

Our reference: 077873-CUR-00-XX-RP-GE-038-V01

30th March 2022

Mr Ryan Shelton
Southway Housing
Southern Gate
729 Princess Road
Didsbury
Manchester
M20 2LT

Dear Ryan,

Re: Phase 2 Geo-Environmental and Geotechnical Report for Varey Street, Project 500 Sites

1.0 Introduction

Curtins Consulting were instructed by Southway Housing to undertake a ground investigation at Varey Street, off Cross Lane, Manchester M18 8PJ. The site is one of three sites currently being investigated on behalf of Southway Housing, as part of Project 500, Manchester City Council's program to deliver affordable homes in the north east of the city.

At the time of writing, the site comprises a mound (raised from pavement level) with a surface cover of grass. The eastern portion of the site includes a beer garden associated with the adjacent pub, including wooden tables/benches, and a gravel surface cover, some c.1m below the grass level.

The investigation was undertaken to determine the ground conditions pertaining to the development site, and to aid contamination risk assessment and foundation design. Development plans indicate the construction of two storey residential dwellings and apartments with private gardens. At the time of writing, building loadings were not available for review, however given the size of the proposed development they are anticipated to be low.

2.0 Background Information

Residential development is proposed at a small parcel of land off Varey Street in Gorton. The site location plan is presented in Figure 1, overleaf.

A topographic survey has provided levels of the site. The site is raised with respect to the adjacent pavement, with grass surface covering. The survey recorded the top of the bund as 74.38m AOD compared to the road level which was approximately 73.00m AOD, the level difference from the highest point on site to the road level is approximately 1.38m.

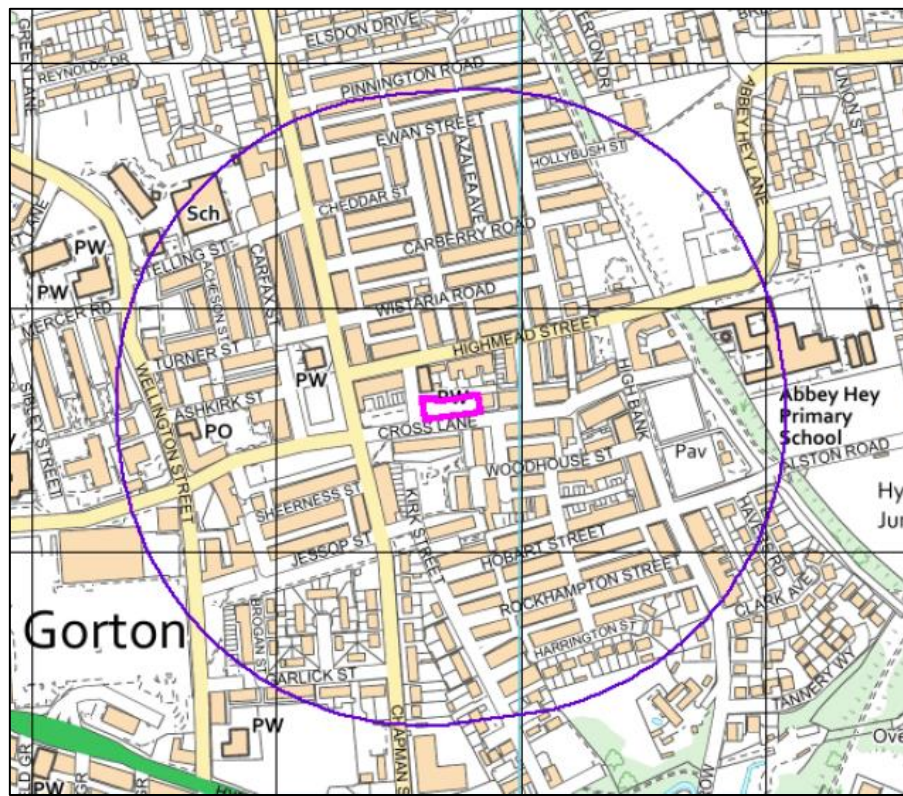


Figure 1 – Site Location Plan (site boundary shown in pink and 250m buffer in purple).
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Development was first identified on the site in 1893, including a row of terraced residential dwellings. These were demolished by 1978 and the site remained undeveloped to present day.

British Geological Survey (BGS) mapping indicates the site is underlain by Glacial Till (clay) and sandstone bedrock of the Chester Formation. Made Ground is anticipated onsite due to past development and presumed bund of Made Ground material onsite. The superficial soils are classified as a Secondary A aquifer, whilst the bedrock is classified as a Principal aquifer. There are no groundwater abstractions within 750m of the site. The nearest surface water feature is an unnamed feature 289m southeast of the site. Gorton reservoir is 480m south east.

Online UXO risk mapping identifies the site as being in a Moderate-risk area. An examination of historical maps identified the presence of one “Ruin” within 250m south of the site on post-war mapping. Detailed bomb strike mapping does not record any strikes or damage on site. No changes occurred on site during the war that may indicate that the site was affected by bombing activity. Therefore, the risk from UXO is considered to be low.

3.0 Curtins Ground Investigation (2021)

Ground investigation works were undertaken on the 10th and 11th November 2021.

The scope of the ground investigation was designed in general accordance with current UK guidance including:

- LCRM (Ref. 1);



- British Standard (BS) 10175:2011+A2:2017 (Ref. 2);
- BS5930:2015+2020 (Ref. 3); and
- BS EN1997: Part 2:2007 Eurocode 7 (Ref. 4).

3.1 Scope of Works

The site works consisted of five window sample boreholes, WS301 to WS305 advanced to between 4.00m to 5.45m bgl. In-situ testing, including Standard Penetration Tests (SPTs) were undertaken at, generally, 1m intervals within the superficial soils.

An exploratory hole plan is included at the end of this report, Ref. 077873-CUR-00-XX-DR-GE-00004-P01.

6 No. of soil samples, five from Made Ground and one from natural soils, were obtained and underwent environmental chemical testing, as detailed in Table 3.1. Analysis was undertaken to assess the contamination risk presented to site end users and construction works in this area of the site.

Table 3.1 - Environmental testing suite (Soils)

Suite Ref.	Analyte	LOD
Soils Suite A	Asbestos Screen	-
	pH Value	0.01 pH Units
	2:1 Water Soluble Sulphate	0.01 g/l
	Soil Organic Matter (SOM)	0.1 % ^{w/w}
	Arsenic, Chromium, Chromium VI, Copper, Lead, Selenium, Nickel	1 mg/kg
	Zinc	5 mg/kg
	Boron (water soluble)	1 mg/kg
	Cadmium	0.5 mg/kg
	Mercury	0.17 mg/kg
	Cyanide (total)	1 mg/kg
	Phenols (screen)	0.2 mg/kg
	PAHs (USEPA 16)	0.01 to 0.08 mg/kg
	TPH (Aro/Ali Split)	0.01 to 1.0 mg/kg

The following laboratory geotechnical testing was undertaken in accordance with methods outlines in BS1377: Part 1:2016 (Ref. 5), to enable a foundation assessment for the proposed residential development:

- 6 No. 4pt Atterberg Tests
- 12 No. 2:1 Water Soluble Sulphate; and
- 12 No. pH Value.

3.2 Ground Conditions

A summary of the ground conditions encountered during the site investigation works is presented in Table 3.2, below, with detailed information presented in the exploratory hole logs included at the end of this report. A summary of each strata is presented below.

**Table 3.2 - Summary of encountered ground conditions:**

Stratum	Depth to Top of Strata m bgl (m AOD)	Thickness (m)		Description
		Min	Max	
MADE GROUND	0.00 (74.00 – 73.10)	1.00	2.30	MADE GROUND: Grass over TOPSOIL brown slightly gravelly fine and medium sand. Gravel is fine and angular of brick, concrete and rare glass. Overlying in all locations MADE GROUND: Brown and grey gravelly fine to coarse sand. Gravel is fine to coarse and angular to sub-rounded of brick, sandstone, wood, metal, coal, wire fragments, glass, ceramic, slate and concrete. Cobbles of brick and concrete. Overlying in all locations MADE GROUND: Greyish brown gravelly fine to coarse sand. Gravel is fine to coarse angular to sub-rounded of brick, concrete, sandstone, slate and wood. Cobbles of sandstone, brick and wood. Overlying in WS302 MADE GROUND: Soft grey sandy slightly gravelly clay. Gravel is fine and angular of brick, concrete, sandstone, ceramic and wood.
GLACIAL TILL (Cohesive)	1.00 – 2.30 (72.50 – 71.20)	1.85 ¹	3.75 ¹	In WS303 and WS304 Soft to firm light brown with grey mottling sandy CLAY. Overlying in all Locations Stiff brown with rare grey mottling slightly sandy, slightly gravelly, CLAY. Gravel is fine and medium and sub-angular to rounded of sandstone, mudstone and rare coal.
GLACIAL TILL (Granular)	3.50 ² (70.10)	0.10		Encountered within WS304 only. Medium dense light brown fine and medium SAND.

1 – Base of strata not encountered.

2 – Encountered within one location.

A brick wall was identified within WS301 along the northern side of the hand pit from 0.40m to >1.30m bgl. This may be associated with relic structures from historic residential dwellings on site.

3.3 Groundwater

Water seepages were recorded within WS302 and WS304 at 4.00m bgl and 3.50m bgl, respectively. The water level in WS304 rose to 3.20m bgl after 20 minutes.

Groundwater levels were recorded during post investigation gas monitoring visits. The monitoring well response zones and depth to the groundwater levels in each monitoring well during the visit are detailed in Table 3.3.

Table 3.3 – Monitoring Well Response Zones

Borehole Ref.	Installation Strata	Response Zone m bgl (m AOD)	Depth to water level m bgl (m AOD)					
			24/11/21	10/12/21	20/12/21	07/01/22	20/01/22	04/02/22
WS301	Made Ground	1.00 – 2.00 (72.50 – 71.50)	Dry	Dry	Dry	Dry	Dry	Dry
WS302	Cohesive Glacial Till	2.00 – 5.00 (71.10 – 68.10)	1.64	1.29	1.45	1.48	1.63	1.60
WS305	Made Ground	0.50 – 1.00 (73.50 – 73.00)	Dry	1.03	1.15	Dry	Dry	Dry



3.4 Obstructions

A brick wall was recorded between 0.40m and 1.20m bgl within the hand excavated service clearance pit in WS301.

4.0 Ground Contamination Assessment

Five soil samples from the Made Ground and one from the natural soils were obtained, and chemically analysed for the testing suite outlined as Suite A in *Table 3.1*. The laboratory chosen by Curtins to undertake the analysis was Envirolab, a UKAS and MCERTS accredited laboratory. Soil samples were obtained to provide adequate and representative coverage for the proposed end use, accounting for the site's history.

Considering the sites proposed end-use for two storey residential housing and two storey apartments with private gardens, results were compared against adopted '*Residential with homegrown*' Generic Assessment Criteria (GACs).

Soil Organic Matter (SOM) content has an influence on the volatilisation of organic contaminants (i.e. the higher the SOM, the lower the volatilisation rate and therefore inhalation exposure risk). Soil organic matter (SOM) values for the 5 No. Made Ground soils were between 6.4% w/w to 9.4% w/w and for the natural soil sample the SOM was 1.3% w/w. With consideration for a calculated geometric average, Made Ground soil features determine an SOM of 7.44% w/w and natural soil features determine an SOM of 1.3%. As such, a comparison against Tier 1 thresholds for SOM of 6.0% w/w for Made Ground and 1.0% w/w for natural soils for '*Residential with homegrown*' end use has been adopted.

The full chemical testing results and adopted GAC's are listed in at the end of this report.

No exceedances were noted within the natural soil sample with respect to the adopted screening criteria.

A number of exceedances were noted within the Made Ground soil samples and are detailed below within *Table 4.0*.

Table 4.0 – Exceedances within Made Ground

Determinant	GAC mg/kg	Concentration (µg/l)				
		WS301 0.70m	WS302 0.70m	WS303 0.30m	WS304 0.60m	WS305 0.50m
Lead	200	396	216	292	397	328
Benzo(a)pyrene	3.0 / 5.0	7.1	–	–	–	–
Benzo(b)fluoranthene	3.7	7.72	–	–	–	–
Dibenzo(ah)anthracene	0.3	0.58	–	–	–	–

– No exceedance noted

No suspected asbestos containing materials (AMCs) were identified in the exploratory hole logs and no asbestos fibres were positively identified during laboratory screening.

Elevated concentrations of lead were identified in all Made Ground samples tested during this investigation. Marginally elevated concentrations of multiple PAHs were also recorded in the Made Ground sample obtained from WS301 (0.70m bgl).



On this basis, it is recommended that a clean cover system is installed in all gardens and areas of soft landscaping, where Made Ground soils remain in place. Where gardens are installed overlying natural soils, no remedial action will be required.

5.0 Geotechnical Laboratory Analysis

A programme of geotechnical testing was scheduled by Curtins to further confirm the ground model for the sites ground conditions, detailed in *Section 3.1*.

5.1 Ground Model

The following section discusses the ground conditions determined from the Curtins Ground Investigation. Where necessary, determination of characteristic parameters has been based on appropriate assessment of results derived from in-situ tests, laboratory analysis and published correlations, complemented with engineering judgement.

The parameters are not considered to be absolute and should be referenced with the specific strata text in this section and reviewed when considering a specific area of the site.

5.1.1 Made Ground

The site is covered by grass, underlain by Made Ground comprising brown slightly gravelly fine to medium sand with gravel fine and angular of brick, concrete and glass within all boreholes from ground level to 0.15 to 0.30m bgl (72.95 to 73.70m AOD).

Underlying soils are generally described as brown and grey gravelly fine to coarse sand, with fine to coarse, angular to sub-rounded gravel of brick, sandstone, wood, metal, coal, wire fragments, glass, ceramic, slate and concrete, and cobbles of brick and concrete.

Underlying this stratum was Made Ground of greyish brown gravelly fine to coarse sand, with gravel fine to coarse angular to sub-rounded of brick, concrete, sandstone, slate and wood. Cobbles of sandstone, brick and wood.

Within WS302 a Made Ground stratum of soft grey sandy slightly gravelly clay was encountered underlying the above strata. The gravel was fine and angular of brick, concrete, sandstone, ceramic and wood.

Given the raised ground level associated with the bund of soils on site, which will require removing from site, no geotechnical testing was undertaken in this stratum.

5.1.2 Glacial Till Deposits

Cohesive Glacial Till was recorded underlying the Made Ground in all exploratory hole locations.

Generally, the soils comprise firm becoming stiff brown with rare grey mottling slightly sandy to sandy, slightly gravelly to gravelly clay. The gravel fraction includes fine and medium angular to subangular sandstone, mudstone and coal.

A thin layer of soft light brown with grey mottling sandy clay was encountered in WS304, from 1.20m to 2.60m bgl (72.40m AOD to 72.00m AOD).



The granular Glacial Till deposits encountered as sand bands from 4.00m bgl (69.10m AOD) in WS302 and an interbedded thin layer of between 0.10m encountered from 3.50 to 3.60m bgl (70.00 to 70.10m AOD) within WS304 was described as a medium dense light brown fine and medium sand.

The geotechnical test results recorded within the superficial deposits are summarised in *Table 5.1.2*.

Table 5.1.2 – Summary of Glacial Till geotechnical test results

Parameter		No. of tests	Minimum	Maximum	Average
pH		7	7.74	9.10	8.58
Water Soluble Sulphate		7	13	54	31
SPT 'N' Value		18	6	32	19.39
Moisture Content		6	16	25	18.67
Atterberg Test	Liquid Limit (%)	6	39	64	48
	Plastic Limit (%)	6	15	25	19.83
	Plasticity Index (%)	6	20	39	28.17
	Modified Plasticity Index (%)	6	19.6	39	28.05

Cohesive Soils

A total of eighteen SPT 'N' values were recorded in the strata, ranging from between 6 and 32, where full penetration was met. The SPT 'N' results indicate variable ground condition, with an increase in strength with depth. Based on the small cohort of results, the results are not displayed graphically.

Six Atterberg tests were undertaken during the ground investigation indicating the soils behave as medium plasticity clays with a moderate volume change potential in accordance with guidance from NHBC Standards Chapter 4.2 (Ref. 6).

A moderately conservative characteristic unit weight of 16-22kN/m³ is deemed appropriate in accordance with BS8002:2015.

The results of SPT can be correlated to an Undrained Shear Strength (C_u) when undertaken within cohesive deposits. For consolidated clays, Stroud (1974) reported good correlations between N and C_u , where:

$$C_u = f_1 \times \text{SPT 'N' Value}$$

where values of f_1 are the conversion factor based on the plasticity of the clay.

Based on an average plasticity Index of 28% and utilising f_1 factor of 4.5 undrained shear strengths ranged between 27kPa and 144kPa are estimated. The results are summarised in Figure 5.1.2a, overleaf.

At elevations >72.00m AOD, cohesive glacial till soil strengths of 27 and 45 kPa were estimated from SPT results.

From elevations <72.00m AOD, the characteristic strength of the cohesive glacial till can be determined through the following equation:

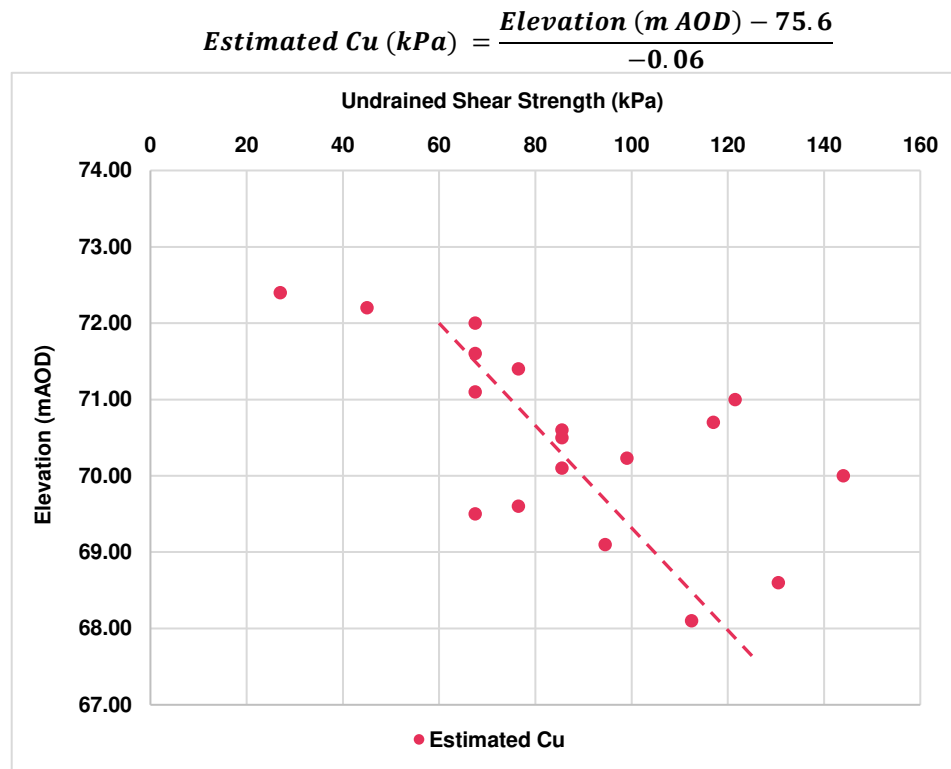


Figure 5.1.2a – Summary of Estimated Undrained Shear Strength of Cohesive Glacial Till

The results of SPT can be correlated to the modulus of volume compressibility (M_v) when undertaken within cohesive deposits. For consolidated clays, Stroud (1974) reported correlations between N and M_v , where:

$$M_v = \frac{1}{f_2 \times SPT \ N}$$

where values of f_2 are a factor of the plasticity of the clay.

Based on an average plasticity index of 28% and utilising f_2 factor of 0.45, M_v values typically range between 0.069 and 0.37 m^2/MN (low to high compressibility) are estimated. Figure 5.1.2b summarises the results.

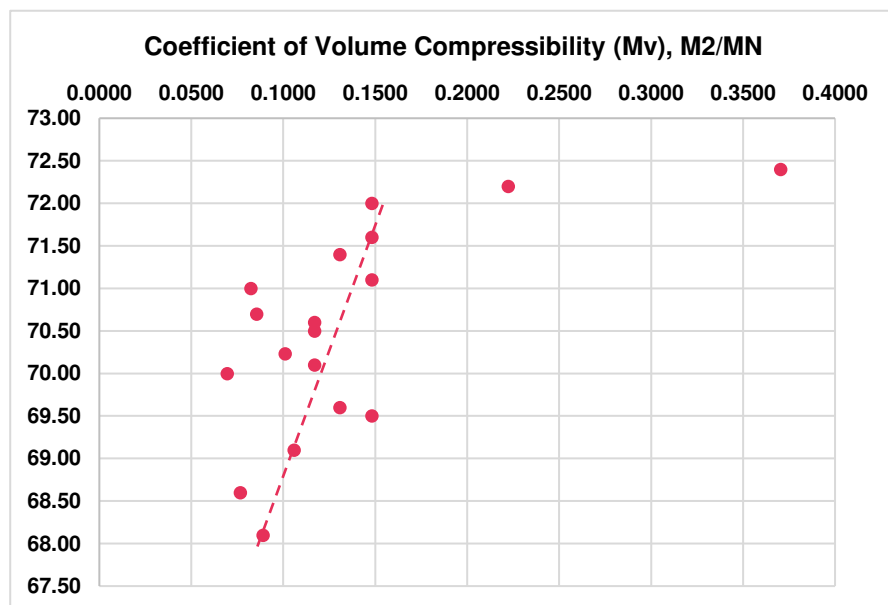




Figure 5.1.2b – Summary of Estimated Coefficient of Volume Compressibility of Cohesive Glacial Till

At elevations >72.00m AOD, the coefficient of volume compressibility of the cohesive glacial till was recorded at 0.2222 m²/MN and 0.3704 m²/MN, estimated from SPT results.

From elevations <72.00m AOD, the characteristic coefficient of volume compressibility of the cohesive glacial till can be determined through the following equation:

$$\text{Estimated } mv \text{ (m}^2\text{/MN)} = \frac{\text{Elevation} - 62.64}{59.1216}$$

The exploratory hole logs, SPT 'N' Values and laboratory testing results indicate generally laterally consistent ground conditions across the site, with a slight increase in the strength of cohesive soils with depth.

Moderately conservative characteristic unit weights of 16-20kN/m³ for medium strength clays, increasing to 18-22kN/m³ for high strength clays, above and below the water table, are deemed appropriate in accordance with BS8004:2015.

The Drained and Undrained Young's Modulus, E' and Eu, can be derived through the empirical relationship with Undrained Shear Strength (Cu) described as Eu=330xCu and E'=200xCu in accordance with the ICE Manual of Geotechnical Engineering (2012). The results range between 8.9 and 47.5 for Eu, and 5.4 and 28.8 for E'.

Granular Soils

Granular Glacial Till was recorded within two of the five locations. The soils were encountered in bands of up to 0.10m in thickness, and therefore no geotechnical testing was undertaken within these soils.

6.0 Gas Risk Assessment

The conceptual site model concluded there was a **Moderate** risk from ground gas due to the two historic landfills within 250m of the site. However there was potential for limited made ground, containing organic /putrescible content as a potential source of ground gas generation, due to a lack of development onsite. Noxious and asphyxiate gases were attributed to include, but not limited to, carbon dioxide, carbon monoxide, methane and hydrogen sulphide.

All boreholes were installed and detailed in *Table 3.3*.

Six rounds of gas monitoring were undertaken between 24th November 2021 and 4th February 2022. The results log sheets are contained within Appendix A6 and summarised in *Table 6.0*.

Barometric pressures ranging between 993mb and 1029mb were recorded during the monitoring period.

Table 6.0 – Summary of Ground Gas Monitoring Results

Exploratory Hole ID	Maximum Methane Concentration (%)	Maximum Carbon Dioxide Concentration (%)	Minimum Steady Oxygen Concentration (%)	Maximum Peak Gas Flow (l/hr)	Steady State Gas Flow (l/hr)
WS301	<0.1	1.3	20.6	-1.0	-1.0
WS302	<0.1	3.1	18.7	-9.2	-1.0
WS305	<0.1	2.8	17.3	-1.0	-1.0



Methane (CH₄) was recorded below the instrument's detection limit within all the monitoring wells.

Carbon Dioxide (CO₂) recorded a maximum concentration of 3.1% v/v within WS302 during the second visit.

Carbon monoxide (CO) recorded a maximum concentration of 4ppm in borehole WS302 on the first visit.

Hydrogen Sulphide (H₂S) recorded a maximum concentration of 2ppm in WS301 on the first monitoring visit.

The maximum peak air flow rate was recorded at -9.2 l/hr within WS302 during the second visit. During this visit, the screened section of the monitoring well was flooded, and the air flow rate recorded may have been a result of changes in headspace pressures within the plain section of pipe. The peak air flow rate on this occasion is not considered to be representative of site conditions and has therefore been discounted from the assessment. The screened section of pipe in WS302 was flooded during all monitoring visits throughout the monitoring period.

The greatest representative peak air flow rate was recorded in WS301 and WS305 (-1.0 l/hr) on the fourth visit. Steady state air flow rates of -1.0 l/hr were also reported on this visit. For the purposes of this assessment, the negative values are taken as absolute values, and it is assumed that a positive air flow rate of the same value may be achieved in natural ground conditions.

Two gas risk assessments have been undertaken, to account for the end use of the site.

Private residential dwellings, assumed to be built in accordance with the 'model' low-rise housing development and NHBC guidelines, will be assessed in accordance with the NHBC Traffic Light Classification.

Hazardous gas flow rates (Q_{hg}) can be evaluated using peak air flow rates and maximum methane concentrations, and steady state air flow rates and steady state carbon dioxide concentrations. On the basis that methane concentrations were recorded below the limit of detection of the monitoring instrument throughout the monitoring period, the gas screening value (GSV) will be determined by the carbon dioxide concentrations recorded.

For carbon dioxide, the greatest steady state air flow rate was recorded in WS301, WS302 and WS303 on the fourth visit (1.0 l/hr). The greatest steady state carbon dioxide concentration was recorded in WS302 on the second visit (3.1%v/v). On this basis, the calculated Q_{hg} for the site is taken as 0.031 l/hr.

The assessment indicates the site is classified as Green, where designs confirm with the NHBC 'model' low rise house.

Developments which differ significantly from the 'model' construction have been assessed in accordance with BS8485:2019. This includes low rise apartments.

The dataset obtained is considered to be representative of site conditions beneath the proposed development footprint. A range of data has been collated which captures significant temporal variation including barometric variability and various ground saturation states. As such, the gas risk assessment will utilise steady state flow rates and maximum gas concentrations when determining the maximum Q_{hg}.

On the basis that methane concentrations were recorded below the limit of detection of the monitoring instrument throughout the monitoring period, the gas screening value (GSV) will be determined by the carbon dioxide concentrations recorded.



Evaluation of the 'borehole' scenario (highest hazardous gas flow rate that is realistically possible, i.e. in a single borehole) records a maximum Q_{hg} of 0.018 l/hr for carbon dioxide in WS302 on the fourth visit, where maximum steady state flow reading of 1.0 l/hr is used, and maximum gas concentrations of 1.8% v/v recorded. Evaluation of the 'worst case' check (highest hazardous gas flow rate irrespective of when the readings were taken within a single strata/zone), records a maximum Q_{hg} of 0.031 l/hr for carbon dioxide.

Both the 'borehole' and 'worst case' scenarios indicate the site is consistent with a Characteristic Situation 1 (CS-1) gas regime, where gas protection measures will not be required.

The potential risks from ground gases to the excavations are to be dealt with by the Contractor, in accordance with the Confined Space Regulations, during construction. Appropriate ground gas monitoring and safety measures should be in place during the works, as the potential presence of ground gases could pose a risk in any confined spaces of deep excavations.

7.0 Geotechnical Assessment and Recommendations

The recommendations provided within this section are based on a review of the encountered ground conditions across the site.

The ground conditions at site generally comprised Made Ground of grass over topsoil overlying Made Ground encountered to a maximum depth of 2.30m bgl (73.10m AOD), underlain by Glacial Till. It is likely that made ground forming the bund of soils on site will be removed, up to 1.30m in places.

Cohesive Glacial Till was encountered from depths between 1.00 and 2.30m bgl (71.20-72.50m AOD) to 4.00m to 5.45m bgl (67.65-69.55m AOD). An interbedded granular band was encountered within WS304 from 3.50 to 3.60m bgl (70.00 to 70.10m AOD). The base of the Glacial Till was not encountered.

7.1 Foundation Assessment

It is understood the proposed development comprises two storey houses and apartments. The loadings of the proposed residential dwellings were not available during the time of writing this report. The loads will pre-determine the suitability of foundations adopted.

Based on the ground and groundwater conditions encountered during the Curtins ground investigation, it is considered that shallow foundations will be possible to support the proposed development. Foundations would need to be taken down below any Made Ground and low strength superficial soils and be placed in the stiff cohesive Glacial Till deposits encountered, from elevations of 72.00m AOD, or lower.

Considering the above, and subject to confirmation of building loads, shallow foundations may be considered dependent on the load of the structures and suitable bearing soils at depth. The soil strength below 72.00m AOD can give an Allowable Bearing Capacity of 85kPa, accounting for settlement of <25mm, for foundations not exceeding 1m in width. A qualified experienced engineer must inspect the founding stratum prior to commencement of the construction works.

If greater foundation loads are anticipated, deeper soils may provide a greater allowable bearing capacity, and further assessment may be undertaken.

7.2 Ground Floor Slab

The suitable ground floor slab for the development is dependent on the foundation solution. It is likely that ground bearing slabs with relatively low imposed load could be founded on suitable stiff clay, subject to removal



of soft or deleterious materials and Made Ground. These materials may be replaced with suitably compacted granular fill and verified by a suitably qualified engineer. Ground floor slabs must be designed by a structural engineer.

7.3 Chemical Attack on Buried Concrete

The classification of the site in terms of concrete in aggressive ground is based on the guidance provided in Table C2 of the Building Research Establishment (BRE) Special Digest 1, 3rd edition of 2005. A summary of the results obtained during are summarised in *Table 7.3a*, and *Table 7.3b* details the classification.

Table 7.3a – Aggressive Chemical Environment for Concrete (ACEC) Site Classification

Stratum	Test Type	No. of Tests	Range
Made Ground	pH	5	8.02 – 8.30
	Water Soluble Sulphate (mg/l)	5	10 – 20
Glacial Till (Cohesive)	pH	7	7.74 – 9.10
	Water Soluble Sulphate (mg/l)	7	13 – 54

Table 7.3b – Aggressive Chemical Environment for Concrete (ACEC) Site Classification

Stratum	Design Sulphate Class	ACEC Class ⁽¹⁾
Made Ground	DS-1	AC-1
Glacial Till	DS-1	AC-1

(1) ACEC assessment was based on the *mobile* groundwater condition in a *natural* scheme area

In these conditions it is considered that deterioration of buried concrete due to sulphate or acid attack is unlikely to occur. The preliminary design of buried concrete according to Table C2 of BRE Special Digest 1:2005 should be in accordance with Class DS-1 (AC-1) conditions assuming mobile groundwater.

8.0 Closure

A **Moderate/Low** risk has been identified to site end-users from soil and dust inhalation, direct contact and ingestion of shallow site soils beneath the site due to the lead and PAH exceedances. A suitable thickness of clean and inert capping should be installed in all private gardens and areas of soft landscaping, detailed in a remediation strategy.

If Made Ground soils are removed from site to facilitate the development, and gardens are installed directly overlying natural clay soils, no capping layer will be required in gardens of soft landscaping areas.

Construction workers should be provided with appropriate personal protection equipment (PPE) with consideration of the environmental testing results presented.

No gas protection measures will be required for the proposed residential development.

Soils <72.00m AOD can provide an allowable bearing capacity of 85 kPa, for foundations not exceeding 1m in width, accounting for estimated settlement of <25mm. Any soft or compressible material at foundation formation level should be removed and replaced with suitable compacted granular fill.

A qualified experienced engineer must inspect the founding stratum prior to commencement of the construction works.



A Design Sulphate class of DS-1 and ACEC Class of AC-1 are deemed suitable for the proposed development for made ground and glacial till.

If you have any queries with regard to this letter report, please do not hesitate to contact us.

Yours sincerely,

R Tidsey
Geo-Environmental Engineer
For and on behalf of
Curtins Consulting Ltd

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Checked	Signature	Date
M Holroyd BSc (Hons) Senior Geo-Environmental Engineer		30 March 2022
Authorised	Signature	Date
K Hughes BSc (Hons) CGeol FGS Associate		30 March 2022

Rev	Description	Issued by	Checked	Date

References

1. Environmental Agency (2020) Land Contamination Risk Management (LCRM)
2. British Standards Institution (2011) Investigation of Potentially Contaminated Sites: Code of Practice (report no. BS10175:2011+A2:2017).
3. British Standards Institution BSI (2015+2000) Code of Practice for Site Investigations (report no. BS5930).
4. British Standards Institution (2006) Eurocode 7: Geotechnical Design (report no. BSEN1997).



5. British Standard (2016) Methods of test for soils for civil engineering purposes. General requirements and sample preparation (report no. BS1377-1).
6. NHBC Standards (2021) Chapter 4.2
7. NHBC (2007) Guidance of Evaluation of Development Proposals on sites where methane and carbon dioxide are present. Report Edition No. 4

Appendices

Appendix A1 – Drawings

Appendix A2 – Exploratory Hole Logs

Appendix A3 – Geo-Environmental Laboratory Testing Results

Appendix A4 – Generic Assessment Criteria (GACs)

Appendix A5 – Geotechnical Laboratory Testing Results

Appendix A6 – Ground Gas Monitoring Results

Project 500, Varey Street

Ref. 077873-CUR-00-XX-RP-GE-038-V01



Appendix A1 – Drawings



SITE INVESTIGATION

-  WINDOW SAMPLES BOREHOLES
-  DENOTES AN INSTALLED MONITORING WELL

Rev:	Description:	Date:	By:	Chkd:
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Birmingham - Bristol - Cardiff - Douglas - Edinburgh - Kendal - Leeds - Liverpool - London - Manchester - Nottingham

Status:

INFORMATION

Project:

VAREY STREET

Drg Title:

EXPLORATORY HOLE LOCATION PLAN

Scale:	Size:	First Issue:	Drawn:	Checked:
NTS	A3	04/01/22	RT	MH

Drg No:	Rev:
077873-CUR-00-XX-DR-GE-00004	P01



105 Proposed Site Plan PL
1 : 200



3D Visual

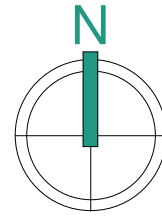
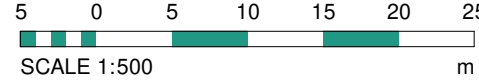
DO NOT SCALE FROM THIS DRAWING
ALL DIMENSIONS MUST BE CHECKED ON SITE BY CONTRACTOR
PRIOR TO CONSTRUCTION

Schedule of Accommodation

1B2P GF	45.4m ²	2no
1B2P FF	50.7m ²	2no
3B5P House	86.3m ²	1no

Total Units **5no**

100% Car Parking



Floor Schedule	
Area	Family and Type
63 m ²	Floor: BTP - Car Parking
77 m ²	Floor: BTP - Front Garden
98 m ²	Floor: BTP - Paving
17 m ²	Floor: BTP - POS
136 m ²	Floor: BTP - Rear Garden
88 m ²	Floor: BTP - Tarmac
480 m ²	

A	25.06.21	MA	Bin storage indicated. Telescopic bollards and obscure windows annotated on plan.
Rev	Date	Int	Description



Client:
Southway Housing Trust
Project:
Varey Street

Description:
Proposed Site Plan option 2

Purpose of Issue:			
Feasibility			
Drawn By:	Checked By:	Date:	Scale @ A1:
MA	MA	12/11/20	1 : 200
Job No:	Status Code:	Drawing No:	Rev:
3810	S0	106	A
File Identifier: VS-BTP-00-SP-DR-A-3810_106			

Project 500, Varey Street

Ref. 077873-CUR-00-XX-RP-GE-038-V01



Appendix A2 – Exploratory Hole Logs



Borehole Log

Borehole No.

WS301

Sheet 1 of 1

Project Name: Varey Street

Project No.
077873.003 C

Co-ords: -

Hole Type
WS

Location: Gorton, Manchester

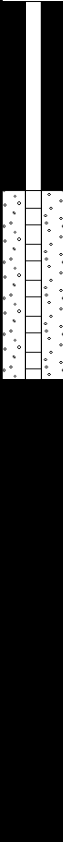
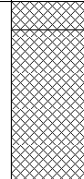
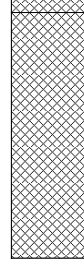
Level: 73.50

Scale
1:40

Client: Southway Housing Trust

Dates: 10/11/2021 - 10/11/2021

Logged By
MH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
		Depth (m)	Type	Results						
					0.15	73.35		Grass over TOPSOIL: Brown silty fine and medium sand. Rare rootlets.	1	
		0.70	ES							MADE GROUND: Brown and greyish brown gravelly fine to coarse sand. Gravel is fine to coarse angular to subrounded brick, sandstone, wood, methal, coal, wire fragments, glass, ceramic, slate and concrete. Rare cobbles of brick and concrete.
		1.20		N=7 (2,3/2,1,2,2)	1.00	72.50		<i>Brick wall identified on northern side of hand pit from 0.40m to >1.30m bgl.</i>		
		2.00		N=17 (7,9/5,5,4,3)				MADE GROUND: Greyish brown and grey gravelly fine to coarse sand. Gravel is fine to coarse angular to subrounded brick, concrete, sandstone, slate and wood. Rare cobbles of sandstone, brick and wood.	2	
		2.30			71.20					
		2.80	D					Stiff brown with rare grey mottling slightly sandy slightly gravelly CLAY. Gravel is fine and medium subangular to rounded sandstone, mudstone and rare coal.		
		3.00		N=19 (3,3/3,5,5,6)					3	
		4.00		N=15 (3,3/3,3,4,5)					4	
							4.45	69.05		End of borehole at 4.45 m
									6	
									7	
									8	

Remarks

Ground level estimated from Survey and Engineering Projects topographic survey, dated April 2021. Service inspection pit hand excavated from GL to 1.00m. No groundwater encountered.





Borehole Log

Borehole No.

WS302

Sheet 1 of 1

Project Name: Varey Street

Project No.
077873.003 C

Co-ords: -

Hole Type
WS

Location: Gorton, Manchester

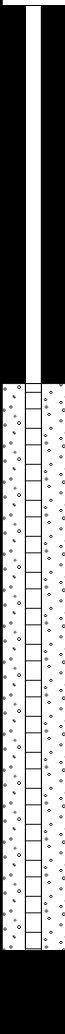
Level: 73.10

Scale
1:40

Client: Southway Housing Trust

Dates: 10/11/2021 - 10/11/2021

Logged By
MH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.15	ES		0.15	72.95		Grass over TOPSOIL: Brown silty fine and medium sand. Rare rootlets.	1
		0.60			0.60	72.50		MADE GROUND: Brown gravelly fine to coarse sand. Grvel is fine to coarse angular to subrounded brick, concrete, sandstone, glass and ceramic fragments.	
		1.20		N=7 (1,0/1,2,2,2)	1.20	71.90		MADE GROUND: Soft grey sandy slightly gravelly clay. Gravel is fine to coarse angular to subangular brick, concrete and sandstone.	
		1.70	D		1.70	71.40		MADE GROUND: Soft grey sandy slightly gravelly clay. Gravel is fine angular ceramic and wood. Rare rootlets.	2
		2.00		N=15 (2,3/3,4,4,4)				Stiff brown with rare grey mottling slightly sandy slightly gravelly CLAY. Gravel is fine and medium subangular to rounded sandstone, mudstone and rare coal.	
		3.00		N=19 (4,4/4,5,5,5)					
		4.00		N=21 (3,3/4,5,6,6)				Rare water bearing sand bands from 4.00m bgl.	
		4.00							4
		5.00		N=25 (4,5/5,6,7,7)					
		5.45			5.45	67.65		End of borehole at 5.45 m	5
									6
									7
									8

Remarks

Ground level estimated from Survey and Engineering Projects topographic survey, dated April 2021. Service inspection pit hand excavated from GL to 1.00m. Groundwater strike encountered at 4.00m bgl.





Borehole Log

Borehole No.

WS303

Sheet 1 of 1

Project Name: Varey Street

Project No.
077873.003 C

Co-ords: -

Hole Type
WS

Location: Gorton, Manchester

Level: 73.40

Scale
1:40

Client: Southway Housing Trust

Dates: 10/11/2021 - 10/11/2021

Logged By
MH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.30	ES		0.20	73.20		Grass over TOPSOIL: Brown silty fine and medium sand. Rare rootlets.	1
					0.40	73.00		MADE GROUND: Brown gravelly fine to coarse sand. Gravel is fine to coarse angular to subrounded brick, concrete, metal, ceramic, glass and rare coal.	
								MADE GROUND: Reworked. Soft light brown sandy clay.	
		1.20		N=10 (1,1/2,2,2,4)	1.00	72.40		Firm light brown with grey mottling sandy CLAY.	
		1.50	D						
		2.00		N=17 (3,3/3,4,5,5)	1.90	71.50		Stiff brown with rare grey mottling slightly sandy slightly gravelly CLAY. Gravel is fine and medium subangular to rounded sandstone, mudstone and rare coal. Rare cobbles of sandstone.	
		2.70		N=26 (25 for 20mm/9,5,6,6)					
		3.00	D						
		3.17		N=22 (5,5/5,5,5,7)					
					4.00	69.40			
								End of borehole at 4.00 m	4
									5
									6
									7
									8

Remarks

Ground level estimated from Survey and Engineering Projects topographic survey, dated April 2021. Service inspection pit hand excavated from GL to 1.00m. No groundwater encountered.





Borehole Log

Borehole No.

WS304

Sheet 1 of 1

Project Name: Varey Street

Project No.
077873.003 C

Co-ords: -

Hole Type
WS

Location: Gorton, Manchester

Level: 73.60

Scale
1:40

Client: Southway Housing Trust

Dates: 10/11/2021 - 10/11/2021

Logged By
MH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	ES	N=6 (1,1/1,1,2,2)	0.20	73.40		Grass over TOPSOIL: Brown slightly silty slightly gravelly fine and medium sand. Gravel is fine and medium subangular to subrounded sandstone, rare brick and rare ceramic.	1
		0.60			0.80	72.80		MADE GROUND: Dark brown gravelly fine to coarse sand. Gravel is fine to coarse angular to subangular brick, concrete, sandstone, slate, ceramic and wood. Rare cobbles of brick and concrete. Rare concrete tiles.	
		1.20			1.20	72.40		MADE GROUND: Loose light brown fine and medium sand.	
			D	N=15 (3,3/3,4,4,4)	1.60	72.00		Soft light brown with grey mottling sandy CLAY.	2
		2.00			2.00			Stiff brown with rare grey mottling slightly sandy slightly gravelly CLAY. Gravel is fine and medium angular to subrounded sandstone, mudstone and coal.	
		3.00							
					3.50	70.10		Medium dense light brown fine and medium SAND.	
					3.60	70.00		Stiff brown with rare grey mottling slightly sandy slightly gravelly CLAY. Gravel is fine and medium angular to subrounded sandstone, mudstone and coal.	
		4.00							
		5.00							
					5.45	68.15		End of borehole at 5.45 m	
									3
									4
									5
									6
									7
									8

Remarks

Ground level estimated from Survey and Engineering Projects topographic survey, dated April 2021. Service inspection pit hand excavated from GL to 1.00m. Groundwater strike encountered at 3.50m bgl, water risen to 3.20m bgl after 20 minutes.





Borehole Log

Borehole No.

WS305

Sheet 1 of 1

Project Name: Varey Street

Project No.
077873.003 C

Co-ords: -

Hole Type
WS

Location: Gorton, Manchester

Level: 74.00

Scale
1:40

Client: Southway Housing Trust

Dates: 10/11/2021 - 10/11/2021

Logged By
MH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.50	ES		0.30	73.70		Grass over TOPSOIL: Brown slightly gravelly fine and medium sand. Gravel is fine angular brick, concrete and rare glass.	1
		1.20		N=12 (3,3/3,3,3,3)				MADE GROUND: Dark greyish brown gravelly fine to coarse sand. Gravel is fine to coarse angular to subangular brick, concrete, metal, slate and glass. Rare cobbles of brick and sandstone.	
		2.00 2.10	ES	N=15 (3,3/3,4,4,4)	1.50	72.50		Stiff brown mottled grey slightly sandy slightly gravelly CLAY. Gravel is fine and medium angular to sub-rounded of sandstone and mudstone.	2
		3.00 3.00	D	N=27 (5,5/6,6,7,8)					3
		4.00		N=32 (5,5/6,7,9,10)					4
					4.45	69.55		End of borehole at 4.45 m	5
									6
									7
									8

Remarks

Ground level estimated from Survey and Engineering Projects topographic survey, dated April 2021. Service inspection pit hand excavated from GL to 1.00m. No groundwater encountered.





Appendix A3 – Geo-Environmental Laboratory Testing Results

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 21/12366
Issue Number: 1

Date: 19 November, 2021

Client: Curtins Consulting (Manchester)
Merchant Exchange
17-19 Whitworth Street
Manchester
UK
M1 5WG

Project Manager: EBMA/Matthew Holroyd
Project Name: Varey Street
Project Ref: B077873
Order No: EBMA3131
Date Samples Received: 12/11/21
Date Instructions Received: 15/11/21
Date Analysis Completed: 19/11/21

Approved by:



Holly Neary-King
Client Services Supervisor

Envirolab Job Number: 21/12366

Client Project Name: Varey Street

Client Project Ref: B077873

Lab Sample ID	21/12366/1	21/12366/2	21/12366/3	21/12366/4	21/12366/5	21/12366/6		Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS305	WS304	WS303	WS301	WS302	WS305				
Depth to Top	0.50	0.60	0.30	0.70	0.70	2.10				
Depth To Bottom										
Date Sampled	10-Nov-21	10-Nov-21	10-Nov-21	10-Nov-21	10-Nov-21	11-Nov-21				
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES				
Sample Matrix Code	4AE	4AE	4AE	4AE	6A	6AE				
% Stones >10mm _A	19.1	6.5	8.6	15.7	<0.1	<0.1		% w/w	0.1	A-T-044
pH _D ^{M#}	8.30	8.05	8.16	8.24	8.02	7.74		pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	0.02	0.02	<0.01	0.02	<0.01	0.03		g/l	0.01	A-T-026s
Cyanide (total) _A ^{M#}	<1	<1	<1	<1	<1	<1		mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC _A	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2		mg/kg	0.2	A-T-050s
Organic matter _D ^{M#}	9.4	6.8	6.7	8.3	6.4	1.3		% w/w	0.1	A-T-032 OM
Arsenic _D ^{M#}	17	28	18	12	17	<1		mg/kg	1	A-T-024s
Boron (water soluble) _D	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0		mg/kg	1	A-T-027s
Cadmium _D ^{M#}	1.1	1.6	1.3	1.0	1.5	1.5		mg/kg	0.5	A-T-024s
Copper _D ^{M#}	69	67	60	49	55	21		mg/kg	1	A-T-024s
Chromium _D ^{M#}	16	31	22	15	22	42		mg/kg	1	A-T-024s
Chromium (hexavalent) _D	<1	<1	<1	<1	<1	<1		mg/kg	1	A-T-040s
Lead _D ^{M#}	328	397	292	396	216	12		mg/kg	1	A-T-024s
Mercury _D	1.30	0.82	0.91	1.10	<0.17	<0.17		mg/kg	0.17	A-T-024s
Nickel _D ^{M#}	18	21	18	13	24	44		mg/kg	1	A-T-024s
Selenium _D ^{M#}	<1	<1	<1	<1	<1	<1		mg/kg	1	A-T-024s
Zinc _D ^{M#}	241	318	165	164	156	47		mg/kg	5	A-T-024s

Envirolab Job Number: 21/12366

Client Project Name: Varey Street

Client Project Ref: B077873

Lab Sample ID	21/12366/1	21/12366/2	21/12366/3	21/12366/4	21/12366/5	21/12366/6		Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS305	WS304	WS303	WS301	WS302	WS305				
Depth to Top	0.50	0.60	0.30	0.70	0.70	2.10				
Depth To Bottom										
Date Sampled	10-Nov-21	10-Nov-21	10-Nov-21	10-Nov-21	10-Nov-21	11-Nov-21				
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES				
Sample Matrix Code	4AE	4AE	4AE	4AE	6A	6AE				
Asbestos in Soil (inc. matrix)										
Asbestos in soil _D [#]	NAD	NAD	NAD	NAD	NAD	NAD				A-T-045
Asbestos Matrix (visual) _D	-	-	-	-	-	-				A-T-045
Asbestos Matrix (microscope) _D	-	-	-	-	-	-				A-T-045
Asbestos ACM - Suitable for Water Absorption Test? _D	N/A	N/A	N/A	N/A	N/A	N/A				A-T-045

Envirolab Job Number: 21/12366

Client Project Name: Varey Street

Client Project Ref: B077873

Lab Sample ID	21/12366/1	21/12366/2	21/12366/3	21/12366/4	21/12366/5	21/12366/6		Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS305	WS304	WS303	WS301	WS302	WS305				
Depth to Top	0.50	0.60	0.30	0.70	0.70	2.10				
Depth To Bottom										
Date Sampled	10-Nov-21	10-Nov-21	10-Nov-21	10-Nov-21	10-Nov-21	11-Nov-21				
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES				
Sample Matrix Code	4AE	4AE	4AE	4AE	6A	6AE				
PAH-16MS										
Acenaphthene _A ^{M#}	0.20	0.24	0.23	0.05	1.99	<0.01		mg/kg	0.01	A-T-019s
Acenaphthylene _A ^{M#}	0.02	0.02	<0.01	<0.01	0.02	<0.01		mg/kg	0.01	A-T-019s
Anthracene _A ^{M#}	0.39	0.53	0.40	0.09	3.22	<0.02		mg/kg	0.02	A-T-019s
Benzo(a)anthracene _A ^{M#}	1.31	1.47	1.44	0.44	8.73	<0.04		mg/kg	0.04	A-T-019s
Benzo(a)pyrene _A ^{M#}	1.23	1.38	1.39	0.49	7.10	<0.04		mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	1.30	1.49	1.44	0.51	7.72	<0.05		mg/kg	0.05	A-T-019s
Benzo(ghi)perylene _A ^{M#}	0.60	0.63	0.62	0.23	2.52	<0.05		mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	0.46	0.49	0.55	0.18	2.75	<0.07		mg/kg	0.07	A-T-019s
Chrysene _A ^{M#}	1.34	1.56	1.54	0.53	8.09	<0.06		mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene _A ^{M#}	0.13	0.15	0.14	0.05	0.58	<0.04		mg/kg	0.04	A-T-019s
Fluoranthene _A ^{M#}	2.82	3.13	2.99	0.98	20.7	<0.08		mg/kg	0.08	A-T-019s
Fluorene _A ^{M#}	0.13	0.15	0.14	0.03	1.11	<0.01		mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	0.65	0.68	0.69	0.25	2.95	<0.03		mg/kg	0.03	A-T-019s
Naphthalene _A ^{M#}	0.08	0.13	0.03	<0.03	0.11	<0.03		mg/kg	0.03	A-T-019s
Phenanthrene _A ^{M#}	1.77	2.05	1.89	0.72	14.3	<0.03		mg/kg	0.03	A-T-019s
Pyrene _A ^{M#}	2.67	2.98	2.86	0.90	19.5	<0.07		mg/kg	0.07	A-T-019s
Total PAH-16MS _A ^{M#}	15.1	17.1	16.4	5.45	101	<0.08		mg/kg	0.01	A-T-019s

Envirolab Job Number: 21/12366

Client Project Name: Varey Street

Client Project Ref: B077873

Lab Sample ID	21/12366/1	21/12366/2	21/12366/3	21/12366/4	21/12366/5	21/12366/6		Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS305	WS304	WS303	WS301	WS302	WS305				
Depth to Top	0.50	0.60	0.30	0.70	0.70	2.10				
Depth To Bottom										
Date Sampled	10-Nov-21	10-Nov-21	10-Nov-21	10-Nov-21	10-Nov-21	11-Nov-21				
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES				
Sample Matrix Code	4AE	4AE	4AE	4AE	6A	6AE				
TPH CWG										
Ali >C5-C6 _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s
Ali >C6-C8 _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s
Ali >C8-C10 _A	2	<1	<1	<1	<1	<1		mg/kg	1	A-T-055s
Ali >C10-C12 _A ^{M#}	<1	<1	<1	<1	<1	<1		mg/kg	1	A-T-055s
Ali >C12-C16 _A ^{M#}	2	1	1	<1	2	<1		mg/kg	1	A-T-055s
Ali >C16-C21 _A ^{M#}	3	3	2	4	5	<1		mg/kg	1	A-T-055s
Ali >C21-C35 _A ^{M#}	17	25	14	16	17	2		mg/kg	1	A-T-055s
Total Aliphatics _A	25	29	17	21	24	2		mg/kg	1	A-T-055s
Aro >C5-C7 _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s
Aro >C7-C8 _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s
Aro >C8-C10 _A	2	<1	<1	<1	<1	<1		mg/kg	1	A-T-055s
Aro >C10-C12 _A	<1	<1	<1	<1	1	<1		mg/kg	1	A-T-055s
Aro >C12-C16 _A	7	8	4	7	24	<1		mg/kg	1	A-T-055s
Aro >C16-C21 _A ^{M#}	35	36	21	25	119	<1		mg/kg	1	A-T-055s
Aro >C21-C35 _A ^{M#}	115	105	72	52	352	<1		mg/kg	1	A-T-055s
Total Aromatics _A	159	149	97	84	496	<1		mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C35) _A	184	178	115	105	520	2		mg/kg	1	A-T-055s
BTEX - Benzene _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s
BTEX - Toluene _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s
BTEX - m & p Xylene _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s
BTEX - o Xylene _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s
MTBE _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s

REPORT NOTES

General

This report shall not be reproduced, except in full, without written approval from Envirolab.

The results reported herein relate only to the material supplied to the laboratory.

The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.

Analytical results reflect the quality of the sample at the time of analysis only.

Opinions and interpretations expressed are outside the scope of our accreditation.

If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.

A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.

The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:

All results are reported as dry weight (<40°C).

For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.

For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any "A" subscripts

All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:

Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:

Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.

Stones etc. are not removed from the sample prior to analysis.

Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:

1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.

Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.

Secondary Matrix Codes:

A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,

E = contains roots/twigs.

Key:

IS indicates Insufficient Sample for analysis.

US indicates Unsuitable Sample for analysis.

NDP indicates No Determination Possible.

NAD indicates No Asbestos Detected.

N/A indicates Not Applicable.

Superscript # indicates method accredited to ISO 17025.

Superscript "M" indicates method accredited to MCERTS.

Subscript "A" indicates analysis performed on the sample as received.

Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need any further information.

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client:	Curtins Consulting (Manchester), Merchant Exchange, 17-19 Whitworth Street , Manchester, UK, M1 5WG	Project No:	21/12366
Project:	Varey Street	Date Received:	15/11/2021 (am)
Clients Project No:	B077873	Cool Box Temperatures (°C):	9.6

NO DEVIATIONS IDENTIFIED

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	21/12366/1	21/12366/2	21/12366/3	21/12366/4	21/12366/5	21/12366/6
Client Sample No						
Client Sample ID/Depth	WS305 0.50m	WS304 0.60m	WS303 0.30m	WS301 0.70m	WS302 0.70m	WS305 2.10m
Date Sampled	10/11/21	10/11/21	10/11/21	10/11/21	10/11/21	11/11/21
A-T-019s	19/11/2021	19/11/2021	19/11/2021	19/11/2021	19/11/2021	19/11/2021
A-T-022s	18/11/2021	18/11/2021	18/11/2021	18/11/2021	18/11/2021	18/11/2021
A-T-024s	19/11/2021	19/11/2021	19/11/2021	19/11/2021	19/11/2021	19/11/2021
A-T-026s	18/11/2021	18/11/2021	18/11/2021	18/11/2021	18/11/2021	18/11/2021
A-T-027s	19/11/2021	19/11/2021	19/11/2021	19/11/2021	19/11/2021	19/11/2021
A-T-031s	18/11/2021	18/11/2021	18/11/2021	18/11/2021	18/11/2021	18/11/2021
A-T-032 OM	18/11/2021	18/11/2021	18/11/2021	18/11/2021	18/11/2021	18/11/2021
A-T-040s	18/11/2021	18/11/2021	18/11/2021	18/11/2021	18/11/2021	18/11/2021
A-T-042sTCN	18/11/2021	18/11/2021	18/11/2021	18/11/2021	18/11/2021	18/11/2021
A-T-044	19/11/2021	19/11/2021	19/11/2021	19/11/2021	19/11/2021	19/11/2021
A-T-045	16/11/2021	16/11/2021	16/11/2021	16/11/2021	16/11/2021	16/11/2021
A-T-050s	18/11/2021	18/11/2021	18/11/2021	18/11/2021	18/11/2021	18/11/2021
A-T-055s	19/11/2021	19/11/2021	19/11/2021	19/11/2021	19/11/2021	19/11/2021

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report



Appendix A4 – Generic Assessment Criteria (GACs)

Adopted Soil Generic Assessment Criteria
Sandy loam with 6% SOM



Contaminants	Residential <u>with</u> home grown produce	Residential <u>without</u> home grown produce	Allotments	Commercial	Public open space near residential housing POS _{resi}	Public park POS _{park}
Metals						
Beryllium	1.7	1.7	35	12	2.2	63
Boron	290	11,000	45	240,000	21,000	46,000
Cadmium	10⁽¹³⁾ 22	85⁽¹³⁾ 150	1.8 3.9	230 410	120 220	560 880
Chromium III	910	910	18,000	8,600	1,500	33,000
Chromium VI	6 21	6 21	1.8 170	33 49	7.7 21	220 250
Lead	200	310	80	2,300	630	1,300
Mercury (<i>elemental</i>)	1	1	26	26	16	26⁽⁸⁾ [30]
Mercury (<i>inorganic</i>)	170	240	80	3600	120	240
Nickel	130⁽¹⁰⁾	180⁽¹⁰⁾	53⁽¹¹⁾	980⁽¹⁰⁾	230	800
Vanadium	410	1200	91	9000	2000	5000
Copper	2400	7100	520	68000	12000	44000
Zinc	3700	40000	620	730000	81000	170000
Semi-Metals and non-metals						
Arsenic	32⁽¹²⁾ 37	35⁽¹²⁾ 40	43⁽¹²⁾ 49	640⁽¹²⁾ 640	79 79	170 170
Antimony		550		7500	1500	3300
Selenium	350	600	120	13000	1100	1800
Inorganic chemicals						
Cyanide	34	34	34	34	34	34
Organic contaminants						
<i>Aliphatic risk banded hydrocarbons - TPHCWG method</i>						
EC ₅₋₅ - EC ₆	160	160	3900	12000	600000	180000
EC ₅₋₆ - EC ₈	530	530	13000	40000	620000	320000
EC ₅₋₈ - EC ₁₀	150	150	1700	11000	13000	21000
EC ₁₀₋₁₀ - EC ₁₂	760	770	7300	47000	13000	24000
EC ₁₂₋₁₂ - EC ₁₆	4300	4400	13000	90000	13000	26000
EC ₅₋₁₆ - EC ₃₅	110000	110000	270000	1800000	250000	490000
EC ₃₅₋₃₅ - EC ₄₄	110000	110000	270000	1800000	250000	490000
<i>Aromatic risk banded hydrocarbons - TPHCWG method</i>						
EC ₅₋₅ - EC ₇	300	1400	57	86000	56000	92000
EC ₅₋₇ - EC ₈	660	3900	120	180000	56000	100000
EC ₅₋₈ - EC ₁₀	190	270	51	17000	5000	9300
EC ₁₀₋₁₀ - EC ₁₂	380	1200	74	34000	5000	10000
EC ₁₂₋₁₂ - EC ₁₆	660	2500	130	38000	5000	10000
EC ₅₋₁₆ - EC ₂₁	930	1900	260	28000	3800	7800
EC ₂₁₋₂₁ - EC ₃₅	1700	1900	1600	28000	3800	7900
EC ₃₅₋₃₅ - EC ₄₄	1700	1900	1600	28000	3800	7900
Aliph + Arom EC >44-70	1900	1900	3000	28000	3800	7900
Aromatic						
Benzene	0.33 0.87	1.0 3.3	0.07 0.18	95 98	73 140	110 230
Ethyl benzene	350	840	90	2800⁽⁸⁾ [66000]	2800⁽⁸⁾ [25000]	2800⁽⁸⁾ [27000]
Toluene	610	2700	120	4400⁽⁸⁾ [190000]	4400⁽⁸⁾ [56000]	4400⁽⁸⁾ [100000]
Xylene ⁽⁹⁾	230	290	160	2600⁽⁸⁾ [32000]	2600⁽⁸⁾ [43000]	2600⁽⁸⁾ [31000]
Phenol	420	520	280	3200⁽¹⁴⁾ (38000)	3200⁽¹⁴⁾ (10000)	3200⁽¹⁴⁾ (9300)
Polycyclic Aromatic Hydrocarbons (PAH)						
Naphthalene	13	13	24	1100	4900	3000
Acenaphthylene	920	6000	160	100000	15000	30000
Acenaphthene	1100	6000	200	100000	15000	30000
Fluorene	860	4500	160	71000	9900	20000
Phenanthrene	440	1500	90	23000	3100	6300
Anthracene	11000	37000	2200	540000	74000	150000
Fluoranthene	890	1600	290	23000	3100	6400
Pyrene	2000	3800	620	54000	7400	15000
Benz(a)anthracene	13	15	13	180	29	62
Chrysene	27	32	19	350	57	120
Benzo(b)fluoranthene	3.7	4.0	3.9	45	7.2	16.0
Benzo(k)fluoranthene	100	110	130	1200	190	440
Benzo(a)pyrene	3.0 5.0	3.2 5.3	3.5 5.7	36 77	5.7 10	13 21
Indeno(123cd)pyrene	41	46	39	510	82	180
Dibenzo(ah)anthracene	0.3	0.32	0.43	3.6	0.58	1.4
Benzo(ghi)perylene	350	360	640	4000	640	1600
Chlorinated Aliphatic Hydrocarbons						
Vinyl chloride	0.0014	0.0015	0.0018	0.12	3.5	5.4
Trichloroethene (TCE)	0.075	0.08	0.21	5.7	120	120
1,1,1,2 Tetrachlorethane	6.4	8.2	4.4	560	1400	2100
Tetrachlorethane (PCE)	0.90	0.92	3.6	95	1400	1500
1,1,1 Trichlorethane	39	40	240	3000	140000	100000

Notes

- All values above are in mg/kg
- Numbers in bold are SGVs or GAC that are derived based on SGV report input parameters, numbers in italics are S4ULs, numbers in bold-italics are based on EIC/AGS/CL:AIRE numbers & input parameters and underlined numbers are C4SLs**
- Soil organic matter (SOM) is assumed to be 6% - DEFAULT VALUE
- Soil type is assumed to be sandy loam - DEFAULT SOIL TYPE
- For residential, the building type is conservatively assumed to be a small terrace house where the development includes bungalows change to more conservative bungalow setting in computer model
- For commercial, the building type is conservatively assumed to be a pre 1970s office building, where the proposed development comprises houses, flat with living spaces changes setting in model accordingly
- For classrooms consider increasing the dust loading factor in the 'Soil and Building Data' of the CLEA 1.04 model from 50 to 100µg m⁻³
- Based on vapour saturation limit as suggested by EA / [] model value
- Lowest of o-, m- and p-xylene
- Based on comparison of inhalation exposure with inhalation TDI
- Based on comparison of oral, dermal, and inhalation exposure with the oral TDI
- Based on a comparison of oral and dermal soil exposure with oral Index Dose only
- Averaged over and based on lifetime exposure
- Based on critical concentration for skin irritation in humans arising from contact with phenol in aqueous solution (number in brackets based on health effects following long term exposure for illustration)
- NA: Not applicable

Adopted Soil Generic Assessment Criteria
Sandy loam with 2.5% SOM



Contaminants	Residential <u>with</u> home grown produce	Residential <u>without</u> home grown produce	Allotments	Commercial	Public open space near residential housing POS _{resi}	Public park POS _{park}
Metals						
Beryllium	1.7	1.7	35	12	2.2	63
Boron	290	11,000	45	240,000	21,000	46,000
Cadmium	10⁽¹³⁾ 22	85⁽¹³⁾ 150	1.8 3.9	230 410	120 220	560 880
Chromium III	910	910	18,000	8,600	1,500	33,000
Chromium VI	6 21	6 21	1.8 170	33 49	7.7 21	220 250
Lead	200	310	80	2,300	630	1,300
Mercury (elemental)	1	1	26	26	16	26⁽⁸⁾ [30]
Mercury (inorganic)	170	240	80	3600	120	240
Nickel	130⁽¹⁰⁾	180⁽¹⁰⁾	53⁽¹¹⁾	980⁽¹⁰⁾	230	800
Vanadium	410	1200	91	9000	2000	5000
Copper	2400	7100	520	68000	12000	44000
Zinc	3700	40000	620	730000	81000	170000
Semi-Metals and non-metals						
Arsenic	32⁽¹²⁾ 37	35⁽¹²⁾ 40	43⁽¹²⁾ 49	640⁽¹²⁾ 640	79 79	170 170
Antimony		550		7500	1500	3300
Selenium	350	600	120	13000	1100	1800
Inorganic chemicals						
Cyanide	34	34	34	34	34	34
Organic contaminants						
<i>Aliphatic risk banded hydrocarbons - TPHCWG method</i>						
EC ₅ - EC ₆	78	78	1700	5900	590000	130000
EC ₆ - EC ₈	230	230	5600	17000	610000	220000
EC ₈ - EC ₁₀	65	65	770	4800	13000	18000
EC ₁₀ - EC ₁₂	330	330	4400	23000	13000	23000
EC ₁₂ - EC ₁₆	2400	2400	13000	82000	13000	25000
EC ₁₆ - EC ₃₅	92000	92000	270000	1700000	250000	480000
EC ₃₅ - EC ₄₄	92000	92000	270000	1700000	250000	480000
<i>Aromatic risk banded hydrocarbons - TPHCWG method</i>						
EC ₅ - EC ₇	140	690	27	46000	56000	84000
EC ₇ - EC ₈	290	1800	51	110000	56000	95000
EC ₈ - EC ₁₀	83	110	21	8100	5000	8500
EC ₁₀ - EC ₁₂	180	590	31	28000	5000	9700
EC ₁₂ - EC ₁₆	330	2300	57	37000	5100	10000
EC ₁₆ - EC ₂₁	540	1900	110	28000	3800	7700
EC ₂₁ - EC ₃₅	1500	1900	820	28000	3800	7800
EC ₃₅ - EC ₄₄	1500	1900	820	28000	3800	7800
Aliph + Arom EC >44-70	1800	1900	2100	28000	3800	7800
<i>Aromatic</i>						
Benzene	0.16	0.49	0.035	50	72	100
Ethyl benzene	150	380	39	1200⁽⁸⁾ [35000]	1200⁽⁸⁾ [24000]	1200⁽⁸⁾ [22000]
Toluene	270	1300	51	1900⁽⁸⁾ [110000]	1900⁽⁸⁾ [56000]	1900⁽⁸⁾ [95000]
Xylene ⁽⁹⁾	98	120	70	1200⁽⁸⁾ [14000]	1200⁽⁸⁾ [42000]	1200⁽⁸⁾ [23000]
Phenol	290	420	140	1500⁽¹⁴⁾ (35000)	1500⁽¹⁴⁾ (10000)	1500⁽¹⁴⁾ (8300)
<i>Polycyclic Aromatic Hydrocarbons (PAH)</i>						
Naphthalene	5.6	5.6	10	460	4900	1900
Acenaphthylene	420	4600	69	97000	15000	30000
Acenaphthene	510	4700	85	97000	15000	30000
Fluorene	400	3800	67	68000	9900	20000
Phenanthrene	220	1500	38	22000	3100	6200
Anthracene	5400	35000	950	540000	74000	150000
Fluoranthene	560	1600	130	23000	3100	6300
Pyrene	1200	3800	270	54000	7400	15000
Benz(a)anthracene	11	14	6.5	170	29	56
Chrysene	22	31	9.4	350	57	110
Benzo(b)fluoranthene	3.3	4.0	2.1	44	7.2	15
Benzo(k)fluoranthene	93	110	75	1200	190	410
Benzo(a)pyrene	2.7	3.2	2	35	5.7	12
Indeno(123cd)pyrene	36	46	21	510	82	170
Dibenzo(ah)anthracene	0.28	0.32	0.27	3.6	0.57	1.3
Benzo(ghi)perylene	340	360	470	4000	640	1500
Chlorinated Aliphatic Hydrocarbons						
Vinyl chloride	0.00087	0.001	0.001	0.077	3.5	5
Trichloroethene (TCE)	0.034	0.036	0.091	2.6	120	91
1,1,1,2 Tetrachlorethane	2.8	3.5	1.9	250	1400	1800
Tetrachlorethane (PCE)	0.39	0.4	1.5	42	1400	1100
1,1,1 Trichlorethane	18	18	110	1300	140000	76000

Notes

- All values above are in mg/kg
- Numbers in bold are SGVs or GAC that are derived based on SGV report input parameters, numbers in italics are S4ULs, numbers in bold-italics are based on EIC/AGS/CL:AIRE numbers & input parameters and underlined numbers are C4SLs
- Soil organic matter (SOM) is assumed to be 2.5% - DEFAULT VALUE
- Soil type is assumed to be sandy loam - DEFAULT SOIL TYPE
- For residential, the building type is conservatively assumed to be a small terrace house where the development includes bungalows change to more conservative bungalow setting in computer model
- For commercial, the building type is conservatively assumed to be a pre 1970s office building, where the proposed development comprises houses, flat with living spaces changes setting in model accordingly
- For classrooms consider increasing the dust loading factor in the 'Soil and Building Data' of the CLEA 1.04 model from 50 to 100µg m⁻³
- Based on vapour saturation limit as suggested by EA / [] model value
- Lowest of o-, m- and p-xylene
- Based on comparison of inhalation exposure with inhalation TDI
- Based on comparison of oral, dermal, and inhalation exposure with the oral TDI
- Based on a comparison of oral and dermal soil exposure with oral Index Dose only
- Averaged over and based on lifetime exposure
- Based on critical concentration for skin irritation in humans arising from contact with phenol in aqueous solution (number in brackets based on health effects following long term exposure for illustration)
- NA: Not applicable

Adopted Soil Generic Assessment Criteria
Sandy loam with 1% SOM



Contaminants	Residential <u>with</u> home grown produce	Residential <u>without</u> home grown produce	Allotments	Commercial	Public open space near residential housing POS _{resi}	Public park POS _{park}
Metals						
Beryllium	1.7	1.7	35	12	2.2	63
Boron	290	11,000	45	240,000	21,000	46,000
Cadmium	10⁽¹³⁾ 22	85⁽¹³⁾ 150	1.8 3.9	230 410	120 220	560 880
Chromium III	910	910	18,000	8,600	1,500	33,000
Chromium VI	6 <u>21</u>	6 <u>21</u>	1.8 <u>170</u>	33 <u>49</u>	7.7 <u>21</u>	220 <u>250</u>
Lead	<u>200</u>	<u>310</u>	80	<u>2,300</u>	630	<u>1,300</u>
Mercury (<i>elemental</i>)	1	1	26	26	16	26⁽⁸⁾ [30]
Mercury (<i>inorganic</i>)	170	240	80	3600	120	240
Nickel	130 ⁽¹⁰⁾	180 ⁽¹⁰⁾	53 ⁽¹¹⁾	980 ⁽¹⁰⁾	230	800
Vanadium	410	1200	91	9000	2000	5000
Copper	2400	7100	520	68000	12000	44000
Zinc	3700	40000	620	730000	81000	170000
Semi-Metals and non-metals						
Arsenic	32⁽¹²⁾ 37	35⁽¹²⁾ 40	43⁽¹²⁾ 49	640⁽¹²⁾ 640	79 <u>79</u>	170 <u>170</u>
Antimony		550		7500	1500	3300
Selenium	350	600	120	13000	1100	1800
Inorganic chemicals						
Cyanide	34	34	34	34	34	34
Organic contaminants						
<i>Aliphatic risk banded hydrocarbons - TPHCWG method</i>						
EC ₅₋₅ - EC ₆	42	42	730	3200	570000	95000
EC ₆₋₆ - EC ₈	100	100	2300	7800	600000	150000
EC ₈₋₈ - EC ₁₀	27	27	320	2000	13000	14000
EC ₁₀₋₁₀ - EC ₁₂	130	130	2200	9700	13000	21000
EC ₁₂₋₁₂ - EC ₁₆	1100	1100	11000	59000	13000	25000
EC ₁₆₋₁₆ - EC ₃₅	65000	65000	260000	1600000	250000	450000
EC ₃₅₋₃₅ - EC ₄₄	65000	65000	260000	1600000	250000	450000
<i>Aromatic risk banded hydrocarbons - TPHCWG method</i>						
EC ₅₋₅ - EC ₇	70	370	13	26000	56000	76000
EC ₇₋₇ - EC ₈	130	860	22	56000	56000	87000
EC ₈₋₈ - EC ₁₀	34	47	8.6	3500	5000	7200
EC ₁₀₋₁₀ - EC ₁₂	74	250	13	16000	5000	9200
EC ₁₂₋₁₂ - EC ₁₆	140	1800	23	36000	5100	10000
EC ₁₆₋₁₆ - EC ₂₁	260	1900	46	28000	3800	7600
EC ₂₁₋₂₁ - EC ₃₅	1100	1900	370	28000	3800	7800
EC ₃₅₋₃₅ - EC ₄₄	1100	1900	370	28000	3800	7800
Aliph + Arom EC >44-70	1600	1900	1200	28000	3800	7800
Aromatic						
Benzene	0.08	0.3	0.017	28	72	90
Ethyl benzene	65	170	16	520⁽⁸⁾ [17000]	520⁽⁸⁾ [24000]	520⁽⁸⁾ [17000]
Toluene	120	610	22	860⁽⁸⁾ [59000]	860⁽⁸⁾ [56000]	860⁽⁸⁾ [87000]
Xylene ⁽⁹⁾	41	53	28	480⁽⁸⁾ [69000]	480⁽⁸⁾ [41000]	480⁽⁸⁾ [17000]
Phenol	180	310	66	760⁽¹⁴⁾ (31000)	760⁽¹⁴⁾ (10000)	760⁽¹⁴⁾ (7600)
Polycyclic Aromatic Hydrocarbons (PAH)						
Naphthalene	2.3	2.3	4.1	190	4900	1200
Acenaphthylene	170	2900	28	83000	15000	29000
Acenaphthene	210	3000	34	84000	15000	29000
Fluorene	170	2800	27	63000	9900	20000
Phenanthrene	95	1300	15	22000	3100	6200
Anthracene	2400	31000	380	520000	74000	150000
Fluoranthene	280	1500	52	23000	3100	6300
Pyrene	620	3700	110	54000	7400	15000
Benz(a)anthracene	7.2	11	2.9	170	29	49
Chrysene	15	30	4.1	350	57	93
Benzo(b)fluoranthene	2.6	3.9	0.99	44	7.1	13
Benzo(k)fluoranthene	77	110	37	1200	190	370
Benzo(a)pyrene	2.2	3.2	0.97	35	5.7	11
Indeno(123cd)pyrene	27	45	9.5	500	82	150
Dibenzo(ah)anthracene	0.24	0.31	0.14	3.5	0.57	1.1
Benzo(ghi)perylene	320	360	290	3900	640	1400
Chlorinated Aliphatic Hydrocarbons						
Vinyl chloride	0.00064	0.00077	0.00055	0.059	3.5	4.8
Trichloroethene (TCE)	0.016	0.017	0.041	1.2	120	70
1,1,1,2 Tetrachlorethane	1.2	1.5	0.79	110	1400	1500
Tetrachlorethane (PCE)	0.18	0.18	0.65	19	1400	810
1,1,1 Trichlorethane	8.8	9	48	660	140000	57000

Notes

- All values above are in mg/kg
- Numbers in bold are SGVs or GAC that are derived based on SGV report input parameters, numbers in italics are S4ULs, numbers in bold-italics are based on EIC/AGS/CL:AIRE numbers & input parameters and underlined numbers are C4SLs**
- Soil organic matter (SOM) is assumed to be 1% - DEFAULT VALUE
- Soil type is assumed to be sandy loam - DEFAULT SOIL TYPE
- For residential, the building type is conservatively assumed to be a small terrace house where the development includes bungalows change to more conservative bungalow setting in computer model
- For commercial, the building type is conservatively assumed to be a pre 1970s office building, where the proposed development comprises houses, flat with living spaces changes setting in model accordingly
- For classrooms consider increasing the dust loading factor in the 'Soil and Building Data' of the CLEA 1.04 model from 50 to 100µg m⁻³
- Based on vapour saturation limit as suggested by EA / [] model value
- Lowest of o-, m- and p-xylene
- Based on comparison of inhalation exposure with inhalation TDI
- Based on comparison of oral, dermal, and inhalation exposure with the oral TDI
- Based on a comparison of oral and dermal soil exposure with oral Index Dose only
- Averaged over and based on lifetime exposure
- Based on critical concentration for skin irritation in humans arising from contact with phenol in aqueous solution (number in brackets based on health effects following long term exposure for illustration)
- NA: Not applicable



Appendix A5 – Geotechnical Laboratory Testing Results

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 21/12603
Issue Number: 1

Date: 22 December, 2021

Client: Curtins Consulting (Manchester)
Merchant Exchange
17-19 Whitworth Street
Manchester
UK
M1 5WG

Project Manager: EBMA/Rebecca Tidsey
Project Name: Varey Street
Project Ref: B077873
Order No: EBMA3132
Date Samples Received: 12/11/21
Date Instructions Received: 22/11/21
Date Analysis Completed: 22/12/21

Approved by:



Holly Neary-King
Client Services Supervisor

Envirolab Job Number: 21/12603

Client Project Name: Varey Street

Client Project Ref: B077873

Lab Sample ID	21/12603/1	21/12603/2	21/12603/3	21/12603/4	21/12603/5	21/12603/6		Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS301	WS302	WS303	WS303	WS304	WS305				
Depth to Top	2.8	4	1.5	3	2	3				
Depth To Bottom				3.3		3.45				
Date Sampled	10-Nov-21	10-Nov-21	10-Nov-21	10-Nov-21	10-Nov-21	10-Nov-21				
Sample Type	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D				
Sample Matrix Code	3AE	3A	3A	3AE	3A	3A				
% Stones >10mm _A	<0.1	<0.1	<0.1	0.3	<0.1	<0.1		% w/w	0.1	A-T-044
pH BRE _D ^{M#}	8.86	9.10	8.01	8.82	8.52	8.98		pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1) _D ^{M#}	54	32	13	23	27	38		mg/l	10	A-T-026s
4 point Liquid & Plastic Limit by Cone Penetrometer _A	Appended	Appended	Appended	Appended	Appended	Appended				Subcon IFA
Moisture Content of Soil (Oven Dried Method) _A	Appended	Appended	Appended	Appended	Appended	Appended				Subcon IFA

REPORT NOTES

General

This report shall not be reproduced, except in full, without written approval from Envirolab.

The results reported herein relate only to the material supplied to the laboratory.

The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.

Analytical results reflect the quality of the sample at the time of analysis only.

Opinions and interpretations expressed are outside the scope of our accreditation.

If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.

A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.

The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:

All results are reported as dry weight (<40°C).

For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.

For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any "A" subscripts

All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:

Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:

Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.

Stones etc. are not removed from the sample prior to analysis.

Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:

1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.

Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.

Secondary Matrix Codes:

A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,

E = contains roots/twigs.

Key:

IS indicates Insufficient Sample for analysis.

US indicates Unsuitable Sample for analysis.

NDP indicates No Determination Possible.

NAD indicates No Asbestos Detected.

N/A indicates Not Applicable.

Superscript # indicates method accredited to ISO 17025.

Superscript "M" indicates method accredited to MCERTS.

Subscript "A" indicates analysis performed on the sample as received.

Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need any further information.

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client:	Curtins Consulting (Manchester), Merchant Exchange, 17-19 Whitworth Street , Manchester, UK, M1 5WG	Project No:	21/12603
Project:	Varey Street	Date Received:	22/11/2021 (am)
Clients Project No:	B077873	Cool Box Temperatures (°C):	9.8

NO DEVIATIONS IDENTIFIED

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	21/12603/1	21/12603/2	21/12603/3	21/12603/4	21/12603/5	21/12603/6
Client Sample No						
Client Sample ID/Depth	WS301 2.8m	WS302 4m	WS303 1.5m	WS303 3-3.3m	WS304 2m	WS305 3-3.45m
Date Sampled	10/11/21	10/11/21	10/11/21	10/11/21	10/11/21	10/11/21
A-T-026s	25/11/2021	25/11/2021	25/11/2021	25/11/2021	25/11/2021	25/11/2021
A-T-031s	25/11/2021	25/11/2021	25/11/2021	25/11/2021	25/11/2021	25/11/2021
A-T-044	02/12/2021	02/12/2021	02/12/2021	02/12/2021	02/12/2021	02/12/2021

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

F.A.O.

Final Test Report - 2280832 / 1

Site: Varey Street
Job Number: 2280832
Originating Client: Envirolab
Originating Reference: 21/12603
Date Sampled: Not Given
Date Scheduled: 29/11/2021
Date Testing Started: 13/12/2021
Date Testing Finished: 22/12/2021

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:



Paul Cathcart
Laboratory Manager

Report Issue Date: 22/12/2021

Page: 2

Results reported relate only to the samples tested.



Final Test Report - 2280832 / 1

Site: Varey Street

Job Number: 2280832

Originating Client: Envirolab

All opinions and interpretations contained within this report are outside of our Scope of Accreditation.

This test report shall not be reproduced, except in full and only with the written permission of Ian Farmer Associates Ltd.

Samples will be retained for 28 days from date of issue of the final test report before being disposed of, unless we receive written instruction to the contrary.

Report Issue Date: 22/12/2021



Appendix A6 – Ground Gas Monitoring Results

Curtins

Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG
Tel: 0161 236 2394
Fax: 0161 228 7902

**GAS MONITORING LOG SHEET**

Project: Varey Street **Date:** 24/11/2021
Job Number: B077873 **Visit:** 1
Client: Southway Housing Trust **Weather:** Clear
Barometric State: Falling **Ground Conditions:** Dry

Borehole Reference	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl	Borehole Base m bgl	Note
		Max	SS	Max	SS	Max	SS						
WS301	1017	0.0	0.0	0.0	0.0	0.3	0.3	20.6	2	1	Dry	1.87	
WS302	1014	0.0	0.0	0.0	0.0	2.2	2.2	19.4	1	4	1.64	5.07	
WS305	1012	0.0	0.0	0.0	0.0	2.8	2.8	17.3	0	1	Dry	1.15	

Notes**Logged by**

MH

1% gas volume = 10,000 ppm

Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.

All other gases recorded at 'steady state' unless otherwise stated

Curtins

Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG
Tel: 0161 236 2394
Fax: 0161 228 7902

**GAS MONITORING LOG SHEET**

Project: Varey Street **Date:** 10/12/2021
Job Number: B077873 **Visit:** 2
Client: Southway Housing Trust **Weather:** Overcast
Barometric State: Rising **Ground Conditions:** Damp

Borehole Reference	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl	Borehole Base m bgl	Note
		Max	SS	Max	SS	Max	SS						
WS301	998	0.1	0.0	0.0	0.0	0.0	0.0	21.20	1	0	Dry	1.90	
WS302	996	-9.2	-0.2	0.1	0.0	3.1	3.1	18.70	0	0	1.29	5.12	
WS305	994	0.0	0.0	0.0	0.0	0.8	0.8	20.00	0	0	1.03	1.16	

Notes**Logged by**

RT

1% gas volume = 10,000 ppm

Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.

All other gases recorded at 'steady state' unless otherwise stated

Curtins

Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG
Tel: 0161 236 2394
Fax: 0161 228 7902

**GAS MONITORING LOG SHEET**

Project: Varey Street **Date:** 20/12/2021
Job Number: B077873 **Visit:** 3
Client: Southway Housing Trust **Weather:** Cold, Cloudy
Barometric State: Falling **Ground Conditions:** Dry

Borehole Reference	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl	Borehole Base m bgl	Note
		Max	SS	Max	SS	Max	SS						
WS301	1029	-0.3	0.0	0.0	0.0	0.1	0.1	20.90	0	0	Dry	1.90	
WS302	1029	-1.4	0.0	0.0	0.0	2.4	2.4	19.00	0	0	1.45	5.12	
WS305	1029	0.0	0.0	0.0	0.0	1.1	1.1	19.70	0	0	1.15	1.16	

Notes**Logged by**

TW

1% gas volume = 10,000 ppm

Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.

All other gases recorded at 'steady state' unless otherwise stated

Curtins

Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG
Tel: 0161 236 2394
Fax: 0161 228 7902

**GAS MONITORING LOG SHEET**

Project: Varey Street **Date:** 07/01/2022
Job Number: B077873 **Visit:** 4
Client: Southway Housing Trust **Weather:** Snow, hail
Barometric State: Rising **Ground Conditions:** Wet

Borehole Reference	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl	Borehole Base m bgl	Note
		Max	SS	Max	SS	Max	SS						
WS301	997	-1.0	-1.0	0.0	0.0	0.6	0.1	20.60	0	0	Dry	1.90	
WS302	999	-1.0	-1.0	0.0	0.0	1.8	0.9	20.20	0	0	1.48	5.10	
WS305	1003	-1.0	-1.0	0.0	0.0	1.2	1.2	19.40	0	0	Dry	1.16	

Notes**Logged by**

ZH

1% gas volume = 10,000 ppm

Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.

All other gases recorded at 'steady state' unless otherwise stated

Curtins

Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG
Tel: 0161 236 2394
Fax: 0161 228 7902

**GAS MONITORING LOG SHEET**

Project: Varey Street **Date:** 20/01/2022
Job Number: B077873 **Visit:** 5
Client: Southway Housing Trust **Weather:** Sunny
Barometric State: Steady **Ground Conditions:** Dry

Borehole Reference	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl	Borehole Base m bgl	Note
		Max	SS	Max	SS	Max	SS						
WS301	1033	0.3	0.0	0.0	0.0	1.3	0.2	20.70	0	0	Dry	1.89	1
WS302	1032	-6.9	-0.3	0.0	0.0	2.8	2.8	19.00	0	0	1.63	5.08	
WS305	1030	-0.1	0.0	0.0	0.0	2.4	1.4	19.10	0	1	Dry	1.15	

Notes

1 - Flow dropped to -0.3 after 3 minutes.

Logged by

ZH

1% gas volume = 10,000 ppm

Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.

All other gases recorded at 'steady state' unless otherwise stated

Curtins

Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG
Tel: 0161 236 2394
Fax: 0161 228 7902

**GAS MONITORING LOG SHEET**

Project: Varey Street **Date:** 04/02/2022
Job Number: B077873 **Visit:** 6
Client: Southway Housing Trust **Weather:** Sunny
Barometric State: Rising **Ground Conditions:** Dry

Borehole Reference	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl	Borehole Base m bgl	Note
		Max	SS	Max	SS	Max	SS						
WS301	100	0.0	0.0	0.0	0.0	0.0	0.0	21.60	0	1	Dry	1.91	
WS302	998	0.0	0.0	0.0	0.0	1.7	1.6	20.70	1	2	1.60	5.12	
WS305	993	0.1	0.0	0.0	0.0	1.4	1.4	20.20	0	2	Dry	1.16	

Notes**Logged by**

RT

1% gas volume = 10,000 ppm

Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.

All other gases recorded at 'steady state' unless otherwise stated