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Mr G Rafferty
Lidl UK GmbH
1st Floor
above Barclays Bank
Heavens Walk
Doncaster
South Yorkshire
DN4 5HZ

Date: 1st March 2018

Our ref.: C7413/AMG/8295

Dear Mr Rafferty,

**Re: C7481 – Wakefield Road, Mapplewell, Barnsley -**
**Supplementary Ground Gas Risk Assessment**

Further to our Preliminary Appraisal Report (Sirius Report Ref. C7481 Rev. A, dated June 2017) Geoenvironmental Appraisal Report (Sirius Report Ref. C7481/GA, dated January 2018) and Remediation Strategy (Sirius Report Ref. C7481/RS, dated March 2018 for the above site, the planned period of ground gas monitoring is now complete. This letter presents the results of that monitoring and an assessment of the risk posed by hazardous ground gases to the proposed development.

Whilst this letter discusses pertinent findings of the Preliminary Appraisal and Geoenvironmental Appraisal reports, it must be read in conjunction with them, which present in detail the site setting and the findings of previous phases of investigation.

**Introduction**

In undertaking this assessment, we have taken account of current best practice guidance in the assessment of risk posed by hazardous permanent ground gases, including:

- BS8485:2015 'Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings' (with February 2016 revision of Figure 5);
- BS8576:2013 'Guidance on Investigations for Ground Gas – Permanent Gases and Volatile Organic Compounds (VOCs)'
- CIRIA 'Assessing Risks Posed by Hazardous Ground Gases to Buildings', report C665, 2007;
- CIRIA 'The VOCs Handbook. Investigating, Assessing and Managing Risks from Inhalation of VOCs at Land Affected by Contamination', report C682, 2009;

- CL:AIRE 'A Pragmatic Approach to Ground Gas Risk Assessment', report ref. RB17, November 2012;
- NHBC 'Guidance on Evaluation of Development Proposals on Sites Where Methane and Carbon Dioxide are Present', report version 04, March 2007.

The proposed development will be for a retail food store end use, which will include several smaller rooms (toilets, cloakrooms, offices, etc.), as shown on HTC Architects Drawing 1744-P401, dated July 2017, included as Attachment A.

In terms of classification of the building type in line with Table 3 of BS 8485:2015, due to the presence of small enclosed rooms within the store layout, it is considered appropriate to classify the development as comprising a Type C building.

**Site Characterisation Relevant to Gas Risk Assessment**

Site History

The site remained as undeveloped agricultural fields until the 1960s, when the William Freemans rubber and plastics factory was constructed. The factory was demolished in the 21st Century, leaving a concrete floor slab, hardstanding, stockpiles of demolition rubble and areas of grass and dense scrub.

Land occupying the eastern part of the site comprises part of a registered historical landfill associated with the former factory.

The former factory covered a larger area than the area of the proposed store, extending approximately 100m further northeast than the northernmost extent of the store. Equally, the historical landfill extends beyond the boundary of the current development site, towards the east and north.

Summary of Relevant Site Investigation Works

The Sirius intrusive site investigation comprised:

- Excavation of 11 trial pits (TP01 - TP08 and SA01 - SA03) to a maximum depth of 3.5m below ground level (bgl);
- Drilling of 9 windowless sampler boreholes (WS01 - WS08 and WS01A) to a maximum depth of 4.0m bgl;
- Rotary open-hole drilling of 9 boreholes (BH01 - BH09) to a maximum depth of 30m bgl.

Exploratory hole locations are shown on the Drawing No. C7481/GA/03, included as Attachment B.

Combined 50mm diameter ground gas and groundwater monitoring wells were installed within six window sampler holes (WS01A, WS02 and WS04 to WS07). Details of the monitoring installations are shown on the relevant boreholes logs in Attachment C.

Geology

The published geological mapping indicates the site geology to comprise solid strata of the Pennine Middle Coal Measures Formation (PMCMF), overlain by Glacial Till of Mid Pleistocene age in the southern part of the site. Elsewhere, superficial deposits are shown as absent.

The Newhill Coal is recorded to outcrop / subcrop within the site, dipping to the north. 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 due to the potential for unrecorded shallow mine workings within the Newhill Coal.

Made ground is shown on the 1:10,000 scale geological map as underlying the eastern part of the site; this is assumed to be associated with the historical landfilling activities in this area.

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

Made ground was found to generally increase in thickness towards the east, encountered to depths of c. 0.3m to 2.2m bgl. Asphalt and / or reinforced concrete surfacing was encountered within the former factory area, underlain by granular sub-base materials, which are in turn underlain by cohesive made ground comprising re-worked residual Coal Measures soils. In the eastern end of the site, exploratory holes WS01, TP04 and TP05 identified a layer of topsoil overlying landfilled waste, which included hot water bottles, plastic, steel drums, polystyrene and wood, in a matrix of clay. Possible re-worked clay was also identified in a number of other boreholes.

Made ground was underlain by residual PMCMF soils, comprising slightly sandy to sandy, slightly gravelly to gravelly clay, with gravel consisting of sandstone and mudstone. PMCMF rock strata were encountered from depths of between 1.8m and 3.3m bgl and comprised interbedded brown / light grey fine-grained sandstone and siltstone, recovered from trial pits as clayey tabular gravel. The Newhill Coal was identified within rotary boreholes, being encountered as a 0.8m - 1.0m thick seam at depths of between 13.5m to 18.7m bgl.

Some re-profiling of the site is proposed, including the construction of retaining walls up to 2.5m high at the northern, eastern and southern boundaries, which will alter shallow ground conditions from those recorded by the site investigation in places. It is also possible that landfilled waste will be removed from the footprint of the building to facilitate the adopted construction methods.

Hydrogeology

The Coal Measures strata below the site are classified as a Secondary A Aquifer. The site is not located within a groundwater Source Protection Zone.

During the monitoring programme, groundwater was recorded within all six of the monitoring wells, at depths ranging between 1.00m and 3.83m bgl.

Coal Mining

The Coal Authority (CA) hold records of underground mining beneath the site in six seams of coal at 110m to 450m depth. The CA also believe there is coal at or close to the surface which could have been worked at some time in the past (considered likely to refer to the Newhill Coal). There are no recorded mine entries within the site, or within 20m of the site.

The intrusive site investigation encountered the Newhill Coal, but no evidence of coal mine workings was noted in any of the boreholes drilled.

Waste Disposal

The land occupying the eastern part of the site, and extending to the north and east of the site, is identified as a historical landfill, with input dates being between 1962 and 1994. Authorised wastes included inert, industrial, commercial and household, with all forms of asbestos waste prohibited. The license status of this landfill is listed as cancelled as of 1st April 1983.

One Local Authority / BGS recorded landfill is also located 510m southwest of the site, recorded as a historical landfill (Blacker Hill Quarry) with inert, industrial and commercial wastes deposited between 1980 and 1984.

As noted above, landfilled waste was identified beneath the east of the site which included hot water bottles, plastic, steel drums, polystyrene and wood, in a matrix of clay.

Radon Gas

The Preliminary Appraisal report identified that basic radon protection measures are required at the site.

Chemical Contamination that could Influence Ground Gas Composition

No significant chemical contamination was observed during the ground investigation (or identified by subsequent chemical soil and groundwater testing) that was considered likely to represent a source of potentially hazardous ground gases or vapours.

Soil Organic Carbon Concentration

Made ground encountered within the former landfill area included potentially degradable organic material such as wood. Ten samples of soil were analysed for their total organic carbon (TOC) concentration; the maximum recorded concentration was 3.4%, within a sample of made ground taken from WS05, located to the west of the landfilled area.

Ground Gas Monitoring Data

Based upon a moderate risk source potential and low sensitivity end use, a ground gas monitoring programme comprising six visits over a period of three months was undertaken. The wells selected for monitoring are described in the above-referenced Geoenvironmental Appraisal Report and shown on the Exploratory Hole Location Plan presented in Attachment B.

The monitoring data obtained is presented in Attachment D. The monitoring events were undertaken during atmospheric pressure conditions of 981 to 1010 mbar, and included periods of falling, steady and rising pressure.

Table 1 summarises the gas monitoring results recorded.

**Table 1 - Summary of Ground Gas and Groundwater Monitoring Data**

| Well | Concentration ranges (%v/v) | | | Concentration ranges (ppm) | | Flow (litres/hour) | | Depth to Groundwater (m bgl) |
|---|---|---|---|---|---|---|---|---|
| | Methane (Peak) | Carbon Dioxide (Steady) | Oxygen (Min.) | Hydrogen Sulphide (Peak) | Carbon Monoxide (Steady) | Peak | Steady | |
| WS 01A | ND | 2.4 - 7.2 | 15.2 - 18.5 | ND | ND | ND - 0.4 | ND | 1.79 - 3.02 |
| WS 02 | ND | 3.7 - 13.6 | 5.1 - 14.9 | ND | ND | ND - 64.9 | ND - 1.5 | 3.40 - 3.83 |
| WS 04 | ND | 2.0 - 8.1 | 8.6 - 18.2 | ND | ND | ND - 104.4 | ND | 1.24 - >3.07 |
| WS 05 | ND | 10.9 - 16.5 | 8.4 - 12.5 | ND | ND | ND - 34.9 | ND - 1.3 | 2.29 - 2.85 |
| WS 06 | ND | ND - 7.1 | 5.3 - 20.1 | ND | ND | ND - 8.9 | ND - 2.7 | 1.00 - 2.16 |
| WS 07 | ND | 1.2 - 5.0 | 10.4 - 17.6 | ND | ND | ND - 86.8 | ND | 1.31 - >3.06 |

ND: Not Detected

Methane was not detected in any of the monitoring wells on any visit.

Carbon dioxide was positively detected in all boreholes on the majority of monitoring visits, with a maximum steady concentration of 16.5% v/v, recorded in borehole WS05.

The maximum recorded peak borehole flow rate was 104.4 litres/hour (l/h), recorded within WS04 on the third gas monitoring visit. The maximum steady flow rate was 2.7 l/hr, recorded within WS06 on the fifth gas monitoring visit.

Hydrogen sulphide and carbon monoxide were not detected in any borehole on any monitoring visit.

Significantly depleted oxygen concentrations were recorded within WS02, WS04, WS05 and WS06 on at least three occasions (minimum of 5.1% v/v, 8.6% v/v, 8.4% v/v and 5.3% v/v respectively). Slightly depleted oxygen concentrations were recorded within each of the other boreholes on at least one monitoring visit.

**Revised Conceptual Site Model for Hazardous Ground Gases**

Potential Ground Gas Sources

The identified significant sources of hazardous ground gas that may affect the site are made ground at the site, including within the landfilled area located on / adjacent to the site, and naturally occurring radon gas generated within underlying natural strata.

Potential Transport Pathways

Ground gases may migrate vertically or laterally from sources at, beneath or around the site through permeable strata (e.g. granular made ground and natural soils), or via preferential pathways, e.g. underground service ducts / trenches.

Receptors

Potential receptors of ground gas accumulation include the proposed future building and its staff / users, as well as site construction / maintenance workers in excavations, etc.

**Ground Gas Risk Assessment**

Quantity of hazardous gas ($Q_{hg}$) values for methane and carbon dioxide were calculated in accordance with BS8485:2015 on the basis of measured gas flows and concentrations or a limit of detection (LoD) of 0.1l/hr and 0.1% v/v, respectively, whichever is the higher (Attachment D).

In accordance with the requirements of BS8485:2015, the worst-possible case condition has been calculated for methane and carbon dioxide, as a 'worst-case' check in the first instance. BS8485:2015 notes that adopting the worst-possible case $Q_{hg}$ as the Gas Screening Value (GSV) should be undertaken only when considered prudent and reasonable to do so.

Based on the monitoring data summarised above and contained in Attachment D, worst-possible $Q_{hg}$ values of 0.1044 l/hr for methane and 0.4455 l/hr for carbon dioxide have been calculated for this site. If these values are applied as GSVs for the site, then the results are indicative of Characteristic Situation 2 (CS2) conditions, as defined by Table 2 of BS8485:2015.

It is considered appropriate to use the worst possible $Q_{hg}$ value for this site, as significantly elevated carbon dioxide concentrations and similar flow rates were measured from several boreholes on most monitoring occasions. In addition, the presence of carbon dioxide at concentrations above 5% v/v in itself indicates CS2 conditions.

It is acknowledged that Table 2 of BS8485:2015 also notes that should flow rates exceed 70l/hr, consideration should be given to classifying the site as CS3. In this case, whilst instantaneous flow rates exceeded 70l/hr at WS04 (one occasion) and WS07 (two occasions), these rates decreased rapidly (over a few seconds) and steady flow rates were all markedly lower.

Additionally, it should also be noted that in line with the Remediation Strategy Report for the site, waste material within the former landfill area lying within the site boundary is to be excavated and removed from the site. These remedial works will therefore remove a potential source of ground gases from within the area of the development site, although it is acknowledged that landfilled material will remain as a potential source outside of the site area.

There is a high degree of confidence that the ground gas monitoring results are representative of the ground gas risks to the site, as ground gas monitoring has been undertaken within a sufficient number of boreholes located in proximity to the primary potential source of ground gases, under a variety of atmospheric conditions.

**Conclusions and Recommendations**

On the basis of the data obtained and the risk assessment above, the site is concluded to fall within Characteristic Situation 2 as defined in BS8485:2015.

Based on Table 4 within BS8485:2015, a minimum gas protection score of 2.5 is required for the proposed development, i.e. for a Type C building. In line with Tables 5 to 7 within BS8485:2015, this should be achieved by a combination of two or more of the following elements:

- The structural barrier of the floor slab;
- Ventilation measures;
- Gas resistant membrane (only when installed and independently verified by suitably qualified personnel).

It should be noted that the site is located within an area where basic radon protection measures are required within the construction of new buildings under current guidance, and therefore the ground gas protection measures proposed should also consider protection against radon (and vice versa).

It is understood that the type of foundations and floor slab to be used for the building have not currently been determined. Likely options for the foundation solution to be used, and the resulting likely floor slab construction, include:

- Spread foundations within natural strata (suspended or ground-bearing slab);
- Full excavation of made ground and construction of raft on engineered fill (ground-bearing slab);
- Vibro stone columns following turnover of made ground, with shallow spread foundations or raft within treated fill (suspended or ground-bearing slab);
- Piled foundations (suspended or ground-bearing slab).

Each combination of foundations and floor slab will contribute differing numbers of points; therefore, the chosen foundation solution should ensure that sufficient points can be obtained for the required gas protection score.

The details of the ground gas protection measures (e.g. membrane specification, ventilation specification and ground floor slab construction details) must be prepared by a suitably qualified person and should take account of the requirement for radon protection. It would also be necessary to produce a ground gas protection measures verification plan in accordance with CIRIA Report C735, *Good Practice on the Testing and Verification of Protection Systems for Buildings against Hazardous Ground Gases* (2014), that will be required to be submitted for approval by regulatory authorities, prior to construction.

Notwithstanding the above, gas monitoring of all excavations and/or underground spaces should be carried out prior to personnel entry, with continuous monitoring throughout the period of working. Gas monitoring should include as a minimum: methane, carbon dioxide, carbon monoxide, and oxygen. Gas monitors shall emit both audible and visual warnings. Alarm levels should be set with due regard to the relevant Occupational Exposure Limits given in HSE EH40/2005, and for low oxygen concentrations. If any anomalous or significantly elevated/depleted gas concentrations are detected, then all personnel should immediately evacuate the area and the advice of an appropriate specialist be obtained before work continues.

The conclusions and recommendations presented in this letter report are considered reasonable based on the findings of the work described. However, these cannot be guaranteed to gain regulatory or other approvals and, therefore, the report should be passed by the client to the appropriate regulatory authorities and/or other appropriate organisations for their comment and approval prior to undertaking any development works at the site.

Yours sincerely,

Adrian Grant
Principal Engineer

For and on behalf of
Sirius Geotechnical Ltd

Enc.: Attachment A. HTC Drawing 1744-P401.

Attachment B. Sirius Drawing C7481/GA/03.

Attachment C. Borehole Logs.

Attachment D. Ground Gas Monitoring Results.

# ATTACHMENT A

# PROPOSED SITE LAYOUT PLAN

## 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!
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

N

**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

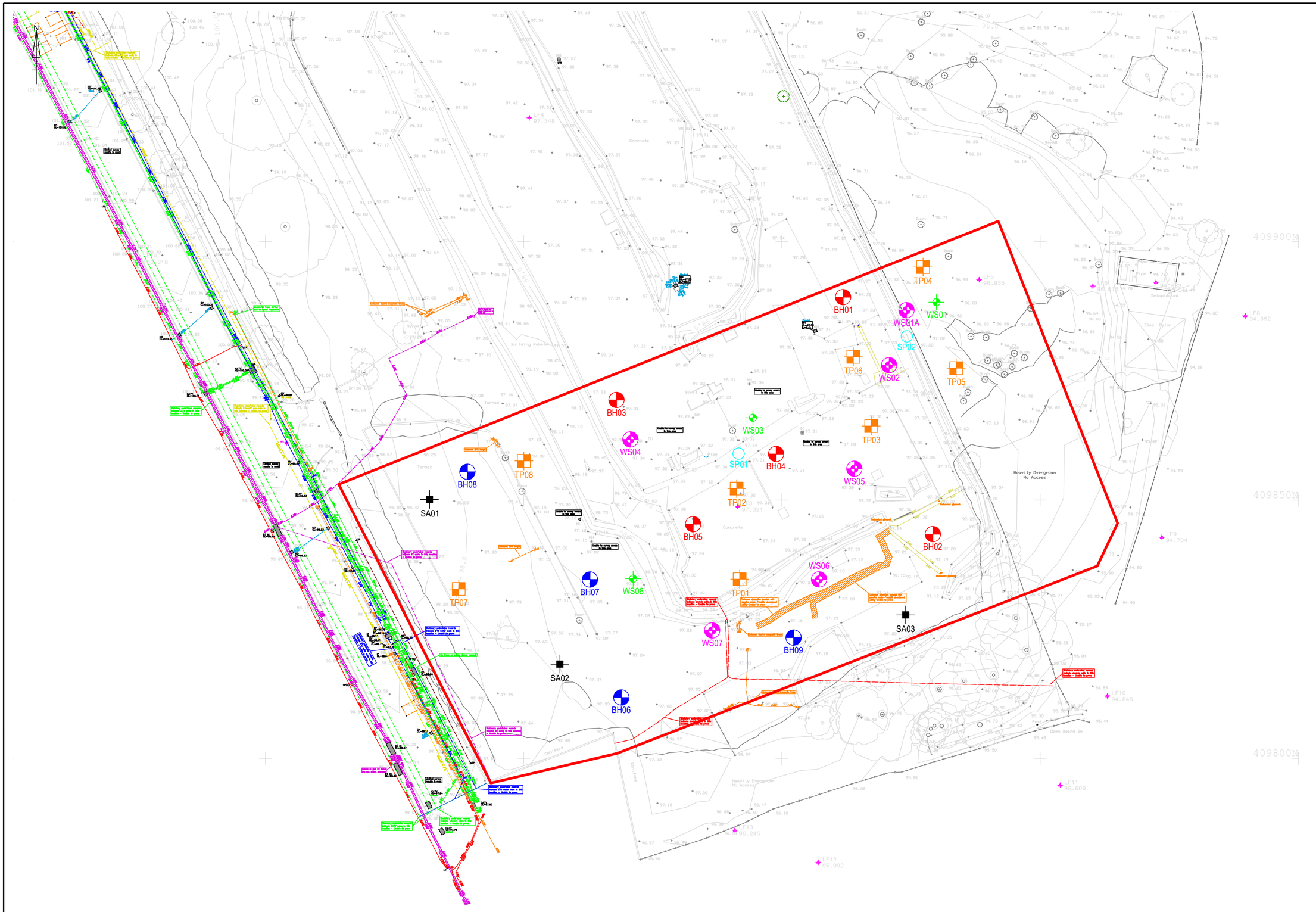
project
New Store
Wakefield Road,
Mapplewell

drawing title
Proposed Type 1300
Surfacing Plan

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

# ATTACHMENT B

# EXPLORATORY HOLE LOCATION PLAN




## 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: SM | APPROVED BY: AG |
| DATE: November 2017 | SCALE: 1:500 |
| | PAPER SIZE: A2 |

# ATTACHMENT C

# BOREHOLE LOGS

# 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 | | | |

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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 | | | | |

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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<br>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<br>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 (1,2/2,2,1,1,2) | 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. | 0.30 | | | |
| D | 0.40 | | | MADE GROUND - Greyish brown sandy GRAVEL. Sand is fine to coarse. Gravel is angular fine to coarse of limestone. (Sub-base). | 0.50 | | | |
| D | 1.00 | 60.0<br>N=5<br>(1,1/1,1,1,2) | 1 | 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). | | | | |
| 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 | | | |
| | | N=17<br>(2,2/2,5,5,5)<br>80.0 | 2 | Stiff high strength orangish grey sandy CLAY. Low plasticity (field description). Sand is fine to coarse. | 1.80 | | | |
| D | 2.60 | | | | | | | |
| D | 2.90 | 50 (7,8/50 for 125mm) | 3 | Very weak brown SANDSTONE with frequent interbeds of siltstone. Recovered as slightly clayey angular gravel of tabular fine grained sandstone and siltstone. | 2.80 | | | |
| | | | | 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.
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

# ATTACHMENT D

# GROUND 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 | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| **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:** GFM436-12746
Gas Range: **$CH_4$** 0 to 100% (0.1) **$CO_2$** 0 to 100% (0.1) **$O_2$** 0 to 25% (0.1)
Gas Flow range: +100l/hr to -60l/hr
Differential Pressure: +1250Pa to -1250Pa
**Date of last manufacturer calibration:** 22/05/2017
**Date of next manufacturer calibration:** 22/05/2018
**Date of last in-house calibration:** 02/11/2017
**Date of next in-house calibration:** 04/12/2017

**Ambient air check:** **$CH_4$** NR **$CO_2$** 20.4% **$O_2$** NR

**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 | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| **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): | | | NR | Before | | | NR | After | | |

**INSTRUMENTATION TECHNICAL SPECIFICATIONS:**

**Ground gas meter:** GFM436-12746
Gas Range: **$CH_4$** 0 to 100% (0.1) **$CO_2$** 0 to 100% (0.1) **$O_2$** 0 to 25% (0.1)
Gas Flow range: +100l/hr to -60l/hr
Differential Pressure: +1250Pa to -1250Pa
**Date of last manufacturer calibration:** 22/05/2017
**Date of next manufacturer calibration:** 22/05/2018
**Date of last in-house calibration:** 04/12/2017
**Date of next in-house calibration:** 02/01/2018

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

**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:** 3 **of** 6
**Date:** 03/01/2018 **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 | 2.7 | **2.7** | ND | ND | ND | ND | 15.8 | 15.8 | NR | NR | ND | ND | | | 0.0001 | 0.0027 | 1.79 | 3.53 | | | 1.0 - 3.5m | |
| WS 02 | **ND** | ND | ND | ND | 12.7 | **12.7** | ND | ND | ND | ND | 7.9 | 7.9 | NR | NR | 57.6 | ND | 0.0 | 1 | 0.0576 | 0.0127 | 3.81 | 4.03 | | | 1.0 - 4.0m | |
| WS 07 | **ND** | ND | ND | ND | 5.0 | **5.0** | ND | ND | ND | ND | 11.3 | 11.3 | NR | NR | 86.8 | ND | 0.0 | 0 | 0.0868 | 0.0050 | 1.45 | 3.06 | | | 1.0 - 3.0m | |
| WS 04 | **ND** | ND | ND | ND | 6.2 | **6.2** | ND | ND | ND | ND | 9.9 | 9.9 | NR | NR | 104.4 | ND | 0.0 | 1 | 0.1044 | 0.0062 | DRY | 3.07 | | | 1.0 - 3.0m | |
| WS 05 | **ND** | ND | ND | ND | 16.5 | **16.5** | ND | ND | ND | ND | 8.4 | 8.4 | NR | NR | 34.9 | 0.4 | 2.0 | 4 | 0.0349 | 0.0660 | 2.58 | 3.00 | | | 1.0 - 3.0m | |
| WS 06 | **ND** | ND | ND | ND | 5.9 | **5.9** | ND | ND | ND | ND | 6.9 | 6.9 | NR | NR | ND | ND | | | 0.0001 | 0.0059 | 2.08 | 3.06 | | | 1.0 - 3.0m | |
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| **Max** | **ND** | **ND** | **ND** | **ND** | **16.5** | **16.5** | **ND** | **ND** | **ND** | **ND** | **15.8** | **15.8** | **NR** | **NR** | **104.4** | **0.4** | **2.0** | **4** | **0.1044** | **0.0660** | **3.81** | | | **NR** | | |
| **Min** | **ND** | **ND** | **ND** | **ND** | **2.7** | **2.7** | **ND** | **ND** | **ND** | **ND** | **6.9** | **6.9** | **NR** | **NR** | **34.9** | **0.4** | **0.0** | **0** | **0.0001** | **0.0027** | **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: | | Calm | | Light | | Moderate | X | Strong | | |
| Cloud cover: | | None | | Slight | | Cloudy | X | Overcast | | |
| Precipitation: | | None | | Slight | X | Moderate | | Heavy | | |
| Time monitoring performed: | | | | Start | | | | End | | |
| Barometric pressure (mbar): | | | 981 | Start | | | 981 | End | | |
| Pressure trend (Daily): | | | | Falling | | Steady | X | Rising | | |
| Source: | weather on line.co.uk | | | | | | | | | |
| Air Temperature (Deg. C): | | | 8 | Before | | | NR | After | | |

**INSTRUMENTATION TECHNICAL SPECIFICATIONS:**

**Ground gas meter:** GFM436-12746
Gas Range: **$CH_4$** 0 to 100% (0.1) **$CO_2$** 0 to 100% (0.1) **$O_2$** 0 to 25% (0.1)
Gas Flow range: +100l/hr to -60l/hr
Differential Pressure: +1250Pa to -1250Pa
**Date of last manufacturer calibration:** 22/05/2017
**Date of next manufacturer calibration:** 22/05/2018
**Date of last in-house calibration:** 02/01/2018
**Date of next in-house calibration:** 03/02/2018

**Ambient air check:** **$CH_4$** NR **$CO_2$** 19.8% **$O_2$** NR

**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:** 4 **of** 6
**Date:** 16/01/2018 **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 | 3.5 | **3.5** | ND | ND | ND | ND | 15.6 | 15.6 | NR | NR | ND | ND | | | 0.0001 | 0.0035 | 1.85 | 3.53 | | | 1.0 - 3.5m | |
| WS 02 | **ND** | ND | ND | ND | 12.8 | **12.8** | ND | ND | ND | ND | 6.9 | 6.9 | NR | NR | 64.9 | ND | 0.0 | 1 | 0.0649 | 0.0128 | 3.81 | 4.03 | | | 1.0 - 4.0m | |
| WS 07 | **ND** | ND | ND | ND | 4.9 | **4.9** | ND | ND | ND | ND | 10.6 | 10.6 | NR | NR | 76.0 | ND | 0.0 | 1 | 0.0760 | 0.0049 | 1.39 | 3.06 | | | 1.0 - 3.0m | |
| WS 04 | **ND** | ND | ND | ND | 6.9 | **6.9** | ND | ND | ND | ND | 9.6 | 9.6 | NR | NR | 60.8 | ND | 0.0 | 1 | 0.0608 | 0.0069 | 3.05 | 3.06 | | | 1.0 - 3.0m | |
| WS 05 | **ND** | ND | ND | ND | 15.9 | **15.9** | ND | ND | ND | ND | 9.0 | 9.0 | NR | NR | 23.6 | ND | 0.0 | 1 | 0.0236 | 0.0159 | 2.51 | 3.00 | | | 1.0 - 3.0m | |
| WS 06 | **ND** | ND | ND | ND | 6.2 | **6.2** | ND | ND | ND | ND | 6.5 | 6.5 | NR | NR | -0.2 | ND | | | 0.0002 | 0.0062 | 2.09 | 3.06 | | | 1.0 - 3.0m | |
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| **Max** | **ND** | **ND** | **ND** | **ND** | **15.9** | **15.9** | **ND** | **ND** | **ND** | **ND** | **15.6** | **15.6** | **NR** | **NR** | **76.0** | **ND** | **0.0** | **1** | **0.0760** | **0.0159** | **3.81** | | | **NR** | | |
| **Min** | **ND** | **ND** | **ND** | **ND** | **3.5** | **3.5** | **ND** | **ND** | **ND** | **ND** | **6.5** | **6.5** | **NR** | **NR** | **-0.2** | **ND** | **0.0** | **1** | **0.0001** | **0.0035** | **1.39** | | | **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: | | Calm | | Light | X | Moderate | | Strong | | |
| Cloud cover: | | None | | Slight | | Cloudy | X | Overcast | | |
| Precipitation: | | None | X | Slight | | Moderate | | Heavy | | |
| Time monitoring performed: | | | | Start | | | | End | | |
| Barometric pressure (mbar): | | | 979 | Start | | | 979 | End | | |
| Pressure trend (Daily): | | | | Falling | | Steady | X | Rising | | |
| Source: | weather on line.co.uk | | | | | | | | | |
| Air Temperature (Deg. C): | | | 1 | Before | | | 2 | After | | |

**INSTRUMENTATION TECHNICAL SPECIFICATIONS:**

**Ground gas meter:** GFM436-12746
Gas Range: **$CH_4$** 0 to 100% (0.1) **$CO_2$** 0 to 100% (0.1) **$O_2$** 0 to 25% (0.1)
Gas Flow range: +100l/hr to -60l/hr
Differential Pressure: +1250Pa to -1250Pa
**Date of last manufacturer calibration:** 22/05/2017
**Date of next manufacturer calibration:** 22/05/2018
**Date of last in-house calibration:** 02/01/2018
**Date of next in-house calibration:** 05/02/2018

**Ambient air check:** **$CH_4$** NR **$CO_2$** 20.3% **$O_2$** NR

**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:** 5 **of** 6
**Date:** 29/01/2018 **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 | 2.4 | **2.4** | ND | ND | ND | ND | 18.5 | 18.5 | NR | NR | 0.4 | ND | 0.0 | 1 | 0.0004 | 0.0024 | 2.64 | 3.53 | | | 1.0 - 3.5m | |
| WS 02 | **ND** | ND | ND | ND | 10.4 | **10.4** | ND | ND | ND | ND | 8.4 | 8.4 | NR | NR | 3.5 | 1.5 | 15.0 | 4 | 0.0035 | 0.1560 | 3.75 | 4.03 | | | 1.0 - 4.0m | |
| WS 07 | **ND** | ND | ND | ND | 4.4 | **4.4** | ND | ND | ND | ND | 10.4 | 10.4 | NR | NR | 1.2 | ND | 0.0 | 1 | 0.0012 | 0.0044 | 1.34 | 3.06 | | | 1.0 - 3.0m | |
| WS 04 | **ND** | ND | ND | ND | 5.8 | **5.8** | ND | ND | ND | ND | 11.9 | 11.9 | NR | NR | 6.9 | ND | 0.0 | 5 | 0.0069 | 0.0058 | 3.02 | 3.07 | | | 1.0 - 3.0m | |
| WS 05 | **ND** | ND | ND | ND | 14.3 | **14.3** | ND | ND | ND | ND | 9.5 | 9.5 | NR | NR | ND | ND | 0.0 | 0 | 0.0001 | 0.0143 | 2.29 | 3.00 | | | 1.0 - 3.0m | |
| WS 06 | **ND** | ND | ND | ND | 4.1 | **4.1** | ND | ND | ND | ND | 10.7 | 10.7 | NR | NR | 8.9 | 2.7 | 12.0 | 5 | 0.0089 | 0.1107 | 2.11 | 3.06 | | | 1.0 - 3.0m | |
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| **Max** | **ND** | **ND** | **ND** | **ND** | **14.3** | **14.3** | **ND** | **ND** | **ND** | **ND** | **18.5** | **18.5** | **NR** | **NR** | **8.9** | **2.7** | **15.0** | **5** | **0.0089** | **0.1560** | **3.75** | | | **NR** | | |
| **Min** | **ND** | **ND** | **ND** | **ND** | **2.4** | **2.4** | **ND** | **ND** | **ND** | **ND** | **8.4** | **8.4** | **NR** | **NR** | **0.4** | **1.5** | **0.0** | **0** | **0.0001** | **0.0024** | **1.34** | | | **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 | X | Moist | | Wet | | Snow | | Frozen |
| Wind: | | Calm | | Light | | Moderate | X | Strong | | |
| Cloud cover: | | None | X | Slight | | Cloudy | | Overcast | | |
| Precipitation: | X | None | | Slight | | Moderate | | Heavy | | |
| Time monitoring performed: | | | | Start | | | | End | | |
| Barometric pressure (mbar): | | | 1010 | Start | | | 1010 | End | | |
| Pressure trend (Daily): | | | | Falling | | Steady | X | Rising | | |
| Source: | weather on line.co.uk | | | | | | | | | |
| Air Temperature (Deg. C): | | | 8 | Before | | | 8 | After | | |

**INSTRUMENTATION TECHNICAL SPECIFICATIONS:**

**Ground gas meter:** GFM436-12746
Gas Range: **$CH_4$** 0 to 100% (0.1) **$CO_2$** 0 to 100% (0.1) **$O_2$** 0 to 25% (0.1)
Gas Flow range: +100l/hr to -60l/hr
Differential Pressure: +1250Pa to -1250Pa
**Date of last manufacturer calibration:** 22/05/2017
**Date of next manufacturer calibration:** 22/05/2018
**Date of last in-house calibration:** 02/01/2018
**Date of next in-house calibration:** 05/02/2018

**Ambient air check:** **$CH_4$** NR **$CO_2$** 20.4% **$O_2$** NR

**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:** 6 **of** 6
**Date:** 14/02/2018 **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 | 3.7 | **3.7** | ND | ND | ND | ND | 15.9 | 15.9 | NR | NR | 0.2 | ND | 0.0 | 1 | 0.0002 | 0.0037 | 2.36 | 3.53 | | | 1.0 - 3.5m | |
| WS 02 | **ND** | ND | ND | ND | 13.6 | **13.6** | ND | ND | ND | ND | 5.1 | 5.1 | NR | NR | ND | ND | 0.0 | 1 | 0.0001 | 0.0136 | 3.81 | 4.03 | | | 1.0 - 4.0m | |
| WS 07 | **ND** | ND | ND | ND | 3.6 | **3.6** | ND | ND | ND | ND | 11.2 | 11.2 | NR | NR | -1.9 | ND | 0.0 | 1 | 0.0019 | 0.0036 | 1.31 | 3.06 | | | 1.0 - 3.0m | |
| WS 04 | **ND** | ND | ND | ND | 8.1 | **8.1** | ND | ND | ND | ND | 8.6 | 8.6 | NR | NR | 15.0 | ND | 4.0 | 5 | 0.0150 | 0.0081 | 3.01 | 3.07 | | | 1.0 - 3.0m | |
| WS 05 | **ND** | ND | ND | ND | 14.4 | **14.4** | ND | ND | ND | ND | 10.4 | 10.4 | NR | NR | 3.6 | 0.6 | 0.0 | 3 | 0.0036 | 0.0864 | 2.31 | 3.00 | | | 1.0 - 3.0m | |
| WS 06 | **ND** | ND | ND | ND | 7.1 | **7.1** | ND | ND | ND | ND | 5.3 | 5.3 | NR | NR | 0.2 | ND | 0.0 | 1 | 0.0002 | 0.0071 | 2.15 | 3.06 | | | 1.0 - 3.0m | |
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| **Max** | **ND** | **ND** | **ND** | **ND** | **14.4** | **14.4** | **ND** | **ND** | **ND** | **ND** | **15.9** | **15.9** | **NR** | **NR** | **15.0** | **0.6** | **4.0** | **5** | **0.0150** | **0.0864** | **3.81** | | | **NR** | | |
| **Min** | **ND** | **ND** | **ND** | **ND** | **3.6** | **3.6** | **ND** | **ND** | **ND** | **ND** | **5.1** | **5.1** | **NR** | **NR** | **-1.9** | **0.6** | **0.0** | **1** | **0.0001** | **0.0036** | **1.31** | | | **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: | | Calm | | Light | X | Moderate | | Strong | | |
| Cloud cover: | | None | | Slight | | Cloudy | X | Overcast | | |
| Precipitation: | | None | | Slight | | Moderate | X | Heavy | | |
| Time monitoring performed: | | | | Start | | | | End | | |
| Barometric pressure (mbar): | | | 982 | Start | | | 982 | End | | |
| Pressure trend (Daily): | | | | Falling | X | Steady | | Rising | | |
| Source: | weather on line.co.uk | | | | | | | | | |
| Air Temperature (Deg. C): | | | 3 | Before | | | 3 | After | | |

**INSTRUMENTATION TECHNICAL SPECIFICATIONS:**

**Ground gas meter:** GFM436-12746
Gas Range: **$CH_4$** 0 to 100% (0.1) **$CO_2$** 0 to 100% (0.1) **$O_2$** 0 to 25% (0.1)
Gas Flow range: +100l/hr to -60l/hr
Differential Pressure: +1250Pa to -1250Pa
**Date of last manufacturer calibration:** 22/05/2017
**Date of next manufacturer calibration:** 22/05/2018
**Date of last in-house calibration:** 05/02/2018
**Date of next in-house calibration:** 05/03/2018

**Ambient air check:** **$CH_4$** NR **$CO_2$** 20.5% **$O_2$** NR

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

## Ground Gas and Groundwater Monitoring Record Sheet

### Summary of all gas monitoring events

**JOB DETAILS:**

**Client:** Lidl UK **Job No:** C7481
**Site:** Wakefield Road, Mapplewell
**Start Date:** 28/11/2017
**End Date:** 14/02/2018 **No. events:** 6

| | GAS CONCENTRATIONS | | | | | | | | | | | | PID | FLOW DATA | | | | | | Max. Qhg Recorded | | Worst-credible Qhg | | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Monitoring Point | Methane (%v/v) | | %LEL | | Carbon dioxide (%v/v) | | Carbon monoxide (ppmv) | | Hydrogen sulphide (ppmv) | | Oxygen (%v/v) | | Peak (ppm) | Peak flow rate (l/hr) | | Steady flow rate (l/hr) | | Differential borehole Pressure (Pa) | Time for flow to equalise (secs) | Methane (l/hr) | CO2 (l/hr) | Methane (l/hr) | CO2 (l/hr) | |
| | **Peak** | Steady | Peak | Steady | Peak | **Steady** | Peak | Steady | Peak | Steady | Min. | Steady | | Max. | Min. | Max. | Min. | | | | | | |
| WS 01A | **ND** | ND | ND | ND | 7.2 | **7.2** | ND | ND | ND | ND | 15.2 | 15.2 | ND | 0.4 | -0.3 | ND | ND | ND | 1 | 0.0004 | 0.0072 | 0.0004 | 0.0072 | |
| WS 02 | **ND** | ND | ND | ND | 13.6 | **13.6** | ND | ND | ND | ND | 5.1 | 5.1 | ND | 64.9 | -0.2 | 1.5 | ND | 15.0 | 4 | 0.0649 | 0.1560 | 0.0649 | 0.2040 | |
| WS 07 | **ND** | ND | ND | ND | 5.0 | **5.0** | ND | ND | ND | ND | 10.4 | 10.4 | ND | 86.8 | -1.9 | ND | ND | ND | 1 | 0.0868 | 0.0050 | 0.0868 | 0.0050 | |
| WS 04 | **ND** | ND | ND | ND | 8.1 | **8.1** | ND | ND | ND | ND | 8.6 | 8.6 | ND | 104.4 | ND | ND | ND | 4.0 | 5 | 0.1044 | 0.0081 | 0.1044 | 0.0081 | |
| WS 05 | **ND** | ND | ND | ND | 16.5 | **16.5** | ND | ND | ND | ND | 8.4 | 8.4 | ND | 34.9 | -0.3 | 1.3 | ND | 3.0 | 4 | 0.0349 | 0.1911 | 0.0349 | 0.2145 | |
| WS 06 | **ND** | ND | ND | ND | 7.1 | **7.1** | ND | ND | ND | ND | 5.3 | 5.3 | ND | 8.9 | -0.2 | 2.7 | ND | 12.0 | 5 | 0.0089 | 0.1107 | 0.0089 | 0.1917 | |
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| **Max** | **ND** | **ND** | **ND** | **ND** | **16.5** | **16.5** | **ND** | **ND** | **ND** | **ND** | **15.2** | **15.2** | **ND** | **104.4** | **-0.2** | **2.7** | **ND** | **15.0** | **5** | **0.1044** | **0.1911** | **0.1044** | **0.2145** | |
| **Min** | **ND** | **ND** | **ND** | **ND** | **5.0** | **5.0** | **ND** | **ND** | **ND** | **ND** | **5.1** | **5.1** | **ND** | **0.4** | **-1.9** | **ND** | **ND** | **ND** | **1** | **0.0004** | **0.0050** | **0.0004** | **0.0050** | |
| | | | | | | | | | | | | | | | | | | | | | | **Worst-possible Qhg** | | |
| | | | | | | | | | | | | | | | | | | | | | | **0.1044** | **0.4455** | |

ND - Not detected
NR - Not recorded

Qhg calculated for methane on the basis of peak flow and concentration (short-term explosive risk).
Qhg calculated for carbon dioxide on the basis of steady flow and concentration (risk of long-term accumulation of suffocating mixture).
For calculation purposes, it is assumed that negative flows could be realised as positive flows.
Max. Qhg recorded is the highest Qhg determined in any individual monitoring event.
Worst-credible Qhg is the value calculated from the highest concentration and flow recorded in any monitoring event for an individual borehole.
Worst-possible Qhg is the value calculated from the highest concentration and flow recorded in any monitoring event for any borehole.

## Ground Gas and Groundwater Monitoring Record Sheet

### Summary of Groundwater Data

**JOB DETAILS:**

**Client:** Lidl UK **Job No:** C7481
**Site:** Wakefield Road, Mapplewell
**Start Date:** 28/11/2017
**End Date:** 14/02/2018 **No. events:** 6

| Monitoring Point | Product thickness (mm) | Water level (mbgl) | | Water level (mAOD) | | Water level range (m) | Response zone |
|---|---|---|---|---|---|---|---|
| | Max. | Max. | Min. | Max. | Min. | | |
| WS 01A | NR | 3.02 | 1.79 | | | 1.23 | 1.0 - 3.5m |
| WS 02 | NR | 3.83 | 3.40 | | | 0.43 | 1.0 - 4.0m |
| WS 07 | NR | 1.51 | 1.31 | | | 0.20 | 1.0 - 3.0m |
| WS 04 | NR | 3.05 | 1.24 | | | 1.81 | 1.0 - 3.0m |
| WS 05 | NR | 2.85 | 2.29 | | | 0.56 | 1.0 - 3.0m |
| WS 06 | NR | 2.16 | 1.00 | | | 1.16 | 1.0 - 3.0m |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| **Max.** | **NR** | **3.83** | **3.40** | | | **1.81** | |
| **Min.** | **NR** | **1.51** | **1.00** | | | **0.20** | |