mg/kg	180000	< 0.01	< 0.01
Aromatic C8-C10	mg/kg	17000	< 0.06	< 0.06
Aromatic C10-C12	mg/kg	34000	< 10	< 10
Aromatic C12-C16	mg/kg	38000	< 10	< 10
Aromatic C16-C21	mg/kg	28000	< 10	28
Aromatic C21-C35	mg/kg	28000	49	80
Aromatic C35-C44	mg/kg	28000	95	57

The Christie CT
Redevelopment
Soil Laboratory Screening

		GSV Commercial 6% SOM	WS101	WS102
			0.80	0.80
			28/04/2024	28/04/2024
Determinant Name	Units		MG	MG
Total Ali/Aro C5-C35	mg/kg	-	< 50	110
Benzene	mg/kg	90	< 0.01	< 0.01
Toluene	mg/kg	180000	< 0.01	< 0.01
Ethylbenzene	mg/kg	25000	< 0.01	< 0.01
m&p Xylene	mg/kg	43000	< 0.02	< 0.02
o-Xylene	mg/kg	33000	< 0.01	< 0.01
MTBE	mg/kg	22000	< 0.01	< 0.01
PAHs				
Acenaphthene	mg/kg	100000	< 0.02	0.87
Acenaphthylene	mg/kg	100000	< 0.02	< 0.02
Anthracene	mg/kg	540000	< 0.02	1.1
Benzo(a)anthracene	mg/kg	180	< 0.02	4.4
Benzo(a)pyrene	mg/kg	36	< 0.02	2.8
Benzo(b)fluoranthene	mg/kg	45	< 0.02	3.2
Benzo(g,h,i)perylene	mg/kg	4000	< 0.02	1.5
Benzo(k)fluoranthene	mg/kg	1200	< 0.02	1.3
Chrysene	mg/kg	350	< 0.02	4.2
Dibenzo(a,h)anthracene	mg/kg	3.6	< 0.02	0.29
Fluoranthene	mg/kg	23000	< 0.02	13
Fluorene	mg/kg	71000	< 0.02	0.6
Indeno(1,2,3-c,d)pyrene	mg/kg	510	< 0.02	1.1
Naphthalene	mg/kg	1100	< 0.02	0.53
Phenanthrene	mg/kg	23000	< 0.02	8.5
Pyrene	mg/kg	54000	< 0.02	12
PAH Total	mg/kg	-	< 0.32	56
Phenols				
Phenol	mg/kg	1300	< 0.20	< 0.20
Cresols	mg/kg	-	< 0.20	< 0.20
Xylenols	mg/kg	-	< 0.20	< 0.20
Trimethyl Phenols	mg/kg	-	< 0.20	< 0.20
Total Phenols (via HPLC)	mg/kg	-	< 0.80	< 0.80
VOCs				
1,1,1,2-tetrachloroethane	mg/kg	560	< 0.01	< 0.01
1,1,1-Trichloroethane	mg/kg	3000	< 0.01	< 0.01
1,1,2,2-Tetrachloroethane	mg/kg	1100	< 0.01	< 0.01
1,1,2-Trichloroethane	mg/kg	3000	< 0.01	< 0.01
1,1-Dichloroethane	mg/kg	24	< 0.01	< 0.01
1,1-Dichloroethylene	mg/kg	-	< 0.01	< 0.01
1,1-Dichloropropene	mg/kg	-	< 0.01	< 0.01
1,2,3-Trichlorobenzene	mg/kg	590	< 0.05	< 0.05
1,2,3-Trichloropropane	mg/kg	-	< 0.02	< 0.02
1,2,4-Trichlorobenzene	mg/kg	1300	< 0.05	< 0.05
1,2,4-trimethylbenzene	mg/kg	210	< 0.01	< 0.01
1,2-Dibromo-3-chloropropane	mg/kg	-	< 0.05	< 0.05
1,2-Dibromoethane	mg/kg	-	0.13	0.11

The Christie CT
Redevelopment
Soil Laboratory Screening

		GSV Commercial 6% SOM	WS101	WS102
			0.80	0.80
			28/04/2024	28/04/2024
Determinant Name	Units		MG	MG
1,2-Dichlorobenzene	mg/kg	11000	< 0.01	< 0.01
1,2-dichloroethane	mg/kg	1.7	< 0.02	< 0.02
1,2-Dichloropropane	mg/kg	11	< 0.01	< 0.01
1,3,5-Trimethylbenzene	mg/kg	-	< 0.01	< 0.01
1,3-Dichlorobenzene	mg/kg	170	< 0.01	< 0.01
1,3-Dichloropropane	mg/kg	-	< 0.01	< 0.01
1,4-Dichlorobenzene	mg/kg	21000	< 0.01	< 0.01
2,2-Dichloropropane	mg/kg	-	< 0.01	< 0.01
2-chlorotoluene	mg/kg	-	< 0.01	< 0.01
4-chlorotoluene	mg/kg	-	< 0.01	< 0.01
4-Isopropyltoluene (P-Cymene)	mg/kg	-	< 0.01	< 0.01
Benzene	mg/kg	90	< 0.01	< 0.01
Bromobenzene	mg/kg	490	< 0.01	< 0.01
Bromochloromethane	mg/kg	-	< 0.05	< 0.05
Bromodichloromethane	mg/kg	-	< 0.01	< 0.01
Bromoform	mg/kg	3000	< 0.05	< 0.05
Bromomethane	mg/kg	-	< 0.05	< 0.05
Carbon Tetrachloride	mg/kg	14	< 0.01	< 0.01
Chlorobenzene	mg/kg	290	< 0.01	< 0.01
Chlorodibromomethane	mg/kg	-	< 0.01	< 0.01
Chloroethane	mg/kg	-	< 0.01	< 0.01
Chloroform	mg/kg	350	< 0.01	< 0.01
Chloromethane	mg/kg	1.5	< 0.02	< 0.02
cis--1,2,-dichloroethylene	mg/kg	-	< 0.01	< 0.01
cis-1,2-dichloropropylene	mg/kg	-	< 0.01	< 0.01
Dibromomethane	mg/kg	-	< 0.02	< 0.02
Dichlorodifluoromethane	mg/kg	-	< 0.05	< 0.05
Dichloromethane	mg/kg	530	< 0.10	< 0.10
Ethylbenzene	mg/kg	27000	< 0.01	< 0.01
Hexachlorobutadiene	mg/kg	120	< 0.05	< 0.05
Isopropylbenzene	mg/kg	7300	< 0.01	< 0.01
m&p Xylene	mg/kg	30000	< 0.02	< 0.02
MTBE	mg/kg	22000	< 0.01	< 0.01
Naphthalene	mg/kg	1100	< 0.05	< 0.05
n-Butylbenzene	mg/kg	-	< 0.01	< 0.01
n-Propylbenzene	mg/kg	20000	< 0.01	< 0.01
o-Xylene	mg/kg	33000	< 0.01	< 0.01
sec-Butylbenzene	mg/kg	-	< 0.01	< 0.01
Styrene	mg/kg	11000	< 0.01	< 0.01
tert-butylbenzene	mg/kg	-	< 0.01	< 0.01
Tetrachloroethylene	mg/kg	-	< 0.01	< 0.01
Toluene	mg/kg	180000	< 0.01	< 0.01
trans-1,2,-dichloroethylene	mg/kg	76	< 0.01	< 0.01
trans-1,3-dichloropropylene	mg/kg	-	< 0.01	< 0.01

The Christie CT
Redevelopment
Soil Laboratory Screening

		GSV Commercial 6% SOM	WS101	WS102
			0.80	0.80
			28/04/2024	28/04/2024
Determinant Name	Units		MG	MG
Trichloroethylene	mg/kg	-	< 0.01	< 0.01
Trichlorofluoromethane	mg/kg	-	< 0.01	0.05
Vinyl Chloride	mg/kg	0.12	< 0.02	< 0.02

The Christie CT
Redevelopment
Soil Laboratory Screening

		GSV Commercial 6% SOM	WS101	WS102
			0.80	0.80
			28/04/2024	28/04/2024
Determinant Name	Units		MG	MG
Asbestos & Misc				
Asbestos	-	-	No asbestos detected	No asbestos detected

G.2 Soil Leachate Screening

The Christie CT Redevelopment

Soil Leachate Screening

Test	Units	UK DWS	WHO	BH102	BH103	BH104	TP101
				0.30	1.40	1.50	0.40
				11/03/2024	27/02/2024	27/02/2024	27/02/2024
				MG	MG	MG	MG
Metals							
Antimony, Dissolved	µg/l	5	20	< 2.5	< 2.5	< 2.5	3.3
Arsenic, Dissolved	µg/l	5	10	< 3	3	< 3	< 3
Barium, Dissolved	µg/l	1000	1300	16	< 5	28	26
Beryllium, Dissolved	µg/l	-	12	< 1	< 1	< 1	< 1
Boron, Dissolved	µg/l	1000	2400	5	29	22	6
Cadmium, Dissolved	µg/l	5	3	< 0.25	< 0.25	< 0.25	< 0.25
Calcium, Dissolved	µg/l	250000	-	< 0.25	< 0.25	< 0.25	< 0.25
Chromium	µg/l	-	-	< 3	< 3	< 3	< 3
Chromium, Hexavalent	µg/l	-	-	<20	<20	<20	<20
Chromium III, Dissolved	µg/l	50	50	< 20	< 20	< 20	< 20
Copper, Dissolved	µg/l	2000	2000	< 1	< 1	< 1	3
Iron, Total	µg/l	200	-	1200	< 0.010	< 0.010	380
Lead, Dissolved	µg/l	10	10	< 5	< 5	< 5	< 5
Magnesium, Dissolved	µg/l	50000	-	1600	68	790	870
Manganese, Dissolved	µg/l	50	400	20	< 5	21	< 5
Mercury, Dissolved	µg/l	1	6	< 0.20	< 0.20	< 0.20	< 0.20
Molybdenum, Dissolved	µg/l	-	70	< 2.5	5.7	4.4	14
Nickel, Dissolved	µg/l	20	70	< 3	< 3	< 3	< 3
Selenium, Dissolved	µg/l	10	40	< 1	< 1	< 1	< 1
Vanadium, Dissolved	µg/l	-	-	20.2	30.5	< 2.50	49
Zinc, Dissolved	µg/l	5000	-	< 5	< 5	120	< 5
Inorganics							
pH	pH	-	-	7.9	11	7.9	7.8
Cyanide, Complex	mg/l	-	-	< 0.5	< 0.5	< 0.5	< 0.5
Cyanide, Free	mg/l	-	-	< 0.5	< 0.5	< 0.5	< 0.5
Cyanide, Total	mg/l	0.05	0.07	< 0.5	< 0.5	< 0.5	< 0.5
Ammoniacal Nitrogen as N	mg/l	-	-	< 0.02	< 0.02	< 0.02	0.39
Chloride	mg/l	250	-	1.6	30	0.72	2.4
Fluoride	mg/l	1.5	1.5	0.61	0.5	0.13	0.47
Sulphate as SO4	mg/l	250	250	< 10	39	< 10	< 10
Phenols							
Phenol	µg/l	0.5	-	7.42	17	18.3	12.9
Cresols	µg/l	-	-	< 0.20	0.81	0.91	0.34
Xylenols	µg/l	-	-	< 0.20	< 0.20	< 0.20	< 0.20
Trimethyl Phenols	µg/l	-	-	< 0.50	< 0.50	< 0.50	< 0.50
Phenols (Total)	µg/l	-	-	7.55	18	19.4	13.2

The Christie CT Redevelopment

Soil Leachate Screening

Test	Units	UK DWS	WHO	WS101
				0.80
				28/04/2024
				MG
Metals				
Antimony, Dissolved	µg/l	5	20	< 2.5
Arsenic, Dissolved	µg/l	5	10	4
Barium, Dissolved	µg/l	1000	1300	120
Beryllium, Dissolved	µg/l	-	12	< 1
Boron, Dissolved	µg/l	1000	2400	15
Cadmium, Dissolved	µg/l	5	3	0.83
Calcium, Dissolved	µg/l	250000	-	11
Chromium	µg/l	-	-	19
Chromium, Hexavalent	µg/l	-	-	20
Chromium III, Dissolved	µg/l	50	50	<20
Copper, Dissolved	µg/l	2000	2000	8
Iron, Total	µg/l	200	-	12000
Lead, Dissolved	µg/l	10	10	41
Magnesium, Dissolved	µg/l	50000	-	2300
Manganese, Dissolved	µg/l	50	400	210
Mercury, Dissolved	µg/l	1	6	<0.20
Molybdenum, Dissolved	µg/l	-	70	<2.5
Nickel, Dissolved	µg/l	20	70	<3
Selenium, Dissolved	µg/l	10	40	<1
Vanadium, Dissolved	µg/l	-	-	57.4
Zinc, Dissolved	µg/l	5000	-	27
Inorganics				
pH	pH	-	-	8.1
Cyanide, Complex	mg/l	-	-	< 0.5
Cyanide, Free	mg/l	-	-	< 0.5
Cyanide, Total	mg/l	0.05	0.07	< 0.5
Ammoniacal Nitrogen as N	mg/l	-	-	<0.02
Chloride	mg/l	250	-	4.9
Fluoride	mg/l	1.5	1.5	0.53
Sulphate as SO4	mg/l	250	250	<10
Phenols				
Phenol	µg/l	0.5	-	8.52
Cresols	µg/l	-	-	0.49
Xylenols	µg/l	-	-	< 0.20
Trimethyl Phenols	µg/l	-	-	< 0.50
Phenols (Total)	µg/l	-	-	9.01

H. HazWasteOnline™ Classification Report

Report reference: V46ZU-N5QSU-SRBNH

Waste Classification Report

HazWasteOnline™ classifies waste as either **hazardous** or **non-hazardous** based on its chemical composition, related legislation and the rules and data defined in the current UK or EU technical guidance (Appendix C) (note that HP 9 Infectious is not assessed). It is the responsibility of the classifier named below to:

a) understand the origin of the waste
b) select the correct List of Waste code(s)
c) confirm that the list of determinands, results and sampling plan are fit for purpose
d) select and justify the chosen metal species (Appendix B)
e) correctly apply moisture correction and other available corrections
f) add the meta data for their user-defined substances (Appendix A)
g) check that the classification engine is suitable with respect to the national destination of the waste (Appendix C)

To aid the reviewer, the laboratory results, assumptions and justifications managed by the classifier are highlighted in pale yellow.

V46ZU-N5QSU-SRBNH

Report is invalid if pages are removed.

Job name

The Christie CT Redevelopment - P23 Input

Description/Comments

BH103A The logs indicate the presence of asphalt in the soils potentially explaining the elevated hydrocarbons identified in the sample from 0.10m

Project

The Christie CT Redevelopment - P23 Input

Site

The Christie Hospital, Greater Manchester

Classified by

Name:
Adam Packman
Date:
12 Feb 2025 09:42 GMT
Telephone:
07595514129

Company:
Mott MacDonald Limited
2 Callaghan Square, Cardiff
Cardiff
CF10 5AZ

HazWasteOnline™ provides a two day, hazardous waste classification course that covers the use of the software and both basic and advanced waste classification techniques. Certification has to be renewed every 3 years.

HazWasteOnline™ Certification: **CERTIFIED**

Course	Date
Hazardous Waste Classification	08 Jun 2023

Next 3 year Refresher due by Jun 2026

Purpose of classification

2 - Material Characterisation

Address of the waste

The Christie Hospital, Withington, Greater Manchester **Post Code** M20 4BX

SIC for the process giving rise to the waste

42990 Construction of other civil engineering projects n.e.c.

Description of industry/producer giving rise to the waste

Redevelopment of a hospital site including partial demolition of existing structures and construction of a new three-storey building with a basement.

Description of the specific process, sub-process and/or activity that created the waste

Waste created during the excavation of the basement and foundation structures as well as site reprofiling where necessary.

Description of the waste

Made Ground comprising soft dark brown slightly sandy gravelly CLAY. Sand is fine to coarse . Gravel is fine to coarse sub-angular to sub-rounded brick, tarmac limestone and brick.
Natural soils comprising medium dense and dense orangish brown slightly clayey slightly gravelly SAND. Gravel comprises fine to coarse subangular sandstone.

Job summary

#	Sample name	Depth [m]	Classification Result	Hazard properties	Page
1	BH101	1.00	Non Hazardous		3
2	BH102	0.30	Non Hazardous		6
3	BH103	0.70	Non Hazardous		9
4	BH103A	0.10	Hazardous	HP 3(i), HP 7, HP 11	12
5	BH104	0.30	Hazardous	HP 7	15
6	TP101	0.40	Non Hazardous		18
7	TP104	0.30	Non Hazardous		21
8	TP105	0.50	Non Hazardous		24
9	TP106	0.40	Non Hazardous		27
10	TP107	0.40	Non Hazardous		30
11	WS101	0.80	Non Hazardous		33
12	WS102	0.80	Non Hazardous		36

Related documents

#	Name	Description
1	MM standard waste stream for soils	waste stream template used to create this Job

Report

Created by: Adam Packman

Created date: 12 Feb 2025 09:42 GMT

Appendices	Page
Appendix A: Classifier defined and non GB MCL determinands	39
Appendix B: Rationale for selection of metal species	40
Appendix C: Version	41

Classification of sample: BH101

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
BH101
Sample Depth:
1.00 m

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	antimony { antimony trioxide }	051-005-00-X	215-175-0	1309-64-4		<3.5 mg/kg	1.197	<4.19 mg/kg	<0.000419 %		<LOD
2	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		<10 mg/kg	1.32	<13.203 mg/kg	<0.00132 %		<LOD
3	barium { barium diboron tetraoxide }	056-005-00-3	237-222-4	13701-59-2		77 mg/kg	1.623	125.007 mg/kg	0.0125 %		
4	beryllium { beryllium oxide }	004-003-00-8	215-133-1	1304-56-9		0.4 mg/kg	2.775	1.11 mg/kg	0.000111 %		
5	boron { diboron trioxide }	005-008-00-8	215-125-8	1303-86-2		<2.5 mg/kg	3.22	<8.05 mg/kg	<0.000805 %		<LOD
6	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.8 mg/kg	1.142	0.914 mg/kg	0.0000914 %		
7	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		8.6 mg/kg	1.462	12.569 mg/kg	0.00126 %		
8	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<1 mg/kg	1.923	<1.923 mg/kg	<0.000192 %		<LOD
9	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		35 mg/kg	1.126	39.406 mg/kg	0.00394 %		
10	iron { iron (III) oxide }		215-168-2	1309-37-1		31000 mg/kg	1.43	44322.09 mg/kg	4.432 %		
11	lead { lead compounds with the exception of those specified elsewhere in this Annex (worst case) }	082-001-00-6			1	50 mg/kg		50 mg/kg	0.005 %		
12	manganese { manganese sulphate }	025-003-00-4	232-089-9	7785-87-7		810 mg/kg	2.749	2226.337 mg/kg	0.223 %		
13	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.1 mg/kg	1.353	0.135 mg/kg	0.0000135 %		
14	molybdenum { molybdenum(VI) oxide }	042-001-00-9	215-204-7	1313-27-5		<2 mg/kg	1.5	<3 mg/kg	<0.0003 %		<LOD
15	nickel { dinickel hexacyanoferrate }	028-037-00-8	238-946-3	14874-78-3		23 mg/kg	2.806	64.528 mg/kg	0.00645 %		

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
16	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<8 mg/kg	1.405	<11.24 mg/kg	<0.00112 %		<LOD
17	vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8	1314-62-1		25 mg/kg	1.785	44.63 mg/kg	0.00446 %		
18	zinc { zinc sulphate }	030-006-00-9	231-793-3 [1] 231-793-3 [2]	7446-19-7 [1] 7733-02-0 [2]		55 mg/kg	2.469	135.811 mg/kg	0.0136 %		
19	pH			PH		7.5 pH		7.5 pH	7.5 pH		
20	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1 mg/kg	1.884	<1.884 mg/kg	<0.000188 %		<LOD
21	TPH (C6 to C40) petroleum group			TPH		<50 mg/kg		<50 mg/kg	<0.005 %		<LOD
22	confirm TPH has NOT arisen from diesel or petrol					☑					
23	benzene	601-020-00-8	200-753-7	71-43-2		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
24	toluene	601-021-00-3	203-625-9	108-88-3		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
25	ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
26	xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
27	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
28	naphthalene	601-052-00-2	202-049-5	91-20-3		<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		<LOD
29	acenaphthylene		205-917-1	208-96-8		<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		<LOD
30	acenaphthene		201-469-6	83-32-9		<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		<LOD
31	fluorene		201-695-5	86-73-7		<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		<LOD
32	phenanthrene		201-581-5	85-01-8		0.12 mg/kg		0.12 mg/kg	0.000012 %		
33	anthracene		204-371-1	120-12-7		0.03 mg/kg		0.03 mg/kg	0.000003 %		
34	fluoranthene		205-912-4	206-44-0		0.2 mg/kg		0.2 mg/kg	0.00002 %		
35	pyrene		204-927-3	129-00-0		0.23 mg/kg		0.23 mg/kg	0.000023 %		
36	benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		0.14 mg/kg		0.14 mg/kg	0.000014 %		
37	chrysene	601-048-00-0	205-923-4	218-01-9		0.16 mg/kg		0.16 mg/kg	0.000016 %		
38	benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		0.27 mg/kg		0.27 mg/kg	0.000027 %		
39	benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		0.08 mg/kg		0.08 mg/kg	0.000008 %		
40	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		0.16 mg/kg		0.16 mg/kg	0.000016 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
41		indeno[123-cd]pyrene				0.18	mg/kg		0.18	mg/kg	0.000018 %		
			205-893-2	193-39-5									
42		dibenz[a,h]anthracene				0.02	mg/kg		0.02	mg/kg	0.000002 %		
		601-041-00-2	200-181-8	53-70-3									
43		benzo[ghi]perylene				0.13	mg/kg		0.13	mg/kg	0.000013 %		
			205-883-8	191-24-2									
44		phenol				<0.2	mg/kg		<0.2	mg/kg	<0.00002 %		**<LOD**
		604-001-00-2	203-632-7	108-95-2									
45		vinyl chloride; chloroethylene				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		**<LOD**
		602-023-00-7	200-831-0	75-01-4									
46		1,2-dibromoethane				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		**<LOD**
		602-010-00-6	203-444-5	106-93-4									
										Total:	4.712 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: BH102

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
BH102
Sample Depth:
0.30 m

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	antimony { antimony trioxide }	051-005-00-X	215-175-0	1309-64-4		<3.5 mg/kg	1.197	<4.19 mg/kg	<0.000419 %		<LOD
2	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		18 mg/kg	1.32	23.766 mg/kg	0.00238 %		
3	barium { barium diboron tetraoxide }	056-005-00-3	237-222-4	13701-59-2		240 mg/kg	1.623	389.633 mg/kg	0.039 %		
4	beryllium { beryllium oxide }	004-003-00-8	215-133-1	1304-56-9		1 mg/kg	2.775	2.775 mg/kg	0.000278 %		
5	boron { diboron trioxide }	005-008-00-8	215-125-8	1303-86-2		<2.5 mg/kg	3.22	<8.05 mg/kg	<0.000805 %		<LOD
6	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.7 mg/kg	1.142	0.8 mg/kg	0.00008 %		
7	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		6 mg/kg	1.462	8.769 mg/kg	0.000877 %		
8	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<1 mg/kg	1.923	<1.923 mg/kg	<0.000192 %		<LOD
9	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		48 mg/kg	1.126	54.043 mg/kg	0.0054 %		
10	iron { iron (III) oxide }		215-168-2	1309-37-1		31000 mg/kg	1.43	44322.09 mg/kg	4.432 %		
11	lead { lead compounds with the exception of those specified elsewhere in this Annex (worst case) }	082-001-00-6			1	130 mg/kg		130 mg/kg	0.013 %		
12	manganese { manganese sulphate }	025-003-00-4	232-089-9	7785-87-7		660 mg/kg	2.749	1814.052 mg/kg	0.181 %		
13	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.1 mg/kg	1.353	0.135 mg/kg	0.0000135 %		
14	molybdenum { molybdenum(VI) oxide }	042-001-00-9	215-204-7	1313-27-5		<2 mg/kg	1.5	<3 mg/kg	<0.0003 %		<LOD
15	nickel { dinickel hexacyanoferrate }	028-037-00-8	238-946-3	14874-78-3		17 mg/kg	2.806	47.695 mg/kg	0.00477 %		

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
16	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<8 mg/kg	1.405	<11.24 mg/kg	<0.00112 %		<LOD
17	vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8	1314-62-1		27 mg/kg	1.785	48.2 mg/kg	0.00482 %		
18	zinc { zinc sulphate }	030-006-00-9	231-793-3 [1] 231-793-3 [2]	7446-19-7 [1] 7733-02-0 [2]		59 mg/kg	2.469	145.688 mg/kg	0.0146 %		
19	pH			PH		7.9 pH		7.9 pH	7.9 pH		
20	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1 mg/kg	1.884	<1.884 mg/kg	<0.000188 %		<LOD
21	TPH (C6 to C40) petroleum group			TPH		<50 mg/kg		<50 mg/kg	<0.005 %		<LOD
22	confirm TPH has NOT arisen from diesel or petrol					☑					
23	benzene	601-020-00-8	200-753-7	71-43-2		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
24	toluene	601-021-00-3	203-625-9	108-88-3		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
25	ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
26	xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
27	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
28	naphthalene	601-052-00-2	202-049-5	91-20-3		<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		<LOD
29	acenaphthylene		205-917-1	208-96-8		<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		<LOD
30	acenaphthene		201-469-6	83-32-9		<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		<LOD
31	fluorene		201-695-5	86-73-7		<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		<LOD
32	phenanthrene		201-581-5	85-01-8		0.03 mg/kg		0.03 mg/kg	0.000003 %		
33	anthracene		204-371-1	120-12-7		<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		<LOD
34	fluoranthene		205-912-4	206-44-0		0.07 mg/kg		0.07 mg/kg	0.000007 %		
35	pyrene		204-927-3	129-00-0		0.07 mg/kg		0.07 mg/kg	0.000007 %		
36	benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		0.04 mg/kg		0.04 mg/kg	0.000004 %		
37	chrysene	601-048-00-0	205-923-4	218-01-9		0.05 mg/kg		0.05 mg/kg	0.000005 %		
38	benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		0.06 mg/kg		0.06 mg/kg	0.000006 %		
39	benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		<LOD
40	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		0.03 mg/kg		0.03 mg/kg	0.000003 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
41		indeno[123-cd]pyrene				0.04	mg/kg		0.04	mg/kg	0.000004 %		
			205-893-2	193-39-5									
42		dibenz[a,h]anthracene				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<**LOD**
		601-041-00-2	200-181-8	53-70-3									
43		benzo[ghi]perylene				0.03	mg/kg		0.03	mg/kg	0.000003 %		
			205-883-8	191-24-2									
44		phenol				<0.2	mg/kg		<0.2	mg/kg	<0.00002 %		<**LOD**
		604-001-00-2	203-632-7	108-95-2									
45		vinyl chloride; chloroethylene				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<**LOD**
		602-023-00-7	200-831-0	75-01-4									
46		1,2-dibromoethane				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		602-010-00-6	203-444-5	106-93-4									
										Total:	4.707 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: BH103

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:	LoW Code:	
BH103	Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:		
0.70 m	Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	antimony { antimony trioxide }	051-005-00-X	215-175-0	1309-64-4		<3.5 mg/kg	1.197	<4.19 mg/kg	<0.000419 %		<LOD
2	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		10 mg/kg	1.32	13.203 mg/kg	0.00132 %		
3	barium { barium diboron tetraoxide }	056-005-00-3	237-222-4	13701-59-2		110 mg/kg	1.623	178.582 mg/kg	0.0179 %		
4	beryllium { beryllium oxide }	004-003-00-8	215-133-1	1304-56-9		0.6 mg/kg	2.775	1.665 mg/kg	0.000167 %		
5	boron { diboron trioxide }	005-008-00-8	215-125-8	1303-86-2		<2.5 mg/kg	3.22	<8.05 mg/kg	<0.000805 %		<LOD
6	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.5 mg/kg	1.142	0.571 mg/kg	0.0000571 %		
7	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		6.4 mg/kg	1.462	9.354 mg/kg	0.000935 %		
8	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<1 mg/kg	1.923	<1.923 mg/kg	<0.000192 %		<LOD
9	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		29 mg/kg	1.126	32.651 mg/kg	0.00327 %		
10	iron { iron (III) oxide }		215-168-2	1309-37-1		16000 mg/kg	1.43	22875.917 mg/kg	2.288 %		
11	lead { lead compounds with the exception of those specified elsewhere in this Annex (worst case) }	082-001-00-6			1	110 mg/kg		110 mg/kg	0.011 %		
12	manganese { manganese sulphate }	025-003-00-4	232-089-9	7785-87-7		300 mg/kg	2.749	824.569 mg/kg	0.0825 %		
13	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.1 mg/kg	1.353	<0.135 mg/kg	<0.0000135 %		<LOD
14	molybdenum { molybdenum(VI) oxide }	042-001-00-9	215-204-7	1313-27-5		<2 mg/kg	1.5	<3 mg/kg	<0.0003 %		<LOD
15	nickel { dinickel hexacyanoferrate }	028-037-00-8	238-946-3	14874-78-3		14 mg/kg	2.806	39.278 mg/kg	0.00393 %		

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
16	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<8 mg/kg	1.405	<11.24 mg/kg	<0.00112 %		<LOD
17	vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8	1314-62-1		19 mg/kg	1.785	33.919 mg/kg	0.00339 %		
18	zinc { zinc sulphate }	030-006-00-9	231-793-3 [1] 231-793-3 [2]	7446-19-7 [1] 7733-02-0 [2]		50 mg/kg	2.469	123.465 mg/kg	0.0123 %		
19	pH			PH		8.3 pH		8.3 pH	8.3 pH		
20	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1 mg/kg	1.884	<1.884 mg/kg	<0.000188 %		<LOD
21	TPH (C6 to C40) petroleum group			TPH		100 mg/kg		100 mg/kg	0.01 %		
22	confirm TPH has NOT arisen from diesel or petrol					☑					
23	benzene	601-020-00-8	200-753-7	71-43-2		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
24	toluene	601-021-00-3	203-625-9	108-88-3		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
25	ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
26	xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
27	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
28	naphthalene	601-052-00-2	202-049-5	91-20-3		0.02 mg/kg		0.02 mg/kg	0.000002 %		
29	acenaphthylene		205-917-1	208-96-8		0.03 mg/kg		0.03 mg/kg	0.000003 %		
30	acenaphthene		201-469-6	83-32-9		0.11 mg/kg		0.11 mg/kg	0.000011 %		
31	fluorene		201-695-5	86-73-7		0.04 mg/kg		0.04 mg/kg	0.000004 %		
32	phenanthrene		201-581-5	85-01-8		1.2 mg/kg		1.2 mg/kg	0.00012 %		
33	anthracene		204-371-1	120-12-7		0.33 mg/kg		0.33 mg/kg	0.000033 %		
34	fluoranthene		205-912-4	206-44-0		2.2 mg/kg		2.2 mg/kg	0.00022 %		
35	pyrene		204-927-3	129-00-0		2.2 mg/kg		2.2 mg/kg	0.00022 %		
36	benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		0.95 mg/kg		0.95 mg/kg	0.000095 %		
37	chrysene	601-048-00-0	205-923-4	218-01-9		1 mg/kg		1 mg/kg	0.0001 %		
38	benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		1.1 mg/kg		1.1 mg/kg	0.00011 %		
39	benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		0.43 mg/kg		0.43 mg/kg	0.000043 %		
40	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		0.88 mg/kg		0.88 mg/kg	0.000088 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
41		indeno[123-cd]pyrene				0.52	mg/kg		0.52	mg/kg	0.000052 %		
			205-893-2	193-39-5									
42		dibenz[a,h]anthracene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
		601-041-00-2	200-181-8	53-70-3									
43		benzo[ghi]perylene				0.49	mg/kg		0.49	mg/kg	0.000049 %		
			205-883-8	191-24-2									
44		phenol				<0.2	mg/kg		<0.2	mg/kg	<0.00002 %		**<LOD**
		604-001-00-2	203-632-7	108-95-2									
45		vinyl chloride; chloroethylene				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		**<LOD**
		602-023-00-7	200-831-0	75-01-4									
46		1,2-dibromoethane				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		**<LOD**
		602-010-00-6	203-444-5	106-93-4									
										Total:	2.439 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"
Force this Hazardous Property to non-hazardous for cumulative determinand results below the threshold of: 1000 mg/kg (0.1%) because: HP 3 Flammable (first indent) can be discounted as this is a solid waste without a free draining liquid phase. The waste does not display these hazardous properties.

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group (conc.: 0.01%)

Classification of sample: BH103A

Hazardous Waste
Classified as **17 05 03 ***
in the List of Waste

Sample details

Sample name:	LoW Code:	
BH103A	Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:		
0.10 m	Entry:	17 05 03 * (Soil and stones containing hazardous substances)

Hazard properties

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group (conc.: 0.19%)

HP 7: Carcinogenic "waste which induces cancer or increases its incidence"

Hazard Statements hit:

Carc. 1B; H350 "May cause cancer [state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard]."

Because of determinand:

TPH (C6 to C40) petroleum group (conc.: 0.19%)

HP 11: Mutagenic "waste which may cause a mutation, that is a permanent change in the amount or structure of the genetic material in a cell"

Hazard Statements hit:

Muta. 1B; H340 "May cause genetic defects [state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard]."

Because of determinand:

TPH (C6 to C40) petroleum group (conc.: 0.19%)

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#		Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		antimony { antimony trioxide }	051-005-00-X	215-175-0	1309-64-4		<3.5	mg/kg	1.197	<4.19	mg/kg	<0.000419 %		**<LOD**
2		arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		11	mg/kg	1.32	14.524	mg/kg	0.00145 %		
3		barium { barium diboron tetraoxide }	056-005-00-3	237-222-4	13701-59-2		290	mg/kg	1.623	470.807	mg/kg	0.0471 %		
4		beryllium { beryllium oxide }	004-003-00-8	215-133-1	1304-56-9		1.1	mg/kg	2.775	3.053	mg/kg	0.000305 %		
5		boron { diboron trioxide }	005-008-00-8	215-125-8	1303-86-2		<2.5	mg/kg	3.22	<8.05	mg/kg	<0.000805 %		**<LOD**
6		cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.7	mg/kg	1.142	0.8	mg/kg	0.00008 %		

#		Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
7		chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		11	mg/kg	1.462	16.077	mg/kg	0.00161 %		
8		chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<1	mg/kg	1.923	<1.923	mg/kg	<0.000192 %		<LOD
9		copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		46	mg/kg	1.126	51.791	mg/kg	0.00518 %		
10		iron { iron (III) oxide }		215-168-2	1309-37-1		28000	mg/kg	1.43	40032.855	mg/kg	4.003 %		
11		lead { lead compounds with the exception of those specified elsewhere in this Annex (worst case) }	082-001-00-6			1	56	mg/kg		56	mg/kg	0.0056 %		
12		manganese { manganese sulphate }	025-003-00-4	232-089-9	7785-87-7		490	mg/kg	2.749	1346.796	mg/kg	0.135 %		
13		mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.1	mg/kg	1.353	0.135	mg/kg	0.0000135 %		
14		molybdenum { molybdenum(VI) oxide }	042-001-00-9	215-204-7	1313-27-5		2.4	mg/kg	1.5	3.6	mg/kg	0.00036 %		
15		nickel { dinickel hexacyanoferrate }	028-037-00-8	238-946-3	14874-78-3		33	mg/kg	2.806	92.584	mg/kg	0.00926 %		
16		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<8	mg/kg	1.405	<11.24	mg/kg	<0.00112 %		<LOD
17		vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8	1314-62-1		35	mg/kg	1.785	62.481	mg/kg	0.00625 %		
18		zinc { zinc sulphate }	030-006-00-9	231-793-3 [1] 231-793-3 [2]	7446-19-7 [1] 7733-02-0 [2]		55	mg/kg	2.469	135.811	mg/kg	0.0136 %		
19		pH			PH		9	pH		9	pH	9pH		
20		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1	mg/kg	1.884	<1.884	mg/kg	<0.000188 %		<LOD
21		TPH (C6 to C40) petroleum group			TPH		1900	mg/kg		1900	mg/kg	0.19 %		
22		confirm TPH has NOT arisen from diesel or petrol					☑							
23		benzene	601-020-00-8	200-753-7	71-43-2		<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
24		toluene	601-021-00-3	203-625-9	108-88-3		<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
25		ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
26		xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
27		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
28		naphthalene	601-052-00-2	202-049-5	91-20-3		<0.2	mg/kg		<0.2	mg/kg	<0.00002 %		<LOD
29		acenaphthylene		205-917-1	208-96-8		<0.2	mg/kg		<0.2	mg/kg	<0.00002 %		<LOD

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
30		acenaphthene				0.96	mg/kg		0.96	mg/kg	0.000096 %		
			201-469-6	83-32-9									
31		fluorene				<0.2	mg/kg		<0.2	mg/kg	<0.00002 %		<LOD
			201-695-5	86-73-7									
32		phenanthrene				1.2	mg/kg		1.2	mg/kg	0.00012 %		
			201-581-5	85-01-8									
33		anthracene				1.1	mg/kg		1.1	mg/kg	0.00011 %		
			204-371-1	120-12-7									
34		fluoranthene				4.7	mg/kg		4.7	mg/kg	0.00047 %		
			205-912-4	206-44-0									
35		pyrene				4.7	mg/kg		4.7	mg/kg	0.00047 %		
			204-927-3	129-00-0									
36		benzo[a]anthracene				2.7	mg/kg		2.7	mg/kg	0.00027 %		
		601-033-00-9	200-280-6	56-55-3									
37		chrysene				2.9	mg/kg		2.9	mg/kg	0.00029 %		
		601-048-00-0	205-923-4	218-01-9									
38		benzo[b]fluoranthene				5.2	mg/kg		5.2	mg/kg	0.00052 %		
		601-034-00-4	205-911-9	205-99-2									
39		benzo[k]fluoranthene				1.9	mg/kg		1.9	mg/kg	0.00019 %		
		601-036-00-5	205-916-6	207-08-9									
40		benzo[a]pyrene; benzo[def]chrysene				4.4	mg/kg		4.4	mg/kg	0.00044 %		
		601-032-00-3	200-028-5	50-32-8									
41		indeno[123-cd]pyrene				4.5	mg/kg		4.5	mg/kg	0.00045 %		
			205-893-2	193-39-5									
42		dibenz[a,h]anthracene				0.63	mg/kg		0.63	mg/kg	0.000063 %		
		601-041-00-2	200-181-8	53-70-3									
43		benzo[ghi]perylene				4.9	mg/kg		4.9	mg/kg	0.00049 %		
			205-883-8	191-24-2									
44		phenol				<0.2	mg/kg		<0.2	mg/kg	<0.00002 %		<LOD
		604-001-00-2	203-632-7	108-95-2									
45		vinyl chloride; chloroethylene				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<LOD
		602-023-00-7	200-831-0	75-01-4									
46		1,2-dibromoethane				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		602-010-00-6	203-444-5	106-93-4									
										Total:	4.426 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Hazardous result
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"
Force this Hazardous Property to non-hazardous for cumulative determinand results below the threshold of: 1000 mg/kg (0.1%)
because: HP 3 Flammable (first indent) can be discounted as this is a solid waste without a free draining liquid phase. The waste does not display these hazardous properties.

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group (conc.: 0.19%)

Classification of sample: BH104

Hazardous Waste
Classified as **17 05 03 ***
in the List of Waste

Sample details

Sample name:	LoW Code:	
BH104	Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:		
0.30 m	Entry:	17 05 03 * (Soil and stones containing hazardous substances)

Hazard properties

HP 7: Carcinogenic "waste which induces cancer or increases its incidence"

Hazard Statements hit:

Carc. 1A; H350 "May cause cancer [state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard]."

Because of determinand:

lead compounds with the exception of those specified elsewhere in this Annex (worst case) (Note 1 conc.: 0.21%)

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	antimony { antimony trioxide }	051-005-00-X	215-175-0	1309-64-4		<3.5 mg/kg	1.197	<4.19 mg/kg	<0.000419 %		**<LOD**
2	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		28 mg/kg	1.32	36.969 mg/kg	0.0037 %		
3	barium { barium diboron tetraoxide }	056-005-00-3	237-222-4	13701-59-2		560 mg/kg	1.623	909.145 mg/kg	0.0909 %		
4	beryllium { beryllium oxide }	004-003-00-8	215-133-1	1304-56-9		1.3 mg/kg	2.775	3.608 mg/kg	0.000361 %		
5	boron { diboron trioxide }	005-008-00-8	215-125-8	1303-86-2		<2.5 mg/kg	3.22	<8.05 mg/kg	<0.000805 %		**<LOD**
6	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		1.1 mg/kg	1.142	1.257 mg/kg	0.000126 %		
7	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		6.5 mg/kg	1.462	9.5 mg/kg	0.00095 %		
8	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<1 mg/kg	1.923	<1.923 mg/kg	<0.000192 %		**<LOD**
9	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		120 mg/kg	1.126	135.107 mg/kg	0.0135 %		
10	iron { iron (III) oxide }		215-168-2	1309-37-1		39000 mg/kg	1.43	55760.048 mg/kg	5.576 %		
11	lead { lead compounds with the exception of those specified elsewhere in this Annex (worst case) }	082-001-00-6			1	2100 mg/kg		2100 mg/kg	0.21 %		
12	manganese { manganese sulphate }	025-003-00-4	232-089-9	7785-87-7		650 mg/kg	2.749	1786.566 mg/kg	0.179 %		
13	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		1.1 mg/kg	1.353	1.489 mg/kg	0.000149 %		

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
14	molybdenum { molybdenum(VI) oxide }	042-001-00-9	215-204-7	1313-27-5		3.1	mg/kg	1.5	4.651	mg/kg	0.000465 %		
15	nickel { dinickel hexacyanoferrate }	028-037-00-8	238-946-3	14874-78-3		24	mg/kg	2.806	67.334	mg/kg	0.00673 %		
16	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<8	mg/kg	1.405	<11.24	mg/kg	<0.00112 %		<LOD
17	vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8	1314-62-1		31	mg/kg	1.785	55.341	mg/kg	0.00553 %		
18	zinc { zinc sulphate }	030-006-00-9	231-793-3 [1] 231-793-3 [2]	7446-19-7 [1] 7733-02-0 [2]		250	mg/kg	2.469	617.324	mg/kg	0.0617 %		
19	pH			PH		8.5	pH		8.5	pH	8.5 pH		
20	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1	mg/kg	1.884	<1.884	mg/kg	<0.000188 %		<LOD
21	TPH (C6 to C40) petroleum group			TPH		<50	mg/kg		<50	mg/kg	<0.005 %		<LOD
22	confirm TPH has NOT arisen from diesel or petrol					☑							
23	benzene	601-020-00-8	200-753-7	71-43-2		<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
24	toluene	601-021-00-3	203-625-9	108-88-3		<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
25	ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
26	xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
27	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
28	naphthalene	601-052-00-2	202-049-5	91-20-3		<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<LOD
29	acenaphthylene		205-917-1	208-96-8		<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<LOD
30	acenaphthene		201-469-6	83-32-9		<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<LOD
31	fluorene		201-695-5	86-73-7		<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<LOD
32	phenanthrene		201-581-5	85-01-8		0.05	mg/kg		0.05	mg/kg	0.000005 %		
33	anthracene		204-371-1	120-12-7		0.05	mg/kg		0.05	mg/kg	0.000005 %		
34	fluoranthene		205-912-4	206-44-0		0.07	mg/kg		0.07	mg/kg	0.000007 %		
35	pyrene		204-927-3	129-00-0		0.07	mg/kg		0.07	mg/kg	0.000007 %		
36	benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		0.04	mg/kg		0.04	mg/kg	0.000004 %		
37	chrysene	601-048-00-0	205-923-4	218-01-9		0.05	mg/kg		0.05	mg/kg	0.000005 %		
38	benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		0.07	mg/kg		0.07	mg/kg	0.000007 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
39		benzo[k]fluoranthene				0.03	mg/kg		0.03	mg/kg	0.000003 %		
		601-036-00-5	205-916-6	207-08-9									
40		benzo[a]pyrene; benzo[def]chrysene				0.05	mg/kg		0.05	mg/kg	0.000005 %		
		601-032-00-3	200-028-5	50-32-8									
41		indeno[123-cd]pyrene				0.06	mg/kg		0.06	mg/kg	0.000006 %		
			205-893-2	193-39-5									
42		dibenz[a,h]anthracene				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		**<LOD**
		601-041-00-2	200-181-8	53-70-3									
43		benzo[ghi]perylene				0.06	mg/kg		0.06	mg/kg	0.000006 %		
			205-883-8	191-24-2									
44		phenol				<0.2	mg/kg		<0.2	mg/kg	<0.00002 %		**<LOD**
		604-001-00-2	203-632-7	108-95-2									
45		vinyl chloride; chloroethylene				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		**<LOD**
		602-023-00-7	200-831-0	75-01-4									
46		1,2-dibromoethane				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		**<LOD**
		602-010-00-6	203-444-5	106-93-4									
										Total:	6.157 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Hazardous result
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP101

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
TP101
Sample Depth:
0.40 m

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	antimony { antimony trioxide }	051-005-00-X	215-175-0	1309-64-4		<3.5 mg/kg	1.197	<4.19 mg/kg	<0.000419 %		<LOD
2	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		14 mg/kg	1.32	18.485 mg/kg	0.00185 %		
3	barium { barium diboron tetraoxide }	056-005-00-3	237-222-4	13701-59-2		110 mg/kg	1.623	178.582 mg/kg	0.0179 %		
4	beryllium { beryllium oxide }	004-003-00-8	215-133-1	1304-56-9		0.8 mg/kg	2.775	2.22 mg/kg	0.000222 %		
5	boron { diboron trioxide }	005-008-00-8	215-125-8	1303-86-2		<2.5 mg/kg	3.22	<8.05 mg/kg	<0.000805 %		<LOD
6	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.7 mg/kg	1.142	0.8 mg/kg	0.00008 %		
7	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		6.9 mg/kg	1.462	10.085 mg/kg	0.00101 %		
8	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<1 mg/kg	1.923	<1.923 mg/kg	<0.000192 %		<LOD
9	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		49 mg/kg	1.126	55.169 mg/kg	0.00552 %		
10	iron { iron (III) oxide }		215-168-2	1309-37-1		21000 mg/kg	1.43	30024.641 mg/kg	3.002 %		
11	lead { lead compounds with the exception of those specified elsewhere in this Annex (worst case) }	082-001-00-6			1	92 mg/kg		92 mg/kg	0.0092 %		
12	manganese { manganese sulphate }	025-003-00-4	232-089-9	7785-87-7		380 mg/kg	2.749	1044.454 mg/kg	0.104 %		
13	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.1 mg/kg	1.353	<0.135 mg/kg	<0.0000135 %		<LOD
14	molybdenum { molybdenum(VI) oxide }	042-001-00-9	215-204-7	1313-27-5		<2 mg/kg	1.5	<3 mg/kg	<0.0003 %		<LOD
15	nickel { dinickel hexacyanoferrate }	028-037-00-8	238-946-3	14874-78-3		14 mg/kg	2.806	39.278 mg/kg	0.00393 %		

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
16	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<8 mg/kg	1.405	<11.24 mg/kg	<0.00112 %		<LOD
17	vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8	1314-62-1		26 mg/kg	1.785	46.415 mg/kg	0.00464 %		
18	zinc { zinc sulphate }	030-006-00-9	231-793-3 [1] 231-793-3 [2]	7446-19-7 [1] 7733-02-0 [2]		52 mg/kg	2.469	128.403 mg/kg	0.0128 %		
19	pH			PH		7.3 pH		7.3 pH	7.3 pH		
20	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1 mg/kg	1.884	<1.884 mg/kg	<0.000188 %		<LOD
21	TPH (C6 to C40) petroleum group			TPH		92 mg/kg		92 mg/kg	0.0092 %		
22	confirm TPH has NOT arisen from diesel or petrol					☑					
23	benzene	601-020-00-8	200-753-7	71-43-2		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
24	toluene	601-021-00-3	203-625-9	108-88-3		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
25	ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
26	xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
27	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
28	naphthalene	601-052-00-2	202-049-5	91-20-3		<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		<LOD
29	acenaphthylene		205-917-1	208-96-8		<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		<LOD
30	acenaphthene		201-469-6	83-32-9		<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		<LOD
31	fluorene		201-695-5	86-73-7		<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		<LOD
32	phenanthrene		201-581-5	85-01-8		0.07 mg/kg		0.07 mg/kg	0.000007 %		
33	anthracene		204-371-1	120-12-7		<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		<LOD
34	fluoranthene		205-912-4	206-44-0		0.14 mg/kg		0.14 mg/kg	0.000014 %		
35	pyrene		204-927-3	129-00-0		0.15 mg/kg		0.15 mg/kg	0.000015 %		
36	benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		0.07 mg/kg		0.07 mg/kg	0.000007 %		
37	chrysene	601-048-00-0	205-923-4	218-01-9		0.1 mg/kg		0.1 mg/kg	0.00001 %		
38	benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		0.12 mg/kg		0.12 mg/kg	0.000012 %		
39	benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		0.03 mg/kg		0.03 mg/kg	0.000003 %		
40	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		0.07 mg/kg		0.07 mg/kg	0.000007 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
41		indeno[123-cd]pyrene				0.07	mg/kg		0.07	mg/kg	0.000007 %		
			205-893-2	193-39-5									
42		dibenz[a,h]anthracene				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<LOD
		601-041-00-2	200-181-8	53-70-3									
43		benzo[ghi]perylene				0.06	mg/kg		0.06	mg/kg	0.000006 %		
			205-883-8	191-24-2									
44		phenol				<0.2	mg/kg		<0.2	mg/kg	<0.00002 %		<LOD
		604-001-00-2	203-632-7	108-95-2									
45		vinyl chloride; chloroethylene				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<LOD
		602-023-00-7	200-831-0	75-01-4									
46		1,2-dibromoethane				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		602-010-00-6	203-444-5	106-93-4									
										Total:	3.176 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"
Force this Hazardous Property to non-hazardous for cumulative determinand results below the threshold of: 1000 mg/kg (0.1%) because: HP 3 Flammable (first indent) can be discounted as this is a solid waste without a free draining liquid phase. The waste does not display these hazardous properties.

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group (conc.: 0.0092%)

Classification of sample: TP104

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:	LoW Code:	
TP104	Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:		
0.30 m	Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	antimony { antimony trioxide }	051-005-00-X	215-175-0	1309-64-4		<3.5 mg/kg	1.197	<4.19 mg/kg	<0.000419 %		<LOD
2	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		13 mg/kg	1.32	17.164 mg/kg	0.00172 %		
3	barium { barium diboron tetraoxide }	056-005-00-3	237-222-4	13701-59-2		950 mg/kg	1.623	1542.299 mg/kg	0.154 %		
4	beryllium { beryllium oxide }	004-003-00-8	215-133-1	1304-56-9		0.8 mg/kg	2.775	2.22 mg/kg	0.000222 %		
5	boron { diboron trioxide }	005-008-00-8	215-125-8	1303-86-2		<2.5 mg/kg	3.22	<8.05 mg/kg	<0.000805 %		<LOD
6	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.9 mg/kg	1.142	1.028 mg/kg	0.000103 %		
7	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		12 mg/kg	1.462	17.539 mg/kg	0.00175 %		
8	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<1 mg/kg	1.923	<1.923 mg/kg	<0.000192 %		<LOD
9	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		90 mg/kg	1.126	101.33 mg/kg	0.0101 %		
10	iron { iron (III) oxide }		215-168-2	1309-37-1		29000 mg/kg	1.43	41462.6 mg/kg	4.146 %		
11	lead { lead compounds with the exception of those specified elsewhere in this Annex (worst case) }	082-001-00-6			1	210 mg/kg		210 mg/kg	0.021 %		
12	manganese { manganese sulphate }	025-003-00-4	232-089-9	7785-87-7		320 mg/kg	2.749	879.54 mg/kg	0.088 %		
13	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.1 mg/kg	1.353	<0.135 mg/kg	<0.0000135 %		<LOD
14	molybdenum { molybdenum(VI) oxide }	042-001-00-9	215-204-7	1313-27-5		<2 mg/kg	1.5	<3 mg/kg	<0.0003 %		<LOD
15	nickel { dinickel hexacyanoferrate }	028-037-00-8	238-946-3	14874-78-3		23 mg/kg	2.806	64.528 mg/kg	0.00645 %		

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
16	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<8 mg/kg	1.405	<11.24 mg/kg	<0.00112 %		<LOD
17	vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8	1314-62-1		33 mg/kg	1.785	58.911 mg/kg	0.00589 %		
18	zinc { zinc sulphate }	030-006-00-9	231-793-3 [1] 231-793-3 [2]	7446-19-7 [1] 7733-02-0 [2]		370 mg/kg	2.469	913.64 mg/kg	0.0914 %		
19	pH			PH		7.9 pH		7.9 pH	7.9 pH		
20	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1 mg/kg	1.884	<1.884 mg/kg	<0.000188 %		<LOD
21	TPH (C6 to C40) petroleum group			TPH		<50 mg/kg		<50 mg/kg	<0.005 %		<LOD
22	confirm TPH has NOT arisen from diesel or petrol					☑					
23	benzene	601-020-00-8	200-753-7	71-43-2		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
24	toluene	601-021-00-3	203-625-9	108-88-3		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
25	ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
26	xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
27	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
28	naphthalene	601-052-00-2	202-049-5	91-20-3		<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		<LOD
29	acenaphthylene		205-917-1	208-96-8		<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		<LOD
30	acenaphthene		201-469-6	83-32-9		<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		<LOD
31	fluorene		201-695-5	86-73-7		<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		<LOD
32	phenanthrene		201-581-5	85-01-8		0.12 mg/kg		0.12 mg/kg	0.000012 %		
33	anthracene		204-371-1	120-12-7		0.03 mg/kg		0.03 mg/kg	0.000003 %		
34	fluoranthene		205-912-4	206-44-0		0.19 mg/kg		0.19 mg/kg	0.000019 %		
35	pyrene		204-927-3	129-00-0		0.18 mg/kg		0.18 mg/kg	0.000018 %		
36	benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		0.11 mg/kg		0.11 mg/kg	0.000011 %		
37	chrysene	601-048-00-0	205-923-4	218-01-9		0.12 mg/kg		0.12 mg/kg	0.000012 %		
38	benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		0.12 mg/kg		0.12 mg/kg	0.000012 %		
39	benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		0.03 mg/kg		0.03 mg/kg	0.000003 %		
40	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		0.1 mg/kg		0.1 mg/kg	0.00001 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
41		indeno[123-cd]pyrene				0.12	mg/kg		0.12	mg/kg	0.000012 %		
			205-893-2	193-39-5									
42		dibenz[a,h]anthracene				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<**LOD**
		601-041-00-2	200-181-8	53-70-3									
43		benzo[ghi]perylene				0.08	mg/kg		0.08	mg/kg	0.000008 %		
			205-883-8	191-24-2									
44		phenol				<0.2	mg/kg		<0.2	mg/kg	<0.00002 %		<**LOD**
		604-001-00-2	203-632-7	108-95-2									
45		vinyl chloride; chloroethylene				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<**LOD**
		602-023-00-7	200-831-0	75-01-4									
46		1,2-dibromoethane				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		602-010-00-6	203-444-5	106-93-4									
										Total:	4.535 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP105

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
TP105
Sample Depth:
0.50 m

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	antimony { antimony trioxide }	051-005-00-X	215-175-0	1309-64-4		<3.5 mg/kg	1.197	<4.19 mg/kg	<0.000419 %		**<LOD**
2	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		26 mg/kg	1.32	34.328 mg/kg	0.00343 %		
3	barium { barium diboron tetraoxide }	056-005-00-3	237-222-4	13701-59-2		120 mg/kg	1.623	194.817 mg/kg	0.0195 %		
4	beryllium { beryllium oxide }	004-003-00-8	215-133-1	1304-56-9		0.7 mg/kg	2.775	1.943 mg/kg	0.000194 %		
5	boron { diboron trioxide }	005-008-00-8	215-125-8	1303-86-2		<2.5 mg/kg	3.22	<8.05 mg/kg	<0.000805 %		**<LOD**
6	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.7 mg/kg	1.142	0.8 mg/kg	0.00008 %		
7	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		5.4 mg/kg	1.462	7.892 mg/kg	0.000789 %		
8	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<1 mg/kg	1.923	<1.923 mg/kg	<0.000192 %		**<LOD**
9	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		63 mg/kg	1.126	70.931 mg/kg	0.00709 %		
10	iron { iron (III) oxide }		215-168-2	1309-37-1		34000 mg/kg	1.43	48611.324 mg/kg	4.861 %		
11	lead { lead compounds with the exception of those specified elsewhere in this Annex (worst case) }	082-001-00-6			1	450 mg/kg		450 mg/kg	0.045 %		
12	manganese { manganese sulphate }	025-003-00-4	232-089-9	7785-87-7		590 mg/kg	2.749	1621.653 mg/kg	0.162 %		
13	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.2 mg/kg	1.353	0.271 mg/kg	0.0000271 %		
14	molybdenum { molybdenum(VI) oxide }	042-001-00-9	215-204-7	1313-27-5		2.8 mg/kg	1.5	4.201 mg/kg	0.00042 %		
15	nickel { dinickel hexacyanoferrate }	028-037-00-8	238-946-3	14874-78-3		21 mg/kg	2.806	58.917 mg/kg	0.00589 %		

#		Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
16		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<8	mg/kg	1.405	<11.24	mg/kg	<0.00112 %		<LOD
17		vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8	1314-62-1		32	mg/kg	1.785	57.126	mg/kg	0.00571 %		
18		zinc { zinc sulphate }	030-006-00-9	231-793-3 [1] 231-793-3 [2]	7446-19-7 [1] 7733-02-0 [2]		73	mg/kg	2.469	180.259	mg/kg	0.018 %		
19		pH			PH		7.8	pH		7.8	pH	7.8 pH		
20		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1	mg/kg	1.884	<1.884	mg/kg	<0.000188 %		<LOD
21		TPH (C6 to C40) petroleum group			TPH		<50	mg/kg		<50	mg/kg	<0.005 %		<LOD
22		confirm TPH has NOT arisen from diesel or petrol					☑							
23		benzene	601-020-00-8	200-753-7	71-43-2		<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
24		toluene	601-021-00-3	203-625-9	108-88-3		<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
25		ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
26		xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
27		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
28		naphthalene	601-052-00-2	202-049-5	91-20-3		<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<LOD
29		acenaphthylene		205-917-1	208-96-8		<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<LOD
30		acenaphthene		201-469-6	83-32-9		<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<LOD
31		fluorene		201-695-5	86-73-7		<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<LOD
32		phenanthrene		201-581-5	85-01-8		<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<LOD
33		anthracene		204-371-1	120-12-7		<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<LOD
34		fluoranthene		205-912-4	206-44-0		<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<LOD
35		pyrene		204-927-3	129-00-0		<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<LOD
36		benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<LOD
37		chrysene	601-048-00-0	205-923-4	218-01-9		<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<LOD
38		benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<LOD
39		benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<LOD
40		benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<LOD

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
41		indeno[123-cd]pyrene				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<LOD
			205-893-2	193-39-5									
42		dibenz[a,h]anthracene				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<LOD
		601-041-00-2	200-181-8	53-70-3									
43		benzo[ghi]perylene				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<LOD
			205-883-8	191-24-2									
44		phenol				<0.2	mg/kg		<0.2	mg/kg	<0.00002 %		<LOD
		604-001-00-2	203-632-7	108-95-2									
45		vinyl chloride; chloroethylene				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<LOD
		602-023-00-7	200-831-0	75-01-4									
46		1,2-dibromoethane				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		602-010-00-6	203-444-5	106-93-4									
										Total:	5.137 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP106

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
TP106
Sample Depth:
0.40 m

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	antimony { antimony trioxide }	051-005-00-X	215-175-0	1309-64-4		<3.5 mg/kg	1.197	<4.19 mg/kg	<0.000419 %		<LOD
2	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		<10 mg/kg	1.32	<13.203 mg/kg	<0.00132 %		<LOD
3	barium { barium diboron tetraoxide }	056-005-00-3	237-222-4	13701-59-2		100 mg/kg	1.623	162.347 mg/kg	0.0162 %		
4	beryllium { beryllium oxide }	004-003-00-8	215-133-1	1304-56-9		0.5 mg/kg	2.775	1.388 mg/kg	0.000139 %		
5	boron { diboron trioxide }	005-008-00-8	215-125-8	1303-86-2		<2.5 mg/kg	3.22	<8.05 mg/kg	<0.000805 %		<LOD
6	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.5 mg/kg	1.142	0.571 mg/kg	0.0000571 %		
7	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		5 mg/kg	1.462	7.308 mg/kg	0.000731 %		
8	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<1 mg/kg	1.923	<1.923 mg/kg	<0.000192 %		<LOD
9	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		32 mg/kg	1.126	36.028 mg/kg	0.0036 %		
10	iron { iron (III) oxide }		215-168-2	1309-37-1		17000 mg/kg	1.43	24305.662 mg/kg	2.431 %		
11	lead { lead compounds with the exception of those specified elsewhere in this Annex (worst case) }	082-001-00-6			1	330 mg/kg		330 mg/kg	0.033 %		
12	manganese { manganese sulphate }	025-003-00-4	232-089-9	7785-87-7		240 mg/kg	2.749	659.655 mg/kg	0.066 %		
13	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.1 mg/kg	1.353	<0.135 mg/kg	<0.0000135 %		<LOD
14	molybdenum { molybdenum(VI) oxide }	042-001-00-9	215-204-7	1313-27-5		<2 mg/kg	1.5	<3 mg/kg	<0.0003 %		<LOD
15	nickel { dinickel hexacyanoferrate }	028-037-00-8	238-946-3	14874-78-3		13 mg/kg	2.806	36.472 mg/kg	0.00365 %		

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
16	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<8 mg/kg	1.405	<11.24 mg/kg	<0.00112 %		<LOD
17	vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8	1314-62-1		21 mg/kg	1.785	37.489 mg/kg	0.00375 %		
18	zinc { zinc sulphate }	030-006-00-9	231-793-3 [1] 231-793-3 [2]	7446-19-7 [1] 7733-02-0 [2]		66 mg/kg	2.469	162.974 mg/kg	0.0163 %		
19	pH			PH		8.5 pH		8.5 pH	8.5 pH		
20	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1 mg/kg	1.884	<1.884 mg/kg	<0.000188 %		<LOD
21	TPH (C6 to C40) petroleum group			TPH		<50 mg/kg		<50 mg/kg	<0.005 %		<LOD
22	confirm TPH has NOT arisen from diesel or petrol					☑					
23	benzene	601-020-00-8	200-753-7	71-43-2		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
24	toluene	601-021-00-3	203-625-9	108-88-3		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
25	ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
26	xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
27	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
28	naphthalene	601-052-00-2	202-049-5	91-20-3		0.04 mg/kg		0.04 mg/kg	0.000004 %		
29	acenaphthylene		205-917-1	208-96-8		0.02 mg/kg		0.02 mg/kg	0.000002 %		
30	acenaphthene		201-469-6	83-32-9		<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		<LOD
31	fluorene		201-695-5	86-73-7		<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		<LOD
32	phenanthrene		201-581-5	85-01-8		0.43 mg/kg		0.43 mg/kg	0.000043 %		
33	anthracene		204-371-1	120-12-7		0.06 mg/kg		0.06 mg/kg	0.000006 %		
34	fluoranthene		205-912-4	206-44-0		0.62 mg/kg		0.62 mg/kg	0.000062 %		
35	pyrene		204-927-3	129-00-0		0.63 mg/kg		0.63 mg/kg	0.000063 %		
36	benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		0.28 mg/kg		0.28 mg/kg	0.000028 %		
37	chrysene	601-048-00-0	205-923-4	218-01-9		0.38 mg/kg		0.38 mg/kg	0.000038 %		
38	benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		0.34 mg/kg		0.34 mg/kg	0.000034 %		
39	benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		0.12 mg/kg		0.12 mg/kg	0.000012 %		
40	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		0.3 mg/kg		0.3 mg/kg	0.00003 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
41		indeno[123-cd]pyrene				0.17	mg/kg		0.17	mg/kg	0.000017 %		
			205-893-2	193-39-5									
42		dibenz[a,h]anthracene				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<**LOD**
		601-041-00-2	200-181-8	53-70-3									
43		benzo[ghi]perylene				0.2	mg/kg		0.2	mg/kg	0.00002 %		
			205-883-8	191-24-2									
44		phenol				<0.2	mg/kg		<0.2	mg/kg	<0.00002 %		<**LOD**
		604-001-00-2	203-632-7	108-95-2									
45		vinyl chloride; chloroethylene				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<**LOD**
		602-023-00-7	200-831-0	75-01-4									
46		1,2-dibromoethane				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		602-010-00-6	203-444-5	106-93-4									
										Total:	2.584 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP107

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
TP107
Sample Depth:
0.40 m

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	antimony { antimony trioxide }	051-005-00-X	215-175-0	1309-64-4		<3.5 mg/kg	1.197	<4.19 mg/kg	<0.000419 %		<LOD
2	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		78 mg/kg	1.32	102.985 mg/kg	0.0103 %		
3	barium { barium diboron tetraoxide }	056-005-00-3	237-222-4	13701-59-2		280 mg/kg	1.623	454.572 mg/kg	0.0455 %		
4	beryllium { beryllium oxide }	004-003-00-8	215-133-1	1304-56-9		1.2 mg/kg	2.775	3.33 mg/kg	0.000333 %		
5	boron { diboron trioxide }	005-008-00-8	215-125-8	1303-86-2		<2.5 mg/kg	3.22	<8.05 mg/kg	<0.000805 %		<LOD
6	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		1.2 mg/kg	1.142	1.371 mg/kg	0.000137 %		
7	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		8.2 mg/kg	1.462	11.985 mg/kg	0.0012 %		
8	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<1 mg/kg	1.923	<1.923 mg/kg	<0.000192 %		<LOD
9	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		210 mg/kg	1.126	236.437 mg/kg	0.0236 %		
10	iron { iron (III) oxide }		215-168-2	1309-37-1		33000 mg/kg	1.43	47181.579 mg/kg	4.718 %		
11	lead { lead compounds with the exception of those specified elsewhere in this Annex (worst case) }	082-001-00-6			1	590 mg/kg		590 mg/kg	0.059 %		
12	manganese { manganese sulphate }	025-003-00-4	232-089-9	7785-87-7		880 mg/kg	2.749	2418.736 mg/kg	0.242 %		
13	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.5 mg/kg	1.353	0.677 mg/kg	0.0000677 %		
14	molybdenum { molybdenum(VI) oxide }	042-001-00-9	215-204-7	1313-27-5		<2 mg/kg	1.5	<3 mg/kg	<0.0003 %		<LOD
15	nickel { dinickel hexacyanoferrate }	028-037-00-8	238-946-3	14874-78-3		27 mg/kg	2.806	75.75 mg/kg	0.00758 %		

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
16	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<8 mg/kg	1.405	<11.24 mg/kg	<0.00112 %		<LOD
17	vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8	1314-62-1		31 mg/kg	1.785	55.341 mg/kg	0.00553 %		
18	zinc { zinc sulphate }	030-006-00-9	231-793-3 [1] 231-793-3 [2]	7446-19-7 [1] 7733-02-0 [2]		360 mg/kg	2.469	888.947 mg/kg	0.0889 %		
19	pH			PH		7.9 pH		7.9 pH	7.9 pH		
20	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1 mg/kg	1.884	<1.884 mg/kg	<0.000188 %		<LOD
21	TPH (C6 to C40) petroleum group			TPH		<50 mg/kg		<50 mg/kg	<0.005 %		<LOD
22	confirm TPH has NOT arisen from diesel or petrol					☑					
23	benzene	601-020-00-8	200-753-7	71-43-2		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
24	toluene	601-021-00-3	203-625-9	108-88-3		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
25	ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
26	xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
27	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
28	naphthalene	601-052-00-2	202-049-5	91-20-3		0.11 mg/kg		0.11 mg/kg	0.000011 %		
29	acenaphthylene		205-917-1	208-96-8		0.04 mg/kg		0.04 mg/kg	0.000004 %		
30	acenaphthene		201-469-6	83-32-9		<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		<LOD
31	fluorene		201-695-5	86-73-7		0.03 mg/kg		0.03 mg/kg	0.000003 %		
32	phenanthrene		201-581-5	85-01-8		0.46 mg/kg		0.46 mg/kg	0.000046 %		
33	anthracene		204-371-1	120-12-7		0.06 mg/kg		0.06 mg/kg	0.000006 %		
34	fluoranthene		205-912-4	206-44-0		0.58 mg/kg		0.58 mg/kg	0.000058 %		
35	pyrene		204-927-3	129-00-0		0.6 mg/kg		0.6 mg/kg	0.00006 %		
36	benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		0.24 mg/kg		0.24 mg/kg	0.000024 %		
37	chrysene	601-048-00-0	205-923-4	218-01-9		0.37 mg/kg		0.37 mg/kg	0.000037 %		
38	benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		0.3 mg/kg		0.3 mg/kg	0.00003 %		
39	benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		0.1 mg/kg		0.1 mg/kg	0.00001 %		
40	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		0.25 mg/kg		0.25 mg/kg	0.000025 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
41		indeno[123-cd]pyrene				0.15	mg/kg		0.15	mg/kg	0.000015 %		
			205-893-2	193-39-5									
42		dibenz[a,h]anthracene				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<**LOD**
		601-041-00-2	200-181-8	53-70-3									
43		benzo[ghi]perylene				0.17	mg/kg		0.17	mg/kg	0.000017 %		
			205-883-8	191-24-2									
44		phenol				<0.2	mg/kg		<0.2	mg/kg	<0.00002 %		<**LOD**
		604-001-00-2	203-632-7	108-95-2									
45		vinyl chloride; chloroethylene				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<**LOD**
		602-023-00-7	200-831-0	75-01-4									
46		1,2-dibromoethane				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		602-010-00-6	203-444-5	106-93-4									
										Total:	5.211 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: WS101

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:	LoW Code:	
WS101	Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:		
0.80 m	Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	antimony { antimony trioxide }	051-005-00-X	215-175-0	1309-64-4		<3.5 mg/kg	1.197	<4.19 mg/kg	<0.000419 %		<LOD
2	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		13 mg/kg	1.32	17.164 mg/kg	0.00172 %		
3	barium { barium diboron tetraoxide }	056-005-00-3	237-222-4	13701-59-2		170 mg/kg	1.623	275.99 mg/kg	0.0276 %		
4	beryllium { beryllium oxide }	004-003-00-8	215-133-1	1304-56-9		0.7 mg/kg	2.775	1.943 mg/kg	0.000194 %		
5	boron { diboron trioxide }	005-008-00-8	215-125-8	1303-86-2		<2.5 mg/kg	3.22	<8.05 mg/kg	<0.000805 %		<LOD
6	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.6 mg/kg	1.142	0.685 mg/kg	0.0000685 %		
7	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		7.5 mg/kg	1.462	10.962 mg/kg	0.0011 %		
8	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<1 mg/kg	1.923	<1.923 mg/kg	<0.000192 %		<LOD
9	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		46 mg/kg	1.126	51.791 mg/kg	0.00518 %		
10	iron { iron (III) oxide }		215-168-2	1309-37-1		25000 mg/kg	1.43	35743.621 mg/kg	3.574 %		
11	lead { lead compounds with the exception of those specified elsewhere in this Annex (worst case) }	082-001-00-6			1	56 mg/kg		56 mg/kg	0.0056 %		
12	manganese { manganese sulphate }	025-003-00-4	232-089-9	7785-87-7		580 mg/kg	2.749	1594.167 mg/kg	0.159 %		
13	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.1 mg/kg	1.353	<0.135 mg/kg	<0.0000135 %		<LOD
14	molybdenum { molybdenum(VI) oxide }	042-001-00-9	215-204-7	1313-27-5		<2 mg/kg	1.5	<3 mg/kg	<0.0003 %		<LOD
15	nickel { dinickel hexacyanoferrate }	028-037-00-8	238-946-3	14874-78-3		18 mg/kg	2.806	50.5 mg/kg	0.00505 %		

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
16	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<8 mg/kg	1.405	<11.24 mg/kg	<0.00112 %		<LOD
17	vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8	1314-62-1		8.4 mg/kg	1.785	14.996 mg/kg	0.0015 %		
18	zinc { zinc sulphate }	030-006-00-9	231-793-3 [1] 231-793-3 [2]	7446-19-7 [1] 7733-02-0 [2]		56 mg/kg	2.469	138.281 mg/kg	0.0138 %		
19	pH			PH		7.6 pH		7.6 pH	7.6 pH		
20	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1 mg/kg	1.884	<1.884 mg/kg	<0.000188 %		<LOD
21	TPH (C6 to C40) petroleum group			TPH		<50 mg/kg		<50 mg/kg	<0.005 %		<LOD
22	confirm TPH has NOT arisen from diesel or petrol					☑					
23	benzene	601-020-00-8	200-753-7	71-43-2		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
24	toluene	601-021-00-3	203-625-9	108-88-3		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
25	ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
26	xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
27	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
28	naphthalene	601-052-00-2	202-049-5	91-20-3		<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		<LOD
29	acenaphthylene		205-917-1	208-96-8		<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		<LOD
30	acenaphthene		201-469-6	83-32-9		<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		<LOD
31	fluorene		201-695-5	86-73-7		<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		<LOD
32	phenanthrene		201-581-5	85-01-8		<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		<LOD
33	anthracene		204-371-1	120-12-7		<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		<LOD
34	fluoranthene		205-912-4	206-44-0		<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		<LOD
35	pyrene		204-927-3	129-00-0		<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		<LOD
36	benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		<LOD
37	chrysene	601-048-00-0	205-923-4	218-01-9		<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		<LOD
38	benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		<LOD
39	benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		<LOD
40	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		<LOD

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
41		indeno[123-cd]pyrene				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<LOD
			205-893-2	193-39-5									
42		dibenz[a,h]anthracene				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<LOD
		601-041-00-2	200-181-8	53-70-3									
43		benzo[ghi]perylene				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<LOD
			205-883-8	191-24-2									
44		phenol				<0.2	mg/kg		<0.2	mg/kg	<0.00002 %		<LOD
		604-001-00-2	203-632-7	108-95-2									
45		vinyl chloride; chloroethylene				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<LOD
		602-023-00-7	200-831-0	75-01-4									
46		1,2-dibromoethane				0.13	mg/kg		0.13	mg/kg	0.000013 %		
		602-010-00-6	203-444-5	106-93-4									
										Total:	3.804 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: WS102

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
WS102
Sample Depth:
0.80 m

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	antimony { antimony trioxide }	051-005-00-X	215-175-0	1309-64-4		<3.5 mg/kg	1.197	<4.19 mg/kg	<0.000419 %		<LOD
2	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		290 mg/kg	1.32	382.894 mg/kg	0.0383 %		
3	barium { barium diboron tetraoxide }	056-005-00-3	237-222-4	13701-59-2		140 mg/kg	1.623	227.286 mg/kg	0.0227 %		
4	beryllium { beryllium oxide }	004-003-00-8	215-133-1	1304-56-9		<4 mg/kg	2.775	<11.101 mg/kg	<0.00111 %		<LOD
5	boron { diboron trioxide }	005-008-00-8	215-125-8	1303-86-2		<2.5 mg/kg	3.22	<8.05 mg/kg	<0.000805 %		<LOD
6	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.5 mg/kg	1.142	0.571 mg/kg	0.0000571 %		
7	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		2.7 mg/kg	1.462	3.946 mg/kg	0.000395 %		
8	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<1 mg/kg	1.923	<1.923 mg/kg	<0.000192 %		<LOD
9	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		41 mg/kg	1.126	46.161 mg/kg	0.00462 %		
10	iron { iron (III) oxide }		215-168-2	1309-37-1		18000 mg/kg	1.43	25735.407 mg/kg	2.574 %		
11	lead { lead compounds with the exception of those specified elsewhere in this Annex (worst case) }	082-001-00-6			1	190 mg/kg		190 mg/kg	0.019 %		
12	manganese { manganese sulphate }	025-003-00-4	232-089-9	7785-87-7		390 mg/kg	2.749	1071.94 mg/kg	0.107 %		
13	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.2 mg/kg	1.353	0.271 mg/kg	0.0000271 %		
14	molybdenum { molybdenum(VI) oxide }	042-001-00-9	215-204-7	1313-27-5		<40 mg/kg	1.5	<60.008 mg/kg	<0.006 %		<LOD
15	nickel { dinickel hexacyanoferrate }	028-037-00-8	238-946-3	14874-78-3		12 mg/kg	2.806	33.667 mg/kg	0.00337 %		

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
16	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<8 mg/kg	1.405	<11.24 mg/kg	<0.00112 %		<LOD
17	vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8	1314-62-1		11 mg/kg	1.785	19.637 mg/kg	0.00196 %		
18	zinc { zinc sulphate }	030-006-00-9	231-793-3 [1] 231-793-3 [2]	7446-19-7 [1] 7733-02-0 [2]		61 mg/kg	2.469	150.627 mg/kg	0.0151 %		
19	pH			PH		8.1 pH		8.1 pH	8.1 pH		
20	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1 mg/kg	1.884	<1.884 mg/kg	<0.000188 %		<LOD
21	TPH (C6 to C40) petroleum group			TPH		110 mg/kg		110 mg/kg	0.011 %		
22	confirm TPH has NOT arisen from diesel or petrol					☑					
23	benzene	601-020-00-8	200-753-7	71-43-2		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
24	toluene	601-021-00-3	203-625-9	108-88-3		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
25	ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
26	xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
27	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
28	naphthalene	601-052-00-2	202-049-5	91-20-3		0.53 mg/kg		0.53 mg/kg	0.000053 %		
29	acenaphthylene		205-917-1	208-96-8		0.87 mg/kg		0.87 mg/kg	0.000087 %		
30	acenaphthene		201-469-6	83-32-9		<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		<LOD
31	fluorene		201-695-5	86-73-7		0.6 mg/kg		0.6 mg/kg	0.00006 %		
32	phenanthrene		201-581-5	85-01-8		8.5 mg/kg		8.5 mg/kg	0.00085 %		
33	anthracene		204-371-1	120-12-7		1.1 mg/kg		1.1 mg/kg	0.00011 %		
34	fluoranthene		205-912-4	206-44-0		13 mg/kg		13 mg/kg	0.0013 %		
35	pyrene		204-927-3	129-00-0		12 mg/kg		12 mg/kg	0.0012 %		
36	benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		4.4 mg/kg		4.4 mg/kg	0.00044 %		
37	chrysene	601-048-00-0	205-923-4	218-01-9		4.2 mg/kg		4.2 mg/kg	0.00042 %		
38	benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		3.2 mg/kg		3.2 mg/kg	0.00032 %		
39	benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		1.3 mg/kg		1.3 mg/kg	0.00013 %		
40	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		2.8 mg/kg		2.8 mg/kg	0.00028 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
41		indeno[123-cd]pyrene				1.1	mg/kg		1.1	mg/kg	0.00011 %		
			205-893-2	193-39-5									
42		dibenz[a,h]anthracene				0.29	mg/kg		0.29	mg/kg	0.000029 %		
		601-041-00-2	200-181-8	53-70-3									
43		benzo[ghi]perylene				1.5	mg/kg		1.5	mg/kg	0.00015 %		
			205-883-8	191-24-2									
44		phenol				<0.2	mg/kg		<0.2	mg/kg	<0.00002 %		**<LOD**
		604-001-00-2	203-632-7	108-95-2									
45		vinyl chloride; chloroethylene				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		**<LOD**
		602-023-00-7	200-831-0	75-01-4									
46		1,2-dibromoethane				0.11	mg/kg		0.11	mg/kg	0.000011 %		
		602-010-00-6	203-444-5	106-93-4									
										Total:	2.813 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"
Force this Hazardous Property to non-hazardous for cumulative determinand results below the threshold of: 1000 mg/kg (0.1%) because: HP 3 Flammable (first indent) can be discounted as this is a solid waste without a free draining liquid phase. The waste does not display these hazardous properties.

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group (conc.: 0.011%)

Appendix A: Classifier defined and non GB MCL determinands

chromium(III) oxide (worst case) (EC Number: 215-160-9, CAS Number: 1308-38-9)

Description/Comments: Data from C&L Inventory Database
Data source: https://echa.europa.eu/information-on-chemicals/cl-inventory-database/-/discli/details/33806
Data source date: 17 Jul 2015
Hazard Statements: Acute Tox. 4; H332 , Acute Tox. 4; H302 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Resp. Sens. 1; H334 , Skin Sens. 1; H317 , Repr. 1B; H360FD , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

iron (III) oxide (EC Number: 215-168-2, CAS Number: 1309-37-1)

Description/Comments:
Data source: C&L Inventory, Registered Substances database, SDS: Sigma-Aldrich dated 19/09/2012 (REACH compliant)
Data source date: 21 May 2015
Hazard Statements: Skin Irrit. 2; H315 , Eye Irrit. 2; H319 , STOT SE 3; H335

lead compounds with the exception of those specified elsewhere in this Annex (worst case)

GB MCL index number: 082-001-00-6
Description/Comments: Worst Case: IARC considers lead compounds Group 2A; Probably carcinogenic to humans; Lead REACH Consortium, following MCL protocols, considers lead compounds from smelting industries, flue dust and similar to be Carcinogenic category 1A
Additional Hazard Statement(s): Carc. 1A; H350
Reason for additional Hazards Statement(s):
20 Nov 2021 - Carc. 1A; H350 hazard statement sourced from: IARC Group 2A (Sup 7, 87) 2006; Lead REACH Consortium www.reach-lead.eu/substanceinformation.html (worst case lead compounds). Review date 29/09/2015

pH (CAS Number: PH)

Description/Comments: Appendix C4
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: None.

salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex

GB MCL index number: 006-007-00-5
Description/Comments: Conversion factor based on a worst case compound: sodium cyanide
Additional Hazard Statement(s): EUH032 >= 0.2 %
Reason for additional Hazards Statement(s):
20 Nov 2021 - EUH032 >= 0.2 % hazard statement sourced from: WM3, Table C12.2

TPH (C6 to C40) petroleum group (CAS Number: TPH)

Description/Comments: Hazard statements taken from WM3 1st Edition 2015; Risk phrases: WM2 3rd Edition 2013
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: Flam. Liq. 3; H226 , Asp. Tox. 1; H304 , STOT RE 2; H373 , Muta. 1B; H340 , Carc. 1B; H350 , Repr. 2; H361d , Aquatic Chronic 2; H411

confirm TPH has NOT arisen from diesel or petrol

Description/Comments: Chapter 3, section 4b requires a positive confirmation for benzo[a]pyrene to be used as a marker in evaluating Carc. 1B; H350 (HP 7) and Muta. 1B; H340 (HP 11)
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: None.

ethylbenzene (EC Number: 202-849-4, CAS Number: 100-41-4)

GB MCL index number: 601-023-00-4
Description/Comments:
Additional Hazard Statement(s): Carc. 2; H351
Reason for additional Hazards Statement(s):
20 Nov 2021 - Carc. 2; H351 hazard statement sourced from: IARC Group 2B (77) 2000

acenaphthylene (EC Number: 205-917-1, CAS Number: 208-96-8)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Acute Tox. 4; H302 , Acute Tox. 1; H330 , Acute Tox. 1; H310 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315

- **acenaphthene** (EC Number: 201-469-6, CAS Number: 83-32-9)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410 , Aquatic Chronic 2; H411

- **fluorene** (EC Number: 201-695-5, CAS Number: 86-73-7)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

- **phenanthrene** (EC Number: 201-581-5, CAS Number: 85-01-8)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Acute Tox. 4; H302 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Carc. 2; H351 , Skin Sens. 1; H317 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410 , Skin Irrit. 2; H315

- **anthracene** (EC Number: 204-371-1, CAS Number: 120-12-7)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Skin Sens. 1; H317 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

- **fluoranthene** (EC Number: 205-912-4, CAS Number: 206-44-0)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21 Aug 2015
Hazard Statements: Acute Tox. 4; H302 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

- **pyrene** (EC Number: 204-927-3, CAS Number: 129-00-0)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 2014
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21 Aug 2015
Hazard Statements: Skin Irrit. 2; H315 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

- **indeno[123-cd]pyrene** (EC Number: 205-893-2, CAS Number: 193-39-5)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Carc. 2; H351

- **benzo[ghi]perylene** (EC Number: 205-883-8, CAS Number: 191-24-2)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 28/02/2015
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 23 Jul 2015
Hazard Statements: Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

Appendix B: Rationale for selection of metal species

antimony {antimony trioxide}

Worst case CLP species based on hazard statements/molecular weight and low solubility. Industrial sources include: flame retardants in electrical apparatus, textiles and coatings

arsenic {arsenic trioxide}

Reasonable case CLP species based on hazard statements/molecular weight and most common (stable) oxide of arsenic. Industrial sources include: smelting; main precursor to other arsenic compounds

barium {barium diboron tetraoxide}

No significant quantities of Cr(VI) to form worst case species (barium chromate) therefore second worst case species chosen instead.

beryllium {beryllium oxide}

Reasonable case CLP species based on hazard statements/molecular weight. Industrial sources include: most common (non alloy) form, used in ceramics

boron {diboron trioxide}

Reasonable case CLP species based on hazard statements/ molecular weight, physical form and low solubility. Industrial sources include: fluxing agent for glass/enamels; additive for fibre optics, borosilicate glass

cadmium {cadmium oxide}

Reasonable case CLP species based on hazard statements/molecular weight, very low solubility in water. Industrial sources include: electroplating baths, electrodes for storage batteries, catalysts, ceramic glazes, phosphors, pigments and nematocides. Worst case compounds in CLP: cadmium sulphate, chloride, fluoride & iodide not expected as either very soluble and/or compound's industrial usage not related to site history

chromium in chromium(III) compounds {chromium(III) oxide (worst case)}

Reasonable case species based on hazard statements/molecular weight. Industrial sources include: tanning, pigment in paint, inks and glass

chromium in chromium(VI) compounds {chromium(VI) oxide}

Worst case CLP species based on hazard statements/molecular weight. Industrial sources include: production stainless steel, electroplating, wood preservation, anti-corrosion agents or coatings, pigments

copper {dicopper oxide; copper (I) oxide}

Reasonable case CLP species based on hazard statements/molecular weight and insolubility in water. Industrial sources include: oxidised copper metal, brake pads, pigments, antifouling paints, fungicide. Worse case copper sulphate is very soluble and likely to have been leached away if ever present and/or not enough soluble sulphate detected

iron {iron (III) oxide}

Reasonable case CLP species based on hazard statements/molecular weight and insolubility in water. Site not heavy industrial and as such, major source likely from natural strata

lead {lead compounds with the exception of those specified elsewhere in this Annex (worst case)}

No significant quantities of Cr(VI) to form worst case species (lead chromate) therefore second worst case species chosen instead.

manganese {manganese sulphate}

Worst case CLP species based on hazard statements/molecular weight

mercury {mercury dichloride}

Worst case CLP species based on hazard statements/molecular weight

molybdenum {molybdenum(VI) oxide}

Worst case CLP species based on hazard statements/molecular weight

nickel {dinickel hexacyanoferrate}

No significant quantities of Cr(VI) to form worst case species (nickel chromate) therefore second worst case species chosen instead.

selenium {selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex}

Harmonised group entry used as most reasonable case. Pigment cadmium sulphoselenide not likely to be present in this soil. No evidence for the other CLP entries: sodium selenite, nickel II selenite and nickel selenide, to be present in this soil

vanadium {divanadium pentaoxide; vanadium pentoxide}

Worst case CLP species based on hazard statements/molecular weight

zinc {zinc sulphate}

No significant quantities of Cr(VI) to form worst case species (zinc chromate) therefore second worst case species chosen instead.

cyanides {salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex}

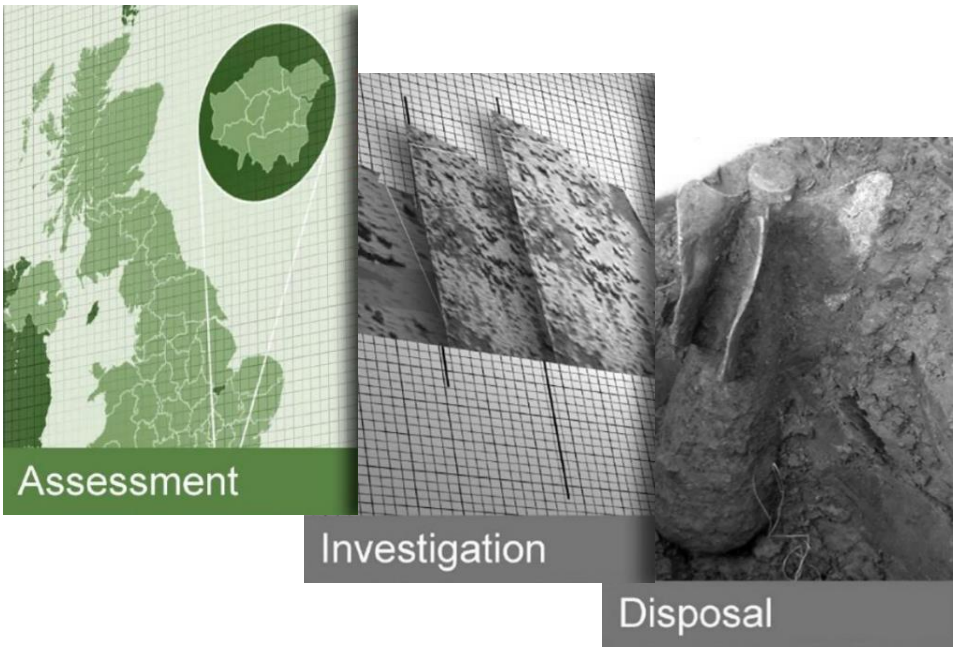
Harmonised group entry used as most reasonable case as complex cyanides and those specified elsewhere in the annex are not likely to be present in this soil: [Note conversion factor based on a worst case compound: sodium cyanide]

Appendix C: Version

HazWasteOnline Classification Engine: WM3 1st Edition v1.2.GB - Oct 2021
HazWasteOnline Classification Engine Version: 2025.24.6453.11761 (25 Jan 2025)
HazWasteOnline Database: 2025.24.6453.11761 (25 Jan 2025)

This classification utilises the following guidance and legislation:
WM3 v1.2.GB - Waste Classification - 1st Edition v1.2.GB - Oct 2021
CLP Regulation - Regulation 1272/2008/EC of 16 December 2008
1st ATP - Regulation 790/2009/EC of 10 August 2009
2nd ATP - Regulation 286/2011/EC of 10 March 2011
3rd ATP - Regulation 618/2012/EU of 10 July 2012
4th ATP - Regulation 487/2013/EU of 8 May 2013
Correction to 1st ATP - Regulation 758/2013/EU of 7 August 2013
5th ATP - Regulation 944/2013/EU of 2 October 2013
6th ATP - Regulation 605/2014/EU of 5 June 2014
WFD Annex III replacement - Regulation 1357/2014/EU of 18 December 2014
Revised List of Waste 2014 - Decision 2014/955/EU of 18 December 2014
7th ATP - Regulation 2015/1221/EU of 24 July 2015
8th ATP - Regulation (EU) 2016/918 of 19 May 2016
9th ATP - Regulation (EU) 2016/1179 of 19 July 2016
10th ATP - Regulation (EU) 2017/776 of 4 May 2017
HP14 amendment - Regulation (EU) 2017/997 of 8 June 2017
13th ATP - Regulation (EU) 2018/1480 of 4 October 2018
14th ATP - Regulation (EU) 2020/217 of 4 October 2019
15th ATP - Regulation (EU) 2020/1182 of 19 May 2020
The Chemicals (Health and Safety) and Genetically Modified Organisms (Contained Use)(Amendment etc.) (EU Exit) Regulations 2020 - UK: 2020 No. 1567 of 16th December 2020
The Waste and Environmental Permitting etc. (Legislative Functions and Amendment etc.) (EU Exit) Regulations 2020 - UK: 2020 No. 1540 of 16th December 2020
GB MCL List - version 1.1 of 09 June 2021
GB MCL List v2.0 - version 2.0 of 20th October 2023
GB MCL List v3.0 - version 3.0 of 11th January 2024
GB MCL List v4.0 - version 4.0 of 2nd March 2024
GB MCL List v5.0 - version 5.0 of 26th June 2024

I. Detailed UXO Desk Study



UXO Desk Study & Risk Assessment

Document Ref.	**P13822-23-R1**
Revision	**A**
Project Title	**Christie NHS Foundation Trust**
Client	**Mott MacDonald**
Date	**14th December 2023**

Drafted by	**Ross Sykes**
Checked by	**James Major**
Authorised by	**Stefan Lang**

UXO DESK STUDY & RISK ASSESSMENT

EXECUTIVE SUMMARY

Key findings: No significant sources of Unexploded Ordnance (UXO) hazard have been identified.

Key actions: Proceed with works.

UXO hazard assessment

No records have been found indicating that the Site was bombed and no other significant sources of UXO hazard have been identified on the Site.

Given this, it is considered that the Site has a low UXO hazard level, as shown in the following Figure, reproduced as Figure 3 in the main report.

The UXO hazard zone plan of the Site is also given in the accompanying P13822-23-R1-MAP01-A.

UXO hazard zone plan of the Site

Source: OpenStreetMap *Not to Scale*

Legend	Very Low		Low		Moderate	
	High		Very High		Site boundary	

The main findings of the report are summarised below.

- No records of military activity on the Site during World War One (WWI) or World War Two (WWII) have been found.
- During WWII the main strategic targets in the vicinity of the Site included Salford Docks, warehouses and wharves along the Manchester Ship Canal, the Fairey Aviation aircraft works, and Crosley Brothers Ltd engine works.

- No records have been found indicating that the Site was bombed during WWII. Records indicate that the nearest bomb was an Oil Bomb (OB) which fell approximately 20m west-southwest of the Site on the 1st October 1940.

Proposed works

It is understood that works on the Site will comprise the demolition of existing blocks of the hospital and construction of a new Computed Tomography (CT) department. Initial Ground Investigation (GI) works will involve exploratory holes to 18m below ground level (bgl).

It is assumed that works on the Site will include excavations, boreholes, and piling.

Risk assessment

The Table below, reproduced as Table 3 in the main report, provides a UXO risk assessment for the proposed works on the Site.

Further details on the risk assessment methodology are given in Section 7.2 of the main report.

UXO risk assessment for the Site

Potential UXO Hazard	Anticipated Works	PE	PD	P = PE x PD	Likelihood	Severity	Risk Rating	UXO Risk
UXB	Excavations	1	1	1	1	5	5	Low
	Boreholes/Piling	1	1	1	1	4	4	Low
Other UXO	Excavations	1	1	1	1	4	4	Low
	Boreholes/Piling	1	1	1	1	3	3	Low
PE = Probability of Encounter; PD = Probability of Detonation; P = Likelihood								

Risk mitigation plan

The Table below, reproduced as Table 4 in the main report, summarises the UXO risk for proposed works on the Site and recommended actions.

Summary of UXO risk and mitigation recommendations

Proposed Works	UXO Risk	Recommended Mitigation
Excavations		**Proceed with works** – if additional comfort is required to address the residual UXO hazard, a formal UXO awareness briefing can be provided.
Boreholes/Piling		**Proceed with works**

In summary, no additional measures are considered essential to reduce the UXO risk on the Site to As Low As Reasonably Practicable (ALARP).

What do I do next?

If you have any comments or require further assistance, contact us and we can help.

	01993 886682		uxo@zetica.com		zeticauxo.com

If you have requirements to identify other buried hazards (such as mapping utilities or obstructions) we can provide these surveys.

If proposed works on the Site change, or additional works are planned, contact Zetica for a re-assessment of the UXO risk and the risk mitigation requirements.

CONTENTS

ABBREVIATIONS **VI**

1 INTRODUCTION **1**

1.1 Project outline

1.2 Sources of information

1.3 Data confidence level

2 THE SITE **3**

2.1 Site location

3 MILITARY ACTIVITY **5**

3.1 Defences

3.2 Military airfields

3.3 Aircraft crashes

3.4 Explosives factories, munitions depots, and disposal areas

3.5 Firing ranges and military training areas

4 BOMBING **7**

4.1 WWI bombing

4.2 WWII bombing

5 POST-WWII EXPLOSIVE ORDNANCE CLEARANCE (EOC) ACTIVITIES **13**

5.1 EOC tasks

6 UXO HAZARD ASSESSMENT **14**

6.1 UXO hazard level

7 UXO RISK ASSESSMENT **15**

7.1 Proposed works

7.2 Risk assessment methodology

7.3 UXO risk level

8 RISK MITIGATION PLAN **17**

8.1 UXO risk summary

8.2 Risk mitigation techniques

8.3 What do I do next?

APPENDICES **19**

Appendix 1 Anticipated ordnance types

Appendix 2 Sources of UXO hazard

Appendix 3 Recent UXO finds

Appendix 4 Glossary and definitions

Appendix 5 Bibliography

Appendix 6 General Notes

Figures, plates, & tables

Figure 1 Site location map 3
Figure 2 Compiled bomb impact map for the vicinity of the Site 10
Figure 3 UXO hazard zone plan of the Site 14

Plate 1 Recent aerial photograph of the Site 4
Plate 2 Luftwaffe target photograph of aircraft and engine works in Manchester 8
Plate 3 Aerial photograph, 7th May 1946 11

Table 1 Bombing statistics 9
Table 2 Estimated average maximum bomb penetration depths 12
Table 3 UXO risk assessment for the Site 16
Table 4 Summary of UXO risk and mitigation recommendations 17

Accompanying GIS data

P13822-23-R1-MAP01-A (UXO Desk Study)

ABBREVIATIONS

AA	Anti-Aircraft
AAP	Aircraft Acceptance Park
ALARP	As Low As Reasonably Practicable
AP	Anti-Personnel
ARP	Air Raid Precaution
AXO	Abandoned Explosive Ordnance
BGS	British Geological Survey
CIRIA	Construction Industry Research and Information Association
CLE	Central Landing Establishment
CLS	Central Landing School
CT	Computed Tomography
DCLG	Department of Communities and Local Government
EO	Explosive Ordnance
EOC	Explosive Ordnance Clearance
EOR	Explosive Ordnance Reconnaissance
ERW	Explosive Remnants of War
ESA	Explosive Substances and Articles
FPP	Ferry Pilots Pool
GI	Ground Investigation
HAA	Heavy Anti-Aircraft
HE	High Explosive
HER	Historic Environment Record
IB	Incendiary Bomb
IWM	Imperial War Museum
LAA	Light Anti-Aircraft
MoD	Ministry of Defence
NAF	National Aircraft Factory
NARA	National Archives & Records Administration
NCAP	National Collection of Aerial Photography
OB	Oil Bomb
OSNGR	Ordnance Survey National Grid Reference
PM	Parachute Mine
RAF	Royal Air Force
RE	Royal Engineers
RFC	Royal Flying Corps
UK	United Kingdom
UXAA	Unexploded Anti-Aircraft
UXB	Unexploded Bomb
UXO	Unexploded Ordnance
UXPM	Unexploded Parachute Mine
WO	War Office
WWI	World War One
WWII	World War Two
ZAA	Rocket Anti-Aircraft

UXO DESK STUDY & RISK ASSESSMENT

Please read: Zetica has colour coded each paragraph. Paragraphs with black text on a white background provide site-specific information or information specifically researched as part of this project.

Boxed paragraphs in a dark green text with a green background provide general information and, where appropriate, links to online resources giving further detail. These are all available at www.zeticauxo.com. If you cannot gain access to these resources, Zetica can forward them on request.

1 INTRODUCTION

1.1 Project outline

Zetica Ltd was commissioned by Mott MacDonald, on behalf of Vinci Building, to carry out a detailed Unexploded Ordnance (UXO) Desk Study and Risk Assessment for an area of approximately 0.8 hectares (ha) off Wilmslow Road, in Withington, Greater Manchester (the 'Site').

The aim of this report is to gain a fair and representative view of the potential UXO hazard on or affecting the Site in accordance with the Construction Industry Research and Information Association (CIRIA) C681 'Unexploded Ordnance (UXO), a Guide for the Construction Industry'.

Where appropriate, this hazard assessment includes:

- Likelihood of ordnance being present.
- Type of ordnance (size, filling, fuze mechanisms).
- Quantity of ordnance.
- Potential for live ordnance.
- Probable location.
- Ordnance condition.

It should be noted that some military activity providing a source of UXO hazard may not be recorded and therefore there cannot be any guarantee that all UXO hazards affecting the Site have been identified in this report.

1.2 Sources of information

Zetica Ltd researched the World War One (WWI)/World War Two (WWII) bombing and military history of the Site and its surrounding area using a range of information sources. The main sources of information are detailed in the following sections and referenced at the end of this report.

1.2.1 Zetica Ltd records

Zetica Ltd's in-house records were consulted, including the Zetica Ltd bomb risk maps (http://zeticauxo.com/downloads-and-resources/risk-maps/), previous requests for information from government bodies, reference books, and archive materials from past work in the region.

Relevant documents have been cited in the bibliography of this report.

1.2.2 Historical records, maps, and drawings

Numerous reference documents including historical maps, aerial photographs and drawings have been consulted from sources such as the National Archives, the US National Archives & Records Administration (NARA), the Imperial War Museum (IWM), Historic England, National

Collection of Aerial Photography (NCAP), the Defence of Britain Project, and relevant archaeological bodies.

The British Geological Survey (BGS) was consulted for borehole information.

1.2.3 Local records

Manchester City Council, the Greater Manchester County Record Office, Manchester Central Library Archive, Manchester University, local historical groups, and the Greater Manchester Historic Environment Record (HER) were consulted for records.

1.3 Data confidence level

In general, there is a high level of confidence in the researched information sources used for this report. Further detail is given in the text of the report where appropriate.

Definitions of data confidence level		
Data Confidence Level		**Definition**
	Low	There are very few sources of information, and/or those available are lacking in detail.
	Moderate	There is a limited range of available sources of information, a key source of information is missing, and/or some sources may be contradictory or lacking in detail.
✓	**High**	There is a wide range of available sources of information, which are detailed and corroborate each other.

2 THE SITE

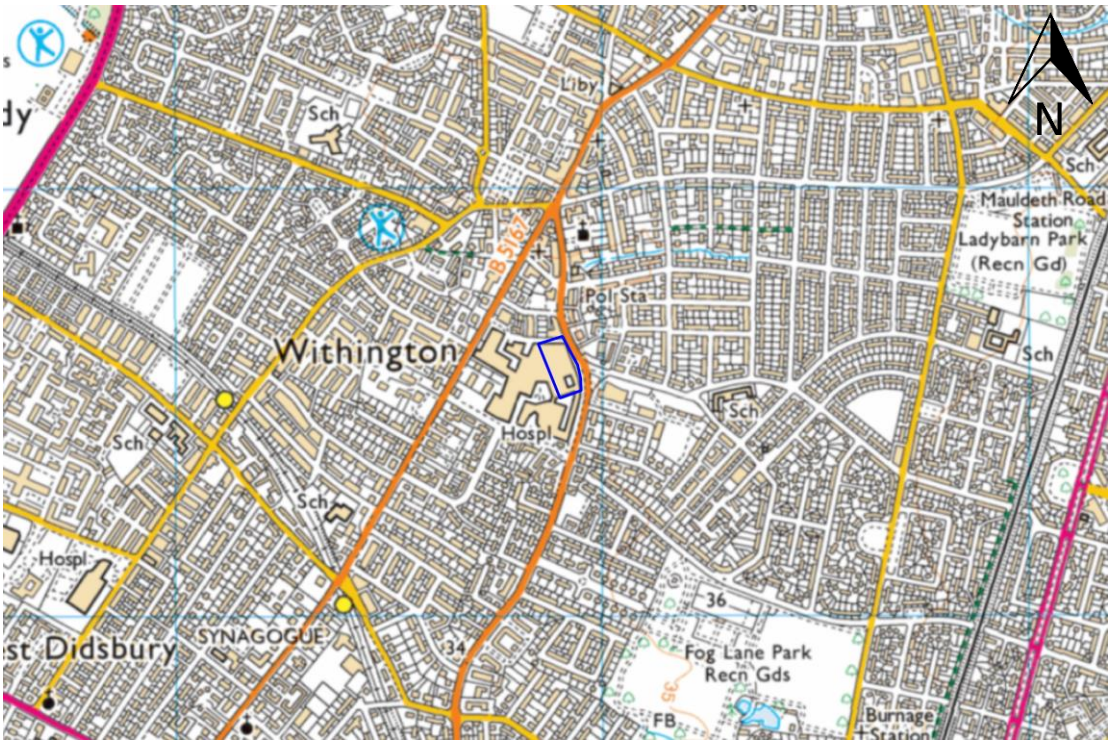
2.1 Site location

The Site is centred on Ordnance Survey National Grid Reference (OSNGR) SJ 849925. It is located approximately 5.3km south-southeast of central Manchester.

The Site comprises hardstanding, part of Christie Hospital, and crossed by Wilmslow Road. It is bounded to the north and south by commercial buildings and Wilmslow Road, to the east by Wilmslow Road, and to the west by the Christie Hospital.

Figure 1 is a Site location map and Plate 1 is a recent aerial photograph of the Site.

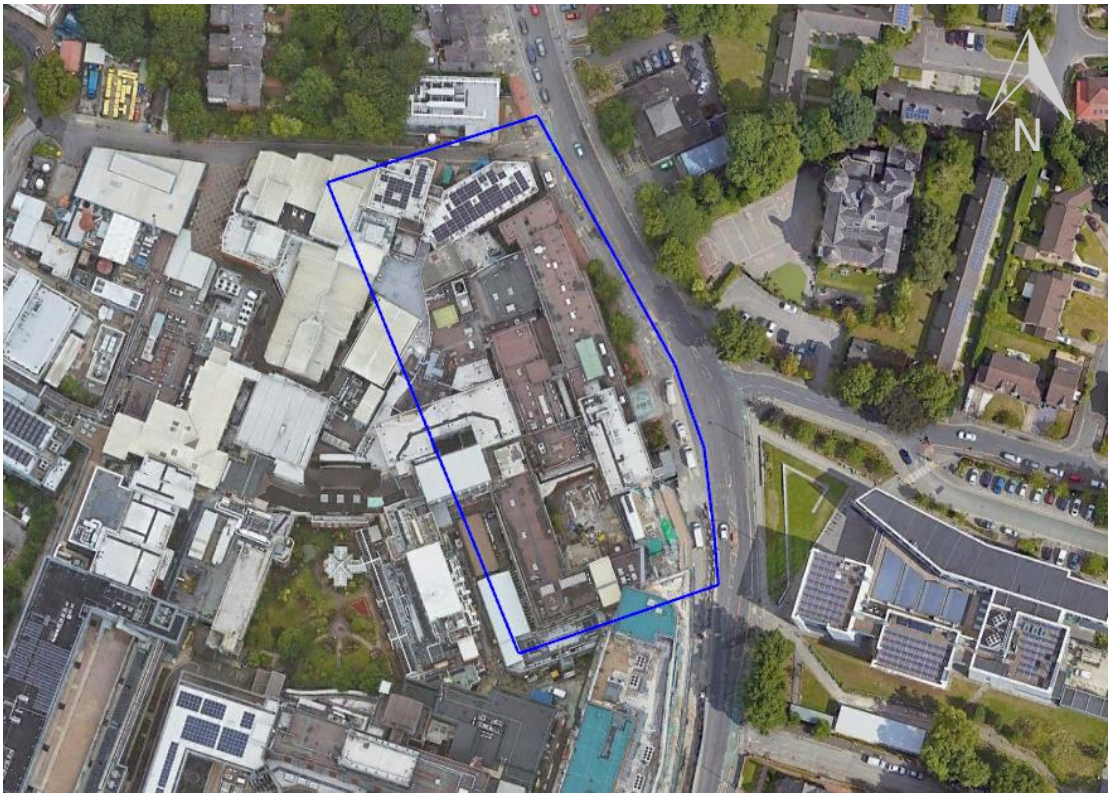
Figure 1 Site location map



Source: © Crown Copyright 2023. Reproduced by permission of Ordnance Survey *Not to Scale*

Legend	Site boundary

Plate 1 Recent aerial photograph of the Site



Source: Google Earth *Not to Scale*

Legend	Site boundary

3 MILITARY ACTIVITY

The following sections outline the recorded military activity in the vicinity of the Site. The potential UXO hazard from WWI and WWII bombing is detailed in Section 4.

3.1 Defences

For further information on military defences, and the potential UXO hazards associated with them, follow the links below:

- Anti-Aircraft Guns
- Anti-Invasion Defences
- Barrage Balloons
- Bombing Decoys
- Home Guard
- Mined Locations
- Mortar & Gun Emplacements
- Pillboxes

No military defences have been identified on the Site. The nearest are described below.

3.1.1 Anti-Aircraft (AA) guns

During WWI there were 9No. AA batteries recorded within 10km of the Site. The nearest was located at Hough End (SD 825935), approximately 2.4km west-northwest of the Site. It was armed with 1No. 6-pounder (-pdr) gun.

During WWII there were 29No. Heavy AA (HAA) and Rocket AA (ZAA) batteries recorded within 10km of the Site. The nearest was located at Hough Ends Playing Fields (SJ 831934), approximately 1.9km northwest of the Site. It was initially armed with 4No. 4.5-inch (") guns.

Potential UXO hazard

Given the number of AA gun batteries in the surrounding area, the potential for an Unexploded AA (UXAA) shell to have fallen on the Site unnoticed, whilst unlikely, cannot be totally discounted.

3.2 Military airfields

For further information on military airfields, and the potential UXO hazards associated with them, follow the link below:

- Military Airfields

No records of any military airfields on or in close proximity to the Site have been found.

During WWI, the nearest operational airfield was Alexandra Park Aerodrome, approximately 0.8km northwest of the Site.

Alexandra Park Aerodrome operated as an Aircraft Acceptance Park (AAP) and was used for the testing and delivery of Royal Flying Corps (RFC) aircraft manufactured at works in Manchester, such as the Avro Works at Trafford Park, approximately 6.4km northwest of the Site, and National Aircraft Factory (NAF) No.2 at Heaton Chapel, approximately 2.3km east of the Site.

After WWI Alexandra Park Aerodrome reverted to civilian use and in May 1919 it accepted Manchester's first commercial flight. In 1922 the Lancashire Aero Club was also formed at Alexandra Park.

During WWII, the nearest operational airfield was Royal Air Force (RAF) Ringway, approximately 7.3km southwest of the Site.

RAF Ringway was home to the Central Landing School (CLS), later Central Landing Establishment (CLE), focused on parachute training, glider training, and developmental work. In 1942 the CLE was renamed the Airborne Forces Establishment.

The Fairey Aviation Company, based at Heaton Chapel approximately 2.8km east of the Site, and Avro, established aircraft production facilities at RAF Ringway and used the airfield for testing. RAF Ringway was also home to No. 3 (later No. 13) Ferry Pilots Pool (FPP), responsible for delivering aircraft to facilities around the United Kingdom (UK).

Post-WWII, Ringway airport re-opened for civil use, with military activity ceasing by 1957. Ringway is now known as Manchester International Airport.

Military airfields are not considered to provide a source of UXO hazard to the Site.

3.3 Aircraft crashes

For further information on military aircraft crashes, and the potential UXO hazards associated with them, follow the link below:

- Aircraft Crashes

No records of any aircraft crashes on or in close proximity to the Site have been found.

3.4 Explosives factories, munitions depots, and disposal areas

For further information on explosives factories, munitions depots and disposal areas, and the potential UXO hazards associated with them, follow the links below:

- Explosives Factories
- Munitions Depots
- Munitions Disposal Areas

No records of any explosives factories, munitions depots or munitions disposal areas on or in close proximity to the Site have been found. The nearest is detailed below.

3.5 Firing ranges and military training areas

For further information on firing ranges and military training areas, and the potential UXO hazards associated with them, follow the links below:

- Artillery Ranges
- Bombing Ranges
- Military Training Areas
- Small Arms Ranges

No records of any firing ranges or military training areas on or in close proximity to the Site have been found. The nearest is detailed below.

4 BOMBING

4.1 WWI bombing

For further information on WWI bombing in the UK, and the potential UXO hazard associated with it, see Appendix 2.1 or use the following link.

- WWI Bombing

No records have been found indicating that the Site was bombed during WWI.

4.2 WWII bombing

For further information on WWII bombing in the UK, and the potential UXO hazard associated with it, see Appendix 2.2 or use the following link.

- WWII Bombing

No records have been found indicating that the Site was bombed during WWII. Details of WWII bombing in the vicinity of the Site are provided in the following sections.

4.2.1 Bombing in Manchester

Manchester's industrial conurbations and port made it a principal target for enemy bombers. The Luftwaffe possessed detailed target photographs of many industrial complexes from as early as 1937.

Air raids on Manchester began in August 1940 and continued until 1945. The heaviest raid on the city occurred between the 22nd and 24th December 1940, the 'Manchester Blitz', during which more than 400No. High Explosive (HE) bombs and 30,000No. Incendiary Bombs (IB) fell on the city, approximately 4km north of the Site.

More than 1,710No. HE bombs and 115No. Parachute Mines (PM) fell across the Manchester region during WWII. Bombing was concentrated on central Manchester, approximatley 5.3km north-northwest of the Site, Salford Docks, and major industrial works at Trafford Park, approximately 5.4km northwest of the Site.

Bombing densities generally decreased away from the city centre and far less damage was sustained by properties in these areas

4.2.2 Strategic targets

From prior to the declaration of war in 1939, Britain was subjected to reconnaissance flights by the Luftwaffe which was building up a photographic record of potential targets.

The Site was located in an area which contained numerous strategic targets, including Salford Docks, warehouses and wharves along the Manchester Ship Canal, the Fairey Aviation aircraft works, and Crosley Brothers Ltd engine works.

Plate 2 is a Luftwaffe target photograph of aircraft and engine works in Manchester, dated the 31st August 1940. This shows the Fairey Aviation aircraft works (GB 7467) and the Crosley Brothers Ltd engine works (GB 824), approximately 2.3km east of the Site.

8No. barrage balloons (a) have also been identified.

Plate 2 Luftwaffe target photograph of aircraft and engine works in Manchester

Source: NARA *Not to Scale*

4.2.3 Bombing densities and incidents

Table 1 gives details of the overall bombing statistics recorded for the Local Authority Districts of the Site (highlighted by bold text) and surrounding districts. These were categorised as Rural Districts (RD), Urban Districts (UD), Municipal Borough (MB), Metropolitan Boroughs (MetB) and County Boroughs (CB). WWII bomb density levels are defined below:

<5 bombs per 405ha is a Very Low regional bombing density.

5-15 bombs per 405ha is Low.

15-50 bombs per 405ha is Moderate.

50-250 bombs per 405ha is High.

>250 bombs per 405ha is Very High.

Official UK bombing statistics have been compiled from both British and German sources. There were differences in the way the figures were originally reported and collated which has led to discrepancies in the summary data.

Note that Table 1 excludes the figures for IBs. Discrepancies between the below list and other records, such as bomb clearance records, demonstrate that this data is likely to under-represent actual bombing.

Table 1 Bombing statistics

Area	Bombs Recorded				
	High Explosive	Parachute Mines	Other	Total	Bombs per 405ha (1000 acres)
Manchester CB	**712**	**18**	**7**	**737**	**27.0**
Stretford MB	456	64	0	520	147.3
Stockport CB	76	1	3	80	10.0

It should be noted that during WWII, many Unexploded Bombs (UXBs) were mapped and subsequently removed as and when conditions and demands on Bomb Disposal teams allowed. Their removal was not always accurately recorded and sometimes records were later destroyed. In practice, most UXBs were probably removed and only a much smaller number were actually registered as officially abandoned bombs.

Details of the nearest recorded bombing incidents to the Site are given in the following section.

1st October 1940

1No. Oil Bomb (OB) bomb fell on the forecourt of Christie Hospital & Holt Radium Institute, approximately 20m west-southwest of the Site.

1No. HE bomb fell on land off Wilmslow Road, approximately 0.1km north-northeast of the Site.

3No. HE bombs fell on Wilmslow Road, between approximately 0.1km and 0.3km north of the Site.

1No. HE bomb fell on land south of Withington Cottage, approximately 0.3km south of the Site.

1No. HE bomb fell on Morris Street, approximately 0.5km north-northwest of the Site.

1No. HE bomb fell on Moorfield Street, approximately 0.5km north of the Site.

2nd January 1941

1No. PM fell on the ground of St Paul's Church, approximately 0.2km north of the Site. This was recorded as an Unexploded PM (UXPM).

10th September 1941

1No. HE bomb fell on Danesmoor Road, approximately 0.5km southwest of the Site.

1st February 1941

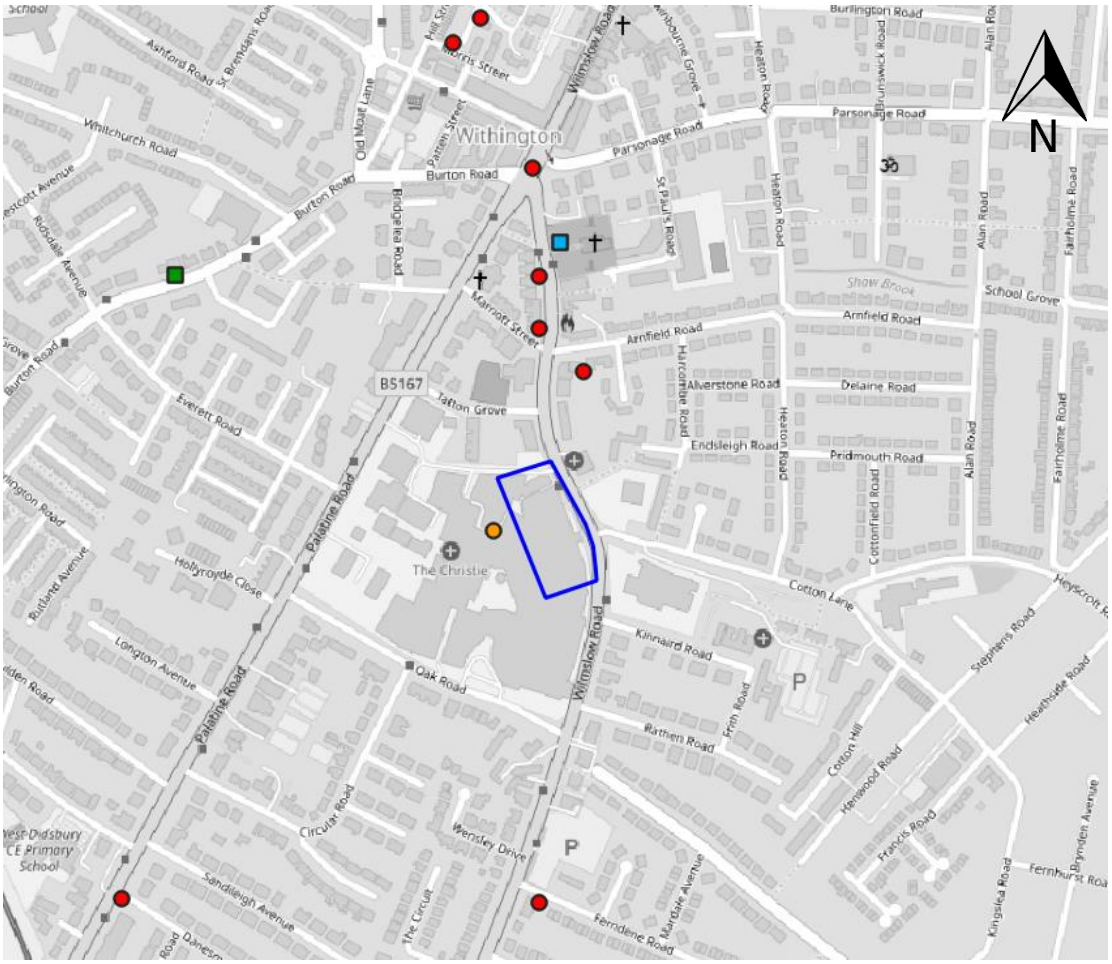
1No. PM fell on Burton Road, approximately 0.4km west-northwest of the Site.

Figure 2 is a map showing the approximate location of recorded bomb impacts in the immediate vicinity of the Site.

The map has been compiled from different sources, including air raid incident reports, historical aerial photographs, and bomb census maps.

The bomb map is also given in the accompanying P13822-23-R1-MAP01-A.

Figure 2 Compiled bomb impact map for the vicinity of the Site

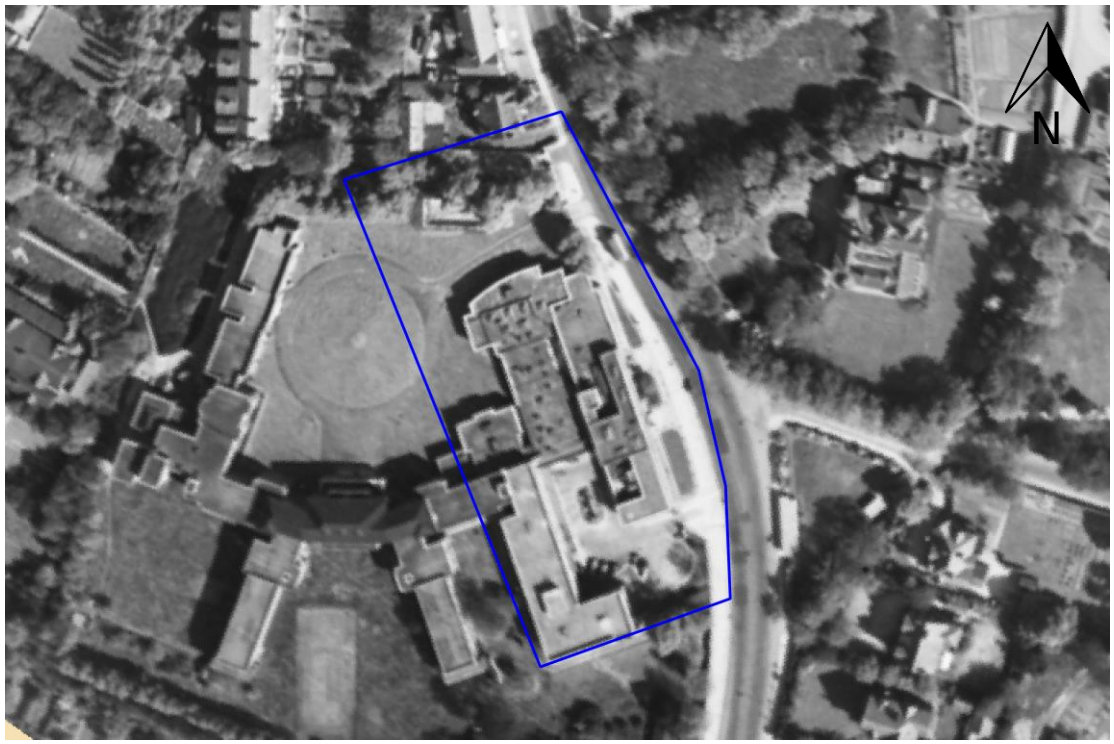


Source: OpenStreetMap *Not to Scale*

Legend	Site boundary	HE bomb	PM	UXPM	OB

Plate 3 is an aerial photograph dated the 7th May 1946. No bomb damage or cratering has been identified on or in the vicinity of the Site.

Plate 3 Aerial photograph, 7th May 1946



Source: Historic England *Not to Scale*

Legend	Site boundary

Potential UXO hazard

No records have been found indicating that the Site was bombed and no bomb damage has been identified on the Site on historical aerial photography.

WWII bombing is not considered to provide a source of UXO hazard to the Site.

4.2.4 Abandoned bombs

No records have been found indicating that any officially abandoned bombs are located on the Site.

4.2.5 Bomb penetration depths

At the time of writing, no Site-specific ground investigation data was available.

Information provided by the Client, BGS 1:50,000 Sheet 85 Manchester (Bedrock & Superficial) and BGS borehole records from nearby investigations have been consulted to get an indicative overview of the Site geology.

The WWII geology of the Site is understood to consist of Made Ground, over Devensian Till, overlying sandstone of the Wilmslow Sandstone Formation.

Table 2 provides an estimate of average maximum bomb penetration depths for the Site assuming WWII ground conditions of 1.5m of Made Ground, overlying 1m of sand, overlying more than 20m of soft rock.

Table 2 Estimated average maximum bomb penetration depths

Estimated average bomb penetration depths for anticipated geology		
Bomb Weight	50kg	2.5m
	250kg	3.5m
	500kg	6.0m

These calculations can be refined on receipt of Site-specific information.

The estimated bomb penetration depths given in Table 2 are from the WWII ground level and are based on the following assumptions:

a) High-level release of the bomb resulting in an impact velocity of 260m/s (>5,000m altitude).

b) A strike angle of 10 to 15 ° to the vertical.

c) That the bomb is stable, both in flight and on penetration.

d) That no retarding units are fitted to the bomb.

e) That the soil type is homogenous.

Assuming the above, a bomb will enter the ground and travel on the same trajectory until momentum is nearly lost. The bomb will then turn abruptly to the horizontal before coming to rest. The horizontal distance between the centre of the entry hole and the centre of the bomb at rest is known as the 'offset'. A marked horizontal movement from the original line of entry is common.

Low-level attacks may have an impact angle of 45° or more, which will frequently lead to a much greater amount of offset movement during soil penetration.

The average offset is one third of the penetration depth. If hardstanding or Made Ground were present during WWII, bomb penetration depths would have been significantly reduced but offset distances may have been up to four times greater.

5 POST-WWII EXPLOSIVE ORDNANCE CLEARANCE (EOC) ACTIVITIES

Based on data from 1939 to 1945, War Office statistics indicate that 200,195No. HE bombs exploded within Great Britain. Additionally, 25,195No. HE bombs (approximately 11%) were recorded as UXBs. However, records from the Royal Engineers (RE) who were responsible for bomb disposal at the time indicate that by 27th February 1946, more than 45,000No. UXBs were disposed of.

On average, 8.5% of UXBs later self-exploded. In some cases, the bombs had delayed action fuzes or were never intended to explode, their purpose being to cause inconvenience and fear. Given the discrepancy in records and the fact that UXBs are still being found unexpectedly, it is clear that the original figures are understated and provide only an approximation of the number of potential UXBs in the UK.

War Office (WO) statistics also show that between October 1940 and May 1941 most UXBs (93%) were either 50kg or 250kg. It should be noted that details of the recovery and size of the UXB were not always accurately reported.

The larger WWII UXBs are often difficult to recover due to both penetration depths and the presence of two or more fuzes, combined with more sensitive fillings of explosive mixtures including Amatol and Trialen.

5.1 EOC tasks

Zetica holds the following records of post-WWII EOC tasks having taken place in the vicinity of the Site.

31st October 2012

1No. WWI shell was discovered at a property in Burton Road, approximately 0.6km west of the Site. It was made safe and removed.

6 UXO HAZARD ASSESSMENT

6.1 UXO hazard level

Definitions of UXO Hazard Level for a Site	
Hazard Level	**Definition**
Very Low	There is positive evidence that UXO is not present, e.g. through physical constraints or removal.
Low	There is no positive evidence that UXO is present, but its occurrence cannot be totally discounted.
Moderate	There is positive evidence that ordnance was present or that other uncharted ordnance may be present as UXO.
High	There is positive evidence that UXO is present.
Very High	As high, but requires immediate or special attention due to the potential hazard.

No records have been found indicating that the Site was bombed and no other significant sources of UXO hazard have been identified on the Site.

Given this, it is considered that the Site has a low UXO hazard level, as shown in Figure 3.

The UXO hazard zone plan of the Site is also given in the accompanying P13822-23-R1-MAP01-A.

Figure 3 UXO hazard zone plan of the Site

Source: OpenStreetMap *Not to Scale*

Legend					
	Very Low		Low		Moderate	
	High		Very High		Site boundary	

7 UXO RISK ASSESSMENT

7.1 Proposed works

It is understood that works on the Site will comprise the demolition of existing blocks of the hospital and construction of a new Computed Tomography (CT) department**.** Initial Ground Investigation (GI) works will involve exploratory holes to 18m below ground level (bgl).

It is assumed that works on the Site will include excavations, boreholes, and piling.

7.2 Risk assessment methodology

A UXO risk assessment has been undertaken for the proposed works, taking into consideration the identified UXO hazard(s).

Firstly, the probability of encountering UXO (PE) has been considered and rated for the proposed construction techniques, as detailed below.

Probability of Encounter (PE)	**Rating**
Frequent, highly likely, almost certain.	5
Probable, more likely to happen than not.	4
Occasional, increased chance or probability.	3
Remote, unlikely to happen but could.	2
Improbable, highly unlikely.	1
Impossible	0

Secondly, the probability of detonating an item of UXO (PD) has been considered and rated for the proposed construction techniques, as detailed below.

Probability of Detonation (PD)	**Rating**
Frequent, highly likely, almost certain.	5
Probable, more likely to happen than not.	4
Occasional, increased chance or probability.	3
Remote, unlikely to happen but could.	2
Improbable, highly unlikely.	1
Impossible	0

Next, the probability of encountering and detonating the UXO (PE x PD) have been used to generate an overall likelihood rating (P).

P = PE x PD	**LIKELIHOOD of Encounter and Detonation**	**Rating**
21 to 25	Frequent, highly likely, almost certain.	5
16 to 20	Probable, more likely to happen than not.	4
6 to 15	Occasional, increased chance or probability.	3
2 to 5	Remote, unlikely to happen but could.	2
1	Improbable, highly unlikely.	1
0	Impossible	0
P ranges from 25, a certainty of UXO being encountered and detonated on the Site by engineering activity, to 0, a certainty that UXO does not occur on the Site and will not be detonated by engineering activity.		

The likelihood of encountering and detonating UXO during site works (P) is multiplied by the severity (S) of such an event occurring (P x S), to provide a risk level using the following matrix.

Severity (S)	Rating
Multiple fatalities	5
Major injury, long term health issues, single fatality.	4
Minor injury, short term health issues, no fatalities.	3
First aid case but no lost time or ill health.	2
Minor injuries, no first aid.	1
No injuries.	0

UXO Risk Matrix							
	SEVERITY (S)						
LIKELIHOOD (P)		5	4	3	2	1	0
	5	25	20	15	10	5	0
	4	20	16	12	8	4	0
	3	15	12	9	6	3	0
	2	10	8	6	4	2	0
	1	5	4	3	2	1	0
	0	0	0	0	0	0	0

7.3 UXO risk level

The UXO risk assessment for proposed works on the Site is given in Table 3.

Table 3 UXO risk assessment for the Site

Potential UXO Hazard	Anticipated Works	PE	PD	P = PE x PD	Likelihood	Severity	Risk Rating	UXO Risk
UXB	Excavations	1	1	1	1	5	5	Low
	Boreholes/Piling	1	1	1	1	4	4	Low
Other UXO	Excavations	1	1	1	1	4	4	Low
	Boreholes/Piling	1	1	1	1	3	3	Low
PE = Probability of Encounter; PD = Probability of Detonation; P = Likelihood								

8 RISK MITIGATION PLAN

Key findings: No significant sources of UXO hazard have been identified.

Key actions: Proceed with works.

8.1 UXO risk summary

Table 4 summarises the UXO risk for proposed works on the Site and recommended actions.

Table 4 Summary of UXO risk and mitigation recommendations

Proposed Works	UXO Risk	Recommended Mitigation
Excavations		**Proceed with works** – if additional comfort is required to address the residual UXO hazard, a formal UXO awareness briefing can be provided.
Boreholes/Piling		**Proceed with works**

In summary, no additional measures are considered essential to reduce the UXO risk on the Site to As Low As Reasonably Practicable (ALARP).

8.2 Risk mitigation techniques

Should you wish to provide staff involved in excavations with increased awareness regarding the potential (albeit low) for UXO encounter, this can be done through a formal briefing.

8.2.1 UXO awareness briefing

A formal UXO awareness briefing should ensure that those involved in intrusive works take appropriate action if a suspect item is uncovered. The briefing can be given to all site workers, but the aim is to provide the client's key staff with the tools to provide the same induction to new staff without the UXO specialist's attendance.

The briefing will offer some recognition skills for typical UXO, and suitably sensitise those involved in excavation to be vigilant.

The induction materials are provided as a file containing both hard and electronic copies with additional information and resources such as UXO awareness posters, ordnance data sheets and emergency contact cards for staff awareness.

By providing the UXO awareness briefing, it ensures that in the unlikely event that UXO is encountered:

- All site staff take appropriate action.
- A support mechanism and points of contact are established.
- The likelihood of harm to people or property is reduced.
- Significant delays to site work are prevented.

8.3 What do I do next?

If you have any comments or require further assistance, contact us and we can help.

	01993 886682		uxo@zetica.com		zeticauxo.com

If you have requirements to identify other buried hazards (such as mapping utilities or obstructions) we can provide these surveys.

If proposed works on the Site change, or additional works are planned, contact Zetica for a re-assessment of the UXO risk and the risk mitigation requirements.

APPENDICES

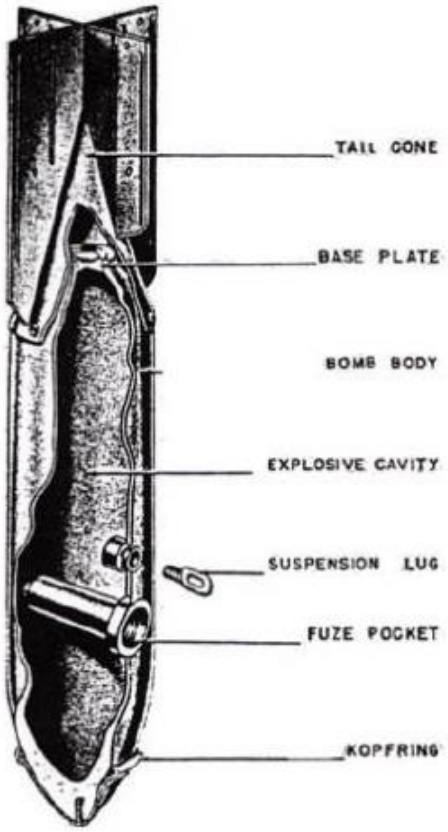
Appendix 1 Anticipated ordnance types

For a more comprehensive set of ordnance data sheets, see http://zeticauxo.com/downloads-and-resources/ordnance-data-sheets/.

Information Data Sheet

Category Bomb (Luftwaffe)
Type Sprengbombe-Cylindrisch (SC) 50kg

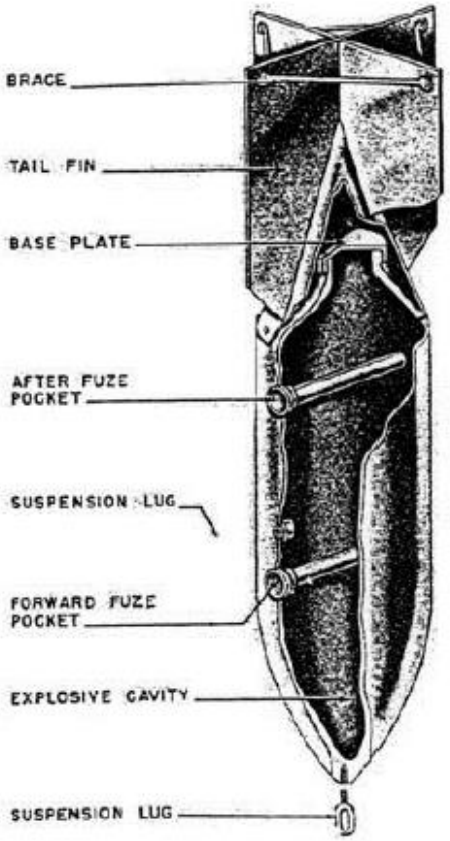
Variants	8
Body Dimensions	762 x 200mm (30" x 7.9")
Weight	55kg (122lbs)
Charge Weight	25kg (54lbs)
Fuze	Single electric impact fuze. Some have short time delay
Composition	Sheet steel
Description	Thick nose welded to a steel body. Nose may be attached to Kopfring (a triangular section steel ring) or spike. Suspension bolt in eye/body and sheet metal tail attached to body with rivets/screws. Originally painted green-grey with a yellow stripe on the tail. Cast TNT, Amatol or Trialen filling.
Function	Designed to maximise shock waves through air, water and earth and for general demolition. Used against easily damageable targets, including roads, aircraft hangars, rolling stock and small buildings. Spike bombs/ 'Stabo' (SC 50 with spikes attached to nose) were used against rail lines and country roads, with Kopfring used against naval targets.



Information Data Sheet

Category Bomb
Type Sprengbombe-Cylindrisch (SC) 250kg

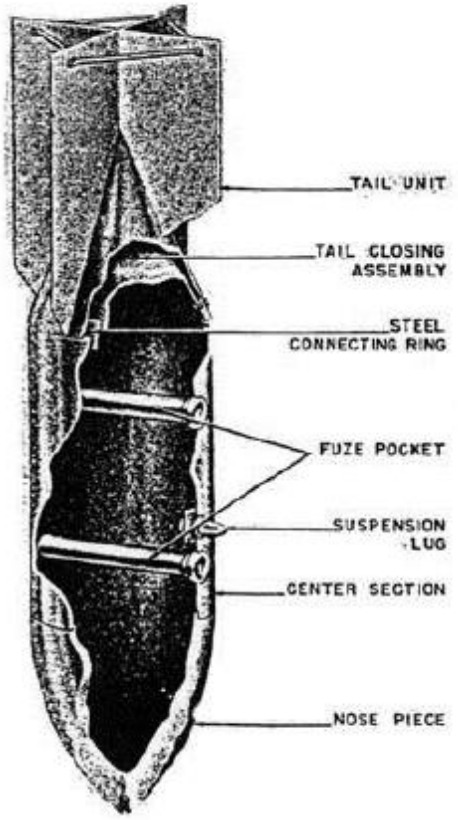
Variants	8
Body Dimensions	1194mm x 368mm (47" x 14.5")
Weight	249-264 kg (548-582lbs)
Charge Weight	130-145 kg (287-320lbs)
Fuze	Electric impact fuze/electric clockwork time fuse & electric anti-disturbance fuze
Composition	Sheet steel with stays
Description	Thick nose welded to steel body. Nose may be attached to Kopfring (triangular section steel ring) or spike. Sheet metal tail attached to body with rivets/ screws. Suspension eye bolt in the nose/body. Originally painted green-grey with a yellow stripe on the tail. TNT; amatol; TNT and aluminium powder, naphthalene, ammonium nitrate and wax/ wood meal filling.
Function	Designed to maximise shock waves through air, water and earth and general demolition. Used against railway installations, large buildings, ammunition depots and below-ground installations (to 8m). Spike bombs/ 'Stabo' (SC 50 with spikes attached to nose) used against rail lines and country roads.



Information Data Sheet

Category Bomb
Type Sprengbombe-Cylindrisch (SC) 500kg

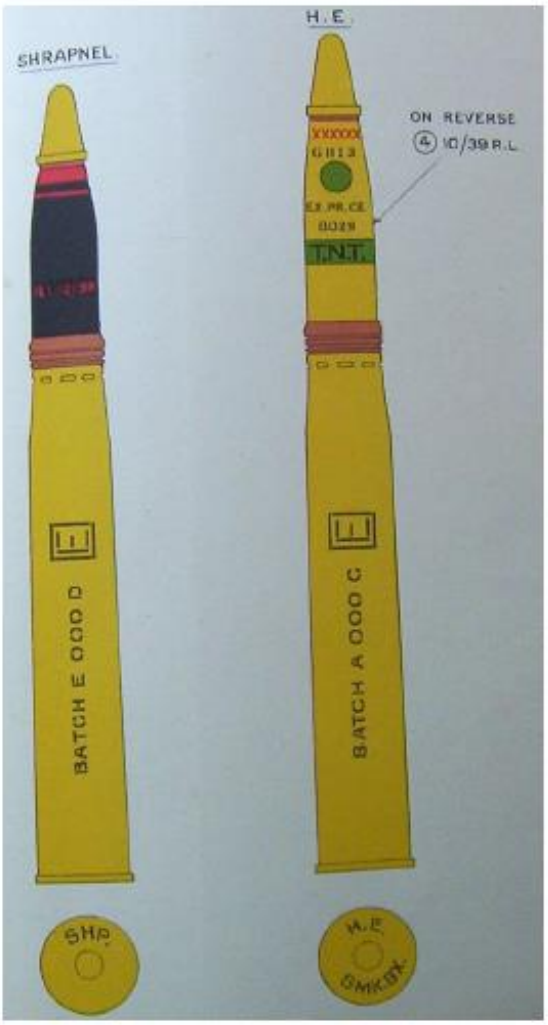
Variants	-
Body Dimensions	1414–1486mm x 470mm (55.7-58.5" x 18.5")
Weight	500kg (1,100lbs)
Charge Weight	220kg (484lbs)
Fuze	Electric impact fuze/electric clockwork time fuse & electric anti-disturbance fuze.
Composition	Sheet steel with stays or drum
Description	Thick nose welded to steel body. Nose may be attached to Kopfring (triangular section steel ring). Tail either steel sheet or drum-shaped. Suspension band. Originally painted green-grey/ buff (some later versions sky blue) with yellow stripe on tail. Filled with amatol, TNT or trialen.
Function	Designed to maximise shock waves through air, water and earth and for general demolition. Used against railway property, large buildings, shipping and below-ground installations.



Information Data Sheet

Category Projectile
Type 3.7" Anti-Aircraft Shell

Variants	6
Body Dimensions	94mm x 360mm (3.7 x 14.7")
Weight	12.7kg (28lb)
Fuze	Mechanical time fuze
Composition	Cast steel
Description	Brass cartridge case. Square-based shell with tapered nose, filled with Amatol, TNT or RDX/TNT. MK6 had forward centring bands and a wider driving band.
Function	Used as a defence against enemy aircraft, fired from fixed batteries and mobile mountings. Could fire approximately 20 rounds per minute with a maximum ceiling of 41,000ft and horizontal range of 20,600 yards.



Information Data Sheet

Category Projectile
Type 4.5" Shell (Mark II – Anti-Aircraft)

Variants -

Body Dimensions 114mm x 566mm (4.5" x 21.9")

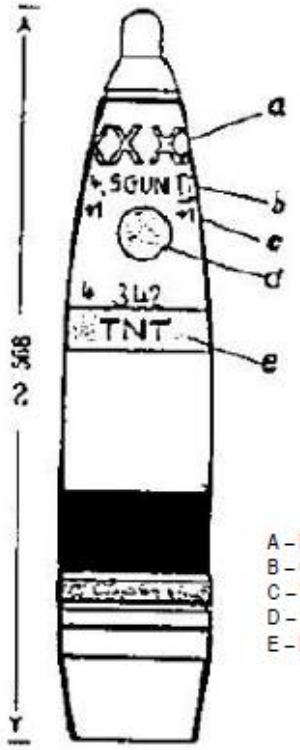
Weight 24.9kg (55lb)

Fuze Mechanical time fuze

Composition Cast steel

Description Square-based, tapered-nosed shell filled with TNT or Amatol. Steel casing, rotating band of either copper or gilding metal located 3.5" in front of the base end with single groove.

Function Used as field artillery and adapted for use in anti-aircraft defence from fixed batteries. Rate of fire of 8 rounds per minute, maximum ceiling of 44,000ft and horizontal range of 22,800 yards.



A – Missile Identification
B – Gun and Bullet Type
C – Weight
D – Smoke pot
E – Explosives Ring

Appendix 2 Sources of UXO hazard

The sections below provide background information on the potential sources of UXO hazard affecting the Site. For a more comprehensive set of UXO information sheets, see http://zeticauxo.com/downloads-and-resources/uxo-information-sheets/.

Appendix 2.1 WWI bombing

Information Data Sheet

Category World War One (WWI) Bombing

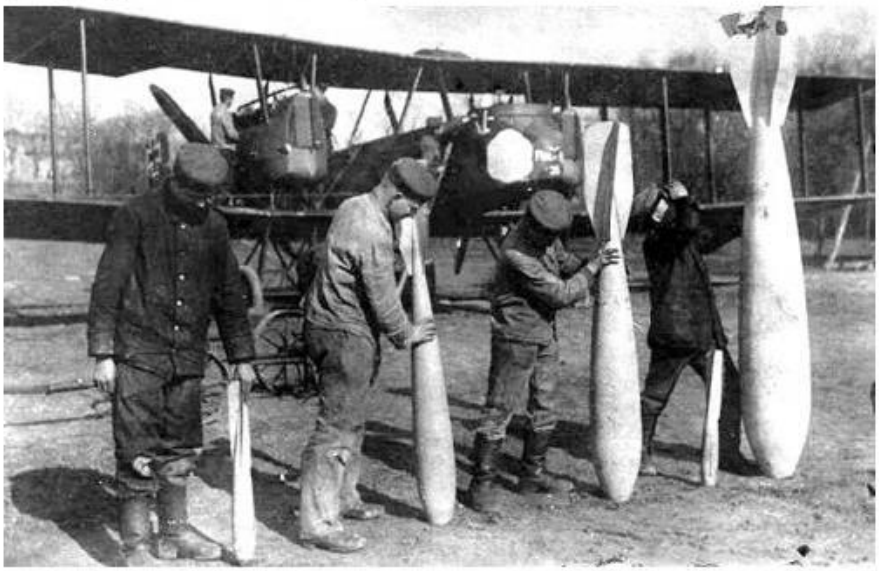
Description:

During WWI, significant bombing took place across some areas of the UK. An estimated 9,000No. German bombs were dropped on Britain during the course of 51No. airship and 52No. aircraft raids. It was the first time that strategic aerial bombardment had been used.

Nearly 100No. air raids were carried out on London and Southeast England, over 40No. of which were by Zeppelin airships. Areas along the East Coast was also targeted regularly due to their proximity to the European continent. Bombing raids further inland were rare and West England and Wales were out of reach for German aircraft of the time.

Aerial bombing during WWI initially relied on visual aiming, with bombsights not developed until later in the war. The inaccuracy inherent in this method meant that bombs often fell some way from their intended targets.

The first recorded raid against England occurred on the 21st December 1914 when 2No. High Explosive (HE) bombs fell near the Admiralty Pier at Dover. Zeppelin raids intensified during 1915 and 1916, with aircraft raids becoming more frequent after 1917. The last raid of WWI took place on the 19th May 1918, when 38 Gotha and 3 Giant aircraft bombed London and surrounding districts, dropping a total of more than 2,500lbs of bombs.



A variety of WWI German bombs

Hazard:

The potential of coming across an Unexploded Bomb (UXB) from WWI is far less likely than an UXB from World War Two (WWII), given the lower bombing densities during raids in WWI.

Some areas which were subjected to sustained bombing raids recorded a higher number of UXBs. In these areas, where there has been no significant development for the last century, the potential of a UXB remaining from WWI cannot be totally discounted.

Appendix 2.2 WWII bombing

Information Data Sheet

Category World War Two (WWII) Bombing

Description:

Bombing raids began in summer 1940 and continued until the end of WWII. Bombing densities generally increased towards major cities, such as London, Birmingham, Coventry, and Hull, or strategic targets such as docks, harbours, industrial areas, and airfields. Coastal towns, such as Eastbourne, and cathedral cities, such as Canterbury were also heavily targeted.

The German bombing campaign saw the extensive use of both High Explosive (HE) bombs and Incendiary Bombs (IBs). 50kg and 250kg HE bombs were most commonly used, although 500kg were also used to a lesser extent. More rarely 1,000kg, 1,400kg and 1,800kg bombs were dropped. HE bombs tended to contain about half of their weight in explosives and were fitted with one or two fuzes. Not all HE bombs were intended to explode on impact and some contained timing mechanisms where detonation could occur more than 70 hours after impact.

Incendiary devices ranged from small 1kg thermite filled, magnesium bodied IBs, to 250kg and 500kg Oil Bombs (OB). Occasionally IBs were fitted with a bursting charge which exploded after the bomb had been alight for a few minutes, causing burning debris to be scattered over a greater area. Large OBs were similar in appearance to HE bombs, although their design was sufficiently different to warrant a specially trained unit of the Royal Engineer (RE) to deal with their disposal.

Variety of WWII bombs

Anti-Personnel (AP) bombs and Parachute Mines (PMs) were also deployed. The most common AP bombs were 1kg and 2kg, which could inflict injury across an area up to 150m away from the impact. PMs could be up to 4m in length and were typically detonated either magnetically or by noise/vibration. Anti-shipping PMs were commonly dropped over navigable rivers, dockland areas, and coastlines. Whilst the Royal Navy (RN) was responsible for ensuring that anti-shipping PMs were made safe, their removal and disposal was still the responsibility of the RE.

In 1944, new offensive weapons were introduced. The Flying Bomb (V1), a pilotless guided missile, exploded on impact and could cause significant damage. The Long Range Rocket (V2), a ballistic missile rocket, travelled at such speed that no one could see or hear its approach.

WWII bomb targeting was inaccurate, especially in the first year of the war. A typical bomb load of 50kg HE bombs mixed with IBs aimed at a specific location might not just miss the intended target but could fall a considerable distance away.

Local Civil Defence authorities in urban areas typically had a comprehensive system for reporting bomb incidents and dealing with Unexploded Bombs (UXB). In more rural and coastal areas where fewer bombing raids occurred, it is known that Air Raid Precaution (ARP) records under-represent the number and frequency of bombs falling. Bombs could be released as part of 'tip and run' raids where bomber crews would drop their bombs to avoid Anti-Aircraft (AA) fire or Allied fighter aircraft, on route to and from other strategic targets. Bombs dropped as a result of poor targeting or 'tip and run' raids often went unrecorded or were recorded as 'fell in open country' or 'fell in the sea'. The Luftwaffe are thought to have dropped approximately 75,000 tons of bombs on Britain throughout WWII and an estimated 11% of all bombs dropped during the war failed to detonate.

Removal of an UXB

Hazard:

The potential for a UXB hazard to exist on a site depends on a variety of factors:

- Were their strategic targets in the surrounding area?
- Was the site bombed and how heavy were the raids?
- Could an UXB impact have been missed, masked by rubble or debris?

Even in rural areas, the potential for UXBs cannot be totally discounted and therefore it is essential that detailed local bombing records are obtained when assessing the UXB hazard on any site.

Appendix 2.3 Anti-Aircraft defences

Information Data Sheet

Category Anti-Aircraft (AA) Defences

Description:

As aerial bombardment first began during World War One (WWI), AA gun batteries were gradually established throughout much of England to counter German bombing raids. By June 1916, there were approximately 271No. AA guns and 258No. searchlight installations defending London alone.

Common WWI AA defences included 3", 75mm, 6-pounder (pdr), and 1pdr guns. Many of these guns were mobile and would follow the course of an airship, firing from areas of open land.

During WWI, Unexploded AA (UXAA) shells, could land up to 13km from the firing point, although they more typically fell within 10km.

WWI 3-pdr mobile Vickers AA gun

WWII 3.7" static AA gun

During World War Two (WWII), AA gun batteries were used extensively to counter the threat posed by enemy aircraft. AA shells could be distributed over a wide area and could land up to 27km from the firing point, although they more typically fell within 15km.

3No. types of AA batteries existed:

- Heavy AA (HAA) – typically 3.7", 4.5", and 5.25" calibre guns designed to engage high flying bomber aircraft. These tended to be permanent gun emplacements.
- Light AA (LAA) – typically used 40mm shells and machine gun ammunition and designed to counter low flying aircraft. These were often mobile and were moved periodically.
- Rocket AA (ZAA) – fired 3" or 3.7" AA rockets with a maximum altitude of 5,800m and a ground range of 9km. These tended to be permanent gun emplacements.

Hazard:

AA batteries had munitions stores which stored shells for the batteries and Small Arms Ammunition (SAA) for troops manning the position. Such stores were typically removed at the end of WWII, although some disposal may have occurred in the immediate vicinity of the gun battery.

In areas heavily protected by AA batteries, it is prudent to consider the potential for UXAA shells in the area surrounding a battery, taking into consideration the likely extent within which shells would have fallen. Finding an UXAA shell immediately adjacent to a former gun battery is less likely.

Appendix 3 Recent UXO finds

Information Data Sheet

Category Recent UXO Finds

UXO finds in the UK are a regular occurrence, although they almost never result in an accidental detonation.

Explosives rarely lose effectiveness with age. In some instances, mechanisms such as fuzes and gaines can become more sensitive and more prone to detonation, regardless of whether the device has been submersed in water or embedded in silt, clay, or similar materials.

Zetica Ltd, and other commercial EOD companies, uncover and make safe thousands of items of UXO each year, though details are rarely made public knowledge.

Publicly recorded discoveries also occur regularly, as shown by the list of recent significant UXO finds in the UK below. Click here to keep up to date with the latest UXO finds.

On the 26th February 2021, a 1,000kg German "Hermann" UXB was discovered by builders at Exeter University campus (see below). It was investigated and detonated in-situ following the evacuation of nearby properties and University halls of residence.

1,000kg German UXB discovered in Exeter, 2021

On the 29th March 2021, 1No. 250lb UXB was discovered on the seabed near Hinkley Point C harbour, Bristol. A maritime exclusion was imposed while the item was investigated and then destroyed in a controlled explosion.

On the 1st June 2021, a cache of approximately 100No. WWII-era hand grenades were found in a Nottinghamshire forest, a possible relic from nearby WWII camps. They were destroyed.

On the 24th July 2021, 1No. 500lb British UXB was uncovered during construction works in Goole, East Yorkshire. Reports indicated that the UXB had been jettisoned by a Lancaster bomber aircraft prior to crashing nearby in WWII. The item was investigated and destroyed.

On the 18th August 2021, 1No. UXB was found by construction workers on a Site in Earl Sterndale, Derbyshire. Upon inspection the UXB was deemed to be dangerous, and a controlled detonation was undertaken.

On the 10th September 2021, EOD teams destroyed 25No. mortar bombs which had been washed up onto beaches around Nairn and Ardersier in Morayshire. These beaches had been used during WWII for training prior to the D-Day landings in Normandy.

Mortar bombs found on beaches in Nairn and Ardersier, 2021

On the 15th December 2021, approximately 200No. artillery shells were discovered at a construction site located within the former Royal Ordnance Factory at Swynnerton in Staffordshire. The shells were removed and destroyed.

On the 2nd January 2022, 1No. heavily deteriorated 105mm artillery shell was discovered by dogwalkers on a beach in Cumbria. This may have originated on one of the several offshore ranges which have been operational along the nearby coastline since WWII.

Between the 24th and 27th January 2022, 5No. empty artillery shells were uncovered at a construction site in Manchester. These were likely linked to a shell-production factory which had been active on the site during WWII.

On the 14th July 2022, 1No. 2" mortar bomb and several Small Arms Ammunition rounds were discovered on a beach near Ardnamurchan. An EOD team disposed of the items.

On the 28th November 2022, 45No. Self-Igniting Phosphorus grenades were discovered during construction works at a school in Swindon. They were disposed of by an EOD team.

On the 5th December 2022, 1No. UXB was discovered during construction at Biggin Hill Airport. An EOD team removed the UXB for safe disposal.

On the 7th February 2023 1No. 250kg bomb was found during dredging works in the River Yare, Great Yarmouth. It detonated unplanned whilst being disarmed by an Army EOD team.

On the 17th April 2023, 1No. unexploded mortar bomb was discovered at Cavenham Heath Nature Reserve. It was destroyed in a controlled explosion by an EOD team. This followed 2No. other similar discoveries on the 7th March and 12th March in the same stretch of canal.

On the 27th July 2023, 1No. 250kg WWII bomb was discovered off the coast of Guernsey by a recreational diver. It was detonated in situ by a Royal Navy EOD diver team.

Appendix 4 Glossary and definitions

Abandoned Explosive Ordnance (AXO)	Explosive ordnance that has not been used during an armed conflict, that has been left behind or disposed of by a party to an armed conflict, and which is no longer under control of that party. Abandoned explosive ordnance may or may not have been primed, fuzed, armed or otherwise prepared for use.
Demil	Derived from the term 'Demilitarisation', demil refers to the break down and the recycling or disposal of ordnance components.
Detonation	The high-speed chemical breakdown of an energetic material producing heat, pressure, flame, and a shock wave.
Device	Any component, sub-assembly or completed ordnance, which may or may not have an explosive risk. It can apply to detonators, primers, gaines, fuzes, shells, or bombs.
Explosive	Compounds forming energetic materials that under certain conditions chemically react, rapidly producing gas, heat, and pressure. These are extremely dangerous and should only be handled by qualified professionals.
Explosive Ordnance (EO)	All munitions containing explosives, nuclear fission or fusion materials, and biological and chemical agents. This includes bombs and warheads, missiles, artillery, mortar, rocket, Small Arms Ammunition, mines, torpedoes, depth charges, pyrotechnics, cluster bombs and dispensers, cartridge and propellant devices, electro-explosive devices, clandestine and improvised explosive devices, and all related items/components which are explosive in nature.
Explosive Ordnance Clearance (EOC)	The operation of ordnance detection, investigation, identification, and removal, with Explosive Ordnance Disposal being a separate operation.
Explosive Ordnance Disposal (EOD)	The detection, identification, on-site evaluation, rendering safe, recovery, and final disposal of Unexploded Ordnance.
Explosive Ordnance Reconnaissance (EOR)	The detection, identification, and on-site evaluation of Unexploded Ordnance before Explosive Ordnance Disposal.
Explosive Remnants of War (ERW)	Unexploded Ordnance and Abandoned Explosive Ordnance, excluding landmines.
Explosive Substances & Articles (ESA)	Explosive substances are solid or liquid substances (or a mixture) which are either: capable by a chemical reaction of producing gas at a speed, temperature, and pressure to cause damage to the surroundings; or designed to produce an effect by heat, light, sound, gas, or smoke (or a combination) as a result of a non-detonative, self-sustaining, exothermic reaction. One or more explosive substances form an explosive article.

Fuze	The part of an explosive device that initiates the main explosive charge to function. In common usage, the word fuze is used indiscriminately, but when being specific (and especially in a military context), fuze is used to mean a more complicated device, such as a device within military ordnance.
Gaine	Small explosive charge that is sometimes placed between the detonator and the main charge to ensure ignition.
Geophysical survey	A range of methods that can be used to detect objects or identify ground conditions without the need for intrusive methods (such as excavation or drilling). This is particularly suited to ordnance, as disturbance of ordnance is to be avoided where possible.
High Explosive (HE)	Secondary explosives (commonly known as HE) make up the main charge or filling of an ordnance device. They are usually less sensitive than primary explosives. Examples of secondary explosives are Nitro-glycerine (NG), Trinitrotoluene (TNT), Amatol (Ammonium nitrate and TNT), gunpowder, and Cyclotrimethylenetrinitramine (RDX).
Land Service Ammunition (LSA)	Items of ordnance thrown, propelled, or placed during land warfare, to include grenades, mortar bombs, projectiles, rockets, and landmines.
Munition	The complete device charged with explosives, propellants, pyrotechnics, initiating composition, or nuclear, biological, or chemical material for use in military operations, including demolitions. This includes those munitions that have been modified for use in training, ceremonial, or non-operational purposes. These fall into three distinct categories: inert (contain no explosives), live (contain explosives and have not been fired), and blind (have fired but failed to function as intended.)
Primary Explosive	Explosives used to initiate less sensitive explosives and usually extremely sensitive to friction, heat, and pressure. Primary explosives are commonly found in detonators. Examples of primary explosives are lead azide, lead styphnate, and mercury fulminate.
Propellants	Provide ordnance with the ability to travel in a controlled manner and deliver the ordnance to a predetermined target. Propellants burn rapidly producing gas, pressure, and flame. Although usually in solid form they can be produced in liquid form. Examples of propellants are ballistite, often in flake form, and cordite, often in string form.
Pyrotechnic	An explosive article or substance designed to produce an effect by heat, light, sound, gas, or smoke (or a combination), as a result of non-detonative, self-sustaining, exothermic chemical reactions.
Small Arms Ammunition (SAA)	Projectiles around 12mm or less in calibre and no longer than approximately 100mm. They are fired from a variety of weapons, including rifles, pistols, shotguns, and machine guns.

Unexploded Anti-Aircraft (UXAA) Shell	Ordnance containing High Explosives, although they can also contain pyrotechnic compounds that produce smoke. They ranged from 2" to 5.25" calibre, although most common were 3.7" and 4.5" HE shells.
Unexploded Bomb (UXB)	A common term for unexploded air-dropped munitions.
Unexploded Ordnance (UXO)	Explosive ordnance that has been primed, fuzed, armed, or prepared for use and subsequently fired, dropped, launched, projected, or placed in such a manner as to present a hazard to operations, persons, or objects, and remains unexploded either by malfunction or design.
V1	The Vergeltungswaffe-1, also designated Fieseler Fi 103/FZG-76, known colloquially in English as the Flying Bomb, Pilotless Aircraft, Buzz Bomb, or Doodlebug, was the first guided missile used in WWII and the forerunner of today's cruise missile.
V2	The Vergeltungswaffe 2 ('Reprisal Weapon 2') was the first ballistic missile. It was used primarily against Belgian and British targets during the later stages of WWII. It was also the first man-made object launched into space, during test flights in 1944.

Appendix 5 Bibliography

Bulloch G, Steeds J E, Green K, Sainsbury M G, Brockwell J S & Slade N J, Land Contamination: Technical Guidance on Special Sites: MoD Land

Bulloch G, Steeds J E, Green K, Sainsbury M G, Brockwell J S & Slade N J, R&D Technical Report P5-042/TR/03, Land Contamination: Technical Guidance on Special Sites: Explosives Manufacturing & Processing Sites

CIRIA, Unexploded Ordnance (UXO), a Guide for the Construction Industry, 2009

Clarke N J, Luftwaffe Target Reconnaissance, German Aerial Photography 1939-1942, 1996

Cocroft W D, Dangerous Energy, 2000

Cocroft W D, Thomas R J, Cold War, 2003

Delve K, The Military Airfields of Northern England, 2006

Department of the Environment, Sampling Strategies for Contaminated Land, Department of the Environment: Contaminated Land Research Report, CLR Report No. 4, 1994

Dobinson C S, Twentieth Century Fortifications in England, Vols I – XI, Council for British Archaeology, 1996

Dobinson C S, Fields of Deception, Britain's Bombing Decoys of World War II, 2000

Dobinson C S, AA Command, 2001

Freethy R, Lancashire 1939-1945: The Secret War, 2005

Hardy C, Manchester at War, 2005

Hayes C, Our Blitz: Red Skies over Manchester, 1999

Mclelland T, Action Stations Revisited Vol. 6, 2012

Morris J, German Air Raids on Britain 1914-1918, 1993

O'Neill J, Manchester in the Great War, 2014

Phythian G, Blitz Britain: Manchester and Salford, 2015

Price A, Blitz on Britain 1939-45, 2000

Ramsey W, The Blitz Then and Now, Vol 1, 1987

Ramsey W, The Blitz Then and Now, Vol 2, 1988

Ramsey W, The Blitz Then and Now, Vol 3, 1990

Smith P J C, Luftwaffe Over Manchester: The Blitz Years 1940-1944, 2003

Zetica, ZeticaUXO Handbook: a guide to dealing with UXO during construction, 2018

Appendix 6 General Notes

1. This report has been prepared in relation to the specific requirement of the contract or commission.
2. The report should not be used by third parties without prior consultation with Zetica Ltd. The copyright for this report remains with Zetica Ltd.
3. No part of this report may be reproduced, published or amended without prior written consent from Zetica Ltd.
4. The report refers to the conditions of the Site at the time of investigation/reporting. Zetica Ltd cannot accept liability for subsequent changes of Site conditions.
5. Zetica Ltd may have relied on externally provided information. Zetica Ltd cannot be held responsible for the accuracy of such information or data supplied.
6. The report has been written utilising relevant guidance and legislation in use at the time of report compilation. Subsequent improvement in techniques, changes in legislation or in site conditions may render parts of this report obsolete. If the report is utilised after such changes have occurred or at a time in excess of 1 year of the issue date, it would be prudent to contact Zetica Ltd to reassess the report under a new contract (see pg. ii).

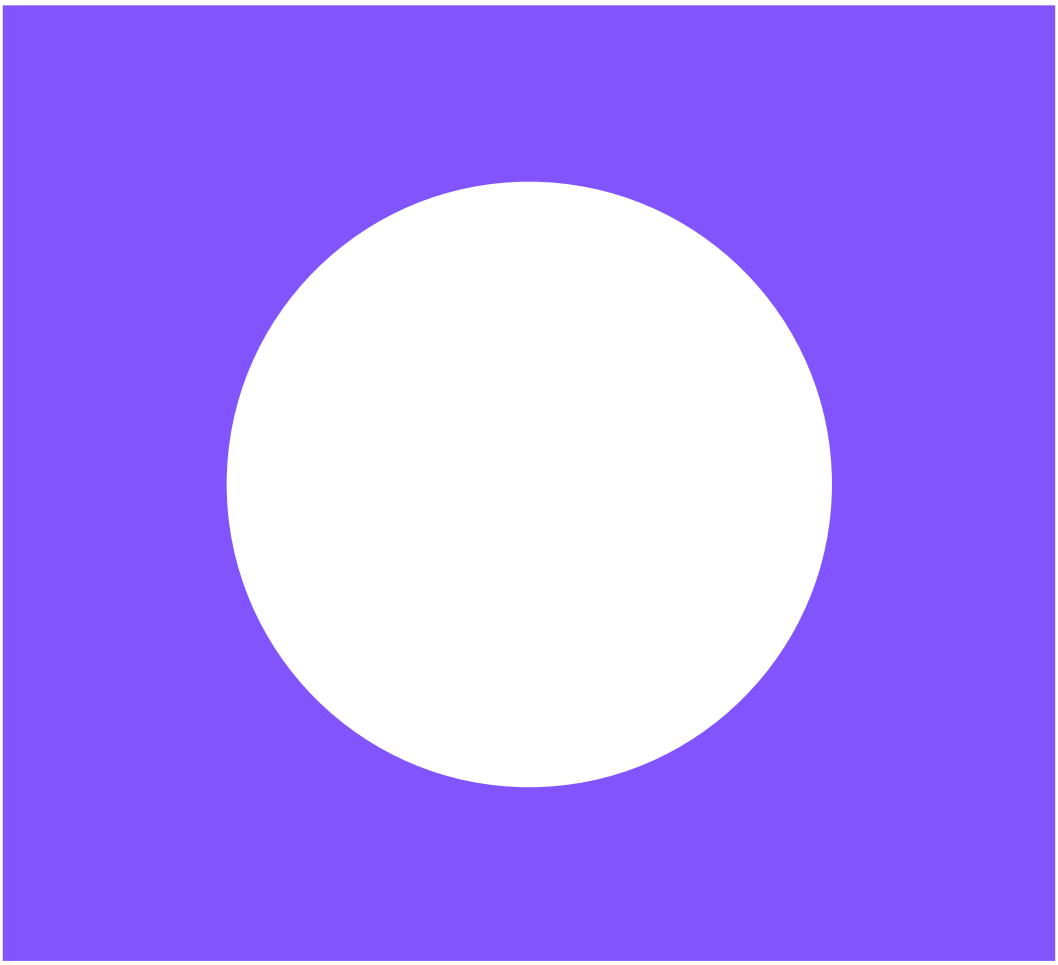
zeticauxo

Established for over 32 years, Zetica's services include

- ☑ Desk studies
- ☑ Unexploded ordnance risk assessments and risk mitigation
- ☑ Utility services detection
- ☑ Environmental and engineering geophysical surveys
- ☑ Transport infrastructure surveys
- ☑ Pipeline & cable route surveys
- ☑ Intrusive ground investigations

More details are available at

www.zetica.com



G. Structural Calculations, Design of Modular Units (3E Consulting Engineers Ltd, 2008)

consulting engineers	Project: Christies Hospital - Manchester				Job Ref.: 8086	
	Section: Structural Design Of Modular Units				Sheet no./rev.	
	Calc. by: JH	Date: Oct 08	Chck'd by: AP	Date: Oct 08	App'd by: AP	Date: Oct 08

Structural Calculations for:

Christie Hospital DCU

Design Of Modular Units

Prepared By

Jennifer M Hart

BEng (Hons)

Calculations by:

3E Consulting Engineers Ltd

4 Calder Close

Calder Park

Wakefield

WF4 3BA

Tel 01924 240420

Fax 01924 240421

Contents Page

Page No	Design Section
2	Revision Log
3	Details Of Structural Design
4	Loading data
5 - 7	Building Arrangement & Plans
8 - 15	Cold Formed Section Design
16 - 23	Hot rolled section Design
24 - 26	Foundation Loads & Design

Revision Log

Rev No	Date	Description	Checked By
∅		Building Regs Issue	JH

DETAILS OF STRUCTURAL DESIGN

Description of Structure

The scope of the design is to provide accommodation on two stories. The new building will provide a combination of patient treatment areas, lab facilities and administration space along with associated comfort facilities.

The modules run both laterally and vertically along the building's gridlines with infill floor and ceiling cassettes making up some circulations areas. The attached isometric image shows the module arrangement.

The modular units will comprise hot rolled steel columns and end frame ties with floor and ceiling joists and main side beams from cold formed steel sections. Ceiling and floor cassettes are similarly formed using hot rolled end ties and cold formed edge and joist members. Deflection limits on joists and side beams to be L/360 for imposed loads and L/250 for Dead + imposed loads.

Stability of the frame is by rigid frame action with storey height deflection limited to h/300

Foundation Type

Foundations are to be deep pad foundations to suit the local ground conditions. Loading details provided

REFERENCES

Element	Description	Code
Loadings	Applied Loads	BS 648 1964 Weights of Building Materials
		BS 6399 Part 1 1984 Dead and Imposed Loads
		BS 6399 Part 3 1988 Imposed Roof Load
		BS 6399 Part 2 1997 CoP for Wind Loads
Steelwork	Continuous frame construction	
	Cold Rolled Sections	BS5950 Part 5:1998
	Hot Rolled Non-composite members	BS5950 Part 1:1990

CALCULATIONS/SKETCHES

PROJECT Christie Hospital		
JOB No. 8086	PREPARED BY JH	SHEET No. 4
DATE OCT 08	CHECKED BY AP	REV

consulting engineers

REF

OUTPUT

Module Loading Data

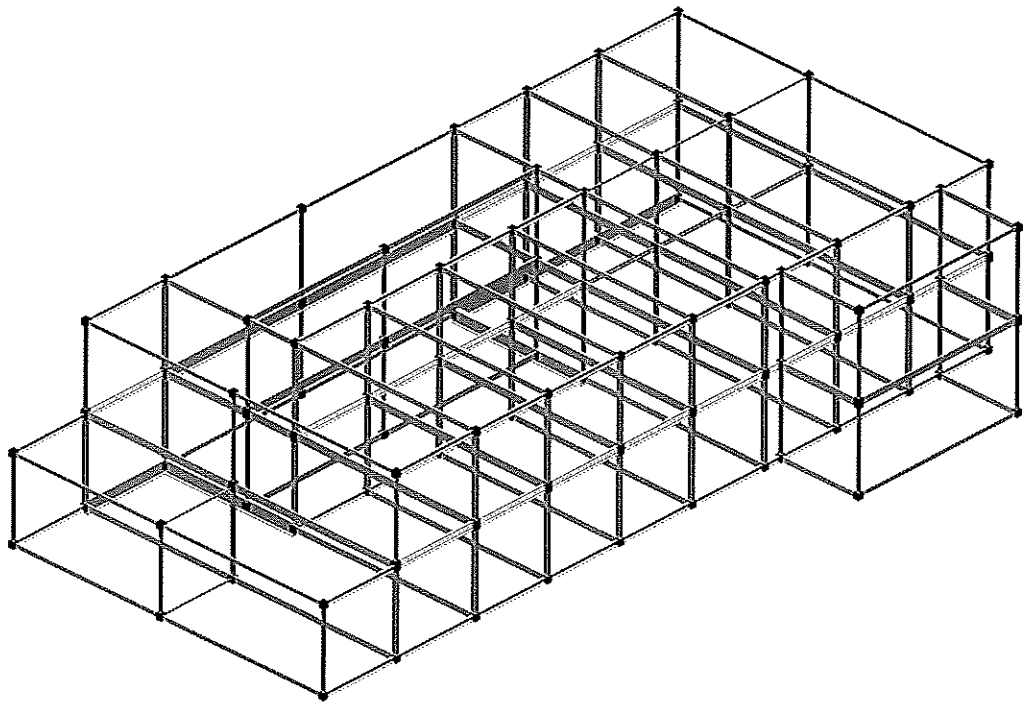
Loadings Listed apply to all module design cases

Floors	Dead	22 ply	0.25		
		Joists	0.15		
		Finishes	0.2		
		Services	0.25		
		Insulation	0.15		
		Ceiling	0		
			1	1.4	1.4 KN/M^2
	Live	Wards/Offices & Circulation	4	1.6	6.4 KN/M^2
		Plant Room	7.5	1.6	12 KN/M^2
		Ceiling	0.6	1.6	0.96 KN/M^2
	Ceilings	Plaster Board	0.32		
		Services	0.15		
		Insulation	0.18		
			0.65	1.4	0.91 KN/M^2
	Live		0	1.6	0 KN/M^2
		TOTAL	**0.65**		**0.91** KN/M^2
				Gf =	1.40
WALLS	Dead				
		STUD	0.25 KN/M^2		
				h =	3 m
			Panels =	0.75 kN/m	

_MasterSeries User Company
1 Circular Road
Newtownabbey
Co. Antrim, BT37 0RA
Tel: (028) 9036 5950 Fax: (028) 9036 5102

25160

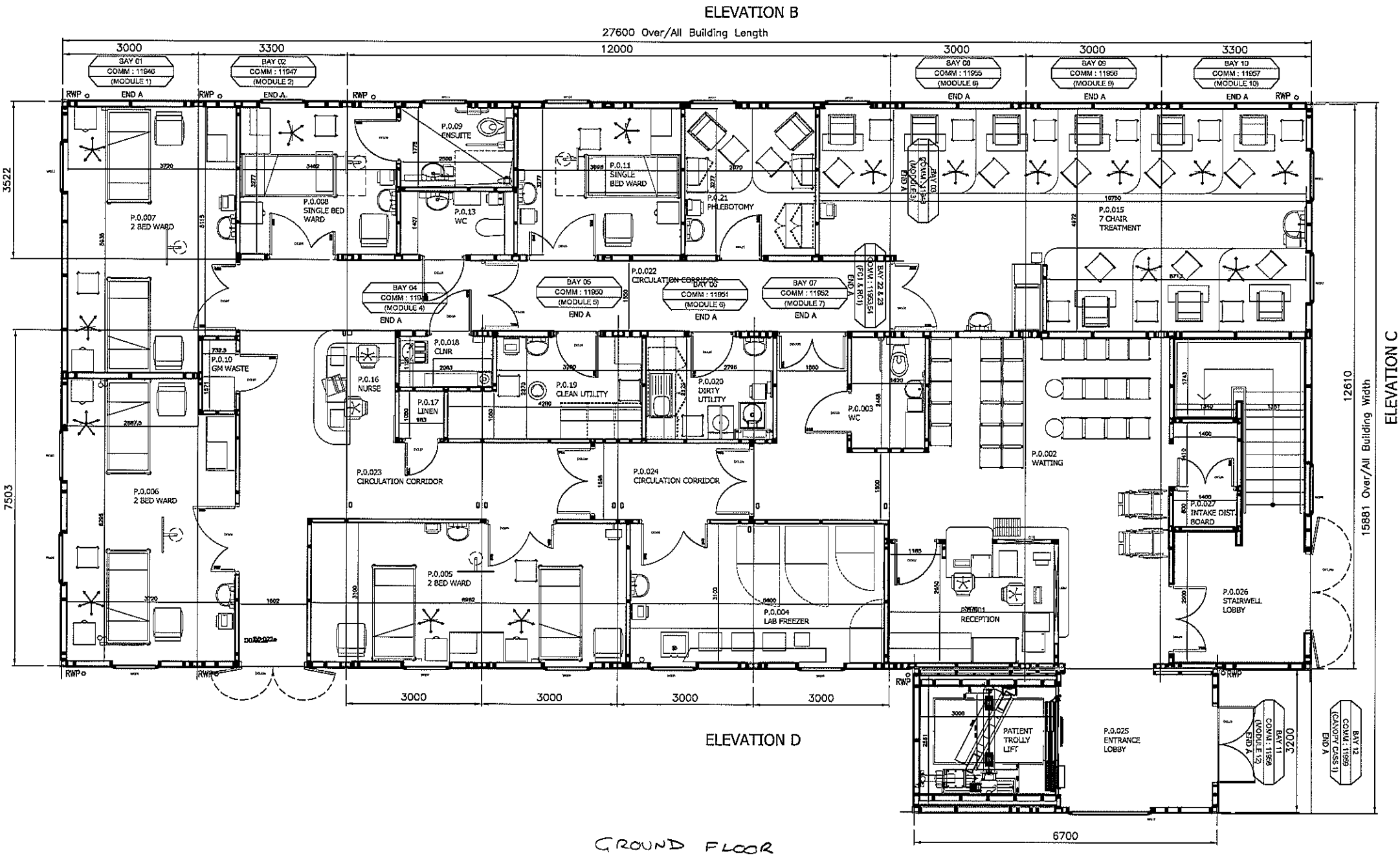
Job Ref	: Building Arrangement
Sheet	: /
Made by	: JMH
Date	: 08 October 2008 / Ver. 2008.09
Checked	: AP
Approved	:

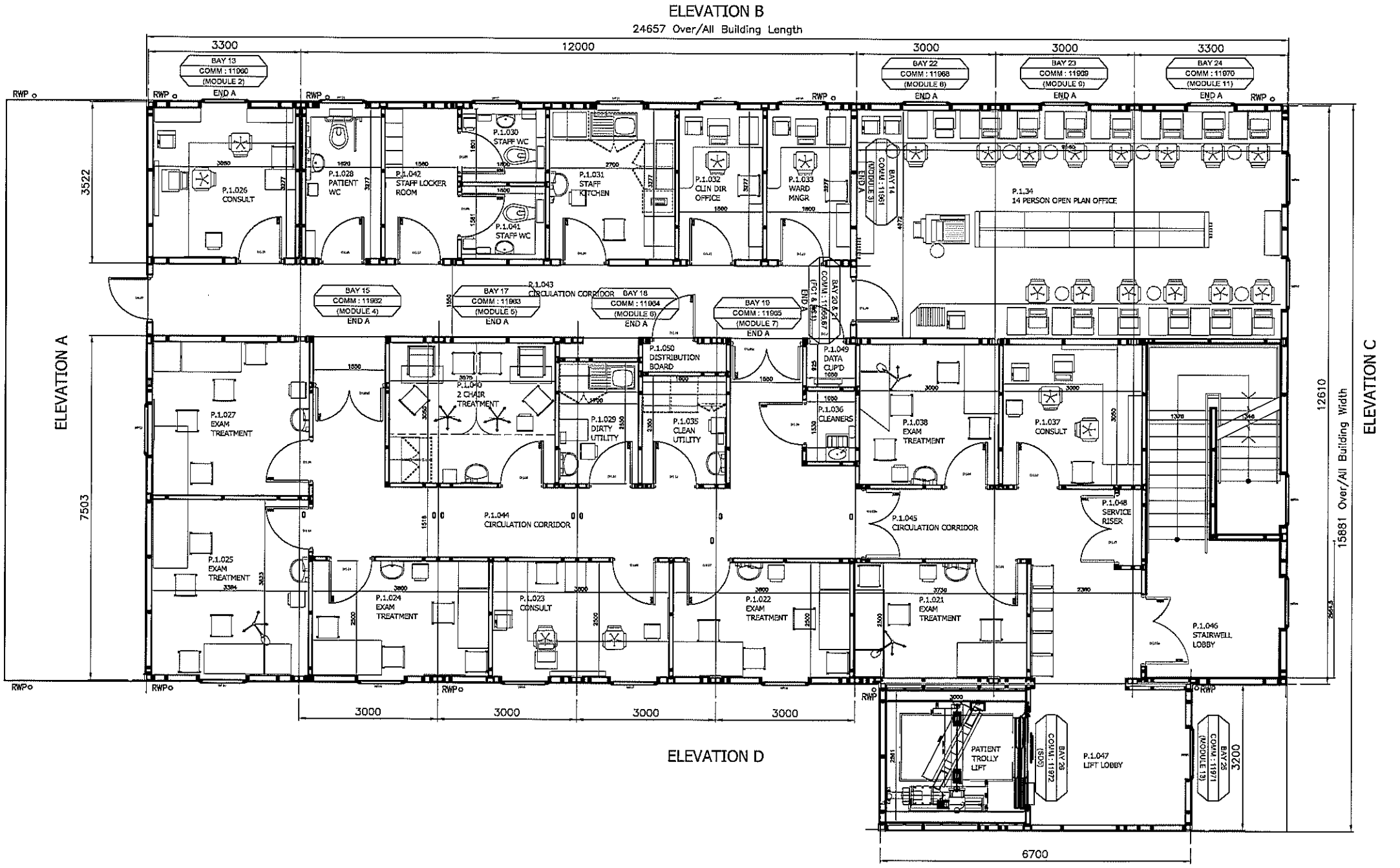


Frame Geometry - (Full Frame) - X+030 Y-047 Z+000

Not to Scale

© Civil and Structural Computer Services Limited, 1 Circular Road, Newtownabbey, Co. Antrim BT37 0RA, Tel: 028 9036 5950 Fax: 028 9036 5102


ELEVATION B
27600 Over/All Building Length
3000
3300
12000
3000
3000
3300
BAY 01
COMM : 11946
(MODULE 1)
BAY 02
COMM : 11947
(MODULE 2)
BAY 08
COMM : 11955
(MODULE 8)
BAY 09
COMM : 11956
(MODULE 9)
BAY 10
COMM : 11957
(MODULE 10)
RWP
END A
P.0.007
2 BED WARD
P.0.008
SINGLE BED
WARD
P.0.09
ENSUITE
P.0.13
WC
P.0.11
SINGLE
BED WARD
P.0.21
PHLEBOTOMY
P.0.015
7 CHAIR
TREATMENT
BAY 04
COMM : 11949
(MODULE 4)
BAY 05
COMM : 11950
(MODULE 5)
BAY 06
COMM : 11951
(MODULE 6)
BAY 07
COMM : 11952
(MODULE 7)
P.0.022
CIRCULATION CORRIDOR
P.0.10
GM WASTE
P.0.16
NURSE
P.0.17
LINEN
P.0.018
CLNR
P.0.19
CLEAN UTILITY
P.0.020
DIRTY
UTILITY
P.0.003
WC
P.0.002
WAITING
P.0.006
2 BED WARD
P.0.023
CIRCULATION CORRIDOR
P.0.024
CIRCULATION CORRIDOR
P.0.027
INTAKE DIST.
BOARD
P.0.005
2 BED WARD
P.0.004
LAB FREEZER
P.0.001
RECEPTION
P.0.026
STAIRWELL
LOBBY
PATIENT
TROLLY
LIFT
P.0.025
ENTRANCE
LOBBY
3522
7503
12610
15881 Over/All Building Width
ELEVATION C
3000
3000
3000
3000
6700
3200
ELEVATION D
GROUND FLOOR


ELEVATION B
24657 Over/All Building Length
3300
12000
3000
3000
3300
BAY 13
COMM : 11960
(MODULE 2)
END A
BAY 22
COMM : 11968
(MODULE 8)
END A
BAY 23
COMM : 11969
(MODULE 9)
END A
BAY 24
COMM : 11970
(MODULE 11)
END A
RWP
P.1.026
CONSULT
P.1.028
PATIENT
WC
P.1.042
STAFF LOCKER
ROOM
P.1.030
STAFF WC
P.1.041
STAFF WC
P.1.031
STAFF
KITCHEN
P.1.032
CLIN DIR
OFFICE
P.1.033
WARD
MNGR
BAY 14
COMM : 11961
(MODULE 3)
END A
P.1.34
14 PERSON OPEN PLAN OFFICE
3522
BAY 15
COMM : 11962
(MODULE 4)
END A
BAY 17
COMM : 11963
(MODULE 6)
END A
P.1.043
CIRCULATION CORRIDOR
BAY 18
COMM : 11964
(MODULE 6)
END A
BAY 19
COMM : 11965
(MODULE 7)
END A
BAY 20 & 21
COMM : 11966 & 11967
(MODULE 7)
END A
P.1.050
DISTRIBUTION
BOARD
P.1.049
DATA
CUPD
P.1.040
2 CHAIR
TREATMENT
P.1.029
DIRTY
UTILITY
P.1.035
CLEAN
UTILITY
P.1.036
CLEANERS
P.1.038
EXAM
TREATMENT
P.1.037
CONSULT
P.1.027
EXAM
TREATMENT
7503
P.1.044
CIRCULATION CORRIDOR
P.1.045
CIRCULATION CORRIDOR
P.1.048
SERVICE
RISER
P.1.025
EXAM
TREATMENT
P.1.024
EXAM
TREATMENT
P.1.023
CONSULT
P.1.022
EXAM
TREATMENT
P.1.021
EXAM
TREATMENT
P.1.046
STAIRWELL
LOBBY
12610
15881 Over/All Building Width
ELEVATION A
ELEVATION C
3000
3000
3000
3000
ELEVATION D
PATIENT
TROLLY
LIFT
P.1.047
LIFT LOBBY
BAY 26
COMM : 11972
(MOD 5)
BAY 25
COMM : 11971
(MODULE 13)
3200
6700

FIRST FLOOR

CALCULATIONS/SKETCHES

PROJECT	CHRISTIE HOSPITAL	
JOB No. 8086	PREPARED BY JMH	SHEET No. 8
DATE OCT 08	CHECKED BY AP	REV

consulting engineers

REF

OUTPUT

DESIGN OF COLD FORMED JOIST SECTIONS -

DESIGN OF FLOOR JOISTS -(TYPICAL)

Dead = 1 kN/m^2 Dead + Live = 5 kN/m^2
Live = 4 kN/m^2
SPAN = 3300 mm
JOISTS C/C = 400 mm

Determine Ixx Required For Deflection Limits

a) Dead + Live = L/350, or 15mm 9.43 mm

b) Live = L/450 7.33 mm

c) dead + 0.3 Dynamic 8Hz 5 mm

d) Complete Floor Deflection 1kN point load

Beam Size For Deflection

Condition

a - Ixx reqd = 159.78 cm^4

b - Ixx reqd = 164.35 cm^4

c - Ixx reqd = 78.34 cm^4

d - Ixx reqd = 85.91 cm^4 Neff 2.5
.j 1.7 mm

Governing Ixx reqd = **164.35 cm^4**

Required Section Modulus, Zxx

Applied Joist Loading = 2 kN/m
Applied Joist Moment = 2.72 kNm

Zr Reqd **7.78** cm^3

Min SECTION - 175*65*1.6

PROVIDE SECTION - 175x65x1.5 (Z35)

CALCULATIONS/SKETCHES

PROJECT	CHRISTIE HOSPITAL	
JOB No. 8086	PREPARED BY JMH	SHEET No. 9
DATE OCT 08	CHECKED BY AP	REV

consulting engineers

REF

OUTPUT

DESIGN OF COLD FORMED JOIST SECTIONS -

DESIGN OF CEILING JOISTS

Dead =	1 kN/m^2	Dead + Live	1.6 kN/m^2
Live =	0.6 kN/m^2		
SPAN =	3300 mm		
JOISTS C/C =	600 mm		

Determine Ixx Required For Deflection Limits

a)	Dead + Live =	L/350, or 15mm	9.43 mm
b)	Live =	L/450	7.33 mm
c)	dead + 0.3 Dynamic	8Hz	5 mm
d)	Complete Floor Deflection	1kN point load	

Beam Size For Deflection

Condition

a -	Ixx reqd =	76.69 cm^4		
b -	Ixx reqd =	36.98 cm^4		
c -	Ixx reqd =	117.51 cm^4		
d -	Ixx reqd =	85.91 cm^4	Neff	2.5
			.j	1.7 mm

Governing Ixx reqd = **117.51 cm^4**

Required Section Modulus, Zxx

Applied Joist Loading =	0.96 kN/m
Applied Joist Moment =	1.31 kNm

Zr Reqd **3.73** cm^3

PROVIDE SECTION - 145 x 65 x 1.5 (Z35)

_MasterSeries User Company

1 Circular Road
Newtownabbey
Co. Antrim, BT37 0RA
Tel: (028) 9036 5950 Fax: (028) 9036 5102

25160

Job Ref : Floor Beam
Sheet : /
Made by : JMH
Date : 08 October 2008 / Ver. 2008.09
Checked : AP
Approved : AP

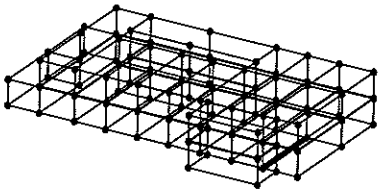
Member M 0121

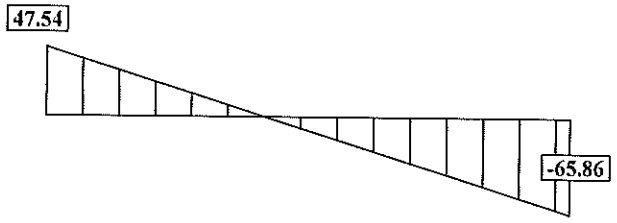
Section : 2xC40010030 - FLOOR BEAM

Load Case 003

Dead plus Live (Serviceability)

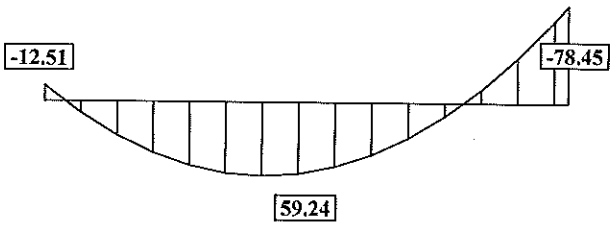
Axial Force (kN)		Torque (kN.m)	
Fmax	0.00	Tmax	0.34
Fmin	0.00	Tmin	0.34





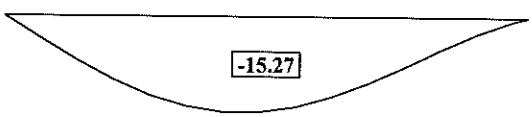
Shear Force : Major Axis

Shear Force : Minor Axis

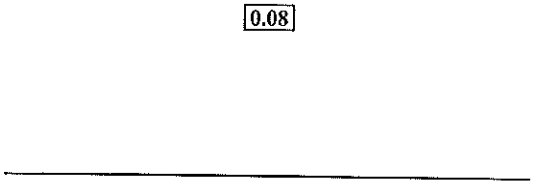


Bending Moment : Major Axis

Bending Moment : Minor Axis



Deflected Shape : Major Axis



Deflected Shape : Minor Axis

© Civil and Structural Computer Services Limited, 1 Circular Road, Newtownabbey, Co. Antrim BT37 0RA, Tel: 028 9036 5950 Fax: 028 9036 5102

_MasterSeries User Company

25160

1 Circular Road
Newtownabbey
Co. Antrim, BT37 0RA
Tel: (028) 9036 5950
Fax: (028) 9036 5102

Job Ref : Floor Beam
Sheet : /
Made by : JMH
Date : 08 October 2008 / Ver. 2008.09
Checked : AP
Approved : AP

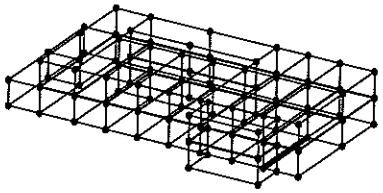
Member M 0121

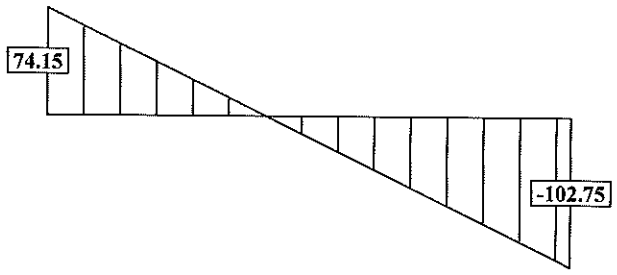
Section : 2xC40010030 · FLOOR BEAM

Load Case 001

Dead plus Live (Ultimate)

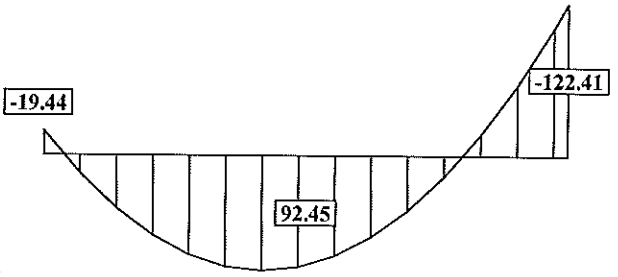
Axial Force (kN)		Torque (kN.m)	
Fmax	0.00	Tmax	0.53
Fmin	0.00	Tmin	0.53



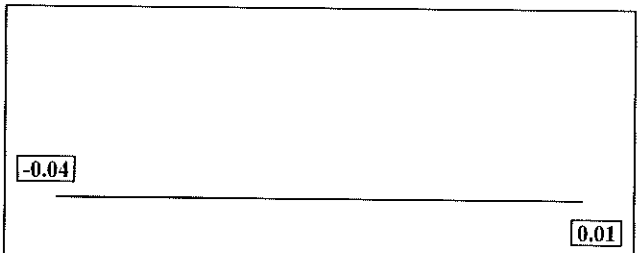


Shear Force : Major Axis

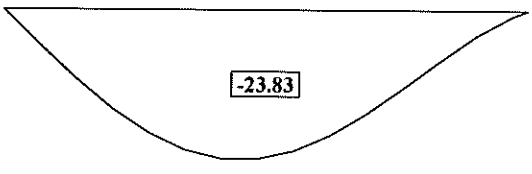
Shear Force : Minor Axis



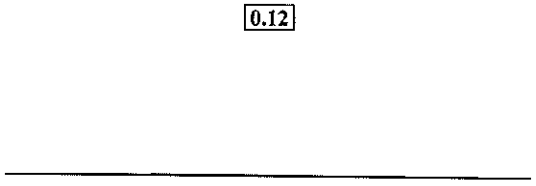
Bending Moment : Major Axis



Bending Moment : Minor Axis



Deflected Shape : Major Axis



Deflected Shape : Minor Axis

© Civil and Structural Computer Services Limited, 1 Circular Road, Newtownabbey, Co. Antrim BT37 0RA, Tel: 028 9036 5950 Fax: 028 9036 5102

CALCULATIONS/SKETCHES

PROJECT	CHRISTIES HOSPITAL	
JOB No. 8086	PREPARED BY JMH	SHEET No. 12
DATE OCT 08	CHECKED BY AP	REV

consulting engineers

REF

OUTPUT

COLD FORMED FLOOR EDGE

Max Span = 7200 mm

Max moment = 92.45 kNm (from computer output)

Shared between 2No. members

∴ Max moment = 92.45 kNm / 2
= 46.23 kNm

Zxx req'd = 46.23 / 0.35
= 132.1 cm³

Section provided is 400 x 100 x 3.0 (Z35)

Zxx prov = 211.19 cm³ > 132.1 cm³ ∴ ok

Max. serviceability deflection (from computer output)

δ = 23.83 mm

∴ span/δ = 7200/23.83

= 302 > 250 ∴ ok

So section provided is adequate

_MasterSeries User Company

25160

1 Circular Road
Newtownabbey
Co. Antrim, BT37 0RA
Tel: (028) 9036 5950

Fax: (028) 9036 5102

Job Ref : Roof Beam
Sheet : /
Made by : JMH
Date : 08 October 2008 / Ver. 2008.09
Checked : AP
Approved : AP

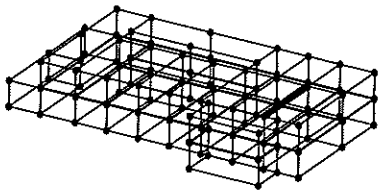
Member M 0181

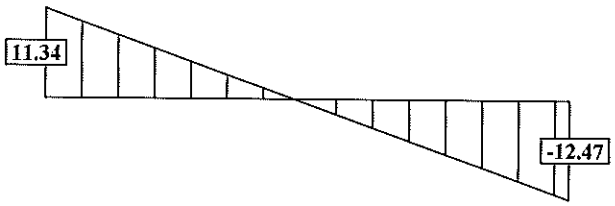
Section : 2xC30010027 - CEILING BEAM

Load Case 003

Dead plus Live (Serviceability)

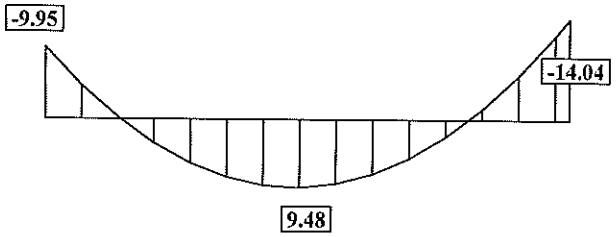
Axial Force (kN)		Torque (kN.m)	
Fmax	-1.42	Tmax	0.11
Fmin	-1.42	Tmin	0.11



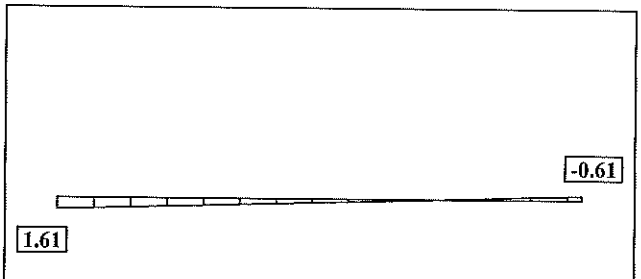


Shear Force : Major Axis

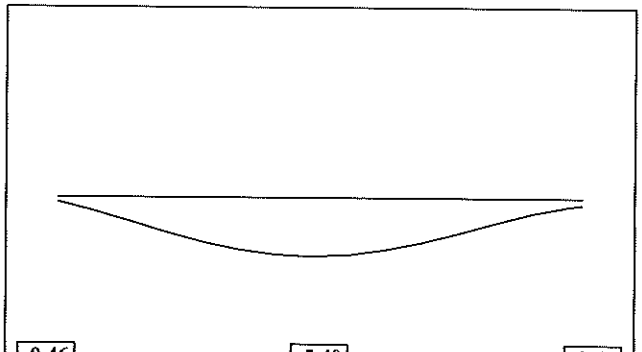
Shear Force : Minor Axis



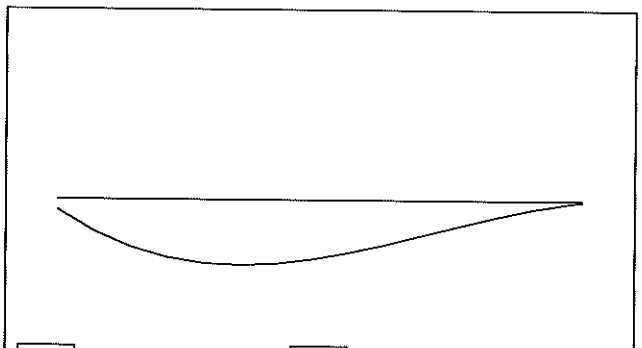
Bending Moment : Major Axis



Bending Moment : Minor Axis



Deflected Shape : Major Axis



Deflected Shape : Minor Axis

© Civil and Structural Computer Services Limited, 1 Circular Road, Newtownabbey, Co. Antrim BT37 0RA, Tel: 028 9036 5950 Fax: 028 9036 5102

_MasterSeries User Company

1 Circular Road
Newtownabbey
Co. Antrim, BT37 0RA
Tel: (028) 9036 5950
Fax: (028) 9036 5102

25160

Job Ref : Roof Beam
Sheet : /
Made by : JMH
Date : 08 October 2008 / Ver. 2008.09
Checked : AP
Approved : AP

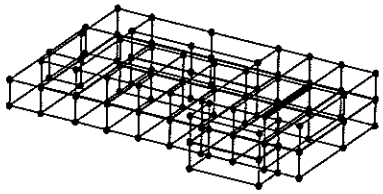
Member M 0181

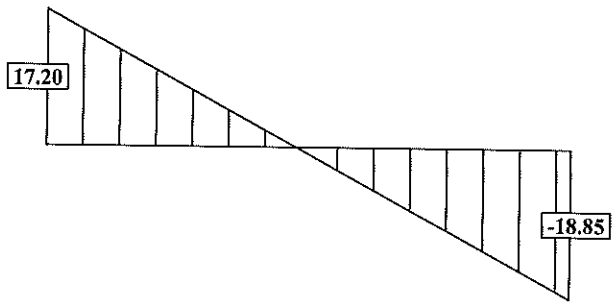
Section : 2xC30010027 - CEILING BEAM

Load Case 001

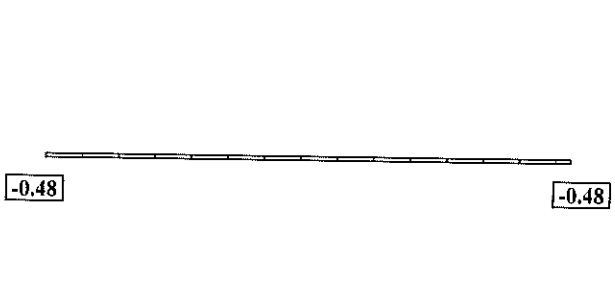
Dead plus Live (Ultimate)

Axial Force (kN)		Torque (kN.m)	
Fmax	-2.27	Tmax	0.16
Fmin	-2.27	Tmin	0.16

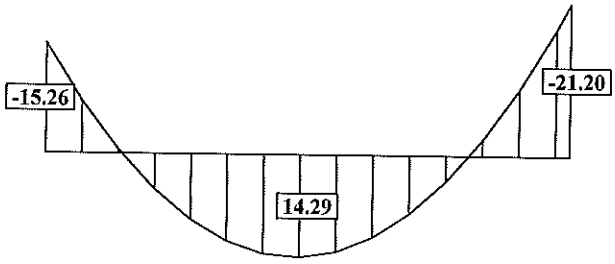




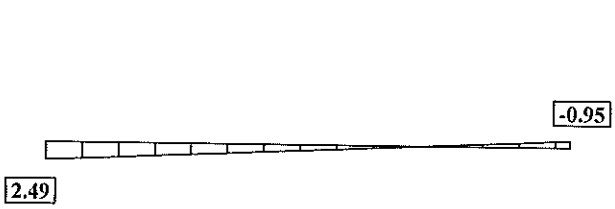
Shear Force : Major Axis



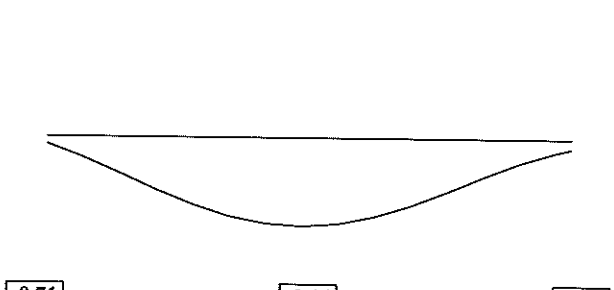
Shear Force : Minor Axis



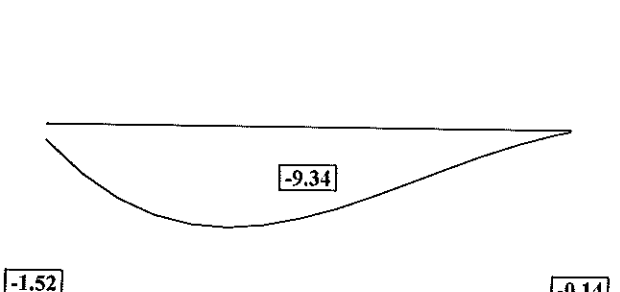
Bending Moment : Major Axis



Bending Moment : Minor Axis



Deflected Shape : Major Axis



Deflected Shape : Minor Axis

© Civil and Structural Computer Services Limited, 1 Circular Road, Newtownabbey, Co. Antrim BT37 0RA, Tel: 028 9036 5950 Fax: 028 9036 5102

CALCULATIONS/SKETCHES

PROJECT	CHRISTIES HOSPITAL	
JOB No. 8086	PREPARED BY JMH	SHEET No. 15
DATE OCT 08	CHECKED BY AP	REV

consulting engineers

REF

OUTPUT

COLD FORMED CEILING EDGE

Max span = 7200mm

Max moment = 21.20 kNm (from computer output)

Shared between 2 No. members

∴ Max moment = 21.20 kNm / 2
= 10.6 kNm

Zxx req'd = 10.6 / 0.35
= 30.29 cm³

Section is 300 x 100 x 2.7 (235)

∴ Zxx prov = 128.43 cm³ > 30.29 cm³ ∴ ok

Max serviceability deflection (from computer output)

δ = 6.03mm

∴ Span / δ = 7200 / 6.03

= 1194 > 360 ∴ ok.

So section provided is adequate.

_MasterSeries User Company
1 Circular Road
Newtownabbey
Co. Antrim, BT37 0RA
Tel: (028) 9036 5950 Fax: (028) 9036 5102

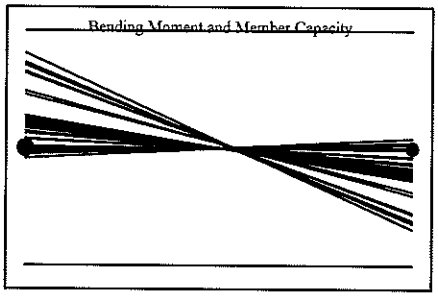
25160

Job Ref : Christies
Sheet : Corner Column /
Made by : JMH
Date : 28 October 2008 / Ver. 2008.09
Checked : AP
Approved : AP

Axial with Moments (Member)
Member 196 (A2) @ Ceiling in Load Case 1

Member Loading and Member Forces - CORNER COLUMN

Loading Combination : 1 UT + 1.4 D1 + 1.6 L1



Member Forces in Load Case 1 and Maximum Deflection from Load Case 3

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
196	6 41	142.37C 142.37C	-0.09 0.09	0.30 0.30	18.21 18.21	-0.46 0.44	-29.53 25.11			3.18 @ 0.750

Classification and Properties (BS 5950: 2000)

Section (14.7 kg/m)	2 No. 100x100x5 SHS 14.7 [Grade 43]		
Class = Fn(b/t,d/t,py,F,Mx,My)	17, 17, 275, 142.37, 0.457, 29.534	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1, 4-6, 9-11, 14-16, 19-21, 24-26, 29-31, 34-36 and 39-41		

Local Capacity Check

Fvx/Pvx	0.299 / 309.045 =	0.001	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 132.72≤1.2 x 275 x 111.78 =	36.498 kN.m	
Fvy/Pvy	18.214 / 309.045 =	0.059	Low Shear
Mcy = py.Syy≤1.2 py.Zyy	275 x 132.72≤1.2 x 275 x 111.78 =	36.498 kN.m	
Pz = Ag.py	37.46 x 275 =	1030.15 kN	
n = F/Pz	142.37 / 1030.15 =	0.138	OK
Srx = Fn(Sxx, n)	132.72, 0.138	126.02 cm³	
Mrx = Srx.py	126.02 x 275	34.655 kN.m	
Sry = Fn(Syy, n)	132.72, 0.138	126.02 cm³	
Mry = Sry.py	126.02 x 275	34.655 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(0.457/34.655)^{1.667}+(29.534/34.655)^{1.667}$=	0.767	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x3/3.86 =	77.7	OK
Pcx = Area.pcx	37.46x208.391/10 =	780.634 kN	Table 24 a
λy = Ley/ryy	100x1x3/3.86 =	77.7	OK
Pcy = Area.pcy	37.46x208.39/10 =	780.634 kN	Table 24 a

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x0+.5x0+.15x0)/0 ≥ 0.44	0.44	Table 18
$m_y=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x-16+.6x-2+.1x11)/30 ≥ .8x16/30	0.43	Table 26
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x0+.6x0+.1x0)/0 ≥ .8x0/0	0.406	Table 26
$m_{yx}=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x-16+.6x-2+.1x11)/30 ≥ .8x16/30	0.43	Table 26

Lateral Buckling Check Mb

Mb = Mc	Section not susceptible to lateral torsional buckling	36.498 kN.m

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.44x-0.5/36.5	0.006
$r_c=F_c/P_{cy}$	142.4/780.6	0.182
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.006•0+0.182•77.7)/(0.006+0.182)	75.393
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.006+0.182)/(0.006+0.182)	17.653
$M_{ob}=M_b(1-F_c/P_{cy})$	36.498(1-142.4/780.6)	29.842
$M_{xy}=2M_{cx}(1-F_c/P_{cy})$	2•36.498(1-142.4/780.6)	59.683
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	36.498(1-142.4/780.6)/(1+0.5•142.4/780.6)	27.348
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	36.498(1-142.4/780.6)/(1+0.5(142.4/780.6))	27.348

© Civil and Structural Computer Services Limited, 1 Circular Road, Newtownabbey, Co. Antrim BT37 0RA, Tel: 028 9036 5950 Fax: 028 9036 5102

_MasterSeries User Company 25160
1 Circular Road
Newtownabbey
Co. Antrim, BT37 0RA
Tel: (028) 9036 5950 Fax: (028) 9036 5102

Job Ref : Christies
Sheet : Corner Column /
Made by : JMH
Date : 28 October 2008 / Ver. 2008.09
Checked : AP
Approved : AP

M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	75.393, 17.653, 1.000, 59.683, 29.842	30.577	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	77.670, 1.000, 34.655, 27.348	28.213	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	77.670, 1.000, 34.655, 27.348	28.213	
$m_x.M_x/M_{ax}+.5m_{yx}.M_y/M_{cy}(1-F_c/P_{cx})$	0.406x0.5/28.2+.5x0.43x29.5/(36.5(1-142.4/780.6))	0.219	OK
$m_{LT}.M_{LT}/M_{ab}+m_y.M_y/M_{ay}$	0.44x-0.5/30.6+0.43x-29.5/28.2	0.457	OK
$m_x.M_x/M_{ax}+m_y.M_y/M_{ay}$	0.406x0.5/28.2+0.43x-29.5/28.2	0.457	OK
Compare with Simplied to 4.8.3.3	0.602, 0.601, 0.601	0.602	
Compare with MoreExact to 4.8.3.3	0.362, 0.565, 0.472	0.565	

Deflection Check - Load Case 3

$\delta \leq$ Span/360	3.18 $\leq$ 3000 / 360	3.18 mm	OK

© Civil and Structural Computer Services Limited, 1 Circular Road, Newtownabbey, Co. Antrim BT37 0RA, Tel: 028 9036 5950 Fax: 028 9036 5102

_MasterSeries User Company
1 Circular Road
Newtownabbey
Co. Antrim, BT37 0RA
Tel: (028) 9036 5950 Fax: (028) 9036 5102

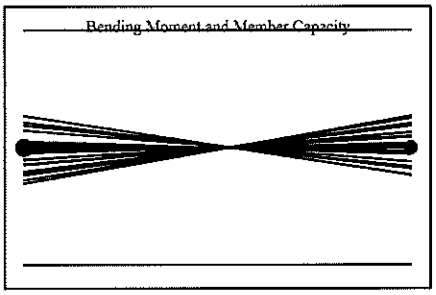
25160

Job Ref : Christies
Sheet : Prop Column /
Made by : JMH
Date : 28 October 2008 / Ver. 2008.09
Checked : AP
Approved : AP

Axial with Moments (Member)
Member 221 (N.31-N.66) @ Ceiling in Load Case 11

Member Loading and Member Forces – INTERNAL PROP

Loading Combination : 1 UT + 1.2 D1 + 1.2 L1 + 1.2 P1 COLUMN



Member Forces in Load Case 11 and Maximum Deflection from Load Case 12

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
221	31	104.10C	0.19	0.53	-5.52	-0.62	8.69			2.62
	66	104.10C	-0.19	0.53	-5.52	0.97	-7.86			@ 0.720

Classification and Properties (BS 5950: 2000)

Section (18.2 kg/m)	120x80x6.3 RHS 18.2 [S 355]		
Class = Fn(b/t,d/t,py,F,Mx,My)	9.7, 16.05, 355, 104.1, 0.966, 8.69	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1, 4-6, 9-11, 14-16, 19-21, 24-26, 29-31, 34-36 and 39-41		

Local Capacity Check

Fvx/Pvx	0.53 / 296.368 =	0.002	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	355 x 90.98≤1.2 x 355 x 73.3 =	31.226 kN.m	
Fvy/Pvy	5.516 / 197.579 =	0.028	Low Shear
Mcy = py.Syy≤1.2 py.Zyy	355 x 68.22≤1.2 x 355 x 57.63 =	24.218 kN.m	
Pz = Ag.py	23.19 x 355 =	823.245 kN	
n = F/Pz	104.1 / 823.245 =	0.126	OK
Srx = Fn(Sxx, n)	90.98, 0.126	89.27 cm³	
Mrx = Srx.py	89.27 x 355	31.226 kN.m	
Sry = Fn(Syy, n)	68.22, 0.126	66.51 cm³	
Mry = Sry.py	66.51 x 355	23.612 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(0.624/31.226)^{1.667}+(8.69/23.612)^{1.667}$=	0.19	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x3/4.35 =	68.9	OK
Pcx = Area.pcx	23.19x273.189/10 =	633.526 kN	Table 24 a
λy = Ley/ryy	100x1x3/3.15 =	95.2	OK
Pcy = Area.pcy	23.19x184.66/10 =	428.235 kN	Table 24 a

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x0+.5x0+.15x1)/1 ≥ 0.44	0.44	Table 18
$m_y=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x5+.6x0+.1x-4)/9 ≥ .8x5/9	0.419	Table 26
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x0+.6x0+.1x1)/1 ≥ .8x1/1	0.47	Table 26
$m_{yx}=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x5+.6x0+.1x-4)/9 ≥ .8x5/9	0.419	Table 26

Lateral Buckling Check Mb

Mb = Mc	Section not susceptible to lateral torsional buckling	31.226 kN.m

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.44x-0.6/31.2	0.009
$r_c=F_c/P_{cy}$	104.1/428.2	0.243
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.009•0+0.243•95.2)/(0.009+0.243)	91.834
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•0.88(2•0.009+0.243)/(0.009+0.243)	15.621
$M_{ob}=M_b(1-F_c/P_{cy})$	31.226(1-104.1/428.2)	23.635
$M_{xy}=2M_{cx}(1-F_c/P_{cy})$	2•31.226(1-104.1/428.2)	47.270
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	31.226(1-104.1/633.5)/(1+0.5•104.1/633.5)	24.114
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	24.218(1-104.1/428.2)/(1+0.5(104.1/428.2))	16.344

© Civil and Structural Computer Services Limited, 1 Circular Road, Newtownabbey, Co. Antrim BT37 0RA, Tel: 028 9036 5950 Fax: 028 9036 5102

_MasterSeries User Company
1 Circular Road
Newtownabbey
Co. Antrim, BT37 0RA
Tel: (028) 9036 5950 **Fax: (028) 9036 5102**

25160

Job Ref : **Christies**
Sheet : **Prop Column /**
Made by : **JMH**
Date : **28 October 2008 / Ver. 2008.09**
Checked : **AP**
Approved : AP

M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	91.834, 15.621, 0.880, 47.270, 23.635	23.635	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	68.888, 0.880, 31.226, 24.114	24.894	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	95.156, 0.880, 23.612, 16.344	16.344	
$m_x.M_x/M_{ax}+.5m_{yx}.M_y/M_{cy}(1-F_c/P_{cx})$	0.47x1/24.9+.5x0.419x8.7/(24.2(1-104.1/633.5))	0.108	OK
$m_{LT}.M_{LT}/M_{ab}+m_y.M_y/M_{ay}$	0.44x-0.6/23.6+0.419x8.7/16.3	0.235	OK
$m_x.M_x/M_{ax}+m_y.M_y/M_{ay}$	0.47x1/24.9+0.419x8.7/16.3	0.235	OK
Compare with Simplied to 4.8.3.3	0.439, 0.43, 0.43	0.439	
Compare with MoreExact to 4.8.3.3	0.255, 0.416, 0.234	0.416	

Deflection Check - Load Case 12

$\delta \leq$ Span/360	2.62 $\leq$ 3000 / 360	2.62 mm	OK

© Civil and Structural Computer Services Limited, 1 Circular Road, Newtownabbey, Co. Antrim BT37 0RA, Tel: 028 9036 5950 Fax: 028 9036 5102

_MasterSeries User Company
1 Circular Road
Newtownabbey
Co. Antrim, BT37 0RA
Tel: (028) 9036 5950 Fax: (028) 9036 5102

25160

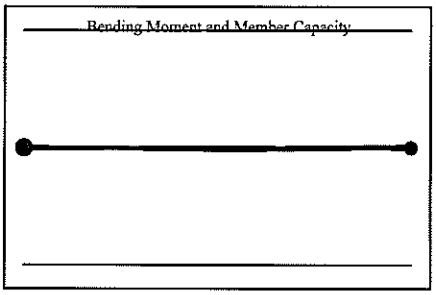
Job Ref : Christies
Sheet : End Tie /
Made by : JMH
Date : 28 October 2008 / Ver. 2008.09
Checked : AP
Approved : AP

Axial with Moments (Member)
Member 62 (A2-N.76) @ First in Load Case 10

Member Loading and Member Forces - END TIE

Loading Combination : 1 UT + 1.4 D1 + 1.4 P1

P1 UDLZ -001.550 (Co/m)



Member Forces in Load Case 10 and Maximum Deflection from Load Case 12

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
62	75 76	0.69T 0.69T	0.00 0.00	-0.63 -0.63	2.56 -2.11	0.96 -0.94	-0.98 -0.30		1.13 @ 1.620	1.54 @ 1.590

Classification and Properties (BS 5950: 2000)

Section (20.3 kg/m)	180x75 PFC 20.3 [Grade 43]		
Class = Fn(b/T,d/t,py,F,Mx,My)	7.14, 22.5, 275, 0, 0.96, 1.13	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1, 4-6, 9-11, 14-16, 19-21, 24-26, 29-31, 34-36 and 39-41		

Local Capacity Check

Fvx/Pvx	0.632 / 178.2 =	0.004	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 176≤1.2 x 275 x 152.22 =	48.4 kN.m	
Fvy/Pvy	2.557 / 233.888 =	0.011	Low Shear
Mcy = py.Syy≤1.2 py.Zyy	275 x 51.8≤1.2 x 275 x 28.68 =	9.464 kN.m	
Pz =Ae.py	25.9x275 =	712.25 kN	
n = F/Pz	-0.686 / 712.25 =	0.001	OK
Srx = Fn(Sxx, n)	176, 0.001	176 cm³	
Mrx = Srx.py	176 x 275	48.4 kN.m	
Sry = Fn(Syy, n)	51.8, 0.001	51.8 cm³	
Mry = Sry.py	51.8 x 275	9.464 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(0.959/48.4)^1+(0.975/9.464)^1$=	0.123	OK

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x0+.5x0+.15x0)/1 ≥ 0.44	0.44	Table 18
$m_y=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x1+.6x1+.1x1)/1 ≥ .8x1/1	0.921	Table 26
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x0+.6x0+.1x0)/1 ≥ .8x0/1	0.405	Table 26
$m_{yx}=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x1+.6x1+.1x1)/1 ≥ .8x1/1	0.91	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 3 =	3 m	
λ = Le/ryy	3 / 2.37	126.36	OK
v = Fn (x,Le,ryy,λ)	15.3, 3, 2.37, 126.36	0.69	Table 19
λ_{LT}= u.v.λ.√βw	0.946 x 0.69 x 126.36 √ 1	82.48	
pb = Fn (py,λ_{LT})	275, 82.48	159.3 N/mm²	Table 16
Mb = Sxx.pb ≤ Mc	176 x 159.3 ≤ 48.4 =	28.037 kN.m	

Simplified Approach

py.Zx	275x152.22	41.861 kN.m	
py.Zy	275x28.68	7.887 kN.m	
F/Pc+mx.Mx/py.Zx+my.My/py.Zy	0+0.405x1/41.9+0.921x1.1/7.9	0.141	OK
F/Pcy+m_{LT}.M_{LT}/Mb+my.My/py.Zy	0+0.44x-0.1/28+0.921x1.1/7.9	0.133	OK

Deflection Check - Load Case 12

δ ≤ Span/360	1.54 ≤ 3000 / 360	1.54 mm	OK

© Civil and Structural Computer Services Limited, 1 Circular Road, Newtownabbey, Co. Antrim BT37 0RA, Tel: 028 9036 5950 Fax: 028 9036 5102

CALCULATIONS/SKETCHES

PROJECT	CHRISTIE HOSPITAL	
JOB No 8086	PREPARED BY JMH	SHEET No 21
DATE JULY	CHECKED BY AR	REV

consulting engineers

REF

OUTPUT

CANTILEVER CANOPY

Cantilever distance = 2.36m

Width of cassette = 3.2m

load - 1 kN/m² Dead SLS = 1.4 kN/m² ULT
0.6 kN/m² Live SLS = 1.0 kN/m² ULT
1.6 kN/m² SLS 2.4 kN/m² ULT

Load acting on cantilever

= 2.4* x 3.2/2
= 3.84 kN/m (2.56 kN/m)

End reaction = 3.84 x 2.36
= 9.1 kN

Max moment = $\frac{3.84 \times 2.36^2}{2}$

= 10.7 kNm

Max δ = 2360/200
= 11.8

Ixx req'd = $\frac{2.56 \times 2360^4}{8 \times 205 \times 11.8 \times 10^7}$

= 410cm⁴

Try 150 x 75 x 18 PFC

Mb = 22.7 kNm > 10.7 kNm ∴ ok

Ixx prov = 861 cm⁴ > 410cm⁴ ∴ ok Actual δ = 5.6mm

ROSTRONSPRINTERS LS12 2PR Tel: 0113 263 6908

CALCULATIONS/SKETCHES

PROJECT	CHRISTIE HOSPITAL	
JOB No 8086	PREPARED BY JMH	SHEET No 22
DATE JULY 08	CHECKED BY NP	REV

consulting engineers

REF

OUTPUT

STAIR PFC

SPAN OF PFC = 3.3m

Stair loading Dead = 1.0 kN/m² × 1.4 (γf) = 1.4 kN/m² (ULT)

Live = 3.0 kN/m² × 1.6 (γf) = 4.8 kN/m² (ULT)

Total = 4.0 kN/m² (SLS) = 6.2 kN/m² ULT

Max span of stair onto PFC = 4m

Stair width = 1.5m

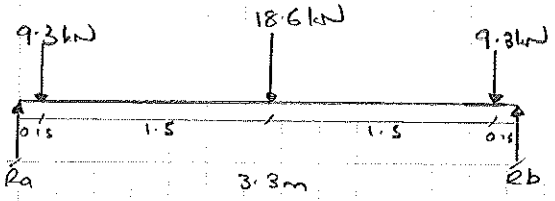
∴ load per stringer = 6.2 × 1.5/2

= 4.65 kN/m (ULT) (3.0 kN/m SLS) γf = 1.55

End reactions from stringers

R_s = 4.65 × 4/2

= 9.3 kN ULT (6 kN SLS)



$R_a = R_b = \frac{9.3 + 9.3 + 18.6}{2}$

= 18.6 kN

Zero shear @ centre

Max moment = 9.3 × 1.5 − 18.6 × 1.65

= 16.75 kNm

RONSTON PRINTERS LS12 2PR Tel: 0113 263 6988

Re-order ref 001/09/03/AR

CALCULATIONS/SKETCHES

PROJECT	CHRISTIE HOSPITAL	
JOB No 8086	PREPARED BY JMH	SHEET No 23
DATE JULY 08	CHECKED BY MP	REV

consulting engineers

REF

OUTPUT

Try 200 x 75 x 23 PFC

M_b = 32.6 kNm > 16.75 kNm ∴ ok.

Deflection.

Equivalent UDL

$$M = \frac{wL^2}{8}$$

$$\therefore \frac{8M}{L^2} = w$$

$$\text{so } \frac{16.75 \times 8}{3.3^2} = 12.3 \text{ kN/m} \div 1.55 = 7.94 \text{ kN/m}$$

$$\delta = \frac{5 \times 7.94 \times 3300^4}{384 \times 205 \times 1370 \times 10^7}$$

I_{xx} = 1370 cm⁴

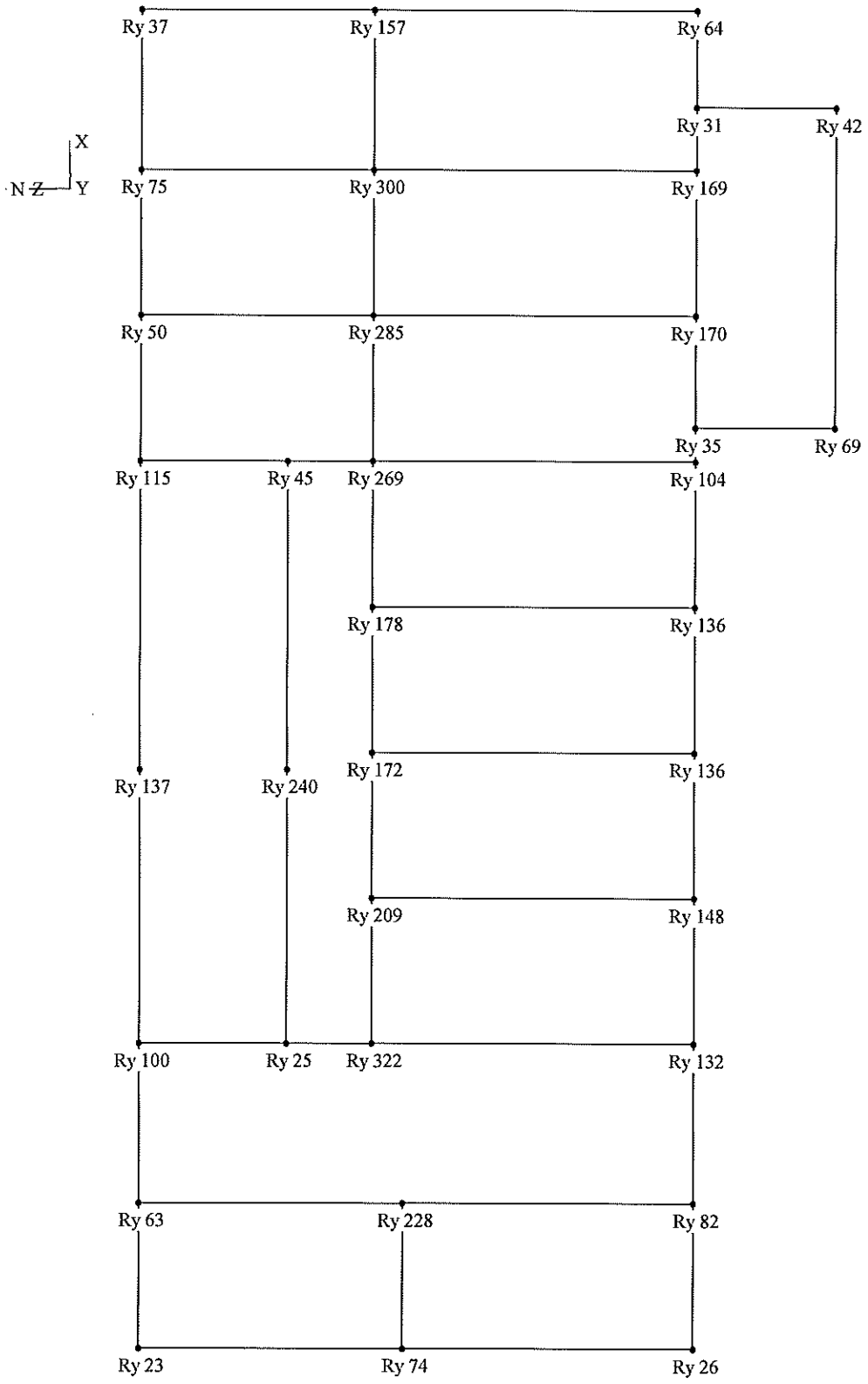
$$\delta = 4.4\text{mm} = \frac{\text{span}}{756} \quad \therefore \text{ ok}$$

ROBERTSONPRINTERS LS12 2PR Tel: 0113 263 6988

© MasterFrame - Project title : ..... P:\3e_Projects\Q8086\Design\160908-jmh

_MasterSeries User Company
25160
1 Circular Road
Newtownabbey
Co. Antrim, BT37 0RA
Tel: (028) 9036 5950 Fax: (028) 9036 5102

Job Ref : Point Loads
Sheet : /
Made by : JMH
Date : 08 October 2008 / Ver. 2008.09
Checked : AP
Approved : AP



SERVICEABILITY (DEAD + LIVE) POINT LOADS

Frame Geometry - (Full Frame) - X+090 Y-091 Z+000

Not to Scale

© Civil and Structural Computer Services Limited, 1 Circular Road, Newtownabbey, Co. Antrim BT37 0RA, Tel: 028 9036 5950 Fax: 028 9036 5102

CALCULATIONS/SKETCHES

PROJECT	CHRISTIE HOSPITAL	
JOB No. 8086	PREPARED BY JMM	SHEET No. 25
DATE OCT 08	CHECKED BY AP	REV

consulting engineers

REF

OUTPUT

FOUNDATIONS

TRIAL HOLE PRIOR TO SITE WORKS REVEALED CARPARK CONSTRUCTION OVER-LYING MEDIUM SOFT TO FIRM BROWN CLAY.

LATER ON SITE EXCAVATIONS REVEALED THAT THIS IN TURN OVERLAY MEDIUM DENSE SAND.

IN THE ABSENCE OF TEST DATA A CONSERVATIVE S.G.B.P OF 100 kN/m² HAS BEEN ASSUMED.

FROM POINT LOAD PRINT-OUT :

Up to 50 kN Area = $\frac{50}{100}$

= 0.5m²

$\sqrt{0.5} = 0.71$

∴ Up to 50 kN 0.75 × 0.75m on plan

Min Depth 400mm.

Up to 75 kN Area = $\frac{75}{100}$

= 0.75m²

∴ 0.9 × 0.9m on plan = 0.81m² ∴ ok

Min 500mm Deep

Up to 100 kN Area = $\frac{100}{100}$ = 1m²

∴ 1.0 × 1.0m on Plan Min 500mm Dp.

CALCULATIONS/SKETCHES

PROJECT	CHRISTIE HOSPITAL	
JOB No. 8086	PREPARED BY JMH	SHEET No. 26
DATE OCT 08	CHECKED BY AP	REV

consulting engineers

REF

OUTPUT

FOUNDATIONS CONT'D

Up to 115kN - Area = $\frac{115}{100}$

$= 1.15 m^2$

1.10m x 1.10m on plan by min 600Dp.

Up to 137kN ∴ Area = $\frac{137}{100}$

$= 1.37 m^2$

1.20m x 1.20m on plan by min 600Dp

Up to 170kN - Area = $\frac{170}{100}$

$= 1.7 m^2$

1.30m x 1.30m on plan by min 700Dp

Up to 180kN - Area = $\frac{180}{100}$

$= 1.8 m^2$

1.40m x 1.40m on plan by min 700Dp

Up to 228kN - Area = $\frac{228}{100}$

$= 2.28 m^2$

1.6m x 1.6m on plan by min 800Dp.

Up to 322 kN - Area = $\frac{322}{100}$ $= 3.22 m^2$

1.8m x 1.8m on plan by min 900Dp

ALL PADS TO BE MASS CONCRETE TAKEN DOWN TO SAND BEARING STRATA.

H. Factual Ground Investigation Report

Report type:	Factual Ground Investigation Report
Site:	CASICD – The Christie Radiology Village
Client:	Integrated Health Projects (VINCI)
GRM Ref:	GRM/P10525/FAC.1
Naming Convention Ref:	CASICD-GRM-XX-ZZ-RP-C-000001-P01
Date:	May 2024

CASICD - THE CHRISTIE RADIOLOGY VILLAGE,

FACTUAL GROUND INVESTIGATION REPORT
Naming Convention reference: CASICD-GRM-XX-ZZ-RP-C-000001-P01
FOR
INTEGRATED HEALTH PROJECTS (VINCI)

GRM Project Ref:
P10525

Date:
May 2024

Prepared for:
VINCI Construction UK Limited
Ditton Road,
Widnes
WA8 0PG

This report has been prepared in accordance with GRM's Accredited Quality Procedures

If you have any queries regarding this report please contact the project manager in the first instance.

Project Manager:	Reviewed by:	Approved by:
Richard Hodgkinson BSc FGS (Senior Geotechnical Engineer) richard.hodgkinson@grm-uk.com	**Paul Wardle** BSc MA FGS (Acting Principal Geologist) paul.wardle@grm-uk.com	**Geoff Beckett** FGS CGeol (Director) geoff.beckett@grm-uk.com
When required in-house geological, geotechnical, environmental, structural and civil staff helped to produce this document.		
Issue	**Description of Revision**	**Signature**
P01	Draft for comment	RJH

Constructionline Silver Member

AGS

ISO 9001 CERTIFIED

TABLE OF CONTENTS

1 INTRODUCTION....2
2 PHASE II GROUND INVESTIGATION 3
3 LABORATORY ANALYSES....7
4 CONCLUSIONS....7

APPENDICES

General Appraisal Comments and Standard Limitations	Appendix A
Site Location and Boundary Plan	Appendix B
Outline Development Plan	Appendix C
Exploratory Hole Location Plan	Appendix D
Exploratory Hole Logs	Appendix E
Foundation Pit Diagrams and Photographs	Appendix F
PAS128 Survey	Appendix G
Rock Core Photos	Appendix H
Gas and Groundwater Monitoring Results	Appendix I
Chemical Analysis Results	Appendix J
Geotechnical Test Results	Appendix K

1 INTRODUCTION

1.1 PREAMBLE

GRM Development Solutions Limited (GRM) has been appointed by Integrated Health Projects - VINCI (Client) to undertake a Phase II Site Investigation to determine the ground conditions for the proposed Christie Radiology Village development. The projects Investigation Supervising Engineer is Mott MacDonald. The works reported within this document comprise the intrusive ground investigation, geotechnical testing and chemical analysis, and the post fieldwork gas and groundwater monitoring.

Client supplied information:

- Ground Investigation Specification by Mott MacDonald ref: 10014293 | P01 | CASCID-MMD-XX-ZZ-SP-C-000001, dated December 2023.
- The Christie Advanced Scanning and Imaging Centre Development Borehole Location and Constraints Plan ref: CASICD-MMD-XX-ZZ-DR-C-000002-P02.
- The Christie CT Development Bill of Quantities ref: CASICD-MMD-XX-ZZ-BQ-C-00001, dated December 2023.
- Designers' Hazard Elimination and Management Record ref: CASICD-MMD-XX-XX-HS-C-000001.
- UXO Desk Study and Risk Assessment by Zetica – The Christie NHS Foundation Trust, dated December 2023.

GRM Standard Limitations of Reporting are provided in Appendix A of this report.

A Site Location and Boundary Plan is presented in Appendix B.

The site is proposed to be re-developed, with the existing hospital buildings being decommissioned and demolished, and a new multi-storey hospital building constructed within a similar footprint.

An outline development footprint plan, on which this report is based, is presented in Appendix C.

2 PHASE II GROUND INVESTIGATION

2.1 FIELDWORK

The ground investigation fieldwork was conducted in several phases due to the logistical challenges of operating in a live hospital site;

- The rotary boreholes BH101, BH102, BH103, BH103A and BH104 and Trial pits TP101, TP102, TP104, TP106 and TP107 were undertaken between the 15th February and 18th March 2024.
- TP103 and TP105 undertaken in the small courtyard, and accessed through a waiting room were undertaken on Sunday 17th March 2024 due to the potential noise disturbance from breaking out hardstanding.
- WS101, WS02 and WS103 were undertaken on Sunday 28th April 2024, due to the logistics of working inside the hospital.

The groundwater/gas monitoring visits continued after the fieldwork.

A total of 14no. exploratory holes (7no. hand dug trial pits and 3no. windowless sample boreholes, and 4no. rotary boreholes) were progressed, to depths ranging between 0.60m (WS103) and 18.30m (BH101) below existing ground level (begl).

During the drilling of BH103, the rock strata encountered below 11.50m begl, was found to be locally softer and highly fractured, and is believed to represent a fault zone. Below this depth, no sample recovery for logging was possible, as recirculating water flush was used, with all the flush lost down the fractures. The issues encountered, resulted in the core barrel and casing being lost down the hole, with the location abandoned at 14.0m begl depth, as no further progress could be made.

The Exploratory Hole Location Plan (Specification document from Mott MacDonald) and Exploratory Hole Logs are presented in Appendix D and Appendix E respectively.

The Foundation Pit Diagrams and Photographs are presented in Appendix F.

The positioning and target depth of the exploratory holes was specified by the Investigation Supervisor.

Two monitoring standpipes were installed during the site works within BH101 and BH104, with the response zones specified by Mott MacDonald, upon completion of each location.

A PAS128 compliant survey was undertaken simultaneously with the investigation works, and provided buried services clearance at each investigation location. Where possible, the locations were also surveyed with GPS to provide coordinates. Locally in

the small courtyard where TP103, TP104 and TP105 were undertaken the GPS was not possible due to the enclosed setting, and no line of sight back to a known station.

The PAS128 survey, is presented in Appendix G.

2.1.1 Logging and Sampling

During the fieldwork, the recovered rock cores were placed in core boxes, and transported back to the GRM main office for logging and storage. During logging, the plastic core liner was split to enable detailed logging and sub-sampling for laboratory testing and core photographs to be taken.

A selection of rock core photographs is presented in Appendix H.

The cores will be held at the GRM office and available for inspection, for a minimum of 30 days after the issuing of the final factual report.

The soils generated by the trial pits and boreholes were logged on site in accordance with BS EN 1997-2 Eurocode 7: Geotechnical Design – Part 2: Ground Investigation and Testing.

Soil samples were delivered to the laboratory, with the scheduling of the testing by the project consultant (Mott MacDonald).

2.2 PROVEN GROUND

The following ground conditions were encountered during the investigation fieldwork:

- Made Ground
- Wilmslow Sandstone Formation

2.2.1 Made Ground

Made ground was encountered in all exploratory holes, to depths of between 0.2m and 4m begl.

The made ground was not fully penetrated in 4no. exploratory holes (TP102, TP104, TP105 and TP107), which all terminated at the specified target depth of 1.20m begl.

Types of made ground observed were;

- Hardstanding materials of concrete, tarmac/asphalt and brick pavers.
- Aggregates e.g. bedding sand, type 1 MOT and other gravel products.

- reworked natural soils, with gravels of chert, brick, tarmac, sandstone, mudstone, limestone and quartzite.

2.2.2 Wilmslow Sandstone Formation

Strata of the Wilmslow Sandstone Formation were encountered in some exploratory holes but were not fully penetrated.

These strata initially comprised of a more weathered zone, comprising; medium dense and dense orangish brown slightly clayey slightly gravelly SAND. Gravel comprises fine to coarse subangular sandstone.

The weathered zone was underlain by more competent rock quality strata, which generally comprised; extremely weak to weak orangish brown medium to coarse grained SANDSTONE.

Fractures within these strata were observed to fall into the following categories:

- Sub-horizontal closely spaced, planar smooth.
- Sub-horizontal widely spaced, planar rough, with some clayey gravelly infill.
- Sub-vertical, widely spaced, open rough with no infill.

Where encountered, zones of core loss and poor recovery within these strata are considered to be the result of both locally heavily fractured strata, and the anticipated location of a geological fault.

2.3 CONTAMINATION OBSERVATIONS

A mild to moderate organic odour was noted while advancing the service inspection pit in WS102 (inside the existing hospital), within the made ground soils.

2.4 GROUNDWATER

The exploratory techniques used were rapid and may have masked smaller water seepages.

During the investigation works, standing groundwater was encountered in the rotary boreholes at between 2.60 and 3.80m begl.

To date, two groundwater monitoring visits have been conducted and the results of the monitoring are reported in Appendix I.

2.5 SCHEDULING OF LABORATORY TESTING

GRM issued draft exploratory holes logs and blank chain of custody forms to Mott MacDonald following the completion of each exploratory hole location. The completed forms were returned to GRM, specifying the required laboratory testing.

Any sample deviations due to holding time exceedances, are outside of GRMs control.

3 LABORATORY ANALYSES

All AGS data for the laboratory testing results will be provided separately, and issued electronically to the Client for distribution.

3.1 CHEMICAL LABORATORY ANALYSIS

Chemical laboratory analyses were specified by Mott MacDonald and was undertaken by Construction Testing Services Ltd.

The chemical analysis results are presented in Appendix J.

Samples not used for testing will be stored for 30 days after issue of this report and then disposed of, unless the Client requests in writing that they be kept.

3.2 GEOTECHNICAL LABORATORY TESTING

Geotechnical testing on both soil and rock samples was specified by Mott MacDonald and was undertaken by Simtec and Geolabs Ltd.

The deformability of rock core testing could not be undertaken due to the nature of the samples recovered, i.e. the fracture state resulting in variability of the cylinder sidewalls, and reduced width to length ratio available.

The geotechnical test results are presented in Appendix K.

4 CONCLUSIONS

The investigation works have been undertaken in accordance with the specification, and supervising engineers instructions.

We trust this is sufficient for your current requirements.

If you have any queries, please contact the project manager in the first instance.

APPENDIX A

GENERAL APPRAISAL COMMENTS

i INFORMATION SOURCES

Where available the following sources have been used for the identification and assessment of potential ground hazards:

- Relevant British Standards
- British Geological Survey (BGS) Geology Map Scale 1:10,000 for local area
- British Geological Survey (BGS) Geology Map Scale 1:50,000/1:63,320
- BGS Memoir
- BGS Borehole Records: https://mapapps2.bgs.ac.uk/geoindex/home.html
- BGS online viewer: https://geologyviewer.bgs.ac.uk
- Magic Groundwater Vulnerability Maps
- Historical Ordnance Survey (OS) Maps
- Environmental Data Report
- Environment Agency Website: http://www.environment-agency.gov.uk/
- Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites, UKWIR, 2010.
- Coal Authority Records / Coal Mining Report
- DEFRA/Environment Agency Contaminated Land publications and DoE Industry Profiles
- BRE Guide BR211 (2023), 'Radon: Guidance on protective measures for new buildings (including supplementary advice for extensions, conversions and refurbishment projects)'
- UK HSA Radon Maps: https://www.ukradon.org/information/ukmaps
- CIRIA C665 'Assessing risks posed by hazardous ground gases to buildings'
- BS8485:2015 +A1: 2019, 'Code of Practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings'
- Other technical references used throughout this document are detailed in the text.

ii CONTAMINANTS OF CONCERN

The DoE Industry Profiles are normally used to assess likely contaminants from past land use and potential nearby industrial sources. For land uses where no profile is available, likely contaminants of concern are selected by GRM based on past experience of similar sites, a general screening suite of contaminants covered by CLEA and common contaminants from the Industry Profiles.

- Arsenic
- Cadmium
- Chromium
- Lead
- Mercury
- Selenium
- Copper
- Nickel
- Zinc
- Phenols
- cyanide (total)
- pH
- Water soluble sulphate
- PAH (polycyclic aromatic hydrocarbons)

Asbestos and PCBs are listed in the vast majority of profiles. PCBs are listed as the profiles expect electricity substations and switch boxes on all industrial sites. There is the potential for asbestos containing material to be mixed up with made ground, following any demolition works.

iii CONCEPTUAL MODEL METHODOLOGY

The consideration of contamination is based upon the principles of risk assessment, using the 'source-pathway-receptor' model in order to establish the presence, or potential presence, of a pollutant linkage.

To create a risk, contamination must have the potential to cause harm to susceptible targets or receptors such as humans, the water environment or the built environment. The potential for harm to occur requires three conditions to be satisfied to form a pollutant linkage:

- The presence of substances that may cause harm (SOURCE).
- The presence of a target which may be harmed (RECEPTOR).
- The existence of a plausible migration route between the source and the receptor (PATHWAY).

In the absence of a plausible pollutant linkage there is no risk. Where a potential linkage is identified in order for it not to pose a risk to the identified receptor it must be broken.

iv INTRUSIVE INVESTIGATION SAMPLING METHODOLOGY

The ground investigation (including fieldwork, sampling, monitoring and laboratory analyses) has been designed to identify and assess potential ground related problems and to allow cost effective solutions to be advised. It has been planned on the basis of the desk study, site inspection and the proposed development layout (where available). All fieldwork and soil descriptions were carried out in general accordance with relevant British Standards.

The exploratory holes have been positioned and advanced to depths to determine the general ground/groundwater/gas conditions below the site. A general grid pattern has been adopted, where possible, to provide sufficient information based on the current proposed layout scheme. Some holes have been targeted at particular hazards identified in the Phase I assessment. The resultant exploratory hole density is considered to be commensurate with the complexity of the site conditions and detail of information required for this phase of the investigation.

v GROUND GAS RISK ASSESSMENT METHODOLOGY

Gas monitoring programmes undertaken by GRM are designed to broadly comply with the recommendations outlined in CIRIA Report C665 'Assessing risks posed by hazardous ground gas to buildings' (2007) and BS8576 'Guidance on Investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs) (2013).

To assess the risks posed by ground gases such as radon, carbon dioxide and methane, the relevant current guidance has been used. For radon the site has been assessed following the guidelines in 'Radon: guidance on protective measures for new dwellings (including supplementary advice for extensions, conversions and refurbishment projects) (BR211: 2023)'. For methane and carbon dioxide the primary guidance document used to determine if protection measures are required is *BS8485:2015 Code of practice for the design of protective measures from methane and carbon dioxide ground gases for new buildings*. This uses hazardous gas flow rates (Q_{hg}), which are gas concentrations multiplied by borehole flow rates, to derive a Gas Flow Rate (GSV) for the site. The gas regime is then determined based on the GSV and other limiting factors such as gas concentrations.

Where flow is not recorded during the monitoring a default flow rate of 0.1l/hr will be used in the assessment to produce a positive result.

vi HUMAN HEALTH RISK ASSESSMENT METHODOLOGY

Guidance contained in the Environment Agency's CLEA Reports has been used to assess the risks posed to human health.

For residential developments that include domestic gardens the default Tier 1 Assessment Criteria (TAC) for 'residential land with plant uptake' are used, i.e. a female with a start age class of one and an end age class of six. All pathways are considered including the consumption of home-grown vegetables.

For residential developments that do not include domestic gardens the default Tier 1 Assessment Criteria (TAC) for 'residential land without plant uptake' are used, i.e. a female with a start age class of one and an end age class of six. All pathways are considered except the consumption of home-grown vegetables. For commercial/industrial developments the default Tier 1 Assessment Criteria (TAC) for 'commercial/industrial' are used, i.e. a female with a start age class of sixteen and an end age class of eighteen. All pathways are considered except the consumption of home-grown vegetables.

The TAC used by GRM include Category 4 Screening Levels (C4SLs) published by DEFRA, values calculated by GRM using the CLEA v1.071 risk assessment, and values and Suitable for Use Levels (S4UL) developed by LQM/CIEH. The TAC used in the assessment are selected based on the lowest site specific SOM values returned as part of the chemical analysis.

Where soil chemical analysis results are found to exceed the TAC, Site-Specific Risk Assessments may be undertaken using the CLEA v1.071 risk assessment software using the age classes and pathways described above.

vii RISK TO SITE WORKERS – GENERAL COMMENTS

The risks to site workers are similar to those posed to site end users, although likely to be less severe due to the site workers' shorter exposure to the identified contamination. However, site workers (particularly groundworkers) are more likely to come into direct contact with contaminated soils due to the nature of their work. On this basis ground and construction workers should be provided with basic Personal Protective Equipment based on the site's general health and safety risk assessment, but including as a minimum safety footwear, gloves and overalls.

A site specific risk assessment should be carried out for all hazards identified within the ground investigation in accordance with current health and safety legislation. This assessment should identify any measures required to further reduce risks i.e. providing further Personal Protective Equipment, welfare facilities and if necessary preventing access to certain areas.

Demolition and dismantling of existing structures on the site must be carried out to a safe and acceptable standard, in accordance with current UK guidance and best practice. Whilst not ground related, asbestos and hazardous substances surveys should be conducted prior to any demolition.

Any unusual colours, odours and suspicious ground should be reported immediately to site management and then GRM.

Whilst this appraisal has considered the long-term effects of contamination, GRM can also help during the formulation of Health and Safety documentation, if required.

viii CONTROLLED WATERS RISK ASSESSMENT METHODOLOGY

Where the desk study and fieldwork do not reveal a potential source of contamination no leachate or groundwater testing will be performed. Where a potential source is identified the testing will comprise leachate testing on the material considered most likely to pose a risk, groundwater testing will be undertaken if water is present at shallow depth.

The UK Drinking Water Standards (UKDWS) or Environmental Quality Standards (EQS) are usually adopted for comparison with the leachate/groundwater test results. When the most sensitive receptor is considered to be the aquifer (groundwater) UKDWS will be adopted as the Initial Tier 1 screening values.

Where the most sensitive receptor is a surface water feature the EQS values will be used as Initial Tier I Screening values.

ix CONSTRUCTION MATERIALS RISK ASSESSMENT METHODOLOGY

The 'screening levels' adopted for the assessment of risk to construction materials are taken from the following documents:

- UK Water Industry Research (UKWIR) Contamination thresholds for sub-surface water pipes, for the protection of buried pipes.
- Building Research Establishment (BRE) Special Digest SD1 (2005), 'Concrete in Aggressive Ground', for the protection of buried concrete.

x WASTE DISPOSAL, SITE WASTE MANAGEMENT PLANS AND MATERIAL MANAGEMENT PLANS

Under current Waste Management Regulations, waste soil materials produced from the site will require characterisation to enable it to be disposed of correctly.

The chemical analysis results included in this report should be provided to the relevant landfill operators to establish the characterisation of the waste, confirm its suitability for landfill disposal and provide estimated costings. If material is classified as hazardous, then the site will need to be registered with the Environment Agency prior to the movement of the waste. Depending on the receiving landfill's current permit, further chemical analysis, incorporating Waste Acceptance Criteria (WAC) leachate analysis, may be required.

All materials removed from the site will be classified as 'waste' and therefore must be removed by a suitably licensed carrier of waste. This applies whether or not the waste is contaminated. All waste removed to landfill will attract Landfill Tax.

The developer/builder is likely to be classed as the waste producer and therefore, has a duty of care to ensure that all waste is disposed of appropriately. This includes ensuring the waste carrier is licensed and disposes of the waste to a suitably licensed landfill site. They are also required to keep a paper trail from 'cradle to grave' including copies of the waste disposal tickets.

Efficient materials management on site is recommended as it can lead to significant cost savings when compared to the traditional side casting or single stockpile of arisings. GRM can assist in the production of Material Management Plans under the CL:AIRE Definition of Waste: Code of Practice. The DoWCoP enables:

- The direct transfer and re-use of clean naturally occurring soil materials between sites, and
- The re-use of both contaminated and uncontaminated materials on their site of origin and between sites within defined Cluster projects.

GRM can also undertake the role of Qualified Person and submit the DoW CoP project Declaration.

Likewise making the site as volume neutral as possible will reduce the costs of development. Whilst not a statutory requirement, Site Waste Management Plans allow better waste management practices, help to reduce the amount of waste produced and identify best environmental disposal options. Implementing a Site Waste Management Plan (SWMP) can reduce costs (increasing business profits) and maximise resource efficiency.

xi GEOTECHNICAL ASSESSMENT GENERAL COMMENTS

Where finished floor levels of proposed structures have not been provided by the Client, then for the purposes of initial assessment, GRM will assume that finished levels will not vary appreciably from the existing ground levels. If the depths of any underground engineering works (i.e. sewers, pumping stations etc.) are unknown they will not be taken in to account in the assessment and it will be assumed that any such works will not compromise foundation or ground stability.

Should the development proposals or finished levels be different from these assumptions then the comments/recommendations in the Geotechnical Assessment may require revising.

It should be noted that the results of window sampling and/or cable percussive boreholes may not give a true indication of a soils actual engineering properties (i.e. stability, mass structure etc). GRM consider that that prior to development trial pitting should be undertaken to confirm the recommendations in the Geotechnical Assessment.

xii GEOTECHNICAL ASSESSMENT – ENGINEERING GROUND TREATMENT

Near surface soils have the potential to be disturbed by weathering and site traffic. Precautions should always be taken to avoid this, as excessive disturbance may leads to more onerous floor slab designs, road cap thickness and increased amounts of off-site disposal etc.

Near surface soils may need treatment or reinforcing to allow safe movement of construction plant and labour. An assessment by the contractor should be undertaken once the type of machinery/plant needed to complete the development is known.

xiii GEOTECHNICAL ASSESSMENT – EXCAVATIONS

Excavation instability (over-break) can result in damage to existing services or structures (e.g. foundations, roads or boundary walls/fences) both on and off-site, as well as increased foundation concrete costs. In order to minimise this, all excavations deeper than 1.2m deep (or any excavation within 1.5m of any existing structure or service) should be supported. Full support should be provided to the full depth of all near vertically sided excavations in made ground, soft and very soft clays and granular soils. A reduction to intermediate support should be acceptable within firm and stiffer natural clays.

Wherever possible, man entry into excavations should be prevented; however, where this is not possible, entry to, and time spent in, excavations should be kept to a minimum.

The build program should be tailored to reflect the impact that deep excavations through potentially unstable strata can have on adjacent properties, so that they are not undermined.

All excavations on site should be in accordance with HSE guidelines and stability should be practically maintained at all times. Reference should be made to HSE construction information sheet No. 8 (Revision 1) ‘Safety in Excavations’.

Care should be taken to ensure that falls from excavation faces do not adversely affect the integrity of foundation concrete.

If contaminated water enters excavations it should be removed and transported to an appropriate treatment facility by a suitably licensed carrier before construction begins.

xiv GEOTECHNICAL ASSESSMENT – SUBSTRUCTURES

Where practicable, existing buried construction should be fully removed; however, if this is not practicable all new foundations should be carried down to fully penetrate it and it should be broken well away from all new structures.

There may be existing structures and/or infrastructure in close proximity to the proposed development. New build foundations may be constructed next to pavements with existing underground services beneath them, or excavations may be required near existing footings associated with adjacent properties. These potential hazards need to be taken into consideration when designing foundations and the groundworker needs to be made aware of their potential impact during the redevelopment works. Foundations close to existing underground services or buildings may require alternative foundation techniques (such as piling) to protect the integrity of these structures.

The contractor for the works should carry them out in such a fashion so as to not cause excessive overbreak, concrete usage or undermine existing buildings/roads/ services that are to be retained.

xv GEOTECHNICAL ASSESSMENT – SOAKAWAYS

Soakaway testing in trial pits by GRM is broadly carried out in accordance with BRE DG 365 (2016). The testing comprises the excavation of a test pit to a suitable depth, and the placement of water into the pit. The level of water present is then monitored over time. For borehole installations, the permeability testing (falling head/rising head) is undertaken in accordance with BS5930.

If it is decided to proceed with the use of soakaway drainage, then the following general points should be noted:

- Soakaways should not be placed so that water can be discharged through potentially contaminated made ground.
- The Environment Agency may require soakaways to be sealed systems such that only roof run off falls to soakaway.
- Interceptors are likely to be required for soakaways for highway drainage. The adopting authority for the highways should be consulted at the earliest opportunity regarding the use of soakaways for highways drainage.
- Consideration of site levels and slopes should be taken into account during the design.
- The construction of all soakaways should be in accordance with the current building regulations.
- Soakaways should not be placed within 5m of a proposed building.
- Placement of soakaways needs to be considered so as to avoid ponding of water down slope.
- The base of a soakaway should not be below the highest recorded water level.
- The Environment Agency prefer 1m of dry soil to be present between the base of a soakaway and the water table to provide attenuation for contamination.

xvi GEOTECHNICAL ASSESSMENT – FOUNDATIONS

If soft or hard spots are encountered during foundation excavation then they should be replaced with suitably compacted material or the footings deepened to suitable strata, to avoid differential settlement.

If strata of differing bearing character (e.g. sand and clay) are encountered at foundation levels within the excavations for a single plot then the excavation depths should be altered as appropriate to ensure the foundations rest on a single stratum, or strata that will not induce differential settlement. Where this is impractical then GRM should be contacted to assess a reinforced concrete detail or an alternative foundation solution (e.g. piles or vibro-replacement).

NOTES ON LIMITATIONS

General

GRM Development Solutions Limited has prepared this report solely for the use of the Client and those parties with whom a warranty agreement had been executed, or with whom an assignment had been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from GRM Development Solutions Limited; a charge may be levied against such approval.

GRM Development Solutions Limited accepts no responsibility or liability for:

a) the consequences of this document being used for any purpose or project other than for which it was commissioned, and

b) the consequences of this document being used by any third party with whom an agreement has not been executed.

Phase I Environmental Audits/ Desk Studies

The work undertaken to provide the basis of this report comprised a study of available documented information from a variety of sources (including the Client), together with (where appropriate) a brief walk over inspection of the site and meetings and discussions with relevant authorities and other interested parties. The opinions given in this report have been dictated by the finite data on which they are based and are relevant only to the purpose for which the report was commissioned. The information reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in this report, GRM Development Solutions Limited reserves the right to review such information and as considered necessary and appropriate to modify the opinions accordingly. It should be noted that any risks identified in a Phase 1 report are perceived risks based on the information reviewed; actual risks can only be assessed following a physical investigation of the site.

Phase II Environmental Audits (Contamination Investigations)

The investigation of the site has been carried out to provide sufficient information concerning the type and degree of contamination, ground and groundwater conditions to allow a reasonable risk assessment to be made. The objectives of the investigation have been limited to establishing the risks associated with potential human targets, building materials, and controlled waters.

The amount of exploratory work and chemical testing undertaken has necessarily been restricted by the short timescale available, and the locations of exploratory holes have been restricted to the areas unoccupied by the building(s) on the site and by buried services. A more comprehensive investigation may be required if the site is to be redeveloped as, in addition to risk assessment, a number of important engineering and environmental issues need to be resolved.

For these reasons if costs have been included in relation to site remediation these must be considered as provisional only and must, in any event, be confirmed by a commercial adviser.

The exploratory holes undertaken, which investigate only a small volume of the ground in relation to the size of the site, can only provide a general indication of site conditions. Whilst exploratory testing is intended to gain an accurate representation of the site, the very nature of sampling and testing is such that it cannot ensure that all localised conditions are detected

The risk assessment and opinions provided take in to consideration, inter alia, currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values.

Phase II Geo-environmental Investigations (Combined Geotechnical and Contamination Investigations)

The investigation of the site has been carried out to provide sufficient information concerning the type and degree of contamination, geotechnical characteristics, and ground and groundwater conditions to provide a reasonable assessment of the environment risks together with engineering and development implications. If costs have been included in relation to site development a commercial adviser must confirm these.

The exploratory holes undertaken, which investigate only a small volume of the ground in relation to the size of the site, can only provide a general indication of site conditions. The opinions provided and recommendations given in this report are based on the ground conditions apparent at the site for each of the exploratory holes. There may be exceptional ground conditions elsewhere on the site which have not been disclosed by this investigation and which have therefore not been taken into account in this report.

The comments made on groundwater conditions are based on observations made at the time the site work was conducted. It should be noted that groundwater levels will vary owing to seasonal, tidal and weather related effects.

The scope of the investigation was selected on the basis of the specific development proposed by the Client and may be inappropriate to another form of development or scheme.

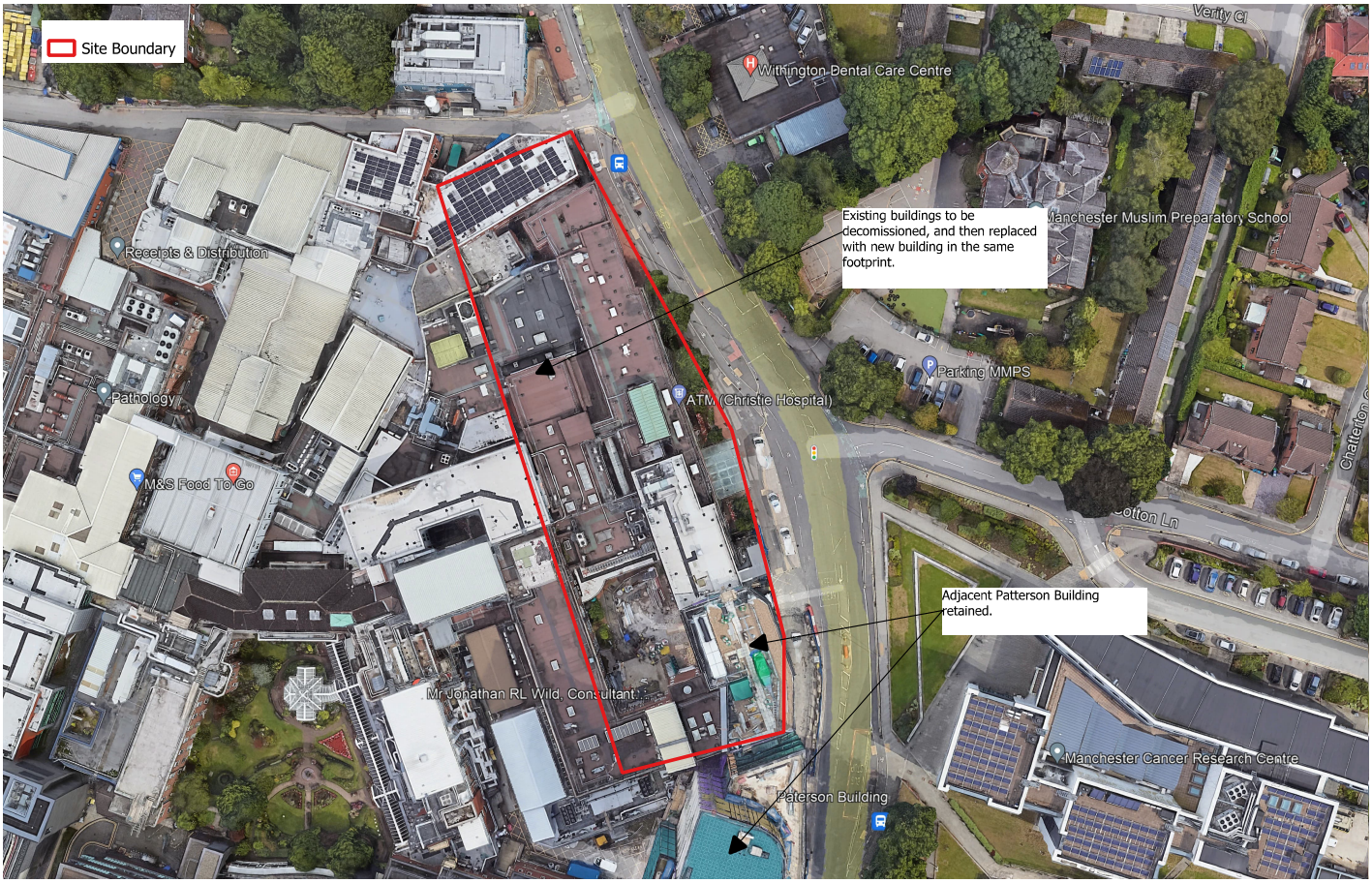
The risk assessment and opinions provided take in to consideration, inter alia, currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values.

APPENDIX B

NOTES: Notes	CLIENT: IHP VINCI	PROJECT No: P10525	DATE: MAY 2024	DESIGN/DRAWN: RJH
	PROJECT: CASICD - THE RADIOLOGY VILLAGE	DRAWING NUMBER: 001	ISSUE: A	
	TITLE: SITE LOCATION PLAN	© GRM Development Solutions Ltd © Crown Copyright. AL 100014100		

GRM Development Solutions Ltd
Tel: 01283 551 249
mail@grm-uk.comwww.grm-uk.com

APPENDIX C



NOTES:
Notes

CLIENT: IHP VINCI

PROJECT: CASICD - THE RADIOLOGY VILLAGE

TITLE: DEVELOPMENT PROPOSAL

PROJECT No: P10525

DATE: MAY 2024

DESIGN/DRAWN: RJH

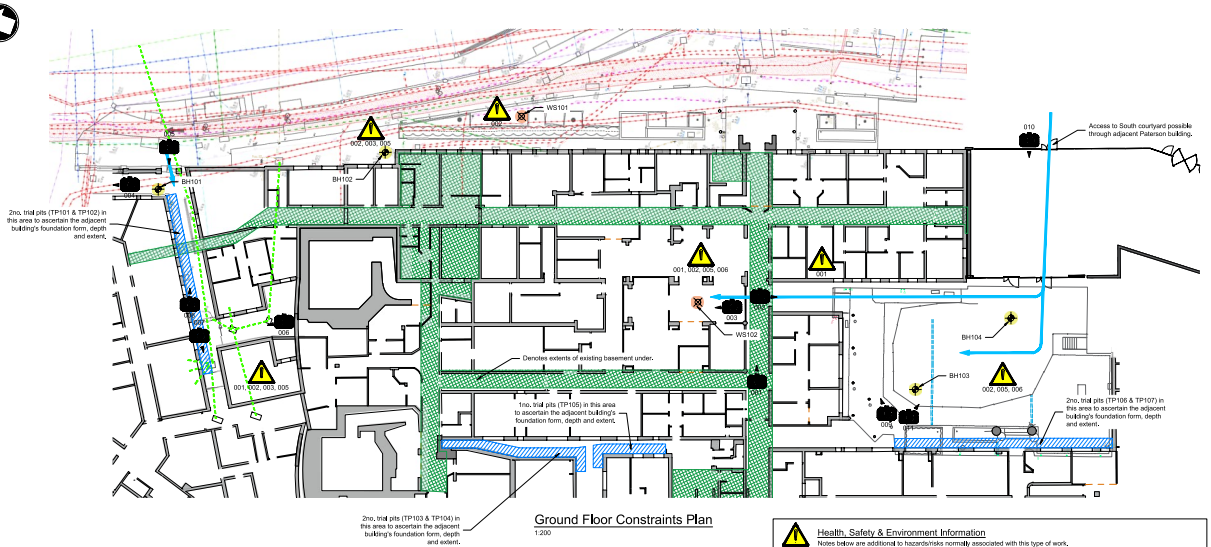
DRAWING NUMBER: 002

ISSUE: A

© GRM Development Solutions Ltd © Crown Copyright. AL 100014100

GRM Development Solutions Ltd
Tel: 01283 551 249
mail@grm-uk.comwww.grm-uk.com

APPENDIX D



Ground Floor Constraints Plan

1:200

XXX

Health, Safety & Environment Information

Notes below are additional to hazards/risks normally associated with this type of work.

Ref.	Hazard	Activity / Process
001	Collapse of existing basement under external areas.	Temporary works Contractor to verify that existing basement is not overloaded when transporting Ground Investigation equipment.
002	Clash with existing services.	Sub-contractor to take full responsibility for utility plans and verify position of additional drainage prior to commencement of works.
003	UXO.	Pre-Desk Study showed site to be moderate risk, detailed desk study to be undertaken prior to GI to inform risk.
004	Working adjacent to the public highway.	Appropriate segregation to be used and agreed with Trust/council.
005	Contaminated ground.	Asbestos known to be present in the basement. Contractor to be vigilant on site for potential asbestos or other contaminants in ground.
006	Working in a live hospital.	Noise/vibration and general disruption to be kept to a minimum and agreed with the NHS Trust prior to commencing work. Appropriate segregation to be used around investigations.

Exploratory Hole Schedule

Borehole ID	Type	Depth (m)	Groundwater monitoring required?	Easting	Northing
BH101	DS + RC	18	Yes	E384907	N392636
BH102	DS + RC	18	No	E384919	N392615
BH103	DS + RC	18	Yes	E384914	N392553
BH104	DS + RC	18	No	E384925	N392547
WS101	WS	5	No	E384927	N392603
WS102	WS	5	No	E384915	N392579
WS103	WS	5	No	E384909	N392608
TP101	HDTP	1.2	No	-	-
TP102	HDTP	1.2	No	-	-
TP103	HDTP	1.2	No	-	-
TP104	HDTP	1.2	No	-	-
TP105	HDTP	1.2	No	-	-
TP106	HDTP	1.2	No	-	-
TP107	HDTP	1.2	No	-	-

Photo 001

Photo 002

Photo 003

Photo 004

Photo 005

Photo 006

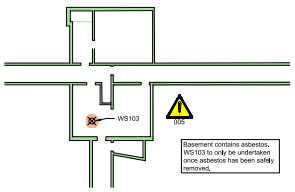
Photo 007

Photo 008

Photo 009

Photo 010

Photo 011



Basement Level Plan Extract

1:200

Ground Investigation Requirements

Requirements for the ground investigation are outlined below. Note that a full specification for the works will be produced prior to undertaking the investigation.
This drawing should be read in conjunction with the Geotechnical and Geoenvironmental Desk Study CASICD-MMD-XX-XX-RP-C-000001.
An indicative ground model has been produced based on the adjacent Paterson Development Ground Investigation:

Stratum	Depth to top of stratum (mBGL)	Elevation at top of stratum (mAOD)	Thickness (m)
Made ground	0	34,72-35,26	0,70-2,20
Devension till	0,70-2,20	32,52-34,22	0,50-2,20
Weathered sandstone	2,20-2,70	31,43-33,06	1,30-2,80
Very weak to weak sandstone (Wilmslow Formation)	3,50-5,00	29,92-31,76	Not proven

- Made ground samples required from all exploratory hole locations for contamination testing.
- Exploratory holes required to a depth of 18m below ground level. DS = RC refers to Dynamic Sampling borehole with Rotary Coring follow-on. WS refers to Window Sample and HDTP refers to Hand-Dug Trial Pit.
- GI Sub-Contractor to advise whether there is scope for other suitable borehole locations within the footprint of the building. GI Sub-Contractor to agree methodology and date/time of exploratory holes with NHS Trust prior to undertaking the works.
- CAT Scan and hand dug trial pits required to a depth of 1.2m at all exploratory hole locations to identify any buried services and/or foundations of adjacent buildings.
- Trial pits to be undertaken in the locations highlighted to determine the extent of existing foundations. Dimensioned sketches to be provided to Structural Engineer.
- If invasive species are seen on site the Contractor is to make the Principal Designer and Investigation Supervisor aware. Risk of invasive species is low due to the site being located in an urban area.

1:200 0 10m 20m

Notes

1. Do not scale from this drawing
2. All utilities shown are taken from "59603 Utility Survey (23-03-23)", with the exception of the lined indicating "Indicative combined sewer location" as shown in the below key, which is only shown in the approximate position based on recieved CCTV information.
3. Boreholes are shown in approximate required position only, the sub-contractor shall be responsible for ensuring that the proposed borehole locations are suitable and do not disrupt any live services or other ground obstructions below.
4. Temporary works contractor to verify that the existing basement is not overloaded when transporting ground investigation equipment.
5. Proposed access routes are to be agreed with the Trust prior to commencement of works. No consideration has been made to storage or site compound areas.

Key to symbols

- British Telecom
- Vodafone
- Virgin Media
- GTT Fibre Optic
- ZAYO
- Empty Ducting
- Earth Cable
- Electricity Cables
- Gas Pipes
- Sewer Combined
- Sewer Foul
- Sewer Surface Water
- Traffic Light Cables
- Unidentified GPR or electro location trace
- Water Pipe
- End of trace
- Multiple Electric Ducts
- Red line boundary
- Extents of basement below
- Trial pits location plan
- Proposed indicative borehole location
- Proposed window sample location
- Indicative combined sewer location
- Proposed access route to South courtyard

Reference drawings

Existing ground floor and basement level plans taken from 1282-21-DAY-XX-00-DR-A-03-0001 and 1282-21-DAY-XX-BA-DR-A-03-0000 respectively.

Paterson Building ground floor general arrangement plan taken from BDP architectural Revit model PRP-BDP-Z01-XX-M3-A-0002.

Utility survey taken from 59603 Utility Survey (23-03-23).dwg

Indicative combined sewer locations shown by a lime green dashed line and associated manholes are taken from NRCWWS CCTV Drain survey dated Oct 2023.

Rev.	Date	Drawn	Description	Ch'k'd	App'd
P02	04.12.2023	M Ufton	Updated following subcontractor comment	CS	AS
P01	14.11.2023	M Ufton	Issued for sub-contractor comment	CS	AS

Status Stamp

PRELIMINARY

MOTT MACDONALD

Mott MacDonald
7th Floor
26 Whitehall Road
Leeds LS12 1BE
United Kingdom

T +44 (0)113 394 6700
W www.mottmac.com

Client

The Christie NHS Foundation Trust

Title

The Christie Advanced Scanning & Imaging Centre Development
Borehole Location & Constraints Plan

Designed	I Sonara	IB	Eng check	M Wild	MW
Drawn	M Ufton	MU	Coordination	C Smith	CS
Dwg check	C Smith	CS	Approved	A Simpson	AS

MMD Project Number	Scale at A1	Security
100114293	1:200	STD

Suitability Description	Suit. Code
Suitable for Review and Comment	S3

Drawing Number	Revision
CASICD-MMD-XX-ZZ-DR-C-000002	P02

© Mott MacDonald

This document is issued for the party which commissioned it and for specific purposes connected with the captioned project only. It should not be relied upon by any other party or used for any other purposes.
We accept no responsibility for the consequences of this document being relied upon by any other party, or being used for any other purpose, or containing any error or omission which is due to an error or omission in data supplied to us by other parties.

C:\Users\UFT904\5496\Mott MacDonald\The Christie CT Redevelopment - P2\3 Input - Do\Develop\C Civil\Engineer\DR Drawing Renditions\Borehole Location Plan\CASICD-MMD-XX-ZZ-DR-C-000002\Christie Utilities Overlay.dwg Dec 4, 2023 - 3:42PM UFT90454

APPENDIX E

GRM Development Solutions Ltd
Laurus House,
First Avenue, Centrum 100,
Burton-on-Trent, DE14 2WH
Tel (HQ): 01283 551249
Email: info@grm-uk.com

Cable-Percussion Borehole

Borehole No. **BH101**

Sheet 1 of 3

Site Name: CASICD - Christie Hospital, Wilmslow, Manchester

Ground Level (mAOD) 35.15

Client: IHP Projects (VINCI)

GRM Project Ref: P10525

Coordinates 384906 E, 392641 N

Install	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	SPT Value		Depth (m)	Level (m)	Legend	Stratum Description
						0.10	35.05		Tarmacadam/asphalt.
		0.30 - 0.40	ES			0.20	34.95		MADE GROUND
		0.40 - 0.50	B						Medium dense, light brown, slightly sandy GRAVEL. Sand is fine to coarse. Gravel is fine to coarse, subangular limestone and quartzite. MADE GROUND
		1.00 - 1.10	ES						Soft, dark brown, slightly sandy, gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded brick, tarmacadam/ asphalt, limestone and brick. MADE GROUND
		1.40	C	N=10 (2,3/2,3,2,3)		1.40	33.75		
		1.50 - 1.60	ES						Firm, light grey and orangish-brown, sandy, gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, angular and subangular mudstone, sandstone, chert and brick. MADE GROUND
		1.90 - 2.00	D			1.90	33.25		
		2.00	C	N=35 (6,8/7,8,9,11)					Medium dense to dense, orangish-brown SAND. Sand is fine to coarse. WEATHERED WILMSLOW SANDSTONE FORMATION
		2.30 - 2.40	D						
		~~2.60~~	~~C~~	~~40 (11,13/40 for 185mm)~~					
		2.60 - 3.30	42	0	0				*... No recovery 2.60-3.10m.*
		3.30 - 4.80	85	10	0	3.30	31.85		Extremely weak reddish brown medium to coarse grained SANDSTONE, locally recovered as sand. Discontinuities; No.1 - sub-horizontal closely spaced, planar rough and open. No.2 - sub-vertical up to 60 degrees, planar rough, very widely spaced. No.3 - sub-horizonal, widely spaced, planar rough, with clayey fine to coarse gravel infill. WILMSLOW SANDSTONE FORMATION
		4.80 - 6.30	100	86	73				
		6.30 - 7.80	100	80	37				

Crew: MACKLIN GEOTECH **Logger:** AM / AW

Equipment: Comacchio 205

Groundwater Remarks:
Groundwater standing at 2.60m.

General Remarks:

Chiselling Details

Depth Top	Duration	Remarks

Casing Diameter by Depth

Depth Base	Diameter	Remarks
3.50	150	

Hole Started: 11/03/2024 **Hole Complete:** 13/03/2024 **Version:** FINAL **Scale:** 1:45

GRM Development Solution Ltd,
Tel (HQ): 01283 551249
Email: info@grm-uk.com
Web: www.grm-uk.com

Rotary Core Log

Borehole No.
BH101
Sheet 2 of 3

Site Name: CASICD - Christie Hospital, Wilmslow, Manchester

Ground Level (mAOD)
35.15

Client: IHP Projects (VINCI)

GRM Project Ref: P10525

Coordinates
384906 E
392641 N

Install	Water Strikes	Depth (m)	Coring TCR	Coring SCR	Coring RQD	FI	Depth (m)	Level (m)	Legend	Stratum Description
		7.80 - 9.30	87	63	30					Extremely weak reddish brown medium to coarse grained SANDSTONE, locally recovered as sand. Discontinuities; No.1 - sub-horizontal closely spaced, planar rough and open. No.2 - sub-vertical up to 60 degrees, planar rough, very widely spaced. No.3 - sub-horizonal, widely spaced, planar rough, with clayey fine to coarse gravel infill. WILMSLOW SANDSTONE FORMATION
		9.30 - 10.80	84	67	22					*... Locally recovered as sand.* *... moderately strong and light brown.*
		10.80 - 12.30	67	53	28					
		12.30 - 13.80	49	29	0					*... Locally grading to a mudstone* *... No recovery 13.50-13.80m.*
		13.80 - 15.30	60	53	33					*... Locally greyish yellow.* *... No recovery 15.0-15.40m.*

9 10 11 12 13 14 15 16

Crew: MACKLIN GEOTECH | **Equipment:** Comacchio 205 | **Logger:** AM / AW

General Remarks:

Groundwater Remarks:
Groundwater standing at 2.60m.

Hole Started: 11/03/2024 | **Hole Complete:** 13/03/2024 | **Version:** FINAL | **Scale:** 1:45

GRM Development Solution Ltd,
Tel (HQ): 01283 551249
Email: info@grm-uk.com
Web: www.grm-uk.com

Rotary Core Log

Borehole No.
BH101
Sheet 3 of 3

Site Name: CASICD - Christie Hospital, Wilmslow, Manchester

Ground Level (mAOD)
35.15

Client: IHP Projects (VINCI)

GRM Project Ref: P10525

Coordinates
384906 E
392641 N

Install	Water Strikes	Depth (m)	Coring TCR	Coring SCR	Coring RQD	FI	Depth (m)	Level (m)	Legend	Stratum Description
		15.30 - 16.80	33	27	18					Extremely weak reddish brown medium to coarse grained SANDSTONE, locally recovered as sand. Discontinuities; No.1 - sub-horizontal closely spaced, planar rough and open. No.2 - sub-vertical up to 60 degrees, planar rough, very widely spaced. No.3 - sub-horizonal, widely spaced, planar rough, with clayey fine to coarse gravel infill. WILMSLOW SANDSTONE FORMATION
		16.80 - 18.30	55	35	13					*... No recovery 16.50-16.80m.* *... No recovery 16.80-17.25m.*
							18.30	16.85		End of Borehole at 18.300m

17 18 19 20 21 22 23 24

Crew: MACKLIN GEOTECH | **Equipment:** Comacchio 205 | **Logger:** AM / AW

General Remarks:

Groundwater Remarks:
Groundwater standing at 2.60m.

Hole Started: 11/03/2024 | **Hole Complete:** 13/03/2024 | **Version:** FINAL | **Scale:** 1:45

GRM Development Solutions Ltd
Laurus House,
First Avenue, Centrum 100,
Burton-on-Trent, DE14 2WH
Tel (HQ): 01283 551249
Email: info@grm-uk.com

Cable-Percussion Borehole

Borehole No. **BH102**

Sheet 1 of 3

Site Name: CASICD - Christie Hospital, Wilmslow, Manchester

Ground Level (mAOD) 35.32

Client: IHP Projects (VINCI)

GRM Project Ref: P10525

Coordinates 384918 E, 392617 N

Install	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	SPT Value	Depth (m)	Level (m)	Legend	Stratum Description
					0.10	35.22		Brick paving.
		0.30 - 0.40	ES		0.20	35.12		MADE GROUND
		0.50 - 0.60	B					Medium dense, light brown, gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular limestone, tarmacadam/asphalt and brick. MADE GROUND
		1.20	C	N=26 (3,3/4,7,7,8)				Medium dense, dark brown, slightly gravelly, clayey SAND. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded limestone, sandstone and brick. MADE GROUND
					1.50	33.82		Medium dense to dense, reddish-brown SAND. Sand is fine to coarse. WEATHERED WILMSLOW SANDSTONE FORMATION
		1.90 - 2.00	D					
		2.00	C	N=41 (5,7/9,10,10,12)				
		2.50 - 2.60	D					
		2.70	C	50 (11,13/50 for 225mm)	2.70	32.62		Extremely weak to weak, orangish brown medium to coarse grained SANDSTONE, locally recovered as sand. Discontinuities; No.1 - sub-horizontal up to 15 degrees, closely spaced, planar smooth to rough, locally some soft clay infill. No.2 - sub-horizontal 20-60 degrees, widely spaced, planar rough open and no infill. WILMSLOW SANDSTONE FORMATION
		2.70 - 3.30	80	20 0				
		3.30 - 4.80	93	90 87				
		4.80 - 6.30	90	83 29				
								... Becomes weak to medium strong.
		6.30 - 7.80	93	83 37				
								... colour locally becomes light brown.

Crew: MACKLIN GEOTECH **Logger:** AM / AW

Equipment: Comacchio 205

Groundwater Remarks:
Groundwater standing at 2.80m.

General Remarks:

Chiselling Details

Depth Top	Duration	Remarks

Casing Diameter by Depth

Depth Base	Diameter	Remarks
3.50	150	

Hole Started: 07/03/2024 **Hole Complete:** 11/03/2024 **Version:** FINAL **Scale:** 1:45

GRM Development Solution Ltd,
Tel (HQ): 01283 551249
Email: info@grm-uk.com
Web: www.grm-uk.com

Rotary Core Log

Borehole No.
BH102
Sheet 2 of 3

Site Name: CASICD - Christie Hospital, Wilmslow, Manchester

Ground Level (mAOD)
35.32

Client: IHP Projects (VINCI)

GRM Project Ref: P10525

Coordinates
384918 E
392617 N

Install	Water Strikes	Depth (m)	Coring TCR	Coring SCR	Coring RQD	FI	Depth (m)	Level (m)	Legend	Stratum Description
		7.80 - 9.30	96	86	47					Extremely weak to weak, orangish brown medium to coarse grained SANDSTONE, locally recovered as sand. Discontinuities; No.1 - sub-horizontal up to 15 degrees, closely spaced, planar smooth to rough, locally some soft clay infill. No.2 - sub-horizontal 20-60 degrees, widely spaced, planar rough open and no infill. WILMSLOW SANDSTONE FORMATION
		9.30 - 10.80	87	73	17					
		10.80 - 12.30	97	89	43					
		12.30 - 13.80	93	77	62					*... Becomes medium strong light brown sandstone.*
		13.80 - 15.30	97	70	32					
										... Locally grading to mudstone.

9 10 11 12 13 14 15 16

Crew: MACKLIN GEOTECH | **Equipment:** Comacchio 205 | **Logger:** AM / AW

General Remarks:

Groundwater Remarks:
Groundwater standing at 2.80m.

Hole Started: 07/03/2024 | **Hole Complete:** 11/03/2024 | **Version:** FINAL | **Scale:** 1:45

GRM Development Solution Ltd,
Tel (HQ): 01283 551249
Email: info@grm-uk.com
Web: www.grm-uk.com

Rotary Core Log

Borehole No.
BH102
Sheet 3 of 3

Site Name: CASICD - Christie Hospital, Wilmslow, Manchester

Ground Level (mAOD)
35.32

Client: IHP Projects (VINCI)

GRM Project Ref: P10525

Coordinates
384918 E
392617 N

Install	Water Strikes	Depth (m)	Coring TCR	Coring SCR	Coring RQD	FI	Depth (m)	Level (m)	Legend	Stratum Description
		15.30 - 16.80	93	73	64					Extremely weak to weak, orangish brown medium to coarse grained SANDSTONE, locally recovered as sand. Discontinuities; No.1 - sub-horizontal up to 15 degrees, closely spaced, planar smooth to rough, locally some soft clay infill. No.2 - sub-horizontal 20-60 degrees, widely spaced, planar rough open and no infill. WILMSLOW SANDSTONE FORMATION
		16.80 - 18.30	47	27	0					... *No recovery 16.80-17.60m.*
							18.30	17.02		End of Borehole at 18.200m

17
18
19
20
21
22
23
24

Crew: MACKLIN GEOTECH
Equipment: Comacchio 205
Logger: AM / AW

General Remarks:

Groundwater Remarks:
Groundwater standing at 2.80m.

Hole Started: 07/03/2024
Hole Complete: 11/03/2024
Version: FINAL
Scale: 1:45

GRM Development Solutions Ltd
Laurus House,
First Avenue, Centrum 100,
Burton-on-Trent, DE14 2WH
Tel (HQ): 01283 551249
Email: info@grm-uk.com

Cable-Percussion Borehole

Borehole No. **BH103**

Sheet 1 of 2

Site Name: CASICD - Christie Hospital, Wilmslow, Manchester

Ground Level (mAOD) 35.28

Client: IHP Projects (VINCI)

GRM Project Ref: P10525

Coordinates 384916 E, 392556 N

Install	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	SPT Value	Depth (m)	Level (m)	Legend	Stratum Description
					0.10	35.18		TARMACADAM
		0.20 - 0.30	ES		0.15	35.13		MADE GROUND
								Dense grey brown sandy fine to coarse GRAVEL of limestone and sandstone - Type 1 MOT.
					0.60	34.68		MADE GROUND
		0.70 - 0.80	ES					Medium dense dark brown gravelly fine to coarse SAND. Gravel is angular to coarse concrete fragments, quartzite, with brick and tile fragments.
								MADE GROUND
		1.30	S	N=12 (3,3/3,3,3,3)	1.30	33.98		Medium dense orange brown slightly gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse angular to subangular brick fragments and quartzite.
		1.40 - 1.50	ES		1.40	33.88		MADE GROUND
		1.90 - 2.00	D		1.90	33.38		weak CONCRETE.
		2.00	S	N=39 (4,6/8,8,11,12)				MADE GROUND
								Medium dense brown and red brown gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse angular to subangular brick and concrete fragments, and occasional sandstone.
		2.50 - 2.60	D					MADE GROUND
								Medium dense brownish red fine to coarse SAND. WEATHERED WILMSLOW SANDSTONE FORMATION
		3.00	C	50 (25 for 140mm/50 for 175mm)	3.00	32.28		*... Becomes dense from 2.0m*
		3.00 - 4.00	75	55 32				Extremely weak to weak, reddish brown silty fine to coarse grained SANDSTONE, locally poorly cemented and friable, with thin interbeds of very silty partings. Discontinuities: no.1 - generally horizontal to sub-horizontal, very closely and closely spaced, planar rough, locally with soft silt infill, generally open. No. 2 - sub-vertical 70-80 degrees, widely spaced, open rough and undulating, no infill.
								WILMSLOW SANDSTONE FORMATION
								... window sample barrel and SPT refusal at 3.0m
		4.00 - 5.50	62	43 8				*... No recovery 3.0-3.20m.*
								... Non-intact - recovered as a coarse angular gravel.
								... Locally and silty sand.
								... No recovery 4.0-4.60m.
								... Non-intact, recovered as gravel.
		5.50 - 7.00	77	70 24				*... No recovery 5.5-5.90m.*
								... locally interbeds of pale brown coarse sandstone.
		7.00 - 8.50	93	53 33				*... No recovery 7.0-7.10m.*

Crew: MACKLIN GEOTECH **Logger:** AM / RJH

Equipment: Comacchio 205

Groundwater Remarks:
Groundwater standing at 3.80-4.0m begl.

General Remarks:
Location moved circa 2m from BH103A (original location), due to obstruction encountered.

Chiselling Details

Depth Top	Duration	Remarks

Casing Diameter by Depth

Depth Base	Diameter	Remarks
3.50	150	

Hole Started: 27/02/2024 **Hole Complete:** 04/03/2024 **Version:** FINAL **Scale:** 1:45

GRM Development Solution Ltd,
Tel (HQ): 01283 551249
Email: info@grm-uk.com
Web: www.grm-uk.com

Rotary Core Log

Borehole No.
BH103
Sheet 2 of 2

Site Name: CASICD - Christie Hospital, Wilmslow, Manchester

Ground Level (mAOD)
35.28

Client: IHP Projects (VINCI)

GRM Project Ref: P10525

Coordinates
384916 E
392556 N

Install	Water Strikes	Depth (m)	Coring TCR	Coring SCR	Coring RQD	FI	Depth (m)	Level (m)	Legend	Stratum Description
										Extremely weak to weak, reddish brown silty fine to coarse grained SANDSTONE, locally poorly cemented and friable, with thin interbeds of very silty partings. Discontinuities: no.1 - generally horizontal to sub-horizontal, very closely and closely spaced, planar rough, locally with soft silt infill, generally open. No. 2 - sub-vertical 70-80 degrees, widely spaced, open rough and undulating, no infill. WILMSLOW SANDSTONE FORMATION
		8.50 - 10.00	80	73	23					*... No recovery 8.50-8.70m.*
		10.00 - 11.50	87	30	8					*... No recovery 10.0-10.20m.* *... becomes pale reddish brown.* *... one joint with polished internal surface and grey gleying with some soft clay.*
		11.50 - 12.50	0	0	0		11.50	23.78		No core recovery - heavily weathered sandstone, possible fault zone. WILMSLOW SANDSTONE FORMATION
		12.50 - 14.00	0	0	0					
							14.00	21.28		End of Borehole at 14.000m

9 10 11 12 13 14 15 16

Crew: MACKLIN GEOTECH | **Equipment:** Comacchio 205 | **Logger:** AM / RJH

General Remarks:
Location moved circa 2m from BH103A (original location), due to obstruction encountered.

Groundwater Remarks:
Groundwater standing at 3.80-4.0m begl.

Hole Started:	27/02/2024	Hole Complete:	04/03/2024	Version:	FINAL	Scale:	1:45

GRM Development Solutions Ltd
Laurus House,
First Avenue, Centrum 100,
Burton-on-Trent, DE14 2WH
Tel (HQ): 01283 551249
Email: info@grm-uk.com

Cable-Percussion Borehole

Borehole No.
BH103A
Sheet 1 of 1

Site Name: CASICD - Christie Hospital, Wilmslow, Manchester

Ground Level (mAOD) 35.26

Client: IHP Projects (VINCI)

GRM Project Ref: P10525

Coordinates 384915 E, 392554 N

Install	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	SPT Value	Depth (m)	Level (m)	Legend	Stratum Description
		0.10 - 0.20	ES		0.10	35.16		TARMACADAM MADE GROUND
					0.30	34.96		Loose dark grey sandy GRAVEL. Sand is fine to coarse. Gravel is fine to coarse angular to subangular brick fragments, tarmac, sandstone, quartzite, and concrete fragments. MADE GROUND
								Medium dense reddish brown silty SAND. Sand is fine to coarse. MADE GROUND
					1.20	34.06		End of Borehole at 1.200m

Crew: MACKLIN GEOTECH **Logger:** AM

Equipment: Comacchio 205

Groundwater Remarks:
No Groundwater encountered.

General Remarks:
Obstruction encountered at 1.20m within inspection pit, therefore abandoned.

Chiselling Details

Depth Top	Duration	Remarks

Casing Diameter by Depth

Depth Base	Diameter	Remarks

Hole Started: 26/02/2024 **Hole Complete:** 26/02/2024 **Version:** FINAL **Scale:** 1:45

GRM Development Solutions Ltd
Laurus House,
First Avenue, Centrum 100,
Burton-on-Trent, DE14 2WH
Tel (HQ): 01283 551249
Email: info@grm-uk.com

Cable-Percussion Borehole

Borehole No. **BH104**

Sheet 1 of 3

Site Name: CASICD - Christie Hospital, Wilmslow, Manchester

Ground Level (mAOD) 35.33

Client: IHP Projects (VINCI)

GRM Project Ref: P10525

Coordinates 384922 E, 392547 N

Install	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	SPT Value	Depth (m)	Level (m)	Legend	Stratum Description
		0.30 - 0.40	ES		0.15	35.18		Tarmacadam/asphalt. MADE GROUND
		0.50 - 0.60	B					Medium dense, brown, slightly clayey ,gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse angular to subangular brick, concrete and tarmacadam/asphalt. Occasional clay clods. MADE GROUND
		1.20	C	N=4 (1,0/1,1,1,1)				
		1.60 - 1.70	ES		1.50	33.83		Firm to stiff, dark brown, slightly gravelly, sandy CLAY. Sand is fine to coarse. Gravel is fine to medium, subangular to subrounded chert, mudstone, sandstone and rare brick. MADE GROUND
		2.10 - 2.20	D		2.00	33.33		Medium dense to dense, reddish-brown SAND. Sand is fine to coarse. WEATHERED WILMSLOW SANDSTONE FORMATION
		2.20	C	N=35 (2,3/5,8,9,13)				*Becoming orangish-brown from 2.60m.*
		2.80 - 2.90	D					
		2.90	C	50 (5,14/50 for 220mm)				
		3.00 - 4.00	42	24 / 18	3.00	32.33		Extremely weak to weak, becomes weak to medium strong with depth, orangish brown, medium to coarse grained SANDSTONE. Joint set 1 is sub-horizontal, widely spaced, planar rough with no infill. Joint set 2 is sub-vertical up to 65 degrees, very widely spaced with clay infill. Joint set 3 is sub-horizontal up to 10 degrees, moderately widely spaced, planar rough with sandy, clayey, mica rich infill. WILMSLOW SANDSTONE FORMATION
		4.00 - 4.50	86	84 / 68				*... No recovery 3.00-3.56m.*
		4.50 - 5.50	81	74 / 55				*... No recovery 3.80-4.25m.*
		5.50 - 6.20	100	81 / 21				*... No recovery 4.50-4.85m.*
		6.20 - 7.70	100	93 / 53				*Becoming weak to locally medium strong at 7.00m.*

Crew: MACKLIN GEOTECH **Logger:** AW

Equipment: Comacchio 205

Groundwater Remarks:
Groundwater standing at 3.80m.

General Remarks:

Chiselling Details

Depth Top	Duration	Remarks

Casing Diameter by Depth

Depth Base	Diameter	Remarks
3.50	150	

Hole Started: 05/03/2024 **Hole Complete:** 07/03/2024 **Version:** FINAL **Scale:** 1:45

GRM Development Solution Ltd,
Tel (HQ): 01283 551249
Email: info@grm-uk.com
Web: www.grm-uk.com

Rotary Core Log

Borehole No.
BH104
Sheet 2 of 3

Site Name: CASICD - Christie Hospital, Wilmslow, Manchester

Ground Level (mAOD)
35.33

Client: IHP Projects (VINCI)

GRM Project Ref: P10525

Coordinates
384922 E
392547 N

Install	Water Strikes	Depth (m)	Coring TCR	Coring SCR	Coring RQD	FI	Depth (m)	Level (m)	Legend	Stratum Description
		7.70 - 9.20	100	93	47					Extremely weak to weak, becomes weak to medium strong with depth, orangish brown, medium to coarse grained SANDSTONE. Joint set 1 is sub-horizontal, widely spaced, planar rough with no infill. Joint set 2 is sub-vertical up to 65 degrees, very widely spaced with clay infill. Joint set 3 is sub-horizontal up to 10 degrees, moderately widely spaced, planar rough with sandy, clayey, mica rich infill. WILMSLOW SANDSTONE FORMATION
		9.20 - 10.70	100	90	47					
		10.70 - 12.20	95	91	65					
		12.20 - 13.70	100	97	53					
		13.70 - 15.20	93	89	13					
		15.20 - 16.70	92	81	49					

9 10 11 12 13 14 15 16

Crew: MACKLIN GEOTECH | **Equipment:** Comacchio 205 | **Logger:** AW

General Remarks:

Groundwater Remarks:
Groundwater standing at 3.80m.

Hole Started: 05/03/2024 | **Hole Complete:** 07/03/2024 | **Version:** FINAL | **Scale:** 1:45

GRM Development Solution Ltd,
Tel (HQ): 01283 551249
Email: info@grm-uk.com
Web: www.grm-uk.com

Rotary Core Log

Borehole No.
BH104
Sheet 3 of 3

Site Name: CASICD - Christie Hospital, Wilmslow, Manchester

Ground Level (mAOD)
35.33

Client: IHP Projects (VINCI)

GRM Project Ref: P10525

Coordinates
384922 E
392547 N

Install	Water Strikes	Depth (m)	Coring TCR	Coring SCR	Coring RQD	FI	Depth (m)	Level (m)	Legend	Stratum Description
										Extremely weak to weak, becomes weak to medium strong with depth, orangish brown, medium to coarse grained SANDSTONE. Joint set 1 is sub-horizontal, widely spaced, planar rough with no infill. Joint set 2 is sub-vertical up to 65 degrees, very widely spaced with clay infill. Joint set 3 is sub-horizontal up to 10 degrees, moderately widely spaced, planar rough with sandy, clayey, mica rich infill. WILMSLOW SANDSTONE FORMATION
		16.70 - 18.20	100	89	41					*Becomes light brown in colour 16.60-16.65m.* *Becomes light brown in colour 17.20-17.25m.*
							18.20	17.13		End of Borehole at 18.200m

17 18 19 20 21 22 23 24

Crew: MACKLIN GEOTECH | **Equipment:** Comacchio 205 | **Logger:** AW

General Remarks:

Groundwater Remarks:
Groundwater standing at 3.80m.

Hole Started:	05/03/2024	Hole Complete:	07/03/2024	Version:	FINAL	Scale:	1:45

GRM Development Solutions Ltd
Laurus House,
First Avenue, Centrum 100,
Burton-on-Trent, DE14 2WH
Tel (HQ): 01283 551249
Email: info@grm-uk.com

Windowless Sample Borehole

Borehole No WS101
Sheet 1 of 1

Site Name: CASICD - Christie Hospital, Wilmslow, Manchester

Ground Level (mAOD) 35.30

Client: IHP Projects (VINCI)

GRM Project Ref: P10525

Coordinates 384927 E, 392604 N

Installation/ Backfill	Water Strike	Samples/Tests: Depth	Type	SPT Result	Depth (m)	Level (m)	Legend	Stratum Description
		0.30	ES		0.25	35.05		Brick pavers laid on sharp sand. MADE GROUND
		0.80	ES					Medium dense dark brown slightly clayey gravelly fine to coarse SAND with low cobble content. Gravel and cobbles are sandstone, brick fragments, concrete and quartzite. MADE GROUND
		1.20 - 1.65 1.20	D C	N=17 (3,3/3,4,5,5)	1.00	34.30		Dense dark red slightly clayey gravelly SAND, grading to very weak poorly cemented sandstone. WEATHERED WILMSLOW SANDSTONE FORMATION
		2.00 - 2.45 2.00	D C	N=50 (7,7/50 for 245mm)				
					2.45	32.85		End of Borehole at 2.450m

1 2 3 4 5

Crew: Macklin Geotechnical | **Logger:** RJH | **Weather:**

Equipment: Archway

Reason for termination of borehole: Refusal on very dense sand.

Groundwater Remarks:
No groundwater encountered.

General Remarks:

Hole Started: 28/04/2024 | **Hole Complete:** 28/04/2024 | **Version:** FINAL | **Scale:** 1:31

GRM Development Solutions Ltd
Laurus House,
First Avenue, Centrum 100,
Burton-on-Trent, DE14 2WH
Tel (HQ): 01283 551249
Email: info@grm-uk.com

Windowless Sample Borehole

Borehole No WS102
Sheet 1 of 1

Site Name: CASICD - Christie Hospital, Wilmslow, Manchester

Ground Level (mAOD) 35.56

Client: IHP Projects (VINCI)

GRM Project Ref: P10525

Coordinates 384915 E, 392577 N

Installation/ Backfill	Water Strike	Samples/Tests: Depth	Type	SPT Result	Depth (m)	Level (m)	Legend	Stratum Description
					0.05	35.51		Heavy duty lino and adhesive. MADE GROUND
					0.30	35.26		Floor screen over reinforced gravelly concrete and membrane. One layer of 8mm mesh at 0.20m begl. MADE GROUND
		0.45	ES		0.40	35.16		Type 1 MOT sub-base. MADE GROUND
		0.80	ES					Medium dense very dark brown slightly gravelly fine to coarse SAND. Gravel is angular coarse brick fragments and concrete. Organic odour below 0.70m begl. MADE GROUND
		1.20 - 1.65 1.20	D C	N=12 (3,3/2,3,4,3)				
					1.50	34.06		Medium dense brownish red and grey slightly gravelly fine to coarse SAND. Gravel is coarse angular sandstone. WEATHERED WILMSLOW SANDSTONE FORMATION
		2.00 - 2.45 2.00	D C	50 (10,13/50 for 195mm)				
					2.45	33.11		End of Borehole at 2.450m

Crew: Macklin Geotechnical | **Logger:** RJH | **Weather:**

Equipment: Archway

Reason for termination of borehole: Refusal on very dense sand.

Groundwater Remarks:
No groundwater encountered.

General Remarks:
Undertaken inside in small waiting room.

Hole Started:	Hole Complete:	Version:	Scale:
28/04/2024	28/04/2024	FINAL	1:31

GRM Development Solutions Ltd
Laurus House,
First Avenue, Centrum 100,
Burton-on-Trent, DE14 2WH
Tel (HQ): 01283 551249
Email: info@grm-uk.com

Windowless Sample Borehole

Borehole No WS103
Sheet 1 of 1

Site Name: CASICD - Christie Hospital, Wilmslow, Manchester

Ground Level (mAOD)

Client: IHP Projects (VINCI)

GRM Project Ref: P10525

Coordinates E N

Installation/ Backfill	Water Strike	Samples/Tests: Depth	Samples/Tests: Type	Samples/Tests: SPT Result	Depth (m)	Level (m)	Legend	Stratum Description
					0.15			Wooden floor. MADE GROUND
					0.45			Concrete MADE GROUND
					0.60			Extremely weak reddish brown fine to coarse SANDSTONE. WILMSLOW SANDSTONE FORMATION
								End of Borehole at 0.600m

Crew: GRM / DSUK **Logger:** RJH **Weather:**

Equipment: Concrete coring and hand digging tools.

Reason for termination of borehole: Refusal on rock.

Groundwater Remarks:
No groundwater encountered.

General Remarks:
Undertaken in basement. Unable to survey X,Y,Z coordinates.

Hole Started:	Hole Complete:	Version:	Scale:
28/04/2024	28/04/2024	FINAL	1:31

GRM Development Solutions Ltd
Laurus House,
First Avenue, Centrum 100,
Burton-on-Trent, DE14 2WH
Tel (HQ): 01283 551249
Email: info@grm-uk.com

Trial Pit Log

Trial Pit No TP101
Sheet 1 of 1

Site Name: CASICD - Christie Hospital, Wilmslow, Manchester

Ground Level (mAOD) 35.00

Client: IHP Projects (VINCI)

GRM Project Ref: P10525

Coordinates 384900 E, 392631 N

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.10	34.90		Tarmacadam/asphalt. MADE GROUND
				0.20	34.80		Medium dense, yellowish-brown, slightly sandy GRAVEL. Sand is fine to coarse. Gravel is fine to coarse, subangular limestone, quartzite and concrete. MADE GROUND
	0.40 - 0.50	ES					
	0.60 - 0.70	B					Northern end of the pit: Medium dense, orangish-brown, slightly gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded quartzite and limestone. MADE GROUND
							Southern end of pit: Medium dense, dark brown, slightly clayey, gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular sandstone, brick, quartzite, limestone and tarmacadam/asphalt between 0.20m and 1.10m.
				1.10	33.90		
	1.20 - 1.30	D					Medium dense, light brown, slightly gravelly, clayey SAND. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded sandstone. WEATHERED WILMSLOW SANDSTONE FORMATION
				1.30	33.70		End of Pit at 1.300m

1
2
3
4

Date Excavated: 05/03/2024
Date Backfilled: 05/03/2024
Shoring: None.
Stability: Stable during excavation.
Plant Used: Hand tools.
Logged by: AW

Groundwater Observations:
No groundwater encountered.

Trial Pit Dimensions (m):
0.50 × 0.60

Reason for termination of Trial Pit:
Target depth reached.

General Remarks:

Relative density is approximate and determined by observation only.

Version: FINAL

Scale: 1:25

GRM Development Solutions Ltd
Laurus House,
First Avenue, Centrum 100,
Burton-on-Trent, DE14 2WH
Tel (HQ): 01283 551249
Email: info@grm-uk.com

Trial Pit Log

Trial Pit No TP102
Sheet 1 of 1

Site Name: CASICD - Christie Hospital, Wilmslow, Manchester

Ground Level (mAOD) 34.89

Client: IHP Projects (VINCI)

GRM Project Ref: P10525

Coordinates 384897 E, 392629 N

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.10	34.79		Tarmacadam/asphalt. MADE GROUND
	0.30 - 0.40	ES		0.20	34.69		Medium dense, light yellowish-brown, slightly sandy GRAVEL. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular limestone, quartzite and concrete. MADE GROUND
							Northern side of pit: Medium dense, light orangish-brown, slightly gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded tarmacadam/asphalt and limestone. MADE GROUND
							Southern side of pit: Medium dense, dark brown, slightly gravelly, clayey SAND. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded brick, limestone, tarmacadam/asphalt between 0.20m and 1.00m.
	1.00 - 1.10	D		1.00	33.89		
				1.20	33.69		Soft, light brownish-grey, slightly sandy, gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded limestone and tarmacadam/ asphalt. MADE GROUND
							End of Pit at 1.200m

1
2
3
4

Date Excavated: 04/03/2024
Date Backfilled: 04/03/2024
Shoring: None.
Stability: Stable during excavation.
Plant Used: Hand tools.
Logged by: AW

Groundwater Observations:
Recovered damp between 0.70m and 0.80m.

Trial Pit Dimensions (m):
0.60 × 0.60

Reason for termination of Trial Pit:
Target depth reached.

General Remarks:

Relative density is approximate and determined by observation only.

Version: FINAL

Scale: 1:25

GRM Development Solutions Ltd
Laurus House,
First Avenue, Centrum 100,
Burton-on-Trent, DE14 2WH
Tel (HQ): 01283 551249
Email: info@grm-uk.com

Trial Pit Log

Trial Pit No TP103
Sheet 1 of 1

Site Name: CASICD - Christie Hospital, Wilmslow, Manchester

Ground Level (mAOD)

Client: IHP Projects (VINCI)

GRM Project Ref: P10525

Coordinates E N

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.05			Pale grey coarse angular GRAVEL of limestone. MADE GROUND
				0.10			Concrete slab. MADE GROUND
	0.30 - 0.40	ES					Medium dense orange brown gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse angular to subrounded brick fragments, tarmac, quartzite and large quartz crystals. MADE GROUND
				0.60			Medium dense orange brown slightly gravelly fine to coarse SAND. Gravel is coarse rounded quartzite. WEATHERED WILMSLOW SANDSTONE FORMATION
	0.80	B					
				1.20			End of Pit at 1.200m

1 2 3 4

Date Excavated: 17/03/2024
Date Backfilled:
Shoring: None.
Stability: Stable during excavation.
Plant Used: Hand tools.
Logged by: RJH

Groundwater Observations:
No groundwater encountered.

Trial Pit Dimensions (m):
0.50 × 0.60

Reason for termination of Trial Pit:
Target depth reached.

General Remarks: Enclosed courtyard, enable to survey X,Y,Z coordinates.

Relative density is approximate and determined by observation only.

Version: FINAL

Scale: 1:25

GRM Development Solutions Ltd
Laurus House,
First Avenue, Centrum 100,
Burton-on-Trent, DE14 2WH
Tel (HQ): 01283 551249
Email: info@grm-uk.com

Trial Pit Log

Trial Pit No TP104
Sheet 1 of 1

Site Name: CASICD - Christie Hospital, Wilmslow, Manchester

Ground Level (mAOD)

Client: IHP Projects (VINCI)

GRM Project Ref: P10525

Coordinates E N

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.10			Loose, light grey and brown GRAVEL. Gravel is fine to medium, subangular to subrounded limestone and quartzite. MADE GROUND
	0.30 - 0.40	ES		0.20			Paving slab. MADE GROUND
	0.50 - 0.60	B					Loose to medium dense, dark brown, slightly gravelly, clayey SAND. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular brick, concrete, limestone and quartzite. Rare concrete cobbles. MADE GROUND
	0.70 - 0.80	D		0.60			Medium dense, light brown, slightly gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded quartzite, concrete and sandstone. MADE GROUND
				1.20			End of Pit at 1.200m

1
2
3
4

Date Excavated: 08/03/2024
Date Backfilled: 08/03/2024
Shoring: None.
Stability: Stable during excavation.
Plant Used: Hand tools.
Logged by: AW

Groundwater Observations:
No groundwater encountered.

Trial Pit Dimensions (m):
0.40 × 0.50

Reason for termination of Trial Pit:
Target depth reached.

General Remarks: Enclosed courtyard, enable to survey X,Y,Z coordinates.

Relative density is approximate and determined by observation only.

Version: FINAL

Scale: 1:25

GRM Development Solutions Ltd
Laurus House,
First Avenue, Centrum 100,
Burton-on-Trent, DE14 2WH
Tel (HQ): 01283 551249
Email: info@grm-uk.com

Trial Pit Log

Trial Pit No TP105
Sheet 1 of 1

Site Name: CASICD - Christie Hospital, Wilmslow, Manchester

Ground Level (mAOD)

Client: IHP Projects (VINCI)

GRM Project Ref: P10525

Coordinates E N

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.15			2x slabs of concrete. MADE GROUND
				0.30			broken concrete gravel and COBBLES. MADE GROUND
	0.50	ES					Medium dense brown slightly clayey gravelly fine to coarse SAND with low cobble content. Cobbles are whole bricks and fragments. MADE GROUND
	0.80	B					
				1.20			End of Pit at 1.200m

1
2
3
4

Date Excavated: 17/03/2024
Date Backfilled:
Shoring: None.
Stability: Stable during excavation.
Plant Used: Hand tools.
Logged by: RJH

Groundwater Observations:
No groundwater encountered.

Trial Pit Dimensions (m):
0.50 × 0.60

Reason for termination of Trial Pit:
Target depth reached.

General Remarks: Enclosed courtyard, enable to survey X,Y,Z coordinates.

Relative density is approximate and determined by observation only.

Version: FINAL

Scale: 1:25

GRM Development Solutions Ltd
Laurus House,
First Avenue, Centrum 100,
Burton-on-Trent, DE14 2WH
Tel (HQ): 01283 551249
Email: info@grm-uk.com

Trial Pit Log

Trial Pit No
TP106
Sheet 1 of 1

Site Name: CASICD - Christie Hospital, Wilmslow, Manchester

Ground Level (mAOD)
35.19

Client: IHP Projects (VINCI)

GRM Project Ref: P10525

Coordinates
384915 E
392532 N

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.10	35.09		Paving slab. MADE GROUND
				0.30	34.89		Medium dense, grey and light yellow, sandy GRAVEL. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular brick, tarmacadam/asphalt, limestone and ceramic. MADE GROUND
	0.40	ES					
	0.50 - 0.60	B		0.50	34.69		Medium dense, reddish-brown and dark grey, gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular, brick, limestone, ceramic and plastic. MADE GROUND
							Dense, reddish-brown SAND. Sand is fine to coarse. WEATHERED WILMSLOW SANDSTONE FORMATION
				1.20	33.99		End of Pit at 1.200m

1
2
3
4

Date Excavated: 27/02/2024
Date Backfilled: 27/02/2024
Shoring: None.
Stability: Stable during excavation.
Plant Used: Hand tools.
Logged by: AW

Groundwater Observations:
No groundwater encountered.

Trial Pit Dimensions (m):
0.50
0.60

Reason for termination of Trial Pit:
Target depth reached.

General Remarks:

Relative density is approximate and determined by observation only.

Version: FINAL

Scale: 1:25

GRM Development Solutions Ltd
Laurus House,
First Avenue, Centrum 100,
Burton-on-Trent, DE14 2WH
Tel (HQ): 01283 551249
Email: info@grm-uk.com

Trial Pit Log

Trial Pit No TP107
Sheet 1 of 1

Site Name: CASICD - Christie Hospital, Wilmslow, Manchester

Ground Level (mAOD) 35.14

Client: IHP Projects (VINCI)

GRM Project Ref: P10525

Coordinates 384909 E, 392548 N

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.10	35.04		Brick paving. MADE GROUND
				0.30	34.84		Medium dense, light yellowish-brown, slightly gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded quartzite and limestone.
	0.40	ES		0.35	34.79		MADE GROUND
							Brick. MADE GROUND
	0.70	B					Medium dense, dark brown, clayey, gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular brick, limestone, quartzite and concrete. MADE GROUND
				1.20	33.94		End of Pit at 1.200m

1
2
3
4

Date Excavated: 27/02/2024
Date Backfilled: 28/02/2024
Shoring: None.
Stability: Stable during excavation.
Plant Used: Hand tools.
Logged by: AW

Groundwater Observations:
No groundwater encountered.

Trial Pit Dimensions (m):
0.40 × 0.50

Reason for termination of Trial Pit:
Target depth reached.

General Remarks:

Relative density is approximate and determined by observation only.

Version: FINAL

Scale: 1:25

APPENDIX F

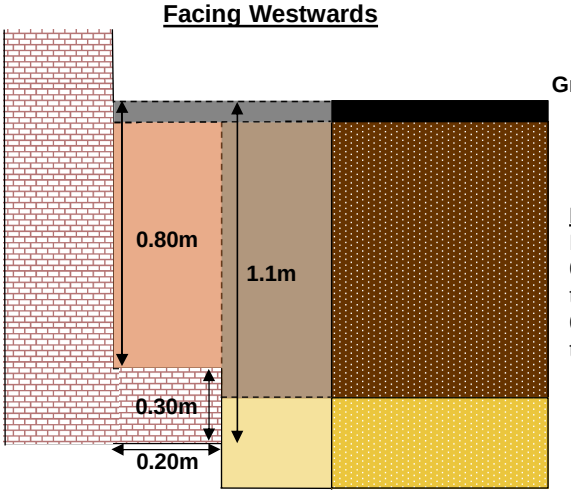
Facing Westwards

Tarmac/Asphalt. GL-0.10m

0.10-0.20m Medium dense yellowish Brown sligthly sandy GRAVEL.
MADE GROUND

0.20-1.10m Medium dense, dark brown, slightly clayey, gravelly SAND.
MADE GROUND.

1.10-1.30m Medium dense, light brown, slightly gravelly, clayey SAND.
WEATHERED WILMSLOW SANDSTONE FORMATION



1.2m total depth

Foundations observed:
Foundation slab encountered at 0.80m depth begl with a thickness of 0.30m extending 0.20m outwards from beneath the building.

DO NOT SCALE

NOTES:

GRM Development Solutions Ltd
Laurus House, First Ave, Centrum 100,
Burton-on-Trent, Staffordshire
Tel: 01283 551 249
info@grm-uk.com www.grm-uk.com

CLIENT:
Integrated Health Projects - VINCI

PROJECT:
Christie Hospital CASICD (Manchester)

TITLE:
Foundation Inspection Pit TP101

SCALE@SIZE :	ISSUE:
NTS	FINAL
DESIGN/DRAWN by :	DATE:
AW	15/3/24
PROJECT No:	DRAWING No:
P10525	001

© GRM Development Solutions Ltd
© Crown Copyright. AL 100014100

Facing Westwards

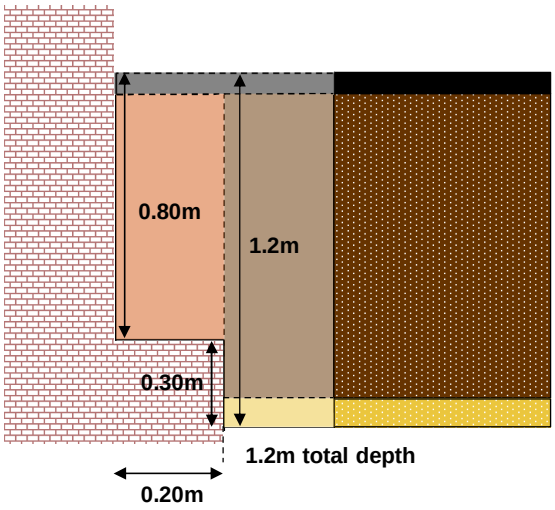
GL-0.10m Tarmac/Asphalt.

0.10-0.20m Medium dense yellowish brown slightly sandy GRAVEL.
MADE GROUND

Medium dense, orangish-brown, slightly gravelly SAND.
MADE GROUND.

0.20-1.0m Medium dense, dark brown, slightly clayey, gravelly SAND.
MADE GROUND.

1.0-1.20m Soft, light brownish-grey, slightly sandy, gravelly CLAY.
MADE GROUND



Foundations observed:
Foundation slab encountered at 0.80m depth begl base of the is slab not seen, slab extending 0.20m outwards from beneath the building.

DO NOT SCALE

NOTES:

GRM Development Solutions Ltd
Laurus House, First Ave, Centrum 100,
Burton-on-Trent, Staffordshire
Tel: 01283 551 249
info@grm-uk.com www.grm-uk.com

CLIENT:
Integrated Health Projects - VINCI

PROJECT:
Christie Hospital CASICD (Manchester)

TITLE:
Foundation Inspection Pit TP102

SCALE@SIZE :	ISSUE:
NTS	FINAL
DESIGN/DRAWN by :	DATE:
AW	15/3/24
PROJECT No:	DRAWING No:
P10525	002

© GRM Development Solutions Ltd
© Crown Copyright. AL 100014100

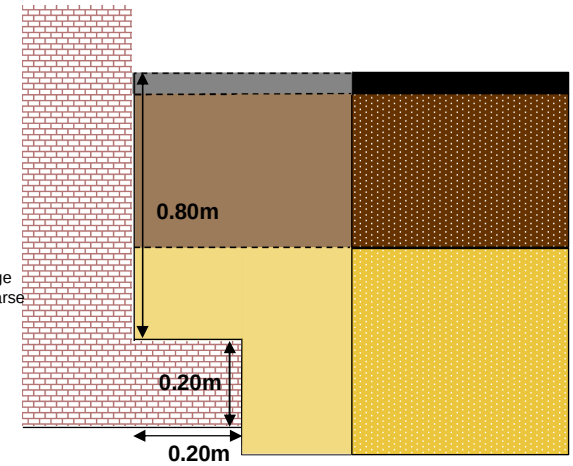
Facing Westwards

GL-0.10m Limestone gravel and concrete slab. MADEGROUND

0.05-0.10m Concrete Slab MADE GROUND.

0.10-0.60m Medium dense orange brown gravelly SAND. MADEGROUND

0.60-1.20m Medium dense orange brown slightly gravelly fine to coarse SAND. WEATHERED WILMSLOW SANDSTONE FORMATION



1.2m total depth begl

Foundations observed:
Foundation slab encountered at 0.80m depth begl the slab is 0.20m thick extending 0.20m outwards from beneath the building.

DO NOT SCALE

NOTES:

GRM Development Solutions Ltd
Laurus House, First Ave, Centrum 100,
Burton-on-Trent, Staffordshire
Tel: 01283 551 249
info@grm-uk.com www.grm-uk.com

CLIENT:
Integrated Health Projects - VINCI

PROJECT:
Christie Hospital CASICD (Manchester)

TITLE:
Foundation Inspection Pit TP103

SCALE@SIZE :	ISSUE:
NTS	FINAL
DESIGN/DRAWN by :	DATE:
AW	15/3/24
PROJECT No:	DRAWING No:
P10525	003

© GRM Development Solutions Ltd
© Crown Copyright. AL 100014100

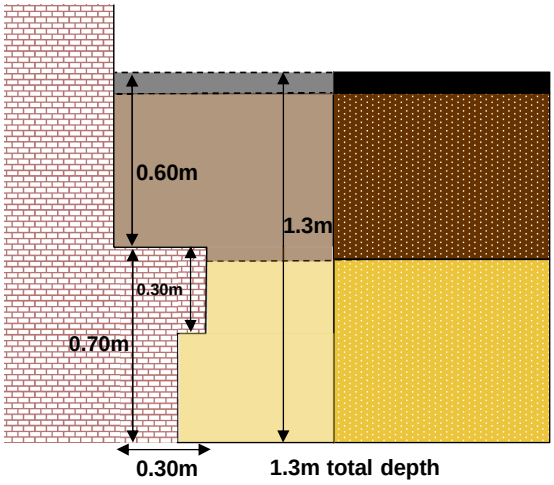
Facing Westwards

GL – 0.10m Loose light grey GRAVEL of limestone. MADE GROUND

0.10-0.20m Paving slabs. MADE GROUND

0.20-0.60m Loose to medium dense, dark brown, slightly gravelly, clayey SAND. MADE GROUND

0.60-1.20m Medium dense, light brown, slightly gravelly SAND. MADE GROUND



Foundations observed:
Foundation slab encountered at 0.60m depth begl with a thickness of 0.30m and extends 0.30m outwards from beneath the building above. Cement foundations continue sloping away towards the building base not seen.

DO NOT SCALE

NOTES:

GRM Development Solutions Ltd
Laurus House, First Ave, Centrum 100,
Burton-on-Trent, Staffordshire
Tel: 01283 551 249
info@grm-uk.com www.grm-uk.com

CLIENT:
Integrated Health Projects - VINCI

PROJECT:
Christie Hospital CASICD (Manchester)

TITLE:
Foundation Inspection Pit TP104

SCALE@SIZE :	ISSUE:
NTS	FINAL
DESIGN/DRAWN by :	DATE:
AW	15/3/24
PROJECT No:	DRAWING No:
P10525	004

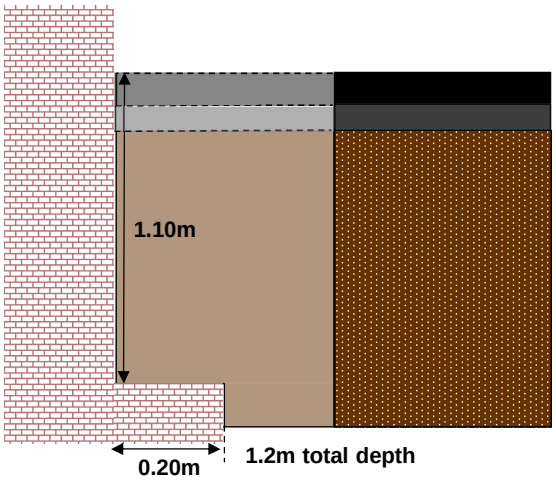
© GRM Development Solutions Ltd
© Crown Copyright. AL 100014100

Facing Westwards

GL-0.15m 2x concrete slabs.
MADE GROUND

0.15-0.30 Broken concrete gravel and COBBLES.
MADE GROUND

0.30-1.20m Medium dense brown slightly clayey gravelly fine to coarse SAND with low cobble content. Cobbles are whole bricks and fragments.
MADE GROUND



Ground Level

1.2m total depth

Foundations observed:
Foundation slab encountered at 1.10m depth begl base of the is slab not seen, slab extending 0.20m outwards from beneath the building.

DO NOT SCALE

NOTES:

GRM Development Solutions Ltd
Laurus House, First Ave, Centrum 100,
Burton-on-Trent, Staffordshire
Tel: 01283 551 249
info@grm-uk.com www.grm-uk.com

CLIENT:
Integrated Health Projects - VINCI

PROJECT:
Christie Hospital CASICD (Manchester)

TITLE:
Foundation Inspection Pit TP105

SCALE@SIZE :	ISSUE:
NTS	FINAL
DESIGN/DRAWN by :	DATE:
AW	15/3/24
PROJECT No:	DRAWING No:
P10525	005

© GRM Development Solutions Ltd
© Crown Copyright. AL 100014100

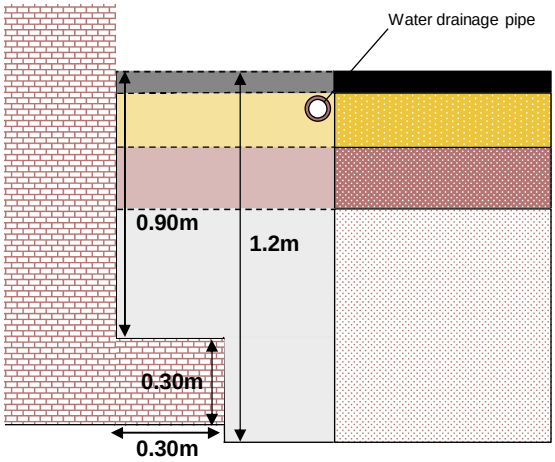
Facing Westwards

GL-0.10m Paving slab.
MADE GROUND

0.10-0.30 Medium dense, grey and light yellow, sandy GRAVEL.
MADE GROUND.

0.30-0.50m Medium dense, reddish-brown and dark grey, gravelly SAND.
MADE GROUND.

0.50-1.20 Dense, reddish-brown SAND. Sand is fine to coarse.
WEATHERED WILMSLOW SANDSTONE FORMATION



Foundations observed:
Foundation slab encountered at 0.90m depth begl with a thickness of 0.30m extending 0.30cm outwards from beneath the building.

DO NOT SCALE

NOTES:

GRM Development Solutions Ltd
Laurus House, First Ave, Centrum 100,
Burton-on-Trent, Staffordshire
Tel: 01283 551 249
info@grm-uk.com www.grm-uk.com

CLIENT:
Integrated Health Projects - VINCI

PROJECT:
Christie Hospital CASICD (Manchester)

TITLE:
Foundation Inspection Pit TP106

SCALE@SIZE :	ISSUE:
NTS	FINAL
DESIGN/DRAWN by :	DATE:
AW	15/3/24
PROJECT No:	DRAWING No:
P10525	006

© GRM Development Solutions Ltd
© Crown Copyright. AL 100014100

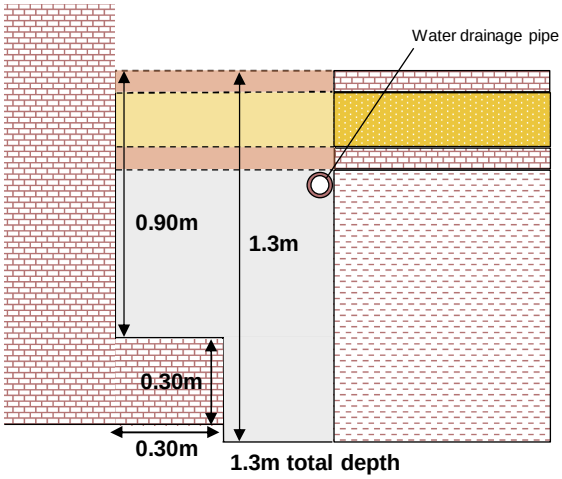
Facing Westwards

GL-0.10m Brick paving.
MADE GROUND

0.10-0.30m Medium dense, light yellowish-brown, slightly gravelly SAND.
MADE GROUND.

0.30-0.35m Crushed brick fragments.
MADE GROUND

0.35-1.20m Medium dense, dark brown, clayey, gravelly SAND.
MADE GROUND.



Foundations observed:
Foundation slab encountered at 0.90m depth begl with a thickness of 0.30m extending 0.30m outwards from beneath the building.

DO NOT SCALE

NOTES:

GRM Development Solutions Ltd
Laurus House, First Ave, Centrum 100,
Burton-on-Trent, Staffordshire
Tel: 01283 551 249
info@grm-uk.com www.grm-uk.com

CLIENT:
Integrated Health Projects - VINCI

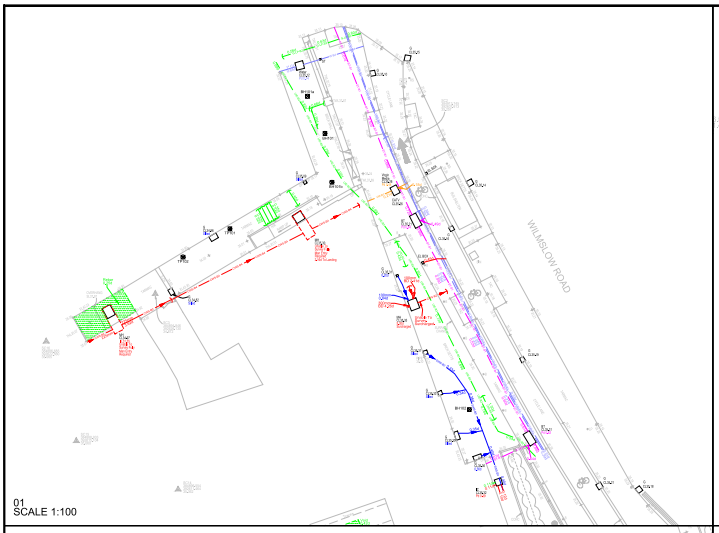
PROJECT:
Christie Hospital CASICD (Manchester)

TITLE:
Foundation Inspection Pit TP107

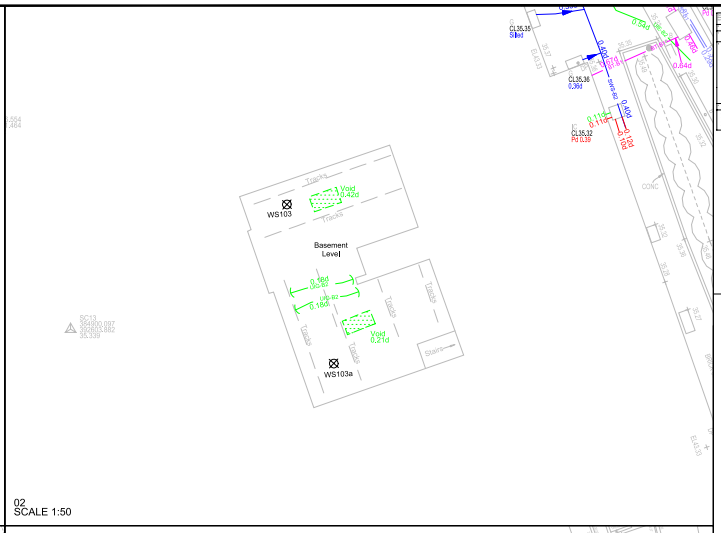
SCALE@SIZE :	ISSUE:
NTS	FINAL
DESIGN/DRAWN by :	DATE:
AW	15/3/24
PROJECT No:	DRAWING No:
P10525	007

© GRM Development Solutions Ltd
© Crown Copyright. AL 100014100

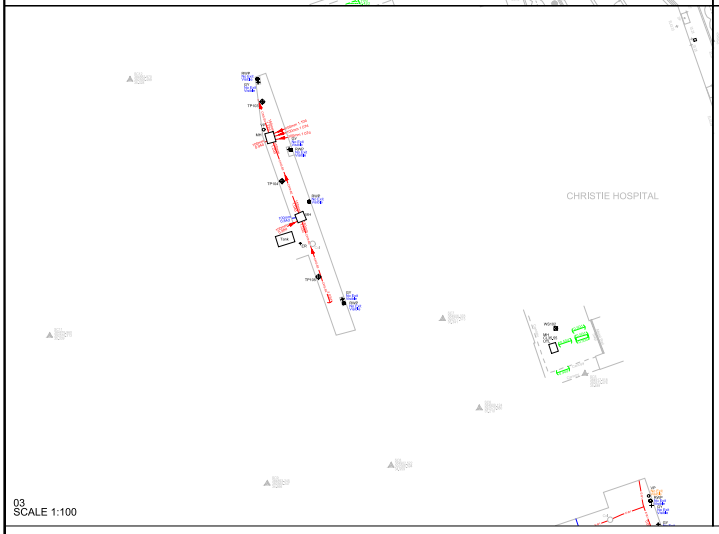
APPENDIX G



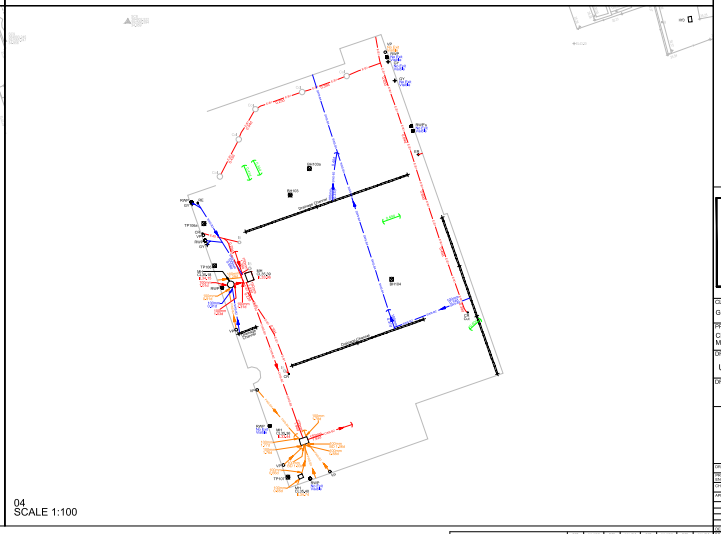
01
SCALE 1:100



02
SCALE 1:50



03
SCALE 1:100



04
SCALE 1:100

GENERAL NOTES

UTILITY & DRAINAGE LEGEND

ADDITIONAL SERVICE INFORMATION

UTILITIES ABBREVIATIONS

SERVICE LOCATION

CLIENT
GRM DEVELOPMENT SOLUTIONS

PROJECT TITLE
CHRISTIE HOSPITAL, WILMSLOW
MANCHESTER, M20 4BX

DRAWING DETAIL
UTILITY CLEARANCE SURVEY

DRAWING STATUS
INFORMATION

UK LAND & UNDERGROUND

DRAWN	JP	DATE	28/04/2024
DESIGNED	JP	SCALE	SEE INSET
CHECKED	MAJ		DRAWN PLOTTED @ A3
APPROVED	MAJ		

REVISIONS	REV	DTE	ORIG	PROJECT
DRAWING NUMBER				SHEET NUMBER
UKUG_2428_01_UTILITY				1 OF 1

ALWAYS USE SAFE DIGGING PRACTICES. ALWAYS CONSULT A TRAINED AND COMPETENT PERSON TO CHECK YOUR EXCAVATION AREA BEFORE BREAKING GROUND

AVAILABILITY OF RECORD DRAWINGS

APPENDIX H

GRM
PHOTOGRAPHIC BOARD
Laurus House, First Avenue
Centrum 100, Burton on Trent
DE14 2WH
01283 551249
info@grm-uk.com
www.grm-uk.com
PROJECT NAME
CASCID - Choffie Hosp
BOX NO.
DATE
MARCH 24
PROJECT NO.
P10525
HOLE NO.
BH101
DEPTH FROM
2·60
M
DEPTH TO
4·80
M
Grey Scale
Colour Control Patches
Blue
Cyan
Green
Yellow
Red
Magenta
White
3/Colour
Black
0.0m
0.1m
0.2m
0.3m
0.4m
0.5m
0.6m
0.7m
0.8m
0.9m
1.0m
2·60
3·30
4·80

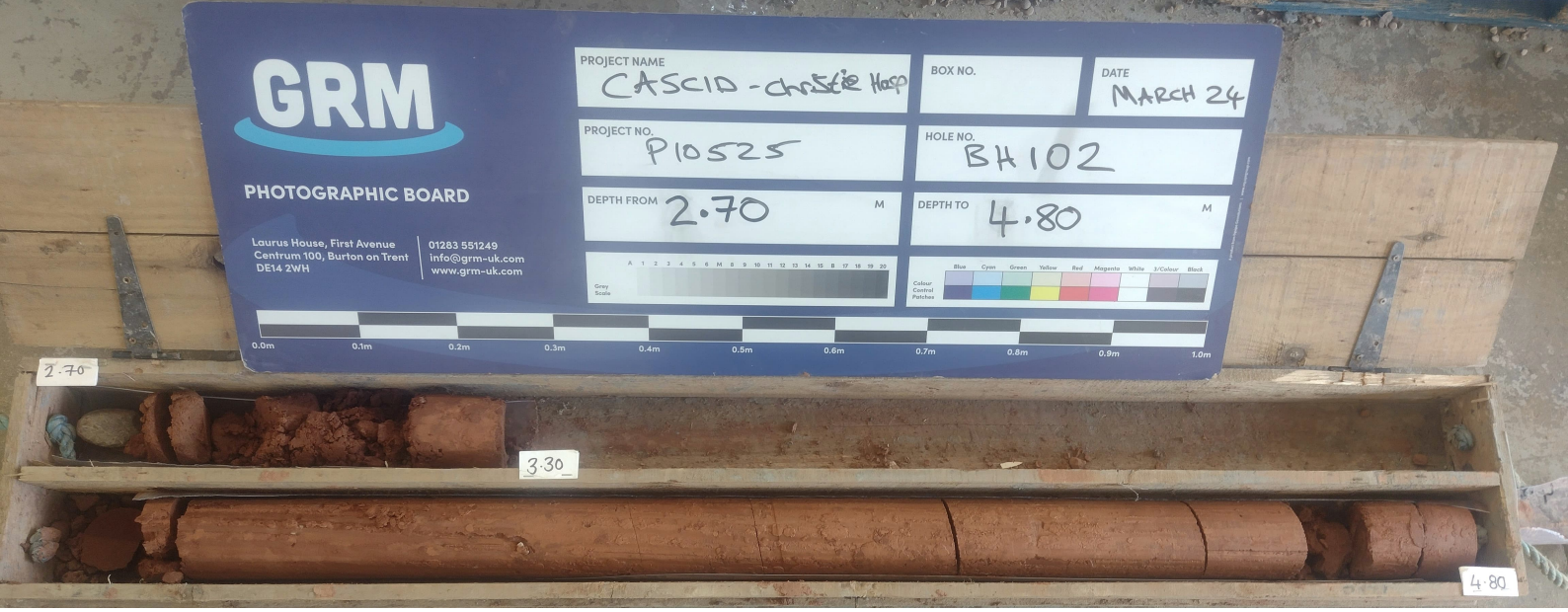
GRM
PHOTOGRAPHIC BOARD
Laurus House, First Avenue
Centrum 100, Burton on Trent
DE14 2WH
01283 551249
info@grm-uk.com
www.grm-uk.com
PROJECT NAME
CASCID - Christie Hosp
BOX NO.
DATE
MARCH 24
PROJECT NO.
P10525
HOLE NO.
BH101
DEPTH FROM
4·80
M
DEPTH TO
7·80
M
Blue
Cyan
Green
Yellow
Red
Magenta
White
Black
0.0m
0.1m
0.2m
0.3m
0.4m
0.5m
0.6m
0.7m
0.8m
0.9m
1.0m

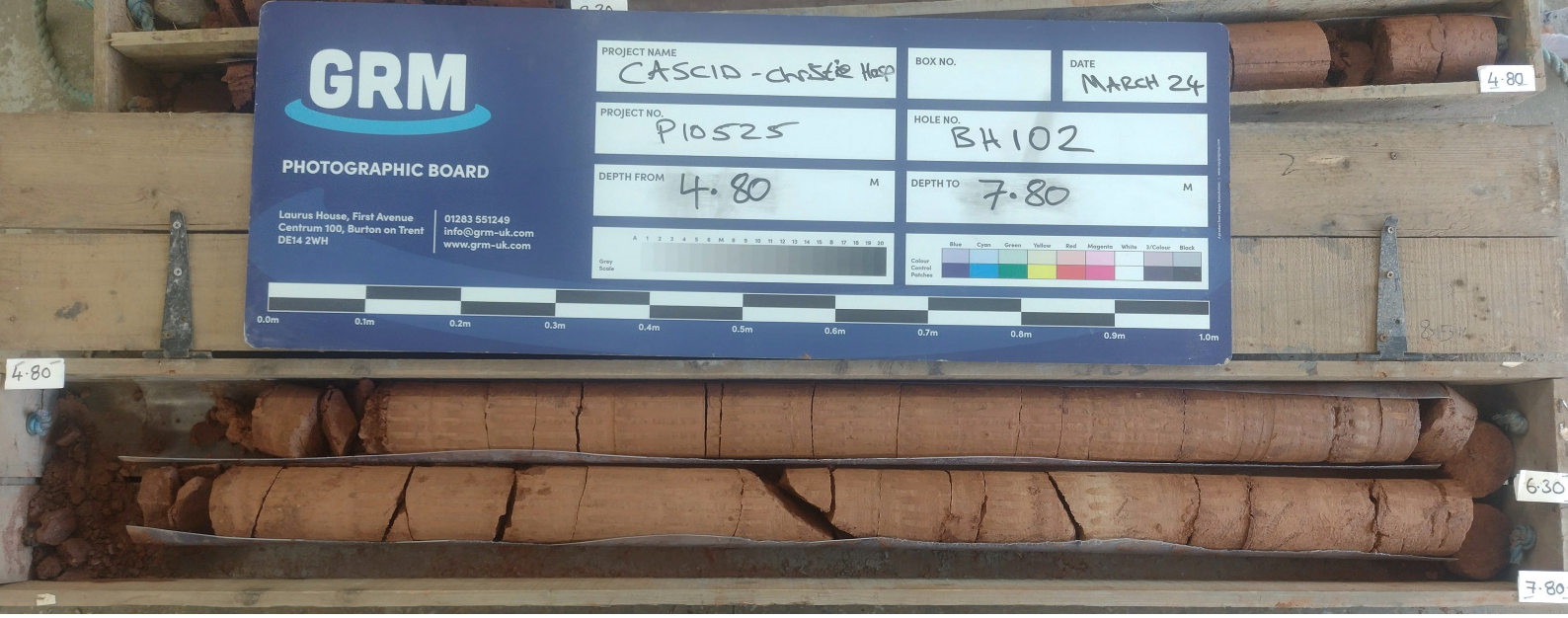
GRM
PHOTOGRAPHIC BOARD
Laurus House, First Avenue
Centrum 100, Burton on Trent
DE14 2WH
01283 551249
info@grm-uk.com
www.grm-uk.com
PROJECT NAME
CASCID - Christie Hosp
BOX NO.
DATE
MARCH 24
PROJECT NO.
P10525
HOLE NO.
BH101
DEPTH FROM
7·80
M
DEPTH TO
10·80
M
Grey Scale
Colour Control Patches
Blue
Cyan
Green
Yellow
Red
Magenta
White
3/Colour
Black
0.0m
0.1m
0.2m
0.3m
0.4m
0.5m
0.6m
0.7m
0.8m
0.9m
1.0m
9.30
10·8

GRM
PHOTOGRAPHIC BOARD
Laurus House, First Avenue
Centrum 100, Burton on Trent
DE14 2WH
01283 551249
info@grm-uk.com
www.grm-uk.com
PROJECT NAME
CASCID - Christie Hosp
BOX NO.
DATE
MARCH 24
PROJECT NO.
P10525
HOLE NO.
BH101
DEPTH FROM
10.80
M
DEPTH TO
13.80
M
Grey Scale
Colour Control Patches
Blue
Cyan
Green
Yellow
Red
Magenta
White
3 Colour
Black
0.0m
0.1m
0.2m
0.3m
0.4m
0.5m
0.6m
0.7m
0.8m
0.9m
1.0m
12.30
13.80

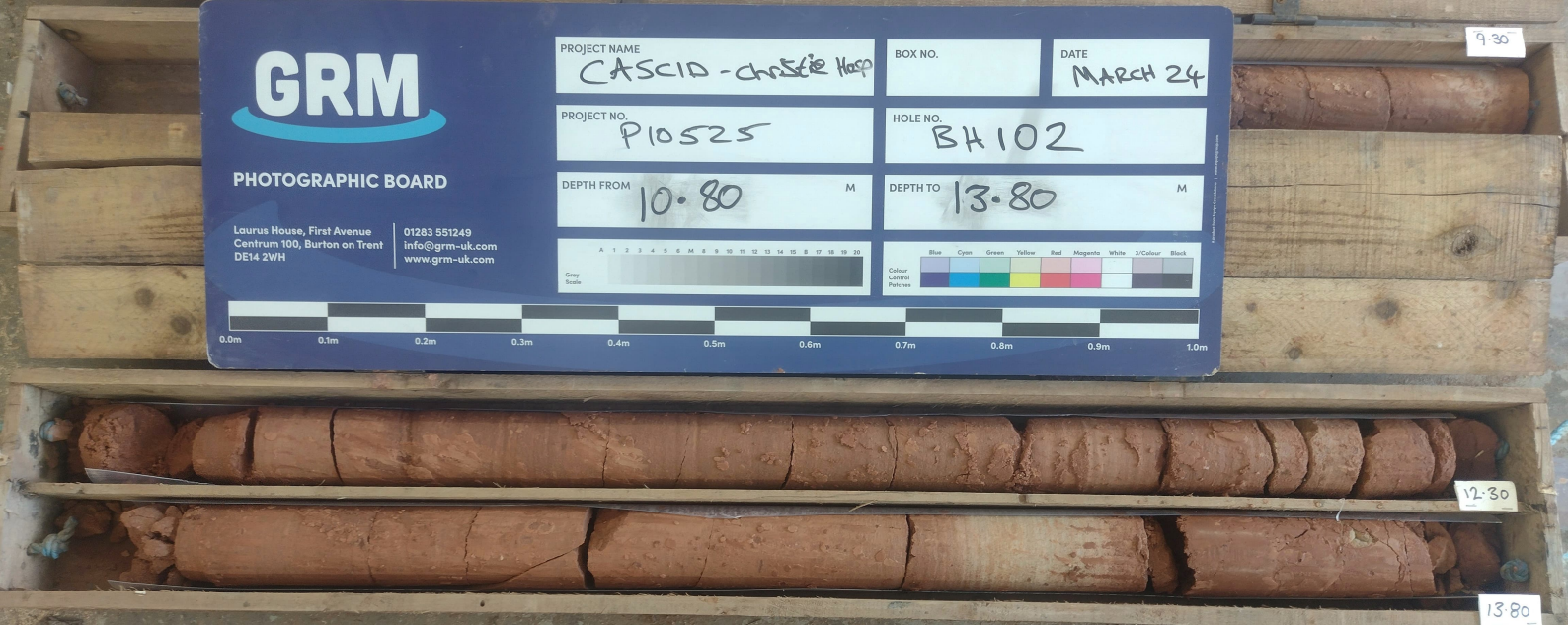
GRM
PHOTOGRAPHIC BOARD
Laurus House, First Avenue
Centrum 100, Burton on Trent
DE14 2WH
01283 551249
info@grm-uk.com
www.grm-uk.com
PROJECT NAME
CASCID - christie Hosp
BOX NO.
DATE
MARCH 24
PROJECT NO.
P10525
HOLE NO.
BH101
DEPTH FROM
13.80
M
DEPTH TO
16.80
M
Grey Scale
Colour Control Patches
Blue
Cyan
Green
Yellow
Red
Magenta
White
3/Colour
Black
0.0m
0.1m
0.2m
0.3m
0.4m
0.5m
0.6m
0.7m
0.8m
0.9m
1.0m
15.30
16.80

GRM
PHOTOGRAPHIC BOARD
Laurus House, First Avenue
Centrum 100, Burton on Trent
DE14 2WH
01283 551249
info@grm-uk.com
www.grm-uk.com
PROJECT NAME
CASCID - Christie Hosp
BOX NO.
DATE
MARCH 24
PROJECT NO.
P10525
HOLE NO.
BH101
DEPTH FROM
16.80
M
DEPTH TO
18.30
M
Grey Scale
Colour Control Patches
Blue
Cyan
Green
Yellow
Red
Magenta
White
3/Colour
Black
0.0m
0.1m
0.2m
0.3m
0.4m
0.5m
0.6m
0.7m
0.8m
0.9m
1.0m
1830


GRM
PHOTOGRAPHIC BOARD
Laurus House, First Avenue
Centrum 100, Burton on Trent
DE14 2WH
01283 551249
info@grm-uk.com
www.grm-uk.com
PROJECT NAME
CASCID - Chrome Harp
BOX NO.
DATE
MARCH 24
PROJECT NO.
P10525
HOLE NO.
BH102
DEPTH FROM
2.70
M
DEPTH TO
4.80
M
Grey Scale
Colour Control Patches
Blue
Cyan
Green
Yellow
Red
Magenta
White
3/Colour
Black
0.0m
0.1m
0.2m
0.3m
0.4m
0.5m
0.6m
0.7m
0.8m
0.9m
1.0m
2.70
3.30
4.80


GRM
PHOTOGRAPHIC BOARD
Laurus House, First Avenue
Centrum 100, Burton on Trent
DE14 2WH
01283 551249
info@grm-uk.com
www.grm-uk.com
PROJECT NAME
CASCID - Christie Hosp
BOX NO.
DATE
MARCH 24
PROJECT NO.
P10525
HOLE NO.
BH102
DEPTH FROM
4.80
M
DEPTH TO
7.80
M
Gray Scale
Colour Control Patches
Blue
Cyan
Green
Yellow
Red
Magenta
White
3/Colour
Black
0.0m
0.1m
0.2m
0.3m
0.4m
0.5m
0.6m
0.7m
0.8m
0.9m
1.0m
4.80
6.30
7.80

GRM
PHOTOGRAPHIC BOARD
Laurus House, First Avenue
Centrum 100, Burton on Trent
DE14 2WH
01283 551249
info@grm-uk.com
www.grm-uk.com
PROJECT NAME
CASCID - Christie Hosp
BOX NO.
DATE
MARCH 24
PROJECT NO.
P10525
HOLE NO.
BH102
DEPTH FROM
7.80
M
DEPTH TO
10.80
M
Grey Scale
Colour Control Patches
Blue
Cyan
Green
Yellow
Red
Magenta
White
3/Colour
Black
0.0m
0.1m
0.2m
0.3m
0.4m
0.5m
0.6m
0.7m
0.8m
0.9m
1.0m
9.30
10.80


GRM
PHOTOGRAPHIC BOARD
Laurus House, First Avenue
Centrum 100, Burton on Trent
DE14 2WH
01283 551249
info@grm-uk.com
www.grm-uk.com
PROJECT NAME
CASCID - Chalkie Heap
BOX NO.
DATE
MARCH 24
PROJECT NO.
P10525
HOLE NO.
BH102
DEPTH FROM
10.80
M
DEPTH TO
13.80
M
Grey Scale
Colour Control Patches
Blue
Cyan
Green
Yellow
Red
Magenta
White
3/Colour
Black
0.0m
0.1m
0.2m
0.3m
0.4m
0.5m
0.6m
0.7m
0.8m
0.9m
1.0m
9.30
12.30
13.80

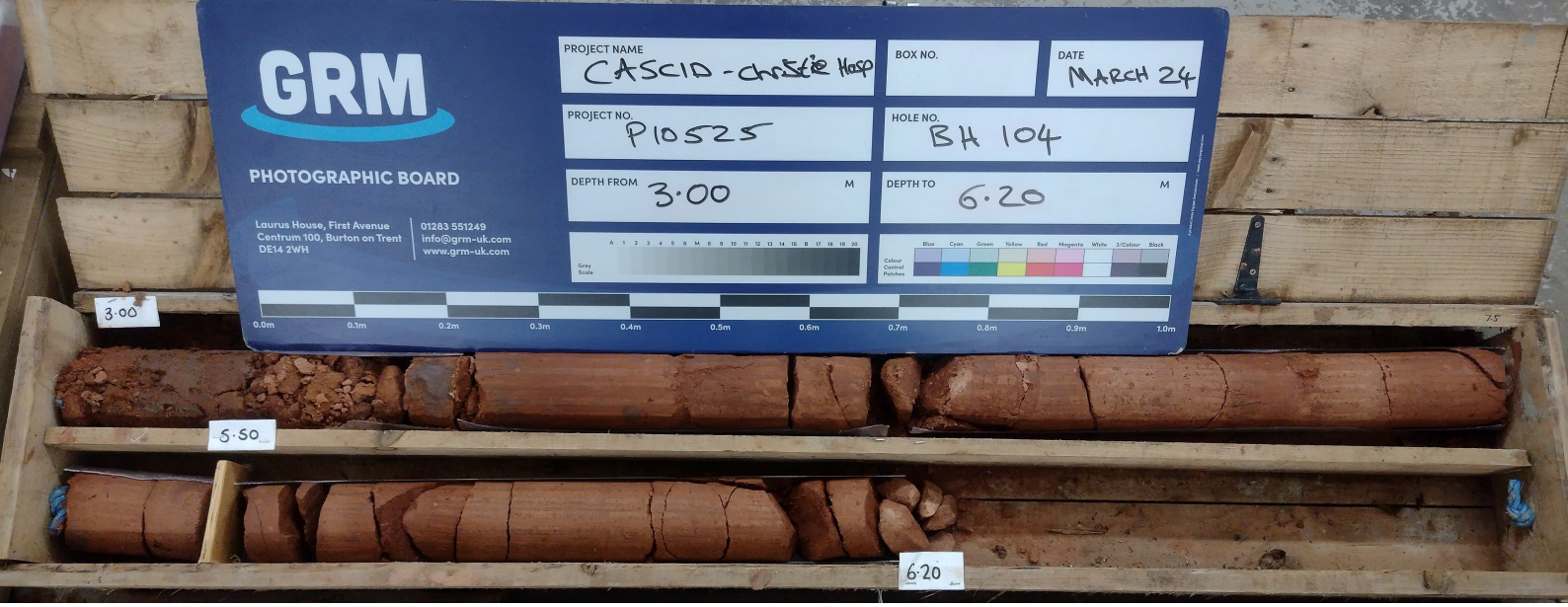
GRM
PHOTOGRAPHIC BOARD
Laurus House, First Avenue
Centrum 100, Burton on Trent
DE14 2WH
01283 551249
info@grm-uk.com
www.grm-uk.com
PROJECT NAME
CASCID - Christie Hosp
BOX NO.
DATE
MARCH 24
PROJECT NO.
P10525
HOLE NO.
BH102
DEPTH FROM
13.80
M
DEPTH TO
16.80
M
Grey Scale
Colour Control Patches
Blue
Cyan
Green
Yellow
Red
Magenta
White
3/Colour
Black
0.0m
0.1m
0.2m
0.3m
0.4m
0.5m
0.6m
0.7m
0.8m
0.9m
1.0m
15.30
16.90

GRM
PHOTOGRAPHIC BOARD
Laurus House, First Avenue
Centrum 100, Burton on Trent
DE14 2WH
01283 551249
info@grm-uk.com
www.grm-uk.com
PROJECT NAME
CASCID - christie Hosp
BOX NO.
DATE
MARCH 24
PROJECT NO.
P10525
HOLE NO.
BH102
DEPTH FROM
16.80
M
DEPTH TO
18.30
M
Grey Scale
Colour Control Patches
Blue
Cyan
Green
Yellow
Red
Magenta
White
3/Colour
Black
0.0m
0.1m
0.2m
0.3m
0.4m
0.5m
0.6m
0.7m
0.8m
0.9m
1.0m
15.30

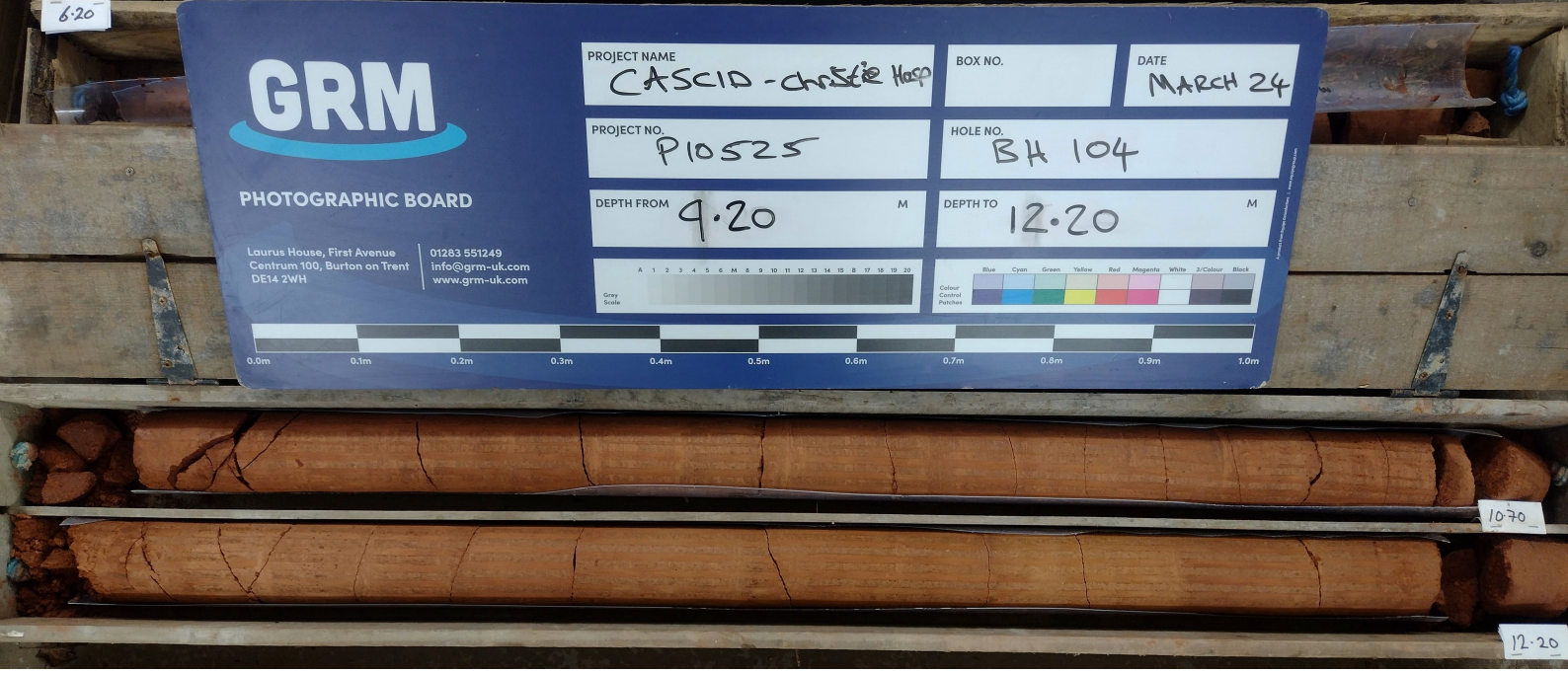
GRM
Laurus House, First Avenue
Centrum 100, Burton on Trent
DE14 2WH
01283 551249
info@grm-uk.com
www.grm-uk.com
PROJECT NAME
CASCID - chaste
PROJECT NO.
P10525
ENGINEER
MotM
CLIENT
IHP VINCI
LOCATION I.D.
BH103
DATE
06.03.24
DEPTH FROM
3.00
M TO
5.50
M
3.00
AZCL
4.00
AZCL
5.50

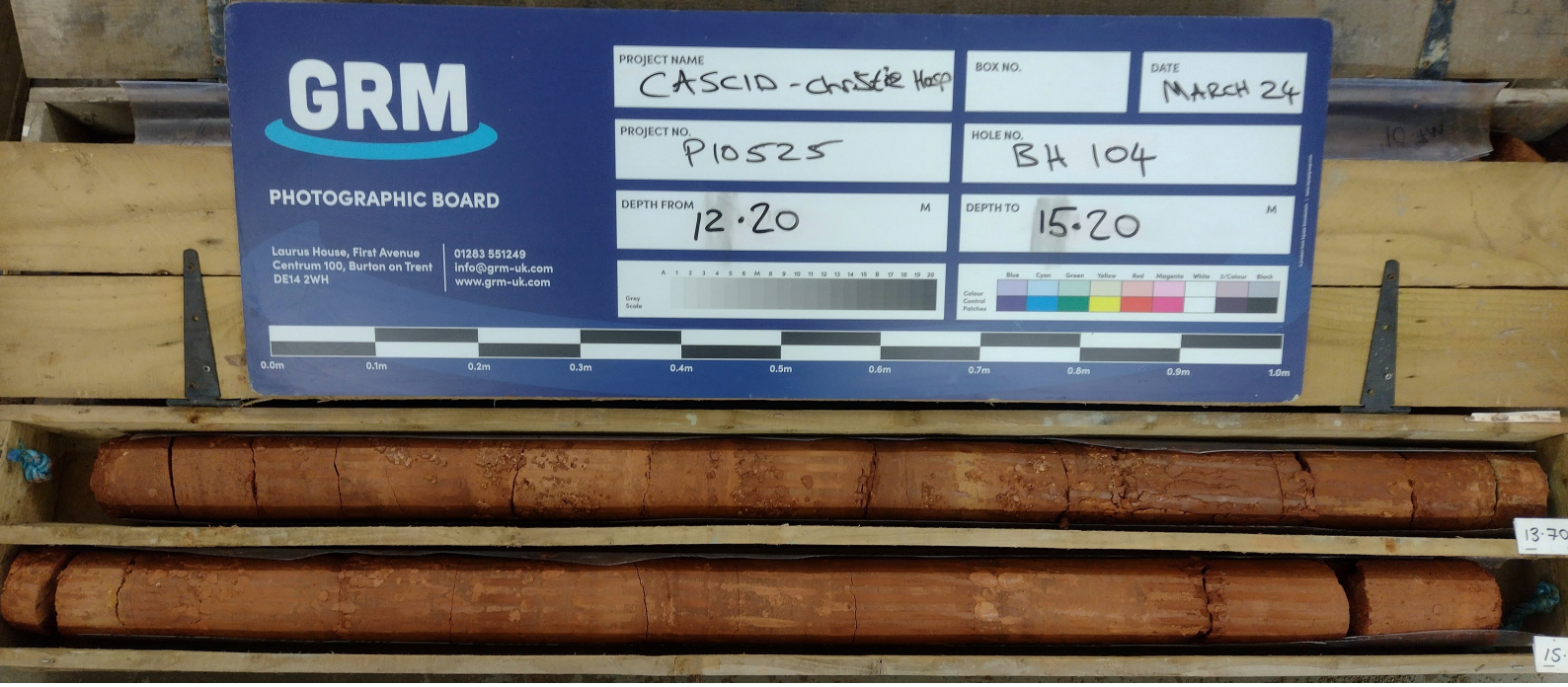
GRM
Laurus House, First Avenue
Centrum 100, Burton on Trent
DE14 2WH
01283 551249
info@grm-uk.com
www.grm-uk.com
PROJECT NAME
CASCID - chalkie
PROJECT NO.
P10525
ENGINEER
Mott M
CLIENT
IHP VINCI
LOCATION I.D.
BH103
DATE
06.03.24
DEPTH FROM
5.50
M TO
8.50
M
Grey Scale
Colour Control Patches
Blue
Cyan
Green
Yellow
Red
Magenta
White
3/Colour
Black
0.0m
0.1m
0.2m
0.3m
0.4m
0.5m
5.50
AZCL
7.00
AZCL
8.5

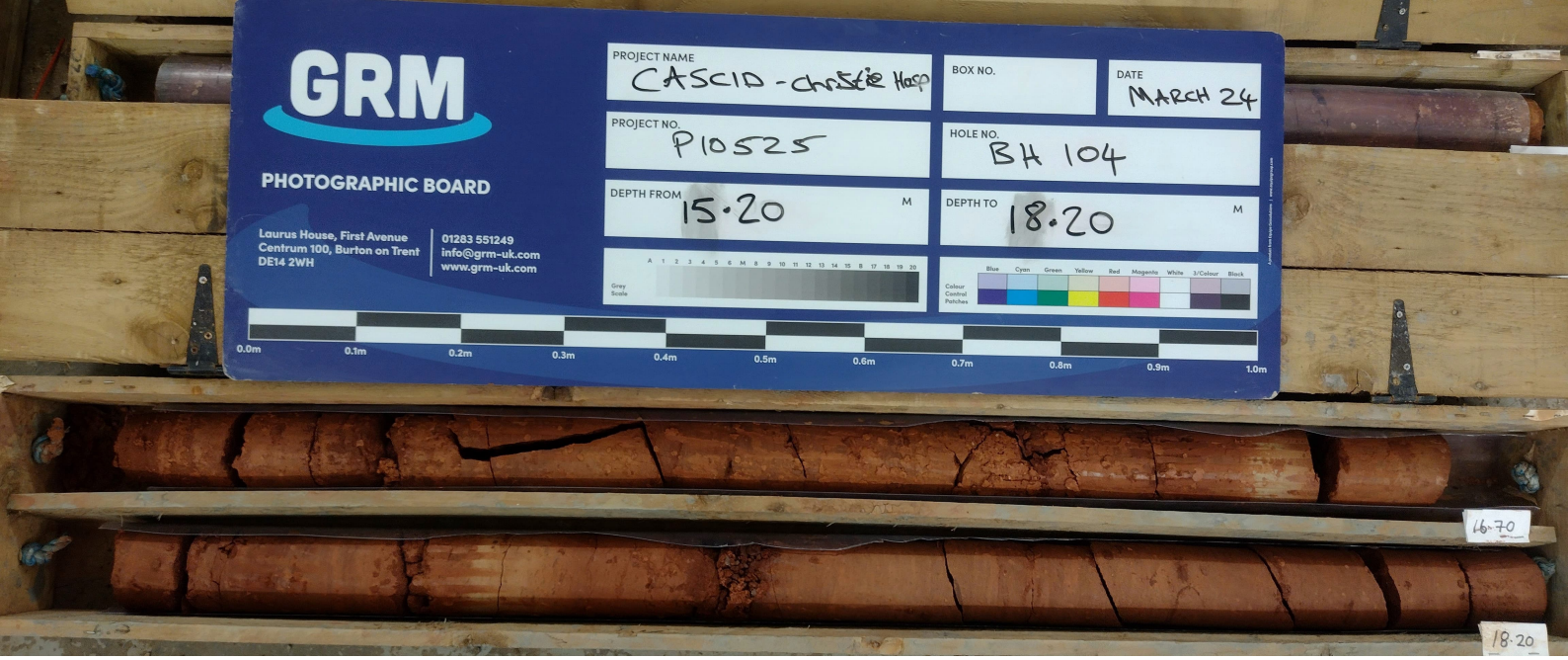
GRM
Laurus House, First Avenue
Centrum 100, Burton on Trent
DE14 2WH
01283 551249
info@grm-uk.com
www.grm-uk.com
PROJECT NAME CASCID - chobtle
PROJECT NO. P10525
ENGINEER MotT M
CLIENT IHP VINCI
LOCATION I.D. BH103
DATE 06.03.24
DEPTH FROM 8.50 M TO 11.50 M
8.50
AZCL
AZCL


GRM
PHOTOGRAPHIC BOARD
Laurus House, First Avenue
Centrum 100, Burton on Trent
DE14 2WH
01283 551249
info@grm-uk.com
www.grm-uk.com
PROJECT NAME
CASCID - Chaffie Hosp
BOX NO.
DATE
MARCH 24
PROJECT NO.
P10525
HOLE NO.
BH 104
DEPTH FROM
3.00
M
DEPTH TO
6.20
M
Grey Scale
Colour Control Patches
Blue
Cyan
Green
Yellow
Red
Magenta
White
3/Colour
Black
3.00
5.50
6.20
0.0m
0.1m
0.2m
0.3m
0.4m
0.5m
0.6m
0.7m
0.8m
0.9m
1.0m

GRM
PHOTOGRAPHIC BOARD
Laurus House, First Avenue
Centrum 100, Burton on Trent
DE14 2WH
01283 551249
info@grm-uk.com
www.grm-uk.com
PROJECT NAME
CASCID - Chrisse Hagg
BOX NO.
DATE
MARCH 24
PROJECT NO.
P10525
HOLE NO.
BH 104
DEPTH FROM
6·20
M
DEPTH TO
9·20
M
Grey Scale
Colour Control Patches
Blue
Cyan
Green
Yellow
Red
Magenta
White
3/Colour
Black
0.0m
0.1m
0.2m
0.3m
0.4m
0.5m
0.6m
0.7m
0.8m
0.9m
1.0m
7·70
9·20


6.20
GRM
PHOTOGRAPHIC BOARD
Laurus House, First Avenue
Centrum 100, Burton on Trent
DE14 2WH
01283 551249
info@grm-uk.com
www.grm-uk.com
PROJECT NAME
CASCID - Christie Hosp
BOX NO.
DATE
MARCH 24
PROJECT NO.
P10525
HOLE NO.
BH 104
DEPTH FROM
9.20
M
DEPTH TO
12.20
M
Grey Scale
Colour Control Patches
Blue
Cyan
Green
Yellow
Red
Magenta
White
3/Colour
Black
0.0m
0.1m
0.2m
0.3m
0.4m
0.5m
0.6m
0.7m
0.8m
0.9m
1.0m
10.70
12.20


GRM
PHOTOGRAPHIC BOARD
Laurus House, First Avenue
Centrum 100, Burton on Trent
DE14 2WH
01283 551249
info@grm-uk.com
www.grm-uk.com
PROJECT NAME
CASCID - Chrissie Harp
BOX NO.
DATE
MARCH 24
PROJECT NO.
P10525
HOLE NO.
BH 104
DEPTH FROM
12·20
M
DEPTH TO
15·20
M
Grey Scale
Colour Control Patches
Blue
Cyan
Green
Yellow
Red
Magenta
White
3/Colour
Black
0.0m
0.1m
0.2m
0.3m
0.4m
0.5m
0.6m
0.7m
0.8m
0.9m
1.0m
13·70
15·


GRM
PHOTOGRAPHIC BOARD
Laurus House, First Avenue
Centrum 100, Burton on Trent
DE14 2WH
01283 551249
info@grm-uk.com
www.grm-uk.com
PROJECT NAME
CASCID - Crossfield Hosp
BOX NO.
DATE
MARCH 24
PROJECT NO.
P10525
HOLE NO.
BH 104
DEPTH FROM
15.20
M
DEPTH TO
18.20
M
Grey Scale
Colour Control Patches
Blue
Cyan
Green
Yellow
Red
Magenta
White
3/Colour
Black
0.0m
0.1m
0.2m
0.3m
0.4m
0.5m
0.6m
0.7m
0.8m
0.9m
1.0m
16.70
18.20

APPENDIX I

In-Situ Gas Monitoring Results

Project Name:	CASICD Christie Hospital
Project Number:	P10525
Client:	IHP
Date:	05.04.2024
Weather:	Dry
Atmospheric Pressure (mb):	*Number
Pressure Trend:	
Equipment:	
Operator:	Liam Press

Ground Gases														Groundwater	
Well ID	Response Zone (mbegl)			Methane (%v/v)		Carbon Dioxide (%v/v)		Oxygen (%v/v)		Gas Flow (l/h)		PID Reading (ppm)		Depth to Groundwater (mbegl)	Total Well Depth (mbegl)
	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady	Peak	Steady		
BH101	3.0	8.0	NAT											4.10	7.80
BH104	3.0	8.0	NAT											4.25	8.01

Comments: Both locations bailed; with BH101 having very slow recharge, BH104 recharging at 1cm every 4 seconds.

Notes

L.E.L.	Lower Explosive Limit (100% L.E.L.'= 5% Flammable Gas)	Highlighted cell for following conditions:	
N.D.	Not Detected	a.	Methane ≥1% v/v
N.R.	Not Recorded	b.	Carbon Dioxide ≥5% v/v
PID	Photo-Ionising Detector	MG	Made Ground
%	By volume	NS	Natural Strata

In-Situ Gas Monitoring Results

Project Name:	CASICD Christie Hospital
Project Number:	P10525
Client:	IHP
Date:	08.05.2024
Weather:	
Atmospheric Pressure (mb):	*Number
Pressure Trend:	
Equipment:	
Operator:	

Ground Gases														Groundwater	
Well ID	Response Zone (mbegl)			Methane (%v/v)		Carbon Dioxide (%v/v)		Oxygen (%v/v)		Gas Flow (l/h)		PID Reading (ppm)		Depth to Groundwater (mbegl)	Total Well Depth (mbegl)
	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady	Peak	Steady		
BH101	3.0	8.0	NAT											4.13	7.63
BH104	3.0	8.0	NAT											4.39	8.04

Comments:

Notes

L.E.L.	Lower Explosive Limit (100% L.E.L.'= 5% Flammable Gas)	Highlighted cell for following conditions:	
N.D.	Not Detected	a.	Methane ≥1% v/v
N.R.	Not Recorded	b.	Carbon Dioxide ≥5% v/v
PID	Photo-Ionising Detector	MG	Made Ground
%	By volume	NS	Natural Strata

APPENDIX J

4161

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

GRM Development Solutions
Laurus House
First Avenue
Centrum 100
Burton Upon Trent
DE14 2WH

Analytical Test Report: L24/01949/GRM - 24-42528-A

Your Project Reference:	**CASCID-Christie Hospital, Manchester P10525**		
Your Order Number:	P10525	Samples Received / Instructed:	07/03/2024 / 07/03/2024
Report Issue Number:	1	Sample Tested:	07/03 to 26/03/2024
Samples Analysed:	4 soil samples	Report issued:	26/03/2024

Signed
[redacted]
CTS Group

Notes:

General
26/03/2024 report amended to show extra testing
Please refer to Methodologies page for details pertaining to the analytical methods undertaken.

Samples will be retained for 14 days after issue of this report with the exception of the asbestos test portion which is held for 6 months unless otherwise requested.

Moisture Content was determined in accordance with CTS method statement MS - CL - Sample Prep, oven dried at <30˚C.

Moisture Content is reported as a percentage of the dry mass of soil, this calculation is in accordance with BS1377, Part 2, 1990, Clause 3.2

Stone Content was determined in accordance with CTS method statement MS - CL - Sample Prep and refers to the percentage of stones retained on a 10mm BS test sieve.

Where specification limits are included these are for guidance only. Where a measured value has been highlighted this is not implying acceptance or failure and certainty of measurement values have not been taken into account.

Uncertainty of measurement values are available on request.

Samples were supplied by customer, results apply to the samples as received.

Asbestos

Please note: Where futher analaysis is required samples identified as containing asbestos are screened and tested on an as recevied basis. No correction is made for moisture content and these results are not covered by our accrediation

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation

WAC Testing

Samples were leached in accordance with BS EN 12457-2: 2002.

Eluate Results are reported as L/S 10. These results have been calculated in accordance with BS EN 12457-2:2002.

Comparative values are taken from the Council Decision Annex - CRITERIA AND PROCEDURES FOR THE ACCEPTANCE OF WASTE AT LANDFILLS, (2003/33/EC).

Deviating Samples

On receipt samples are compared against our sample holding and handling protocols, where any deviations have been noted these are reported on our deviating sample page (if present)

Accreditation Key

UKAS = UKAS Accreditation, MCERTS = MCERTS Accreditation, u = Unaccredited, subUKAS - Subcontracted to a laboratory UKAS accredited for this test

MCERTS Accreditation only covers the SAND, CLAY and LOAM matrices

Date of Issue: 18.03.2024

Issued by: J. Gane

Issue No: 4

Rev No: 6

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42528-A

Project Reference - CASCID-Christie Hospital, Manchester
P10525

Analytical Test Results - Solid

Lab Reference			345250	345251	345252
Client Sample ID			-	-	-
Client Sample Location			BH104	BH103A	BH103
Client Sample Type			ES	ES	ES
Client Sample Number			-	-	-
Depth - Top (m)			0.30	0.10	0.70
Depth - Bottom (m)			0.40	0.20	0.80
Date of Sampling			27/02/2024	27/02/2024	27/02/2024
Time of Sampling			-	-	-
Sample Matrix			Sand	Sand	Sand
Determinant	**Units**	**Accreditation**			
Antimony	(mg/kg)	u	< 3.5	< 3.5	< 3.5
Arsenic	(mg/kg)	MCERTS	28	11	10
Barium	(mg/kg)	MCERTS	560	290	110
Beryllium	(mg/kg)	MCERTS	1.3	1.1	0.6
Boron (w/s)	(mg/kg)	u	< 2.5	< 2.5	< 2.5
Cadmium	(mg/kg)	MCERTS	1.1	0.7	0.5
Chromium (III)	(mg/kg)	u	6.5	11	6.4
Chromium (Total)	(mg/kg)	UKAS	7.5	12	7.4
Copper	(mg/kg)	MCERTS	120	46	29
Iron	(mg/kg)	u	39000	28000	16000
Lead	(mg/kg)	MCERTS	2100	56	110
Manganese	(mg/kg)	MCERTS	650	490	300
Mercury	(mg/kg)	UKAS	< 2.5	< 2.5	< 2.5
Mercury (Total, Low Level)	(mg/kg)	u	1.1	0.1	< 0.1
Molybdenum	(mg/kg)	u	3.1	2.4	< 2.0
Nickel	(mg/kg)	MCERTS	24	33	14
Selenium	(mg/kg)	u	< 8.0	< 8.0	< 8.0
Vanadium	(mg/kg)	UKAS	31	35	19
Zinc	(mg/kg)	MCERTS	250	55	50
Phenol	(mg/kg)	MCERTS	< 0.20	< 0.20	< 0.20
Cresols	(mg/kg)	MCERTS	< 0.20	< 0.20	< 0.20
Xylenols	(mg/kg)	MCERTS	< 0.20	< 0.20	< 0.20
Trimethyl Phenols	(mg/kg)	UKAS	< 0.20	< 0.20	< 0.20
Total Phenols (via HPLC)	(mg/kg)	UKAS	< 0.80	< 0.80	< 0.80
Cyanide (Free)	(mg/kg)	u	< 1.0	< 1.0	< 1.0
Chromium (Hexavalent)	(mg/kg)	u	< 1.0	< 1.0	< 1.0
pH	pH Units	MCERTS	8.5	9.0	8.3
Sulphate (Water soluble as SO_4)	(mg/l)	u	34	61	14
Sulphur (Total)	(%)	UKAS	0.06	0.20	0.02
Acenaphthene	(mg/kg)	MCERTS	< 0.02	< 0.20	0.03
Acenaphthylene	(mg/kg)	UKAS	< 0.02	0.96	0.11
Anthracene	(mg/kg)	UKAS	0.05	1.1	0.33
Benzo (a) anthracene	(mg/kg)	MCERTS	0.04	2.7	0.95
Benzo (a) pyrene	(mg/kg)	MCERTS	0.05	4.4	0.88
Benzo (b) fluoranthene	(mg/kg)	MCERTS	0.07	5.2	1.1
Benzo (g, h, i) perylene	(mg/kg)	MCERTS	0.06	4.9	0.49
Benzo (k) fluoranthene	(mg/kg)	MCERTS	0.03	1.9	0.43
Chrysene	(mg/kg)	MCERTS	0.05	2.9	1.0
Dibenzo (a,h) anthracene	(mg/kg)	MCERTS	< 0.02	0.63	0.10
Fluoranthene	(mg/kg)	MCERTS	0.07	4.7	2.2
Fluorene	(mg/kg)	MCERTS	< 0.02	< 0.20	0.04
Indeno (1, 2, 3,-cd) pyrene	(mg/kg)	MCERTS	0.06	4.5	0.52
Naphthalene	(mg/kg)	MCERTS	< 0.02	< 0.20	0.02

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42528-A

Project Reference - CASCID-Christie Hospital, Manchester P10525

Analytical Test Results - Solid

Lab Reference			345250	345251	345252
Client Sample ID			-	-	-
Client Sample Location			BH104	BH103A	BH103
Client Sample Type			ES	ES	ES
Client Sample Number			-	-	-
Depth - Top (m)			0.30	0.10	0.70
Depth - Bottom (m)			0.40	0.20	0.80
Date of Sampling			27/02/2024	27/02/2024	27/02/2024
Time of Sampling			-	-	-
Sample Matrix			Sand	Sand	Sand
Determinant	**Units**	**Accreditation**			
Phenanthrene	(mg/kg)	MCERTS	0.05	1.2	1.2
Pyrene	(mg/kg)	MCERTS	0.07	4.7	2.2
Total PAH (Sum of USEPA 16)	(mg/kg)	UKAS	0.71	40	12
FOC	-	UKAS	0.051	0.070	0.022
Asbestos	-	UKAS	No asbestos detected	No asbestos detected	No asbestos detected

4161

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42528-A

Project Reference - CASCID-Christie Hospital, Manchester P10525

Analytical Test Results - Chemical Analysis

Lab Reference			345251	345252
Client Sample ID			-	-
Client Sample Location			BH103A	BH103
Client Sample Type			ES	ES
Client Sample Number			-	-
Depth - Top (m)			0.10	0.70
Depth - Bottom (m)			0.20	0.80
Date of Sampling			27/02/2024	27/02/2024
Time of Sampling			-	-
Sample Matrix			Sand	Sand
Determinant	**Units**	**Accreditation**		
Water soluble sulphate (as SO_4)	(mg/l)	u	61	14
Acid Soluble Sulphate	(%)	u	0.06	< 0.01
Total Sulphur	(%)	UKAS	0.20	0.02
pH Value	pH Units	MCERTS	9.0	8.3

7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42528-A

Project Reference - CASCID-Christie Hospital, Manchester P10525

Analytical Test Results - VPH / EPH

Lab Reference			345250	345251	345252
Client Sample ID			-	-	-
Client Sample Location			BH104	BH103A	BH103
Client Sample Type			ES	ES	ES
Client Sample Number			-	-	-
Depth - Top (m)			0.30	0.10	0.70
Depth - Bottom (m)			0.40	0.20	0.80
Date of Sampling			27/02/2024	27/02/2024	27/02/2024
Time of Sampling			-	-	-
Sample Matrix			Sand	Sand	Sand
Determinant	**Units**	**Accreditation**			
Aliphatic >C_5 to C_6 [HS_MS_1D_AL]	(mg/kg)	MCERTS	< 0.06	< 0.06	< 0.06
Aliphatic >C_6 to C_8 [HS_MS_1D_AL]	(mg/kg)	MCERTS	< 0.06	< 0.06	< 0.06
Aliphatic >C_8 to C_{10} [HS_MS_1D_AL]	(mg/kg)	MCERTS	< 0.06	< 0.06	< 0.06
Aliphatic >C_{10} to C_{12} [EH_CU_1D_AL]	(mg/kg)	u	< 10	< 10	< 10
Aliphatic >C_{12} to C_{16} [EH_CU_1D_AL]	(mg/kg)	u	< 10	< 10	< 10
Aliphatic >C_{16} to C_{21} [EH_CU_1D_AL]	(mg/kg)	u	< 10	41	< 10
Aliphatic >C_{21} to C_{35} [EH_CU_1D_AL]	(mg/kg)	u	< 20	610	38
Aliphatic >C_{35} to C_{44} [EH_CU_1D_AL]	(mg/kg)	u	< 15	320	68
Aromatic >C_5 to C_7 [HS_MS_1D_AR]	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Aromatic >C_7 to C_8 [HS_MS_1D_AR]	(mg/kg)	MCERTS	< 0.01	0.01	< 0.01
Aromatic >C_8 to C_{10} [HS_MS_1D_AR]	(mg/kg)	MCERTS	< 0.06	< 0.06	< 0.06
Aromatic >C_{10} to C_{12} [EH_CU_1D_AR]	(mg/kg)	u	< 10	< 10	< 10
Aromatic >C_{12} to C_{16} [EH_CU_1D_AR]	(mg/kg)	u	< 10	12	< 10
Aromatic >C_{16} to C_{21} [EH_CU_1D_AR]	(mg/kg)	u	< 10	81	< 10
Aromatic >C_{21} to C_{35} [EH_CU_1D_AR]	(mg/kg)	u	31	1200	64
Aromatic >C_{35} to C_{44} [EH_CU_1D_AR]	(mg/kg)	u	< 15	930	100
Total >C_5 to C_{35} [EH_CU+HS_1D_Total]	(mg/kg)	u	< 50	1900	100
Benzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Toluene	(mg/kg)	MCERTS	< 0.01	0.01	< 0.01
Ethylbenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
m&p Xylene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02
o-Xylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
MTBE	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01

4161

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42528-A

Project Reference - CASCID-Christie Hospital, M

Analytical Test Results - VOC

Lab Reference			345250	345251	345252
Client Sample ID			-	-	-
Client Sample Location			BH104	BH103A	BH103
Client Sample Type			ES	ES	ES
Client Sample Number			-	-	-
Depth - Top (m)			0.30	0.10	0.70
Depth - Bottom (m)			0.40	0.20	0.80
Date of Sampling			27/02/2024	27/02/2024	27/02/2024
Time of Sampling			-	-	-
Sample Matrix			Sand	Sand	Sand
Determinant	**Units**	**Accreditation**			
Benzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Toluene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Ethylbenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
m&p Xylene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02
o-Xylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Dichlorodifluoromethane	(mg/kg)	UKAS	< 0.05	< 0.05	< 0.05
Chloromethane	(mg/kg)	UKAS	< 0.02	< 0.02	< 0.02
Vinyl Chloride	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02
Bromomethane	(mg/kg)	u	< 0.05	< 0.05	< 0.05
Chloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Trichlorofluoromethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,1-Dichloroethylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Dichloromethane	(mg/kg)	u	< 0.10	< 0.10	< 0.10
MTBE	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
trans-1,2,-dichloroethylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,1-Dichloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
2,2-Dichloropropane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
cis--1,2,-dichloroethylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Bromochloromethane	(mg/kg)	MCERTS	< 0.05	< 0.05	< 0.05
Chloroform	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,1,1-Trichloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,1-Dichloropropene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Carbon Tetrachloride	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,2-dichloroethane	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02
Trichloroethylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,2-Dichloropropane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Dibromomethane	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02
Bromodichloromethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
cis-1,2-dichloropropylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
trans-1,3-dichloropropylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,1,2-Trichloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,3-Dichloropropane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Tetrachloroethylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Chlorodibromomethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,2-Dibromoethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Chlorobenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,1,1,2-tetrachloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Styrene	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01
Isopropylbenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Bromoform	(mg/kg)	MCERTS	< 0.05	< 0.05	< 0.05
1,1,2,2-Tetrachloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,2,3-Trichloropropane	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02
n-Propylbenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Bromobenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,3,5-Trimethylbenzene	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01
2-chlorotoluene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
4-chlorotoluene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
tert-butylbenzene	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01
1,2,4-trimethylbenzene	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01
sec-Butylbenzene	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01
4-Isopropyltoluene (P-Cymene)	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01
1,3-Dichlorobenzene	(mg/kg)	u	< 0.01	< 0.01	< 0.01
1,4-Dichlorobenzene	(mg/kg)	u	< 0.01	< 0.01	< 0.01
n-Butylbenzene	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01
1,2-Dichlorobenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,2-Dibromo-3-chloropropane	(mg/kg)	u	< 0.05	< 0.05	< 0.05
1,2,4-Trichlorobenzene	(mg/kg)	u	< 0.05	< 0.05	< 0.05
Hexachlorobutadiene	(mg/kg)	u	< 0.05	< 0.05	< 0.05
Naphthalene	(mg/kg)	u	< 0.05	< 0.05	< 0.05
1,2,3-Trichlorobenzene	(mg/kg)	u	< 0.05	< 0.05	< 0.05

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42528-A

Project Reference - CASCID-Christie Hospital, Manchester P10525

Certificate Of Analysis - WAC Suite

Lab Reference	345250
Client Sample ID	-
Client Sample Location	BH104
Client Sample Type	ES
Client Sample Number	-
Depth - Top (m)	0.3
Depth - Bottom (m)	0.4
Date of Sampling	27/02/2024
Time of Sampling	-
Sample Description	Made Ground- dark greyish brown slightly clayey gravelly silty sand with occasional brick fragments slag bituminous material
Sample Matrix	Sand
Moisture Content (%)	16
Stone content (%)	16

			Determined Result	Inert Waste Landfill	Stable non reactive hazardous waste in a non hazardous landfill	Hazardous Waste Landfill
Solid Analysis						
Total Organic Carbon	%	MCERTS	5.1	3.0	5.0	6.0
Loss on Ignition	%	UKAS	3.0	-	-	10.0
BTEX	mg/kg	MCERTS	< 0.06	6.00	-	-
PCB's (7 Congeners)	mg/kg	u	< 0.028	1.00	-	-
Mineral Oil (>C_{10} to C_{40}) [EH_1D_Total]	mg/kg	MCERTS	91	500	-	-
PAH	mg/kg	u	0.7	100	-	-
pH	units	MCERTS	8.5	-	> 6	-
Eluate Analysis						
Arsenic	mg/kg	u	0.10	0.50	2	25
Barium	mg/kg	u	< 0.05	20	100	300
Cadmium	mg/kg	u	< 0.03	0.04	1	5
Chromium (total)	mg/kg	u	0.04	0.5	10	70
Copper	mg/kg	u	< 0.01	2.0	50	100
Mercury	mg/kg	u	< 0.01	0.01	0.2	2
Molybdenum	mg/kg	u	< 0.03	0.5	10.0	30
Nickel	mg/kg	u	< 0.03	0.4	10.0	40
Lead	mg/kg	u	0.05	0.5	10.0	50
Antimony	mg/kg	u	< 0.03	0.06	0.7	5
Selenium	mg/kg	u	< 0.01	0.1	0.5	7
Zinc	mg/kg	u	< 0.05	4	50	200
Chloride	mg/kg	u	200	800	15000	25000
Fluoride	mg/kg	u	2	10	150	500
Sulphate (as SO_4)	mg/kg	u	48	1000	20000	50000
Total Dissolved Solids	mg/kg	u	1100	4000	60000	100000
Phenol Index	mg/kg	u	< 1.0	1	-	-
Dissolved Organic Carbon	mg/kg	u	23.0	500	800	1000

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42528-A

Project Reference - CASCID-Christie Hospital, Manchester P10525

Certificate Of Analysis - WAC Suite

Lab Reference	345252
Client Sample ID	-
Client Sample Location	BH103
Client Sample Type	ES
Client Sample Number	-
Depth - Top (m)	0.7
Depth - Bottom (m)	0.8
Date of Sampling	27/02/2024
Time of Sampling	-
Sample Description	Made Ground- dark brown clayey slightly gravelly silty sand with occasional slag
Sample Matrix	Sand
Moisture Content (%)	12
Stone content (%)	< 0.1

			Determined Result	Inert Waste Landfill	Stable non reactive hazardous waste in a non hazardous landfill	Hazardous Waste Landfill
Solid Analysis						
Total Organic Carbon	%	MCERTS	2.2	3.0	5.0	6.0
Loss on Ignition	%	UKAS	2.2	-	-	10.0
BTEX	mg/kg	MCERTS	< 0.06	6.00	-	-
PCB's (7 Congeners)	mg/kg	u	< 0.028	1.00	-	-
Mineral Oil (>C_{10} to C_{40}) [EH_1D_Total]	mg/kg	MCERTS	56	500	-	-
PAH	mg/kg	u	12	100	-	-
pH	units	MCERTS	8.3	-	> 6	-
Eluate Analysis						
Arsenic	mg/kg	u	0.07	0.50	2	25
Barium	mg/kg	u	< 0.05	20	100	300
Cadmium	mg/kg	u	< 0.03	0.04	1	5
Chromium (total)	mg/kg	u	< 0.03	0.5	10	70
Copper	mg/kg	u	< 0.01	2.0	50	100
Mercury	mg/kg	u	< 0.01	0.01	0.2	2
Molybdenum	mg/kg	u	< 0.03	0.5	10.0	30
Nickel	mg/kg	u	< 0.03	0.4	10.0	40
Lead	mg/kg	u	< 0.05	0.5	10.0	50
Antimony	mg/kg	u	< 0.03	0.06	0.7	5
Selenium	mg/kg	u	< 0.01	0.1	0.5	7
Zinc	mg/kg	u	< 0.05	4	50	200
Chloride	mg/kg	u	< 1	800	15000	25000
Fluoride	mg/kg	u	4	10	150	500
Sulphate (as SO_4)	mg/kg	u	< 10	1000	20000	50000
Total Dissolved Solids	mg/kg	u	440	4000	60000	100000
Phenol Index	mg/kg	u	< 1.0	1	-	-
Dissolved Organic Carbon	mg/kg	u	32.0	500	800	1000

7 - 11 Harding Street
Leicester
LE1 4DH

S **L24/01949/GRM - 24-42528-A**

\# **Project Reference - CASCID-Christie Hospital, Manchester P10525**

Analytical Test Results - 2:1 Leachate Suite

DE	**Lab Reference**	**345253**
	Client Sample ID	-
	Client Sample Location	BH103
	Client Sample Type	ES
	Client Sample Number	-
	Depth - Top (m)	1.40
	Depth - Bottom (m)	1.50
	Date of Sampling	27/02/2024
	Time of Sampling	-
	Sample Matrix	Leachate

	Determinant	Units	Accreditation	
EN	Boron	(mg/l)	u	0.029
EN	Calcium	(mg/l)	u	48
EN	Iron	(mg/l)	u	< 0.010
EN	Antimony	(µg/l)	u	< 2.5
EN	Arsenic	(µg/l)	u	3
EN	Barium	(µg/l)	u	< 5
EN	Beryllium	(µg/l)	u	< 1
EN	Boron	(µg/l)	u	29
SU	Cadmium (LL)	(µg/l)	u	< 0.25
EN	Chromium	(µg/l)	u	< 3
EN	Chromium (III)	(µg/l)	u	< 20
EN	Copper	(µg/l)	u	< 1
EN	Lead	(µg/l)	u	< 5
EN	Magnesium	(µg/l)	u	68
EN	Manganese	(µg/l)	u	< 5
EN	Mercury	(µg/l)	u	< 0.20
EN	Molydenum	(µg/l)	u	5.7
EN	Nickel	(µg/l)	u	< 3
EN	Selenium	(µg/l)	u	< 1
EN	Vanadium	(µg/l)	u	30.5
EN	Zinc	(µg/l)	u	< 5
EN	pH	pH Units	u	11
EN	Cyanide (Free)	(mg/l)	u	< 0.5
EN	Cyanide (Complex)	(mg/l)	u	< 0.5
EN	Cyanide (Total)	(mg/l)	u	< 0.5
EN	Chromium (Hexavalent)	(mg/l)	u	< 0.02
EN	Chloride	(mg/l)	u	30
EN	Fluoride	(mg/l)	u	0.50
EN	Sulphate (As SO_4)	(mg/l)	u	39
EN	Ammonium (As N)	(mg/l)	u	< 0.02
EN	Phenol	(µg/l)	u	17.0
EN	Cresols	(µg/l)	u	0.81
EN	Xylenols	(µg/l)	u	< 0.20
EN	Trimethyl Phenols	(µg/l)	u	< 0.50
EN	Phenols (Total)	(µg/l)	u	18.0

7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42528-A

Project Reference - CASCID-Christie Hospital, Manchester P10525

Sample Descriptions

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Description	Moisture Content (%)	Stone Content (%)	Passing 2mm test sieve (%)
345250	-	BH104	ES	-	Made Ground- dark greyish brown slightly clayey gravelly silty sand with occasional brick fragments slag bituminous material	16	16	82
345251	-	BH103A	ES	-	Made Ground- black very gravelly silty sand with frequent slag bituminous material brick fragments	5.3	55	20
345252	-	BH103	ES	-	Made Ground- dark brown clayey slightly gravelly silty sand with occasional slag	12	< 0.1	83

7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42528-A

Project Reference - CASCID-Christie Hospital, Manchester P10525

Sample Comments

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Comments
345250	-	BH104	ES	-	VPH/BTEX - Sample taken from container with headspace.
345251	-	BH103A	ES	-	PAHAR 1:10 Dilution VPH/BTEX - Sample taken from container with headspace. VOC - Sample taken from container with headspace.
345252	-	BH103	ES	-	VPH/BTEX - Sample taken from container with headspace. VOC - Sample taken from container with headspace.

7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42528-A

Project Reference - CASCID-Christie Hospital, Manchester P10525

Analysis Methodologies

Test Code	Test Name / Reference	Sample condition for analysis	Sample Preperation	Test Details
ANIONSL	MS - CL - Anions by Aquakem	As received	-	Determination of Anions (inc Sulphate, chloride etc.) in leachate samples by Aquakem
ANIONSS	MS - CL - Anions by Aquakem (2:1Extract)	Oven dried	Passing 2mm test sieve	Determination of Anions (inc Sulphate, chloride etc.) in soils by Aquakem. Analysis is based on a 2:1 water to soil extraction ratio
EPHS	MS - CL - EPH in Soil	As received	Passing 10mm test sieve	Determination of Extractable Petroleum Hydrocarbons in soils via GC-MS
PCB7S	MS - CL - PCB Soils	As received	Passing 10mm test sieve	Determination of PCB's (7 congeners) in soils via GC-MS
PAHASRDS	MS - CL - PAH (As Received)	As received	Passing 10mm test sieve	Determination of Polyaromatic hydrocarbons in soil via GC-MS
CWGS	MS - CL - VPH & MS - CL - EPH	As received	Passing 10mm test sieve	Determination of TPH CWG (Volatile Petroleum Hydrocarbons and Extractable Petroleum Hydrocarbons) in soils via Headspace-GC-MS and GC-MS respectively
WACTOCS	MS - CL - TOC Eltra (WAC)	Air dried	Passing 10mm test sieve	Determination of Total Organic Carbon in soil as part of a WAC test
TOCS	MS - CL - TOC Eltra	Air Dried	Passing 10mm test sieve	Determination of Total Organic Carbon in soils
TPHS	MS - CL - TPH (GC-FID)	As received	Passing 10mm test sieve	Determination of Total Petroleum Hydrocarbons in soil using GC-FID
WACSKALAR	MS - CL - Phenols by Skalar (WAC)	As received	BSEN:12457 Leaching	Determination of Total Phenols within leachate as part of a WAC test using a Skalar Segmented flow analyser
VOCS	MS - CL - VOC and MBTEX	As received	Passing 10mm test sieve	Determination of VOCs (inc BTEX) in soils via Headspace-GC-MS
VPHS	MS - CL - VPH	As received	Passing 10mm test sieve	Determination of VPH in soils via Headspace-GC-MS
WSBORONS	MS - CL - WS Boron	Air dried	Passing 10mm test sieve	Determination of Water soluble Boron in soils via ICP
SKALARCNL	MS - CL - Cyanide by Skalar - Leachate	As received	BSEN:12457 Leaching	Determination of cyanide (total / free / complex) in leachates using a Skalar segmented flow analyser
SKALARCNS	MS - CL - Cyanide by Skalar	As received	Passing 10mm test sieve	Determination of cyanide (total / free / complex) in soil using a Skalar segmented flow analyser
WACDOC	MS - CL - DOC (WAC)	As received	BSEN:12457 Leaching	Determination of dissolved organic carbon in a leachate as part of a WAC test
SKALARHCL	MS - CL - Hexavalent Cr by Skalar - L	As received	BSEN:12457 Leaching	Determination of hexavalent chromium in leachate using Skalar segmented flow analyser
SKALARHCS	MS - CL - Hexavalent Chromium by Skalar	As received	Passing 10mm test sieve	Determination of hexavalent chromium in soil using Skalar segmented flow analyser
WACMETALS	MS - CL - ICP - Metals in Waters (WAC)	As received	BSEN:12457 Leaching	Determination of metals in a leachate as part of a WAC test via ICP
ICPMETL	MS - CL - ICP Metals in Waters	As received	BSEN:12457 Leaching	Determination of metals in leachates via ICP
ICPMETS	MS - CL - ICP Metals	Air dried	Passing 10mm test sieve	Determination of metals in soils via ICP
PHL	MS - CL - pH in Waters	As received	BSEN:12457 Leaching	Determination of pH in leachates using a pH probe

7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42528-A

Project Reference - CASCID-Christie Hospital, Manchester P10525

Analysis Methodologies

Test Code	Test Name / Reference	Sample condition for analysis	Sample Preperation	Test Details
WACPHS	MS - CL - pH in Soils (WAC)	As received	BSEN:12457 Leaching	Determination of pH in soils as part of a WAC test via pH probe
PHS	MS - CL - pH in Soils	As received	Passing 10mm test sieve	Determination of pH in soils using a pH probe (using a 1:3 soil to water extraction)
PHOHHPLCL	MS - CL - Phenol Waters by HPLC	As received	BSEN:12457 Leaching	Determination of speciated phenols in leachates using HPLC
PHOHHPLCS	MS - CL - Phenols by HPLC (soil)	As received	Passing 10mm test sieve	Determination of speciated phenols in soil using HPLC
WACANIONS	MS - CL - Anions by Aquakem (WAC)	As received	BSEN:12457 Leaching	Determination of sulphate, chloride and fluoride in a leachate as part of a WAC test using a Aquakem analyser
TDSL	MS-CL-Conductivity in Water(TDS by Calc)	As received	BSEN:12457 Leaching	Determination of total dissolved solids in leachates (by calculation)
ASSO4S	MS - CL - Acid Soluble Sulphate	Oven Dried	Passing 2mm test sieve	Determination of total sulphate in soils by acid extraction followed by ICP analysis
ASB	MS - AS - Asbestos	-	-	Fibre identification is in accordance with in house documented methods which are based on the procedure documented in the HSE Document HSG 248 "Asbestos: The analysts guide for sampling, analysis and clearance procedures"
ENLEACHP	BS EN 12457-2	As Received	-	Leaching in accordance with BSEN 12457-2 (10:1 Ratio)
ENLEACHP2	BS EN 12457-3	As Received	-	Leaching in accordance with BSEN 12457-3
SAMPLEPREP	MS - CL - Sample Preparation	-	-	Preparation of samples (including determination of moisture content) to allow for subsequent analysis
SUBCON-ENV	Subcontract - ENV Lab	-	-	Subcontract testing
1377LOI	BS1377 LoI	Oven dried	Passing 2mm test sieve	Testing was in accordance with BS 1377: Part 3: 2018 + A1 :2021 Clause 6. Determination of the mass loss on ignition. Some information required by BS1377: 2016: Part 1 has not been reported. This information is available on request.
1377TS-ELT	BS1377 Total Sulphur Content by HTC	Oven dried	BS1377 : Part 1 : 2016	Total Sulphur Content testing of Soil in accordance with BS 1377 : Part 3 : 2018 + A1 : 2021 Clause 7.10 (using Eltra CS-800 Analyser)

7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42528-A

Project Reference - CASCID-Christie Hospital, Manchester P10525

Sample Deviations

Deviations are listed below against each sample and associated test method, where deviation(s) are noted it means data may not be representative of the sample at the time of sampling and it is possible that results provided may be compromised.

Observations on receipt

A - No date of sampling provided
C - Received in inappropriate container
H - Contains headspace
T - Temperature on receipt exceeds storage temperature
R - Sample(s) received with less than 96 hours for testing to commence/complete, any result formally classed as deviating will be marked with an X against the applicable test (i.e. RX)

Observations whilst in laboratory

X - Exceeds sampling to extraction or analysis timescales

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Test	Deviations
345250	-	BH104	ES	-	MS - CL - Cyanide by Skalar	RX
345250	-	BH104	ES	-	MS - CL - EPH in Soil	RX
345250	-	BH104	ES	-	MS - CL - PAH (As Received)	RX
345250	-	BH104	ES	-	MS - CL - Phenols by HPLC (soil)	RX
345250	-	BH104	ES	-	MS - CL - TPH (GC-FID)	RX
345250	-	BH104	ES	-	MS - CL - VOC and MBTEX	RX
345250	-	BH104	ES	-	MS - CL - VPH	RX
345250	-	BH104	ES	-	MS - CL - pH in Soils	RX
345250	-	BH104	ES	-	MS - CL - pH in Soils (WAC)	RX
345251	-	BH103A	ES	-	MS - CL - Cyanide by Skalar	RX
345251	-	BH103A	ES	-	MS - CL - EPH in Soil	RX
345251	-	BH103A	ES	-	MS - CL - PAH (As Received)	RX
345251	-	BH103A	ES	-	MS - CL - Phenols by HPLC (soil)	RX
345251	-	BH103A	ES	-	MS - CL - VOC and MBTEX	RX
345251	-	BH103A	ES	-	MS - CL - VPH	RX
345251	-	BH103A	ES	-	MS - CL - pH in Soils	RX
345252	-	BH103	ES	-	MS - CL - Cyanide by Skalar	RX
345252	-	BH103	ES	-	MS - CL - EPH in Soil	RX
345252	-	BH103	ES	-	MS - CL - PAH (As Received)	RX
345252	-	BH103	ES	-	MS - CL - Phenols by HPLC (soil)	RX
345252	-	BH103	ES	-	MS - CL - TPH (GC-FID)	RX
345252	-	BH103	ES	-	MS - CL - VOC and MBTEX	RX
345252	-	BH103	ES	-	MS - CL - VPH	RX
345252	-	BH103	ES	-	MS - CL - pH in Soils	RX
345252	-	BH103	ES	-	MS - CL - pH in Soils (WAC)	RX

L24/01949/GRM - 24-42528-A

Project Reference - CASCID-Christie Hospital, Manchester P10525

HWOL TPH Acronym Index

Acronym	Description
HS	Headspace Analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
Total	Aliphatics and Aromatics
AL	Aliphatics Only
AR	Aromatics Only
2D	GC-GC - Double Coil Gas Chromatography
#1	EH_Total but with humics mathmatically subtracted
#2	EH_Total but with fatty acids mathmatically subtracted
_	Operator - underscore to separate acronyms (except for +)
+	Operator to indicate cumlative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry

4161

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

GRM Development Solutions
Laurus House
First Avenue
Centrum 100
Burton Upon Trent
DE14 2WH

Analytical Test Report: L24/01949/GRM - 24-42792

Your Project Reference:	**P10525 CASCID - Christie Hospital, Manchester**		
Your Order Number:	P10525	Samples Received / Instructed:	12/03/2024 / 12/03/2024
Report Issue Number:	1	Sample Tested:	12/03 to 26/03/2024
Samples Analysed:	5 soil samples	Report issued:	26/03/2024

Signed

[redacted]

Notes:

General

Please refer to Methodologies page for details pertaining to the analytical methods undertaken.

Samples will be retained for 14 days after issue of this report with the exception of the asbestos test portion which is held for 6 months unless otherwise requested.

Moisture Content was determined in accordance with CTS method statement MS - CL - Sample Prep, oven dried at <30˚C.

Moisture Content is reported as a percentage of the dry mass of soil, this calculation is in accordance with BS1377, Part 2, 1990, Clause 3.2

Stone Content was determined in accordance with CTS method statement MS - CL - Sample Prep and refers to the percentage of stones retained on a 10mm BS test sieve.

Where specification limits are included these are for guidance only. Where a measured value has been highlighted this is not implying acceptance or failure and certainty of measurement values have not been taken into account.

Uncertainty of measurement values are available on request.

Samples were supplied by customer, results apply to the samples as received.

Asbestos

Please note: Where futher analaysis is required samples identified as containing asbestos are screened and tested on an as recevied basis. No correction is made for moisture content and these results are not covered by our accrediation

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation

WAC Testing

Samples were leached in accordance with BS EN 12457-2: 2002.

Eluate Results are reported as L/S 10. These results have been calculated in accordance with BS EN 12457-2:2002.

Comparative values are taken from the Council Decision Annex - CRITERIA AND PROCEDURES FOR THE ACCEPTANCE OF WASTE AT LANDFILLS, (2003/33/EC).

Deviating Samples

On receipt samples are compared against our sample holding and handling protocols, where any deviations have been noted these are reported on our deviating sample page (if present)

Accreditation Key

UKAS = UKAS Accreditation, MCERTS = MCERTS Accreditation, u = Unaccredited, subUKAS - Subcontracted to a laboratory UKAS accredited for this test

MCERTS Accreditation only covers the SAND, CLAY and LOAM matrices

Date of Issue: 18.03.2024

Issued by: J. Gane

Issue No: 4

Rev No: 6

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42792

Project Reference - P10525 CASCID - Christie Hospital, Manchester

Analytical Test Results - Solid

Lab Reference			346673	346674	346676
Client Sample ID			-	-	-
Client Sample Location			TP106	TP107	TP101
Client Sample Type			ES	ES	ES
Client Sample Number			-	-	-
Depth - Top (m)			0.40	0.40	0.40
Depth - Bottom (m)			0.40	0.40	0.50
Date of Sampling			27/02/2024	27/02/2024	27/02/2024
Time of Sampling			-	-	-
Sample Matrix			Sand	Clay	Sand
Determinant	**Units**	**Accreditation**			
Antimony	(mg/kg)	u	< 3.5	< 3.5	< 3.5
Arsenic	(mg/kg)	MCERTS	< 10	78	14
Barium	(mg/kg)	MCERTS	100	280	110
Beryllium	(mg/kg)	MCERTS	0.5	1.2	0.8
Boron (w/s)	(mg/kg)	u	< 2.5	< 2.5	< 2.5
Cadmium	(mg/kg)	MCERTS	0.5	1.2	0.7
Chromium (III)	(mg/kg)	u	5.0	8.2	6.9
Chromium (Total)	(mg/kg)	UKAS	6.0	9.2	7.9
Copper	(mg/kg)	MCERTS	32	210	49
Iron	(mg/kg)	u	17000	33000	21000
Lead	(mg/kg)	MCERTS	330	590	92
Manganese	(mg/kg)	MCERTS	240	880	380
Mercury	(mg/kg)	UKAS	< 2.5	< 2.5	< 2.5
Mercury Total (Low Level)	(mg/kg)	u	< 0.1	0.5	< 0.1
Molybdenum	(mg/kg)	u	< 2.0	< 2.0	< 2.0
Nickel	(mg/kg)	MCERTS	13	27	14
Selenium	(mg/kg)	u	< 8.0	< 8.0	< 8.0
Vanadium	(mg/kg)	UKAS	21	31	26
Zinc	(mg/kg)	MCERTS	66	360	52
Phenol	(mg/kg)	MCERTS	< 0.20	< 0.20	< 0.20
Cresols	(mg/kg)	MCERTS	< 0.20	< 0.20	< 0.20
Xylenols	(mg/kg)	MCERTS	< 0.20	< 0.20	< 0.20
Trimethyl Phenols	(mg/kg)	UKAS	< 0.20	< 0.20	< 0.20
Total Phenols (via HPLC)	(mg/kg)	UKAS	< 0.80	< 0.80	< 0.80
Cyanide (Free)	(mg/kg)	u	< 1.0	< 1.0	< 1.0
Chromium (Hexavalent)	(mg/kg)	u	< 1.0	< 1.0	< 1.0
pH	pH Units	MCERTS	8.5	7.9	7.3
Sulphate (Water soluble as SO_4)	(mg/l)	u	< 10	< 10	< 10
Sulphur (Total)	(%)	UKAS	0.02	0.01	0.02
Acenaphthene	(mg/kg)	MCERTS	0.02	0.04	< 0.02
Acenaphthylene	(mg/kg)	UKAS	< 0.02	< 0.02	< 0.02
Anthracene	(mg/kg)	UKAS	0.06	0.06	< 0.02
Benzo (a) anthracene	(mg/kg)	MCERTS	0.28	0.24	0.07
Benzo (a) pyrene	(mg/kg)	MCERTS	0.30	0.25	0.07
Benzo (b) fluoranthene	(mg/kg)	MCERTS	0.34	0.30	0.12
Benzo (g, h, i) perylene	(mg/kg)	MCERTS	0.20	0.17	0.06
Benzo (k) fluoranthene	(mg/kg)	MCERTS	0.12	0.10	0.03
Chrysene	(mg/kg)	MCERTS	0.38	0.37	0.10
Dibenzo (a,h) anthracene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02
Fluoranthene	(mg/kg)	MCERTS	0.62	0.58	0.14
Fluorene	(mg/kg)	MCERTS	< 0.02	0.03	< 0.02
Indeno (1, 2, 3,-cd) pyrene	(mg/kg)	MCERTS	0.17	0.15	0.07
Naphthalene	(mg/kg)	MCERTS	0.04	0.11	< 0.02

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42792

Project Reference - P10525 CASCID - Christie Hospital, Manchester

Analytical Test Results - Solid

Lab Reference			346673	346674	346676
Client Sample ID			-	-	-
Client Sample Location			TP106	TP107	TP101
Client Sample Type			ES	ES	ES
Client Sample Number			-	-	-
Depth - Top (m)			0.40	0.40	0.40
Depth - Bottom (m)			0.40	0.40	0.50
Date of Sampling			27/02/2024	27/02/2024	27/02/2024
Time of Sampling			-	-	-
Sample Matrix			Sand	Clay	Sand
Determinant	**Units**	**Accreditation**			
Phenanthrene	(mg/kg)	MCERTS	0.43	0.46	0.07
Pyrene	(mg/kg)	MCERTS	0.63	0.60	0.15
Total PAH (Sum of USEPA 16)	(mg/kg)	UKAS	3.7	3.5	1.0
FOC	-	UKAS	0.011	0.036	0.033
Asbestos	-	UKAS	No asbestos detected	No asbestos detected	No asbestos detected

7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42792

Project Reference - P10525 CASCID - Christie Hospital, Manchester

Analytical Test Results - Chemical Analysis

Lab Reference			346673	346675	346676
Client Sample ID			-	-	-
Client Sample Location			TP106	TP102	TP101
Client Sample Type			ES	ES	ES
Client Sample Number			-	-	-
Depth - Top (m)			0.40	0.30	0.40
Depth - Bottom (m)			0.40	0.40	0.50
Date of Sampling			27/02/2024	27/02/2024	27/02/2024
Time of Sampling			-	-	-
Sample Matrix			Sand	Sand	Sand
Determinant	**Units**	**Accreditation**			
Water soluble sulphate (as SO_4)	(mg/l)	u	< 10	< 10	< 10
Acid Soluble Sulphate	(%)	u	0.02	0.02	0.02
Total Sulphur	(%)	UKAS	0.02	0.02	0.02
pH Value	pH Units	MCERTS	8.5	7.6	7.3

7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42792

Project Reference - P10525 CASCID - Christie Hospital, Manchester

Analytical Test Results - VPH / EPH

Lab Reference			346673	346674	346676
Client Sample ID			-	-	-
Client Sample Location			TP106	TP107	TP101
Client Sample Type			ES	ES	ES
Client Sample Number			-	-	-
Depth - Top (m)			0.40	0.40	0.40
Depth - Bottom (m)			0.40	0.40	0.50
Date of Sampling			27/02/2024	27/02/2024	27/02/2024
Time of Sampling			-	-	-
Sample Matrix			Sand	Clay	Sand
Determinant	**Units**	**Accreditation**			
Aliphatic >C_5 to C_6 [HS_MS_1D_AL]	(mg/kg)	MCERTS	< 0.06	< 0.06	< 0.06
Aliphatic >C_6 to C_8 [HS_MS_1D_AL]	(mg/kg)	MCERTS	< 0.06	< 0.06	< 0.06
Aliphatic >C_8 to C_{10} [HS_MS_1D_AL]	(mg/kg)	MCERTS	< 0.06	< 0.06	< 0.06
Aliphatic >C_{10} to C_{12} [EH_CU_1D_AL]	(mg/kg)	u	< 10	< 10	< 10
Aliphatic >C_{12} to C_{16} [EH_CU_1D_AL]	(mg/kg)	u	< 10	< 10	< 10
Aliphatic >C_{16} to C_{21} [EH_CU_1D_AL]	(mg/kg)	u	< 10	< 10	< 10
Aliphatic >C_{21} to C_{35} [EH_CU_1D_AL]	(mg/kg)	u	< 20	< 20	31
Aliphatic >C_{35} to C_{44} [EH_CU_1D_AL]	(mg/kg)	u	< 15	< 15	27
Aromatic >C_5 to C_7 [HS_MS_1D_AR]	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Aromatic >C_7 to C_8 [HS_MS_1D_AR]	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Aromatic >C_8 to C_{10} [HS_MS_1D_AR]	(mg/kg)	MCERTS	< 0.06	< 0.06	< 0.06
Aromatic >C_{10} to C_{12} [EH_CU_1D_AR]	(mg/kg)	u	< 10	< 10	< 10
Aromatic >C_{12} to C_{16} [EH_CU_1D_AR]	(mg/kg)	u	< 10	< 10	< 10
Aromatic >C_{16} to C_{21} [EH_CU_1D_AR]	(mg/kg)	u	< 10	< 10	< 10
Aromatic >C_{21} to C_{35} [EH_CU_1D_AR]	(mg/kg)	u	< 20	< 20	61
Aromatic >C_{35} to C_{44} [EH_CU_1D_AR]	(mg/kg)	u	< 15	< 15	75
Total >C_5 to C_{35} [EH_CU+HS_1D_Total]	(mg/kg)	u	< 50	< 50	92
Benzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Toluene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Ethylbenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
m&p Xylene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02
o-Xylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
MTBE	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01

4161

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42792

Project Reference - P10525 CASCID - Christie Hc

Analytical Test Results - VOC

Lab Reference			346673	346674	346676
Client Sample ID			-	-	-
Client Sample Location			TP106	TP107	TP101
Client Sample Type			ES	ES	ES
Client Sample Number			-	-	-
Depth - Top (m)			0.40	0.40	0.40
Depth - Bottom (m)			0.40	0.40	0.50
Date of Sampling			27/02/2024	27/02/2024	27/02/2024
Time of Sampling			-	-	-
Sample Matrix			Sand	Clay	Sand
Determinant	**Units**	**Accreditation**			
Benzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Toluene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Ethylbenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
m&p Xylene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02
o-Xylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Dichlorodifluoromethane	(mg/kg)	UKAS	< 0.05	< 0.05	< 0.05
Chloromethane	(mg/kg)	UKAS	< 0.02	< 0.02	< 0.02
Vinyl Chloride	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02
Bromomethane	(mg/kg)	u	< 0.05	< 0.05	< 0.05
Chloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Trichlorofluoromethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,1-Dichloroethylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Dichloromethane	(mg/kg)	u	< 0.10	< 0.10	< 0.10
MTBE	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
trans-1,2,-dichloroethylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,1-Dichloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
2,2-Dichloropropane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
cis--1,2,-dichloroethylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Bromochloromethane	(mg/kg)	MCERTS	< 0.05	< 0.05	< 0.05
Chloroform	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,1,1-Trichloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,1-Dichloropropene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Carbon Tetrachloride	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,2-dichloroethane	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02
Trichloroethylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,2-Dichloropropane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Dibromomethane	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02
Bromodichloromethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
cis-1,2-dichloropropylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
trans-1,3-dichloropropylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,1,2-Trichloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,3-Dichloropropane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Tetrachloroethylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Chlorodibromomethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,2-Dibromoethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Chlorobenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,1,1,2-tetrachloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Styrene	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01
Isopropylbenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Bromoform	(mg/kg)	MCERTS	< 0.05	< 0.05	< 0.05
1,1,2,2-Tetrachloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,2,3-Trichloropropane	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02
n-Propylbenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Bromobenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,3,5-Trimethylbenzene	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01
2-chlorotoluene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
4-chlorotoluene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
tert-butylbenzene	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01
1,2,4-trimethylbenzene	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01
sec-Butylbenzene	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01
4-Isopropyltoluene (P-Cymene)	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01
1,3-Dichlorobenzene	(mg/kg)	u	< 0.01	< 0.01	< 0.01
1,4-Dichlorobenzene	(mg/kg)	u	< 0.01	< 0.01	< 0.01
n-Butylbenzene	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01
1,2-Dichlorobenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,2-Dibromo-3-chloropropane	(mg/kg)	u	< 0.05	< 0.05	< 0.05
1,2,4-Trichlorobenzene	(mg/kg)	u	< 0.05	< 0.05	< 0.05
Hexachlorobutadiene	(mg/kg)	u	< 0.05	< 0.05	< 0.05
Naphthalene	(mg/kg)	u	< 0.05	< 0.05	< 0.05
1,2,3-Trichlorobenzene	(mg/kg)	u	< 0.05	< 0.05	< 0.05

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42792

Project Reference - P10525 CASCID - Christie Hospital, Manchester

Certificate Of Analysis - WAC Suite

Lab Reference	346674
Client Sample ID	-
Client Sample Location	TP107
Client Sample Type	ES
Client Sample Number	-
Depth - Top (m)	0.4
Depth - Bottom (m)	0.4
Date of Sampling	27/02/2024
Time of Sampling	-
Sample Description	Brown slightly gravelly very sandy silty clay
Sample Matrix	Clay
Moisture Content (%)	23
Stone content (%)	1.7

			Determined Result	Inert Waste Landfill	Stable non reactive hazardous waste in a non hazardous landfill	Hazardous Waste Landfill
Solid Analysis						
Total Organic Carbon	%	MCERTS	3.6	3.0	5.0	6.0
Loss on Ignition	%	UKAS	3.7	-	-	10.0
BTEX	mg/kg	MCERTS	< 0.06	6.00	-	-
PCB's (7 Congeners)	mg/kg	u	< 0.028	1.00	-	-
Mineral Oil (>C_{10} to C_{40}) [EH_1D_Total]	mg/kg	MCERTS	132	500	-	-
PAH	mg/kg	u	3.6	100	-	-
pH	units	MCERTS	7.9	-	> 6	-
Eluate Analysis						
Arsenic	mg/kg	u	0.14	0.50	2	25
Barium	mg/kg	u	0.07	20	100	300
Cadmium	mg/kg	u	< 0.03	0.04	1	5
Chromium (total)	mg/kg	u	< 0.03	0.5	10	70
Copper	mg/kg	u	< 0.01	2.0	50	100
Mercury	mg/kg	u	< 0.01	0.01	0.2	2
Molybdenum	mg/kg	u	< 0.03	0.5	10.0	30
Nickel	mg/kg	u	< 0.03	0.4	10.0	40
Lead	mg/kg	u	< 0.05	0.5	10.0	50
Antimony	mg/kg	u	< 0.03	0.06	0.7	5
Selenium	mg/kg	u	< 0.01	0.1	0.5	7
Zinc	mg/kg	u	< 0.05	4	50	200
Chloride	mg/kg	u	< 1	800	15000	25000
Fluoride	mg/kg	u	2	10	150	500
Sulphate (as SO_4)	mg/kg	u	23	1000	20000	50000
Total Dissolved Solids	mg/kg	u	520	4000	60000	100000
Phenol Index	mg/kg	u	< 1.0	1	-	-
Dissolved Organic Carbon	mg/kg	u	29.0	500	800	1000

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42792

Project Reference - P10525 CASCID - Christie Hospital, Manchester

Certificate Of Analysis - WAC Suite

Lab Reference	346675
Client Sample ID	-
Client Sample Location	TP102
Client Sample Type	ES
Client Sample Number	-
Depth - Top (m)	0.3
Depth - Bottom (m)	0.4
Date of Sampling	27/02/2024
Time of Sampling	-
Sample Description	Made Ground- mottled reddish brown slightly gravelly slightly clayey silty sand with occasional brick fragments
Sample Matrix	Sand
Moisture Content (%)	18
Stone content (%)	17

			Determined Result	Inert Waste Landfill	Stable non reactive hazardous waste in a non hazardous landfill	Hazardous Waste Landfill
Solid Analysis						
Total Organic Carbon	%	MCERTS	3.2	3.0	5.0	6.0
Loss on Ignition	%	UKAS	3.6	-	-	10.0
BTEX	mg/kg	MCERTS	< 0.06	6.00	-	-
PCB's (7 Congeners)	mg/kg	u	< 0.028	1.00	-	-
Mineral Oil (>C_{10} to C_{40}) [EH_1D_Total]	mg/kg	MCERTS	572	500	-	-
PAH	mg/kg	u	1.3	100	-	-
pH	units	MCERTS	7.6	-	> 6	-
Eluate Analysis						
Arsenic	mg/kg	u	< 0.03	0.50	2	25
Barium	mg/kg	u	0.05	20	100	300
Cadmium	mg/kg	u	< 0.03	0.04	1	5
Chromium (total)	mg/kg	u	< 0.03	0.5	10	70
Copper	mg/kg	u	< 0.01	2.0	50	100
Mercury	mg/kg	u	< 0.01	0.01	0.2	2
Molybdenum	mg/kg	u	0.04	0.5	10.0	30
Nickel	mg/kg	u	< 0.03	0.4	10.0	40
Lead	mg/kg	u	< 0.05	0.5	10.0	50
Antimony	mg/kg	u	< 0.03	0.06	0.7	5
Selenium	mg/kg	u	< 0.01	0.1	0.5	7
Zinc	mg/kg	u	< 0.05	4	50	200
Chloride	mg/kg	u	< 1	800	15000	25000
Fluoride	mg/kg	u	1	10	150	500
Sulphate (as SO_4)	mg/kg	u	24	1000	20000	50000
Total Dissolved Solids	mg/kg	u	680	4000	60000	100000
Phenol Index	mg/kg	u	< 1.0	1	-	-
Dissolved Organic Carbon	mg/kg	u	71.0	500	800	1000

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

S **L24/01949/GRM - 24-42792**

\# **Project Reference - P10525 CASCID - Christie Hospital, Manchester**

Analytical Test Results - 2:1 Leachate Suite

DE	Lab Reference			346676	346677
	Client Sample ID			-	-
	Client Sample Location			TP101	BH104
	Client Sample Type			ES	ES
	Client Sample Number			-	-
	Depth - Top (m)			0.40	1.50
	Depth - Bottom (m)			0.50	1.70
	Date of Sampling			27/02/2024	27/02/2024
	Time of Sampling			-	-
	Sample Matrix			Leachate	Leachate
	Determinant	**Units**	**Accreditation**		
EN	Boron	(mg/l)	u	0.006	0.022
EN	Calcium	(mg/l)	u	46	8.3
EN	Iron	(mg/l)	u	0.38	< 0.010
EN	Antimony	(µg/l)	u	3.3	< 2.5
EN	Arsenic	(µg/l)	u	< 3	< 3
EN	Barium	(µg/l)	u	26	28
EN	Beryllium	(µg/l)	u	< 1	< 1
EN	Boron	(µg/l)	u	6	22
SU	Cadmium (LL)	(µg/l)	u	< 0.25	< 0.25
EN	Chromium	(µg/l)	u	< 3	< 3
EN	Chromium (III)	(µg/l)	u	< 20	< 20
EN	Copper	(µg/l)	u	3	< 1
EN	Lead	(µg/l)	u	< 5	< 5
EN	Magnesium	(µg/l)	u	870	790
EN	Manganese	(µg/l)	u	< 5	21
SU	Mercury (LL)	(µg/l)	u	< 0.20	< 0.20
EN	Molydenum	(µg/l)	u	14	4.4
EN	Nickel	(µg/l)	u	< 3	< 3
EN	Selenium	(µg/l)	u	< 1	< 1
EN	Vanadium	(µg/l)	u	49.0	< 2.50
EN	Zinc	(µg/l)	u	< 5	120
EN	pH	pH Units	u	7.8	7.9
EN	Cyanide (Free)	(mg/l)	u	< 0.5	< 0.5
EN	Cyanide (Complex)	(mg/l)	u	< 0.5	< 0.5
EN	Cyanide (Total)	(mg/l)	u	< 0.5	< 0.5
EN	Chromium (Hexavalent)	(mg/l)	u	< 0.02	< 0.02
EN	Chloride	(mg/l)	u	2.4	0.72
EN	Fluoride	(mg/l)	u	0.47	0.13
EN	Sulphate (As SO_4)	(mg/l)	u	< 10	< 10
EN	Ammonium (As N)	(mg/l)	u	0.39	< 0.02
EN	Phenol	(µg/l)	u	12.9	18.3
EN	Cresols	(µg/l)	u	0.34	0.91
EN	Xylenols	(µg/l)	u	< 0.20	< 0.20
EN	Trimethyl Phenols	(µg/l)	u	< 0.50	< 0.50
EN	Phenols (Total)	(µg/l)	u	13.2	19.4

4161

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42792

Project Reference - P10525 CASCID - Christie Hospital, Manchester

Sample Descriptions

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Description	Moisture Content (%)	Stone Content (%)	Passing 2mm test sieve (%)
346673	-	TP106	ES	-	Mottled reddish brown gravelly slightly clayey silty sand	10	28	66
346674	-	TP107	ES	-	Brown slightly gravelly very sandy silty clay	23	1.7	81
346675	-	TP102	ES	-	Made Ground- mottled reddish brown slightly gravelly slightly clayey silty sand with occasional brick fragments	18	17	72
346676	-	TP101	ES	-	Made Ground- mottled reddish brown slightly gravelly slightly clayey silty sand with occasional brick fragments	18	13	89

7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42792

Project Reference - P10525 CASCID - Christie Hospital, Manchester

Sample Comments

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Comments
346673	-	TP106	ES	-	VOC - Sample taken from container with headspace. VPH/BTEX - Sample taken from container with headspace.
346674	-	TP107	ES	-	VOC - Sample taken from container with headspace. VPH/BTEX - Sample taken from container with headspace.
346675	-	TP102	ES	-	VPH/BTEX - Sample taken from container with headspace.
346676	-	TP101	ES	-	VOC - Sample taken from container with headspace. VPH/BTEX - Sample taken from container with headspace.

7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42792

Project Reference - P10525 CASCID - Christie Hospital, Manchester

Analysis Methodologies

Test Code	Test Name / Reference	Sample condition for analysis	Sample Preperation	Test Details
ANIONSL	MS - CL - Anions by Aquakem	As received	-	Determination of Anions (inc Sulphate, chloride etc.) in leachate samples by Aquakem
ANIONSS	MS - CL - Anions by Aquakem (2:1Extract)	Oven dried	Passing 2mm test sieve	Determination of Anions (inc Sulphate, chloride etc.) in soils by Aquakem. Analysis is based on a 2:1 water to soil extraction ratio
EPHS	MS - CL - EPH in Soil	As received	Passing 10mm test sieve	Determination of Extractable Petroleum Hydrocarbons in soils via GC-MS
PCB7S	MS - CL - PCB Soils	As received	Passing 10mm test sieve	Determination of PCB's (7 congeners) in soils via GC-MS
PAHASRDS	MS - CL - PAH (As Received)	As received	Passing 10mm test sieve	Determination of Polyaromatic hydrocarbons in soil via GC-MS
CWGS	MS - CL - VPH & MS - CL - EPH	As received	Passing 10mm test sieve	Determination of TPH CWG (Volatile Petroleum Hydrocarbons and Extractable Petroleum Hydrocarbons) in soils via Headspace-GC-MS and GC-MS respectively
WACTOCS	MS - CL - TOC Eltra (WAC)	Air dried	Passing 10mm test sieve	Determination of Total Organic Carbon in soil as part of a WAC test
TOCS	MS - CL - TOC Eltra	Air Dried	Passing 10mm test sieve	Determination of Total Organic Carbon in soils
TPHS	MS - CL - TPH (GC-FID)	As received	Passing 10mm test sieve	Determination of Total Petroleum Hydrocarbons in soil using GC-FID
WACSKALAR	MS - CL - Phenols by Skalar (WAC)	As received	BSEN:12457 Leaching	Determination of Total Phenols within leachate as part of a WAC test using a Skalar Segmented flow analyser
VOCS	MS - CL - VOC and MBTEX	As received	Passing 10mm test sieve	Determination of VOCs (inc BTEX) in soils via Headspace-GC-MS
VPHS	MS - CL - VPH	As received	Passing 10mm test sieve	Determination of VPH in soils via Headspace-GC-MS
WSBORONS	MS - CL - WS Boron	Air dried	Passing 10mm test sieve	Determination of Water soluble Boron in soils via ICP
SKALARCNL	MS - CL - Cyanide by Skalar - Leachate	As received	BSEN:12457 Leaching	Determination of cyanide (total / free / complex) in leachates using a Skalar segmented flow analyser
SKALARCNS	MS - CL - Cyanide by Skalar	As received	Passing 10mm test sieve	Determination of cyanide (total / free / complex) in soil using a Skalar segmented flow analyser
WACDOC	MS - CL - DOC (WAC)	As received	BSEN:12457 Leaching	Determination of dissolved organic carbon in a leachate as part of a WAC test
SKALARHCL	MS - CL - Hexavalent Cr by Skalar - L	As received	BSEN:12457 Leaching	Determination of hexavalent chromium in leachate using Skalar segmented flow analyser
SKALARHCS	MS - CL - Hexavalent Chromium by Skalar	As received	Passing 10mm test sieve	Determination of hexavalent chromium in soil using Skalar segmented flow analyser
WACMETALS	MS - CL - ICP - Metals in Waters (WAC)	As received	BSEN:12457 Leaching	Determination of metals in a leachate as part of a WAC test via ICP
ICPMETL	MS - CL - ICP Metals in Waters	As received	BSEN:12457 Leaching	Determination of metals in leachates via ICP
ICPMETS	MS - CL - ICP Metals	Air dried	Passing 10mm test sieve	Determination of metals in soils via ICP
PHL	MS - CL - pH in Waters	As received	BSEN:12457 Leaching	Determination of pH in leachates using a pH probe

4161

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42792

Project Reference - P10525 CASCID - Christie Hospital, Manchester

Analysis Methodologies

Test Code	Test Name / Reference	Sample condition for analysis	Sample Preperation	Test Details
WACPHS	MS - CL - pH in Soils (WAC)	As received	BSEN:12457 Leaching	Determination of pH in soils as part of a WAC test via pH probe
PHS	MS - CL - pH in Soils	As received	Passing 10mm test sieve	Determination of pH in soils using a pH probe (using a 1:3 soil to water extraction)
PHOHHPLCL	MS - CL - Phenol Waters by HPLC	As received	BSEN:12457 Leaching	Determination of speciated phenols in leachates using HPLC
PHOHHPLCS	MS - CL - Phenols by HPLC (soil)	As received	Passing 10mm test sieve	Determination of speciated phenols in soil using HPLC
WACANIONS	MS - CL - Anions by Aquakem (WAC)	As received	BSEN:12457 Leaching	Determination of sulphate, chloride and fluoride in a leachate as part of a WAC test using a Aquakem analyser
TDSL	MS-CL-Conductivity in Water(TDS by Calc)	As received	BSEN:12457 Leaching	Determination of total dissolved solids in leachates (by calculation)
ASSO4S	MS - CL - Acid Soluble Sulphate	Oven Dried	Passing 2mm test sieve	Determination of total sulphate in soils by acid extraction followed by ICP analysis
ASB	MS - AS - Asbestos	-	-	Fibre identification is in accordance with in house documented methods which are based on the procedure documented in the HSE Document HSG 248 "Asbestos: The analysts guide for sampling, analysis and clearance procedures"
ENLEACHP	BS EN 12457-2	As Received	-	Leaching in accordance with BSEN 12457-2 (10:1 Ratio)
ENLEACHP2	BS EN 12457-3	As Received	-	Leaching in accordance with BSEN 12457-3
SAMPLEPREP	MS - CL - Sample Preparation	-	-	Preparation of samples (including determination of moisture content) to allow for subsequent analysis
SUBCON-ENV	Subcontract - ENV Lab	-	-	Subcontract testing
1377LOI	BS1377 LoI	Oven dried	Passing 2mm test sieve	Testing was in accordance with BS 1377: Part 3: 2018 + A1 :2021 Clause 6. Determination of the mass loss on ignition. Some information required by BS1377: 2016: Part 1 has not been reported. This information is available on request.
1377TS-ELT	BS1377 Total Sulphur Content by HTC	Oven dried	BS1377 : Part 1 : 2016	Total Sulphur Content testing of Soil in accordance with BS 1377 : Part 3 : 2018 + A1 : 2021 Clause 7.10 (using Eltra CS-800 Analyser)

7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42792

Project Reference - P10525 CASCID - Christie Hospital, Manchester

Sample Deviations

Deviations are listed below against each sample and associated test method, where deviation(s) are noted it means data may not be representative of the sample at the time of sampling and it is possible that results provided may be compromised.

Observations on receipt

A - No date of sampling provided
C - Received in inappropriate container
H - Contains headspace
T - Temperature on receipt exceeds storage temperature
R - Sample(s) received with less than 96 hours for testing to commence/complete, any result formally classed as deviating will be marked with an X against the applicable test (i.e. RX)

Observations whilst in laboratory

X - Exceeds sampling to extraction or analysis timescales

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Test	Deviations
346673	-	TP106	ES	-	MS - CL - Cyanide by Skalar	RX
346673	-	TP106	ES	-	MS - CL - EPH in Soil	RX
346673	-	TP106	ES	-	MS - CL - PAH (As Received)	RX
346673	-	TP106	ES	-	MS - CL - Phenols by HPLC (soil)	RX
346673	-	TP106	ES	-	MS - CL - VOC and MBTEX	RX
346673	-	TP106	ES	-	MS - CL - VPH	RX
346673	-	TP106	ES	-	MS - CL - pH in Soils	RX
346674	-	TP107	ES	-	MS - CL - Cyanide by Skalar	RX
346674	-	TP107	ES	-	MS - CL - EPH in Soil	RX
346674	-	TP107	ES	-	MS - CL - PAH (As Received)	RX
346674	-	TP107	ES	-	MS - CL - Phenols by HPLC (soil)	RX
346674	-	TP107	ES	-	MS - CL - TPH (GC-FID)	RX
346674	-	TP107	ES	-	MS - CL - VOC and MBTEX	RX
346674	-	TP107	ES	-	MS - CL - VPH	RX
346674	-	TP107	ES	-	MS - CL - pH in Soils	RX
346674	-	TP107	ES	-	MS - CL - pH in Soils (WAC)	RX
346675	-	TP102	ES	-	MS - CL - PAH (As Received)	RX
346675	-	TP102	ES	-	MS - CL - TPH (GC-FID)	RX
346675	-	TP102	ES	-	MS - CL - VPH	RX
346675	-	TP102	ES	-	MS - CL - pH in Soils	RX
346675	-	TP102	ES	-	MS - CL - pH in Soils (WAC)	RX
346676	-	TP101	ES	-	MS - CL - Cyanide by Skalar	RX
346676	-	TP101	ES	-	MS - CL - EPH in Soil	RX
346676	-	TP101	ES	-	MS - CL - PAH (As Received)	RX
346676	-	TP101	ES	-	MS - CL - Phenols by HPLC (soil)	RX
346676	-	TP101	ES	-	MS - CL - VOC and MBTEX	RX
346676	-	TP101	ES	-	MS - CL - VPH	RX
346676	-	TP101	ES	-	MS - CL - pH in Soils	RX

4161

7 - 11 Harding Street
Leicester
LE1 4DH

L24/01949/GRM - 24-42792

Project Reference - P10525 CASCID - Christie Hospital, Manchester

HWOL TPH Acronym Index

Acronym	Description
HS	Headspace Analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
Total	Aliphatics and Aromatics
AL	Aliphatics Only
AR	Aromatics Only
2D	GC-GC - Double Coil Gas Chromatography
#1	EH_Total but with humics mathmatically subtracted
#2	EH_Total but with fatty acids mathmatically subtracted
_	Operator - underscore to separate acronyms (except for +)
+	Operator to indicate cumlative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry

7 - 11 Harding Street
Leicester
LE1 4DH

GRM Development Solutions
Laurus House
First Avenue
Centrum 100
Burton Upon Trent
DE14 2WH

Analytical Test Report: L24/02224/GRM - 24-42845

Your Project Reference:	**P10525 CASCID - Christie Hospital, Manchester**		
Your Order Number:	P10525	Samples Received / Instructed:	13/03/2024 / 13/03/2024
Report Issue Number:	1	Sample Tested:	13/03 to 28/03/2024
Samples Analysed:	4 soil samples	Report issued:	28/03/2024

[redacted]

Notes:

General

Please refer to Methodologies page for details pertaining to the analytical methods undertaken.

Samples will be retained for 14 days after issue of this report with the exception of the asbestos test portion which is held for 6 months unless otherwise requested.

Moisture Content was determined in accordance with CTS method statement MS - CL - Sample Prep, oven dried at <30˚C.

Moisture Content is reported as a percentage of the dry mass of soil, this calculation is in accordance with BS1377, Part 2, 1990, Clause 3.2

Stone Content was determined in accordance with CTS method statement MS - CL - Sample Prep and refers to the percentage of stones retained on a 10mm BS test sieve.

Where specification limits are included these are for guidance only. Where a measured value has been highlighted this is not implying acceptance or failure and certainty of measurement values have not been taken into account.

Uncertainty of measurement values are available on request.

Samples were supplied by customer, results apply to the samples as received.

Asbestos

Please note: Where futher analaysis is required samples identified as containing asbestos are screened and tested on an as recevied basis. No correction is made for moisture content and these results are not covered by our accrediation

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation

WAC Testing

Samples were leached in accordance with BS EN 12457-2: 2002.

Eluate Results are reported as L/S 10. These results have been calculated in accordance with BS EN 12457-2:2002.

Comparative values are taken from the Council Decision Annex - CRITERIA AND PROCEDURES FOR THE ACCEPTANCE OF WASTE AT LANDFILLS, (2003/33/EC).

Deviating Samples

On receipt samples are compared against our sample holding and handling protocols, where any deviations have been noted these are reported on our deviating sample page (if present)

Accreditation Key

UKAS = UKAS Accreditation, MCERTS = MCERTS Accreditation, u = Unaccredited, subUKAS - Subcontracted to a laboratory UKAS accredited for this test

MCERTS Accreditation only covers the SAND, CLAY and LOAM matrices

Date of Issue: 18.03.2024

Issued by: J. Gane

Issue No: 4

Rev No: 6

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/02224/GRM - 24-42845

Project Reference - P10525 CASCID - Christie Hospital, Manchester

Analytical Test Results - Solid

Lab Reference			346893	346895	346896
Client Sample ID			-	-	-
Client Sample Location			BH101	BH102	TP104
Client Sample Type			ES	ES	ES
Client Sample Number			-	-	-
Depth - Top (m)			1.00	0.30	0.30
Depth - Bottom (m)			1.10	0.40	0.40
Date of Sampling			11/03/2024	11/03/2024	11/03/2024
Time of Sampling			-	-	-
Sample Matrix			Clay	Sand	Sand
Determinant	**Units**	**Accreditation**			
Antimony	(mg/kg)	u	< 3.5	< 3.5	< 3.5
Arsenic	(mg/kg)	MCERTS	< 10	18	13
Barium	(mg/kg)	MCERTS	77	240	950
Beryllium	(mg/kg)	MCERTS	0.4	1.0	0.8
Boron (w/s)	(mg/kg)	u	< 2.5	< 2.5	< 2.5
Cadmium	(mg/kg)	MCERTS	0.8	0.7	0.9
Chromium (III)	(mg/kg)	u	8.6	6.0	12
Chromium (Total)	(mg/kg)	UKAS	9.6	7.0	13
Copper	(mg/kg)	MCERTS	35	48	90
Iron	(mg/kg)	u	31000	31000	29000
Lead	(mg/kg)	MCERTS	50	130	210
Manganese	(mg/kg)	MCERTS	810	660	320
Mercury	(mg/kg)	UKAS	< 2.5	< 2.5	< 2.5
Mercury Total (low level)	(mg/kg)	u	0.1	0.1	< 0.1
Molybdenum	(mg/kg)	u	< 2.0	< 2.0	< 2.0
Nickel	(mg/kg)	MCERTS	23	17	23
Selenium	(mg/kg)	u	< 8.0	< 8.0	< 8.0
Vanadium	(mg/kg)	UKAS	25	27	33
Zinc	(mg/kg)	MCERTS	55	59	370
Phenol	(mg/kg)	MCERTS	< 0.20	< 0.20	< 0.20
Cresols	(mg/kg)	MCERTS	< 0.20	< 0.20	< 0.20
Xylenols	(mg/kg)	MCERTS	< 0.20	< 0.20	< 0.20
Trimethyl Phenols	(mg/kg)	UKAS	< 0.20	< 0.20	< 0.20
Total Phenols (via HPLC)	(mg/kg)	UKAS	< 0.80	< 0.80	< 0.80
Cyanide (Free)	(mg/kg)	u	< 1.0	< 1.0	< 1.0
Chromium (Hexavalent)	(mg/kg)	u	< 1.0	< 1.0	< 1.0
pH	pH Units	MCERTS	7.5	7.9	7.9
Sulphate (Water soluble as SO_4)	(mg/l)	u	11	10	< 10
Sulphur (Total)	(%)	UKAS	0.03	0.02	0.02
Acenaphthene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02
Acenaphthylene	(mg/kg)	UKAS	< 0.02	< 0.02	< 0.02
Anthracene	(mg/kg)	UKAS	0.03	< 0.02	0.03
Benzo (a) anthracene	(mg/kg)	MCERTS	0.14	0.04	0.11
Benzo (a) pyrene	(mg/kg)	MCERTS	0.16	0.03	0.10
Benzo (b) fluoranthene	(mg/kg)	MCERTS	0.27	0.06	0.12
Benzo (g, h, i) perylene	(mg/kg)	MCERTS	0.13	0.03	0.08
Benzo (k) fluoranthene	(mg/kg)	MCERTS	0.08	< 0.02	0.03
Chrysene	(mg/kg)	MCERTS	0.16	0.05	0.12
Dibenzo (a,h) anthracene	(mg/kg)	MCERTS	0.02	< 0.02	< 0.02

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/02224/GRM - 24-42845

Project Reference - P10525 CASCID - Christie Hospital, Manchester

Analytical Test Results - Solid

Lab Reference			346893	346895	346896
Client Sample ID			-	-	-
Client Sample Location			BH101	BH102	TP104
Client Sample Type			ES	ES	ES
Client Sample Number			-	-	-
Depth - Top (m)			1.00	0.30	0.30
Depth - Bottom (m)			1.10	0.40	0.40
Date of Sampling			11/03/2024	11/03/2024	11/03/2024
Time of Sampling			-	-	-
Sample Matrix			Clay	Sand	Sand
Determinant	**Units**	**Accreditation**			
Fluoranthene	(mg/kg)	MCERTS	0.20	0.07	0.19
Fluorene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02
Indeno (1, 2, 3,-cd) pyrene	(mg/kg)	MCERTS	0.18	0.04	0.12
Naphthalene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02
Phenanthrene	(mg/kg)	MCERTS	0.12	0.03	0.12
Pyrene	(mg/kg)	MCERTS	0.23	0.07	0.18
Total PAH (Sum of USEPA 16)	(mg/kg)	UKAS	1.8	0.60	1.3
FOC	-	UKAS	0.016	0.038	0.036
Asbestos	-	UKAS	No asbestos detected	No asbestos detected	No asbestos detected

7 - 11 Harding Street
Leicester
LE1 4DH

L24/02224/GRM - 24-42845

Project Reference - P10525 CASCID - Christie Hospital, Manchester

Analytical Test Results - Chemical Analysis

Lab Reference			346894	346895	346896
Client Sample ID			-	-	-
Client Sample Location			BH101	BH102	TP104
Client Sample Type			ES	ES	ES
Client Sample Number			-	-	-
Depth - Top (m)			1.50	0.30	0.30
Depth - Bottom (m)			1.60	0.40	0.40
Date of Sampling			11/03/2024	11/03/2024	11/03/2024
Time of Sampling			-	-	-
Sample Matrix			Clay	Sand	Sand
Determinant	**Units**	**Accreditation**			
Water soluble sulphate (as SO_4)	(mg/l)	u	11	10	< 10
Acid Soluble Sulphate	(%)	u	< 0.01	0.02	0.01
Total Sulphur	(%)	UKAS	0.01	0.02	0.02
pH Value	pH Units	MCERTS	7.4	7.9	7.9

7 - 11 Harding Street
Leicester
LE1 4DH

L24/02224/GRM - 24-42845

Project Reference - P10525 CASCID - Christie Hospital, Manchester

Analytical Test Results - VPH / EPH

Lab Reference			346893	346895	346896
Client Sample ID			-	-	-
Client Sample Location			BH101	BH102	TP104
Client Sample Type			ES	ES	ES
Client Sample Number			-	-	-
Depth - Top (m)			1.00	0.30	0.30
Depth - Bottom (m)			1.10	0.40	0.40
Date of Sampling			11/03/2024	11/03/2024	11/03/2024
Time of Sampling			-	-	-
Sample Matrix			Clay	Sand	Sand
Determinant	**Units**	**Accreditation**			
Aliphatic >C_5 to C_6 [HS_MS_1D_AL]	(mg/kg)	MCERTS	< 0.06	< 0.06	< 0.06
Aliphatic >C_6 to C_8 [HS_MS_1D_AL]	(mg/kg)	MCERTS	< 0.06	< 0.06	< 0.06
Aliphatic >C_8 to C_{10} [HS_MS_1D_AL]	(mg/kg)	MCERTS	< 0.06	< 0.06	< 0.06
Aliphatic >C_{10} to C_{12} [EH_CU_1D_AL]	(mg/kg)	u	< 10	< 10	< 10
Aliphatic >C_{12} to C_{16} [EH_CU_1D_AL]	(mg/kg)	u	< 10	< 10	< 10
Aliphatic >C_{16} to C_{21} [EH_CU_1D_AL]	(mg/kg)	u	< 10	< 10	< 10
Aliphatic >C_{21} to C_{35} [EH_CU_1D_AL]	(mg/kg)	u	< 20	< 20	< 20
Aliphatic >C_{35} to C_{44} [EH_CU_1D_AL]	(mg/kg)	u	< 15	< 15	< 15
Aromatic >C_5 to C_7 [HS_MS_1D_AR]	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Aromatic >C_7 to C_8 [HS_MS_1D_AR]	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Aromatic >C_8 to C_{10} [HS_MS_1D_AR]	(mg/kg)	MCERTS	< 0.06	< 0.06	< 0.06
Aromatic >C_{10} to C_{12} [EH_CU_1D_AR]	(mg/kg)	u	< 10	< 10	< 10
Aromatic >C_{12} to C_{16} [EH_CU_1D_AR]	(mg/kg)	u	< 10	< 10	< 10
Aromatic >C_{16} to C_{21} [EH_CU_1D_AR]	(mg/kg)	u	< 10	< 10	< 10
Aromatic >C_{21} to C_{35} [EH_CU_1D_AR]	(mg/kg)	u	24	< 20	< 20
Aromatic >C_{35} to C_{44} [EH_CU_1D_AR]	(mg/kg)	u	33	22	25
Total >C_5 to C_{35} [EH_CU+HS_1D_Total]	(mg/kg)	u	< 50	< 50	< 50
Benzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Toluene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Ethylbenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
m&p Xylene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02
o-Xylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
MTBE	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01

7 - 11 Harding Street
Leicester
LE1 4DH

L24/02224/GRM - 24-42845

Project Reference - P10525 CASCID - Christie H

Analytical Test Results - VOC

Lab Reference			346893	346895	346896
Client Sample ID			-	-	-
Client Sample Location			BH101	BH102	TP104
Client Sample Type			ES	ES	ES
Client Sample Number			-	-	-
Depth - Top (m)			1.00	0.30	0.30
Depth - Bottom (m)			1.10	0.40	0.40
Date of Sampling			11/03/2024	11/03/2024	11/03/2024
Time of Sampling			-	-	-
Sample Matrix			Clay	Sand	Sand
Determinant	**Units**	**Accreditation**			
Benzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Toluene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Ethylbenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
m&p Xylene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02
o-Xylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Dichlorodifluoromethane	(mg/kg)	UKAS	< 0.05	< 0.05	< 0.05
Chloromethane	(mg/kg)	UKAS	< 0.02	< 0.02	< 0.02
Vinyl Chloride	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02
Bromomethane	(mg/kg)	u	< 0.05	< 0.05	< 0.05
Chloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Trichlorofluoromethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,1-Dichloroethylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Dichloromethane	(mg/kg)	u	< 0.10	< 0.10	< 0.10
MTBE	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
trans-1,2,-dichloroethylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,1-Dichloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
2,2-Dichloropropane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
cis--1,2,-dichloroethylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Bromochloromethane	(mg/kg)	MCERTS	< 0.05	< 0.05	< 0.05
Chloroform	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,1,1-Trichloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,1-Dichloropropene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Carbon Tetrachloride	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,2-dichloroethane	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02
Trichloroethylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,2-Dichloropropane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Dibromomethane	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02
Bromodichloromethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
cis-1,2-dichloropropylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
trans-1,3-dichloropropylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,1,2-Trichloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,3-Dichloropropane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Tetrachloroethylene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Chlorodibromomethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,2-Dibromoethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Chlorobenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,1,1,2-tetrachloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Styrene	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01
Isopropylbenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Bromoform	(mg/kg)	MCERTS	< 0.05	< 0.05	< 0.05
1,1,2,2-Tetrachloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,2,3-Trichloropropane	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02
n-Propylbenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Bromobenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,3,5-Trimethylbenzene	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01
2-chlorotoluene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
4-chlorotoluene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
tert-butylbenzene	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01
1,2,4-trimethylbenzene	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01
sec-Butylbenzene	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01
4-Isopropyltoluene (P-Cymene)	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01
1,3-Dichlorobenzene	(mg/kg)	u	< 0.01	< 0.01	< 0.01
1,4-Dichlorobenzene	(mg/kg)	u	< 0.01	< 0.01	< 0.01
n-Butylbenzene	(mg/kg)	UKAS	< 0.01	< 0.01	< 0.01
1,2-Dichlorobenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
1,2-Dibromo-3-chloropropane	(mg/kg)	u	< 0.05	< 0.05	< 0.05
1,2,4-Trichlorobenzene	(mg/kg)	u	< 0.05	< 0.05	< 0.05
Hexachlorobutadiene	(mg/kg)	u	< 0.05	< 0.05	< 0.05
Naphthalene	(mg/kg)	u	< 0.05	< 0.05	< 0.05
1,2,3-Trichlorobenzene	(mg/kg)	u	< 0.05	< 0.05	< 0.05

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/02224/GRM - 24-42845

Project Reference - P10525 CASCID - Christie Hospital, Manchester

Certificate Of Analysis - WAC Suite

Lab Reference	346893
Client Sample ID	-
Client Sample Location	BH101
Client Sample Type	ES
Client Sample Number	-
Depth - Top (m)	1
Depth - Bottom (m)	1.1
Date of Sampling	11/03/2024
Time of Sampling	-
Sample Description	Dark brown slightly gravelly sandy silty clay
Sample Matrix	Clay
Moisture Content (%)	13
Stone content (%)	12

			Determined Result	Inert Waste Landfill	Stable non reactive hazardous waste in a non hazardous landfill	Hazardous Waste Landfill
Solid Analysis						
Total Organic Carbon	%	MCERTS	1.6	3.0	5.0	6.0
Loss on Ignition	%	UKAS	2.6	-	-	10.0
BTEX	mg/kg	MCERTS	< 0.06	6.00	-	-
PCB's (7 Congeners)	mg/kg	u	< 0.028	1.00	-	-
Mineral Oil (>C_{10} to C_{40}) [EH_1D_Total]	mg/kg	MCERTS	75	500	-	-
PAH	mg/kg	u	1.8	100	-	-
pH	units	MCERTS	7.5	-	> 6	-
Eluate Analysis						
Arsenic	mg/kg	u	< 0.03	0.50	2	25
Barium	mg/kg	u	< 0.05	20	100	300
Cadmium	mg/kg	u	< 0.03	0.04	1	5
Chromium (total)	mg/kg	u	< 0.03	0.5	10	70
Copper	mg/kg	u	0.01	2.0	50	100
Mercury	mg/kg	u	< 0.01	0.01	0.2	2
Molybdenum	mg/kg	u	< 0.03	0.5	10.0	30
Nickel	mg/kg	u	< 0.03	0.4	10.0	40
Lead	mg/kg	u	< 0.05	0.5	10.0	50
Antimony	mg/kg	u	< 0.03	0.06	0.7	5
Selenium	mg/kg	u	< 0.01	0.1	0.5	7
Zinc	mg/kg	u	< 0.05	4	50	200
Chloride	mg/kg	u	66	800	15000	25000
Fluoride	mg/kg	u	6	10	150	500
Sulphate (as SO_4)	mg/kg	u	< 10	1000	20000	50000
Total Dissolved Solids	mg/kg	u	330	4000	60000	100000
Phenol Index	mg/kg	u	< 1.0	1	-	-
Dissolved Organic Carbon	mg/kg	u	26.0	500	800	1000

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

S **L24/02224/GRM - 24-42845**

\# **Project Reference - P10525 CASCID - Christie Hospital, Manchester**

Analytical Test Results - 2:1 Leachate Suite

DE	Lab Reference			346895
	Client Sample ID			-
	Client Sample Location			BH102
	Client Sample Type			ES
	Client Sample Number			-
	Depth - Top (m)			0.30
	Depth - Bottom (m)			0.40
	Date of Sampling			11/03/2024
	Time of Sampling			-
	Sample Matrix			Leachate
	Determinant	**Units**	**Accreditation**	
EN	Boron	(mg/l)	u	0.005
EN	Calcium	(mg/l)	u	27
EN	Iron	(mg/l)	u	1.2
EN	Antimony	(µg/l)	u	< 2.5
EN	Arsenic	(µg/l)	u	< 3
EN	Barium	(µg/l)	u	16
EN	Beryllium	(µg/l)	u	< 1
EN	Boron	(µg/l)	u	5
SU	Cadmium (LL)	(µg/l)	u	< 0.25
EN	Chromium	(µg/l)	u	< 3
EN	Chromium (III)	(µg/l)	u	< 20
EN	Copper	(µg/l)	u	< 1
EN	Lead	(µg/l)	u	< 5
EN	Magnesium	(µg/l)	u	1600
EN	Manganese	(µg/l)	u	20
SU	Mercury (LL)	(µg/l)	u	< 0.20
EN	Molydenum	(µg/l)	u	< 2.5
EN	Nickel	(µg/l)	u	< 3
EN	Selenium	(µg/l)	u	< 1
EN	Vanadium	(µg/l)	u	20.2
EN	Zinc	(µg/l)	u	< 5
EN	pH	pH Units	u	7.9
EN	Cyanide (Free)	(mg/l)	u	< 0.5
EN	Cyanide (Complex)	(mg/l)	u	< 0.5
EN	Cyanide (Total)	(mg/l)	u	< 0.5
EN	Chromium (Hexavalent)	(mg/l)	u	< 0.02
EN	Chloride	(mg/l)	u	1.6
EN	Fluoride	(mg/l)	u	0.61
EN	Sulphate (As SO_4)	(mg/l)	u	< 10
EN	Ammonium (As N)	(mg/l)	u	< 0.02
EN	Phenol	(µg/l)	u	7.42
EN	Cresols	(µg/l)	u	< 0.20
EN	Xylenols	(µg/l)	u	< 0.20
EN	Trimethyl Phenols	(µg/l)	u	< 0.50
EN	Phenols (Total)	(µg/l)	u	7.55

7 - 11 Harding Street
Leicester
LE1 4DH

L24/02224/GRM - 24-42845

Project Reference - P10525 CASCID - Christie Hospital, Manchester

Analytical Test Results - 2:1 Leachate Suite

Lab Reference		
Client Sample ID		
Client Sample Location		
Client Sample Type		
Client Sample Number		
Depth - Top (m)		
Depth - Bottom (m)		
Date of Sampling		
Time of Sampling		
Sample Matrix		
Determinant	**Units**	**Accreditation**
Boron	(mg/l)	u
Calcium	(mg/l)	u
Iron	(mg/l)	u
Antimony	(µg/l)	u
Arsenic	(µg/l)	u
Barium	(µg/l)	u
Beryllium	(µg/l)	u
Boron	(µg/l)	u
Cadmium (LL)	(µg/l)	u
Chromium	(µg/l)	u
Chromium (III)	(µg/l)	u
Copper	(µg/l)	u
Lead	(µg/l)	u
Magnesium	(µg/l)	u
Manganese	(µg/l)	u
Mercury (LL)	(µg/l)	u
Molydenum	(µg/l)	u
Nickel	(µg/l)	u
Selenium	(µg/l)	u
Vanadium	(µg/l)	u
Zinc	(µg/l)	u
pH	pH Units	u
Cyanide (Free)	(mg/l)	u
Cyanide (Complex)	(mg/l)	u
Cyanide (Total)	(mg/l)	u
Chromium (Hexavalent)	(mg/l)	u
Chloride	(mg/l)	u
Fluoride	(mg/l)	u
Sulphate (As SO_4)	(mg/l)	u
Ammonium (As N)	(mg/l)	u
Phenol	(µg/l)	u
Cresols	(µg/l)	u
Xylenols	(µg/l)	u
Trimethyl Phenols	(µg/l)	u
Phenols (Total)	(µg/l)	u

7 - 11 Harding Street
Leicester
LE1 4DH

L24/02224/GRM - 24-42845

Project Reference - P10525 CASCID - Christie Hospital, Manchester

Sample Descriptions

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Description	Moisture Content (%)	Stone Content (%)	Passing 2mm test sieve (%)
346893	-	BH101	ES	-	Dark brown slightly gravelly sandy silty clay	13	12	67
346894	-	BH101	ES	-	Mottled brown silty clay	-	-	100
346895	-	BH102	ES	-	Dark brown clayey silty loamy sand	18	2.5	71
346896	-	TP104	ES	-	Dark brown slightly clayey silty sand with frequent brick fragments	14	< 0.1	81

7 - 11 Harding Street
Leicester
LE1 4DH

L24/02224/GRM - 24-42845

Project Reference - P10525 CASCID - Christie Hospital, Manchester

Sample Comments

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Comments
346893	-	BH101	ES	-	VOC - Sample taken from container with headspace. VPH/BTEX - Sample taken from container with headspace.
346894	-	BH101	ES	-	
346895	-	BH102	ES	-	VOC - Sample taken from container with headspace. VPH/BTEX - Sample taken from container with headspace.
346896	-	TP104	ES	-	VOC - Sample taken from container with headspace. VPH/BTEX - Sample taken from container with headspace.

7 - 11 Harding Street
Leicester
LE1 4DH

L24/02224/GRM - 24-42845

Project Reference - P10525 CASCID - Christie Hospital, Manchester

Analysis Methodologies

Test Code	Test Name / Reference	Sample condition for analysis	Sample Preperation	Test Details
ANIONSL	MS - CL - Anions by Aquakem	As received	-	Determination of Anions (inc Sulphate, chloride etc.) in leachate samples by Aquakem
ANIONSS	MS - CL - Anions by Aquakem (2:1Extract)	Oven dried	Passing 2mm test sieve	Determination of Anions (inc Sulphate, chloride etc.) in soils by Aquakem. Analysis is based on a 2:1 water to soil extraction ratio
EPHS	MS - CL - EPH in Soil	As received	Passing 10mm test sieve	Determination of Extractable Petroleum Hydrocarbons in soils via GC-MS
PCB7S	MS - CL - PCB Soils	As received	Passing 10mm test sieve	Determination of PCB's (7 congeners) in soils via GC-MS
PAHASRDS	MS - CL - PAH (As Received)	As received	Passing 10mm test sieve	Determination of Polyaromatic hydrocarbons in soil via GC-MS
CWGS	MS - CL - VPH & MS - CL - EPH	As received	Passing 10mm test sieve	Determination of TPH CWG (Volatile Petroleum Hydrocarbons and Extractable Petroleum Hydrocarbons) in soils via Headspace-GC-MS and GC-MS respectively
WACTOCS	MS - CL - TOC Eltra (WAC)	Air dried	Passing 10mm test sieve	Determination of Total Organic Carbon in soil as part of a WAC test
TOCS	MS - CL - TOC Eltra	Air Dried	Passing 10mm test sieve	Determination of Total Organic Carbon in soils
TPHS	MS - CL - TPH (GC-FID)	As received	Passing 10mm test sieve	Determination of Total Petroleum Hydrocarbons in soil using GC-FID
WACSKALAR	MS - CL - Phenols by Skalar (WAC)	As received	BSEN:12457 Leaching	Determination of Total Phenols within leachate as part of a WAC test using a Skalar Segmented flow analyser
VOCS	MS - CL - VOC and MBTEX	As received	Passing 10mm test sieve	Determination of VOCs (inc BTEX) in soils via Headspace-GC-MS
VPHS	MS - CL - VPH	As received	Passing 10mm test sieve	Determination of VPH in soils via Headspace-GC-MS
WSBORONS	MS - CL - WS Boron	Air dried	Passing 10mm test sieve	Determination of Water soluble Boron in soils via ICP
SKALARCNL	MS - CL - Cyanide by Skalar - Leachate	As received	BSEN:12457 Leaching	Determination of cyanide (total / free / complex) in leachates using a Skalar segmented flow analyser
SKALARCNS	MS - CL - Cyanide by Skalar	As received	Passing 10mm test sieve	Determination of cyanide (total / free / complex) in soil using a Skalar segmented flow analyser
WACDOC	MS - CL - DOC (WAC)	As received	BSEN:12457 Leaching	Determination of dissolved organic carbon in a leachate as part of a WAC test
SKALARHCL	MS - CL - Hexavalent Cr by Skalar - L	As received	BSEN:12457 Leaching	Determination of hexavalent chromium in leachate using Skalar segmented flow analyser
SKALARHCS	MS - CL - Hexavalent Chromium by Skalar	As received	Passing 10mm test sieve	Determination of hexavalent chromium in soil using Skalar segmented flow analyser
WACMETALS	MS - CL - ICP - Metals in Waters (WAC)	As received	BSEN:12457 Leaching	Determination of metals in a leachate as part of a WAC test via ICP
ICPMETL	MS - CL - ICP Metals in Waters	As received	BSEN:12457 Leaching	Determination of metals in leachates via ICP

7 - 11 Harding Street
Leicester
LE1 4DH

L24/02224/GRM - 24-42845

Project Reference - P10525 CASCID - Christie Hospital, Manchester

Analysis Methodologies

Test Code	Test Name / Reference	Sample condition for analysis	Sample Preperation	Test Details
ICPMETS	MS - CL - ICP Metals	Air dried	Passing 10mm test sieve	Determination of metals in soils via ICP
PHL	MS - CL - pH in Waters	As received	BSEN:12457 Leaching	Determination of pH in leachates using a pH probe
WACPHS	MS - CL - pH in Soils (WAC)	As received	BSEN:12457 Leaching	Determination of pH in soils as part of a WAC test via pH probe
PHS	MS - CL - pH in Soils	As received	Passing 10mm test sieve	Determination of pH in soils using a pH probe (using a 1:3 soil to water extraction)
PHOHHPLCL	MS - CL - Phenol Waters by HPLC	As received	BSEN:12457 Leaching	Determination of speciated phenols in leachates using HPLC
PHOHHPLCS	MS - CL - Phenols by HPLC (soil)	As received	Passing 10mm test sieve	Determination of speciated phenols in soil using HPLC
WACANIONS	MS - CL - Anions by Aquakem (WAC)	As received	BSEN:12457 Leaching	Determination of sulphate, chloride and fluoride in a leachate as part of a WAC test using a Aquakem analyser
TDSL	MS-CL-Conductivity in Water(TDS by Calc)	As received	BSEN:12457 Leaching	Determination of total dissolved solids in leachates (by calculation)
ASSO4S	MS - CL - Acid Soluble Sulphate	Oven Dried	Passing 2mm test sieve	Determination of total sulphate in soils by acid extraction followed by ICP analysis
ASB	MS - AS - Asbestos	-	-	Fibre identification is in accordance with in house documented methods which are based on the procedure documented in the HSE Document HSG 248 "Asbestos: The analysts guide for sampling, analysis and clearance procedures"
ENLEACHP	BS EN 12457-2	As Received	-	Leaching in accordance with BSEN 12457-2 (10:1 Ratio)
ENLEACHP2	BS EN 12457-3	As Received	-	Leaching in accordance with BSEN 12457-3
SAMPLEPREP	MS - CL - Sample Preparation	-	-	Preparation of samples (including determination of moisture content) to allow for subsequent analysis
SUBCON-ENV	Subcontract - ENV Lab	-	-	Subcontract testing
1377LOI	BS1377 LoI	Oven dried	Passing 2mm test sieve	Testing was in accordance with BS 1377: Part 3: 2018 + A1 :2021 Clause 6. Determination of the mass loss on ignition. Some information required by BS1377: 2016: Part 1 has not been reported. This information is available on request.
1377TS-ELT	BS1377 Total Sulphur Content by HTC	Oven dried	BS1377 : Part 1 : 2016	Total Sulphur Content testing of Soil in accordance with BS 1377 : Part 3 : 2018 + A1 : 2021 Clause 7.10 (using Eltra CS-800 Analyser)

7 - 11 Harding Street
Leicester
LE1 4DH

L24/02224/GRM - 24-42845

Project Reference - P10525 CASCID - Christie Hospital, Manchester

Sample Deviations

Deviations are listed below against each sample and associated test method, where deviation(s) are noted it means data may not be representative of the sample at the time of sampling and it is possible that results provided may be compromised.

Observations on receipt

A - No date of sampling provided
C - Received in inappropriate container
H - Contains headspace
T - Temperature on receipt exceeds storage temperature
R - Sample(s) received with less than 96 hours for testing to commence/complete, any result formally classed as deviating will be marked with an X against the applicable test (i.e. RX)

Observations whilst in laboratory

X - Exceeds sampling to extraction or analysis timescales

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Test	Deviations
346893	-	BH101	ES	-	MS - CL - Phenols by HPLC (soil)	X
346895	-	BH102	ES	-	MS - CL - Phenols by HPLC (soil)	X
346896	-	TP104	ES	-	MS - CL - Phenols by HPLC (soil)	X

7 - 11 Harding Street
Leicester
LE1 4DH

L24/02224/GRM - 24-42845

Project Reference - P10525 CASCID - Christie Hospital, Manchester

HWOL TPH Acronym Index

Acronym	Description
HS	Headspace Analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
Total	Aliphatics and Aromatics
AL	Aliphatics Only
AR	Aromatics Only
2D	GC-GC - Double Coil Gas Chromatography
#1	EH_Total but with humics mathmatically subtracted
#2	EH_Total but with fatty acids mathmatically subtracted
_	Operator - underscore to separate acronyms (except for +)
+	Operator to indicate cumlative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry

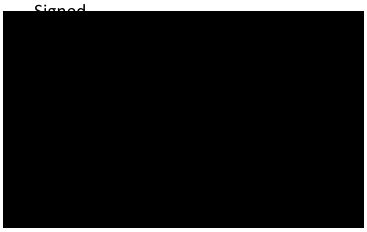
7 - 11 Harding Street
Leicester
LE1 4DH

GRM Development Solutions
Laurus House
First Avenue
Centrum 100
Burton Upon Trent
DE14 2WH

Analytical Test Report: L24/02431/GRM - 24-43078 - Amendment A

Your Project Reference:	**P10525 CASCID Christie Hospital Manchester**		
Your Order Number:	P10525	Samples Received / Instructed:	19/03/2024 / 19/03/2024
Report Issue Number:	2	Sample Tested:	19/03 to 03/04/2024
Samples Analysed:	2 soil samples	Report issued:	05/04/2024

Signed



Notes:

Amendment A 05/04/2024 - Report amended to include updated reporting limit

General

Please refer to Methodologies page for details pertaining to the analytical methods undertaken.

Samples will be retained for 14 days after issue of this report with the exception of the asbestos test portion which is held for 6 months unless otherwise requested.

Moisture Content was determined in accordance with CTS method statement MS - CL - Sample Prep, oven dried at <30˚C.

Moisture Content is reported as a percentage of the dry mass of soil, this calculation is in accordance with BS1377, Part 2, 1990, Clause 3.2

Stone Content was determined in accordance with CTS method statement MS - CL - Sample Prep and refers to the percentage of stones retained on a 10mm BS test sieve.

Where specification limits are included these are for guidance only. Where a measured value has been highlighted this is not implying acceptance or failure and certainty of measurement values have not been taken into account.

Uncertainty of measurement values are available on request.

Samples were supplied by customer, results apply to the samples as received.

Asbestos

Please note: Where futher analaysis is required samples identified as containing asbestos are screened and tested on an as recevied basis. No correction is made for moisture content and these results are not covered by our accrediation

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation

Deviating Samples

On receipt samples are compared against our sample holding and handling protocols, where any deviations have been noted these are reported on our deviating sample page (if present)

Accreditation Key

UKAS = UKAS Accreditation, MCERTS = MCERTS Accreditation, u = Unaccredited, subUKAS - Subcontracted to a laboratory UKAS accredited for this test

MCERTS Accreditation only covers the SAND, CLAY and LOAM matrices

Date of Issue: 18.03.2024

Issued by: J. Gane

Issue No: 4

Rev No: 6

7 - 11 Harding Street
Leicester
LE1 4DH

L24/02431/GRM - 24-43078 - Amendment A

Project Reference - P10525 CASCID Christie Hospital Manchester

Analytical Test Results - Solid

Lab Reference			347803
Client Sample ID			-
Client Sample Location			TP105
Client Sample Type			ES
Client Sample Number			-
Depth - Top (m)			0.50
Depth - Bottom (m)			0.50
Date of Sampling			17/03/2024
Time of Sampling			-
Sample Matrix			Sand
Determinant	**Units**	**Accreditation**	
Antimony	(mg/kg)	u	< 3.5
Arsenic	(mg/kg)	MCERTS	26
Barium	(mg/kg)	MCERTS	120
Beryllium	(mg/kg)	MCERTS	0.7
Boron (w/s)	(mg/kg)	u	< 2.5
Cadmium	(mg/kg)	MCERTS	0.7
Chromium (III)	(mg/kg)	u	5.4
Chromium (Total)	(mg/kg)	UKAS	6.4
Copper	(mg/kg)	MCERTS	63
Iron	(mg/kg)	u	34000
Lead	(mg/kg)	MCERTS	450
Manganese	(mg/kg)	MCERTS	590
Mercury	(mg/kg)	UKAS	< 2.5
Mercury (Total, Low level)	(mg/kg)	u	0.2
Molybdenum	(mg/kg)	u	2.8
Nickel	(mg/kg)	MCERTS	21
Selenium	(mg/kg)	u	< 8.0
Vanadium	(mg/kg)	UKAS	32
Zinc	(mg/kg)	MCERTS	73
Phenol	(mg/kg)	MCERTS	< 0.20
Cresols	(mg/kg)	MCERTS	< 0.20
Xylenols	(mg/kg)	MCERTS	< 0.20
Trimethyl Phenols	(mg/kg)	UKAS	< 0.20
Total Phenols (via HPLC)	(mg/kg)	UKAS	< 0.80
Cyanide (Free)	(mg/kg)	u	< 1.0
Chromium (Hexavalent)	(mg/kg)	u	< 1.0
pH	pH Units	MCERTS	7.8
Sulphate (Water soluble as SO_4)	(mg/l)	u	29
Sulphur (Total)	(%)	UKAS	0.01
Acenaphthene	(mg/kg)	MCERTS	< 0.02
Acenaphthylene	(mg/kg)	UKAS	< 0.02
Anthracene	(mg/kg)	UKAS	< 0.02
Benzo (a) anthracene	(mg/kg)	MCERTS	< 0.02
Benzo (a) pyrene	(mg/kg)	MCERTS	< 0.02
Benzo (b) fluoranthene	(mg/kg)	MCERTS	< 0.02
Benzo (g, h, i) perylene	(mg/kg)	MCERTS	< 0.02
Benzo (k) fluoranthene	(mg/kg)	MCERTS	< 0.02
Chrysene	(mg/kg)	MCERTS	< 0.02
Dibenzo (a,h) anthracene	(mg/kg)	MCERTS	< 0.02

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/02431/GRM - 24-43078 - Amendment A

Project Reference - P10525 CASCID Christie Hospital Manchester

Analytical Test Results - Solid

Lab Reference			347803
Client Sample ID			-
Client Sample Location			TP105
Client Sample Type			ES
Client Sample Number			-
Depth - Top (m)			0.50
Depth - Bottom (m)			0.50
Date of Sampling			17/03/2024
Time of Sampling			-
Sample Matrix			Sand
Determinant	**Units**	**Accreditation**	
Fluoranthene	(mg/kg)	MCERTS	< 0.02
Fluorene	(mg/kg)	MCERTS	< 0.02
Indeno (1, 2, 3,-cd) pyrene	(mg/kg)	MCERTS	< 0.02
Naphthalene	(mg/kg)	MCERTS	< 0.02
Phenanthrene	(mg/kg)	MCERTS	< 0.02
Pyrene	(mg/kg)	MCERTS	< 0.02
Total PAH (Sum of USEPA 16)	(mg/kg)	UKAS	< 0.32
FOC	-	UKAS	0.038
Asbestos	-	UKAS	No asbestos detected

7 - 11 Harding Street
Leicester
LE1 4DH

L24/02431/GRM - 24-43078 - Amendment A

Project Reference - P10525 CASCID Christie Hospital Manchester

Analytical Test Results - Chemical Analysis

Lab Reference			347802
Client Sample ID			-
Client Sample Location			TP103
Client Sample Type			ES
Client Sample Number			-
Depth - Top (m)			0.30
Depth - Bottom (m)			0.40
Date of Sampling			17/03/2024
Time of Sampling			-
Sample Matrix			Sand
Determinant	**Units**	**Accreditation**	
Water soluble sulphate (as SO_4)	(mg/l)	u	< 10
Acid Soluble Sulphate	(%)	u	0.03
Total Sulphur	(%)	UKAS	0.02
pH Value	pH Units	MCERTS	8.7

7 - 11 Harding Street
Leicester
LE1 4DH

L24/02431/GRM - 24-43078 - Amendment A

Project Reference - P10525 CASCID Christie Hospital Manchester

Analytical Test Results - VPH / EPH

Lab Reference			347803
Client Sample ID			-
Client Sample Location			TP105
Client Sample Type			ES
Client Sample Number			-
Depth - Top (m)			0.50
Depth - Bottom (m)			0.50
Date of Sampling			17/03/2024
Time of Sampling			-
Sample Matrix			Sand
Determinant	**Units**	**Accreditation**	
Aliphatic >C_5 to C_6 [HS_MS_1D_AL]	(mg/kg)	MCERTS	< 0.06
Aliphatic >C_6 to C_8 [HS_MS_1D_AL]	(mg/kg)	MCERTS	< 0.06
Aliphatic >C_8 to C_{10} [HS_MS_1D_AL]	(mg/kg)	MCERTS	< 0.06
Aliphatic >C_{10} to C_{12} [EH_CU_1D_AL]	(mg/kg)	u	< 10
Aliphatic >C_{12} to C_{16} [EH_CU_1D_AL]	(mg/kg)	u	< 10
Aliphatic >C_{16} to C_{21} [EH_CU_1D_AL]	(mg/kg)	u	< 10
Aliphatic >C_{21} to C_{35} [EH_CU_1D_AL]	(mg/kg)	u	< 20
Aliphatic >C_{35} to C_{44} [EH_CU_1D_AL]	(mg/kg)	u	< 15
Aromatic >C_5 to C_7 [HS_MS_1D_AR]	(mg/kg)	MCERTS	< 0.01
Aromatic >C_7 to C_8 [HS_MS_1D_AR]	(mg/kg)	MCERTS	< 0.01
Aromatic >C_8 to C_{10} [HS_MS_1D_AR]	(mg/kg)	MCERTS	< 0.06
Aromatic >C_{10} to C_{12} [EH_CU_1D_AR]	(mg/kg)	u	< 10
Aromatic >C_{12} to C_{16} [EH_CU_1D_AR]	(mg/kg)	u	< 10
Aromatic >C_{16} to C_{21} [EH_CU_1D_AR]	(mg/kg)	u	< 10
Aromatic >C_{21} to C_{35} [EH_CU_1D_AR]	(mg/kg)	u	< 20
Aromatic >C_{35} to C_{44} [EH_CU_1D_AR]	(mg/kg)	u	< 15
Total >C_5 to C_{35} [EH_CU+HS_1D_Total]	(mg/kg)	u	< 50
Benzene	(mg/kg)	MCERTS	< 0.01
Toluene	(mg/kg)	MCERTS	< 0.01
Ethylbenzene	(mg/kg)	MCERTS	< 0.01
m&p Xylene	(mg/kg)	MCERTS	< 0.02
o-Xylene	(mg/kg)	MCERTS	< 0.01
MTBE	(mg/kg)	MCERTS	< 0.01

4161

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/02431/GRM - 24-43078 - Amendment A

Project Reference - P10525 CASCID Christie Hospital Manchester

Analytical Test Results - VOC

Lab Reference			347803
Client Sample ID			-
Client Sample Location			TP105
Client Sample Type			ES
Client Sample Number			-
Depth - Top (m)			0.50
Depth - Bottom (m)			0.50
Date of Sampling			17/03/2024
Time of Sampling			-
Sample Matrix			Sand
Determinant	**Units**	**Accreditation**	
Benzene	(mg/kg)	MCERTS	< 0.01
Toluene	(mg/kg)	MCERTS	< 0.01
Ethylbenzene	(mg/kg)	MCERTS	< 0.01
m&p Xylene	(mg/kg)	MCERTS	< 0.02
o-Xylene	(mg/kg)	MCERTS	< 0.01
Dichlorodifluoromethane	(mg/kg)	UKAS	< 0.05
Chloromethane	(mg/kg)	UKAS	< 0.02
Vinyl Chloride	(mg/kg)	MCERTS	< 0.02
Bromomethane	(mg/kg)	u	< 0.05
Chloroethane	(mg/kg)	MCERTS	< 0.01
Trichlorofluoromethane	(mg/kg)	MCERTS	< 0.01
1,1-Dichloroethylene	(mg/kg)	MCERTS	< 0.01
Dichloromethane	(mg/kg)	u	< 0.10
MTBE	(mg/kg)	MCERTS	< 0.01
trans-1,2,-dichloroethylene	(mg/kg)	MCERTS	< 0.01
1,1-Dichloroethane	(mg/kg)	MCERTS	< 0.01
2,2-Dichloropropane	(mg/kg)	MCERTS	< 0.01
cis--1,2,-dichloroethylene	(mg/kg)	MCERTS	< 0.01
Bromochloromethane	(mg/kg)	MCERTS	< 0.05
Chloroform	(mg/kg)	MCERTS	< 0.01
1,1,1-Trichloroethane	(mg/kg)	MCERTS	< 0.01
1,1-Dichloropropene	(mg/kg)	MCERTS	< 0.01
Carbon Tetrachloride	(mg/kg)	MCERTS	< 0.01
1,2-dichloroethane	(mg/kg)	MCERTS	< 0.02
Trichloroethylene	(mg/kg)	MCERTS	< 0.01
1,2-Dichloropropane	(mg/kg)	MCERTS	< 0.01
Dibromomethane	(mg/kg)	MCERTS	< 0.02
Bromodichloromethane	(mg/kg)	MCERTS	< 0.01
cis-1,2-dichloropropylene	(mg/kg)	MCERTS	< 0.01
trans-1,3-dichloropropylene	(mg/kg)	MCERTS	< 0.01
1,1,2-Trichloroethane	(mg/kg)	MCERTS	< 0.01
1,3-Dichloropropane	(mg/kg)	MCERTS	< 0.01
Tetrachloroethylene	(mg/kg)	MCERTS	< 0.01
Chlorodibromomethane	(mg/kg)	MCERTS	< 0.01
1,2-Dibromoethane	(mg/kg)	MCERTS	< 0.01
Chlorobenzene	(mg/kg)	MCERTS	< 0.01
1,1,1,2-tetrachloroethane	(mg/kg)	MCERTS	< 0.01
Styrene	(mg/kg)	UKAS	< 0.01
Isopropylbenzene	(mg/kg)	MCERTS	< 0.01
Bromoform	(mg/kg)	MCERTS	< 0.05
1,1,2,2-Tetrachloroethane	(mg/kg)	MCERTS	< 0.01
1,2,3-Trichloropropane	(mg/kg)	MCERTS	< 0.02
n-Propylbenzene	(mg/kg)	MCERTS	< 0.01
Bromobenzene	(mg/kg)	MCERTS	< 0.01
1,3,5-Trimethylbenzene	(mg/kg)	UKAS	< 0.01
2-chlorotoluene	(mg/kg)	MCERTS	< 0.01
4-chlorotoluene	(mg/kg)	MCERTS	< 0.01
tert-butylbenzene	(mg/kg)	UKAS	< 0.01
1,2,4-trimethylbenzene	(mg/kg)	UKAS	< 0.01
sec-Butylbenzene	(mg/kg)	UKAS	< 0.01
4-Isopropyltoluene (P-Cymene)	(mg/kg)	UKAS	< 0.01
1,3-Dichlorobenzene	(mg/kg)	u	< 0.01
1,4-Dichlorobenzene	(mg/kg)	u	< 0.01
n-Butylbenzene	(mg/kg)	UKAS	< 0.01
1,2-Dichlorobenzene	(mg/kg)	MCERTS	< 0.01
1,2-Dibromo-3-chloropropane	(mg/kg)	u	< 0.05
1,2,4-Trichlorobenzene	(mg/kg)	u	< 0.05
Hexachlorobutadiene	(mg/kg)	u	< 0.05
Naphthalene	(mg/kg)	u	< 0.05

4161

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/02431/GRM - 24-43078 - Amendment A

Project Reference - P10525 CASCID Christie Hospital Manchester

Analytical Test Results - VOC

Lab Reference			347803
Client Sample ID			-
Client Sample Location			TP105
Client Sample Type			ES
Client Sample Number			-
Depth - Top (m)			0.50
Depth - Bottom (m)			0.50
Date of Sampling			17/03/2024
Time of Sampling			-
Sample Matrix			Sand
Determinant	**Units**	**Accreditation**	
1,2,3-Trichlorobenzene	(mg/kg)	u	< 0.05

7 - 11 Harding Street
Leicester
LE1 4DH

L24/02431/GRM - 24-43078 - Amendment A

Project Reference - P10525 CASCID Christie Hospital Manchester

Sample Descriptions

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Description	Moisture Content (%)	Stone Content (%)	Passing 2mm test sieve (%)
347802	-	TP103	ES	-	Dark greyish brown gravelly silty sand	-	-	74
347803	-	TP105	ES	-	Brown gravelly silty sand	13	< 0.1	87

7 - 11 Harding Street
Leicester
LE1 4DH

L24/02431/GRM - 24-43078 - Amendment A

Project Reference - P10525 CASCID Christie Hospital Manchester

Sample Comments

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Comments
347802	-	TP103	ES	-	
347803	-	TP105	ES	-	VOC - Sample taken from container with headspace. VPH/BTEX - Sample taken from container with headspace.

7 - 11 Harding Street
Leicester
LE1 4DH

L24/02431/GRM - 24-43078 - Amendment A

Project Reference - P10525 CASCID Christie Hospital Manchester

Analysis Methodologies

Test Code	Test Name / Reference	Sample condition for analysis	Sample Preperation	Test Details
ANIONSS	MS - CL - Anions by Aquakem (2:1Extract)	Oven dried	Passing 2mm test sieve	Determination of Anions (inc Sulphate, chloride etc.) in soils by Aquakem. Analysis is based on a 2:1 water to soil extraction ratio
EPHS	MS - CL - EPH in Soil	As received	Passing 10mm test sieve	Determination of Extractable Petroleum Hydrocarbons in soils via GC-MS
PAHASRDS	MS - CL - PAH (As Received)	As received	Passing 10mm test sieve	Determination of Polyaromatic hydrocarbons in soil via GC-MS
CWGS	MS - CL - VPH & MS - CL - EPH	As received	Passing 10mm test sieve	Determination of TPH CWG (Volatile Petroleum Hydrocarbons and Extractable Petroleum Hydrocarbons) in soils via Headspace-GC-MS and GC-MS respectively
TOCS	MS - CL - TOC Eltra	Air Dried	Passing 10mm test sieve	Determination of Total Organic Carbon in soils
VOCS	MS - CL - VOC and MBTEX	As received	Passing 10mm test sieve	Determination of VOCs (inc BTEX) in soils via Headspace-GC-MS
VPHS	MS - CL - VPH	As received	Passing 10mm test sieve	Determination of VPH in soils via Headspace-GC-MS
WSBORONS	MS - CL - WS Boron	Air dried	Passing 10mm test sieve	Determination of Water soluble Boron in soils via ICP
SKALARCNS	MS - CL - Cyanide by Skalar	As received	Passing 10mm test sieve	Determination of cyanide (total / free / complex) in soil using a Skalar segmented flow analyser
SKALARHCS	MS - CL - Hexavalent Chromium by Skalar	As received	Passing 10mm test sieve	Determination of hexavalent chromium in soil using Skalar segmented flow analyser
ICPMETS	MS - CL - ICP Metals	Air dried	Passing 10mm test sieve	Determination of metals in soils via ICP
PHS	MS - CL - pH in Soils	As received	Passing 10mm test sieve	Determination of pH in soils using a pH probe (using a 1:3 soil to water extraction)
PHOHHPLCS	MS - CL - Phenols by HPLC (soil)	As received	Passing 10mm test sieve	Determination of speciated phenols in soil using HPLC
ASSO4S	MS - CL - Acid Soluble Sulphate	Oven Dried	Passing 2mm test sieve	Determination of total sulphate in soils by acid extraction followed by ICP analysis
ASB	MS - AS - Asbestos	-	-	Fibre identification is in accordance with in house documented methods which are based on the procedure documented in the HSE Document HSG 248 "Asbestos: The analysts guide for sampling, analysis and clearance procedures"
SAMPLEPREP	MS - CL - Sample Preparation	-	-	Preparation of samples (including determination of moisture content) to allow for subsequent analysis
SUBCON-ENV	Subcontract - ENV Lab	-	-	Subcontract testing
1377TS-ELT	BS1377 Total Sulphur Content by HTC	Oven dried	BS1377 : Part 1 : 2016	Total Sulphur Content testing of Soil in accordance with BS 1377 : Part 3 : 2018 + A1 : 2021 Clause 7.10 (using Eltra CS-800 Analyser)

7 - 11 Harding Street
Leicester
LE1 4DH

L24/02431/GRM - 24-43078 - Amendment A

Project Reference - P10525 CASCID Christie Hospital Manchester

HWOL TPH Acronym Index

Acronym	Description
HS	Headspace Analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
Total	Aliphatics and Aromatics
AL	Aliphatics Only
AR	Aromatics Only
2D	GC-GC - Double Coil Gas Chromatography
#1	EH_Total but with humics mathmatically subtracted
#2	EH_Total but with fatty acids mathmatically subtracted
_	Operator - underscore to separate acronyms (except for +)
+	Operator to indicate cumlative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry

7 - 11 Harding Street
Leicester
LE1 4DH

GRM Development Solutions
Laurus House
First Avenue
Centrum 100
Burton Upon Trent
DE14 2WH

Analytical Test Report: L24/02431/GRM - 24-43078

Your Project Reference:	**P10525 CASCID Christie Hospital Manchester**		
Your Order Number:	P10525	Samples Received / Instructed:	19/03/2024 / 19/03/2024
Report Issue Number:	2	Sample Tested:	19/03 to 03/04/2024
Samples Analysed:	2 soil samples	Report issued:	03/04/2024

Signed

Notes:

General

Please refer to Methodologies page for details pertaining to the analytical methods undertaken.

Samples will be retained for 14 days after issue of this report with the exception of the asbestos test portion which is held for 6 months unless otherwise requested.

Moisture Content was determined in accordance with CTS method statement MS - CL - Sample Prep, oven dried at <30˚C.

Moisture Content is reported as a percentage of the dry mass of soil, this calculation is in accordance with BS1377, Part 2, 1990, Clause 3.2

Stone Content was determined in accordance with CTS method statement MS - CL - Sample Prep and refers to the percentage of stones retained on a 10mm BS test sieve.

Where specification limits are included these are for guidance only. Where a measured value has been highlighted this is not implying acceptance or failure and certainty of measurement values have not been taken into account.

Uncertainty of measurement values are available on request.

Samples were supplied by customer, results apply to the samples as received.

Asbestos

Please note: Where futher analaysis is required samples identified as containing asbestos are screened and tested on an as recevied basis. No correction is made for moisture content and these results are not covered by our accrediation

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation

Deviating Samples

On receipt samples are compared against our sample holding and handling protocols, where any deviations have been noted these are reported on our deviating sample page (if present)

Accreditation Key

UKAS = UKAS Accreditation, MCERTS = MCERTS Accreditation, u = Unaccredited, subUKAS - Subcontracted to a laboratory UKAS accredited for this test

MCERTS Accreditation only covers the SAND, CLAY and LOAM matrices

Date of Issue: 18.03.2024

Issued by: J. Gane

Issue No: 4

Rev No: 6

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/02431/GRM - 24-43078

Project Reference - P10525 CASCID Christie Hospital Manchester

Analytical Test Results - Solid

Lab Reference			347803
Client Sample ID			-
Client Sample Location			TP105
Client Sample Type			ES
Client Sample Number			-
Depth - Top (m)			0.50
Depth - Bottom (m)			0.50
Date of Sampling			17/03/2024
Time of Sampling			-
Sample Matrix			Sand
Determinant	**Units**	**Accreditation**	
Antimony	(mg/kg)	u	< 3.5
Arsenic	(mg/kg)	MCERTS	26
Barium	(mg/kg)	MCERTS	120
Beryllium	(mg/kg)	MCERTS	0.7
Boron (w/s)	(mg/kg)	u	< 2.5
Cadmium	(mg/kg)	MCERTS	0.7
Chromium (III)	(mg/kg)	u	5.4
Chromium (Total)	(mg/kg)	UKAS	6.4
Copper	(mg/kg)	MCERTS	63
Iron	(mg/kg)	u	34000
Lead	(mg/kg)	MCERTS	450
Manganese	(mg/kg)	MCERTS	590
Mercury	(mg/kg)	UKAS	< 2.5
Mercury (Total, Low level)	(mg/kg)	u	< 1.0
Molybdenum	(mg/kg)	u	2.8
Nickel	(mg/kg)	MCERTS	21
Selenium	(mg/kg)	u	< 8.0
Vanadium	(mg/kg)	UKAS	32
Zinc	(mg/kg)	MCERTS	73
Phenol	(mg/kg)	MCERTS	< 0.20
Cresols	(mg/kg)	MCERTS	< 0.20
Xylenols	(mg/kg)	MCERTS	< 0.20
Trimethyl Phenols	(mg/kg)	UKAS	< 0.20
Total Phenols (via HPLC)	(mg/kg)	UKAS	< 0.80
Cyanide (Free)	(mg/kg)	u	< 1.0
Chromium (Hexavalent)	(mg/kg)	u	< 1.0
pH	pH Units	MCERTS	7.8
Sulphate (Water soluble as SO_4)	(mg/l)	u	29
Sulphur (Total)	(%)	UKAS	0.01
Acenaphthene	(mg/kg)	MCERTS	< 0.02
Acenaphthylene	(mg/kg)	UKAS	< 0.02
Anthracene	(mg/kg)	UKAS	< 0.02
Benzo (a) anthracene	(mg/kg)	MCERTS	< 0.02
Benzo (a) pyrene	(mg/kg)	MCERTS	< 0.02
Benzo (b) fluoranthene	(mg/kg)	MCERTS	< 0.02
Benzo (g, h, i) perylene	(mg/kg)	MCERTS	< 0.02
Benzo (k) fluoranthene	(mg/kg)	MCERTS	< 0.02
Chrysene	(mg/kg)	MCERTS	< 0.02
Dibenzo (a,h) anthracene	(mg/kg)	MCERTS	< 0.02
Fluoranthene	(mg/kg)	MCERTS	< 0.02
Fluorene	(mg/kg)	MCERTS	< 0.02
Indeno (1, 2, 3,-cd) pyrene	(mg/kg)	MCERTS	< 0.02
Naphthalene	(mg/kg)	MCERTS	< 0.02

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/02431/GRM - 24-43078

Project Reference - P10525 CASCID Christie Hospital Manchester

Analytical Test Results - Solid

Lab Reference			347803
Client Sample ID			-
Client Sample Location			TP105
Client Sample Type			ES
Client Sample Number			-
Depth - Top (m)			0.50
Depth - Bottom (m)			0.50
Date of Sampling			17/03/2024
Time of Sampling			-
Sample Matrix			Sand
Determinant	**Units**	**Accreditation**	
Phenanthrene	(mg/kg)	MCERTS	< 0.02
Pyrene	(mg/kg)	MCERTS	< 0.02
Total PAH (Sum of USEPA 16)	(mg/kg)	UKAS	< 0.32
FOC	-	UKAS	0.038
Asbestos	-	UKAS	No asbestos detected

4161

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/02431/GRM - 24-43078

Project Reference - P10525 CASCID Christie Hospital Manchester

Analytical Test Results - Chemical Analysis

Lab Reference			347802
Client Sample ID			-
Client Sample Location			TP103
Client Sample Type			ES
Client Sample Number			-
Depth - Top (m)			0.30
Depth - Bottom (m)			0.40
Date of Sampling			17/03/2024
Time of Sampling			-
Sample Matrix			Sand
Determinant	**Units**	**Accreditation**	
Water soluble sulphate (as SO_4)	(mg/l)	u	< 10
Acid Soluble Sulphate	(%)	u	0.03
Total Sulphur	(%)	UKAS	0.02
pH Value	pH Units	MCERTS	8.7

7 - 11 Harding Street
Leicester
LE1 4DH

L24/02431/GRM - 24-43078

Project Reference - P10525 CASCID Christie Hospital Manchester

Analytical Test Results - VPH / EPH

Lab Reference			347803
Client Sample ID			-
Client Sample Location			TP105
Client Sample Type			ES
Client Sample Number			-
Depth - Top (m)			0.50
Depth - Bottom (m)			0.50
Date of Sampling			17/03/2024
Time of Sampling			-
Sample Matrix			Sand
Determinant	**Units**	**Accreditation**	
Aliphatic >C_5 to C_6 [HS_MS_1D_AL]	(mg/kg)	MCERTS	< 0.06
Aliphatic >C_6 to C_8 [HS_MS_1D_AL]	(mg/kg)	MCERTS	< 0.06
Aliphatic >C_8 to C_{10} [HS_MS_1D_AL]	(mg/kg)	MCERTS	< 0.06
Aliphatic >C_{10} to C_{12} [EH_CU_1D_AL]	(mg/kg)	u	< 10
Aliphatic >C_{12} to C_{16} [EH_CU_1D_AL]	(mg/kg)	u	< 10
Aliphatic >C_{16} to C_{21} [EH_CU_1D_AL]	(mg/kg)	u	< 10
Aliphatic >C_{21} to C_{35} [EH_CU_1D_AL]	(mg/kg)	u	< 20
Aliphatic >C_{35} to C_{44} [EH_CU_1D_AL]	(mg/kg)	u	< 15
Aromatic >C_5 to C_7 [HS_MS_1D_AR]	(mg/kg)	MCERTS	< 0.01
Aromatic >C_7 to C_8 [HS_MS_1D_AR]	(mg/kg)	MCERTS	< 0.01
Aromatic >C_8 to C_{10} [HS_MS_1D_AR]	(mg/kg)	MCERTS	< 0.06
Aromatic >C_{10} to C_{12} [EH_CU_1D_AR]	(mg/kg)	u	< 10
Aromatic >C_{12} to C_{16} [EH_CU_1D_AR]	(mg/kg)	u	< 10
Aromatic >C_{16} to C_{21} [EH_CU_1D_AR]	(mg/kg)	u	< 10
Aromatic >C_{21} to C_{35} [EH_CU_1D_AR]	(mg/kg)	u	< 20
Aromatic >C_{35} to C_{44} [EH_CU_1D_AR]	(mg/kg)	u	< 15
Total >C_5 to C_{35} [EH_CU+HS_1D_Total]	(mg/kg)	u	< 50
Benzene	(mg/kg)	MCERTS	< 0.01
Toluene	(mg/kg)	MCERTS	< 0.01
Ethylbenzene	(mg/kg)	MCERTS	< 0.01
m&p Xylene	(mg/kg)	MCERTS	< 0.02
o-Xylene	(mg/kg)	MCERTS	< 0.01
MTBE	(mg/kg)	MCERTS	< 0.01

4161

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/02431/GRM - 24-43078

Project Reference - P10525 CASCID Christie Hos

Analytical Test Results - VOC

Lab Reference			347803
Client Sample ID			-
Client Sample Location			TP105
Client Sample Type			ES
Client Sample Number			-
Depth - Top (m)			0.50
Depth - Bottom (m)			0.50
Date of Sampling			17/03/2024
Time of Sampling			-
Sample Matrix			Sand
Determinant	**Units**	**Accreditation**	
Benzene	(mg/kg)	MCERTS	< 0.01
Toluene	(mg/kg)	MCERTS	< 0.01
Ethylbenzene	(mg/kg)	MCERTS	< 0.01
m&p Xylene	(mg/kg)	MCERTS	< 0.02
o-Xylene	(mg/kg)	MCERTS	< 0.01
Dichlorodifluoromethane	(mg/kg)	UKAS	< 0.05
Chloromethane	(mg/kg)	UKAS	< 0.02
Vinyl Chloride	(mg/kg)	MCERTS	< 0.02
Bromomethane	(mg/kg)	u	< 0.05
Chloroethane	(mg/kg)	MCERTS	< 0.01
Trichlorofluoromethane	(mg/kg)	MCERTS	< 0.01
1,1-Dichloroethylene	(mg/kg)	MCERTS	< 0.01
Dichloromethane	(mg/kg)	u	< 0.10
MTBE	(mg/kg)	MCERTS	< 0.01
trans-1,2,-dichloroethylene	(mg/kg)	MCERTS	< 0.01
1,1-Dichloroethane	(mg/kg)	MCERTS	< 0.01
2,2-Dichloropropane	(mg/kg)	MCERTS	< 0.01
cis--1,2,-dichloroethylene	(mg/kg)	MCERTS	< 0.01
Bromochloromethane	(mg/kg)	MCERTS	< 0.05
Chloroform	(mg/kg)	MCERTS	< 0.01
1,1,1-Trichloroethane	(mg/kg)	MCERTS	< 0.01
1,1-Dichloropropene	(mg/kg)	MCERTS	< 0.01
Carbon Tetrachloride	(mg/kg)	MCERTS	< 0.01
1,2-dichloroethane	(mg/kg)	MCERTS	< 0.02
Trichloroethylene	(mg/kg)	MCERTS	< 0.01
1,2-Dichloropropane	(mg/kg)	MCERTS	< 0.01
Dibromomethane	(mg/kg)	MCERTS	< 0.02
Bromodichloromethane	(mg/kg)	MCERTS	< 0.01
cis-1,2-dichloropropylene	(mg/kg)	MCERTS	< 0.01
trans-1,3-dichloropropylene	(mg/kg)	MCERTS	< 0.01
1,1,2-Trichloroethane	(mg/kg)	MCERTS	< 0.01
1,3-Dichloropropane	(mg/kg)	MCERTS	< 0.01
Tetrachloroethylene	(mg/kg)	MCERTS	< 0.01
Chlorodibromomethane	(mg/kg)	MCERTS	< 0.01
1,2-Dibromoethane	(mg/kg)	MCERTS	< 0.01
Chlorobenzene	(mg/kg)	MCERTS	< 0.01
1,1,1,2-tetrachloroethane	(mg/kg)	MCERTS	< 0.01
Styrene	(mg/kg)	UKAS	< 0.01
Isopropylbenzene	(mg/kg)	MCERTS	< 0.01
Bromoform	(mg/kg)	MCERTS	< 0.05
1,1,2,2-Tetrachloroethane	(mg/kg)	MCERTS	< 0.01
1,2,3-Trichloropropane	(mg/kg)	MCERTS	< 0.02
n-Propylbenzene	(mg/kg)	MCERTS	< 0.01
Bromobenzene	(mg/kg)	MCERTS	< 0.01
1,3,5-Trimethylbenzene	(mg/kg)	UKAS	< 0.01
2-chlorotoluene	(mg/kg)	MCERTS	< 0.01
4-chlorotoluene	(mg/kg)	MCERTS	< 0.01
tert-butylbenzene	(mg/kg)	UKAS	< 0.01
1,2,4-trimethylbenzene	(mg/kg)	UKAS	< 0.01
sec-Butylbenzene	(mg/kg)	UKAS	< 0.01
4-Isopropyltoluene (P-Cymene)	(mg/kg)	UKAS	< 0.01
1,3-Dichlorobenzene	(mg/kg)	u	< 0.01
1,4-Dichlorobenzene	(mg/kg)	u	< 0.01
n-Butylbenzene	(mg/kg)	UKAS	< 0.01
1,2-Dichlorobenzene	(mg/kg)	MCERTS	< 0.01
1,2-Dibromo-3-chloropropane	(mg/kg)	u	< 0.05
1,2,4-Trichlorobenzene	(mg/kg)	u	< 0.05
Hexachlorobutadiene	(mg/kg)	u	< 0.05
Naphthalene	(mg/kg)	u	< 0.05
1,2,3-Trichlorobenzene	(mg/kg)	u	< 0.05

4161

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/02431/GRM - 24-43078

Project Reference - P10525 CASCID Christie Hospital Manchester

Sample Descriptions

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Description	Moisture Content (%)	Stone Content (%)	Passing 2mm test sieve (%)
347802	-	TP103	ES	-	Dark greyish brown gravelly silty sand	-	-	74
347803	-	TP105	ES	-	Brown gravelly silty sand	13	< 0.1	87

4161

7 - 11 Harding Street
Leicester
LE1 4DH

L24/02431/GRM - 24-43078

Project Reference - P10525 CASCID Christie Hospital Manchester

Sample Comments

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Comments
347802	-	TP103	ES	-	
347803	-	TP105	ES	-	VOC - Sample taken from container with headspace. VPH/BTEX - Sample taken from container with headspace.

7 - 11 Harding Street
Leicester
LE1 4DH

L24/02431/GRM - 24-43078

Project Reference - P10525 CASCID Christie Hospital Manchester

Analysis Methodologies

Test Code	Test Name / Reference	Sample condition for analysis	Sample Preperation	Test Details
ANIONSS	MS - CL - Anions by Aquakem (2:1Extract)	Oven dried	Passing 2mm test sieve	Determination of Anions (inc Sulphate, chloride etc.) in soils by Aquakem. Analysis is based on a 2:1 water to soil extraction ratio
EPHS	MS - CL - EPH in Soil	As received	Passing 10mm test sieve	Determination of Extractable Petroleum Hydrocarbons in soils via GC-MS
PAHASRDS	MS - CL - PAH (As Received)	As received	Passing 10mm test sieve	Determination of Polyaromatic hydrocarbons in soil via GC-MS
CWGS	MS - CL - VPH & MS - CL - EPH	As received	Passing 10mm test sieve	Determination of TPH CWG (Volatile Petroleum Hydrocarbons and Extractable Petroleum Hydrocarbons) in soils via Headspace-GC-MS and GC-MS respectively
TOCS	MS - CL - TOC Eltra	Air Dried	Passing 10mm test sieve	Determination of Total Organic Carbon in soils
VOCS	MS - CL - VOC and MBTEX	As received	Passing 10mm test sieve	Determination of VOCs (inc BTEX) in soils via Headspace-GC-MS
VPHS	MS - CL - VPH	As received	Passing 10mm test sieve	Determination of VPH in soils via Headspace-GC-MS
WSBORONS	MS - CL - WS Boron	Air dried	Passing 10mm test sieve	Determination of Water soluble Boron in soils via ICP
SKALARCNS	MS - CL - Cyanide by Skalar	As received	Passing 10mm test sieve	Determination of cyanide (total / free / complex) in soil using a Skalar segmented flow analyser
SKALARHCS	MS - CL - Hexavalent Chromium by Skalar	As received	Passing 10mm test sieve	Determination of hexavalent chromium in soil using Skalar segmented flow analyser
ICPMETS	MS - CL - ICP Metals	Air dried	Passing 10mm test sieve	Determination of metals in soils via ICP
PHS	MS - CL - pH in Soils	As received	Passing 10mm test sieve	Determination of pH in soils using a pH probe (using a 1:3 soil to water extraction)
PHOHHPLCS	MS - CL - Phenols by HPLC (soil)	As received	Passing 10mm test sieve	Determination of speciated phenols in soil using HPLC
ASSO4S	MS - CL - Acid Soluble Sulphate	Oven Dried	Passing 2mm test sieve	Determination of total sulphate in soils by acid extraction followed by ICP analysis
ASB	MS - AS - Asbestos	-	-	Fibre identification is in accordance with in house documented methods which are based on the procedure documented in the HSE Document HSG 248 "Asbestos: The analysts guide for sampling, analysis and clearance procedures"
SAMPLEPREP	MS - CL - Sample Preparation	-	-	Preparation of samples (including determination of moisture content) to allow for subsequent analysis
SUBCON-ENV	Subcontract - ENV Lab	-	-	Subcontract testing
1377TS-ELT	BS1377 Total Sulphur Content by HTC	Oven dried	BS1377 : Part 1 : 2016	Total Sulphur Content testing of Soil in accordance with BS 1377 : Part 3 : 2018 + A1 : 2021 Clause 7.10 (using Eltra CS-800 Analyser)

7 - 11 Harding Street
Leicester
LE1 4DH

L24/02431/GRM - 24-43078

Project Reference - P10525 CASCID Christie Hospital Manchester

HWOL TPH Acronym Index

Acronym	Description
HS	Headspace Analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
Total	Aliphatics and Aromatics
AL	Aliphatics Only
AR	Aromatics Only
2D	GC-GC - Double Coil Gas Chromatography
#1	EH_Total but with humics mathmatically subtracted
#2	EH_Total but with fatty acids mathmatically subtracted
_	Operator - underscore to separate acronyms (except for +)
+	Operator to indicate cumlative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry

4161

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

GRM Development Solutions
Laurus House
First Avenue
Centrum 100
Burton Upon Trent
DE14 2WH

Analytical Test Report: L24/03842/GRM - 24-44683

Your Project Reference:	**CASID-Christie Hospital, Manchaster**		
Your Order Number:	P10525	Samples Received / Instructed:	30/04/2024 / 01/05/2024
Report Issue Number:	1	Sample Tested:	01/05 to 21/05/2024
Samples Analysed:	4 soil samples	Report issued:	21/05/2024

Signed

Notes:

General

Please refer to Methodologies page for details pertaining to the analytical methods undertaken.

Samples will be retained for 14 days after issue of this report with the exception of the asbestos test portion which is held for 6 months unless otherwise requested.

Moisture Content was determined in accordance with CTS method statement MS - CL - Sample Prep, oven dried at <30˚C.

Moisture Content is reported as a percentage of the dry mass of soil, this calculation is in accordance with BS1377, Part 2, 1990, Clause 3.2

Stone Content was determined in accordance with CTS method statement MS - CL - Sample Prep and refers to the percentage of stones retained on a 10mm BS test sieve.

Where specification limits are included these are for guidance only. Where a measured value has been highlighted this is not implying acceptance or failure and certainty of measurement values have not been taken into account.

Uncertainty of measurement values are available on request.

Samples were supplied by customer, results apply to the samples as received.

Asbestos

Please note: Where futher analaysis is required samples identified as containing asbestos are screened and tested on an as recevied basis. No correction is made for moisture content and these results are not covered by our accrediation

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation

WAC Testing

Samples were leached in accordance with BS EN 12457-2: 2002.

Eluate Results are reported as L/S 10. These results have been calculated in accordance with BS EN 12457-2:2002.

Comparative values are taken from the Council Decision Annex - CRITERIA AND PROCEDURES FOR THE ACCEPTANCE OF WASTE AT LANDFILLS, (2003/33/EC).

Deviating Samples

On receipt samples are compared against our sample holding and handling protocols, where any deviations have been noted these are reported on our deviating sample page (if present)

Accreditation Key

UKAS = UKAS Accreditation, MCERTS = MCERTS Accreditation, u = Unaccredited, subUKAS - Subcontracted to a laboratory UKAS accredited for this test, subMCERTS - Subcontracted to a laboratory MCERTS accredited for this test

MCERTS Accreditation only covers the SAND, CLAY and LOAM matrices

Date of Issue: 13.05.2024

Issued by: J. Gane

Issue No: 4

Rev No: 9

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/03842/GRM - 24-44683

Project Reference - CASID-Christie Hospital, Manchaster

Analytical Test Results - Solid

Lab Reference			360713	360715
Client Sample ID			-	-
Client Sample Location			WS101	WS102
Client Sample Type			ES	ES
Client Sample Number			-	-
Depth - Top (m)			0.80	0.80
Depth - Bottom (m)			0.80	0.80
Date of Sampling			28/04/2024	28/04/2024
Time of Sampling			-	-
Sample Matrix			Sand	Sand
Determinant	**Units**	**Accreditation**		
Antimony	(mg/kg)	u	< 3.5	< 3.5
Arsenic	(mg/kg)	MCERTS	13	290
Barium	(mg/kg)	MCERTS	170	140
Beryllium	(mg/kg)	MCERTS	0.7	< 4.0
Boron (w/s)	(mg/kg)	u	< 2.5	< 2.5
Cadmium	(mg/kg)	MCERTS	0.6	0.5
Chromium (III)	(mg/kg)	u	7.5	2.7
Chromium (Total)	(mg/kg)	UKAS	8.5	3.7
Copper	(mg/kg)	MCERTS	46	41
Iron	(mg/kg)	u	25000	18000
Lead	(mg/kg)	MCERTS	56	190
Manganese	(mg/kg)	MCERTS	580	390
Mercury	(mg/kg)	UKAS	< 2.5	< 2.5
Mercury (Total, Low Level)	(mg/kg)	u	< 0.1	0.2
Molybdenum	(mg/kg)	u	< 2.0	< 40.0
Nickel	(mg/kg)	MCERTS	18	12
Selenium	(mg/kg)	u	< 8.0	< 8.0
Vanadium	(mg/kg)	UKAS	8.4	11
Zinc	(mg/kg)	MCERTS	56	61
Phenol	(mg/kg)	MCERTS	< 0.20	< 0.20
Cresols	(mg/kg)	MCERTS	< 0.20	< 0.20
Xylenols	(mg/kg)	MCERTS	< 0.20	< 0.20
Trimethyl Phenols	(mg/kg)	UKAS	< 0.20	< 0.20
Total Phenols (via HPLC)	(mg/kg)	UKAS	< 0.80	< 0.80
Cyanide (Free)	(mg/kg)	u	< 1.0	< 1.0
Chromium (Hexavalent)	(mg/kg)	u	< 1.0	< 1.0
pH	pH Units	MCERTS	7.6	8.1
Sulphate (Water soluble as SO_4)	(mg/l)	u	< 10	63
Sulphur (Total)	(%)	UKAS	< 0.01	0.02
Acenaphthene	(mg/kg)	MCERTS	< 0.02	0.87
Acenaphthylene	(mg/kg)	UKAS	< 0.02	< 0.20
Anthracene	(mg/kg)	UKAS	< 0.02	1.1
Benzo (a) anthracene	(mg/kg)	MCERTS	< 0.02	4.4
Benzo (a) pyrene	(mg/kg)	MCERTS	< 0.02	2.8
Benzo (b) fluoranthene	(mg/kg)	MCERTS	< 0.02	3.2
Benzo (g, h, i) perylene	(mg/kg)	MCERTS	< 0.02	1.5
Benzo (k) fluoranthene	(mg/kg)	MCERTS	< 0.02	1.3
Chrysene	(mg/kg)	MCERTS	< 0.02	4.2
Dibenzo (a,h) anthracene	(mg/kg)	MCERTS	< 0.02	0.29
Fluoranthene	(mg/kg)	MCERTS	< 0.02	13
Fluorene	(mg/kg)	MCERTS	< 0.02	0.60
Indeno (1, 2, 3,-cd) pyrene	(mg/kg)	MCERTS	< 0.02	1.1
Naphthalene	(mg/kg)	MCERTS	< 0.02	0.53

7 - 11 Harding Street
Leicester
LE1 4DH

L24/03842/GRM - 24-44683

Project Reference - CASID-Christie Hospital, Manchaster

Analytical Test Results - Solid

Lab Reference			360713	360715
Client Sample ID			-	-
Client Sample Location			WS101	WS102
Client Sample Type			ES	ES
Client Sample Number			-	-
Depth - Top (m)			0.80	0.80
Depth - Bottom (m)			0.80	0.80
Date of Sampling			28/04/2024	28/04/2024
Time of Sampling			-	-
Sample Matrix			Sand	Sand
Determinant	**Units**	**Accreditation**		
Phenanthrene	(mg/kg)	MCERTS	< 0.02	8.5
Pyrene	(mg/kg)	MCERTS	< 0.02	12
Total PAH (Sum of USEPA 16)	(mg/kg)	UKAS	< 0.32	56
FOC	-	UKAS	0.027	0.019
Asbestos	-	UKAS	No asbestos detected	No asbestos detected

7 - 11 Harding Street
Leicester
LE1 4DH

L24/03842/GRM - 24-44683

Project Reference - CASID-Christie Hospital, Manchaster

Analytical Test Results - Chemical Analysis

Lab Reference			360712	360714
Client Sample ID			-	-
Client Sample Location			WS101	WS102
Client Sample Type			ES	ES
Client Sample Number			-	-
Depth - Top (m)			0.30	0.45
Depth - Bottom (m)			0.30	0.45
Date of Sampling			28/04/2024	28/04/2024
Time of Sampling			-	-
Sample Matrix			Sand	Sand
Determinant	**Units**	**Accreditation**		
Water soluble sulphate (as SO_4)	(mg/l)	u	< 10	48
Acid Soluble Sulphate	(%)	u	< 0.01	0.02
Total Sulphur	(%)	UKAS	< 0.01	0.01
pH Value	pH Units	MCERTS	7.5	7.8

4161

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/03842/GRM - 24-44683

Project Reference - CASID-Christie Hospital, Manchaster

Analytical Test Results - VPH / EPH

Lab Reference			360713	360715
Client Sample ID			-	-
Client Sample Location			WS101	WS102
Client Sample Type			ES	ES
Client Sample Number			-	-
Depth - Top (m)			0.80	0.80
Depth - Bottom (m)			0.80	0.80
Date of Sampling			28/04/2024	28/04/2024
Time of Sampling			-	-
Sample Matrix			Sand	Sand
Determinant	**Units**	**Accreditation**		
Benzene	(mg/kg)	MCERTS	< 0.01	< 0.01
Toluene	(mg/kg)	MCERTS	< 0.01	< 0.01
Ethylbenzene	(mg/kg)	MCERTS	< 0.01	< 0.01
m&p Xylene	(mg/kg)	MCERTS	< 0.02	< 0.02
o-Xylene	(mg/kg)	MCERTS	< 0.01	< 0.01
MTBE	(mg/kg)	MCERTS	< 0.01	< 0.01
Aliphatic >C_5 to C_6 [HS_MS_1D_AL]	(mg/kg)	MCERTS	< 0.06	< 0.06
Aliphatic >C_6 to C_8 [HS_MS_1D_AL]	(mg/kg)	MCERTS	< 0.06	< 0.06
Aliphatic >C_8 to C_{10} [HS_MS_1D_AL]	(mg/kg)	MCERTS	< 0.06	< 0.06
Aliphatic >C_{10} to C_{12} [EH_CU_1D_AL]	(mg/kg)	u	< 10	< 10
Aliphatic >C_{12} to C_{16} [EH_CU_1D_AL]	(mg/kg)	u	< 10	< 10
Aliphatic >C_{16} to C_{21} [EH_CU_1D_AL]	(mg/kg)	u	< 10	< 10
Aliphatic >C_{21} to C_{35} [EH_CU_1D_AL]	(mg/kg)	u	< 20	< 20
Aliphatic >C_{35} to C_{44} [EH_CU_1D_AL]	(mg/kg)	u	23	< 15
Aromatic >C_5 to C_7 [HS_MS_1D_AR]	(mg/kg)	MCERTS	< 0.01	< 0.01
Aromatic >C_7 to C_8 [HS_MS_1D_AR]	(mg/kg)	MCERTS	< 0.01	< 0.01
Aromatic >C_8 to C_{10} [HS_MS_1D_AR]	(mg/kg)	MCERTS	< 0.06	< 0.06
Aromatic >C_{10} to C_{12} [EH_CU_1D_AR]	(mg/kg)	u	< 10	< 10
Aromatic >C_{12} to C_{16} [EH_CU_1D_AR]	(mg/kg)	u	< 10	< 10
Aromatic >C_{16} to C_{21} [EH_CU_1D_AR]	(mg/kg)	u	< 10	28
Aromatic >C_{21} to C_{35} [EH_CU_1D_AR]	(mg/kg)	u	49	80
Aromatic >C_{35} to C_{44} [EH_CU_1D_AR]	(mg/kg)	u	95	57
Total >C_5 to C_{35} [EH_CU+HS_1D_Total]	(mg/kg)	u	< 50	110

4161

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/03842/GRM - 24-44683

Project Reference - CASID-Christie Hospital, Ma

Analytical Test Results - VOC

Lab Reference			360713	360715
Client Sample ID			-	-
Client Sample Location			WS101	WS102
Client Sample Type			ES	ES
Client Sample Number			-	-
Depth - Top (m)			0.80	0.80
Depth - Bottom (m)			0.80	0.80
Date of Sampling			28/04/2024	28/04/2024
Time of Sampling			-	-
Sample Matrix			Sand	Sand
Determinant	**Units**	**Accreditation**		
Benzene	(mg/kg)	MCERTS	< 0.01	< 0.01
Toluene	(mg/kg)	MCERTS	< 0.01	< 0.01
Ethylbenzene	(mg/kg)	MCERTS	< 0.01	< 0.01
m&p Xylene	(mg/kg)	MCERTS	< 0.02	< 0.02
o-Xylene	(mg/kg)	MCERTS	< 0.01	< 0.01
Dichlorodifluoromethane	(mg/kg)	UKAS	< 0.05	< 0.05
Chloromethane	(mg/kg)	UKAS	< 0.02	< 0.02
Vinyl Chloride	(mg/kg)	MCERTS	< 0.02	< 0.02
Bromomethane	(mg/kg)	u	< 0.05	< 0.05
Chloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01
Trichlorofluoromethane	(mg/kg)	MCERTS	< 0.01	< 0.01
1,1-Dichloroethylene	(mg/kg)	MCERTS	< 0.01	< 0.01
Dichloromethane	(mg/kg)	u	0.13	0.11
MTBE	(mg/kg)	MCERTS	< 0.01	< 0.01
trans-1,2,-dichloroethylene	(mg/kg)	MCERTS	< 0.01	< 0.01
1,1-Dichloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01
2,2-Dichloropropane	(mg/kg)	MCERTS	< 0.01	< 0.01
cis--1,2,-dichloroethylene	(mg/kg)	MCERTS	< 0.01	< 0.01
Bromochloromethane	(mg/kg)	MCERTS	< 0.05	< 0.05
Chloroform	(mg/kg)	MCERTS	< 0.01	< 0.01
1,1,1-Trichloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01
1,1-Dichloropropene	(mg/kg)	MCERTS	< 0.01	< 0.01
Carbon Tetrachloride	(mg/kg)	MCERTS	< 0.01	< 0.01
1,2-dichloroethane	(mg/kg)	MCERTS	< 0.02	< 0.02
Trichloroethylene	(mg/kg)	MCERTS	< 0.01	< 0.01
1,2-Dichloropropane	(mg/kg)	MCERTS	< 0.01	< 0.01
Dibromomethane	(mg/kg)	MCERTS	< 0.02	< 0.02
Bromodichloromethane	(mg/kg)	MCERTS	< 0.01	< 0.01
cis-1,2-dichloropropylene	(mg/kg)	MCERTS	< 0.01	< 0.01
trans-1,3-dichloropropylene	(mg/kg)	MCERTS	< 0.01	< 0.01
1,1,2-Trichloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01
1,3-Dichloropropane	(mg/kg)	MCERTS	< 0.01	< 0.01
Tetrachloroethylene	(mg/kg)	MCERTS	< 0.01	< 0.01
Chlorodibromomethane	(mg/kg)	MCERTS	< 0.01	< 0.01
1,2-Dibromoethane	(mg/kg)	MCERTS	< 0.01	< 0.01
Chlorobenzene	(mg/kg)	MCERTS	< 0.01	< 0.01
1,1,1,2-tetrachloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01
Styrene	(mg/kg)	UKAS	< 0.01	< 0.01
Isopropylbenzene	(mg/kg)	MCERTS	< 0.01	< 0.01
Bromoform	(mg/kg)	MCERTS	< 0.05	< 0.05
1,1,2,2-Tetrachloroethane	(mg/kg)	MCERTS	< 0.01	< 0.01
1,2,3-Trichloropropane	(mg/kg)	MCERTS	< 0.02	< 0.02
n-Propylbenzene	(mg/kg)	MCERTS	< 0.01	< 0.01
Bromobenzene	(mg/kg)	MCERTS	< 0.01	< 0.01
1,3,5-Trimethylbenzene	(mg/kg)	UKAS	< 0.01	< 0.01
2-chlorotoluene	(mg/kg)	MCERTS	< 0.01	< 0.01
4-chlorotoluene	(mg/kg)	MCERTS	< 0.01	< 0.01
tert-butylbenzene	(mg/kg)	UKAS	< 0.01	< 0.01
1,2,4-trimethylbenzene	(mg/kg)	UKAS	< 0.01	< 0.01
sec-Butylbenzene	(mg/kg)	UKAS	< 0.01	< 0.01
4-Isopropyltoluene (P-Cymene)	(mg/kg)	UKAS	< 0.01	< 0.01
1,3-Dichlorobenzene	(mg/kg)	u	< 0.01	< 0.01
1,4-Dichlorobenzene	(mg/kg)	u	< 0.01	< 0.01
n-Butylbenzene	(mg/kg)	UKAS	< 0.01	< 0.01
1,2-Dichlorobenzene	(mg/kg)	MCERTS	< 0.01	< 0.01
1,2-Dibromo-3-chloropropane	(mg/kg)	u	< 0.05	< 0.05
1,2,4-Trichlorobenzene	(mg/kg)	u	< 0.05	< 0.05
Hexachlorobutadiene	(mg/kg)	u	< 0.05	< 0.05
Naphthalene	(mg/kg)	u	< 0.05	0.05
1,2,3-Trichlorobenzene	(mg/kg)	u	< 0.05	< 0.05

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/03842/GRM - 24-44683

Project Reference - CASID-Christie Hospital, Manchaster

Certificate Of Analysis - WAC Suite

Lab Reference	360715
Client Sample ID	-
Client Sample Location	WS102
Client Sample Type	ES
Client Sample Number	-
Depth - Top (m)	0.8
Depth - Bottom (m)	0.8
Date of Sampling	28/04/2024
Time of Sampling	-
Sample Description	Brown slightly gravelly silty sand
Sample Matrix	Sand
Moisture Content (%)	7.6
Stone content (%)	30

			Determined Result	Inert Waste Landfill	Stable non reactive hazardous waste in a non hazardous landfill	Hazardous Waste Landfill
Solid Analysis						
Total Organic Carbon	%	MCERTS	1.9	3.0	5.0	6.0
Loss on Ignition	%	UKAS	2.4	-	-	10.0
BTEX	mg/kg	MCERTS	< 0.06	6.00	-	-
PCB's (7 Congeners)	mg/kg	u	< 0.028	1.00	-	-
Mineral Oil (>C_{10} to C_{40}) [EH_1D_Total]	mg/kg	MCERTS	185	500	-	-
PAH	mg/kg	u	57	100	-	-
pH	units	MCERTS	8.1	-	> 6	-
Eluate Analysis						
Arsenic	mg/kg	u	3.90	0.50	2	25
Barium	mg/kg	u	< 0.05	20	100	300
Cadmium	mg/kg	u	< 0.03	0.04	1	5
Chromium (total)	mg/kg	u	< 0.03	0.5	10	70
Copper	mg/kg	u	< 0.01	2.0	50	100
Mercury	mg/kg	u	< 0.01	0.01	0.2	2
Molybdenum	mg/kg	u	< 0.03	0.5	10.0	30
Nickel	mg/kg	u	< 0.03	0.4	10.0	40
Lead	mg/kg	u	< 0.05	0.5	10.0	50
Antimony	mg/kg	u	< 0.03	0.06	0.7	5
Selenium	mg/kg	u	< 0.01	0.1	0.5	7
Zinc	mg/kg	u	< 0.05	4	50	200
Chloride	mg/kg	u	3	800	15000	25000
Fluoride	mg/kg	u	10	10	150	500
Sulphate (as SO_4)	mg/kg	u	87	1000	20000	50000
Total Dissolved Solids	mg/kg	u	770	4000	60000	100000
Phenol Index	mg/kg	u	< 1.0	1	-	-
Dissolved Organic Carbon	mg/kg	u	28.0	500	800	1000

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/03842/GRM - 24-44683

Project Reference - CASID-Christie Hospital, Manchaster

Analytical Test Results - 2:1 Leachate Suite

Lab Reference			360713
Client Sample ID			-
Client Sample Location			WS101
Client Sample Type			ES
Client Sample Number			-
Depth - Top (m)			0.80
Depth - Bottom (m)			0.80
Date of Sampling			28/04/2024
Time of Sampling			-
Sample Matrix			Leachate
Determinant	**Units**	**Accreditation**	
Boron	(mg/l)	u	0.015
Calcium	(mg/l)	u	11
Iron	(mg/l)	u	12
Antimony	(µg/l)	u	< 2.5
Arsenic	(µg/l)	u	4
Barium	(µg/l)	u	120
Beryllium	(µg/l)	u	< 1
Boron	(µg/l)	u	15
Cadmium (LL)	(µg/l)	u	0.83
Cadmium	(µg/l)	u	< 3
Chromium	(µg/l)	u	19
Chromium (III)	(µg/l)	u	< 20
Copper	(µg/l)	u	8
Lead	(µg/l)	u	41
Magnesium	(µg/l)	u	2300
Manganese	(µg/l)	u	210
Mercury (LL)	(µg/l)	u	< 0.20
Mercury	(µg/l)	u	< 1
Molydenum	(µg/l)	u	< 2.5
Nickel	(µg/l)	u	< 3
Selenium	(µg/l)	u	< 1
Vanadium	(µg/l)	u	57.4
Zinc	(µg/l)	u	27
Phenol	(µg/l)	u	8.52
pH	pH Units	u	8.1
Cyanide (Free)	(mg/l)	u	< 0.5
Cyanide (Complex)	(mg/l)	u	< 0.5
Cyanide (Total)	(mg/l)	u	< 0.5
Chromium (Hexavalent)	(mg/l)	u	0.02
Chloride	(mg/l)	u	4.9
Fluoride	(mg/l)	u	0.53
Sulphate (As SO_4)	(mg/l)	u	< 10
Cresols	(µg/l)	u	0.49
Xylenols	(µg/l)	u	< 0.20
Trimethyl Phenols	(µg/l)	u	< 0.50
Phenols (Total)	(µg/l)	u	9.01
Ammonium (As N)	(mg/l)	u	< 0.02

4161

CTS Group
7 - 11 Harding Street
Leicester
LE1 4DH

L24/03842/GRM - 24-44683

Project Reference - CASID-Christie Hospital, Manchaster

Sample Descriptions

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Description	Moisture Content (%)	Stone Content (%)	Passing 2mm test sieve (%)
360712	-	WS101	ES	-	Brown slightly gravelly silty sand	-	-	85
360713	-	WS101	ES	-	Brown slightly gravelly slightly clayey silty sand	12	< 0.1	90
360714	-	WS102	ES	-	Brown slightly gravelly silty sand	-	-	95
360715	-	WS102	ES	-	Brown slightly gravelly silty sand	7.6	30	89

7 - 11 Harding Street
Leicester
LE1 4DH

L24/03842/GRM - 24-44683

Project Reference - CASID-Christie Hospital, Manchaster

Sample Comments

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Comments
360712	-	WS101	ES	-	
360713	-	WS101	ES	-	VPH/BTEX - Sample taken from container with headspace.
360714	-	WS102	ES	-	
360715	-	WS102	ES	-	VPH/BTEX - Sample taken from container with headspace.

7 - 11 Harding Street
Leicester
LE1 4DH

L24/03842/GRM - 24-44683

Project Reference - CASID-Christie Hospital, Manchaster

Analysis Methodologies

Test Code	Test Name / Reference	Sample condition for analysis	Sample Preperation	Test Details
ANIONSL	MS - CL - Anions by Aquakem	As received	-	Determination of Anions (inc Sulphate, chloride etc.) in leachate samples by Aquakem
ANIONSS	MS - CL - Anions by Aquakem (2:1Extract)	Oven dried	Passing 2mm test sieve	Determination of Anions (inc Sulphate, chloride etc.) in soils by Aquakem. Analysis is based on a 2:1 water to soil extraction ratio
EPHS	MS - CL - EPH in Soil	As received	Passing 10mm test sieve	Determination of Extractable Petroleum Hydrocarbons in soils via GC-FID
PCB7S	MS - CL - PCB Soils	As received	Passing 10mm test sieve	Determination of PCB's (7 congeners) in soils via GC-MS
PAHASRDS	MS - CL - PAH (As Received)	As received	Passing 10mm test sieve	Determination of Polyaromatic hydrocarbons in soil via GC-MS
CWGS	Calculation from VPH-S and EPH-S	As received	Passing 10mm test sieve	Determination of TPH CWG (Volatile Petroleum Hydrocarbons and Extractable Petroleum Hydrocarbons) in soils via Headspace-GC-MS and GC-GC-FID respectively
WACTOCS	MS - CL - TOC Eltra (WAC)	Air dried	Passing 10mm test sieve	Determination of Total Organic Carbon in soil as part of a WAC test
TOCS	MS - CL - TOC Eltra	Air Dried	Passing 10mm test sieve	Determination of Total Organic Carbon in soils
TPHS	MS - CL - TPH (GC-FID)	As received	Passing 10mm test sieve	Determination of Total Petroleum Hydrocarbons in soil using GC-FID
WACSKALAR	MS - CL - Phenols by Skalar (WAC)	As received	BSEN:12457 Leaching	Determination of Total Phenols within leachate as part of a WAC test using a Skalar Segmented flow analyser
VOCS	MS - CL - VOC and MBTEX	As received	Passing 10mm test sieve	Determination of VOCs (inc BTEX) in soils via Headspace-GC-MS
VPHS	MS - CL - VPH	As received	Passing 10mm test sieve	Determination of VPH in soils via Headspace-GC-MS
WSBORONS	MS - CL - WS Boron	Air dried	Passing 10mm test sieve	Determination of Water soluble Boron in soils via ICP
SKALARCNL	MS - CL - Cyanide by Skalar - Leachate	As received	BSEN:12457 Leaching	Determination of cyanide (total / free / complex) in leachates using a Skalar segmented flow analyser
SKALARCNS	MS - CL - Cyanide by Skalar	As received	Passing 10mm test sieve	Determination of cyanide (total / free / complex) in soil using a Skalar segmented flow analyser
WACDOC	MS - CL - DOC (WAC)	As received	BSEN:12457 Leaching	Determination of dissolved organic carbon in a leachate as part of a WAC test
SKALARHCL	MS - CL - Hexavalent Cr by Skalar - L	As received	BSEN:12457 Leaching	Determination of hexavalent chromium in leachate using Skalar segmented flow analyser
SKALARHCS	MS - CL - Hexavalent Chromium by Skalar	As received	Passing 10mm test sieve	Determination of hexavalent chromium in soil using Skalar segmented flow analyser
WACMETALS	MS - CL - ICP - Metals in Waters (WAC)	As received	BSEN:12457 Leaching	Determination of metals in a leachate as part of a WAC test via ICP
ICPMETL	MS - CL - ICP Metals in Waters	As received	BSEN:12457 Leaching	Determination of metals in leachates via ICP
ICPMETS	MS - CL - ICP Metals	Air dried	Passing 10mm test sieve	Determination of metals in soils via ICP
PHL	MS - CL - pH in Waters	As received	BSEN:12457 Leaching	Determination of pH in leachates using a pH probe

7 - 11 Harding Street
Leicester
LE1 4DH

L24/03842/GRM - 24-44683

Project Reference - CASID-Christie Hospital, Manchaster

Analysis Methodologies

Test Code	Test Name / Reference	Sample condition for analysis	Sample Preperation	Test Details
WACPHS	MS - CL - pH in Soils (WAC)	As received	BSEN:12457 Leaching	Determination of pH in soils as part of a WAC test via pH probe
PHS	MS - CL - pH in Soils	As received	Passing 10mm test sieve	Determination of pH in soils using a pH probe (using a 1:3 soil to water extraction)
PHOHHPLCL	MS - CL - Phenol Waters by HPLC	As received	BSEN:12457 Leaching	Determination of speciated phenols in leachates using HPLC
PHOHHPLCS	MS - CL - Phenols by HPLC (soil)	As received	Passing 10mm test sieve	Determination of speciated phenols in soil using HPLC
WACANIONS	MS - CL - Anions by Aquakem (WAC)	As received	BSEN:12457 Leaching	Determination of sulphate, chloride and fluoride in a leachate as part of a WAC test using a Aquakem analyser
TDSL	MS-CL-Conductivity in Water(TDS by Calc)	As received	BSEN:12457 Leaching	Determination of total dissolved solids in leachates (by calculation)
ASSO4S	MS - CL - Acid Soluble Sulphate	Oven Dried	Passing 2mm test sieve	Determination of total sulphate in soils by acid extraction followed by ICP analysis
ASB	MS - AS - Asbestos	-	-	Fibre identification is in accordance with in house documented methods which are based on the procedure documented in the HSE Document HSG 248 "Asbestos: The analysts guide for sampling, analysis and clearance procedures"
ENLEACHP	BS EN 12457-2	As Received	-	Leaching in accordance with BSEN 12457-2 (10:1 Ratio)
ENLEACHP2	BS EN 12457-3	As Received	-	Leaching in accordance with BSEN 12457-3
SAMPLEPREP	MS - CL - Sample Preparation	-	-	Preparation of samples (including determination of moisture content) to allow for subsequent analysis
SUBCON-ENV	Subcontract - ENV Lab	-	-	Subcontract testing
1377LOI	BS1377 LoI	Oven dried	Passing 2mm test sieve	Testing was in accordance with BS 1377: Part 3: 2018 + A1 :2021 Clause 6. Determination of the mass loss on ignition. Some information required by BS1377: 2016: Part 1 has not been reported. This information is available on request.
1377TS-ELT	BS1377 Total Sulphur Content by HTC	Oven dried	BS1377 : Part 1 : 2016	Total Sulphur Content testing of Soil in accordance with BS 1377 : Part 3 : 2018 + A1 : 2021 Clause 7.10 (using Eltra CS-800 Analyser)

7 - 11 Harding Street
Leicester
LE1 4DH

L24/03842/GRM - 24-44683

Project Reference - CASID-Christie Hospital, Manchaster

HWOL TPH Acronym Index

Acronym	Description
HS	Headspace Analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
Total	Aliphatics and Aromatics
AL	Aliphatics Only
AR	Aromatics Only
2D	GC-GC - Double Coil Gas Chromatography
#1	EH_Total but with humics mathmatically subtracted
#2	EH_Total but with fatty acids mathmatically subtracted
_	Operator - underscore to separate acronyms (except for +)
+	Operator to indicate cumlative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry

APPENDIX K

GEOLABS Limited
Bucknalls Lane
Garston
Watford
Hertfordshire
WD25 9XX
Tel: +44(0) 1923 892 190
Fax: +44(0) 1923 892 191
email: admin@geolabs.co.uk
web: www.geolabs.co.uk

Simtec Material Testing
72, 113, 114, 116 The Burrows
East Goscote
Leicester

LE7 3XD

11 April 2024
Report No : GEO/40186/01

For the attention of Charlie Needham / Rob McGoff

Date samples received	26/03/2024
Date written instructions received	26/03/2024
Date testing commenced	27/03/2024
Date of sample disposal	**09/05/2024**

Our ref **GEO / 40186**
Your Ref **11359**

Project **CASCID - CHRISTIE HOSPITAL, MANCHESTER**

Further to your instructions we have pleasure in enclosing the results of the tests you requested in the attached figures.

LABORATORY TEST REPORT

Item No	Test Quantity	Description
1	2	Point Load Strength Index

Any opinions or interpretations expressed herein are outside the scope of UKAS accreditation. All results contained in this report are provisional unless signed by an approved signatory. The results contained in this report relate only to samples received in the laboratory and are tested 'as received' unless otherwise stated. This report should not be reproduced, except in full, without the written approval of the laboratory. The results reported are applicable only to the test items received by the laboratory.

All the necessary data required by the documented test procedures has been recorded and will be stored for a period of not less than 6 years. This data will be issued to yourselves at your request. All samples will be disposed of after the date shown above. Written confirmation will be required to retain the samples beyond this period and a storage charge may be applied.

We trust that the above meets your requirements and should you require any further information or assistance, please do not hesitate to contact us.

Yours faithfully
on behalf of **GEOLABS Limited**

[redacted]

I Tabios
Laboratory Manager

"Geolabs" and the Geolabs logo are registered trademarks in the name of Geolabs Limited
Registered Office: Bucknalls Lane Garston Watford Hertfordshire WD25 9XX Registered in England and Wales No: 3177641

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006 In-house Technical Procedure TP35

DETERMINATION OF POINT LOAD STRENGTH ON ROCK

Sample details			Point Load test											
Borehole Ref.	Depth (m)	Description	D. Tested	Test type & Direction		Sample width W (mm)	Platen separation (mm)		Water Content (%)	Equiv. Diameter D_e (mm)	Failure Load P (kN)	I_s P/De^2 (MPa)	Correction Factor F	Point Load Index $I_{s(50)}$ (MPa)
							Start D	End D'						
BH101 (11359/20861)	5.95-6.05	Extremely weak reddish brown fine to medium grained SANDSTONE. Fresh to slightly weathered	10/04/24	D	L	84.7	81.8	79.6		80.7	0.14	0.02	1.24	0.02
BH101 (11359/20865)	10.25-10.35	Extremely weak reddish brown fine to medium grained SANDSTONE. Fresh to slightly weathered	10/04/24	D	L	84.5	82.2	80.1		81.1	0.03	0.01	1.24	0.01

(*) Sample failed on weakness

Test type and direction: **D** - Diametral **A** - Axial **B** - Block **I** - Irregular lump **P** - Perpendicular to planes of weakness **U** - Random or unknown orientation **L** - Parallel to planes of weakness

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 11/04/2024

Project Number:

GEO / 40186

Project Name:

CASCID - CHRISTIE HOSPITAL, MANCHESTER
11359

GEOLABS®

UKAS TESTING 1982

TESTING RESTRICTION

The following tests have been scheduled on the below project. Those listed **CANNOT** be performed for the reason stated. If alternative samples are available for the restricted tests, please supply details.

Sample details				
Borehole Ref.	Depth (m)	Description	Tests restricted	Reason for restriction and comments
BH101 (11359/20860)	5.50-5.75	n/a	UCS w/ YM	Sample not received.
BH101 (11359/20861)	5.95-6.05	n/a	UCS w/ YM	Sample too short and broken into pieces before any testing has been done.
BH101 (11359/20865)	10.25-10.35	n/a	UCS w/ YM	Sample too short and broken into pieces before any testing has been done.

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 11/04/2024

Project Number:

GEO / 40186

Project Name:

CASCID - CHRISTIE HOSPITAL, MANCHESTER

11359

GEOLABS®

GEOLABS Limited
Bucknalls Lane
Garston
Watford
Hertfordshire
WD25 9XX

Tel: +44(0) 1923 892 190
Fax: +44(0) 1923 892 191
email: admin@geolabs.co.uk
web: www.geolabs.co.uk

Simtec Material Testing
72, 113, 114, 116 The Burrows
East Goscote
Leicester

LE7 3XD

11 April 2024
Report No : GEO/40187/01

For the attention of Charlie Needham / Rob McGoff

Date samples received	26/03/2024
Date written instructions received	26/03/2024
Date testing commenced	27/03/2024
Date of sample disposal	**09/05/2024**

Our ref **GEO / 40187**
Your Ref **11360**

Project **CASCID - CHRISTIE HOSPITAL, MANCHESTER**

Further to your instructions we have pleasure in enclosing the results of the tests you requested in the attached figures.

LABORATORY TEST REPORT

Item No	Test Quantity	Description
1	2	Unconfined Compressive Strength with Deformability
2	1	Point Load Strength Index

Any opinions or interpretations expressed herein are outside the scope of UKAS accreditation. All results contained in this report are provisional unless signed by an approved signatory. The results contained in this report relate only to samples received in the laboratory and are tested 'as received' unless otherwise stated. This report should not be reproduced, except in full, without the written approval of the laboratory. The results reported are applicable only to the test items received by the laboratory.

All the necessary data required by the documented test procedures has been recorded and will be stored for a period of not less than 6 years. This data will be issued to yourselves at your request. All samples will be disposed of after the date shown above. Written confirmation will be required to retain the samples beyond this period and a storage charge may be applied.

We trust that the above meets your requirements and should you require any further information or assistance, please do not hesitate to contact us.

Yours faithfully
on behalf of **GEOLABS Limited**

[redacted]

I Tabios
Laboratory Manager

"Geolabs" and the Geolabs logo are registered trademarks in the name of Geolabs Limited
Registered Office: Bucknalls Lane Garston Watford Hertfordshire WD25 9XX Registered in England and Wales No: 3177641

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

UNIAXIAL COMPRESSIVE STRENGTH OF ROCK MATERIALS

Sample details					Density		Uniaxial Compression Test (LF0879C (1000kN) compression frame used)							
							Mean after prep.							
Borehole Ref.	Depth (m)	Description	MC (%)	Degree of Saturation (%)	Bulk (Mg/m³)	Dry (Mg/m³)	Diameter (mm)	Height (mm)	H/D Ratio	Load at Failure (kN)	UCS (MPa) 3 sig. fig.	Failure Sketch	D. Tested	Remarks
BH102 (11360/20869)	3.40-3.55	Very weak thinly laminated reddish brown fine grained SANDSTONE. Fresh to slightly weathered	14	77.8	2.17	1.90	84.90	125.60	1.5	13.1	2.31		10/04/24	Non-standard test as samples does not meet the required height to diameter ratio.
BH102 (11360/20876)	16.50-16.70	Extremely weak thinly laminated reddish brown fine grained SANDSTONE. Fresh to slightly weathered	16	78.9	2.13	1.84	84.30	173.20	2.1	4.7	0.842		10/04/24	

Note: The dimensional requirements of flatness (<0.02 mm), perpendicularity (<0.05 / 50 mm) and straightness (0.3 mm deviation) are all met. Specific Gravity used for Degree of Saturation is assumed unless specified by the client.

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 11/04/2024

Project Number:

GEO / 40187

Project Name:

CASCID - CHRISTIE HOSPITAL, MANCHESTER

11360

GEOLABS®

UKAS TESTING 1982

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

UNCONFINED COMPRESSIVE STRENGTH WITH YOUNG'S MODULUS

Borehole Ref.:	BH102 (11360/20869)
Sample Ref.:	-
Depth (m):	3.40-3.55

Description:
Very weak thinly laminated reddish brown fine grained SANDSTONE. Fresh to slightly weathered

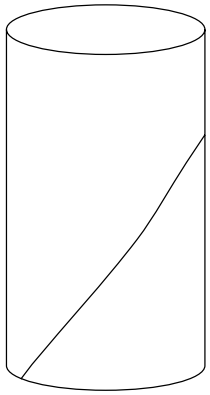
LF0879C (1000kN) compression frame used

Diameter	84.90 mm
Height	125.60 mm
Bulk Density	2.17 Mg/m³
Dry Density	1.90 Mg/m³
Water Content	14 %

Degree of Saturation: 77.8 % Specific Gravity: 2.9 Mg/m³ (Assumed)

Failure Sketch

Mode of failure: Diagonal shearing



Solid lines for material failures.
Dashed lines for apparent weakness failure.

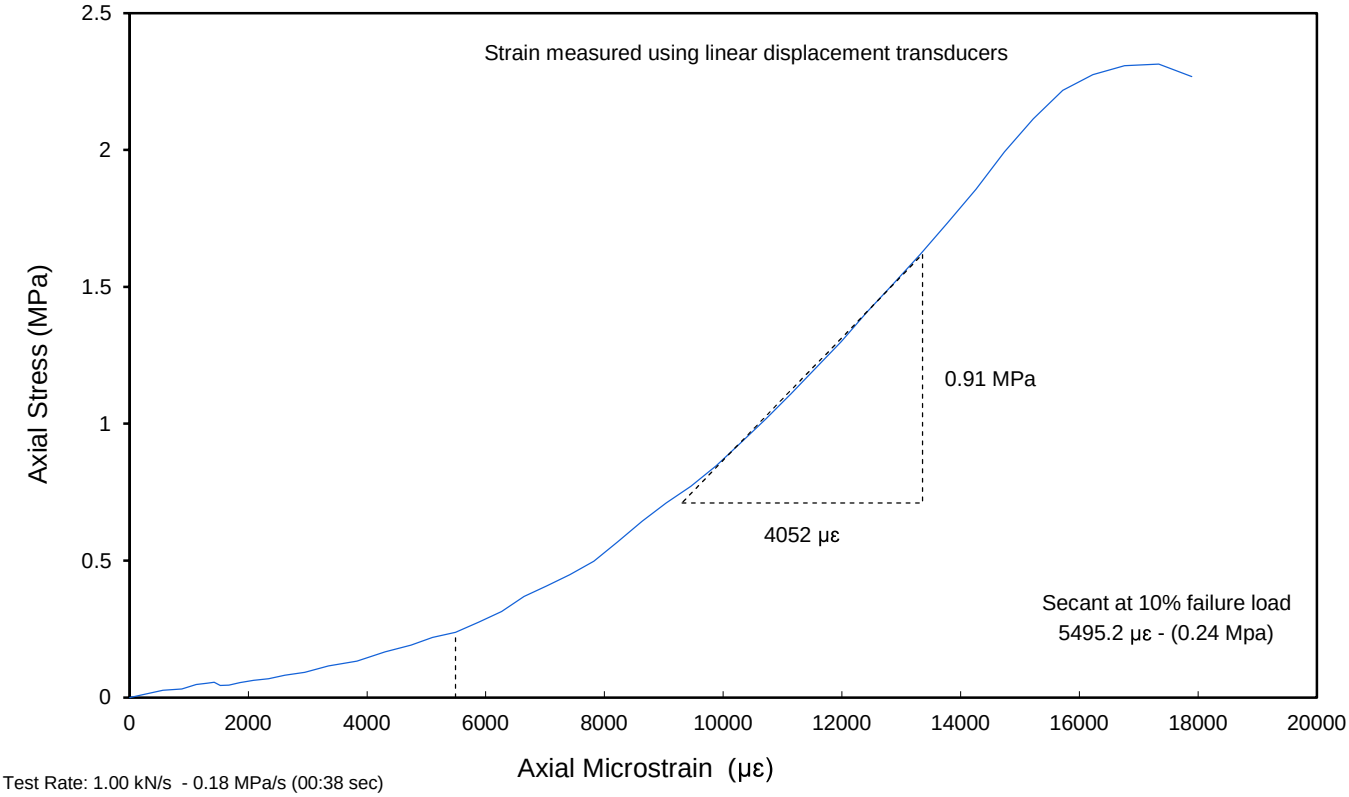
Date tested: 10/04/2024

Angle of foliation/Axis of loading: n/a
Angle of shear plane/Axis of loading: n/a

Sample type	C

Test results

Unconfined Compressive Strength Maximum load (kN): 13.10	2.31 MPa
Young's Modulus (tangential at 50% failure load)	0.224 GPa
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 10% failure load)	0.0434 GPa
Poisson's Ratio (secant at 10% failure load)	n/a



Test Rate: 1.00 kN/s - 0.18 MPa/s (00:38 sec)

Remarks: Non-standard test as samples does not meet the required height to diameter ratio.

Note: The dimensional requirements of Flatness (<0.02 mm), Perpendicularity (<0.05 / 50 mm) and Straightness (0.3 mm deviation) are all met.

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 11/04/2024

Project Number:

GEO / 40187

Project Name:

CASCID - CHRISTIE HOSPITAL, MANCHESTER

11360

GEOLABS®

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

UNCONFINED COMPRESSIVE STRENGTH WITH YOUNG'S MODULUS

Borehole Ref.:	BH102 (11360/20876)
Sample Ref.:	-
Depth (m):	16.50-16.70

Description:
Extremely weak thinly laminated reddish brown fine grained SANDSTONE.
Fresh to slightly weathered

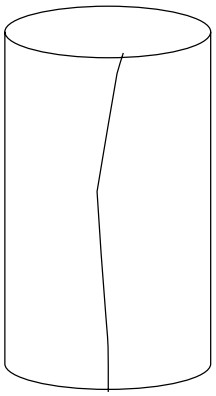
LF0879C (1000kN) compression frame used

Diameter	84.30 mm
Height	173.20 mm
Bulk Density	2.13 Mg/m³
Dry Density	1.84 Mg/m³
Water Content	16 %

Degree of Saturation: 78.9 % Specific Gravity: 2.9 Mg/m³ (Assumed)

Failure Sketch

Mode of failure: Axial splitting



Solid lines for material failures.
Dashed lines for apparent weakness failure.

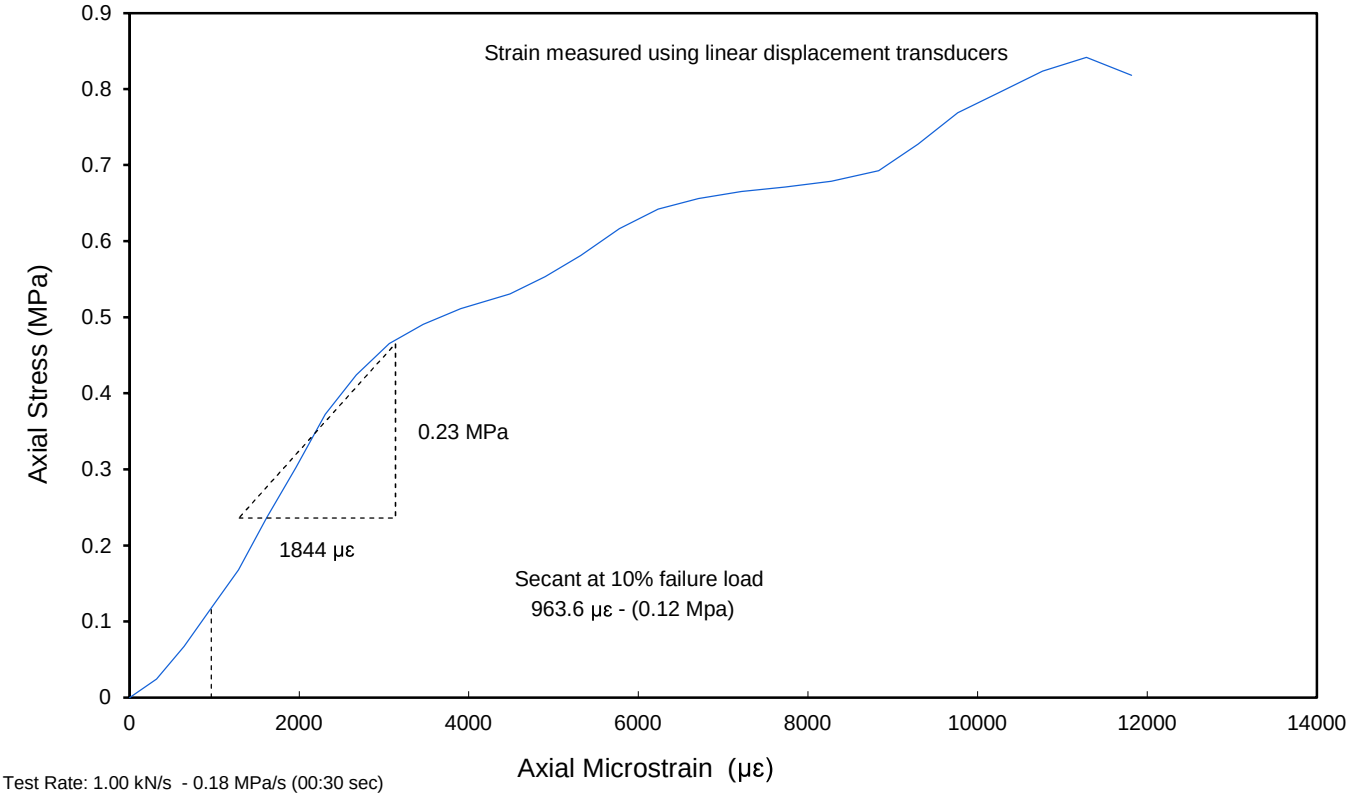
Date tested: 10/04/2024

Angle of foliation/Axis of loading: n/a
Angle of shear plane/Axis of loading: n/a

Sample type	C

Test results

Unconfined Compressive Strength Maximum load (kN): 4.70	0.842 MPa
Young's Modulus (tangential at 50% failure load)	0.124 GPa
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 10% failure load)	0.122 GPa
Poisson's Ratio (secant at 10% failure load)	n/a



Test Rate: 1.00 kN/s - 0.18 MPa/s (00:30 sec)

Note: The dimensional requirements of Flatness (<0.02 mm), Perpendicularity (<0.05 / 50 mm) and Straightness (0.3 mm deviation) are all met.

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 11/04/2024

Project Number:

GEO / 40187

Project Name:

CASCID - CHRISTIE HOSPITAL, MANCHESTER

11360

GEOLABS®

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006 In-house Technical Procedure TP35

DETERMINATION OF POINT LOAD STRENGTH ON ROCK

Sample details			Point Load test											
Borehole Ref.	Depth (m)	Description	D. Tested	Test type & Direction		Sample width W (mm)	Platen separation (mm)		Water Content (%)	Equiv. Diameter D_e (mm)	Failure Load P (kN)	I_s P/De^2 (MPa)	Correction Factor F	Point Load Index $I_{s(50)}$ (MPa)
							Start D	End D'						
BH102 (11360/20873)	8.30-8.45	Extremely weak thinly laminated reddish brown fine grained SANDSTONE. Fresh to slightly weathered	10/04/24	D	L	85.1	83.3	81.5		82.4	0.24	0.04	1.25	0.05

(*) Sample failed on weakness

Test type and direction: **D** - Diametral **A** - Axial **B** - Block **I** - Irregular lump **P** - Perpendicular to planes of weakness **U** - Random or unknown orientation **L** - Parallel to planes of weakness

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 11/04/2024

Project Number:

GEO / 40187

Project Name:

CASCID - CHRISTIE HOSPITAL, MANCHESTER
11360

GEOLABS®

UKAS TESTING 1982

TESTING RESTRICTION

The following tests have been scheduled on the below project. Those listed **CANNOT** be performed for the reason stated. If alternative samples are available for the restricted tests, please supply details.

Sample details				
Borehole Ref.	Depth (m)	Description	Tests restricted	Reason for restriction and comments
BH102 (11360/20873)	8.30-8.45	n/a	UCS w/ YM	Sample broken into short pieces before any testing has been done.

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 11/04/2024

Project Number:

GEO / 40187

Project Name:

CASCID - CHRISTIE HOSPITAL, MANCHESTER

11360

GEOLABS®

GEOLABS Limited
Bucknalls Lane
Garston
Watford
Hertfordshire
WD25 9XX

Tel: +44(0) 1923 892 190
Fax: +44(0) 1923 892 191
email: admin@geolabs.co.uk
web: www.geolabs.co.uk

Simtec Material Testing
72, 113, 114, 116 The Burrows
East Goscote
Leicester

LE7 3XD

11 April 2024
Report No : GEO/40185/01

For the attention of Charlie Needham / Rob McGoff

Date samples received	26/03/2024
Date written instructions received	26/03/2024
Date testing commenced	27/03/2024
Date of sample disposal	**09/05/2024**

Our ref **GEO / 40185**
Your Ref **11358**

Project **CASCID - CHRISTIE HOSPITAL, MANCHESTER**

Further to your instructions we have pleasure in enclosing the results of the tests you requested in the attached figures.

LABORATORY TEST REPORT

Item No	Test Quantity	Description
1	3	Unconfined Compressive Strength with Deformability
2	2	Point Load Strength Index

Any opinions or interpretations expressed herein are outside the scope of UKAS accreditation. All results contained in this report are provisional unless signed by an approved signatory. The results contained in this report relate only to samples received in the laboratory and are tested 'as received' unless otherwise stated. This report should not be reproduced, except in full, without the written approval of the laboratory. The results reported are applicable only to the test items received by the laboratory.

All the necessary data required by the documented test procedures has been recorded and will be stored for a period of not less than 6 years. This data will be issued to yourselves at your request. All samples will be disposed of after the date shown above. Written confirmation will be required to retain the samples beyond this period and a storage charge may be applied.

We trust that the above meets your requirements and should you require any further information or assistance, please do not hesitate to contact us.

Yours faithfully
on behalf of **GEOLABS Limited**

I Tabios
Laboratory Manager

"Geolabs" and the Geolabs logo are registered trademarks in the name of Geolabs Limited
Registered Office: Bucknalls Lane Garston Watford Hertfordshire WD25 9XX Registered in England and Wales No: 3177641

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

UNIAXIAL COMPRESSIVE STRENGTH OF ROCK MATERIALS

Sample details					Density		Uniaxial Compression Test (LF0879C (1000kN) compression frame used)							
							Mean after prep.							
Borehole Ref.	Depth (m)	Description	MC (%)	Degree of Saturation (%)	Bulk (Mg/m³)	Dry (Mg/m³)	Diameter (mm)	Height (mm)	H/D Ratio	Load at Failure (kN)	UCS (MPa) 3 sig. fig.	Failure Sketch	D. Tested	Remarks
BH104 (11358/20848)	4.30-4.40	Very weak reddish brown fine to medium grained SANDSTONE. Fresh to slightly weathered	11	51.9	2.01	1.82	86.50	93.90	1.1	14.4	2.45		10/04/24	Non-standard test as the sample does not meet the required height to diameter ratio.
BH104 (11358/20853)	11.20-11.38	Very weak reddish brown fine to medium grained SANDSTONE. Fresh to slightly weathered	15	75.3	2.11	1.83	85.50	138.90	1.6	22.1	3.85		10/04/24	Non-standard test as the sample does not meet the required height to diameter ratio.
BH104 (11358/20855)	14.75-14.90	Very weak reddish brown fine to medium grained SANDSTONE. Fresh to slightly weathered	13	78.5	2.21	1.95	84.90	115.10	1.4	10.4	1.84		10/04/24	Non-standard test as the sample does not meet the required height to diameter ratio.

Note: The dimensional requirements of flatness (<0.02 mm), perpendicularity (<0.05 / 50 mm) and straightness (0.3 mm deviation) are all met. Specific Gravity used for Degree of Saturation is assumed unless specified by the client.

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 11/04/2024

Project Number:

GEO / 40185

Project Name:

CASCID - CHRISTIE HOSPITAL, MANCHESTER

11358

GEOLABS®

UKAS TESTING 1982

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

UNCONFINED COMPRESSIVE STRENGTH WITH YOUNG'S MODULUS

Borehole Ref.:	BH104 (11358/20848)
Sample Ref.:	-
Depth (m):	4.30-4.40

Description:
Very weak reddish brown fine to medium grained SANDSTONE. Fresh to slightly weathered

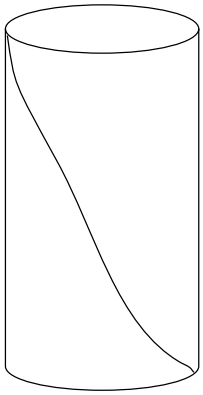
LF0879C (1000kN) compression frame used

Diameter	86.50 mm
Height	93.90 mm
Bulk Density	2.01 Mg/m³
Dry Density	1.82 Mg/m³
Water Content	11 %

Degree of Saturation: 51.9 % Specific Gravity: 2.9 Mg/m³ (Assumed)

Failure Sketch

Mode of failure: Diagonal shearing



Solid lines for material failures.
Dashed lines for apparent weakness failure.

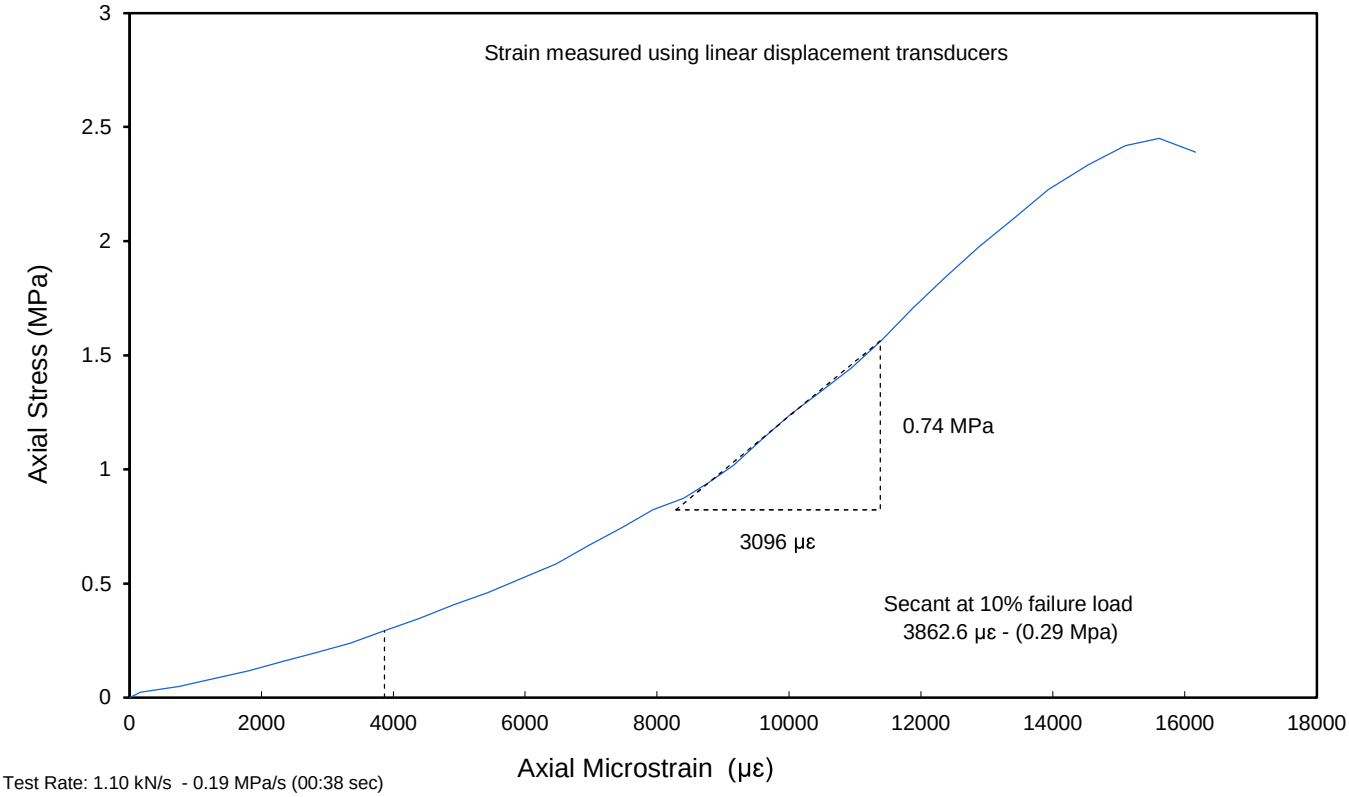
Date tested: 10/04/2024

Angle of foliation/Axis of loading: n/a
Angle of shear plane/Axis of loading: n/a

Sample type	C

Test results

Unconfined Compressive Strength (Maximum load (kN): 14.40)	2.45 MPa
Young's Modulus (tangential at 50% failure load)	0.239 GPa
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 10% failure load)	0.0757 GPa
Poisson's Ratio (secant at 10% failure load)	n/a



Test Rate: 1.10 kN/s - 0.19 MPa/s (00:38 sec)

Remarks: Non-standard test as the sample does not meet the required height to diameter ratio.

Note: The dimensional requirements of Flatness (<0.02 mm), Perpendicularity (<0.05 / 50 mm) and Straightness (0.3 mm deviation) are all met.

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 11/04/2024

Project Number:

GEO / 40185

Project Name:

CASCID - CHRISTIE HOSPITAL, MANCHESTER

11358

GEOLABS®

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

UNCONFINED COMPRESSIVE STRENGTH WITH YOUNG'S MODULUS

Borehole Ref.:	BH104 (11358/20853)
Sample Ref.:	-
Depth (m):	11.20-11.38

Description:
Very weak reddish brown fine to medium grained SANDSTONE. Fresh to slightly weathered

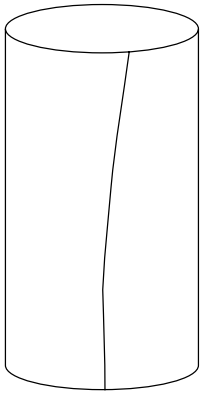
LF0879C (1000kN) compression frame used

Diameter	85.50 mm
Height	138.90 mm
Bulk Density	2.11 Mg/m³
Dry Density	1.83 Mg/m³
Water Content	15 %

Degree of Saturation: 75.3 % Specific Gravity: 2.9 Mg/m³ (Assumed)

Failure Sketch

Mode of failure: Axial splitting



Solid lines for material failures.
Dashed lines for apparent weakness failure.

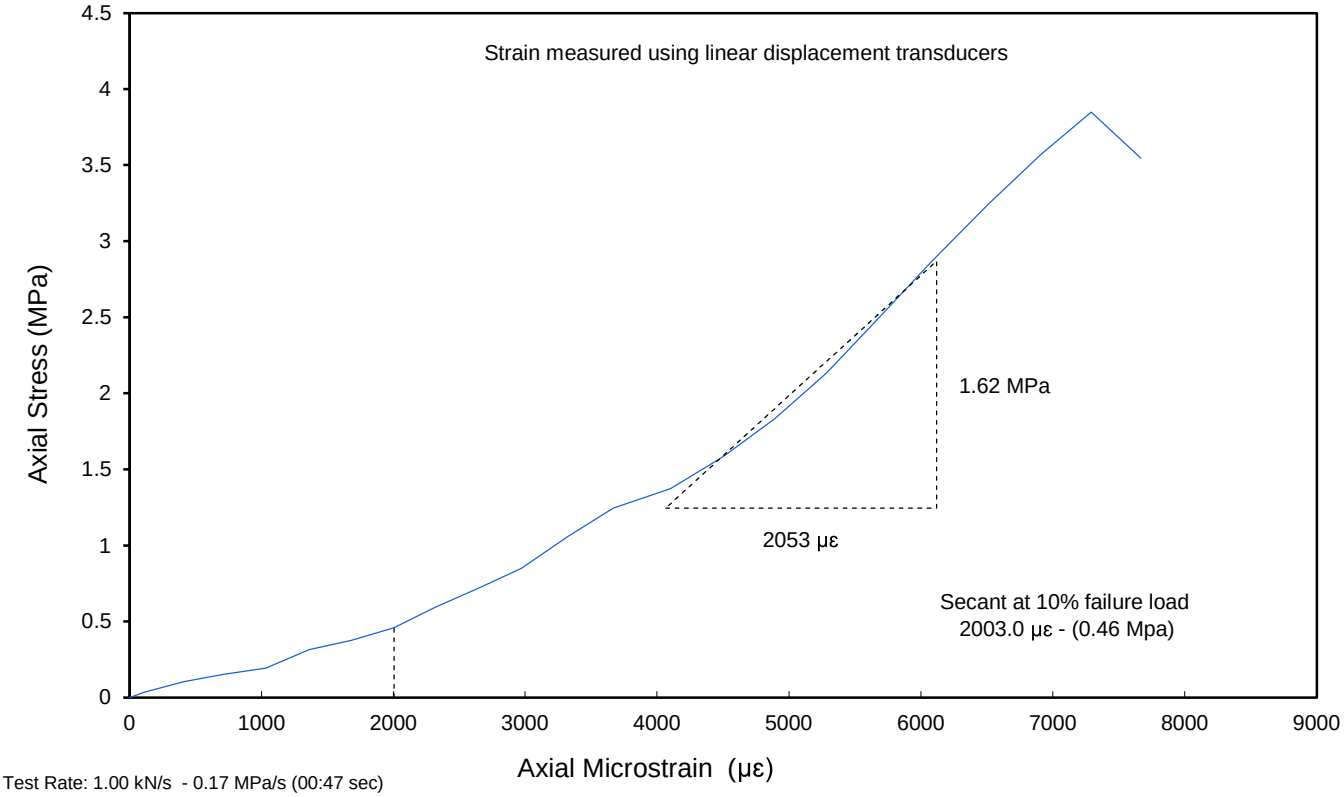
Date tested: 10/04/2024

Angle of foliation/Axis of loading: n/a
Angle of shear plane/Axis of loading: n/a

Sample type	C

Test results

Unconfined Compressive Strength Maximum load (kN): 22.10	3.85 MPa
Young's Modulus (tangential at 50% failure load)	0.791 GPa
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 10% failure load)	0.228 GPa
Poisson's Ratio (secant at 10% failure load)	n/a



Test Rate: 1.00 kN/s - 0.17 MPa/s (00:47 sec)

Remarks: Non-standard test as the sample does not meet the required height to diameter ratio.

Note: The dimensional requirements of Flatness (<0.02 mm), Perpendicularity (<0.05 / 50 mm) and Straightness (0.3 mm deviation) are all met.

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 11/04/2024

Project Number:

GEO / 40185

Project Name:

CASCID - CHRISTIE HOSPITAL, MANCHESTER

11358

GEOLABS®

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

UNCONFINED COMPRESSIVE STRENGTH WITH YOUNG'S MODULUS

Borehole Ref.:	BH104 (11358/20855)
Sample Ref.:	-
Depth (m):	14.75-14.90

Description:
Very weak reddish brown fine to medium grained SANDSTONE. Fresh to slightly weathered

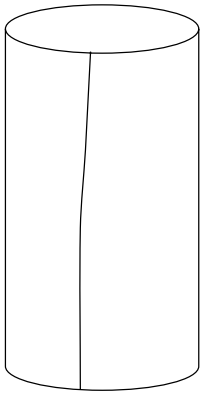
LF0879C (1000kN) compression frame used

Diameter	84.90 mm
Height	115.10 mm
Bulk Density	2.21 Mg/m³
Dry Density	1.95 Mg/m³
Water Content	13 %

Degree of Saturation: 78.5 % Specific Gravity: 2.9 Mg/m³ (Assumed)

Failure Sketch

Mode of failure: Axial splitting



Solid lines for material failures.
Dashed lines for apparent weakness failure.

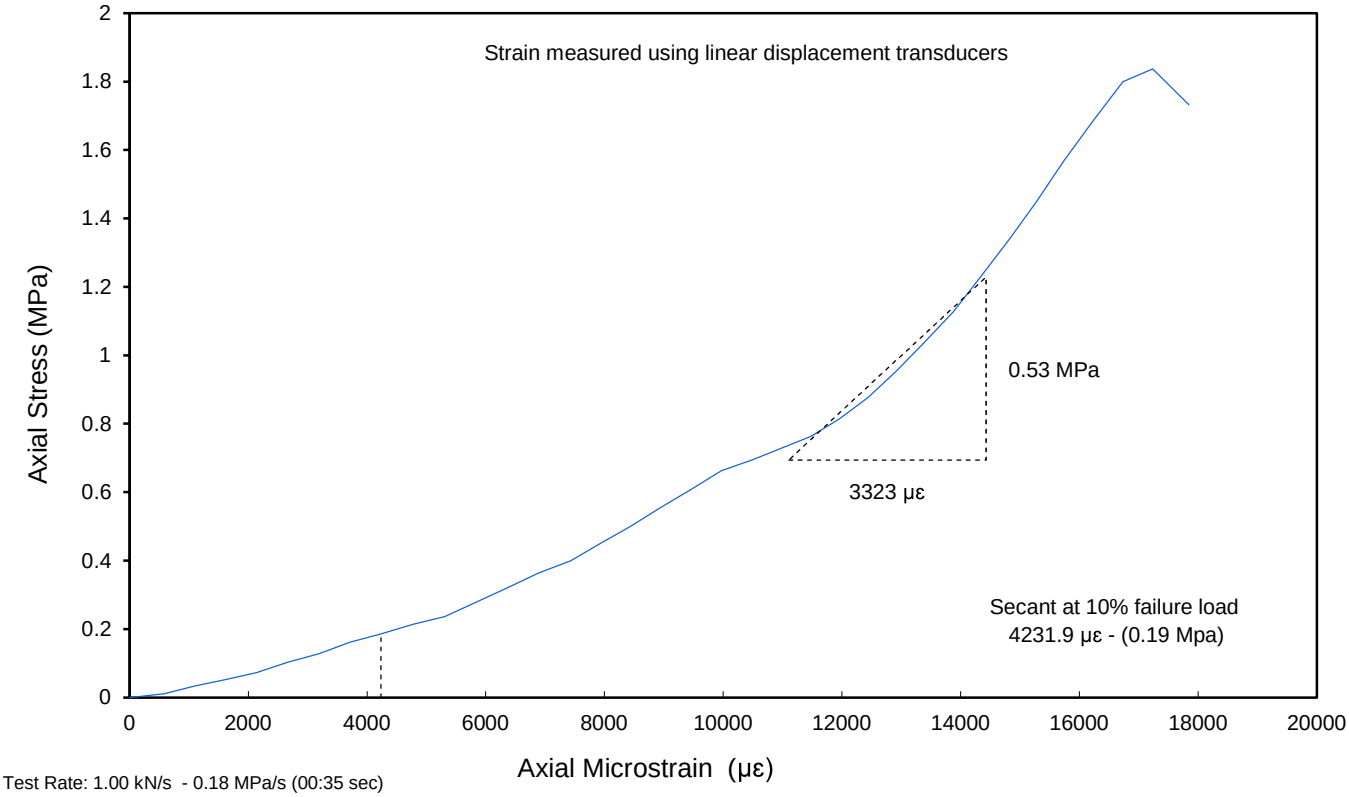
Date tested: 10/04/2024

Angle of foliation/Axis of loading: n/a
Angle of shear plane/Axis of loading: n/a

Sample type	C

Test results

Unconfined Compressive Strength (Maximum load (kN): 10.40)	1.84 MPa
Young's Modulus (tangential at 50% failure load)	0.161 GPa
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 10% failure load)	0.044 GPa
Poisson's Ratio (secant at 10% failure load)	n/a



Test Rate: 1.00 kN/s - 0.18 MPa/s (00:35 sec)

Remarks: Non-standard test as the sample does not meet the required height to diameter ratio.

Note: The dimensional requirements of Flatness (<0.02 mm), Perpendicularity (<0.05 / 50 mm) and Straightness (0.3 mm deviation) are all met.

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 11/04/2024

Project Number:

GEO / 40185

Project Name:

CASCID - CHRISTIE HOSPITAL, MANCHESTER

11358

GEOLABS®

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006 In-house Technical Procedure TP35

DETERMINATION OF POINT LOAD STRENGTH ON ROCK

Sample details			Point Load test											
Borehole Ref.	Depth (m)	Description	D. Tested	Test type & Direction		Sample width W (mm)	Platen separation (mm)		Water Content (%)	Equiv. Diameter D_e (mm)	Failure Load P (kN)	I_s P/De^2 (MPa)	Correction Factor F	Point Load Index $I_{s(50)}$ (MPa)
							Start D	End D'						
BH104 (11358/20849)	7.10-7.20	Very weak reddish brown fine to medium grained SANDSTONE. Fresh to slightly weathered	10/04/24	A	P	85.4	57.8	56.2		78.2	0.79	0.13	1.22	0.16
BH104 (11358/20890)	17.10-17.30	Extremely weak reddish brown fine to medium grained SANDSTONE. Fresh to slightly weathered	10/04/24	D	L	85.0	80.8	78.4		79.6	0.08	0.01	1.23	0.01

(*) Sample failed on weakness

Test type and direction: **D** - Diametral **A** - Axial **B** - Block **I** - Irregular lump **P** - Perpendicular to planes of weakness **U** - Random or unknown orientation **L** - Parallel to planes of weakness

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 11/04/2024

Project Number:

GEO / 40185

Project Name:

CASCID - CHRISTIE HOSPITAL, MANCHESTER
11358

GEOLABS®

UKAS TESTING 1982

TESTING RESTRICTION

The following tests have been scheduled on the below project. Those listed **CANNOT** be performed for the reason stated. If alternative samples are available for the restricted tests, please supply details.

Sample details				
Borehole Ref.	Depth (m)	Description	Tests restricted	Reason for restriction and comments
BH104 (11358/20849)	7.10-7.20	Very weak reddish brown fine to medium grained SANDSTONE. Fresh to slightly weathered	UCS w/ YM	Sample broken into short pieces before any testing has been done.
BH104 (11358/20890)	17.10-17.30	Extremely weak reddish brown fine to medium grained SANDSTONE. Fresh to slightly weathered	UCS w/ YM	Sample broken into short pieces before any testing has been done.

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 11/04/2024

Project Number:

GEO / 40185

Project Name:

CASCID - CHRISTIE HOSPITAL, MANCHESTER

11358

GEOLABS®

GRM Development Solutions Ltd
Laurus House First Avenue, Centrum 100, Burton-on-Trent, Staffordshire, DE14 2WH

10108

Unit 116, The Burrows, East Goscote Ind Est
East Goscote, Leicestershire, LE7 3XD
t: 0116 3196100 e: info@simtec-mt.co.uk

Analytical Test Report: CERT084b-SM10947-PIP-1

Your Project Reference:	**P10525 - CASCID-Christie Hospital, Manchester**		
Your Order Number:	P10525	Testing Received / Instructed:	12/03/2024
Report Issue Number:	1	Sample Tested:	12/03/2024 to 25/03/2024
Samples Analysed:	7 soil Samples	Report issued:	25/03/2024

Signed

Notes:

Samples will be retained for 14 days after issue of this report unless otherwise requested.

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

Some information required by BS1377 is not included in the report. The information will be provided if requested.

A certificate of sampling was not supplied

Samples were supplied by customer, results apply to the samples as received.

Within the report any information provided by the client is identified with a '#'

Where specification limits are included these are for guidance only. Where a measured value has been highlighted this is not implying acceptance or failure and certainty of measurement values have not been taken into account.

Accreditation Key

UKAS = UKAS Accreditation, u = Unaccredited

Date of Issue: 25.03.2024

Issued by: RM

Issue No: 01

Rev No: 01

SIMTEC
CONSTRUCTION MATERIALS TESTING
A PHENNA GROUP COMPANY

CERT084b-SM10947-PIP-1

Project Reference - P10525 - CASCID-Christie Hospital, Manchester

Analytical Test Results - Soil

Unit 116, The Burrows, East Goscote Ind Est
East Goscote, Leicestershire, LE7 3XD
t: 0116 3196100 e: info@simtec-mt.co.uk

Lab Reference		19757	19758	19759	19760	19761
Client Sample ID (#)		-	-	-	-	-
Client Sample Location (#)		TP101	TP102	TP106	TP107	BH103
Client Sample Type (#)		B	D	B	B	B
Depth - Top (m) (#)		0.6	1.00	0.50	0.70	1.90
Depth - Bottom (m) (#)		0.7	1.10	0.60	0.70	2.00
Date of Sampling (#)		Not supplied	Not supplied	Not supplied	Not supplied	Not supplied
Sample type		Bulk	Disturbed	Bulk	Bulk	Bulk
Sample Description		Brown slightly gravelly clayey silty SAND	Brown slightly gravelly silty clayey SAND	Red slightly gravelly slightly silty SAND	Brown slightly gravelly clayey silty SAND	Red slightly silty SAND
Determinant	**Units**					
BS1377 PSD						
125.0	(% Passing)	100	100	100	100	100
90.0	(% Passing)	100	100	100	100	100
75.0	(% Passing)	100	100	100	100	100
63.0	(% Passing)	100	100	100	100	100
50.0	(% Passing)	100	100	100	100	100
37.5	(% Passing)	100	100	100	100	100
28.0	(% Passing)	100	100	100	100	100
20.0	(% Passing)	100	100	100	100	100
14.0	(% Passing)	100	100	100	97	100
10.0	(% Passing)	98	100	99	95	100
6.3	(% Passing)	96	100	96	93	100
5.0	(% Passing)	96	100	95	92	100
3.35	(% Passing)	94	99	94	90	100
2.00	(% Passing)	93	98	93	88	100
1.18	(% Passing)	92	97	92	86	100
0.600	(% Passing)	89	93	89	79	99
0.425	(% Passing)	81	86	84	69	92
0.300	(% Passing)	64	72	70	50	55
0.212	(% Passing)	44	55	42	31	36
0.150	(% Passing)	32	44	25	21	22
0.063	(% Passing)	19	33	9.0	14	9.0
0.02	(% Passing)	13	27	5.5	12	5.3
0.006	(% Passing)	9.8	22	3.8	9.4	3.8
0.002	(% Passing)	7.0	18	2.6	6.9	2.4
PSD test Method	-	Wet Sieve	Wet Sieve	Wet Sieve	Wet Sieve	Wet Sieve
Sedimentation was pretreated	-	No	No	No	No	No

CERT084b-SM10947-PIP-1

Project Reference - P10525 - CASCID-Chr

Analytical Test Results - Soil

Lab Reference		19762	19763
Client Sample ID (#)			
Client Sample Location (#)		BH103	BH104
Client Sample Type (#)		D	D
Depth - Top (m) (#)		2.50	2.80
Depth - Bottom (m) (#)		2.60	2.90
Date of Sampling (#)		Not supplied	Not supplied
Sample type		Disturbed	Disturbed
Sample Description		Red slightly silty SAND	Brown silty SAND and GRAVEL
Determinant	**Units**		
BS1377 PSD			
125.0	(% Passing)	100	100
90.0	(% Passing)	100	100
75.0	(% Passing)	100	100
63.0	(% Passing)	100	100
50.0	(% Passing)	100	100
37.5	(% Passing)	100	100
28.0	(% Passing)	100	100
20.0	(% Passing)	100	100
14.0	(% Passing)	100	89
10.0	(% Passing)	100	83
6.3	(% Passing)	100	77
5.0	(% Passing)	100	72
3.35	(% Passing)	100	66
2.00	(% Passing)	100	60
1.18	(% Passing)	100	55
0.600	(% Passing)	98	47
0.425	(% Passing)	90	40
0.300	(% Passing)	51	31
0.212	(% Passing)	29	21
0.150	(% Passing)	17	18
0.063	(% Passing)	7.0	15
0.02	(% Passing)	4.2	9.6
0.006	(% Passing)	3.0	5.9
0.002	(% Passing)	1.8	4.1
PSD test Method	-	Wet Sieve	Wet Sieve
Sedimentation was pretreated	-	No	No

SIMTEC CONSTRUCTION MATERIALS TESTING
A PHOENIX GROUP COMPANY

Unit 116, The Burrows, East Goscote Ind Est
East Goscote, Leicestershire, LE7 3XD
t: 0116 3196100 e: info@simtec-mt.co.uk

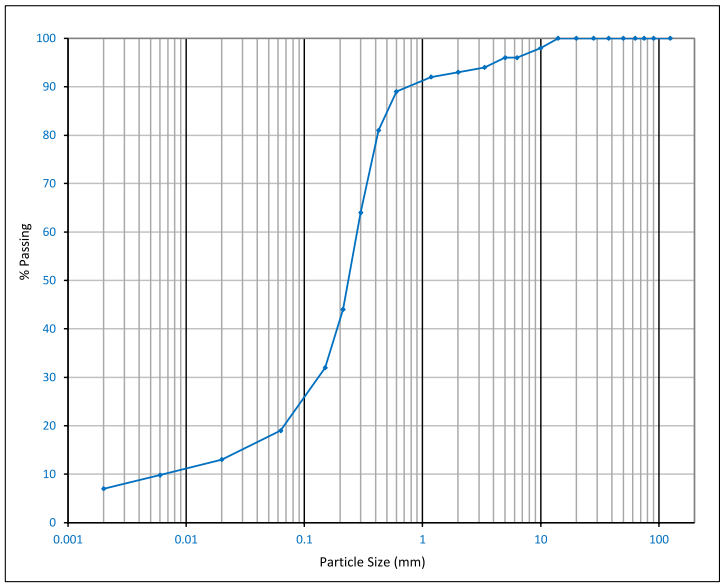
CERT084b-SM10947-PIP-1

Project Reference - P10525 - CASCID-Christie Hospital, Manchester

Material Analysis Results

Lab Reference	**19757**

Client Sample ID (#)	-
Client Sample Location (#)	TP101
Client Sample Type (#)	B
Depth - Top (m) (#)	0.60
Depth - Bottom (m) (#)	0.70
Date of Sampling (#)	Not supplied
Sample type	Bulk
Sample Description	Brown slightly gravelly clayey silty SAND



Specification:

Sieve Size (mm)	Upper Limit (%)	Lower Limit (%)	Passing (%)	
125			100	Cobbles
90			100	
75			100	
63			100	0
50			100	Gravel
37.5			100	
28			100	
20			100	
14			100	
10			98	
6.3			96	
5			96	
3.35			94	6
2			93	Sand
1.18			92	
0.6			89	
0.425			81	
0.3			64	
0.212			44	
0.15			32	
0.063			19	75
0.02			13	Silt
0.006			10	
0.002			7	12
				Clay 7

NOTES :

SIMTEC CONSTRUCTION MATERIALS TESTING
A PHOENIX GROUP COMPANY

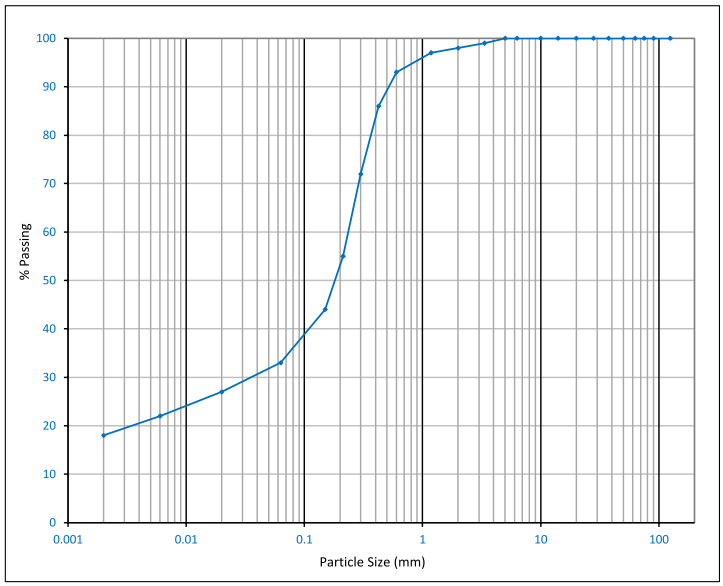
Unit 116, The Burrows, East Goscote Ind Est
East Goscote, Leicestershire, LE7 3XD
t: 0116 3196100 e: info@simtec-mt.co.uk

CERT084b-SM10947-PIP-1

Project Reference - P10525 - CASCID-Christie Hospital, Manchester

Material Analysis Results

Lab Reference	**19758**
Client Sample ID (#)	-
Client Sample Location (#)	TP102
Client Sample Type (#)	D
Depth - Top (m) (#)	1.00
Depth - Bottom (m) (#)	1.10
Date of Sampling (#)	Not supplied
Sample type	Disturbed
Sample Description	Brown slightly gravelly silty clayey SAND



Specification:

Sieve Size (mm)	Upper Limit (%)	Lower Limit (%)	Passing (%)	
125			100	Cobbles
90			100	
75			100	
63			100	0
50			100	Gravel
37.5			100	
28			100	
20			100	
14			100	
10			100	
6.3			100	
5			100	
3.35			99	1
2			98	Sand
1.18			97	
0.6			93	
0.425			86	
0.3			72	
0.212			55	
0.15			44	
0.063			33	66
0.02			27	Silt
0.006			22	
0.002			18	15
				Clay 18

NOTES :

SIMTEC CONSTRUCTION MATERIALS TESTING
A PHOENIX GROUP COMPANY

Unit 116, The Burrows, East Goscote Ind Est
East Goscote, Leicestershire, LE7 3XD
t: 0116 3196100 e: info@simtec-mt.co.uk

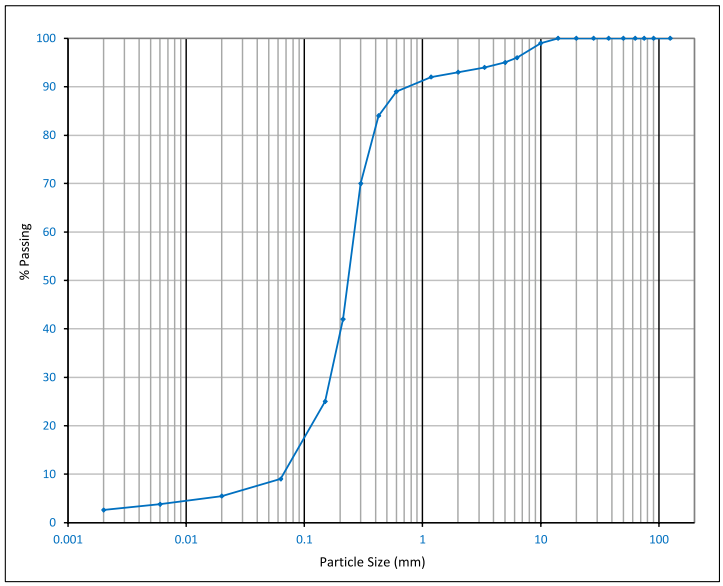
CERT084b-SM10947-PIP-1

Project Reference - P10525 - CASCID-Christie Hospital, Manchester

Material Analysis Results

Lab Reference	**19759**

Client Sample ID (#)	-
Client Sample Location (#)	TP106
Client Sample Type (#)	B
Depth - Top (m) (#)	0.50
Depth - Bottom (m) (#)	0.60
Date of Sampling (#)	Not supplied
Sample type	Bulk
Sample Description	Red slightly gravelly slightly silty SAND



Specification:

Sieve Size (mm)	Upper Limit (%)	Lower Limit (%)	Passing (%)	
125			100	Cobbles
90			100	
75			100	
63			100	0
50			100	Gravel
37.5			100	
28			100	
20			100	
14			100	
10			99	
6.3			96	
5			95	
3.35			94	6
2			93	Sand
1.18			92	
0.6			89	
0.425			84	
0.3			70	
0.212			42	
0.15			25	
0.063			9	85
0.02			6	Silt
0.006			4	
0.002			3	6
				Clay 3

NOTES :

SIMTEC
CONSTRUCTION MATERIALS TESTING

Unit 116, The Burrows, East Goscote Ind Est
East Goscote, Leicestershire, LE7 3XD
t: 0116 3196100 e: info@simtec-mt.co.uk

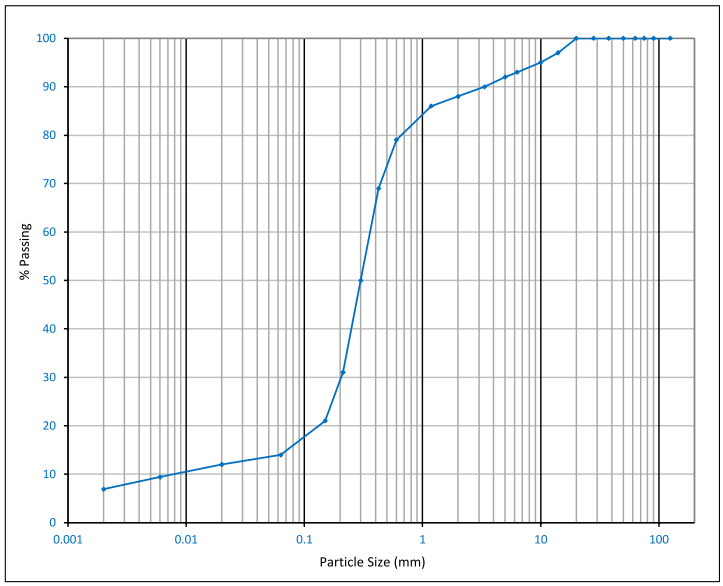
CERT084b-SM10947-PIP-1

Project Reference - P10525 - CASCID-Christie Hospital, Manchester

Material Analysis Results

Lab Reference	**19760**

Client Sample ID (#)	-
Client Sample Location (#)	TP107
Client Sample Type (#)	B
Depth - Top (m) (#)	2.50
Depth - Bottom (m) (#)	2.60
Date of Sampling (#)	Not supplied
Sample type	Bulk
Sample Description	Brown slightly gravelly clayey silty SAND



Specification:				
Sieve Size (mm)	Upper Limit (%)	Lower Limit (%)	Passing (%)	
125			100	Cobbles
90			100	
75			100	
63			100	0
50			100	Gravel
37.5			100	
28			100	
20			100	
14			97	
10			95	
6.3			93	
5			92	
3.35			90	10
2			88	Sand
1.18			86	
0.6			79	
0.425			69	
0.3			50	
0.212			31	
0.15			21	
0.063			14	76
0.02			12	Silt
0.006			9	
0.002			7	7
				Clay 7

NOTES :

SIMTEC CONSTRUCTION MATERIALS TESTING
A PHOENIX GROUP COMPANY

Unit 116, The Burrows, East Goscote Ind Est
East Goscote, Leicestershire, LE7 3XD
t: 0116 3196100 e: info@simtec-mt.co.uk

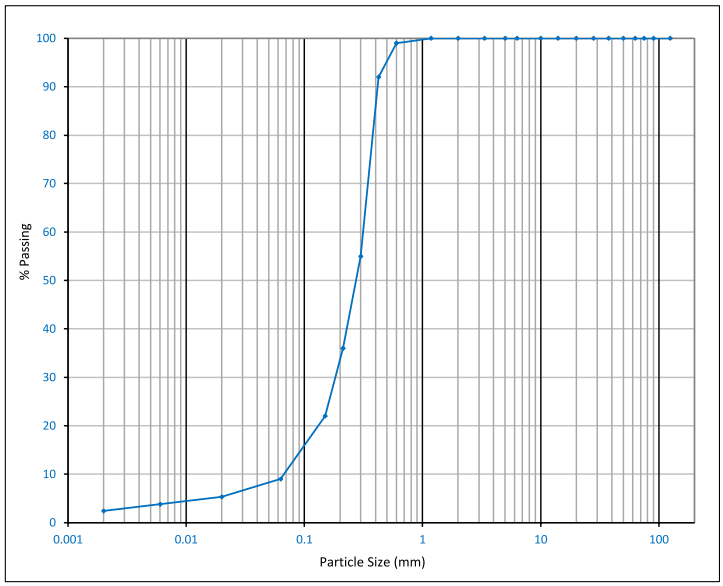
CERT084b-SM10947-PIP-1

Project Reference - P10525 - CASCID-Christie Hospital, Manchester

Material Analysis Results

Lab Reference	**19761**

Client Sample ID (#)	-
Client Sample Location (#)	BH103
Client Sample Type (#)	D
Depth - Top (m) (#)	1.90
Depth - Bottom (m) (#)	2.00
Date of Sampling (#)	Not supplied
Sample type	Disturbed
Sample Description	Red slightly silty SAND



Specification:

Sieve Size (mm)	Upper Limit (%)	Lower Limit (%)	Passing (%)	
125			100	Cobbles
90			100	
75			100	
63			100	0
50			100	Gravel
37.5			100	
28			100	
20			100	
14			100	
10			100	
6.3			100	
5			100	
3.35			100	0
2			100	Sand
1.18			100	
0.6			99	
0.425			92	
0.3			55	
0.212			36	
0.15			22	
0.063			9	91
0.02			5	Silt
0.006			4	
0.002			2	7
				Clay 2

NOTES :

SIMTEC
CONSTRUCTION MATERIALS TESTING

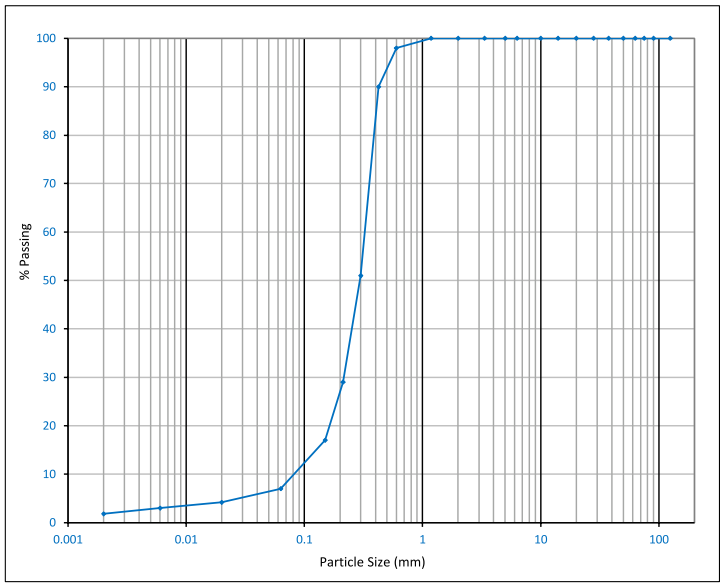
Unit 116, The Burrows, East Goscote Ind Est
East Goscote, Leicestershire, LE7 3XD
t: 0116 3196100 e: info@simtec-mt.co.uk

CERT084b-SM10947-PIP-1

Project Reference - P10525 - CASCID-Christie Hospital, Manchester

Material Analysis Results

Lab Reference	**19762**
Client Sample ID (#)	-
Client Sample Location (#)	BH103
Client Sample Type (#)	D
Depth - Top (m) (#)	2.50
Depth - Bottom (m) (#)	2.60
Date of Sampling (#)	Not supplied
Sample type	Disturbed
Sample Description	Red Slightly silty SAND



Specification:

Sieve Size (mm)	Upper Limit (%)	Lower Limit (%)	Passing (%)	
125			100	Cobbles
90			100	
75			100	
63			100	0
50			100	Gravel
37.5			100	
28			100	
20			100	
14			100	
10			100	
6.3			100	
5			100	
3.35			100	0
2			100	Sand
1.18			100	
0.6			98	
0.425			90	
0.3			51	
0.212			29	
0.15			17	
0.063			7	93
0.02			4	Silt
0.006			3	
0.002			2	5
				Clay 2

NOTES :

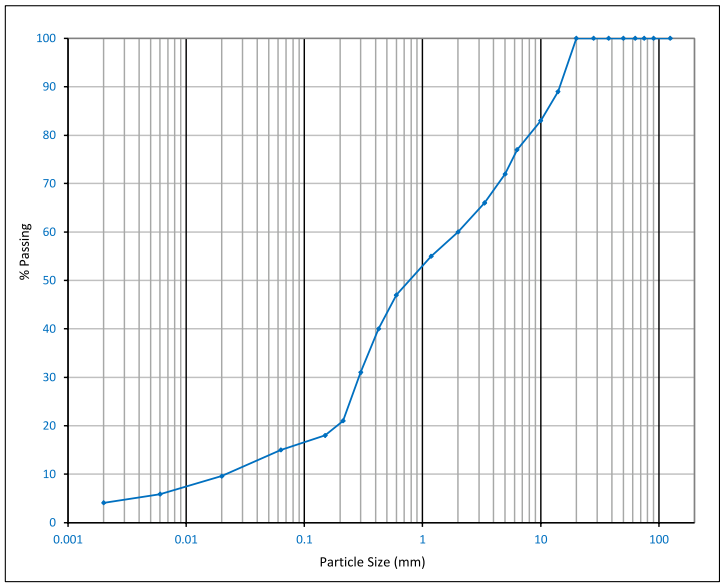
SIMTEC
CONSTRUCTION MATERIALS TESTING
Unit 116, The Burrows, East Goscote Ind Est
East Goscote, Leicestershire, LE7 3XD
t: 0116 3196100 e: info@simtec-mt.co.uk

CERT084b-SM10947-PIP-1

Project Reference - P10525 - CASCID-Christie Hospital, Manchester

Material Analysis Results

Lab Reference	**19762**
Client Sample ID (#)	-
Client Sample Location (#)	BH104
Client Sample Type (#)	D
Depth - Top (m) (#)	2.80
Depth - Bottom (m) (#)	2.90
Date of Sampling (#)	Not supplied
Sample type	Disturbed
Sample Description	Brown silty SAND and GRAVEL



Specification:

Sieve Size (mm)	Upper Limit (%)	Lower Limit (%)	Passing (%)	
125			100	Cobbles
90			100	
75			100	
63			100	0
50			100	Gravel
37.5			100	
28			100	
20			100	
14			89	
10			83	
6.3			77	
5			72	
3.35			66	34
2			60	Sand
1.18			55	
0.6			47	
0.425			40	
0.3			31	
0.212			21	
0.15			18	
0.063			15	51
0.02			10	Silt
0.006			6	
0.002			4	11
				Clay 4

NOTES :

Unit 116, The Burrows, East Goscote Ind Est
East Goscote, Leicestershire, LE7 3XD
t: 0116 3196100 e: info@simtec-mt.co.uk

CERT084b-SM10947-PIP-1

Project Reference - P10525 - CASCID-Christie Hospital, Manchester

Analysis Methodologies

Determinant	Details and Test method used
BS1377 PSD	1377 Particle Size Distribution 1. Sample preparation was in accordance with BS1377:Part 1:2016. 2. Testing was in accordance with BS1377:Part 2:1990 clause 9.2 wet sieving method
BS1377 Sedimentation by pipette	1377 Particle Size Distribution Sedimentation 1. Sample preparation was in accordance with BS1377:Part 1:2016. 2. Testing was in accordance with BS1377:Part 2:1990 clause 9.4 sedimentation by pipette method.

GRM Development Solutions Ltd
Laurus House First Avenue, Centrum 100, Burton-on-Trent, Staffordshire, DE14 2WH

10108

Unit 116, The Burrows, East Goscote Ind Est
East Goscote, Leicestershire, LE7 3XD
t: 0116 3196100 e: info@simtec-mt.co.uk

Analytical Test Report: CERT084b-SM11106-PIP-1

Your Project Reference:	**P10525 - CASCID-Christie Hospital, Manchester**		
Your Order Number:	P10525	Testing Received / Instructed:	18/03/2024
Report Issue Number:	1	Sample Tested:	18/03/2024 to 25/03/2024
Samples Analysed:	5 soil Samples	Report issued:	25/03/2024

[redacted]

Notes:

Samples will be retained for 14 days after issue of this report unless otherwise requested.

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

Some information required by BS1377 is not included in the report. The information will be provided if requested.

A certificate of sampling was not supplied

Samples were supplied by customer, results apply to the samples as received.

Within the report any information provided by the client is identified with a '#'

Where specification limits are included these are for guidance only. Where a measured value has been highlighted this is not implying acceptance or failure and certainty of measurement values have not been taken into account.

Accreditation Key

UKAS = UKAS Accreditation, u = Unaccredited

Date of Issue: 25.03.2024

Issued by: RM

Issue No: 01

Rev No: 01

SIMTEC CONSTRUCTION MATERIALS TESTING
A PHENNA GROUP COMPANY

Unit 116, The Burrows, East Goscote Ind Est
East Goscote, Leicestershire, LE7 3XD
t: 0116 3196100 e: info@simtec-mt.co.uk

CERT084b-SM11106-PIP-1

Project Reference - P10525 - CASCID-Christie Hospital, Manchester

Analytical Test Results - Soil

Lab Reference		20302	20303	20304	20305	20306
Client Sample ID (#)		-	-	-	-	-
Client Sample Location (#)		BH101	BH101	BH102	BH102	TP104
Client Sample Type (#)		B	D	B	D	D
Depth - Top (m) (#)		0.4	2.30	0.50	2.50	0.70
Depth - Bottom (m) (#)		0.5	2.40	0.60	2.60	0.80
Date of Sampling (#)		Not supplied	Not supplied	Not supplied	Not supplied	Not supplied
Sample type		Bulk	Disturbed	Bulk	Disturbed	Disturbed
Sample Description		Brown slightly gravelly slightly clayey silty SAND	Red silty SAND	Brown slightly gravelly slightly clayey slightly silty SAND	Red slightly silty SAND	Brown slightly silty SAND
Determinant	**Units**					
BS1377 PSD						
125.0	(% Passing)	100	100	100	100	100
90.0	(% Passing)	100	100	100	100	100
75.0	(% Passing)	100	100	100	100	100
63.0	(% Passing)	100	100	100	100	100
50.0	(% Passing)	100	100	100	100	100
37.5	(% Passing)	100	100	100	100	100
28.0	(% Passing)	100	100	100	100	100
20.0	(% Passing)	100	100	100	100	100
14.0	(% Passing)	99	100	98	100	100
10.0	(% Passing)	97	100	98	100	95
6.3	(% Passing)	93	100	98	100	93
5.0	(% Passing)	92	100	97	100	92
3.35	(% Passing)	90	100	97	100	92
2.00	(% Passing)	87	100	96	100	91
1.18	(% Passing)	84	100	96	100	90
0.600	(% Passing)	77	100	89	100	84
0.425	(% Passing)	70	98	77	98	71
0.300	(% Passing)	57	86	52	86	46
0.212	(% Passing)	44	56	29	46	23
0.150	(% Passing)	36	35	21	29	13
0.063	(% Passing)	25	13	15	14	8.0
0.02	(% Passing)	16	8.2	12	9.0	5.0
0.006	(% Passing)	11	6.0	9.8	6.0	4.4
0.002	(% Passing)	7.3	4.2	7.3	4.2	3.1
PSD test Method	-	Wet Sieve	Wet Sieve	Wet Sieve	Wet Sieve	Wet Sieve
Sedimentation was pretreated	-	No	No	No	No	No

SIMTEC CONSTRUCTION MATERIALS TESTING
A PHOENIX GROUP COMPANY

Unit 116, The Burrows, East Goscote Ind Est
East Goscote, Leicestershire, LE7 3XD
t: 0116 3196100 e: info@simtec-mt.co.uk

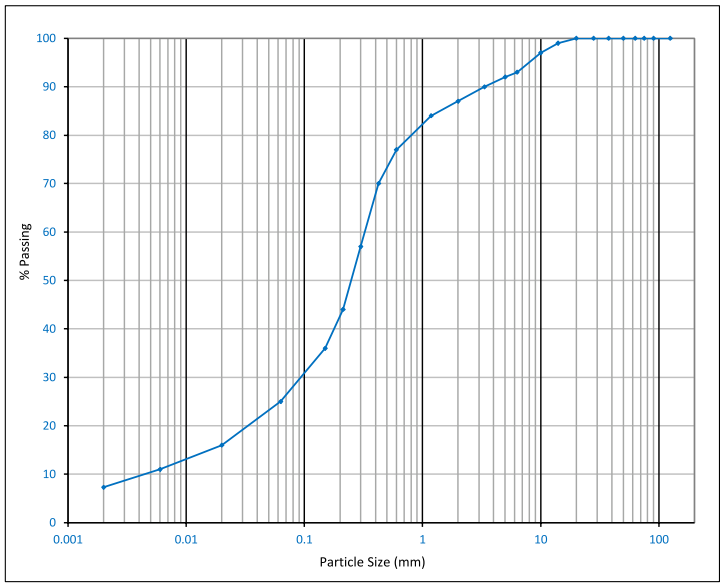
CERT084b-SM11106-PIP-1

Project Reference - P10525 - CASCID-Christie Hospital, Manchester

Material Analysis Results

Lab Reference	**20302**

Client Sample ID (#)	-
Client Sample Location (#)	BH101
Client Sample Type (#)	B
Depth - Top (m) (#)	0.40
Depth - Bottom (m) (#)	0.50
Date of Sampling (#)	Not supplied
Sample type	Bulk
Sample Description	Brown slightly gravelly slightly clayey silty SAND



Specification:				
Sieve Size (mm)	Upper Limit (%)	Lower Limit (%)	Passing (%)	
125			100	Cobbles
90			100	
75			100	
63			100	0
50			100	Gravel
37.5			100	
28			100	
20			100	
14			99	
10			97	
6.3			93	
5			92	
3.35			90	10
2			87	Sand
1.18			84	
0.6			77	
0.425			70	
0.3			57	
0.212			44	
0.15			36	
0.063			25	65
0.02			16	Silt
0.006			11	
0.002			7	18
				Clay 7

NOTES :

SIMTEC
CONSTRUCTION MATERIALS TESTING
A PHOENIX GROUP COMPANY

Unit 116, The Burrows, East Goscote Ind Est
East Goscote, Leicestershire, LE7 3XD
t: 0116 3196100 e: info@simtec-mt.co.uk

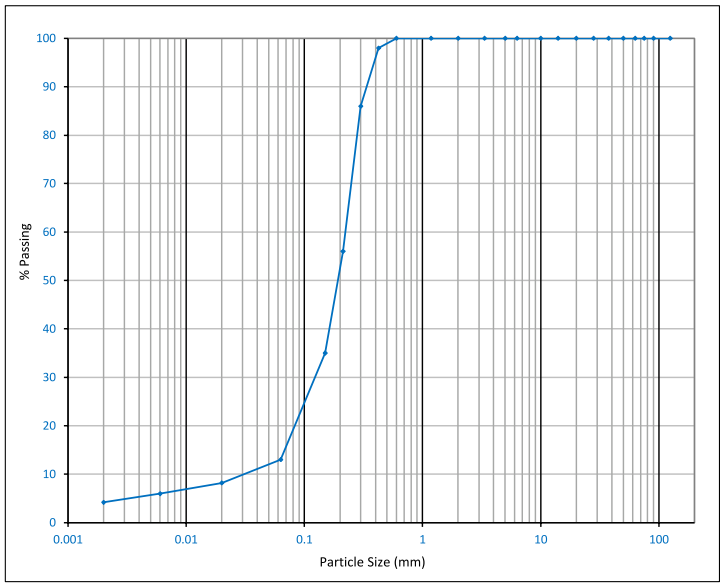
CERT084b-SM11106-PIP-1

Project Reference - P10525 - CASCID-Christie Hospital, Manchester

Material Analysis Results

Lab Reference	**20303**

Client Sample ID (#)	-
Client Sample Location (#)	BH101
Client Sample Type (#)	D
Depth - Top (m) (#)	2.30
Depth - Bottom (m) (#)	2.40
Date of Sampling (#)	Not supplied
Sample type	Disturbed
Sample Description	Red silty SAND



Specification:

Sieve Size (mm)	Upper Limit (%)	Lower Limit (%)	Passing (%)	
125			100	Cobbles
90			100	
75			100	
63			100	0
50			100	Gravel
37.5			100	
28			100	
20			100	
14			100	
10			100	
6.3			100	
5			100	
3.35			100	0
2			100	Sand
1.18			100	
0.6			100	
0.425			98	
0.3			86	
0.212			56	
0.15			35	
0.063			13	87
0.02			8	Silt
0.006			6	
0.002			4	9
				Clay 4

NOTES :

SIMTEC CONSTRUCTION MATERIALS TESTING
A PHOENIX GROUP COMPANY

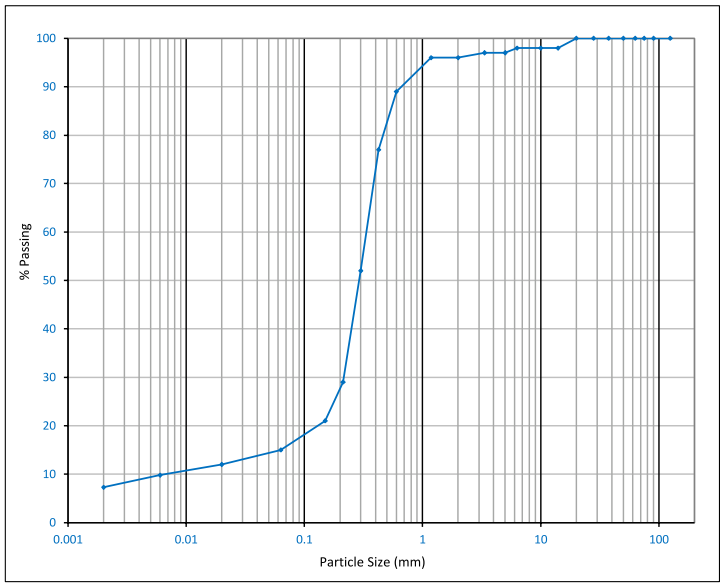
Unit 116, The Burrows, East Goscote Ind Est
East Goscote, Leicestershire, LE7 3XD
t: 0116 3196100 e: info@simtec-mt.co.uk

CERT084b-SM11106-PIP-1

Project Reference - P10525 - CASCID-Christie Hospital, Manchester

Material Analysis Results

Lab Reference	**20304**
Client Sample ID (#)	-
Client Sample Location (#)	BH102
Client Sample Type (#)	B
Depth - Top (m) (#)	0.50
Depth - Bottom (m) (#)	0.60
Date of Sampling (#)	Not supplied
Sample type	Bulk
Sample Description	Brown slightly gravelly slightly clayey slightly silty SAND



Specification:

Sieve Size (mm)	Upper Limit (%)	Lower Limit (%)	Passing (%)	
125			100	Cobbles
90			100	
75			100	
63			100	0
50			100	Gravel
37.5			100	
28			100	
20			100	
14			98	
10			98	
6.3			98	
5			97	
3.35			97	3
2			96	Sand
1.18			96	
0.6			89	
0.425			77	
0.3			52	
0.212			29	
0.15			21	
0.063			15	82
0.02			12	Silt
0.006			10	
0.002			7	8
				Clay 7

NOTES :

SIMTEC CONSTRUCTION MATERIALS TESTING
A PHOENIX GROUP COMPANY

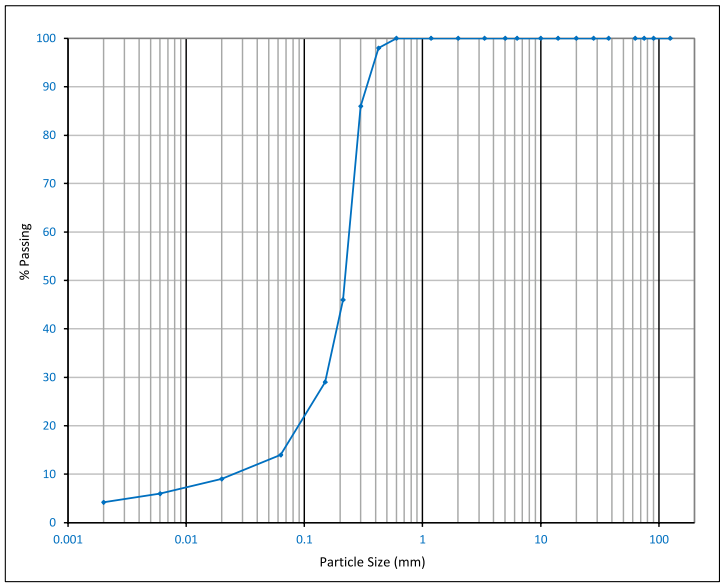
Unit 116, The Burrows, East Goscote Ind Est
East Goscote, Leicestershire, LE7 3XD
t: 0116 3196100 e: info@simtec-mt.co.uk

CERT084b-SM11106-PIP-1

Project Reference - P10525 - CASCID-Christie Hospital, Manchester

Material Analysis Results

Lab Reference	**20305**
Client Sample ID (#)	-
Client Sample Location (#)	BH102
Client Sample Type (#)	D
Depth - Top (m) (#)	2.50
Depth - Bottom (m) (#)	2.60
Date of Sampling (#)	Not supplied
Sample type	Disturbed
Sample Description	Red slightly silty SAND



Specification:

Sieve Size (mm)	Upper Limit (%)	Lower Limit (%)	Passing (%)	
125			100	Cobbles
90			100	
75			100	
63			100	0
50			1000	Gravel
37.5			100	
28			100	
20			100	
14			100	
10			100	
6.3			100	
5			100	
3.35			100	0
2			100	Sand
1.18			100	
0.6			100	
0.425			98	
0.3			86	
0.212			46	
0.15			29	
0.063			14	86
0.02			9	Silt
0.006			6	
0.002			4	10
				Clay 4

NOTES :

SIMTEC CONSTRUCTION MATERIALS TESTING
A PHOENIX GROUP COMPANY

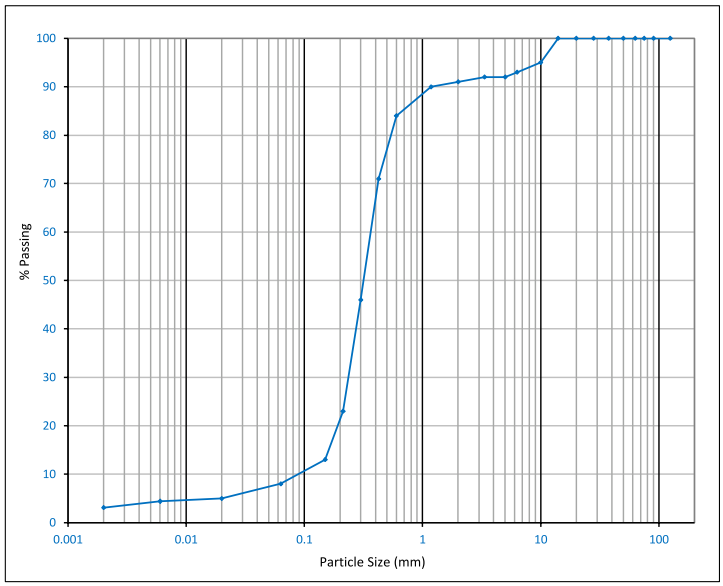
Unit 116, The Burrows, East Goscote Ind Est
East Goscote, Leicestershire, LE7 3XD
t: 0116 3196100 e: info@simtec-mt.co.uk

CERT084b-SM11106-PIP-1

Project Reference - P10525 - CASCID-Christie Hospital, Manchester

Material Analysis Results

Lab Reference	**20306**
Client Sample ID (#)	-
Client Sample Location (#)	TP104
Client Sample Type (#)	D
Depth - Top (m) (#)	0.70
Depth - Bottom (m) (#)	0.80
Date of Sampling (#)	Not supplied
Sample type	Disturbed
Sample Description	Brown slightly silty SAND



Specification:

Sieve Size (mm)	Upper Limit (%)	Lower Limit (%)	Passing (%)	
125			100	Cobbles
90			100	
75			100	
63			100	0
50			100	Gravel
37.5			100	
28			100	
20			100	
14			100	
10			95	
6.3			93	
5			92	
3.35			92	8
2			91	Sand
1.18			90	
0.6			84	
0.425			71	
0.3			46	
0.212			23	
0.15			13	
0.063			8	84
0.02			5	Silt
0.006			4	
0.002			3	5
				Clay 3

NOTES :

Unit 116, The Burrows, East Goscote Ind Est
East Goscote, Leicestershire, LE7 3XD
t: 0116 3196100 e: info@simtec-mt.co.uk

CERT084b-SM11106-PIP-1

Project Reference - P10525 - CASCID-Christie Hospital, Manchester

Analysis Methodologies

Determinant	Details and Test method used
BS1377 PSD	1377 Particle Size Distribution 1. Sample preparation was in accordance with BS1377:Part 1:2016. 2. Testing was in accordance with BS1377:Part 2:1990 clause 9.2 wet sieving method
BS1377 Sedimentation by pipette	1377 Particle Size Distribution Sedimentation 1. Sample preparation was in accordance with BS1377:Part 1:2016. 2. Testing was in accordance with BS1377:Part 2:1990 clause 9.4 sedimentation by pipette method.

GRM Development Solutions Ltd
Laurus House First Avenue, Centrum
100, Burton -on-Trent, Staffordshire

10108

Unit 116, The Burrows, East Goscote Ind Est
East Goscote, Leicestershire, LE7 3XD
t: 0116 3196100 e: info@simtec-mt.co.uk

Analytical Test Report: **CERT084b-SM11247-PIP-1**

Your Project Reference:	**P10525 - CASCID-Christie Hospital, Manchester**		
Your Order Number:	P10525	Testing Received / Instructed:	24/03/2024
Report Issue Number:	1	Sample Tested:	25/032024 to 27/03/2024
Samples Analysed:	1 Soil Sample	Report issued:	25/04/2024

Signed

[redacted]

Notes:

Samples will be retained for 14 days after issue of this report unless otherwise requested.

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

Some information required by BS1377 is not included in the report. The information will be provided if requested.

A certificate of sampling was not supplied

Samples were supplied by customer, results apply to the samples as received.

Within the report any information provided by the client is identified with a '#'

Accreditation Key

UKAS = UKAS Accreditation, u = Unaccredited

Date of Issue: 18.08.2022

Issued by: RM

Issue No: 1

Rev No: 1

Unit 116, The Burrows, East Goscote Ind Est
East Goscote, Leicestershire, LE7 3XD
t: 0116 3196100 e: info@simtec-mt.co.uk

CERT084b-SM11247-PIP-1

Project Reference - P10525 - CASCID-Christie Hospital, Manchester

Analytical Test Results - Soil

Lab Reference		**20561**
Client Sample ID (#)		-
Client Sample Location (#)		TP105
Client Sample Type (#)		B
Depth - Top (m) (#)		0.8
Depth - Bottom (m) (#)		0.8
Date of Sampling (#)		17/03/2024
Sample type		Bulk - Disturbed
Sample Description		Brown SAND
Determinant	**Units**	
BS1377 PSD		
125.0	(% Passing)	100
90.0	(% Passing)	100
75.0	(% Passing)	100
63.0	(% Passing)	100
50.0	(% Passing)	100
37.5	(% Passing)	100
28.0	(% Passing)	100
20.0	(% Passing)	100
14.0	(% Passing)	100
10.0	(% Passing)	100
6.3	(% Passing)	100
5.0	(% Passing)	100
3.35	(% Passing)	100
2.00	(% Passing)	99
1.18	(% Passing)	99
0.600	(% Passing)	95
0.425	(% Passing)	82
0.300	(% Passing)	48
0.212	(% Passing)	14
0.150	(% Passing)	3.0
0.063	(% Passing)	1.0
0.02	(% Passing)	0.3
0.006	(% Passing)	0.2
0.002	(% Passing)	0.1
PSD test Method	-	Wet sieving
Sedimentation was pretreated	-	no

SIMTEC
CONSTRUCTION MATERIALS TESTING

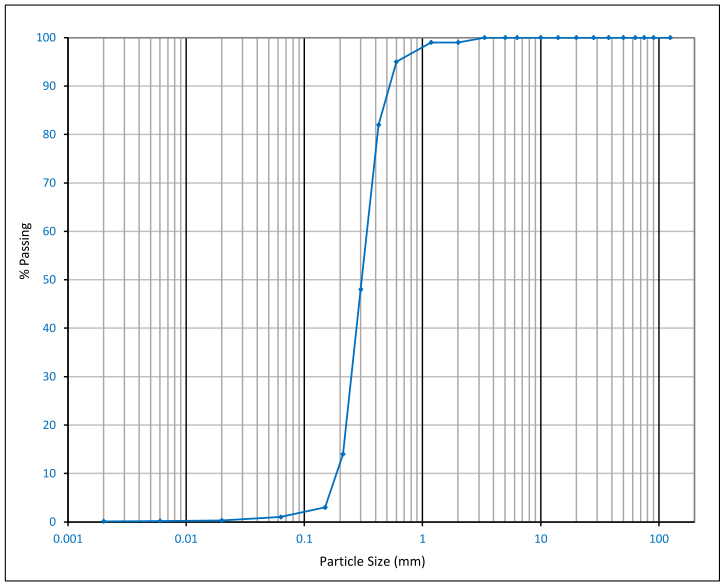
Unit 116, The Burrows, East Goscote Ind Est
East Goscote, Leicestershire, LE7 3XD
t: 0116 3196100 e: info@simtec-mt.co.uk

CERT084b-SM11247-PIP-1

Project Reference - P10525 - CASCID-Christie Hospital, Manchester

Analytical Test Results - Soil

Lab Reference	**20561**
Client Sample ID (#)	-
Client Sample Location (#)	TP105
Client Sample Type (#)	B
Depth - Top (m) (#)	0.80
Depth - Bottom (m) (#)	0.80
Date of Sampling (#)	17/03/2024
Sample type	Bulk - Disturbed
Sample Description	Brown SAND



Specification:

Sieve Size (mm)	Upper Limit (%)	Lower Limit (%)	Passing (%)	
125			100	Cobbles
90			100	
75			100	
63			100	0
50			100	Gravel
37.5			100	
28			100	
20			100	
14			100	
10			100	
6.3			100	
5			100	
3.35			100	0
2			99	Sand
1.18			99	
0.6			95	
0.425			82	
0.3			48	
0.212			14	
0.15			3	
0.063			1	99
0.02			0	Silt
0.006			0	
0.002			0	1
				Clay 0

NOTES :

Unit 116, The Burrows, East Goscote Ind Est
East Goscote, Leicestershire, LE7 3XD
t: 0116 3196100 e: info@simtec-mt.co.uk

CERT084b-SM11247-PIP-1

Project Reference - P10525 - CASCID-Christie Hospital, Manchester

Analysis Methodologies

Determinant	Details and Test method used
BS1377 PSD	1377 Particle Size Distribution 1. Sample preparation was in accordance with BS1377:Part 1:2016. 2. Testing was in accordance with BS1377:Part 2:1990 clause 9.2 wet sieving method
BS1377 Sedimentation by pipette	1377 Particle Size Distribution Sedimentation 1. Sample preparation was in accordance with BS1377:Part 1:2016. 2. Testing was in accordance with BS1377:Part 2:1990 clause 9.4 sedimentation by pipette method.

LABORATORY REPORT

Contract Number: PSL24/2235

Report Date: 05 April 2024

Client's Reference:

Client Name: Simtec - Leicester
116 The Burrows
East Goscote
Leicester
LE7 3XD

For the attention of: Charlie Needham/Rob McGoff

Contract Title: CASCID - Chrisite Hospital, Manchester

Date Received: 27/3/2024
Date Commenced: 27/3/2024
Date Completed: 5/4/2024

Notes: Opinions and Interpretations are outside the UKAS Accreditation

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

Checked and Approved Signatories:

[redacted]

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

SUMMARY OF POINT LOAD TEST RESULTS

ISRM Suggested Methods : 2007

Borehole Number	Depth (m)	Test Type	Orientation	Dimensions (mm)		Area	D_e^2	D_e	Failure Load (P)		I_s	Corr Fac	I_{s50}	Failure Type	Remarks
			Par / Perp	W	D	(mm2)		(mm)	(Mpa)	(kN)	(MPa)	F	(MPa)		
BH104 (11358/20850)	7.50	A	Perp	83	34	2822	3593.08	59.94	-	0.20	0.06	1.085	0.06	Valid	
BH104 (11358/20851)	8.10	A	Perp	84	68	5712	7272.74	85.28	-	0.87	0.12	1.272	0.15	Valid	
BH104 (11358/20852)	10.10	A	Perp	84	79	6636	8449.22	91.92	-	0.74	0.09	1.315	0.12	Valid	
BH104 (11358/20854)	13.25	I	Par	84	39	3276	4171.13	64.58	-	0.07	0.02	1.122	0.02	Valid	
BH104 (11358/20856)	15.87	A	Perp	83	53	4399	5600.98	74.84	-	0.34	0.06	1.199	0.07	Valid	

Note All testing carried out on samples at as received water content

Par = parallel, Perp = perpendicular, U = Random

A = Axial, D = Diametral, I = Irregular

UKAS TESTING 4043

PSL PROFESSIONAL SOILS LABORATORY A PHENNA GROUP COMPANY

CASCID - Chrisite Hospital, Manchester

Contract No:
PSL24/2235
Client Ref:

LABORATORY REPORT

Contract Number: PSL24/2236

Report Date: 05 April 2024

Client's Reference:

Client Name: Simtec - Leicester
116 The Burrows
East Goscote
Leicester
LE7 3XD

For the attention of: Charlie Needham/Rob McGoff

Contract Title: CASCID - Chrisite Hospital, Manchester

Date Received: 27/3/2024
Date Commenced: 27/3/2024
Date Completed: 5/4/2024

Notes: Opinions and Interpretations are outside the UKAS Accreditation

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

Checked and Approved Signatories:

[redacted]

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

SUMMARY OF POINT LOAD TEST RESULTS

ISRM Suggested Methods : 2007

Borehole Number	Depth (m)	Test Type	Orientation	Dimensions (mm)		Area	D_e^2	D_e	Failure Load (P)		I_s	Corr Fac	I_{s50}	Failure Type	Remarks
			Par / Perp	W	D	(mm2)		(mm)	(Mpa)	(kN)	(MPa)	F	(MPa)		
BH101 (11359/20862)	6.10	A	Perp	84	41	3444	4385.04	66.22	-	0.18	0.04	1.135	0.05	Valid	
BH101 (11359/20863)	9.30	A	Perp	84	79	6636	8449.22	91.92	-	0.80	0.09	1.315	0.12	Valid	
BH101 (11359/20864)	9.90	I	Perp	75	34	2550	3246.76	56.98	-	0.12	0.04	1.061	0.04	Valid	
BH101 (11359/20866)	11.45	A	Perp	85	50	4250	5411.27	73.56	-	0.56	0.10	1.190	0.12	Valid	
BH101 (11359/20867)	13.45	A	Perp	83	60	4980	6340.73	79.63	-	0.48	0.08	1.233	0.09	Valid	
BH101 (11359/20868)	16.20	A	Perp	85	66	5610	7142.87	84.52	-	0.27	0.04	1.266	0.05	Valid	

Note All testing carried out on samples at as received water content

Par = parallel, Perp = perpendicular, U = Random

A = Axial, D = Diametral, I = Irregular

UKAS TESTING 4043

PSL PROFESSIONAL SOILS LABORATORY A PHENNA GROUP COMPANY

CASCID - Chrisite Hospital, Manchester

Contract No:

PSL24/2236

Client Ref:

SUMMARY OF POINT LOAD TEST RESULTS

ISRM Suggested Methods : 2007

Borehole Number	Depth (m)	Test Type	Orientation	Dimensions (mm)		D_e^2	D_e	Failure Load		I_s	Corr Fac	I_{s50}	Failure Type	Remarks
			Par / Perp	L	D		(mm)	(Mpa)	(kN)	(MPa)	F	(MPa)		
BH101 (11359/20866)	11.45	D	Par	-	85	7225	85.00	-	1.00	0.138	1.270	0.18	Valid	

Note All testing carried out on samples at as received water content Par = parallel, Perp = perpendicular, U = Random

UKAS TESTING 4043

PSL PROFESSIONAL SOILS LABORATORY A PHENNA GROUP COMPANY

CASCID - Chrisite Hospital, Manchester

Contract No:

PSL24/2236

Client Ref:

LABORATORY REPORT

Contract Number: PSL24/2237

Report Date: 05 April 2024

Client's Reference:

Client Name: Simtec - Leicester
116 The Burrows
East Goscote
Leicester
LE7 3XD

For the attention of: Charlie Needham/Rob McGoff

Contract Title: CASCID - Chrisite Hospital, Manchester

Date Received: 27/3/2024
Date Commenced: 27/3/2024
Date Completed: 5/4/2024

Notes: Opinions and Interpretations are outside the UKAS Accreditation

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

Checked and Approved Signatories:

[redacted]

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

SUMMARY OF POINT LOAD TEST RESULTS

ISRM Suggested Methods : 2007

Borehole Number	Depth (m)	Test Type	Orientation	Dimensions (mm)		Area	D_e^2	D_e	Failure Load (P)		I_s	Corr Fac	I_{s50}	Failure Type	Remarks
			Par / Perp	W	D	(mm2)		(mm)	(Mpa)	(kN)	(MPa)	F	(MPa)		
BH102 (11360/20870)	4.35	A	Perp	85	59	5015	6385.30	79.91	-	0.61	0.10	1.235	0.12	Valid	
BH102 (11360/20871)	5.60	A	Perp	84	53	4452	5668.46	75.29	-	0.43	0.08	1.202	0.09	Valid	
BH102 (11360/20872)	7.90	A	Perp	84	57	4788	6096.27	78.08	-	0.26	0.04	1.222	0.05	Valid	
BH102 (11360/20874)	11.66	A	Perp	84	58	4872	6203.22	78.76	-	0.30	0.05	1.227	0.06	Valid	
BH102 (11360/20875)	15.80	I	Perp	84	63	5292	6737.98	82.09	-	0.53	0.08	1.250	0.10	Valid	

Note All testing carried out on samples at as received water content

Par = parallel, Perp = perpendicular, U = Random

A = Axial, D = Diametral, I = Irregular

UKAS TESTING 4043

PSL PROFESSIONAL SOILS LABORATORY A PHENNA GROUP COMPANY

CASCID - Chrisite Hospital, Manchester

Contract No:

PSL24/2237

Client Ref:

SUMMARY OF POINT LOAD TEST RESULTS

ISRM Suggested Methods : 2007

Borehole Number	Depth (m)	Test Type	Orientation	Dimensions (mm)		D_e^2	D_e	Failure Load		I_s	Corr Fac	I_{s50}	Failure Type	Remarks
			Par / Perp	L	D		(mm)	(Mpa)	(kN)	(MPa)	F	(MPa)		
BH102 (11360/20870)	4.35	D	Par	-	85	7225	85.00	-	0.17	0.024	1.270	0.03	Valid	
BH102 (11360/20871)	5.60	D	Par	-	84	7056	84.00	-	0.08	0.011	1.263	0.01	Valid	
BH102 (11360/20874)	11.66	D	Par	-	84	7056	84.00	-	0.16	0.023	1.263	0.03	Valid	

Note All testing carried out on samples at as received water content Par = parallel, Perp = perpendicular, U = Random

UKAS TESTING 4043

PSL PROFESSIONAL SOILS LABORATORY A PHENNA GROUP COMPANY

CASCID - Chrisite Hospital, Manchester

Contract No:

PSL24/2237

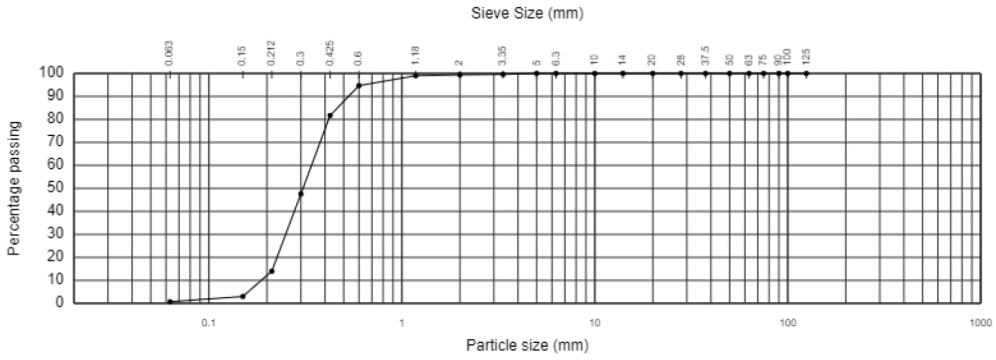
Client Ref:

TEST REPORT: DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Tested in accordance with BS 1377 - 2 : 1990, Method 9.2 Washing & Dry Sieving and BS 1377 - 2 : 1990, Method 3.2

REPORT NUMBER:	C4002211 / 11247.1.1.1		
SAMPLE NUMBER:	20561	CLIENT:	GRM Development Solutions Ltd
CLIENT REF:	TP105 0.80m	ADDRESS:	Laurus House First Avenue, Centrum 100, Burton-on-Trent, Staffordshire, DE14 2WH
DATE SAMPLED:	17/03/2024	SITE:	P10525 - CASCID-Christie Hospital, Manchester
SAMPLED BY:	Client	SOURCE / SUPPLIER:	Unknown, Unknown
DATE RECEIVED:	21/03/2024	MATERIAL DESCRIPTION:	Brown SAND
DATE COMPLETED:	05/04/2024	PROPOSED CLASSIFICATION:	Class 1B
TESTED BY:	Jacob Haywood	LOCATION:	TP105, TP, 0.80, B, 0.80
TYPE OF SAMPLE:	Disturbed	PREPARATION METHOD:	BS 1377:Part 1:2016 clause 8.3 & 8.4.5
VARIATIONS:	No variations	SAMPLING PLAN:	Client Provided
METHOD OF SAMPLING:	Sampled by client	LOCATION AND ORIENTATION WITHIN SAMPLE:	
ENVIRONMENTAL CONDITIONS:			

RESULT **Test Location: Simtec East Goscote**



Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse		
0.020	0.063	0.20	0.63	2.0	6.3	20	63	200
SILT/CLAY	SAND			GRAVEL			COBBLE	BOULDERS

Percentage BOULDERS: 0%
Percentage COBBLES: 0%
Percentage GRAVEL: 1%
Percentage SAND: 99%
Percentage SILT/CLAY: 1%

Applied Specification: Class 1B - Specification for Highway Works (2016) Table 6/2 Earthworks Materials - Class 1B

This certificate only confirms the material has met the relevant grading requirements of the material specification

SIEVE ANALYSIS

Particle Diameter mm	Passing %	Specification Limits
125	100	100 - 100
100	100	
90	100	
75	100	
63	100	
50	100	
37.5	100	
28	100	
20	100	
14	100	
10	100	
6.3	100	
5	100	
3.35	100	
2	99	
1.18	99	
0.6	95	
0.425	82	
0.3	48	
0.212	14	
0.15	3	
0.063	1	0 - 15

Decision Rule: For a test performed according to published method BS 1377-2: 1990 , with bias consistent with the published method values, and no additional influences being identified... PASS: when percentage passing stated sieve size is within the tolerances stated in specification, FAIL: otherwise.

Remarks:
Test results reported relate only to the items tested.
This report shall not be reproduced except in full without approval of the Laboratory.
Opinions and interpretations expressed herein are outside the scope of UKAS Accreditation.The laboratory does not apply a conformity statement to test reports as standard, unless specifically requested by the customer.

For and on behalf of Simtec
Robert McGoff - Laboratory Supervisor

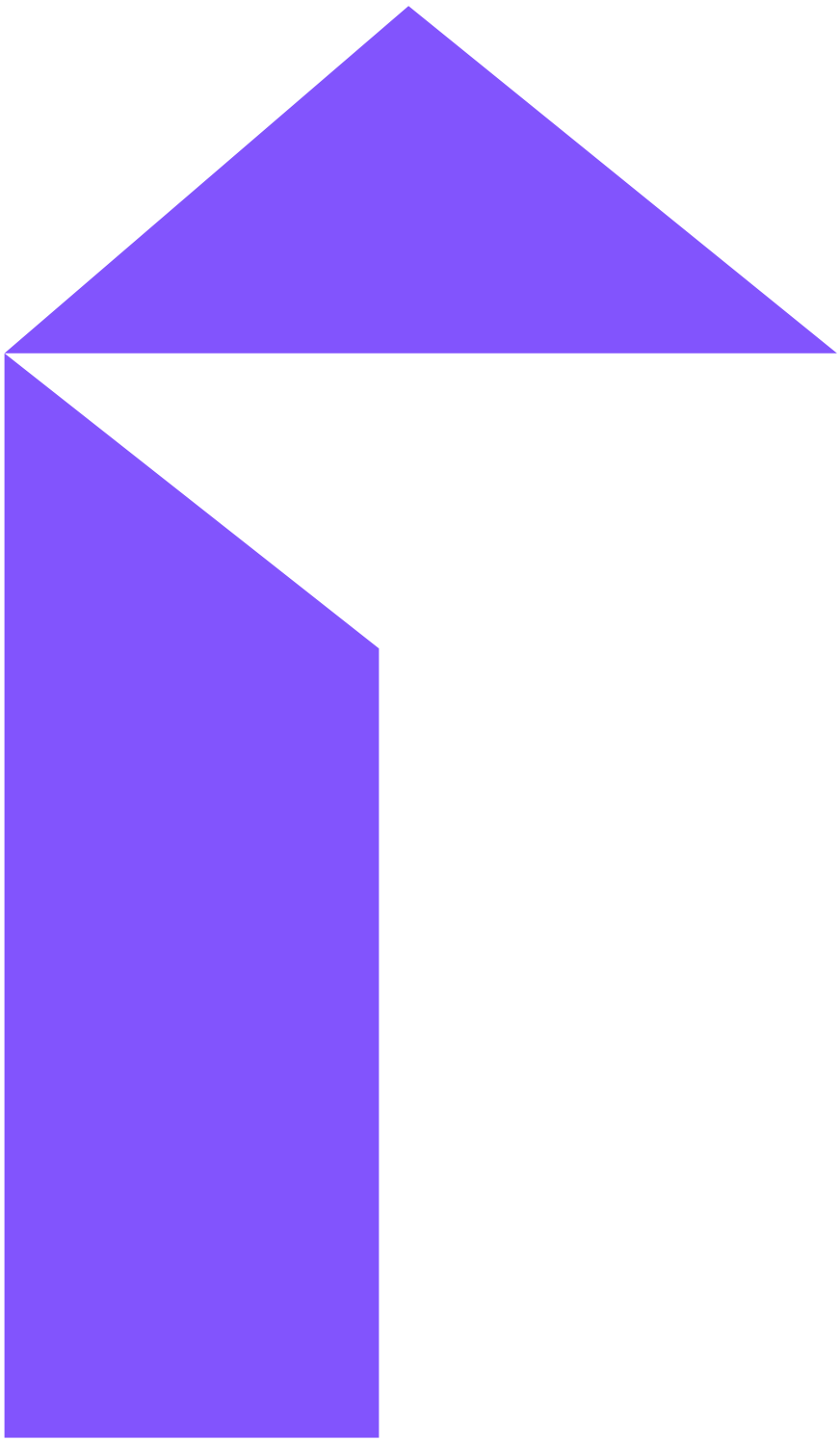
[redacted]

Approved Signatory
Report date 10-Apr-24

UKAS TESTING
10108

Report Format: PSDsoil/TP02/Rep Issue 1 Rev 0 05/17

116 The Burrows,
East Goscote,
Leicester LE7 3XD

0116 319 6100
info@simtec-mt.co.uk
www.simtec-mt.co.uk

END OF REPORT