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TIER 2 CONTAMINATION ASSESSMENT

RECTORY FARM

RECTORY ROAD

TYDD ST. MARY

LINCOLNSHIRE

Report Reference No. 128775

On behalf of:-

Katie Fathers
Rectory Farm
Rectory Road
Tydd St. Mary
PE13 5QJ

March 2025

KATIE FATHERS

TIER 2 CONTAMINATION ASSESSMENT

FOR

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INTRODUCTION

Katie Fathers, the client, intends to construct two new houses at Rectory Farm, Rectory Road, Tydd St. Mary in Lincolnshire. Details of the proposed redevelopment are available in Planning Reference H21-0785-24.

Lucion Ground Engineering Limited undertook a Tier 1 Preliminary Risk Assessment for the site, comprising a desktop study and site walkover, in February 2025 (Ref.128293).

Lucion Ground Engineering Limited was instructed by the client to carry out a contamination assessment of the site, comprising a review of the Tier 1 Preliminary Risk Assessment and an intrusive site investigation.

LOCATION, TOPOGRAPHY, GEOLOGY AND HYDROGEOLOGY

The site is located off the north-western side of Rectory Road in the village of Tydd St. Mary within the South Holland district of Lincolnshire, and some 9km north of Wisbech. The site is centred at National Grid Reference TF 44010 18430. A site location plan is presented at the rear of this report.

The approximately 40m wide and 70m long site has an 18m wide frontage off the north-western side of Rectory Road. The site is bounded by the Rectory Farm farmhouse to the south; The Old Coach House and its driveway to the north and east; and by a field to the west.

The site was surfaced with gravel or grass, with an area of concrete hardstanding in the north-eastern corner, screened by hedgerows. A stockpile of demolition rubble was present in the northern part of the gravel area. A single-storey corrugated metal barn was located at the western end of the site. The floor of the barn was surfaced with a concrete slab and was used for general storage, including mowers and furniture. The remains of a demolished building were present on the northern side of the barn. A shallow tree-lined drainage ditch was present at the site's north-western corner.

The site stands at an elevation of approximately 3mOD within the low lying Fens. Church Road stands at an elevation of 4mOD immediately to the east of the site and falls toward the south. A field boundary drain is present adjacent the north-western corner of the site, part of a drainage network connected to the South Holland Main Drain to the north and the North Level Main Drain to the south.

The 1978 geological map at 1:50,000 scale, King's Lynn and the Wash, sheet 220 with part of 129, shows the site to be covered by Marine Alluvium of the Terrington Beds and underlain at depth by the solid geology of the Ampthill Clay. More recent geological mapping by the British Geological Survey (B.G.S.), available online, shows the site to be covered by Tidal Flat Deposits and underlain at depth by the Ampthill Clay Formation.

Previous investigations undertaken in the locality by Lucion Ground Engineering Limited (and its precursor Ground Engineering Limited) indicate that the Tidal Flat Deposits comprise a cover of silt to approximately 1.00m depth, mantling Marine Sand, which locally contains pockets of organic silt and clay. The Marine Sand is expected to be 20.00m to 25.00m thick and underlain by glacial Boulder Clay.

The Tidal Flat Deposits and Ampthill Clay Formation are designated by the Environment Agency (E.A.) as 'Unproductive' strata. Marine Sand and the glacial Boulder Clay beneath the site apparently do not have aquifer designations in this locality.

The direction of surface water and near surface groundwater flow would be toward the north and to The Wash.

DESK STUDY REVIEW

The site comprised a farmstead in 1889, until it was altered into a haulage depot between 1950 and 1975, when three buildings were constructed within the site. Two of these buildings were removed, one by 1991 and the other by 2003, after which the building in the western part of the site was partially demolished.

The surrounding area comprised the village of Tydd St. Mary and fields in 1889. At this time a brickworks was in operation to the north-west, but was closed in the early 20th Century. During the mid to late 20th Century and into the 21st Century the village expanded to cover the fields to the north-west.

There are two historical industrial land uses recorded within the site, both for an unspecified depot. There are a further two historical industrial land uses recorded within 250m of the site, both for the former brickworks to the north-west of the site. There is a single historical tank recorded within 250m of the site, for an unspecified tank 196m to the north-east.

There are two recent industrial land uses recorded within 250m of the site, for a sewage works 192m to the north-east and an electricity sub-station 238m to the north-west.

There are eight licenced discharges of treated or untreated effluent to controlled waters, under the Water Resources Act 1991, listed within 250m of the site. The closest is for a treated sewage discharge, 21m to the north-west, into a tributary of South Holland Drain. The remainder are for six unspecified effluent types, discharging to land, between 177m and 233m west of the site; and for a treated sewage discharge to a tributary of Old Shire Drain, 178m to the north.

The site is recorded as being covered by Tidal Flat Deposits, an 'Unproductive' stratum, and underlain by the solid geology of the Ampthill Clay Formation, also an 'Unproductive' stratum.

There are eleven Water Network records listed for the site, all for drainage ditches and associated culverts.

The site lies within the Tydd St. Mary Conservation Area.

There is a ‘moderate’ on-site hazard from running sands and compressible deposits; a ‘low’ on-site hazard from shrinking and swelling clays; a ‘very low’ on-site hazard from landslides; and a ‘negligible’ on-site hazard from collapsible deposits and ground dissolution of soluble rocks.

There are seven historical records for surface ground workings within 250m of the site, all for the former brickworks to the north-west.

PRELIMINARY RISK ASSESSMENT

In order to assess the risks associated with the presence of ground contamination the linkages between the sources and potential receptors to contamination need to be established and evaluated. This is in accordance with the Environmental Protection Act 1990, which provides a statutory definition of Contaminated Land. To fall within this definition it is necessary that, as a result of the condition of the land, substances may be present on or under the land such that;

- *Significant harm is being caused or there is a significant possibility of such harm being caused; or*
- *Pollution of controlled waters is being, or is likely to be, caused*

There are three principal factors that are assessed whilst undertaking a qualitative risk assessment for any site. These are the presence of a contamination source, the existence of migration pathways and the presence of a sensitive target(s). It should be noted that it is necessary for each element of source, pathway and target to be present in order for exposure of a human or environmental receptor to occur.

UK Government guidance on the assessment of contaminated land, requires risk to human health and the environment to be reviewed using source – pathway – target relationships. If each of these elements is present, the linkage provides a potential risk to the identified targets. ***Contaminants or potential pollutants*** identified as ***sources*** in relation to the identified previous uses are listed below in Table 1.

Table 1: Identified Potential Contaminant Sources

Contaminant Source	***Comments***
Drainage	Effluent from existing drains could provide a contaminant source.
Existing Building and demolition rubble/spoil heap	The existing building, spoil heap and demolition rubble may have asbestos containing material within them.
Soil Beneath Site	Contamination may be present within any made ground, associated with former use as a haulage yard.
Soil Gas	Potential soil gas generated from made ground or underlying natural strata.
Ground Contamination Outside Site Boundary	Ground contamination migrating from nearby sites such as the former brickworks to the north-west.

A ***Pathway*** is defined as one or more routes through which a receptor is being, or could be, exposed to, or affected by, a given contaminant.

Potential ***Target or Receptors*** fall within the categories of Human Health, Water Environment, Flora and Fauna, and Building Materials.

There are a number of possible pathways for the contaminants identified on the site to impact human and/or environmental receptors and these are summarised in Tables 2 and 3.

Table 2: Human Receptors and Pathways

Human Receptor-Mechanism	***Typical Exposure Pathway***
Human Inhalation	Breathing Dust and Fumes Breathing Gas emissions
Human Ingestion	Eating -contaminated soil, for example by small children -plants grown on contaminated soil Ingesting dust or soil on fruit or vegetables Drinking contaminated water
Human Contact	Direct skin contact with contamination Direct skin contact with contaminated liquids

Table 3: Water Receptors and Pathways

Receptor-Water Environment	***Typical Exposure Pathway***
Groundwater The site is recorded as being covered by Tidal Flat Deposits and underlain by the solid geology of the Ampthill Clay Formation, both 'Unproductive' strata.	Surface infiltration of atmospheric waters into the soils beneath the site could wash or dissolve potential contaminants and migrate to underlying groundwater. Contamination leads to restriction/prevention of use as a resource, for example, drinking water, and can have secondary impacts on other resources, which depend on it.
Surface Water/River Networks A surface drain is present immediately to the north-west of the site.	Surface infiltration of atmospheric waters into the soils beneath the site could wash or dissolve potential contaminants and laterally migrate. Contamination leads to a restriction/prevention of use: -as drinking water resource -for amenity use Effects on aquatic life

Table 4: Preliminary Conceptual Model Relative to Construction/Future Use of Site

Receptors	Pathway	Estimated Potential for Linkage with Contaminant Sources				
		Drainage	Buildings/ Demolition Rubble and Spoil Heaps	Soil Beneath Site	Soil Gas	Ground Contamination Outside Site Boundary
Human Health – construction workers	Ingestion and Inhalation of contaminated Soil, Dust and Vapour	Likely	Likely	Likely	Low likelihood	Low likelihood
Human Health – users of completed development	Ingestion and Inhalation of contaminated Soil, Dust and Vapour	Low likelihood	Low likelihood	Likely	Low likelihood	Low likelihood
Water Environment	Migration through ground into surface water or groundwater	Unlikely	Unlikely	Low likelihood	Low likelihood	Unlikely
Flora	Vegetation on site growing on contaminated soil	Unlikely	Unlikely	Low likelihood	Low likelihood	Unlikely
Building Materials	Contact with contaminated soil	Unlikely	Unlikely	Low likelihood	Low likelihood	Unlikely

Key to Table 4

Estimated Potential for Linkage with Contaminant Source	Definition
High likelihood	There is a pollution linkage and an event that either appears very likely in the short term, and almost inevitable over the long term, or there is evidence at the receptor of harm or pollution.
Likely	There is a pollution linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.
Low likelihood	There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such an event would take place, and is less likely in the shorter term.
Unlikely	There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long term.

SITE WORK

The site work was undertaken on 20th February 2025 and comprised four window sample boreholes (WS1 to WS4) at positions determined by Lucion Ground Engineering Limited. The final positions are recorded on the exploratory hole location plan at the rear of this report.

The investigation followed the protocols detailed in British Standards (BS) 'Code of Practice for Site Investigations' (BS5930:2015+A1:2020) and 'Investigation of Potentially Contaminated Sites' (BS10175:2001+A2:2017).

Services information was obtained prior to the start of the investigation, was referenced in relation to the exploratory hole positions, and a scan was undertaken using a cable avoidance tool (CAT) prior to excavation/boring.

The exploratory hole records give the descriptions and depths of the various strata encountered, results of the in-situ tests, details of all samples taken, and the groundwater conditions observed during excavation, boring, on completion and subsequently during the return monitoring visit.

Window Sample Boreholes

Four window sample boreholes (WS1 to WS4) were undertaken using a tracked, super heavy dynamic sampling rig on 20th February 2025. Prior to boring, a starter pit was dug at each position using hand tools to 1.20m depth in order to ensure the absence of buried services. The boreholes were completed at the intended depth of 3.00m below ground level.

The window sampling equipment consisted of 1.00m long drive-in samplers of specially constructed and strengthened 87mm to 57mm diameter steel sample tubes with a plastic core-liner. The samplers were driven into the ground from the base of the hole by an automatic trip hammer weighing 63.50kg falling freely through 750mm. Upon extraction a continuous profile of the soil was obtained in the plastic liners (U) inserted in the samplers. The liners were subsequently split and logged by a Geo-environmental Engineer.

Small disturbed (D) samples of soil recovered at regular intervals within the starter pits and the boreholes were placed into polycarbonate pots. Environmental samples were also taken throughout the pits and placed within amber glass jars.

On completion 38mm diameter standpipes were installed to the base of boreholes WS1 and WS4 at 3.00m below ground level. The annulus around each standpipe was backfilled with pea gravel with a bentonite seal placed around the top of each installation within 1.00m of ground level. A gas tap was installed in the top of each standpipe and a protective stopcock cover was concreted into the ground, over each installation and flush with the surface. The remaining boreholes were backfilled with arisings and slabbed.

Gas and Groundwater Monitoring

A single return visit was undertaken on 3rd March 2025, in order to record the methane, carbon dioxide and oxygen gas levels in the borehole standpipe installations, together with the ambient pressure, flow rate and depth to groundwater. The water levels have been added to the borehole records and the gas/groundwater results are presented following the exploratory hole records.

A water sample was recovered from the WS4 standpipe installation in a glass bottle and glass vial, pending laboratory testing.

LABORATORY TESTING

The samples were inspected in the laboratory and assessments of the soil characteristics have been taken into account during preparation of the exploratory hole records. The soil sample descriptions are in accordance with BS5930:2015+A1:2020.

Chemical analysis of selected soil samples recovered from the exploratory holes was undertaken, by an independent laboratory, primarily for characterisation purposes. The chemical testing programme was devised by Ground Engineering Limited for a broad suite of potential contaminants, outlined by the Environment Agency (EA) and National House Building Council (NHBC) document R&D 66; 2008 'Guidance for the Safe Development of Housing on Land Affected by Contamination'.

The chemical test results are included in Appendix 1 at the rear of this report.

Chemical Testing

Selected soil samples from the exploratory holes were tested for total concentrations of arsenic, cadmium, chromium, lead, mercury, selenium and nickel, together with speciated polyaromatic hydrocarbons (PAH), boron, copper and zinc, phenols, total and free cyanide, hexavalent chromium, sulphate, sulphide and pH. The organic content of the soil samples was also determined. Samples were also screened for asbestos and tested for total petroleum hydrocarbons (TPH).

A sample of water recovered from the WS4 standpipe installation was tested for speciated total petroleum hydrocarbons (TPH CWG).

GROUND CONDITIONS

The ground conditions encountered by the exploratory holes comprised a thin cover of made ground over Tidal Flat Deposits. The underlying solid geology of the Ampthill Clay Formation was not encountered in the 3.00m deep boreholes.

Groundwater was met 'perched' within the Tidal Flat Deposits at depths between 1.00m and 3.00m below ground level, and was subsequently recorded at 0.77m and 1.05m depth in the two standpipe installations during the return monitoring visit.

Made Ground

The western part of the site (WS1 and WS2) was covered by a soft, friable, dark brown and dark grey, slightly sandy, slightly gravelly, silty, organic clay or similar clayey silt. This topsoil fill had a gravel fraction of brick, flint and metal; and was proved to 0.10m depth.

The eastern half of the site was covered by a dark brown and red brown, clayey or silty, sandy gravel. This coarse-grained fill had a gravel fraction of brick, concrete, flint, quartzite and limestone; and was proved to 0.10m or 0.60m below ground level in the north-eastern and south-eastern parts of the site, respectively.

A soft or firm, brown and grey, slightly sandy, slightly gravelly, silty clay or similar clayey silt was met at 0.10m depth beneath the topsoil fill in the western part of the site and the coarse-grained fill in the north-eastern part of the site. This clay fill had a gravel fraction of brick, flint and ash, and was proved to between 0.30m and 0.60m below ground level.

Tidal Flat Deposits

In the north-eastern corner of the site a light brown and orange brown, silty, fine sand was met beneath the made ground at 0.30m depth, and was proved to 0.90m below ground level.

At 0.40m to 0.90m depth, beneath the made ground and Tidal Flat Deposit sand, a soft or firm, brown, orange brown and grey, slightly sandy, silty clay was met beneath the site. This Tidal Flat Deposit locally contained brown silt partings; and was proved to between 1.10m and 1.40m below ground level.

The Tidal Flat Deposit became a soft, grey, silty, locally slightly organic clay with occasional black carbonaceous traces below 1.10m to 1.40m depth. This Tidal Flat Deposit was found to at least the base of the three boreholes at 3.00m depth.

Groundwater

Borehole WS3 was dry during boring and on completion. Groundwater was met 'perched' within the Tidal Flat Deposits at 2.00m depth in boreholes WS1 and WS2 in the western part of the site, rising rapidly to 1.00m depth, where the water was recorded on completion. A seepage was recorded at the base of WS4 at 3.00m depth, although the hole was recorded as dry on completion.

During the return monitoring visit in March 2025 water was recorded at 0.77m depth in the WS1 standpipe installation and 1.05m depth in the WS4 installation.

Evidence of Contamination

The made ground contained fragments of brick, concrete, metal and ash.

No suspected asbestos containing material was observed within the holes during the site work. Fibres/clumps of chrysotile asbestos were identified within the made ground in borehole WS1 and WS4 during screening in the laboratory.

A hydrocarbon odour was noted within borehole WS4 at 0.60m to 1.35m depth. No visual or olfactory evidence of hydrocarbon contamination was observed in the remaining soils beneath the site.

COMMENTS ON THE CHEMICAL TEST RESULTS

The results of the laboratory chemical testing on near surface soil samples have primarily been compared to soil screening values (SSVs) produced by Land Quality Management Limited (LQM) and the Chartered Institute for Environmental Health (CIEH) presented in their document 'The LQM/CIEH S4ULs for Human Health Risk Assessment: 2015 (Publication Number S4UL3608)'. The LQM/CIEH S4ULs are intended for use in assessing the potential risks posed to human health by contaminants in soil and are transparently-derived and cautious 'trigger values' above which further assessment of the risks or remedial action may be needed. The S4ULs (Suitable for Use Levels) have been derived, in accordance with UK legislation and Environment Agency policy, using a modified version of the Environment Agency CLEA 1.06 software.

Reference has also been given to AGAC soil screening values produced by Society of Brownfield Risk Assessment (SoBRA) as documented in their July 2020 publication 'Development of Acute Generic Assessment Criteria for Assessing Risks to Human Health from Contaminants in Soil'. With the absence of a S4UL for cyanide, the SoBRA AGAC has been used as the soil screening criteria within this report because the acute dose toxicity thresholds for free cyanide are very close to the chronic dose toxicity thresholds.

In 2014 the Department for Environment Food and Rural Affairs (DEFRA) published, in their document SP1010, Category 4 Screening Levels (C4SL) for several contaminants including lead. The C4SL represent screening levels below which the land could be considered suitable for a specified use and definitely not contaminated land in respect of those determinands. With the absence of S4UL for lead the C4SL has been used as the soil screening criteria within this report.

For each contaminant the adopted soil screening criteria have been calculated for the following land uses:

- Residential use with home grown produce
- Residential use without home grown produce
- Commercial and industrial usage

The intended purpose of the SSVs are as “intervention values” in the regulatory framework for assessment of human health risks in relation to land use. These values are not binding standards, but are intended to inform judgements about the need for action to ensure that a new use of land does not pose any unacceptable risks to the health of the intended users.

Tables 5 and 6 compare the test results for the made ground with the SSVs in relation to the specified uses. The number of test results, which exceed these values, are also provided.

Table 5: Comparison of Chemical Test Results for Made Ground with SSVs

Determinand	Number of Samples	Min Value (mg/kg)	Max Value (mg/kg)	Number of Samples Exceeding SSV for:			Soil Screening Criteria SSV (1% SOM)			
				Residential with home grown produce	Residential without home grown produce	Commercial/ Industrial	Assessment Method	Residential with home grown produce mg/kg	Residential without home grown produce mg/kg	Commercial/ Industrial (mg/kg)
Organic matter	5	2.2%	7.2%	-	-	-	-	-	-	-
Arsenic	5	8.6	25	0	0	0	S4UL	37	40	640
Cadmium	5	<0.10	0.66	0	0	0	S4UL	11	85	190
Total Chromium	5	16	37	0	0	0	S4UL	910	910	8600
Hexavalent Chromium	5	<0.50	<0.50	0	0	0	S4UL	6	6	33
Lead	5	10	230	1	0	0	C4SL	200	310	2330
Mercury	5	0.19	0.31	0	0	0	S4UL	11	15	320
Selenium	5	0.29	0.80	0	0	0	S4UL	250	430	12,000
Nickel	5	16	40	0	0	0	S4UL	130	180	980
Phenols	5	<0.10	<0.10	0	0	0	S4UL	120	440	440
Copper	5	7.8	55	0	0	0	S4UL	2400	7100	68,000
Zinc	5	38	320	0	0	0	S4UL	3700	40,000	730,000
Free Cyanide	5	<0.50	<0.50	0	0	0	AGAC	24	24	24

Notes

*The concentration of Trivalent Chromium is assumed to be equivalent to the Total Chromium concentration. This is because most naturally occurring chromium is in the trivalent (chromic) state.
S4UL and C4SL for metals were derived using 6% SOM. These values are not sensitive to SOM and would also be applicable for 1% SOM and 2.5% SOM
LQM/CIEH S4ULs 'Copyright Land Quality Management Limited reproduced with permission; Publication Number S4UL3608. All rights reserved'
AGAC soil screening values produced by Society of Brownfield Risk Assessment (SoBRA) as documented in their July 2020 publication 'Development of Acute Generic Assessment Criteria for Assessing Risks to Human Health from Contaminants in Soil'.

Table 6: Comparison of Chemical Test Results for Made Ground with SSVs

Determinand	Number of Samples	Min Value (mg/kg)	Max Value (mg/kg)	Number of Samples Exceeding SSV for:			Soil Screening Criteria SSV (1% SOM)			
				Residential with home grown produce	Residential without home grown produce	Commercial/ Industrial	Assessment Method	Residential with home grown produce mg/kg	Residential without home grown produce mg/kg	Commercial/ Industrial (mg/kg)
Acenaphthene	5	<0.10	0.54	0	0	0	S4UL	210	3000	84,000
Acenaphthylene	5	<0.10	0.16	0	0	0	S4UL	170	2900	83,000
Anthracene	5	<0.10	1.5	0	0	0	S4UL	2400	3100	520,000
Benzo[a] anthracene	5	<0.10	4.2	0	0	0	S4UL	7.2	11	170
Benzo[a]pyrene	5	<0.10	3.3	1	1	0	S4UL	2.2	3.2	35
Benzo[b] fluoranthene	5	<0.10	4.5	1	1	0	S4UL	2.6	3.9	44
Benzo[g,h,i] perylene	5	<0.10	2.7	0	0	0	S4UL	320	360	390
Benzo[k] fluoranthene	5	<0.10	2.4	0	0	0	S4UL	77	110	1200
Chrysene	5	<0.10	5.8	0	0	0	S4UL	15	30	350
Dibenz[a,h] anthracene	5	<0.10	0.66	1	1	0	S4UL	0.24	0.31	3.5
Fluoranthene	5	0.49	10	0	0	0	S4UL	280	1500	23,000
Fluorene	5	<0.10	0.40	0	0	0	S4UL	170	2800	63,000
Indeno[1,2,3-cd]pyrene	5	<0.10	1.9	0	0	0	S4UL	27	45	500
Naphthalene	5	<0.10	0.70	0	0	0	S4UL	2.3	2.3	190
Phenanthrene	5	<0.10	7.7	0	0	0	S4UL	95	1300	22,000
Pyrene	5	0.62	9.9	0	0	0	S4UL	620	3700	54,000

Notes

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Discussion of Results

The results of the laboratory analyses (Tables 5 & 6) indicate that the made ground beneath the site contained elevated concentrations of lead and three (benzo[a]pyrene, benzo[b]fluoranthene and dibenz[a,h]anthracene) of the sixteen PAHs tested for in regards to the SSVs for a residential with home grown produce end use. Concentrations of benzo[a]pyrene, benzo[b]fluoranthene and dibenz[a,h]anthracene also exceeded their respective SSVs for a residential without home grown produce end use. None of the concentrations of contaminants tested for exceeded their respective SSVs for a commercial/industrial end use.

All of the elevated concentrations of lead, benzo[a]pyrene, benzo[b]fluoranthene and dibenz[a,h]anthracene were found within the made ground soils in borehole WS1, in the south-western corner of the site.

A hydrocarbon odour was noted within borehole WS4 between 0.60m and 1.35m depth. Visual or olfactory evidence of hydrocarbon impacted soils was not detected within the remaining soils encountered during the site work. The TPH results obtained from the tested soil samples in boreholes WS1 to WS3 were between <10mg/kg and 50mg/kg. The TPH results recorded in borehole WS4 were between 92mg/kg and 1200mg/kg, with the highest result recorded at 1.20m depth. These results are considered to reflect the presence of petroleum hydrocarbon pollution within the soils in the south-eastern corner of the site.

Fibres/clumps of chrysotile asbestos were found within the made ground soils in WS1 and WS4 during laboratory screening by microscopy. No asbestos containing materials were identified within the remaining samples screened by the laboratory.

The results indicate that the soils encountered beneath the southern half of the site would be unsuitable for retention exposed at the surface in a residential with home grown produce setting, considered representative of the proposed end use, due to the presence of elevated concentrations of lead, benzo[a]pyrene, benzo[b]fluoranthene and dibenz[a,h]anthracene, together with the presence of hydrocarbon impacted soils and fibres/clumps of chrysotile asbestos.

SOIL GAS MONITORING RESULTS

A single return monitoring visit to the site on 3rd March 2025 recorded concentrations of landfill type gasses (methane, carbon dioxide and oxygen) in the borehole standpipe installations. The results are presented to the rear of the exploratory hole records. The recorded concentrations of methane were less than 0.1%. The carbon dioxide concentrations were between 1.1% and 2.3%. The recorded oxygen concentration within the WS4 standpipe was depleted when compared to atmospheric conditions. The in-situ measurement recorded steady gas emission flow rates of less than 0.1l/hr in both boreholes. An initial flow rate of -61.3l/hr was recorded within the WS4 standpipe, but is considered to have been impacted by the change in water level between installation and monitoring.

Assuming a 'worst case' positive flow rate of 0.1l/hr, the results give a Gas Screening Value (GSV) of 0.0023l/hr. This GSV falls within Characteristic Situation 1 as defined by BS8485:2015+A1:2019 ‘Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings’.

COMMENTS ON THE GROUNDWATER TEST RESULTS

A single sample of water recovered from the borehole WS4 standpipe installation on 3rd March 2025 was tested for speciated TPH. The primary assessment tool employed for the generic screening of samples for the protection of 'Controlled Waters' comprised the Statutory Instrument 2016 No.614 which supersedes Statutory Instrument 2000 No.3184 'The Water Supply (Water Quality) Regulations 2000'. The latter document amends the 1991 version, which provides a standard of 10µg/l for dissolved or emulsified hydrocarbons represented by total petroleum hydrocarbons (TPH) in the chemical analysis. There is no amendment indicated in Statutory Instrument 2000 No.3184 and consequently with the absence of an amendment or update we refer to the 1991 standard, which is generally accepted within the industry.

The total TPH result was 310µg/l, considerably above the UK drinking water standard of 10µg/l indicating that the groundwater beneath the site has been impacted by the presence of hydrocarbon contamination. Speciation of the TPH results indicated that the carbon range of the hydrocarbons was mainly in aromatic TPH C5-C7, indicative of petrol or light lubricating oils.

UPDATED CONCEPTUAL MODEL

An assessment of the potential linkage between ground contamination sources, human and environmental receptors has been based on the desk study and intrusive ground investigation documented in the preceding sections of this report.

A generalised conceptual model, updated following the intrusive works, monitoring and testing, and targeted to provide coverage across the site, relative to the construction phase and completed development, is presented below in Table 7.

Table 7: Updated Conceptual Model Relative to Construction and Future Redevelopment

Receptors	Pathway	Estimated Potential for Linkage with Contaminant Sources				
		Drainage	Buildings/ Demolition Rubble and Spoil Heaps	Soil Beneath Site	Soil Gas	Ground Contamination Outside Site Boundary
Human Health – ground workers	Ingestion and Inhalation of contaminated Soil, Dust and Vapour	Moderate Risk	Moderate Risk	Moderate Risk	Very Low Risk	Very Low Risk
Human Health – users of completed development	Ingestion and Inhalation of contaminated Soil, Dust and Vapour	N/A	N/A	Moderate Risk	Very Low Risk	Very Low Risk
Water Environment	Migration through ground into surface water or groundwater	N/A	N/A	Moderate Risk	Very Low Risk	Very Low Risk
Flora	Vegetation on site growing on contaminated soil.	N/A	N/A	Very Low Risk	Very Low Risk	Very Low Risk
Building Materials	Contact with contaminated soil	N/A	N/A	Very Low Risk	Very Low Risk	Very Low Risk

Key to Table 7

RISK	Definition
Very High	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, or, there is evidence that severe harm to a designated receptor is currently happening. The risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation are likely to be required.
High	Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) and remedial works may be necessary in the short term and likely over the long term.
Moderate	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild.
Low	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.
Very Low	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.
N/A	Not Applicable because the proposed development will remove the source.

COMMENTS ON GROUND CONTAMINATION IN RELATION TO PROPOSED DEVELOPMENT

It is proposed to construct two new houses at a former farm and haulage yard. A plan of the proposed development is included at the rear of this report. This investigation may not have revealed the full extent of contamination on the site and appropriate professional advice should be sought if subsequent site works reveal materials that appear to be contaminated.

Contaminated Soil

The exploratory holes found up to 0.80m of made ground beneath the site. Concentrations of lead, benzo[a]pyrene, benzo[b]fluoranthene and dibenz[a,h]anthracene were locally found in the south-western part of the site that exceeded their soil screening values for residential end uses. Elevated concentrations of TPH were also locally found beneath the south-eastern corner of the site, indicating the localised presence of petroleum hydrocarbon contamination. Fibres/clumps of chrysotile asbestos were also found within the made ground soils in the southern half of the site.

Due to the presence of elevated concentrations of lead, benzo[a]pyrene, benzo[b]fluoranthene and dibenz[a,h]anthracene, and TPH, and fibres/clumps of chrysotile asbestos, there is a moderate risk that the made ground soils would affect groundworkers, and impact future end users of the site where the made ground is exposed, such as in garden areas in the proposed redevelopment.

Existing Drainage

Redundant foul or surface water drain runs should be removed from beneath the site and precautions should be in place to ensure that any remaining effluent is directly disposed off-site. The integrity of existing drainage should be checked, and where they are to be retained, any damaged sections should be replaced prior to redevelopment. The latter measures should remove any future risk to human health and to the water environment.

Existing Buildings/Rubble and Spoil Heaps

The existing barn buildings may contain asbestos containing materials within their construction. Asbestos containing materials may be present within rubble and spoil heaps on the site. Suitable precautions, in line with current best practice, should be put in place to protect workers from the effects of asbestos material, during the demolition phase.

Human Health - Construction Workers

The presence of elevated levels of lead, benzo[a]pyrene, benzo[b]fluoranthene, dibenz[a,h]anthracene and TPH, and fibres/clumps of chrysotile asbestos, within the made ground soils beneath the site, indicates that there is a moderate risk that a pathway could develop affecting groundworkers during the construction phase of the redevelopment.

No special precautions would be required during the development of the site by workers who may come into contact with the soil during groundworks, providing that standard precautions are adopted which should generally include the procedures given by the Health and Safety Executive industry guidance.

For the protection of workers during groundworks the following is recommended:

a) Limit repeated or prolonged skin contact with soils by wearing gloves with sleeves rolled down.

b) Washing facilities should be made available to groundworkers, as to minimise the potential for inadvertent ingestion of soil.

c) If any soils are revealed which are different to those encountered by this ground investigation, the advice of a specialist should be sought in view of classifying the material and ascertaining its risk to groundworkers.

d) Dust suppression measures such as ‘dampening down’, could also be adopted to prevent the spread of soil contaminants, including asbestos fibres.

e) Asbestos containing material was locally encountered within the near surface made ground. This made ground should not be crushed and it is recommended that the groundworks contractor visually screen such made ground for suspected asbestos and handpick

such materials for separate off-site disposal as special waste. Care should be taken to protect ground workers from inhalation of dust.

f) Care should be taken to ensure that asbestos containing material is handled properly, not crushed or broken, kept wet and that special precautions are adopted, and appropriate PPE used to prevent the spread and inhalation of asbestos fibres.

g) Health and safety measures should be implemented to protect ground workers from soil gases and hydrocarbon vapours when entering excavations.

Human Health - Users of Completed Development

The risk of the identified ground contamination (lead, PAHs, TPH and asbestos fibres) affecting the site users in the proposed residential with home grown produce setting is considered to be moderate, where a pathway is present.

Where present beneath permanent areas of hardstanding, the risk of the encountered ground contamination affecting the site users would be very low. This is because it would be highly unlikely that the general site users would normally be able to penetrate the floors and hardstanding, which would be necessary for them to uncover any contaminated soils beneath the site.

The results of the chemical analysis indicate that the made ground in the northern half of the site would generally be considered suitable for re-use at the surface in the proposed residential with grown produce setting, due to the absence of elevated concentrations of contaminants.

In the southern half of the site, the made ground would be unsuitable for retention at the surface in a residential setting due to the presence of elevated concentrations of lead, PAHs, TPH and asbestos fibres.

Within new garden areas in the southern half of the site made ground should either be completely removed, or removed and replaced with a surface covering of at least 0.60m of certified ‘clean’ topsoil, which would be considered to provide a suitable pathway break. This would reduce the risk to future users of the development to very low.

Effects on Services

Consideration should be given to upgrading service materials, particularly for water supply pipes, where they will be in contact with made ground containing elevated concentrations of TPH, lead and PAHs or ensure that the made ground is not used as a backfill around such water supply pipes. Further guidance on the selection of materials for use as water supply pipes should be sought from the local water supplier.

Soil Gas

According to the environmental database information obtained there are no active landfills within influencing distance of the site. The soils beneath the site were locally noted to be slightly organic.

The gas monitoring of the borehole standpipes has determined that a Characteristic Situation 1 would apply, so the risk to groundworkers and end users can be reduced to very low.

There is a potential for hydrocarbon vapours to accumulate within enclosed excavations. The design of new structures should give due consideration to the emplacement of a vapour barrier to prevent the accumulation of hydrocarbon vapours.

The site lies within an area where no radon protection measures are required for new dwellings in accordance with BR211.

Water Environment

A northward draining ditch is located immediately to the north-west of the site. Groundwater was recorded at about 1.00m depth beneath the site, within the Tidal Flat Deposits.

Elevated concentrations of TPH were locally found within the made ground and natural soils in WS4, with elevated concentrations of TPH also present within the groundwater. It is considered that there is a moderate risk that the contamination found beneath the site will affect the underlying groundwater due to the presence of elevated concentrations of TPH.

CONTAMINATION ASSESSMENT CONCLUSIONS

It is proposed to construct two new houses with associated parking and gardens. In regard to the proposed end use within a residential with home grown produce setting, elevated concentrations of lead and PAHs, together with high concentrations of TPH and fibres/clumps of asbestos containing material were found beneath the southern part of the site. The layout of the redevelopment is shown on the proposed development plan at the rear of this report.

Additional Investigation

Due to the presence of high concentrations of TPH within the soils beneath the south-eastern corner of the site, together with the presence of fibres/clumps of chrysotile asbestos across the southern part of the site, consideration should be given to undertaking additional investigation. Further shallow exploratory holes could be undertaken to determine the extent of TPH and asbestos contamination, together with its impact on the groundwater table.

Remediation

1. The risk of the encountered ground contamination affecting site users when present beneath buildings and permanent areas of hardstanding would be very low and consequently no formal scheme of remediation is proposed for such areas.

2. Remediation should be carried out, where new landscaped areas are to be included in the southern half of the site. For the proposed setting, a minimum depth of removal and replacement of 0.60m, or the full thickness of made ground where the made ground is less than this, would be considered appropriate in front gardens and landscaping, where soil will be exposed at the surface, and will involve the removal of the made ground and replacement with a suitably thick cover or barrier layer in order to break the pathway between the underlying made ground and the site users. This should be increased to 1.00m for rear garden areas. A high visibility ‘no dig’ geotextile should be incorporated at the base of any imported topsoil.

3. A visual screen should be made for suspected asbestos containing material, and any such materials such be hand picked for separate off-site disposal.

4. In new areas of gardens and soft landscaping, imported topsoil and subsoil should have appropriate certificates confirming its suitability prior to placement. Where such works are necessary, the local authority should be informed, and information gathered to demonstrate the works.

5. If any soils are revealed which are different to those encountered by this ground investigation, the advice of a specialist should be sought in view of classifying the material and ascertaining its risk to groundworkers.

Validation

Where remediation is undertaken (new landscaping) it is recommended that the work is fully documented and on completion a validation report is prepared providing a full descriptive record of the process, quantities of material excavated, stored and removed, and the materials imported and placed, together with chemical test results and photographs.

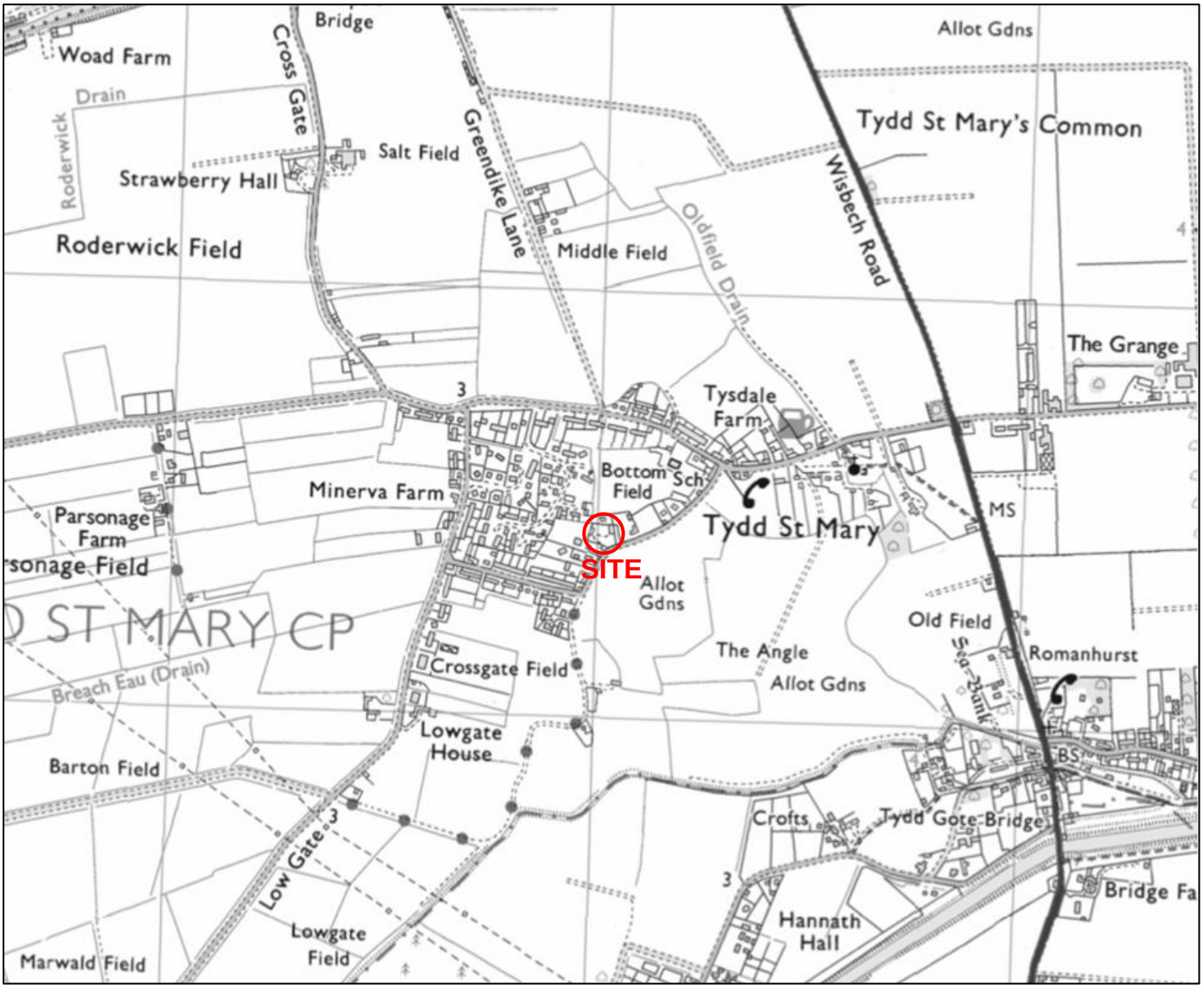
LUCION GROUND ENGINEERING LIMITED

A. J. MURDOCH
M.Geol., F.G.S.,
Senior Geo-Environmental Engineer

pp **S. J. FLEMING**
M.Sc., M.C.S.M.,
C.Geol., F.G.S.,
Ground Engineering Director

Site Location Plan

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0m 500m 1000m

Project : Rectory Farm, Rectory Road, Tydd St. Mary

Client : Katie Fathers

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LUCION GROUND ENGINEERING LIMITED
Peterborough Tel : 01733 566566

Project No.
128775

Proposed Development Plan

Reproduced from a plan provided by the client.



Key

Window Sample Borehole

Not to Scale

Project : Rectory Farm, Rectory Road, Tydd St. Mary

Client : Katie Fathers

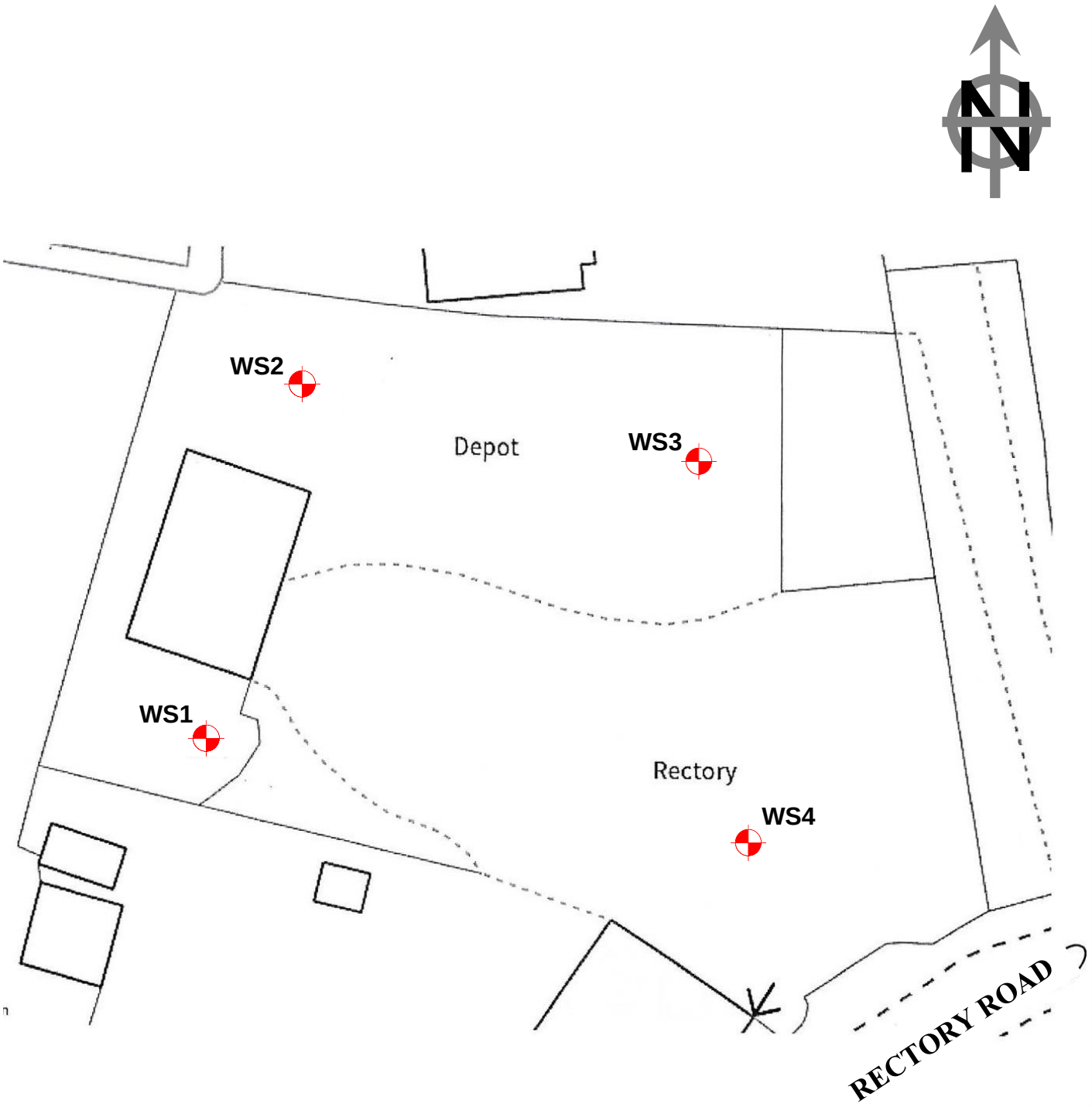
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Project No.
128775

Exploratory Hole Location Plan

Reproduced from a plan provided by the client.



Not to Scale

Project : Rectory Farm, Rectory Road, Tydd St. Mary

Client : Katie Fathers

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Project No.
128775

GROUND ENGINEERING LIMITED

Tel: 01733-566566
www.groundengineering.co.uk

Site: RECTORY FARM, RECTORY ROAD, TYDD ST. MARY

WINDOW SAMPLE
WS1

Date: 20/02/25

Hole Size: 87mm dia to 2.00m
77mm dia to 3.00m

Ground Level:

Samples and in-situ Tests			(Date) Water	Inst.	Description of Strata	Legend	Depth m	O.D. Level m
Depth m	Type	Result						
0.05	D1				MADE GROUND - Soft, friable, dark brown, slightly sandy, slightly gravelly, clayey SILT. Gravel of brick. Fibres/clumps of chrysotile asbestos.		0.10	
0.05	ES1				MADE GROUND - Soft, grey and brown, slightly gravelly, clayey SILT. Gravel of ash.			
0.40	D2							
0.40	ES2						0.60	
			▼s		Firm, brown and grey, slightly sandy, silty CLAY.			
0.80	D3							
0.80	ES3		▼c 1		(TIDAL FLAT DEPOSIT)		1.10	
1.20	D4				Soft, grey, silty CLAY with occasional black carbonaceous traces.			
1.20-2.00	U1							
1.20	ES4							
2.00-3.00	U2		▽ 1		(TIDAL FLAT DEPOSIT)		3.00	
					Hole completed at 3.00m depth			

REMARKS
1. Starter pit excavated to 1.20m depth
2. Gas monitoring standpipe installed to 3.00m depth

Project No
128775

Scale 1:25

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KEY
D - Disturbed Sample
B - Bulk Sample
U - Undisturbed Sample
W - Water Sample
▽ Water Strike
▼c Depth to Water on completion
J - Jar Sample
MP - Mackintosh Probe
V - Vane Shear Test Cohesion ( ) kPa
P( ) - Hand Penetrometer Cohesion ( ) kPa
▼s Standpipe Level

Groundwater Strikes						Groundwater Observations			
	Depth m						Depth m		
No	Struck	Rose to	Rate	Cased	Sealed	Date	Hole	Casing	Water
1	2.00	1.00				20/02/25	3.00		1.00
						03/03/25	3.00	1.00	0.77

GROUND ENGINEERING LIMITED

Tel: 01733-566566
www.groundengineering.co.uk

Site: RECTORY FARM, RECTORY ROAD, TYDD ST. MARY

WINDOW SAMPLE
WS2

Date: 20/02/25

Hole Size: 67mm dia to 2.00m
57mm dia to 3.00m

Ground Level:

Samples and in-situ Tests			(Date) Water	Description of Strata	Legend	Depth m	O.D. Level m
Depth m	Type	Result					
0.05	D1			MADE GROUND - Soft, friable, dark grey and dark brown, slightly sandy, slightly gravelly, silty, organic CLAY with abundant humic material. Gravel of flint, brick and metal.		0.10	
0.05	ES1			MADE GROUND - Firm, brown and grey, slightly sandy, slightly gravelly, silty CLAY. Gravel of brick and flint.			
0.30	D2					0.40	
0.30	ES2			Soft, brown, orange brown and grey, slightly sandy, silty CLAY with occasional brown silt partings.			
0.60	D3						
0.90	D4		1	(TIDAL FLAT DEPOSIT)			
1.20	D5						
1.20-2.00	U1					1.40	
				Soft, grey, silty CLAY.			
2.00-3.00	U2		1				
				(TIDAL FLAT DEPOSIT)		3.00	
				Hole completed at 3.00m depth			

REMARKS 1. Starter pit excavated to 1.20m depth

Project No 128775

Scale 1:25

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KEY

D - Disturbed Sample
B - Bulk Sample
U - Undisturbed Sample
W - Water Sample
▽ Water Strike
▼c Depth to Water on completion
J - Jar Sample
MP - Mackintosh Probe
V - Vane Shear Test Cohesion ( ) kPa
P( ) - Hand Penetrometer Cohesion ( ) kPa
▼s Standpipe Level

Groundwater Strikes

No	Depth m Struck	Rose to	Rate	Cased	Sealed
1	2.00	1.00			

Groundwater Observations

Date	Depth m Hole	Casing	Water
20/02/25	3.00		1.00

GROUND ENGINEERING LIMITED

Tel: 01733-566566
www.groundengineering.co.uk

Site: RECTORY FARM, RECTORY ROAD, TYDD ST. MARY

WINDOW SAMPLE
WS3

Date: 20/02/25

Hole Size: 67mm dia to 2.00m
57mm dia to 3.00m

Ground Level:

Samples and in-situ Tests			(Date) Water	Description of Strata	Legend	Depth m	O.D. Level m
Depth m	Type	Result					
0.05	D1			MADE GROUND - Dark brown, slightly clayey, sandy GRAVEL. Gravel of limestone and flint.		0.10	
0.05	ES1			MADE GROUND - Firm, brown and grey, slightly sandy, slightly gravelly, silty CLAY. Gravel of ash and brick.		0.30	
0.20	D2			Light brown and orange brown, silty, fine SAND.			
0.20	ES2						
0.50	D3						
0.50	ES3			(TIDAL FLAT DEPOSIT)			
0.80	D4					0.90	
				Firm, grey, brown and orange brown, slightly sandy, silty CLAY.			
1.20	D5			(TIDAL FLAT DEPOSIT)			
1.20-2.00	U1					1.40	
				Soft, grey, silty CLAY.			
2.00-3.00	U2						
				(TIDAL FLAT DEPOSIT)			
						3.00	
				Hole completed at 3.00m depth			

REMARKS 1. Starter pit excavated to 1.20m depth

Project No 128775

Scale 1:25 | Page 1/1

KEY
D - Disturbed Sample
B - Bulk Sample
U - Undisturbed Sample
W - Water Sample
▽ Water Strike
▼c Depth to Water on completion
J - Jar Sample
MP - Mackintosh Probe
V - Vane Shear Test Cohesion ( ) kPa
P( ) - Hand Penetrometer Cohesion ( ) kPa
▼s Standpipe Level

Groundwater Strikes						Groundwater Observations			
	Depth m						Depth m		
No	Struck	Rose to	Rate	Cased	Sealed	Date	Hole	Casing	Water
						20/03/25	3.00		dry

GROUND ENGINEERING LIMITED

Tel: 01733-566566
www.groundengineering.co.uk

Site: RECTORY FARM, RECTORY ROAD, TYDD ST. MARY

WINDOW SAMPLE
WS4

Date: 20/02/25

Hole Size: 67mm dia to 2.00m
57mm dia to 3.00m

Ground Level:

Samples and in-situ Tests			(Date) Water	Inst.	Description of Strata	Legend	Depth m	O.D. Level m
Depth m	Type	Result						
0.20	D1				MADE GROUND - Red brown, silty, sandy GRAVEL. Gravel of brick, concrete, flint and quartzite. Fibres/clumps of chrysotile asbestos.			
0.20	ES1						0.30	
0.50	D2				MADE GROUND - Dark brown, silty, sandy GRAVEL. Gravel of concrete and brick. Fibres/clumps of chrysotile asbestos.			
0.50	ES2						0.60	
0.80	D3				Firm, grey, slightly sandy, silty CLAY with a mild hydrocarbon odour.			
0.80	ES3		▼s					
1.20	D4				(TIDAL FLAT DEPOSIT)			
1.20-2.00	U1							
1.20	ES4						1.35	
					Soft, grey, silty, slightly organic CLAY with occasional black carbonaceous traces.			
2.00-3.00	U2							
					(TIDAL FLAT DEPOSIT)			
			▽1				3.00	
					Hole completed at 3.00m depth			

REMARKS
1. Starter pit excavated to 1.20m depth
2. Gas monitoring standpipe installed to 3.00m depth

Project No
128775

Scale 1:25

Page 1/1

KEY
D - Disturbed Sample
B - Bulk Sample
U - Undisturbed Sample
W - Water Sample
▽ Water Strike
▼c Depth to Water on completion
J - Jar Sample
MP - Mackintosh Probe
V - Vane Shear Test Cohesion ( ) kPa
P( ) - Hand Penetrometer Cohesion ( ) kPa
▼s Standpipe Level

Groundwater Strikes

No	Struck (Depth m)	Rose to (Depth m)	Rate	Cased	Sealed
1	3.00		seepage		

Groundwater Observations

Date	Depth m Hole	Depth m Casing	Depth m Water
20/02/25	3.00		dry
03/03/25	3.00	1.00	1.02

APPENDIX 1

CHEMICAL TEST RESULTS

Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	25-06770-1
Initial Date of Issue:	07-Mar-2025
Re-Issue Details:	
Client	Lucion Ground Engineering Limited
Client Address:	Newark Road Peterborough Cambridgeshire PE1 5UA
Contact(s):	Ashley Murdoch Admin
Project	128775 Rectory Farm

Quotation No.:	Q25-37507	**Date Received:**	26-Feb-2025
Order No.:	20028	**Date Instructed:**	26-Feb-2025
No. of Samples:	9		
Turnaround (Wkdays):	5	**Results Due:**	04-Mar-2025
Date Approved:	07-Mar-2025		

Approved By:



Details: David Smith, Technical Director

For details about application of accreditation to specific matrix types, please refer to the Table at the back of this report

Results - Soil

Project: 128775 Rectory Farm

Client: Lucion Ground Engineering Limited				**Chemtest Job No.:**		25-06770	25-06770	25-06770	25-06770	25-06770	25-06770	25-06770
Quotation No.: Q25-37507				**Chemtest Sample ID.:**		1939356	1939357	1939358	1939359	1939360	1939361	1939362
Order No.: 20028				Client Sample Ref.:		1	2	D3	1	2	1	2
				Sample Location:		WS1	WS1	WS2	WS3	WS3	WS4	WS4
				Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		0.05	0.40	0.30	0.10	0.20	0.20	0.50
				Bottom Depth (m):				0.60				
				Date Sampled:		20-Feb-2025	20-Feb-2025	20-Feb-2025	20-Feb-2025	20-Feb-2025	20-Feb-2025	20-Feb-2025
				Asbestos Lab:		DURHAM		DURHAM	DURHAM		DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**							
pH at 20C		M	2010		4.0	9.8	8.3	8.0		7.6	8.4	
Moisture		N	2030	%	0.020	16	18	18		19	7.7	
Stones and Removed Materials		N	2030	%	0.020	< 0.020	< 0.020	< 0.020		< 0.020	< 0.020	
Boron (Hot Water Soluble)		M	2120	mg/kg	0.40	0.94	1.7	2.8		3.4	0.96	
Sulphate (2:1 Water Soluble) as SO4		M	2120	g/l	0.010	0.017	< 0.010	0.38		0.74	0.33	
Cyanide (Free)		M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50		< 0.50	< 0.50	
Cyanide (Total)		M	2300	mg/kg	0.50	1.4	< 0.50	0.50		< 0.50	< 0.50	
Sulphide (Easily Liberatable)		N	2325	mg/kg	0.50	2.8	1.9	3.1		11	4.7	
Arsenic		M	2455	mg/kg	0.5	25	12	12		8.6	11	
Cadmium		M	2455	mg/kg	0.10	0.66	0.23	0.54		< 0.10	0.18	
Chromium		M	2455	mg/kg	0.5	37	22	25		16	21	
Copper		M	2455	mg/kg	0.50	55	31	36		7.8	46	
Mercury		M	2455	mg/kg	0.05	0.31	0.28	0.31		0.20	0.19	
Nickel		M	2455	mg/kg	0.50	40	22	25		17	16	
Lead		M	2455	mg/kg	0.50	190	230	89		10	33	
Selenium		M	2455	mg/kg	0.25	0.80	0.48	0.55		0.29	0.40	
Zinc		M	2455	mg/kg	0.50	320	120	230		38	79	
Chromium (Hexavalent)		N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50		< 0.50	< 0.50	
Organic Matter		M	2625	%	0.40	7.2	3.5	3.6		5.0	2.2	
Acenaphthene		M	2700	mg/kg	0.10	0.54	< 0.10	< 0.10		< 0.10	< 0.10	
Acenaphthylene		M	2700	mg/kg	0.10	0.16	< 0.10	< 0.10		< 0.10	< 0.10	
Anthracene		M	2700	mg/kg	0.10	1.5	0.12	< 0.10		< 0.10	< 0.10	
Benzo[a]anthracene		M	2700	mg/kg	0.10	4.2	0.76	< 0.10		0.17	0.90	
Benzo[a]pyrene		M	2700	mg/kg	0.10	3.3	0.73	< 0.10		< 0.10	0.94	
Benzo[b]fluoranthene		M	2700	mg/kg	0.10	4.5	0.71	< 0.10		< 0.10	1.4	
Benzo[g,h,i]perylene		M	2700	mg/kg	0.10	2.7	0.45	< 0.10		< 0.10	1.2	
Benzo[k]fluoranthene		M	2700	mg/kg	0.10	2.4	0.68	< 0.10		< 0.10	0.81	
Chrysene		M	2700	mg/kg	0.10	5.8	0.78	< 0.10		0.22	1.5	
Dibenz(a,h)Anthracene		M	2700	mg/kg	0.10	0.66	0.17	< 0.10		< 0.10	0.24	
Fluoranthene		M	2700	mg/kg	0.10	10	1.4	0.54		0.49	1.3	
Fluorene		M	2700	mg/kg	0.10	0.40	< 0.10	< 0.10		< 0.10	< 0.10	
Indeno(1,2,3-c,d)Pyrene		M	2700	mg/kg	0.10	1.9	0.53	< 0.10		< 0.10	0.77	
Naphthalene		M	2700	mg/kg	0.10	0.70	< 0.10	< 0.10		< 0.10	< 0.10	
Phenanthrene		M	2700	mg/kg	0.10	7.7	0.61	< 0.10		< 0.10	0.49	
Pyrene		M	2700	mg/kg	0.10	9.9	1.5	0.62		0.63	1.4	
Total Of 16 PAH's		M	2700	mg/kg	2.0	56	8.4	< 2.0		< 2.0	11	

Results - Soil

Project: 128775 Rectory Farm

Client: Lucion Ground Engineering Limited				**Chemtest Job No.:**		25-06770	25-06770	25-06770	25-06770	25-06770	25-06770	25-06770
Quotation No.: Q25-37507				**Chemtest Sample ID.:**		1939356	1939357	1939358	1939359	1939360	1939361	1939362
Order No.: 20028				Client Sample Ref.:		1	2	D3	1	2	1	2
				Sample Location:		WS1	WS1	WS2	WS3	WS3	WS4	WS4
				Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		0.05	0.40	0.30	0.10	0.20	0.20	0.50
				Bottom Depth (m):				0.60				
				Date Sampled:		20-Feb-2025	20-Feb-2025	20-Feb-2025	20-Feb-2025	20-Feb-2025	20-Feb-2025	20-Feb-2025
				Asbestos Lab:		DURHAM		DURHAM	DURHAM		DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**							
Total Phenols		M	2920	mg/kg	0.10	< 0.10	< 0.10	< 0.10		< 0.10	< 0.10	
ACM Type		N	2192		N/A	Fibres/Clumps		-	-		Fibres/Clumps	Fibres/Clumps
Asbestos Identification		U	2192		N/A	Chrysotile		No Asbestos Detected	No Asbestos Detected		Chrysotile	Chrysotile
Soil Colour		N	2040		N/A	Brown	Brown	Brown		Brown	Brown	
Other Material		N	2040		N/A	Stones, Roots and leaf	Stones and Roots	Stones and Roots		Roots	Stones and brick	
Soil Texture		N	2040		N/A	Loam	Clay	Clay		Clay	Sand	
Total TPH >C6-C40	EH_1D_Total	U	2670	mg/kg	10	37	16	50		< 10	92	

Results - Soil

Project: 128775 Rectory Farm

Client: Lucion Ground Engineering Limited				**Chemtest Job No.:**		25-06770	25-06770
Quotation No.: Q25-37507				**Chemtest Sample ID.:**		1939363	1939364
Order No.: 20028				Client Sample Ref.:		3	5
				Sample Location:		WS4	WS4
				Sample Type:		SOIL	SOIL
				Top Depth (m):		0.80	1.20
				Bottom Depth (m):			
				Date Sampled:		20-Feb-2025	20-Feb-2025
				Asbestos Lab:			
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**		
pH at 20C		M	2010		4.0		
Moisture		N	2030	%	0.020	18	18
Stones and Removed Materials		N	2030	%	0.020		
Boron (Hot Water Soluble)		M	2120	mg/kg	0.40		
Sulphate (2:1 Water Soluble) as SO4		M	2120	g/l	0.010		
Cyanide (Free)		M	2300	mg/kg	0.50		
Cyanide (Total)		M	2300	mg/kg	0.50		
Sulphide (Easily Liberatable)		N	2325	mg/kg	0.50		
Arsenic		M	2455	mg/kg	0.5		
Cadmium		M	2455	mg/kg	0.10		
Chromium		M	2455	mg/kg	0.5		
Copper		M	2455	mg/kg	0.50		
Mercury		M	2455	mg/kg	0.05		
Nickel		M	2455	mg/kg	0.50		
Lead		M	2455	mg/kg	0.50		
Selenium		M	2455	mg/kg	0.25		
Zinc		M	2455	mg/kg	0.50		
Chromium (Hexavalent)		N	2490	mg/kg	0.50		
Organic Matter		M	2625	%	0.40		
Acenaphthene		M	2700	mg/kg	0.10		
Acenaphthylene		M	2700	mg/kg	0.10		
Anthracene		M	2700	mg/kg	0.10		
Benzo[a]anthracene		M	2700	mg/kg	0.10		
Benzo[a]pyrene		M	2700	mg/kg	0.10		
Benzo[b]fluoranthene		M	2700	mg/kg	0.10		
Benzo[g,h,i]perylene		M	2700	mg/kg	0.10		
Benzo[k]fluoranthene		M	2700	mg/kg	0.10		
Chrysene		M	2700	mg/kg	0.10		
Dibenz(a,h)Anthracene		M	2700	mg/kg	0.10		
Fluoranthene		M	2700	mg/kg	0.10		
Fluorene		M	2700	mg/kg	0.10		
Indeno(1,2,3-c,d)Pyrene		M	2700	mg/kg	0.10		
Naphthalene		M	2700	mg/kg	0.10		
Phenanthrene		M	2700	mg/kg	0.10		
Pyrene		M	2700	mg/kg	0.10		
Total Of 16 PAH's		M	2700	mg/kg	2.0		

Results - Soil

Project: 128775 Rectory Farm

Client: Lucion Ground Engineering Limited				**Chemtest Job No.:**		25-06770	25-06770
Quotation No.: Q25-37507				**Chemtest Sample ID.:**		1939363	1939364
Order No.: 20028				Client Sample Ref.:		3	5
				Sample Location:		WS4	WS4
				Sample Type:		SOIL	SOIL
				Top Depth (m):		0.80	1.20
				Bottom Depth (m):			
				Date Sampled:		20-Feb-2025	20-Feb-2025
				Asbestos Lab:			
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**		
Total Phenols		M	2920	mg/kg	0.10		
ACM Type		N	2192		N/A		
Asbestos Identification		U	2192		N/A		
Soil Colour		N	2040		N/A	Brown	Brown
Other Material		N	2040		N/A	None	None
Soil Texture		N	2040		N/A	Clay	Clay
Total TPH >C6-C40	EH_1D_Total	U	2670	mg/kg	10	260	1600

Test Methods

SOP	Title	Parameters included	Method summary	Water Accred.
2010	pH Value of Soils	pH at 20°C	pH Meter	
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <30°C.	
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930	
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES	
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry	
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.	
2325	Sulphide in Soils	Sulphide	Steam distillation with sulphuric acid / analysis by 'Aquakem 600' Discrete Analyser, using N,N–dimethyl-p-phenylenediamine.	
2455	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.	
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.	
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.	
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID	
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)	
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.	

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NEW_ASB	Eurofins Chemtest Limited, 11 Depot Road, Newmarket, CB8 0AL
DURHAM	Eurofins Chemtest Limited, Unit A North Wing, Prospect Business Park, Crookhall Lane, Consett, Co Durham, DH8 7PW

Sample Deviation Codes

As a result of any of the below deviations applying, the test results may be unreliable

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - The required amount of sample for analysis was not received
H - Appropriate cooling measures were not taken for sample transportation

Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt.
All water samples will be retained for 14 days from the date of receipt.
Charges may apply to extended sample storage.

Report Information

Water Sample Category Key for Accreditation

DW - Drinking Water
GW - Ground Water
LE - Land Leachate
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PL - Prepared Leachate
PW - Processed Water
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2D - GC-GC – Double coil gas chromatography
#1 - EH_2D_Total but with humics mathematically subtracted
#2 - EH_2D_Total but with fatty acids mathematically subtracted
+ - Operator to indicate cumulative e.g. EH+EH_Total or EH_CU+HS_Total

Asbestos Tests LOD = LOQ

Limit of Detection = Limit of Quantification for asbestos results only

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	25-07520-1
Initial Date of Issue:	10-Mar-2025
Re-Issue Details:	
Client	Lucion Ground Engineering Limited
Client Address:	Newark Road Peterborough Cambridgeshire PE1 5UA
Contact(s):	Admin Ashley Murdoch
Project	128775 Rectory Farm

Quotation No.:	Q24-36851	**Date Received:**	05-Mar-2025
Order No.:	20176	**Date Instructed:**	05-Mar-2025
No. of Samples:	1		
Turnaround (Wkdays):	5	**Results Due:**	11-Mar-2025
Date Approved:	10-Mar-2025		

Approved By:



Details: David Smith, Technical Director

For details about application of accreditation to specific matrix types, please refer to the Table at the back of this report

Results - Water

Project: 128775 Rectory Farm

Client: Lucion Ground Engineering Limited				**Chemtest Job No.:**		25-07520
Quotation No.: Q24-36851				**Chemtest Sample ID.:**		1942464
Order No.: 20176				Client Sample Ref.:		1
				Sample Location:		WS4
				Sample Type:		WATER
				Sample Sub Type:		Ground Water
				Top Depth (m):		1.02
				Date Sampled:		03-Mar-2025
				Time Sampled:		10:30
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**	
Aliphatic TPH >C5-C6	EH_2D_AL_#1	N	1675	µg/l	0.10	8.0
Aliphatic TPH >C6-C8	EH_2D_AL_#1	N	1675	µg/l	0.10	< 0.10
Aliphatic TPH >C8-C10	EH_2D_AL_#1	N	1675	µg/l	0.10	12
Aliphatic TPH >C10-C12	EH_2D_AL_#1	N	1675	µg/l	0.10	< 0.10
Aliphatic TPH >C12-C16	EH_2D_AL_#1	N	1675	µg/l	0.10	< 0.10
Aliphatic TPH >C16-C21	EH_2D_AL_#1	N	1675	µg/l	0.10	25
Aliphatic TPH >C21-C35	EH_2D_AL_#1	N	1675	µg/l	0.10	< 0.10
Aliphatic TPH >C35-C44	EH_2D_AL_#1	N	1675	µg/l	0.10	< 0.10
Total Aliphatic Hydrocarbons	EH_2D_AL_#1	N	1675	µg/l	5.0	45
Aromatic TPH >C5-C7	EH_2D_AR_#1	N	1675	µg/l	0.10	150
Aromatic TPH >C7-C8	EH_2D_AR_#1	N	1675	µg/l	0.10	5.4
Aromatic TPH >C8-C10	EH_2D_AR_#1	N	1675	µg/l	0.10	47
Aromatic TPH >C10-C12	EH_2D_AR_#1	N	1675	µg/l	0.10	12
Aromatic TPH >C12-C16	EH_2D_AR_#1	N	1675	µg/l	0.10	< 0.10
Aromatic TPH >C16-C21	EH_2D_AR_#1	N	1675	µg/l	0.10	< 0.10
Aromatic TPH >C21-C35	EH_2D_AR_#1	N	1675	µg/l	0.10	42
Aromatic TPH >C35-C44	EH_2D_AR_#1	N	1675	µg/l	0.10	< 0.10
Total Aromatic Hydrocarbons	EH_2D_AR_#1	N	1675	µg/l	5.0	260
Total Petroleum Hydrocarbons	EH_2D_Total_#1	N	1675	µg/l	10	310

Test Methods

SOP	Title	Parameters included	Method summary	Water Accred.
1675	TPH Aliphatic/Aromatic split in Waters by GC-FID(cf. Texas Method 1006 / TPH CWG)	Aliphatics: >C5–C6, >C6–C8, >C8– C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Pentane extraction / GCxGC FID detection	

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