

GEO-ENVIRONMENTAL AUDIT

PHASE 1 Preliminary Risk Assessment

PHASE 2 Site Investigation

PHASE 3 Remediation Statement

Proposed Residential Development

Bamford Way

Rochdale

OL11 5NB

Author: Daniel Slattery
Client: Mr Mohammed Sohail
Reference: rep-tjba-sohail-43 bamford way-Phs
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Revision	Date	Reason
0	Sept 2022	Original to support planning application.

T J Booth Associates.
20A Eastgate St,
Rochdale,
Lancs,
OL16 1DH.
Tel: 01706 868288.
Email: office@tjba.co.uk

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1. PHASE 1 – PRELIMINARY RISK ASSESSMENT

1.1. Introduction.

T. J. Booth Associates have been appointed by Mr Mohammed Sohail to undertake an Environmental Audit to support a Town & Country Planning application for a new residential development.

The Development Site is located in a residential area of Bamford Rochdale, and currently comprises a single detached residential bungalow within a large private curtilage.

A planning application was submitted in March 2020, and approved in June 2020 for the "Erection of 5 no. detached dwellings, 4 no. double garages, and associated access road and infrastructure, following demolition of existing dwelling". The application was a resubmission of an earlier application, ref No.19/00593/FUL. Planning condition No.3 of the approval certificate, stated the need for an environmental assessment of the Site. Refer to particulars below:

Town and Country Planning Act 1990 (as amended)

PLANNING PERMISSION GRANTED

APPLICATION REFERENCE: 20/00253/FUL

Name and address for correspondence:	Applicant name:
Nigel Longshaw A.J. COCKER ASSOCIATES New Century House 176 Drake Street Rochdale OL16 1UP	Mr Sohail

Part I - Particulars of Application

Date of Application: 3 March 2020

Proposal:	Erection of 5 no. detached dwellings, 4 no. detached double garages and associated access road and infrastructure, following demolition of existing dwelling - Resubmission of 19/00593/FUL
Location:	43 Bamford Way, Rochdale, OL11 5NB

Part II - Particulars of decision

- 3 No development shall take place until an investigation and risk assessment has been submitted to and approved in writing by the Local Planning Authority. The assessment shall investigate the nature and extent of any contamination on the site (whether or not it originates on the site). The assessment shall be undertaken by competent persons and a written report of the findings submitted to and approved in writing by the Local Planning Authority before any development takes place.

The submitted report shall include:

- i) a survey of the extent, scale and nature of contamination
- ii) an assessment of the potential risks to:
 - o human health;
 - o property (existing or proposed) including buildings, crops, livestock, pets, woodland, and service lines and pipes;
 - o adjoining land;
 - o groundwaters and surface waters;
 - o ecological systems;
 - o archaeological sites and ancient monuments; and
- iii) where unacceptable risks are identified, an appraisal of remedial options and proposal of the preferred option(s) to form a remediation strategy for the site.

The development shall thereafter be carried out in accordance with the approved remediation strategy and a verification report submitted to and approved in writing by the Local Planning Authority before any of the building(s) hereby approved are first occupied.

Reason: To prevent pollution of the environment and to ensure the safe development of the site in the interests of the amenity of future occupiers in accordance with Policies G8 and G9 of the Core Strategy and the National Planning Policy Framework.

Reason for pre-commencement condition: Further investigation will be necessary prior to commencement of any building or engineering works on site.

T J Booth Associates have since been employed to undertake an environmental assessment of the Site including the Phase 1 desk study, Phase 2 Site investigations, and associated Phase 3 remediation statement if required, in accordance current UK guidance for environmental assessment within the construction industry. Principal to the assessment is the potential for contamination pollutant linkages via the CLR-11 source-pathway-receptor methodology. Assessment of potential pollution

linkages is primarily undertaken in strict accordance with BS5930:2015, BS 10175:2011+A2:2017, CIRIA C665, and BS 8485:2015+A1:2019 et al.

1.2. Proposed Development

The proposed development is for the erection of 5No. two-storey, detached residential dwellings. The dwellings will each have a double garage and soft landscaped garden areas. The Site is on a split level with plots 1 & 2 to the north part of the Site at higher level, and Plots 3, 4, & 5 to the south at lower level.

A new access road through the Site will utilise the existing driveway, splitting Plots 1 & 2, and falling in elevation to a shared turning circle in front of Plots 3, 4, & 5.

1.3. Historic Maps

DATE	ON-SITE	OFF-SITE/SURROUNDING AREA
c1851	The north part of the Site is within agricultural fields. The south half of the Site is within a reservoir that extends off-site to the west side. The east & south boundaries of the Site are formed by the reservoir edge. There is a watercourse to the middle of the east Site boundary which is assumed to be the inlet.	The reservoir has an outfall approximately 50m to the east of the Application Site boundary, which then joins a watercourse flowing southwest towards another reservoir closer to Bury Road. The wider area comprises agricultural land, with some farmhouses in the wider area.
c1890	No change.	Watercourse adjacent the inlet to the east of the Site no longer shown. No overall change in the wider area.
c1910	No change.	No overall change.
c1930	No change.	Some development in the wider area but none that affects the environmental risk of the Site.
c1937	No change.	No overall change.
c1957-59	On-site reservoir now noted as old. The plans clearly show the inlet (issues) to the east side, and outlet (sluice) to the west.	Some residential development to Bury Road.
c1966-88	The existing bungalow (No.43) is erected on the north part of the Site. The south part of the Site still shows the disused reservoir.	Much of the wider area to the north, east and west are now developed much as in the present day. Only the immediate south of the Site including the Site reservoir remains undeveloped between the Site and Bury Road.
c1977-90	No change.	Rochbury Close to the south side of the Application Site is now developed as per the present day with residential dwellings.
c1982-90	Reservoir no longer shown on map.	No change in the wider area.

1.4. Present Day Paper & Electronic Maps/Topographic Surveys

Site Boundaries, Outlines of Structures and Buildings:	The Application Site is surrounded by residential development on all sides, and the boundary is generally formed by the rear garden fencing to neighbouring properties.
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	The north part of the Site is accessed via a macadam driveway off Bamford Way. The bungalow, driveway patios and immediate landscaped garden areas are to the higher north part of the Site. The south part of the Site is relatively heavily vegetated with semi mature and mature trees to the perimeter east boundary, as well as other sapling around the Site. There is a combined manhole noted to the southeast corner of the bungalow.
Ground Contours, Natural Drainage Features:	Ground level falls from north to south over the Site. Bamford Way is approximately 151.00m aOD falling to around 147.5m aOD at the bungalow. Ground level falls gently to around 146.00m aOD where it then sharply falls to around 140.00 at the southern part of the Site.
Water Courses:	No evidence of watercourses on current maps.
Below Ground Obstructions:	None noted.

1.5. Geology

Bedrock Geology:	Undifferentiated Carboniferous Westphalian Coal Measures, generally comprising interbedded sandstone and mudstone. The local stratigraphic dip is approx 0-5 degrees south.
Superficial Geology:	Glacial clay till underlies the local area.
Coal Seams.	The closest coal seam subcropping beneath the area is the Arley coal seam approximately 450m north of the Site.

1.6. Boreholes Records

There are no borehole records within close or relevant proximity to the Site.

1.7. Planning/Other Data.

N/A.

1.8. Landmark Environmental Data

1.8.1. AGENCY & HYDROLOGICAL

BGS groundwater flooding susceptibility:	On-site.
Contaminated land register entries and notices:	No records within 250m.
Discharge consents:	No records within 250m.
Local Authority pollution prevention and controls:	No records within 250m.
Pollution incidents to controlled waters:	2 records relating to incidents 167m & 205m south of the Site.
Groundwater vulnerability:	Medium.
Bedrock aquifer:	Secondary A Aquifer.

Superficial aquifer:	Secondary undifferentiated Aquifer.
Source protection zone:	Not within a Source Protection Zone.

1.8.2. WASTE

BGS recorded landfill sites:	No records within 250m.
Historic landfill sites:	No records within 250m.
Registered landfill sites:	No records within 250m.

1.8.3. HAZARDOUS SUBSTANCES

Planning hazardous substance consents:	No records within 250m.
Planning hazardous substance enforcements:	No records within 250m.

1.8.4. GEOLOGICAL

Mining Instability:	In an area that may be affected by coal mining.
Potential for Collapsible Ground Stability Hazards:	Very low.
Potential for Compressible Ground Stability Hazards:	No hazard.
Potential for Ground Dissolution Stability Hazards:	No hazard.
Potential for Landslide Ground Stability Hazards:	Very low.
Potential for Running Sand Ground Stability Hazards:	Very low.
Potential for Shrinking or Swelling Clay Ground Stability Hazards:	No hazard.
Radon Potential - Radon Affected Areas:	The property is in a low Probability Radon Area where <1% of homes are estimated to be at or above the action level.
Radon Potential - Radon Protection Measures:	No radon protection measures are necessary in the construction of new dwellings or extensions.

1.9. Coal Authority

Entries, Adits, Shafts.	No mine entries close to the Site. Closest are approximately 450m distant.
Past Recorded Underground Mining.	No recorded workings of coal beneath the Site.
Shallow Unrecorded Mining.	None noted beneath the Site.
Shallow Recorded Mining.	None noted beneath the Site.
Development High Risk Area.	The Site is not within a Development High Risk Area.

1.10. Industry Profiles

N/A.

1.11. TJBA Site Reconnaissance – December 2019 & September 2022

Details of Existing Structures & Features:	The Site was initially inspected in December 2019. The residential dwelling to the north side of the Site remained, and the access and immediate surrounds were still intact. There was an inspection chamber to the southeast side of the bungalow, presumably the combined drainage which appeared to flow into neighbouring land but was blocked and partially filled with water. The land to the south of the dwelling was heavily vegetated with semi mature and mature trees, followed by a steep slope down to the lower part of the Site nominally half way from north to south along the Site length. An stone inlet was noted along the east boundary of the lower part of the Site, along with 4No. 100dia outlet pipes to the west boundary cased in concrete. Between these points was a small channel nominally 300 deep which had been former through the Site. The south boundary of the Site was at high level, presumably the former embankment to the former reservoir. The west boundary with the adjacent dwelling was formed by a timber fence, however, the former bank to the east of that side could be seen approximately 50m away. ** September 2022 update – there was no change to the Site between December 2019 and September 2022.
Adjacent Properties:	Site is surrounded by residential housing on all sides.
Water Levels, Directions of Flow and Rates in Rivers:	The spring which flows through the Site flows from east to west but is not always flowing.
Old Mine or Quarry Workings:	No evidence noted.
Areas of Discoloured Soil, Polluted Water, Vegetation, and Significant Odours:	None noted.

1.12. Identification of Source-Pathway-Receptor.

1.12.1. Potential Contaminants.

CURRENT SOURCE/S	ORIGINAL ASSOCIATED SOURCE	CONTAMINANT/S
Made ground to upper part of the Site.	Development of the bungalow & surrounds.	Metals, PAH, inorganics, asbestos
Made ground to lower part of the Site.	Made ground used in embankments, reprofiling. Siltation and inflow from the former reservoir.	Metals, PAH, inorganics.

1.12.2. Potential Pathways.

The potential pathways to/from the Development Site include (not an exhaustive list but a summary of the main points):

PATHWAY	MEDIA
Soil and dust ingestion	Soil and indoor dust
Consumption of home grown fruit and vegetables	Produce

Skin contact (indoors)	Indoor dust
Skin contact (outdoors)	Soil
Inhalation of dust (indoors)	Air
Inhalation of dust (outdoors)	Air
Vapours (indoors)	Air
Vapours (outdoors)	Air

1.12.3. Potential Receptors.

Receptors mainly comprise workers in the construction phase, and residential users for the proposed end use.

1.13. Environmental Site Risk Summary/Conclusions

The historic use of the upper part of the Site was agricultural until the current housing estate was erected c1950-60s. Prior to the area was agricultural.

The lower part of the Site was historically used as a reservoir c1850 and there are no mapping records that precede this date. There have been no uses of the lower part since the reservoir was abandoned, and it simply became part of the garden area to 43 Bamford Way after the estate was erected.

No peat horizons were noted on Site, no landfills were noted in the local area. There were also no particular risks to the Site from coal mining legacy or radon.

1.14. Preliminary Conceptual Model.

CURRENT SOURCE/S		ORIGINAL ASSOCIATED USAGE / LOCATION	CONTAMINANT TYPE	PATHWAY	RECEPTOR	POLLUTION LINKAGE	CONSEQUENCE	PROBABILITY	RISK
CHEMICAL (SOLID)	Existing made ground/infilled ground – ex surface/sub-soil.	Infilled ground in the local area.	Metals, PAHs, sulphates, asbestos.	Direct ingestion, aerial ingestion, dermal contact, drinking water.	Site construction operatives & future occupants. Site buildings.	Made ground potentially exists associated with the residential dwellings & also potentially within the former reservoir which could present an unacceptable risk to Site receptors.	Medium.	Likely.	Moderate risk.
	Anthropogenic ground gas sources/existing made ground/infilled ground - surface/sub-soil.	Infilled ground in the local area.	CH ₄ , CO ₂ , other trace gases.	Diffusion through soil, substructures, aerial inhalation.	Future occupants. Explosion, suffocation.	Infilled ground should it exist beneath the Site may present a source material for ground gas migration. No historic landfill Sites locally.	Severe.	Unlikely.	Moderate to low risk.
GROUND GAS RISK (VAPOURS)	Geological ground gas sources.	Coal mining/seams.	Rn			Although coal mining has occurred in the local area, no mining has occurred at shallow depth and no entries exist at or close to the Site.	Medium.	Unlikely.	Low risk.
		Radon bearing rocks.				The Site is within a Class 2 radon area. No protective measures are required.	Medium.	Unlikely.	Low risk.
CHEMICAL (LIQUID)	Existing made ground/infilled ground - surface/sub-soil.	Infilled ground in the local area.	Metals, PAHs, sulphates.	Permeation through soil.	Contaminated ground / surface water. Controlled Waters such as watercourses, canal, aquatic habitats & associated wildlife.	Although any infilled ground in the local area would likely contain contaminants of concern above residential threshold limits to human end use receptors; it is unlikely that significant quantities exist beneath the Site to pose a risk to controlled waters. In addition, the vulnerability of aquifer noted in the landmark data is considered low, and there are no other known controlled water such as watercourses or source protection zone nearby. The local geology is also likely to be impermeable clay from BGS records.	Mild.	Unlikely.	Very low risk.

1.15. Site Investigation Strategy

1.15.1. Ground/Soil Contamination Risk

The Site has been developed both for residential housing & landscaping c1970s, and historically as a historic reservoir to the south part of the Site.

Any Site which has been developed historically is potentially at risk from minor contamination unsuitable for use to modern standards. Historically, material which are now considered unsafe for use were prevalent in the building industry.

Ground levels were often altered & made ground often comprising harmful materials was used to infill & make up levels.

Although, there is no specific major contaminative risk associated with the Site, there is the potential for low level of contaminative risk in existing Site soil which should be sampled and proven to be suitable for the proposed end use.

BS10175:2011+A1:2013 & R&D TECHNICAL REPORT P5-066/TR considers the upper 500mm is sufficient to categorise the ground profile for development with respect to:

- human/animal intake arising from ingestion and dermal contact;
- potential for wind entrainment leading to inhalation (of contaminated soils and dusts);
- or deposition onto neighbouring land;
- surface water run-off (e.g. due to flash flooding);
- uptake by shallow rooting plants (e.g. crops, ornamental and wild species);
- surface leaching to groundwater.

There is no definitive guidance on the number of samples required for soil representation in current guidance. However, R&D TECHNICAL REPORT P5-066/TR indicates that sample spacing should be between 10-25m for residential applications.

Considering the proposed area for soft landscaping, and the land available (not as hardstanding) predevelopment; nominally 5 soil samples representative of the upper 500mm of MADE GROUND would satisfy guidance criteria for sampling.

Soil samples should be tested for contaminant suites including: metals, speciated PAH, inorganics & sulphates, SOM, and asbestos screening. Samples should be analysed against common threshold comparison data, specifically the Defra Category 4 Screening Levels (C4SLs) where available, then to the LQM/CIEH (S4ULs) thereafter.

All TJBA Soil analysis will use the LQM/CIEH S4ULs, and the DEFRA C4ULs. The LQM/CIEH S4UL data is the most current and comprehensive list of contaminant exposure level based on proposed end use, however, contaminant levels within S4ULs are considered 'low risk' and exceedance of S4ULs may warrant further analysis to ensure suitability for the specified end use.

1.15.2. Ground Gas Risk

No ground gas risk has been noted from either natural geological processes or anthropogenic sources, and therefore no ground gas investigations are proposed.

2. PHASE 2 - SITE INVESTIGATION & RISK ASSESSMENT

2.1. Site Investigations

2.1.1. Summary

Considering the above preliminary conceptual model, and the history of the Site; there is the potential for minor made ground and which may lead to contaminants of concern being encountered by the end user of the Site.

Although no major contamination is suspected, minor contamination with contaminants of concern such as metals & PAH will need to be considered.

No major ground gas risk was noted in the local area, and the risk rating from the preliminary conceptual model was moderate to low risk as a result of the linkage severity rather than the likelihood of occurrence.

All TJBA Soil analysis will use the LQM/CIEH S4ULs, and the DEFRA C4ULs. The LQM/CIEH S4UL data is the most current and comprehensive list of contaminant exposure level based on proposed end use, however, contaminant levels within S4ULs are considered 'low risk' and exceedance of S4ULs may warrant further analysis to ensure suitability for the specified end use.

The C4SL data relates to updated DEFRA Statutory Guidance under Part 2A of the Environmental Protection Act 1990 (Part 2A). The guidance introduces a 4 category system in which Category 4 is of the least concern and levels falling within this risk category are considered as 'acceptably low'.

As the S4ULs are considered more conservative than C4SLs, any contaminant levels exceeding a S4UL although not considered 'low risk' can still be considered 'acceptably low' for use within the planning regime as long as it is still within the C4SL risk category. Thus, soil sampling results are firstly held to C4SLs where available and then to S4ULs thereafter to define suitability with respect to specified proposed end uses within the planning regime.

2.1.2. Trial Holes 22.09.2022

A Site investigation was undertaken by T J Booth Associates on the 15.12.2022. The investigations comprised 5No. machine excavated trial holes (THs 1-5), undertaken with a 5t back acting excavator.

Trial holes were undertaken around the Site to gain an understanding of the geology and made ground depths for geotechnical & geo-environmental purposes. A trial hole was undertaken in the location of each proposed plot, giving a nominal grid format of investigation.

Site investigations revealed the following:

Lower Site – The geology in the former reservoir comprised an upper TOPSOIL over generally firm to stiff CLAY, over WEATHER BEDROCK (shale).

Upper Site – The upper part of the Site comprised TOPSOIL over a SILT layer not found on the lower Site. This was underlain by a very stiff CLAY over the WEATHERED BEDROCK (very stiff to hard shale).

Refer to Appendix for full site investigation logs.

2.1.3. Soil Sampling (contamination)

Soil samples (S1-5) were taken from the upper 500mm of MADE GROUND in each of the trial holes. They were sealed in 1kg white plastic snap top containers, amber jars & vials; and sent to Eurofins Chemtest Ltd to be tested for a range of common contaminants.

All samples were tested for metals, speciated PAH, inorganics & sulphates, SOM, & asbestos screening in accordance with the preliminary conceptual model. There was no visual or olfactory evidence of hydrocarbon contamination, and thus soils were not tested.

On return the samples were assessed by TJ Booth Associates to common threshold comparison data, specifically the Defra Category 4 Screening Levels (C4SLs), then to LQM/CIEH (S4ULs).

2.1.4. Soil Sampling (Geotechnical)

Although the foundation design of the Site isn't covered in the report, sampling has been included for clarity.

Soil samples (S6 & S7) were taken from trial holes TH1 & TH5 respectively. The samples were sealed in 1kg white plastic snap top containers and sent to Eurofins Chemtest Ltd to be tested for plasticity analysis to BS1377 : PART 2 : 1990.

Only sample S7 was tested for plasticity analysis, and sample S6 discarded.

Sample S7 was a very stiff orange-brown/grey mottled friable CLAY with a plasticity Index of 16%. The % passing 425um test sieve was 97%. In accord with NHBC guidelines, the Modified Plasticity Index (I'_p) of the clay soil is: $16 \times 0.97 = 16\%$, indicating a LOW SHRINKAGE POTENTIAL.

2.1.5. Gas Monitoring

N/A – Not required.

2.2. Final Conceptual Model.

CURRENT SOURCE/S		ORIGINAL ASSOCIATED USAGE / LOCATION	CONTAMINANT TYPE	PATHWAY	RECEPTOR	POLLUTION LINKAGE OR MITIGATING FACTORS	RISK (FROM PRA)	MITIGATION
CHEMICAL (SOLID)	Existing made ground/infilled ground – ex surface/sub-soil.	Infilled ground in the local area.	Metals, PAHs, sulphates, asbestos.	Direct ingestion, aerial ingestion, dermal contact, drinking water.	Site construction operatives & future occupants. Site buildings.	Sampling of the upper soil across the Site has revealed no elevated level of potential contaminants of concern. With no source material, the risk is mitigated.	Moderate risk.	NO ACTION.
GROUND GAS RISK (VAPOURS)	Anthropogenic ground gas sources/existing made ground/infilled ground - surface/sub-soil.	Infilled ground in the local area.	CH ₄ , CO ₂ , other trace gases.	Diffusion through soil, substructures, aerial inhalation.	Future occupants. Explosion, suffocation.	No pollutant linkage. No made ground noted on Site.	Moderate to low risk.	NO ACTION.

3. PHASE 3 - REMEDIATION STATEMENT

3.1. Basic Site Details

Full details included in the Phase 1 & 2 Site Investigation Introduction & subsequent sections.

3.2. Site & Remedial Objectives

Site investigations undertaken as part of the Phase 2, comprised trial holes, & soil sampling methods.

Made ground was generally absent from the Site in test areas, with only minor made ground/minor inclusion of construction material (brick/clay pipe) noted in topsoil close to the house in suspected service trenches.

Remedial objectives were to ensure residential end users will be safe from potential sources of contamination and other environmental factors.

3.3. Conceptual Model (Final) & Relevant Pollution Linkages

All final pollutant linkages are considered to be mitigated with no further residual risk to the Site & receptors.

3.4. Recommended Remediation.

No remedial measures required.

3.5. Verification (Phase 4 requirements)

No verification required.

3.6. Additional Notes

Should any suspected potential contamination be noted within the groundworks or construction phases of development, the associated areas should be isolated and professional environmental advice sought from a suitably qualified environmental consultant.

Before any further work is undertaken, this report should be submitted to and agreed by the Local Planning Authority Contaminated Land Department/Building Control Department as necessary.

We trust that the above clear, but should you require further advice please contact the undersigned.

Signed.....



D.S. Slattery BSc (Hons).

T J Booth Associates.

Authorised...



T J Booth BSc (Hons), C. Eng. C. Env. MICE.

T J Booth Associates.

4. REFERENCES.

BS 8485:2015+A1:2019. Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings.

BS 10175:2011+A2:2017. Investigation of potentially contaminated sites. Code of practice.

BS5930:2015. Code of practice for site investigations.

CL:AIRE. 2012. Research Bulletin-RB17-A Pragmatic Approach to Ground Gas Risk Assessment.

CIRIA. Report C665.

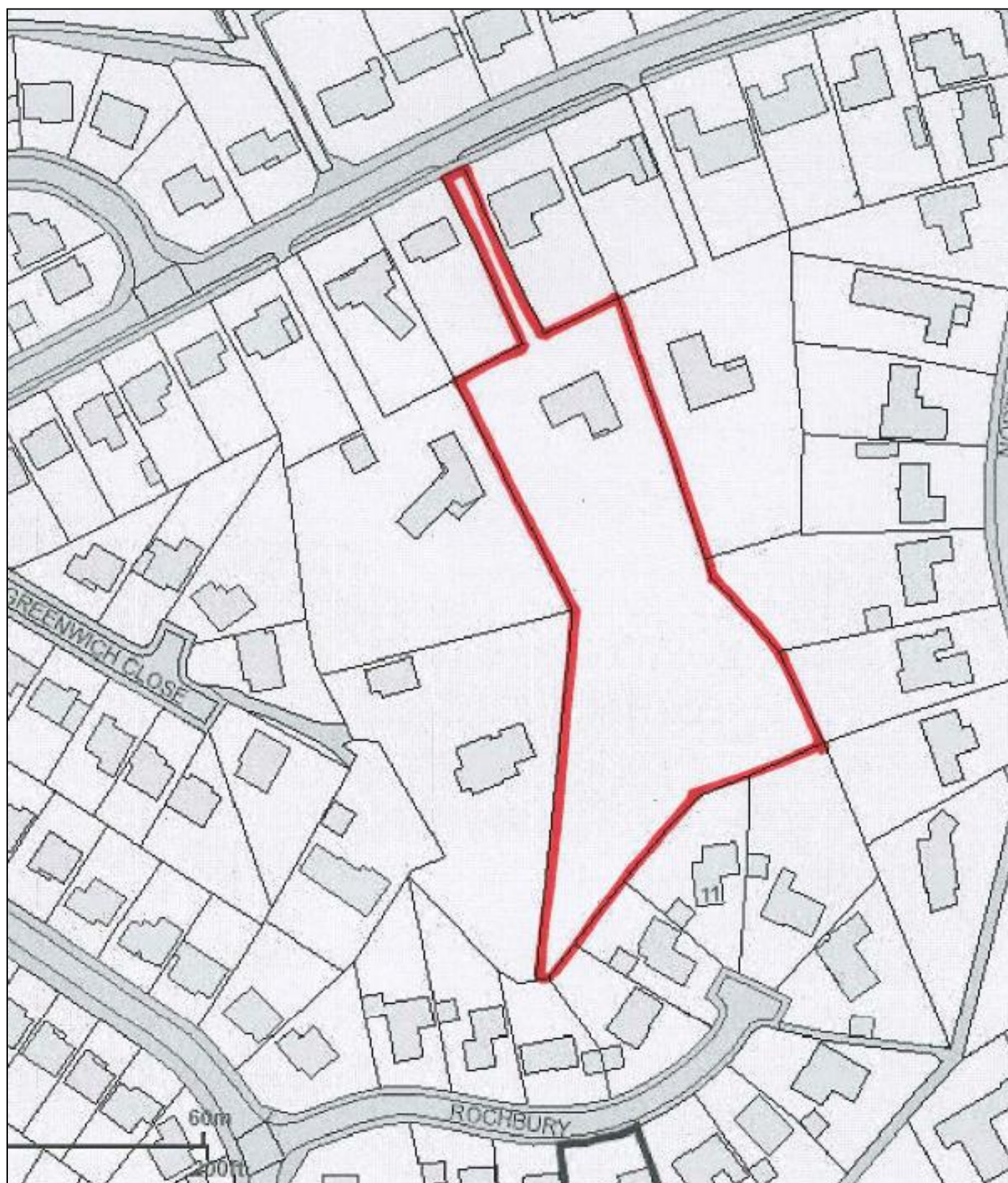
Environment Agency. 2005. Secondary Model Procedure for the Development of Appropriate Soil Sampling Strategies for Land Contamination. R&D Technical Report P5-066/TR.

ICE Manual of Geotechnical Engineering Volume I. 2012.

CIRIA. Report SP32.

5. APPENDIX A: PHOTOS & FIGURES.

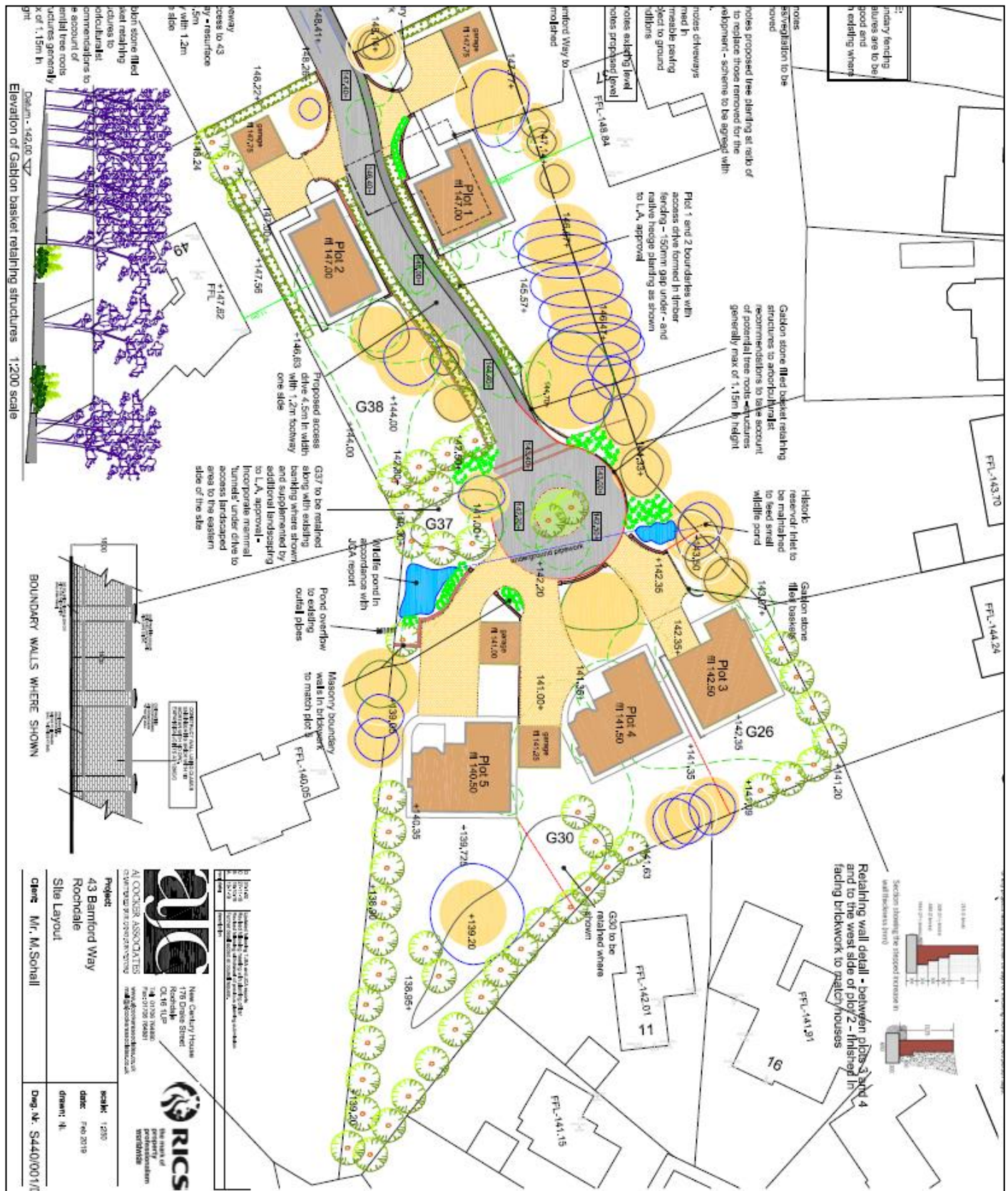
5.1. Location Plan.



5.2. Existing Site Plan.



5.3. Proposed Site Plan.



5.4. Site Investigation Plan.



5.5. Borehole Logs.

N/A – not required.

5.6. Trial pit and borehole logging (BS5930)

TRIAL PIT LOG

Trial pit reference TH1				Sheet 1 of 1
Water	Reduced Level (m)	Legend	Depth (m)	Description
	140.40			
	140.10	X X X X	(0.30) 0.30	Dark brown slightly gravelly silty TOPSOIL (S1)
	139.80	- : - : - : - : - :	(0.30) 0.60	Soft orange-brown/grey mottled slightly sandy CLAY with occasional cobbles/boulders
	139.20	- - - - - -	(0.60) 1.20	Firm to stiff orange-brown/grey mottled CLAY (S6 clay sample at 900)
	138.80	- - - - -	(0.40) 1.60	Stiff brown gravelly (shale) CLAY
	138.40	X o X o o X o X	(0.40) 2.00	Dark brown-grey gravelly WEATHER BEDROCK (shale)
				Trial pit ends
Not shown to scale				
Additional notes:				

TRIAL PIT LOG

Trial pit reference TH2				Sheet 1 of 1
Water	Reduced Level (m)	Legend	Depth (m)	Description
	139.10			
	138.95	X o X o	0.15	Dark brown slightly gravelly TOPSOIL (S2)
	138.10	- - - - - - - - -	(0.85) 1.00	Stiff orange-brown CLAY
	137.30	- - - - - - - -	(0.80) 1.80	Stiff brown gravelly (shale) CLAY
<u>v</u>	136.85 136.70	X X X X X X	(0.60) 2.40	Dark brown-grey gravelly WEATHERED BEDROCK (shale), slightly clayey to upper 300
				Trial pit ends
Not shown to scale				
Additional notes:				

TRIAL PIT LOG

Trial pit reference TH3				Sheet 1 of 1
Water	Reduced Level (m)	Legend	Depth (m)	Description
	138.85			
	138.70	X x X x	0.15	Dark brown silty TOPSOIL (S3)
		- - -	(1.00)	Firm orange-brown/grey mottled CLAY occasional sandstone cobbles & boulders
	137.70	- - -	1.15	
		- - -	(0.55)	Brown very gravelly (shale) CLAY
	137.15	- - -	1.70	
		X o X o	(0.70)	Brown-grey gravelly WEATHERED BEDROCK (shale), slightly wet but no standing groundwater encountered
	136.45	o X o X	2.40	
				Trial pit ends
Not shown to scale				
Additional notes:				

TRIAL PIT LOG

Trial pit reference TH4				Sheet 1 of 1
Water	Reduced Level (m)	Legend	Depth (m)	Description
	147.10			
		X x X x	(0.50)	Dark brown/brown silty TOPSOIL (S4)
	146.60	x X x X	0.50	
		X x X x		
		x x x	(0.80)	Firm light brown/orange slightly gravelly (shale) SILT
	145.80	x x	1.30	
		x x x		
		x x		
		X X	(0.50)	Very stiff to hard brown-grey WEATHERED BEDROCK (shale), friable on excavation
	145.30	X X	1.80	
		X X		
				Trial pit ends
Not shown to scale				
Additional notes:				

TRIAL PIT LOG

Trial pit reference TH5				Sheet 1 of 1
Water	Reduced Level (m)	Legend	Depth (m)	Description
	147.50			
	147.10	X X X X	(0.40) 0.40	Dark brown-brown TOPSOIL with occasional gravel sized brick & broken clay pipe, (S5)
	146.60	x x x x x x x x x	(0.50) 0.90	Firm light brown/orange slightly gravelly (shale) SILT
	145.70	- - - - - - - - - - - -	(0.90) 1.80	Very stiff orange-brown/grey mottled CLAY - friable (clay sample S7)
	145.40	X X X X	(0.30) 2.10	Very stiff to hard brown-grey WEATHERED BEDROCK (shale), friable on excavation
				Trial pit ends
Not shown to scale				
Additional notes:				

5.7. Soil Sampling Analysis.

Client / Site:		Sohail - 43 Bamford Way, Rochdale					
Sample Type:		Soil Samples					
Sampling Date:		15.12.2022					
Contaminant		No	Max	Mean	t 95	RESIDENTIAL (with or without plant uptake)	
						Pass/Fail	Comment
METALS	Arsenic as As, dry weight	5	26	16.68	24.8	37	PASS
	Boron as B, hot water sol dw	5	5.7	2.04	4.82	290	PASS
	Cadmium as Cd, dry weight	5	0.49	0.3	0.478	22	PASS
	chromium as Cr(III) dry weight	5	26	21.40	25.60	910	PASS
	Chromium as Cr(VI), dry weight	5	0.5	0.5	0.5	21	PASS
	Copper, as Dry Weight	5	74	48.8	70.6	2400	PASS
	Lead, as Dry Weight	5	130	85.2	128	200	PASS
	Mercury as Hg, dry weight	4	0.33	0.2175	0.312	1.2	PASS
	Nickel as Ni, dry weight	5	28	21.2	27	130	PASS
	Selenium as Se, dry weight	5	1.5	1.222	1.5	250	PASS
	Zinc as Zn, dry weight	5	160	88.2	147	3700	PASS
INORGANIC	Cyanide (Total)	5	12	2.86	9.76	2.5	comment
	Sulphate (Total) as SO ₄	5	0.089	0.0528	0.085	0.24	PASS
	Sulphide	5	1.1	0.926	1.074	250	PASS
	pH	5	5.8	5.6	5.76	6 to 8	ACIDIC
	Sulphur (Elemental)	5	39	15.96	37.2	100	PASS
	Asbestos Identification	5	0	0	0	0	PASS
ORGANIC	SOM	5	6	5	6		
	PAH acenaphthene	5	0.1	0.1	0.1	1100	PASS
	PAH acenaphthylene	5	0.1	0.1	0.1	920	PASS
	PAH anthracene	5	0.1	0.1	0.1	11000	PASS
	PAH benzo[a]anthracene	5	1.2	0.432	1.092	13	PASS
	PAH benzo[a]pyrene	5	0.1	0.1	0.1	5	PASS
	PAH benzo[b]fluoranthene	5	0.1	0.1	0.1	3.7	PASS
	PAH benzo[g,h,i]perylene	5	0.1	0.1	0.1	350	PASS
	PAH benzo[k]fluoranthene	5	0.1	0.1	0.1	100	PASS
	PAH chrysene	5	3.5	1.28	3.32	27	PASS
	PAH dibenz[ah]anthracene	5	0.1	0.1	0.1	0.3	PASS
	PAH fluoranthene	5	2.5	1.152	2.22	890	PASS
	PAH fluorene	5	0.1	0.1	0.1	860	PASS
	PAH indeno[123-cd]pyrene	5	0.1	0.1	0.1	41	PASS
	PAH naphthalene	5	0.1	0.1	0.1	13	PASS
	PAH phenanthrene	5	0.1	0.1	0.1	440	PASS
	PAH pyrene	5	2.6	1.28	2.34	2000	PASS
	PAH PAH (Total - SUM EPA16)	5	9.8	4.36	8.96	1	comment
SVOC	phenol	5	0.1	0.1	0.1	380	PASS

5.8. Eurofins Chemtest – Soil Testing Certificates.



eurofins | **Chemtest**
Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	22-48420-1		
Initial Date of Issue:	09-Jan-2023		
Client	TJ Booth Associates		
Client Address:	20a Eastgate Street Rochdale Lancs OL16 1DH		
Contact(s):	Daniel Slattery		
Project	Sohail - 43 Bamford Way, Rochdale OL16 1DH		
Quotation No.:	Q22-27132	Date Received:	19-Dec-2022
Order No.:		Date Instructed:	19-Dec-2022
No. of Samples:	7		
Turnaround (Wkdays):	10	Results Due:	06-Jan-2023
Date Approved:	09-Jan-2023	Subcon Results Due:	16-Jan-2023
Approved By:			
Details:	Stuart Henderson, Technical Manager		

Results - Soil

Project: Sohail - 43 Bamford Way, Rochdale OL16 1DH

Client: TJ Booth Associates		Chemtest Job No.:		22-48420	22-48420	22-48420	22-48420	22-48420	22-48420	22-48420	22-48420	22-48420
Quotation No.: Q22-27132		Chemtest Sample ID.:		1566374	1566375	1566376	1566377	1566378	1566379	1566380		
		Client Sample ID.:		S1	S6	S2	S3	S4	S5	S7		
		Sample Location:		TH1	TH1	TH2	TH3	TH4	TH5	TH5		
		Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL		
		Top Depth (m):		0.00	0.00	0.00	0.00	0.00	0.00	0.00		
		Bottom Depth (m):		0.30	0.90	0.15	0.15	0.50	0.40	1.10		
		Date Sampled:		15-Dec-2022	15-Dec-2022	15-Dec-2022	15-Dec-2022	15-Dec-2022	15-Dec-2022	15-Dec-2022		
		Asbestos Lab:		NEW-ASB		NEW-ASB	NEW-ASB	NEW-ASB	NEW-ASB			
Determinand	Accred.	SOP	Units	LOD								
ACM Type	U	2192		N/A								
Asbestos Identification	U	2192		N/A	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected		
Moisture	N	2030	%	0.020	20	32	22	22	17	See attached		
Plasticity Index (Subcon)	S			N/A								
pH	U	2010		4.0	5.6	5.5	5.8	5.6	5.5			
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40	1.3	5.7	1.3	1.0	0.90			
Sulphur (Elemental)	U	2180	mg/kg	1.0	39	30	2.7	5.0	3.1			
Cyanide (Total)	U	2300	mg/kg	0.50	< 0.50	12	0.80	< 0.50	< 0.50			
Thiocyanate	U	2300	mg/kg	5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50	0.84	0.88	0.97	1.1	0.84			
Sulphate (Total)	U	2430	mg/kg	100	890	680	570	400	100			
Arsenic	U	2455	mg/kg	0.5	18	16	26	20	3.4			
Cadmium	U	2455	mg/kg	0.10	0.20	0.49	0.43	0.27	0.11			
Chromium	U	2455	mg/kg	0.5	18	24	26	20	19			
Copper	U	2455	mg/kg	0.50	40	57	51	74	22			
Mercury	U	2455	mg/kg	0.05	0.21	0.33	0.17	0.16	< 0.05			
Nickel	U	2455	mg/kg	0.50	21	28	23	20	14			
Lead	U	2455	mg/kg	0.50	74	130	120	85	17			
Selenium	U	2455	mg/kg	0.25	0.99	1.5	1.5	1.2	0.92			
Zinc	U	2455	mg/kg	0.50	74	160	95	76	36			
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50			
Organic Matter	U	2625	%	0.40	9.2	9.9	4.6	5.3	1.4			
Naphthalene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10			
Acenaphthylene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10			
Acenaphthene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10			
Fluorene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10			
Phenanthrene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10			
Anthracene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10			
Fluoranthene	U	2700	mg/kg	0.10	0.96	2.5	1.1	1.1	< 0.10			
Pyrene	U	2700	mg/kg	0.10	1.2	2.6	1.2	1.3	< 0.10			
Benzo[a]anthracene	U	2700	mg/kg	0.10	< 0.10	1.2	< 0.10	0.66	< 0.10			
Chrysene	U	2700	mg/kg	0.10	< 0.10	3.5	< 0.10	2.6	< 0.10			
Benzo[b]fluoranthene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10			
Benzo[k]fluoranthene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10			
Benzo[a]pyrene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10			

Results - Soil

Project: Sohail - 43 Bamford Way, Rochdale OL16 1DH

Client: TJ Booth Associates		Chemtest Job No.:		22-48420	22-48420	22-48420	22-48420	22-48420	22-48420	22-48420	22-48420	22-48420
Quotation No.: Q22-27132		Chemtest Sample ID.:		1566374	1566375	1566376	1566377	1566378	1566379	1566380		
		Client Sample ID.:		S1	S6	S2	S3	S4	S5	S7		
		Sample Location:		TH1	TH1	TH2	TH3	TH4	TH5	TH5		
		Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL		
		Top Depth (m):		0.00	0.00	0.00	0.00	0.00	0.00	0.00		
		Bottom Depth (m):		0.30	0.90	0.15	0.15	0.50	0.40	1.10		
		Date Sampled:		15-Dec-2022	15-Dec-2022	15-Dec-2022	15-Dec-2022	15-Dec-2022	15-Dec-2022	15-Dec-2022		
		Asbestos Lab:		NEW-ASB		NEW-ASB	NEW-ASB	NEW-ASB	NEW-ASB	NEW-ASB		
		Determindand		Accred.	SOP	Units	LOD					
		Indeno(1,2,3-c,d)Pyrene		U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	
		Dibenz(a,h)Anthracene		U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	
		Benzo[g,h,i]perylene		U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	
		Total Of 16 PAH's		U	2700	mg/kg	2.0	2.1	9.8	2.3	5.6	< 2.0
		Total Phenols		U	2920	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	



TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 09/01/2023



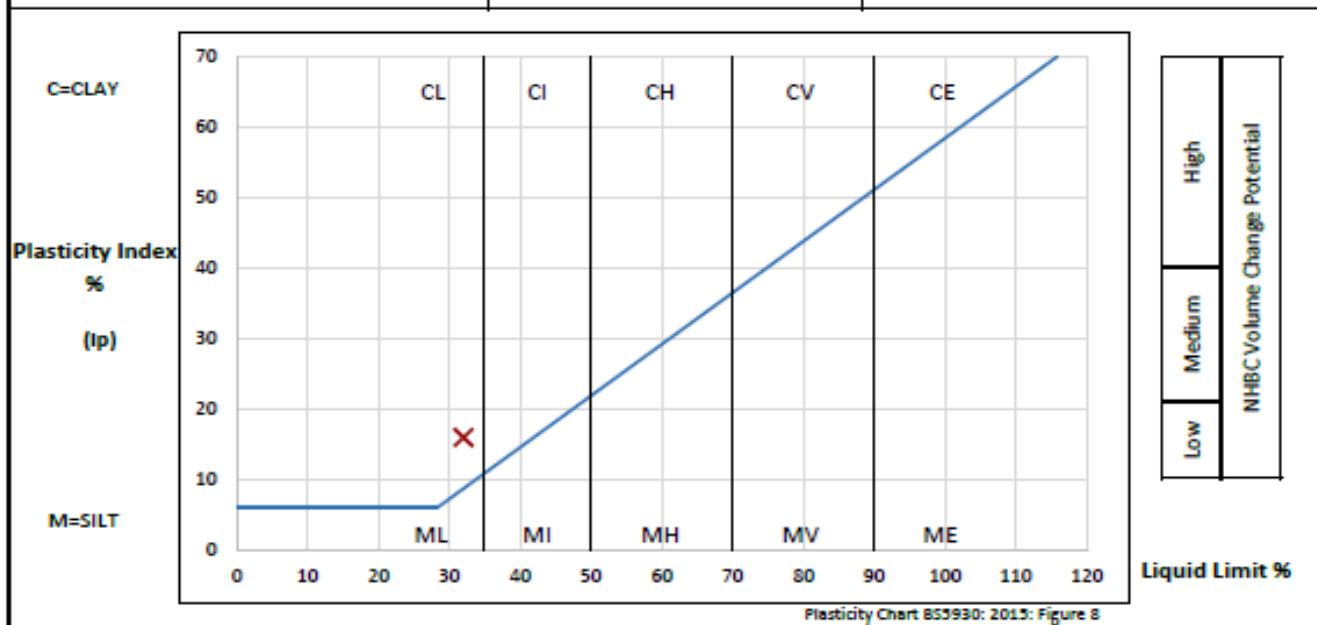
0998

Contract	22-48420
Serial No.	41932_1

**DETERMINATION OF WATER CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND
DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX**

Borehole / Pit No.	Depth m	Sample Type	Sample Reference	Water Content (W) %	Description	Remarks
TH5		D	1566380	16.2	Stiff friable mottled orangish brown and brown slightly gravelly slightly sandy/silty CLAY. Gravel is fine and medium	

PREPARATION				Liquid Limit	32 %
Method of preparation				From natural/gravel picked out by hand	Plastic Limit 16 %
Sample retained 0.425mm sieve (Approximate)				3 %	Plasticity Index 16 %
Corrected water content for material passing 0.425mm					Liquidity Index 0.01
Sample retained 2mm sieve (Approximate)				3 %	NHBC Modified (I _p) n/a
Curing time		24 hrs		Clay Content	Not analysed
				Derived Activity	Not analysed



Method of Preparation: BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 4.2
 Method of Test: BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 3.2, 4.4, 5.3, 5.4
 Type of Sample Key: U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
 Comments:

6. APPENDIX B: PHOTOS.



Figure 1 – TH1.



Figure 2 – TH2.



Figure 3 – TH3.



Figure 4 – TH4.



Figure 5 – TH5.

7. APPENDIX C: ENVIROCHECK.