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GEO-ENVIRONMENTAL ASSESSMENT (GROUND INVESTIGATION) REPORT

**TUTHILL'S YARD
KELSHALL ROAD
THERFIELD
SG8 9TT**



Report Title: Geo-environmental Assessment Ground Investigation Report for Tuthill's Yard,
Kelshall Road, Therfield, SG8 9TT

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EXECUTIVE SUMMARY

Quanta Homes 6 commissioned Jomas Associates Ltd to undertake a Geo-environmental ground investigation at the site referred to as Tuthill's Yard, Kelshall Road, Therfield, SG8 9TT.

The principal objectives of the study were as follows:

- To determine the nature and where possible, the extent of contaminants potentially present at the site;
- To establish the presence of significant pollutant linkages, in accordance with the procedures set out within the Environment Agency (EA) report R&D CLR11 and relevant guidance within the National Planning Policy Framework (NPPF);
- To assess whether the site is safe and suitable for the purpose for which it is intended, or can be made so by remedial action.

It should be noted that the table below is an executive summary of the findings of this report and is for briefing purposes only. Reference should be made to the main report for detailed information and analysis.

Site History and Ground Investigation	
Desk Study Overview	A desk study was previously undertaken for the site and issued separately (Jomas August 2020 (v3.1)). A brief overview of the report is presented below. A review of earliest available (1877) historical maps indicates that the site comprised agricultural land at that time. By the map dated 1974, the site is shown to be occupied by a single square structure located in the south eastern corner. Few changes then occur to the site until 1994 when the site is labelled as a depot. An aerial photo from 2015 confirms the presence of a telecommunications tower located in the south western corner of site. The surrounding area has historically been in primarily agricultural land with sparse residential developments and some chalk and gravel pits further afield. Of note within the vicinity of the study site is a number of small waterbodies and ponds within 100m, an ancient castle mound 200m south and a water tower 75m south. The British Geological Survey indicates that the site is directly underlain superficial deposits of the Lowestoft Formation which are underlain by undifferentiated solid deposits of the Lewes Nodular Chalk Formation and Seaford Chalk Formation. No artificial deposits are reported within the site. The superficial deposits underlying the site are identified as an undifferentiated aquifer with the underlying solid deposits identified as a principal aquifer. A review of the EnviroInsight Report indicates that the site is within a Zone 3 source protection zone. There are no groundwater, surface water or potable water abstractions reported within 1km of the site. The nearest detailed river entry is reported 371m south east of the site. There are no surface water features reported within 250m of the site.

Site History and Ground Investigation	
	There are no Environment Agency Zone 2 or 3 floodplains reported within 250m of the site. A ground investigation was recommended due to reported site usage as a car breaking yard. Ground gas monitoring and groundwater analysis was also recommended.
Intrusive Investigation	The ground investigation was undertaken on 29th and 30th July 2020, and consisted of the following: • 10No. window sampling boreholes, drilled up to 5.00m below ground level (bgl), with associated sampling; • Laboratory analysis for chemical purposes, • 4No. return visits to monitor ground gas concentrations and groundwater levels.
Ground Conditions	The results of the ground investigation revealed a ground profile comprising Made Ground over superficial deposits of Lowestoft Formation of varying depth, underlain by Undifferentiated Chalk deposits. No groundwater was reported during drilling. During return site visits undertaken from 4th August 2020 to 25th August 2020, wells installed in WS1, WS3, WS5 and WS10 were monitored. All wells were reported to be dry during the initial visit. WS1 remained dry whilst water was reported in the remaining boreholes between 0.71mbgl and 4.87mbgl.
Environmental Considerations	Following generic risk assessments, no determinands were reported above the screening criteria within the 'residential with plant uptake' end use scenario. No asbestos fibres were detected in the samples analysed in the laboratory. Groundwater analysis was included in the original scope of the investigation; however, no groundwater was recorded during drilling, or within the wells on the first monitoring visits. Subsequent visits did report varying levels of water within the wells however this was not considered to represent true groundwater. For details see Section 6.4. As no polyaromatic hydrocarbon compounds have been reported above laboratory detection limit, extremely low levels of petroleum hydrocarbon compounds and low levels of metals have been reported in soils, there is not considered to be significant risk to controlled waters receptors from soil on site. Calculating the Gas Screening Value using worst case results indicates Characteristic Situation 1. Therefore, formal gas protection measures are not considered necessary. On the basis of the findings of this investigation, the site is not considered to pose a significant risk to the identified sensitive receptors. No further remediation works are considered necessary, and the site is considered suitable for the proposed use following the adoption of the measures above. As with any ground investigation, the presence of further hotspots between sampling points cannot be ruled out. Should any contamination be encountered, a suitably qualified environmental consultant should be informed immediately, so that adequate measures may be recommended.

1 INTRODUCTION

1.1 Terms of Reference

- 1.1.1 Quanta Homes 6 ("The Client") has commissioned Jomas Associates Ltd, to assess the risk of contamination posed by the ground conditions at a site referred to as Tuthill's Yard, Kelshall Road, Therfield, SG8 9TT, prior to the redevelopment of the site.
- 1.1.2 To this end a Desk Study has been produced for the site and issued separately (Jomas, August, 2020), followed by an intrusive investigation (detailed in this report).
- 1.1.3 A full list of previous reports undertaken for the site by Jomas are detailed in Table 1.1:

Table 1.1: Previous Reports - Jomas

Title	Author	Reference	Date
Desk Study/Preliminary Risk Assessment Report for Tuthill's Yard, Kelshall Road, Therfield, SG8 9TT	Jomas	P1803J1532/AJH, Final v3.1	05/08/2020

- 1.1.4 The intrusive investigation was undertaken in accordance with Jomas proposal dated 18th June 2020.

1.2 Proposed Development

- 1.2.1 It is understood that the proposed development will comprise 3No detached residential units with private gardens and a communal access courtyard area.
- 1.2.2 A plan of the proposed development is provided as Figure 3.
- 1.2.3 For the purposes of the contamination risk assessment, the proposed development is classified as 'residential with plant uptake'.

1.3 Objectives

- 1.3.1 The objectives of Jomas' investigation were as follows:
- To conduct an intrusive investigation, to determine the nature and extent of contaminants potentially present at the site;
 - To establish the presence of significant pollutant linkages, in accordance with the procedures set out within Part IIA of the Environmental Protection Act 1990, associated statutory guidance and current best practice including the EA report R&D CLR 11.

1.4 Scope of Works

1.4.1 The following tasks were undertaken to achieve the objectives listed above:

- Intrusive ground investigation to determine shallow ground conditions, and potential for contamination at the site;
- Undertaking of laboratory chemical testing upon samples obtained;
- The compilation of this report, which collects and discusses the above data, and presents an assessment of the site conditions, conclusions and recommendations.

1.5 Supplied Documentation

1.5.1 A report previously prepared by a third party was supplied to Jomas Associates at the commencement of this investigation. Table 1.2 details the document supplied:

Table 1.2: Supplied Reports

Title	Author	Reference	Date
Soakaway Investigation & Contamination Risk Assessment Report	Southern Testing	J14326	19 th March 2020

1.6 Limitations

1.6.1 Jomas Associates Ltd has prepared this report for the sole use of Quanta Homes 6, in accordance with the generally accepted consulting practices and for the intended purposes as stated in the agreement under which this work was completed. This report may not be relied upon by any other party without the explicit written agreement of Jomas Associates Limited. No other third party warranty, expressed or implied, is made as to the professional advice included in this report. This report must be used in its entirety.

1.6.2 The records search was limited to information available from public sources; this information is changing continually and frequently incomplete. Unless Jomas Associates Limited has actual knowledge to the contrary, information obtained from public sources or provided to Jomas Associates Limited by site personnel and other information sources, have been assumed to be correct. Jomas Associates Limited does not assume any liability for the misinterpretation of information or for items not visible, accessible or present on the subject property at the time of this study.

1.6.3 Whilst every effort has been made to ensure the accuracy of the data supplied, and any analysis derived from it, there may be conditions at the site that have not been disclosed by the investigation, and could not therefore be taken into account. As with any site, there may be differences in soil conditions between exploratory hole positions. Furthermore, it should be noted that groundwater conditions may vary due to seasonal and other effects and may at times be significantly different from those

measured by the investigation. No liability can be accepted for any such variations in these conditions.

- 1.6.4 Any reports provided to Jomas Associates Limited have been reviewed in good faith. Jomas Associates Limited cannot be held liable for any errors or omissions in these reports, or for any incorrect interpretation contained within them.
- 1.6.5 This investigation and report has been carried out in accordance with the relevant standards and guidance in place at the time of the works. Future changes to these may require a re-assessment of the recommendations made within this report.
- 1.6.6 *This report is not an engineering design and the figures and calculations contained in the report should be used by the Structural Engineer, taking note that variations may apply, depending on variations in design loading, in techniques used, and in site conditions. Our recommendations should therefore not supersede the Engineer's design.***

2 SITE SETTING

2.1 Site Information

2.1.1 The site location plan is appended to this report in as Figure 1, Appendix 1.

Table 2.1: Site Information

Name of Site	Tuthill's Yard
Address of Site	Kelshall Road Therfield SG8 9TT
Approx. National Grid Ref.	533134 237313
Site Area (Approx)	0.48ha
Site Occupation	Hardstanding covered yard
Local Authority	North Hertfordshire District Council

2.2 Desk Study Overview

2.2.1 A desk study was previously undertaken for the site and issued separately (Jomas August 2020 (v3.1)). A brief overview of the report is presented below.

2.2.2 A review of earliest available (1877) historical maps indicates that the site comprised agricultural land at that time. By the map dated 1974, the site is shown to be occupied by a single square structure located in the south eastern corner. Few changes then occur to the site until 1994 when the site is labelled as a depot. An aerial photo from 2015 confirms the presence of a telecommunications tower located in the south western corner of site. Jomas has been informed that as of 2021 the mast is no longer present on site.

2.2.3 The surrounding area has historically been in primarily agricultural land with sparse residential developments and some chalk and gravel pits further afield. Of note within the vicinity of the study site is a number of small waterbodies and ponds within 100m, an ancient castle mound 200m south and a water tower 75m south.

2.2.4 The British Geological Survey indicates that the site is directly underlain superficial deposits of the Lowestoft Formation which are underlain by undifferentiated solid deposits of the Lewes Nodular Chalk Formation and Seaford Chalk Formation. No artificial deposits are reported within the site.

2.2.5 The superficial deposits underlying the site are identified as an undifferentiated aquifer with the underlying solid deposits identified as a principal aquifer.

2.2.6 A review of the EnviroInsight Report indicates that the site is within a Zone 3 source protection zone.

-
- 2.2.7 There are no groundwater, surface water or potable water abstractions reported within 1km of the site.
- 2.2.8 The nearest detailed river entry is reported 371m south east of the site. There are no surface water features reported within 250m of the site.
- 2.2.9 There are no Environment Agency Zone 2 or 3 floodplains reported within 250m of the site.
- 2.2.10 A ground investigation was recommended due to reported site usage as a car breaking yard. Ground gas monitoring and groundwater analysis was also recommended.
- 2.2.11 The conceptual site model is reproduced in Table 2.2 overleaf.

Table 2.2: Preliminary Risk Assessment for the Site

Sources	Pathways (P)	Receptors	Consequence of Impact	Probability of Impact	Risk Estimation	Hazard Assessment
• Potential for Made Ground associated with previous development operations – on site (S1) • Potential ground contamination from previous industrial use – (S2) - Depot on site - Car breakers on site • Potential off-site industrial uses(S3): - Farm buildings adjacent - recorded pollution incident involving oils and fuels 57m NE • Off-site ground gas sources – (S4) - Potentially infilled ponds – nearest approx. 20m off site - Therfield Tip 280m NE	• Ingestion and dermal contact with contaminated soil (P1) • Inhalation or contact with potentially contaminated dust and vapours (P2) • Permeation of water pipes and attack on concrete foundations by aggressive soil conditions (P6)	• Construction workers (R1) • Maintenance workers (R2) • Neighbouring site users (R3) • Future site users (R4) • Building foundations and on site buried services (water mains, electricity and sewer) (R5)	Medium	Low likelihood	Moderate	GI – Ground Investigation
	• Accumulation and migration of soil gases (P5)		Severe for Asbestos	Low likelihood	Moderate	
				Severe	Low likelihood	
		• Leaching through permeable soils, migration within the vadose zone (i.e., unsaturated soil above the water table) and/or lateral migration within surface water, as a result of cracked hardstanding or via service pipe/corridors and surface water runoff. (P3) • Horizontal and vertical migration of contaminants within groundwater (P4)	• Neighbouring site users (R3) • Controlled waters – SPZ 3, Principal and Undifferentiated Aquifers, inland river 389m SE. • Building foundations and on site buried services (water mains, electricity and sewer) (R5)	Medium	Low likelihood	

3 GROUND INVESTIGATION

3.1 Rationale for Ground Investigation

3.1.1 The site investigation has been undertaken generally in accordance with Contaminated Land Report 11, BS10175, NHBC Standards Chapter 4.1, and other associated Statutory Guidance. If required, further targeted investigations and remedial option appraisal would be dependent on the findings of this site investigation.

3.1.2 The soil sampling rationale for the site investigation was developed with reference to EA guidance 'Secondary Model Procedure for the Development of Appropriate Soil Sampling Strategies for Land Contamination' (Technical Report P5-066/TR).

3.1.3 The sampling proposal was designed in order to gather data representative of the site conditions.

3.2 Scope of Ground Investigation

3.2.1 The ground investigation was undertaken on 29th & 30th July 2020.

3.2.2 The work was undertaken in accordance with BS5930 'Code of Practice for Site Investigation' and BS10175 'Investigation of Potentially Contaminated Sites'. All works were completed without incident.

3.2.3 The investigation focused on collecting data on the following:

- Quality of Made Ground/ natural ground within the site boundaries;
- Presence of groundwater beneath the site (if any), perched or otherwise;
- Determination of the presence or absence of hazardous ground gases

3.2.4 A summary of the fieldwork carried out at the site, with justifications for exploratory hole positions, are offered in Table 3.1 below.

Table 3.1: Scope of Intrusive Investigation

Investigation Type	Number of Exploratory Holes Achieved	Exploratory Hole Designation	Depth Achieved (mbgl)	Justification
Window Sample Boreholes	10	WS1 – 10	Up to 5mbgl	Obtain shallow samples for contamination testing. WS1 – Targeting off site landfill and pollution event WS2 – Targeting oil staining noted during walkover WS3 – Targeting infilled pond

Investigation Type	Number of Exploratory Holes Achieved	Exploratory Hole Designation	Depth Achieved (mbgl)	Justification
				WS4 – Non-targeted to provide site coverage WS5 – Positioned near oil staining noted during walkover and in vicinity of possible interceptor WS7 – Targeting possible interceptor. WS8-10 – Non targeted to provide site coverage
Monitoring Wells	4	WS1, WS3, WS5 and WS10	Up to 5mbgl	Combined soil gas and groundwater monitoring wells. WS1 - response zone in chalk WS3 - response zone in Made Ground WS5 - response zone in chalk WS10 - response zone in the Lowestoft Formation

3.2.5 A plan of the exploratory hole locations is provided as Figure 2.

3.2.6 The exploratory holes were completed to allow soil samples to be taken in the areas of interest identified in Table 3.1 above. In all cases, all holes were logged in accordance with BS5930:2015.

3.2.7 Exploratory hole positions were located approximately with reference to known features on site, as shown in the exploratory hole location plan presented in Appendix 1. The exploratory hole records are included in Appendix 2.

3.2.8 Where monitoring well installations were not installed, the exploratory holes were backfilled with the arisings (in the reverse order in which they were drilled) and the ground surface was reinstated so that no depression was left.

3.3 Sampling Rationale

3.3.1 Our soil sampling rationale for the site investigation was developed with reference to EA guidance 'Secondary Model Procedure for the Development of Appropriate Soil Sampling Strategies for Land Contamination' (Technical Report P5-066/TR).

3.3.2 The exploratory holes were positioned by applying a combined non-targeted sampling strategy, as well as sample locations positioned with reference to sources identified from the desk study.

3.3.3 Soil samples were taken from across the site at various depths as shown in the exploratory hole logs.

3.3.4 Jomas Associates Limited's engineers normally collect samples at appropriate depths based on field observations such as:

- appearance, colour and odour of the strata and other materials, and changes in these;
- the presence or otherwise of sub-surface features such as pipework, tanks, foundations and walls; and,
- areas of obvious damage, e.g. to the building fabric.

3.3.5 A number of the samples were taken from the top 0-1m to aid in the assessment of the pollutant linkages identified at the site. In addition, some deeper samples were taken to aid in the interpretation of fate and transport of any contamination identified.

3.3.6 Samples were stored in cool boxes (<4°C) and preserved in accordance with laboratory guidance.

3.3.7 Any groundwater strikes noted during drilling, are recorded within the exploratory hole records in Appendix 2.

3.4 Sampling Limitations

3.4.1 The boreholes were drilled to the proposed depths.

3.4.2 Groundwater analysis was included in the original scope of the investigation; however, no groundwater was recorded during drilling, or within the wells on the first monitoring visits. Subsequent visits did report varying levels of water within the wells however this was not considered to represent true groundwater. For details see Section 6.4.

3.5 Laboratory Analysis

3.5.1 A programme of chemical laboratory testing, scheduled by Jomas Associates Limited, was carried out on selected samples of Made Ground and natural strata.

Chemical Testing

3.5.2 Soil samples were submitted to i2 Analytical (a UKAS and MCerts accredited laboratory), for analysis.

3.5.3 The samples were analysed for a wide range of contaminants as shown in Table 3.2 below:

Table 3.2: Chemical Tests Scheduled

Test Suite	No. of tests	
	Made Ground / Topsoil	Natural
Basic Suite S3	2	0
Basic Suite S5	5	1
Total Organic Carbon	3	1
Water Soluble Sulphate	7	1
TPHCWG (inc BTEX)	5	1
VOC	5	1
TPH	2	0
Asbestos Screen & ID	8	2

- 3.5.4 The determinands contained in the Basic Suite S3 are as detailed in Table 3.3 below. Basic Suite S5 contains the same determinands but without hydrocarbon compounds to prevent double reporting when scheduled with the extended hydrocarbon suite.

Table 3.3: Basic Suite of Determinands

DETERMINAND	LIMIT OF DETECTION (mg/kg)	UKAS ACCREDITATION	TECHNIQUE
Arsenic	1	Y (MCERTS)	ICPMS
Cadmium	0.2	Y (MCERTS)	ICPMS
Chromium	1	Y (MCERTS)	ICPMS
Chromium (Hexavalent)	4	Y (MCERTS)	Colorimetry
Lead	1	Y (MCERTS)	ICPMS
Mercury	0.3	Y (MCERTS)	ICPMS
Nickel	1	Y (MCERTS)	ICPMS
Selenium	1	Y (MCERTS)	ICPMS
Copper	1	Y (MCERTS)	ICPMS
Zinc	1	Y (MCERTS)	ICPMS
Boron (Water Soluble)	0.2	Y (MCERTS)	ICPMS
pH Value	0.1 units	Y (MCERTS)	Electrometric
Sulphate (Water Soluble)	0.0125g/l	Y (MCERTS)	Ion Chromatography
Total Cyanide	1	Y (MCERTS)	Colorimetry
Speciated/Total PAH	0.05/0.80	Y (MCERTS)	GCFID
Phenols	1	Y (MCERTS)	HPLC
Total Petroleum Hydrocarbons (banded)	-	N Y (MCERTS)	Gas Chromatography

- 3.5.5 To support the selection of appropriate tier 1 screening values, 4No samples were analysed for total organic carbon.
- 3.5.6 Laboratory test results are summarised in Section 6, with raw laboratory data included in Appendix 3.

4 GROUND CONDITIONS

4.1 Soil

- 4.1.1 Ground conditions were logged in accordance with the requirements of BS5930:2015. Detailed exploratory hole logs are provided in Appendix 2. The ground conditions encountered are summarised in Table 4.1 below, based on the strata observed during the investigation.

Table 4.1: Ground Conditions Encountered

Stratum and Description	Encountered from (mbgl)	Base of strata (mbgl)	Thickness range (m)
Reinforced concrete over Sandy gravel/gravelly clay. Gravel consists of brick and flint. (MADE GROUND)	GL	0.35 - 0.60	0.20 – 0.45
Brown/grey/orange gravelly CLAY. Gravel is flint and/chalk. Interbedded with chalk in WS10. (LOWESTOFT FORMATION)	0.15 - 0.50	0.50 – >5.00	0.15 - >4.50
WS1, WS3, WS5, WS8 and WS9 White structureless CHALK. D Grade. (LEWES NODULAR CHALK FORMATION AND SEAFORD CHALK FORMATION (UNDIFFERENTIATED))	0.35 – 4.90	>5.00	>0.10 - >4.65
WS1, WS2, WS3, WS4, WS5, WS6, WS7 and WS10			

- 4.1.2 Given the likely ground strata profile identified in the Desk Study and the BGS descriptions of the materials given in Section 3 of the Desk Study it is considered that the encountered strata represent the Lowestoft Formation underlain by undifferentiated chalk.

4.2 Hydrogeology

- 4.2.1 Groundwater was not encountered in any of the exploratory holes during the drilling process.
- 4.2.2 4No return groundwater monitoring visits were undertaken between 4th August 2020 and 25th August 2020. The results are summarised below.

Table 4.2: Groundwater Monitoring Records

Exploratory Hole ID	Depth Encountered (mbgl)	Depth to Base of Well (mbgl)	Strata targeted by response zone
WS1	Dry	5.00	Undifferentiated Chalk
WS3	Dry – 4.84	5.01	Undifferentiated Chalk
WS5	Dry – 1.24	4.88	Lowestoft Formation
WS10	Dry – 0.71	5.00	Lowestoft Formation

- 4.2.3 Given the lack of water strikes during drilling, the absence of water during the first monitoring visit and the variable water levels reported thereafter, the water measured within the boreholes is believed to be perched water and not representative of the true groundwater table. In addition, nearby historic borehole records indicate groundwater to be present at approximately 100mbgl.

4.3 Physical and Olfactory Evidence of Contamination

- 4.3.1 Visual or olfactory evidence of contamination was not observed during the course of the investigation.

5 RISK ASSESSMENT – ANALYTICAL FRAMEWORK

5.1 Context and Objectives

- 5.1.1 This section seeks to evaluate the level of risk pertaining to human health and the environment which may result from both the existing use and proposed future use of the site. It makes use of the site investigation findings, as described in the previous sections, to evaluate further the potential pollutant linkages identified in the desk study. A combination of qualitative and quantitative techniques is used, as described below.
- 5.1.2 The purpose of generic quantitative risk assessment is to compare concentrations of contaminants found on site against screening level generic assessment criteria (GAC) to establish whether there are actual or potential unacceptable risks. It also determines whether further detailed assessment is required. The approaches detailed all broadly fit within a tiered assessment structure in line with the framework set out in the Department of Environment, Food and Rural Affairs (DEFRA), EA and Institute for Environment and Health Publication, Guidelines for Environmental Risk Assessment and Management.
- 5.1.3 It should be noted that the statistical tests carried out in this report in accordance with CL:AIRE and CIEH (2008) recommendations, are for guidance purposes only and the conclusions of this report should be approved by the local authority prior to any redevelopment works being undertaken.

5.2 Analytical Framework – Soils

- 5.2.1 There is no single methodology that covers all the various aspects of the assessment of potentially contaminated land and groundwater. Therefore, the analytical framework adopted for this investigation is made up of a number of procedures, which are outlined below. All of these are based on a Risk Assessment methodology centred on the identification and analysis of Source – Pathway – Receptor linkages.
- 5.2.2 The CLEA model provides a methodology for quantitative assessment of the long term risks posed to human health by exposure to contaminated soils. Toxicological data have been used to calculate Soil Guideline Values (SGV) for individual contaminants, based on the proposed site use; these represent minimal risk concentrations and may be used as screening values.
- 5.2.3 In the absence of any published SGVs for certain substances, or where the assumptions made in generating the SGVs do not apply to the site, Jomas Associates Limited have obtained Tier 1 screening values for initial assessment of the soil, based on available current UK guidance including the LQM/CIEH S4ULs and DEFRA C4SL. Site-specific assessments are undertaken wherever possible and/or applicable. All assessments are carried out in accordance with the CLEA protocol.

- 5.2.4 CLEA requires a statistical treatment of the test results to take into account the normal variations in concentration of potential contaminants in the soil and allow comparisons to be made with published guidance.
- 5.2.5 The assessment criteria used for the screening of determinands within soils are identified within Table 5.1.

Table 5.1: Selected Assessment Criteria – Contaminants in Soils

Substance Group	Determinand(s)	Assessment Criteria Selected
<u>Organic Substances</u>		
Non-halogenated Hydrocarbons	Total Petroleum Hydrocarbons (TPHCWG banded)	S4UL
	Total Phenols	S4UL
Polycyclic Aromatic Hydrocarbons (PAH-16)	Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenzo(a,h)anthracene, Benzo(ghi)perylene	S4UL
Volatile Organic Compounds (VOCs/sVOCs).	Toluene, Ethylbenzene, Benzene, Xylenes	S4UL
<u>Inorganic Substances</u>		
Heavy Metals and Metalloids	Arsenic, Cadmium, Chromium, Lead, Mercury, Nickel, Selenium, Copper, Zinc	S4UL
	Copper, Zinc, Nickel	BS: 3882 (2015).
Cyanides	Free Cyanide	CLEA v1.06
Sulphates	Water Soluble Sulphate	BRE Special Digest 1:2005

5.3 BRE

- 5.3.1 The BRE Special Digest 1:2005, 'Concrete in Aggressive Ground' is used with soluble sulphate and pH results to assess the aggressive chemical environment of future underground concrete structures at the site.

5.4 Site Specific Criteria

- 5.4.1 The criteria adopted in the selection of correct screening criteria from published reports as previously described, are provided within Tables 5.2.

Table 5.2: Site Specific Data

Input Details	Value
Land Use	Residential with plant uptake
Soil Organic Matter	1%

- 5.4.2 As the published reports only offer the option of selecting an SOM value of 1%, 2.5% or 6%, an SOM value of 1% has been used for the generation of generic assessment criteria, as 0.40% was the mean value obtained from laboratory analysis.
- 5.4.3 It is understood that the site is to be developed to provide residential units with associated communal and private soft landscaping. As a result, the site has been assessed as residential with plant uptake.

6 GENERIC QUANTITATIVE RISK ASSESSMENT

6.1 Screening of Soil Chemical Analysis Results – Human Health Risk Assessment

6.1.1 To focus on the contaminants of potential concern (COPC), the results have been compared with the respective SGV/GAC. Those contaminants which exceed the SGV/GAC are considered to be the COPC. Those which do not exceed the respective SGV/GAC are not considered to be COPC and as such do not require further assessment in relation to the proposed development of the site.

6.1.2 Laboratory analysis for soils are summarised in Tables 6.1 to 6.3. Raw laboratory data is included in Appendix 7.

Table 6.1: Soil Laboratory Analysis Results – Metals, Metalloids, Phenol, Cyanide

Determinand	Unit	No. samples tested	Screening Criteria	Min	Max	No. Exceeding
Arsenic	mg/kg	8	37 S4UL	6.8	17	0
Cadmium	mg/kg	8	11 S4UL	<0.2	0.5	0
Chromium	mg/kg	8	910 S4UL	3.3	42	0
Lead	mg/kg	8	200 C4SL	2.6	12	0
Mercury	mg/kg	8	40 S4UL	< 0.3	< 0.3	0
Nickel	mg/kg	8	180 S4UL	3	23	0
Copper	mg/kg	8	2400 S4UL	2.7	17	0
Zinc	mg/kg	8	3700 S4UL	9	70	0
Total Cyanide ^A	mg/kg	8	33 CLEA v 1.06	<1.0	<1.0	0
Selenium	mg/kg	8	250 S4UL	<1.0	<1.0	0
Boron Water Soluble	mg/kg	8	290 S4UL	<0.2	5.2	0
Phenols	mg/kg	8	120 S4UL	< 1.0	< 1.0	0

Notes:

^A Generic assessment criteria derived for free inorganic cyanide.

Table 6.2: Soil Laboratory Analysis Results – Polycyclic Aromatic Hydrocarbons (PAHs)

Determinand	Unit	No. Samples Tested	Screening Criteria	Min	Max	No. Exceeding
Naphthalene	mg/kg	8	S4UL 2.3	< 0.05	< 0.05	0
Acenaphthylene	mg/kg	8	S4UL 170	< 0.05	< 0.05	0
Acenaphthene	mg/kg	8	S4UL 210	< 0.05	< 0.05	0
Fluorene	mg/kg	8	S4UL 170	< 0.05	< 0.05	0
Phenanthrene	mg/kg	8	S4UL 95	< 0.05	< 0.05	0

SECTION 6
GENERIC QUANTITATIVE RISK
ASSESSMENT

Determinand	Unit	No. Samples Tested	Screening Criteria		Min	Max	No. Exceeding
Anthracene	mg/kg	8	S4UL	2400	< 0.05	< 0.05	0
Fluoranthene	mg/kg	8	S4UL	280	< 0.05	< 0.05	0
Pyrene	mg/kg	8	S4UL	620	< 0.05	< 0.05	0
Benzo(a)anthracene	mg/kg	8	S4UL	7.2	< 0.05	< 0.05	0
Chrysene	mg/kg	8	S4UL	15	< 0.05	< 0.05	0
Benzo(b)fluoranthene	mg/kg	8	S4UL	2.6	< 0.05	< 0.05	0
Benzo(k)fluoranthene	mg/kg	8	S4UL	77	< 0.05	< 0.05	0
Benzo(a)pyrene	mg/kg	8	S4UL	2.2	< 0.05	< 0.05	0
Indeno(123-cd)pyrene	mg/kg	8	S4UL	27	< 0.05	< 0.05	0
Dibenzo(ah)anthracene	mg/kg	8	S4UL	0.24	< 0.05	< 0.05	0
Benzo(ghi)perylene	mg/kg	8	S4UL	320	< 0.05	< 0.05	0
Total PAH	mg/kg	8	-		< 0.80	< 0.80	-

Table 6.3: Soil Laboratory Analysis Results – Total Petroleum Hydrocarbons (TPH)

TPH Band	Unit	No. Samples Tested	Screening Criteria		Min	Max	No. Exceeding
C ₈ -C ₁₀	mg/kg	2	S4UL	27	< 0.1	< 0.1	0
>C ₁₀ -C ₁₂	mg/kg	2	S4UL	74	< 2.0	< 2.0	0
>C ₁₂ -C ₁₆	mg/kg	2	S4UL	140	< 4.0	< 4.0	0
>C ₁₆ -C ₂₁	mg/kg	2	S4UL	260	< 1.0	< 1.0	0
>C ₂₁ -C ₃₅	mg/kg	2	S4UL	1100	< 10	17	0
Total TPH	mg/kg	2	-	-	<17.1	<24.1	-

Note: *The lower value of guidelines for Aromatic/Aliphatics has been selected

Table 6.4: Soil Laboratory Analysis Results – Total Petroleum Hydrocarbons (TPHCWG)

TPH Band	Unit	No. Samples Tested	Screening Criteria		Min	Max	No. Exceeding
>C ₅ -C ₆ Aliphatic	mg/kg	2	S4UL	42	< 0.001	< 0.001	0
>C ₆ -C ₈ Aliphatic	mg/kg	2	S4UL	100	< 0.001	< 0.001	0
>C ₈ -C ₁₀ Aliphatic	mg/kg	2	S4UL	27	< 0.001	< 0.001	0
>C ₁₀ -C ₁₂ Aliphatic	mg/kg	2	S4UL	130	< 1.0	< 1.0	0
>C ₁₂ -C ₁₆ Aliphatic	mg/kg	2	S4UL	1100	< 2.0	< 2.0	0
>C ₁₆ -C ₃₅ Aliphatic	mg/kg	2	S4UL	65000	<16.0	<16.0	0
>C ₅ -C ₇ Aromatic	mg/kg	2	S4UL	70	< 0.001	<0.01	0

TPH Band	Unit	No. Samples Tested	Screening Criteria		Min	Max	No. Exceeding
>C ₇ -C ₈ Aromatic	mg/kg	2	S4UL	130	< 0.001	<0.01	0
>C ₈ -C ₁₀ Aromatic	mg/kg	2	S4UL	34	< 0.001	< 0.001	0
>C ₁₀ -C ₁₂ Aromatic	mg/kg	2	S4UL	74	< 1.0	< 1.0	0
>C ₁₂ -C ₁₆ Aromatic	mg/kg	2	S4UL	140	< 2.0	< 2.0	0
>C ₁₆ -C ₂₁ Aromatic	mg/kg	2	S4UL	260	< 10	< 10	0
>C ₂₁ -C ₃₅ Aromatic	mg/kg	2	S4UL	1100	< 10	< 10	0
Total TPH (Ali/Aro)	mg/kg	2	S4UL	1900	<20	<20	0

6.2 Volatile Organic Compounds

6.2.1 In addition to the suites outlined previously, 6No samples were tested for the presence of volatile organic compounds including BTEX compounds (benzene, toluene, ethylbenzene, xylene).

6.2.2 No VOCs were reported above the laboratory detection limit within any tested sample.

6.3 Asbestos in Soil

6.3.1 10No samples of the Made Ground were screened in the laboratory for the presence of asbestos.

6.3.2 No asbestos was reported in samples analysed.

6.4 Controlled Waters Risk Assessment

6.4.1 It is noted that the site is located above a Secondary Undifferentiated aquifer (Lowestoft Formation) and Primary Aquifer (undifferentiated chalk). Sampling and analysis of the groundwater was proposed; however, although small amounts of groundwater were recorded during return monitoring visits, this was not considered to represent true groundwater for the following reasons:

- No groundwater strikes were reported during the drilling process;
- All monitoring wells were reported dry during the first monitoring visit;
- Despite the site being broadly flat and level, there is a discrepancy of over 4m in water level between monitoring wells;
- Nearby historic wells to greater depth report the groundwater to be present in excess of 100m below the ground surface.

6.4.2 On this basis, the water reported within the wells is considered most likely to represent surface water that has percolated into the well and been unable to drain away through clay horizons of the Lowestoft Formation, and therefore sampling and analysis of this water would be of little benefit for the purposes of assessing risk to the identified controlled receptors.

6.4.3 In place of direct groundwater analysis, a qualitative assessment of the risks to groundwater has been undertaken.

6.4.4 As no polyaromatic hydrocarbon compounds have been reported above laboratory detection limit, extremely low levels of petroleum hydrocarbon compounds and low levels of metals have been reported in soils, there is not considered to be significant risk to controlled waters receptors from soil on site.

6.5 Screening of Soil Chemical Analysis Results – Potential Risks to Plant Growth

6.5.1 Zinc, copper and nickel are phytotoxins and could therefore inhibit plant growth in soft landscaped areas. Concentrations measured in soil for these determinands have been compared with the pH dependent values given in BS: 3882 (2015).

6.5.2 Adopting a pH value of greater than 7, as indicated by the results of the laboratory analysis, the following is noted;

Table 6.5: Soil Laboratory Analysis Results – Phytotoxic Determinands

Determinand	Threshold level (mg/kg)	Min (mg/kg)	Max (mg/kg)	No. Exceeding
Zinc	300	9	70	0
Copper	200	2.7	17	0
Nickel	110	3	23	0

6.6 Screening for Water Pipes

6.6.1 The results of the analysis have been assessed for potential impact upon water supply pipes. Table 6.6 below summarises the findings of the assessment:

Table 6.6: Screening Guide for Water Pipes

Determinand	No. of tests	Threshold adopted for PE (mg/kg)	Value for site data (mg/kg)		No of Exceedances
			Min	Max	
Total VOCs	6	0.5	0.056	0.056	0
BTEX	6	0.1	0.004	0.004	0
MTBE	6	0.1	0.001	0.001	0
EC5-EC10	8	1	<0.1	<0.006	0
EC10-EC16	8	10	<2.0	<6.0	0
EC16-EC40	8	500	<11.0	<36.0	0

SECTION 6
GENERIC QUANTITATIVE RISK
ASSESSMENT

Determinand	No. of tests	Threshold adopted for PE (mg/kg)	Value for site data (mg/kg)		No of Exceedances
			Min	Max	
Naphthalene	8	5	<0.05	0.28	0
Phenols	8	2	<1	<1	0

*Laboratory detection limit

- 6.6.2 The above suggests that upgraded pipe work is unlikely to be required.
- 6.6.3 The water supply pipe requirements for this site should be discussed at an early stage with the relevant utility provider.
- 6.7 Waste Disposal**
- 6.7.1 The classification of materials for waste disposal purposes was outside the scope of this report. Should quantities of material require off-site disposal, Waste Acceptance Criteria testing will be required.

7 SOIL GAS RISK ASSESSMENT

7.1 Soil Gas Results

- 7.1.1 4No return monitoring visits have been undertaken to monitor wells installed within boreholes at the site for soil gas concentrations and groundwater levels.
- 7.1.2 Four return monitoring visits have been undertaken from 4th August 2020 to 25th August 2020, to monitor wells installed within boreholes at the site for soil gas concentrations and groundwater levels.
- 7.1.3 During these visits atmospheric pressure ranged between 978mb and 999mb. During these visits pressure trends observed were static and falling.
- 7.1.4 The results of the monitoring undertaken are summarised in Table 7.1 below, with the monitoring records presented in Appendix 6.

Table 7.1: Summary of Gas Monitoring Data

Hole No.	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	H ₂ S (ppm)	VOCs	Peak Flow Rate (l/hr)	Depth to water (mbgl)	Depth of installation (mbgl)
WS1	0.1 – 0.2	1.2 – 1.4	18.0 – 18.6	0	0.0	<0.1 – 0.1	Dry	5.00
WS3	0.1 – 0.2	2.2 – 3.4	17.2 – 18.8	0	0.0	<0.1 – 0.1	Dry – 4.84	5.01
WS5	<0.1 – 0.2	0.2 – 1.5	17.2 – 20.3	0	0.0	<0.1	Dry – 1.21	4.88
WS10	<0.1 – 0.2	0.2 – 0.6	17.1 – 19.0	0	0.0	-0.2 - <0.1	Dry – 0.71	5.00

7.2 Screening of Results

- 7.2.1 As shown in Table 7.1, methane has been reported at a maximum concentration of 0.2% v/v. Carbon dioxide has been reported to a maximum concentration of 3.0% v/v. Volatile organic compounds (VOCs) have not been reported above detection limits. A maximum flow rate of -0.2/hr has been reported.
- 7.2.2 In the assessment of risks posed by hazardous ground gases and selection of appropriate mitigation measures, BS8485 (2015) identifies four types of development, termed Type A to Type D.
- 7.2.3 Type A buildings are defined as
- “private ownership with no building management controls on alternations to the internal structure, the use of rooms, the ventilation of rooms or the structural fabric of the building. Some small rooms present. Probably conventional building construction (rather than civil engineering). Examples include private housing and some retail premises.”*
- 7.2.4 Type A has been adopted as the relevant category for the proposed development.

7.2.5 The soil gas assessment method is based on that proposed by Wilson & Card (1999), which was a development of a method proposed in CIRIA publication R149 (CIRIA, 1995). The method uses both gas concentrations and borehole flow rates to define a characteristic situation based on the limiting borehole gas volume flow for methane and carbon dioxide. In both these methods, the limiting borehole gas volume flow is renamed as the Gas Screening Value (GSV).

7.2.6 The Gas Screening Value (litres of gas per hour) is calculated by using the following equation

$$\text{GSV} = (\text{Concentration}/100) \times \text{Flow rate}$$

Where concentration is measured in percent (%)
and flow rate is measured in litres per hour (l/hr)

7.2.7 The Characteristic Situation is then determined from Table 8.5 of CIRIA C665.

7.2.8 A worst case flow rate of 0.2l/hr (maximum reported) will be used in the calculation of GSVs for the site. The Characteristic Situation is then determined from Table 8.5 of CIRIA C665.

7.2.9 To accord with C665, worst case conditions are used in the calculation of GSVs for the site. These have been summarised below in Table 7.2.

Table 7.2: Summary of Gas Monitoring Data

Gas	Concentration (v/v %)	Peak Flow Rate (l/hr)	GSV (l/hr)	Characteristic Situation (after CIRIA C665)
CO ₂	3.0	0.2	0.006	1
CH ₄	0.2	0.2	0.0004	1

7.2.10 As the site has been determined as Characteristic Situation 1, no formal gas protection measures are considered necessary.

7.2.11 BS 8576:2013 has been used to derive threshold levels for carbon monoxide and volatile organic compounds.

7.2.12 Given the recorded levels it is not considered that additional protection measures need to be incorporated to protect end users from the recorded VOC and Carbon Monoxide concentrations.

8 SUMMARY OF RESULTS

8.1 Land Quality Impact Summary

8.1.1 Following the ground investigation, the following is noted:

- It is understood that the proposed development will comprise 3No detached residential units with private gardens and a communal access courtyard area.
- Following generic risk assessments, no determinands were reported above the screening criteria within the 'residential with plant uptake' end use scenario.
- No asbestos fibres were detected in the samples analysed in the laboratory.
- Groundwater analysis was included in the original scope of the investigation; however, no groundwater was recorded during drilling, or within the wells on the first monitoring visits. Subsequent visits did report varying levels of water within the wells however this was not considered to represent true groundwater. For details see Section 6.4.
- As no polyaromatic hydrocarbon compounds have been reported above laboratory detection limit, extremely low levels of petroleum hydrocarbon compounds and low levels of metals have been reported in soils, there is not considered to be significant risk to controlled waters receptors from soil on site.
- Calculating the Gas Screening Value using worst case results indicates Characteristic Situation 1. Therefore, formal gas protection measures are not considered necessary.
- On the basis of the findings of this investigation, the site is not considered to pose a significant risk to the identified sensitive receptors.
- No further remediation works are considered necessary, and the site is considered suitable for the proposed use following the adoption of the measures above.
- As with any ground investigation, the presence of further hotspots between sampling points cannot be ruled out. Should any contamination be encountered, a suitably qualified environmental consultant should be informed immediately, so that adequate measures may be recommended.

8.1.2 The above conclusions are made subject to approval by the statutory regulatory bodies.

8.2 Review of Pollutant Linkages Following Site Investigation

- 8.2.1 The site CSM has been revised and updated from that suggested in the desk study in view of the ground investigation data, including soil laboratory analysis results. Table 8.1 highlights whether pollutant linkages identified in the original CSM are still relevant following the risk assessment, or whether pollutant linkages, not previously identified, exist.

SECTION 8

SUMMARY OF RESULTS

Table 8.1: Plausible Pollutants Linkages Summary (Pre Remediation)

Potential Source (from desk study)	Pathway	Receptor	Relevant Pollutant Linkage?	Comment
- Potential for Made Ground associated with previous development operations – on site (S1) - Potential ground contamination from previous industrial use – (S2) - Depot on site - Car breakers on site - Potential off-site industrial uses(S3): - Farm buildings adjacent - recorded pollution incident involving oils and fuels 57m NE - Off-site ground gas sources – (S4) - Potentially infilled ponds nearest approx. 20m off site - Therfield Tip 280m NE	- Ingestion and dermal contact with contaminated soil (P1) - Inhalation or contact with potentially contaminated dust and vapours (P2) - Permeation of water pipes and attack on concrete foundations by aggressive soil conditions (P6)	- Construction workers (R1) - Maintenance workers (R2) - Neighbouring site users (R3) - Future site users (R4) - Building foundations and on site buried services (water mains, electricity and sewer) (R5)	X	Remedial measures not considered necessary The findings of this report should be included in the construction health and safety file, with adequate measures put in place for the protection of construction and maintenance workers.
	Accumulation and migration of soil gases (P5)		X	Gas Protection measures not considered necessary
	- Leaching through permeable soils, migration within the vadose zone (i.e., unsaturated soil above the water table) and/or lateral migration within surface water, as a result of cracked hardstanding or via service pipe/corridors and surface water runoff. (P3) - Horizontal and vertical migration of contaminants within groundwater (P4)	- Neighbouring site users (R3) - Building foundations and on site buried services (water mains, electricity and sewer) (R5) - Controlled waters – SPZ 3, Principal and Undifferentiated Aquifers, inland river 389m SE.	X	Remedial measures not considered necessary Contact should be made with relevant utility providers to confirm if upgraded materials are required.

9 REFERENCES

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BRE Special Digest 1: Concrete in Aggressive Ground, 2005

British Standards Institution (2007) BS 3882:2007 *Specification for topsoil and requirements for use*. Milton Keynes: BSI

British Standards Institution (2011) BS 10175:2011 *Code of practice for the investigation of potentially contaminated sites*. Milton Keynes: BSI

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Environment Agency (2004) *Model procedures for the management of land contamination*. CLR11. Bristol: Environment Agency

Environment Agency, NHBC & CIEH (2008) *Guidance for the safe development of housing on land affected by contamination*. R & D Publication 66. London: Environment Agency

Environment Agency (2006) *Remedial Targets Methodology: Hydrogeological Risk Assessment for Land Contamination* Environment Agency

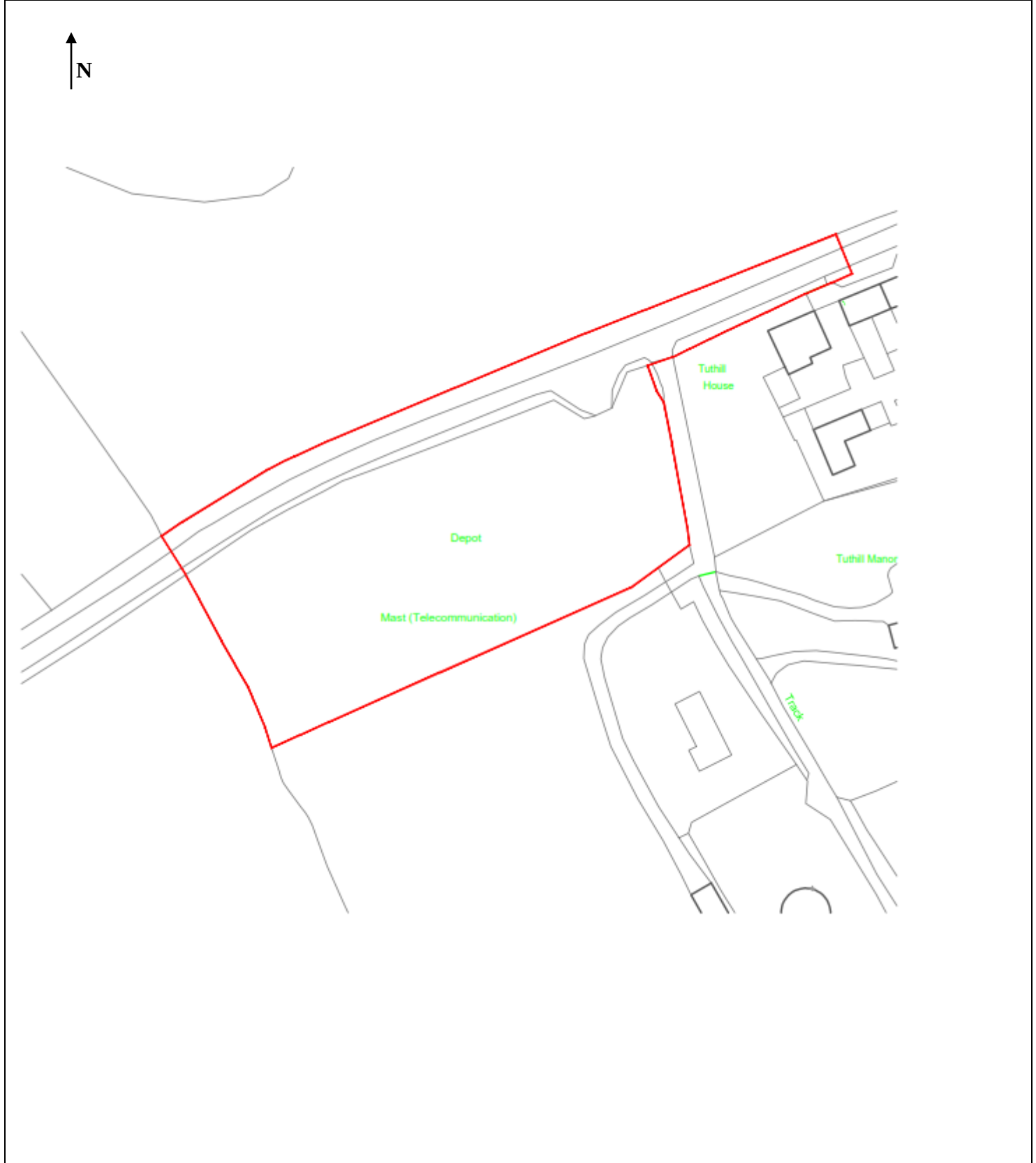
LQM/CIEH S4ULs. LQM, 2014

Ministry of Housing, Communities & Local Government: *National Planning Policy Framework*. February 2019.

APPENDICES

APPENDIX 1 – FIGURES

PROJECT NAME:	Tuthill's Yard	CLIENT:	Quanta Homes 6
TITLE:	Site location plan	PROJECT NO.	P1803J1532
DATE:	December 2021	FIGURE:	1



Project Name	Turthills yard, Kelshall Road.	Client	Quanta Homes 6
Project No.	P1803J1532	Date	27/07/2020
Title	Completed GI Plan	Figure	2

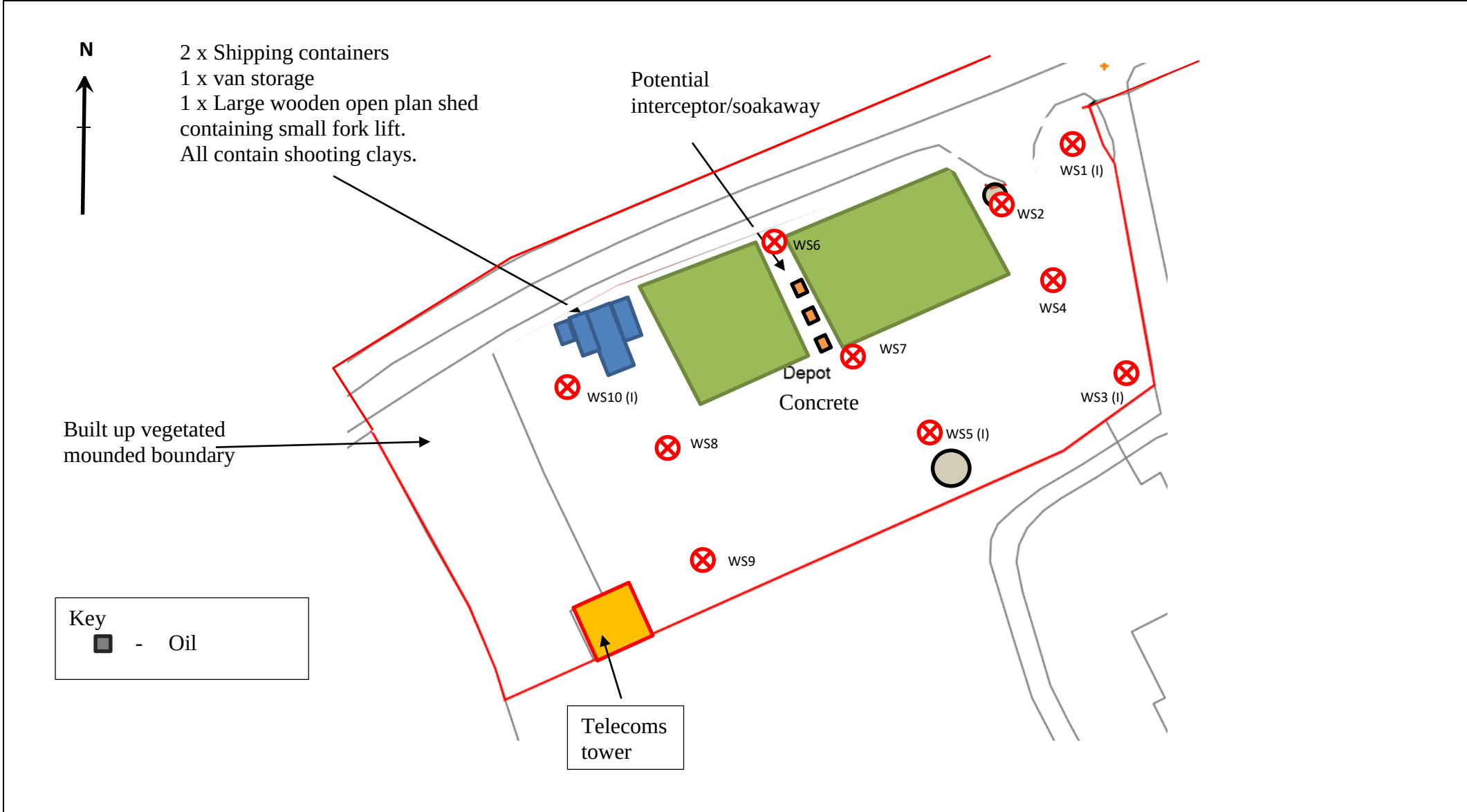


Figure 3: Proposed Development Plan



P01	Original Issue by Scene	OBL	16.05.24
Rev	Description	Initials	Date



1:500

0m 5m 15m 30m



Stage 3

Tuthills Yard

// Proposed Site Layout Plan

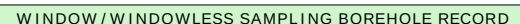
Client Name	Quanta Homes LTD
Address	Tuthill's Yard, Therefiend, Royston, SG8 9TT

Drawn by	OBL	Checked by	BKM
Scale	1:500 @ A3	Date	16/05/24
Scene Ref.	1549	Rev no.	P01
Drawing no.	THSYD-SCN-XX-XX-DR-A-01.002-A3		



// SceneArchitects.co.uk // 01245 440 302

APPENDIX 2 – EXPLORATORY HOLE RECORDS



WS1

Project No:	P1803J1532
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Ground Level:

Date Commenced:	30/07/2020
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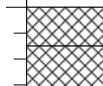
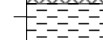
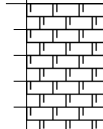
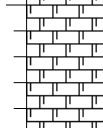
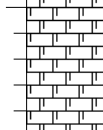
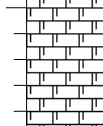
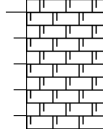
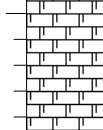
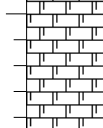
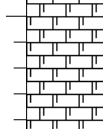
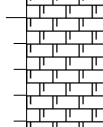
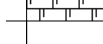
Date Completed:	30/07/2020
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Sheet No:	1 Of 1
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Date:						
Hole depth:						
Casing depth:						
Level water on strike:						
Water Level after 20mins:						

1: No water reported

Sample or Tests	Strata
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Type	Depth (mbgl)	Result								Legend	Depth (mbgl)	Water Strikes (mbgl)	Strata Description	Installation	
		75	75	75	75	75	75	N							
ES+D	0.25								0.00		0.15		Reinforced concrete. (MADE GROUND)		
									0.35		Sandy gravel. Gravel consists of brick. (MADE GROUND)				
									0.50		Brown gravelly CLAY. Gravel consists of flint. (LOWESTOFT FORMATION)				
ES+D	0.50								0.50		0.50		Brown gravelly CLAY. Gravel consists of flint. (LOWESTOFT FORMATION)		
ES+D	0.70											White structureless CHALK. Grade D. (LEWES NODULAR CHALK FORMATION AND SEAFORD CHALK FORMATION (UNDIFFERENTIATED))			
ES+D	1.00								1.00				White structureless CHALK. Grade D. (LEWES NODULAR CHALK FORMATION AND SEAFORD CHALK FORMATION (UNDIFFERENTIATED))		
ES+D	2.00								1.50				White structureless CHALK. Grade D. (LEWES NODULAR CHALK FORMATION AND SEAFORD CHALK FORMATION (UNDIFFERENTIATED))		
									2.00				White structureless CHALK. Grade D. (LEWES NODULAR CHALK FORMATION AND SEAFORD CHALK FORMATION (UNDIFFERENTIATED))		
									2.50				White structureless CHALK. Grade D. (LEWES NODULAR CHALK FORMATION AND SEAFORD CHALK FORMATION (UNDIFFERENTIATED))		
									3.00				White structureless CHALK. Grade D. (LEWES NODULAR CHALK FORMATION AND SEAFORD CHALK FORMATION (UNDIFFERENTIATED))		
									3.50				White structureless CHALK. Grade D. (LEWES NODULAR CHALK FORMATION AND SEAFORD CHALK FORMATION (UNDIFFERENTIATED))		
D	4.00								4.00				White structureless CHALK. Grade D. (LEWES NODULAR CHALK FORMATION AND SEAFORD CHALK FORMATION (UNDIFFERENTIATED))		
									4.50				White structureless CHALK. Grade D. (LEWES NODULAR CHALK FORMATION AND SEAFORD CHALK FORMATION (UNDIFFERENTIATED))		
									5.00				White structureless CHALK. Grade D. (LEWES NODULAR CHALK FORMATION AND SEAFORD CHALK FORMATION (UNDIFFERENTIATED))		
D	5.00								5.00		5.00				

Sampling Code: U- Undisturbed B - Large Disturbed D - Small Disturbed W - Water (U*) Non recovery of Sample
 Jomas Associates Ltd - Lakeside House, 1 Furzeground Way, Stockley Park, UB11 1BD
 T: 0843 289 2187 E: info@jomasassociates.com W: www.jomasassociates.com



WINDOW / WINDOWLESS SAMPLING BOREHOLE RECORD

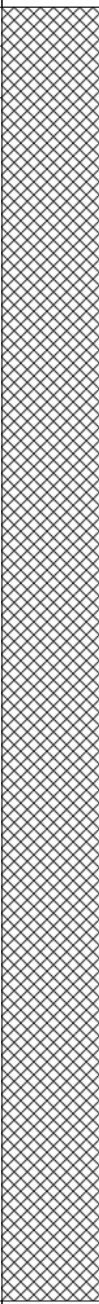
Exploratory Hole No:

WS2

Site Address:	Tuthill's Yard, Kelshall Road, Therfield, SG8 9TT	Project No:	P1803J1532
Client:	Quanta Homes	Ground Level:	
Logged By:	NS	Date Commenced:	30/07/2020
Checked By:	TE	Date Completed:	30/07/2020
Type and diameter of equipment:	Windowless Sampler	Sheet No:	1 Of 1

Water levels recorded during boring, m						
Date:						
Hole depth:						
Casing depth:						
Level water on strike:						
Water Level after 20mins:						

Remarks						
1: No water reported						
2:						
3:						
4:						

Sample or Tests									Strata			Strata Description	Installation	
Type	Depth (mbgl)	Result							Legend	Depth (mbgl)	Water Strikes (mbgl)			
		75	75	75	75	75	75							N
ES+D	0.25								0.00		0.15		Reinforced concrete. (MADE GROUND)	
											0.35		Brown gravel. Gravel consists of brick. (MADE GROUND)	
ES+D	0.50								0.50			White structureless CHALK. Grade D. (LEWES NODULAR CHALK FORMATION AND SEAFORD CHALK FORMATION (UNDIFFERENTIATED))		
ES+D	0.70													
ES+D	1.00								1.00					
ES+D	2.00								1.50					
D	3.00								2.00					
									2.50					
ES+D	4.00								3.00					
									3.50					
D	5.00								4.00					
									4.50					
								5.00		5.00				

Sampling Code: U- Undisturbed B - Large Disturbed D - Small Disturbed W - Water (U*) Non recovery of Sample
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WINDOW / WINDOWLESS SAMPLING BOREHOLE RECORD

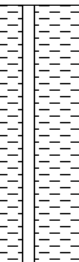
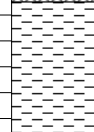
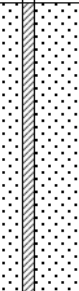
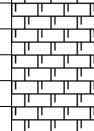
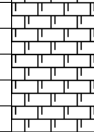
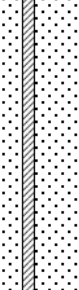
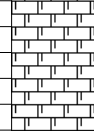
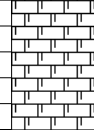
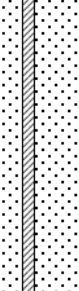
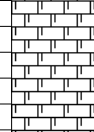
Exploratory Hole No:

WS3

Site Address:	Tuthill's Yard, Kelshall Road, Therfield, SG8 9TT	Project No:	P1803J1532
Client:	Quanta Homes	Ground Level:	
Logged By:	NS	Date Commenced:	30/07/2020
Checked By:	TE	Date Completed:	30/07/2020
Type and diameter of equipment:	Windowless Sampler	Sheet No:	1 Of 1

Water levels recorded during boring, m						
Date:						
Hole depth:						
Casing depth:						
Level water on strike:						
Water Level after 20mins:						

Remarks						
1: No water reported						
2: * Field description						
3:						
4:						

Sample or Tests										Strata			Strata Description	Installation									
Type	Depth (mbgl)	Result								Legend	Depth (mbgl)	Water Strikes (mbgl)											
		75	75	75	75	75	75	N															
ES+D	0.25								0.00		0.15		Reinforced concrete. (MADE GROUND)										
ES+D	0.50								0.50				Brown gravelly CLAY. Gravel consissts of flint and chalk. (LOWESTOFT FORMATION)										
ES+D	0.70										0.70												
ES+D	1.00								1.00														
ES+D	1.00												Firm consistency* white structureless CHALK. Grade D. (LEWES NODULAR CHALK FORMATION AND SEAFORD CHALK FORMATION (UNDIFFERENTIATED))										
ES+D	2.00								1.50														
ES+D	2.00								2.00														
ES+D	3.00												Soft consistency* white strcutureless CHALK. Grade D. (LEWES NODULAR CHALK FORMATION AND SEAFORD CHALK FORMATION (UNDIFFERENTIATED))										
ES+D	3.00								3.00														
ES+D	4.00																						
D	4.00								4.00														
D	5.00												Soft consistency* white strcutureless CHALK. Grade D. (LEWES NODULAR CHALK FORMATION AND SEAFORD CHALK FORMATION (UNDIFFERENTIATED))										
D	5.00								5.00		5.00												

Sampling Code: U- Undisturbed B - Large Disturbed D - Small Disturbed W - Water (U*) Non recovery of Sample
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WINDOW / WINDOWLESS SAMPLING BOREHOLE RECORD

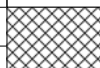
Exploratory Hole No:

WS4

Site Address:	Tuthill's Yard, Kelshall Road, Therfield, SG8 9TT	Project No:	P1803J1532
Client:	Quanta Homes	Ground Level:	
Logged By:	NS	Date Commenced:	30/07/2020
Checked By:	TE	Date Completed:	30/07/2020
Type and diameter of equipment:	Windowless Sampler	Sheet No:	1 Of 1

Water levels recorded during boring, m						
Date:						
Hole depth:						
Casing depth:						
Level water on strike:						
Water Level after 20mins:						

Remarks						
1: No water reported						
2:						
3:						
4:						

Sample or Tests										Strata			Strata Description	Installation	
Type	Depth (mbgl)	Result								Legend	Depth (mbgl)	Water Strikes (mbgl)			
		75	75	75	75	75	75	N							
ES+D	0.25								0.00		0.15		Concrete. (MADE GROUND)		
									0.35		Brown gravel. Gravel consists of brick. (MADE GROUND)				
ES+D	0.50								0.50		0.50		Brown gravelly clay. Gravel consists of brick and flint. (MADE GROUND)		
ES+D	0.70												White structureless CHALK. Grade D. (LEWES NODULAR CHALK FORMATION AND SEAFORD CHALK FORMATION (UNDIFFERENTIATED))		
ES+D	1.00								1.00						
ES+D	2.00								1.50						
									2.00						
									2.50						
									3.00						
									3.50						
									4.00						
ES+D	4.00								4.00						
ES+D	5.00								4.50						
									5.00						
									5.00						
									5.00						
									5.00						
									5.00						
ES+D	5.00								5.00		5.00				

Sampling Code: U- Undisturbed B - Large Disturbed D - Small Disturbed W - Water (U*) Non recovery of Sample
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WINDOW / WINDOWLESS SAMPLING BOREHOLE RECORD

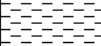
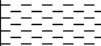
Exploratory Hole No:

WS5

Site Address:	Tuthill's Yard, Kelshall Road, Therfield, SG8 9TT	Project No:	P1803J1532
Client:	Quanta Homes	Ground Level:	
Logged By:	NS	Date Commenced:	29/07/2020
Checked By:	TE	Date Completed:	29/07/2020
Type and diameter of equipment:	Windowless Sampler	Sheet No:	1 Of 1

Water levels recorded during boring, m						
Date:						
Hole depth:						
Casing depth:						
Level water on strike:						
Water Level after 20mins:						

Remarks						
1: No water reported						
2:						
3:						
4:						

Sample or Tests										Strata			Strata Description	Installation			
Type	Depth (mbgl)	Result								Legend	Depth (mbgl)	Water Strikes (mbgl)					
		75	75	75	75	75	75	N									
ES+D	0.25								0.00		0.20		Reinforced concrete. (MADE GROUND)				
												Brown gravelly clay. Gravel consists of brick and flint. (MADE GROUND)					
												0.35				Brown orange gravelly CLAY. Gravel consists of fine to medium flint and chalk. (LOWESTOFT FORMATION)	
ES+D	0.50								0.50								
ES+D	0.70																
ES+D	1.00																
ES+D	1.00								1.00								
D	2.00								1.50								
D	3.00								2.00								
D	3.00								2.50								
D	3.00								3.00								
D	3.00								3.50								
ES+D	4.00								4.00								
ES+D	4.00								4.50								
ES+D	5.00								5.00								

Sampling Code: U- Undisturbed B - Large Disturbed D - Small Disturbed W - Water (U*) Non recovery of Sample
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WINDOW / WINDOWLESS SAMPLING BOREHOLE RECORD

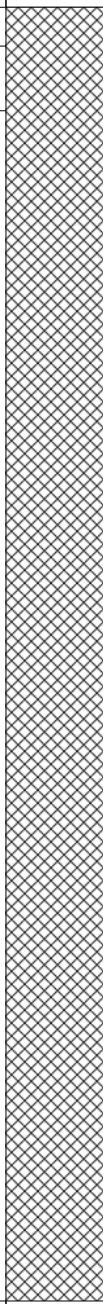
Exploratory Hole No:

WS6

Site Address:	Tuthill's Yard, Kelshall Road, Therfield, SG8 9TT	Project No:	P1803J1532
Client:	Quanta Homes	Ground Level:	
Logged By:	NS	Date Commenced:	30/07/2020
Checked By:	TE	Date Completed:	30/07/2020
Type and diameter of equipment:	Windowless Sampler	Sheet No:	1 Of 1

Water levels recorded during boring, m						
Date:						
Hole depth:						
Casing depth:						
Level water on strike:						
Water Level after 20mins:						

Remarks						
1: No water reported						
2:						
3:						
4:						

Sample or Tests										Strata			Strata Description	Installation
Type	Depth (mbgl)	Result								Legend	Depth (mbgl)	Water Strikes (mbgl)		
		75	75	75	75	75	75	N						
ES+D	0.25								0.00		0.15		Reinforced concrete. (MADE GROUND)	
										0.40		Sandy gravel. Gravel is brick. (MADE GROUND)		
ES+D	0.50								0.50			White structureless CHALK. Grade D. (LEWES NODULAR CHALK FORMATION AND SEAFORD CHALK FORMATION (UNDIFFERENTIATED))		
ES+D	0.70													
ES+D	1.00								1.00					
														
									1.50					
														
ES+D	2.00								2.00					
														
									2.50					
														
ES+D	3.00								3.00					
														
									3.50					
														
ES+D	4.00								4.00					
														
									4.50					
D	5.00								5.00		5.00			

Sampling Code: U- Undisturbed B - Large Disturbed D - Small Disturbed W - Water (U*) Non recovery of Sample
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WINDOW / WINDOWLESS SAMPLING BOREHOLE RECORD

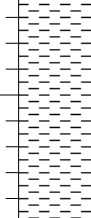
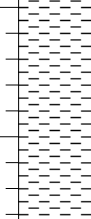
Exploratory Hole No:

WS8

Site Address:	Tuthill's Yard, Kelshall Road, Therfield, SG8 9TT	Project No:	P1803J1532
Client:	Quanta Homes	Ground Level:	
Logged By:	NS	Date Commenced:	30/07/2020
Checked By:	TE	Date Completed:	30/07/2020
Type and diameter of equipment:	Windowless Sampler	Sheet No:	1 Of 1

Water levels recorded during boring, m						
Date:						
Hole depth:						
Casing depth:						
Level water on strike:						
Water Level after 20mins:						

Remarks						
1: No water reported						
2:						
3:						
4:						

Sample or Tests										Strata			Strata Description	Installation
Type	Depth (mbgl)	Result								Legend	Depth (mbgl)	Water Strikes (mbgl)		
		75	75	75	75	75	75	N						
ES+D	0.25								0.00		0.15		Reinforced concrete. (MADE GROUND)	
										0.30		Brown sandy gravel. Gravel consists of brick. (MADE GROUND)		
										0.50		Brown sandy gravelly clay. Gravel consists of brick. (MADE GROUND)		
ES+D	0.50								0.50				Light brown to grey gravelly CLAY. Gravel consists of chalk. (LOWESTOFT FORMATION)	
ES+D	0.70													
ES+D	1.00													
D	2.00								1.00					
									1.50					
									2.00					
									2.50					
									3.00					
ES+D	3.00								3.00					
ES+D	4.00								3.50					
									4.00					
									4.50					
									5.00					
									5.00					
D	5.00								5.00					

Sampling Code: U- Undisturbed B - Large Disturbed D - Small Disturbed W - Water (U*) Non recovery of Sample
Jomas Associates Ltd - Lakeside House, 1 Furzeground Way, Stockley Park, UB11 1BD
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WINDOW / WINDOWLESS SAMPLING BOREHOLE RECORD

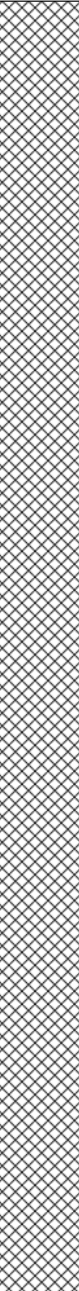
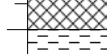
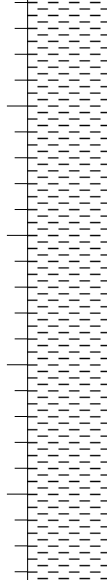
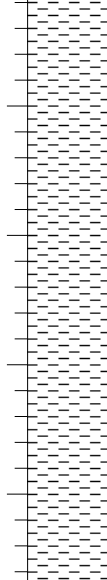
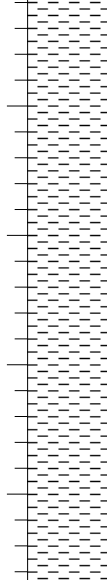
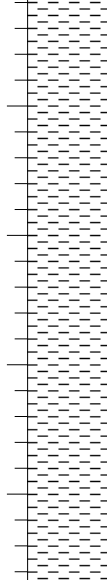
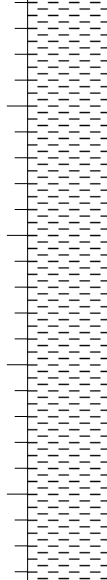
Exploratory Hole No:

WS9

Site Address:	Tuthill's Yard, Kelshall Road, Therfield, SG8 9TT	Project No:	P1803J1532
Client:	Quanta Homes	Ground Level:	
Logged By:	NS	Date Commenced:	29/07/2020
Checked By:	TE	Date Completed:	29/07/2020
Type and diameter of equipment:	Windowless Sampler	Sheet No:	1 Of 1

Water levels recorded during boring, m						
Date:						
Hole depth:						
Casing depth:						
Level water on strike:						
Water Level after 20mins:						

Remarks						
1: No water reported						
2: * Field description						
3:						
4:						

Sample or Tests										Strata			Strata Description	Installation
Type	Depth (mbgl)	Result								Legend	Depth (mbgl)	Water Strikes (mbgl)		
		75	75	75	75	75	75	N						
ES+D	0.10								0.00		0.10		Concrete. (MADE GROUND)	
ES+D	0.30									0.30		Sandy gravel. Gravel is brick. (MADE GROUND)		
ES+D	0.60									0.50		Sandy gravelly clay. Gravel is brick. (MADE GROUND)		
ES+D	1.00											Stiff consistency* light brown grey gravelly CLAY. Gravel is chalk. (LOWESTOFT FORMATION)		
ES+D	2.00													
D	3.00						3.00							
ES+D	4.00						4.00							
D	5.00						5.00							



WINDOW / WINDOWLESS SAMPLING BOREHOLE RECORD

Exploratory Hole No:

WS10

Site Address: Tuthill's Yard, Kelshall Road, Therfield, SG8 9TT

Client: Quanta Homes

Logged By: NS

Checked By: TE

Type and diameter of equipment: Windowless Sampler

Project No: P1803J1532

Ground Level:

Date Commenced: 29/07/2020

Date Completed: 29/07/2020

Sheet No: 1 Of 1

Water levels recorded during boring, m

Date:

Hole depth:

Casing depth:

Level water on strike:

Water Level after 20mins:

Remarks

1: No water reported

2:

3:

4:

Sample or Tests										Strata			Strata Description	Installation	
Type	Depth (mbgl)	Result								Legend	Depth (mbgl)	Water Strikes (mbgl)			
		75	75	75	75	75	75	N							
ES+D	0.15								0.00		0.15		Concrete. (MADE GROUND)		
ES+D	0.30												Brown sandy gravel. Gravel consists of brick. (MADE GROUND)		
ES+D	0.60								0.50		0.60		White structureless CHALK. Grade D. (LOWESTOFT FORMATION)		
ES+D	1.00								1.00						
									1.50						
D	2.00								2.00						
									2.50				Brown orange gravelly CLAY. Gravel consits of fine to medium flint. (LOWESTOFT FORMATION)		
ES+D	3.00								3.00		2.70				
									3.40						
									3.50		3.90		White structureless CHALK. Grade D. (LOWESTOFT FORMATION)		
D	4.00								4.00				Brown gravelly CLAY. Gravel consists of fine to medium flint and chalk. (LOWESTOFT FORMATION)		
									4.50						
									4.90						
ES+D	5.00								5.00		5.00		White structureless CHALK. Grade D. (LEWES NODULAR CHALK FORMATION AND SEAFORD CHALK FORMATION (UNDIFFERENTIATED))		

Sampling Code: U- Undisturbed B - Large Disturbed D - Small Disturbed W - Water (U*) Non recovery of Sample
Jomas Associates Ltd - Lakeside House, 1 Furzeground Way, Stockley Park, UB11 1BD
T: 0843 289 2187 E: info@jomasassociates.com W: www.jomasassociates.com

APPENDIX 3 – CHEMICAL LABORATORY TEST RESULTS

**Adam Hines**

Jomas Associates Ltd
Lakeside House
1 Furzeground Way
Stockley Park
UB11 1BD

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

t: 01923 225404

f: 01923 237404

e: reception@i2analytical.com

e: Jomas Associates -

Analytical Report Number : 20-23281

Project / Site name: Tuthill's Yard, Kelshall Road,
Therfield, SG8 9TT

Samples received on: 31/07/2020

Your job number: JJ1532

**Sample instructed/
Analysis started on:** 04/08/2020

Your order number: P1803JJ1532.3

Analysis completed by: 11/08/2020

Report Issue Number: 1

Report issued on: 11/08/2020

Samples Analysed: 10 soil samples

Signed:

Joanna Wawrzeczko
Technical Reviewer (Reporting Team)

For & on behalf of i2 Analytical Ltd.

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

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

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

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

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

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

Iss No 20-23281-1 Tuthill's Yard, Kelshall Road, Therfield, SG8 9TT JJ1532

This certificate should not be reproduced, except in full, without the express permission of the laboratory.

The results included within the report relate only to the sample(s) submitted for testing.

Page 1 of 13

Analytical Report Number: 20-23281

Project / Site name: Tuthill's Yard, Kelshall Road, Therfield, SG8 9TT

Your Order No: P1803JJ1532.3

Lab Sample Number				1584358	1584359	1584360	1584361	1584362
Sample Reference				WS1	WS2	WS3	WS4	WS5
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.25	0.25	0.50	0.50	0.25
Date Sampled				30/07/2020	30/07/2020	30/07/2020	30/07/2020	29/07/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	10	5.7	15	13	11
Total mass of sample received	kg	0.001	NONE	1.4	1.4	1.4	1.4	1.4

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
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General Inorganics

pH - Automated	pH Units	N/A	MCERTS	11.1	11.6	-	8.5	9.4
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	-	< 1	< 1
Total Sulphate as SO ₄	mg/kg	50	MCERTS	51000	20000	-	1100	7600
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	1.9	1.8	-	0.22	2.2
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	1900	1840	-	219	2210
Total Organic Carbon (TOC)	%	0.1	MCERTS	0.4	-	0.8	-	0.5

Total Phenols

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

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	< 0.05	< 0.05
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	< 0.05	< 0.05
Pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	< 0.05	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	< 0.05	< 0.05
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	< 0.05	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	< 0.05	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	< 0.05	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	< 0.05	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	< 0.05	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80	< 0.80	-	< 0.80	< 0.80
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Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	12	14	-	< 1.0	15
Boron (water soluble)	mg/kg	0.2	MCERTS	2.1	2.1	-	0.8	5.2
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.5	0.4	-	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	-	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	42	39	-	5.0	38
Copper (aqua regia extractable)	mg/kg	1	MCERTS	17	13	-	2.7	13
Lead (aqua regia extractable)	mg/kg	1	MCERTS	12	9.8	-	2.6	16
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	-	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	23	21	-	3.7	21
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	70	67	-	15	58

Analytical Report Number: 20-23281

Project / Site name: Tuthill's Yard, Kelshall Road, Therfield, SG8 9TT

Your Order No: P1803JJ1532.3

Lab Sample Number	1584358	1584359	1584360	1584361	1584362
Sample Reference	WS1	WS2	WS3	WS4	WS5
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	0.25	0.25	0.50	0.50	0.25
Date Sampled	30/07/2020	30/07/2020	30/07/2020	30/07/2020	29/07/2020
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		

Monoaromatics & Oxygenates

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

Petroleum Hydrocarbons

Petroleum Range Organics (C6 - C10)	mg/kg	0.1	MCERTS	-	-	-	< 0.1	-
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TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001	< 0.001	-	-	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	-	-	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	-	-	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	-	-	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	-	-	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0	< 8.0	-	-	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	< 8.0	< 8.0	-	-	< 8.0
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	< 10	-	-	< 10

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001	< 0.001	-	-	< 0.001
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	-	-	< 0.001
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	-	-	< 0.001
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	-	-	< 1.0
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	-	-	< 2.0
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	< 10	< 10	-	-	< 10
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	< 10	< 10	-	-	< 10
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	< 10	-	-	< 10

TPH (C10 - C12)	mg/kg	2	MCERTS	-	-	-	< 2.0	-
TPH (C12 - C16)	mg/kg	4	MCERTS	-	-	-	< 4.0	-
TPH (C16 - C21)	mg/kg	1	MCERTS	-	-	-	< 1.0	-
TPH (C21 - C40)	mg/kg	10	MCERTS	-	-	-	< 10	-



Analytical Report Number: 20-23281

Project / Site name: Tuthill's Yard, Kelshall Road, Therfield, SG8 9TT

Your Order No: P1803JJ1532.3

Lab Sample Number	1584358	1584359	1584360	1584361	1584362
Sample Reference	WS1	WS2	WS3	WS4	WS5
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	0.25	0.25	0.50	0.50	0.25
Date Sampled	30/07/2020	30/07/2020	30/07/2020	30/07/2020	29/07/2020
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		

VOCs

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



Analytical Report Number: 20-23281

Project / Site name: Tuthill's Yard, Kelshall Road, Therfield, SG8 9TT

Your Order No: P1803JJ1532.3

Lab Sample Number				1584358	1584359	1584360	1584361	1584362
Sample Reference				WS1	WS2	WS3	WS4	WS5
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.25	0.25	0.50	0.50	0.25
Date Sampled				30/07/2020	30/07/2020	30/07/2020	30/07/2020	29/07/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)				Units	Limit of detection	Accreditation Status		

Analytical Report Number: 20-23281

Project / Site name: Tuthill's Yard, Kelshall Road, Therfield, SG8 9TT

Your Order No: P1803JJ1532.3

Lab Sample Number				1584363	1584364	1584365	1584366	1584367
Sample Reference				WS6	WS7	WS8	WS9	WS10
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.25	0.50	0.50	0.25	0.30
Date Sampled				30/07/2020	29/07/2020	29/07/2020	29/07/2020	29/07/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	6.1	17	1.1	13	9.9
Total mass of sample received	kg	0.001	NONE	1.4	1.4	1.4	1.4	1.4

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
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General Inorganics

pH - Automated	pH Units	N/A	MCERTS	11.3	8.2	8.7	-	9.6
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	-	< 1
Total Sulphate as SO ₄	mg/kg	50	MCERTS	21000	720	500	-	3200
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	1.9	0.016	0.064	-	0.52
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	1920	15.6	63.5	-	520
Total Organic Carbon (TOC)	%	0.1	MCERTS	-	-	-	0.5	-

Total Phenols

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

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	-	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	-	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	-	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	-	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	-	< 0.05
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	-	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	-	< 0.05
Pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	-	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	-	< 0.05
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	-	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	-	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	-	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	-	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	-	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	-	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	-	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80	< 0.80	< 0.80	-	< 0.80
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Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	17	< 1.0	6.8	-	11
Boron (water soluble)	mg/kg	0.2	MCERTS	2.0	< 0.2	0.5	-	2.0
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.3	< 0.2	< 0.2	-	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	-	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	36	3.3	16	-	20
Copper (aqua regia extractable)	mg/kg	1	MCERTS	13	3.0	10	-	16
Lead (aqua regia extractable)	mg/kg	1	MCERTS	9.7	3.6	8.6	-	11
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	-	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	23	3.0	19	-	18
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	53	9.0	28	-	49

Analytical Report Number: 20-23281

Project / Site name: Tuthill's Yard, Kelshall Road, Therfield, SG8 9TT

Your Order No: P1803JJ1532.3

Lab Sample Number				1584363	1584364	1584365	1584366	1584367
Sample Reference				WS6	WS7	WS8	WS9	WS10
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.25	0.50	0.50	0.25	0.30
Date Sampled				30/07/2020	29/07/2020	29/07/2020	29/07/2020	29/07/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Monoaromatics & Oxygenates								
Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	-
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	-
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	-
p & m-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	-
o-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	-

Petroleum Hydrocarbons

Petroleum Range Organics (C6 - C10)	mg/kg	0.1	MCERTS	-	-	-	-	< 0.1
TPH-CWG - Aliphatic >EC5 - EC6								
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	-	-
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	-	-
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	-
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	-	-
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0	-	-
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0	-	-
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	< 10	< 10	-	-
TPH-CWG - Aromatic >EC5 - EC7								
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	-	-
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	-	-
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	-
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	-	-
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	< 10	< 10	< 10	-	-
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	< 10	< 10	< 10	-	-
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	< 10	< 10	-	-
TPH (C10 - C12)								
TPH (C10 - C12)	mg/kg	2	MCERTS	-	-	-	-	< 2.0
TPH (C12 - C16)	mg/kg	4	MCERTS	-	-	-	-	< 4.0
TPH (C16 - C21)	mg/kg	1	MCERTS	-	-	-	-	< 1.0
TPH (C21 - C40)	mg/kg	10	MCERTS	-	-	-	-	17



Analytical Report Number: 20-23281

Project / Site name: Tuthill's Yard, Kelshall Road, Therfield, SG8 9TT

Your Order No: P1803JJ1532.3

Lab Sample Number				1584363	1584364	1584365	1584366	1584367
Sample Reference				WS6	WS7	WS8	WS9	WS10
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.25	0.50	0.50	0.25	0.30
Date Sampled				30/07/2020	29/07/2020	29/07/2020	29/07/2020	29/07/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	-	-
Chloroethane	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	-	-
Bromomethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	-	-
Vinyl Chloride	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	-	-
Trichlorofluoromethane	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	-	-
1,1-Dichloroethene	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	-	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	-	-
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	-
1,1-Dichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	-
2,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	-
Trichloromethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	-
1,1,1-Trichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	-
1,2-Dichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	-
1,1-Dichloropropene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	-
Trans-1,2-dichloroethene	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	-	-
Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	-
Tetrachloromethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	-
1,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	-
Trichloroethene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	-
Dibromomethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	-
Bromodichloromethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	-
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	-	-
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	-	-
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	-
1,1,2-Trichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	-
1,3-Dichloropropane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	-	-
Dibromochloromethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	-	-
Tetrachloroethene	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	-	-
1,2-Dibromoethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	-	-
Chlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	-
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	-
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	-
p & m-Xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	-
Styrene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	-
Tribromomethane	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	-	-
o-Xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	-
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	-
Isopropylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	-
Bromobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	-
n-Propylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	-	-
2-Chlorotoluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	-
4-Chlorotoluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	-
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	-	-
tert-Butylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	-
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	-	-
sec-Butylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	-
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	-	-
p-Isopropyltoluene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	-	-
1,2-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	-
1,4-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	-
Butylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	-
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	-	-
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	-
Hexachlorobutadiene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	-
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	-	-



Analytical Report Number: 20-23281

Project / Site name: Tuthill's Yard, Kelshall Road, Therfield, SG8 9TT

Your Order No: P1803JJ1532.3

Lab Sample Number				1584363	1584364	1584365	1584366	1584367
Sample Reference				WS6	WS7	WS8	WS9	WS10
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.25	0.50	0.50	0.25	0.30
Date Sampled				30/07/2020	29/07/2020	29/07/2020	29/07/2020	29/07/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)				Units	Limit of detection	Accreditation Status		



Analytical Report Number : 20-23281

Project / Site name: Tuthill's Yard, Kelshall Road, Therfield, SG8 9TT

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1584358	WS1	None Supplied	0.25	Brown clay and sand with gravel and rubble.
1584359	WS2	None Supplied	0.25	Brown clay and sand with gravel and rubble.
1584360	WS3	None Supplied	0.50	Brown clay and sand with gravel and chalk.
1584361	WS4	None Supplied	0.50	Light brown clay and sand with chalk.
1584362	WS5	None Supplied	0.25	Brown clay and sand with gravel and rubble.
1584363	WS6	None Supplied	0.25	Brown clay and sand with gravel and rubble.
1584364	WS7	None Supplied	0.50	Beige clay and sand with chalk.
1584365	WS8	None Supplied	0.50	Beige clay and sand with chalk.
1584366	WS9	None Supplied	0.25	Brown clay and sand with gravel.
1584367	WS10	None Supplied	0.30	Brown loam and sand with gravel and vegetation.

Analytical Report Number : 20-23281

Project / Site name: Tuthill's Yard, Kelshall Road, Therfield, SG8 9TT

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 dphenylcarbazine followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
PRO (Soil)	Determination of hydrocarbons C6-C10 by headspace GC-MS.	In-house method based on USEPA8260	L088-PL	W	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	MCERTS
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS

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The results included within the report relate only to the sample(s) submitted for testing.

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Analytical Report Number : 20-23281

Project / Site name: Tuthill's Yard, Kelshall Road, Therfield, SG8 9TT

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS

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

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

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

Sample Deviation Report



Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
WS10		S	20-23281	1584367	c	Total cyanide in soil	L080-PL	c
WS5		S	20-23281	1584362	c	Total cyanide in soil	L080-PL	c
WS7		S	20-23281	1584364	c	Total cyanide in soil	L080-PL	c
WS8		S	20-23281	1584365	c	Total cyanide in soil	L080-PL	c

APPENDIX 4 – SOIL GAS MONITORING TEST RESULTS

GAS AND GROUNDWATER MONITORING BOREHOLE RECORD SHEET					
Site: Turthill Yard, Kelshall Road	Operative(s): JPB	Date: 4/08/20	Time: 9:00	Round: 1	Page: 1
MONITORING EQUIPMENT					
Instrument Type	Instrument Make	Serial No.	Date Last Calibrated		
Analox	GA5000	G501805	09/03/2020		
PID	Phocheck tiger	T-106448	11/03/2020		
Dip Meter	GeoTech				
MONITORING CONDITIONS					
Weather Conditions: Sunny		Ground Conditions: Dry		Temperature: 16 °C	
Barometric Pressure (mbar): 999		Barometric Pressure Trend (24hr): Steady		Ambient Concentration: 0.1 %CH ₄ , 0.0 %CO ₂ %O ₂	

MONITORING RESULTS														
Monitoring Point Location	Flow		Atmospheric Pressure (mbar)	CH ₄ %	CH ₄ % LEL	CO ₂ %	O ₂ %	VOC (ppm)		H ₂ S (ppm)	CO (ppm)	Depth to product (mbgl)	Depth to water (mbgl)	Depth to Base of well (mbgl)
	Peak	Steady						Peak	steady					
WS1	0	0	999	0.1	/	1.3	18.2	0	0	0	0	-	Dry	5.00
WS3	0	0	1000	0.1	/	3.0	18.2	0	0	0	0	-	Dry	5.01
WS5	0	0	1000	0.0	/	1.5	19.3	0	0	0	0	-	Dry	4.88
WS10	0	0	1000	0.0	/	0.3	18.6	0	0	0	0	-	Dry	5.00

Red dipmeter.

GAS AND GROUNDWATER MONITORING BOREHOLE RECORD SHEET					
Site: Turthill Yard, Kelshall Road	Operative(s): JPB	Date: 13/08/20	Time: 9:00	Round: 2	Page: 1
MONITORING EQUIPMENT					
Instrument Type	Instrument Make	Serial No.	Date Last Calibrated		
Analox	GA5000	G501805	09/03/2020		
PID	Phocheck tiger	T-106448	11/03/2020		
Dip Meter	GeoTech				
MONITORING CONDITIONS					
Weather Conditions: Rain		Ground Conditions: Wet		Temperature: 21 °C	
Barometric Pressure (mbar): 996		Barometric Pressure Trend (24hr): Falling		Ambient Concentration: 0.1 %CH ₄ , 0.0 %CO ₂ , 21.2%O ₂	

MONITORING RESULTS														
Monitoring Point Location	Flow		Atmospheric Pressure (mbar)	CH ₄ %	CH ₄ % LEL	CO ₂ %	O ₂ %	VOC (ppm)		H ₂ S (ppm)	CO (ppm)	Depth to product (mbgl)	Depth to water (mbgl)	Depth to Base of well (mbgl)
	Peak	Steady						Peak	steady					
WS1	+0.1	+0.1	996	0.0	/	1.3	18.1	0	0	0	0	-	Dry	5.00
WS3	0	0	996	0.0	/	2.2	18.8	0	0	0	0	-	4.87	5.01
WS5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WS10	-0.2	-0.2	996	0.0	/	0.4	19.0	0	0	0	0	-	0.71	5.00

Red dipmeter.

GAS AND GROUNDWATER MONITORING BOREHOLE RECORD SHEET					
Site: Turthill Yard, Kelshall Road	Operative(s): JPB	Date: 18/08/20	Time: 13:30	Round: 3	Page: 1
MONITORING EQUIPMENT					
Instrument Type	Instrument Make	Serial No.	Date Last Calibrated		
Analox	GA5000	G501805	09/03/2020		
PID	Phocheck tiger	T-106448	11/03/2020		
Dip Meter	GeoTech				
MONITORING CONDITIONS					
Weather Conditions: Cloudy		Ground Conditions: Dry		Temperature: 16 °C	
Barometric Pressure (mbar): 991		Barometric Pressure Trend (24hr): Steady		Ambient Concentration: 0.1 %CH ₄ , 0.2%CO ₂ , 20.4 %O ₂	

MONITORING RESULTS														
Monitoring Point Location	Flow		Atmospheric Pressure (mbar)	CH ₄ %	CH ₄ % LEL	CO ₂ %	O ₂ %	VOC (ppm)		H ₂ S (ppm)	CO (ppm)	Depth to product (mbgl)	Depth to water (mbgl)	Depth to Base of well (mbgl)
	Peak	Steady						Peak	steady					
WS1	+0.1	+0.1	991	0.1	/	1.2	18.6	0	0	0	0	-	Dry	5.00
WS3	0	0	991	0.1	/	2.9	17.2	0	0	0	2	-	4.84	5.01
WS5	0	0	991	0.0	/	0.2	17.7	0	0	0	2	-	1.24	4.88
WS10	0	0	991	0.0	/	0.2	17.1	0	0	0	0	-	4.55	5.00

Red dipmeter.

GAS AND GROUNDWATER MONITORING BOREHOLE RECORD SHEET					
Site: Turthill Yard, Kelshall Road	Operative(s): CLP	Date: 25/08/20	Time: 11:50	Round: 4	Page: 1
MONITORING EQUIPMENT					
Instrument Type	Instrument Make	Serial No.	Date Last Calibrated		
Analox	GA5000	G501805	09/03/2020		
PID	Phocheck tiger	T-106448	11/03/2020		
Dip Meter	GeoTech				
MONITORING CONDITIONS					
Weather Conditions: Raining		Ground Conditions: Dry		Temperature: 16 °C	
Barometric Pressure (mbar): 978		Barometric Pressure Trend (24hr): Falling		Ambient Concentration: 0.2 %CH ₄ , 0.2 %CO ₂ , 20.2 %O ₂	

MONITORING RESULTS														
Monitoring Point Location	Flow		Atmospheric Pressure (mbar)	CH ₄ %	CH ₄ % LEL	CO ₂ %	O ₂ %	VOC (ppm)		H ₂ S (ppm)	CO (ppm)	Depth to product (mbgl)	Depth to water (mbgl)	Depth to Base of well (mbgl)
	Peak	Steady						Peak	steady					
WS1	0	0	978	0.2	/	1.4	18.0	0	0	0	1	-	Dry	5.00
WS3	0	0	978	0.2	/	3.4	17.4	0	0	0	1	-	Dry	5.01
WS5	0	0	978	0.2	/	0.4	20.3	0	0	0	1	-	2.00	4.88
WS10	0	0	978	0.2	/	0.6	17.6	0	0	0	0	-	Dry	5.00

Red dipmeter.

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