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Date: 23rd March 2020

Bellway Homes
By EMAIL

For the attention of Mr K. Yardley

Dear Ken,

RE: Derby Road, Hatton – Additional Gas Monitoring and Updated Gas Risk Assessment

GRM Development Solutions Limited (GRM) has been appointed by Bellway Homes East Midlands (Client) to undertake a targeted ground investigation to supplement the previous works and further investigate the ground gas regime on the above site, as part of the proposed residential development of the site.

This report should be read in conjunction with previous works;

- Phase I Desk Study by GRM, report ref: GRM/P6901/F.1 dated March 2015.
- Phase II Site Appraisal by GRM, report Ref: GRM/P6901/Ph2/F.1, dated April 2015.
- Gas Addendum Letter – Derby Road, Hatton, dated, 16th June 2015.

A Copy of GRM Standard Limitations of Reporting is provided in Appendix A.

A Site Location Plan is presented in Appendix B and a Proposed Development Plan is presented in Appendix C.

This report aims to provide an updated assessment of the gas regime on the site with the addition of further monitoring locations and data from monitoring visits.

Background – 2015 Investigation

A number of potential gas sources were put forward in the previous works;

- A historical landfill to the east of the site was identified from historical maps as a potential source of ground gas.
- Made Ground identified around the former farm yard area and across the surrounding field to the east.
- Alluvium was observed across the majority of the site.

The Phase II ground investigation undertaken by GRM in 2015 and subsequent ground gas monitoring consisted of 6 visits over 3 months. This recorded elevated concentrations of carbon dioxide, in the following locations;

- WS05 – up to 11%
- WS15 - up to 25%
- WS19 - up to 10%
- BH01 – up to 7.4%

Despite the absence of flow recorded during the initial monitoring period, due to the elevated concentrations of carbon dioxide, it was initially recommended that gas protection measures commensurate with 'Traffic

Light – Amber 1' and 'Characteristic Situation 2' were installed along with further investigation and monitoring.

Additional Investigation – September 2019

Due to the ploughing and destruction of the monitoring locations from the 2015 phase of works, new monitoring wells were installed.

The supplementary targeted ground investigation undertaken by GRM comprised eight boreholes (WS101 to WS108), advanced with windowless sampling to a maximum depth of 4.0m below existing ground level (begl) and installed with gas monitoring wells. These were undertaken on the 26th and 27th September 2019. The table below summarises the rationale for the locations of the recent windowless sample boreholes.

LIST OF TARGETED EXPLORATORY HOLES	
Exploratory Hole	Reason for Location
WS101	Targeting area adjacent to WS15.
WS102 – WS105	Located around BH01.
WS106 & WS107	Located along eastern boundary, adjacent to historical landfill.
WS108	Located adjacent to WS05.

At the time of writing this report, it was not possible to access the field in which WS05 was located, due to the presence of livestock. It was only possible to install one ground gas monitoring location (WS108) in the adjacent field to the north of WS05, as the livestock remained in the southern field for the duration of the monitoring period.

An exploratory hole location plan is presented in Appendix D and the exploratory hole logs in Appendix E.

Geology

The following strata were encountered in the investigation and are consistent with the findings of GRM's original investigation:

Topsoil

Topsoil was encountered in all exploratory holes with a thickness of 0.15m, and comprised dark brown, silty, slightly sandy CLAY. The ground surface comprised grass in all locations and abundant rootlets were present throughout the Topsoil.

Relaid Topsoil

Relaid Topsoil was encountered in one exploratory hole (WS101) to a depth of 0.10m begl. It comprised brown, clayey, slightly sandy SILT with abundant rootlets, topped by grass.

Made Ground

Made Ground was encountered in one exploratory hole (WS101 – field adjacent to the former farm area) to a depth of 1.0m begl. This material generally comprised of CLAY/SILT with gravels of quartzite and sandstone.

Alluvium

Deposits of Alluvium were encountered in most exploratory holes, to depths of between 0.45m and 2.15m begl with thicknesses of between 0.10m and 1.95m. These deposits generally comprised of CLAY with sand and gravels, locally but rarely with organic matter.

River Terrace Deposits

River Terrace Deposits comprising sandy GRAVEL, gravelly SAND, SAND and sandy, gravelly CLAY were encountered in all exploratory holes, to depths of up to 4.0m begl with a general thickness of 2.20m. This strata was generally recorded beneath the Alluvium with the exception of WS101, where it was locally recorded beneath Made Ground.

A selection of summary cross sections of the geological conditions encountered are presented in Appendix F.

Groundwater Observations

First Round of Monitoring – Phase II 2015 Investigation (March-June):

Groundwater was observed in all exploratory holes at depths of between 1.0m and 1.82m begl. An average groundwater level across the site for all 6 monitoring visits is circa 1.0m begl.

Second Round of Monitoring – 2019 Additional Investigation (October-January):

The recorded groundwater levels during this phase of the monitoring were generally shallower than the previous, with this phase of works taking place during the wetter autumn/winter season. Much of the granular strata of the River Terrace Deposits were saturated, with standing water locally present at the surface.

Given this natural variation in the groundwater depths, it is likely that the groundwater recorded by the monitoring is representative of the local groundwater regime, and due to the higher permeability mainly granular natural underlying soils, dynamic in nature and reactive to dryer and wetter periods of weather.

The groundwater flow beneath the site has been determined generally to be to the south towards the River Dove. From the available monitoring data, the gradient is likely to be very shallow as the site topography is flat across a relatively large area. A groundwater flow diagram created from the monitoring data is presented in Appendix G.

Additional Monitoring

Following completion of the 2019 additional investigation and installation of additional monitoring wells, a ground gas monitoring programme was undertaken consisting of a further 6 visits over 3 months. A composite Gas Monitoring Plan including all the monitoring locations from both phases of work is presented in Appendix H, and the results of the monitoring are presented in Appendix I.

During the 2015 monitoring visits, elevated carbon dioxide readings were recorded; however, these results were not repeated during the 2019 monitoring, with marginally elevated concentrations of methane identified during the second phase of monitoring.

Elevated concentrations of methane of up to 1.3% (above the 1% threshold) were recorded in WS103, WS104 and WS105, positioned around BH01.

Gas sample Analysis

Gas samples obtained from standpipes (WS103, WS104 and WS105) were submitted for bulk gases landfill suite analysis. No significantly elevated concentrations of methane were recorded. The results are presented in Appendix J.

Gas Screening Values

The primary guidance document to determine if protection measures are required is BS8485:2015+A1:2019 Code of practice for the design of protective measures from methane and carbon dioxide ground gases for new buildings. This uses hazardous gas flow rates (Q_{hg}), which are gas concentrations multiplied by borehole flow rates, to derive a Gas Screening Value (GSV) for the site. The gas regime is then determined based on the GSV and other limiting factors such as gas concentrations.

As the flow rate was below the monitor's lower limit of detection a default flow rate of 0.1l/hr has been used in the following assessment.

Using the default flow rate of 0.1l/hr and the maximum methane concentration of 1.3%v/v a Q_{hg} of 0.0013l/hr has been calculated for methane. Using the default flow rate of 0.1l/hr and the maximum carbon dioxide concentration of 25%v/v, a Q_{hg} of 0.025l/hr has been calculated for carbon dioxide. On this basis the GSV for the site is determined as 0.025l/hr.

Discussion

In order to assist with the risk assessment process, the monitoring results have been assessed using a ternary graph plot analysis. The ternary gas plots, provide an assessment of the likely gas source and is

based on Ground Gas Information Sheet No.1 (Wilson S, Collins F & Lavery R, 2018). The concentrations of ground gas obtained from the monitoring data are plotted on to the graph and depending on the area of the graph the results fall into, the likely gas source is determined. The graph plot produced is presented in Appendix K. This illustrates that generally the gas is assessed to have been generated by microbial respiration and released from the soils present, rather than be from landfill or geogenic gas sources.

Three potential sources of ground gas have been identified at the site and are discussed below.

Made Ground – former farm yard area and adjacent field

Due to its thickness, the Made Ground was not monitored during the monitoring period; however, it has since been confirmed that the existing site levels are to be raised by circa 1.0m. Therefore it is considered prudent to install gas protection measures commensurate with 'Characteristic Situation 2' within this area.

This affects plots 152-197 of the current development layout. The plots requiring gas protection measures will be confirmed on the design drawings and foundation schedule.

Natural Strata – Alluvium

In general, the Alluvium was recorded at shallow depth and groundwater was typically above the response zones in the wells, and where the Alluvium was monitored, the strata was only screened through a very thin band of Alluvium. Based on the soil logging descriptions, the Alluvium is not particularly organic and whilst small volumes of ground gas have been produced they are not significant and are considered to be the result of variations in groundwater levels and microbial respiration.

Alluvium is present across the majority of the site, with only locally organic material observed, this would explain the sporadic occurrence and nature of the monitoring results e.g. elevated carbon dioxide and methane recorded during different visits and phases of the monitoring.

Therefore, gas protection measures are not considered to be required due to the Alluvium.

Landfill Gas

The landfill adjacent to the south eastern boundary is a potential source of ground gas, even though it is recorded to have received inert waste, and elevated concentrations of ground gas have not been identified in close proximity. Additionally, the ternary gas plot illustrates that the gas concentrations recorded by the monitoring are not indicative of landfill gas.

In conclusion, the majority of the site has been assessed as 'Characteristic Situation 1' with the exception of the former farmyard area and adjacent field and the area adjacent to the historical landfill along the south eastern boundary. As a precautionary measure all proposed plots that fall within 50m of the landfill boundary, and those in the far south eastern corner of the proposed development area have been assessed as 'Characteristic Situation 2' and should include gas protection measures.

This affects plots 315-331, 338-340, 349-369, 376-379 under the current development layout. The plots requiring gas protection measures will be confirmed on the design drawings and foundation schedule

A Gas Protection Measures Requirements Plan is presented in Appendix L.

This assessment is considered suitable due to the following mitigating factors:

- The entire development will utilise beam and block ventilated floor slabs, the ventilation acting as the primary protection method in most gas protection measures for new residential houses.
- The site levels will be raised by circa 1.0m across the whole site area. The soils used for this will be approved by GRM prior to being imported under a Materials Movement Plan (MMP) declaration to CL:AIRE.
- The monitoring results record sporadic and although locally elevated results, are not typically elevated.
- No flow has been recorded in any location during any monitoring visit.

This assessment supersedes the previous Gas Addendum Letter for the site.

It is recommended that until this assessment is agreed with the EHO and warranty provider, gas protection measures should be installed within all plots.

Conclusion

It should be noted; this assessment relies on the soils used to raise existing levels should not create a further potential source of ground gas, and should only be clean inert natural soils with the low organic content.

This report and assessment should be approved by the Local Authority and Warranty Provider.

We trust this is suitable for your current requirements, should you require any further information or would like any clarification of the points raised do not hesitate to contact us.

Yours sincerely
for GRM Development Solutions Ltd.

Project Manager:
Richard Hodgkinson BSc (Hons) FGS
Senior Geotechnical Engineer

Approved by:
Richard Upton BSc MSc CEnv
Director

Enc.

Appendix A – GRM Standard Limitations of Reporting
Appendix B – Site Location Plan
Appendix C – Proposed Development Plan
Appendix D – Exploratory Hole Location Plan - 2019
Appendix E – Exploratory Hole Logs
Appendix F – Geological Cross Sections
Appendix G – Groundwater Flow Diagram
Appendix H – Composite Gas Monitoring Plan
Appendix I – Gas Monitoring Results
Appendix J – Gas Sample Analysis
Appendix K – Ternary Plot Graph
Appendix L – Gas Protection Area Requirements Plan



A P P E N D I X A

**GRM Development Solutions provides
multi-disciplinary consultancy services, UK-wide:**

- Geotechnical and Geo-environmental Services
- Civil and Infrastructure Services
- Structural Engineering Services
- Construction Management
- Site Services

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GENERAL APPRAISAL COMMENTS

i INFORMATION SOURCES

Where available the following sources have been used for the identification and assessment of potential ground hazards:

- Relevant British Standards
- British Geological Survey (BGS) Geology Map Scale 1:10,000 for local area
- British Geological Survey (BGS) Geology Map Scale 1:50,000/1:63,320
- BGS Memoir
- BGS Borehole Records
- BGS online viewer: <http://www.bgs.ac.uk/data/mapViewers/home.html>
- Historical Ordnance Survey (OS) Maps
- Environmental Data Report
- MAGIC Website: <http://magic.defra.gov.uk/>
- Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites, UKWIR (2010).
- Coal Authority Records / Coal Mining Report
- DEFRA/Environment Agency Contaminated Land publications and DoE Industry Profiles
- HPA-RPD-033 Indicative Atlas of Radon in England and Wales (HPA & BGS, 2007)
- BR211 Radon: Guidance on protective measures for new buildings (BRE, 2015)
- PHE-CRCE-032 Radon in Homes in England: 2016 Data Report (PHE, 2017)
- CIRIA C665 Assessing risks posed by hazardous ground gases to buildings (CIRIA, 2007)
- BS8485:2015+A1:2019 Code of Practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings (BSI, 2019)
- CIRIA C733 Asbestos in soil and made ground: a guide to understanding and managing risks (CIRIA, 2014).
- CIRIA C765 Asbestos in soil and made ground good practice site guide (CIRIA, 2017)
- Other technical references used throughout this document are detailed in the text.

ii CONTAMINANTS OF CONCERN

The DoE Industry Profiles are normally used to assess likely contaminants from past land use and potential nearby industrial sources. For land uses where no profile is available, likely contaminants of concern are selected by GRM based on past experience of similar sites, a general screening suite of contaminants covered by CLEA and common contaminants from the Industry Profiles.

- | | | |
|------------|-------------------|--|
| • Arsenic | • Copper | • Water soluble sulphate |
| • Cadmium | • Nickel | • PAH (polycyclic aromatic hydrocarbons) |
| • Chromium | • Zinc | |
| • Lead | • Phenols | |
| • Mercury | • cyanide (total) | |
| • Selenium | • pH | |

Asbestos and PCBs are listed in the vast majority of profiles. PCBs are listed as the profiles expect electricity substations and switch boxes on all industrial sites. There is the potential for asbestos containing material to be mixed up with made ground, following any demolition works.

iii CONCEPTUAL MODEL METHODOLOGY

The consideration of contamination is based upon the principles of risk assessment, using the 'source-pathway-receptor' model in order to establish the presence, or potential presence, of a pollutant linkage.

To create a risk, contamination must have the potential to cause harm to susceptible targets or receptors such as humans, the water environment or the built environment. The potential for harm to occur requires three conditions to be satisfied to form a pollutant linkage:

- The presence of substances that may cause harm (SOURCE).
- The presence of a target which may be harmed (RECEPTOR).
- The existence of a plausible migration route between the source and the receptor (PATHWAY).

In the absence of a plausible pollutant linkage there is no risk. Where a potential linkage is identified in order for it not to pose a risk to the identified receptor it must be broken.

iv INTRUSIVE INVESTIGATION SAMPLING METHODOLOGY

The ground investigation (including fieldwork, sampling, monitoring and laboratory analyses) has been designed to identify and assess potential ground related problems and to allow cost effective solutions to be advised. It has been planned on the basis of the desk study, site inspection and the proposed development layout (where available). All fieldwork and soil descriptions were carried out in general accordance with relevant British Standards.

The exploratory holes have been positioned and advanced to depths to determine the general ground/groundwater/gas conditions below the site. A general grid pattern has been adopted, where possible, to provide sufficient information based on the current proposed layout scheme. Some holes have been targeted at particular hazards identified in the Phase I assessment. The resultant exploratory hole density is considered to be commensurate with the complexity of the site conditions and detail of information required for this phase of the investigation.

v GROUND GAS RISK ASSESSMENT METHODOLOGY

Gas monitoring programmes undertaken by GRM are designed to broadly comply with the recommendations outlined in CIRIA Report C665 'Assessing risks posed by hazardous ground gas to buildings' (2007) and BS8576 'Guidance on Investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs) (2013).

To assess the risks posed by ground gases such as radon, carbon dioxide and methane, the relevant current guidance has been used. For radon the site has been assessed following the guidelines in 'Radon: guidance on protective measures for new dwellings (BR211: 2015)'. For methane and carbon dioxide the primary guidance document used to determine if protection measures are required is *BS8485:2015+A1:2019 Code of practice for the design of protective measures from methane and carbon dioxide ground gases for new buildings*. This uses hazardous gas flow rates (Q_{hg}), which are gas concentrations multiplied by borehole flow rates, to derive a Gas Flow Rate (GSV) for the site. The gas regime is then determined based on the GSV and other limiting factors such as gas concentrations.

Where flow is not recorded during the monitoring a default flow rate of 0.1l/hr will be used in the assessment to produce a positive result.

vi HUMAN HEALTH RISK ASSESSMENT METHODOLOGY

Guidance contained in the Environment Agency's CLEA Reports has been used to assess the risks posed to human health.

For residential developments that include domestic gardens the default Tier 1 Assessment Criteria (TAC) for 'residential land with plant uptake' are used, i.e. a female with a start age class of one and an end age class of six. All pathways are considered including the consumption of home-grown vegetables.

For residential developments that do not include domestic gardens the default Tier 1 Assessment Criteria (TAC) for 'residential land without plant uptake' are used, i.e. a female with a start age class of one and an end age class of six. All pathways are considered except the consumption of home-grown vegetables.

For commercial/industrial developments the default Tier 1 Assessment Criteria (TAC) for 'commercial/industrial' are used, i.e. a female with a start age class of sixteen and an end age class of eighteen. All pathways are considered except the consumption of home-grown vegetables.

The TAC used by GRM include Category 4 Screening Levels (C4SLs) published by DEFRA, values calculated by GRM using the CLEA v1.071 risk assessment, and values and Suitable for Use Levels (S4UL) developed by LQM/CIEH. The TAC used in the assessment are selected based on the lowest site specific SOM values returned as part of the chemical analysis.

Where soil chemical analysis results are found to exceed the TAC, Site-Specific Risk Assessments may be undertaken using the CLEA v1.071 risk assessment software using the age classes and pathways described above.

vii RISK TO SITE WORKERS – GENERAL COMMENTS

The risks to site workers are similar to those posed to site end users, although likely to be less severe due to the site workers' shorter exposure to the identified contamination. However, site workers (particularly groundworkers) are more likely to come into direct contact with contaminated soils due to the nature of their work. On this basis ground and construction workers should be provided with basic Personal Protective Equipment based on the site's general health and safety risk assessment, but including as a minimum safety footwear, gloves and overalls.

A site specific risk assessment should be carried out for all hazards identified within the ground investigation in accordance with current health and safety legislation. This assessment should identify any measures required to further reduce risks i.e. providing further Personal Protective Equipment, welfare facilities and if necessary preventing access to certain areas. Reference is made to the following guidance in respect of asbestos:

- Control of Asbestos Regulations (CAR) 2012 and Approved Code of Practice and guidance (L143 2nd Ed.) (HSE, 2013)
- CAR-SOIL™ Control of Asbestos Regulations 2012. Interpretation for Managing and Working with Asbestos in Soil and Construction and Demolition Materials: Industry Guidance (CLAIRE, 2016)

Demolition and dismantling of existing structures on the site must be carried out to a safe and acceptable standard, in accordance with current UK guidance and best practice. Whilst not ground related, asbestos and hazardous substances surveys should be conducted prior to any demolition.

Any unusual colours, odours and suspicious ground should be reported immediately to site management and then GRM.

Whilst this appraisal has considered the long-term effects of contamination, GRM can also help during the formulation of Health and Safety documentation, if required.

viii CONTROLLED WATERS RISK ASSESSMENT METHODOLOGY

Where the desk study and fieldwork do not reveal a potential source of contamination no leachate or groundwater testing will be performed. Where a potential source is identified the testing will comprise leachate testing on the material considered most likely to pose a risk, groundwater testing will be undertaken if water is present at shallow depth.

The UK Drinking Water Standards (UKDWS) or Environmental Quality Standards (EQS) are usually adopted for comparison with the leachate/groundwater test results. When the most sensitive receptor is considered to be the aquifer (groundwater) UKDWS will be adopted as the Initial Tier 1 screening values. Where the most sensitive receptor is a surface water feature the EQS values will be used as Initial Tier I Screening values.

ix CONSTRUCTION MATERIALS RISK ASSESSMENT METHODOLOGY

The 'screening levels' adopted for the assessment of risk to construction materials are taken from the following documents:

- UK Water Industry Research (UKWIR) Contamination thresholds for sub-surface water pipes, for the protection of buried pipes.
- Building Research Establishment (BRE) Special Digest SD1 (2005), 'Concrete in Aggressive Ground', for the protection of buried concrete.

x WASTE DISPOSAL, SITE WASTE MANAGEMENT PLANS AND MATERIAL MANAGEMENT PLANS

Under current Waste Management Regulations, waste soil materials produced from the site will require characterisation to enable it to be disposed of correctly.

The chemical analysis results included in this report should be provided to the relevant landfill operators to establish the characterisation of the waste, confirm its suitability for landfill disposal and provide estimated costings. Depending on the receiving landfill's current permit, further chemical analysis, incorporating Waste Acceptance Criteria (WAC) leachate analysis, may be required.

All materials removed from the site will be classified as 'waste' and therefore must be removed by a suitably licensed carrier of waste. This applies whether or not the waste is contaminated. All waste removed to landfill will attract Landfill Tax.

The developer/builder is likely to be classed as the waste producer and therefore, has a duty of care to ensure that all waste is disposed of appropriately. This includes ensuring the waste carrier is licensed and disposes of the waste to a suitably licensed landfill site. They are also required to keep a paper trail from 'cradle to grave' including copies of the waste disposal tickets.

Efficient materials management on site is recommended as it can lead to significant cost savings when compared to the traditional side casting or single stockpile of arisings. GRM can assist in the production of Material Management Plans under the CL:AIRE Definition of Waste: Code of Practice. The DoWCoP enables:

- The direct transfer and re-use of clean naturally occurring soil materials between sites, and
- The re-use of both contaminated and uncontaminated materials on their site of origin and between sites within defined Cluster projects.

GRM can also undertake the role of Qualified Person and submit the DoWCoP project Declaration.

Likewise making the site as volume neutral as possible will reduce the costs of development. Whilst not a statutory requirement, Site Waste Management Plans allow better waste management practices, help to reduce the amount of waste produced and identify best environmental disposal options. Implementing a Site Waste Management Plan (SWMP) can reduce costs (increasing business profits) and maximise resource efficiency.

xi GEOTECHNICAL ASSESSMENT GENERAL COMMENTS

Where finished floor levels of proposed structures have not been provided by the Client, then for the purposes of initial assessment, GRM will assume that finished levels will not vary appreciably from the existing ground levels. If the depths of any underground engineering works (i.e. sewers, pumping stations etc.) are unknown they will not be taken in to account in the assessment and it will be assumed that any such works will not compromise foundation or ground stability.

Should the development proposals or finished levels be different from these assumptions then the comments/recommendations in the Geotechnical Assessment may require revising.

It should be noted that the results of window sampling and/or cable percussive boreholes may not give a true indication of a soils actual engineering properties (i.e. stability, mass structure etc). GRM consider that that prior to development trial pitting should be undertaken to confirm the recommendations in the Geotechnical Assessment.

xii GEOTECHNICAL ASSESSMENT – ENGINEERING GROUND TREATMENT

Near surface soils have the potential to be disturbed by weathering and site traffic. Precautions should always be taken to avoid this, as excessive disturbance may leads to more onerous floor slab designs, road cap thickness and increased amounts of off-site disposal etc.

Near surface soils may need treatment or reinforcing to allow safe movement of construction plant and labour. An assessment by the contractor should be undertaken once the type of machinery/plant needed to complete the development is known.

xiii GEOTECHNICAL ASSESSMENT – EXCAVATIONS

Excavation instability (over-break) can result in damage to existing services or structures (e.g. foundations, roads or boundary walls/fences) both on and off-site, as well as increased foundation concrete costs. In order to minimise this, all excavations should be assessed by a competent person to determine whether support is required.

All excavations on site should be in accordance with the Construction (Design and Management) Regulations 2015 (Regulation 22) and stability should be practically maintained at all times to prevent danger to any person.

Man entry into excavations should be prevented. Entry should only take place by persons with the necessary competencies to do so and where the excavation has been inspected by a competent person.

The build program should be tailored to reflect the impact that deep excavations through potentially unstable strata can have on adjacent properties, so that they are not undermined.

Care should be taken to ensure that falls from excavation faces do not adversely affect the integrity of foundation concrete.

If contaminated water enters excavations it should be removed and transported to an appropriate treatment facility by a suitably licensed carrier before construction begins.

xiv GEOTECHNICAL ASSESSMENT – SUBSTRUCTURES

Where practicable, existing buried construction should be fully removed; however, if this is not practicable all new foundations should be carried down to fully penetrate it and it should be broken well away from all new structures.

There may be existing structures and/or infrastructure in close proximity to the proposed development. New build foundations may be constructed next to pavements with existing underground services beneath them, or excavations may be required near existing footings associated with adjacent properties. These potential hazards need to be taken into consideration when designing foundations and the groundworker needs to be made aware of their potential impact during the redevelopment works. Foundations close to existing underground services or buildings may require alternative foundation techniques (such as piling) to protect the integrity of these structures.

The contractor for the works should carry them out in such a fashion so as to not cause excessive overbreak, concrete usage or undermine existing buildings/roads/ services that are to be retained.

xv GEOTECHNICAL ASSESSMENT – SOAKAWAYS

Soakaway testing in trial pits by GRM is broadly carried out in accordance with BRE DG 365 (2016). The testing comprises the excavation of a test pit to a suitable depth, and the placement of water into the pit.

The level of water present is then monitored over time. For borehole installations, the permeability testing (falling head/rising head) is undertaken in accordance with BS5930.

If it is decided to proceed with the use of soakaway drainage, then the following general points should be noted:

- Soakaways should not be placed so that water can be discharged through potentially contaminated made ground.
- The Environment Agency may require soakaways to be sealed systems such that only roof run off falls to soakaway.
- Interceptors are likely to be required for soakaways for highway drainage. The adopting authority for the highways should be consulted at the earliest opportunity regarding the use of soakaways for highways drainage.
- Consideration of site levels and slopes should be taken into account during the design.
- The construction of all soakaways should be in accordance with the current building regulations.
- Soakaways should not be placed within 5m of a proposed building.
- Placement of soakaways needs to be considered so as to avoid ponding of water down slope.
- The base of a soakaway should not be below the highest recorded water level.
- The Environment Agency prefer 1m of dry soil to be present between the base of a soakaway and the water table to provide attenuation for contamination.

xvi GEOTECHNICAL ASSESSMENT – FOUNDATIONS

If soft or hard spots are encountered during foundation excavation then they should be replaced with suitably compacted material or the footings deepened to suitable strata, to avoid differential settlement.

If strata of differing bearing character (e.g. sand and clay) are encountered at foundation levels within the excavations for a single plot then the excavation depths should be altered as appropriate to ensure the foundations rest on a single stratum, or strata that will not induce differential settlement. Where this is impractical then GRM should be contacted to assess a reinforced concrete detail or an alternative foundation solution (e.g. piles or vibro-replacement).

NOTES ON LIMITATIONS**General**

GRM Development Solutions Limited has prepared this report solely for the use of the Client and those parties with whom a warranty agreement had been executed, or with whom an assignment had been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from GRM Development Solutions Limited; a charge may be levied against such approval.

GRM Development Solutions Limited accepts no responsibility or liability for:

- a) the consequences of this document being used for any purpose or project other than for which it was commissioned, and
- b) the consequences of this document being used by any third party with whom an agreement has not been executed.

Phase I Environmental Audits/ Desk Studies

The work undertaken to provide the basis of this report comprised a study of available documented information from a variety of sources (including the Client), together with (where appropriate) a brief walk over inspection of the site and meetings and discussions with relevant authorities and other interested parties. The opinions given in this report have been dictated by the finite data on which they are based and are relevant only to the purpose for which the report was commissioned. The information reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in this report, GRM Development Solutions Limited reserves the right to review such information and as considered necessary and appropriate to modify the opinions accordingly. It should be noted that any risks identified in a Phase 1 report are perceived risks based on the information reviewed; actual risks can only be assessed following a physical investigation of the site.

Phase II Environmental Audits (Contamination Investigations)

The investigation of the site has been carried out to provide sufficient information concerning the type and degree of contamination, ground and groundwater conditions to allow a reasonable risk assessment to be made. The objectives of the investigation have been limited to establishing the risks associated with potential human targets, building materials, and controlled waters.

The amount of exploratory work and chemical testing undertaken has necessarily been restricted by the short timescale available, and the locations of exploratory holes have been restricted to the areas unoccupied by the building(s) on the site and by buried services. A more comprehensive investigation may be required if the site is to be redeveloped as, in addition to risk assessment, a number of important engineering and environmental issues need to be resolved.

For these reasons if costs have been included in relation to site remediation these must be considered as provisional only and must, in any event, be confirmed by a commercial adviser.

The exploratory holes undertaken, which investigate only a small volume of the ground in relation to the size of the site, can only provide a general indication of site conditions. Whilst exploratory testing is intended to gain an accurate representation of the site, the very nature of sampling and testing is such that it cannot ensure that all localised conditions are detected.

The risk assessment and opinions provided take in to consideration, inter alia, currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values.

Phase II Geo-environmental Investigations (Combined Geotechnical and Contamination Investigations)

The investigation of the site has been carried out to provide sufficient information concerning the type and degree of contamination, geotechnical characteristics, and ground and groundwater conditions to provide a reasonable assessment of the environment risks together with engineering and development implications. If costs have been included in relation to site development a commercial adviser must confirm these.

The exploratory holes undertaken, which investigate only a small volume of the ground in relation to the size of the site, can only provide a general indication of site conditions. The opinions provided and recommendations given in this report are based on the ground conditions apparent at the site for each of the exploratory holes. There may be exceptional ground conditions elsewhere on the site which have not been disclosed by this investigation and which have therefore not been taken into account in this report.

The comments made on groundwater conditions are based on observations made at the time the site work was conducted. It should be noted that groundwater levels will vary owing to seasonal, tidal and weather related effects. The scope of the investigation was selected on the basis of the specific development proposed by the Client and may be inappropriate to another form of development or scheme.

The risk assessment and opinions provided take in to consideration, inter alia, currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values.



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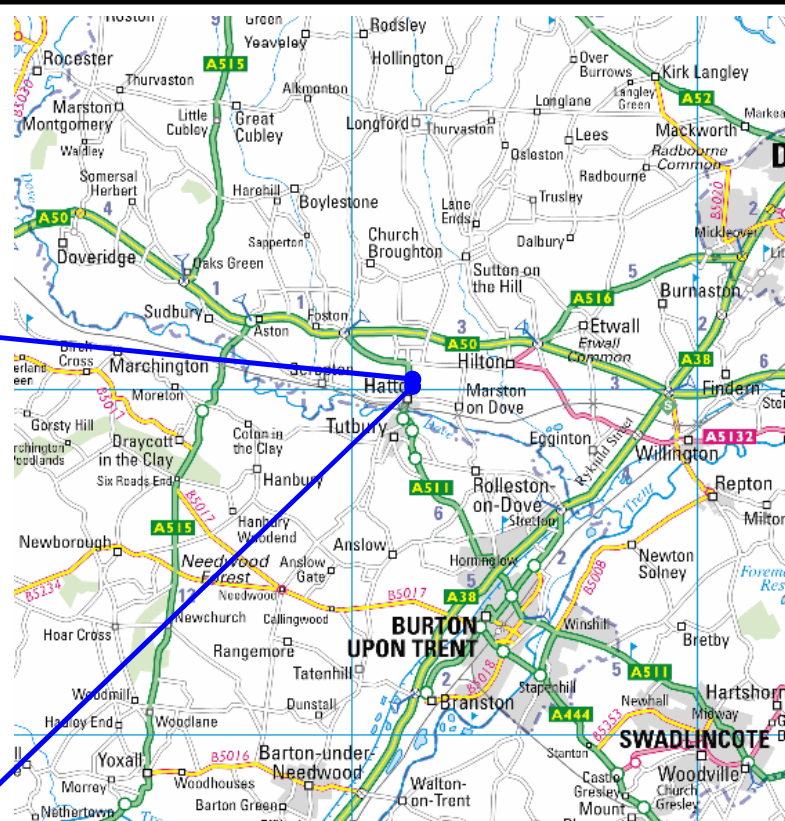
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Tel: 01283 551249

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Fax: 01283 211968

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DO NOT SCALE

NOTES:



Approx Site Location



Site Boundary

Approximate Postcode: ST14 8NF



GRM Development Solutions Ltd

Laurus House, First Ave, Centrum 100,

Burton-on-Trent, Staffordshire

Tel: 01283 551 249 Fax: 01283 211 968

mail@grm-uk.com www.grm-uk.com

CLIENT:

Bellway Homes

PROJECT:

Derby Road, Hatton

TITLE:

Site Location and Boundary Plan

SCALE@SIZE:

NT

ISSUE:

FINAL

DESIGN/DRAWN :

RJH

DATE:

03/2015

PROJECT No:

P6901

DRAWING No:

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NOTES:
Scale 1:1500

CLIENT: Bellway Homes East Midlands	TITLE: Additional Ground Investigation 2019 Exploratory Hole Location Plan	PROJECT No: P6901	DATE: 10/10/2019	 GRM Development Solutions Ltd Laurus House, First Ave, Centrum 100, Burton-on-Trent, Staffordshire Tel: 01283 551 249 Fax: 01283 211 968 mail@grm-uk.com www.grm-uk.com
PROJECT: Derby Road, Hatton		DESIGN/DRAWN: AR	ISSUE: Final	
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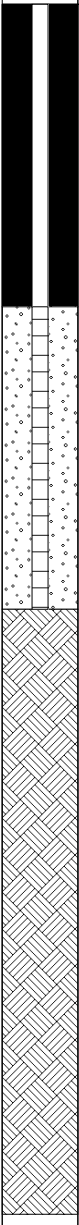
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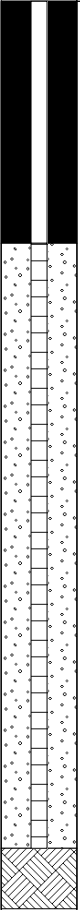
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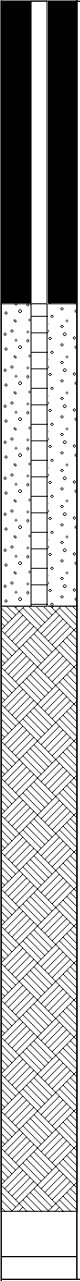
		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Windowless Sample Borehole				Borehole No WS101 Sheet 1 of 1		
Site Name: Derby Road, Hatton								Ground Level (mAOD)		
Client: Bellway Homes East Midlands				GRM Project Ref: P6901				Coordinates 421817 E 330643 N		
Installation/ Backfill 	Water Strike 	Samples/Tests			Dynamic Probing (Blows per 100mm)	Depth (m)	Level (m)	Legend	Stratum Description	
		Depth	Type	Result						
		0.10							Grass over brown, clayey, slightly sandy SILT. Sand is fine to medium. Abundant rootlets. RELAI D TOPSOIL	
		0.45							Firm, brown, clayey, sandy, slightly gravelly SILT. Sand is fine to coarse. Gravel is fine to medium, angular to subrounded glass, quartzite, sandstone and quartz. MADE GROUND	
		1.00	C	N=13 (2,2/3,3,4,3)					Firm, brown, silty, sandy, gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, subangular to rounded quartzite and sandstone. Frequent plant matter. MADE GROUND	
		1.30							Medium dense, light brown, slightly clayey, sandy GRAVEL. Gravel is fine to coarse, subangular to rounded quartzite. Sand is fine to coarse. RIVER TERRACE DEPOSITS	
		1.70							Loose, orangish-brown, slightly gravelly SAND. Sand is fine to coarse. Gravel is fine to medium, subrounded to rounded quartzite. RIVER TERRACE DEPOSITS	
		2.00	C	N=7 (2,2/3,1,2,1)					Wet strata at 1.30m. Loose, orangish-brown, sandy GRAVEL. Gravel is fine to coarse, subangular to subrounded quartzite. Sand is fine to coarse. RIVER TERRACE DEPOSITS	
		3.00	C	N=8 (1,1/2,1,2,3)					Loose, brown, very gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse, subangular to rounded quartzite. RIVER TERRACE DEPOSITS	
		3.70							Becoming slightly gravelly at 2.80m.	
4.00	C	N=29 (4,7/7,7,8,7)		4.00			Medium dense, brown, sandy GRAVEL. Gravel is fine to coarse, subrounded to rounded quartzite. Sand is fine to coarse. RIVER TERRACE DEPOSITS			
Wet strata at 3.70m. End of Borehole at 4.000m										
Crew: Regional Drilling Ltd.					Logger: JB			Weather: Sunny		
Equipment: Premier Compact 110										
Reason for termination of borehole:					Target depth reached.					
Groundwater Remarks: Wet strata at 1.30m, 2.0m and 3.70m.										
General Remarks: Hole collapse to 2.0m upon reaching 4.0m.										
Hole Started: 26/09/2019		Hole Complete: 26/09/2019		Version: DRAFT			Scale: 1:25			

		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Windowless Sample Borehole			Borehole No WS102 Sheet 1 of 1	
Site Name: Derby Road, Hatton							Ground Level (mAOD)	
Client: Bellway Homes East Midlands					GRM Project Ref: P6901		Coordinates 421952 E 330685 N	

Installation/ Backfill	Water Strike	Samples/Tests			Dynamic Probing (Blows per 100mm)	Depth (m)	Level (m)	Legend	Stratum Description	
		Depth	Type	Result						
									Grass over dark brown, sandy SILT. Sand is fine to medium. Abundant rootlets. TOPSOIL <i>Becoming slightly gravelly at 0.15m.</i> <i>Gravel is fine to coarse, subrounded to rounded quartzite.</i>	
		0.35							Soft, approximately low strength, brown, silty, slightly sandy, gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, subrounded to rounded quartzite. ALLUVIUM Medium dense, orangish-brown, fine to coarse SAND with rare fine to coarse, subrounded to rounded gravel of quartzite. RIVER TERRACE DEPOSITS <i>Becoming brown at 0.70m.</i> <i>Wet strata at 1.0m.</i>	1
		0.45							<i>Becoming slightly gravelly at 1.40m.</i> <i>Gravel is fine to coarse, subrounded to rounded quartz and quartzite.</i>	
		1.00	C	N=12 (1,2/3,3,3,3)						
		2.00	C	N=7 (2,2/3,1,2,1)		1.85			Loose, brown, very sandy GRAVEL. Gravel is fine to coarse, subrounded to rounded. Sand is fine to coarse. RIVER TERRACE DEPOSITS <i>Wet strata at 1.85m.</i>	2
		3.00	C	N=32 (3,4/6,8,8,10)		3.00			<i>Becoming dense at 2.80m.</i>	3
									End of Borehole at 3.000m	4

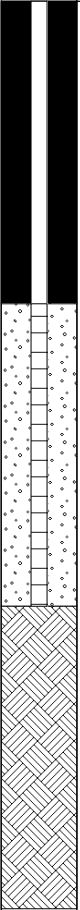
Crew: Regional Drilling Ltd.	Logger: JB	Weather: Sunny
Equipment: Premier Compact 110		
Reason for termination of borehole: Target depth reached.		
Groundwater Remarks: Wet strata at 1.0m.		
General Remarks: Hole collapse up to 2.80m upon reaching 3.0m		
Hole Started: 26/09/2019	Hole Complete: 26/09/2019	Version: DRAFT Scale: 1:25

		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Windowless Sample Borehole			Borehole No WS103 Sheet 1 of 1	
Site Name: Derby Road, Hatton							Ground Level (mAOD)	
Client: Bellway Homes East Midlands					GRM Project Ref: P6901		Coordinates 421966 E 330698 N	

Installation/ Backfill	Water Strike	Samples/Tests			Dynamic Probing (Blows per 100mm)	Depth (m)	Level (m)	Legend	Stratum Description
		Depth	Type	Result					
									Grass over dark brown, silty, fine to coarse SAND. Abundant rootlets. TOPSOIL
									Firm, orangish-brown mottled light brown, slightly sandy CLAY. Sand is fine to medium. ALLUVIUM <i>Becoming sandy at 0.60m.</i>
		1.00	C	N=9 (1,2/2,2,2,3)					Loose, light brown SAND with rare fine to medium, subrounded to rounded gravel of quartzite. Sand is fine to coarse. RIVER TERRACE DEPOSITS <i>Wet strata at 1.20m.</i>
		2.00	C	N=5 (1,1/1,1,1,2)					Loose, light brown, very sandy GRAVEL. Gravel is fine to coarse, subrounded to rounded quartz and quartzite. Sand is fine to coarse. RIVER TERRACE DEPOSITS Loose, brown, slightly gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse, subrounded to rounded quartzite. RIVER TERRACE DEPOSITS <i>Wet strata at 2.0m.</i>
		3.00	C	N=4 (2,3/1,1,1,1)					Loose, light brown, very sandy GRAVEL. Gravel is fine to coarse, subrounded to rounded quartz and quartzite. Sand is fine to coarse. RIVER TERRACE DEPOSITS <i>Becoming medium dense at 4.0m.</i> End of Borehole at 4.000m
		4.00	C	N=16 (3,3/3,4,4,5)		4.00			

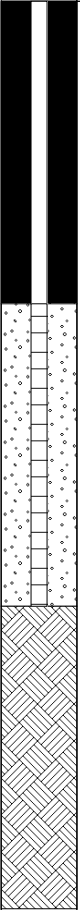
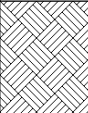
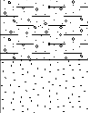
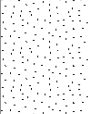
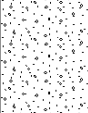
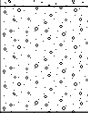
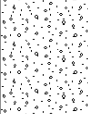
Crew: Regional Drilling Ltd.	Logger: JB	Weather: Heavy rain
Equipment: Premier Compact 110		
Reason for termination of borehole: Target depth reached.		
Groundwater Remarks: Wet strata at 1.20m and 2.0m.		
General Remarks: Hole collapse up to 2.0m upon reaching 3.0m.		
Hole Started: 26/09/2019	Hole Complete: 26/09/2019	Version: DRAFT
		Scale: 1:25

		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Windowless Sample Borehole			Borehole No WS104 Sheet 1 of 1	
Site Name: Derby Road, Hatton							Ground Level (mAOD)	
Client: Bellway Homes East Midlands					GRM Project Ref: P6901		Coordinates 421939 E 330698 N	

Installation/ Backfill	Water Strike	Samples/Tests			Dynamic Probing (Blows per 100mm)	Depth (m)	Level (m)	Legend	Stratum Description		
		Depth	Type	Result							
									Grass over dark brown, silty SAND. Sand is fine to medium. Abundant rootlets. TOPSOIL		
									Loose dense, brown, clayey, slightly gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse, subangular to rounded quartz and quartzite. RIVER TERRACE DEPOSITS <i>Damp strata at 0.65m.</i>		
		1.00	C	N=5 (1,2/1,1,1,2)					Loose, orangish-brown SAND with rare fine to coarse, subrounded to rounded gravel of quartzite. Sand is fine to coarse. RIVER TERRACE DEPOSITS	1	
		2.00	C	N=6 (1,1/1,2,1,2)					Loose, brown, very sandy GRAVEL. Gravel is fine to coarse, subangular to rounded quartz and quartzite. Sand is fine to coarse. RIVER TERRACE DEPOSITS <i>Wet strata at 1.64m.</i>	2	
									Loose, brown, fine to coarse SAND. RIVER TERRACE DEPOSITS		
									Loose, brown, gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse, subangular to rounded quartz and quartzite. RIVER TERRACE DEPOSITS		
									Loose, brown, sandy GRAVEL. Gravel is fine to coarse, subrounded to rounded quartz and quartzite. Sand is fine to coarse. RIVER TERRACE DEPOSITS <i>Becoming medium dense at 3.0m.</i>	3	
		3.00	C	N=11 (1,2/2,3,3,3)		3.00			<i>End of Borehole at 3.000m</i>		

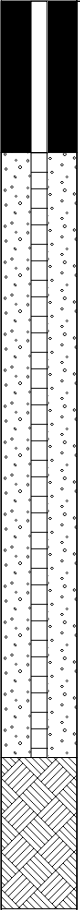
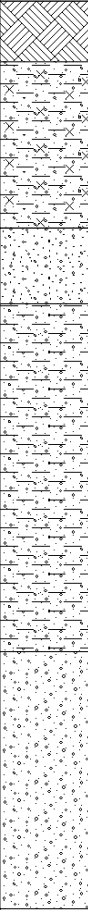
Crew: Regional Drilling Ltd.		Logger: JB		Weather: Heavy rain	
Equipment: Premier Compact 110					
Reason for termination of borehole: Target depth reached.					
Groundwater Remarks: Damp strata at 0.65m. Wet strata at 1.64m.					
General Remarks: Hole collapse to 2.0m upon reaching 3.0m.					
Hole Started:	26/09/2019	Hole Complete:	26/09/2019	Version:	DRAFT
				Scale:	1:25

		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Windowless Sample Borehole			Borehole No WS105 Sheet 1 of 1		
Site Name: Derby Road, Hatton							Ground Level (mAOD)		
Client: Bellway Homes East Midlands					GRM Project Ref: P6901			Coordinates 421952 E 330713 N	

Installation/ Backfill	Water Strike	Samples/Tests			Dynamic Probing (Blows per 100mm)	Depth (m)	Level (m)	Legend	Stratum Description	
		Depth	Type	Result						
		1.00	C	N=12 (3,4/3,3,3,3)					Grass over brown, clayey, slightly sandy SILT. Sand is fine to medium. Abundant rootlets. TOPSOIL	1
									Firm, approximately medium strength, yellowish-brown, sandy, slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded sandstone, quartz and quartzite. ALLUVIUM	
									Medium dense, orangish-brown SAND with rare fine to coarse, subrounded to rounded gravel of quartzite. Sand is fine to coarse. RIVER TERRACE DEPOSITS	
									Medium dense, brown, gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse, subrounded to rounded quartz and quartzite. RIVER TERRACE DEPOSITS	
		2.00	C	N=17 (2,3/3,3,5,6)					Medium dense, greyish-brown, very sandy GRAVEL. Gravel is fine to coarse, subangular to rounded quartz and quartzite. Sand is fine to coarse. RIVER TERRACE DEPOSITS	2
								Medium dense, brown SAND and GRAVEL. Sand is fine to coarse. Gravel is fine to coarse, subangular to rounded quartz and quartzite. RIVER TERRACE DEPOSITS		
		3.00	C	N=20 (3,5/5,5,5,5)					End of Borehole at 3.000m	3
										4

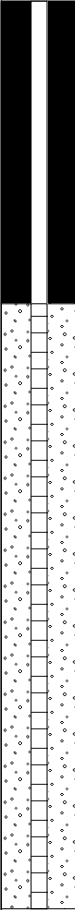
Crew: Regional Drilling Ltd		Logger: JB		Weather: Heavy rain	
Equipment: Premier Compact 110					
Reason for termination of borehole: Target depth reached.					
Groundwater Remarks: Wet strata at 1.0m.					
General Remarks: Hole collapse up to 2.0m upon reaching 3.0m.					
Hole Started:	26/09/2019	Hole Complete:	26/09/2019	Version:	DRAFT
				Scale:	1:25

		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Windowless Sample Borehole			Borehole No WS106 Sheet 1 of 1		
Site Name: Derby Road, Hatton							Ground Level (mAOD)		
Client: Bellway Homes East Midlands					GRM Project Ref: P6901			Coordinates 422063 E 330427 N	

Installation/ Backfill	Water Strike	Samples/Tests			Dynamic Probing (Blows per 100mm)	Depth (m)	Level (m)	Legend	Stratum Description	
		Depth	Type	Result						
	  	0.20						Grass over dark brown, clayey, slightly sandy SILT. Sand is fine to medium. Abundant rootlets. TOPSOIL		
		0.75						Firm, approximately medium strength, brown, silty, slightly sandy, slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, subrounded to rounded quartz and quartzite. ALLUVIUM <i>Becoming very sandy and gravelly at 0.50m.</i>		
		1.00	C	N=4 (1,1/1,1,1,1)				Loose, brown, gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse, subrounded to rounded quartz and quartzite. ALLUVIUM <i>Damp strata at 0.75m.</i>		
		2.00	C	N=25 (3,5/6,6,6,7)				Soft, approximately low strength, light brown, very sandy, slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, subrounded to rounded quartz and quartzite. ALLUVIUM <i>Wet strata at 1.0m.</i> <i>Becoming brown with black organic matter from 1.50m</i> <i>Wet strata at 2.0m.</i>		
		2.15						Medium dense, brown, sandy GRAVEL. Gravel is fine to coarse, subangular to rounded quartz and quartzite. Sand is fine to coarse. RIVER TERRACE DEPOSITS		
		3.00	C	N=32 (4,5/7,7,7,11)				End of Borehole at 3.000m		

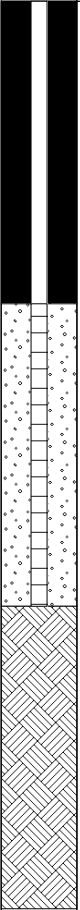
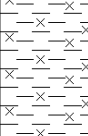
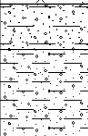
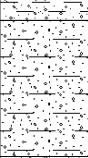
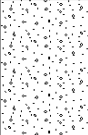
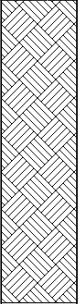
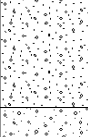
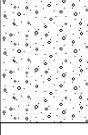
Crew: Regional Drilling Ltd.		Logger: JB		Weather: Light rain	
Equipment: Premier Compact 110					
Reason for termination of borehole: Target depth reached.					
Groundwater Remarks: Damp strata at 0.75m. Wet strata at 1.0m and 2.0m.					
General Remarks: Hole collapse up to 2.50m upon reaching 3.0m.					
Hole Started:	27/09/2019	Hole Complete:	27/09/2019	Version:	DRAFT
				Scale:	1:25

		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Windowless Sample Borehole			Borehole No WS107 Sheet 1 of 1		
Site Name: Derby Road, Hatton							Ground Level (mAOD)		
Client: Bellway Homes East Midlands					GRM Project Ref: P6901			Coordinates 422047 E 330367 N	

Installation/ Backfill	Water Strike	Samples/Tests			Dynamic Probing (Blows per 100mm)	Depth (m)	Level (m)	Legend	Stratum Description		
		Depth	Type	Result							
									Grass over dark brown, silty, sandy CLAY. Sand is fine to medium. Abundant rootlets. TOPSOIL Firm, approximately medium strength, brown mottled orangish-brown, silty CLAY. ALLUVIUM		
		0.17									
		0.75									
		1.00	C	N=9 (1,1/2,2,3,2)						Firm, approximately medium strength, grey mottled orangish-brown and reddish-brown, sandy, slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, subrounded to rounded quartz and quartzite. ALLUVIUM <i>Becoming very sandy at 1.0m.</i> <i>Wet strata at 1.0m.</i>	1
		2.00	C	N=19 (2,2/2,4,5,8)					Loose, brown, clayey, gravelly SAND. Sand is fine to coarse. Gravel is fine to medium, subrounded to rounded quartz and quartzite. RIVER TERRACE DEPOSITS <i>No longer clayey below 1.40m.</i>	2	
						2.50					
		3.00	C	N=31 (6,5/8,8,7,8)					Dense, brown, sandy GRAVEL. Gravel is fine to coarse, subangular to rounded quartz and quartzite. Sand is fine to coarse. RIVER TERRACE DEPOSITS	3	
						3.00			End of Borehole at 3.000m		
										4	

Crew: Regional Drilling Ltd.		Logger: JB		Weather: Light rain	
Equipment: Premier Compact 110					
Reason for termination of borehole: Target depth reached.					
Groundwater Remarks: Damp strata at 0.75m. Wet strata at 1.0m.					
General Remarks:					
Hole Started:	27/09/2019	Hole Complete:	27/09/2019	Version:	DRAFT
				Scale:	1:25

		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Windowless Sample Borehole			Borehole No WS108 Sheet 1 of 1	
Site Name: Derby Road, Hatton							Ground Level (mAOD)	
Client: Bellway Homes East Midlands					GRM Project Ref: P6901		Coordinates 421908 E 330359 N	

Installation/ Backfill	Water Strike	Samples/Tests			Dynamic Probing (Blows per 100mm)	Depth (m)	Level (m)	Legend	Stratum Description	
		Depth	Type	Result						
		0.18						 Grass over dark brown, silty, slightly sandy CLAY. Sand is fine to medium. Abundant rootlets. TOPSOIL		
		0.75						 Stiff, approximately high strength, brown mottled orangish-brown, silty CLAY. ALLUVIUM		
		0.90						 Loose, brown mottled orangish-brown, very clayey, gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse, subrounded to rounded quartz and quartzite. ALLUVIUM	1	
		1.25						 Soft, approximately low strength, brown mottled orangish-brown, very sandy, gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, subrounded to rounded quartz and quartzite. ALLUVIUM		
		1.70						 Wet strata at 1.0m. Loose, brown, clayey, gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse, subrounded to rounded quartz and quartzite. ALLUVIUM	2	
		2.00	C	N=6 (1,1/1,1,2,2)				 Becoming dark brown with abundant organic matter at 1.35m Loose, dark brown, very gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse, subrounded to rounded quartz and quartzite. Occasional organic material. RIVER TERRACE DEPOSITS		
		2.50						 Becoming dense at 2.0m. Wet strata at 2.0m. Medium dense, brown, sandy GRAVEL. Gravel is fine to coarse, subangular to rounded quartz and quartzite. Sand is fine to coarse. RIVER TERRACE DEPOSITS	3	
		3.00	C	N=37 (8,10/10,9,9,9)				 End of Borehole at 3.000m		
									4	

Crew: Regional Drilling Ltd.		Logger: JB		Weather: Light rain	
Equipment: Premier Compact 110					
Reason for termination of borehole: Target depth reached.					
Groundwater Remarks: Wet strata at 1.0m and 2.0m.					
General Remarks: Hole collapse up to 2.0m upon reaching 3.0m.					
Hole Started: 27/09/2019		Hole Complete: 27/09/2019		Version: DRAFT	
				Scale: 1:25	



A P P E N D I X F

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multi-disciplinary consultancy services, UK-wide:**

- Geotechnical and Geo-environmental Services
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- Structural Engineering Services
- Construction Management
- Site Services

Tel: 01283 551249

info@grm-uk.com

Fax: 01283 211968

www.grm-uk.com

Title: Section line 1

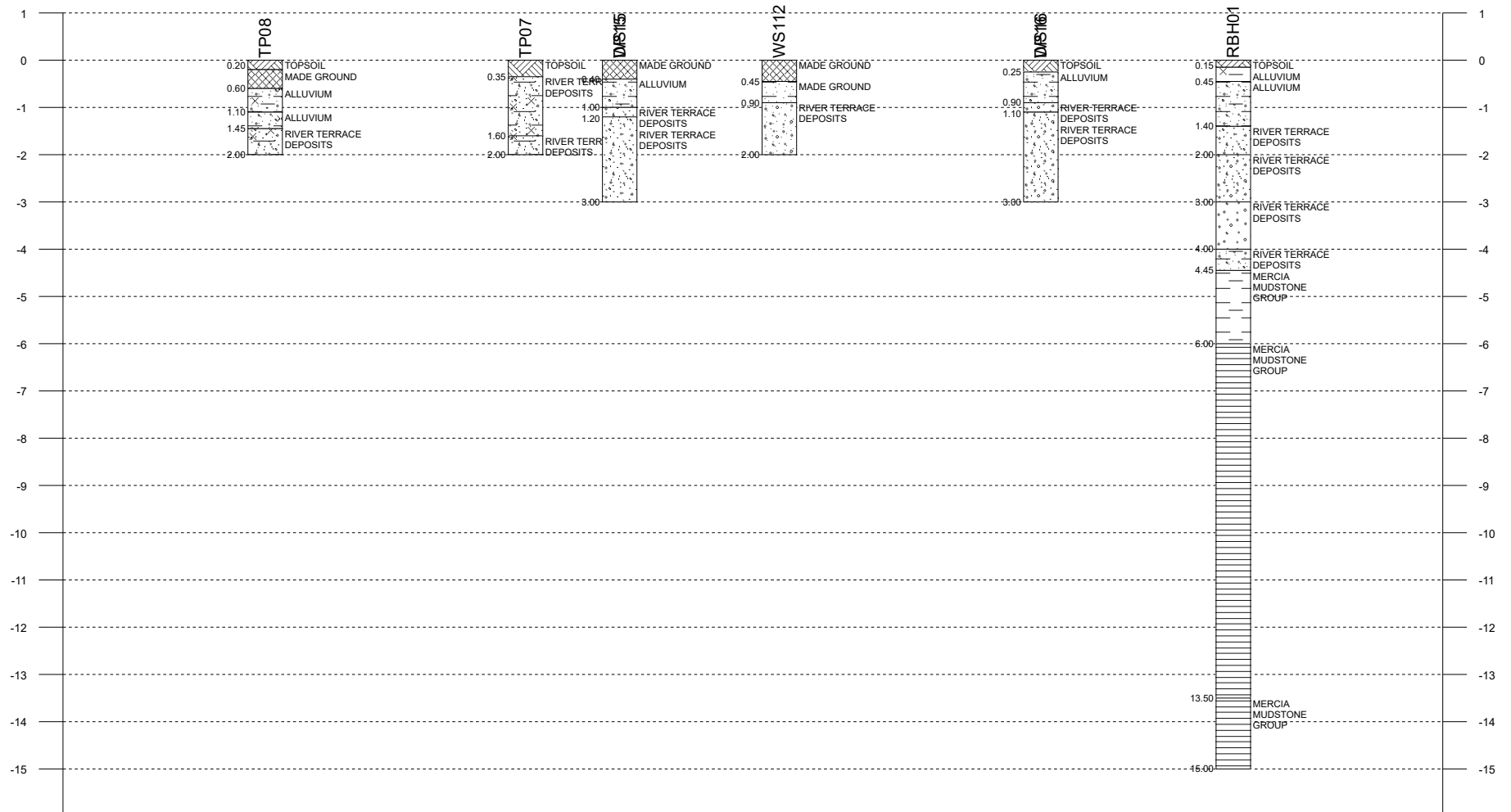
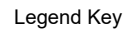
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Horizontal Scale: 1:1768

Engineer: GRM Development Solutions Ltd

Bristol Tel: 0117 975 8641

Manchester Tel: 0161 2478590

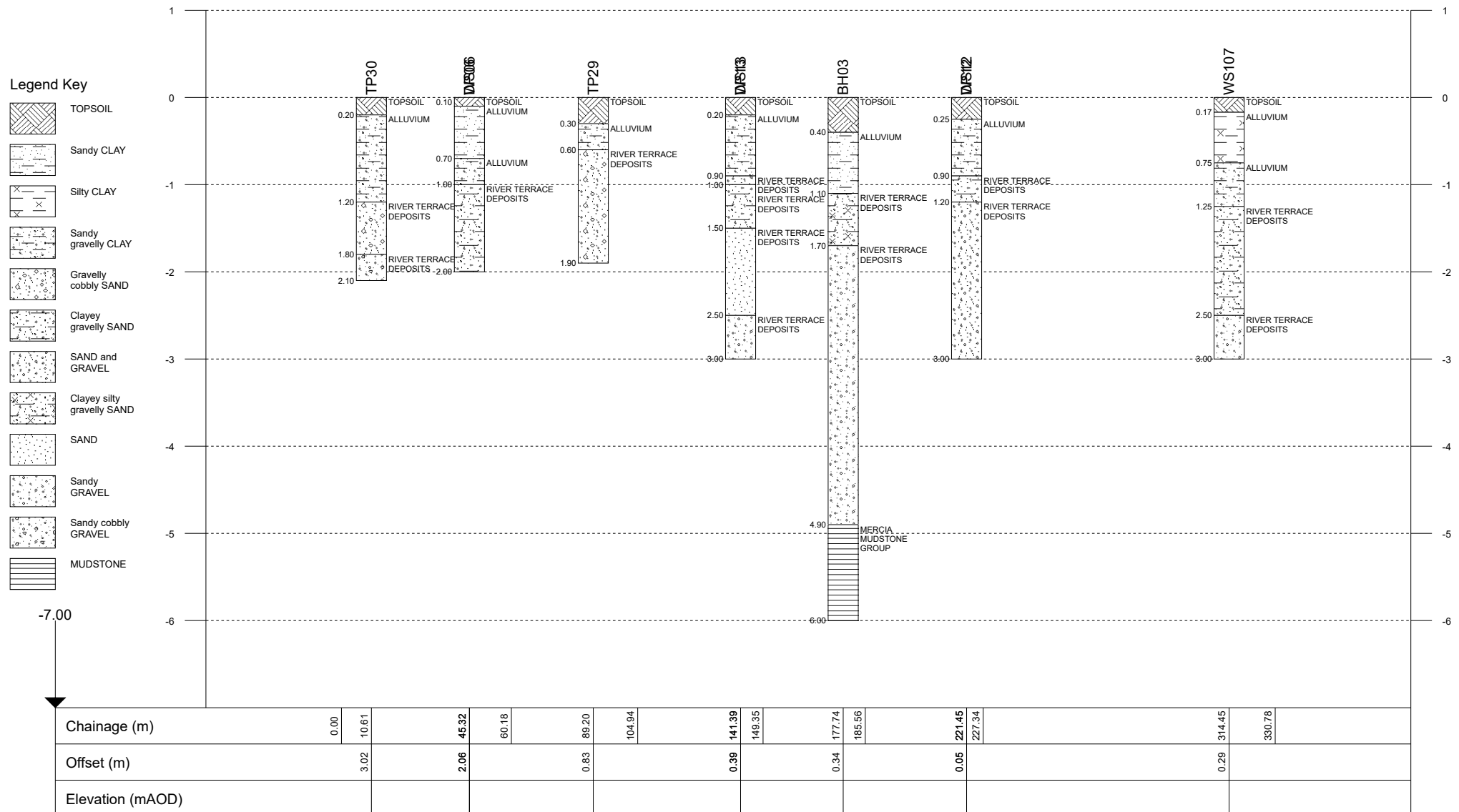
[illegible]

Project Id: P6901
Project Title: Derby Road, Hatton
Location:
Client: Bellway Homes East Midlands

Title: Site Plan
Scale: 1:1250
Engineer: GRM Development Solutions Ltd
Contractor:

Burton-on-Trent (HQ) Tel: 01283 551249
Bristol Tel: 0117 975 8641
Milton Keynes Tel: 01908 843624
Manchester Tel: 0161 2478590





Project Id: P6901
Project Title: Derby Road, Hatton
Location:
Client: Bellway Homes East Midlands

Title: Site Plan
Scale: 1:1500
Engineer: GRM Development Solutions Ltd
Contractor:

Burton-on-Trent (HQ) Tel: 01283 551249
Bristol Tel: 0117 975 8641
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Project Id: P6901
Project Title: Derby Road, Hatton
Location:
Client: Bellway Homes East Midlands

Title: Groundwater Flow Diagram
Scale: 1:4000
Engineer: GRM Development Solutions Ltd
Contractor:

Burton-on-Trent (HQ) Tel: 01283 551249
Bristol Tel: 0117 975 8641
Milton Keynes Tel: 01908 843624
Manchester Tel: 0161 2478590



- 2015 Monitoring location
- 2019 Monitoring location





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In-Situ Gas Monitoring Results

Project Name: Derby Road, Hatton
 Project Number: P6901
 Client: Bellway Homes
 Date: 31 March 2015
 Weather: Rain
 Atmospheric Pressure (mb): 992
 Pressure Trend: Rising
 Equipment: Gas Data LMSXi
 Operator: Dave Evans

Ground Gases													
Well ID	Response Zone (mbegl)			Methane (%v/v)		Carbon Dioxide (%v/v)		Oxygen (%v/v)		Gas Flow (l/h)		PID Reading (ppm)	
	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady	Peak	Steady
WS4	1.0	2.0	NS	0.00	0.00	0.60	0.60	19.90	19.90	0.00	0.00	N.R.	N.R.
WS5	0.5	1.5	NS	0.00	0.00	3.10	3.10	12.60	12.60	0.00	0.00	N.R.	N.R.
WS7	1.0	2.0	NS	0.00	0.00	0.80	0.80	20.50	20.50	0.00	0.00	N.R.	N.R.
WS10	1.0	2.0	NS	0.00	0.00	0.80	0.80	20.20	20.20	0.00	0.00	N.R.	N.R.
WS14	1.0	2.0	NS	0.00	0.00	2.40	2.40	17.90	17.90	0.00	0.00	N.R.	N.R.
WS15	1.0	2.0	NS	0.00	0.00	16.00	16.00	3.10	3.10	0.00	0.00	N.R.	N.R.
WS16	1.0	2.0	NS	0.00	0.00	0.70	0.70	20.70	20.70	0.00	0.00	N.R.	N.R.
WS17	1.0	2.0	NS	0.00	0.00	0.60	0.60	20.70	20.70	0.00	0.00	N.R.	N.R.
WS18	1.0	1.3	NS	0.00	0.00	1.40	1.40	20.50	20.50	0.00	0.00	N.R.	N.R.
WS19	1.0	2.2	NS	1.10	1.10	7.70	7.70	8.20	8.20	0.00	0.00	N.R.	N.R.
BH01	1.0	7.0	NS										
BH02	1.0	6.0	NS										
BH03	1.0	6.0	NS										
BH04	1.0	6.0	NS										

Groundwater	
Depth to Groundwater (mbegl)	Total Well Depth (mbegl)
0.57	1.72
0.57	1.62
0.35	1.75
0.62	1.57
0.74	1.59
1.10	1.84
0.50	1.70
0.55	1.48
0.20	1.25
1.14	2.00

Comments: #E.g. WS1 Destroyed / flooded / not found / bung missing#

Notes

L.E.L.	Lower Explosive Limit (100% L.E.L. = 5% Flammable Gas)	Highlighted cell for following conditions:
N.D.	Not Detected	a. Methane $\geq 1\%$ v/v
N.R.	Not Recorded	b. Carbon Dioxide $\geq 5\%$ v/v
PID	Photo-Ionising Detector	MG Made Ground
%	By volume	NS Natural Strata



In-Situ Gas Monitoring Results

Project Name: Derby Road, Hatton
 Project Number: P6901
 Client: Bellway Homes
 Date: 14th April 2015
 Weather: Dry
 Atmospheric Pressure (mb): 1019
 Pressure Trend: Rising
 Equipment: Gas Data LMSXi
 Operator: Jem Ward

Well ID	Response Zone (mbegl)			Ground Gases									
				Methane (%v/v)		Carbon Dioxide (%v/v)		Oxygen (%v/v)		Gas Flow (l/h)		PID Reading (ppm)	
	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady	Peak	Steady
WS4	1.0	2.0	NS	0.00	0.00	3.20	3.20	13.50	15.00	0.00	0.00	N.R.	N.R.
WS5	0.5	1.5	NS	0.00	0.00	0.40	0.10	18.90	19.10	0.00	0.00	N.R.	N.R.
WS7	1.0	2.0	NS	0.00	0.00	4.10	3.50	16.30	17.00	0.00	0.00	N.R.	N.R.
WS10	1.0	2.0	NS	0.00	0.00	0.00	0.00	20.30	20.30	0.00	0.00	N.R.	N.R.
WS14	1.0	2.0	NS	0.00	0.00	0.10	0.10	20.20	20.20	0.00	0.00	N.R.	N.R.
WS15	1.0	2.0	NS	0.00	0.00	4.70	0.70	13.40	20.00	0.00	0.00	N.R.	N.R.
WS16	1.0	2.0	NS	0.00	0.00	0.70	0.70	20.60	20.60	0.00	0.00	N.R.	N.R.
WS17	1.0	2.0	NS	0.00	0.00	0.00	0.00	20.50	20.50	0.00	0.00	N.R.	N.R.
WS18	1.0	1.3	NS	0.00	0.00	0.40	0.40	19.10	19.80	0.00	0.00	N.R.	N.R.
WS19	1.0	2.2	NS	0.00	0.00	4.40	4.30	14.20	15.30	0.00	0.00	N.R.	N.R.
BH01	1.0	7.0	NS	0.00	0.00	1.20	0.10	18.50	18.70	0.00	0.00	N.R.	N.R.
BH02	1.0	6.0	NS	0.00	0.00	1.30	0.80	19.80	20.00	0.00	0.00	N.R.	N.R.
BH03	1.0	6.0	NS	0.00	0.00	2.00	1.70	18.20	18.60	0.00	0.00	N.R.	N.R.
BH04	1.0	6.0	NS	0.00	0.00	1.30	0.60	19.30	19.70	0.00	0.00	N.R.	N.R.

Groundwater	
Depth to Groundwater (mbegl)	Total Well Depth (mbegl)
0.98	1.70
1.15	1.60
0.84	1.70
1.01	1.53
1.15	1.60
1.37	1.80
0.81	1.70
0.93	1.40
0.58	1.00
1.55	2.00
0.82	5.00
1.29	5.35
1.24	4.48
1.15	4.30

Comments: #E.g. WS1 Destroyed / flooded / not found / bung missing#

Notes

L.E.L.	Lower Explosive Limit (100% L.E.L. = 5% Flammable Gas)	Highlighted cell for following conditions:	
N.D.	Not Detected	a. Methane $\geq 1\%$ v/v	
N.R.	Not Recorded	b. Carbon Dioxide $\geq 5\%$ v/v	
PID	Photo-Ionising Detector	MG	Made Ground
%	By volume	NS	Natural Strata



In-Situ Gas Monitoring Results

Project Name: Derby Road, Hatton
 Project Number: P6901
 Client: Bellway Homes
 Date: 30th April 2015
 Weather: Dry
 Atmospheric Pressure (mb): 1005
 Pressure Trend: Steady
 Equipment: Gas Data LMSXi
 Operator: Jem Ward

Well ID	Ground Gases												
	Response Zone (mbegl)			Methane (%v/v)		Carbon Dioxide (%v/v)		Oxygen (%v/v)		Gas Flow (l/h)		PID Reading (ppm)	
	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady	Peak	Steady
WS4	1.0	2.0	NS	0.00	0.00	2.40	1.60	19.40	20.40	0.00	0.00	N.R.	N.R.
WS5	0.5	1.5	NS	0.00	0.00	4.90	3.70	16.80	19.80	0.00	0.00	N.R.	N.R.
WS7	1.0	2.0	NS	0.00	0.00	2.00	1.60	19.30	19.30	0.00	0.00	N.R.	N.R.
WS10	1.0	2.0	NS	0.00	0.00	0.60	0.60	20.40	20.40	0.00	0.00	N.R.	N.R.
WS14	1.0	2.0	NS	0.00	0.00	0.90	0.70	20.00	20.10	0.00	0.00	N.R.	N.R.
WS15	1.0	2.0	NS	0.00	0.00	0.10	0.10	20.80	20.90	0.00	0.00	N.R.	N.R.
WS16	1.0	2.0	NS	0.00	0.00	0.30	0.10	20.30	20.50	0.00	0.00	N.R.	N.R.
WS17	1.0	2.0	NS	0.00	0.00	0.00	0.00	20.50	20.50	0.00	0.00	N.R.	N.R.
WS18	1.0	1.3	NS	0.00	0.00	4.00	3.90	17.80	18.00	0.00	0.00	N.R.	N.R.
WS19	1.0	2.2	NS	0.00	0.00	10.00	10.00	10.70	11.70	0.00	0.00	N.R.	N.R.
BH01	1.0	7.0	NS	0.00	0.00	1.40	1.40	19.40	19.40	0.00	0.00	N.R.	N.R.
BH02	1.0	6.0	NS	0.00	0.00	0.20	0.20	20.80	20.80	0.00	0.00	N.R.	N.R.
BH03	1.0	6.0	NS	0.00	0.00	0.20	0.20	20.80	20.80	0.00	0.00	N.R.	N.R.
BH04	1.0	6.0	NS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	N.R.	N.R.

Groundwater	
Depth to Groundwater (mbegl)	Total Well Depth (mbegl)
1.13	1.70
1.33	1.62
0.89	1.70
1.19	1.50
1.25	1.60
1.55	1.80
1.10	1.67
0.97	1.40
0.90	1.00
1.73	2.00
1.11	5.00
1.40	5.35
1.35	4.45
1.12	4.30

Comments: #E.g. WS1 Destroyed / flooded / not found / bung missing#

Notes

L.E.L.	Lower Explosive Limit (100% L.E.L.= 5% Flammable Gas)	Highlighted cell for following conditions:
N.D.	Not Detected	a. Methane ≥1% v/v
N.R.	Not Recorded	b. Carbon Dioxide ≥5% v/v
PID	Photo-Ionising Detector	MG Made Ground
%	By volume	NS Natural Strata



In-Situ Gas Monitoring Results

Project Name: Derby Road, Hatton
 Project Number: P6901
 Client: Bellway Homes
 Date: 11 May 2015
 Weather: Dry
 Atmospheric Pressure (mb): 1009
 Pressure Trend: Steady
 Equipment: Gas Data LMSXi
 Operator: Dave Evans

Ground Gases														Groundwater	
Well ID	Response Zone (mbe gl)			Methane (%v/v)		Carbon Dioxide (%v/v)		Oxygen (%v/v)		Gas Flow (l/h)		PID Reading (ppm)		Depth to Groundwater (mbe gl)	Total Well Depth (mbe gl)
	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady	Peak	Steady		
WS4	1.0	2.0	NS	0.00	0.00	1.10	1.10	19.50	19.50	0.00	0.00	N.R.	N.R.	0.96	1.70
WS5	0.5	1.5	NS	0.00	0.00	7.60	7.60	12.30	12.30	0.00	0.00	N.R.	N.R.	1.19	1.62
WS7	1.0	2.0	NS	0.00	0.00	0.40	0.40	20.00	20.00	0.00	0.00	N.R.	N.R.	0.89	1.72
WS10	1.0	2.0	NS	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
WS14	1.0	2.0	NS	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
WS15	1.0	2.0	NS	0.00	0.00	24.00	24.00	0.90	0.90	0.00	0.00	N.R.	N.R.	1.42	1.83
WS16	1.0	2.0	NS	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
WS17	1.0	2.0	NS	0.00	0.00	3.00	3.00	17.50	17.50	0.00	0.00	N.R.	N.R.	1.07	1.42
WS18	1.0	1.3	NS	0.00	0.00	2.50	2.50	18.00	18.00	0.00	0.00	N.R.	N.R.	0.78	1.03
WS19	1.0	2.2	NS	0.00	0.00	9.20	9.20	9.50	9.50	0.00	0.00	N.R.	N.R.	1.57	2.00
BH01	1.0	7.0	NS	0.00	0.00	7.30	7.30	12.90	12.90	0.00	0.00	N.R.	N.R.	0.93	4.89
BH02	1.0	6.0	NS	0.00	0.00	0.80	0.80	20.00	20.00	0.00	0.00	N.R.	N.R.	1.28	5.35
BH03	1.0	6.0	NS	NR	NR	NR	NR	NR	NR	NR	NR	N.R.	N.R.	NR	NR
BH04	1.0	6.0	NS	0.00	0.00	0.30	0.30	20.20	20.20	0.00	0.00	N.R.	N.R.	1.14	4.31

Comments: #E.g. WS1 Destroyed / flooded / not found / bung missing#

Notes

L.E.L.	Lower Explosive Limit (100% L.E.L. = 5% Flammable Gas)	Highlighted cell for following conditions:	
N.D.	Not Detected	a. Methane $\geq 1\%$ v/v	
N.R.	Not Recorded	b. Carbon Dioxide $\geq 5\%$ v/v	
PID	Photo-Ionising Detector	MG	Made Ground
%	By volume	NS	Natural Strata



In-Situ Gas Monitoring Results

Project Name: Derby Road, Hatton
 Project Number: P6901
 Client: Bellway Homes
 Date: 26 May 2015
 Weather: Dry
 Atmospheric Pressure (mb): 1015
 Pressure Trend: Rising
 Equipment: Gas Data LMSXi
 Operator: Dave Evans

Ground Gases														Groundwater	
Well ID	Response Zone (mbe gl)			Methane (%v/v)		Carbon Dioxide (%v/v)		Oxygen (%v/v)		Gas Flow (l/h)		PID Reading (ppm)		Depth to Groundwater (mbe gl)	Total Well Depth (mbe gl)
	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady	Peak	Steady		
WS4	1.0	2.0	NS	0.00	0.00	1.40	1.40	19.80	19.80	0.00	0.00	N.R.	N.R.	1.15	1.70
WS5	0.5	1.5	NS	0.00	0.00	11.00	11.00	11.90	11.90	0.00	0.00	N.R.	N.R.	1.33	1.62
WS7	1.0	2.0	NS	0.00	0.00	1.20	1.20	19.80	19.80	0.00	0.00	N.R.	N.R.	1.08	1.72
WS10	1.0	2.0	NS	0.00	0.00	0.90	0.90	20.10	20.10	0.00	0.00	N.R.	N.R.	1.32	1.56
WS14	1.0	2.0	NS	0.00	0.00	0.90	0.90	20.50	20.50	0.00	0.00	N.R.	N.R.	1.27	1.59
WS15	1.0	2.0	NS	0.00	0.00	25.00	25.00	2.80	2.80	0.00	0.00	N.R.	N.R.	1.59	1.83
WS16	1.0	2.0	NS	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
WS17	1.0	2.0	NS	0.00	0.00	2.70	2.70	19.30	19.30	0.00	0.00	N.R.	N.R.	ND	1.42
WS18	1.0	1.3	NS	0.00	0.00	1.30	1.30	19.90	19.90	0.00	0.00	N.R.	N.R.	ND	1.03
WS19	1.0	2.2	NS	0.00	0.00	7.10	7.10	15.60	15.60	0.00	0.00	N.R.	N.R.	1.76	2.00
BH01	1.0	7.0	NS	0.00	0.00	7.40	7.40	16.50	16.50	0.00	0.00	N.R.	N.R.	1.09	4.89
BH02	1.0	6.0	NS	0.00	0.00	0.30	0.30	20.40	20.40	0.00	0.00	N.R.	N.R.	1.27	5.20
BH03	1.0	6.0	NS	0.00	0.00	0.20	0.20	20.40	20.40	0.00	0.00	N.R.	N.R.	1.28	4.24
BH04	1.0	6.0	NS	0.00	0.00	0.50	0.50	20.40	20.40	0.00	0.00	N.R.	N.R.	1.32	4.31

Comments: #E.g. WS1 Destroyed / flooded / not found / bung missing#

Notes

L.E.L.	Lower Explosive Limit (100% L.E.L. = 5% Flammable Gas)	Highlighted cell for following conditions:	
N.D.	Not Detected	a. Methane ≥1% v/v	
N.R.	Not Recorded	b. Carbon Dioxide ≥5% v/v	
PID	Photo-Ionising Detector	MG	Made Ground
%	By volume	NS	Natural Strata



In-Situ Gas Monitoring Results

Project Name: Derby Road, Hatton
 Project Number: P6901
 Client: Bellway Homes
 Date: 08 June 2015
 Weather: Dry
 Atmospheric Pressure (mb): 1028
 Pressure Trend: Steady
 Equipment: Gas Data LMSXi
 Operator: Dave Evans

Well ID	Ground Gases												
	Response Zone (mbegl)			Methane (%v/v)		Carbon Dioxide (%v/v)		Oxygen (%v/v)		Gas Flow (l/h)		PID Reading (ppm)	
	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady	Peak	Steady
WS4	1.0	2.0	NS	0.00	0.00	1.90	1.90	20.10	20.10	0.00	0.00	N.R.	N.R.
WS5	0.5	1.5	NS	0.00	0.00	9.80	9.80	16.10	16.10	0.00	0.00	N.R.	N.R.
WS7	1.0	2.0	NS	0.00	0.00	1.70	1.70	19.60	19.60	0.00	0.00	N.R.	N.R.
WS10	1.0	2.0	NS	0.00	0.00	1.00	1.00	19.80	19.80	0.00	0.00	N.R.	N.R.
WS14	1.0	2.0	NS	0.00	0.00	0.80	0.80	21.00	21.00	0.00	0.00	N.R.	N.R.
WS15	1.0	2.0	NS	0.00	0.00	24.00	24.00	3.20	3.20	0.00	0.00	N.R.	N.R.
WS16	1.0	2.0	NS	0.00	0.00	NR	NR	NR	NR	NR	NR	N.R.	N.R.
WS17	1.0	2.0	NS	0.00	0.00	2.70	2.70	19.40	19.40	0.00	0.00	N.R.	N.R.
WS18	1.0	1.3	NS	0.00	0.00	1.40	1.40	19.70	19.70	0.00	0.00	N.R.	N.R.
WS19	1.0	2.2	NS	0.00	0.00	7.50	7.50	14.60	14.60	0.00	0.00	N.R.	N.R.
BH01	1.0	7.0	NS	0.00	0.00	5.90	5.90	17.90	17.90	0.00	0.00	N.R.	N.R.
BH02	1.0	6.0	NS	0.00	0.00	0.30	0.30	20.40	20.40	0.00	0.00	N.R.	N.R.
BH03	1.0	6.0	NS	0.00	0.00	0.20	0.20	20.30	20.30	0.00	0.00	N.R.	N.R.
BH04	1.0	6.0	NS	0.00	0.00	0.50	0.50	20.60	20.60	0.00	0.00	N.R.	N.R.

Groundwater	
Depth to Groundwater (mbegl)	Total Well Depth (mbegl)
1.22	1.70
1.38	1.62
1.16	1.72
1.28	1.56
1.25	1.59
1.63	1.83
N.R.	N.R.
ND	1.42
ND	1.03
1.82	2.00
1.16	4.89
1.44	5.20
1.20	4.24
1.37	4.31

Comments: #E.g. WS1 Destroyed / flooded / not found / bung missing#

Notes

L.E.L.	Lower Explosive Limit (100% L.E.L. = 5% Flammable Gas)	Highlighted cell for following conditions:	
N.D.	Not Detected	a. Methane ≥1% v/v	
N.R.	Not Recorded	b. Carbon Dioxide ≥5% v/v	
PID	Photo-Ionising Detector	MG	Made Ground
%	By volume	NS	Natural Strata



In-Situ Gas Monitoring Results

Project Name: Derby Lane, Hatton
Project Number: P6901
Client: Bellway Homes East Midlands Ltd
Date: 04/10/2019
Weather: Dreary
Atmospheric Pressure (mb): 994
Pressure Trend: TBA
Equipment: Gas Data GFM430
Operator: James Wardle

Ground Gases																					
				Methane %v/v		CO2 %v/v		Oxygen %v/v		Hydrogen ppm		Carbon Monoxide ppm		Hydrogen Cyanide ppm		Hydrogen Sulfide ppm		Gas Flow l/h		PID Reading ppm	
ID	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady
WS101	1.00	2.00	NS	0.20	0.20	1.50	1.50	18.60	18.60	Not Recorded		Not Recorded		Not Recorded		Not Recorded		0.00	0.00	Not Recorded	
WS102	0.80	2.80	NS	0.20	0.20	0.50	0.50	19.80	19.80	Not Recorded		Not Recorded		Not Recorded		Not Recorded		0.00	0.00	Not Recorded	
WS103	1.00	2.00	NS	0.00	0.00	0.60	0.60	19.40	19.40	Not Recorded		Not Recorded		Not Recorded		Not Recorded		0.00	0.00	Not Recorded	
WS104	1.00	2.00	NS	0.00	0.00	0.30	0.30	20.00	20.00	Not Recorded		Not Recorded		Not Recorded		Not Recorded		0.00	0.00	Not Recorded	
WS105	1.00	2.00	NS	0.00	0.00	0.60	0.60	19.40	19.40	Not Recorded		Not Recorded		Not Recorded		Not Recorded		0.00	0.00	Not Recorded	
WS106	0.50	2.50	NS	0.00	0.00	0.60	0.60	19.40	19.40	Not Recorded		Not Recorded		Not Recorded		Not Recorded		0.00	0.00	Not Recorded	
WS107	1.00	3.00	NS	0.00	0.00	0.60	0.60	19.70	19.70	Not Recorded		Not Recorded		Not Recorded		Not Recorded		0.00	0.00	Not Recorded	
WS108	1.00	2.00	NS	0.00	0.00	0.60	0.60	19.60	19.60	Not Recorded		Not Recorded		Not Recorded		Not Recorded		0.00	0.00	Not Recorded	

Ground Waters	
Depth to Groundwater mbegl	Total Well Depth mbegl
Not Detected	1.70
0.71	2.00
0.44	1.46
0.60	1.90
0.52	1.87
1.10	2.22
1.04	3.00
0.80	2.05

Comments bailed but not rechecked

Notes

L.E.L.	Lower Explosive Limit (100% L.E.L. = 5% Flammable Gas)	Highlighted cell for following conditions:
N.D.	Not Detected	a Methane =>1% v/v
N.R.	Not Recorded	b Carbon Dioxide =>5% v/v
PID	Photo-Ionising Detector	MG Made Ground
%	By volume	NS Natural Strata

Ground Material Key

NS Natural Strata



In-Situ Gas Monitoring Results

Project Name: Derby Lane, Hatton
Project Number: P6901
Client: Bellway Homes East Midlands Ltd
Date: 16/10/2019
Weather: Drizzle
Atmospheric Pressure (mb): 995
Pressure Trend: Steady
Equipment: Gas Data LMSXi
Operator: Bryan Burgh

Ground Gases																					
				Methane %v/v		CO2 %v/v		Oxygen %v/v		Hydrogen ppm		Carbon Monoxide ppm		Hydrogen Cyanide ppm		Hydrogen Sulfide ppm		Gas Flow l/h		PID Reading ppm	
ID	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady
WS101	1.00	2.00	NS	0.00	0.00	1.90	1.90	20.80	20.80	Not Recorded		Not Recorded		Not Recorded		Not Recorded		0.00	0.00	Not Recorded	
WS102	0.80	2.80	NS	0.00	0.00	0.80	0.80	20.50	20.50	Not Recorded		Not Recorded		Not Recorded		Not Recorded		0.00	0.00	Not Recorded	
WS103	1.00	2.00	NS	0.60	0.60	0.90	0.90	20.20	20.20	Not Recorded		Not Recorded		Not Recorded		Not Recorded		0.00	0.00	Not Recorded	
WS104	1.00	2.00	NS	0.00	0.00	0.90	0.90	20.20	20.20	Not Recorded		Not Recorded		Not Recorded		Not Recorded		0.00	0.00	Not Recorded	
WS105	1.00	2.00	NS	0.00	0.00	1.60	1.60	20.30	20.30	Not Recorded		Not Recorded		Not Recorded		Not Recorded		0.00	0.00	Not Recorded	
WS106	0.50	2.50	NS	0.00	0.00	0.90	0.90	20.30	20.30	Not Recorded		Not Recorded		Not Recorded		Not Recorded		0.00	0.00	Not Recorded	
WS107	1.00	3.00	NS	0.00	0.00	0.50	0.50	20.70	20.70	Not Recorded		Not Recorded		Not Recorded		Not Recorded		0.00	0.00	Not Recorded	
WS108	1.00	2.00	NS	0.00	0.00	0.60	0.60	20.70	20.70	Not Recorded		Not Recorded		Not Recorded		Not Recorded		0.00	0.00	Not Recorded	

Ground Waters	
Depth to Groundwater mbegl	Total Well Depth mbegl
1.01	1.68
0.20	2.06
0.00	1.54
0.29	1.98
0.00	1.95
0.57	2.31
0.46	3.07
0.37	2.16

Comments all bailed waited for recharge and re-monitored

Notes

L.E.L.	Lower Explosive Limit (100% L.E.L. = 5% Flammable Gas)	Highlighted cell for following conditions:
N.D.	Not Detected	a Methane =>1% v/v
N.R.	Not Recorded	b Carbon Dioxide =>5% v/v
PID	Photo-Ionising Detector	MG Made Ground
%	By volume	NS Natural Strata

Ground Material Key

NS Natural Strata



In-Situ Gas Monitoring Results

Project Name: Derby Lane, Hatton
Project Number: P6901
Client: Bellway Homes East Midlands Ltd
Date: 01/11/2019
Weather: Drizzle
Atmospheric Pressure (mb): 994
Pressure Trend: TBA
Equipment: Gas Data LMSXi
Operator: Bryan Burgh

Ground Gases																					
				Methane %v/v		CO2 %v/v		Oxygen %v/v		Hydrogen ppm		Carbon Monoxide ppm		Hydrogen Cyanide ppm		Hydrogen Sulfide ppm		Gas Flow l/h		PID Reading ppm	
ID	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady
WS101	1.00	2.00	NS	0.00	0.00	4.50	4.50	19.40	19.40	Not Recorded		Not Recorded		Not Recorded		Not Recorded		0.00	0.00	Not Recorded	
WS102	0.80	2.80	NS	0.00	0.00	1.40	1.40	20.40	20.40	Not Recorded		Not Recorded		Not Recorded		Not Recorded		0.10	0.10	Not Recorded	
WS103	1.00	2.00	NS	1.00	1.00	1.80	1.80	20.10	20.10	Not Recorded		Not Recorded		Not Recorded		Not Recorded		0.10	0.10	Not Recorded	
WS104	1.00	2.00	NS	0.00	0.00	1.30	1.30	20.50	20.50	Not Recorded		Not Recorded		Not Recorded		Not Recorded		0.00	0.00	Not Recorded	
WS105	1.00	2.00	NS	0.00	0.00	1.70	1.70	20.50	20.50	Not Recorded		Not Recorded		Not Recorded		Not Recorded		0.00	0.00	Not Recorded	
WS106	0.50	2.50	NS	0.00	0.00	1.70	1.70	20.10	20.10	Not Recorded		Not Recorded		Not Recorded		Not Recorded		0.00	0.00	Not Recorded	
WS107	1.00	3.00	NS	0.00	0.00	1.60	1.60	20.60	20.60	Not Recorded		Not Recorded		Not Recorded		Not Recorded		-0.10	-0.10	Not Recorded	
WS108	1.00	2.00	NS	0.00	0.00	0.70	0.70	20.70	20.70	Not Recorded		Not Recorded		Not Recorded		Not Recorded		0.00	0.00	Not Recorded	

Ground Waters	
Depth to Groundwater mbegl	Total Well Depth mbegl
1.11	1.71
0.15	2.02
0.00	1.57
0.20	1.97
0.00	1.93
0.99	2.30
0.55	3.07
0.35	2.16

Comments: None

Notes

L.E.L.	Lower Explosive Limit (100% L.E.L. = 5% Flammable Gas)	Highlighted cell for following conditions:
N.D.	Not Detected	a Methane =>1% v/v
N.R.	Not Recorded	b Carbon Dioxide =>5% v/v
PID	Photo-Ionising Detector	MG Made Ground
%	By volume	NS Natural Strata

Ground Material Key

NS Natural Strata



In-Situ Gas Monitoring Results

Project Name: Derby Lane, Hatton
Project Number: P6901
Client: Bellway Homes East Midlands Ltd
Date: 13/11/2019
Weather: Sunny
Atmospheric Pressure (mb): 991
Pressure Trend: TBA
Equipment: Gas Data LMSXi
Operator: Tom Robson

Ground Gases																					
				Methane %v/v		CO2 %v/v		Oxygen %v/v		Hydrogen ppm		Carbon Monoxide ppm		Hydrogen Cyanide ppm		Hydrogen Sulfide ppm		Gas Flow l/h		PID Reading ppm	
ID	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady
WS101	1.00	2.00	NS	0.00	0.00	0.30	0.30	20.80	20.80	Not Recorded		Not Recorded		Not Recorded		Not Recorded		0.00	0.00	Not Recorded	
WS102	0.80	2.80	NS	0.00	0.00	0.10	0.10	20.90	20.90	Not Recorded		Not Recorded		Not Recorded		Not Recorded		0.00	0.00	Not Recorded	
WS103	1.00	2.00	NS	0.00	0.00	0.20	0.20	20.90	20.90	Not Recorded		Not Recorded		Not Recorded		Not Recorded		0.00	0.00	Not Recorded	
WS104	1.00	2.00	NS	1.30	1.30	1.00	1.00	20.30	20.30	Not Recorded		Not Recorded		Not Recorded		Not Recorded		0.00	0.00	Not Recorded	
WS105	1.00	2.00	NS	1.10	1.10	1.30	1.30	20.30	20.30	Not Recorded		Not Recorded		Not Recorded		Not Recorded		0.00	0.00	Not Recorded	
WS106	0.50	2.50	NS	0.00	0.00	0.30	0.30	20.90	20.90	Not Recorded		Not Recorded		Not Recorded		Not Recorded		0.00	0.00	Not Recorded	
WS107	1.00	3.00	NS	0.00	0.00	0.60	0.60	20.70	20.70	Not Recorded		Not Recorded		Not Recorded		Not Recorded		0.00	0.00	Not Recorded	
WS108	1.00	2.00	NS	0.00	0.00	0.60	0.60	20.80	20.80	Not Recorded		Not Recorded		Not Recorded		Not Recorded		0.00	0.00	Not Recorded	

Ground Waters	
Depth to Groundwater mbegl	Total Well Depth mbegl
0.92	1.70
0.23	1.95
0.00	1.95
0.00	1.97
0.00	1.68
0.00	2.13
0.00	1.98
0.00	2.03

Comments: None

Notes

L.E.L.	Lower Explosive Limit (100% L.E.L. = 5% Flammable Gas)	Highlighted cell for following conditions:
N.D.	Not Detected	a Methane =>1% v/v
N.R.	Not Recorded	b Carbon Dioxide =>5% v/v
PID	Photo-Ionising Detector	MG Made Ground
%	By volume	NS Natural Strata

Ground Material Key

NS Natural Strata



In-Situ Gas Monitoring Results

Project Name: Derby Lane, Hatton
Project Number: P6901
Client: Bellway Homes East Midlands Ltd
Date: 28/11/2019
Weather: Drizzle
Atmospheric Pressure (mb): 991
Pressure Trend: TBA
Equipment: Gas Data LMSXi
Operator: Bryan Burgh

Ground Gases																					
				Methane %v/v		CO2 %v/v		Oxygen %v/v		Hydrogen ppm		Carbon Monoxide ppm		Hydrogen Cyanide ppm		Hydrogen Sulfide ppm		Gas Flow l/h		PID Reading ppm	
ID	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady
WS101	1.00	2.00	NS	0.00	0.00	1.50	1.50	21.20	21.20	Not Recorded		Not Recorded		Not Recorded		Not Recorded		0.10	0.10	Not Recorded	
WS102	0.80	2.80	NS	0.00	0.00	1.60	1.60	21.10	21.10	Not Recorded		Not Recorded		Not Recorded		Not Recorded		0.00	0.00	Not Recorded	
WS103	1.00	2.00	NS	0.50	0.50	2.80	2.80	20.50	20.50	Not Recorded		Not Recorded		Not Recorded		Not Recorded		0.00	0.00	Not Recorded	
WS104	1.00	2.00	NS	0.00	0.00	2.40	2.40	20.90	20.90	Not Recorded		Not Recorded		Not Recorded		Not Recorded		0.00	0.00	Not Recorded	
WS105	1.00	2.00	NS	0.00	0.00	2.40	2.40	20.90	20.90	Not Recorded		Not Recorded		Not Recorded		Not Recorded		0.00	0.00	Not Recorded	
WS106	0.50	2.50	NS	0.00	0.00	1.50	1.50	21.00	21.00	Not Recorded		Not Recorded		Not Recorded		Not Recorded		0.00	0.00	Not Recorded	
WS107	1.00	3.00	NS	0.00	0.00	2.30	2.30	20.90	20.90	Not Recorded		Not Recorded		Not Recorded		Not Recorded		0.00	0.00	Not Recorded	
WS108	1.00	2.00	NS	0.00	0.00	1.70	1.70	20.90	20.90	Not Recorded		Not Recorded		Not Recorded		Not Recorded		0.00	0.00	Not Recorded	

Ground Waters	
Depth to Groundwater mbegl	Total Well Depth mbegl
1.08	1.72
0.00	1.96
0.25	1.72
0.33	1.91
0.00	1.94
0.66	2.30
0.53	3.05
0.39	2.15

Comments readings after bail and recharge

Notes

L.E.L.	Lower Explosive Limit (100% L.E.L. = 5% Flammable Gas)	Highlighted cell for following conditions:
N.D.	Not Detected	a Methane =>1% v/v
N.R.	Not Recorded	b Carbon Dioxide =>5% v/v
PID	Photo-Ionising Detector	MG Made Ground
%	By volume	NS Natural Strata

Ground Material Key

NS Natural Strata



A P P E N D I X J

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1015

TEST REPORT

The results relate only to the items tested, calibrated or sampled



GAS ANALYSIS

Customer: GRM, Laurus House, Centrum 100, First Avenue, Burton Upon Trent, DE14 2WH

Date Received: 01 February 2020

Date Sampled: 30 January 2020

Report N° GA08485

Date Analysed: 10 February 2020

Site: Unknown

SAMPLE REFERENCE	Analysis % V/V						
	Carbon Dioxide (CO ₂)	Oxygen (O ₂)	Carbon Monoxide (CO)	Hydrogen (H ₂)	Methane (CH ₄)	Ethane (C ₂ H ₆)	Hydrogen Sulphide (H ₂ S)†
Method of Analysis	3	4	3	4	3	3	5
WS 103	0.27	20.7	<0.0005	0.0005	0.13	<0.0005	<0.0001
WS 104	0.29	20.7	<0.0005	<0.0005	<0.0005	<0.0005	<0.0001
WS 105	0.11	20.8	<0.0005	0.0014	<0.0005	<0.0005	<0.0001

Method of 3 G.C. with F.I.D. - ENV/GAS03

Analysis:- 4 G.C. with T.C.D. - ENV/GAS09

5 G.C. with F.P.D. (Not UKAS Accredited)

† Not UKAS Accredited

Customer Analytical RequirementsCO₂, O₂, CO, H₂, CH₄, C₂H₆, H₂S**Authorised by**

Daniel Bignell

Comment Box

Authorised by:

Analyst: Daniel Bignell

Issue Date: 14 February 2020

SOCOTEC accepts no responsibility for the collection of any of the samples referred to in this report.

Daniel Bignell, Senior Analyst
Direct Dial: 01 283 554461



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P6901 - Derby Road, Hatton

plot of gas results
from monitoring data

Indicative of microbial
action

Carbon Dioxide

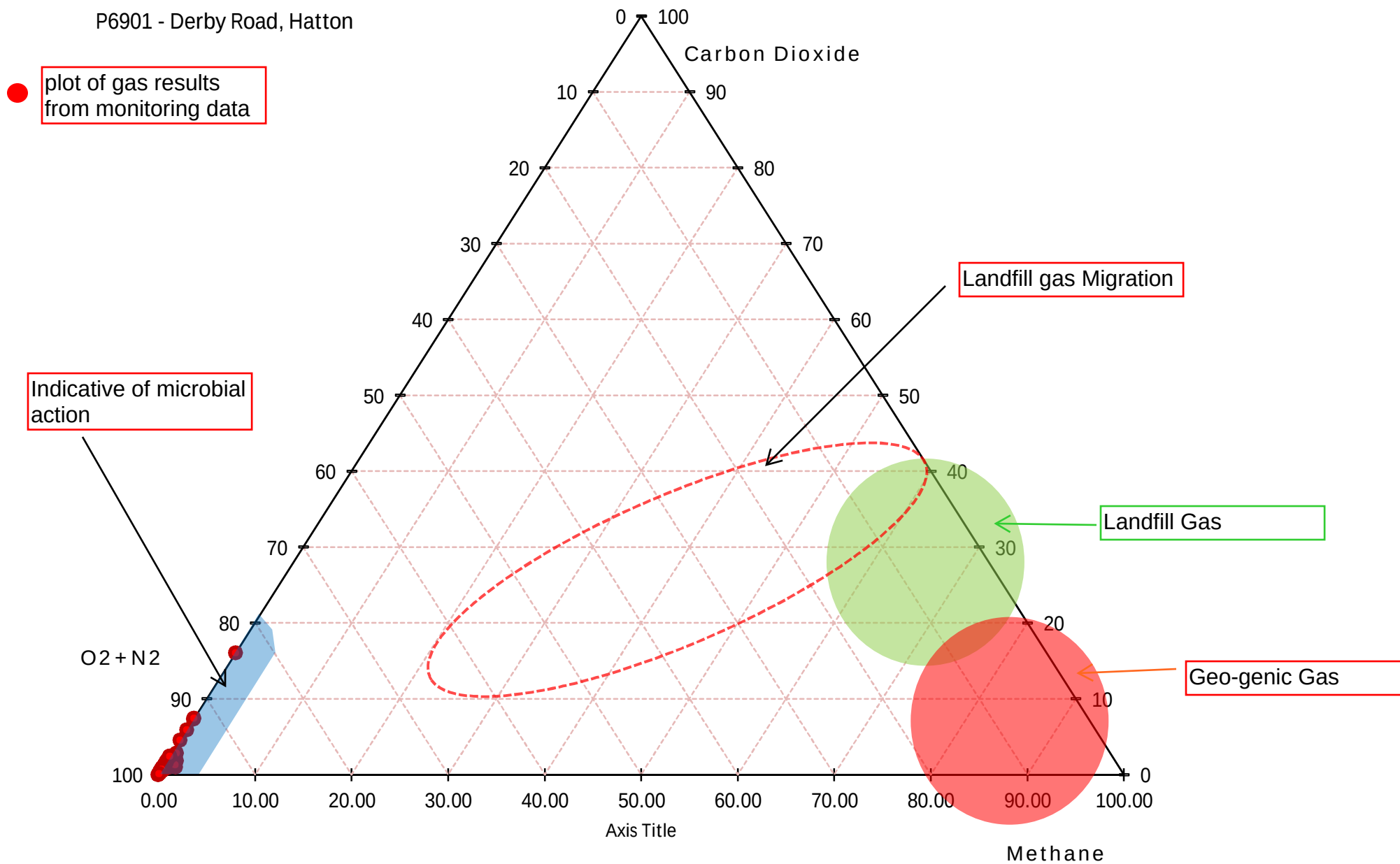
Landfill gas Migration

Landfill Gas

Geo-genic Gas

O₂ + N₂

Methane





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