REPORT C7481/GA
JANUARY 2018

GEOENVIRONMENTAL APPRAISAL

of land off
WAKEFIELD ROAD, MAPPLEWELL

prepared for
LIDL UK GMBH

REPORT NUMBER:	C7481/GA	**REPORT STATUS:**	Final
REPORT TYPE:	GEOENVIRONMENTAL APPRAISAL		
REPORT DATE:	JANUARY 2018		
SITE:	WAKEFIELD ROAD, MAPPLEWELL		
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EXECUTIVE SUMMARY

Introduction	Sirius Geotechnical Ltd (Sirius) was commissioned by Lidl UK GmbH (Lidl) to undertake a Geoenvironmental Appraisal of land off Wakefield Road, Mapplewell, Barnsley, South Yorkshire (the 'site'). It is understood that consideration is being given to redevelopment of the site for a Lidl food store with access road, hard surfaced car parking and peripheral landscaping. Earthworks, comprising raising ground levels by up to c. 2.5m, with construction of gabion retaining walls, up to 2.5m high, is proposed.
National Grid Reference	434050, 409825.
Site Description	The site is approximately 1 hectare in area and comprises mainly hard standing remaining from demolition of the former William Freeman rubber and plastics factory. There are stockpiles of demolition wastes across the hardstanding area. There are mature trees along the western boundary with Wakefield Road, and an area of scrubland at the eastern end of the site; this area comprises a historical landfill associated with the former factory.
Site History	Review of historical Ordnance Survey maps indicate the site to be undeveloped agricultural fields until the 1960s, when the William Freeman factory was constructed. The factory was subsequently demolished some time in the 21st Century. By the latter half of the Nineteenth Century, the Barnsley Coal Railway Extension, with associated cutting, was constructed close to the site's eastern boundary.
Fieldwork	The intrusive site investigation comprised excavation of 8 trial pits, soakaway testing in three trial pits, drilling of 9 windowless sampler boreholes and rotary open-hole drilling of 9 boreholes.
Laboratory Testing	Soil and groundwater samples were analysed for a range of commonly occurring contaminants and chemical parameters. Waste Acceptance Criteria (WAC) analysis was undertaken on eight soil samples. Two samples of suspected asbestos containing materials (ACMs) were taken from the surface stockpiles on the site and analysed for asbestos presence / absence. Disturbed soil samples were analysed for geotechnical parameters including Atterberg limits, moisture content / dry density relationship and remoulded CBR values.
Ground Conditions	The intrusive site investigation has identified that made ground / possible re-worked clay soils in proximity to the footprint of the proposed food store building varies in depth from 0.6m to 3.0m, with the greatest thicknesses recorded in the eastern side of the footprint, including landfilled waste at the north-eastern tip. The identified landfilled waste includes hot water bottles, plastic, steel drums, polystyrene and wood, in a matrix of clay. The made ground is underlain by competent natural strata originating from weathering of the Pennine Middle Coal Measures Formation on the site, comprising generally medium to high strength cohesive residual soils from weathered rock strata. The cohesive residual soils are in turn underlain by extremely weak to very weak sandstone, interbedded with siltstone. The first two rounds of groundwater monitoring recorded groundwater depths ranging

	between 1.0 and 3.4m below ground level (bgl).
Shallow Coal Mine Workings	The Newhill Coal seam was found to be intact below the site in every rotary borehole drilled. Furthermore, the ratio of intact rock overlying coal to the recorded seam thickness exceeded 10 in every borehole. Therefore, the risk to site stability from unrecorded pillar and stall mining is considered negligible. The minimum recorded depth to the Newhill Coal (13.5m) below the site is beyond the typical maximum depths of bell pits (12m) stated in CIRIA Special Publication 32, Construction over Abandoned Mine Workings (2002). Therefore, the risk to site stability from unrecorded bell pits is considered to be low. No mine entries are recorded within the site or within 20m of the site. However, as the site is underlain by coal and mine workings at depth, the possibility of unrecorded mine entries below the site cannot be entirely discounted. It is recommended that all excavations are inspected for evidence of mine entries / bell pits. If evidence of a mine entry or ground disturbance is suspected, advice regarding treatment / foundation precautions should be sought from a suitably qualified engineer.
Soakaways	Percolation testing undertaken during the site investigation has demonstrated that the site is underlain by low permeability soils and the use of soakaways for surface water disposal is not feasible.
Foundations and Floor Slabs	The made ground and possible re-worked clay are considered unsuitable as founding strata in their current condition, due to their variability and presence of deleterious materials, etc. Raising of the ground level below the proposed building footprint by c. 1.3m is proposed, which will alter shallow ground conditions for foundation construction from those recorded by the site investigation in places. Based on the above and the results of the site investigation, several possible foundation solutions may be considered, including the following: I. Spread foundations constructed within natural strata from existing ground level, with ongoing underbuild; II. Full excavation of existing made ground, with replacement by fully engineered fill, with construction of raft foundation upon the fill; III. Vibro stone columns, following turnover of the made ground / possible re-worked clay and removal of landfilled waste at the north-eastern corner, with construction of shallow spread foundations / raft within treated fill. The existing made ground and re-worked clay are not considered suitable as bearing strata for a ground-bearing floor slab in their current condition. However, depending on the loading and performance requirements for the slab, consideration could be given to construction of a ground-bearing slab following engineering of existing made ground / re-worked clay to remove hard / soft spots, followed by placement of suitable new engineered fill to receive the slab. The proximity of the proposed retaining wall to the north of the proposed building should be considered within the selection of foundation and ground floor types.
Sulphate Class	Design Sulphate Class DS-1 and ACEC Class AC-2z should be assumed for concrete substructures on the site.
Soil Contamination	Recorded soil contaminant concentrations do not exceed generic assessment criteria, for retail use and formal remediation to protect site end users is not considered

	necessary in this respect. However, a growing medium including imported topsoil shall be required within soft landscaped areas. Unforeseen contamination cannot be discounted.
Groundwater Contamination	The risk from groundwater contamination associated with the site is considered to be low and formal remediation to protect controlled waters is not considered necessary in this respect.
Asbestos	Demolition waste stockpiles on the site include minor proportions of ACMs; fragments of asbestos cement corrugated sheeting and rainwater pipe were identified, confirmed to contain chrysotile by laboratory analysis. All visible ACM fragments should be removed from the stockpiles prior crushing, to minimise the risk of release of asbestos fibres into the air, and contamination of the crushed product. If the crushed product is to be re-used as fill on the site, it should be placed in areas where future disturbance will not take place, e.g., by construction and maintenance activities, in accordance with a Materials Management Plan.
Ground Gas	Ground gas monitoring is ongoing, with two gas monitoring visits undertaken to date (of six planned). The results of the first two gas monitoring visits are indicative of Characteristic Situation 2 conditions; however, the ground gas risk and any protection measures required can only be determined upon completion of the gas monitoring programme. A supplementary ground gas risk assessment letter report will be issued under separate cover following completion of the planned gas monitoring visits.
Invasive Species	No evidence of invasive plants was noted during the site investigation, although this should be confirmed by a suitably qualified ecologist during the growing season.

The executive summary is an overview of the key findings and conclusions of the report. There may be other information contained in the body of the report which puts into context the findings of the executive summary. No reliance should be placed on the executive summary in isolation, particularly when deriving design detail/abnormal costs.

1. INTRODUCTION

Sirius Geotechnical Ltd (Sirius) was commissioned by Lidl UK GmbH (Lidl), to undertake a Geoenvironmental Appraisal for land off Wakefield Road, Mapplewell, Barnsley, South Yorkshire (the 'site').

It is understood that Lidl is considering development with a Lidl food store, associated access road, hard surfaced car parking and peripheral landscaping. A proposed development layout plan was provided to Sirius by Lidl (HTC Architects drawing ref. 1744 P401, dated July 2017), which is presented within Appendix A. Existing site levels and proposed finished floor and external levels are shown on HTC Architects drawing ref. 1744 P403, dated July 2017, also included in Appendix A. These plans indicate that retaining walls, up to 2.5m high, will be constructed at the northern, eastern and southern boundaries, in order to accommodate level differences between finished site levels and the surrounding area. Should these proposals be revised significantly, the findings of this report should be reviewed and amended if necessary.

Sirius previously produced a Preliminary Appraisal Report (Desk Study) (report ref. C7481 Rev A, dated June 2017) for the site. The Desk Study should be referred to for full descriptions of the site history, published geology and environmental setting, etc., of the site, although it should be noted that the Desk Study was produced for a larger site boundary, to include land to the north and east of the land assessed within this report. The Desk Study also considered risks associated with residential site end use, which is not applicable to this assessment. In view of this, the Preliminary Conceptual Site Model within this report has been revised to reflect retail / commercial type development only, within a smaller site area.

The objectives of this appraisal were to:

- Investigate near surface soil and groundwater conditions;
- Determine the potential risks posed by any ground contamination and provide recommendations on remedial measures to manage such risks;
- Establish the risks associated with hazardous ground gas;
- Evaluate whether past mining could have an influence on the site;
- Provide advice relating to geotechnical issues associated with the site;

- Provide foundation recommendations.

Fieldwork was undertaken from 15th to 16th November 2017 and comprised excavation of 8 trial pits, soakaway testing in three trial pits, drilling of 9 windowless sampler boreholes and rotary open-hole drilling of 9 boreholes.

This report, which was designed to meet the requirements of relevant current guidance, presents the factual information available during this appraisal, an interpretation of the data obtained and recommendations relevant to the defined objectives.

Where the report refers to the potential presence of invasive plants or asbestos-containing materials (ACMs), such observations are for information only and should be verified by a suitably qualified expert.

The comments and opinions presented in this report are based on the findings of the desk study, ground conditions encountered during intrusive investigation works performed by Sirius and the results of tests carried out within one or more laboratories. There may be other conditions prevailing on the site which have not been revealed by this investigation and which have not been taken into account by this report. Responsibility cannot be accepted for any conditions not revealed by this investigation. Any diagram or opinion on the possible configuration of strata, contamination or other spatially variable features between or beyond investigation positions is conjectural and given for guidance only. Confirmation of ground conditions between exploratory holes should be undertaken if deemed necessary. Evaluation of ground gas and groundwater is based on observations made at the time of the investigation and monitoring visits. It should be noted that ground gas and groundwater levels and quality may vary due to seasonal and other effects.

This report has been prepared for the sole use of Lidl UK GmbH. No other third party may rely upon or reproduce the contents of this report without the written approval of Sirius. If any unauthorised third party comes into possession of this report, they rely on it entirely at their own risk and the authors do not owe them any Duty of Care or Skill.

2. ENVIRONMENTAL SETTING

2.1. Introduction

Published environmental, geological and historical data relating to the site were reviewed as part of the Desk Study for the site. A summary of salient information is provided below.

2.2. Site Location

The site is located off Wakefield Road, Mapplewell, Barnsley, South Yorkshire. The National Grid Reference of the site is 434050, 409825. The site location is shown on Drawing No. C7481/GA/01, in Appendix A.

2.3. Site Description

The site is approximately 1 hectare in area and comprises mainly hardstanding remaining from demolition of the former William Freeman rubber and plastics factory. There are stockpiles of demolition wastes across the hardstanding area. There are mature trees along the western boundary with Wakefield Road, and an area of scrubland at the eastern end of the site; this area comprises part of a historical landfill associated with the former factory.

2.4. Site History

Review of historical Ordnance Survey (OS) maps indicate the site to be undeveloped agricultural fields until the 1960s, when the William Freeman factory was constructed. The factory was subsequently demolished some time in the 21st Century.

By the latter half of the 19th Century, the Barnsley Coal Railway Extension, with associated cutting, was constructed in proximity to the site's eastern boundary.

2.5. Published Geological Information

Published geological information indicates the southern part of the site to be underlain by superficial deposits of Glacial Till, comprising sandy, silty clay with pebbles, overlying solid strata of the Pennine Middle Coal Measures Formation, typically comprising interbedded grey mudstone, siltstone and pale grey sandstone with common coal seams.

Made ground is indicated on the 1:10,000 scale geological plans to underlie the eastern part of the site, associated with historical landfilling activities.

2.6. Coal Mining

Geological mapping records the Newhill (aka Steam) Coal to outcrop / subcrop within the site, dipping to the north.

The Newhill Coal is recorded to vary in thickness between 2.5m at Darton Lane Head, approximately 2km west of the site, and 0.4m to 1.1m at Carlton, approximately 2.5km east of the site. This seam is reported to often contain several dirt partings which may be up to 0.45m thick and to have been worked a little at crop.

There are no recorded shallow mine workings or mine entries within the site, although the site is within a Development High Risk area set by the Coal Authority (CA), due to the potential for unrecorded shallow mine workings within the Newhill Coal.

2.7. Hydrology and Hydrogeology

The nearest surface water body is an unnamed watercourse approximately 240m west of the site.

Under the aquifer classification system developed by the EA, the Glacial Till superficial deposits (where present) are classified as a Secondary Undifferentiated Aquifer and the Coal Measures solid geology underlying the site are classified as Secondary A Aquifer.

The site is not located within a groundwater Source Protection Zone.

2.8. Landfilling and Waste Management

The land occupying the eastern part of the site is identified as a historical landfill, noted as, *'On waste land to rear of Subseal Works'.* The first input date was 1962 and the last date of input was 1994. Deposited wastes included inert, industrial, commercial and household waste.

2.9. Radon Risk

The site lies within an area where basic radon protective measures are required.

2.10. Previous Site Investigation Reports

A previous Geo-environmental Investigation Report undertaken for the site by Joynes Pike & Associates (JPA) (report reference NLM/DRS/120700197.20070986), dated 10th August 2007 has been made available to Sirius by the Client. JPA were commissioned by Ben Bailey Homes Ltd to undertake a geo-environmental investigation at the former William Freeman Factory, assuming a site end use of low-rise residential with gardens. The site boundary considered within this report is

the same as that within the Sirius Desk Study report, i.e., extends to the north and east of that contemplated within this Geoenvironmental Appraisal.

The intrusive investigation comprised the excavation of 21 No. trial pits to a maximum depth of 3.5m bgl and the sinking of 15 No. window sample boreholes to a maximum depth of 4.0m bgl. Five combined gas and groundwater monitoring wells were installed within selected boreholes. However, no monitoring wells were installed within the former landfill, owing to the initial development proposals excluding this area.

Made ground comprising clayey angular gravel was typically encountered within the area of the former works, to a depth of approximately 0.5m bgl. Made ground within the area of former landfill to the east was recorded as comprising reworked clay and sand containing fabric, plastic and brick, to a maximum depth of 2.10m bgl.

Natural strata encountered were typically found to comprise residual Coal Measures noted to be high strength, slightly gravelly clay. Weathered bedrock of mudstone, recovered as tabular gravel and clay, was recorded from depths of between 0.50m beneath the former works in the west and 3.50m in the area of the former landfill in the east.

It was considered by JPA that the main contaminants of concern identified are within the made ground associated with the landfill. Elevated concentrations of nickel within the natural gravelly clay is thought to be of negligible risk to human health, owing to the depth of the strata. Further investigation and analysis is required to confirm no significant risk is posed to end uses from petroleum hydrocarbons in the vicinity of former above-ground fuel tanks.

The risk of groundwater contamination was considered by JPA to be negligible, due to the environmental setting of the site, including the underlying low permeability clays and the lack of abstraction activities in the vicinity.

Further investigation works recommended prior to development include a gas monitoring programme, a drilling investigation and additional investigation of the former landfill, and, following demolition / clearance, of previously inaccessible areas, including directly beneath the former above ground storage tanks.

2.11. Preliminary Conceptual Site Model

Within the Sirius Desk Study report, a preliminary conceptual site (CSM) was developed for the proposed future land use with critical sensitivity (residential with gardens).

This has been reviewed for the current site boundary and retail end use, as summarised below and on Drawing No. C7481/GA/02 in Appendix A.

In summary, the preliminary CSM has identified the following potential contaminant linkages, which could result in an unacceptable risk to a number of receptors (an unacceptable risk is defined as being higher than 'low risk', as defined within the risk assessment methodology included in Appendix B):

- Ingestion, inhalation of dust, and dermal contact with potential heavy metals, metalloids, petroleum hydrocarbons, polyaromatic hydrocarbons (PAH) and asbestos in made ground and shallow natural soils, posing a low to moderate risk to site end users, adjacent site users, construction workers.

- Risk from inhalation of hydrocarbon and volatile organic compound (VOC) vapours associated with possible leakage of former on-site fuel storage tanks, posing a low to moderate risk to construction workers, site end-users and adjacent land users.

- Possible leaching of heavy metals, metalloids, other inorganic and organic contaminants from made ground posing a low to moderate risk to controlled waters (underlying Secondary A Aquifer).

- Possible migration of heavy metals, metalloids, other inorganic (e.g., ammonia and sulphates) and organic contaminants (e.g., PAH, petroleum hydrocarbons and phenol) in groundwater posing a low to moderate risk to controlled waters (underlying Secondary A Aquifer).

- Risk from hazardous ground gases (including radon), associated with areas of deep made ground, including landfill located on site and possible shallow coal mine workings, posing a high risk to proposed end users, construction workers and adjacent site users and the proposed development.

- Risk from exposure via (ingestion, dermal contact and dust inhalation pathways to PCB-contaminated soils associated with possible spillage / leakage from former electrical sub-stations posing a low to moderate risk to constructions workers, site end-users and adjacent land users.

- Phytotoxic effects of heavy metals (e.g., copper and zinc) on planting and landscaping within the proposed development, posing a **low to moderate risk**.

- Damage to concrete foundations by sulphate within soil and groundwater, posing a **low to moderate** risk to the built environment.

3. FIELDWORK

3.1. Scope of Investigation

The information contained in this report is limited to areas of land accessible during the investigation within the site boundary, as indicated on the site plan presented in Appendix A as Drawing No. C7481/GA/03.

The investigation, which was supervised by Sirius Geoenvironmental Engineers, took place from 15th to 16th November 2017 and comprised the following:

- Excavation of 8 trial pits (TP01 – TP08) with a mechanical excavator, to a maximum depth of 3.5m bgl;
- Soakaway testing in three trial pits (SA01 – SA03), mechanically excavated to a maximum depth of 2.4m bgl;
- Drilling of 9 windowless sampler boreholes (WS01 – WS08 and WS01A), to a maximum depth of 4.0m bgl, with installation of combined ground gas / groundwater monitoring wells (50mm diameter HDPE, with lockable covers) in six boreholes;
- Rotary open-hole drilling of 9 boreholes (BH01 – BH09), to a maximum depth of 30m bgl.

In addition, two samples (SP01 and SP02) of suspected asbestos containing materials (ACMs) were taken from demolition material stockpiles on the site on 22nd November 2017.

3.2. Exploratory Hole Locations

The exploratory hole locations were selected using the findings of the Preliminary Conceptual Site Model in order to achieve general site coverage, target specific areas of interest and resolve key uncertainties, as detailed in Table 3.1. The principles given in BS 10175:2011+A1:2013 and BS EN 1997:2007 were followed when determining exploratory hole locations. Exploratory hole logs are included within Appendix C.

Table 3.1 Exploratory Hole Rationale

Exploratory Hole(s)	Rationale
TP01 – TP08 and WS01 – WS08	To record shallow ground conditions on a site-wide basis, with particular focus on the proposed building footprint. TP01 and WS07 were located in proximity to a former electrical substation, in order to collect soil samples for analysis for PCBs. TP06 and WS02 were located in the area of former above-ground fuel storage tanks, in order to assess whether hydrocarbon contamination has occurred. TP04, TP05, WS01 and WS01A were located within and immediately adjacent to the historical landfill within the eastern part of the site.
SA01 – SA03	To undertake soakaway testing within areas external to the proposed building. Soakaway testing results are included within Appendix D.
BH01 – BH09	To determine the presence, depth and thickness of the Newhill (aka Steam) Coal and any unrecorded mine workings within it.

Exploratory hole locations are shown on Drawing No. C7481/GA/03 in Appendix A of this report. Exploratory hole locations were constrained by factors including the presence of underground services, stockpiles and dense vegetation in parts of the site.

Trial pits were generally excavated to a depth at which no further progress was possible, due to the strength of the strata present, or where the practicable depth of the excavator was reached. TP05, excavated within the landfill, was terminated at 1.9m bgl due to rapid groundwater inflow.

Windowless sampler boreholes were generally drilled to a depth at which hard strata (identified by an SPT 'N' value >50) were encountered. WS01 was terminated at 0.6m due to being unable to penetrate rubber materials present within the landfill area. WS03 was terminated at 0.7m bgl due to the presence of an obstruction.

The rotary boreholes were drilled to a depth suitable for proving the depth and thickness of the Newhill Coal seam.

3.3. Strata Description

Strata descriptions were logged in accordance with Eurocode 7. Detailed descriptions of strata and groundwater observations made during investigation works, together with samples recovered and the results of field testing, are presented on the Engineer's records in Appendix C. The depths of strata on the record sheets from the Sirius ground investigation are recorded from current ground levels at each location.

3.4. Geotechnical Testing

Limited geotechnical laboratory testing on selected samples was carried out under subcontract by Professional Soils Laboratory (PSL), a UKAS-accredited laboratory.

Geotechnical test results are included within Appendix E of this report.

3.5. Chemical Testing

Selected samples of soils and groundwater were tested for a range of chemical parameters and potential contaminants under subcontract by Concept Life Sciences, a UKAS accredited laboratory, with MCERTS accredited analysis used where available.

The potential contaminants of concern identified by the preliminary conceptual site model were selected as the analytes for the samples recovered from the site. The results of chemical soil analysis results, as received from the laboratory, are presented in Appendix E of this report.

Eight soil samples were analysed for a full waste acceptance criteria (WAC) testing suite.

Two samples of suspected ACMs (SP01 and SP02) were qualitatively analysed for the presence / absence of asbestos.

4. GROUND CONDITIONS AND MATERIAL PROPERTIES

4.1. Strata Profile

A summary of the strata profile encountered by the Sirius site investigation is provided in Table 4.1.

Table 4.1 Strata Profile

Strata	Depth Range (Thickness Range)	Description and Comments
Made Ground	From Ground Level (0.3 – 2.2m)	In general, made ground increases in depth to the east. Asphalt and / or reinforced concrete surfacing was found in exploratory holes within the former factory area, to a maximum depth of 0.3m bgl. The made ground underlying the hard standing in the former factory area is generally granular, comprising clayey sandy gravel of brick and tile, or locally, limestone hardcore. Underlying the granular sub-base in the former factory area, cohesive made ground comprising re-worked residual Coal Measures soils are present, typically comprising slightly sandy slightly gravelly clay. In the eastern end of the site, exploratory holes WS01, TP04 and TP05 identified 0.1 – 0.3m of topsoil overlying landfilled waste, which included hot water bottles, plastic, steel drums, polystyrene and wood, in a matrix of clay.
Possible Reworked Clay	0.3 – 1.0m (0.25 – 1.6m)	Identified within WS01A, WS04-WS08, TP03 and TP05, underlying made ground and comprising variable cohesive soils, including greyish brown slightly sandy slightly gravelly clay, grey very silty clay with wood fragments and grass, orange-brown slightly gravelly clay, greenish-grey sandy silty clay, blueish grey gravelly clay, greyish green sandy clay and dark brown silty clay with organic odour.
Residual	0.3 – 2.2m	Generally comprises slightly sandy to sandy, slightly

Strata	Depth Range (Thickness Range)	Description and Comments
PMCMF Soils	(0.8 – >3.4m)	gravelly to gravelly clay, with the gravel comprising sandstone and mudstone.
PMCMF Rock Strata	1.8 – 3.3m (NR)	Interbedded brown / light grey fine-grained sandstone and siltstone, recovered from trial pits as clayey tabular gravel.
Newhill Coal	13.5 – 18.7m (0.8 – 1.0m)	Identified within rotary boreholes only; described as black coal.

Glacial Till, shown to underlie the site on geological mapping, was not identified within any exploratory hole.

4.2. Material Properties

Cohesive Made Ground

Atterberg limits determination undertaken on three samples of cohesive made ground indicate the material to be clay of low to high plasticity, with recorded liquid limits ranging between 33% and 53%, plastic limits ranging between 18% and 26% and plasticity index values ranging between 15% and 27%, with a mean value of 21%.

Calculation of the modified Plasticity Index, in accordance with NHBC standards, indicates these soils to have Medium Volume Change Potential. The Consistency Index (I_c) value for the samples tested ranged between 0.87 and 1.00, indicating the material to be of stiff consistency.

Particle size distribution (PSD) analysis of two samples of cohesive made ground indicates this material to be slightly sandy slightly gravelly clay.

Laboratory California bearing ratio (CBR) analysis of a remoulded bulk sample of this material recorded remoulded CBR values of 2.1% and 2.7% in the top and bottom of the sample respectively (average CBR value of 2.4%).

One SPT was undertaken within this soil type, with the recorded 'N' value being 7. Using a correlation factor of 5.2 (Stroud, 1975[1]) for a representative plasticity index of 21, would equate to an undrained shear strength value of 41 kPa, indicative of medium strength soils.

Seven hand shear vane results in this soil type ranged between 50 kPa and 100 kPa, with the mean and median values being 74 kPa and 75 kPa respectively (indicative of medium to high strength soils).

Possibly Reworked Clay

Atterberg limits determination undertaken on one sample of possibly reworked clay indicate the material to be clay of high plasticity, with a recorded liquid limit of 60%, plastic limit of 25% and plasticity index of 35%.

Calculation of the modified Plasticity Index, in accordance with NHBC standards, indicates these soils to have Medium Volume Change Potential. The Consistency Index (I_c) value for the sample tested was 0.86, indicating the material to be of stiff consistency.

Particle size distribution (PSD) analysis of one sample of this material indicates that it is slightly sandy clay.

Three SPTS were undertaken within this soil type, with the recorded 'N' values ranging between 5 and 7, with a mean and median value of 6. Using a correlation factor of 4.5 (Stroud, 1975) for a representative plasticity index of 35, would equate to undrained shear strength values ranging between 22 kPa and 32 kPa, indicative of low strength soils.

Four hand shear vane results in this soil type ranged between 60 kPa and 90 kPa, with the mean and median values being 73 kPa and 70 kPa respectively (indicative of medium strength soils).

Residual Pennine Middle Coal Measures Formation (Cohesive Soils)

Atterberg limit determinations undertaken on four samples of clay originating from weathering of Pennine Middle Coal Measures Formation strata indicates the material to be clay of intermediate and high plasticity, with recorded liquid limits ranging between 44% and 51%, plastic limits ranging

[1] Stroud, M.A. 1975. *The Standard Penetration Test in Insensitive Clays and Soft Rocks.* Proceedings of the European Symposium on Penetration Testing.

between 21% and 24% and plasticity index values ranging between 23% and 27%, with a mean value of 24%.

Calculation of the modified Plasticity Index, in accordance with NHBC standards, indicates these soils to have Medium volume change potential. The Consistency Index (I_c) values for the samples tested ranged between 0.74 and 1.09, indicating the material to be of firm, to very stiff consistency.

Laboratory CBR analysis of two remoulded bulk samples of these materials recorded average (top and bottom) remoulded CBR values of 1.3% and 7.7%.

Nine SPTs were undertaken within this soil type, with the recorded 'N' values ranging between 6 and 21, with a mean value of 13 and median value of 11. Using a correlation factor of 4.8 (Stroud, 1975) for a representative plasticity index of 24, would equate to undrained shear strength values ranging between 29 kPa and 101 kPa, indicative of low to high strength soils. The mean and median values equate to 61 kPa and 53 kPa respectively (medium strength soils).

Seventeen hand shear vane results in this soil type ranged between 45 kPa and 110 kPa, indicative of medium, to high strength soil. The mean and median values were 78 kPa and 80 kPa respectively (high strength soil).

Pennine Middle Coal Measures Formation (PMCMF) Sandstone

Five SPTs were undertaken within sandstone of the PMCMF. The recorded 'N' values ranged between 25 and 50 for as little as 100mm penetration. Using the correlation for weak rock suggested within CIRIA Report 143, *The Standard Penetration Test (SPT): Methods and Use* (1995), these values are indicative of unconfined compressive strength values ranging between 250 and 1,500 kPa, i.e., extremely weak to very weak rock.

4.3. Fill Classification

Based on limited laboratory test results, i.e., particle size distributions and Atterberg limits, on disturbed bulk samples of soils taken from trial pits, the soils have been classified as fill materials in accordance with Highways Agency (HA) publication *'Specification for Highway Works Series 600, Earthworks'*, as summarised in Table 4.2. The Table also summarises the results of maximum dry density / optimum moisture content relationship analysis, with a comment for each sample tested as to whether the natural moisture content value lies within the optimum range for compaction (i.e., to achieve ≥95% of the maximum dry density and <5% air voids), or is too wet or dry for optimum compaction.

Table 4.2 Summary of Fill Classifications (Specification for Highways Works)

Sample Location and Depth	Material	HA Soil Class	Optimum Moisture content (%)	Maximum Dry Density (Mg/m^3)	Optimum Moisture Content Range (95% maximum dry density / <5% air voids)		Natural Moisture Content (%)	Comments on Natural Moisture Content
					Lower (%)	Upper (%)		
SA02, 0.5m	Made Ground	2A/2C	18	1.72	18	22	19	OK for effective compaction
SA03, 1.0m	Made Ground	2C	18	1.81	16	22	21	OK for effective compaction
TP03, 1.5m	Possible reworked clay	2A	25	1.57	25	30	32	2% too wet for effective compaction

4.4. Obstructions

Window sampler borehole WS03 was terminated at 0.7m bgl due to the presence of an obstruction within made ground.

No artificial obstructions were encountered within the trial pits excavated during this site investigation.

However, the presence of relic foundations within the footprint of the former factory building should be anticipated. Similarly, the presence of buried services including sewers and drains should be anticipated across the former factory site.

The majority of trial pits were terminated due to the presence of rockhead, at depths ranging between 2.7m and 3.5m bgl.

Window sampler boreholes recorded SPT refusals within natural strata at depths ranging between 2m and 4m bgl.

4.5. Ground Stability

Trial pit side walls generally remained stable during excavation.

4.6. Subsurface Mine Workings

An intact shallow coal seam, 0.8m – 1.0m thick (most likely to represent the Newhill Coal) was identified within every rotary borehole, at depths ranging between 13.5m and 18.7m bgl.

No evidence of coal mine workings, e.g., loss of flush or rapid acceleration in drilling rate, was noted within any rotary boreholes.

4.7. Groundwater

Groundwater seepages recorded during the Sirius ground investigation are summarised in Table 4.3. It should be noted that the use of water flush or air-water mist flush in rotary boreholes can mask groundwater seepages during drilling.

Table 4.3 Summary of Groundwater Encountered during Sirius Ground Investigation

Exploratory Hole	Depth Encountered (m bgl)	Stratum
TP05	1.3	Clay (possibly reworked).
WS03	0.3	Made ground.

The depths to groundwater measured within monitoring installations during the first two of six planned monitoring visits are summarised in Table 4.4.

Table 4.4 Summary of Groundwater Monitoring (two visits completed)

Monitoring Well	Depth to Groundwater (range) (m bgl)
WS01A	2.97 – 3.02
WS02	3.40 – 3.83
WS04	DRY – 1.24
WS05	2.72 – 2.85
WS06	1.00 – 2.16
WS07	DRY – 1.51

4.8. Visual/Olfactory Evidence of Contamination

Visual and olfactory evidence of possible contamination was noted within a number of exploratory holes during the ground investigation, as summarised in Table 4.5.

Table 4.5 Visual and Olfactory Evidence of Possible Contamination

Exploratory Hole	Depth Encountered (m bgl)	Stratum	Description
TP03	0.3	Made Ground	Black staining and strong hydrocarbon odour.
TP04	1.0 – 2.2	Made Ground (landfilled waste)	Car radiator, steel drums, white powder.
TP04	2.2 – 2.5	Residual PMCMF	Slight hydrocarbon odour.
TP06	0.4 – 0.7	Made Ground	Ashy sand.
WS02	0.45 – 0.6	Made Ground	Ashy sand; clinker gravel.
WS05	0.3 – 0.4	Made Ground	Some ashy sand.

4.9. Soakaway Testing Results

The full results of the soakaway testing undertaken are included in Appendix D.

In summary, the water level in all three trial pits (SA01 – SA03) did not fall to 75% of the initial level during the test period (366 – 442 minutes). Therefore, the tests are deemed to have failed, due to the low permeability of the ground in which the tests were performed.

4.10. Ground Gas

Ground gas monitoring is to be undertaken on nine occasions. The results of the first two monitoring visits are summarised in Table 4.6. Details of ground gas monitoring results obtained to date are included in Appendix F.

Table 4.6 Summary of Gas Monitoring (two visits completed)

Well	Methane (Peak) %v/v	Carbon Dioxide (Steady) %v/v	Oxygen (Minimum) %v/v	Flow (Peak) litres/hr	Flow (Steady) litres/hour
WS01A	ND	7.1 – 7.2	15.2	ND to -0.3	ND
WS02	ND	3.7 – 9.6	11.7 – 14.9	-0.2 to 38.3	ND
WS04	ND	2.0 – 2.1	15.3 – 18.2	ND to 52.2	ND
WS05	ND	10.9 – 14.7	10.0 – 12.5	-0.3 to 22.3	ND – 1.3
WS06	ND	ND – 0.2	18.9 – 20.1	ND	ND
WS07	ND	1.2 – 1.5	15.8 – 17.6	ND to -0.4	ND

ND - Not Detected

5. RESULTS OF CHEMICAL TESTING

The results of chemical analysis are provided in full within Appendix E.

5.1. Assessment Methodology

Soil Data

The laboratory test data for the relevant soil strata were reviewed for completeness and consistency. Determinands that represent potential contaminants of concern were subject to further evaluation.

For each potential contaminant of concern, analytical data for soil samples were evaluated against the relevant Stage 1 Sirius Generic Assessment Criteria (GAC) in the first instance, taking account of the soil organic matter (SOM) concentration. For this site, recorded values were compared to GAC derived for a commercial / industrial end use. Source data for GAC used within this assessment are provided in Appendix G.

In relation to human health risk assessment, total concentrations of PCBs within soil samples have been compared to the EA soil guideline value (SGV) for commercial land use for the sum of PCDDs, PCDFs and dioxin-like PCBs[2] (0.24mg/kg).

If any samples are recorded as having contaminant concentrations that exceed a GAC, then consideration is given to the applicability of statistical data evaluation in line with the methods described for the Planning Scenario in CL:AIRE & CIEH *'Guidance on Comparing Soil Contamination Data with a Critical Concentration',* May 2008, using the statistical software package ProUCL.

Groundwater Data

The site is located over a Secondary Aquifer and is not within a groundwater Source Protection Zone or in proximity to any potable groundwater abstraction. There is an un-named surface water course c. 240m west of the site. Therefore, groundwater and surface water analysis results have been evaluated against GAC values based on Environmental Quality Standards (EQS) values for freshwater.

[2] Martin, I. and Stutt, E. 2009. Science Report SC050021, *Soil Guideline Values for Dioxins, Furans and Dioxin-like PCBs in Soil*. Environment Agency, Bristol.

5.2. Soil Analysis

Granular Made Ground (Red-brown Gravel)

Table 5.1 presents a summary of the chemical analysis results for granular made ground comprising reddish-brown and their evaluation against the applicable GAC. The recorded SOM concentration within samples of this material range between 1.0% and 1.4%; therefore, the GAC for 1% SOM have been used within Table 5.1.

Table 5.1 Summary of Soil Analysis – Granular Made Ground (Reddish-brown Gravel)

Determinant	No. of Samples Tested	Range of Results	$UCL_{0.95}$	Stage 1 GAC (1% SOM)	No. of Samples Exceeding GAC	Samples Exceeding GAC
		(mg/kg unless otherwise specified)				
Metals and Metalloids						
Arsenic	3	4 - 28		630	0	-
Cadmium	3	<1		190	0	-
Chromium	3	21 - 6		8,600	0	-
Copper	3	17 - 28		68,000	0	-
Lead	3	23 - 27		2,300	0	-
Mercury	3	<1		1,100	0	-
Nickel	3	26 - 50		980	0	-
Selenium	3	<3		12,000	0	-
Zinc	3	50 -95		750,000	0	-
Other Inorganics						
Asbestos (present/absent)	2	Not Detected		Fibres Detected	0	-
pH (units)	5	7.1 – 8.5		<5 or >9	0	-
Water soluble sulphate (g/l)	3	<0.01 – 0.07		0.5	0	-
Polycyclic Aromatic Hydrocarbons						
Acenaphthene	5	<0.1 - <1.0		75,000	0	-
Acenaphthylene	5	<0.1 - <1.0		76,000	0	-
Anthracene	5	<0.1 - 6.4		520,000	0	-
Benzo(a)anthracene	5	<0.1 - 26		B(a)P	N/A	-
Benzo(a)pyrene	5	<0.1 - 24		27	0	-
Benzo(b)fluoranthene	3	<0.1		B(a)P	N/A	-
Benzo(k)fluoranthene	3	<0.1		B(a)P	N/A	-
Benzo(g,h,i)perylene	5	<0.1 - 13		B(a)P	N/A	-
Chrysene	5	<0.1 - 26		B(a)P	N/A	-
Dibenzo(a,h)anthracene	5	<0.1 - 4.3		B(a)P	N/A	-
Fluoranthene	5	<0.1 - 40		23,000	0	-
Fluorene	5	<0.1 – 2.0		60,000	0	-
Indeno(1,2,3-c,d)pyrene	5	<0.1 - 11		B(a)P	N/A	-
Naphthalene	5	<0.1 - <1.0		110	0	-
Phenanthrene	5	<0.1 - 24		22,000	0	-
Pyrene	5	<0.1 - 41		54,000	0	-
Total Petroleum Hydrocarbons						
Aliphatic C5-C6	1	<0.100		2,400	0	-
Aliphatic C6-C8	1	<0.10		5,300	0	-
Aliphatic C8-C10	1	<0.10		1,300	0	-
Aliphatic C10-C12	1	<1		6,100	0	-

Determinant	No. of Samples Tested	Range of Results	$UCL_{0.95}$	Stage 1 GAC (1% SOM)	No. of Samples Exceeding GAC	Samples Exceeding GAC
		(mg/kg unless otherwise specified)				
Aliphatic C12-C16	1	<2		43,000	0	-
Aliphatic C16-C21	1	<1		$>10^6$	0	-
Aliphatic C21-C35	1	<4		$>10^6$	0	-
Aromatic C5-C7	1	<0.10		15,000	0	-
Aromatic C7-C8	1	<0.10		33,000	0	-
Aromatic C8-C10	1	<0.10		2,200	0	-
Aromatic C10-C12	1	<1		11,000	0	-
Aromatic C12-C16	1	<1		35,000	0	-
Aromatic C16-C21	1	1		28,000	0	-
Aromatic C21-C35	1	<1		28,000	0	-
BTEX Compounds and MTBE						
Benzene	3	<0.01		15	0	-
Toluene	3	<0.01		33,000	0	-
Ethylbenzene	3	<0.01		3,200	0	-
Xylenes	3	<0.02		3,200	0	-
MTBE	1	<0.01		7,400	0	-
Others						
Phenol	5	<1		440	0	-
PCBs	4	<0.06 - <0.07		0.24*	0	-

B(a)P – Assessed using benzo(a)pyrene as a surrogate marker

N/A – Not Applicable.

* - SGV

Metals

No metals were recorded as having maximum concentrations that are greater than the adopted GAC within the samples of this material analysed.

PAH

No PAH compounds were recorded as having maximum concentrations that are greater than the adopted GAC within the samples of this material analysed.

Petroleum Hydrocarbons, BTEX, MTBE and Phenol

The maximum recorded concentrations of phenol, all petroleum hydrocarbon fractions, BTEX compounds and MTBE are less than the adopted GAC.

Asbestos

Asbestos was not detected within any of the samples of this material analysed.

Soil pH and Water-Soluble Sulphate

None of the samples of this material analysed had pH values less than or greater than the applicable GAC values. None of the samples were recorded as containing a water-soluble sulphate concentration greater than the GAC of 0.5g/l, which is set at the upper limit of Design Sulphate class DS-1 within BRE Special Digest 1 (SD-1).

Volatile Organic Compounds (VOCs)

As well as the analysis summarised in Table 5.1, one sample of this material was analysed for a suite of 53 individual VOCs. None of the VOCs were recorded to be present in concentrations greater than the laboratory's respective detection limits.

PCBs

The sum of PCB congener concentrations is less than the SGV for commercial / industrial use in the samples analysed.

Granular Made Ground (Ashy Material)

Table 5.2 presents a summary of the chemical analysis results for granular made ground comprising dark ashy material and their evaluation against the applicable GAC. The minimum recorded SOM concentration within samples of these material was 1.4%; therefore, the GAC for 1% SOM have been used within Table 5.2.

Table 5.2 Summary of Soil Analysis – Granular Made Ground (Dark Ashy Material)

Determinant	No. of Samples Tested	Range of Results	$UCL_{0.95}$	Stage 1 GAC (1% SOM)	No. of Samples Exceeding GAC	Samples Exceeding GAC
		(mg/kg unless otherwise specified)				
Metals and Metalloids						
Arsenic	2	7 – 12		630	0	-
Cadmium	2	<1		190	0	-
Chromium	2	21 – 23		8,600	0	-
Copper	2	24 – 32		68,000	0	-
Lead	2	36 – 500		2,300	0	-
Mercury	2	<1		1,100	0	-
Nickel	2	16 – 32		980	0	-
Selenium	2	<3		12,000	0	-
Zinc	2	92 - 320		750,000	0	-
Other Inorganics						
pH (units)	2	7.1 – 7.9		<5 or >9	0	-
Water soluble sulphate (g/l)	2	<0.01 – 0.07		0.5	0	-
Polycyclic Aromatic Hydrocarbons						
Acenaphthene	3	<0.1 – 0.1		75,000	0	-
Acenaphthylene	3	<0.1		76,000	0	-
Anthracene	3	<0.1 – 0.3		520,000	0	-
Benzo(a)anthracene	3	<0.1 – 0.6		B(a)P	N/A	-
Benzo(a)pyrene	3	<0.1 - 0.5		27	0	-
Benzo(b)fluoranthene	2	<0.1 – 0.5		B(a)P	N/A	-
Benzo(k)fluoranthene	2	<0.1 – 0.4		B(a)P	N/A	-
Benzo(g,h,i)perylene	3	<0.1 – 0.2		B(a)P	N/A	-
Chrysene	3	<0.1 – 0.6		B(a)P	N/A	-
Dibenzo(a,h)anthracene	3	<0.1 – 0.1		B(a)P	N/A	-
Fluoranthene	3	<0.1 – 1.8		23,000	0	-
Fluorene	3	<0.1 – 0.3		60,000	0	-
Indeno(1,2,3-c,d)pyrene	3	<0.1 – 0.3		B(a)P	N/A	-
Naphthalene	3	<0.1		110	0	-
Phenanthrene	3	<0.1 – 1.2		22,000	0	-
Pyrene	3	<0.1 – 1.5		54,000	0	-
BTEX Compounds						
Benzene	1	<0.01		15	0	-
Toluene	1	<0.01		33,000	0	-
Ethylbenzene	1	<0.01		3,200	0	-
Xylenes	1	<0.02		3,200	0	-
Others						

Determinant	No. of Samples Tested	Range of Results	$UCL_{0.95}$	Stage 1 GAC (1% SOM)	No. of Samples Exceeding GAC	Samples Exceeding GAC
		(mg/kg unless otherwise specified)				
Phenol	3	<0.1 - <1		440	0	-
Calorific value (MJ/kg)	2	<0.1 – 0.3		2	0	-

B(a)P – Assessed using benzo(a)pyrene as a surrogate marker

N/A – Not Applicable.

Metals

No metals were recorded as having maximum concentrations that are greater than the adopted GAC within the samples of this material analysed.

PAH

No PAH compounds were recorded as having maximum concentrations that are greater than the adopted GAC within the samples of this material analysed.

BTEX and Phenol

The maximum recorded concentrations of BTEX compounds and phenol less than the adopted GAC in this material.

Soil pH and Water-Soluble Sulphate

None of the samples of this material analysed had pH values less than or greater than the applicable GAC values. None of the samples were recorded as containing a water-soluble sulphate concentration greater than the GAC.

Calorific Value

The two samples of this material analysed had calorific values that are less than the GAC.

Cohesive Made Ground / Possible Reworked Clay

Table 5.3 presents a summary of the chemical analysis results for samples of cohesive made ground and possible reworked clay soils and their evaluation against the applicable GAC. Two of the three samples of this material analysed had SOM concentrations of 1.0% or less; therefore, the GAC for 1% SOM have been used within this assessment.

Table 5.3 Summary of Soil Analysis – Cohesive Made Ground and Possible Reworked Clay Soils

Determinant	No. of Samples Tested	Range of Results	$UCL_{0.95}$	Stage 1 GAC (1% SOM)	No. of Samples Exceeding GAC	Samples Exceeding GAC
		(mg/kg unless otherwise specified)				
Metals and Metalloids						
Arsenic	4	3 – 24		630	0	-
Cadmium	4	<1		190	0	-
Chromium	4	22 – 33		8,600	0	-
Copper	4	8 – 100		68,000	0	-
Lead	4	9 – 99		2,300	0	-
Mercury	4	<1		1,100	0	-
Nickel	4	22 - 55		980	0	-
Selenium	4	<3		12,000	0	-
Zinc	4	47 - 320		750,000	0	-
Other Inorganics						
Asbestos (present/absent)	2	Not Detected		Fibres Detected	0	-
pH (units)	5	6.4 – 7.2		<5 or >9	0	-
Water soluble sulphate (g/l)	5	<0.01 – 0.13		0.5	0	-
Polycyclic Aromatic Hydrocarbons						
Acenaphthene	5	<0.1		75,000	0	-
Acenaphthylene	5	<0.1		76,000	0	-
Anthracene	5	<0.1		520,000	0	-
Benzo(a)anthracene	5	<0.1		B(a)P	N/A	-
Benzo(a)pyrene	5	<0.1		27	0	-
Benzo(b)fluoranthene	4	<0.1		B(a)P	N/A	-
Benzo(k)fluoranthene	4	<0.1		B(a)P	N/A	-
Benzo(g,h,i)perylene	5	<0.1		B(a)P	N/A	-
Chrysene	5	<0.1		B(a)P	N/A	-
Dibenzo(a,h)anthracene	5	<0.1		B(a)P	N/A	-
Fluoranthene	5	<0.1		23,000	0	-
Fluorene	5	<0.1		60,000	0	-
Indeno(1,2,3-c,d)pyrene	5	<0.1		B(a)P	N/A	-
Naphthalene	5	<0.1		110	0	-
Phenanthrene	5	<0.1		22,000	0	-
Pyrene	5	<0.1		54,000	0	-
Total Petroleum Hydrocarbons						
Aliphatic C5-C6	1	<0.100		2,400	0	-
Aliphatic C6-C8	1	<0.10		5,300	0	-

Determinant	No. of Samples Tested	Range of Results	$UCL_{0.95}$	Stage 1 GAC (1% SOM)	No. of Samples Exceeding GAC	Samples Exceeding GAC
		(mg/kg unless otherwise specified)				
Aliphatic C8-C10	1	<0.10		1,300	0	-
Aliphatic C10-C12	1	<1		6,100	0	-
Aliphatic C12-C16	1	<2		43,000	0	-
Aliphatic C16-C21	1	<1		$>10^6$	0	-
Aliphatic C21-C35	1	<4		$>10^6$	0	-
Aromatic C5-C7	1	<0.10		15,000	0	-
Aromatic C7-C8	1	<0.10		33,000	0	-
Aromatic C8-C10	1	<0.10		2,200	0	-
Aromatic C10-C12	1	<1		11,000	0	-
Aromatic C12-C16	1	<1		35,000	0	-
Aromatic C16-C21	1	<1		28,000	0	-
Aromatic C21-C35	1	<1		28,000	0	-
BTEX Compounds and MTBE						
Benzene	2	<0.01		15	0	-
Toluene	2	<0.01		33,000	0	-
Ethylbenzene	2	<0.01		3,200	0	-
Xylenes	2	<0.01		3,200	0	-
MTBE	1	<0.01		7,400	0	-
Others						
Phenol	5	<1		440	0	-
Calorific value (MJ/kg)	1	0.7		2	0	-
PCBs	3	<0.007		<0.24	0	-

B(a)P – Assessed using benzo(a)pyrene as a surrogate marker

N/A – Not Applicable

* - SGV

Metals

No metals were recorded as having maximum concentrations that are greater than the adopted GAC within the samples of this material analysed.

PAH

No PAH compounds were recorded as having maximum concentrations that are greater than the adopted GAC within the samples of this material analysed.

Petroleum Hydrocarbons, BTEX, MTBE and Phenol

The maximum recorded concentrations of phenol, all petroleum hydrocarbon fractions, BTEX compounds and MTBE are less than the adopted GAC.

Asbestos

Asbestos was not detected within any of the samples of this material analysed.

Soil pH and Water-Soluble Sulphate

None of the samples of this material analysed had pH values less than or greater than the applicable GAC values. None of the samples were recorded as containing a water-soluble sulphate concentration greater than the GAC.

Volatile Organic Compounds (VOCs)

As well as the analysis summarised in Table 5.3, one sample of this material was analysed for a suite of 53 individual VOCs. None of the VOCs were recorded to be present in concentrations greater than the laboratory's respective detection limits.

PCBs

The sum of PCB congener concentrations is less than the SGV for commercial / industrial use in the samples analysed.

Summary of Soil Analysis – Made Ground (Landfilled Waste)

Table 5.4 presents a summary of the chemical analysis results for samples of landfilled waste and their evaluation against the applicable GAC. The sample of this material analysed had a recorded SOM concentration of 1.3%. Therefore, the GAC for 1% SOM have been used within this assessment.

Table 5.4 Summary of Soil Analysis – Landfilled Waste

Determinant	No. of Samples Tested	Range of Results	$UCL_{0.95}$	Stage 1 GAC (1% SOM)	No. of Samples Exceeding GAC	Samples Exceeding GAC
		(mg/kg unless otherwise specified)				
Metals and Metalloids						
Arsenic	1	4		630	0	-
Cadmium	1	<1		190	0	-
Chromium	1	27		8,600	0	-
Copper	1	27		68,000	0	-
Lead	1	24		2,300	0	-
Mercury	1	<1		1,100	0	-
Nickel	1	39		980	0	-
Selenium	1	<3		12,000	0	-
Zinc	1	530		750,000	0	-
Other Inorganics						
Asbestos (present/absent)	2	Not Detected		Fibres Detected	0	-
pH (units)	2	7.2 – 7.8		<5 or >9	0	-
Water soluble sulphate (g/l)	1	0.02		0.5	0	-
Polycyclic Aromatic Hydrocarbons						
Acenaphthene	2	<0.1 - <1.0		75,000	0	-
Acenaphthylene	2	<0.1 - <1.0		76,000	0	-
Anthracene	2	<0.1 - <1.0		520,000	0	-
Benzo(a)anthracene	2	<0.1 - <1.0		B(a)P	N/A	-
Benzo(a)pyrene	2	<0.1 - <1.0		27	0	-
Benzo(b)fluoranthene	1	<1.0		B(a)P	N/A	-
Benzo(k)fluoranthene	1	.0		B(a)P	N/A	-
Benzo(g,h,i)perylene	2	<0.1 - <1.0		B(a)P	N/A	-
Chrysene	2	<0.1 - <1.0		B(a)P	N/A	-
Dibenzo(a,h)anthracene	2	<0.1 - <1.0		B(a)P	N/A	-
Fluoranthene	2	<0.1 - <1.0		23,000	0	-
Fluorene	2	<0.1 - <1.0		60,000	0	-
Indeno(1,2,3-c,d)pyrene	2	<0.1 - <1.0		B(a)P	N/A	-
Naphthalene	2	<0.1 - <1.0		110	0	-
Phenanthrene	2	<0.1 - <1.0		22,000	0	-
Pyrene	2	<0.1 - <1.0		54,000	0	-
Total Petroleum Hydrocarbons						
Aliphatic C5-C6	1	<0.100		2,400	0	-
Aliphatic C6-C8	1	<0.10		5,300	0	-
Aliphatic C8-C10	1	<0.10		1,300	0	-
Aliphatic C10-C12	1	<1		6,100	0	-

Determinant	No. of Samples Tested	Range of Results	$UCL_{0.95}$	Stage 1 GAC (1% SOM)	No. of Samples Exceeding GAC	Samples Exceeding GAC
		(mg/kg unless otherwise specified)				
Aliphatic C12-C16	1	<2		43,000	0	-
Aliphatic C16-C21	1	4		$>10^6$	0	-
Aliphatic C21-C35	1	<4		$>10^6$	0	-
Aromatic C5-C7	1	<0.10		15,000	0	-
Aromatic C7-C8	1	<0.10		33,000	0	-
Aromatic C8-C10	1	<0.10		2,200	0	-
Aromatic C10-C12	1	<1		11,000	0	-
Aromatic C12-C16	1	<1		35,000	0	-
Aromatic C16-C21	1	<1		28,000	0	-
Aromatic C21-C35	1	<1		28,000	0	-
BTEX Compounds and MTBE						
Benzene	3	<0.01		15	0	-
Toluene	3	<0.01		33,000	0	-
Ethylbenzene	3	<0.01		3,200	0	-
Xylenes	3	<0.01		3,200	0	-
MTBE	1	<0.01		7,400	0	-
Others						
Phenol	3	<1		440	0	-
PCBs	1	<0.107		0.24*	0	-

B(a)P – Assessed using benzo(a)pyrene as a surrogate marker

N/A – Not Applicable.

* - SGV

Metals

No metals were recorded as having maximum concentrations that are greater than the adopted GAC within the samples of this material analysed.

PAH

No PAH compounds were recorded as having maximum concentrations that are greater than the adopted GAC within the samples of this material analysed.

Petroleum Hydrocarbons, BTEX, MTBE and Phenol

The maximum recorded concentrations of phenol, all petroleum hydrocarbon fractions, BTEX compounds and MTBE are less than the adopted GAC.

Asbestos

Asbestos was not detected within either of the samples of this material analysed.

Soil pH and Water-Soluble Sulphate

None of the samples of this material analysed had pH values less than or greater than the applicable GAC values. None of the samples were recorded as containing a water-soluble sulphate concentration greater than the GAC.

PCBs

The sum of PCB congener concentrations is less than the SGV for commercial / industrial use in the sample analysed.

Natural Subsoils

Table 5.5 presents a summary of the chemical analysis results for natural subsoils and their evaluation against the applicable GAC. A conservative SOM concentration of 1% has been assumed for this material.

Table 5.5 Summary of Soil Analysis – Natural Subsoils

Determinant	No. of Samples Tested	Range of Results	$UCL_{0.95}$	Stage 1 GAC (1% SOM)	No. of Samples Exceeding GAC	Samples Exceeding GAC
		(mg/kg unless otherwise specified)				
Other Inorganics						
pH (units)	7	5.9 – 7.5		<5 or >9	0	-
Water soluble sulphate (g/l)	5	<0.01 – 0.06		0.5	0	-
Polycyclic Aromatic Hydrocarbons						
Acenaphthene	1	<0.1		75,000	0	-
Acenaphthylene	1	<0.1		76,000	0	-
Anthracene	1	<0.1		520,000	0	-
Benzo(a)anthracene	1	<0.1		B(a)P	N/A	-
Benzo(a)pyrene	1	<0.1		27	0	-
Benzo(g,h,i)perylene	1	<0.1		B(a)P	N/A	-
Chrysene	1	<0.1		B(a)P	N/A	-
Dibenzo(a,h)anthracene	1	<0.1		B(a)P	N/A	-
Fluoranthene	1	<0.1		23,000	0	-
Fluorene	1	<0.1		60,000	0	-
Indeno(1,2,3-c,d)pyrene	1	<0.1		B(a)P	N/A	-
Naphthalene	1	<0.1		110	0	-
Phenanthrene	1	<0.1		22,000	0	-
Pyrene	1	<0.1		54,000	0	-
Total Petroleum Hydrocarbons						
Aliphatic C5-C6	1	<0.100		2,400	0	-
Aliphatic C6-C8	1	<0.10		5,300	0	-
Aliphatic C8-C10	1	<0.10		1,300	0	-
Aliphatic C10-C12	1	<1		6,100	0	-
Aliphatic C12-C16	1	<2		43,000	0	-
Aliphatic C16-C21	1	<1		$>10^6$	0	-
Aliphatic C21-C35	1	<4		$>10^6$	0	-
Aromatic C5-C7	1	<0.10		15,000	0	-
Aromatic C7-C8	1	<0.10		33,000	0	-
Aromatic C8-C10	1	<0.10		2,200	0	-
Aromatic C10-C12	1	<1		11,000	0	-
Aromatic C12-C16	1	<1		35,000	0	-
Aromatic C16-C21	1	<1		28,000	0	-
Aromatic C21-C35	1	<1		28,000	0	-
BTEX Compounds and MTBE						
Benzene	3	<0.01		15	0	-
Toluene	3	<0.01		33,000	0	-

Determinant	No. of Samples Tested	Range of Results	$UCL_{0.95}$	Stage 1 GAC (1% SOM)	No. of Samples Exceeding GAC	Samples Exceeding GAC
		(mg/kg unless otherwise specified)				
Ethylbenzene	3	<0.01		3,200	0	-
Xylenes	3	<0.01		3,200	0	-
MTBE	1	<0.01		7,400	0	-
Others						
Phenol	2	<1		440	0	-
PCBs	3	<0.06 - <0.07		0.24*	0	-

B(a)P – Assessed using benzo(a)pyrene as a surrogate marker

N/A – Not Applicable.

* - SGV

PAH

No PAH compounds were recorded as having maximum concentrations that are greater than the adopted GAC within the sample of this material analysed.

Petroleum Hydrocarbons, BTEX, MTBE and Phenol

The maximum recorded concentrations of phenol, all petroleum hydrocarbon fractions, BTEX compounds and MTBE are less than the adopted GAC.

Soil pH and Water-Soluble Sulphate

None of the samples of this material analysed had pH values less than or greater than the applicable GAC values. None of the samples were recorded as containing a water-soluble sulphate concentration greater than the GAC.

Volatile Organic Compounds (VOCs)

As well as the analysis summarised in Table 5.5, one sample of this material was analysed for a suite of 53 individual VOCs. None of the VOCs were recorded to be present in concentrations greater than the laboratory's respective detection limits.

PCBs

The sum of PCB congener concentrations is less than the SGV for commercial / industrial use in the samples analysed.

WAC Analysis

Table 5.6 presents a summary of the WAC analysis results obtained.

Table 5.6 Summary of WAC Analysis

	Sample Location and Depth							
Determinant	**TP02, 0.7m**	**TP04, 0.6m**	**TP05, 0.15m**	**TP06, 0.8m**	**SA01, 0.4m**	**SA02, 0.5m**	**SA03, 2.0m**	**WS08, 0.2m**
Total Organic Carbon (%)	0.3	0.8	4.1	0.5	1.9	0.4	1.5	2.8
Loss on Ignition (%)	7.8	5.7	10	7.3	5.7	5.0	7.1	3.7
BTEX (sum) (mg/kg)	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040
PCB EC& (sum) (mg/kg)	<0.007	<0.007	0.077	<0.007	<0.070	<0.007	<0.007	<0.007
Total petroleum hydrocarbons C10 – C40 (sum) (mg/kg)	<1	12	5200	11	450	5	1	1100
PAH (sum)	<1.6	<1.6	<1.6	<1.6	140	<1.6	<1.6	250
pH	6.7	7.2	7.8	7.5	8.1	7.2	7.2	7.1
Acid neutralising capacity (pH 4) (Mol/kg)	<2	<2	<2	<2	<2	<2	<2	<2
Acid neutralising capacity (pH 7) (Mol/kg)	<2	<2	<2	<2	<2	<2	<2	<2
	Concentration in 10:1 Leachate Preparation (mg/kg)							
Antimony	<0.010	<0.010	0.017	<0.010	0.13	<0.010	<0.010	<0.010
Arsenic	<0.0020	<0.0020	0.0056	<0.0020	0.026	0.018	0.0035	0.030
Barium	0.081	0.13	1.1	0.023	0.31	0.20	0.017	0.27
Cadmium	0.000045	<0.00020	0.00029	0.00052	0.00056	0.00041	0.00038	<0.00020
Chloride	<10	<10	15	16	18	11	14	<10
Chromium	<0.010	0.011	<0.010	<0.010	<0.010	0.013	<0.010	<0.010
Copper	<00050	0.011	0.0075	<00050	<00050	0.018	<0.0050	0.0076
Dissolved organic carbon	23	26	42	20	58	60	31	12
Fluoride	1.5	11	10	0.69	5.0	4.8	0.54	2.9
Lead	<0.0030	<0.0030	<0.0030	<0.0030	0.0043	0.0087	<0.0030	0.0078
Mercury	<0.00050	<0.00050	<0.00050	0.00086	0.00050	0.0010	0.00096	<0.00050
Molybdenum	<0.010	0.013	0.090	<0.010	0.26	0.017	<0.010	<0.010
Nickel	0.036	<0.010	0.035	0.059	<0.010	0.015	<0.010	<0.010
Phenols (total mono)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Selenium	<0.0050	<0.0050	0.0052	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Sulphate	490	84	400	300	410	36	200	30
Total dissolved solids	<1000	<1000	1400	<1000	1500	<1000	<1000	<1000
Zinc	0.041	0.043	0.48	0.058	0.035	0.040	0.035	0.037

5.3. Groundwater Analysis

The results of the groundwater analyses and the outcome of screening are summarised in Table 5.7. Where there is no applicable GAC for a given contaminant/parameter, it is excluded from Table 5.7 for brevity.

Table 5.7 Summary of Groundwater Analysis

Determinant	No. of Samples Tested	No. Samples Above Limit of Detection	Range of Results (µg/l unless specified)	GAC Value (EQS) (µg/l unless specified)	No. of Samples Exceeding GAC	Samples Exceeding GAC
Metals and Metalloids						
Arsenic	4	4	0.6 – 6.2	50	0	-
Cadmium	4	4	0.03 – 0.59	0.08	2	WS01A, WS04
Chromium	4	2	<1 – 8	4.7	1	WS02
Copper	4	4	1.5 – 4.8	1.0	4	All
Lead	4	3	<0.3 – 1.6	1.2	1	WS04
Mercury	4	1	<0.05 – 0.08	0.07	1	WS02
Nickel	4	4	4 – 69	4.0	3	WS01A, WS02, WS04
Zinc	4	4	3 – 240	10.9	2	WS01A, WS04
Other Parameters						
pH (units)	4	N/A	6.51 – 8.74	N/A	-	-
Ammoniacal Nitrogen (total as N) (mg/l)	4	4	0.22 – 1.9	0.3	2	WS04, WS06
Sulphate	4	N/A	82 - 320	N/A	-	-
PAH						
Anthracene	4	4	0.01 – 1.6	0.1	3	WS01A, WS02, WS06
Benzo(a)pyrene	4	3	<0.01 – 5.3	0.00017	3	WS01A, WS02, WS04*, WS06
Fluoranthene	4	4	0.02 – 9.9	0.0063	4	All
Naphthalene	4	3	<0.01 – 2.9	2.0	1	WS01A
BTEX Compounds and MTBE						
Benzene	4	0	<1	10	0	-
Toluene	4	0	<1	74	0	-
MTBE	4	0	<1	2,600	0	-
Speciated TPH						

Determinant	No. of Samples Tested	No. Samples Above Limit of Detection	Range of Results (µg/l unless specified)	GAC Value (EQS) (µg/l unless specified)	No. of Samples Exceeding GAC	Samples Exceeding GAC
C5-C6 aliphatic	4	0	<10	10	0	-
C6-C8 aliphatic	4	0	<10	10	0	-
C8-C10 aliphatic	4	0	<10	10	0	-
C10-C12 aliphatic	4	0	<10 - <100	10	0*	-
C12-C16 aliphatic	4	3	<10 - 140	10	3	WS01A, WS02, WS04
C16-C21 aliphatic	4	4	110 - 180	10	4	All
C21-C35 aliphatic	4	2	<10 - 150	10	2	WS01A, WS06
C6-C7 aromatic	4	0	<10	10	0	-
C7-C8 aromatic	4	0	<10	10	0	-
C8-C10 aromatic	4	0	<10	10	0	-
C10-C12 aromatic	4	0	<10 - <100	10	0*	-
C12-C16 aromatic	4	1	<10 – 150	10	1*	WS01A
C16-C21 aromatic	4	0	<10 - <100	10	0*	-
C21-C35 aromatic	4	0	<10 - <100	10	0*	-
Other Organic Contaminants						
Phenol	4	0	<100	7.7	0*	-

N/A - Not Applicable.

* Laboratory detection limit is higher than EQS value.

Metals and Metalloids

The recorded concentrations of copper, nickel and zinc within two to four of the four groundwater samples analysed exceed the respective GAC. However, it should be noted that the EQS values for these metals are exceedingly low (for example, when compared to the Drinking Water Standards for copper and zinc (2,000µg/l and 5,000µg/l respectively)) and relate to bioavailable concentrations within the receiving surface water.

The GAC for cadmium was exceeded in two of the four groundwater samples analysed. Recorded concentrations of chromium, lead and mercury exceeded the GAC in one sample each, with the lead and mercury exceedances being marginal.

Given the low sensitivity of groundwater resources in proximity to the site, the local geological setting and the urban location, these are not considered to represent a significant risk to controlled waters.

PAH

The recorded concentration of anthracene and benzo(a)pyrene and fluoranthene exceeded the respective EQS values within three and four (out of four) groundwater samples analysed respectively. In addition, the concentration of naphthalene exceeded the GAC in one groundwater sample.

It is considered that the EQS values for these compounds are exceedingly low, and given the low sensitivity of groundwater resources in proximity to the site, the local geological setting and the urban location, these are not considered to represent a significant risk to controlled waters.

Petroleum Hydrocarbons

Slightly elevated concentrations of aliphatic hydrocarbons in the carbon chain bands C12-C16, C16-C21 and C21-C35 were recorded within three, four and two groundwater samples analysed, respectively. In addition, a slightly elevated concentration of aromatic hydrocarbons in the carbon chain band C12-C16 was recorded in the groundwater sample from WS01.

None of the groundwater samples analysed were recorded as containing any of the BTEX compounds in concentrations greater than the laboratory's limit of detection (LoD).

It is considered that, given the limited environmental mobility, the absence of more mobile hydrocarbon / BTEX compounds and the relatively low sensitivity of groundwater resources in proximity to the site, the local geological setting and the urban location, these are not considered to represent a significant risk to controlled waters.

Ammoniacal Nitrogen

The recorded concentrations of ammoniacal nitrogen within groundwater samples taken from WS04 and WS06 were greater than the adopted GAC. As elevated ammoniacal nitrogen concentrations were not recorded within the two groundwater sampling wells located nearest to the historical landfill on the site (WS01A and WS02), it is considered that the source of elevated ammonia is not the historical landfill, but is more likely to be decomposition of natural organic matter within buried topsoil strata encountered within these boreholes.

Given the relatively low sensitivity of groundwater resources in proximity to the site, the local geological setting and the urban location, these are not considered to represent a significant risk to controlled waters.

Phenol

The concentration of phenol was below the laboratory's (LoD) in all groundwater samples analysed, although the LoD was greater than the GAC.

pH and Sulphate

The characteristic groundwater pH value and sulphate concentration, calculated in accordance with BRE SD-1 are 6.51 and 320 mg/l respectively.

VOCs

As well as the analysis summarised in Table 5.7, the groundwater samples were analysed for a suite of 53 individual VOCs. None of the VOCs were recorded to be present in concentrations greater than the laboratory's respective detection limits.

5.4. Asbestos Analysis of Demolition Arising Stockpiles

Both samples of suspected ACMs taken from the demolition arising stockpiles (SP01 and SP02) were confirmed by laboratory analysis to contain chrysotile asbestos.

6. REVISED CONCEPTUAL SITE MODEL

The preliminary conceptual site model, developed from the desk study information and presented in Section 2, has been revised in light of the ground investigation and the chemical analysis results presented above.

The revised conceptual model has been developed for the proposed future land use (retail) and summarises the understanding of surface and sub-surface features, the potential contaminant sources, transport pathways and receptors.

The revised conceptual model is presented in schematic form in Appendix A, Drawing No. C7481/GA/04.

6.1. Summary of Residual Contaminant Linkages

The qualitative risk assessment of identified contaminant linkages has also been revised, following the methodology described in Appendix B. In summary, the revised CSM has identified the following residual contaminant linkages (defined as being greater than 'low' risk) that could result in an unacceptable risk in the proposed end-use:

- Inhalation of dust containing chrysotile fibres resulting from crushing and re-use of demolition waste on the site containing asbestos cement products within earthworks during development, posing a **moderate risk** to site end users, adjacent site users and construction workers.

- Risk from hazardous ground gases (including radon), associated with made ground, including the historical landfill located on / adjacent to the site. At this stage, based on limited gas monitoring data, these linkages are assessed to pose a **high risk** to proposed end users and the proposed development; however, this is subject to review following completion of the gas monitoring programme and a quantitative ground gas risk assessment.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1. General

This Geoenvironmental Appraisal has been performed for land off Wakefield Road, Mapplewell, Barnsley, South Yorkshire.

This report has been produced with reference to the proposed retail end use, as shown on HTC Architects drawing ref. 1744 P401, dated July 2017), which is presented within Appendix A. Existing site levels and proposed finished floor and external levels are shown on HTC Architects drawing ref. 1744 P403, dated July 2017, also included in Appendix A.

Should these proposals be revised significantly, the findings of this report should be reviewed and amended if necessary.

7.2. Geotechnical

Coal Mining

The Newhill Coal seam was found to be intact below the site in every borehole drilled. Furthermore, the ratio of intact rock overlying coal to the recorded seam thickness exceeded 10 in every borehole. Therefore, the risk to site stability from unrecorded pillar and stall mining is considered to be negligible.

The minimum recorded depth to the Newhill Coal (13.5m) below the site is beyond the typical maximum depths of bell pits (12m) stated in CIRIA Special Publication 32, *Construction over Abandoned Mine Workings* (2002). Therefore, the risk to site stability from unrecorded bell pits is considered to be low.

No mine entries are recorded within, or within 20m of the site. However, as the site is underlain by coal and underground mine workings at depths greater than the Newhill coal seam, the possibility of unrecorded mine entries below the site cannot be entirely discounted. It is recommended that all excavations are inspected for evidence of mine entries / bell pits. If evidence of a mine entry or ground disturbance is suspected, advice regarding treatment / foundation precautions should be sought from a suitably qualified engineer.

Groundworks / Earthworks, Excavation Stability and Groundwater Dewatering

It is recommended that the material generated during groundworks / earthworks, and any imported fill material, is sorted, classified and compacted in a controlled manner in accordance to an approved earthworks specification (including verification). At this stage, the proposed development proposals show construction of part of the store and service yard over the historical landfill to the east. Waste from the landfill to the east (in particular the types encountered within TP04, TP05 and WS01), is unlikely to be classified as suitable for re-use within the earthworks on this site. It is also considered unsuitable to remain in situ, particularly in the light of proposals to raise site levels in this area, together with the need to construct mass type retaining walls. As such it is recommended the waste is excavated in full and disposed of to a licenced landfill / waste management facility.

Where site-won or surplus soils imported from another site are used within earthworks, this should be undertaken in accordance with a Materials Management Plan (MMP), which should be agreed with CL:AIRE prior to development.

It is generally recommended that existing topsoil and made ground is excavated in order to expose the underlying natural strata prior to earthworks commencing.

Notwithstanding the above, where ground levels are to be raised, the placed fill will logically impose a surcharge load to the underlying ground. Therefore, it is recommended existing made ground and clays identified as 'possibly reworked' be removed to expose natural strata, in particular the residual Coal Measures beneath. At formation level, it is recommended the exposed natural material be proof rolled. In the event that any soft spots, large obstructions or other deleterious material are identified, these should be removed and replaced with suitably compacted selected fill. The finished site levels should then be achieved by placing geotechnically suitable/ selected site-won and/or imported fill materials in a controlled manner in accordance with an approved Earthworks Specification.

Excavation should generally be suitable for standard plant within made ground, reworked soils, residual soils and weathered rock. However, the use of breakers is likely to be required for deep excavations within the intact sandstone, which was encountered at rockhead, or for breaking out intact substructures.

Excavations into existing made ground and natural subsoils should be assumed to be potentially unstable. No personnel entry into unsupported excavations shall be allowed without an appropriate risk assessment. Reference to CIRIA Report 97, *Trenching Practice* (1992) should be made to establish suitable means of support or battering of excavation sides.

In general, based on the results of this investigation, significant groundwater seepages or inflows within shallow excavations (<2m) are considered unlikely across the site. However, rapid perched groundwater inflow was recorded within TP05, within the historical landfill located in the eastern end of the site.

If groundwater is encountered at shallow depth, then it should be possible to deal with seepages through normal site pumping practices for any shallow excavations open for short periods of time. Disposal/discharge of water will require appropriate treatment /consent.

It is recommended that an adequate drainage system for surface water be installed by a competent contractor in order to prevent surface water ponding or collecting, both during and post construction, as this may lead to deterioration of the founding stratum.

Proposed Retaining Walls/Structures

The proposed external works drawings show that retaining walls are to be constructed to accommodate the variation in finished levels between the site and adjoining land. At the time of writing, gabion (mass) retaining walls up to approximately 2.5m high are proposed.

At this stage, the exact construction details of proposed retaining walls/structures are not known, and the design of the structures will, to varying degrees, be dependent upon a number of factors. For example, the effective strength parameters of the retained engineered fill (either site-won or imported fill) the strength of founding materials, deformation properties of the founding materials, global stability (i.e. slope stability) and retaining wall type.

At this stage, Sirius is only able to comment on a very limited number of aspects of retaining wall design. It is generally recommended that the foundations of the retaining walls be taken through the made ground to bear onto the underlying competent natural soils (i.e. residual Coal Measures strata) or rock. Alternatively, subject to adequate removal of made ground and reworked soils to reveal residual Coal Measures strata beneath and subsequent compaction of fills to final site levels, together with provision of retaining wall design loads, consideration could be given to placement of gabion walls upon the compacted fill.

The foundations for the proposed retaining walls should be designed/constructed so as to not undermine or exert any undue loading onto the underlying founding strata of the proposed store foundations.

Consideration should be given to the type of plant utilised and development activities carried out in proximity to any existing retaining walls/neighbouring structures in order to limit imposed vibration.

Foundations

The intrusive site investigation has identified that made ground and reworked clays within the floor plan of the proposed food store building varies in depth from 0.6m to 2.2m, with the greatest thicknesses recorded in the eastern side of the footprint, including landfilled waste at the east and north-eastern corner. It is noted the finished floor level of the store is 98.6m AOD. This necessitates a need to raise site levels by around 1.3m within the floor plan area of the store.

The made ground and reworked clays are underlain by competent natural strata originating from weathering of the Pennine Middle Coal Measures Formation on the site, comprising mainly medium, to high strength cohesive residual soils from weathered rock strata. The cohesive residual soils are in turn underlain by extremely weak to very weak sandstone, interbedded with siltstone. The first two rounds of groundwater monitoring recorded groundwater depths ranging between 1.0 and 3.83m bgl.

The made ground and particularly in light of rises in site level (approximately 1.3m rise in levels to establish finished floor level of the store) the reworked clays are considered unsuitable as a founding stratum in its current condition, due to its variability and presence of deleterious materials, etc.

Based on the above and the results of the site investigation, several possible foundation solutions may be considered, including the following:

I. Spread foundations constructed upon residual Coal Measures strata;

II. Full excavation of existing made ground, with replacement by fully engineered fill, with construction of raft upon engineered fill;

III. Vibro stone columns, following turnover of existing made ground, removal of any obstructions and removal of landfilled waste at the north-eastern corner, with construction of shallow spread foundations within treated fill.

Option I: Spread Foundations within Natural Strata

Existing made ground and reworked clays are considered unsuitable as bearing strata for structural loads owing to the potential for excessive total and differential settlements and low bearing resistance in parts.

Therefore, spread foundations should penetrate through any existing made ground to found wholly within competent natural undisturbed strata. This could take the form of pier-type foundations cast within manhole rings, built up to shallow depth below finished ground level.

The underlying residual Coal Measures is considered to have a characteristic undrained shear strength (C_u) of 70 kPa at the upper surface of the stratum. By way of example, calculations indicate that a square / circular pad foundation of plan area 3.24m^2, bearing on the natural undisturbed residual Coal Measures clay soils at a depth of 3.3m below finished ground level, can impose a static load of 500 kN (or an allowable pressure of around 130 kN/m^2). For this foundation type, in light of the formation comprising soils derived from the weathering of rock, the application of such a pressure is expected to keep settlements to 25mm or less.

Clay soils on the site (in particular the residual Coal Measures strata) have been found to be of Medium volume change potential. Albeit this classification of cohesive soils is applied to residential development, in terms of determining a moisture stable depth to place foundations in order to mitigate against the influence of seasonal shrinkage and swelling, it would be considered prudent to apply this to the proposed retail type development. Therefore, should the situation arise, any foundations within residual Coal Measures should be a minimum of 0.9m below original ground levels, locally deepened within the zone of influence of existing or proposed trees.

A tree survey was outside the scope of this investigation but should be undertaken to enable production of a detailed foundation schedule. The removal of trees during development of the site may cause heave of cohesive soils and heave protection measures should be adopted in foundation design where the requirement for deepening exceeds 1.5m.

Based on the available ground investigation information rockhead is not expected at formation depth within the footprint of the proposed store. However, in the event spread foundation excavations encounter bedrock, differential settlements between rock and residual soils could be around 10mm to 15mm (if applying the aforementioned calculated load and foundation type / dimensions). Notwithstanding the above, any store design should take account of the proposed foundation arrangement, sizes and column loads and determine likely differential settlements between foundations on rockhead and residual Coal Measures strata.

To reiterate the above, the above calculations are based on theoretical foundations. Settlements of foundations are dependent on foundation loading and dimensions. It is therefore recommended that foundation settlements are reviewed once final loading arrangements and foundation sizes are known.

Foundations should be taken below a line drawn up at 45° from the base of any existing or proposed services.

It should be noted that any groundwater encountered may have an adverse effect on foundation construction and performance (such as softening/loosening of founding materials, instability of excavation walls, etc.), particularly in winter months. This should be considered when designing foundations.

Option II: Excavation of Existing Made Ground, with Construction of Raft upon Engineered Fill

For this foundation solution, the existing made ground, (inclusive of the landfill waste in the east and possible reworked clays) within the footprint of the proposed building would be excavated to its full depth, with the natural formation level (i.e. residual Coal Measures strata) proof rolled to identify any soft spots, which would be treated where found. Engineered fill would then be placed in accordance with an earthworks specification written to be sufficiently robust to allow construction of a raft foundation. The earthworks specification would be required to take into consideration the variation in depth of existing made ground at the site, which generally increases from west to east.

Landfilled waste present at the eastern end of the footprint of the proposed building, would require complete removal prior to placement of suitable engineered fill. As this material is likely to be unsuitable for re-use within the development, removal to suitably licenced waste management facilities would be required.

Option III: Reinforced Spread Foundations or Rafts on Vibro-Treated Ground

Consideration could be given to stabilisation of existing made ground and newly placed fill by vibro replacement techniques.

The full thickness of made ground and any re-worked clay soils should be ‘turned over’ within the footprint of the vibro treatment area, with any hard obstructions, soft clay, oversized or otherwise unsuitable material removed. The replaced made ground should be sorted, classified and compacted in accordance with the current Highways Agency *Specification for Highways Works*,

Section 601, *Fill to Structures,* to achieve a minimum of 95% of maximum dry density and maximum of 5% air voids.

Landfilled waste is present at the eastern end of the proposed building. This material would not be suitable for vibro treatment and would require excavation and replacement with suitable material. As the landfilled waste is likely to be unsuitable for re-use within the development, removal to suitably licenced waste management facilities would be required.

New fill placed above existing made ground to achieve the finished floor level should comprise either:

- Granular fill meeting the ground improvement contractor's particle size distribution and other material properties requirements. Such granular fill should not undergo compaction prior to vibratory treatment, so as not to impede vibroflot penetration; or
- Selected fill material, compacted to achieve a minimum of 95% of maximum dry density and maximum of 5% air voids, in accordance with *Specification for Highways Works*, Section 601, *Fill to Structures.*

If the existing brick demolition waste stockpiles are to be processed and re-used within the earthworks, remediation to remove asbestos, with appropriate verification, will be required by the ground improvement contractors.

Following satisfactory completion of ground treatment, shallow reinforced spread foundations or a raft would be suitable.

Further guidance should be sought from a suitably qualified ground improvement contractor.

Ground Floor Construction

Outwith the raft foundation solution, the existing made ground is not considered suitable to support a ground-bearing floor slab in its current condition. However, depending on the loading and performance requirements for the slab, consideration could be given to construction of a ground-bearing slab following engineering and / or ground improvement of both existing and additional made ground used to establish final site levels.

The requirement for incorporation of ground gas protection measures within the floor slab construction would be determined within the ground gas risk assessment, following completion of the planned programme of ground gas monitoring.

Design Sulphate and ACEC Class

In accordance with BRE SD-1, the site is classified as Brownfield, with Mobile groundwater conditions.

The assessments made in Section 5 of this report indicate that buried concrete structures (e.g., foundations) should conform to the requirements for Design Sulphate Class DS-1 and ACEC Class of AC-2z.

Slope Stability

Slopes are shown within the site on the proposed external works drawings, at the western and eastern boundaries. It is recommended that the slopes are constructed from selected fill, compacted in accordance with an agreed earthworks specification. It is strongly recommended that the long-term stability of such slopes be quantitatively assessed prior to finalising the external works design. For the proposed slope at the eastern site boundary, this should include consideration of the presence of landfilled waste.

Pavements and Highways

The eastern end of the site is underlain by landfilled waste including much deleterious material, e.g., rubber hot water bottles, wood and plastic. The settlement performance of this material is therefore difficult to predict with any confidence. However, at this stage, settlements are expected to exceed the normal performance capacity of any standard pavement design, if this material type is left in situ. It would be considered prudent to remove the landfilled waste in its entirety and establish final site levels with suitably compacted materials. Following this exercise, a lightly reinforced (i.e., a single layer of geogrid) could be incorporated into the base of the hardstand construction in this area.

Landfilled waste materials are unlikely to be suitable for re-use within the development and would therefore require removal from site to suitably licenced waste management facilities.

For made ground in other parts of the site, based on the results of limited the laboratory testing undertaken on remoulded cohesive soils (made ground and natural soils), a CBR value of <2.5% should be assumed for these materials at this stage. Consideration could be given to excavate the upper 1m to 2m of fill, (or down to residual Coal Measure strata if shallower), classify and compact to development subgrade levels to facilitate the construction of a lightly reinforced hardstand as within the eastern landfill area.

If residual Coal Measures strata is encountered at subgrade, which may be the case in the western corner of the site in the locale of SA01 and TP07, then no requirement for reinforcement is needed.

It is recommended that in-situ CBR testing is carried out following completion of the enabling works, when final site levels will be known.

Soakaways

Based on the results of the percolation testing undertaken, the use of soakaways within the development is not considered to be feasible, due to the low permeability of the natural strata.

7.3. Asbestos-Containing Materials (ACMs)

Stockpiled demolition materials on the site were observed to contain visible ACMs, in the form of fragments of asbestos cement corrugated roof panel and rainwater pipes. Laboratory analysis confirmed that the observed suspected ACMs contained chrysotile.

It is recommended that visible ACM's are removed from stockpiled demolition materials prior to any movement, crushing or sorting of the stockpiles, to avoid production of asbestos-contaminated granular fill material and / or release of asbestos fibres into the environment. Any visible asbestos fragments should be carefully picked by an appropriately trained operative, double bagged and placed into a secure area for subsequent off-site disposal.

Visible ACMs were not observed within below-ground soils encountered during this investigation.

In addition, asbestos fibres were not detected within any of the soil samples analysed.

However, due to the history of the site, the possibility of fragments of asbestos-containing materials within made ground or shallow natural soils cannot be discounted. If encountered, advice should be sought from an appropriately qualified asbestos specialist and an appropriate strategy developed for the safe removal and disposal of the material.

7.4. Soil and Groundwater Contamination

Risk Evaluation for the Proposed Land Use (Retail)

Contaminant linkages assessed as a Low or Negligible risk are not considered significant or requiring remedial action.

Human Health Receptors

Assuming that ACMs are removed from the site as discussed above, the site investigation has not identified any soil or groundwater contamination that presents an unacceptable risk to human health following redevelopment, and no formal remedial measures are required in this respect.

If the existing demolition product stockpiles are to be processed / crushed for re-use on site, the resulting crushed product should be placed in areas where future disturbance (e.g., by foundation construction or installation / maintenance of buried services) will not occur, in accordance with a Materials Management Plan produced in accordance with the CL:AIRE Development Industry Code of Practice.

Controlled Waters Receptors

The risk to controlled waters receptors associated with the site is considered to be low, with no remedial measures being required in this respect.

Utilities

It is recommended that the results of the chemical testing and details of the proposed remedial works are provided to the appropriate utility companies to determine the necessity for service protection.

Construction and Maintenance Workers

Contamination may pose a short-term (acute) or long-term (chronic) risk to workers during construction and maintenance. The potential risks must be specifically assessed as part of the health and safety evaluation for the works to be performed in accordance with prevailing legislation. Site practices must conform to the specific legislative requirements and follow appropriate guidance (e.g., HSE, 1991; CIRIA, 1996).

Potential sources of ground gases affect the site. Accordingly, precautions should be taken to protect workers entering and/or working in confined spaces if considered necessary following a task-specific risk assessment.

Unforeseen Contamination

It is possible that areas of more significant contamination, not identified to date, may be encountered on site during excavation and construction works. If any areas of noxious, odorous,

brightly coloured, fibrous, liquid or other potential contamination are encountered, then further advice should be sought from a suitably qualified consultant.

7.5. Ground Gas

Ground gas monitoring is ongoing, with two gas monitoring visits undertaken to date (of six planned). The results of the first two gas monitoring visits are indicative of Characteristic Situation 2 conditions (as defined within BS8485:2015); however, the ground gas risk and any protection measures required can only be determined upon completion of the gas monitoring programme. A supplementary ground gas risk assessment letter report will be issued under separate cover following completion of the planned gas monitoring visits. This will confirm the ground gas risk, as well as the gas protection measures and verification requirements

The Desk Study report determined that basic radon protection measures are required for the site.

7.6. Invasive Plants

Invasive plant species were not observed on this site at the time of investigation.

It is recommended that the absence of invasive plant species is confirmed by qualified consultant ecologist and their advice taken on appropriate treatment. The treatment of any invasive species should take place in advance of the proposed construction works.

7.7. Disposal of Soils

Any removal of materials from site should be undertaken in accordance with current Duty of Care requirements and the EA Technical Guidance Document WM3, dated 2015. In light of the regulations it is recommended that discussion with landfill operators takes place at an early stage, including provision of the chemical analysis including (WAC) analysis results.

8. REGULATORY APPROVALS

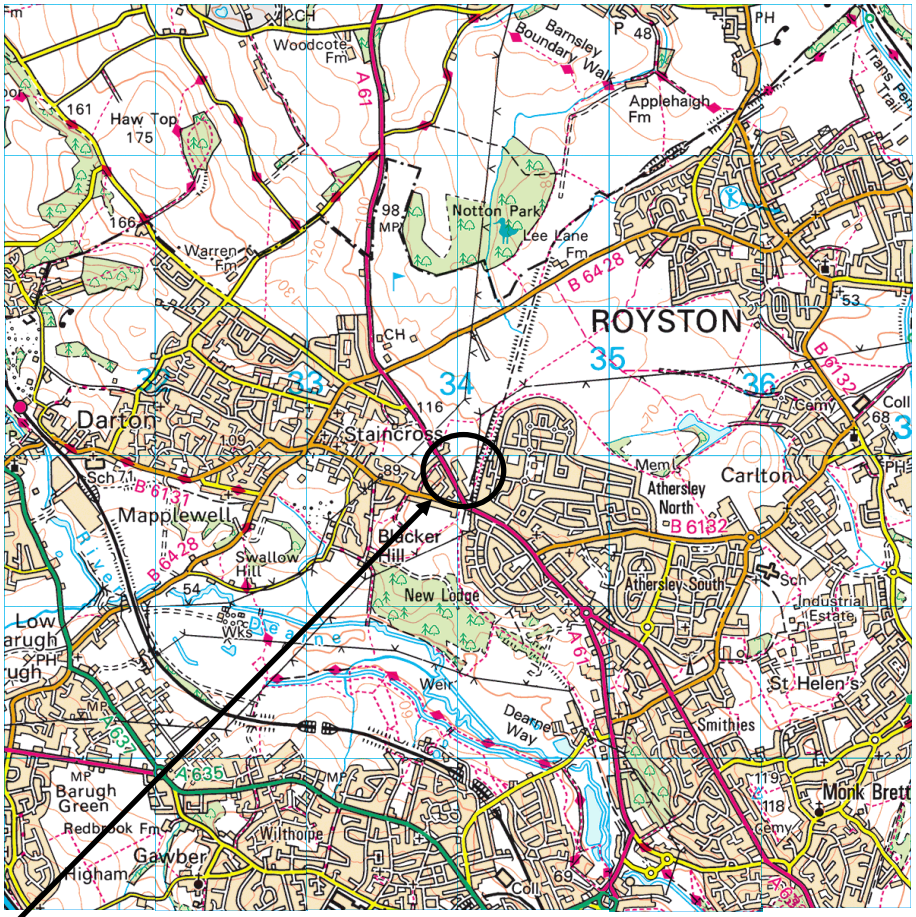
The conclusions and recommendations presented above are considered reasonable based on the findings of the site investigation. However, these cannot be guaranteed to gain regulatory approval and therefore the report should be passed to the appropriate regulatory authorities and/or other relevant organisations for their comment and approval prior to undertaking any works on site.

APPENDIX A

DRAWINGS

Site Location Plan

Contract Number	**C7481**
Contract	**Wakefield Road, Mapplewell**
Client	**Lidl UK GmbH**



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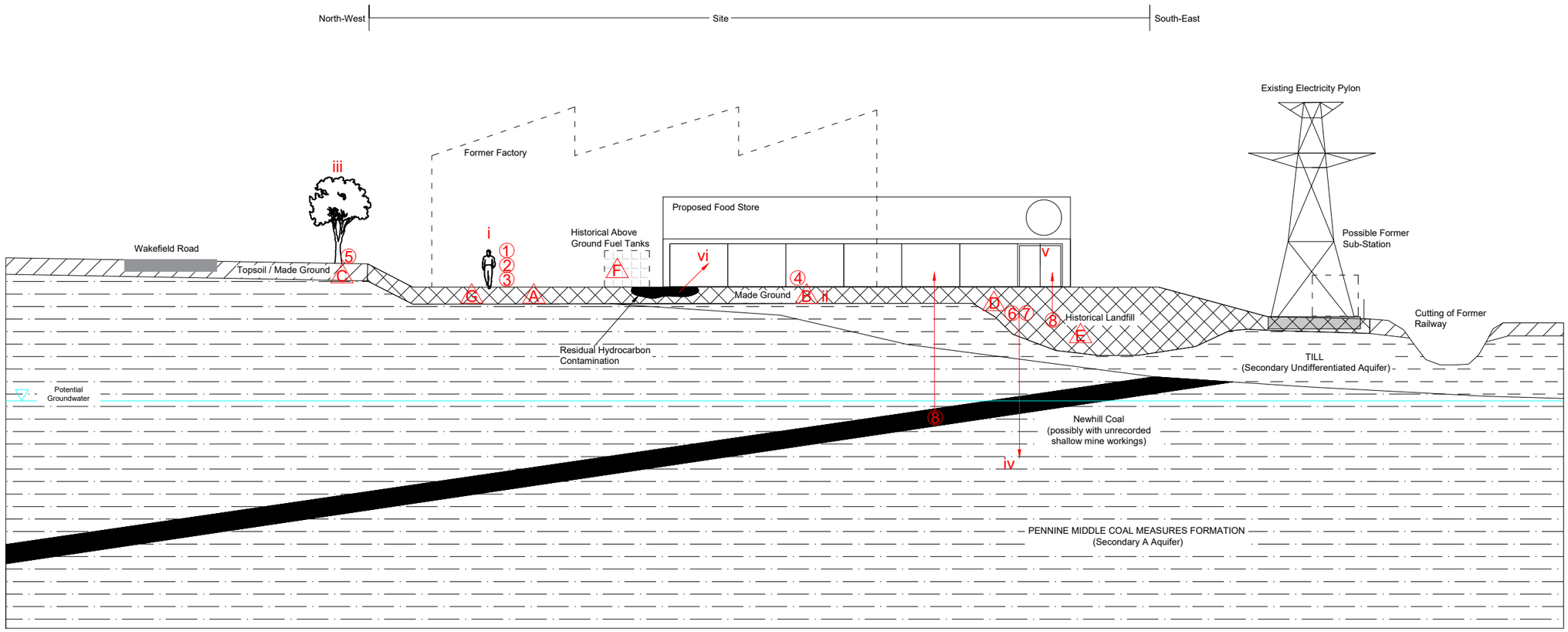
Scale	**1:50,000**		
Drawn by	**AMG**	**Approved**	**AMG**
Drawing Number	**C7481/GA/01**		



Contamination Source	Contamination Pathway	Potential Receptors	Risk of Significant Contaminant Linkage
A - Metals, metalloids, asbestos and organic contaminants (including PAHs and petroleum hydrocarbons) within made ground and / or shallow natural soils.	1. Direct and indirect ingestion of soil 2. Inhalation of contaminated particles and dust 3. Dermal contact	i - Construction workers / end-users / adjacent land users	Low to Moderate Low to Moderate Low to Moderate
B – Acids and sulphates within shallow soils and ground water.	4. Sulphate attack	ii – Concrete substructures	Low to Moderate
C – Phytotoxic metals within made ground.	5. Plant uptake	iii - Landscaping	Low to Moderate
D - Leaching of metals / metalloids, other inorganic compounds and/ or organic contaminants from made ground and / or shallow natural soils.	6. Migration via groundwater flow	iv - Controlled waters (including underlying Secondary A Aquifer)	Low to Moderate
D - Migration of metals / metalloids, other inorganic compounds (including ammonia and sulphates) and / or organic contaminants in perched / shallow groundwater.	7. Migration via groundwater flow	iv - Controlled waters (including underlying Secondary A Aquifer)	Low to Moderate
E - Hazardous ground gases (including radon) resulting from landfill and underlying bedrock, including possible shallow coal mine workings.	8. Gas migration / Inhalation	v - Construction workers / end-users / adjacent land users within buildings	High
F - Possible hydrocarbon spillage / contamination (more specifically in the vicinity of former above ground tanks).	9. Vapour inhalation	vi – Construction workers / end-users / adjacent land users within buildings	Low to Moderate
G - PCBs associated with possible spillage / contamination within the vicinity of former electricity sub-station.	1. Direct and indirect ingestion of soil 2. Inhalation of contaminated particals and dust 3. Dermal contact	i - Construction workers / end-users / adjacent land users Construction workers / end-users / adjacent land users Construction workers / end-users / adjacent land users	Low to Moderate Low to Moderate Low to Moderate

NOTES

REVISION

0	For Information
A	>>
B	>>
C	>>
D	>>

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FAX: 0113 264 9962

CLIENT

Lidl UK GmbH

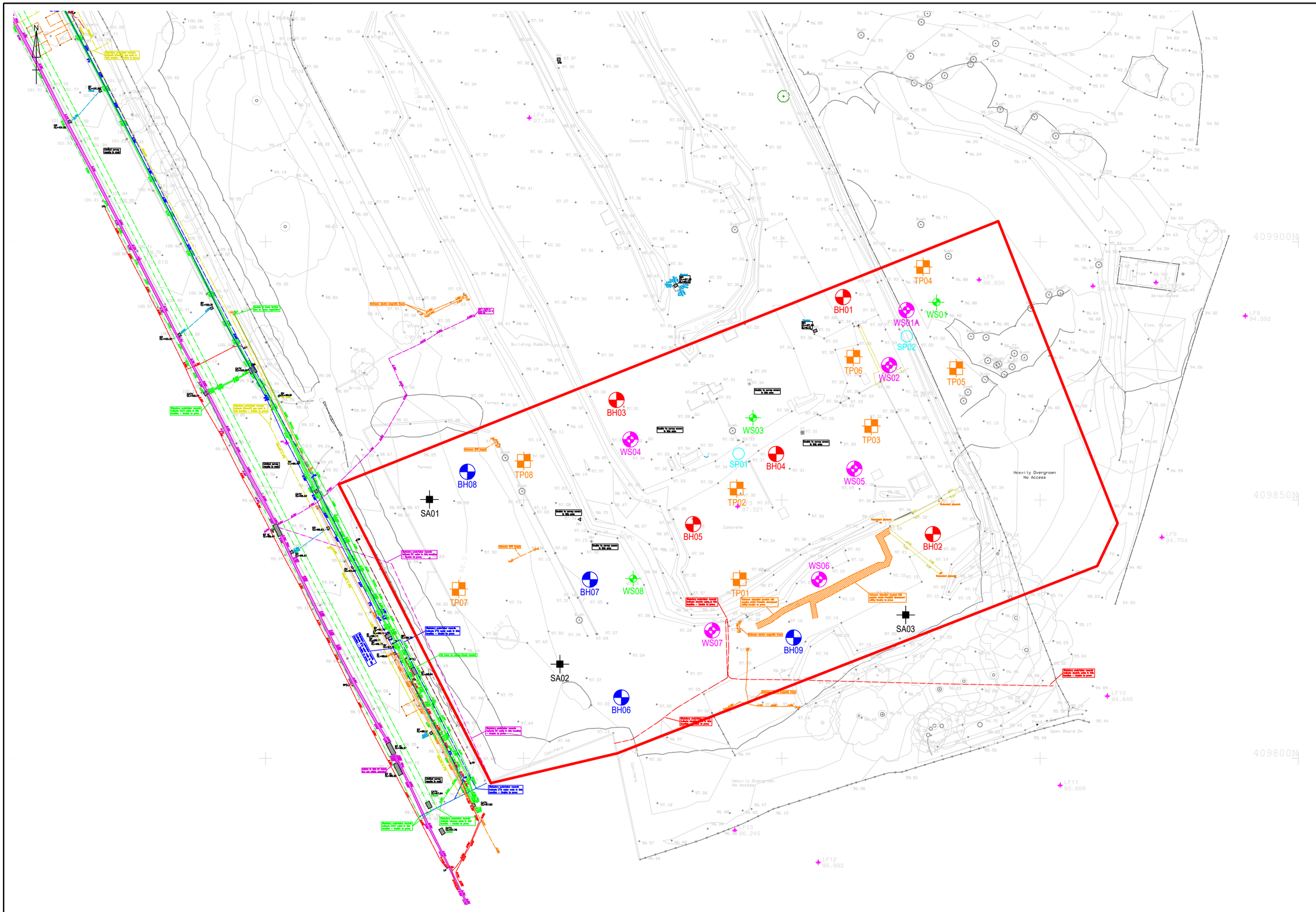
SITE

**Wakefield Road,
Mapplewell**

DRAWING TITLE

**Preliminary Conceptual
Site Model**

DRAWING NO.	REVISION NO.
C7481/GA/02	0
DRAWN BY: SM	APPROVED BY: AG
DATE: December 2017	SCALE: NTS
	PAPER SIZE: A3



NOTES

- Site Boundary
- BH — Rotary Borehole (Water Flush)
- BH — Rotary Borehole (Mist Flush)
- WS — Window Sampler Borehole with Groundwater / Gas Monitoring Well
- WS — Window Sampler Borehole
- TP — Trial Pit
- SA — Soakaway Test
- SP — Stockpile Surface Sample

REVISION		BY	DATE
0	For Information	>>	>>
A	>>	>>	>>
B	>>	>>	>>
C	>>	>>	>>
D	>>	>>	>>

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CLIENT

Lidl UK GmbH

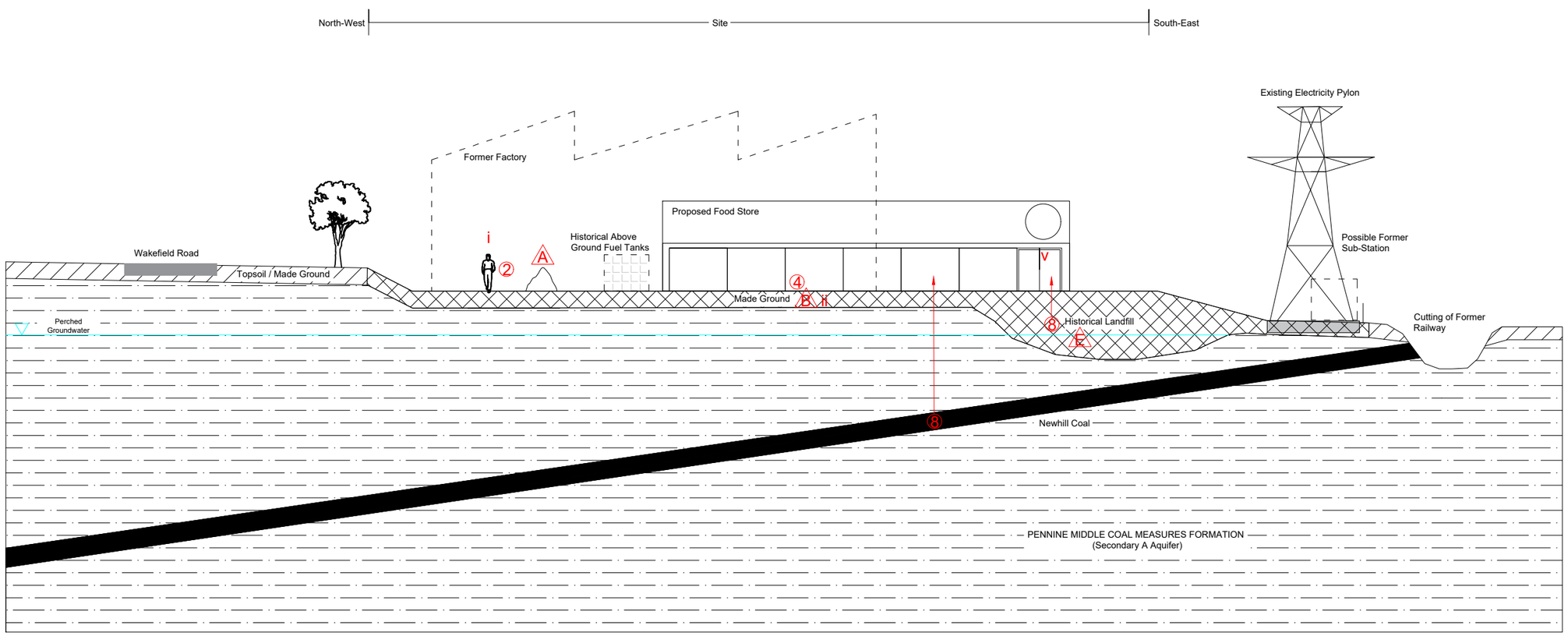
SITE

**Wakefield Road,
Mapplewell**

DRAWING TITLE

**Exploratory Hole
Location Plan**

DRAWING NO.	REVISION NO.
C7481/GA/03	0
DRAWN BY	APPROVED BY
SM	AG
DATE	SCALE	PAPER SIZE
November 2017	1:500	A2



Contamination Source	Contamination Pathway	Potential Receptors	Risk of Significant Contaminant Linkage
A – Asbestos fibres released into air by crushing ACM-contaminated stockpiles.	(2.) Inhalation of contaminated dust	i - Construction workers / end-users / adjacent land users	Moderate
B – Acids and sulphates within shallow soils and ground water.	(4.) Sulphate attack	ii – Concrete substructures	Low to Moderate
E – Hazardous ground gases (including radon) resulting from landfill and underlying bedrock.	(8.) Gas migration / inhalation	v – Construction workers / end-users / adjacent land users within building	High (Pending completion of gas monitoring)

NOTES

REVISION

0	For Information
A	>>
B	>>
C	>>
D	>>

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CLIENT

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SITE

Wakefield Road, Mapplewell

DRAWING TITLE

Revised Conceptual Site Model

DRAWING NO.	REVISION NO.
C7481/GA/04	0

DRAWN BY	APPROVED BY
SM	AG

DATE	SCALE	PAPER SIZE
December 2017	NTS	A3

Surfacing Treatment Key

- SMA (Stone Mastic Asphalt) to new car park circulation areas with white and yellow thermoplastic paint to denote car parking spaces in accordance with Lidl spec.
- PMB (Poly-modified Bitumen) to the HGV route, in accordance with Lidl specification
- 200x100mm dark grey/anthracite concrete block paving with pencil edge in Herringbone bond to front of store and paths in accordance with Lidl specification
- Reinforced concrete delivery ramp in accordance with Lidl specification
- Soft landscaping in accordance with Lidl specification

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DO NOT SCALE!
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SUBJECT TO HGV TRACKING CHECK

INLINE WITH TOPOGRAPHICAL SURVEY, LANDFORM SURVEY DATED 03.07.15 DRAWING NUMBER 001.

SUBJECT TO REVIEW OF LEVELS AND FALLS

SUBJECT TO CONFIRMATION OF CAR CHARGING POINT REQUIREMENT

SUBJECT TO LIGHTING PLAN

BASED ON LIDL SPEC DRAWING LD(13)-GF-01 - Ground Floor - Setting Out Plan

SUBJECT TO HIGHWAYS CONSULTED DESIGN

N

Residual Hazard Register:
HGV Tracking
Vehicular movements within car park
Pedestrian movements within car park.

Rev.	Date	Description	Drawn

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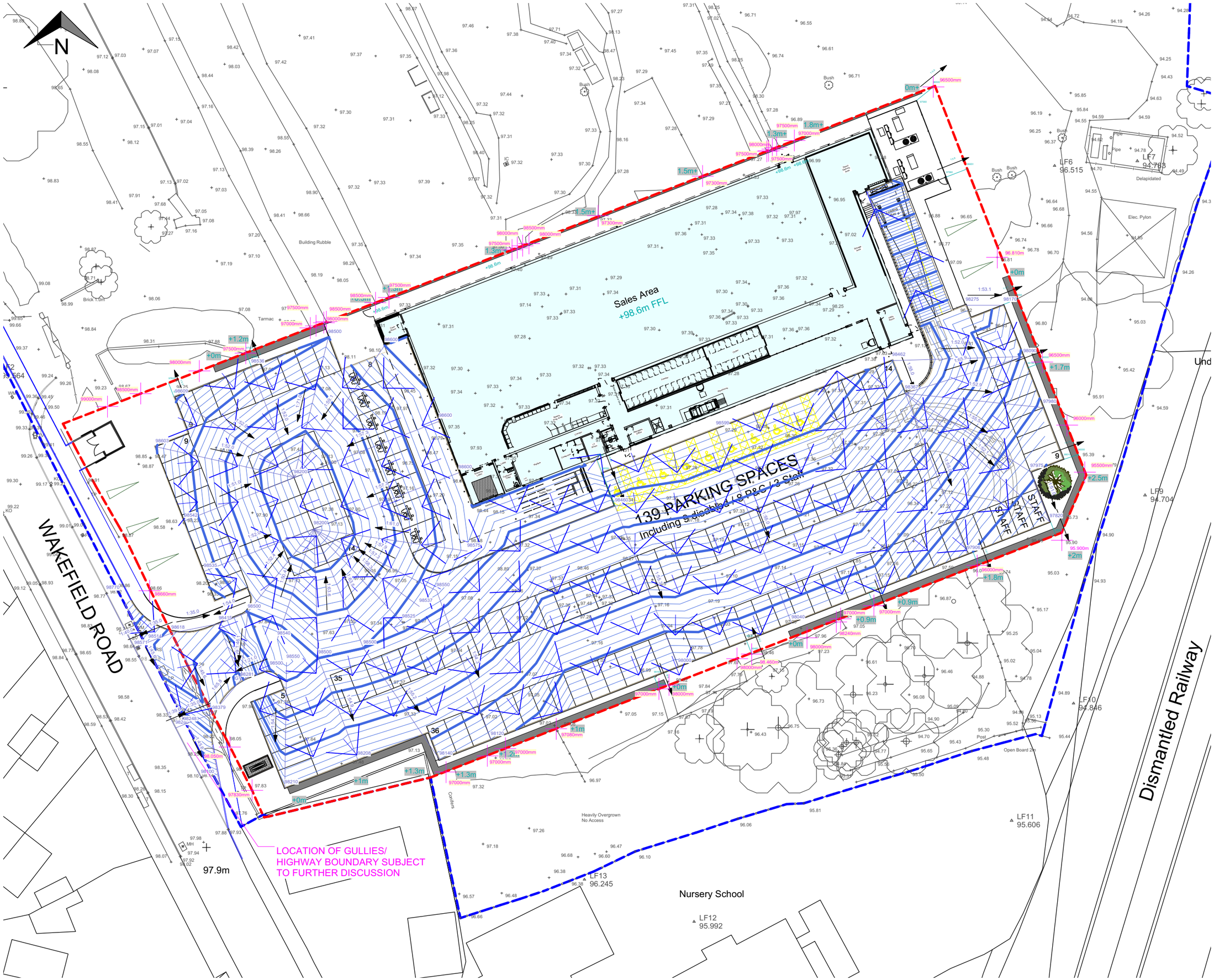
project
New Store
Wakefield Road,
Mapplewell

drawing title
Proposed Type 1300
Surfacing Plan

date	July 2017		
status	Planning Issue		
scale	1:500 @ A3		
drawn	AB	checked	LS
job no.	1744	dwg no.	P401 rev. -



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DO NOT SCALE!
ALL DIMENSIONS SHOULD BE CHECKED ON SITE BEFORE WORK COMMENCES

SUBJECT TO HGV TRACKING CHECK

INLINE WITH TOPOGRAPHICAL SURVEY, LANDFORM SURVEY DATED 03.07.15 DRAWING NUMBER 001.

SUBJECT TO REVIEW OF LEVELS AND FALLS

SUBJECT TO CONFIRMATION OF CAR CHARGING POINT REQUIREMENT

SUBJECT TO LIGHTING PLAN

BASED ON LIDL SPEC DRAWING LD(13)-GF-01 - Ground Floor - Setting Out Plan

SUBJECT TO HIGHWAYS CONSULTED DESIGN

EXISTING LEVELS SHOWN IN PINK

PROPOSED LEVELS AND FALLS SHOWN IN GREEN

Residual Hazard Register:
HGV Tracking
Vehicular movements within car park
Pedestrian movements within car park.

Rev.	Date	Description	Drawn

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client
Lidl UK GmbH

project
New Store
Wakefield Road,
Mapplewell

drawing title
Proposed Type 1300 Levels Plan

date July 2017
status Planning Issue
scale 1:500 @ A3
drawn AB checked LS
job no. 1744 dwg no. P403 rev. -

APPENDIX B

QUALITATIVE RISK ASSESSMENT METHODOLOGY

Qualitative Risk Assessment Methodology

The approach adopted by Sirius for the qualitative assessment of risk is based upon that given in Annex 4 of NHBC-Environment Agency-CIEH "Guidance for the Safe Development of Housing on Land Affected by Contamination" (2008) and is consistent with other current guidance.

The risk posed by viable contaminant linkages is based upon the consideration of both:

a) the magnitude of the potential consequence (i.e. its severity); and,

b) the probability (likelihood) of that consequence being realised.

The classifications used in this report for consequence and probability are given in Tables 1 and 2, respectively. The derived risk classifications are defined in Table 3.

Where there is no viable contaminant linkage there is no potential risk.

Table 1. Classification of Consequence

Classification	Definition
Severe	Contaminant concentrations at the receptor that are likely to result in "significant harm" to human health (as defined in Part 2A of the Environmental Protection Act 1990). Major pollution of controlled waters that could have persistent and/or extensive effects on water quality, for example fish kills, closure of an abstraction, or substantial deterioration in quality of the receiving water body. Major impact on receptor amenity value or major damage to agriculture or commerce. Major damage to an ecosystem that is likely to result in a substantial adverse change in its functioning or harm to a species of special interest that endangers the long-term maintenance of the population. Catastrophic damage to crops, buildings or property.
Medium	Elevated concentrations at the receptor that might result in "significant harm" to human health (as defined in Part 2A of the Environmental Protection Act 1990). A pollution incident that has significant effect on water quality or abstraction potential. An incident that has a marked effect on receptor amenity value, agriculture or commerce. Damage to an ecosystem that may result in a substantial adverse change in its functioning or harm to a species of special interest that may endanger the long-term maintenance of the population. Significant damage to crops, buildings or property.

Classification	Definition
Mild	Potential human health impact at the receptor point but unlikely to be classified as "significant harm" (as defined in Part 2A of the Environmental Protection Act 1990). Pollution of water that will have a small or short-lived effect on water quality and marginal effects on its amenity or resource value or its use in agriculture or commerce. Minor or short-lived damage to ecosystems, which is unlikely to result in a substantial adverse change Minor damage to crops, buildings or property
Minor	No potential measurable detrimental human health impacts at the receptor point. Impact on water that will have no or minimal effect on water quality or use. No or minor and easily repairable effects on buildings, structures and services.

Table 2. Classification of Probability

Classification	Definition
High	An impact is already occurring or is very likely in the short-term and almost inevitable over the long-term.
Medium	It is probable that an event would occur. This is not inevitable but possible in the short-term and likely over the long-term.
Low	Circumstances are possible under which an event could occur. However, it is by no means certain that an event will take place, even over the long-term.
Unlikely	Circumstances are such that it is improbable that an event would occur even over the very long-term.

Table 3. Risk Classification

	Consequence			
Probability	***Severe***	***Medium***	***Mild***	***Minor***
High	Very High	High	Moderate	Low
Medium	High	Moderate	Low to Moderate	Low
Low	Moderate	Low to Moderate	Low	Very Low
Unlikely	Low to Moderate	Low	Very Low	Negligible

Table 4 provides a context for interpretation of the risk classification categories. The definitions provided are based on those given in CIRIA (2001) "Contaminated Land Risk Assessment. A Guide to Good Practice", Report C552.

Table 4. Interpretation of Risk Classification Categories

Risk Classification	Definition
Very High	There is a high probability that severe harm to one or more identified receptors could occur or there is evidence that this is already happening. This risk is likely to result in a substantial liability. Urgent investigation and remediation are likely to be required.
High	Harm is likely to be caused to one or more identified receptors. Realisation of the risk is likely to present a substantial liability. Urgent investigation is required and remedial works may be necessary in the short-term and are likely over the longer term.
Moderate	It is possible that harm could be caused to one or more identified receptors. However, it is relatively unlikely that such harm would be severe. Investigation is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer term.
Low	It is possible that harm could be caused to one or more identified receptors but it is likely that this harm, if realised, would normally be mild. No further investigation is considered necessary to assess risk or environmental liability but investigations could be undertaken if desired to confirm 'baseline' conditions for the purposes of liability management. Remedial works are unlikely to be required.
Very Low	There is a low probability that harm could be caused to one or more identified receptors. In the event of such harm being realised, it is likely to be mild, at worst. No further investigation is considered necessary to assess risk or environmental liability but investigations could be undertaken if desired to confirm 'baseline' conditions for the purposes of liability management. Remedial works are very unlikely to be required.
Negligible	It is unlikely that harm could be caused to one or more identified receptors. In the event of harm being realised, it is likely to be minor. No further investigation is considered necessary to assess risk or environmental liability. Remedial works are not expected.

APPENDIX C

EXPLORATORY HOLE LOGS

TRIAL PIT RECORD

TP No. **SA01**
Sheet 1 of 1

Site: Wakefield Road, Mapplewell
Contract No: C7481

Client: Lidl UK GmbH
Date: 16/11/2017

Method: JCB 3CX with a 600mm diameter toothed bucket and a concrete breaker.
Scale: 1:25

Logged By: AW | Checked By: AG

SAMPLE DETAILS | STRATA RECORD

Type	Depth From - To(m)	Vane Results kN/m2 {}{PID}	Ground -water	Description	Depth (m)	Level (m AOD) PID (ppm)	Legend	Backfill
				MADE GROUND - Black Asphalt.	0.06			
ES	0.40			MADE GROUND - Reddish brown slightly clayey sandy GRAVEL. Sand is fine to coarse. Gravel is angular to sub-angular fine to coarse of brick and tile (Sub-base).	0.60			
B D	1.00 1.00	90.0	1	Stiff high strength blueish grey mottled orange in parts slightly sandy slightly gravelly CLAY. Intermediate plasticity. Sand is fine to coarse. Gravel is sub-rounded to sub-angular fine to coarse of sandstone and mudstone.	1.40			
		100.0		Firm to stiff high strength brownish grey mottled orange in parts slightly sandy slightly gravelly CLAY. Low plasticity (field description). Sand is fine to coarse. Gravel is sub-rounded to sub-angular fine to coarse of sandstone and mudstone. *From 1.4m bgl - becoming brownish grey.*				
			2	End of trial pit at 2.00m	2.00			
			3					
			4					

Remarks and Groundwater Observations

1. Trial pit completed a 2.00m bgl.
2. Trial pit broken out using hydraulic breaker.
3. No groundwater encountered.
4. Trial pit filled with stone and slotted monitoring pipe for soakaway testing.

GL (m AOD)
Easting:
Northing:

Fig No.
SA01

TRIAL PIT RECORD

TP No. **SA02**
Sheet 1 of 1

Site: Wakefield Road, Mapplewell
Contract No: C7481

Client: Lidl UK GmbH
Date: 16/11/2017

Method: JCB 3CX with a 600mm diameter toothed bucket and a concrete breaker.
Scale: 1:25

Logged By: AW | Checked By: AG

SAMPLE DETAILS | STRATA RECORD

Type	Depth From - To(m)	Vane Results kN/m2 {}{PID}	Ground -water	Description	Depth (m)	Level (m AOD) PID (ppm)	Legend	Backfill
				MADE GROUND - Black Asphalt.	0.05			
ES	0.30			MADE GROUND - Reddish brown slightly clayey sandy GRAVEL. Sand is fine to coarse. Gravel is angular to sub-angular fine to coarse of brick and tile (Sub-base).	0.40			
B ES	0.50 0.50	75.0		MADE GROUND - Stiff medium to high strength blueish grey silty slightly sandy slightly gravelly CLAY. Low plasticity. Sand is fine to coarse.	0.70			
D ES	1.00 1.00	70.0	1	Stiff medium strength orangish brown mottled grey slightly sandy slightly gravelly CLAY. Low plasticity (field description). Sand is fine to coarse. Gravel is angular fine to coarse of sandstone and mudstone.				
D	1.70			*From 2.4m bgl - becoming brown and increasingly sandy with depth.*	1.80			
D	1.90		2	Very weak brown SANDSTONE with frequent interbeds of siltstone. Recovered as slightly clayey angular gravel of tabular fine grained sandstone and siltstone.	2.00			
				End of trial pit at 2.00m				
			3					
			4					

Remarks and Groundwater Observations

1. Trial pit completed a 2.00m bgl.
2. Trial pit broken out using hydraulic breaker.
3. No groundwater encountered.
4. Trial pit filled with stone and slotted monitoring pipe for soakaway testing.

GL (m AOD)
Easting:
Northing:

Fig No.
SA02

TRIAL PIT RECORD

TP No. **SA03**
Sheet 1 of 1

Site: Wakefield Road, Mapplewell
Contract No: C7481

Client: Lidl UK GmbH
Date: 16/11/2017

Method: JCB 3CX with a 600mm diameter toothed bucket and a concrete breaker.
Scale: 1:25

Logged By: AW | Checked By: AG

SAMPLE DETAILS | STRATA RECORD

Type	Depth From - To(m)	Vane Results kN/m2 {}{PID}	Ground -water	Description	Depth (m)	Level (m AOD) PID (ppm)	Legend	Backfill
				MADE GROUND - Grey reinforced CONCRETE.	0.07			
				MADE GROUND - Grey gravelly SAND with rare steel fragments. Sand is fine to coarse. Gravel is sub-rounded to sub-angular fine to coarse of brick.	0.30			
B ES	0.50 0.50	50.0		MADE GROUND - Firm medium strength blueish grey silty slightly sandy slightly gravelly CLAY. Low plasticity (field description). Sand is fine to coarse. Gravel is sub-rounded to sub-angular fine to coarse of brick and sandstone.	0.80			
B ES	1.00 1.00	60.0	1	MADE GROUND - Stiff medium strength blueish grey silty slightly sandy slightly gravelly CLAY. Intermediate plasticity. Sand is fine to coarse. Gravel is sub-rounded to sub-angular fine to coarse of sandstone.	1.40			
B ES	2.00 2.00	110.0	2	Firm high strength orangish brown mottled grey sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is sub-rounded fine to coarse of sandstone.				
				End of trial pit at 2.40m	2.40			
			3					
			4					

Remarks and Groundwater Observations

1. Trial pit completed a 2.40m bgl.
2. Trial pit broken out using hydraulic breaker.
3. No groundwater encountered.
4. Trial pit filled with stone and slotted monitoring pipe for soakaway testing.

GL (m AOD)
Easting:
Northing:

Fig No.
SA03

TRIAL PIT RECORD

TP No. **TP01**
Sheet 1 of 1

Site: Wakefield Road, Mapplewell
Contract No: C7481

Client: Lidl UK GmbH
Date: 15/11/2017

Method: JCB 3CX with a 600mm diameter toothed bucket and a concrete breaker.
Scale: 1:25

Logged By: AW | Checked By: AG

SAMPLE DETAILS | STRATA RECORD

Type	Depth From - To(m)	Vane Results kN/m2 {}{PID}	Ground -water	Description	Depth (m)	Level (m AOD) PID (ppm)	Legend	Backfill
				MADE GROUND - Grey reinforced CONCRETE.				
					0.20			
ES	0.30			MADE GROUND - Reddish brown slightly clayey sandy GRAVEL. Sand is fine to coarse. Gravel is angular to sub-angular fine to coarse of brick and tile (Sub-base).	0.40			
				MADE GROUND - Stiff high strength yellowish brown mottled grey and orange slightly sandy CLAY. Low plasticity (field description). Sand is fine to coarse and in isolated pockets.				
B	0.80	100.0						
ES	0.80							
			1					
				MADE GROUND - Dark brownish grey slightly silty sandy slightly gravelly CLAY. Low plasticity (field description). Sand is fine to coarse. Gravel is sub-angular to sub-rounded of brick.	1.10			
ES	1.30							
				Stiff orangish brown mottled grey slightly sandy slightly gravelly CLAY. Low plasticity (field description). Sand is fine to coarse. Gravel is angular fine to coarse of sandstone, mudstone and coal lithorelicts.	1.40			
B	1.80							
D	1.80							
ES	1.80							
			2					
				From 2.2m bgl - becoming brown and increasingly sandy with depth.				
D	2.50							
					2.70			
D	2.80			Very weak greyish brown SANDSTONE with frequent interbeds of siltstone. Recovered as slightly clayey angular gravel of tabular fine grained sandstone and siltstone.	2.90			
			3	End of trial pit at 2.90m				
			4					

Remarks and Groundwater Observations

1. Trial pit completed a 2.90m bgl.
2. Trial pit broken out using hydraulic breaker.
3. No groundwater encountered.
4. Trial pit backfilled with arisings upon completion.

GL (m AOD)
Easting:
Northing:

Fig No. TP01

TRIAL PIT RECORD

TP No. **TP02**
Sheet 1 of 1

Site: Wakefield Road, Mapplewell
Contract No: C7481

Client: Lidl UK GmbH
Date: 15/11/2017

Method: JCB 3CX with a 600mm diameter toothed bucket and a concrete breaker.
Scale: 1:25

Logged By: AW | Checked By: AG

SAMPLE DETAILS | STRATA RECORD

Type	Depth From - To(m)	Vane Results kN/m2 {}{PID}	Ground -water	Description	Depth (m)	Level (m AOD) PID (ppm)	Legend	Backfill
				MADE GROUND - Grey reinforced CONCRETE.	0.20			
ES	0.30			MADE GROUND - Reddish brown slightly clayey sandy GRAVEL. Sand is fine to coarse. Gravel is angular to sub-angular fine to coarse of brick and tile (Sub-base).	0.40			
ES	0.70	70.0		MADE GROUND - Stiff medium strength yellowish brown mottled grey and orange slightly sandy CLAY. Low plasticity (field description). Sand is fine to coarse and in isolated pockets.				
			1		1.10			
B	1.40			MADE GROUND - Stiff dark brownish grey slightly silty sandy slightly gravelly CLAY. High plasticity. Sand is fine to coarse. Gravel is sub-angular to sub-rounded of brick.				
ES	1.40				1.50			
				Stiff high strength orangish brown mottled grey slightly sandy slightly gravelly CLAY. High plasticity. Sand is fine to coarse. Gravel is angular fine to coarse of sandstone mudstone and coal lithorelicts.				
B	1.90	90.0						
ES	1.90		2					
D	2.20							
				From 2.4m bgl - becoming brown and increasingly sandy with depth.				
D	2.60							
			3		3.00			
D	3.10			Very weak blueish grey SANDSTONE with frequent interbeds of siltstone. Recovered as slightly clayey angular gravel of tabular fine grained sandstone and siltstone.	3.20			
				End of trial pit at 3.20m				
			4					

Remarks and Groundwater Observations

1. Trial pit completed a 3.20m bgl.
2. Trial pit broken out using hydraulic breaker.
3. No groundwater encountered.
4. Trial pit backfilled with arisings upon completion.

GL (m AOD)
Easting:
Northing:

Fig No. TP02

TRIAL PIT RECORD

TP No. **TP03**
Sheet 1 of 1

Site: Wakefield Road, Mapplewell
Contract No: C7481

Client: Lidl UK GmbH
Date: 15/11/2017

Method: JCB 3CX with a 600mm diameter toothed bucket and a concrete breaker.
Scale: 1:25

Logged By: AW | Checked By: AG

SAMPLE DETAILS | STRATA RECORD

Type	Depth From - To(m)	Vane Results kN/m2 {}{PID}	Ground -water	Description	Depth (m)	Level (m AOD) PID (ppm)	Legend	Backfill
				MADE GROUND - Grey reinforced CONCRETE.	0.20			
ES	0.30			MADE GROUND - Reddish brown slightly sandy slightly gravelly COBBLES of whole and half bricks. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of brick.	0.30			
B ES	0.80 0.80	75.0		MADE GROUND - Stiff medium to high strength yellowish brown mottled grey and orange slightly sandy CLAY. Low plasticity (field description). Sand is fine to coarse. Gravel is sub-angular to sub-rounded fine to coarse of sandstone and brick. Slight organic odour in parts.				
			1	*At 0.3m bgl - black staining in northern wall of the trial pit. Strong hydrocarbon odour.*	1.30			
B ES	1.50 1.50	60.0		Stiff medium strength greyish green mottled orange slightly sandy CLAY. High plasticity. Sand is fine to coarse. (Possibly reworked).				
			2		2.20			
D	2.40			Stiff friable orangish brown mottled grey slightly sandy slightly gravelly CLAY. Low plasticity (field description). Sand is fine to coarse. Gravel is angular fine to coarse of sandstone mudstone and coal lithorelicts.				
				From 2.5m bgl - becoming brown and increasingly sandy with depth.				
D	2.80				2.90			
			3	Very weak brown SANDSTONE with frequent interbeds of siltstone. Recovered as slightly clayey angular gravel of tabular fine grained sandstone and siltstone.				
D	3.10							
				End of trial pit at 3.30m	3.30			
			4					

Remarks and Groundwater Observations

1. Trial pit completed a 3.30m bgl.
2. Trial pit broken out using hydraulic breaker.
3. No groundwater encountered.
4. Trial pit backfilled with arisings upon completion.

GL (m AOD)
Easting:
Northing:

Fig No. TP03

TRIAL PIT RECORD

TP No. **TP04**
Sheet 1 of 1

Site: Wakefield Road, Mapplewell
Contract No: C7481

Client: Lidl UK GmbH
Date: 15/11/2017

Method: JCB 3CX with a 600mm diameter toothed bucket and a concrete breaker.
Scale: 1:25

Logged By: AW | Checked By: AG

SAMPLE DETAILS | STRATA RECORD

Type	Depth From - To(m)	Vane Results kN/m2 {}{PID}	Ground -water	Description	Depth (m)	Level (m AOD) PID (ppm)	Legend	Backfill
				MADE GROUND - Dark brown silty gravelly sandy TOPSOIL. Low cobble content of whole and half bricks. Sand is fine to coarse. Gravel is sub-angular to sub-rounded fine to coarse of sandstone and brick.				
B ES	0.30 - 1.00 0.30			MADE GROUND - Brown mottled grey in parts WASTE comprising of 70% pink and blue hot water bottles and valves bound in a clay matrix.	0.30			
ES	0.60							
B	1.00 - 1.50		1	MADE GROUND - Greyish black WASTE comprising of plastic, car radiator, steel drums, polystyrene, wood, white powder and hot water bottles bound in a clay matrix.	1.00			
			2					
				Firm dark brown silty intermediate plasticity CLAY with a slight hydrocarbon odour in upper 300mm.	2.20			
D ES	2.40 2.40							
				From 2.7m bgl - becoming brown and increasingly sandy with depth.				
D	2.90		3					
				Very weak brown SANDSTONE with frequent interbeds of siltstone. Recovered as slightly clayey angular gravel of tabular fine grained sandstone and siltstone.	3.00			
D	3.20							
				End of trial pit at 3.30m	3.30			
			4					

Remarks and Groundwater Observations

1. Trial pit completed a 3.30m bgl.
2. No groundwater encountered.
3. Trial pit backfilled with arisings upon completion.

GL (m AOD)
Easting:
Northing:

Fig No.
TP04

TRIAL PIT RECORD

TP No. **TP05**
Sheet 1 of 1

Site: Wakefield Road, Mapplewell
Contract No: C7481

Client: Lidl UK GmbH
Date: 15/11/2017

Method: JCB 3CX with a 600mm diameter toothed bucket and a concrete breaker.
Scale: 1:25

Logged By: AW | Checked By: AG

SAMPLE DETAILS | STRATA RECORD

Type	Depth From - To(m)	Vane Results kN/m2 {}{PID}	Ground -water	Description	Depth (m)	Level (m AOD) PID (ppm)	Legend	Backfill
				MADE GROUND - Dark brown silty gravelly sandy TOPSOIL. Sand is fine to coarse. Gravel is sub-angular to sub-rounded fine to coarse of sandstone and brick.	0.10			
B ES	0.50 - 1.10 0.50			MADE GROUND - Brown mottled grey in parts WASTE comprising of 70% pink and blue hot water bottles and valves bound in a clay matrix.				
ES	1.00		1					
				Grey dark brown silty CLAY. High plasticity (field description). Slight organic odour. Possibly reworked.	1.10			
B	1.30 - 1.80							
				End of trial pit at 1.90m	1.90			
			2					
			3					
			4					

Remarks and Groundwater Observations

1. Trial pit terminated at 1.90m bgl due to rapid perched water ingress.
2. Rapid perched water ingress from north western corner of the pit. from 1.3m.
3. Trial pit backfilled with arisings upon completion.

GL (m AOD)
Easting:
Northing:

Fig No.
TP05

TRIAL PIT RECORD

TP No. **TP06**
Sheet 1 of 1

Site: Wakefield Road, Mapplewell
Contract No: C7481

Client: Lidl UK GmbH
Date: 15/11/2017

Method: JCB 3CX with a 600mm diameter toothed bucket and a concrete breaker.
Scale: 1:25

Logged By: AW | Checked By: AG

SAMPLE DETAILS | STRATA RECORD

Type	Depth From - To(m)	Vane Results kN/m2 {}{PID}	Ground -water	Description	Depth (m)	Level (m AOD) PID (ppm)	Legend	Backfill
				MADE GROUND - Black Asphalt.	0.05			
				MADE GROUND - Grey CONCRETE.	0.30			
ES	0.35			MADE GROUND - Reddish brown slightly clayey sandy GRAVEL. Sand is fine to coarse. Gravel is angular to sub-angular fine to coarse of brick and tile. (Sub-base).	0.40			
ES	0.65			MADE GROUND - Black gravelly SAND. Sand is fine to coarse of ash. Gravel is angular to sub-angular of brick and black stained wood. Ashy odour.	0.70			
D	0.80	90.0		Stiff high strength brown mottled orange and grey slightly gravelly slightly sandy CLAY. Low plasticity (field description). Sand is fine to coarse. Gravel is angular to sub-angular to sub-angular fine to coarse of sandstone.				
ES	0.80		1					
					1.70			
D	2.00	60.0		Firm medium strength greenish grey dark grey in parts mottled brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is sub-angular to sub-rounded fine to coarse of sandstone.				
ES	2.00		2					
					2.40			
D	2.60	90.0		Stiff high strength brown mottled grey slightly sandy slightly gravelly CLAY. Low plasticity (field description). Sand is fine to coarse. Gravel is angular fine to coarse of weak sandstone.				
ES	2.60			*From 2.5m bgl - becoming brown and increasingly sandy with depth.*				
D	2.80		3					
					3.30			
D	3.40			Very weak brown SANDSTONE with frequent interbeds of siltstone. Recovered as slightly clayey angular gravel of tabular fine grained sandstone and siltstone.	3.50			
				End of trial pit at 3.50m				
			4					

Remarks and Groundwater Observations

1. Trial pit completed a 3.50m bgl.
2. Trial pit broken out using hydraulic breaker.
3. No groundwater encountered.
4. Trial pit backfilled with arisings upon completion.

GL (m AOD)
Easting:
Northing:

Fig No. TP06

TRIAL PIT RECORD

TP No. **TP07**
Sheet 1 of 1

Site: Wakefield Road, Mapplewell
Contract No: C7481

Client: Lidl UK GmbH
Date: 16/11/2017

Method: JCB 3CX with a 600mm diameter toothed bucket and a concrete breaker.
Scale: 1:25

Logged By: GB | Checked By: AG

SAMPLE DETAILS | STRATA RECORD

Type	Depth From - To(m)	Vane Results kN/m2 {}{PID}	Ground -water	Description	Depth (m)	Level (m AOD) PID (ppm)	Legend	Backfill
B	0.10 - 0.20			MADE GROUND - Black Asphalt.	0.06			
ES	0.20			MADE GROUND - Dark brownish grey slightly clayey very gravelly SAND with low cobble content of whole and half bricks. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of sandstone, slate and burnt shale.	0.25			
ES	0.40							
D	0.60			MADE GROUND - Firm grey silty slightly gravelly CLAY. High plasticity (field description). Gravel is angular of sandstone, limestone and coal.	0.75			
B	0.80 - 1.00			Firm to stiff blueish grey mottled orangish brown slightly gravelly sandy CLAY. High plasticity (field description). Sand is fine to coarse. Gravel is angular fine of sandstone and rare coal.				
ES	0.90		1					
D	1.80		2	*From 2.0 - becoming stiff and grey, mottled brown.*				
				Very weak brown SANDSTONE with frequent interbeds of siltstone. Recovered as slightly clayey angular gravel of tabular fine grained sandstone and siltstone.	2.20			
			3	*From 2.8m bgl - Recovered as cobbles.*				
				End of trial pit at 3.20m	3.20			
			4					

Remarks and Groundwater Observations

1. Trial pit completed a 3.20m bgl.
2. Trial pit broken out using hydraulic breaker.
3. No groundwater encountered.
4. Trial pit backfilled with arisings upon completion.

GL (m AOD)
Easting:
Northing:

Fig No.
TP07

TRIAL PIT RECORD

TP No. **TP08**
Sheet 1 of 1

Site: Wakefield Road, Mapplewell
Contract No: C7481

Client: Lidl UK GmbH
Date: 16/11/2017

Method: JCB 3CX with a 600mm diameter toothed bucket and a concrete breaker.
Scale: 1:25

Logged By: GB | Checked By: AG

SAMPLE DETAILS | STRATA RECORD

Type	Depth From - To(m)	Vane Results kN/m2 {}{PID}	Ground -water	Description	Depth (m)	Level (m AOD) PID (ppm)	Legend	Backfill
				MADE GROUND - Black degraded ASPHALT.	0.10			
ES	0.30			MADE GROUND - Dark reddish brown slightly clayey very gravelly SAND. Sand is fine to coarse. Gravel is angular fine to coarse of brick, sandstone, limestone and asphalt from above. High cobble content of of angular brick.				
B ES	0.80 - 0.90 0.80		1	Very stiff blueish grey mottled orange brown sandy slightly gravelly CLAY. Intermediate plasticity. Sand is fine to coarse. Gravel is angular fine to coarse of sandstone and rare coal.	0.70			
			2	Very weak brown SANDSTONE with frequent interbeds of siltstone. Recovered as slightly clayey angular gravel of tabular fine grained sandstone and siltstone.	1.90			
				From 2.5m bgl - recovered as cobbles.				
				End of trial pit at 2.70m	2.70			
			3					
			4					

Remarks and Groundwater Observations

1. Trial pit completed a 2.70m bgl.
2. Trial pit broken out using hydraulic breaker.
3. No groundwater encountered.
4. Trial pit backfilled with arisings upon completion.

GL (m AOD)
Easting:
Northing:

Fig No.
TP08

WINDOW SAMPLING RECORD

BH No. **WS01**
Sheet 1 of 1

Site: Wakefield Road, Mapplewell
Contract No: C7481

Client: Lidl UK GmbH
Date: 16/11/2017

Method: Tracked window sample rig.
Scale: 1:25

Logged By: AW | Checked By: AG
Driller:

SAMPLE DETAILS | STRATA RECORD

Type	Depth From - To(m)	(N) {PID} Shear Vane	Ground-water	Description	Depth (m)	Level (m AOD)	Legend	Well
				MADE GROUND - Dark brown silty gravelly sandy TOPSOIL. Sand is fine to coarse. Gravel is sub-angular to sub-rounded fine to coarse of sandstone and brick.	0.20			
				MADE GROUND - Brown mottled grey in parts WASTE comprising of 70% pink and blue hot water bottles and valves bound in a clay matrix.				
				End of Borehole at 0.60m	0.60			

1
2
3
4

Remarks and Water Observations:

1. Window sample borehole refusal at 0.5m bgl due to bouncing on rubber.
2. No groundwater encountered.
3. Window sample borehole backfilled with arisings upon completion.

GL (m AOD)
Easting:
Northing:

Fig No.
WS01

WINDOW SAMPLING RECORD

BH No. **WS01A**
Sheet 1 of 1

Site: Wakefield Road, Mapplewell
Contract No: C7481

Client: Lidl UK GmbH
Date: 16/11/2017

Method: Tracked window sample rig.
Scale: 1:25

Logged By: AW | Checked By: AG
Driller: RP Drilling Ltd

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	(N) {PID} Shear Vane	Ground-water	Description	Depth (m)	Level (m AOD)	Legend	Well
				MADE GROUND - Dark brown sandy clay TOPSOIL. Sand is fine to coarse.				
				MADE GROUND - Firm to stiff greyish brown mottled orange slightly sandy slightly gravelly CLAY. Low plasticity (field description). Sand is fine to coarse. Gravel is sub-rounded fine to coarse of sandstone and brick.	0.20			
ES	0.50							
		N=7 (1,1/2,2,1,2)	1	Firm to stiff medium strength greyish brown mottled orange slightly sandy slightly gravelly CLAY. Low plasticity (field description). Sand is fine to coarse. Gravel is sub-rounded to sub-angular fine to coarse of weak sandstone. (Possibly reworked).	1.00			
ES	1.30							
				Soft to firm grey very silty CLAY. High plasticity (field description). Small fragments of wood and grass. Slight organic odour. (Possibly reworked).	1.60			
ES	1.80							
		N=10 (1,2/2,2,2,4)	2	Firm to stiff medium strength orangish brown mottled grey in parts slightly silty slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is sub-rounded to sub-angular fine to coarse weak sandstone.	2.10			
D	2.50							
D	2.80							
		N=39 (3,4/6,6,10,17)	3	Very weak brown SANDSTONE with frequent interbeds of siltstone. Recovered as slightly clayey angular gravel of tabular fine grained sandstone and siltstone.	2.90			
		50 (25 for 60mm/50 for 100mm)		End of Borehole at 3.50m	3.50			
			4					

Remarks and Water Observations:

1. Window sample borehole refusal at 3.5m bgl.
2. No groundwater encountered.
3. 50mm diameter gas / groundwater monitoring well installed as detailed above.

GL (m AOD)
Easting:
Northing:

Fig No.
WS01A

WINDOW SAMPLING RECORD

BH No. **WS02**
Sheet 1 of 1

Site: Wakefield Road, Mapplewell
Contract No: C7481

Client: Lidl UK GmbH
Date: 16/11/2017

Method: Tracked window sample rig.
Scale: 1:25

Logged By: AW | Checked By: AG

Driller: RP Drilling Ltd

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	(N) {PID} Shear Vane	Ground-water	Description	Depth (m)	Level (m AOD)	Legend	Well
				MADE GROUND - Black ASPHALT.	0.05			
				MADE GROUND - Reinforced CONCRETE.	0.20			
				MADE GROUND - Greyish brown sandy GRAVEL. Sand is fine to coarse. Gravel is angular fine to coarse of limestone.				
ES	0.50			MADE GROUND - Black sandy GRAVEL. Sand is fine to coarse of ash. Gravel is angular to sub-angular fine to coarse of brick and clinker.	0.45			
		100.0		Stiff high to medium strength orangish brown mottled grey slightly gravelly CLAY. Low plasticity (field description). Gravel is sub-rounded fine to coarse of weak mudstone and sandstone.	0.60			
ES	0.90							
		N=6 (1,1/1,2,1,2)	1					
D	1.50							
		60.0						
		N=7 (0,1/1,1,2,3)	2					
				Firm low to medium strength greyish brown mottled orange, brown and black slightly sandy CLAY. High plasticity (field description). Sand is fine to coarse.	2.10			
D	2.50	45.0						
				Stiff orangish brown very sandy slightly gravelly CLAY. Low plasticity (field description). Sand is fine to coarse. Gravel is angular to sub-angular fine to coarse of weak sandstone.	2.60			
D	2.90							
		N=21 (5,5/5,4,5,7)	3	Very stiff high strength friable very sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to sub-angular fine to coarse of sandstone.	3.00			
D	3.50	65.0						
		50 (25 for 105mm/50 for 90mm)	4	End of Borehole at 4.00m	4.00			

Remarks and Water Observations:

1. Concrete cored using a 150mm diameter corer.
2. Window sample borehole refusal at 4.0m bgl.
3. No groundwater encountered.
4. 50mm diameter gas / groundwater monitoring well installed as detailed above.

GL (m AOD)
Easting:
Northing:

Fig No.
WS02

WINDOW SAMPLING RECORD

BH No. **WS03**
Sheet 1 of 1

Site: Wakefield Road, Mapplewell
Contract No: C7481

Client: Lidl UK GmbH
Date: 16/11/2017

Method: Tracked window sample rig.
Scale: 1:25

Logged By: AW | Checked By: AG
Driller: RP Drilling Ltd

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	(N) {PID} Shear Vane	Ground-water	Description	Depth (m)	Level (m AOD)	Legend	Well
				MADE GROUND - Reinforced CONCRETE.	0.10			
D	0.30			MADE GROUND - Reddish brown slightly clayey sandy GRAVEL. Sand is fine to coarse. Gravel is angular to sub-angular fine to coarse of brick and tile (Sub-base).	0.40			
D	0.50			MADE GROUND - Light brown gravelly CLAY. High plasticity (field description). Gravel is angular to sub-angular fine to coarse of brick and limestone.	0.70			
				End of Borehole at 0.70m				

1
2
3
4

Remarks and Water Observations:

1. Concrete cored using a 150mm diameter corer.
2. Window sample borehole refusal at 0.7m bgl.
3. Rapid groundwater ingress rising to 0.3m bgl after 5 minutes.
4. Window sample borehole backfilled with arisings upon completion.

GL (m AOD)
Easting:
Northing:

Fig No.
WS03

WINDOW SAMPLING RECORD

BH No. **WS04**
Sheet 1 of 1

Site: Wakefield Road, Mapplewell
Contract No: C7481

Client: Lidl UK GmbH
Date: 16/11/2017

Method: Tracked window sample rig.
Scale: 1:25

Logged By: AW | Checked By: AG
Driller: RP Drilling Ltd

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	(N) {PID} Shear Vane	Ground-water	Description	Depth (m)	Level (m AOD)	Legend	Well
				MADE GROUND - Reinforced CONCRETE.				
ES	0.25			MADE GROUND - Reddish brown slightly clayey sandy GRAVEL. Sand is fine to coarse. Gravel is angular to sub-angular fine to coarse of brick and tile (Sub-base).	0.20 0.35			
D	0.50	90.0		Firm to stiff high strength orangish brown slightly gravelly CLAY. Low plasticity (field description). Sand is fine to coarse. (Possibly reworked).	0.70			
D	0.90	60.0		Firm medium strength dark brownish green mottled brown and black silty CLAY. Low plasticity (field description). Slight organic odour.				
		N=10 (2,2/1,2,3,4)	1	Stiff medium to high strength orangish grey sandy CLAY. Low plasticity (field description). Sand is fine to coarse.	1.00			
				From 1.4m bgl - becoming brown and increasingly sandy with depth.				
D	1.80	80.0						
		N=25 (2,4/5,5,6,9)	2					
				Extremely weak brown SANDSTONE with frequent interbeds of siltstone. Recovered as slightly clayey angular gravel of tabular fine grained sandstone and siltstone.	2.10			
D	2.50							
		50 (10,12/50 for 165mm)	3	End of Borehole at 3.00m	3.00			
			4					

Remarks and Water Observations:

1. Concrete cored using a 150mm diameter corer.
2. Window sample borehole refusal at 3.0m bgl.
3. No groundwater encountered.
4. 50mm diameter gas / groundwater monitoring well installed as detailed above.

GL (m AOD)
Easting:
Northing:

Fig No.
WS04

WINDOW SAMPLING RECORD

BH No. **WS05**
Sheet 1 of 1

Site: Wakefield Road, Mapplewell
Contract No: C7481

Client: Lidl UK GmbH
Date: 16/11/2017

Method: Tracked window sample rig.
Scale: 1:25

Logged By: AW | Checked By: AG
Driller: RP Drilling Ltd

SAMPLE DETAILS				STRATA RECORD			
Type	Depth From - To(m)	(N) {PID} Shear Vane	Ground-water	Description	Depth (m)	Level (m AOD)	Legend / Well
				MADE GROUND - Reinforced CONCRETE.			
D	0.20			MADE GROUND - Reddish brown slightly clayey sandy GRAVEL. Sand is fine to coarse. Gravel is angular to sub-angular fine to coarse of brick and tile (Sub-base).	0.15		
ES	0.35			MADE GROUND - Blueish grey slightly sandy slightly gravelly CLAY. Low plasticity (field description). Sand is fine to coarse with some ash. Gravel is angular to sub-angular fine to coarse of brick.	0.30 0.40		
D	0.70			Firm to stiff orangish brown mottled grey slightly sandy slightly gravelly CLAY. Low plasticity (field description). Sand is fine to coarse. Gravel is angular to sub-angular fine to coarse of sandstone and mudstone. (Possibly reworked).			
		N=7 (1,2/2,2,1,2)	1				
D	1.50						
D	2.00 - 3.00	N=11 (1,2/2,2,3,4)	2	Very poor recovery - 0.05m Recovered - (Firm to stiff medium strength orangish brown mottled grey CLAY. Low plasticity (field description). Sand is fine to coarse. Gravel is angular to sub-angular fine to coarse of sandstone and mudstone.)	2.00		
		50 (7,8/50 for 285mm)	3	End of Borehole at 3.00m	3.00		
			4				

Remarks and Water Observations:

1. Concrete cored using a 150mm diameter corer.
2. Window sample borehole refusal at 3.0m bgl.
3. No groundwater encountered.
4. 50mm diameter gas / groundwater monitoring well installed as detailed above.

GL (m AOD)
Easting:
Northing:

Fig No.
WS05

WINDOW SAMPLING RECORD

BH No. **WS06**
Sheet 1 of 1

Site: Wakefield Road, Mapplewell
Contract No: C7481

Client: Lidl UK GmbH
Date: 16/11/2017

Method: Tracked window sample rig.
Scale: 1:25

Logged By: AW | Checked By: AG

Driller: RP Drilling Ltd

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	(N) {PID} Shear Vane	Ground-water	Description	Depth (m)	Level (m AOD)	Legend	Well
				MADE GROUND - Black ASPHALT.	0.05			
				MADE GROUND - Reinforced CONCRETE.				
D	0.40			MADE GROUND - Greyish brown sandy GRAVEL. Sand is fine to coarse. Gravel is angular fine to coarse of limestone. (Sub-base).	0.30			
				Soft to firm low to medium strength orangish brown mottled grey in parts slightly silty slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is sub-rounded to sub-angular fine to coarse weak sandstone. (Possibly reworked).	0.50			
D	1.00	60.0 N=5 (1,1/1,1,1,2)	1					
D	1.50	30.0		Soft low strength dark brownish green mottled brown and black silty CLAY. Low plasticity (field description). Slight organic odour. (Possibly buried topsoil).	1.50			
				Stiff high strength orangish grey sandy CLAY. Low plasticity (field description). Sand is fine to coarse.	1.80			
		N=17 (2,2/2,5,5,5) 80.0	2					
D	2.60							
D	2.90			Very weak brown SANDSTONE with frequent interbeds of siltstone. Recovered as slightly clayey angular gravel of tabular fine grained sandstone and siltstone.	2.80			
		50 (7,8/50 for 125mm)	3		3.00			
				End of Borehole at 3.00m				
			4					

Remarks and Water Observations:

1. Concrete cored using a 150mm diameter corer.
2. Window sample borehole refusal at 3.0m bgl.
3. No groundwater encountered.
4. 50mm diameter gas / groundwater monitoring well installed as detailed above.

GL (m AOD)
Easting:
Northing:

Fig No.
WS06

WINDOW SAMPLING RECORD

BH No. **WS07**
Sheet 1 of 1

Site: Wakefield Road, Mapplewell
Contract No: C7481

Client: Lidl UK GmbH
Date: 16/11/2017

Method: Tracked window sample rig.
Scale: 1:25

Logged By: AW | Checked By: AG

Driller: RP Drilling Ltd

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	(N) {PID} Shear Vane	Ground-water	Description	Depth (m)	Level (m AOD)	Legend	Well
				MADE GROUND - Black ASPHALT.	0.05			
				MADE GROUND - Reinforced CONCRETE.	0.20			
ES	0.30			MADE GROUND -Black and yellow in parts gravelly SAND. Sand is fine to coarse. Gravel is angular to sub-angular fine to coarse of limestone and sandstone.	0.45			
				MADE GROUND - Reddish brown slightly clayey sandy GRAVEL. Sand is fine to coarse. Gravel is angular to sub-angular fine to coarse of brick and tile (Sub-base).	0.55			
ES	0.80	90.0		MADE GROUND - Firm to stiff high strength mottled orange grey slightly gravelly slightly sandy CLAY. Low plasticity (field description). Gravel is angular to sub-angular fine to coarse of sandstone and mudstone. Thin strand of straw present.				
		N=8 (1,2/2,2,2,2)	1					
				Soft to firm low strength greenish grey mottled orange brown in parts sandy silty CLAY. High plasticity (field description). Sand is fine to coarse. (Possibly reworked).	1.20			
ES	1.30				1.45			
				Stiff medium strength orangish brown mottled grey slightly sandy slightly gravelly CLAY. Low plasticity (field description). Sand is fine to coarse. Gravel is angular fine to coarse of sandstone mudstone and coal lithorelicts.				
D	1.60	60.0						
ES	1.60							
D	1.85							
D	1.95				1.90			
		N=17 (1,2/3,3,5,6)	2	Stiff high strength dark brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is sub-rounded to sub-angular fine to coarse of coarse sandstone and coal lithorelicts.				
D	2.50							
		50 (4,6/50 for 245mm)	3	End of Borehole at 3.00m	3.00			
			4					

Remarks and Water Observations:

1. Concrete cored using a 150mm diameter corer.
2. Window sample borehole refusal at 3.0m bgl.
3. No groundwater encountered.
4. 50mm diameter gas / groundwater monitoring well installed as detailed above.

GL (m AOD)
Easting:
Northing:

Fig No.
WS07

WINDOW SAMPLING RECORD

BH No. **WS08**
Sheet 1 of 1

Site: Wakefield Road, Mapplewell
Contract No: C7481

Client: Lidl UK GmbH
Date: 16/11/2017

Method: Tracked window sample rig.
Scale: 1:25

Logged By: AW | Checked By: AG
Driller: RP Drilling Ltd

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	(N) {PID} Shear Vane	Ground-water	Description	Depth (m)	Level (m AOD)	Legend	Well
				MADE GROUND - Black ASPHALT.	0.05			
ES	0.20			MADE GROUND - Reddish brown slightly clayey sandy GRAVEL. Sand is fine to coarse. Gravel is angular to sub-angular fine to coarse of brick and tile (Sub-base).	0.30			
ES	0.50	80.0		Stiff high strength blueish grey gravelly CLAY. Low plasticity (field description). Gravel is angular of mudstone. Slight organic odour. Possibly reworked.	0.70			
D	0.90	80.0		Stiff high strength orangish grey sandy CLAY. Low plasticity (field description). Sand is fine to coarse.				
ES	0.90	N=15 (2,3/3,3,4,5)	1	Very stiff medium strength friable very sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to sub-angular fine to coarse of sandstone.	1.00			
D	1.20							
D	1.80							
		50 (6,10/50 for 145mm)	2	End of Borehole at 2.00m	2.00			
			3					
			4					

Remarks and Water Observations:

1. Concrete cored using a 150mm diameter corer.
2. Window sample borehole refusal at 2.0m bgl.
3. No groundwater encountered.
4. Window sample borehole backfilled with arisings upon completion.

GL (m AOD)
Easting:
Northing:

Fig No.
WS08

BOREHOLE RECORD

BH No. **BH01**
Sheet 1 of 1

Site: Wakefield Road, Mapplewell

Contract No: C7481

Client: Lidl UK GmbH

Date: 15/11/2017

Method: Tracked rotary drilling rig using air mist flush

Scale: 1:150

Logged By: GB | Checked By: AG

Driller:

SAMPLE DETAILS

Depth From - To(m)	TCR	SCR	RQD	FI	Ground -water

STRATA RECORD

Depth (m)	Level (m AOD)	Legend	Well

MADE GROUND - Brown slightly sandy slightly gravelly CLAY. Gravel is angular of sandstone, siltstone and brick.

2.00

Grey SILTSTONE with frequent thin interbeds of fine grained sandstone.

13.00

Light grey fine grained SANDSTONE.

15.00

Grey SILTSTONE with frequent thin interbeds of fine grained sandstone.

18.70

Black COAL.

19.70

Grey SILTSTONE with frequent thin interbeds of fine grained sandstone.

30.00

End of Borehole at 30.00m

TCR	SCR	RQD	FI

Remarks and Groundwater Observations:

1. Borehole complete at 30.0m bgl. 2. Groundwater not recorded due to flush techniques. 3. Backfilled with arisings and bentonite seal upon completion.

GL (m AOD)

Eastings:

Northings:

Fig No.

BH01

BOREHOLE RECORD

BH No. **BH02**
Sheet 1 of 1

Site: Wakefield Road, Mapplewell

Contract No: C7481

Client: Lidl UK GmbH

Date: 15/11/2017

Method: Tracked rotary drilling rig using air mist flush

Scale: 1:150

Logged By: GB | Checked By: AG

Driller:

SAMPLE DETAILS

Depth From - To(m)	TCR	SCR	RQD	FI	Ground -water

STRATA RECORD

Depth (m)	Level (m AOD)	Legend	Well
3.00			
14.50			
16.50			
17.00			
17.80			
18.80			

MADE GROUND - Brown slightly sandy slightly gravelly CLAY. Gravel is angular of sandstone, siltstone and brick.

Grey SILTSTONE with frequent thin interbeds of fine grained sandstone.

Light grey fine grained SANDSTONE.

Grey SILTSTONE with frequent thin interbeds of fine grained sandstone.

Black COAL.

Grey SILTSTONE with frequent thin interbeds of fine grained sandstone.

End of Borehole at 18.80m

Remarks and Groundwater Observations:

1. Borehole complete at 18.8m bgl. 2. Groundwater not recorded due to flush techniques. 3. Backfilled with arisings and bentonite seal upon completion.

GL (m AOD)

Eastings:

Northings:

Fig No.

BH02

BOREHOLE RECORD

BH No. **BH03**
Sheet 1 of 1

Site: Wakefield Road, Mapplewell

Contract No: C7481

Client: Lidl UK GmbH

Date: 16/11/2017

Method: Tracked rotary drilling rig using air mist flush

Scale: 1:150

Logged By: GB | Checked By: AG

Driller:

SAMPLE DETAILS

Depth From - To(m)	TCR	SCR	RQD	FI	Ground -water

STRATA RECORD

Depth (m)	Level (m AOD)	Legend	Well	Strata Description
				MADE GROUND - Brown slightly sandy slightly gravelly CLAY. Gravel is angular of sandstone, siltstone and brick.
2.00				Grey SILTSTONE with frequent thin interbeds of fine grained sandstone.
16.00				Black COAL.
17.00				Grey SILTSTONE with frequent thin interbeds of fine grained sandstone.
20.00				End of Borehole at 20.00m

TCR SCR RQD FI

Remarks and Groundwater Observations:

1. Borehole complete at 20.0m bgl. 2. Groundwater not recorded due to flush techniques. 3. Backfilled with arisings and bentonite seal upon completion.

GL (m AOD)

Eastings:

Northings:

Fig No.

BH03

BOREHOLE RECORD

BH No. **BH04** Sheet 1 of 1

Site: Wakefield Road, Mapplewell

Contract No: C7481

Client: Lidl UK GmbH

Date: 16/11/2017

Method: Tracked rotary drilling rig using air mist flush

Scale: 1:150

Logged By: GB | Checked By: AG

Driller:

SAMPLE DETAILS

Depth From - To(m)	TCR	SCR	RQD	FI	Ground -water

STRATA RECORD

Depth (m)	Level (m AOD)	Legend	Well

MADE GROUND - Brown slightly sandy slightly gravelly CLAY. Gravel is angular of sandstone, siltstone and brick.

2.50

Grey SILTSTONE with frequent thin interbeds of fine grained sandstone.

16.20

Black COAL.

17.20

Grey SILTSTONE with frequent thin interbeds of fine grained sandstone.

20.00

End of Borehole at 20.00m

TCR	SCR	RQD	FI

Remarks and Groundwater Observations:

1. Borehole complete at 20.0m bgl. 2. Groundwater not recorded due to flush techniques. 3. Backfilled with arisings and bentonite seal upon completion.

GL (m AOD)

Eastings:

Northings:

Fig No.

BH04

BOREHOLE RECORD

BH No. **BH05** Sheet 1 of 1

Site: Wakefield Road, Mapplewell

Contract No: C7481

Client: Lidl UK GmbH

Date: 16/11/2017

Method: Tracked rotary drilling rig using air mist flush

Scale: 1:150

Logged By: GB | Checked By: AG

Driller:

SAMPLE DETAILS

Depth From - To(m)	TCR	SCR	RQD	FI	Ground -water

STRATA RECORD

Depth (m)	Level (m AOD)	Legend	Well
0.00			

MADE GROUND - Brown slightly sandy slightly gravelly CLAY. Gravel is angular of sandstone, siltstone and brick.

2.50

Grey SILTSTONE with frequent thin interbeds of fine grained sandstone.

13.50

Black COAL.

14.50

Grey SILTSTONE with frequent thin interbeds of fine grained sandstone.

20.00

End of Borehole at 20.00m

TCR	SCR	RQD	FI

Remarks and Groundwater Observations:

1. Borehole complete at 20.0m bgl. 2. Groundwater not recorded due to flush techniques. 3. Backfilled with arisings and bentonite seal upon completion.

GL (m AOD)

Eastings:

Northings:

Fig No.

BH05

BOREHOLE RECORD

BH No. **BH06** Sheet 1 of 1

Site: Wakefield Road, Mapplewell

Contract No: C7481

Client: Lidl UK GmbH

Date: 16/11/2017

Method: Tracked rotary drilling rig using water flush

Scale: 1:150

Logged By: GB | Checked By: AG

Driller:

SAMPLE DETAILS

Depth From - To(m)	TCR	SCR	RQD	FI	Ground -water

STRATA RECORD

Depth (m)	Level (m AOD)	Legend	Well	Description
				MADE GROUND - Brown slightly sandy slightly gravelly CLAY. Gravel is angular of sandstone, siltstone and brick.
2.60				Grey SILTSTONE with frequent thin interbeds of fine grained sandstone.
14.00				Black COAL.
15.00				Grey SILTSTONE with frequent thin interbeds of fine grained sandstone.
17.00				End of Borehole at 17.00m

TCR SCR RQD FI

Remarks and Groundwater Observations:

1. Borehole complete at 17.0m bgl. 2. Groundwater not recorded due to flush techniques. 3. Backfilled with arisings and bentonite seal upon completion.

GL (m AOD)

Eastings:

Northings:

Fig No.

BH06

BOREHOLE RECORD

BH No. **BH07**
Sheet 1 of 1

Site: Wakefield Road, Mapplewell

Contract No: C7481

Client: Lidl UK GmbH

Date: 16/11/2017

Method: Tracked rotary drilling rig using water flush

Scale: 1:150

Logged By: GB | Checked By: AG

Driller:

SAMPLE DETAILS

Depth From - To(m)	TCR	SCR	RQD	FI	Ground -water

STRATA RECORD

Depth (m)	Level (m AOD)	Legend	Well

MADE GROUND - Brown slightly sandy slightly gravelly CLAY. Gravel is angular of sandstone, siltstone and brick.

2.90

Grey SILTSTONE with frequent thin interbeds of fine grained sandstone.

15.10

Black COAL.

16.00

Grey SILTSTONE.

18.00

End of Borehole at 18.00m

TCR	SCR	RQD	FI

Remarks and Groundwater Observations:

1. Borehole complete at 18.0m bgl. 2. Groundwater not recorded due to flush techniques. 3. Backfilled with arisings and bentonite seal upon completion.

GL (m AOD)

Eastings:

Northings:

Fig No.

BH07

BOREHOLE RECORD

BH No. **BH08**
Sheet 1 of 1

Site: Wakefield Road, Mapplewell

Contract No: C7481

Client: Lidl UK GmbH

Date: 16/11/2017

Method: Tracked rotary drilling rig using water flush

Scale: 1:150

Logged By: GB | Checked By: AG

Driller:

SAMPLE DETAILS

Depth From - To(m)	TCR	SCR	RQD	FI	Ground -water

STRATA RECORD

Depth (m)	Level (m AOD)	Legend	Well

MADE GROUND - Brown slightly sandy slightly gravelly CLAY. Gravel is angular of sandstone, siltstone and brick.

2.20

Grey SILTSTONE with frequent thin interbeds of fine grained sandstone.

14.20

Black COAL.

15.20

Grey SILTSTONE.

17.20

End of Borehole at 17.20m

TCR	SCR	RQD	FI

Remarks and Groundwater Observations:

1. Borehole complete at 17.2m bgl. 2. Groundwater not recorded due to flush techniques. 3. Backfilled with arisings and bentonite seal upon completion.

GL (m AOD)

Eastings:

Northings:

Fig No.

BH08

BOREHOLE RECORD

BH No. **BH09**
Sheet 1 of 1

Site: Wakefield Road, Mapplewell

Contract No: C7481

Client: Lidl UK GmbH

Date: 16/11/2017

Method: Tracked rotary drilling rig using water flush

Scale: 1:150

Logged By: GB | Checked By: AG

Driller:

SAMPLE DETAILS

Depth From - To(m)	TCR	SCR	RQD	FI	Ground -water

STRATA RECORD

Depth (m)	Level (m AOD)	Legend	Well

MADE GROUND - Brown slightly sandy slightly gravelly CLAY. Gravel is angular of sandstone, siltstone and brick.

2.30

Grey SILTSTONE with frequent thin interbeds of fine grained sandstone.

15.00

Black COAL.

16.00

Grey SILTSTONE with frequent thin interbeds of fine grained sandstone.

18.00

End of Borehole at 18.00m

TCR	SCR	RQD	FI

Remarks and Groundwater Observations:

1. Borehole complete at 18.0m bgl. 2. Groundwater not recorded due to flush techniques. 3. Backfilled with arisings and bentonite seal upon completion.

GL (m AOD)

Eastings:

Northings:

Fig No.

BH09

APPENDIX D

SOAKAWAY TESTING RESULTS

SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365: 2007			
Client:	Lidl UK GmbH		
Site:	Wakefield Road, Mapplewell		
Job No:	C7481	Test No:	SA01

CALCULATION OF SOIL INFILTRATION RATE

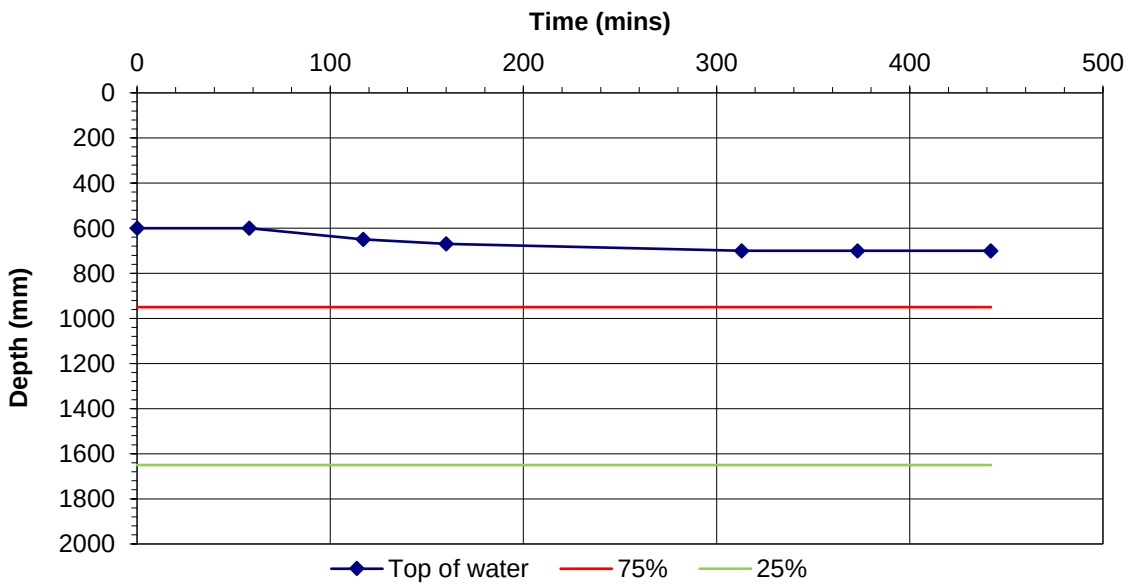
Time (min)	Depth (mm)
0	600
58	600
117	650
160	670
313	700
373	700
442	700

Size of Soakaway		
	Length (m) =	2.20
	Width (m) =	0.70
	Depth (m) =	2.00

Depth at start of test (mm)=	600mm
Depth of trial pit (mm)=	2000mm
75% effective depth (mm)=	950mm
50% effective depth =	1300mm
25% effective depth =	1650mm
Base area of pit (m^2) =	1.540
Effective area of loss 50% (m^2) =	5.600
Volume outflow 75 - 25% (m^3) =	1.078

From the graph:	
tp 75 (min) =	NA
tp 25 (min) =	NA

Soil infiltration rate, f, (m/s) =		N/A	Did not reach 75% full.
Input by:	GB	Date:	21.11.17
Checked by:	AG	Date:	21.11.17



SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365: 2007			
Client:	Lidl UK GmbH		
Site:	Wakefield Road, Mapplewell		
Job No:	C7481	Test No:	SA02

CALCULATION OF SOIL INFILTRATION RATE

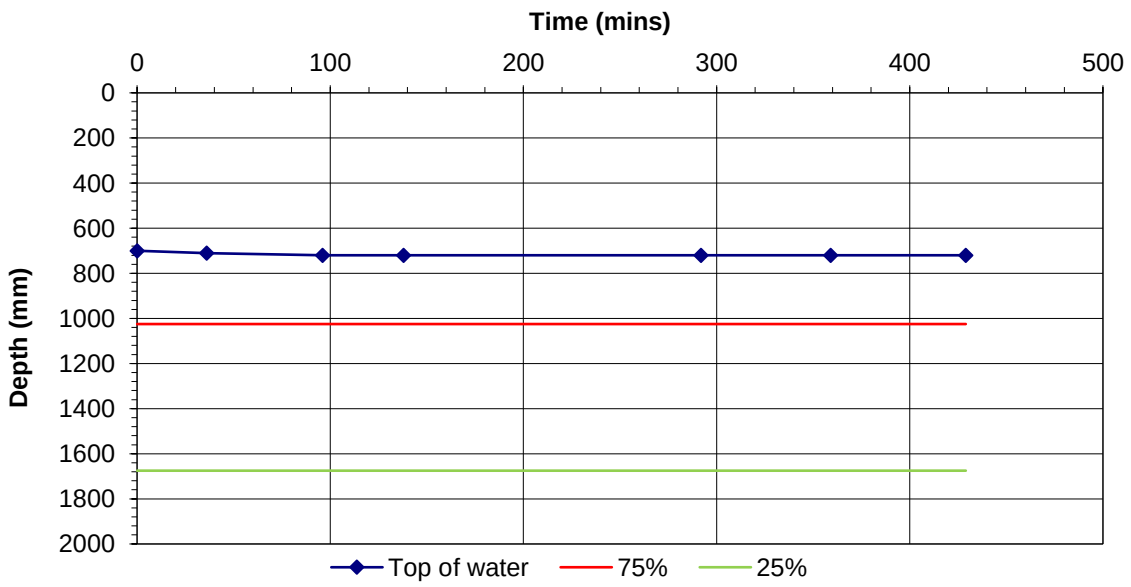
Time (min)	Depth (mm)
0	700
36	710
96	720
138	720
292	720
359	720
429	720

Size of Soakaway		
	Length (m) =	2.20
	Width (m) =	0.70
	Depth (m) =	2.00

Depth at start of test (mm)=	700mm
Depth of trial pit (mm)=	2000mm
75% effective depth (mm)=	1025mm
50% effective depth =	1350mm
25% effective depth =	1675mm
Base area of pit (m^2) =	1.540
Effective area of loss 50% (m^2) =	5.310
Volume outflow 75 - 25% (m^3) =	1.001

From the graph:	
tp 75 (min) =	NA
tp 25 (min) =	NA

Soil infiltration rate, f, (m/s) =		N/A	Did not reach 75% full.
Input by:	GB	Date:	21.11.17
Checked by:	AG	Date:	21.11.17



SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365: 2007			
Client:	Lidl UK GmbH		
Site:	Wakefield Road, Mapplewell		
Job No:	C7481	Test No:	SA03

CALCULATION OF SOIL INFILTRATION RATE

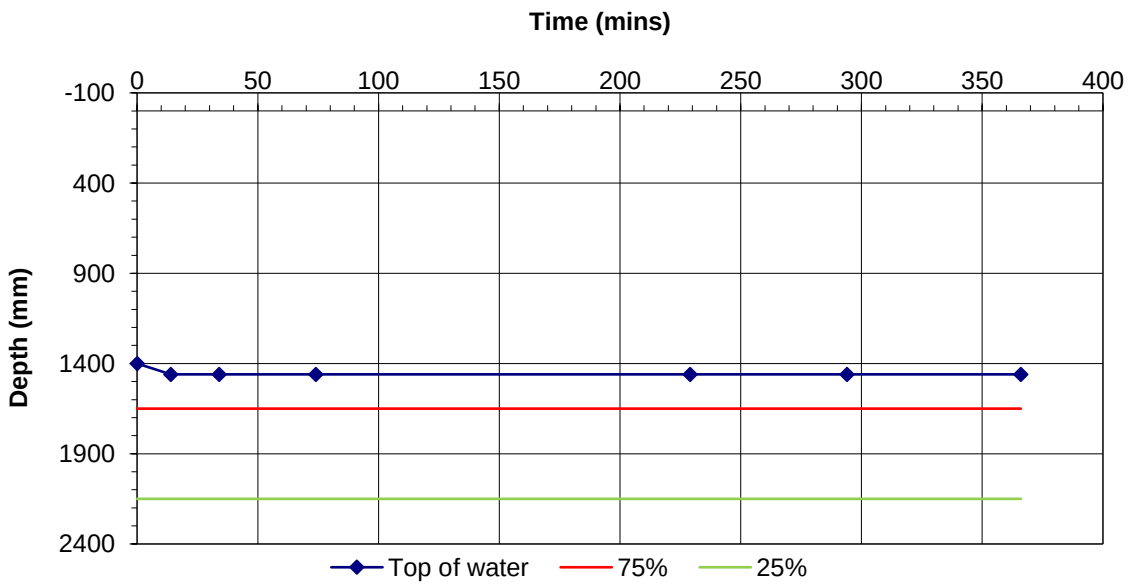
Time (min)	Depth (mm)
0	1400
14	1460
34	1460
74	1460
229	1460
294	1460
366	1460

Size of Soakaway		
	Length (m) =	2.30
	Width (m) =	0.70
	Depth (m) =	2.40

Depth at start of test (mm)=	1400mm
Depth of trial pit (mm)=	2400mm
75% effective depth (mm)=	1650mm
50% effective depth =	1900mm
25% effective depth =	2150mm
Base area of pit (m^2) =	1.610
Effective area of loss 50% (m^2) =	4.610
Volume outflow 75 - 25% (m^3) =	0.805

From the graph:	
tp 75 (min) =	NA
tp 25 (min) =	NA

Soil infiltration rate, f, (m/s) =	N/A	Did not reach 75% full.
Input by: GB	Date:	21.11.17
Checked by: AG	Date:	21.11.17



APPENDIX E

LABORATORY ANALYSIS RESULTS

LABORATORY REPORT

REPORT

4043

Contract Number: PSL17/5786

Report Date: 19 December 2017

Client's Reference: C7481

Client Name: Sirius Leeds
4245 Park Approach
Century Way
Thorpe Park
Leeds
LS15 8GB

For the attention of: Adrian Grant

Contract Title: Wakefield Road, Mapplewell

Date Received: 28/11/2017
Date Commenced: 28/11/2017
Date Completed: 19/12/2017

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:

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SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
SA01		B	1.00		Light brown CLAY.
SA02		B	0.50		Greyish brown very gravelly very sandy silty CLAY.
SA03		B	1.00		Brown very gravelly sandy CLAY.
TP02		B	1.40		Brown slightly sandy CLAY.
TP02		B	1.90		Brown mottled grey slightly sandy CLAY.
TP03		B	1.50		Brown mottled grey sandy CLAY.
TP04		D	2.40		Brown mottled grey slightly gravelly sandy CLAY.
TP08		B	0.80	0.90	Greyish brown sandy CLAY.

UKAS TESTING
4043

PSL
Professional Soils Laboratory

Wakefield Road, Mapplewell

Contract No:
PSL17/5786
Client Ref:
C7481

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
SA01		B	1.00		25			46	22	24	97	Intermediate plasticity CI.
SA02		B	0.50		20			33	18	15	69	Low plasticity CL.
SA03		B	1.00		21			41	21	20	60	Intermediate plasticity CI.
TP02		B	1.40		27			53	26	27	100	High plasticity CH.
TP02		B	1.90		26			51	24	27	100	High plasticity CH.
TP03		B	1.50		30			60	25	35	98	High plasticity CH.
TP04		D	2.40		29			46	23	23	98	Intermediate plasticity CI.
TP08		B	0.80	0.90	19			44	21	23	100	Intermediate plasticity CI.

SYMBOLS : **NP : Non Plastic** *** : Liquid Limit and Plastic Limit Wet Sieved.**

UKAS TESTING 4043

PSL Professional Soils Laboratory

Wakefield Road, Mapplewell

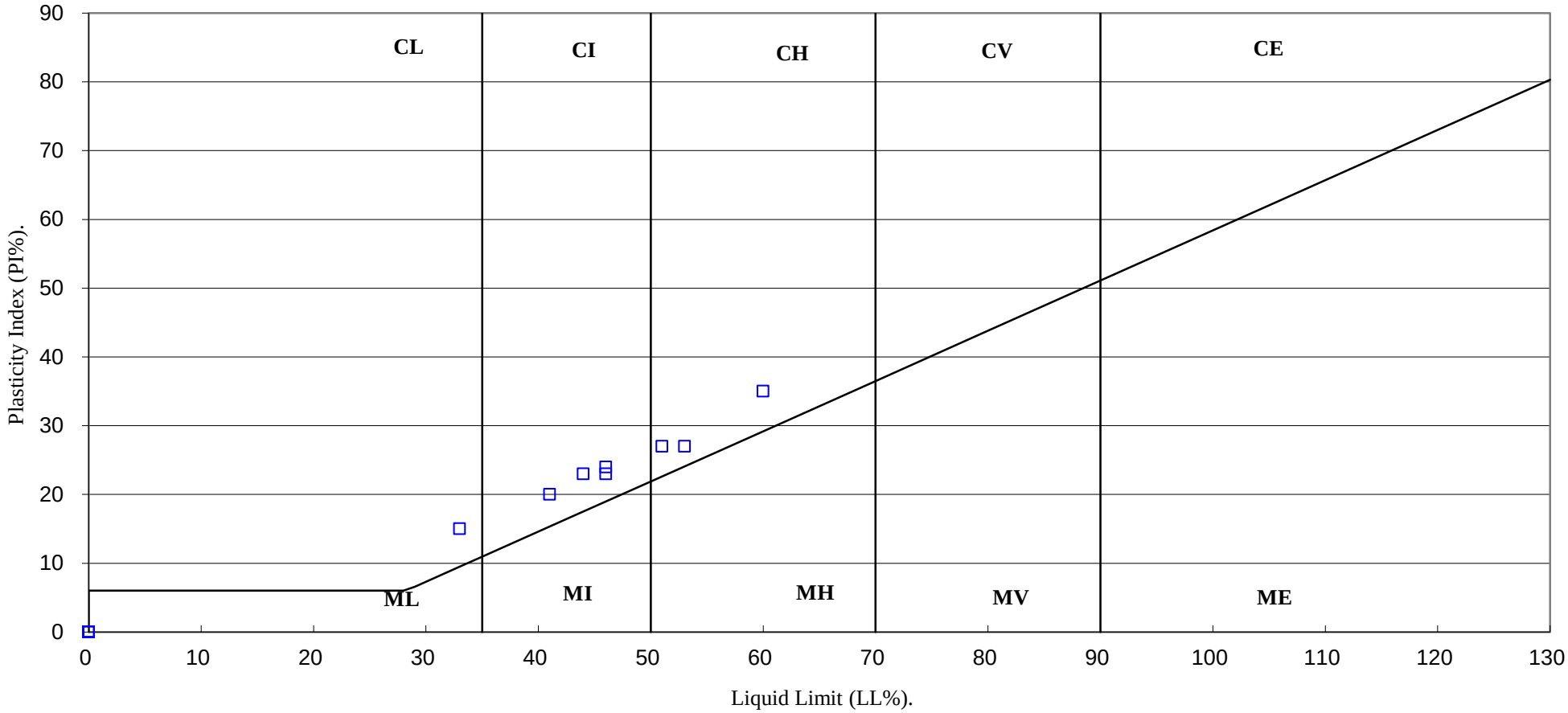
Contract No:

PSL17/5786

Client Ref:

C7481

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



UKAS TESTING 4043	PSL Professional Soils Laboratory	Wakefield Road, Mapplewell	**Contract No:** PSL17/5786 **Client Ref:** C7481

PARTICLE SIZE DISTRIBUTION TEST

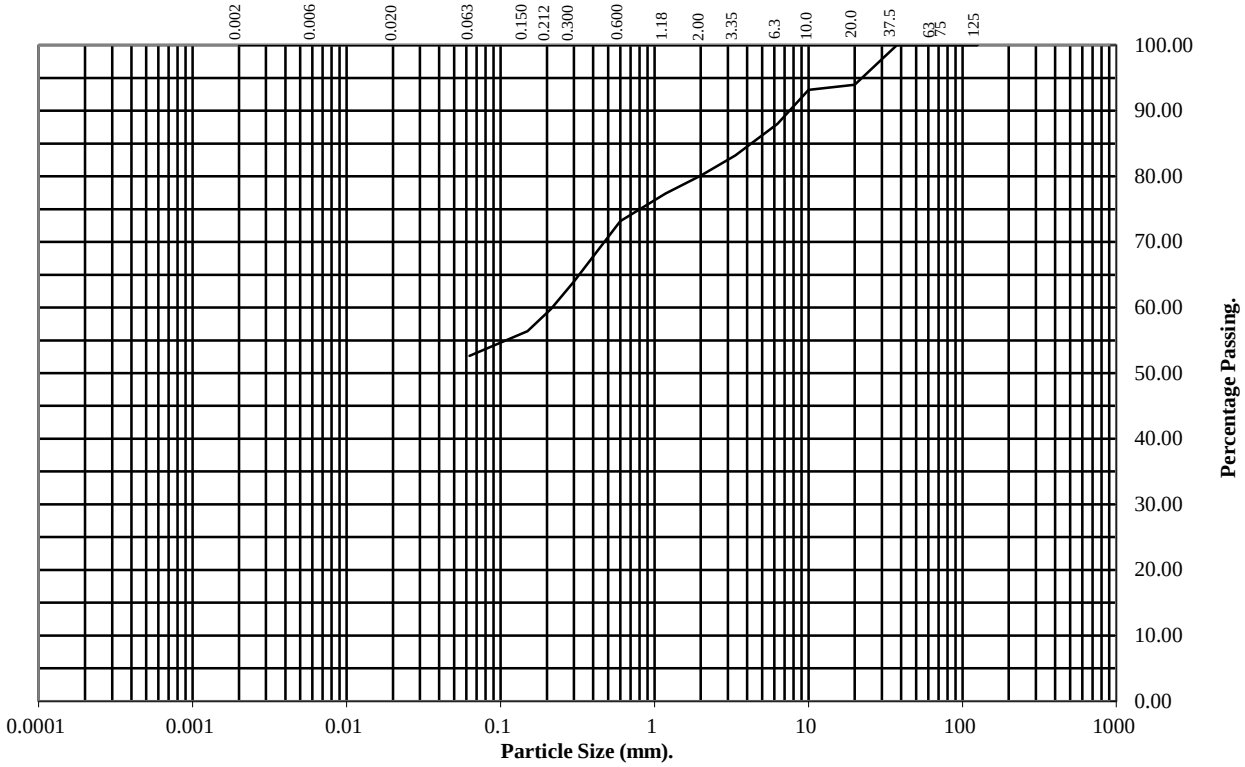
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **SA02** **Top Depth (m):** **0.50**

Sample Number: **Base Depth(m):**

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	94
10	93
6.3	88
3.35	83
2	80
1.18	77
0.6	73
0.3	64
0.212	60
0.15	56
0.063	53

Soil Fraction	Total Percentage
Cobbles	0
Gravel	20
Sand	27
Silt/Clay	53

Remarks:

See Summary of Soil Descriptions

UKAS TESTING 4043

PSL Professional Soils Laboratory

Wakefield Road, Mapplewell

Contract No:
PSL17/5786
Client Ref:
C7481

PARTICLE SIZE DISTRIBUTION TEST

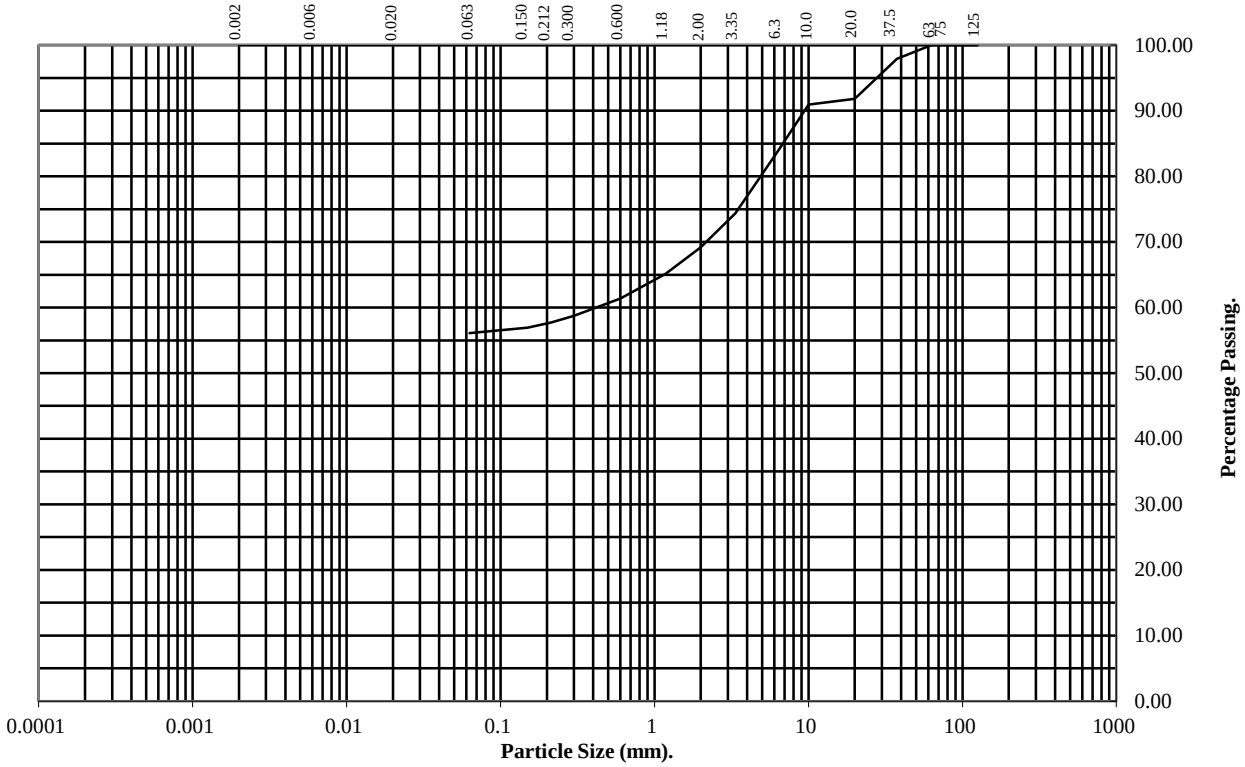
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **SA03** **Top Depth (m):** **1.00**

Sample Number: **Base Depth(m):**

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	98
20	92
10	91
6.3	84
3.35	74
2	69
1.18	65
0.6	61
0.3	59
0.212	58
0.15	57
0.063	56

Soil Fraction	Total Percentage
Cobbles	0
Gravel	31
Sand	13
Silt/Clay	56

Remarks:

See Summary of Soil Descriptions

UKAS TESTING 4043

PSL Professional Soils Laboratory

Wakefield Road, Mapplewell

Contract No:
PSL17/5786
Client Ref:
C7481

PARTICLE SIZE DISTRIBUTION TEST

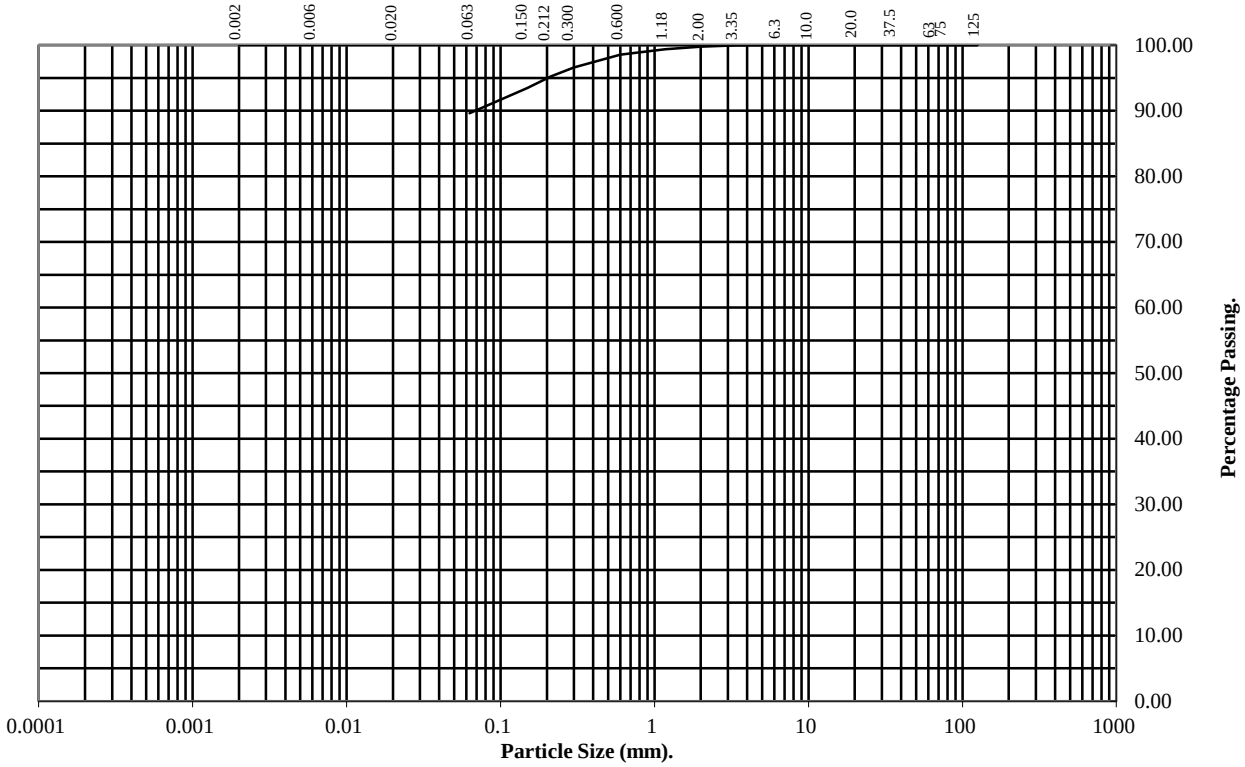
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **TP03** **Top Depth (m):** **1.50**

Sample Number: **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	99
0.6	99
0.3	97
0.212	95
0.15	93
0.063	90

Soil Fraction	Total Percentage
Cobbles	0
Gravel	0
Sand	10
Silt/Clay	90

Remarks:

See Summary of Soil Descriptions

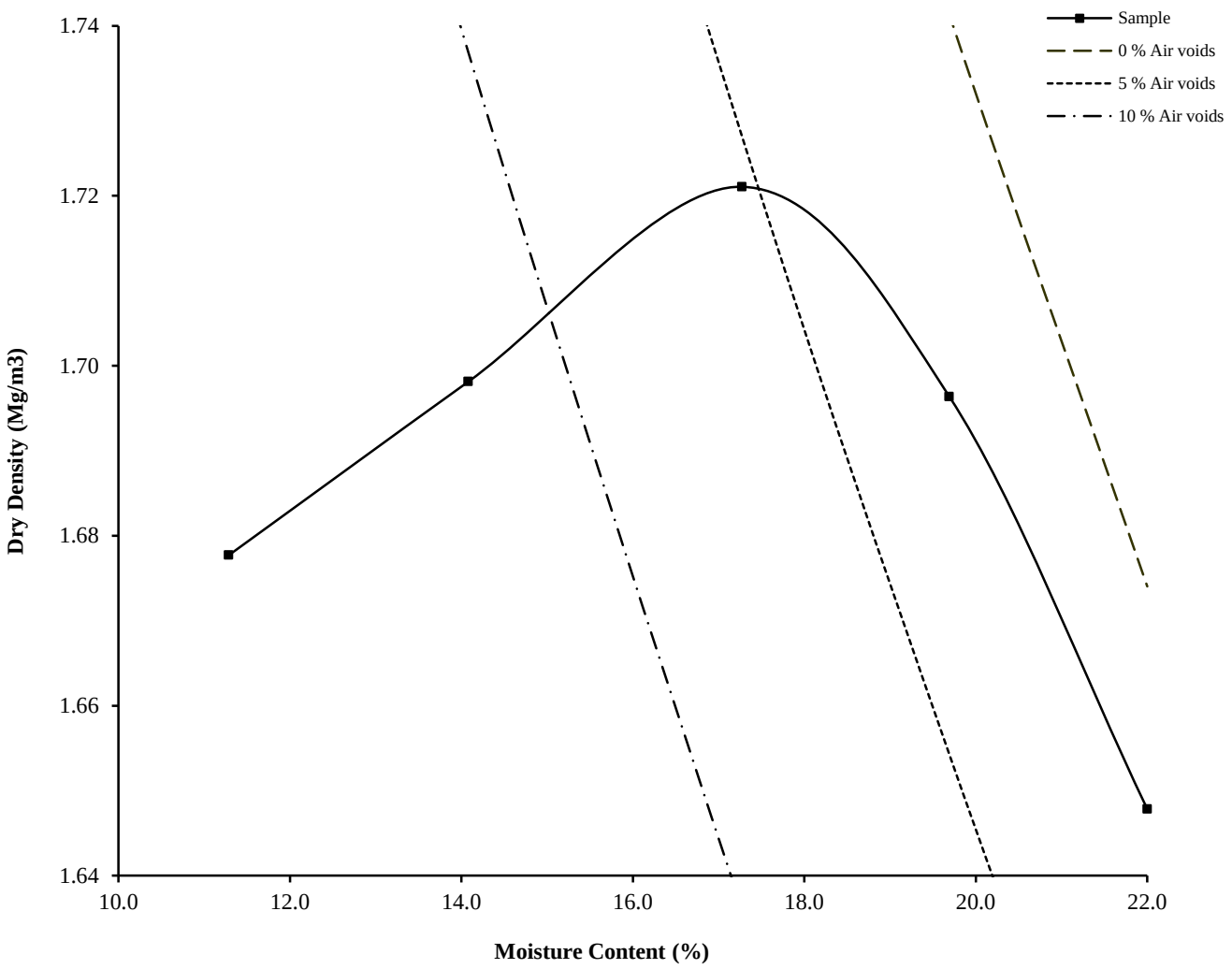
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

BS 1377 : Part 4 : 1990

Hole Number: SA02 **Top Depth (m) :** 0.50

Sample Number: **Base Depth (m) :**

Sample Type: B



Initial Moisture Content:		19	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):		1.72	Material Retained on 20.0 mm Test Sieve (%):		4.9
Optimum Moisture Content (%):		18			
Remarks See summary of soil descriptions.					

UKAS TESTING 4043	PSL Professional Soils Laboratory	**Wakefield Road, Mapplewell**	**Contract** **PSL17/5786** **Client Ref** **C7481**

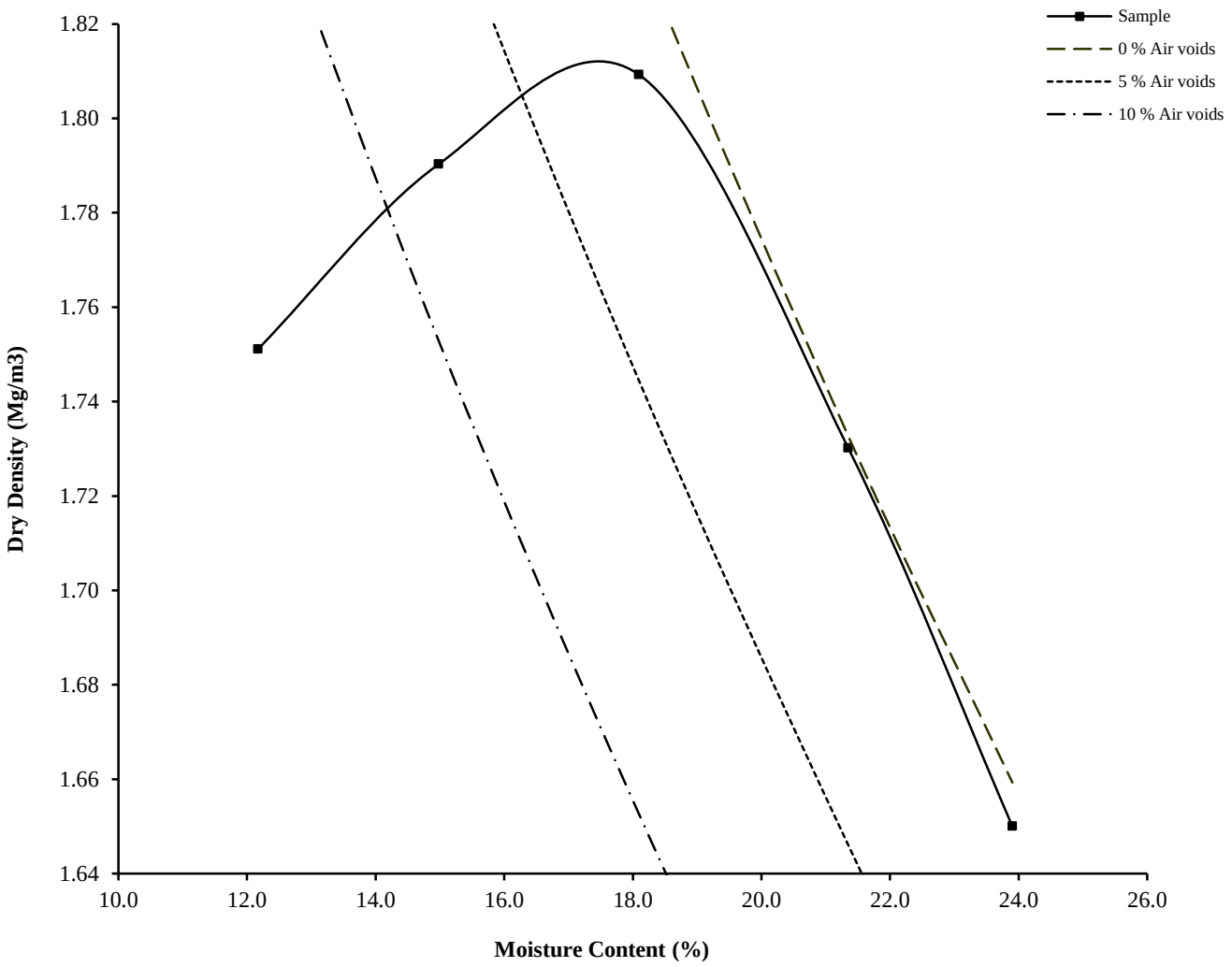
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

BS 1377 : Part 4 : 1990

Hole Number: SA03 **Top Depth (m) :** 1.00

Sample Number: **Base Depth (m) :**

Sample Type: B



Initial Moisture Content:		21	Method of Compaction:	2.5kg	Separate Samples
Particle Density (Mg/m3):	2.75	Assumed	Material Retained on 37.5 mm Test Sieve (%):		2
Maximum Dry Density (Mg/m3):		1.81	Material Retained on 20.0 mm Test Sieve (%):		6
Optimum Moisture Content (%):		18			
Remarks See summary of soil descriptions.					

UKAS TESTING 4043	PSL Professional Soils Laboratory	**Wakefield Road, Mapplewell**	**Contract** **PSL17/5786** **Client Ref** **C7481**

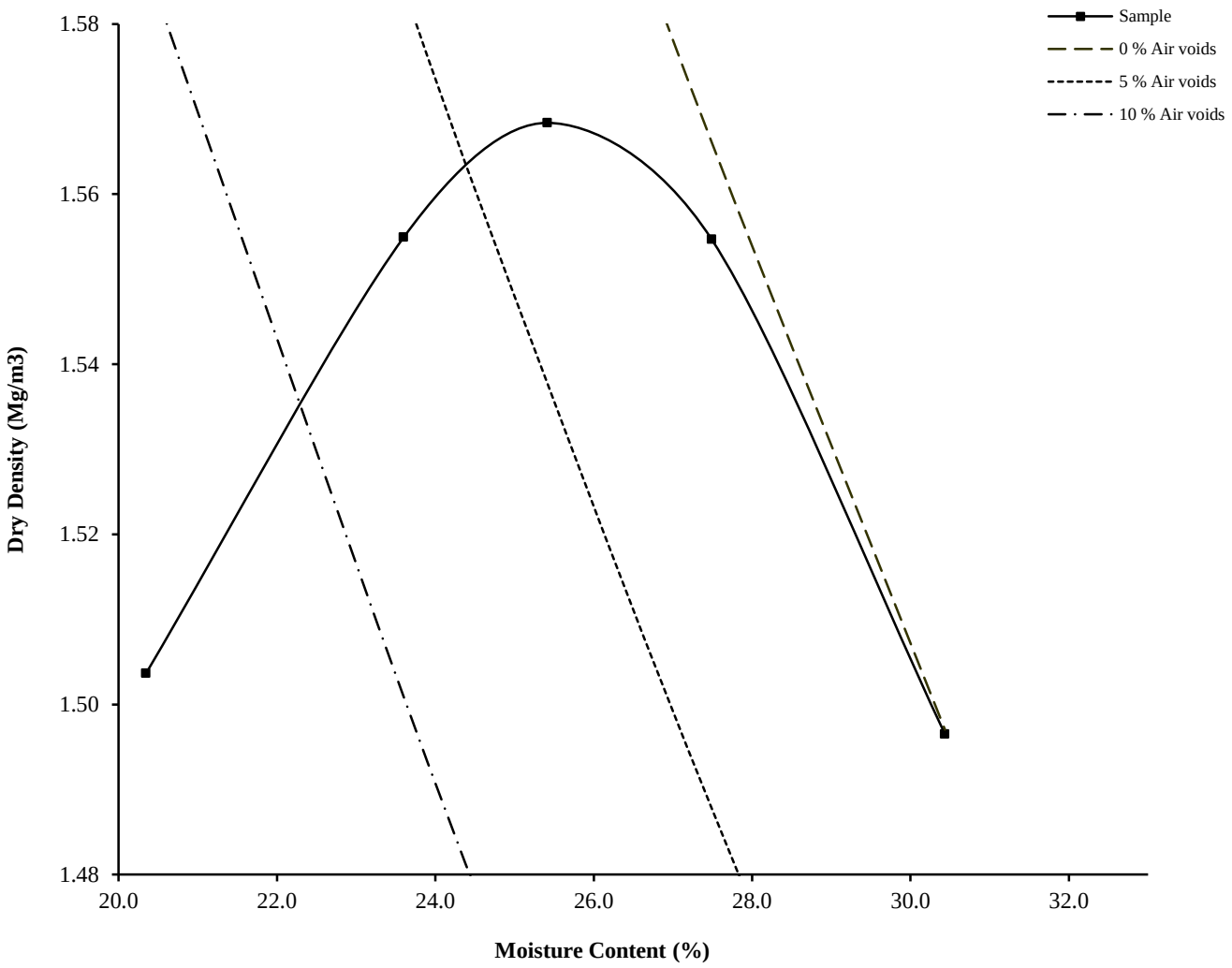
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

BS 1377 : Part 4 : 1990

Hole Number: TP03 **Top Depth (m) :** 1.50

Sample Number: **Base Depth (m) :**

Sample Type: B



Initial Moisture Content:		32	Method of Compaction:	2.5kg	Separate Samples
Particle Density (Mg/m3):	2.75	Assumed	Material Retained on 37.5 mm Test Sieve (%):		0
Maximum Dry Density (Mg/m3):		1.57	Material Retained on 20.0 mm Test Sieve (%):		0
Optimum Moisture Content (%):		25			
Remarks See summary of soil descriptions.					

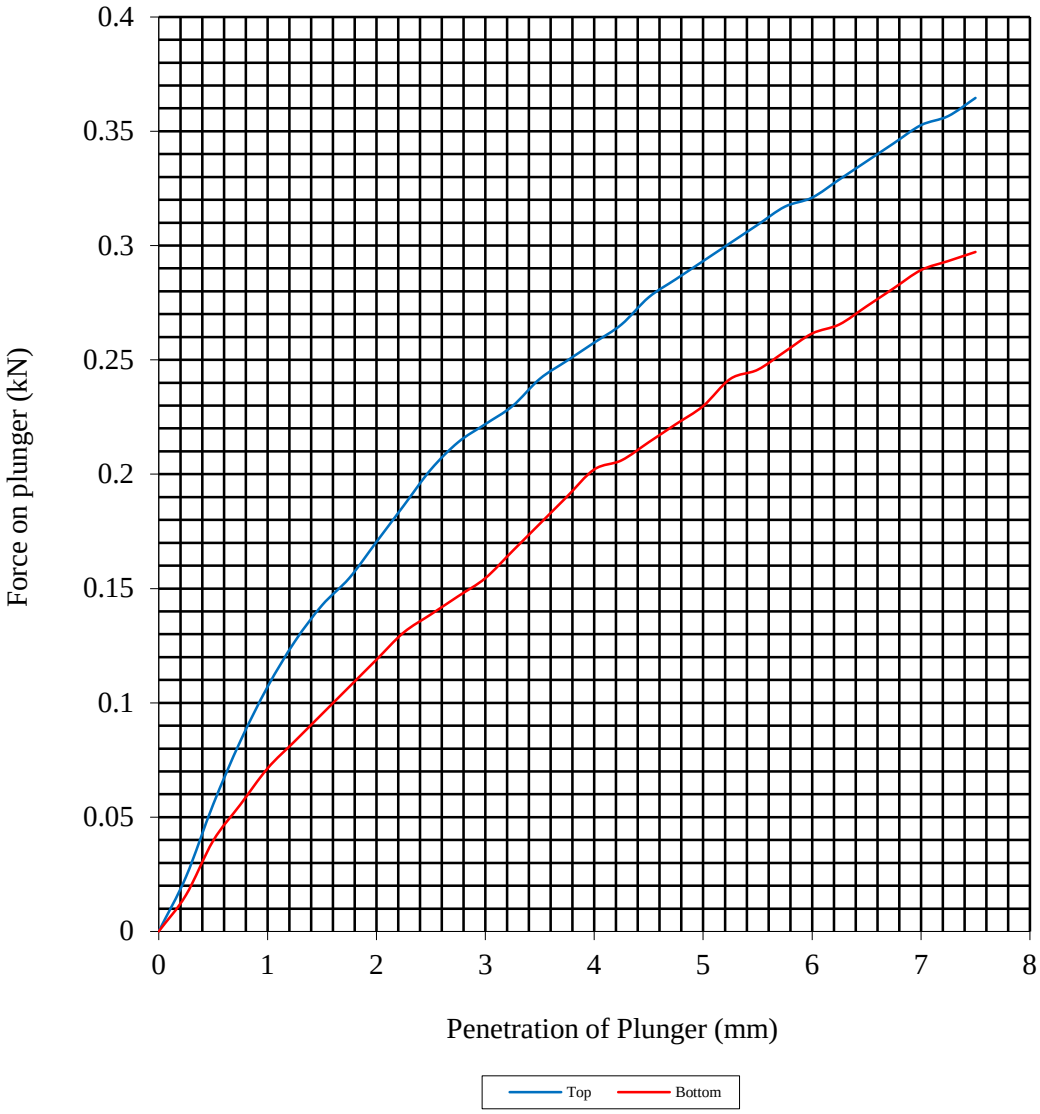
CALIFORNIA BEARING RATIO TEST

BS 1377 : Part 4 : 1990

Hole Number: SA01 **Top Depth (m):** 1.00

Sample Number: **Base Depth (m):**

Sample Type: B



Initial Sample Conditions		Sample Preparation		Final Moisture Content %		C.B.R. Value %	
Moisture Content:	25	Surcharge Kg:	4.20	Sample Top	25	Sample Top	1.5
Bulk Density Mg/m3:	1.97	Soaking Time hrs	0	Sample Bottom	25	Sample Bottom	1.1
Dry Density Mg/m3:	1.57	Swelling mm:	0.00	Remarks : See Summary of Soil Descriptions.			
Percentage retained on 20mm BS test sieve:			0				
Compaction Conditions		2.5kg					

UKAS TESTING 4043

PSL Professional Soils Laboratory

Wakefield Road, Mapplewell

Contract No: PSL17/5786

Client Ref: C7481

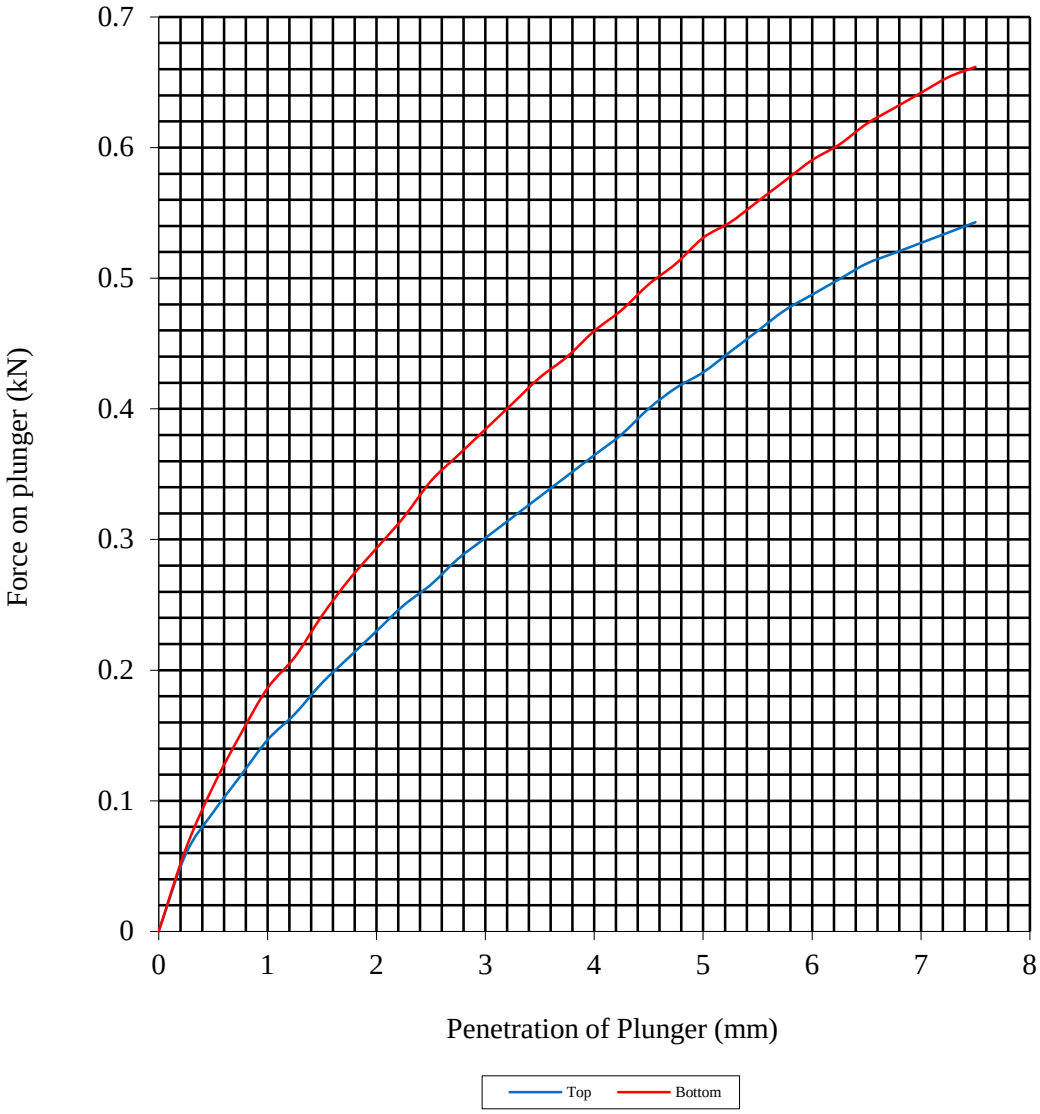
CALIFORNIA BEARING RATIO TEST

BS 1377 : Part 4 : 1990

Hole Number: TP02 **Top Depth (m):** 1.40

Sample Number: **Base Depth (m):**

Sample Type: B



Initial Sample Conditions		Sample Preparation		Final Moisture Content %		C.B.R. Value %	
Moisture Content:	27	Surcharge Kg:	4.20	Sample Top	27	Sample Top	2.1
Bulk Density Mg/m3:	1.92	Soaking Time hrs	0	Sample Bottom	26	Sample Bottom	2.7
Dry Density Mg/m3:	1.52	Swelling mm:	0.00	Remarks : See Summary of Soil Descriptions.			
Percentage retained on 20mm BS test sieve:			0				
Compaction Conditions		2.5kg					

UKAS TESTING 4043

PSL Professional Soils Laboratory

Wakefield Road, Mapplewell

Contract No: PSL17/5786

Client Ref: C7481

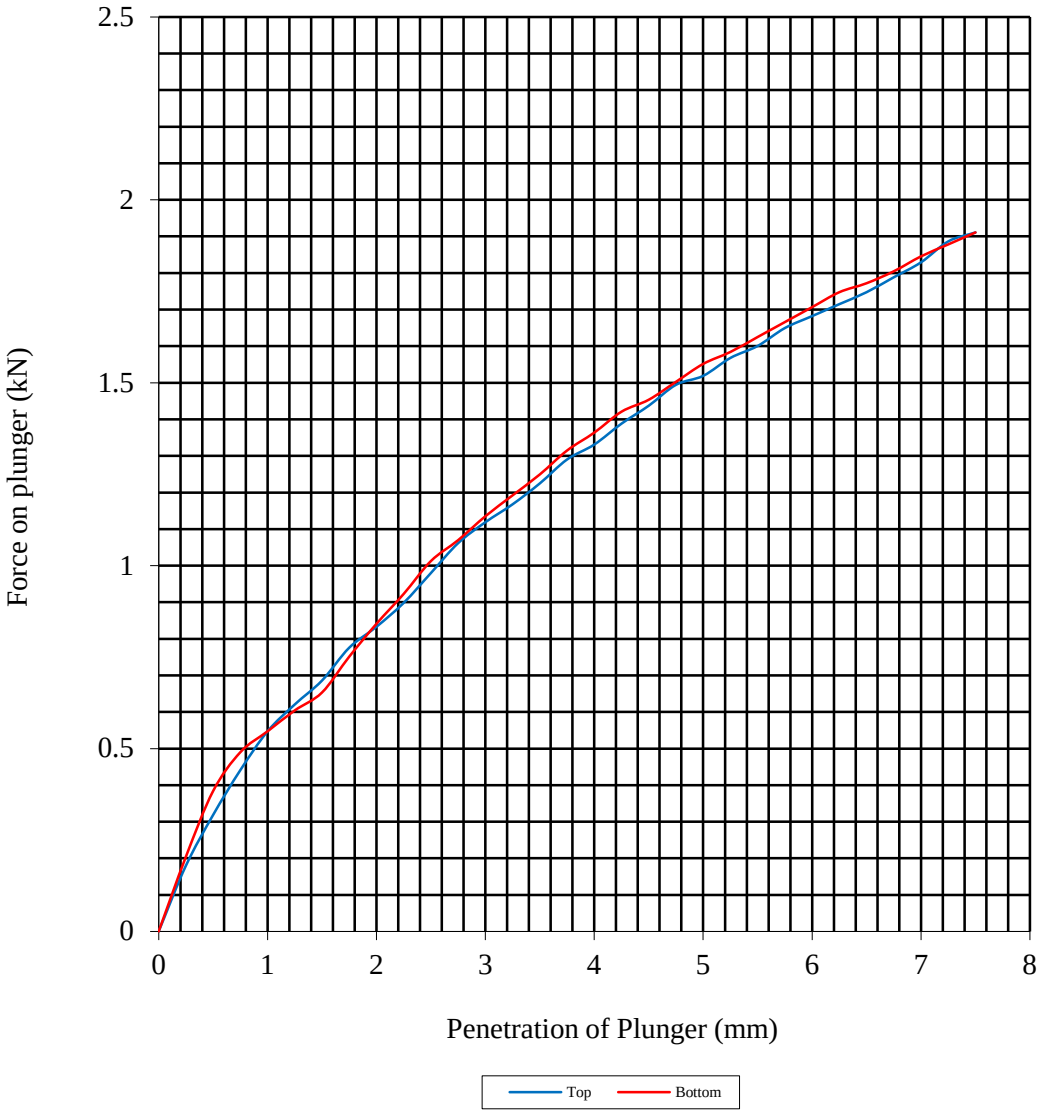
CALIFORNIA BEARING RATIO TEST

BS 1377 : Part 4 : 1990

Hole Number: TP08 **Top Depth (m):** 0.80

Sample Number: **Base Depth (m):** 0.90

Sample Type: B



Initial Sample Conditions		Sample Preparation		Final Moisture Content %		C.B.R. Value %	
Moisture Content:	19	Surcharge Kg:	4.20	Sample Top	19	Sample Top	7.6
Bulk Density Mg/m3:	2.06	Soaking Time hrs	0	Sample Bottom	19	Sample Bottom	7.8
Dry Density Mg/m3:	1.73	Swelling mm:	0.00	Remarks : See Summary of Soil Descriptions.			
Percentage retained on 20mm BS test sieve:			0				
Compaction Conditions		2.5kg					

UKAS TESTING 4043	PSL Professional Soils Laboratory	**Wakefield Road, Mapplewell**	**Contract No: PSL17/5786** **Client Ref: C7481**

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Concept Life Sciences

Certificate of Analysis

Hadfield House
Hadfield Street
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Manchester
M16 9FE
Tel : 0161 874 2400
Fax : 0161 874 2468

Report Number: 698321-2

Date of Report: 04-Dec-2017

Customer: Sirius Geotechnical & Environmental Ltd
4245 Park Approach
Thorpe Park
Leeds
LS15 8GB

Customer Contact: Mr Adrian Grant

Customer Job Reference: C7481
Customer Purchase Order: 16053/C7708/AMG
Customer Site Reference: Wakefield Road, Mapplewell
Date Job Received at Concept: 17-Nov-2017
Date Analysis Started: 22-Nov-2017
Date Analysis Completed: 04-Dec-2017

The results reported relate to samples received in the laboratory and may not be representative of a whole batch.

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation

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Tests covered by this certificate were conducted in accordance with Concept Life Sciences SOPs

All results have been reviewed in accordance with Section 25 of the Concept Life Sciences, Analytical Services Quality Manual

UKAS TESTING
1549

mCERTS
THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

Report checked
and authorised by :
Miajan Miah
Customer Service Advisor

Issued by :
Miajan Miah
Customer Service Advisor

Waste Acceptance Criteria

Customer Sample Reference : TP02
SAL Sample Reference : 698321 006
Project Site : Wakefield Road, Mapplewell
Customer Reference : C7481
Depth : 0.70
Date Sampled : 15-NOV-2017
Matrix Class : Clay

Soil					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
Total Organic Carbon	OX/IR	0.1	%	N	**0.3**	3.0	5.0	6.0
Loss on Ignition	Grav	0.1	%	N	**7.8**			10.0
BTEX (Sum)	Calc	0.040	mg/kg	U	<0.040	6.0		
PCB EC7 (Sum)	Calc	0.007	mg/kg	M	<0.007	1.0		
Total Petroleum Hydrocarbons C10-C40 (Sum)	Calc	1	mg/kg	N	(13) <1	500.0		
PAH (Sum)	Calc	1.6	mg/kg	N	<1.6	100.0		
pH	Probe			M	**6.7**		> 6.0	
Acid Neutralising Capacity (pH 4)	Titration	2	Mol/kg	N	<2			
Acid Neutralising Capacity (pH 7)	Titration	2	Mol/kg	N	<2			

Data for BS EN 12457-2 (10:1)					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
Antimony	Calc WAC ICP/MS	0.010	mg/kg	N	<0.010	0.06	0.7	5.0
Arsenic	Calc WAC ICP/MS	0.0020	mg/kg	N	<0.0020	0.5	2.0	25.0
Barium	Calc WAC ICP/MS	0.010	mg/kg	N	**0.081**	20.0	100.0	300.0
Cadmium	Calc WAC ICP/MS	0.00020	mg/kg	N	**0.00045**	0.04	1.0	5.0
Chloride	Calc (W)	10	mg/kg	N	<10	800.0	15000.0	25000.0
Chromium	Calc WAC ICP/MS	0.010	mg/kg	N	<0.010	0.5	10.0	70.0
Copper	Calc WAC ICP/MS	0.0050	mg/kg	N	<0.0050	2.0	50.0	100.0
Dissolved Organic Carbon	Calc	10	mg/kg	N	**23**	500.0	800.0	1000.0
Fluoride	Calc (W)	0.50	mg/kg	N	**1.5**	10.0	150.0	500.0
Lead	Calc WAC ICP/MS	0.0030	mg/kg	N	<0.0030	0.5	10.0	50.0
Mercury	Calc WAC ICP/MS	0.00050	mg/kg	N	<0.00050	0.01	0.2	2.0
Molybdenum	Calc WAC ICP/MS	0.010	mg/kg	N	<0.010	0.5	10.0	30.0
Nickel	Calc WAC ICP/MS	0.010	mg/kg	N	**0.036**	0.4	10.0	40.0
Phenols (Total-Mono)	Calc	1.0	mg/kg	N	<1.0	1.0		
Selenium	Calc WAC ICP/MS	0.0050	mg/kg	N	<0.0050	0.1	0.5	7.0
Sulphate	Calc (W)	5	mg/kg	N	**490**	1000.0	20000.0	50000.0
Total Dissolved Solids	Calc	1000	mg/kg	N	<1000	4000.0	60000.0	100000.0
Zinc	Calc WAC ICP/MS	0.020	mg/kg	N	**0.041**	4.0	50.0	200.0

Following the recommendation from the Environment Agency (England and Wales)*, the leachate preparation in this report has been carried out to BS EN 12457-2 : One Stage batch test at a liquid to solid ratio of 10 l/kg. This is also compliant with Schedule 10 of the Environmental Permitting Regulations 2010.

Note : This is the minimum amount of testing which is required.

Further testing may be required if :

- evidence of immediately leachable parameters becomes available.
- evidence to indicate that the sample could be classified as hazardous under H1-H14 of the Waste(England and Wales) Regulations 2011(as amended) becomes available.

Acceptance of waste at landfill is always at the discretion of the Landfill Operator.

*** Waste Sampling and Testing for Disposal at Landfill, EBPRI 11507B, Environment Agency (England and Wales) March 2013**

As detailed in- Waste Classification. Guidance on the classification and assessment of waste. Technical Guidance WM3:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/427077/LIT_10121.pdf

Landfill WAC analysis (specifically leaching test results) should not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Waste Acceptance Criteria

Customer Sample Reference : TP04
SAL Sample Reference : 698321 013
Project Site : Wakefield Road, Mapplewell
Customer Reference : C7481
Depth : 0.60
Date Sampled : 15-NOV-2017
Matrix Class : Clay

Soil					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
Total Organic Carbon	OX/IR	0.1	%	N	**0.8**	3.0	5.0	6.0
Loss on Ignition	Grav	0.1	%	N	**5.7**			10.0
BTEX (Sum)	Calc	0.040	mg/kg	U	<0.040	6.0		
PCB EC7 (Sum)	Calc	0.007	mg/kg	M	<0.007	1.0		
Total Petroleum Hydrocarbons C10-C40 (Sum)	Calc	1	mg/kg	N	(13) **12**	500.0		
PAH (Sum)	Calc	1.6	mg/kg	N	<1.6	100.0		
pH	Probe			M	**7.2**		> 6.0	
Acid Neutralising Capacity (pH 4)	Titration	2	Mol/kg	N	<2			
Acid Neutralising Capacity (pH 7)	Titration	2	Mol/kg	N	<2			

Data for BS EN 12457-2 (10:1)					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
Antimony	Calc WAC ICP/MS	0.010	mg/kg	N	<0.010	0.06	0.7	5.0
Arsenic	Calc WAC ICP/MS	0.0020	mg/kg	N	<0.0020	0.5	2.0	25.0
Barium	Calc WAC ICP/MS	0.010	mg/kg	N	**0.13**	20.0	100.0	300.0
Cadmium	Calc WAC ICP/MS	0.00020	mg/kg	N	<0.00020	0.04	1.0	5.0
Chloride	Calc (W)	10	mg/kg	N	<10	800.0	15000.0	25000.0
Chromium	Calc WAC ICP/MS	0.010	mg/kg	N	**0.011**	0.5	10.0	70.0
Copper	Calc WAC ICP/MS	0.0050	mg/kg	N	**0.011**	2.0	50.0	100.0
Dissolved Organic Carbon	Calc	10	mg/kg	N	**26**	500.0	800.0	1000.0
Fluoride	Calc (W)	0.50	mg/kg	N	**11**	**10.0**	150.0	500.0
Lead	Calc WAC ICP/MS	0.0030	mg/kg	N	<0.0030	0.5	10.0	50.0
Mercury	Calc WAC ICP/MS	0.00050	mg/kg	N	<0.00050	0.01	0.2	2.0
Molybdenum	Calc WAC ICP/MS	0.010	mg/kg	N	**0.013**	0.5	10.0	30.0
Nickel	Calc WAC ICP/MS	0.010	mg/kg	N	<0.010	0.4	10.0	40.0
Phenols (Total-Mono)	Calc	1.0	mg/kg	N	<1.0	1.0		
Selenium	Calc WAC ICP/MS	0.0050	mg/kg	N	<0.0050	0.1	0.5	7.0
Sulphate	Calc (W)	5	mg/kg	N	**84**	1000.0	20000.0	50000.0
Total Dissolved Solids	Calc	1000	mg/kg	N	<1000	4000.0	60000.0	100000.0
Zinc	Calc WAC ICP/MS	0.020	mg/kg	N	**0.043**	4.0	50.0	200.0

Following the recommendation from the Environment Agency (England and Wales)*, the leachate preparation in this report has been carried out to BS EN 12457-2 : One Stage batch test at a liquid to solid ratio of 10 l/kg. This is also compliant with Schedule 10 of the Environmental Permitting Regulations 2010.

Note : This is the minimum amount of testing which is required.

Further testing may be required if :

- evidence of immediately leachable parameters becomes available.
- evidence to indicate that the sample could be classified as hazardous under H1-H14 of the Waste(England and Wales) Regulations 2011(as amended) becomes available.

Acceptance of waste at landfill is always at the discretion of the Landfill Operator.

*** Waste Sampling and Testing for Disposal at Landfill, EBPRI 11507B, Environment Agency (England and Wales) March 2013**

As detailed in- Waste Classification. Guidance on the classification and assessment of waste. Technical Guidance WM3:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/427077/LIT_10121.pdf

Landfill WAC analysis (specifically leaching test results) should not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Waste Acceptance Criteria

Customer Sample Reference : TP05
SAL Sample Reference : 698321 015
Project Site : Wakefield Road, Mapplewell
Customer Reference : C7481
Depth : 0.50
Date Sampled : 15-NOV-2017
Matrix Class : Sandy Soil

Soil					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
Total Organic Carbon	OX/IR	0.1	%	N	**4.1**	**3.0**	5.0	6.0
Loss on Ignition	Grav	0.1	%	N	**10**			**10.0**
BTEX (Sum)	Calc	0.040	mg/kg	U	<0.040	6.0		
PCB EC7 (Sum)	Calc	0.007	mg/kg	M	**0.077**	1.0		
Total Petroleum Hydrocarbons C10-C40 (Sum)	Calc	1	mg/kg	N	(13) **5200**	**500.0**		
PAH (Sum)	Calc	1.6	mg/kg	N	<1.6	100.0		
pH	Probe			M	**7.8**		> 6.0	
Acid Neutralising Capacity (pH 4)	Titration	2	Mol/kg	N	<2			
Acid Neutralising Capacity (pH 7)	Titration	2	Mol/kg	N	<2			

Data for BS EN 12457-2 (10:1)					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
Antimony	Calc WAC ICP/MS	0.010	mg/kg	N	**0.017**	0.06	0.7	5.0
Arsenic	Calc WAC ICP/MS	0.0020	mg/kg	N	**0.0056**	0.5	2.0	25.0
Barium	Calc WAC ICP/MS	0.010	mg/kg	N	**1.1**	20.0	100.0	300.0
Cadmium	Calc WAC ICP/MS	0.00020	mg/kg	N	**0.00029**	0.04	1.0	5.0
Chloride	Calc (W)	10	mg/kg	N	**15**	800.0	15000.0	25000.0
Chromium	Calc WAC ICP/MS	0.010	mg/kg	N	<0.010	0.5	10.0	70.0
Copper	Calc WAC ICP/MS	0.0050	mg/kg	N	**0.0075**	2.0	50.0	100.0
Dissolved Organic Carbon	Calc	10	mg/kg	N	**42**	500.0	800.0	1000.0
Fluoride	Calc (W)	0.50	mg/kg	N	**10**	**10.0**	150.0	500.0
Lead	Calc WAC ICP/MS	0.0030	mg/kg	N	<0.0030	0.5	10.0	50.0
Mercury	Calc WAC ICP/MS	0.00050	mg/kg	N	<0.00050	0.01	0.2	2.0
Molybdenum	Calc WAC ICP/MS	0.010	mg/kg	N	**0.090**	0.5	10.0	30.0
Nickel	Calc WAC ICP/MS	0.010	mg/kg	N	**0.035**	0.4	10.0	40.0
Phenols (Total-Mono)	Calc	1.0	mg/kg	N	<1.0	1.0		
Selenium	Calc WAC ICP/MS	0.0050	mg/kg	N	**0.0052**	0.1	0.5	7.0
Sulphate	Calc (W)	5	mg/kg	N	**400**	1000.0	20000.0	50000.0
Total Dissolved Solids	Calc	1000	mg/kg	N	**1400**	4000.0	60000.0	100000.0
Zinc	Calc WAC ICP/MS	0.020	mg/kg	N	**0.48**	4.0	50.0	200.0

Following the recommendation from the Environment Agency (England and Wales)*, the leachate preparation in this report has been carried out to BS EN 12457-2 : One Stage batch test at a liquid to solid ratio of 10 l/kg. This is also compliant with Schedule 10 of the Environmental Permitting Regulations 2010.

Note : This is the minimum amount of testing which is required.

Further testing may be required if :

- evidence of immediately leachable parameters becomes available.
- evidence to indicate that the sample could be classified as hazardous under H1-H14 of the Waste(England and Wales) Regulations 2011(as amended) becomes available.

Acceptance of waste at landfill is always at the discretion of the Landfill Operator.

*** Waste Sampling and Testing for Disposal at Landfill, EBPRI 11507B, Environment Agency (England and Wales) March 2013**

As detailed in- Waste Classification. Guidance on the classification and assessment of waste. Technical Guidance WM3:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/427077/LIT_10121.pdf

Landfill WAC analysis (specifically leaching test results) should not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Waste Acceptance Criteria

Customer Sample Reference : TP06
SAL Sample Reference : 698321 019
Project Site : Wakefield Road, Mapplewell
Customer Reference : C7481
Depth : 0.80
Date Sampled : 15-NOV-2017
Matrix Class : Clay

Soil					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
Total Organic Carbon	OX/IR	0.1	%	N	**0.5**	3.0	5.0	6.0
Loss on Ignition	Grav	0.1	%	N	**7.3**			10.0
BTEX (Sum)	Calc	0.040	mg/kg	U	<0.040	6.0		
PCB EC7 (Sum)	Calc	0.007	mg/kg	M	<0.007	1.0		
Total Petroleum Hydrocarbons C10-C40 (Sum)	Calc	1	mg/kg	N	(13) **11**	500.0		
PAH (Sum)	Calc	1.6	mg/kg	N	<1.6	100.0		
pH	Probe			M	**7.5**		> 6.0	
Acid Neutralising Capacity (pH 4)	Titration	2	Mol/kg	N	<2			
Acid Neutralising Capacity (pH 7)	Titration	2	Mol/kg	N	<2			

Data for BS EN 12457-2 (10:1)					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
Antimony	Calc WAC ICP/MS	0.010	mg/kg	N	<0.010	0.06	0.7	5.0
Arsenic	Calc WAC ICP/MS	0.0020	mg/kg	N	<0.0020	0.5	2.0	25.0
Barium	Calc WAC ICP/MS	0.010	mg/kg	N	**0.023**	20.0	100.0	300.0
Cadmium	Calc WAC ICP/MS	0.00020	mg/kg	N	**0.00052**	0.04	1.0	5.0
Chloride	Calc (W)	10	mg/kg	N	**16**	800.0	15000.0	25000.0
Chromium	Calc WAC ICP/MS	0.010	mg/kg	N	<0.010	0.5	10.0	70.0
Copper	Calc WAC ICP/MS	0.0050	mg/kg	N	<0.0050	2.0	50.0	100.0
Dissolved Organic Carbon	Calc	10	mg/kg	N	**20**	500.0	800.0	1000.0
Fluoride	Calc (W)	0.50	mg/kg	N	**0.69**	10.0	150.0	500.0
Lead	Calc WAC ICP/MS	0.0030	mg/kg	N	<0.0030	0.5	10.0	50.0
Mercury	Calc WAC ICP/MS	0.00050	mg/kg	N	**0.00086**	0.01	0.2	2.0
Molybdenum	Calc WAC ICP/MS	0.010	mg/kg	N	<0.010	0.5	10.0	30.0
Nickel	Calc WAC ICP/MS	0.010	mg/kg	N	**0.059**	0.4	10.0	40.0
Phenols (Total-Mono)	Calc	1.0	mg/kg	N	<1.0	1.0		
Selenium	Calc WAC ICP/MS	0.0050	mg/kg	N	<0.0050	0.1	0.5	7.0
Sulphate	Calc (W)	5	mg/kg	N	**300**	1000.0	20000.0	50000.0
Total Dissolved Solids	Calc	1000	mg/kg	N	<1000	4000.0	60000.0	100000.0
Zinc	Calc WAC ICP/MS	0.020	mg/kg	N	**0.058**	4.0	50.0	200.0

Following the recommendation from the Environment Agency (England and Wales)*, the leachate preparation in this report has been carried out to BS EN 12457-2 : One Stage batch test at a liquid to solid ratio of 10 l/kg. This is also compliant with Schedule 10 of the Environmental Permitting Regulations 2010.

Note : This is the minimum amount of testing which is required.

Further testing may be required if :

- evidence of immediately leachable parameters becomes available.
- evidence to indicate that the sample could be classified as hazardous under H1-H14 of the Waste(England and Wales) Regulations 2011(as amended) becomes available.

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*** Waste Sampling and Testing for Disposal at Landfill, EBPRI 11507B, Environment Agency (England and Wales) March 2013**

As detailed in- Waste Classification. Guidance on the classification and assessment of waste. Technical Guidance WM3:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/427077/LIT_10121.pdf

Landfill WAC analysis (specifically leaching test results) should not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Waste Acceptance Criteria

Customer Sample Reference : SA01
SAL Sample Reference : 698321 027
Project Site : Wakefield Road, Mapplewell
Customer Reference : C7481
Depth : 0.40
Date Sampled : 16-NOV-2017
Matrix Class : Sandy Soil

Soil					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
Total Organic Carbon	OX/IR	0.1	%	N	**1.9**	3.0	5.0	6.0
Loss on Ignition	Grav	0.1	%	N	**5.7**			10.0
BTEX (Sum)	Calc	0.040	mg/kg	U	<0.040	6.0		
PCB EC7 (Sum)	Calc	0.070	mg/kg	M	(9) <0.070	1.0		
Total Petroleum Hydrocarbons C10-C40 (Sum)	Calc	1	mg/kg	N	(13) **450**	500.0		
PAH (Sum)	Calc	1.6	mg/kg	N	**140**	**100.0**		
pH	Probe			M	**8.1**		> 6.0	
Acid Neutralising Capacity (pH 4)	Titration	2	Mol/kg	N	<2			
Acid Neutralising Capacity (pH 7)	Titration	2	Mol/kg	N	<2			

Data for BS EN 12457-2 (10:1)					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
Antimony	Calc WAC ICP/MS	0.010	mg/kg	N	**0.13**	**0.06**	0.7	5.0
Arsenic	Calc WAC ICP/MS	0.0020	mg/kg	N	**0.026**	0.5	2.0	25.0
Barium	Calc WAC ICP/MS	0.010	mg/kg	N	**0.31**	20.0	100.0	300.0
Cadmium	Calc WAC ICP/MS	0.00020	mg/kg	N	**0.00056**	0.04	1.0	5.0
Chloride	Calc (W)	10	mg/kg	N	**18**	800.0	15000.0	25000.0
Chromium	Calc WAC ICP/MS	0.010	mg/kg	N	<0.010	0.5	10.0	70.0
Copper	Calc WAC ICP/MS	0.0050	mg/kg	N	<0.0050	2.0	50.0	100.0
Dissolved Organic Carbon	Calc	10	mg/kg	N	**58**	500.0	800.0	1000.0
Fluoride	Calc (W)	0.50	mg/kg	N	**5.0**	10.0	150.0	500.0
Lead	Calc WAC ICP/MS	0.0030	mg/kg	N	**0.0043**	0.5	10.0	50.0
Mercury	Calc WAC ICP/MS	0.00050	mg/kg	N	**0.00050**	0.01	0.2	2.0
Molybdenum	Calc WAC ICP/MS	0.010	mg/kg	N	**0.26**	0.5	10.0	30.0
Nickel	Calc WAC ICP/MS	0.010	mg/kg	N	<0.010	0.4	10.0	40.0
Phenols (Total-Mono)	Calc	1.0	mg/kg	N	<1.0	1.0		
Selenium	Calc WAC ICP/MS	0.0050	mg/kg	N	<0.0050	0.1	0.5	7.0
Sulphate	Calc (W)	5	mg/kg	N	**410**	1000.0	20000.0	50000.0
Total Dissolved Solids	Calc	1000	mg/kg	N	**1500**	4000.0	60000.0	100000.0
Zinc	Calc WAC ICP/MS	0.020	mg/kg	N	**0.035**	4.0	50.0	200.0

Following the recommendation from the Environment Agency (England and Wales)*, the leachate preparation in this report has been carried out to BS EN 12457-2 : One Stage batch test at a liquid to solid ratio of 10 l/kg. This is also compliant with Schedule 10 of the Environmental Permitting Regulations 2010.

Note : This is the minimum amount of testing which is required.

Further testing may be required if :

- evidence of immediately leachable parameters becomes available.
- evidence to indicate that the sample could be classified as hazardous under H1-H14 of the Waste(England and Wales) Regulations 2011(as amended) becomes available.

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*** Waste Sampling and Testing for Disposal at Landfill, EBPRI 11507B, Environment Agency (England and Wales) March 2013**

As detailed in- Waste Classification. Guidance on the classification and assessment of waste. Technical Guidance WM3:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/427077/LIT_10121.pdf

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Waste Acceptance Criteria

Customer Sample Reference : SA02
SAL Sample Reference : 698321 029
Project Site : Wakefield Road, Mapplewell
Customer Reference : C7481
Depth : 0.50
Date Sampled : 16-NOV-2017
Matrix Class : Clay

Soil					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
Total Organic Carbon	OX/IR	0.1	%	N	**0.4**	3.0	5.0	6.0
Loss on Ignition	Grav	0.1	%	N	**5.0**			10.0
BTEX (Sum)	Calc	0.040	mg/kg	U	<0.040	6.0		
PCB EC7 (Sum)	Calc	0.007	mg/kg	M	<0.007	1.0		
Total Petroleum Hydrocarbons C10-C40 (Sum)	Calc	1	mg/kg	N	(13) **5**	500.0		
PAH (Sum)	Calc	1.6	mg/kg	N	<1.6	100.0		
pH	Probe			M	**7.2**		> 6.0	
Acid Neutralising Capacity (pH 4)	Titration	2	Mol/kg	N	<2			
Acid Neutralising Capacity (pH 7)	Titration	2	Mol/kg	N	<2			

Data for BS EN 12457-2 (10:1)					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
Antimony	Calc WAC ICP/MS	0.010	mg/kg	N	<0.010	0.06	0.7	5.0
Arsenic	Calc WAC ICP/MS	0.0020	mg/kg	N	**0.018**	0.5	2.0	25.0
Barium	Calc WAC ICP/MS	0.010	mg/kg	N	**0.20**	20.0	100.0	300.0
Cadmium	Calc WAC ICP/MS	0.00020	mg/kg	N	**0.00041**	0.04	1.0	5.0
Chloride	Calc (W)	10	mg/kg	N	**11**	800.0	15000.0	25000.0
Chromium	Calc WAC ICP/MS	0.010	mg/kg	N	**0.013**	0.5	10.0	70.0
Copper	Calc WAC ICP/MS	0.0050	mg/kg	N	**0.018**	2.0	50.0	100.0
Dissolved Organic Carbon	Calc	10	mg/kg	N	**60**	500.0	800.0	1000.0
Fluoride	Calc (W)	0.50	mg/kg	N	**4.8**	10.0	150.0	500.0
Lead	Calc WAC ICP/MS	0.0030	mg/kg	N	**0.0087**	0.5	10.0	50.0
Mercury	Calc WAC ICP/MS	0.00050	mg/kg	N	**0.0010**	0.01	0.2	2.0
Molybdenum	Calc WAC ICP/MS	0.010	mg/kg	N	**0.017**	0.5	10.0	30.0
Nickel	Calc WAC ICP/MS	0.010	mg/kg	N	**0.015**	0.4	10.0	40.0
Phenols (Total-Mono)	Calc	1.0	mg/kg	N	<1.0	1.0		
Selenium	Calc WAC ICP/MS	0.0050	mg/kg	N	<0.0050	0.1	0.5	7.0
Sulphate	Calc (W)	5	mg/kg	N	**36**	1000.0	20000.0	50000.0
Total Dissolved Solids	Calc	1000	mg/kg	N	<1000	4000.0	60000.0	100000.0
Zinc	Calc WAC ICP/MS	0.020	mg/kg	N	**0.040**	4.0	50.0	200.0

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Note : This is the minimum amount of testing which is required.

Further testing may be required if :

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*** Waste Sampling and Testing for Disposal at Landfill, EBPRI 11507B, Environment Agency (England and Wales) March 2013**

As detailed in- Waste Classification. Guidance on the classification and assessment of waste. Technical Guidance WM3:

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Waste Acceptance Criteria

Customer Sample Reference : SA03
SAL Sample Reference : 698321 033
Project Site : Wakefield Road, Mapplewell
Customer Reference : C7481
Depth : 2.00
Date Sampled : 16-NOV-2017
Matrix Class : Clay

Soil					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
Total Organic Carbon	OX/IR	0.1	%	N	**1.5**	3.0	5.0	6.0
Loss on Ignition	Grav	0.1	%	N	**7.1**			10.0
BTEX (Sum)	Calc	0.040	mg/kg	U	<0.040	6.0		
PCB EC7 (Sum)	Calc	0.007	mg/kg	M	<0.007	1.0		
Total Petroleum Hydrocarbons C10-C40 (Sum)	Calc	1	mg/kg	N	(13) **1**	500.0		
PAH (Sum)	Calc	1.6	mg/kg	N	<1.6	100.0		
pH	Probe			M	**7.2**		> 6.0	
Acid Neutralising Capacity (pH 4)	Titration	2	Mol/kg	N	<2			
Acid Neutralising Capacity (pH 7)	Titration	2	Mol/kg	N	<2			

Data for BS EN 12457-2 (10:1)					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
Antimony	Calc WAC ICP/MS	0.010	mg/kg	N	<0.010	0.06	0.7	5.0
Arsenic	Calc WAC ICP/MS	0.0020	mg/kg	N	**0.0035**	0.5	2.0	25.0
Barium	Calc WAC ICP/MS	0.010	mg/kg	N	**0.017**	20.0	100.0	300.0
Cadmium	Calc WAC ICP/MS	0.00020	mg/kg	N	**0.00038**	0.04	1.0	5.0
Chloride	Calc (W)	10	mg/kg	N	**14**	800.0	15000.0	25000.0
Chromium	Calc WAC ICP/MS	0.010	mg/kg	N	<0.010	0.5	10.0	70.0
Copper	Calc WAC ICP/MS	0.0050	mg/kg	N	<0.0050	2.0	50.0	100.0
Dissolved Organic Carbon	Calc	10	mg/kg	N	**31**	500.0	800.0	1000.0
Fluoride	Calc (W)	0.50	mg/kg	N	**0.54**	10.0	150.0	500.0
Lead	Calc WAC ICP/MS	0.0030	mg/kg	N	<0.0030	0.5	10.0	50.0
Mercury	Calc WAC ICP/MS	0.00050	mg/kg	N	**0.00096**	0.01	0.2	2.0
Molybdenum	Calc WAC ICP/MS	0.010	mg/kg	N	<0.010	0.5	10.0	30.0
Nickel	Calc WAC ICP/MS	0.010	mg/kg	N	<0.010	0.4	10.0	40.0
Phenols (Total-Mono)	Calc	1.0	mg/kg	N	<1.0	1.0		
Selenium	Calc WAC ICP/MS	0.0050	mg/kg	N	<0.0050	0.1	0.5	7.0
Sulphate	Calc (W)	5	mg/kg	N	**200**	1000.0	20000.0	50000.0
Total Dissolved Solids	Calc	1000	mg/kg	N	<1000	4000.0	60000.0	100000.0
Zinc	Calc WAC ICP/MS	0.020	mg/kg	N	**0.035**	4.0	50.0	200.0

Following the recommendation from the Environment Agency (England and Wales)*, the leachate preparation in this report has been carried out to BS EN 12457-2 : One Stage batch test at a liquid to solid ratio of 10 l/kg. This is also compliant with Schedule 10 of the Environmental Permitting Regulations 2010.

Note : This is the minimum amount of testing which is required.

Further testing may be required if :

- evidence of immediately leachable parameters becomes available.
- evidence to indicate that the sample could be classified as hazardous under H1-H14 of the Waste(England and Wales) Regulations 2011(as amended) becomes available.

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*** Waste Sampling and Testing for Disposal at Landfill, EBPRI 11507B, Environment Agency (England and Wales) March 2013**

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Waste Acceptance Criteria

Customer Sample Reference : WS08
SAL Sample Reference : 698321 045
Project Site : Wakefield Road, Mapplewell
Customer Reference : C7481
Depth : 0.20
Date Sampled : 16-NOV-2017
Matrix Class : Sandy Soil

Soil					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
Total Organic Carbon	OX/IR	0.1	%	N	**2.8**	3.0	5.0	6.0
Loss on Ignition	Grav	0.1	%	N	**3.7**			10.0
BTEX (Sum)	Calc	0.040	mg/kg	U	<0.040	6.0		
PCB EC7 (Sum)	Calc	0.007	mg/kg	M	<0.007	1.0		
Total Petroleum Hydrocarbons C10-C40 (Sum)	Calc	1	mg/kg	N	(13) **1100**	**500.0**		
PAH (Sum)	Calc	1.6	mg/kg	N	**250**	**100.0**		
pH	Probe			M	**7.1**		> 6.0	
Acid Neutralising Capacity (pH 4)	Titration	2	Mol/kg	N	<2			
Acid Neutralising Capacity (pH 7)	Titration	2	Mol/kg	N	<2			

Data for BS EN 12457-2 (10:1)					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
Antimony	Calc WAC ICP/MS	0.010	mg/kg	N	<0.010	0.06	0.7	5.0
Arsenic	Calc WAC ICP/MS	0.0020	mg/kg	N	**0.030**	0.5	2.0	25.0
Barium	Calc WAC ICP/MS	0.010	mg/kg	N	**0.27**	20.0	100.0	300.0
Cadmium	Calc WAC ICP/MS	0.00020	mg/kg	N	<0.00020	0.04	1.0	5.0
Chloride	Calc (W)	10	mg/kg	N	<10	800.0	15000.0	25000.0
Chromium	Calc WAC ICP/MS	0.010	mg/kg	N	<0.010	0.5	10.0	70.0
Copper	Calc WAC ICP/MS	0.0050	mg/kg	N	**0.0076**	2.0	50.0	100.0
Dissolved Organic Carbon	Calc	10	mg/kg	N	**12**	500.0	800.0	1000.0
Fluoride	Calc (W)	0.50	mg/kg	N	**2.9**	10.0	150.0	500.0
Lead	Calc WAC ICP/MS	0.0030	mg/kg	N	**0.0078**	0.5	10.0	50.0
Mercury	Calc WAC ICP/MS	0.00050	mg/kg	N	<0.00050	0.01	0.2	2.0
Molybdenum	Calc WAC ICP/MS	0.010	mg/kg	N	<0.010	0.5	10.0	30.0
Nickel	Calc WAC ICP/MS	0.010	mg/kg	N	<0.010	0.4	10.0	40.0
Phenols (Total-Mono)	Calc	1.0	mg/kg	N	<1.0	1.0		
Selenium	Calc WAC ICP/MS	0.0050	mg/kg	N	<0.0050	0.1	0.5	7.0
Sulphate	Calc (W)	5	mg/kg	N	**30**	1000.0	20000.0	50000.0
Total Dissolved Solids	Calc	1000	mg/kg	N	<1000	4000.0	60000.0	100000.0
Zinc	Calc WAC ICP/MS	0.020	mg/kg	N	**0.037**	4.0	50.0	200.0

Following the recommendation from the Environment Agency (England and Wales)*, the leachate preparation in this report has been carried out to BS EN 12457-2 : One Stage batch test at a liquid to solid ratio of 10 l/kg. This is also compliant with Schedule 10 of the Environmental Permitting Regulations 2010.

Note : This is the minimum amount of testing which is required.

Further testing may be required if :

- evidence of immediately leachable parameters becomes available.
- evidence to indicate that the sample could be classified as hazardous under H1-H14 of the Waste(England and Wales) Regulations 2011(as amended) becomes available.

Acceptance of waste at landfill is always at the discretion of the Landfill Operator.

*** Waste Sampling and Testing for Disposal at Landfill, EBPRI 11507B, Environment Agency (England and Wales) March 2013**

As detailed in- Waste Classification. Guidance on the classification and assessment of waste. Technical Guidance WM3:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/427077/LIT_10121.pdf

Landfill WAC analysis (specifically leaching test results) should not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Concept Reference: 698321
Project Site: Wakefield Road, Mapplewell
Customer Reference: C7481

Soil Analysed as Soil
MCERTS Preparation

				Concept Reference	**698321 002**	**698321 005**	**698321 006**	**698321 010**	**698321 013**
				Customer Sample Reference	**TP01**	**TP02**	**TP02**	**TP03**	**TP04**
				Test Sample	**AR**	**AR**	**AR**	**AR**	**AR**
				Depth	**0.80**	**0.30**	**0.70**	**0.80**	**0.60**
				Date Sampled	**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**
				Matrix Class	**Clay**	**Sandy Soil**	**Clay**	**Clay**	**Clay**
Determinand	**Method**	**LOD**	**Units**	**Symbol**					
Moisture @105C	Grav (1 Dec) (105 C)	0.1	%	N	**16**	**11**	**13**	**22**	**16**

Concept Reference: 698321
Project Site: Wakefield Road, Mapplewell
Customer Reference: C7481

Soil Analysed as Soil
MCERTS Preparation

				Concept Reference	**698321 014**	**698321 015**	**698321 017**	**698321 018**	**698321 019**
				Customer Sample Reference	**TP04**	**TP05**	**TP06**	**TP06**	**TP06**
				Test Sample	**AR**	**AR**	**AR**	**AR**	**AR**
				Depth	**2.40**	**0.50**	**0.35**	**0.65**	**0.80**
				Date Sampled	**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**
				Matrix Class	**Clay**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Clay**
Determinand	**Method**	**LOD**	**Units**	**Symbol**					
Moisture @105C	Grav (1 Dec) (105 C)	0.1	%	N	**23**	**39**	**11**	**15**	**17**

Concept Reference: 698321
Project Site: Wakefield Road, Mapplewell
Customer Reference: C7481

Soil Analysed as Soil
MCERTS Preparation

				Concept Reference	**698321 027**	**698321 028**	**698321 029**	**698321 033**	**698321 037**
				Customer Sample Reference	**SA01**	**SA02**	**SA02**	**SA03**	**WS02**
				Test Sample	**AR**	**AR**	**AR**	**AR**	**AR**
				Depth	**0.40**	**0.30**	**0.50**	**2.00**	**0.50**
				Date Sampled	**16-NOV-2017**	**16-NOV-2017**	**16-NOV-2017**	**16-NOV-2017**	**16-NOV-2017**
				Matrix Class	**Sandy Soil**	**Clay**	**Clay**	**Clay**	**Clay**
Determinand	**Method**	**LOD**	**Units**	**Symbol**					
Moisture @105C	Grav (1 Dec) (105 C)	0.1	%	N	**9.7**	**15**	**17**	**18**	**16**

Concept Reference: 698321
Project Site: Wakefield Road, Mapplewell
Customer Reference: C7481

Soil Analysed as Soil
MCERTS Preparation

				Concept Reference	**698321 040**	**698321 043**	**698321 045**	**698321 046**
				Customer Sample Reference	**WS05**	**WS07**	**WS08**	**WS08**
				Test Sample	**AR**	**AR**	**AR**	**AR**
				Depth	**0.35**	**1.30**	**0.20**	**0.50**
				Date Sampled	**16-NOV-2017**	**16-NOV-2017**	**16-NOV-2017**	**16-NOV-2017**
				Matrix Class	**Clay**	**Clay**	**Sandy Soil**	**Clay**
Determinand	**Method**	**LOD**	**Units**	**Symbol**				
Moisture @105C	Grav (1 Dec) (105 C)	0.1	%	N	**16**	**16**	**16**	**18**

Concept Reference: 698321
Project Site: Wakefield Road, Mapplewell
Customer Reference: C7481

Soil Analysed as Soil
MCERTS Preparation

				Concept Reference	**698321 002**	**698321 005**	**698321 006**	**698321 010**	**698321 013**
				Customer Sample Reference	**TP01**	**TP02**	**TP02**	**TP03**	**TP04**
				Test Sample	**M40**	**M40**	**M40**	**M40**	**M40**
				Depth	**0.80**	**0.30**	**0.70**	**0.80**	**0.60**
				Date Sampled	**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**
				Matrix Class	**Clay**	**Sandy Soil**	**Clay**	**Clay**	**Clay**
Determinand	**Method**	**LOD**	**Units**	**Symbol**					
Retained on 10mm sieve	Grav	0.1	%	N	<0.1	<0.1	<0.1	<0.1	<0.1

Concept Reference: 698321
Project Site: Wakefield Road, Mapplewell
Customer Reference: C7481

Soil Analysed as Soil
MCERTS Preparation

				Concept Reference	**698321 014**	**698321 015**	**698321 017**	**698321 018**	**698321 019**
				Customer Sample Reference	**TP04**	**TP05**	**TP06**	**TP06**	**TP06**
				Test Sample	**M40**	**M40**	**M40**	**M40**	**M40**
				Depth	**2.40**	**0.50**	**0.35**	**0.65**	**0.80**
				Date Sampled	**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**
				Matrix Class	**Clay**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Clay**
Determinand	**Method**	**LOD**	**Units**	**Symbol**					
Retained on 10mm sieve	Grav	0.1	%	N	<0.1	<0.1	<0.1	<0.1	<0.1

Concept Reference: 698321
Project Site: Wakefield Road, Mapplewell
Customer Reference: C7481

Soil Analysed as Soil
MCERTS Preparation

				Concept Reference	**698321 027**	**698321 028**	**698321 029**	**698321 033**	**698321 037**
				Customer Sample Reference	**SA01**	**SA02**	**SA02**	**SA03**	**WS02**
				Test Sample	**M40**	**M40**	**M40**	**M40**	**M40**
				Depth	**0.40**	**0.30**	**0.50**	**2.00**	**0.50**
				Date Sampled	**16-NOV-2017**	**16-NOV-2017**	**16-NOV-2017**	**16-NOV-2017**	**16-NOV-2017**
				Matrix Class	**Sandy Soil**	**Clay**	**Clay**	**Clay**	**Clay**
Determinand	**Method**	**LOD**	**Units**	**Symbol**					
Retained on 10mm sieve	Grav	0.1	%	N	<0.1	<0.1	<0.1	<0.1	<0.1

Concept Reference: 698321
Project Site: Wakefield Road, Mapplewell
Customer Reference: C7481

Soil Analysed as Soil
MCERTS Preparation

				Concept Reference	**698321 040**	**698321 043**	**698321 045**	**698321 046**
				Customer Sample Reference	**WS05**	**WS07**	**WS08**	**WS08**
				Test Sample	**M40**	**M40**	**M40**	**M40**
				Depth	**0.35**	**1.30**	**0.20**	**0.50**
				Date Sampled	**16-NOV-2017**	**16-NOV-2017**	**16-NOV-2017**	**16-NOV-2017**
				Matrix Class	**Clay**	**Clay**	**Sandy Soil**	**Clay**
Determinand	**Method**	**LOD**	**Units**	**Symbol**				
Retained on 10mm sieve	Grav	0.1	%	N	<0.1	<0.1	<0.1	<0.1

Concept Reference: 698321
Project Site: Wakefield Road, Mapplewell
Customer Reference: C7481

Leachate to BS EN 12457-2 (10:1) Analysed as Water

Waste Acceptance Criteria

				Concept Reference	**698321 006**	**698321 013**	**698321 015**	**698321 019**	**698321 027**
				Customer Sample Reference	**TP02**	**TP04**	**TP05**	**TP06**	**SA01**
				Test Sample	**10:1**	**10:1**	**10:1**	**10:1**	**10:1**
				Depth	**0.70**	**0.60**	**0.50**	**0.80**	**0.40**
				Date Sampled	**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**	**16-NOV-2017**
				Matrix Class	**Clay**	**Clay**	**Sandy Soil**	**Clay**	**Sandy Soil**
Determinand	**Method**	**LOD**	**Units**	**Symbol**					
Arsenic (Dissolved)	ICP/MS (Filtered)	0.2	µg/l	U	<0.2	<0.2	**0.6**	<0.2	**2.6**
Barium (Dissolved)	ICP/MS (Filtered)	1	µg/l	U	**8**	**13**	**110**	**2**	**31**
Molybdenum (Dissolved)	ICP/MS (Filtered)	1	µg/l	N	<1	**1**	**9**	<1	**26**
Total Dissolved Solids	Grav	100	mg/l	N	<100	<100	**140**	<100	**150**
Phenols (Total-Mono)	Colorimetry	0.1	mg/l	U	<0.1	<0.1	<0.1	<0.1	<0.1
Dissolved Organic Carbon	OX/IR	1	mg/l	N	**2**	**3**	**4**	**2**	**6**
Electrical Conductivity	Probe	10	µS/cm	N	**130**	**87**	**230**	**94**	**260**
Antimony (Dissolved)	ICP/MS (Filtered)	1	µg/l	U	<1	<1	**2**	<1	**13**
Cadmium (Dissolved)	ICP/MS (Filtered)	0.02	µg/l	U	**0.05**	<0.02	**0.03**	**0.05**	**0.06**
Chromium (Dissolved)	ICP/MS (Filtered)	1	µg/l	U	<1	**1**	<1	<1	<1
Copper (Dissolved)	ICP/MS (Filtered)	0.5	µg/l	U	<0.5	**1.1**	**0.8**	<0.5	<0.5
Lead (Dissolved)	ICP/MS (Filtered)	0.3	µg/l	U	<0.3	<0.3	<0.3	<0.3	**0.4**
Mercury (Dissolved)	ICP/MS (Filtered)	0.05	µg/l	U	<0.05	<0.05	<0.05	**0.09**	**0.05**
Nickel (Dissolved)	ICP/MS (Filtered)	1	µg/l	U	**4**	<1	**4**	**6**	<1
Selenium (Dissolved)	ICP/MS (Filtered)	0.5	µg/l	U	<0.5	<0.5	**0.5**	<0.5	<0.5
Zinc (Dissolved)	ICP/MS (Filtered)	2	µg/l	U	**4**	**4**	**48**	**6**	**3**
Chloride	Discrete Analyser	1	mg/l	U	<1	<1	**1**	**2**	**2**
Fluoride	Discrete Analyser	0.05	mg/l	U	**0.15**	**1.1**	**1.0**	**0.07**	**0.50**
Sulphate	Discrete Analyser	0.5	mg/l	U	**49**	**8.4**	**40**	**30**	**41**

Concept Reference: 698321
Project Site: Wakefield Road, Mapplewell
Customer Reference: C7481

Leachate to BS EN 12457-2 (10:1) Analysed as Water

Waste Acceptance Criteria

				Concept Reference	**698321 029**	**698321 033**	**698321 045**
				Customer Sample Reference	**SA02**	**SA03**	**WS08**
				Test Sample	**10:1**	**10:1**	**10:1**
				Depth	**0.50**	**2.00**	**0.20**
				Date Sampled	**16-NOV-2017**	**16-NOV-2017**	**16-NOV-2017**
				Matrix Class	**Clay**	**Clay**	**Sandy Soil**
Determinand	**Method**	**LOD**	**Units**	**Symbol**			
Arsenic (Dissolved)	ICP/MS (Filtered)	0.2	µg/l	U	**1.8**	**0.3**	**3.0**
Barium (Dissolved)	ICP/MS (Filtered)	1	µg/l	U	**20**	**2**	**27**
Molybdenum (Dissolved)	ICP/MS (Filtered)	1	µg/l	N	**2**	<1	<1
Total Dissolved Solids	Grav	100	mg/l	N	<100	<100	<100
Phenols (Total-Mono)	Colorimetry	0.1	mg/l	U	<0.1	<0.1	<0.1
Dissolved Organic Carbon	OX/IR	1	mg/l	N	**6**	**3**	**1**
Electrical Conductivity	Probe	10	µS/cm	N	**71**	**71**	**63**
Antimony (Dissolved)	ICP/MS (Filtered)	1	µg/l	U	<1	<1	<1
Cadmium (Dissolved)	ICP/MS (Filtered)	0.02	µg/l	U	**0.04**	**0.04**	<0.02
Chromium (Dissolved)	ICP/MS (Filtered)	1	µg/l	U	**1**	<1	<1
Copper (Dissolved)	ICP/MS (Filtered)	0.5	µg/l	U	**1.8**	<0.5	**0.8**
Lead (Dissolved)	ICP/MS (Filtered)	0.3	µg/l	U	**0.9**	<0.3	**0.8**
Mercury (Dissolved)	ICP/MS (Filtered)	0.05	µg/l	U	**0.10**	**0.10**	<0.05
Nickel (Dissolved)	ICP/MS (Filtered)	1	µg/l	U	**1**	<1	<1
Selenium (Dissolved)	ICP/MS (Filtered)	0.5	µg/l	U	<0.5	<0.5	<0.5
Zinc (Dissolved)	ICP/MS (Filtered)	2	µg/l	U	**4**	**3**	**4**
Chloride	Discrete Analyser	1	mg/l	U	**1**	**1**	<1
Fluoride	Discrete Analyser	0.05	mg/l	U	**0.48**	**0.05**	**0.29**
Sulphate	Discrete Analyser	0.5	mg/l	U	**3.6**	**20**	**3.0**

Concept Reference: 698321
Project Site: Wakefield Road, Mapplewell
Customer Reference: C7481

Soil Analysed as Soil
Sirius Soil Suite 1

				Concept Reference	**698321 002**	**698321 005**	**698321 006**	**698321 010**	**698321 013**
				Customer Sample Reference	**TP01**	**TP02**	**TP02**	**TP03**	**TP04**
				Test Sample	**A40**	**A40**	**A40**	**A40**	**A40**
				Depth	**0.80**	**0.30**	**0.70**	**0.80**	**0.60**
				Date Sampled	**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**
				Matrix Class	**Clay**	**Sandy Soil**	**Clay**	**Clay**	**Clay**
Determinand	**Method**	**LOD**	**Units**	**Symbol**					
Total Organic Carbon	OX/IR	0.1	%	N	**0.1**	**0.8**	**0.3**	**0.6**	**0.8**
Sulphate (Total)	ICP/OES	0.01	%	N	**0.05**	**0.36**	**0.09**	**0.07**	**0.04**
Soil Organic Matter	Calc TOC/0.58	0.1	%	N	**0.3**	**1.4**	**0.6**	**1.0**	**1.3**

Concept Reference: 698321
Project Site: Wakefield Road, Mapplewell
Customer Reference: C7481

Soil Analysed as Soil
Sirius Soil Suite 1

				Concept Reference	**698321 018**	**698321 028**	**698321 037**	**698321 040**	**698321 046**
				Customer Sample Reference	**TP06**	**SA02**	**WS02**	**WS05**	**WS08**
				Test Sample	**A40**	**A40**	**A40**	**A40**	**A40**
				Depth	**0.65**	**0.30**	**0.50**	**0.35**	**0.50**
				Date Sampled	**15-NOV-2017**	**16-NOV-2017**	**16-NOV-2017**	**16-NOV-2017**	**16-NOV-2017**
				Matrix Class	**Sandy Soil**	**Clay**	**Clay**	**Clay**	**Clay**
Determinand	**Method**	**LOD**	**Units**	**Symbol**					
Total Organic Carbon	OX/IR	0.1	%	N	**1.9**	**0.6**	**0.8**	**3.4**	**0.7**
Sulphate (Total)	ICP/OES	0.01	%	N	**0.36**	**0.03**	**0.05**	**0.10**	**0.03**
Soil Organic Matter	Calc TOC/0.58	0.1	%	N	**3.2**	**1.0**	**1.4**	**5.9**	**1.2**

Concept Reference: 698321
Project Site: Wakefield Road, Mapplewell
Customer Reference: C7481

Soil Analysed as Soil
Sirius Soil Suite 1

				Concept Reference	**698321 002**	**698321 005**	**698321 006**	**698321 010**	**698321 013**
				Customer Sample Reference	**TP01**	**TP02**	**TP02**	**TP03**	**TP04**
				Test Sample	**AR**	**AR**	**AR**	**AR**	**AR**
				Depth	**0.80**	**0.30**	**0.70**	**0.80**	**0.60**
				Date Sampled	**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**
				Matrix Class	**Clay**	**Sandy Soil**	**Clay**	**Clay**	**Clay**
Determinand	**Method**	**LOD**	**Units**	**Symbol**					
pH	Probe			M	**7.2**	**8.5**	**6.7**	**6.4**	**7.2**
(Water Soluble) Sulphate expressed as SO4	2:1 Extraction/ICP/OES (TRL 447 T1)	0.01	g/l	N	**0.07**	**0.07**	**0.13**	**0.06**	**0.02**

Concept Reference: 698321
Project Site: Wakefield Road, Mapplewell
Customer Reference: C7481

Soil Analysed as Soil
Sirius Soil Suite 1

Concept Reference	**698321 018**	**698321 028**	**698321 037**	**698321 040**	**698321 046**
Customer Sample Reference	**TP06**	**SA02**	**WS02**	**WS05**	**WS08**
Test Sample	**AR**	**AR**	**AR**	**AR**	**AR**
Depth	**0.65**	**0.30**	**0.50**	**0.35**	**0.50**
Date Sampled	**15-NOV-2017**	**16-NOV-2017**	**16-NOV-2017**	**16-NOV-2017**	**16-NOV-2017**
Matrix Class	**Sandy Soil**	**Clay**	**Clay**	**Clay**	**Clay**

Determinand	Method	LOD	Units	Symbol					
pH	Probe			M	**7.9**	**8.1**	**7.1**	**7.0**	**7.2**
(Water Soluble) Sulphate expressed as SO4	2:1 Extraction/ICP/OES (TRL 447 T1)	0.01	g/l	N	**0.07**	**0.02**	<0.01	**0.04**	<0.01

Concept Reference: 698321
Project Site: Wakefield Road, Mapplewell
Customer Reference: C7481

Soil Analysed as Soil
Sirius Soil Suite 1

Concept Reference					**698321 002**	**698321 005**	**698321 006**	**698321 010**	**698321 013**
Customer Sample Reference					**TP01**	**TP02**	**TP02**	**TP03**	**TP04**
Test Sample					**M105**	**M105**	**M105**	**M105**	**M105**
Depth					**0.80**	**0.30**	**0.70**	**0.80**	**0.60**
Date Sampled					**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**
Matrix Class					**Clay**	**Sandy Soil**	**Clay**	**Clay**	**Clay**
Determinand	**Method**	**LOD**	**Units**	**Symbol**					
Acenaphthene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	GC/MS (MCERTS)	0.1	mg/kg	U	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	GC/MS (MCERTS)	0.1	mg/kg	U	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)Anthracene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)Pyrene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b)fluoranthene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(k)fluoranthene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(ghi)Perylene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(ah)Anthracene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1	<0.1
Indeno(123-cd)Pyrene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1	<0.1
Naphthalene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1	<0.1
Polyaromatic Hydrocarbons (Total)	GC/MS (MCERTS)	0.1	mg/kg	U	<0.1	<0.1	<0.1	<0.1	<0.1

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Soil Analysed as Soil
Sirius Soil Suite 1

				Concept Reference	**698321 018**	**698321 028**	**698321 037**	**698321 040**	**698321 046**
				Customer Sample Reference	**TP06**	**SA02**	**WS02**	**WS05**	**WS08**
				Test Sample	**M105**	**M105**	**M105**	**M105**	**M105**
				Depth	**0.65**	**0.30**	**0.50**	**0.35**	**0.50**
				Date Sampled	**15-NOV-2017**	**16-NOV-2017**	**16-NOV-2017**	**16-NOV-2017**	**16-NOV-2017**
				Matrix Class	**Sandy Soil**	**Clay**	**Clay**	**Clay**	**Clay**
Determinand	**Method**	**LOD**	**Units**	**Symbol**					
Acenaphthene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	**0.1**	<0.1	<0.1
Acenaphthylene	GC/MS (MCERTS)	0.1	mg/kg	U	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	GC/MS (MCERTS)	0.1	mg/kg	U	**0.3**	<0.1	**0.3**	<0.1	<0.1
Benzo(a)Anthracene	GC/MS (MCERTS)	0.1	mg/kg	M	**0.6**	<0.1	**0.5**	<0.1	**0.6**
Benzo(a)Pyrene	GC/MS (MCERTS)	0.1	mg/kg	M	**0.5**	<0.1	**0.3**	<0.1	**0.6**
Benzo(b)fluoranthene	GC/MS (MCERTS)	0.1	mg/kg	M	**0.5**	<0.1	**0.3**	<0.1	**0.6**
Benzo(k)fluoranthene	GC/MS (MCERTS)	0.1	mg/kg	M	**0.4**	<0.1	**0.3**	<0.1	**0.6**
Benzo(ghi)Perylene	GC/MS (MCERTS)	0.1	mg/kg	M	**0.2**	<0.1	**0.2**	<0.1	**0.4**
Chrysene	GC/MS (MCERTS)	0.1	mg/kg	M	**0.6**	<0.1	**0.4**	<0.1	**0.6**
Dibenzo(ah)Anthracene	GC/MS (MCERTS)	0.1	mg/kg	M	**0.1**	<0.1	<0.1	<0.1	**0.1**
Fluoranthene	GC/MS (MCERTS)	0.1	mg/kg	M	**1.8**	<0.1	**1.2**	<0.1	**0.9**
Fluorene	GC/MS (MCERTS)	0.1	mg/kg	M	**0.2**	<0.1	**0.3**	<0.1	<0.1
Indeno(123-cd)Pyrene	GC/MS (MCERTS)	0.1	mg/kg	M	**0.3**	<0.1	**0.2**	<0.1	**0.4**
Naphthalene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	GC/MS (MCERTS)	0.1	mg/kg	M	**0.8**	<0.1	**1.2**	<0.1	**0.1**
Pyrene	GC/MS (MCERTS)	0.1	mg/kg	M	**1.5**	<0.1	**0.9**	<0.1	**1.1**
Polyaromatic Hydrocarbons (Total)	GC/MS (MCERTS)	0.1	mg/kg	U	**7.8**	<0.1	**6.2**	<0.1	**6.1**

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Soil Analysed as Soil
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				Concept Reference	**698321 002**	**698321 005**	**698321 006**	**698321 010**	**698321 013**
				Customer Sample Reference	**TP01**	**TP02**	**TP02**	**TP03**	**TP04**
				Test Sample	**M40**	**M40**	**M40**	**M40**	**M40**
				Depth	**0.80**	**0.30**	**0.70**	**0.80**	**0.60**
				Date Sampled	**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**
				Matrix Class	**Clay**	**Sandy Soil**	**Clay**	**Clay**	**Clay**
Determinand	**Method**	**LOD**	**Units**	**Symbol**					
Arsenic	ICP/OES	2	mg/kg	M	**3**	**28**	**4**	**5**	**4**
Cadmium	ICP/OES	1	mg/kg	M	<1	<1	<1	<1	<1
Chromium	ICP/OES	1	mg/kg	M	**22**	**22**	**27**	**27**	**27**
Copper	ICP/OES	1	mg/kg	M	**8**	**28**	**17**	**22**	**27**
Lead	ICP/OES	1	mg/kg	M	**9**	**27**	**15**	**23**	**24**
Mercury	ICP/OES	1	mg/kg	M	<1	<1	<1	<1	<1
Nickel	ICP/OES	1	mg/kg	M	**22**	**31**	**27**	**32**	**39**
Selenium	ICP/OES	3	mg/kg	M	<3	<3	<3	<3	<3
Zinc	ICP/OES	1	mg/kg	M	**47**	**50**	**64**	**77**	**530**

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Soil Analysed as Soil
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				Concept Reference	**698321 018**	**698321 028**	**698321 037**	**698321 040**	**698321 046**
				Customer Sample Reference	**TP06**	**SA02**	**WS02**	**WS05**	**WS08**
				Test Sample	**M40**	**M40**	**M40**	**M40**	**M40**
				Depth	**0.65**	**0.30**	**0.50**	**0.35**	**0.50**
				Date Sampled	**15-NOV-2017**	**16-NOV-2017**	**16-NOV-2017**	**16-NOV-2017**	**16-NOV-2017**
				Matrix Class	**Sandy Soil**	**Clay**	**Clay**	**Clay**	**Clay**
Determinand	**Method**	**LOD**	**Units**	**Symbol**					
Arsenic	ICP/OES	2	mg/kg	M	**12**	**4**	**7**	**24**	**7**
Cadmium	ICP/OES	1	mg/kg	M	<1	<1	<1	<1	<1
Chromium	ICP/OES	1	mg/kg	M	**21**	**26**	**23**	**33**	**21**
Copper	ICP/OES	1	mg/kg	M	**32**	**25**	**24**	**100**	**17**
Lead	ICP/OES	1	mg/kg	M	**500**	**25**	**36**	**99**	**23**
Mercury	ICP/OES	1	mg/kg	M	<1	<1	<1	<1	<1
Nickel	ICP/OES	1	mg/kg	M	**16**	**50**	**32**	**55**	**26**
Selenium	ICP/OES	3	mg/kg	M	<3	<3	<3	<3	<3
Zinc	ICP/OES	1	mg/kg	M	**320**	**95**	**92**	**320**	**72**

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Soil Analysed as Soil
Miscellaneous

				Concept Reference	**698321 004**	**698321 008**	**698321 014**	**698321 020**	**698321 047**
				Customer Sample Reference	**TP01**	**TP02**	**TP04**	**TP06**	**WS08**
				Test Sample	**A40**	**A40**	**A40**	**A40**	**A40**
				Depth	**1.80**	**1.90**	**2.40**	**2.00**	**0.90**
				Date Sampled	**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**	**16-NOV-2017**
				Matrix Class			**Clay**		
Determinand	**Method**	**LOD**	**Units**	**Symbol**					
pH	Probe			U	**5.9**	**6.4**	**6.6**	**7.0**	**7.2**

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Soil Analysed as Soil
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				Concept Reference	**69832 1 002**	**69832 1 004**	**69832 1 005**	**69832 1 006**	**69832 1 008**
				Customer Sample Reference	**TP01**	**TP01**	**TP02**	**TP02**	**TP02**
				Test Sample	**AR**	**AR**	**AR**	**AR**	**AR**
				Depth	**0.80**	**1.80**	**0.30**	**0.70**	**1.90**
				Date Sampled	**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**
				Matrix Class	**Clay**		**Sandy Soil**	**Clay**	
Determinand	**Method**	**LOD**	**Units**	**Symbol**					
(Water Soluble) Sulphate expressed as SO4	2:1 Extraction/ICP/OES (TRL 447 T1)	0.01	g/l	N	**0.07**	**0.02**	**0.07**	**0.13**	<0.01
Calorific Value (Gross) (Moisture Free)	Bomb calorimetry (based on BS EN 15408:2011) (Moisture Free)	0.1	MJ/kg	N	-	-	-	-	-

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Soil Analysed as Soil
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Concept Reference	**698321 010**	**698321 013**	**698321 014**	**698321 018**	**698321 020**
Customer Sample Reference	**TP03**	**TP04**	**TP04**	**TP06**	**TP06**
Test Sample	**AR**	**AR**	**AR**	**AR**	**AR**
Depth	**0.80**	**0.60**	**2.40**	**0.65**	**2.00**
Date Sampled	**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**
Matrix Class	**Clay**	**Clay**	**Clay**	**Sandy Soil**	

Determinand	Method	LOD	Units	Symbol					
(Water Soluble) Sulphate expressed as SO4	2:1 Extraction/ICP/OES (TRL 447 T1)	0.01	g/l	N	**0.06**	**0.02**	<0.01	**0.07**	<0.01
Calorific Value (Gross) (Moisture Free)	Bomb calorimetry (based on BS EN 15408:2011) (Moisture Free)	0.1	MJ/kg	N	-	-	-	**0.3**	-

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Soil Analysed as Soil
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Concept Reference	**698321 028**	**698321 037**	**698321 040**	**698321 046**	**698321 047**
Customer Sample Reference	**SA02**	**WS02**	**WS05**	**WS08**	**WS08**
Test Sample	**AR**	**AR**	**AR**	**AR**	**AR**
Depth	**0.30**	**0.50**	**0.35**	**0.50**	**0.90**
Date Sampled	**16-NOV-2017**	**16-NOV-2017**	**16-NOV-2017**	**16-NOV-2017**	**16-NOV-2017**
Matrix Class	**Clay**	**Clay**	**Clay**	**Clay**	

Determinand	Method	LOD	Units	Symbol					
(Water Soluble) Sulphate expressed as SO4	2:1 Extraction/ICP/OES (TRL 447 T1)	0.01	g/l	N	**0.02**	<0.01	**0.04**	<0.01	**0.06**
Calorific Value (Gross) (Moisture Free)	Bomb calorimetry (based on BS EN 15408:2011) (Moisture Free)	0.1	MJ/kg	N	-	<0.1	**0.7**	-	-

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Soil Analysed as Soil
Total and Speciated USEPA16 PAH

Concept Reference					**698321 006**	**698321 013**	**698321 015**	**698321 019**	**698321 027**
Customer Sample Reference					**TP02**	**TP04**	**TP05**	**TP06**	**SA01**
Test Sample					**M105**	**M105**	**M105**	**M105**	**M105**
Depth					**0.70**	**0.60**	**0.50**	**0.80**	**0.40**
Date Sampled					**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**	**16-NOV-2017**
Matrix Class					**Clay**	**Clay**	**Sandy Soil**	**Clay**	**Sandy Soil**
Determinand	**Method**	**LOD**	**Units**	**Symbol**					
Naphthalene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	(9) <1.0	<0.1	(9) <1.0
Acenaphthylene	GC/MS (MCERTS)	0.1	mg/kg	U	<0.1	<0.1	(9) <1.0	<0.1	(9) <1.0
Acenaphthene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	(9) <1.0	<0.1	**1.8**
Fluorene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	(9) <1.0	<0.1	**2.0**
Phenanthrene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	(9) <1.0	<0.1	**24**
Anthracene	GC/MS (MCERTS)	0.1	mg/kg	U	<0.1	<0.1	(9) <1.0	<0.1	**6.4**
Fluoranthene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	(9) <1.0	<0.1	**27**
Pyrene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	(9) <1.0	<0.1	**22**
Benzo(a)Anthracene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	(9) <1.0	<0.1	**12**
Chrysene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	(9) <1.0	<0.1	**12**
Benzo(b/k)Fluoranthene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	(9) <1.0	<0.1	**15**
Benzo(a)Pyrene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	(9) <1.0	<0.1	**8.2**
Indeno(123-cd)Pyrene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	(9) <1.0	<0.1	**4.4**
Dibenzo(ah)Anthracene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	(9) <1.0	<0.1	**1.2**
Benzo(ghi)Perylene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	(9) <1.0	<0.1	**5.2**
Polyaromatic Hydrocarbons (Total)	GC/MS (MCERTS)	0.1	mg/kg	U	<0.1	<0.1	(9) <1.0	<0.1	**140**
Coronene	GC/MS	0.1	mg/kg	N	<0.1	<0.1	(9) <1.0	<0.1	(9) <1.0
Phenol	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	(9) <1.0	<0.1	(9) <1.0

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Soil Analysed as Soil
Total and Speciated USEPA16 PAH

				Concept Reference	**698321 029**	**698321 033**	**698321 045**
				Customer Sample Reference	**SA02**	**SA03**	**WS08**
				Test Sample	**M105**	**M105**	**M105**
				Depth	**0.50**	**2.00**	**0.20**
				Date Sampled	**16-NOV-2017**	**16-NOV-2017**	**16-NOV-2017**
				Matrix Class	**Clay**	**Clay**	**Sandy Soil**
Determinand	**Method**	**LOD**	**Units**	**Symbol**			
Naphthalene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	(9) <1.0
Acenaphthylene	GC/MS (MCERTS)	0.1	mg/kg	U	<0.1	<0.1	(9) <1.0
Acenaphthene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	**1.5**
Fluorene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	(9) <1.0
Phenanthrene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	**16**
Anthracene	GC/MS (MCERTS)	0.1	mg/kg	U	<0.1	<0.1	**2.7**
Fluoranthene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	**40**
Pyrene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	**41**
Benzo(a)Anthracene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	**26**
Chrysene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	**26**
Benzo(b/k)Fluoranthene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	**46**
Benzo(a)Pyrene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	**24**
Indeno(123-cd)Pyrene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	**11**
Dibenzo(ah)Anthracene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	**4.3**
Benzo(ghi)Perylene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	**13**
Polyaromatic Hydrocarbons (Total)	GC/MS (MCERTS)	0.1	mg/kg	U	<0.1	<0.1	**250**
Coronene	GC/MS	0.1	mg/kg	N	<0.1	<0.1	**3.0**
Phenol	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1	(9) <1.0

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Soil Analysed as Soil
BTEX

				Concept Reference	**698321 006**	**698321 013**	**698321 015**	**698321 019**	**698321 027**
				Customer Sample Reference	**TP02**	**TP04**	**TP05**	**TP06**	**SA01**
				Test Sample	**M105**	**M105**	**M105**	**M105**	**M105**
				Depth	**0.70**	**0.60**	**0.50**	**0.80**	**0.40**
				Date Sampled	**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**	**16-NOV-2017**
				Matrix Class	**Clay**	**Clay**	**Sandy Soil**	**Clay**	**Sandy Soil**
Determinand	**Method**	**LOD**	**Units**	**Symbol**					
Benzene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	(13) <10	(13) <10	(13) <10	(13) <10	(13) <10
Toluene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10	<10	<10	<10	<10
EthylBenzene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10	<10	<10	<10	<10
Meta/Para-Xylene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10	<10	<10	<10	<10
Ortho-Xylene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10	<10	<10	<10	<10

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Soil Analysed as Soil
BTEX

				Concept Reference	**698321 029**	**698321 033**	**698321 045**
				Customer Sample Reference	**SA02**	**SA03**	**WS08**
				Test Sample	**M105**	**M105**	**M105**
				Depth	**0.50**	**2.00**	**0.20**
				Date Sampled	**16-NOV-2017**	**16-NOV-2017**	**16-NOV-2017**
				Matrix Class	**Clay**	**Clay**	**Sandy Soil**
Determinand	**Method**	**LOD**	**Units**	**Symbol**			
Benzene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	(13) <10	(13) <10	(13) <10
Toluene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10	<10	<10
EthylBenzene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10	<10	<10
Meta/Para-Xylene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10	<10	<10
Ortho-Xylene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10	<10	<10

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Soil Analysed as Soil
TPH UKCWG

				Concept Reference	**698321 010**	**698321 014**	**698321 017**	**698321 043**
				Customer Sample Reference	**TP03**	**TP04**	**TP06**	**WS07**
				Test Sample	**M105**	**M105**	**M105**	**M105**
				Depth	**0.80**	**2.40**	**0.35**	**1.30**
				Date Sampled	**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**	**16-NOV-2017**
				Matrix Class	**Clay**	**Clay**	**Sandy Soil**	**Clay**
Determinand	**Method**	**LOD**	**Units**	**Symbol**				
Benzene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	(13) <10	(13) <10	(13) <10	(13) <10
Toluene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10	<10	<10	<10
EthylBenzene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10	<10	<10	<10
Methyl tert-Butyl Ether	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10	<10	<10	<10
Ortho-Xylene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10	<10	<10	<10
Meta/Para-Xylene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10	<10	<10	<10
Total Petroleum Hydrocarbons (C5 - C6 aliphatic)	GC/MS (Head Space)(MCERTS)	0.100	mg/kg	N	<0.100	<0.100	<0.100	<0.100
Total Petroleum Hydrocarbons (C6-C8 aliphatic)	GC/MS (Head Space)(MCERTS)	0.10	mg/kg	N	<0.10	<0.10	<0.10	<0.10
Total Petroleum Hydrocarbons (C8-C10 aliphatic)	GC/MS (Head Space)(MCERTS)	0.10	mg/kg	N	<0.10	<0.10	<0.10	<0.10
Total Petroleum Hydrocarbons (C10-C12 aliphatic)	GC/FID (MCERTS)	1	mg/kg	N	(13) <1	(13) <1	<1	<1
Total Petroleum Hydrocarbons (C12-C16 aliphatic)	GC/FID (MCERTS)	2	mg/kg	M	(13) <2	(13) <2	<2	<2
Total Petroleum Hydrocarbons (C16-C21 aliphatic)	GC/FID (MCERTS)	1	mg/kg	M	(13) <1	**(13) 4**	<1	<1
Total Petroleum Hydrocarbons (C21-C35 aliphatic)	GC/FID (MCERTS)	4	mg/kg	M	(13) <4	(13) <4	<4	<4
Total Petroleum Hydrocarbons (C35-C44 aliphatic)	GC/FID	1	mg/kg	N	(13) <1	(13) <1	<1	<1
Total Petroleum Hydrocarbons (Aliphatic) total	Calc		mg/kg	N	(13) <4.0	**(13) 4.1**	<4.0	<4.0
Total Petroleum Hydrocarbons (C6 - C7 aromatic)	GC/MS (Head Space)(MCERTS)	0.10	mg/kg	N	<0.10	<0.10	<0.10	<0.10
Total Petroleum Hydrocarbons (C7-C8 aromatic)	GC/MS (Head Space)(MCERTS)	0.10	mg/kg	N	<0.10	<0.10	<0.10	<0.10
Total Petroleum Hydrocarbons (C8-C10 aromatic)	GC/MS (Head Space)(MCERTS)	0.10	mg/kg	N	<0.10	<0.10	<0.10	<0.10
Total Petroleum Hydrocarbons (C10-C12 aromatic)	GC/FID (MCERTS)	1	mg/kg	M	(13) <1	(13) <1	<1	<1
Total Petroleum Hydrocarbons (C12-C16 aromatic)	GC/FID (MCERTS)	1	mg/kg	M	(13) <1	(13) <1	<1	<1
Total Petroleum Hydrocarbons (C16-C21 aromatic)	GC/FID (MCERTS)	1	mg/kg	M	(13) <1	(13) <1	**1**	<1
Total Petroleum Hydrocarbons (C21-C35 aromatic)	GC/FID (MCERTS)	1	mg/kg	M	(13) <1	(13) <1	<1	<1
Total Petroleum Hydrocarbons (C35-C44 aromatic)	GC/FID	1	mg/kg	N	(13) <1	(13) <1	<1	<1
Total Petroleum Hydrocarbons (Aromatic) total	Calc		mg/kg	N	(13) <1.0	(13) <1.0	**1.2**	<1.0
Total Petroleum Hydrocarbons (Aliphatic+Aromatic)	Calc		mg/kg	N	(13) <4.0	**(13) 4.1**	<4.0	<4.0

Concept Reference: 698321
Project Site: Wakefield Road, Mapplewell
Customer Reference: C7481

Soil Analysed as Soil
Total Petroleum Hydrocarbons

				Concept Reference	**698321 006**	**698321 013**	**698321 015**	**698321 019**	**698321 027**
				Customer Sample Reference	**TP02**	**TP04**	**TP05**	**TP06**	**SA01**
				Test Sample	**M105**	**M105**	**M105**	**M105**	**M105**
				Depth	**0.70**	**0.60**	**0.50**	**0.80**	**0.40**
				Date Sampled	**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**	**16-NOV-2017**
				Matrix Class	**Clay**	**Clay**	**Sandy Soil**	**Clay**	**Sandy Soil**
Determinand	**Method**	**LOD**	**Units**	**Symbol**					
Total Petroleum Hydrocarbons	GC/FID	1	mg/kg	M	(13) <1	**(13) 12**	**(13) 4900**	**(13) 5**	**(13) 390**
Total Petroleum Hydrocarbons (C35-C40)	GC/FID	1	mg/kg	N	(13) <1	(13) <1	**(13) 250**	**(13) 6**	**(13) 63**

Concept Reference: 698321
Project Site: Wakefield Road, Mapplewell
Customer Reference: C7481

Soil Analysed as Soil
Total Petroleum Hydrocarbons

				Concept Reference	**698321 029**	**698321 033**	**698321 045**
				Customer Sample Reference	**SA02**	**SA03**	**WS08**
				Test Sample	**M105**	**M105**	**M105**
				Depth	**0.50**	**2.00**	**0.20**
				Date Sampled	**16-NOV-2017**	**16-NOV-2017**	**16-NOV-2017**
				Matrix Class	**Clay**	**Clay**	**Sandy Soil**
Determinand	**Method**	**LOD**	**Units**	**Symbol**			
Total Petroleum Hydrocarbons	GC/FID	1	mg/kg	M	**(13) 3**	(13) <1	**(13) 1000**
Total Petroleum Hydrocarbons (C35-C40)	GC/FID	1	mg/kg	N	**(13) 2**	**(13) 1**	**(13) 57**

Concept Reference: 698321
Project Site: Wakefield Road, Mapplewell
Customer Reference: C7481

Soil Analysed as Soil
Phenol

				Concept Reference	**698321 002**	**698321 005**	**698321 006**	**698321 010**	**698321 013**
				Customer Sample Reference	**TP01**	**TP02**	**TP02**	**TP03**	**TP04**
				Test Sample	**AR**	**AR**	**AR**	**AR**	**AR**
				Depth	**0.80**	**0.30**	**0.70**	**0.80**	**0.60**
				Date Sampled	**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**
				Matrix Class	**Clay**	**Sandy Soil**	**Clay**	**Clay**	**Clay**
Determinand	**Method**	**LOD**	**Units**	**Symbol**					
Phenols (Total-Mono)	Colorimetry (CF)	1	mg/kg	M	<1	<1	<1	<1	<1

Concept Reference: 698321
Project Site: Wakefield Road, Mapplewell
Customer Reference: C7481

Soil Analysed as Soil
Phenol

				Concept Reference	**698321 018**	**698321 028**	**698321 037**	**698321 040**	**698321 046**
				Customer Sample Reference	**TP06**	**SA02**	**WS02**	**WS05**	**WS08**
				Test Sample	**AR**	**AR**	**AR**	**AR**	**AR**
				Depth	**0.65**	**0.30**	**0.50**	**0.35**	**0.50**
				Date Sampled	**15-NOV-2017**	**16-NOV-2017**	**16-NOV-2017**	**16-NOV-2017**	**16-NOV-2017**
				Matrix Class	**Sandy Soil**	**Clay**	**Clay**	**Clay**	**Clay**
Determinand	**Method**	**LOD**	**Units**	**Symbol**					
Phenols (Total-Mono)	Colorimetry (CF)	1	mg/kg	M	<1	<1	<1	<1	<1

Concept Reference: 698321
Project Site: Wakefield Road, Mapplewell
Customer Reference: C7481

Soil Analysed as Soil

Volatile Organic Compounds (USEPA 624) (MCERTS)

				Concept Reference	**698321 014**	**698321 017**	**698321 043**
				Customer Sample Reference	**TP04**	**TP06**	**WS07**
				Test Sample	**M105**	**M105**	**M105**
				Depth	**2.40**	**0.35**	**1.30**
				Date Sampled	**15-NOV-2017**	**15-NOV-2017**	**16-NOV-2017**
				Matrix Class	**Clay**	**Sandy Soil**	**Clay**
Determinand	**Method**	**LOD**	**Units**	**Symbol**			
Dichlorodifluoromethane	GC/MS (Head Space)(MCERTS)	50	µg/kg	M	<50	<50	<50
Chloromethane	GC/MS (Head Space)(MCERTS)	50	µg/kg	U	<50	<50	<50
Vinyl chloride monomer	GC/MS (Head Space)(MCERTS)	50	µg/kg	M	<50	<50	<50
Bromomethane	GC/MS (Head Space)(MCERTS)	50	µg/kg	U	<50	<50	<50
Chloroethane	GC/MS (Head Space)(MCERTS)	50	µg/kg	M	<50	<50	<50
Trichlorofluoromethane	GC/MS (Head Space)(MCERTS)	50	µg/kg	M	<50	<50	<50
1,1-Dichloroethylene	GC/MS (Head Space)(MCERTS)	50	µg/kg	M	<50	<50	<50
Dichloromethane	GC/MS (Head Space)(MCERTS)	50	µg/kg	U	<50	<50	<50
Trans-1,2-Dichloroethylene	GC/MS (Head Space)(MCERTS)	50	µg/kg	M	<50	<50	<50
1,1-Dichloroethane	GC/MS (Head Space)(MCERTS)	50	µg/kg	M	<50	<50	<50
Cis-1,2-Dichloroethylene	GC/MS (Head Space)(MCERTS)	50	µg/kg	M	<50	<50	<50
2,2-Dichloropropane	GC/MS (Head Space)(MCERTS)	50	µg/kg	U	<50	<50	<50
Chloroform	GC/MS (Head Space)(MCERTS)	50	µg/kg	M	<50	<50	<50
Bromochloromethane	GC/MS (Head Space)(MCERTS)	50	µg/kg	M	<50	<50	<50
1,1,1-Trichloroethane	GC/MS (Head Space)(MCERTS)	50	µg/kg	M	<50	<50	<50
1,1-Dichloropropene	GC/MS (Head Space)(MCERTS)	50	µg/kg	M	<50	<50	<50
Carbon tetrachloride	GC/MS (Head Space)(MCERTS)	50	µg/kg	M	<50	<50	<50
1,2-Dichloroethane	GC/MS (Head Space)(MCERTS)	50	µg/kg	M	<50	<50	<50
Benzene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	(13) <10	(13) <10	(13) <10
1,2-Dichloropropane	GC/MS (Head Space)(MCERTS)	50	µg/kg	M	<50	<50	<50
Trichloroethylene	GC/MS (Head Space)(MCERTS)	50	µg/kg	M	<50	<50	<50
Bromodichloromethane	GC/MS (Head Space)(MCERTS)	50	µg/kg	M	<50	<50	<50
Dibromomethane	GC/MS (Head Space)(MCERTS)	50	µg/kg	M	<50	<50	<50
Cis-1,3-Dichloropropene	GC/MS (Head Space)(MCERTS)	50	µg/kg	M	<50	<50	<50
Toluene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10	<10	<10
Trans-1,3-Dichloropropene	GC/MS (Head Space)(MCERTS)	50	µg/kg	M	<50	<50	<50
1,1,2-Trichloroethane	GC/MS (Head Space)(MCERTS)	50	µg/kg	M	<50	<50	<50
1,3-Dichloropropane	GC/MS (Head Space)(MCERTS)	50	µg/kg	M	<50	<50	<50
Tetrachloroethylene	GC/MS (Head Space)(MCERTS)	50	µg/kg	M	<50	<50	<50
Chlorodibromomethane	GC/MS (Head Space)(MCERTS)	50	µg/kg	M	<50	<50	<50
1,2-dibromoethane	GC/MS (Head Space)(MCERTS)	50	µg/kg	M	<50	<50	<50
Chlorobenzene	GC/MS (Head Space)(MCERTS)	50	µg/kg	M	<50	<50	<50
1,1,1,2-Tetrachloroethane	GC/MS (Head Space)(MCERTS)	50	µg/kg	M	<50	<50	<50
EthylBenzene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10	<10	<10
Meta/Para-Xylene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10	<10	<10
Ortho-Xylene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10	<10	<10
Styrene	GC/MS (Head Space)(MCERTS)	50	µg/kg	U	<50	<50	<50
Bromoform	GC/MS (Head Space)(MCERTS)	50	µg/kg	M	<50	<50	<50
Isopropyl benzene	GC/MS (Head Space)(MCERTS)	50	µg/kg	M	<50	<50	<50
1,1,2,2-Tetrachloroethane	GC/MS (Head Space)(MCERTS)	50	µg/kg	U	<50	<50	<50
1,2,3-Trichloropropane	GC/MS (Head Space)(MCERTS)	50	µg/kg	U	<50	<50	<50
n-Propylbenzene	GC/MS (Head Space)(MCERTS)	50	µg/kg	M	<50	<50	<50
Bromobenzene	GC/MS (Head Space)(MCERTS)	50	µg/kg	M	<50	<50	<50
1,3,5-Trimethylbenzene	GC/MS (Head Space)(MCERTS)	50	µg/kg	M	<50	<50	<50
Tert-Butylbenzene	GC/MS (Head Space)(MCERTS)	50	µg/kg	M	<50	<50	<50
1,2,4-Trimethylbenzene	GC/MS (Head Space)(MCERTS)	50	µg/kg	M	<50	<50	<50
Sec-Butylbenzene	GC/MS (Head Space)(MCERTS)	50	µg/kg	M	<50	<50	<50
p-Isopropyltoluene	GC/MS (Head Space)(MCERTS)	50	µg/kg	M	<50	<50	<50
2-Chlorotoluene	GC/MS (Head Space)(MCERTS)	50	µg/kg	U	<50	<50	<50
4-Chlorotoluene	GC/MS (Head Space)(MCERTS)	50	µg/kg	U	<50	<50	<50
1,3-Dichlorobenzene	GC/MS (Head Space)(MCERTS)	50	µg/kg	M	<50	<50	<50
1,4-Dichlorobenzene	GC/MS (Head Space)(MCERTS)	50	µg/kg	M	<50	<50	<50
1,2-Dichlorobenzene	GC/MS (Head Space)(MCERTS)	50	µg/kg	M	<50	<50	<50

Concept Reference: 698321
Project Site: Wakefield Road, Mapplewell
Customer Reference: C7481

Soil Analysed as Soil
PCB EC7

				Concept Reference	**698321 006**	**698321 013**	**698321 015**	**698321 019**	**698321 027**
				Customer Sample Reference	**TP02**	**TP04**	**TP05**	**TP06**	**SA01**
				Test Sample	**M105**	**M105**	**M105**	**M105**	**M105**
				Depth	**0.70**	**0.60**	**0.50**	**0.80**	**0.40**
				Date Sampled	**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**	**16-NOV-2017**
				Matrix Class	**Clay**	**Clay**	**Sandy Soil**	**Clay**	**Sandy Soil**
Determinand	**Method**	**LOD**	**Units**	**Symbol**					
Polychlorinated biphenyl BZ#101	GC/MS (SIR)	1	µg/kg	M	<1	<1	**17**	<1	(9) <10
Polychlorinated biphenyl BZ#118	GC/MS (SIR)	1	µg/kg	M	<1	<1	**30**	<1	(9) <10
Polychlorinated biphenyl BZ#138	GC/MS (SIR)	1	µg/kg	M	<1	<1	**16**	<1	(9) <10
Polychlorinated biphenyl BZ#153	GC/MS (SIR)	1	µg/kg	M	<1	<1	**14**	<1	(9) <10
Polychlorinated biphenyl BZ#180	GC/MS (SIR)	1	µg/kg	M	<1	<1	(9) <10	<1	(9) <10
Polychlorinated biphenyl BZ#28	GC/MS (SIR)	1	µg/kg	M	<1	<1	(9) <10	<1	(9) <10
Polychlorinated biphenyl BZ#52	GC/MS (SIR)	1	µg/kg	M	<1	<1	(9) <10	<1	(9) <10

Concept Reference: 698321
Project Site: Wakefield Road, Mapplewell
Customer Reference: C7481

Soil Analysed as Soil
PCB EC7

				Concept Reference	**698321 029**	**698321 033**	**698321 045**
				Customer Sample Reference	**SA02**	**SA03**	**WS08**
				Test Sample	**M105**	**M105**	**M105**
				Depth	**0.50**	**2.00**	**0.20**
				Date Sampled	**16-NOV-2017**	**16-NOV-2017**	**16-NOV-2017**
				Matrix Class	**Clay**	**Clay**	**Sandy Soil**
Determinand	**Method**	**LOD**	**Units**	**Symbol**			
Polychlorinated biphenyl BZ#101	GC/MS (SIR)	1	µg/kg	M	<1	<1	<1
Polychlorinated biphenyl BZ#118	GC/MS (SIR)	1	µg/kg	M	<1	<1	<1
Polychlorinated biphenyl BZ#138	GC/MS (SIR)	1	µg/kg	M	<1	<1	<1
Polychlorinated biphenyl BZ#153	GC/MS (SIR)	1	µg/kg	M	<1	<1	<1
Polychlorinated biphenyl BZ#180	GC/MS (SIR)	1	µg/kg	M	<1	<1	<1
Polychlorinated biphenyl BZ#28	GC/MS (SIR)	1	µg/kg	M	<1	<1	<1
Polychlorinated biphenyl BZ#52	GC/MS (SIR)	1	µg/kg	M	<1	<1	<1

Concept Reference: 698321
Project Site: Wakefield Road, Mapplewell
Customer Reference: C7481

Soil Analysed as Soil
Poly-Chlorinated Biphenyls (WHO 12)

				Concept Reference	**698321 005**	**698321 011**	**698321 039**
				Customer Sample Reference	**TP02**	**TP03**	**WS04**
				Test Sample	**M105**	**M105**	**M105**
				Depth	**0.30**	**1.50**	**0.25**
				Date Sampled	**15-NOV-2017**	**15-NOV-2017**	**16-NOV-2017**
				Matrix Class	**Sandy Soil**	**Clay**	
Determinand	**Method**	**LOD**	**Units**	**Symbol**			
Polychlorinated biphenyl BZ#77	GC/MS (HR)	0.05	µg/kg	U	<0.05	<0.05	<0.05
Polychlorinated biphenyl BZ#81	GC/MS (HR)	0.05	µg/kg	U	<0.05	<0.05	<0.05
Polychlorinated biphenyl BZ#105	GC/MS (HR)	0.05	µg/kg	U	<0.05	<0.05	<0.05
Polychlorinated biphenyl BZ#114	GC/MS (HR)	0.05	µg/kg	U	<0.05	<0.05	<0.05
Polychlorinated biphenyl BZ#118	GC/MS (HR)	0.05	µg/kg	U	<0.05	<0.05	<0.05
Polychlorinated biphenyl BZ#123	GC/MS (HR)	0.05	µg/kg	U	<0.05	<0.05	<0.05
Polychlorinated biphenyl BZ#126	GC/MS (HR)	0.05	µg/kg	U	<0.05	<0.05	<0.05
Polychlorinated biphenyl BZ#156	GC/MS (HR)	0.05	µg/kg	U	<0.05	<0.05	<0.05
Polychlorinated biphenyl BZ#157	GC/MS (HR)	0.05	µg/kg	U	<0.05	<0.05	<0.05
Polychlorinated biphenyl BZ#167	GC/MS (HR)	0.05	µg/kg	U	<0.05	<0.05	<0.05
Polychlorinated biphenyl BZ#169	GC/MS (HR)	0.05	µg/kg	U	<0.05	<0.05	<0.05
Polychlorinated biphenyl BZ#189	GC/MS (HR)	0.05	µg/kg	U	<0.05	<0.05	<0.05

Concept Reference: 698321
Project Site: Wakefield Road, Mapplewell
Customer Reference: C7481

Soil Analysed as Soil
Asbestos

				Concept Reference	**698321 002**	**698321 005**	**698321 013**	**698321 016**	**698321 028**
				Customer Sample Reference	**TP01**	**TP02**	**TP04**	**TP05**	**SA02**
				Test Sample	**AR**	**AR**	**AR**	**AR**	**AR**
				Depth	**0.80**	**0.30**	**0.60**	**1.00**	**0.30**
				Date Sampled	**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**	**15-NOV-2017**	**16-NOV-2017**
				Matrix Class	**Clay**	**Sandy Soil**	**Clay**		**Clay**
Determinand	**Method**	**LOD**	**Units**	**Symbol**					
Asbestos ID	PLM			SU	N.D.	N.D.	N.D.	N.D.	N.D.

Concept Reference: 698321
Project Site: Wakefield Road, Mapplewell
Customer Reference: C7481

Soil Analysed as Soil
Asbestos

				Concept Reference	**698321 046**
				Customer Sample Reference	**WS08**
				Test Sample	**AR**
				Depth	**0.50**
				Date Sampled	**16-NOV-2017**
				Matrix Class	**Clay**
Determinand	**Method**	**LOD**	**Units**	**Symbol**	
Asbestos ID	PLM			SU	N.D.

Index to symbols used in 698321-2

Value	Description
10:1 S	Data for BS EN 12457-2 (10:1)
AR	As Received
M105	Analysis conducted on an "as received" aliquot. Results are reported on a dry weight basis where moisture content was determined by assisted drying of sample at 105C
A40	Assisted dried < 40C
10:1	Leachate to BS EN 12457-2 (10:1)
M40	Analysis conducted on sample assisted dried at no more than 40C. Results are reported on a dry weight basis.
N.D.	Not Detected
9	LOD raised due to dilution of sample
13	Results have been blank corrected.
S	Analysis was subcontracted
M	Analysis is MCERTS accredited
U	Analysis is UKAS accredited
N	Analysis is not UKAS accredited

Notes

Asbestos was subcontracted to REC Asbestos.

CONCEPT LIFE SCIENCES
DELIVERING SCIENCE

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Concept Life Sciences

Certificate of Analysis

Hadfield House
Hadfield Street
Cornbrook
Manchester
M16 9FE
Tel : 0161 874 2400
Fax : 0161 874 2468

Report Number: 698605-1

Date of Report: 29-Nov-2017

Customer: Sirius Geotechnical & Environmental Ltd
4245 Park Approach
Thorpe Park
Leeds
LS15 8GB

Customer Contact: Mr Rob Howells

Customer Job Reference: C7481
Customer Purchase Order: 16053/C7708/AMG
Customer Site Reference: Wakefield Road, Mapplewell
Date Job Received at Concept: 21-Nov-2017
Date Analysis Started: 23-Nov-2017
Date Analysis Completed: 29-Nov-2017

The results reported relate to samples received in the laboratory and may not be representative of a whole batch.

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Tests covered by this certificate were conducted in accordance with Concept Life Sciences SOPs

All results have been reviewed in accordance with Section 25 of the Concept Life Sciences, Analytical Services Quality Manual

Report checked
and authorised by :
Miajan Miah
Customer Service Advisor

Issued by :
Miajan Miah
Customer Service Advisor

Concept Reference:	698605
Project Site:	Wakefield Road, Mapplewell
Customer Reference:	C7481
Bulk Product	Analysed as Bulk Product
Miscellaneous	

				Concept Reference	**698605 001**	**698605 002**
				Customer Sample Reference	**SP01**	**SP02**
				Date Sampled	**21-NOV-2017**	**21-NOV-2017**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**		
Asbestos	T27	AR			Chrysotile Detected	Chrysotile Detected

Index to symbols used in 698605-1

Value	Description
AR	As Received
S	Analysis was subcontracted
U	Analysis is UKAS accredited

Notes

Asbestos is subcontracted to REC Asbestos.

Method Index

Value	Description
T27	PLM

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
Asbestos	T27	AR			SU	001-002

CONCEPT LIFE SCIENCES
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Concept Life Sciences

Certificate of Analysis

Hadfield House
Hadfield Street
Cornbrook
Manchester
M16 9FE
Tel : 0161 874 2400
Fax : 0161 874 2468

Report Number: 700299-1

Date of Report: 06-Dec-2017

Customer: Sirius Geotechnical & Environmental Ltd
4245 Park Approach
Thorpe Park
Leeds
LS15 8GB

Customer Contact: Mr Adrian Grant

Customer Job Reference: C7481
Customer Purchase Order: 16100/C7481/AMG
Customer Site Reference: Wakefield Road, Mapplewell
Date Job Received at Concept: 29-Nov-2017
Date Analysis Started: 01-Dec-2017
Date Analysis Completed: 06-Dec-2017

The results reported relate to samples received in the laboratory and may not be representative of a whole batch.

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation

This report should not be reproduced except in full without the written approval of the laboratory

Tests covered by this certificate were conducted in accordance with Concept Life Sciences SOPs

All results have been reviewed in accordance with Section 25 of the Concept Life Sciences, Analytical Services Quality Manual

UKAS TESTING
1549

Report checked
and authorised by :
Miajan Miah
Customer Service Advisor

Issued by :
Miajan Miah
Customer Service Advisor

Concept Reference: 700299
Project Site: Wakefield Road, Mapplewell
Customer Reference: C7481

Water Analysed as Water
Sirius Water Suite

				Concept Reference	**700299 001**	**700299 002**	**700299 003**	**700299 004**
				Customer Sample Reference	**WS01**	**WS02**	**WS04**	**WS06**
				Date Sampled	**28-NOV-2017**	**28-NOV-2017**	**28-NOV-2017**	**28-NOV-2017**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**				
As (Dissolved)	T281	AR	0.2	µg/l	**0.9**	**6.2**	**0.6**	**1.4**
Cd (Dissolved)	T281	AR	0.02	µg/l	**0.59**	**0.05**	**0.46**	**0.03**
Cr (Dissolved)	T281	AR	1	µg/l	**3**	**8**	<1	<1
Cu (Dissolved)	T281	AR	0.5	µg/l	**4.8**	**3.3**	**1.5**	**1.8**
Pb (Dissolved)	T281	AR	0.3	µg/l	**0.4**	<0.3	**1.6**	**0.7**
Hg (Dissolved)	T281	AR	0.05	µg/l	<0.05	**0.08**	<0.05	<0.05
Ni (Dissolved)	T281	AR	1	µg/l	**69**	**9**	**22**	**4**
Se (Dissolved)	T281	AR	0.5	µg/l	**2.9**	**5.0**	**11**	**12**
Zn (Dissolved)	T281	AR	2	µg/l	**240**	**3**	**23**	**5**
Ammonia expressed as N	T686	F	0.05	mg/l	**0.24**	**0.22**	**0.63**	**1.9**
Ammonia expressed as NH3	T686	F	0.05	mg/l	**0.29**	**0.27**	**0.76**	**2.3**
Electrical Conductivity	T7	AR	10	µS/cm	**1100**	**1200**	**930**	**680**
pH	T7	AR			**6.51**	**8.74**	**6.51**	**7.75**
Sulphate	T686	F	0.5	mg/l	**320**	**310**	**280**	**82**
Acenaphthene	T149	AR	0.01	µg/l	(13) **0.70**	(13) **0.20**	(13) <0.01	(13) **0.08**
Acenaphthylene	T149	AR	0.01	µg/l	(13) **0.30**	(13) **0.10**	(13) <0.01	(13) **0.05**
Anthracene	T149	AR	0.01	µg/l	(13) **1.6**	(13) **0.40**	(13) **0.01**	(13) **0.19**
Benzo(a)Anthracene	T149	AR	0.01	µg/l	(13) **5.1**	(13) **1.4**	(13) **0.01**	(13) **1.1**
Benzo(a)Pyrene	T149	AR	0.01	µg/l	(13) **5.3**	(13) **1.4**	(13) <0.01	(13) **1.3**
Benzo(b)fluoranthene	T149	AR	0.01	µg/l	(13) **5.4**	(13) **1.6**	(13) **0.01**	(13) **1.4**
Benzo(k)fluoranthene	T149	AR	0.01	µg/l	(13) **4.3**	(13) **1.2**	(13) <0.01	(13) **1.1**
Benzo(ghi)Perylene	T149	AR	0.01	µg/l	(13) **3.9**	(13) **1.1**	(13) <0.01	(13) **1.1**
Chrysene	T149	AR	0.01	µg/l	(13) **5.7**	(13) **1.6**	(13) **0.01**	(13) **1.3**
Dibenzo(ah)Anthracene	T149	AR	0.01	µg/l	(13) **0.80**	(13) **0.20**	(13) <0.01	(13) **0.20**
Fluoranthene	T149	AR	0.01	µg/l	(13) **9.9**	(13) **3.1**	(13) **0.02**	(13) **2.1**
Fluorene	T149	AR	0.01	µg/l	(13) **0.80**	(13) **0.30**	(13) <0.01	(13) **0.11**
Indeno(123-cd)Pyrene	T149	AR	0.01	µg/l	(13) **3.1**	(13) **0.90**	(13) <0.01	(13) **0.90**
Naphthalene	T149	AR	0.01	µg/l	(13) **2.9**	(13) **0.20**	(13) <0.01	(13) **0.22**
Phenanthrene	T149	AR	0.01	µg/l	(13) **5.8**	(13) **1.6**	(13) <0.01	(13) **0.74**
Pyrene	T149	AR	0.01	µg/l	(13) **9.2**	(13) **2.7**	(13) **0.02**	(13) **2.2**
PAH(total)	T149	AR	0.01	µg/l	**65**	**18**	**0.08**	**14**

Concept Reference: 700299
Project Site: Wakefield Road, Mapplewell
Customer Reference: C7481

Water Analysed as Water
TPH (CWG) with MTBE, BTEX

				Concept Reference	**700299 001**	**700299 002**	**700299 003**	**700299 004**
				Customer Sample Reference	**WS01**	**WS02**	**WS04**	**WS06**
				Date Sampled	**28-NOV-2017**	**28-NOV-2017**	**28-NOV-2017**	**28-NOV-2017**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**				
Benzene	T54	AR	1	µg/l	(13) <1	(13) <1	(13) <1	(13) <1
Toluene	T54	AR	1	µg/l	<1	<1	<1	<1
EthylBenzene	T54	AR	1	µg/l	<1	<1	<1	<1
M/P Xylene	T54	AR	1	µg/l	<1	<1	<1	<1
O Xylene	T54	AR	1	µg/l	<1	<1	<1	<1
Methyl tert-Butyl Ether	T54	AR	1	µg/l	<1	<1	<1	<1
TPH (C5-C6 aliphatic)	T215	AR	0.010	mg/l	<0.010	<0.010	<0.010	<0.010
TPH (C6-C8 aliphatic)	T215	AR	0.010	mg/l	<0.010	<0.010	<0.010	<0.010
TPH (C8-C10 aliphatic)	T215	AR	0.010	mg/l	<0.010	<0.010	<0.010	<0.010
TPH (C10-C12 aliphatic)	T910	AR	0.01	mg/l	(100,13) <0.10	(100,13) <0.10	(13,100) <0.10	(13) <0.01
TPH (C12-C16 aliphatic)	T910	AR	0.01	mg/l	**(13) 0.14**	**(13) 0.11**	**(13) 0.11**	(13) <0.01
TPH (C16-C21 aliphatic)	T910	AR	0.01	mg/l	**(13) 0.17**	**(13) 0.13**	**(13) 0.18**	**(13) 0.11**
TPH (C21-C35 aliphatic)	T910	AR	0.01	mg/l	**(13) 0.15**	(100,13) <0.10	(13,100) <0.10	**(13) 0.14**
TPH (C6-C7 aromatic)	T215	AR	0.010	mg/l	<0.010	<0.010	<0.010	<0.010
TPH (C7-C8 aromatic)	T215	AR	0.010	mg/l	<0.010	<0.010	<0.010	<0.010
TPH (C8-C10 aromatic)	T215	AR	0.010	mg/l	<0.010	<0.010	<0.010	<0.010
TPH (C10-C12 aromatic)	T910	AR	0.01	mg/l	(100,13) <0.10	(100,13) <0.10	(100,13) <0.10	(13) <0.01
TPH (C12-C16 aromatic)	T910	AR	0.01	mg/l	**(13) 0.15**	(100,13) <0.10	(100,13) <0.10	(13) <0.01
TPH (C16-C21 aromatic)	T910	AR	0.01	mg/l	(13,100) <0.10	(100,13) <0.10	(13,100) <0.10	(13) <0.01
TPH (C21-C35 aromatic)	T910	AR	0.01	mg/l	(13,100) <0.10	(13,100) <0.10	(13,100) <0.10	(13) <0.01

Concept Reference: 700299
Project Site: Wakefield Road, Mapplewell
Customer Reference: C7481

Water Analysed as Water
Phenol

				Concept Reference	**700299 001**	**700299 002**	**700299 003**	**700299 004**
				Customer Sample Reference	**WS01**	**WS02**	**WS04**	**WS06**
				Date Sampled	**28-NOV-2017**	**28-NOV-2017**	**28-NOV-2017**	**28-NOV-2017**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**				
Phenols(Mono)	T4	AR	0.1	mg/l	<0.1	<0.1	<0.1	<0.1

Concept Reference: 700299
Project Site: Wakefield Road, Mapplewell
Customer Reference: C7481

Water Analysed as Water
Volatile Organic Compounds (USEPA 624)

				Concept Reference	**700299 001**	**700299 002**	**700299 003**	**700299 004**
				Customer Sample Reference	**WS01**	**WS02**	**WS04**	**WS06**
				Date Sampled	**28-NOV-2017**	**28-NOV-2017**	**28-NOV-2017**	**28-NOV-2017**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**				
Dichlorodifluoromethane	T54	AR	1	µg/l	<1	<1	<1	<1
Chloromethane	T54	AR	1	µg/l	<1	<1	<1	<1
Vinyl chloride	T54	AR	1	µg/l	<1	<1	<1	<1
Bromomethane	T54	AR	1	µg/l	<1	<1	<1	<1
Chloroethane	T54	AR	1	µg/l	<1	<1	<1	<1
Trichlorofluoromethane	T54	AR	1	µg/l	<1	<1	<1	<1
1,1-Dichloroethylene	T54	AR	1	µg/l	<1	<1	<1	<1
Dichloromethane	T54	AR	50	µg/l	<50	<50	<50	<50
Trans-1,2-Dichloroethene	T54	AR	1	µg/l	<1	<1	<1	<1
1,1-Dichloroethane	T54	AR	1	µg/l	<1	<1	<1	<1
Cis-1,2-Dichloroethylene	T54	AR	1	µg/l	<1	<1	<1	<1
2,2-Dichloropropane	T54	AR	1	µg/l	<1	<1	<1	<1
Chloroform	T54	AR	1	µg/l	<1	<1	<1	<1
Bromochloromethane	T54	AR	1	µg/l	<1	<1	<1	<1
1,1,1-Trichloroethane	T54	AR	1	µg/l	<1	<1	<1	<1
1,1-Dichloropropene	T54	AR	1	µg/l	<1	<1	<1	<1
Carbon tetrachloride	T54	AR	1	µg/l	<1	<1	<1	<1
1,2-Dichloroethane	T54	AR	1	µg/l	<1	<1	<1	<1
Benzene	T54	AR	1	µg/l	(13) <1	(13) <1	(13) <1	(13) <1
1,2-Dichloropropane	T54	AR	1	µg/l	<1	<1	<1	<1
1,1,2-Trichloroethylene	T54	AR	1	µg/l	<1	<1	<1	<1
Bromodichloromethane	T54	AR	1	µg/l	<1	<1	<1	<1
Dibromomethane	T54	AR	1	µg/l	<1	<1	<1	<1
Cis-1,3-Dichloropropene	T54	AR	1	µg/l	<1	<1	<1	<1
Toluene	T54	AR	1	µg/l	<1	<1	<1	<1
Trans-1,3-Dichloropropene	T54	AR	1	µg/l	<1	<1	<1	<1
1,1,2-Trichloroethane	T54	AR	1	µg/l	<1	<1	<1	<1
1,3-Dichloropropane	T54	AR	1	µg/l	<1	<1	<1	<1
Tetrachloroethene	T54	AR	1	µg/l	<1	<1	<1	<1
Chlorodibromomethane	T54	AR	1	µg/l	<1	<1	<1	<1
1,2-dibromoethane	T54	AR	1	µg/l	<1	<1	<1	<1
Chlorobenzene	T54	AR	1	µg/l	<1	<1	<1	<1
1,1,1,2-Tetrachloroethane	T54	AR	1	µg/l	<1	<1	<1	<1
EthylBenzene	T54	AR	1	µg/l	<1	<1	<1	<1
M/P Xylene	T54	AR	1	µg/l	<1	<1	<1	<1
O Xylene	T54	AR	1	µg/l	<1	<1	<1	<1
Styrene	T54	AR	1	µg/l	<1	<1	<1	<1
Bromoform	T54	AR	1	µg/l	<1	<1	<1	<1
Isopropyl benzene	T54	AR	1	µg/l	<1	<1	<1	<1
1,1,2,2-Tetrachloroethane	T54	AR	1	µg/l	<1	<1	<1	<1
1,2,3-Trichloropropane	T54	AR	1	µg/l	<1	<1	<1	<1
n-Propylbenzene	T54	AR	1	µg/l	<1	<1	<1	<1
Bromobenzene	T54	AR	1	µg/l	<1	<1	<1	<1
1,3,5-Trimethylbenzene	T54	AR	1	µg/l	<1	<1	<1	<1
T-Butylbenzene	T54	AR	1	µg/l	<1	<1	<1	<1
1,2,4-Trimethylbenzene	T54	AR	1	µg/l	<1	<1	<1	<1
S-Butylbenzene	T54	AR	1	µg/l	<1	<1	<1	<1
p-Isopropyltoluene	T54	AR	1	µg/l	<1	<1	<1	<1
2-Chlorotoluene	T54	AR	1	µg/l	<1	<1	<1	<1
4-Chlorotoluene	T54	AR	1	µg/l	<1	<1	<1	<1
1,3-Dichlorobenzene	T54	AR	1	µg/l	<1	<1	<1	<1
1,4-Dichlorobenzene	T54	AR	1	µg/l	<1	<1	<1	<1
1,2-Dichlorobenzene	T54	AR	1	µg/l	<1	<1	<1	<1

Index to symbols used in 700299-1

Value	Description
F	Filtered
AR	As Received
100	LOD determined by sample aliquot used for analysis
13	Results have been blank corrected.
U	Analysis is UKAS accredited
N	Analysis is not UKAS accredited

Method Index

Value	Description
T910	GCxGC (LV)
T215	GC/MS (Headspace)(LV)
T686	Discrete Analyser
T4	Colorimetry
T7	Probe
T149	GC/MS (SIR)
T281	ICP/MS (Filtered)
T54	GC/MS (Headspace)

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
Dichlorodifluoromethane	T54	AR	1	µg/l	U	001-004
Chloromethane	T54	AR	1	µg/l	U	001-004
Vinyl chloride	T54	AR	1	µg/l	U	001-004
Bromomethane	T54	AR	1	µg/l	U	001-004
Chloroethane	T54	AR	1	µg/l	U	001-004
Trichlorofluoromethane	T54	AR	1	µg/l	U	001-004
1,1-Dichloroethylene	T54	AR	1	µg/l	U	001-004
Dichloromethane	T54	AR	50	µg/l	N	001-004
Trans-1,2-Dichloroethene	T54	AR	1	µg/l	U	001-004
1,1-Dichloroethane	T54	AR	1	µg/l	U	001-004
Cis-1,2-Dichloroethylene	T54	AR	1	µg/l	U	001-004
2,2-Dichloropropane	T54	AR	1	µg/l	U	001-004
Chloroform	T54	AR	1	µg/l	U	001-004
Bromochloromethane	T54	AR	1	µg/l	U	001-004
1,1,1-Trichloroethane	T54	AR	1	µg/l	U	001-004
1,1-Dichloropropene	T54	AR	1	µg/l	U	001-004
Carbon tetrachloride	T54	AR	1	µg/l	U	001-004
1,2-Dichloroethane	T54	AR	1	µg/l	U	001-004
Benzene	T54	AR	1	µg/l	U	001-004
1,2-Dichloropropane	T54	AR	1	µg/l	U	001-004
1,1,2-Trichloroethylene	T54	AR	1	µg/l	U	001-004
Bromodichloromethane	T54	AR	1	µg/l	U	001-004
Dibromomethane	T54	AR	1	µg/l	U	001-004
Cis-1,3-Dichloropropene	T54	AR	1	µg/l	U	001-004
Trans-1,3-Dichloropropene	T54	AR	1	µg/l	U	001-004
1,1,2-Trichloroethane	T54	AR	1	µg/l	U	001-004
1,3-Dichloropropane	T54	AR	1	µg/l	U	001-004
Tetrachloroethene	T54	AR	1	µg/l	U	001-004
Chlorodibromomethane	T54	AR	1	µg/l	U	001-004
1,2-dibromoethane	T54	AR	1	µg/l	U	001-004
Chlorobenzene	T54	AR	1	µg/l	U	001-004
1,1,1,2-Tetrachloroethane	T54	AR	1	µg/l	U	001-004
M/P Xylene	T54	AR	1	µg/l	U	001-004
O Xylene	T54	AR	1	µg/l	U	001-004
Styrene	T54	AR	1	µg/l	U	001-004
Bromoform	T54	AR	1	µg/l	U	001-004
Isopropyl benzene	T54	AR	1	µg/l	U	001-004
1,1,2,2-Tetrachloroethane	T54	AR	1	µg/l	U	001-004
1,2,3-Trichloropropane	T54	AR	1	µg/l	U	001-004
n-Propylbenzene	T54	AR	1	µg/l	U	001-004
Bromobenzene	T54	AR	1	µg/l	U	001-004
1,3,5-Trimethylbenzene	T54	AR	1	µg/l	U	001-004
T-Butylbenzene	T54	AR	1	µg/l	U	001-004
1,2,4-Trimethylbenzene	T54	AR	1	µg/l	U	001-004
S-Butylbenzene	T54	AR	1	µg/l	U	001-004
p-Isopropyltoluene	T54	AR	1	µg/l	U	001-004

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
2-Chlorotoluene	T54	AR	1	µg/l	U	001-004
4-Chlorotoluene	T54	AR	1	µg/l	U	001-004
1,3-Dichlorobenzene	T54	AR	1	µg/l	U	001-004
1,4-Dichlorobenzene	T54	AR	1	µg/l	U	001-004
1,2-Dichlorobenzene	T54	AR	1	µg/l	U	001-004
Toluene	T54	AR	1	µg/l	U	001-004
EthylBenzene	T54	AR	1	µg/l	U	001-004
Methyl tert-Butyl Ether	T54	AR	1	µg/l	U	001-004
TPH (C5-C6 aliphatic)	T215	AR	0.010	mg/l	N	001-004
TPH (C6-C8 aliphatic)	T215	AR	0.010	mg/l	N	001-004
TPH (C8-C10 aliphatic)	T215	AR	0.010	mg/l	N	001-004
TPH (C10-C12 aliphatic)	T910	AR	0.01	mg/l	N	001-004
TPH (C12-C16 aliphatic)	T910	AR	0.01	mg/l	N	001-004
TPH (C16-C21 aliphatic)	T910	AR	0.01	mg/l	N	001-004
TPH (C21-C35 aliphatic)	T910	AR	0.01	mg/l	N	001-004
TPH (C6-C7 aromatic)	T215	AR	0.010	mg/l	N	001-004
TPH (C7-C8 aromatic)	T215	AR	0.010	mg/l	N	001-004
TPH (C8-C10 aromatic)	T215	AR	0.010	mg/l	N	001-004
TPH (C10-C12 aromatic)	T910	AR	0.01	mg/l	N	001-004
TPH (C12-C16 aromatic)	T910	AR	0.01	mg/l	N	001-004
TPH (C16-C21 aromatic)	T910	AR	0.01	mg/l	N	001-004
TPH (C21-C35 aromatic)	T910	AR	0.01	mg/l	N	001-004
As (Dissolved)	T281	AR	0.2	µg/l	U	001-004
Cd (Dissolved)	T281	AR	0.02	µg/l	U	001-004
Cr (Dissolved)	T281	AR	1	µg/l	U	001-004
Cu (Dissolved)	T281	AR	0.5	µg/l	U	001-004
Pb (Dissolved)	T281	AR	0.3	µg/l	U	001-004
Hg (Dissolved)	T281	AR	0.05	µg/l	U	001-004
Ni (Dissolved)	T281	AR	1	µg/l	U	001-004
Se (Dissolved)	T281	AR	0.5	µg/l	U	001-004
Zn (Dissolved)	T281	AR	2	µg/l	U	001-004
Ammonia expressed as N	T686	F	0.05	mg/l	U	001-004
Ammonia expressed as NH3	T686	F	0.05	mg/l	U	001-004
Electrical Conductivity	T7	AR	10	µS/cm	N	001-004
pH	T7	AR			U	001-004
Sulphate	T686	F	0.5	mg/l	U	001-004
Acenaphthene	T149	AR	0.01	µg/l	U	001-004
Acenaphthylene	T149	AR	0.01	µg/l	U	001-004
Anthracene	T149	AR	0.01	µg/l	U	001-004
Benzo(a)Anthracene	T149	AR	0.01	µg/l	U	001-004
Benzo(a)Pyrene	T149	AR	0.01	µg/l	U	001-004
Benzo(b)fluoranthene	T149	AR	0.01	µg/l	U	001-004
Benzo(k)fluoranthene	T149	AR	0.01	µg/l	U	001-004
Benzo(ghi)Perylene	T149	AR	0.01	µg/l	U	001-004
Chrysene	T149	AR	0.01	µg/l	U	001-004
Dibenzo(ah)Anthracene	T149	AR	0.01	µg/l	U	001-004
Fluoranthene	T149	AR	0.01	µg/l	U	001-004
Fluorene	T149	AR	0.01	µg/l	U	001-004
Indeno(123-cd)Pyrene	T149	AR	0.01	µg/l	U	001-004
Naphthalene	T149	AR	0.01	µg/l	U	001-004
Phenanthrene	T149	AR	0.01	µg/l	U	001-004
Pyrene	T149	AR	0.01	µg/l	U	001-004
PAH(total)	T149	AR	0.01	µg/l	U	001-004
Phenols(Mono)	T4	AR	0.1	mg/l	U	001-004

APPENDIX F

INTERIM GROUNDWATER AND GAS MONITORING RESULTS

Ground Gas and Groundwater Monitoring Record Sheet

JOB DETAILS:

Client: Lidl UK **Job No:** C7481
Site: Wakefield Road, Mapplewell **Visit No:** 1 **of** 6
Date: 28/11/2017 **Operator:** DB **Project Manager:** AMG

Monitoring Point	GAS CONCENTRATIONS												VOLATILES		FLOW DATA				Qhg per borehole		WELL AND WATER DATA					Comments
	Methane (%v/v)		%LEL		Carbon dioxide (%v/v)		Carbon monoxide (ppmv)		Hydrogen sulphide (ppmv)		Oxygen (%v/v)		PID Peak (ppm)	Product thickness (mm)	Flow rate (l/hr)		Differential borehole Pressure (Pa)	Time for flow to equalise (secs)	Methane (l/hr)	CO2 (l/hr)	Water level (mbgl)	Depth of well (m)	Top of BH (mAOD)	Water level (mAOD)	Response Zone	
	Peak	Steady	Peak	Steady	Peak	**Steady**	Peak	Steady	Peak	Steady	Min.	Steady			Peak	Steady										
WS 01A	**ND**	ND	ND	ND	7.1	**7.1**	ND	ND	ND	ND	15.2	15.2	NR	NR	ND	ND			0.0001	0.0071	2.97	3.53			1.0 - 3.5m	
WS 02	**ND**	ND	ND	ND	3.7	**3.7**	ND	ND	ND	ND	14.9	14.9	NR	NR	-0.2	ND			0.0002	0.0037	3.40	4.03			1.0 - 4.0m	
WS 07	**ND**	ND	ND	ND	1.2	**1.2**	ND	ND	ND	ND	15.8	15.8	NR	NR	-0.4	ND			0.0004	0.0012	DRY	3.06			1.0 - 3.0m	
WS 04	**ND**	ND	ND	ND	2.0	**2.0**	ND	ND	ND	ND	18.2	18.2	NR	NR	ND	ND			0.0001	0.0020	1.24	2.99			1.0 - 3.0m	
WS 05	**ND**	ND	ND	ND	10.9	**10.9**	ND	ND	ND	ND	12.5	12.5	NR	NR	-0.3	ND			0.0003	0.0109	2.85	3.00			1.0 - 3.0m	
WS 06	**ND**	ND	ND	ND	0.2	**0.2**	ND	ND	ND	ND	18.9	18.9	NR	NR	ND	ND			0.0001	0.0002	1.00	3.06			1.0 - 3.0m	
Max	**ND**	**ND**	**ND**	**ND**	**10.9**	**10.9**	**ND**	**ND**	**ND**	**ND**	**18.9**	**18.9**	**NR**	**NR**	**-0.2**	**ND**	**NR**	**NR**	**0.0004**	**0.0109**	**3.40**			**NR**		
Min	**ND**	**ND**	**ND**	**ND**	**0.2**	**0.2**	**ND**	**ND**	**ND**	**ND**	**12.5**	**12.5**	**NR**	**NR**	**-0.4**	**ND**	**NR**	**NR**	**0.0001**	**0.0002**	**DRY**			**NR**		

ND - Not detected

NR - Not recorded

NB: Where no flow (ND) recorded, Qhg values are calculated using equiment limit of detection (0.1l/hr). Where negative flows recorded, these are converted to positive values for calculation of Qhg.

METEOROLOGICAL AND SITE INFORMATION: (Select correct box with X or enter data, as applicable)

State of ground:	X	Dry		Moist		Wet		Snow		Frozen
Wind:		Calm	X	Light		Moderate		Strong		
Cloud cover:		None		Slight		Cloudy	X	Overcast		
Precipitation:	X	None		Slight		Moderate		Heavy		
Time monitoring performed:				Start				End		
Barometric pressure (mbar):			992	Start			1000	End		
Pressure trend (Daily):				Falling		Steady	X	Rising		
Source:	weather on line.co.uk									
Air Temperature (Deg. C):			7	Before			7	After		

INSTRUMENTATION TECHNICAL SPECIFICATIONS:

Ground gas meter: gfm437-12746
Gas Range: **CH_4** **CO_2** **O_2**
Gas Flow range:
Differential Pressure:
Date of last calibration: 02/11/2017
Date of next calibration: 04/12/2017

Ambient air check: **CH_4** **CO_2** 20.40% **O_2**

PID:
Calibrated range:
Calibration gas:
Response time:
Accuracy:
Date of last calibration:
Date of next calibration:

Ground Gas and Groundwater Monitoring Record Sheet

JOB DETAILS:

Client: Lidl UK **Job No:** C7481
Site: Wakefield Road, Mapplewell **Visit No:** 2 **of** 6
Date: 12/12/2017 **Operator:** DB **Project Manager:** AMG

Monitoring Point	GAS CONCENTRATIONS												VOLATILES		FLOW DATA				Qhg per borehole		WELL AND WATER DATA					Comments
	Methane (%v/v)		%LEL		Carbon dioxide (%v/v)		Carbon monoxide (ppmv)		Hydrogen sulphide (ppmv)		Oxygen (%v/v)		PID Peak (ppm)	Product thickness (mm)	Flow rate (l/hr)		Differential borehole Pressure (Pa)	Time for flow to equalise (secs)	Methane (l/hr)	CO2 (l/hr)	Water level (mbgl)	Depth of well (m)	Top of BH (mAOD)	Water level (mAOD)	Response Zone	
	Peak	Steady	Peak	Steady	Peak	**Steady**	Peak	Steady	Peak	Steady	Min.	Steady			Peak	Steady										
WS 01A	**ND**	ND	ND	ND	7.2	**7.2**	ND	ND	ND	ND	15.2	15.2	NR	NR	-0.3	ND			0.0003	0.0072	3.02	3.69			1.0 - 3.5m	
WS 02	**ND**	ND	ND	ND	9.6	**9.6**	ND	ND	ND	ND	11.7	11.7	NR	NR	38.3	ND	0.0	2	0.0383	0.0096	3.83	4.03			1.0 - 4.0m	
WS 07	**ND**	ND	ND	ND	1.5	**1.5**	ND	ND	ND	ND	17.6	17.6	NR	NR	ND	ND			0.0001	0.0015	1.51	3.06			1.0 - 3.0m	
WS 04	**ND**	ND	ND	ND	2.1	**2.1**	ND	ND	ND	ND	15.3	15.3	NR	NR	52.2	ND	0.0	1	0.0522	0.0021	DRY	3.07			1.0 - 3.0m	
WS 05	**ND**	ND	ND	ND	14.7	**14.7**	ND	ND	ND	ND	10.0	10.0	NR	NR	22.3	1.3	3.0	2	0.0223	0.1911	2.72	3.00			1.0 - 3.0m	
WS 06	**ND**	ND	ND	ND	ND	**ND**	ND	ND	ND	ND	20.1	20.1	NR	NR	ND	ND			0.0001	0.0001	2.16	3.06			1.0 - 3.0m	
Max	**ND**	**ND**	**ND**	**ND**	**14.7**	**14.7**	**ND**	**ND**	**ND**	**ND**	**20.1**	**20.1**	**NR**	**NR**	**52.2**	**1.3**	**3.0**	**2**	**0.0522**	**0.1911**	**3.83**			**NR**		
Min	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**10.0**	**10.0**	**NR**	**NR**	**-0.3**	**1.3**	**0.0**	**1**	**0.0001**	**0.0001**	**DRY**			**NR**		

ND - Not detected

NR - Not recorded

NB: Where no flow (ND) recorded, Qhg values are calculated using equiment limit of detection (0.1l/hr). Where negative flows recorded, these are converted to positive values for calculation of Qhg.

METEOROLOGICAL AND SITE INFORMATION: (Select correct box with X or enter data, as applicable)

State of ground:		Dry		Moist	X	Wet		Snow		Frozen
Wind:	X	Calm		Light		Moderate		Strong		
Cloud cover:	X	None		Slight		Cloudy		Overcast		
Precipitation:	X	None		Slight		Moderate		Heavy		
Time monitoring performed:				Start				End		
Barometric pressure (mbar):			1005	Start			1004	End		
Pressure trend (Daily):			X	Falling		Steady		Rising		
Source:	weather on line.co.uk									
Air Temperature (Deg. C):				Before				After		

INSTRUMENTATION TECHNICAL SPECIFICATIONS:

Ground gas meter: GFM 436-12746
Gas Range: **CH_4** **CO_2** **O_2**
Gas Flow range:
Differential Pressure:
Date of last calibration: 04/12/2017
Date of next calibration: 02/01/2018

Ambient air check: **CH_4** **CO_2** 20.1% **O_2**

PID:
Calibrated range:
Calibration gas:
Response time:
Accuracy:
Date of last calibration:
Date of next calibration:

APPENDIX G

SIRIUS GENERIC ASSESSMENT CRITERIA

The Sirius Group
Stage 1 Generic Assessment Criteria for Soils

Revision: 20th August 2015

Parameter	Residential (mg/kg, unless otherwise stated)						Commercial / Industrial (mg/kg, unless otherwise stated)			Note
	With Homegrown Produce			Without Homegrown Produce						
	1% SOM	2.5% SOM	5% SOM	1% SOM	2.5% SOM	5% SOM	1% SOM	2.5% SOM	5% SOM	
Metals/Metalloids										
Arsenic (inorganic)	37			40			630			[1]
Cadmium	11			85			190			[2]
Chromium (III)	910			4000			8600			
Chromium (VI)	6.0			6.1			33			[3]
Copper	200			7100			68000			[4]
Lead	200			310			2300			[5]
Mercury (inorganic)	40			56			1100			[6]
Nickel	130			180			980			[7]
Selenium	250			430			12000			
Vanadium	410			1200			9000			
Zinc	450			40000			750000			[4]
Other Inorganics										
pH	<5 or >9			<5 or >9			<5 or >9			
Total Sulphate	2400			2400			2400			[8]
Water-Soluble Sulphate	0.5 g/l			0.5 g/l			0.5 g/l			[8]
Free Cyanide	34			34			1400			[9]
Organics										
PAHs										
Acenaphthene	200	490	920	2000	3600	4900	75000	92000	100000	
Acenaphthylene	170	400	760	2000	3600	4900	76000	93000	100000	
Anthracene	2300	5300	9400	30000	34000	36000	520000	540000	540000	[10]
Benzo(a)anthracene	Assessed using benzo(a)pyrene as a surrogate marker									[10]
Benzo(a)pyrene	2.1	2.1	2.2	2.3	2.3	2.3	27	27	27	[11]
Benzo(b)fluoranthene	Assessed using benzo(a)pyrene as a surrogate marker									[10]
Benzo(k)fluoranthene	Assessed using benzo(a)pyrene as a surrogate marker									[10]
Benzo(g,h,i)perylene	Assessed using benzo(a)pyrene as a surrogate marker									[10]
Chrysene	Assessed using benzo(a)pyrene as a surrogate marker									[10]
Dibenzo(a,h)anthracene	Assessed using benzo(a)pyrene as a surrogate marker									[10]
Fluoranthene	280	560	820	1500	1600	1600	23000	23000	23000	
Fluorene	170	390	730	2200	3400	4000	60000	67000	70000	
Indeno(1,2,3-c,d)pyrene	Assessed using benzo(a)pyrene as a surrogate marker									[10]
Naphthalene	1.0	2.3	4.6	1.0	2.4	4.7	110	260	510	
Phenanthrene	95	220	380	1300	1400	1500	22000	22000	23000	
Pyrene	620	1200	1900	3700	3800	3800	54000	54000	54000	
BTEX and related										
Benzene	0.063	0.13	0.24	0.16	0.30	0.38	15	28	49	
Toluene	100	240	460	370	830	1100	33000	68000	110000	
Ethylbenzene	26	62	120	34	81	110	3200	7400	14000	
Xylenes (total)	28	67	130	33	78	110	3200	7700	15000	[12]
1,2,4-trimethylbenzene	0.22	0.53	1.1	0.24	0.58	1.2	39	93	170	
Iso-propylbenzene	6.6	16	32	6.8	17	33	1300	3100	6100	
Propylbenzene	21	51	100	23	57	110	3800	9100	17000	
Styrene	6.9	16	32	21	49	93	3100	6100	9500	
TPH										
Aliphatic EC 5-6	24	41	68	24	41	48	2400	4100	6900	
Aliphatic EC >6-8	53	110	210	53	110	150	5300	11000	21000	
Aliphatic EC >8-10	13	31	61	13	31	43	1300	3100	6000	
Aliphatic EC >10-12	62	150	300	62	150	220	6100	15000	28000	
Aliphatic EC >12-16	510	1200	2300	510	1200	1700	43000	72000	85000	
Aliphatic EC >16-35	41000	70000	90000	42000	70000	80000	>1E6	>1E6	>1E6	[13]
Aromatic EC >5-7	53	110	200	150	300	380	15000	28000	48000	
Aromatic EC >7-8	100	240	460	370	820	1100	33000	68000	110000	
Aromatic EC >8-10	20	48	94	22	54	75	2200	5200	9800	
Aromatic EC >10-12	63	150	290	120	290	400	11000	22000	30000	
Aromatic EC >12-16	140	320	570	1100	1900	2100	35000	37000	37000	
Aromatic EC >16-21	260	540	840	1800	1900	1900	28000	28000	28000	
Aromatic EC >21-35	1100	1500	1700	1900	1900	1900	28000	28000	28000	
Chlorinated Organics										
Chlorobenzene	0.19	0.44	0.86	0.19	0.45	0.87	31	71	140	
Dichloromethane (DCM)	0.47	0.78	1.2	1.2	1.7	2.4	250	340	470	
1,1-dichloroethane (DCA)	1.4	2.4	4.0	1.4	2.4	4.1	260	420	690	
1,2-dichloroethane (DCA)	0.0031	0.0048	0.0076	0.0035	0.0053	0.0084	0.34	0.51	0.81	
1,1-dichloroethene (DCE)	0.15	0.26	0.45	0.15	0.26	0.46	24	43	74	
cis -1,2-dichloroethene (DCE)	0.066	0.12	0.20	0.069	0.12	0.21	14	23	38	
trans -1,2-dichloroethene (DCE)	0.11	0.21	0.38	0.12	0.22	0.39	21	37	65	
Pentachlorophenol	0.21	0.52	1.0	27	30	31	400	400	400	
1,1,1,2-tetrachloroethane	0.56	1.3	2.6	0.63	1.5	2.9	59	140	270	
1,1,2,2-tetrachloroethane	0.98	2.1	4.0	1.6	3.4	6.3	150	310	570	

The Sirius Group
Stage 1 Generic Assessment Criteria for Soils

Parameter	Residential (mg/kg, unless otherwise stated)						Commercial / Industrial (mg/kg, unless otherwise stated)			Note
	With Homegrown Produce			Without Homegrown Produce						
	1% SOM	2.5% SOM	5% SOM	1% SOM	2.5% SOM	5% SOM	1% SOM	2.5% SOM	5% SOM	
Tetrachloroethene (PCE)	0.074	0.17	0.32	0.07	0.17	0.33	10	23	45	
Tetrachloromethane (CT)	0.011	0.024	0.046	0.011	0.024	0.046	1.6	3.6	6.9	
1,1,1-trichloroethane (TCA)	3.7	7.8	15	3.8	7.9	15	370	770	1400	
1,1,2-trichloroethane (TCA)	0.39	0.85	1.6	0.51	1.1	2.0	89	180	320	
Trichloroethene (TCE)	0.0070	0.015	0.028	0.0071	0.015	0.68	1.5	2.8	44	
Trichloromethane (CF)	0.43	0.80	1.4	0.48	0.89	53	98	170	300	
Vinyl Chloride	0.00034	0.00045	0.00062	0.00037	0.00048	0.00066	0.038	0.049	0.068	
Miscellaneous Organics										
Carbon disulphide	0.066	0.13	0.25	0.066	0.13	0.25	6.7	14	25	
Di-(2-ethylhexyl)-phthalate	290	660	1100	3900	4000	4100	85000	85000	8600	
MTBE	31	55	94	39	68	120	7400	12000	19000	
Phenol	110	190	330	420	440	440	440			[14]
Methylphenols (cresols), total	78	170	330	5600	8200	9900	160000	170000	18000	[15]
2,4-dimethylphenol (m-xylenol)	18	43	82	200	430	720	15000	23000	28000	
Other Parameters										
TOC	3% w/w			3% w/w			3% w/w			[16]
Calorific Value	2 MJ/kg			2 MJ/kg			2 MJ/kg			[17]
Asbestos	Fibres present			Fibres present			Fibres present			

All concentration-based criteria are rounded to 2 significant figures.

The criteria assume a sandy soil type, which will be conservative for the great majority of soils (including made ground) encountered on historically contaminated sites.

Except where otherwise stated, criteria have been derived by Sirius using CLEA version 1.06. Parameters for the land use cases are consistent with those given in Environment Agency (2009) "Updated Technical Background to the CLEA Model", report SC050021/SR3 but updated (where relevant) for respiration rate, exposure frequency for dermal contact outdoors, soil adherence factors for children, and plant uptake concentration factors given in CL:AIRE (2014) and Nathanail et al., (2015). No correction has been made for the "Top Two" crop types in the Residential with Homegrown Produce land use and the criteria will therefore be conservative in this regard.

Health Criteria Values (HCVs) and (except where specifically noted) chemical property data were obtained from:
- Environment Agency Science Report SC050021 Series;
- Nathanail et al. (2015);
- CL:AIRE-AGS-EIC (2010).

Footnotes

[1] Based on oral GAC as this is the lower GAC and reflects a cancer risk many orders of magnitude greater than for inhalation.

[2] Determined for lifetime exposure. Plant uptake concentration factors applied were as given in CL:AIRE (2014). The GAC values are based on data for soils having a pH value in the range 6-8; caution should be applied in applying them at pH values outside this range, especially at pH values <5.

[3] Both oral and inhalation HCVs are based on local toxicological effects and therefore the lowest (oral) GAC value is adopted.

[4] For the Residential with Homegrown Produce land use, the GAC values for Cu and Zn are based on potential phytotoxic effects and have been set at the maximum allowable concentrations for sewage sludge-amended soils presented in the "Sludge (Use in Agriculture) Regulations" (SI 1263/1989); these criteria may also be applied in any land use where plants are to be grown. The equivalent GAC values for human health protection in the Residential with Homegrown Produce land use are around an order of magnitude greater.

[5] The Category 4 Screening Levels for lead defined in CL:AIRE (2013) have been adopted directly to provide an acceptable basis for initial assessment of data. Where background concentrations of lead exceed the GAC value, then site-specific evaluation will be required.

[6] The SGV for mercury is based on inorganic mercury which represents the most common form encountered within the environment. This is considered appropriate for most sites as: "…the SGV for inorganic mercury can normally be compared with chemical analysis for total mercury content because the equilibrium concentrations of elemental and methylmercury compounds are likely to be very low" (Environment Agency report SC050021/Mercury SGV). Analysis and specific assessment for elemental or methylated forms of mercury will need to be considered if historical land use or site-specific factors indicate that these forms of mercury are likely to be present.

[7] Toxicological effects by inhalation are localised, therefore the lower of the GAC values for oral and inhalation HCVs have been adopted.

[8] BRE (2005). Sulphate is not considered to pose a potential risk to human health under normal circumstances – this GAC applies to construction cases only and is set at the upper limit for DS-1 Design Sulphate Class concrete.

[9] GAC calculated for acute risk. Further information can be provided upon request.

[10] The genotoxic PAHs (benz(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(g,h,i)perylene, chrysene, dibenz(a,h)anthracene, indeno(1,2,3-c,d)pyrene) are routinely assessed using benzo(a)pyrene as a surrogate (HPA (2010) "Risk Assessment Approaches for Polycyclic Aromatic Hydrocarbons (PAHs)", version 5). Separate information on this approach is provided.

[11] Calculated using a 'minimum risk' oral index dose derived from the application of a 10,000x safety factor to the BMD10 presented in CL:AIRE (2014) for benzo(a)pyrene as a surrogate marker and the inhalation index dose specified in CL:ARE (2014) and Nathanail *et al*. (2015). As a conservative measure, the GAC is based on combined exposure pathways to account for systemic carcinogenic effects. Further information on the derivation can be provided upon request.

[12] For screening purposes, a single GAC has been set for total xylene. This is the lowest of the values calculated for the three individual xylene isomers.

[13] "No GAC" indicates that no value has been specified for this land use as the TDSI cannot be exceeded at achievable soil concentrations.

[14] 440mg/kg is the minimum concentration that is protective for direct skin contact with phenol (See Environment Agency SR050021/Phenol SGV) and is adopted where GACs for chronic exposure are higher.

[15] For screening purposes, a single GAC has been set for total methylphenol. This is the lowest of the values calculated for the three individual methylphenol isomers.

[16] The Hazardous Waste (England and Wales) Regulations 2005. TOC content in itself does not represent a potential risk to human health. This GAC is provided for indicative assessment of disposal options, in the case that off-site landfill of soil is undertaken. This GAC is specified at the 'Inert' waste threshold and should be considered as for information purposes only.

[17] ICRCL (1986) Guidance Note 61/84, 2nd Edition, Notes on the Fire Hazards of Contaminated Land. Calorific value is not an indication of direct human health risk but may be useful in assessment of the potential fire risk posed by made ground or natural soils containing elevated concentrations of potentially combustible organic matter.

GAC VALUES FOR CONTROLLED WATERS IN ENGLAND AND WALES

Parameter	GAC (µg/l, unless stated)			Notes
	Inland waters		Coastal and transition waters	
	EQS	DWS	EQS	
Metals and metalloids (dissolved)				
Arsenic	50	10	25	1
Cadmium	See separate table	5	0.2	1, 2
Chromium (total)	4.7	50	N.A.	1, 3
Copper	1.0 (bioavailable)	2000	3.76	1, 4
Lead	1.2 (bioavailable)	10	1.3	1, 4
Mercury	0.07	1.0	0.07	1, 4, 5
Nickel	4.0 (bioavailable)	20	8.6	1, 4
Zinc	10.9 (bioavailable) + background	5000	6.8 + background	1, 4, 6
Misc. inorganics				
Ammonia (total, as N)	See separate table	N.A.	N.A.	7
Ammonia (total, as $NH4^+$)	N.A.	500	N.A.	
Ammonia (un-ionised (NH3), as N)	N.A.	N.A.	21	7
Cyanide (free)	10	50	10	
Sulphate	N.A.	250 mg/l	N.A.	8
Petroleum hydrocarbons and related				
TPH (speciated analysis) *per fraction*	10	10	10	9, 10
Benzene	10	1.0	8	
Toluene	74	700	74	11
Xylenes (sum)	N.A.	500	N.A.	11
MTBE	2600	200	2600	12, 13
PAHs				
Anthracene	0.1	N.A.	0.1	
Benzo(b)fluoranthene + Benzo(k)fluoranthene (sum)	N.A.	Sum of 4 = 0.1	N.A.	
Benzo(g,h,i)perylene + indeno(1,2,3-c,d)pyrene (sum)	N.A.		N.A.	
Benzo(a)pyrene	1.7E-04	0.01	1.7E-04	
Fluoranthene	0.0063	N.A.	0.0063	
Naphthalene	2.0	N.A.	2.0	
Phenol				
Phenol	7.7	N.A.	7.7	
Chlorinated organics				
Dichloromethane	20	N.A.	20	
Trichloromethane (chloroform)	2.5	100	2.5	14
Tetrachloromethane (carbon tetrachloride)	12	3.0	12	
1,2-dichloroethane (1,2-DCA)	10	3.0	10	

Cadmium - inland waters EQS	
Hardness (as mg/l CaCO3)	EQS (µg/l)
<40	0.08
40-50	0.08
50-100	0.09
100-200	0.15
>=200	0.25

Ammonia - inland waters EQS		
Alkalinity (as mg/l CaCO3)	Altitude	EQS (µg/l)
<10	Any	300
10-50	Any	300
50-100	<80m	600
50-100	>80m	300
100-200	<80m	600
100-200	>80m	300
>200	Any	600

Parameter	GAC (µg/l, unless stated)			Notes
	Inland waters		Coastal and transition waters	
	EQS	DWS	EQS	
1,1,1-trichloroethane (1,1,1-TCA)	100	N.A.	100	
1,1,2-trichloroethane (1,1,2-TCA)	400	N.A.	300	
Trichloroethene (TCE)	10	Sum of 2 = 10	10	
Tetrachloroethene (PCE)	10		10	
Vinyl chloride	N.A.	0.5	N.A.	

Notes referenced in table:

1. Metals and metalloid EQS relate to dissolved contamination only (i.e. analysis of filtered samples).
2. Inland waters EQS for cadmium is dependent upon hardness or alkalinity of the receiving surface water. See separate table.
3. Separate EQS standards exist for Cr III and CrVI in fresh water. The fresh water Cr III has been value adopted as the screening value for total Cr analysis as it is normally the predominant form in solution. Specific EQS for Cr VI (3.4µg/l in freshwater; 0.6µg/l in transition and coastal waters) must be applied where relevant.
4. The bioavailable concentration of copper, nickel and zinc in fresh water is dependent upon the pH, DOC and calcium data for the receiving surface water. These data should be collected whenever possible to calculate an equivalent GAC for total metal concentration using the UKTAG m-BAT spreadsheet model. Although the standard indicates that lead should be assessed on a bioavilable basis, no tool is currently avaiable and this criterion should be applied as-is for screening purposes.
5. The value for mercury is the Maximum Acceptable Concentration (MAC) as no annual average EQS is specified in the legislation.
6. The EQS for zinc may be adjusted for the ambient uncontaminated background concentration in the receiving surface water where data are available.
7. EQS for ammonia in inland waters depends on the hardness and altitude of the receiving water body - see separate table. The criteria given here are based on the attainment of "good" chemical quality in the water body.
8. No EQS for sulphate appears in the referenced legislation.
9. No concentration-based EQS values currently exist for TPH. In the absence of specific criteria, our recent discussions with the Environment Agency have led us to adopt 10µg/l *for each individual fraction* determined by speciated TPH (TPHCWG) analysis.
10. No concentration-based DWS exists for TPH. A sum TPH concentration of 200µg/l defines the DW2 Class threshold limit in the Surface Water (Abstraction for Drinking Water) (Classification) Regulations 1996; DW2 waters are generally suitable for abstraction as drinking water supplies, subject to standard filtration and chemical treatment. We therefore consider that the 10µg/l criterion *for each fraction* provides a reasonable and proportionate basis for the initial assessment of risk posed to off-site groundwater and/or surface water potable abstractions that may be impacted at a downgradient abstraction point by TPH contamination originating from the site.
11. The drinking water-based criteria are from World Health Organisation (WHO) Guidelines for Drinking Water Quality, 2008. Taint may result at lower concentrations.
12. The "EQS" given here for MTBE is the PNEC value for fresh and sea water life given in: EU Risk Assessment Report (2002) MTBE, 3rd Priority List, volume 19.
13. DWS for MTBE is a 5-fold dilution of the USEPA (1997) Drinking Water Advisory value for taint, EPA-822-F-97-009. Toxicological thresholds are significantly higher.
14. Sum trihalomethanes limit for drinking water is 100µg/l but chloroform is only compound of this class normally encountered at contaminated sites.

Sources and general comments

Unless otherwise stated, EQS-based GACs are annual average surface water quality criteria given in Table 1 within Part 3 (Priority Substances) or long-term average criteria given in Table 1 within Part 2 (Specific Pollutants) of The Water Framework Directive (Standards and Classification) Directions (England and Wales), 2015.

Unless otherwise stated, drinking water standard-based GACs are taken from the Water Supply (Water Quality) Regulations 2016, and relate to concentration at the supply point and/or consumers' taps.

This list presents recommended GAC values for commonly monitored analytes but is not exhaustive. See the above-referenced legislation for the full lists of criteria.

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