



e3p

Phase II Geoenvironmental Site Assessment

George Street, Heywood

Reference: 13-224-R2-1
Date: February 2022



PHASE II GEOENVIRONMENTAL SITE ASSESSMENT

Land off George St
Heywood
OL10 4PW

Prepared for:
Fleet Grace

Report Ref: 13-224-R2-1
Date Issued: February 2022

George Street, Heywood

Phase II Geoenvironmental Site Assessment
February 2022

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EXECUTIVE SUMMARY

Site Address	George Street, Heywood, OL10 4PW	
Grid Reference	E 384965, N 410900	
Site Area	0.85 Ha.	
Proposed Development	It is understood that Fleet Grace Ltd has agreed to purchase the subject site for future regeneration as a motor vehicle sales showroom with ancillary external hardstanding and infrastructure.	
Current Site Use	The site is an irregular shaped parcel of land located to the west of George Street, Heywood. The site currently comprises predominantly rough scrubland with self-seeded vegetation and overgrown grass. An area of kept grass is present in the west of the site while the south of the site comprises semi-mature and mature trees.	
Site History	A review of the pertinent ordnance survey mapping indicates that the site was developed in the 1800s and comprised of two cotton mills (Wrigley Brook Mill in the south and Mossfield Mill in the northeast) with associated tanks, reservoirs and chimneys. Residential terraced housing was recorded in the southeast and the northwest of the site in the late 1800s until the early 1900s when Wrigley Brook Mill was demolished along with the associated housing and reservoir in the southwest of the site. The southwest of the site is recorded as allotment gardens between circa 1950 and is then redeveloped with several buildings recorded likely to be garages in circa 1970. Wrigley Brook was recorded on-site from the earliest available mapping along the western site boundary flowing in a south to north direction. In the 1970s, Wrigley Brook is no longer recorded on site therefore it is assumed that the brook has been culverted beneath the site. The northwest of the site is recorded as a scrap yard from circa 1980 until the early 2000s. Mossfield mill in the northeast of the site was demolished in the early 2000s, during this time, the scrap yard is also removed, and the site is partially landscaped. Rough scrub vegetation is now present across the majority of the site with no buildings recorded.	
Environmental Setting	Drift Geology	Till, Devensian - Diamicton
	Bedrock Geology	Pennine Lower Coal Measure Formation
	Faults	67 m west, normal fault, trending north to south, dipping to the east.
	Hydrogeology	A secondary undifferentiated aquifer is located within the Devensian Till. A Secondary A aquifer is located within the Pennine Lower Coal Measures Formation.
	Hydrology	No surface water features within 25 m of the site. However, historical mapping indicates that a brook (Wrigley Brook) was present in the west of the site which may now be culverted beneath the site.
	Flood Risk	The site is located within Flood Risk Zone 1.
Utility Locations	No formal survey has been completed however a review of the statutory utility plans indicates the presence of an electricity substation on the north eastern boundary and overhead power lines across the site. Low to medium pressure gas mains are also present along George Street to the east of the site.	



Landfill Sites and Ground Gases	A former scrapyard was located in the northeast of the site from 1989, the license was surrendered in March 2019. Previous site investigation works have indicated that scrap yard materials have been deposited at the site. Any Made Ground derived from the former scrap yard may produce carbon dioxide and methane. Glacial Till will likely restrict migration of any ground gas.
Radon	Less than 1% of houses are above the 'Action Level' – no special precautions required.
Coal Mining/Land Stability	The site is within a Coal Authority Coal Reporting Area, however, it is not within a high-risk development zone, so no further assessment is required.
Hazardous Installations	No hazardous installations that could potentially prejudice the proposed construction of highly sensitive residential dwellings have been identified within influencing distance of the subject site.
Initial Conceptual Site Model	Contaminant Sources ✿ Infilled Reservoir and Cutting – Made Ground – PAH, TPH, heavy metals and asbestos. ✿ Former buildings – Asbestos containing material. ✿ Former allotments – inorganic and organic compounds. ✿ Former cotton mills – metals, inorganic and organic compounds, soaps and detergents. ✿ Scrapyard – heavy machinery, oil, hydrocarbons, metals, inorganic compounds. ✿ Other Industrial Work Mills – metals, inorganic and organic compounds. Pathways ✿ Dermal contact and inhalation. ✿ Vapour inhalation. ✿ Dust inhalation. ✿ Vertical migration. Receptors ✿ Future site users (commercial end-user and construction workers). ✿ Underlying aquifer - secondary A in bedrock. ✿ Onsite culvert (if present).

GROUND INVESTIGATION

Ground Investigation Works	E3P has completed an intrusive ground investigation comprising; ✿ 14 window sample boreholes; ✿ Construction of environmental monitoring installations to allow for ground gas and groundwater monitoring and sampling; and ✿ Chemical and geotechnical sampling.
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Ground Conditions	Made Ground – 0.00 m bgl to 4.40 m bgl Made Ground deposits were encountered within all exploratory hole locations from ground level to a maximum proven depth of 4.40 m bgl within WS113B. Reworked topsoil of either dark brown slightly clayey gravelly fine to medium sand with rootlets with gravel generally of glass, mudstone, sandstone and brick or a brown sandy gravelly clay with frequent rootlets, was encountered in all locations to depths of between 0.10 m and 0.30 m bgl. Previous trial pits in the area of WS113B indicate this to be an area where waste materials have been deposited. These materials included car batteries, rubber door seals, car wheel trims, plastic from domestic appliances, lightbulbs parts, rubber hoses, vehicle indicator glass, various metal fixtures and large fragments of Asbestos Insulation Board. Shallow refusals were encountered in the majority of locations across the central area of the site on concrete slab/cobbles between 0.40m and 0.90m bgl. In the remaining locations, Made Ground deposits typically comprise brown clayey gravelly fine to medium sand with gravel of brick, plastic, ceramic, glass, mudstone and sandstone. In WS107A, WS107B and WS107C, a reddish-brown sandy gravel with concrete cobble fragments, and a similar gravel content as above was encountered. DRIFT – 1.10 m bgl to 5.45 m bgl Drift deposits were encountered within seven exploratory locations to depths of between 1.10 m to a maximum proven depth of 5.45m bgl. Drift deposits were not encountered where the full depth of Made Ground could not be proven due to underground obstructions. Where encountered, drift deposits generally comprise a firm to stiff, medium to high strength, greyish brown CLAY with gravel of sandstone, mudstone and quartz. The clay is typically interbedded and underlain by gravelly fine to coarse SAND with gravel of sandstone and mudstone. SOLID – The solid bedrock geology was not encountered during the site investigation. BGS boreholes records within proximity to the site indicate the presence of shale bedrock at circa 7.10 m bgl. GROUNDWATER – Groundwater was encountered between 1.00 m bgl and 4.00 m bgl during the investigation and subsequent groundwater monitoring identified groundwater levels between 1.00 m bgl and 4.10 m bgl.
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CONTAMINATED LAND ASSESSMENT

Human Health	The results of the tier 1 comparison indicate that there are no exceedances when compared with the screening criteria for a commercial end-use. Previous site investigations (both the LK Consult and E3P investigations) encountered soils with between <0.001% to 0.097% asbestos and have also noted localised areas of ACM within the Made Ground in the western, former scrap yard area. Asbestos impacted soils should be managed according to the asbestos risk mitigation conceptual site model and following JIWG guidance.
Controlled Waters	The results of the data review and Tier 1 qualitative risk assessment has allowed E3P to draw the following conclusions in respect to the risk to controlled waters:



	- There have been multiple phases of ground investigation, this has enabled reasonable characterisation of the pollution risk and potential to impact the critical receptors. - The primary receptors are identified as the culverted brook (Wrigley Brook) in the west of the site and the underlying secondary A aquifer. - The presence and nature of the onsite culvert is currently unknown therefore further investigation is likely required. - As part of the anticipated programme of remediation and enabling works, large volumes of Made Ground soils are to be removed and/or treated to remove frag wastes and other unsuitable materials and in doing so, this will likely remove potential source of the metalloid and PAH impact on site. - The site is a public open space consisting of soft standing surface cover which allows for extensive infiltration of rainfall into underlying Made Ground soils. - The proposed development will comprise predominantly hardstanding which will significantly reduce the infiltration to the underlying Made Ground and therefore reducing the leachability of the contaminants.
Ground Gas	Previous ground gas monitoring undertaken by LK Consult indicates that the site can be classified as CS1 based on the low sensitivity commercial development and therefore no ground gas protection measures will be required. This will need to be approved prior by the LABC prior to the construction of the proposed commercial development.
Potable Water Infrastructure	This will need to be confirmed following the completion of a UKWIR risk assessment. Post-remediation and enabling works ground conditions may be different from those identified during this site investigation. Based on existing chemical sampling, it is likely that barrier pipe will be required at the proposed development.

GEOTECHNICAL ASSESSMENT

Underground Obstructions	Significant concrete and brick obstructions have been encountered within the Made Ground, indicative of relict foundations from the former developments and infilled ground across the central area of the site. During a phase of cut-and-fill enabling works to create a developable platform, all below-ground obstructions will require grubbing out to the base of the Made Ground to enable the construction of proposed the proposed sales office. Obstructions removed from the eastern site area can be crushed on-site and re-used as a recycled aggregate.
Allowable Bearing Pressure	Based on the assessment of the relative undrained shear strength and corresponding safe net allowable bearing pressure, the suitable target founding stratum has been identified as the underlying stiff to very stiff CLAY, which in the area of the proposed showroom is at ca. 1.5 m to 1.8 m bgl, although it should also be noted that some locations did not penetrate the Made Ground due to obstructions. Where the natural strata were recorded, exploration locations within the vicinity of the showroom indicate ABPs range from 131 kN/m² at ca. 1.5 m bgl to 227 kN/m² at 4.0 m.



Foundations	Based on the assessment of the relative undrained shear strength and corresponding safe net allowable bearing pressure, the suitable target founding stratum has been identified as the underlying stiff to very stiff CLAY, which in the area of the proposed showroom is at ca. 1.5 m to 1.8 m bgl, although it should also be noted that some locations did not penetrate the Made Ground due to obstructions. Where the natural strata were recorded, exploration locations within the vicinity of the showroom indicate ABPs range from 131 kN/m² at ca. 1.5 m bgl to 227 kN/m² at 4.0 m. However, prior to the detailed design of suitable foundations solution, a programme of remediation and enabling works will be required to remove buried obstructions and cut/fill the site to provide suitable development platform levels. Depending on the precise depth of Made Ground encountered beneath the proposed units, it may be possible to utilise shallow pad foundations to support the portal frame of the proposed commercial/industrial building. If below ground obstructions mean that a greater depth of Made Ground is present, then upon completion of these enabling works, then most cost-effective option for the majority of the site would be to re-engineer the Made Ground using vibro-stone columns (VSCs) to support pad foundation.
External Hardstanding	A programme of remediation and enabling works will be required to remediate the proposed road subgrade in accordance with the requirements of the Manual of Contract Documents for Highway Works Volume 1 Specification For Highway Works (Series 600-Earthworks) for a method compaction. As there will be a requirement to upfill the site to achieve site levels, it is considered likely that this will be achieved using site won granular fill or imported recycled aggregates. It is considered that the material can be re-engineered using method compaction to achieve a CBR in excess of 5% if works are completed in favourable climatic conditions.
Soakaway Drainage	The Made Ground and underlying granular soils are cohesive in nature, with localised areas impacted by low-level inorganic and hydrocarbon compounds. A full BRE365 soakaway assessment will be required to determine the soakage potential of the underlying ground conditions.
Sulphate Assessment	Concrete classification will be DS2 AC1s.
Waste Characterisation	Any material that is to be disposed off-site should undergo assessment using Technical Guidance WM3: <i>Waste Classification – Guidance on the classification and assessment of waste</i>. Arising from the former scrap yard are likely to be classified as Hazardous Waste.

RECOMMENDATIONS

Based on the findings of the geoenvironmental site assessment, the following additional works are recommended to be completed in due course:

-  Investigation and sampling of the potentially culverted brook on-site.
-  Remediation and enabling works strategy.
-  Construction phase Surface Water Management Plan.



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DRAWING LIST

13-224-001 – Site Location Plan
13-224-002 – Proposed Development Plan
13-224-003 – Historical Features Plan
13-224-004 – Site Features Plan
13-224-005 – Exploratory Hole Location Plan
13-224-006 – Depth of Made Ground Plan
13-224-010 – Conceptual Site Model
13-224-015 – Development Constraints Plan
13-224-018 – Controlled Waters Contamination Exceedance Plan



1. INTRODUCTION

1.1. BACKGROUND

E3P has been commissioned by Fleet Grace Ltd to undertake a detailed Phase II Geoenvironmental Site Assessment on a parcel of land to the west of George Street, Heywood, OL10 4PW.

This report is required to determine potential contaminated land liabilities and remediation requirements that will be required as part of the proposed development for a commercial development including motorhome sales building and areas of external hardstanding.

1.2. PROPOSED DEVELOPMENT

It is understood that Fleet Grace Ltd. has agreed to purchase the subject site for future regeneration as a motor vehicle sales showroom with ancillary external hardstanding and infrastructure. The main facility is subject to planning approval reference 18/00971/FUL.

A snapshot of the proposed development layout is indicated in Figure 1.1.

FIGURE 1.1 SNAPSHOT OF PROPOSED DEVELOPMENT



1.3. OBJECTIVES

The objectives of the geoenvironmental assessment are as follows:



- ✦ Review historical plans, geology, hydrogeology, site sensitivity, floodplain issues, mining records and any local authority information available in order to complete a desk study in line with Environment Agency (EA) document *Land Contamination: Risk Management (LCRM) (2019)*.
- ✦ Undertake a supplementary stage of sampling and analysis to provide an overview of environmental issues identified.
- ✦ Assess the implications of any potential environmental risks, liabilities and development constraints associated with the site in relation to the future use of the site and in relation to off-site receptors.
- ✦ Provide recommendations regarding future works required.

1.4. SCOPE OF WORKS

The scope of work includes the following elements:

- ✦ Design of suitable intrusive ground investigation.
- ✦ Window sample probeholes with, and construction of, environmental monitoring installations.
- ✦ In-situ geotechnical testing.
- ✦ Chemical analysis.
- ✦ Groundwater monitoring and sampling.
- ✦ Contamination risk assessment and conceptual site model.
- ✦ Factual and interpretive reporting.

1.5. LIMITATIONS

The limitations of this report are presented in Appendix I.

1.6. CONFIDENTIALITY

E3P has prepared this report solely for the use of the client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from E3P; a charge may be levied against such approval.



1.7. PREVIOUS REPORTS

In addition to the data obtained during the works described within this report, E3P has also utilised the following reports:

- ✳ LK Consult Preliminary Risk Assessment Britannia Metals, Heywood. Ref: CL-602-LKC 18 1262-01; September 2018. Prepared for Rochdale Borough Council.
- ✳ LK Consult Final Phase 2 Geo-Environmental Investigation, Risk Assessment and Remediation Strategy. Ref: CL-602-LKC 18 1262-01; November 2018. Prepared for Rochdale Borough Council.
- ✳ E3P Land Remediation, Enabling & Abnormal Foundation Cost Assessment Land at George Street, Heywood. 13-224-L1 dated 22 March 2019.
- ✳ E3P Land Remediation Works, Land at George Street, Heywood. 13-224-L3 dated 1 June 2021.
- ✳ The LK Phase 2 report did not identify any significant risks to human health or controlled waters, concluding:
 - Moderate risk associated ACMs in shallow soils and localised heavy end hydrocarbons and lead in areas of landscaping
 - Moderate risk associated with elevated sulphate meaning a requirement for Class DS2 concrete.
 - Moderate risk to water supply pipe due to elevated organics in the Made Ground. A UKWIR risk assessment was recommended.

1.8. REGULATORY CORRESPONDENCE

As part of the acquisition of the site, E3P has undertaken consultation with the Environment Agency in respect of the LK reports, site waste management licence surrender and subsequent identification of scrap yard waste material in the northwest of the site. Copies of this correspondence are included in Appendix VII.

Specifically, the EA has indicated that the identified fragmentiser waste associated with former scrap yard would need to be removed from site as there was no option to process the waste and leave it on site without the requirement for a landfill permit. Such a permit was stated by the EA as unlikely to be approved.



2. GROUND INVESTIGATION

2.1. GENERAL OVERVIEW

A ground investigation has been designed based on the findings of the desk study, with exploratory holes advanced to target specific potential contaminant sources identified in the previous site investigations. The investigation has also been used to collect groundwater samples in order to assess and understand the risk associated with the existing ground conditions in relation to controlled waters.

E3P has completed two phases of ground investigation with trial pits completed in the eastern and north-western sector in 2019; the results of which are summarised in the letter report referenced 13-224-L1 and included in this report for reference.

The more recent Exploratory fieldwork was completed on Thursday 9th December 2021. The works are summarised in Table 2.1.

2.2. LIMITATIONS OF THE INVESTIGATION

The site is currently overgrown shrubs with localised areas of semi-mature trees. Where the trees were densely populated, access was restricted.

During the investigation, underground obstructions were encountered within several of the exploratory hole locations which meant the final depths in these locations was limited.



2.3. SCOPE OF INVESTIGATION

TABLE 1.1 SUMMARY OF FIELDWORK

POTENTIAL SOURCE/RATIONALE	LOCATION HOLE	TYPE	MAXIMUM DEPTH (m bgl)	MONITORING WELLS RESPONSE ZONE (m bgl)
General Ground Conditions and Investigation within the area of the Former Cotton Mill	TP101-TP108	Trial Pit	2.8	N/A
	WS104A		0.30	N/A
	WS104B		0.30	N/A
	WS104C		0.30	N/A
General Ground Conditions and Investigation within the area of the Former Reservoir (Smethurst Street)	WS105		5.30	2.85–4.85
	WS106		5.25	4.00–5.00
General Ground Conditions and Investigation within the area of the Former Mill	WS107A	Window Sample Probehole	0.90	N/A
	WS107B		0.90	N/A
	WS107C		0.40	N/A
	WS109		3.40	0.50–3.00
	WS110		0.90	N/A
	WS111A		0.40	N/A
	WS111B		0.40	N/A
	WS108		4.80	1.50–4.50
General Ground Conditions and Investigation within the area of the Former Reservoirs and Scrap Yard	TPA-TPE	Trial Pit	4.00	N/A
	WS101A	Window Sample Probehole	0.50	N/A
	WS101B		0.50	N/A
	WS101C		0.50	N/A
	WS102		5.45	2.70–3.20
	WS103A		0.20	N/A
	WS103B		0.20	N/A
	WS103C		0.25	N/A
	WS112		2.40	1.00–2.00
	WS114		5.45	3.50–5.00
	WS113A		0.40	N/A
	WS113B		5.45	1.00–5.00

Window sample probeholes were advanced to undertake in-situ detailed geotechnical testing, obtain environmental samples and install groundwater and ground gas monitoring wells.

The sampling locations are illustrated in Drawing 13-224-005 (Appendix III). The ground conditions encountered are indicated on the logs, which are provided in Appendix IV.



Return visits were made to monitor installations for groundwater level. In addition, selected wells were purged and samples of groundwater were recovered for chemical analysis.

2.4. IN-SITU STANDARD PENETRATION TESTING (SPT)

In-situ geotechnical testing was conducted using the standard penetration test (SPT) and, where the ground is granular, a 60° cone (SPT(C)) was used instead of the sampling tube. The results are shown in the probehole logs in Appendix IV and presented in Table 3.6 and discussed in Section 6.

2.5. LABORATORY ANALYSIS

Selected soil samples were submitted for a range of chemical analysis comprising:

- ✳ Metals.
- ✳ pH, total sulphate, water-soluble sulphate (2:1 extract).
- ✳ Sulphide.
- ✳ Cyanide.
- ✳ Phenols.
- ✳ Total and speciated polycyclic aromatic hydrocarbons (PAHs).
- ✳ Asbestos identification and quantification.
- ✳ Speciated and banded total petroleum hydrocarbon (TPH).

Selected water samples were submitted for a range of chemical analysis comprising:

- ✳ Metals.
- ✳ pH.
- ✳ Cyanide.
- ✳ Dissolved Organic Carbon.
- ✳ Monoaromatics & Oxygenates.
- ✳ Petroleum Hydrocarbons.
- ✳ Volatile Organic Compounds (VOCs)
- ✳ Semi-volatile Organic Compounds (SVOCs).

I2 Analytical undertook the analytical work and the testing results are included in Appendix V and discussed in Section 4.



3. GROUND AND GROUNDWATER CONDITIONS

3.1. SUMMARY OF GROUND CONDITIONS

The ground investigation generally confirms the published geology and identifies the strata set out in Table 3.1.

TABLE 3.1 SUMMARY OF STRATA

HOLE	DEPTH TO STRATUM (m bgl)			
	MADE GROUND (TOPSOIL)	MADE GROUND	CLAY	SAND
TP101	0.00-0.10	0.10-1.70	1.70-2.80	-
TP102	0.00-0.10	0.10-0.70	0.70-2.40	-
TP103	0.00-0.12	0.12-1.80	1.80-2.50	-
TP104	0.00-0.10	0.10-1.50	1.50-2.90	-
TP105	0.00-0.10	0.10-1.80	1.80-2.70	-
TP106	0.00-0.10	0.10-0.80	0.80-2.00	-
TP107	0.00-0.10	0.10-1.20	1.20-2.20	-
TP108	0.00-0.20	0.20-0.60	0.60-2.30	-
WS101A	0.00-0.15	0.15 - 0.50	-	-
WS101B	0.00-0.15	0.15 - 0.50	-	-
WS101C	0.00-0.15	0.15 - 0.50	-	-
WS102	0.00-0.15	0.15 - 1.90	1.90 - 3.00	3.00 - 5.45
WS103A	0.00-0.10	0.10 - 0.20	-	-
WS103B	0.00-0.10	0.10 - 0.20	-	-
WS103C	0.00-0.10	0.10 - 0.20	-	-
WS104A	0.00-0.10	0.10 - 0.30	-	-
WS104B	0.00-0.10	0.10 - 0.30	-	-
WS104C	0.00-0.10	0.10 - 0.30	-	-
WS105	0.00-0.10	0.10 - 2.60	2.60 - 4.00 4.00- 5.30	-
WS106	0.00-0.30	0.30 - 4.00	4.00 - 4.50	4.50 - 5.25
WS107A	0.00-0.20	0.00 - 0.20	-	-
WS107B	0.00-0.20	0.20 - 0.90		
WS107C	0.00-0.20	0.20 - 0.40	-	-
WS108	0.00-0.20	0.20 - 1.10	1.10 - 4.00	4.00 - 4.80
WS109	0.00-0.20	0.25 - 2.70	2.70 - 3.40	-
WS110	0.00-0.30	0.30 - 0.90	-	-
WS111A	0.00 - 0.30	0.30 - 0.40	-	-



HOLE	DEPTH TO STRATUM (m bgl)			
	MADE GROUND (TOPSOIL)	MADE GROUND	CLAY	SAND
WS111B	0.00 – 0.30	0.30 – 0.40	–	–
WS112	0.00 – 0.15	0.15 – 2.40	–	–
WS113A	0.00 – 0.30	0.30 – 0.40	–	–
WS113B	0.00 – 0.20	0.20 – 4.40	4.40 – 5.45	–
WS114	0.00 – 0.10	0.10 – 3.40	3.40 – 4.30 4.70 – 5.45	4.30 – 4.70

3.2. MADE GROUND

Made Ground deposits were encountered within all exploratory hole locations from ground level to a maximum proven depth of 4.40 m bgl within WS113B. Previous trial pits in the area of WS113B indicate this to be an area where waste materials have been deposited. These materials included car batteries, rubber door seals, car wheel trims, plastic from domestic appliances, lightbulbs parts, rubber hoses, vehicle indicator glass, various metal fixtures and fragments of Asbestos Insulation Board (AIB).

Reworked topsoil of either dark brown slightly clayey gravelly fine to medium sand with rootlets with gravel generally of glass, mudstone, sandstone and brick or a brown sandy gravelly clay with frequent rootlets, was encountered in all locations to depths of between 0.10 m and 0.30 m bgl.

Shallow refusals were encountered in the majority of locations across the central area of the site on concrete slab/cobbles between 0.40 m and 0.90 m bgl.

In the remaining locations, Made Ground deposits typically comprise brown clayey gravelly fine to medium sand with gravel of brick, plastic, ceramic, glass, mudstone and sandstone. In WS107A, WS107B and WS107C, a reddish brown sandy gravel with concrete cobble fragments, and a similar gravel content as above were encountered.

A Depth of Made Ground Plan is presented as Drawing 13-244-003 in Appendix III.

3.3. DRIFT DEPOSITS

Drift deposits were encountered within seven exploratory locations to depths of between 1.10 m to a maximum proven depth of 5.45 m bgl. Drift deposits were not encountered where the full depth of Made Ground could not be proven due to underground obstructions.

Where encountered, drift deposits generally comprise a firm to stiff, medium to high strength, greyish brown CLAY with gravel of sandstone, mudstone and quartz. The clay is typically interbedded and underlain by gravelly fine to coarse SAND with gravel of sandstone and mudstone.

3.4. SOLID GEOLOGY

The solid bedrock geology was not encountered during the site investigation. BGS boreholes within proximity to the site indicate the presence of shale bedrock at depths in excess of circa 7.10 m bgl.



3.5. GROUNDWATER

Groundwater strikes were encountered as seepages. The depth of the seepages are shown on the exploratory hole records in Appendix IV and are summarised in Table 3.2.

TABLE 3.2 SUMMARY GROUNDWATER STRIKES

LOCATION	DEPTH TO STRIKE (m)	NOTES
WS102	2.00	Seepage
WS105	3.10	Seepage
WS106	3.60	Seepage
WS108	4.00	Seepage
WS112	1.00	Seepage
WS113B	3.10	Seepage
WS113B	3.50	Seepage
WS114	4.00	Seepage

Return visits were carried out to obtain groundwater samples from selected wells and to monitor the depth to water within each monitoring well location. The data has been summarised in Table 3.3.

TABLE 3.3 SUMMARY OF GROUNDWATER STRIKES DURING GROUND GAS MONITORING

LOCATION	DEPTH TO WATER (m bgl)	
	DECEMBER 2021	JANUARY 2022
WS102	2.40	2.80
WS105	3.40	3.60
WS106	3.60	3.70
WS107A	0.70	0.70
WS108	3.45	3.65
WS109	1.80	2.90
WS112	1.40	1.60
WS113B	4.10	4.10
WS114	3.77	3.95

3.6. VISUAL AND OLFACTORY EVIDENCE OF CONTAMINATION

Visual evidence of potential contamination has been identified during the site investigation and these are summarised in Table 3.4.

TABLE 3.4 SUMMARY VISUAL AND OLFACTORY EVIDENCE OF CONTAMINATION

LOCATION	DEPTH (m)	STRATUM	NOTES
WS101A	0.15 – 0.50	Made Ground	Asphalt – PAHs and hydrocarbons
WS108	0.65 – 1.10	Made Ground	Clinker – PAHs and hydrocarbons
WS113A	0.20 – 4.40	Made Ground	Clinker – PAHs and hydrocarbons



LOCATION	DEPTH (m)	STRATUM	NOTES
WS113B	0.20 – 4.40	Made Ground	Clinker – PAHs and hydrocarbons
WS114	0.80 – 2.20	Made Ground	Slag – heavy metals

3.7. SOIL CONSISTENCY

Undrained shear strength values were measured using both field hand shear vane tests and from in-situ standard penetration tests. Results of the tests are presented in Table 3.5 and Table 3.6, which indicate the clay soils vary between stiff and very stiff. Strength test data is generally consistent with the field descriptions of the aforementioned soils.

TABLE 3.5 SUMMARY OF HAND SHEAR VANE TESTS

LOCATION	DEPTH	SHEAR STRENGTH (kPa)	CALCULATED ALLOWABLE BEARING PRESSURE (kN/m ²)
TP101	2.3	93	217
TP102	1.0	110	257
	1.3	105	245
	1.6	106	248
	2.2	86	201
TP103	1.0	62	145
	1.5	80	187
	2.0	85	198
	2.5	85	198
TP104	1.7.	79	184
	2.3	88	205
	2.6	71	166
TP105	2.0	116	271
	2.3	95	222
	2.6	94	219
TP106	1.0	82	191
	1.3	109	255
	1.6	97	226
	1.9	91	212
TP107	1.5	74	173
	2.1	99	231
TP108	1.0	56	131
	1.3	67	142
	1.6	42	98
	1.9	63	147



LOCATION	DEPTH	SHEAR STRENGTH (kPA)	CALCULATED ALLOWABLE BEARING PRESSURE (kN/m ²)
TP108	2.2	70	163



TABLE 3.6 STANDARD/CONE PENETRATION TEST RESULTS

BOREHOLES	DEPTH (m bgl)	MATERIAL FIELD DESCRIPTION	CPT/S PT "N" VALUE	CORRECTED "N" VALUE (N ₁) ₆₀	TERZAGHI & PECK RELATIVE DENSITY (SANDS)	EUROCODE SOIL STRENGTH	CONSISTENCY (BS 5930)	TERZAGHI & PECK APPROXIMATE UNDRAINED SHEAR STRENGTH (kN/m ²)	ALLOWABLE BEARING PRESSURE (kN/m ²)*
WS102	1.00	MADE GROUND Sand	19	19.15	Medium Dense	N/A	N/A	N/A	191.55
WS102	2.00	Silty CLAY	11	10.05	N/A	Medium strength	Stiff	50.24	103.30
WS102	3.00	Clayey SAND	35	30.44	Dense	N/A	N/A	N/A	304.38
WS102	4.00	Clayey SAND	15	12.67	Medium Dense	N/A	N/A	N/A	126.73
WS102	5.00	Clayey SAND	13	10.79	Medium Dense	N/A	N/A	N/A	107.85
WS105	1.00	MADE GROUND Sand	4	4.03	Loose	N/A	N/A	N/A	40.33
WS105	2.00	MADE GROUND Sand	2	1.83	Very Loose	N/A	N/A	N/A	18.27
WS105	3.00	Silty CLAY	8	6.96	N/A	Low strength	Firm	34.79	71.52
WS105	4.00	Silty CLAY	32	27.04	N/A	High strength	Very Stiff	135.18	277.92
WS105	4.85	Silty CLAY	50	41.57	N/A	Very high strength	Very Stiff	207.87	427.38
WS106	1.00	MADE GROUND Sand	4	4.03	Loose	N/A	N/A	N/A	40.33
WS106	2.00	MADE GROUND Sand	2	1.83	Very Loose	N/A	N/A	N/A	18.27
WS106	3.00	MADE GROUND Sand	14	12.18	Medium Dense	N/A	N/A	N/A	121.75
WS106	4.00	Silty CLAY	19	16.05	N/A	High strength	Very Stiff	80.26	165.02
WS106	4.80	Gravelly SAND	26	21.64	Medium Dense	N/A	N/A	N/A	216.36
WS108	1.00	Silty CLAY	11	11.09	N/A	Medium strength	Stiff	55.45	114.00
WS108	2.00	Silty CLAY	13	11.88	N/A	Medium strength	Stiff	59.38	122.09
WS108	3.00	Silty CLAY	11	9.57	N/A	Medium strength	Stiff	47.83	98.34



George Street, Heywood

Phase II Geoenvironmental Site Assessment

February 2022

BOREHOLES	DEPTH (m bgl)	MATERIAL FIELD DESCRIPTION	CPT/S PT "N" VALUE	CORRECTED "N" VALUE (N ₁) ₆₀	TERZAGHI & PECK RELATIVE DENSITY (SANDS)	EUROCODE SOIL STRENGTH	CONSISTENCY (BS 5930)	TERZAGHI & PECK APPROXIMATE UNDRAINED SHEAR STRENGTH (kN/m ²)	ALLOWABLE BEARING PRESSURE (kN/m ²)*
WS108	4.00	Silty CLAY	32	27.04	N/A	High strength	Very Stiff	135.18	277.92
WS108	4.50	Silty SAND	50	41.82	Dense	N/A	N/A	N/A	418.18
WS109	1.00	MADE GROUND Sand	1	1.01	Very Loose	N/A	N/A	N/A	10.08
WS109	2.00	MADE GROUND Sand	26	23.75	Medium Dense	N/A	N/A	N/A	237.52
WS109	3.00	Silty CLAY	50	43.48	N/A	Very high strength	Very Stiff	217.41	447.00
WS112	1.00	MADE GROUND Gravel	46	46.37	Dense	N/A	N/A	N/A	463.75
WS112	2.00	MADE GROUND Gravel	50	45.68	Dense	N/A	N/A	N/A	456.77
WS113B	1.00	MADE GROUND Sand	11	11.09	Medium Dense	N/A	N/A	N/A	110.90
WS113B	2.00	MADE GROUND Sand	10	9.14	Loose	N/A	N/A	N/A	91.35
WS113B	3.00	MADE GROUND Sand	10	8.70	Loose	N/A	N/A	N/A	86.97
WS113B	4.00	MADE GROUND Sand	3	2.53	Very Loose	N/A	N/A	N/A	25.35
WS113B	5.00	Sandy CLAY	14	11.61	N/A	Medium strength	Stiff	58.07	119.40
WS114	1.00	MADE GROUND Sand	16	16.13	Medium Dense	N/A	N/A	N/A	161.30
WS114	2.00	MADE GROUND Sand	10	9.14	Loose	N/A	N/A	N/A	91.35
WS114	3.00	MADE GROUND Sand	13	11.31	Medium Dense	N/A	N/A	N/A	113.05
WS114	4.00	Gravelly CLAY	27	22.81	N/A	High strength	Very Stiff	114.05	234.50
WS114	5.00	Silty CLAY	17	14.10	N/A	Medium strength	Stiff	70.52	144.98



NOTES

* The Allowable Bearing Pressure (ABP) should be considered indicative.

The interpretation of in situ mass undrained shear strength (c_u) data from SPT Blow Count (N) results and the influence of the Plasticity Index (PI) was reported in Standard Penetration Test in Insensitive Clays and Soft Rocks. Stroud (1974). The standard penetration test and the engineering properties of glacial materials subsequently. Stroud and Butler (1975) and (1989).

Allowable bearing pressure on sands. Soil Mechanics in Engineering Practice Terzaghi, K. & Peck, R.B. 1996.



3.8. pH AND SULPHATE

Chemical analyses for pH and soluble sulphate content are contained in Appendix V (summarised in Table 3.6).

TABLE 3.6 SUMMARY OF pH AND SULPHATE DATA

LOCATION	DEPTH (m)	SO ₄ IN 2:1 WATER/SOIL (g/l)	pH VALUE	CLASSIFICATION
WS106	3.20	0.082	8.1	DS-1, AC-1s
WS111A	0.10	0.077	8.9	DS-1, AC-1s
WS113B	2.00	0.43	8.0	DS-1, AC-1s

Based upon the results of the chemical analyses it is considered that subsurface concrete can be designed in accordance with Design Sulphate Class DS-1, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-1s in accordance with the recommendations provided in BRE *Special Digest 1* (2005).



4. TIER I QUALITATIVE CONTAMINATED LAND RISK ASSESSMENT

E3P has undertaken a Tier 1 qualitative risk assessment to determine if any potential contaminants within the underlying soils and groundwater pose an unacceptable level of risk to the identified receptors.

4.1. HUMAN HEALTH RISK ASSESSMENT

At Tier 1 stage, the long term (chronic) human health toxicity of the soil has been assessed by comparing the on-site concentrations of organic and inorganic compounds with reference values published in LQM/CIEH S4UL (S4UL3267).

The results of this comparison have been summarised in Table 4.1.



TABLE 4.1 SUMMARY OF INORGANIC AND HYDROCARBON TOXICITY ASSESSMENT FOR A COMMERCIAL END USE

DETERMINAND	UNITS	GAC	N	MC	LOC. OF EX	PATH WAY	ASSESSMENT
Arsenic	mg/kg	640	3	72	N/A	1	No Further Action
Cadmium	mg/kg	190	3	0.8	N/A	1	No Further Action
Chromium (VI)	mg/kg	33	3	<4.0	N/A	1	No Further Action
Lead	mg/kg	2300	3	460	N/A	1	No Further Action
Mercury	mg/kg	58	3	1.0	N/A	4	No Further Action
Nickel	mg/kg	980	3	190	N/A	1	No Further Action
Selenium	mg/kg	12000	3	<1.0	N/A	1	No Further Action
Copper	mg/kg	68000	3	260	N/A	1	No Further Action
Zinc	mg/kg	730000	3	300	N/A	1	No Further Action
Cyanide - Total	mg/kg	791	3	<1.0	N/A	1	No Further Action
Phenols - Total.	mg/kg	440	3	<1.0	N/A	1	No Further Action
Naphthalene	mg/kg	190	3	0.38	N/A	4	No Further Action
Acenaphthylene	mg/kg	83000	3	<0.05	N/A	2	No Further Action
Acenaphthene	mg/kg	84000	3	<0.05	N/A	1	No Further Action
Fluorene	mg/kg	63000	3	<0.05	N/A	1	No Further Action
Phenanthrene	mg/kg	22000	3	1.3	N/A	2	No Further Action
Anthracene	mg/kg	520000	3	0.33	N/A	2	No Further Action
Fluoranthene	mg/kg	23000	3	2.7	N/A	2	No Further Action
Pyrene	mg/kg	54000	3	2.9	N/A	2	No Further Action
Benzo(a)Anthracene	mg/kg	170	3	2.1	N/A	2	No Further Action
Chrysene	mg/kg	350	3	1.9	N/A	2	No Further Action
Benzo(b)Fluoranthene	mg/kg	44	3	2.2	N/A	2	No Further Action
Benzo(k)Fluoranthene	mg/kg	1200	3	1.1	N/A	2	No Further Action
Benzo(a)Pyrene	mg/kg	35	3	2.1	N/A	2	No Further Action
Indeno(123-cd)Pyrene	mg/kg	500	3	0.89	N/A	2	No Further Action
Dibenzo(a,h)Anthracene	mg/kg	3.5	3	0.30	N/A	2	No Further Action
Benzo(ghi)Perylene	mg/kg	3900	3	1.00	N/A	2	No Further Action
TPH C5-C6 (aliphatic)	mg/kg	3200	3	<1.00	N/A	4	No Further Action
TPH C6-C8 (aliphatic)	mg/kg	7800	3	<1.00	N/A	4	No Further Action
TPH C8-C10 (aliphatic)	mg/kg	2000	3	<1.00	N/A	4	No Further Action
TPH C10-C12 (aliphatic)	mg/kg	9700	3	<10	N/A	4	No Further Action
TPH C12-C16 (aliphatic)	mg/kg	59000	3	<10	N/A	1	No Further Action
TPH C16-C35 (aliphatic)	mg/kg	1600000	3	<20	N/A	1	No Further Action
TPH C5-C7 (aromatic)	mg/kg	26000	3	<1.00	N/A	1	No Further Action
TPH C7-C8 (aromatic)	mg/kg	56000	3	<1.00	N/A	4	No Further Action
TPH C8-C10 (aromatic)	mg/kg	3500	3	<1.00	N/A	4	No Further Action
TPH C10-C12 (aromatic)	mg/kg	16000	3	23	N/A	4	No Further Action
TPH C12-C16 (aromatic)	mg/kg	36000	3	150	N/A	4	No Further Action
TPH C16-C21 (aromatic)	mg/kg	28000	3	100	N/A	1	No Further Action
TPH C21-C35 (aromatic)	mg/kg	28000	3	<10	N/A	1	No Further Action

Notes

Main exposure pathways: 1 = soil ingestion, 2 = dermal contact and ingestion, 3 = dust inhalation, 4 = vapour inhalation (indoor).
Abbreviations: GAC = general assessment criteria, n = number of samples, MC = maximum concentration; Loc of Ex = location of exceedance; NFD = no fibres detected.



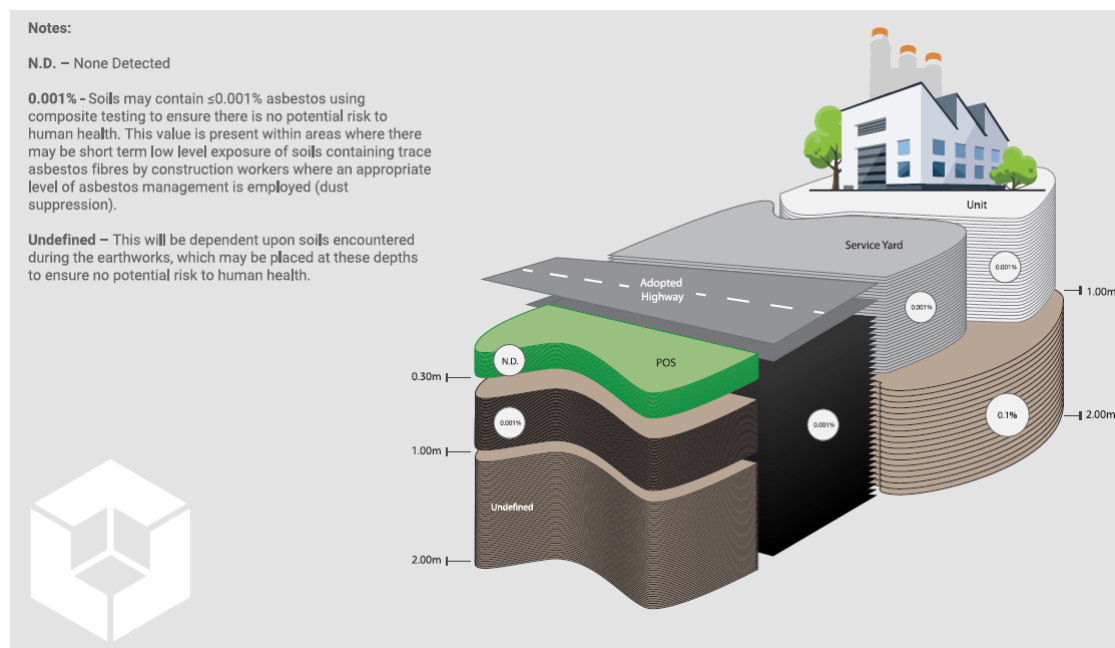
* The Tier 1 GAC for the hydrocarbon fraction is derived from the CIEH assessment for petroleum hydrocarbons Criteria Working Group (CWG) for both aliphatic and aromatic compounds. E3P has utilised the Tier 1 values for aliphatic compounds for the volatile and semi volatile fractions (C5-C12) and the Tier 1 values for aromatic compound for the non-volatile fractions (C12-C35). The comparison of a total (aliphatic/aromatic) compounds to an individual fraction is considered to be a conservative approach and satisfactory for the protection of human health.

Referring to Table 4.1, the results of this direct comparison indicates that there are no exceedances when compared with the screening criteria for a commercial end-use.

Asbestos was not included in the chemical analysis as it has been identified previously on site as both trace fibres and bulk fragments within Made Ground. Previous site investigations (both the LK Consult and E3P investigations) encountered soils with between <0.001% to 0.097% asbestos and have also noted localised areas of ACM within the Made Ground.

Bulk fragments of asbestos will need to be removed from the Made Ground with any residual trace fibres managed according to the asbestos risk mitigation conceptual site model shown in Figure 4.1.

FIGURE 4.1 ASBESTOS RISK MITIGATION CONCEPTUAL SITE MODEL



4.2. CONTROLLED WATERS RISK ASSESSMENT

E3P has undertaken a controlled waters risk assessment for the site based on the consideration of the conceptual site model and the sensitive receptors which are summarised in Table 4.2.

TABLE 4.2 CONTROLLED WATERS CONCEPTUAL MODEL AND SENSITIVITY PROFILE

DISCUSSION	SENSITIVITY RATING
Contaminant Source	
Made Ground The site has been developed since the 1800s and Made Ground has been proven to depths in excess of 4.00 m bgl in localised areas. Where Made Ground is present, given the significant development history of the site, heavy metals, PAHs and hydrocarbon compounds are likely to be present. Localised areas of soils with TPH, PAHs and heavy metals have been encountered on site during previous investigations.	High
Former Mills and Reservoirs Between circa 1851 and 1969, the northeast and south of the site comprised two cotton mills (Wrigley Brook Mill and Mossfield Mill) with associated tanks, chimneys and reservoirs. Terraced housing was also recorded on-site likely associated with the mills used for the workers. The presence of heavy metals and PAHs are likely to be present within Made Ground soils across the site while the presence of ash and clinker has been proven within localised areas. The reservoirs are no longer recorded on-site indicating they have been infilled. The presence of heavy metals, PAHs and hydrocarbon compounds is likely within the localised areas of infilled ground.	High
Former Scrap Yard The west of the site was recorded as a scrap yard from the 1970s and subsequent ground investigation has proven the presence of frag waste within the Made Ground soils. The presence of frag waste and scrap materials within Made Ground soils is indicative of the presence of heavy metals, PAHs, TPHs and inorganic compounds such as phenols, solvents, fuels and acids.	High
Pathway	
Vertical Migration The BGS indicates that the site is underlain by glacial till. Previous ground investigations indicate the presence of clay across the site at depths from circa 1.00 m bgl to 5.00 m bgl, locally interbedded with sand and gravel. The presence of granular Made Ground in some areas reduces the thickness of the underlying drift deposits. Where present, the cohesive drift deposits will somewhat reduce the downward migration of mobile phase contaminants to the underlying secondary A aquifer.	Moderate/High
Lateral migration Lateral migration of contaminants is considered possible due to the presence of granular Made Ground to depths over 4.00 m bgl in localised areas. The presence of clay drift deposits will somewhat reduce the lateral migration of mobile phase contaminants to the adjacent culverted brook and off-site surface water features.	Medium

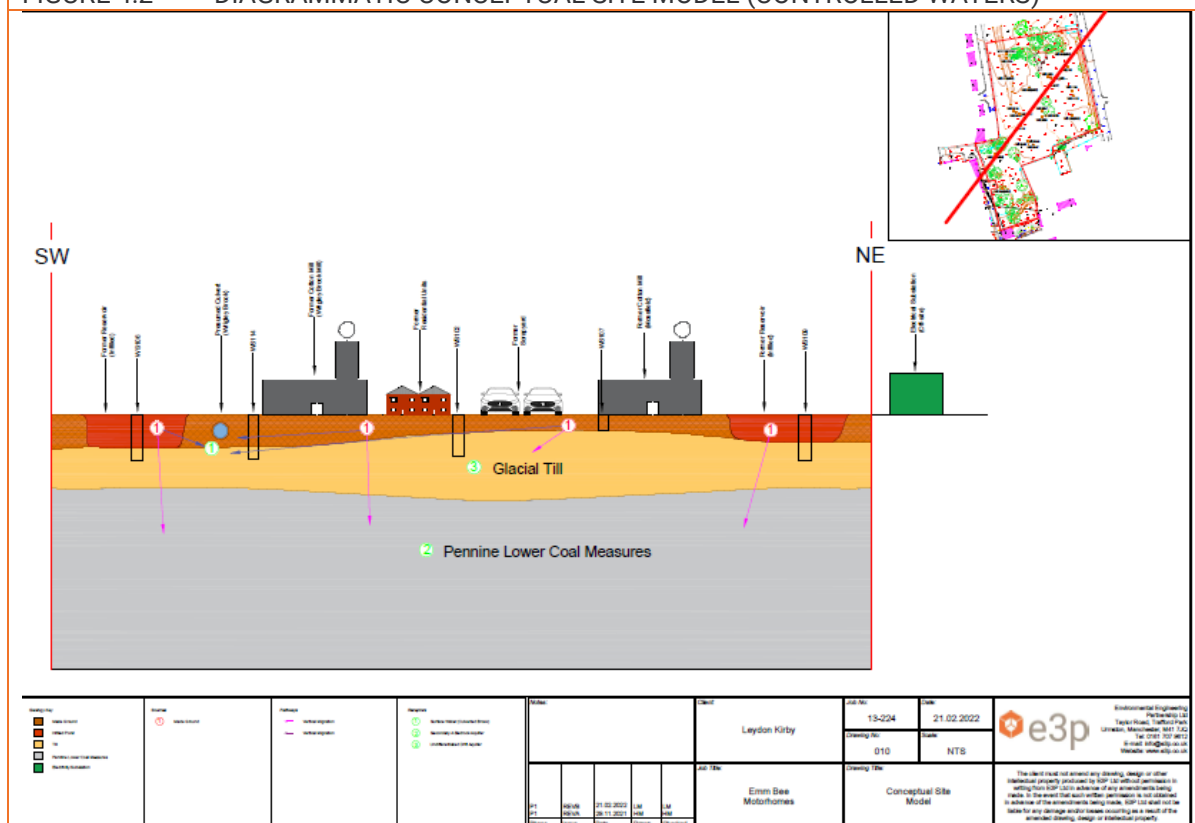


Receptor		
Aquifer Classification in Superficial Drift Deposits	Secondary Undifferentiated.	Medium
Aquifer Classification in Bedrock	Secondary A aquifer	High
Groundwater Source Protection Zone or Drinking Water Safeguard Zone	The site is not located within a Groundwater Source Protection Zone or a Drinking Water Safeguard Zone.	Low
Distance to the Closest Groundwater Abstraction Point	None identified within a 1 km radius.	Low
Is the Site Located Within 50 m of a Surface Watercourse?	There are no surface water features recorded within 50m of the site, however, Wrigley Brook was previously recorded in the west of the site flowing in a north-south direction. With the redevelopment of the site, it appears that the brook has been culverted beneath the site therefore is still seen as a viable receptor.	High

The ICSM developed within the context of the site setting has viable pollutant pathway, which would be the downward migration of potentially mobile phase-soluble contaminants towards the underlying secondary A aquifer and the lateral migration towards the possible culvert in the west of the site.

In addition to above, E3P has developed a diagrammatic conceptual model which considers the factors in Table 4.2. This is available as Drawing 13-224-010 and a snapshot is included in Figure 4.2.

FIGURE 4.2 DIAGRAMMATIC CONCEPTUAL SITE MODEL (CONTROLLED WATERS)



To ensure a robust appraisal of the identified risk to controlled waters, E3P has identified the sources of potential contamination that represent a risk to controlled waters from the initial CSM, we have then assessed the availability of ground investigation data in the form of analysis of the solid phase (soil) and dissolved phase within the perched groundwater or aquifer. The results of this assessment are presented in Table 4.3.

TABLE 4.3 QUALITATIVE RISK TO CONTROLLED WATERS FROM SOIL ANALYTICAL RESULTS

CONTAMINANT	ASSESSMENT RATING	DISCUSSION
BTEX > 1 mg/kg	The previous soil data analysis has not identified any significantly elevated concentrations of VOCs above 1mg/kg and the most recent analysis did not identify elevated levels of TPH C5 to C6 that might otherwise be indicative of VOC impact.	None
Total VOC > 1 mg/kg		
Total SVOC > 1 mg/kg		
C5-C10 > 5 mg/kg	All concentrations are below the laboratory LOD.	None
C10-C12 > 10 mg/kg	All concentrations are below the laboratory LOD.	None
C12-C16 > 50 mg/kg	All concentrations are below the laboratory LOD.	None
Phenols > 2 mg/kg	All concentrations are below the laboratory LOD.	None
Naphthalene > 2 mg/kg	No concentrations of naphthalene above 2 mg/kg have been recorded.	None
Total PAH > 10 mg/kg	Total concentrations of low-solubility PAH compounds greater than 10 mg/kg have been detected in WS111A and WS113B at 17 mg/kg and 19 mg/kg respectively.	Further discussion
PCB > 1 mg/kg	PCB has not been included within the chemical analysis due to the distance of soil samples from the electricity substation and the low-mobility of PCBs.	None
Heavy metals > 500 mg/kg	No concentrations of heavy metals above 500 mg/kg have been recorded.	None

The Tier I assessment has included a comparison of leachate analysis from samples of the Made Ground and groundwater samples to drinking water standards (DWS) and environmental quality standards (EQS), due to the presence of the secondary A bedrock aquifer and the possible culvert. The table below includes leachate analysis undertaken following the E3P site investigation in December 2021 and groundwater monitoring from both December 2021 and January 2022.

These are presented in Table 4.4 and Table 4.5.



TABLE 4.4 COMPARISON OF LEACHATE ANALYSIS WITH TIER 1 SCREENING LEVELS

DETERMINANT	UNIT	EQS ^{1, 2, 3}	DWS _{3,4,5}	NO. OF LEACHATE SAMPLES	MAX CONC. IN LEACHATE	LOCATION OF EXCEEDANCE	ASSESSMENT
		AA					
Arsenic	µg/l	50.00	10.00	7	18.00	WS105 0.90m (DWS)	Further Action
Cadmium	µg/l	0.08-0.25	5.00	7	1.10	WS109 1.80m (EQS)	Further Action
Chromium (VI)	µg/l	3.40	–	7	<5.00	N/A	No Further Action
Chromium (III)	µg/l	4.70	50.00	7	1.50	N/A	No Further Action
Copper	µg/l	1.00	2000	7	14.00 14.00 4.20 3.60 14.00 3.20 5.90	WS102 1.20m (EQS) WS105 0.90m (EQS) WS106 3.20m (EQS) WS109 1.80m (EQS) WS111A 0.10m (EQS) WS108 0.80m (EQS) WS113B 2.00m (EQS)	Further Action
Total Cyanide	µg/l	1.00	50.00	7	1.00	N/A	No Further Action
Lead	µg/l	1.20	10.00	7	2.20 5.10 5.60 2.90 11.00 3.20 4.80	WS102 1.20m (EQS) WS105 0.90m (EQS) WS106 3.20m (EQS) WS109 1.80m (EQS) WS111A 0.10m (EQS & DWS) WS108 0.80m (EQS) WS113B 2.00m (EQS)	Further Action
Mercury	µg/l	–	1.00	7	37.00	WS113B 2.00m (DWS)	Further Action
Nickel	µg/l	4.00	20.00	7	16.00	WS109 1.80m (EQS)	Further Action
Selenium	µg/l	–	10.00	7	24.00	WS109 1.80m (DWS)	Further Action
Zinc	µg/l	10.90	–	7	60.00 13.00 14.00	WS109 1.80m (EQS) WS111A 0.10m (EQS) WS113B 2.00m (EQS)	Further Action
pH	6–9	–	–	7	8.000	N/A	No Further Action



DETERMINANT	UNIT	EQS ^{1, 2, 3}	DWS _{3,4,5}	NO. OF LEACHATE SAMPLES	MAX CONC. IN LEACHATE	LOCATION OF EXCEEDANCE	ASSESSMENT
		AA					
Polycyclic Aromatic Hydrocarbons							
Naphthalene	µg/l	2.00	10.00*	7	<0.01	N/A	No Further Action
Anthracene	µg/l	0.10	10.00*	7	2.80	WS102 1.20m (EQS)	Further Action
Benzo[b]fluoranthene	µg/l	0.00017*	10.00*	7	<0.01	N/A	No Further Action
Benzo[k]fluoranthene	µg/l	0.00017*	10.00*	7	<0.01	N/A	No Further Action
Benzo(a)pyrene	µg/l	0.00017*	10.00*	7	<0.01	N/A	No Further Action
Indeno(123-cd)pyrene	µg/l	0.00017*	10.00*	7	<0.01	N/A	No Further Action
Fluoranthene	µg/l	0.0063	10.00*	7	0.69	WS102 1.20m (EQS)	Further Action
Benzo(ghi)perylene	µg/l	1.70–4.00	10.00*	7	<0.01	N/A	No Further Action
Aromatic Hydrocarbon ⁵							
TPH C5-C6 (benzene)	µg/l	10.00	1.00	7	<1.00	N/A	No Further Action
TPH C6-C8 (toluene)	µg/l	74.00	700	7	<1.00	N/A	No Further Action
TPH C8-C10 (ethyl benzene)	µg/l	20.00	300	7	<1.00	N/A	No Further Action
TPH C10-C12 (xylene)	µg/l	30.00	500	7	<1.00	N/A	No Further Action
TPH C10-C12 (xylene)	µg/l	30.00	500	7	<1.00	N/A	No Further Action
TPH C12-C16	µg/l	2.00	90.00 ⁵	7	150	WS102 1.20m (EQS)	Further Action
TPH C16-C35	µg/l	50.00#	90.00 ⁵	7	100	WS102 1.20m (EQS)	Further Action
Aliphatic Hydrocarbon ⁵							
TPH C5-C6	µg/l	–	15000	7	<1.0	N/A	No Further Action
TPH C6-C8	µg/l	–	15000	7	<1.0	N/A	No Further Action
TPH C8-C10	µg/l	–	300	7	<1.0	N/A	No Further Action
TPH C10-C12	µg/l	–	300	7	<10	N/A	No Further Action



DETERMINANT	UNIT	EQS ^{1, 2, 3}	DWS _{3,4,5}	NO. OF LEACHATE SAMPLES	MAX CONC. IN LEACHATE	LOCATION OF EXCEEDANCE	ASSESSMENT
		AA					
TPH C12-C16	µg/l	–	300	7	<10	N/A	No Further Action
TPH C16-C21	µg/l	–	300**	7	<10	N/A	No Further Action
TPH C21-C35	µg/l	–	300**	7	<10	N/A	No Further Action

Notes

Solubility <0.01µg/l

AA – Annual Average

MAC- Maximum Admissible Concentration

* Polyaromatic hydrocarbons (PAH) - Benzo(a)pyrene (BaP), Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(g,h,i)-perylene and Indeno(1,2,3-cd)-pyrene. Benzo(a)pyrene can be considered as a marker for the other PAHs, hence only benzo(a)pyrene needs to be monitored for comparison with the biota EQS or the corresponding AA-EQS in water

** There are no WHO Guideline Values for aliphatic fractions C16-C21 and C21-C35, therefore the guideline value for aliphatic fractions inclusive of C8-C16 (300µg/l) has been applied.

1. The Water Environment (Water Framework Directive) (England and Wales) (Amendment) Regulations (2015)
2. Directive establishing a framework for Community action in the field of water policy (Water Framework Directive)
3. Council Directive on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community (Dangerous Substances Directive) - List II substances
4. Council Directive on the quality of water intended for human consumption (Drinking Water Directive)
5. WHO Guidelines for Drinking Water Quality. Third edition (2004)



TABLE 4.5 COMPARISON OF GROUNDWATER ANALYSIS WITH TIER 1 SCREENING LEVELS

DETERMINAND	UNIT	EQS ^{1,2,3}	DWS _{3,4,5}	TOTAL NO. OF GW SAMPLES	MAX CONC. IN GROUNDWATER				ASSESSMENT
		AA			DATE: 14/12/2022	LOCATION OF EXCEEDANCE	DATE: 20/01/2022	LOCATION OF EXCEEDANCE	
Arsenic	µg/l	50	10	6	4.40	N/A	12.20	WS109 (DWS)	Further Action
Cadmium	µg/l	0.08-0.25	5	6	0.18	N/A	0.35	WS114 (EQS)	Further Action
Chromium (VI)	µg/l	3.4	–	6	<5.00	N/A	<5.00	N/A	No Further Action
Chromium (III)	µg/l	4.7	50	6	3.80	N/A	5.70	WS106 (EQS)	Further Action
Copper	µg/l	1	2000	6	5.70 2.40 5.00	WS106 (EQS) WS108 (EQS) WS114 (EQS)	22.00 4.90 4.10	WS109 (EQS) WS114 (EQS) WS106 (EQS)	Further Action
Total Cyanide	µg/l	1	50	6	<1.00	N/A	4.80	WS109 (EQS)	Further Action
Lead	µg/l	1.2	10	6	1.10	N/A	3.70	WS109 (EQS)	Further Action
Mercury	µg/l	–	1.0	6	<0.05	N/A	<0.05	N/A	No Further Action
Nickel	µg/l	4	20	6	7.10 8.10 18.00	WS106 (EQS) WS108 (EQS) WS114 (EQS)	19.00 14.00 6.50	WS109 (EQS) WS114 (EQS) WS106 (EQS)	Further Action
Selenium	µg/l	–	10	6	30.00	WS106 (DWS)	63.00	WS109 (DWS)	Further Action
Zinc	µg/l	10.9	–	6	36.00 21.00	WS106 (EQS) WS114 (EQS)	76.00 19.00 39.00	WS109 (EQS) WS114 (EQS) WS106 (EQS)	Further Action
pH	6–9			6	6.7–6.9	N/A	6.7–6.9	N/A	No Further Action
Polycyclic Aromatic Hydrocarbons									
Naphthalene	µg/l	2	10*	6	<0.01	N/A	<0.01	N/A	No Further Action
Anthracene	µg/l	0.1	10*	6	<0.01	N/A	0.43	WS109 (EQS)	Further Action
Benzo[b]fluoranthene	µg/l	0.00017*	10*	6	<0.01	N/A	1.60	WS109 (EQS)	Further Action



DETERMINAND	UNIT	EQS ^{1,2,3}	DWS _{3,4,5}	TOTAL NO. OF GW SAMPLES	MAX CONC. IN GROUNDWATER				ASSESSMENT
		AA			DATE: 14/12/2022	LOCATION OF EXCEEDANCE	DATE: 20/01/2022	LOCATION OF EXCEEDANCE	
Benzo[k]fluoranthene	µg/l	0.00017*	10*	6	<0.01	N/A	0.55	WS109 (EQS)	Further Action
Benzo(a)pyrene	µg/l	0.00017*	10*	6	<0.01	N/A	<0.01	N/A	No Further Action
Indeno(123-cd)pyrene	µg/l	0.00017*	10*	6	<0.01	N/A	<0.01	N/A	No Further Action
Fluoranthene	µg/l	0.0063	10*	6	<0.01	N/A	0.47	WS109 (EQS)	Further Action
Benzo(ghi)perylene	µg/l	1.7–4	10*	6	<0.01	N/A	<0.01	N/A	No Further Action
Aromatic Hydrocarbon ⁵									
TPH C5-C6 (benzene)	µg/l	10	1	6	<1.00	N/A	<1.00	N/A	No Further Action
TPH C6-C8 (toluene)	µg/l	74	700	6	<1.00	N/A	<1.00	N/A	No Further Action
TPH C8-C10 (ethyl benzene)	µg/l	20	300	6	<1.00	N/A	<1.00	N/A	No Further Action
TPH C10-C12 (xylene)	µg/l	30	500	6	<1.00	N/A	<1.00	N/A	No Further Action
TPH C12-C16	µg/l	2	90 ⁵	6	<10.00	N/A	<10.00	N/A	No Further Action
TPH C16-C35	µg/l	50#	90 ⁵	6	<10.00	N/A	<10.00	N/A	No Further Action
Aliphatic Hydrocarbon ⁵									
TPH C5-C6	µg/l	–	15000	6	<1.00	N/A	<1.00	N/A	No Further Action
TPH C6-C8	µg/l	–	15000	6	<1.00	N/A	<1.00	N/A	No Further Action
TPH C8-C10	µg/l	–	300	6	<1.00	N/A	<1.00	N/A	No Further Action
TPH C10-C12	µg/l	–	300	6	<10.00	N/A	<10.00	N/A	No Further Action
TPH C12-C16	µg/l	–	300	6	<10.00	N/A	<10.00	N/A	No Further Action
TPH C16-C21	µg/l	–	300**	6	<10.00	N/A	<10.00	N/A	No Further Action
TPH C21-C35	µg/l	–	300**	6	<10.00	N/A	<10.00	N/A	No Further Action



4.2.1. CONTROLLED WATER RISK ASSESSMENT AND MITIGATION

The comparison of leachate analysis against the tier 1 screening values indicates the following exceedances:

-  Arsenic (DWS)
-  Cadmium (EQS)
-  Copper (EQS)
-  Lead (EQS & DWS)
-  Mercury (DWS)
-  Nickel (EQS)
-  Selenium (DWS)
-  Zinc (EQS)
-  Anthracene (EQS)
-  Fluoranthene (EQS)
-  TPH C12-C16 (EQS)
-  TPH C16-C35 (EQS)

The comparison of groundwater samples against the tier 1 screening values indicates the following exceedances:

-  Arsenic (DWS)
-  Cadmium (EQS)
-  Chromium III (EQS)
-  Copper (EQS)
-  Total Cyanide (EQS)
-  Lead (EQS)
-  Nickel (EQS)
-  Selenium (DWS)
-  Zinc (EQS)
-  Anthracene (EQS)
-  Benzo(b)fluoranthene (EQS)
-  Benzo(k)fluoranthene (EQS)



 Fluoranthene (EQS)

In relation to the elevated mercury and TPH C12-C35, these were isolated occurrences from leachate analysis undertaken in Made Ground soils at WS102 and WS113B. Where leachate analysis has been undertaken, this can overstate the risk and is not wholly representative of the site characterisation, therefore following the assessment of groundwater samples indicative of the true dissolved phase impact, the risk associated with mercury and TPH is deemed to be low. This, therefore, indicates that the source is within the soils and can be dealt with during any remediation works, removing the source and therefore the risk becomes negligible to controlled water receptors.

The remaining determinants identified above the tier 1 screening criteria from the leachate analysis largely correlate with the exceedances encountered within the groundwater.

In relation to the remaining exceedances, Table 4.6 provides a summary.

TABLE 4.6 SUMMARY OF ELEVATED CONTAMINANTS IN GROUNDWATER

CONTAMINANT	WS106 (µg/l)	WS108 (µg/l)	WS109 (µg/l)	WS114 (µg/l)
	Contaminant Source			
	Former Mill and Infilled Reservoir	Former Mill and Residential Units	Former Mill	Former Reservoir and Scrap Yard
Arsenic	—	—	12.20	—
Cadmium	—	—	—	0.35
Chromium (III)	5.70	—	—	—
Copper	5.70 4.10	2.40	22.00	5.00 4.90
Total Cyanide	—	—	4.80	—
Lead	—	—	3.70	—
Nickel	7.10 6.50	8.10	19.00	18.00 14.00
Selenium	30.00	—	63.00	—
Zinc	36.00 39.00	—	76.00	21.00 19.00
Anthracene	—	—	0.43	—
Benzo(b)fluoranthene	—	—	1.60	—
Benzo(k)fluoranthene	—	—	0.55	—
Fluoranthene	—	—	0.47	—

4.2.2. M-BAT ASSESSMENT

Due to exceedances in both soils and leachate samples for copper, nickel and zinc, an m-BAT assessment has been completed to assess the bioavailability of the metals with respect to surface water receptors (Culverted Wrigley Brook - onsite). The chemical values from the groundwater analysis have been input into the assessment.

Where the Risk Characterisation Ratio (RCR) is greater than 1, this indicates the bioavailable concentration is above the EQS and the receptor is therefore at risk. In this instance, groundwater chemical data and slow flow monitoring data for DOC was input into the m-BAT for the onsite locations. The following locations exceed the RCR:



- ✳ WS106 (Visit 1) – Zinc (1.66), Copper (0.79), Nickel (0.34).
- ✳ WS109 – Zinc (1.87), Copper (0.93), Nickel (0.43).
- ✳ WS106 (Visit 2) – Zinc (1.70), Copper (0.35), Zinc (0.29).

The m-BAT assessment has confirmed that although identified above the EQS screening level, copper and nickel are not considered bioavailable within any of the groundwater samples analysed. Elevated levels of Zinc encountered within WS106 and WS109 have been proven to be bioavailable with an RCR >1 and may pose a risk to the onsite culverted brook.

In light of the above assessment, E3P does not consider the site to pose an unacceptable level of risk to surface waters for copper and nickel. It should also be noted the site is currently uncapped and the proposed development (predominantly car parking and hardstanding) will largely encapsulate the site, thus limiting the potential for infiltration and therefore leaching potential.

4.2.3. FINAL PB SCREENING TOOL

Lead is not included in the M-BAT tool as it is not a full bioavailable EQS, however, a separate assessment using the Pb screening tool has been completed for lead. The assessment confirms that there is a low risk as the risk characterisation ratio is less than 1.0 within WS109.

In light of the above assessment, E3P does not consider the site to pose an unacceptable level of risk to surface waters for lead.

4.2.4. DISCUSSION OF CONTROLLED WATERS RISK ASSESSMENT

Historically, the site has been subjected to extensive infilling and a number of industrial uses including two cotton mills with associated tanks and chimneys, reservoirs, residential units and more recently a scrap yard. Heavy metals and PAHs have been identified as the main contaminants of concern relating to controlled waters which are deemed to be associated with the Made Ground in localised areas, particularly where the scrap yard was recorded.

The site is underlain by generally cohesive clay interbedded with granular sand and gravel in localised areas. Where present, the granular deposits will afford less protection to the underlying secondary A aquifer in the bedrock and the onsite culverted brook. Impacted groundwater has the potential to migrate laterally towards nearby controlled water receptors, including the culverted brook and aquifer, however, the presence of cohesive drift deposits may limit the migration pathway.

Localised heavy metal and PAH contamination have been identified within groundwater samples on-site. The source of such contamination is likely the Made Ground soils where heavy metal and PAH impact has also been encountered within soil analysis.

As the site is currently open, public space, with little hardstanding surface cover, rainfall is not being intercepted and subsequently infiltrates freely into the underlying Made Ground, potentially mobilising the identified contaminants.

Due to the requirement for material associated with the scrap yard to be removed, it is anticipated the potential source material will be removed from the site and in addition, the proposed development will create hardstanding cover across the site, thus reducing the amount of infiltration generated. This will, in turn, reduce the leachate potential associated with any residual impact and reduce the risk further to the underlying aquifer and onsite culverted brook. Given that the majority of the site is underlain by low permeability clay, the leaching of contaminants will likely be significantly reduced.



The presence of the culverted brook will need to be proven and its construction properties assessed as this will significantly affect the potential for migration of mobile phase contaminants. If the culvert is within a self-contained system, the infiltration of groundwater from the surrounding soil is unlikely therefore the identified contaminants do not have a viable pathway the risk will be significantly reduced. However, if the culvert is an open system that allows the infiltration of surrounding groundwater, the risk associated with the identified contaminants may be significant due to the presence of a viable pathway.

It must be noted that samples have not been obtained from the culvert and so, it is not yet proven whether the source-pathway-receptor linkage is complete. Without samples of the surface water (culverted brook), the extent, if any, of metalloid and PAH impact cannot be proven.

The results of the data review and Tier 1 qualitative risk assessment has allowed E3P to draw the following conclusions in respect to the risk to controlled waters:

- ✧ There have been multiple phases of ground investigation, this has enabled reasonable characterisation of the pollution risk and potential to impact the critical receptors.
- ✧ The primary receptors are identified as the culverted brook (Wrigley Brook) in the west of the site and the underlying secondary A aquifer.
- ✧ The presence and nature of the onsite culvert is currently unknown therefore further investigation is likely required.
- ✧ As part of the anticipated programme of remediation and enabling works, large volumes of Made Ground soils are to be removed and/or treated to remove frag wastes and other unsuitable materials and in doing so, this will likely remove potential source of the metalloid and PAH impact on site.
- ✧ The site is a public open space consisting of soft standing surface cover which allows for extensive infiltration of rainfall into underlying Made Ground soils.
- ✧ The proposed development will comprise predominantly hardstanding which will significantly reduce the infiltration to the underlying Made Ground and therefore reducing the leachability of the contaminants.

4.3. POTABLE WATER SUPPLY

Due to the previous nature of the site and the identified presence of frag waste, former scrapyard waste and former land uses, significant depths of Made Ground are recorded across the site. Localised TPH, heavy metal and PAH impact has been encountered within Made Ground.

Based on the assessment of current site conditions it is likely that barrier pipe will be required at the proposed development. Post remediation site conditions are likely to vary significantly therefore, a post-remediation UKWIR assessment should be undertaken to confirm the requirements for the potable water supply for the proposed development.

4.4. DRAINAGE

The presence of substantial depths of Made Ground across some areas of the site may result in settlement. It is therefore recommended that drain runs are designed using steeper gradients and flexible joints to allow for some differential settlement.

Made Ground impacted by low level heavy metals, TPH and PAHs has been identified on site therefore the use of soakaway drainage may be limited.



A full BRE365 assessment will be required to determine the soakage potential of the underlying ground conditions.



5. GEOTECHNICAL ASSESSMENT

5.1. SITE PREPARATION

The site should be cleared and any vegetation below areas of proposed development stripped in accordance with Series 200 of the *Manual of Contract Documents for Highway Works (MCHW)*. This should include the following:

- ✳ Roots present below the footprint of proposed structures and infrastructure should be grubbed out and the resulting void infilled with suitable compacted engineered fill.
- ✳ Demolition of all existing buildings and removal of all concrete hardstanding.
- ✳ Redundant services should be sealed off and grubbed out and replaced with suitable compacted engineered fill.
- ✳ Buried structures and old foundations have been encountered on site. These should be excavated from below the proposed development footprint with the resulting void backfilled.

5.2. FOUNDATION CONDITIONS AND ASSESSMENT OF POTENTIAL BEARING CAPACITIES

In due consideration of the identified ground conditions, in-situ and laboratory geotechnical testing, E3P has undertaken an assessment of the net safe allowable bearing pressure (ABP) within the underlying natural stratum to assist in the detailed design of foundations and infrastructure and determine the target founding stratum. The results of this assessment are summarised in Table 6.1.

TABLE 6.1 SUMMARY OF ABP

COHESIVE SOILS			
Description	Depth (range m bgl)	Undrained Shear Strength (Cu) (kN/m ²)	Allowable Bearing Pressure (kN/m ²)
Firm to Very Stiff, Gravelly CLAY	2-3	34-217	71-447
	4-5	58-207	119-427

Based on the assessment of the relative undrained shear strength and corresponding safe net allowable bearing pressure, the suitable target founding stratum has been identified as the underlying stiff to very stiff CLAY, which in the area of the proposed showroom is at ca.1.5 m to 1.8 m bgl, although it should also be noted that some locations did not penetrate the Made Ground due to obstructions. Where the natural strata were recorded, exploration locations within the vicinity of the showroom indicate ABPs range from 131 kN/m² at ca. 1.5 m bgl to 227 kN/m² at 4.0 m.

However, before the detailed design of a suitable foundations solution, a programme of remediation and enabling works will be required to remove buried obstructions and cut/fill the site to provide suitable development platform levels.

Depending on the precise depth of Made Ground encountered beneath the proposed units, it may be possible to utilise shallow pad foundations to support the portal frame of the proposed commercial/industrial building.



If below ground obstructions mean that a greater depth of Made Ground is present, then upon completion of these enabling works, then most cost-effective option for the majority of the site would be to re-engineer the Made Ground using vibro-stone columns (VSCs) to support pad foundation.

E3P has prepared a ground improvement design risk matrix, summarised in Table 6.2, to ensure that the ground conditions have been proven by the intrusive site investigation are satisfactory to facilitate the appropriate stabilisation.

TABLE 6.2 GROUND IMPROVEMENT DESIGN RISK MATRIX

Risk Item	Comment	Pass/Fail
Soft clays with an undrained shear strength less than 30 kN/m²	CLAY soils are generally firm to stiff with $C_u > 30 \text{ kN/m}^2$	PASS
Ground with peat layers close to foundation level or the base of the stone column, or where intermediate layers of peat are thicker than 200 mm, either as a single layer or the sum of the thicknesses of individual layers throughout the length of the stone column	None identified	PASS
Voided filled ground, e.g. old water tanks, pottery, glass bottles, concrete rubble or brick fill of unsuitable grading	The ground investigation has identified obstructions and former sandstone floor slabs in the area of the proposed sales showroom. These will need to be excavated and removed.	PASS – on completion of enabling works
Loose or non-engineered fill not previously subject to rising or fluctuating water levels saturation	Made Ground is present across the entire site to depths of typically 1 to 1.5m. These are likely to be have subject to varying water levels due to perching on the underlying clay.	Pass
Filled ground still settling or expected to settle under its own weight or due to the effects of surcharging/upfilling where there is a high organic content or where decay is continuing	None identified	PASS
Fill, containing degradable material where organic material forms more than 15% of fill by volume	None identified.	PASS
Clays with a plasticity index greater than 40%	None identified.	PASS
Highly sensitive soils liable to collapse or remoulding	None identified.	PASS
Cohesive soils with trees in influencing distance	No trees are present in the area of the proposed show room.	PASS
Overall Risk Rating and Suitability for Vibratory Ground Improvement		PASS



5.3. GROUND FLOOR SLABS

Where a ground-bearing floor slab is to be constructed within the conjectured zone of tree influence, any shallow clay will need to be removed to ensure that any desiccated soil cannot swell and induce heave to the structure. Alternatively, it may be possible to design the structure to resist the influence of clay heave using an exaggerated sub-base and additional reinforcement within the slab to be designed by the structural engineer.

Depending on the design requirements of the proposed commercial units, it may be possible to utilise either a suspended or cast in-situ floor slab.

5.4. HIGHWAYS CONSTRUCTION

A programme of remediation and enabling works will be required to remediate the proposed road subgrade in accordance with the requirements of the Manual of Contract Documents for Highway Works Volume 1 Specification For Highway Works (Series 600-Earthworks) for a method compaction.

As there will be a requirement to upfill the site to achieve site levels, it is considered likely that this will be achieved using site won granular fill or imported recycled aggregates. It is considered that the material can be re-engineered using method compaction to achieve a CBR in excess of 5% if works are completed in favourable climatic conditions.

5.5. DRAINAGE

The presence of substantial depths of Made Ground across some areas of the site may result in settlement. It is therefore recommended that drain runs are designed using steeper gradients and flexible joints to allow for some differential settlement.

Furthermore, the site is predominantly underlain by circa 1–2 m of likely low-permeability gravelly CLAY. Therefore, the use of soakaway drainage will be limited, and as the lateral continuity of the Made Ground cannot be assured, it is not recommended that soakaways are utilised for disposal of surface water runoff.

If soakaway drainage is to be considered, full BRE 365 testing must be completed to inform the detailed design.

5.6. CONCRETE DURABILITY

Previous assessment has indicated elevated sulphate concentrations meeting Class DS-2.

5.7. EXCAVATIONS

Due to the depth and variability of the Made Ground and likelihood of trench collapse, it is considered that all excavations are supported or battered back in accordance with guidance contained in CIRIA R97.

If local pumping of groundwater is required during the advancement of excavations for the proposed foundations then consideration should be given to the potential for dewatering gravels in the surrounding areas that may cause structural damage to building substructures in close proximity to the site.



TABLE 6.5 CIVIL ENGINEERING EXCAVATION RISK MATRIX

RISK ITEM	PRESENT	COMMENT
Running Sands	No	No running sand has been identified.
Minor Water Ingress	Yes	Mine water ingress will require localised dewatering/sump pumping during the construction of site drainage infrastructure. Ingress of water into foundation excavation will potentially flood foundation excavations, limiting the viability of spread foundations to be constructed.
Shallow Bedrock	No	None identified.

5.8. CONSTRUCTION ACTIVITY AND INSPECTION

The following activities and inspections should be incorporated into the site works:

- Due to the variability of the soils at the site, it is recommended that sufficient allowance is made for the inspection of formations and sub-formations to foundations and pavement construction.
- Excavations, where access is required, should be subject to a risk assessment from a competent person and, where appropriate, mitigation measures such as benching back the sides or use of support systems in accordance with CIRIA R97 should be utilised.
- It is considered that dewatering may be required, especially following periods of heavy rainfall. Removal of surface water and water within trenches should be possible with conventional sump pumping. Discharge of any water should be agreed with the relevant regulatory body and be undertaken under a trade effluent discharge, where required. Measures to remove silt and suspended solids may be required and consideration should be given to the provision of space for settling tanks or an attenuation pond.
- Where access to confined spaces is required, appropriate mitigation measures should be addressed within the construction stage health and safety plan. Particular account should be taken of the gas results.
- The presence of potential contamination and mitigation measures should be addressed as part of the construction stage health and safety plan and should include measures to design out the risks, reduce their impact and, finally, include the use of personnel protective equipment (PPE).



6. CONCLUSIONS AND RECOMMENDATIONS

6.1. CONTAMINATED LAND ASSESSMENT

Human Health	The results of the tier 1 comparison indicates that there are no exceedances when compared with the screening criteria for a commercial end-use. Previous site investigations (both the LK Consult and E3P investigations) encountered soils with between <0.001% to 0.097% asbestos and have also noted localised areas of ACM within the Made Ground. Asbestos impacted soils should be managed according to the asbestos risk mitigation conceptual site model.
Controlled Waters	The results of the data review and Tier 1 qualitative risk assessment has allowed E3P to draw the following conclusions in respect to the risk to controlled waters: ✳ There have been multiple phases of ground investigation, this has enabled reasonable characterisation of the pollution risk and potential to impact the critical receptors. ✳ The primary receptors are identified as the culverted brook (Wrigley Brook) in the west of the site and the underlying secondary A aquifer. ✳ The presence and nature of the onsite culvert is currently unknown therefore further investigation is likely required. ✳ As part of the anticipated programme of remediation and enabling works, large volumes of Made Ground soils are to be removed and/or treated to remove frag wastes and other unsuitable materials and in doing so, this will likely remove potential source of the metalloid and PAH impact on site. ✳ The site is a public open space consisting of soft standing surface cover which allows for extensive infiltration of rainfall into underlying Made Ground soils. ✳ The proposed development will comprise predominantly hardstanding which will significantly reduce the infiltration to the underlying Made Ground and therefore reducing the leachability of the contaminants.
Ground Gas	Previous ground gas monitoring undertaken by LK Consult indicates that the site can be classified as CS1 based on the low sensitivity commercial development and therefore no ground gas protection measures will be required. This will need to be approved prior by the LABC prior to the construction of the proposed commercial development.



Potable Water

This will need to be confirmed following the completion of a UKWIR risk assessment. Post-remediation and enabling works ground conditions may be different from those identified during this site investigation. Based on existing chemical sampling, it is likely that barrier pipe will be required at the proposed development.

6.2. OUTLINE REMEDIATION STRATEGY

Foundations associated with any proposed showroom will depend largely on where the building is located but it is likely that the drift will provide a suitable founding stratum. Given the depth of Made Ground in some areas of the eastern sector, it is likely that an engineered foundation (Vibro Stone Column) solution will be required.

With respect to the remainder of the site, the area is proposed as hardstanding and based on the data reported in the LK report and the ground conditions encountered by E3P it is considered that near-surface organic top-soil and upper Made Ground horizon will need to be removed (Ca.500mm) and the underlying Made Ground sorted and processed to an engineered specification with the shortfall in material made up with imported engineered material again to be laid in accordance with an engineered specification.

E3P observed the presence of 'frag' wastes within the central area of the western sector and this will be excavated and removed from the site (in its entirety). E3P estimate approximately 250 m³ based on an area of ca.100 m² by an average thickness of 2.5 m deep. This material will need to be removed off-site and is likely to be classified as Hazardous Waste.

A Cut/Fill Volumetric Appraisal of the site is presented in Appendix III. This indicates that the removal of top-soil and the upper horizons of Made Ground will equate to approximately 6043 m³ for off-site disposal. The majority of the material is likely to be inert but an allowance for some Hazardous Waste disposal (ca.5% = 300 m³) should be made based upon the findings of the LK and E3P site investigation reports.

The above works and the requirement to level the site will result in a net shortfall of approximately 7223 m³ at the site in order to deliver a suitable development platform. This will need to be achieved through the importation of chemically and geotechnically suitable engineered fill.

The site remediation and enabling works that may be required to negate the potential pollutant linkages and construct a development platform are summarised below:



- ✳ Cut / fill the site to required levels;
- ✳ Excavate and remove fragmentiser waste from the north-western sector of the site;
- ✳ Remove near-surface material and top-soil;
- ✳ Excavation and management of all identified ACM (if any) in accordance with detailed approved working methodologies to ensure no fibre release;
- ✳ Disposal of unsuitable or excess material off-site;
- ✳ Importation of clean suitable material to make up site levels;
- ✳ Placement of soils to required formation levels to achieve 'end product' compaction specification to support optimal foundations and hardstanding;
- ✳ Validation of materials placement to confirm suitability;
- ✳ All work is to be undertaken in strict accordance with UK Environmental Permitting and Local Planning Authority Requirements.
- ✳ The developers may also require the completion of further mitigation measures depending on layout including:
 - Provision of a 300 mm cover system within areas of public open space;
 - Provision of appropriately protected water supply pipes.

6.3. SUMMARY & CONCLUSIONS

E3P monitored the preliminary Ground Investigation works completed by LKC in conjunction with the E3P supplementary / confirmatory investigations which included an assessment of contamination risk within the context of the proposed development and intended retail use.

It is apparent that notable waste materials associated with the dismantling of motor vehicles remain, this is a significant pollution liability and therefore further clarification is sought from the landowner in respect to their Waste Management License surrender and proposals to address this hazardous material.

The site is overlain by a variable horizon of organic topsoil with significant anthropogenic influence and critically asbestos, this material is unsuitable for recovery and re-use and given the poor geotechnical properties, this cannot be re-used in construction.

In light of the above, the preferred remediation solution is considered to be the excavation and off-site disposal of waste from the former scrap yard to a licensed facility in its entirety.

The only material that is permissible to remain is anthropogenic and natural soils that are not considered to represent waste materials that were derived from the scrap yard operations.

Summary of suggested land remediation works to remove waste materials:

- 1) Demarcation of all Made Ground identified to be impacted by fragmented waste from scrap yard operations;



- 2) Excavation and removal of fragmented waste to a licensed facility under the supervision of an independent environmental consultant;
- 3) Validation of the resulting excavation to confirm the removal of fragmented by photographic record and sampling of the sub-formation to confirm the absence of any residual impact.

The site will be considered to have been remediated as and when the fragmented waste derived from the former operations regulated under the WML has been removed.

END OF REPORT



APPENDIX I

LIMITATIONS

1. This report and its findings should be considered in relation to the terms of reference and objectives agreed between E3P and the client as indicated in Section 1.3.
2. For the work, reliance has been placed on publicly available data obtained from the sources identified. The information is not necessarily exhaustive and further information relevant to the site may be available from other sources. When using the information it has been assumed it is correct. No attempt has been made to verify the information.
3. This report has been produced in accordance with current UK policy and legislative requirements for land and groundwater contamination which are enforced by the local authority and the Environment Agency. Liabilities associated with land contamination are complex and requires advice from legal professionals.
4. During the site walkover, reasonable effort has been made to obtain an overview of the site conditions. However, during the site walkover, no attempt has been made to enter areas of the site that are unsafe or present a risk to health and safety, are locked, barricaded, overgrown, or the location of the area has not been made known or accessible.
5. Access considerations, the presence of services and the activities being carried out on the site limited the locations where sampling locations could be installed and the techniques that could be used.
6. Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities.
7. Where mention has been made to the identification of Japanese Knotweed and other invasive plant species and asbestos or asbestos-containing materials, this is for indicative purposes only and do not constitute or replace full and proper surveys.
8. The executive summary, conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the report in full.
9. E3P cannot be held responsible for any use of the report or its contents for any purpose other than that for which it was prepared. The copyright in this report and other plans and documents prepared by E3P is owned by them and no such plans or documents may be reproduced, published or adapted without written consent. Complete copies of this may, however, be made and distributed by the client as is expected in dealing with matters related to its commission. Should the client pass copies of the report to other parties for information, the whole report should be copied, but no professional liability or warranties shall be extended to other parties by E3P in this connection without their explicit written agreement there to by E3P.
10. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.



APPENDIX II

GLOSSARY

TERMS

ACM	Asbestos-containing material	MMP	Materials management plan
ADS	Acoustic design statement	ND	Not detected
AST	Above-ground storage tank	NDP	Nuclear density probe
BGS	British Geological Survey	NMP	Noise management plan
BSI	British Standards Institute	NPSE	Noise policy statement for England
BTEX	Benzene, toluene, ethylbenzene, xylenes	NR	Not recorded
CA	Coal Authority	PAH	Polycyclic aromatic hydrocarbon
CBR	California bearing ratio	PCB	Polychlorinated biphenyl
CIEH	Chartered Institute of Environmental Health	PI	Plasticity index
CIRIA	Construction Industry Research Association	PID	Photo ionisation detector
CLEA	Contaminated land exposure assessment	POS	Public open space
CML	Council of Mortgage Lenders	PPE	Personnel protective equipment
CoC	Contaminants of concern	ProPG	Professional practice guidance
CSM	Conceptual site model	QA	Quality assurance
DNAPL	Dense non-aqueous phase liquid (chlorinated solvents, PCB)	SGV	Soil guideline value
DWS	Drinking water standard	SPH	Separate-phase hydrocarbon
EA	Environment Agency	SPT	Standard penetration test
EQS	Environmental quality standard	SVOC	Semi-volatile organic compound
FFL	Finished floor level	TPH	Total and speciated petroleum hydrocarbon
GAC	General assessment criteria	TPH CWG	Total Petroleum Hydrocarbon (Criteria Working Group)
GL	Ground level	UKWIR	United Kingdom Water Infrastructure Risk
GSV	Gas screening value	UST	Underground storage tank
HCV	Health criteria value	VCC	Vibro-concrete column
ICSM	Initial conceptual site model	VOC	Volatile organic compound
LEL	Lower explosive limit	VRSC	Vibro-replacement stone columns
LMRL	Lower method reporting limit	VSC	Vibro-stone columns
LNAPL	Light non-aqueous phase liquid (petrol, diesel, kerosene)	WHO	World Health Organisation
MCV	Moisture condition value	WRAP	Waste and Resources Action Programme



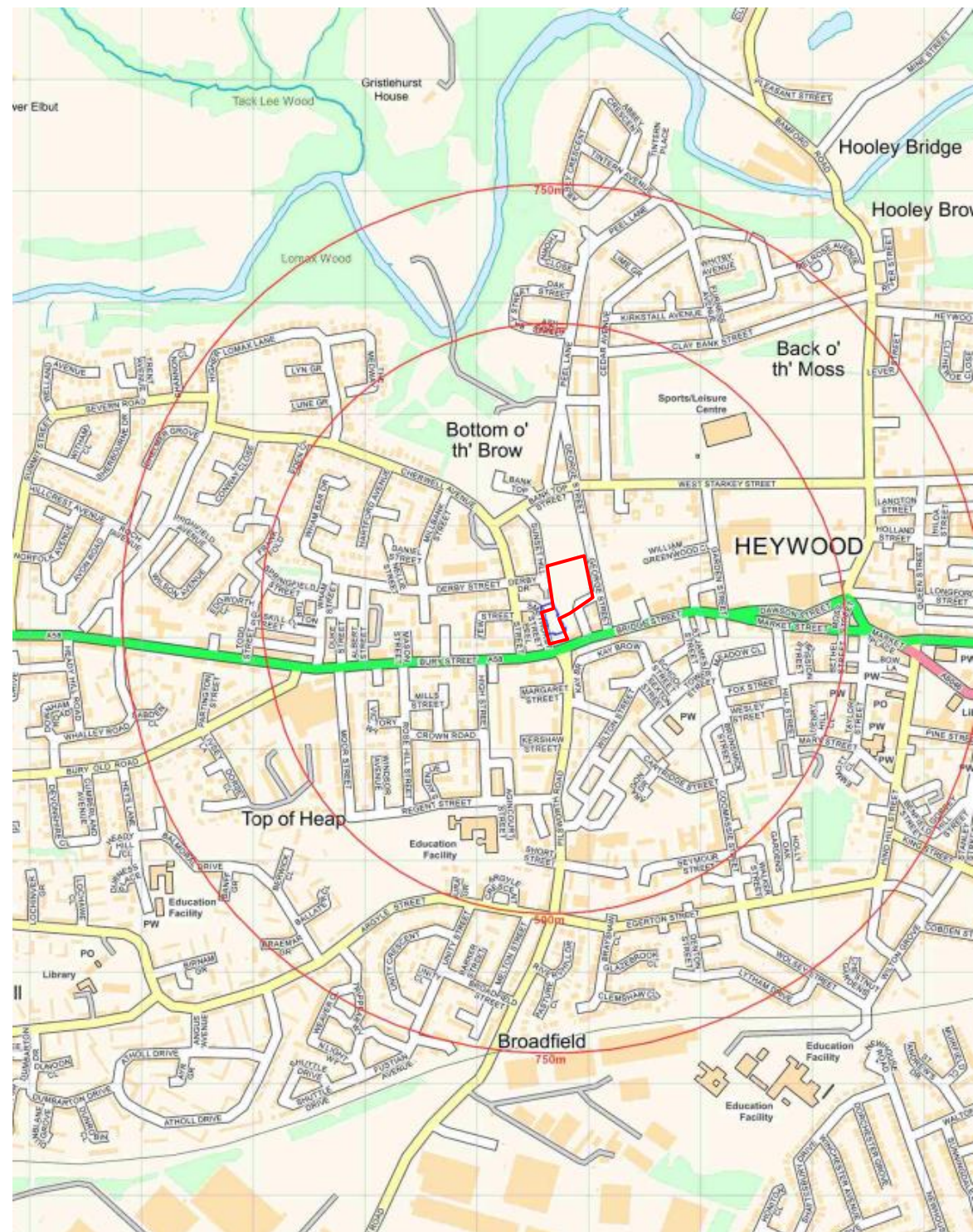
MIBK	Methyl isobutyl ketone	WTE	Water table elevation
m	Metres	ppm	Parts per million
km	Kilometres	mg/m³	Milligram per metre cubed
% v/v	Percent volume in air	m bgl	Metres below ground level
mb	Millibars (atmospheric pressure)	m bcl	Metre below cover level
l/hr	Litres per hour	mAOD	Metres above ordnance datum (sea level)
µg/l	Micrograms per litre (parts per billion)	kN/m²	Kilonewtons per metre squared
ppb	Parts per billion	µm	Micrometre
mg/kg	Milligrams per kilogram (parts per million)	SSRT	Site Specific Remediation Target
PSD	Particle Size Distribution	DD	Dry Density
CL:AIRE	Contaminated Land: Applications in Real Environments	Mc	Moisture Content
ρ	Bulk Density	GPR	Ground Penetrating Radar
NDP	Nuclear Density Probe	FFL	Finished Floor Level
LEL	Lower Explosive Limit	UKWIR	UK Water Industry Research
CIRIA	Construction Industry Research and Information Association	LOD	Limit of Detection

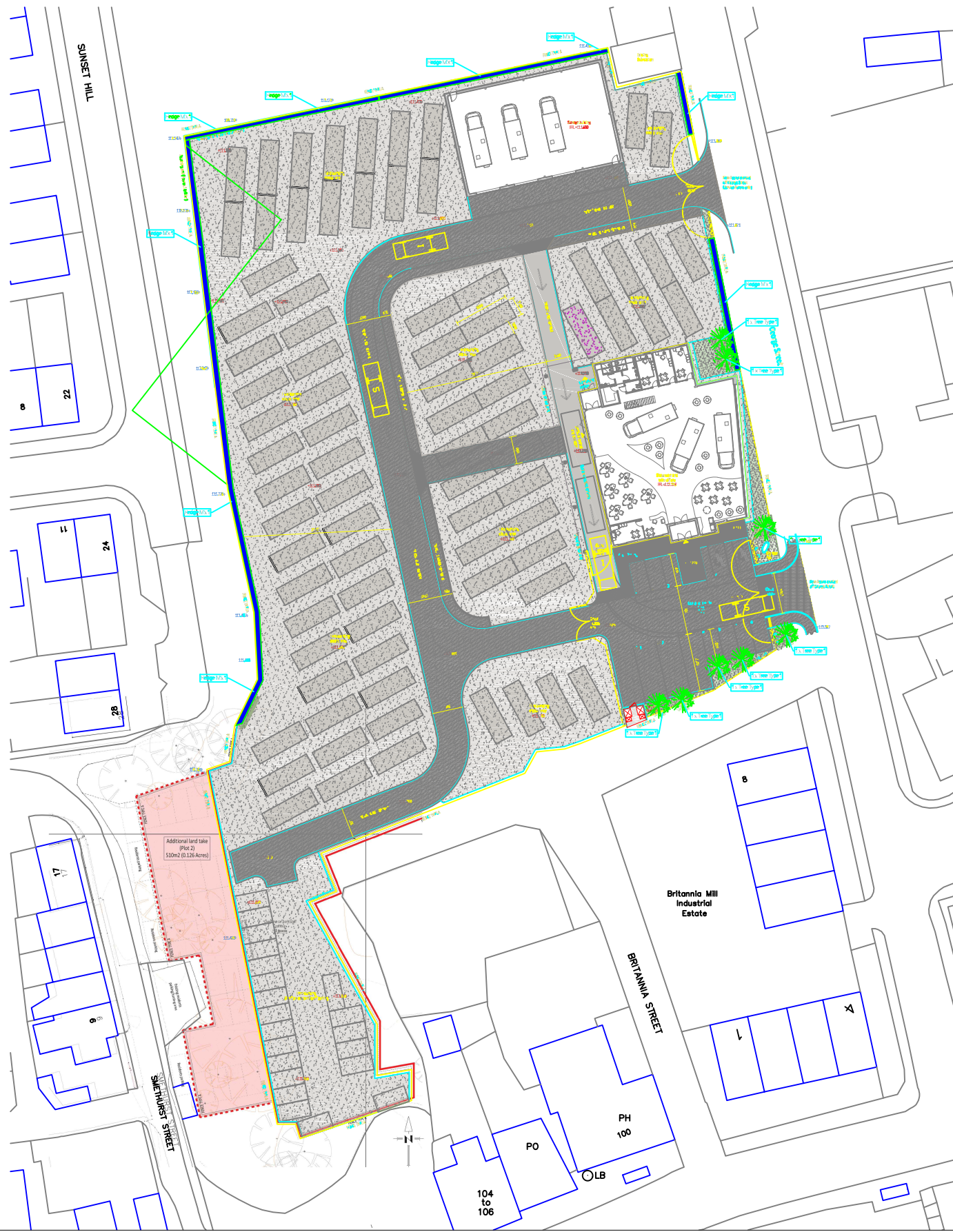


APPENDIX III

DRAWINGS

DRAWING 13-224-001 – SITE LOCATION PLAN





Notes:				
P1	REVC	28.02.2022	HM	ND
P1	REVB	21.02.2022	LM	ND
P1	REVA	16.11.2021	EB	AE
Phase	Issue	Date	Drawn	Checked

Client:	Fleet Grace
Job Title:	George Street, Heywood

Job No:	13-224
Drawing No:	002

Date:	28.02.2022
Scale:	NTS@ A3



Environmental Engineering Partnership Ltd
Taylor Road, Trafford Park
Urmston, Manchester, M41 7JQ
Tel: 0161 707 9612
E-mail: info@e3p.co.uk
Website: www.e3p.co.uk

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Historical Features Former Reservoir Former Brook Former Housing Former Mill Former Mill Former Mill Former Scrap Yard Buildings Former Building Former Weighing Machine Former Tank Electricity Substation Former Road Former Field Boundary Former Scrapyard		Notes:					Client: Fleet Grace		Job No: 13-224 Drawing No: 003		Date: 28.02.2022 Scale: NTS@ A3		e3p Environmental Engineering Partnership Ltd Taylor Road, Trafford Park Urmston, Manchester, M41 7JQ Tel: 0161 707 9612 E-mail: info@e3p.co.uk Website: www.e3p.co.uk	
		P1 REVC 28.02.2022 HM AE P1 REVB 21.02.2022 LM ND P1 REVA 16.11.2021 EB AE					Job Title: George Street, Heywood		Drawing Title: Historical Features Plan		The client must not amend any drawing, design or other intellectual property produced by E3P Ltd without permission in writing from E3P Ltd in advance of any amendments being made. In the event that such written permission is not obtained in advance of the amendments being made, E3P Ltd shall not be liable for any damage and/or losses occurring as a result of the amended drawing, design or intellectual property.			
		Phase Issue Date Drawn Checked												



Site Features

-  Rough Grass
-  Trees / Vegetation
-  Tarmac
-  Electricity Substation

Notes:

P1	REVB	22.02.2022	LM	ND
P1	REVA	16.11.2021	EB	AE
Phase	Issue	Date	Drawn	Checked

Client:

Fleet Grace

Job Title:

George Street,
Heywood

Job No:

13-224

Drawing No:

004

Date:

22.02.2022

Scale:

NTS@ A3

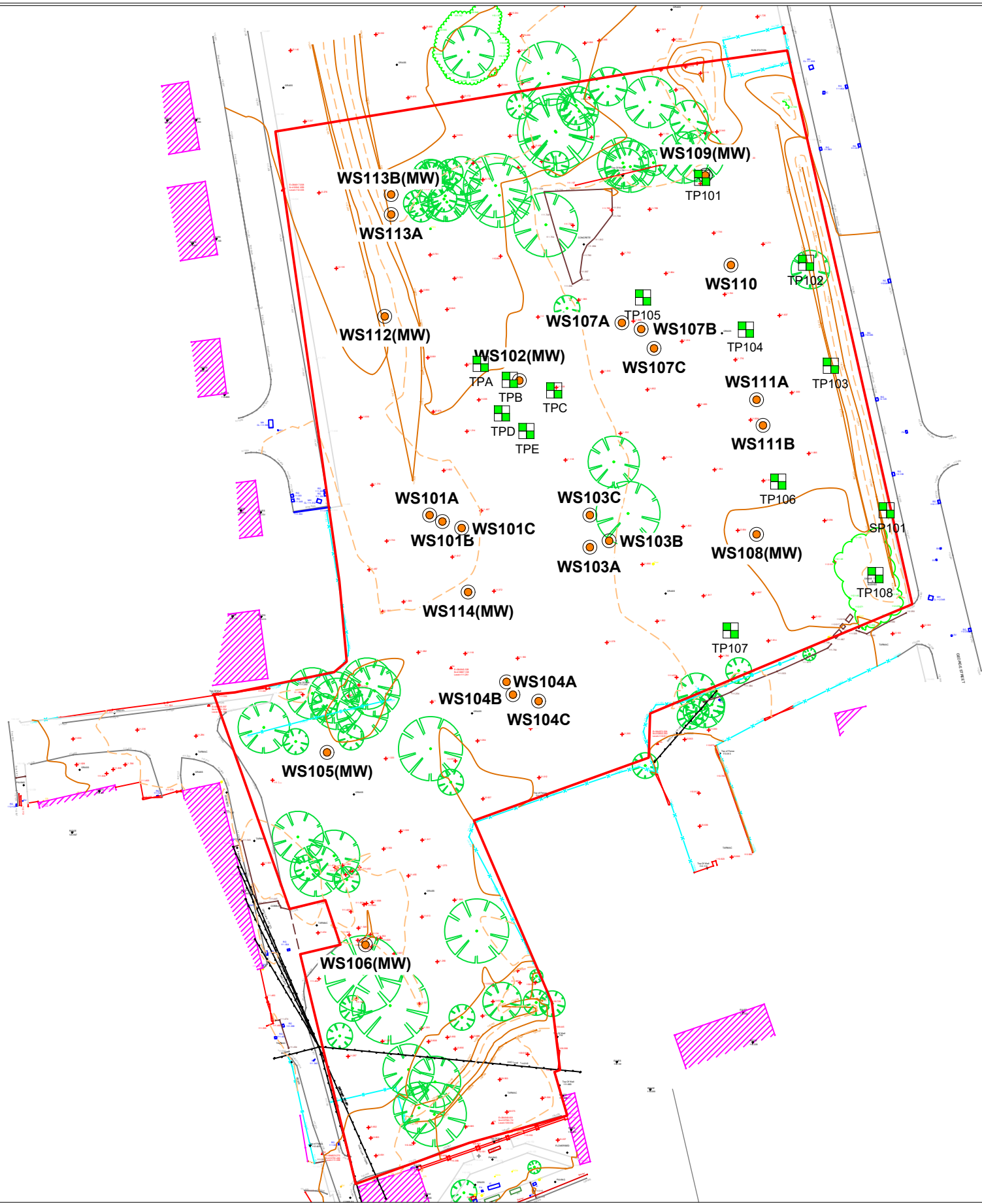
Drawing Title:

Site Features Plan



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Location Symbols

-  Approximate Window Sample Probehole Location
-  Approximate Window Sample Probehole Location with Install
-  Approximate Trial Pit Location (E3P - March 2019)

Notes:

P1	REVC	28.02.2022	HM	AE
P1	REVB	18.02.2022	EB	ND
P1	REVA	10.12.2021	EB	ND
Phase	Issue	Date	Drawn	Checked

Client:

Fleet Grace

Job Title:

George Street,
Heywood

Job No:

13-224

Drawing No:

005

Date:

28.02.2022

Scale:

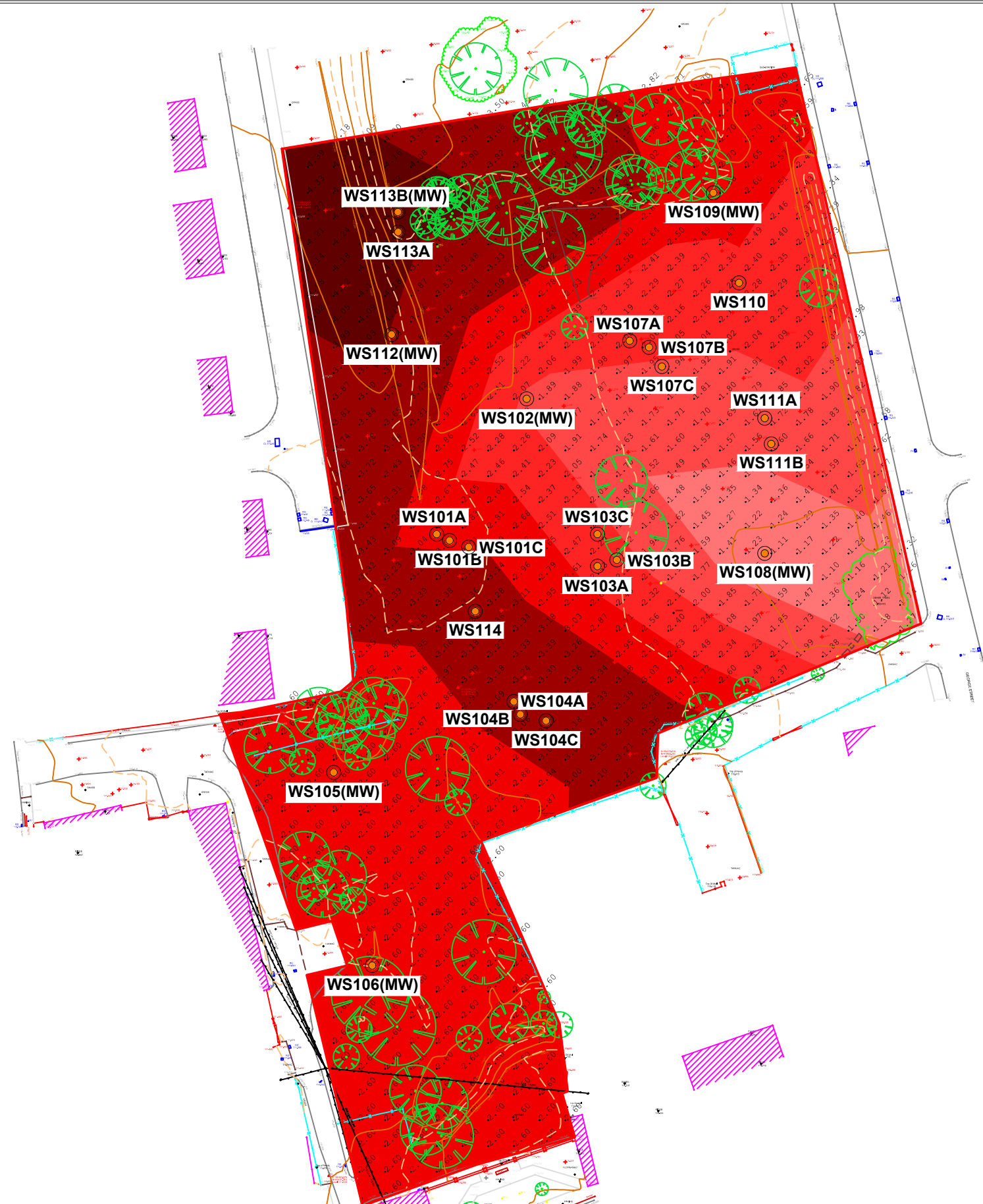
NTS@ A3



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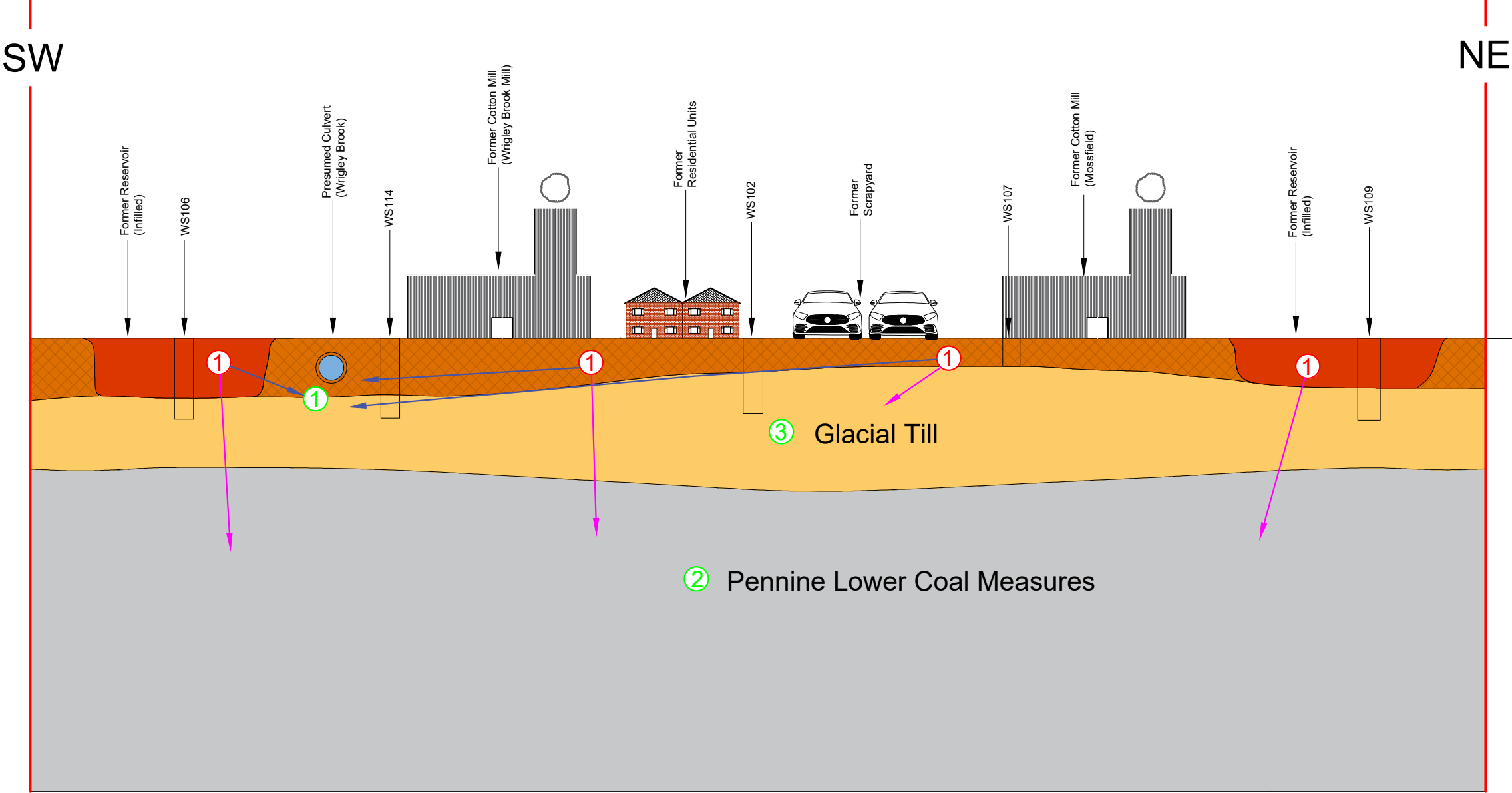
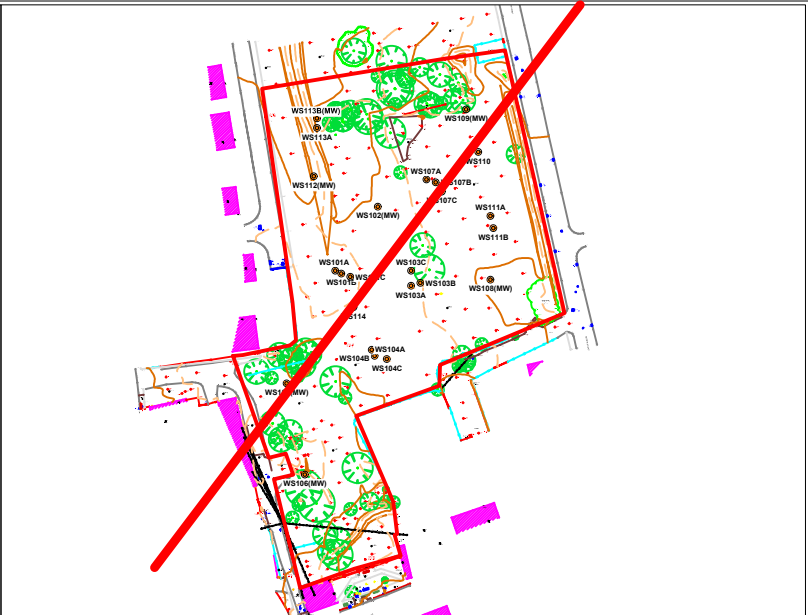
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Exploratory Hole
Location Plan

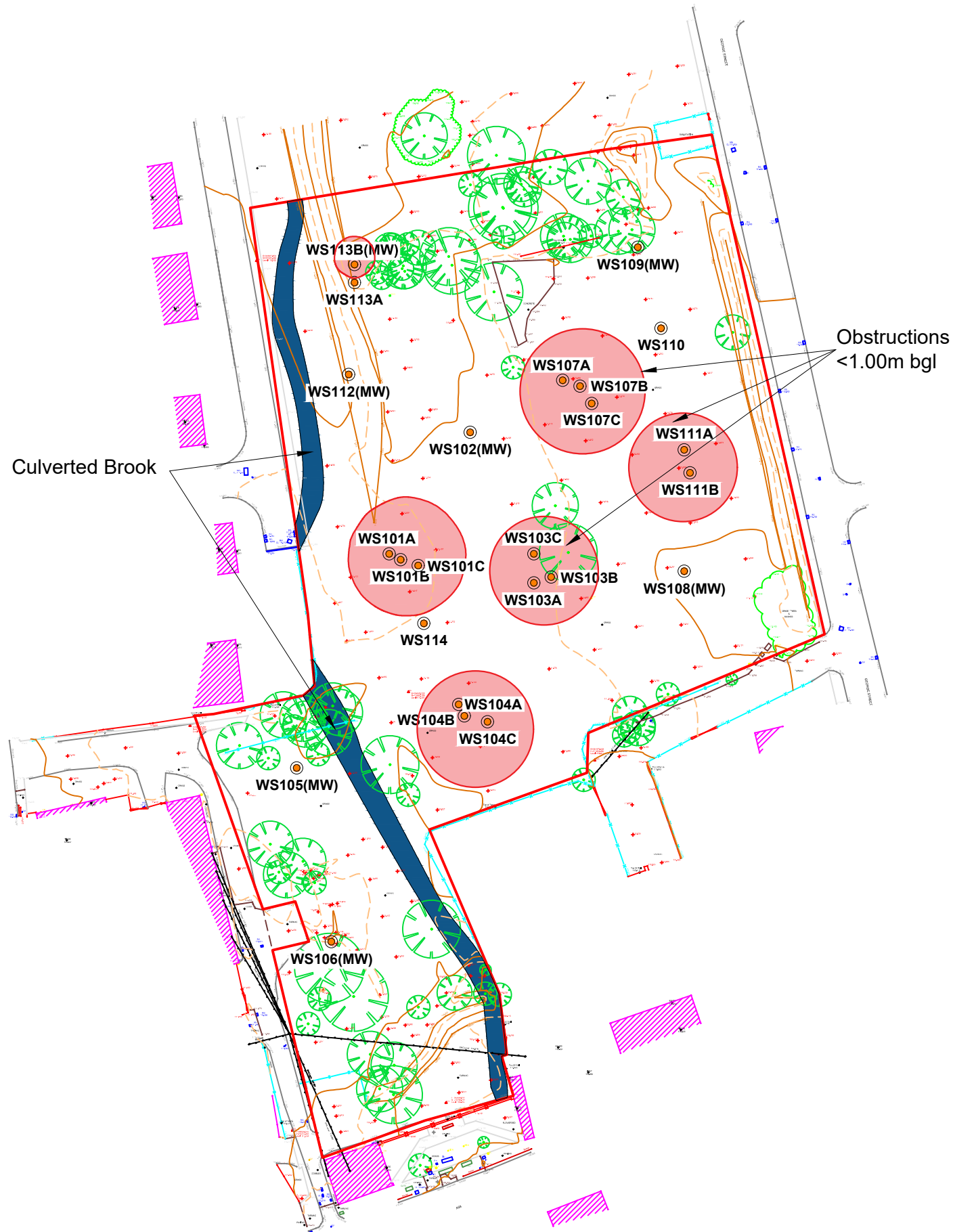


Location Symbols		Made Ground Depth (m)		Notes:		Client: Fleet Grace		Job No: 13-224		Date: 25.02.2022		Environmental Engineering Partnership Ltd Taylor Road, Trafford Park Urmston, Manchester, M41 7JQ Tel: 0161 707 9612 E-mail: info@e3p.co.uk Website: www.e3p.co.uk			
 Approximate Window Sample Probehole Location  Approximate Window Sample Probehole Location with Install		 Depth of Made Ground 0.00 - 0.49m  Depth of Made Ground 0.50 - 0.99m  Depth of Made Ground 1.00 - 1.49m  Depth of Made Ground 1.50 - 1.99m  Depth of Made Ground 2.00 - 2.49m  Depth of Made Ground 2.50 - 2.99m  Depth of Made Ground 3.00 - 3.49m  Depth of Made Ground 3.50 - 3.99m  Depth of Made Ground >4.00m						P1 P1 REV B REV A 25.02.2022 22.02.2022 EB LM EF ND Phase Issue Date Drawn Checked		Job Title: George Street, Heywood				Drawing No: 006	
												Drawing Title: Depth of Made Ground Plan		The client must not amend any drawing, design or other intellectual property produced by E3P Ltd without permission in writing from E3P Ltd in advance of any amendments being made. In the event that such written permission is not obtained in advance of the amendments being made, E3P Ltd shall not be liable for any damage and/or losses occurring as a result of the amended drawing, design or intellectual property.	

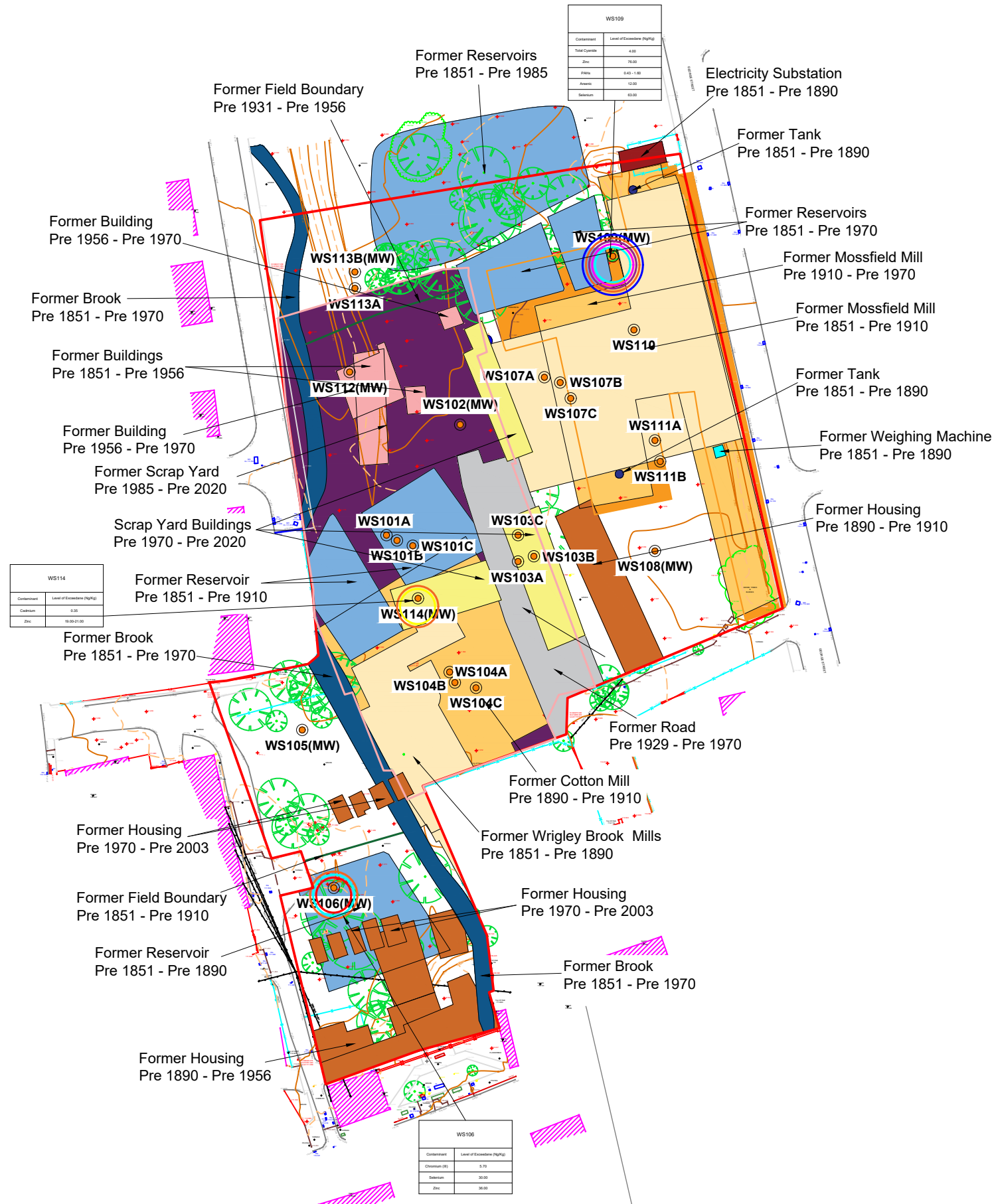
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Geology Key Made Ground Infilled Pond Till Pennine Lower Coal Measures Electricity Substation	Sources ① Made Ground	Pathways Vertical Migration Vertical Migration	Receptors ① Surface Water (Culverted Brook) ② Secondary A Bedrock Aquifer ③ Undifferentiated Drift Aquifer	Notes:					Client: Leydon Kirby		Job No: 13-224	Date: 21.02.2022	e3p Environmental Engineering Partnership Ltd Taylor Road, Trafford Park Urmston, Manchester, M41 7JQ Tel: 0161 707 9612 E-mail: info@e3p.co.uk Website: www.e3p.co.uk				
											Drawing No: 010	Scale: NTS					
				P1 P1					REVB REVA	21.02.2022 29.11.2021	LM HM	LM HM		Job Title: Emm Bee Motorhomes		Drawing Title: Conceptual Site Model	The client must not amend any drawing, design or other intellectual property produced by E3P Ltd without permission in writing from E3P Ltd in advance of any amendments being made. In the event that such written permission is not obtained in advance of the amendments being made, E3P Ltd shall not be liable for any damage and/or losses occurring as a result of the amended drawing, design or intellectual property.
				Phase					Issue	Date	Drawn	Checked					



Location Symbols  Approximate Window Sample Probehole Location  Approximate Window Sample Probehole Location with Install Development Constraints  Culverted Brook  Obstruction <1.00m bgl					Notes:					Client: Fleet Grace		Job No: 13-224		Date: 18.02.2022		Environmental Engineering Partnership Ltd Taylor Road, Trafford Park Urmston, Manchester, M41 7JQ Tel: 0161 707 9612 E-mail: info@e3p.co.uk Website: www.e3p.co.uk	
										Drawing No: 015		Scale: NTS@ A3					
					Job Title: George Street, Heywood					Drawing Title: Development Constraints Plan		The client must not amend any drawing, design or other intellectual property produced by E3P Ltd without permission in writing from E3P Ltd in advance of any amendments being made. In the event that such written permission is not obtained in advance of the amendments being made, E3P Ltd shall not be liable for any damage and/or losses occurring as a result of the amended drawing, design or intellectual property.					
P1 REVA 21.02.2022 LM ND																	
Phase Issue Date Drawn Checked																	



Location Symbols

- WS101 Approximate Window Sample Probehole Location
- WS113(MW) Approximate Window Sample Probehole Location with Install

Groundwater Analysis

- Arsenic
- PAHs
- Cadmium
- Chromium (III)
- Selenium
- Zinc
- Total Cyanide

Notes:

P1	REVB	28.02.2022	HM	ND
P1	REVA	21.02.2022	LM	ND
Phase	Issue	Date	Drawn	Checked

Client:

Fleet Grace

Job Title:

George Street,
Heywood

Job No:

13-224

Drawing No:

018

Date:

28.02.2022

Scale:

NTS@ A3

Drawing Title:

Contamination
Exceedances Plan



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APPENDIX IV

E3P EXPLORATORY HOLE

LOGS



Borehole Log

Borehole No.

WS101A

Sheet 1 of 1

Project Name: George Street

Project No.
13224

Co-ords: 384938.00 - 410894.00

Hole Type
WS

Location: Heywood

Level:

Scale
1:50

Client: Fleetgrace Ltd

Dates: 09/12/2021 -

Logged By
J.Beer

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.15			MADE GROUND: Brown sandy gravelly clay with frequent rootlets. Gravel is fine to medium sub angular to sub rounded of mudstone, sandstone and brick. (Topsoil). MADE GROUND: Brown clayey very gravelly fine to medium sand. Gravel is fine to coarse angular to sub rounded of mudstone, sandstone, brick, ceramic, glass and asphalt. End of borehole at 0.50 m	
					0.50				
									1
									2
									3
									4
									5
									6
									7
									8
									9
									10

Remarks

1. Terminated. 2. Refusal on sandstone cobble at 0.50 m bgl.





Borehole Log

Borehole No.

WS101B

Sheet 1 of 1

Project Name: George Street

Project No.
13224

Co-ords: 384841.00 - 410893.00

Hole Type
WS

Location: Heywood

Level:

Scale
1:50

Client: Fleetgrace Ltd

Dates: 09/12/2021 -

Logged By
J.Beer

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.30	ES		0.15 0.50			MADE GROUND: Brown sandy gravelly clay with frequent rootlets. Gravel is fine to medium sub angular to sub rounded of mudstone, sandstone and brick. (Topsoil). MADE GROUND: Brown clayey very gravelly fine to medium sand. Gravel is fine to coarse angular to sub rounded of mudstone, sandstone, brick, ceramic, glass and asphalt. End of borehole at 0.50 m	1 2 3 4 5 6 7 8 9 10

Remarks

1. Terminated. 2. Refusal on sandstone cobble at 0.50 m bgl.





Borehole Log

Borehole No.

WS101C

Sheet 1 of 1

Project Name: George Street

Project No.
13224

Co-ords: 384948.00 - 410895.00

Hole Type
WS

Location: Heywood

Level:

Scale
1:50

Client: Fleetgrace Ltd

Dates: 09/12/2021 -

Logged By
J.Beer

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.15			MADE GROUND: Brown sandy gravelly clay with frequent rootlets. Gravel is fine to medium sub angular to sub rounded of mudstone, sandstone and brick. (Topsoil).	
					0.50			MADE GROUND: Brown clayey very gravelly fine to medium sand. Gravel is fine to coarse angular to sub rounded of mudstone, sandstone, brick, ceramic, glass and asphalt. End of borehole at 0.50 m	1
									2
									3
									4
									5
									6
									7
									8
									9
									10

Remarks

1. Terminated. 2. Refusal on sandstone cobble at 0.50 m bgl.



Borehole Log

Borehole No.

WS102

Sheet 1 of 1

Project Name: George Street

Project No.
13224

Co-ords: 384956.00 - 410916.00

Hole Type
WS

Location: Heywood

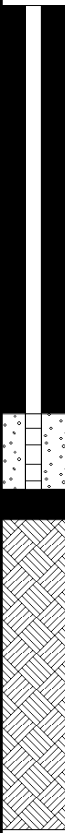
Level:

Scale
1:50

Client: Fleetgrace Ltd

Dates: 09/12/2021 -

Logged By
J.Beer

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.15			0.15			MADE GROUND: Brown slightly clayey gravelly fine to medium sand with frequent rootlets and occasional roots. Gravel is fine to medium angular to sub rounded of mudstone, sandstone, brick and glass. (Topsoil).	
		0.50			0.50			MADE GROUND: Greyish brown very gravelly fine to coarse sand. Gravel is fine to coarse angular to sub rounded of mudstone, sandstone, brick, ceramic, glass, metal, plastic and textile.	
		1.00	D	N=19 (3,3/4,5,5,5)	1.10			MADE GROUND: Blackish brown sandy gravel. Gravel is fine to coarse angular to sub rounded of mudstone, sandstone, brick, ceramic, and plastic.	1
		1.00	ES		1.10			MADE GROUND: Medium dense brownish black slightly clayey gravelly fine to coarse sand. Gravel is fine to medium angular to sub rounded of mudstone, sandstone, and brick.	
		1.20			1.60			MADE GROUND: Dark brown mottled light brown slightly clayey gravelly fine to medium sand with one cobble. Gravel is fine to medium sub angular to sub rounded of mudstone, sandstone and brick. Cobble is sub angular of sandstone.	
		2.00	D	N=11 (1,2/2,3,3,3)	1.90			Stiff medium strength brown silty CLAY.	2
		2.00			3.00			Dense brown slightly clayey fine to coarse sand. Limited recovery due to water strike at 3.00 m bgl. Becomes medium dense at circa 4.00m bgl.	
		3.00	D	N=35 (2,4/8,9,9,9)	3.00				3
		3.00			4.00				
		4.00	D	N=15 (2,2/3,3,4,5)	4.00				4
		4.00			5.00				
		5.00		N=13 (2,2/3,4,3,3)	5.00				5
					5.45			End of borehole at 5.45 m	6
									7
									8
									9
									10

Remarks

1. Complete. 2. Water strike at 2.00 m bgl. 3. Slight hydrocarbon odour at 1.20 m bgl. 4. Collapse from 5.00 m to 5.30 m bgl. 5. Monitoring well installed.



Borehole Log

Borehole No.

WS103A

Sheet 1 of 1

Project Name: George Street

Project No.
13224

Co-ords: 384966.00 - 410894.00

Hole Type
WS

Location: Heywood

Level:

Scale
1:50

Client: Fleetgrace Ltd

Dates: 09/12/2021 -

Logged By
J.Beer

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.10 0.20			MADE GROUND: Brown slightly clayey gravelly fine to medium sand with frequent rootlets and timber. Gravel is fine to medium sub angular to sub rounded of mudstone, sandstone and brick. MADE GROUND: Brown clayey very gravelly fine to medium sand. Gravel is fine to coarse angular to sub rounded of mudstone, sandstone, brick, ceramic, glass and concrete. End of borehole at 0.20 m	1
									2
									3
									4
									5
									6
									7
									8
									9
									10

Remarks

1. Terminated. 2. Refusal on concrete at 0.20m bgl, presumed relic structure/ concrete slab.





Borehole Log

Borehole No.

WS103B

Sheet 1 of 1

Project Name: George Street

Project No.
13224

Co-ords: 384969.00 - 410897.00

Hole Type
WS

Location: Heywood

Level:

Scale
1:50

Client: Fleetgrace Ltd

Dates: 09/12/2021 -

Logged By
J.Beer

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.10 0.20			MADE GROUND: Brown slightly clayey gravelly fine to medium sand with frequent rootlets and timber. Gravel is fine to medium sub angular to sub rounded of mudstone, sandstone and brick. MADE GROUND: Brown clayey very gravelly sand. Gravel is fine to coarse angular to sub rounded of mudstone, sandstone, brick, ceramic, glass and concrete. End of borehole at 0.20 m	1
									2
									3
									4
									5
									6
									7
									8
									9
									10

Remarks

1. Terminated. 2. Refusal on concrete at 0.20m bgl. presumed relic structure/ concrete slab.





Borehole Log

Borehole No.

WS103C

Sheet 1 of 1

Project Name: George Street

Project No.
13224

Co-ords: 384965.00 - 410903.00

Hole Type
WS

Location: Heywood

Level:

Scale
1:50

Client: Fleetgrace Ltd

Dates: 09/12/2021 -

Logged By
J.Beer

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.10 0.25			MADE GROUND: Brown slightly clayey gravelly fine to medium sand with frequent rootlets and timber. Gravel is fine to medium sub angular to sub rounded of mudstone, sandstone and brick. MADE GROUND: Brown clayey very gravelly sand. Gravel is fine to coarse angular to sub rounded of mudstone, sandstone, brick, ceramic, glass and concrete. End of borehole at 0.25 m	1 2 3 4 5 6 7 8 9 10

Remarks

1. Terminated. 2. Refusal on concrete at 0.25m bgl, presumed relic structure/ concrete slab.





Borehole Log

Borehole No.

WS104A

Sheet 1 of 1

Project Name: George Street

Project No.
13224

Co-ords: 384954.00 - 410863.00

Hole Type
WS

Location: Heywood

Level:

Scale
1:50

Client: Fleetgrace Ltd

Dates: 09/12/2021 -

Logged By
J.Beer

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.10			MADE GROUND: Brown sandy gravelly clay with frequent rootlets. Gravel is fine to medium sub angular to sub rounded of mudstone, sandstone and brick. (Topsoil). MADE GROUND: Brown clayey very gravelly fine to medium sand. Gravel is fine to coarse angular to sub rounded of mudstone, sandstone, brick, ceramic, glass and concrete. End of borehole at 0.30 m	
					0.30				
									1
									2
									3
									4
									5
									6
									7
									8
									9
									10

Remarks

1. Terminated. 2. Refusal on concrete at 0.30m bgl presumed relic structure/ concrete slab.





Borehole Log

Borehole No.

WS104B

Sheet 1 of 1

Project Name: George Street

Project No.
13224

Co-ords: 384956.00 - 410862.00

Hole Type
WS

Location: Heywood

Level:

Scale
1:50

Client: Fleetgrace Ltd

Dates: 09/12/2021 -

Logged By
J.Beer

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.10			MADE GROUND: Brown slightly clayey gravelly fine to medium sand with frequent rootlets and occasional roots. Gravel is fine to medium sub angular to sub rounded of mudstone, sandstone, brick, ceramic and glass. (Topsoil).	
					0.30			MADE GROUND: Brown clayey very gravelly fine to medium sand. Gravel is fine to coarse angular to sub rounded of mudstone, sandstone, brick, ceramic, glass and concrete. End of borehole at 0.30 m	1
									2
									3
									4
									5
									6
									7
									8
									9
									10

Remarks

1. Terminated. 2. Refusal on concrete at 0.30m bgl, presumed relic structure/ concrete slab.





Borehole Log

Borehole No.

WS104C

Sheet 1 of 1

Project Name: George Street

Project No.
13224

Co-ords: 384959.00 - 410860.00

Hole Type
WS

Location: Heywood

Level:

Scale
1:50

Client: Fleetgrace Ltd

Dates: 09/12/2021 -

Logged By
J.Beer

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.10			MADE GROUND: Brown sandy gravelly clay with frequent rootlets. Gravel is fine to medium sub angular to sub rounded of mudstone, sandstone and brick. (Topsoil).	
					0.30			MADE GROUND: Brown clayey very gravelly fine to medium sand. Gravel is fine to coarse angular to sub rounded of mudstone, sandstone, brick, ceramic, glass and concrete. End of borehole at 0.30 m	1
									2
									3
									4
									5
									6
									7
									8
									9
									10

Remarks

1. Terminated. 2. Refusal on concrete at 0.30m bgl, presumed relic structure/ concrete slab.



Borehole Log

Borehole No.

WS105

Sheet 1 of 1

Project Name: George Street

Project No.
13224

Co-ords: 384922.00 - 410855.00

Hole Type
WS

Location: Heywood

Level:

Scale
1:50

Client: Fleetgrace Ltd

Dates: 09/12/2021 -

Logged By
J.Beer

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10			0.10			MADE GROUND: Dark brown slightly gravelly fine to medium sand with frequent rootlets. Gravel is fine sub angular to sub rounded of mudstone and sandstone. (Topsoil).	
		0.90	ES		0.80			MADE GROUND: Dark brown very gravelly fine to medium sand. Gravel is fine to medium angular to sub rounded of mudstone, sandstone, brick and glass.	1
		1.00	D	N=4 (1,2/1,1,1,1)	1.00			MADE GROUND: Dark brown very gravelly fine to medium sand with pockets of light grey sandy clay. Gravel is fine to medium angular to sub rounded of mudstone, sandstone, brick and glass.	2
		2.00	D	N=2 (1,0/1,0,1,0)	2.60			MADE GROUND: Dark brown gravelly clayey fine to medium sand. Gravel is fine to coarse angular to sub rounded of mudstone, sandstone and brick.	3
		3.00	D	N=8 (1,0/1,2,2,3)	4.00			Firm low strength grey mottled light brown gravelly silty CLAY. Gravel is fine to coarse sub angular to sub rounded of mudstone.	4
		4.00	D	N=32 (4,6/7,8,8,9)	4.85			Very stiff high strength grey slightly gravelly silty CLAY. Gravel is fine to medium sub angular to sub rounded of mudstone. Becomes very stiff very high strength circa 4.85m bgl.	5
		4.85		50 (6,8/50 for 290mm)	5.30			End of borehole at 5.30 m	6
									7
									8
									9

Remarks

1. Complete. 2. Water strike at 3.10 m bgl. 3. Barrell refused at 4.85 m bgl. 4. SPT carried out at 4.85m bgl. 5. Monitoring well installed (response zone 2.85m-4.85m).

Borehole Log

Borehole No.

WS106

Sheet 1 of 1

Project Name: George Street

Project No.
13224

Co-ords: 384931.00 - 410821.00

Hole Type
WS

Location: Heywood

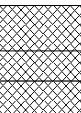
Level:

Scale
1:50

Client: Fleetgrace Ltd

Dates: 09/12/2021 -

Logged By
J.Beer

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	ES		0.30 0.50			MADE GROUND: Dark brown gravelly clayey fine to medium sand with frequent rootlets and occasional roots. Gravel is fine sub angular to sub rounded of mudstone, sandstone and brick. (Topsoil).	1
		1.00 1.00	D	N=4 (1,0/1,0,1,2)	1.00 1.30			MADE GROUND: Light grey mottled brown gravelly clay (friable). Gravel is fine to medium angular to sub rounded of mudstone, sandstone and brick.	
		1.80 2.00	ES	N=2 (1,0/1,0,1,0)	2.00 2.30			MADE GROUND: Brown very gravelly fine to medium sand with pockets of grey clay at 0.90 m bgl. Gravel is fine to coarse angular to sub angular of mudstone, sandstone and brick.	2
								MADE GROUND: Brown clayey gravelly fine to medium sand. Gravel is fine to medium angular to sub rounded of mudstone and sandstone.	
								MADE GROUND: Yellowish light brown clayey sandy gravel. Gravel is fine to coarse sub angular to sub rounded of mudstone, sandstone, and brick.	3
		3.00 3.00 3.20	D ES	N=14 (1,2/3,3,4,4)	3.00			MADE GROUND: Greyish dark brown gravelly fine to medium sand. Gravel is fine to medium sub angular to sub rounded of mudstone, sandstone and brick.	
								MADE GROUND: Reddish grey gravelly fine to medium sand. Gravel is fine to coarse angular to sub rounded of mudstone, sandstone and brick.	4
		4.00 4.00	D	N=19 (1,0/1,2,7,9)	4.00 4.50			MADE GROUND: Reddish brown clayey gravelly fine to coarse sand with rare cobbles. Gravel is fine to coarse angular to sub rounded of mudstone, sandstone and brick. Cobbles are sub rounded of brick and mudstone.	
		4.80 4.80	D	N=26 (10,6/6,6,6,8)	5.25			Very stiff high strength greyish brown silty CLAY.	5
								Medium dense brown slightly gravelly fine to coarse SAND. Gravel is fine to medium sub angular to sub rounded of mudstone, and sandstone.	
								End of borehole at 5.25 m	6
									7
									8
									9
									10

Remarks

1. Complete. 2. Water strike at 3.60 m bgl. 3. Barrell refused at 4.80 m bgl. 4. SPT carried out at 4.80m bgl. 5. Monitoring well installed (Response zone 4.00m-4.80m bgl).



Borehole Log

Borehole No.

WS107A

Sheet 1 of 1

Project Name: George Street

Project No.
13224

Co-ords: 384971.00 - 410917.00

Hole Type
WS

Location: Heywood

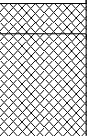
Level:

Scale
1:50

Client: Fleetgrace Ltd

Dates: 09/12/2021 -

Logged By
N. Dawson

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.80	ES		0.20 0.90			MADE GROUND: Dark brown slightly clayey gravelly fine to medium sand with rootlets. Gravel is fine to medium sub angular of mudstone, sandstone brick and plastic. (Topsoil). MADE GROUND: Reddish brown sandy gravel with cobble fragments. Gravel is fine to coarse angular to sub angular of brick, sandstone, concrete, mudstone and wire. End of borehole at 0.90 m	1 2 3 4 5 6 7 8 9 10

Remarks

1. Terminated. 2. Refusal on concrete cobble at 0.90 m bgl.





Borehole Log

Borehole No.

WS107B

Sheet 1 of 1

Project Name: George Street

Project No.
13224

Co-ords: 384973.00 - 410917.00

Hole Type
WS

Location: Heywood

Level:

Scale
1:50

Client: Fleetgrace Ltd

Dates: 09/12/2021 -

Logged By
N. Dawson

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.50	ES		0.20			MADE GROUND: Dark brown slightly clayey very gravelly fine to medium sand with rootlets. Gravel is fine to medium angular to sub angular mudstone, brick and plastic. (Topsoil).	
					0.90			MADE GROUND: Reddish brown sandy gravel with fragments of cobbles. Gravel is fine to coarse angular to sub angular of mudstone, brick, concrete and plastic.	1
								End of borehole at 0.90 m	
									2
									3
									4
									5
									6
									7
									8
									9
									10

Remarks

1. Terminated. 2. Refusal on concrete cobble at 0.90 m bgl. 3. Monitoring well installed (Response zone 0.30m-0.80m bgl).





Borehole Log

Borehole No.

WS107C

Sheet 1 of 1

Project Name: George Street

Project No.
13224

Co-ords: 384975.00 - 410914.00

Hole Type
WS

Location: Heywood

Level:

Scale
1:50

Client: Fleetgrace Ltd

Dates: 09/12/2021 -

Logged By
N. Dawson

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.20 0.40			MADE GROUND: Dark brown slightly clayey gravelly fine to medium sand with rootlets. Gravel is fine to medium sub angular of mudstone, sandstone brick and plastic. (Topsoil). MADE GROUND: Reddish brown sandy gravel with cobble fragments. Gravel is fine to coarse angular to sub angular of brick, sandstone, concrete, mudstone and wire. End of borehole at 0.40 m	1 2 3 4 5 6 7 8 9 10

Remarks

1. Terminated. 2. Refusal on concrete cobble at 0.90 m bgl.



Borehole Log

Borehole No.

WS108

Sheet 1 of 1

Project Name: George Street

Project No.
13224

Co-ords: 384993.00 - 410888.00

Hole Type
WS

Location: Heywood

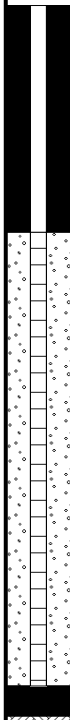
Level:

Scale
1:50

Client: Fleetgrace Ltd

Dates: 09/12/2021 -

Logged By
N. Dawson

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.20			MADE GROUND: Dark brown slightly clayey gravelly fine to medium sand with rootlets. Gravel is fine to medium sub angular of glass, concrete, brick. (Topsoil).	
					0.50				
					0.65				
		0.80	ES					MADE GROUND: Black gravelly fine to medium sand. Gravel is fine to medium sub rounded to sub angular of mudstone, brick and ceramic.	1
		1.00	D						
		1.00		N=11 (1,3/3,3,3,2)	1.10			MADE GROUND: Orange mottled grey brown clay.	
								MADE GROUND: Black sandy gravel. Gravel is fine to medium angular to sub angular of mudstone, clinker, brick and concrete.	
		2.00		N=13 (2,2/3,3,3,4)				Stiff medium strength brown silty CLAY.	2
									
		3.00	D						3
		3.00		N=11 (1,1/2,2,3,4)					
									
		4.00	D		4.00			Dense orangish brown silty fine to medium sand.	4
		4.00		N=32 (4,6/6,8,8,10)					
		4.50		50 (10,13/50 for 235mm)					
		4.80			4.80				
		5.00	D					End of borehole at 4.80 m	5
									6
									7
									8
									9
									10

Remarks

1. Terminated. 2. Refusal on dense sand in SPT. 3. Water strike at 4.00 m bgl. 4. Monitoring well installed (Response zone 1.50m-4.50m bgl). 5. Barrel refused at 4.5m bgl. 6. SPT carried out at 4.50m bgl.

Borehole Log

Borehole No.

WS109

Sheet 1 of 1

Project Name: George Street

Project No.
13224

Co-ords: 384985.00 - 410944.00

Hole Type
WS

Location: Heywood

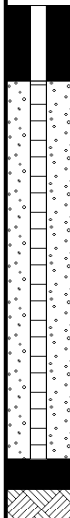
Level:

Scale
1:50

Client: Fleetgrace Ltd

Dates: 09/12/2021 -

Logged By
N. Dawson

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.25			MADE GROUND: Dark brown slightly clayey gravelly fine to medium sand with rootlets. Gravel is fine to medium sub angular of mudstone, sandstone brick. (Topsoil).	
		1.00		N=1 (2,2/1,0,0,0)				MADE GROUND: Dark brownish black very gravelly fine to medium sand with fragments of cobbles. Gravel is fine to coarse angular to sub angular of brick, mudstone, sandstone and concrete.	1
		1.80	ES						
		2.00	D						2
		2.00		N=26 (10,13/9,6,5,6)					
					2.70			Very stiff very high strength sandy silty CLAY.	3
		3.00	D						
		3.00		50 (12,12/50 for 235mm)					
					3.40			End of borehole at 3.40 m	
									4
									5
									6
									7
									8
									9
									10

Remarks

1. Terminated. 2. Refusal on stiff clay at 3.40 m bgl. 3. Water strike at 2.10 m bgl. 4. Monitoring well installed (Response zone 0.50m-3.00m bgl).



Borehole Log

Borehole No.

WS110

Sheet 1 of 1

Project Name: George Street

Project No.
13224

Co-ords: 384991.00 - 410936.00

Hole Type
WS

Location: Heywood

Level:

Scale
1:50

Client: Fleetgrace Ltd

Dates: 09/12/2021 -

Logged By
N. Dawson

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.50	ES		0.30			MADE GROUND: Dark brown slightly clayey gravelly fine to medium sand with rootlets. Gravel is fine to medium sub angular of glass, concrete, brick and plastic. (Topsoil).	
					0.90			MADE GROUND: Dark brown clayey gravelly fine to medium sand. Gravel is fine to coarse angular to sub rounded of brick, plastic, mudstone and sandstone. Concrete cobble at 0.90m bgl.	1
								End of borehole at 0.90 m	2
									3
									4
									5
									6
									7
									8
									9
									10

Remarks

1. Terminated. 2. Refusal on concrete cobble at 0.90 m bgl.





Borehole Log

Borehole No.

WS111A

Sheet 1 of 1

Project Name: George Street

Project No.
13224

Co-ords: 384995.00 - 410912.00

Hole Type
WS

Location: Heywood

Level:

Scale
1:50

Client: Fleetgrace Ltd

Dates: 09/12/2021 -

Logged By
N. Dawson

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10	ES		0.30 0.40			MADE GROUND: Dark brown slightly clayey gravelly fine to medium sand with rootlets. Gravel is fine to medium sub angular of glass, mudstone, brick. (Topsoil). MADE GROUND: Concrete. End of borehole at 0.40 m	1
									2
									3
									4
									5
									6
									7
									8
									9
									10

Remarks

1. Terminated. 2. Refusal on concrete cobble at 0.40 m bgl.





Borehole Log

Borehole No.

WS111B

Sheet 1 of 1

Project Name: George Street

Project No.
13224

Co-ords: 384994.00 - 410911.00

Hole Type
WS

Location: Heywood

Level:

Scale
1:50

Client: Fleetgrace Ltd

Dates: 09/12/2021 -

Logged By
N. Dawson

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.30 0.40			MADE GROUND: Dark brown slightly clayey gravelly fine to medium sand with rootlets. Gravel is fine to medium sub angular of glass, mudstone, brick. (Topsoil). MADE GROUND: Concrete. End of borehole at 0.40 m	1 2 3 4 5 6 7 8 9 10

Remarks

1. Terminated. 2. Refusal on concrete cobble at 0.40 m bgl.



Borehole Log

Borehole No.

WS112

Sheet 1 of 1

Project Name: George Street

Project No.
13224

Co-ords: 384935.00 - 410921.00

Hole Type
WS

Location: Heywood

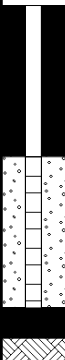
Level:

Scale
1:50

Client: Fleetgrace Ltd

Dates: 09/12/2021 -

Logged By
J.Beer

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.15			0.15			MADE GROUND: Brown slightly gravelly clay with frequent rootlets. Gravel is fine to medium sub angular to sub rounded of mudstone, sandstone, brick. (Topsoil).	
		1.00	D	N=46 (3,12/10,10,13,13)	0.80			MADE GROUND: Brown mottled orange gravelly clay. Gravel is fine to medium angular to sub rounded of mudstone, sandstone, brick, ceramic and glass.	1
		1.00			1.30			MADE GROUND: Grey gravel. Gravel is fine to coarse angular to sub rounded of mudstone, sandstone, brick, ceramic and plastic.	
		1.80	ES		1.70			MADE GROUND: Greyish brown sandy gravel. Gravel is fine to coarse angular to sub rounded of mudstone, sandstone, brick, ceramic and glass.	2
		2.00	D	50 (7,10/50 for 260mm)	2.40			MADE GROUND: Reddish black sandy gravel. Gravel is fine to coarse angular to sub angular of mudstone, sandstone, brick, ceramic, glass and metal.	
		2.00						End of borehole at 2.40 m	3
									4
									5
									6
									7
									8
									9
									10

Remarks

1. Terminated. 2. Refusal on sandstone cobble at 2.00 m bgl. 3. Water strike at 1.00 m bgl. 4. Monitoring well installed (Response zone 1.00m-2.00m bgl).



Borehole Log

Borehole No.

WS113A

Sheet 1 of 1

Project Name: George Street

Project No.
13224

Co-ords: 384937.00 - 410940.00

Hole Type
WS

Location: Heywood

Level:

Scale
1:50

Client: Fleetgrace Ltd

Dates: 09/12/2021 -

Logged By
N. Dawson

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.30 0.40			MADE GROUND: Brown slightly gravelly sandy clay with rootlets. Gravel is fine to medium sub rounded of mudstone and rare brick (Topsoil). MADE GROUND: Brown slightly clayey very gravelly fine to medium sand. Gravel is fine to coarse angular to sub rounded of brick, glass, metal, ceramic, mudstone, plastic, clinker and fragments of brick cobbles. End of borehole at 0.40 m	1 2 3 4 5 6 7 8 9 10

Remarks

1. Terminated. 2. Refusal on brick cobble at 0.40 m bgl.



Borehole Log

Borehole No.

WS113B

Sheet 1 of 1

Project Name: George Street

Project No.
13224

Co-ords: 384937.00 - 410943.00

Hole Type
WS

Location: Heywood

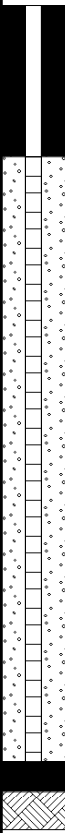
Level:

Scale
1:50

Client: Fleetgrace Ltd

Dates: 09/12/2021 -

Logged By
N. Dawson

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20			0.20			MADE GROUND: Brown slightly gravelly sandy clay with rootlets. Gravel is fine to medium sub rounded of mudstone and rare brick (Topsoil).	
		0.85 1.00	ES	N=11 (1,1/2,3,3,3)				MADE GROUND: Brown slightly clayey very gravelly fine to medium sand. Gravel is fine to coarse angular to sub rounded of brick, glass, metal, ceramic, mudstone, plastic, clinker and fragments of brick cobbles.	1
		2.00 2.00	ES	N=10 (1,1/1,1,2,6)					2
		3.00		N=10 (3,2/2,2,2,4)					3
		4.00		N=3 (1,0/1,0,1,1)					4
		4.40			4.40			Stiff medium strength dark brown sandy CLAY.	
		5.00		N=14 (1,1/2,3,4,5)					5
		5.45			5.45			End of borehole at 5.45 m	
									6
									7
									8
									9
									10

Remarks

1. Complete. 2. Water strike at 3.10 m and 3.50 m bgl. 3. Monitoring well installed (Response zone 1.00-5.00m bgl).

Borehole Log

Borehole No.

WS114

Sheet 1 of 1

Project Name: George Street

Project No.
13224

Co-ords: 384947.00 - 410878.00

Hole Type
WS

Location: Heywood

Level:

Scale
1:50

Client: Fleetgrace Ltd

Dates: 09/12/2021 -

Logged By
J.Beer

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.10			MADE GROUND: Brown slightly sandy gravelly clay with frequent rootlets. Gravel is fine to medium sub angular to sub rounded of mudstone, sandstone and brick. (Topsoil).	
					0.30			MADE GROUND: Brown clayey very gravelly fine to medium sand. Gravel is fine to coarse angular to sub rounded of mudstone, sandstone, brick, ceramic and glass.	
					0.50			MADE GROUND: Sandstone cobble.	
					0.80			MADE GROUND: Brownish reddish grey sandy gravel. Gravel is fine to coarse angular to sub rounded of mudstone, sandstone, brick and ceramic.	
		1.00	ES	N=16 (5,4/4,5,4,3)				MADE GROUND: Dark brown gravelly fine to medium sand. Gravel is fine to coarse angular to sub rounded of mudstone, sandstone, brick, ceramic, glass and slag.	1
		1.20						MADE GROUND: Dark brown gravelly clayey fine to medium sand. Gravel is fine to coarse angular to sub rounded of mudstone, sandstone and brick.	
		2.00		N=10 (2,5/3,3,2,2)	2.20				2
		3.00	D	N=13 (3,4/3,3,3,4)					3
		3.00			3.40			Very stiff high strength brown slightly gravelly CLAY. Gravel is fine to coarse sub angular to sub rounded of mudstone and sandstone.	4
		4.00	D	N=27 (2,3/6,7,7,7)	4.30			Brown fine to coarse SAND.	
		4.00			4.70			Stiff medium strength greyish brown silty CLAY.	5
		5.00	D	N=17 (3,3/3,5,5,4)					
		5.00			5.45			End of borehole at 5.45 m	6
									7
									8
									9
									10

Remarks

1. Complete. 2. Water strike at 4.00m bgl. 3. Monitoring well installed (Response zone 3.50m-5.00m bgl).

				Trial Pit Log			TrialPit No TP101 Sheet 1 of 1	
Project Name: George Street				Project No. 12606		Co-ords: - Level:		Date 27/02/2019
Location: Heywood						Dimensions (m):		Scale 1:24
Client:						Depth 2.80		Logged A. Allcock

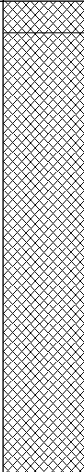
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
				0.10			MADE GROUND: Brown slightly gravelly, silty fine to medium sand. Gravel is fine to medium, subangular to angular of brick and mudstone with rootlets (topsoil)	
	0.50	ES					MADE GROUND: Brown gravelly fine to medium sand with cobbles and boulders. Gravel is fine to coarse subrounded to angular of brick, concrete, timber, metal and rare plastic. Cobbles are subangular to angular of brick, concrete and sandstone. Boulders are angular of concrete and slate.	1
	1.00	B						
				1.60			MADE GROUND: Black slightly gravelly fine to medium sand with ash. Gravel is fine to medium subrounded to angular of brick.	
				1.70			Firm to stiff bluey grey slightly gravelly, slightly sandy CLAY. Gravel is fine to medium subrounded to rounded of mudstone.	2
	2.00	HVP	126					
	2.30	D						
	2.30	HVP	93.33333333					
				2.80			End of Pit at 2.80m	3
								4
								5

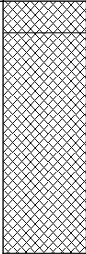
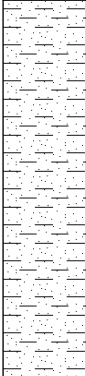
Remarks: Complete.		
Stability: Stable.		

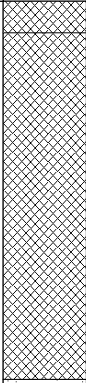
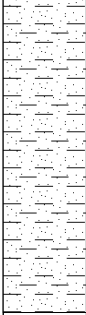
				Trial Pit Log			TrialPit No TP103 Sheet 1 of 1		
Project Name: George Street				Project No. 12606		Co-ords: - Level:		Date 27/02/2019	
Location: Heywood						Dimensions (m):		Scale 1:24	
Client:						Depth 2.50		Logged A. Allcock	

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
				0.12			MADE GROUND: Brown slightly gravelly, silty fine to medium sand. Gravel is fine to medium, subangular to angular of brick, ceramic and mudstone with rootlets (topsoil)	
	0.30	ES		0.50			MADE GROUND: Brown gravelly fine to medium sand with cobbles. Gravel is fine to coarse subangular to angular brick, concrete, ceramic, sandstone and rare plastic tubing. Cobbles are subangular to angular brick and concrete.	
	1.00	HVP	62.66666667	1.20			MADE GROUND: Firm to stiff dark brown gravelly, slightly sandy clay with cobbles. Gravel is fine to coarse subangular to angular brick, sandstone and concrete. Cobbles are subangular to angular brick (reworked).	1
	1.50	HVP	80.66666667	1.60			MADE GROUND stiff light brown slightly gravelly fine to medium clay. Gravel is rubrounded to rounded mudstone (reworked)	
	1.70	ES		1.80			MADE GROUND: Firm dark brown clay with rare gravel. Gravel is coarse angular brick (reworked).	
	2.00	ES					Firm to stiff bluey grey slightly gravelly, slightly sandy CLAY. Gravel is fine to medium subrounded to rounded of mudstone.	2
	2.00	HVP	85.33333333					
	2.50	HVP	85.33333333	2.50			End of Pit at 2.50m	3
								4
								5

Remarks: Complete.		
Stability: Stable.		

				Trial Pit Log			TrialPit No TP104 Sheet 1 of 1			
Project Name: George Street				Project No. 12606		Co-ords: - Level:		Date 27/02/2019		
Location: Heywood						Dimensions (m):		Scale 1:24		
Client:						Depth 2.90		Logged A. Allcock		
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description			
	Depth	Type	Results							
				0.10			MADE GROUND: Brown slightly gravelly, slightly silty fine to medium sand. Gravel is fine to medium subangular to angular brick and mudstone.	1		
	1.00	ES					MADE GROUND: Brown gravelly fine to medium sand with cobbles and boulders. Gravel is fine to coarse subangular to angular brick, concrete, metal, slate, asbestos sheeting, clinker and rare plastic. Cobbles are of subangular to angular brick, Boulders are of subangular to angular concrete.			
				1.50			Firm to stiff brown and light brown slightly sandy CLAY.			
	1.70	HVP	79.3333333							
	2.00 2.00	ES HVP	80							2
	2.30	HVP	88							
	2.60	HVP	71.33333333				End of Pit at 2.90m	3		
				2.90				4		
								5		
Remarks: Complete.										
Stability: Stable.										

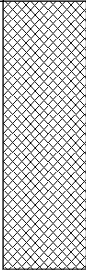
				Trial Pit Log			TrialPit No TP106 Sheet 1 of 1	
Project Name: George Street				Project No. 12606		Co-ords: - Level:		Date 27/02/2019
Location: Heywood						Dimensions (m):		Scale 1:24
Client:						Depth 2.00		Logged A. Allcock
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.05	ES		0.10			MADE GROUND: Brown slightly gravelly, silty fine to medium sand. Gravel is fine to medium, subangular to angular of brick and mudstone with rootlets (topsoil)	1 2 3 4 5
				0.80			MADE GROUND: Dark brown gravelly fine to medium sand with cobbles. Gravel is fine to coarse subangular to angular brick, slate and concrete with cobbles of subangular to angular brick.	
	1.00	HVP	82				Stiff light grey and light brown sandy CLAY.	
	1.30	HVP	109.333333					
	1.40	ES						
	1.50	D						
	1.60	HVP	97.33333333					
1.90	HVP	91.33333333	2.00			End of Pit at 2.00m		
Remarks: Complete.								
Stability: Stable.								

				Trial Pit Log			TrialPit No TP107 Sheet 1 of 1	
Project Name: George Street				Project No. 12606		Co-ords: - Level:		Date 27/02/2019
Location: Heywood						Dimensions (m):		Scale 1:24
Client:						Depth 2.20		Logged A. Allcock
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
				0.10			MADE GROUND: Brown slightly gravelly, silty fine to medium sand. Gravel is fine to medium, subangular to angular of brick and mudstone with rootlets (topsoil)	1
	0.30	ES					MADE GROUND: Dark brown very gravelly fine to medium sand. Gravel is fine to coarse (mainly fine) subangular angular brick, mudstone, slate and rare clinker and fabric with ash.	
	0.80	B						
				1.20			Stiff light grey and light brown sandy CLAY.	2
	1.50	HVP	74.66666667					
2.00 2.00 2.10	D ES HVP	99.33333333	2.20					
	End of Pit at 2.20m						3	
								4

Remarks: Complete.

 Stability: Stable.



				Trial Pit Log			TrialPit No SP101 Sheet 1 of 1	
Project Name: George Street				Project No. 12606		Co-ords: - Level:		Date 27/02/2019
Location: Heywood						Dimensions (m):		Scale 1:24
Client:						Depth 0.85		Logged A. Allcock
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.40	ES		0.85			MADE GROUND: Brown slightly gravelly fine to medium sand. Gravel is fine to medium subrounded to subangular mudstone, brick and ceramic with rootlets.	
							End of Pit at 0.85m	
								1
								2
								3
								4
								5
Remarks: Complete.								
Stability: Stable.								

APPENDIX V

CHEMICAL TESTING

RESULTS

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WD18 8YS

t: 01923 225404
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e: reception@i2analytical.com

Analytical Report Number : 21-28636

Project / Site name:	George Street, Heywood	Samples received on:	10/12/2021
Your job number:	13-224	Samples instructed on/ Analysis started on:	13/12/2021
Your order number:	13-224-JB-B	Analysis completed by:	20/12/2021
Report Issue Number:	1	Report issued on:	20/12/2021
Samples Analysed:	7 leachate samples - 3 soil samples		

Signed: *Karolina Marek*

Karolina Marek
PL Head of Reporting Team
For & on behalf of i2 Analytical Ltd.

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

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

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

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

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

Analytical Report Number: 21-28636
Project / Site name: George Street, Heywood
Your Order No: 13-224-JB-B

Lab Sample Number				2113926	2113927	2113928
Sample Reference				WS106	WS111A	WS113B
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				3.20	0.10	2.00
Date Sampled				09/12/2021	09/12/2021	09/12/2021
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	19	23	20
Total mass of sample received	kg	0.001	NONE	0.60	1.0	0.50

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.1	8.9	8.0
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Total Sulphate as SO ₄	mg/kg	50	MCERTS	1300	2200	3000
Water Soluble SO ₄ (2:1 Leach. Equiv.) 1hr extraction	g/l	0.00125	MCERTS	0.082	0.077	0.43
Water Soluble SO ₄ (2:1 Leach. Equiv.) 1hr extraction	mg/kg	2.5	MCERTS	160	150	870
Water Soluble SO ₄ (2:1 Leach. Equiv.) 1hr extraction	mg/l	1.25	MCERTS	82.1	77.0	434
Sulphide	mg/kg	1	MCERTS	4.2	9.4	16
Total Sulphur	mg/kg	50	MCERTS	660	860	1300
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	2.7	4.0	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	< 0.05	0.38
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	0.30	1.1	1.3
Anthracene	mg/kg	0.05	MCERTS	< 0.05	0.23	0.33
Fluoranthene	mg/kg	0.05	MCERTS	0.38	2.5	2.7
Pyrene	mg/kg	0.05	MCERTS	0.41	2.5	2.9
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.33	1.8	2.1
Chrysene	mg/kg	0.05	MCERTS	0.29	1.6	1.9
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	0.37	2.2	2.2
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	0.17	0.92	1.1
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.34	2.0	2.1
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	0.89	0.83
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	0.25	0.30
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	1.0	0.96

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	2.59	17.0	19.0
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Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	49	15	72
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	0.8	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	21	310	28
Copper (aqua regia extractable)	mg/kg	1	MCERTS	110	140	260
Lead (aqua regia extractable)	mg/kg	1	MCERTS	370	460	330
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	1.0	0.4	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	38	190	47
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	110	300	220

Analytical Report Number: 21-28636
 Project / Site name: George Street, Heywood
 Your Order No: 13-224-JB-B

Lab Sample Number	2113926	2113927	2113928
Sample Reference	WS106	WS111A	WS113B
Sample Number	None Supplied	None Supplied	None Supplied
Depth (m)	3.20	0.10	2.00
Date Sampled	09/12/2021	09/12/2021	09/12/2021
Time Taken	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status

Petroleum Hydrocarbons

TPH (C5 - C6) HS_ID_TOTAL	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0
TPH (C6 - C8) HS_ID_TOTAL	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1
TPH (C8 - C10) HS_ID_TOTAL	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1
TPH (C10 - C12) EH_CU_ID_TOTAL	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0
TPH (C12 - C16) EH_CU_ID_TOTAL	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0
TPH (C16 - C21) EH_CU_ID_TOTAL	mg/kg	1	MCERTS	5.4	13	22
TPH (C21 - C35) EH_CU_ID_TOTAL	mg/kg	1	MCERTS	7.5	120	110
TPH (C35 - C40) EH_CU_ID_TOTAL	mg/kg	10	MCERTS	< 10	75	20
TPH Total C5 - C40 EH_CU+HS_ID_TOTAL	mg/kg	10	MCERTS	13	210	150

U/S = Unsuitable Sample I/S = Insufficient Sample



Analytical Report Number: 21-28636
Project / Site name: George Street, Heywood

Your Order No: 13-224-JB-B

Lab Sample Number	2113929	2113930	2113931	2113932	2113933
Sample Reference	WS102	WS105	WS106	WS109	WS111A
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	1.20	0.90	3.20	1.80	0.10
Date Sampled	09/12/2021	09/12/2021	09/12/2021	09/12/2021	09/12/2021
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	7.9	7.9	7.9	6.5	8.0
Total Cyanide (Low Level 1 µg/l)	µg/l	1	ISO 17025	1.0	< 1.0	< 1.0	< 1.0	< 1.0

Total Phenols

Total Phenols (monohydric)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
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Speciated PAHs

Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthylene	µg/l	0.01	ISO 17025	0.52	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	19	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	µg/l	0.01	ISO 17025	11	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	µg/l	0.01	ISO 17025	6.8	< 0.01	< 0.01	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	2.8	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	0.69	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	0.47	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 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	< 0.01	< 0.01	< 0.01

Total PAH

Total EPA-16 PAHs	µg/l	0.2	NONE	41	< 0.2	< 0.2	< 0.2	< 0.2
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Heavy Metals / Metalloids

Arsenic (dissolved)	µg/l	1	ISO 17025	4.1	18	3.7	4.1	1.5
Cadmium (dissolved)	µg/l	0.08	ISO 17025	< 0.08	< 0.08	0.12	1.1	0.14
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chromium (dissolved)	µg/l	0.4	ISO 17025	< 0.4	0.8	1.0	< 0.4	1.3
Copper (dissolved)	µg/l	0.7	ISO 17025	14	14	4.2	3.6	14
Lead (dissolved)	µg/l	1	ISO 17025	2.2	5.1	5.6	2.9	11
Mercury (dissolved)	µg/l	0.5	ISO 17025	0.6	< 0.5	0.8	< 0.5	< 0.5
Nickel (dissolved)	µg/l	0.3	ISO 17025	3.4	3.2	1.9	16	3.5
Selenium (dissolved)	µg/l	4	ISO 17025	6.7	< 4.0	< 4.0	24	< 4.0
Zinc (dissolved)	µg/l	0.4	ISO 17025	5.0	9.5	9.1	60	13

Monoaromatics & Oxygenates

Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10



Analytical Report Number: 21-28636

Project / Site name: George Street, Heywood

Your Order No: 13-224-JB-B

Lab Sample Number	2113929	2113930	2113931	2113932	2113933
Sample Reference	WS102	WS105	WS106	WS109	WS111A
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	1.20	0.90	3.20	1.80	0.10
Date Sampled	09/12/2021	09/12/2021	09/12/2021	09/12/2021	09/12/2021
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Leachate Analysis)	Units	Limit of detection	Accreditation Status		

Petroleum Hydrocarbons

TPH1 (C10 - C40) EH_ID_TOTAL_#1_#2_MS	µg/l	10	NONE	270	< 10	< 10	< 10	< 10
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TPH-CWG - Aliphatic >C5 - C6 HS_ID_AL	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C6 - C8 HS_ID_AL	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C8 - C10 HS_ID_AL	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C10 - C12 EH_ID_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16 EH_ID_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21 EH_ID_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35 EH_ID_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic (C5 - C35) HS+EH_ID_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10

TPH-CWG - Aromatic >C5 - C7 HS_ID_AR	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C7 - C8 HS_ID_AR	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C8 - C10 HS_ID_AR	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C10 - C12 EH_ID_AR_#1_#2_MS	µg/l	10	NONE	23	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C12 - C16 EH_ID_AR_#1_#2_MS	µg/l	10	NONE	150	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C16 - C21 EH_ID_AR_#1_#2_MS	µg/l	10	NONE	100	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C21 - C35 EH_ID_AR_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic (C5 - C35) HS+EH_ID_AR_#1_#2_MS	µg/l	10	NONE	270	< 10	< 10	< 10	< 10

U/S = Unsuitable Sample I/S = Insufficient Sample



Analytical Report Number: 21-28636
Project / Site name: George Street, Heywood

Your Order No: 13-224-JB-B

Lab Sample Number				2113934	2113935
Sample Reference				WS108	WS1113B
Sample Number				None Supplied	None Supplied
Depth (m)				0.80	2.00
Date Sampled				09/12/2021	09/12/2021
Time Taken				None Supplied	None Supplied
Analytical Parameter (Leachate Analysis)	Units	Limit of detection	Accreditation Status		

General Inorganics

pH (automated)	pH Units	N/A	ISO 17025	7.4	7.7
Total Cyanide (Low Level 1 µg/l)	µg/l	1	ISO 17025	< 1.0	< 1.0

Total Phenols

Total Phenols (monohydric)	µg/l	1	ISO 17025	< 1.0	< 1.0
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Speciated PAHs

Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	NONE	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	NONE	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	NONE	< 0.01	< 0.01

Total PAH

Total EPA-16 PAHs	µg/l	0.2	NONE	< 0.2	< 0.2
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Heavy Metals / Metalloids

Arsenic (dissolved)	µg/l	1	ISO 17025	3.4	3.5
Cadmium (dissolved)	µg/l	0.08	ISO 17025	< 0.08	< 0.08
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0
Chromium (dissolved)	µg/l	0.4	ISO 17025	0.5	1.5
Copper (dissolved)	µg/l	0.7	ISO 17025	3.2	5.9
Lead (dissolved)	µg/l	1	ISO 17025	3.2	4.8
Mercury (dissolved)	µg/l	0.5	ISO 17025	< 0.5	37
Nickel (dissolved)	µg/l	0.3	ISO 17025	2.8	3.1
Selenium (dissolved)	µg/l	4	ISO 17025	8.0	4.5
Zinc (dissolved)	µg/l	0.4	ISO 17025	10	14

Monoaromatics & Oxygenates

Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	10	NONE	< 10	< 10



Analytical Report Number: 21-28636

Project / Site name: George Street, Heywood

Your Order No: 13-224-JB-B

Lab Sample Number				2113934	2113935
Sample Reference				WS108	WS1113B
Sample Number				None Supplied	None Supplied
Depth (m)				0.80	2.00
Date Sampled				09/12/2021	09/12/2021
Time Taken				None Supplied	None Supplied
Analytical Parameter (Leachate Analysis)	Units	Limit of detection	Accreditation Status		

Petroleum Hydrocarbons

TPH1 (C10 - C40) EH_1D_TOTAL_#1_#2_MS	µg/l	10	NONE	< 10	< 10
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TPH-CWG - Aliphatic >C5 - C6 HS_1D_AL	µg/l	1	ISO 17025	< 1.0	< 1.0
TPH-CWG - Aliphatic >C6 - C8 HS_1D_AL	µg/l	1	ISO 17025	< 1.0	< 1.0
TPH-CWG - Aliphatic >C8 - C10 HS_1D_AL	µg/l	1	ISO 17025	< 1.0	< 1.0
TPH-CWG - Aliphatic >C10 - C12 EH_1D_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16 EH_1D_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21 EH_1D_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35 EH_1D_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aliphatic (C5 - C35) HS+EH_1D_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10

TPH-CWG - Aromatic >C5 - C7 HS_1D_AR	µg/l	1	ISO 17025	< 1.0	< 1.0
TPH-CWG - Aromatic >C7 - C8 HS_1D_AR	µg/l	1	ISO 17025	< 1.0	< 1.0
TPH-CWG - Aromatic >C8 - C10 HS_1D_AR	µg/l	1	ISO 17025	< 1.0	< 1.0
TPH-CWG - Aromatic >C10 - C12 EH_1D_AR_#1_#2_MS	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aromatic >C12 - C16 EH_1D_AR_#1_#2_MS	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aromatic >C16 - C21 EH_1D_AR_#1_#2_MS	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aromatic >C21 - C35 EH_1D_AR_#1_#2_MS	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aromatic (C5 - C35) HS+EH_1D_AR_#1_#2_MS	µg/l	10	NONE	< 10	< 10

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number : 21-28636

Project / Site name: George Street, Heywood

* 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 *
2113926	WS106	None Supplied	3.2	Brown gravelly loam.
2113927	WS111A	None Supplied	0.1	Brown loam and clay with gravel and vegetation.
2113928	WS113B	None Supplied	2	Brown gravelly loam.

Analytical Report Number : 21-28636

Project / Site name: George Street, Heywood

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
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
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.	L038-PL	D	MCERTS
BS EN 12457-1 (2:1) Leachate Prep	2:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis.	In-house method based on BSEN12457-1.	L043-PL	W	NONE
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.	L039-PL	W	ISO 17025
Hexavalent chromium in leachate	Determination of hexavalent chromium in leachate by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	ISO 17025
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in leachate - LOW LEVEL 1 ug/l	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 (skalar)	L080-PL	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 (skalar)	L080-PL	W	MCERTS
Speciated EPA-16 PAHs in leachate	Determination of PAH compounds in leachate by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L102B-PL	W	NONE
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
pH at 20oC in leachate (automated)	Determination of pH in leachate by electrometric measurement.	In house method.	L099B	W	ISO 17025
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-PL	D	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
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.	L019-UK/PL	D	NONE
Total Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS

Analytical Report Number : 21-28636
Project / Site name: George Street, Heywood

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
TPH1 (Leachates)	Determination of dichloromethane extractable hydrocarbons in leachate by GC-MS.	In-house method	L070-PL	W	NONE
TPHCWG (Leachates)	Determination of dichloromethane extractable hydrocarbons in leachate by GC-MS.	In-house method	L070-PL	W	NONE
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 (Skalar)	L080-PL	W	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
BTEX and MTBE in leachates (Monoaromatics)	Determination of BTEX and MTBE in leachates by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	MCERTS
Total cyanide in leachate - 1µg/l	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-PL	W	ISO 17025
Sulphate, water soluble, in soil (1hr extraction)	Sulphate, water soluble, in soil (1hr extraction)	In-house method	L038-PL	D	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

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

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

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

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

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

Sample Deviation Report



Analytical Report Number : 21-28636
Project / Site name: George Street, Heywood

Sample ID	Other ID	Sample Type	Lab Sample Number	Sample Deviation	Test Name	Test Ref	Test Deviation
WS113B	None Supplied	S	2113928	b	Monohydric phenols in soil	L080-PL	b
WS113B	None Supplied	S	2113928	b	Speciated EPA-16 PAHs in soil	L064-PL	b
WS113B	None Supplied	S	2113928	b	TPH in (Soil)	L076-PL	b



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Analytical Report Number : 21-29564

Project / Site name:	George Street	Samples received on:	15/12/2021
Your job number:	13224	Samples instructed on/ Analysis started on:	17/12/2021
Your order number:	000174	Analysis completed by:	23/12/2021
Report Issue Number:	1	Report issued on:	23/12/2021
Samples Analysed:	3 water samples		

Izabela Wójcik
Signed:

Izabela Wójcik
Technical Reviewer (Reporting Team)
For & on behalf of i2 Analytical Ltd.

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

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

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

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

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



Analytical Report Number: 21-29564
Project / Site name: George Street

Your Order No: 000174

Lab Sample Number				2119022	2119023	2119024
Sample Reference				WS106	WS108	WS114
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied
Date Sampled				14/12/2021	14/12/2021	14/12/2021
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)				Units	Limit of detection	Accreditation Status

General Inorganics

pH	pH Units	N/A	ISO 17025	6.7	6.8	6.9
Total Cyanide (Low Level 1 µg/l)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Dissolved Organic Carbon (DOC)	mg/l	0.1	ISO 17025	2.45	5.95	4.66

Total Phenols

Total Phenols (monohydric)	µg/l	1	ISO 17025	3.4	3.7	3.2
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Heavy Metals / Metalloids

Calcium (dissolved)	mg/l	0.012	ISO 17025	260	200	270
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0	< 5.0

Arsenic (dissolved)	µg/l	0.15	ISO 17025	2.09	4.40	1.25
Cadmium (dissolved)	µg/l	0.02	ISO 17025	0.08	0.06	0.18
Chromium (dissolved)	µg/l	0.2	ISO 17025	3.8	1.9	2.6
Copper (dissolved)	µg/l	0.5	ISO 17025	5.7	2.4	5.0
Lead (dissolved)	µg/l	0.2	ISO 17025	1.1	< 0.2	0.4
Manganese (dissolved)	µg/l	0.05	ISO 17025	86	1200	3300
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05	< 0.05
Nickel (dissolved)	µg/l	0.5	ISO 17025	7.1	8.1	18
Selenium (dissolved)	µg/l	0.6	ISO 17025	30	1.0	< 0.6
Zinc (dissolved)	µg/l	0.5	ISO 17025	36	10	21

Monoaromatics & Oxygenates

Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0



Analytical Report Number: 21-29564
Project / Site name: George Street

Your Order No: 000174

Lab Sample Number	2119022	2119023	2119024
Sample Reference	WS106	WS108	WS114
Sample Number	None Supplied	None Supplied	None Supplied
Depth (m)	None Supplied	None Supplied	None Supplied
Date Sampled	14/12/2021	14/12/2021	14/12/2021
Time Taken	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status

Petroleum Hydrocarbons

TPH1 (C10 - C40) EH_2D_TOTAL_#1_#2	µg/l	10	NONE	< 10	< 10	< 10
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TPH-CWG - Aliphatic >C5 - C6 HS_1D_AL	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C6 - C8 HS_1D_AL	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C8 - C10 HS_1D_AL	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C10 - C12 EH_1D_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16 EH_1D_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21 EH_1D_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35 EH_1D_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aliphatic (C5 - C35) HS+EH_1D_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10

TPH-CWG - Aromatic >C5 - C7 HS_1D_AR	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C7 - C8 HS_1D_AR	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C8 - C10 HS_1D_AR	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C10 - C12 EH_1D_AR_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aromatic >C12 - C16 EH_1D_AR_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aromatic >C16 - C21 EH_1D_AR_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aromatic >C21 - C35 EH_1D_AR_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aromatic (C5 - C35) HS+EH_1D_AR_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10

VOCs

Chloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Chloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Bromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Vinyl Chloride	µg/l	1	NONE	< 1.0	< 1.0	< 1.0
Trichlorofluoromethane	µg/l	1	NONE	< 1.0	< 1.0	< 1.0
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Trichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Trichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Dibromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Chlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
p & m-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0



Analytical Report Number: 21-29564
Project / Site name: George Street

Your Order No: 000174

Lab Sample Number				2119022	2119023	2119024
Sample Reference				WS106	WS108	WS114
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied
Date Sampled				14/12/2021	14/12/2021	14/12/2021
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status			
Styrene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Tribromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
o-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Bromobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0

SVOCs

Aniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Phenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
2-Chlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Bis(2-chloroethyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
1,3-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
1,2-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
1,4-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Bis(2-chloroisopropyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
2-Methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Hexachloroethane	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Nitrobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
4-Methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Isophorone	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
2-Nitrophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
2,4-Dimethylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Bis(2-chloroethoxy)methane	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
1,2,4-Trichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
2,4-Dichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
4-Chloroaniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Hexachlorobutadiene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
4-Chloro-3-methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
2,4,6-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
2,4,5-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
2-Methylnaphthalene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
2-Chloronaphthalene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Dimethylphthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
2,6-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
2,4-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Dibenzofuran	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05



Analytical Report Number: 21-29564
Project / Site name: George Street

Your Order No: 000174

Lab Sample Number				2119022	2119023	2119024
Sample Reference				WS106	WS108	WS114
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied
Date Sampled				14/12/2021	14/12/2021	14/12/2021
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status			
4-Chlorophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Diethyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
4-Nitroaniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Azobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Bromophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Carbazole	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Dibutyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Anthraquinone	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Butyl benzyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
3&4-Methylphenol	µg/l	0.1	NONE	< 0.10	< 0.10	< 0.10

U/S = Unsuitable Sample I/S = Insufficient Sample



Analytical Report Number : 21-29564

Project / Site name: George Street

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
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 *for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 dphenylcarbazine followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Monohydric phenols in water - LOW LEVEL 1 ug/l	Determination of phenols in water by continuous flow analyser. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
Semi-volatile organic compounds in water	Determination of semi-volatile organic compounds in leachate by extraction in dichloromethane followed by GC-MS.	In-house method based on USEPA 8270	L102B-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Low level total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
TPH1 (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS.	In-house method	L070-PL	W	NONE

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

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

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

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

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel



Analytical Report Number : 21-29564

Project / Site name: George Street

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
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				

**Info**

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Analytical Report Number : 22-34876

Project / Site name: George Street

Samples received on: 21/01/2022

Your job number:

**Samples instructed on/
Analysis started on:** 24/01/2022

Your order number: 000408

Analysis completed by: 31/01/2022

Report Issue Number: 1

Report issued on: 31/01/2022

Samples Analysed: 3 water samples

Signed:

Joanna Wawrzeczko
Technical Reviewer (Reporting Team)
For & on behalf of i2 Analytical Ltd.

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

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

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

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

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



Analytical Report Number: 22-34876
Project / Site name: George Street

Lab Sample Number	2146640	2146641	2146642
Sample Reference	WS109	WS114	WS106
Sample Number	None Supplied	None Supplied	None Supplied
Depth (m)	None Supplied	None Supplied	None Supplied
Date Sampled	20/01/2022	20/01/2022	20/01/2022
Time Taken	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status

General Inorganics

pH	pH Units	N/A	ISO 17025	6.7	6.9	6.7
Total Cyanide (Low Level 1 µg/l)	µg/l	1	ISO 17025	4.8	< 1.0	< 1.0
Dissolved Organic Carbon (DOC)	mg/l	0.1	ISO 17025	25.1	5.26	3.74

Total Phenols

Total Phenols (monohydric)	µg/l	1	ISO 17025	2.5	2.9	2.5
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Heavy Metals / Metalloids

Calcium (dissolved)	mg/l	0.012	ISO 17025	690	320	280
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0	< 5.0

Arsenic (dissolved)	µg/l	0.15	ISO 17025	12.2	0.60	0.59
Cadmium (dissolved)	µg/l	0.02	ISO 17025	0.25	0.35	0.09
Chromium (dissolved)	µg/l	0.2	ISO 17025	1.9	4.4	5.7
Copper (dissolved)	µg/l	0.5	ISO 17025	22	4.9	4.1
Lead (dissolved)	µg/l	0.2	ISO 17025	3.7	0.6	0.6
Manganese (dissolved)	µg/l	0.05	ISO 17025	800	5500	140
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05	< 0.05
Nickel (dissolved)	µg/l	0.5	ISO 17025	19	14	6.5
Selenium (dissolved)	µg/l	0.6	ISO 17025	63	0.7	9.6
Zinc (dissolved)	µg/l	0.5	ISO 17025	76	19	39

Monoaromatics & Oxygenates

Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0

Petroleum Hydrocarbons

TPH1 (C10 - C40) EH_2D_TOTAL_#1_#2	µg/l	10	NONE	< 10	< 10	< 10
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TPH-CWG - Aliphatic >C5 - C6 HS_ID_AL	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C6 - C8 HS_ID_AL	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C8 - C10 HS_ID_AL	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C10 - C12 EH_ID_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16 EH_ID_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21 EH_ID_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35 EH_ID_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aliphatic (C5 - C35) HS+EH_ID_AL_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10

TPH-CWG - Aromatic >C5 - C7 HS_ID_AR	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C7 - C8 HS_ID_AR	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C8 - C10 HS_ID_AR	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C10 - C12 EH_ID_AR_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aromatic >C12 - C16 EH_ID_AR_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aromatic >C16 - C21 EH_ID_AR_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aromatic >C21 - C35 EH_ID_AR_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aromatic (C5 - C35) HS+EH_ID_AR_#1_#2_MS	µg/l	10	NONE	< 10	< 10	< 10



Analytical Report Number: 22-34876
Project / Site name: George Street

Lab Sample Number				2146640	2146641	2146642
Sample Reference				WS109	WS114	WS106
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied
Date Sampled				20/01/2022	20/01/2022	20/01/2022
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status			

VOCs

Chloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Chloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Bromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Vinyl Chloride	µg/l	1	NONE	< 1.0	< 1.0	< 1.0
Trichlorofluoromethane	µg/l	1	NONE	< 1.0	< 1.0	< 1.0
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Trichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Trichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Dibromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Chlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
p & m-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Styrene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Trichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
o-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Bromobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0

Analytical Report Number: 22-34876
Project / Site name: George Street

Lab Sample Number				2146640	2146641	2146642
Sample Reference				WS109	WS114	WS106
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied
Date Sampled				20/01/2022	20/01/2022	20/01/2022
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status			
Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0

SVOCs

Aniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Phenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
2-Chlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Bis(2-chloroethyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
1,3-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
1,2-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
1,4-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Bis(2-chloroisopropyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
2-Methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Hexachloroethane	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Nitrobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
4-Methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Isophorone	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
2-Nitrophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
2,4-Dimethylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Bis(2-chloroethoxy)methane	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
1,2,4-Trichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
2,4-Dichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
4-Chloroaniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Hexachlorobutadiene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
4-Chloro-3-methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
2,4,6-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
2,4,5-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
2-Methylnaphthalene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
2-Chloronaphthalene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Dimethylphthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
2,6-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
2,4-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Dibenzofuran	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
4-Chlorophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Diethyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
4-Nitroaniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Azobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Bromophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	0.43	< 0.01	< 0.01
Carbazole	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Dibutyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Anthraquinone	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Fluoranthene	µg/l	0.01	ISO 17025	0.47	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	0.42	< 0.01	< 0.01



Analytical Report Number: 22-34876
Project / Site name: George Street

Lab Sample Number				2146640	2146641	2146642
Sample Reference				WS109	WS114	WS106
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied
Date Sampled				20/01/2022	20/01/2022	20/01/2022
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status			
Butyl benzyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Benzo(a)anthracene	µg/l	0.01	ISO 17025	0.36	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	0.72	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	1.6	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	0.55	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
3&4-Methylphenol	µg/l	0.1	NONE	< 0.10	< 0.10	< 0.10

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number : 22-34876

Project / Site name: George Street

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
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 *for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Monohydric phenols in water - LOW LEVEL 1 ug/l	Determination of phenols in water by continuous flow analyser. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
Semi-volatile organic compounds in water	Determination of semi-volatile organic compounds in leachate by extraction in dichloromethane followed by GC-MS.	In-house method based on USEPA 8270	L102B-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Low level total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
TPH1 (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS.	In-house method	L070-PL	W	NONE

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

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

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

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



Analytical Report Number : 22-34876

Project / Site name: George Street

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
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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

Sample Deviation Report



Analytical Report Number : 22-34876

Project / Site name: George Street

This deviation report indicates the sample and test deviations that apply to the samples submitted for analysis. Please note that the associated result(s) may be unreliable and should be interpreted with care.

Sample ID	Other ID	Sample Type	Lab Sample Number	Sample Deviation	Test Name	Test Ref	Test Deviation
WS106	None Supplied	W	2146642	c	pH at 20oC in water (automated)	L099-PL	c
WS109	None Supplied	W	2146640	c	pH at 20oC in water (automated)	L099-PL	c
WS114	None Supplied	W	2146641	c	pH at 20oC in water (automated)	L099-PL	c

APPENDIX VI

ORIGIN OF TIER I GENERIC ASSESSMENT CRITERIA

CONSTITUENT	ORIGIN OF RISK ASSESSMENT VALUE
Arsenic	2014 LQM/CIEH S4ULs
Cadmium	2014 LQM/CIEH S4ULs
Chromium	2014 LQM/CIEH S4ULs
Lead	PROVISIONAL C4SL
Mercury	2014 LQM/CIEH S4ULs – methylmercury
Nickel	2014 LQM/CIEH S4ULs
Selenium	2014 LQM/CIEH S4ULs
Copper	2014 LQM/CIEH S4ULs
Zinc	2014 LQM/CIEH S4ULs
Cyanide – Total	2014 LQM/CIEH S4ULs
Phenols – Total	2014 LQM/CIEH S4ULs
Naphthalene	General assessment criteria (GAC) developed by CIEH/LQM Suitable 4 Use Levels with supporting data from SR3, SR7 and existing Tox report where applicable. 1% SOM.
Acenaphthylene	
Acenaphthene	
Fluorene	
Phenanthrene	
Anthracene	
Fluoranthene	
Pyrene	
Benzo(a)Anthracene	
Chrysene	
Benzo(b/k)Fluoranthene ⁽ⁱⁱⁱ⁾	
Benzo(a)Pyrene	
Indeno(123-cd)Pyrene	
Dibenzo(a,h)Anthracene	
Benzo(ghi)Perylene	
TPH C ₅ -C ₆ (aliphatic)	
TPH C ₆ -C ₈ (aliphatic)	
TPH C ₈ -C ₁₀ (aliphatic)	
TPH C ₁₀ -C ₁₂ (aliphatic)	
TPH C ₁₂ -C ₁₆ (aromatic)	
TPH C ₁₆ -C ₂₁ (aromatic)	
TPH C ₂₁ -C ₃₅ (aromatic)	



APPENDIX VII REGULATORY CORRESPONDCE

Andrew Edgar

From: Andrew Edgar
Sent: 27 May 2020 11:45
To: robert.tinsley@rjtconsulting.co.uk
Subject: FW: BRITANIA METALS LAND OFF GEORGE STREET HEYWOOD
ENVPAC/1/GMC/00241

EA correspondence 2

From: Beveridge, Lee <lee.beveridge@environment-agency.gov.uk>
Sent: 26 May 2020 08:55
To: Andrew Edgar <andrew@e3p.co.uk>
Cc: Whittingham, Sylvia <sylvia.whittingham@environment-agency.gov.uk>
Subject: RE: BRITANIA METALS LAND OFF GEORGE STREET HEYWOOD ENVPAC/1/GMC/00241

Hello Andrew

Thank you for your email. I agreed with Sylvia that I would take this forward as I know which internal teams to consult regarding your questions below.

Having spoken to our teams; specifically our legal services team I have the following comments:

1. The Environment Agency would be unlikely to pursue the current owner of the site (we assume this not to be your client) as we would be unsure of obtaining a conviction. There are many reasons why this would be the case but, it does not conclude the fact that there is unlikely to be sufficient evidence pointing to the current owner being responsible for the illegal disposal of waste; the evidence that has been presented to date is inferential not definitive. Due to the time lapse between the likely disposal then and now the balance of probability would be that we would be unable to obtain sufficient information to support any legal action and, I am told, it would be unlikely to pass the public interest test.
The fact that the site has already received planning permission is beside the point as is the fact that the council did not seek commentary from the Environment Agency on land contamination based on the surrender of the site permit. Further, we do not necessarily agree that there is no recourse through the planning process as it is very clear in paragraph 120 of the National Planning Policy framework document that "where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner."
2. This would not be possible. Any special arrangement would have to come from the area management team. They would have to agree to a special enforcement position statement. They would not, in this circumstance agree to that. They would not agree to it because, as we have stated previously, there is a method to undertake treatment of the materials to meet the end of waste criteria. The fact the end use would make that option no financially viable would not and could not be a consideration in making that decision. To do so would be contrary to the environmental regulations that the Environment Agency enforce and apply.

Our legal services team have confirmed that, in their opinion, this is a private or civil matter. The standing principle of Caveat Emptor applies. Your client will be purchasing the site with full knowledge of the liabilities associated with the ground conditions as well as full knowledge of the remediation requirements.

We hope this clarifies the current Environment Agency position.

Kind Regards

Lee.

L. Beveridge
BSc (Hons), MSc
Technical Specialist
Environment Agency
Groundwater, Hydrology & Contaminated Land team

Warrington

Tel. 0203 025 0768
Mob. 07771 625922

From: Andrew Edgar [<mailto:andrew@e3p.co.uk>]
Sent: 14 May 2020 16:37
To: Whittingham, Sylvia <sylvia.whittingham@environment-agency.gov.uk>
Cc: Beveridge, Lee <lee.beveridge@environment-agency.gov.uk>
Subject: RE: BRITANIA METALS LAND OFF GEORGE STREET HEYWOOD ENVPAC/1/GMC/00241

Thanks for this Sylvia

Would it be possible for the relevant departments to comment on the following:

- 1 – The site has already obtained full planning permission for its use as a motorhomes sales facility. As part of the approval of the planning permission we know the EA was not formally consulted on the basis that the licence surrender given by the EA stated that they were satisfied that no waste was present and that there was no environmental risk. Given that we now know wastes are present, would the EA consider further legal action against the owner of the site as we do not consider that there is currently any recourse through planning. (notwithstanding any future planning applications).
- 2 – Given that removal of all material is likely to prove prohibitively expensive and result in blighting the site - if the site owner could demonstrate that the material currently in-situ did not pose a risk to the environment - would the EA consider any special arrangements regarding accepting a reduced permit requirement in order to bring the site forward and provide much needed employment opportunity. If so is this something E3P/RMBC could discuss further?

My client is keen to purchase the site but understandably is nervous about possible legal action from the EA and potential costs associated with remediation. I am certain RMBC feel the same which is why the site may not be brought forward unless a pragmatic solution can be developed.

I am happy to speak with the relevant officers if required.

Andy

From: Whittingham, Sylvia <sylvia.whittingham@environment-agency.gov.uk>
Sent: 14 May 2020 16:13
To: Andrew Edgar <andrew@e3p.co.uk>
Subject: BRITANIA METALS LAND OFF GEORGE STREET HEYWOOD ENVPAC/1/GMC/00241

Please find attached our comments relating to the above enquiry.

Should you have any further queries, please do not hesitate to contact me.

Kind regards
Sylvia Whittingham

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or for litigation. Email messages and attachments sent to or from any Environment Agency address may also be accessed by someone other than the sender or recipient, for business purposes.

Andrew Edgar

From: Beveridge, Lee <lee.beveridge@environment-agency.gov.uk>
Sent: 27 April 2020 15:55
To: Andrew Edgar
Subject: RE: Britannia Metals

Hi Andy

I have had a look at the work; I was just refreshing my memory of the LK group report.

On the basis of what I have seen and read, the remediation strategy which you have put forwards would not be sufficient for us to condition the planning application when it land on our doorstep. We would be minded to object on the basis that we would not be sure that a successful development could be achieved given what has been identified as being present on site.

The material which was not described and disclosed in the LK Consult report (something that I am not going to comment upon as I need to have additional conversations with internal colleagues about it in particular) would be considered by the Environment Agency to be waste. I would agree that it does resemble frag waste and as such would be considered to be hazardous.

The process that you describe section 2 (RE-6) to remove materials above 120mm and return the residual to the base of the excavation would not meet the definition of an end-of-waste treatment. If you followed this process then you would be required to apply for a hazardous waste landfill permit. I am almost certain that you would not be granted one.

I have asked some of my colleagues and they, like myself and my first thoughts, agree that even a stabilisation and solidification treatment would be unlikely to succeed based on the hydrocarbons and other organic contaminants which are likely to be present given the previous land use but have not been fully tested for. Stabilisation of a frag waste has been attempted and has failed the requisite 64day tank test.

At planning, even if you did obtain a conditional permission I can confirm that additional ground investigation, assessment and detailed remediation would be needed; the previous reports would not be sufficient.

A more detailed commentary will follow but these are my summarised thoughts.

Kind regards.

Lee.

L. Beveridge
BSc (Hons), MSc
Technical Specialist
Environment Agency
Groundwater, Hydrology & Contaminated Land team
Warrington

Tel. 0203 025 0768
Mob. 07771 625922

From: Andrew Edgar [mailto:andrew@e3p.co.uk]
Sent: 27 April 2020 13:33
To: Beveridge, Lee <lee.beveridge@environment-agency.gov.uk>
Cc: Katie Barker Fleetgrace Ltd <kb@fleetgrace.co.uk>
Subject: RE: Britannia Metals

Hi Lee

I just wondered if you had had a chance to look at this site at all?

We don't necessarily need a detailed review of the remediation strategy at this as we can deal with that in planning. We are more concerned at this stage as to whether the approach is likely to be acceptable given the history of the site, permit surrender and subsequent discovery of scrap yard waste.

If the answer is likely to be no....then the client will wall away as the numbers just wont stack up.

Feel free to discuss if you would prefer that. My details are below.

Andy

Andrew Edgar
Director



Mobile: 07789 642148
Office: 0161 707 9612
Email: andrew@e3p.co.uk

Manchester Office
Taylor Road, Trafford Park, Urmston, Manchester, M41 7JQ

E3P current Coronavirus update

- **E3P is fully supportive of self-isolating and actively encouraging working from home where necessary with full access to our cloud based servers ensuring timescales are on target.**
- **We utilise excellent IT technology so meetings can be undertaken via video link or conference call.**
- **Due to the nature of site investigation works and our RAMS, E3P will be functioning as normal and ensuring mobilisation times to site are within a week.**

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Environmental Engineering Partnerships Ltd trades as E3P Company Registration No. 08725262

From: Beveridge, Lee <lee.beveridge@environment-agency.gov.uk>
Sent: 27 March 2020 07:39
To: Andrew Edgar <andrew@e3p.co.uk>
Subject: RE: Britannia Metals

Hi Andrew

Keeping well and doing my best to keep things as normal as possible.

I can confirm the contract is established; the work parcel has appeared on my queue and I will be working towards it progressively. We are all currently having to adapt to limited network availability as the entire EA work forces works from home or remotely.

Once the review is complete I will put my comments on the system as well as sending you a draft version.

Kind Regards

Lee.

L. Beveridge
BSc (Hons), MSc
Technical Specialist
Environment Agency
Groundwater, Hydrology & Contaminated Land team
Warrington

Tel. 0203 025 0768
Mob. 07771 625922

From: Andrew Edgar [<mailto:andrew@e3p.co.uk>]
Sent: 26 March 2020 17:21
To: Beveridge, Lee <lee.beveridge@environment-agency.gov.uk>
Subject: RE: Britannia Metals

Hi Lee

I trust you are well in these strange times?

I just wanted to check that everything was ok with the contract etc for this project?

Kind regards

Andy

From: Beveridge, Lee <lee.beveridge@environment-agency.gov.uk>
Sent: 11 March 2020 10:27
To: Andrew Edgar <andrew@e3p.co.uk>
Cc: Berends, Lindsey <Lindsey.Berends@environment-agency.gov.uk>
Subject: RE: Britannia Metals

Hi Andrew;

Let me go and check and chivvy someone along; sorry for the delay.

Lee.

L. Beveridge
BSc (Hons), MSc
Technical Specialist
Environment Agency
Groundwater, Hydrology & Contaminated Land team
Warrington

Tel. 0203 025 0768
Mob. 07771 625922

From: Andrew Edgar [<mailto:andrew@e3p.co.uk>]
Sent: 11 March 2020 10:22
To: Beveridge, Lee <lee.beveridge@environment-agency.gov.uk>
Cc: SPPlanning.RFH <SPPlanning.RFH@environment-agency.gov.uk>; Berends, Lindsey <Lindsey.Berends@environment-agency.gov.uk>
Subject: RE: Britannia Metals

Hi Lee

I have emailed the relevant people but didn't get much by way of an affirmative response – I don't suppose you have received any sort of authorisation?

If need be I can transfer to money direct to you team – makes no difference to us but we are keen to get moving.

Andy

From: Beveridge, Lee <lee.beveridge@environment-agency.gov.uk>
Sent: 26 February 2020 13:54
To: Andrew Edgar <andrew@e3p.co.uk>
Cc: SPPlanning.RFH <SPPlanning.RFH@environment-agency.gov.uk>; Berends, Lindsey <Lindsey.Berends@environment-agency.gov.uk>
Subject: RE: Britannia Metals

Hello Andy

Yes, Lindsey is currently away from the office on extended absence. As such she will not be able to pick up work.

Having looked through the email chain below I agree that a chargeable contract is needed. In that circumstance could I ask you approach our Sustainable Places team at the address below and set the contract up.

I am happy to take this forwards and review the works. I would suggest a 15hr contract as I am sure it will include a telephone call at some stage.

I would appreciate it if you could include the reports in your email to the SP team so that we can formally save them and review them from there.

Email: SPPlanning.RFH@environment-agency.gov.uk

Many thanks

Lee.

L. Beveridge
BSc (Hons), MSc
Technical Specialist
Environment Agency
Groundwater, Hydrology & Contaminated Land team
Warrington

Tel. 0203 025 0768
Mob. 07771 625922

From: Andrew Edgar [<mailto:andrew@e3p.co.uk>]
Sent: 26 February 2020 13:45
To: Beveridge, Lee <lee.beveridge@environment-agency.gov.uk>
Subject: FW: Britannia Metals

Hi Lee

I hope you are well.

I was wondering if Lindsey was taking some time out at the moment – I tried to call her and the answer machine message implied that.

My client is looking to instruct the EA to undertake a paid consultation in relation to remedial works at the former Britannia Metals site in Heywood.

The email chain below explains a little of what the back the story is but if this is likely to be passed to a new officer I would be happy to speak with them or pop over and give them the background.

Any help would be appreciated as Rochdale Council would like to sell the site and our client would like to buy it but only if the waste/contaminated land issues can be economically dealt with.

Happy to chat about this.

Kind regards

Andy

Andrew Edgar
Director



Mobile: 07789 642148
Office: 0161 707 9612
Email: andrew@e3p.co.uk

Manchester Office
Heliport Business Park, Liverpool Road, Eccles, Manchester, M30 7RU

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From: Andrew Edgar
Sent: 11 February 2020 15:28
To: Berends, Lindsey <Lindsey.Berends@environment-agency.gov.uk>
Subject: RE: Britannia Metals

Hi Lindsey

This project has been out in the ether for a while but its come back to life and the client has asked that I confirm that we would like for the EA to undertake a review of the information with a view to understanding the EA position and whether the remediation strategy could be approved in the circumstances.

I am very happy to re-issue all the relevant documents for this so you have all the information in you inbox near the top.

You email below infers that you propose ca.14hours to review the document could you possibly confirm what this would equate to in pounds – I don't think it will be problem but I think the client / Rochdale Council will like to know.

Feel free to give me a call if you would like to refresh your mind on any aspect of this project.

Kind regards

Andy

Andrew Edgar
Director



Mobile: 07789 642148
Office: 0161 707 9612
Email: andrew@e3p.co.uk

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From: Berends, Lindsey <Lindsey.Berends@environment-agency.gov.uk>
Sent: 12 September 2019 10:48
To: Andrew Edgar <andrew@e3p.co.uk>
Subject: RE: Britannia Metals

Hi Andy,

Apologies for not getting back to you sooner.

From a brief review of the documents provided it appears the made ground is impacted by a number of contaminants of concern which includes hydrocarbons, frag waste and asbestos. However, without reviewing the documents in detail including the remediation strategy I can't confirm at this stage whether the mitigation measures proposed within the RS are adequate in respect of controlled waters. One comment I would make at this stage is that SI works are limited in the eastern part of the site and it is likely that we would recommend that additional works are undertaken to characterise soil / groundwater conditions beneath this area of the site if further works are not proposed within the RS.

In terms of reusing any excavated made ground on site under CL:AIRE CoP this may be possible. However, any undesirables would need to be removed to ensure that only materials listed under section 1.10 within the CL:AIRE CoP were reused and obviously the materials would need to meet the reuse factors stated in the CoP. Given both asbestos and frag waste are present I'm presuming the screening / sorting process would need to include some form of handpicking to remove any ACM? In terms of the frag waste you would need to demonstrate that the chosen method for removal would be capable of removing the frag material including the majority of the finer materials if they are present. I haven't sought a legal position on this but if your client decides to go ahead with the paid consultation I would advise that you include a detailed methodology of how you intend to remove any desirables then I can run this past our waste legal team. It might be worth thinking about undertaking a trial to ascertain the success of removing any undesirables. If fine frag materials are present I'd assume there would be some flexibility on not having to remove everything providing all reasonable measures have been undertaken to remove it. However, I'd have to check this position with legal.

In terms of reviewing the documents and drafting a response under a paid consultation my estimate would be 14h. If you want to go ahead with this please let me know and I'll forward the relevant information onto our planning team to set up the charged agreement.

Kind Regards,

Lindsey

Lindsey Berends
Technical Specialist (Contaminated Land)
BSc (Hons) FGS PG
GWHCL team

✉ Richard Fairclough House Knutsford Road Latchford Warrington Cheshire WA4 1HT

☎ 02030251354 (*internal 51354*)

✉ lindsey.berends@environment-agency.gov.uk

🌱 Please consider the Environment before printing this email.

Our website: www.gov.uk/environment-agency

From: Andrew Edgar [<mailto:andrew@e3p.co.uk>]
Sent: 06 September 2019 14:31
To: Berends, Lindsey <Lindsey.Berends@environment-agency.gov.uk>
Subject: Britannia Metals

Hi Lindsey

Nice to talk with you just now.

Please find attached photographs and a letter that we prepared in relation to the site.

I understand that as you have not been consulted through planning on this that to spend time reviewing the LK reports etc would required a paid consultation. If you could let me know how much this might be I will speak with the client and see how they wish to progress.

From my clients perspective, they are concerned that due to the surrender of the permit and the nature of ground conditions and type of material present, that the EA might enforce additional remediation which might make the site uneconomic.

At present our remediation strategy is as per attached.

Happy to discuss or meet if needed.

Kind regards

Andy

Andrew Edgar
Director



Mobile: 07789 642148
Office: 0161 707 9612
Email: andrew@e3p.co.uk

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