FINAL REPORT ON SITE INVESTIGATION

carried out at

BOLTON UPON DEARNE

Prepared for

HORIZON RESIDENTIAL DEVELOPMENTS LIMITED
Level 1
City Mark
Fountainbridge
Edinburgh
EH3 9PE

Contract No: 3914

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EXECUTIVE SUMMARY

It is understood that it is proposed to develop the site for residential dwellings comprising two storey detached and semi-detached houses with gardens.

On the instructions of Halcrow Group Limited Consulting Engineers on behalf of Horizon Residential Developments Limited a site investigation was undertaken to determine ground conditions to enable foundation and road/hard standing design to be carried out, together with an assessment of contamination and gas emissions.

The site work was carried out between 6th and 10th March 2006. Five boreholes, designated BH3 to BH7 were sunk by light cable percussion method, nineteen boreholes, designated WS1 to WS18, were undertaken by drive-in window sampler technique, twenty four trial pits were dug by mechanical excavator and six trial pits by hand digging. The depths of boreholes and trial pits, descriptions of strata encountered and comments on groundwater conditions are given in the borehole and trial pit records, Appendix 2.

Standard (split-barrel and cone) penetration tests were carried out in the light cable percussion boreholes in the various strata to assess the relative density or consistency. The values of penetration resistance are given in the borehole records.

Representative disturbed and undisturbed samples were taken at the depths shown on the borehole and trial pit records and despatched to the laboratory. Samples were collected for environmental purposes in amber glass jars and kept in a cool box.

Gas monitoring for volatile organic compounds, by headspace analysis, was undertaken using a Photo-Ionisation Detector (PID).

Perforated standpipes, surrounded by pea gravel and protected by a stopcock cover were installed in all of the boreholes, as detailed in the borehole records. Four sets of Groundwater readings have been taken to date and three gas monitoring visits have been carried out.

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1.0 INTRODUCTION

It is understood that it is proposed to develop the site for residential dwellings comprising two storey detached and semi-detached houses with gardens.

On the instructions of Halcrow Group Limited Consulting Engineers on behalf of Horizon Residential Developments Limited a site investigation was undertaken to determine ground conditions to enable foundation and road/hard standing design to be carried out, together with an assessment of contamination and gas emissions.

This report has been prepared for the use of the Client, and is assignable to the first purchaser in the event of the site being sold, for the purpose described and no extended duty of care to any party, other than the above indicated, is implied or offered. Any other parties using any information contained within this report do so at their own risk.

The comments given in this report and the opinions expressed herein are based on the information received, the conditions encountered during site works, and on the results of tests made in the field and laboratory. However, there may be conditions prevailing at the site which have not been disclosed by the investigation and which have not been taken into account in the report.

The comments on groundwater conditions are based on observations made at the time the site work was carried out. It should be noted that groundwater levels vary owing to seasonal or other effects.

2.0 SITE SETTING

2.1 Site Location

The site is situated to the south of Lowfield Road, Bolton upon Dearne and may be located by Grid reference 445950 402440. A site location plan is included in Appendix 1, Figure A1.1.

3.0 SITE WORK

The site work was carried out between 6th and 10th March 2006 on the basis of the practices set out in BS 10175:2001, ref. 5.1, and BS 5930:1999 ref. 5.2.

Five boreholes, designated BH3 to BH7 were sunk by light cable percussion method, nineteen boreholes, designated WS1 to WS18 were undertaken by drive-in window sampler technique, (WS9A was sunk in order to investigation further the potential of

contamination from the adjacent tank). Twenty four trial pits were dug by mechanical excavator and six trial pits by hand digging. The positions of the exploratory holes are shown on the site plan, Appendix 1, Plan No.BODSI1. The depths of boreholes and trial pits, descriptions of strata encountered and comments on groundwater conditions are given in the borehole and trial pit records, Appendix 2.

Standard (split-barrel and cone) penetration tests, ref. 5.3 were carried out in the light cable percussion boreholes in the various strata to assess the relative density or consistency. The values of penetration resistance are given in the borehole records.

Representative disturbed and undisturbed samples were taken at the depths shown on the borehole and trial pit records and despatched to the laboratory.

Samples were collected for environmental purposes in amber glass jars and kept in a cool box.

Gas monitoring for volatile organic compounds, by headspace analysis, was undertaken using a Photo-Ionisation Detector (PID). The results are given on the exploratory hole logs under Field Records. A copy of the calibration certificate and technical details of the PID meter are presented in Appendix 6.

Perforated standpipes, surrounded by pea gravel and protected by a stopcock cover were installed in all of the boreholes, as detailed in the borehole records.

The ground levels at the borehole and trial pit locations were determined by IFA.

Four sets of Groundwater readings have been taken to date and three gas monitoring visits have been carried out.

4.0 LABORATORY TESTS

4.1 Geotechnical Testing

The geotechnical analyses undertaken by IFA, as scheduled by Halcrow Group Limited, are detailed below:

No.	Test	British Standard Reference	Notes
22	Moisture Content	BS 1377: Part 2: Clause 3.2	For comparison with Atterberg limits (if required) the measured moisture content would have to be corrected to give the equivalent moisture content of the fraction passing the 425 micron sieve.

No.	Test	British Standard Reference	Notes
15	Atterberg Limits	BS 1377: Part 2: Clause 4.3	The plastic limit was determined for the same samples using the definitive method detailed in Clause 5.3. The samples were wet sieved in accordance with Clause 4.2.4 (marked with 's' in Table 1 of the results).
1	Sulphur	BRE 279 (1985)	
5	Water Soluble Sulphate	BS 1377: Part 3: Clause 5.5	The samples prepared in accordance with Clause 5.3.
4	Chloride	BS 1377: Part 3: Clause 5.5	The samples prepared in accordance with Clause 7.2.3.2
3	CBR (California Bearing Ratio)	BS 1377: Part 4: Clause 7.4	Using penetration test procedure, samples prepared in accordance with Clause 7.2.4.4.
5	pH	BS 1377: Part 3: Clause 9.5	Samples prepared in accordance with Clause 9.4.

The results of these tests are shown in Appendix 3.

4.2 Chemical Testing

The suite of chemical analyses has been scheduled by Halcrow Group Limited and samples were sent directly from the site to Alcontrol Geochem from the site. The nature of the analyses is detailed below:

Metals screen - arsenic, cadmium, chromium, lead, mercury, selenium, boron (water soluble), copper, nickel, zinc, antimony, barium, beryllium, cobalt, molybdenum, tin, vanadium,

Organic Screen - total petroleum hydrocarbons (TPH), aliphatic hydrocarbons, polyaromatic hydrocarbons (PAH) – USEPA 16 suite, monohydric phenols

Inorganics Screen - cyanide (total), sulphate (water soluble), sulphide, sulphur, nitrate

Pesticides

Others - pH, organic matter, asbestos, PCB

Volatile Organic Compounds (VOC) - including: benzene, toluene, ethylbenzene and xylenes (BTEX) and chlorinated solvents

Semi-Volatile Organic Compounds (SVOC) - including: phenols and polyaromatic hydrocarbons (PAH)

The results of these tests are shown in Appendix 4.

5.0 REFERENCES

5.1 British Standards Institute: BS 10175 'Code of practice for the investigation of potentially contaminated sites', BSI 2001.

5.2 British Standards Institute: BS 5930 'Code of practice for site investigations', BSi 1999.

5.3 British Standard 1377:1990, Part 9, 'Methods of Test for Soils for Civil Engineering Purposes'.

5.4 Department of the Environment and the Welsh Office. 'The Building Regulations Approved Document C, Site Preparation and Resistance to Moisture', 1992.

5.5 CIRIA Reports 149 to 152, 'Methane and Associated Hazards to Construction', 1995.

5.6 Wilson S A and Card G B, 'Reliability and Risk in Gas Protection Design', 2004.

5.7 Skennerton S, 'Landfill Gas: Rates vs Concentrations', Presentation notes from Remediation of Hazardous Gases: Workshop. Regional Group Meeting, Geological Society, 3 June 1997.

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