

Geo-Environmental Assessment
Charters
Tilehurst, Reading
RG31 6TQ

Maxika Homes

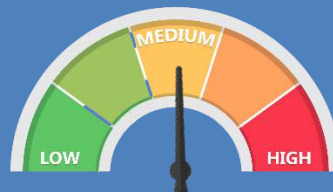
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CONTAMINATION



FOUNDATIONS



DRAINAGE



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1.0 EXECUTIVE SUMMARY

Phase 1 Desk Study	Comments	Risk Rating
Site Setting	Former car sales garage with bulk fuel tanks present	High
Published Geology and Hydrogeology	- Seaford chalk and New Haven chalk formation with no superficial deposits - Principal aquifer, Outside of SPZ, No abstractions within 500m	Moderate
Hydrology/Flood Risk	River Thames 71m N and negligible risk of flooding	Moderate
Historical land use	The site is clear until c1934 when an unknown structure in NW appears. This expands slightly by c1960 when site is labelled a garage until 1993 when car maintenance building appears and forms the current configuration.	High
Landfill/Infilled land	No landfills or infilled land recorded within 250m	Low
UXO	Low – No further actions likely	Low
Phase 2 Intrusive	Comments	Risk Rating
Proven Ground Conditions	Made Ground to 1.00m (up to 2.50m in tank farm) over gravelly clay to 3.80m and white Dm chalk beneath	
Groundwater/Drainage	No groundwater encountered. Good permeability likely within chalk materials	Low
Contamination	Exceedances within the soil and leachate in made ground and tank farm for PAHs, asbestos, lead and hydrocarbons	Moderate/High
Ground Engineering	Piled foundations likely within tank farm area due to made ground and disturbance. Strip foundations likely feasible outside of tank areas.	Moderate
Recommendations	- Decommissioning of USTs in line with regulatory requirements - Preparation of Remedial Strategy to manage identified contamination - Deep borehole investigation for pile design - BRE365 soakage testing if considered to be feasible	

2.0 INTRODUCTION

WDE Consulting Limited (WDE) was appointed by Maxika Homes (the client) to conduct a Geo-Environmental Assessment at Charters, Tilehurst, Reading, RG31 6TQ (Figure 1). The current site comprises a vacant car sales garage and is situated at grid reference [467247 175323](#), What 3 Words being.raves.undulation (Figure 2).

2.1 Context

The purpose of this assessment was to determine the potential ground risks at the subject site prior to its acquisition for future residential development comprising 11 houses and eight flats (Figure 3).

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

Item	Scope of Works	Objectives
1	Site walkover	To identify any areas of potential contamination
2	Intrusive site investigation	- 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 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	- 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](#))
- Petroleum Officers information (Appendix C)
- Publicly available information

3.2 Site Description and Walkover

The site is a vacant former car garage that occupies a narrow-shaped area of approximately 0.35 hectares (measuring 150 NW to SE by 30m SW to NE). On site are three brick built buildings including a garage in the north-west, a car showroom in the central area (Photo 1) and a car maintenance garage in the south-eastern portion (Photo 6). The surface surrounding the buildings was hard-standing comprising a mixture of reinforced concrete and bituminous paving, with no visible signs of surface staining. Both underground and above ground bulk fuel tanks were identified to be present on site, details of which are discussed in Section 3.2.1.

Surrounding the site is the railway line on the northern border with the River Thames beyond it located ~15 lower than the subject site. A residential row of properties is located NW and S with the A329 between,

3.2.1 Bulk Fuel Tanks

Above Ground Tanks

Three above ground storage tanks (ASTs) were identified to be present on site (Figure 2), details of which are summarised in Table 2,

Table 2 – AST Details

Ref	Capacity L	Status	Type of Construction	Bunded/Unbunded	Photo
A1	~2,500	Not known	Steel	Unbunded	8
A2	~2,000	Not known	Steel	Unbunded	7
A3	~2,000	Not known	Steel	Unbunded	6

Underground Tanks

A number of underground storage tanks (USTs) and 4no vent pipes were identified to be present in the north-western portion of the site (ref D on Figure 2) adjacent to the former car showroom. The

manholes were opened and revealed pipework and dip sticks which enabled some of the tank volumes to be established and whether any product remained. Where possible the caps were opened to enable measurement with a PID. The USTs findings from the site walkover is provided in Table 3.

Table 3 – UST Details from Site Walkover

Ref	Capacity	Details	PID (ppm)	Photo	Status
U1	Not known	Chamber flooded	2.4		Not known
U2	500 gal	25 gallons of oil in tank according to dip stick	1053	4	Not decommissioned
U3	500 gal	Empty	25		Not decommissioned
U4	Not known	Lid stuck			Not known
U5	Not known	Cap stuck			Not known
U6	Not known	No dip stick	140		Not decommissioned
U7	Not known	Cap stuck		3	Not known
U8	4000 gal	Possibly empty to 1000 gallons then dip stick kinks so unable to confirm.	154	9	Not decommissioned
U9	Not known	Lid stuck		9	Not known
U10	Not known	Cap stuck		9	Not known

3.2.2 Discussions with Regulatory Authorities

Copies of the correspondence with the Regulatory Authorities are presented in Appendix C.

An initial attempt was made to contact Trading Standards (Neil Parsons) was made 27/03/2024 who got back in touch 30/04/2024 to inform that they could not locate the file for the site but that a representative from the council visited the site and concluded that there are likely three tanks underground present. He would continue to search for information. Dave Acreman (Senior Environmental Health Officer) at Reading Council replied on 15/05/2024 that that the site is not on their records for pollution prevention and controls (PPC).

On 16/05/24, Neil Parsons passed on a drawing (date not known) associated with the addition of 3no underground tanks and a pump island. Already present on site were 7no other tank manholes and a three stage interceptor. A summary of the identified USTs is presented in Table 4.

Table 4 – UST Details from Trading Standards

Ref	Capacity	Product Type	Details
U8	4,000gal (18,184L)	Premium	Date not known
U9	2,000gal (9,092L)	Regular	Date not known
U10	2,000gal (9,092L)	Derv	Date not known

Ref	Capacity	Product Type	Details
U1 to U7	Not known		Present at time of the drawing

It would therefore appear that there might remain a number of underground tanks on site which have not been adequately decommissioned and require urgent attention. This will require the services of a specialist remediation contractor as well as the involvement of the regulatory authorities.

3.2.3 Key Findings of Desk Study

The key findings from the desk study are presented in Table 5.

Table 5 – Key Findings of Desk Study

Item	Details
Published Geology	Seaford chalk and New Haven chalk formation with no superficial deposits
Geological Hazards	All very low/low except compressible deposits
Hydrogeology	Principal aquifer, Outside of SPZ, No abstractions within 500m
Hydrology	River Thames 71m N and negligible risk of flooding
Current Land Use on site	Former petrol station forecourt and car maintenance/sales
Current Land Use within 250m radius	Railway sidings 10m N, Tilehurst Railway Station 207m SE
Radon Risk	Less than 1%. No protective measures required
Historical land use on site	The site is clear until c1934 when an unknown structure in NW appears. This expands slightly by c1960 when site is labelled a garage. Expands slightly until 1993 when car maintenance building appears and forms the current configuration.
Historical land use with 250m radius	Garage onsite, Cuttings 19 to 105m NW. Railway Station 183m SE
Landfills/Infilled Land	No landfills or infilled land recorded within 250m
Identified potential areas of concern references	1 – 10: Underground Storage Tank (USTs) - A – C: Above Ground Storage Tank (AST) - Potentially imported made ground
Pollution Incidents	None recorded
UXO Risk	Low – No further actions likely
Environmental Sensitive Land Uses	Within nitrate vulnerable zone

3.3 Preliminary Risk Assessment

3.3.1 Identification of Critical Receptors

The identified potentially critical receptors are presented in Table 6.

Table 6 – Identification of Potential Receptors

Receptor Type	Current/Future	Receptor Details	Active
Human Health	Future	Residential receptors onsite	Yes
	Current	Residential receptors offsite	Yes
	Future	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 7, and presented on Figure 2.

Table 7 – Identification of Potential Areas of Concern

Ref Area of Concern	Location	Potential Risk	Comments
A1 to A3	Onsite	3no AST – ~2,500L Tank	Hydrocarbons (TPH, BTEX, PAH)
U1 to U10	Onsite	10no UST up to 4,000gal/18,184L	Hydrocarbons (TPH, BTEX, PAH)
C	Onsite	Car maintenance garage	Hydrocarbons (TPH, BTEX, PAH), heavy metals, inorganics, asbestos, Chlorinate Solvents
D	Onsite	4no vent pipes	Hydrocarbons (TPH, BTEX, PAH)
-	Onsite	Potentially imported made ground	Hydrocarbons (TPH, BTEX, PAH), heavy metals, inorganics, asbestos, phenols, ground gas

The potential contaminants of PCBs arising from electricity substations located offsite have been discounted as PCBs are not considered to be sufficiently mobile or soluble¹.

3.3.3 Identified Potential Pathways

Human Health Pathways

The potential human health exposure pathways for a residential receptor are indicated in Table 8.

¹ Department of the Environment, 1996, Industry Profile: Engineering works. P.14 Sect 3.2.1

Table 8 – 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 9.

Table 9 – Identification of Potentially Active Controlled Water Pathways

Potential Pathway	Active/ Inactive	Notes
Impacted soils leaching to groundwater within Principal Aquifer	Active	Qualitative Risk Assessment required
Impacted soils leaching to groundwater and migration to surface water	Active	Qualitative Risk 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 10, along with a qualitative risk assessment.

Table 10 – 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/Moderate	Further investigation required
Availability of readily degradable material, such as vegetable matter and food waste	Inactive	Low	Not identified from desk study
Nature of fill material - depth of fill >1m, incohesive materials, poorly compacted and within unsaturated zone.	Active	Moderate	Further intrusive investigation required
Age of Materials - Ground gas generated from current/historical landfills <25yrs old	Inactive	Low	Not indicated in desk study
Distance from receptor – a higher distance reduces the potential risk for offsite migration. High risk generally limited to within 100m distance.	Active	High	Further intrusive investigation required
Presence of Preferential Pathways – fissures/fractures in bedrock or permeable strata beneath an impermeable cover	Active	Moderate	Further intrusive investigation required
Chemical storage/spillages with potential for hydrocarbon vapours	Active	High	Further intrusive investigation required
Shallow or deep mine workings	Inactive	Low	Not indicated in desk study
Radon gas protective measures required	Inactive	Low	Not indicated in desk study

3.3.4 Qualitative Risk Assessment

A summary of the relevant pollutant linkages based on a source-pathway-receptors analysis is provided in Table 11.

Table 11 – Summary of Potentially Active Source-Pathway-Target Assessment

Sources	Potential Pathway	Potential Receptor	Risk Classification
Onsite Sources (USTs, ASTs, Car maintenance historical use, potential made ground)	Dermal contact, outdoor and indoor inhalation, ingestion, homegrown produce	Human Health (Onsite Residential)	High
	Vapour inhalation from dissolved phase groundwater migrating from site to neighbouring properties	Human Health (Offsite Residential)	Moderate/High
	Impacted soil leaching to groundwater within Principal Aquifer	Controlled Waters (Groundwater)	High
	Impacted soil leaching to groundwater and migration to surface water	Controlled Waters (Surface water)	Moderate
Offsite Source (Railway line)	Vapour inhalation from dissolved phase migration from offsite sources	Human Health (Onsite Residential)	Low
Onsite tanks and soil materials	Source for ground gas generation	Human Health (Onsite Residential)	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 12 – Summary of Phase II Intrusive Works

Item	Details	Appendix
Shallow Boreholes	9no to 4m max depth using window sampling techniques (BH1 to BH9)	D
Groundwater monitoring	5no 50mm monitoring wells installed for groundwater monitoring (BH1, BH2, BH6, BH7, BH8)	E
Vapour Monitoring	PID readings taken from monitoring wells	E
Analytical Testing	Standard QRA suite with VOCs undertaken for soils and leachate	F
Geotechnical Testing	Atterberg, triaxial and sieve analysis undertaken	G

4.2 Constraints/Selection of Intrusive Locations

Access was only possible in external areas, with no access available within the building footprint. The locations of the boreholes were constrained by the presence of a number of underground tanks, associated underground pipework and underground utilities.

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 13.

Table 13 – Rationale for Exploratory Hole Locations

Ref	Description	Location	Intrusive Locations
A1	AST	NW portion	BH9
A2	AST	SE portion	No access
A3	AST	E portion	BH3
U1 to U10	USTs and associated pipework	Central portion	BH4 to BH8
C	ASTs, car maintenance building	SE portion	BH1, BH3
D	Vent pipes	Central portion	BH2, BH4
-	Site coverage and down gradient of tank farm	N boundary	BH2

4.4 Field Results

4.4.1 Geology

A summary of the geology encountered during the intrusive investigation is summarised in Table 14 and are presented in full Appendix D.

Table 14 – Summary of Geology Proved Onsite

Strata	Descriptions	Min - Max Depth (m bgl)	Average Depth (m bgl)	Locations
Made Ground	Dark brown silty sandy gravelly clay with red brick and concrete fragments	0.60 – 2.50	0.00 – 1.00	All
Gravelly Clay	Soft to firm brown sandy gravelly Clay	3.50 – 4.00	1.00 – 3.80	All
Seaford Chalk	White putty chalk (grade Dm)	Absent – 4.00+	3.80 – 4.00+	BH1, BH6

The materials in BH4 were silty clayey very sandy gravel from 1 to 2m depth. A refusal on an unknown obstruction (possibly a UST) was encountered in BH5 at 1.50m bgl.

4.4.2 Groundwater

A summary of the groundwater monitoring results are presented in Table 15.

Table 15 – Groundwater Field Monitoring Results (m bgl) – 09/04/2024

Date	BH1	BH2	BH6	BH7	BH8
Depth to Water	Dry	Dry	Dry	Dry	Dry
Depth of Well	4.00	4.00	4.00	4.00	4.00

4.4.3 Contamination Observations

A summary of the contamination observations is summarised below in Table 16.

Table 16 – Contamination Observations

Location	Depth (m bgl)	PID ppm(v)	Observations (m bgl)
BH7	1.50 – 1.60	0.8	Grey staining with distinct hydrocarbon odour

All other soil samples returned PID readings of <0.1ppm(v).

4.4.4 Permeability Results

A summary of the borehole permeability testing results is presented in Table 17 and are presented in full in Appendix E.

Table 17 – Soakage Test Results

Location	Test Type	Material	Depth of Test m bgl	Drainage (m/sec)	Indicative Qualitative Soakage Potential
BH1	Borehole	Chalk	4.00	E-04	Good

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 18 which has incorporated the results obtained from this assessment.

Table 18 – 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)	Inactive	Low	Max 2.8
Nature of fill material - depth of fill >1m, incohesive materials, poorly compacted and within unsaturated zone.	Active	Moderate	Made ground extends to 2.5m max within UST farm
Presence of Preferential Pathways – fissures/fractures in bedrock or permeable strata beneath an impermeable cover	Active	Low/moderate	Alluvium over chalk
Chemical storage/spillages with potential for hydrocarbon vapours	Active	Moderate/high	USTs with product still present

Vapour has been detected with a PID within the monitoring wells (Appendix E). The USTs are also known to have product within some of them. In line with published guidance² the site is currently identified as CS2 (low/NHBC Amber 1). Therefore, there is likely to be a requirement for further ground gas monitoring once the USTs have been dealt with to characterise the ground gas regime.

² Research Bulletin 17 (RB17). November 2012. CL:AIRE.

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 private gardens. 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 within the made ground and are summarised below:

- BH3 @ 0.30m for Asbestos (0.015%), PAHs, TPH-Aromatic C16-21
- BH4 @ 0.60m for PAHs
- BH6 @ 1.00m for PAHs
- BH7 @ 1.55m for TPH-Aromatic C21-35 (2,600mg/kg)
- BH8 @ 1.50m for PAHs, TPH-Aromatic C16-21
- BH9 @ 0.40m for PAHs, Lead

6.2 Leachate Testing Results

A comparison of the groundwater/leachate analytical test results with the adopted Environmental Assessment Levels (EALs) is presented in Appendix E, along with laboratory certificates of analyses.

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

- BH4 @ 0.30m for PAHs
- BH6 @ 0.30m for PAHs
- BH8 @ 0.50m for PAHs

6.3 Waste Classification/Onsite Reuse Options

Table 19 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 19 – Likely Waste Classification/Reuse Options for Onsite Materials

Material	Waste Classification	Likely WAC	On Site Reuse Options
Made Ground Tanks	Hazardous	Hazardous	None
Made Ground elsewhere	Non-Haz	Non-Haz	Beneath hard-standing/surface cover
Natural Materials	Inert	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.

6.4 Conclusions on Contamination

There have been exceedances of the adopted GACs/EALs which will require further assessment via a DQRA. Further details of the remedial methods, pathway control measures, verification criteria, sampling frequency and discovery strategy will need to be presented within the Remedial Strategy in line with the likely planning conditions.

A revised *source-pathway-receptor* assessment is presented in Table 20.

Table 20 – Summary of Revised Active Source-Pathway-Target Assessment

Sources	Potential Pathway	Potential Receptor	Risk Classification
Onsite Sources (USTs, ASTs, Car maintenance historical use, potential made ground)	Dermal contact, outdoor and indoor inhalation, ingestion, homegrown produce	Human Health (Onsite Residential)	High
	Vapour inhalation from dissolved phase groundwater migrating from site to neighbouring properties	Human Health (Offsite Residential)	Moderate/High
	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 (Railway line)	Vapour inhalation from dissolved phase migration from offsite sources	Human Health (Onsite Residential)	Low
Onsite tanks	Source for ground gas generation	Human Health (Onsite Residential)	Moderate

7.0 GROUND ENGINEERING

7.1 Field Testing Results

A summary of the ground engineering field testing results is provided in Table 21 and are presented in on the logs in Appendix D. This includes the calculated SPT N values.

Table 21 – Field Geotechnical Results

Depth (m)	BH1	BH2	BH3	BH4	BH5	BH6	BH7	BH8	BH9
	N value	N value	N value	N value	N value	N value	N value	N value	N value
1.0	2	9	1	8	1	2	3	1	7
2.0	17	13	9	10	50+	16	18	19	11
3.0	15	9	16	13	-	22	21	25	14
4.0	13	11	13	11	-	13	-	21	13

7.2 Geotechnical Testing

Particle size distribution (PSD), Triaxial undrained shear strength (Cu) and Atterberg limit (PI) testing of the encountered strata are summarised below in Table 22 with the full results presented in Appendix G. No geotechnical testing was undertaken on the chalk materials as they were unsuitable for testing (comprising mostly putty Dm chalk).

Table 22 – Summary of Geotechnical Test Results

Description	Average Depth (m bgl)	MC %	Modified PI %	PSD %	Triaxial kPa
Gravelly Clay	1.00 – 3.80	10 – 21	5 – 14	Gravel 21-53, Sand 25-35, Fines 23-44	33 – 114

Gravelly Clay

Testing of the gravelly clay between returned a modified plasticity index of <14% indicating a low volume change potential. The gravelly clay recorded a shear strength value of 33kPa at 1.5m (**low strength**) in BH1, with 77kPa in BH9 between 1 to 2m (**medium strength**) and then 114kPa at 2 to 3m in BH6- (**high strength**).

7.3 Potential Desiccation

An assessment of potential desiccation has been undertaken and is presented in Appendix G.

No potential desiccation has been identified in the upper 4m, which is therefore likely to warrant further actions.

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 23.

Table 23 – Summary of BRE Concrete in Aggressive Ground Parameters

Location	Concrete Parameters
pH (pH Units)	8.3 – 11.3
Water Soluble Sulphate as (2:1 Leachate Equivalent) (mg/l)	1,670
ACEC Classification	AC-3
Design Sulphate Class	DS-3

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 24 with full results presented in Appendix E.

Table 24 - Comparison of Soil Laboratory Results from the upper 1.35m with UKWIR (mg/kg)

Contaminant of Concern	No. of Samples	UKWIR Threshold	Max	No. Samples > GAC	Samples Exceeded
Total BTEX & MTBE	8	0.1	BDL	0	-
EC5-EC10 Aliphatic	8	2	BDL	0	-
EC10-EC16 Aliphatic	8	10	100	2	BH3.1, BH7.2
EC16-EC40 Aliphatic	8	500	8110	2	BH3.1, BH7.2
EC5-EC10 Aromatic	8	2	BDL	0	-
EC10-EC16 Aromatic	8	10	36	4	BH3.1, BH4.2, BH7.2, BH8.2
EC16-EC40 Aromatic	8	500	3170	3	BH3.1, BH7.2, BH8.2
Phenol	8	2	-	0	-
Cresols and chlorinated phenols	8	2	-	-	-
Corrosive	8	Various	11.3	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 4.00m, hence dewatering for shallow excavations is unlikely to be required. Excavation walls are likely to require additional support within the more granular materials and within the made ground of the tank excavations. There

are a number of bulk fuel tanks with potential fuel within which will need to be safely dealt with during pre-construction phase.

7.7 Preliminary Road Design Parameters

Frost susceptibility tends to be a feature of silty and sandy clays, of low to medium plasticity. Table 25 gives an indication of frost susceptibility and permeability with grading and plasticity index for preliminary identification.

Table 25 – 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 7-13% and therefore 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 conditions³, 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

Further ground gas monitoring is likely to be required once the USTs have been confirmed decommissioned. Currently the ground gas risk for the site has been characterised as a *Low Risk* and there is considered to be a requirement for enhancement of the membrane above the standard specification to CS2 (NHBC Amber 1). 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.

However, this risk is associated with the underground tanks and potential for organic vapour concentrations, hence once the source has been removed then the ground gas regime should be reassessed.

³ TRRL 1984 Structure Design of Bituminous Roads. Report LR1132

7.9 Soakage Potential

The borehole permeability tests indicate good permeability ($>10^{-4}$ m/sec) within the chalk materials, which may need to be confirmed via BRE365 testing should a soakaway be proposed within the design. Due to the former use as a petrol station and car maintenance, any soakaways will need to be positioned away from potential sources of contamination. Based on the current information, they should be positioned at least 10m distance from any dwelling ³⁰ (based on low density chalk). It is recommended 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 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 proposals are for residential development to comprise construction of two storey residential dwellings including houses and apartments. Shallow traditional strip foundations are likely to be feasible for consideration in some of the plots, adopting an allowable bearing capacity of between 100 and 150kPa. The depth of made ground and the potential for having 3m deep excavations following the tank removal are likely to require piled foundations to be adopted in this area. Additional deep boreholes will be needed to determine the pile design criteria to be adopted.

The preliminary foundation parameters are included in Table 26 for each plot as taken from Figure 3.

Table 26 – Preliminary Foundation Parameters for Each Plot

Plots	Strip Foundations (Yes/No)	Allowable Bearing Capacity (kPa)	Comments
4Bed house	Yes	100	Foundation minimum depth of 1.80m into medium strength/firm gravelly clay.
3Bed house	Yes		
Flats	No	-	Piled foundations due to made ground depth/tank excavation
Townhouses	Yes	150	Foundation minimum depth of 1.00m into stiff gravelly clay

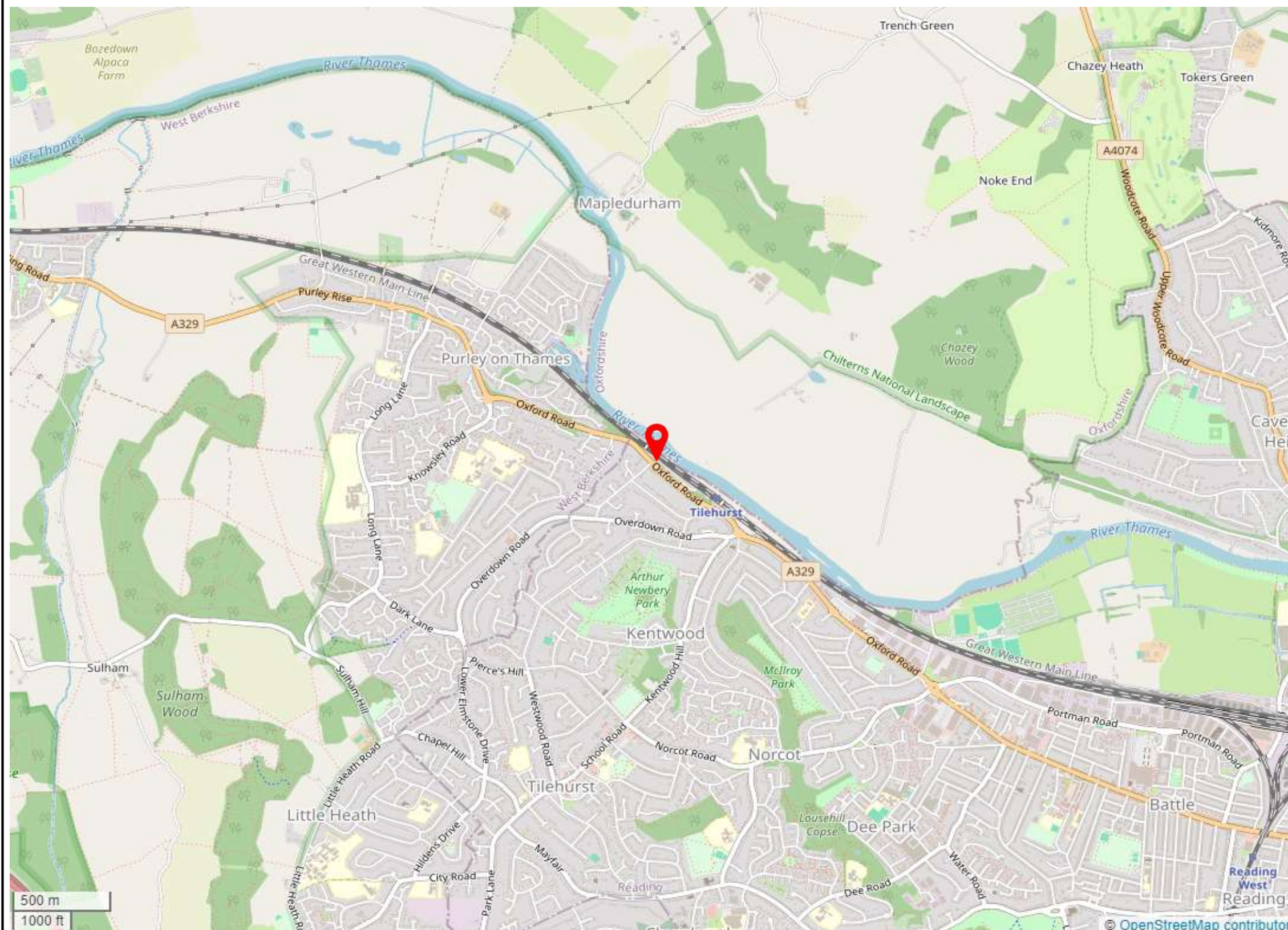
It is recommended that a structural engineer is consulted for the detailed foundation design.

8.0 RECOMMENDATIONS FOR FUTURE WORK

WDE recommends that the following items are undertaken:

- Decommissioning of USTs in line with regulatory requirements
- Preparation of Remedial Strategy to manage identified contamination
- Deep borehole investigation for pile design
- BRE365 soakage testing if considered to be feasible

FIGURES



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

Client

MAXIKA HOMES

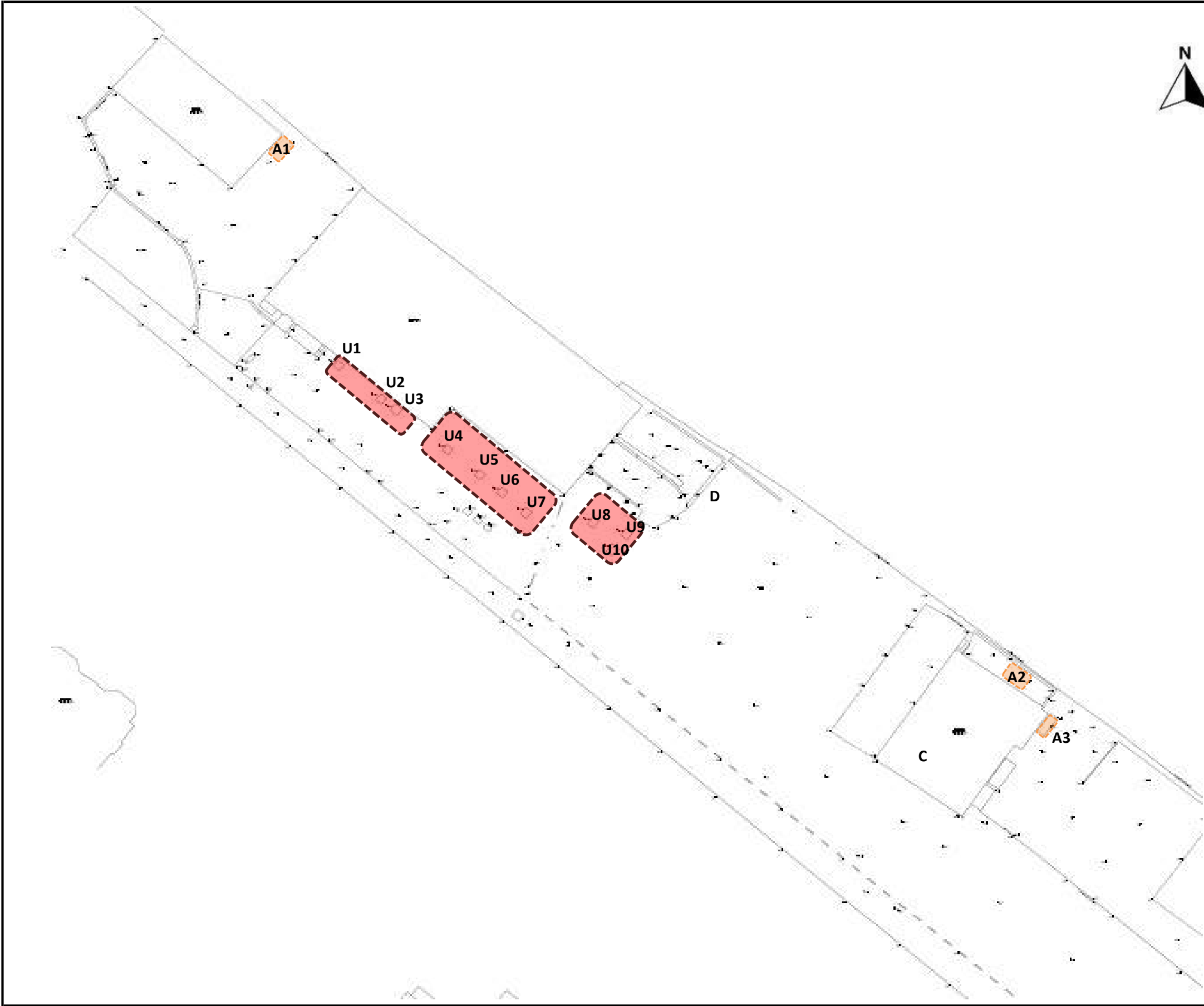
Project

CHARTERS, TILEHURST, READING

Title

FIGURE 1: SITE LOCATION PLAN

© OpenStreetMap contributors



62A Western Road
Tring
HERTS
HP23 4BB
T: 01442 825570
E: general@wdeconsulting.co.uk

LEGEND

-  Underground storage tanks
-  Above ground storage tanks
-  Area of concern ref

Client

MAXIKA HOMES

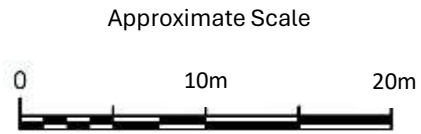
Project

CHARTERS, TILEHURST, READING

Title

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

Drawing supplied by client

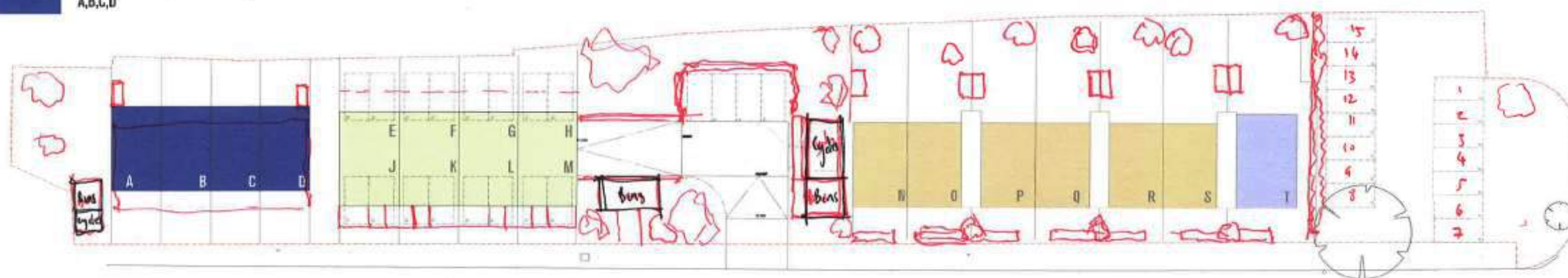


KEY
UNIT FOOTPRINT - CONCEPT SIZING

- 1 No. 4B HOUSE, 6 X 10m footprint
T
- 6 No. 3B HOUSE, 5.5 X 9m footprint
N,O,P,Q,R,S
- 8 No. 2 bed FLATS, 6 X 10m footprint
E,F,G,H,J,K,L,M
- 4 No. ^{3b} Townhouses, 5 X 9m footprint
A,B,C,D

19 Units total.
8 Flats
11 Houses.

SCALE 1:400 on A3



LEGEND

Client

MAXIKA HOMES

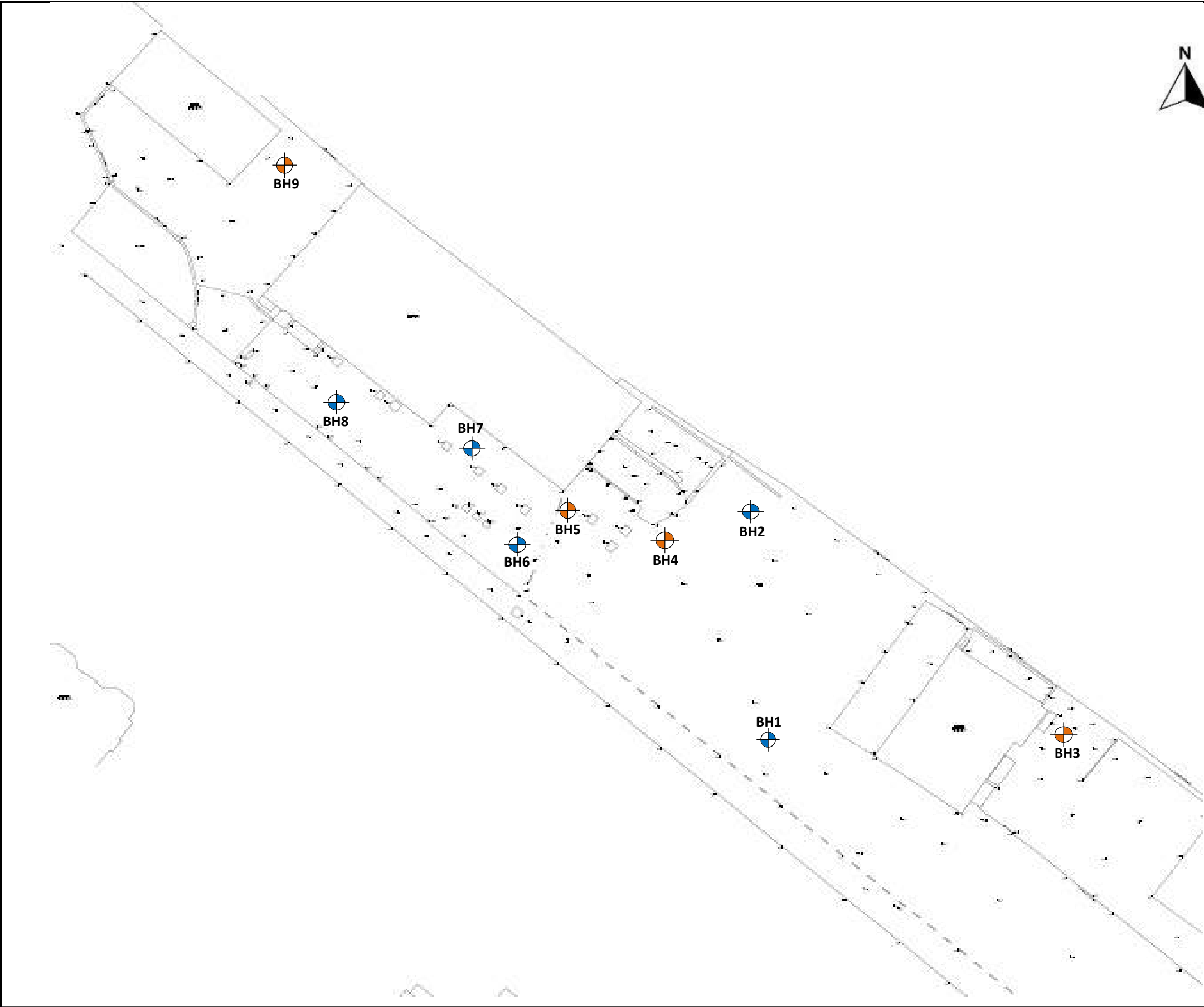
Project

CHARTERS, TILEHURST, READING

Title

FIGURE 3: PROPOSED SITE PLAN

Drawing supplied by client



62A Western Road
Tring
HERTS
HP23 4BB
T: 01442 825570
E: general@wdeconsulting.co.uk

- LEGEND**
-  Borehole
 -  Borehole w/ monitoring well

Client

MAXIKA HOMES

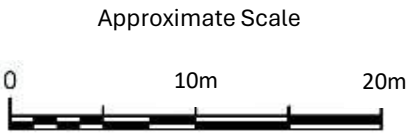
Project

CHARTERS, TILEHURST, READING

Title

FIGURE 4: INTRUSIVE LOCATION 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 Framework⁴ 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 Agency⁵. 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 Sites⁶ and for undertaking Site Investigations⁷ which have duly been considered. An update to the potential human health exposure pathways is provided in the Environment Agency Soil Science Report SR3⁸. 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

⁴ Department of Communities and Local Government. March 2012

⁵ Environment Agency. 2020. Land Contamination Risk Management (LCRM)

⁶ British Standards 2011. Investigation of Potentially Contaminated Sites-Codes of Practice. BS10175:2011

⁷ British Standards. 2015. Code of Practice for Site Investigations. BS5930

⁸ Environment Agency, August 2008, Updated technical background to the CLEA model, Science Report - SC050021/SR3

Affected by Contamination⁹. Guidance is provided in the CLR Report No 4 on sampling strategies for contaminated land¹⁰.

QUALITATIVE RISK ASSESSMENT

The potentially active human health are based on the Agency Soil Science Report SR3¹¹. 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 soluble¹².

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 66⁹.

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)¹³. 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.

⁹ Environment Agency, 2008. Guidance for the Safe Development of Housing on Land Affected by Contamination. R&D 66

¹⁰ DOE, 1994. Sampling Strategies for Contaminated Land. CLR Report No 4

¹¹ Environment Agency, August 2008, Updated technical background to the CLEA model, Science Report - SC050021/SR3

¹² Department of the Environment, 1996, Industry Profile: Engineering works. P.14 Sect 3.2.1

¹³ LQM/CIEH 2014. The LQM/CIEH S4ULs for Human Health Risk Assessment.

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

GROUNDSED 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 Directive¹⁴ and the Water Supply Regulations¹⁵, 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

¹⁴ The Water Framework Directive (Standards and Classifications) Directions (England and Wales). 2015.

¹⁵ The Water Supply (Water Quality) Regulations. 2016.

GROUNDING 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 buildings¹⁶
- NHBC: Guidance on evaluation of development proposals on sites where methane and carbon dioxide are present¹⁷
- NHBC: Technical Extra¹⁸
- The Building Regulations Site Preparation and resistance to contaminants and moisture. ¹⁹
- British Standard. Guidance on Investigations for Ground Gas²⁰
- NHBC guidance on Hazardous groundgas²¹

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

¹⁶ CIRIA 2007. Assessing Risks Posed by Hazardous Ground Gases to Buildings. C665

¹⁷ NHBC 2007. Guidance on Evaluation of Development Proposals on Sites where methane and carbon dioxide are present

¹⁸ NHBC 2016. Technical Extra. Ground Gas Update. April 2016. Issue 20

¹⁹ Building Regulations 2004. Approved Document C, Site Preparation and resistance to contaminants and moisture.

²⁰ British Standards 2013. Guidance on Investigation for Ground Gas. BS8576. 2013

²¹ NHBC 2023. Hazardous Ground Gas – an essential guide for housebuilders. NF94

4	Moderate to High	<15	QRA recommended	As above but with oversight 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 Pipes²²
- Water UK Contaminated Land Assessment Guidance²³

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.

²² UK Water Industry Research 2011. Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites. 10/WM/03/21.

²³ Water UK 2014. Contaminated Land Assessment Guidance.

The Agency have published guidance on the classification of Hazardous Waste²⁴, 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 Landfills²⁵. 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 Waste²⁶ 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 combined²⁷. 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.

²⁴ Environment Agency. 2013. Interpretation of the Definition and Classification of Hazardous Waste. Technical Guidance WM2

²⁵ Environment Agency. 2010 Waste Acceptance at Landfills. Version 1.

²⁶ CL:AIRE 2001. The Definition of Waste: Development Industry Code of Practice. Version 2.

²⁷ UK Parliament. Building to new zero: costing carbon in construction. First Report of Session 2022-23

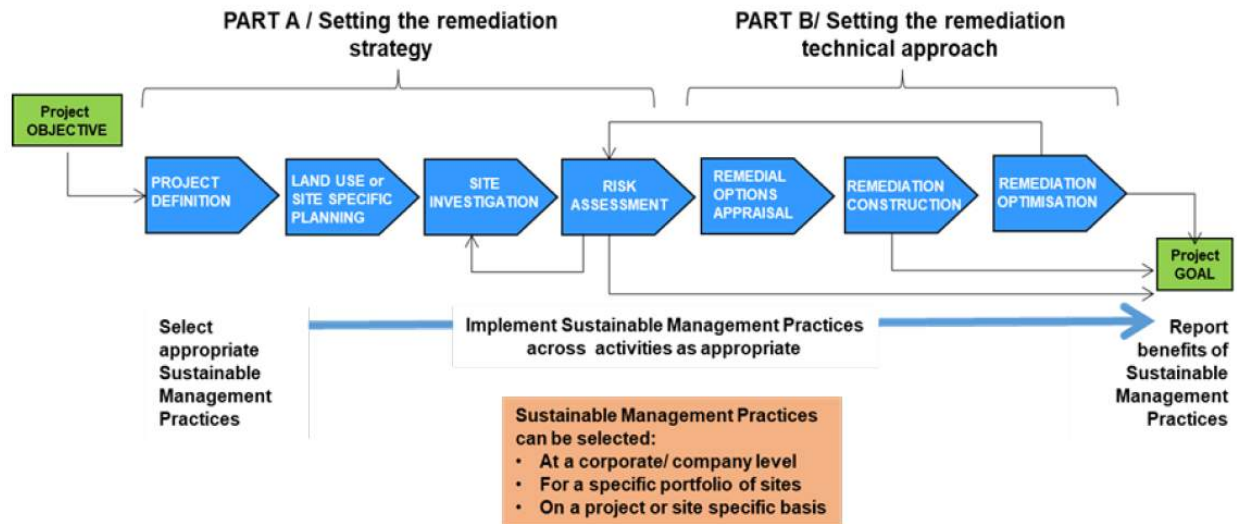


Figure 2.1: Application of sustainable management practices in context of life cycle of land contamination management and SuRF UK Framework

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 desiccation²⁸ is Richard Driscoll's method that significant desiccation has occurred when the moisture content is less than 0.4 x the liquid limit.

²⁸ 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 samples²⁹. 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 BRE412²⁸

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 – BS5930⁷
- BRE Digest 365 2003 Soakage testing

The CIRIA publication³⁰ 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

²⁹ Proceedings of The Institute of Civil Engineers: Geotechnical Engineering. 1995, 113, 25-30

³⁰ 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 – The site looking toward the northern boundary



Photo 2 – UST tank farm location (ref U4 to U7)

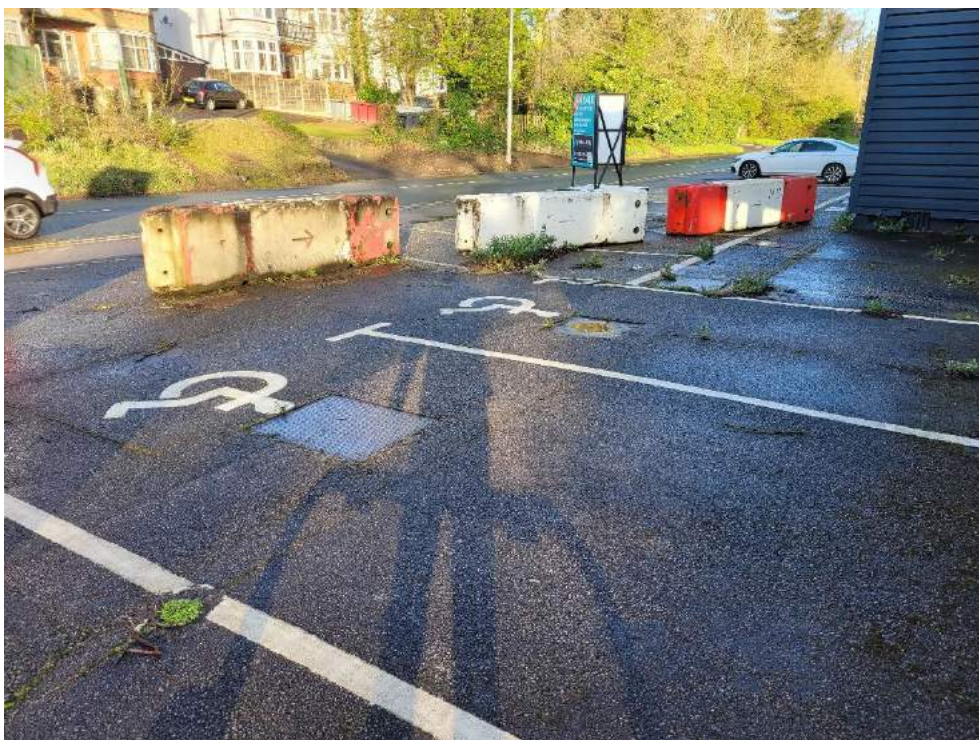


Photo 3 – Exposed tank entry (ref U7)



Photo 4 – Product showing on dip stick (ref U2)

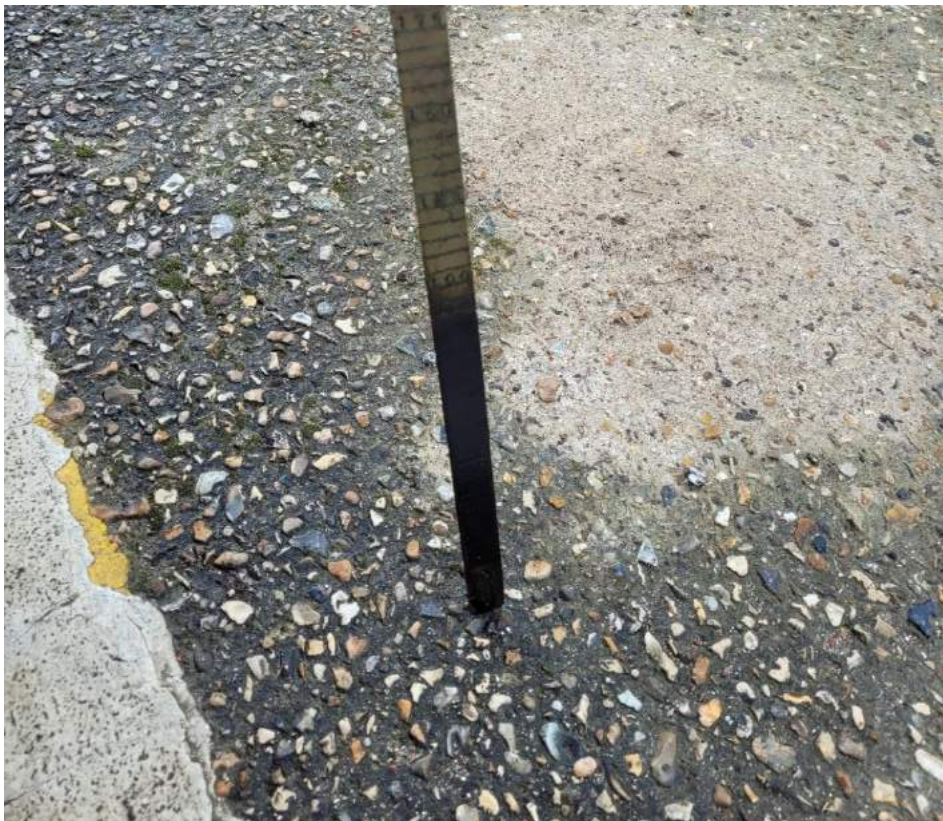


Photo 5 – Window sampling at location BH5



Photo 6 – AST ref A3



Photo 7 – AST ref A2



Photo 8 – AST ref A1



Photo 9 – UST ref U8, U9, U10



APPENDIX C:
ENVIRONMENTAL [DATABASE](#)
REGULATORY CORRESPONDENCE

Tilehurst

markswanston rake-rem.co.uk <markswanston@rake-rem.co.uk>

Tue 14/05/24 08:50

To:Simon Ware <sware@wdeconsulting.co.uk>;Jason Fitzgerald
<jfitzgerald@wdeconsulting.co.uk>

Morning

No reply from David Acreman (Environment Protection and Nuisance team) .
I rang Neil Parsons - apparantly the file has been lost ,
He says that he will see if there is any data available and will get back to me
tomorrow.

Regards

Mark

Rake Remediation Ltd
Unit G
Nyewood Industrial Estate
Rogate
GU315HA
Tel: 01730892224 Mobile: 07831470669
Email: markswanston@rake-rem.co.uk

RE: Charters Garage: Tilehurst Reading.

markswanston rake-rem.co.uk <markswanston@rake-rem.co.uk>

Wed 15/05/24 08:54

To:Acreman, David <David.Acreman@reading.gov.uk>

Dave

We have found underground tanks, some with product remaining. I suspect these tanks date from before the car dealership and have not been decommissioned when the premises ceased retailing fuel.

Regards

Mark

Rake Remediation Ltd

Unit G

Nyewood Industrial Estate

Rogate

GU315HA

Tel: 01730892224 Mobile: 07831470669

Email: markswanston@rake-rem.co.uk

> On 14/05/2024 16:01 BST Acreman, David <david.acreman@reading.gov.uk> wrote:

>

>

> Hi Mark,

>

> I can't see any permit related to this site, as far as I can tell it appears to have been a car dealership.

>

> Kind Regards

>

> Dave

>

>

> Dave Acreman MCIEH

> Senior Environmental Health Officer

> Environmental Protection and Nuisance Team

> Regulatory Services| Directorate of Economic Growth and Neighbourhood Services

> Reading Borough Council

> Civic Offices

> Bridge Street

> Reading

> RG1 2LU

> 0118 937 2386

> 07813 725642

> Website | Facebook | Twitter | YouTube | Instagram | LinkedIn

>

>

>

>

> -----Original Message-----

> From: markswanston rake-rem.co.uk <markswanston@rake-rem.co.uk>

> Sent: Monday, May 13, 2024 4:39 PM

> To: Acreman, David <David.Acreman@reading.gov.uk>

> Subject: Re: Charters Garage: Tilehurst Reading.

>

> Warning ! For the attention of RBC, BfC Staff and Councillors

>

> This mail is from an external sender - please do not click any links or open any attachments unless you trust this sender, and know the content is safe

>

> Dave,

>

> Have you found any details re Part B permit or other authorisation?

>

> Regards

>

> Mark

>

> Remediation Ltd

> Unit G

> Nyewood Industrial Estate

> Rogate

> GU315HA

> Tel: 01730892224 Mobile: 07831470669 Rake

> Email: markswanston@rake-rem.co.uk

>

>

> > On 08/05/2024 15:42 BST Acreman, David

<david.acreman@reading.gov.uk> wrote:

> >

> >

> > Dear Mark,

> >

> > Thank you for contacting us regarding the above. I will look through our record to see if we issued a part B permit or authorisation for this premises and let you know if I find anything that would be useful to you.

> >

> > Kind Regards

> >

> > Dave

> >

> >

> >

> > Dave Acreman MCIEH

> > Senior Environmental Health Officer

> > Environmental Protection and Nuisance Team Regulatory Services|

> > Directorate of Economic Growth and Neighbourhood Services Reading

> > Borough Council Civic Offices Bridge Street Reading

> > RG1 2LU

> > 0118 937 2386

> > 07813 725642

> > Website (<http://www.reading.gov.uk/>)|Facebook

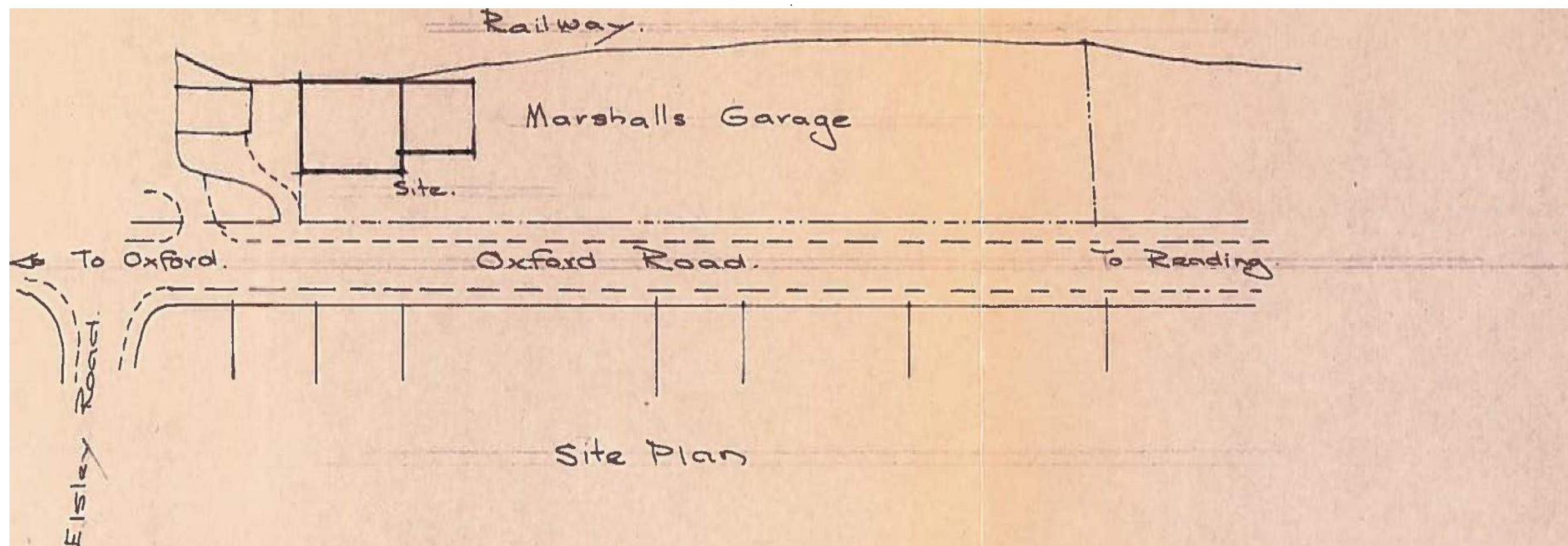
> > (<http://www.facebook.com/readingcouncil>)|Twitter

> > (<http://www.twitter.com/readingcouncil>)|YouTube

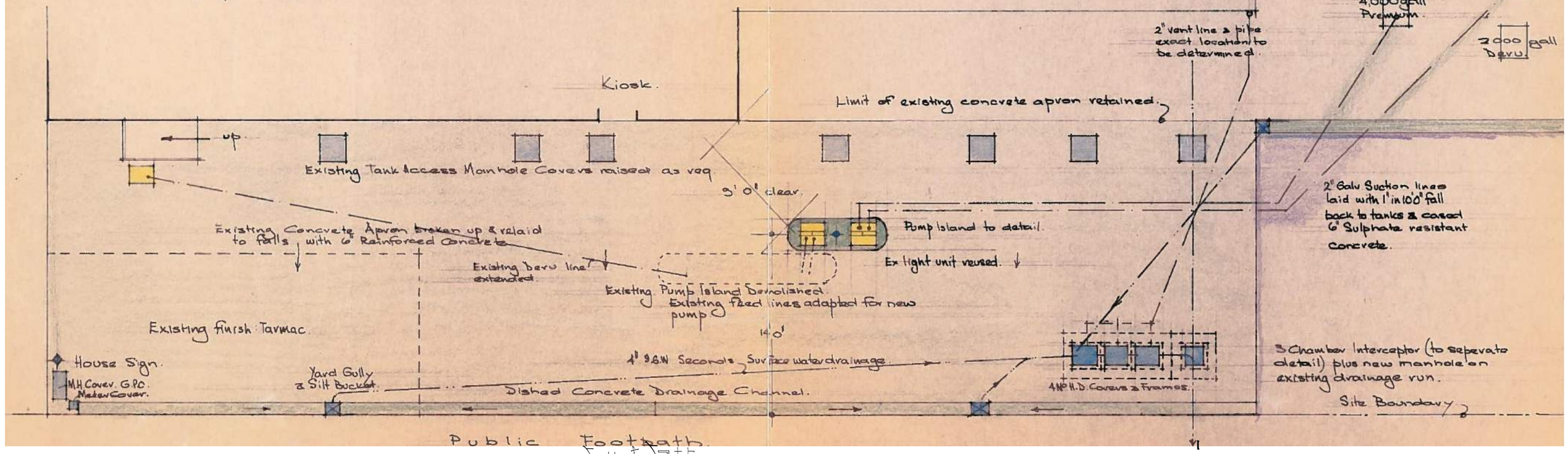
> > (<https://www.youtube.com/c/ReadingCouncilNews>)|Instagram

> > (<http://www.instagram.com/readingcouncil>)|LinkedIn

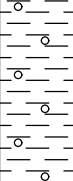
> > (<https://www.linkedin.com/company/reading-borough-council>)

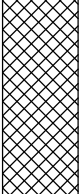
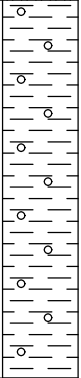


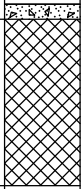
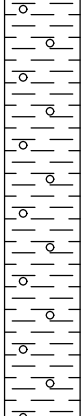
NB Allow for 4" P.F. Duct from exit point of existing electrical duct from Kiosk to new Pump Island. Allow for 18" x 18" Access Chamber adjacent to Island with ducts to pumps & light positions. (These not indicated).



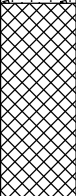
APPENDIX D: FIELD LOGS

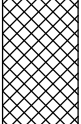
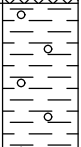
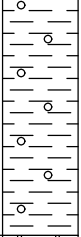
			62a Western Road Tring, Hertfordshire HP23 4BB Tel. 01442 825570 Fax. 01442 891410			Site Reading		Borehole Number BH1	
Excavation Method Window Sampler		Dimensions		Ground Level (mOD)		Client Maxika Homes		Job Number 21283	
		Location		Dates		Engineer JF		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	DESCRIPTION	Legend	Water	Instr
0.40 0.50	J J				0.10 (0.70)	MADE GROUND: Bituminous material. MADE GROUND: Dark brown silty sandy gravelly clay with red brick, chalk and concrete fragments.			
1.00	SPT N=2		1,1/0,1,1,0		0.80	Soft to firm brown sandy gravelly CLAY. Gravels are fmc subangular to subrounded.			
2.00	SPT N=17		3,4/4,4,4,5		(2.90)				
3.00	SPT N=15		7,5/5,3,3,4			3.00 chalk gravels present			
4.00	SPT N=13		2,3/3,3,3,4		3.70 4.00	White CHALK (grade Dm/Dc). Complete at 4.00m			
Remarks Groundwater not encountered							Scale (approx) 1:50	Logged By JF	Figure Number 21283.BH1

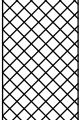
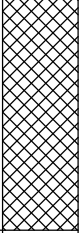
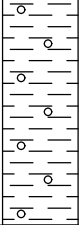
				62a Western Road Tring, Hertfordshire HP23 4BB Tel. 01442 825570 Fax. 01442 891410		Site Reading		Borehole Number BH2	
Excavation Method Window Sampler		Dimensions		Ground Level (mOD)		Client Maxika Homes		Job Number 21283	
		Location		Dates		Engineer JF		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	DESCRIPTION	Legend	Water	Instr
0.20	J				0.10	MADE GROUND: Bituminous material.			
1.00	SPT N=9		2,2/3,2,2,2		(1.40)	MADE GROUND: Dark brown silty sandy gravelly clay with red brick and concrete fragments.			
1.20	J								
2.00	SPT N=13		2,2/3,3,4,3		1.50	Soft to firm brown sandy gravelly CLAY. Gravels are fmc subangular to subrounded.			
3.00	SPT N=9		2,2/3,2,2,2		(2.50)	2.00 - 3.00 very sandy clay			
4.00	SPT N=11		2,2/2,3,3,3		4.00	Complete at 4.00m			
Remarks Groundwater not encountered							Scale (approx) 1:50	Logged By JF	Figure Number 21283.BH2

				62a Western Road Tring, Hertfordshire HP23 4BB Tel. 01442 825570 Fax. 01442 891410		Site Reading		Borehole Number BH3		
Excavation Method Window Sampler		Dimensions		Ground Level (mOD)		Client Maxika Homes			Job Number 21283	
		Location		Dates		Engineer JF			Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	DESCRIPTION	Legend	Water	Instr	
0.30	J				0.10	CONCRETE.				
					(1.10)	MADE GROUND: Dark brown silty sandy gravelly clay with red brick, wood and concrete fragments.				
1.00	J SPT N=1		1,0/0,1,0,0		1.20	Soft to firm brown sandy gravelly CLAY. Gravels are fmc subangular to subrounded.				
2.00	SPT N=9		2,2/2,2,2,3		(2.80)					
3.00	SPT N=16		2,3/4,4,4,4							
4.00	SPT N=13		2,3/3,3,4,3		4.00	Complete at 4.00m				
Remarks Groundwater not encountered							Scale (approx) 1:50	Logged By JF	Figure Number 21283.BH3	

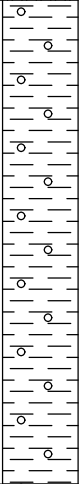
			62a Western Road Tring, Hertfordshire HP23 4BB Tel. 01442 825570 Fax. 01442 891410			Site Reading		Borehole Number BH4	
Excavation Method Window Sampler		Dimensions		Ground Level (mOD)		Client Maxika Homes		Job Number 21283	
		Location		Dates		Engineer JF		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	DESCRIPTION	Legend	Water	Instr
0.30	J				0.10	MADE GROUND: Bituminous material.			
0.60	J				(0.50)	MADE GROUND: Dark brown silty sandy gravelly clay with red brick and concrete fragments.			
1.00	SPT N=8		2,1/1,2,2,3		0.60	Soft to firm brown sandy gravelly CLAY. Gravels are fmc subangular to subrounded. 1.00 - 2.00 Clayey very sandy GRAVEL.			
2.00	SPT N=10		2,3/3,2,2,3		(3.40)				
3.00	SPT N=13		3,3/3,3,4,3						
4.00	SPT N=11		3,3/2,3,3,3		4.00	Complete at 4.00m			
Remarks Groundwater not encountered							Scale (approx) 1:50	Logged By JF	Figure Number 21283.BH4

WDEconsulting 62a Western Road Tring, Hertfordshire HP23 4BB Tel. 01442 825570 Fax. 01442 891410				Site Reading		Borehole Number BH5			
Excavation Method Window Sampler		Dimensions		Ground Level (mOD)		Client Maxika Homes		Job Number 21283	
		Location		Dates		Engineer JF		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	DESCRIPTION	Legend	Water	Instr
1.00	SPT N=1		1,0/0,1,0,0		0.20 (1.30)	CONCRETE. MADE GROUND: Dark brown silty sandy gravelly clay with red brick and concrete fragments.	 		
1.50	SPT N=50		50,50/50,0,0,0		1.50	Refusal on obstruction. Complete at 1.50m			
Remarks Groundwater not encountered							Scale (approx) 1:50	Logged By JF	Figure Number 21283.BH5

			62a Western Road Tring, Hertfordshire HP23 4BB Tel. 01442 825570 Fax. 01442 891410			Site Reading		Borehole Number BH6	
Excavation Method Window Sampler		Dimensions		Ground Level (mOD)		Client Maxika Homes		Job Number 21283	
		Location		Dates		Engineer JF		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	DESCRIPTION	Legend	Water	Instr
0.30	J				0.10	MADE GROUND: Bituminous material.			
					(0.90)	MADE GROUND: Dark brown silty sandy gravelly clay with red brick and concrete fragments.			
1.00	J SPT N=2		1,0/0,1,1,0		1.00	Soft to firm brown sandy gravelly CLAY. Gravels are fmc subangular to subrounded.			
2.00	SPT N=16		2,3/4,4,4,4		(2.50)				
3.00	SPT N=22		4,4/5,6,6,5			3.00 chalk gravels present			
					3.50	White CHALK (grade Dm/Dc).			
4.00	SPT N=13		2,2/3,3,3,4		4.00	Complete at 4.00m			
Remarks Groundwater not encountered							Scale (approx) 1:50	Logged By JF	Figure Number 21283.BH6

			62a Western Road Tring, Hertfordshire HP23 4BB Tel. 01442 825570 Fax. 01442 891410			Site Reading		Borehole Number BH7	
Excavation Method Window Sampler		Dimensions		Ground Level (mOD)		Client Maxika Homes		Job Number 21283	
		Location		Dates		Engineer JF		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	DESCRIPTION	Legend	Water	Instr
0.15	J				0.10	CONCRETE.			
						MADE GROUND: Gravelly cobbly brick fill with asbestos fragments. Poor Recovery.			
1.00	SPT N=3		1,1/2,1,0,0		(2.40)				
1.55	J		PID=0.8ppm			1.50 - 1.60 Distinct hydrocarbon odour, grey staining			
2.00	SPT N=18		2,2/4,5,5,4		2.50	Soft to firm brown sandy gravelly CLAY. Gravels are fmc subangular to subrounded.			
3.00	SPT N=21		4,5/5,6,5,5		(1.50)				
					4.00	Complete at 4.00m			
Remarks Groundwater not encountered							Scale (approx) 1:50	Logged By JF	Figure Number 21283.BH7

			62a Western Road Tring, Hertfordshire HP23 4BB Tel. 01442 825570 Fax. 01442 891410			Site Reading		Borehole Number BH8	
Excavation Method Window Sampler		Dimensions		Ground Level (mOD)		Client Maxika Homes		Job Number 21283	
		Location		Dates		Engineer JF		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	DESCRIPTION	Legend	Water	Instr
0.50	J				0.10 0.30	CONCRETE. MADE GROUND: Gravel and brick fill. MADE GROUND: Dark brown silty sandy gravelly clay with red brick and concrete fragments.	  		
1.00	SPT N=1		1,0/0,1,0,0		(1.50)				
1.50	J								
2.00	SPT N=19		4,4/5,5,5,4		1.80	Soft to firm brown sandy gravelly CLAY. Gravels are fmc subangular to subrounded.			
3.00	SPT N=25		4,5/5,6,6,8		(2.20)				
4.00	SPT N=21		4,5/5,5,5,6		4.00	Complete at 4.00m			
Remarks Groundwater not encountered							Scale (approx) 1:50	Logged By JF	Figure Number 21283.BH8

			62a Western Road Tring, Hertfordshire HP23 4BB Tel. 01442 825570 Fax. 01442 891410			Site Reading		Borehole Number BH9	
Excavation Method Window Sampler		Dimensions		Ground Level (mOD)		Client Maxika Homes		Job Number 21283	
		Location		Dates		Engineer JF		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	DESCRIPTION	Legend	Water	Instr
0.40	J				0.10 (0.70)	MADE GROUND: Bituminous material. MADE GROUND: Dark brown silty sandy gravelly clay with red brick and concrete fragments.	 		
1.00	SPT N=7		2,2/1,2,2,2		0.80	Soft to firm brown sandy gravelly CLAY. Gravels are fmc subangular to subrounded.			
2.00	SPT N=11		2,3/3,2,3,3		(3.20)				
3.00	SPT N=14		2,3/3,4,3,4						
4.00	SPT N=13		2,3/3,3,3,4		4.00	Complete at 4.00m			
Remarks Groundwater not encountered							Scale (approx) 1:50	Logged By JF	Figure Number 21283.BH9

APPENDIX E: FIELD SHEETS

Ground Vapour/Water Monitoring

Visit Date: 9/4/24

Air Temp: 11°C

Visit Number: 1

Borehole Number	1	2	6
PID	0.90	0.10	1.00
Depth to Groundwater (m)	Dry	Dry	Dry
Depth to Base of Borehole (m)	3.91	3.98	3.95
Condition of Standpipe			

Borehole Number	7	8	
PID	0.00	1.20	
Depth to Groundwater (m)	Dry	Dry	
Depth to Base of Borehole (m)	2.93	3.93	
Condition of Standpipe			

APPENDIX F: ANALYTICAL TEST RESULTS

WDE Consulting Ltd
62a Western Road
Tring
Hertfordshire
HP23 4BB

t: 01442 825570

e: general@wdeconsulting.co.uk

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

t: 01923 225404

f: 01923 237404

e: reception@i2analytical.com

Analytical Report Number : 24-012885

Replaces Analytical Report Number: 24-012885, issue no. 1

Client sampling date amended.

Sampling dates added to all samples as per client's request.

Project / Site name:	Tilehurst, Reading	Samples received on:	08/04/2024
Your job number:	21283	Samples instructed on/ Analysis started on:	08/04/2024
Your order number:	24-139	Analysis completed by:	15/04/2024
Report Issue Number:	2	Report issued on:	10/05/2024
Samples Analysed:	8 soil samples - 5 leachate samples		

Signed:



Joanna Szwagrak
Reporting Specialist

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

Excel copies of reports are only valid when accompanied by this PDF certificate.

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: 24-012885
Project / Site name: Tilehurst, Reading
Your Order No: 24-139

Lab Sample Number				164552	164554	164557	164559	164560
Sample Reference				BH2.1	BH3.1	BH4.2	BH6.2	BH7.1
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.20	0.30	0.60	1.00	0.15
Date Sampled				04/04/2024	04/04/2024	04/04/2024	04/04/2024	04/04/2024
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)				Units	Limit of detection	Accreditation Status		

Stone Content	%	0.1	NONE	< 0.1	33.2	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	13	11	12	16	7.8
Total mass of sample received	kg	0.1	NONE	0.8	0.8	0.8	0.8	0.8

Asbestos

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

Asbestos % by hand picking/weighing	%	0.001	ISO 17025	-	0.015	-	-	< 0.001
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Asbestos Containing Material Types Detected (ACM)	Type	N/A	ISO 17025	-	Loose Fibrous Debris	-	-	Loose Fibres
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General Inorganics

pH (L099)	pH Units	N/A	MCERTS	8.9	9.9	9.8	8.3	11.3
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Sulphate as SO ₄	%	0.005	MCERTS	0.079	0.159	0.115	0.061	1.14
Water Soluble Sulphate as SO ₄ 16hr extraction (2:1)	mg/kg	2.5	MCERTS	260	610	100	140	3300
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	132	303	50.3	69.1	1670
Sulphide	mg/kg	1	MCERTS	< 1.0	75	< 1.0	2	7.9
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	0.4	2.2	0.6	1.4	0.4

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	0.47	0.09	0.3	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	1.4	0.32	1.6	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	3.2	0.31	1.9	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	3.3	0.38	3.1	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	0.19	35	5	38	0.46
Anthracene	mg/kg	0.05	MCERTS	0.06	10	1.4	9.7	0.12
Fluoranthene	mg/kg	0.05	MCERTS	0.36	53	11	49	1.5
Pyrene	mg/kg	0.05	MCERTS	0.31	45	10	40	1.3
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.2	24	5.9	19	0.73
Chrysene	mg/kg	0.05	MCERTS	0.17	23	6	18	0.72
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	0.27	28	8.5	20	0.91
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	0.07	13	2.6	9.3	0.33
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.21	26	6.7	19	0.75
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	16	4.3	12	0.54
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	4.5	1.2	3.1	0.16
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	19	5.3	13	0.71

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	1.84	304	69.5	256	8.28
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Heavy Metals / Metalloids

Analytical Report Number: 24-012885
Project / Site name: Tilehurst, Reading
Your Order No: 24-139

Lab Sample Number				164552	164554	164557	164559	164560
Sample Reference				BH2.1	BH3.1	BH4.2	BH6.2	BH7.1
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.20	0.30	0.60	1.00	0.15
Date Sampled				04/04/2024	04/04/2024	04/04/2024	04/04/2024	04/04/2024
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	13	17	16	18	19
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.57	1	0.56	1.2	0.8
Boron (water soluble)	mg/kg	0.2	MCERTS	1.3	0.5	0.5	0.7	0.3
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	1.3	< 0.2	< 0.2	1.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	21	33	19	23	42
Copper (aqua regia extractable)	mg/kg	1	MCERTS	48	66	29	29	22
Lead (aqua regia extractable)	mg/kg	1	MCERTS	42	130	84	69	48
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	18	25	14	21	18
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	38	41	30	38	39
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	63	280	88	260	87

Petroleum Hydrocarbons

TPHCWG - Aliphatic >C5 - C6 HS_ID_AL	mg/kg	0.02	NONE	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
TPHCWG - Aliphatic >C6 - C8 HS_ID_AL	mg/kg	0.02	NONE	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
TPHCWG - Aliphatic >C8 - C10 HS_ID_AL	mg/kg	0.05	NONE	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
TPHCWG - Aliphatic >C10 - C12 EH_CU_ID_AL	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPHCWG - Aliphatic >C12 - C16 EH_CU_ID_AL	mg/kg	2	MCERTS	2.7	15	9	< 2.0	< 2.0
TPHCWG - Aliphatic >C16 - C21 EH_CU_ID_AL	mg/kg	8	MCERTS	9.8	50	31	< 8.0	< 8.0
TPHCWG - Aliphatic >C21 - C35 EH_CU_ID_AL	mg/kg	8	MCERTS	31	440	54	14	72
TPHCWG - Aliphatic >C35 - C44 EH_CU_ID_AL	mg/kg	8.4	NONE	< 8.4	190	36	< 8.4	50
TPHCWG - Aliphatic >C5 - C35 EH_CU+HS_ID_AL	mg/kg	10	NONE	43	510	94	14	72
TPHCWG - Aliphatic >C5 - C44 EH_CU+HS_ID_AL	mg/kg	10	NONE	43	700	130	14	120

TPHCWG - Aromatic >EC5 - EC7 HS_ID_AR	mg/kg	0.01	NONE	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
TPHCWG - Aromatic >EC7 - EC8 HS_ID_AR	mg/kg	0.01	NONE	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
TPHCWG - Aromatic >EC8 - EC10 HS_ID_AR	mg/kg	0.05	NONE	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
TPHCWG - Aromatic >EC10 - EC12 EH_CU_ID_AR	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPHCWG - Aromatic >EC12 - EC16 EH_CU_ID_AR	mg/kg	2	MCERTS	< 2.0	36	3.8	13	< 2.0
TPHCWG - Aromatic >EC16 - EC21 EH_CU_ID_AR	mg/kg	10	MCERTS	< 10	280	51	140	< 10
TPHCWG - Aromatic >EC21 - EC35 EH_CU_ID_AR	mg/kg	10	MCERTS	< 10	640	110	170	58
TPHCWG - Aromatic >EC35 - EC44 EH_CU_ID_AR	mg/kg	8.4	NONE	< 8.4	220	55	33	39
TPHCWG - Aromatic >EC5 - EC35 EH_CU+HS_ID_AR	mg/kg	10	NONE	< 10	960	160	320	58
TPHCWG - Aromatic >EC5 - EC44 EH_CU+HS_ID_AR	mg/kg	10	NONE	< 10	1200	220	350	97

Analytical Report Number: 24-012885
 Project / Site name: Tilehurst, Reading
 Your Order No: 24-139

Lab Sample Number	164552	164554	164557	164559	164560
Sample Reference	BH2.1	BH3.1	BH4.2	BH6.2	BH7.1
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	0.20	0.30	0.60	1.00	0.15
Date Sampled	04/04/2024	04/04/2024	04/04/2024	04/04/2024	04/04/2024
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		

VOCs

Chloromethane	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chloroethane	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Bromomethane	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Vinyl Chloride	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Trichlorofluoromethane	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,1-Dichloroethene	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Trans 1,2-dichloroethylene	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,1-Dichloroethane	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
2,2-Dichloropropane	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chloroform	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,1,1-Trichloroethane	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,2-Dichloroethane	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,1-Dichloropropene	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Cis-1,2-dichloroethene	µg/kg	5	ISO 17025	< 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
Carbontetrachloride	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,2-Dichloropropane	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Trichloroethene	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Dibromomethane	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Bromodichloromethane	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Cis-1,3-dichloropropene	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Trans-1,3-dichloropropene	µg/kg	5	ISO 17025	< 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
1,1,2-Trichloroethane	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,3-Dichloropropane	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Dibromochloromethane	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Tetrachloroethene	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,2-Dibromoethane	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chlorobenzene	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,1,1,2-Tetrachloroethane	µg/kg	5	ISO 17025	< 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
Styrene	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Bromoform	µg/kg	5	NONE	< 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
Isopropylbenzene	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0

Analytical Report Number: 24-012885
Project / Site name: Tilehurst, Reading
Your Order No: 24-139

Lab Sample Number				164552	164554	164557	164559	164560
Sample Reference				BH2.1	BH3.1	BH4.2	BH6.2	BH7.1
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.20	0.30	0.60	1.00	0.15
Date Sampled				04/04/2024	04/04/2024	04/04/2024	04/04/2024	04/04/2024
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
1,1,2,2-Tetrachloroethane	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Bromobenzene	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
n-Propylbenzene	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
2-Chlorotoluene	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
4-Chlorotoluene	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,3,5-Trimethylbenzene	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
tert-Butylbenzene	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,2,4-Trimethylbenzene	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
sec-Butylbenzene	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,3-Dichlorobenzene	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
p-Isopropyltoluene	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,4-Dichlorobenzene	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,2-Dichlorobenzene	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Butylbenzene	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,2-Dibromo-3-chloropropane	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,2,4-Trichlorobenzene ##	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Hexachlorobutadiene	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,2,3-Trichlorobenzene	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0

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

Analytical Report Number: 24-012885
Project / Site name: Tilehurst, Reading
Your Order No: 24-139

Lab Sample Number	164561	164563	164564
Sample Reference	BH7.2	BH8.2	BH9.1
Sample Number	None Supplied	None Supplied	None Supplied
Depth (m)	1.55	1.50	0.40
Date Sampled	04/04/2024	04/04/2024	04/04/2024
Time Taken	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status

Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	10	13	13
Total mass of sample received	kg	0.1	NONE	0.9	0.7	0.7

Asbestos

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

Asbestos % by hand picking/weighing	%	0.001	ISO 17025	-	-	-
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Asbestos Containing Material Types Detected (ACM)	Type	N/A	ISO 17025	-	-	-
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General Inorganics

pH (L099)	pH Units	N/A	MCERTS	8.4	8.4	7.7
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Total Sulphate as SO ₄	%	0.005	MCERTS	0.045	0.037	0.071
Water Soluble Sulphate as SO ₄ 16hr extraction (2:1)	mg/kg	2.5	MCERTS	180	52	33
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	90.9	26	16.4
Sulphide	mg/kg	1	MCERTS	11	4.9	1.8
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	2.8	1.5	2.4

Total Phenols

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

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	1.2	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	0.16	4.9	0.18
Acenaphthene	mg/kg	0.05	MCERTS	0.19	2.7	0.06
Fluorene	mg/kg	0.05	MCERTS	0.52	5	0.07
Phenanthrene	mg/kg	0.05	MCERTS	2.7	76	1.6
Anthracene	mg/kg	0.05	MCERTS	0.7	15	0.35
Fluoranthene	mg/kg	0.05	MCERTS	3.9	130	4.7
Pyrene	mg/kg	0.05	MCERTS	3.6	110	4.4
Benzo(a)anthracene	mg/kg	0.05	MCERTS	1.9	53	2.3
Chrysene	mg/kg	0.05	MCERTS	2.1	58	2.7
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	1.9	62	3.4
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	0.83	31	1.6
Benzo(a)pyrene	mg/kg	0.05	MCERTS	1.8	61	3.1
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	1.2	31	1.8
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	7.9	0.46
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	1.3	39	2.1

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	22.8	689	28.7
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Heavy Metals / Metalloids

Analytical Report Number: 24-012885
Project / Site name: Tilehurst, Reading
Your Order No: 24-139

Lab Sample Number				164561	164563	164564
Sample Reference				BH7.2	BH8.2	BH9.1
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				1.55	1.50	0.40
Date Sampled				04/04/2024	04/04/2024	04/04/2024
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status			
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	15	19	18
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.81	1.2	0.95
Boron (water soluble)	mg/kg	0.2	MCERTS	0.9	0.8	1.1
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	1.5
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	55	44	140
Copper (aqua regia extractable)	mg/kg	1	MCERTS	12	17	56
Lead (aqua regia extractable)	mg/kg	1	MCERTS	25	40	330
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	0.7
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	20	23	23
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	41	43	32
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	50	80	410

Petroleum Hydrocarbons

TPHCWG - Aliphatic >C5 - C6 HS_ID_AL	mg/kg	0.02	NONE	< 0.020	< 0.020	< 0.020
TPHCWG - Aliphatic >C6 - C8 HS_ID_AL	mg/kg	0.02	NONE	< 0.020	< 0.020	< 0.020
TPHCWG - Aliphatic >C8 - C10 HS_ID_AL	mg/kg	0.05	NONE	< 0.050	< 0.050	< 0.050
TPHCWG - Aliphatic >C10 - C12 EH_CU_ID_AL	mg/kg	1	MCERTS	5.1	< 1.0	< 1.0
TPHCWG - Aliphatic >C12 - C16 EH_CU_ID_AL	mg/kg	2	MCERTS	100	3.3	2.3
TPHCWG - Aliphatic >C16 - C21 EH_CU_ID_AL	mg/kg	8	MCERTS	210	8.6	< 8.0
TPHCWG - Aliphatic >C21 - C35 EH_CU_ID_AL	mg/kg	8	MCERTS	6300	64	56
TPHCWG - Aliphatic >C35 - C44 EH_CU_ID_AL	mg/kg	8.4	NONE	1600	50	56
TPHCWG - Aliphatic >C5 - C35 EH_CU+HS_ID_AL	mg/kg	10	NONE	6600	76	58
TPHCWG - Aliphatic >C5 - C44 EH_CU+HS_ID_AL	mg/kg	10	NONE	8200	130	110

TPHCWG - Aromatic >EC5 - EC7 HS_ID_AR	mg/kg	0.01	NONE	< 0.010	< 0.010	< 0.010
TPHCWG - Aromatic >EC7 - EC8 HS_ID_AR	mg/kg	0.01	NONE	< 0.010	< 0.010	< 0.010
TPHCWG - Aromatic >EC8 - EC10 HS_ID_AR	mg/kg	0.05	NONE	< 0.050	< 0.050	< 0.050
TPHCWG - Aromatic >EC10 - EC12 EH_CU_ID_AR	mg/kg	1	MCERTS	1.2	1.8	< 1.0
TPHCWG - Aromatic >EC12 - EC16 EH_CU_ID_AR	mg/kg	2	MCERTS	23	33	5.3
TPHCWG - Aromatic >EC16 - EC21 EH_CU_ID_AR	mg/kg	10	MCERTS	140	450	27
TPHCWG - Aromatic >EC21 - EC35 EH_CU_ID_AR	mg/kg	10	MCERTS	2600	790	110
TPHCWG - Aromatic >EC35 - EC44 EH_CU_ID_AR	mg/kg	8.4	NONE	430	150	64
TPHCWG - Aromatic >EC5 - EC35 EH_CU+HS_ID_AR	mg/kg	10	NONE	2800	1300	140
TPHCWG - Aromatic >EC5 - EC44 EH_CU+HS_ID_AR	mg/kg	10	NONE	3200	1400	200

Analytical Report Number: 24-012885
Project / Site name: Tilehurst, Reading
Your Order No: 24-139

Lab Sample Number	164561	164563	164564
Sample Reference	BH7.2	BH8.2	BH9.1
Sample Number	None Supplied	None Supplied	None Supplied
Depth (m)	1.55	1.50	0.40
Date Sampled	04/04/2024	04/04/2024	04/04/2024
Time Taken	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status

VOCs

Chloromethane	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0
Chloroethane	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0
Bromomethane	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0
Vinyl Chloride	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0
Trichlorofluoromethane	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0
1,1-Dichloroethene	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0
Trans 1,2-dichloroethylene	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0
1,1-Dichloroethane	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0
2,2-Dichloropropane	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0
Chloroform	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0
1,1,1-Trichloroethane	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0
1,2-Dichloroethane	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0
1,1-Dichloropropene	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0
Cis-1,2-dichloroethene	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0
Benzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0
Carbontetrachloride	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0
1,2-Dichloropropane	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0
Trichloroethene	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0
Dibromomethane	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0
Bromodichloromethane	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0
Cis-1,3-dichloropropene	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0
Trans-1,3-dichloropropene	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0
Toluene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0
1,1,2-Trichloroethane	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0
1,3-Dichloropropane	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0
Dibromochloromethane	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0
Tetrachloroethene	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0
1,2-Dibromoethane	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0
Chlorobenzene	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0
1,1,1,2-Tetrachloroethane	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0
p & m-Xylene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0
Styrene	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0
Bromoform	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0
o-Xylene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0
Isopropylbenzene	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0

Analytical Report Number: 24-012885
Project / Site name: Tilehurst, Reading
Your Order No: 24-139

Lab Sample Number				164561	164563	164564
Sample Reference				BH7.2	BH8.2	BH9.1
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				1.55	1.50	0.40
Date Sampled				04/04/2024	04/04/2024	04/04/2024
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status			
1,1,2,2-Tetrachloroethane	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0
Bromobenzene	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0
n-Propylbenzene	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0
2-Chlorotoluene	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0
4-Chlorotoluene	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0
1,3,5-Trimethylbenzene	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0
tert-Butylbenzene	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0
1,2,4-Trimethylbenzene	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0
sec-Butylbenzene	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0
1,3-Dichlorobenzene	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0
p-Isopropyltoluene	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0
1,4-Dichlorobenzene	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0
1,2-Dichlorobenzene	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0
Butylbenzene	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0
1,2-Dibromo-3-chloropropane	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0
1,2,4-Trichlorobenzene ##	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0
Hexachlorobutadiene	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0
1,2,3-Trichlorobenzene	µg/kg	5	ISO 17025	< 5.0	< 5.0	< 5.0

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

Analytical Report Number: 24-012885
Project / Site name: Tilehurst, Reading
Your Order No: 24-139

Certificate of Analysis - Asbestos Quantification

Methods:

Qualitative Analysis

The samples were analysed qualitatively for asbestos by polarising light and dispersion staining as described by the Health and Safety Executive in HSG 248.

Quantitative Analysis

The analysis was carried out using our documented in-house method A006 based on HSE Contract Research Report No: 83/1996: Development and Validation of an analytical method to determine the amount of asbestos in soils and loose aggregates (Davies et al, 1996) and HSG 248. Our method includes initial examination of the entire representative sample, then fractionation and detailed analysis of each fraction, with quantification by hand picking and weighing.

The limit of detection (reporting limit) of this method is 0.001 %.

The method has been validated using samples of at least 100 g, results for samples smaller than this should be interpreted with caution.

Both Qualitative and Quantitative Analyses are UKAS accredited.

Sample Number	Sample ID	Sample Depth (m)	Sample Weight (g)	Asbestos Containing Material Types Detected (ACM)	PLM Results	Asbestos by hand picking/weighing (%)	Total % Asbestos in Sample
164554	BH3.1	0.30	157	Loose Fibrous Debris	Chrysotile	0.015	0.015
164560	BH7.1	0.15	181	Loose Fibres	Chrysotile	< 0.001	< 0.001

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

Analytical Report Number: 24-012885
Project / Site name: Tilehurst, Reading

Your Order No: 24-139

Lab Sample Number	164553	164555	164556	164558	164562
Sample Reference	BH2.2	BH3.2	BH4.1	BH6.1	BH8.1
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	1.20	1.00	0.30	0.30	0.50
Date Sampled	04/04/2024	04/04/2024	04/04/2024	04/04/2024	04/04/2024
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Leachate Analysis)	Units	Limit of detection	Accreditation Status		

General Inorganics

pH (automated)	pH Units	N/A	ISO 17025	8.9	7.6	9.1	9	8.1
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Sulphate as SO ₄	µg/l	45	ISO 17025	13800	7360	4690	1970	4590
Sulphate as SO ₄	mg/l	0.045	ISO 17025	13.8	7.36	4.69	1.97	4.59
Sulphide	µg/l	5	NONE	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	6.2	9.5	8.1	5.6	7

Total Phenols

Total Phenols (monohydric)	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
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Speciated PAHs

Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	0.39	< 0.01	0.13
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	0.07	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	0.07	< 0.01	0.15
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	0.1	< 0.01	0.17
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	0.38	0.15	0.32
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	0.11	< 0.01	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	0.54	0.21	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	0.55	0.21	< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	0.21	0.1	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	0.23	0.1	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	0.33	0.1	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	0.12	0.06	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	0.28	0.09	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	NONE	< 0.01	< 0.01	0.17	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	NONE	< 0.01	< 0.01	0.23	< 0.01	< 0.01

Total PAH

Total EPA-16 PAHs	µg/l	0.16	NONE	< 0.16	< 0.16	3.78	1.02	0.77
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Heavy Metals / Metalloids

Arsenic (dissolved)	µg/l	1	ISO 17025	2.6	< 1.0	4.2	1.3	1.7
Beryllium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Boron (dissolved)	µg/l	10	ISO 17025	30	40	13	< 10	22
Cadmium (dissolved)	µg/l	0.08	ISO 17025	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08
Chromium (dissolved)	µg/l	0.4	ISO 17025	0.8	2.2	1.6	< 0.4	0.9
Copper (dissolved)	µg/l	0.7	ISO 17025	5.7	26	8.8	2.3	12
Lead (dissolved)	µg/l	1	ISO 17025	< 1.0	4.1	< 1.0	< 1.0	2.6
Mercury (dissolved)	µg/l	0.5	ISO 17025	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Nickel (dissolved)	µg/l	0.3	ISO 17025	0.9	3.5	0.5	< 0.3	1.5
Selenium (dissolved)	µg/l	4	ISO 17025	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Vanadium (dissolved)	µg/l	1.7	ISO 17025	3.8	4.2	8.8	2.4	5.9
Zinc (dissolved)	µg/l	0.4	ISO 17025	< 0.4	31	1.1	< 0.4	8.7

Analytical Report Number: 24-012885
Project / Site name: Tilehurst, Reading

Your Order No: 24-139

Lab Sample Number	164553	164555	164556	164558	164562
Sample Reference	BH2.2	BH3.2	BH4.1	BH6.1	BH8.1
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	1.20	1.00	0.30	0.30	0.50
Date Sampled	04/04/2024	04/04/2024	04/04/2024	04/04/2024	04/04/2024
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Leachate Analysis)	Units	Limit of detection	Accreditation Status		

Petroleum Hydrocarbons

TPH - Aliphatic >C5 - C6 _{HS 1D AL}	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH - Aliphatic >C6 - C8 _{HS 1D AL}	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH - Aliphatic >C8 - C10 _{HS 1D AL}	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH - Aliphatic >C10 - C12 _{EH 1D AL MS}	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH - Aliphatic >C12 - C16 _{EH 1D AL MS}	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH - Aliphatic >C16 - C21 _{EH 1D AL MS}	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH - Aliphatic >C21 - C35 _{EH 1D AL MS}	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH - Aliphatic >C5 - C35 _{HS+EH 1D AL MS}	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10

TPH - Aromatic >EC5 - EC7 _{HS 1D AR}	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH - Aromatic >EC7 - EC8 _{HS 1D AR}	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH - Aromatic >EC8 - EC10 _{EH 1D AR MS}	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH - Aromatic >EC10 - EC12 _{EH 1D AR MS}	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH - Aromatic >EC12 - EC16 _{EH 1D AR MS}	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH - Aromatic >EC16 - EC21 _{EH 1D AR MS}	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH - Aromatic >EC21 - EC35 _{EH 1D AR MS}	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH - Aromatic >EC6 - EC35 _{HS+EH 1D AR MS}	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10

VOCs

Chloromethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Chloroethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Bromomethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Vinyl Chloride	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,1-dichloroethene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Trans 1,2-dichloroethylene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,1-dichloroethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
2,2-Dichloropropane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Chloroform	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,1,1-Trichloroethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,2-dichloroethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,1-Dichloropropene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Cis-1,2-dichloroethene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Benzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Carbontetrachloride	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,2-dichloropropane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Trichloroethene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Dibromomethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Bromodichloromethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Cis-1,3-dichloropropene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Trans-1,3-dichloropropene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Toluene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,1,2-Trichloroethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,3-Dichloropropane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Dibromochloromethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Tetrachloroethene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,2-Dibromoethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Chlorobenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,1,1,2-Tetrachloroethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Ethylbenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
p & m-xylene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Styrene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Bromoform	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0

Analytical Report Number: 24-012885
Project / Site name: Tilehurst, Reading

Your Order No: 24-139

Lab Sample Number				164553	164555	164556	164558	164562
Sample Reference				BH2.2	BH3.2	BH4.1	BH6.1	BH8.1
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.20	1.00	0.30	0.30	0.50
Date Sampled				04/04/2024	04/04/2024	04/04/2024	04/04/2024	04/04/2024
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Leachate Analysis)	Units	Limit of detection	Accreditation Status					
o-xylene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Isopropylbenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Bromobenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
n-Propylbenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
2-Chlorotoluene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
4-Chlorotoluene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,3,5-Trimethylbenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
ter-Butylbenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,2,4-Trimethylbenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
sec-Butylbenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,3-dichlorobenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
p-Isopropyltoluene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,4-dichlorobenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,2-dichlorobenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Butylbenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,2-Dibromo-3-chloropropane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,2,4-Trichlorobenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Hexachlorobutadiene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,2,3-Trichlorobenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Trichlorofluoromethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0

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

Analytical Report Number : 24-012885

Project / Site name: Tilehurst, Reading

* 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 *
164552	BH2.1	None Supplied	0.2	Brown clay and sand with gravel and chalk
164554	BH3.1	None Supplied	0.3	Brown clay and sand with stones
164557	BH4.2	None Supplied	0.6	Brown clay and sand with gravel
164559	BH6.2	None Supplied	1	Brown clay and sand
164560	BH7.1	None Supplied	0.15	Brown sand with gravel
164561	BH7.2	None Supplied	1.55	Brown clay and sand with gravel
164563	BH8.2	None Supplied	1.5	Brown clay and sand with gravel
164564	BH9.1	None Supplied	0.4	Brown loam with gravel

Analytical Report Number : 24-012885
Project / Site name: Tilehurst, Reading

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 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
Asbestos Quantification - Gravimetric	Asbestos quantification by gravimetric method - in house method based on references	HSE Report No: 83/1996, HSG 248 (2021), HSG 264 (2012) & SCA Blue Book (draft)	A006B	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
Sulphide in leachate	Determination of sulphide in leachate by ion selective electrode	In-house method	L029	W	NONE
Dissolved Organic Carbon in leachate	Determination of dissolved organic carbon in leachate by the measurement on a non-dispersive infrared analyser of carbon dioxide released by acidification	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037B	W	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
Metals by ICP-OES in leachate	Determination of metals in leachate by acidification followed by ICP-OES	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil	L039B	W	ISO 17025
Speciated EPA-16 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
Total petroleum hydrocarbons with carbon banding by GC-MS/GC-MS HS in leachate	Determination of total petroleum hydrocarbons in leachate by GC-MS/GC-MS HS with carbon banding aliphatic and aromatic	In-house method	L070B/L088	W	NONE
BTEX and/or Volatile organic compounds in leachate	Determination of volatile organic compounds in leachate by headspace GC-MS	In-house method based on USEPA 8260	L073B	W	NONE
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

Analytical Report Number : 24-012885
Project / Site name: Tilehurst, Reading

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
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 leachate	Determination of phenols in leachate by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080	W	ISO 17025
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 leachate	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	ISO 17025
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
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement	In-house method	L099	D	MCERTS
pH at 20°C in leachate (automated)	Determination of pH in leachate by electrometric measurement	In-house method	L099	W	ISO 17025
Speciated EPA-16 PAHs and/or Semi-volatile organic compounds in leachate	SVOCs and PAHs in leachate	In-house method	L102B		ISO 17025

Analytical Report Number : 24-012885
Project / Site name: Tilehurst, Reading

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
WAC Leachate 10:1		In-house method	L043B	W	NONE

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

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

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

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

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 - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

- Quality control parameter has a high recovery (outside of limit); however the associated result is below the reporting limit, other checks applied prior to reporting the data have been accepted. The result should be considered as being deviating and may be compromised

	No. of Samples	Unit	Target Concentration	Source	Min	Max	No. That Exceed
General Inorganics							
Total Arsenic	5	mg/L	0.05	WSR	0.001	0.001	0
Sulfate as SO ₄	5	mg/L	0	WSR	0	0	0
Subphosphate	5	mg/L	0	WSR	1.97	13.8	0
Total Chloride	5	mg/L	0	WSR	5.6	9.5	0
Total Organic Carbon (TOC)	5	mg/L	0	WSR	5.6	9.5	0
Total Phenols							
Total Phenols (nonhalogen)	5	mg/L	0.0077	WFO	0.001	0.001	0
Speciated PAHs							
Benzo(a)anthracene	5	mg/L	0.002	WFO	0.00001	0.00039	0
Benzo(b)fluoranthene	5	mg/L	0.0001	WSR	0.00001	0.00007	0
Acenaphthene	5	mg/L	0.0001	WSR	0.00001	0.00015	0
Acenaphthylene	5	mg/L	0.0001	WSR	0.00001	0.00017	0
Fluorene	5	mg/L	0.0001	WSR	0.00001	0.00016	0
Phenanthrene	5	mg/L	0.0001	WSR	0.00001	0.00038	3
Anthracene	5	mg/L	0.0001	WSR	0.00001	0.00011	1
Benzo(a)pyrene	5	mg/L	0.0001	WSR	0.00001	0.00004	0
Pyrene	5	mg/L	0.0001	WSR	0.00001	0.00055	2
Benzo(k)fluoranthene	5	mg/L	0.0001	WSR	0.00001	0.00021	2
Triphenylene	5	mg/L	0.0001	WSR	0.00001	0.00002	0
Benzo(g,h,i)perylene	5	mg/L	0.0001	WSR	0.00001	0.00023	2
Benzo(a)fluoranthene	5	mg/L	0.0001	WSR	0.00001	0.00013	1
Benzo(a)anthracene	5	mg/L	0.000077	WSR	0.00001	0.00008	0
Indeno(1,2,3-cd)pyrene	5	mg/L	0.0001	WSR	0.00001	0.00017	2
Benzo(b)fluoranthene	5	mg/L	0.0001	WSR	0.00001	0.00003	0
Benzo(a)pyrene	5	mg/L	0.0001	WSR	0.00001	0.00003	0
Total PAH							
Total PAH - 6 Sites	5	mg/L	0	WSR	0	0	0
Heavy Metals / Metalloids							
Arsenic (dissolved)	5	mg/L	0.01	UK DWS	0.001	0.0042	0
Arsenic (total)	5	mg/L	0.05	WHO	0.01	0.04	0
Cadmium (dissolved)	5	mg/L	0.005	UK DWS	0.00008	0.0008	0
Chromium (dissolved)	5	mg/L	0.05	UK DWS	0.0004	0.0022	0
Copper (dissolved)	5	mg/L	2	UK DWS	0.0001	0.008	0
Lead (dissolved)	5	mg/L	0.01	UK DWS	0.001	0.0041	0
Mercury (dissolved)	5	mg/L	0.0001	UK DWS	0.0005	0.0005	0
Nickel (dissolved)	5	mg/L	0.02	UK DWS	0.001	0.015	0
Selenium (dissolved)	5	mg/L	0.01	UK DWS	0.004	0.004	0
Zinc (dissolved)	5	mg/L	3	UK DWS	0.0004	0.031	0
Nonmetals/Amino Acids							
Benzene	5	mg/L	0.001	EQS	0.001	0	0
Toluene	5	mg/L	0.05	EQS	0.001	0	0
Ethylbenzene	5	mg/L	0.02	EQS	0.001	0	0
Xylenes (sum)	5	mg/L	0.03	EQS	0.001	0	0
MTBE (Methyl Tertiary Butyl Ether)	5	mg/L	DL	EQS	0.001	0	0
Antiestrogen Hydrocarbons							
THP (C10 - C40)	0	mg/L	0	WHO	0	0	0
THP-CWG - Aliphatic - C5 - C8	5	mg/L	0.01	UK DWS	0.001	0	0
THP-CWG - Aromatic - C5 - C8	5	mg/L	0.01	UK DWS	0.001	0	0
THP-CWG - Aliphatic - C9 - C10	5	mg/L	0.3	WHO	0.001	0	0
THP-CWG - Aromatic - C10 - C12	5	mg/L	0.3	WHO	0.001	0	0
THP-CWG - Aliphatic - C11 - C16	5	mg/L	0.3	WHO	0.001	0	0
THP-CWG - Aromatic - C16 - C21	5	mg/L	0.01	UK DWS	0.001	0	0
THP-CWG - Aliphatic - C21 - C25	5	mg/L	0.01	UK DWS	0.	0	0
THP-CWG - Aliphatic (C5 - C15)							
THP-CWG - Aromatic - C5 - C7	5	mg/L	0.01	UK DWS	0.001	0	0
THP-CWG - Aromatic - C7 - C8	5	mg/L	0.01	UK DWS	0.001	0	0
THP-CWG - Aromatic - C8 - C10	5	mg/L	0.3	WHO	0.001	0	0
THP-CWG - Aromatic - C10 - C12	5	mg/L	0.1	WHO	0.001	0	0
THP-CWG - Aromatic - C12 - C16	5	mg/L	0.3	WHO	0.001	0	0
THP-CWG - Aromatic - C16 - C21	5	mg/L	0.09	WHO	0.001	0	0
THP-CWG - Aromatic - C21 - C25	5	mg/L	0.01	UK DWS	0.001	0	0
THP-CWG - Aromatic (C5 - C15)							
VOCs							

Leakage FAI

WDE Standard QRA Suite

	No. of Samples	Unit	Target Concentration	Source	Min	Max	No. That Exceed	Sample Ref	BH2.1	BH3.1	BH4.2	BH6.2	BH7.1	BH7.2	BH8.2	BH9.1
								Type								
								Depth	0.20	0.30	0.60	1.00	0.15	1.55	1.50	0.40
								Date	04/04/2024	04/04/2024	04/04/2024	04/04/2024	04/04/2024	04/04/2024	04/04/2024	04/04/2024
ACM Lab																
Moisture Content	8	%	Residential with hgp						13	11	12	16	7.8	10	13	13
Asbestos	8	N/A	DL	WDE					Not-detected	Detected	Not-detected	Not-detected	Detected	Not-detected	Not-detected	Not-detected
Asbestos Quantification	2	%	0.001	HSE	0.015	0.015	1		0.015				<0.001			
pH	8	pH Units	-	-	7.7	11.3	0		8.9	9.9	9.8	8.3	11.3	8.4	8.4	7.7
Total Cyanide	8	mg/kg	50	DIV	0	BDL	0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Sulphate Total	8	%	-	-	0.037	1.14	-		0.079	0.159	0.115	0.061	1.14	0.045	0.037	0.071
Sulphate as SO ₄	8	g/l	-	-	0.033	3.3	-		0.26	0.61	0.1	0.14	3.3	0.18	0.052	0.033
Sulphide	8	mg/kg	-	-	1.8	75	-		< 1.0	75	< 1.0	2	7.9	11	4.9	1.8
Total Organic Carbon (TOC)	8	%	-	-	0.4	2.8	-		0.4	2.2	0.6	1.4	0.4	2.8	1.5	2.4
Total Phenols (monohydric)	8	mg/kg	280	LQM	0	BDL	0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Naphthalene	8	mg/kg	2.3	LQM	0.09	1.2	0		< 0.05	0.47	0.09	0.3	< 0.05	< 0.05	1.2	< 0.05
Acenaphthylene	8	mg/kg	170	LQM	0.16	4.9	0		< 0.05	1.4	0.32	1.6	< 0.05	0.16	4.9	0.18
Acenaphthene	8	mg/kg	210	LQM	0.06	3.2	0		< 0.05	3.2	0.31	1.9	< 0.05	0.19	2.7	0.06
Fluorene	8	mg/kg	170	LQM	0.07	5	0		< 0.05	3.3	0.38	3.1	< 0.05	0.52	5	0.07
Phenanthrene	8	mg/kg	95	LQM	0.19	76	0		0.19	35	5	38	0.46	2.7	76	1.6
Anthracene	8	mg/kg	2400	LQM	0.06	15	0		0.06	10	1.4	9.7	0.12	0.7	15	0.35
Fluoranthene	8	mg/kg	280	LQM	0.36	130	0		0.36	53	11	49	1.5	3.9	130	4.7
Pyrene	8	mg/kg	620	LQM	0.31	110	0		0.31	45	10	40	1.3	3.6	110	4.4
Benzo(a)anthracene	8	mg/kg	7.2	LQM	0.2	53	3		0.2	24	5.9	19	0.73	1.9	53	2.3
Chrysene	8	mg/kg	15	LQM	0.17	58	3		0.17	23	6	18	0.72	2.1	58	2.7
Benzo(b)fluoranthene	8	mg/kg	2.6	LQM	0.27	62	5		0.27	28	8.5	20	0.91	1.9	62	3.4
Benzo(k)fluoranthene	8	mg/kg	77	LQM	0.07	31	0		0.07	13	2.6	9.3	0.33	0.83	31	1.6
Benzo(a)pyrene	8	mg/kg	2.2	LQM	0.21	61	5		0.21	26	6.7	19	0.75	1.8	61	3.1
Indeno(1,2,3-cd)pyrene	8	mg/kg	27	LQM	0.54	31	1		< 0.05	16	4.3	12	0.54	1.2	31	1.8
Dibenzo(a,h)anthracene	8	mg/kg	0.24	LQM	0.16	7.9	5		< 0.05	4.5	1.2	3.1	0.16	< 0.05	7.9	0.46
Benzo(ghi)perylene	8	mg/kg	320	LQM	0.71	39	0		< 0.05	19	5.3	13	0.71	1.3	39	2.1
Total EPA-16 PAHs	8	mg/kg	-	-	1.84	689	0		1.84	304	69.5	256	8.28	22.8	689	28.7
Arsenic (dissolved)	8	mg/kg	37	LQM	13	19	0		13	17	16	18	19	15	19	18
Beryllium	8	mg/kg	1.7	LQM	0.56	1.2	0		0.57	1	0.56	1.2	0.8	0.81	1.2	0.95
Boron (dissolved)	8	mg/kg	290	LQM	0.3	1.3	0		1.3	0.5	0.5	0.7	0.3	0.9	0.8	1.1
Cadmium (dissolved)	8	mg/kg	11	LQM	1.2	1.5	0		< 0.2	1.3	< 0.2	< 0.2	1.2	< 0.2	< 0.2	1.5
Chromium (dissolved)	8	mg/kg	910	LQM	19	140	0		21	33	19	23	42	55	44	140
Copper (dissolved)	8	mg/kg	2400	LQM	12	66	0		48	66	29	29	22	12	17	56
Lead (dissolved)	8	mg/kg	210	C4SL	25	330	1		42	130	84	69	48	25	40	330
Mercury (dissolved)	8	mg/kg	40	LQM	0.7	0.7	0		< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	0.7
Nickel (dissolved)	8	mg/kg	180	LQM	14	25	0		18	25	14	21	18	20	23	23
Selenium (dissolved)	8	mg/kg	250	LQM	0	BDL	0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium	8	mg/kg	410	LQM	30	43	0		38	41	30	38	39	41	43	32
Zinc (dissolved)	8	mg/kg	3700	LQM	50	410	0		63	280	88	260	87	50	80	410
Benzene	8	mg/kg	0.087	LQM	0	BDL	0		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Toluene	8	mg/kg	130	LQM	0	BDL	0		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Ethylbenzene	8	mg/kg	47	LQM	0	BDL	0		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Xylenes (o)	8	mg/kg	60	LQM	0	BDL	0		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Xylenes (m p)	8	mg/kg	56	LQM	0	BDL	0		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
MTBE (Methyl Tertiary Butyl Ether)	8	mg/kg	49	CLAIRE	0	BDL	0		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Total Petroleum Hydrocarbons	0	mg/kg	-	-	0	BDL	0									
TPH-CWG - Aliphatic >C5 - C6	8	mg/kg	42	LQM	0	BDL	0		< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
TPH-CWG - Aliphatic >C6 - C8	8	mg/kg	100	LQM	0	BDL	0		< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
TPH-CWG - Aliphatic >C8 - C10	8	mg/kg	27	LQM	0	BDL	0		< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
TPH-CWG - Aliphatic >C10 - C12	8	mg/kg	130	LQM	5.1	5.1	0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C12 - C16	8	mg/kg	1100	LQM	2.3	100	0		2.7	15	9	< 2.0	< 2.0	100	3.3	2.3
TPH-CWG - Aliphatic >C16 - C21	8	mg/kg	65000	LQM	8.6	210	0		9.8	50	31	< 8.0	< 8.0	210	8.6	< 8.0
TPH-CWG - Aliphatic >C21 - C35	8	mg/kg	65000	LQM	14	6300	0		31	440	54	14	72	6300	64	56
TPH-CWG - Aliphatic >C35 - C44	8	mg/kg	65000	LQM	36	1600	0		< 8.4	190	36	< 8.4	50	1600	50	56
Total Aliphatic Hydrocarbons	0	mg/kg	-	-	0	BDL	0									
TPH-CWG - Aromatic >C5 - C7	8	mg/kg	70	LQM	0	BDL	0		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
TPH-CWG - Aromatic >C7 - C8	8	mg/kg	130	LQM	0	BDL	0		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
TPH-CWG - Aromatic >C8 - C10	8	mg/kg	34	LQM	0	BDL	0		< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
TPH-CWG - Aromatic >C10 - C12	8	mg/kg	74	LQM	1.2	1.8	0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.2	1.8	< 1.0
TPH-CWG - Aromatic >C12 - C16	8	mg/kg	140	LQM	3.8	36	0		< 2.0	36	3.8	13	< 2.0	23	33	5.3
TPH-CWG - Aromatic >C16 - C21	8	mg/kg	260	LQM	27	450	2		< 10	280	51	140	< 10	140	450	27
TPH-CWG - Aromatic >C21 - C35	8	mg/kg	1100	LQM	58	2600	1		< 10	640	110	170	58	2600	790	110
TPH-CWG - Aromatic >C35 - C44	8	mg/kg	1100	LQM	33	430	0		< 8.4	220	55	33	39	430	150	64
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				0.000047					0.000047					0.000047	0.000047
Acenaphthylene	0.00014			0.00014											
Acenaphthene	0.00032														
Fluorene															
Phenanthrene	0.0035			0.0035					0.0035						
Anthracene	0.001													0.001	0.001
Fluoranthene	0.0053			0.0053					0.0053						
Pyrene	0.0045			0.0045											
Benzo(a)anthracene															
Chrysene				0.0023			0.0023						0.0023		
Benzo(b)fluoranthene							0.0028							0.0028	0.0028
Benzo(k)fluoranthene				0.0013			0.0013								
Benzo(a)pyrene							0.0026				0.0026		0.0026	0.0026	0.0026
Indeno(1,2,3-cd)pyrene															
Dibenz(a,h)anthracene							0.00045							0.00045	0.00045
Benzo(ghi)perylene														0.0019	0.0019
Arsenic			0.0019		0.0019									0.0019	0.0019
Boron	0.00013			0.00013											
Cadmium	0.00012	0.00012	0.00012		0.00012	0.00012	0.00012								
Chromium										0.014			0.014		
Copper				0.0066										0.0066	0.0066
Lead				0.033					0.033		0.033	0.033		0.033	0.033
Mercury		0.00007				0.00007								0.00007	0.00007
Nickel							0.0025	0.0025	0.0025						
Selenium			0.0001		0.0001										0.0001
Zinc	0.041			0.041											
Benzene	0.0005		0.0005	0.0005			0.0005								
Toluene				0.0005											
Ethylbenzene				0.0005	0.0005							0.0005			
p & m-xylene	0.0005			0.0005								0.0005			
o-xylene	0.0005			0.0005											
MTBE (Methyl Tertiary Butyl Eth	0.0005														
PRO C6-C10				0.000016			0.000016							0.000016	0.000016
DRO C10-C25				0.1463					0.1463					0.1463	0.1463
Total (or greatest)	0.0580	0.00019	0.0026	0.2466	0.0026	0.00019	0.0028	0.0025	0.1463	0.0140	0.0330	0.0330	0.0140	0.1967	0.1968
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							26						0.0026		
BaP Concentration in TPH													0.000003822		
BaP Exceeded (y/n)													N		
TPH (EC5 - EC35)				0.147			1470				0.147		0.147	0.147	0.147
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			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											0.015						
Threshold (%)											0.1						
Hazardous Properties											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
Naphthalene				0.000005					0.000005					0.000005	0.000005
Acenaphthylene	0.000005			0.000005											
Acenaphthene	0.000005														
Fluorene															
Phenanthrene	0.000019			0.000019					0.000019						
Anthracene	0.000006													0.000006	0.000006
Fluoranthene	0.000036			0.000036					0.000036						
Pyrene	0.000031			0.000031											
Benzo(a)anthracene															
Chrysene				0.000017			0.000017						0.000017		
Benzo(b)fluoranthene							0.000027							0.000027	0.000027
Benzo(k)fluoranthene				0.000007			0.000007								
Benzo(a)pyrene							0.000021				0.000021		0.000021	0.000021	0.000021
Indeno(1,2,3-cd)pyrene															
Dibenz(a,h)anthracene							0.000005							0.000005	0.000005
Benzo(ghi)perylene														0.000005	0.000005
Arsenic			0.0019		0.0019									0.0019	0.0019
Boron	0.00013			0.00013											
Cadmium	0.00012	0.00012	0.00012		0.00012	0.00012	0.00012								
Chromium										0.014			0.014		
Copper				0.0066										0.0066	0.0066
Lead				0.033					0.033		0.033	0.033		0.033	0.033
Mercury		0.00007				0.00007								0.00007	0.00007
Nickel							0.0025	0.0025	0.0025						
Selenium			0.0001		0.0001										0.0001
Zinc	0.041			0.041											
Benzene	0.0005		0.0005	0.0005			0.0005								
Toluene				0.0005											
Ethylbenzene				0.0005	0.0005							0.0005			
p & m-xylene	0.0005			0.0005								0.0005			
o-xylene	0.0005			0.0005											
MTBE (Methyl Tertiary Butyl Eth	0.0005														
PRO C6-C10				0.000016			0.000016							0.000016	0.000016
DRO C10-C25				0.00675					0.00675					0.00675	0.00675
Total (or greatest)	0.0434	0.00019	0.0026	0.0901	0.0026	0.00019	0.0025	0.0025	0.0330	0.0140	0.0330	0.0330	0.0140	0.0484	0.0485
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							0.21						0.000021		
BaP Concentration in TPH													1.113E-09		
BaP Exceeded (y/n)													N		
TPH (EC5 - EC35)				0.0053			53				0.0053		0.0053	0.0053	0.0053
Threshold (%)				25.0			Y				5.0		0.1	2.50	2.50
Hazardous Properties				N			N				N		N	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					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											0.015						
Threshold (%)											0.1						
Hazardous Properties											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
Naphthalene				0.00012					0.00012					0.00012	0.00012
Acenaphthylene	0.00049			0.00049											
Acenaphthene	0.00032														
Fluorene															
Phenanthrene	0.0076			0.0076					0.0076						
Anthracene	0.0015													0.0015	0.0015
Fluoranthene	0.013			0.013					0.013						
Pyrene	0.011			0.011											
Benzo(a)anthracene															
Chrysene				0.0058			0.0058						0.0058		
Benzo(b)fluoranthene							0.0062							0.0062	0.0062
Benzo(k)fluoranthene				0.0031			0.0031								
Benzo(a)pyrene							0.0061				0.0061		0.0061	0.0061	0.0061
Indeno(1,2,3-cd)pyrene															
Dibenz(a,h)anthracene							0.00079							0.00079	0.00079
Benzo(ghi)perylene														0.0039	0.0039
Arsenic			0.0019		0.0019									0.0019	0.0019
Boron	0.00013			0.00013											
Cadmium	0.00012	0.00012	0.00012		0.00012	0.00012	0.00012								
Chromium										0.014			0.014		
Copper				0.0066										0.0066	0.0066
Lead				0.033					0.033		0.033	0.033		0.033	0.033
Mercury		0.00007				0.00007								0.00007	0.00007
Nickel							0.0025	0.0025	0.0025						
Selenium			0.0001		0.0001										0.0001
Zinc	0.041			0.041											
Benzene	0.0005		0.0005	0.0005			0.0005								
Toluene				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 Eth	0.0005														
PRO C6-C10				0.000016			0.000016							0.000016	0.000016
DRO C10-C25				0.97029					0.97029					0.97029	0.97029
Total (or greatest)	0.0772	0.00019	0.0026	1.0946	0.0026	0.00019	0.0062	0.0025	0.9703	0.0140	0.0330	0.0330	0.0140	1.0305	1.0306
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									61							0.0061		
BaP Concentration in TPH																0.00005734		
BaP Exceeded (y/n)																Y		
TPH (EC5 - EC35)				0.94					9400			0.94				0.94	0.94	0.94
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					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											0.015						
Threshold (%)											0.1						
Hazardous Properties											N						

APPENDIX G: GEOTECHNICAL TEST RESULTS



LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

Job No. 35124

Borehole/Pit No. BH1

Site Name Tilehurst, Reading

Sample No. -

Project No. 21283/PO24-140

Client

WDE Consulting

Depth Top m 1.00

Soil Description

Light brown slightly gravelly slightly sandy silty CLAY with numerous fine chalk fragments (gravel is fm and sub-angular)

Depth Base m -

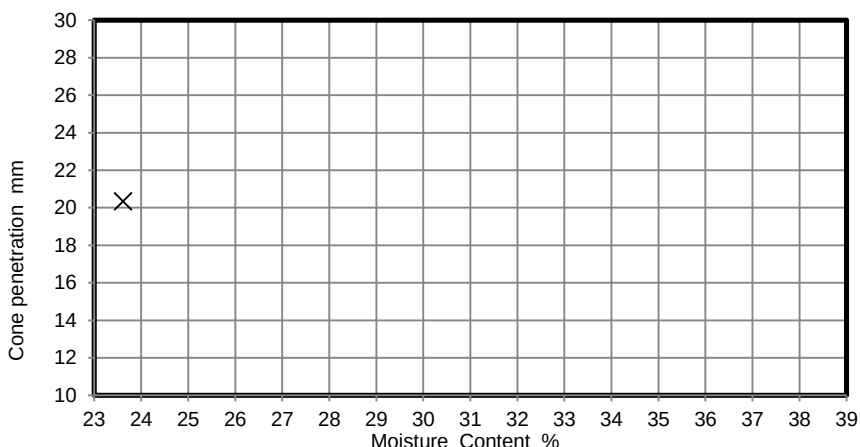
Sample Type D

Samples received 08/04/2024

Schedules received 08/04/2024

Project Started 09/04/2024

Date Tested 30/04/2024



NATURAL MOISTURE CONTENT

20

%

% PASSING 425µm SIEVE

75

%

LIQUID LIMIT

23

%

PLASTIC LIMIT

12

%

PLASTICITY INDEX

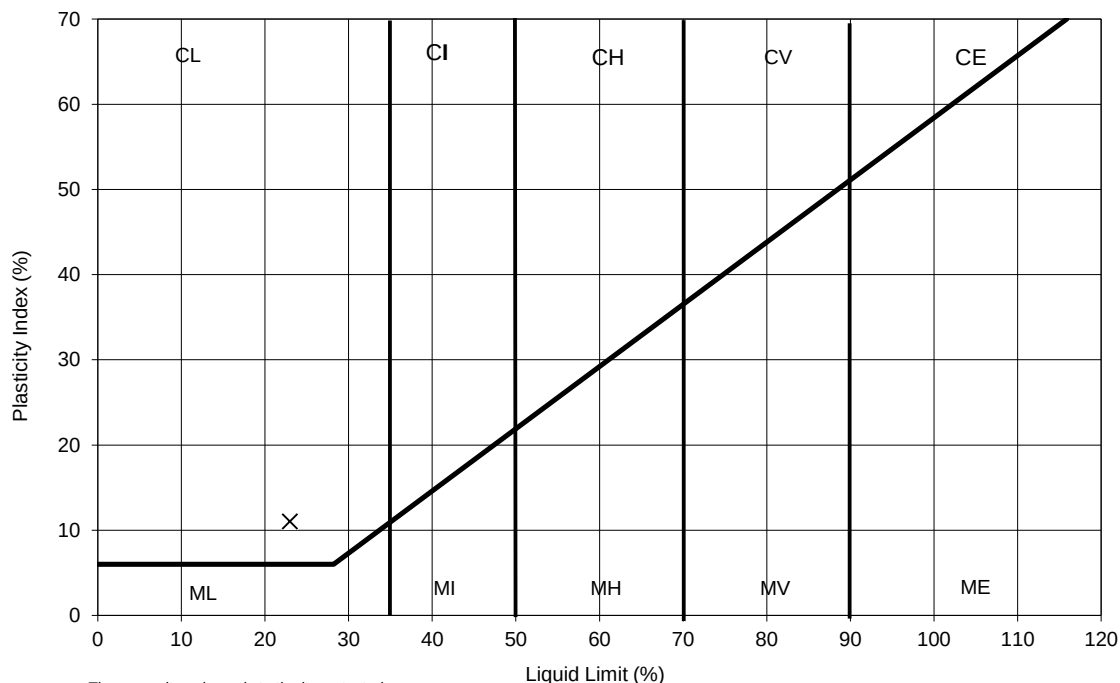
11

%

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: 02/05/2024

MSF-5 R2



2519

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



LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

Job No. 35124

Borehole/Pit No. BH1

Site Name Tilehurst, Reading

Sample No. -

Project No. 21283/PO24-140 Client WDE Consulting

Depth Top m 2.00

Soil Description

Light brown slightly sandy gravelly silty CLAY (gravel is fmc and angular to sub-angular chalk and flint)

Depth Base m -

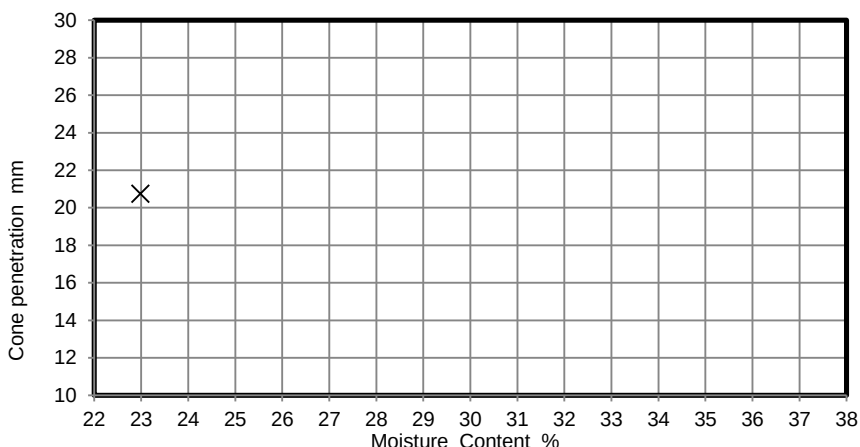
Sample Type D

Samples received 08/04/2024

Schedules received 08/04/2024

Project Started 09/04/2024

Date Tested 24/04/2024



NATURAL MOISTURE CONTENT

11

%

% PASSING 425µm SIEVE

56

%

LIQUID LIMIT

23

%

PLASTIC LIMIT

14

%

PLASTICITY INDEX

9

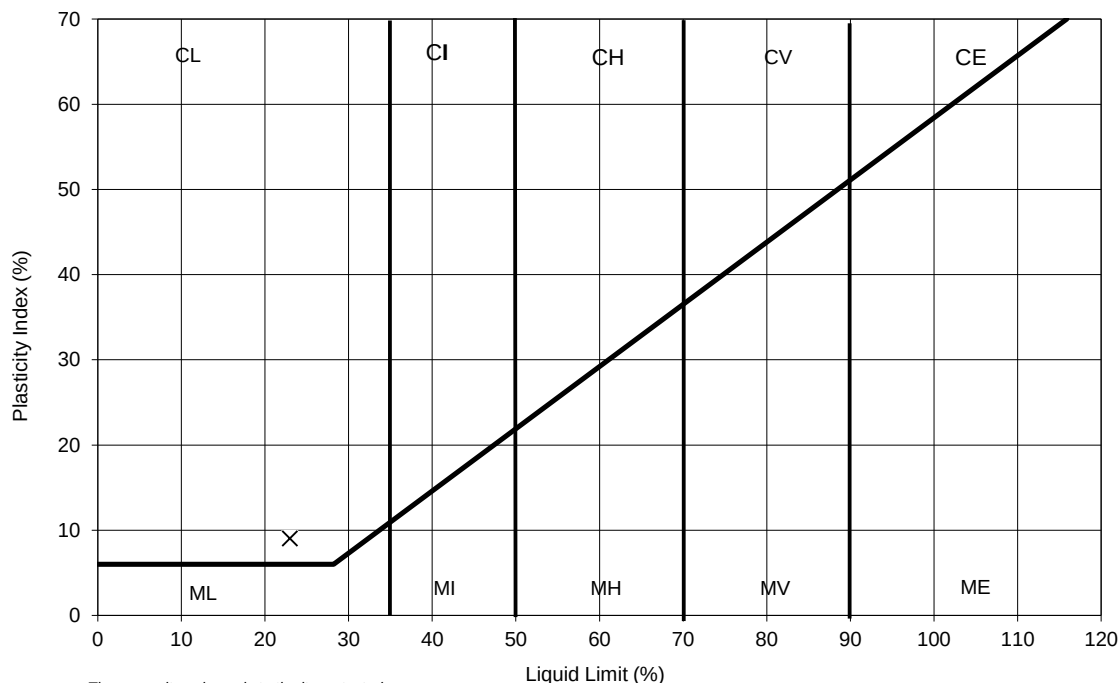
%

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

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: 02/05/2024

2519

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

MSF-5 R2



LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

Job No. 35124

Borehole/Pit No. BH2

Site Name Tilehurst, Reading

Sample No. -

Project No. 21283/PO24-140

Client

WDE Consulting

Depth Top m 2.00

Soil Description

Dark brown slightly gravelly sandy silty CLAY with roots (gravel is fm and sub-angular)

Depth Base m -

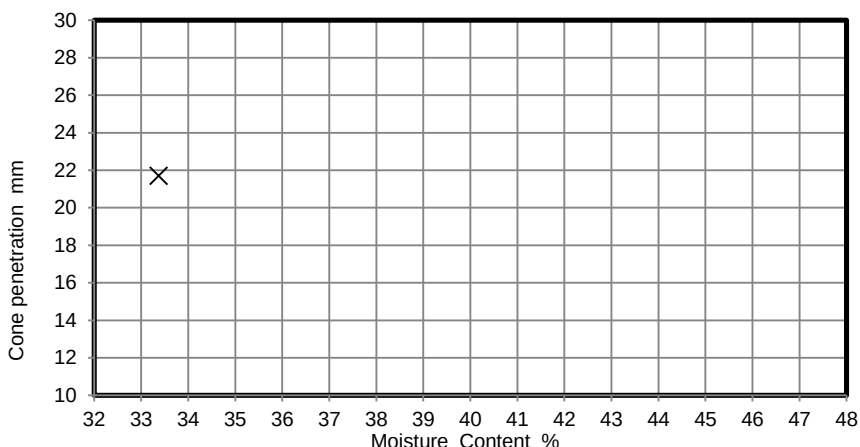
Sample Type D

Samples received 08/04/2024

Schedules received 08/04/2024

Project Started 09/04/2024

Date Tested 30/04/2024



NATURAL MOISTURE CONTENT

21

%

% PASSING 425µm SIEVE

90

%

LIQUID LIMIT

33

%

PLASTIC LIMIT

18

%

PLASTICITY INDEX

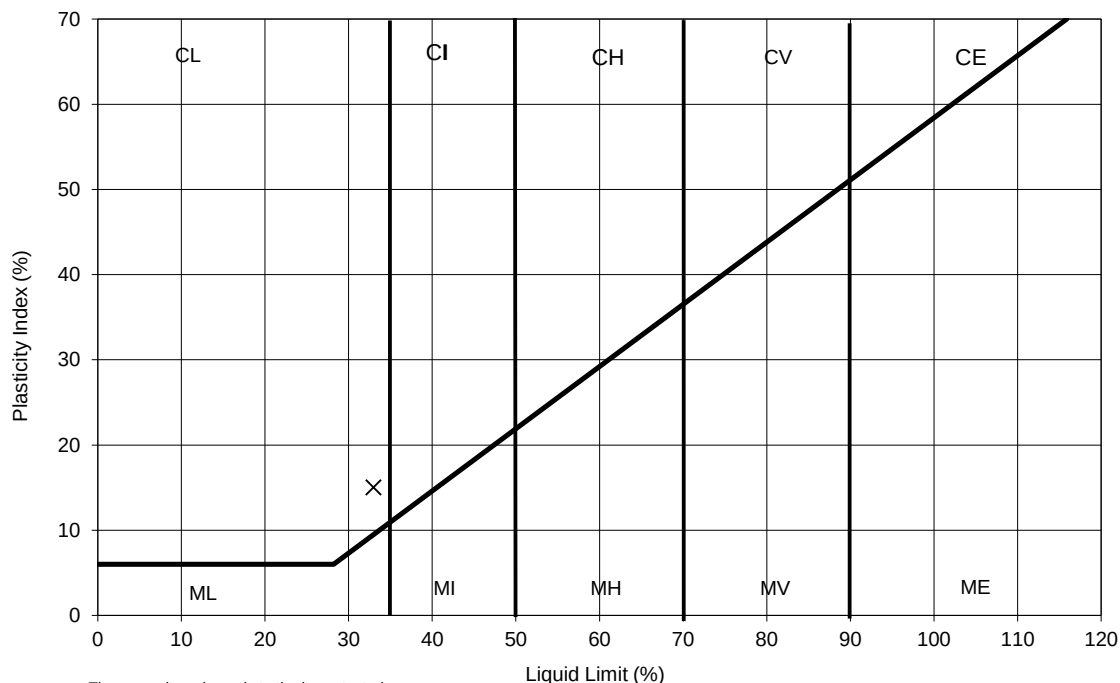
15

%

Remarks

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

PLASTICITY INDEX



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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: 02/05/2024

2519

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

MSF-5 R2



LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

Job No. 35124

Borehole/Pit No. BH2

Site Name Tilehurst, Reading

Sample No. -

Project No. 21283/PO24-140

Client

WDE Consulting

Depth Top m 3.00

Soil Description

Brown slightly gravelly sandy silty CLAY (gravel is fmc and sub-angular)

Depth Base m -

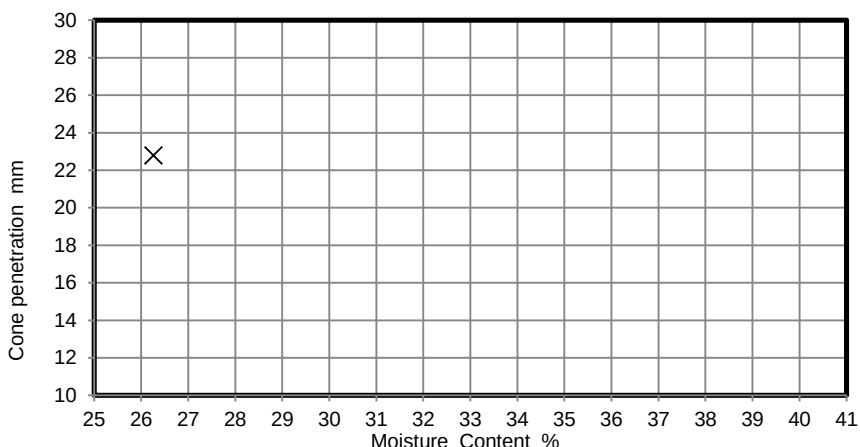
Sample Type D

Samples received 08/04/2024

Schedules received 08/04/2024

Project Started 09/04/2024

Date Tested 30/04/2024



NATURAL MOISTURE CONTENT

15

%

% PASSING 425µm SIEVE

70

%

LIQUID LIMIT

25

%

PLASTIC LIMIT

13

%

PLASTICITY INDEX

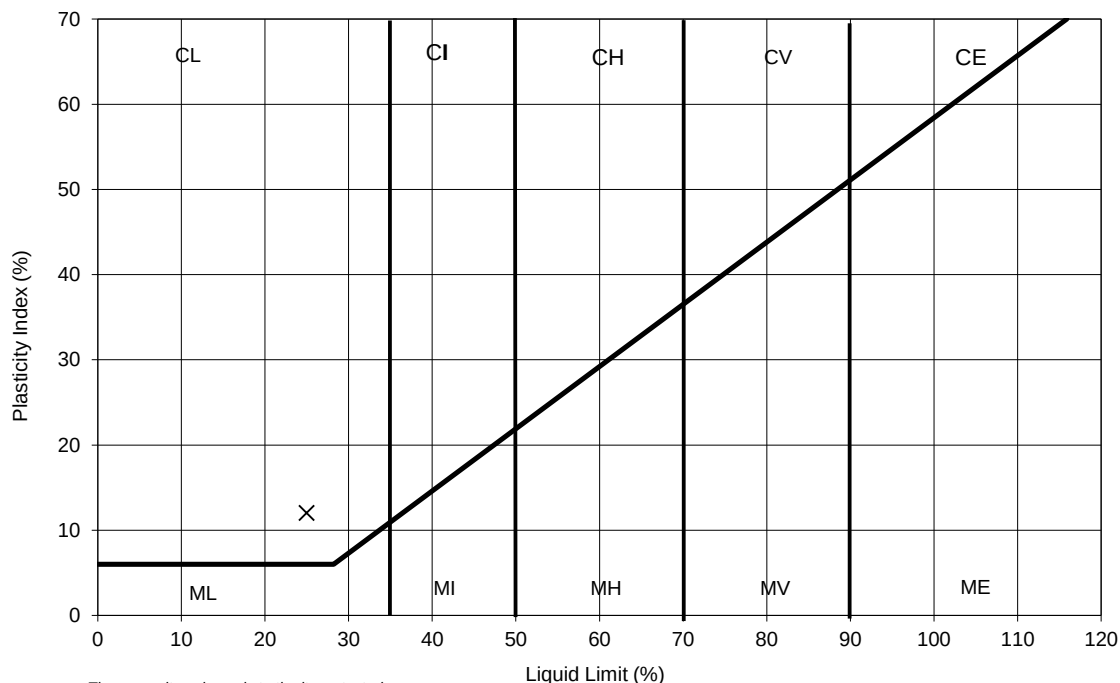
12

%

Remarks

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

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Checked and Approved

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MSF-5 R2



LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

Job No. 35124

Borehole/Pit No. BH4

Site Name Tilehurst, Reading

Sample No. -

Project No. 21283/PO24-140

Client

WDE Consulting

Depth Top m 1.00

Soil Description

Brown silty clayey very sandy GRAVEL (gravel is fmc and sub-angular)

Depth Base m 2.00

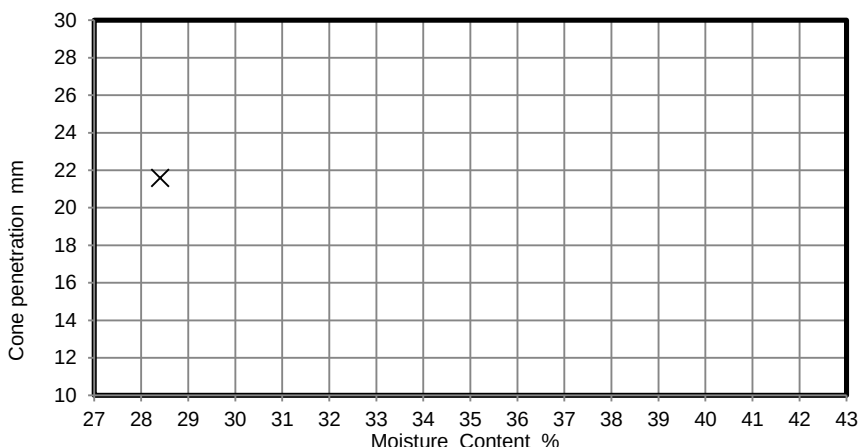
Sample Type C

Samples received 08/04/2024

Schedules received 08/04/2024

Project Started 09/04/2024

Date Tested 30/04/2024



NATURAL MOISTURE CONTENT

10

%

% PASSING 425µm SIEVE

41

%

LIQUID LIMIT

28

%

PLASTIC LIMIT

15

%

PLASTICITY INDEX

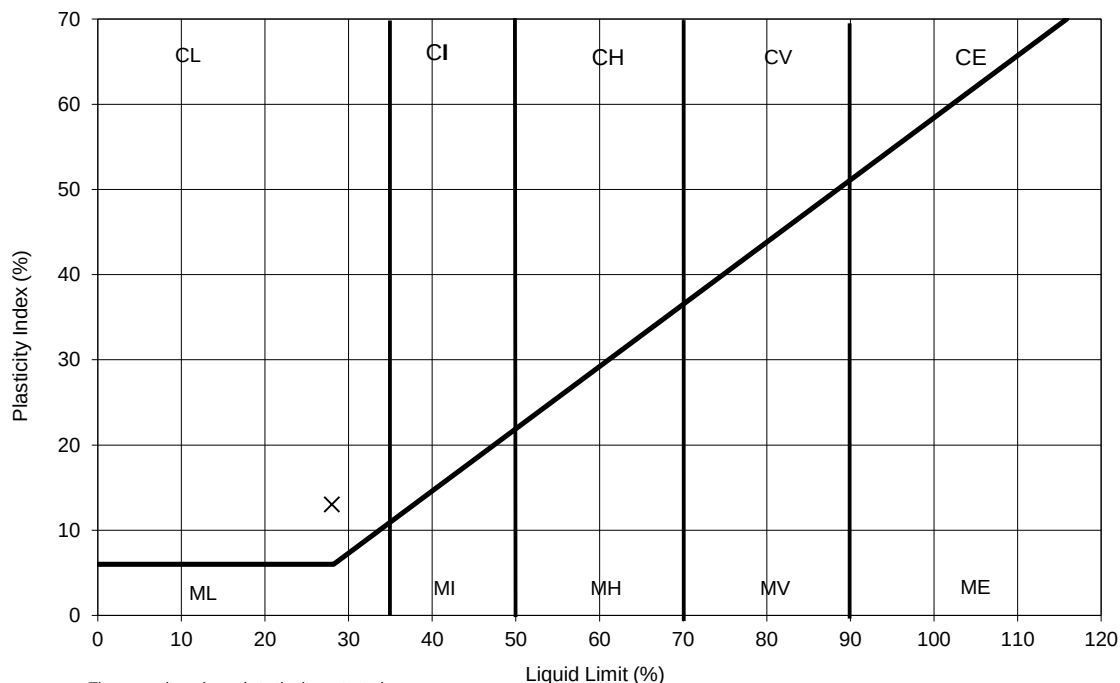
13

%

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

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Initials: J.P

Date: 02/05/2024

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MSF-5 R2



LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

Job No. 35124

Borehole/Pit No. BH8

Site Name Tilehurst, Reading

Sample No. -

Project No. 21283/PO24-140 Client WDE Consulting

Depth Top m 2.00

Soil Description

Light brown slightly sandy slightly gravelly silty CLAY (gravel is fmc and angular to sub-angular chalk and flint)

Depth Base m -

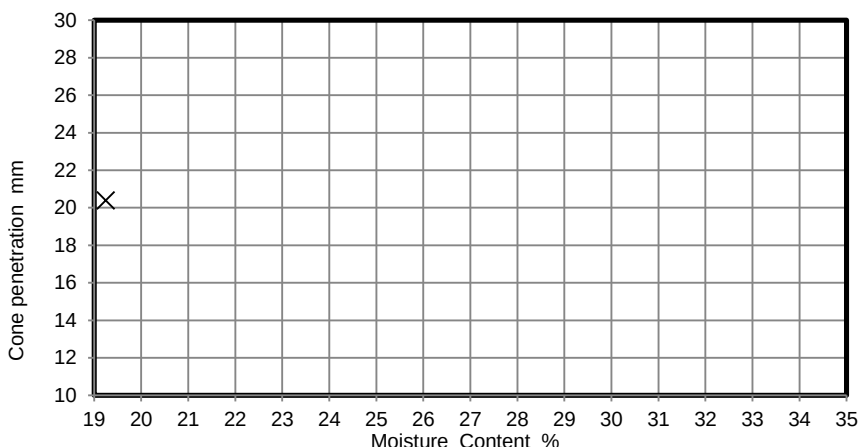
Sample Type D

Samples received 08/04/2024

Schedules received 08/04/2024

Project Started 09/04/2024

Date Tested 24/04/2024



NATURAL MOISTURE CONTENT

12 %

% PASSING 425µm SIEVE

66 %

LIQUID LIMIT

19 %

PLASTIC LIMIT

12 %

PLASTICITY INDEX

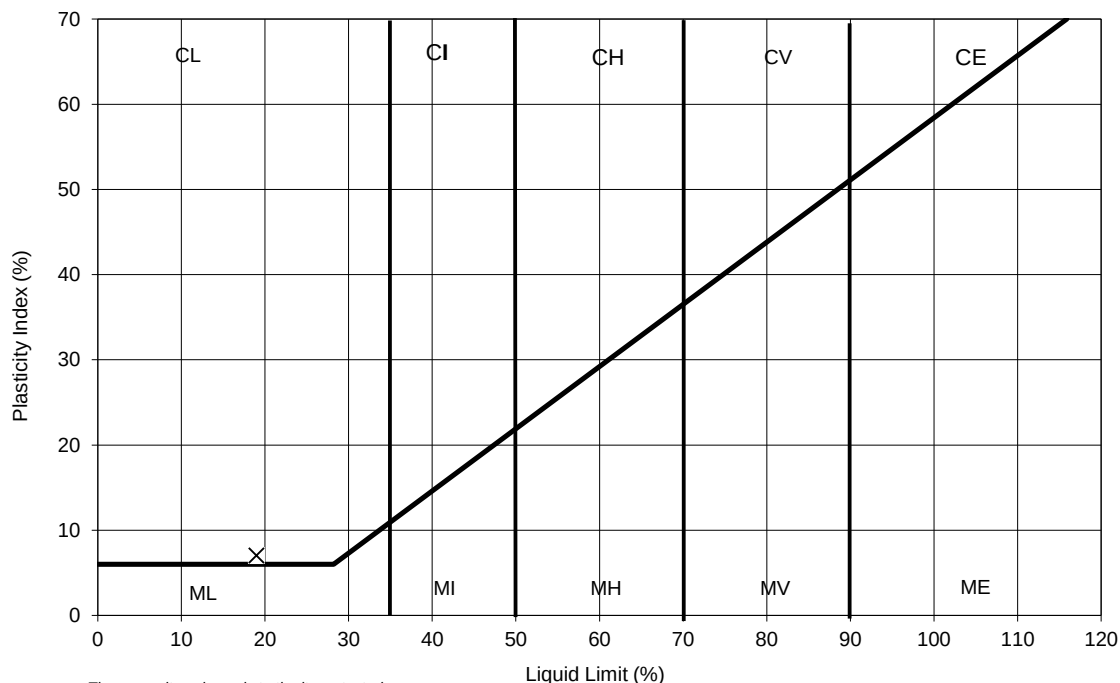
7 %

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

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Checked and Approved

Initials: J.P

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

MSF-5 R2



LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

Job No. 35124

Borehole/Pit No. BH9

Site Name Tilehurst, Reading

Sample No. -

Project No. 21283/PO24-140

Client

WDE Consulting

Depth Top m 1.00

Soil Description

High strength brown slightly gravelly slightly sandy silty CLAY with chalk fragments (gravel is fmc and angular)

Depth Base m 2.00

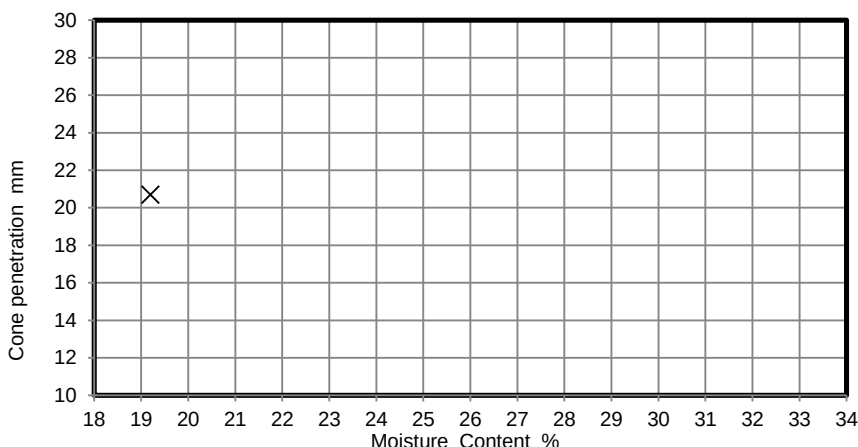
Sample Type D

Samples received 08/04/2024

Schedules received 08/04/2024

Project Started 09/04/2024

Date Tested 24/04/2024



NATURAL MOISTURE CONTENT

9.6

%

% PASSING 425µm SIEVE

78

%

LIQUID LIMIT

19

%

PLASTIC LIMIT

11

%

PLASTICITY INDEX

8

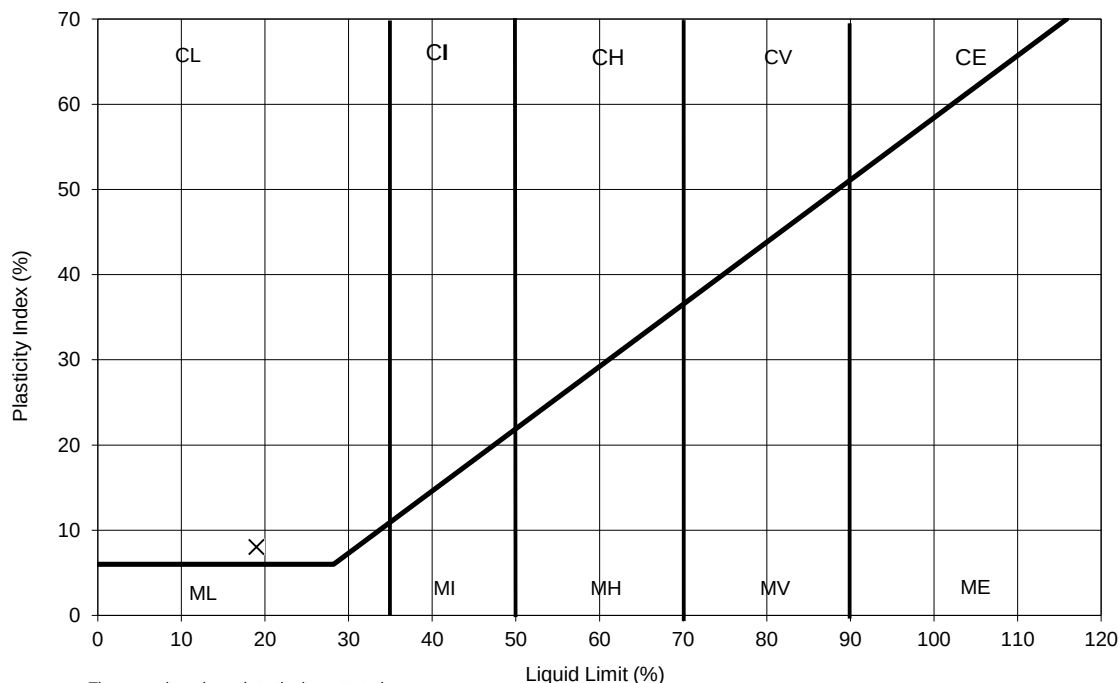
%

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: 02/05/2024

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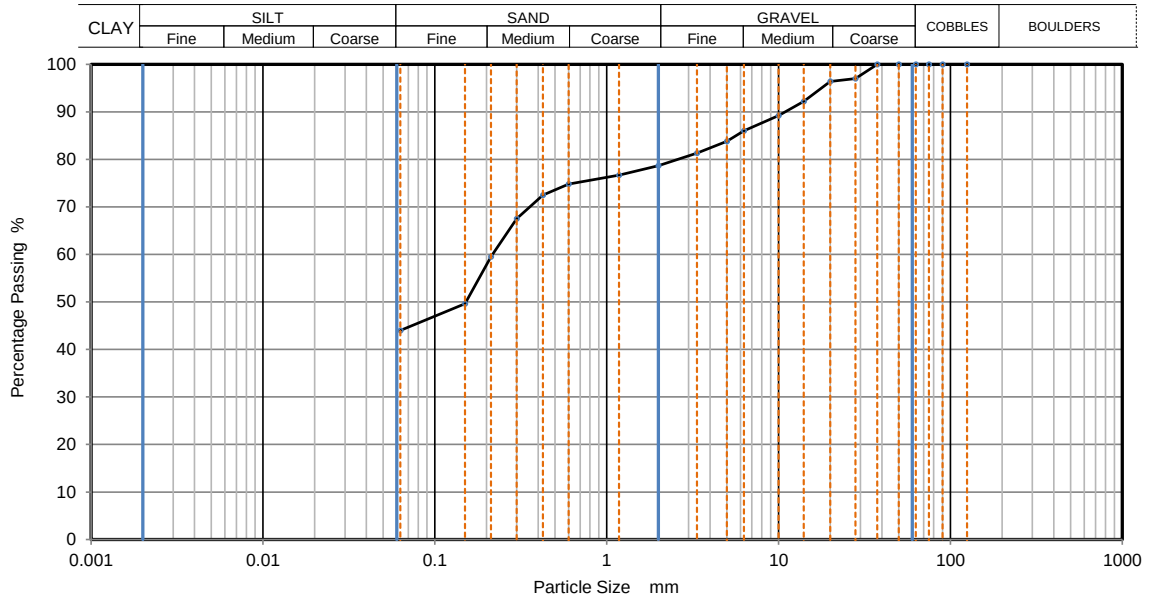
Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5 R2

		Summary of Natural Moisture Content, Liquid Limit and Plastic Limit Results												
Job No. 35124		Project Name Tilehurst, Reading						Programme Samples received 08/04/2024 Schedule received 08/04/2024 Project started 09/04/2024 Testing Started 24/04/2024						
Project No. 21283/PO24-140		Client WDE Consulting												
Hole No.	Sample				Soil Description	NMC %	Passing 425µm %	LL %	PL %	PI %	Remarks			
	Ref	Top m	Base m	Type										
BH1	-	1.00	-	D	Light brown slightly gravelly slightly sandy silty CLAY with numerous fine chalk fragments (gravel is fm and sub-angular)	20	75	23	12	11				
BH1	-	2.00	-	D	Light brown slightly sandy gravelly silty CLAY (gravel is fmc and angular to sub-angular chalk and flint)	11	56	23	14	9	Sample washed to obtain test fraction			
BH2	-	2.00	-	D	Dark brown slightly gravelly sandy silty CLAY with roots (gravel is fm and sub-angular)	21	90	33	18	15				
BH2	-	3.00	-	D	Brown slightly gravelly sandy silty CLAY (gravel is fmc and sub-angular)	15	70	25	13	12				
BH4	-	1.00	2.00	C	Brown silty clayey very sandy GRAVEL (gravel is fmc and sub-angular)	10	41	28	15	13				
BH8	-	2.00	-	D	Light brown slightly sandy slightly gravelly silty CLAY (gravel is fmc and angular to sub-angular chalk and flint)	12	66	19	12	7	Sample washed to obtain test fraction			
BH9	-	1.00	2.00	D	High strength brown slightly gravelly slightly sandy silty CLAY with chalk fragments (gravel is fmc and angular)	9.6	78	19	11	8	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> NOTE: The report shall not be reproduced except in full without authority of the laboratory					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: 02/05/2024	
2519					Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)					MSF-5-R1(b)				

	PARTICLE SIZE DISTRIBUTION			Job Ref	35124
				Borehole/Pit No.	BH3
Site Name	Tilehurst, Reading			Sample No.	-
Project No.	21283/PO24-140	Client	WDE Consulting	Depth Top	2.00 m
Soil Description	Brown and light brown slightly gravelly sandy silty CLAY with scattered chalk deposits (gravel is fmc and sub-angular to sub-rounded chalk and flint)			Depth Base	3.00 m
				Sample Type	C
				Samples received	08/04/2024
				Schedules received	08/04/2024
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	09/04/2024
				Date tested	19/04/2024

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	97		
20	96		
14	92		
10	89		
6.3	86		
5	84		
3.35	81		
2	79		
1.18	77		
0.6	75		
0.425	73		
0.3	68		
0.212	60		
0.15	50		
0.063	44		

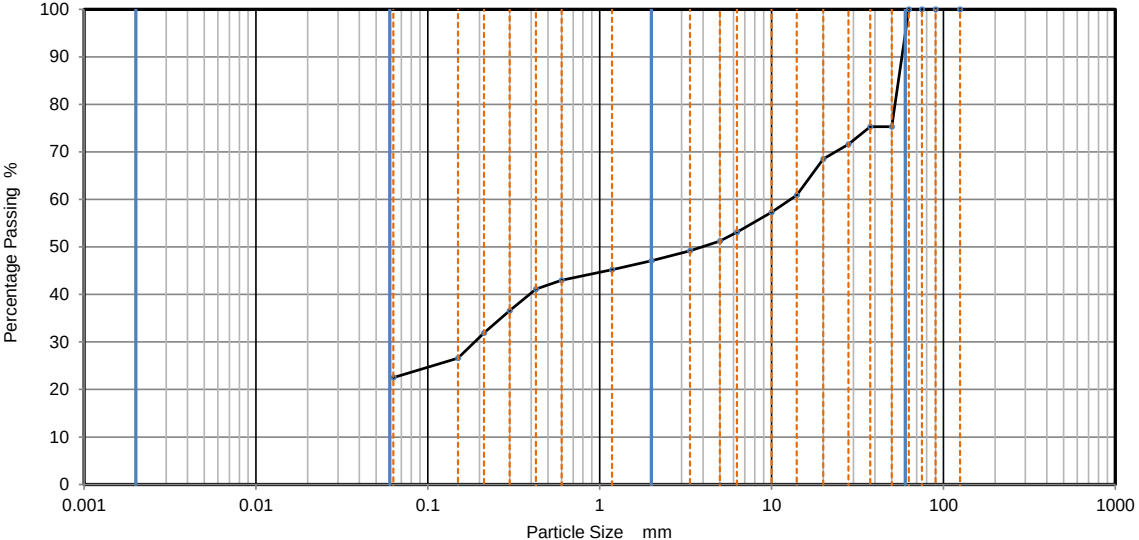
Sample Proportions	% dry mass
Very coarse	0.00
Gravel	21.30
Sand	34.74
Fines <0.063mm	43.96

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

Remarks
Preparation and testing in accordance with BS1377 unless noted below

	PARTICLE SIZE DISTRIBUTION			Job Ref	35124
				Borehole/Pit No.	BH4
Site Name	Tilehurst, Reading			Sample No.	-
Project No.	21283/PO24-140	Client	WDE Consulting	Depth Top	1.00 m
Soil Description	Brown silty clayey very sandy GRAVEL (gravel is fmc and sub-angular)			Depth Base	2.00 m
				Sample Type	C
				Samples received	08/04/2024
				Schedules received	08/04/2024
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	09/04/2024
These results only apply to the items tested				Date tested	19/04/2024

CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	75		
37.5	75		
28	72		
20	69		
14	61		
10	57		
6.3	53		
5	51		
3.35	49		
2	47		
1.18	45		
0.6	43		
0.425	41		
0.3	37		
0.212	32		
0.15	27		
0.063	23		

Sample Proportions		% dry mass
Very coarse		0.00
Gravel		52.85
Sand		24.65
Fines <0.063mm		22.50

Grading Analysis		
D100	mm	
D60	mm	12.8
D30	mm	0.187
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

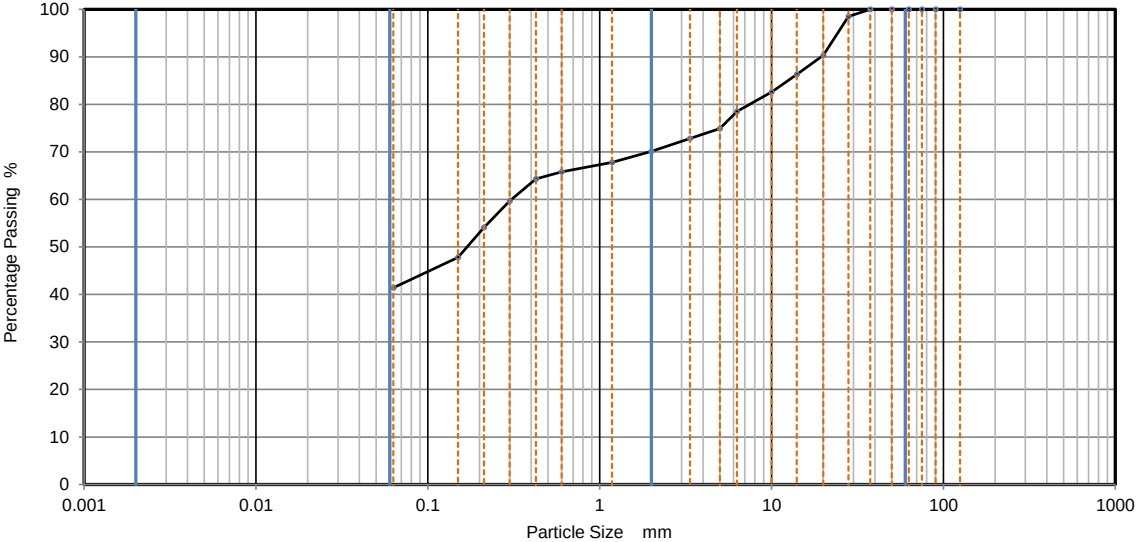
Remarks
Preparation and testing in accordance with BS1377 unless noted below

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	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: 02/05/2024
	Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)		MSF-5-R3
	2519		

	PARTICLE SIZE DISTRIBUTION			Job Ref	35124
				Borehole/Pit No.	BH8
Site Name	Tilehurst, Reading			Sample No.	-
Project No.	21283/PO24-140	Client	WDE Consulting	Depth Top	2.00 m
Soil Description	Light brown slightly sandy slightly gravelly silty CLAY with scattered chalk deposits (gravel is fmc and sub-angular to sub-rounded chalk and flint)			Depth Base	3.00 m
				Sample Type	D
				Samples received	08/04/2024
				Schedules received	08/04/2024
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	09/04/2024
These results only apply to the items tested				Date tested	19/04/2024

CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	99		
20	90		
14	86		
10	83		
6.3	79		
5	75		
3.35	73		
2	70		
1.18	68		
0.6	66		
0.425	64		
0.3	60		
0.212	54		
0.15	48		
0.063	41		

Sample Proportions		% dry mass
Very coarse		0.00
Gravel		29.86
Sand		28.69
Fines <0.063mm		41.45

Grading Analysis		
D100	mm	
D60	mm	0.306
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks
Preparation and testing in accordance with BS1377 unless noted below

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	Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)		MSF-5-R3
	2519		

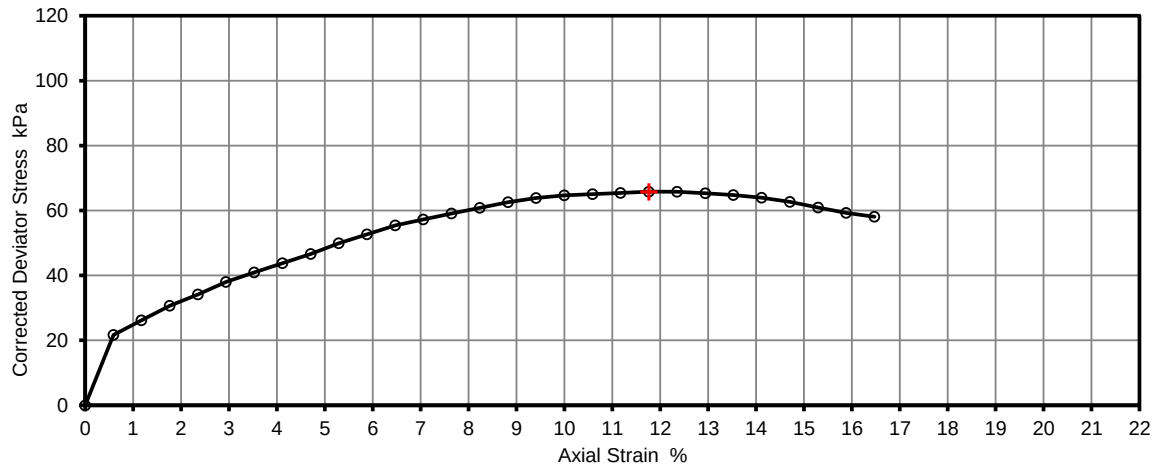
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	35124
				Borehole/Pit No.	BH1
Site Name	Tilehurst, Reading			Sample No.	-
Project No.	21283/PO24-140	Client	WDE Consulting	Depth Top	1.50 m
Soil Description	Low strength brown slightly mottled orangish brown slightly gravelly slightly sandy silty CLAY (gravel is fm and sub-angular)			Depth Base	- m
				Sample Type	D
				Samples received	08/04/2024
				Schedules received	08/04/2024
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	22/04/2024

Remarks

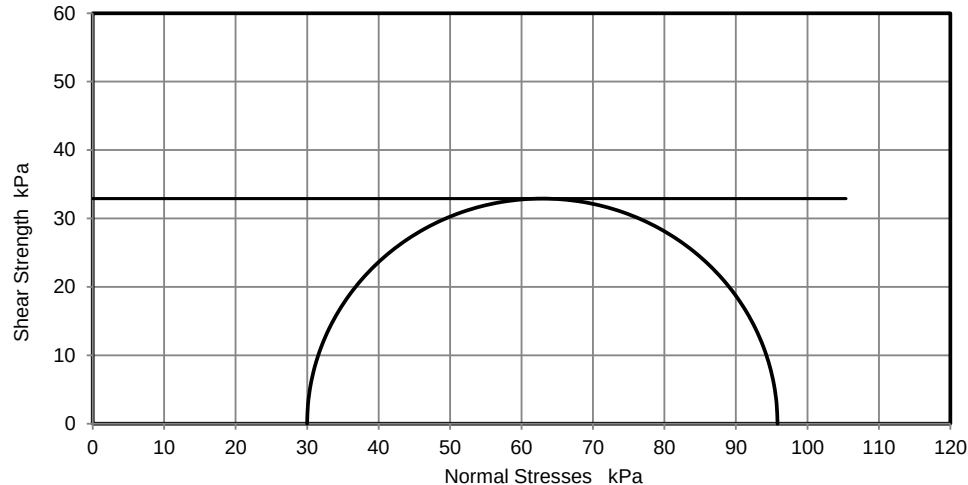
Position within sample

Test Number	1
Length	170.0 mm
Diameter	83.0 mm
Bulk Density	2.11 Mg/m ³
Moisture Content	17 %
Dry Density	1.80 Mg/m ³
Rate of Strain	2.0 %/min
Cell Pressure	30 kPa
Axial Strain	12 %
Deviator Stress, ($\sigma_1 - \sigma_3$)f	66 kPa
Undrained Shear Strength, cu	33 kPa $\frac{1}{2}(\sigma_1 - \sigma_3)$ 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**
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Checked and Approved
Initials: J.P
Date 02/05/2024

	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	35124
				Borehole/Pit No.	BH6
Site Name	Tilehurst, Reading			Sample No.	-
Project No.	21283/PO24-140	Client	WDE Consulting	Depth Top	2.00 m
Soil Description	High strength brown mottled light brown slightly gravelly sandy silty CLAY with chalk fragments and deposits (gravel is fm and sub-angular)			Depth Base	3.00 m
				Sample Type	D
				Samples received	08/04/2024
				Schedules received	08/04/2024
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	22/04/2024

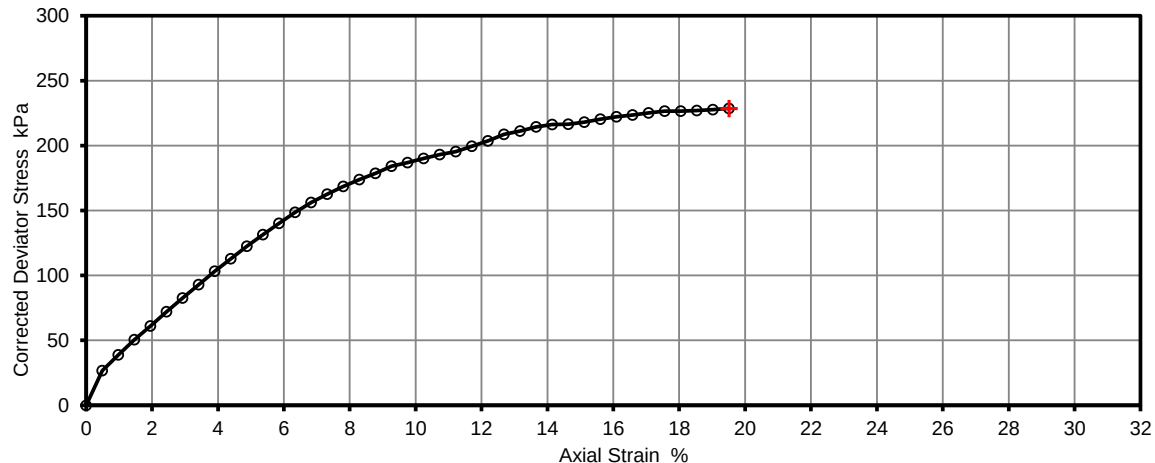
Remarks

Recompacted @ NMC using 2.5 kg hammer

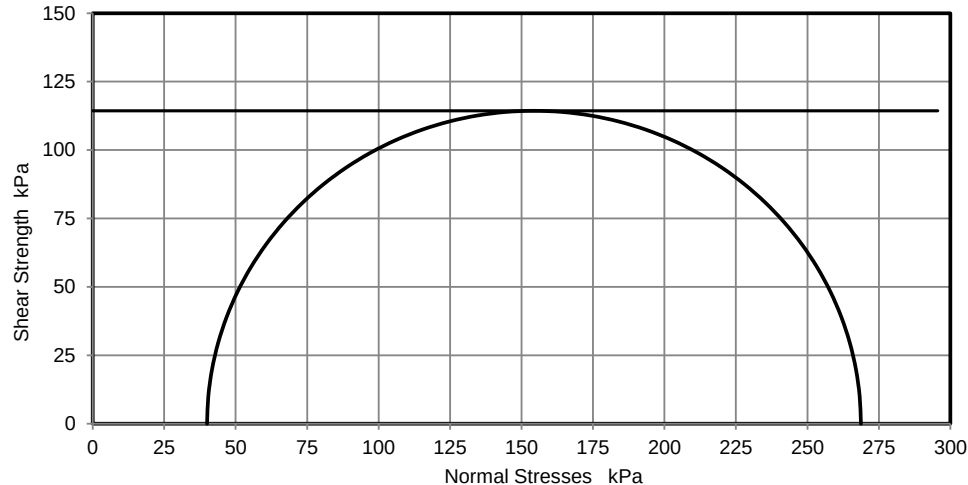


Test Number	1
Length	205.0 mm
Diameter	100.0 mm
Bulk Density	1.89 Mg/m ³
Moisture Content	13 %
Dry Density	1.67 Mg/m ³
Rate of Strain	2.0 %/min
Cell Pressure	40 kPa
Axial Strain	20 %
Deviator Stress, ($\sigma_1 - \sigma_3$)f	229 kPa
Undrained Shear Strength, cu	114 kPa $\frac{1}{2}(\sigma_1 - \sigma_3)$ 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.



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Checked and Approved

Initials: J.P

Date 02/05/2024

	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen			Job Ref	35124
				Borehole/Pit No.	BH9
Site Name	Tilehurst, Reading			Sample No.	-
Project No.	21283/PO24-140	Client	WDE Consulting	Depth Top	1.00 m
Soil Description	High strength brown slightly gravelly slightly sandy silty CLAY with chalk fragments (gravel is fmc and angular)			Depth Base	2.00 m
				Sample Type	D
				Samples received	08/04/2024
				Schedules received	08/04/2024
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen			Date of test	22/04/2024

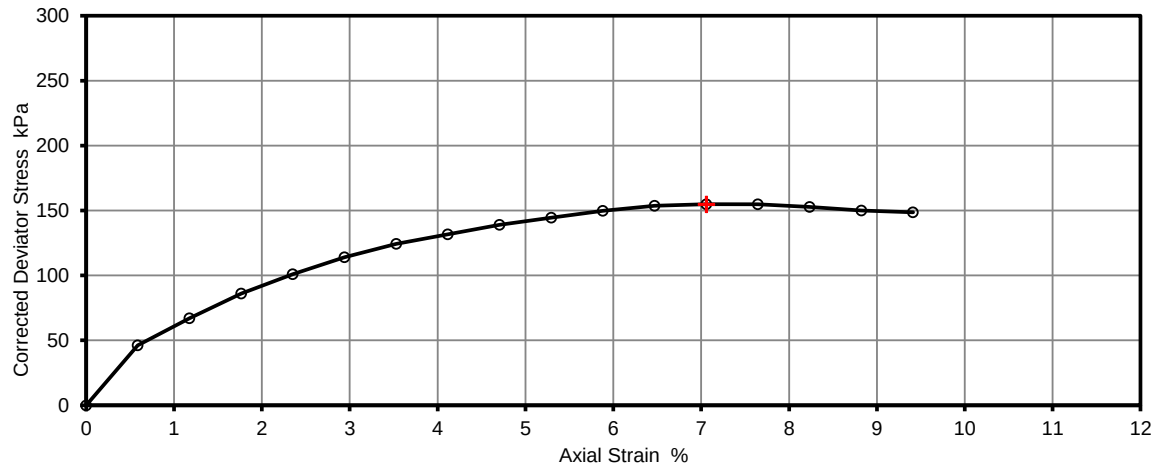
Remarks

Coarse gravel not present in the part tested

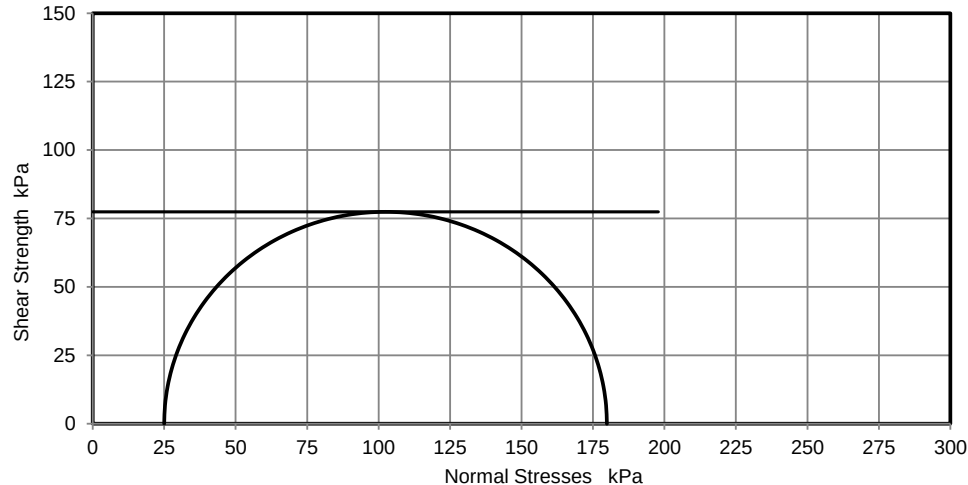


Test Number	1	
Length	170.0	mm
Diameter	83.0	mm
Bulk Density	2.22	Mg/m ³
Moisture Content	12	%
Dry Density	1.99	Mg/m ³
Rate of Strain	2.0	%/min
Cell Pressure	25	kPa
Axial Strain	7.1	%
Deviator Stress, ($\sigma_1 - \sigma_3$)f	155	kPa
Undrained Shear Strength, cu	77	kPa $\frac{1}{2}(\sigma_1 - \sigma_3)$ 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.

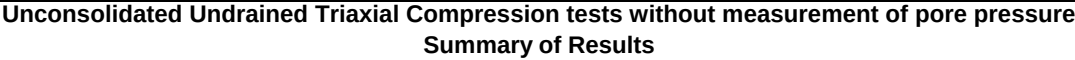


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Initials: J.P

Date 02/05/2024



Job No.	Project Name	Programme	
35124	Tilehurst, Reading	Samples received	08/04/2024
		Schedule received	08/04/2024
Project No.	Client	Project started	09/04/2024
21283/PO24-140	WDE Consulting	Testing Started	22/04/2024

Legend	UU - single stage test (single and multiple specimens)	σ_3	Cell pressure	Mode of failure ;	B - Brittle
	UUM - Multistage test on a single specimen	$\sigma_1 - \sigma_3$	Maximum corrected deviator stress		P - Plastic
	suffix R - remoulded or recompacted	cu	Undrained shear strength, $\frac{1}{2} (\sigma_1 - \sigma_3)$		C - Compound

	Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU Tel: 01923 711 288 Email: james@k4soils.com Email: james@k4soils.com	Checked and Approved
	<i>These results only apply to the items tested. The report shall not be reproduced except in full without authority of the laboratory</i>	Initials: J.P Date: 02/05/2024
2519	Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)	MSF-5-R7b

Potential Desiccation using Driscoll Method

BH	Depth (m)	Moisture Content	% Passing 425um Sieve	Liquid Limit (LL)	Modified LL	0.4 * LL
1	1	20	75	23	17.25	6.90
1	2	11	56	23	12.88	5.15
2	2	21	90	33	29.7	11.88
2	3	15	70	25	17.5	7.00
4	1	10	41	28	11.48	4.59
8	2	12	66	19	12.54	5.02
9	1	9.6	78	19	14.82	5.93

Potentially desiccated

WDE RANGE OF SERVICES

