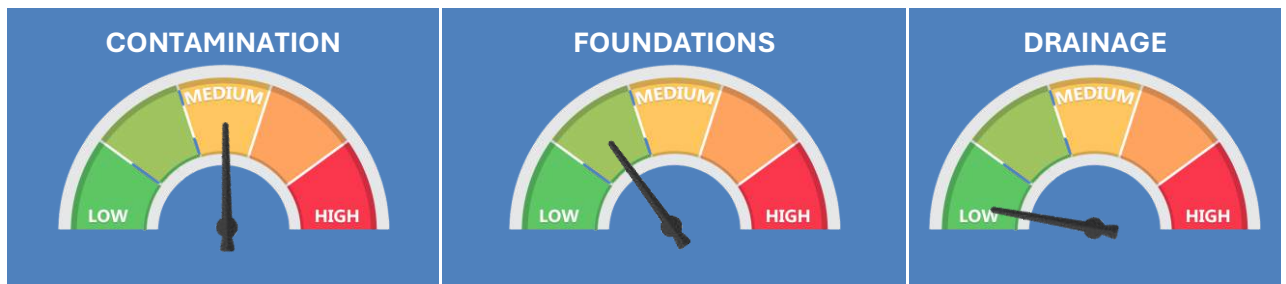


Geo-Environmental Assessment
Land off Fritwell Road
Somerton, Oxfordshire
OX25 6NJ

Client: Laxton Properties

Issue Date: September 2024
Report Ref: 21318R1 (Issue A)



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Date	September 2024	September 2024	September 2024	September 2024

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Relevant Guidance and Legislation

[APPENDIX B](#)

Site Photos

[APPENDIX C](#)

Environmental Database

[APPENDIX D](#)

Field Logs

[APPENDIX E](#)

Permeability Sheets

[APPENDIX F](#)

Analytical Test Results

[APPENDIX G](#)

Geotechnical Test Results

1.0 EXECUTIVE SUMMARY

Phase 1 Desk Study	Comments	Risk Rating
Site Setting	Farmyard with 5no. barns/sheds set within hard standing.	Moderate
Published Geology and Hydrogeology	White Limestone Formation (Principal Aquifer) with no superficial deposits. Outside of a SPZ and no abstractions within 250m.	Low
Hydrology/Flood Risk	Tributary of River Cherwell 144m NW, Outside of Flood Risk area	Low
Historical land use	The site is undeveloped until c2001 when two structures appear in the north. By 2010 the current configuration is established	Low/Moderate
Landfill/Infilled land	There are no landfills recorded within 250m of the site. Infilled land is present 24 to 62m SW and 75 to 100m S	Low/Moderate
UXO	Low risk	Low
Phase 2 Intrusive	Comments	Risk Rating
Proven Ground Conditions	Made ground/reworked to a maximum depth of 1.10m bgl, gravelly clay to a maximum depth of 2.45m bgl, limestone to a depth of 2.30+m bgl	
Groundwater/Drainage	<ul style="list-style-type: none"> Groundwater was not encountered to BRE365 Soakage moderate/good (E-04 to E-05m/sec) 	Low
Ground Gas	Low risk of ground gas	Low
Contamination	Exceedances of adopted GACs for PAH, TPH and ACM in BH2 and BH4 within the upper 1m of made ground	Moderate
Ground Engineering	Potential desiccation identified in BH1, BH3 and BH4 at 1m. Strip foundations are likely to be feasible onto the limestone bedrock (250 kPa). Piles may be required in areas where foundations need deepening	Low/Moderate
Recommendations	Remedial Strategy/Verification Plan is prepared to manage the contamination	

2.0 INTRODUCTION

WDE Consulting Limited (WDE) was appointed by Laxton Properties (the *client*) to conduct a Geo-Environmental Assessment at Land off Fritwell Road, Somerton, Oxfordshire, OX25 6NJ (Figure 1). The current site comprises an active farm and is situated at NGR 450090 228640, What 3 Words /// plankton.freezers.carbon (Figure 2).

2.1 Context

It is understood that the site is being considered for residential development comprising demolition of the existing farm buildings (Figure 2 & 3) and construction of 10no new dwellings.

The works have been completed in line with the current regulations, guidance and good practice presented in Appendix A.

2.2 Agreed Scope of Works and Objectives

The scope of work that was agreed with client is presented in Table 1.

Table 1 – Agreed Scope of Works and Objectives

		Objectives
1	Site walkover	To identify any areas of potential contamination
2	Intrusive site investigation	<ul style="list-style-type: none"> To identify whether there is any contamination onsite which is considered to pose an unacceptable risk to human health, controlled waters or the environment To identify the geotechnical properties of the ground to enable design parameters for foundations and drainage
3	Monitoring rounds	To undertake groundwater and ground gas monitoring of borehole monitoring wells
4	Permeability testing	Investigate the drainage potential of the materials through field investigations
5	Laboratory analyses	Contamination and geotechnical soil/water samples are analysed at a laboratory
6	Reporting	<ul style="list-style-type: none"> Complete a Phase 1 desk-based study of the site to ascertain information on the site geology, hydrology, and surrounding land uses Compare onsite soil and water concentrations with generic UK based assessment criteria Provide recommendations on contamination, foundations, and drainage

3.0 PHASE 1 DESK STUDY

3.1 Information Sources

The sources of information that were used during the desk study included the following items:

- Site walkover (photos presented in Appendix B)
- Environmental database information (Appendix C)
- Publicly available information

3.2 Site Description and Walkover

The site consists of an agricultural farmyard comprising five barns/sheds (Figure 2) of surrounding hard standing. Access is via Fritwell Road to the north.

Building 1

Steel corrugated shed with open sliding doors and measuring ~600m² with a concrete slab floor in good condition. A bunded above ground storage tank (AST) of ~5,000L is located on the north-east of the shed (Photo 1). A site operative indicated that the tank is empty and no longer in use, although previously was previously filled with gas oil. The electrical fuse box is located in this area also, along with numerous old empty fuel containers ranging in size from 20L jerry cans to 210L drums. No spillages or gross contamination was observed in this area. The remaining shed is used as storage of farm machinery including tractors.

Building 2

An open access steel corrugated shed used for storage of farm vehicles and machinery and measuring 150m², laid on a compacted Type 1 fill (Photo 2).

Building 3

A part block work and corrugated steel barn with sliding doors, gates and open access measuring ~1,000m² (Photo 3). This barn is used primarily to house cattle and is laid on a concrete slab. A water tank is located in the west.

Building 4

An open access steel corrugated shed used for grain storage and measuring 350m², which has a concrete slab floor (Photo 4).

Building 5

A gated semi-open access steel corrugated shed used for storage of farm vehicles and machinery and measuring 700m², with a concrete slab form (Photo 5).

A further AST for diesel storage (volume ~2,500L) was located ~20m east offsite which is used by farm workers for the filling of machinery (Photo 6). No grossly contaminated materials or invasive species were identified during the site walkover.

3.2.1 Key Findings of Desk Study

The key findings from the desk study are presented in Table 2.

Table 2 – Key Findings of Desk Study

Item	Details
Published Geology	White Limestone Formation bedrock (principal aquifer) with no superficial deposits
Geological Hazards	No features identified in environmental database
Hydrogeology	Outside of a SPZ and no abstractions within 250m
Hydrology	Tributary of River Cherwell 144m NW, Outside of Flood Risk area
Current Land Use on site	Farm
Current Land Use within 250m radius	None recorded within 250m
Radon Risk	1-3%. No protective measures likely
Historical land use on site	The site was undeveloped until 2001 when two structures appear in the north (within current area of building 3). By 2010 the current site configuration is established and continues to the present day
Historical land use with 250m radius	<ul style="list-style-type: none"> Electrical substation 23m W (1974) General quarrying 24 to 61m SW (1885)
Landfills/Infilled Land	<ul style="list-style-type: none"> No landfills recorded within 250m Filled ground 24 to 61m SW (1979 – 1993) Filled ground 75 to 100m S (1993)
Identified potential areas of concern	<ul style="list-style-type: none"> A: AST on site (5,000L) B: AST offsite (2,500L) Potentially imported made ground
Pollution Incidents	None recorded
UXO Risk	Low – No further actions likely

The identified ASTs are summarised in Table 4 and referenced on Figure 2.

Table 3 – Above Ground Storage Tank details

Ref	Fuel Type	Volume (L)	Status	Photo
A	Gas oil	~5,000	Inactive	Photo 1
B	Diesel	~2,500	Active	Photo 6

3.3 Preliminary Risk Assessment

3.3.1 Identification of Critical Receptors

The identified potentially critical receptors are presented in Table 4.

Table 4 – Identification of Potential Receptors

Receptor Type	Current/Future	Receptor Details	Active
Human Health	Future	Residential receptors onsite	Yes
	Current	Residential/commercial receptors offsite	Yes
	Current	Public Open Space	No
Controlled waters	Current	Groundwater within aquifer	Yes
	Current	Groundwater within SPZ/licensed abstraction	No
	Current	Surface water body	Yes

The risks to onsite workers can be minimised by following appropriate health and safety guidance on site (i.e. wearing protective clothing and washing).

3.3.2 Identification of Potential Areas of Concern

The list of potential areas of concern on site and in the surrounding area are summarised in Table 5, and presented on Figure 2.

Table 5 – Identification of Potential Areas of Concern

Ref Area of Concern	Location	Potential Risk	Comments
A	Onsite	AST – 5,000L Gas Oil	Hydrocarbons (TPH, BTEX, PAH)
B	Offsite	AST – 2,500L Diesel tank	Hydrocarbons (TPH, BTEX, PAH)
-	Onsite	Potentially imported made ground	Hydrocarbons (TPH, BTEX, PAH), heavy metals, inorganics, asbestos, cyanide, phenols, ground gas

3.3.3 Identified Potential Pathways

Human Health Pathways

The potential human health exposure pathways for a residential/commercial receptor are indicated in Table 6.

Table 6 – Identification of Potentially Active Human Health Exposure Pathways

Potential Pathway	Active/ Inactive	Notes
Ingestion of soil and dusts	Active	Qualitative Risk Assessment required
Ingestion of home grown produce	Active	Qualitative Risk Assessment required
Dermal contact with soils and dust	Active	Qualitative Risk Assessment required
Inhalation of dusts	Active	Qualitative Risk Assessment required
Inhalation of organic vapours (generated by shallow soils) in external areas or inside buildings	Active	Qualitative Risk Assessment required
Inhalation of organic vapours generated by dissolved phase groundwater migrating offsite to neighbouring residential properties	Active	Qualitative Risk Assessment Required
Inhalation of organic vapours generated by dissolved phase groundwater migrating onto site from surrounding offsite sources	Active	Qualitative Risk Assessment Required
Contaminants from site entering groundwater and migrating into public water abstraction borehole for human consumption	Inactive	No potable abstractions within 500m. No further assessment necessary

Controlled Waters Pathways

The potentially active controlled waters migration pathways are indicated in Table 7.

Table 7 – Identification of Potentially Active Controlled Water Pathways

Potential Pathway	Active/ Inactive	Notes
Impacted soils leaching to groundwater within Principal Aquifer	Active	Further assessment required
Impacted soils leaching to groundwater and migration to surface water	Active	Nearest surface water 144m W. Further assessment required

Ground Gas Pathways

The potential for ground gas risk depends on source-pathway-receptor linkages, with the age of infilling and type of waste as controlling factors. The potentially active migration pathways for ground gas are indicated in Table 8, along with a qualitative risk assessment.

Table 8 – Identification of Potentially Active Ground Gas Pathways

Potential Pathway	Active/ Inactive	Qualitative Risk Assessment	Notes
Potential for natural materials with high organic content, such as peat (>4% TOC)	Active	Moderate	Further assessment required
Availability of readily degradable material, such as vegetable matter and food waste	Inactive	Low	No landfill within 250m. No further assessment required
Nature of fill material - depth of fill >1m, incohesive materials, poorly compacted and within unsaturated zone.	Active	Low/Moderate	Further assessment required
Age of Materials - Ground gas generated from current/historical landfills <25yrs old	Inactive	Low	No landfill within 250m. No further assessment required
Distance from receptor – a higher distance reduces the potential risk for offsite migration. High risk generally limited to within 100m distance.	Active	Moderate/High	Oakwood House adjacent NE. Further assessment required
Presence of Preferential Pathways – fissures/fractures in bedrock or permeable strata beneath an impermeable cover	Active	Low/Moderate	Published geology indicates limestone bedrock, but no superficial deposits indicated. Further assessment required
Chemical storage/spillages with potential for hydrocarbon vapours	Active	Moderate/High	Further assessment required
Shallow or deep mine workings	Inactive	Low	Not indicated by desk study. No further assessment required
Radon gas protective measures required	Active	Low/Moderate	1 – 3%, no further assessment required

3.3.4 Qualitative Risk Assessment

A summary of the relevant pollutant linkages based on a source-pathway-receptors analysis is provided in Table 9.

Table 9 – Summary of Potentially Active Source-Pathway-Target Assessment

Sources	Potential Pathway	Potential Receptor	Risk Classification
Onsite Sources (AST, potential made ground)	Dermal contact, outdoor and indoor inhalation, ingestion, homegrown produce	Human Health (Onsite Residential)	Moderate
	Vapour inhalation from dissolved phase groundwater migrating from site to neighbouring properties	Human Health (Offsite Residential)	Moderate
	Impacted soil leaching to groundwater within Principal Aquifer	Controlled Waters (Groundwater)	Moderate/High
	Impacted soil leaching to groundwater and migration to surface water	Controlled Waters (Surface water)	Low/Moderate
Offsite Source (AST)	Vapour inhalation from dissolved phase migration from offsite sources	Human Health (Onsite Commercial)	Low/Moderate
Historical landfill and infilled land	Source for ground gas generation	Human Health (Onsite Commercial)	Moderate

4.0 PHASE II INVESTIGATION WORKS

4.1 Summary of Works

The locations of the intrusive investigation are presented on Figure 4 and comprised the following:

Table 10 – Summary of Phase II Intrusive Works

Item	Details	Appendix
Shallow boreholes	4no. boreholes (BH1 to BH4) with SPTs were drilled to a maximum depth of 2.45m bgl using a mechanically driven window sampler	D
Trial pits/Hand pit	3no. trial pits (TP1 to TP3) were excavated to a maximum depth of 2.30m bgl using a JCB 3CX for BRE365 Soakage Testing. 1no hand pit (HP1) was dug to 0.50m bgl	D
Groundwater monitoring	Groundwater monitoring undertaken in BH3	E
Analytical Testing	Standard QRA testing undertaken	F
Geotechnical Testing	Atterberg, point load, PSD and triaxial testing undertaken	G

4.2 Constraints/Selection of Intrusive Locations

Drilling was terminated in BH2 at 2.45m bgl due to suspected asbestos containing materials (ACM) being encountered.

4.3 Rationale for Selection of Intrusive Locations

The intrusive locations are indicated on Figure 4, with rationale used for the selection of locations presented in Table 11.

Table 11 – Rationale for Exploratory Hole Locations

Ref	Description	Location	Intrusive Locations
A	Above Ground Storage Tank	Building 1	BH2
B	Above Ground Storage Tank	Offsite	BH4
-	Site coverage for proposed infrastructure	Remainder of site	All

4.4 Field Results

4.4.1 Geology

A summary of the geology encountered during the intrusive investigation is summarised in Table 12 and are presented in full Appendix [D](#).

Table 12 – Summary of Geology Proved Onsite

Strata	Descriptions	Min - Max Depth (m bgl)	Average Depth (m bgl)	Locations
Made Ground/ reworked	Brown silty gravelly clay with red brick and bituminous fragments	0.25 – 1.10	0.00 – 0.50	All
Gravelly Clay	Soft to stiff light brown sandy gravelly calcareous clay	0.50 – 2.45	0.50 – 2.00	All
Limestone	Moderately weak to strong white/yellow highly weathered limestone	Absent – 2.30	2.00 – 2.30+	All except HP1, BH2

Refusals on limestone bedrock were encountered in BH1, BH3 and BH4

4.4.2 Groundwater

A summary of the groundwater monitoring results is presented in Table 13.

Table 13 – Groundwater Field Monitoring Results (m bgl)

Date		BH3
13/08/2024	Depth to Water	Dry
	Depth to Base	2.30

4.4.3 Contamination Observations

A summary of the contamination observations are summarised below in Table 14.

Table 14 – Contamination Observations

Location	Depth (m bgl)	PID ppm(v)	Visual Observations
BH2	0.20 – 1.10	0.0	Broken asbestos containing materials (ACM) >50mm.

4.4.4 Permeability Results

A summary of the BRE365 soakage testing results is presented in Table 15 and are presented in full in Appendix E.

Table 15 – Soakage Test Results

Location	Test Type	Material	Depth of Test m bgl	Test No	Drainage (m/sec)	Adopted Value (m/sec)	Qualitative Soakage Potential
TP1	BRE365	Limestone	2.30	1	3.97E-03	3.97E-03	Very good
				2	3.97E-03		
				3	3.97E-03		
TP2	BRE365	Limestone	2.20	1	3.85E-04	2.94E-04	Good
				2	3.14E-04		
				3	2.94E-04		
TP3	BRE365	Limestone	1.50	1	1.01E-04	8.55E-05	Moderate
				2	1.09E-04		
				3	8.55E-05		

5.0 GROUND GAS ASSESSMENT

5.1 Published Guidance

A ground gas assessment has been undertaken to assess risks associated with carbon dioxide and methane to new buildings and their users, adopting the current guidance presented in Appendix A.

5.2 Updated Ground Gas Conceptual Site Model

An update to the ground gas conceptual model is presented in Table 16 which has incorporated the results obtained from this assessment.

Table 16 – Identification of Potentially Active Ground Gas Pathways

Potential Pathway	Active/ Inactive	Qualitative Risk Assessment	Notes
Potential for natural materials with high organic content, such as peat (>4% TOC)	Active	Low	Max TOC = 5.6% associated with bituminous materials in made ground. Will not degrade to produce ground gas in hazardous quantities.
Nature of fill material - depth of fill >1m, incohesive materials, poorly compacted and within unsaturated zone.	Active	Low	Average thickness = <1m
Presence of Preferential Pathways – fissures/fractures in bedrock or permeable strata beneath an impermeable cover	Active	Low/moderate	Limestone geology observed
Chemical storage/spillages with potential for hydrocarbon vapours	Active	Low	ASTs present onsite although no gross contamination or spillages identified

There is unlikely to be a requirement for further ground gas monitoring visits. The revised ground gas risk assessment indicates a low risk from ground gas (CS1/green) and therefore no special protective measures are likely to be required.

6.0 CONTAMINATION ASSESSMENT

6.1 Soil Analytical Test Results

Based on the context of the assessment, the proposed land use is assumed to be residential with plant uptake. A comparison of the soil analytical test results with the adopted GACs is presented in Appendix E, along with laboratory certificates of analyses.

The locations that have exceeded the adopted GACs are summarised below:

- BH2 @ 0.70m (made ground/bituminous materials)
 - PAHs: Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene
 - TPH: Aromatic C16 – 44
 - Bulk asbestos (asbestos cement) @ 1.00m
- BH4 @ 0.15m (made ground/bituminous materials)
 - PAHs: Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(a)pyrene,

6.2 Waste Classification/Onsite Reuse Options

Table 17 provides an overview of the likely waste classification for onsite materials, as well as onsite reuse options, with the waste classification sheets presented in Appendix E.

Table 17 – Likely Waste Classification/Reuse Options for Onsite Materials

Material	Waste Classification	On Site Reuse Options
Made Ground with ACM (BH2)	Hazardous	None unless ACM removed
Made Ground with bituminous fragments (BH2/BH4)	Hazardous	None unless treated
Made Ground (elsewhere)	Non-hazardous	Beneath roads, hardstanding
Natural Materials	Inert	All scenarios except surface cover

Reuse of site won materials is to be encouraged in line with a sustainable approach, which will require a CL:AIRE DoW:CoP Materials Management Plan (MMP) or U1 waste exemption form to be completed.

Treatment and subsequent reuse of bituminous waste will need to be undertaken in line with published guidance¹.

¹ Managing Reclaimed Asphalt – Highways and Pavements. ADEPT. August 2019

6.3 Conclusions on Contamination

There have been exceedances of the adopted GACs although these are non-volatile and likely associated with the bituminous materials and ACM within the made ground in the upper 1.00m. Therefore, no large-scale remedial action is likely to be required with only hotspot removal and pathway control measures required.

A Remedial Strategy is likely to be required to comply with the planning conditions, that will include details of the hot spot removal, pathway control measures, verification criteria, sampling frequency and discovery strategy.

A revised *source-pathway-receptor* assessment is presented in Table 18.

Table 18 – Summary of Revised Active Source-Pathway-Target Assessment

Sources	Potential Pathway	Potential Receptor	Risk Classification
Onsite Sources (AST, ACM, made ground)	Dermal contact, outdoor and indoor inhalation, ingestion, homegrown produce	Human Health (Onsite Residential)	Moderate
	Vapour inhalation from dissolved phase groundwater migrating from site to neighbouring properties	Human Health (Offsite Residential)	Low
	Impacted soil leaching to groundwater within Principal Aquifer	Controlled Waters (Groundwater)	Low
	Impacted soil leaching to groundwater and migration to surface water	Controlled Waters (Surface water)	Low
Offsite Source (AST)	Vapour inhalation from dissolved phase migration from offsite sources	Human Health (Onsite Commercial)	Low
Historical landfill and infilled land	Source for ground gas generation	Human Health (Onsite Commercial)	Low

7.0 GROUND ENGINEERING

7.1 Field Testing Results

A summary of the ground engineering field testing results is provided in Table 19 and are presented in on the logs in Appendix D. This includes the calculated SPT N value and inferred shear strength (Cu) using a pocket penetrometer (PP).

Table 19 – Field Geotechnical Results

Depth (m)	BH1		BH2		BH3		BH4	
	N value	PP kPa	N value	PP kPa	N value	PP kPa	N value	PP kPa
1.0	>50	160	8		12	275	>50	
2.0			12		>50	150		

7.2 Geotechnical Testing

Particle size distribution (PSD), point load, triaxial undrained shear strength (Cu) and Atterberg limit (PI) testing of the encountered strata are summarised below in Table 20 with the full results presented in Appendix G.

Table 20 – Summary of Geotechnical Test Results

Description	Average Depth (m bgl)	MC %	Modified PI%	PSD %	Intact Dry Density (mg/m ³)	Predicted UCS Strength (MPa)	Triaxial kPa
Gravelly Clay	0.50 – 2.00	4.8 – 21	2 – 35	Gravel (42), Sand (31), Silt (14), Clay (13)			47
Limestone	2.00 – 2.30+				1.13 – 2.44	23.7 – 51.24	

Gravelly Clay

The gravelly clay has a low to medium volume change potential and a shear strength of 47 kPa indicating it is a medium strength material.

Limestone

Point load testing undertaken on the limestone indicates that it is moderately weak to strong.

7.3 Potential Desiccation

An assessment of potential desiccation has been undertaken and is presented in Appendix G. Potential desiccation has been identified in BH1, BH3 and BH4 at 1m which will need to be taken into account within the foundation design.

7.4 Concrete Design Parameters

A summary of the sulphate, pH and corresponding BRE concrete in aggressive ground parameters for concrete design are presented in Table 21.

Table 21 – Summary of BRE Concrete in Aggressive Ground Parameters

Location	Concrete Parameters
pH (pH Units)	8.1 – 9.7
Water Soluble Sulphate as (2:1 Leachate Equivalent) (mg/l)	61
ACEC Classification	AC-1
Design Sulphate Class	DS-1

7.5 Comparison with Water UK Threshold Concentration Values

The soil laboratory results from the upper 1.35m have been compared to the UKWIR thresholds for the selection of water supply pipes in Table 22 with full results presented in Appendix E.

Table 22 - Comparison of Soil Laboratory Results from the upper 1.35m with UKWIR (mg/kg)

Contaminant of Concern	No. of Samples	UKWIR Threshold	Min	Max	No. Samples > GAC	Samples Exceeded
Total BTEX & MTBE	5	0.1	BDL	BDL	0	-
EC5-EC10 Aliphatic	5	2	BDL	BDL	0	-
EC10-EC16 Aliphatic	5	10	BDL	36	1	BH2
EC16-EC40 Aliphatic	5	500	BDL	1250	2	BH2, BH4
EC5-EC10 Aromatic	5	2	BDL	BDL	0	-
EC10-EC16 Aromatic	5	10	BDL	110	2	BH2, BH4
EC16-EC40 Aromatic	5	500	BDL	7000	2	BH2, BH4
Phenol	5	2	BDL	BDL	0	-
Cresols and chlorinated phenols	5	2	-	-	-	-
Corrosive	5	Various	7.5	8.2	0	-

There have been exceedances of the UKWIR threshold values and therefore it is likely that additional mitigation measures in the form of protective pipe will be necessary. Further consultation should be sought with the water supply company.

7.6 Excavations, Groundwater Control and Services

Groundwater was not encountered during the investigation within the upper 2.30m so is unlikely to require dewatering for shallow excavations. Excavation walls are likely to require additional support within the made ground. There are a number of potentially live electrical services beneath the site which will need to be safely dealt with during construction.

7.7 Preliminary Road Design Parameters

Frost susceptibility tends to be a feature of silty and sandy clays, of low to medium plasticity. Table 23 gives an indication of frost susceptibility and permeability with grading and plasticity index for preliminary identification.

Table 23 – Likely Frost Susceptibility of Soil Materials (adapted from TRRL)

Permeability	Soil Texture	Frost Susceptible
High Permeability	Granular, <10% finer than 75 microns	No
Intermediate Permeability	Granular, >10% finer than 75 microns. Cohesive PI <20%	Yes
Low Permeability	Cohesive PI >20%	No

This site has recorded a PI of 10-39% and therefore in accordance with the TRRL is considered to have frost susceptible soil materials and should be taken into the total highway pavement construction thickness.

It is anticipated that the soils encountered at formation level will a mixture of cohesive and incohesive materials and will be above the water table. The amount of loading is unknown for the roads and pavements, but for poor to good construction conditions², a CBR design value of 2.5 to 3% is recommended for initial design.

Where the CBR is <2% it will be required to either increase the capping layer or to excavate out any soft spots.

7.8 Preliminary Floor Design

The ground gas risk for the site has been characterised as a low risk on therefore there only standard membranes (CS1/Green) are required. A block and beam vented subfloor should also be allowed for in the floor design which would also accommodate potential heave within the shallow clays.

² TRRL 1984 Structure Design of Bituminous Roads. Report LR1132

7.9 Soakage Potential

The BRE365 soakage testing indicate moderate to good permeability (E-04 to E-05m/sec) within the limestone materials. It is recommended that a drainage engineer is consulted to formulate the drainage design.

7.10 Preliminary Foundation Design

Factors that will need to be considered when selecting the type and depth of new foundations includes:

- Anticipated loads required by proposed development
- Depth of groundwater
- Depth of made ground
- Areas containing soft/loose or peaty materials identified during field testing
- Differences in founding materials to avoid differential settlement issues
- Type/height and types of trees in combination with volume change potential of soils
- Potential desiccation

It is understood that the development is to comprise demolition of all the farm buildings and construction of 10no new dwellings.

Traditional strip foundations are likely to be feasible for consideration and extending either onto the limestone bedrock or firm clay extending to a depth of 2.00m to avoid potential desiccation, adopting an allowable bearing capacity of 100kPa for the clay and 250kPa for the limestone. Care will be needed to avoid differential settlement and therefore it may be preferable to found onto the limestone bedrock. Figure 5 outlines the foundation zoning plan for foundations onto the limestone.

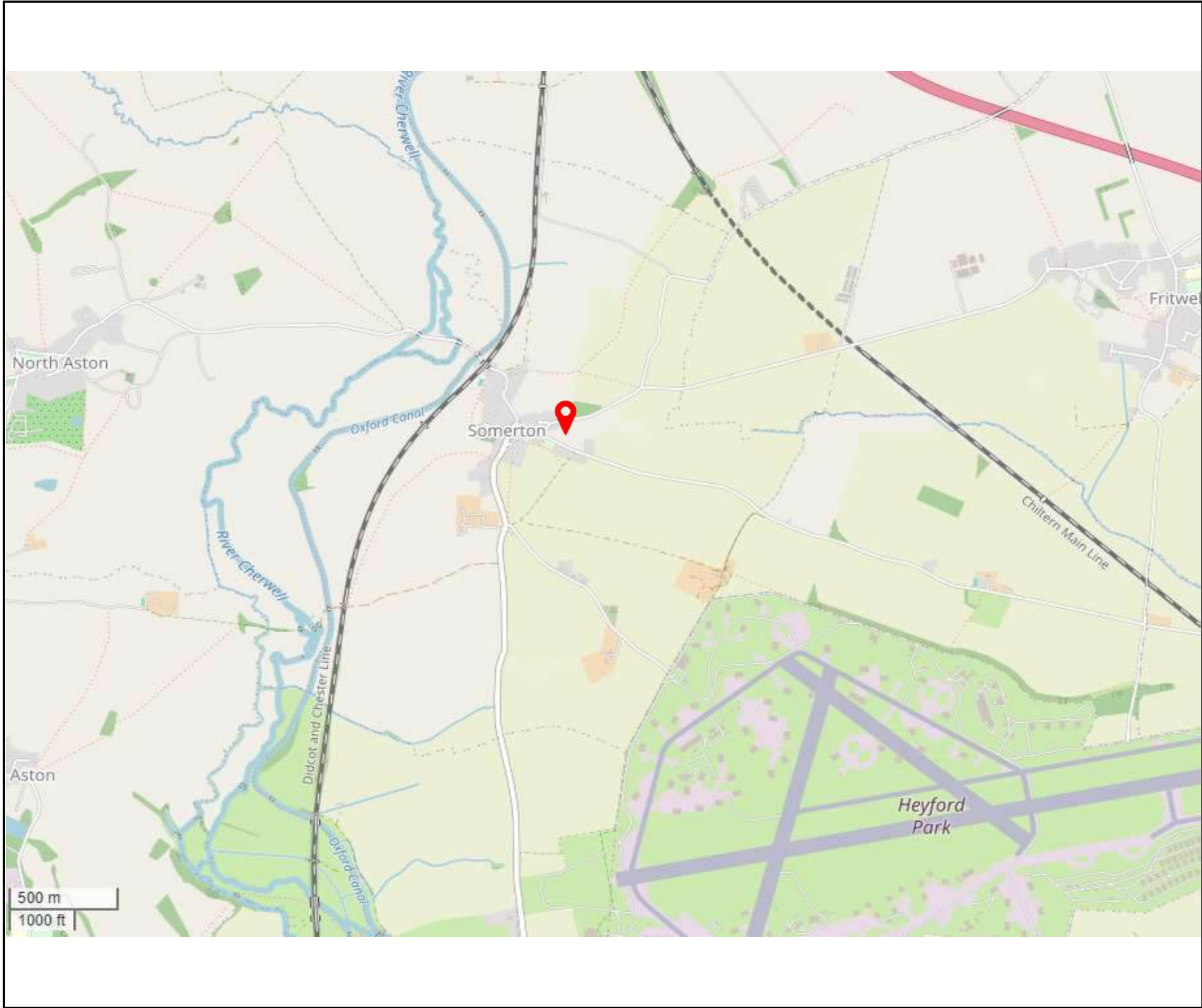
It is recommended that a structural engineer is consulted for the detailed foundation design.

8.0 RECOMMENDATIONS FOR FUTURE WORK

WDE recommends that the following items are undertaken:

- Preparation of a Remedial Strategy/Verification Plan to manage the identified contamination

FIGURES



62A Western Road
 Tring
 HERTS
 HP23 4BB
 T: 01442 825570

Client

LAXTON PROPERTIES

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21318 - SOMERTON, OXFORD

Title

FIGURE 1: SITE LOCATION PLAN

© OpenStreetMap contributors



LEGEND

- 1 Building ref
- AB** Area of concern

Client

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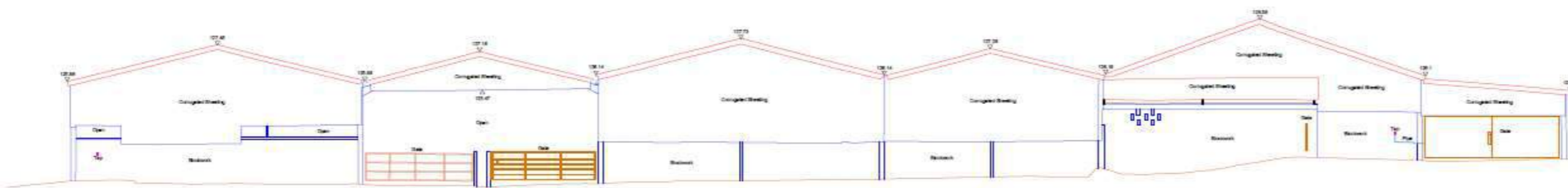
Title

**FIGURE 2: CURRENT SITE
PLAN/AREAS OF CONCERN**

Drawing supplied by client





LEGEND





LEGEND

-  Intrusive location
-  BRE365 trial pit



Client

LAXTON PROPERTIES

Project

21318 - SOMERTON, OXFORD






Title

**FIGURE 4: INTRUSIVE LOCATION
PLAN**

Drawing supplied by client



LEGEND

-  Intrusive location
-  BRE365 trial pit
-  Shallow Strip 1.1m into bedrock
-  Deep Strip 1.5m into bedrock
-  Deep Strip/Piled 2.5+m into bedrock

Client

LAXTON PROPERTIES

Project

21318 - SOMERTON, OXFORD

Title

FIGURE 5: FOUNDATION ZONING PLAN

Drawing supplied by client

APPENDIX A: RELEVANT GUIDANCE AND LEGISLATION

WDE Consulting has duly taken account of the recommendation contained within relevant guidance documents and legislation during the preparation of this report.

CONTAMINATION

Part IIa of the Environmental Protection Act 1990 defined contamination in relation to continued land use and introduced the “polluter pays” principal. The Groundwater Regulations 1998 defined List 1 and List 2 substances and the procedures for preventing them from entering groundwater. The Water Resources Act of 1991 introduced the term “controlled waters” and gave powers to the Environment Agency to require remediation where there was pollution of controlled waters.

The National Planning Policy Framework³ requires the following:

- The site is made suitable for its intended use, taking account of all ground conditions arising from natural and former activities, pollution arising from previous uses and proposals for mitigation including land remediation.
- 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.
- Adequate site information, prepared by a competent person, is presented.

The methodology adopted for this report follows the guidance and procedures for Land Contamination Risk Management (LCRM) produced by the Agency⁴. The LCRM process provides a reasoned and structured mechanism to identify potential risk issues and, where necessary, provide a way forward to develop a robust risk management strategy to address potentially unacceptable risks in an appropriate manner. Contained within the LCRM Framework are the following stages:

1. Stage 1 risk assessment
2. Stage 2 options appraisal
3. Stage 3 remediation and verification

British Standards has issued guidance for the Investigation of Potentially Contaminated Sites⁵ and for undertaking Site Investigations⁶ which have duly been considered. An update to the potential human health exposure pathways is provided in the Environment Agency Soil Science Report SR3⁷. In 2008 the Environment Agency and the National House-Building Council (NHBC), Chartered Institute of Environmental Health (CIEH) released a joint publication for the Safe Development of Housing on Land

³ Department of Communities and Local Government. March 2012

⁴ Environment Agency. 2020. Land Contamination Risk Management (LCRM)

⁵ British Standards 2011. Investigation of Potentially Contaminated Sites-Codes of Practice. BS10175:2011

⁶ British Standards. 2015. Code of Practice for Site Investigations. BS5930

⁷ Environment Agency, August 2008, Updated technical background to the CLEA model, Science Report - SC050021/SR3

Affected by Contamination⁸. Guidance is provided in the CLR Report No 4 on sampling strategies for contaminated land⁹.

QUALITATIVE RISK ASSESSMENT

The potentially active human health are based on the Agency Soil Science Report SR3¹⁰. The potential contaminants of PCBs arising from the electricity substation located offsite have been discounted as PCBs are not considered to be sufficiently mobile or soluble¹¹.

To assess the potential for risk, the Source → Pathway → Receptor relationships have been evaluated to determine whether there are potentially active pollutant linkages between sources and receptors. Only when there is an active pollutant linkage, can there be a potential risk to a receptor from a source via a particular pathway. Each active pathway has been assigned a qualitative assessment as to the level of risk as shown in the below table and as per R&D 66⁸.

Qualitative Risk Classification Scheme

		CONSEQUENCE			
		Severe	Medium	Mild	Minor
PROBABILITY (Likelihood)	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

ADOPTED GACS

The Generic Assessment Criteria (GACs) that have been adopted are based on the Land Quality Management (LQM) Suitable for Use Levels (S4UL)¹². These published values are available for residential with/without home grown produce, commercial, allotment and public open space land use scenarios. As there is no current UK GAC for lead or cyanide, the Category 4 Screening Level (C4SL) will be adopted for lead and the Dutch Intervention Value (DIV) for cyanide. In the absence of any UK published value, the detection limits have been adopted.

⁸ Environment Agency, 2008. Guidance for the Safe Development of Housing on Land Affected by Contamination. R&D 66

⁹ DOE, 1994. Sampling Strategies for Contaminated Land. CLR Report No 4

¹⁰ Environment Agency, August 2008, Updated technical background to the CLEA model, Science Report - SC050021/SR3

¹¹ Department of the Environment, 1996, Industry Profile: Engineering works. P.14 Sect 3.2.1

¹² LQM/CIEH 2014. The LQM/CIEH S4ULs for Human Health Risk Assessment.

GROUNDED SOLUTIONS

For asbestos, there are no current GAC for asbestos fibres in soils. For surface soils within a residential/allotments setting, it is best practice to take a conservative approach and to adopt the detection limit (0.001%) as the threshold. A *very low quantity* threshold for asbestos of 0.01% had been proposed by CL:AIRE²⁷, which is considered to be appropriate for adoption within a commercial/public open space scenario.

GACs For Various Land Uses (mg/kg)

Contaminant of Concern	Residential with HGP	Residential without HGP	Allotments	Commercial	Public Open Space Res
Asbestos	DL	DL	DL	DL	DL
Asbestos Quantification %	0.001	0.001	0.001	0.01	0.01
Total Cyanide	50	50	50	50	50
Total Phenols	280	750	66	760	760
Naphthalene	2.3	2.3	4.1	190	4900
Acenaphthylene	170	2900	28	83000	15000
Acenaphthene	210	3000	34	84000	15000
Fluorene	170	2800	27	63000	9900
Phenanthrene	95	1300	15	22000	3100
Anthracene	2400	31000	380	520000	74000
Fluoranthene	280	1500	52	23000	3100
Pyrene	620	3700	110	54000	7400
Benzo(a)anthracene	7.2	11	2.9	170	29
Chrysene	15	30	4.1	350	57
Benzo(b)fluoranthene	2.6	3.9	0.99	44	7.1
Benzo(k)fluoranthene	77	110	37	1200	190
Benzo(a)pyrene	2.2	3.2	0.97	35	5.7
Indeno(1,2,3-cd)pyrene	27	45	9.5	500	82
Dibenz(a,h)anthracene	0.24	0.31	0.14	3.5	0.57
Benzo(ghi)perylene	320	360	290	3900	640
Arsenic	37	40	43	640	79
Beryllium	1.7	1.7	35	12	2.2
Boron	290	11000	45	240000	21000
Cadmium	11	85	1.9	190	120
Chromium	910	910	18000	8600	1500
Copper	2400	7100	520	68000	12000
Lead	210	330	84	6600	760
Mercury	40	56	19	1100	120
Nickel	180	180	230	980	230
Selenium	250	430	88	12000	1100
Vanadium	410	1200	91	9000	2000
Zinc	3700	40000	620	730000	81000
Benzene	0.087	0.38	0.017	27	72
Toluene	130	880	22	56000	56000
Ethylbenzene	47	83	16	5700	24000
Xylenes (sum)	56	79	28	5900	41000
MTBE	49	73	23	7900	7900
TPH - Aliphatic >C5 - C6	42	42	730	3200	570000
TPH - Aliphatic >C6 - C8	100	100	2300	7800	600000
TPH - Aliphatic >C8 - C10	27	27	320	2000	13000
TPH - Aliphatic >C10 - C12	130	130	2200	9700	13000
TPH - Aliphatic >C12 - C16	1100	1100	11000	59000	13000
TPH - Aliphatic >C16 - C21	65000	65000	260000	1600000	250000
TPH - Aliphatic >C21 - C35	65000	65000	260000	1600000	250000
TPH - Aliphatic >C35 - C44	65000	65000	260000	1600000	250000
TPH - Aromatic >C5 - C7	70	370	13	26000	56000
TPH - Aromatic >C7 - C8	130	860	22	56000	56000
TPH - Aromatic >C8 - C10	34	47	8.6	3500	5000
TPH - Aromatic >C10 - C12	74	250	13	16000	5000

GROUNDED SOLUTIONS

TPH - Aromatic >C12 - C16	140	1800	23	36000	5100
TPH - Aromatic >C16 - C21	260	1900	46	28000	3800
TPH - Aromatic >C21 - C35	1100	1900	370	28000	3800
TPH - Aromatic >C35 - C44	1100	1900	370	28000	3800

CONTROLLED WATER EALS

In the UK there are two published Environmental Assessment Levels (EALs) available for comparison with groundwater, the Water Framework Directive¹³ and the Water Supply Regulations¹⁴, apart from TPH fractions, Ethylbenzene and Xylenes where the DWS and EQS values has been adopted, respectively. Detection Limit (DL) is used where a standard has not been derived. SoBRA have calculated the risks from vapour inhalation from volatile dissolved phase contaminants for residential and commercial human health receptors.

Adopted Controlled Water Targets (mg/l)

Contaminant Concern	of	EAL	Source	SoBRA Res	SoBRA Comm
Total Phenols		0.0077	UK WFD	-	-
Cyanide		0.05	UK WSR	-	-
Naphthalene		0.002	UK WFD	-	-
Acenaphthylene		0.0001	UK WSR	-	-
Acenaphthene		0.0001	UK WSR	-	-
Fluorene		0.0001	UK WSR	-	-
Phenanthrene		0.0001	UK WSR	-	-
Anthracene		0.0001	UK WSR	-	-
Fluoranthene		0.0001	UK WSR	-	-
Pyrene		0.0001	UK WSR	-	-
Benzo(a)anthracene		0.0001	UK WSR	-	-
Chrysene		0.0001	UK WSR	-	-
Benzo(b)fluoranthene		0.0001	UK WSR	-	-
Benzo(k)fluoranthene		0.0001	UK WSR	-	-
Benzo(a)pyrene		0.00001	UK WSR	-	-
Indeno(1,2,3-cd)pyrene		0.0001	UK WSR	-	-
Dibenz(a,h)anthracene		0.0001	UK WSR	-	-
Benzo(ghi)perylene		0.0001	UK WSR	-	-
Arsenic		0.01	UK WSR	-	-
Boron		1	UK WSR	-	-
Cadmium		0.005	UK WSR	-	-
Chromium		0.05	UK WSR	-	-
Copper		2	UK WSR	-	-
Lead		0.01	UK WSR	-	-
Mercury		0.001	UK WSR	-	-
Nickel		0.02	UK WSR	-	-
Selenium		0.01	UK WSR	-	-
Zinc		0.0123	UK WFD	-	-
Benzene		0.001	UK WSR	0.21	20
Toluene		0.074	UK WFD	230	21000
Ethylbenzene		0.02	UK EQS	10	960
Xylenes (sum)		0.03	UK EQS	31.4	3020
MTBE		DL	WDE	-	-
TPH - Aliphatic >C5 - C6		0.01	UK DWS	1.9	190
TPH - Aliphatic >C6 - C8		0.01	UK DWS	1.5	150

¹³ The Water Framework Directive (Standards and Classifications) Directions (England and Wales). 2015.

¹⁴ The Water Supply (Water Quality) Regulations. 2016.

GROUNDED SOLUTIONS

TPH - Aliphatic >C8 - C10	0.01	UK DWS	0.057	5.7
TPH - Aliphatic >C10 - C12	0.01	UK DWS	0.037	3.6
TPH - Aliphatic >C12 - C16	0.01	UK DWS	-	-
TPH - Aliphatic >C16 - C21	0.01	UK DWS	-	-
TPH - Aliphatic >C21 - C35	0.01	UK DWS	-	-
TPH - Aromatic >C5 - C7	0.01	UK DWS	210	20000
TPH - Aromatic >C7 - C8	0.01	UK DWS	220	21000
TPH - Aromatic >C8 - C10	0.01	UK DWS	1.9	190
TPH - Aromatic >C10 - C12	0.01	UK DWS	6.8	660
TPH - Aromatic >C12 - C16	0.01	UK DWS	39	3700
TPH - Aromatic >C16 - C21	0.01	UK DWS	-	-
TPH - Aromatic >C21 - C35	0.01	UK DWS	-	-

GROUND GAS

The following relevant guidance will be used to assess the risks posed by ground gas:

- CIRIA Assessing risks posed by hazardous ground gases to buildings¹⁵
- NHBC: Guidance on evaluation of development proposals on sites where methane and carbon dioxide are present¹⁶
- NHBC: Technical Extra¹⁷
- The Building Regulations Site Preparation and resistance to contaminants and moisture. ¹⁸
- British Standard. Guidance on Investigations for Ground Gas¹⁹
- NHBC guidance on Hazardous ground gas²⁰

The 2007 CIRIA guidance calculates a gas screening value to identify the protective measures required, as shown below.

Summary of CIRIA 2007 Guidance

Characterisation Situation	Risk Classification	Gas Screening Value (l/hr)	Typical Factors	Protective Measure
1	Very Low	<0.07	Methane <1% or carbon dioxide <5%; otherwise increase to Situation 2	No special precautions (See recommendation)
2	Low	<0.7	Air Flow rate <70l/hr; otherwise increase to Situation 3	Block and beam with 2,000g, Cast in situ with 1,200g. All joints and penetrations sealed
3	Moderate	<3.5	-	As above but with gas resistant membranes and passively ventilated or positive pressured sub-floor void

¹⁵ CIRIA 2007. Assessing Risks Posed by Hazardous Ground Gases to Buildings. C665

¹⁶ NHBC 2007. Guidance on Evaluation of Development Proposals on Sites where methane and carbon dioxide are present

¹⁷ NHBC 2016. Technical Extra. Ground Gas Update. April 2016. Issue 20

¹⁸ Building Regulations 2004. Approved Document C, Site Preparation and resistance to contaminants and moisture.

¹⁹ British Standards 2013. Guidance on Investigation for Ground Gas. BS8576. 2013

²⁰ NHBC 2023. Hazardous Ground Gas – an essential guide for housebuilders. NF94

GROUNDED SOLUTIONS

4	Moderate to High	<15	QRA recommended	As above but with oversite capping, in-ground venting layer and in ground wells or barriers
5 – 6	High to Very High	<70		Not suitable unless gas regime is reduced first and QRA completed

Summary of NHBC Traffic Light System

Gas Regime	Methane		Carbon Dioxide	
	Typical max %	Gas Screening Value (U/hr)	Typical max %	Gas Screening Value (U/hr)
Green	<1	<0.16	<5	<0.78
Amber 1	1 – 5	0.16 – 0.63	5 – 10	0.78 – 1.56
Amber 2	5 – 20	0.63 – 1.56	10 – 30	1.56 – 3.13
Red	20+	1.56+	30+	3.13+

UK WATER SUPPLY PIPES

The following guidance has been followed for the selection of water supply pipes:

- UKWIR Guidance for the selection of Water Supply Pipes²¹
- Water UK Contaminated Land Assessment Guidance²²

These mainly apply to brownfield sites, although may apply to greenfield sites should the preliminary risk assessment identify there is a potential for contamination to be present.

WASTE MANAGEMENT

The EU Waste Framework Directive 2008 presents the legislative framework for the collection, transport, recovery, and disposal of waste. This framework provides a five-step hierarchical plan for managing waste comprising prevention, preparing for re-use, recycling, recovery, and disposal, which have been made into UK law via the UK Waste Regulations 2011. This requires all businesses/organisations that either produces or handles waste to either prevent waste or to apply the waste hierarchy for the transfer of waste. The Environment Protection (Duty of Care) Regulations 1991 require that transfer notes are used to identify the type of waste, volume, source and intended destination along with the details of the licensed carrier.

²¹ UK Water Industry Research 2011. Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites. 10/WM/03/21.

²² Water UK 2014. Contaminated Land Assessment Guidance.

The Agency have published guidance on the classification of Hazardous Waste²³, which defines how man-made materials are classified as being hazardous by exceeding at least one of the fifteen hazardous properties (H1 to H15). Man Made materials can either be absolute hazardous, absolute non-hazardous or mirror and if mirror then an assessment needs to be made as to whether the materials poses any of the hazardous properties before classifying the materials as being either hazardous or non-hazardous. The Agency has also published guidance on the Waste Acceptance at Landfills²⁴. Landfills are classified as to whether they can accept hazardous, non-hazardous, or inert materials. Waste Acceptance Criteria (WAC) thresholds have been set to determine the class of landfill that can accept the materials. Disposal of hazardous materials requires pre-treatment. WAC limits are not to be used for determining whether waste is hazardous.

The CL:AIRE CoP of the Definition of Waste²⁵ was developed to provide clarity on when the reuse of site won materials will cease to be waste. It requires the development of Material Management Plan (MMP) that is specific to the site and the intended reuse of materials. The MMP will need to be based on a site specific Remedial Strategy/Design Statement that will demonstrate that the reuse of the site won materials will not pose an unacceptable risk to sensitive receptors. There will then need to be a requirement for verification that the proposed reuse has been carried out as was planned.

CLIMATE CHANGE

The UK has signed up to achieving a net zero target by 2050 under the COP 21 Paris Agreement in 2015, which requires all industry to reduce its emissions by 78% by 2035 compared to 1990 levels. Approximately 1.25% of the UK total greenhouse gases are attributable to the built environment, with CO2 emissions amounting to 40-50million tonnes, more than for aviation and shipping combined²⁶. The use of low carbon materials, retrofitting old ones and the need for considering whole-life carbon of new buildings needs to be balanced with the need for additional housing.

The National Planning Policy Framework (NPPF) and LCRM advocates the adoption of sustainable development practices. The Sustainable Management Practices for the Management of Land Contamination issued in 2021 by CL:AIRE/SuRF-UK promote sustainability principles for all aspects of land contamination management, a summary of which is provided below.

²³ Environment Agency. 2013. Interpretation of the Definition and Classification of Hazardous Waste. Technical Guidance WM2

²⁴ Environment Agency. 2010 Waste Acceptance at Landfills. Version 1.

²⁵ CL:AIRE 2001. The Definition of Waste: Development Industry Code of Practice. Version 2.

²⁶ UK Parliament. Building to new zero: costing carbon in construction. First Report of Session 2022-23

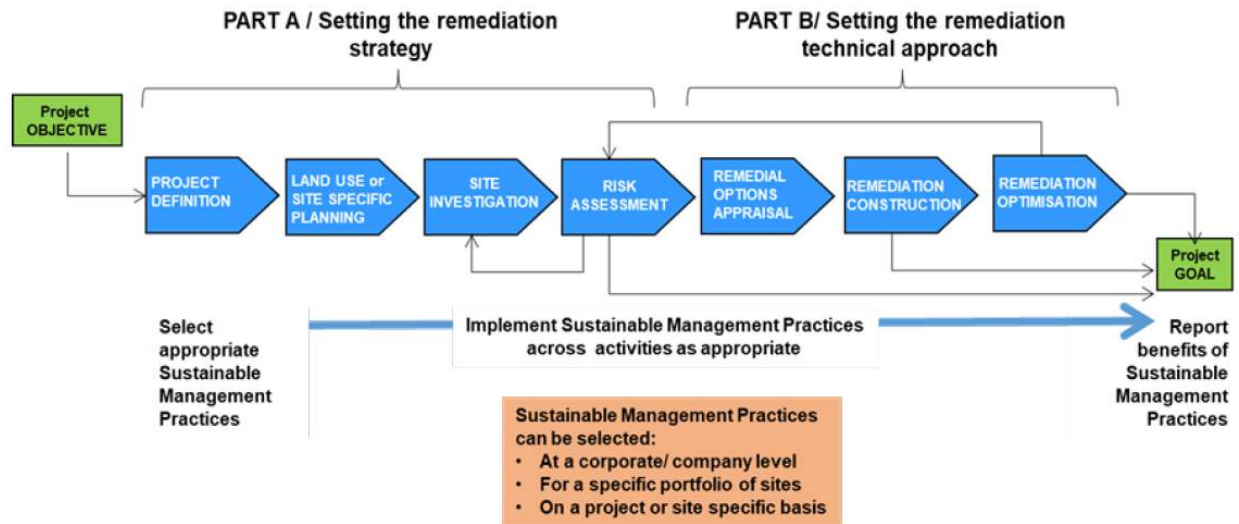


Figure 2.1: Application of sustainable management practices in context of life cycle of land contamination management and SuRF UK Framework

GROUND ENGINEERING

In accordance with BS-EN-1997-1 2004 Geotechnical Design: General Rules, engineering parameters for use in geotechnical design have been assessed using a three-step process:

1. Compilation of test data to determine a range of values for each relevant engineering parameter either by using direct results, geotechnical theory/correlations, or empiricism
2. Use of engineering judgement to determine a characteristic value for each parameter
3. Application of partial factors to give a design value for each parameter

Geotechnical site assessments were carried out in accordance where practical with the recommendations of BS EN 1997:2 2007 Eurocode 7 Geotechnical Design: Ground Investigation and Testing. This report has been written in line with the requirements of a Ground Investigation Report (GIR) as set out in BS EN 1997:2 and does not constitute a Geotechnical Design Report.

DESICCATION TESTING

There are a number of methods for determining desiccation in clay soils. These include:

Driscoll's Method

Following laboratory testing of cohesive soils, the most commonly accepted method for determining the degree of desiccation²⁷ is Richard Driscoll's method that significant desiccation has occurred when the moisture content is less than 0.4 x the liquid limit.

²⁷ BRE 1996. Desiccation in clay soils. Digest 412.

Weeks' Method

Another method for determining desiccation and first developed by Dr Alan Weeks, involves the use of a pocket penetrometer with measurements taken directly on borehole core samples²⁸. The depth and extent of desiccation is assessed by comparison of penetrometer readings against a control. An assessment of desiccation can be made by comparing the results of each borehole to the profile representing equilibrium conditions for London Clay, however the technique should equally be applicable to any stiff, over consolidated, shrinkable clay and has been used successfully for Gault, Weald and Wadhurst Clays.

Liquidity Index from BRE412²⁷

To overcome issues with control boreholes and local variations in soil, it may be possible to plot the results in terms of the soil's Liquidity Index and comparing profiles of the resulting values. A value of 0 means that the soil's water content is at the Plastic Limit, while negative values indicate that the soil is drier than the Plastic Limit. Apart from these difficulties, this method often works reasonably well, and the information obtained can be used to estimate the ground heave potential.

SOAKAGE TESTING AND DESIGN

The following guidance has been followed during the soakage testing:

- Falling Head Tests in boreholes – BS5930⁶
- BRE Digest 365 2003 Soakage testing

The CIRIA publication²⁹ provides guidance as to the required distance of buildings from soakages to ground in chalk as follows:

- 20m distance of soakaways from buildings where dissolution features are known to be prevalent
- 10m distance of soakaways from buildings where chalk is low density or unknown
- 5m distance of soakaways from buildings where chalk is of medium to high density

EFFECTS OF TREES AND SHRINKABLE MATERIALS ON FOUNDATION DEPTHS

The following guidance has been followed for determining the foundation depths:

- NHBC Standards 2010 Part 4 Foundations

²⁸ Proceedings of The Institute of Civil Engineers: Geotechnical Engineering. 1995,113, 25-30

²⁹ CIRIA. 2002. Engineering in Chalk. C574.

This document includes guidance on likely foundation depth required when taking into account the volume change potential of materials in combination with the distance to different tree species (height and water demand status).

PRELIMINARY ROAD DESIGN PARAMETERS

The following guidance has been followed for the preliminary likelihood of frost susceptible soils affecting the site:

- Transport and Road Research Laboratory (1970) (TRRL)

APPENDIX B: SITE PHOTOS

Photo 1 - AST within Building 1



Photo 2 - Building 2



Photo 3 - Building 3 (cattle sheds)



Photo 4 - Building 4 (grain storage)



Photo 5 - Building 5



Photo 6 - Offsite AST



Photo 7 - Window sampler at BH2









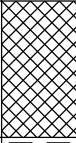
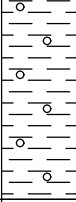
Photo 8 - BRE365 test being undertake in TP3



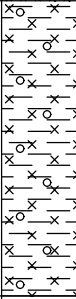







APPENDIX C: ENVIRONMENTAL [DATABASE](#)

APPENDIX D: FIELD LOGS

		62a Western Road Tring, Hertfordshire HP23 4BB Tel. 01442 825570 Fax. 01442 891410			Site Somerton, Ox		Borehole Number BH1		
Excavation Method Window Sampler		Dimensions		Ground Level (mOD)		Client Laxton Properties		Job Number 21318	
		Location		Dates 06/08/2024		Engineer JF/CB		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	DESCRIPTION	Legend	Water	Instr
0.32	J1				(0.40)	Soft brown gravelly cobbly CLAY. Gravels are fine to coarse angular limestone (POSSIBLY REWORKED)			
1.00	D1 PP=160 SPT N=119	2,2/10,27,41,41			(0.90)	Soft to firm pale brown calcareous CLAY with occasional shell fragments			
					1.30	1.00 ...becoming firm by 1.0m			
					1.45	Moderately weak to strong off-white/brown highly weathered LIMESTONE. Refusal on limestone bedrock			
						Complete at 1.45m			
Remarks Groundwater not encountered							Scale (approx) 1:50	Logged By	Figure Number 21318.BH1

		62a Western Road Tring, Hertfordshire HP23 4BB Tel. 01442 825570 Fax. 01442 891410			Site Somerton, Ox		Borehole Number BH2		
Excavation Method Window Sampler		Dimensions		Ground Level (mOD)		Client Laxton Properties		Job Number 21318	
		Location		Dates 06/08/2024		Engineer JF/CB		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	DESCRIPTION	Legend	Water	Instr
0.70	J1				0.20	Soft brown CLAY (POSSIBLY REWORKED)			
1.00	B2 SPT N=8		1,1/2,2,2,2		(0.90)	MADE GROUND: Soft brown silty gravelly CLAY with bituminous material and suspected asbestos			
					1.10	Firm brown gravelly CLAY. Gravels are fine to coarse subangular to subrounded limestone			
2.00	SPT N=12		2,2/3,3,3,3		(1.35)				
					2.45	Complete at 2.45m			
Remarks Groundwater not encountered							Scale (approx) 1:50	Logged By	Figure Number 21318.BH2

		62a Western Road Tring, Hertfordshire HP23 4BB Tel. 01442 825570 Fax. 01442 891410			Site Somerton, Ox		Borehole Number BH3		
Excavation Method Window Sampler		Dimensions		Ground Level (mOD)		Client Laxton Properties		Job Number 21318	
		Location		Dates 06/08/2024		Engineer JF/CB		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	DESCRIPTION	Legend	Water	Instr
0.20	J1				0.35	MADE GROUND: Brown gravelly clay with bituminous material			
1.00	D2 PP=275 SPT N=12	2,3/3,3,3,3			(1.95)	Soft to stiff brown silty gravelly CLAY. Gravels are coarse, subangular			
2.00	D3 PP=150				2.30	Refusal on limestone bedrock Complete at 2.30m			
Remarks Groundwater not encountered							Scale (approx) 1:50	Logged By	Figure Number 21318.BH3

			62a Western Road Tring, Hertfordshire HP23 4BB Tel. 01442 825570 Fax. 01442 891410			Site Somerton, Ox			Borehole Number BH4	
Excavation Method Window Sampler		Dimensions		Ground Level (mOD)		Client Laxton Properties			Job Number 21318	
		Location		Dates 06/08/2024		Engineer JF/CB			Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	DESCRIPTION	Legend	Water	Instr	
0.15	J1				0.25	MADE GROUND: Soft brown silty gravelly clay with bituminous material and red brick fragments				
					(0.55)	Soft to firm light brown/yellow slightly sandy gravelly CLAY. Gravels are fine, subrounded to subangular limestone				
1.00	D2				0.80	Moderately weak to strong off-white highly weathered LIMESTONE.				
					1.10	Refusal on limestone bedrock				
						Complete at 1.10m				
Remarks Groundwater not encountered							Scale (approx) 1:50	Logged By	Figure Number 21318.BH4	



62a Western Road
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HP23 4BB
Tel. 01442 825570
Fax. 01442 891410


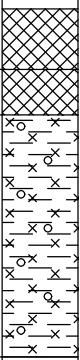
Site
Somerton, Ox

Borehole Number
HP1

Excavation Method Inspection pit	Dimensions	Ground Level (mOD)	Client Laxton Properties	Job Number 21318
	Location	Dates 06/08/2024	Engineer JF/CB	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	DESCRIPTION	Legend	Water
0.40	J1				0.05 0.25 0.50	CONCRETE MADE GROUND: Hardcore fill with limestone Brown clayey gravelly SILT. Gravels are fine to coarse subrounded Complete at 0.50m		

Plan 	Remarks		
	Scale (approx) 1:50	Logged By	Figure Number 21318.HP1

			62a Western Road Tring, Hertfordshire HP23 4BB Tel. 01442 825570 Fax. 01442 891410			Site Somerton, Ox		Borehole Number TP1			
Excavation Method Trial pit/trench		Dimensions		Ground Level (mOD)		Client Laxton Properties		Job Number 21318			
		Location		Dates 06/08/2024		Engineer JF/CB		Sheet 1/1			
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	DESCRIPTION		Legend	Water		
2.00	B1				0.40	MADE GROUND: Hardcore fill with bituminous material					
					0.40	MADE GROUND: Dark brown silty sandy gravelly clay with red brick fragments					
					0.70	Soft to firm brown silty gravelly calcareous CLAY. Gravels are fine to coarse subangular to subrounded limestone					
					1.60						
					2.30	Refusal on limestone bedrock Complete at 2.30m					
Plan						Remarks Groundwater not encountered					
						Scale (approx) 1:50		Logged By		Figure Number 21318.TP1	



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HP23 4BB
Tel. 01442 825570
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Site
Somerton, Ox

Borehole Number
TP2

Excavation Method Trial pit/trench	Dimensions	Ground Level (mOD)	Client Laxton Properties	Job Number 21318
	Location	Dates 06/08/2024	Engineer JF/CB	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	DESCRIPTION	Legend	Water
					0.30	MADE GROUND: Hardcore fill with bituminous material		
					(0.40)	MADE GROUND: Dark brown silty sandy gravelly clay with red brick fragments and bituminous material		
					0.70	Soft to firm brown silty gravelly calcareous CLAY. Gravels are fine to coarse subangular to subrounded limestone		
					(1.50)			
					2.20	Refusal on limestone bedrock		
						Complete at 2.20m		

Plan	Remarks Groundwater not encountered		
	<table border="1"> <tr> <td>Scale (approx) 1:50</td> <td>Logged By</td> <td>Figure Number 21318.TP2</td> </tr> </table>	Scale (approx) 1:50	Logged By
Scale (approx) 1:50	Logged By	Figure Number 21318.TP2	



62a Western Road
Tring, Hertfordshire
HP23 4BB
Tel. 01442 825570
Fax. 01442 891410

Site
Somerton, Ox

Borehole Number
TP3

Excavation Method Trial pit/trench	Dimensions	Ground Level (mOD)	Client Laxton Properties	Job Number 21318
	Location	Dates 06/08/2024	Engineer JF/CB	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	DESCRIPTION	Legend	Water
					0.40	Soft brown gravelly cobbly CLAY. Gravels are fine to coarse angular limestone (POSSIBLY REWORKED)		
					0.90	Soft to firm pale brown calcareous CLAY with occasional shell fragments		
					1.30	Moderately weak to strong off-white/brown highly weathered LIMESTONE.		
					1.50	Refusal on limestone bedrock		
						Complete at 1.50m		

Plan 	Remarks Groundwater not encountered		
	Scale (approx) 1:50	Logged By	Figure Number 21318.TP3

APPENDIX E: FIELD SHEETS

Permeability Sheets

APPENDIX F: ANALYTICAL TEST RESULTS



WDE Consulting Ltd
62a Western Road
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Hertfordshire
HP23 4BB

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WD18 8YS

t: 01442 825570

t: 01923 225404

e: results@wdeconsulting.co.uk

f: 01923 237404

e: reception@i2analytical.com

Analytical Report Number : 24-034702

Project / Site name:	Somerton, Ox	Samples received on:	06/08/2024
Your job number:	21318	Samples instructed on/ Analysis started on:	06/08/2024
Your order number:	24 313	Analysis completed by:	22/08/2024
Report Issue Number:	1	Report issued on:	22/08/2024
Samples Analysed:	5 soil samples - 1 bulk sample		

Signed: 

Rafał Szczepańczyk
Technical Reviewer
For & on behalf of i2 Analytical Ltd.

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

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

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

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

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

Analytical Report Number: 24-034702
 Project / Site name: Somerton, Ox
 Your Order No: 24 313

Lab Sample Number	278817	278818	278819	278821	278822
Sample Reference	HP1/J1	BH1/J1	BH2/J1	BH3/J1	BH4/J1
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	0.40	0.30	0.70	0.20	0.15
Date Sampled	06/08/2024	06/08/2024	06/08/2024	06/08/2024	06/08/2024
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status		

Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	11	11	6.7	13	3.5
Total mass of sample received	kg	0.1	NONE	0.8	0.9	0.8	0.9	0.8

Asbestos

Asbestos in Soil Detected/Not Detected	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	EWS	EWS	SSZ	EWS	EWS

General Inorganics

pH (L099)	pH Units	N/A	MCERTS	8.1	8.4	9.7	8.2	8.7
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Sulphate as SO ₄	%	0.005	MCERTS	0.064	0.123	0.073	0.077	0.121
Water Soluble Sulphate as SO ₄ 16hr extraction (2:1)	mg/kg	2.5	MCERTS	53	54	88	120	110
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	26.3	27	44.1	61.4	55.8
Sulphide	mg/kg	1	MCERTS	< 1.0	3.5	59	8.8	30
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	0.7	2.4	5.6	2.3	4.6

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.84	< 0.05	0.19
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	2.4	< 0.05	0.77
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	0.06	8.4	0.22	1.4
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	6.4	0.16	0.96
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	0.39	49	0.43	11
Anthracene	mg/kg	0.05	MCERTS	< 0.05	0.15	25	0.15	3.9
Fluoranthene	mg/kg	0.05	MCERTS	0.09	1.7	180	0.36	31
Pyrene	mg/kg	0.05	MCERTS	0.08	1.6	160	0.29	30
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	0.68	78	< 0.05	18
Chrysene	mg/kg	0.05	MCERTS	< 0.05	0.78	72	0.1	20
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05	0.97	96	0.17	28
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05	0.41	38	0.08	12
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	0.89	83	< 0.05	24
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	0.47	44	< 0.05	13
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	0.11	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	0.54	46	0.13	15

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	< 0.80	8.67	888	2.08	208
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Analytical Report Number: 24-034702
 Project / Site name: Somerton, Ox
 Your Order No: 24 313

Lab Sample Number	278817	278818	278819	278821	278822
Sample Reference	HP1/J1	BH1/J1	BH2/J1	BH3/J1	BH4/J1
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	0.40	0.30	0.70	0.20	0.15
Date Sampled	06/08/2024	06/08/2024	06/08/2024	06/08/2024	06/08/2024
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status		

Heavy Metals / Metalloids

Element	Units	Test Limit of detection	Test Accreditation Status	278817	278818	278819	278821	278822
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	13	12	11	13	9.8
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	1	0.74	0.71	0.73	0.99
Boron (water soluble)	mg/kg	0.2	MCERTS	1.1	1.9	0.5	1.5	1.1
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	0.5	< 0.2	< 0.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	31	20	28	23	19
Copper (aqua regia extractable)	mg/kg	1	MCERTS	11	9.7	17	13	27
Lead (aqua regia extractable)	mg/kg	1	MCERTS	13	21	32	31	34
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	20	14	9.7	14	11
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	1.4	1	1.3	1.1	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	55	38	48	41	51
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	50	51	52	54	62

Petroleum Hydrocarbons

Parameter	Units	Test Limit of detection	Test Accreditation Status	278817	278818	278819	278821	278822
TPHCWG - Aliphatic >EC5 - EC6 HS_1D_AL	mg/kg	0.01	MCERTS	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
TPHCWG - Aliphatic >EC6 - EC8 HS_1D_AL	mg/kg	0.01	MCERTS	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
TPHCWG - Aliphatic >EC8 - EC10 HS_1D_AL	mg/kg	0.01	MCERTS	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
TPHCWG - Aliphatic >EC10 - EC12 EH_CU_1D_AL	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPHCWG - Aliphatic >EC12 - EC16 EH_CU_1D_AL	mg/kg	2	MCERTS	< 2.0	< 2.0	36	< 2.0	8.5
TPHCWG - Aliphatic >EC16 - EC21 EH_CU_1D_AL	mg/kg	8	MCERTS	< 8.0	< 8.0	110	< 8.0	39
TPHCWG - Aliphatic >EC21 - EC35 EH_CU_1D_AL	mg/kg	8	MCERTS	< 8.0	< 8.0	700	< 8.0	280
TPHCWG - Aliphatic >EC35 - EC44 EH_CU_1D_AL	mg/kg	8.4	NONE	< 8.4	< 8.4	440	10	290
TPHCWG - Aliphatic >EC5 - EC35 EH_CU+HS_1D_AL	mg/kg	10	NONE	< 10	< 10	850	< 10	320
TPHCWG - Aliphatic >EC5 - EC44 EH_CU+HS_1D_AL	mg/kg	10	NONE	< 10	< 10	1300	10	610

Parameter	Units	Test Limit of detection	Test Accreditation Status	278817	278818	278819	278821	278822
TPHCWG - Aromatic >EC5 - EC7 HS_1D_AR	mg/kg	0.01	MCERTS	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
TPHCWG - Aromatic >EC7 - EC8 HS_1D_AR	mg/kg	0.01	MCERTS	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
TPHCWG - Aromatic >EC8 - EC10 HS_1D_AR	mg/kg	0.02	MCERTS	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
TPHCWG - Aromatic >EC10 - EC12 EH_CU_1D_AR	mg/kg	1	MCERTS	< 1.0	< 1.0	1.8	< 1.0	1.4
TPHCWG - Aromatic >EC12 - EC16 EH_CU_1D_AR	mg/kg	2	MCERTS	< 2.0	2.2	110	< 2.0	17
TPHCWG - Aromatic >EC16 - EC21 EH_CU_1D_AR	mg/kg	10	MCERTS	< 10	14	1800	< 10	240
TPHCWG - Aromatic >EC21 - EC35 EH_CU_1D_AR	mg/kg	10	MCERTS	< 10	41	3700	< 10	1000
TPHCWG - Aromatic >EC35 - EC44 EH_CU_1D_AR	mg/kg	8.4	NONE	< 8.4	9.1	1400	< 8.4	900
TPHCWG - Aromatic >EC5 - EC35 EH_CU+HS_1D_AR	mg/kg	10	NONE	< 10	57	5600	< 10	1300
TPHCWG - Aromatic >EC5 - EC44 EH_CU+HS_1D_AR	mg/kg	10	NONE	< 10	66	7000	< 10	2200

VOCS

Parameter	Units	Test Limit of detection	Test Accreditation Status	278817	278818	278819	278821	278822
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Benzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Toluene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
p & m-Xylene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
o-Xylene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0

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



Analytical Report Number: 24-034702

Project / Site name: Somerton, Ox

Your Order No: 24 313

Lab Sample Number				278820
Sample Reference				BH2/B2
Sample Number				None Supplied
Depth (m)				1.00
Date Sampled				06/08/2024
Time Taken				None Supplied
Analytical Parameter (Bulk Analysis)	Units	Test Limit of detection	Test Accreditation Status	

Asbestos

Asbestos in bulks	Type	N/A	ISO 17025	Detected
Asbestos Analyst ID	N/A	N/A	N/A	EWS
Actinolite detected	Type	N/A	ISO 17025	Not-detected
Amosite detected	Type	N/A	ISO 17025	Not-detected
Anthophyllite detected	Type	N/A	ISO 17025	Not-detected
Chrysotile detected	Type	N/A	ISO 17025	Detected
Crocidolite detected	Type	N/A	ISO 17025	Not-detected
Tremolite detected	Type	N/A	ISO 17025	Not-detected

Asbestos Containing Material Types Detected (ACM)	Type	N/A	ISO 17025	Asbestos Cement
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U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number : 24-034702

Project / Site name: Somerton, Ox

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

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

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
278817	HP1/J1	None Supplied	0.4	Brown clay and sand with gravel
278818	BH1/J1	None Supplied	0.3	Brown loam and clay with gravel
278819	BH2/J1	None Supplied	0.7	Brown loam with gravel and vegetation
278821	BH3/J1	None Supplied	0.2	Brown clay and loam with gravel and vegetation
278822	BH4/J1	None Supplied	0.15	Brown loam with gravel and vegetation

Analytical Report Number : 24-034702

Project / Site name: Somerton, Ox

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in Bulks	Asbestos Identification in bulk material with the use of polarised light microscopy in conjunction with dispersion staining techniques	In-house method based on HSG 248, 2021	A001B	W	ISO 17025
Asbestos identification in Soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques	In-house method based on HSG 248, 2021	A001B	D	ISO 17025
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate (Walkley Black Method)	In-house method	L009B	D	MCERTS
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode	In-house method	L010	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically (up to 30°C)	In-house method	L019B	W	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight	In-house method based on British Standard Methods and MCERTS requirements.	L019B	D	NONE
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil	L038B	D	MCERTS
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES	In-house method based on Second Site Properties version 3	L038B	D	MCERTS
Total sulphate (as SO ₄ in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES	In-house method	L038B	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Sulphate, water soluble, in soil (16hr extraction)	In-house method	L038B	D	MCERTS
Speciated PAHs and/or Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds (including PAH) in soil by extraction in dichloromethane and hexane followed by GC-MS	In-house method based on USEPA 8270	L064B	D	MCERTS
BTEX and/or Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS	In-house method based on USEPA 8260	L073B	W	MCERTS
Total petroleum hydrocarbons with carbon banding by GC-FID/GC-MS HS in soil	Determination of total petroleum hydrocarbons in soil by GC-FID/GC-MS HS with carbon banding aliphatic and aromatic	In-house method	L076B/L088	D/W	MCERTS
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080	W	MCERTS
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080	W	MCERTS

Analytical Report Number : 24-034702

Project / Site name: Somerton, Ox

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement	In-house method	L099	D	MCERTS

For method numbers ending in 'UK' or 'A' analysis have been carried out in our laboratory in the United Kingdom (Watford).

For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).

For method numbers ending in 'PL' or 'B' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

Quality control parameter failure associated with individual result applies to calculated sum of individuals.

The result for sum should be interpreted with caution

WDE Standard QRA Suite

	No. of Samples	Unit	Target Concentration	Source	Min	Max	No. That Exceed	Sample Ref	HP1/J1	BH1/J1	BH2/J1	BH3/J1	BH4/J1
								Type	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
			Residential with hgp					Depth	0.40	0.30	0.70	0.20	0.15
								Date	06/08/2024	06/08/2024	06/08/2024	06/08/2024	06/08/2024
								ACM Lab	EWS	EWS	SSZ	EWS	EWS
Moisture Content	5	%	-						11	11	6.7	13	3.5
Asbestos	0	N/A	DL	WDE									
Asbestos Quantification	5	%	0.001	HSE	0	BDL	0		Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
pH	5	pH Units	-	-	8.1	9.7	0		8.1	8.4	9.7	8.2	8.7
Total Cyanide	5	mg/kg	50	DIV	0	BDL	0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Sulphate Total	5	%	-	-	0.064	0.123	-		0.064	0.123	0.073	0.077	0.121
Sulphate as SO ₄	0	g/l	-	-	0	BDL	-						
Sulphide	5	mg/kg	-	-	3.5	59	-		< 1.0	3.5	59	8.8	30
Total Organic Carbon (TOC)	5	%	-	-	0.7	5.6	-		0.7	2.4	5.6	2.3	4.6
Total Phenols (monohydric)	5	mg/kg	280	LQM	0	BDL	0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Naphthalene	5	mg/kg	2.3	LQM	0.19	0.84	0		< 0.05	< 0.05	0.84	< 0.05	0.19
Acenaphthylene	5	mg/kg	170	LQM	0.77	2.4	0		< 0.05	< 0.05	2.4	< 0.05	0.77
Acenaphthene	5	mg/kg	210	LQM	0.06	8.4	0		< 0.05	0.06	8.4	0.22	1.4
Fluorene	5	mg/kg	170	LQM	0.16	6.4	0		< 0.05	< 0.05	6.4	0.16	0.96
Phenanthrene	5	mg/kg	95	LQM	0.39	49	0		< 0.05	0.39	49	0.43	11
Anthracene	5	mg/kg	2400	LQM	0.15	25	0		< 0.05	0.15	25	0.15	3.9
Fluoranthene	5	mg/kg	280	LQM	0.09	180	0		0.09	1.7	180	0.36	31
Pyrene	5	mg/kg	620	LQM	0.08	160	0		0.08	1.6	160	0.29	30
Benzo(a)anthracene	5	mg/kg	7.2	LQM	0.68	78	2		< 0.05	0.68	78	< 0.05	18
Chrysene	5	mg/kg	15	LQM	0.1	72	2		< 0.05	0.78	72	0.1	20
Benzo(b)fluoranthene	5	mg/kg	2.6	LQM	0.17	96	2		< 0.05	0.97	96	0.17	28
Benzo(k)fluoranthene	5	mg/kg	77	LQM	0.08	38	0		< 0.05	0.41	38	0.08	12
Benzo(a)pyrene	5	mg/kg	2.2	LQM	0.89	83	2		< 0.05	0.89	83	< 0.05	24
Indeno(1,2,3-cd)pyrene	5	mg/kg	27	LQM	0.47	44	1		< 0.05	0.47	44	< 0.05	13
Dibenz(a,h)anthracene	5	mg/kg	0.24	LQM	0.11	0.11	0		< 0.05	0.11	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	5	mg/kg	320	LQM	0.13	46	0		< 0.05	0.54	46	0.13	15
Total EPA-16 PAHs	0	mg/kg	-	-	0	BDL	0						
Arsenic (dissolved)	5	mg/kg	37	LQM	9.8	13	0		13	12	11	13	9.8
Beryllium	5	mg/kg	1.7	LQM	0.71	1	0		1	0.74	0.71	0.73	0.99
Boron (dissolved)	5	mg/kg	290	LQM	0.5	1.9	0		1.1	1.9	0.5	1.5	1.1
Cadmium (dissolved)	5	mg/kg	11	LQM	0.5	0.5	0		< 0.2	< 0.2	0.5	< 0.2	< 0.2
Chromium (dissolved)	5	mg/kg	910	LQM	19	31	0		31	20	28	23	19
Copper (dissolved)	5	mg/kg	2400	LQM	9.7	27	0		11	9.7	17	13	27
Lead (dissolved)	5	mg/kg	210	CASL	13	34	0		13	21	32	31	34
Mercury (dissolved)	5	mg/kg	40	LQM	0	BDL	0		< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (dissolved)	5	mg/kg	180	LQM	9.7	20	0		20	14	9.7	14	11
Selenium (dissolved)	5	mg/kg	250	LQM	1	1.4	0		1.4	1	1.3	1.1	< 1.0
Vanadium	5	mg/kg	410	LQM	38	55	0		55	38	48	41	51
Zinc (dissolved)	5	mg/kg	3700	LQM	50	62	0		50	51	52	54	62
Benzene	5	mg/kg	0.087	LQM	0	BDL	0		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Toluene	5	mg/kg	130	LQM	0	BDL	0		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Ethylbenzene	5	mg/kg	47	LQM	0	BDL	0		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Xylenes (o)	5	mg/kg	60	LQM	0	BDL	0		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Xylenes (m p)	5	mg/kg	56	LQM	0	BDL	0		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
MTBE (Methyl Tertiary Butyl Ether)	5	mg/kg	49	CLAIRE	0	BDL	0		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Total Petroleum Hydrocarbons	0	mg/kg	-	-	0	BDL	0						
TPH-CWG - Aliphatic >C5 - C6	5	mg/kg	42	LQM	0	BDL	0		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
TPH-CWG - Aliphatic >C6 - C8	5	mg/kg	100	LQM	0	BDL	0		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
TPH-CWG - Aliphatic >C8 - C10	5	mg/kg	27	LQM	0	BDL	0		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
TPH-CWG - Aliphatic >C10 - C12	5	mg/kg	130	LQM	0	BDL	0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C12 - C16	5	mg/kg	1100	LQM	8.5	36	0		< 2.0	< 2.0	36	< 2.0	8.5
TPH-CWG - Aliphatic >C16 - C21	5	mg/kg	65000	LQM	39	110	0		< 8.0	< 8.0	110	< 8.0	39
TPH-CWG - Aliphatic >C21 - C35	5	mg/kg	65000	LQM	280	700	0		< 8.0	< 8.0	700	< 8.0	280
TPH-CWG - Aliphatic >C35 - C44	5	mg/kg	65000	LQM	10	440	0		< 8.4	< 8.4	440	10	290
Total Aliphatic Hydrocarbons	0	mg/kg	-	-	0	BDL	0						
TPH-CWG - Aromatic >C5 - C7	5	mg/kg	70	LQM	0	BDL	0		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
TPH-CWG - Aromatic >C7 - C8	5	mg/kg	130	LQM	0	BDL	0		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
TPH-CWG - Aromatic >C8 - C10	5	mg/kg	34	LQM	0	BDL	0		< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
TPH-CWG - Aromatic >C10 - C12	5	mg/kg	74	LQM	1.4	1.8	0		< 1.0	< 1.0	1.8	< 1.0	1.4
TPH-CWG - Aromatic >C12 - C16	5	mg/kg	140	LQM	2.2	110	0		< 2.0	2.2	110	< 2.0	17
TPH-CWG - Aromatic >C16 - C21	5	mg/kg	260	LQM	14	1800	1		< 10	14	1800	< 10	240
TPH-CWG - Aromatic >C21 - C35	5	mg/kg	1100	LQM	41	3700	1		< 10	41	3700	< 10	1000
TPH-CWG - Aromatic >C35 - C44	5	mg/kg	1100	LQM	9.1	1400	1		< 8.4	9.1	1400	< 8.4	900
Total Aromatic Hydrocarbon	0	mg/kg	-	-	0	BDL	0						

Below GAC
Exceedence

Category or Danger	Xi	T+	T	Xn	T	T+	Car. Cat 1 / 2	Carc. Cat 3	C	Repr. Cat 1 / 2	Muta. Cat 1 / 2	N			
Substance	Irritant	Harmful			Toxic		Carcinogenic			Corrosive	Teratogenic		Mutagenic	Ecotoxic	
Risk Phase	R36-38	R26-28, R39	R23-25, R39, R48	R20-22, 48,65,68	R23-25, R39, R48	R26-28, R39	R45	R49	R40	R35	R60 / R61	R62 / R63	R46	R50	R53
Hazard	H4	H5	H5	H5	H6	H6	H7			H8	H10		H11	H14	H14
Naphthalene				0.00084					0.00084					0.00084	0.00084
Acenaphthylene	0.00024			0.00024											
Acenaphthene	0.00084														
Fluorene															
Phenanthrene	0.0049			0.0049					0.0049						
Anthracene	0.0025													0.0025	0.0025
Fluoranthene	0.018			0.018					0.018						
Pyrene	0.016			0.016											
Benzo(a)anthracene															
Chrysene				0.0072			0.0072						0.0072		
Benzo(b)fluoranthene							0.0096							0.0096	0.0096
Benzo(k)fluoranthene				0.0038			0.0038								
Benzo(a)pyrene							0.0083			0.0083			0.0083	0.0083	0.0083
Indeno[1,2,3-cd]pyrene															
Dibenz(a,h)anthracene							0.000005						0.000005	0.000005	0.000005
Benzo(ghi)perylene													0.0046	0.0046	0.0046
Arsenic			0.0011		0.0011								0.0011	0.0011	0.0011
Boron	0.00005			0.00005											
Cadmium	0.00005	0.00005	0.00005		0.00005	0.00005	0.00005						0.0028		
Chromium										0.0028			0.0028		
Copper				0.0017									0.0017	0.0017	0.0017
Lead				0.0032					0.0032		0.0032	0.0032	0.0032	0.0032	0.0032
Mercury		0.00003				0.00003							0.00003	0.00003	0.00003
Nickel							0.00097	0.00097	0.00097						
Selenium			0.00013		0.00013										0.00013
Zinc	0.0052			0.0052											
Benzene	0.0005		0.0005		0.0005		0.0005								
Toluene				0.0005								0.0005			
Ethylbenzene				0.0005	0.0005							0.0005			
p & m-xylene	0.0005			0.0005											
o-xylene	0.0005			0.0005											
MTBE (Methyl Tertiary Butyl Ethel	0.0005														
PRO C6-C10				0.000007			0.000007							0.000007	0.000007
DRO C10-C25				0.64588					0.64588					0.64588	0.64588
Total (or greatest)	0.0498	0.00008	0.0018	0.7088	0.0018	0.00008	0.0096	0.0010	0.6459	0.0028	0.0083	0.0032	0.0083	0.6770	0.6771
Threshold (%)	20.0	0.1	3	25.0	3.0	0.1	0.1	0.1	1.0	1.0	0.5	5.0	0.1	25.00	25.00
Exceeded? (y/n)	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N

Category or Danger	Xi	T+	T	Xn	T	T+	Car. Cat 1 / 2	Carc. Cat 3	C	Repr. Cat 1 / 2	Muta. Cat 1 / 2	N			
Substance	Irritant	Harmful			Toxic		Carcinogenic			Corrosive	Teratogenic		Mutagenic	Ecotoxic	
Risk Phase	R36-38	R26-28, R39	R23-25, R39, R48	R20-22, 48,65,68	R23-25, R39, R48	R26-28, R39	R45	R49	R40	R35	R60 / R61	R62 / R63	R46	R50	R53
Hazard	H4	H5	H5	H5	H6	H6	H7			H8	H10		H11	H14	H14
Benzo(a)pyrene							83						0.0083		
BaP Concentration in TPH													0.0006889		
BaP Exceeded (y/n)													Y		
TPH (EC5 - EC35)				0.83			8300				0.83		0.83	0.83	0.83
Threshold (%)				25.0			Y				5.0		0.1	2.50	2.50
Hazardous Properties				N			Y				N		Y	N	N

TPH has to be >1000mg otherwise non-haz

Category or Danger	Xi	T+	T	Xn	T	T+	Car. Cat 1 / 2	Carc. Cat 3	Car. Cat 1a	Repr. Cat 1 / 2	Muta. Cat 1 / 2	N			
Substance	Irritant	Harmful			Toxic		Carcinogenic			Corrosive	Teratogenic		Mutagenic	Ecotoxic	
Risk Phase	R36-38	R26-28, R39	R23-25, R39, R48	R20-22, 48,65,68	R23-25, R39, R48	R26-28, R39	R45	R49	R40	RE1	R60 / R61	R62 / R63	R46	R50	R53
Hazard	H4	H5	H5	H5	H6	H6	H7			H350	H10		H11	H14	H14
Asbestos										0					
Threshold (%)										0.1					
Hazardous Properties										N					

APPENDIX G: GEOTECHNICAL TEST RESULTS

Potential Desiccation using Driscoll Method

BH	Depth (m)	Moisture Content	% Passing 425um Sieve	Liquid Limit (LL)	Modified LL	0.4 * Mod LL	0.4 * LL
1	1	21	90	59	53.1	21.24	23.60
3	1	15	90	40	36	14.40	16.00
3	2	12	41	30	12.3	4.92	12.00
4	1	4.8	23	26	5.98	2.39	10.40

Potentially desiccated



LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

Job No. 35820

Borehole/Pit No. BH1

Site Name Somerton, Ox

Sample No. 1

Project No. 21318/PO 24-314 Client WDE Consulting

Depth Top m 1.00

Soil Description Brown slightly gravelly silty CLAY with occasional fm cemented siltstone fragments (gravel is fm and sub-angular)

Depth Base m -

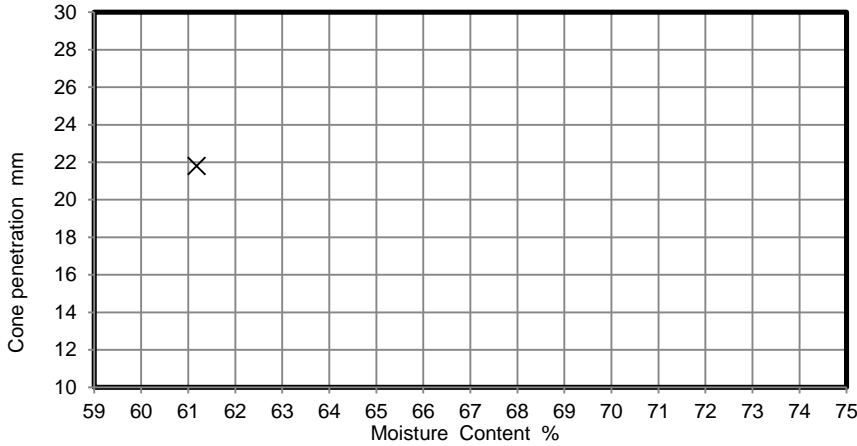
Sample Type D

Samples received 07/08/2024

Schedules received 07/08/2024

Project Started 07/08/2024

Date Tested 14/08/2024

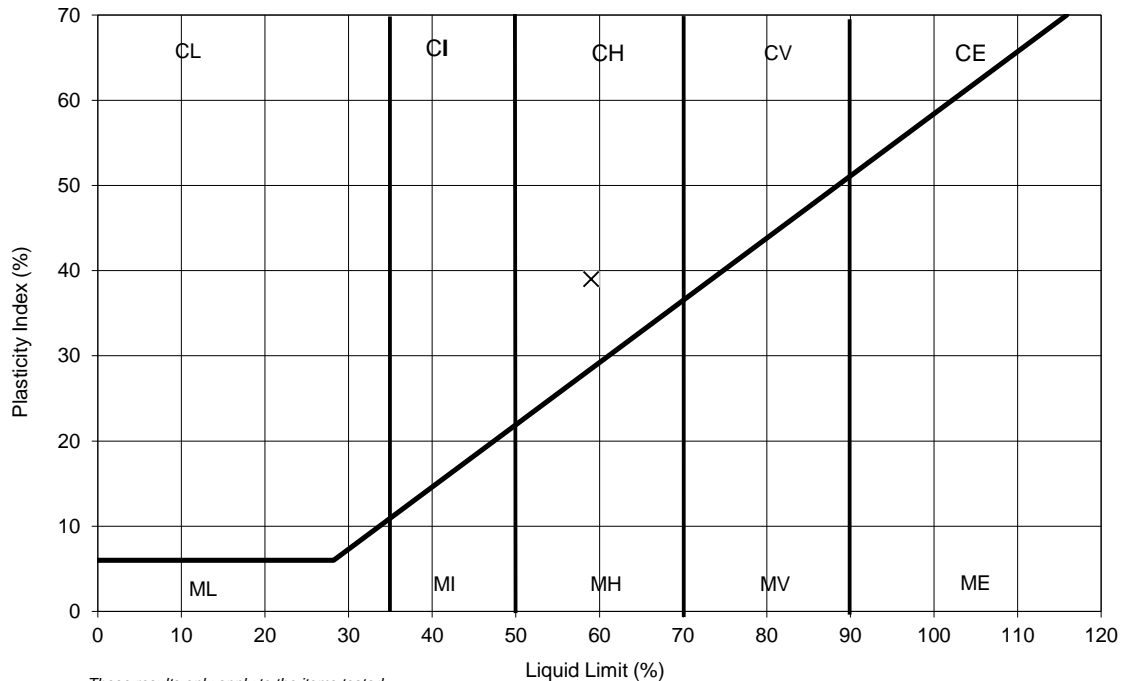


NATURAL MOISTURE CONTENT	21	%
% PASSING 425µm SIEVE	90	%
LIQUID LIMIT	59	%
PLASTIC LIMIT	20	%
PLASTICITY INDEX	39	%

Remarks

Factors corresponding to the cone penetration and moisture content range in Table 1 (BS1377:1990 ; Part 2)

PLASTICITY INDEX



These results only apply to the items tested

NOTE: The report shall not be reproduced except in full without authority of the laboratory

TEST METHOD

BS1377: Part 2 :Clause 4.4 : 1990 Determination of the liquid limit by the cone penetrometer method

BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index

BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU

Tel: 01923 711 288 Email: James@k4soils.com

Checked and Approved

Initials: J.P

Date: 20/08/2024



2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5 R2



LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

Job No. 35820

Borehole/Pit No. BH3

Site Name Somerton, Ox

Sample No. 2

Project No. 21318/PO 24-314 Client WDE Consulting

Depth Top m 1.00

Soil Description Brown slightly gravelly silty CLAY with occasional fm chalk gravel (gravel is fm and sub-angular)

Depth Base m -

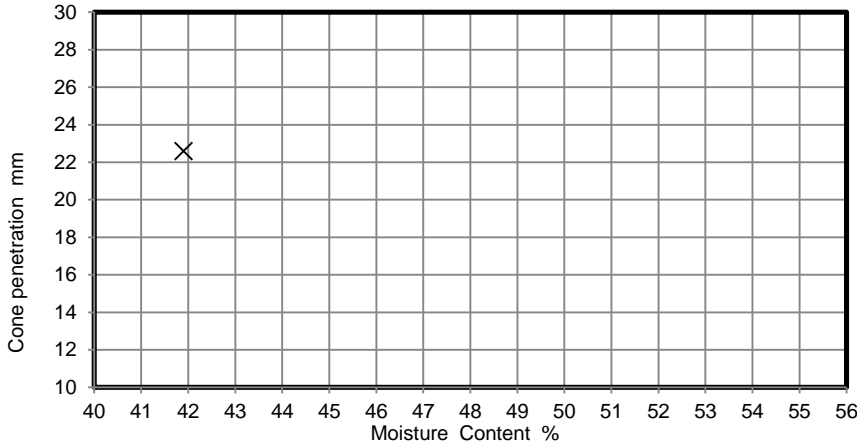
Sample Type D

Samples received 07/08/2024

Schedules received 07/08/2024

Project Started 07/08/2024

Date Tested 14/08/2024

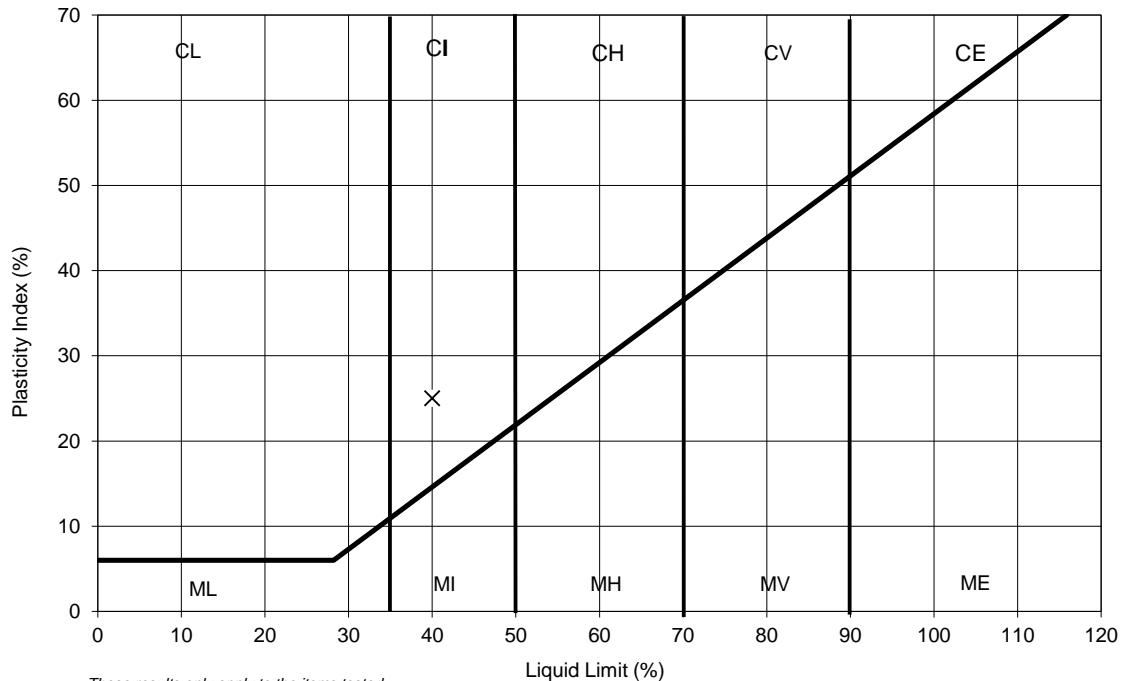


NATURAL MOISTURE CONTENT	15	%
% PASSING 425µm SIEVE	90	%
LIQUID LIMIT	40	%
PLASTIC LIMIT	15	%
PLASTICITY INDEX	25	%

Remarks

Factors corresponding to the cone penetration and moisture content range in Table 1 (BS1377:1990 ; Part 2)

PLASTICITY INDEX



These results only apply to the items tested

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TEST METHOD

BS1377: Part 2 :Clause 4.4 : 1990 Determination of the liquid limit by the cone penetrometer method

BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index

BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU

Tel: 01923 711 288 Email: James@k4soils.com

Checked and Approved

Initials: J.P

Date: 20/08/2024



2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5 R2



LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

Job No. 35820

Borehole/Pit No. BH3

Site Name Somerton, Ox

Sample No. 3

Project No. 21318/PO 24-314 Client WDE Consulting

Depth Top m 2.00

Soil Description Light brown and brown mottled sandy gravelly silty CLAY (gravel is fmc weakly to strongly cemented possibly sandstone fragments)

Depth Base m -

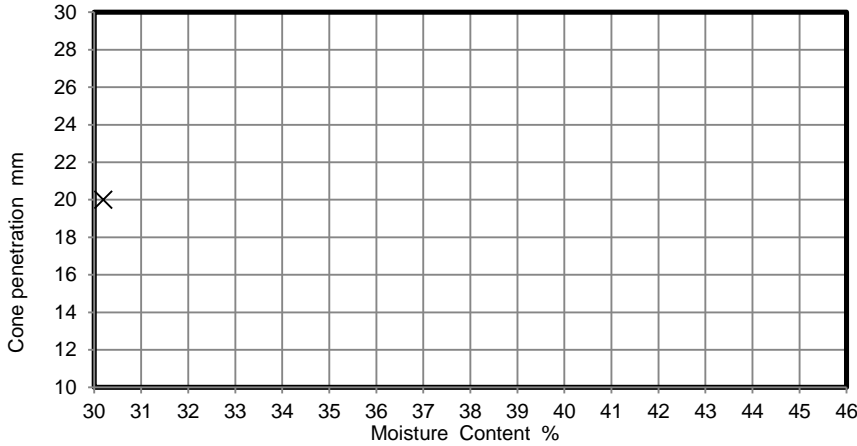
Sample Type D

Samples received 07/08/2024

Schedules received 07/08/2024

Project Started 07/08/2024

Date Tested 14/08/2024



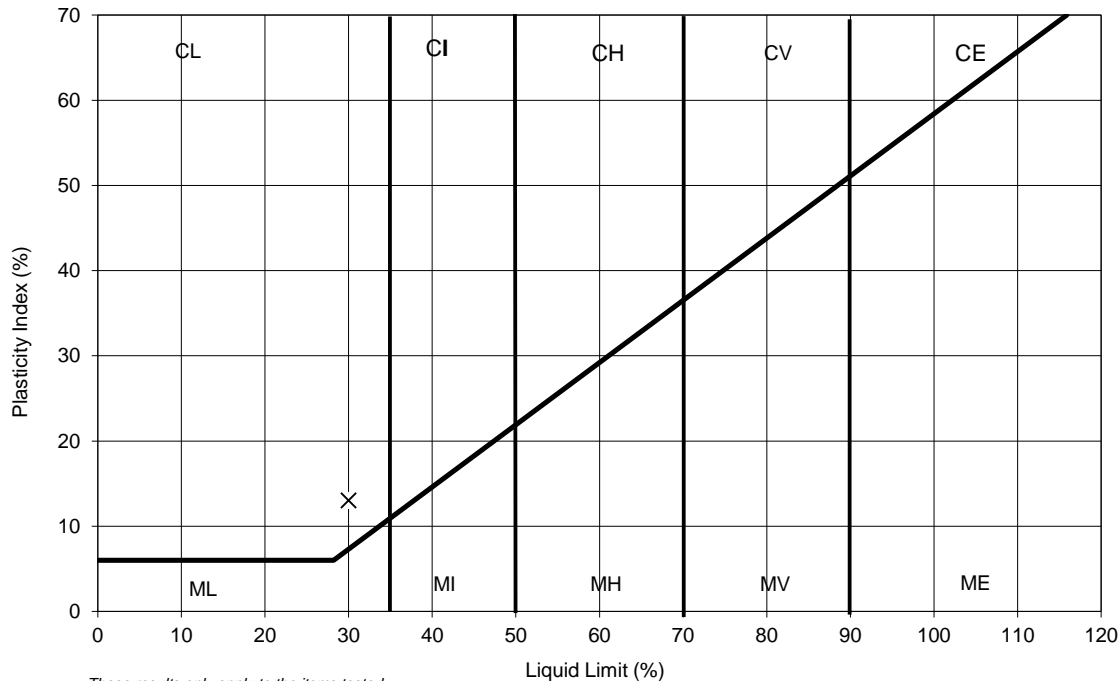
NATURAL MOISTURE CONTENT	12	%
% PASSING 425µm SIEVE	41	%
LIQUID LIMIT	30	%
PLASTIC LIMIT	17	%
PLASTICITY INDEX	13	%

Remarks

Sample washed to obtain test fraction

Factors corresponding to the cone penetration and moisture content range in Table 1 (BS1377:1990 ; Part 2)

PLASTICITY INDEX



These results only apply to the items tested

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TEST METHOD

BS1377: Part 2 :Clause 4.4 : 1990 Determination of the liquid limit by the cone penetrometer method

BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index

BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU

Tel: 01923 711 288 Email: James@k4soils.com

Checked and Approved

Initials: J.P

Date: 20/08/2024



2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5 R2



LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

Job No. 35820

Borehole/Pit No. BH4

Site Name Somerton, Ox

Sample No. 2

Project No. 21318/PO 24-314 Client WDE Consulting

Depth Top m 1.00

Soil Description Light brown sandy very gravelly silty CLAY (gravel is fmc and angular to sub-angular sandstone fragments)

Depth Base m -

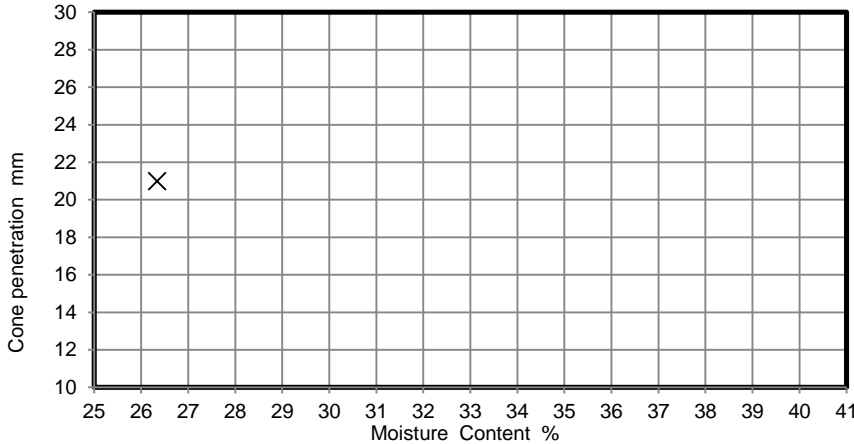
Sample Type D

Samples received 07/08/2024

Schedules received 07/08/2024

Project Started 07/08/2024

Date Tested 14/08/2024



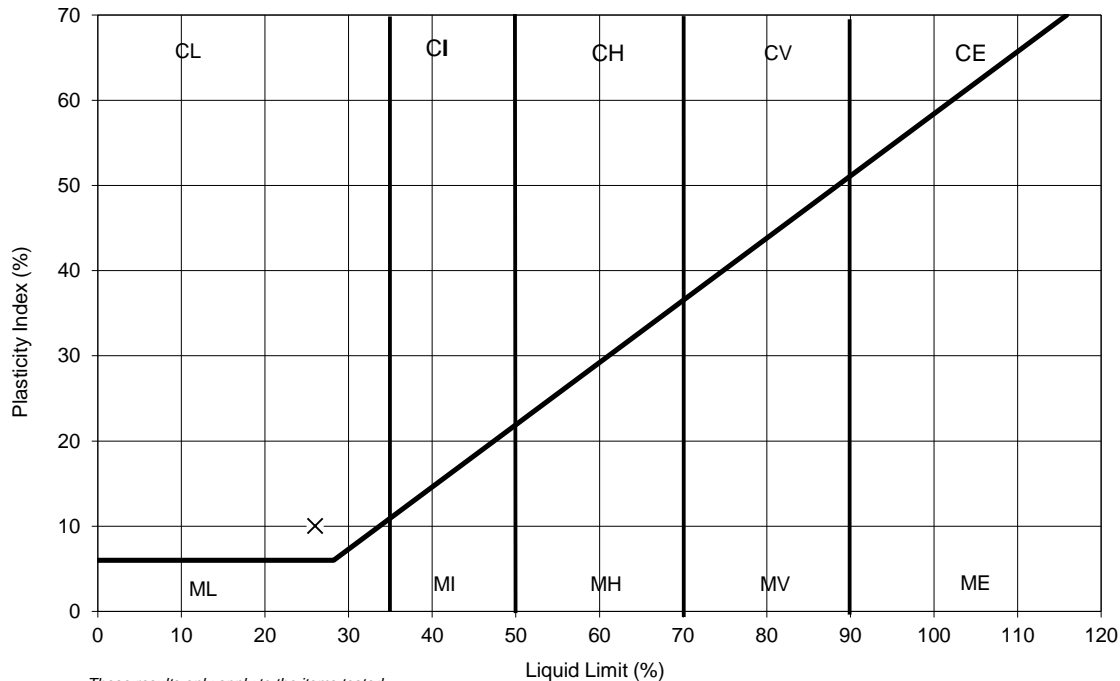
NATURAL MOISTURE CONTENT	4.8	%
% PASSING 425µm SIEVE	23	%
LIQUID LIMIT	26	%
PLASTIC LIMIT	16	%
PLASTICITY INDEX	10	%

Remarks

Sample washed to obtain test fraction

Factors corresponding to the cone penetration and moisture content range in Table 1 (BS1377:1990 ; Part 2)

PLASTICITY INDEX



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TEST METHOD

BS1377: Part 2 :Clause 4.4 : 1990 Determination of the liquid limit by the cone penetrometer method

BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index

BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU

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Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5 R2



Summary of Natural Moisture Content, Liquid Limit and Plastic Limit Results

Job No. 35820	Project Name Somerton, Ox	Programme	
		Samples received	07/08/2024
Project No. 21318/PO 24-314	Client WDE Consulting	Schedule received	07/08/2024
		Project started	07/08/2024
		Testing Started	14/08/2024

Hole No.	Sample				Soil Description	NMC %	Passing 425µm %	LL %	PL %	PI %	Remarks
	Ref	Top m	Base m	Type							
BH1	1	1.00	-	D	Brown slightly gravelly silty CLAY with occasional fm cemented siltstone fragments (gravel is fm and sub-angular)	21	90	59	20	39	
BH3	2	1.00	-	D	Brown slightly gravelly silty CLAY with occasional fm chalk gravel (gravel is fm and sub-angular)	15	90	40	15	25	
BH3	3	2.00	-	D	Light brown and brown mottled sandy gravelly silty CLAY (gravel is fmc weakly to strongly cemented possibly sandstone fragments)	12	41	30	17	13	Sample washed to obtain test fraction
BH4	2	1.00	-	D	Light brown sandy very gravelly silty CLAY (gravel is fmc and angular to sub-angular sandstone fragments)	4.8	23	26	16	10	Sample washed to obtain test fraction

	Test Methods: BS1377: Part 2: 1990: Natural Moisture Content : clause 3.2 Atterberg Limits: clause 4.3 and 5.0 <i>These results only apply to the items tested</i>	Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU Tel: 01923 711 288 Email: James@k4soils.com	Checked and Approved
	NOTE: The report shall not be reproduced except in full without authority of the laboratory		Initials J.P Date: 20/08/2024
2519	Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)		MSF-5-R1(b)



Summary of Point Load Test Results

Job No. 35820	Project Name Somerton, Ox	Programme	
		Samples received	07/08/2024
Project No. 21318/PO 24-314	Client WDE Consulting	Schedule received	07/08/2024
		Project started	07/08/2024
		Date started	13/08/2024

Hole No.	Sample				Description	Test Type	Sample Width W (mm)	Platen Separation D (mm)	Moisture Content %	Failure Load P (kN)	Equivalent Diameter De (mm)	P/De2 (Mpa)	Correction Factor F	Is (50)	Remarks
	Ref	Top m	Base m	Type											
TP1	1	2.00	-	B	Light brown and light grey fmc and cobble size LIMESTONE core	Irregular lump	76.00	30.00	7.3	5.31	53.88	1.83	1.03	1.89	
TP1	1	2.00	-	B	Light brown and light grey fmc and cobble size LIMESTONE core	Irregular lump	69.00	42.00	7.3	3.81	60.74	1.03	1.09	1.13	
TP1	1	2.00	-	B	Light brown and light grey fmc and cobble size LIMESTONE core	Irregular lump	99.00	39.00	7.3	9.20	70.11	1.87	1.16	2.18	
TP1	1	2.00	-	B	Light brown and light grey fmc and cobble size LIMESTONE core	Irregular lump	82.00	21.00	7.3	5.51	46.82	2.51	0.97	2.44	
TP1	1	2.00	-	B	Light brown and light grey fmc and cobble size LIMESTONE core	Irregular lump	81.00	36.00	7.3	4.90	60.93	1.32	1.09	1.44	

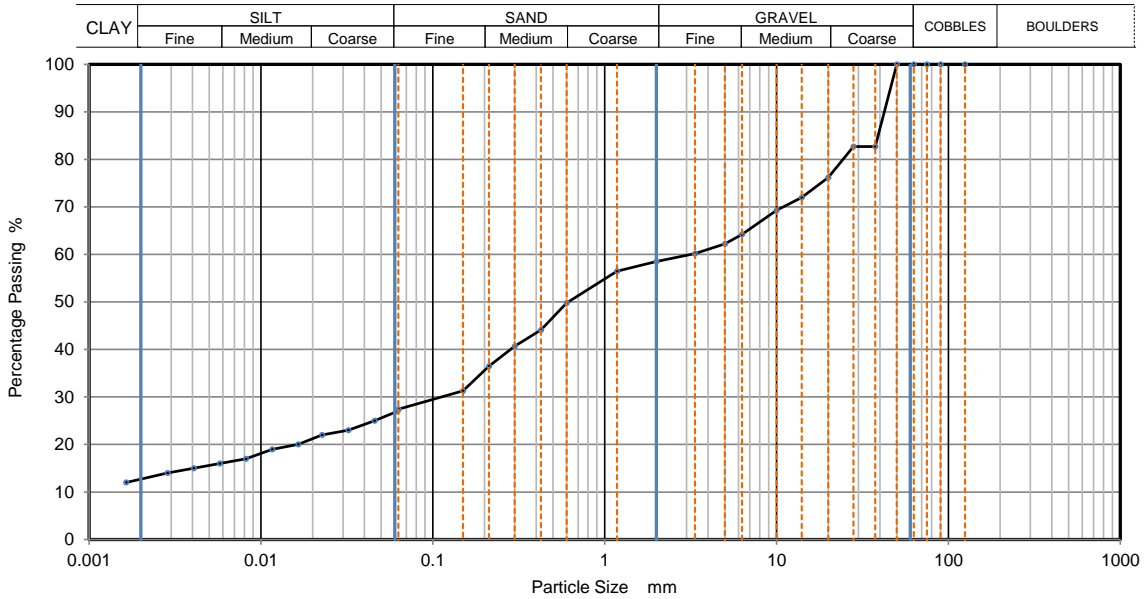
<p>Tested in accordance with ISRM 325-89 RTH Suggested Method for Determining Point Load Strength</p>	<p>Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU</p> <p>Tel: 01923 711 288 Email: James@k4soils.com</p>	<p style="text-align: center;">Checked and Approved</p> <p>Initials J.P</p> <p>Date: 20/08/2024</p>
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PARTICLE SIZE DISTRIBUTION

		Job Ref	35820
		Borehole/Pit No.	BH2
Site Name	Somerton, Ox	Sample No.	2
Project No.	21318/PO 24-314	Client	WDE Consulting
		Depth Top	1.00 m
Soil Description	Medium strength brown mottled light grey slightly sandy very gravelly silty CLAY with occasional black carbonaceous deposits (gravel is fmc calcareous fragments)	Depth Base	2.00 m
		Sample Type	B
		Samples received	07/08/2024
		Schedules received	07/08/2024
Test Method	BS1377:Part 2: 1990, clause 9.0	Project started	07/08/2024
		Date tested	14/08/2024

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0621	27
90	100	0.0459	25
75	100	0.0323	23
63	100	0.0227	22
50	100	0.0165	20
37.5	83	0.0116	19
28	83	0.0082	17
20	76	0.0058	16
14	72	0.0041	15
10	69	0.0029	14
6.3	64	0.0016	12
5	62		
3.35	60		
2	59		
1.18	57		
0.6	50	Particle density (assumed)	
0.425	44	2.70	Mg/m3
0.3	41		
0.212	37		
0.15	31		
0.063	27		


Sample Proportions	% dry mass
Very coarse	0
Gravel	42
Sand	31
Silt	14
Clay	13

Grading Analysis		
D100	mm	
D60	mm	3.14
D30	mm	0.113
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks
Preparation and testing in accordance with BS1377 unless noted below

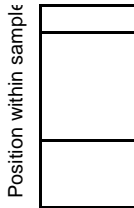
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 UKAS TESTING	K4 Soils Laboratory Unit 8, Olds Close, Watford, Herts, WD18 9RU Email: james@k4soils.com Tel: 01923 711288	Checked and Approved Initials: J.P Date: 20/08/2024	
	2519	Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)	MSF-5-R3

	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	35820
				Borehole/Pit No.	BH2
Site Name	Somerton, Ox			Sample No.	2
Project No.	21318/PO 24-314	Client	WDE Consulting	Depth Top	1.00 m
Soil Description	Medium strength brown mottled light grey slightly sandy very gravelly silty CLAY with occasional black carbonaceous deposits (gravel is fmc calcareous fragments)			Depth Base	2.00 m
				Sample Type	B
				Samples received	07/08/2024
				Schedules received	07/08/2024
Test Method	BS EN ISO 17892-8:2018			Date of test	12/08/2024

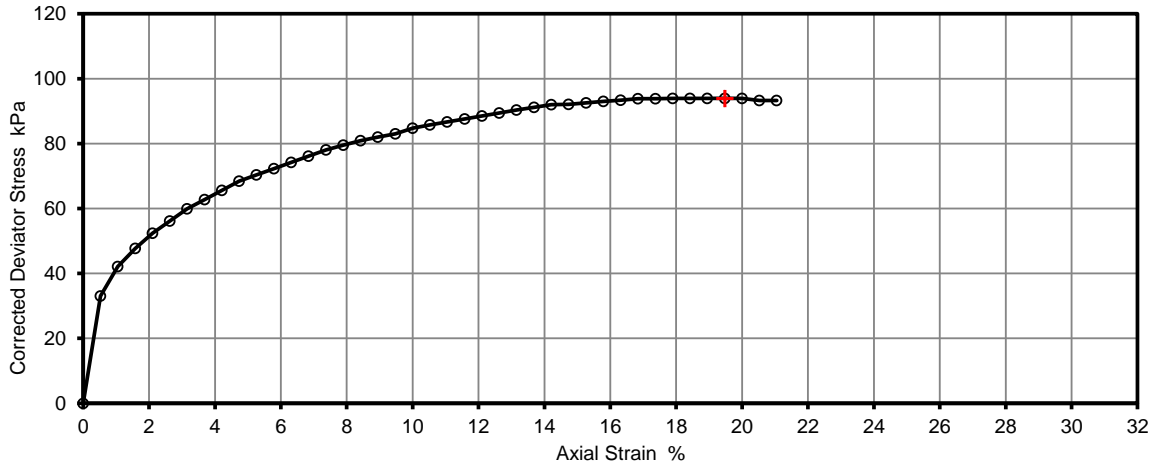
Remarks

Test sample taken from intact section within bag

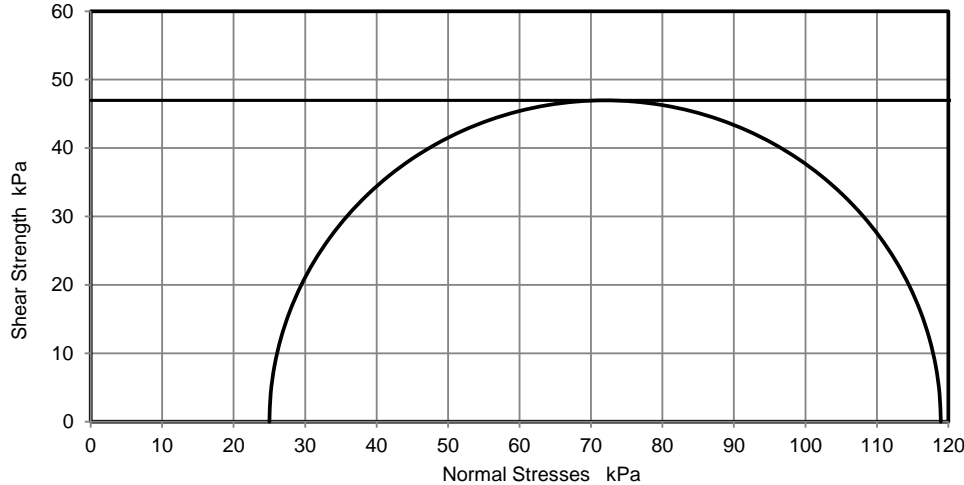


Test Number	1	
Length	76.0	mm
Diameter	38.0	mm
Bulk Density	1.95	Mg/m ³
Moisture Content	25	%
Dry Density	1.56	Mg/m ³
Rate of Strain	2.0	%/min
Cell Pressure	25	kPa
Axial Strain	19	%
Deviator Stress, (σ ₁ - σ ₃) _f	94	kPa
Undrained Shear Strength, c _u	47	kPa ½(σ ₁ - σ ₃) _f
Mode of Failure	Compound	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.



Test Report by K4 SOILS LABORATORY
 Unit 8 Olds Close Olds Approach
 Watford Herts WD18 9RU
 Tel: 01923 711 288 Email: James@k4soils.com

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 Initials: J.P
 Date 20/08/2024

WDE RANGE OF SERVICES

