REC
DELIVERING SOLUTIONS

PHASE II GEO-ENVIRONMENTAL SITE INVESTIGATION

KINGSPAN

SHERBURN IN ELMET

REC REFERENCE: 108742P2R1

REPORT PREPARED FOR: FISHER GERMAN LLP

DATE: FEBRUARY 2020

DELIVERING ENVIRONMENTAL AND RISK MANAGEMENT SOLUTIONS

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EXECUTIVE SUMMARY		
Site Address	Kingspan Site, Sherburn in Elmet, Leeds, LS25 6NF	
Grid Reference	451223, 433337	
Site Area	1.14 ha	
Current Site Use	The site is occupied by Kingspan Insulation Ltd, involved in the manufacture of insulation products. The area proposed for redevelopment is primarily made up of undeveloped grassland, with a tarmac road running around the north and west boundaries of the site with carparks and service yards in the west. Two silo's and an outbuilding associated with Kingspan Insulation Ltd are present in the northern area of the site where the factory extension is proposed.	
Proposed Use	The site is proposed for potential industrial development, comprising the installation of a biomass combined heat and power (CHP) plant and factory extension to the pre-existing Kingspan Insulation Ltd factory. Additional associated infrastructure including boiler housing, turbine building, offices, a fuel store, weighbridge, gatehouse and new access road are proposed. Supercraft Structures Limited drawing No. 26478/3 details the location of the proposed developments.	
Site Investigation Findings	**Geology**	**Made Ground:** Granular and cohesive Made Ground encountered site wide to a maximum depth of 1.50 mbgl. **Superficial:** Hemingbrough Glaciolacustrine Formation (silts and clays); encountered within all exploratory holes underlying made ground to an unproven depth of 5.00 mbgl. **Bedrock:** Roxby Formation (Calcareous Mudstone); not encountered during site works.
	Groundwater	Groundwater encountered as strikes during drilling between 1.30 mbgl and 4.80 mbgl. Groundwater recorded within monitoring wells on return visits at depths between 1.16 mbgl and 1.53 mbgl. Groundwater assumed to be present site wide at shallow depth.
Detailed Conceptual Site Model (CSM)	**Human Health**	Elevated concentrations of concentrations of beryllium and dibenzo (a, h) anthracene within a single sample in comparison to their respective GAC. No other exceedances recorded. Removal of contaminated soils, or implantation of hardstanding or clean cover system could be used to break contamination pathway. Chrysotile asbestos cement detected within a single sample. Due to the historical use as an old airbase, with asbestos detected in the ground it is advised that a watching brief along with background and personal air monitoring is undertaken during site works.
	Controlled Water	No notably contaminated Made Ground or areas of free phase hydrocarbons were noted and no ongoing contaminating activities are active which could continue to leach contaminants to groundwater over time. The isolated areas of soil contamination identified will have reducing contamination concentrations over time and as such are assumed to have negligible affect to controlled waters.

	Ground Gases	At the time of writing 3no. out of 6no.ground gas monitoring visits have been undertaken. The site has provisionally been classified as CS1.
Recommendations	The exceedance of beryllium and dibenzo (a, h) anthracene appear to be localised within the made ground strata described as grey slightly clayey sandy gravel with a slight hydrocarbon odour. Where this material is encountered during site works, especially at shallow depths, it should be removed to eliminate the contamination source. Alternatively, where hardstanding is to be implemented this exposure pathway would be broken. Where soft standing is proposed removal of contaminated soils or implementation of a clean cover system to a depth agreed with the Environmental Health Officer. Due to the presence of asbestos in the ground and the historical use of the site as an airbase provision should be made for control measures to be in place during the construction phase of works. A watching brief accompanied by personal air monitoring should be undertaken during site works to ensure workers and site users are not put at risk during works. A Remediation Strategy is recommended to address the issues arising from the presence of asbestos and elevated levels of beryllium and dibenzo (a, h) anthracene and in Made ground.	

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Drawing No 108742 - 001 – Site Location Plan
Drawing No 108742 - 002 – Exploratory Hole Location and Proposed Site Plan
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1.0 INTRODUCTION

1.1 Background

Resource and Environmental Consultants Ltd (REC) was commissioned by Fisher German ("the Client") to undertake a Phase II Geo-Environmental Site Investigation for Kingspan, Sherbert in Elmet, Leeds, LS25 6NF (hereinafter referred to as the 'site').

A Site Location Plan (Drawing ref: 108742-001) is provided within Appendix III.

1.2 Proposed Development

The site is proposed for a potential industrial development, comprising the installation of a biomass combined heat and power (CHP) plant and factory extension to the pre-existing Kingspan Insulation Ltd factory. Additional associated infrastructure including boiler housing, turbine building, offices, fuel store, weighbridge, gatehouse and new access roads are proposed. Supercraft Structure Limited drawing No. 26478/3 details the location of the proposed developments.

1.3 Previous Reports

REC has previously undertaken two desk study reports for the biomass plant area and the additional factory area respectively; the findings are reported in the following:

- Phase 1 Environmental Site Assessment, Aviation Road, REC ref 45378p1r0, January 2014; and
- Phase 1 Geo-Environmental Site Assessment, Kingspan, Sherburn in Elmet, REC ref 101374p1r0, June 2016.

This report should be read in conjunction with the previous reports.

1.4 Objectives & Scope

The objective of the investigation is to assess the implications of potential environmental risks and liabilities with the site and any potential receptors in order to satisfy pre-commencement planning conditions 6 and 7 of the decision notice 2018/0898/EIA; which are as follows:

06. ''*No development shall commence on site until a detailed site investigation report (to include soil contamination analysis), a remedial statement and an unforeseen contamination strategy have been submitted to and agreed in writing by the Local Planning Authority. The development shall be carried out in strict accordance with the agreed documents and upon completion of works a validation report shall be submitted certifying that the land is suitable for the approved end use.*''

07. *''Prior to development, an investigation and risk assessment (in addition to any assessment provided with the planning application) must be undertaken to assess the nature and extent of any land contamination. The investigation and risk assessment must be undertaken by competent persons and a written report of the findings must be produced. The written report is subject to the approval in writing of the Local Planning Authority…''*

1.5 Confidentiality and Limitations

REC has prepared this report solely for the use of the Client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from REC. The full limitations of this report are presented in Appendix I.

2.0 SITE SETTING

2.1 Site Details

A Site Location Plan (REC Drawing Ref: 108742-001) is presented within Appendix III. Key details are summarised in Table 2.1. All acronyms used within this report are defined in the Glossary presented in Appendix II.

Table 2.1 Site Setting

Site Address	Kingspan Site, Sherburn in Elmet, Leeds, LS25 6NF
National Grid Reference	451223, 433337
Site Area	4.20 ha

The site is a situated within a primarily industrial area south of the B1222. Approximately 350m to the north is farmland. The closest residential housing is located approximately 650m west.

2.2 Geology and Hydrogeology

The British Geological Survey (BGS) maps and GeoIndex indicate that the site is underlain by the geological sequence presented in Table 2.2.

Table 2.2 Summary of Geological and Hydrogeological Data

Geological Unit	Classification	Description	Aquifer Classification	Sensitivity
Superficial	Hemingbrough Glaciolacustrine Formation	Silts and Clays	Unproductive Strata	Low
Bedrock	Roxby Formation	Calcareous Mudstone	Secondary B Aquifer	Low - Moderate

2.3 Hydrology

The nearest surface water feature is a man-made deluge pond for spillages located along the eastern border of the site.

Green Dyke is culverted flowing east-west across the centre of the proposed development site; the dyke emerges into an open channel approximately 20m to the east. Green Dyke is not located under any proposed structure at this time and is situated between the proposed factory extension and biomass plant area.

2.4 Desk Study Information

Potential contamination sources have been identified from the conceptual site model (CSM) provided within the previous Site Investigation Reports and are listed in Table 2.3 below.

Table 2.3 Summary of Potential Contaminant Sources

Potential Source	Potential Contaminants	Potential Impact
Made Ground associated with historic construction site buildings / hardstanding areas.	Heavy metals, sulphates, polycyclic aromatic hydrocarbons PAH's, asbestos, hydrocarbons and hazardous ground gases.	Potential human health risk through ingestion, dermal contact and inhalation.
Former operation and maintenance of aircraft on site.	Volatiles, solvents, ethylene glycol and total petroleum hydrocarbons (TPH).	Potential human health risk through ingestion, dermal contact and inhalation.
Cadmium known to have been released into the Green Dyke 260m west.	Cadmium.	The hydraulic flow of the stream would carry the contaminant through the site via the culvert. The potential for contamination would be dependent on the integrity of the culvert and the flows involved. Possibility that concentrations of cadmium dissolved within stream water may locally impact the water surrounding the culvert but are unlikely.

3.0 SITE INVESTIGATION

3.1 Site Investigation Rationale

The ground investigation was designed to provide information relating to potential contamination and ground gases as well as ground conditions including the near surface heave potential, strength, consistency and variability of the underlying superficial deposits, and to identify if bedrock is encountered within the potential founding depths for the proposed development.

Standards employed during the investigation were broadly in accordance with BS5930:2015 ('Code of Practise for Site Investigation'), Geotechnical Design (Ref: BS-EN 1997-2:2007) and Geotechnical Investigation and Testing – Sampling Methods and Groundwater Measurements, Part 1 (Ref: BS EN ISO 22474-1:2006).

Exploratory fieldwork was completed from the 16th-17th January 2020. A selection of site photographs are presented in Appendix VII. A summary of site works is given in Table 3.1.

Table 3.1 Summary of Fieldwork

Exploratory Hole	Potential Source / Rationale	Type	Maximum Depth (mbgl)	Monitoring Well Response Zone (mbgl)
WS101	Collection of geo-environmental samples for human health assessment and to gather information on ground conditions. Install combined ground gas and water monitoring wells.	Window Sample	5.45	1.00 – 4.70
WS102			5.45	1.00 – 4.60
WS103			5.45	1.00 – 4.50
WS104			5.45	1.00 – 4.50
WS105			5.45	1.00 – 4.60
WS106	Collection of geo-environmental samples for human health assessment and to gather information on ground conditions.		5.45	n/a
WS107			5.45	n/a
WS108			5.45	n/a

mbgl – metres below ground level

Exploratory hole locations are shown on the Exploratory Hole Location plan (REC Drawing ref. 108742-002) presented within Appendix III.

3.2 Standard Penetration Tests

Standard Penetration Tests (SPT) were carried out within each borehole from 1.2 mbgl at the base of the hand pit and at 1m intervals from 2m to 5 mbgl. The testing was carried out to provide validation of ground consistency and strength observations. The results of the in-situ testing are presented on the exploratory hole logs in Appendix IV.

3.3 Chemical Analysis

A total of 8 no. samples were submitted to UKAS accredited i2 Analytical and analysed for:

- Asbestos identification (Made Ground only);
- Soil Organic Matter (SOM);
- Metals, total cyanide and total phenols;
- Total and speciated Polycyclic Aromatic Hydrocarbons; and
- Total Petroleum Hydrocarbons Criteria Working Group (TPH CWG).

The results of the chemical analyses are included in Appendix V.

3.4 Gas and Groundwater Monitoring

Following the intrusive phase of site works, monitoring visits were scheduled to be undertaken between 24th January and 17th March 2020. At the time of writing three ground gas monitoring visits have been undertaken.

Concentrations of methane (CH4), carbon dioxide (CO2), oxygen (O2), hydrogen sulphide (H2S) and carbon monoxide (CO) were measured from monitoring wells using an infra-red gas analyser (GFM436), calibrated to a reference standard (before and after each survey) and gas flow rates were measured using an internal flow pod. Gas measurements were recorded for a minimum of sixty seconds at each location, at which point the maximum concentration of CH_4, CO_2, H_2S and CO together with the lowest concentration of O_2 were recorded.

Groundwater level monitoring was undertaken using an electronic dip meter. Results of monitoring are presented in Section 4 and discussed in Section 5.

4.0 GROUND AND GROUNDWATER CONDITIONS

4.1 Ground Conditions

The ground investigation identified and detailed the ground conditions summarised below. Full descriptions of the strata with associated depths are shown on the exploratory hole logs presented in Appendix IV. Table 4.1 below summarises strata encountered.

Table 4.1 Summary of Strata Encountered

Stratum	Min Depth to Top of Strata (m)	Max Depth to Top of Strata (m)	Max Thickness (m)
Made ground cohesive	Ground Level	Ground Level	0.80 (WS107)
Made ground granular	0.80 (WS107)	0.80 (WS107)	0.70 (WS107)
Hemingbrough Glaciolacustrine Formation cohesive	0.50 (WS102 & WS104)	1.50 (WS107)	4.95 (WS102 & WS104)
Hemingbrough Glaciolacustrine Formation granular	1.10 (WS105)	1.30 (WS103)	0.20 (WS105 & WS108)

**– Strata Thickness Not Proven*

Made Ground

Made Ground was encountered at every location to a maximum depth of 1.50 mbgl (WS107).

Cohesive Made Ground consisted of grass over slightly gravelly clay with frequent rootlets. Gravel is subrounded to subangular fine to coarse mudstone, sandstone, coal, black combustion material (BCM), plastic brick and ceramic.

Granular Made Ground was encountered as a light yellowish brown to grey sandy gravel. Sand is fine to coarse. Gravel is subrounded to angular fine to coarse concrete and sandstone. The granular Made Ground was encountered underlying concrete or cohesive made ground deposits.

Within WS107 a strata of grey slightly clayey sandy gravel with slight hydrocarbon odour was encountered between 0.80 mbgl to 1.50 mbgl. Sand is fine to coarse. Gravel is subangular to angular fine to coarse tarmac, build stone, furnace slag and cement. This stratum is likely associated with a relic structure, road or runway.

Hemingbrough Glaciolacustrine Formation

Superficial deposits of the Hemingbrough Glaciolacustrine Formation were encountered within all exploratory holes underlying made ground to the final depth of exploratory holes (5m bgl). Superficial deposits were recovered as soft mottled brown and orangey brown clay with varying amounts of sand and silt.

4.2 Consistency and Density

In-situ SPTs were undertaken within all strata in the boreholes and window samples and is summarised in Table 4.2 and included within exploratory hole logs included within Appendix IV.

Table 4.2 In-Situ Standard Penetration Results

Location	Start Depth (mbgl)	Stratum	Soil Principal Constituent	SPT 'N' Value	Approximate Shear Strength (kPa) derived from SPT value	Density/Consistency & Strength Descriptor
WS101	1.20	HGF	Clay	6	25	Low Strength
	2.00		Clay	7	34	Low Strength
	3.00			7	34	Low Strength
	4.00			8	36	Low Strength
	5.00			7	34	Low Strength
WS102	1.20	HGF	Clay	9	44	Medium Strength
	2.00			7	32	Low Strength
	3.00			7	32	Low Strength
	4.00		Clay	6	25	Low Strength
	5.00			6	25	Low Strength
WS103	1.20	HGF	Sand	6		
	2.00		Clay	8	36	Low Strength
	3.00			7	32	Low Strength
	4.00			8	36	Low Strength
	5.00			8	36	Low Strength
WS104	1.2	HGF	Clay	7	32	Low Strength
	2.00			7	32	Low Strength
	3.00		Clay	7	32	Low Strength
	4.00			6	25	Low Strength
	5.00		Clay	8	36	Low Strength
WS105	1.20	HGF	Clay	9	4	Medium Strength
	2.00			8	36	Low Strength
	3.00		Clay	7	34	Low Strength
	4.00			7	34	Low Strength
	5.00			7	34	Low Strength
WS106	1.20	HGF	Sand	7	-	
	2.00		Clay	9	44	Medium Strength
	3.00			6	25	Low Strength
	4.00			6	25	Low Strength
	5.00			7	34	Low Strength
WS107	1.20	MG	Made Ground	11		
	2.00	HGF	Clay	8	36	Low Strength
	3.00		Clay	7	34	Low Strength
	4.00		Clay	6	25	Low Strength
	5.00		Clay	7	34	Low Strength
WS108	1.20	HGF	Sand	6		
	2.00		Clay	7	34	Low Strength
	3.00		Clay	6	25	Low Strength
	4.00		Clay	7	34	Low Strength
	5.00		Clay	7	34	Low Strength

4.3 pH and Sulphate

Chemical analyses for pH and water-soluble sulphate content contained in Appendix V and summarised in Table 4.3 below indicated that the Made Ground varies in accordance with BRE Special Digest 1 (2005), however concrete classifications all fall within the DS-1 / AC-1 requirements, with localised areas of DS-2 /AC-1.

Table 4.3 Summary of pH and Sulphate Data

Location	Depth (mbgl)	pH Value	Water soluble SO_4 (mg/l)	Concrete Classification
WS101	0.10 – 0.20	7.5	19.1	DS-1: AC-1
WS102	0.30 – 0.40	8.7	24.2	DS-1: AC-1
WS103	0.50 – 0.60	8.2	45.6	DS-1: AC-1
WS104	0.30	8.2	20.4	DS-1: AC-1
WS105	0.40	8.1	21.0	DS-1: AC-1
WS106	0.30	8.4	40.8	DS-1: AC-1
WS107	1.00	11.0	1210	DS-2: AC-1
WS108	0.30	8.0	14.9	DS-1: AC-1

4.4 Groundwater and Ground Gas Conditions

During drilling works, groundwater strikes were encountered, with records summarised as Table 4.4 and presented on the Exploratory Hole Logs in Appendix IV.

Table 4.4 Summary of Groundwater Strikes

Location	Depth to Strike (mbgl)	Depth to Water after 20 minutes (mbgl)
WS101	1.3	1.3
WS102	4.8	4.8
WS103	4.3	4.3
WS103	4.6	4.3
WS108	4.8	4.8

Return monitoring visits recorded groundwater within all monitoring wells at depths between 1.16 mbgl and 1.53 mbgl. Groundwater is assumed to be present site wide at shallow depth. The results of return gas and groundwater monitoring are presented in Table 4.5 overleaf.

Table 4.5 Summary of Ground Gas and Groundwater Monitoring Results

Location	Date	CH_4 Max %v/v	CH_4 Steady %v/v	CO_2 Max %v/v	CO_2 Steady %v/v	O_2 %v/v	Flow Max (l/hr)	Flow Steady (l/hr)	Response Zone (mbgl)	Depth to Base (mbgl)	Depth to Water (mbgl)
WS101	24/01/2020	<0.1	<0.1	1.0	1.0	19.3	7.2	0.5	0.70 – 4.70	4.55	1.23
	03/02/2020	<0.1	<0.1	1.2	1.4	19.1	5.1	0.5		4.47	1.22
	17/02/2020	<0.1	<0.1	2.0	2.0	18.2	11.3	0.7		4.50	1.17
WS102	24/01/2020	<0.1	<0.1	0.3	0.3	17.5	3.6	3.2	0.60 – 4.60	4.60	1.22
	03/02/2020	<0.1	<0.1	0.4	0.4	18.6	4.1	4.1		4.46	1.16
	17/02/2020	<0.1	<0.1	0.2	0.1	20.5	4.6	4.4		4.40	1.08
WS103	24/01/2020	<0.1	<0.1	1.0	1.0	19.3	8.2	0.7	0.70 – 4.50	4.02	1.37
	03/02/2020	<0.1	<0.1	0.9	0.9	19.2	10.4	0.7		4.04	1.53
	17/02/2020	<0.1	<0.1	0.8	0.8	18.9	15.3	0.9		3.91	0.90
WS104	24/01/2020	<0.1	<0.1	0.8	0.7	19.0	3.1	0.3	0.50 – 4.50	4.47	1.20
	03/02/2020	<0.1	<0.1	1.0	1.0	18.8	2.1	0.1		4.45	1.23
	17/02/2020	Well Flooded								N/A	
WS105	24/01/2020	<0.1	<0.1	0.8	0.8	19.8	3.5	0.5	0.70 – 4.60	4.45	1.18
	03/02/2020	<0.1	<0.1	0.9	0.9	19.6	3.7	0.4		4.45	1.22
	17/02/2020	Well Flooded								N/A	

5.0 TIER II GENERIC QUALITATIVE CONTAMINATED LAND RISK ASSESSMENT

5.1 Risk Assessment

At a Tier II stage, the long term (chronic) risk to human health is assessed by utilising appropriate and conservative generic assessment criteria (GAC) to determine whether there are potentially unacceptable risks present.

To undertake the Tier II assessment within the context of the development proposal, the most appropriate GAC values available will be those based upon a commercial development.

The following assessment summarised in Table 5.1 below and overleaf, has primarily adopted the S4UL (Suitable for Use Levels reference values published by LQM/CIEH in 2015, the S4ULs). Currently, no published GAC value is available for cyanide and therefore REC has utilised the Environmental Agency Contaminated Land Exposure Assessment Tool (CLEA v1.06) to derive the relevant GAC for this proposed land use. Due to the absence of a published lead GAC for direct use within the planning regime, the 2014 Defra C4SL (Category 4 Screening Level) has been used as this value is considered to incorporate the latest toxicological, bio-accessibility and exposure modelling research to date.

12no. samples were analysed for Soil Organic Matter (SOM). The geometric mean SOM value was calculated as 1.63% and therefore the soil results have been compared with a GACs for a soil with 1% SOM to be appropriately conservative.

Table 5.1 Summary of Human Health Risk Assessment for a Commercial Development

Determinand	Units	GAC	Max Concentration (mg/kg)	Location and Depth	Assessment
Arsenic	mg/kg	37	12	-	No Further Investigation Required.
Antimony	mg/kg	99	2.3		
Barium	mg/kg	1200	440		
Beryllium	**mg/kg**	**1.7**	**12**	**WS107 @ 1m bgl**	**See discussion**
Boron	mg/kg	290	2.7	-	No Further Investigation Required.
Cadmium	mg/kg	11	0.5		
Chromium (VI)	mg/kg	6	<1.2		
Lead	mg/kg	200	48		
Mercury [Inorganic]	mg/kg	40	<0.3		
Nickel	mg/kg	180	30		
Selenium	mg/kg	250	4.5		
Copper	mg/kg	2400	27		
Zinc	mg/kg	3,700	160		
Cyanide [Total]	mg/kg	3.4	<1		
Asbestos	**-**	**N.D.**	**D.**	**WS101 at 0.1-0.2 m bgl**	**See discussion**
Organic Substances					
Phenols	mg/kg	280	<1.0	-	No Further Investigation Required.
Naphthalene	mg/kg	2.3	0.34		
Acenaphthylene	mg/kg	170	<0.05		
Acenaphthene	mg/kg	210	<0.05		
Fluorene	mg/kg	170	<0.05		

Determinand	Units	GAC	Max Concentration (mg/kg)	Location and Depth	Assessment
Phenanthrene	mg/kg	95	0.77		
Anthracene	mg/kg	2400	0.63		
Fluoranthene	mg/kg	280	1.4		
Pyrene	mg/kg	620	4.3		
Benzo(a) Anthracene	mg/kg	7.2	2.8		
Chrysene	mg/kg	15	2.1		
Benzo(b) Fluoranthene	mg/kg	2.6	2.5		
Benzo(k) Fluoranthene	mg/kg	77	1.5		
Benzo(a)Pyrene	mg/kg	2.2	2.1		
Indeno (123-cd) Pyrene	mg/kg	27	1.1		
Dibenzo(a, h) Anthracene	**mg/kg**	**0.24**	**0.37**	**WS107 at 1m bgl**	**See discussion**
Benzo(g,h,i) Perylene	mg/kg	320	1.2		
TPH Ali C_5-C_6	mg/kg	42	<0.001		
TPH Ali C_6-C_8	mg/kg	100	<0.001		
TPH Ali C_8-C_{10}	mg/kg	27	<0.001		
TPH Ali C_{10}-C_{12}	mg/kg	130	<1.0		
TPH Ali C_{12}-C_{16}	mg/kg	1100	<2.0		
TPH Ali C_{16}-C_{35}	mg/kg	65000	<8.4		
TPH Ali C_{35}-C_{40}	mg/kg	65000	<8.4	-	No Further Investigation required.
TPH Aro C_5-C_7	mg/kg	70	<0.001		
TPH Aro C_7-C_8	mg/kg	130	<0.001		
TPH Aro C_8-C_{10}	mg/kg	34	<0.001		
TPH Aro C_{10}-C_{12}	mg/kg	74	<1.0		
TPH Aro C_{12}-C_{16}	mg/kg	140	8.3		
TPH Aro C_{16}-C_{21}	mg/kg	260	25		
TPH Aro C_{21}-C_{35}	mg/kg	1100	42		
TPH Aro C_{35}-C_{40}	mg/kg	1100	27		
BTEX					
Benzene	mg/kg	0.087	<1.0		
Toluene	mg/kg	130	<1.0		
EthylBenzene	mg/kg	47	<1.0	-	No Further Investigation required.
M/P Xylene	mg/kg	56	<1.0		

5.2 Discussion of Soil Results

Referring to Table 5.1, the results of this direct comparison indicate that elevated levels of beryllium and dibenzo (a, h) anthracene were recorded above the respective GAC for the sample taken from WS107. Additionally, asbestos cement was positively identified within the sample obtained from WS101.

Beryllium and Dibenzo (a, h) anthracene

The exceedance of beryllium and dibenzo (a, h) anthracene appear to be localised within the made ground strata described as grey slightly clayey sandy GRAVEL with a slight hydrocarbon odour. Gravel is subangular to angular, fine to coarse tarmac, build stone, furnace slag and cement.

The main exposure pathway for both beryllium and dibenzo (a, h) anthracene is through soil ingestion/inhalation of dust. Where hardstanding is to be implemented this exposure pathway would be broken. Where soft standing is proposed removal of contaminated soils or implementation of a clean cover system to a depth agreed with the Environmental Health Officer.

Asbestos

One of the eight samples recorded the presence of chrysotile asbestos in the form of a cement fragment. The sample was sent for quantification analysis, the results are presented in Table 5.2 below:

Table 5.2 Asbestos Quantification Result

BH Location	Depth (m bgl)	Asbestos Identified	Quantification
WS101	0.10 – 0.20	Chrysotile – Cement	<0.001

Although the asbestos quantification has returned a below detection result, due to the historical use as an old airbase, with asbestos detected in the ground it is advised that a watching brief along with background and personal air monitoring is undertaken during site works that disturb Made Ground.

5.3 Ground Gas

The potential impact on the development from ground gases has been assessed with reference to standards and guidelines published within BS 8485:2015+A1:2019 for the monitoring undertaken to date. At the time of writing 3no. additional monitoring visits are scheduled to be undertaken.

In general, Made Ground was only present at depths of up to 0.5m bgl and is considered unlikely to generate ground gases. In addition, organic carbon concentrations were low in the Made Ground samples tested increasing confidence the limited gas generating potential of soils.

A summary of results from the first half of the gas monitoring program and calculated Gas Screening Values (GSV) are given as Table 5.3.

Table 5.3 Summary of Ground Gas Risk Assessment

Location	Max Steady Flow Rate (L/hr)	Maximum Steady CH_4 (%)	Maximum Steady CO_2 (%)	CH_4 Qhg (L/hr)	CO_2 Qhg (L/hr)	Implied CH_4 CS	Implied CO_2 CS
WS101	0.7	<0.1	2.0	0.0007	0.014	CS1	CS1
WS102	4.4	<0.1	0.4	0.0044	0.0176	CS1	CS1
WS103	0.9	<0.1	1.0	0.0009	0.009	CS1	CS1
WS104	0.3	<0.1	1.0	0.0003	0.003	CS1	CS1
WS105	0.5	<0.1	0.9	0.0005	0.0045	CS1	CS1

CS: Characteristic Situation Qhg: Hazardous gas flow rate

The max flow rates within all the monitoring wells appear to vary between visits and settle at relatively consistent and lower steady flow rates; As such the implied characteristic situation for the boreholes has been calculated by combining the maximum observed steady flow rate and maximum observed steady concentrations for each borehole during all monitoring events. This methodology provides a 'worst case scenario' in order to characterise the highest potential risk to human health from ground gas at the site.

Based on the preliminary results obtained during the initial 3no. gas monitoring visits, the site is characterised as Characteristic Situation 1 (CS1) in accordance with BS8485:2015. As such, no gas protection measures are considered necessary based on the results to date.

5.4 Controlled Waters

No notably contaminated Made Ground or areas of free phase hydrocarbons were noted and no ongoing contaminating activities are active which could continue to leach contaminants to groundwater over time. The isolated areas of soil contamination identified will have reducing contamination concentrations over time and as such are assumed to have negligible affect to controlled waters.

5.5 Revised Conceptual Site Model

The site investigation has identified elevated concentrations of concentrations of beryllium and dibenzo (a, h) anthracene within WS107 at 1m bgl.

Asbestos cement was detected within WS101 at 0.10-0.20 mbgl, therefore provision should be made for control measures to be in place during the construction phase of works.

Based on the ground gas monitoring to date, no risk from ground gases was identified onsite. As such, no further measures are deemed necessary at this stage subject to completion of the monitoring programme.

A revised conceptual site model is presented as Table 5.4.

Table 5.4 Revised Conceptual Site Model

Source	Contaminant	Potential migration pathway	Potential Receptors	Likelihood	Severity	Overall Risk Rating	Active / Inactive
On-Site							
Made Ground associated with historical development on the site	Heavy Metals (As, Cd, Cr, Pb, Hg, Se, Ni)	Ingestion of soils. Dermal contact with soils	Future Site Users	Likely	Mild	Moderate	Active– Isolated beryllium and dibenzo (a, h) anthracene encountered in excess of the GAC recorded. Contaminated material should be removed. Alternatively, a clean cover system or hardstanding could be implemented to sever the contamination pathway.
		Lateral migration	Controlled Waters	Low Likelihood	Minor	Very Low	
	Polycyclic Aromatic Hydrocarbons (PAHs)	Ingestion of soils Dermal contact with soils Inhalation of vapours	Future Site Users	likely	Mild	Moderate	
		Lateral migration	Secondary Aquifer	Low Likelihood	Minor	Very Low	
	Total Petroleum Hydrocarbons (TPHs)	Ingestion of soils Dermal contact with soils Inhalation of vapours	Future Site Users	Likely	Mild	Moderate	
		Lateral migration	Secondary Aquifer	Low Likelihood	Minor	Very Low	
		Infiltration	Water Supply Pipes	Likely	Mild	Moderate	
	Ground gas generation (CH_4 and CO_2)	Build up and inhalation of ground gases	Future Site Users	Likely	Minor	Low	Based on preliminary gas monitoring data, site is classified as (CS1) in accordance with BS8485:2015. As such, no gas protection measures are considered necessary.
Made Ground associated with historical development on the site	Asbestos Fibres in Soils	Inhalation of airborne fibres	Future Site Users	Likely	Medium	High	One sample contained asbestos. Site personnel should be made aware of the possibility of encountering asbestos fibres within Made Ground materials. A watching brief accompanied by personal air monitoring should be undertaken during site works to ensure workers and site users are not put at risk during works.

6.0 CONCLUSIONS & RECOMMENDATIONS

6.1 Contaminated Land

The results of the Phase II Geo-Environmental Site Investigation and laboratory analyses identified elevated concentrations of concentrations of beryllium and dibenzo (a, h) anthracene within a single sample (WS107 at 1.00mbgl) in comparison to their respective GAC. No other exceedances were recorded.

Asbestos cement was detected within a single sample (WS101 at 0.10-0.20 mbgl), therefore provision should be made for control measures to be in place during the construction phase of works.

No ongoing contaminating activities are occurring on site, as such no source of contamination was identified. The isolated areas of soil contamination identified will have reducing contamination concentrations over time and as such are assumed to have negligible affect to controlled waters.

Based on the ground gas monitoring to date, the site is classified under CS1 in accordance with BS8485:2015. As such, no further measures are deemed necessary at this stage subject to completion of the monitoring programme.

6.2 Recommendations

The exceedance of beryllium and dibenzo (a, h) anthracene appear to be localised within the made ground strata described as grey slightly clayey sandy gravel with a slight hydrocarbon odour. Where this material is encountered during site works, especially at shallow depths, it should be removed to eliminate the contamination source.

Alternatively where hardstanding is to be implemented this exposure pathway would be broken. Where soft standing is proposed removal of contaminated soils or implementation of a clean cover system to a depth agreed with the Environmental Health Officer.

Due to the presence of asbestos in the ground and the historical use of the site as an airbase provision should be made for control measures to be in place during the construction phase of works. A watching brief accompanied by personal air monitoring should be undertaken during site works to ensure workers and site users are not put at risk during works.

A Remediation Strategy is recommended to address the issues arising from the presence of asbestos and elevated levels of beryllium and dibenzo (a, h) anthracene and in Made ground.

END OF REPORT

APPENDIX I

LIMITATIONS

1. This report and its findings should be considered in relation to the terms of reference and objectives agreed between REC Ltd and the Client.
2. For the work, reliance has been placed on publicly available data obtained from the sources identified. The information is not necessarily exhaustive and further information relevant to the site may be available from other sources. When using the information it has been assumed it is correct. No attempt has been made to verify the information.
3. This report has been produced in accordance with current UK policy and legislative requirements for land and groundwater contamination which are enforced by the local authority and the Environment Agency. Liabilities associated with land contamination are complex and requires advice from legal professionals.
4. Access considerations, the presence of services and the activities being carried out on the site limited the locations where sampling locations could be installed and the techniques that could be used.
5. In addition to the above REC Ltd note that when investigating, or developing, potentially contaminated land it is important to recognise that sub-surface conditions may vary spatially and also with time. The absence of certain ground, ground gas, and contamination or groundwater conditions at the positions tested is not a guarantee that such conditions do not exist anywhere across the site. Due to the presence of existing buildings and structures access could not be obtained to all areas. Additional contamination may be identified following the removal of the buildings or hard standing.
6. Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities.
7. Where mention has been made to the identification of Japanese Knotweed and other invasive plant species and asbestos or asbestos-containing materials this is for indicative purposes only and do not constitute or replace full and proper surveys.
8. The executive summary, conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the report in full.
9. This report presents an interpretation of the geotechnical information established by excavation, observation and testing. Whilst every effort is made in interpretative reporting to assess the soil conditions over the Site it should be noted that natural strata vary from point to point and that man made deposits are subject to an even greater diversity. Groundwater conditions are dependent on seasonal and other factors. Consequently there may be conditions present not revealed by this investigation.
10. REC can not be held responsible for any use of the report or its contents for any purpose other than that for which it was prepared. The copyright in this report and other plans and documents prepared by REC is owned by them and no such plans or documents may be reproduced, published or adapted without written consent. Complete copies of this may, however, be made and distributed by the client as is expected in dealing with matters related to its commission. Should the client pass copies of the report to other parties for information, the whole report should be copied, but no professional liability or warranties shall be extended to other parties by REC in this connection without their explicit written agreement there to by REC.
11. This investigation has been undertaken to reasonably characterise existing sub-surface conditions and the findings of this study are our best interpretation of the data collected, within the scope of work and agreed budget. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.

APPENDIX II

GLOSSARY

TERMS

AST	Above Ground Storage Tank
BGS	British Geological Survey
BSI	British Standards Institute
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
CIEH	Chartered Institute of Environmental Health
CIRIA	Construction Industry Research Association
CLEA	Contaminated Land Exposure Assessment
CSM	Conceptual Site Model
DNAPL	Dense Non-Aqueous Phase Liquid (chlorinated solvents, PCB)
DWS	Drinking Water Standard
EA	Environment Agency
EQS	Environmental Quality Standard
GAC	General Assessment Criteria
GL	Ground Level
GSV	Gas Screening Value
HCV	Health Criteria Value
ICSM	Initial Conceptual Site Model
LNAPL	Light Non-Aqueous Phase Liquid (petrol, diesel, kerosene)
ND	Not Detected
LMRL	Lower Method Reporting Limit
NR	Not Recorded
PAH	Poly Aromatic Hydrocarbon
PCB	Poly-Chlorinated Biphenyl
PID	Photo Ionisation Detector
QA	Quality Assurance
SGV	Soil Guideline Value
SPH	Separate Phase Hydrocarbon
Sp.TPH (CWG)	Total Petroleum Hydrocarbon (Criteria Working Group)
SPT	Standard Penetration Test
SVOC	Semi Volatile Organic Compound
UST	Underground Storage Tank
VCCs	Vibro Concrete Columns
VOC	Volatile Organic Compound
WTE	Water Table Elevation

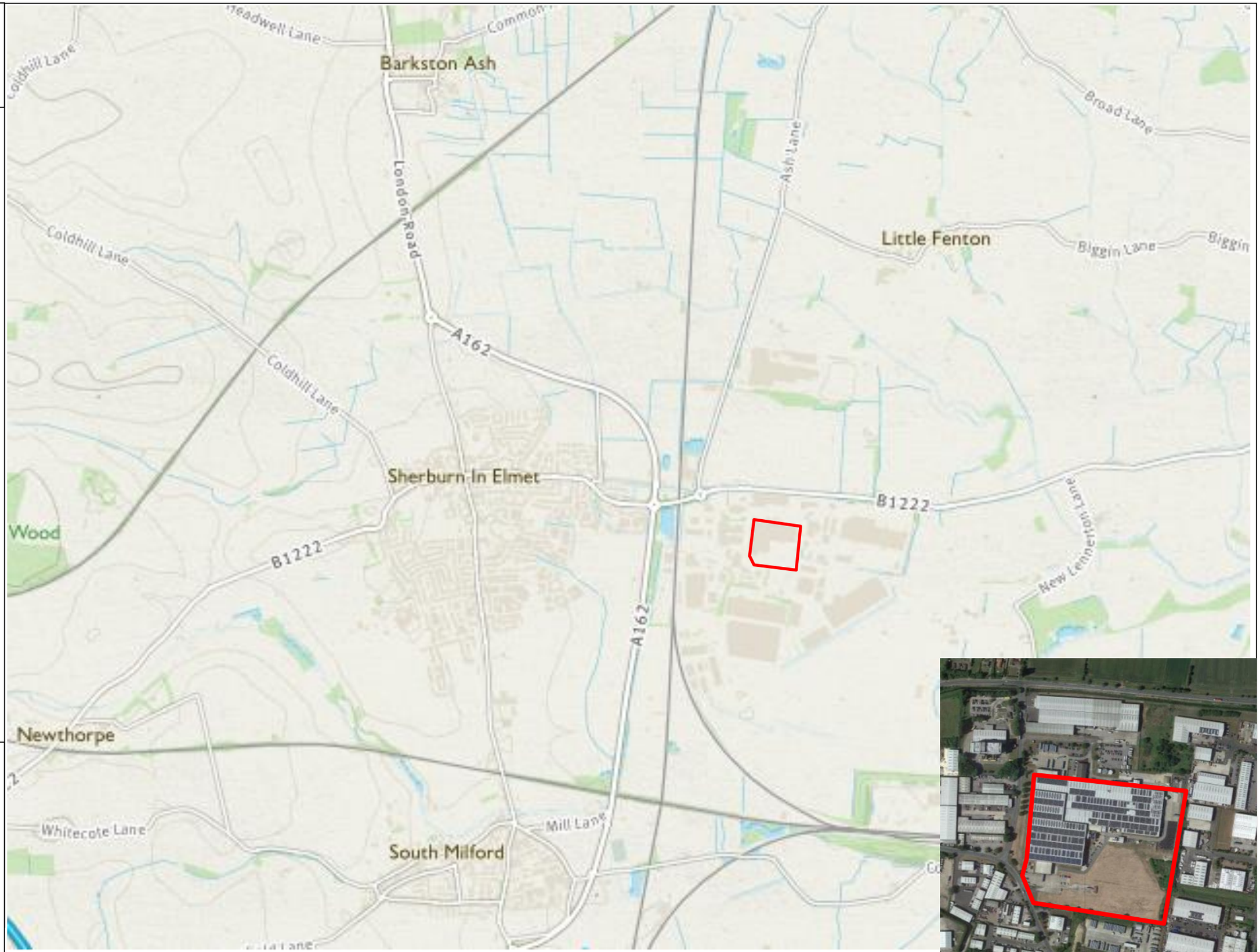
APPENDIX III

DRAWINGS

KEY:

N

Site boundary



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Client:

Fisher German LLP

Job No: CO108742

Drawn By: MD

Approved by:

Notes:

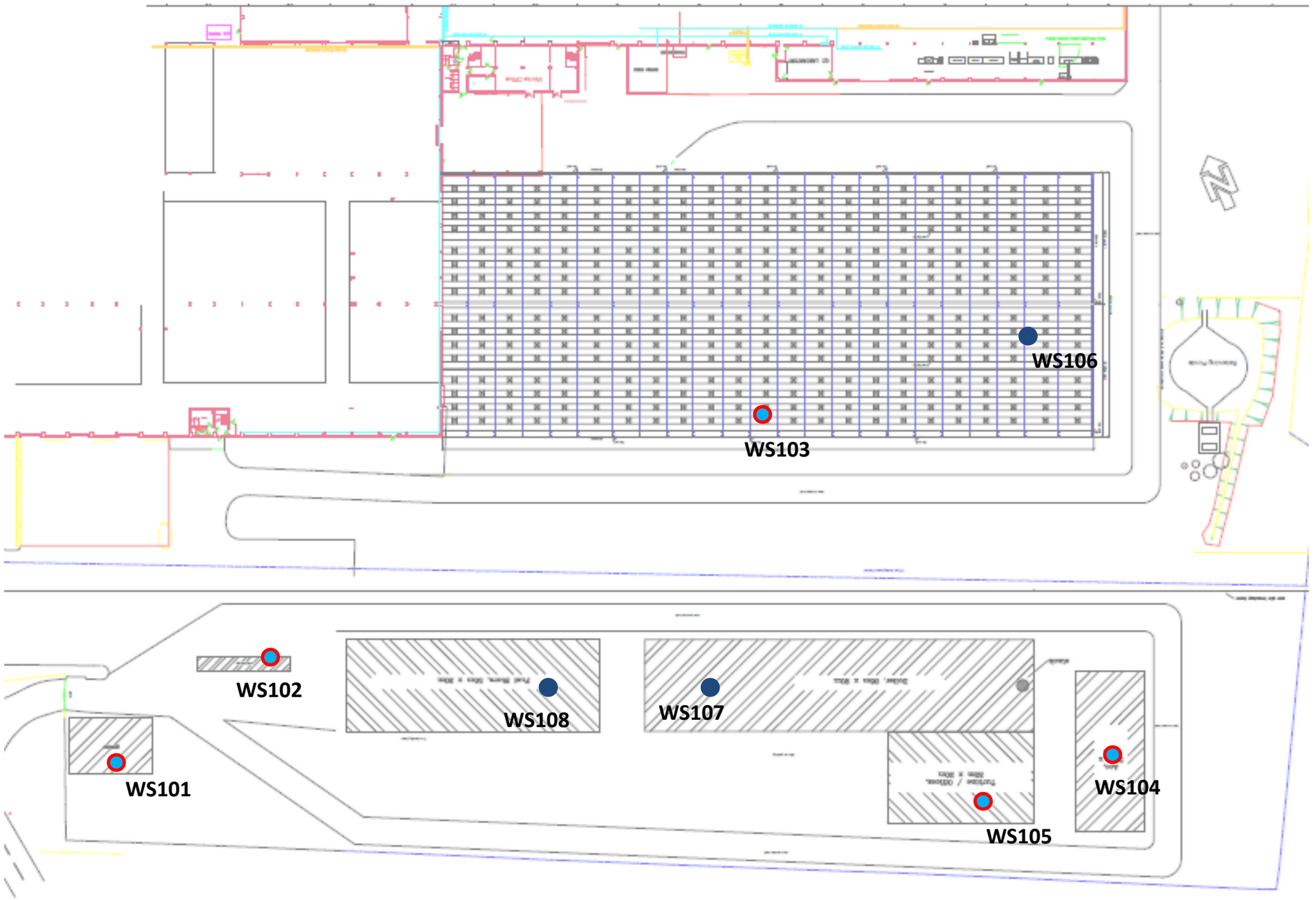
Drawing Title:

001 – Site Location Plan

KEY:

N

- Window sample borehole with combined gas and groundwater install
- Window sample borehole



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002 – Exploratory Hole Location Plan

APPENDIX IV

EXPLORATORY HOLE LOGS

Borehole Log

Borehole No. **WS101**

Sheet 1 of 1

Project Name:	Kingspan, Selby	Proj. ID: 108742	Easting:		Hole Type: WS
			Northing:		
Location:	Kingspan, Sherburn in Elmet, Leeds, LS25 6NF	Plant: Dando Terrier	Level (m AOD):		Scale: 1:30
			Final Depth (m):	5.45	
Client:	Fisher German LLP	Crew: RP Drilling	Start Date:	16/01/2020	REC Engineer: MD
			End Date:	16/01/2020	

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.10 - 0.20	ES					Grass over brown slightly gravelly CLAY with frequent rootlets. Gravel is rounded to subangular fine to medium mudstone, sandstone, brick and ceramic. [MADE GROUND]
		0.30 - 0.40	ES		0.25			
		0.50 - 0.70	ES		0.45			Light yellowish brown sandy GRAVEL. Sand is fine to coarse. Gravel is subrounded to angular fine to coarse concrete and sandstone. [MADE GROUND]
					0.70			Dark brown slightly gravelly CLAY. Gravel is subangular to angular fine to coarse concrete and sandstone. [MADE GROUND]
	▼	1.20	SPT	N=6 (1,1/2,1,1,2)				Soft mottled grey, brown and orangey brown sandy CLAY. Sand is fine to medium. [HEMINGBROUGH GLACIOLACUSTRINE FORMATION]
		1.50	D					
		2.00 - 2.45	D					
		2.00	SPT	N=7 (1,1/2,1,2,2)				
		3.00 - 3.45	D		3.00			Soft dark brown silty CLAY. [HEMINGBROUGH GLACIOLACUSTRINE FORMATION]
		3.00	SPT	N=7 (1,2/1,2,2,2)				
		4.00 - 4.45	D					
		4.00	SPT	N=8 (1,1/2,2,2,2)				
		5.00	SPT	N=7 (1,1/2,1,2,2)				
					5.45			End of Borehole at 5.45m

Remarks:

Location cleared services using cable avoidance tool (CAT) and ground penetrating radar (GPR). Groundwater encountered as seepage at 1.30 mbgl. Location installed with combined groundwater and ground gas standpipes fitted with a flush cover.

Borehole Log

Borehole No. **WS102**

Sheet 1 of 1

Project Name: Kingspan, Selby	Proj. ID: 108742	Easting: / Northing:	Hole Type: WS
Location: Kingspan, Sherburn in Elmet, Leeds, LS25 6NF	Plant: Dando Terrier	Level (m AOD): / Final Depth (m): 5.45	Scale: 1:30
Client: Fisher German LLP	Crew: RP Drilling	Start Date: 16/01/2020 / End Date: 16/01/2020	REC Engineer: MD

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.30 - 0.40	ES		0.20			Concrete [CONCRETE]
					0.50			Light grey sandy GRAVEL. Sand is fine to coarse. Gravel is subangular to angular concrete. [MADE GROUND]
		0.80	D					Firm mottled grey, brown and orangey brown sandy CLAY. Sand is fine to coarse. [HEMINGBROUGH GLACIOLACUSTRINE FORMATION]
		1.00 - 1.10	ES					
		1.20	SPT	N=9 (2,1/2,2,2,3)				
		2.00 - 2.45	D					
		2.00	SPT	N=7 (2,1/1,2,2,2)	2.20			Soft dark brown slightly sandy CLAY. Sand is fine to coarse. [HEMINGBROUGH GLACIOLACUSTRINE FORMATION]
		3.00 - 3.45	D					
		3.00	SPT	N=7 (2,1/1,2,2,2)				
		4.00 - 4.45	D					
		4.00	SPT	N=6 (0,1/6 for 245mm)				
	▼							
		5.00	SPT	N=6 (2,1/1,2,1,2)				
					5.45			End of Borehole at 5.45m

1 2 3 4 5 6

Remarks:

Location cleared services using cable avoidance tool (CAT) and ground penetrating radar (GPR). Groundwater encountered as strike at 4.80 mbgl. Location installed with combined groundwater and ground gas standpipes fitted with a flush cover.

Borehole Log

Borehole No. **WS103**

Sheet 1 of 1

Project Name: Kingspan, Selby	Proj. ID: 108742	Easting: / Northing:	Hole Type: WS
Location: Kingspan, Sherburn in Elmet, Leeds, LS25 6NF	Plant: Dando Terrier	Level (m AOD): / Final Depth (m): 5.45	Scale: 1:30
Client: Fisher German LLP	Crew: RP Drilling	Start Date: 16/01/2020 / End Date: 16/01/2020	REC Engineer: MD

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.20 - 0.30	ES					Grass over brown slightly gravelly CLAY with frequent rootlets. Gravel is subangular to angular fine to medium mudstone, sandstone, brick, coal, plastic and ceramic. [MADE GROUND]
		0.50 - 0.60	ES		0.70			
		1.10	D					Soft mottled grey, brown and orangey brown sandy CLAY. Sand is fine to coarse. [HEMINGBROUGH GLACIOLACUSTRINE FORMATION]
		1.20	SPT	N=6 (1,2/1,2,1,2)	1.30			
					1.40			Loose orangey brown clayey SAND. Sand is fine to coarse. [HEMINGBROUGH GLACIOLACUSTRINE FORMATION]
		2.00	SPT	N=8 (1,2/1,2,2,3)				Soft mottled grey, brown and orangey brown sandy CLAY. Sand is fine to coarse. [HEMINGBROUGH GLACIOLACUSTRINE FORMATION]
		2.50	D					
		3.00	SPT	N=7 (2,1/2,1,2,2)				
					3.20			Soft dark brown silty CLAY. [HEMINGBROUGH GLACIOLACUSTRINE FORMATION]
		4.00	D					
		4.00	SPT	N=8 (1,2/2,2,2,2)				
		5.00	SPT	N=8 (2,1/2,1,2,3)				
					5.45			End of Borehole at 5.45m

Remarks:

Location cleared services using cable avoidance tool (CAT) and ground penetrating radar (GPR). Groundwater encountered as strikes at 4.30 and 4.60 mbgl. Location installed with combined groundwater and ground gas standpipes fitted with a flush cover.

Borehole Log

Borehole No. **WS104**

Sheet 1 of 1

Project Name: Kingspan, Selby	Proj. ID: 108742	Easting: / Northing:	Hole Type: WS
Location: Kingspan, Sherburn in Elmet, Leeds, LS25 6NF	Plant: Dando Terrier	Level (m AOD): / Final Depth (m): 5.45	Scale: 1:30
Client: Fisher German LLP	Crew: RP Drilling	Start Date: 16/01/2020 / End Date: 16/01/2020	REC Engineer: MD

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.30	ES		0.50			Grass over gravelly CLAY with frequent rootlets. Gravel is subangular to angular fine to coarse sandstone, mudstone, brick, coal, concrete and ceramic. [MADE GROUND]
		1.20	SPT	N=7 (2,1/2,1,2,2)	1.20			Soft light brown mottled grey sandy CLAY. Sand is fine to coarse. [HEMINGBROUGH GLACIOLACUSTRINE FORMATION]
		1.50	D					
		2.00	SPT	N=7 (1,2/1,2,2,2)				Soft dark brown mottled grey slightly sandy CLAY. Sand is fine to coarse. [HEMINGBROUGH GLACIOLACUSTRINE FORMATION]
		3.00	SPT	N=7 (2,1/2,1,2,2)	3.00			Soft dark brown silty CLAY. [HEMINGBROUGH GLACIOLACUSTRINE FORMATION]
		3.50	D					
		4.00	SPT	N=6 (1,1/1,1,2,2)				
		5.00	SPT	N=8 (1,2/2,2,2,2)				
					5.45			End of Borehole at 5.45m

1 2 3 4 5 6

Remarks:

Location cleared services using cable avoidance tool (CAT) and ground penetrating radar (GPR). No groundwater encountered. Location installed with combined groundwater and ground gas standpipes fitted with a flush cover.

CONCEPT LIFE SCIENCES

Borehole Log

Borehole No. **WS105**

Sheet 1 of 1

Project Name:	Kingspan, Selby	Proj. ID: 108742	Easting:		Hole Type: WS
			Northing:		
Location:	Kingspan, Sherburn in Elmet, Leeds, LS25 6NF	Plant: Dando Terrier	Level (m AOD):		Scale: 1:30
			Final Depth (m):	5.45	
Client:	Fisher German LLP	Crew: RP Drilling	Start Date:	17/01/2020	REC Engineer: MD
			End Date:	17/01/2020	

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20	ES		0.30			Grass over slightly gravelly CLAY with frequent rootlets. Gravel is subangular to angular fine to coarse mudstone, sandstone, coal, brick and ceramic. [MADE GROUND]
		0.40	ES		0.50			Brown gravelly CLAY. Gravel is subangular to angular fine to coarse sandstone, coal, black carbonaceous material, brick and ceramic. [MADE GROUND]
					0.70			Brown slightly gravelly CLAY. Gravel is subangular to angular fine to medium sandstone, brick and ceramic. [MADE GROUND]
		1.00	D		1.10			Soft mottled light brown and grey slightly sandy CLAY. Sand is fine to coarse. [HEMINGBROUGH GLACIOLACUSTRINE FORMATION]
		1.20	SPT	N=9 (2,1/3,1,2,3)	1.30			Loose light brown clayey SAND. Sand is fine to coarse. [HEMINGBROUGH GLACIOLACUSTRINE FORMATION]
		2.00 - 2.45	D					Soft mottled light brown and grey slightly sandy CLAY. Sand is fine to coarse. [HEMINGBROUGH GLACIOLACUSTRINE FORMATION]
		2.00	SPT	N=8 (1,2/1,2,2,3)				
		3.00	SPT	N=7 (1,2/1,2,2,2)	3.20			Soft dark brown silty CLAY. [HEMINGBROUGH GLACIOLACUSTRINE FORMATION]
		4.00	SPT	N=7 (0,2/1,2,2,2)				
		5.00 - 5.45	D					
		5.00	SPT	N=7 (2,2/1,2,2,2)	5.45			End of Borehole at 5.45m

Remarks:

Location cleared services using cable avoidance tool (CAT) and ground penetrating radar (GPR). No groundwater encountered.
Location installed with combined groundwater and ground gas standpipes fitted with a flush cover.

Borehole Log

Borehole No. **WS106**

Sheet 1 of 1

Project Name: Kingspan, Selby	Proj. ID: 108742	Easting: / Northing:	Hole Type: WS
Location: Kingspan, Sherburn in Elmet, Leeds, LS25 6NF	Plant: Dando Terrier	Level (m AOD): / Final Depth (m): 5.45	Scale: 1:30
Client: Fisher German LLP	Crew: RP Drilling	Start Date: 17/01/2020 / End Date: 17/01/2020	REC Engineer: MD

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.30	ES		0.20			Grass over gravelly CLAY with frequent rootlets. Gravel is subangular to angular fine to coarse mudstone, sandstone, coal, brick and ceramic. [MADE GROUND]
					0.60			Brown gravelly CLAY with low cobble content. Gravel is subrounded to subangular fine to coarse sandstone, mudstone, concrete, coal, brick and ceramic. Cobbles of subangular concrete. [MADE GROUND]
		1.00	ES					Soft mottled brown and light grey slightly sandy CLAY. Sand is fine coarse. [HEMINGBROUGH GLACIOLACUSTRINE FORMATION]
		1.20	SPT	N=7 (2,1/1,2,2,2)	1.10			
					1.30			Loose light brown clayey SAND. Sand is fine to coarse. [HEMINGBROUGH GLACIOLACUSTRINE FORMATION]
		2.00 - 2.45	D					Soft to firm mottled brown and light grey slightly sandy CLAY. Sand is fine coarse. [HEMINGBROUGH GLACIOLACUSTRINE FORMATION]
		2.00	SPT	N=9 (2,1/2,2,2,3)				
		3.00 - 3.45	D		3.00			Soft dark brown silty CLAY. [HEMINGBROUGH GLACIOLACUSTRINE FORMATION]
		3.00	SPT	N=6 (0,1/1,2,1,2)				
		4.00 - 4.45	D					
		4.00	SPT	N=6 (0,2/1,1,2,2)				
		5.00	SPT	N=7 (2,1/2,1,2,2)				
					5.45			End of Borehole at 5.45m

1 2 3 4 5 6

Remarks:

Location cleared services using cable avoidance tool (CAT) and ground penetrating radar (GPR). No groundwater encountered. Location backfilled with arisings upon completion.

Borehole Log

Borehole No. **WS107**

Sheet 1 of 1

Project Name: Kingspan, Selby	Proj. ID: 108742	Easting: / Northing:	Hole Type: WS
Location: Kingspan, Sherburn in Elmet, Leeds, LS25 6NF	Plant: Dando Terrier	Level (m AOD): / Final Depth (m): 5.45	Scale: 1:30
Client: Fisher German LLP	Crew: RP Drilling	Start Date: 17/01/2020 / End Date: 17/01/2020	REC Engineer: MD

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.50	ES		0.80			Grass over gravelly CLAY with frequent rootlets. Gravel is subrounded to subangular fine to coarse mudstone, sandstone, coal, brick and ceramic. [MADE GROUND]
		1.00	ES					Grey slightly clayey sandy GRAVEL with slight hydrocarbon odour. Sand is fine to coarse. Gravel is subangular to angular fine to coarse tarmac, build stone, furnace slag and cement. [MADE GROUND]
		1.20	SPT	N=11 (4,2/4,2,3,2)	1.50			
		2.00	SPT	N=8 (2,1/2,2,2,2)				Soft mottled brown and orangey brown sandy CLAY. Sand is fine to coarse. [HEMINGBROUGH GLACIOLACUSTRINE FORMATION]
		3.00 - 3.45 3.00	D SPT	N=7 (1,1/2,1,2,2)	3.20			
		4.00	SPT	N=6 (0,2/1,1,2,2)				Soft dark brown silty CLAY. [HEMINGBROUGH GLACIOLACUSTRINE FORMATION]
		5.00 - 5.45 5.00	D SPT	N=7 (2,2/1,2,2,2)	5.45			End of Borehole at 5.45m

Remarks:

Location cleared services using cable avoidance tool (CAT) and ground penetrating radar (GPR). No groundwater encountered. Location backfilled with arisings upon completion.

Borehole Log

Borehole No. **WS108**

Sheet 1 of 1

Project Name: Kingspan, Selby	Proj. ID: 108742	Easting: / Northing:	Hole Type: WS
Location: Kingspan, Sherburn in Elmet, Leeds, LS25 6NF	Plant: Dando Terrier	Level (m AOD): / Final Depth (m): 5.45	Scale: 1:30
Client: Fisher German LLP	Crew: RP Drilling	Start Date: 17/01/2020 / End Date: 17/01/2020	REC Engineer: MD

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.30	ES					Grass over slightly gravelly CLAY with frequent rootlets. Gravel is subrounded to subangular fine to coarse mudstone, sandstone, coal, brick and ceramic. [MADE GROUND]
		0.60	ES		0.60			Soft mottled brown, orangey brown and grey slightly sandy CLAY. Sand is fine to coarse. [HEMINGBROUGH GLACIOLACUSTRINE FORMATION]
		1.20	SPT	N=6 (2,1/1,2,1,2)	1.20			Loose orangey brown clayey SAND. Sand is fine to coarse. [HEMINGBROUGH GLACIOLACUSTRINE FORMATION]
		1.50	D		1.40			Soft mottled brown, orangey brown and grey slightly sandy CLAY. Sand is fine to coarse. [HEMINGBROUGH GLACIOLACUSTRINE FORMATION]
		2.00	SPT	N=7 (1,2/2,1,2,2)				
		3.00	SPT	N=6 (1,1/1,2,1,2)	2.70			Soft dark brown silty CLAY. [HEMINGBROUGH GLACIOLACUSTRINE FORMATION]
		4.00 - 4.45	D					
		4.00	SPT	N=7 (2,1/1,2,2,2)				
	▼	5.00	SPT	N=7 (3 for 70mm/7 for 125mm)				
					5.45			End of Borehole at 5.45m

1 2 3 4 5 6

Remarks:

Location cleared services using cable avoidance tool (CAT) and ground penetrating radar (GPR). Groundwater encountered as strike at 4.80 mbgl. Location backfilled with arisings upon completion.

CONCEPT LIFE SCIENCES

APPENDIX V

CHEMICAL TESTING RESULTS

Matthew Dee
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e: matthew.dee@recltd.co.uk

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

[redacted]

Analytical Report Number : 20-82017

Project / Site name:	Kingspan	**Samples received on:**	20/01/2020
Your job number:	108742	**Samples instructed on:**	20/01/2020
Your order number:	7978	**Analysis completed by:**	27/01/2020
Report Issue Number:	1	**Report issued on:**	27/01/2020
Samples Analysed:	8 soil samples		

Signed: [redacted]

Zina Abdul Razzak
Senior Quality Specialist

For & on behalf of i2 Analytical Ltd.

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

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

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

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

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

Analytical Report Number: 20-82017

Project / Site name: Kingspan

Your Order No: 7978

Lab Sample Number				1416735	1416736	1416737	1416738	1416739
Sample Reference				WS101	WS102	WS103	WS104	WS105
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.10-0.20	0.30-0.40	0.50-0.60	0.30	0.40
Date Sampled				Deviating	Deviating	Deviating	Deviating	Deviating
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	28	7.7	18	13	14
Total mass of sample received	kg	0.001	NONE	1.0	1.2	1.2	1.1	1.2
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	7.5	8.7	8.2	8.2	8.1
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	38	48	91	41	42
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.019	0.024	0.046	0.020	0.021
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	19.1	24.2	45.6	20.4	21.0
Organic Matter	%	0.1	MCERTS	7.4	0.2	2.4	1.3	1.4
Fraction Organic Carbon (FOC)	N/A	0.001	MCERTS	0.043	0.0013	0.014	0.0073	0.0081
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	0.47	< 0.05	0.25	< 0.05	< 0.05
Anthracene	mg/kg	0.05	MCERTS	0.11	< 0.05	< 0.05	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	1.1	< 0.05	0.30	< 0.05	< 0.05
Pyrene	mg/kg	0.05	MCERTS	1.0	< 0.05	0.28	< 0.05	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.66	< 0.05	< 0.05	< 0.05	< 0.05
Chrysene	mg/kg	0.05	MCERTS	0.51	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	0.56	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	0.37	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.52	< 0.05	< 0.05	< 0.05	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.27	< 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	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.32	< 0.05	< 0.05	< 0.05	< 0.05
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	5.90	< 0.80	0.83	< 0.80	< 0.80

Analytical Report Number: 20-82017

Project / Site name: Kingspan

Your Order No: 7978

Lab Sample Number				1416735	1416736	1416737	1416738	1416739
Sample Reference				WS101	WS102	WS103	WS104	WS105
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.10-0.20	0.30-0.40	0.50-0.60	0.30	0.40
Date Sampled				Deviating	Deviating	Deviating	Deviating	Deviating
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Antimony (aqua regia extractable)	mg/kg	1	ISO 17025	1.8	< 1.0	2.0	< 1.0	1.3
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	9.6	2.5	5.5	5.1	6.8
Barium (aqua regia extractable)	mg/kg	1	MCERTS	430	38	440	190	220
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	1.4	0.12	1.3	0.88	0.97
Boron (water soluble)	mg/kg	0.2	MCERTS	2.7	0.3	2.2	0.6	0.4
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.5	0.2	0.4	< 0.2	0.2
Chromium (hexavalent)	mg/kg	1.2	MCERTS	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	35	7.4	33	20	23
Copper (aqua regia extractable)	mg/kg	1	MCERTS	22	2.6	14	12	13
Lead (aqua regia extractable)	mg/kg	1	MCERTS	48	3.1	34	16	20
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	28	4.9	26	22	24
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	1.8	< 1.0	1.9	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	37	7.6	38	21	24
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	110	15	94	52	59
Monoaromatics & Oxygenates								
Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0
TPH-CWG - Aliphatic > EC35 - EC44	mg/kg	8.4	NONE	< 8.4	< 8.4	< 8.4	< 8.4	< 8.4
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic (EC5 - EC44)	mg/kg	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	2.4	< 2.0	< 2.0	< 2.0	< 2.0
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	42	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic > EC35 - EC44	mg/kg	8.4	NONE	27	< 8.4	< 8.4	< 8.4	< 8.4
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	50	< 10	12	< 10	< 10
TPH-CWG - Aromatic (EC5 - EC44)	mg/kg	10	NONE	77	< 10	12	< 10	< 10

Analytical Report Number: 20-82017

Project / Site name: Kingspan

Your Order No: 7978

Lab Sample Number				1416740	1416741	1416742		
Sample Reference				WS106	WS107	WS108		
Sample Number				None Supplied	None Supplied	None Supplied		
Depth (m)				0.30	1.00	0.30		
Date Sampled				Deviating	Deviating	Deviating		
Time Taken				None Supplied	None Supplied	None Supplied		
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1		
Moisture Content	%	N/A	NONE	16	3.9	16		
Total mass of sample received	kg	0.001	NONE	1.1	1.2	1.1		
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	8.4	11.0	8.0		
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1		
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	82	2400	30		
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.041	1.2	0.015		
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	40.8	1210	14.9		
Organic Matter	%	0.1	MCERTS	2.5	1.0	3.1		
Fraction Organic Carbon (FOC)	N/A	0.001	MCERTS	0.015	0.0059	0.018		
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	0.34	< 0.05		
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Phenanthrene	mg/kg	0.05	MCERTS	0.70	1.8	0.77		
Anthracene	mg/kg	0.05	MCERTS	0.14	0.63	0.17		
Fluoranthene	mg/kg	0.05	MCERTS	0.99	4.9	1.4		
Pyrene	mg/kg	0.05	MCERTS	0.91	4.3	1.2		
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.59	2.8	0.68		
Chrysene	mg/kg	0.05	MCERTS	0.42	2.1	0.59		
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	0.51	2.5	0.57		
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	0.24	1.5	0.37		
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.46	2.1	0.49		
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.20	1.1	0.24		
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	0.37	< 0.05		
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.26	1.2	0.30		
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	5.42	25.6	6.72		

Analytical Report Number: 20-82017

Project / Site name: Kingspan

Your Order No: 7978

Lab Sample Number				1416740	1416741	1416742		
Sample Reference				WS106	WS107	WS108		
Sample Number				None Supplied	None Supplied	None Supplied		
Depth (m)				0.30	1.00	0.30		
Date Sampled				Deviating	Deviating	Deviating		
Time Taken				None Supplied	None Supplied	None Supplied		
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Antimony (aqua regia extractable)	mg/kg	1	ISO 17025	1.5	< 1.0	2.3		
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	9.2	6.3	12		
Barium (aqua regia extractable)	mg/kg	1	MCERTS	300	380	370		
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	1.2	12	1.6		
Boron (water soluble)	mg/kg	0.2	MCERTS	1.7	1.5	2.5		
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.4	< 0.2	0.4		
Chromium (hexavalent)	mg/kg	1.2	MCERTS	< 1.2	< 1.2	< 1.2		
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	25	32	31		
Copper (aqua regia extractable)	mg/kg	1	MCERTS	17	4.7	27		
Lead (aqua regia extractable)	mg/kg	1	MCERTS	35	< 1.0	48		
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3		
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	23	4.1	30		
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	1.8	4.5	< 1.0		
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	29	100	38		
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	73	18	160		
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								
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 > EC35 - EC44	mg/kg	8.4	NONE	< 8.4	< 8.4	< 8.4		
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	< 10	< 10		
TPH-CWG - Aliphatic (EC5 - EC44)	mg/kg	10	NONE	< 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	8.3	< 2.0		
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	11	25	< 10		
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	30	57	16		
TPH-CWG - Aromatic > EC35 - EC44	mg/kg	8.4	NONE	< 8.4	< 8.4	< 8.4		
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	40	90	25		
TPH-CWG - Aromatic (EC5 - EC44)	mg/kg	10	NONE	40	90	25		

Analytical Report Number : 20-82017

Project / Site name: Kingspan

* 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 *
1416735	WS101	None Supplied	0.10-0.20	Brown loam and clay with gravel and vegetation.
1416736	WS102	None Supplied	0.30-0.40	Brown loam and clay with gravel.
1416737	WS103	None Supplied	0.50-0.60	Brown loam and clay with gravel and vegetation.
1416738	WS104	None Supplied	0.30	Brown loam and clay with gravel and vegetation.
1416739	WS105	None Supplied	0.40	Brown loam and clay with gravel and vegetation.
1416740	WS106	None Supplied	0.30	Brown loam and clay with gravel and vegetation.
1416741	WS107	None Supplied	1.00	Brown loam and clay with gravel and vegetation.
1416742	WS108	None Supplied	0.30	Brown loam and clay with gravel and vegetation.

Analytical Report Number : 20-82017

Project / Site name: Kingspan

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
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
Fraction of Organic Carbon in soil	Determination of fraction of organic carbon in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
Hexavalent chromium in soil (Lower Level)	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
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
Organic matter (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
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
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
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	NONE
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

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 ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
WS101		S	20-82017	1416735	a			
WS102		S	20-82017	1416736	a			
WS103		S	20-82017	1416737	a			
WS104		S	20-82017	1416738	a			
WS105		S	20-82017	1416739	a			
WS106		S	20-82017	1416740	a			
WS107		S	20-82017	1416741	a			
WS108		S	20-82017	1416742	a			

Key: a - No sampling date b - Incorrect container
c - Holding time d - Headspace e - Temperature

Manchester
Cody Court
Unit M3 Kansas Avenue,
Salford
Manchester
M50 2GE

2520

Certificate of Analysis for Bulk Identification

Project No. M-65759

Customer Address

REC Geo Ltd

Site Address

Kingspan

Certificate Version No	
Client Order Number	108742
Samples Submitted By	Client
Sampled By	Client
No. of Samples Received	8
Date Samples Received	27/01/2020
Date Samples Analysed	28/01/2020
Samples Analysed In	Manchester
Samples Analysed By	Joanna Cannon
Analyst / Authorised Signature	[redacted]

REC Ltd. accepts no responsibility for sampling activities undertaken by the client. The client will be notified of any deviating samples or contacted for further instructions before proceeding. Analysis is conducted in accordance with HSG 248 / Bulk Analysis Procedures. Where the presence of Asbestos Fibres in soil analysis is required the technique used is as described in Quantification Procedures Stage 1. The material description shall be regarded as tentative and is not included in the UKAS Accreditation for this laboratory. Opinions and interpretations expressed herein are outside the scope of UKAS Accreditation. Where this document has been digitally signed, printed copies are uncontrolled..

Sample No	Origin / Location of Material	Material Type	Asbestos Type(s)	Comments
01	WS101 - 0.1-0.2m	Soil	Chrysotile	Cement Fragment
02	WS102 - 0.3-0.4m	Soil	No Asbestos Detected	
03	WS103 - 0.5-0.6m	Soil	No Asbestos Detected	
04	WS104 - 0.3m	Soil	No Asbestos Detected	
05	WS105 - 0.4m	Soil	No Asbestos Detected	
06	WS106 - 0.3m	Soil	No Asbestos Detected	
07	WS107 - 1m	Soil	No Asbestos Detected	
08	WS108 - 0.3m	Soil	No Asbestos Detected	

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Salford
Manchester
M50 2GE

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Certificate of Analysis for Quantification of Asbestos in Soil / Aggregate

Job No M 65759

Customer Address	*Site Address*
REC GEO	108742- Kingspan

REC Asbestos accepts no responsibility for sampling activities undertaken by the client. The client will be notified of any deviating samples or contacted for further instructions before proceeding. Analysis is conducted in accordance with HSG 248 and documented in house procedures for soil analysis and quantification. Where soil analysis requires the taking of representative sub samples, the cone and quarter technique is used as described in Bulk Analysis Procedures. The material description shall be regarded as tentative and is not included in the UKAS Accreditation for this laboratory. Opinions and interpretations expressed herein are outside the scope of UKAS Accreditation. NAD = No Asbestos Detected. Where this document has been digitally signed, printed copies are uncontrolled. Uncertainty of measurement has been calculated in line with current available reference data . Uncertainty of measurement may increase with samples of clay soil type and loose chrysotile. AC = Asbestos Cement. AIB = Asbestos Insulation Board.

Customer Order No	
Samples Submitted By	Client
Sampled By	Client
No. of Samples Submitted	1
Date Samples Submitted	29/01/2020
Previous Project number	N/A
Date Samples Analysed	11/02/2020
Stage 1 analysed In	Manchester
Stage 1 analysed By	Joanna Cannon
Stage 2 analysed In	Manchester
Stage 2 analysed By	Joanna Cannon
Stage 3 Analysed By	Joanna Cannon
Stage 3 Analysed In	Manchester
Analyst / Authorised Signatures	[redacted]

Sample No	Origin / Location of Material / Depth	Material Type	ACMs Identified	Asbestos Type(s) Identified	Overall Mass Percentage of Asbestos	Comments	Level of Analysis Conducted
1	WS101 @ 0.10-0.20m	Soil	AC	Chrysotile	<0.001		Stage 1-3