Supplementary Geoenvironmental Appraisal

Land at Crossley Lane, Dalton

For Harron Homes Yorkshire

Report no:	3435/1
Date:	March 2020

SUMMARY OF GEOENVIRONMENTAL ISSUES

Job No.	3435	**Site area/ha**	8.6
Client:	Harron Homes Yorkshire	**NGR:**	SE 174 173
Site:	Crossley Lane, Dalton	**Nearest postcode:**	HD5 0QP

The site is located off Crossley Lane, approximately 3km east of Huddersfield town centre, and currently comprises 3 relatively flat parcels of land:

- Area A (2.55ha) - previously undeveloped area of rough grass in the southwest.
- Areas B1 & B2 (5.2 ha) - previously occupied by a gas & dye works and Minerva Works (north & south of Crossley Lane respectively). Now predominantly overgrown concrete hardstand.
- Area C (0.89 ha) - former industrial building (built in 1970s) in the north-west, to the west of Cold Royd Lane.

More recently the site has been used for the manufacture of tiles.

A c. 7m high retaining wall, and steep slope, are present on the northern boundary, with a surface watercourse flowing west immediately beyond the southern boundary.

Lithos were commissioned by Harron to provide a geoenvironmental appraisal of the site, which it is understood is to be redeveloped with 193 no. two storey domestic dwellings, associated gardens, POS and adoptable roads and sewers. Lithos' investigation included a review of 3rd party reports, the site's history and environmental setting, and a ground investigation comprising 34 trial pits, 15 dynamic sampling boreholes and 7 cable percussive boreholes.

A summary of salient geoenvironmental issues is provided in the table below.

Issue	Remarks
Made ground	Made ground is present across the majority of the site (none present in the southwest) to depths of up to 3.3m (average 1.4m). Made ground typically comprised handstand (concrete/tarmac) underlain by Sub-base, Cohesive & Granular Made Ground, Ash & Clinker and Reworked Natural Ground. The deepest made ground is present in the southeast beneath a former industrial building, and within the vicinity of the former gas works.
Natural ground	Natural strata is highly variable across the site. Head deposits (firm to stiff clay) are present in the northwest, southwest and centre north. In the centre and southeast, alluvium (soft clay, peat and loose sand/gravel) is present to depths in excess of 3m. Deeper ground comprises Glaciofluvial Deposits encountered as medium dense sand & gravel and stiff clay. Mudstone bedrock is present at depths of between 6.3m and 9.2m depth, typically deeper in the south.
Contamination	Arsenic-contaminated Topsoil identified in Area A. Further bioaccessibility testing is required to assess suitability for reuse. Elevated concentrations of inorganic determinants and high pH recorded in made ground across Areas B1, B2 & C. Made ground in gardens should be isolated below a 600mm clean cover, with an additional 150mm break layer. Although low level organic contamination has been recorded in soils in Areas B1 & B2, more extensive visual and olfactory evidence of contamination was identified during fieldwork. Groundwater and surface water sampling should be undertaken to provide an indication of the extent of impact. A former lagoon, drain and tar well (Area B2), as well and known fuel tanks (Area B1) will require decommissioning, excavation and treatment / disposal from site.
Mining & quarrying	The site is located within a Coal Mining Development Low Risk Area. There are no known quarries on, or within 50m of the site.
Hazardous gas	Hazardous gas and vapour monitoring are ongoing, and a ground gas risk assessment will be issued on completion of this.
Preparatory works	General site clearance including clearance of vegetation, demolition of existing building in the east and grubbing up of hardstand. Above and underground tanks will require decommissioning and removing. Turnover of the full thickness of made ground to remove obstructions and contamination. Raising of site levels and provision of a minimum 600mm thick cover layer of 'clean' soils plus 150mm "hard dig" layer in all garden and landscaped areas underlain by made ground.

This brief summary should not be assumed to represent a complete account of all the potential geo-environmental issues that may exist at the site. As such it is strongly recommended that the report be read in its entirety.

SUMMARY OF GEOENVIRONMENTAL ISSUES

Job No.	3435	**Site area/ha**	8.6
Client:	Harron Homes Yorkshire	**NGR:**	SE 174 173
Site:	Crossley Lane, Dalton	**Nearest postcode:**	HD5 0QP

Issue	Remarks
Foundations	Approximately 10% of plots in the west will be founded on strip/trench-fill footings; 0.75m wide at 1.0m in granular soils and 0.6m wide at 0.9m in cohesive soils. Approximately 15% of plots in the southwest and northwest will either be founded on deep trench-fill footings at c. 2.5m depth, or possible piles depending on tree influence. About 75% of plots across the remaining area will require piled foundations, end-bearing on bedrock at c. 9m depth.
Groundwater & excavations	Based on observations made during the investigation, and subsequent groundwater monitoring, groundwater is likely to be encountered across the site at less than 2m depth. The stability of even shallow excavations is likely to be poor, most notably in saturated granular soils and made ground, and therefore allowances should be made for shoring.
Flooding & drainage	The centre and west of the site lie within Flood Zone 3 (but benefits from flood defences) and the east lies within Flood Zones 2 & 3.
Highways	Made ground is present across the majority of the site, typically to depths of around 1.4m, and consultation with the adopting authority, regarding the specification of the highways, is strongly recommended. Where made ground is present it should be excavated and either replaced with suitable aggregate, or screened, to allow selection of suitable material, before being replaced in engineered layers. Where the made ground is re-engineered it is considered that a CBR value of at least 3% should be achievable. However, this should be verified by field trials. Land in the west is underlain by shallow cohesive soils. Based on visual inspection of the shallow natural materials and published guidance, the firm to stiff clay should provide a CBR value of at least 2%. This value should be verified prior to or during construction.

Significant developer abnormals relating to geoenvironmental issues at the site are:

- Significant evidence of contamination has been identified in the southeast and centre, and a tar well associated with the former gas works is present in the southeast.
- Demolition of existing building and grubbing up of hardstand.
- Ground improvement – turnover of the full thickness of made ground, in order to deal with contamination and remove buried obstructions.
- Significant areas of deep made ground and/or 'poor ground' will require piling of about 75% of plots.

Some further work is required, most notably:

- Groundwater and surface water sampling should be undertaken to assess risks to the aquifer and controlled waters. Following this, a detailed quantitative risk assessment should be produced to give site-specific screening values for use in remediation.

This brief summary should not be assumed to represent a complete account of all the potential geo-environmental issues that may exist at the site. As such it is strongly recommended that the report be read in its entirety.

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\# Some of this data is not included within the paper or PDF copies of this report; by request, it can be provided electronically.

FOREWORD (geoenvironmental appraisal report)

This report has been prepared for the sole internal use and reliance of the Client named on page 1. This report shall not be relied upon or transferred to any other parties without the express written authorisation of Lithos Consulting Limited (Lithos); such authorisation not to be unreasonably withheld. If any unauthorised third party comes into possession of this report, they rely on it at their peril and the authors owe them no duty of care and skill.

This report has been reviewed by a Competent Person, as defined in the National Planning Policy Framework. We ensure that all projects are managed by individuals with necessary experience, relevant qualifications, and current membership of a relevant professional organisation. Records of engineers, project managers and reviewers involved in this project are maintained by us. Lithos QA/QC procedures for all our work forms an integral part of our ISO9001 accreditation and as such is regularly audited.

The report presents observations and factual data obtained during our site investigation and provides an assessment of geoenvironmental issues with respect to information provided by the Client regarding the proposed development. Further advice should be sought from Lithos prior to significant revision of the development proposals.

The report should be read in its entirety, including all associated drawings and appendices. Lithos cannot be held responsible for any misinterpretations arising from the use of extracts that are taken out of context. However, it should be noted that in order to keep the number of sheets of paper in the hard copy to a minimum, some information (e.g. full copy of the Landmark/Groundsure Report) is not included in the pdf, by request, it can be provided on a CD.

The findings and opinions conveyed in this report (including review of any third-party reports) are based on information obtained from a variety of sources as detailed within this report, and which Lithos believes are reliable. Reasonable care and skill has been applied in examining the information obtained. Nevertheless, Lithos cannot and does not guarantee the authenticity or reliability of the information it has relied upon.

The report represents the findings and opinions of experienced geoenvironmental consultants. Lithos does not provide legal advice and the advice of lawyers may also be required.

Intrusive investigation can only investigate shallow ground beneath a small proportion of the total site area. It is possible therefore that the intrusive investigation undertaken by Lithos, whilst fully appropriate, may not have encountered all significant subsurface conditions. Consequently, no liability can be accepted for conditions not revealed by the exploratory holes. Any opinion expressed as to the possible configuration of strata between or below exploratory holes is for guidance only and no responsibility is accepted as to its accuracy

It should be borne in mind that the timescale over which the investigation was undertaken may not allow the establishment of equilibrium groundwater levels. Particularly relevant in this context is that groundwater levels are susceptible to seasonal and other variations and may be higher during wetter periods than those encountered during this commission.

Where the report refers to the potential presence of invasive weeds such as Japanese Knotweed, or the presence of asbestos containing materials, it should be noted that the observations are for information only and should be verified by a suitably qualified expert.

This report assumes that ground levels will not change significantly from those existing at present and that houses will be of two storey construction. If this is not to be the case, then some modification to this report may be required.

Lithos cannot be responsible for the consequences of changing practices, revisions to waste management legislation etc that may affect the viability of proposed remediation options.

Lithos reserve the right to amend their conclusions and recommendations in the light of further information that may become available.

SUPPLEMENTARY
GEOENVIRONMENTAL APPRAISAL
of land at
CROSSLEY LANE, DALTON

1 INTRODUCTION

1.1 The commission and brief

1.1.1 Lithos Consulting Limited were commissioned by Harron Homes Yorkshire to carry out a geoenvironmental appraisal of land off Crossley Lane, Dalton.

1.1.2 Correspondence regarding Lithos' appointment, including the brief for this investigation, is included in Appendix C. The agreed scope of works included:

- A review of third party reports
- A site walkover and inspection
- An assessment of the land use history
- Determination of the site's environmental setting
- An intrusive ground investigation comprising 34 trial pits, 15 dynamic sampling boreholes and 7 cable percussive boreholes
- Assessment of the geotechnical properties of the near surface deposits to enable provision of foundation and highway recommendations
- A qualitative assessment of contamination risks
- Recommendations for the necessary site preparatory and remediation works

1.1.3 Primary aims of this investigation were to:

- supplement work already undertaken at the site by ARP (see Section 5)
- identify salient geoenvironmental issues affecting the site to support the submission of a planning application
- enable Harron to obtain budget costs for: foundations; gas protection measures; and site preparatory and remediation works.

1.2 The proposed development

1.2.1 It is understood that consideration is being given to redevelopment of the site with 193 no. two storey domestic dwellings, associated gardens, POS and adoptable roads and sewers.

1.2.2 A site layout has been provided by Harron (Drawing reference 493-03 Rev. F, dated 24th February 2020) which is reproduced as Drawing 3435/102 in Appendix B to this report.

1.3 Report format and limitations

1.3.1 All standard definitions, procedures and guidance are contained within Appendix A, which includes background, generic information on:

- Assessment of the site's environmental setting
- Ground investigation fieldwork
- Geotechnical testing
- Contamination testing
- Hazardous gas

1.3.2 General notes and limitations relevant to all Lithos geoenvironmental investigations are described in the Foreword and should be read in conjunction with this report. The text of the report draws specific attention to any modification to these procedures and to any other special techniques employed.

1.3.3 In accordance with the agreed scope of works, the ground investigation reported here is not fully compliant with Eurocode 7 (EC7) and this report does not purport to be a Ground Investigation Report, nor a Geotechnical Design Report as defined by EC7. The ground appraisal, parametric assessment and preliminary design guidance presented are intended to assist others as they prepare the design of the proposed works.

2 SITE DESCRIPTION

2.1 General

2.1.1 The site’s location is shown on Drawing 3435/101 presented in Appendix B to this report. Site details are summarised in the table below.

Detail	**Remarks**
Location	3 km east of Huddersfield town centre
NGR	SE 174 173
Approximate area	8.6 ha (21.3 acres)
Known services	Underground electric, water, sewer, fibre optic and telecom Overhead telecom

2.2 Site features

2.2.1 Lithos completed a walkover survey of the site on 15th January 2020.

2.2.2 The site is split by Crossley Lane, running east-west and Cold Royd Lane running north-south and can be divided into 4 areas based on current features, as shown on Drawing 3435/103 in Appendix B.

2.2.3 **Area A** in the southwest is relatively flat rough grassland some areas of dense vegetation and (semi)mature trees. It is accessed from adjacent land to the east. A metal pylon and overhead electric cables are present in the far south.

2.2.4 Localised areas of boggy ground were noted in the centre and trodden footpaths cross the area. A raised footpath is situated immediately beyond the southern boundary with Lee Head Beck (stream, flowing to the west) beyond.

2.2.5 Along the south, running parallel to Lees Head Beck are flood defences comprising a c. 1.0m high grassed bund.

2.2.6 **Area B2** comprises a relatively flat parcel of land spilt over two levels and predominantly covered by hardstand. The far south is covered by dense vegetation and (semi)mature trees with Ox Field Beck (stream) immediately beyond the southern boundary.

2.2.7 The area is accessed off Crossley Lane to the north, via 3 former gated entrances which are now secured by earth bunds.

2.2.8 The far west is covered by tarmac and concrete hardstand and is approximately 1.2m below the centre and east of the area. The tarmacked area looks to be a former car park. Small 'bays' constructed with sandstone walls (c. 1m high), are located in the southwest, probably formerly used for storage. Piles of general waste were noted here.

2.2.9 The centre and east are covered by concrete hardstand, the majority of which appears to be former building floor slabs. There are sporadic bushes growing across this area. A large stockpile of demolition rubble (bricks, concrete blocks etc) is present in the centre and small amount of household waste has been dumped in the centre north. In addition, a burned-out portacabin is present in the northeast.

2.2.10 A large circular concrete base (approximately 10m in diameter) is present in the centre south. An area secured by fencing in the far east houses 3 propane gas tanks. There is also a former fuel filling pump in this area, the pipe for which extends below ground, indicating the likely presence of a former underground-storage tank.

2.2.11 Open manholes were noted in the north and east.

2.2.12 **Area B1** is accessed off Crossley Lane in the southwest and is predominantly covered by concrete hardstand. The majority of the area is relatively flat with a vertical retaining wall (c. 7m high) on the northern boundary and a steep overgrown slope (c. 1 in 2) in the northeast (former railway embankment A raised concrete platform is present in the north which is approximately 2.4m above the rest of the concrete hardstand.

2.2.13 An area of ground at the base of the steep slope in the northeast appears to have been raised with fill material (bricks, concrete blocks, etc).

2.2.14 A bunded area with two large circular tanks is present in the far west with an overgrown drainage ditch on the western boundary. The tanks are labelled calcium hydroxide suspension and ferric chloride with both displaying toxic warning signs. A smaller unlabelled tank (not bunded) is also present within the drainage ditch area.

2.2.15 The centre and east of Area B1 are heavily overgrown with bushes and (semi)mature trees, with further mature trees on the embankment that forms the northeast boundary. The west of Area B1 is partially overgrown with semimature trees on the western boundary.

2.2.16 A single storey brick building with corrugated metal roof is present in the southeast which appears to have been an electric substation. A significant amount of cement sheet was noted on the ground around the building, possibly an asbestos-containing material.

2.2.17 Large stockpiles of demolition rubble (brick, concrete blocks) are present in the west and a bund of the same material crosses northeast-southwest across the centre. Sporadic fragments of cement sheet were noted in the west.

2.2.18 Open manholes were noted across the area.

2.2.19 **Area C** comprises a relatively flat parcel of land covered by concrete hardstand in the centre with dense vegetation and trees on the north and west boundaries. Land in the northeast slopes up to the east and is covered by overgrown rough grass.

2.2.20 Saplings and semimature trees were noted growing through the concrete hardstand. A number of stockpiles of concrete and possibly excavated material are present in the centre.

2.2.21 The area is accessed off Cold Royd Lane in the east with an earth bund and bollards securing the eastern boundary. Footprints of houses are present in the east, with footings exposed and blockwork in place up to 1m high. Sporadic fragments of cement sheet were noted on the surface.

2.2.22 Existing salient features, at the time of the walkover are presented on Drawing 3435/103 in Appendix B to this report and summarised in the table below.

Feature	**Remarks**
Current Access	Off Crossley Lane and Cold Royd lane
Topography	Site is relatively flat although spilt over two 'terraces' with the west generally c. 1.5m below the east Retaining wall (c. 7m high) on northern boundary and steep slope (c. 1 in 2) in the northeast (former railway embankment).
Approximate areas	43,500m^2 concrete hardstand 39,000m^2 grass & overgrown areas 2,000m^2 tarmac hardstand 1,500m^2 gravel surfacing 50m^2 buildings 50m^2 tanks
Nature of boundaries	Mix of boundary types across site including palisade, post & wire, chain-link and heras fencing; brick walls and no physical boundary in some parts
Surrounding land uses	North – housing and allotment gardens East – Albany Road and industrial premises South – Lee Head Beck with housing beyond West – housing and POS

2.2.23 A selection of site photographs is included on Drawing 3435/105.

3 SITE HISTORY

3.1 OS plans

3.1.1 Site centred extracts from Ordnance Survey (OS) plans dating back to 1854 have been examined. Some of these plans are presented in Appendix D to this report.

3.1.2 Key changes in site history are summarised in Drawings 3435/104A to 104E in Appendix B.

3.1.3 The table below provides a summary of the salient points relating to the history of the site. It is not the intention of this report to describe in detail all the changes that have occurred on or adjacent to the site. Significant former uses/operations are highlighted in **bold** text for ease of reference.

Date	Site	Surrounding land
1854	Open fields separated by Crossley Lane (running east-west) and Cold Royd Lane (running north-south)	Lee Head Beck and Ox Field Beck immediately beyond southern boundary Open fields and small isolated residential areas in all directions Mills 100m south, east and southwest Kirkheaton village 600m northeast
1893	**Kirkheaton, Dalton & Lepton Gas Works** with buildings and gas holders in southeast **Coal Tar Colour Works** in the northeast **Railway line** shown on northern boundary	**Kirkheaton Station** and **railway sidings** located immediately east
1907	Buildings in the northeast renamed **Minerva Works (Dyeing & Bleaching)** Gas works no longer labelled and gas holders not shown (buildings remain) Bowling green encroaches in to far west	Mills to the south replaced by Huddersfield Sanatorium (Infectious Disease) Mills to the southwest labelled Dyeing & Bleaching
1918	**Expansion of Minerva Works** across majority of site to the north of Crossley Lane **Additional building** shown in the southeast	Expansion of residential area to the west Goods Shed shown at train station to the east
1930	Buildings of **Minerva Works occupies entire area** to the north of Crossley Lane Additional **small buildings** shown in centre of southern parcel	Mills to the east no longer shown
1938	No significant changes	Expansion of residential area to the west
1956	Slight expansion of buildings in far north **Overhead electric cables** shown in far south	No significant changes
1958	**Small buildings** occupy north of small parcel off Cold Royd Lane	No significant changes
1961	Buildings in the south labelled Works Area of excavation (**lagoon**) shown in centre with **possible trench/drain** leading to Ox Field Beck to the south Allotment Gardens shown in the southwest	Major expansion of residential area to the southwest Large building immediately east labelled Works Mills to the southwest no longer shown
1970	Railway line on northern boundary labelled as dismantled	Kirkheaton Station no longer shown, and railway labelled as dismantled Expansion of residential area to the southeast
1976	Allotment gardens no longer shown	No significant changes
1979	**Single large building** shown in the northwest parcel adjacent to Cold Royd Lane	No significant changes
1985	**Single large building** labelled Minerva Works shown in centre and east of southern parcel with **small circular feature** adjacent to Ox Field Beck Numerous tanks labelled in the far north	Works and Coal Yard shown immediately east in place of railway station

Date	Site	Surrounding land
1993	Buildings labelled Works (no longer Minerva)	No significant changes
2000	No significant changes	Hospital to the south replaced by houses
2015	Building in the northwest parcel and majority of the buildings in the northern parcel no longer shown	No significant changes

Gas works

3.1.4 General processes undertaken at a gas works are summarised below:

3.1.5 Coal is placed in a sealed vessel, or retort contained in the **retort house**, and heated in oxygen-poor conditions by a furnace to drive of volatile compounds which produces 'dirty' gas, and coke as a by-product. The gas is contaminated with coal tar, ammonia and hydrogen cyanide amongst other compounds.

3.1.6 The 'dirty' gas was cooled in the **condenser,** which caused coal tar to fall out of the gas and form a liquor. This liquor would have been drained from the condenser to a **tar well**. Further processing of the tar to extract volatile compounds often occurred. These volatile compounds were sold to chemical industries, such as dye works. Once the volatile fraction was extracted, the coal tar was referred to as coal pitch and often remained the in tar well as waste.

3.1.7 Once the coal tar was removed, the gas was passed through a **scrubber & purifier**; usually a weak ammonia solution, or water, to remove soluble compounds such as ammonia, and phenol. This process produced an ammoniacal liquor which was also often sold as a commodity to the chemical industry. The gas was then further purified to remove hydrogen cyanide and sulphide. Pre-1880, hydrogen cyanide and sulphide were removed by passing the gas over wet lime, which produced sulphuric acid and a blue waste sludge, known as blue billy. The lime sludge was often disposed of on site or directly to water courses.

3.1.8 Post-1880 (or 1910 in small gas works) the gas was passed over iron oxide to remove the impurities producing a solid clinker waste which was easier to manage, but which had little commercial value. Spent iron oxide (when saturated with cyanide and also called blue billy) was often tipped close to the gas works.

3.1.9 In medium and large gas works, naphthalene and benzene were removed from the gas in the **benzole plant** and sold for use in other industries. However, this is unlikely to have occurred on such a small site, and was not common practice until post 1920.

3.1.10 The clean gas, or town gas, was stored in a **gas holder** before being distributed to consumers. The design of gas holders changed markedly from simple rectangular structures of wood and iron to telescopic cylindrical structures which provided additional storage. As gas works developed, early gasholders which were too small to efficiently store gas were often converted to tar wells.

3.1.11 The Kirkheaton, Dalton & Lepton Gas Works, also known as the Kirkheaton Gas Company, was founded in 1866 in order to provide gas to the surrounding villages. The company was taken over by the Huddersfield Corporation Gas Department in 1919. The date of closure is unknown, although the gas works is not identified on historic maps post 1907. The gasworks is unlikely to have continued for much longer due to the expansion of larger town gas works.

3.1.12 Given the age and size of the gas works, it is likely to have consisted of a retort house, condenser, scrubber/purifier, tar well and gas holder. Indeed, a number of rectangular buildings are shown on the 1893 OS plan, likely housing the retorts and purifiers, and circular structures which are likely to have been a gas holder and tar well.

3.1.13 The cleaning of the crude gas is likely to have used the wet lime process rather than iron oxide, and given the close proximity to Ox Field Beck, the waste lime may have been tipped directly into the stream, a common practice pre-1900. However, it is not possible to entirely discount the presence of tipped blue billy on site.

3.2 Coal tar colour works

3.2.1 Organic vapours extracted from coal tar waste produced during gas production were used extensively in the chemical industry, this included the development of dyes for textiles.

3.2.2 The main extracts of coal tar used in the dye industry were benzene, toluene, ethylbenzene, xylene, naphthalene, phenol, cresol and anthracene. These compounds were used in numerous chemical reactions to produce specific colours. New colours and new reactions were rapidly emerging to ensure the industry matched pace with changing fashion trends.

3.2.3 Coal tar dye works manufactured dyes used one, or several, of the following 11 techniques.

Method	**Description**
Sulphonation	Addition of sulphuric acid. Replaces hydrogen with SO_2HO. Final product often less toxic than original
Caustic fusion	Treatment of a sulphonated product with sodium hydroxide, replacing SO_2HO with hydroxyl group
Nitration	Addition of nitric and sulphuric acid, forming dinitro and trinitro compounds including dinitrobenzene, nitroanilines, dinitrophenol. A large volume of water is required to cool nitrified compounds.
Reduction	Acid reduction using hydrochloric acid and iron filings (to form aniline); alkaline reduction using zinc dust and caustic soda; neutral reduction using zinc dust. Filings containing arsenic were also sometimes used. Filter cake is formed in the reactor (from iron filings and zinc dust, impregnated with organic compounds and acids). This was removed by hand until post 1920 when health and safety legislation required reactors to be flushed with water, rather than manually scraped.
Chlorination	Addition of hydrochloric acid to substitute hydrogen for chlorine(s)
Alkylation	Introduction of methyl or ethyl groups into a hydroxy or amido group such as dimethylaniline and diethylaniline. The latter is made by treating aniline with ethyl alcohol.
Oxidation	Substances used as oxidizers are usually inorganic salts, such as sodium dichromate, sodium chlorate, permanganate, manganese dioxide or lead peroxide with an acid (hydrochloric, sulphuric or nitric). Anthraquinone, the intermediate for alizarin dyes, is produced by oxidizing anthracene with sodium dichromate.
Carboxylation	Caustic soda (sodium hydroxide) and carbon dioxide gas are reacted with phenol to produce salicylic acid, used extensively in the dye industry
Liming	Lime or chalk are added to a sulphonated product to separate one salt from another. This allows the less soluble salt to be used to produce the dye, giving a longer lasting colour
Condensation	The removal of water from a compound. Hydrochloric or sulphuric acid is sometimes used with the addition of phosphorus, zinc, sulphur or tin.
Diazotizing	Treatment of an amide (an inorganic compound derived from ammonia) or phenol with sodium nitrate or hydrochloric acid to form an azo compound.

3.2.4 Given the complexity of the dye industry and the need to continually refine chemical reaction to form new colours, the range of possible associated by-products and intermediates is vast.

3.2.5 However, within any dye manufacturing works there would have been the need for bulk storage of acids and raw chemicals (coal tar liquor), and also iron filings, zinc dust, lime, sodium hydroxide etc.

3.2.6 Some reactions were exothermic and were more likely to have been undertaken outside, but all reactions would have been carried out in reactor vessels. These could have been both above and below ground and included a mixing paddle and associated pipe work. Many reactions also required the use of water for cooling or final cleaning. Lagoons were often used for the disposal of sludge/filter cake generated after washing reactors. The wet sludge would settle in the lagoon and the excess water drained back to a nearby stream.

3.2.7 Common groups of dyes included analine, phenol derived dyes and azo (nitrogen based) dyes. Intermediates in the production of these include chlorobenzene, diphenylamine, nitrotoluene, nitronaphthalene. The manufactured dyes often occurred as a solution, but large areas were also set aside for drying to form crystals and sometimes a paste, which would later be dissolved by a solvent (water, methylated spirits or acetic acid) in a dye-bath, into which the fabric (wool, cotton, etc) could be placed.

Minerva Works

3.2.8 The Minerva Works housed Jarmain & Son Ltd, a wool processing company that was established in 1873 and initially based on land to the north of Crossley Lane. Internet research on Minerva Works indicates operations expanded in the late 1950s to Area B1, formerly occupied by the Coal Tar Colour Works (although historic maps show Minerva works on this site since 1907). The large warehouse in Area B2 was built in the late 1970s.

3.2.9 Processing involves scouring (washing) the wool in water with a detergent to remove soluble impurities such as grease, and a chemical process called carbonising to remove vegetable matter such as grass. The wool is submerged in sulphuric acid, dried and mechanically agitated to remove dust. Finally, the wool is neutralised using sodium carbonate and bleached with hydrogen peroxide in preparation for dyeing.

3.2.10 Processing of wool at the Minerva Works is likely to have used large volumes of detergents and sulphuric acid to clean the raw wool. Subsequent dyeing may have used a wide range of compounds depending on the final requirements, although no details are known about the goods produced at the Minerva Works.

3.2.11 A significant amount of water would have been required for the processing of wool and the lagoon area identified in the centre north of Area B2 (shown on Drawing 3435/104E) may have been used as a settlement area for storing liquid waste. The suspected lagoon may also have been in use during the operation of the Coal Tar Dye Works, although not shown on historic maps. The trench, which appears to run from the lagoon, to Ox Field Beck, is likely to have allowed wastewater to drain directly into the Beck.

4 ENVIRONMENTAL SETTING

4.1 General

4.1.1 Notes describing how the site's environmental setting has been assessed are included in Appendix A to this report. Extracts from the response received from Landmark are presented in Appendix E. These responses are summarised below, together with the findings of our own "desk study" investigation.

Issue	Data reviewed	Summary
Geology	1:50,000 BGS map (Sheet 77) 1:10,000 BGS map (Sheet SE11NE) Technical Report WA/00/01	Drift – Alluvium (clay, silt, sand & gravel) mapped across the south and centre. Further details in Section 4.2. Solid – Predominantly Pennine Lower Coal Measures (mudstone, siltstone & sandstone) with Elland Flags (sandstone) in the far west. Shallowest coal seam – Hard Bed Coal at about 100m depth. Strata dip – gentle (2°) to the southeast. Faults – northwest-southeast trending fault in the southeast, downthrowing to the northeast.
Mining	Coal Authority	This site is located within a Coal Mining Development Low Risk Area (within the defined coalfield, but no known defined risks have been recorded by the Coal Authority; there may still be unrecorded issues). Past and present workings - No. Opencast - No. Mine entries – None within 20m.
Quarrying	Historical OS plans	No known quarries within 50m of site.
Radon	Public Health England	The site lies in an area where between 1% and 3% of homes are estimated to be above the action level. See in Section 11.
Hydrogeology	Environment Agency Envirocheck Report	Groundwater Source Protection Zone? No. Aquifer Secondary A (Drift); Secondary A (Solid). Groundwater abstractions? Borehole abstraction in north-east of Area B1 for general industrial use. BGS records show it extends through 'gravel & clay' to c.9m, then through Shale down to c. 90m. Registered for Minerva Works. Soil leaching potential - High. Pollution incidents? None recorded within 500m.
Hydrology		Nearest watercourse(s) – Lees Head Beck/ Ox Field Beck flows west along southern boundary. Water quality – site located in Fenay Beck from Source to River Colne catchment area, currently rated as ecologically moderate and chemically good. Pollution incidents? A total of 5 Category 2 (significant) or Category 3 (minor) incidents have occurred on site between 1990 and 1992. In addition, a Category 1 (Major) incident occurred immediately west of site in 1998 with detergents/surfactants entering Fenay Beck killing up to 500 fish. Abstractions? Nearest abstraction 430m southeast from Lee Head Beck for general industrial use. Discharge consents? Nearest consent 20m west with sewage discharges (storm water overflow) entering Lees Head Beck.
Flood risk		The centre and west lies within Flood Zone 3 (but benefits from flood defences) and the south-east lies within Flood Zones 2 & 3. The remainder of the site lies in Flood Zone 1. In accordance with Chapter 10 of the National Planning Policy Framework, a site-specific flood risk assessment is required for; new development in Flood Zones 2 and 3. In addition, the Envirocheck Report indicates the potential for groundwater flooding at the surface in the southeast and centre of the site.

4.2 Geology

4.2.1 The BGS 1:10,000 geological map shows the entirety of Areas A & B2, and the south of Areas B1 & C, to be underlain by **Alluvium**. Alluvium typically comprises unconsolidated material deposited by a stream/river in the bed and on floodplains. As a consequence, it is encountered as soft sandy clay and silt, with beds of gravel and/or peat. A 'desiccated crust' can be present at surface, which can appear firm/stiff as a result of desiccation.

4.2.2 The BGS Technical Report (WA/00/01) for the area indicates that a shallow clay layer may be present as a recent floodplain deposit (Alluvium) from existing streams and rivers However, the Technical Report suggests that underlying gravels may be 'old alluvium' of unknown age. Alternatively, the gravels may have been deposited by meltwaters during glacial or periglacial periods (much older) and could therefore be of **glaciofluvial** origin.

4.2.3 The report also indicates Alluvium associated with Fenay Beck, which flows into Lees Head Beck on the southern boundary, can extend up to 300m from the watercourse.

4.2.4 In addition to the alluviual depots, the report states that '**Head'**, a clayey deposit with stones of local origin, is common across the area covered by the 1:10,000 BGS map, especially on gentle slopes, although it is only mapped where significant thicknesses are present. This is formed by periglacial solifluction (flow of waterlogged soils downslope during thawing of frozen ground) and gelifluction (type of solifluction whereby thawed soil flows downslope due to underlying frozen ground).

4.2.5 Based on the above information, it is likely the site will be underlain by softer deposits in the south (recent Alluvium) close to Lees Hall Beck and Ox Field Beck with granular material (older Alluvium/Glaciofluvial deposits) beneath. Although no drift deposits are recorded in the north of Areas B1 & C, it is possible Head deposits may be present given the sloping nature of land to the north.

4.3 Landfills

4.3.1 Known or suspected areas of landfill in the vicinity of the proposed development site are summarised below:

Location	NGR (proximity to site)	Remarks	Source of data
Land adjacent to Albany Road Bridge	SE 174 172 (20m south)	Site operated by National Rivers Authority between 199 and 1992 Accepted excavation waste from Fenay Beck	Envirocheck Report Environment Agency

4.3.2 Waste excavated from a beck is likely to be rich in organic matter which can decompose and produce hazardous gas. The landfill area is recorded to the south of Ox Field Beck which, combined with likely saturated shallow soils, may limit the potential for lateral migration of gas to the site.

5 PREVIOUS INVESTIGATION FINDINGS

5.1 General

5.1.1 Harron have provided Lithos with a copy of the following reports:

- Combined Stages 1 & 2 Desk Study & Geo-environmental Report – Land at Crossley Lane, Dalton, Huddersfield (Ref. MWD/01r1), issued by ARP in August 2016 to Minerva Works Developments Ltd.
- Combined Stages 1 & 2 Desk Study & Geo-environmental Report – Sites Four and Five, Land at Crossley Lane, Dalton, Huddersfield (Ref. MWD/01r2), issued by ARP in March 2017 to Minerva Works Developments Ltd.

5.1.2 The reports include a review of data from a Landmark Envirocheck report and historical OS maps dating back to 1854. A site walkover was also undertaken. Sections 1 to 4 of this Lithos Report include similar content to ARP's reports, but with further detail.

5.2 Summary of ARP's findings

5.2.1 ARP's ground investigation works comprised:

- Trial pits (TPs 01 to 50).
- Window sample boreholes (WSs 01 to 47).
- Monitoring wells were installed in 12 window sample boreholes, with response zones recorded as 1m to 3m depth in all holes.
- Geotechnical classification tests (Atterberg Limits, pH, soluble sulphate etc).
- Chemical laboratory tests (including metals, asbestos, TPH and VOC).
- Gas monitoring; 6 visits between August and September 2016, with atmospheric pressures in range 995mb to 1016mb (falling on two visits). Steady flows were recorded in 13 wells.

5.3 Lithos comments

5.3.1 Lithos have previously issued a high level review of the ARP reports to Harron (dated 14th January 2020), which is presented in Annex I. A summary of the key points is provided below.

5.3.2 The site is subdivided by ARP into 5 parcels (Sites 1 to 5), presumably due to land sales at the time of writing. It would be better considered (based on past use & ground conditions) as 3 parcels of land (Areas A, B & C), intersected by Cold Royd Lane running north-south and Crossley Lane running east-west. Area B is further sub-divided into Areas B1 (north of Crossley Lane) and B2 (south).

5.3.3 A large number of samples have been tested for chemical contaminants, but the testing is not bespoke to the site's previous use (for example, no cyanide or ammonia testing has been undertaken, and the TPH assessment is not robust enough to allow risk assessment for human health or controlled waters).

5.3.4 An area of grossly contaminated soils has been identified by ARP in Area B (although they state there is no risk from TPH contamination here). The potential for ground & surface water contamination has not been considered thoroughly enough.

5.3.5 Based on ARP's data, remediation requirements are likely to comprise:

- **Area A** - Greenfield area in the south-west: No significant made ground or contamination encountered and no remediation required
- **Areas B1 & B2** - Former Minerva Works, gas works and bleach & dye works: Contamination includes heavy metals, PAH, VOCs and asbestos. 600mm clean soil cover and 100mm hard dig later required in garden/landscaped areas. Excavation and treatment/disposal of contamination hotspots.
- **Area C** - Former industrial building in the north-west: Some (relatively minor) arsenic and PAH contamination. 600mm clean soil cover required in garden/landscaped areas.

5.3.6 Full turnover of the made ground is likely to be required as part of remediation. This will allow identification and treatment/removal of any further 'hot-spots' of contamination, as well as removal of obstructions and preparation of development platforms.

5.3.7 Assessment of hazardous gas risks by ARP is not considered appropriate. Additional monitoring across c. 20 locations is recommended.

5.3.8 Ground conditions encountered by ARP include significant areas of 'good' ground (medium/high strength clay and medium dense/dense granular soils), which should be suitable for the adoption of strip/trench fill foundations. However, areas of deep made ground and soft/loose soils were also encountered, most notably in the south but also more sporadically in the north. These areas will likely necessitate a piled foundation solution.

5.3.9 The only assessment of density of granular soils by ARP was done via window sampling and dynamic probing. Competent strata beneath the sands and gravels has not been proven. Additional cable percussion drilling is recommended to allow a more robust assessment of the strength/density of the natural soils, and to prove the depth to competent bedrock for pile design.

5.3.10 The area of the former gas works does not appear to have been 'targeted' by ARP.

6 GROUND INVESTIGATION DESIGN

6.1 Anticipated ground conditions & potential issues

6.1.1 Based on the data reviewed in Sections 4 (Environmental Setting) and 5 (Previous Investigation Findings), anticipated ground conditions are expected to comprise:

Anticipated condition	Remarks
Made ground	Heterogenous mix of ground types including hardstand, brickfill and ash & clinker to variable depths but typically less than 2m. Significant obstructions anticipated.
Natural soils	Alluvium comprising sandy/gravelly clay and (possibly glaciofluvial) Sand & Gravel deposits at depth
Bedrock	Coal Measures (mudstone, siltstone and sandstone) at about 8m to 10m depth
Mineworkings	Not likely to be present at shallow depth beneath site
Groundwater	Likely perched in made ground. Closer to the beck (in low-lying areas) groundwater is anticipated at shallow depth in granular deposits, likely in continuity with the adjacent watercourse.

6.1.2 Based on the data above and that in Sections 2 (Site Description) and 3 (History), potential ground-related issues associated with this site are likely to include:

Type of issue	Specific issue	Remarks
Potential on-site contamination sources	1. naturally occurring contaminants 2. above and underground storage tanks (ASTs/USTs) and reactors 3. former gas works including gas holders/tar well 4. made ground 5. railway line in far northeast 6. possible lagoon in Area B2	1. metals in the topsoil in Area A 2. leakage/spillage of fuel and chemicals associated with previous uses 3. include significant contamination including coal tar and gas holders may be backfilled with unknown materials 4. contamination associated with fill material 5. possible contamination from use as railway land 6. possible lagoon containing contaminated reactor/process generated sludge
Potential off-site contamination sources	1. landfill	1. possible source of hazardous gas
Potential geotechnical hazards	1. relict buried obstructions 2. deep made ground 3. steep slopes 4. soft/loose ground	1. associated with former buildings 2. associated with past development 3. in the northeast beyond retaining wall 4. associated with alluvial soils
Other potential constraints	1. underground and overhead utilities	1. high-pressure gas main, sewer and overhead electric cables in southwest

6.2 Preliminary conceptual site model

6.2.1 A preliminary conceptual site model, presented as Drawing 3435/106 in Appendix B, has been prepared after consideration of all the data presented in Sections 2 to 6.1 inclusive of this report.

6.2.2 An assessment of potential contaminants associated with the former uses has been undertaken with reference to CLR8 and the following DETR Industry Profiles:

- Gas works, coke works and other coal carbonisation plants
- Road vehicle fuelling, service and repair
- Railway land
- Textile works and dye works

6.2.3 As a consequence of this assessment, anticipated potential contaminants, within soil and/or groundwater include:

- Asbestos
- Organics (PAHs, fuels/oils, coal tar, solvents, benzene and benzene derivatives)
- Inorganics (heavy metals particularly zinc and arsenic)
- Cyanide
- Sulphates, hydrogen peroxide, sodium carbonate and acids
- Detergents

6.2.4 Many of the contaminants associated with the dye works and Minerva works are highly soluble and unlikely to persist for any prolonged period in soil, although an indication of impact may be obtained by significant high or low pH values. Those soluble in water may be detected in groundwater samples where a continued source is present.

6.2.5 Potential pollutant linkages are shown on the preliminary conceptual site model.

6.2.6 Of particular concern is the former gas works and gas holders/tar well to the adjacent watercourse and the potential for contaminated waters to migrate from the suspected lagoon area, via the trench, again to the watercourse.

6.2.7 Given the age of the gas holder/tar well, they are unlikely to have a concrete base. It is most likely that they are clay lined, or possibly unlined, and will probably only extend to limited depths given the likely issues associated with groundwater ingress within the shallow granular soils (as encountered by ARP).

6.2.8 Suspected gas holder/tar well, lagoon and associated trench should be targeted during the ground investigation. Groundwater and surface water monitoring should be undertaken once the results of the ground investigation have been reviewed.

6.3 Ground investigation design & strategy

6.3.1 The preliminary conceptual site model was used as a basis for design of an appropriate ground investigation, the scope of which is summarised below.

Exploratory holes	**Purpose**
About 30 trial pits	To determine the general nature of soils underlying the site, including the: • Nature, distribution and thickness of made ground • Nature, degree and extent of contamination • Proportion of undesirable elements e.g. biodegradable matter, foundations etc • Suitability of the ground for founding structures and highways
About 4 trial pits	To investigate ground conditions around the former gas works
About 7 cable percussive boreholes and 15 dynamic sample boreholes	To retrieve geotechnical data from depth and install monitoring wells across the site in order to: • Monitor for hazardous gas • Determine groundwater levels and assess flow direction • Retrieve representative groundwater samples, to determine water quality

6.3.2 Proposed exploratory hole locations were selected to supplement ARP's and to target potential areas of interest identified in Section 6.1 above. A nominal 50m grid spacing was proposed with a closer spacing (c. 20m) in areas of particular interest. Additional exploratory locations might be scheduled by the site engineer in light of the ground conditions actually encountered.

6.3.3 The number of representative samples taken will be reflective of the geological complexity actually encountered. However, about 3 samples will be taken from most trial pits.

7 FIELDWORK

7.1 Objectives

7.1.1 The original investigation strategy is outlined in Section 6.3.1 above.

7.2 Exploratory hole location constraints

7.2.1 No access was available to land in the northeast (north of the retaining wall) due to the steep topography and dense vegetation. Exploratory holes in the southwest were restricted by a foul sewer, gas main and overhead electricity pylons, but no 'hard' development is proposed here. The south-west of the site was too boggy for access with a cable percussion borehole rig.

7.3 Scope of works

7.3.1 Fieldwork was supervised by Lithos between 23rd January and 11th February 2020 and comprised the exploratory holes listed below.

Technique	**Exploratory holes**	**Final depth(s)**	**Remarks**
Trial pitting (machine dug)	TPs 101 to 134	1.4m to 4.8m	Vane tests in cohesive soils
Cable percussive boreholes	BHs 101 to 107	7.6m to 9.9m	SPTs typically at 1m centres. Monitoring wells installed in all boreholes
Dynamic sample boreholes	WSs 101 to 115	1.3m to 6.0m	Monitoring wells installed in all boreholes

7.3.2 Notes describing ground investigation techniques, in-situ testing and sampling are included in Appendix A to this report.

7.3.3 Exploratory hole logs are presented in Appendices F to H to this Report. These logs include details of the:

- Samples taken
- Descriptions of the solid strata, and any groundwater encountered.
- Results of the in-situ testing
- The monitoring wells installed

7.3.4 Exploratory hole locations are shown on Drawing 3435/107 presented in Appendix B; exploratory holes were picked-up by a surveyor and co-ordinates/ground levels are included on the logs.

8 GROUND CONDITIONS

8.1 General

8.1.1 A complete record of strata encountered beneath the proposed development site is given on the various exploratory hole records, presented in Appendices F to H.

8.1.2 The site can be divided into 3 areas based on ground conditions. These areas are shown on Drawing 3435/103 and are summarised below:

Site area	General location	Area (m²)
A	Previously undeveloped area in the southwest	25,500
B1 & B2	Land previously occupied by gas & dye works and Minerva Works (north & south of Crossley Lane respectively).	52,000
C	Small parcel of land off Cold Royd Lane	8,900

8.1.3 Typical ground conditions encountered at the site are described below in Sections 8.2 (made ground) and 8.4 (natural ground), with a summary provided in the table on pages 19 to 22.

8.2 Made ground

8.2.1 The made ground on site is a heterogeneous mixture of materials and it is unlikely, even with a huge amount of sampling, that it could be accurately characterised. Nonetheless, the bulk of the made ground can be categorised as one of 8 broad types:

- **Concrete Hardstand:** typically 200mm thick encountered across Areas B1, B2 & C with metal rebar between 5mm and 20mm thick
- **Macadam Hardstand:** encountered locally in the south of Area B1 and northwest of Area B2 with a typical thickness of 100mm
- **Sub-base:** typically sandy gravel of limestone and sandstone encountered in the majority of holes in Areas B1, B2 & C to an average depth of 0.4m (maximum 0.8m)
- **Granular Made Ground:** clayey sandy gravel of mixed lithologies (sandstone, mudstone, brick, concrete, tarmac, slag, clinker, metal, coal) with cobbles and boulders of sandstone, brick and concrete encountered in approximately half of the exploratory holes to a maximum of >2.6m (TP131), average depth of 1.1m
- **Cohesive Made Ground:** encountered in the south of Area B1 and southwest of Area B2 to a maximum depth of 2.2m (average 1.3m) comprising clay with gravel of mixed lithologies including brick, sandstone, coal and metal
- **Ash & Clinker:** black sand of ash and gravel of predominantly clinker (rare brick, sandstone and metal) encountered in the centre south of Area B1 and locally in Area B2 to between 0.6m and 1.8m depth (average 1.1m)
- **Reworked Natural Ground:** predominantly encountered in the south of Area B1 and north and centre of Area B2 up to 3.3m depth (typically less than 2.0m) comprising gravelly clay/clayey gravel of mudstone and sandstone with rare brick and ceramic
- **Brickfill:** encountered in the far north of Area B1 only (TPs 119 & 125) to a depth of greater than 2.8m and predominantly comprised cobbles and boulders of brick and concrete

8.2.2 Review of the trial pit logs suggest made ground thicknesses beneath the site vary between 0.3m and 3.3m; average 1.4m. Made ground in excess of 2m deep was encountered in 9 of the 59 exploratory holes.

8.2.3 The deepest areas of made ground were typically encountered in the southeast, beneath the former industrial building, and within the vicinity of the former gas works. Additional localised areas of deep made ground are present in the centre and northeast of Area B1.

8.2.4 Whilst not encountered during this investigation, the possibility of 'burial pits', and/or asbestos sheeting (used as shuttering), and/or fragments of asbestos sheeting within the hardcore beneath concrete slabs cannot be entirely discounted.

8.2.5 Made ground was not encountered within Area A, although ARP logged some topsoil as made ground due to the presence of rare coal, clinker and sandstone.

8.3 Obstructions

8.3.1 It is apparent from a review of historical OS Plans (see Section 3) and the site visit that buildings have been present on about 45% of the site area. Furthermore, concrete (c. 200mm thick) and macadam hardstand (c. 100mm thick) cover approximately 43,500m^2 and 2,000m^2 respectively.

8.3.2 Drawing 3435/104E shows the footprints of the former structures and Drawing 3435/103 shows the areas of hardstand.

8.3.3 Trial pits have been excavated at locations where relict foundations were anticipated (based on superimposition of the historical OS Plan on the current site layout). Obstructions encountered are summarised below:

Hole ID	Area of site/former feature	Depth	Obstruction encountered
TP109	Area B2 – Minerva Works building (1985 to 2012)	1.7m to 1.9m	Cobbles of brick – possible former floor
TP112E	Area B1 – Minerva Works buildings (1918 to 2012)	0.2m to 1.8m	Brick wall running north-south through middle of pit
TP112W		1.8m	Concrete slab
TP113	Area B1 – Minerva Works buildings (1958 to 2012)	0.5m	200mm concrete slab in south of pit
TP115	Area B1 – Minerva Works buildings (1893 to 2012)	0.2m to 1.2m	Brick wall in east of pit
TP118	Area B1 – Area of tanks associated with works (1893 to 2012)	0.3m to 2.0m	Brick walls in west and middle of pit with possible foundation at 2.0m
TP119		2.8m	Steel girders in base of pit
TP124S	Area B2 – Gas works & Minerva Works (1893 to 2012)	0.6m to >2.1m	Brick wall in south of pit
TP131		0.7m	250mm thick concrete slab in east of pit

8.3.4 Given the above, it is apparent that whilst former buildings have been demolished, substantial foundations, concrete, bases etc remain below ground.

8.3.5 In the vicinity of the former gas works, some evidence of coating and/or impregnation by oily contamination was noted on the coarse fragments (brick, concrete, etc).

8.3.6 In addition to the obstructions described above, locally the made ground comprised large oversize materials such as sandstone slabs, boulders and steel girders.

8.3.7 The depth and distribution of the in-situ relict foundations/floor slabs etc suggests that at least two "generations" of buildings are present. Drawings 3435/104A to 104E show how the site evolved between 1893 and 1993.

8.3.8 Given the redevelopment proposals, removal of obstructions and oversize will be required.

8.4 Natural ground

8.4.1 Natural ground was encountered in the majority of the exploratory holes, and typically comprised:

- **Topsoil:** clayey, friable topsoil was identified across Area A to a typical depth of 400mm
- **Cohesive Alluvium:** encountered in about half of the exploratory holes, mainly in Areas B1 & B2, as very soft to firm sandy/gravelly clay to a typical depth of 3.0m
- **Granular Alluvium:** loose to medium dense gravelly sand and sandy gravel encountered locally in the south of Areas A, B1 & C
- **Head:** typically firm to stiff clay with angular to rounded gravel of mudstone and sandstone, encountered predominantly in the west to a typical depth of 1.9m
- **Granular Glaciofluvial Deposits:** medium dense to dense gravelly sand and sandy gravel, encountered in the majority of exploratory holes across the site typically from 2.3m depth
- **Cohesive Glaciofluvial Deposits:** encountered in the south of Area B1 and north of Area B2 as firm to stiff sandy gravelly clay from between 2.9m and 7.1m depth
- **Cohesive Residual Soil:** stiff clay with mudstone gravel encountered in BH103 between 8.4m and 9.0m depth
- **Coal Measures:** encountered in 5 of the 7 'deep' boreholes at between 6.3m and 9.2m depth (typically c. 9m) as weathered/weak mudstone

8.4.2 Given the dense nature of the deeper sand & gravel deposits, these have been interpreted as glaciofluvial in origin rather than 'old alluvium' as described in Section 4.2.2.

8.4.3 The in-situ relative density of granular deposits on site was established by carrying out Standard Penetration Tests (SPTs) during the drilling of the boreholes; see Section 12.7.

Summary of Ground Conditions – Trial Pits

Hole	Final depth (m)	Depth to Base of Made Ground (m)	Depth to Base of (m)													Remarks
			Made Ground								Natural Soils					
			Concr.	T'mac	Sub-base	Cohesive Made Ground	Granular Made Ground	Ash & Clinker	Reworked Natural Ground	Brickfill	Topsoil	Granular Alluvium	Cohesive Alluvium	Head	Granular Glacio-fluvial Deposits	
TP101	4.2	-	-	-	-	-	-	-	-	-	0.3	2.3	2.6	-	>4.2	Groundwater seepage at 2.5m
TP102	3.5	1.3	-	-	-	-	-	-	-	-	0.5	-	-	1.3	>3.5	Instability from 2.8m Groundwater at 3.4m
TP103	3.7	3.7	-	-	-	-	-	-	-	-	0.3	-	-	1.5	>3.7	Groundwater at 3.5m
TP104	4.2	4.2	-	-	-	-	-	-	-	-	0.5	-	-	2.0	>4.2	Groundwater at 3.0m
TP105	4.8	4.8	-	-	-	-	-	-	-	-	0.4	-	-	1.3	>4.8	Groundwater at 3.4m
TP106	2.4	-	-	-	-	-	-	-	-	-	0.3	-	-	-	>2.4	Inflow of groundwater at 1.0m Instability from 1.8m
TP107	4.3	3.3	0.3	-	0.6	-	2.4	-	3.3	-	-	-	-	-	>4.3	
TP108	3.8	0.6	-	0.1	0.4	-	-	0.6	-	-	-	-	-	3.1	>3.8	
TP109	3.8	1.9	0.2	-	0.5	0.7	-	-	1.7	1.9	-	-	2.9	-	>3.8	Spalling between 1.7m and 1.9m Groundwater inflow at 3.7m
TP110	2.5	0.8	0.4	-	-	-	0.8	-	-	-	-	-	-	>2.5	-	Groundwater inflow at 0.8m
TP111	3.2	0.4	0.2	-	0.4	-	-	-	-	-	-	-	-	>3.2	-	Groundwater seepage at 0.6m
TP112E	3.2	2.5	0.1	-	0.2	0.6	2.5	-	1.0	-	-	-	>3.2	-	-	Significant spalling from 0.3m Brick wall from 0.2m to 1.8m Groundwater inflow at 1.5m
TP112W	1.8	1.8	0.1	-	0.2	-	-	1.8	-	-	-	-	-	-	-	Groundwater inflow at 1.5m Concrete slab at 1.8m
TP113	3.6	1.5	0.1	-	0.2	-	0.4	1.5	-	-	-	-	>3.6	-	-	200mm thick concrete slab at 0.5m
TP114	1.4	1.4	-	0.1	-	-	-	0.6	>1.4	-	-	-	-	-	-	Ceramic drain encountered at 1.3m with significant water inflow
TP115	3.9	1.7	-	0.1	-	-	-	0.7	1.1	1.7	-	-	2.7	-	>3.9	Brick wall from 0.2m to 1.2m Spalling in made ground Groundwater inflow at 1.5m
TP116	4.0	1.1	0.2	-	-	-	0.5	-	1.1	-	-	3.7	2.5, then >4.0	-	-	Groundwater seepage at 1.1m
TP117	3.3	0.4	0.1	0.4	0.2	-	-	-	-	-	-	1.1	2.4	-	>3.3	Fast groundwater inflow at 1.1m Instability from 2.8m
TP118	3.5	0.3	-	-	-	-	0.3	-	-	-	-	2.0	>3.5	-	-	Brick wall from 0.3m with possible foundation at 2.0m

Hole	Final depth (m)	Depth to Base of Made Ground (m)	Depth to Base of (m)													Remarks
			Made Ground								Natural Soils					
			Concr.	T'mac	Sub-base	Cohesive Made Ground	Granular Made Ground	Ash & Clinker	Reworked Natural Ground	Brickfill	Topsoil	Granular Alluvium	Cohesive Alluvium	Head	Granular Glacio-fluvial Deposits	
TP118A	3.3	2.0	-	-	-	-	2.0	-	-	-	-	-	>3.3	-	-	
TP119	2.8	2.8	-	-	-	-	-	-	-	>2.8	-	-	-	-	-	Groundwater seepage at 2.7m Steel girders at 2.8m
TP120	4.1	3.1	0.2	-	0.5	0.9	-	-	3.1	-	-	-	-	-	>4.1	Instability from 1.6m with major collapse at 4.1m Groundwater seepage at 3.2m
TP121	4.2	1.4	0.2	-	0.4	-	0.6	-	1.4	-	-	-	2.7	-	>4.2	Groundwater seepages at 1.5m and 2.9m Spalling from 2.7m
TP122	3.8	0.8	0.1	-	-	-	0.8	-	-	-	-	-	2.1	-	>3.8	Major spalling from 1.3m Groundwater inflow at 2.1m
TP123	3.1	1.0	0.2	-	0.6	-	-	-	1.0	-	-	-	>3.1	-	-	Groundwater inflow at 1.1m Major overbreak between 1.1m and 3.1m due to cobbles (possible former culvert)
TP124N	2.1	1.0	0.2	-	0.3	-	0.6	-	1.0	-	-	-	>2.1	-	-	Slight spalling in made ground Groundwater inflow at 1.3m Brick wall/obstruction at 2.1m
TP124S	2.1	2.1	0.2	-	0.3	-	>2.1	-	-	-	-	-	-	-	-	Brick wall from 0.6m to 2.1m Groundwater inflow at 1.3m
TP125	1.4	1.4	-	-	-	-	-	-	-	>1.4	-	-	-	-	-	
TP126	3.4	0.7	0.2	-	0.7	-	-	-	-	-	-	1.3	2.0	-	>3.4	Groundwater seepage at 2.0m Spalling from 2.7m
TP127	2.5	0.7	0.3	-	-	-	0.7	-	-	-	-	-	-	1.2	>2.5	Groundwater seepage at 0.4m Obstruction at 2.5m
TP128	2.8	1.1	0.2	-	-	-	-	-	1.1	-	-	-	-	2.2	1.6, then >2.8	Groundwater seepage at 2.2m
TP129	3.3	0.6	0.2	-	0.6	-	-	-	-	-	-	-	-	2.8	>3.3	Terracotta drain at 0.6m Groundwater seepage at 2.8m
TP130	3.7	1.8	-	-	-	-	1.8	-	-	-	-	-	>3.7	-	-	Groundwater at 1.8m
TP131	2.6	2.6	0.2	-	0.7	-	>2.6	1.2	-	-	-	-	-	-	-	250mm thick concrete slab at 0.7m Groundwater at 1.1m
TP132	3.3	1.1	0.4	-	0.8	-	1.1	-	-	-	-	-	2.8	-	>3.3	

Hole	**Final depth (m)**	**Depth to Base of Made Ground (m)**	**Depth to Base of (m)**													**Remarks**
			Made Ground								**Natural Soils**					
			Concr.	**T'mac**	**Sub-base**	**Cohesive Made Ground**	**Granular Made Ground**	**Ash & Clinker**	**Reworked Natural Ground**	**Brickfill**	**Topsoil**	**Granular Alluvium**	**Cohesive Alluvium**	**Head**	**Granular Glacio-fluvial Deposits**	
TP133	3.2	0.5	0.2	-	0.5	-	-	-	-	-	-	-	-	1.6	>3.2	Groundwater at 0.9m Instability from 2.9m
TP134	3.2	0.5	0.2	-	0.4	-	0.5	-	-	-	-	-	-	2.2	>3.2	

Summary of Ground Conditions – Dynamic Sample Boreholes

Hole	**Final depth (m)**	**Depth to Base of Made Ground (m)**	**Depth to Base of (m)**											
			Made Ground							**Natural Soils**				
			Concrete Hardstand	**Macadam Hardstand**	**Sub-base**	**Granular Made Ground**	**Cohesive Made Ground**	**Ash & Clinker**	**Reworked Natural Ground**	**Topsoil**	**Granular Alluvium**	**Cohesive Alluvium**	**Head**	**Granular Glaciofluvial Deposits**
WS101	3.0	2.2	0.1	-	-	2.2	-	-	-	-	-	>3.0	-	-
WS102	4.0	1.5	0.1	-	-	0.7	1.5	-	-	-	-	>4.0	-	-
WS103	2.0	0.7	0.1	-	0.3	0.7	-	-	0.6	-	-	-	>2.0	-
WS104	4.0	0.8	0.1	-	0.3	0.8	-	-	-	-	-	>4.0	-	-
WS105	2.0	1.4	0.1	-	0.3	1.4	-	-	-	-	-	-	>2.0	-
WS106	4.0	0.3	-	0.1	0.3	-	-	-	-	-	-	-	2.2	>4.0
WS107	3.0	>3.0	0.1	-	0.5	-	-	-	>3.0	-	-	-	-	-
WS108	3.0	0.3	0.1	-	0.3	-	-	-	-	-	1.5	2.4	-	>3.0
WS109	6.0	1.1	0.2	-	0.4	0.8	-	-	1.1	-	-	2.2	-	>6.0
WS110	4.0	0.6	0.1	-	0.4	0.6	-	-	-	-	-	2.5	-	>4.0
WS111	1.3	>1.3	0.2	-	0.4	-	>1.3	-	-	-	-	-	-	-
WS112	4.0	1.4	0.1	-	0.4	-	-	1.4	0.9	-	-	>4.0	-	-

Hole	Final depth (m)	Depth to Base of Made Ground (m)	Depth to Base of (m)											
			Made Ground							Natural Soils				
			Concrete Hardstand	Macadam Hardstand	Sub-base	Granular Made Ground	Cohesive Made Ground	Ash & Clinker	Reworked Natural Ground	Topsoil	Granular Alluvium	Cohesive Alluvium	Head	Granular Glaciofluvial Deposits
WS113	4.0	0.5	0.1	-	0.3	0.5	-	-	-	-	-	-	>4.0	-
WS114	4.0	-	-	-	-	-	-	-	-	0.3	-	-	1.2	>4.0
WS115	4.0	-	-	-	-	-	-	-	-	0.4	-	-	1.3	>4.0

Summary of Ground Conditions – Cable Percussion Boreholes

Hole	Final depth (m)	Depth to Base of Made Ground (m)	Depth to Base of (m)											Depth to Coal Measures (mudstone) bedrock (m)
			Made Ground					Natural Soils						
			Concrete Hardstand	Sub-base	Granular Made Ground	Cohesive Made Ground	Reworked Natural Ground	Topsoil	Cohesive Alluvium	Head	Granular Glaciofluvial Deposits	Cohesive Glaciofluvial Deposits	Cohesive Residual Soil	
BH101	8.3	1.9	-	-	-	-	1.9	0.3		4.5	5.3, then >8.3	7.0	-	-
BH102	9.4	2.2	0.1	0.5	1.2	2.2	-	-	3.1		5.5, then 9.2	-	-	9.2
BH103	9.4	1.2	0.2	0.5	-	1.2	-	-	2.3		2.8	8.4	9.0	9.0
BH104	8.7	1.8	0.1	0.4	-	1.8	-	-	4.0		>8.7	-	-	-
BH105	7.6	1.1	0.2	0.3	0.8	1.1	-	-	2.9		-	6.3	-	6.3
BH106	9.9	1.7	0.1	-	1.7	-	-	-	3.0		7.1	6.2, then 9.2	-	9.2
BH107	9.3	0.5	0.1	0.5	-	-	-	-			-	9.0	-	9.0

8.5 Visual & olfactory evidence of organic contamination

8.5.1 Exploratory locations where evidence of significant organic contamination was noted are summarised below:

Hole ID	Material	Depth	Observation
TP107	Reworked Natural Ground	2.4m to 3.3m	Strong hydrocarbon odour, possibly diesel
	Granular Alluvium	3.9m	Dark grey gravel with slight oily sheen and strong hydrocarbon odour
TP109	Cohesive Made Ground	0.6m	Slight hydrocarbon odour
TP112E	Granular Made Ground	1.5m	Strong hydrocarbon odour and iridescent sheen associated with groundwater inflow
TP120	Reworked Natural Ground	1.0m	Hydrocarbon odour
	Granular Alluvium	3.3m	Strong hydrocarbon odour and iridescent sheen associated with groundwater inflow
TP123	Cobbles/boulders of sandstone (possible culvert)	1.1m	Strong hydrocarbon odour and iridescent sheen associated with groundwater inflow
TP124S	Granular Made Ground	1.3m	Inflow of black water with strong hydrocarbon odour and iridescent sheen
TP125	Brickfill	1.4m	Possible asbestos containing material
TP131	Ash & Clinker	1.1m	Inflow of black water with strong hydrocarbon odour and iridescent sheen
	Granular Made Ground	1.2m to 2.6m	Black material with strong oil/tar odour
TP132	Granular Alluvium	2.9m	Slight hydrocarbon odour
TP133	Cohesive Alluvium	0.9m	Groundwater with slight petrol odour
	Granular Alluvium	1.6m to 3.2m	Strong petrol odour
WS108	Granular Alluvium	1.1m to 1.5m	Slight oily sheen and hydrocarbon odour
WS109	Granular Alluvium	2.2m to 6.0m	Slight methylated spirit odour
WS112	Cohesive Alluvium	1.4m to 4.0m	Strong hydrocarbon and metallic odour
WS113	Cohesive Alluvium	2.2m	Groundwater with light methylated spirit odour
BH104	Cohesive Made Ground	1.2m	Slight hydrocarbon odour
BH106	Granular Made Ground	0.1m to 0.4m	Bricks with grey staining and oily sheen

8.5.2 Selected samples of potentially contaminated materials were scheduled for chemical testing to determine the nature and extent of the identified contamination; see Section 9.

Targeted sampling

8.5.3 Trial pits 123 & 131 were excavated within the footprint of suspected gas holders/tar well associated with the former gas works in the southeast. No significant made ground was encountered in TP123 although groundwater at 1.1m had a strong hydrocarbon odour and iridescent sheen. Deeper made ground (>2.6m) is present in TP131 which had a black coating and strong tar/heavy oil odour.

8.5.4 It is possible that TP123 was excavated within the footprint of a former gas holder, and it is only of limited depth, or that the gas holder is located further north than TP123's location. TP131 was almost certainly located within the former tar well.

8.5.5 Trail pits 107, 120 and 134 were excavated to target the potential lagoon and associated trench. A strong hydrocarbon odour was noted in TP107 & 120.

8.5.6 The visual and olfactory evidence encountered in the exploratory holes appears to form a 'plume' as shown on Drawing 3435/110. This plume appears to broadly follow the line of the suspected lagoon and associated trench (see Section 3.1).

8.5.7 Additionally, evidence of contamination was noted in the far east where it is believed an underground fuel tank is located.

8.6 Groundwater

8.6.1 Groundwater was encountered as seepages in 10 trial pits at between 0.4m and 3.2m depth (average 1.9m) and as inflows in a further 15 trial pits at between 0.8m and 3.7m (average 1.9m).

8.6.2 Groundwater strikes were recorded in 8 'shallower' boreholes at between 1.2m and 4.0m (average 2.5m) and in all 7 of the 'deeper' boreholes at between 2.2m and 4.5m. Groundwater levels recorded in the monitoring wells are summarised below.

Hole ID	**Response zone (depth range & strata)**	**Groundwater body**	**Standing water level**	
			m bgl	**m AoD#**
BH101	4.0m to 6.0m (Head, Granular & Cohesive Glaciofluvial Deposits)	Shallow (drift)	1.0	59.4
BH102	3.0m to 6.0m (Granular & Cohesive Glaciofluvial Deposits)		0.1	62.1
BH103	1.5m to 4.0m (Cohesive Alluvium, Granular & Cohesive Glaciofluvial Deposits)		0.9	61.3
BH104	2.0m to 6.0m (Cohesive Alluvium & Granular Glaciofluvial Deposits)		1.7	60.6
BH105	2.0m to 4.0m (Cohesive Alluvium & Cohesive Glaciofluvial Deposits)		0.8	61.6
BH106	3.0m to 6.0m (Cohesive Glaciofluvial Deposits)		2.4	59.8
BH107	3.0m to 6.0m (Cohesive Glaciofluvial Deposits)		1.0	59.6
WS101	0.5m to 2.0m (made ground)	Made ground	N.R.	N.R.
WS102	1.5m to 3.5m (Cohesive Alluvium)	Shallow (drift)	1.5	60.6
WS103	0.7m to 1.5m (Head)		0.1	62.2
WS104	1.0m to 4.0m (Cohesive Alluvium)		1.8	60.4
WS105	0.5m to 1.4m (made ground)	Made ground	1.2	59.4
WS106	0.5m to 2.5m (Head & Granular Glaciofluvial Deposits)	Shallow (drift)	0.5	60.2
WS107	0.5m to 1.3m (made ground)	Made ground	0.6	60.3
WS108	0.5m to 1.3m (Granular Alluvium)	Shallow (drift)	N.D.	N.D.
WS109	2.5m to 4.5m (Cohesive Alluvium & Granular Glaciofluvial Deposits)		1.9	60.3
WS110	0.7m to 3.7m Cohesive Alluvium & Granular Glaciofluvial Deposits)		0.8	61.4
WS111	0.5m to 1.3m (made ground)	Made ground	N.D.	N.D.
WS112	2.0m to 4.0m (Cohesive Alluvium)	Shallow (drift)	1.3	60.9
WS113	0.5m to 4.0m (Head)		0.6	60.3
WS114	2.0m to 4.0m (Granular Glaciofluvial Deposits)		0.5	59.5
WS115	2.0m to 4.0m (Granular Glaciofluvial Deposits)		0.8	59.4

 # levelled-in by survey

N.R. not recorded

N.D. non detected (dry well)

8.6.3 Dip data to date suggests a shallow water table across the site (typically within 1.5m of ground level). After an initial dip to record standing water level, 8 of the wells were bailed to establish an approximate rate of **recharge**.

8.6.4 The bailing of water (up to 20 litres) resulted in minimal to no reduction of water level in the monitoring wells indicating recharge is rapid.

8.6.5 It is apparent from the above that permeability of the ground is quite high – unsurprising given that all well response zones intercepted granular soils. Groundwater levels are considered to be reflective of the true water table (rather than "trapped" waters associated with drilling or surface water run-off).

8.6.6 Further groundwater dips will be taken during gas monitoring visits and should provide an indication of groundwater level fluctuations, and flow direction. Although, based on current data groundwater is flowing towards the southwest.

8.6.7 These results should be of interest to the drainage designer, and groundworker (especially if/where deep excavation is required).

8.7 Stability

8.7.1 Instability (spalling, overbreak and/or collapse) was noted in 10 of the 32 trial pits typically occurring in made ground and deeper granular soils where groundwater was encountered.

8.8 Revised conceptual ground model (ground conditions)

8.8.1 The Preliminary Conceptual Site Model has been revised in light of data obtained during the ground investigation, most notably with respect to:

- The strength, nature and depth of underlying natural strata
- The nature and distribution of contamination (based on visual/olfactory evidence only)

8.8.2 Further refinement of the Conceptual Site Model is presented in Section 10.2, where the results of laboratory testing for contaminants have been considered.

9 CONTAMINATION (ANALYSIS)

9.1 General

9.1.1 The site has been formerly used as a:

- Gas works in the southeast between c. 1870 and c. 1920 (Area B2)
- Coal tar colour works in the north between c. 1890 and c. 1910 (Area B1)
- Bleaching and dye works (Minerva Works) across the north and south between 1910 and c. 2000 (Area B1& B2)

9.1.2 It is known the gas works was a relatively small operation to provide gas for the surrounding villages. It is likely to have had a retort house with condensers and purifiers/scrubbers and will have produced by-products/wastes including coal tar and cyanide impacted lime. Based on the age of the gas works, benzole and naphthalene would not have been recovered.

9.1.3 The coal tar colour works and dye works would have required significant amounts of water for processing which is likely to have been abstracted onsite from a borehole (see Section 4.1). The suspected lagoon noted on historical OS plans around 1950 may have been a settlement pond for liquid waste, with water draining off into Ox Field Beck via the trench to the south. The lagoon may have existed prior to 1950 but is not recorded on historical maps.

9.1.4 Based on the site's former usage, and visual and olfactory evidence of contamination encountered in exploratory holes, it is anticipated that significant ground contamination will be present in the vicinity of:

- the former gas works (especially the tar well),
- the lagoon and drain associated with the dye works
- any areas of former bulk storage (tanks)
- any remaining below ground reactors and mixing tanks,
- as well as localised contamination associated with below ground pipes and drains.

9.1.5 An assessment of potential contaminants associated with the former uses has been undertaken; see Section 6.2.

9.1.6 In the context of risks to human health associated with residential redevelopment, the Tier 1 Soil Screening Values referenced in this report have been derived via the CLEA default conceptual site model (CSM) used for generating SGVs, but amended, where appropriate, to be more specific to redevelopment within the planning process.

9.1.7 Where available, Category 4 Screening Levels (C4SL) have also been referenced.

9.1.8 Generic Note 04 in Appendix A provides further details with respect to current guidance and the interpretation of analytical data.

9.2 Testing scheduled

9.2.1 Based on the above assessment, Lithos submitted a test schedule (summarised in the table below) to a UKAS accredited laboratory. Account has also been taken of visual and olfactory evidence recorded during the ground investigation.

Type of sample	No. of samples	Determinands
Made ground	30	TOC
	29	Asbestos ID Semi-Volatile Organic Compounds (sVOC), includes PAHs
	28	pH, water soluble boron, and total metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium and zinc) Volatile Organic Compounds (VOC), includes BTEX
	25	Total cyanide
	22	Banded Total Petroleum Hydrocarbons (TPH)
	14	Total Phenols
	8	Leachable metals: arsenic, boron, cadmium, chromium, copper, lead, mercury, nickel, selenium and zinc
	6	Calorific Value (CV) & Cairney Combustibility screen
	5	Poly-Chlorinated Biphenyls (PCB) Extractable Petroleum Hydrocarbons (EPH) cleaned for coal tar ID
	3	Speciated Total Petroleum Hydrocarbons (TPH) BTEX Speciated Polycyclic Aromatic Hydrocarbons (PAH)
Topsoil	7	pH, water soluble boron, and total metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium and zinc) & Asbestos ID TOC & Speciated Polycyclic Aromatic Hydrocarbons (PAH)
Natural soil	13	TOC
	10	Speciated Polycyclic Aromatic Hydrocarbons (PAH) & BTEX
	8	Speciated Total Petroleum Hydrocarbons (TPH)
	7	Semi-Volatile Organic Compounds (sVOC), includes PAHs
	5	pH, water soluble boron, and total metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium and zinc)
	4	Total Phenols
	3	Volatile Organic Compounds (VOC), includes BTEX Extractable Petroleum Hydrocarbons (EPH) cleaned for coal tar ID
	1	Asbestos ID Banded Total Petroleum Hydrocarbons (TPH)

9.2.2 Account was taken of previous uses in specific areas, with EPH analysis for coal tar identification concentrated on samples recovered from the vicinity of former gas works and VOC and SVOC analysis in the area of the lagoon and dye works.

9.3 Soil contamination results

9.3.1 The soil contamination test results are summarised in the tables in Annexes II to IV.

9.3.2 Laboratory test certificates as received from the laboratory are presented in Appendix I to this report.

9.3.3 No statistical analysis has been undertaken on samples as it is accepted that, with the exception of Topsoil in Area A, elevated concentrations recorded are likely to be due to a key source area and are not part of a sample population across the wider site.

Area A

9.3.4 Samples of topsoil and Glaciofluvial deposit were analysed for a range of inorganic and organic determinants. With the exception of arsenic in topsoil, all determinants were below their respective tier 1 screening values.

9.3.5 Of the 8 samples tested, 5 samples of Topsoil exceed the arsenic screening value of 37mg/kg, with a maximum concentration of 58mg/kg. Elevations were sporadic across Area A, rather than within a cluster and it is reasonable, based on this data, to assume that all Topsoil is likely to be impacted.

9.3.6 Area A has always been greenfield, but given the proximity to the former dye works it is unclear if the source of arsenic is agricultural, such as land spreading, or impact from the adjacent industrial land.

9.3.7 Further bioaccessability testing could be undertaken to confirm if the topsoil is suitable for retention and reuse within the development.

Area B1 & B2

9.3.8 Elevated concentrations of **inorganic** arsenic, copper, lead and zinc, above generic screening values, were recorded in made ground. Metals are associated with the previous use as a coal tar colour works and dye works and can also be attributed to made ground such as Ash & Clinker.

9.3.9 In respect to **organic** analysis, **Total Petroleum Hydrocarbon** (TPH) and **Polycyclic Aromatic Hydrocarbons** (PAH) can be associated with a variety of sources and elevated concentrations do not automatically infer a petroleum product is present. Of the 40 samples analyses for PAH and TPH, only 3 returned results with elevated PAH concentrations (namely BaP) in Area B1 (two associated with macadam and one with Ash & Clinker). A further single elevated TPH value (DRO and LRO) was recorded in Area B2 in TP120 (within the drain from the suspected lagoon).

9.3.10 Of the 36 samples tested for **Semi Volatile Organic Compound** (SVOCs) and 31 samples tested for **Volatile Organic Compounds** (VOCs), none yielded significantly elevated concentrations of any compound.

9.3.11 However, low levels of anthracene, aniline (and derivatives), phenol (and derivatives), naphthalene (and derivatives) and carbazole were recorded in numerous trial pit locations across Area B1 & B2, including TP107, 108, 109, 112, 113, 115, 120, 123, 124 & 131. These compounds are all intermediates used in the production of dyes from coal tar.

9.3.12 Of these locations, TP120 within the drain leading from the lagoon, had a significantly higher concentration than any other location; with concentrations of aniline at 48mg/kg, phenol at 50mg/kg & methylnaphthalene at 400mg/kg.

9.3.13 Review of trial pit locations did identify some known sources, such as the gas holder & tar well (TP 131 & 124 respectively). Other positive locations were not intentionally targeting a specific source (TP108, 109, 115), suggesting some contamination is likely across all of Areas B1 & B2.

9.3.14 More significant concentrations of SVOCs and VOCs should be anticipated, especially in any areas of former bulk storage, waste disposal and distribution pipes, also any below ground reactor vessels.

9.3.15 Considering the trial pit locations where visual and olfactory evidence of contamination was noted (section 8.5 above), and the actual laboratory results, there are a number of discrepancies; i.e. where clear evidence of contamination was recorded in the trial pit but laboratory testing did not yield any elevated data.

9.3.16 There may be a number of reasons for this, firstly the chemistry involved in the dye industry is very complex and although the suite of VOC and SVOC compounds is relatively extensive it does not cover all organic compounds that could be present. Secondly the highly volatile and soluble nature of some anticipated contaminants could result in a visual and olfactory identification, but the bulk of the contamination is in a vapour or dissolved in the shallow groundwater, rather than retained in soil.

Area C

9.3.17 Of the 4 samples analysed for inorganics, only sub-base in TP26 yielded a slightly elevated lead concentration of 250mg/kg cf. 200mg/kg. Elevated DRO and LRO were recorded in TP127 at 0.5mbgl, with a concentration of 193 & 9000mg/kg respectively.

9.3.18 The exploratory log for this location did not record any olfactory or visual impact of hydrocarbon, but did record a natural organic odour at 0.4m. The presence of lubricating range hydraulic oils may not be visually evident and given this trial pit is located in an area of the former factory, the presence of a localised ‘hotspot’ of contamination cannot be discounted.

Area B1, B2 & C

9.3.19 A further parameter that provides an indication of the state of the soil in Area B1, B2 & C is pH. On most brownfield sites, the pH of made ground will vary between 5 to 9. Maximum pH values recorded for this site were 11.8, and frequently above 9.

9.3.20 Chemicals used extensively in dye works and wool treatment, such as sodium carbonate, detergents and ammonia are all alkaline, as is lime. These could contribute to a high soil pH.

Calorific value

9.3.21 The calorific value of 6 samples of Ash & Clinker, have yielded an average CV of 6.0 MJ/kg. Materials whose CVs exceed 10MJ/kg are almost certainly combustible, while those with values below 2MJ/kg are unlikely to burn.

9.3.22 Consequently, the samples of Ash & Clinker were scheduled for Cairney Combustion Susceptibility Testing to determine the likelihood of the material burning. The test involves applying a heat source (i.e. Bunsen burner flame) and grading the sample from A to F depending on the reaction, with A meaning the sample burns vigorously and F meaning it does not glow (i.e. it is inert).

9.3.23 The 6 samples tested yielded results of between C and E indicating the sample ignites but does not continue to burn on removal of the heat source.

Asbestos

9.3.24 Screening for asbestos identified fibres in one of the 29 samples of made ground tested. Subsequent quantification yielded a result of 0.002% which is only marginally above the limit of detection (<0.001%).

9.3.25 No fibres were identified in any of the samples of Topsoil tested.

Cyanide

9.3.26 Given the presence of a former gas works in the southeast and a coal tar colour works in the north, 25 samples of made ground were scheduled for total cyanide.

9.3.27 Low concentrations (typically <0.5mg/kg) have been detected although samples of made ground recovered from within the vicinity of the former gas works have higher concentrations (c. 2mg/kg).

9.3.28 Given the acute risk (c.f. chronic, long-term risk) associated with cyanide, further consideration may be required in relation to both end-users of the site (i.e. future residents) and site workers. However, concentrations recorded to date are unlikely to present a risk.

Polychlorinated Biphenyls (PCB)

9.3.29 Given the presence of a former electric substation in the east of Area B1 and an existing substation to the north of Area B2, 5 samples of made ground recovered from these areas were tested for PCBs. None of the samples exceeded the Tier 1 value with the majority being below the limit of detection.

9.3.30 However, it should be noted it was not possible to recover samples from beneath the electric substations and therefore the presence of PCBs in the immediate vicinity cannot be discounted.

Leachables

9.3.31 Of the leachability tests conducted on 8 samples of made ground, two copper concentrations were above the maximum permissible concentrations as defined in the Water Supply (Water Quality) Regulations 1989, as amended in 2000.

9.3.32 Shallow, fast flowing groundwater is present under Areas A, B & C. Based on available dip data this flows toward the Ox Beck in the south west.

9.3.33 Groundwater and surface water monitoring have not yet been competed but it is likely that this will provide a clearer picture of the extent of contamination present, this should also indicate if any below ground tanks, pipes or drains are continuing to release contamination.

9.3.34 Given the very soluble nature of some of the anticipated contamination and the high hydraulic conductivity of shallow groundwater, any plumes may already have migrated beyond the site boundary or discharged into the surface water.

10 CONTAMINATION (QUALITATIVE RISK ASSESSMENT & REMEDIATION)

10.1 Summary of significant contamination

Area A

10.1.1 Topsoil, typically 400mm thick is present in Area A. Testing has yielded elevated concentrations of arsenic and therefore bioaccessibility testing is required to confirm whether or not it is suitable for reuse in garden areas.

10.1.2 Given the nature of the topsoil in Area A it would be expected to be suitable to support plant growth. However, no testing in accordance with BS3882:2015 Specification for Topsoil (N-P-K, clay content etc) has been undertaken to date.

10.1.3 It should be noted the Tier 1 value for Public Open Space (POS) areas is higher for arsenic (79mg/kg cf 37mg/kg) and therefore the Topsoil is considered suitable for reuse in areas of POS without any additional bioaccessibility testing.

Areas B1, B2 & C

10.1.4 Made ground underlies Areas B1, B2 & C, which is typically less than 2m thick and comprises Concrete/Macadam Hardstand underlain by Sub-base, Ash & Clinker, Reworked Natural Ground and Cohesive & Granular Made Ground.

10.1.5 This made ground contains elevated concentrations of a number of inorganic determinands and contains materials (e.g. clinker, brick, metal, etc), which would generally be considered undesirable as a near-surface material in garden areas.

10.1.6 There is a ‘plume’ of potentially significant organic contamination, believed to be associated with the former lagoon and drain, in Area B2. Drawing 3435/110, indicates the area that is suspected to be impacted, although further widespread contamination, associated with former tanks, pipes and drains should also be anticipated in Area B1 & B2.

10.1.7 Significant organic contamination has also been encountered in a suspected tar well in the vicinity of the former gas works in the southeast of Area B2.

10.2 Revised conceptual ground model (contamination)

10.2.1 The Preliminary Conceptual Site Model has been amended in light of data obtained during the ground investigation, most notably with respect to the distribution of made ground and contaminants.

10.2.2 A revised Conceptual Site Model is presented as Drawing 3435/108 in Appendix B. The Model includes the contaminants described in Section 10.1 above, and potential pollutant linkages (summarised below in Section 10.4) to receptors.

10.3 Environmental setting & end use

10.3.1 As discussed in Section 10.1 above, contamination exists in the soil beneath this site. In order to assess the significance of this contamination, consideration must be given to the site’s environmental setting and the proposed end use.

10.3.2 The underlying drift deposits are classified as a Secondary A aquifer. The nearest surface watercourse is the Ox Filed Beck and Lees Head Beck which flow in a westerly direction, immediately beyond the site’s southern boundary. Shallow groundwater appears to flow towards the watercourse. Therefore, the site’s environmental setting is considered to be **high sensitivity**.

10.3.3 With respect to human health, the proposed end use (residential) is considered sensitive.

10.3.4 Transient risks to construction workers can be addressed by the adoption of appropriate health and safety measures, see Section 14.6.

10.4 Pollutant linkages

10.4.1 In terms of a proposed redevelopment of this site, plausible pollutant linkages can be summarised as follows.

Contaminants

10.4.2 Contaminants have been summarised in Section 10.1 above.

Pathways

10.4.3 Potential contaminant pathways include:

- Ingestion
- Dermal contact
- Inhalation of contaminated particulates and vapour
- Surface water run-off, including existing drainage infrastructure
- Horizontal migration of leachable/mobile contaminants to surface waters
- Downward infiltration of leachable/mobile contaminants to groundwater

Receptors

10.4.4 Potential contaminant receptors include:

- The environment – Secondary A aquifer (drift) and watercourses (Ox Field Beck & Lees Head Beck) immediately south
- End users of the site (residents)

10.4.5 It can be concluded that there are plausible pathways between the soil contaminants summarised in Section 10.1 above and potential receptors. Consequently, some remediation will be required; either treatment/removal of the contaminant, or "breakage" of the pathway.

10.5 Potential remediation options

General

10.5.1 Approval of the recommendations given below should be sought from the appropriate regulatory authorities prior to commencement of site redevelopment.

Combustibility

10.5.2 The Ash & Clinker is considered combustible and, in accordance with current guidance, the following remediation measures should be adopted if it is left on site:

- Services: utility trenches (especially those carrying potential heat sources e.g. electric cables) should be cut oversize and backfilled with clean, inert material. This applies to any utility trenches that run beneath estate roads or extend under houses. It is strongly recommended that further advice be sought from all statutory service bodies with respect to the ground conditions within which they will lay services.
- Estate roads: no action required (although generally less than 1,000mm thick, the road construction is considered to provide adequate isolation as there will be no heat source). Local Authority Highways approval should be sought.

- Houses: no action required (the floor slab will include insulation and therefore heat transfer into the ground will be negligible). Local Authority Building Control and Warranty Provider approval should be sought.

10.5.3 As further mitigation against the risk of spontaneous combustion, the ash could be excavated, replaced in approximate 300mm thick layers, wetted and subjected to nominal compaction, comprising at least 2 passes with a towed vibratory roller of at least 2,900 kg per metre width. Compaction will help to prevent the material drying out and reduce the ingress of oxygen.

Asbestos

10.5.4 CL:AIRE has published a Joint Industry Working Group (JIWG) guidance[1] document with the support of the Health & Safety Executive which provides an explanation of how legal requirements of the Control of Asbestos Regulations 2012 have been interpreted to be more directly applicable to the risks associated with asbestos contaminated soil and construction & demolition materials.

10.5.5 As discussed in Section 9.3, an asbestos ID (screen) was scheduled on 29 samples of made ground, with asbestos identified in one sample. Supplementary analysis (asbestos quantification) yielded a result only marginally above the limit of measurement (<0.001%).

10.5.6 However, testing undertaken by ARP identified 20 samples of made ground with positive identification of asbestos and therefore the made ground, especially in Areas B1 & B2, are considered to be contaminated with asbestos.

10.5.7 Made ground soils with only a trace of asbestos still have the potential to be hazardous to human health. This is because soil with a low asbestos content of say 0.001% may contain thousands, possibly hundreds of thousands, of potentially respirable asbestos fibres per gram of soil. However, asbestos fibres only pose a risk if they are allowed to become airborne, and release from soil to air can only occur if the soil is dry and then agitated (e.g. by vehicle movement, excavation, wind etc).

10.5.8 Provided soils are kept damp the risk of airborne fibre release, even during disturbance associated with excavation, should be negligible, and certainly below the control limit (as set by the Control of Asbestos Regulations 2012) of 0.1 f/cm3 airborne fibres averaged over a 4-hour period.

10.5.9 In our experience, damp soils do not allow the release of asbestos fibres, even from soils that contain concentrations in excess of the hazardous waste threshold (0.1%).

10.5.10 There may be transient risks during the excavation of made ground soils. Exposure to asbestos of personnel involved in these excavation works is considered likely to be sporadic and of low intensity (provided soils are kept damp). Therefore in accordance with Regulation 3(2) of the Control of Asbestos Regulations (2012), exemption from Regulations: 9 (notification of work with asbestos); 18(1)(a) (asbestos areas); and 22 (health records and medical surveillance) should apply, provided it is 'clear from a suitable and sufficient risk assessment that the control limit of 0.1 f/cm3 airborne fibres averaged over a 4-hour period will not be exceeded'.

10.5.11 Nonetheless, risks must be mitigated by appropriate measures (principally damping down), working procedures, and PPE. Method Statements and Risk Assessments should be prepared by the Contractor, and then be reviewed by the Client and Lithos.

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[1] *Control of Asbestos Regulations 2012: Interpretation for Managing and Working with Asbestos in Soil and Construction & Demolition materials: Industry Guidance. CL:AIRE, 2016.*

10.5.12 Any fragments of asbestos cement sheeting encountered during the excavation works, should be gathered by hand and placed in double sealed bags. Personnel involved in this activity must be equipped with an appropriate respirator (i.e. a FFP3 or better), in addition to their "standard" PPE. The bags of asbestos waste should be placed in a sealed skip for off-site disposal at a suitably licensed landfill site; such material will be classified as hazardous waste.

10.5.13 It should be noted that ACMs were commonly used as shuttering beneath concrete slabs, and to form ducts, and it is important that this is kept in mind when breaking through concrete slabs.

10.5.14 Made ground where asbestos has been positively identified and considered representative of near-surface soils, should ultimately be isolated beneath a minimum 600mm thick surface cover of "clean" soil with a 150m "hard-dig" layer (garden/landscaped areas), or hardstand (parking areas), or floor slabs (buildings) and therefore there will be no risk of release of asbestos fibres from the ground.

10.5.15 Consequently, in line with the principles of sustainable development, there should be no need to export any soil from site.

10.5.16 New utilities should be laid in trenches reinstated with 'clean' backfill in order to prevent exposure to maintenance workers in the future.

10.5.17 See also comments in the 'Waste Classification' Section below.

Inorganic contamination

10.5.18 The made ground has yielded elevated concentrations of a number of metals; most notably arsenic, copper, lead and zinc. Therefore, where residual made ground remains beneath garden and landscaped areas (i.e. not beneath hardstanding) a minimum **600mm** thick surface cover of "clean" soil comprising 500mm subsoil and 100mm topsoil is recommended. This cover will break potential pollutant linkages between the contaminated made ground and future end-users.

10.5.19 A minimum **150mm** thick "**hard dig**" layer of crushed demolition arisings should be placed immediately beneath the soil cover due to the possible presence of cyanide (although any significant blue billy identified during remediation works should be removed from site), and the relatively high pH of the made ground from Area B & C.

10.5.20 Cyanide presents a risk via direct contact (ingestion and dermal contact) and although cyanide can be volatile, it is unlikely to be present in a volatile form in soils.

10.5.21 Since the location of any lime-impacted cyanide from the gas works has not been identified, the management of soils potentially impacted with cyanide is likely to be more feasible via adoption of a watching brief and sampling protocol during site preparatory works. A site-specific screening value should be derived through site specific detailed risk assessment.

10.5.22 Alternatively, the made ground is considered suitable for redistribution beneath concrete oversite or areas of hardstanding, where they would be satisfactorily isolated from end users.

Organic contamination

10.5.23 As discussed in Section 10.1 above, hydrocarbon contamination has been encountered especially in the vicinity of the former gas works (suspected tar well) and around a former lagoon and drain in the centre of Area B2. Further organic contamination is expected to be identified once made ground is excavated.

10.5.24 Such contaminants can be mobile and as such may pose a risk to the environment and human health.

10.5.25 Based on a qualitative review of the data obtained to date, it is considered that some grossly contaminated soil will require removal or treatment.

10.5.26 Given the anticipated 750mm cover, Lithos Scenario B Screening Values (see Generic Note 4 in Appendix A) could be adopted as target concentrations. However further remedial targets, for non-standard contaminants should be derived by site specific risk assessment to be protective of health **and** the environment.

10.5.27 Following groundwater and surface water sampling, a controlled waters risk assessment may be required to determine any further remediation necessary.

10.5.28 With respect to organic determinants, remediation proposals will be influenced by some/all of the following:

- The Conceptual Ground Model, including:
    - Geology, hydrogeology, proximity to watercourses etc
    - The volume and distribution of soil requiring remediation
    - The nature (i.e. gravelly or clayey) of soil requiring remediation
    - The nature of the contaminants – the "mixture", mobility, volatility, and resistance to degradation
- Classification of the soil for the purposes of disposal to landfill.
- The site's size – area available for remediation activities.
- The site's location – consideration of odour, dust and noise associated with remediation activities.
- Redevelopment proposals, most notably with respect to private gardens. Consideration of the desired construction programme will also be required.
- Estimated costs and timescale associated with the proposed remediation technique.
- Degree of confidence/certainty in proposed remediation technique.
- Views of the Local Authority.

10.5.29 Remediation option should be considered in further detail following water sampling and detailed risk assessment (if required).

10.6 Summary of potential pollutant linkages & mitigation

10.6.1 In terms of the proposed redevelopment plausible pollutant linkages, and feasible remediation options, can be summarised as follows:

Receptors	**Pathways**	**Contaminants**	**Plausible pollutant linkage? (and remediation options where required)**
Human health (Future residents) ◊	Consumption of contaminated vegetables	Metals, cyanide, pH & hydrocarbons in the made ground (Area B1 & B2, Area C to a lesser extent)	Isolation beneath at least 600mm clean soil cover with 150mm "hard dig" layer in garden and landscaped areas
	Ingestion		
	Dermal contact		
	Inhalation (dust and/or vapours)		Treatment or removal of volatile organic hydrocarbons
	Infiltration of water supply pipes	BTEX, hydrocarbons phenol, CN, sulphate, sulphide & chloride in the made ground (Area B1 & B2, Area C to a lesser extent)	Treatment or removal of hydrocarbons Water company will insist of "protectaline" pipework in Area B & C
Buildings	Migration & accumulation of explosive gas	Methane Hydrocarbons in the made ground	To be assessed on completion of monitoring and gas risk assessment
Groundwater Ox Field Beck & Lee Head Beck	Migration of dissolved and/or free phase organics	Hydrocarbons (leaking from tanks, and/or faults in the site drainage system, and/or spills)	Treatment or removal of hydrocarbons determined via detailed risk assessment
	Surface water run-off	Metals, hydrocarbons in the made ground	

◊ transient risks to construction workers will be addressed by the adoption of appropriate health and safety measures in accordance with the Health and Safety at Work Act 1974 and regulations made under the Act including for example the COSHH Regulations.

10.7 Waste classification

10.7.1 Disposal of the made ground off site is generally not considered appropriate, economically viable, nor in line with current Government philosophy regarding sustainable development. However, following remediation some excess arisings may be generated by excavations for foundations, sewers etc. Disposal to landfill (or an appropriate soil / aggregate transfer station) may be the most practical solution, if redistribution and retention on site is not feasible.

10.7.2 Following excavation and stockpiling, sampling will be required prior to disposal.

10.7.3 As there is no WRAP protocol for soils, the characterisation, sampling and classification of soils arising from brownfield sites has been incorporated within the Environment Agency's Technical Guidance WM3[2]. Classification of soils as non-hazardous or hazardous in accordance with WM3 is quite a complex process, although it ultimately results in a simple classification as hazardous or non-hazardous. Note: inert is not a class under WM3; WAC testing is required to determine whether a waste soil can be considered inert.

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[2] Technical Guidance WM3 – Guidance on the classification and assessment of waste. Environment Agency 2015

10.7.4 If waste soil is classed as hazardous following classification under WM3, and destined for landfill, waste acceptance criteria (WAC) leachate testing will need to be undertaken. Similarly, if waste soil destined for landfill is classed as non-hazardous under WM3, and suspected to be inert, WAC leachate testing will need to be undertaken. However, non-hazardous soil waste can go to a non-hazardous landfill facility; no further testing (e.g. WAC) is required.

10.7.5 WAC analysis is different to the 'routine' laboratory testing (such as that included earlier in this Section) undertaken in order to determine hazardous properties. Lithos typically only include WAC analysis if significant off-site disposal (of soil classified as hazardous waste) is anticipated.

10.7.6 It is critical if material is to be exported from site that this is allocated an appropriate waste code, following the steps within WM3. Waste carriers transporting, and sites accepting, this material should have a corresponding code within their permits. It is the responsibility of those generating the waste (i.e. the site), to ensure that the waste is handled and disposed of appropriately.

10.7.7 Soil treatment facilities (STFs) provide an alternative to landfill. STFs are regulated by the Environment Agency and allow soils to be treated and screened (effectively recycled to be used at other sites). Export to an STF does not require WAC testing and suitability of various soil types will be dependent on material waste codes, which may be allocated after consideration of the data in Section 9 but will often need supplementing with further testing after soils have been stockpiled (see also advice in Section 14.3).

10.7.8 Most STFs are permitted to accept soils with waste code 17 05 04 (i.e. soils which do not exhibit hazardous properties). Lithos has a list of permitted STFs and can help identify one local to this development site.

10.7.9 With respect to **asbestos**, waste soils will be classed hazardous if the soil mass contains more than 0.1% asbestos fibres that are free and dispersed. However, WM3 states that where the waste contains identifiable pieces of asbestos (i.e. any particle of a size that can be identified as potentially being asbestos by a competent person if examined by the naked eye), then the waste is hazardous if the concentration of asbestos in the pieces alone is 0.1%. If a stockpile of soil contained rare fragments of broken asbestos-cement sheeting, the whole stockpile would be classed as hazardous unless all the fragments could be picked-out (even though the concentration of asbestos in the soil mass might be orders of magnitude less than 0.1%).

10.7.10 As discussed in Section 8.2, tarmac hardstand is present in the northwest of Area B2 and locally in the south of Area B1.

10.7.11 This **tarmac** could be recycled and crushed to yield a 6F3 selected granular material, provided the recovered bitumen content is less than 10% (determined in accordance with BS598-1:2011). Crushed tarmac could also be blended with crushed concrete etc to generate 6F2 graded material. 6F2 can contain up to 50% recycled tarmac/asphalt (provided it does not pose a contamination risk to controlled waters and, if the proportion of asphalt is greater than 20%, the recovered bitumen content is less than 2%).

10.7.12 However, if off-site disposal is anticipated, tarmac assessment is based on the amount of coal tar present, this will vary depending on the age of the tarmac. The assessment is based on the amount of benzo(a)pyrene and has a concentration limit of 50mg/kg.

10.7.13 Speciated PAH analysis has been undertaken on 2 samples of tarmac recovered from Area B1, BaP concentrations were >50mg/kg. Consequently, tarmac is likely to fall within waste code 17 03 01:

- 17 - Construction and Demolition wastes,
- 03 – bituminous mixtures, coal tar and tarred products
- 01 – bituminous mixtures containing coal tar

10.7.14 17 03 01 is a mirror **hazardous** entry (17 03 02 is the corresponding mirror non- hazardous entry). This code along with this supporting report, in particular the laboratory results, should be used to complete a paper trail documenting disposal routes for tarmac.

10.7.15 Contractors exporting waste from the site should review the site investigation data and make their own assessment. Alternatively, Lithos could undertake this assessment once exported waste streams have been identified.

11 HAZARDOUS GAS

11.1 General

11.1.1 Consideration of the conceptual site model and potential linkages has enabled a preliminary qualitative assessment of risks associated with gas:-

Source	Receptors	Hazard	Pathway	Initial risk
On-site made ground	Human health	Asphyxiation & explosion	Vertical migration, ingress & accumulation	**Low**: made ground essentially inert, with little degradable matter
	Buildings	Explosion		
Off-site landfill (20m south)	Human health	Asphyxiation & explosion	Lateral migration, ingress & accumulation	**Low**: risks of gas migration are lowered somewhat by the Lees Head/Ox Field Beck watercourse and presence of shallow groundwater
	Buildings	Explosion		
	Buildings	Explosion		

11.1.2 Given the above gas monitoring wells have been installed in 22 boreholes across the site. Details of the installations are given on the borehole logs presented in Appendices G & H.

11.1.3 The generation potential of the gas source was initially considered to be Low and this has been confirmed by the monitoring results obtained. Consequently, in accordance with CIRIA Report C665[3], given the proposed residential end use, 6 visits have been scheduled over a 3-month period.

11.2 Scope of works

11.2.1 To date, the wells have been monitored on one occasion for groundwater levels and soils-gases, and the results are presented in Appendix K.

11.2.2 A standard procedure was followed, in accordance with CIRIA guidance:

- Ambient oxygen concentration
- Atmospheric temperature & pressure
- Methane, oxygen and carbon dioxide concentrations and flow rates using a Gas Data GFM436 infra-red gas analyser
- Standing water level using a dipmeter
- Ambient oxygen concentration (check for instrument drift)

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[3] CIRIA C665: Assessing risks posed by hazardous ground gases to buildings (2007).

11.3 Monitoring results

11.3.1 The results of the monitoring completed to date are summarised below.

Well	Response zone	Methane concentrations (% v/v)	Carbon dioxide concentrations (% v/v)	Steady flow rates (litre/hour)
BH101	4.0m to 6.0m (Head, Granular & Cohesive Glaciofluvial Deposits)	N.D.	N.D.	N.D.
BH102	3.0m to 6.0m (Granular & Cohesive Glaciofluvial Deposits)	N.D.	N.D.	N.D.
BH103	1.5m to 4.0m (Cohesive Alluvium, Granular & Cohesive Glaciofluvial Deposits)	N.D.	N.D.	3.4
BH104	2.0m to 6.0m (Cohesive Alluvium & Granular Glaciofluvial Deposits)	N.D.	0.1	N.D.
BH105	2.0m to 4.0m (Cohesive Alluvium & Cohesive Glaciofluvial Deposits)	N.D.	0.3	0.3
BH106	3.0m to 6.0m (Cohesive Glaciofluvial Deposits)	N.D.	0.4	N.D.
BH107	3.0m to 6.0m (Cohesive Glaciofluvial Deposits)	N.D.	1.8	N.D.
WS101	0.5m to 2.0m (made ground)	N.D.	0.5	N.D.
WS102	1.5m to 3.5m (Cohesive Alluvium)	N.D.	0.4	N.D.
WS103	0.7m to 1.5m (Head)	N.D.	0.2	N.D.
WS104	1.0m to 4.0m (Cohesive Alluvium)	N.D.	1.7	N.D.
WS105	0.5m to 1.4m (made ground)	N.D.	0.3	N.D.
WS106	0.5m to 2.5m (Head & Granular Glaciofluvial Deposits)	N.D.	0.5	N.D.
WS107	0.5m to 1.3m (made ground)	N.D.	0.1	N.D.
WS108	0.5m to 1.3m (Granular Alluvium)	N.D.	0.1	N.D.
WS109	2.5m to 4.5m (Cohesive Alluvium & Granular Glaciofluvial Deposits)	N.D.	0.3	N.D.
WS110	0.7m to 3.7m Cohesive Alluvium & Granular Glaciofluvial Deposits)	N.D.	0.1	N.D.
WS111	0.5m to 1.3m (made ground)	N.D.	0.1	N.D.
WS112	2.0m to 4.0m (Cohesive Alluvium)	N.D.	0.2	N.D.
WS113	0.5m to 4.0m (Head)	N.D.	N.D.	N.D.
WS114	2.0m to 4.0m (Granular Glaciofluvial Deposits)	N.D.	0.5	N.D.
WS115	2.0m to 4.0m (Granular Glaciofluvial Deposits)	N.D.	0.5	N.D.

11.4 Discussion

11.4.1 Generic Note 05 in Appendix A outlines how monitoring results are interpreted.

11.4.2 A hazardous gas risk assessment incorporating all of the results will be issued on completion of monitoring in June 2020.

11.4.3 Monitoring of all locations with a PID, to assess the extent and significance of organic vapours will also be undertaken alongside gas monitoring.

11.5 Radon

11.5.1 The Public Health England UK radon map and the Landmark report indicate that the site is in an area where between **1% and 3%** of homes are estimated to be above the action level.

11.5.2 Consequently, basic radon protection measures are not required. However, in light of Public Health England advice, the Developer might consider providing all new dwellings with basic radon protection measures.

12 GEOTECHNICAL TESTING

12.1 General

12.1.1 A total of 27 samples of natural soil were delivered to a suitably accredited laboratory with a schedule of geotechnical testing drawn up by Lithos.

12.1.2 The geotechnical laboratory test results are presented in Appendix J to this report.

12.2 Atterberg limits

12.2.1 The plasticity indices of 21 samples of cohesive soil have been determined; results are summarised below.

Soil type	No. samples tested	Moisture content range (average)	Range of Plasticity Indices* (average)	Shrinkability
Cohesive Alluvium	11	28 to 41 (33)	17 to 38 (27)	Low to Medium
Head	10	14 to 38 (27)	10 to 34 (24)	Low to Medium

* Modified where appropriate in accordance with Chapter 4.2 of the NHBC Standards.

Note. The term Shrinkability is equivalent to the term Volume Change Potential used in Chapter 4.2.

12.2.2 For the purposes of foundation design, it is recommended that all cohesive soils be regarded as being of **medium** shrinkability.

12.3 Particle size distribution

12.3.1 The grading of 6 samples of natural and made ground has been determined by wet sieving and the results are summarised in the table below:

Sample & depth	Field description	% passing 37.5mm sieve	% passing 20mm sieve	% passing 2mm sieve	% fines	Material description (based on grading & plasticity)
TP109, 1.3m	Slightly sandy very gravelly CLAY	91	85	52	35	Sandy very gravelly CLAY
TP112W, 0.6m	SAND & GRAVEL	100	95	32	3	Slightly clayey sandy GRAVEL
TP113, 1.1m	SAND & GRAVEL	96	78	27	5	Clayey sandy GRAVEL
TP122, 0.7m	Clayey sandy GRAVEL	100	100	73	52	Slightly sandy slightly gravelly CLAY
TP101, 1.5m	Very clayey silty SAND	100	100	100	84	Sandy CLAY
TP118A, 3.0m	Slightly gravelly sandy CLAY	100	100	99	93	Slightly sandy slightly gravelly CLAY

12.3.2 NHBC Chapter 4.2 considers shrinkable soils to be those containing more than 35% fines and having a Modified Plasticity Index greater than 10%. The results above generally confirm that materials logged as 'clay' can be considered shrinkable, whereas those logged as granular soils (sand, gravel) can be considered non-shrinkable.

12.4 Soluble sulphate and pH

12.4.1 In accordance with BRE Special Digest 1:2005, this site has been classified as brownfield with a mobile groundwater regime.

12.4.2 It is envisaged foundations will extend to depths of between 1.5m (strips/trench-fill) and 12m (piles) through made ground and natural strata and samples taken from this depth range have been submitted for pH and water-soluble sulphate (2:1 soil/water extract).

12.4.3 The concentrations of sulphate in the aqueous natural soil extracts of 21 samples were determined. In addition, 8 samples of made ground were tested as part of the contamination suite. The pH value of each sample has also been determined.

12.4.4 The highest water-soluble sulphate concentration and the lowest pH value for each soil type analysed are shown in the table below.

Soil type	No. samples tested	Lowest pH values	Highest soluble sulphate concentration (mg/l)
Made Ground	8	6.7	1300
Granular Alluvium	3	6.3	61
Cohesive Alluvium	5	6.2	100
Peat	1	7.4	310
Head	9	6.9	110
Granular Glaciofluvial Deposits	3	6.8	300

12.4.5 In addition to the above, a further 6 samples of deeper natural ground have been scheduled for testing to determine the pH and soluble sulphate concentrations.

12.4.6 pH values were all above 5.5, therefore concentrations of chloride and nitrate are considered insignificant.

12.4.7 In accordance with Tables C1 and C2 of SD1, sub-surface concrete should be Design Sulphate Class **DS-2**, with the site allocated an ACEC Classification of **AC-2**. This could be revised to DS-1, AC-2z where concrete does not come into contact with made ground.

12.5 Compaction tests

12.5.1 Laboratory compaction tests are useful wherever ground improvement is anticipated, for example to provide a satisfactory CBR beneath proposed highways.

12.5.2 In accordance with BS5930:2015 engineered fill is defined as material which is selected, placed and compacted to an appropriate specification so that it will exhibit the required engineering behaviour.

12.5.3 Grading and moisture content control the degree to which materials can be effectively compacted. If the grading or moisture content of an in-situ material is not suitable to facilitate its compaction then screening, wetting, or lime addition may be required.

12.5.4 Laboratory compaction testing was scheduled on 6 samples of natural and made ground (using a 2.5kg rammer) to determine their suitability for re-engineering.

12.5.5 Laboratory compaction tests are only appropriate if:

- At least 90% of the material passes the 37.5mm sieve; and/or
- At least 70% of the material passes the 20mm sieve

12.5.6 It is apparent from the gradings tabulated in Section 12.3, that the samples scheduled for compaction tests are suitable (i.e. at least 70% of the material is finer than 20mm).

12.5.7 The material particle density (Gs) is required in order to plot the 0, 5 and 10% air voids lines on the compaction graph for each material type.

12.5.8 The results are summarised in the tables below:

Sample location & depth	Stratum	Gs (Mg/m³)	MDD (Mg/m³)	OMC (%)	Allowable mc range for 95% MDD & <5% air voids	Typical in-situ moisture content (%)
TP109, 1.3m	Reworked Natural Ground	2.65	1.83	15	14.5 to 19.5	15
TP112W, 0.6m	Ash & Clinker	1.76	1.13	28	27.5 to 32.5	23
TP113, 1.1m	Ash & Clinker	1.97	1.29	25	24.5 to 30.0	23
TP122, 0.7m	Granular Made Ground	2.60	1.79	15	14.5 to 19.5	15
TP101, 1.5m	Granular Alluvium	2.65	1.59	22	22.0 to 27.5	28
TP118A, 3.0m	Cohesive Alluvium	2.63	1.53	25	24.0 to 29.0	34

12.5.9 The in-situ moisture content of the Ash & Clinker (TPs 112W & 113) is typically slightly too dry to achieve 95% MDD. Therefore, the Ash & Clinker is likely to require some wetting before it can be utilised for engineered fill.

12.5.10 The Cohesive & Granular Alluvium are typically slightly too wet to achieve 95% MDD and therefore they will require some drying out before they can be utilised for engineered fill.

12.5.11 Drying out of these soils will require careful management on site. They should be placed in sealed stockpiles during periods of wet weather, or while the site is unattended. During periods of favourable weather (ideally warm & windy) the soils should be spread in thin layers over as wide an area as possible and aerated by turning with an excavator. Alternatively, consideration could be given to lime stabilisation

12.5.12 As part of the preparatory & remediation works, turnover of made ground and removal of oversize will be required (see Section 14.2). Additional testing of made ground generated on site following screening and crushing will be required as works progress.

12.5.13 Acceptability of the natural soils and made ground for use in the proposed controlled earthworks will need detailed appraisal by the Earthworks Designer in light of the required performance characteristics.

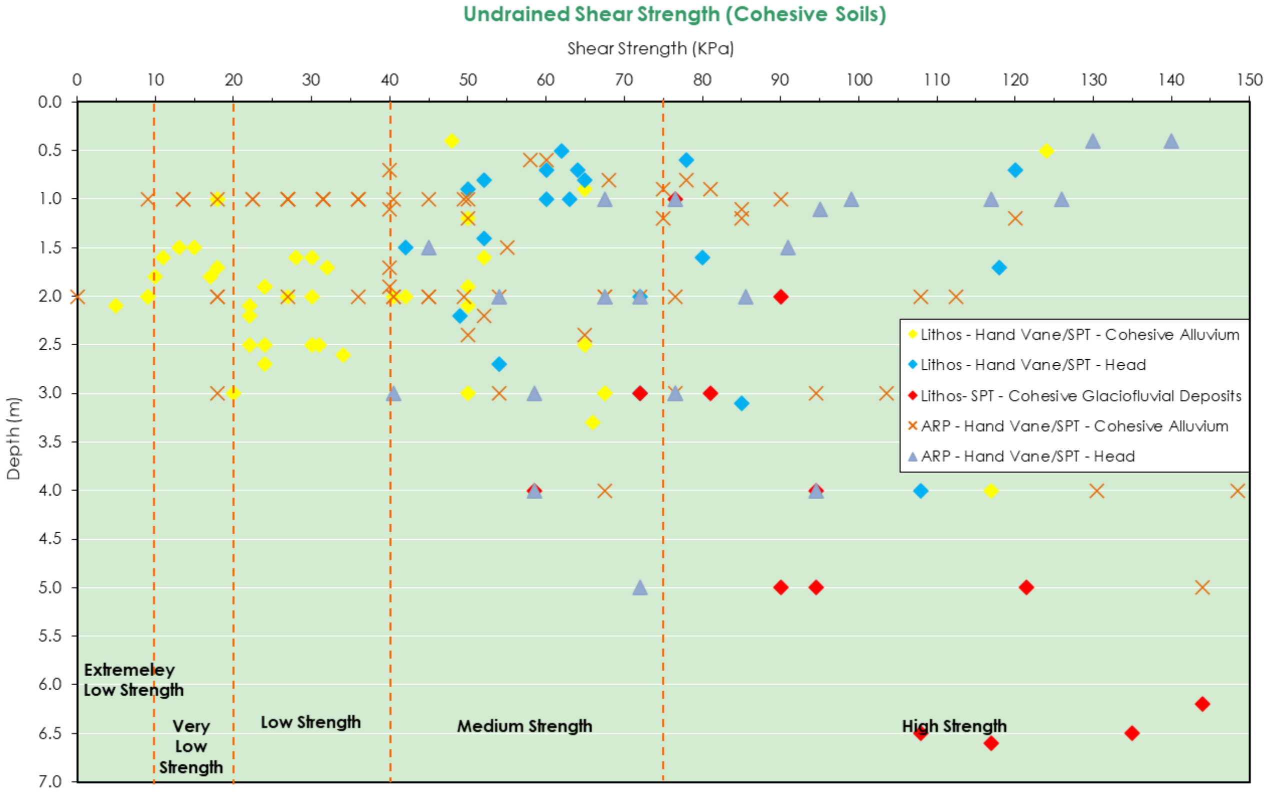
12.6 Undrained shear strength testing

Hand shear vane testing

12.6.1 Hand shear vane testing was undertaken within trial pits in-situ to around 1.2m depth and from larger blocks of excavated clay below that depth. The results are summarised within the graph below.

Standard Penetration tests (SPTs)

12.6.2 SPTs were performed when drilling through cohesive soils during dynamic sampling and cable percussion boreholes as part of ARP's and Lithos' ground investigation. SPT results within cohesive soils can be broadly equated to undrained shear strength values (SPT 'N' value x 4.5). Undrained shear strength results derived from SPTs are included in the graph on page 44.



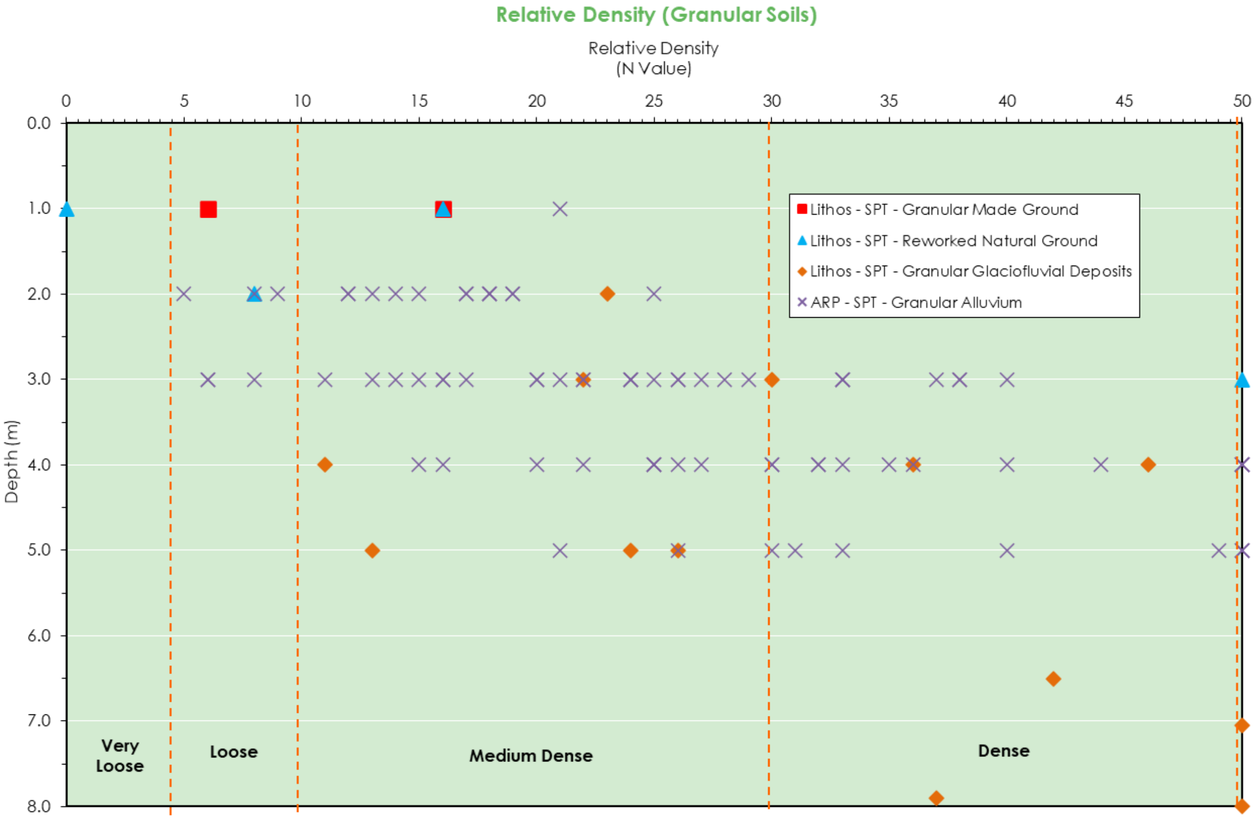
12.7 Standard penetration test (SPT)

12.7.1 The in-situ relative density of granular soils was established by carrying out Standard Penetration Tests (SPTs) during the drilling of the cable percussion boreholes.

12.7.2 The SPT results are summarised in below:

Stratum	Ave. SPT 'N' value	Estimated density	Remarks
Granular Alluvium	26	Loose to medium dense	The majority of results obtained by ARP are from greater than 2m depth and are likely to be Granular Glaciofluvial Deposits
Granular Glaciofluvial Deposits	35	Dense	

12.7.3 The plot below presents a summary of SPT 'N' values.



12.8 Discussion of geotechnical laboratory results

12.8.1 The Cohesive Alluvium is generally of low strength (average 36 kPa), although ARP recorded predominantly medium strength clays (average 60 kPa). It is possible that some of the cohesive deposits logged as 'alluvium' by ARP were actually Head deposits.

12.8.2 The Head deposits encountered by Lithos are typically of medium to high strength (average 75kPa) which corresponds with those encountered by ARP.

12.8.3 Deeper Cohesive Glaciofluvial Deposits encountered in the cable percussion boreholes were predominantly of high strength.

12.8.4 The reported blow counts within SPTs obtained by ARP for the Granular Alluvium range from 5 to 50 at depths of between 1.0m and 5.0m depth.

12.8.5 Based on information included in the BGS Technical Report (see Section 4.2), the majority of the deeper results are likely to actually be Glaciofluvial Deposits (not alluvium) and therefore the actual density of the Granular Alluvium is lower than that reported (average SPT 'N' value of c. 10).

12.8.6 For the purpose of foundations, design values presented in the table below can be adopted for the underlying strata types:

Material	**Typical depth and distribution**	**Design Su value (kPa)**	**Design SPT 'N' value**
Cohesive Alluvium	0.5m to 3.0m in the south and centre	20	-
Granular Alluvium	Sporadically at <2.0m	-	6
Head	0.5m to 3.0m in the north and west	55	-
Cohesive Glaciofluvial Deposits	3.0m to 9.0m across the site	75	-
Granular Glaciofluvial Deposits	2.0m to 9.0m across the site	**-**	15

13 GEOTECHNICAL ISSUES

13.1 Conceptual site model

13.1.1 Made ground is present beneath Areas B1, B2 & C to an average depth of 1.4m (maximum 3.3m) and comprises Concrete/Macadam Hardstand underlain by a mix of Ash & Clinker, Cohesive & Granular Made Ground and Reworked Natural Ground.

13.1.2 No made ground was encountered in Area A.

13.1.3 Natural ground comprises Alluvium (soft clay/loose sand) in the south and centre to a typical depth of 3.0m, underlain by medium dense/dense sand & gravel (assumed to be glaciofluvial in origin). Firm to stiff gravelly clay (interpreted as Head deposits) have been encountered at shallow depth in the north and west.

13.1.4 Coal Measures (mudstone) bedrock is present at depths of between 6.3m and 9.2m (typically 9.0m) depth.

13.1.5 It is understood that as part of the development, levels across the site will be raised by between 0.3m in the southeast and 2.5m in the centre north, presumably to mitigate against flooding risk.

13.2 Mining & quarrying

13.2.1 This site is underlain at depth by Pennine Lower Coal Measures bedrock and the shallowest coal seam lies at about 100m below the surface. Whilst the site lies within a Coal Authority Low Risk area, no significant risks have been identified, and an intrusive mining investigation will not be required.

13.2.2 There are no known quarries on, or within 50m of the site.

13.3 Site regrade and/or ground improvement

13.3.1 Made ground currently underlies Areas B1, B2 & C to an average depth of about 1.4m; maximum of 3.3m. This made ground is of variable and poor strength and is therefore not considered a suitable foundation material. It has also yielded elevated concentrations of a number of inorganic determinands and contains materials (e.g. brick, concrete, clinker, coal, etc), which would generally be considered undesirable as a near-surface material in garden areas.

13.3.2 Given the substantial volume of made ground present, export to landfill is not considered economically viable.

13.3.3 The **full thickness** made ground will require turnover (excavation, screening and replacement in engineered layers). Turnover is considered an appropriate ground improvement solution since significant excavation of the made ground will be required in any case to remove the soil/fill grossly contaminated with hydrocarbons and relict foundations.

13.3.4 Because turnover enables inspection of the full thickness of fill, the developer and their prospective property purchasers, are provided with the reassurance that no significant hazard is left undetected. This is considered advantageous from a perception viewpoint. Furthermore, any potential for surface water infiltration, which would drive potential leaching of contaminants, should be reduced by compaction.

13.3.5 Screened and engineered fill should yield CBR values in excess of 3%, thereby reducing abnormals associated with the construction of estate roads and car parking areas. Excavations through the engineered fill, for drainage etc and foundations will not encounter significant obstructions or grossly contaminated ground and should be stable with little overbreak.

13.3.6 Excavation of the uppermost 600mm or so of natural soils beneath made ground could be undertaken in order to generate a sufficient volume of 'clean' subsoil for placement across the proposed development in gardens and landscaped areas. This subsoil would be best placed during the construction phase; i.e. it should be left in stockpile(s) on completion of the site preparatory works. It should be noted however that this is only feasible for 'clean' natural soils, away from areas where contaminated soil was identified (see Drawing 3435/110).

13.3.7 There are a number of advantages to such a 'soil inversion' operation; most notably:

- Ground levels will remain essentially as existing (i.e. there is no need to raise levels by 600mm to accommodate soil cover).
- Reduced traffic movements due to a reduction in the amount of material going off-site, as well as the amount of import required.

13.3.8 The above solution is considered to be in line with current government philosophy regarding sustainable development. Turnover works should be undertaken in accordance with the CL:AIRE Code of Practice (v2, March 2011), and a Materials Management Plan (MMP) should be prepared prior to commencement.

13.3.9 However, the amount of natural soil available for recovery and re-use from below areas of made ground will be limited by:

- The presence of natural soil which contains visual/olfactory evidence of contamination (which will not be suitable for re-use in gardens)
- The depth to groundwater and Environment Agency guidance regarding disturbance of aquifers as outlined in their protection position statements[4].

13.3.10 The remediation contractor should assess the viability of a 'soil inversion' based on the findings of this investigation and liaison with regulators as necessary.

13.3.11 Given existing topography in the northeast (gradient of about to 1 in 2 – former railway embankment), retaining walls will be required along the base of the slope. A retaining wall is already present in the far north of Area B1. This should be inspected by a suitably qualified structural engineer to assess whether it is suitable for incorporation into the proposed development.

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[4] *The Environment Agency's approach to groundwater protection, February 2018 Version 1.2.*

13.3.12 Careful consideration will need to be given to earthworks design, and implications for slope stability, retaining walls, foundations, highway gradients and drainage.

13.3.13 Any digital terrain modelling undertaken, or commissioned, by Harron should consider implications for the foundation recommendations outlined below.

13.3.14 Natural ground underlying this site is often clayey, therefore consideration should be given to the implication of undertaking earthworks in poor/wet weather when the ground surface is likely to become difficult to cross with heavy machinery.

13.3.15 Wherever possible, Lithos recommend that excavated soils are retained on site. However, if this is not possible the comments in Section 10.7 should apply.

13.4 Foundation recommendations

General

13.4.1 It is understood that consideration is being given to redevelopment of the site with 193 no. two storey domestic dwellings, associated gardens, POS and adoptable roads and sewers.

13.4.2 Foundation recommendations assume that development will be two or three storey construction and that line loads will not exceed 90kN/m run. If this is not the case significant alteration to these recommendations will be required.

13.4.3 It is understood that levels across the site will be raised by between 0.3m in the southeast and 2.5m in the centre north, presumably to mitigate against flood risk. Any digital terrain modelling undertaken, or commissioned, by Harron should consider implications for the foundation recommendations outlined below.

13.4.4 Made ground is not considered a suitable foundation material and foundations should therefore be taken through these materials into underlying natural strata of adequate bearing capacity.

13.4.5 Based on ground conditions and proposals to raise levels, the site can be divided into two broad areas in terms of likely foundation requirements for new plots:

- Shallow strips/trench-fill footings in the north of Area A and northwest of Area C (c. 25% of plots)
- Piled foundations in the south of Area A, east of Area C and entirety of Areas B1 & B2 (c. 75% of plots)

13.4.6 The extent of the above areas is shown on Drawing 3435/109 in Appendix B.

Strip/trench fill footings

13.4.7 It is considered that shallow strip or deepened trench fill footings will be the most suitable foundation solution for two or three storey houses constructed in the north of Areas A and northwest of Area C. This solution is viable where the made ground is less than about 2.5m thick, and medium/high strength clay or medium dense to dense granular deposits are the founding material.

13.4.8 Reinforcement, as a precaution against differential settlement, is recommended only where foundation excavations encounter significant lateral and vertical variations in strata. One layer of B385 mesh placed 75mm above the base of the footing is likely to provide suitable reinforcement, but further advice should be sought from the Structural Engineer.

13.4.9 Where existing buildings are to be demolished, all concrete slabs and service ducts will require breaking out prior to re-development.

13.4.10 Foundations of plots placed over relict foundations should be taken to greater depth than the relict foundations and into natural ground of adequate bearing capacity.

13.4.11 Foundations will be required to be placed below a line drawn up at 45° from the base of any service or similar excavation.

13.4.12 Overdeepened foundations should be stepped in accordance with NHBC Standards, Chapter 4.4.

13.4.13 In order to minimise softening and swelling of cohesive soils or loosening of granular soils, it is recommended that footings are cast as soon as formation level is reached (or alternatively formation could be blinded using concrete with as low a water:cement ratio as possible).

13.4.14 Whilst strip or trench fill footings generally represent a simple and inexpensive foundation solution, there are a number of potential disadvantages associated with their use on this site:

- The made ground contains elevated concentrations of some inorganic contaminants and a 600mm thick cover of clean subsoil (see Section 10.5) has been recommended. Subject to final remediated development levels, this cover is likely to increase footing depth/underbuild.
- Disposal of arisings will be required.
- Foundation and drainage excavations may encounter significant obstructions resulting in significant overbreak, although this will be minimised somewhat by the proposed turnover.
- Foundation and drainage excavations may require shoring in made ground.

13.4.15 In addition to the above deeper excavations for trench fill may be unstable where the centre-lines of parallel trenches are closer than about 2m (assuming 600mm widths), even after turnover. Harron should supervise their groundworker to ensure footings are excavated in a controlled and safe manner.

13.4.16 Harron or their groundworker should seek further advice from Lithos if unexpected ground conditions are encountered in foundation or sewer excavations, including any conflict between soft ground associated with a backfilled trial pit excavation and the line of a proposed footing.

13.4.17 On-going groundwater monitoring shows a relatively shallow groundwater table (close to surface in some locations).

13.4.18 A shallow water table significantly reduces the bearing capacity of granular soils, by effectively reducing the (resisting) overburden pressure above the foundation. The bearing capacity stated below conservatively assumes that groundwater could reach surface level (or close to).

Granular soils (sand & gravel)

13.4.19 SPT results suggest that the Granular Glaciofluvial Deposits have a medium dense relative density (equivalent SPT 'N' Value of >10).

13.4.20 The shallower Granular Alluvium is not considered suitable founding stratum for strip footings given its lower density (predominantly 'loose').

13.4.21 A safe bearing capacity of around 130kPa, allowing a maximum foundation line load of 90kN/m run, can be assumed if the following are true:

- A foundation length of 8m
- A foundation breadth of **0.75m**
- A foundation thickness of 225mm
- A foundation depth of **1.0m**
- A shallow water table (likely to rise above foundation level)
- An angle of shearing resistance of ϕ=32° for the granular deposits

13.4.22 Assuming the foundation geometry detailed above, settlements of less than 25mm would be anticipated. This is considered likely to be acceptable. However, further advice should be sought from the Structural Engineer responsible for foundation design.

13.4.23 It should be noted that founding at shallow depth (450mm), whilst desirable from an excavation stability viewpoint, may not provide sufficient bearing capacity due to the lesser depth of (resisting) overburden. Consequently, a minimum founding depth of 750mm is recommended.

13.4.24 It should also be noted that the footing may require deepening or stepping in order to allow plot drainage to exit the plot footprint (either over or under the footing).

13.4.25 Where plots are underlain by granular soil and within the influence of existing trees, footings can be cast in the granular soil at a "standard" depth of 0.75mm, provided that all the following conditions are satisfied:

- consistent ground across the plot
- the depth of granular soil is greater than ¾ of the depth which would be computed if founding in shrinkable clay
- the thickness of granular soil beneath the footing is equal to or greater than the foundation width (i.e. usually >600mm)

13.4.26 Good control/supervision of groundworks will be essential because there is a significant risk that over-excavation into granular soils (especially below the water table) will result in unstable trenches and collapse which may render the ground unsuitable and necessitate a piled solution.

Cohesive soils (clay)

13.4.27 Clay classification tests suggest that natural cohesive soils at the site should be regarded as being of medium shrinkability. A minimum founding depth of 900mm is therefore recommended for all soils on the site where strip footings are proposed.

13.4.28 In accordance with NHBC Standards, founding depths in cohesive soils should be taken from original or finished ground level, whichever is the lower, to the underside of the footing.

13.4.29 Foundations should be deepened near trees in accordance with NHBC Standards Chapter 4.2. It is estimated that the majority of the plots that can be founded on strip footings will be affected by trees.

13.4.30 A number of immature (likely self-seeded) trees were noted across Area B1, and sporadically in Areas A, B2 & C, during the site walkover, and these will require removal prior to construction. A number of these trees lie within the footprint of proposed plots. In theory, this could result in foundation depths of >2.5m, and consequently necessitate **piling**.

13.4.31 However, in accordance with NHBC Standards Chapter 4.2, if the trees are <50% of their mature height at the time of removal, a default distance to the proposed foundation of 2m can be applied to foundation depth calculations. This will likely result in few (if any) foundation depths of >2.5m. This should be confirmed by a detailed tree survey prior to vegetation removal, and removal should take place as soon as possible.

13.4.32 Trench fill foundations should be designed in accordance with NHBC Standards, Chapter 4.2. Heave precautions (a suitable approved compressible void former) should be used on the internal face of all external walls where the foundation is within the zone of influence of trees and greater than 1.5m deep.

13.4.33 Given the presence of trees in the northwest and northeast of Area A, and far north of Area C, it has been conservatively assumed that foundation excavations will be required to extend through underlying cohesive soils into deeper granular strata. Consequently, some plots in these areas may require piling; it is highly recommended that a foundation schedule is prepared at an early stage.

13.4.34 Any trench fill foundation deeper than 2.5m will need to be designed by a Chartered Engineer, whose status is accepted by NHBC (NHBC Standards, Technical Requirement R5).

13.4.35 It is therefore that a detailed foundation schedule be prepared in order to confirm the number of piled plots, and to seek approval from NHBC in order to determine likely foundation abnormals.

13.4.36 A safe bearing capacity of around 150kPa, allowing a maximum foundation line load of 90kN/m run, can be assumed if the following are true

- A foundation length of 8m
- A foundation breadth of 0.6m
- A foundation thickness of 225mm
- A foundation depth of 0.9m
- An undrained shear strength of 55kPa for the firm clay (typical minimum recorded on site)

13.4.37 Assuming the foundation geometry detailed above, settlements of less than 25mm would be anticipated. This is considered likely to be acceptable. However, further advice should be sought from the Structural Engineer responsible for foundation design.

Geological fault

13.4.38 Drawing 3435/109 shows the approximate line of the fault superimposed on the proposed housing layout; the fault trends northwest-southeast and crosses the centre of the site.

13.4.39 It should be noted that the line of a fault on a geological map is often very approximate, and it may be inaccurate by 10m or more. Furthermore, the presence of a fault is usually 'masked' by overlying drift or residual soils; they can only be seen where long trenches are excavated into bedrock.

13.4.40 At this site, no movement associated with past, present or future mining is anticipated, therefore building can take place over the fault, without the need to search for the fault, and without the need to adopt special precautions in the footings of those plots suspected to lie in the vicinity of the fault.

13.4.41 However, NHBC like to see reinforcement of footings with one layer of B385 mesh placed 75mm above the base of the footing. Given the uncertainty regarding the precise line of the fault, it would be prudent to reinforce the footings of all plots within 25m of its assumed line; i.e. Plots 150 to 155, 162 to 167 and 169 to 171.

13.4.42 Further advice should be sought if a significant weak zone is encountered (e.g. ground comprising loose, broken or soft 'gouge' material) during the excavation of footings. If associated with a fault, the weak zone is likely to form a fairly continuous "linear belt", rather than a localised "pocket", and be anything from a few centimetres to a few metres in width.

Piled foundations

13.4.43 Piled foundations will be required for dwellings constructed in areas of deeper made ground and soft/loose ground (south of Area A, east of Area C and entirety of Areas B1 & B2). In addition, depending on tree influence, some plots within otherwise 'good' ground in the north-west of Area C and far west & far east of Area A may require piling.

13.4.44 The following general comments relating to piling are provided for guidance, and further advice should be sought from a specialist-piling contractor.

13.4.45 Should any impenetrable shallow obstructions be encountered, i.e. boulders etc, they should either be grubbed-up, or alternatively the piling layout could be re-designed (although might also require design of foundations able to span and/or cantilever as necessary).

13.4.46 Piled foundations should extend into the underlying bedrock. The safe working load that may be supported on a pile is dependent on the pile diameter, its founding depth and the method of installation.

13.4.47 Boreholes indicate that competent mudstone bedrock lies at depths of between 6.3m and 9.2m (typically 9.0m), below current ground levels.

13.4.48 As piles would be founded in bedrock, they will be essentially end bearing, although there may also be some shaft adhesion in the Cohesive Alluvium and Glaciofluvial deposits.

13.4.49 Given the presence of soft cohesive alluvium in some parts, pile design will need to consider potential for down-drag (negative skin friction).

13.4.50 It is recommended that flexible service connections are used on this site, especially where they enter the buildings, in order to avoid any possible damage due to self-settlement of the weak strata once the site is developed.

13.4.51 Driven piles may lessen the volume of potentially contaminated made ground requiring off-site disposal (cf arisings associated with say trench fill). However, driving can induce some ground vibration. Assessment of any vibration risk to adjacent structures and/or existing site features should be undertaken by pile designer.

13.4.52 New houses can be built off ring beams designed to span the piles. In order to bond them to the piles, the tops of the piles must be broken out to expose the reinforcement, which can then be tied to that of the beams.

13.4.53 Ground conditions at this site are considered likely to require provision of a piling mat (working platform) and further advice should be sought from the appointed specialist-piling contractor regarding the proposed plant loadings and resulting pressures. This data, together with a knowledge of the strength and variability of the near-surface ground conditions is required in order that design of a mat can be undertaken in accordance with guidance provided in the 2004 BRE document, "BR 470: Working platforms for tracked plant".

13.4.54 The design of working platforms for tracked plant is a geotechnical design process and should be carried out by a competent person. The following parties should have input into the design:

- Permanent works designer, to consider additional uses for platform material as part of the overall development
- Principal contractor, to define any other purposes for which the platform might be used
- Contractor or subcontractor, to specify requirements for the platform, including gradients, ramps and edges

13.4.55 At this stage, it is considered likely that around 75% of plots will require piling.

13.4.56 It may be more practical and economic to pile all the plots on this site, since mobilisation charges are likely to be similar regardless of how many plots are piled. A piled solution would also result in less disturbance than strip footings and negate the need to dispose of contaminated arisings.

13.4.57 Piles can provide an enhanced pathway for the vertical migration of mobile contaminants. The Environment Agency may therefore object to the adoption of piles as a foundation solution. However, objection is considered unlikely given the nature of the contamination encountered, and the fact that made ground is currently resting directly on the underlying alluvium (including granular soils).

13.4.58 Pile design should be undertaken in accordance with the Environment Agency's guidance booklet "Piling into Contaminated Sites".

Summary of foundation recommendations

13.4.59 In summary, the following foundation solutions are likely to be most appropriate (subject to Harron preferences regarding site preparatory works, final levels & costs associated with each foundation option).

Areas	Foundation solution(s)	Remarks (influencing factors)
Centre north of A & majority of C (c. 10%)	Strips/trench-fill at up to 2.5m	Made ground, depth to competent strata and proposed level changes.
Northeast & northwest of A and north of C (c. 15%)	Deep trench-fill at 2.5m or possibly piles (depending on tree influence)	Raising ground levels combined with existing tree influence and underlying cohesive soils
Elsewhere (c. 75%)	Piles, likely end-bearing in bedrock	Deep made ground and soft/loose alluvial soils combined with raising levels.

13.4.60 A 'simple' foundation zoning plan is presented as Drawing 3435/109 in Appendix B.

13.4.61 Lithos could prepare a detailed Foundation Schedule if provided with: an External Works Drawing (with proposed FFLs & infrastructure details); a topographic survey; a tree survey.

13.4.62 The foundation solutions outlined in the above table assume that ground levels will not change significantly from those existing at present. If this is not to be the case, further advice should be sought from Lithos.

13.5 Floor slabs

13.5.1 Floors for low rise housing (2-3 storeys) constructed on piled foundations typically utilise reinforced concrete ground beams which rest on pre-cast or in-situ pile caps. A suspended 'Beam and Block' ground floor is then usually constructed using concrete or polystyrene blocks placed between further concrete beams suspended across the ring beams.

13.5.2 Suspended floor slabs should be utilised where the depth of made ground or engineered stone exceeds 600mm in accordance with NHBC Standards Chapter 5.1 (to negate potential settlement problems).

13.5.3 It is estimated that, following proposed level changes, the thickness of made ground is likely to exceed 600mm beneath the majority of plots, therefore ground-bearing floors are not recommended on this site.

13.5.4 Where shallow foundations are within the influence of existing or proposed trees (and are underlain by shrinkable soils), NHBC require a suspended floor slab, with sub-floor void. The floor slab is most commonly a precast block and beam construction, but alternatively could comprise a suspended timber floor, or a slab cast on a suitable compressible void former. Ground-bearing and cast in-situ suspended slabs (other than those cast on a void former) are not acceptable where foundations are within the influence of trees.

13.5.5 In accordance with NHBC Standards Chapter 4.2, a minimum void height of 250mm should be adopted for a precast block and beam (or suspended timber) floor; this includes a 150mm ventilation allowance. If a suspended, cast in-situ slab (on a void former) is proposed, a minimum clear void height of 100mm should be adopted; of course, the actual thickness of the void former will be significantly greater.

13.5.6 Floor slab design should be finalised/take account of the results of the gas monitoring and protection measures required, which will be detailed in Lithos' gas risk assessment, to be issued on completion of monitoring in June 2020.

13.6 Designated concrete mixes

13.6.1 Designated mixes are considered in BRE Special Digest SD1 and BS 8500 -1:2015+A1:2016. However, in addition to soil chemistry (sulphate class), there are a number of other considerations relating to structural design that need to be taken into account when determining an appropriate concrete mix.

13.6.2 Consequently, Harron should seek advice from their appointed Structural Engineer.

13.7 Excavations

13.7.1 Groundwater should be controlled in accordance with CIRIA report 113 "Control of Groundwater for Temporary Works".

13.7.2 Based on the results of the investigation, groundwater control over and above normal site pumping practices may be required for any excavations in excess of 2.0m deep.

13.7.3 The stability of even shallow excavations is likely to be poor, most notably in saturated granular soils and made ground, and therefore allowances should be made for shoring.

13.7.4 Where sand is encountered (especially running sand), beware of over-digging and creating a "large hole". It is generally prudent to stop excavation and "probe" to check thickness of sand. If in doubt, please seek advice from Lithos. "Blowing" sand is caused by excess water heads, and it may be prudent to fill the excavation and ensure groundwater control measures are effective.

13.8 Drainage

13.8.1 Given the significant thicknesses of made ground encountered on-site and shallow groundwater, soakaways will not be feasible. It should be noted that soakaways cannot be allowed to infiltrate into made ground due to the risk of settlement caused by wash out of fine soil particles and the base of soakaways should be at least 1m above the water table to allow dispersion within eh unsaturated zone.

13.8.2 Consequently, it will be necessary to consider alternative sustainable drainage systems (SUDS), and there may be a need for surface water balancing.

13.8.3 It is recommended that the developer contact Yorkshire Water Services with respect to capacity in existing foul and surface water sewers in the vicinity of the development area.

13.9 Highways

13.9.1 This site is underlain by made ground which is likely to be subject to re-engineering prior to the construction of new estate roads. Consequently, there was no merit in obtaining CBR values at this stage.

13.9.2 Made ground is present across the site and consultation with the adopting authority, regarding the specification of the highways, is strongly recommended.

13.9.3 The made ground present beneath this site is highly variable in terms of both composition, and strength/density. Furthermore, it often contains a significant amount of oversize (boulders etc) and obstructions (old foundations etc), which represent potential 'hard-spots'.

13.9.4 Consequently, where made ground is present its full thickness (up to a maximum of 2m - from existing ground level or proposed highway formation, whichever is the lower) should be excavated and either:

- replaced with suitable aggregate in accordance with Series 600 (Earthworks) of The Highways Agency (HA) "Specification for Highway Works" 1998; or
- screened, to allow selection of suitable material, before being replaced in engineered layers (in accordance with Series 600). Unsuitable materials include any soft or wet materials, biodegradables including topsoil, wood, scrap metal, frozen material and oversize.

13.9.5 Some refinement of the above advice might be possible after highways design (with consideration of the proposed formation level cf existing ground level), and via inspection (and usually CBR testing) of the proposed formation during site preparatory groundworks.

13.9.6 Any residual made ground materials in the base of the excavation should be inspected and (where necessary) any soft spots removed and replaced with suitable engineered fill.

13.9.7 Where the made ground is re-engineered it is considered that a CBR value of at least 3% should be achievable. However, this should be verified by field trials.

13.9.8 Crushing of demolition/hardstand/foundation arisings will generate aggregate, which (subject to confirmatory testing) should be suitable for use as unbound pavement materials within the highways.

13.10 External works

13.10.1 Any digital terrain modelling undertaken, or commissioned, by Harron should be made available to their Engineering Designer prior to issue of an External Works Drawing.

13.10.2 Based on existing topography, the proposed layout and finished floor levels there is likely to be a need for retaining walls and underbuild, especially in the north of the site.

14 REDEVELOPMENT ISSUES

14.1 General

14.1.1 This report has presented options with respect to foundation solutions, management of contamination, re-use of topsoil etc that are considered technically feasible and in line with current good practice. Further site-specific risk assessment of vapour, groundwater and surface water may be required. Copies of this report should be forwarded to the relevant regulatory authorities (Warranty Provider & Local Authority) for their comment/approval.

14.1.2 Even after an appropriate preliminary investigation and ground investigation, with exploratory holes on a closely spaced grid (say trial pits at 30m centres), a geoenvironmental appraisal is typically based on inspection of the ground underlying less than 0.5% of the total site area (and much less at depths in excess of about 3.5m). Consequently, there is always a possibility that unanticipated ground conditions will be encountered during the construction phase.

14.1.3 If unanticipated ground is encountered during the construction phase, the Contractor should immediately seek further advice from the Engineer.

14.2 Remediation strategy

14.2.1 Redevelopment of this site will almost certainly be subject to planning conditions relating to remediation and validation. Once further assessments have been completed and a specific, preferred development strategy has been decided, Lithos could liaise with local Planning Authority and Warranty Provider and prepare a detailed Remediation Strategy document for approval.

14.2.2 The Remediation Strategy document would include:

- General background information, including site location, site description and a summary of ground investigation data
- An overview of existing constraints on development and the aims of the proposed remediation works
- Specific details of the anticipated site remediation/preparatory works
- Details of site supervision and verification
- A summary of implications for redevelopment

14.2.3 The Remediation Strategy will describe what is required, but not how it is achieved; the appointed Contractor would normally be expected to undertake an Options Appraisal, and then prepare a Method Statement.

14.2.4 The anticipated remediation works are likely to include:

- General site clearance of surface materials and vegetation
- Demolition of building in east of Area B1
- Break-up of slabs and hardstand
- Crushing of all suitable artificial hard material (i.e. concrete/brick etc)
- Turnover (excavation, screening and replacement in engineered layers, with nominal compaction) of the full thickness of made ground in Area B1, B2 & C to enable:
    - Removal of Ash & Clinker; with subsequent isolation beneath areas of hardstand/1,000mm cover in garden/landscaped areas
    - Removal of localised fuel/oil/organic contamination and any associated below ground structures, pipes and drains; with subsequent treatment and/or off-site disposal
    - Inspection of the made ground
    - Removal of below ground obstructions
    - Preparation of the ground for highway construction
- Excavation of natural soils from beneath made ground to source 'clean' subsoil for use in gardens and landscaped areas
- Excavation and removal/treatment of organic contamination associated with lagoon and drain 'plume' (see Drawing 3435/110)
- Backfill of all resultant excavations, with appropriate compaction
- Treatment of hydrocarbon impacted soil using an appropriate technique following remedial options appraisal
- Re-grade of site to levels specified by Harron
- Excavation of up to a maximum depth of 2m beneath proposed adoptable road footprints and controlled re-engineering of selected materials in layers to approximately 650mm below final road levels
- Removal of above and underground tanks
- Provision of a minimum 600mm thick cover layer of 'clean' soils with 150mm "hard dig" layer in all garden and landscaped areas underlain by made ground

14.2.5 The remediation contractor should survey reduced levels during the proposed turnover, prior to the placement of any fill.

14.2.6 Subsoil excavated during the site preparatory works for subsequent use as cover in gardens and landscaped areas, would be best placed during the construction phase; i.e. it should be left in stockpile(s) on completion of the site preparatory/remediation works.

14.2.7 A minimum 200mm thickness of suitable granular fill (i.e. a "blanket" of 6F2) could be placed along the line of proposed haul roads to provide a firm and stable running layer for the subsequent construction works.

14.2.8 It is strongly recommended that the remediation contractor should chase-out all significant buried structures, survey-in the resultant excavations and take validation samples of underlying soil before making them safe by backfilling. Similarly, it would be prudent to complete a drainage survey prior to blading rubble across the site to leave it safe and secure.

14.3 Control of excavation arisings

14.3.1 Excavations into made ground are likely to yield contaminated arisings. The groundworker should carefully segregate (and stockpile separately) made ground arisings from arisings of "clean" natural soils, in order that an excessive volume of unsuitable material is not generated.

14.3.2 It should be ensured that the groundworker understands the need for good materials management. Most notably the importance of not mixing different materials within a given stockpile; i.e. there should be separate stockpiles of: topsoil; grubbed-up concrete hardstand; tarmac; Ash & Clinker; fuel-contaminated soil; excess clean, natural soil arisings; general construction waste etc.

14.3.3 Further characterisation of stockpiled materials is likely to be required if off-site disposal is proposed. See also comments in Section 10.7 regarding asbestos.

14.3.4 Made ground arisings could be:

- Placed in area deliberately left low on completion of the remediation works in order to accommodate construction arisings proving these are shown to be chemical suitable to be in close contact with groundwater
- Redistributed beneath concrete oversite, or areas of hardstanding, where they would be satisfactorily isolated from end users;
- Isolated beneath the 600mm thick cover layer (plus a 150mm "hard dig" layer) in garden or landscaped areas
- Exported from site to a suitably licensed landfill facility

14.3.5 Natural ground arisings should be suitable for use as subsoil in the proposed soil cover.

14.4 Good practice guidance

14.4.1 The construction phase groundworker should follow good environmental practice to minimise the risks of spillage, leakage etc with reference, but not limited, to the following documents:

- CIRIA C502 'Environmental Good Practice on Site'
- EA Pollution Prevention Guidelines[5]:
    - PPG6 - Working at construction and demolition sites
    - PPG2 - Above ground oil storage tank
    - PPG7 – The safe operation of refuelling facilities.
    - PPG21 – Incident Response Planning

14.4.2 Site preparatory works associated with this project are likely to involve the re-use of both natural and made ground soils on site, and the import of natural soils from another development site. Therefore, the Contractor should prepare a Materials Management Plan (MMP) in accordance with the CL:AIRE Code of Practice (v2, March 2011).

14.4.3 The MMP will document how all of the materials to be excavated during the proposed site preparatory and remediation earthworks are to be dealt with.

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[5] *Whilst this has formally been withdrawn it can still be accessed via the EA archives and provides useful information on managing risks.*

14.5 New utilities

14.5.1 It is strongly recommended that all statutory service bodies are consulted at an early stage with respect to the ground conditions within which they will lay services in order to enable them to assess at an early stage any potential abnormal costs.

14.5.2 It is recommended that trenches for services including site drainage and water supply are cut over size in order to isolate pipe materials from potential contaminants and to enable maintenance to be conducted in "clean" material.

14.5.3 Water Companies have a statutory duty to supply wholesome water, which could be compromised by the selection of an inappropriate pipe material. For example, compounds such as petroleum hydrocarbons and solvents can permeate commonly used plastics pipes, and/or corrosive chemicals can reduce the service life of metallic pipes. Guidance has been developed for the selection of pipes in brownfield sites and is contained in a UKWIR Report[6].

14.5.4 This site is brownfield, and therefore consideration of soil contaminant concentrations is required. Samples taken must be representative of the soil conditions in which the water pipes are proposed to be laid; normally water pipes are laid 0.7m to 1.3m below finished ground level.

14.5.5 At the time of writing, significant remediation earthworks are anticipated, and ground currently present along proposed pipeline routes will almost certainly be redistributed. Consequently, to date laboratory testing of soil samples in line with UKWIR guidance has not been undertaken.

14.5.6 However, given the site's size, history, and ground conditions encountered, Yorkshire Water may require sampling within 15m of proposed water supply pipes, once infrastructure design has been completed. In the meantime, it is considered likely that Yorkshire Water will request the use of Protectaline mains, with plastic coated copper house connections, given that residual organic contaminants will still be present post-remediation, albeit at acceptable concentrations.

14.6 Health & safety issues - construction workers

14.6.1 Access into excavations etc. must be controlled and undertaken in accordance with the CDM Regulations 2015, most notably Regulation 22, to mitigate risk of collapse or asphyxiation.

14.6.2 Before site operations are started, the necessary COSHH statements and Health & Safety Plan should be drafted in accordance with the CDM regulations.

14.6.3 All of the made ground could be retained on site. However, made ground has been found to contain low concentrations of cyanide which is a known acute toxin and the possibility of further significant cyanide contamination cannot be discounted.

14.6.4 Consequently, during the remediation and construction phases of the site development it will be necessary to protect the health and safety of site personnel. General guidance on these matters is given in the Health and Safety Executive (HSE) document "Protection of Workers and the General Public during the Redevelopment of Contaminated Land".

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[6] *UKWIR Report 10/WM/03/21 – 'Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites'.*

14.6.5 In summary, the following measures are suggested to provide a minimum level of protection:

- All ground workers should be issued with protective clothing, footwear and gloves. Personnel should be instructed in why and how they are to be used.
- Hand-washing and boot-washing facilities.
- Care should be taken to minimise the potential for off-site migration of contamination by the provision of dust suppression control and wheel cleaning equipment during the construction works.
- Good practices relating to personal hygiene should be adopted on the site.
- The contractor should satisfy the Health & Safety Executive with regard to any other matters concerning the health, safety and welfare of persons on the site.

14.6.6 Guidance should be provided to all ground workers, via toolbox talks, about the risks of cyanide, how to identify and handle possible cyanide contamination.

14.7 Potential development constraints

14.7.1 Some deterioration of the surface is likely to be caused by trafficking, especially after topsoil has been stripped and during/after periods of significant rainfall. Consequently, it would be prudent to consider placement of a minimum 200mm thickness of suitable granular fill (i.e. a “blanket” of 6F2) along the line of proposed highways and any temporary haul roads to protect formation during the construction phase.

14.7.2 It would be prudent to allow flexibility in the groundworks programme to take advantage of any prolonged dry\warm weather (typically between May and September) to enable footings to be cast and blockwork brought up to DPC level well in advance of the build programme (i.e. so it is never necessary to dig deep footings in winter/early spring, when the groundwater table is likely to be higher).

14.7.3 The existing utilities (high-pressure gas, sewer and overhead electric) present a potential development constraint unless they can be relocated. Additional enquiries are required to ascertain the feasibility of such diversionary works and the particular easement required by each service undertaker if they remain in-situ.

14.7.4 Yorkshire Water may seek to restrict changes in site level if the depth of cover above their sewer were adversely affected by any development proposals. This aspect requires further clarification.

14.7.5 The depth and line of the high-pressure gas main across the southwest of the site will have a significant impact on the plot layout at the site and it is understood that it will not be re-routed.

14.7.6 It is almost certain that Northern Powergrid will have restrictions with respect to development in the vicinity of the overhead electric cables in the south; an easement will probably be required.

14.7.7 Ox Field Beck and Lee Head Beck flow west along the site’s southern boundary. Therefore, it is recommended that a silt and surface water management plan be developed prior to construction activities commencing.

15 SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

15.1 General

15.1.1 The site is located off Crossley Lane and Cold Royd Lane, approximately 3km east of Huddersfield town centre, and currently comprises 3 relatively flat parcels of land:

- Area A (2.55ha) - previously undeveloped area of rough grass in the southwest.
- Areas B1 & B2 (5.2 ha) - previously occupied by a gas & dye works and Minerva Works (north & south of Crossley Lane respectively). Now predominantly overgrown concrete hardstand.
- Area C (0.89 ha) - former industrial building (built in 1970s) in the north-west, to the west of Cold Royd Lane.

15.1.2 It is understood that consideration is being given to redevelopment of the site with 193 no. two -storey domestic dwellings, associated gardens, POS and adoptable roads and sewers. A site layout has been provided by Harron.

15.1.3 Made ground is present beneath Areas B1, B2 & C to a typical depth of 1.4m (maximum 3.3m) and comprises Concrete/Macadam Hardstand underlain by a mix of Ash & Clinker, Cohesive & Granular Made Ground and Reworked Natural Ground.

15.1.4 Natural ground comprises Alluvium (soft clay/loose sand) in the south and centre to a typical depth of 3.0m, underlain by medium dense/dense sand & gravel (assumed to be glaciofluvial in origin). Firm to stiff gravelly clay (interpreted as Head deposits) have been encountered at shallow depth in the north and west.

15.1.5 Coal Measures (mudstone) bedrock is present at depths of between 6.3m and 9.2m (typically 9.0m) depth.

15.1.6 It is understood that as part of the development, levels across the site will be raised by between 0.3m in the southeast and 2.5m in the centre north, presumably to mitigate against flooding risk.

15.2 Mining

15.2.1 This site is underlain at depth by Pennine Lower Coal Measures bedrock, and the shallowest coal seams lies at about 100m below the surface. Whilst the site lies within a Coal Authority Low Risk area, no significant risks have been identified, and an intrusive mining investigation will not be required.

15.3 Hazardous gas

15.3.1 The site is in an area where between 1% and 3% of homes are estimated to be above the radon action level. Radon protection is not required, but the Developer might consider providing new dwellings with basic measures in light of Public Health England advice.

15.3.2 A recorded former landfill is located 20m south of the site and therefore gas monitoring is currently underway to determine the need for special precautions against methane / carbon dioxide gas.

15.3.3 Vapour monitoring should also be undertaken alongside gas monitoring to consider the extent and distribution of organic contamination.

15.4 Contamination & remediation

15.4.1 Topsoil in Area A is likely to be suitable for reuse, following bioaccessibility testing of arsenic.

15.4.2 There is a 'plume' of potentially significant organic contamination, believed to be associated with the former lagoon and drain, in Area B2. Drawing 3435/110, indicates the area that is suspected to be impacted, although further widespread contamination, associated with former tanks, pipes and drains should also be anticipated in Area B1 & B2.

15.4.3 Significant organic contamination has also been encountered in a suspected tar well in the vicinity of the former gas works in the southeast of Area B2.

15.4.4 Visual and olfactory evidence of contamination was identified in Areas B1 & B2. Ground contamination reported by the laboratory was less significant than had been expected based on field observations, but evidence of coal tar derived compounds was recorded at low concentrations. Further monitoring should be undertaken on groundwater and surface water to assess the extent of the organic impact. A detailed site-specific risk assessment may be required.

15.4.5 Elevated TPH (DRO and LRO) was recorded in one location in Area C. This appears to represent a single 'hotspot' which could be excavated and disposed form site. However, care should be taken during site preparation in this Area, in case further 'hotpots' are identified.

15.4.6 Where made ground remains beneath garden and landscaped areas a minimum **600mm** thick surface cover of "clean" soil is recommended. This cover will break potential pollutant linkages between the contaminated made ground and future end-users.

15.4.7 A minimum **150mm** thick "**hard dig**" layer of crushed demolition arisings should be placed immediately beneath the soil cover due to the possible presence of cyanide and the relatively high pH of the made ground from Area B & C.

15.5 Foundations

15.5.1 Strip/trench-fill foundations can be utilised in the centre north of Area A and majority of Area C (c. 10% of plots), where the thickness of made ground is less than 2.5m and the underlying strata is firm clay or medium dense gravel. These will need to be 0.75m wide at 1.0m in granular soils and 0.6m wide at 0.9m in cohesive soils.

15.5.2 In the northeast and northwest of Area A and far north of Area C (c 15%), existing trees and underlying cohesive soils is likely to require overdeepening of trench-fill footings to 2.5m depth, or possibly piled foundations.

15.5.3 Piles will be required in areas of deep made ground and soft alluvium in the south of Area A, southeast of Area C and entirety of Areas B1 & B2 (c. 75% of plots).

15.6 Flooding

15.6.1 The centre and west of the site lie within Flood Zone 3 (but benefits from flood defences) and the east lies within Flood Zones 2 & 3.

15.7 Drainage

15.7.1 Due to the presence of significant made ground, cohesive natural soils and high groundwater levels, soakaways will not provide a suitable drainage solution for surface water run-off at the site. Consequently, it will be necessary to consider alternative sustainable drainage systems (SUDS), and there may be a need for surface water balancing.

15.8 Highways

15.8.1 Made ground is present across the majority of the site, typically to depths of around 1.4m, and consultation with the adopting authority, regarding the specification of the highways, is strongly recommended.

15.8.2 Where made ground is present it should be excavated and either replaced with suitable aggregate, or screened, to allow selection of suitable material, before being replaced in engineered layers. Where the made ground is re-engineered it is considered that a CBR value of at least 3% should be achievable. However, this should be verified by field trials.

15.8.3 Land in the west is underlain by shallow cohesive soils. Based on visual inspection of the shallow natural materials and published guidance, the firm to stiff clay should provide a CBR value of at least 2%. This value should be verified prior to or during construction.

15.9 Further works

15.9.1 Groundwater and surface water sampling should be undertaken to assess risks to the aquifer and controlled waters. Following this, a detailed quantitative risk assessment should be produced to give site-specific screening values for use in remediation.

ANNEX I

LITHOS REVIEW OF ARP REPORTS

REVIEW OF GROUND ISSUES

Job No.	3435	**Site area/ha**	8.3
Client:	Harron Homes	**NGR:**	SE 174 173
Site:	Crossley Lane, Dalton	**Nearest postcode:**	HD5 0QP

Introduction. It is understood that Harron Homes are considering acquisition of land at Crossley Lane, Dalton with a view to redevelopment with housing. Harron have provided Lithos with copies of the following:

1. 'Combined Stage 1 & 2 Desk Study & Geo-environmental Report – Land at Crossley Lane, Dalton, Huddersfield' (Ref MWD/01r1) issued by ARP in August 2016 to Minerva Works Developments Ltd.
2. 'Combined Stage 1 & 2 Desk Study & Geo-environmental Report – Sites Four and Five, Land at Crossley Lane, Dalton, Huddersfield' (Ref MWD/01r2) issued by ARP in March 2017 to Minerva Works Developments Ltd.

The two reports relate to Harron's proposed development site, which totals 8.3ha. ARP (and prior to them, Sirius) split the site into 5 parcels, named Sites 1 to 5. Report 1 relates to Sites 1, 2 & 3; Report 2 relates to Sites 4 & 5.

The boundaries of Sites 1 to 5 are shown on Lithos Drawing 3435/6 appended to this report.

The Site. The site can be better considered (based on past use & ground conditions) as 3 parcels of land (Areas A, B & C), intersected by Cold Royd Lane running north-south and Crossley Lane running east-west. Area B is further sub-divided into Areas B1 (north of Crossley Lane) and B2 (south).

The site is bounded to the south by Lees Hall Beck (named Ox Field Beck in the east), and to the north by steeply sloping land associated with a railway embankment. Previous site uses include a gas works (Area B2), dye & bleach works (Areas B1 & B2) and later, industrial development (warehouses/workshops) across Area B1 and Area C. The south-west (Area A) is essentially greenfield.

Key features are shown on Drawing 3435/3.

Proposed Development & Levels. Harron have provided a topographical survey and proposed layout (in CAD format), copied here as Drawing 3435/2.

Environmental Setting. Lithos have reviewed the above reports and our own geological maps, and data available on the Environment Agency's website. A summary is provided in the Table below.

Issue	Remarks
The Site	Comprises three parcels of land split by Crossley Lane (running east-west) and Cold Royd Lane (running north-south). Concrete hardstand (former floor slabs of industrial buildings) are present across the south-east and north. A retaining wall runs along the north-east boundary at the base of a slope which is approximately 5m tall (former railway embankment) and heavily covered in vegetation. Stockpiles of demolition waste in the central north and south. Two cylindrical tanks in south-west of Area B1 (labelled ferric chloride). In the east of Area B2, above-ground gas tanks are present, along with a filling pump, likely associated with a UST. Concrete base of a (probable) former gas holder is seen in the south-east. Underground services include a high pressure gas main and underground sewer; overhead powerlines run along the southern boundary. The south-west is covered by rough grassland, with trodden footpaths evident.
Site History	**Area A** Essentially greenfield, with the exception of a bowling green that formerly encroached in the west and former allotments in the north. Lees Head Beck encroached into the south-west, then re-routed prior to 1958. **Area C** First developed in 1950s, but more significant development by 1980s with industrial building. Now demolished to slab level. **Areas B1 & B2** Shows as 'Coal Tar Colour Works' from late 1890s, later renamed Minerva Works (Dyeing and Bleaching), expanding through to 1950s before redevelopment with a two large industrial buildings (one spanning Sites 3 & 4, one on Site 5), including tanks in the north and east.

Issue	Remarks
	Now demolished to slab level. A former substation (recently demolished) was present in the north-west of Site 5. In addition to the above, a railway embankment runs along the north-east boundary of (Sites 2, 3 & 4) from the late 1890s, resulting in a steep bank along the north-east boundary. This encroaches into Site 3. Railway shown as dismantled from the late 1960s.
Environmental Setting	**Geology**: Made Ground: Shown in north-east (associated with railway embankment). Drift: Alluvium across Sites 1 and 5 (south of Crossley Lane) and in the south of Site 2, 3 & 4 (north of Crossley Lane). Solid: Elland Flags in the north & west of Site 1, elsewhere Lower Coal Measures. Strata Dip: 2° to the south-east. **Faults**: One fault running north-west to south-east runs through Site 5, downthrow to north-east. **Hydrogeology**: The site does not lie within a groundwater Source Protection Zone. The bedrock aquifer is designated as Secondary A Aquifer. Groundwater abstraction in Site 3. **Hydrology**: Lees Head Beck/Ox Field Beck immediately south, flowing to the west. Surface water abstraction in Site 3. **Landfills**: Two within 250m. One immediately south (inert & commercial material as well as 'excavation waste from Fenay Beck') and one accepting inert waste 180m south-east. **Radon**: The site lies in an area where 1-3% of homes are estimated to be above the action level; no measures required. **Flooding**: Site 1 – majority is Flood Zone 3 but benefitting from flood defences, the north-east is Flood Zone 2. Sites 2, 3, & 4 – Flood Zone 1 Site 5 – majority in Flood Zone 1, east lies in Flood Zones 2 and 3.
Mining & Quarrying	**Coal**: Shallowest coal c. 100m (Hard Bed). No significant risks identified. **Elland Flags**: Risks of Elland Flags mining are not mentioned by ARP. The west of the site (Site 1) is underlain by Elland Flags Sandstone. However, no quarries are shown on historical plans on site, nor within the local area. The nearest known former Elland Flags mine is at Fixby, some 6km north-west, and the Elland Flags are overlain by alluvium (according to BGS plans). Therefore, risks of workings beneath the site are considered very low and do no warrant further assessment. **Quarries**: None within the vicinity of the site.
Ground Investigations	Have been undertaken by: **Sirius** (2006). This included boreholes, trial pits and WSs across the site. ARP's Report 1 (for Sites 1 to 3) includes Sirius' lab testing results and comments are made regarding ground conditions encountered by Sirius. However, Sirius' logs are not included in ARP's report and Lithos do not have a copy of Sirius' report. In Report 2 (for Sites 4 and 5), ARP do not appear to use any of Sirius' lab testing results. **ARP** (2016): This GI included: 48 trial pits and 48 window-sample boreholes. All exploratory hole locations are shown on Drawing 3435/6. Further comments below.
Made Ground	**<u>Site 1 (Area A)</u>** Made Ground Topsoil only (to 0.3m depth), with "possible" deeper made ground (loose sand and very soft clay) to 2.7m in WS46 (south-west). Looking at the log for WS46, this is more likely to be alluvium than made ground, but could be fill material associated with the diversion of the beck. **<u>Sites 2 to 5 (Areas B1, B2 & C)</u>** Reinforced **concrete** covers the majority of these sites, between 0.1-0.3m thick. The reinforcement across Site 5 (south-east) was noted as stronger and more difficult to penetrate with a coring barrel on the window sampling rig. **Macadam** Hardstand (0.1m thick) was encountered in the north-west of Site 5. In the west of Site 5 (grassed areas), **Made Ground Topsoil** was encountered. Made ground encountered by ARP typically comprised **Granular Made Ground** (sandy gravel of limestone, brick, concrete, clinker, with some 'ash' noted), occasionally interbedded with **Cohesive Made Ground** (soft clay with gravel of brick, sandstone, mudstone, coal) and occasionally re-worked natural soils. Depths of made ground range from 0.2m to >3.45m. Typically, made ground is less than 2m thick, but sporadic areas of deeper made ground (>2.5m thick) are present in Site 3 (WS22), Site 4 (WS31, TP39) and Site 5 (TPs 10 to 14 and WSs 6, 7 & 12) roughly in the centre. Locally, made ground topsoil is present in former soft landscaped areas of the works buildings.
Natural Ground	Natural ground encountered by ARP typically comprises **firm to stiff gravelly clay**, often interbedded with sands and gravel. This material is classified by ARP as 'Alluvium' in the majority of exploratory holes, although occasionally it is referred to as 'Possible Head' deposits. Dynamic probing by ARP across the site achieved depths of between 8m and 10m before refusal on suspected bedrock.

Issue	Remarks
	Some loose sands/soft clays were encountered, usually within the upper 1m or so, but occasionally extending to >2.5m depth (south of Site 4 and south of Sites 1 & 5). In the far south, **peat** was encountered close to Lees Hall Beck in WS12 on the southern boundary. The material encountered in the far north (at the base of the railway embankment) is almost certainly weathered Coal Measures (residual soils) and not 'Head' deposits as described by ARP. Further comments below.
Groundwater	Groundwater was encountered by ARP at depths of between 1m and 3m in various exploratory holes across the site as seepages/inflows. Groundwater inflows/seepages were more common in the lower-lying Sites 1 and 5, closer to Lees Hall Beck to the south.
Contamination	During fieldwork a potential 'hotspot' of hydrocarbon contamination (visual & olfactory evidence) was encountered by ARP within cohesive made ground up to 2m thick in the central-west (see Drawing 3435/3). In addition, *'possible methylated sprits'* were identified in TP13. Across both Sirius' and ARP's investigations, the following were tested (according to ARP's report) • 38 samples of topsoil/ MG topsoil • 102 samples of made ground It is likely that more testing was carried out by Sirius in Sites 4 and 5, but only Sirius' results for Sites 1 to 3 are used by ARP (as well as their own tests results). In summary, ARP conclude: **Site 1** No contamination with the exception of topsoil in TP4, which ARP state requires further sampling to delineate the extent of lead and PAH contamination. TP4 actually lies in Site 5, so Site 1 (greenfield) is considered 'clean' based on ARP's report, and should be suitable for re-use. **Site 2** Arsenic and PAH contamination encountered within the made ground. Will require 600mm clean soil cover in gardens underlain by made ground. **Sites 3, 4 & 5** Made ground across the former Minerva Works was found to contain elevated concentrations of various heavy metals, asbestos (especially within Site 5) and PAHs. Elevated concentrations of VOCs were also encountered sporadically across Sites 4 and 5. A 600mm clean soil cover system is recommended in garden areas, with an underlying hard-dig layer (100mm thick) due to the presence of asbestos contamination. Not all of the samples which yielded positive asbestos IDs were scheduled for quantifications. Of those that were, results ranged from <0.001% to 0.009%. Sirius' BH 3 on Site 3 identified elevated concentrations of DRO and MRO in groundwater. ARP state that they installed a well adjacent to this to re-test the groundwater in this location. This was done after the report was issued so the results are not included. ARP conclude that risks to surface waters from VOCs could be mitigated by removal of the contamination (by excavation). Further comments provided below.
Hazardous Gas	14 no. wells installed and monitored by ARP. In addition, monitoring was undertaken by Sirius in 2006. They zone the site by calculating worst-case GSVs for each individual wells, concluding that the west and north-east can be characterised as CS1, with the centre and south-west requiring CS2 protection measures. This assessment is not considered appropriate. Further comments given below. No radon measures are required.
Site preparatory works	These are not discussed in great detail by ARP, but are likely to include: • General clearance and grubbing up of hardstand • Turnover of made ground • Excavation and treatment/disposal of contamination hotspots • Provision of 100mm hard-dig layer in Sites 3, 4 & 5 • Provision of 600mm clean soil cover in Sites 2, 3, 4 & 5 Further comments given below.
Foundations	Clay is of medium shrinkability, so a minimum founding depth of 0.9m is required in clay soils. ARP suggest a bearing capacity of 100kPa for the natural soils on Sites 1 to 3; with footings to be deepened through localised soft/loose deposits. ARP suggest a bearing capacity of 90kPa for the natural strata beneath Sites 4 and 5 , again with footings to be deepened through any soft material, but shallow foundations are only practically possible in the north-east of Site 4 (according to ARP). Reinforcement is recommended given the variability of the natural soils. Piled foundations are recommended by ARP in the south of Site 1, the majority of Site 4 and all of Site 5 where competent strata are at significant depth (c. 4m) and/or where the nature of shallow natural strata is highly variable. Further comments are given below.

Issue	Remarks
Excavations	Excavations by ARP in the natural soils generally showed good stability, with the exception of the south-west of Site 1. Elsewhere, some instability was common when excavating through the made ground, most notably where groundwater was also encountered. Although not discussed in great detail by ARP, some obstructions (former floor slabs, boulders up to 0.5m) were encountered in the made ground.
Drainage	ARP state that soakaways are *"unlikely to be feasible"* due to low permeability natural soils, watercourses and shallow groundwater. Lithos agree that soakaways are not suitable here.
Highways	ARP give an estimated CBR value of 2% for shallow natural soils, which seems reasonable, although slightly conservative.

Lithos Comments

Scope. The ARP investigation appears reasonable in terms of scope; a good number of trial pits and boreholes have been advanced, and a good number of samples have been tested.

That said, VOC analysis was somewhat limited, and testing for hydrocarbons was done via a 'total EPH' test with speciation only carried out on 4 samples. This does not provide sufficient data for a robust risk assessment with regards to hydrocarbons, especially given the site's previous use and the presence of grossly contaminated soils in Site 5. On the back of the 4 speciated TPH results, ARP dismiss risks of hydrocarbon contamination in relation to human health. The three-step approach for TPH contamination does not seem to have been followed here and their conclusions with regards to human health risks are considered highly questionable.

No samples were tested for cyanide, a known contaminant associated with gas works.

No cable percussion boreholes have been advanced in areas of deep made ground/alluvial soils (most notably in the south of the site, where piled foundations are anticipated). These will be required for pile design, along with more detailed geotechnical soils analysis (including triaxial strength tests and consolidation tests on undisturbed samples of clay where possible).

14 no. gas monitoring wells were installed and monitored by ARP; ideally around 30 would have been installed. In addition, the same response zone (1m to 3m) was installed in each borehole, regardless of the strata encountered. Response zones should never span the boundary between made ground and natural ground; a mixture of response zones should have been installed, some within made ground and some in natural ground in order to enable a more detailed assessment of gas risks, assessing the sources (made ground, natural strata and landfills) individually.

No access was available to very steep slopes in the north of Site 3 (former railway embankment) due to dense vegetation and topography.

Reports. ARP's investigation has been split across two reports, and then split further into individual parcels (referred to as Sites 1 to 5). Presumably, this was something to do with proposed land sales at the time of writing. However, it makes reading the ARP reports somewhat confusing. Every aspect of the investigation (exploratory holes, ground conditions, laboratory testing results, remediation proposals) is split into sub-headings associated with each individual parcel. This is not always appropriate as the parcel boundaries (most notably between Sites 3 and 4) are somewhat arbitrary, and in terms of conceptualisation from a contamination risk point of view, findings from Parcels 3, 4 & 5 should be considered more holistically as they all former part of the former 'Minerva Works'.

This sub-division also lends itself to clerical errors. For example, the log for TP31 is not included within either ARP report (likely due to deleting one too many from the appendices). In addition, numerous references are made to contamination encountered in TP04 within Site 1 in Report 1. Actually, TP04 lies in Site 5, within a grassed area associated with the former Minerva Works buildings. The topsoil in Site 1 (essentially greenfield) is therefore considered 'clean' based on ARP's report.

Ground conditions & logs. The natural ground described by ARP varies, but in most locations includes firm to stiff gravelly clay, often interbedded with sands and gravel. Trial pits often '*terminate in hard strata*'. The clay is sometimes described as 'friable' and the gravel content varies significantly including subrounded to angular tabular sandstone. This material is classified by ARP as 'Alluvium' in the majority of exploratory holes, although occasionally it is referred to as 'Possible Head' deposits.

In some cases, descriptions in boreholes/trial pits are similar to each other but are given different geological classifications (stratum names) despite their similarities. This might be a case of simply assigning a strata type based on the BGS plan and the hole's location.

The classifications given by ARP are questionable given the descriptions within their logs. Typically, alluvial deposits would include soft clay/silt and loose sands, often organic-rich with some peat. Such material was rarely encountered, and where it was, it tended to be towards the southern boundary (close to Lees Hall Beck). Nonetheless, the majority of the soils encountered are called 'alluvium' by ARP.

Where soft material was encountered, it was typically within WS boreholes (not trial pits). It is possible that the disturbance caused by drilling has artificially softened the soils that the field engineer has described.

Most of the SPTs within the window sample boreholes, and hand vane readings yielded 'good' results within the upper most 2.5m, but results within the soft/loose range were recorded up to 4m depth in multiple locations, most notably on Site 5, and sporadically on Sites 3 & 4.

Cable percussion boreholes would allow a more robust description and assessment of natural soils beneath the site.

The firm/stiff gravelly clays encountered across the majority of the site could actually be weathered Coal Measures strata, although this too appears unlikely given the depths achieved by ARP in their dynamic probes (between 8m and 10m before refusal). That said, the material encountered in the far north (at the base of the railway embankment) is almost certainly weathered Coal Measures and not 'Head' deposits as described by ARP.

Foundations. ARP suggest an allowable bearing capacity of 100kPa for all natural soils in Report 1 (Sites 1, 2 and 3) but only 90kPa in Report 2 (Sites 4 and 5). It is not clear why, given that the natural ground conditions are similar across all parcels, with the exception of the northern edge of Site 4 where suspected weathered Coal Measures strata was encountered.

Reference is made by ARP to '*halving the bearing capacity due to shallow groundwater*' in their report. This is misleading. Whilst shallow groundwater can significantly affect the bearing capacity of granular soils, it requires site-specific assessment based on ground conditions and groundwater monitoring results. Groundwater has little effect on clay soils (the predominant soil type here).

A bearing capacity of at least 100kPa (possibly up to c. 150kPa) seems reasonable at this stage for natural ground (aside from soft/loose spots). If proven by supplementary investigation, a bearing capacity in excess of 130kPa would allow strip/trench fill foundations where competent strata lies within 2.5m depth. However, it should be noted that no compressibility testing (consolidation tests) has been undertaken by ARP. This is important within suspected alluvial soils (which are under-consolidated) in order to assess likely long-term settlements and therefore shallow foundation feasibility.

ARP rightly point out that, where deep made ground and/or soft/loose soils are encountered, foundations will need deepening through to competent strata below.

Piled foundations are recommended by ARP in the south of Site 1, the majority of Site 4 and all of Site 5 where competent strata are at significant depth (c. 4m) and/or where the nature of shallow natural strata is highly variable.

Additional assessment is needed before foundation recommendations can be given. Most notably:

- Trial pitting in order to:
  - Provide further assessment of the origin of natural soils beneath the site (i.e. alluvial, weathered Coal Measures etc)
  - Delineate areas of deep made ground/soft clays
- Cable percussion drilling in order to:
  - Obtain geotechnical data from depth (SPTs, undisturbed samples of clay where possible)
  - Ascertain the depth of soft/loose sands
  - Ascertain natural ground conditions beneath areas of deep made ground/soft & loose soils for pile design

That said, some preliminary recommendations can be given based on the data available from ARP's investigation. An approximate zoning plan showing areas likely to require piling has been produced by Lithos (see Drawing 3435/2) based on the ground conditions reported by ARP.

Based on Harron's current layout, Plots 65 to 68 will necessitate significant 'cut' into a steep railway embankment which runs along the northern boundary (c. 5m high). This may also be the case for Plots 26, 56 to 59 and 64, though the topo survey is not clear. Such works will require substantial retaining walls along the northern boundary of the plots and gardens.

Highways. Where made ground is present its full thickness (up to a maximum of 2m - from existing ground level or proposed highway formation, whichever is the lower) should be excavated and either: replaced with suitable aggregate; or screened, before being replaced in engineered layers. Some refinement of this advice might be possible after highways design (with consideration of the proposed formation level cf existing ground level), and via inspection (and usually CBR testing) of the proposed formation during site preparatory groundworks.

ARP give a CBR value of 2% for the shallow natural soils, which seems reasonable, although slightly conservative. Any soft spots encountered within the natural ground would require excavation and replacement with suitable aggregate.

Contamination & remediation. Whilst a significant number of samples have been tested by Sirius and ARP, the Sirius data is somewhat out of date (2006) and ARP's scope/risk assessment is lacking in some areas, most notably with respect to:

- Poor assessment of TPH (hydrocarbon)contamination risks
- Test suite is not bespoke to the past use (e.g., no samples scheduled for cyanide & ammonia analysis, known contaminants on former gas works sites)
- Limited number of samples scheduled for VOC analysis
- Limited number of asbestos quantifications
- Although risks to groundwater as dismissed by ARP, there is very limited data to back this up; additional analysis should be undertaken across a greater number of locations to assess risks to controlled waters (most notably, Lees Hall Beck).

ARP's use of statistical analysis is split along the parcel boundaries (Sites 1 to 5) instead of considering the data more holistically. They identify numerous 'outliers' but given the number of locations identified as outliers which *"require further assessment"* it becomes impracticable to treat these individually.

ARP recommend removal of topsoil from Site 1 in the vicinity of TP04 (after further testing to delineate the area affected). This is not needed as TP04 lies in Site 5. Topsoil is 'clean' in Site 1 (based on ARP and Sirius' data). ARP state that contaminated topsoil cannot be placed beneath the proposed soil cover, but this should be possible provided it is placed at no greater than 1m depth.

Instead of dividing the site into Sites 1 to 5 (as per ARP's reports), the following zoning of the site would be more appropriate when assessing contamination risks and remediation proposals (as shown on Drawing 3435/3):

- **Area A** - Greenfield area in the south-west (Site 1): No significant made ground or contamination encountered and no remediation required
- **Areas B1 & B2** - Former Minerva Works gas works and bleach & dye works (Sites 3, 4 & 5): Contamination includes heavy metals, PAH, VOCs and asbestos. 600mm clean soil cover and 100mm hard dig later required in garden/landscaped areas. Excavation and treatment/disposal of contamination hotspots.
- **Area C** - Former industrial building in the north-west (Site 2): Some (relatively minor) arsenic and PAH contamination. 600mm clean soil cover required in garden/landscaped areas.

In addition to the above, it is understood that a remediation contractor (Vertase) have investigated land in the area of former gas holders in the south of Area B and located two no. circular holders which are 16m and 14m in diameter. The holders are backfilled with crushed product, hydrocarbon-contaminated materials, thick tar and 'contaminated water'. Vertase estimate them to be around 2m to 4m deep.

Preparatory works (as part of remediation) are not discussed in great detail by ARP. Such works are likely to include:

- General site clearance of surface materials and vegetation
- Break-up of slabs and hardstand
- Crushing of all suitable artificial hard material (i.e. concrete/brick etc)
- Turnover (excavation, screening and replacement in engineered layers, with nominal compaction) of the full thickness of made ground to enable:
    - Removal of localised fuel/oil contamination within the south of Area B; with subsequent treatment and/or off-site disposal
    - Inspection of the made ground, including any other contamination 'hot-spots'
    - Removal of below ground obstructions
    - Preparation of the ground for highway construction
- Possible excavation of natural soils from beneath made ground to source 'clean' subsoil for use in gardens and landscaped areas
- Backfill of all resultant excavations, with appropriate compaction
- Excavation of up to a maximum depth of 2m beneath proposed adoptable road footprints and controlled re-engineering of selected materials in layers to approximately 650mm below final road levels
- Removal of underground tanks
- Provision of a minimum 600mm thick cover layer of 'clean' soils in all garden and landscaped areas in Areas B & C, with an underlying 100mm thick hard-dig layer in Area B.
- Assessment of the retaining wall in the north of the site by a Structural Engineer.

ARP recommend removal of volatile contaminants (vicinity of WS24, TP36, TP6, TP10) from below building footprints and from within a 2m radius of plots. This is unlikely to be practicable and additional (unidentified) areas of VOC contamination may exist. A more pragmatic approach would be to assess risks during made ground turnover through engineering supervision and additional sampling where necessary. Depending on the extent and nature of VOC contamination identified during the remediation phase, it may be necessary to utilise a hydrocarbon-resistant membrane in plots (rather than the '*methane impermeable barrier*' specified by ARP).

ARP's remediation statement (included as an appendix in their reports) essentially repeats the contamination summary contained in the SI report, and then states the validation procedures for importing clean soil cover (i.e. the number of samples etc required). A more detailed remediation strategy is required which includes consideration of the bullet points listed above.

Gas. A limited number of gas wells were installed and monitored by ARP and no consideration was given to placement of their response zones (see comments given on page 4).

Zoning of the site based on GSVs calculated on a hole-by-hole basis is not considered appropriate. A more thorough assessment, which considers the site more holistically, is recommended, looking at worst-case scenarios between boreholes.

The assessment should include information from gas wells which target the made ground and natural strata separately. This may allow zoning of the site (for example, if the made ground is considered a significant source, Area A is unlikely to require significant gas protection. However, if gas concentrations are found to be more significant closer to the landfill off-site to the south, zoning based on distance from this source might be more appropriate).

Methane was detected by Sirius, up to 10% in one borehole in Site 3 (not 1.0% as stated in the ARP Report). In addition, ARP's readings include steady flow rates of up to 14.1lt/hr (WS17), maximum carbon dioxide concentrations of up to 9.3% (WS2) and maximum methane concentrations of up to 1.0% (WS7). Based on these results, the GSVs would be 0.14 for methane, and 1.31 for carbon dioxide, which equates to Amber 1 (NHBC) or CS3 (Wilson & Card).

At this stage, it would be prudent to assume at least **Amber 1** measures for all plots.

Further work. Following review of ARP's data, some additional work is recommended. The scope outlined below assumes Harron Homes will have reliance on ARP's reports and is intended to supplement their data.

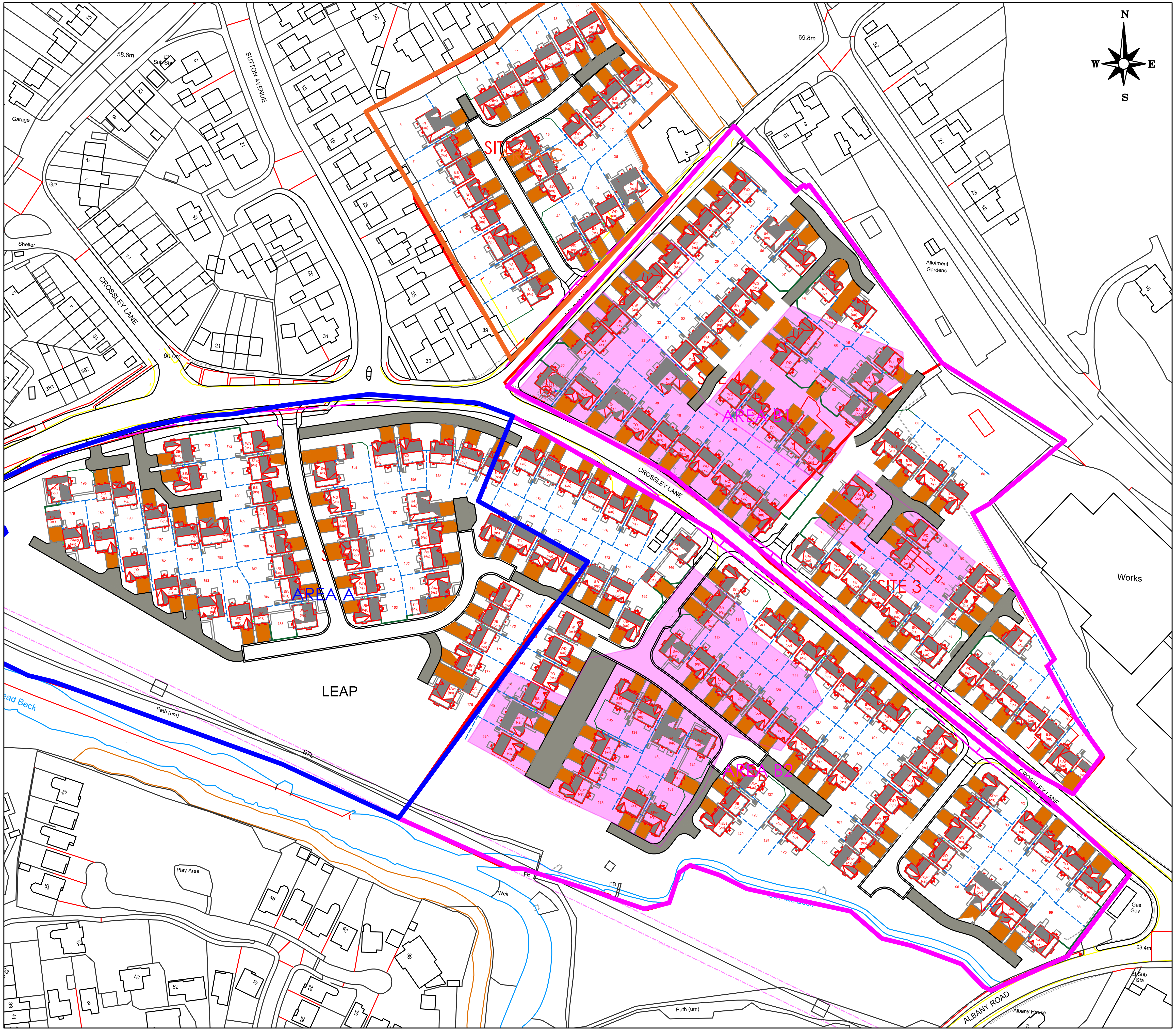
In summary, the following are required:

- Excavation of around 30 trial pits across the site using a tracked excavator to:
  - allow inspection of the natural soils and zone the site as appropriate in terms of foundation recommendations.
  - delineate areas of deep made ground.
- Cable percussion boreholes advanced to rockhead across the site (most notably in areas of soft soils/deep made ground identified in the trial pitting) to enable more thorough inspection of natural soils and to provide sufficient information for pile design.
- Installation of gas wells across the in around 20 no. locations. Boreholes could be advanced using window sampling techniques. Gas wells should then be monitored on at least 6 occasions over 3 months.
- Installation of groundwater monitoring wells in around 5 locations, and chemical testing of groundwater samples on at least 2 occasions.
- Chemical testing on around 25 no samples to supplement ARP's data. The test suite should include ammonia, cyanide, speciated TPH and VOCs.
- Geotechnical analysis on samples of undisturbed clay (where possible) recovered from cable percussion boreholes to allow assessment of compressibility and shear strength.

It might be possible to avoid the need for gas monitoring (and therefore installation of gas wells across the site), if Amber 1 measures were adopted across the site. However, this would require approval from NHBC and the Local Authority.

Slope stability needs to be considered for the steep sloping embankment running along the northern boundary. This would include boreholes along the crest of the slope and geotechnical analysis/modelling. However, this area is not accessible without significant enabling works. Indeed, it may be more economical to simply opt for a robust retaining structure in this area, adopting a broadly 'worst-case' scenario with regards to stability (given the reasonably high costs and timescales involved in an intrusive investigation and assessment).

On completion of the above, the findings should be presented in a report which assesses the site as a whole, and should include ARP's data.



NOTES

▨ PILED FOUNDATIONS (made ground and/or soft/loose ground to >2.5m)

Elsewhere, strip/trench fill foundations potentially feasible depending on supplementary site investigation

REV.	DESCRIPTION	DATE

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CLIENT

HARRON HOMES

JOB TITLE

CROSSLEY LANE, DALTON

DRAWING TITLE

PRELIMINARY ZONING PLAN - PILED FOUNDATIONS

DRAWN	DATE	STATUS
MJT	14/01/2019	FOR COMMENT ☐ FOR APPROVAL ☐
CHECKED	DATE	
REG	14/01/2019	DRAFT ☐ FINAL ☑

SCALE	SHEET	DRAWING NO.	REVISION
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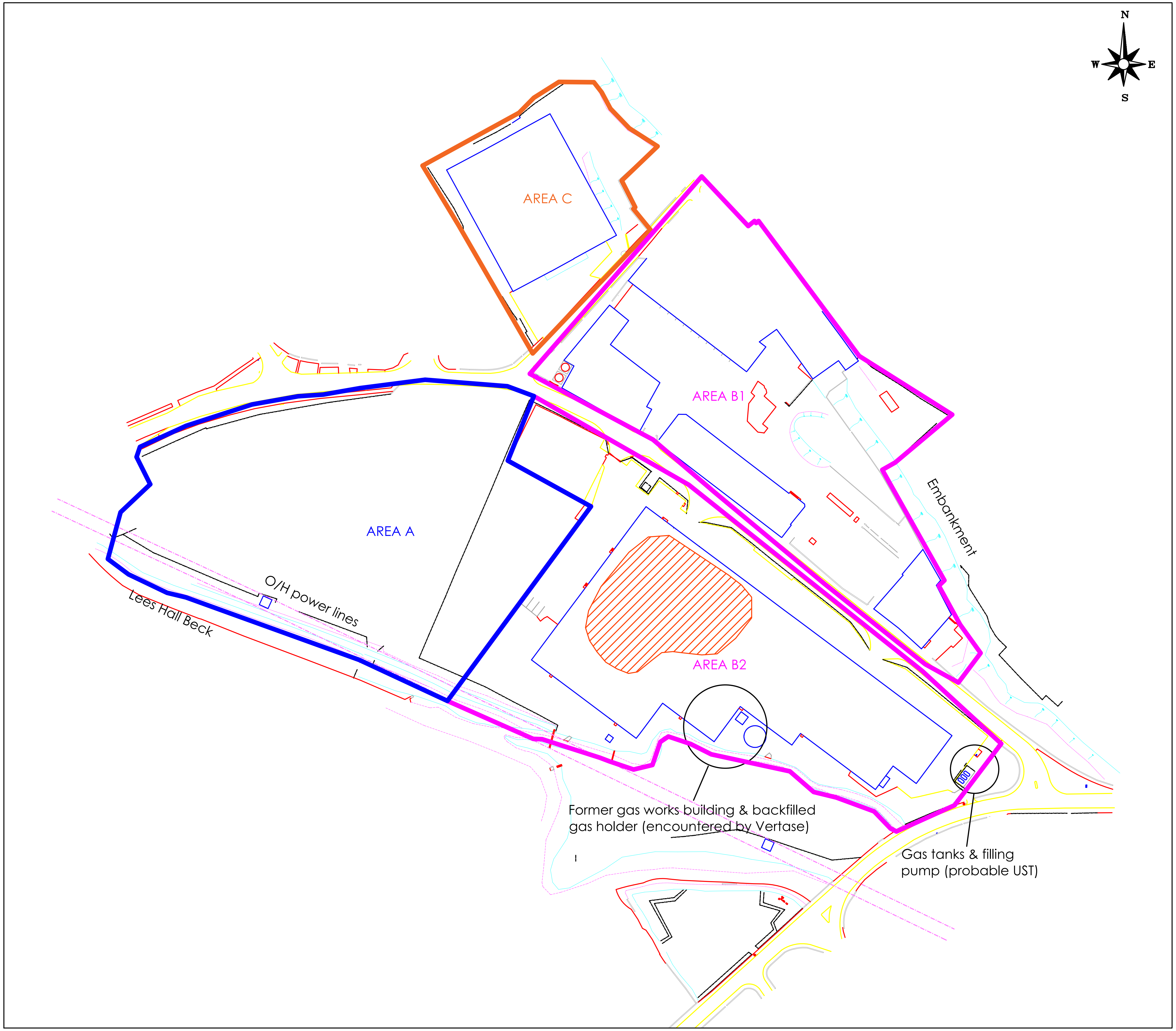

NOTES

— AREA A - No remediation required

— AREA B - 600mm soil cover and 100mm hard-dig layer

— AREA C - 600mm clean soil cover

▨ HYDROCARBON HOTSPOT - Grossly contaminated soils encoutered by ARP

REV.	DESCRIPTION	DATE

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CLIENT
HARRON HOMES

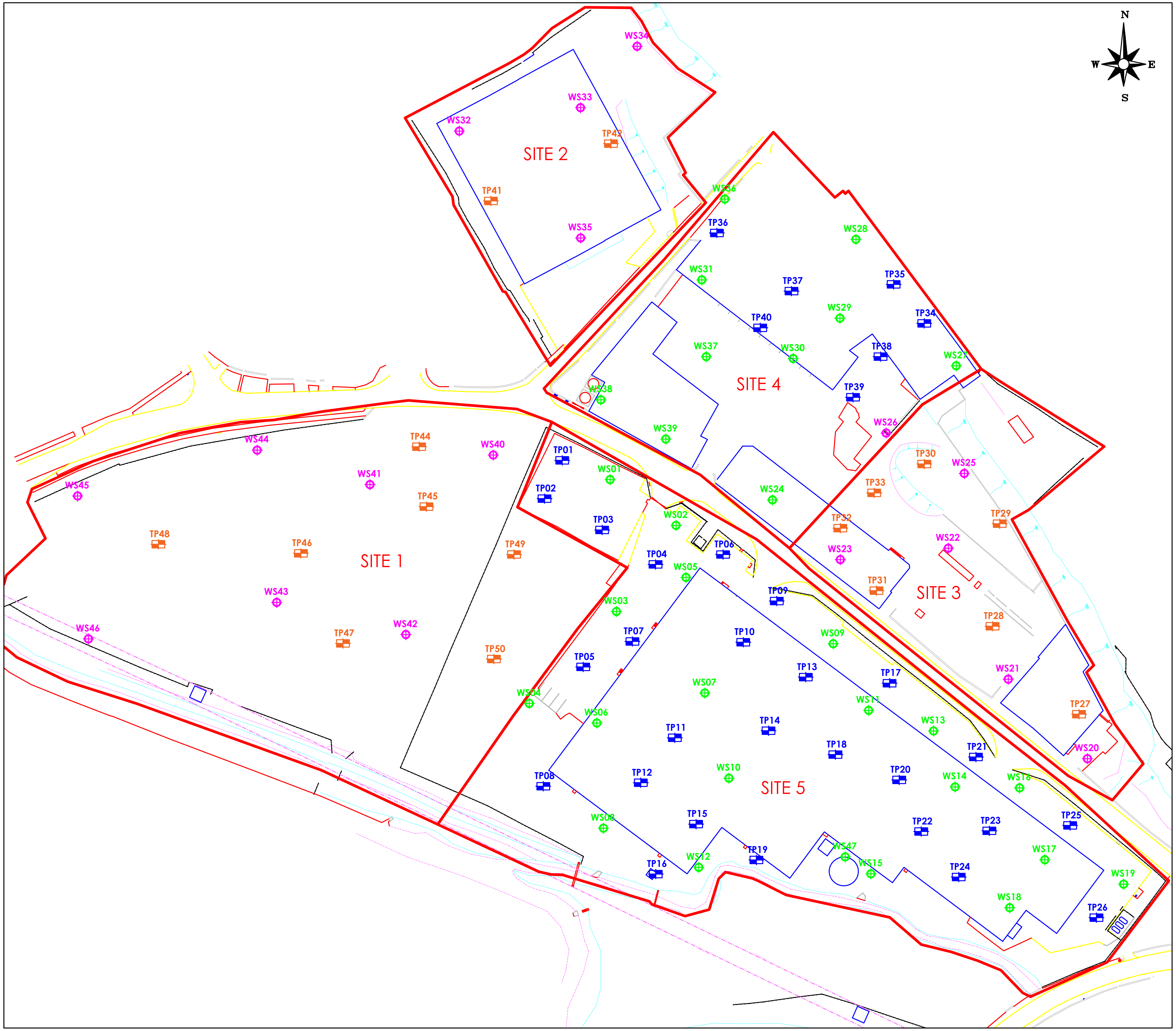
JOB TITLE
CROSSLEY LANE, DALTON

DRAWING TITLE
KEY FEATURES & REMEDIATION ZONES

DRAWN: MJT
DATE: 14/01/2020
CHECKED: REG
DATE: 14/01/2020

STATUS
FOR COMMENT ☐
FOR APPROVAL ☐
DRAFT ☐
FINAL ☑

SCALE: 1:2,000
SHEET: A3
DRAWING NO.: 3435/3
REVISION:



NOTES

🟦	TRIAL PIT ARP REPORT 1
🟧	TRIAL PIT ARP REPORT 2
⊕	WINDOW SAMPLE ARP SI ONE
⊕	WINDOW SAMPLE ARP SI TWO
—	APPROXIMATE SITE BOUNDARY

REV.	DESCRIPTION	DATE

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CLIENT

HARRON
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JOB TITLE

CROSSLEY LANE,
DALTON

DRAWING TITLE

EXPLORATORY HOLE LOCATIONS

DRAWN	DATE	STATUS
JBA	10 01 20	FOR COMMENT ☐ FOR APPROVAL ☐
CHECKED	DATE	
REG	14 01 20	DRAFT ☐ FINAL ☑

SCALE	SHEET	DRAWING NO.	REVISION
1:1500	A3	3435/6	

ANNEX II

SUMMARY OF DEGREE OF SOILS CONTAMINATION (INORGANICS)

Expl Hole	**Depth (m)**	**Material**	Concentrations in mg/kg unless otherwise stated. Results are quoted to 1 decimal place if <10, and whole numbers if >10. Trigger Level Concentrations are shown in **BLUE** and assume a **residential with gardens** end-use.												
			pH	As ∞	B~	Cd ∞	Cr x	Cu♣$	Pb ∞	Hg*	Ni	Se	Zn$	CV	Asbestos
				37	5	26	3000	200	200	169	127	350	200	2	
Area A															
TP101	0.2	Topsoil	5.5	29	0.8	0.3	35	68	110	0.2	30	1.1	110	-	N.D.
TP102	0.3	Topsoil	6.5	**55**	0.7	0.4	34	130	99	0.3	36	1.7	130	-	N.D.
TP102	0.3	Topsoil	6.5	**56**	0.9	0.5	35	120	100	0.3	35	1.4	130	-	N.D.
TP103	0.2	Topsoil	6.5	**45**	0.5	0.3	27	63	86	0.2	29	1.8	110	-	N.D.
TP104	0.3	Topsoil	7.5	33	1.0	0.4	29	70	79	0.2	27	0.9	110	-	N.D.
TP105	0.2	Topsoil	6.1	**42**	0.9	0.4	31	72	92	0.4	28	1.0	110	-	N.D.
TP106	0.2	Topsoil	6.4	**45**	0.7	0.4	36	79	110	0.3	36	1.2	130	-	N.D.
TP103	1.7	Granular Glaciofluvial Deposits	7.4	9.0	< 0.2	0.2	20	23	21	< 0.1	31	< 0.5	69	-	N.D.

Expl Hole	**Depth (m)**	**Material**	Concentrations in mg/kg unless otherwise stated. Results are quoted to 1 decimal place if <10, and whole numbers if >10. Trigger Level Concentrations are shown in **BLUE** and assume a **residential with gardens** end-use.												
			pH	As ∞	B~	Cd ∞	Cr x	Cu♣$	Pb ∞	Hg*	Ni	Se	Zn$	CV	Asbestos
				37	5	26	3000	200	200	169	127	350	200	2	
Area B1															
TP110	0.6	Granular Made Ground	**11.8**	2.9	0.5	0.3	11	13	7.6	< 0.1	12	< 0.5	43	-	N.D.
TP112E	1.5	Granular Made Ground	7.5	**110**	0.8	0.8	38	**1100**	**290**	0.3	36	< 0.5	**370**	-	N.D.
TP113	0.3	Granular Made Ground	**9.4**	35	0.7	0.3	14	55	91	0.2	22	< 0.5	100	-	N.D.
TP118	0.2	Granular Made Ground	**10.1**	19	0.5	0.3	32	150	**310**	0.2	38	< 0.5	**480**	-	N.D.
TP130	0.6	Granular Made Ground	8.7	29	< 0.2	< 0.1	13	110	24	< 0.1	45	< 0.5	12	-	N.D.
TP112E	0.3	Cohesive Made Ground	**9.8**	32	0.4	0.2	31	180	100	0.3	27	< 0.5	120	-	N.D.
TP112W	0.5	Ash & Clinker	6.7	26	0.6	< 0.1	15	61	95	< 0.1	38	< 0.5	33	**6.2**	N.D.
TP113	0.7	Ash & Clinker	8.7	**110**	0.3	0.2	19	100	45	< 0.1	45	< 0.5	85	**5.5**	**Chrysotile fibres**
TP115	0.5	Ash & Clinker	8.4	15	0.2	< 0.1	9.4	66	11	< 0.1	31	< 0.5	18	**9.6**	N.D.
TP116	0.7	Reworked Natural Ground	8.5	9.1	< 0.2	< 0.1	25	34	17	< 0.1	26	< 0.5	61	-	N.D.
TP117	0.2	Sub-base	**11.7**	2.1	0.4	0.2	7.8	9.2	9.0	< 0.1	7.2	< 0.5	24	-	N.D.
TP117	1.3	Cohesive Alluvium	7.9	14	0.3	0.1	25	35	33	0.1	27	< 0.5	91	-	-
TP118	0.5	Granular Alluvium	7.5	31	0.5	0.2	21	38	41	0.1	17	< 0.5	160	-	-
TP119	0.7	Brickfill	**9.1**	13	1.4	0.3	19	190	170	0.1	18	< 0.5	**260**	-	N.D.
TP125	1.4	Brickfill	-	-	-	-	-	-	-	-	-	-	-	-	N.D.

Expl Hole	**Depth (m)**	**Material**	Concentrations in mg/kg unless otherwise stated. Results are quoted to 1 decimal place if <10, and whole numbers if >10. Trigger Level Concentrations are shown in **BLUE** and assume a **residential with gardens** end-use.												
			pH	As ∞	B~	Cd ∞	Cr x	Cu♣$	Pb ∞	Hg*	Ni	Se	Zn$	CV	Asbestos
				37	5	26	3000	200	200	169	127	350	200	2	
Area B2															
TP109	0.3	Sub-base	**10.2**	4.2	0.3	0.2	22	15	13	< 0.1	23	0.8	43	-	N.D.
TP121	0.2	Sub-base	**11.2**	3.2	0.3	0.2	17	14	9.2	< 0.1	19	< 0.5	38	-	N.D.
TP108	0.5	Ash & Clinker	8.6	20	0.6	0.1	10	58	33	< 0.1	20	< 0.5	49	**3.2**	N.D.
TP131	0.8	Ash & Clinker	**10.5**	**58**	0.3	0.5	17	93	66	< 0.1	29	< 0.5	86	**5.3**	N.D.
TP131	1.1	Ash & Clinker	**10.6**	**96**	0.4	0.4	25	130	140	0.1	42	< 0.5	190	**6.2**	N.D.
TP122	0.3	Granular Made Ground	8.7	5.5	0.3	0.2	22	20	17	< 0.1	24	< 0.5	54	-	N.D.
TP124S	1.3	Granular Made Ground	**11.0**	19	0.9	0.1	14	47	44	< 0.1	17	< 0.5	57	-	N.D.
TP131	1.3	Granular Made Ground	8.0	**140**	0.6	0.6	35	**240**	**560**	0.2	55	1.8	**420**	-	N.D.
TP109	0.6	Cohesive Made Ground	7.6	29	0.9	0.9	33	78	84	0.1	32	< 0.5	120	-	N.D.
TP120	0.6	Cohesive Made Ground	7.8	12	0.5	0.3	35	55	50	< 0.1	42	< 0.5	130	-	N.D.
TP123	0.8	Reworked Natural Ground	7.1	5.2	0.4	0.1	28	23	17	< 0.1	29	< 0.5	70	-	N.D.
TP109	0.8	Reworked Natural Ground	6.8	11	0.3	0.2	38	73	31	< 0.1	49	0.8	100	-	N.D.
TP107	2.5	Reworked Natural Ground	7.3	13	< 0.2	0.1	33	30	76	< 0.1	27	< 0.5	68	-	N.D.
TP108	1.9	Head deposits	7.6	4.1	< 0.2	0.1	22	32	26	< 0.1	32	< 0.5	69	-	-

Expl Hole	Depth (m)	Material	Concentrations in mg/kg unless otherwise stated. Results are quoted to 1 decimal place if <10, and whole numbers if >10. Trigger Level Concentrations are shown in **BLUE** and assume a **residential with gardens** end-use.											
			pH	As ∞	B~	Cd ∞	Cr x	Cu♣$	Pb ∞	Hg*	Ni	Se	Zn$	CV	Asbestos
				37	5	26	3000	200	200	169	127	350	200	2	
Area C															
TP126	0.4	Sub-base	**10.5**	11	0.3	0.1	16	25	**250**	0.1	21	< 0.5	93	-	N.D.
TP127	0.5	Granular Made Ground	**11.3**	5.9	0.4	0.1	11	15	68	0.1	10	< 0.5	72	-	N.D.
TP134	0.4	Granular Made Ground	7.6	15	0.4	0.3	38	36	41	0.1	53	< 0.5	110	-	N.D.
TP129	0.9	Head deposits	8.0	4.4	0.4	0.1	32	44	26	< 0.1	42	< 0.5	91	-	-

Key	
36	Parameter tested for and found to be in excess of Tier 1 concentration
179	Parameter tested for and found to be > 5 x Tier 1 concentration
12	Parameter tested for but not found to be in excess of Tier 1 concentration
	Parameter not tested for
♣	Tier 1 Value is pH dependent
x	Assumes Cr is CrIII. If demonstrated Cr is CrVI screen would be 21mg/kg
*	Assumes mercury present as an inorganic compound (cf elemental metal or within organic compound). See Science Report SC050021/Mercury SGV.

Source of Guidance Trigger Level	
With the exception of those annotated with one of the symbols below (∞, $, ~), all Soil Screening Values in brackets above have been derived using CLEA v1.06. Values assume contaminants located in a sandy loam, with 6% soil organic matter (SOM).	
∞	Category 4 Screening Level – SP1010, December 2013 (CL:AIRE\Defra)
$	Ministry of Agriculture, Fisheries & Food. Code of Practice for Agricultural Practice for the Protection of Soil. 1998
~	Engineering judgement (Lithos). Boron is a phytotoxic, although most phytotoxic compounds can pose a risk to human health if sufficient concentrations are present. However, plants represent the most sensitive receptor, and a Tier 1 value which is protective of flora is therefore also protective of human health.
N.D.	Not detected, applicable to asbestos I.D. screen only

ANNEX III

SUMMARY OF THE LEACHABILITY TESTING

Expl Hole	Depth (m)	Material	Concentration in µg/litre unless otherwise Shown. Results are quoted to 1 decimal place if <10, and whole numbers if >10. Tier 1 Screening Concentrations are shown in **BLUE**.										
			pH	As ~	B *	Cd ~	Cr ~	Cu ~	Pb ~	Hg ~	Ni ~	Se *	Zn ~
				50	1000	5	5	5	50	1	50	10	30
TP108	0.5	Ash & Clinker	6.9	5.6	17	< 0.1	< 0.3	2.9	0.9	< 0.1	< 0.5	0.8	< 1.3
TP112W	0.5	Ash & Clinker	6.7	0.6	13	< 0.1	< 0.3	1.5	0.2	< 0.1	0.9	< 0.25	3.2
TP131	0.8	Ash & Clinker	8.3	16	< 12	< 0.1	2.4	3.8	0.3	< 0.1	< 0.5	0.5	1.5
TP112E	0.3	Cohesive Made Ground	9.7	6.1	< 12	< 0.1	1.9	**13**	0.4	< 0.1	< 0.5	0.8	< 1.3
TP109	0.6	Cohesive Made Ground	7.1	3.6	24	< 0.1	< 0.3	3.4	1.2	< 0.1	< 0.5	0.3	< 1.3
TP122	0.3	Granular Made Ground	8.8	0.3	< 12	< 0.1	2.1	1.3	< 0.1	< 0.1	< 0.5	< 0.25	< 1.3
TP110	0.6	Granular Made Ground	10.3	1.0	< 12	< 0.1	3.7	**7.2**	0.4	< 0.1	0.7	0.6	< 1.3
TP124S	1.3	Granular Made Ground	10.3	16	30	< 0.1	0.3	1.0	0.3	< 0.1	1.6	0.8	< 1.3

Key		Source of guidance trigger level	
36	Parameter tested for and found to be in excess of Tier 1 concentration	~	Directive (2000/60/EC) establishing a framework for Community action in the field of water policy (Water Framework Directive)
0.3	Parameter tested for but not found to be in excess of Tier 1 concentration	*	Water Supply (Water Quality) Regulations 1989, as amended in 2000

ANNEX IV

SUMMARY OF DEGREE OF SOILS CONTAMINATION (ORGANICS)

Expl Hole	**Depth (m)**	**Material**	Concentrations in mg/kg. Results are quoted to 1 decimal place if <10, and whole numbers if >10. Trigger Level Concentrations are shown in **BLUE** and assume a **residential with gardens and 600mm** cover end use											
			% TOC	Benzene ∞	Toluene	Ethyl Benzene	Xylenes	Phenols	PCB	PAH		TPH - C6 to C40		
										B(a)P ∞	Naphthalene	GRO~ C_6 to C_{10}	DRO◊ C_{10} to C_{21}	LRO C_{21} to C_{40}
				0.9	3,000	932	327	2,400	8	25	9	34	156	5000
Area A														
TP101	0.2	Topsoil	7.4	-	-	-	-	-	-	0.1	< 0.1	-	-	-
TP102	0.3	Topsoil	6.1	-	-	-	-	-	-	0.1	0.1	-	-	-
TP102	0.3	Topsoil	11	-	-	-	-	-	-	0.1	< 0.1	-	-	-
TP104	0.3	Topsoil	7.5	-	-	-	-	-	-	0.3	0.1	-	-	-
TP106	0.2	Topsoil	3.1	-	-	-	-	-	-	0.1	< 0.1	-	-	-
TP103	1.7	Granular Glaciofluvial Deposits	1.1	< 0.1	< 0.1	< 0.1	< 0.1	-	-	< 0.1	< 0.1	< 0.1	< 10	< 10
Area B1														
TP114	0.1	Macadam Hardstand	-	-	-	-	-	-	-	**64**	< 3.00	-	-	-
TP117	0.3	Macadam Hardstand	-	-	-	-	-	-	-	**64**	< 3.00	-	-	-
TP117	0.2	Sub-base	< 0.5	< 0.1	< 0.1	< 0.1	< 0.1	-	< 0.1	4.1	< 0.1	< 0.1	59	224
TP116	0.2	Granular Made Ground	-	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-	-	-	-	-
TP110	0.6	Granular Made Ground	< 0.5	< 0.1	< 0.1	< 0.1	< 0.1	-	-	< 0.1	< 0.1	< 0.1	< 10	32
TP130	0.6	Granular Made Ground	7.5	< 0.1	< 0.1	< 0.1	< 0.1	-	-	0.6	< 0.1	< 0.1	< 10	11

Expl Hole	**Depth (m)**	**Material**	Concentrations in mg/kg. Results are quoted to 1 decimal place if <10, and whole numbers if >10. Trigger Level Concentrations are shown in **BLUE** and assume a **residential with gardens and 600mm** cover end use										
			% TOC	Benzene ∞	Toluene	Ethyl Benzene	Xylenes	Phenols	PCB	PAH		TPH - C6 to C40		
										B(a)P ∞	Naphthalene	GRO~ C_6 to C_{10}	DRO◊ C_{10} to C_{21}	LRO C_{21} to C_{40}
				0.9	3,000	932	327	2,400	8	25	9	34	156	5000
TP112E	1.5	Granular Made Ground	9.3	< 0.1	< 0.1	< 0.1	< 0.1	-	-	0.4	< 0.1	< 0.1	4.1	26
TP112E	0.3	Cohesive Made Ground	6.5	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-	0.3	< 0.1	< 0.1	23	76
TP112W	0.5	Ash & Clinker	12	< 0.1	< 0.1	< 0.1	< 0.1	-	-	0.1	< 0.1	< 0.1	< 10	< 10
TP115	0.5	Ash & Clinker	26	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-	0.3	< 0.1	< 0.1	< 10	88
TP113	0.7	Ash & Clinker	7.9	< 0.1	< 0.1	< 0.1	< 0.1	-	-	**25**	< 0.1	-	-	-
TP119	0.7	Brickfill	7.5	< 0.1	< 0.1	< 0.1	< 0.1	-	-	0.4	< 0.1	-	-	-
TP116	0.7	Reworked Natural Ground	0.5	< 0.1	< 0.1	< 0.1	< 0.1	-	< 0.1	< 0.1	< 0.1	< 0.1	< 10	< 10
TP117	1.3	Cohesive Alluvium	2.1	-	-	-	-	-	-	< 0.1	< 0.1	-	-	-
TP130	1.9	Cohesive Alluvium	7.1	< 0.1	< 0.1	< 0.1	< 0.1	-	-	< 0.1	< 0.1	< 0.1	< 10	< 10
TP113	2.7	Cohesive Alluvium	0.8	< 0.1	< 0.1	< 0.1	< 0.1	-	-	< 0.1	< 0.1	< 0.1	< 10	< 10
TP112E	2.7	Cohesive Alluvium	0.9	< 0.1	< 0.1	< 0.1	< 0.1	-	-	< 0.1	< 0.1	< 0.1	< 10	< 10
TP118	0.5	Granular Alluvium	2.5	-	-	-	-	-	-	< 0.1	< 0.1	-	-	-

Expl Hole	Depth (m)	Material	Concentrations in mg/kg. Results are quoted to 1 decimal place if <10, and whole numbers if >10. Trigger Level Concentrations are shown in **BLUE** and assume a **residential with gardens and 600mm** cover end use											
			% TOC	Benzene ∞	Toluene	Ethyl Benzene	Xylenes	Phenols	PCB	PAH		TPH - C6 to C40		
										B(a)P ∞	Naphthalene	GRO~ C_6 to C_{10}	DRO◊ C_{10} to C_{21}	LRO C_{21} to C_{40}
				0.9	3,000	932	327	2,400	8	25	9	34	156	5000
Area B2														
TP121	0.2	Sub-base	< 0.5	< 0.1	< 0.1	< 0.1	< 0.1	-	-	< 0.1	< 0.1	< 0.1	< 10	< 10
TP109	0.3	Sub-base	0.7	< 0.1	< 0.1	< 0.1	< 0.1	-	-	0.5	< 0.1	< 0.1	13	31
TP134	0.4	Granular Made Ground	2.4	-	-	-	-	-	-	< 0.1	< 0.1	< 0.1	< 10	< 10
TP121	0.5	Granular Made Ground	-	< 0.1	< 0.1	< 0.1	< 0.1	0.1	-	-	-	< 0.1	105	341
TP124S	0.5	Granular Made Ground	-	< 0.1	< 0.1	< 0.1	< 0.1	< 0.01	-	3.7	0.7	-	-	-
TP131	1.3	Granular Made Ground	18	< 0.1	< 0.1	< 0.1	< 0.1	0.1	-	1.5	< 0.1	-	-	-
TP124S	1.3	Granular Made Ground	4.9	0.1	< 0.1	< 0.1	< 0.1	< 0.1	-	0.6	0.1	-	-	-
TP108	0.5	Ash & Clinker	9.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	3.5	< 0.1	< 0.1	86	348
TP131	0.8	Ash & Clinker	16	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-	0.3	< 0.1	-	-	-
TP131	1.1	Ash & Clinker	16	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-	1.2	< 0.1	-	-	-
TP109	0.8	Reworked Natural Ground	1.6	< 0.1	< 0.1	< 0.1	< 0.1	-	-	< 0.1	< 0.1	< 0.1	< 10	< 10
TP123	0.8	Reworked Natural Ground	0.9	< 0.1	< 0.1	< 0.1	< 0.1	-	-	< 0.1	< 0.1	< 0.1	< 10	< 10
TP120	1.0	Reworked Natural Ground	27	< 0.1	0.1	< 0.1	0.1	-	-	< 1.0	0.1	10	**7100**	**6200**

Expl Hole	**Depth (m)**	**Material**	Concentrations in mg/kg. Results are quoted to 1 decimal place if <10, and whole numbers if >10. Trigger Level Concentrations are shown in **BLUE** and assume a **residential with gardens and 600mm** cover end use											
			% TOC	Benzene ∞	Toluene	Ethyl Benzene	Xylenes	Phenols	PCB	PAH		TPH - C6 to C40		
										B(a)P ∞	Naphthalene	GRO~ C_6 to C_{10}	DRO◊ C_{10} to C_{21}	LRO C_{21} to C_{40}
				0.9	3,000	932	327	2,400	8	25	9	34	156	5000
TP107	2.5	Reworked Natural Ground	0.7	< 0.1	< 0.1	< 0.1	< 0.1	-	-	< 0.1	0.3	< 0.1	21	< 10
TP132	1.2	Cohesive Alluvium	-	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-	< 0.1	< 0.1	-	-	-
TP123	1.2	Cohesive Alluvium	-	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-	0.4	< 0.1	-	-	-
TP123	2.2	Cohesive Alluvium	-	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-	1.0	1.9	-	-	-
TP133	1.0	Head deposits	2.4	< 0.1	< 0.1	< 0.1	< 0.1	-	-	< 0.1	< 0.1	< 0.1	< 10	< 10
TP108	1.9	Head deposits	1.6	-	-	-	-	-	-	< 0.1	0.1	-	-	-
TP133	1.8	Granular Glaciofluvial Deposits	2.5	< 0.1	< 0.1	< 0.1	0.1	-	-	< 0.1	< 0.1	2.5	< 10	< 10
TP133	2.8	Granular Glaciofluvial Deposits	2.4	< 0.1	< 0.1	< 0.1	0.1	-	-	< 0.1	< 0.1	1.4	17	< 10
TP132	2.9	Granular Glaciofluvial Deposits	-	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-	-	-	-	-	-
TP120	3.4	Granular Glaciofluvial Deposits	4.8	0.2	< 0.1	< 0.1	0.1	-	-	-	-	0.4	< 10	< 10
TP107	3.9	Granular Glaciofluvial Deposits	0.6	0.4	0.2	< 0.1	0.7	-	-	-	-	4.3	112	16

Expl Hole	**Depth (m)**	**Material**	Concentrations in mg/kg. Results are quoted to 1 decimal place if <10, and whole numbers if >10. Trigger Level Concentrations are shown in **BLUE** and assume a **residential with gardens and 600mm** cover end use											
			% TOC	Benzene ∞	Toluene	Ethyl Benzene	Xylenes	Phenols	PCB	PAH		TPH - C6 to C40		
										B(a)P ∞	Naphthalene	GRO~ C_6 to C_{10}	DRO◊ C_{10} to C_{21}	LRO C_{21} to C_{40}
				0.9	3,000	932	327	2,400	8	25	9	34	156	5000
Area C														
TP126	0.4	Sub-base	1.2	< 0.1	< 0.1	< 0.1	< 0.1	-	-	< 0.1	< 0.1	< 0.1	< 10	< 10
TP127	0.5	Granular Made Ground	2.4	< 0.1	< 0.1	< 0.1	< 0.1	-	-	< 0.1	< 0.1	< 0.1	**193**	**9000**
TP129	0.9	Head	1.7	-	-	-	-	-	-	0.06	< 0.1	-	-	-

Key		**Source of Guidance Trigger Level**	
0.3	Parameter tested for but not in excess of Tier 1 concentration	All Soil Screening Values in brackets above have been derived using CLEA v1.06. Values assume contaminants located in a sandy loam, with 6% soil organic matter (SOM). Assumes isolation beneath a **minimum 600mm thickness of soil cover**, see Generic Notes 04 in Appendix A.	
60	Parameter tested for and in excess of Tier 1 concentration	~	Assumes all GRO is aromatic fraction C7 to C8
	Contaminant not tested for	◊	Assumes all DRO is aliphatic fraction C10 to C12
		∞	Category 4 Screening Level – SP1010, December 2013 (CL:AIRE\Defra)

Appendix A

General Notes

01 - Environmental setting
Generic notes – geoenvironmental Investigations

General

Third party information obtained from the British Geological Survey (BGS), the Coal Authority, the Local Authority etc is presented in the "Search Responses" Appendix of this Geoenvironmental Report.

Geology, mining & quarrying

In order to establish the geological setting of a site, Lithos refer to BGS maps for the area, and the relevant geological memoir. Further information is sourced by reference to current and historical OS plans.

In July 2011, the Coal Authority (CA) formalised their requirements in relation to planning applications and introduced some new terminology. The CA, using its extensive records has prepared plans for all coalfield Local Planning Authorities, which effectively refines the defined coalfield areas into High Risk and Low Risk areas. High Risk areas are likely to be affected by a range of legacy issues that pose a risk to surface stability, including: mine entries; shallow coal workings; workable coal seam outcrops; mines gas; and previous surface mining sites. Low Risk areas comprise the remainder of the defined coalfield, and are areas where no known defined risks have been recorded; although there may still be unrecorded issues. Where a site lies within either a High or Low Risk area, a mining report is obtained from the CA.

Landfills

Lithos obtain data from Landmark or Groundsure, the Environment Agency and the Local Authority with respect to known areas of landfilling within 250m of the proposed development site. Historical OS plans are also inspected for evidence of backfilled quarries, railway cuttings, colliery spoil tips etc.

Radon

Radon is a colourless, odourless gas, which is radioactive. It is formed in strata that contain uranium and radium (most notably granite), and can move though fissures eventually discharging to atmosphere, or the spaces under and within buildings. Where radon occurs in high concentrations, it can pose a risk to health.

In order to assess potential risks associated with radon gas, Lithos refer to BRE Report BR211[1], and the Public Health England website. Advice on the limitation of exposure of the population to radon in buildings was originally published in 1990 by the National Radiological Protection Board (NRPB), which joined the Health Protection Agency (HPA) in 2005; the HPA updated NRPB advice in July 2010[2]. The HPA became part of Public Health England in 2013.

The HPA recommended that the NRPB radon Action Level for homes be retained, and a new Target Level for radon in homes be introduced. The values of the Action Level and Target Level, expressed as the annual average radon concentration in the home, are 200 Bqm^{-3} and 100 Bqm^{-3} respectively. The Target Level was to provide an objective for remedial action in existing homes and preventive action in new homes.

The term 'radon Affected Area' is defined as those parts of the country with >1% of homes estimated to be above the Action Levels. The NRPB first indicated which parts of the country should be regarded as radon Affected Areas in 1990. A more detailed mapping method was developed by the HPA in conjunction with the British Geological Survey in 2007[3]. The level of protection needed is site-specific and can be determined by reference to this mapping on the Public Health England website, which indicates the highest radon potential within each 1km grid square. Each 1km grid square is classified on the basis of the percentage of existing homes within that grid square estimated to have radon concentrations above the Action Level. There are 6 'bands': <1%; 1 to 3%; 3 to 5%; 5 to 10%; 10 to 30%; and >30%.

The NRPB advised that action should be taken to reduce radon concentrations in existing homes if the radon concentration exceeded the Action Level of 200 Bqm^{-3} in room air averaged over a year; ten times the average UK domestic radon concentration. NRPB advice informed changes in the requirements for radon protection in new buildings.

- **Basic** preventive measures are required in new buildings, extensions, conversions and refurbishments if the probability of exceeding the Action Level is **>3%** in England and Wales, and >1% in Scotland and Northern Ireland.
- Provision for further preventive (**Full**) measures is required in new buildings if the probability of exceeding the Action Level is **>10%**.

At present Building Regulations Approved Document C advocates basic measures for the probability banding 3% to 10%, and full measures if >10%. However, Public Health England would like to see all new build include basic measures.

Action and Target Levels should also be applied to non-domestic buildings with public occupancy exceeding 2,000 hours per year and to all schools.

Hydrogeology

Lithos obtain information from the Environment Agency (EA), and Landmark or Groundsure with respect to:

- Groundwater quality
- Recorded pollution incidents
- Licensed groundwater abstractions

From April 2010 the EA's Groundwater Protection Policy uses aquifer designations that are consistent with the Water Framework Directive. These designations reflect the importance of aquifers in terms of groundwater as a resource (drinking water supply), but also their role in supporting surface water flows and wetland ecosystems. The aquifer designation data is based on geological mapping provided by the British Geological Survey. The maps are split into two different types of aquifer designation:

- Superficial (Drift) - permeable unconsolidated (loose) deposits. For example, sands and gravels
- Bedrock - solid permeable formations e.g. sandstone, chalk and limestone

The maps display the following aquifer designations:

Principal aquifers: These are layers of rock or superficial deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer.

Secondary aquifers: These include a wide range of rock layers or superficial deposits with an equally wide range of water permeability and storage. Secondary aquifers are subdivided into three types:

- Secondary A - permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
- Secondary B - predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers
- Secondary undifferentiated - In most cases, this is because the rock type in question has previously been designated as both a minor and non-aquifer in different locations due to the variable characteristics.

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[1] BRE Report BR211, 2015: "Radon: guidance on protective measures for new buildings.

[2] Limitation of Human Exposure to Radon, Documents of the Health Protection Agency - Radiation, Chemical and Environmental Hazards, RCE-15. July 2010.

[3] Miles JCH, Appleton JD, Rees DM, Green BMR, Adlam KAM and Myers AH (2007). Indicative Atlas of Radon in England and Wales. Chilton, HPA-RPD-033.

Unproductive strata: These are rock layers or superficial deposits with low permeability that have negligible significance for water supply or river base flow.

The EA maps only display the principal and secondary aquifers as coloured areas. All uncoloured areas on the map will be unproductive strata. However, for uncoloured areas on the superficial (drift) designation map it is not possible to distinguish between areas of unproductive strata and areas where no superficial deposits are present; to do this, it is necessary to consult the published geological survey maps.

For the purposes of the EA's Groundwater Protection Policy the following default position applies, unless there is site specific information to the contrary:

- If no superficial (drift) aquifers are shown, the bedrock designation is adopted
- In areas where the bedrock designation shows unproductive strata (the uncoloured areas) the superficial designation is adopted
- In all other areas, the more sensitive of the two designations is used (e.g. If secondary superficial overlies principal bedrock, an overall designation of principal is assumed)

The EA have also designated groundwater Source Protection Zones, which are based on proximity to a groundwater source (springs, wells and abstraction boreholes). The size of a Source Protection Zone is a function of the aquifer, volume of groundwater abstracted and the effective rainfall, and may vary from tens to several thousand hectares.

Hydrology

Lithos obtain information from the Environment Agency and Landmark or Groundsure with respect to:

- Surface water quality
- Recorded pollution incidents
- Licensed abstractions (groundwater & surface waters)
- Licensed discharge consents
- Site susceptibility to flooding

The EA have set water quality targets for all rivers. These targets are known as River Quality Objectives (RQOs). The water quality classification scheme used to set RQO planning targets is known as the River Ecosystem scheme. The scheme comprises five classes (RE1 to RE5) which reflect the chemical quality requirements of communities of plants and animals occurring in our rivers.

General Quality Assessment (GQA) grades reflect actual water quality. They are based on the most recent analytical testing undertaken by the EA. There are 6 GQA grades (denoted A to F) defined by the concentrations of biochemical oxygen demand, total ammonia and dissolved oxygen.

The susceptibility of a site to flooding is assessed by reference to a Flood Map on the Environment Agency's website. These maps show natural floodplains - areas potentially at risk of flooding if a river rises above its banks, or high tides and stormy seas cause flooding in coastal areas. There are two different kinds of area shown on the Flood Map:

1. Dark blue areas (Flood Zone 3) could be flooded by the sea by a flood that has a 0.5% (1 in 200) or greater chance of happening each year, or by a river by a flood that has a 1% (1 in 100) or greater chance of happening each year
2. Light blue areas (Flood Zone 2) show the additional extent of an extreme flood from rivers or the sea. These outlying areas are likely to be affected by a major flood, with up to a 0.1% (1 in 1000) chance of occurring each year

These two colours show the extent of the natural floodplain if there were no flood defences or certain other manmade structures and channel improvements. Where there is no blue shading (Flood Zone 1), there is less than a 0.1% (1 in 1000) chance of flooding occurring each year.

The maps also show all flood defences built in the last five years to protect against river floods with a 1% (1 in 100) chance of happening each year, or floods from the sea with a 0.5% (1 in 200) chance of happening each year, together with some, but not all, older defences and defences which protect against smaller floods.

The Agency's assessment of the likelihood of flooding from rivers and the sea at any location is based on the presence and effect of all flood defences, predicted flood levels, and ground levels.

It should also be noted that as the floodplain shown is the 1 in 100 year, areas outside this may be flooded by more extreme floods (e.g. the 1 in 1000 year flood). Also, parts of the areas shown at risk of flooding will be flooded by lesser floods (e.g. the 1 in 5 year flood). In some places due to the shape of the river valley, the smaller floods will flood a very similar extent to larger floods but to a lesser depth.

If a site falls within a floodplain, it is recommended that a flood survey be undertaken by a specialist who can advise on appropriate mitigating measures; i.e. raising slab levels, provision of storage etc. In accordance with Chapter 10 of the National Planning Policy Framework, a site-specific flood risk assessment is required for: proposals of 1 hectare or greater in Flood Zone 1, or in an area within Flood Zone 1 which has critical drainage problems (as notified to the local planning authority by the Environment Agency); and any new development in Flood Zones 2 and 3.

COMAH & explosive sites

Lithos obtain information from Landmark or Groundsure with respect to Control of Major Accident Hazards (COMAH) or explosive sites within 1km of the proposed development site. Lithos' report refers to any that are present, and recommends that the Client seeks further advice from the HSE.

Areas around COMAH sites (chemical plants etc) are zoned with respect to the implementation of emergency plans. The HSE are a statutory consultee to the local planning authority for all COMAH sites. The COMAH site may have to revise its emergency action plan if development occurs. This might be quite straightforward or could entail significant expenditure. Consequently, the COMAH site may object to a proposed development (although it is the Local Authority who have final say, and they are likely to place more weight on advice from the HSE).

Preliminary conceptual site model

The site's environmental setting (and proposed end use) is used by Lithos to assess the significance of any contamination encountered during the subsequent ground investigation.

Assessment of contaminated land is based on an evaluation of pollutant linkages (source-pathway-receptor). Contaminants within the near surface strata represent a potential source of pollution. The environment (most notably groundwater), site workers and end users are potential receptors.

Potential pollutant linkages are shown on a preliminary conceptual site model (pCSM). A CSM is essentially a cross-section through a site that reflects both the surface topography and underlying geology, and shows surface features of interest. The most significant sources of contamination are then superimposed onto this cross-section together with potential receptors (human health & controlled waters), and plausible pathways between the two. In addition to environmental issues, the CSM should also highlight geotechnical issues.

A pCSM is prepared after consideration of all available "desk study" data, and before design of the ground investigation. Data reviewed should include historical plans (with superimposition on a current-day plan), previous SI reports, geological maps etc. The pCSM, in conjunction with knowledge of site constraints (buildings, services, slopes etc) is used to design the ground investigation.

The revised CSM takes account of data obtained during the ground investigation, including the distribution of made ground, the nature and distribution of contamination etc.

02 - Ground investigation fieldwork
Generic notes – geoenvironmental investigations

General

Lithos Ground Investigations are undertaken in accordance with current UK guidance including:

- BS5930:2015 “Code of practice for site investigation”
- Eurocode 7: BS EN 1997-1:2004. Geotechnical design - Part 1: General rules
- Eurocode 7: BS EN 1997-2:2007. Geotechnical design - Part 2: Ground investigation and testing
- BS10175:2013 "Code of practice for the identification of potentially contaminated sites"
- “Technical Aspects of Site Investigation” – EA R&D Technical Report P5-065/TR (2000)
- “Development of appropriate soil sampling strategies for land contamination” – EA R&D Technical Report P5-066/TR (2001)
- Contaminated Land Reports 1 to 6, most notably CLR Report No. 4 “Sampling strategies for contaminated land”
- “Guidance on the protection of housing on contaminated land” – NHBC & EA R&D Publication 66 (2000)
- AGS: 1996 “Guide to the selection of Geotechnical Soil Laboratory Testing”

Exploratory hole locations

Exploratory hole locations are selected by Lithos, prior to commencement of fieldwork, to provide a representative view of the strata beneath the site and to target potential contaminant sources identified during the preliminary investigation (desk study). Additional exploratory locations are often determined by the site engineer in light of the ground conditions actually encountered; this enables better delineation of the depth and lateral extent of organic contamination, poor ground, relict structures etc.

Investigation techniques

Ground conditions can be investigated by a number of techniques; the procedures used are in general accordance with BS5930: 2015 and BS1377: 1990. Techniques most commonly used by Lithos include:

- Machine excavated trial pits, usually equipped with a backactor and a 0.6m wide bucket.
- Cable percussive (Shell & Auger) boreholes, typically using 150mm diameter tools and casing.
- Window or windowless sampling boreholes (dynamic sampling). Constraints associated with existing buildings, operations and underground service runs can render some sites partly or wholly inaccessible to a mechanical excavator. In such circumstances, window sampling is often the most appropriate technique. A window sampling drilling rig can be manoeuvred in areas of restricted access and results in minimal disturbance of the ground (a 150mm diameter tarmac/concrete core can be lifted and put to one side). However, it should be noted that window sampling allows only a limited inspection of the ground (especially made ground with a significant proportion of coarse material).
- Rotary percussive open-hole probeholes are typically drilled using a tri-cone rock roller or polycrystalline diamond compact (PDC) bit with air as the flushing medium. Probeholes are generally lined through made ground with temporary steel casing to prevent hole collapse.

Where installed, gas\groundwater monitoring wells typically comprise a lower slotted section, surrounded by a filter pack of 10 mm non-calcareous gravel and an upper plain section surrounded in part by a bentonite seal and in part by gravel or arisings. The top of the plain pipe is cut off below ground level and the monitoring well protected by a square, stopcock type manhole cover set in concrete, or the plain pipe is cut off just above ground level and the well protected by 100mm diameter steel borehole helmet set in concrete. Monitoring well details, including the location of the response zone and bentonite seal are presented on the relevant exploratory hole logs.

In-situ testing

Relative densities of granular materials given on the trial pit logs are based on visual inspection only, they do not relate to any specific bearing capacities.

The relative densities of granular materials encountered in cable percussive boreholes are based on Standard Penetration Test (SPT) results. SPTs are carried out boreholes, in accordance with BS 1377 1990, Part 9 Section 3.3. Where full penetration (600mm) is not possible, N values are calculated by linear extrapolation and are shown on the logs as N* = x. The strength of cohesive deposits is determined using a hand shear vane.

Shear strength test results (hand vane readings) reported on trial pit logs are considered to be more reliable than those reported on window sample logs. Significant sample disturbance occurs during window sampling and consequently shear strength results on disturbed window samples are generally lower than results obtained during trial pitting, in-situ or in large excavated blocks.

Sampling

Typically Lithos collect at least three soil samples from each exploratory hole, although in practice a greater number are often taken. The collection of a sufficient number of samples provides a sound basis upon which to schedule laboratory analysis, ensuring:

- A sufficient number of samples from each (common) site material are tested
- Horizontal and vertical coverage of the site is adequate, thereby providing a robust data set for use in the conceptual ground model
- Any localised, significant, but non-pervasive conditions are considered

Made ground and natural soils encountered in the field during a ground investigation often contain a significant proportion of coarse grained material (e.g. brick etc). Soil samples obtained during most investigations are often only truly representative of the in-situ soil mass where there is an absence of particles coarser than medium gravel; i.e the entire soil mass would pass a 20mm sieve.

Representative bulk samples of the **soil mass** are retrieved from coarse soils for specific geotechnical tests (most notably grading and compaction); this typically requires the collection of at least 10kg of soil, and occasionally >50kg. However, in the context of assessing land contamination, it is generally accepted that samples should be representative of the **soil matrix** of the stratum from which they are taken. Consequently, truly representative samples of coarse soils for subsequent contaminant analysis are not obtained - only the finer fraction is placed in sample containers. Coarse constituents not sampled would typically comprise any 'particles' with an average diameter greater than about 20mm (i.e. coarse gravel, cobble and boulder).

At present, neither ISO/IEC 17025 nor MCERTS specify sample pre-treatment with respect to stone removal. Unsurprisingly therefore UKAS accredited testing laboratories do not adopt the same approach to stones[1] – some crush and test the “as received” soil, whilst others sieve out stones and analyse only the residual soil (the sieve size used varies depending on the laboratory).

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[1] *Mark Perrin. Stoned – Sample Preparation for Soils Analysis. Ground Engineering, April 2007.*

In essence, samples taken from coarser soils for contaminant analysis are "screened" by the geoenvironmental engineer in the field, and often sieved again by the laboratory during sample preparation. Geoenvironmental engineers do not typically re-calculate soil mass contaminant concentrations by taking account of the unsampled coarse fraction. Likewise, laboratories that remove stones typically report contaminant concentrations based on the dry weight of soil passing the sieve. In the context of land contamination and human health risk assessment, this is considered reasonable, because it is the soil matrix which is of greatest concern. Stones are unlikely to:

- Provide a significant source for plant uptake (consumption of vegetables)
- Remain on vegetables after washing (consumption of vegetables)
- Be eaten (accidentally by an adult, or deliberately by a child)
- Be whipped-up by the wind for dust generation (inhalation)
- Stick to the skin for any length of time (dermal contact)
- Yield toxic vapour (inhalation)

Consequently, Lithos instruct labs to remove all stones >10mm, and to report the results as dry-weight based on the mass of matrix tested. However, the laboratory are given site-specific instruction where coarse stones are coated in say oil, or impregnated with mobile contaminants such as diesel. Where the stones are predominantly natural, or inert (e.g. brick, concrete etc), removal will clearly result in higher reported concentrations, than if the stones were crushed and added to the matrix.

Where the stones include a significant proportion of contaminant-rich material (e.g. slag, fragments of galvanised metal etc) an argument could be made for crushing and analysing. However, provided the stones are stable (i.e. unlikely to disintegrate or degrade) they should not pose a significant risk to human health for the reasons stated above.

Sometimes it is necessary to obtain samples that are not representative of the wider soil matrix, for example when investigating localised, significant, but non-pervasive conditions. Any such unrepresentative samples are annotated with the suffix '*' (eg 2D*, or 4G*). Lithos' site engineer describes both the unrepresentative sample, and the soil mass from which it was been taken.

Sample Containers (for contaminant analysis). Samples of soil for contaminant testing are placed into appropriate containers (see below). Soil samples for organic analysis are stored in cool boxes, at a temperature of approximately 4°C, until delivery to the selected laboratory.

Anticipated testing	**Container(s)**
Asbestos identification	500ml plastic tub
pH & metals, and non-volatile organics	500ml glass jar
Speciated TPH	500ml & 50ml glass jars
VOCs (incl. naphthalene and\or GRO)	50ml glass jar

Sample Containers (for geotechnical analysis*).* The majority of samples are only scheduled for PI and sulphate testing, for which 500g of sample is required (a full 0.5-litre plastic tub). However, bulk bags are taken where scheduling of compaction or grading tests is proposed.

Groundwater

Where encountered during fieldwork, groundwater is recorded on exploratory hole logs. If monitoring wells are installed, groundwater levels are also recorded on one or more occasions after completion of the fieldwork. Long-term monitoring of standpipes or piezometers is always recommended if water levels are likely to have a significant effect on earthworks or foundation design.

It should be borne in mind that the rapid excavation rates used during a ground investigation may not allow the establishment of equilibrium water levels. Water levels are likely to fluctuate with season/rainfall and could be substantially higher at wetter times of the year than those found during this investigation.

Description of strata

Soils encountered during a Lithos investigation are described (logged) in general accordance with BS 5930:2015. The descriptions and depth of strata encountered are presented on the exploratory hole logs and summarised in the Ground Conditions section within the main body of text. The materials encountered in the trial pits are logged, samples taken, and tests performed on the in-situ materials in the excavation faces, to depths of up to 1.2m; below this depth these operations are conducted at the surface on disturbed samples recovered from the excavation.

Key to exploratory hole logs

Keys to logs are presented in the Appendix containing the logs. There are two Keys – Symbols & Legends and Terms & Definitions.

03 – Geotechnical laboratory testing
Generic notes – geoenvironmental investigations

General

Soil samples are delivered to the laboratory for testing along with a schedule of testing drawn up by Lithos. All tests are carried out in accordance with BS 1377:1990. The following laboratory testing is routinely carried out on a selection of samples:

- Atterberg limits & moisture contents
- Soluble sulphate & pH

Where soft, cohesive soils are encountered, one-dimensional consolidation tests are scheduled in order to assess settlement characteristics, and unconsolidated undrained triaxial compression tests to assess shear strength.

The additional tests are typically only scheduled where significant earthworks regrade is anticipated:

- Grading
- Compaction tests
- Particle density

Test results are presented as received in an Appendix to the Geoenvironmental Report.

Atterberg limits & moisture content

The Liquid and Plastic Limits of samples of natural in-situ clay are determined using the cone penetrometer method and the rolling thread test. These tests enable determination of an average Plasticity Index (PI) for each "type" of clay, although judgement is applied where variable results are reported.

PI can be related to shrinkability (low, medium or high) and then to minimum founding depth. Lithos typically only consider a soil to be shrinkable if the proportion finer than 63µm is >35%. PI results are compared against guidance given in the NHBC Standards, Chapter 4.2 (revised April 2003), which advocates the use of modified Plasticity Index (I'p), defined as:

I'p = Ip * (%< 425µm/100)

i.e. if PI is 30%, but the soil contains 80% < 425µm, then: I'p = 30 * 80/100 = 24%.

It should be noted that in accordance with the requirements of BS 1377, the % passing the 425µm sieve is routinely reported by testing labs. Lithos apply engineering judgment where PI results are spread over a range of classifications. Consideration is given to:

- The average values for each particular soil type (ie differentiate between residual soil and alluvium)
- The number of results in each class and
- The actual values

Unless the judgment strongly indicates otherwise, Lithos typically adopts a conservative approach and recommends assumption of the higher classification.

Soluble sulphate and pH

Sulphates in soil and groundwater are the chemical agents most likely to attack sub-surface concrete, resulting in expansion and softening of the concrete to a mush. Another common cause of concrete deterioration is groundwater acidity.

The rate of chemical attack depends on the concentration of aggressive ions and their replenishment at the reaction surface. The rate of replenishment is related to the presence and mobility of groundwater.

Lithos refer to BRE Special Digest 1 (SD1) "Concrete in aggressive ground. Part 1: Assessing the aggressive chemical environment" (2005). SD 1 provides definitions of:

- The nature of the site (greenfield, brownfield or pyritic)
- The groundwater regime (static, mobile or highly mobile)
- The design sulphate class (DS class) and
- The aggressive chemical environment for concrete (ACEC class)

Lithos reports clearly state each of the above for the site being considered.

The concentrations of sulphate in aqueous soil/fill extracts are determined in the laboratory using the gravimetric method. The results are expressed in terms of SO_4 for direct comparison with BS 5328:1997. The pH value of each sample was determined by the electrometric method.

SD1 also discusses determination of "representative" sulphate concentration from a number of tests. Essentially if <10 samples of a given soil-type have been tested, the highest measured sulphate concentration should be taken. If >10 samples have been tested, the mean of the highest 20% of the sulphate test results can be taken. With respect to groundwater, the highest sulphate concentration should always be taken.

With respect to pH (soil & groundwater) the value used is the lowest value if <10 samples have been tested and the mean of the lowest 20% if >10 samples have been tested.

Oedometer (Consolidation) tests

Oedometer tests measure a soil's consolidation properties, and are performed by applying different loads to a soil sample and measuring the deformation response. Typically the sample is subject to 5 incremental pressures (4 loading & 1 unloading), and the convention is for each subsequent pressure to be double the previous pressure. BS1377 suggests the **initial** pressure should be:

a) For stiff soils the effective overburden pressure*
b) For firm soils "somewhat less" than the effective overburden pressure
c) For soft soils "appreciably less" than the effective overburden pressure, usually 25 kPa or less
d) For very soft soils very low, typically 5 kPa or 10 kPa

* Effective **overburden pressure** (kNm^{-2}) = depth (m) x soil bulk unit weight (kNm^{-3})

Results from these tests are used to predict how a soil in the field will deform in response to a change in effective stress.

Triaxial tests

This test measures the mechanical properties of a soil by placing the sample between two parallel platens which apply stress in one (usually vertical) direction, with fluid used to apply a confining pressure in the perpendicular directions. During the test, the surrounding fluid is pressurized, and then stress on the platens is increased until the material in the cylinder fails.

From triaxial test data, it is possible to extract fundamental material parameters, including its angle of shearing resistance, apparent cohesion, and dilatancy angle. These parameters are then used in computer models to predict how the material will behave in a larger-scale engineering application.

Quick (single stage, Unconsolidated, Undrained tests) are most appropriate for foundation design**.** This is because load is applied relatively quickly, and shear strength of the clay will be lowest initially; after the applied load causes some consolidation of the ground (after drainage results in dissipation of short-term excess pore water pressure), the in-situ clays will become progressively stronger and hence the factor of safety will increase. Confining pressure is specified as equivalent to overburden pressure (kNm^{-2}).

Foundations on granular soils would use effective shear strength parameters (c' and phi') to assess safe bearing capacity, as the soil would fully drain quickly. These effective shear strength parameters could be determined from Consolidated Undrained (or sometimes the more expensive Consolidated Drained) triaxial tests, but often correlations to the SPT are used.

Unconsolidated Undrained triaxial tests are most appropriate for assessment of the stability of fill slopes on clays. Similar to foundations, the application of load gradually increases the strength of the clays and hence the critical case is the short term undrained condition.

Consolidated Undrained (or sometimes **Consolidated Drained**) triaxial tests are most appropriate for assessment of the stability of cut slopes in clays. This is because unloading of the ground leads to short term reduction in pore pressures that approximately balance the unloading, hence the soil strength is largely unchanged. Over time the reduced pore pressures suck water in, which leads in to the progressive increase in pore pressure and loss of strength. The fully drained state is critical, which must be modelled using effective strength parameters and a reasonable estimate of the long term water table conditions.

Slopes formed in granular soils would use effective shear strength parameters (c' and phi') to assess safe bearing capacity, as the soil would fully drain quickly. These effective shear strength parameters could be determined from Consolidated Undrained (or sometimes the more expensive Consolidated Drained) triaxial tests, but often correlations to the SPT are used.

04 - Contamination analysis & interpretation (including WAC)
Generic notes – geoenvironmental investigations

Determination of analytical suite

An assessment of potential contaminants associated with the former usages of the site is undertaken with reference to CLR 8 "Potential contaminants for the assessment of land" and the relevant DETR Industry Profile(s).

Common contaminants

Common **Inorganic** Contaminants include:

- Metals, most notably cadmium, copper, chromium, mercury, lead, nickel, and zinc
- Semi-metals, most notably arsenic, selenium, and (water soluble) boron
- Non-metals, most notably sulphur
- Inorganic anions, most notably cyanides (free & complex), sulphates, sulphides, and nitrates

With respect to the terminology used by most analytical laboratories:

Total cyanide = Free cyanide + Complex cyanide

Total cyanide (CN) is determined by acid extraction; whereas free cyanide is the water soluble fraction. Complex cyanide is "bound" in compounds and is hard to breakdown. Laboratory determination of complex CN involves subjecting the sample to UV digestion for determination of both free and total CN.

Thiocyanate (SCN) is a different species combined with sulphur.

Elemental sulphur (S) and free sulphur are the same. Total sulphur is all forms, including that present in sulphates (SO_4), sulphides etc.

There are 2 forms of chromium (Cr), chromium VI and chromium III. Chromium VI is the more toxic of these. In soils, total chromium is determined by a strong aqua regia acid digestion. Chromium VI is an empirical method based on a water extract test.

Common **Organic** Contaminants include hydrocarbons, phenols, and polychlorinated biphenyls.

Petroleum is a mixture of hydrocarbons produced from the distillation of crude oil, and includes aliphatics (alkanes, alkenes and cycloalkanes), aromatics (benzene and derivatives) and hydrocarbon-like compounds containing minor amounts of oxygen, sulphur or nitrogen. Petroleum hydrocarbons can be grouped based on the carbon number range:

- GRO – Gasoline Range Organics (typically C_6 to C_{10}). Also referred to as PRO – Petroleum Range Organics
- DRO – Diesel Range Organics (typically C_{10} to C_{28})
- LRO - Lubricating Oil Range Organics (typically C_{28} to C_{40})
- MRO – Mineral Oil Range Organics (typically C_{18} to C_{44})

However, it should be borne in mind that the terms "GRO" and "DRO" analysis are purely descriptive terms, the exact definition of which varies. Total Petroleum Hydrocarbons (TPH) is also a poorly defined term; some testing laboratories regard TPH as hydrocarbons ranging from C_5-C_{40}, whereas others define TPH as C_{10}-C_{30}.

The composition of a TPH plume migrating through the ground can vary significantly; this is primarily dictated by the nature of the source (eg petrol, diesel, engine oil etc). Furthermore, different hydrocarbons are affected differently by weathering processes, and this can result in further variation in the chemical composition of the TPH.

Gasoline contains light aliphatic hydrocarbons (especially within the C_4 to C_5 range) that are volatile. The aromatic hydrocarbons in gasoline are primarily benzene, toluene, ethylbenzene and xylenes, referred to as BTEX. Small amounts of polycyclic aromatic hydrocarbons (PAHs) such as benzo(a)pyrene may also be present. Diesel and light fuel oils have higher molecular weights than gasoline. Consequently, they are less volatile and less water soluble. About 25 to 35% is composed of aromatic hydrocarbons. BTEX concentrations are generally low.

Heavy Fuel Oils are typically dark in colour and considerably more viscous than water. They contain 15 to 40% aromatic hydrocarbons. Polar nitrogen, sulphur and oxygen-containing compounds (NSO) compounds are also present. Lubricating Oils are relatively viscous and insoluble in groundwater. They may contain 10 to 30% aromatics, including the heavier PAHs. NSO compounds are also common.

Polycyclic Aromatic Hydrocarbons (PAHs) have more than two fused benzene rings as a structural characteristic. PAH compounds are present in both petrol and diesel, although in significantly lower concentrations than in coal tars. Certain PAH compounds are carcinogenic (benzo(a)pyrene) and\or mobile in the environment (naphthalene).

Volatile Organic Compounds (VOCs) are organic chemicals, and most are liquids that readily evaporate on exposure to air. Examples include benzene, toluene, xylene, chloroform etc. Semi-Volatile Organic Compounds (sVOCs) include phenol and benzo(a)pyrene, and have relatively low boiling points. Both groups of chemicals are readily absorbed through skin and some, such as benzene, are believed to be linked to tumour growth.

Phenols are compounds that have a hydroxyl group (-OH) attached to an aromatic ring (ie include a benzene ring and an –OH group). Most are colourless solids. A solution of phenol in water is known as carbolic acid, and is a powerful antiseptic. However, phenol vapour is toxic, and skin contact can result in burns.

Polychlorinated Biphenyls (PCBs) were used in pre-1974 transformers as dielectric fluids. PCB's are of increasing toxicity relative to the degree of chlorination. Acute symptoms of PCB poisoning are irritation of the respiratory tract leading to coughing and shortness of breath. Nausea, vomiting and abdominal pain are caused by ingestion of PCB's.

Dioxins and furans (polychlorinated dibenzodioxins and polychlorinated dibenzofurans) are some of the most toxic chemicals known; in the environment, they tend to bio-accumulate in the food chain. Dioxin is a general term that describes a group of hundreds of chemicals that are highly persistent in the environment. The most toxic compound is 2,3,7,8-tetrachlorodibenzo-p-dioxin or TCDD.

Dioxin is formed by burning chlorine-based chemical compounds with hydrocarbons. The major source of dioxin in the environment comes from waste-burning incinerators and also from backyard burn-barrels. Dioxin pollution is also affiliated with paper mills which use chlorine bleaching in their process and with the production of Polyvinyl Chloride (PVC) plastics and with the production of certain chlorinated chemicals (like many pesticides).

Methods of analysis (organic compounds)

TPH by GC-FID is an analytical technique which only detects hydrocarbons (aliphatic and aromatic) in the range C_{10} to C_{40} (volatiles, heavy tars, humic material and sulphur are not detected). The laboratory can provide a broad, 'banded' breakdown of the TPH results into gasoline range organics (GRO), diesel range organics (DRO) and heavier lubricating oil range organics (LRO), or fully speciated results with the reporting of hydrocarbon concentrations in 14 specific carbon bandings based upon behavioural characteristics, e.g. aliphatic C_6 to C_8, aromatic C_{10} to C_{12} etc.

Speciated VOC (by GC-MS) analysis quantifies the concentrations of 30 USA-EPA priority compounds. These include chlorinated alkanes and alkenes (in the molecular weight range chloroethane to tetrachloroethane); trimethylbenzenes; dichlorobenzenes; and the 4 BTEX compounds (benzene, ethyl-benzene, toluene & xylene).

Speciated sVOC by (GC-MS) analysis quantifies the concentrations of a variety of organic compounds, including the 16 USA-EPA priority PAHs, phenols, 7 USA EPA priority PCB congeners, herbicides & pesticides.

Note: PAHs are hydrocarbons and consequently (where present) will be picked-up when scheduling TPH by GC-FID.

Note: Risk assessment models require physiochemical properties (solubilities, toxicities etc) of compounds in order to model their behaviour in the environment. These physiochemical properties cannot be derived from a single "TPH", "GRO" or "DRO" value. However, the carbon banded fractions can be used in risk assessment models.

Current UK guidance

The UK approach to contaminated land is set out in Contaminated Land Report No. 11 (2004) "Model Procedures for the Management of Land Contamination". The approach is based upon risk assessment, where risk is defined as the combination of the probability of occurrence of a defined hazard and the magnitude of the consequences of the occurrence.

In the context of land contamination, there are three essential elements to any risk: (1) a contaminant source; (2) a receptor (eg controlled water or people); and (3) a pathway linking (1) and (2). Risk can only exist where all three elements combine to create a pollutant linkage. Risk assessment requires the formulation of a conceptual model which supports the identification and assessment of pollutant linkages.

Lithos adopt a tiered approach to risk assessment, consistent with UK guidance and best practice. The initial step of such a risk assessment (or Tier 1) is the comparison of site data with appropriate UK guidance levels, Lithos risk-derived screening values, or remedial targets. It should be noted that exceedance of Tier 1 does not necessarily mean that remedial action will be required.

Soil screening values used by Lithos

In March 2002 DEFRA and the Environment Agency published a series of technical papers (R&D Publications CLR 7, 8, 9 and 10) outlining the UK approach to the assessment of risk to human health from land contamination. In 2008 CLR 7, 9 and 10 and all corresponding SGV and Tox reports were withdrawn and superseded by new guidance including:

- Guidance on Comparing Soil Contamination Data with a Critical Concentration - CL:AIRE and CIEH, May 2008
- Evaluation of models for predicting plant uptake of chemicals from soil - Science Report – SC050021/SR
- Human health toxicological assessment of contaminants in soil - Science Report: SC050021/SR2
- Updated technical background to the CLEA model - Science Report: SC050021/SR3
- CLEA Software Handbook (Version 1.071), Science report: SC050021/SR4
- Compilation of data for priority organic pollutants for derivation of Soil Guideline Values - Science Report: SC050021/SR7

The approach set out in these documents represents current scientific knowledge and thinking; and includes the Contaminated Land Exposure Model (CLEAv1.06). The Environment Agency are in the process of using this updated approach to regenerate a selection of Soil Guideline Values (SGVs).

CLEA SGVs were derived for standard land use scenarios predominantly in the context of Part IIA, using a conceptual site model (CSM) defined in SR3. Lithos have incorporated amendments to the CSM used to derive SGVs, that more accurately reflect redevelopment within the planning regime; consequently, Lithos have not adopted any published SGV as a screening value.

The CLEA conceptual site model assumes a source located in a sandy loam, with 6% soil organic matter (SOM) - equivalent to 3.5% total organic carbon (TOC). However, where the average TOC value for a particular soil type is significantly lower than the 3.5%, evaluation of Lithos Screening Values should be undertaken and a site specific risk assessment will usually be required. Other CLEA default characteristics adopted by Lithos are:

Sandy Loam characteristics (source)	Default values adopted
Total porosity (fraction)	0.53
Water filled porosity (fraction)	0.33
Air filled porosity (fraction)	0.2

Lithos have derived Screening Values for four different CSMs (scenarios); these are:

A - Residential with gardens, but no cover (or only up to 300mm)
B - Residential with gardens and 600mm 'clean' cover
C - Residential apartments with landscaping (i.e. no home grown produce)
D - Commercial/industrial with landscaping
E – Importation of soil cover

The **exposure** pathways considered for each scenario are detailed in the table below.

Scenario	Land use	Pathways	Justification
A	Residential with garden, but no cover (or only up to 300mm)	• Direct ingestion of soil • Dermal contact • Consumption of vegetables & soil attached to vegetables • Inhalation of indoor vapours and dust • Inhalation of outdoor vapours and dust	Minimal cover – insufficient to break any pathways therefore all exposure pathways are relevant.
B	Residential with garden minimum 600mm cover	• Inhalation of indoor vapours • Inhalation of outdoor vapours	The 600mm cover removes the risk from all pathways other than inhalation.
C	Residential apartments with landscaped areas and minimum 300mm cover	• Direct ingestion of soil • Dermal contact • Inhalation of indoor vapours and dust • Inhalation of outdoor vapours and dust	All pathways applicable due to possible exposure from landscaped areas. However consumption of home grown produce not included as unlikely to be grown in landscaped areas. Where vegetables are to be grown site specific QRA may be required.
D	Commercial/ industrial with landscaped areas no cover	• Direct ingestion of soil • Dermal contact • Inhalation of indoor vapours and dust • Inhalation of outdoor vapours and dust	All pathways applicable due to possible exposure from landscaped areas. Assumed the commercial development consists of offices to provide a conservative assessment.
E	Importation of soil for cover in garden and landscaped areas	• Direct ingestion of soil • Dermal contact • Consumption of vegetables & soil attached to vegetables • Inhalation of outdoor vapours and dust	Material used as cover to break existing pathways therefore all direct and indirect pathways relevant; however cover is **not** placed below plots therefore indoor inhalation is not relevant.

Lithos have assumed the source of contamination is directly below the building foundations; i.e. a depth to source of 0.15m as opposed to the CLEA default of 0.65m. This assumption provides for a more conservative approach than the UK default. This adjustment has been included to account for sites where made ground is re-engineered to enable new buildings to be established on raft foundations. In such situations contamination may lie directly beneath the foundation.

The Soil Screening Values referred to in this document are **not** intended to be used when considering potential risks associated with:

- Existing land uses in the context of Part IIA of the Environment Protection Act 1990;
- End uses such as allotments, sports fields, children's playgrounds, care homes, hospitals etc; and
- Controlled waters.

In December 2013 Defra published the results of research project SP1010 – Development of Category 4 Screening Levels (C4SLs) for Assessment of Land Affected by Contamination. The objective of this project was provide technical guidance in support of Defra's revised Statutory Guidance for Part 2A of the Environmental Protection Act 1990 (Part 2A). The revised Statutory Guidance, published in April 2012, introduced a new four-category system for classifying land under Part 2A where Category 1 includes land where the level of risk is clearly unacceptable, and Category 4 includes land where the level of risk posed is acceptably low. Project SP1010 aimed to deliver:

- A methodology for deriving C4SLs for four generic land-uses comprising residential, commercial, allotments and public open space; and
- Demonstration of the methodology, via derivation of C4SLs for 6 substances – arsenic, cadmium, chromium IV, lead, benzene & benzo(a)pyrene.

The methodology for deriving both the previous Soil Guideline Values and the new Category 4 Screening Levels is based on the Environment Agency's Contaminated Land Exposure Assessment (CLEA) methodology. Development of C4SLs has been achieved by modifying the toxicological and\or exposure parameters used within CLEA (while maintaining current exposure parameters).

The Part 2A Statutory Guidance was developed on the basis that C4SLs could be used under the planning regime. However, policy responsibility for the National Planning Policy Framework falls to the Department for Communities and Local Government. Defra anticipate that, where they exist, C4SLs will be used as generic screening criteria, and Lithos consider C4SLs to be suitable for use as Tier 1 Screening Values. Lithos have discussed this matter with both NHBC and YALPAG (collection of Yorkshire & Lincolnshire local authorities) and received confirmation that they are satisfied with this approach.

With respect to **inorganic** determinands, Lithos derived Tier 1 values for the five Scenarios A to E are presented below:

Inorganic contaminant	**Tier 1 assessment criteria (mg/kg) for Scenarios A to E**							**Comments/notes**
	SGV*	**C4SL***	**A**	**B**	**C**	**D**	**E**	
As	32	37	37	Use (A) in SI Report for initial "screen". If >5 x A, then consider increase of cover to 1,000mm	40	640	37	C4SL adopted
Cd	10	26	26		149	410	26	C4SL adopted
Cr			3,000		3,000	30,000	3,000	Assumes Cr is CrIII
Pb	450	200	200		310	2,330	200	C4SL adopted
Ni	130		127		127	1,700	127	Assessment of health risk only
Se	350		350		595	13,000	434	
Hg	170		169		238	3,640	199	Assumes in an inorganic compound
B			5		5	5	5	Based on phytotoxic risks as plants are the more sensitive receptor (Cu is pH dependant)
Cu			80-200		80-200	80-200	80-200	
Zn			200		200	200	200	

With respect to **organic** determinands, Lithos derived Tier 1 values for the five Scenarios A to E are presented below:

Organic contaminant (all sourced via CLEA)	**Tier 1 assessment criteria (mg/kg) for Scenarios A to E**							**Comments/notes**
	SGV*	**C4SL***	**A**	**B**	**C**	**D**	**E**	
Benzene	0.33	0.87	0.9	0.9	3.3	98	N/A	C4SL adopted
Toluene	610		600	3,000	2,700	5,000	N/A	Calculated value over 10,000
Ethyl Benzene	350		350	932	843	5,000	N/A	
Xylenes	240		246	327	321	5,000	N/A	
Phenol	420		412	2,400	519	5,000	N/A	
PCBs			2	8	2	38	N/A	Based on toxicity of EC7
Benzo(a)pyrene		5	5	25	5.3	76	5	C4SL adopted. Where source is not a coal tar
Naphthalene			8	9	9	1,000	12	
Gasoline Range Organics			30	34	34	5,000	45	See 3-step assessment of TPH below
Diesel Range Organics			151	156	154	5,000	219	
Lubricating Range Org			1,000	5,000	2,000	5,000	1,000	

* *For a residential end use*

The significance of PAHs can be determined by considering indicator compounds. In most cases benzo(a)pyrene (BaP) is adopted as an indicator due to the amount of toxicological data available and has been used by various authoritative bodies to assess the carcinogenic risk of PAHs in food. A surrogate marker approach can be used to estimate the toxicity of a mixture of PAHs in soil using toxicity data for individual indicator compounds within that mixture. Exposure to the surrogate marker is assumed to represent exposure to all PAHs in that matrix. The surrogate marker approach relies on a number of assumptions:

- Surrogate marker (bap) must be present in all soil samples
- Profile of the different pah relative to bap should be similar in all samples
- PAH profile in the soil samples should be similar to that used in the pivotal toxicity study[1]

---

[1] SP1010 Appendix E, Provisional C4Sls for benzo(a)pyrene as a surrogate marker for PAHs, CL:AIRE 2013

To assess the PAH profile in a soil sample, the ratio of the seven genotoxic PAHs (benz[a]anthracene, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[g,h,i]perylene, chrysene, dibenz[a,h]anthracene and indeno[1,2,3-c,d]pyrene), relative to BaP, should be calculated. The ratio relative to BaP should lie within an order of magnitude above and below the mean ratio to BaP.

Naphthalene should also be considered separately against its generic screen. Whilst classed as a PAH, naphthalene is more volatile and mobile in the environment than most other PAHs. As such the significance of naphthalene cannot be considered within the surrogate marker approach.

Similarly, **TPH** cannot be assessed as a single "total" value, and reference has been made to the Environment Agency's document P5-080/TR3, "The UK approach for evaluating human health risks from petroleum hydrocarbons in soils". This document supports the assumptions and recommendations made by the US Total Petroleum Hydrocarbons Criteria Working Group (TPHCWG). The TPHCWG have broken down "TPH" into representative constituent fractions or "EC Bandings". The TPHCWG have derived a series of physiochemical and toxicological parameters for each of the bandings.

The significance of speciated TPH results can be assessed by following the 3 steps outlined in the tables below.

Step	Result	Action
1. Consider indicator compounds: Are BTEX, naphthalene, benzo(a)pyrene above their respective Tier 1 values?	Yes	Remediation or dQRA required
	No	Proceed to Step 2
2. Consider individual TPH fractions: are they above respective screening values?	Yes	Remediation or dQRA required
	No	Proceed to Step 3
3. Assess Cumulative effects: Is the calculated Hazard Index for each source >1	Yes	Remediation or dQRA required
	No	TPH compounds pose no significant risk

Step 1 - Assessing indicator compounds

TPH fraction Indicator compound	End use specific screening value (mg/kg)			
	A: Residential no cover	B: Residential with 600mm cover	C: Residential no gardens	D: Commercial\ industrial
Benzene	0.9	0.9	3.3	98
Toluene	600	3,000	2,700	5,000
Ethyl Benzene	350	932	843	5,000
Xylenes	246	327	321	5,000
Naphthalene	8	9	9	1,000
Benzo(a)pyrene	5	25	5.3	76

Step 2 - Assessing individual TPH fractions

TPH fraction		End use specific screening value (mg/kg)			
		A: Residential no cover	B: Residential with 600mm cover	C: Residential with no gardens	D: Commercial/ industrial
Aliphatic 5-6	GRO	41	41	42	5,000^ per fraction
Aliphatic 6-8	GRO	125	125	125	
Aliphatic 8-10	GRO	31	31	32	
Aliphatic 10-12	DRO	151	156	154	
Aliphatic 12-16	DRO	500^	500^	500^	
Aliphatic 16-21	DRO	1,000^	5,000#	1,000^	
Aliphatic 21-35	LRO	1,000^	5,000#	1,000^	
Aromatic 5-7	GRO	100	123	122	
Aromatic 7-8	GRO	30	34	34	
Aromatic 8-10	GRO	47	50	50	
Aromatic 10-12	DRO	215	287	266	
Aromatic 12-16	DRO	689	1,000*	1,000*	
Aromatic 16-21	DRO	1,000^	5,000#	1,000^	
Aromatic 21-35	LRO	1,000^	5,000#	1,000^	

* Calculated Screening Value exceeded soil saturation limit and could indicate free product, therefore calculated soil saturation limit adopted as a target

^ Calculated Screening Value close to soil saturation limit, screening value selected by Lithos considering visual and olfactory impacts.

Five times the screening value for Scenario A.

Step 3 - Assessing Cumulative Effects

$$HI = \sum_{F_i=1}^{16} HQ\ F_i = \frac{\text{Measured concentration } F_i\ (mg\,kg^{-1})}{SGV\ F_i\ (mg\,kg^{-1})}$$

where HI = Hazard Index
HQ = Hazard Quotient
F_i = Fraction $_i$
SGV = Soil Guideline Value

Other screening values used by Lithos

Tier 1 risk assessment of **hazardous gas** is undertaken through reference to the following documents (and further information is presented in Generic Note No. 5 – Hazardous Gas):

- Approved Document C, Building Regulations 2000
- Boyle & Witherington (2007) – Guidance on evaluation on development proposals on sites where methane and carbon dioxide are present, incorporating "traffic lights". Report Ref. 10627-R01-(02), for NHBC
- CIRIA C665 (2007) – Assessing risks posed by hazardous ground gases to buildings
- BS 8485:2015 – Code of Practice for the characterisation & remediation from ground gas in affected developments

With respect to the assessment of potential **phytotoxic effects** of contaminants, Lithos refer to "The Soil Code" (MAFF, 1998) for copper and zinc. The CLEA SGV is adopted for nickel due to its human health effects.

The potential risk to **building materials** is considered through reference to relevant BRE Digests, with particular emphasis on BRE Special Digest 1, 'Concrete in aggressive ground', 2005.

With respect to the interpretation of the **calorific values**, at present there are no accepted methods to assess whether a sample is combustible and under what circumstances it might smoulder. Some guidance is given in ICRCL Note 61/84 "Notes on the fire hazards of contaminated land" which states that: *"In general … it seems likely that materials whose CV's exceed 10MJ/kg are almost certainly combustible, while those with values below 2MJ/kg are unlikely to burn"*.

Tier 1 **groundwater** risk assessments are undertaken by comparing leachate or groundwater concentrations with the appropriate water quality standard. Tier 1 Screening Values have been discussed with the Environment Agency, and typically those in **bold** below are adopted.

Analyte	**Source of Tier 1 Screening Value (µg/l)**			
	Surface water (Abstraction for drinking) 1996	**Water Supply Regulations 2000**	**Water Framework Directive**	**EA Advice**
Arsenic	50	10	**50**	
Selenium	10	**10**		
Cadmium	5	5	**1.5**	
Chromium	50	50	**32**	
Copper	50	2,000	**28**	
Lead	50	10	**7.2**	
Nickel		20	**20**	
Zinc	3,000		**125**	
Boron		**1,000**		
Mercury	1	1	**0.07**	
Petroleum Hydrocarbons				**10**
1,1,1-Trichloroethane			**100**	
1,1 Dichloroethane				**100**
1,2-Dichloroethane		3	**10**	
1,1-Dichloroethene				**100**
Benzene		1	**10**	
Ethylbenzene				**10**
Tetrachloroethene		10	**10**	
Toluene			**50**	
Trichloroethene		10	**10**	
Vinyl Chloride		**0.5**		
Trichloromethane			**2.5**	
Xylenes			**30**	
Chloroethane				**100**

Waste classification & WAC

In the context of waste soils generated by remediation and\or groundworks activities on brownfield sites, the following definitions (from the Landfill Regulations 2002) apply:

- Inert (e.g. uncontaminated 'natural' soil, bricks, concrete, tiles & ceramics)
- Non-Hazardous (e.g. soil excavated from a contaminated site which contains dangerous substances, but at concentrations below prescribed thresholds)
- Hazardous (e.g. soil excavated from a contaminated site which contains dangerous substances at concentrations above prescribed thresholds)

Dangerous substances include compounds containing a variety of determinants commonly found in contaminated soils on brownfield sites, for example arsenic, lead, chromium, benzene etc.

Landfill operators require Waste Acceptance Criteria (WAC) laboratory data, if soil waste is classified as **hazardous**, and such waste must have been subjected to pre-treatment. However, subject to WAC testing it may be possible to classify it as stable, non-reactive hazardous waste, which can be placed within a dedicated cell within the non-hazardous landfill.

Lithos typically only include WAC analysis in site investigation proposals and reports, if significant off-site disposal (of soil classified as hazardous waste) is anticipated, for example where redevelopment proposals include basement construction etc. If off-site disposal of soils classified as hazardous waste during redevelopment is anticipated, then WAC analysis should be scheduled at an early stage in the remediation programme. However, organic compounds (BTEX, TPH, PAH etc) are the most common contaminants that result in soils being classed as hazardous, and these contaminants can often be dealt with by alternative technologies (eg by bioremediation or stabilisation) and consequently retention on site is often possible.

It should be noted that **non-hazardous** soil waste can go to a non-hazardous landfill facility; no further testing (eg WAC) is required.

Possible action in event of Tier 1 exceedance

Should any of the Tier 1 criteria detailed above be exceeded, then three potential courses of action are available. (The first is only applicable in terms of human health, but the second and third could also be applied to groundwater or landfill gas).

1. Undertake further statistical analysis following the approach set out in "*Guidance on Comparing Soil Contamination Data* with *a Critical Concentration - CL:AIRE and CIEH, May 2008*" in order to determine whether contaminant concentrations of inorganic contaminants within soil\fill actually present a risk (only applicable to assessing the risk to human health).
2. Carry out a more detailed quantitative risk assessment in order to determine whether contamination risks actually exist.
3. Based on a qualitative risk assessment, advocate an appropriate level of remediation to "break" the pollutant linkage - for example the removal of the contaminated materials or the provision of a clean cover.

Prior to undertaking any statistical analysis the issue of the **averaging area** requires further consideration. The CL:AIRE\CIEH document still refers to CLR 7, which suggests averaging area should reflect receptor behaviour and therefore might be a single garden, or an open area used by the local community as a play area. This approach to averaging areas is considered applicable within the context of Part IIA of the Environmental Protection Act (EPA) 1990, in terms of an existing residential development.

However, Lithos consider the concept of a single garden as an averaging area to be inappropriate with respect to brownfield redevelopment, which is regulated by the planning regime. In this context, contamination across the entire site needs to be characterised by reference to the Conceptual Site Model. Consequently, Lithos gather and analyse sample results by fill type, and\or by former use in a given sub-area of the site, before undertaking statistical analysis; ie the averaging area is associated with the extent of a particular fill type, or an area affected by spillage\leakage.

In terms of brownfield redevelopment, this is considered a more appropriate methodology which provides a more representative sample population for statistical analysis. As such the entire site is considered in terms of the proposed end use, be this residential with, or without gardens.

Analysis by soil\fill type is appropriate for essentially immobile contaminants associated with a particular fill type, for example arsenic in colliery spoil, metals in ash & clinker, sulphate in plaster-rich demolition rubble etc.

Analysis by former use is appropriate where more mobile contaminants have entered the ground, for example diesel associated with leakage from a former fuel tank, downward migration of leachable metals through granular materials, various soluble contaminants present in a wastewater leaking into the ground via a fractured sewer etc. In these circumstances, it may be appropriate to undertake statistical analysis of sample results from a variety of different soil\fill types. However, consideration would have to be given to factors such as porosity which might influence impregnation of a mobile contaminant into the soil mass, ie contamination would normally be more pervasive and significant in granular soils than cohesive soils

05 – Hazardous gas
Generic notes – geoenvironmental investigations

General

Hazardous gas is considered to be any mixture of potentially explosive, toxic or asphyxiating gases, most notably methane, carbon dioxide and oxygen (deficiency). In addition, radon, a naturally occurring radioactive gas is also considered. Further information about radon is included in Notes 01 – Environmental Setting.

Assessment of potential risks associated with hazardous gas are based on a review of data obtained from the Landmark Information Group, the Environment Agency and the Local Authority and the British Geological Survey. Reference is also made to historical OS plans, which are inspected for evidence of backfilled quarries, railway cuttings, colliery spoil tips etc.

Where landfilling has occurred within 250m of the site boundary, the Local Planning Authority may request a landfill gas investigation in accordance with the Town and Country Planning General Development Order, 1988.

Sources

Potential sources of hazardous gas include:

- Landfill sites
- Made ground, especially where significant depths are present
- Shallow mineworkings associated with coal extraction
- Geological strata, including peat, organic silts, coal and limestone (reaction with acidic waters), granite (radon)
- Groundwater can sometimes act as a "carrier" for hazardous gas
- Leakages from pipelines or storage tanks
- Sewers, septic tanks and cess pits

Generation

Wherever biodegradable material is deposited, landfill gas (principally a mixture of methane and carbon dioxide) is likely to be generated by microbial activity. Carbon dioxide is an asphyxiant and toxic; methane is flammable and a mixture containing between 5% and 15% methane by volume in air is explosive. Landfill gas in the ground is unlikely in itself to pose a significant risk, though it may damage vegetation. However, infiltration of landfill gas into confined spaces (e.g. cellars, services, etc) may give rise to considerable risk.

There is no typical figure for the length of time that landfill gas will be evolved, but at many sites significant gas generation continues for at least 15 years after the last deposit of waste.

Migration

Gas migration from a landfill site may occur in several ways. It may migrate through adjacent strata; the distance of migration being dependent on the pressure gradients, volume of gas and permeability of the strata. Where there are faults, cavities and fissures within the strata, gas may move considerable distances. Other migration pathways for gas include man-made features such as mine shafts, roadways and underground services.

Gas migration is influenced by a number of climatic factors, such as atmospheric pressure variations, water table level variations and the influence of a covering of snow or ice over the surface of the site and surrounding area.

Gas monitoring procedure

Lithos adopt a standard gas monitoring procedure, in accordance with CIRIA guidance. This procedure involves the measurement, in the following order of:

- Atmospheric temperature, pressure and ambient oxygen concentration
- Gas emission rate
- Methane, oxygen and carbon dioxide concentrations using an infra-red gas analyser
- Standing water level using a dipmeter.

In addition, ground conditions at each sampling location are recorded together with prevailing weather conditions and any other observations such as any vandalism. Where samples of gas are required for laboratory analysis, Gresham Tubes or multi-layer Tedlar / ALTEF sampling bags are used. Gas concentrations in the well are typically recorded immediately before and after retrieval of a sample.

Current guidance

CIRIA Report 151 (1995)[i] identified that there was inadequate guidance on trigger concentrations for ground gases. CIRIA concluded that the most important aspect of a gas regime below or adjacent to a site was the surface emission rate, i.e. how quickly the gas is coming out of the ground. The lower the surface emission rate the lower the risk. CIRIA Report C665 (2007)[ii] advocates two methodologies for characterising sites:

A – All developments except low rise housing. The advocated methodology is that proposed by Wilson & Card, 1999[iii]

B – Low rise housing. An alternative (traffic light) methodology, derived by Boyle and Witherington, 2006[iv] for NHBC

Both methodologies refer to Gas Screening Values (GSV); previously referred to as limiting borehole gas volume flow.

A – All developments except low rise housing

(Wilson & Card, 1999)[v] revised Table 28 of CIRIA 149[v] in terms of borehole gas volume flow rate (now GSV) in order to achieve a more consistent design of protection measures. This was done to reflect the importance of recognising the gas surface emission rate. Wilson & Card then developed a method for classifying gassing sites (Table 1 below), which took into account the combined gas concentration and GSV.

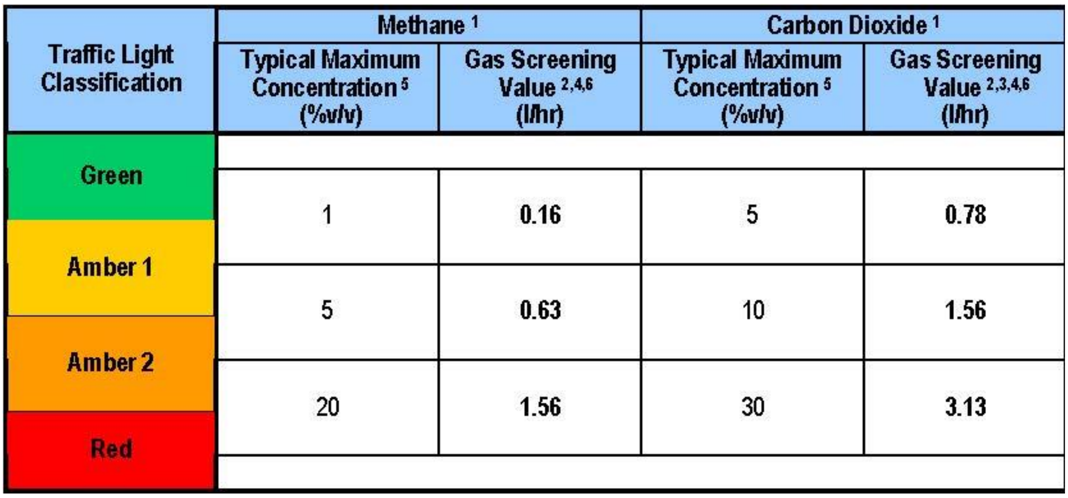
Characteristic Situation	Gas Screening Value, CH_4 or CO_2 (l/hr)	Additional limiting factors	Typical source of generation
1	<0.07	Methane not to exceed 1% v/v and carbon dioxide not to exceed 5% v/v	Natural soils with low organic content
2	<0.7	Borehole air flow rate not to exceed 70 litre/hr otherwise increase to Characteristic Situation 3	Natural soil, high peat/organic content
3	<3.5		Old landfill, inert waste, mineworkings flooded.
4	<15	Quantitative Risk Assessment required to evaluate scope of protection measures.	Mineworkings – susceptible to flooding, completed landfill, inert waste
5	<70		Mineworkings unflooded, inactive
6	>70		Recent landfill site

***Notes**: Borehole flow rate = volume of gas (regardless of composition) which is escaping from well (l/hr). Gas Screening Value (litre/hour) = gas concentration (%) / 100 x borehole flow rate (l/hr). To facilitate design implementation, the limiting values for both methane and carbon dioxide are identical.*

B – Low rise housing.

NHBC have developed a characterisation system similar to that of Wilson & Card above, but specific to low-rise housing development (Boyle and Witherington) (Table 8.7). This approach compares measured gas emission rates with generic "Traffic Lights". The Traffic Lights include "Typical Maximum Concentrations" for initial screening, and risk-based Gas Screening Values (GSVs) for consideration of situations where the Typical Maximum Concentrations are exceeded. Calculations are carried out for both methane and carbon dioxide and the worst case adopted in order to establish the appropriate protection measures.

Table 8.7 NHBC Traffic light system for 150 mm void



Traffic Light Classification	Methane [1]		Carbon Dioxide [1]	
	Typical Maximum Concentration [5] (%v/v)	Gas Screening Value [2,4,6] (l/hr)	Typical Maximum Concentration [5] (%v/v)	Gas Screening Value [2,3,4,6] (l/hr)
Green				
	1	0.16	5	0.78
Amber 1				
	5	0.63	10	1.56
Amber 2				
	20	1.56	30	3.13
Red				

Notes:

1. The worst gas-regime identified at the site, either methane or carbon dioxide, recorded from monitoring in the worst temporal conditions, will be the decider for which Traffic Light and GSV is allocated.
2. Generic GSVs are based on guidance contained within "The Building Regulations: Approved Document C" (2004) and assume a sub-floor void of 150 mm thickness.
3. A leak of gas from the sub-floor void into a small room (e.g. downstairs toilet with soil pipe potentially passing into sub-floor void) of dimensions 1.50m × 1.50m × 2.50m, with a total room volume of 5.63m^3 has been considered.
4. The GSV, in litres per hour, is as defined in Wilson and Card (1999) as the borehole flow rate multiplied by the concentration in the air stream of the particular gas being considered.
5. The Typical Maximum Concentrations can be exceeded in certain circumstances should the conceptual site model indicate it is safe to do so. This is where professional judgment will be required, based on a thorough understanding of the gas regime identified at the site where monitoring in the worst temporal conditions has occurred.
6. The GSV thresholds should not generally be exceeded without completion of a detailed gas risk assessment taking into account site-specific conditions.

---

[i] *Harries CR, Witherington PJ and McEntee JM (1995). Interpreting measurements of gas in the ground. CIRIA Report 151*

[ii] *CIRIA (2007) – Assessing risks posed by hazardous ground gases to buildings.*

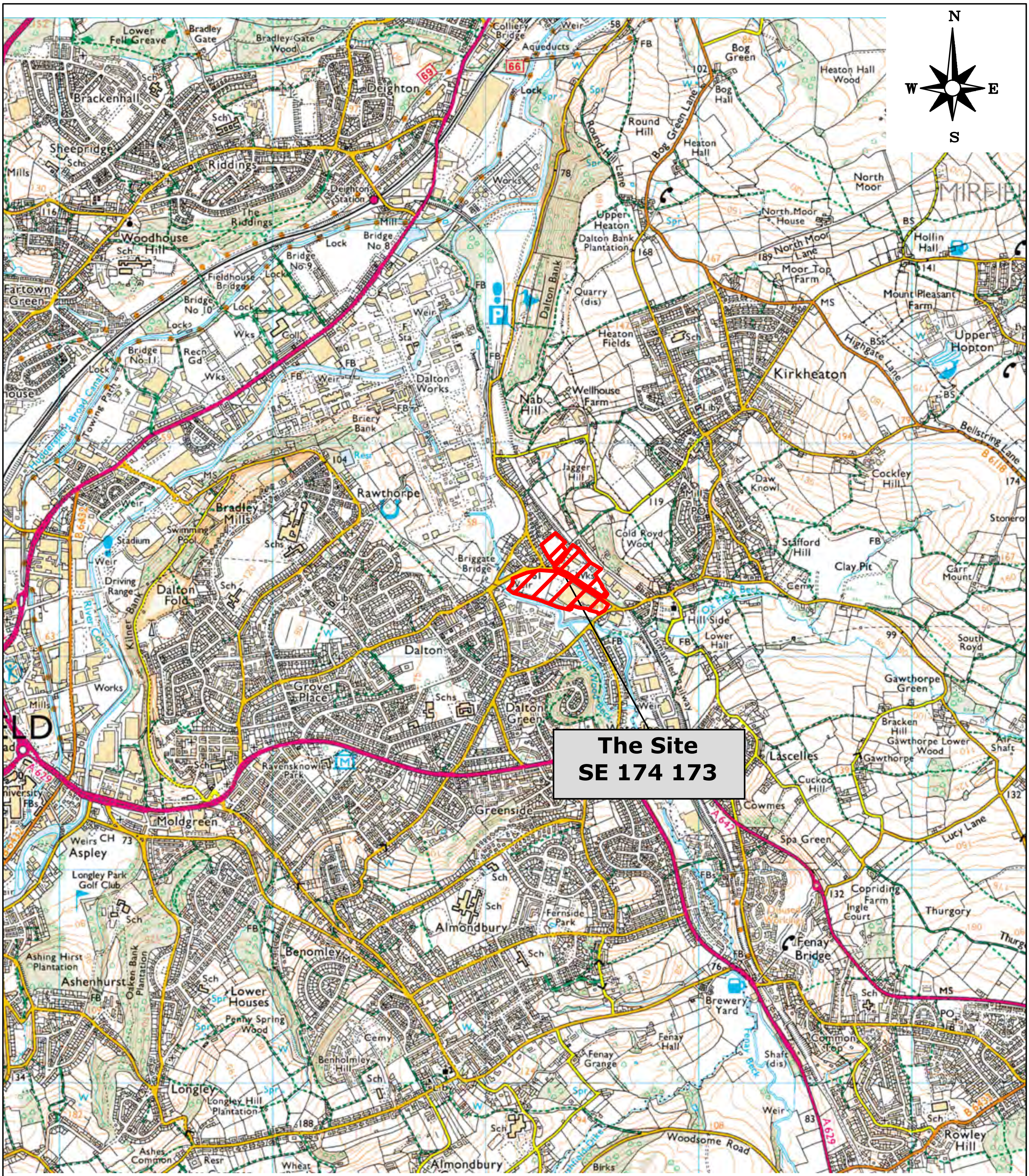
[iii] *Wilson SA and Card GB (February 1999). Reliability and Risk in Gas Protection Design. Ground Engineering.*

[iv] *Boyle & Witherington (2006) – Guidance on evaluation on development proposals on sites where methane and carbon dioxide are present, incorporating "traffic lights". Report Ref. 10627-R01-(02), for NHBC*

[v] *Wilson SA and Card GB (February 1999). Reliability and Risk in Gas Protection Design. Ground Engineering.*

Appendix B

Drawings



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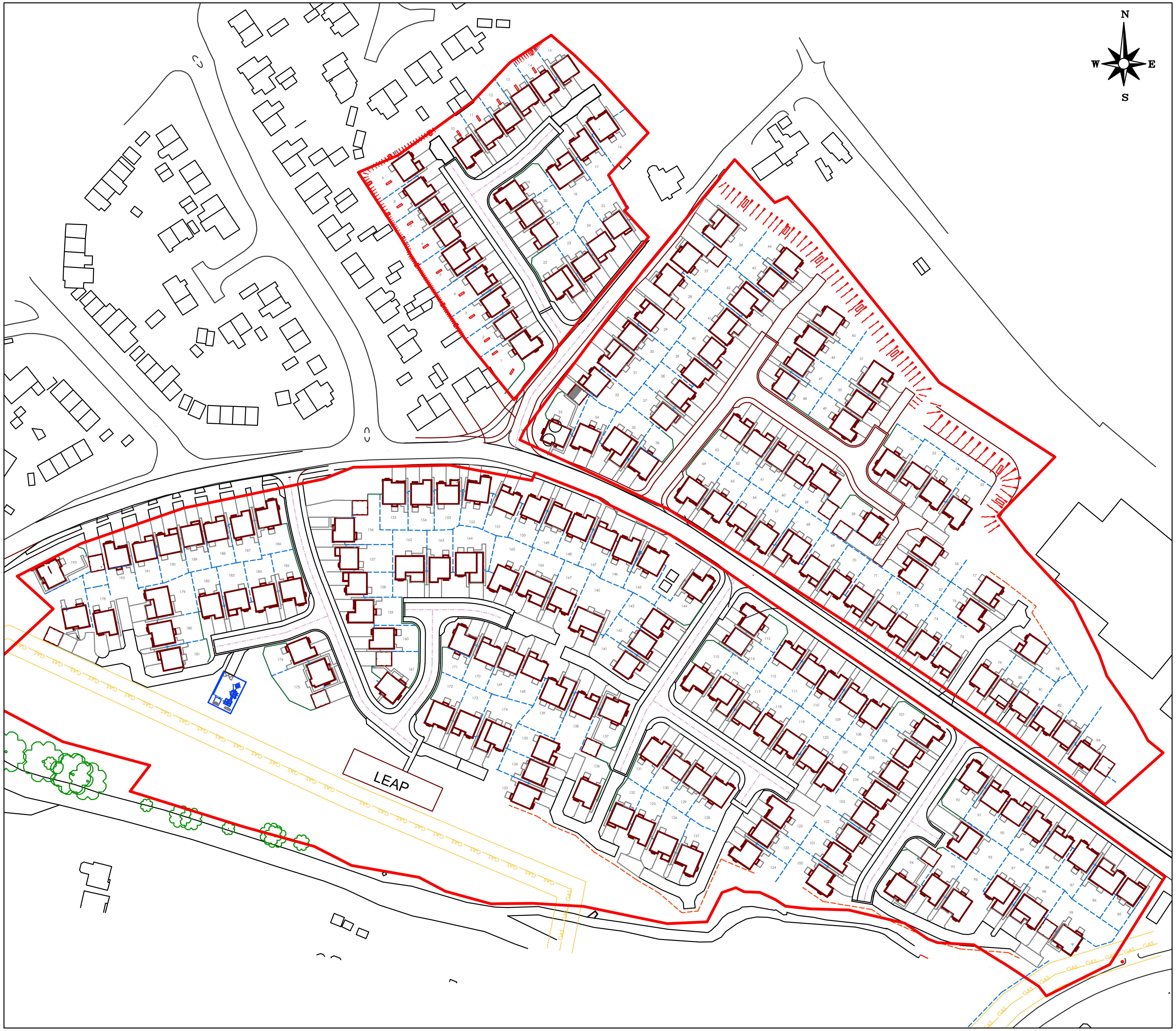
CLIENT
HARRON HOMES

JOB TITLE
CROSSLEY LANE, DALTON

DRAWING TITLE
SITE LOCATION PLAN

DRAWN	LEW			DATE	03 02 20
CHECKED	MJT			DATE	03 02 20
STATUS	FOR COMMENT ☐	FOR APPROVAL ☐		DRAFT ☐	FINAL ☑
SCALE 1:25,000	SHEET A4		DRAWING NO. 3435/101	REVISION	



NOTES

— APPROXIMATE SITE BOUNDARY

REPRODUCED FROM HARRON HOMES
DRAWING REFERENCE 493-03 REV. F, DATED
24th FEBRUARY 2020

REV.	DESCRIPTION	DATE

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CLIENT

HARRON
HOMES

JOB TITLE

CROSSLEY LANE,
DALTON

DRAWING TITLE

PROPOSED SITE LAYOUT

DRAWN	DATE	STATUS
LEW	27 02 20	FOR COMMENT ☐ FOR APPROVAL ☐ DRAFT ☐ FINAL ☑
CHECKED	DATE	
MJT	27 02 20	

SCALE	SHEET	DRAWING NO.	REVISION
1:1,500	A3	3435/102	

NOTES

🟩	GRASS & OVERGROWN AREAS
🟨	BUILDING
🟧	GRAVEL OR HARDCORE SURFACING
⬛	TARMAC HARDSTAND
⬜	CONCRETE HARDSTAND
🟥	STORAGE TANKS
▨	STOCKPILE
—	APPROXIMATE SITE BOUNDARY

REV.	DESCRIPTION	DATE

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CLIENT

HARRON
HOMES

JOB TITLE

CROSSLEY LANE,
DALTON

DRAWING TITLE

SITE FEATURES

DRAWN	DATE	STATUS
LEW	07 02 20	FOR COMMENT ☐ FOR APPROVAL ☐
CHECKED	DATE	
MJT	07 02 20	DRAFT ☐ FINAL ☑

SCALE	SHEET	DRAWING NO.	REVISION
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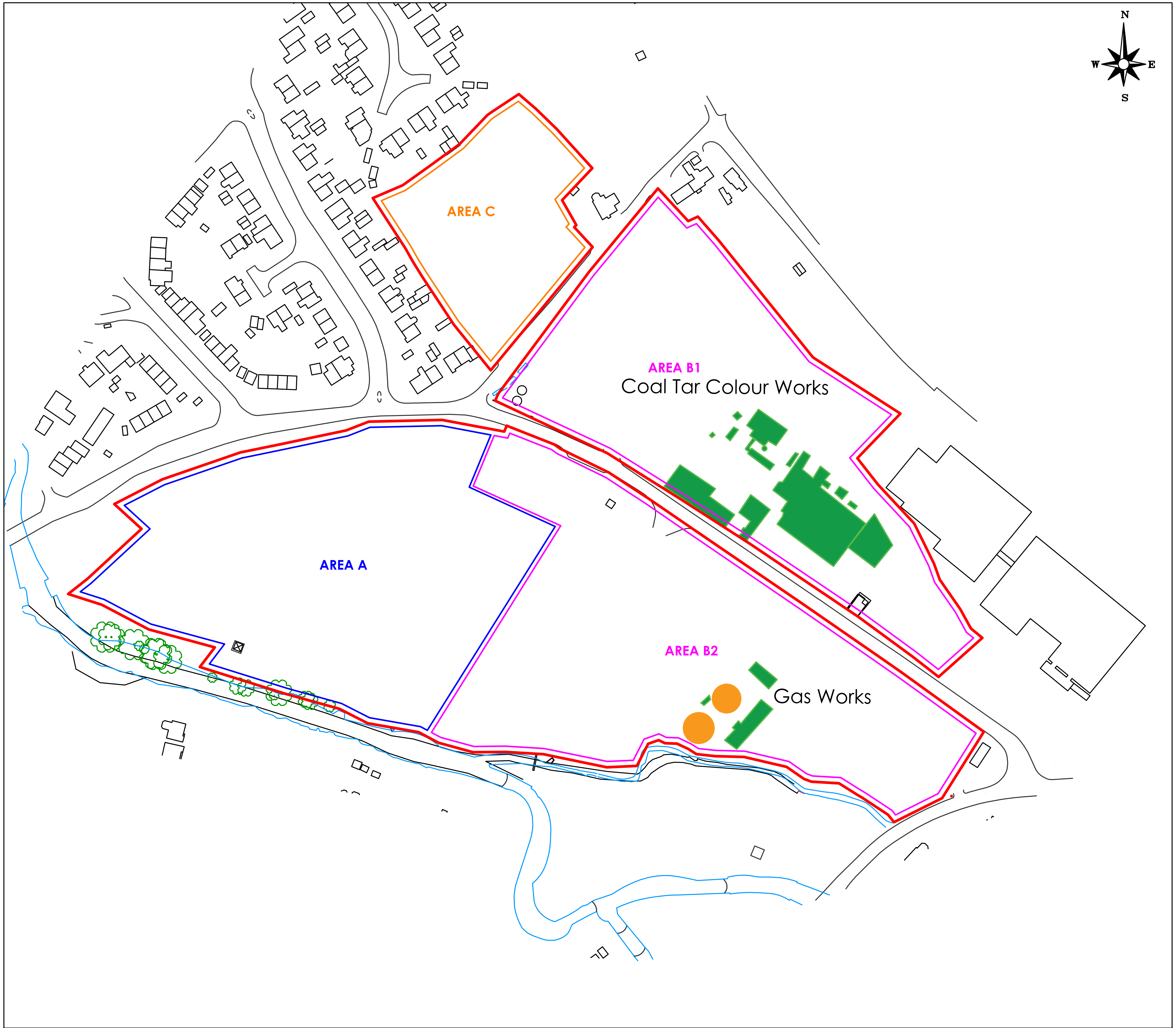

NOTES

🟩 HISTORICAL BUILDING FOOTPRINT
🟧 HISTORICAL GAS HOLDERS
— APPROXIMATE SITE BOUNDARY

REV.	DESCRIPTION	DATE

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CLIENT

HARRON
HOMES

JOB TITLE

CROSSLEY LANE,
DALTON

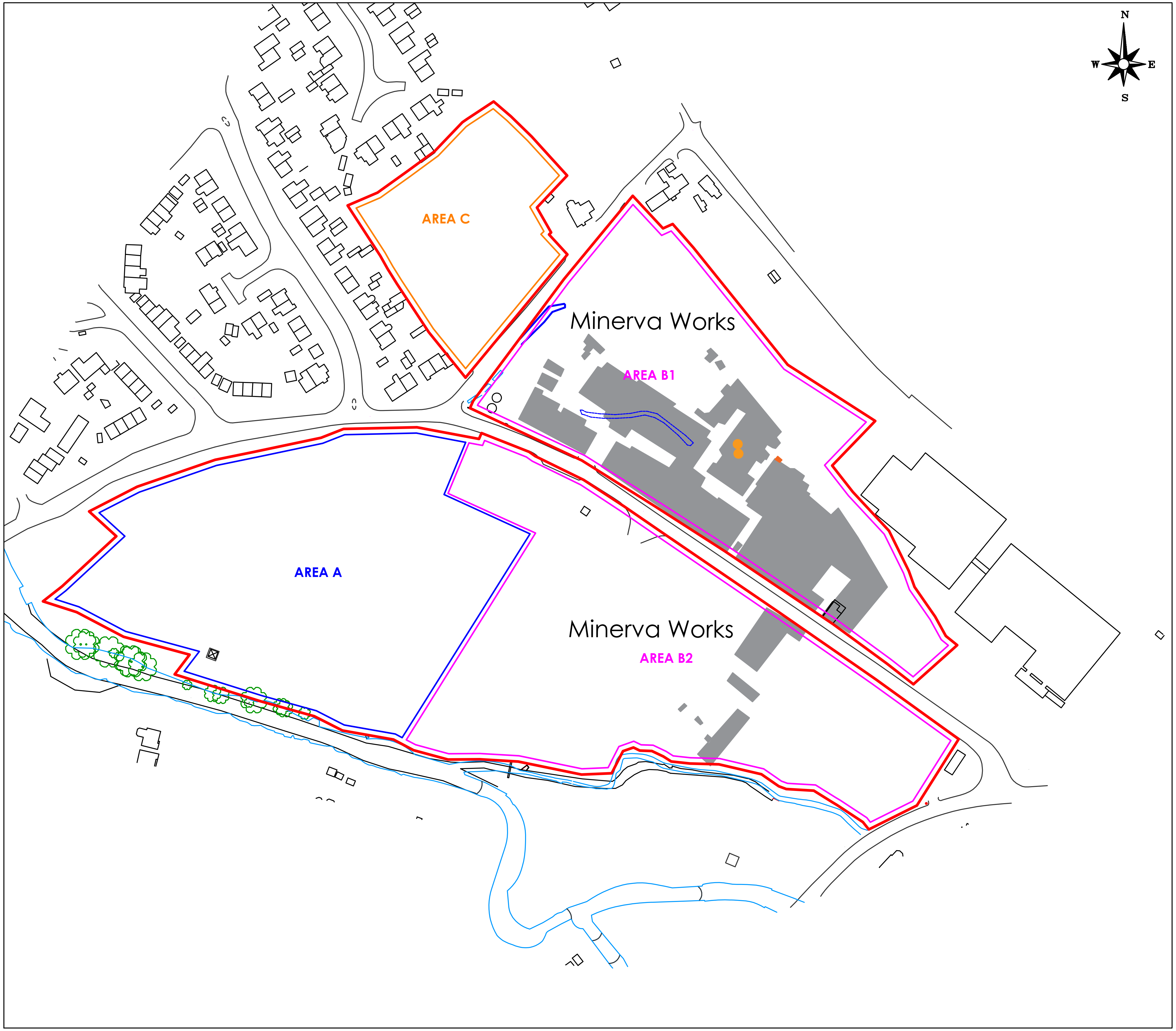
DRAWING TITLE

1893 HISTORICAL FEATURES

DRAWN: CC
DATE: 21/01/2020
CHECKED: MJT
DATE: 21/01/2020

STATUS
FOR COMMENT ☐
FOR APPROVAL ☐
DRAFT ☐
FINAL ☑

SCALE: 1:2,000
SHEET: A3
DRAWING NO.: 3435/104A
REVISION:



NOTES

▨	HISTORICAL BUILDING FOOTPRINT
🟧	HISTORICAL FUEL STORAGE TANKS
┄	HISTORICAL LINEAR FEATURE (1907)
─	HISTORICAL LINEAR FEATURE (1918)
─	APPROXIMATE SITE BOUNDARY

of Topsoil required

REV.	DESCRIPTION	DATE

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CLIENT

HARRON
HOMES

JOB TITLE

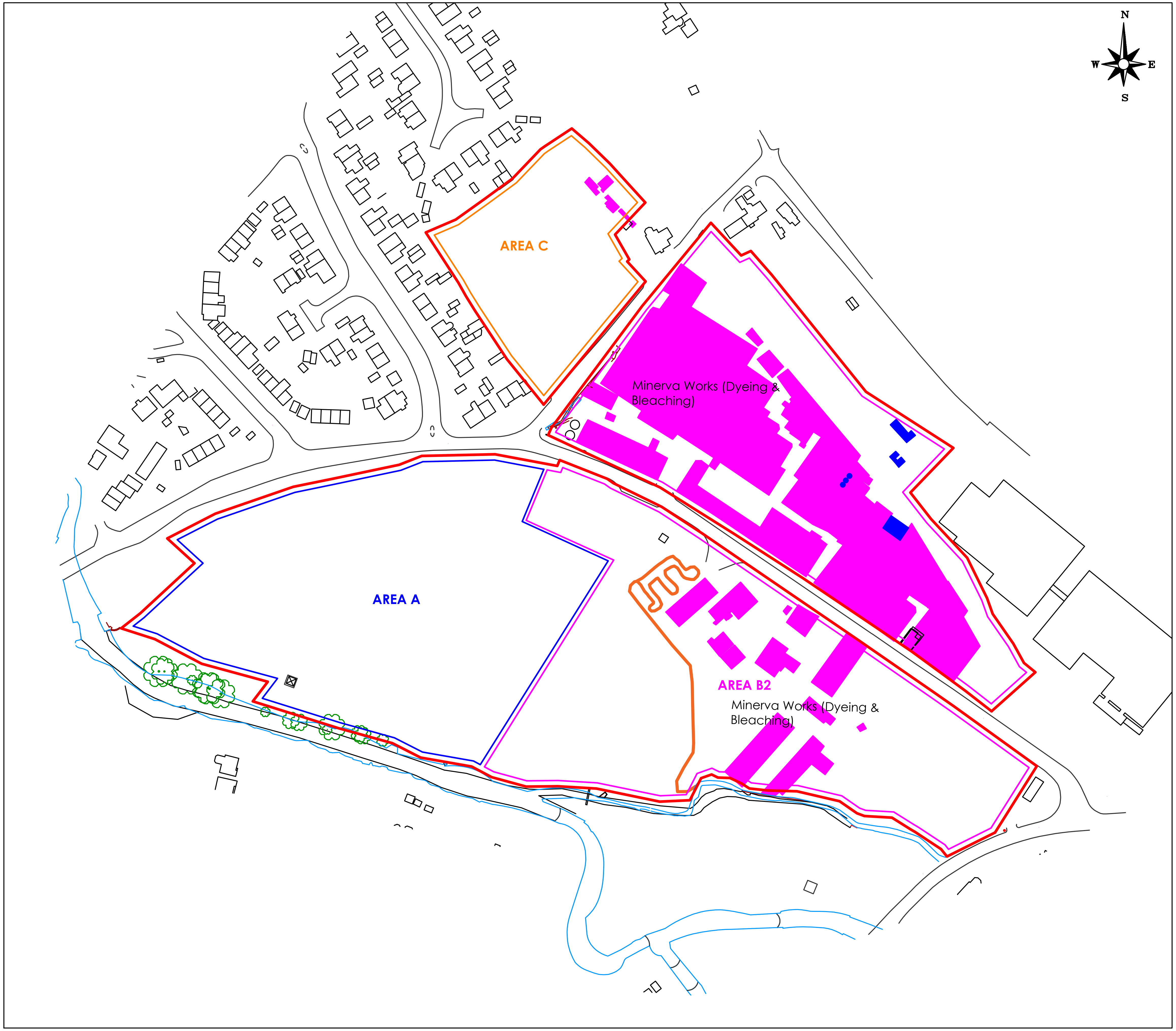
CROSSLEY LANE,
DALTON

DRAWING TITLE

1918 HISTORICAL FEATURES

DRAWN	DATE	STATUS
CC	21/01/2020	FOR COMMENT ☐ FOR APPROVAL ☐
CHECKED	DATE	DRAFT ☐ FINAL ☑
MJT	21/01/2020	

SCALE	SHEET	DRAWING NO.	REVISION
1:2,000	A3	3435/104B	



NOTES

- 🟪 HISTORICAL BUILDING FOOTPRINT
- 🟦 HISTORICAL FUEL STORAGE TANKS
- — LINEAR TOPOGRAPHIC FEATURE
- — APPROXIMATE SITE BOUNDARY

REV.	DESCRIPTION	DATE
	— AREA A - Bioaccessibi	

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JOB TITLE

CROSSLEY LANE,
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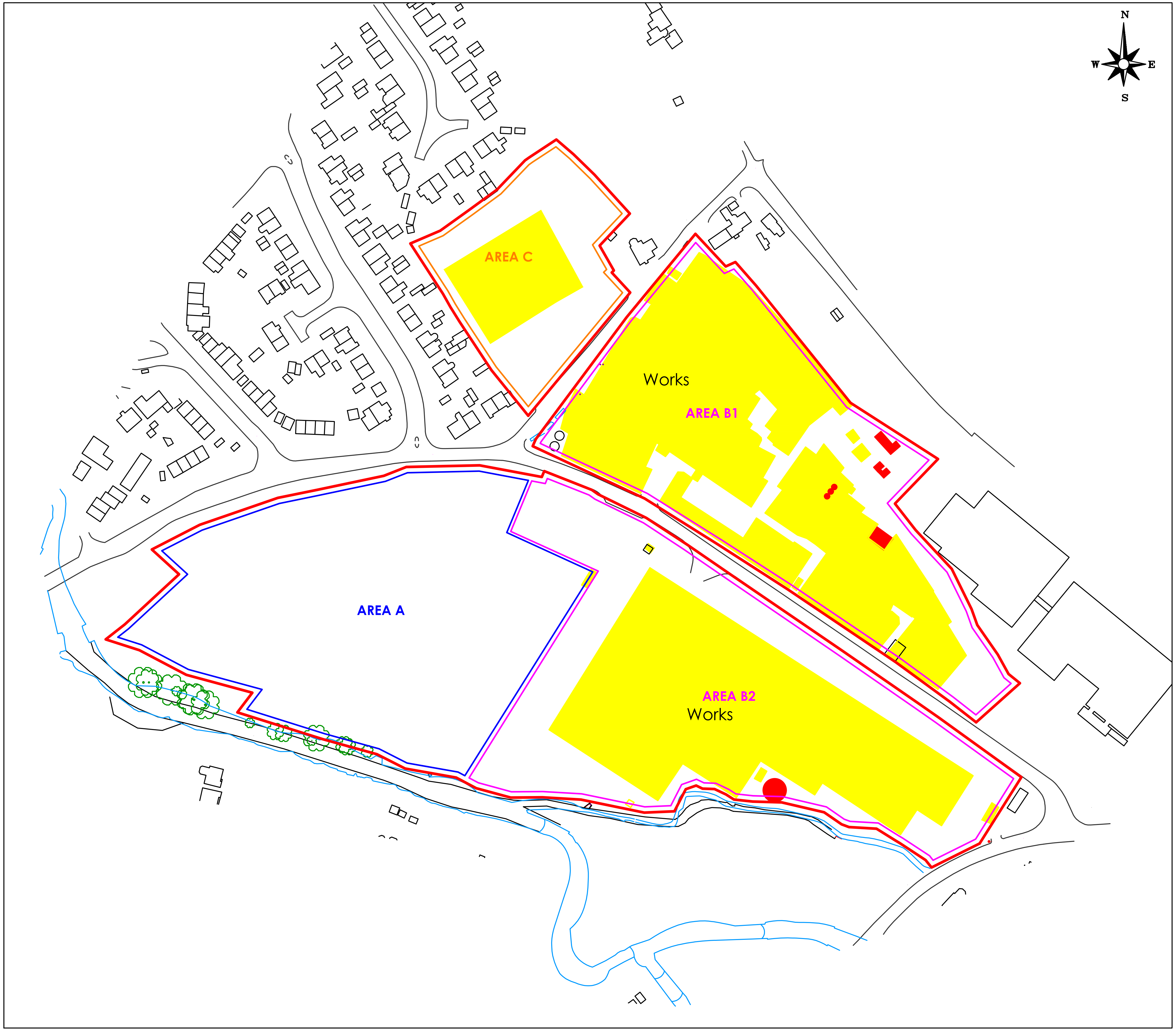
DRAWING TITLE

1958 HISTORICAL FEATURES

DRAWN: CC
DATE: 21/01/2020
CHECKED: MJT
DATE: 21/01/2020

STATUS
FOR COMMENT ☐
FOR APPROVAL ☐
DRAFT ☐
FINAL ☑

SCALE: 1:2,000
SHEET: A3
DRAWING NO.: 3435/104C
REVISION:



NOTES

🟨 HISTORICAL BUILDING FOOTPRINT

🟥 HISTORICAL FUEL STORAGE TANKS

— APPROXIMATE SITE BOUNDARY

REV.	DESCRIPTION	DATE

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HARRON HOMES

JOB TITLE

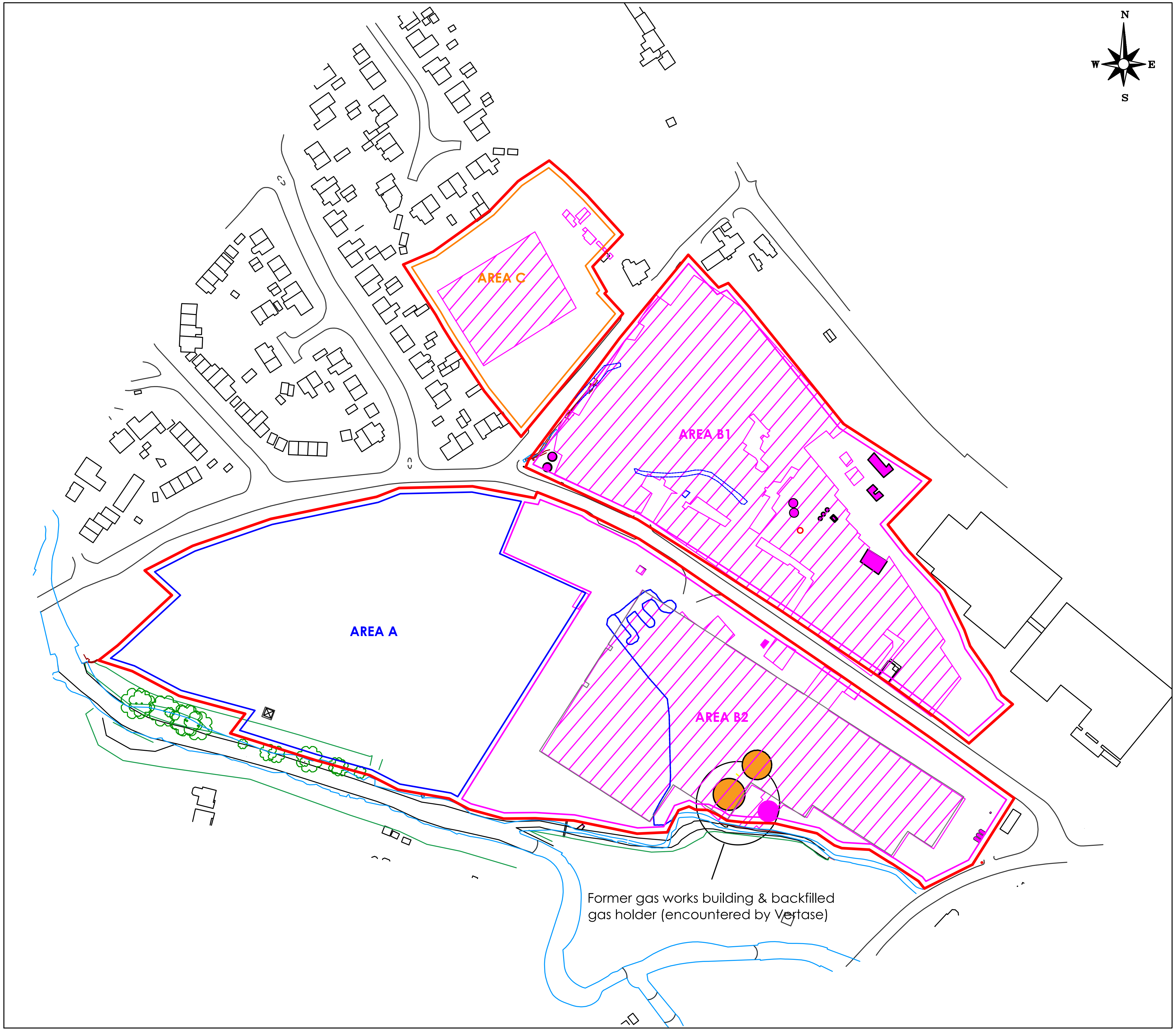
CROSSLEY LANE, DALTON

DRAWING TITLE

1993 HISTORICAL FEATURES

DRAWN	DATE	STATUS
CC	21/01/2020	FOR COMMENT ☐ FOR APPROVAL ☐
CHECKED	DATE	
MJT	21/01/2020	DRAFT ☐ FINAL ☑

SCALE	SHEET	DRAWING NO.	REVISION
1:2,000	A3	3435/104D	



Former gas works building & backfilled gas holder (encountered by Vertase)

NOTES

🟧	HISTORICAL GAS HOLDER
▨	HISTORICAL BUILDING FOOTPRINT
🟪	HISTORICAL FUEL STORAGE TANKS
┈	HISTORICAL LINEAR FEATURE
—	APPROXIMATE SITE BOUNDARY

REV.	DESCRIPTION	DATE

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HARRON HOMES

JOB TITLE

CROSSLEY LANE, DALTON

DRAWING TITLE

ALL HISTORICAL FEATURES

DRAWN	DATE	STATUS
CC	21/01/2020	FOR COMMENT ☐ FOR APPROVAL ☐
CHECKED	DATE	DRAFT ☐ FINAL ☑
MJT	21/01/2020	

SCALE	SHEET	DRAWING NO.	REVISION
1:2,000	A3	3435/104E	

NOTES

- 🟩 GRASS & OVERGROWN AREAS
- 🟨 BUILDING
- 🟧 GRAVEL OR HARDCORE SURFACING
- ▩ TARMAC HARDSTAND
- ☐ CONCRETE HARDSTAND
- 🟥 STORAGE TANKS
- — APPROXIMATE SITE BOUNDARY
- ◁ LOCATION & ORIENTATION OF PHOTOGRAPH

REV.	DESCRIPTION	DATE

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CLIENT

HARRON
HOMES

JOB TITLE

CROSSLEY LANE,
DALTON

DRAWING TITLE

SITE PHOTOGRAPHS - GENERAL

DRAWN	DATE	STATUS
LEW	07 02 20	FOR COMMENT ☐ FOR APPROVAL ☐
CHECKED	DATE	
MJT	07 02 20	DRAFT ☐ FINAL ☑

SCALE	SHEET	DRAWING NO.	REVISION
NOT TO SCALE	A3	3435/105A	

NOTES

🟩	GRASS & OVERGROWN AREAS
🟨	BUILDING
🟧	GRAVEL OR HARDCORE SURFACING
⬛	TARMAC HARDSTAND
⬜	CONCRETE HARDSTAND
🟥	STORAGE TANKS
—	APPROXIMATE SITE BOUNDARY
◁	LOCATION & ORIENTATION OF PHOTOGRAPH

REV.	DESCRIPTION	DATE

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JOB TITLE

CROSSLEY LANE,
DALTON

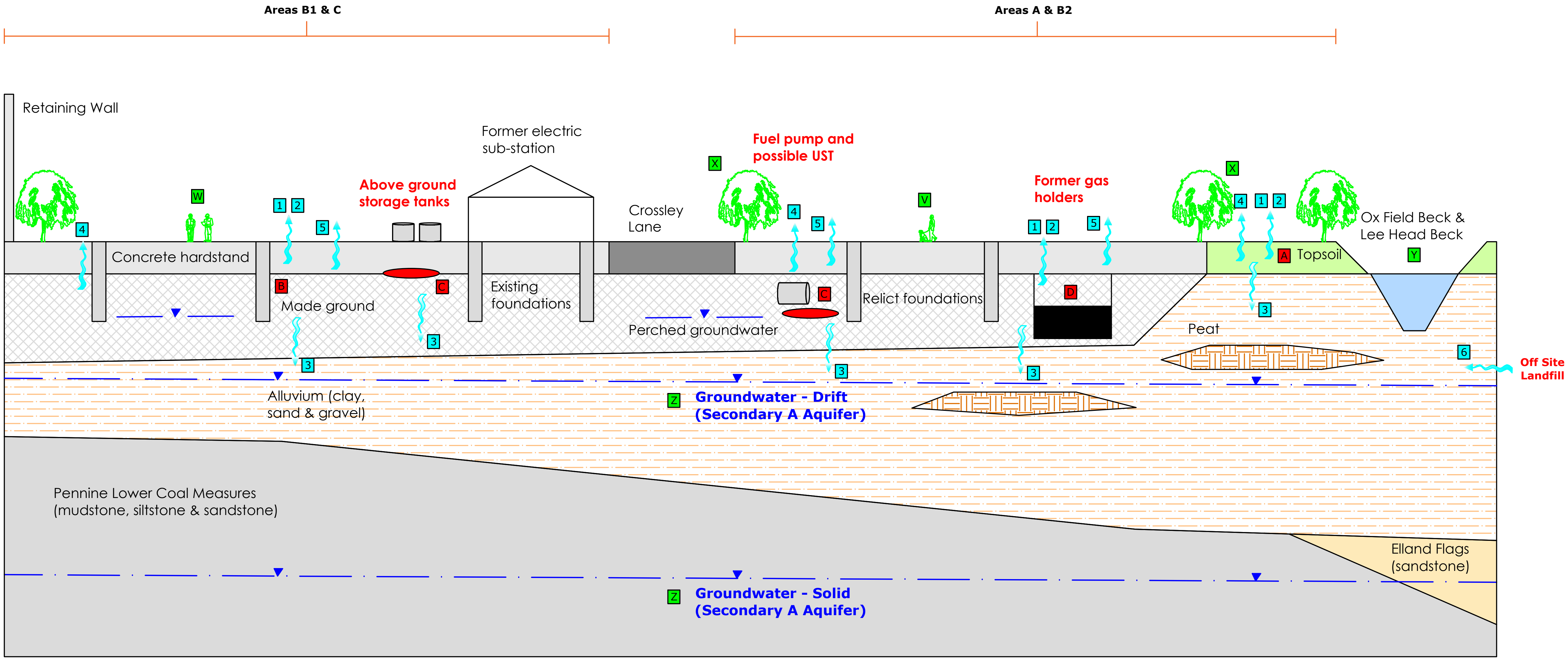
DRAWING TITLE

SITE PHOTOGRAPHS - DETAIL

DRAWN: LEW
DATE: 07 02 20
CHECKED: MJT
DATE: 07 02 20

STATUS
FOR COMMENT ☐
FOR APPROVAL ☐
DRAFT ☐
FINAL ☑

SCALE: NOT TO SCALE
SHEET: A3
DRAWING NO.: 3435/105B
REVISION:



SOURCES	
A	NATURALLY OCCURRING CONTAMINANTS (INORGANICS)
B	MADE GROUND (INORGANICS & ORGANICS)
C	LEAKAGE/SPILLAGE (ORGANICS)
D	GAS HOLDERS (ORGANICS)

PATHWAYS	
1	DERMAL CONTACT
2	INGESTION/INHALATION
3	LEACHING OF CONTAMINANTS
4	UPTAKE BY PLANTS
5	VOLATILISATION
6	MIGRATION OF GAS

RECEPTORS	
V	END USERS (RESIDENTS)
W	SITE WORKERS
X	VEGETATION
Y	SURFACE WATERS
Z	GROUNDWATER

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HARRON HOMES

JOB TITLE
CROSSLEY LANE, DALTON

DRAWING TITLE
PRELIMINARY CONCEPTUAL SITE MODEL

NOTES

REV.	DESCRIPTION	DATE

STATUS
FOR COMMENT ☐ FOR APPROVAL ☐ DRAFT ☐ FINAL ☑

DRAWN	DATE
LEW	04 02 20
APPROVED	DATE
MJT	04 02 20
SCALE	SHEET
Not to scale	A3
DRAWING NO.	REVISION
3435/106	

NOTES

Lithos - January 2020

🟦 TRIAL PIT LOCATION
⊕ WINDOW SAMPLE LOCATION
● BOREHOLE LOCATION

ARP - June 2016

🟧 TRIAL PIT LOCATION
⊕ WINDOW SAMPLE LOCATION
— APPROXIMATE SITE BOUNDARY

REV.	DESCRIPTION	DATE

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JOB TITLE

CROSSLEY LANE,
DALTON

DRAWING TITLE

EXPLORATORY HOLE LOCATIONS

DRAWN	DATE	STATUS
LEW	24 02 20	FOR COMMENT ☐ FOR APPROVAL ☐
CHECKED	DATE	
MJT	24 02 20	DRAFT ☐ FINAL ☑

SCALE	SHEET	DRAWING NO.	REVISION
1:1500	A3	3435/107	

NOTES

Lithos - January 2020

- TRIAL PIT LOCATION
- WINDOW SAMPLE LOCATION
- BOREHOLE LOCATION
- 🟧 HISTORICAL GAS HOLDER
- ▨ HISTORICAL BUILDING FOOTPRINT
- 🟪 HISTORICAL FUEL STORAGE TANKS
- HISTORICAL LINEAR FEATURE
- APPROXIMATE SITE BOUNDARY

REV.	DESCRIPTION	DATE

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JOB TITLE

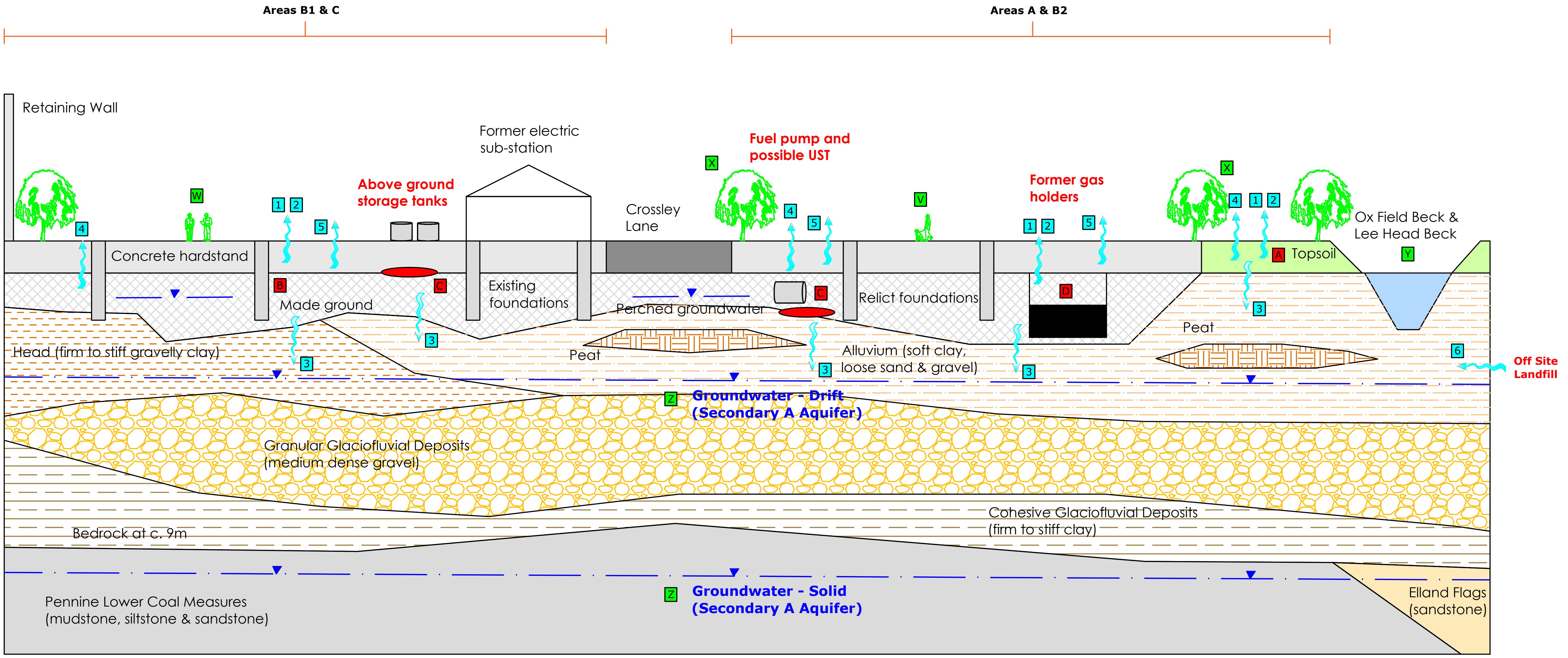
CROSSLEY LANE,
DALTON

DRAWING TITLE

EXPLORATORY HOLE LOCATIONS &
HISTORICAL FEATURES

DRAWN	DATE	STATUS
LEW	24 02 20	FOR COMMENT ☐ FOR APPROVAL ☐
CHECKED	DATE	
MJT	24 02 20	DRAFT ☐ FINAL ☑

SCALE	SHEET	DRAWING NO.	REVISION
1:1500	A3	3435/107B	



SOURCES	
A	NATURALLY OCCURRING CONTAMINANTS (INORGANICS)
B	MADE GROUND (INORGANICS & ORGANICS)
C	LEAKAGE/SPILLAGE (ORGANICS)
D	GAS HOLDERS (ORGANICS)

PATHWAYS	
1	DERMAL CONTACT
2	INGESTION/INHALATION
3	LEACHING OF CONTAMINANTS
4	UPTAKE BY PLANTS
5	VOLATILISATION
6	MIGRATION OF GAS

RECEPTORS	
V	END USERS (RESIDENTS)
W	SITE WORKERS
X	VEGETATION
Y	SURFACE WATERS
Z	GROUNDWATER

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JOB TITLE
CROSSLEY LANE, DALTON

DRAWING TITLE
REVISED CONCEPTUAL SITE MODEL

NOTES

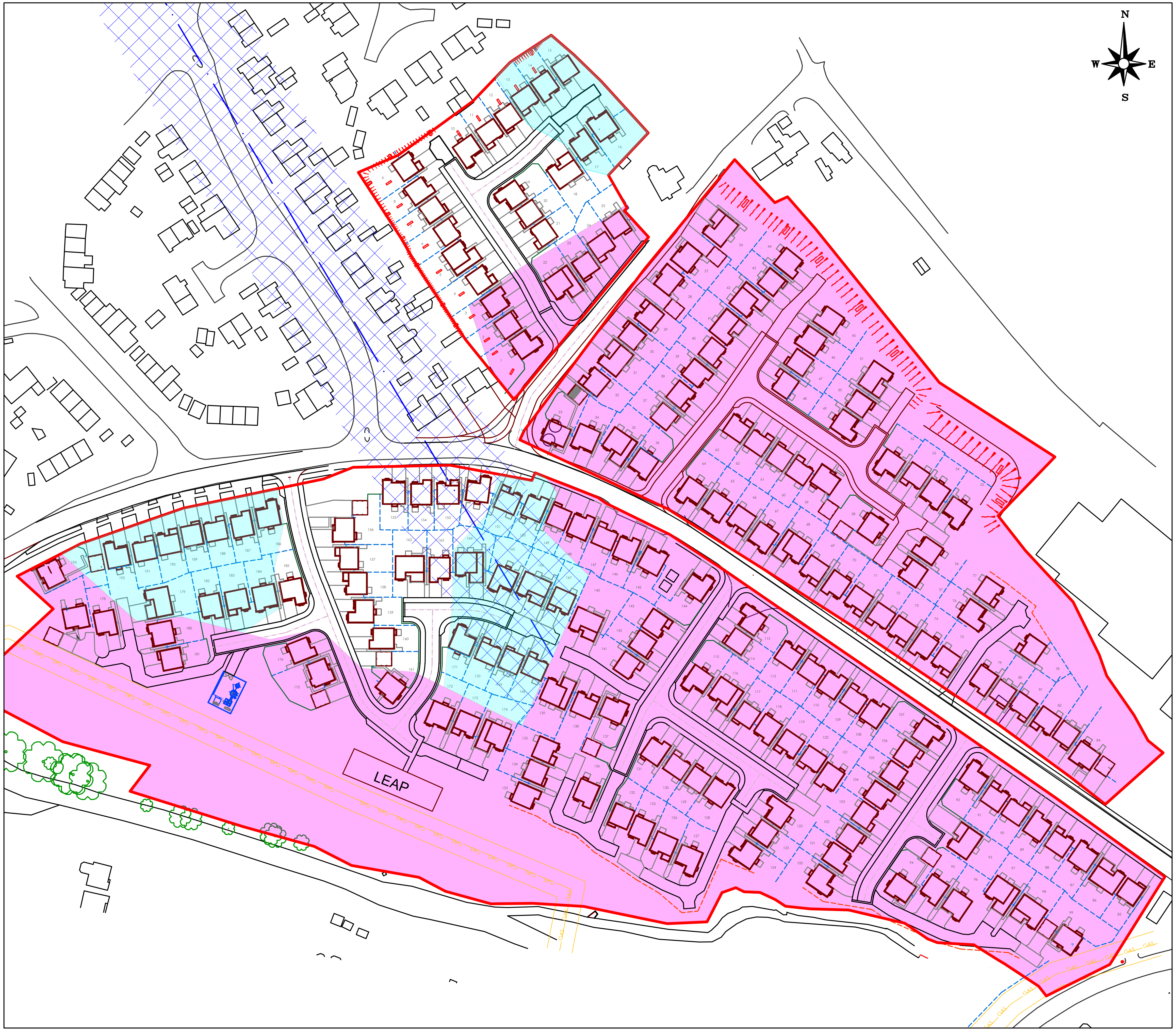
REV.	DESCRIPTION	DATE

STATUS
FOR COMMENT ☐ FOR APPROVAL ☐ DRAFT ☐ FINAL ☑

DRAWN	DATE
LEW	27 02 20
APPROVED	DATE
MJT	27 02 20

SCALE	SHEET
Not to scale	A3

DRAWING NO.	REVISION
3435/108	



NOTES

🟪 PILED FOUNDATIONS (made ground and/or soft/loose ground to >2.5m)

🟦 TRENCH-FILL & PILED FOUNDATIONS (trees over plots and cohesive soils)

☐ STRIP/TRENCH-FILL FOUNDATIONS (firm/stiff clay or medium dense gravel at <2.5m)

— APPROXIMATE LINE OF FAULT

▨ 25m BUFFER WHERE STRIP/TRENCH-FILL FOUNDATIONS REQUIRE REINFORCEMENT

Note - foundation recommendations take into account existing trees, ground conditions and proposed level changes as per Harron's Engineering Drawing (493-03 Rev. F dated 24th Februaru 2020)

— APPROXIMATE SITE BOUNDARY

REV.	DESCRIPTION	DATE

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JOB TITLE

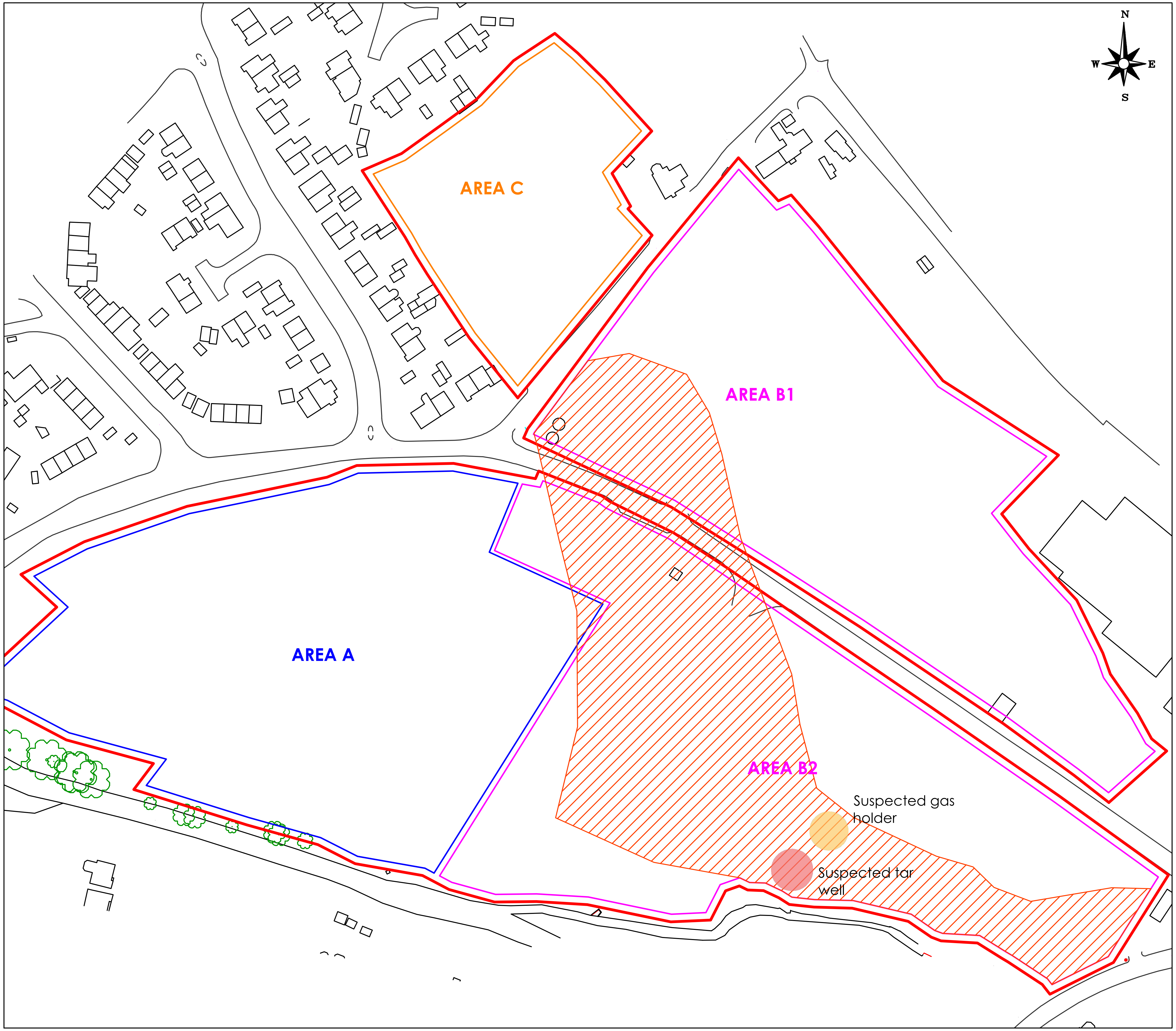
CROSSLEY LANE, DALTON

DRAWING TITLE

FOUNDATION ZONING PLAN

DRAWN	DATE	STATUS
LEW	27 02 20	FOR COMMENT ☐ FOR APPROVAL ☐
CHECKED	DATE	DRAFT ☐ FINAL ☑
MJT	27 02 20	

SCALE	SHEET	DRAWING NO.	REVISION
1:1,500	A3	3435/109	



NOTES

- AREA A - Bioaccessibility of Topsoil required to confirm suitability for reuse due to elevated arsenic concentrations
- AREA B - 600mm clean soil cover and 100mm hard-dig layer
- AREA C - 600mm clean soil cover and 100mm hard-dig layer
- ▨ HYDROCARBON PLUME - based on visual and olfactory evidence in exploratory holes

REV.	DESCRIPTION	DATE

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JOB TITLE

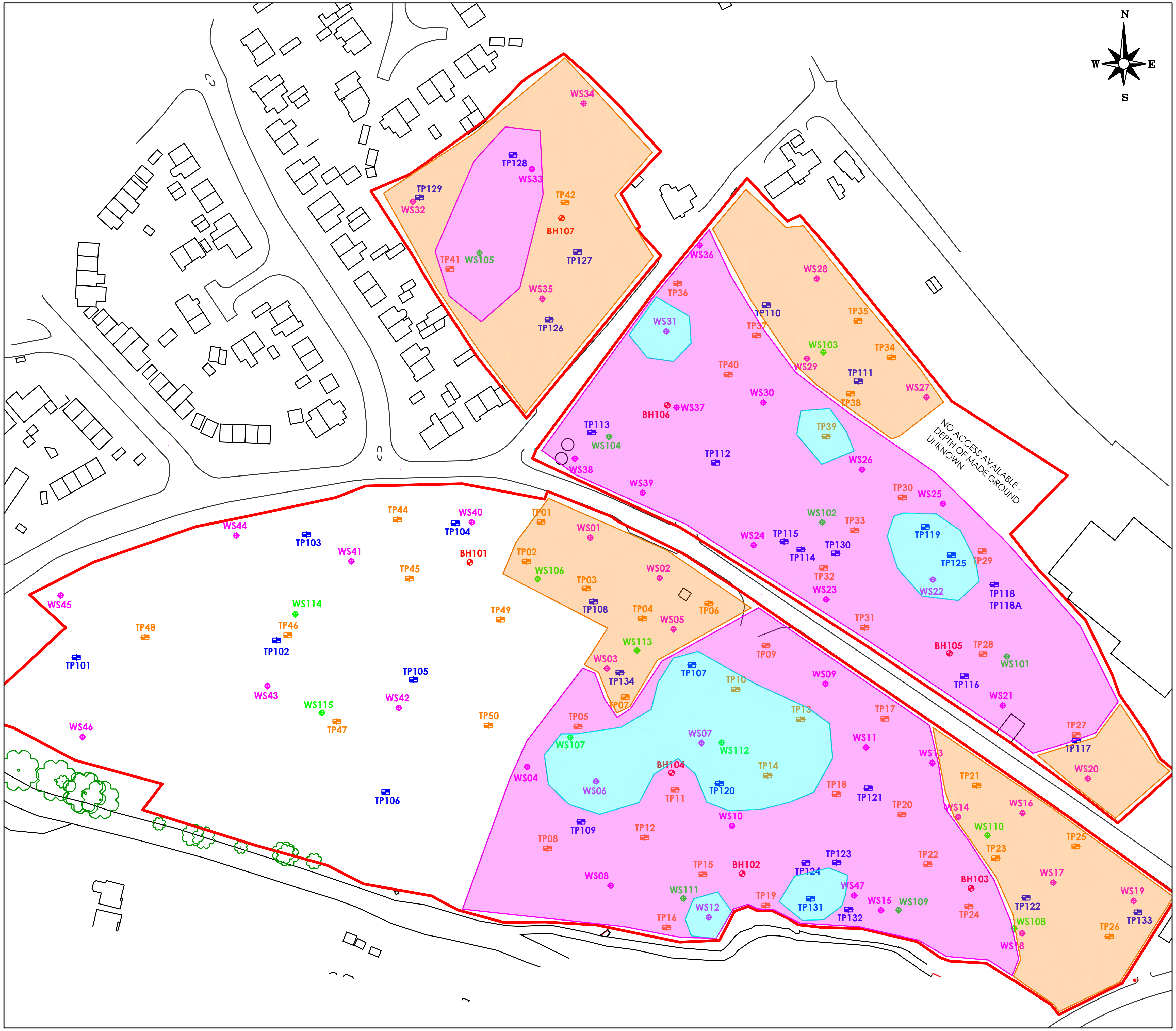
CROSSLEY LANE, DALTON

DRAWING TITLE

CONTAMINATION SUMMARY

DRAWN	DATE	STATUS
LEW	27 02 20	FOR COMMENT ☐ FOR APPROVAL ☐
CHECKED	**DATE**	DRAFT ☐ FINAL ☑
MJT	27 02 20	

SCALE	SHEET	DRAWING NO.	REVISION
1:1,500	A3	3435/110	



NOTES

☐ No made ground

🟧 < 1.0m

🟪 1.0m to 2.5m

🟦 > 2.5m

Based on Lithos and ARP exploratory hole - locally depths of made ground may vary.

APPROXIMATE SITE BOUNDARY

REV.	DESCRIPTION	DATE

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CLIENT

HARRON HOMES

JOB TITLE

CROSSLEY LANE, DALTON

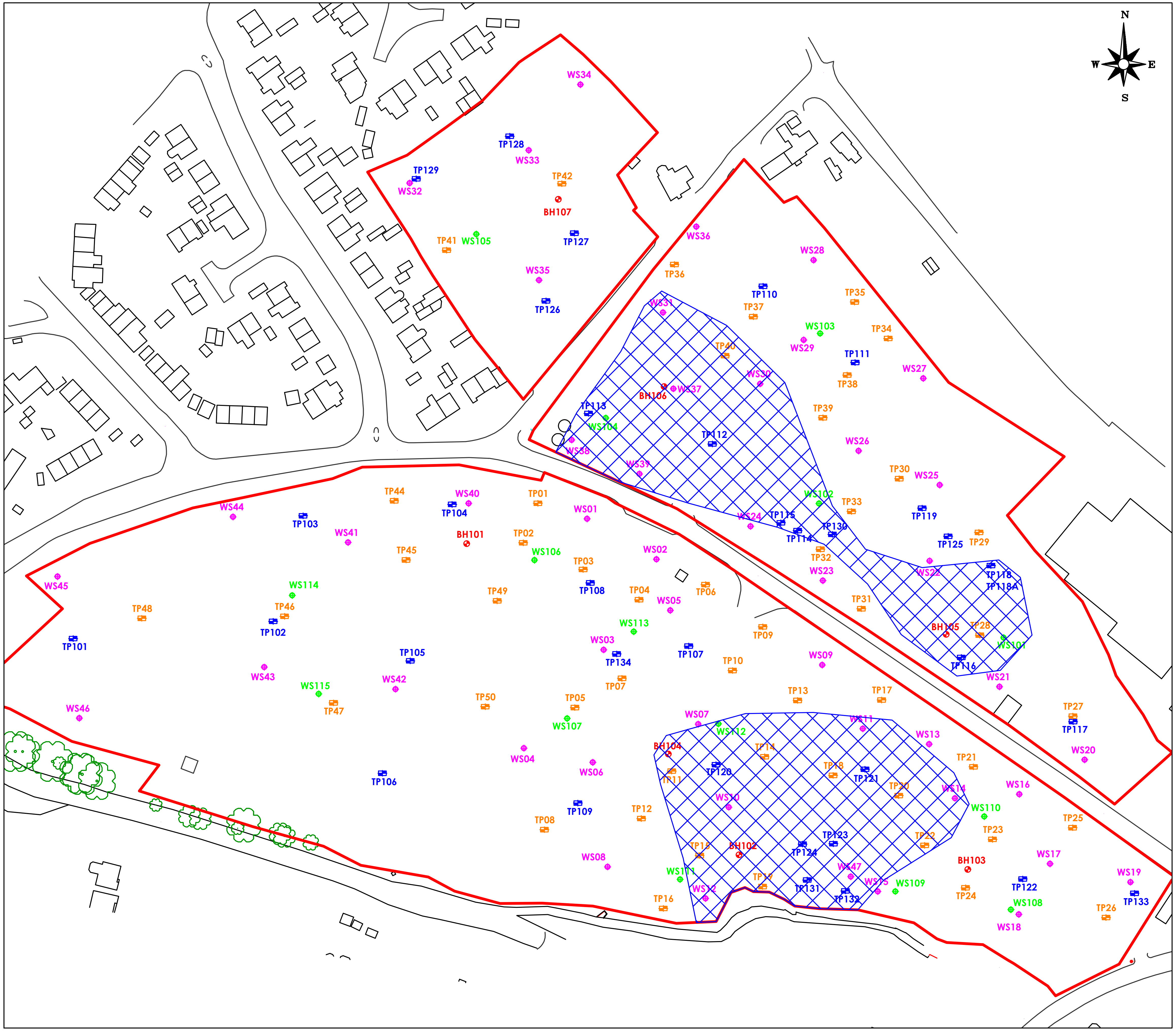
DRAWING TITLE

DEPTH OF MADE GROUND

DRAWN: LEW
DATE: 27 02 20
CHECKED: MJT
DATE: 27 02 20

STATUS
FOR COMMENT ☐
FOR APPROVAL ☐
DRAFT ☐
FINAL ☑

SCALE: 1:1,500
SHEET: A3
DRAWING NO.: 3435/111
REVISION:



NOTES

▨ APPROXIMATE EXTENT OF SOFT/LOOSE NATURAL GROUND TO GREATER THAN 2.5m DEPTH

Based on Lithos and ARP exploratory hole - locally natural ground may vary.

APPROXIMATE SITE BOUNDARY

REV.	DESCRIPTION	DATE

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HARRON HOMES

JOB TITLE

CROSSLEY LANE, DALTON

DRAWING TITLE

EXTENT OF SOFT/LOOSE NATURAL GROUND

DRAWN	DATE	STATUS
LEW	16 03 20	FOR COMMENT ☐ FOR APPROVAL ☐
CHECKED	DATE	DRAFT ☐ FINAL ☑
MJT	16 03 20	

SCALE	SHEET	DRAWING NO.	REVISION
1:1500	A3	3435/112	

Appendix C

Commission

006/3435/MJT

21st January 2020

LITHOS CONSULTING

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Crossley Lane, Dalton

Further to completion of our review of 3rd party data, please find attached our updated proposal (revisions from quote ref. 006/3435/MJT shown in blue text) for undertaking a supplementary site investigation on the above land. We understand that your proposed development will include traditional 2 storey domestic dwellings with associated gardens, POS and adoptable roads and sewers.

As per recent discussions, piles are likely to be end-bearing in bedrock and piling contractors may request that boreholes be extended a minimum 5m into competent bedrock using rotary coring techniques. This adds significant cost to the proposed investigation. It would be prudent to liaise with your preferred piling contractor(s) and let us know whether or not rotary coring is required (ideally prior to commencement of the cable percussion boring; likely w\c 27th January)

The site consists of 4 parcels of land totalling 8.3 hectares off Crossley Lane and Cold Royd Lane, comprising grassland in the south-west, and concrete hardstanding (former floor slabs) in the south-east and across the north.

Lithos have undertaken a review of 3rd party (ARP) reports for this site. Key points from which are:

- Areas of deep made ground and soft/loose soils are present
- Natural soils are highly variable and require further assessment (and zoning)
- Piling will likely be needed across significant areas, and will require information from cable percussion boreholes
- Additional chemical analysis of soils and groundwater is required (including TPH, cyanide and VOC)
- Additional gas monitoring is recommended (unless site-wide Amber 1 measures are assumed & accepted by NHBC)

The scope of works outlined in this letter should enable us to assess abnormal development issues, associated with ground. However, the nature of site investigation is such that it is not always possible to foresee all the potential issues. Consequently, it is sometimes necessary to recommend additional work, but where this occurs we will inform you immediately, provide costs, and seek your further instruction.

The scope outlined below assumes that Harron have reliance on ARP's reports, and therefore this investigation is designed to supplement the existing data.

However, contrary to our original quote letter (ref. 006/3435/MJT) after liaison with Vertase, we understand that the gas holder areas do require investigation, therefore we have allowed for some additional trial pitting and chemical analysis within this area.

Our site investigation will be undertaken in accordance with UK good practice (as outlined in BS5930, BS10175, CLR11 etc). Our Report may not be fully compliant with Eurocode 7 (EC7) and will not purport to be a Ground Investigation Report, nor a Geotechnical Design Report as defined by EC7. Our ground appraisal is intended to assist others as they proceed with design of the proposed development.

This proposal allows for the following works:

Fieldwork: We have allowed for 4 day's trial pitting and the drilling of 6 cable percussion boreholes to around 10m depth. In addition, two day's dynamic sampling using a mini percussion drilling rig will be carried out to enable installation of additional gas monitoring wells. All trial pits and boreholes will be supervised and logged by an experienced geoenvironmental engineer.

A 360° tracked mechanical excavator used to excavate **trial pits**. A second excavator (JCB or similar) will be mobilised on the first day, equipped with a breaker to proposed trial pit and borehole locations through the concrete hardstanding.

We will make every effort to compact arisings and 'sweep' them over each pit. However, you should be aware that on completion of the investigation, "graves" of spoil (each about 3m long by 1m wide) unsuitable for trafficking, will be left up to 400mm proud at each trial pit location. At this stage, no allowance has been made for any further reinstatement such as removal of excess arisings, replacement of turf, reinstatement of the hardstanding.

Representative soil samples of natural and man-made ground, including any contaminated samples, will be taken during the works. In-situ shear strengths of any cohesive soils encountered will be determined by the use of a hand-held shear vane.

The **cable percussion boreholes** will be advanced to depths of c. 12m or refusal in bedrock, whichever is the shallower, and are primarily intended to enable the retrieval of geotechnical data from depth, in areas of deep made ground/soft & loose ground where piled foundations are anticipated.

The locations of cable percussion boreholes will be determined once the trial pitting has been completed.

The boreholes will also allow the installation of gas and groundwater wells (50mm ID, HDPE pipework with bentonite seals and a gravel filter pack). Well headworks will comprise 100mm diameter steel security helmet which will extend about 300mm above ground level. The groundwater wells will be developed, purged and sampled (twice each) shortly after completion of drilling.

Given the anticipated presence of soft clays and granular deposits, SPTs will be undertaken at approximate 1m intervals as the boreholes are advanced. SPTs allow assessment of the in-situ density of granular soils, enabling determination of allowable bearing capacity and thereby definitive foundation advice.

Undisturbed, thin wall open-tube samples (UT100) will be obtained from natural in-situ cohesive soils on striking and then alternate with SPTs (except in soft clays where only UT100s will be recovered) at intervals of c.2m.

The borehole will be cased-off during drilling to at least rock head, in order to reduce the possibility of blowing sands, groundwater ingress, mis-sampling etc.

Given the anticipated nature and thickness of drift strata here, piles are likely to be end-bearing in bedrock. In accordance with BS 8004:2015 and EC7, **piling contractors** may request that boreholes be extended a minimum 5m into competent bedrock using rotary coring techniques. This adds significant cost to the proposed investigation. It would be prudent to liaise with your preferred piling contractor(s) (ideally prior to commencement of the cable percussion boring; likely w\c 27th January).

This investigation should yield sufficient data to enable a foundation zoning plan, and possibly a detailed Foundation Schedule. However, if ground conditions are found to be more variable than anticipated, a 'tighter' grid of pits will be necessary prior to preparation of a detailed Foundation Schedule. This proposal does not allow for the preparation of a detailed Foundation Schedule, but we will provide a quote on completion of the site investigation if requested.

We have allowed for all exploratory holes to be picked-up by a **surveyor** (co-ordinates/ground levels will be included on the logs).

Given ARP's findings, we have allowed for the installation of wells in 20 boreholes (6 cable percussion boreholes and 14 window sample boreholes) and monitoring for hazardous **gas** (and any shallow groundwater).

The generation potential of this gas source is considered likely to be Low, but data is already available from previous phases of investigation. Therefore, in accordance with CIRIA Report C665, we have initially allowed for 6 visits over a 3-month period. A hazardous gas risk assessment will be issued on completion of monitoring.

Testing: This will comprise routine **geotechnical** soils analysis, including 25 moisture content & Atterberg limits, and 25 pH & water-soluble sulphate. We will also schedule 10 compaction tests on samples of made ground to assess suitability for use in earthworks.

Given the anticipated soft and potentially compressible alluvial deposits, we have allowed for single stage, undrained unconsolidated triaxial tests on 12 undisturbed samples to assess shear strength, and one-dimensional analysis on 12 undisturbed samples to enable assessment of potential settlement and therefore aid foundation design.

This site is brownfield and therefore likely to be underlain by made ground which in turn is likely to be subject to re-engineering prior to the construction of new estate roads. Consequently, there is no merit in obtaining CBR values at this stage.

Appropriate **chemical analyses**, based on our review of ARP's reports and knowledge of the site's history, have been allowed for; this will comprise 35 samples for a suite including heavy metals, speciated PAH, VOCs, cyanide and banded TPH (with supplementary speciation as/where appropriate). In the event that ground contamination is more significant or different to that anticipated, it might be necessary to carry out additional chemical testing.

Within in our proposal we have allowed for the screening (ID) of 35 samples for asbestos. In the event that positive IDs are reported, it is likely that we will need to schedule further analysis (asbestos quantification), in order to determine the significance of the results. Asbestos quantification is currently a relatively expensive test and consequently we have not allowed for it at this stage. We will inform you immediately after receipt of results if we consider asbestos quantification is required.

Reporting & timescales: In order to provide you with sufficient information to enable assessment of abnormal costs at the earliest opportunity we will issue a concise overview report within 3 days of fieldwork completion.

On completion of the desk study, fieldwork and laboratory testing a comprehensive bound, factual and interpretative report will be issued. This will contain detailed engineering records, laboratory test results, copies of all relevant correspondence and drawings of the site. The report will include qualitative risk assessment with respect to both controlled waters and human health. The report will also include consideration of foundation types.

Fieldwork could be commenced within 3 weeks of receipt of your written instruction to proceed. Our comprehensive geoenvironmental appraisal report will be issued within 4 weeks of fieldwork completion. This report will comment on issues associated with hazardous gas, but the gas risk assessment will not be issued until monitoring is completed.

Given previous usage of this land, it is considered highly likely that a Remediation Strategy report will be required by the Local Authority, and our proposal allows for this.

It should be noted that a Remediation Strategy outlines the remediation objectives necessary to protect environmental receptors, and render a site suitable for the proposed end use. A Remediation Strategy is not the same as a Method Statement; the latter should be prepared subsequently, usually by a Contractor, in order to detail how the objectives will be achieved.

At this stage, a detailed Quantitative Risk Assessment (dQRA) has not been allowed for; the need for a dQRA will be discussed on completion of the site investigation. You should allow a budget of £ for this should it be required.

A copy of the final report will be issued to the relevant regulatory authorities on receipt of written instruction from yourselves.

Invoicing: The attached proposal provides a breakdown of the costs associated with this project. This breakdown is for information only and the proposal can be regarded as a lump sum price of **£** plus VAT. Variation will only occur in the event that a given item is not undertaken or that substantial additional works are recommended, in which case we will inform you immediately, provide costs for the required works, and seek your prior consent.

Our proposal allows for submission of the report to the Local Authority and NHBC, and for submission of a single piece of subsequent correspondence with each regulator to address any queries they may have. Any further meetings, correspondence etc, would be chargeable.

We will submit invoices for this project at the milestones defined below:

- 1st milestone invoice (Items A to E) within 5 days of fieldwork completion, with exploratory hole logs and an interim letter report outlining our initial findings
- 2nd milestone invoice (Items F, G & H) on issue of the final SI report
- 3rd milestone invoice (Item I) on issue of the Remediation Strategy
- 4th and final invoice (Item J) after completion of the gas monitoring/issue of the supplementary letter report

Health, safety & welfare: The works outlined above will be carried out in accordance with Lithos' task- and site- specific Risk Assessments and Method Statements.

Details of welfare will be included within the Method Statements, however, this investigation is expected to last for at least 5 working days and therefore this proposal includes for provision of a Welfare Unit, with the benefit of full canteen facilities, hot water with full size sink, toilet and drying room.

Utility plans are required in order to protect operatives from the hazards associated with striking buried services and avoid potentially substantial disruption\repair costs. We will make every effort not to damage any services (including review of utility plans and use of a CAT detector). However, Lithos cannot accept liability for damage to any underground services that are not accurately marked on plans made available to us prior to commencement of our field investigation, or have not been accurately marked on the ground by a responsible third party (e.g. utility company, site owner).

Most developers have copies of the necessary utility plans (including electricity, gas, water, drainage & telecom), and it would be appreciated if you could forward these prior to the proposed fieldworks. However, if you do not have the necessary plans, Lithos will obtain them direct from each of the utility companies.

It is highly likely that the site is underlain by many "private" services and drains etc which will not be shown on statutory utility plans. Consequently, it would be appreciated if copies of plans showing these services could be made available to our field engineer, and\or someone with site knowledge could advise us with respect to safe locations for our exploratory holes.

Under the **CDM** Regulations 2015, Lithos must be provided with pre-construction information already in your possession, or information that can reasonably be obtained through sensible enquiry. This information must be relevant to the project, have an appropriate level of detail, and be proportionate to the nature of the risks.

Further work: In addition to the investigation outlined above, the following further works may ultimately be required:

- Groundwater sampling & analysis
- Detailed Quantitative Risk Assessment (dQRA).
- Slope stability analysis on the steep sloping embankment running along the north of the site. This would include boreholes along the crest of the slope and geotechnical analysis/modelling. This area is not accessible without significant enabling works. Indeed, it may be more economical to simply opt for a robust retaining structure in this area, adopting a broadly 'worst-case' scenario with regards to stability (given the reasonably high costs and timescales involved in an intrusive investigation and assessment).

Terms & conditions: This work will be undertaken in accordance with our Standard Terms and Conditions, a copy of which are enclosed.

It is hoped the above is sufficient for your present needs. However, should you require any further information, please contact the undersigned.

Yours sincerely

Matt Thompson
Associate Director
for and on behalf of
LITHOS CONSULTING LIMITED

Terms and Conditions for the Appointment of Lithos Consulting Limited

V006.18

1 DEFINITIONS AND INTERPRETATION

1.1 In this Agreement, unless the context otherwise requires, the following words and expressions have the following meanings:

"Agreement" shall mean these Terms (entitled "Terms and Conditions for the Appointment of Lithos Consulting"), the Proposal, any document recording the Client's unequivocal acceptance of the Proposal and any other documents or parts of other documents expressly referred to in any of the foregoing:

"Client" shall mean the party for whom the Services are being provided by Lithos;

"Documents" shall mean all documents of any kind and includes plans, drawings, reports, programmes, specifications, Bills of Quantities, calculations, letters, e-mails, faxes, memoranda, films and photographs (including negatives), or any other form of record prepared or provided or received by, or on behalf of Lithos, and whether in paper form or stored electronically or on disk, or otherwise;

"Lithos" shall mean Lithos Consulting Limited whose registered office is at Parkhill, Walton Road, Wetherby, West Yorkshire, LS22 5DZ.

"Intellectual Property" includes all rights to, and any interests in, any patents, designs, trade marks, copyright, know-how, trade secrets and any other proprietary rights or forms of intellectual property (protectable by registration or not) in respect of any technology, concept, idea, data, programme or other software (including source and object codes), specification, plan, drawing, schedule, minutes, correspondence, scheme, programme, design, system, process logo, mark, style, or other matter or thing, existing or conceived, used, developed or produced by any person;

"Parties" shall mean the Client and Lithos

"Project" shall mean the project described in the Proposal and any enquiry from the Client on which Lithos has based its Proposal;

"Proposal" means the offer document prepared by Lithos in response to an enquiry or otherwise, in connection with the proposed provision of the Services;

"Services" means the work and services relating to the Project to be provided by Lithos pursuant to the Agreement and as set out in the Proposal and shall include any additions or amendments thereto made in accordance with these Terms;

"Terms" means these terms entitled "Lithos Consulting Terms of Appointment".

1.2 Words importing the singular only shall also include the plural and vice versa, where the context requires.

1.3 Words importing persons or parties shall include firms, corporations and any organisation having legal capacity and vice versa, where the context requires; and words importing a particular gender include all genders.

1.4 The sub-headings to the clauses of these Terms are for convenience only and shall not affect the construction of the Agreement.

1.5 A reference to legislation includes that legislation as from time to time amended, re-enacted or substituted and any Orders in Council, orders, rules, regulations, schemes, warrants, by-laws, directives or codes of practice issued under any such legislation.

1.6 In the event of conflict between the documents forming part of the Agreement, the Proposal shall prevail, followed by the Terms.

2 APPOINTMENT

2.1 The Client agrees to engage Lithos and Lithos agrees to provide the Services in accordance with the provisions of the Agreement.

3 OBLIGATIONS OF LITHOS

3.1 Lithos shall perform the Services using the reasonable standard of skill and care normally exercised by similar professional Environmental firms in performing similar services under similar conditions.

3.2 Lithos shall use all reasonable endeavours to perform the Services in accordance with all relevant environmental and safety legislation.

4 OBLIGATIONS OF THE CLIENT

4.1 Throughout the period of this Agreement the Client shall afford to Lithos or procure the affording to Lithos of access to any site where access is required for the performance of the Services.

4.2 The Client accepts responsibility for ensuring that Lithos is notified in writing of all special site and/or plant conditions, including without prejudice to the generality of the foregoing, the existence and precise location of all underground services, cables, pipes, drains or underground buildings, constructions or any hazards known or suspected by the Client, which the Client shall clearly mark on the ground or identify on accurate location plans supplied to Lithos prior to the commencement of the Services. The Client shall also inform Lithos in writing of any relevant operating procedures including any site safe operating procedures and any other regulations relevant to the carrying out of the Services. The Client shall indemnify Lithos against all costs, claims, demands and expenses arising as a result of any non-disclosure in this respect, including but not limited to indemnification against any action brought by the owner of the land or otherwise.

4.3 If the Client discovers any conflict, defect or other fault in the information or designs provided by Lithos pursuant to the Agreement, he will advise Lithos in writing of such defect, conflict or other fault and Lithos shall have the right to rectify the same or where necessary, to design the solution for rectification of any works carried out by others pursuant the conflicting, defective or in any other way faulty information or designs.

5 INTELLECTUAL PROPERTY

5.1 The copyright in all Intellectual Property prepared by or on behalf of Lithos in connection with the Project for delivery to the Client shall remain vested in Lithos.

5.2 The Client shall have a non-exclusive licence to copy and use such Intellectual Property for purposes directly related to the Project. Such licence shall enable the Client to copy and use the Intellectual Property but solely for its own purposes in connection with the Project and such use shall not include any licence to reproduce any conceptual designs or professional opinions contained therein nor shall it include any license to amend any drawing, design or other Intellectual Property produced by Lithos.

5.3 Should the Client wish to use such Intellectual Property in connection with any other works or for any other purpose not directly related to the Project or wish to pass any Intellectual Property to any third party, it must obtain the prior written consent of Lithos. The giving of such consent shall be at the discretion of Lithos and shall be upon such terms as may be required by Lithos. Lithos shall not be liable for the use by any person of such Intellectual Property for any purpose other than that for which the same were prepared by or on behalf of Lithos.

5.4 Ownership of any proposals submitted to the Client that are not subsequently confirmed as part of the Services to be provided for the Client remain with Lithos and such proposals must not be used as the basis for any future work undertaken by the Client or a third party and no liability can be accepted howsoever arising from such proposals.

5.5 In the event of the Client being in default of payment of any fees or other amounts due, Lithos may suspend further use of the licence on giving 2 days' notice of the intention to do so. Use of the licence may be resumed on receipt of the outstanding amounts.

6 TITLE

6.1 Lithos shall transfer only such title or rights in respect of the Documents as it has, and if any part is purchased from a third party Lithos shall transfer only such title or rights as that party had and has transferred to Lithos.

6.2 Title in the Documents shall remain with and shall not pass to the Client until the amount due under the invoice(s) (including interest and costs) has been paid in full.

6.3 Until title passes, the Client shall hold the Documents as bailee for Lithos and shall store or mark them so that they can at all times be identified as the property of Lithos.

6.4 At any time before title passes (save and except where payment is not due), but only after prior consultation with the Client, Lithos may without any liability to the Client repossess and use or sell all or any of part of the Documents and by doing so terminate the right of the Client to use, sell or otherwise deal in the Documents.

6.5 Lithos may maintain an action for the price of the Documents notwithstanding that title in them has not passed to the Client.

7 CONFIDENTIALITY AND DATA PROTECTION

7.1 Lithos undertakes not to divulge or disclose to any third party without the written consent of the Client information which is designated confidential by the Client or which can reasonably be considered to be confidential and arises during the performance of the Services unless required to do so by law or necessary in the proper performance of its duties in relation to the Project, or in order to make full frank and proper disclosure to its insurers or intended insurers, or to obtain legal or accounting advice.

7.2 Subject to the above and Lithos' Privacy Policy which can be found on www.lithos.co.uk, Lithos shall be permitted to use information related to the Services it provides in connection with the Project for the purposes of marketing its services and in proposals for work of a similar type.

8 THIRD PARTIES

8.1 The Agreement or any part thereof or any benefit or interest thereunder may not be assigned by the Client without the prior written consent of Lithos. The giving of such consent shall be at the discretion of Lithos and Lithos will only agree to an assignment on its terms and in return for payment of a fee by the Client to Lithos to cover Lithos' legal and other costs associated with any assignment.

8.2 The Agreement shall not confer and shall not purport to confer on any third party any benefit or any right to enforce any term of this Agreement for the purposes of the Contracts (Rights of Third Parties) Act 1999 or otherwise.

8.3 Lithos will consider and may consent to any request from the Client for Lithos to enter a collateral warranty with a third party with regard to the Services provided under the Agreement. The giving of such consent shall be at the discretion of Lithos and Lithos will only enter a collateral warranty on its terms and in return for payment of a fee by the Client to Lithos to cover Lithos' legal and other costs associated with any collateral warranty.

9 INSURANCE

9.1 Lithos warrants to the Client that there is in force a policy of Professional Indemnity insurance covering its liabilities for negligence under this Agreement, with a limit of indemnity of £5,000,000 (FIVE MILLION POUNDS) any one claim, save for pollution and contamination claims and asbestos claims both of which carry £2,000,000 (TWO MILLION) in the aggregate cover. This policy is annually renewable and whilst renewal is not automatic, Lithos agrees to use reasonable endeavours to maintain such insurance at all times until six years from the date of the completion (or termination) of the Services under the Agreement, provided such insurance is available at commercially reasonable rates having regard, inter alia, to premiums required and policy terms obtainable.

9.2 If for any period such insurance is not available at commercially reasonable rates, Lithos shall forthwith inform the Client and shall obtain in respect of such period such reduced level of Professional Indemnity insurance as is available and as would be fair and reasonable in the circumstances for Lithos to obtain.

10 LIMITATIONS ON LIABILITY

10.1 Unless otherwise agreed in writing, Lithos' liability under or in connection with the Agreement whether in contract, tort, negligence, breach of statutory duty or otherwise (other than in respect of personal injury or death) shall be limited to and shall not exceed the lesser of either five million pounds in the aggregate (unless it is a pollution, contamination or asbestos claim in which case it is two million pounds in the aggregate) or 10 times the total value of invoices issued to the Client for consultancy work instructed under the Agreement.

10.2 No action or proceedings under or in respect of the Agreement whether in contract, tort, negligence, under statute or otherwise shall be commenced against Lithos after the expiry of a period of six years from the date of the completion (or termination) of the Services under the Agreement.

10.3 Whilst Lithos will scan all potential exploratory locations with a Cable Avoidance Tool, Lithos shall not be liable for any damage to underground services, cables, pipes, drains or underground buildings, constructions and the like which were either not marked on site or for which accurate plans were not provided.

10.4 Lithos shall not be liable for the cost of rectifying any defect, conflict or other fault in the information or designs provided by Lithos or for the cost of designing a solution for and rectifying any subsequent works carried out by others pursuant to the conflicting, defective or in any other way faulty information or designs, unless Lithos has been advised in writing of the same by the Client and has been given the opportunity to rectify the same or where necessary, to design the solution for rectification of any subsequent works carried out by others pursuant to the same.

11 PAYMENT

11.1 Invoices for services rendered will be submitted for payment in accordance with the Proposal.

11.2 The due date for payment is the date of the invoice and the final date for payment is 28 days from the date of the invoice.

11.3 If the Client disputes the amount included for payment in an invoice a written notice must be served on Lithos by the Client not later than 14 days before the final date for payment. If no notice is given the amount due shall be the amount stated in the invoice.

11.4 In the event of failure on the part of the Client to pay any monies in accordance with the foregoing payment provisions, Lithos will be entitled to charge interest on any monies owed to it by the Client, such interest to be at a rate of 8% above the base rate of a clearing bank from time to time calculated from the final date for payment to the date of actual payment on a compound basis.

12 DELAY

12.1 Lithos will comply with any timescale agreed for completion of the Services unless delayed or prevented by circumstances beyond its reasonable control and in the event of any such circumstances arising Lithos undertakes to complete the Services within a reasonable period, but will not be liable to the Client for any delay as a result.

13 TERMINATION

13.1 The Agreement may be terminated by either party in the event of the other making a composition or arrangement with its creditors, becoming bankrupt, or being a company, making a proposal for a voluntary arrangement for a composition of debts, or has a provisional liquidator appointed, or has a winding-up order made, or passes a resolution for voluntary winding-up (except for the purposes of a bona fide scheme of amalgamation or reconstruction), or has an administrator or an administrative receiver appointed to the whole or any part of its assets. Notice of termination must be given to the party which is insolvent by the other party.

13.2 If for any reason the performance of the Services by Lithos is suspended for a period in excess of three calendar months then Lithos shall be entitled to terminate its appointment in respect of the Services by seven days written notice to the Client.

13.3 If the Client shall fail to pay in full any sum due under the terms of the Agreement by the final date for payment for that sum and no effective notice of intention to withhold payment has been issued, Lithos may serve written notice on the Client demanding payment within 14 days of such notice. If the Client shall fail to comply with such notice, Lithos shall be entitled to terminate its employment under the Agreement forthwith.

13.4 Any termination of the appointment of Lithos howsoever caused shall be without prejudice to the right of Lithos to require payment for all services performed up to the date of such termination including but not limited to payment of a fair and reasonable proportion of any figure identified in the Proposal or otherwise for fees in respect of a particular service which Lithos has started, but not completed.

14 NOTICES

14.1 Any notice provided for in the Agreement shall be in writing and shall be deemed to be properly given if delivered by hand or sent by first class post to the address of the relevant party as may have been notified by each party to the other or, in the absence of notification, to the address of Lithos set out above or to the registered address of the Client.

14.2 Such notice shall be deemed to have been received on the day of delivery if delivered by hand or on the second working day after the day of posting if sent by first class post.

15 ENTIRE AGREEMENT

15.1 The Agreement constitutes the complete and entire agreement between the Client and Lithos with respect to the Services and supersedes any prior oral and/or written warranties, terms, conditions, communications and representations, whether express or implied and any claim against Lithos in respect of the Services can only be made in contract under the provisions of the Agreement and not otherwise under the law or tort or otherwise.

15.2 No amendments, modifications or variation of the Agreement shall be valid unless made in writing and agreed to by both the Client and Lithos; such agreement must be recorded in writing by at least one of the Parties.

15.3 Lithos will not be bound by any standard or printed terms or conditions furnished by the Client in any of its documents unless Lithos specifically states in writing separately from such documents that it intends such terms and conditions to apply.

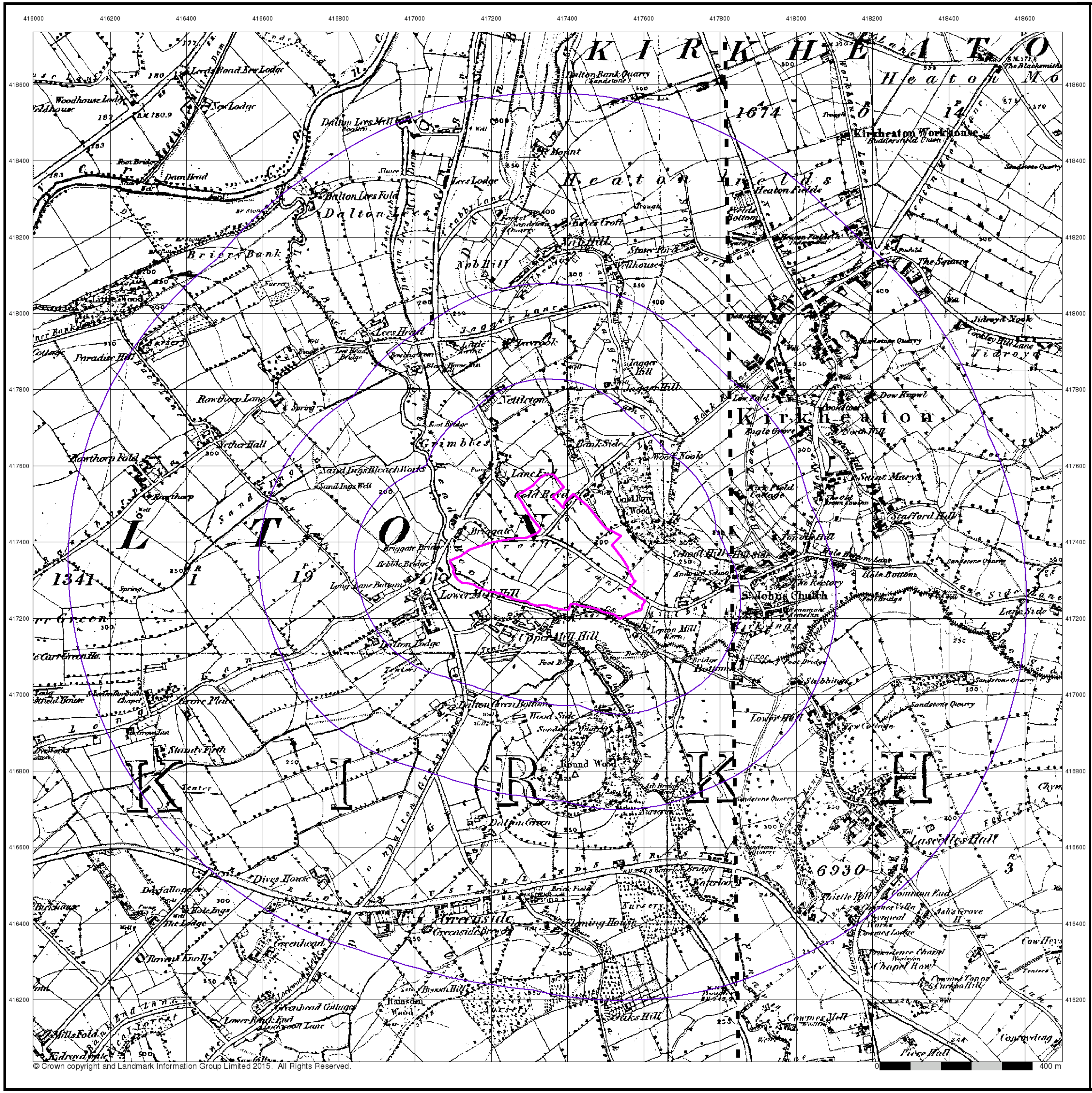
16 DISPUTES AND GOVERNING LAW

16.1 The Agreement shall be governed by and construed in accordance with English law and the Parties irrevocably and unconditionally submit to the jurisdiction of the English Courts.

16.2 Where the Housing Grants, Construction and Regeneration Act 1996 applies, any dispute between the Parties may be referred to adjudication in accordance with The Scheme for Construction Contracts Regulations 1998 or any amendment or modification thereof being in force at the time of the dispute, as applicable to England, Wales, Scotland and Northern Ireland.

Appendix D

Historical OS Plans



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ARP GEOTECHNICAL LIMITED
CHARTERED CONSULTING ENGINEERS

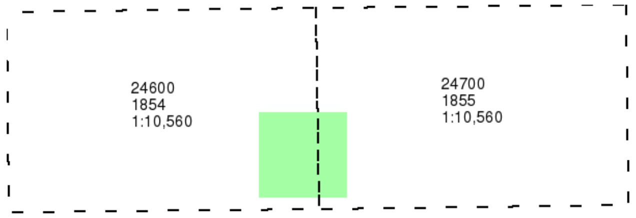
Yorkshire

Published 1854 - 1855

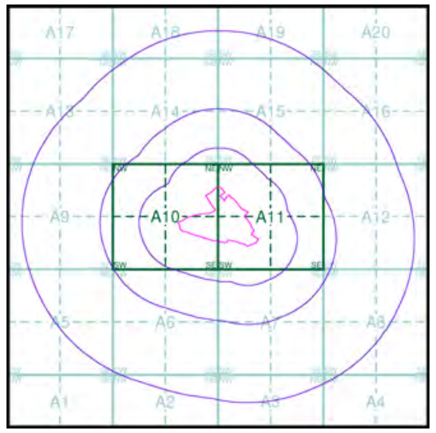
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

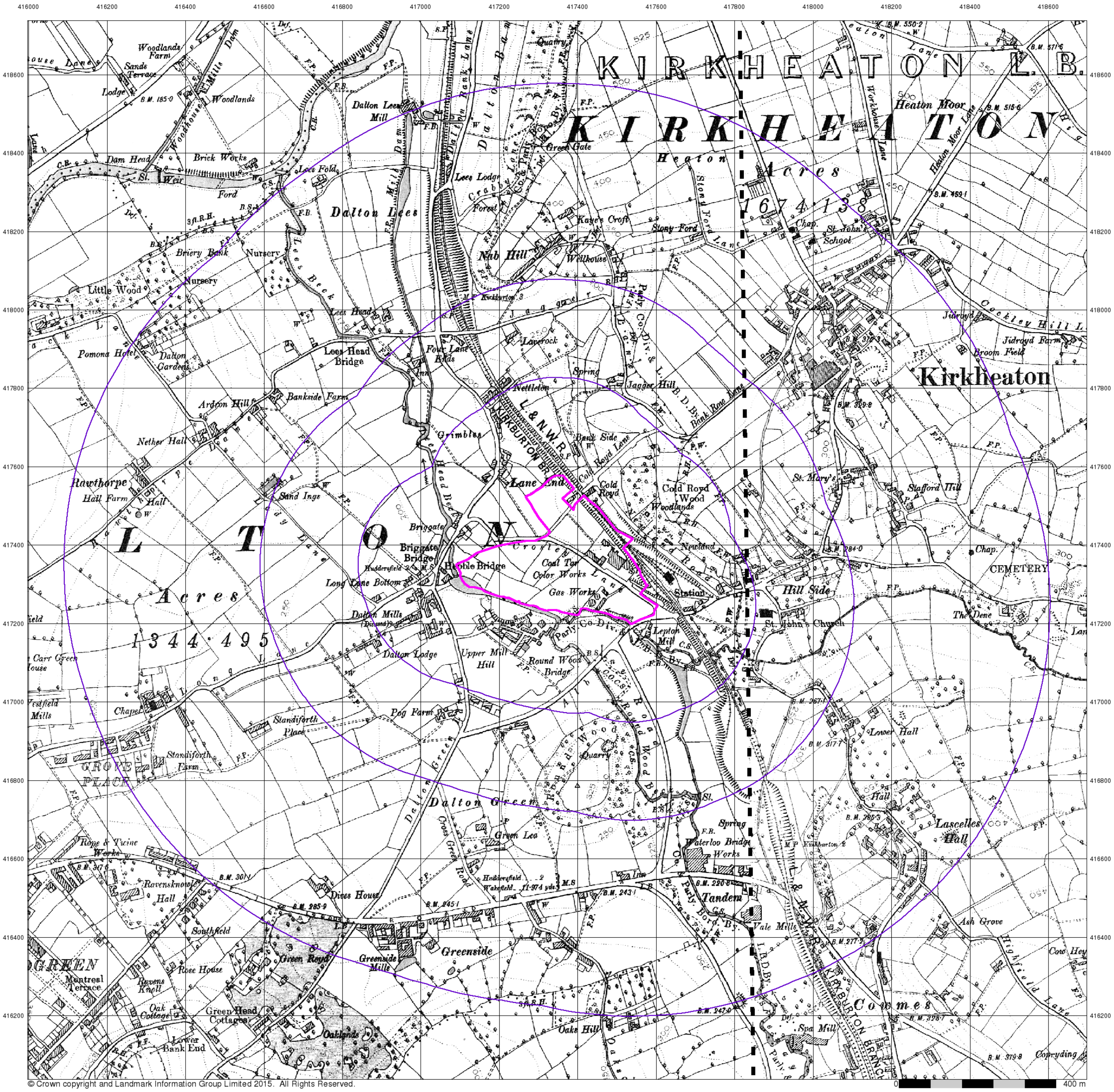
Order Number:	85639099_1_1
Customer Ref:	MWD/01
National Grid Reference:	417360, 417360
Slice:	A
Site Area (Ha):	9.58
Search Buffer (m):	1000

Site Details

Land at, Crossley Lane, Dalton, Huddersfield, HD5 9SA

Landmark Information Group

Tel:	0844 844 9952
Fax:	0844 844 9951
Web:	www.envirocheck.co.uk

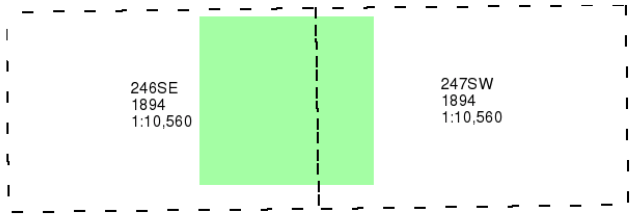


ARP GEOTECHNICAL LIMITED
CHARTERED CONSULTING ENGINEERS

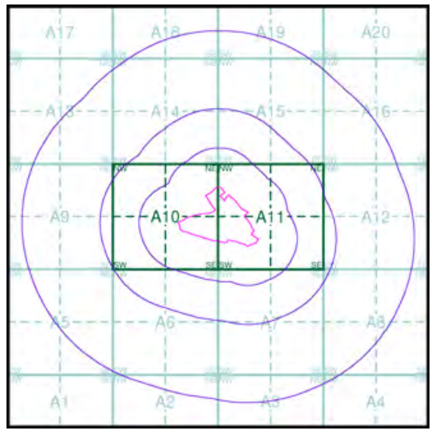
Yorkshire
Published 1894
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



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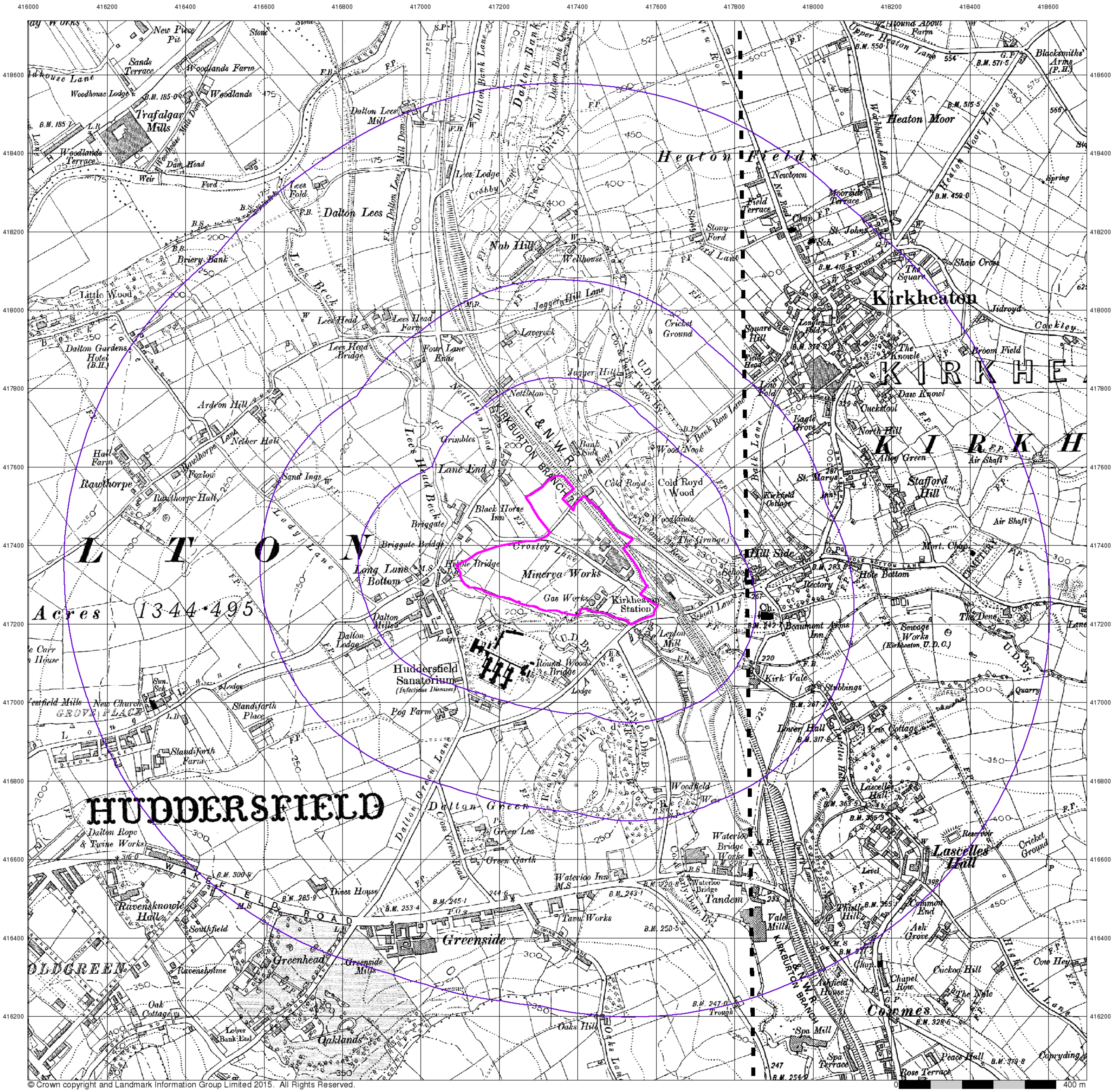


ARP GEOTECHNICAL LIMITED
CHARTERED CONSULTING ENGINEERS

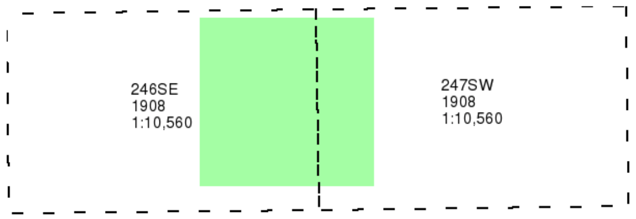
Yorkshire

Published 1908

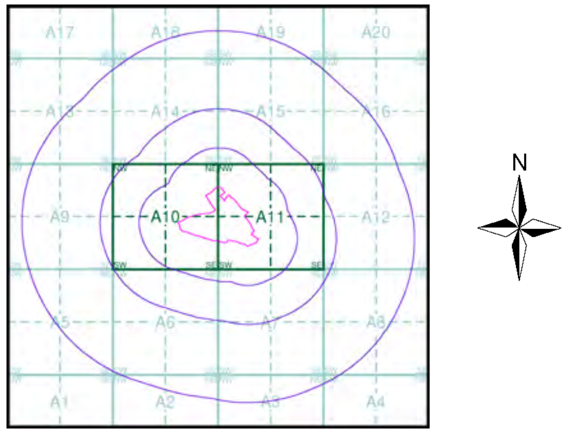
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



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Site Area (Ha):	9.58
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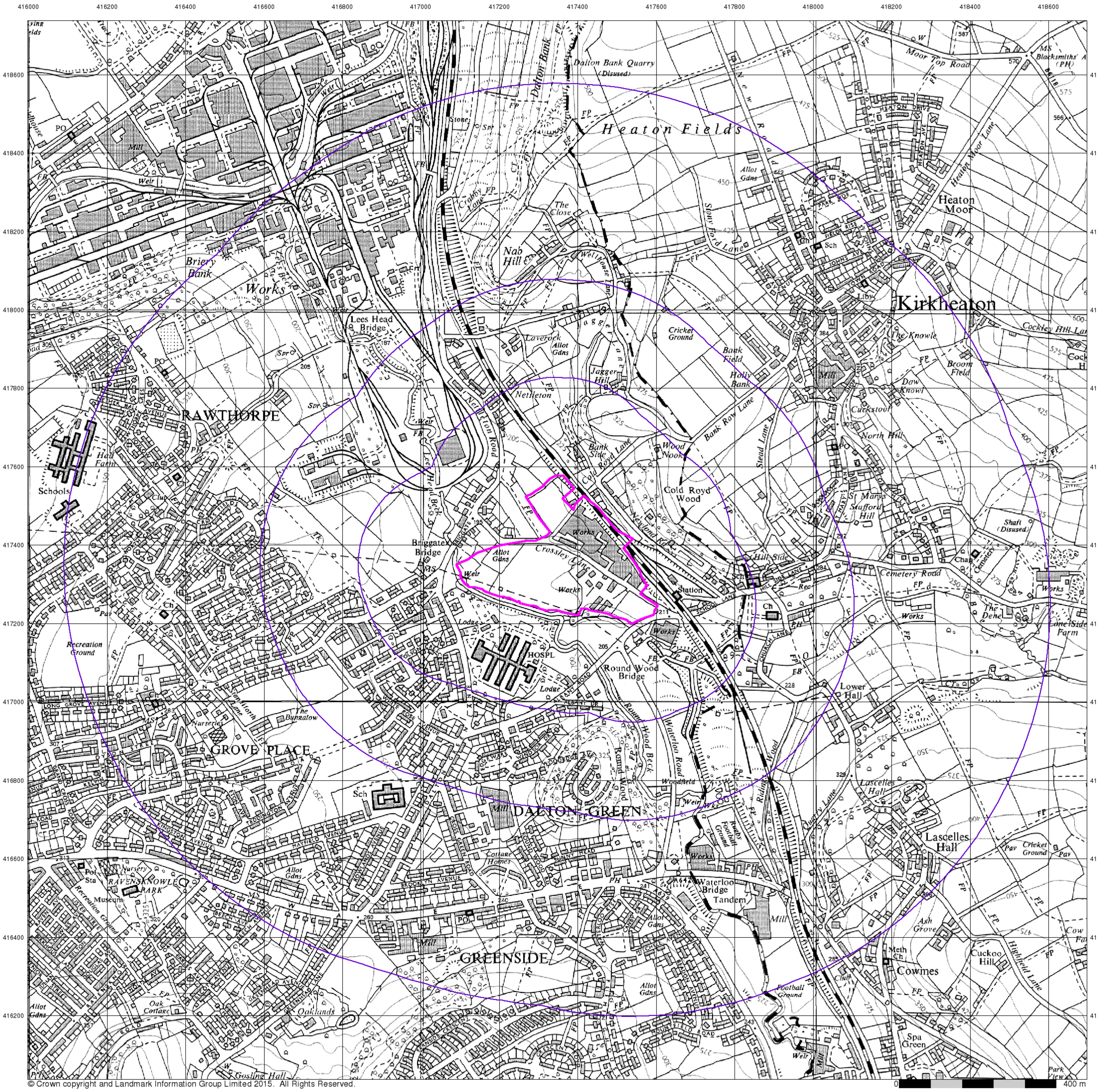

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ARP GEOTECHNICAL LIMITED
CHARTERED CONSULTING ENGINEERS

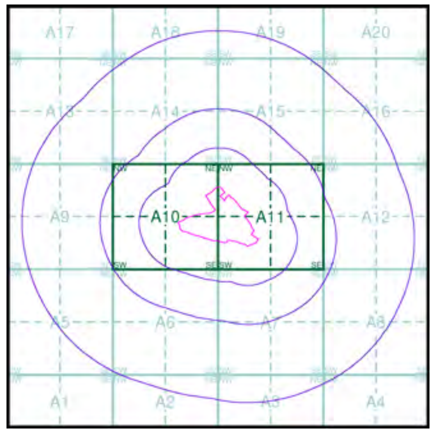
Ordnance Survey Plan
Published 1965
Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)

SE11NE
1965
1:10,560

Historical Map - Slice A



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Order Details

Order Number:	85639099_1_1
Customer Ref:	MWD/01
National Grid Reference:	417360, 417360
Slice:	A
Site Area (Ha):	9.58
Search Buffer (m):	1000

Site Details

Land at, Crossley Lane, Dalton, Huddersfield, HD5 9SA

Tel:	0844 844 9952
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Web:	www.envirocheck.co.uk

ARP GEOTECHNICAL LIMITED
CHARTERED CONSULTING ENGINEERS

10k Raster Mapping

Published 2000

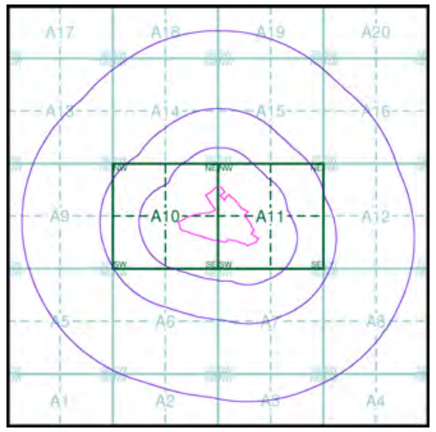
Source map scale - 1:10,000

The historical maps shown were produced from the Ordnance Survey`s 1:10,000 colour raster mapping. These maps are derived from Landplan which replaced the old 1:10,000 maps originally published in 1970. The data is highly detailed showing buildings, fences and field boundaries as well as all roads, tracks and paths. Road names are also included together with the relevant road number and classification. Boundary information depiction includes county, unitary authority, district, civil parish and constituency.

Map Name(s) and Date(s)

SE11NE
2000
1:10,000

Historical Map - Slice A



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Customer Ref:	MWD/01
National Grid Reference:	417360, 417360
Slice:	A
Site Area (Ha):	9.58
Search Buffer (m):	1000

Site Details

Land at, Crossley Lane, Dalton, Huddersfield, HD5 9SA

Tel:	0844 844 9952
Fax:	0844 844 9951
Web:	www.envirocheck.co.uk

Appendix E

Search Responses & other Correspondence

Envirocheck® Report:

Datasheet

Order Details:

Order Number:
85639099_1_1

Customer Reference:
MWD/01

National Grid Reference:
417360, 417360

Slice:
A

Site Area (Ha):
9.58

Search Buffer (m):
1000

Site Details:

Land at
Crossley Lane
Dalton
Huddersfield
HD5 9SA

Client Details:

Mr J Race
ARP Geotechnical Ltd
Northwest House
5-6 Northwest Business Park
Servia Hill
Leeds
LS6 2QH

Contents

Introduction

The Environment Act 1995 has made site sensitivity a key issue, as the legislation pays as much attention to the pathways by which contamination could spread, and to the vulnerable targets of contamination, as it does the potential sources of contamination.
For this reason, Landmark's Site Sensitivity maps and Datasheet(s) place great emphasis on statutory data provided by the Environment Agency/Natural Resources Wales and the Scottish Environment Protection Agency; it also incorporates data from Natural England (and the Scottish and Welsh equivalents) and Local Authorities; and highlights hydrogeological features required by environmental and geotechnical consultants. It does not include any information concerning past uses of land. The datasheet is produced by querying the Landmark database to a distance defined by the client from a site boundary provided by the client.

In the attached datasheet the National Grid References (NGRs) are rounded to the nearest 10m in accordance with Landmark's agreements with a number of Data Suppliers.

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Report Version v50.0

Summary

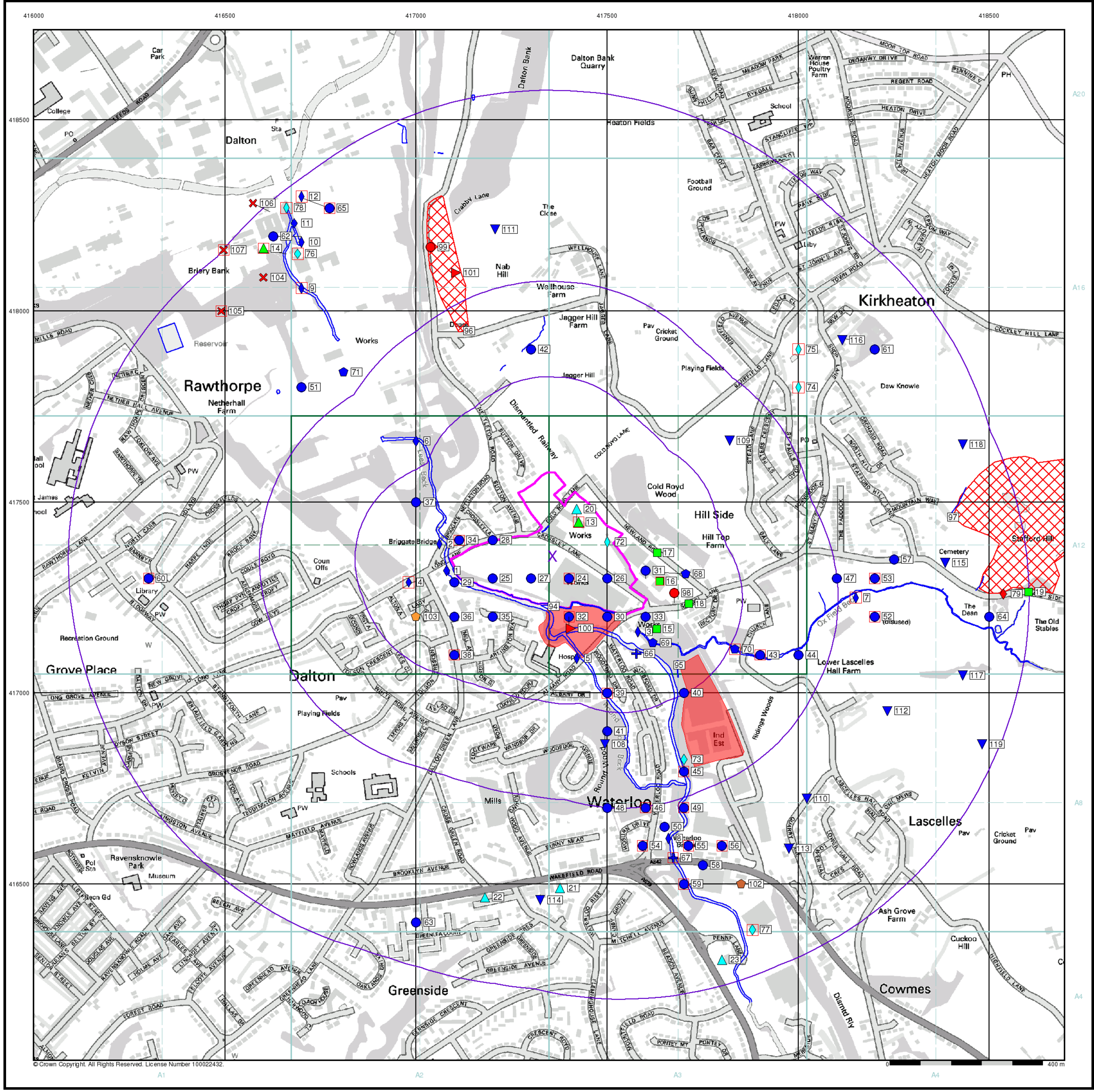
Data Type	Page Number	On Site	0 to 250m	251 to 500m	501 to 1000m (*up to 2000m)
Agency & Hydrological					
BGS Groundwater Flooding Susceptibility	pg 1	Yes	Yes	Yes	n/a
Contaminated Land Register Entries and Notices					
Discharge Consents	pg 3		8	1	15
Prosecutions Relating to Controlled Waters			n/a	n/a	n/a
Enforcement and Prohibition Notices					
Integrated Pollution Controls	pg 9	5			3
Integrated Pollution Prevention And Control	pg 10		5		1
Local Authority Integrated Pollution Prevention And Control					
Local Authority Pollution Prevention and Controls	pg 11	1			3
Local Authority Pollution Prevention and Control Enforcements					
Nearest Surface Water Feature	pg 12	Yes			
Pollution Incidents to Controlled Waters	pg 12	5	18	13	37
Prosecutions Relating to Authorised Processes					
Registered Radioactive Substances					
River Quality	pg 24		2		2
River Quality Biology Sampling Points	pg 25		1		
River Quality Chemistry Sampling Points	pg 26				3
Substantiated Pollution Incident Register	pg 28		2	2	1
Water Abstractions	pg 29	1		1	28 (*35)
Water Industry Act Referrals	pg 45				1
Groundwater Vulnerability	pg 45	Yes	n/a	n/a	n/a
Drift Deposits			n/a	n/a	n/a
Bedrock Aquifer Designations	pg 45	Yes	n/a	n/a	n/a
Superficial Aquifer Designations	pg 45	Yes	n/a	n/a	n/a
Source Protection Zones					
Extreme Flooding from Rivers or Sea without Defences	pg 45	Yes		n/a	n/a
Flooding from Rivers or Sea without Defences	pg 45	Yes	Yes	n/a	n/a
Areas Benefiting from Flood Defences	pg 46	Yes		n/a	n/a
Flood Water Storage Areas				n/a	n/a
Flood Defences	pg 46	Yes		n/a	n/a
Detailed River Network Lines	pg 46		Yes	Yes	n/a
Detailed River Network Offline Drainage					n/a

Summary

Data Type	Page Number	On Site	0 to 250m	251 to 500m	501 to 1000m (*up to 2000m)
Waste					
BGS Recorded Landfill Sites					
Historical Landfill Sites	pg 49	1	1		
Integrated Pollution Control Registered Waste Sites					
Licensed Waste Management Facilities (Landfill Boundaries)	pg 49			1	1
Licensed Waste Management Facilities (Locations)	pg 49		1		1
Local Authority Landfill Coverage	pg 50	1	n/a	n/a	n/a
Local Authority Recorded Landfill Sites					
Registered Landfill Sites	pg 50		1		1
Registered Waste Transfer Sites	pg 51				1
Registered Waste Treatment or Disposal Sites	pg 51		1		
Hazardous Substances					
Control of Major Accident Hazards Sites (COMAH)					
Explosive Sites					
Notification of Installations Handling Hazardous Substances (NIHHS)					
Planning Hazardous Substance Consents	pg 52				17
Planning Hazardous Substance Enforcements					
Geological					
BGS 1:625,000 Solid Geology	pg 55	Yes	n/a	n/a	n/a
BGS Recorded Mineral Sites	pg 55			2	10
Brine Compensation Area			n/a	n/a	n/a
Coal Mining Affected Areas	pg 57	Yes	n/a	n/a	n/a
Mining Instability	pg 57	Yes	n/a	n/a	n/a
Man-Made Mining Cavities	pg 57				1
Natural Cavities					
Non Coal Mining Areas of Great Britain				n/a	n/a
Potential for Collapsible Ground Stability Hazards	pg 57	Yes	Yes	n/a	n/a
Potential for Compressible Ground Stability Hazards	pg 57	Yes	Yes	n/a	n/a
Potential for Ground Dissolution Stability Hazards				n/a	n/a
Potential for Landslide Ground Stability Hazards	pg 57	Yes	Yes	n/a	n/a
Potential for Running Sand Ground Stability Hazards	pg 58	Yes	Yes	n/a	n/a
Potential for Shrinking or Swelling Clay Ground Stability Hazards	pg 58	Yes		n/a	n/a
Radon Potential - Radon Affected Areas	pg 59	Yes	n/a	n/a	n/a
Radon Potential - Radon Protection Measures			n/a	n/a	n/a

Summary

Data Type	Page Number	On Site	0 to 250m	251 to 500m	501 to 1000m (*up to 2000m)
Industrial Land Use					
Contemporary Trade Directory Entries	pg 60	3	7	7	37
Fuel Station Entries	pg 64				4
Gas Pipelines					
Underground Electrical Cables					
Sensitive Land Use					
Ancient Woodland	pg 66		1		
Areas of Adopted Green Belt	pg 66	1			
Areas of Unadopted Green Belt					
Areas of Outstanding Natural Beauty					
Environmentally Sensitive Areas					
Forest Parks					
Local Nature Reserves	pg 66				1
Marine Nature Reserves					
National Nature Reserves					
National Parks					
Nitrate Sensitive Areas					
Nitrate Vulnerable Zones					
Ramsar Sites					
Sites of Special Scientific Interest					
Special Areas of Conservation					
Special Protection Areas					
World Heritage Sites					



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General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Map ID
- Several of Type at Location

Agency and Hydrological

- Contaminated Land Register Entry or Notice (Location)
- Contaminated Land Register Entry or Notice
- Discharge Consent
- Enforcement or Prohibition Notice
- Integrated Pollution Control
- Integrated Pollution Prevention Control
- Local Authority Integrated Pollution Prevention and Control
- Local Authority Pollution Prevention and Control
- Local Authority Pollution Prevention and Control Enforcement
- Pollution Incident to Controlled Waters
- Prosecution Relating to Authorised Processes
- Prosecution Relating to Controlled Waters
- Registered Radioactive Substance
- River Network or Water Feature
- River Quality Sampling Point
- Substantiated Pollution Incident Register
- Water Abstraction
- Water Industry Act Referral

Geological

- BGS Recorded Mineral Site

Industrial Land Use

- Contemporary Trade Directory Entry
- Fuel Station Entry

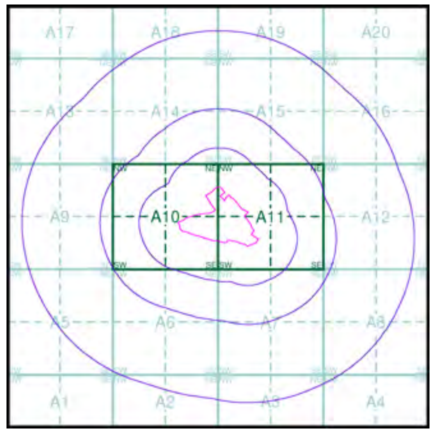
Waste

- BGS Recorded Landfill Site (Location)
- BGS Recorded Landfill Site
- EA Historic Landfill (Buffered Point)
- EA Historic Landfill (Polygon)
- Integrated Pollution Control Registered Waste Site
- Licensed Waste Management Facility (Landfill Boundary)
- Licensed Waste Management Facility (Location)
- Local Authority Recorded Landfill Site (Location)
- Local Authority Recorded Landfill Site
- Registered Landfill Site
- Registered Landfill Site (Location)
- Registered Landfill Site (Point Buffered to 100m)
- Registered Landfill Site (Point Buffered to 250m)
- Registered Waste Transfer Site (Location)
- Registered Waste Transfer Site
- Registered Waste Treatment or Disposal Site (Location)
- Registered Waste Treatment or Disposal Site

Hazardous Substances

- COMAH Site
- Explosive Site
- NIHHS Site
- Planning Hazardous Substance Consent
- Planning Hazardous Substance Enforcement

Site Sensitivity Map - Slice A



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Customer Ref:	MWD/01
National Grid Reference:	417360, 417360
Slice:	A
Site Area (Ha):	9.58
Search Buffer (m):	1000

Site Details

Land at, Crossley Lane, Dalton, Huddersfield, HD5 9SA

ARP GEOTECHNICAL LIMITED
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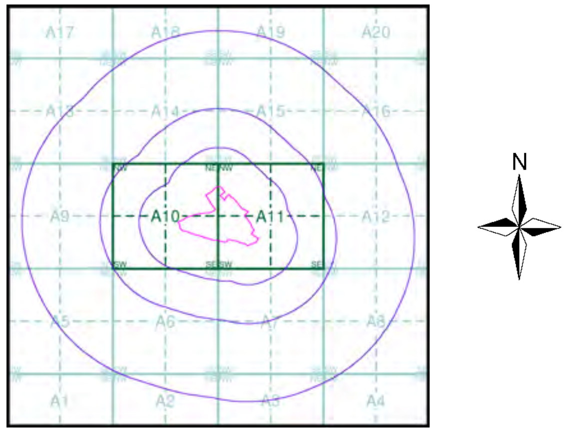
General

- Specified Site
- Specified Buffer(s)
- X Bearing Reference Point

Agency and Hydrological (Flood)

- 🟦 Extreme Flooding from Rivers or Sea without Defences (Zone 2)
- 🟦 Flooding from Rivers or Sea without Defences (Zone 3)
- ▨ Area Benefiting from Flood Defence
- 🟪 Flood Water Storage Areas
- Flood Defence

Flood Map - Slice A



Order Details

Order Number:	85639099_1_1
Customer Ref:	MWD/01
National Grid Reference:	417360, 417360
Slice:	A
Site Area (Ha):	9.58
Search Buffer (m):	1000

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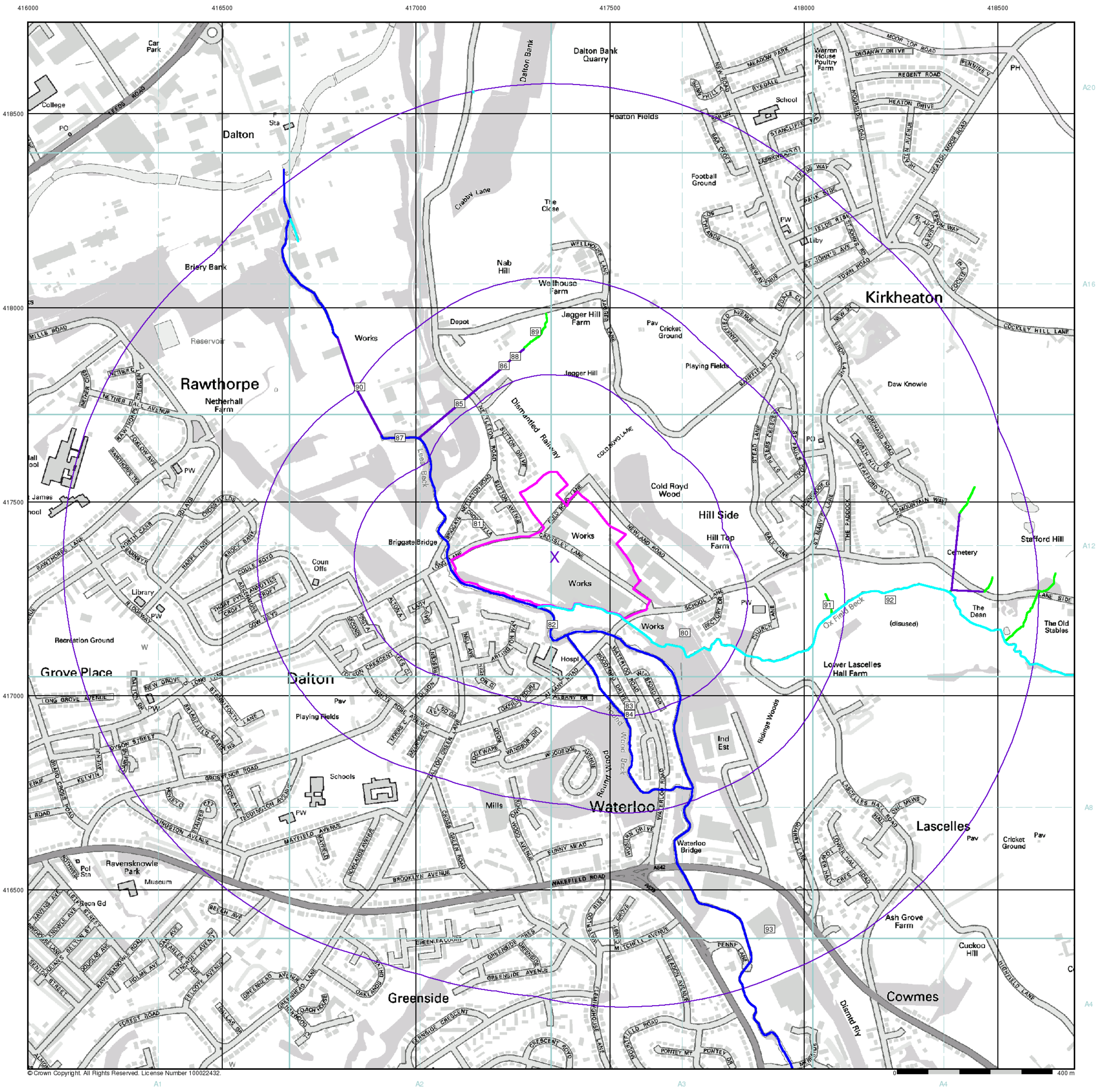

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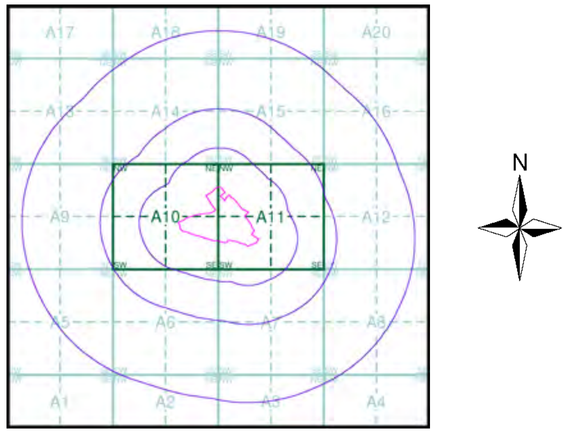
General

- Specified Site
- Specified Buffer(s)
- X Bearing Reference Point
- 8 Map ID

Detailed River Network Data

- Primary River
- Secondary River
- Tertiary River
- Canal
- Canal Tunnel
- Undefined River
- Lake/Reservoir
- Offline Drainage Feature
- Extended Culvert (greater than 50m)
- Underground River (inferred)
- Underground River (local knowledge)
- Downstream of High Water Mark
- Downstream of Seaward Extension
- Not assigned River feature

EA/NRW Detailed River Network Map - Slice A



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Customer Ref:	MWD/01
National Grid Reference:	417360, 417360
Slice:	A
Site Area (Ha):	9.58
Search Buffer (m):	1000

Site Details

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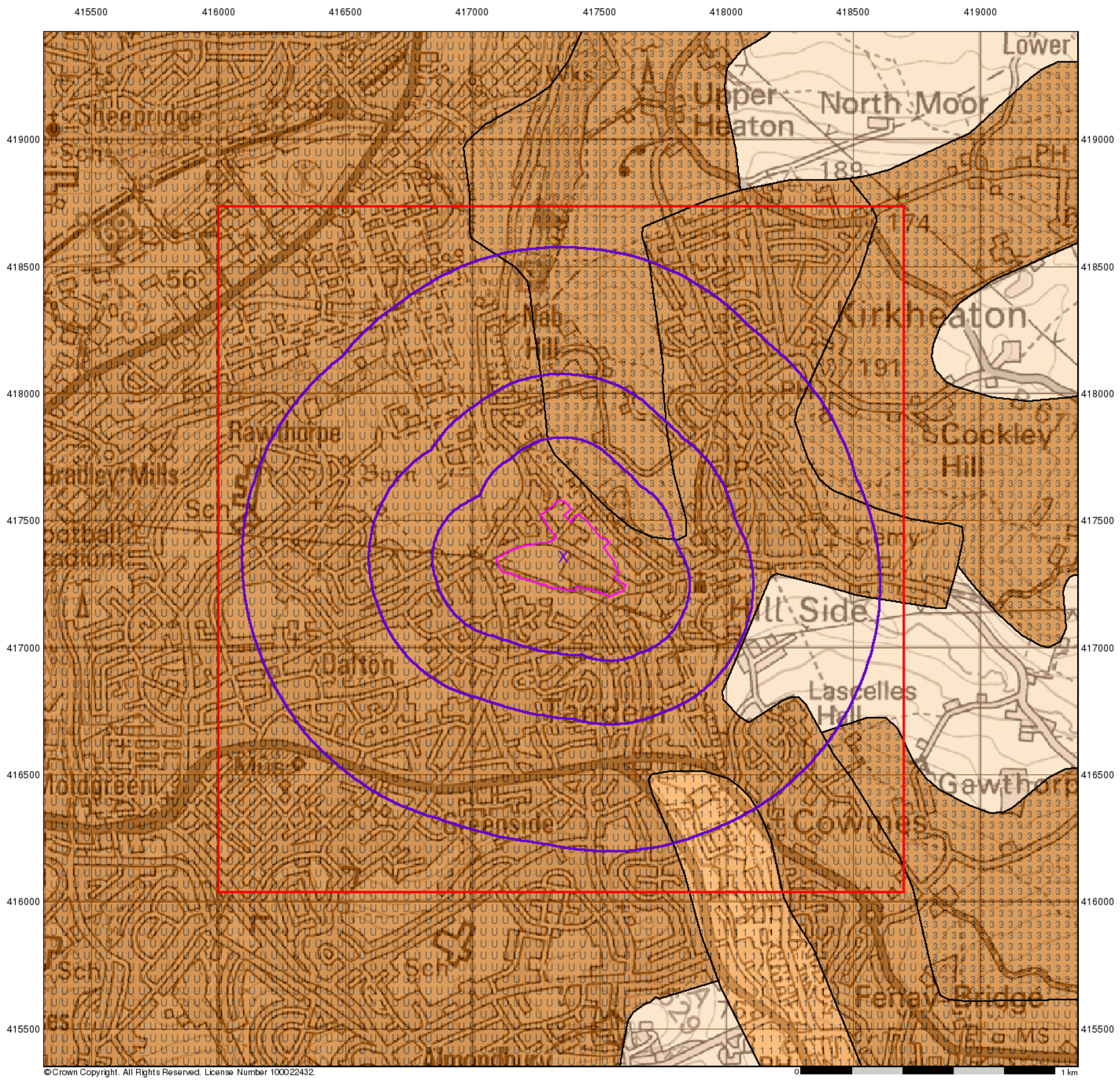

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Groundwater Vulnerability

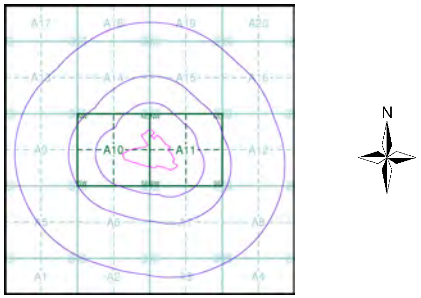
General

- Specified Site
- Specified Buffer(s)
- X Bearing Reference Point
- □ Slice
- 8 Map ID

Agency and Hydrological

Geological Classes		Soil Classes
Major Aquifer (Highly Permeable)	■	High (H) 1, 2, 3, U
	■	Intermediate (I) 1, 2
	■	Low
Minor Aquifer (Variably Permeable)	■	High (H) 1, 2, 3, U
	■	Intermediate (I) 1, 2
	■	Low
Non Aquifer (Negligibly Permeable)	🟩	
Water or Sea	■	
Drift Deposit	⁙	

Site Sensitivity Context Map - Slice A



Order Details

Order Number:	85639099_1_1
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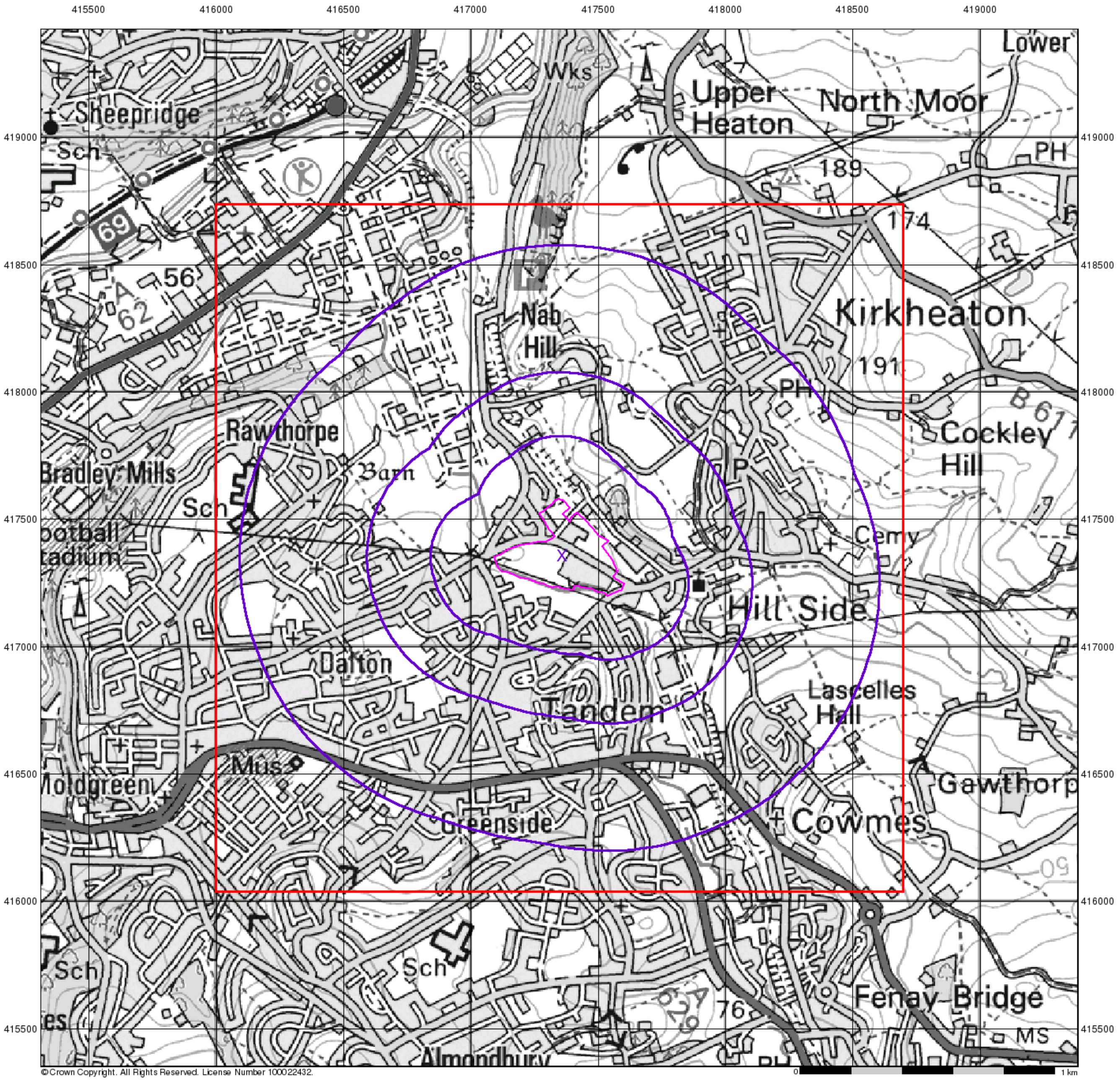
Site Area (Ha):	9.58
Search Buffer (m):	1000

Site Details

Land at, Crossley Lane, Dalton, Huddersfield, HD5 9SA



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Source Protection Zones

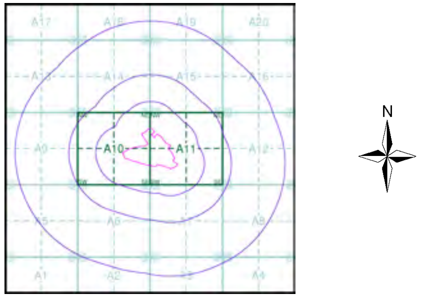
General

- Specified Site
- Specified Buffer(s)
- X Bearing Reference Point
- ☐ Slice
- 8 Map ID

Agency and Hydrological

- 🟥 Inner zone (Zone 1)
- ▨ Inner zone - subsurface activity only (Zone 1c)
- 🟩 Outer zone (Zone 2)
- ▨ Outer zone - subsurface activity only (Zone 2c)
- 🟦 Total catchment (Zone 3)
- ▨ Total catchment - subsurface activity only (Zone 3c)
- 🟫 Special interest (Zone 4)
- 🟥 Source Protection Zone Borehole

Site Sensitivity Context Map - Slice A



Order Details

Order Number:	85639099_1_1
Customer Ref:	MWD/01
National Grid Reference:	417360, 417360
Slice:	A
Site Area (Ha):	9.58
Search Buffer (m):	1000

Site Details

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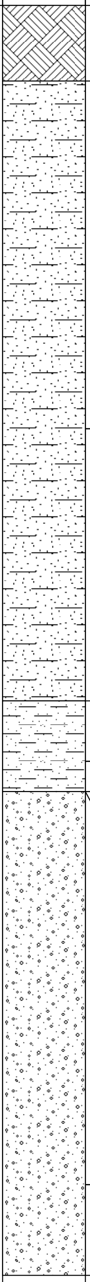
Appendix F

Trial Pit Logs

Trial Pit Log

Trialpit No
TP101
Sheet 1 of 1

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417150.79 - 417339.51 Level: 59.45	Date 23/01/2020
Location: Huddersfield		Dimensions (m): Depth 4.20	Scale 1:25
Client: Harron Homes			Logged LT

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.20	J,K&T		0.25	59.20		TOPSOIL: Soft dark brown sandy silty CLAY. Sand is fine. (TOPSOIL)
	0.50 1.50	D B		2.30	57.15		Brown very clayey silty fine SAND. (GRANULAR ALLUVIUM) *From 1.4m, frequent lenses of very sandy clay.*
▼	2.50	D	HVP=22	2.60	56.85		Very soft brown slightly gravelly slightly sandy CLAY. Gravel is subangular tabular of mudstone and coal. Sand is fine to coarse. (COHESIVE ALLUVIUM) *At 2.5m, groundwater seepage.*
	3.00	D		4.20	55.25		Brownish orange and dark grey sandy very clayey subangular to subrounded fine to coarse GRAVEL of sandstone and mudstone with a high cobble content. Cobbles are subangular of mudstone and sandstone. (GRANULAR GLACIOFLUVIAL DEPOSITS) *From 2.6m, unstable.* *From 3.9m, gravel and cobbles are angular and tabular. Possibly weathered bedrock.*
							End of pit at 4.20 m

Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater seepage was apparent at 2.5m depth during excavation. 3. Backfilled with materials arising upon completion. 4. Exploratory hole surveyed in (level and co-ordinates) on completion.

Stability: 1. The sides of the trial pit were unstable from 2.6m depth during excavation.

Trial Pit Log

Trialpit No
TP102
Sheet 1 of 1

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417229.76 - 417346.31 Level: 59.95	Date 23/01/2020
Location: Huddersfield		Dimensions (m):	Scale 1:25
Client: Harron Homes		Depth 3.50	Logged LT

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.30	J,K&T		0.50	59.45	▨	TOPSOIL: Soft dark grey sandy silty CLAY. Sand is fine. (TOPSOIL)
	0.60	D	HVP=120	1.30	58.65	▤	Stiff light brown mottled grey and orangish brown slightly gravelly slightly sandy CLAY. Gravel is subangular to subrounded of sandstone and mudstone. Sand is fine to coarse. (HEAD) *From 0.9m, occasional lenses of very clayey sandy gravel.*
▼	1.50	J,K&T		3.50	56.45	⁘	Dark grey sandy clayey subangular to subrounded fine to coarse GRAVEL of sandstone and limestone. Sand is fine to coarse. (GRANULAR GLACIOFLUVIAL DEPOSITS) *At 1.3m, rare cementation.* *From 2.8m, occasional cobbles.* *From 2.8m, unstable.* *From 3.0m, subangular to subrounded, similar to River Terrace Deposits.* *At 3.4m, groundwater.* *From 3.4m, difficult to excavate.*

End of pit at 3.50 m

Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was apparent at 3.2m depth during excavation. 3. Backfilled with materials arising upon completion. 4. Exploratory hole surveyed in (level and co-ordinates) on completion.

Stability: 1. The sides of the trial pit were unstable from 2.8m depth during excavation.

Trial Pit Log

Trialpit No
TP103
Sheet 1 of 1

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417241.57 - 417387.95 Level: 59.80	Date 23/01/2020
Location: Huddersfield		Dimensions (m): Depth 3.70	Scale 1:25
Client: Harron Homes			Logged LT

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
							TOPSOIL: Dark grey slightly sandy CLAY. Sand is fine. (TOPSOIL)
	0.20	J,K&T					
				0.30	59.50		Firm light brown mottled grey and orangish brown slightly gravelly slightly sandy CLAY. Gravel is subangular to subrounded fine to coarse of mudstone and sandstone. Sand is fine to coarse. (HEAD)
			HVP=62				
	0.60	D					
	1.00	J,K&T					
				1.50	58.30		Dark grey sandy clayey angular to subrounded fine to coarse GRAVEL of sandstone, limestone and mudstone. Occasional cobbles and boulders of sandstone and limestone. (GRANULAR GLACIOFLUVIAL DEPOSITS)
	1.70	J,K&T					
▼							*At 3.5m, groundwater.*
				3.70	56.10		*At 3.7m, unable to excavate further.* End of pit at 3.70 m

Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was apparent at 3.5m depth during excavation. 3. Backfilled with materials arising upon completion. 4. Exploratory hole surveyed in (level and co-ordinates) on completion.

Stability: 1. The sides of the trial pit remained stable during excavation.

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Trial Pit Log

Trialpit No
TP104
Sheet 1 of 1

Project Name: Crossley Lane, Dalton
Project No. 3435
Co-ords: 417300.41 - 417392.46
Level: 60.20
Date 23/01/2020
Location: Huddersfield
Dimensions (m):
Depth 4.20
Scale 1:25
Client: Harron Homes
Logged LT

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.30	J,K&T		0.45	59.75		TOPSOIL: Dark brown slightly sandy CLAY. (TOPSOIL)
	0.90	D	HVP=78	2.00	58.20		Firm to stiff light brown slightly gravelly slightly sandy CLAY. Gravel is subrounded of sandstone. Sand is fine to coarse. (HEAD)
▼	2.50	J,K&T		4.20	56.00		Dark grey sandy clayey angular to subrounded fine to coarse GRAVEL of sandstone and limestone with a medium cobble content and occasional boulders. Cobbles are subangular to rounded of sandstone and limestone. Occasional boulders of cemented gravel. (GRANULAR GLACIOFLUVIAL DEPOSITS) *At 3.6m, groundwater.*
							End of pit at 4.20 m

Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was apparent at 3.6m depth during excavation. 3. Backfilled with materials arising upon completion. 4. Exploratory hole surveyed in (level and co-ordinates) on completion.

Stability: 1. The sides of the trial pit remained stable during excavation.

AGS

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Trial Pit Log

Trialpit No
TP105
Sheet 1 of 1

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417283.87 - 417330.72 Level: 60.45	Date 23/01/2020
Location: Huddersfield		Dimensions (m): Depth 4.80	Scale 1:25
Client: Harron Homes			Logged LT

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.20	J,K&T					TOPSOIL: Dark brown sandy CLAY. (TOPSOIL)
				0.35	60.10		Stiff light brown mottled light grey and orangish brown slightly gravelly slightly sandy CLAY. (HEAD)
	0.50	D					
			HVP=60				
							From 1.1m, occasional lenses of clayey sandy GRAVEL.
				1.30	59.15		Dark grey sandy clayey angular to subangular fine to coarse GRAVEL of sandstone and mudstone with a medium cobble content and occasional boulders. Cobbles are subangular of limestone and sandstone. Boulders are subangular of sandstone. (GRANULAR GLACIOFLUVIAL DEPOSITS)
	1.70	J,K&T					
▼							*At 3.4m, groundwater.*
				4.80	55.65		End of pit at 4.80 m

Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was apparent at 3.4m depth during excavation. 3. Backfilled with materials arising upon completion. 4. Exploratory hole surveyed in (level and co-ordinates) on completion.

Stability: 1. The sides of the trial pit remained stable during excavation.

AGS

Trial Pit Log

Trialpit No	**TP106**
Sheet 1 of 1	

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417272.88 - 417286.39 Level: 60.20	Date 23/01/2020
Location: Huddersfield		Dimensions (m):	Scale 1:25
Client: Harron Homes		Depth 2.40	Logged LT

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.20	J,K&T		0.30	59.90	▨	TOPSOIL: Soft dark brown sandy silty CLAY. (TOPSOIL)
	0.50	D		1.60	58.60	░	Light brown very clayey fine SAND with occasional lenses of sandy CLAY. (GRANULAR ALLUVIUM)
▼	1.80	J,K&T		2.40	57.80	░	Orange, brown and grey sandy clayey subangular to subrounded fine to coarse GRAVEL of sandstone and mudstone. Sand is fine to coarse. (GRANULAR ALLUVIUM) *At 1.6m, groundwater, fast inflow.* *From 1.8m, unstable.* *From 2.0m, tabular gravel.*
							End of pit at 2.40 m

Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Fast groundwater inflow was apparent at 1.6m depth during excavation. 3. Backfilled with materials arising upon completion. 4. Exploratory hole surveyed in (level and co-ordinates) on completion.

Stability: 1. The sides of the trial pit were unstable from 1.8m depth during excavation.

Trial Pit Log

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417393.79 - 417336.55 Level: 62.20	Trialpit No **TP107** Sheet 1 of 1
Location: Huddersfield		Dimensions (m):	Date 23/01/2020
Client: Harron Homes		Depth 4.30	Scale 1:25 Logged LT

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.25	61.95		MADE GROUND: Reinforced grey CONCRETE. (CONCRETE HARDSTAND)
	0.45	J,K&T		0.55	61.65		MADE GROUND: Light brown sandy angular to subangular fine to coarse GRAVEL of mixed lithologies. (SUB-BASE)
	0.70	J,K&T		2.40	59.80		MADE GROUND: Dark grey sandy very clayey angular to subangular fine to coarse GRAVEL of mudstone, sandstone and clinker with a medium cobble content. Cobbles are subangular of brick, sandstone and mudstone. (GRANULAR MADE GROUND) *From 2.0m, occasional lenses of gravelly CLAY.*
	2.50	J,K&T		3.30	58.90		MADE GROUND: Firm light brown and grey slightly gravelly sandy CLAY. Gravel is subangular to subrounded fine to coarse of sandstone and mudstone. Strong hydrocarbon odour, possibly diesel. (REWORKED NATURAL GROUND)
	3.90	J,K&T		4.30	57.90		Dark grey sandy very clayey angular to subangular GRAVEL of sandstone, mudstone and limestone. Sand is fine to coarse. Strong hydrocarbon odour, possibly diesel. (GRANULAR GLACIOFLUVIAL DEPOSITS) *From 3.9m, dark grey with a slight oily sheen. Stronger hydrocarbon odour.* *From 4.1m, less sheen visible.*
							End of pit at 4.30 m

Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during excavation. 3. Backfilled with materials arising upon completion. 4. Exploratory hole surveyed in (level and co-ordinates) on completion.

Stability: 1. The sides of the trial pit remained stable during excavation.

LITHOS CONSULTING

Trial Pit Log

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417354.92 - 417361.50 Level: 60.75	Trialpit No **TP108** Sheet 1 of 1 Date 23/01/2020
Location: Huddersfield		Dimensions (m): Depth 3.80	Scale 1:25
Client: Harron Homes			Logged LT

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.05	J&K		0.05	60.70	▨	MADE GROUND: Tarmac. (MACADAM HARDSTAND)
				0.35	60.40	▨	MADE GROUND: Beige sandy angular to subangular limestone GRAVEL. (SUB-BASE)
	0.50	J,K&T		0.60	60.15	▨	MADE GROUND: Black sandy angular to subangular clinker ashy GRAVEL. Slight hydrocarbon odour. (ASH & CLINKER) *At 0.35m, fabric membrane.*
				1.70	59.05	▤	Firm to stiff grey slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of mudstone and sandstone. (HEAD)
	1.90	J,K&T		3.10	57.65	▤	Firm orange gravelly slightly sandy CLAY. Gravel is subangular to subrounded of sandstone and mudstone. Sand is fine to coarse. (HEAD)
	3.50	J&K		3.80	56.95	░	Grey sandy subangular to rounded fine to coarse GRAVEL of sandstone and mudstone. Sand is fine to coarse. Low subrounded sandstone cobble content. (GRANULAR GLACIOFLUVIAL DEPOSITS)
							End of pit at 3.80 m

Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during excavation. 3. Backfilled with materials arising upon completion. 4. Exploratory hole surveyed in (level and co-ordinates) on completion.

Stability: 1. The sides of the trial pit remained stable during excavation.

AGS

Trial Pit Log

Trialpit No	**TP109**
	Sheet 1 of 1
Project Name:	Crossley Lane, Dalton
Project No.	3435
Co-ords:	417347.63 - 417270.43
Level:	62.25
Date	24/01/2020
Location:	Huddersfield
Dimensions (m):	
Depth	3.80
Scale	1:25
Client:	Harron Homes
Logged	LEW

Water Strike	Samples and In Situ Testing: Depth	Type	Results
	0.30	J,K&T	
	0.60	J,K&T	
	0.80	J,K&T	
	1.30	B	
			HVP=50
	2.50	D	
			HVP=65
▼			

Depth (m)	Level (m)	Stratum Description
0.15	62.10	MADE GROUND: Strong light grey CONCRETE with 60% aggregate of subangular to rounded fine to medium gravel of mixed lithologies. 10mm rebar. Polythene sheet at base. (CONCRETE HARDSTAND)
0.50	61.75	MADE GROUND: Light brown clayey sandy angular to subrounded fine to coarse GRAVEL of predominantly sandstone, rare brick and mudstone. Low cobble content of sandstone. (SUB-BASE)
0.70	61.55	MADE GROUND: Dark grey sandy gravelly CLAY. Gravel is subangular to subrounded fine to coarse of mixed lithologies. (COHESIVE MADE GROUND) *At 0.6m, slight hydrocarbon odour.*
1.70	60.55	MADE GROUND: Brownish grey slightly sandy very gravelly CLAY. Gravel is subangular to rounded fine to coarse of predominantly mudstone. Rare sandstone and brick. (REWORKED NATURAL GROUND)
1.90	60.35	MADE GROUND: Reddish brown gravelly COBBLES of brick. Gravel is of brick and limestone (possible former floor). (BRICKFILL) *From 1.7m to 1.9m, spalling of trial pit walls.*
2.90	59.35	Firm light brown slightly sandy CLAY. (COHESIVE ALLUVIUM) *From 2.7m, clay is gravelly.*
3.80	58.45	Greyish brown clayey sandy subangular to rounded GRAVEL of predominantly sandstone and rare mudstone. Low cobble content of sandstone. (GRANULAR GLACIOFLUVIAL DEPOSITS) *At 3.7m, groundwater inflow.*

End of pit at 3.80 m

Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2.Groundwater inflow was apparent at 3.7m depth during excavation. 3. Backfilled with materials arising upon completion. 4. Exploratory hole surveyed in (level and co-ordinates) on completion.

Stability: 1. Spalling of the sides of the trial pit from 1.7m and 1.9m depth during excavation.

Trial Pit Log

Trialpit No **TP110**
Sheet 1 of 1

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417423.13 - 417478.53 Level: 62.30	Date 23/01/2020
Location: Huddersfield		Dimensions (m): Depth 2.50	Scale 1:25
Client: Harron Homes			Logged LEW

Water Strike	Samples and In Situ Testing Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.15	62.15		MADE GROUND: Strong light grey and dark grey reinforced CONCRETE. 50% aggregate of angular to subangular fine to medium gravel of limestone. (CONCRETE HARDSTAND)
				0.40	61.90		MADE GROUND: Strong light grey and dark grey reinforced CONCRETE. 50% aggregate of angular to subangular fine to medium gravel of limestone. 5mm & 10mm rebar. (CONCRETE HARDSTAND) *Metal sheet 15cm wide and 10mm thick on surface of second concrete slab.*
	0.60	J,K&T					
▼				0.80	61.50		MADE GROUND: Greyish brown clayey sandy subangular to rounded fine to coarse GRAVEL of mixed lithologies including rare brick. (GRANULAR MADE GROUND)
	1.00	D	HVP=60				Firm brown slightly sandy gravelly CLAY. Gravel is angular to subrounded fine to coarse of predominantly mudstone and sandstone. (HEAD) *At 0.8m, groundwater inflow.* *From 1.5m, clay is stiff.*
			HVP=80				
	1.90	D					*From 2.0m, low cobble content of angular tabular sandstone and mudstone. No hand vane shear tests could be undertaken due to cobble and gravel content of clay.*
				2.50	59.80		End of pit at 2.50 m

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Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2.Groundwater inflow was apparent at 0.8m depth during excavation. 3. Backfilled with materials arising upon completion. 4. Exploratory hole surveyed in (level and co-ordinates) on completion.

Stability: 1. The sides of the trial pit remained stable during excavation.

Trial Pit Log

Trialpit No
TP111
Sheet 1 of 1

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417459.47 - 417448.45 Level: 62.35	Date 23/01/2020
Location: Huddersfield		Dimensions (m): Depth 3.20	Scale 1:25
Client: Harron Homes			Logged LEW

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.15	62.20		MADE GROUND: Strong light grey CONCRETE with 5mm rebar. 60% aggregate of angular to subrounded fine to coarse gravel. Polythene sheet at base. (CONCRETE HARDSTAND)
	0.30	J,K&T					
				0.40	61.95		MADE GROUND: Yellowish brown clayey sandy angular to subangular fine to coarse GRAVEL of sandstone and rare brick. (SUB-BASE)
▼	0.60	J&K					
			HVP=65				
	1.50	D					
			HVP=54				
			HVP=85				
				3.20	59.15		Firm brown slightly sandy gravelly CLAY with a low cobble content. Gravel is angular to subrounded fine to coarse of predominantly sandstone and rare mudstone. Cobbles are angular tabular of sandstone. (HEAD) *At 0.6m, groundwater seepage.* *From 1.0m, locally clayey sandy gravel.* *From 1.7m, locally feels soft.*

End of pit at 3.20 m

Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2.Groundwater seepage was apparent at 0.6m depth during excavation. 3. Backfilled with materials arising upon completion. 4. Exploratory hole surveyed in (level and co-ordinates) on completion.

Stability: 1. The sides of the trial pit remained stable during excavation.

Trial Pit Log

Trialpit No
TP112E
Sheet 1 of 1

Project Name:	Crossley Lane, Dalton	Project No. 3435	Co-ords: 417403.12 - 417416.29 Level: 62.10	Date 23/01/2020
Location:	Huddersfield		Dimensions (m):	Scale 1:25
Client:	Harron Homes		Depth 3.20	Logged LEW

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Stratum Description
	Depth	Type	Results			
				0.10	62.00	MADE GROUND: Strong light grey CONCRETE with 40% aggregate of subangular to rounded fine to medium gravel. (CONCRETE HARDSTAND)
				0.15	61.95	MADE GROUND: Yellow sandy angular to subangular fine to medium gravel of limestone. (SUB-BASE)
	0.30	J,K&T				
				0.60	61.50	MADE GROUND: Greyish brown sandy gravelly CLAY with a low cobble content of brick. Gravel is angular to subrounded fine to coarse of mixed lithologies including clinker, sandstone, brick, glass and metal. Locally has ashy matrix. (COHESIVE MADE GROUND) *From 0.2m to 1.8m, brick wall running north-south through middle of pit.* *From 0.3m, significant spalling.*
				1.00	61.10	MADE GROUND: Orangish brown and grey slightly gravelly CLAY. Gravel is subangular to subrounded of coal, brick and sandstone. (REWORKED NATURAL GROUND)
▼	1.50	J,K&T				
				2.50	59.60	MADE GROUND: Dark grey clayey sandy angular to subrounded fine to coarse GRAVEL of mixed lithologies including brick and clinker. Medium cobble content of sandstone. (GRANULAR MADE GROUND) *At 1.5m, groundwater inflow with iridescent sheen and strong hydrocarbon odour.*
			HVP=34			
	2.70	J,K&T				
	2.80	D				
			HVP=20			
				3.20	58.90	Soft grey CLAY. (COHESIVE ALLUVIUM) *At 3.2m, pit abandoned due to groundwater inflow and instability.* End of pit at 3.20 m

Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2.Groundwater inflow was apparent at 1.5m depth during excavation. 3. Backfilled with materials arising upon completion. 4. Exploratory hole surveyed in (level and co-ordinates) on completion.

Stability: 1. Spalling of the sides of the trial pit from 0.3m depth during excavation.

Trial Pit Log

Trialpit No **TP112W**

Sheet 1 of 1

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417403.12 - 417416.29 Level: 62.10	Date 23/01/2020
Location: Huddersfield		Dimensions (m): Depth 1.80	Scale 1:25
Client: Harron Homes			Logged LEW

Water Strike	Samples and In Situ Testing Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.10	62.00		MADE GROUND: strong light grey CONCRETE with 40% aggregate of subangular to rounded fine to medium gravel. (CONCRETE HARDSTAND)
				0.15	61.95		MADE GROUND: Yellow sandy angular to subangular fine to medium gravel of limestone. (SUB-BASE)
	0.50	J,K&T					MADE GROUND: Black fine to coarse SAND of ash and angular to subangular fine to coarse GRAVEL of clinker. (ASH & CLINKER) *At 0.15m, 3 inch wide RSJ's crossing pit.*
	0.60	B					
▼							*At 1.5m, groundwater inflow.*
				1.80	60.30		*At 1.8m, concrete slab. Unable to advance trial pit beyond.*

End of pit at 1.80 m

Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2.Groundwater inflow was apparent at 1.5m depth during excavation. 3. Backfilled with materials arising upon completion. 4. Exploratory hole surveyed in (level and co-ordinates) on completion.

Stability: 1. The sides of the trial pit remained stable during excavation.

Trial Pit Log

Trialpit No
TP113
Sheet 1 of 1

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417354.24 - 417428.34 Level: 62.10	Date 23/01/2020
Location: Huddersfield		Dimensions (m):	Scale 1:25
Client: Harron Homes		Depth 3.60	Logged LEW

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.10	62.00		MADE GROUND: Strong light grey CONCRETE with 50% aggregate of angular to subangular fine to medium limestone. 5mm rebar. Blue polythene at base. (CONCRETE HARDSTAND)
				0.15	61.95		MADE GROUND: Yellowish be clayey sandy angular to subangular fine to coarse GRAVEL of limestone. (SUB-BASE)
	0.30	J,K&T					
				0.40	61.70		MADE GROUND: Brownish grey clayey sandy angular to subangular fine to coarse GRAVEL of mixed lithologies including brick, limestone and clinker. Medium cobble content of brick. (GRANULAR MADE GROUND)
	0.70	J,K&T					
	1.10	B					
				1.50	60.60		MADE GROUND: Dark grey fine to coarse SAND of ash and angular to subangular fine to coarse GRAVEL of predominantly clinker, rare metal, sandstone and brick. (ASH & CLINKER) *At 0.5m, 200mm thick concrete slab in south of trial pit.*
			HVP=11				
				1.70	60.40		Very soft orangish brown sandy CLAY. (COHESIVE ALLUVIUM)
			HVP=17				
	1.90	D					
				2.20	59.90		Soft black clayey PEAT with some visible plant fibres. (PEAT) *At 1.7m, strong egg smell associated with peat.*
	2.50	D					
			HVP=31				
	2.70	J&K					
			HVP=24				
				2.80	59.30		Soft greenish grey slightly sandy CLAY. (COHESIVE ALLUVIUM) *At 2.7m, slight organic odour.*
			HVP=50				
			HVP=66				
				3.60	58.50		Firm orangish brown mottled grey slightly sandy slightly gravelly CLAY with a low cobble content. Gravel is subrounded fine to medium of sandstone. Cobbles are subangular to subrounded of sandstone. (COHESIVE ALLUVIUM)
							End of pit at 3.60 m

Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during excavation. 3. Backfilled with materials arising upon completion. 4. Exploratory hole surveyed in (level and co-ordinates) on completion.

Stability: 1. The sides of the trial pit remained stable during excavation.

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Trial Pit Log

Trialpit No
TP114
Sheet 1 of 1

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417436.79 - 417382.11 Level: 62.10	Date 23/01/2020
Location: Huddersfield		Dimensions (m): Depth 1.40	Scale 1:25
Client: Harron Homes			Logged LEW

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.05	J		0.10	62.00	▨	MADE GROUND: Black tarmac. (MACADAM HARDSTAND)
				0.60	61.50	▨	MADE GROUND: Brownish grey slightly clayey sandy angular to rounded fine to coarse GRAVEL of predominantly clinker and sandstone. Low cobble content of brick. (ASH & CLINKER)
▼				1.40	60.70	▨	MADE GROUND: Dark grey slightly clayey slightly sandy angular tabular fine to coarse GRAVEL of predominantly mudstone with rare sandstone and brick. (REWORKED NATURAL GROUND) *At 1.3m, ceramic drain encountered with significant water inflow.*
							End of pit at 1.40 m

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Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2.Significant groundwater inflow was apparent at 1.3m depth during excavation. 3. Backfilled with materials arising upon completion. 4. Exploratory hole surveyed in (level and co-ordinates) on completion.

Stability: 1. The sides of the trial pit remained stable during excavation.

AGS

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Trial Pit Log

Trialpit No **TP115**

Sheet 1 of 1

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417430.16 - 417385.20 Level: 62.15	Date 23/01/2020
Location: Huddersfield		Dimensions (m): Depth 3.90	Scale 1:25
Client: Harron Homes			Logged LEW

Water Strike	Samples and In Situ Testing Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.10	62.05	▨	MADE GROUND: Black tarmac. (MACADAM HARDSTAND)
	0.50	J,K&T					
				0.70	61.45	▨	MADE GROUND: Purplish grey slightly clayey fine to coarse SAND of ash and angular to subangular fine to coarse GRAVEL of clinker. Low cobble content of brick, sandstone and concrete. (ASH & CLINKER) *From 0.2m to 1.2m, brick wall in east of trial pit.*
				1.10	61.05	▨	MADE GROUND: Brown slightly clayey sandy angular to subangular tabular fine to coarse GRAVEL of mudstone and sandstone. (REWORKED NATURAL GROUND) *Spalling of sides of trial pit in made ground.*
▼	1.50	J,K&T					
				1.70	60.45	▨	MADE GROUND: Greyish brown clayey sandy gravelly angular to subangular tabular COBBLES of sandstone and brick. High boulder content of sandstone and concrete up to 1m across. *At 1.5m, groundwater inflow.*
			HVP=24				
	2.50	D					
			HVP=30				
				2.70	59.45		Soft light brown slightly sandy slightly gravelly CLAY. Gravel is subangular to rounded fine to medium of mixed lithologies. (COHESIVE ALLUVIUM)
				3.50	58.65		Orangish brown very clayey sandy angular to subrounded fine to coarse GRAVEL of predominantly sandstone. (GRANULAR GLACIOFLUVIAL DEPOSITS)
				3.90	58.25		Greyish brown clayey sandy angular to rounded fine to coarse GRAVEL of predominantly sandstone and mudstone. (GRANULAR GLACIOFLUVIAL DEPOSITS)
							End of pit at 3.90 m

Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2.Groundwater inflow was apparent at 1.5m depth during excavation. 3. Backfilled with materials arising upon completion. 4. Exploratory hole surveyed in (level and co-ordinates) on completion.

Stability: 1. Spalling of the sides of the trial pit in made ground during excavation.

AGS

Trial Pit Log

Trialpit No	**TP116**
	Sheet 1 of 1

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417501.38 - 417332.09 Level: 62.40	Date 23/01/2020
Location: Huddersfield		Dimensions (m): Depth 4.00	Scale 1:25
Client: Harron Homes			Logged LT

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
						░	MADE GROUND: Grey CONCRETE. (CONCRETE HARDSTAND)
	0.20	J,K&T		0.15	62.25	▨	MADE GROUND: Brown and orange very sandy angular to subangular fine to coarse GRAVEL of brick, sandstone and clinker. Sand is fine to coarse. Occasional ash. (GRANULAR MADE GROUND)
	0.70	J,K&T		0.45	61.95	▨	MADE GROUND: Grey very clayey very sandy angular to subangular tabular GRAVEL of mudstone. Sand is fine to coarse. (REWORKED NATURAL GROUND)
▼							
				1.10	61.30	▤	Soft grey sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is subrounded of sandstone. (COHESIVE ALLUVIUM) *At 1.1m, groundwater seepage.*
	1.50	J,K&T	HVP=52			▤	*From 1.7m, mottled light grey.* *From 2.0m, mottled orangish brown and grey.*
				2.50	59.90	░	Grey and orangish brown sandy subangular to rounded GRAVEL of sandstone and mudstone with a medium cobble content. Sand is coarse. Cobbles are subangular to sandstone. (GRANULAR ALLUVIUM)
	3.80	J&K		3.70	58.70	▤	Soft dark grey slightly gravelly sandy CLAY with rare organic material. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of mudstone. (COHESIVE ALLUVIUM)
				4.00	58.40		End of pit at 4.00 m

Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater seepage was apparent at 1.1m depth during excavation. 3. Backfilled with materials arising upon completion. 4. Exploratory hole surveyed in (level and co-ordinates) on completion.

Stability: 1. The sides of the trial pit remained stable during excavation.

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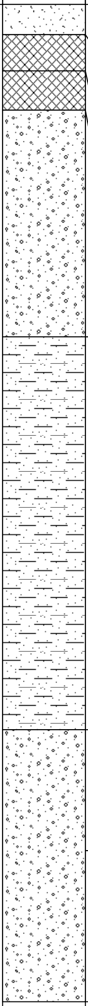
Trial Pit Log

Trialpit No
TP117
Sheet 1 of 1

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417545.51 - 417306.74 Level: 63.05	Date 23/01/2020
Location: Huddersfield		Dimensions (m):	Scale 1:25
Client: Harron Homes		Depth 3.30	Logged LT



Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.10	62.95		MADE GROUND: Reinforced grey CONCRETE. (CONCRETE HARDSTAND)
	0.15	J,K&T		0.22	62.83		MADE GROUND: Light brown sandy angular to subrounded GRAVEL of mixed lithologies. (SUB-BASE)
	0.25	J&K		0.35	62.70		MADE GROUND: Tarmac. (MACADAM HARDSTAND)
▼				1.10	61.95		Grey and orange very sandy very clayey angular to subangular fine to coarse GRAVEL of mudstone and sandstone with a low cobble content. Cobbles are subangular of mudstone. (GRANULAR ALLUVIUM)
	1.30	J,K&T	HVP=32 HVP=38	2.40	60.65		Soft grey slightly sandy CLAY. Sand is fine. (COHESIVE ALLUVIUM) *At 1.1m, fast groundwater inflow.*
				3.30	59.75		Brown and grey sandy angular to subangular fine to coarse GRAVEL of mudstone, sandstone and siltstone with a low cobble content and rare boulders. Cobbles and boulders are subangular of mudstone and sandstone. (GRANULAR GLACIOFLUVIAL DEPOSITS) *From 2.8m, unstable.*
							End of pit at 3.30 m

Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Fast groundwater inflow was apparent at 1.1m depth during excavation. 3. Backfilled with materials arising upon completion. 4. Exploratory hole surveyed in (level and co-ordinates) on completion.

Stability: 1. The sides of the trial pit were unstable from 2.8m depth during excavation.

AGS

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Trial Pit Log

Trialpit No **TP118**

Sheet 1 of 1

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417513.11 - 417368.30 Level: 65.10	Date 23/01/2020
Location: Huddersfield		Dimensions (m):	Scale 1:25
Client: Harron Homes		Depth 3.50	Logged LT

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.20	J,K&T				▩	MADE GROUND: Brown and orange very sandy angular to subangular fine to coarse GRAVEL of brick, concrete and sandstone. (GRANULAR MADE GROUND)
	0.50	J,K&T		0.30	64.80	▨	Beige sandy clayey angular to subangular fine to coarse sandstone GRAVEL with a medium cobble content. Cobbles are subangular of sandstone. Occasional lenses of gravelly CLAY. (GRANULAR ALLUVIUM) *At 0.30m brick walls in West and middle of pit. Possible foundation at 2.0m.*
				2.00	63.10	▤	Soft to firm bluish grey slightly gravelly sandy CLAY. Sand is fine. (COHESIVE ALLUVIUM)
				3.50	61.60		End of pit at 3.50 m

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Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during excavation. 3. Backfilled with materials arising upon completion. 4. Exploratory hole surveyed in (level and co-ordinates) on completion.

Stability: 1. The sides of the trial pit remained stable during excavation.

AGS

Trial Pit Log

Trialpit No
TP118A
Sheet 1 of 1

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417485.93 - 417390.98 Level: 64.60	Date 23/01/2020
Location: Huddersfield		Dimensions (m): Depth 3.30	Scale 1:25
Client: Harron Homes			Logged LT

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
						▩	MADE GROUND: Orange and grey very sandy angular to subangular fine to coarse GRAVEL of brick, concrete and sandstone with a high cobble content and frequent boulders. Cobbles are angular to subangular of brick, concrete and sandstone. Boulders are subangular of limestone. (GRANULAR MADE GROUND)
	1.00	J,K&T					
				2.00	62.60	▤	Firm greyish brown and bluish brown slightly gravelly sandy CLAY. Gravel is angular to subangular fine to coarse of mudstone and sandstone. Sand is fine to coarse. (COHESIVE ALLUVIUM)
	2.30	J&K					
							At 2.5m, too gravelly for vane.
	3.00	B					
				3.30	61.30		End of pit at 3.30 m

Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during excavation. 3. Backfilled with materials arising upon completion. 4. Exploratory hole surveyed in (level and co-ordinates) on completion.

Stability: 1. The sides of the trial pit remained stable during excavation.

LITHOS CONSULTING

Trial Pit Log

Trialpit No
TP119
Sheet 1 of 1

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417485.93 - 417390.98 Level: 64.60	Date 23/01/2020
Location: Huddersfield		Dimensions (m): Depth 2.80	Scale 1:25
Client: Harron Homes			Logged LT

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
						▨	MADE GROUND: Comprising of bricks and blocks of concrete, 80%. Gravel and sand matrix, angular to subangular of brick. Sand is fine to coarse. Concrete breezeblocks, 400mm x 120mm x 120mm. Occasional tiles and metal pieces. (BRICKFILL)
	0.70	J,K&T				▨	
						▨	*At 1.8m, 1 no. metal pipe, rusted steel.*
▼						▨	*At 2.7m, groundwater seepage.* *From 2.8m, unable to excavate further due to steel girders at base of pit.*
				2.80	61.80		End of pit at 2.80 m

1
2
3
4
5

Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2.Groundwater seepage was apparent at 2.7m depth during excavation. 3. Backfilled with materials arising upon completion. 4. Exploratory hole surveyed in (level and co-ordinates) on completion.

Stability: 1. The sides of the trial pit remained stable during excavation.

AGS

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Trial Pit Log

Trialpit No	**TP120**	Sheet 1 of 1	
Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417404.58 - 417289.75 Level: 62.20	Date 24/01/2020
Location: Huddersfield		Dimensions (m):	Scale 1:25
Client: Harron Homes		Depth 4.10	Logged LEW

Water Strike	Samples and In Situ Testing Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.15	62.05		MADE GROUND: Strong light grey CONCRETE with 60% aggregate of subrounded to rounded fine to medium gravel of mixed lithologies. 5mm and 20mm rebar. Polythene sheet at base. (CONCRETE HARDSTAND)
				0.50	61.70		MADE GROUND: Light brown clayey sandy subangular to rounded fine to coarse GRAVEL of predominantly sandstone with rare brick and mudstone. (SUB-BASE)
	0.60	J,K&T					
				0.90	61.30		MADE GROUND: Dark grey slightly sandy very gravelly CLAY with a low cobble content. Gravel is subangular to rounded fine to coarse of predominantly mudstone. Rare brick, sandstone and metal. Cobbles of sandstone. (COHESIVE MADE GROUND)
	1.00	J,K&T					
				1.20	61.00		MADE GROUND: Dark grey and black slightly gravelly organic rich CLAY. Gravel is subangular to subrounded fine to medium of mixed lithologies including coal and brick. Visible plant remains. (REWORKED NATURAL GROUND) *At 1.0m, hydrocarbon odour.*
	1.40	J,K&T					
				1.80	60.40		MADE GROUND: Light brown slightly sandy CLAY with rare gravel of brick and ceramic. (REWORKED NATURAL GROUND) *From 1.6m, collapse of sides of trial pit walls.*
				3.10	59.10		MADE GROUND: Very soft light brown sandy gravelly CLAY. Gravel is subangular to rounded fine to coarse of predominantly sandstone with rare brick. (REWORKED NATURAL GROUND)
▼							
	3.40	J&K					
				4.10	58.10		Orangish brown clayey sandy subangular to rounded fine to coarse GRAVEL of predominantly sandstone. Low cobble content of sandstone. (GRANULAR GLACIOFLUVIAL DEPOSITS) *At 3.2m, groundwater seepage.* *From 3.3m, strong hydrocarbon odour and sheen on groundwater.* *At 4.1m, major collapse.*
							End of pit at 4.10 m

Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2.Groundwater seepage was apparent at 3.2m depth during excavation. 3. Backfilled with materials arising upon completion. 4. Exploratory hole surveyed in (level and co-ordinates) on completion.

Stability: 1. The sides of the trial pit were unstable from1.6m depth during excavation with major collapse at 4.1m.

AGS

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Trial Pit Log

Trialpit No
TP121
Sheet 1 of 1

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417463.37 - 417287.94 Level: 62.20	Date 24/01/2020
Location: Huddersfield		Dimensions (m):	Scale 1:25
Client: Harron Homes		Depth 4.20	Logged LEW

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.15	62.05		MADE GROUND: Strong light grey CONCRETE with 70% aggregate of subrounded to rounded fine to medium gravel. 7mm rebar. Polythene sheet at base. (CONCRETE HARDSTAND)
	0.20	J,K&T					
				0.40	61.80		MADE GROUND: Brown clayey sandy subangular to subrounded fine to coarse GRAVEL of predominantly sandstone with rare brick and plastic. (SUB-BASE)
	0.50	J,K&T					
				0.60	61.60		MADE GROUND: Dark grey clayey sandy angular to subrounded fine to coarse GRAVEL of predominantly brick and sandstone with rare clinker, coal, mudstone and metal. Low cobble content of brick and sandstone. (GRANULAR MADE GROUND)
				1.40	60.80		MADE GROUND: Brown slightly sandy gravelly CLAY with a low cobble content. Gravel is angular to subrounded fine to coarse of predominantly sandstone and mudstone with rare brick. Low cobble content of sandstone. (REWORKED NATURAL GROUND) *In west of trial pits, cobbles and boulders of sandstone (possible former culvert).*
▼							
	1.60	D					
			HVP=30				
			HVP=42				
			HVP=24				
				2.70	59.50		Soft grey CLAY. (COHESIVE ALLUVIUM) *At 1.5m, groundwater seepage.*
▼							
	3.00	D					
				3.30	58.90		Orangish brown clayey sandy subangular to rounded fine to coarse GRAVEL of predominantly sandstone. Low cobble content of sandstone. (GRANULAR GLACIOFLUVIAL DEPOSITS) *From 2.7m, spalling of sides of trail pit.* *At 2.9m, groundwater seepage.*
				4.20	58.00		Dark grey clayey sandy subangular to rounded fine to coarse GRAVEL of predominantly mudstone and sandstone. Low cobble content of sandstone. (GRANULAR GLACIOFLUVIAL DEPOSITS) *From 3.7m, difficult to excavate due to cobbles.*
							End of pit at 4.20 m

Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2.Groundwater seepage was apparent at 1.5m and 2.9m depth during excavation. 3. Backfilled with materials arising upon completion. 4. Exploratory hole surveyed in (level and co-ordinates) on completion.

Stability: 1. Spalling of the sides of the trial pit from 2.7m depth during excavation.

AGS

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Trial Pit Log

Trialpit No
TP122
Sheet 1 of 1

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417525.66 - 417244.67 Level: 62.25	Date 24/01/2020
Location: Huddersfield		Dimensions (m): Depth 3.80	Scale 1:25
Client: Harron Homes			Logged LEW

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.10	62.15		MADE GROUND: Strong light grey CONCRETE. 50% aggregate of subangular to rounded fine to medium gravel of mixed lithologies. 7mm rebar. Polythene sheet at base. (CONCRETE HARDSTAND)
	0.30	J,K&T					
				0.40	61.85		MADE GROUND: Light brown clayey sandy subangular to subrounded fine to coarse GRAVEL of predominantly sandstone. Rare brick, metal and cloth. Medium cobble content of sandstone and brick. (GRANULAR MADE GROUND)
	0.60	J,K&T					
	0.70	B					
				0.80	61.45		MADE GROUND: Dark grey clayey sandy angular to subrounded fine to coarse GRAVEL of mixed lithologies including mudstone, sandstone, ceramic and brick. (GRANULAR MADE GROUND)
	0.90	D					
			HVP=65				
			HVP=50				
				1.60	60.65		Firm brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to medium of sandstone. (COHESIVE ALLUVIUM) *From 1.3m, major spalling.*
			HVP=24				
▼				2.10	60.15		Soft orangish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to rounded fine to medium of sandstone. (COHESIVE ALLUVIUM)
	2.20	J&K					
				2.70	59.55		Orangish brown very clayey sandy subangular to rounded fine to coarse GRAVEL of predominantly sandstone. Low cobble and boulder content up to 400mm across. (GRANULAR GLACIOFLUVIAL DEPOSITS) *At 2.1m, groundwater inflow.*
	3.20	D					
				3.80	58.45		Greyish brown and dark grey clayey sandy subrounded to rounded fine to coarse GRAVEL of mudstone and sandstone. (GRANULAR GLACIOFLUVIAL DEPOSITS) *At 3.4m, cobble of rotting wood.*
							End of pit at 3.80 m

Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2.Groundwater inflow was apparent at 2.1m depth during excavation. 3. Backfilled with materials arising upon completion. 4. Exploratory hole surveyed in (level and co-ordinates) on completion.

Stability: 1. Major spalling of the sides of the trial pit from 1.3m depth during excavation.

AGS

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Trial Pit Log

Trialpit No
TP123
Sheet 1 of 1

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417450.89 - 417258.58 Level: 62.20	Date 24/01/2020
Location: Huddersfield		Dimensions (m): Depth 3.10	Scale 1:25
Client: Harron Homes			Logged LEW

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.15	62.05		MADE GROUND: Strong light grey CONCRETE with 60% aggregate of subangular to rounded fine to medium gravel of mixed lithologies. 7mm rebar. Polythene sheet at base. (CONCRETE HARDSTAND)
	0.40	J,K&T		0.60	61.60		MADE GROUND: Light brown clayey sandy angular to rounded fine to coarse GRAVEL of predominantly sandstone. Rare brick, limestone and coal. (SUB-BASE)
	0.80	J,K&T		1.00	61.20		MADE GROUND: Brown slightly sandy gravelly CLAY. Gravel is subangular to subrounded fine to coarse of predominantly sandstone. Low cobble content of sandstone. (REWORKED NATURAL GROUND)
▼	1.20	J,K&T					Soft grey slightly sandy CLAY. (COHESIVE ALLUVIUM) *At 1.1m, significant groundwater inflow with strong hydrocarbon odour and iridescent sheen.* *Major overbreak of trial pit walls in west due to cobbles and boulders.* *Between 1.1m and 3.1m in west of pit, cobbles and boulders of sandstone and brick (possible former culvert).*
			HVP=13				
	2.20	J&K	HVP=22				
				3.10	59.10		*Trial pit abandoned at 3.1m due to groundwater inflow and instability.*

End of pit at 3.10 m

Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2.Significant groundwater inflow was apparent at 1.1m depth during excavation. 3. Backfilled with materials arising upon completion. 4. Exploratory hole surveyed in (level and co-ordinates) on completion.

Stability: 1. Major overbreak of the sides of the trial pit from 1.1m depth during excavation.

AGS

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Trial Pit Log

Trialpit No **TP124N**

Sheet 1 of 1

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417438.73 - 417258.44 Level: 62.25	Date 24/01/2020
Location: Huddersfield		Dimensions (m): Depth 2.10	Scale 1:25
Client: Harron Homes			Logged LEW

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.15	62.10		MADE GROUND: Light grey CONCRETE with 60% aggregate of subangular to rounded fine to medium gravel of mixed lithologies. 7mm rebar. Polythene sheet at base. (CONCRETE HARDSTAND)
				0.30	61.95		MADE GROUND: Light brown slightly clayey sandy angular to subangular fine to coarse GRAVEL of sandstone. (SUB-BASE)
				0.60	61.65		MADE GROUND: Dark grey sandy angular to subrounded fine to coarse GRAVEL of mixed lithologies including clinker, coal, brick, sandstone and mudstone. Low cobble content of brick. (GRANULAR MADE GROUND)
				1.00	61.25		MADE GROUND: Orangish brown slightly sandy slightly gravelly CLAY. Gravel is angular to subangular tabular fine to coarse of siltstone and sandstone. (REWORKED NATURAL GROUND) *Slight spalling of trial pit walls in made ground.*
▼	1.50	D	HVP=15				Soft greyish brown CLAY. (COHESIVE ALLUVIUM) *At 1.3m, inflow of black water with strong hydrocarbon odour and iridescent sheen.*
			HVP=30	2.10	60.15		*Unable to excavate beyond 2.1m due to brick wall/obstruction.*

End of pit at 2.10 m

Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during excavation. 3. Backfilled with materials arising upon completion. 4. Exploratory hole surveyed in (level and co-ordinates) on completion.

Stability: 1. Slight spalling of the sides of the trial pit in made ground during excavation.

AGS

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Trial Pit Log

Trialpit No
TP124S
Sheet 1 of 1

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417438.73 - 417258.44 Level: 62.25	Date 24/01/2020
Location: Huddersfield		Dimensions (m): Depth 2.10	Scale 1:25
Client: Harron Homes			Logged LEW

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.15	62.10	░	MADE GROUND: Strong light grey CONCRETE with 60% aggregate of subangular to rounded fine to medium gravel of mixed lithologies. 7mm rebar. Polythene sheet at base. (CONCRETE HARDSTAND)
				0.30	61.95	▨	MADE GROUND: Light brown slightly clayey sandy angular to subangular fine to coarse GRAVEL of sandstone. (SUB-BASE)
	0.50	J,K&T					
				0.60	61.65	▨	MADE GROUND: Dark grey sandy angular to subrounded fine to coarse GRAVEL of mixed lithologies including clinker, coal, brick, sandstone and mudstone. Low cobble content of brick. (GRANULAR MADE GROUND)
▼	1.30	J,K&T					
				2.10	60.15	▨	MADE GROUND: Black slightly clayey sandy angular to subangular fine to coarse GRAVEL of mixed lithologies including sandstone, brick, metal, timber and clinker. High cobble content of brick and sandstone. (GRANULAR MADE GROUND) *From 0.6 to 2.1m, brick wall in South of pit.* *At 1.3m, inflow of black water with strong hydrocarbon odour and iridescent sheen.* *Unable to excavate beyond 2.1m due to brick wall/obstruction.* End of pit at 2.10 m

Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2.Groundwater inflow was apparent at 1.3m depth during excavation. 3. Backfilled with materials arising upon completion. 4. Exploratory hole surveyed in (level and co-ordinates) on completion.

Stability: 1. Slight spalling of the sides of the trial pit in made ground during excavation.

AGS

LITHOS CONSULTING	# Trial Pit Log	Trialpit No **TP125** Sheet 1 of 1

Project Name:	Crossley Lane, Dalton	Project No. 3435	Co-ords: 417496.20 - 417379.89 Level: 64.90	Date 23/01/2020
Location:	Huddersfield		Dimensions (m):	Scale 1:25
Client:	Harron Homes		Depth 1.40	Logged LT

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
						▨	MADE GROUND: Comprising of bricks, concrete cobbles and boulders. Matrix is gravel and sand. Brick walls (BRICKFILL)
	1.40	T		1.40	63.50		*At 1.4m, pit terminated due to possible asbestos containing material.* End of pit at 1.40 m

Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during excavation. 3. Backfilled with materials arising upon completion. 4. Exploratory hole surveyed in (level and co-ordinates) on completion.

Stability: 1. The sides of the trial pit remained stable during excavation.

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Trial Pit Log

Trialpit No **TP126**
Sheet 1 of 1

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417337.44 - 417472.73 Level: 60.50	Date 24/01/2020
Location: Huddersfield		Dimensions (m): 2.8 × 0.9 Depth 3.40	Scale 1:25
Client: Harron Homes			Logged CC

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.20	60.30		MADE GROUND: Light grey reinforced CONCRETE. Cement 55%. Gravel 40%. Voids 5%. (CONCRETE HARDSTAND)
	0.40	J&T					
				0.70	59.80		MADE GROUND: Light greyish brown gravelly SAND. Gravel is subangular to subrounded fine to coarse of mixed lithologies including brick, limestone, mudstone, sandstone and rare full and half bricks. (SUB-BASE)
	0.90	D					
				1.30	59.20		Dark brown slightly clayey sandy angular to subrounded fine to coarse GRAVEL of mixed lithologies including mudstone, coal and sandstone. (HEAD)
	1.50	D					
			HVP=28				
			HVP=50				
▼				2.00	58.50		Soft light orange and grey mottled slightly gravelly sandy CLAY. Gravel is angular to subrounded fine to medium of mixed lithologies including mudstone, sandstone and weathered ironstone. (HEAD)
				2.70	57.80		Reddish brown slightly clayey sandy angular to rounded fine to coarse GRAVEL of sandstone. (GRANULAR GLACIOFLUVIAL DEPOSITS) *At 2.0m, groundwater seepage.*
	2.90	D					
				3.40	57.10		Dark bluish grey slightly clayey sandy angular to rounded fine to coarse GRAVEL of mudstone and sandstone. (GRANULAR GLACIOFLUVIAL DEPOSITS) *From 2.7m, spalling of sides of trail pit.*
							End of pit at 3.40 m

Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2.Groundwater seepage was apparent at 2.0m depth during excavation. 3. Backfilled with materials arising upon completion. 4. Exploratory hole surveyed in (level and co-ordinates) on completion.

Stability: 1. Spalling of the sides of the trial pit between 2.7m and 3.2m depth during excavation.

AGS

Trial Pit Log

Trialpit No **TP127**

Sheet 1 of 1

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417348.67 - 417499.45 Level: 60.60	Date 24/01/2020
Location: Huddersfield		Dimensions (m): 3 × 0.9 Depth 2.50	Scale 1:25
Client: Harron Homes			Logged CC

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.30	60.30		MADE GROUND: Light grey reinforced CONCRETE. Gravel 50%. Cement 48%. Voids 2%. (CONCRETE HARDSTAND)
▼	0.50	J,K&T		0.70	59.90		MADE GROUND: Dark grey slightly clayey sandy ashy angular to subangular fine to coarse GRAVEL of mixed lithologies including wood, brick and mudstone. (GRANULAR MADE GROUND) *At 0.4m, natural organic odour.* *At 0.4m, groundwater seepage from small hole - not pipe.*
	0.80 1.00	J D	HVP=50	1.20	59.40		Firm light grey mottled grey slightly sandy gravelly CLAY. Gravel is subangular to subrounded fine to coarse of sandstone and mudstone. (HEAD)
				2.50	58.10		Light grey slightly sandy clayey angular to subangular fine to coarse GRAVEL of sandstone and mudstone. (GRANULAR GLACIOFLUVIAL DEPOSITS) *At 2.50m, unable to excavate further due to unseen obstruction.*

End of pit at 2.50 m

Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2.Groundwater seepage was apparent at 0.4m depth during excavation. 3. Backfilled with materials arising upon completion. 4. Exploratory hole surveyed in (level and co-ordinates) on completion.

Stability: 1. The sides of the trial pit remained stable during excavation.

Trial Pit Log

Trialpit No **TP128**
Sheet 1 of 1

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417323.13 - 417537.71 Level: 60.60	Date 24/01/2020
Location: Huddersfield		Dimensions (m): 2.6 × 0.8 Depth 2.80	Scale 1:25
Client: Harron Homes			Logged CC

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.20	60.40		MADE GROUND: Light grey reinforced CONCRETE. (CONCRETE HARDSTAND)
	0.60	J&T		1.10	59.50		Dark greyish brown slightly sandy gravelly CLAY. Gravel is angular to subangular fine to coarse of sandstone and mudstone. (REWORKED NATURAL GROUND)
	1.30	D		1.60	59.00		Light greyish brown very clayey angular to subangular fine to coarse GRAVEL of sandstone and mudstone. (HEAD) *From 1.1m to 1.6m, round sandstone in west face of pit.*
	1.80	D	HVP=118	2.20	58.40		Stiff light orange and grey mottled slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of sandstone and mudstone. (HEAD)
▼				2.80	57.80		Light greyish brown slightly clayey sandy subangular to rounded fine to coarse GRAVEL of mixed lithologies. (GRANULAR GLACIOFLUVIAL DEPOSITS) *At 2.2m, groundwater seepage.*

End of pit at 2.80 m

Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2.Groundwater seepage was apparent at 2.2m depth during excavation. 3. Backfilled with materials arising upon completion. 4. Exploratory hole surveyed in (level and co-ordinates) on completion.

Stability: 1. The sides of the trial pit remained stable during excavation.

Trial Pit Log

Trialpit No
TP129
Sheet 1 of 1

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417286.22 - 417520.91 Level: 60.60	Date 24/01/2020
Location: Huddersfield		Dimensions (m): 2.8 × 0.9 Depth 3.30	Scale 1:25
Client: Harron Homes			Logged CC

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.20	60.40		MADE GROUND: Light grey reinforced CONCRETE. Matrix 40%. Cement 59%. Voids 1%. (CONCRETE HARDSTAND)
	0.40	J&T		0.60	60.00		Light brown slightly gravelly SAND. Gravel is angular to subangular of sandstone. (SUB-BASE)
	0.90	J&T		2.10	58.50		Dark brownish grey clayey angular to subangular fine to coarse GRAVEL of mixed lithologies including sandstone and mudstone. (HEAD) *At 0.6m, terracotta drain, 15cm diameter along west face of pit.*
	 2.40	 D	HVP=49 	2.80	57.80		Firm light orange and grey mottled slightly gravelly CLAY. Gravel is angular to subangular fine to coarse of sandstone and mudstone. (HEAD)
▼				3.30	57.30		Light brown slightly sandy clayey subangular to subrounded fine to coarse GRAVEL of sandstone. (GRANULAR GLACIOFLUVIAL DEPOSITS) *At 2.8m, groundwater seepage.*
							End of pit at 3.30 m

Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2.Groundwater seepage was apparent at 2.8m depth during excavation. 3. Backfilled with materials arising upon completion. 4. Exploratory hole surveyed in (level and co-ordinates) on completion.

Stability: 1. The sides of the trial pit remained stable during excavation.

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Trial Pit Log

Trialpit No
TP130
Sheet 1 of 1

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417450.52 - 417380.62 Level: 62.20	Date 23/01/2020
Location: Huddersfield		Dimensions (m): Depth 3.70	Scale 1:25
Client: Harron Homes			Logged LT

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.30	J,K&T				▨	MADE GROUND: Brown sandy angular to subangular GRAVEL of tarmac and clinker. Sand is fine to coarse of ash. (GRANULAR MADE GROUND) *From 0.4m, black.*
	0.60	J,K&T		0.55	61.65	▨	MADE GROUND: Reddish brown sandy angular to subangular fine to coarse GRAVEL of slag, clinker and brick. Sand is fine to coarse. (GRANULAR MADE GROUND) *From 0.80m, gravel is medium to coarse with occasional clinker and slag cobbles.*
▼			HVP=10	1.80	60.40	▤	Soft dark grey slightly sandy CLAY. Sand is fine. Slight organic odour. (COHESIVE ALLUVIUM) *At 1.8m, groundwater strike.* *From 2.0m, greenish grey mottled light brown.*
	1.90	J,K&T					
			HVP=22				
	2.20	T					
				3.70	58.50		End of pit at 3.70 m

Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2.Groundwater strike at 1.8m depth during excavation. 3. Backfilled with materials arising upon completion. 4. Exploratory hole surveyed in (level and co-ordinates) on completion.

Stability: 1. The sides of the trial pit remained stable during excavation.

AGS

Trial Pit Log

Trialpit No
TP131
Sheet 1 of 1

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417440.55 - 417244.27 Level: 62.15	Date 24/01/2020
Location: Huddersfield		Dimensions (m): Depth 2.60	Scale 1:25
Client: Harron Homes			Logged LEW

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.15	62.00		MADE GROUND: Strong Light grey CONCRETE 70% aggregate of subrounded to rounded fine to coarse GRAVEL of mixed lithologies. 7mm rebar. Polythene sheet at base. (CONCRETE HARDSTAND)
				0.70	61.45		MADE GROUND: Yellowish brown slightly clayey sandy subangular to rounded fine to coarse GRAVEL of predominantly sandstone with rare brick. (SUB-BASE)
	0.80	J,K&T					
▼	1.10	J,K&T					
				1.20	60.95		MADE GROUND: Purplish grey slightly clayey sandy angular to rounded fine to coarse GRAVEL of predominantly clinker with rare brick and sandstone. (ASH & CLINKER) *At 0.7m, 2nd concrete slab 0.25m thick in east of pit.* *At 1.1m, significant inflow of black water with strong hydrocarbon odour and iridescent sheen.*
	1.30	J&K					
				2.60	59.55		MADE GROUND: Black clayey sandy angular to subrounded fine to coarse GRAVEL of mixed lithologies including sandstone, clinker, wood, brick and felt with strong oil/tar odour. (GRANULAR MADE GROUND)
							End of pit at 2.60 m

Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Significant groundwater inflow was apparent at 1.1m depth during excavation. 3. Backfilled with materials arising upon completion. 4. Exploratory hole surveyed in (level and co-ordinates) on completion.

Stability: 1. The sides of the trial pit remained stable during excavation.

AGS

Trial Pit Log

Trialpit No
TP132
Sheet 1 of 1

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417455.66 - 417239.96 Level: 62.40	Date 24/01/2020
Location: Huddersfield		Dimensions (m): Depth 3.30	Scale 1:25
Client: Harron Homes			Logged LEW

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.40	62.00		MADE GROUND: Strong light grey CONCRETE with 50% aggregate of subrounded to rounded fine to coarse gravel of mixed lithologies. Significant reinforcing with 10mm rebar. (CONCRETE HARDSTAND)
	0.50	J,K&T		0.80	61.60		MADE GROUND: Light brown slightly clayey sandy subangular to rounded fine to coarse GRAVEL of sandstone. (SUB-BASE)
				1.10	61.30		MADE GROUND: Dark grey clayey sandy angular to subrounded fine to coarse GRAVEL of sandstone, mudstone, brick and coal. (GRANULAR MADE GROUND)
	1.20 1.50	J&K D		2.80	59.60		Soft brown CLAY. (COHESIVE ALLUVIUM)
	2.90	J&K		3.30	59.10		Greyish brown and light brown very clayey sandy subrounded to rounded fine to coarse GRAVEL of predominantly sandstone. Medium cobble content of sandstone. (GRANULAR GLACIOFLUVIAL DEPOSITS) *At 2.9m, slight odour.* *At 3.3m, difficult to excavate beyond due to cobbles.*

End of pit at 3.30 m

Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during excavation. 3. Backfilled with materials arising upon completion. 4. Exploratory hole surveyed in (level and co-ordinates) on completion.

Stability: 1. The sides of the trial pit remained stable during excavation.

LITHOS CONSULTING

Trial Pit Log

Trialpit No
TP133
Sheet 1 of 1

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417569.79 - 417239.02 Level: 62.35	Date 11/02/2020
Location: Huddersfield		Dimensions (m): Depth 3.20	Scale 1:25
Client: Harron Homes			Logged LT

Water Strike	Samples and In Situ Testing Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.15	62.20		MADE GROUND: Grey reinforced CONCRETE. (CONCRETE HARDSTAND)
				0.50	61.85		MADE GROUND: Brown sandy angular to subangular fine to coarse GRAVEL of mixed lithologies. (SUB-BASE)
	0.70	T	HVP=52				Firm greyish brown slightly gravelly slightly sandy CLAY. Gravel is subangular fine to coarse of SANDSTONE. Sand is fine to coarse. (HEAD)
▼	1.00	J		1.60	60.75		*At 0.9m, groundwater. Slight petrol odour.*
	1.80	J&K					Brown and grey very clayey sandy angular to subrounded fine to coarse GRAVEL of sandstone, mudstone and siltstone with low cobble content. Sand is fine to coarse. Cobbles are subangular sandstone. Strong petrol odour. (GRANULAR GLACIOFLUVIAL DEPOSITS)
	2.80	J&K		3.20	59.15		*From 2.9m, unstable.*

End of pit at 3.20 m

1
2
3
4
5

Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was apparent at 0.9m during excavation. 3. Backfilled with materials arising upon completion. 4. Exploratory hole surveyed in (level and co-ordinates) on completion.

Stability: 1. The sides of the trial pit were unstable from 2.9m depth during excavation.

AGS

Trial Pit Log

LITHOS CONSULTING

Trialpit No **TP134**
Sheet 1 of 1

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417365.35 - 417333.47 Level: 60.90	Date 11/02/2020
Location: Huddersfield		Dimensions (m): Depth 3.20	Scale 1:25
Client: Harron Homes			Logged LT

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.18	60.72		MADE GROUND: Grey reinforced CONCRETE. (CONCRETE HARDSTAND)
				0.35	60.55		MADE GROUND: Grey sandy angular to subangular fine to coarse GRAVEL of mixed lithologies. (SUB-BASE)
	0.40	J,K&T		0.50	60.40		MADE GROUND: Grey sandy clayey angular to subangular fine to coarse GRAVEL of sandstone, limestone and rare clinker. Sand is fine to coarse. (GRANULAR MADE GROUND)
	0.70 0.90	J&K T	HVP=64 HVP=52	2.20	58.70		Firm grey slightly gravelly slightly sandy CLAY. Gravel is subangular fine to coarse of mudstone and sandstone. Sand is fine to coarse. (HEAD) *At 0.5m, white membrane.* *From 1.2m, clay is gravelly, orangish brown mottled light grey. Gravel is subangular of mudstone and rare coal.* *From 1.6, orange. Gravel is subangular of sandstone.*
	2.40	J&K		3.20	57.70		Dark grey very clayey sandy angular to subangular fine to coarse GRAVEL of mudstone siltstone and sandstone. Sand is fine to coarse. (GRANULAR GLACIOFLUVIAL DEPOSITS)
							End of pit at 3.20 m

1
2
3
4
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Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during excavation. 3. Backfilled with materials arising upon completion. 4. Exploratory hole surveyed in (level and co-ordinates) on completion.

Stability: 1. The sides of the trial pit remained stable during excavation.

AGS

Appendix G

Dynamic Sample Borehole Logs

Borehole Log

LITHOS CONSULTING	Borehole Log		Borehole No. **WS101** Sheet 1 of 1
Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417518.12 - 417339.88	Hole Type WS
Location: Huddersfield		Level: 62.40	Scale 1:25
Client: Harron Homes		Dates: 28/01/2020 - 28/01/2020	Logged By LT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.10	62.30		MADE GROUND: Light grey CONCRETE. (CONCRETE HARDSTAND)
					2.20	60.20		MADE GROUND: Black and orange sandy angular to subangular fine to coarse GRAVEL of brick, clinker and sandstone with a low cobble content. Sand is fine to coarse. Cobbles are brick. (GRANULAR MADE GROUND)
					2.50	59.90		Soft greenish grey sandy CLAY. Sand is fine to coarse. (COHESIVE ALLUVIUM)
					3.00	59.40		Firm light brown mottled grey gravelly slightly sandy CLAY. Gravel is subangular fine to coarse sandstone and mudstone. (COHESIVE ALLUVIUM)
								End of borehole at 3.00 m

Remarks
1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during drilling. 3. Exploratory hole surveyed in (level and co-ordinates) on completion.

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Borehole Log

				Borehole No. **WS102** Sheet 1 of 1
Project Name:	Crossley Lane, Dalton	Project No. 3435	Co-ords: 417445.20 - 417392.79	Hole Type WS
Location:	Huddersfield		Level: 62.10	Scale 1:25
Client:	Harron Homes		Dates: 28/01/2020 - 28/01/2020	Logged By LT

Well	Water Strikes	**Samples and In Situ Testing**			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.10	62.00		MADE GROUND: Light grey CONCRETE. (CONCRETE HARDSTAND)
					0.70	61.40		MADE GROUND: Brown, orange and grey sandy angular to subangular fine to coarse GRAVEL of brick, ash and clinker. Sand is fine to coarse. (GRANULAR MADE GROUND)
					1.50	60.60		MADE GROUND: Firm light brown slightly gravelly slightly sandy CLAY. Gravel is subangular to subrounded fine to coarse sandstone and limestone with rare brick. (COHESIVE MADE GROUND)
					2.10	60.00		Soft dark grey organic CLAY. (COHESIVE ALLUVIUM)
					4.00	58.10		Firm light brown slightly gravelly slightly sandy CLAY. Gravel is subangular fine to coarse sandstone. Sand is fine to coarse. (COHESIVE ALLUVIUM)
								End of borehole at 4.00 m

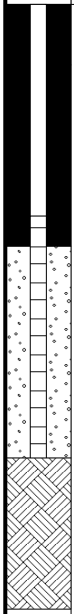
Remarks
1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during drilling. 3. Exploratory hole surveyed in (level and co-ordinates) on completion.

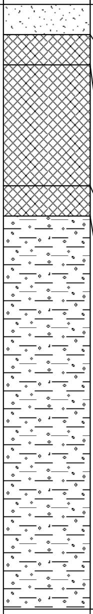
AGS

Borehole Log

Borehole No.
WS103
Sheet 1 of 1

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417445.66 - 417459.92	Hole Type WS
Location: Huddersfield		Level: 62.30	Scale 1:25
Client: Harron Homes		Dates: 28/01/2020 - 28/01/2020	Logged By LT





Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.10	62.20		MADE GROUND: Grey CONCRETE. (CONCRETE HARDSTAND)
					0.20	62.10		MADE GROUND: Light brown sandy angular to subangular fine to coarse GRAVEL of mixed lithology. (SUB-BASE)
					0.60	61.70		MADE GROUND: Firm brown gravelly CLAY. Gravel is subangular sandstone and coal. (REWORKED NATURAL GROUND)
					0.70	61.60		MADE GROUND: Grey angular to subangular fine to coarse GRAVEL of mixed lithology. (GRANULAR MADE GROUND)
					2.00	60.30		Firm brown gravelly slightly sandy CLAY. Gravel is subangular to subrounded fine to coarse sandstone limestone and mudstone. Sand is fine to coarse. (HEAD)
								End of borehole at 2.00 m

Remarks
1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during drilling. 3. Exploratory hole surveyed in (level and co-ordinates) on completion.

Borehole Log

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417361.06 - 417426.52	Borehole No. **WS104** Sheet 1 of 1
Location: Huddersfield		Level: 62.15	Hole Type WS
			Scale 1:25
Client: Harron Homes		Dates: 28/01/2020 - 28/01/2020	Logged By LT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.10	62.05		MADE GROUND: Grey reinforced CONCRETE with 5mm rebar. Blue plastic membrane at 0.10m (CONCRETE HARDSTAND)
					0.30	61.85		MADE GROUND: Brown sandy angular to subangular fine to coarse GRAVEL. Sand is fine to coarse. (SUB-BASE)
					0.75	61.40		MADE GROUND: Brown and grey gravelly clayey fine to coarse SAND. Gravel is subangular fine to coarse brick, clinker and sandstone. (GRANULAR MADE GROUND)
					0.80	61.35		MADE GROUND: Black and orange angular to subangular fine to coarse GRAVEL of clinker and brick. (GRANULAR MADE GROUND)
		1.00		N=4 (1,2/2,1,1,0)				
		2.00		N=9 (2,2/2,2,3,2)	2.20	59.95		Firm light brown gravelly slightly sandy CLAY. Gravel is subangular fine to coarse sandstone and mudstone. Sand is fine to coarse. (COHESIVE ALLUVIUM) *From 1.60m gravel is sandstone, siltstone and mudstone.*
		3.00		N=15 (2,3/3,3,4,5)	3.60	58.55		Firm bluish grey mottled light brown slightly sandy CLAY. Sand is fine. (COHESIVE ALLUVIUM)
		4.00		N=26 (5,6/5,6,7,8)	4.00	58.15		Firm light brown gravelly slightly sandy CLAY. Gravel is angular to subangular fine to coarse sandstone mudstone and siltstone. (COHESIVE ALLUVIUM)
								End of borehole at 4.00 m

Remarks

1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during drilling. 3. Exploratory hole surveyed in (level and co-ordinates) on completion.

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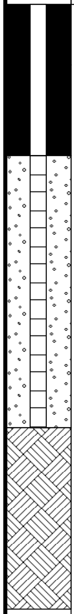
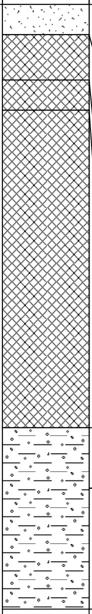
Borehole Log

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417309.92 - 417499.09	Borehole No. **WS105** Sheet 1 of 1
Location: Huddersfield		Level: 60.60	Hole Type WS
			Scale 1:25
Client: Harron Homes		Dates: 28/01/2020 - 28/01/2020	Logged By LT





Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.10	60.50		MADE GROUND: Reinforced grey CONCRETE with 5mm rebar. (CONCRETE HARDSTAND)
					0.25	60.35		MADE GROUND: Light brown sandy angular to subangular fine to coarse GRAVEL of mixed lithology with frequent cobbles. Cobbles are subangular concrete sandstone and cobbles. (SUB-BASE)
					0.35	60.25		MADE GROUND: Orange and grey angular to subangular brick and clinker GRAVEL. (GRANULAR MADE GROUND)
		1.00		N=16 (5,4/4,4,4,4)				
					1.40	59.20		MADE GROUND: Grey and light brown sandy angular to subangular medium to coarse GRAVEL of sandstone limestone and concrete with medium cobble content. Sand is fine to coarse. Cobbles are subangular sandstone. (GRANULAR MADE GROUND)
		2.00		N=16 (4,3/5,4,4,3)	2.00	58.60		Firm grey slightly gravelly slightly sandy CLAY. Gravel is subangular fine to coarse mudstone sandstone and rare coal. (HEAD) *From 1.60m yellowish brown mottled light grey.*

End of borehole at 2.00 m

Remarks
1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during drilling. 3. Exploratory hole surveyed in (level and co-ordinates) on completion.

AGS

Borehole Log

Borehole No.
WS106
Sheet 1 of 1

Project Name:	Crossley Lane, Dalton	Project No. 3435	Co-ords:	417332.89 - 417370.47	Hole Type WS
Location:	Huddersfield		Level:	60.70	Scale 1:25
Client:	Harron Homes		Dates:	28/01/2020 - 28/01/2020	Logged By LT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.07	60.63		MADE GROUND: Tarmac. (MACADAM HARDSTAND)
					0.30	60.40		MADE GROUND: Beige sandy angular to subangular fine to coarse GRAVEL of mixed lithology. Sand is fine. (SUB-BASE)
				HVP=42	2.20	58.50		Firm grey slightly gravelly slightly sandy CLAY. Gravel is subangular fine to coarse sandstone and mudstone. Sand is fine to coarse. (HEAD) *At 0.30m white membrane.* *From 0.90m soft yellowish brown mottled light grey,* *From 1.50m orangish brown gravelly slightly sandy. Gravel is subangular sandstone, siltstone and mudstone.*
					4.00	56.70		Brown and orange very sandy angular to subangular fine to coarse GRAVEL of sandstone and mudstone. Sand is fine to coarse. (GRANULAR GLACIOFLUVIAL DEPOSITS)
								End of borehole at 4.00 m

Remarks
1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during drilling. 3. Exploratory hole surveyed in (level and co-ordinates) on completion.

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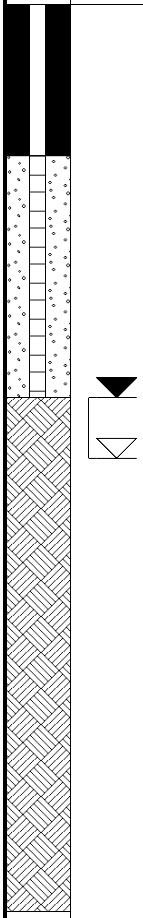
Borehole Log

Borehole No. **WS107** Sheet 1 of 1			
Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417346.05 - 417303.41	Hole Type WS
Location: Huddersfield		Level: 60.90	Scale 1:25
Client: Harron Homes		Dates: 28/01/2020 - 28/01/2020	Logged By LT



Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.10	60.80		MADE GROUND: Reinforced grey CONCRETE with 5mm rebar. (CONCRETE HARDSTAND)
					0.45	60.45		MADE GROUND: Grey sandy angular to subangular fine to coarse GRAVEL of mixed lithology. (SUB-BASE)
		1.00		N=0 (0,0/0,0,0,0)	1.30	59.60		MADE GROUND: Very soft brown sandy silty CLAY with occasional organic material. Sand is fine. Organic material is decomposed wood. (REWORKED NATURAL GROUND)
	▼	2.00		N=8 (1,2/2,2,2,2)	2.70	58.20		MADE GROUND: Soft orangish brown slightly gravelly slightly sandy CLAY. Gravel is subangular fine to coarse sandstone, mudstone and rare coal. Sand is fine to coarse. (REWORKED NATURAL GROUND) *From 1.55m mottled bluish grey.*
		3.00		50 (6,8/50 for 175mm)	3.00	57.90		MADE GROUND: Grey sandy clayey angular to subangular fine to coarse GRAVEL of limestone and sandstone and rare fine brick. Sand is fine to coarse. (REWORKED NATURAL GROUND) *At 2.95m wood material.*
								End of borehole at 3.00 m

1
2
3
4
5

Remarks
1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was encountered at 1.5m during drilling. 3. Exploratory hole surveyed in (level and co-ordinates) on completion.

AGS

Borehole Log

Borehole No.	**WS108**
	Sheet 1 of 1
Project Name:	Crossley Lane, Dalton
Project No.	3435
Co-ords:	417520.97 - 417232.58
Hole Type	WS
Location:	Huddersfield
Level:	62.25
Scale	1:25
Client:	Harron Homes
Dates:	30/01/2020 - 30/01/2020
Logged By	LT

Water Strikes	Samples and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Stratum Description
				0.10	62.15	MADE GROUND: Grey reinforced CONCRETE with 10mm and 5mm rebar and black plastic membrane. (CONCRETE HARDSTAND)
				0.30	61.95	MADE GROUND: Light brown sandy angular to subangular fine to coarse GRAVEL of mixed lithology. Sand is fine to coarse. (SUB-BASE)
▼				1.10	61.15	Brown very gravelly clayey fine to coarse SAND. Gravel is angular to subangular fine to coarse sandstone, mudstone and rare coal. (GRANULAR ALLUVIUM)
	1.30	T		1.50	60.75	Brown, grey and orange angular to subangular fine to coarse GRAVEL of mixed lithology. Sand is fine to coarse. Slight oily sheen and hydrocarbon odour. (GRANULAR ALLUVIUM)
	1.80	T		2.40	59.85	Soft orangish brown mottled bluish grey sandy slightly gravelly CLAY. Sand is fine to coarse. (COHESIVE ALLUVIUM)
				3.00	59.25	Grey and brown sandy clayey angular to subangular fine to coarse GRAVEL of sandstone, mudstone and siltstone. (GRANULAR GLACIOFLUVIAL DEPOSITS) *From 2.40m gravelly slightly sandy.* *From 2.80m dark grey with occasional coal gravel.*

End of borehole at 3.00 m

Remarks

1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was encountered at 1.2m during drilling. 3. Exploratory hole surveyed in (level and co-ordinates) on completion.

Borehole Log

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417475.37 - 417239.78	Borehole No. **WS109** Sheet 1 of 2
Location: Huddersfield		Level: 62.25	Hole Type WS
Client: Harron Homes		Dates: 30/01/2020 - 30/01/2020	Scale 1:25
			Logged By LT

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.15	62.10		MADE GROUND: Grey reinforced CONCRETE with 5mm rebar. (CONCRETE HARDSTAND)
					0.40	61.85		MADE GROUND: Light brown sandy angular to subangular fine to coarse GRAVEL of mixed lithology. (SUB-BASE)
					0.80	61.45		MADE GROUND: Dark grey and orange sandy angular to subangular fine to coarse GRAVEL of clinker, brick and concrete with occasional bricks. Sand is fine to coarse of ash. (GRANULAR MADE GROUND)
					1.10	61.15		MADE GROUND: Firm greyish brown slightly gravelly slightly sandy CLAY. Gravel is subangular fine to coarse sandstone, mudstone and rare clinker. Rare pieces of burnt wood <5mm. (REWORKED NATURAL GROUND)
					2.20	60.05		Firm brown slightly gravelly slightly sandy CLAY. Gravel is subangular fine to coarse sandstone and mudstone. Sand is fine to coarse. Rare rootlets - possible relict topsoil. (COHESIVE ALLUVIUM) *From 1.55m mottled light grey.*
	▼	2.40	J&K					Brown and grey sandy clayey angular to subangular fine to coarse GRAVEL of mudstone and sandstone with slight methylated spirit odour. (GRANULAR GLACIOFLUVIAL DEPOSITS) *From 4.50m very clayey, sandy.*

Continued on next sheet

Remarks

1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was encountered at 4.0m during drilling. 3. Exploratory hole surveyed in (level and co-ordinates) on completion.

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Borehole Log

Borehole No.	**WS109**	Sheet 2 of 2	
Project Name:	Crossley Lane, Dalton	Project No. 3435	
Co-ords:	417475.37 - 417239.78	Hole Type	WS
Location:	Huddersfield		
Level:	62.25	Scale	1:25
Client:	Harron Homes		
Dates:	30/01/2020 - 30/01/2020	Logged By	LT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
▨					6.00	56.25	░	End of borehole at 6.00 m	6
									7
									8
									9
									10

Remarks
1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was encountered at 4.0m during drilling. 3. Exploratory hole surveyed in (level and co-ordinates) on completion.

AGS

Borehole Log

Borehole No.	**WS110**	Sheet 1 of 1	
Project Name:	Crossley Lane, Dalton	Project No.	3435
Co-ords:	417510.47 - 417269.31	Hole Type	WS
Location:	Huddersfield	Level:	62.20
Scale	1:25		
Client:	Harron Homes	Dates:	30/01/2020 - 30/01/2020
Logged By	LT		

Water Strikes	Samples and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Stratum Description
				0.10	62.10	MADE GROUND: Grey reinforced CONCRETE with 5mm rebar. (CONCRETE HARDSTAND)
				0.40	61.80	MADE GROUND: Light brown and grey angular to subangular GRAVEL of mixed lithology. (SUB-BASE)
				0.60	61.60	MADE GROUND: Light brown sandy angular to subangular fine to coarse GRAVEL of sandstone and limestone. Sand is fine to coarse. (GRANULAR MADE GROUND) *From 0.50m grey.* *From 0.55m gravel is clinker, sandstone and limestone.*
				1.20	61.00	Firm dark grey slightly sandy organic CLAY with occasional rootlets - Possible relict topsoil? (COHESIVE ALLUVIUM) *At 0.60m white membrane.*
▼ (2.0)				2.50	59.70	Firm bluish grey slightly gravelly slightly sandy CLAY. Gravel is subangular mudstone sandstone and rare coal. Sand is fine to coarse. (COHESIVE ALLUVIUM) *From 1.50m soft, mottled orangish brown.* *From 1.70m gravelly sandy. Gravel is subangular fine to medium mudstone with orangish brown staining.*
				4.00	58.20	Orangish brown sandy very clayey angular to subangular fine to medium GRAVEL of mudstone. Sand is fine to coarse. (GRANULAR GLACIOFLUVIAL DEPOSITS) *From 2.90m grey, gravel is sandstone and siltstone.*

End of borehole at 4.00 m

Remarks

1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was encountered at 2.0m during drilling. 3. Exploratory hole surveyed in (level and co-ordinates) on completion.

Borehole Log

LITHOS CONSULTING	Borehole Log		Borehole No. **WS111** Sheet 1 of 1
Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417390.39 - 417244.48	Hole Type WS
Location: Huddersfield		Level: 62.20	Scale 1:25
Client: Harron Homes		Dates: 30/01/2020 - 30/01/2020	Logged By LT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								MADE GROUND: Grey CONCRETE. (CONCRETE HARDSTAND)
					0.23	61.97		MADE GROUND: Grey sandy angular to subangular fine to coarse GRAVEL of mixed lithology. (SUB-BASE)
					0.35	61.85		MADE GROUND: Firm brown gravelly sandy CLAY. Gravel is subangular to subrounded fine to coarse sandstone, brick, clinker and mudstone. Sand is fine to coarse. (COHESIVE MADE GROUND) *From 0.70m pushing brick and concrete cobble.*
					1.30	60.90		End of borehole at 1.30 m

Remarks
1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during drilling. 3. Exploratory hole surveyed in (level and co-ordinates) on completion.

AGS

LITHOS CONSULTING

Borehole Log

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417405.51 - 417305.86	Borehole No. **WS112** Sheet 1 of 1
Location: Huddersfield		Level: 62.25	Hole Type WS
			Scale 1:25
Client: Harron Homes		Dates: 30/01/2020 - 30/01/2020	Logged By LT

Well	Water Strikes	Samples and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.10	62.15		MADE GROUND: Grey reinforced CONCRETE with 5mm rebar. (CONCRETE HARDSTAND)
					0.35	61.90		MADE GROUND: Grey sandy angular to subangular GRAVEL of mixed lithology. (SUB-BASE)
					0.45	61.80		MADE GROUND: Brown sandy angular to subangular fine to coarse GRAVEL of sandstone. Sand is fine to coarse. (REWORKED NATURAL GROUND)
					0.85	61.40		MADE GROUND: Dark grey sandy very clayey angular to subangular GRAVEL of mudstone and siltstone. (REWORKED NATURAL GROUND)
		0.90	T					
					0.95	61.30		MADE GROUND: White very sandy very clayey angular to subrounded fine to coarse GRAVEL of chalk. Sand is fine to coarse.
					1.35	60.90		MADE GROUND: Black and brown sandy angular to subangular fine to coarse GRAVEL of slag and clinker. (ASH & CLINKER)
		1.50	J,K&T					
	▼							
		3.50	J&K					
					4.00	58.25		Soft grey gravelly slightly sandy CLAY with strong hydrocarbon and metallic odour. Gravel is subangular fine to coarse mudstone. Sand is fine to coarse. (COHESIVE ALLUVIUM)
								End of borehole at 4.00 m

Remarks
1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was encountered at 3.0m during drilling. 3. Exploratory hole surveyed in (level and co-ordinates) on completion.

AGS

Borehole Log

Borehole No.	**WS113**	Sheet 1 of 1	
Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417372.12 - 417342.24	Hole Type WS
Location: Huddersfield		Level: 60.95	Scale 1:25
Client: Harron Homes		Dates: 30/01/2020 - 30/01/2020	Logged By LT

Well	Water Strikes	Samples and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.10	60.85		MADE GROUND: Grey reinforced CONCRETE with 5mm rebar. (CONCRETE HARDSTAND)
					0.25	60.70		MADE GROUND: Grey sandy angular to subangular fine to coarse GRAVEL of mixed lithology. Sand is fine to coarse. (SUB-BASE)
					0.45	60.50		MADE GROUND: Grey very clayey angular to subangular fine to coarse GRAVEL of limestone sandstone and mudstone. (GRANULAR MADE GROUND)
	▼	2.50	J&K		4.00	56.95		Firm grey slightly gravelly slightly sandy CLAY. Gravel is subangular to subrounded fine to coarse sandstone, mudstone and rare coal. (HEAD) *At 0.45m white membrane.* *Water strike at 2.20m with slight methylated spirit odour.* *From 2.50m to 2.60m mudstone gravel with orangish brown staining.*
								End of borehole at 4.00 m

Remarks

1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was encountered at 2.2m during drilling. 3. Exploratory hole surveyed in (level and co-ordinates) on completion.

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Borehole Log

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417237.27 - 417356.53	Borehole No. **WS114** Sheet 1 of 1 Hole Type WS
Location: Huddersfield		Level: 59.95	Scale 1:25
Client: Harron Homes		Dates: 30/01/2020 - 30/01/2020	Logged By LT

Well	Water Strikes	**Samples and In Situ Testing**			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
								TOPSOIL: Soft brown sandy silty CLAY. (TOPSOIL)	
					0.30	59.65		Firm light brown sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse mudstone and sandstone. (HEAD) *From 0.45m mottled light grey and orange.*	
		1.00		N=14 (3,4/4,4,3,3)					1
					1.20	58.75		Orange, brown and dark grey sandy very clayey subangular fine to coarse GRAVEL of sandstone and mudstone. Sand is fine to coarse. (GRANULAR GLACIOFLUVIAL DEPOSITS)	
		2.00		N=23 (6,6/7,6,5,5)					2
					2.70	57.25		Brown and grey sandy clayey angular to subrounded fine to medium GRAVEL of sandstone and mudstone. Possible river terrace deposits. (GRANULAR GLACIOFLUVIAL DEPOSITS)	
	▼	3.00		N=30 (5,5/7,7,8,8)					3
		4.00		N=46 (5,8/10,10,14,12)	4.00	55.95		End of borehole at 4.00 m	4
									5

Remarks
1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was encountered at 3.0m during drilling. 3. Exploratory hole surveyed in (level and co-ordinates) on completion.

AGS

Borehole Log

Borehole No.
WS115
Sheet 1 of 1

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417247.73 - 417317.67	Hole Type WS
Location: Huddersfield		Level: 60.20	Scale 1:25
Client: Harron Homes		Dates: 30/01/2020 - 30/01/2020	Logged By LT

Depth (m)	Level (m)	Stratum Description
		TOPSOIL: Soft dark brown sandy silty CLAY. Sand is fine. (TOPSOIL)
0.35	59.85	Firm light brown mottled grey and orangish brown gravelly slightly sandy CLAY. Gravel is subangular to subrounded fine to coarse sandstone and mudstone. (HEAD)
1.30	58.90	Orangish brown and dark grey sandy very clayey angular to subangular fine to coarse GRAVEL of sandstone and mudstone. (GRANULAR GLACIOFLUVIAL DEPOSITS) *From 2.60m dark grey, possible river terrace deposits.*
3.90	56.30	Dark grey sandy angular to subangular GRAVEL of mudstone and siltstone. (GRANULAR GLACIOFLUVIAL DEPOSITS)
4.00	56.20	End of borehole at 4.00 m

Remarks
1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was encountered at 3.0m during drilling. 3. Exploratory hole surveyed in (level and co-ordinates) on completion.

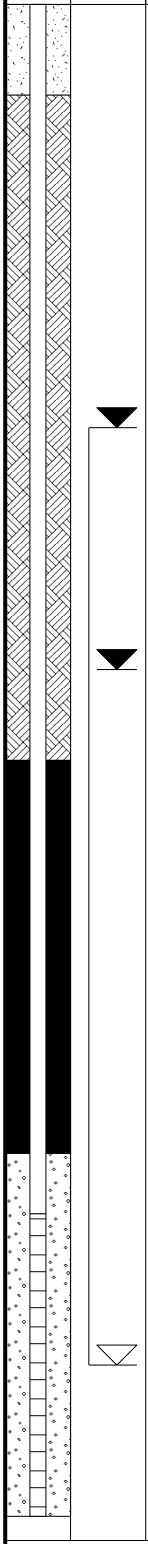
Appendix H

Cable Percussion Borehole Logs

LITHOS CONSULTING

Borehole Log

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417306.20 - 417377.02	Borehole No. **BH101** Sheet 1 of 2
Location: Huddersfield		Level: 60.40	Hole Type CP
Client: Harron Homes		Dates: 31/01/2020 - 01/02/2020	Scale 1:25
			Logged By LEW



Samples and In Situ Testing					
Depth (m)	Type	Results	Depth (m)	Level (m)	Stratum Description
			0.30	60.10	TOPSOIL: Dark brown slightly gravelly CLAY with occasional rootlets. Gravel is subangular to subrounded fine to medium of mixed lithologies including rare brick. (TOPSOIL)
1.00 1.00	D	N=16 (3,4/4,4,4,4)	1.90	58.50	Firm brown slightly sandy gravelly CLAY. Gravel is subangular to rounded fine to medium of sandstone, mudstone and rare coal. (HEAD)
2.00 2.00	D	N=39 (4,8/13,7,11,8)	3.00	57.40	Dense brown very clayey sandy angular to rounded fine to coarse GRAVEL of sandstone and mudstone. Low cobble content of sandstone. (HEAD)
3.00 3.00	D	N=16 (1,2/2,3,4,7)	3.60	56.80	Firm grey gravelly silty CLAY. Gravel is angular to subrounded fine to coarse of siltstone and mudstone. (HEAD)
4.00 4.00	D	N=24 (5,5/6,6,5,7)	4.50	55.90	Stiff brown slightly sandy gravelly CLAY. Gravel is subangular to rounded fine to medium of sandstone and mudstone. (HEAD) *Locally very clayey sandy subangular to rounded fine to coarse gravel.*
5.00	D				Medium dense brown slightly clayey sandy subangular to rounded fine to coarse GRAVEL of predominantly sandstone. Low cobble content of sandstone. (GRANULAR GLACIOFLUVIAL DEPOSITS)

Continued on next sheet

Remarks

1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was encountered at 2.2m and 4.5m during drilling. 3. Exploratory hole surveyed in (level and co-ordinates) on completion.

AGS

LITHOS CONSULTING

Borehole Log

Borehole No.
BH101
Sheet 2 of 2

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417306.20 - 417377.02	Hole Type CP
Location: Huddersfield		Level: 60.40	Scale 1:25
Client: Harron Homes		Dates: 31/01/2020 - 01/02/2020	Logged By LEW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		5.00		N=24 (8,5/5,4,7,8)				
					5.30	55.10		Stiff greyish brown slightly sandy gravelly CLAY. Gravel is subangular to subrounded fine to medium of sandstone and mudstone. (COHESIVE GLACIOFLUVIAL DEPOSITS)
		6.20	D					
		6.20		N=32 (5,7/9,9,7,7)				
		6.60	D					
		6.60		N=26 (5,5/5,5,7,9)				
					7.00	53.40		Dense brown clayey sandy angular to subangular fine to coarse GRAVEL of sandstone. (GRANULAR GLACIOFLUVIAL DEPOSITS)
		7.05	D					
		7.05		37 (14,12/12,10,15,)				
		7.90	D					
		7.90		N=37 (8,8/8,7,8,14)				
					8.30	52.10		End of borehole at 8.30 m

Remarks
1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was encountered at 2.2m and 4.5m during drilling. 3. Exploratory hole surveyed in (level and co-ordinates) on completion.

LITHOS CONSULTING

Borehole Log

Borehole No.	**BH102**	Sheet 1 of 2	
Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417413.73 - 417254.21	Hole Type CP
Location: Huddersfield		Level: 62.20	Scale 1:25
Client: Harron Homes		Dates: 05/02/2020 - 05/02/2020	Logged By LT

Well	Water Strikes	Samples and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description	
					0.12	62.08		MADE GROUND: Grey reinforced CONCRETE with 5mm and 20mm rebar. Plastic membrane at base (CONCRETE HARDSTAND)	
					0.50	61.70		MADE GROUND: Brown sandy angular to subangular fine to coarse GRAVEL of mixed lithology. Sand is fine to coarse. (SUB-BASE)	
		1.00 1.00 - 1.45	D	N=6 (2,1/2,1,1,2)	1.20	61.00		MADE GROUND: Brown, black and grey sandy clayey angular to subangular fine to coarse GRAVEL of sandstone, brick and concrete with slight hydrocarbon odour. (GRANULAR MADE GROUND) *From 0.75m dark grey, gravel is clinker with occasional ash.*	1
		2.00 2.00 - 2.45	D	N=2 (1,0/1,0,1,0)	2.20	60.00		MADE GROUND: Soft dark grey gravelly CLAY. Gravel is subangular fine to coarse brick sandstone and clinker. (COHESIVE MADE GROUND)	2
		3.00 3.00 - 3.45	D	N=22 (2,4/5,5,5,7)	3.10	59.10		Very soft dark grey mottled lightly brown slightly sandy CLAY with slight organic odour. Sand is fine. (COHESIVE ALLUVIUM)	3
		4.00 4.00 - 4.45	D	N=36 (4,4/8,9,9,10)				Medium dense brown and grey very sandy clayey angular to subangular fine to coarse GRAVEL of sandstone and mudstone. Sand is fine to coarse. (GRANULAR GLACIOFLUVIAL DEPOSITS) *From 4.5m low cobble content. Cobbles are subangular sandstone.*	4
		5.00		N=26 (9,9/7,7,5,7)					5

Continued on next sheet

Remarks
1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was encountered at 4.4m during drilling. 3. Exploratory hole surveyed in (level and co-ordinates) on completion.

AGS

Borehole Log

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417413.73 - 417254.21	Borehole No. **BH102** Sheet 2 of 2
Location: Huddersfield		Level: 62.20	Hole Type CP
			Scale 1:25
Client: Harron Homes		Dates: 05/02/2020 - 05/02/2020	Logged By LT

Well	Water Strikes	**Samples and In Situ Testing** Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description	
		5.00 - 5.45	D						
					5.50	56.70		Firm brown gravelly sandy CLAY. Gravel is angular to subangular fine to coarse sandstone and mudstone. Sand is fine to coarse. (COHESIVE GLACIOFLUVIAL DEPOSITS)	
									6
		6.50 6.50 - 6.95	 D	N=30 (4,12/8,6,6,10)					
					6.80	55.40		Dense brown and grey sandy angular to subangular fine to coarse GRAVEL of mixed lithology. Sand is fine to coarse. (GRANULAR GLACIOFLUVIAL DEPOSITS)	
									7
								From 7.8m to 8.0m layer of gravelly sandy CLAY.	
		8.00 8.00 - 8.45	 D	N=50 (9,10/14,12,11,13)					8
		8.90 8.90 - 9.29	 D	50 (6,10/50 for 190mm)					9
					9.20	53.00		Dark grey weathered MUDSTONE recovered as angular to subangular gravel. (COAL MEASURES)	
					9.35	52.85		End of borehole at 9.35 m	
									10

Remarks
1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was encountered at 4.4m during drilling. 3. Exploratory hole surveyed in (level and co-ordinates) on completion.

LITHOS CONSULTING

Borehole Log

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417504.02 - 417248.46	Borehole No. **BH103** Sheet 1 of 2
Location: Huddersfield		Level: 62.25	Hole Type CP
			Scale 1:25
Client: Harron Homes		Dates: 06/02/2020 - 06/02/2020	Logged By LEW

Samples and In Situ Testing

Depth (m)	Type	Results
0.70	J&K	
1.00	D	
1.00		N=5 (1,1/1,1,1,2)
1.50	J&K	
2.00	U	HVP=5
2.45	D	
3.00	D	
3.00		N=33 (1,2/3,6,12,12)
4.10	D	
4.10		N=41 (9,9/10,8,11,12)
5.00	D	

Depth (m)	Level (m)	Stratum Description
0.15	62.10	MADE GROUND: Strong light grey CONCRETE with 40% aggregate of subrounded to rounded fine to medium gravel of mixed lithologies. 20mm rebar and polythene sheet at base. (CONCRETE HARDSTAND)
0.50	61.75	MADE GROUND: Light brown clayey very sandy angular to subrounded fine to coarse GRAVEL of sandstone. Fabric membrane at base. (SUB-BASE)
1.20	61.05	MADE GROUND: Dark grey slightly sandy very gravelly CLAY. Gravel is subangular to subrounded fine to coarse of mixed lithologies including sandstone, brick and clinker. (COHESIVE MADE GROUND) *Slight hydrocarbon odour.*
2.30	59.95	Soft brown slightly gravelly sandy CLAY. Gravel is subangular to rounded fine to coarse of sandstone. (COHESIVE ALLUVIUM) *UT sample obtained - 35 blows. Bottom half contains gravel.*
2.80	59.45	Medium dense orangish brown clayey very sandy angular to rounded fine to coarse GRAVEL of sandstone and mudstone. Low cobble content of angular tabular sandstone. (GRANULAR GLACIOFLUVIAL DEPOSITS)
3.10	59.15	Firm brown slightly gravelly CLAY with low cobble content. Gravel is subangular to subrounded fine to coarse of sandstone and mudstone. Cobbles of sandstone. (COHESIVE GLACIOFLUVIAL DEPOSITS)
		Stiff greyish brown slightly sandy gravelly CLAY with low cobble content. Gravel is subangular to rounded fine to coarse of sandstone, mudstone and rare coal. Cobbles of sandstone. (COHESIVE GLACIOFLUVIAL DEPOSITS) *Locally clayey sandy subangular to rounded fine to coarse gravel.*

Continued on next sheet

Remarks

1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was encountered at 2.3m during drilling. 3. Exploratory hole surveyed in (level and co-ordinates) on completion.

AGS

LITHOS CONSULTING	Borehole Log		Borehole No. **BH103** Sheet 2 of 2
Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417504.02 - 417248.46	Hole Type CP
Location: Huddersfield		Level: 62.25	Scale 1:25
Client: Harron Homes		Dates: 06/02/2020 - 06/02/2020	Logged By LEW

Well	Water Strikes	**Samples and In Situ Testing**			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		5.00		N=43 (5,6/9,10,11,13)				
		6.50	D					
		6.50		N=24 (5,7/8,7,5,4)				
		8.00	D					
		8.00		N=37 (4,6/7,8,9,13)				
					8.40	53.85		Stiff grey gravelly CLAY. Gravel is subangular fine to medium of mudstone lithorelicts. (COHESIVE RESIDUAL SOIL)
		9.00	D		9.00	53.25		Very weak grey thinly laminated MUDSTONE. (COAL MEASURES)
		9.00		48 (9,10/14,16,18,)				
					9.40	52.85		End of borehole at 9.40 m

Remarks
1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was encountered at 2.3m during drilling. 3. Exploratory hole surveyed in (level and co-ordinates) on completion.

AGS

LITHOS CONSULTING

Borehole Log

Borehole No.	**BH104**
Sheet 1 of 2	
Project Name:	Crossley Lane, Dalton
Project No.	3435
Co-ords:	417385.78 - 417293.99
Hole Type	CP
Location:	Huddersfield
Level:	62.20
Scale	1:25
Client:	Harron Homes
Dates:	07/02/2020 - 07/02/2020
Logged By	LT

Samples and In Situ Testing		
Depth (m)	Type	Results
1.00		N=26 (5,6/5,8,8,5)
1.00 - 1.45	D	
2.00		N=6 (2,1/1,1,2,2)
2.00 - 2.45	D	
3.00		N=15 (2,4/4,4,2,5)
3.00 - 3.45	D	
4.00		N=11 (2,2/3,2,1,5)
4.00 - 4.45	D	
5.00		N=13 (2,2/2,2,2,7)

Depth (m)	Level (m)	Stratum Description
0.13	62.07	MADE GROUND: Grey reinforced CONCRETE with 5mm and 20mm rebar. (CONCRETE HARDSTAND)
0.40	61.80	MADE GROUND: Brown sandy angular to subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. (SUB-BASE)
1.75	60.45	MADE GROUND: Firm brown gravelly sandy CLAY. Gravel is subangular fine to coarse of brick and sandstone. Sand is fine to coarse. (COHESIVE MADE GROUND) *From 1.2m, dark grey. Gravel is of clinker with occasional ash. Slight hydrocarbon odour.*
4.00	58.20	Very soft brown sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse of sandstone and mudstone. (COHESIVE ALLUVIUM) *From 3.0m, firm.*
		Medium dense brown and grey very sandy very clayey angular to subangular fine to coarse GRAVEL of mixed lithologies with a low cobble content. Sand is fine to coarse. (GRANULAR GLACIOFLUVIAL DEPOSITS)

Continued on next sheet

Remarks

1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was encountered at 3.0m during drilling. 3. Exploratory hole surveyed in (level and co-ordinates) on completion.

AGS

Borehole Log

Borehole No.	**BH104**
	Sheet 2 of 2
Project Name:	Crossley Lane, Dalton
Project No.	3435
Co-ords:	417385.78 - 417293.99
Hole Type	CP
Location:	Huddersfield
Level:	62.20
Scale	1:25
Client:	Harron Homes
Dates:	07/02/2020 - 07/02/2020
Logged By	LT

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description	
		5.00 - 5.45	D						
								From 6.0m, dense.	6
		6.50 6.50 - 6.95	 D	N=54 (3,4/7,12,17,18)					
									7
									8
		8.20 8.20 - 8.65	 D	N=54 (8,12/13,12,14,15)					
					8.65	53.55		End of borehole at 8.65 m	
									9
									10

Remarks
1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was encountered at 3.0m during drilling. 3. Exploratory hole surveyed in (level and co-ordinates) on completion.

Borehole Log

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417495.50 - 417341.20	Borehole No. **BH105** Sheet 1 of 2 Hole Type CP
Location: Huddersfield		Level: 62.45	Scale 1:25
Client: Harron Homes		Dates: 07/02/2020 - 10/02/2020	Logged By LT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.15	62.30		MADE GROUND: Grey CONCRETE. (CONCRETE HARDSTAND)
					0.25	62.20		MADE GROUND: Light brown sandy angular to subangular GRAVEL of mixed lithologies. (SUB-BASE)
					0.75	61.70		MADE GROUND: Grey sandy clayey angular to subangular fine to coarse GRAVEL of sandstone, clinker, slag and concrete. Sand is fine to coarse. Occasional ash. (GRANULAR MADE GROUND)
		1.00 1.00 - 1.45	D	N=4 (1,1/1,1,1,1)	1.10	61.35		MADE GROUND: Very soft grey gravelly slightly sandy CLAY. Gravel is angular to subangular of sandstone, mudstone, brick and rare clinker. Sand is fine to coarse. (COHESIVE MADE GROUND)
		2.00 2.00 - 2.45	D	N=2 (1,0/0,1,0,1)	2.90	59.55		Very soft dark grey slightly gravelly slightly sandy silty CLAY. Gravel is subangular fine of sandstone. Sand is fine to coarse. Organic odour. Occasional layers of clayey gravel. (COHESIVE ALLUVIUM)
		3.00 3.00 - 3.45	D	N=16 (1,3/5,5,4,2)				Firm greyish brown gravelly slightly sandy CLAY. Gravel is subangular fine to coarse of sandstone and mudstone. Sand is fine to coarse. (COHESIVE GLACIOFLUVIAL DEPOSITS)
		4.00 4.00 - 4.45	D	N=13 (2,2/2,2,3,6)				*From 4.5m, stiff.*
		5.00		N=20 (2,5/5,5,5,5)				

Continued on next sheet

Remarks

1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was encountered at 3.45m during drilling. 3. Exploratory hole surveyed in (level and co-ordinates) on completion.

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Borehole Log

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417495.50 - 417341.20
Location: Huddersfield		Level: 62.45
Client: Harron Homes		Dates: 07/02/2020 - 10/02/2020

Borehole No. **BH105**

Sheet 2 of 2

Hole Type CP

Scale 1:25

Logged By LT

Well	Water Strikes	Samples and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description	
		5.00 - 5.45	D						
									6
					6.30	56.15		Weathered MUDSTONE. Recovered as weak dark grey angular to subangular gravel with occasional orangish brown staining. (COAL MEASURES)	
		6.50		N=24 (3,3/4,6,7,7)					
		6.50 - 6.95	D						
									7
		7.60		N=42 (9,10/10,10,10,12)	7.60	54.85		End of borehole at 7.60 m	
		7.60 - 8.05	D						
									8
									9
									10

Remarks

1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was encountered at 3.45m during drilling. 3. Exploratory hole surveyed in (level and co-ordinates) on completion.

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Borehole Log

Borehole No.	**BH106**	Sheet 1 of 2	
Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417384.12 - 417438.92	Hole Type CP
Location: Huddersfield		Level: 62.15	Scale 1:25
Client: Harron Homes		Dates: 10/02/2020 - 10/02/2020	Logged By LT

Samples and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Stratum Description
			0.10	62.05	MADE GROUND: Grey CONCRETE. (CONCRETE HARDSTAND)
			0.40	61.75	MADE GROUND: Brown sandy angular to subangular fine to coarse GRAVEL of mixed lithologies. A low cobble content of bricks and subangular sandstone. Bricks with grey staining - oily sheen. (GRANULAR MADE GROUND)
					MADE GROUND: Light brown grey and orange sandy angular to subangular fine to coarse GRAVEL of sandstone, brick, concrete and rare timber. Sand is fine to coarse. A medium cobble content of white bricks, sandstone and rare slate. (GRANULAR MADE GROUND) *At 0.83m, 1 no sandstone slab, 4cm thick.* *From 1.3m, very clayey.*
1.70 1.70 - 2.15	D	N=4 (1,0/1,1,1,1)	1.70	60.45	Very soft grey and dark grey organic CLAY. Slight organic odour. Possible relict topsoil. (COHESIVE ALLUVIUM)
3.00 3.00 - 3.45	D	N=18 (1,1/2,4,5,7)	3.00	59.15	Firm brown and light brown gravelly CLAY. Gravel is subangular fine to coarse of sandstone. A low cobble content of subangular sandstone. (COHESIVE GLACIOFLUVIAL DEPOSITS)
4.00 4.00 - 4.45	D	N=36 (7,7/8,8,10,10)			
5.00		N=21 (6,5/5,5,5,6)			Continued on next sheet

1
2
3
4
5

Remarks

1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was encountered at 2.15m and 4.0m during drilling. 3. Exploratory hole surveyed in (level and co-ordinates) on completion.

AGS

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Borehole Log

Borehole No.	**BH106**
Sheet 2 of 2	

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417384.12 - 417438.92	Hole Type CP
Location: Huddersfield		Level: 62.15	Scale 1:25
Client: Harron Homes		Dates: 10/02/2020 - 10/02/2020	Logged By LT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		5.00 - 5.45	D						
		6.00 - 6.95	D						6
					6.20	55.95		Dense brown and grey sandy clayey angular to subrounded fine to coarse GRAVEL of sandstone and mudstone. Sand is fine to coarse. (GRANULAR GLACIOFLUVIAL DEPOSITS)	
		6.50		N=42 (11,7/9,10,12,11)					
									7
					7.10	55.05		Firm brown and light brown gravelly CLAY. Gravel is subangular fine to coarse of sandstone. A low cobble content of subangular sandstone. (COHESIVE GLACIOFLUVIAL DEPOSITS)	
		7.50		N=37 (12,9/9,11,10,7)					
		7.50 - 7.95	D						
									8
		8.50		N=50 (5,6/8,9,15,18)					
		8.50 - 8.95	D						
									9
					9.20	52.95		Weathered MUDSTONE. Recovered as extremely weak dark grey angular to subangular fine to coarse gravel. (COAL MEASURES)	
		9.40	D						
		9.40		50 (12,14/12,30,8,)					
					9.85	52.30		End of borehole at 9.85 m	
									10

Remarks
1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was encountered at 2.15m and 4.0m during drilling. 3. Exploratory hole surveyed in (level and co-ordinates) on completion.

AGS

LITHOS CONSULTING

Borehole Log

Borehole No.	**BH107**	Sheet 1 of 2	
Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417342.38 - 417512.85	Hole Type CP
Location: Huddersfield		Level: 60.65	Scale 1:25
Client: Harron Homes		Dates: 11/02/2020 - 11/02/2020	Logged By LT

Well	Water Strikes	Samples and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.10	60.55		MADE GROUND: CONCRETE. (CONCRETE HARDSTAND)
					0.50	60.15		MADE GROUND: Grey sandy angular to subangular fine to coarse GRAVEL of mixed lithologies. (SUB-BASE)
								Firm greyish brown slightly gravelly slightly sandy CLAY. Gravel is subangular fine to coarse of sandstone and mudstone. Sand is fine to coarse. (COHESIVE GLACIOFLUVIAL DEPOSITS)
		1.00		N=17 (3,3/4,4,4,5)				
		2.00 2.00 - 2.45	D	N=20 (3,3/3,5,5,7)				
		3.00		N=36 (5,2/8,8,10,10)				
		4.00 4.00 - 4.45	D	N=21 (8,7/6,5,5,5)				
		5.00		N=27 (5,5/6,6,7,8)				

Continued on next sheet

Remarks

1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was encountered at 3.5m during drilling. 3. Exploratory hole surveyed in (level and co-ordinates) on completion.

AGS

LITHOS CONSULTING

Borehole Log

Project Name: Crossley Lane, Dalton	Project No. 3435	Co-ords: 417342.38 - 417512.85	Borehole No. **BH107** Sheet 2 of 2
Location: Huddersfield		Level: 60.65	Hole Type CP
			Scale 1:25
Client: Harron Homes		Dates: 11/02/2020 - 11/02/2020	Logged By LT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		5.00 - 5.45	D					
		6.40 - 6.85	D					*From 6.5m, stiff gravelly CLAY. Gravel is mudstone.*
		7.50 - 7.95	D					
		9.00 - 9.30	D		9.00	51.65		Weathered MUDSTONE. Recovered as weak grey angular to subangular fine to coarse gravel. (COAL MEASURES)
					9.30	51.35		End of borehole at 9.30 m

Remarks
1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was encountered at 3.5m during drilling. 3. Exploratory hole surveyed in (level and co-ordinates) on completion.

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Appendix I

Chemical Test Results

Certificate of Analysis

10-Mar-20

Certificate Number	20-02158-2
Client	Lithos Consulting Ltd Parkhill Walton Rd Wetherby LS22 5DZ
Our Reference	20-02158-2
Client Reference	3435
Order No	15647(001/3435)
Contract Title	Crossley Lane, Dalton
Description	57 Soil samples, 8 Leachate samples, 1 Misc sample.
Date Received	03-Feb-20
Date Started	03-Feb-20
Date Completed	10-Mar-20
Test Procedures	Identified by prefix DETSn (details on request).
Notes	This test supersedes 20-02158-1, additional testing. Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved B

Adam Fenwick
Contracts Manager

UKAS
TESTING
2139

Summary of Chemical Analysis
Soil/Misc Samples

Our Ref	20-02158-2
Client Ref	3435
Contract Title	Crossley Lane, Dalton

			Lab No	1632464	1632465	1632466	1632467	1632468	1632469
			Sample ID	TP108	TP112W	TP115	TP113	TP131	TP131
			Depth	0.50	0.50	0.50	0.70	0.80	1.10
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	23/01/2020	23/01/2020	23/01/2020	23/01/2020	24/01/2020	24/01/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Asbestos Quantification	DETSC 1102	0.001	%				0.002		
Metals									
Arsenic	DETSC 2301#	0.2	mg/kg	20	26	15	110	58	96
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg	0.6	0.6	0.2	0.3	0.3	0.4
Cadmium	DETSC 2301#	0.1	mg/kg	0.1	< 0.1	< 0.1	0.2	0.5	0.4
Chromium	DETSC 2301#	0.15	mg/kg	10	15	9.4	19	17	25
Chromium III	DETSC 2301*	0.15	mg/kg	10	15	9.4	19	17	25
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	58	61	66	100	93	130
Lead	DETSC 2301#	0.3	mg/kg	33	95	11	45	66	140
Magnesium Aqueous Extract	DETSC 2076*	10	mg/l		11	< 10		< 10	
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.08
Nickel	DETSC 2301#	1	mg/kg	20	38	31	45	29	42
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Zinc	DETSC 2301#	1	mg/kg	49	33	18	85	86	190
Inorganics									
Combustibility	DETSC 2036*	0		E	E	C	C	D	D
pH	DETSC 2008#		pH	8.6	6.7	8.4	8.7	10.5	10.6
Calorific Value	DETSC 5008	1	MJ/kg	3.2	6.2	9.6	5.5	5.3	6.2
Cyanide, Total	DETSC 2130#	0.1	mg/kg	0.2	< 0.1			0.7	0.7
Total Organic Carbon	DETSC 2084#	0.5	%	9.2	12	26	7.9	16	16
Chloride Aqueous Extract	DETSC 2055	1	mg/l		7.6	6.0		11	
Nitrate Aqueous Extract as NO3	DETSC 2055	1	mg/l		12	1.8		2.1	
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l		1300	75		150	
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg		< 0.01				
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg		< 0.01				
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg		< 0.01				
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg		< 1.5				
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg		< 1.2				
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg		< 1.5				
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg		< 3.4				
Aliphatic C5-C35	DETSC 3072*	10	mg/kg		< 10				
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg		< 0.01				
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg		< 0.01				
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg		< 0.01				
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg		< 0.9				
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg		< 0.5				
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg		< 0.6				
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg		< 1.4				

Summary of Chemical Analysis
Soil/Misc Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

			Lab No	1632464	1632465	1632466	1632467	1632468	1632469
			Sample ID	TP108	TP112W	TP115	TP113	TP131	TP131
			Depth	0.50	0.50	0.50	0.70	0.80	1.10
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	23/01/2020	23/01/2020	23/01/2020	23/01/2020	24/01/2020	24/01/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Aromatic C5-C35	DETSC 3072*	10	mg/kg		< 10				
TPH Ali/Aro Total	DETSC 3072*	10	mg/kg		< 10				
EPH (C6-C10)	DETSC 3321*	0.1	mg/kg	< 0.1		< 0.1			
EPH (C10-C12)	DETSC 3311	10	mg/kg	< 10		< 10			
EPH (C12-C16)	DETSC 3311	10	mg/kg	11		< 10			
EPH (C16-C21)	DETSC 3311	10	mg/kg	75		< 10			
EPH (C21-C35)	DETSC 3311	10	mg/kg	260		72			
EPH (C35-C40)	DETSC 3311	10	mg/kg	88		16			
EPH (C10-C40)	DETSC 3311#	10	mg/kg	430		93		10	15
Benzene	DETSC 3321#	0.01	mg/kg		< 0.01				
Ethylbenzene	DETSC 3321#	0.01	mg/kg		< 0.01				
Toluene	DETSC 3321#	0.01	mg/kg		< 0.01				
Xylene	DETSC 3321#	0.01	mg/kg		< 0.01				
MTBE	DETSC 3321	0.01	mg/kg		< 0.01				
PAHs									
Naphthalene	DETSC 3303#	0.03	mg/kg						
Acenaphthylene	DETSC 3303#	0.03	mg/kg						
Acenaphthene	DETSC 3303#	0.03	mg/kg						
Fluorene	DETSC 3303	0.03	mg/kg						
Phenanthrene	DETSC 3303#	0.03	mg/kg						
Anthracene	DETSC 3303	0.03	mg/kg						
Fluoranthene	DETSC 3303#	0.03	mg/kg						
Pyrene	DETSC 3303#	0.03	mg/kg						
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg						
Chrysene	DETSC 3303	0.03	mg/kg						
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg						
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg						
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg						
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg						
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg						
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg						
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg						
PCBs									
PCB 28 + PCB 31	DETSC 3401#	0.01	mg/kg	< 0.01					
PCB 52	DETSC 3401#	0.01	mg/kg	< 0.01					
PCB 101	DETSC 3401#	0.01	mg/kg	< 0.01					
PCB 118	DETSC 3401#	0.01	mg/kg	< 0.01					
PCB 153	DETSC 3401#	0.01	mg/kg	< 0.01					
PCB 138	DETSC 3401#	0.01	mg/kg	< 0.01					
PCB 180	DETSC 3401#	0.01	mg/kg	< 0.01					

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil/Misc Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

			Lab No	1632464	1632465	1632466	1632467	1632468	1632469
			Sample ID	TP108	TP112W	TP115	TP113	TP131	TP131
			Depth	0.50	0.50	0.50	0.70	0.80	1.10
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	23/01/2020	23/01/2020	23/01/2020	23/01/2020	24/01/2020	24/01/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
PCB 7 Total	DETSC 3401#	0.01	mg/kg	< 0.01					
Organics									
DEM	DETSC 3001*	50	mg/kg					< 50	< 50
DEM Cleanup	DETSC 3001*	50	mg/kg					< 50	< 50
Phenols									
Phenol	DETSC 3451*	0.01	mg/kg	< 0.01		< 0.01		< 0.01	0.01
4-Chloro-3-methylphenol	DETSC 3451*	0.01	mg/kg	< 0.01		< 0.01		< 0.01	< 0.01
2,4-Dichlorophenol	DETSC 3451*	0.01	mg/kg	< 0.01		< 0.01		< 0.01	< 0.01
2,4-Dimethylphenol	DETSC 3451*	0.01	mg/kg	0.01		< 0.01		< 0.01	< 0.01
p-cresol	DETSC 3451*	0.01	mg/kg	0.02		< 0.01		< 0.01	0.03
2,6-Dimethylphenol	DETSC 3451*	0.01	mg/kg	< 0.01		< 0.01		< 0.01	< 0.01
2,6-Dichlorophenol	DETSC 3451*	0.01	mg/kg	< 0.01		< 0.01		< 0.01	< 0.01
2,4,6-Trichlorophenol	DETSC 3451*	0.01	mg/kg	< 0.01		< 0.01		< 0.01	< 0.01

Summary of Chemical Analysis
Soil/Misc Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

			Lab No	1632470	1632471	1632472	1632473	1632474	1632475
			Sample ID	TP119	TP132	TP123	TP117	TP108	TP130
			Depth	0.70	1.20	1.20	1.30	1.90	1.90
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	23/01/2020	24/01/2020	24/01/2020	23/01/2020	23/01/2020	23/01/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Asbestos Quantification	DETSC 1102	0.001	%						
Metals									
Arsenic	DETSC 2301#	0.2	mg/kg	13			14	4.1	
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg	1.4			0.3	< 0.2	
Cadmium	DETSC 2301#	0.1	mg/kg	0.3			0.1	0.1	
Chromium	DETSC 2301#	0.15	mg/kg	19			25	22	
Chromium III	DETSC 2301*	0.15	mg/kg	19			25	22	
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0			< 1.0	< 1.0	
Copper	DETSC 2301#	0.2	mg/kg	190			35	32	
Lead	DETSC 2301#	0.3	mg/kg	170			33	26	
Magnesium Aqueous Extract	DETSC 2076*	10	mg/l						
Mercury	DETSC 2325#	0.05	mg/kg	0.10			0.06	< 0.05	
Nickel	DETSC 2301#	1	mg/kg	18			27	32	
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5			< 0.5	< 0.5	
Zinc	DETSC 2301#	1	mg/kg	260			91	69	
Inorganics									
Combustibility	DETSC 2036*	0							
pH	DETSC 2008#		pH	9.1			7.9	7.6	
Calorific Value	DETSC 5008	1	MJ/kg						
Cyanide, Total	DETSC 2130#	0.1	mg/kg						
Total Organic Carbon	DETSC 2084#	0.5	%	7.5			2.1	1.6	7.1
Chloride Aqueous Extract	DETSC 2055	1	mg/l						
Nitrate Aqueous Extract as NO3	DETSC 2055	1	mg/l						
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l						
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg						< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg						< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg						< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg						< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg						< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg						< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg						< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg						< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg						< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg						< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg						< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg						< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg						< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg						< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg						< 1.4

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil/Misc Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

			Lab No	1632470	1632471	1632472	1632473	1632474	1632475
			Sample ID	TP119	TP132	TP123	TP117	TP108	TP130
			Depth	0.70	1.20	1.20	1.30	1.90	1.90
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	23/01/2020	24/01/2020	24/01/2020	23/01/2020	23/01/2020	23/01/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Aromatic C5-C35	DETSC 3072*	10	mg/kg						< 10
TPH Ali/Aro Total	DETSC 3072*	10	mg/kg						< 10
EPH (C6-C10)	DETSC 3321*	0.1	mg/kg						
EPH (C10-C12)	DETSC 3311	10	mg/kg						
EPH (C12-C16)	DETSC 3311	10	mg/kg						
EPH (C16-C21)	DETSC 3311	10	mg/kg						
EPH (C21-C35)	DETSC 3311	10	mg/kg						
EPH (C35-C40)	DETSC 3311	10	mg/kg						
EPH (C10-C40)	DETSC 3311#	10	mg/kg		< 10	66			
Benzene	DETSC 3321#	0.01	mg/kg		< 0.01	< 0.01			< 0.01
Ethylbenzene	DETSC 3321#	0.01	mg/kg		< 0.01	< 0.01			< 0.01
Toluene	DETSC 3321#	0.01	mg/kg		< 0.01	< 0.01			< 0.01
Xylene	DETSC 3321#	0.01	mg/kg		< 0.01	< 0.01			< 0.01
MTBE	DETSC 3321	0.01	mg/kg		< 0.01	< 0.01			< 0.01
PAHs									
Naphthalene	DETSC 3303#	0.03	mg/kg				< 0.03	0.12	< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg				< 0.03	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg				< 0.03	< 0.03	< 0.03
Fluorene	DETSC 3303	0.03	mg/kg				< 0.03	< 0.03	< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg				0.11	< 0.03	0.04
Anthracene	DETSC 3303	0.03	mg/kg				0.14	< 0.03	< 0.03
Fluoranthene	DETSC 3303#	0.03	mg/kg				0.08	< 0.03	0.04
Pyrene	DETSC 3303#	0.03	mg/kg				0.06	< 0.03	0.03
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg				0.03	< 0.03	< 0.03
Chrysene	DETSC 3303	0.03	mg/kg				< 0.03	< 0.03	< 0.03
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg				< 0.03	< 0.03	< 0.03
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg				< 0.03	< 0.03	< 0.03
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg				< 0.03	< 0.03	< 0.03
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg				< 0.03	< 0.03	< 0.03
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg				< 0.03	< 0.03	< 0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg				< 0.03	< 0.03	< 0.03
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg				0.38	0.12	< 0.10
PCBs									
PCB 28 + PCB 31	DETSC 3401#	0.01	mg/kg						
PCB 52	DETSC 3401#	0.01	mg/kg						
PCB 101	DETSC 3401#	0.01	mg/kg						
PCB 118	DETSC 3401#	0.01	mg/kg						
PCB 153	DETSC 3401#	0.01	mg/kg						
PCB 138	DETSC 3401#	0.01	mg/kg						
PCB 180	DETSC 3401#	0.01	mg/kg						

Summary of Chemical Analysis
Soil/Misc Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

			Lab No	1632470	1632471	1632472	1632473	1632474	1632475
			Sample ID	TP119	TP132	TP123	TP117	TP108	TP130
			Depth	0.70	1.20	1.20	1.30	1.90	1.90
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	23/01/2020	24/01/2020	24/01/2020	23/01/2020	23/01/2020	23/01/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
PCB 7 Total	DETSC 3401#	0.01	mg/kg						
Organics									
DEM	DETSC 3001*	50	mg/kg		< 50	< 50			
DEM Cleanup	DETSC 3001*	50	mg/kg		< 50	< 50			
Phenols									
Phenol	DETSC 3451*	0.01	mg/kg		< 0.01	< 0.01			
4-Chloro-3-methylphenol	DETSC 3451*	0.01	mg/kg		< 0.01	< 0.01			
2,4-Dichlorophenol	DETSC 3451*	0.01	mg/kg		< 0.01	< 0.01			
2,4-Dimethylphenol	DETSC 3451*	0.01	mg/kg		< 0.01	< 0.01			
p-cresol	DETSC 3451*	0.01	mg/kg		< 0.01	< 0.01			
2,6-Dimethylphenol	DETSC 3451*	0.01	mg/kg		< 0.01	< 0.01			
2,6-Dichlorophenol	DETSC 3451*	0.01	mg/kg		< 0.01	< 0.01			
2,4,6-Trichlorophenol	DETSC 3451*	0.01	mg/kg		< 0.01	< 0.01			

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil/Misc Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

			Lab No	1632476	1632477	1632478	1632479	1632480	1632481
			Sample ID	TP123	TP113	TP112E	TP112E	TP109	TP120
			Depth	2.20	2.70	2.70	0.30	0.60	0.60
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	24/01/2020	23/01/2020	23/01/2020	23/01/2020	24/01/2020	24/01/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Asbestos Quantification	DETSC 1102	0.001	%						
Metals									
Arsenic	DETSC 2301#	0.2	mg/kg				32	29	12
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg				0.4	0.9	0.5
Cadmium	DETSC 2301#	0.1	mg/kg				0.2	0.9	0.3
Chromium	DETSC 2301#	0.15	mg/kg				31	33	35
Chromium III	DETSC 2301*	0.15	mg/kg				31	33	35
Chromium, Hexavalent	DETSC 2204*	1	mg/kg				< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg				180	78	55
Lead	DETSC 2301#	0.3	mg/kg				100	84	50
Magnesium Aqueous Extract	DETSC 2076*	10	mg/l				< 10		< 10
Mercury	DETSC 2325#	0.05	mg/kg				0.30	0.14	< 0.05
Nickel	DETSC 2301#	1	mg/kg				27	32	42
Selenium	DETSC 2301#	0.5	mg/kg				< 0.5	< 0.5	< 0.5
Zinc	DETSC 2301#	1	mg/kg				120	120	130
Inorganics									
Combustibility	DETSC 2036*	0							
pH	DETSC 2008#		pH				9.8	7.6	7.8
Calorific Value	DETSC 5008	1	MJ/kg						
Cyanide, Total	DETSC 2130#	0.1	mg/kg				< 0.1	0.2	0.3
Total Organic Carbon	DETSC 2084#	0.5	%		0.8	0.9	6.5	5.9	4.4
Chloride Aqueous Extract	DETSC 2055	1	mg/l				29		13
Nitrate Aqueous Extract as NO3	DETSC 2055	1	mg/l				4.8		< 1.0
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l				130		73
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg		< 0.01	< 0.01			
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg		< 0.01	< 0.01			
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg		< 0.01	< 0.01			
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg		< 1.5	< 1.5			
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg		< 1.2	< 1.2			
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg		< 1.5	< 1.5			
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg		< 3.4	< 3.4			
Aliphatic C5-C35	DETSC 3072*	10	mg/kg		< 10	< 10			
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg		< 0.01	< 0.01			
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg		< 0.01	< 0.01			
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg		< 0.01	< 0.01			
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg		< 0.9	< 0.9			
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg		< 0.5	< 0.5			
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg		< 0.6	< 0.6			
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg		< 1.4	< 1.4			

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Summary of Chemical Analysis
Soil/Misc Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

			Lab No	1632476	1632477	1632478	1632479	1632480	1632481
			Sample ID	TP123	TP113	TP112E	TP112E	TP109	TP120
			Depth	2.20	2.70	2.70	0.30	0.60	0.60
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	24/01/2020	23/01/2020	23/01/2020	23/01/2020	24/01/2020	24/01/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Aromatic C5-C35	DETSC 3072*	10	mg/kg		< 10	< 10			
TPH Ali/Aro Total	DETSC 3072*	10	mg/kg		< 10	< 10			
EPH (C6-C10)	DETSC 3321*	0.1	mg/kg				< 0.1	< 0.1	< 0.1
EPH (C10-C12)	DETSC 3311	10	mg/kg				< 10	< 10	< 10
EPH (C12-C16)	DETSC 3311	10	mg/kg				< 10	79	< 10
EPH (C16-C21)	DETSC 3311	10	mg/kg				23	610	38
EPH (C21-C35)	DETSC 3311	10	mg/kg				76	1100	230
EPH (C35-C40)	DETSC 3311	10	mg/kg				< 10	250	39
EPH (C10-C40)	DETSC 3311#	10	mg/kg			< 10	110	2100	310
Benzene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01			
Ethylbenzene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01			
Toluene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01			
Xylene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01			
MTBE	DETSC 3321	0.01	mg/kg	< 0.01	< 0.01	< 0.01			
PAHs									
Naphthalene	DETSC 3303#	0.03	mg/kg		< 0.03	< 0.03			
Acenaphthylene	DETSC 3303#	0.03	mg/kg		< 0.03	< 0.03			
Acenaphthene	DETSC 3303#	0.03	mg/kg		< 0.03	< 0.03			
Fluorene	DETSC 3303	0.03	mg/kg		< 0.03	< 0.03			
Phenanthrene	DETSC 3303#	0.03	mg/kg		< 0.03	< 0.03			
Anthracene	DETSC 3303	0.03	mg/kg		< 0.03	< 0.03			
Fluoranthene	DETSC 3303#	0.03	mg/kg		< 0.03	< 0.03			
Pyrene	DETSC 3303#	0.03	mg/kg		< 0.03	< 0.03			
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg		< 0.03	< 0.03			
Chrysene	DETSC 3303	0.03	mg/kg		< 0.03	< 0.03			
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg		< 0.03	< 0.03			
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg		< 0.03	< 0.03			
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg		< 0.03	< 0.03			
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg		< 0.03	< 0.03			
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg		< 0.03	< 0.03			
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg		< 0.03	< 0.03			
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg		< 0.10	< 0.10			
PCBs									
PCB 28 + PCB 31	DETSC 3401#	0.01	mg/kg						
PCB 52	DETSC 3401#	0.01	mg/kg						
PCB 101	DETSC 3401#	0.01	mg/kg						
PCB 118	DETSC 3401#	0.01	mg/kg						
PCB 153	DETSC 3401#	0.01	mg/kg						
PCB 138	DETSC 3401#	0.01	mg/kg						
PCB 180	DETSC 3401#	0.01	mg/kg						

Summary of Chemical Analysis
Soil/Misc Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

			Lab No	1632476	1632477	1632478	1632479	1632480	1632481
			Sample ID	TP123	TP113	TP112E	TP112E	TP109	TP120
			Depth	2.20	2.70	2.70	0.30	0.60	0.60
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	24/01/2020	23/01/2020	23/01/2020	23/01/2020	24/01/2020	24/01/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
PCB 7 Total	DETSC 3401#	0.01	mg/kg						
Organics									
DEM	DETSC 3001*	50	mg/kg			< 50			
DEM Cleanup	DETSC 3001*	50	mg/kg			< 50			
Phenols									
Phenol	DETSC 3451*	0.01	mg/kg	< 0.01			< 0.01		0.01
4-Chloro-3-methylphenol	DETSC 3451*	0.01	mg/kg	< 0.01			< 0.01		< 0.01
2,4-Dichlorophenol	DETSC 3451*	0.01	mg/kg	< 0.01			< 0.01		0.07
2,4-Dimethylphenol	DETSC 3451*	0.01	mg/kg	< 0.01			< 0.01		0.12
p-cresol	DETSC 3451*	0.01	mg/kg	< 0.01			0.01		0.02
2,6-Dimethylphenol	DETSC 3451*	0.01	mg/kg	< 0.01			< 0.01		0.01
2,6-Dichlorophenol	DETSC 3451*	0.01	mg/kg	< 0.01			< 0.01		< 0.01
2,4,6-Trichlorophenol	DETSC 3451*	0.01	mg/kg	< 0.01			< 0.01		< 0.01

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Summary of Chemical Analysis
Soil/Misc Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

			Lab No	1632482	1632483	1632484	1632485	1632486	1632487
			Sample ID	TP118	TP129	TP132	TP120	TP107	TP116
			Depth	0.50	0.90	2.90	3.40	3.90	0.20
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	23/01/2020	24/01/2020	24/01/2020	24/01/2020	23/01/2020	23/01/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Asbestos Quantification	DETSC 1102	0.001	%						
Metals									
Arsenic	DETSC 2301#	0.2	mg/kg	31	4.4				
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg	0.5	0.4				
Cadmium	DETSC 2301#	0.1	mg/kg	0.2	0.1				
Chromium	DETSC 2301#	0.15	mg/kg	21	32				
Chromium III	DETSC 2301*	0.15	mg/kg	21	32				
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0				
Copper	DETSC 2301#	0.2	mg/kg	38	44				
Lead	DETSC 2301#	0.3	mg/kg	41	26				
Magnesium Aqueous Extract	DETSC 2076*	10	mg/l						
Mercury	DETSC 2325#	0.05	mg/kg	0.09	< 0.05				
Nickel	DETSC 2301#	1	mg/kg	17	42				
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5				
Zinc	DETSC 2301#	1	mg/kg	160	91				
Inorganics									
Combustibility	DETSC 2036*	0							
pH	DETSC 2008#		pH	7.5	8.0				
Calorific Value	DETSC 5008	1	MJ/kg						
Cyanide, Total	DETSC 2130#	0.1	mg/kg						
Total Organic Carbon	DETSC 2084#	0.5	%	2.5	1.7		4.8	0.6	
Chloride Aqueous Extract	DETSC 2055	1	mg/l						
Nitrate Aqueous Extract as NO3	DETSC 2055	1	mg/l						
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l						
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg				< 0.01	0.07	
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg				0.01	0.03	
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg				< 0.01	< 0.01	
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg				< 1.5	2.5	
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg				< 1.2	2.8	
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg				< 1.5	< 1.5	
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg				< 3.4	< 3.4	
Aliphatic C5-C35	DETSC 3072*	10	mg/kg				< 10	< 10	
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg				0.15	0.39	
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg				0.03	0.03	
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg				0.18	3.8	
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg				< 0.9	48	
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg				< 0.5	34	
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg				< 0.6	25	
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg				< 1.4	16	

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Summary of Chemical Analysis
Soil/Misc Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

			Lab No	1632482	1632483	1632484	1632485	1632486	1632487
			Sample ID	TP118	TP129	TP132	TP120	TP107	TP116
			Depth	0.50	0.90	2.90	3.40	3.90	0.20
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	23/01/2020	24/01/2020	24/01/2020	24/01/2020	23/01/2020	23/01/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Aromatic C5-C35	DETSC 3072*	10	mg/kg				< 10	130	
TPH Ali/Aro Total	DETSC 3072*	10	mg/kg				< 10	130	
EPH (C6-C10)	DETSC 3321*	0.1	mg/kg						
EPH (C10-C12)	DETSC 3311	10	mg/kg						
EPH (C12-C16)	DETSC 3311	10	mg/kg						
EPH (C16-C21)	DETSC 3311	10	mg/kg						
EPH (C21-C35)	DETSC 3311	10	mg/kg						
EPH (C35-C40)	DETSC 3311	10	mg/kg						
EPH (C10-C40)	DETSC 3311#	10	mg/kg						
Benzene	DETSC 3321#	0.01	mg/kg			< 0.01	0.15	0.39	< 0.01
Ethylbenzene	DETSC 3321#	0.01	mg/kg			< 0.01	< 0.01	0.21	< 0.01
Toluene	DETSC 3321#	0.01	mg/kg			< 0.01	0.03	0.03	< 0.01
Xylene	DETSC 3321#	0.01	mg/kg			< 0.01	0.06	0.69	< 0.01
MTBE	DETSC 3321	0.01	mg/kg			< 0.01	< 0.01	0.06	< 0.01
PAHs									
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	0.03				
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03				
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	0.08				
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03	0.05				
Phenanthrene	DETSC 3303#	0.03	mg/kg	< 0.03	0.50				
Anthracene	DETSC 3303	0.03	mg/kg	< 0.03	0.10				
Fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	0.43				
Pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	0.36				
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	0.09				
Chrysene	DETSC 3303	0.03	mg/kg	< 0.03	0.15				
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	0.10				
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	0.04				
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	0.06				
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	0.04				
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03				
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	< 0.03	0.04				
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	< 0.10	2.0				
PCBs									
PCB 28 + PCB 31	DETSC 3401#	0.01	mg/kg						< 0.01
PCB 52	DETSC 3401#	0.01	mg/kg						< 0.01
PCB 101	DETSC 3401#	0.01	mg/kg						< 0.01
PCB 118	DETSC 3401#	0.01	mg/kg						< 0.01
PCB 153	DETSC 3401#	0.01	mg/kg						< 0.01
PCB 138	DETSC 3401#	0.01	mg/kg						< 0.01
PCB 180	DETSC 3401#	0.01	mg/kg						< 0.01

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Summary of Chemical Analysis
Soil/Misc Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

			Lab No	1632482	1632483	1632484	1632485	1632486	1632487
			Sample ID	TP118	TP129	TP132	TP120	TP107	TP116
			Depth	0.50	0.90	2.90	3.40	3.90	0.20
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	23/01/2020	24/01/2020	24/01/2020	24/01/2020	23/01/2020	23/01/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
PCB 7 Total	DETSC 3401#	0.01	mg/kg						< 0.01
Organics									
DEM	DETSC 3001*	50	mg/kg						
DEM Cleanup	DETSC 3001*	50	mg/kg						
Phenols									
Phenol	DETSC 3451*	0.01	mg/kg			< 0.01			< 0.01
4-Chloro-3-methylphenol	DETSC 3451*	0.01	mg/kg			< 0.01			< 0.01
2,4-Dichlorophenol	DETSC 3451*	0.01	mg/kg			< 0.01			< 0.01
2,4-Dimethylphenol	DETSC 3451*	0.01	mg/kg			< 0.01			< 0.01
p-cresol	DETSC 3451*	0.01	mg/kg			< 0.01			0.01
2,6-Dimethylphenol	DETSC 3451*	0.01	mg/kg			< 0.01			< 0.01
2,6-Dichlorophenol	DETSC 3451*	0.01	mg/kg			< 0.01			< 0.01
2,4,6-Trichlorophenol	DETSC 3451*	0.01	mg/kg			< 0.01			< 0.01

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil/Misc Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

			Lab No	1632488	1632489	1632490	1632491	1632492	1632493
			Sample ID	TP118	TP113	TP122	TP121	TP124S	TP127
			Depth	0.20	0.30	0.30	0.50	0.50	0.50
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	23/01/2020	23/01/2020	24/01/2020	24/01/2020	24/01/2020	24/01/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Asbestos Quantification	DETSC 1102	0.001	%						
Metals									
Arsenic	DETSC 2301#	0.2	mg/kg	19	35	5.5			5.9
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg	0.5	0.7	0.3			0.4
Cadmium	DETSC 2301#	0.1	mg/kg	0.3	0.3	0.2			0.1
Chromium	DETSC 2301#	0.15	mg/kg	32	14	22			11
Chromium III	DETSC 2301*	0.15	mg/kg	32	14	22			11
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0			< 1.0
Copper	DETSC 2301#	0.2	mg/kg	150	55	20			15
Lead	DETSC 2301#	0.3	mg/kg	310	91	17			68
Magnesium Aqueous Extract	DETSC 2076*	10	mg/l						< 10
Mercury	DETSC 2325#	0.05	mg/kg	0.17	0.18	< 0.05			0.05
Nickel	DETSC 2301#	1	mg/kg	38	22	24			10
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5			< 0.5
Zinc	DETSC 2301#	1	mg/kg	480	100	54			72
Inorganics									
Combustibility	DETSC 2036*	0							
pH	DETSC 2008#		pH	10.1	9.4	8.7			11.3
Calorific Value	DETSC 5008	1	MJ/kg						
Cyanide, Total	DETSC 2130#	0.1	mg/kg	1.2	0.1	< 0.1	0.4	2.3	< 0.1
Total Organic Carbon	DETSC 2084#	0.5	%	6.2	7.0	0.8			2.4
Chloride Aqueous Extract	DETSC 2055	1	mg/l						10
Nitrate Aqueous Extract as NO3	DETSC 2055	1	mg/l						< 1.0
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l						220
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg						
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg						
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg						
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg						
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg						
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg						
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg						
Aliphatic C5-C35	DETSC 3072*	10	mg/kg						
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg						
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg						
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg						
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg						
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg						
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg						
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg						

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Summary of Chemical Analysis
Soil/Misc Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

			Lab No	1632488	1632489	1632490	1632491	1632492	1632493
			Sample ID	TP118	TP113	TP122	TP121	TP124S	TP127
			Depth	0.20	0.30	0.30	0.50	0.50	0.50
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	23/01/2020	23/01/2020	24/01/2020	24/01/2020	24/01/2020	24/01/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Aromatic C5-C35	DETSC 3072*	10	mg/kg						
TPH Ali/Aro Total	DETSC 3072*	10	mg/kg						
EPH (C6-C10)	DETSC 3321*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1		< 0.1
EPH (C10-C12)	DETSC 3311	10	mg/kg	< 200.0	< 10	< 10	< 10		< 10
EPH (C12-C16)	DETSC 3311	10	mg/kg	< 200.0	72	< 10	18		13
EPH (C16-C21)	DETSC 3311	10	mg/kg	< 200.0	530	< 10	87		180
EPH (C21-C35)	DETSC 3311	10	mg/kg	820	1500	< 10	290		7700
EPH (C35-C40)	DETSC 3311	10	mg/kg	470	250	< 10	51		1300
EPH (C10-C40)	DETSC 3311#	10	mg/kg	1300	2300	< 10	450	78	9200
Benzene	DETSC 3321#	0.01	mg/kg				< 0.01	< 0.01	
Ethylbenzene	DETSC 3321#	0.01	mg/kg				< 0.01	< 0.01	
Toluene	DETSC 3321#	0.01	mg/kg				< 0.01	< 0.01	
Xylene	DETSC 3321#	0.01	mg/kg				< 0.01	< 0.01	
MTBE	DETSC 3321	0.01	mg/kg				< 0.01	< 0.01	
PAHs									
Naphthalene	DETSC 3303#	0.03	mg/kg						
Acenaphthylene	DETSC 3303#	0.03	mg/kg						
Acenaphthene	DETSC 3303#	0.03	mg/kg						
Fluorene	DETSC 3303	0.03	mg/kg						
Phenanthrene	DETSC 3303#	0.03	mg/kg						
Anthracene	DETSC 3303	0.03	mg/kg						
Fluoranthene	DETSC 3303#	0.03	mg/kg						
Pyrene	DETSC 3303#	0.03	mg/kg						
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg						
Chrysene	DETSC 3303	0.03	mg/kg						
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg						
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg						
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg						
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg						
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg						
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg						
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg						
PCBs									
PCB 28 + PCB 31	DETSC 3401#	0.01	mg/kg	0.12					
PCB 52	DETSC 3401#	0.01	mg/kg	0.07					
PCB 101	DETSC 3401#	0.01	mg/kg	0.02					
PCB 118	DETSC 3401#	0.01	mg/kg	0.01					
PCB 153	DETSC 3401#	0.01	mg/kg	< 0.01					
PCB 138	DETSC 3401#	0.01	mg/kg	< 0.01					
PCB 180	DETSC 3401#	0.01	mg/kg	< 0.01					

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Summary of Chemical Analysis
Soil/Misc Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

			Lab No	1632488	1632489	1632490	1632491	1632492	1632493
			Sample ID	TP118	TP113	TP122	TP121	TP124S	TP127
			Depth	0.20	0.30	0.30	0.50	0.50	0.50
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	23/01/2020	23/01/2020	24/01/2020	24/01/2020	24/01/2020	24/01/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
PCB 7 Total	DETSC 3401#	0.01	mg/kg	0.22					
Organics									
DEM	DETSC 3001*	50	mg/kg					< 50	
DEM Cleanup	DETSC 3001*	50	mg/kg					< 50	
Phenols									
Phenol	DETSC 3451*	0.01	mg/kg	< 0.10	0.11	< 0.01	0.05	< 0.01	
4-Chloro-3-methylphenol	DETSC 3451*	0.01	mg/kg	< 0.10	< 0.01	< 0.01	< 0.01	< 0.01	
2,4-Dichlorophenol	DETSC 3451*	0.01	mg/kg	< 0.10	< 0.01	< 0.01	< 0.01	< 0.01	
2,4-Dimethylphenol	DETSC 3451*	0.01	mg/kg	< 0.10	0.09	< 0.01	< 0.01	< 0.01	
p-cresol	DETSC 3451*	0.01	mg/kg	< 0.10	0.16	< 0.01	< 0.01	< 0.01	
2,6-Dimethylphenol	DETSC 3451*	0.01	mg/kg	< 0.10	0.16	< 0.01	< 0.01	< 0.01	
2,6-Dichlorophenol	DETSC 3451*	0.01	mg/kg	< 0.10	< 0.01	< 0.01	< 0.01	< 0.01	
2,4,6-Trichlorophenol	DETSC 3451*	0.01	mg/kg	< 0.10	< 0.01	< 0.01	< 0.01	< 0.01	

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Summary of Chemical Analysis
Soil/Misc Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

			Lab No	1632494	1632495	1632496	1632497	1632498	1632499
			Sample ID	TP110	TP130	TP131	TP124S	TP112E	TP114
			Depth	0.60	0.60	1.30	1.30	1.50	0.05
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	23/01/2020	23/01/2020	24/01/2020	24/01/2020	23/01/2020	23/01/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Asbestos Quantification	DETSC 1102	0.001	%						
Metals									
Arsenic	DETSC 2301#	0.2	mg/kg	2.9	29	140	19	110	
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg	0.5	< 0.2	0.6	0.9	0.8	
Cadmium	DETSC 2301#	0.1	mg/kg	0.3	< 0.1	0.6	0.1	0.8	
Chromium	DETSC 2301#	0.15	mg/kg	11	13	35	14	38	
Chromium III	DETSC 2301*	0.15	mg/kg	11	13	35	14	38	
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
Copper	DETSC 2301#	0.2	mg/kg	13	110	240	47	1100	
Lead	DETSC 2301#	0.3	mg/kg	7.6	24	560	44	290	
Magnesium Aqueous Extract	DETSC 2076*	10	mg/l						
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	< 0.05	0.15	< 0.05	0.31	
Nickel	DETSC 2301#	1	mg/kg	12	45	55	17	36	
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	1.8	< 0.5	< 0.5	
Zinc	DETSC 2301#	1	mg/kg	43	12	420	57	370	
Inorganics									
Combustibility	DETSC 2036*	0							
pH	DETSC 2008#		pH	11.8	8.7	8.0	11.0	7.5	
Calorific Value	DETSC 5008	1	MJ/kg						
Cyanide, Total	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	2.2	1.2	0.5	
Total Organic Carbon	DETSC 2084#	0.5	%	< 0.5	7.5	18	4.9	9.3	
Chloride Aqueous Extract	DETSC 2055	1	mg/l						
Nitrate Aqueous Extract as NO3	DETSC 2055	1	mg/l						
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l						
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg					< 0.01	
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg					< 0.01	
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg					< 0.01	
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg					< 1.5	
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg					< 1.2	
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg					< 1.5	
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg					< 3.4	
Aliphatic C5-C35	DETSC 3072*	10	mg/kg					< 10	
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg					< 0.01	
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg					< 0.01	
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg					< 0.01	
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg					< 0.9	
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg					0.7	
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg					3.4	
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg					26	

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Summary of Chemical Analysis
Soil/Misc Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

			Lab No	1632494	1632495	1632496	1632497	1632498	1632499
			Sample ID	TP110	TP130	TP131	TP124S	TP112E	TP114
			Depth	0.60	0.60	1.30	1.30	1.50	0.05
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	23/01/2020	23/01/2020	24/01/2020	24/01/2020	23/01/2020	23/01/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Aromatic C5-C35	DETSC 3072*	10	mg/kg					30	
TPH Ali/Aro Total	DETSC 3072*	10	mg/kg					30	
EPH (C6-C10)	DETSC 3321*	0.1	mg/kg	< 0.1	< 0.1			< 0.1	
EPH (C10-C12)	DETSC 3311	10	mg/kg	< 10	< 10			< 10	
EPH (C12-C16)	DETSC 3311	10	mg/kg	< 10	< 10			11	
EPH (C16-C21)	DETSC 3311	10	mg/kg	< 10	< 10			420	
EPH (C21-C35)	DETSC 3311	10	mg/kg	17	11			620	
EPH (C35-C40)	DETSC 3311	10	mg/kg	15	< 10			69	
EPH (C10-C40)	DETSC 3311#	10	mg/kg	31	14	710	94	1100	
Benzene	DETSC 3321#	0.01	mg/kg					< 0.01	
Ethylbenzene	DETSC 3321#	0.01	mg/kg					< 0.01	
Toluene	DETSC 3321#	0.01	mg/kg					< 0.01	
Xylene	DETSC 3321#	0.01	mg/kg					< 0.01	
MTBE	DETSC 3321	0.01	mg/kg					< 0.01	
PAHs									
Naphthalene	DETSC 3303#	0.03	mg/kg						< 3.00
Acenaphthylene	DETSC 3303#	0.03	mg/kg						15
Acenaphthene	DETSC 3303#	0.03	mg/kg						26
Fluorene	DETSC 3303	0.03	mg/kg						42
Phenanthrene	DETSC 3303#	0.03	mg/kg						330
Anthracene	DETSC 3303	0.03	mg/kg						95
Fluoranthene	DETSC 3303#	0.03	mg/kg						310
Pyrene	DETSC 3303#	0.03	mg/kg						260
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg						92
Chrysene	DETSC 3303	0.03	mg/kg						86
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg						83
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg						32
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg						64
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg						27
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg						8.0
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg						31
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg						< 1490.03
PCBs									
PCB 28 + PCB 31	DETSC 3401#	0.01	mg/kg						
PCB 52	DETSC 3401#	0.01	mg/kg						
PCB 101	DETSC 3401#	0.01	mg/kg						
PCB 118	DETSC 3401#	0.01	mg/kg						
PCB 153	DETSC 3401#	0.01	mg/kg						
PCB 138	DETSC 3401#	0.01	mg/kg						
PCB 180	DETSC 3401#	0.01	mg/kg						

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Summary of Chemical Analysis
Soil/Misc Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

			Lab No	1632494	1632495	1632496	1632497	1632498	1632499
			Sample ID	TP110	TP130	TP131	TP124S	TP112E	TP114
			Depth	0.60	0.60	1.30	1.30	1.50	0.05
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	23/01/2020	23/01/2020	24/01/2020	24/01/2020	23/01/2020	23/01/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
PCB 7 Total	DETSC 3401#	0.01	mg/kg						
Organics									
DEM	DETSC 3001*	50	mg/kg			< 50	< 50		
DEM Cleanup	DETSC 3001*	50	mg/kg			< 50	< 50		
Phenols									
Phenol	DETSC 3451*	0.01	mg/kg			< 0.01	< 0.01		
4-Chloro-3-methylphenol	DETSC 3451*	0.01	mg/kg			< 0.01	< 0.01		
2,4-Dichlorophenol	DETSC 3451*	0.01	mg/kg			< 0.01	< 0.01		
2,4-Dimethylphenol	DETSC 3451*	0.01	mg/kg			< 0.01	< 0.01		
p-cresol	DETSC 3451*	0.01	mg/kg			0.08	< 0.01		
2,6-Dimethylphenol	DETSC 3451*	0.01	mg/kg			< 0.01	< 0.01		
2,6-Dichlorophenol	DETSC 3451*	0.01	mg/kg			< 0.01	< 0.01		
2,4,6-Trichlorophenol	DETSC 3451*	0.01	mg/kg			< 0.01	< 0.01		

Summary of Chemical Analysis
Soil/Misc Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

			Lab No	1632500	1632501	1632502	1632503	1632504	1632505
			Sample ID	TP117	TP116	TP109	TP123	TP120	TP103
			Depth	0.25	0.70	0.80	0.80	1.00	1.70
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	23/01/2020	23/01/2020	24/01/2020	24/01/2020	23/01/2020	23/01/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Asbestos Quantification	DETSC 1102	0.001	%						
Metals									
Arsenic	DETSC 2301#	0.2	mg/kg		9.1	11	5.2		9.0
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg		< 0.2	0.3	0.4		< 0.2
Cadmium	DETSC 2301#	0.1	mg/kg		< 0.1	0.2	0.1		0.2
Chromium	DETSC 2301#	0.15	mg/kg		25	38	28		20
Chromium III	DETSC 2301*	0.15	mg/kg		25	38	28		20
Chromium, Hexavalent	DETSC 2204*	1	mg/kg		< 1.0	< 1.0	< 1.0		< 1.0
Copper	DETSC 2301#	0.2	mg/kg		34	73	23		23
Lead	DETSC 2301#	0.3	mg/kg		17	31	17		21
Magnesium Aqueous Extract	DETSC 2076*	10	mg/l						
Mercury	DETSC 2325#	0.05	mg/kg		< 0.05	< 0.05	< 0.05		< 0.05
Nickel	DETSC 2301#	1	mg/kg		26	49	29		31
Selenium	DETSC 2301#	0.5	mg/kg		< 0.5	0.8	< 0.5		< 0.5
Zinc	DETSC 2301#	1	mg/kg		61	100	70		69
Inorganics									
Combustibility	DETSC 2036*	0							
pH	DETSC 2008#		pH		8.5	6.8	7.1		7.4
Calorific Value	DETSC 5008	1	MJ/kg						
Cyanide, Total	DETSC 2130#	0.1	mg/kg		< 0.1	< 0.1	0.3		
Total Organic Carbon	DETSC 2084#	0.5	%		0.5	1.6	0.9	27	1.1
Chloride Aqueous Extract	DETSC 2055	1	mg/l						
Nitrate Aqueous Extract as NO3	DETSC 2055	1	mg/l						
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l						
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg						
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg						
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg						
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg						
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg						
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg						
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg						
Aliphatic C5-C35	DETSC 3072*	10	mg/kg						
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg						
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg						
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg						
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg						
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg						
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg						
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg						

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil/Misc Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

			Lab No	1632500	1632501	1632502	1632503	1632504	1632505
			Sample ID	TP117	TP116	TP109	TP123	TP120	TP103
			Depth	0.25	0.70	0.80	0.80	1.00	1.70
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	23/01/2020	23/01/2020	24/01/2020	24/01/2020	23/01/2020	23/01/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Aromatic C5-C35	DETSC 3072*	10	mg/kg						
TPH Ali/Aro Total	DETSC 3072*	10	mg/kg						
EPH (C6-C10)	DETSC 3321*	0.1	mg/kg		< 0.1	< 0.1	< 0.1	10	< 0.1
EPH (C10-C12)	DETSC 3311	10	mg/kg		< 10	< 10	< 10	1900	< 10
EPH (C12-C16)	DETSC 3311	10	mg/kg		< 10	< 10	< 10	1900	< 10
EPH (C16-C21)	DETSC 3311	10	mg/kg		< 10	< 10	< 10	3300	< 10
EPH (C21-C35)	DETSC 3311	10	mg/kg		< 10	< 10	< 10	5200	< 10
EPH (C35-C40)	DETSC 3311	10	mg/kg		< 10	< 10	< 10	1000	< 10
EPH (C10-C40)	DETSC 3311#	10	mg/kg		< 10	< 10	< 10	13000	< 10
Benzene	DETSC 3321#	0.01	mg/kg						
Ethylbenzene	DETSC 3321#	0.01	mg/kg						
Toluene	DETSC 3321#	0.01	mg/kg						
Xylene	DETSC 3321#	0.01	mg/kg						
MTBE	DETSC 3321	0.01	mg/kg						
PAHs									
Naphthalene	DETSC 3303#	0.03	mg/kg	< 3.00					
Acenaphthylene	DETSC 3303#	0.03	mg/kg	44					
Acenaphthene	DETSC 3303#	0.03	mg/kg	11					
Fluorene	DETSC 3303	0.03	mg/kg	54					
Phenanthrene	DETSC 3303#	0.03	mg/kg	620					
Anthracene	DETSC 3303	0.03	mg/kg	190					
Fluoranthene	DETSC 3303#	0.03	mg/kg	450					
Pyrene	DETSC 3303#	0.03	mg/kg	370					
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	110					
Chrysene	DETSC 3303	0.03	mg/kg	120					
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	83					
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	33					
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	64					
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	23					
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	7.2					
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	24					
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	< 2147.04					
PCBs									
PCB 28 + PCB 31	DETSC 3401#	0.01	mg/kg		< 0.01				
PCB 52	DETSC 3401#	0.01	mg/kg		< 0.01				
PCB 101	DETSC 3401#	0.01	mg/kg		< 0.01				
PCB 118	DETSC 3401#	0.01	mg/kg		< 0.01				
PCB 153	DETSC 3401#	0.01	mg/kg		< 0.01				
PCB 138	DETSC 3401#	0.01	mg/kg		< 0.01				
PCB 180	DETSC 3401#	0.01	mg/kg		< 0.01				

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Summary of Chemical Analysis
Soil/Misc Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

			Lab No	1632500	1632501	1632502	1632503	1632504	1632505
			Sample ID	TP117	TP116	TP109	TP123	TP120	TP103
			Depth	0.25	0.70	0.80	0.80	1.00	1.70
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	23/01/2020	23/01/2020	24/01/2020	24/01/2020	23/01/2020	23/01/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
PCB 7 Total	DETSC 3401#	0.01	mg/kg		< 0.01				
Organics									
DEM	DETSC 3001*	50	mg/kg						
DEM Cleanup	DETSC 3001*	50	mg/kg						
Phenols									
Phenol	DETSC 3451*	0.01	mg/kg						
4-Chloro-3-methylphenol	DETSC 3451*	0.01	mg/kg						
2,4-Dichlorophenol	DETSC 3451*	0.01	mg/kg						
2,4-Dimethylphenol	DETSC 3451*	0.01	mg/kg						
p-cresol	DETSC 3451*	0.01	mg/kg						
2,6-Dimethylphenol	DETSC 3451*	0.01	mg/kg						
2,6-Dichlorophenol	DETSC 3451*	0.01	mg/kg						
2,4,6-Trichlorophenol	DETSC 3451*	0.01	mg/kg						

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Summary of Chemical Analysis
Soil/Misc Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

			Lab No	1632506	1632507	1632508	1632509	1632510	1632511
			Sample ID	TP107	TP117	TP121	TP109	TP126	TP101
			Depth	2.50	0.15	0.20	0.30	0.40	0.20
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	23/01/2020	23/01/2020	24/01/2020	24/01/2020	24/01/2020	23/01/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Asbestos Quantification	DETSC 1102	0.001	%						
Metals									
Arsenic	DETSC 2301#	0.2	mg/kg	13	2.1	3.2	4.2	11	29
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg	< 0.2	0.4	0.3	0.3	0.3	0.8
Cadmium	DETSC 2301#	0.1	mg/kg	0.1	0.2	0.2	0.2	0.1	0.3
Chromium	DETSC 2301#	0.15	mg/kg	33	7.8	17	22	16	35
Chromium III	DETSC 2301*	0.15	mg/kg	33	7.8	17	22	16	35
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	30	9.2	14	15	25	68
Lead	DETSC 2301#	0.3	mg/kg	76	9.0	9.2	13	250	110
Magnesium Aqueous Extract	DETSC 2076*	10	mg/l		< 10			< 10	
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	0.05	0.24
Nickel	DETSC 2301#	1	mg/kg	27	7.2	19	23	21	30
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	0.8	< 0.5	1.1
Zinc	DETSC 2301#	1	mg/kg	68	24	38	43	93	110
Inorganics									
Combustibility	DETSC 2036*	0							
pH	DETSC 2008#		pH	7.3	11.7	11.2	10.2	10.5	5.5
Calorific Value	DETSC 5008	1	MJ/kg						
Cyanide, Total	DETSC 2130#	0.1	mg/kg		< 0.1	< 0.1	< 0.1	0.2	
Total Organic Carbon	DETSC 2084#	0.5	%	0.7	< 0.5	< 0.5	0.7	1.2	7.4
Chloride Aqueous Extract	DETSC 2055	1	mg/l		49			19	
Nitrate Aqueous Extract as NO3	DETSC 2055	1	mg/l		5.9			1.6	
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l		67			70	
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01					
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01					
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01					
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5					
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2					
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5					
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4					
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10					
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01					
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01					
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01					
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	5.2					
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	8.7					
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	7.2					
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4					

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Summary of Chemical Analysis
Soil/Misc Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

			Lab No	1632506	1632507	1632508	1632509	1632510	1632511
			Sample ID	TP107	TP117	TP121	TP109	TP126	TP101
			Depth	2.50	0.15	0.20	0.30	0.40	0.20
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	23/01/2020	23/01/2020	24/01/2020	24/01/2020	24/01/2020	23/01/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Aromatic C5-C35	DETSC 3072*	10	mg/kg	21					
TPH Ali/Aro Total	DETSC 3072*	10	mg/kg	21					
EPH (C6-C10)	DETSC 3321*	0.1	mg/kg		< 0.1	< 0.1	< 0.1	< 0.1	
EPH (C10-C12)	DETSC 3311	10	mg/kg		< 10	< 10	< 10	< 10	
EPH (C12-C16)	DETSC 3311	10	mg/kg		< 10	< 10	< 10	< 10	
EPH (C16-C21)	DETSC 3311	10	mg/kg		59	< 10	13	< 10	
EPH (C21-C35)	DETSC 3311	10	mg/kg		190	< 10	31	< 10	
EPH (C35-C40)	DETSC 3311	10	mg/kg		34	< 10	< 10	< 10	
EPH (C10-C40)	DETSC 3311#	10	mg/kg		290	< 10	48	< 10	
Benzene	DETSC 3321#	0.01	mg/kg	< 0.01					
Ethylbenzene	DETSC 3321#	0.01	mg/kg	< 0.01					
Toluene	DETSC 3321#	0.01	mg/kg	< 0.01					
Xylene	DETSC 3321#	0.01	mg/kg	< 0.01					
MTBE	DETSC 3321	0.01	mg/kg	< 0.01					
PAHs									
Naphthalene	DETSC 3303#	0.03	mg/kg						< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg						< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg						< 0.03
Fluorene	DETSC 3303	0.03	mg/kg						< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg						0.14
Anthracene	DETSC 3303	0.03	mg/kg						0.04
Fluoranthene	DETSC 3303#	0.03	mg/kg						0.30
Pyrene	DETSC 3303#	0.03	mg/kg						0.27
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg						0.12
Chrysene	DETSC 3303	0.03	mg/kg						0.09
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg						0.11
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg						0.04
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg						0.07
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg						0.04
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg						< 0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg						< 0.03
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg						1.2
PCBs									
PCB 28 + PCB 31	DETSC 3401#	0.01	mg/kg		< 0.01				
PCB 52	DETSC 3401#	0.01	mg/kg		< 0.01				
PCB 101	DETSC 3401#	0.01	mg/kg		< 0.01				
PCB 118	DETSC 3401#	0.01	mg/kg		< 0.01				
PCB 153	DETSC 3401#	0.01	mg/kg		< 0.01				
PCB 138	DETSC 3401#	0.01	mg/kg		< 0.01				
PCB 180	DETSC 3401#	0.01	mg/kg		< 0.01				

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Summary of Chemical Analysis
Soil/Misc Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

			Lab No	1632506	1632507	1632508	1632509	1632510	1632511
			Sample ID	TP107	TP117	TP121	TP109	TP126	TP101
			Depth	2.50	0.15	0.20	0.30	0.40	0.20
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	23/01/2020	23/01/2020	24/01/2020	24/01/2020	24/01/2020	23/01/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
PCB 7 Total	DETSC 3401#	0.01	mg/kg		< 0.01				
Organics									
DEM	DETSC 3001*	50	mg/kg						
DEM Cleanup	DETSC 3001*	50	mg/kg						
Phenols									
Phenol	DETSC 3451*	0.01	mg/kg						
4-Chloro-3-methylphenol	DETSC 3451*	0.01	mg/kg						
2,4-Dichlorophenol	DETSC 3451*	0.01	mg/kg						
2,4-Dimethylphenol	DETSC 3451*	0.01	mg/kg						
p-cresol	DETSC 3451*	0.01	mg/kg						
2,6-Dimethylphenol	DETSC 3451*	0.01	mg/kg						
2,6-Dichlorophenol	DETSC 3451*	0.01	mg/kg						
2,4,6-Trichlorophenol	DETSC 3451*	0.01	mg/kg						

Summary of Chemical Analysis
Soil/Misc Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

			Lab No	1632512	1632513	1632514	1632515	1632516	1632517
			Sample ID	TP103	TP105	TP106	TP102	TP102	TP104
			Depth	0.20	0.20	0.20	0.30	0.30	0.30
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	23/01/2020	23/01/2020	23/01/2020	23/01/2020	23/01/2020	23/01/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Asbestos Quantification	DETSC 1102	0.001	%						
Metals									
Arsenic	DETSC 2301#	0.2	mg/kg	45	42	45	55	56	33
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg	0.5	0.9	0.7	0.9	0.9	1.0
Cadmium	DETSC 2301#	0.1	mg/kg	0.3	0.4	0.4	0.4	0.5	0.4
Chromium	DETSC 2301#	0.15	mg/kg	27	31	36	34	35	29
Chromium III	DETSC 2301*	0.15	mg/kg	27	31	36	34	35	29
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	63	72	79	130	120	70
Lead	DETSC 2301#	0.3	mg/kg	86	92	110	100	100	79
Magnesium Aqueous Extract	DETSC 2076*	10	mg/l						
Mercury	DETSC 2325#	0.05	mg/kg	0.19	0.39	0.28	0.30	0.33	0.21
Nickel	DETSC 2301#	1	mg/kg	29	28	36	34	35	27
Selenium	DETSC 2301#	0.5	mg/kg	1.8	1.0	1.2	1.5	1.4	0.9
Zinc	DETSC 2301#	1	mg/kg	110	110	130	130	130	110
Inorganics									
Combustibility	DETSC 2036*	0							
pH	DETSC 2008#		pH	6.5	6.1	6.4	6.5	6.2	7.5
Calorific Value	DETSC 5008	1	MJ/kg						
Cyanide, Total	DETSC 2130#	0.1	mg/kg						
Total Organic Carbon	DETSC 2084#	0.5	%	7.1	8.7	3.1	6.1	11	7.5
Chloride Aqueous Extract	DETSC 2055	1	mg/l						
Nitrate Aqueous Extract as NO3	DETSC 2055	1	mg/l						
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l						
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg						
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg						
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg						
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg						
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg						
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg						
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg						
Aliphatic C5-C35	DETSC 3072*	10	mg/kg						
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg						
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg						
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg						
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg						
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg						
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg						
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg						

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Summary of Chemical Analysis
Soil/Misc Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

			Lab No	1632512	1632513	1632514	1632515	1632516	1632517
			Sample ID	TP103	TP105	TP106	TP102	TP102	TP104
			Depth	0.20	0.20	0.20	0.30	0.30	0.30
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	23/01/2020	23/01/2020	23/01/2020	23/01/2020	23/01/2020	23/01/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Aromatic C5-C35	DETSC 3072*	10	mg/kg						
TPH Ali/Aro Total	DETSC 3072*	10	mg/kg						
EPH (C6-C10)	DETSC 3321*	0.1	mg/kg						
EPH (C10-C12)	DETSC 3311	10	mg/kg						
EPH (C12-C16)	DETSC 3311	10	mg/kg						
EPH (C16-C21)	DETSC 3311	10	mg/kg						
EPH (C21-C35)	DETSC 3311	10	mg/kg						
EPH (C35-C40)	DETSC 3311	10	mg/kg						
EPH (C10-C40)	DETSC 3311#	10	mg/kg						
Benzene	DETSC 3321#	0.01	mg/kg						
Ethylbenzene	DETSC 3321#	0.01	mg/kg						
Toluene	DETSC 3321#	0.01	mg/kg						
Xylene	DETSC 3321#	0.01	mg/kg						
MTBE	DETSC 3321	0.01	mg/kg						
PAHs									
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	0.05	0.03	0.05	< 0.03	0.09
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	0.06	0.08	0.07	0.07	0.04	0.20
Fluorene	DETSC 3303	0.03	mg/kg	0.04	0.06	0.04	0.04	< 0.03	0.12
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.27	0.38	0.40	0.39	0.20	1.1
Anthracene	DETSC 3303	0.03	mg/kg	0.07	0.08	0.06	0.12	0.05	0.23
Fluoranthene	DETSC 3303#	0.03	mg/kg	0.35	0.53	0.56	0.59	0.29	1.9
Pyrene	DETSC 3303#	0.03	mg/kg	0.32	0.47	0.48	0.53	0.26	1.8
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.12	0.17	0.17	0.20	0.08	0.47
Chrysene	DETSC 3303	0.03	mg/kg	0.11	0.18	0.19	0.22	0.10	0.53
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.11	0.16	0.18	0.19	0.08	0.47
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	0.04	0.06	0.06	0.08	< 0.03	0.18
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	0.07	0.12	0.11	0.14	0.05	0.29
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	0.04	0.05	0.05	< 0.03	0.12
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	< 0.03	0.04	0.05	0.06	< 0.03	0.15
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	1.5	2.3	2.4	2.7	1.1	7.7
PCBs									
PCB 28 + PCB 31	DETSC 3401#	0.01	mg/kg						
PCB 52	DETSC 3401#	0.01	mg/kg						
PCB 101	DETSC 3401#	0.01	mg/kg						
PCB 118	DETSC 3401#	0.01	mg/kg						
PCB 153	DETSC 3401#	0.01	mg/kg						
PCB 138	DETSC 3401#	0.01	mg/kg						
PCB 180	DETSC 3401#	0.01	mg/kg						

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil/Misc Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

			Lab No	1632512	1632513	1632514	1632515	1632516	1632517
			Sample ID	TP103	TP105	TP106	TP102	TP102	TP104
			Depth	0.20	0.20	0.20	0.30	0.30	0.30
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	23/01/2020	23/01/2020	23/01/2020	23/01/2020	23/01/2020	23/01/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
PCB 7 Total	DETSC 3401#	0.01	mg/kg						
Organics									
DEM	DETSC 3001*	50	mg/kg						
DEM Cleanup	DETSC 3001*	50	mg/kg						
Phenols									
Phenol	DETSC 3451*	0.01	mg/kg						
4-Chloro-3-methylphenol	DETSC 3451*	0.01	mg/kg						
2,4-Dichlorophenol	DETSC 3451*	0.01	mg/kg						
2,4-Dimethylphenol	DETSC 3451*	0.01	mg/kg						
p-cresol	DETSC 3451*	0.01	mg/kg						
2,6-Dimethylphenol	DETSC 3451*	0.01	mg/kg						
2,6-Dichlorophenol	DETSC 3451*	0.01	mg/kg						
2,4,6-Trichlorophenol	DETSC 3451*	0.01	mg/kg						

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Summary of Chemical Analysis
Soil/Misc Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

Test	Method	LOD	Units	1641129	1641130	1641131
Sample ID				TP112E Sub Sample 1	TP112E Sub Sample 2	TP112E Sub Sample 3
Depth				1.50	1.50	1.50
Other ID						
Sample Type				SOIL	SOIL	SOIL
Sampling Date				23/01/2020	23/01/2020	23/01/2020
Sampling Time				n/s	n/s	n/s
Asbestos Quantification	DETSC 1102	0.001	%			
Metals						
Arsenic	DETSC 2301#	0.2	mg/kg			
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg			
Cadmium	DETSC 2301#	0.1	mg/kg			
Chromium	DETSC 2301#	0.15	mg/kg			
Chromium III	DETSC 2301*	0.15	mg/kg			
Chromium, Hexavalent	DETSC 2204*	1	mg/kg			
Copper	DETSC 2301#	0.2	mg/kg	44	44	46
Lead	DETSC 2301#	0.3	mg/kg			
Magnesium Aqueous Extract	DETSC 2076*	10	mg/l			
Mercury	DETSC 2325#	0.05	mg/kg			
Nickel	DETSC 2301#	1	mg/kg			
Selenium	DETSC 2301#	0.5	mg/kg			
Zinc	DETSC 2301#	1	mg/kg			
Inorganics						
Combustibility	DETSC 2036*	0				
pH	DETSC 2008#		pH			
Calorific Value	DETSC 5008	1	MJ/kg			
Cyanide, Total	DETSC 2130#	0.1	mg/kg			
Total Organic Carbon	DETSC 2084#	0.5	%			
Chloride Aqueous Extract	DETSC 2055	1	mg/l			
Nitrate Aqueous Extract as NO3	DETSC 2055	1	mg/l			
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l			
Petroleum Hydrocarbons						
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg			
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg			
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg			
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg			
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg			
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg			
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg			
Aliphatic C5-C35	DETSC 3072*	10	mg/kg			
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg			
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg			
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg			
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg			
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg			
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg			
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg			

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Summary of Chemical Analysis
Soil/Misc Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

Lab No	1641129	1641130	1641131
Sample ID	TP112E Sub Sample 1	TP112E Sub Sample 2	TP112E Sub Sample 3
Depth	1.50	1.50	1.50
Other ID			
Sample Type	SOIL	SOIL	SOIL
Sampling Date	23/01/2020	23/01/2020	23/01/2020
Sampling Time	n/s	n/s	n/s

Test	**Method**	**LOD**	**Units**			
Aromatic C5-C35	DETSC 3072*	10	mg/kg			
TPH Ali/Aro Total	DETSC 3072*	10	mg/kg			
EPH (C6-C10)	DETSC 3321*	0.1	mg/kg			
EPH (C10-C12)	DETSC 3311	10	mg/kg			
EPH (C12-C16)	DETSC 3311	10	mg/kg			
EPH (C16-C21)	DETSC 3311	10	mg/kg			
EPH (C21-C35)	DETSC 3311	10	mg/kg			
EPH (C35-C40)	DETSC 3311	10	mg/kg			
EPH (C10-C40)	DETSC 3311#	10	mg/kg			
Benzene	DETSC 3321#	0.01	mg/kg			
Ethylbenzene	DETSC 3321#	0.01	mg/kg			
Toluene	DETSC 3321#	0.01	mg/kg			
Xylene	DETSC 3321#	0.01	mg/kg			
MTBE	DETSC 3321	0.01	mg/kg			
PAHs						
Naphthalene	DETSC 3303#	0.03	mg/kg			
Acenaphthylene	DETSC 3303#	0.03	mg/kg			
Acenaphthene	DETSC 3303#	0.03	mg/kg			
Fluorene	DETSC 3303	0.03	mg/kg			
Phenanthrene	DETSC 3303#	0.03	mg/kg			
Anthracene	DETSC 3303	0.03	mg/kg			
Fluoranthene	DETSC 3303#	0.03	mg/kg			
Pyrene	DETSC 3303#	0.03	mg/kg			
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg			
Chrysene	DETSC 3303	0.03	mg/kg			
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg			
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg			
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg			
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg			
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg			
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg			
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg			
PCBs						
PCB 28 + PCB 31	DETSC 3401#	0.01	mg/kg			
PCB 52	DETSC 3401#	0.01	mg/kg			
PCB 101	DETSC 3401#	0.01	mg/kg			
PCB 118	DETSC 3401#	0.01	mg/kg			
PCB 153	DETSC 3401#	0.01	mg/kg			
PCB 138	DETSC 3401#	0.01	mg/kg			
PCB 180	DETSC 3401#	0.01	mg/kg			

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Summary of Chemical Analysis
Soil/Misc Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

Lab No	1641129	1641130	1641131
Sample ID	TP112E Sub Sample 1	TP112E Sub Sample 2	TP112E Sub Sample 3
Depth	1.50	1.50	1.50
Other ID			
Sample Type	SOIL	SOIL	SOIL
Sampling Date	23/01/2020	23/01/2020	23/01/2020
Sampling Time	n/s	n/s	n/s

Test	**Method**	**LOD**	**Units**			
PCB 7 Total	DETSC 3401#	0.01	mg/kg			
Organics						
DEM	DETSC 3001*	50	mg/kg			
DEM Cleanup	DETSC 3001*	50	mg/kg			
Phenols						
Phenol	DETSC 3451*	0.01	mg/kg			
4-Chloro-3-methylphenol	DETSC 3451*	0.01	mg/kg			
2,4-Dichlorophenol	DETSC 3451*	0.01	mg/kg			
2,4-Dimethylphenol	DETSC 3451*	0.01	mg/kg			
p-cresol	DETSC 3451*	0.01	mg/kg			
2,6-Dimethylphenol	DETSC 3451*	0.01	mg/kg			
2,6-Dichlorophenol	DETSC 3451*	0.01	mg/kg			
2,4,6-Trichlorophenol	DETSC 3451*	0.01	mg/kg			

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Combustability Test Results

Screening Test Procedure and Classification

Sample divided into 5 sub-samples. 10g of material was then abstracted from each sub-sample and heated on gauze cloth over a Bunsen burner for 15 minutes. Reactions were observed both during and after heating and the material classified as follows:

Reaction Grade	**Description**
F	The material did not glow, but there was a slight decrepitation (inert material).
E	The sample glowed but did not ignite (inert material).
D	Volatiles were emitted and/or some bubbling occurred, but the material did not ignite (inert material).
C	Sample ignited, but did not persist burning after the Bunsen burner was withdrawn.
B	Sample ignited, continued burning weakly and smouldered after the Bunsen burner was withdrawn.
A	Sample ignited and continued to burn vigorously after the Bunsen burner was withdrawn.

Summary of Chemical Analysis
Soil VOC/SVOC Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

			Lab No	1632464	1632465	1632466	1632467	1632468	1632469
			Sample ID	TP108	TP112W	TP115	TP113	TP131	TP131
			Depth	0.50	0.50	0.50	0.70	0.80	1.10
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	23/01/2020	23/01/2020	23/01/2020	23/01/2020	24/01/2020	24/01/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
VOCs									
Vinyl Chloride	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1 Dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Trans-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Cis-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Bromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chloroform	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1,1-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Carbon tetrachloride	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Trichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01
1,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibromomethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Bromodichloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
cis-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Toluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
trans-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1,2-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Tetrachloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,3-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2-dibromoethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1,1,2-tetrachloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Ethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
m+p-Xylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
o-Xylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Styrene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Bromoform	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Isopropylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Bromobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2,3-trichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
n-propylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,3,5-trimethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
4-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Tert-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2,4-trimethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Soil VOC/SVOC Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

Test	Method	LOD	Units						
			Lab No	1632464	1632465	1632466	1632467	1632468	1632469
			Sample ID	TP108	TP112W	TP115	TP113	TP131	TP131
			Depth	0.50	0.50	0.50	0.70	0.80	1.10
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	23/01/2020	23/01/2020	23/01/2020	23/01/2020	24/01/2020	24/01/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
sec-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
p-isopropyltoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,3-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,4-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
n-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2-dibromo-3-chloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2,4-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Hexachlorobutadiene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Naphthalene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2,3-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
MTBE	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
SVOCs									
Phenol	DETSC 3433	0.1	mg/kg		< 0.1		0.2		
Aniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Chlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzyl Alcohol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	0.1	< 0.1	< 0.1
2-Methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Bis(2-chloroisopropyl)ether	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
3&4-Methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	0.4	< 0.1	0.1
2,4-Dimethylphenol	DETSC 3433	0.1	mg/kg		< 0.1		< 0.1		
Bis-(dichloroethoxy)methane	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,4-Dichlorophenol	DETSC 3433	0.1	mg/kg		< 0.1		< 0.1		
1,2,4-Trichlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Naphthalene	DETSC 3433	0.1	mg/kg						
4-Chloro-3-methylphenol	DETSC 3433	0.1	mg/kg		< 0.1		< 0.1		
2-Methylnaphthalene	DETSC 3433	0.1	mg/kg	0.1	< 0.1	0.1	1.6	< 0.1	< 0.1
Hexachlorocyclopentadiene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,4,6-Trichlorophenol	DETSC 3433	0.1	mg/kg		< 0.1		< 0.1		
2,4,5-Trichlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Chloronaphthalene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,4-Dinitrotoluene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	DETSC 3433	0.1	mg/kg	1.0	< 0.1	0.1	1.3	< 0.1	0.3
3-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	DETSC 3433	0.1	mg/kg	0.4	< 0.1	< 0.1	4.9	< 0.1	< 0.1
4-Nitrophenol	DETSC 3433*	0.1	mg/kg	0.7	< 0.1	0.4	1.8	< 0.1	< 0.1
Dibenzofuran	DETSC 3433	0.1	mg/kg	0.7	< 0.1	0.4	1.6	< 0.1	< 0.1
2,6-Dinitrotoluene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,3,4,6-Tetrachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Diethylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
4-Chlorophenylphenylether	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Soil VOC/SVOC Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

			Lab No	1632464	1632465	1632466	1632467	1632468	1632469
			Sample ID	TP108	TP112W	TP115	TP113	TP131	TP131
			Depth	0.50	0.50	0.50	0.70	0.80	1.10
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	23/01/2020	23/01/2020	23/01/2020	23/01/2020	24/01/2020	24/01/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Fluorene	DETSC 3433	0.1	mg/kg	1.3	< 0.1	< 0.1	3.7	< 0.1	< 0.1
4-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Methyl-4,6-Dinitrophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Diphenylamine	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
4-Bromophenylphenylether	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Hexachlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Pentachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	DETSC 3433	0.1	mg/kg	8.0	< 0.1	2.5	37	0.1	1.0
Anthracene	DETSC 3433	0.1	mg/kg	2.6	< 0.1	0.3	10	< 0.1	0.5
Di-n-butylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluoranthene	DETSC 3433	0.1	mg/kg	9.2	0.3	1.2	55	0.3	2.3
Pyrene	DETSC 3433	0.1	mg/kg	7.0	0.2	1.0	49	0.2	2.1
Butylbenzylphthalate	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)anthracene	DETSC 3433	0.1	mg/kg	3.6	0.2	0.4	27	0.2	1.1
Chrysene	DETSC 3433	0.1	mg/kg	3.4	0.1	0.4	24	0.2	1.1
Bis(2-ethylhexyl)phthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	0.1	< 0.1
Di-n-octylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(b)fluoranthene	DETSC 3433	0.1	mg/kg	3.9	0.2	0.4	28	0.4	1.4
Benzo(k)fluoranthene	DETSC 3433	0.1	mg/kg	1.7	< 0.1	0.2	11	< 0.1	0.6
Benzo(a)pyrene	DETSC 3433	0.1	mg/kg	3.5	0.1	0.3	25	0.3	1.2
Indeno(123cd)pyrene	DETSC 3433	0.1	mg/kg	1.7	< 0.1	0.3	14	0.2	0.6
Dibenzo(ah)anthracene	DETSC 3433	0.1	mg/kg	0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(ghi)perylene	DETSC 3433	0.1	mg/kg	1.9	< 0.1	0.5	16	0.3	0.7
1,4-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dimethylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
1,3-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
1,2-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,3,5,6-Tetrachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Azobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Carbazole	DETSC 3433*	0.1	mg/kg	0.8	< 0.1	0.2	3.6	< 0.1	< 0.1

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Soil VOC/SVOC Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

			Lab No	1632470	1632471	1632472	1632476	1632479	1632480
			Sample ID	TP119	TP132	TP123	TP123	TP112E	TP109
			Depth	0.70	1.20	1.20	2.20	0.30	0.60
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	23/01/2020	24/01/2020	24/01/2020	24/01/2020	23/01/2020	24/01/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
VOCs									
Vinyl Chloride	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
1,1 Dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
Trans-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
1,1-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
Cis-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
2,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
Bromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
Chloroform	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
1,1,1-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
1,1-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
Carbon tetrachloride	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
Benzene	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
1,2-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
Trichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
1,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
Dibromomethane	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
Bromodichloromethane	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
cis-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
Toluene	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
trans-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
1,1,2-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
Tetrachloroethylene	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
1,3-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
Dibromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
1,2-dibromoethane	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
Chlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
1,1,1,2-tetrachloroethane	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
Ethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
m+p-Xylene	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
o-Xylene	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
Styrene	DETSC 3431*	0.01	mg/kg	< 0.01				< 0.01	< 0.01
Bromoform	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
Isopropylbenzene	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
Bromobenzene	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
1,2,3-trichloropropane	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
n-propylbenzene	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
2-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
1,3,5-trimethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
4-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
Tert-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
1,2,4-trimethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Soil VOC/SVOC Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

			Lab No	1632470	1632471	1632472	1632476	1632479	1632480
			Sample ID	TP119	TP132	TP123	TP123	TP112E	TP109
			Depth	0.70	1.20	1.20	2.20	0.30	0.60
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	23/01/2020	24/01/2020	24/01/2020	24/01/2020	23/01/2020	24/01/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
sec-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
p-isopropyltoluene	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
1,3-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
1,4-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
n-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
1,2-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
1,2-dibromo-3-chloropropane	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
1,2,4-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
Hexachlorobutadiene	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
Naphthalene	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
1,2,3-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01				< 0.01	< 0.01
MTBE	DETSC 3431*	0.01	mg/kg	< 0.01				< 0.01	< 0.01
SVOCs									
Phenol	DETSC 3433	0.1	mg/kg	< 0.1					0.1
Aniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	2.5	0.1
2-Chlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzyl Alcohol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Bis(2-chloroisopropyl)ether	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
3&4-Methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.2
2,4-Dimethylphenol	DETSC 3433	0.1	mg/kg	< 0.1					0.1
Bis-(dichloroethoxy)methane	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,4-Dichlorophenol	DETSC 3433	0.1	mg/kg	< 0.1					< 0.1
1,2,4-Trichlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Naphthalene	DETSC 3433	0.1	mg/kg		< 0.1	< 0.1	1.9		
4-Chloro-3-methylphenol	DETSC 3433	0.1	mg/kg	< 0.1					< 0.1
2-Methylnaphthalene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.7
Hexachlorocyclopentadiene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,4,6-Trichlorophenol	DETSC 3433	0.1	mg/kg	< 0.1					< 0.1
2,4,5-Trichlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Chloronaphthalene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,4-Dinitrotoluene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	1.1	< 0.1	< 0.1
3-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	0.5	< 0.1	3.0
4-Nitrophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	1.0	< 0.1	1.4
Dibenzofuran	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	1.0	< 0.1	1.5
2,6-Dinitrotoluene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,3,4,6-Tetrachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Diethylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
4-Chlorophenylphenylether	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Soil VOC/SVOC Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

			Lab No	1632470	1632471	1632472	1632476	1632479	1632480
			Sample ID	TP119	TP132	TP123	TP123	TP112E	TP109
			Depth	0.70	1.20	1.20	2.20	0.30	0.60
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	23/01/2020	24/01/2020	24/01/2020	24/01/2020	23/01/2020	24/01/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Fluorene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	1.4	< 0.1	2.3
4-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Methyl-4,6-Dinitrophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Diphenylamine	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	0.4	< 0.1
4-Bromophenylphenylether	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Hexachlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Pentachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	DETSC 3433	0.1	mg/kg	0.3	< 0.1	0.6	4.8	0.3	18
Anthracene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	0.2	1.9	< 0.1	3.7
Di-n-butylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluoranthene	DETSC 3433	0.1	mg/kg	0.6	< 0.1	1.0	3.3	0.5	21
Pyrene	DETSC 3433	0.1	mg/kg	0.6	< 0.1	0.8	2.5	0.5	18
Butylbenzylphthalate	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)anthracene	DETSC 3433	0.1	mg/kg	0.4	< 0.1	0.5	1.2	0.3	8.9
Chrysene	DETSC 3433	0.1	mg/kg	0.4	< 0.1	0.4	1.3	0.3	8.2
Bis(2-ethylhexyl)phthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	0.6	< 0.1
Di-n-octylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(b)fluoranthene	DETSC 3433	0.1	mg/kg	0.5	< 0.1	0.4	1.0	0.3	9.6
Benzo(k)fluoranthene	DETSC 3433	0.1	mg/kg	0.2	< 0.1	0.2	0.5	0.2	3.7
Benzo(a)pyrene	DETSC 3433	0.1	mg/kg	0.4	< 0.1	0.4	1.0	0.3	8.7
Indeno(123cd)pyrene	DETSC 3433	0.1	mg/kg	0.2	< 0.1	0.2	0.4	0.2	4.1
Dibenzo(ah)anthracene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(ghi)perylene	DETSC 3433	0.1	mg/kg	0.3	< 0.1	0.2	0.5	0.2	4.6
1,4-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dimethylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
1,3-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
1,2-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,3,5,6-Tetrachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Azobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	0.6	< 0.1
Carbazole	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	0.3	< 0.1	2.4

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Soil VOC/SVOC Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

			Lab No	1632481	1632484	1632485	1632486	1632488	1632489
			Sample ID	TP120	TP132	TP120	TP107	TP118	TP113
			Depth	0.60	2.90	3.40	3.90	0.20	0.30
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	24/01/2020	24/01/2020	24/01/2020	23/01/2020	23/01/2020	23/01/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
VOCs									
Vinyl Chloride	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
1,1 Dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
Trans-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
1,1-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
Cis-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	0.05	< 0.01	< 0.01
2,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
Bromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
Chloroform	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
1,1,1-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
1,1-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
Carbon tetrachloride	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
Benzene	DETSC 3431	0.01	mg/kg	0.02		0.08	0.06	< 0.01	< 0.01
1,2-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
Trichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
1,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
Dibromomethane	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
Bromodichloromethane	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
cis-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
Toluene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
trans-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
1,1,2-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
Tetrachloroethylene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
1,3-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
Dibromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
1,2-dibromoethane	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
Chlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
1,1,1,2-tetrachloroethane	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
Ethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	0.09	< 0.01	< 0.01
m+p-Xylene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	0.35	< 0.01	< 0.01
o-Xylene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	0.19	< 0.01	< 0.01
Styrene	DETSC 3431*	0.01	mg/kg	< 0.01		< 0.01	0.02	< 0.01	< 0.01
Bromoform	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
Isopropylbenzene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
Bromobenzene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
1,2,3-trichloropropane	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
n-propylbenzene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	0.02	< 0.01	< 0.01
2-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
1,3,5-trimethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	0.51	< 0.01	< 0.01
4-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
Tert-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
1,2,4-trimethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	1.9	< 0.01	< 0.01

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Soil VOC/SVOC Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

Lab No	1632481	1632484	1632485	1632486	1632488	1632489
Sample ID	TP120	TP132	TP120	TP107	TP118	TP113
Depth	0.60	2.90	3.40	3.90	0.20	0.30
Other ID						
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sampling Date	24/01/2020	24/01/2020	24/01/2020	23/01/2020	23/01/2020	23/01/2020
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s

Test	**Method**	**LOD**	**Units**	1632481	1632484	1632485	1632486	1632488	1632489
sec-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	0.04	< 0.01	< 0.01
p-isopropyltoluene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	0.16	< 0.01	< 0.01
1,3-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
1,4-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
n-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
1,2-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
1,2-dibromo-3-chloropropane	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
1,2,4-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
Hexachlorobutadiene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
Naphthalene	DETSC 3431	0.01	mg/kg	< 0.01		0.08	270	0.04	0.01
1,2,3-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
MTBE	DETSC 3431*	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
SVOCs									
Phenol	DETSC 3433	0.1	mg/kg			< 0.1	< 0.1		
Aniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Chlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzyl Alcohol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.2
Bis(2-chloroisopropyl)ether	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
3&4-Methylphenol	DETSC 3433	0.1	mg/kg	0.2	< 0.1	< 0.1	< 0.1	< 0.1	0.8
2,4-Dimethylphenol	DETSC 3433	0.1	mg/kg			< 0.1	< 0.1		
Bis-(dichloroethoxy)methane	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,4-Dichlorophenol	DETSC 3433	0.1	mg/kg			< 0.1	< 0.1		
1,2,4-Trichlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Naphthalene	DETSC 3433	0.1	mg/kg		0.1				
4-Chloro-3-methylphenol	DETSC 3433	0.1	mg/kg			< 0.1	< 0.1		
2-Methylnaphthalene	DETSC 3433	0.1	mg/kg	0.5	< 0.1	< 0.1	13	< 0.1	0.8
Hexachlorocyclopentadiene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,4,6-Trichlorophenol	DETSC 3433	0.1	mg/kg			< 0.1	< 0.1		
2,4,5-Trichlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Chloronaphthalene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,4-Dinitrotoluene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	DETSC 3433	0.1	mg/kg	0.6	< 0.1	< 0.1	0.5	< 0.1	7.0
3-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	DETSC 3433	0.1	mg/kg	0.6	0.1	0.6	2.6	< 0.1	5.3
4-Nitrophenol	DETSC 3433*	0.1	mg/kg	0.9	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dibenzofuran	DETSC 3433	0.1	mg/kg	1.0	< 0.1	0.6	3.8	< 0.1	4.5
2,6-Dinitrotoluene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,3,4,6-Tetrachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Diethylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
4-Chlorophenylphenylether	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Soil VOC/SVOC Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

			Lab No	1632481	1632484	1632485	1632486	1632488	1632489
			Sample ID	TP120	TP132	TP120	TP107	TP118	TP113
			Depth	0.60	2.90	3.40	3.90	0.20	0.30
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	24/01/2020	24/01/2020	24/01/2020	23/01/2020	23/01/2020	23/01/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Fluorene	DETSC 3433	0.1	mg/kg	1.3	0.1	0.2	3.2	< 0.1	8.4
4-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Methyl-4,6-Dinitrophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Diphenylamine	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
4-Bromophenylphenylether	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Hexachlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Pentachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	DETSC 3433	0.1	mg/kg	5.9	1.1	< 0.1	3.0	0.3	100
Anthracene	DETSC 3433	0.1	mg/kg	1.3	0.4	< 0.1	0.6	< 0.1	24
Di-n-butylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluoranthene	DETSC 3433	0.1	mg/kg	5.1	1.4	< 0.1	0.6	0.5	150
Pyrene	DETSC 3433	0.1	mg/kg	4.1	1.2	< 0.1	0.4	0.4	120
Butylbenzylphthalate	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)anthracene	DETSC 3433	0.1	mg/kg	1.8	0.6	< 0.1	0.1	0.2	58
Chrysene	DETSC 3433	0.1	mg/kg	1.8	0.7	< 0.1	< 0.1	0.3	57
Bis(2-ethylhexyl)phthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Di-n-octylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(b)fluoranthene	DETSC 3433	0.1	mg/kg	2.0	0.7	< 0.1	< 0.1	0.3	63
Benzo(k)fluoranthene	DETSC 3433	0.1	mg/kg	0.9	0.2	< 0.1	< 0.1	< 0.1	18
Benzo(a)pyrene	DETSC 3433	0.1	mg/kg	1.8	0.6	< 0.1	< 0.1	0.2	58
Indeno(123cd)pyrene	DETSC 3433	0.1	mg/kg	0.8	0.2	< 0.1	< 0.1	< 0.1	25
Dibenzo(ah)anthracene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	6.6
Benzo(ghi)perylene	DETSC 3433	0.1	mg/kg	0.9	0.2	< 0.1	< 0.1	< 0.1	25
1,4-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dimethylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
1,3-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
1,2-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,3,5,6-Tetrachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Azobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Carbazole	DETSC 3433*	0.1	mg/kg	0.8	< 0.1	< 0.1	< 0.1	< 0.1	6.0

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Soil VOC/SVOC Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

			Lab No	1632490	1632492	1632493	1632494	1632495	1632496
			Sample ID	TP122	TP124S	TP127	TP110	TP130	TP131
			Depth	0.30	0.50	0.50	0.60	0.60	1.30
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	24/01/2020	24/01/2020	24/01/2020	23/01/2020	23/01/2020	24/01/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
VOCs									
Vinyl Chloride	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
1,1 Dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
Trans-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
1,1-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
Cis-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
2,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
Bromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
Chloroform	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
1,1,1-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
1,1-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
Carbon tetrachloride	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
Benzene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	0.03
1,2-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
Trichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
1,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
Dibromomethane	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
Bromodichloromethane	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
cis-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
Toluene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
trans-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
1,1,2-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
Tetrachloroethylene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
1,3-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
Dibromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
1,2-dibromoethane	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
Chlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
1,1,1,2-tetrachloroethane	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
Ethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
m+p-Xylene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
o-Xylene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
Styrene	DETSC 3431*	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
Bromoform	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
Isopropylbenzene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
Bromobenzene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
1,2,3-trichloropropane	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
n-propylbenzene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
2-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
1,3,5-trimethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
4-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
Tert-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
1,2,4-trimethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Soil VOC/SVOC Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

			Lab No	1632490	1632492	1632493	1632494	1632495	1632496
			Sample ID	TP122	TP124S	TP127	TP110	TP130	TP131
			Depth	0.30	0.50	0.50	0.60	0.60	1.30
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	24/01/2020	24/01/2020	24/01/2020	23/01/2020	23/01/2020	24/01/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
sec-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
p-isopropyltoluene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
1,3-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
1,4-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
n-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
1,2-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
1,2-dibromo-3-chloropropane	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
1,2,4-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
Hexachlorobutadiene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
Naphthalene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	0.03
1,2,3-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
MTBE	DETSC 3431*	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
SVOCs									
Phenol	DETSC 3433	0.1	mg/kg			< 0.1	< 0.1	< 0.1	
Aniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Chlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzyl Alcohol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Bis(2-chloroisopropyl)ether	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
3&4-Methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,4-Dimethylphenol	DETSC 3433	0.1	mg/kg			< 0.1	< 0.1	< 0.1	
Bis-(dichloroethoxy)methane	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,4-Dichlorophenol	DETSC 3433	0.1	mg/kg			< 0.1	< 0.1	< 0.1	
1,2,4-Trichlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Naphthalene	DETSC 3433	0.1	mg/kg		0.7				
4-Chloro-3-methylphenol	DETSC 3433	0.1	mg/kg			< 0.1	< 0.1	< 0.1	
2-Methylnaphthalene	DETSC 3433	0.1	mg/kg	< 0.1	0.3	< 0.1	< 0.1	< 0.1	< 0.1
Hexachlorocyclopentadiene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,4,6-Trichlorophenol	DETSC 3433	0.1	mg/kg			< 0.1	< 0.1	< 0.1	
2,4,5-Trichlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Chloronaphthalene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,4-Dinitrotoluene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	DETSC 3433	0.1	mg/kg	< 0.1	0.7	< 0.1	< 0.1	< 0.1	< 0.1
3-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	DETSC 3433	0.1	mg/kg	< 0.1	0.4	< 0.1	< 0.1	< 0.1	0.2
4-Nitrophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dibenzofuran	DETSC 3433	0.1	mg/kg	< 0.1	0.7	< 0.1	< 0.1	< 0.1	0.2
2,6-Dinitrotoluene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,3,4,6-Tetrachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Diethylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
4-Chlorophenylphenylether	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Soil VOC/SVOC Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

			Lab No	1632490	1632492	1632493	1632494	1632495	1632496
			Sample ID	TP122	TP124S	TP127	TP110	TP130	TP131
			Depth	0.30	0.50	0.50	0.60	0.60	1.30
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	24/01/2020	24/01/2020	24/01/2020	23/01/2020	23/01/2020	24/01/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Fluorene	DETSC 3433	0.1	mg/kg	< 0.1	1.2	< 0.1	< 0.1	< 0.1	0.4
4-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Methyl-4,6-Dinitrophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Diphenylamine	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
4-Bromophenylphenylether	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Hexachlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Pentachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	DETSC 3433	0.1	mg/kg	0.2	6.1	< 0.1	< 0.1	0.4	1.1
Anthracene	DETSC 3433	0.1	mg/kg	< 0.1	2.3	< 0.1	< 0.1	< 0.1	0.5
Di-n-butylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluoranthene	DETSC 3433	0.1	mg/kg	0.4	9.0	< 0.1	< 0.1	1.4	3.2
Pyrene	DETSC 3433	0.1	mg/kg	0.3	7.1	< 0.1	< 0.1	1.2	2.9
Butylbenzylphthalate	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)anthracene	DETSC 3433	0.1	mg/kg	0.2	4.5	< 0.1	< 0.1	0.6	1.8
Chrysene	DETSC 3433	0.1	mg/kg	0.2	3.8	< 0.1	< 0.1	0.6	1.8
Bis(2-ethylhexyl)phthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Di-n-octylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(b)fluoranthene	DETSC 3433	0.1	mg/kg	0.2	4.5	< 0.1	< 0.1	0.7	2.3
Benzo(k)fluoranthene	DETSC 3433	0.1	mg/kg	< 0.1	1.8	< 0.1	< 0.1	0.3	0.8
Benzo(a)pyrene	DETSC 3433	0.1	mg/kg	0.1	3.7	< 0.1	< 0.1	0.6	1.5
Indeno(123cd)pyrene	DETSC 3433	0.1	mg/kg	< 0.1	1.9	< 0.1	< 0.1	0.3	0.8
Dibenzo(ah)anthracene	DETSC 3433	0.1	mg/kg	< 0.1	0.5	< 0.1	< 0.1	< 0.1	0.2
Benzo(ghi)perylene	DETSC 3433	0.1	mg/kg	< 0.1	1.7	< 0.1	< 0.1	0.3	0.8
1,4-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dimethylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
1,3-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
1,2-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,3,5,6-Tetrachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Azobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Carbazole	DETSC 3433*	0.1	mg/kg	< 0.1	0.6	< 0.1	< 0.1	< 0.1	< 0.1

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Soil VOC/SVOC Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

			Lab No	1632497	1632498	1632501	1632502	1632503	1632504
			Sample ID	TP124S	TP112E	TP116	TP109	TP123	TP120
			Depth	1.30	1.50	0.70	0.80	0.80	1.00
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	24/01/2020	23/01/2020	23/01/2020	24/01/2020	24/01/2020	23/01/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
VOCs									
Vinyl Chloride	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1 Dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Trans-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Cis-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Bromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chloroform	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1,1-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Carbon tetrachloride	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzene	DETSC 3431	0.01	mg/kg	0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.21
Trichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibromomethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Bromodichloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
cis-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Toluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.06
trans-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1,2-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Tetrachloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,3-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2-dibromoethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1,1,2-tetrachloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Ethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01
m+p-Xylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.03
o-Xylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.02
Styrene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Bromoform	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Isopropylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Bromobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2,3-trichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
n-propylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,3,5-trimethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
4-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Tert-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2,4-trimethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Soil VOC/SVOC Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

			Lab No	1632497	1632498	1632501	1632502	1632503	1632504
			Sample ID	TP124S	TP112E	TP116	TP109	TP123	TP120
			Depth	1.30	1.50	0.70	0.80	0.80	1.00
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	24/01/2020	23/01/2020	23/01/2020	24/01/2020	24/01/2020	23/01/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
sec-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
p-isopropyltoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,3-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,4-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
n-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2-dibromo-3-chloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2,4-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Hexachlorobutadiene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Naphthalene	DETSC 3431	0.01	mg/kg	0.06	< 0.01	< 0.01	< 0.01	< 0.01	0.10
1,2,3-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
MTBE	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
SVOCs									
Phenol	DETSC 3433	0.1	mg/kg		< 0.1	< 0.1	< 0.1	< 0.1	50
Aniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	48
2-Chlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 1.0
Benzyl Alcohol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 1.0
2-Methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 1.0
Bis(2-chloroisopropyl)ether	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 1.0
3&4-Methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 1.0
2,4-Dimethylphenol	DETSC 3433	0.1	mg/kg		< 0.1	< 0.1	< 0.1	< 0.1	42
Bis-(dichloroethoxy)methane	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 1.0
2,4-Dichlorophenol	DETSC 3433	0.1	mg/kg		< 0.1	< 0.1	< 0.1	< 0.1	< 1.0
1,2,4-Trichlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 1.0
Naphthalene	DETSC 3433	0.1	mg/kg						
4-Chloro-3-methylphenol	DETSC 3433	0.1	mg/kg		< 0.1	< 0.1	< 0.1	< 0.1	< 1.0
2-Methylnaphthalene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	400
Hexachlorocyclopentadiene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 1.0
2,4,6-Trichlorophenol	DETSC 3433	0.1	mg/kg		< 0.1	< 0.1	< 0.1	< 0.1	< 1.0
2,4,5-Trichlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 1.0
2-Chloronaphthalene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 1.0
2-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 1.0
2,4-Dinitrotoluene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 1.0
Acenaphthylene	DETSC 3433	0.1	mg/kg	0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 1.0
3-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 1.0
Acenaphthene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 1.0
4-Nitrophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 1.0
Dibenzofuran	DETSC 3433	0.1	mg/kg	0.2	< 0.1	< 0.1	< 0.1	< 0.1	73
2,6-Dinitrotoluene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 1.0
2,3,4,6-Tetrachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 1.0
Diethylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 1.0
4-Chlorophenylphenylether	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 1.0

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Soil VOC/SVOC Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

			Lab No	1632497	1632498	1632501	1632502	1632503	1632504
			Sample ID	TP124S	TP112E	TP116	TP109	TP123	TP120
			Depth	1.30	1.50	0.70	0.80	0.80	1.00
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	24/01/2020	23/01/2020	23/01/2020	24/01/2020	24/01/2020	23/01/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Fluorene	DETSC 3433	0.1	mg/kg	0.4	< 0.1	< 0.1	< 0.1	< 0.1	58
4-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 1.0
2-Methyl-4,6-Dinitrophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 1.0
Diphenylamine	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 1.0
4-Bromophenylphenylether	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 1.0
Hexachlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 1.0
Pentachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 1.0
Phenanthrene	DETSC 3433	0.1	mg/kg	2.0	< 0.1	< 0.1	< 0.1	< 0.1	100
Anthracene	DETSC 3433	0.1	mg/kg	0.5	< 0.1	< 0.1	< 0.1	< 0.1	8.8
Di-n-butylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 1.0
Fluoranthene	DETSC 3433	0.1	mg/kg	1.9	1.4	< 0.1	0.1	< 0.1	27
Pyrene	DETSC 3433	0.1	mg/kg	1.4	1.2	< 0.1	0.1	< 0.1	9.4
Butylbenzylphthalate	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 1.0
Benzo(a)anthracene	DETSC 3433	0.1	mg/kg	0.7	0.6	< 0.1	< 0.1	< 0.1	4.5
Chrysene	DETSC 3433	0.1	mg/kg	0.8	0.6	< 0.1	< 0.1	< 0.1	4.4
Bis(2-ethylhexyl)phthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 1.0
Di-n-octylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 1.0
Benzo(b)fluoranthene	DETSC 3433	0.1	mg/kg	0.8	0.7	< 0.1	< 0.1	< 0.1	3.6
Benzo(k)fluoranthene	DETSC 3433	0.1	mg/kg	0.3	< 0.1	< 0.1	< 0.1	< 0.1	< 1.0
Benzo(a)pyrene	DETSC 3433	0.1	mg/kg	0.6	0.4	< 0.1	< 0.1	< 0.1	< 1.0
Indeno(123cd)pyrene	DETSC 3433	0.1	mg/kg	0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 1.0
Dibenzo(ah)anthracene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 1.0
Benzo(ghi)perylene	DETSC 3433	0.1	mg/kg	0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 1.0
1,4-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 1.0
Dimethylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 1.0
1,3-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 1.0
1,2-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 1.0
2,3,5,6-Tetrachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 1.0
Azobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 1.0
Carbazole	DETSC 3433*	0.1	mg/kg	0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 1.0

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Soil VOC/SVOC Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

			Lab No	1632505	1632506	1632507	1632508	1632509	1632510
			Sample ID	TP103	TP107	TP117	TP121	TP109	TP126
			Depth	1.70	2.50	0.15	0.20	0.30	0.40
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	23/01/2020	23/01/2020	23/01/2020	24/01/2020	24/01/2020	24/01/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
VOCs									
Vinyl Chloride	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1 Dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Trans-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Cis-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Bromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chloroform	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1,1-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Carbon tetrachloride	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Trichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibromomethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Bromodichloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
cis-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Toluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
trans-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1,2-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Tetrachloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,3-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2-dibromoethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1,1,2-tetrachloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Ethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
m+p-Xylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
o-Xylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Styrene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Bromoform	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Isopropylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Bromobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2,3-trichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
n-propylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,3,5-trimethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
4-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Tert-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2,4-trimethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Soil VOC/SVOC Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

			Lab No	1632505	1632506	1632507	1632508	1632509	1632510
			Sample ID	TP103	TP107	TP117	TP121	TP109	TP126
			Depth	1.70	2.50	0.15	0.20	0.30	0.40
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	23/01/2020	23/01/2020	23/01/2020	24/01/2020	24/01/2020	24/01/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
sec-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
p-isopropyltoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,3-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,4-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
n-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2-dibromo-3-chloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2,4-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Hexachlorobutadiene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Naphthalene	DETSC 3431	0.01	mg/kg	< 0.01	0.28	< 0.01	< 0.01	< 0.01	< 0.01
1,2,3-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
MTBE	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
SVOCs									
Phenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Chlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzyl Alcohol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Bis(2-chloroisopropyl)ether	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
3&4-Methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,4-Dimethylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Bis-(dichloroethoxy)methane	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,4-Dichlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
1,2,4-Trichlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Naphthalene	DETSC 3433	0.1	mg/kg						
4-Chloro-3-methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Methylnaphthalene	DETSC 3433	0.1	mg/kg	< 0.1	0.2	< 0.1	< 0.1	< 0.1	< 0.1
Hexachlorocyclopentadiene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,4,6-Trichlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,4,5-Trichlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Chloronaphthalene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,4-Dinitrotoluene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	1.3	< 0.1	< 0.1	< 0.1
3-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	DETSC 3433	0.1	mg/kg	< 0.1	0.3	0.2	< 0.1	0.1	< 0.1
4-Nitrophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dibenzofuran	DETSC 3433	0.1	mg/kg	< 0.1	0.8	0.7	< 0.1	< 0.1	< 0.1
2,6-Dinitrotoluene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,3,4,6-Tetrachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Diethylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
4-Chlorophenylphenylether	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Soil VOC/SVOC Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

			Lab No	1632505	1632506	1632507	1632508	1632509	1632510
			Sample ID	TP103	TP107	TP117	TP121	TP109	TP126
			Depth	1.70	2.50	0.15	0.20	0.30	0.40
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	23/01/2020	23/01/2020	23/01/2020	24/01/2020	24/01/2020	24/01/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Fluorene	DETSC 3433	0.1	mg/kg	< 0.1	0.4	0.8	< 0.1	< 0.1	< 0.1
4-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Methyl-4,6-Dinitrophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Diphenylamine	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
4-Bromophenylphenylether	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Hexachlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Pentachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	DETSC 3433	0.1	mg/kg	< 0.1	0.5	8.8	0.2	0.9	< 0.1
Anthracene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	3.0	< 0.1	0.2	< 0.1
Di-n-butylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluoranthene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	10	0.3	1.4	< 0.1
Pyrene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	8.4	0.2	1.2	< 0.1
Butylbenzylphthalate	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)anthracene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	3.9	0.1	0.6	< 0.1
Chrysene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	4.3	0.2	0.6	< 0.1
Bis(2-ethylhexyl)phthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Di-n-octylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(b)fluoranthene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	4.9	0.1	0.6	< 0.1
Benzo(k)fluoranthene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	1.9	< 0.1	0.2	< 0.1
Benzo(a)pyrene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	4.1	< 0.1	0.5	< 0.1
Indeno(123cd)pyrene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	1.7	< 0.1	0.3	< 0.1
Dibenzo(ah)anthracene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	0.4	< 0.1	< 0.1	< 0.1
Benzo(ghi)perylene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	1.9	< 0.1	0.2	< 0.1
1,4-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dimethylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
1,3-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
1,2-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,3,5,6-Tetrachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Azobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Carbazole	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	1.0	< 0.1	< 0.1	< 0.1

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

			Lab No	1632518	1632519	1632520	1632521	1632522	1632523	1632524	1632525
			Sample ID	TP108	TP112W	TP131	TP112E	TP109	TP122	TP110	TP124S
			Depth	0.50	0.50	0.80	0.30	0.60	0.30	0.60	1.30
			Other ID								
			Sample Type	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE
			Sampling Date	23/01/2020	23/01/2020	23/01/2020	23/01/2020	24/01/2020	24/01/2020	23/01/2020	24/01/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**								
Preparation											
NRA Leachate Preparation	DETSC 1009*			Y	Y	Y	Y	Y	Y	Y	Y
Metals											
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	5.6	0.59	16	6.1	3.6	0.29	0.97	16
Boron, Dissolved	DETSC 2306*	12	ug/l	17	13	< 12	< 12	24	< 12	< 12	30
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03	< 0.03	< 0.03	< 0.03	0.03	< 0.03	0.04	< 0.03
Chromium, Dissolved	DETSC 2306	0.25	ug/l	< 0.25	< 0.25	2.4	1.9	< 0.25	2.1	3.7	0.31
Copper, Dissolved	DETSC 2306	0.4	ug/l	2.9	1.5	3.8	13	3.4	1.3	7.2	1.0
Lead, Dissolved	DETSC 2306	0.09	ug/l	0.93	0.23	0.27	0.42	1.2	< 0.09	0.44	0.33
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01	0.01	0.02
Nickel, Dissolved	DETSC 2306	0.5	ug/l	< 0.5	0.9	< 0.5	< 0.5	< 0.5	< 0.5	0.7	1.6
Selenium, Dissolved	DETSC 2306	0.25	ug/l	0.83	< 0.25	0.49	0.79	0.28	< 0.25	0.60	0.79
Zinc, Dissolved	DETSC 2306	1.3	ug/l	< 1.3	3.2	1.5	< 1.3	< 1.3	< 1.3	< 1.3	< 1.3
Inorganics											
pH	DETSC 2008		pH	6.9	6.7	8.3	9.7	7.1	8.8	10.3	10.3

Key: * -not accredited. n/s -not supplied.

Summary of Asbestos Analysis
Soil Samples

Our Ref	20-02158-2
Client Ref	3435
Contract Title	Crossley Lane, Dalton

Lab No	Sample ID	Sample Location	Material Type*	Result	Comment*	Analyst
1632464	TP108 0.50		SOIL	NAD	none	Colin Patrick
1632465	TP112W 0.50		SOIL	NAD	none	Colin Patrick
1632466	TP115 0.50		SOIL	NAD	none	Colin Patrick
1632467	TP113 0.70		SOIL	Chrysotile	bundle of Chrysotile fibres	Colin Patrick
1632468	TP131 0.80		SOIL	NAD	none	Colin Patrick
1632469	TP131 1.10		SOIL	NAD	none	Colin Patrick
1632470	TP119 0.70		SOIL	NAD	none	Colin Patrick
1632479	TP112E 0.30		SOIL	NAD	none	Colin Patrick
1632480	TP109 0.60		SOIL	NAD	none	Colin Patrick
1632481	TP120 0.60		SOIL	NAD	none	Colin Patrick
1632488	TP118 0.20		SOIL	NAD	none	Colin Patrick
1632489	TP113 0.30		SOIL	NAD	none	Colin Patrick
1632490	TP122 0.30		SOIL	NAD	none	Colin Patrick
1632493	TP127 0.50		SOIL	NAD	none	Colin Patrick
1632494	TP110 0.60		SOIL	NAD	none	Colin Patrick
1632495	TP130 0.60		SOIL	NAD	none	Colin Patrick
1632496	TP131 1.30		SOIL	NAD	none	Colin Patrick
1632497	TP124S 1.30		SOIL	NAD	none	Colin Patrick
1632498	TP112E 1.50		SOIL	NAD	none	Colin Patrick
1632501	TP116 0.70		SOIL	NAD	none	Colin Patrick
1632502	TP109 0.80		SOIL	NAD	none	Colin Patrick
1632503	TP123 0.80		SOIL	NAD	none	Colin Patrick
1632505	TP103 1.70		SOIL	NAD	none	Colin Patrick
1632506	TP107 2.50		SOIL	NAD	none	Colin Patrick
1632507	TP117 0.15		SOIL	NAD	none	Colin Patrick
1632508	TP121 0.20		SOIL	NAD	none	Colin Patrick
1632509	TP109 0.30		SOIL	NAD	none	Colin Patrick
1632510	TP126 0.40		SOIL	NAD	none	Colin Patrick
1632511	TP101 0.20		SOIL	NAD	none	Colin Patrick
1632512	TP103 0.20		SOIL	NAD	none	Colin Patrick
1632513	TP105 0.20		SOIL	NAD	none	Colin Patrick
1632514	TP106 0.20		SOIL	NAD	none	Colin Patrick
1632515	TP102 0.30		SOIL	NAD	none	Colin Patrick
1632516	TP102 0.30		SOIL	NAD	none	Colin Patrick
1632517	TP104 0.30		SOIL	NAD	none	Colin Patrick
1640256	TP125 1.40		Cement	NAD	none	Keith Wilson

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * -not included in laboratory scope of accreditation.

Summary of Asbestos Quantification Analysis
Soil Samples

Our Ref 20-02158-2
Client Ref 3435
Contract Title Crossley Lane, Dalton

Lab No	1632467
Sample ID	TP113
Depth	0.70
Other ID	
Sample Type	SOIL
Sampling Date	23/01/2020
Sampling Time	

Test	**Method**	**Units**	
Total Mass% Asbestos (a+b+c)	DETSC 1102	Mass %	**0.002**
Gravimetric Quantification (a)	DETSC 1102	Mass %	na
Detailed Gravimetric Quantification (b)	DETSC 1102	Mass %	0.002
Quantification by PCOM (c)	DETSC 1102	Mass %	na
Potentially Respirable Fibres (d)	DETSC 1102	Fibres/g	na
Breakdown of Gravimetric Analysis (a)			
Mass of Sample		g	874.35
ACMs present*		type	
Mass of ACM in sample		g	
% ACM by mass		%	
% asbestos in ACM		%	
% asbestos in sample		%	
Breakdown of Detailed Gravimetric Analysis (b)			
% Amphibole bundles in sample		Mass %	na
% Chrysotile bundles in sample		Mass %	0.002
Breakdown of PCOM Analysis (c)			
% Amphibole fibres in sample		Mass %	na
% Chrysotile fibres in sample		Mass %	na
Breakdown of Potentially Respirable Fibre Analysis (d)			
Amphibole fibres		Fibres/g	na
Chrysotile fibres		Fibres/g	na

* Denotes test or material description outside of UKAS accreditation.
% asbestos in Asbestos Containing Materials (ACMs) is determined by
by reference to HSG 264.
Recommended sample size for quantification is approximately 1kg
# denotes deviating sample

Information in Support of the Analytical Results

Our Ref 20-02158-2
Client Ref 3435
Contract Crossley Lane, Dalton

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1632464	TP108 0.50 SOIL	23/01/20	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days), VOC (7 days)	
1632465	TP112W 0.50 SOIL	23/01/20	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days), VOC (7 days)	
1632466	TP115 0.50 SOIL	23/01/20	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days), VOC (7 days)	
1632467	TP113 0.70 SOIL	23/01/20	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days), VOC (7 days)	
1632468	TP131 0.80 SOIL	24/01/20	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days), VOC (7 days)	
1632469	TP131 1.10 SOIL	24/01/20	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days), VOC (7 days)	
1632470	TP119 0.70 SOIL	23/01/20	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days), VOC (7 days)	
1632471	TP132 1.20 SOIL	24/01/20	GJ 250ml, GJ 60ml		
1632472	TP123 1.20 SOIL	24/01/20	GJ 250ml, GJ 60ml, PT 1L		
1632473	TP117 1.30 SOIL	23/01/20	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days)	
1632474	TP108 1.90 SOIL	23/01/20	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days)	
1632475	TP130 1.90 SOIL	23/01/20	GJ 250ml, GJ 60ml		
1632476	TP123 2.20 SOIL	24/01/20	GJ 250ml, GJ 60ml		
1632477	TP113 2.70 SOIL	23/01/20	GJ 250ml, GJ 60ml		
1632478	TP112E 2.70 SOIL	23/01/20	GJ 250ml, GJ 60ml		
1632479	TP112E 0.30 SOIL	23/01/20	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days), VOC (7 days)	
1632480	TP109 0.60 SOIL	24/01/20	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days), VOC (7 days)	
1632481	TP120 0.60 SOIL	24/01/20	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days), VOC (7 days)	
1632482	TP118 0.50 SOIL	23/01/20	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days)	
1632483	TP129 0.90 SOIL	24/01/20	GJ 250ml, PT 1L	pH + Conductivity (7 days)	
1632484	TP132 2.90 SOIL	24/01/20	GJ 250ml, GJ 60ml		
1632485	TP120 3.40 SOIL	24/01/20	GJ 250ml, GJ 60ml	VOC (7 days)	
1632486	TP107 3.90 SOIL	23/01/20	GJ 250ml, GJ 60ml, PT 1L	VOC (7 days)	
1632487	TP116 0.20 SOIL	23/01/20	GJ 250ml, GJ 60ml, PT 1L		
1632488	TP118 0.20 SOIL	23/01/20	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days), VOC (7 days)	
1632489	TP113 0.30 SOIL	23/01/20	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days), VOC (7 days)	
1632490	TP122 0.30 SOIL	24/01/20	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days), VOC (7 days)	
1632491	TP121 0.50 SOIL	24/01/20	GJ 250ml, GJ 60ml, PT 1L		
1632492	TP124S 0.50 SOIL	24/01/20	GJ 250ml, GJ 60ml, PT 1L		
1632493	TP127 0.50 SOIL	24/01/20	GJ 250ml, PT 1L	pH + Conductivity (7 days), VOC (7 days)	
1632494	TP110 0.60 SOIL	23/01/20	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days), VOC (7 days)	
1632495	TP130 0.60 SOIL	23/01/20	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days), VOC (7 days)	
1632496	TP131 1.30 SOIL	24/01/20	GJ 250ml, GJ 60ml	pH + Conductivity (7 days), VOC (7 days)	
1632497	TP124S 1.30 SOIL	24/01/20	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days), VOC (7 days)	
1632498	TP112E 1.50 SOIL	23/01/20	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days), VOC (7 days)	
1632499	TP114 0.05 SOIL	23/01/20	GJ 250ml		
1632500	TP117 0.25 SOIL	23/01/20	GJ 250ml, GJ 60ml		
1632501	TP116 0.70 SOIL	23/01/20	GJ 250ml, GJ 60ml, PT 1L x2	pH + Conductivity (7 days), VOC (7 days)	
1632502	TP109 0.80 SOIL	24/01/20	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days), VOC (7 days)	
1632503	TP123 0.80 SOIL	24/01/20	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days), VOC (7 days)	
1632504	TP120 1.00 SOIL	23/01/20	GJ 250ml, GJ 60ml, PT 1L	VOC (7 days)	
1632505	TP103 1.70 SOIL	23/01/20	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days), VOC (7 days)	
1632506	TP107 2.50 SOIL	23/01/20	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days), VOC (7 days)	
1632507	TP117 0.15 SOIL	23/01/20	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days), VOC (7 days)	
1632508	TP121 0.20 SOIL	24/01/20	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days), VOC (7 days)	
1632509	TP109 0.30 SOIL	24/01/20	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days), VOC (7 days)	
1632510	TP126 0.40 SOIL	24/01/20	GJ 250ml, PT 1L	pH + Conductivity (7 days), VOC (7 days)	
1632511	TP101 0.20 SOIL	23/01/20	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days)	
1632512	TP103 0.20 SOIL	23/01/20	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days)	

Information in Support of the Analytical Results

Our Ref 20-02158-2
Client Ref 3435
Contract Crossley Lane, Dalton

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1632513	TP105 0.20 SOIL	23/01/20	GJ 60ml, PT 1L	pH + Conductivity (7 days)	
1632514	TP106 0.20 SOIL	23/01/20	GJ 60ml, PT 1L	pH + Conductivity (7 days)	
1632515	TP102 0.30 SOIL	23/01/20	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days)	
1632516	TP102 0.30 SOIL	23/01/20	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days)	
1632517	TP104 0.30 SOIL	23/01/20	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days)	
1632518	TP108 0.50 LEACHATE	23/01/20	GJ 250ml, GJ 60ml, PT 1L		
1632519	TP112W 0.50 LEACHATE	23/01/20	GJ 250ml, GJ 60ml, PT 1L		
1632520	TP131 0.80 LEACHATE	23/01/20	GJ 250ml, GJ 60ml, PT 1L		
1632521	TP112E 0.30 LEACHATE	23/01/20	GJ 250ml, GJ 60ml, PT 1L		
1632522	TP109 0.60 LEACHATE	24/01/20	GJ 250ml, GJ 60ml, PT 1L		
1632523	TP122 0.30 LEACHATE	24/01/20	GJ 250ml, GJ 60ml, PT 1L		
1632524	TP110 0.60 LEACHATE	23/01/20	GJ 250ml, GJ 60ml, PT 1L		
1632525	TP124S 1.30 LEACHATE	24/01/20	GJ 250ml, GJ 60ml, PT 1L		
1640256	TP125 1.40 MISC	24/01/20	PT 1L		
1641129	TP112E Sub Sample 1 1.50 SOIL	23/01/20	GJ 250ml, GJ 60ml, PT 1L		
1641130	TP112E Sub Sample 2 1.50 SOIL	23/01/20	GJ 250ml, GJ 60ml, PT 1L		
1641131	TP112E Sub Sample 3 1.50 SOIL	23/01/20	GJ 250ml, GJ 60ml, PT 1L		

Key: G-Glass P-Plastic J-Jar T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

Certificate of Analysis

Certificate Number	20-03375	27-Feb-20
Client	Lithos Consulting Ltd Parkhill Walton Rd Wetherby LS22 5DZ	

Our Reference 20-03375

Client Reference 3435

Order No PO15740/3435

Contract Title Crossley Lane, Dalton

Description 4 Soil samples.

Date Received 18-Feb-20

Date Started 18-Feb-20

Date Completed 27-Feb-20

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Adam Fenwick
Contracts Manager

UKAS
TESTING
2139

Summary of Chemical Analysis
Soil Samples

Our Ref 20-03375
Client Ref 3435
Contract Title Crossley Lane, Dalton

			Lab No	1640715	1640716	1640717	1640718
			Sample ID	TP133	TP133	TP133	TP134
			Depth	1.00	1.80	2.80	0.40
			Other ID				
			Sample Type	SOIL	SOIL	SOIL	SOIL
			Sampling Date	11/02/2020	11/02/2020	11/02/2020	11/02/2020
			Sampling Time	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
Metals							
Arsenic	DETSC 2301#	0.2	mg/kg				15
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg				0.4
Cadmium	DETSC 2301#	0.1	mg/kg				0.3
Chromium	DETSC 2301#	0.15	mg/kg				38
Chromium III	DETSC 2301*	0.15	mg/kg				38
Chromium, Hexavalent	DETSC 2204*	1	mg/kg				< 1.0
Copper	DETSC 2301#	0.2	mg/kg				36
Lead	DETSC 2301#	0.3	mg/kg				41
Magnesium Aqueous Extract	DETSC 2076*	10	mg/l				< 10
Mercury	DETSC 2325#	0.05	mg/kg				0.08
Nickel	DETSC 2301#	1	mg/kg				53
Selenium	DETSC 2301#	0.5	mg/kg				< 0.5
Zinc	DETSC 2301#	1	mg/kg				110
Inorganics							
pH	DETSC 2008#		pH				7.6
Total Organic Carbon	DETSC 2084#	0.5	%	2.4	2.5	2.4	2.4
Chloride Aqueous Extract	DETSC 2055	1	mg/l				7.1
Nitrate Aqueous Extract as NO3	DETSC 2055	1	mg/l				4.2
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l				52
Petroleum Hydrocarbons							
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	0.09	0.08	
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	1.2	0.55	
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	8.4	
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	8.6	
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4	< 3.4	
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	18	
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	0.03	
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	0.03	0.01	
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	1.2	0.77	
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6	< 0.6	
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4	< 1.4	< 1.4	
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	
TPH Ali/Aro Total	DETSC 3072*	10	mg/kg	< 10	< 10	19	
EPH (C6-C10)	DETSC 3321*	0.1	mg/kg				< 0.1
EPH (C10-C12)	DETSC 3311	10	mg/kg				< 10
EPH (C12-C16)	DETSC 3311	10	mg/kg				< 10
EPH (C16-C21)	DETSC 3311	10	mg/kg				< 10

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 20-03375
Client Ref 3435
Contract Title Crossley Lane, Dalton

			Lab No	1640715	1640716	1640717	1640718
			Sample ID	TP133	TP133	TP133	TP134
			Depth	1.00	1.80	2.80	0.40
			Other ID				
			Sample Type	SOIL	SOIL	SOIL	SOIL
			Sampling Date	11/02/2020	11/02/2020	11/02/2020	11/02/2020
			Sampling Time	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
EPH (C21-C35)	DETSC 3311	10	mg/kg				< 10
EPH (C35-C40)	DETSC 3311	10	mg/kg				< 10
EPH (C10-C40)	DETSC 3311#	10	mg/kg				< 10
Benzene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	0.03	
Ethylbenzene	DETSC 3321#	0.01	mg/kg	< 0.01	0.04	< 0.01	
Toluene	DETSC 3321#	0.01	mg/kg	< 0.01	0.03	0.01	
Xylene	DETSC 3321#	0.01	mg/kg	< 0.01	0.11	0.07	
MTBE	DETSC 3321	0.01	mg/kg	< 0.01	< 0.01	< 0.01	
PAHs							
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03	0.06	< 0.03	< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg	< 0.03	0.10	0.04	0.03
Anthracene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	0.03
Pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Chrysene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	< 0.10	0.16	< 0.10	< 0.10

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Asbestos Analysis
Soil Samples

Our Ref 20-03375
Client Ref 3435
Contract Title Crossley Lane, Dalton

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
1640718	TP134 0.40	SOIL	NAD	none	Keith Wilson

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * - not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 20-03375
Client Ref 3435
Contract Crossley Lane, Dalton

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1640715	TP133 1.00 SOIL	11/02/20	GJ 250ml, GJ 60ml, PT 1L		
1640716	TP133 1.80 SOIL	11/02/20	GJ 250ml, GJ 60ml		
1640717	TP133 2.80 SOIL	11/02/20	GJ 250ml, GJ 60ml		
1640718	TP134 0.40 SOIL	11/02/20	GJ 250ml, GJ 60ml, PT 1L		

Key: G-Glass P-Plastic J-Jar T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

Appendix J

Geotechnical Test Results

LABORATORY REPORT

4043

Contract Number: PSL20/0646

Report Date:	21 February 2020
Client's Reference:	3435
Client Name:	Lithos Consulting Parkhill Walton Road Wetherby North Yorkshire LS22 5DZ
For the attention of:	**Lewis Whiteley / Matt Thompson**
Contract Title:	Crossley Lane, Dalton
Date Received:	31/1/2020
Date Commenced:	31/1/2020
Date Completed:	21/2/2020
Notes:	**Opinions and Interpretations are outside the UKAS Accreditation**

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

R Gunson (Director)	A Watkins (Director)	R Berriman (Quality Manager)
L Knight (Senior Technician)	S Eyre (Senior Technician)	S Royle (Laboratory Manager)

5 – 7 Hexthorpe Road, Hexthorpe,
Doncaster DN4 0AR
tel: +44 (0)844 815 6641
fax: +44 (0)844 815 6642
e-mail: rgunson@prosoils.co.uk
awatkins@prosoils.co.uk

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
TP101	3	B	1.50		Brown sandy CLAY.
TP109	4	B	1.30		Brown very gravelly sandy CLAY.
TP112W	2	B	0.60		MADE GROUND dark grey very sandy slightly silty gravel.
TP113	3	B	1.10		MADE GROUND dark grey very sandy silty gravel.
TP118A	3	B	3.00		Brown mottled grey slightly gravelly slightly sandy CLAY.
TP122	3	B	0.70		Brown very gravelly very sandy CLAY.
TP106	2	D	0.50		Brown slightly sandy CLAY.
TP104	2	D	0.90		Brown mottled grey slightly gravelly slightly sandy CLAY.
TP122	4	D	0.90		Brown slightly gravelly slightly sandy CLAY.
TP110	2	D	1.00		Brown gravelly very sandy CLAY.
TP127	3	D	1.00		Brown mottled grey slightly gravelly sandy CLAY.
TP111	2	D	1.50		Brown slightly gravelly very sandy CLAY.
TP124N	1	D	1.50		Brown mottled grey slightly gravelly slightly sandy CLAY.
TP126	3	D	1.50		Brown slightly gravelly slightly sandy CLAY.
TP132	3	D	1.50		Brown slightly sandy silty CLAY.
TP121	3	D	1.60		Brown slightly sandy silty CLAY.
TP128	3	D	1.80		Brown mottled grey slightly gravelly slightly sandy CLAY.
TP110	3	D	1.90		Brown very gravelly very sandy CLAY.
TP129	3	D	2.40		Brown mottled grey slightly gravelly slightly sandy CLAY.

UKAS TESTING
4043

PSL
Professional Soils Laboratory

Crossley Lane, Dalton

Contract No:
PSL20/0646
Client Ref:
3435

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
TP101	4	D	2.50		Brown very gravelly sandy CLAY.
TP109	5	D	2.50		Brown slightly sandy silty CLAY.
TP113	5	D	2.50		Brown mottled grey sandy silty CLAY.
TP115	3	D	2.50		Brown mottled grey slightly gravelly sandy CLAY.
TP112E	4	D	2.80		Brown mottled grey slightly gravelly sandy CLAY.
TP105	2	D	0.50		Brown slightly gravelly slightly sandy silty CLAY.
TP102	2	D	0.60		Brown slightly sandy CLAY.
TP103	2	D	0.60		Brown slightly gravelly slightly sandy CLAY.

UKAS TESTING
4043

PSL
Professional Soils Laboratory

Crossley Lane, Dalton

Contract No:
PSL20/0646
Client Ref:
3435

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % Clause 3.2	Linear Shrinkage % Clause 6.5	Particle Density Mg/m^3 Clause 8.2	Liquid Limit % Clause 4.3/4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	Passing .425mm %	Remarks
TP106	2	D	0.50		29			57	26	31	100	High plasticity CH.
TP104	2	D	0.90		32			61	27	34	97	High plasticity CH.
TP122	4	D	0.90		28			54	25	29	98	High plasticity CH.
TP110	2	D	1.00		14			31	16	15	83	Low plasticity CL.
TP127	3	D	1.00		25			46	22	24	96	Intermediate plasticity CI.
TP111	2	D	1.50		18			35	18	17	91	Intermediate plasticity CI.
TP124N	1	D	1.50		33			59	26	33	94	High plasticity CH.
TP126	3	D	1.50		30			56	25	31	90	High plasticity CH.
TP132	3	D	1.50		41			65	28	37	100	High plasticity CH.
TP121	3	D	1.60		39			67	29	38	100	High plasticity CH.
TP128	3	D	1.80		26			55	26	29	92	High plasticity CH.
TP110	3	D	1.90		16			32	17	15	69	Low plasticity CL.
TP129	3	D	2.40		31			57	25	32	95	High plasticity CH.
TP101	4	D	2.50		29			45	22	23	72	Intermediate plasticity CI.
TP109	5	D	2.50		30			53	27	26	100	High plasticity CH.
TP113	5	D	2.50		34			46	23	23	100	Intermediate plasticity CI.
TP115	3	D	2.50		29			43	21	22	93	Intermediate plasticity CI.
TP112E	4	D	2.80		36			45	22	23	98	Intermediate plasticity CI.
TP105	2	D	0.50		33			59	28	31	92	High plasticity CH.

SYMBOLS : NP : Non Plastic * : Liquid Limit and Plastic Limit Wet Sieved.

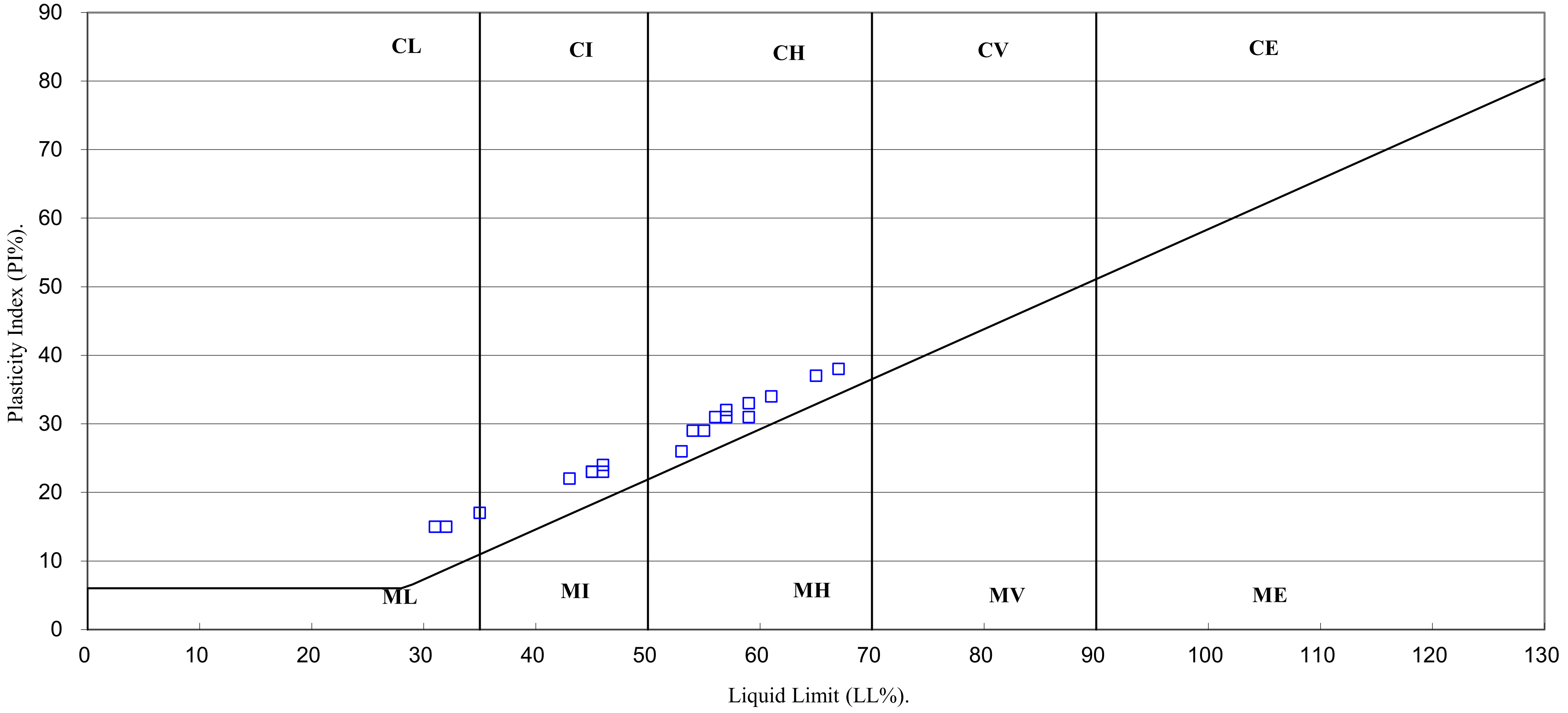
UKAS TESTING
4043

PSL
Professional Soils Laboratory

Crossley Lane, Dalton

Contract No:
PSL20/0646
Client Ref:
3435

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



UKAS TESTING 4043	PSL Professional Soils Laboratory	**Crossley Lane, Dalton**	**Contract No:** **PSL20/0646** **Client Ref:** **3435**

SUMMARY OF SOIL CLASSIFICATION TESTS

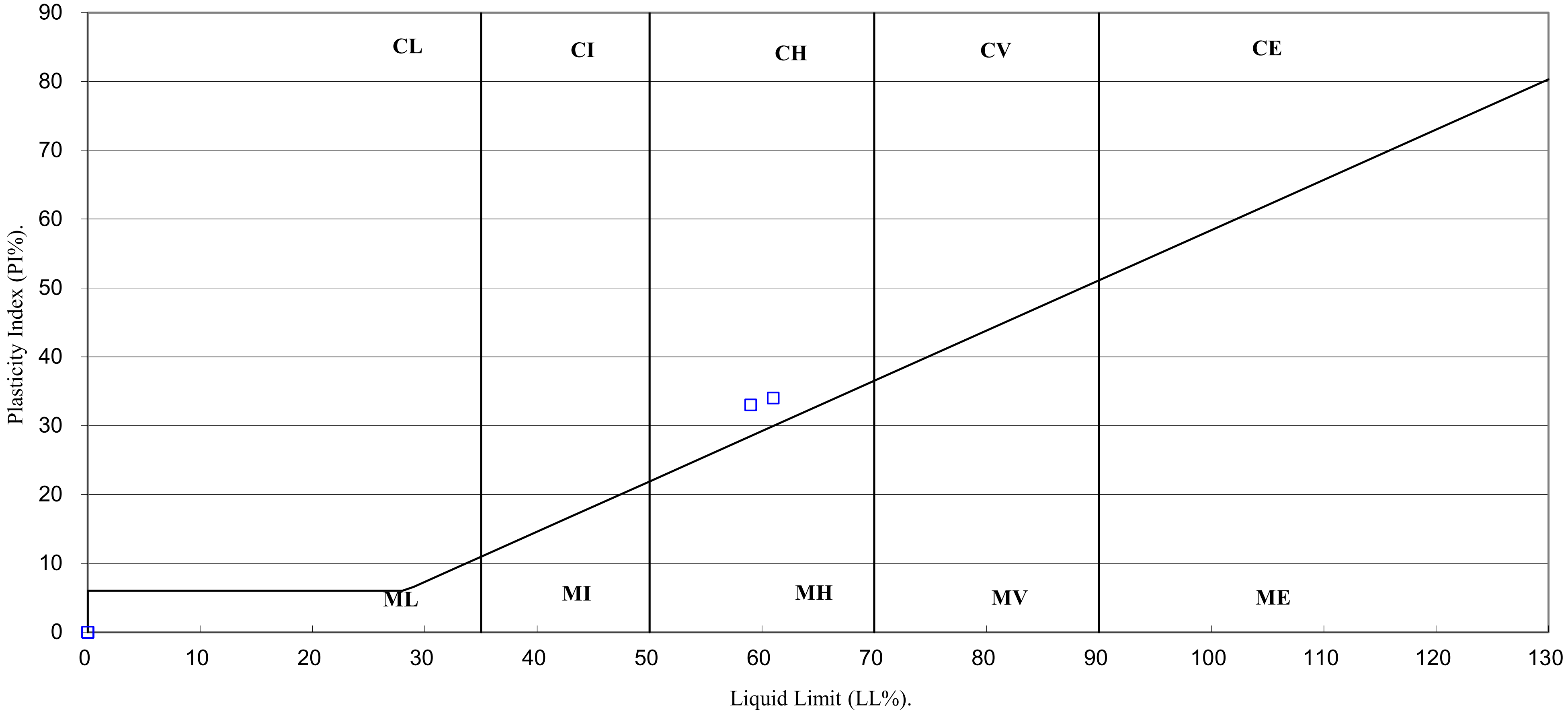
(BS1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % Clause 3.2	Linear Shrinkage % Clause 6.5	Particle Density Mg/m^3 Clause 8.2	Liquid Limit % Clause 4.3/4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	Passing .425mm %	Remarks
TP102	2	D	0.60		32			61	27	34	100	High plasticity CH.
TP103	3	D	0.60		38			59	26	33	93	High plasticity CH.

SYMBOLS : NP : Non Plastic

* : Liquid Limit and Plastic Limit Wet Sieved.

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



UKAS TESTING 4043

Professional Soils Laboratory

Crossley Lane, Dalton

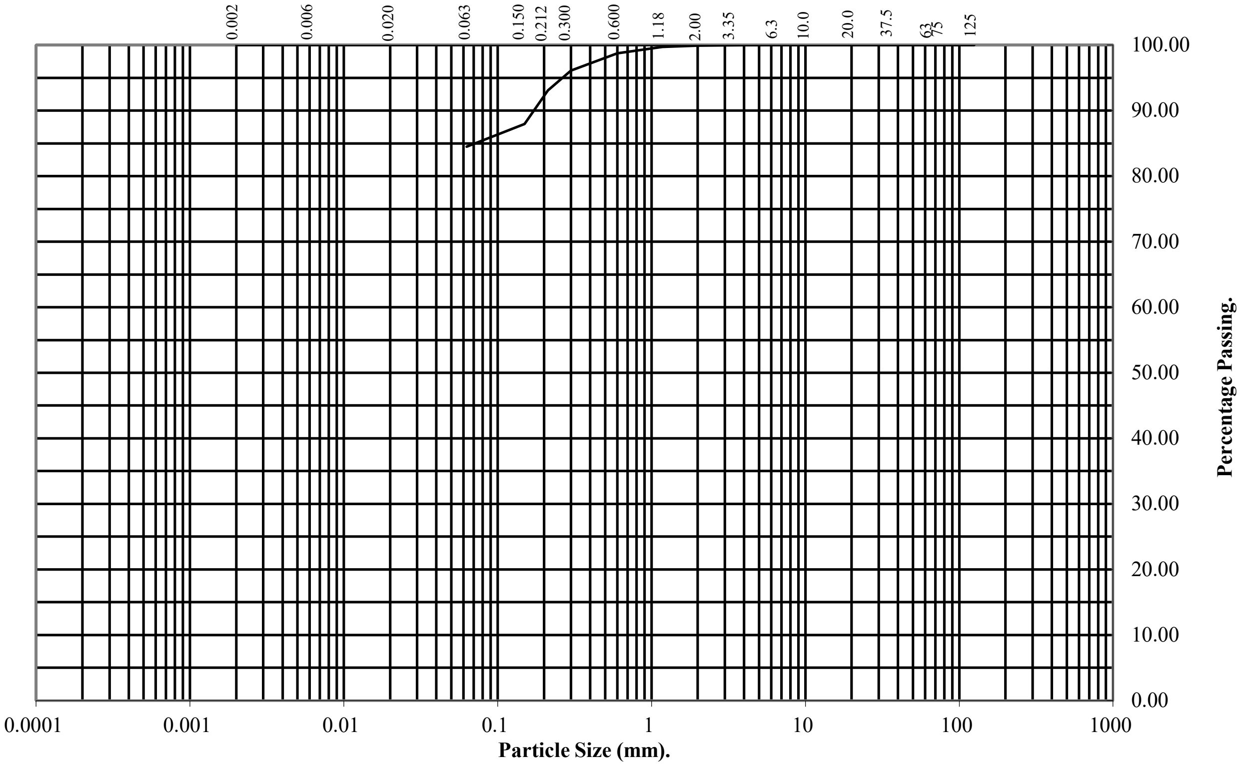
Contract No:	
PSL20/0646	
Client Ref:	
3435	

PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number:	**TP01**	**Top Depth (m):**	**1.50**
Sample Number:	**3**	**Base Depth(m):**	
Sample Type:	**B**		



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2	100
1.18	100
0.6	99
0.3	96
0.212	93
0.15	88
0.063	84

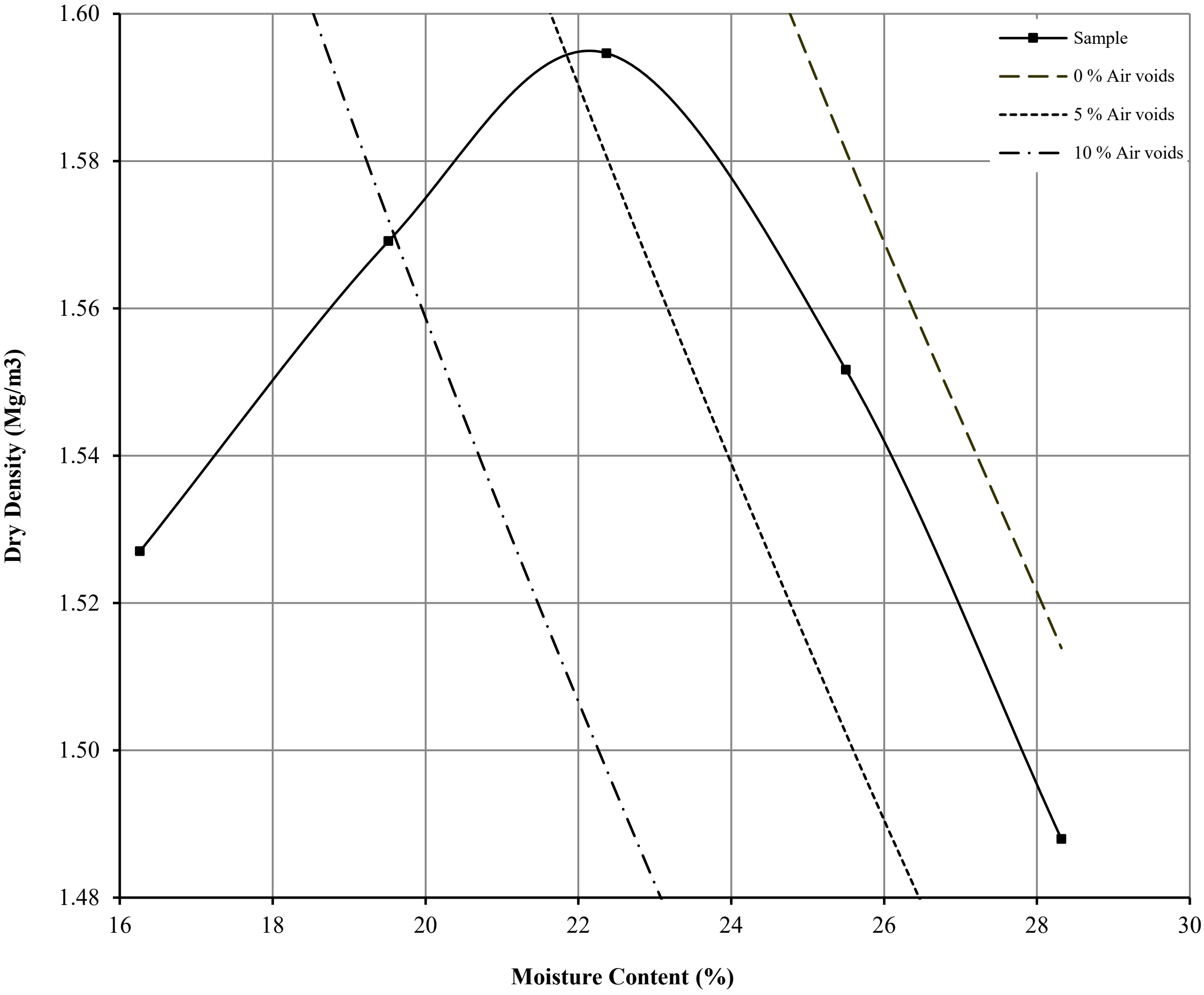
Soil Fraction	Total Percentage
Cobbles	0
Gravel	0
Sand	16
Silt/Clay	84

Remarks:
See Summary of Soil Descriptions

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

BS 1377 : Part 4 : Clause 3.3 : 1990

Hole Number:	**TP101**	**Top Depth (m) :**	**1.50**
Sample Number:	**3**	**Base Depth (m) :**	
Sample Type:	**B**		



Initial Moisture Content:		28	Method of Compaction:	2.5kg	Separate Samples
Particle Density (Mg/m3):	2.65	Assumed	Material Retained on 37.5 mm Test Sieve (%):		0
Maximum Dry Density (Mg/m3):		1.59	Material Retained on 20.0 mm Test Sieve (%):		0
Optimum Moisture Content (%):		22			

Remarks

See summary of soil descriptions.

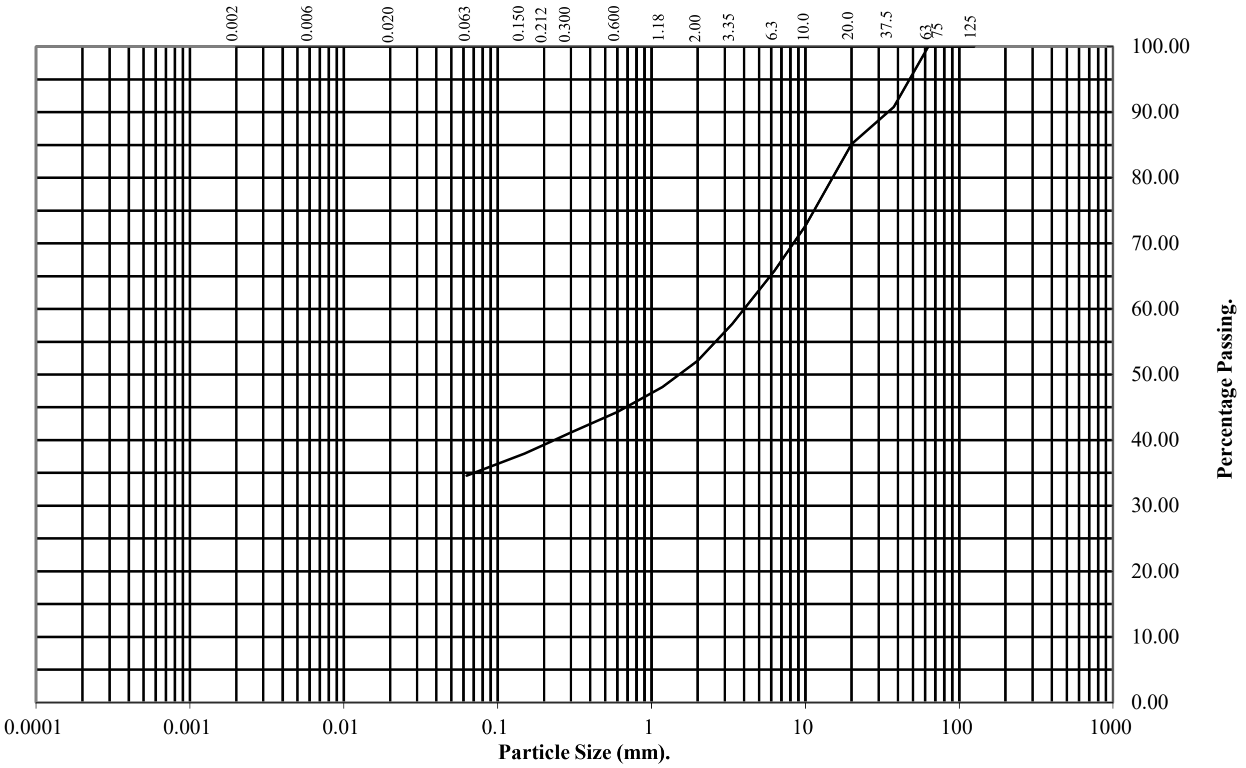
UKAS TESTING 4043	PSL Professional Soils Laboratory	**Crossley Lane, Dalton**	**Contract** **PSL20/0646** **Client Ref** **3435**

PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number:	**TP109**	**Top Depth (m):**	**1.30**
Sample Number:	**4**	**Base Depth(m):**	
Sample Type:	**B**		



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	91
20	85
10	73
6.3	66
3.35	58
2	52
1.18	48
0.6	44
0.3	41
0.212	40
0.15	38
0.063	35

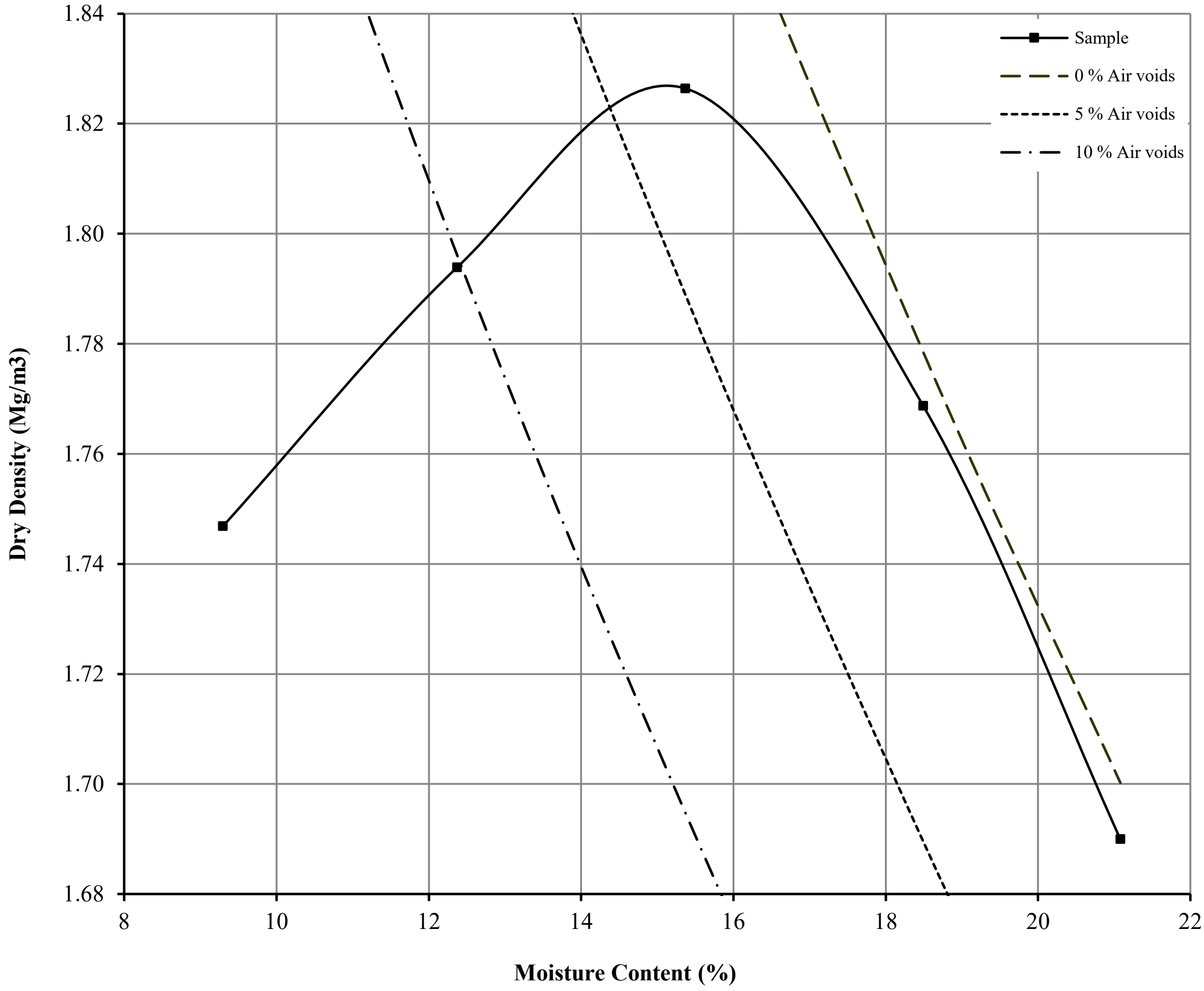
Soil Fraction	Total Percentage
Cobbles	0
Gravel	48
Sand	17
Silt/Clay	35

Remarks:
See Summary of Soil Descriptions

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

BS 1377 : Part 4 : Clause 3.4 : 1990

Hole Number:	**TP109**	**Top Depth (m) :**	**1.30**
Sample Number:	**4**	**Base Depth (m) :**	
Sample Type:	**B**		



Initial Moisture Content:		15	Method of Compaction: 2.5kg	Separate Samples
Particle Density (Mg/m3):	2.65	Assumed	Material Retained on 37.5 mm Test Sieve (%):	9
Maximum Dry Density (Mg/m3):		1.83	Material Retained on 20.0 mm Test Sieve (%):	6
Optimum Moisture Content (%):		15		

Remarks

See summary of soil descriptions.

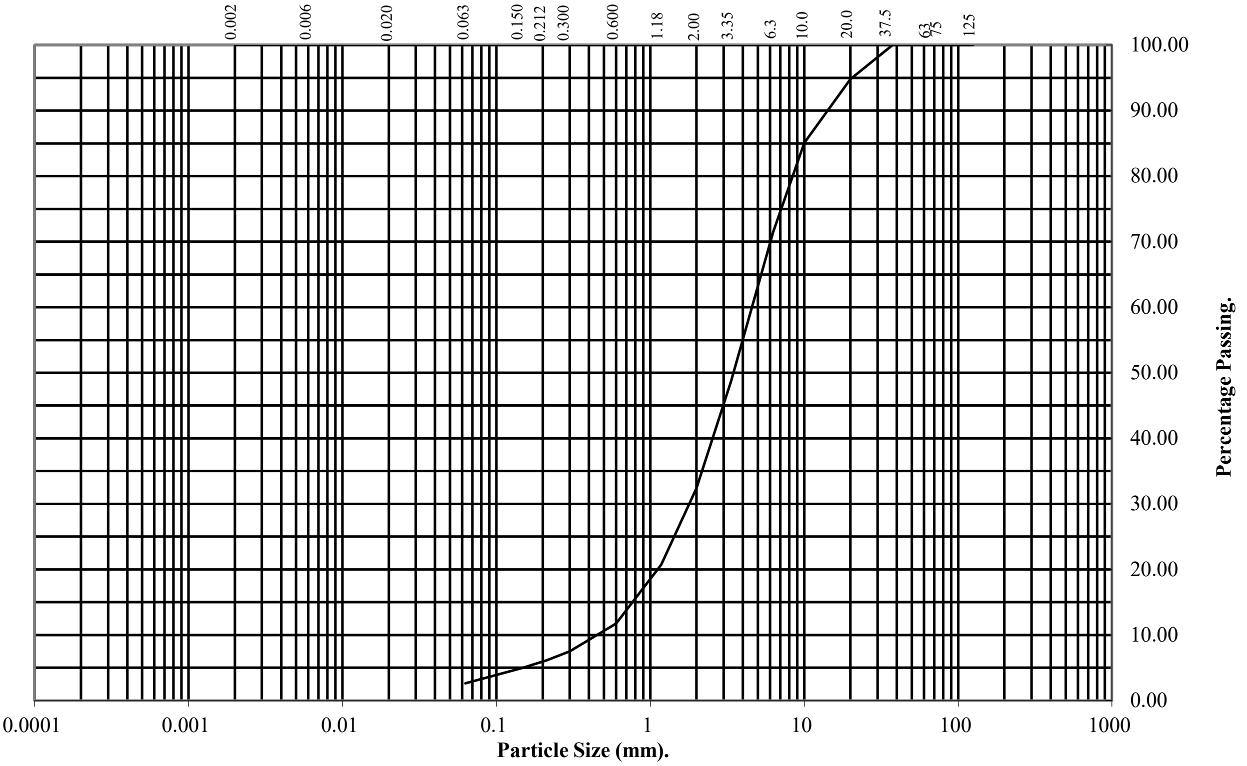
UKAS TESTING 4043	PSL Professional Soils Laboratory	**Contract**
	Crossley Lane, Dalton	**PSL20/0646**
		Client Ref
		3435

PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number:	**TP112W**	**Top Depth (m):**	**0.60**
Sample Number:	**2**	**Base Depth(m):**	
Sample Type:	**B**		



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	95
10	85
6.3	72
3.35	49
2	32
1.18	21
0.6	12
0.3	7
0.212	6
0.15	5
0.063	3

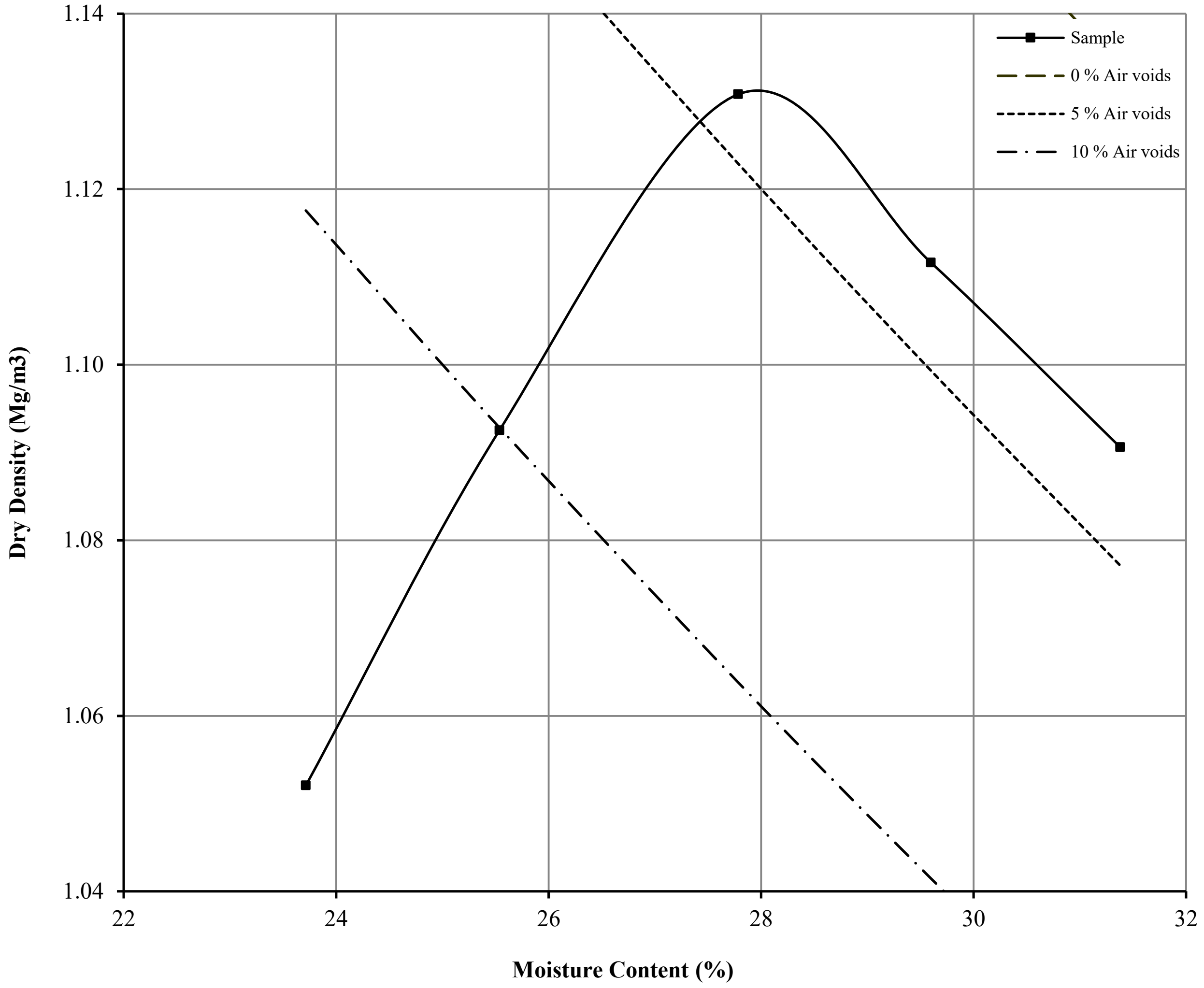
Soil Fraction	Total Percentage
Cobbles	0
Gravel	68
Sand	29
Silt/Clay	3

Remarks:
See Summary of Soil Descriptions

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

BS 1377 : Part 4 : Clause 3.4 : 1990

Hole Number:	**TP112W**	**Top Depth (m) :**	**0.60**
Sample Number:	**2**	**Base Depth (m) :**	
Sample Type:	**B**		



Initial Moisture Content:		24	Method of Compaction:	2.5kg	Separate Samples
Particle Density (Mg/m3):	1.76	Assumed	Material Retained on 37.5 mm Test Sieve (%):		0
Maximum Dry Density (Mg/m3):		1.13	Material Retained on 20.0 mm Test Sieve (%):		6
Optimum Moisture Content (%):		28			

Remarks

See summary of soil descriptions.

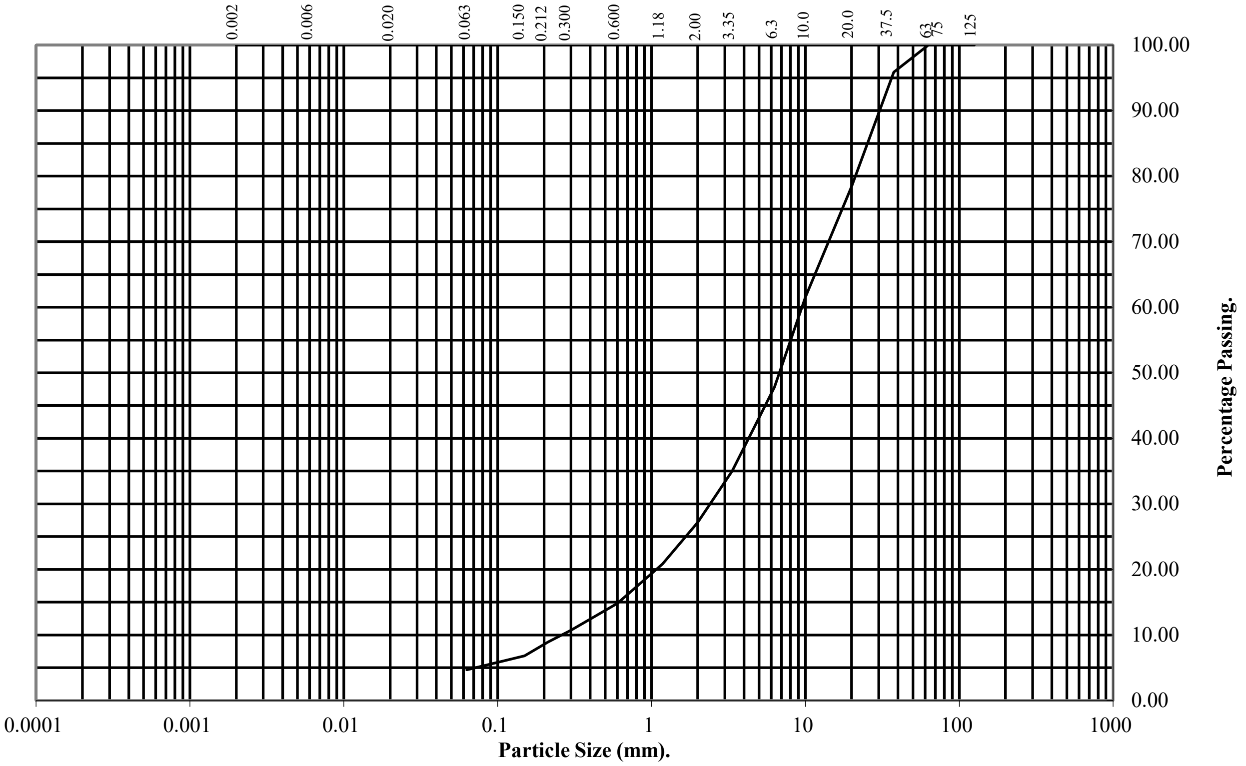
UKAS TESTING 4043	PSL Professional Soils Laboratory	**Crossley Lane, Dalton**	**Contract** **PSL20/0646** **Client Ref** **3435**

PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number:	**TP113**	**Top Depth (m):**	**1.10**
Sample Number:	**3**	**Base Depth(m):**	
Sample Type:	**B**		



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	96
20	78
10	62
6.3	48
3.35	35
2	27
1.18	21
0.6	15
0.3	11
0.212	9
0.15	7
0.063	5

Soil Fraction	Total Percentage
Cobbles	0
Gravel	73
Sand	22
Silt/Clay	5

Remarks:
See Summary of Soil Descriptions

UKAS TESTING 4043

Professional Soils Laboratory

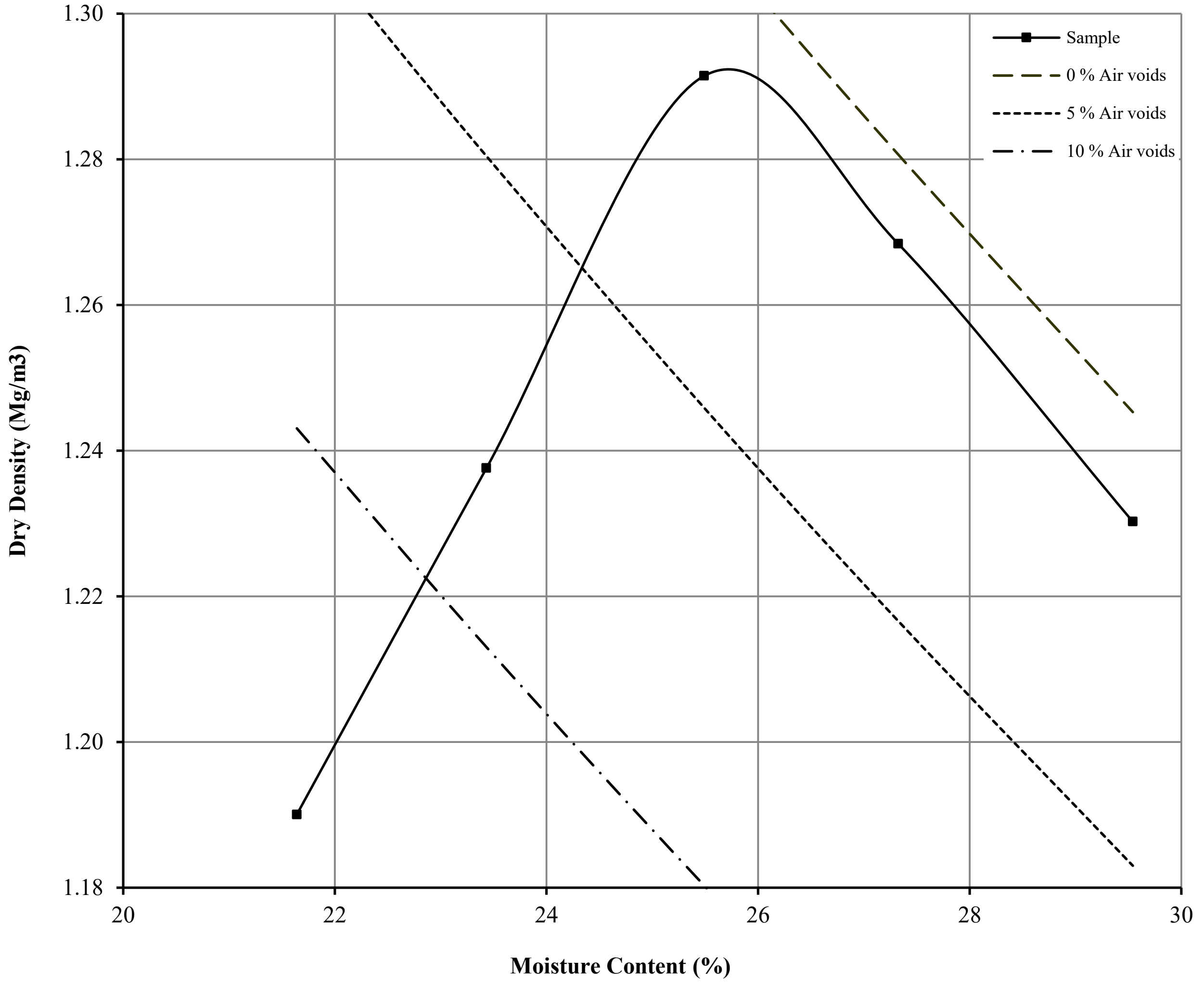
Crossley Lane, Dalton

Contract No: **PSL20/0646**
Client Ref: **3435**

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

BS 1377 : Part 4 : Clause 3.4 : 1990

Hole Number:	**TP113**	**Top Depth (m) :**	**1.10**
Sample Number:	**3**	**Base Depth (m) :**	
Sample Type:	**B**		



Initial Moisture Content:		22	Method of Compaction:	2.5kg	Separate Samples
Particle Density (Mg/m3):	1.97	Assumed	Material Retained on 37.5 mm Test Sieve (%):		4
Maximum Dry Density (Mg/m3):		1.29	Material Retained on 20.0 mm Test Sieve (%):		18
Optimum Moisture Content (%):		25			

Remarks

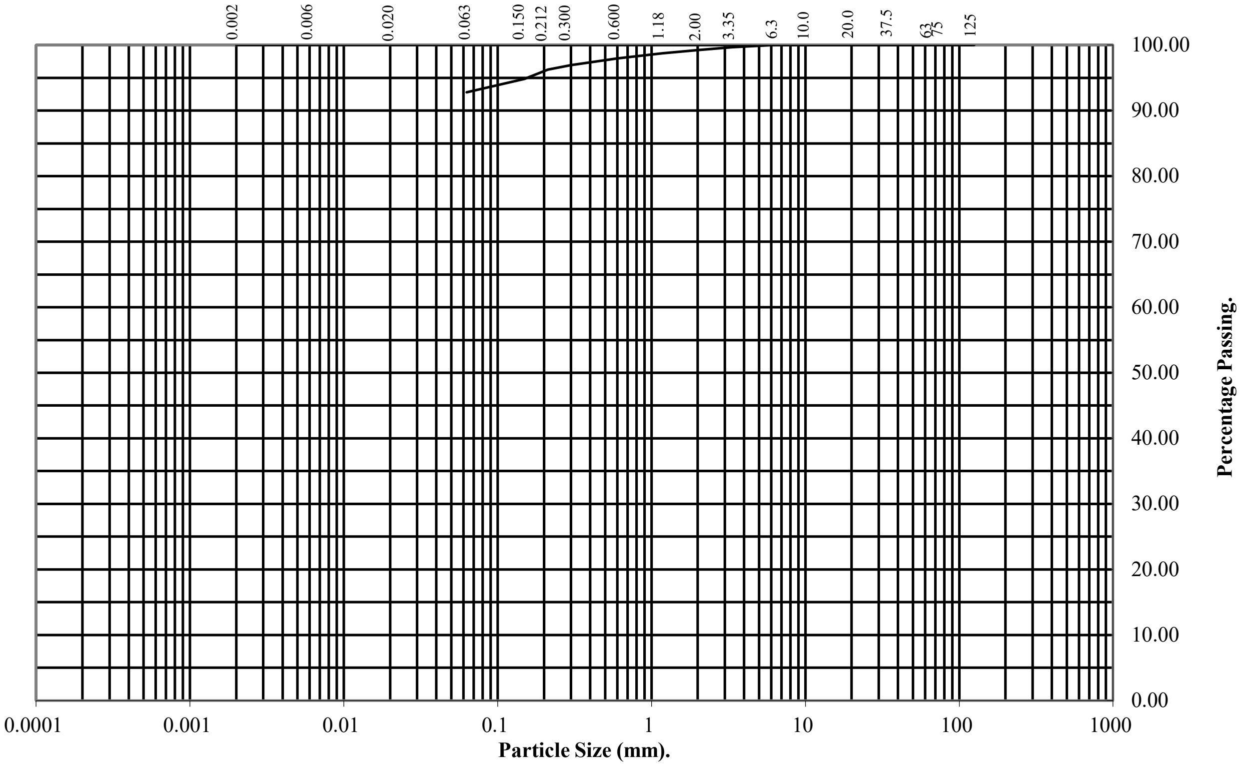
See summary of soil descriptions.

PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number:	**TP118A**	**Top Depth (m):**	**3.00**
Sample Number:	**3**	**Base Depth(m):**	
Sample Type:	**B**		



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2	99
1.18	99
0.6	98
0.3	97
0.212	96
0.15	95
0.063	93

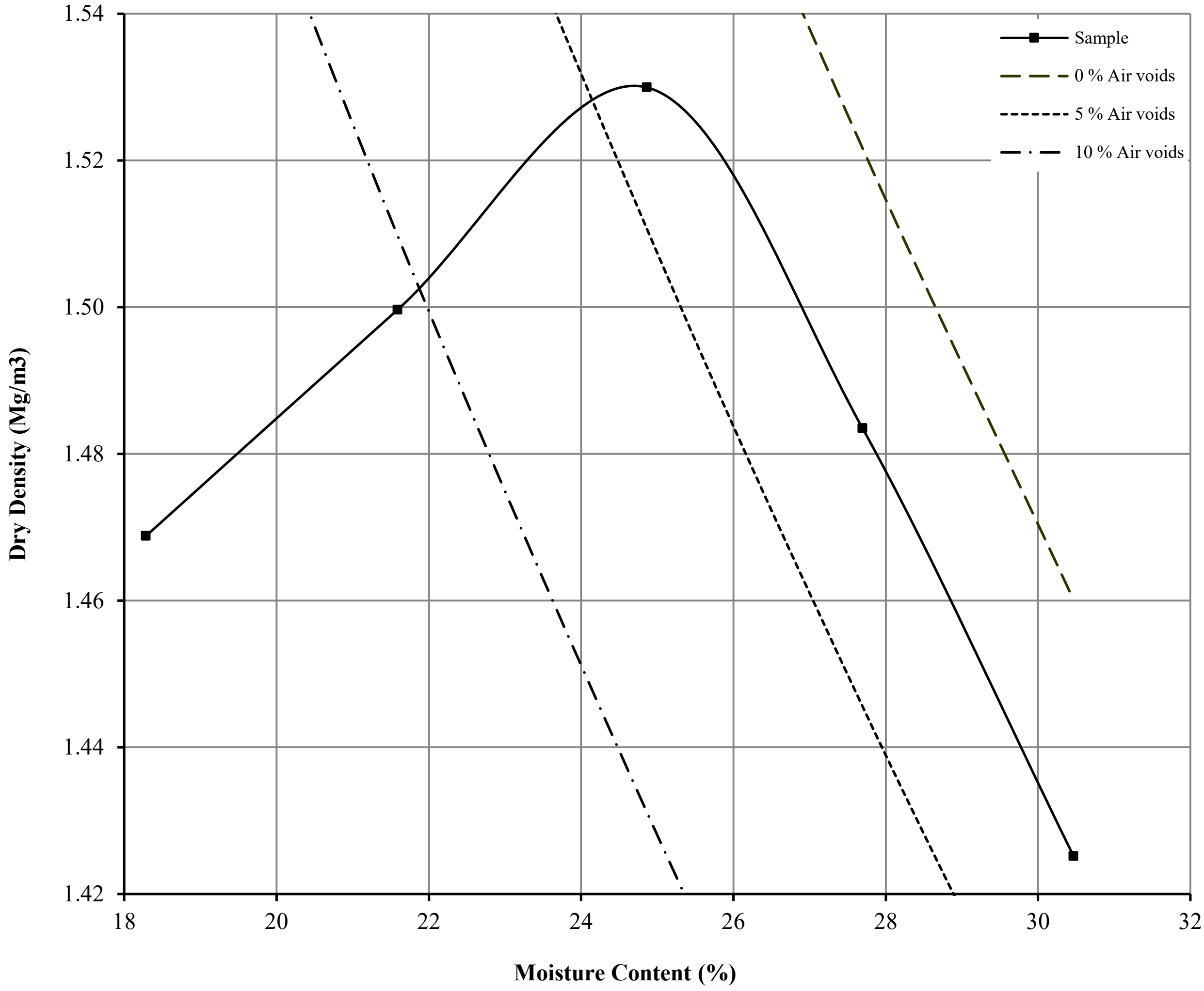
Soil Fraction	Total Percentage
Cobbles	0
Gravel	1
Sand	6
Silt/Clay	93

Remarks:
See Summary of Soil Descriptions

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

BS 1377 : Part 4 : Clause 3.3 : 1990

Hole Number:	**TP118A**	**Top Depth (m) :**	**3.00**
Sample Number:	**3**	**Base Depth (m) :**	
Sample Type:	**B**		



Initial Moisture Content:		34	Method of Compaction: 2.5kg	Separate Samples
Particle Density (Mg/m3):	2.63	Assumed	Material Retained on 37.5 mm Test Sieve (%):	0
Maximum Dry Density (Mg/m3):		1.53	Material Retained on 20.0 mm Test Sieve (%):	0
Optimum Moisture Content (%):		25		

Remarks

See summary of soil descriptions.

UKAS TESTING 4043

PSL Professional Soils Laboratory

Crossley Lane, Dalton

Contract
PSL20/0646
Client Ref
3435

PARTICLE SIZE DISTRIBUTION TEST

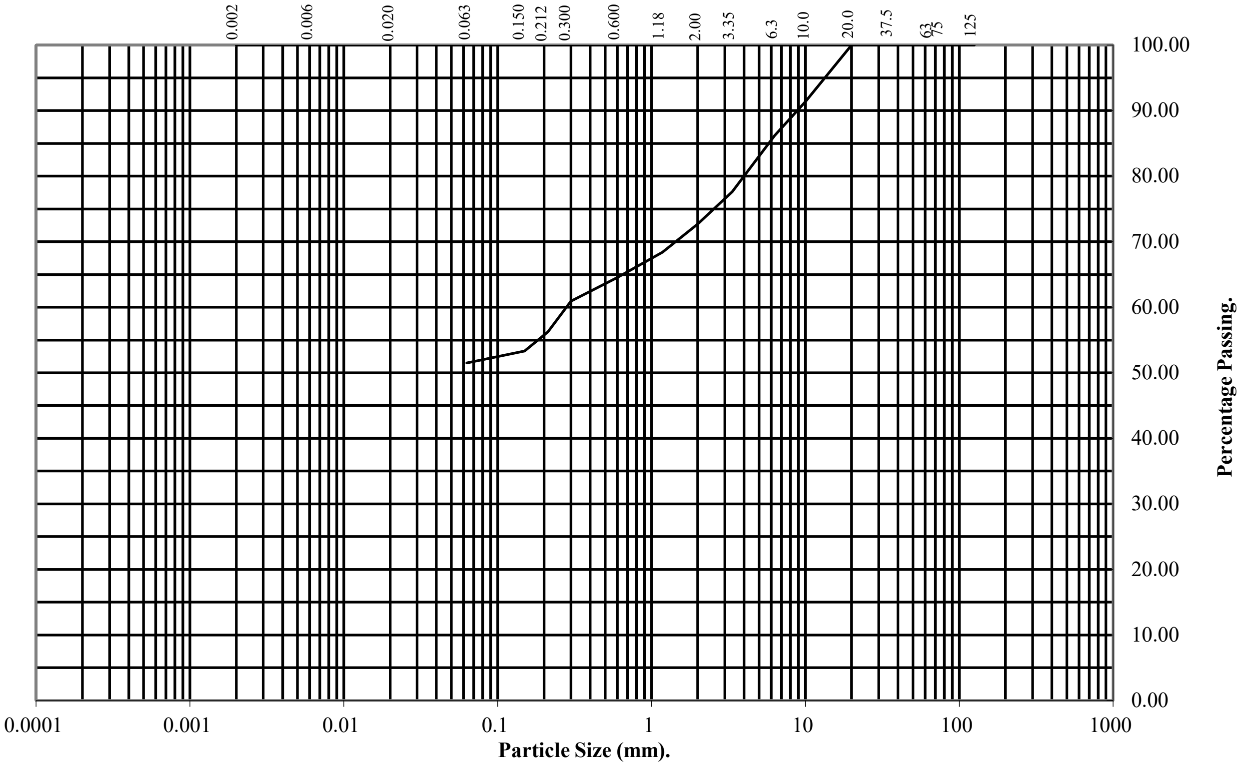
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: TP122 **Top Depth (m):** 0.70

Sample Number: 3 **Base Depth(m):**

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	91
6.3	86
3.35	78
2	73
1.18	68
0.6	65
0.3	61
0.212	56
0.15	53
0.063	52

Soil Fraction	Total Percentage
Cobbles	0
Gravel	27
Sand	21
Silt/Clay	52

Remarks:
See Summary of Soil Descriptions

UKAS TESTING 4043

PSL Professional Soils Laboratory

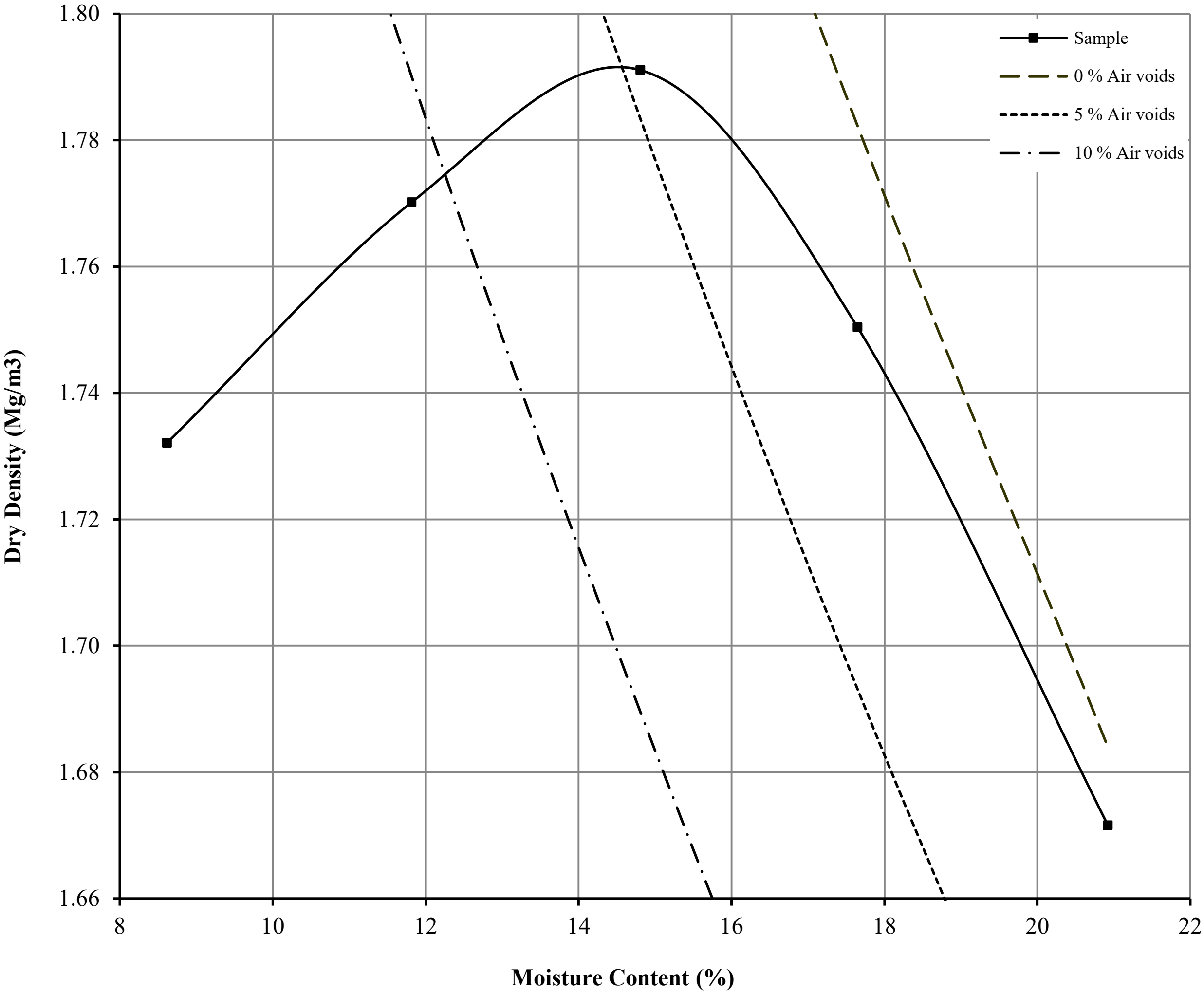
Crossley Lane, Dalton

Contract No: PSL20/0646
Client Ref: 3435

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

BS 1377 : Part 4 : Clause 3.3 : 1990

Hole Number:	**TP122**	**Top Depth (m) :**	**0.70**
Sample Number:	**3**	**Base Depth (m) :**	
Sample Type:	**B**		



Initial Moisture Content:		15	Method of Compaction:	2.5kg	Separate Samples
Particle Density (Mg/m3):	2.60	Assumed	Material Retained on 37.5 mm Test Sieve (%):		0
Maximum Dry Density (Mg/m3):		1.79	Material Retained on 20.0 mm Test Sieve (%):		0
Optimum Moisture Content (%):		15			
Remarks See summary of soil descriptions.					

Certificate of Analysis

Certificate Number	20-03077
Client	Professional Soils Laboratory Ltd 5/7 Hexthorpe Road Hexthorpe DN4 0AR

17-Feb-20

Our Reference	20-03077
Client Reference	PSL20/0646
Order No	(not supplied)
Contract Title	Crossley lane, Dalton
Description	21 Soil samples.
Date Received	13-Feb-20
Date Started	13-Feb-20
Date Completed	17-Feb-20
Test Procedures	Identified by prefix DETSn (details on request).
Notes	Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Adam Fenwick
Contracts Manager

Summary of Chemical Analysis
Soil Samples

Our Ref 20-03077
Client Ref PSL20/0646
Contract Title Crossley lane, Dalton

			Lab No	1638554	1638555	1638556	1638557	1638558	1638559	1638560	1638561	1638562	1638563
			Sample ID	TP106	TP104	TP122	TP127	TP111	TP124N	TP132	TP128	TP129	TP109
			Depth	0.50	0.90	0.90	1.00	1.50	1.50	1.50	1.80	2.40	2.50
			Other ID	2	2	4	3	2	1	3	3	3	5
			Sample Type	D	D	D	D	D	D	D	D	D	D
			Sampling Date	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**										
Inorganics													
pH	DETSC 2008#		pH	7.2	7.3	7.1	7.2	7.1	7.3	7.1	7.0	6.9	6.2
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	19	30	22	56	73	53	100	110	100	29

Key: # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis

Soil Samples

Our Ref 20-03077
Client Ref PSL20/0646
Contract Title Crossley lane, Dalton

			Lab No	1638564	1638565	1638566	1638567	1638568	1638569	1638570	1638571	1638572	1638573	1638574
			Sample ID	TP115	TP101	TP126	TP128	TP126	TP101	TP122	TP113	TP105	TP102	TP103
			Depth	2.50	0.50	0.90	1.30	2.90	3.00	3.20	1.90	0.50	0.60	0.60
			Other ID	3	2	2	2	4	5	6	4	2	2	2
			Sample Type	D	D	D	D	D	D	D	D	D	D	D
			Sampling Date	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**											
Inorganics														
pH	DETSC 2008#		pH	6.3	6.3	6.8	6.9	6.8	7.3	7.4	7.4	7.1	7.1	7.2
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	27	28	61	55	70	230	300	310	24	25	40

Key: # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Information in Support of the Analytical Results

Our Ref 20-03077
Client Ref PSL20/0646
Contract Crossley lane, Dalton

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1638554	TP106 0.50 SOIL		PT 500ml	Sample date not supplied, Anions 2:1 (365 days), pH + Conductivity (7 days)	
1638555	TP104 0.90 SOIL		PT 500ml	Sample date not supplied, Anions 2:1 (365 days), pH + Conductivity (7 days)	
1638556	TP122 0.90 SOIL		PT 500ml	Sample date not supplied, Anions 2:1 (365 days), pH + Conductivity (7 days)	
1638557	TP127 1.00 SOIL		PT 500ml	Sample date not supplied, Anions 2:1 (365 days), pH + Conductivity (7 days)	
1638558	TP111 1.50 SOIL		PT 500ml	Sample date not supplied, Anions 2:1 (365 days), pH + Conductivity (7 days)	
1638559	TP124N 1.50 SOIL		PT 500ml	Sample date not supplied, Anions 2:1 (365 days), pH + Conductivity (7 days)	
1638560	TP132 1.50 SOIL		PT 500ml	Sample date not supplied, Anions 2:1 (365 days), pH + Conductivity (7 days)	
1638561	TP128 1.80 SOIL		PT 500ml	Sample date not supplied, Anions 2:1 (365 days), pH + Conductivity (7 days)	
1638562	TP129 2.40 SOIL		PT 500ml	Sample date not supplied, Anions 2:1 (365 days), pH + Conductivity (7 days)	
1638563	TP109 2.50 SOIL		PT 500ml	Sample date not supplied, Anions 2:1 (365 days), pH + Conductivity (7 days)	
1638564	TP115 2.50 SOIL		PT 500ml	Sample date not supplied, Anions 2:1 (365 days), pH + Conductivity (7 days)	
1638565	TP101 0.50 SOIL		PT 1L	Sample date not supplied, Anions 2:1 (365 days), pH + Conductivity (7 days)	
1638566	TP126 0.90 SOIL		PT 1L	Sample date not supplied, Anions 2:1 (365 days), pH + Conductivity (7 days)	
1638567	TP128 1.30 SOIL		PT 1L	Sample date not supplied, Anions 2:1 (365 days), pH + Conductivity (7 days)	
1638568	TP126 2.90 SOIL		PT 1L	Sample date not supplied, Anions 2:1 (365 days), pH + Conductivity (7 days)	
1638569	TP101 3.00 SOIL		PT 1L	Sample date not supplied, Anions 2:1 (365 days), pH + Conductivity (7 days)	
1638570	TP122 3.20 SOIL		PT 1L	Sample date not supplied, Anions 2:1 (365 days), pH + Conductivity (7 days)	
1638571	TP113 1.90 SOIL		PT 1L	Sample date not supplied, Anions 2:1 (365 days), pH + Conductivity (7 days)	
1638572	TP105 0.50 SOIL		PT 500ml	Sample date not supplied, Anions 2:1 (365 days), pH + Conductivity (7 days)	
1638573	TP102 0.60 SOIL		PT 500ml	Sample date not supplied, Anions 2:1 (365 days), pH + Conductivity (7 days)	
1638574	TP103 0.60 SOIL		PT 500ml	Sample date not supplied, Anions 2:1 (365 days), pH + Conductivity (7 days)	

Key: P-Plastic T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Information in Support of the Analytical Results

Our Ref 20-03077
Client Ref PSL20/0646
Contract Crossley lane, Dalton

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

Appendix K

Gas Monitoring Results