



Ground Gas Addendum Report
Laystall Street, Manchester

Reference:15-140-R2-1
Date: May 2022



GROUND GAS ADDENDUM REPORT

Laystall Street
Manchester
M1 2JZ

Prepared for:

Great Places Housing Group



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Table of Contents

1. INTRODUCTION	2
1.1. Background	2
1.2. Proposed Development.....	2
1.3. Objectives	2
1.4. Limitations	2
1.5. Confidentiality	2
2. RATIONALE	3
2.1. Ground Conditions.....	3
2.2. Sources and pathways of Ground Gas (CSM)	4
3. GROUND GAS RISK ASSESSMENT	5
3.1. Ground Gas Risk Assessment Methodology	5
3.2. Monitoring Methodology.....	7
3.3. Summary of Monitoring Results	11
3.3.1. Groundwater	11
3.3.2. Barometric pressure	11
3.3.3. Gas Flow	11
3.3.4. Gas Concentrations	11
3.4. Conclusion	14
3.5. Ground Gas risk assessment - conclusion	15
APPENDIX I LIMITATIONS.....	16
APPENDIX II GLOSSARY	18
APPENDIX III DRAWINGS	21



1. INTRODUCTION

1.1. BACKGROUND

E3P has previously completed a ground investigation on the site known as Laystall Street in Manchester. The findings of the ground investigation are presented within the E3P report entitled Phase II GSA – Phase 2- Laystall Street, Manchester (Ref: 15-140-R1, dated March 2022).

During the investigation E3P installed six ground gas monitoring wells, which were to be monitored over a period of three months after installation with at least two sets of readings at low or falling atmospheric pressure. The data collected from the gas monitoring wells are summarised in this report and this comprises the completed ground gas assessment.

1.2. PROPOSED DEVELOPMENT

A proposed development layout has not been provided to date.

1.3. OBJECTIVES

The objectives of the ground gas addendum report are to provide a detailed assessment of ground gas risk based on all available data from the E3P ground investigation works.

1.4. LIMITATIONS

The limitations of this report are presented in Appendix I.

1.5. 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.



2. RATIONALE

Hazardous ground gas qualitative risk assessment is based on a conceptual site model (CSM) similar to that used for soil and groundwater contamination sources (i.e., source pathway receptor pollutant linkages).

The risk can be assessed based on knowledge of the ground conditions and CSM and a measure of hazardous gas concentrations and gas flow at the site within monitoring standpipes.

2.1. GROUND CONDITIONS

Made Ground

- Made Ground deposits were encountered within all exploratory hole locations to depths of between 0.80 m and 2.05 m bgl.
- Made Ground deposits generally comprise asphalt or concrete overlying light grey sandy gravel of concrete and limestone (MOT sub-base). Underneath the sub-base, Made Ground was identified as brown sandy gravelly clay with cobbles. Gravel comprises fine to coarse, angular to subangular brick, ash and clinker and cobbles comprise subangular brick.

Drift Deposits

- Drift deposits were encountered within all exploratory locations to depths of 18.80 m bgl. The drift deposits generally comprise stiff to very stiff brown mottled grey slightly gravelly CLAY with gravel of sandstone and mudstone.
- Dense brown slightly gravelly fine SAND with gravel of sandstone was identified in CP101 between 17.00 and 18.80 m bgl.

Solid Geology

- The solid bedrock geology was not encountered during the ground investigation. The depth to bedrock is not recorded on the closest BGS boreholes.

Groundwater

- Groundwater was encountered as occasional seepages between 1.40 m bgl and 2.00 m bgl during the site investigation with monitoring recording groundwater levels between 0.90 m and 2.40 m bgl.



2.2. SOURCES AND PATHWAYS OF GROUND GAS (CSM)

In this instance, the CSM (15-140-R1, March 2022) identified the following potential sources of ground gas:

Made Ground

There is potential for localised ground gas migration in proximity of the identified sources, albeit reduced by predominantly low permeability strata.

The CIRIA C665 guidance on gas risk assessment includes recommendations for periods and frequencies for monitoring visits. These recommendations take into account the nature of the proposed development and the likely generation potential of the source.

The proposed development comprises private residential properties, which would be classified as a Type A development (high sensitivity) in accordance with BS8485:2015+A1:2019. However, it is considered that the likely generation potential of the identified gas sources (taking into account the likelihood of future increases in gas generation) would be best classified as low.

Therefore within the context of the proposed residential end-use and ground gas generation potential, the gas assessment requires six visits over three months, with at least two sets of readings at low or falling atmospheric pressure.



3. GROUND GAS RISK ASSESSMENT

3.1. GROUND GAS RISK ASSESSMENT METHODOLOGY

The potential impact on the development from ground gases has been assessed with reference to standards and guidelines published in:

-  CIRIA Report 665 – *Assessing risks posed by hazardous ground gases to buildings (2007)*
-  BS8485:2015+A1:2019 – *Code of Practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings*

BS8485 provides guidance on the level of gas protection requirements based upon the characteristic situation (CS) and the proposed development based on building type.

Therefore, in accordance with BS8485, based on the measured flow rates and hazardous gas concentrations, individual hazardous gas flow rates (Q_{hg}) shall be derived for each monitoring point, from which the site characteristic hazardous gas flow rate (Q_{hgs}), and then the Characteristic Situation (CS) can be determined.

The following equation should be utilised:

$$Q_{hg} = q \left(\frac{C_{hg}}{100} \right)$$

Where:

- q is the measured flow rate (in litres per hour) of combined gases from the monitoring standpipe
- C_{hg} is the measured hazardous gas concentration (in percentage volume/volume).

The subsequent derived gas screening value (GSV) should be the maximum Q_{hg} (flow rate x concentration as a percentage volume) for all the monitoring events.

A 'worst case check' may be carried out using the maximum recorded flow in any hole with the maximum concentration in any hole to present the plausible worst case conditions. Adoption of the worst case Q_{hg} requires thorough justification and reference to the CSM.

The final derived GSV can then be used to characterise the site as summarised in Table 3.1.



TABLE 3.1 SITE CHARACTERISATION BY GSV (BS8485:2015)

CS	HAZARD POTENTIAL	GSV (l/hr) FOR METHANE AND CARBON DIOXIDE	ADDITIONAL FACTORS
CS1	Very Low	< 0.07	Typically <1% methane concentration and <5% carbon dioxide concentration (otherwise consider an increase to CS2)
CS2	Low	< 0.70	Typical measured flow rate <70 l/h (otherwise consider an increase to CS3)
CS3	Moderate	< 3.5	N/A
CS4	Moderate to High	< 15	N/A
CS5	High	< 70	N/A
CS6	Very High	> 70	N/A

Notes

1. The CS is equivalent to the characteristic GSV in CIRIA C665.
2. The worst-case ground gas regime identified on the site, either methane or carbon dioxide, at the worst-case temporal conditions that the site may be expected to encounter should be considered.
3. Gas Screening Value is the Borehole Gas Volume Flow Rate, in litres per hour, multiplied by the concentration in the air stream of the particular gas being considered.
4. The Gas Screening Value thresholds should not generally be exceeded without the completion of a detailed ground gas risk assessment taking into account site-specific conditions.

NHBC guidance (Report No 10627R01) can also be considered, if appropriate, which is based on standard residential houses with precast concrete floors (block and beam) / suspended cast in situ concrete floor slabs.

The thresholds for GSVs based upon NHBC guidance are provided within Table 3.2.

TABLE 3.2 THRESHOLDS FOR GAS SCREENING VALUES (GSV) IN ACCORDANCE WITH NHBC REPORT NO 10627R01 – RESIDENTIAL END USE

NHBC – SUBFLOOR VOID				
CLASSIFICATION	Methane ¹		Carbon Dioxide ¹	
	TYPICAL MAXIMUM CONCENTRATION ³ (%V/V)	GAS SCREENING VALUE ^{2,4} (l/hr)	TYPICAL MAXIMUM CONCENTRATION ³ (%V/V)	Gas Screening Value ^{2,4} (l/hr)
Green	< 1	< 0.16	< 5	< 0.78
Amber 1	< 5	< 0.63	< 10	< 1.56
Amber 2	< 5	< 1.56	< 30	< 3.10
Red	> 20	> 1.56	> 30	> 3.10

Notes

1. The worst-case ground gas regime identified on the site, either methane or carbon dioxide, at the worst-case temporal conditions that the site may be expected to encounter will be the decider as to what Traffic Light is allocated;
2. Gas Screening Value is the Borehole Gas Volume Flow Rate, in litres per hour, as defined in Wilson and Card (1999), which is the borehole flow rate multiplied by the concentration in the air stream of the particular gas being considered;
3. The Typical Maximum Concentrations can be exceeded in certain circumstances should the Conceptual Site Model indicate it is safe to do so;
4. The Gas Screening Value thresholds should not generally be exceeded without the completion of a detailed ground gas risk assessment taking into account site-specific conditions.



It should be noted that in the first instance, this assessment has been carried out in accordance with BS8485:2015+A1(2019) and the thresholds given in Table 3.1.

3.2. MONITORING METHODOLOGY

Concentrations of methane (CH_4), carbon dioxide (CO_2) and oxygen (O_2) were measured using a calibrated infrared gas analyser (GFM435) with gas flow rates measured using an integrated flow meter.

Gas measurements were recorded for a minimum of 500 seconds at each location, at which point the maximum concentration of CH_4 and CO_2 , together with the lowest concentration of O_2 were recorded.

The results of the ground gas monitoring are presented in Table 3.2.

In addition to the raw data, the results for each standpipe have been assessed with reference to guidance provided in BS8485:2015. Based on the initial peak measured flow rates and hazardous gas concentrations, individual hazardous gas flow rates (Q_{hg}) have been derived for each monitoring point, from which an individual Characteristic Situation (CS) can ultimately be determined.



TABLE 3.2 SUMMARY OF GROUND GAS MONITORING RESULTS

WELL	STRATA	DATE	CH ₄ PEAK (%V/V)	CH ₄ STEADY (%V/V)	CH ₄ Q _{hg} (l/hr)	CO ₂ PEAK (%V/V)	CO ₂ STEADY (%V/V)	CO ₂ Q _{hg} (l/hr)	O ₂ (%V/V)	ATMOS (mb)	ATMOS. DYNAMIC	PEAK FLOW (l/hr)	STEADY FLOW (l/hr)	RESPONSE ZONE (m bgl)	DEPTH TO BASE (m bgl)	DEPTH TO WATER (m bgl)
WS101	Made Ground	01/02/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	19.4	1010	Steady	0.1	0.1	0.50-1.20	1.20	Dry
		14/02/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	19.3	1004	Rising	0.1	0.1		1.20	Dry
		28/02/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	19.2	1011	Rising	0.1	0.1		1.05	Dry
		10/03/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	19.9	1010	Rising	0.1	0.1		1.15	0.75
		25/03/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	20	1028	Rising	0.1	0.1		1.16	0.90
		11/04/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	18.7	1003	Rising	0.1	0.1		1.16	0.72
WS102	Made Ground	01/02/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	19.4	1010	Steady	0.1	0.1	0.50-2.00	2.10	1.70
		14/02/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	19.4	1004	Rising	0.1	0.1		2.10	1.90
		28/02/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	19.1	1012	Rising	0.1	0.1		1.95	1.60
		10/03/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	19.9	1004	Rising	0.1	0.1		2.00	1.86
		25/03/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	20.1	1004	Rising	0.1	0.1		2.00	1.87
		11/04/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	18.9	1004	Rising	0.1	0.1		2.01	1.85
WS103	Made Ground	01/02/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	19.4	1012	Steady	0.1	0.1	0.50-1.00	1.00	Dry
		14/02/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	19.4	1004	Rising	0.1	0.1		1.00	Dry
		28/02/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	19.1	1012	Rising	0.1	0.1		0.75	Dry
		10/03/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	20	1008	Rising	0.1	0.1		0.95	0.9
		25/03/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	20.2	1031	Rising	0.1	0.1		0.95	Dry
		11/04/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	18.8	1003	Rising	0.1	0.1		0.95	Dry



WELL	STRATA	DATE	CH ₄ PEAK (%V/V)	CH ₄ STEADY (%V/V)	CH ₄ Q _{hg} (l/hr)	CO ₂ PEAK (%V/V)	CO ₂ STEADY (%V/V)	CO ₂ Q _{hg} (l/hr)	O ₂ (%V/V)	ATMOS (mb)	ATMOS. DYNAMIC	PEAK FLOW (l/hr)	STEADY FLOW (l/hr)	RESPONSE ZONE (m bgl)	DEPTH TO BASE (m bgl)	DEPTH TO WATER (m bgl)
WS104	Natural CLAY Drift	01/02/2022	0.1	0.1	0.0001	0.4	0.4	0.0004	19.2	1013	Steady	0.1	0.1	2.00-3.00	3.00	0.90
		14/02/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	19.3	1005	Rising	0.1	0.1		3.00	2.30
		28/02/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	19.0	1012	Rising	0.1	0.1		2.85	2.40
		10/03/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	20	1008	Rising	0.1	0.1		2.97	2.28
		25/03/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	20.2	1030	Rising	0.1	0.1		2.96	2.45
		11/04/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	18.8	1003	Rising	0.1	0.1		2.97	2.36
WS105	Made Ground	01/02/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	19.5	1015	Steady	0.1	0.1	0.50-2.00	1.95	1.85
		14/02/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	19.4	1005	Rising	0.1	0.1		1.95	Dry
		28/02/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	19.2	1012	Rising	0.1	0.1		1.80	1.70
		10/03/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	20	1007	Rising	0.1	0.1		1.90	1.81
		25/03/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	20.4	1029	Rising	0.1	0.1		1.90	1.84
		11/04/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	18.9	1002	Rising	0.1	0.1		1.90	1.79
WS106	Made Ground	01/02/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	19.5	1016	Steady	0.1	0.1	0.40-0.90	0.90	Dry
		14/02/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	19.4	1005	Rising	0.1	0.1		0.90	Dry
		28/02/2022	0.1	0.1	0.0001	0.2	0.1	0.0002	19.0	1012	Rising	0.1	0.1		0.75	Dry
		10/03/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	20	1007	Rising	0.1	0.1		0.84	Dry
		25/03/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	20.3	1027	Rising	0.1	0.1		0.84	Dry
		11/04/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	18.9	1001	Rising	0.1	0.1		0.84	Dry



Notes

CIRIA Characteristic Situation		Q_{hg}		
	CS1	<0.07	Typical Max CO2 <5 % Typical Max CH4 <1 %	Values in BOLD exceed CS1 Thresholds
	CS2	<0.7	Flow rate not to exceed 70 l/hr otherwise consider increase to CS3	Values in BLUE denote water above level of response zone (flooded)
	CS3	<3.5		
	CS4	<15	Quantitative Risk Assessment required to evaluate scope of protective measures	



3.3. SUMMARY OF MONITORING RESULTS

3.3.1. GROUNDWATER

WS104 was flooded during the 4 of the 6 visits, and was subsequently bailed and left to recharge for 20 minutes prior to readings taken. The monitoring well within WS104 was set in a low-permeability clay stratum and groundwater is likely to be representative of potential near-surface percolation entering the well through shallow soils rather than a measure of true groundwater.

WS106 were recorded as dry during all monitoring visits.

Groundwater was recorded between depths of 0.72 m bgl and 2.45 m bgl throughout the remaining monitoring wells.

3.3.2. BAROMETRIC PRESSURE

Visit 1 was undertaken during a period of steady pressure and the remaining 5 visits were undertaken during rising pressure.

The lowest atmospheric pressure recorded was noted on Visit 6 (11/04/2022), with a reading of 1002 m bar.

3.3.3. GAS FLOW

Throughout the monitoring visits completed to date, flow rates were recorded to be 0.1 l/hr (limit of detection of the analyser).

3.3.4. GAS CONCENTRATIONS

The maximum methane value recorded within the monitoring wells was 0.1 % v/v (limit of detection of the analyser).

Carbon dioxide concentrations ranged from 0.1 % v/v to 0.4 % v/v, below the 5% v/v threshold.



3.4. RB17 APPROACH

As a visit was not completed within worst-case climatic conditions, the potential impact on the development from ground gases has also been assessed with reference to standards and guidelines published in CIEH Research Bulletin 17 A Pragmatic Approach to Ground Gas Risk Assessment (RB17).

This has been considered appropriate given the age and limited thickness of Made Ground identified.

CL:AIRE Research Bulletin RB17 provides an alternative framework for the investigation and assessment of ground gas that takes into account other factors such as site history and the nature of the ground conditions beneath a site. It has been prepared to allow gas well installation and monitoring to be avoided where appropriate and may also be used in conjunction with gas monitoring to reduce the monitoring period or to avoid extra gas monitoring where anomalous results are recorded. The assessment is summarised in Table 3.3 below.

3.4.1. RB 17 ASSESSMENT

TABLE 3.3 RB17 GROUND GAS RISK ASSESSMENT

ITEM	OUTCOME	ACTION	RISK SCORE
Have any credible OFF SITE ground gas sources been identified within the Desk Study & ICSM that would include: <i>Registered landfill within 250m; Historical landfill; Infilled pond within 50m; Infilled ground 100m.</i>	No	None	1
Is the site located within close proximity to a variable groundwater regime (river or tidal) that could potentially influence the ground gas regime?	No	None	1
Has a credible pathway for the migration of gas from historical mine workings been identified.	No	None	1
Average depth of Made Ground >5.0m	No	None	1
Average depth Made Ground >3.0m	No	None	1
Average Depth Made Ground >1.0m	Yes	Made Ground deposits were encountered within all exploratory hole locations to depths of between 0.80 m and 2.05 m bgl.	1
TOC <1	Yes	Total Organic Carbon (TOC) values were 0.80% within the underlying natural CLAY	1
TOC 1-3	Yes	Total Organic Carbon (TOC) values were 0.30% to 3.00% within the Made Ground	2
TOC >3	No	None	1
Made Ground In-situ >20 Years	No	None	1
Made Ground In-situ <20 Years	No	None	1
Only natural soils with no potential to generate CH ₄	Yes	None	1
Recorded coal gas emission	No	None	1
Radon Protection Measures Required	No	None	1
Risk Score			14



Notes for E3P RB17 Gas Risk Assessment

This risk assessment is an internal tool kit developed by E3P in due consideration of the guidance published within CL:AIRE RB17. The minimum score attributed is 1 with the assessment to be completed by a suitably qualified person deemed capable of making a reasoned and informed assessment.

3.4.2. RISK SCORE

-  1 = Low
-  2 = Moderate
-  3 = High

3.4.3. RISK PROFILE

-  Cumulative risk score is ≤ 14 the site is deemed to be very low risk and thus conforms to Characteristic Situation 1
-  Cumulative risk score is ≥ 15 but ≤ 20 the site is deemed to be very low risk and thus conforms to Characteristic Situation 2
-  Cumulative risk score is > 20 the site is deemed to be very low risk and thus conforms to Characteristic Situation 3

3.4.4. RB17 CONCLUSION

The RB17 assessment indicates a cumulative score of 14 and that suggests Characteristic Situation 1 of Green.



3.5. CONCLUSION

The determined Characteristic Situation for each standpipe for each visit is presented in Table 3.3. This indicates that based on the peak flow rates the majority of the monitoring visits classify as Characteristic Situation (CS)1 – Very Low Gas Risk.

TABLE 4.9 GAS RISK PROFILE AND LOCATION

WELL	DATE	DEPTH TO WATER (m bgl)	MAX FLOW (l/hr)	MAX CH ₄ (%V/V)	MAX CH ₄ Q _{hg} (l/hr)	MAX CO ₂ (%V/V)	MAX CO ₂ Q _{hg} (l/hr)	CHARACTERISTIC SITUATION	NHBC TRAFFIC LIGHT
WS101	01/02/2022	Dry	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
	14/02/2022	Dry	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
	28/02/2022	Dry	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
	10/03/2022	0.75	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
	25/03/2022	0.90	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
	11/04/2022	0.72	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
WS102	01/02/2022	1.70	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
	14/02/2022	1.90	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
	28/02/2022	1.60	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
	10/03/2022	1.86	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
	25/03/2022	1.87	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
	11/04/2022	1.85	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
WS103	01/02/2022	Dry	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
	14/02/2022	Dry	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
	28/02/2022	Dry	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
	10/03/2022	0.90	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
	25/03/2022	Dry	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
	11/04/2022	Dry	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
WS104	01/02/2022	0.90	0.1	0.1	0.0001	0.4	0.0004	CS1	Green
	14/02/2022	2.30	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
	28/02/2022	2.40	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
	10/03/2022	2.28	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
	25/03/2022	2.45	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
	11/04/2022	2.36	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
WS105	01/02/2022	1.85	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
	14/02/2022	Dry	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
	28/02/2022	1.70	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
	10/03/2022	1.81	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
	25/03/2022	1.84	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
	11/04/2022	1.79	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
WS106	01/02/2022	Dry	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
	14/02/2022	Dry	0.1	0.1	0.0001	0.1	0.0001	CS1	Green



WELL	DATE	DEPTH TO WATER (m bgl)	MAX FLOW (l/hr)	MAX CH ₄ (%V/V)	MAX CH ₄ Q _{hg} (l/hr)	MAX CO ₂ (%V/V)	MAX CO ₂ Q _{hg} (l/hr)	CHARACTERISTIC SITUATION	NHBC TRAFFIC LIGHT
	28/02/2022	Dry	0.1	0.1	0.0001	0.2	0.0002	CS1	Green
	10/03/2022	Dry	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
	25/03/2022	Dry	0.1	0.1	0.0001	0.1	0.0001	CS1	Green
	11/04/2022	Dry	0.1	0.1	0.0001	0.1	0.0001	CS1	Green

The GSV has been compared to the criteria outlined with CIRIA C665 to determine the level of risk to the proposed development and to ensure the appropriate remedial options are incorporated into any future building design in this area.

3.5.1. GROUND GAS RISK ASSESSMENT - CONCLUSION

E3P has assessed the previous variables and come to the following conclusions:

- ✳ Ground gas monitoring suggests that the site can be classified as CS1, and in these areas, it is considered that gas protection measures will not be required.
- ✳ Made Ground deposits were encountered within all exploratory hole locations to depths of between 0.80 m and 2.05 m bgl, generally comprising asphalt or concrete overlying light grey sandy gravel of concrete and limestone (MOT sub-base). Underneath the sub-base, Made Ground was identified as brown sandy gravelly clay with cobbles.
- ✳ The site is predominantly low permeability glacial till CLAY to depths of 18.80 m bgl.
- ✳ No alluvium, peat or putrescible material was identified within the Made Ground across site.
- ✳ No off-site sources of ground gas have been identified.
- ✳ Out of the 6 visits undertaken, none were completed within a low or falling period of barometric pressure, however, based on the absence of a source of ground gas, it is considered by E3P that this is unlikely to affect the conclusions of this risk assessment.
- ✳ As a visit was not completed within worst-case climatic conditions, the potential impact on the development from ground gases has also been assessed with reference to standards and guidelines published in CIEH Research Bulletin 17 A Pragmatic Approach to Ground Gas Risk Assessment (RB17). This further desk-based assessment has indicated Total Organic Carbon (TOC) values within the underlying soils to range between 0.30% to 3.00% within the Made Ground and a value of 0.80% within the underlying natural CLAY, indicating the site to fall within a Characteristic Situation 1 category.
- ✳ Therefore, with due consideration to the Conceptual Site Model and the absence of any persistent gas source and gas generation potential, it is considered by E3P that the site can be classified as CS1, and therefore no gas protection measures are required.

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 reinterpretation 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	Aboveground 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 nonaqueous 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	Vibronaceae column
ICSM	Initial conceptual site model	VOC	Volatile organic compound
LEL	Lower explosive limit	VRSC	Vibroreplacement stone columns
LMRL	Lower method reporting limit	VSC	Vibrostone columns
LNAPL	Light nonaqueous 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



Historical Features

- Former Residential Housing
- Clothing Factory
- Public House
- Former Buildings
- Buildings

Notes:

P1	REVC	09.03.2022	EB	NS
P1	REVB	08.03.2022	EB	NS
P1	REVA	07.03.2022	LM	NS
Phase	Issue	Date	Drawn	Checked

Client:

Great Places Housing Group

Job Title:

Laystall Street, Manchester

Job No:

15-140

Drawing No:

003

Drawing Title:

Historical Features Plan

Date:

09.03.2022

Scale:

NTS @ A3

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Site Features Former Clothing Factory Car Park Outside Space Semi Mature / Mature Trees Wooden Gate	Notes:					Client: Great Places Housing Group	Job No: 15-140	Date: 09.03.2022	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
	P1 REVC 09.03.2022 EB NS P1 REVB 08.03.2022 EB NS P1 REVA 07.03.2022 LM NS Phase Issue Date Drawn Checked					Drawing No: 004	Scale: NTS @ A3		
						Job Title: Laystall Street, Manchester	Drawing Title: Site 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.	



Location Symbols

- Approximate Window Sample Probehole Location with Install
- Approximate Cable Percussive Borehole Location

Made Ground Depth (m)

- 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

Notes:

P1	REVB	08.03.2022	EB	NS
P1	REVA	06.03.2022	LM	NS
Phase	Issue	Date	Drawn	Checked

Client:

Great Places Housing Group

Job Title:

Laystall Street, Manchester

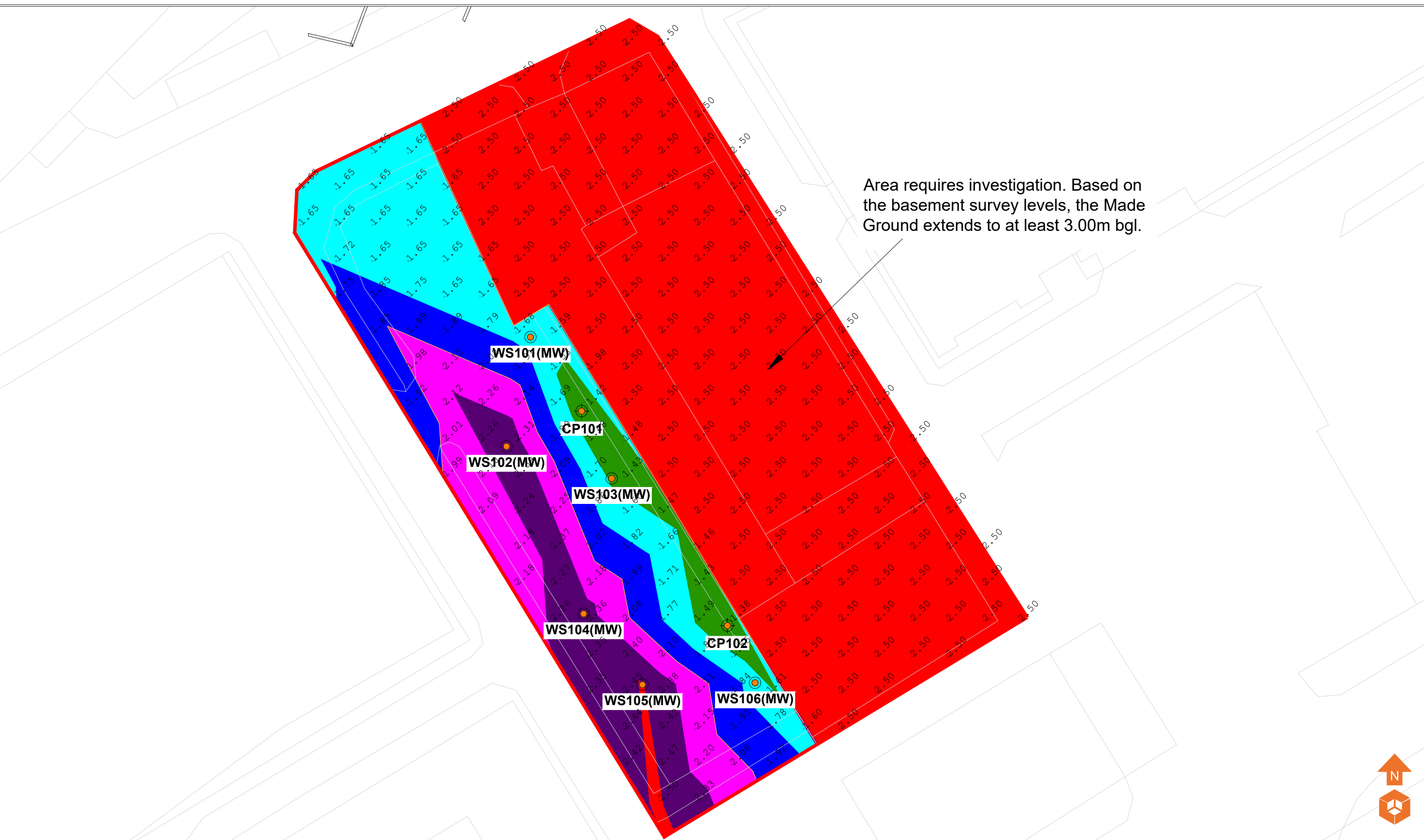
Job No:	15-140	Date:	08.03.2022
Drawing No:	006	Scale:	NTS @ A3

Drawing Title:

Depth to Made Ground Plan

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Location Symbols

Approximate Window Sample Probehole Location with Install

Approximate Cable Percussive Borehole Location

Shallow Spread Footings

Depth to Founding Strata 0.00 - 1.24m

Depth to Founding Strata 1.25 - 1.49m

Mass Trench Fill Footings

Depth to Founding Strata 1.50 - 1.74m

Depth to Founding Strata 1.75 - 1.99m

Depth to Founding Strata 2.00 - 2.24m

Engineered Footings

Depth to Founding Strata 2.25 - 2.49m

Depth to Founding Strata >2.50m

Notes:

P1	REVB	08.03.2022	EB	NS
P1	REVA	08.03.2022	LM	NS
Phase	Issue	Date	Drawn	Checked

Client:

Great Places Housing Group

Job Title:

Laystall Street, Manchester

Job No:

15-140

Drawing No:

008

Date:

08.03.2022

Scale:

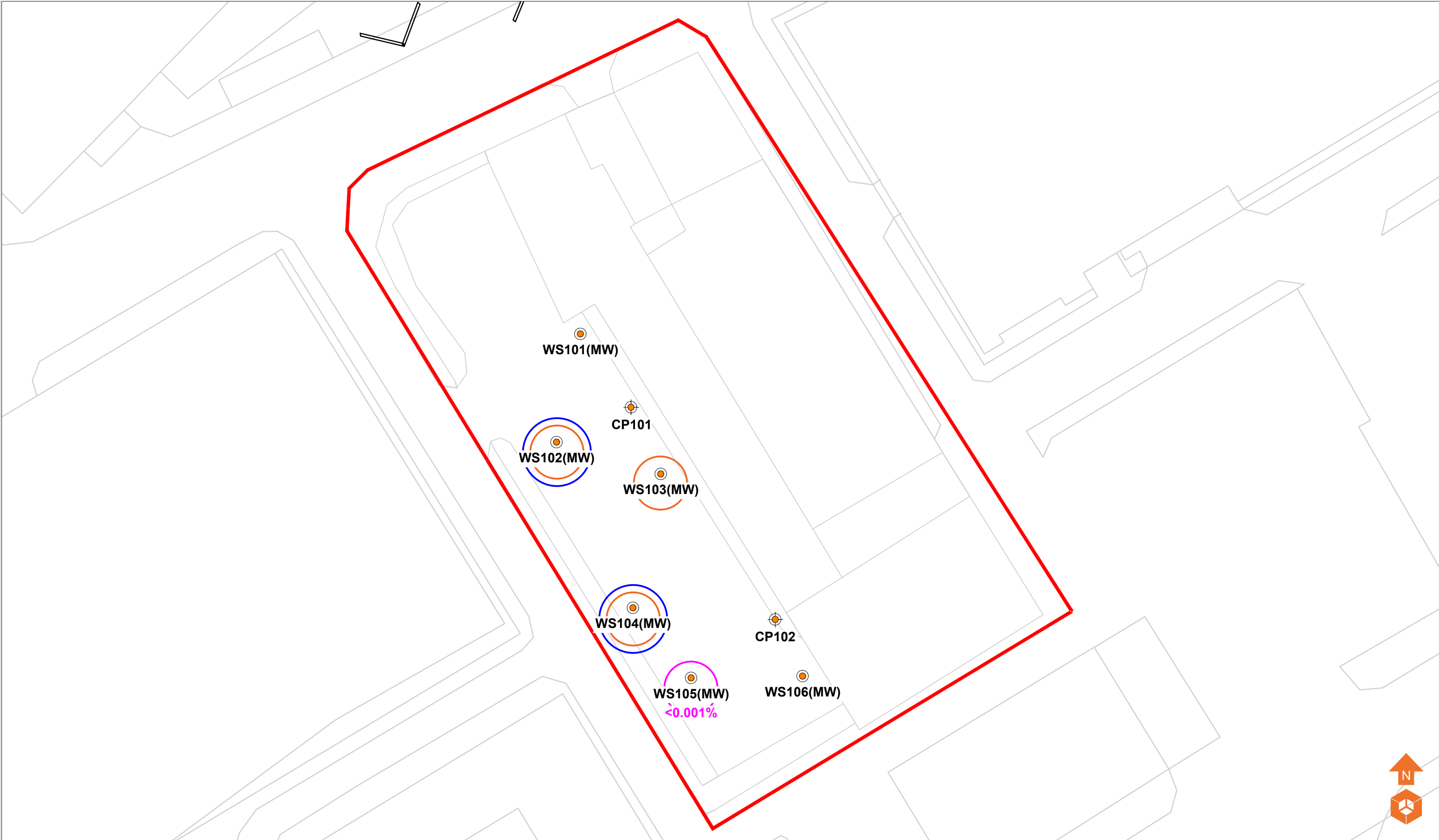
NTS @ A3

Drawing Title:

Depth to Founding Strata Plan

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Website: www.e3p.co.uk



Location Symbols WS101(MW) Approximate Window Sample Probehole Location with Install CP101 Approximate Cable Percussive Borehole Location	Contamination Exceedances Lead Asbestos Non Volatile PAH	Notes: 	Client: Great Places Housing Group	Job No: 15-140	Date: 07.03.2022	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
		P1 Phase REVA Issue 07.03.2022 Date LM Drawn NS Checked	Job Title: Laystall Street, Manchester	Drawing No: 018	Scale: NTS @ A3	

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