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Geotechnical Ground Investigation

61 to 65 Spear Street, Manchester

March 2025

Site Ref: 6178/VSE-G

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Geotechnical Investigation – Concrete Floor Slab

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Geotechnical Investigation

1. Introduction

This report is an account of an initial ground investigation carried out by GeoAssist Limited at the request of Desimome Consulting Engineering on behalf of their Client Jadebricks Manchester Limited and undertaken at the location of the 61 to 65 Spear Street, Manchester.

The object of this investigation was to obtain information into the ground conditions inside the basement of the existing commercial unit which is to be ultimately developed with additional storeys with residential accommodation. In particular the ground conditions beneath the basement were to be investigated at this stage in order to assess the viability of the additional storey loads to be carried through a central column onto a pad or piled foundation.

The work was commissioned following the instructions to proceed issued on 10th February 2025 by Desimome Consulting Engineering on behalf of the Client, Jadebricks Manchester Limited.

The location of the area under investigation is indicated on the site plan in Appendix A1 along with the exploratory hole locations.

2. Description of the Site

2.1 Present

The site is located to at 61 to 65 Spear Street to the north east of Manchester City Centre (Northern Quarter). A four storey Victorian warehouse structure with a basement occupies the entirety of the site and there is no outside space associated with the site. Most recently the building has been used as office space. The site is rectangular in shape and the general topography of the surrounding area is level. The building frontage and entrance is on Spear Street. Back Spear Street follows the line of the building to the side and rear. To the north-east the building abuts a derelict commercial/retail unit also earmarked for future development. Commercial property surrounds the building in all directions.

2.2 Proposed Development

The proposed development comprises modification to the existing property to accommodate an additional 3 storey roof extension. It is understood the ground floor will be given to commercial space and the upper floors will be repurposed as residential apartments.

3. Geology

The BGS online GeoIndex shows the site to be located on Boulder Clay (Glacial Till) Drift deposits.

The depth of the drift is not readily discernible from the plans although it is likely to be of the order of 20m depth.

The underlying solid geology is shown as Chester Formation Sandstone.

No faults in the solid geology are shown as passing directly beneath the site.

4. Intrusive Investigation

The ground investigation was carried out in accordance with BS 5930:1999/2015 where relevant.

All fieldwork was supervised by suitably qualified GeoAssist Limited Geotechnical Engineers.

Geotechnical in situ testing, sampling and laboratory testing was carried out within the GeoAssist Laboratory.

The exploratory holes were located at positions that were accessible for the equipment used and as indicated by Thomasons Engineer.

4.1 Exploratory Hole Programme

Exploratory hole WS1 was undertaken using windowless sampling techniques due the severe restrictions on accessing the basement area. Two hand excavated foundation trial pits were undertaken at specific locations in an attempt to establish the nature of the existing building foundations.

The internal concrete floor was broken out to allow for the in-situ testing and sampling beneath.

The locations of all the exploratory holes are shown on the site plan attached to this report in Appendix A1.

The exploratory holes were completed between the 18th February and 3rd March 2025.

4.2 Field Sampling and Testing

Representative samples were taken of all the strata encountered in the exploratory holes.

In Situ Dynamic Penetration tests using the Standard SPT drop weight and drop height were carried out in the exploratory holes. All samples were stored in airtight containers and returned to the laboratory for subsequent examination and testing.

Observations of groundwater conditions were made throughout the fieldwork operations.

On completion to depth all exploratory holes were backfilled with arisings.

4.3 Field Results

Full details of the subsoil conditions in the exploratory holes are given in the exploratory hole log sheet and the trial pit log sheets, which form Appendix C1 and C2 to this report.

The details of the strata in the exploratory holes were recorded by a suitably qualified Professional Engineer.

5. Laboratory Investigation

5.1 Geotechnical Testing

The following geotechnical tests were performed in GeoAssist's laboratory on samples recovered from the exploratory holes.

Table 5.1 Geotechnical Testing

Test	Purpose
Shear Strength from Hand Vane/Hand Penetrometer test	Assessment of in-situ shear strength of cohesive deposits
Natural Moisture Content and Classification test	Assessment of in-situ subsoil conditions and compressibility/shrinkage of cohesive deposits
Sulphate and pH test	Assessment of potential aggressive ground conditions with respect to subsurface concrete
Shear Strength from Undrained Triaxial test	Assessment of in-situ shear strength of cohesive deposits
Oedometer Consolidation test	Determination of the settlement characteristics of cohesive deposits

5.2 Test Results

The geotechnical test results are given in the laboratory test results summary sheets, which form Appendices D1 to D5 to this report.

6. Subsurface Stratigraphy

The subsoil profile obtained from the exploratory hole WS1s consists of concrete overlying granular and cohesive Made Ground to 1.0m depth. The subsoils beneath the made ground consists of an upper slightly gravelly sandy silty clay, stiff in consistency and intermediate in plasticity over an intermediate firm to stiff slightly sandy silty clay intermediate in plasticity with sand and silt inclusions and partings. Seepage groundwater was encountered at 2.50m depth in exploratory hole WS1 which resulted in a softening of the clay in this area.

WS1 penetrated a stiff to very stiff gravelly sandy silty clay from 7.00m depth to 10.45m depth.

Further details of the subsurface stratigraphy can be found in the exploratory hole log sheets which form Appendix C1 to this report.

Table 6.0 Subsoil Profile Summary WS1 only

Strata	Depth of Strata (m) below ground level	
	Top	Base
Made Ground Concrete/Hard standing over variable mixed granular/cohesive Made Ground	Ground Level	1.00
Upper Glacial Deposit Slightly gravelly sandy silty Clay – stiff of intermediate plasticity and compressibility	1.00	2.30
Intermediate Glacial Deposit Slightly gravelly sandy silty Clay – firm to stiff of intermediate plasticity and compressibility	2.30	7.00
Lower Glacial Deposit – GT Gravelly sandy silty Clay – stiff to very stiff and intermediate plasticity	7.00	>10.45

7. Groundwater

Seepage groundwater was encountered at a depth of 2.50m in WS1 and a depth of 1.00m in TP1 during the course of the fieldwork. The groundwater conditions entered on the exploratory hole logs are those observed at the time of the drilling operations and the water level may not have reached equilibrium with the surrounding water level prior to the record being taken.

Standing groundwater levels will be subject to seasonal variation or changes in local drainage conditions and could be higher at certain times of the year particularly after periods of heavy rainfall.

A high groundwater ingress from 0.30m depth was encountered during the excavation of TP2 which despite excessive localised pumping prevented excavation to expose the base of foundations in this area.

8. Geotechnical Properties

The following sections summarise the geotechnical properties for the main strata encountered on this site and are based on physical description, measured and empirical values.

8.1 Made Ground

Made ground has been identified in all of the exploratory holes as being mainly granular with reworked sandy silty clays with brick fragments.

Table 8.1 Summary of Geotechnical Properties – Made Ground

Property	Number of Tests	Range of Results	Derived Value Weighted Mean
Sulphate 2:1 Water:Soil Extract	4	160 to 2580 mg/l	2580 mg/l
pH	4	7.0 to 7.4	NA

8.2 Upper Glacial Till

Gravelly sandy silty Clay, medium to high strength and low to intermediate in plasticity

Table 8.2 Summary of Geotechnical Properties – upper Glacial Till

Property	Number of Tests	Range of Results	Derived Value Weighted Mean
Shear Strength From Triaxial tests and hand vane/Hand Penetrometer Tests	4	154 to 185 kN/m ²	170 kN/m ² Bearing capacity will be dictated by limits on allowable settlement in the underlying clay strata (see section 8.3 below)
Plasticity Index	2	12% to 22%	22%

8.3 Intermediate Glacial Till

Gravelly sandy silty Clay, medium strength and intermediate in plasticity

Table 8.3 Summary of Geotechnical Properties – Lower Glacial Till

Property	Number of Tests	Range of Results	Derived Value Weighted Mean
Shear Strength From Hand Penetrometer	7	38 to 75 kN/m ²	60 kN/m ²
Plasticity Index	2	21% to 30%	30%

8.4 Lower Glacial Till

Gravelly sandy silty Clay, high to very high strength and Intermediate to low in plasticity

Table 8.4 Summary of Geotechnical Properties – Lower Glacial Till

Property	Number of Tests	Range of Results	Derived Value Weighted Mean
Shear Strength From Hand Penetrometer	3	117 to 177 kN/m ²	140 kN/m ²
Plasticity Index	2	22% to 26%	26%

9. Geotechnical Assessment

9.1 Design Criteria

The following typical design criteria have been supplied by the Clients Engineer for the proposed development.

Column Load of 500kN located on pad foundation at shallow (1.0m) depth.

Settlements to be less than 50mm.

9.2 Foundation Design Considerations.

Made ground is present across the site. Shallow depth reinforced concrete pad foundations located in the natural clay present at 1.00m depth are understood to be the preferred option for the foundation.

9.3 Shallow Depth Footings

Isolated reinforced concrete foundations located on the upper stiff natural slightly gravelly sandy silty clay at 1.00m depth can be designed to the allowable bearing capacities given below with the likely associated settlements as indicated.

Note that the allowable bearing pressure will be dictated by limit on allowable settlement.

Depth m	Foundation Subsoil	Foundation Type	Maximum Foundation Size	Allowable bearing capacity kN/m ²	Long term Total Settlement mm	Long term Differential Settlement mm
Central Column on isolated 2.00m square concrete pad – WS1						
1.00	Stiff sandy silty Clay Intermediate plasticity	Isolated Pad	Up to 2.00 square	125	Up to 50mm	

Concreting of foundations should take place as soon as formation level is exposed in order to prevent softening of the subsoil due to the ingress of surface/seepage groundwater as noted in TP1

The upper clay foundation depth is high in strength and overlies lower strength clays below and consequently foundations loads should be limited to prevent adverse settlements occurring.

9.4 Pile Foundations

Alternatively, the use of pile foundations penetrating into the more competent deposits at depth may be considered for the proposed foundation.

The magnitude of the loads to be taken by pile foundations can only be determined by consultation with the relevant piling contractor. It should be noted that piled foundations transfer the loads to deeper depths and consequently pile lengths may be limited to depths that do not exceed the overall depth of the deepest hole undertaken on this site to comply with Federation of Piling Contractors (FPS) and typical warranty provider requirements.

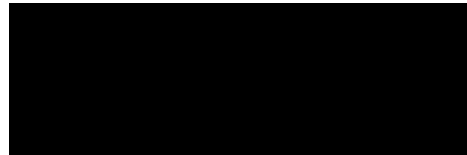
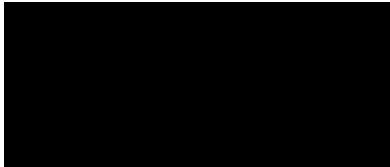
9.5 Excavations

Ancillary shallow depth excavations (<1.20m) in the made ground will require nominal support with at least pumping from sumps to control surface water ingress. A high groundwater ingress on site was recorded in TP2 at 0.30m depth and will be subject to seasonal variation or changes in local drainage conditions and could be higher at certain times of the year particularly after periods of heavy rainfall.

10. Subsurface Concrete Attack

The results of the soluble sulphate and pH tests carried out on samples of subsoil obtained from this site in general indicate that according to Building Research Establishments Special Digest 1 (2005) that particular precautions for concrete foundations will be required.

Generally, the use of concrete mix design sulphate class DS-3 and according to ACEC Class AC-3 of Table C2 conditions would be required for subsurface concrete mix design in contact with the made ground.



Field investigations have been restricted to a level of detail required to achieve the stated objectives of the work. Ground conditions are, and can be, variable and have only been tested at isolated locations across the site. Therefore, the potential exists for ground conditions to be encountered which are different to those considered in this report.

This report has been prepared by GeoAssist Limited with all reasonable professional skill, care and diligence within the terms of the contract with Jadebricks Manchester Limited. The report is confidential to Desimome Consulting Engineering and Jadebricks Manchester Limited and GeoAssist Limited accepts no responsibility of whatever nature to third parties to whom this report may be divulged. GeoAssist Limited owns the copyright in this report. All rights are reserved, and unauthorised use is prohibited. Desimome Consulting Engineering and Jadebricks Manchester Limited may use the report for their/her/his own purposes.

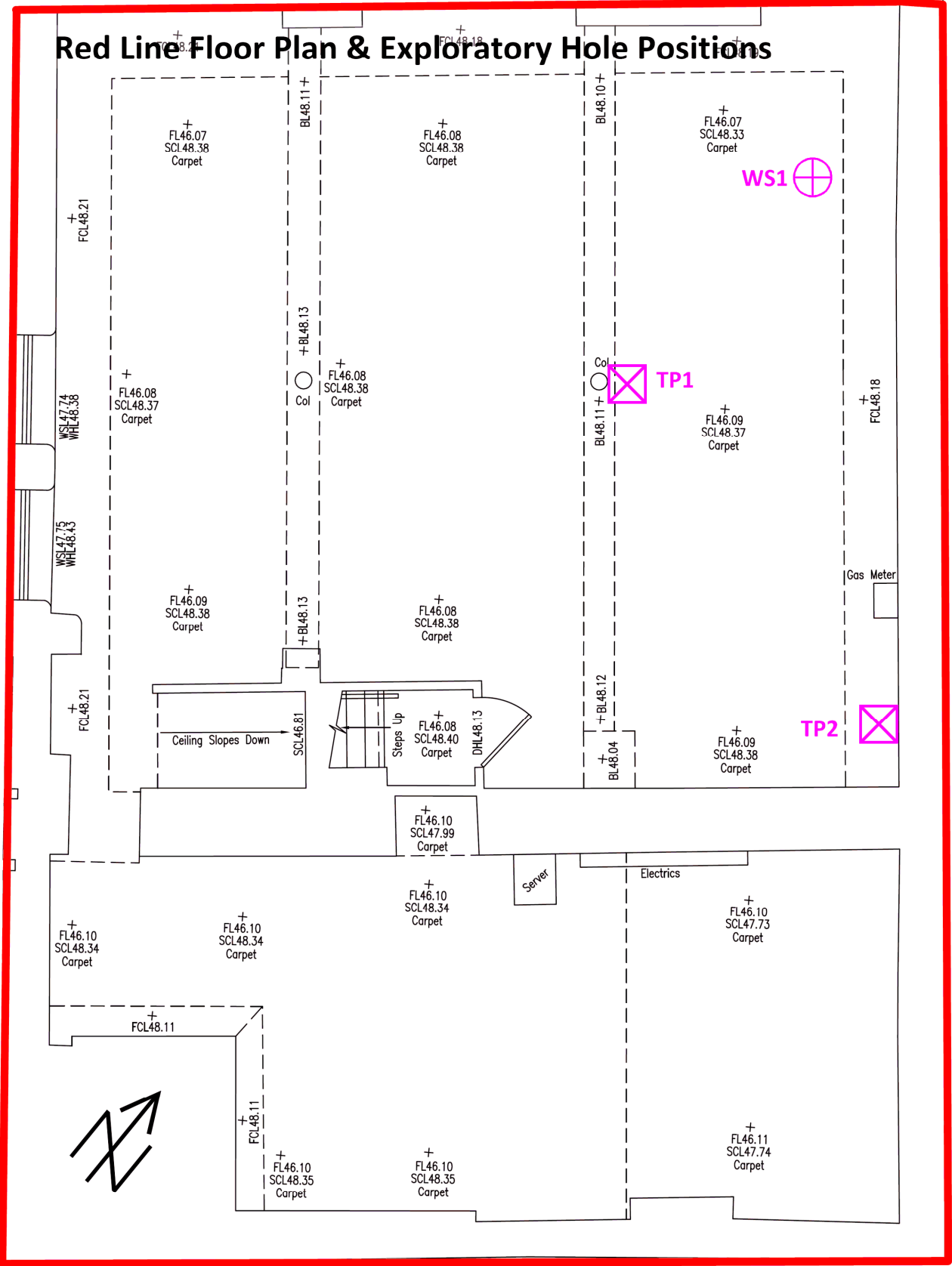
Appendix A

A1 Site Plan with Exploratory Hole Locations

Site Location (Red Line) Plan



Red Line Floor Plan & Exploratory Hole Positions



A1 Site Plan

Site Name	61 to 65 Spear Street
Location	Manchester
GeoAssist Ref	6178VSE
Client	Jadebricks Manchester Limited
	Apartment 2.2, 19 Trevor Square Knightsbridge London SW7 1DZ
Planning Consultant	Desimome Consulting Engineering
NGR (centre of site)	384597,398557
Production Date	March 2025
Survey Method	
Surveyor	Others
Status	Final v1.00
Base Survey	OSGB36

Do Not Scale



Appendix B

- B1 Terminology used in Soil Descriptions
- B2 List of Abbreviations
- B3 Concrete in Aggressive Ground
- B4 Standard Penetration Test

Terminology used in Soil Descriptions

The procedure and principles given in BS EN ISO 14688-1:2002 Part 1: 'Identification and description' have been adopted in producing the soil descriptions contained within this report.

The general identification and description of soils is based on a flexible system for immediate (field) use by experienced persons, covering both material and mass characteristics by visual and manual techniques.

Details are given of the individual characteristics for identifying soils and the descriptive terms in regular use, including those related to the results of tests from the field.

This part of ISO 14688 is applicable to natural soils *in situ*, similar man-made materials *in situ* and soils redeposited by man.

Particular sections of BS EN ISO 14688-1:2002 Part 1 are reproduced here in order to clarify the production of the soil descriptions contained within this report.

Identification of soil

General

Soil characteristics that generally permit soil to be identified with adequate accuracy for general (or preliminary) characterization are outlined below. A more accurate identification and classification based on grading, plasticity or organic content can be achieved by laboratory tests. In addition to identifying soils, the condition in which a soil is encountered, any particular secondary constituents, other features of a soil, such as carbonate content, particle shape, surface roughness of particles, odour, any common names and the geological classification are indicated.

The identification and description of soils generally follows the flow chart in Figure B1.1 attached.

Particle size

Particle size is the fundamental basis for designating mineral soils using particle fractions to distinguish the soil mechanical behaviour.

Table B1 shows the terms to be used for each soil fraction and its sub-fractions, together with the corresponding chosen range of particle sizes.

Basic soils are soils with uniform grading (i.e. they consist of particles of only one size range as specified in Table B1.1

Table B1.1 Particle Size Fractions

Soil fractions	Sub-fractions	Symbols	Particle sizes mm
Very coarse soil	Large boulder	LBo	> 630
	Boulder	Bo	> 200 to 630
	Cobble	Co	> 63 to 200
Coarse soil	Gravel	Gr	> 2,0 to 63
	Coarse gravel	CGr	> 20 to 63
	Medium gravel	MGr	> 6,3 to 20
	Fine gravel	FGr	> 2,0 to 6,3
	Sand	Sa	> 0,063 to 2,0
	Coarse sand	CSa	> 0,63 to 2,0
	Medium sand	MSa	> 0,2 to 0,63
	Fine sand	FSa	> 0,063 to 0,2
Fine soil	Silt	Si	> 0,002 to 0,063
	Coarse silt	CSi	> 0,02 to 0,063
	Medium silt	MSi	> 0,006 3 to 0,02
	Fine silt	FSi	> 0,002 to 0,006 3
	Clay	Cl	≤ 0,002

APPENDIX B1

Form No.: QF029AEN

Composite soils

General

Most soils are composite and consist of principal and secondary fractions. They are designated by a noun (main term) describing the principal fraction and by one or more adjectives (qualifying terms) describing the secondary fractions (e.g. sandy gravel saGr, gravelly clay grCl).

Principal fraction

The principal fraction in terms of mass determines the engineering properties of the soil and is given in capital letters for clarity.

In the case of very coarse soils, the principal fraction is the relevant very coarse soil fraction predominating in terms of mass. The very coarse fraction should be separated from the sample before identifying the fine and coarse fractions.

In the case of coarse soils, the principal fraction is the relevant coarse soil fraction predominating in terms of mass.

Composite coarse soils include a fines fraction (silt and/or clay) that does not determine the engineering properties of the soil.

In the case of fine soils, the principal fraction is the relevant fine soil type determining the engineering properties of the soil.

In the case of composite fine soils, the fines fraction determines the engineering properties of the soil. The fines fraction is regarded as determining the characteristics of a composite soil if this is of at least medium dry strength or exhibits a certain degree of plasticity.

In both cases, the soil is termed either "clay" or "silt", depending on the plasticity of the fines fraction and not on the grading.

Secondary fractions

Secondary and further fractions do not determine but will affect the engineering properties of the soil. The secondary fractions as adjectives are placed with the term describing the principal fraction in the order of their relevance.

If coarse secondary fractions are present in a particularly small or particularly large proportion, the term "slightly" or "very" shall precede the qualifying term.

If it is a fine soil, the properties of which are determined by fines fractions, a soil can be identified as "silt" or "clay" by checking for the presence of fine secondary constituents on the basis of its plasticity properties.

If, in the case of coarse soils, two soil fractions are present in approximately equal proportions, an oblique shall be placed between the relevant terms, e.g. gravel/sand (Gr/Sa) or fine/medium sand (FSa/MSa).

Plasticity

Assessment of the plasticity and identification of a soil as either silt or clay permits the soil to be qualified as being of low plasticity or high plasticity.

An exact determination can only be made by establishing the liquid limit and the plastic limit in laboratory tests.

Organic content

Small quantities of dispersed organic matter in a soil can produce a distinctive odour and colour. The intensity of odour and colour indicates the proportion of organic matter and should be described.

Determination of consistency

The consistency of a cohesive soil shall be determined in a manual test, permitting the following identification and description:

- a) a soil is to be identified as **very soft** if it exudes between the fingers when squeezed in the hand;
- b) a soil is to be identified as **soft** if it can be moulded by light finger pressure;
- c) a soil is to be identified as **firm** if it cannot be moulded by the fingers, but rolled in the hand to thick threads without breaking or crumbling;
- d) a soil is to be identified as **stiff** if it crumbles and breaks when rolled to thick threads but is still sufficiently moist to be moulded to a lump again;
- e) a soil is to be identified as **very stiff** if it has dried out and is mostly light coloured. It can no longer be moulded but crumbles under pressure. It can be indented by the thumbnail.

Preliminary descriptions are based on visual and manual identification only.

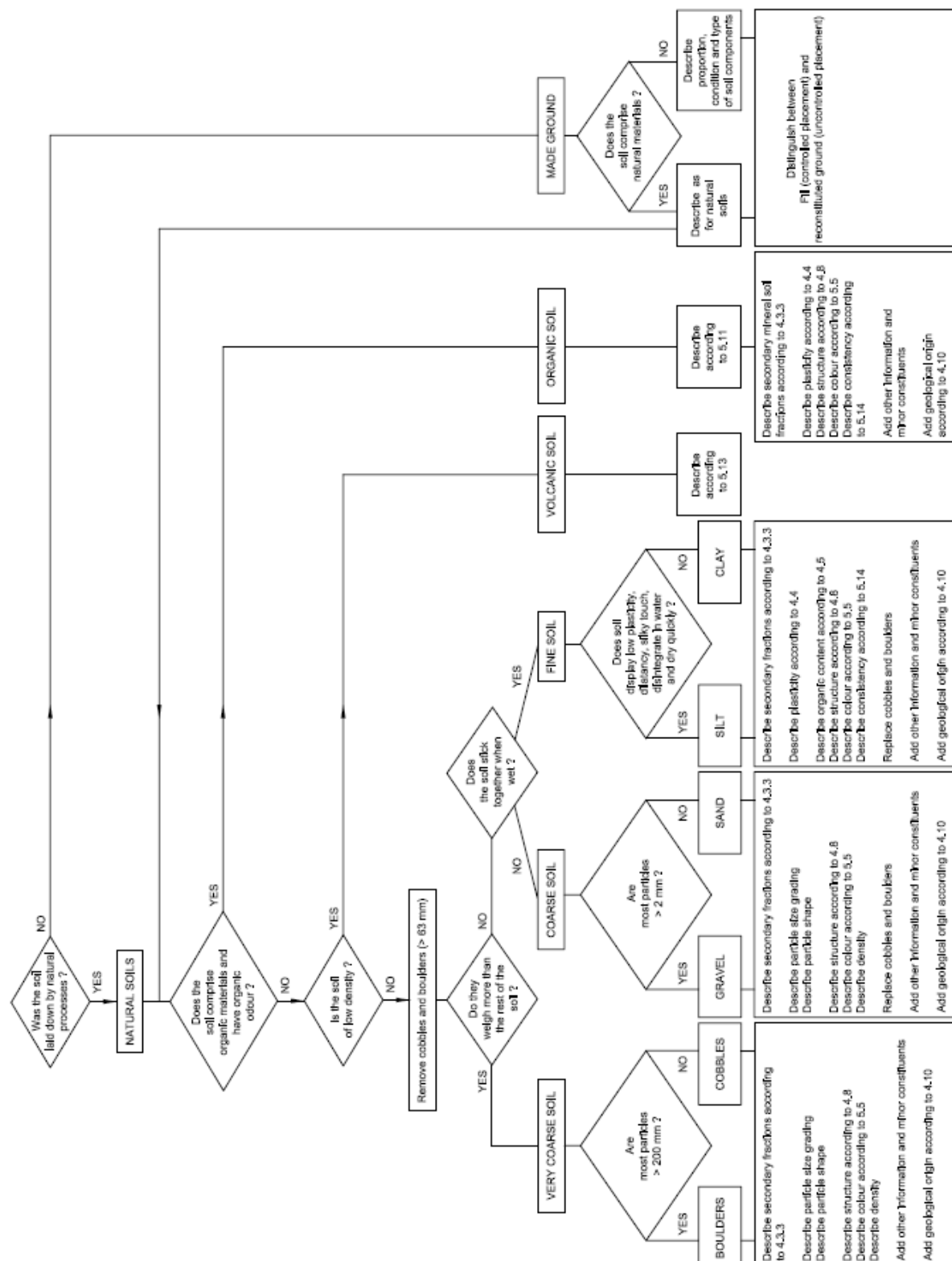


Figure B1.1 Flow chart for the identification and description of soils

Terminology used in Soil Classification

The procedure and principles given in BS EN ISO 14688-2:2004 Part 2: 'Principles for a classification' have been adopted in producing the soil descriptions contained within this report where laboratory or in situ field tests have been carried out.

The classification principles established in this part of ISO 14688 permit soils to be grouped into classes of similar composition and geotechnical properties and, with respect to their suitability for geotechnical engineering purposes.

This part of ISO 14688 is applicable to natural soil and similar man-made material *in situ* and redeposited, but it is not a classification of soil by itself.

Particular sections of BS EN ISO 14688-1:2002 Part 2 are reproduced here in order to clarify the production of the soil descriptions contained within this report.

Principles of soil classifications
General

Soils shall be classified into soil groups on the basis of their nature, which is the composition only, irrespective of their water content or compactness, taking into account the particle size distribution (grading), plasticity, organic content, genesis as appropriate.

The most common approach to classification is to divide the soils on the basis of particle size grading and plasticity. The division is made on the relative size fractions present for the coarser soil fractions, determined on the whole sample, and on the plasticity of the finer fractions (Table B1.2).

Table B1.2 Principles of a classification of soils

Criterion	Soil group	Quantification	Denomination into groups of similiar properties			Further subdivision as appropriate by
Wet soil does not stick together	very coarse	most particles > 200 mm	Bo	xBo		Requires special consideration
				boCo	coBo	
	most particles > 63 mm	Co	saCo, grCo	sagrCo		
	coarse	most particles > 2 mm	Gr	coGr	cosaGr	Particle size (grading) Shape of grading curve Relative density Permeability
			saGr, grSa	sasiGr, grsiSa		
		most particles > 0,063 mm	Sa	siGr, clGr orSa	siSa, clSa, sacIGr	(Mineralogy) (Particle shape)
Wet soils sticks together	fine	low plasticity dilatant	Si	saSi	sagrSi sacI Si	Plasticity Water content Strength, sensitivity Compressibility, stiffness (Clay mineralogy)
				clSi, siCl		
		plastic non-dilatant	Cl	orSi, orCl	sagrCl	
Dark colour, low density	organic		Or	saOr, siOr	clOr	Requires special consideration
Not naturally	Made ground	deposited	Mg	xMg	Man-made material	Requires special consideration
					Relaid natural materials	As for natural soils
Key to symbols						Cases requiring special consideration should be classified according to national or project requirements
Soil	Principal	Secondary or tertiary component				
Boulders	Bo	bo				
Cobbles	Co	co				
Gravel	Gr	gr	Gr(gr) and Sa(sa) can be subdivided into fine F(f), medium M(m) or coarse C(c)			
Sand	Sa	sa				
Silt	Si	si				
Clay	Cl	cl				
Organic	Or	or				
Made ground	Mg	—				
		x	any combination of components			

APPENDIX B1

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Fractions

Soil is a mixture of materials of different particle size, which are grouped into fractions as specified in BS EN ISO 14688-1.

Classification of coarse and very coarse soils is to be based on the particle size distribution alone (see Table B1.3)

Table B1.3 Classification of very coarse soils

Fraction	Percent by mass	Term
Boulders	< 5	low boulder content
	5 to 20	medium boulder content
	> 20	high boulder content
Cobbles	< 10	low cobble content
	10 to 20	medium cobble content
	> 20	high cobble content

In the case of soils composed of both fine and coarse material, classification is to be based on both plasticity and particle size distribution.

Particle size distribution (grading)

The particle sizes and their distribution in a soil are determined by mechanical analysis carried out by the separation of the coarser fractions by sieving on a series of standard sieves and the determination of the finer fractions by sedimentation.

The results of the sieving and sedimentation process are plotted as a grading curve.

Plasticity

The fine fractions of soil, represented by clay and silt and containing clay minerals (see also BS EN ISO 14688-1), both alone or in mixtures with coarser material, are usually classified according to their plasticity characteristics. This is carried out on the basis of laboratory tests to determine the liquid limit w_L and plastic limit w_P .

Organic content

When soils with organic constituents are classified according to their organic content (Table B1.4), a distinction is to be made between organic soils and mineral soils with an organic content.

Table B1.4 Classification of soils with organic constituents

Soil	Organic content (≤ 2 mm) % of dry mass
Low-organic	2 to 6
Medium-organic	6 to 20
High-organic	> 20

Classification of coarse and composite organic soils accumulated *in situ* is based on the type of organic matter and that of organic soils, on the genetic origin and the degree of decomposition of the organic constituents.

APPENDIX B1

Form No.: QF029AEN

Undrained shear strength of fine soils

The terms to be used for the designation of the undrained shear strength according to the results of laboratory and field tests are given in Table B1.5.

Table B1.5 Undrained shear strength of fine soils

Undrained shear strength of clays	Undrained shear strength c_u kPa
Extremely low	< 10
Very low	10 to 20
Low	20 to 40
Medium	40 to 75
High	75 to 150
Very high	150 to 300
Extremely high ^a	> 300
^a Materials with shear strength greater than 300 kPa may behave as weak rocks and should be described as rocks according to ISO 14689-1.	

Table B1.6 Guiding values for the division of mineral soils on a basis of the contents of various fractions

Fraction	Content of fraction in wt % of material ≤ 63 mm	Content of fraction in wt % of material ≤ 0,063 mm	Name of soil	
			Modifying term	Main term
Gravel	20 to 40 > 40		gravelly	gravel
Sand	20 to 40 > 40		sandy	sand
Silt + clay (fine soil)	5 to 15	< 20	slightly silty	silt silt clay clay
		≥ 20	slightly clayey	
	15 to 40	< 20	silty	
		≥ 20	clayey	
	> 40	< 10		
		10 to 20	clayey	
		20 to 40	silty	
		> 40		

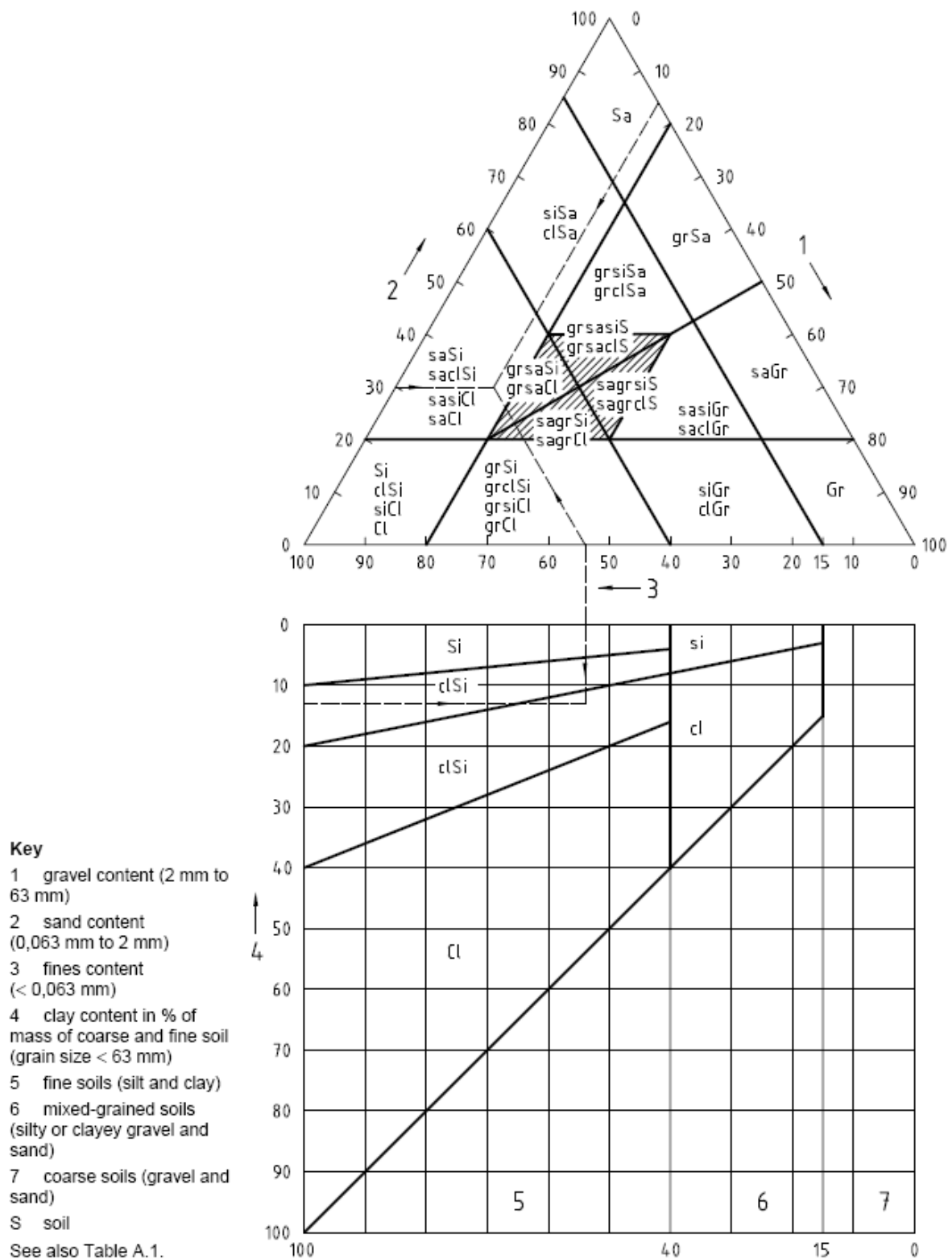


Figure B1.2 Classification of soils, based on grading alone

References

BS EN ISO 14688-1: 2002

Geotechnical investigation and testing — Identification and classification of soil — Part 1: Identification and description

BS EN ISO 14688-2: 2004

Geotechnical investigation and testing — Identification and classification of soil — Part 2: Principles for a classification

Abbreviations**Exploratory Hole log****Sample Type**

AGS Code	Sample Type	AGS Code	Sample Type
B	Bulk Disturbed sample	SPT	Penetration Test – split spoon
CBR	CBR sample	U	Undisturbed sample – open drive
CPT	Penetration Test – cone	UF	Undisturbed sample failed recovery
D	Small disturbed sample	W	Water sample
PU	Piston sample	C - ES	Environmental sample

SPT and CPT – Standard Penetration Test

Blow Count (N) – If full penetration of 450mm then the total number of blows for the last 300mm is given.

If limited penetration following 150mm seating blows then the number of blows for the stated penetration is given.

If limited penetration then the total number of blows for the stated penetration is given.

The N values are actual blows recorded and uncorrected.

U - Undisturbed Sample

Blow Count – total number of blows for recovered length

Legend – As per British Standard – if blank then CAVITY/OPEN HOLE

Core Rec.:

T - Total Core Recovery as a percentage of the cored run

S – Solid Core Recovery as a percentage of the cored run

RQD – Rock Quality Designation as a percentage of the cored run

FI – Fracture index as number of fractures per metre

l_f – Fracture spacing as the average length of solid core pieces between natural fractures over core length of reasonable uniform characteristics

APPENDIX B2

Form No.: QF033AEN

Laboratory Test Summary Sheet

Tests on Soils

AGS Code	Test Name	AGS Code	Test Name
ASB	Asbestos	IDEN	In Situ Density
BDEN	Bulk Density	IGNIS	Loss on Ignition
CBR	California Bearing Ratio	IVAN	In Situ Vane
CD	Consolidated drained (single stage)	LS	Linear shrinkage
CDM	Consolidated drained (multi stage)	MCVG	Moisture Condition Value
CLSS	Atterberg Limits	NMC	Natural Moisture content
CMPG	Compaction	OMS	Organic Matter
CNMT	Contaminant and Chemical	PD	Particle density
CONG	Consolidation	PHS	pH
CU	Consolidated undrained with pwp measurement (single stage)	PTST	Laboratory permeability
CUM	Consolidated undrained with pwp measurement (multi stage)	RELD	Relative Density
DDEN	Dry Density	SHBG	Shear box
FRST	Frost Susceptibility	SLIM	Shrinkage Limit
GRAD HY	Particle Size (Hydrometer)	SULWS	Sulphate on 2:1 Water:Soil Extract
GRAD WS	Particle size (wet Sieve)	TNPC	Ten Per Cent Fines
HVP	Hand vane – peak	UU	Unconsolidated quick undrained (single stage)
ICBR	In situ CBR	UUM	Unconsolidated quick undrained (multi stage)

Tests on rocks and Aggregates

AGS Code	Test Name	AGS Code	Test Name
ACV	Aggregate crushing value	SHOR	Shore hardness
BRAZ	Tensile Strength by Brazilian method	SOUN	Aggregate Soundness Test
LOSA	Aggregate Los Angeles Abrasion	UCS	Uniaxial Compressive Strength
PLSI	Point Load Index – size corrected	WTAB	Aggregate Water Absorption

4. Reference AGS Format Edition 3

Concrete in Aggressive Ground

1. Assessing the Aggressive Chemical Environment

In order to assess the levels of sulphate in the ground or groundwater, which may have a deleterious effect on concrete, the sulphate content of soil and groundwater may be determined in accordance with BS 1377 (2001) Test 3:5. The sulphate contents determined are grouped into Aggressive Chemical Environment for Concrete (ACEC) site classifications in Building Research Establishment Special Digest 1 – Part 1 (2005) Tables C1 and C2 as reproduced below.

Based on this classification BRE Special Digest 1 gives recommendations for the design of suitable concrete mixes to resist chemical attack for each ACEC classification. Care should be taken in the interpretation of results over the site area, if classification is based solely on groundwater analysis, it should be based on the highest sulphate concentration recorded. Where a large number of results from soil analysis are available it should be based on the average of the highest 20 per cent of the results. If a varied set of results are recorded from a limited sampling programme it is important to carry out further analyses before a detailed classification is given.

2. References

BS 1377: 2001: 'Methods of Test for Soils for Civil Engineering Purposes': British Standards Institution.

BRE Special Digest 1: 2005: 'Concrete in Aggressive Ground': Building Research Establishment.

Table C1 Aggressive Chemical Environment for Concrete (ACEC) classification for natural ground locations ^a						
Sulfate Design Sulfate Class for location	2:1 water/soil extract ^b	Groundwater	Total potential sulfate ^c	Groundwater Static water	Mobile water	ACEC Class for location
1	2 (SO ₄ mg/l)	3 (SO ₄ mg/l)	4 (SO ₄ %)	5 (pH)	6 (pH)	7
DS-1	< 500	< 400	< 0.24	≥ 2.5	> 5.5 ^d 2.5–5.5	AC-1s AC-1 ^e AC-2z
DS-2	500–1500	400–1400	0.24–0.6	> 3.5 2.5–3.5	> 5.5 2.5–5.5	AC-1s AC-2 AC-2s AC-3z
DS-3	1600–3000	1500–3000	0.7–1.2	> 3.5 2.5–3.5	> 5.5 2.5–5.5	AC-2s AC-3 AC-3s AC-4
DS-4	3100–6000	3100–6000	1.3–2.4	> 3.5 2.5–3.5	> 5.5 2.5–5.5	AC-3s AC-4 AC-4s AC-5
DS-5	> 6000	> 6000	> 2.4	> 3.5 2.5–3.5	≥ 2.5	AC-4s AC-5

Notes

- Applies to locations on sites that comprise either undisturbed ground that is in its natural state (ie is not brownfield – Table C2) or clean fill derived from such ground.
- The limits of Design Sulfate Classes based on 2:1 water/soil extracts have been lowered relative to previous Digests (Box C7).
- Applies only to locations where concrete will be exposed to sulfate ions (SO₄) which may result from the oxidation of sulfides (eg pyrite) following ground disturbance (Appendix A1 and Box C8).
- For flowing water that is potentially aggressive to concrete owing to high purity or an aggressive carbon dioxide level greater than 15 mg/l (Section C2.2.3), increase the ACEC Class to AC-2z.

Table C2 Aggressive Chemical Environment for Concrete (ACEC) classification for brownfield locations^a

Sulfate and magnesium						Groundwater		ACEC Class for location
Design Sulfate Class for location	2:1 water/soil extract ^b		Groundwater		Total potential sulfate ^c	Static water	Mobile water	
1	2 (SO ₄ mg/l)	3 (Mg mg/l)	4 (SO ₄ mg/l)	5 (Mg mg/l)	6 (SO ₄ %)	7 (pH) ^d	8 (pH) ^d	9
DS-1	< 500		< 400		< 0.24	≥ 2.5	> 6.5 ^e 5.5–6.5 4.5–5.5 2.5–4.5	AC-1s AC-1 AC-2s AC-3s AC-4s
DS-2	500–1500		400–1400		0.24–0.6	> 5.5 2.5–5.5	> 6.5 5.5–6.5 4.5–5.5 2.5–5.5	AC-1s AC-2 AC-2s AC-3s AC-4s AC-5s
DS-3	1600–3000		1500–3000		0.7–1.2	> 5.5 2.5–5.5	> 6.5 5.5–6.5 2.5–5.5	AC-2s AC-3 AC-3s AC-4 AC-5
DS-4	3100–6000	≤ 1200	3100–6000	≤ 1000	1.3–2.4	> 5.5 2.5–5.5	> 6.5 2.5–6.5	AC-3s AC-4 AC-4s AC-5
DS-4m	3100–6000	> 1200 ^e	3100–6000	> 1000 ^e	1.3–2.4	> 5.5 2.5–5.5	> 6.5 2.5–6.5	AC-3s AC-4m AC-4ms AC-5m
DS-5	> 6000	≤ 1200	> 6000	≤ 1000	> 2.4	> 5.5 2.5–5.5	> 2.5	AC-4s AC-5
DS-5m	> 6000	> 1200 ^e	> 6000	> 1000 ^e	> 2.4	> 5.5 2.5–5.5	≥ 2.5	AC-4ms AC-5m

Notes

- ^a Brownfield locations are those sites, or parts of sites, that might contain chemical residues produced by or associated with industrial production (Section C5.1.3).
- ^b The limits of Design Sulfate Classes based on 2:1 water/soil extracts have been lowered from previous Digests (Box C7).
- ^c Applies only to locations where concrete will be exposed to sulfate ions (SO₄²⁻), which may result from the oxidation of sulfides such as pyrite, following ground disturbance (Appendix A1 and Box C8).
- ^d An additional account is taken of hydrochloric and nitric acids by adjustment to sulfate content (Section C5.1.3).
- ^e The limit on water-soluble magnesium does not apply to brackish groundwater (chloride content between 12 000 mg/l and 17 000 mg/l). This allows 'm' to be omitted from the relevant ACEC classification. Seawater (chloride content about 18 000 mg/l) and stronger brines are not covered by this table.

Standard Penetration Test

The full procedure for carrying out the Standard Penetration Test (SPT) is given in EN ISO 22476-3:2005+A1:2011: Geotechnical investigation and testing - Field testing - Part 3: Standard penetration test.

The Energy ratio for the hammer used on this site is as given on the test certificates attached.

The blow counts N noted on the borehole logs are the uncorrected field blows counts as recorded.

Essentially the test consists of driving a 50mm external diameter split barrel sampler into the soil using a 63.5kg hammer dropping 760mm. The penetration resistance is expressed as the number of blows required to obtain 300mm penetration below an initial seating drive of 150mm through any disturbed ground at the bottom of the borehole. The number of blows for the 300mm test drive penetration is recorded on the borehole log as the N-value.

The test is normally performed on sands, but may also be used in gravels, weak rocks and glacial tills in which case the driving shoe may be replaced by a cone. When attempting the standard penetration test in very dense materials or weathered bedrock it may be necessary to terminate the test before completion to prevent damage to the equipment. In these circumstances it is important to distinguish how the blow count relates to the penetration of the sampler. This may be achieved in the following manner.

- (a) Where the 150mm seating drive is complete and where the test drive is terminated at 50 blows the number of blows for the partial test drive (usually 50) and the penetration of the sampler within the test drive are recorded. An approximate N-value may be obtained by linear extrapolation of the number of blows recorded for the partial test drive.
- (b) If the total penetration is equal to or less than the 150mm seating drive then the number of blows (usually 50) and the depth of penetration within the initial seating penetration are recorded on the borehole logs.

The N-value obtained from the Standard Penetration Test may be used to assess the terms for classification of relative density of sands and gravels only in accordance with Table 10 of BS 5930: 2015+A1:2020, Code of Practice for Site Investigations, as follows:

Term	Classification based on uncorrected SPT N-values for use of borehole logs Blows/300mm Penetration
Very loose	0-4
Loose	4-10
Medium dense	10 - 30
Dense	30 - 50
Very dense	over 50

The blow counts N noted on the borehole logs are the uncorrected field blows counts as recorded.

SPT Hammer Energy Test Report

in accordance with BS EN ISO 22476-3:2005

ARCHWAY ENGINEERING (UK) LTD
AINLEYS INDUSTRIAL ESTATE
ELLAND
WEST YORKSHIRE
HX5 9JP

SPT Hammer Ref: DART3140
Test Date: 02/02/2024
Report Date: 02/02/2024
File Name: DART3140.spt
Test Operator: MT

Instrumented Rod Data

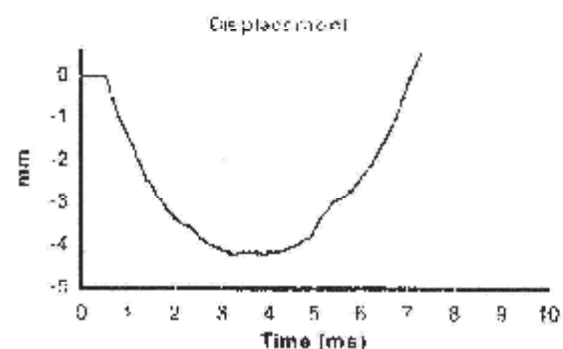
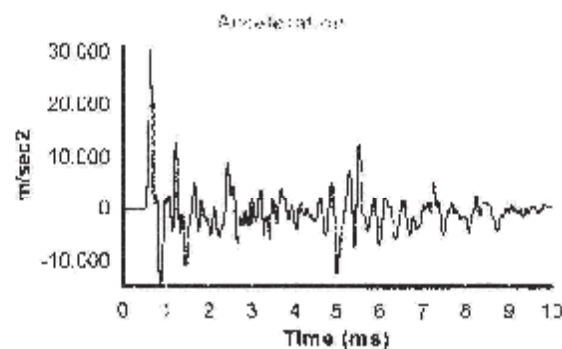
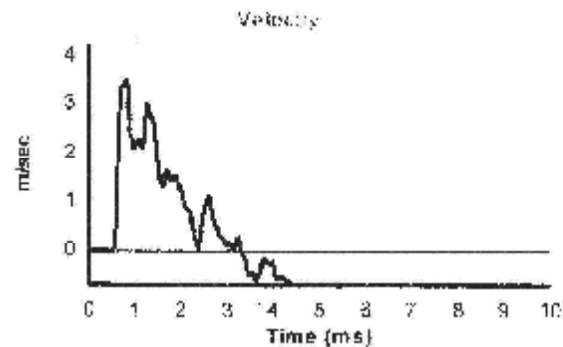
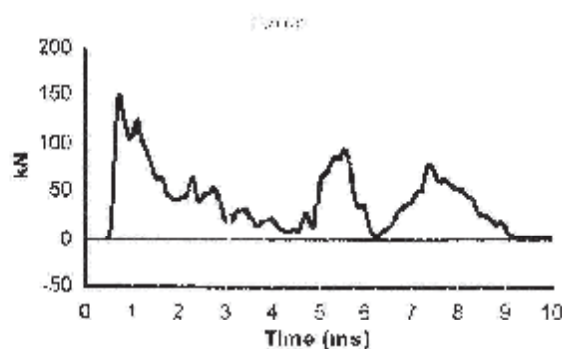
Diameter d_r (mm): 54
Wall Thickness t_r (mm): 6.6
Assumed Modulus E_s (GPa): 200
Accelerometer No.1: 7080
Accelerometer No.2: 11609

SPT Hammer Information

Hammer Mass m (kg): 63.5
Falling Height h (mm): 760
SPT String Length L (m): 10.0

Comments / Location

GEO ASSIST - 88173



Calculations

Area of Rod A (mm²): 983
Theoretical Energy E_{theor} (J): 473
Measured Energy E_{meas} (J): 346

Energy Ratio E_r (%): **73**

Signed: C. McCLUSKEY
Title: FITTER

The recommended calibration interval is 12 months

Appendix C

- C1 Exploratory Hole Log WS1
- C2 Exploratory Trial Pit TP1 and TP2

Remarks: The groundwater conditions entered on the exploratory hole logs are those observed at the time of the drilling operations and the water level may not have reached equilibrium with the surrounding water level prior to the record being taken. Standing groundwater levels will be subject to seasonal variation or changes in local drainage conditions and could be higher at certain times of the year particularly after periods of heavy rainfall.	Logged: M Benson Date: 19/02/2025 Checked: M Richardson Date: 12/03/2025 Site Ref: 6178/VSE Scale 1:50 nominal
---	--

GeoAssist Limited		Exploratory Hole Record Sheet						Ref: WS1				
Consultant:		Project: 61 to 65 Spear Street						Sheet: 2				
Desimome Consulting Engineering		Location: Manchester										
Client:		Equipment:				Ground Level: 46.07 m.AOD						
Jadebricks Manchester Limited		Archway Dart Rig				Co-ordinates: Easting: (m) Northing: (m)						
								Dates: 18/02/2025 to 19/02/2025				
Lead Driller: M Walton Assistant Driller:		Depth (Thick) (m)	Reduced Level (mAOD)	Strata Legend/ Standpipe Backfill	Samples/Tests/Core Records			Field Records				
STRATUM DESCRIPTION					Depth (m) from to	Ref.	Count N/(U)					
Site Geotechnical Engineer/Geologist: M Benson		T %	S %	RQD %								
Continued stratum: Stiff to very stiff brown high to very high strength gravelly sandy silty CLAY		(0.45) 10.45	35.62			10.00	10.45	P1		44		P1 at 10.00m - (7,8/10,10,10,14)
Exploratory Hole complete at 10.45m												19/02/2025: On completion of exploratory hole at 10.45m. Casing at 4.00m. Standing water level Nil with casing. On withdrawal of casing exploratory hole backfilled and reinstated.
-11												
-12												
-13												
-14												
-15												
-16												
-17												
-18												
-19												
-20												
Remarks:										Logged: M Benson		
The groundwater conditions entered on the exploratory hole logs are those observed at the time of the drilling operations and the water level may not have reached equilibrium with the surrounding water level prior to the record being taken. Standing groundwater levels will be subject to seasonal variation or changes in local drainage conditions and could be higher at certain times of the year particularly after periods of heavy rainfall.										Date: 19/02/2025		
										Checked: M Richardson		
										Date: 12/03/2025		
										Site Ref: 6178/VSE		
Scale 1:50 nominal												

GeoAssist Limited

Civil, Geotechnical & Environmental
Engineers

Calculation Sheet

Job Name : 6178 / VSE

Job Ref. : 61-65 SPEAR STREET

Originator : MB

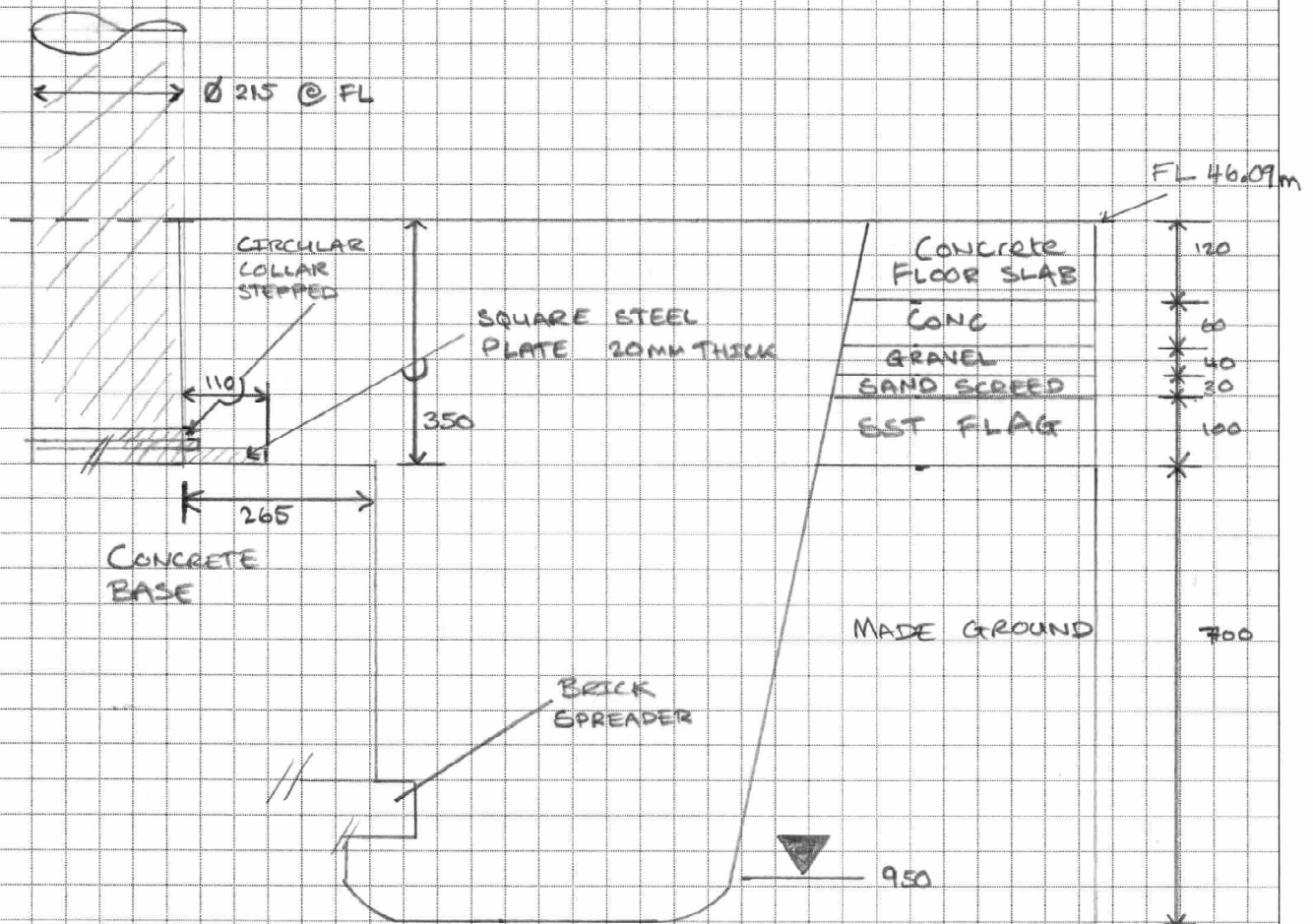
Checked by :

Sheet Number : 1 of 2

Date :

TP1 SECTION

SCALE 1:10



GeoAssist Limited

Civil, Geotechnical & Environmental
Engineers

Calculation Sheet

Job Name : G178 / USE

Job Ref. : G1-65 SPEAR STREET

Originator : MB

Checked by :

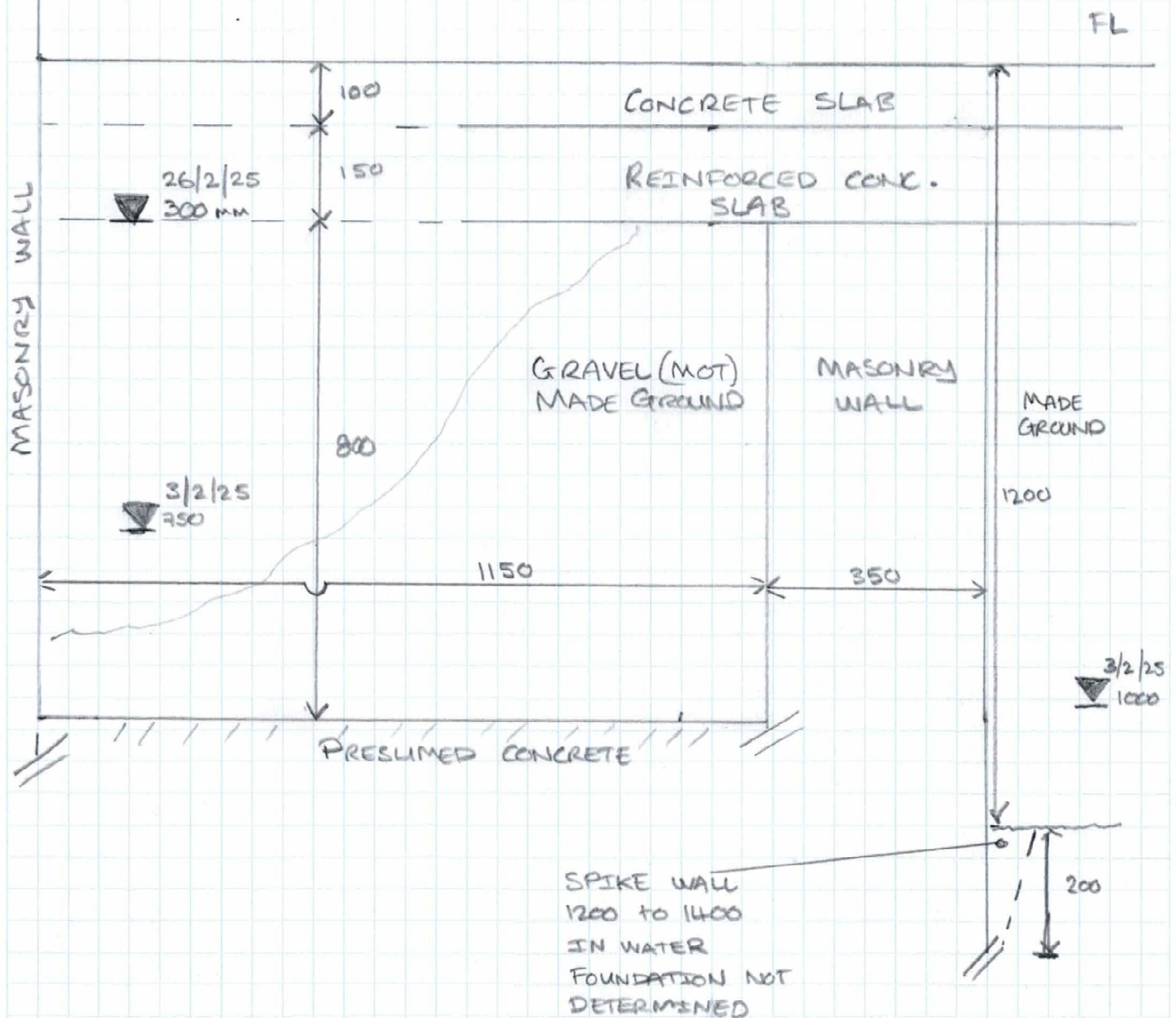
Sheet Number : 1 of 1

Date :

TP2 SECTION

SCALE 1:10

NB SIGNIFICANT VOLUMES OF WATER PUMPED DURING
EXCAVATION



Appendix D

- D1 Laboratory Test Summary Sheets
- D2 Classification Test Summary Sheet
- D3 Sulphate and pH Test Summary Sheet
- D4 Triaxial Test Summary Sheet
- D5 Consolidation Test Graphs

GeoAssist Limited SOIL LABORATORY SUMMARY SHEET	Project: 61 to 65 Spear Street Location: Manchester Client: Jadebricks Manchester Limited Consultant : Desimome Consulting Engineering	Site Ref: 6178/VSE Project Code :
		Hole Ref WS1, TP1 + TP2

Sample Ref.	Depth m	Sample Description	Classification					Triaxial Compression					Chemical		Test Code
			LL %	PL %	PI %	% passing 425 m	Moist Cont. %	Bulk Density Mg/m³	Sample Dia mm	Confining Pressure kN/m²	Deviator /Shear Stress kN/m²	Shear Cohesion kN/m² /Friction angle degrees	So4 2:1 extract Soil:Water mg/l	pH	
WS1 D1	0.50	Brown gravelly sandy silty clay with sandstone fragments - MADE GROUND					-						2580	7.4	SULWS PH
WS1 MC1	1.20	Brown slightly gravelly slightly sandy silty CLAY					21								NMC
WS1 U1	1.50	Brown slightly gravelly slightly sandy silty CLAY					19	2.06	102	100 200 300	332 356 356	174			UUM CONG
WS1 D2	1.70	Brown slightly gravelly slightly sandy silty CLAY	41	19	22	98	19								NMC CLSS
WS1 MC2	1.20	Brown slightly gravelly slightly sandy silty CLAY					19								NMC
WS1 MC3	2.10	Brown slightly gravelly slightly sandy silty CLAY					20								NMC
WS1 D3	2.70	Brown very silty CLAY	31	19	12	100	23								NMC CLSS
WS1 MC4	2.70	Brown very silty CLAY					24								NMC
WS1 MC5	3.50	Brown slightly gravelly sandy silty CLAY with silt partings					20								NMC
WS1 U2	3.60	Brown slightly gravelly sandy silty CLAY with silt partings					25	2.02	102	100 200 300	137 153 160	75			UUM CONG
WS1 D4	3.60	Brown slightly gravelly sandy silty CLAY with silt partings	36	15	21	97	19								NMC CLSS
WS1 MC6	4.50	Brown slightly gravelly sandy silty CLAY with silt partings					22								NMC

GeoAssist Limited SOIL LABORATORY SUMMARY SHEET	Project:	61 to 65 Spear Street	Site Ref:	6178/VSE
	Location:	Manchester	Project Code :	
	Client:	Jadebricks Manchester Limited		
	Consultant :	Desimome Consulting Engineering	Hole Ref	WS1, TP1 + TP2

Sample Ref.	Depth m	Sample Description	Classification					Triaxial Compression					Chemical		Test Code
			LL %	PL %	PI %	% passing 425 m	Moist Cont. %	Bulk Density Mg/m³	Sample Dia mm	Confining Pressure kN/m²	Deviator /Shear Stress kN/m²	Shear Cohesion kN/m² /Friction angle degrees	So4 2:1 extract Soil:Water mg/l	pH	
WS1 MC7	5.50	Brown slightly gravelly sandy silty CLAY with silt partings					23								NMC
WS1 U3	5.60	Brown slightly gravelly sandy silty CLAY with silt partings					20	2.20	84	100 200 300	113 123 123	60			UUM CONG
WS1 D5	5.60	Brown slightly gravelly sandy silty CLAY with silt partings	48	18	30	98	24								NMC CLSS
WS1 MC8	6.50	Brown slightly gravelly sandy silty CLAY with silt partings					23								NMC
WS1 D6	7.20	Brown gravelly sandy silty CLAY	36	14	22	95	16								NMC CLSS
WS1 MC9	7.50	Brown gravelly sandy silty CLAY					15								NMC
WS1 MC10	8.50	Brown gravelly sandy silty CLAY					19								NMC
WS1 MC11	9.50	Brown gravelly sandy silty CLAY					18								NMC
WS1 D7	9.80	Brown gravelly sandy silty CLAY	41	15	26	98	18								NMC CLSS
TP1 C2	0.90	MADE GROUND					-						220	7.2	SULWS PH
TP2 C1	0.50	MADE GROUND					-						160	7.4	SULWS PH
TP2 D1	1.10	MADE GROUND					-						220	7.0	SULWS PH

Site Reference:		6178 VSE						
Project Site:		61 to 65 Spear Street						
Project Location:		Manchester						
Client:		Jadebricks Manchester Limited						
Consultant:		Desimome Consulting Engineering						
	CLASSIFICATION TEST							
Borehole Reference	Sample	Depth	Liquid Limit	Plastic Limit	Plasticity Index	% passing 425 micro	Natural Moisture Content	Material Code
WS1	D2	1.70	41	19	22	98	19	CI
WS1	D3	2.70	31	19	12	100	23	CL
WS1	D4	3.60	36	15	21	97	19	CI
WS1	D5	5.60	48	18	30	98	24	CI
WS1	D6	7.20	36	14	22	95	16	CI/CL
WS1	D7	9.80	41	15	26	98	18	CI
		Mean	39	17	22	98	20	
		Maximum	48	19	30	100	24	
CLAY		Minimum	31	14	12	95	16	
	Standard Deviation		6	2	6	2	3	
		Count	6	6	6	6	6	

Site Reference:			6178	VSE		
Project Site:			61 to 65 Spear Street			
Project Location:			Manchester			
Client:			Jadebricks Manchester Limited			
Consultant:			Desimome Consulting Engineering			
	GEOTECHNICAL SULPHATE AND PH TEST					
Borehole Reference	Sample	Depth	SO4 2:1 Water:Soil extract mg/l	pH	SO4 Water mg/l	
WS1	D1	0.50	2580	7.4		
TP1	C2	0.90	220	7.2		
TP2	C1	0.50	160	7.4		
TP2	D1	1.10	220	7.0		
		Mean	795	7.3		
ALL		Maximum	2580	7.4		
		Minimum	160	7.0		
	Standard Deviation		1190	0.2		
		Count	4			

Site Reference:			6178 VSE							
Project Site:			61 to 65 Spear Street							
Project Location:			Manchester							
Client:			Jadebricks Manchester Limited							
Consultant:			Desimome Consulting Engineering							
	TRIAXIAL TEST RESULTS SUMMARY									
BH No	Sample	Depth m	Moisture Content %	Bulk Density MN/m3	Diameter mm	Strength kN/m²	Equivalent Undrained Shear Strength	Material Code	Apparent cohesion kN/m²	Apparent angle degrees
WS1	U1	1.50	19	2.06	102	174	Very high		152	3
WS1	U2	3.60	25	2.02	102	75	High		61	3
WS1	U3	5.60	20	2.20	84	60	Medium		54	1
		Average	21	2.09		103			89	2
CLAY		Maximum	25	2.20		174			152	3
		Minimum	19	2.02		60			54	1
		Count	3	3		3			3	3

GeoAssist Limited**CONSOLIDATION TEST**

Site No: 6178

Site Ref: VSE

Project: 61 to 65 Spear Street

Location: Manchester

Client: Jadebricks Manchester Limited

Consultant: Desimome Consulting Engineering

Hole Ref: WS1

Sample No: U1

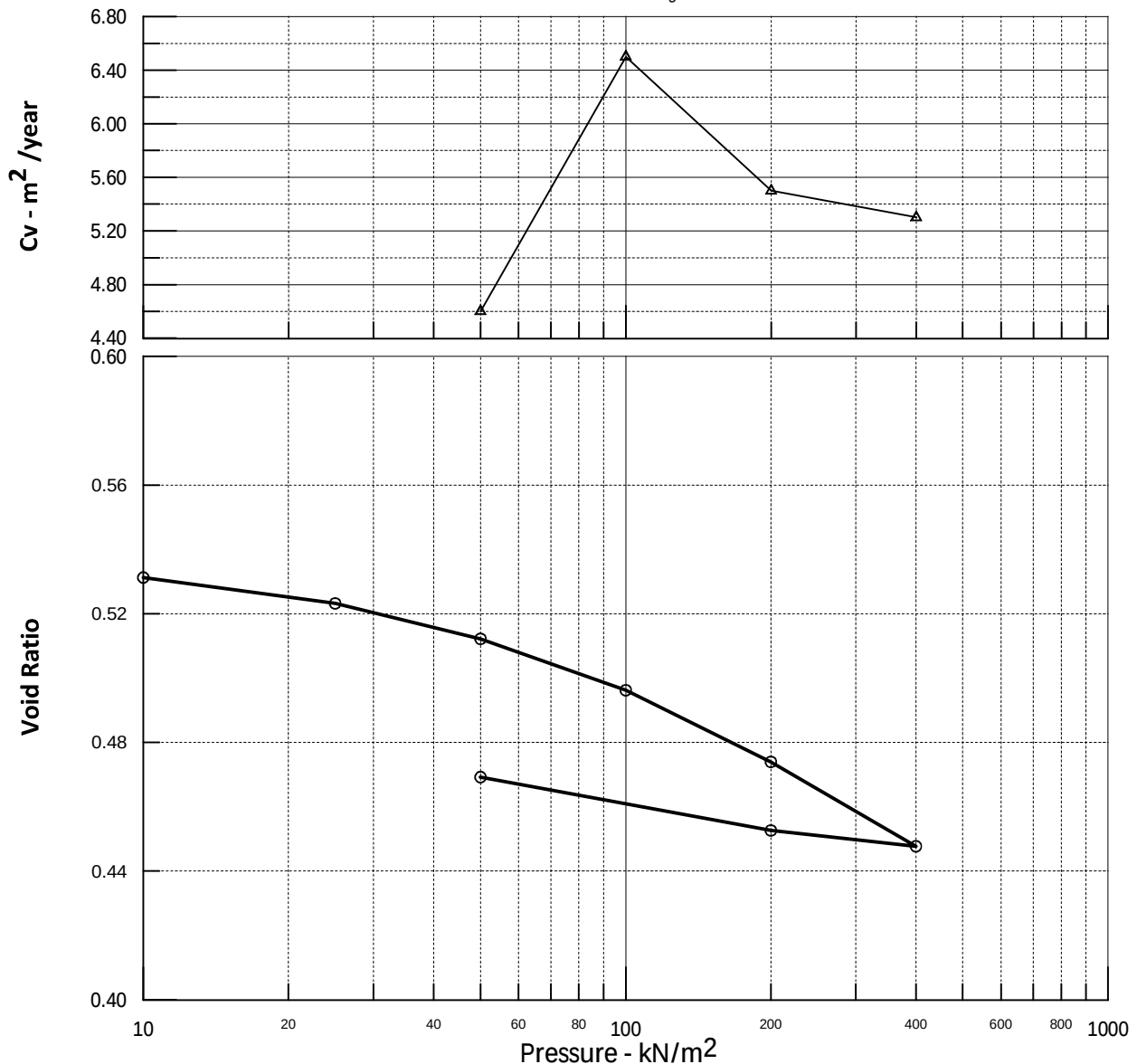
Depth: 2.10m

Pressure Range kN/m ² <i>from to</i>		Void Ratio end of increment	Volume Compressibility $m_v - m^2/MN$	Consolidation Coefficient $c_v - m^2/year$	Bulk density(Mg/m ³)	
					Dry density(Mg/m ³)	
10	25	0.5232			2.14	
25	50	0.5122	0.29	4.60	1.80	
50	100	0.4962	0.21	6.50		2.75 Assumed
100	200	0.4739	0.15	5.50		Initial Moist. Cont. (%): Final Moist. Cont. (%):
200	400	0.4477	0.09	5.30		19.1 19.6
400	200	0.4526	0.02			Initial Void ratio: Final Void ratio:
200	50	0.4692				0.5312 0.4770
					Thickness(mm):	19.0
					Diameter(mm):	76.0

Cv Notes:

N.A. = Not applicable Indet. = Indeterminate

Cv determined from Log Plots



GeoAssist Limited**CONSOLIDATION TEST**

Site No: 6178

Site Ref: VSE

Project: 61 to 65 Spear Street

Location: Manchester

Client: Jadebricks Manchester Limited

Consultant: Desimome Consulting Engineering

Hole Ref: WS1

Sample No: U2

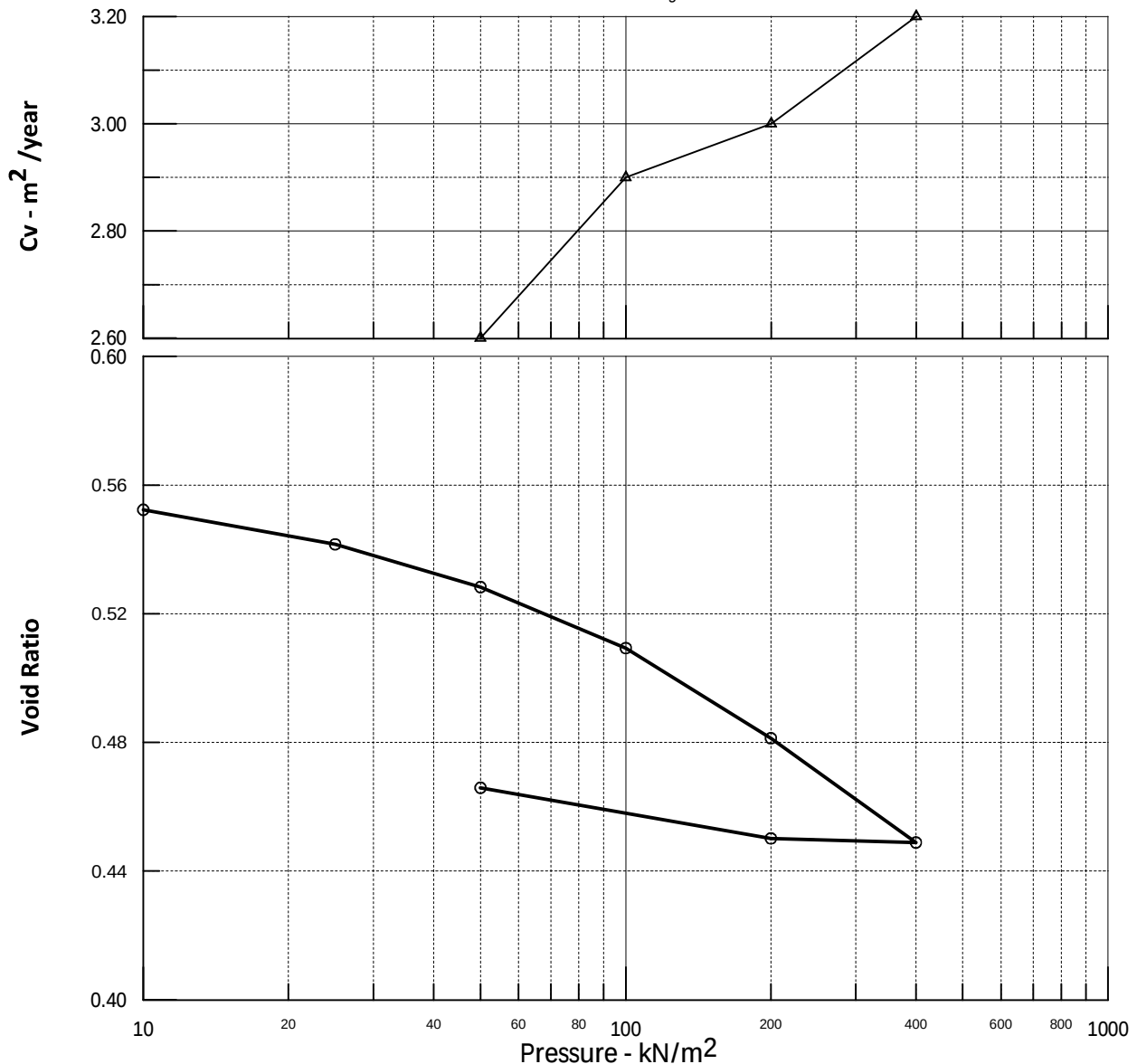
Depth: 3.90m

Pressure Range kN/m ² <i>from to</i>		Void Ratio end of increment	Volume Compressibility $m_v - m^2/MN$	Consolidation Coefficient $c_v - m^2/year$	Bulk density(Mg/m ³)	
					Dry density(Mg/m ³)	
10	25	0.5415			2.12	
25	50	0.5282	0.34	2.60	1.77	
50	100	0.5093	0.25	2.90		2.75 Assumed
100	200	0.4813	0.19	3.00		
200	400	0.4489	0.11	3.20		
400	200	0.4502	0.00			
200	50	0.4659				
					Specific gravity	
					Initial Moist. Cont. (%):	
					Final Moist. Cont. (%):	
					Initial Void ratio:	
					Final Void ratio:	
					Thickness(mm):	
					Diameter(mm):	

Cv Notes:

N.A. = Not applicable Indet. = Indeterminate

Cv determined from Log Plots



GeoAssist Limited**CONSOLIDATION TEST**

Site No: 6178

Site Ref: VSE

Project: 61 to 65 Spear Street

Location: Manchester

Client: Jadebricks Manchester Limited

Consultant: Desimome Consulting Engineering

Hole Ref: WS1

Sample No: U3

Depth: 5.60m

Pressure Range kN/m ² <i>from to</i>		Void Ratio end of increment	Volume Compressibility $m_v - m^2/MN$	Consolidation Coefficient $c_v - m^2/year$	Bulk density(Mg/m ³)	
					Dry density(Mg/m ³)	
10	25	0.6530			2.08	
25	50	0.6375	0.38	6.60	1.66	
50	100	0.6157	0.27	8.20	Specific gravity	
100	200	0.5833	0.20	4.00	2.75	
200	400	0.5483	0.11	11.90	Assumed	
400	200	0.5554	0.02		Initial Moist. Cont. (%):	
200	50	0.5751			25.4	
					Final Moist. Cont. (%):	
					23.5	
					Initial Void ratio:	
					0.6599	
					Final Void ratio:	
					0.5636	
					Thickness(mm):	
					19.0	
					Diameter(mm):	
					76.0	

Cv Notes:

N.A. = Not applicable Indet. = Indeterminate

Cv determined from Log Plots

