GROUND INVESTIGATION REPORT

SMALL PLOT OF LAND OFF ESKDALE AVENUE, CARR MILL, ST. HELENS

Date: May 2008

Job Ref: 6561

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GROUND INVESTIGATION REPORT SMALL PLOT OF LAND OFF ESKDALE AVENUE, CARR MILL, ST. HELENS	
Job no.	**Issue Status**
6561	Final

	Name	Position	Signature	Date
Prepared By:	Kristoffer Harries	Geologist		May 2008
Checked & Approved By:	Matt Uttley	Environment Manager		May 2008

GROUND INVESTIGATION REPORT
SMALL PLOT OF LAND OFF ESKDALE AVENUE, CARR MILL, ST. HELENS

Executive Summary

Urban Vision Partnership Ltd have been commissioned by St Helens Council to carry out a ground investigation on a small plot of land off Eskdale Avenue, Carr Mill, St Helens.

The investigation was required to provide advice on the nature and condition of ground conditions of the site prior to the land being sold and redeveloped. The future development of the site is described as residential.

The intrusive investigation included open hole rotary boreholes and hand auger holes. The hand auger holes were excavated on 22nd April 2008, while the rotary boreholes were carried out between 23rd and 29th May 2008.

The soil risk assessment identified a low to medium risk to human health presented by elevated levels of arsenic and benzo(a)pyrene in the shallow soils at the site.

Further assessment of the soil contamination hazard at the site is required and should be set in context of the site development plan. Further assessment is likely to include soil sampling and testing at an approximate frequency of 1 sample per garden plot.

When compared to WRAS assessment criteria, to assess the potential future risk to water supply pipes, elevated concentrations of toxic (arsenic) were identified. It is therefore recommended that should potable water supply be required as part of the development, further advice be sought from the local water supplier.

No quantitative assessment of ground gas risk has been carried out as part of this ground investigation. It is recommended that either gas risk assessment is undertaken in accordance with CIRIA C665 guidance or that Characteristic Situation 2 (CS2) gas protection measures are to be used for future buildings at the site.

The preliminary mine workings assessment has highlighted that coal mine workings has taken place and that there is a possibility of voids at the site. It is therefore recommended that a full assessment of voids associated with mine workings is undertaken. This will include quantifying the amount of voids and will allow more accurate costs for grouting if required.

In excavations where coal is present sealing will be required prior to foundation construction in order to prevent the possibility of spontaneous combustion. Further proof drilling is also likely to be needed in the area of the foundations prior to construction in order to establish the presence of coal. Allowances should be made for this in future budgeting.

GROUND INVESTIGATION REPORT
SMALL PLOT OF LAND OFF ESKDALE AVENUE, CARR MILL, ST. HELENS

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1.0 Introduction

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The investigation was required to provide advice on the nature and condition of ground conditions of the site prior to the land being sold and redeveloped. The future development of the site is described as residential.

This report describes the near surface ground investigation undertaken to provide a quantitative assessment of soil contamination risks associated with the proposed end use. Furthermore, the report identifies appropriate remediation options which should be considered in the future to mitigate the identified risks.

Former shallow mine workings investigation will provide a preliminary assessment of past mine workings beneath the site.

2.0 Site Characteristics and Preliminary Conceptual Model

2.1 Site Description

Site location	Small plot of land off Eskdale Avenue, Carr Mill, St Helens (Site Plan Figure 1, Appendix A)
National Grid Reference	351917, 397723
Site area	0.48 hectares
Elevation	59mAOD (above ordnance datum)
Current land use	Site: No potentially contaminative land uses. Surrounding area: Predominantly residential with occasional commercial usages. Near to the site are a library, NHS centre and police station.
Invasive plants	None noted on site.

Table 1 Site description

2.2 Site History

A summary of the historical contaminative past uses is provided below.

Potentially Contaminative Past Uses	**Map Date**	
	From	**To**
None	NA	NA

Table 2 On site history

Surrounding area: Potentially Contaminative Past Uses	**Map Date**	
	From	**To**
Sand Pit 223m south of site. Infilled by 1928	1907	1926
Excavation approx 140m south of site. Infilled by 1937	1926	1928

Table 3 Off site history

2.3 Environmental Setting

A summary of the environmental settings is provided below.

Artificial Geology	None.
Drift Geology	No drift deposits on site with exception of Shirdley Hill Sand Formation in the SE part of site.
Solid Geology	Pennine Lower Coal Measures (Mudstone, Siltstone & Sandstone). One inferred coal seam on site.
Hydrogeology	Minor Aquifer (High Leaching Potential)
Hydrology	Small stream approx 400m NW of site & Carr Mill Dam approx 430m E of site.
Water abstraction sites	No surface water or groundwater abstractions licenses within 1000m of the site.
Env. Designations	None

Radon	The site is not in a radon affected area as less 1% of properties are above the action level therefore no radon protective measures are necessary.
Landfill Sites	There are no registered landfills, waste treatment, transfer and disposal facilities within 250m of the site. There are 2 potential landfill sites within 250m of the site.
Mining and Minerals	The Groundsure Environmental Data Report states that the site is located within the specified search distance of an identified mining area (Shafts located 892m to the southeast of the site). The hazard of subsidence relating to shallow mining under the site is low. The Coal Authority Mining Report presented in Appendix B states that the site is in the likely zone of influence from workings in 1 coal seam at shallow depth and last worked in 1925. There are also 2 recorded mine entries within the site boundary.

Table 4: Environmental setting

2.4 Preliminary Conceptual Model

A summary of the preliminary conceptual model is as follows:

Potential Source	Potential Contaminant	Potential Pathway	Potential Receptor
Ground gas by potential landfilling and Coal Measures	Methane	• Migration through variably permeable strata • Preferential migration through culverts, service ducts/trenches	Future buildings and site users
	Carbon dioxide	• Inhalation of gas • Migration through variably permeable strata • Preferential migration through culverts, service ducts/trenches	Current and future site users
Made ground	Metals, metalloids and their compounds, Inorganic compounds, Organic compounds including hydrocarbons and asbestos	• Dermal contact with soil/soil derived dust • Ingestion of soil/soil derived dust • Inhalation of soil derived dust • Inhalation of vapours • Infiltration through contaminated soil into groundwater • Surface run-off	• Current and future site users • Controlled Waters

Table 5 Preliminary Conceptual Model

3.0 Ground Investigation

3.1 Method

3.1.1 Desk Study Mining Investigation and Geophysical Survey Investigation

The coal seam beneath the site is known as Little Delph and is dipping 15-20º to the southeast. The approximate depth to the coal seam near to the mine shaft is expected to be 7.5m below ground level (bgl) with it becoming deeper with dip.

The Coal Authority report presented in Appendix B indicated that there has been mine workings of one seam of coal at shallow depth and was last worked in 1925. The report also indicated that there is a mine shaft and adit on site for which no records of what steps, if any, have been taken to make safe. It is also stated that records may be incomplete and there may exist other mine entries.

A visit to the Coal Authority was carried out on 6th March 2008 to inspect the mining information and records held for the site.

The review found that a mining plan (Coal Authority reference No. 8056) indicated that the site had been actively mined for coal. The mine is known as the Arley Mine – worked out by The Carr Mill Arley Colliery Co. Ltd and was last worked in 31st March 1925.

The |Coal Authority plan has been geo-rectified using GIS software and is presented as Figure 2 in Appendix A. It must be noted that the process of geo-rectifying contains a limited margin of error when aligning the Coal Authority plan with the OS master map data. Figure 2 shows the extent of mine workings undertaken beneath the site and indicates the potential locations of the mine entries (shafts). It also shows that there have been probable older mine workings that have not been surveyed.

A geophysical survey was carried out on 19th March 2008 by Subsurface Geotechnical using ground probing radar survey (GPR) and the report is presented in Appendix C. The GPR survey was specifically designed to find buried mineshaft features as the technique has limited application in finding mine workings at depths >4m bgl. The survey was carried out in the northwest part of the site. The area was 30m^2 and the survey lines were spaced out at 1.5m intervals. This part of the site incorporated the mine openings as recorded on the Coal Authority report and a large depression visible at the surface.

A summary of the geophysical survey is provided below:

- There is no clear evidence of any large voids present
- Large depression visible on the ground surface with deep disturbed fill and could possibly be due to a collapsing mineshaft.
- Small area of deep disturbed fill located along north eastern site boundary.
- Numerous areas of disturbed ground.
- Numerous small buried structures which could be made ground materials.

3.1.2 Intrusive Investigation

The intrusive investigation included open hole rotary boreholes and hand auger holes (Figure 3, Appendix A). The hand auger holes were excavated on 22nd April 2008, while the rotary boreholes were carried out between 23rd and 29th May 2008 under license from the Coal Authority (permit No. 3433).

Seven hand auger holes were excavated to a maximum depth of 1.05m bgl, the material was logged, photographed and contamination samples taken before the holes were backfilled with arisings and clean compost.

Nine rotary open holing boreholes were drilled to sufficient depth to locate Little Delph coal seam beneath the site or to confirm that no coal is present along the north western part of the site. The rotary holes were drilled using a water flush system rather than a air flush system as preferred by the Coal Authority. All rotary boreholes were reinstated with a permanent sealing of bentonite from base to ground level in accordance with Coal Authority requirements.

Photographs of the hand auger spoil and the logs prepared in accordance with BS EN ISO 14655-1:2002[1] are presented in Appendix D. The rotary logs are presented in Appendix E.

The hand auger locations were non-targeted to provide even coverage across the site. Whereas, rotary boreholes were targeted to create three east-west profile lines across the site in order to provide a preliminary mine workings investigation.

3.1.3 Sampling Strategy

Disturbed soil samples were taken from the hand auger holes only. They were taken in the top 0.5m bgl and then every change in strata. One sample was taken at the made ground-natural ground interface.

3.1.4 Laboratory Testing

Chemical testing was carried out by i2 Analytical of Watford, Hertfordshire. The laboratory is UKAS accredited in accordance with ISO17025 and is also MCERTS accredited for selected soil testing.

Six representative made ground soil samples were selected from across the site and were all tested for a standard suite of contaminants which included metals, metalloids, inorganic compounds, phenols, speciated polycyclic aromatic hydrocarbons (PAHs), asbestos and fraction of organic carbon.

Soil contamination results are presented in Appendix F.

[1] British Standards (2002) Geotechnical investigation and testing – Identification and classification of Soil. Part 1: Identification and description. *BS EN ISO 14688-1:2002*

3.2 Ground Conditions

3.2.1 Geology

The generalised sequence encountered across the site has been summarised below:

- Made ground was identified in each position. The made ground mainly consisted of Sand with secondary constituents of clay and gravel. Gravel comprises brick, ash, slag, sandstone and mudstone. Made ground was observed up to 1.4m bgl.
- Drift deposits comprised predominantly soft to firm Clay. Drift deposits were observed up to 3.2m bgl.
- Bedrock was encountered in all the boreholes and mainly comprised predominantly mudstone overlying coal, overlying predominantlyr mudstone. Bedrock was encountered at depths ranging from 1.5m bgl to 10.5m bgl.

3.2.2 Soil Waste Classification

The soil contamination results have been assessed using Cat-Waste Soil (a web based model produced by McArdle and Atkins to determine the likely classification of waste should surplus soils be removed from site during construction).

The Cat-Waste Soil report in Appendix G indicates that the soils on site are not likely to be classed as hazardous waste. However, should surplus soils be removed from site, reference should also be made to the latest Environment Agency guidance for treating non-hazardous wastes for landfill.

NB: The soil classification should not be considered definitive as there may be other factors that may influence whether the waste is hazardous. Full details of the soils and contamination results should be made available to a specialist disposal contractor to confirm the nature of the waste prior to removal.

4.0 Generic Quantitative Risk Assessment

Current good practice requires that the findings from a site investigation be evaluated on a site-specific basis, using a risk-based approach. Risk assessment involves identification and assessment of the hazards presented by the concentrations of contaminants measured. This is followed by estimation of risk resulting from each hazard, and an evaluation of whether each risk is acceptable.

Risk estimation is based on consideration of magnitude, probability and consequence of a contaminant-pathway-receptor linkage occurring, using a matrix recommended by Defra. The rationale behind the estimation of risk in this investigation is presented in Appendix H. This is in line with guidance described in CLR11[2]. Risk assessment requires an evaluation of the contaminant-pathway-receptor linkage model and can be qualitative or quantitative.

4.1 Soil

4.1.1 Human Health Receptor

Current UK guidance recommends that soil samples are assessed against the Contaminated Land Exposure Assessment (CLEA) Soil Guideline Values (SGVs). The UK's risk assessment model CLEA UK assumes that land-use falls into one of the following three categories (the first having two sub-categories): residential with and without plant uptake; allotments and; commercial / industrial use.

For contaminants without a CLEA derived SGV, results have been compared against equivalent Generic Assessment Criteria (GAC) derived by the Chartered Institute of Environmental Health (CIEH) and Land Quality Management Ltd (LQM)[3] for the four land use scenarios. The GACs have been derived using CLEA UK (beta) and as such are relevant in the UK context.

GACs have been selected based on a soil organic matter (SOM) value of 2.5% which is based on the fraction of organic carbon (FOC) values derived from made ground samples tested.

The soil test results have been compared to the assessment criteria for residential with plant uptake end use scenarios and this comparison is presented in Appendix I.

A number of contaminants were found to have exceeded the assessment criteria for residential with plant uptake land uses. A summary is provided in Table 6 below.

[2] Department for Environment, Food and Rural Affairs and the Environment Agency (2004). Model procedures for the management of land contamination. *R&D Publication CLR11.*
[3] Nathanail, C.P., McCaffrey, C., Ashmore, M., Cheng, Y., Gillett, A., Hooker, P., and Ogden, R.C. (2007) *Generic Assessment Criteria for Human Health Risk Assessment.* Land Quality Press, Nottingham.

Contaminant	Units	No. of samples	Max. result	Assessment Criteria	Source of Criteria	No. exceeded
Arsenic	mg/kg	6	29	20	CLEA SGV	2
Benzo(a)pyrene	mg/kg	6	1.9	1.08	LQM GAC	1
Copper	mg/kg	6	120	111	LQM GAC	1
Zinc	Mg/kg	6	400	330	LQM GAC	1

Table 6: Summary of soil results

The average soil organic matter (SOM) is 3.06% therefore; the soil organic matter value used to assess the site is 2.5%. The pH across the site ranged from 6.5 to 7.0 with an average pH of 6.8.

When compared to residential with plant uptake SGVs and GACs, two soil samples were found to contain elevated arsenic (29mg/kg, HA802 and 27mg/kg, HA806). One sample was found to contain elevated benzo(a)pyrene (BaP) (1.9mg/kg, HA806), copper (120mg/kg, HA802) and zinc (400mg/kg, HA806).

In order to assess the risk presented by the made ground across the site, CLR7[4] recommends comparing the dataset to the assessment criteria using the mean value and maximum value tests.

The mean value test identifies the 95% confidence limits of the measured mean of the dataset and compares the upper 95th percentile (upper bound level) with the SGV / GAC.

The maximum value test identifies whether the maximum values should be classified as outliers. These outliers may indicate areas of contamination. The statistical output sheets for this analysis are presented in Appendix J.

A summary table of the statistical analysis is provided in Table 7 below.

[4] Department for Environment, Food and Rural Affairs and the Environment Agency (2002). Assessment of risks to human health from land contamination: an overview of the development of soil guideline values and related research. R&D Publication CLR7.

Contaminant	Maximum concentration mg/kg	No. outliers	Mean, mg/kg	Upper 95th Percentile mg/kg	Residential with Screening Values, mg/kg
First Statistical Test					
Arsenic	29	0	17.72	24.93	20
BaP	1.9	1	0.61	1.14	1.08
Copper	120	0	86	109.48	111
Zinc	400	0	144.33	251.59	330
Second Statistical Test without maximum value					
BaP	0.54	0	0.29	0.43	1.08

Table 7: Statistical Summary.

The statistical analysis undertaken indicates there to be a outlier present for BaP in HA806. Elevated BaP is likely to be sourced from the ash which is recorded in the log.

Analysis demonstrates that the upper bound value does not exceed the screening criteria for residential with plant uptake land use for copper and zinc. Therefore there is considered to be no risk associated with these contaminants at the site.

The only contaminant to have the upper bound value exceed the screening criteria was arsenic. Therefore arsenic is considered to be a site wide problem.

Further assessment of the soil contamination hazard at the site is required and should be set in context of the site development plan. Further assessment is likely to include soil sampling and testing at an approximate frequency of 1 sample per garden plot.

4.1.2 Water pipes

Soil contamination results have been compared to the material selection 'threshold' levels recommended in the Water Regulations Advisory Scheme (WRAS) guidance on the selection of materials for water supply pipes to be laid in contaminated land[5]. This comparison is presented in Appendix K.

Concentrations of toxic (arsenic) exceed the threshold levels. Appropriate pipe materials should therefore be selected unless the remediation removes / reduces the concentration of the contaminant.

Furthermore, as arsenic has been identified, the Foundation for Water Research Guidance Notes[6] recommend that it is unacceptable to lay potable water pipelines without site remediation.

[5] Water Regulations Advisory Scheme (2002) The selection of materials for water supply pipes to be laid in contaminated land. *Information and Guidance Note No 9-04-03, Issue 1.*
[6] Foundation for Water Research (1994) Laying potable water pipelines in contaminated ground. *FR 0448.*

4.2 Controlled Waters

Based on the limited presence of contamination within the soils tested, the risk to controlled waters (i.e. the underlying minor aquifer) is considered to be negligible.

4.3 Ground Gas

No quantitative assessment of this risk has been carried out as part of this ground investigation. It is recommended that either gas risk assessment is carried out in accordance with CIRIA C665[7] guidance or that Characteristic Situation 2 (CS2) gas protection measures are to be used for future buildings at the site.

If CS 2 gas measures were used then they would include:

- Reinforced concrete cast in situ floor slab (suspended, non suspended or raft) with at least 1200g DPM2 and under-floor venting or;
- Beam and block or pre-cast concrete and 2000g DMP/ reinforced gas membrane and under-floor venting
- All joints and penetrations sealed.

4.4 Conceptual Model

Following the intrusive site investigation, the preliminary risk assessment has been re-evaluated and specific linkages examined based on the testing and monitoring results and the proposed end use of the site. The contaminant-pathway-receptor linkage model for this site has been revised and summarised in Table 8 below:

[7] Construction Industry Research and Information Association (2007) Assessing risks posed by hazardous ground gases to buildings. *CIRIA Report C665*.

Potential Source	Potential Contaminant	Potential Pathway	Potential Receptor	Probability	Consequence	Risk
Made Ground	Arsenic and BaP	• Dermal contact with soil/soil derived dust • Ingestion of soil/soil derived dust • Inhalation of soil derived dust • Consumption of home grown vegetables	• On site future users • Construction workers	Low	Moderate	**Low**
Ground gas by potential landfilling and Coal Measures	Methane	• Migration through variably permeable strata • Preferential migration through culverts, service ducts/trenches	• Site users • Buildings	Low	Severe	**Low**
	Carbon Dioxide	• Inhalation of gas • Migration through variably permeable strata • Preferential migration through culverts, service ducts/trenches	• Site users • Buildings	Low	Severe	**Low**

Table 8: Revised Conceptual Model

5.0 Preliminary Shallow Mine Workings Assessment

Coal was proven in the all rotary boreholes (with exception of BH801) at shallow depths between 1.5 and 9.6m bgl. BH801 was drilled to confirm that no coal was present in that part of the site.

The rotary drilling came across no voids. However, in BH802 the coal was described as coal dust and is likely to have been possibly tipped during the coal workings. BH804, BH805, BH807, BH808 and BH809 exhibited either weak drilling through the coal or temporary loss of water flush. The weak drilling and loss of flush is likely to be associated with coal mining and possible voids.

The preliminary mine workings assessment has highlighted that coal mine workings has taken place and that there is a possibility of voids at the site. It is therefore recommended that a full assessment of voids associated with mine workings is undertaken. This will include quantifying the amount of voids and will allow more accurate costs for grouting if required.

In excavations where coal is present sealing will be required prior to foundation construction in order to prevent the possibility of spontaneous combustion. Further proof drilling is also likely to be needed in the area of the foundations prior to construction in order to establish the presence of coal. Allowances should be made for this in future budgeting.

6.0 Conclusions and Recommendations

The soil risk assessment identified a low to medium risk to human health presented by elevated levels of arsenic and benzo(a)pyrene in the shallow soils in HA802 and HA806.

Further assessment of the soil contamination hazard at the site is required and should be set in context of the site development plan. Further assessment is likely to include soil sampling and testing at an approximate frequency of 1 sample per garden plot.

When compared to WRAS assessment criteria, to assess the potential future risk to water supply pipes, elevated concentrations of toxic (arsenic) were identified. It is therefore recommended that should potable water supply be required as part of the development, further advice be sought from the local water supplier.

Remedial solutions may involve excavation of a sterile trench (minimum width of the pipe diameter plus 1m and a minimum depth of 0.3m below the pipe) or the laying of 'Table Y' blue polythene coated copper service pipe or MDPE Barrier Pipe e.g. Protectaline or equivalent' and wrapping of any joints with 'serviwrap', 'denso' or equivalent tape to reduce the risk of polluting the water supply.

No quantitative assessment of ground gas risk has been carried out as part of this ground investigation. It is recommended that either gas risk assessment is carried out in accordance with CIRIA C665 guidance or that Characteristic Situation 2 (CS2) gas protection measures are to be used for future buildings at the site.

The preliminary mine workings assessment has highlighted that coal mine workings has taken place and that there is a possibility of voids at the site. It is therefore recommended that a full assessment of voids associated with mine workings is undertaken. This will include quantifying the amount of voids and will allow more accurate costs for grouting if required.

In excavations where coal is present sealing will be required prior to foundation construction in order to prevent the possibility of spontaneous combustion. Further proof drilling is also likely to be needed in the area of the foundations prior to construction in order to establish the presence of coal. Allowances should be made for this in future budgeting.
……

7.0 Limitations

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

Urban Vision Partnership Ltd accepts no responsibility for the consequences of this document being used for any purpose or project other than for which it was commissioned or for consequences arising from this document's use by any third party with whom an agreement has not been executed.

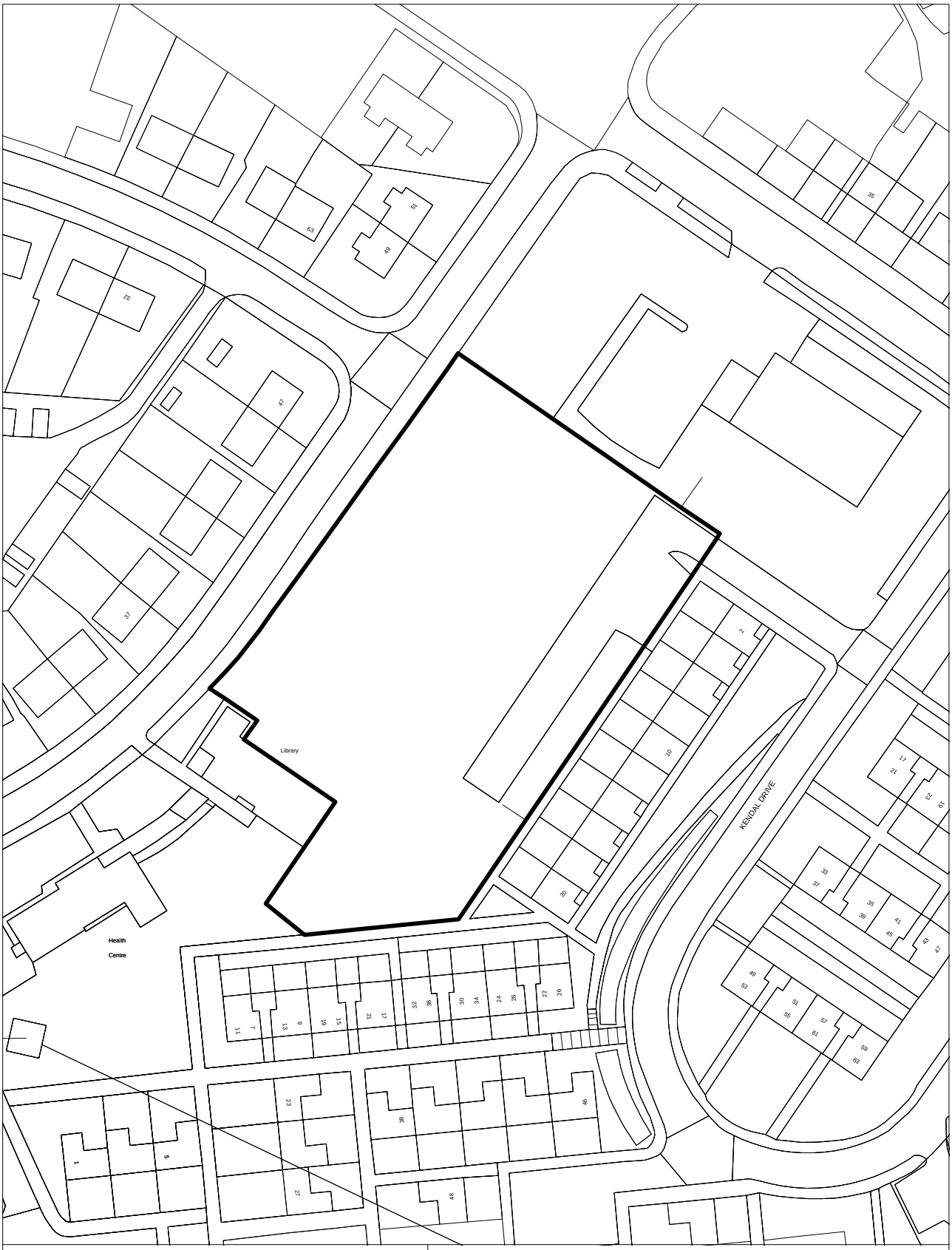
The investigation of the site has been carried out to provide sufficient information concerning the type and degree of contamination, to provide a reasonable assessment of the human risks.

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

The risk assessment and opinions provided, *inter alia*, take into consideration 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.

APPENDIX A

FIGURE 1 – SITE PLAN
FIGURE 2 – SITE PLAN SHOWING MINE WORKINGS
FIGURE 3 – EXPLORATORY HOLE LOCATION PLAN



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PRODUCED FROM THE ORDNANCE SURVEY MAP WITH THE PERMISSION OF THE CONTROLLER OF HER MAJESTY'S STATIONERY OFFICE CROWN COPYRIGHT RESERVED

Figure 1
Site Plan
Small plot of land off Eskdale Avenue, Carr Mill, St Helens

Date: May 2008
Scale: 1:1,000
Client: St Helens MBC
Job Ref: 6561

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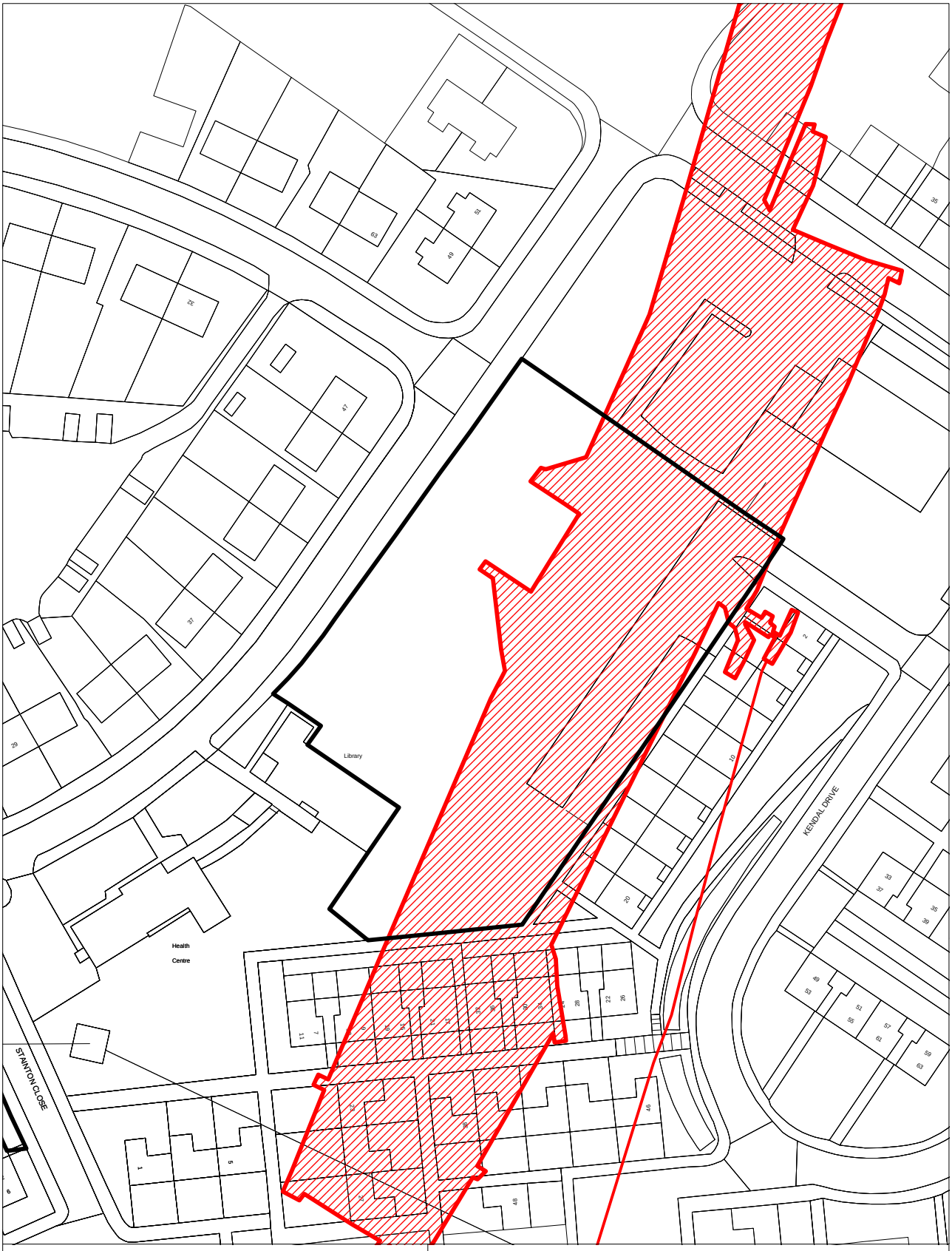

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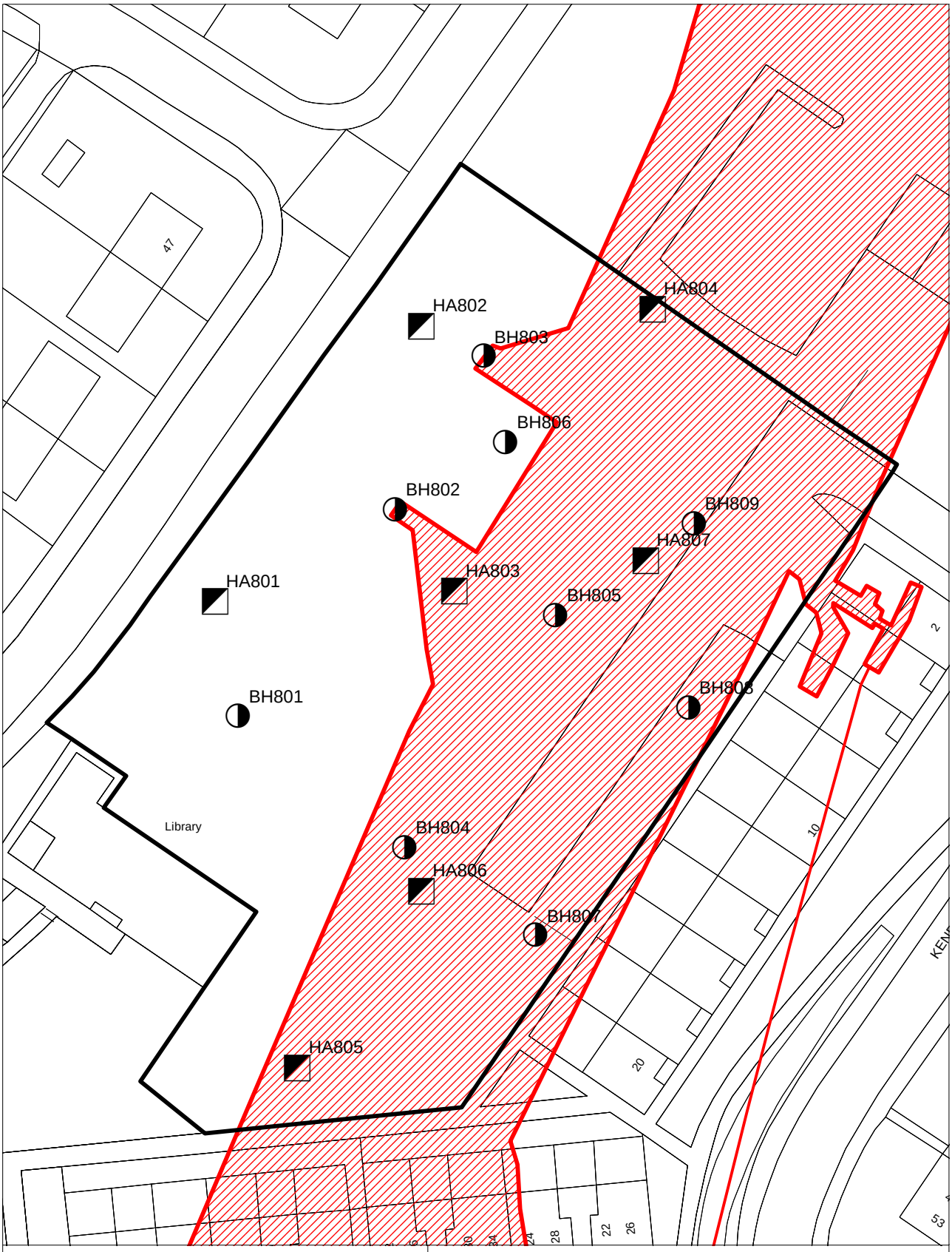
Figure 2
Site plan showing mine workings
Small plot of land off Eskdale Avenue, Carr Mill, St Helens

Date: May 2008
Scale: 1:1,000
Client: St Helens MBC
Job Ref: 6561

urbanvision



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Exploratory hole location plan
Small plot of land off Eskdale Avenue
Carr Mill, St Helens

Date: May 2008
Scale: 1:600

Figure 3

Client: St Helens MBC

Job Ref: 6561

APPENDIX B

COAL AUTHORITY REPORT

Issued by:
The Coal Authority, Mining Reports Office, 200 Lichfield Lane, Berry Hill, Mansfield, Nottinghamshire NG18 4RG
On-Line Service: www.coalminingreports.co.uk - Phone: 0845 762 6848 - DX 716176 MANSFIELD 5

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ECCLES,
MANCHESTER,
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M30 0TE

Person dealing with this matter:	**Richard Booth**
Our reference:	**00013780-08**
Your reference:	6561
Electronic Ref:	EME_00008848190002_005
RRUID:	005.00008848190002
Date of your enquiry:	**20 February 2008**
Date we received your enquiry:	**20 February 2008**
Date of issue:	**20 February 2008**

This report is for the property described in the address below and the attached plan.

Coal and Brine Report

Small Plot Off, Eskdale Avenue, Carr Mill, St Helens, Merseyside

This report is based on and limited to the records held by, the Coal Authority, and the Cheshire Brine Subsidence Compensation Board's records, at the time we answer the search.

Coal mining	Yes
Brine extraction	No

Information from the Coal Authority

Underground Coal Mining

Past

The property is in the likely zone of influence from workings in 1 seam of coal at shallow depth, and last worked in 1925.

Present

The property is not in the likely zone of influence of any present underground coal workings.

Future

The property is not in an area for which the Coal Authority is determining whether to grant a licence to remove coal using underground methods.

The property is not in an area for which a licence has been granted to remove coal using underground methods.

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The property is not in an area that is likely to be affected at the surface from any planned future workings.

However reserves of coal exist in the local area which could be worked at some time in the future.

No notice of the risk of the land being affected by subsidence has been given under section 46 of the Coal Mining Subsidence Act 1991.

Mine entries

Within, or within 20 metres of, the boundary of the property there are 2 mine entries, the approximate positions of which are shown on the attached plan.

There is no record of what steps, if any, have been taken to treat the mine entries.

Records may be incomplete. Consequently, there may exist in the local area mine entries of which the Coal Authority has no knowledge.

Coal-mining geology

At the surface, there are no known faults or other lines of weakness due to coal mining that have made the property unstable.

Opencast Coal Mining

Past

The property is not within the boundary of an opencast site from which coal has been removed by opencast methods.

Present

The property does not lie within 200 metres of the boundary of an opencast site from which coal is being removed by opencast methods.

Future

The property is not within 800 metres of the boundary of an opencast site for which the Coal Authority is determining whether to grant a licence to remove coal by opencast methods.

The property is not within 800 metres of the boundary of an opencast site for which a licence to remove coal by opencast methods has been granted.

Coal-mining subsidence

The Coal Authority has not received a damage notice or claim for the property since 1 January 1984. There is no current Stop Notice delaying the start of remedial works or repairs to the property.

The Coal Authority has not received a request to carry out preventive work before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.

Mine gas

There is no record of a mine gas emission requiring action by the Coal Authority within the boundary of the property.

Hazards related to coal mining

The property has not been subject to remedial works, by or on behalf of the Authority, under its Emergency Surface Hazard Call Out procedures.

Withdrawal of Support

The property is not in an area for which a notice of entitlement to withdraw support has been published.

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The property is not in an area for which a notice has been given under section 41 of the Coal Industry Act 1994, revoking the entitlement to withdraw support.

Working Facilities Orders

The property is not in an area for which an Order has been made under the provisions of the Mines (Working Facilities and Support) Acts 1923 and 1966 or any statutory modification or amendment thereof.

Payments to Owners of Former Copyhold Land

The property is not in an area for which a relevant notice has been published under the Coal Industry Act 1975/Coal Industry Act 1994.

Comments on Coal Authority information

Where development proposals are being considered, technical advice should be obtained before beginning work on site. All proposals should apply good engineering practice developed for mining areas. No development should be undertaken that intersects, disturbs or interferes with any coal or mines of coal without the permission of the Coal Authority. This is necessary due to the Public Safety implications of any development in these circumstances.

Information from the Cheshire Brine Subsidence Compensation Board

The property lies outside the Cheshire Brine Compensation District.

Additional remarks

This report is prepared in accordance with the Law Society's Guidance Notes 2006, the User Guide 2006 and the Coal Authority and Cheshire Brine Board's Terms and Conditions 2006. The report is compliant with Home Information Pack requirements.

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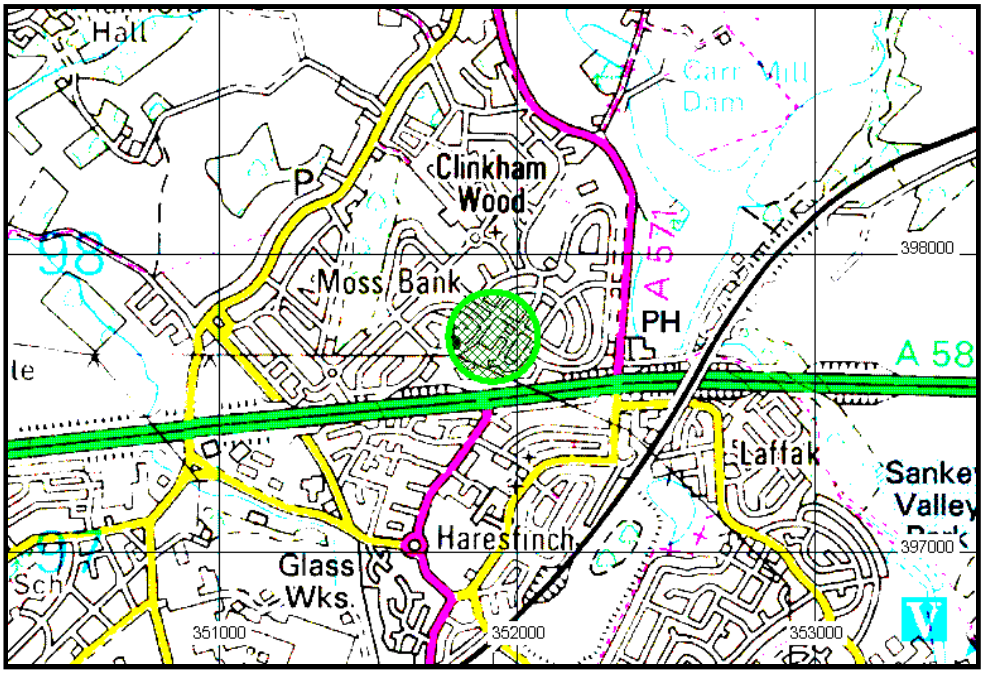
Issued by:	The Coal Authority, 200 Lichfield Lane, Mansfield, Nottinghamshire, NG18 4RG
Date:	20 Feb 2008
Ground stability report at:	Small Plot Off, Eskdale Avenue, Carr Mill, St Helens, Merseyside
Reference number:	00013780-08
Cost:	£42.56
Plus VAT:	£7.44
Total received:	£50.00
VAT registration number:	598 5850 68

Location map

Approximate position of property



Enquiry boundary

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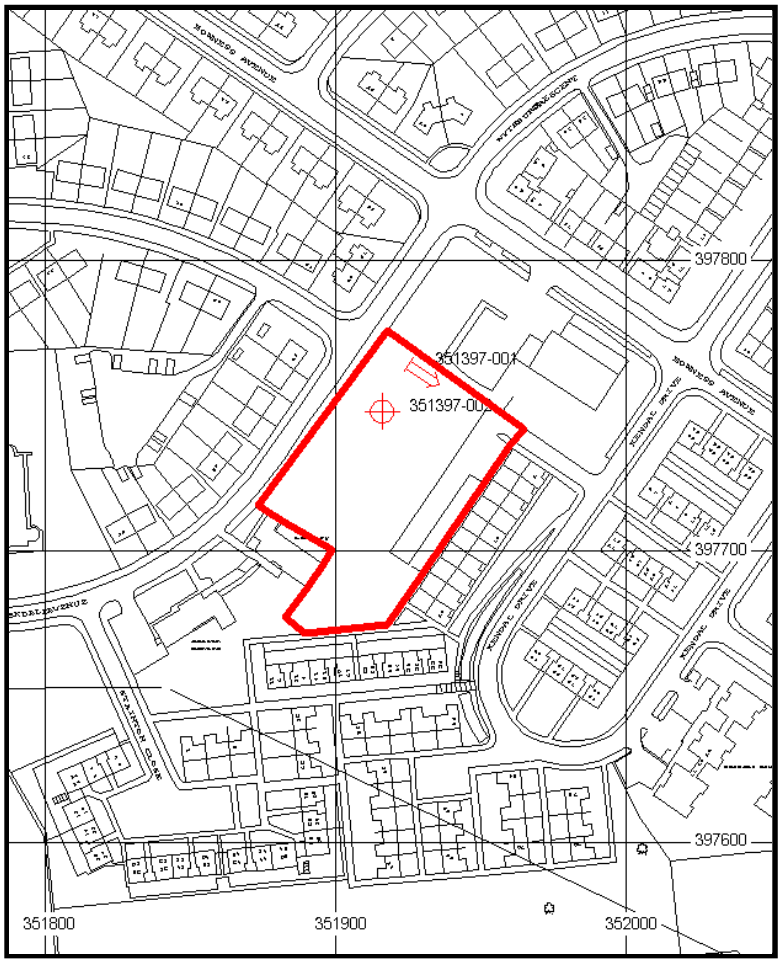

Key

Approximate position of enquiry boundary shown

Disused Adit or Mineshaft

Mapping sourced from Ordnance Survey

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APPENDIX C

SUBSURFACE GEOTECHNICAL REPORT

RECEIVED
10 APR 2008

SUBSURFACE Geotechnical

GEOPHYSICAL
GEOLOGICAL
& MATERIAL
CONSULTANTS

Report No. 447

April 2008

Ground Probing Radar Survey of Eskdale Avenue, St Helens

First Floor Suite St Swithins House Trinity Street Worcester WR1 2PW Tel. 01905 619531 Fax. 01905 619532
www.subsurfacegeotechnical.co.uk

1. Introduction

This report presents the results of a Ground Probing Radar (GPR) investigation of a plot of land in Eskdale Avenue, Carr Mill, St Helens, Merseyside. The investigation was commissioned by the Urban Vision Partnership Ltd. The geophysical site work was carried out on the 19th March 2008.

The plot of land is located opposite numbers 37 – 47 Eskdale Avenue. The land formerly belonged to the Coal Board when coal mining was active in the area. Following closure and decommissioning the land was grassed over and is now used as a public recreational facility. During a recent desk study, two potential mine entries were reported on the site by a Coal Authority report.

The objective of the geophysical survey was to search for voids associated with abandoned near surface mine workings. Local ground conditions are believed to be topsoil overlying about one metre of sandy superficial material, underlain by Coal Measures bedrock.

2. The Ground Probing Radar Method

The Ground Probing Radar (GPR) method utilises UHF/VHF electromagnetic pulses to produce graphic depth sections. It can be considered as an electromagnetic analogy of marine sonar. GPR has many useful applications in the field of shallow, land based site investigation. Examples include the detection and location of voids and buried obstructions; the mapping of geological interfaces such as soil or rock layering and depth to bedrock; identifying ancient landfill, and examining archaeological sites. GPR is also used as a non-destructive way of investigating building materials to locate reinforcing, voids, delaminations and internal layering within concrete and masonry.

The GPR system consists of an antenna unit, a signal control and processing unit with a built in monitor, and a graphic recorder. The system is powered from a 12V DC battery source. During survey operations, only the antenna unit is in direct contact with the structure, with the other equipment normally stored on a trolley or vehicle.

The resolution and depth range of the GPR system is dependent on the frequency of the antenna units used. Higher frequency antennas provide the optimum resolution of hidden features, but generally have a limited depth range. Conversely, low frequency antenna units have greater depth range, but lower resolving power. Antenna units in general use have centre frequencies of 80 MHz - 1.5 GHz. The actual depth range of the system also depends on the conductivity of the medium through which the signal is propagated.

The method operates by transmitting impulses of electromagnetic energy from the antenna, which is moved in traverses over the ground or material under investigation. When a pulse arrives at a boundary between electrically contrasting materials within the medium, part of the pulse energy is reflected, with the remainder transmitted through the interface (Fig. 1). The reflected signals are detected by the antenna unit, and then sent via an umbilical cable to the signal processing and recording equipment.

Digital radar systems sample and record the reflected waveforms digitally. This enables the data to be viewed on a colour monitor in various modes, such as variably shaded or coloured straight lines, or wiggle traces, which are direct analogues of the reflected pulse (Fig. 2). Successive reflection waveforms are recorded continuously by the radar system, to build up a composite record of the section under investigation.

The signals are also digitally stored on the system hard disk, facilitating the use of data processing programmes to enhance and improve the quality of the data. Generally, relatively little processing is done in the field apart from basic filtering, to prevent the erroneous removal of potentially useful data. Consequently most processing is done post-survey back at the office.

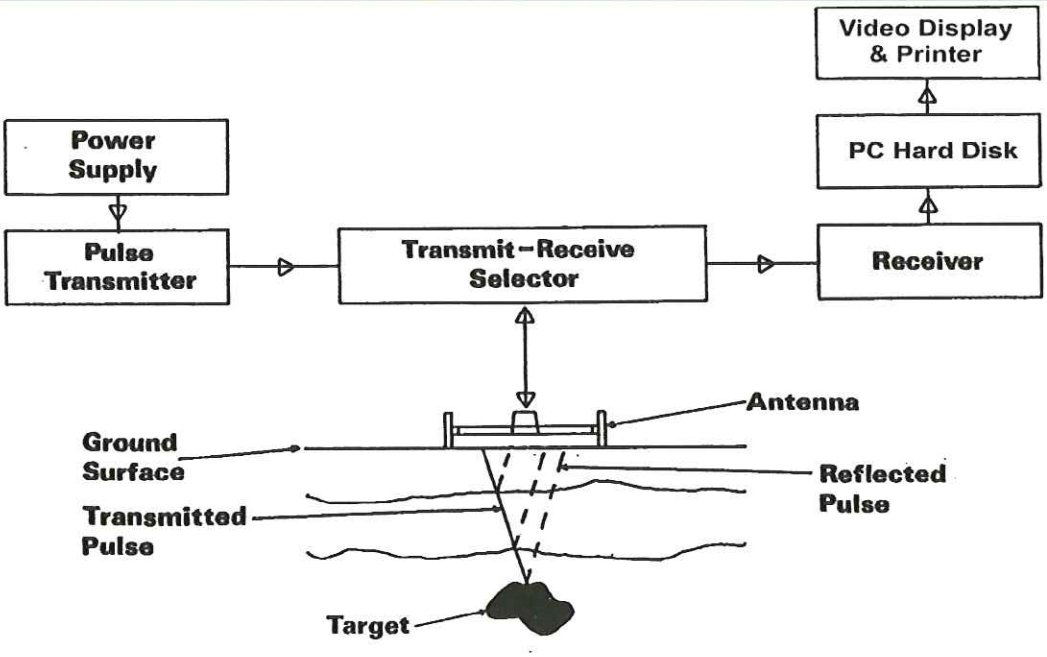


Fig. 1 Block diagram of a digital ground probing radar system. The lower part of the diagram shows how radar reflections are produced

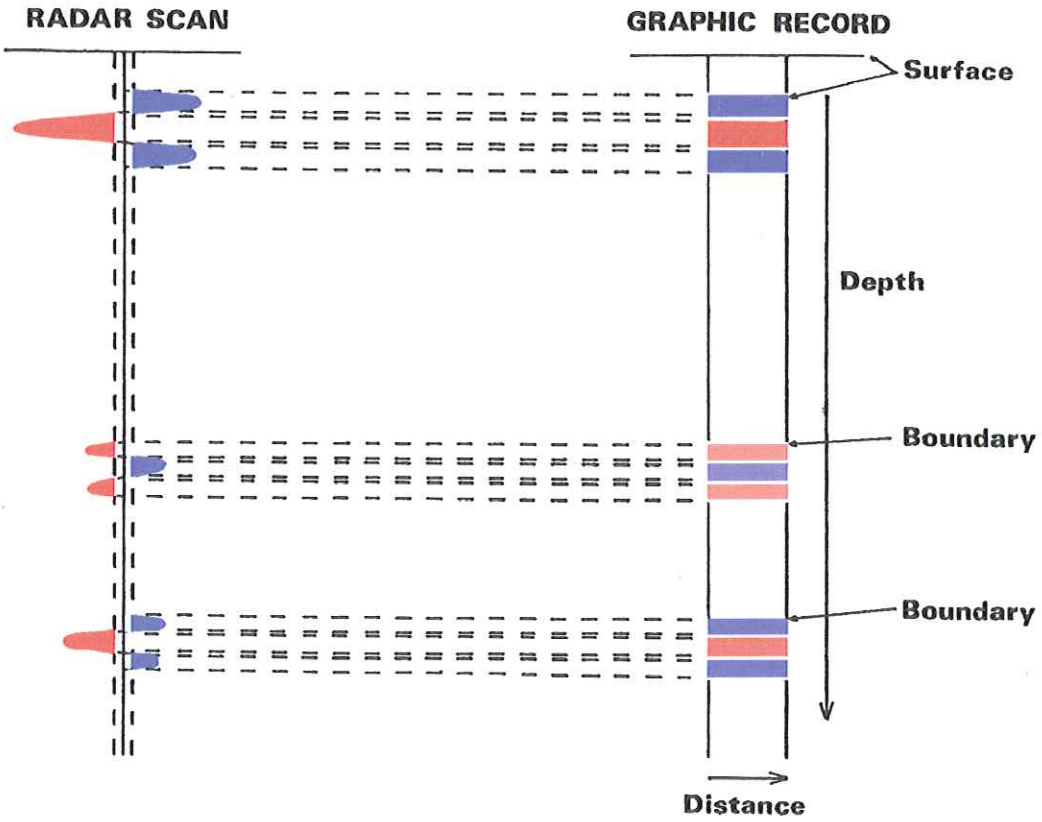


Fig. 2 A diagram showing how radar reflections are represented on a graphic print-out or PC display

Accurate depth profiles are obtained by moving the antenna along marked survey lines, producing a two-dimensional image of reflecting boundaries below the survey line. The horizontal scale is obtained by marking regular intervals of distance along the profile, using a marker switch. The vertical time axis is calibrated in nanoseconds per centimetre, and converted to depth by using standard equations. The radar record produced is therefore a graph of reflection time against distance along the survey line.

GPR is most effective at detecting reflections between two different materials where a clear dielectric contrast is present at the interface. The method is not normally able to identify transitional or gradational boundaries. The reflected events on the record can be correlated with physical interfaces within the ground such as layering, air cavities or bedrock, by the careful application of interpretation techniques.

It should be understood that the interpretation of ground probing radar data are opinions based on inferences from electromagnetic measurements, factors and assumptions, and that such inferences are not infallible. For the foregoing reasons and because of the uncertainty of variable ground conditions, it is not possible to guarantee the accuracy of any interpretation. Such interpretation should not be relied upon as the sole basis for construction or financial decision.

3. Survey Procedure

The Ground Probing Radar (GPR) survey was carried out using the SIR 2000 Ground Probing Radar System manufactured by GSSI Inc., New Hampshire, USA. The SIR 2000 was used in conjunction with a 200 MHz antenna unit; selected to provide the optimum combination of good depth penetration and sufficient resolution for detecting large buried voids.

The investigation was referenced from a base line constructed on the north-west side of the site. A parallel series of NE/SW trending radar profiles were carried out over the site spaced at 1.5 metre intervals, where access allowed. A preliminary review of the GPR profiles was undertaken on site for targeting transverse NE/SW trending profiles over potentially anomalous areas. The cover page shows a transverse GPR profile in progress on the north-east side of the site.

The survey coverage was impeded by dense vegetation growing by the wall near the north-east corner of the site, which prevented access in this area.

The positions of all the GPR profiles completed, together with the survey base line are presented in Fig. 4 at a scale of 1 : 200, using a base diagram supplied by Urban Vision.

4. Interpretation of the Results

4.1 Introduction

Most ground conditions contain electrically contrasting layers that produce reflection events on the Ground Probing Radar (GPR) profiles. Features such as soil or fill boundaries provide the background signals against which anomalous features such as voids and obstructions are identified. The processing and interpretation procedure is designed to separate radar reflections into various target categories, and then to map the different targets on to plan diagrams. This process involves the interpretation of each individual radar profile, followed by an areal interpretation of all the radar profiles. Features identified across several profiles are interpolated, in areas where the data is well constrained.

The confidence levels that can be placed on a plan interpretation depend to a great extent upon the line spacing of the survey grid. A target such as a void must be intersected by at least one radar profile to be detected. Ideally the survey line spacing should allow any targets of interest to be intersected by several profiles. It is not usually possible to obtain total survey coverage of a site. Consequently the survey line spacing is selected to provide a good indication of site conditions and allow for available access.

The method used to detect voids depends on identifying the strong electrical changes associated with void targets. The large electrical contrast between air and solid materials generates a very high amplitude response, which should be clearly identifiable against background reflections. Void reflections may also be associated with ringing, caused by reverberation of the radar pulse within the void. The amplitude of the reflected signal diminishes significantly if a void is partially filled by rubble or sediment.

No obvious void targets were detected by the GPR survey on the site. Three significant categories of radar reflections were identified by the GPR survey.

i) Possible structure
ii) Disturbed ground
iii) Deep disturbed fill

4.2 Possible Structure

This reflection category typically consists of planar or curved, moderate to high amplitude reflections with discrete margins. Small structures tend to have more hyperbolic shaped reflections caused by edge scattering. An example of this reflection category is shown in Fig. 3ii.

4.3 Disturbed Ground

This reflection category is characterised by moderate-high amplitude, irregular heterogeneous reflections showing broken layering or a chaotic internal structure. Due to the chaotic reflection characteristics associated with this type of ground, it is often difficult to identify individual features within zones of disturbed ground. It is possible that some targets present within these areas may not have been detected by the GPR survey. Figs. 3ii and 3iii present examples of the disturbed ground reflection category.

4.4 Deep Disturbed Fill

Deep disturbed fill bears some similarity to the disturbed ground reflection category described in Section 4.3. However the reflections are much higher in amplitude, the layer disruption is denser, more intensive and extends to a greater depth, usually to the base of the record. The boundaries of zones of deep disturbed fill are often fairly discrete and vertically oriented. An example of the deep disturbed fill reflection category is given in Fig. 3i.

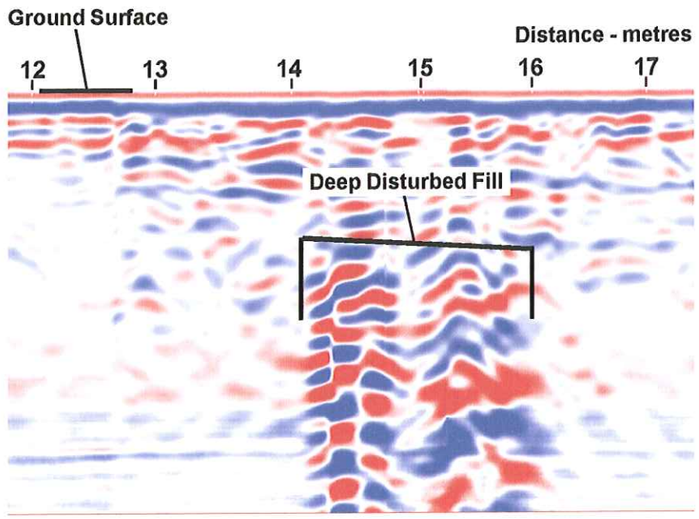
4.5 Data Calibration

Once the reflection events correlating to potential targets have been identified, the reflection times on the radar records can be calibrated into depths using a standard two-way time conversion equation.

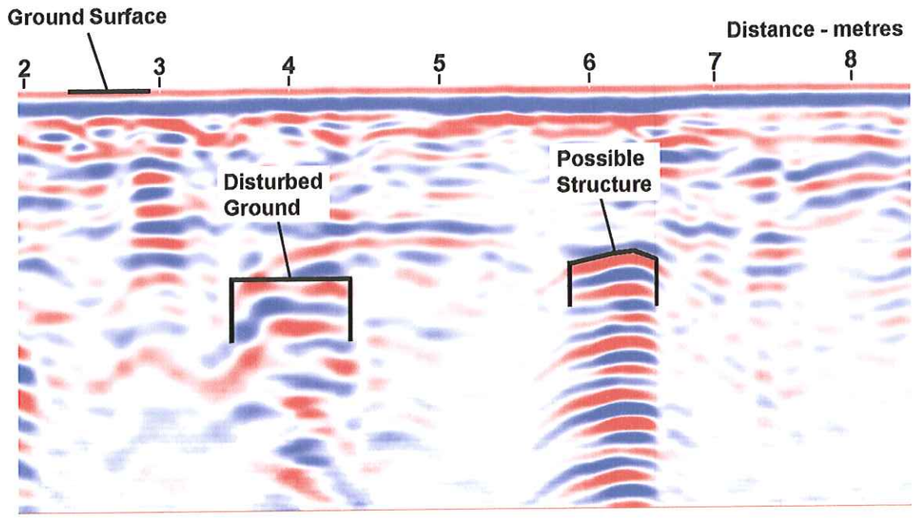
In the absence of accurately located borehole or test pit information, the GPR profiles were calibrated using a propagation velocity of 0.1 m/ns. This is an estimated velocity value for the sandy made ground believed to be covering the site.

The depths in metres to the tops of the GPR targets are presented on the plan interpretation. It is estimated that the cover depths to the tops of the targets are accurate to roughly $\pm$ 30%.

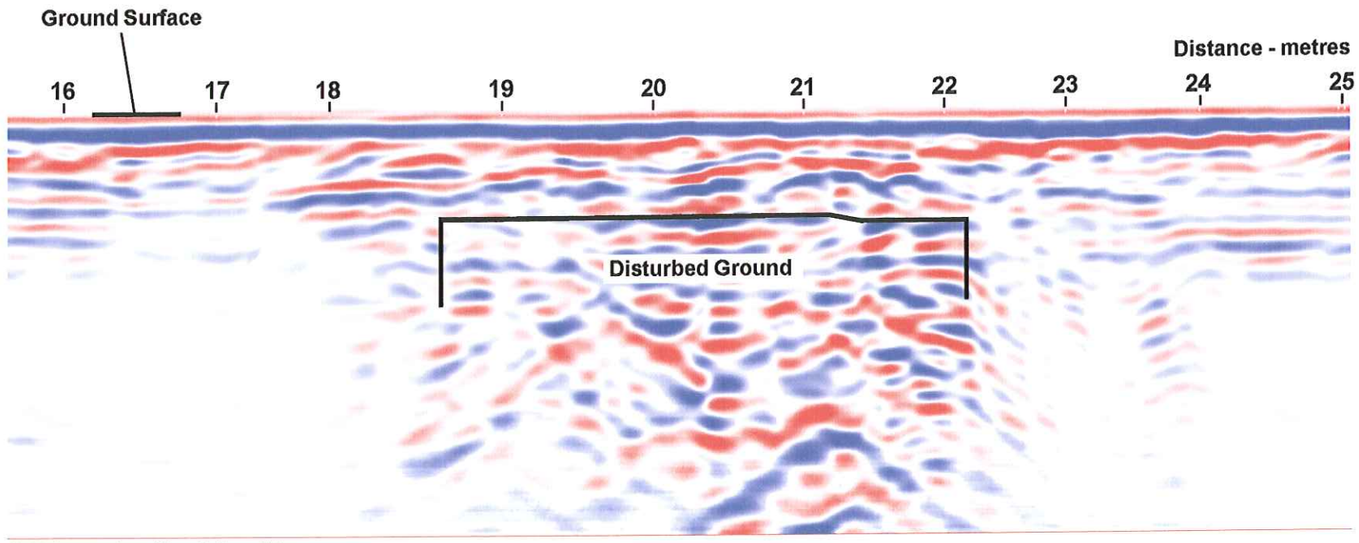
Fig. 3 Example GPR Profiles, Eskdale Avenue, St Helens



(i) Transverse Profile



(ii) Longitudinal Profile



(iii) Longitudinal Profile

5. Summary of Results

The results of the Ground Probing Radar (GPR) survey of Eskdale Avenue, Carr Mill, St Helens are presented as a plan interpretation in Fig. 4 at a scale of 1 : 200. Three significant categories of radar reflection targets were identified by the GPR survey.

i) Possible structure
ii) Disturbed ground
iii) Deep disturbed fill

The boundaries of the targets have been interpolated between survey lines in areas where the data was well constrained. The depths of cover to the tops of the targets have been plotted on the plan interpretation. All GPR anomalies should be relocated by referencing from the survey baseline and the wall forming the north-east site boundary shown in Fig. 4.

The maximum depth range achieved by the GPR survey was approximately four metres below ground level. Any targets below this depth would be beyond the range of the GPR survey. There was no clear evidence of any large void targets present on the site.

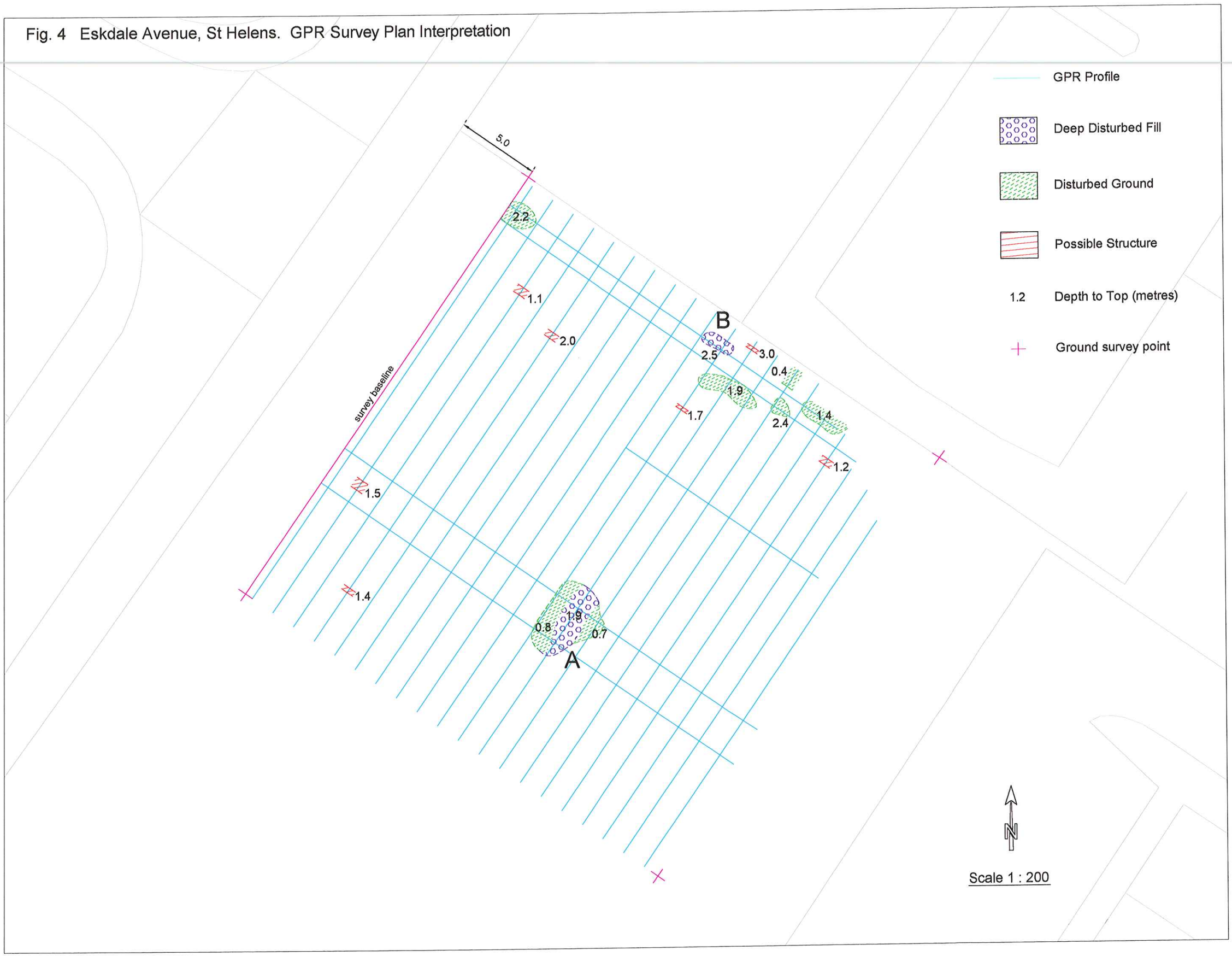
The most significant target detected is the large composite zone of disturbed ground with a central core of deep disturbed fill (target A), located in the middle of the southern half of the site. This feature is almost 5 metres long and broadly coincides with a depression visible on the ground surface. Possible causes of target A would include a collapsing mineshaft, a crownhole, or deep former excavation that was poorly compacted when backfilled.

A second smaller area of deep disturbed fill (target B) is located close to the wall forming the north-eastern site boundary. This zone of deep disturbed fill is roughly 2 metres long. The nature of this anomaly is uncertain. There are three nearby areas of disturbed ground to the south-east of target B. Disturbed ground is caused by factors such as changes in ground composition, backfilled excavations or possibly areas of slight ground settlement. One other area of disturbed ground is located by the northern corner of the site, near the grid origin.

Any other potential mine workings present beneath the site would be beyond the maximum depth range of the GPR survey.

The small buried structures scattered around the site are probably indicative of features such as concrete or masonry blocks or larger pieces of scrap metal.

Fig. 4 Eskdale Avenue, St Helens. GPR Survey Plan Interpretation



APPENDIX D

HAND AUGER LOGS AND PHOTOGRAPHS

urbanvision	Job No.	6561	Hand Auger Log	HA801

Project:	Small plot of land off Eskdale Avenue, Carr Mill, St Helens		
Client:	St Helens MBC	**Eastings (m):**	351893.9
Excavation Method:	Hand auger	**Northings (m):**	397732.224
Weather:	Sunny	**Elevation (m AOD):**	52.624
Logged By:	G. Sanderson	**Date:**	22/04/2008

Depth (m bgl)	Elev (mAOD)	Legend	Description	Sample Ref	Elev Contaminants (above SGV/GAC)
0.10	52.5		MADE GROUND: Topsoil comprising soft dark brown sandy CLAY with frequent rootlets.	HA801 - CS1	
0.45	52.2		MADE GROUND: Dark brown slightly gravelly clayey fine SAND with frequent gravel size pockets of clay and occassional rootlets. Gravel is fine to medium, angular to subrounded and consists of ash and glass.		
1.00	51.6		MADE GROUND: Mottled orange, grey and light brown slightly gravelly clayey fine to medium SAND with frequent pockets of clay and occassional rootlets. Gravel is fine to medium, subangular to subrounded and consist of ash.		

Remarks :Hand auger hole completed at 1.00m bgl.

1:10	Prepared By :G. Sanderson	Checked By :K. Harries	Page 1 of 1

urbanvision	Job No.	6561	Hand Auger Log	HA802

Project:	Small plot of land off Eskdale Avenue, Carr Mill, St Helens		
Client:	St Helens MBC	**Eastings (m):**	351913.541
Excavation Method:	Hand auger	**Northings (m):**	397758.017
Weather:	Sunny	**Elevation (m AOD):**	53.696
Logged By:	G. Sanderson	**Date:**	22/04/2008

Depth (m bgl)	Elev (mAOD)	Legend	Description	Sample Ref	Elev Contaminants (above SGV/GAC)
0.10	53.6		MADE GROUND: Topsoil comprising dark brown slightly clayey fine to medium SAND with occassional rootlets and gravel of mudstone.		
0.70	53.0		MADE GROUND: Dark brown with occassional orange slightly clayey gravelly fine to corase SAND with rare rootlets and pockets of clay. Gravel is fine to medium, angular to subrounded and consists of ash, mudstone, glass, sandstone and slag.	HA802 - CS1	As and Cu
0.90	52.8		Orange slightly clayey fine to coarse SAND with occassional gravel of mudstone.	HA802 - CS2	
1.00	52.7		Stiff orange, blue, grey sandy CLAY.		

Remarks :Hand auger hole completed at 1.00m bgl.

1:10	Prepared By :G. Sanderson	Checked By :K. Harries	**Page 1 of 1**

urbanvision	Job No.	6561	Hand Auger Log	HA803

Project:	Small plot of land off Eskdale Avenue, Carr Mill, St Helens		
Client:	St Helens MBC	**Eastings (m):**	351912.17
Excavation Method:	Hand auger	**Northings (m):**	397735.68
Weather:	Sunny	**Elevation (m AOD):**	52.322
Logged By:	G. Sanderson	**Date:**	22/04/2008

Depth (m bgl)	Elev (mAOD)	Legend	Description	Sample Ref	Elev Contaminants (above SGV/GAC)
0.15	52.2		MADE GROUND: Topsoil comprising dark brown slightly clayey fine to medium SAND with ocassional rootlets.		
0.50	51.8		MADE GROUND: Dark brown with some orange slightly gravelly clayey fine to coarse SAND with frequent gravel sized pockets of clay and occassional rootlets. Gravel is fine to coarse, angular to subrounded and consists of ash, sandstone, wood and mudstone.	HA803 - CS1	
0.80	51.5		MADE GROUND: Brown slightly gravelly clayey fine to coarse SAND. Gravel is fine to medium subangular to subrounded and consists of ash, slag and sandstone.		
1.00	51.3		Soft mottled orange, grey and blue sandy CLAY with occasional gravel of mudstone.	HA803 - CS2	

Remarks :Hand auger hole completed at 1.00m bgl.

1:10	Prepared By :G. Sanderson	Checked By :K. Harries	Page 1 of 1

urbanvision	Job No.	6561	Hand Auger Log	HA804

Project:	Small plot of land off Eskdale Avenue, Carr Mill, St Helens		
Client:	St Helens MBC	**Eastings (m):**	351935.567
Excavation Method:	Hand auger	**Northings (m):**	397760.023
Weather:	Sunny	**Elevation (m AOD):**	52.945
Logged By:	G. Sanderson	**Date:**	22/04/2008

Depth (m bgl)	Elev (mAOD)	Legend	Description	Sample Ref	Elev Contaminants (above SGV/GAC)
0.10	52.8		MADE GROUND: Topsoil comprising dark brown slightly gravelly clayey fine to medium SAND with frequent rootlets.		
0.70	52.2		MADE GROUND: Dark brown, black, occassional orange slightly gravelly clayey SAND with rare rootlets. Gravel is fine to medium, angular to subrounded and consists of ash, coal, sandstone and mudstone.	HA804 - CS1	
0.90	52.0		Orange slightly clayey fine to coarse SAND with occassional gravel of mudstone.		
1.05	51.9		Soft mottled orange, grey and light brown sandy CLAY.		

Remarks :Hand auger hole completed at 1.05m bgl.

1:10	Prepared By :G. Sanderson	Checked By :K. Harries	Page 1 of 1

urbanvision	Job No.	6561	Hand Auger Log	HA805

Project:	Small plot of land off Eskdale Avenue, Carr Mill, St Helens		
Client:	St Helens MBC	**Eastings (m):**	351906.601
Excavation Method:	Hand auger	**Northings (m):**	397679.262
Weather:	Sunny	**Elevation (m AOD):**	48.954
Logged By:	G. Sanderson	**Date:**	22/04/2008

Depth (m bgl)	Elev (mAOD)	Legend	Description	Sample Ref	Elev Contaminants (above SGV/GAC)
0.10	48.9		MADE GROUND: Topsoil comprising dark brown clayey fine to medium SAND with frequent rootlets and occassional gravel of brick.		
0.35	48.6		MADE GROUND: Dark brown slightly clayey gravelly fine to coarse SAND. Gravel is fine to coarse, angular to subangular and consists of brick, ash, sandstone and potentially mudstone.	HA805 - CS1	
0.50	48.5		MADE GROUND: Dark brown clayey fine to medium SAND with occasssional gravel of ash and mudstone.		
1.00	48.0		Mottled orange, grey, light brown fine to coarse SAND with occassional / rare pockets of clay.	HA805 - CS2	

Remarks :Hand auger hole completed at 1.00m bgl.

1:10	Prepared By :G. Sanderson	Checked By :K. Harries	Page 1 of 1

urbanvision	Job No.	6561	Hand Auger Log	HA806

Project:	Small plot of land off Eskdale Avenue, Carr Mill, St Helens		
Client:	St Helens MBC	**Eastings (m):**	351917.416
Excavation Method:	Hand auger	**Northings (m):**	397699.825
Weather:	Sunny	**Elevation (m AOD):**	49.92
Logged By:	G. Sanderson	**Date:**	22/04/2008

Depth (m bgl)	Elev (mAOD)	Legend	Description	Sample Ref	Elev Contaminants (above SGV/GAC)
0.10	49.8		MADE GROUND: Topsoil comprising dark brown slightly gravelly clayey SAND with occassional rootlets and gravel of brick.	HA806 - CS1	BaP, As, Cd and Zn
0.25	49.7		MADE GROUND: Dark brown gravelly fine to coarse SAND. Gravel is fine to coarse, angular to subangular and consists of brick, ceramics, mudstone, sandstone, metal wire, ash and glass.		

Remarks :Attempts 1, 2 and 3 failed due to gravel (including brick). Fourth attempt failed after 0.25m bgl. Due to gravel.

1:10	Prepared By :G. Sanderson	Checked By :K. Harries	**Page 1 of 1**

urbanvision	Job No.	6561	Hand Auger Log	HA807

Project:	Small plot of land off Eskdale Avenue, Carr Mill, St Helens		
Client:	St Helens MBC	**Eastings (m):**	351938.687
Excavation Method:	Hand auger	**Northings (m):**	397739.004
Weather:	Sunny	**Elevation (m AOD):**	51.312
Logged By:	G. Sanderson	**Date:**	22/04/2008

Depth (m bgl)	Elev (mAOD)	Legend	Description	Sample Ref	Elev Contaminants (above SGV/GAC)
0.10	51.2		MADE GROUND: Topsoil comprising dark brown slightly gravelly clayey fine to medium SAND with frequent rootlets.		
0.35	51.0		MADE GROUND: Dark brown slightly gravelly clayey fine to coarse SAND. Gravel is fine to medium, angular to subrounded and consists of glass, sandstone, ash and plastic fragments.	HA807 - CS1	

Remarks :Attempts 1, 2 and 3 failed due to gravel (including brick). Fourth attempt failed after 0.35m bgl. Due to gravel/ solid geology.

1:10	Prepared By :G. Sanderson	Checked By :K. Harries	**Page 1 of 1**

Hand Auger Photographs

HA801

HA802

HA803

HA804

HA805

HA806

HA807

APPENDIX E

DRILLERS ROTARY LOGS

SINTEC GEOTHERMAL

Geothermal Drilling Contractors

Unit 4, Bridge Mills, Rochdale Road, Edenfield, Ramsbottom, BURY, Lancs. BL0 0RE

w. www.sintec-environmental.co.uk e. info@sintec-environmental.co.uk

t. 01706 281414 t/f. 01706 281414 mob. 07966 432224

TO: MR K. HARRIES
URBAN VISION PARTNERSHIP LIMITED

RE: SMALL PLOT OF LAND OFF ESKDALE AVENUE, ST HELENS

BH801

G.L. – 0.8m	Grass over fill consisting of soil, brick & clay
0.8m – 1.5m	Grey silty sand
1.5m – 2.2m	Brown / grey firm clay
2.2m – 3.0m	Light grey mudstone (firm drilling)
3.0m – 4.5m	Brown sandstone (firm to hard drilling)
4.5m – 5.0m	Light grey mudstone (firm drilling)

INSTALLATION DETAILS:

BASE TO GROUND LEVEL – BENTONITE SEAL

CO-ORDINATES:

Easting	351893
Northing	397717
Elevation	51.68

SINTEC GEOTHERMAL

Geothermal Drilling Contractors

Unit 4, Bridge Mills, Rochdale Road, Edenfield, Ramsbottom, BURY, Lancs. BL0 0RE

w. www.sintec-environmental.co.uk e. info@sintec-environmental.co.uk

t. 01706 281414 t/f. 01706 281414 mob. 07966 432224

TO: MR K. HARRIES
URBAN VISION PARTNERSHIP LIMITED

RE: SMALL PLOT OF LAND OFF ESKDALE AVENUE, ST HELENS

BH802

G.L. – 0.8m	Grass over sandy soil with brick fragments
0.8m – 1.2m	Soft, damp, sandy brown clay
1.2m – 1.5m	firm, brown, orange & grey mottled sandy clay
1.5m – 2.2m	Coal dust – weak to firm drilling, no loss (possibly tipped)
2.2m – 3.4m	Brown weathered sand-stone (firm drilling)
3.4m – 5.0m	Light grey mudstone (firm drilling)

INSTALLATION DETAILS:

BASE TO GROUND LEVEL – BENTONITE SEAL

CO-ORDINATES:

Easting	351910
Northing	397739
Elevation	52.53

SINTEC GEOTHERMAL

Geothermal Drilling Contractors

Unit 4, Bridge Mills, Rochdale Road, Edenfield, Ramsbottom, BURY, Lancs. BL0 0RE

w. www.sintec-environmental.co.uk e. info@sintec-environmental.co.uk

t. 01706 281414 t/f. 01706 281414 mob. 07966 432224

TO: MR K. HARRIES
URBAN VISION PARTNERSHIP LIMITED

RE: SMALL PLOT OF LAND OFF ESKDALE AVENUE, ST HELENS

BH803

G.L. – 0.8m	Grass over very sandy soil with brick fragments
0.8m – 1.8m	Grey, brown & orange mottled firm sandy clay
1.8m – 2.4m	Brown weathered sand-stone (firm drilling)
2.4m – 4.3m	Light grey mudstone (firm drilling)
4.3m – 5.0m	Coal – no loss – no void (firm drilling)
5.0m – 6.0m	Light grey mudstone (firm drilling)

INSTALLATION DETAILS:

BASE TO GROUND LEVEL – BENTONITE SEAL

CO-ORDINATES:

Easting	351920
Northing	397755
Elevation	53.35

SINTEC GEOTHERMAL

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TO: MR K. HARRIES
URBAN VISION PARTNERSHIP LIMITED

RE: SMALL PLOT OF LAND OFF ESKDALE AVENUE, ST HELENS

BH804

G.L. – 0.4m	Grass over soil
0.4m – 1.3m	Silty grey sand
1.3m – 3.2m	Orange, brown & grey mottled sandy firm clay
3.2m – 5.5m	Light grey mudstone (firm drilling)
5.5m – 6.5m	Coal (loose drilling – losing flush)
6.5m – 7.5m	Light grey mudstone (firm drilling)

INSTALLATION DETAILS:

BASE TO GROUND LEVEL – BENTONITE SEAL

CO-ORDINATES:

Easting	351912
Northing	397702
Elevation	50.20

SINTEC GEOTHERMAL

Geothermal Drilling Contractors

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TO: MR K. HARRIES
URBAN VISION PARTNERSHIP LIMITED

RE: SMALL PLOT OF LAND OFF ESKDALE AVENUE, ST HELENS

BH805

G.L. – 0.2m	Grass over soil
0.2m – 1.4m	Made ground consisting of sandy clay, soil & brick
1.4m – 2.2m	Orange, brown & grey mottled sandy firm clay
2.2m – 2.8m	Grey firm stiff grey clay with traces of brown & grey mudstone gravels
2.8m – 2.9m	Brown mudstone
2.9m – 5.2m	Light grey mudstone (firm drilling)
5.2m – 6.7m	Coal – weak to firm drilling – temporary flush loss
6.7m – 7.5m	Light grey mudstone

INSTALLATION DETAILS:

BASE TO GROUND LEVEL – BENTONITE SEAL

CO-ORDINATES:

Easting	351928
Northing	397728
Elevation	51.43

SINTEC GEOTHERMAL

Geothermal Drilling Contractors

Unit 4, Bridge Mills, Rochdale Road, Edenfield, Ramsbottom, BURY, Lancs. BL0 0RE

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Vat Number: 899 9518 26 Company Registered Number: 05961146

TO: MR K. HARRIES
URBAN VISION PARTNERSHIP LIMITED

RE: SMALL PLOT OF LAND OFF ESKDALE AVENUE, ST HELENS

BH806

G.L. – 1.2m	Grass over fill consisting of soil, brick & clay
1.2m – 1.8m	Orange, brown & grey mottled sandy clay
1.8m – 2.9m	Coal – no loss or void
2.9m – 7.5m	Light grey mudstone (firm drilling)

INSTALLATION DETAILS:

BASE TO GROUND LEVEL – BENTONITE SEAL

CO-ORDINATES:

Easting	351928
Northing	397748
Elevation	52.64

Vat Number: 899 9518 26 Company Registered Number: 05961146

SINTEC GEOTHERMAL

Geothermal Drilling Contractors

Unit 4, Bridge Mills, Rochdale Road, Edenfield, Ramsbottom, BURY, Lancs. BL0 0RE

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TO: MR K. HARRIES
URBAN VISION PARTNERSHIP LIMITED

RE: SMALL PLOT OF LAND OFF ESKDALE AVENUE, ST HELENS

BH807

G.L. – 0.6m	Grass over soil with brick fill
0.6m – 1.0m	Silty grey sand
1.0m – 3.0m	Orange, brown & grey mottled firm clay
3.0m – 5.4m	Dark grey mudstone (firm drilling)
5.4m – 8.2m	Light grey mudstone (firm drilling)
8.2m – 9.2m	Coal (firm to weak drilling) no loss – no void
9.2m – 10.2m	Light grey mudstone (firm drilling)

INSTALLATION DETAILS:

BASE TO GROUND LEVEL – BENTONITE SEAL

CO-ORDINATES:

Easting	351926
Northing	397693
Elevation	49.19

SINTEC GEOTHERMAL

Geothermal Drilling Contractors

Unit 4, Bridge Mills, Rochdale Road, Edenfield, Ramsbottom, BURY, Lancs. BL0 0RE

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TO: MR K. HARRIES
URBAN VISION PARTNERSHIP LIMITED

RE: SMALL PLOT OF LAND OFF ESKDALE AVENUE, ST HELENS

BH808

G.L. – 0.9m	Grass over fill consisting of soil, clay, tarmac & bricks
0.9m – 2.2m	Grey, silty very sandy clay
2.2m – 5.6m	Dark grey mudstone (firm drilling)
5.6m – 8.5m	Light grey mudstone (firm drilling)
8.5m - 9.6m	Coal (loose drilling – temporary loss of flush)
9.6m – 10.5m	dark grey mudstone (firm drilling)

INSTALLATION DETAILS:

BASE TO GROUND LEVEL – BENTONITE SEAL

CO-ORDINATES:

Easting	351942
Northing	397718
Elevation	50.29

SINTEC GEOTHERMAL

Geothermal Drilling Contractors

Unit 4, Bridge Mills, Rochdale Road, Edenfield, Ramsbottom, BURY, Lancs. BL0 0RE

w. www.sintec-environmental.co.uk e. info@sintec-environmental.co.uk

t. 01706 281414 t/f. 01706 281414 mob. 07966 432224

TO: MR K. HARRIES
URBAN VISION PARTNERSHIP LIMITED

RE: SMALL PLOT OF LAND OFF ESKDALE AVENUE, ST HELENS

BH809

G.L. – 1.0m	Grass over made ground of bricks, clay, concrete & ash
1.0m – 1.3m	Orange, brown & grey sandy mottled clay
1.3m – 4.2m	Dark grey mudstone (firm drilling)
4.2m – 7.5m	Light grey mudstone (firm drilling)
7.5m – 8.8m	Coal – no loss – no void (weak to firm drilling)
8.8m – 10.0m	Light grey mudstone (firm drilling)

INSTALLATION DETAILS:

BASE TO GROUND LEVEL – BENTONITE SEAL

CO-ORDINATES:

Easting	351943
Northing	397737
Elevation	50.94

APPENDIX F

SOIL CONTAMINATION RESULTS

UKAS TESTING 4041

mCERTS

environmentalscience

Kristoffer Harries
Urban Vision Partnership Ltd
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Building 19,
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WD25 9XX

t: 01923 67 00 20
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e: info@i2analytical.com

Analytical Report Number : 08-14763

Project / Site name:	Plot 2-Eskdale Avenue	**Samples received on:**	28/04/2008
Your job number:	6561	**Samples instructed on:**	24/04/2008
Your order number:	ZUVG6561C1	**Analysis completed by:**	12/05/2008
Report Issue Number:	1	**Report issued on:**	12/05/2008
Samples Analysed:	6 soil samples		

Signed:

Russell Jarvis
General Manager
For & on behalf of i2 Analytical Ltd.

Signed:

Kevin Old
Quality Manager
For & on behalf of i2 Analytical Ltd.

Other office located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland

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The results included within the report are representative of the samples submitted for analysis.

UKAS TESTING 4041

MCERTS

environmentalscience

Analytical Report Number: 08-14763

Project / Site name: Pot 2-Eskdale Avenue

Lab Sample Number				103895	103896	103897	103898	103899
Sample Reference				HA801	HA802	HA804	HA805	HA806
Sample Number				CS1	CS1	CS1	CS1	CS1
Depth				0.10-0.45	0.10-0.70	0.10-0.70	0.10-0.35	0.10-0.25
Date Sampled				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Moisture Content	%	N/A	NONE	15	14	16	16	19
Total mass of sample recieved	kg	2	NONE	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Asbestos (Screen)	P/A	N/A	NONE	Not Suspected	Not Suspected	Not Suspected	Not Suspected	Not Suspected
General Inorganics								
pH	pH Units	N/A	MCERTS	7.0	6.9	6.8	6.8	6.5
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Sulphate as SO_4	mg/kg	100	MCERTS	150	340	500	460	1100
Sulphide	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Elemental Sulphur	mg/kg	20	MCERTS	< 20	< 20	< 20	< 20	< 20
Fraction Organic Carbon (FOC)		0.001	NONE	0.0076	0.014	0.018	0.017	0.032
Total Phenols								
Total Phenols (monohydric)	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	ISO 17025	< 0.05	< 0.05	< 0.05	< 0.05	0.73
Acenaphthylene	mg/kg	0.2	ISO 17025	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Acenaphthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	1.7
Fluorene	mg/kg	0.2	ISO 17025	< 0.20	< 0.20	< 0.20	< 0.20	0.86
Phenanthrene	mg/kg	0.3	ISO 17025	< 0.30	0.46	0.37	< 0.30	4.6
Anthracene	mg/kg	0.1	ISO 17025	0.13	< 0.10	< 0.10	< 0.10	0.62
Fluoranthene	mg/kg	0.2	MCERTS	0.38	1.6	0.98	0.43	6.1
Pyrene	mg/kg	0.2	ISO 17025	0.31	1.4	0.91	0.38	5.2
Benzo(a)anthracene	mg/kg	0.2	MCERTS	0.30	0.60	0.91	0.40	2.2
Chrysene	mg/kg	0.3	ISO 17025	0.42	0.76	1.2	0.55	2.7
Benzo(b)fluoranthene	mg/kg	0.5	ISO 17025	< 0.50	2.0	1.3	< 0.50	6.4
Benzo(k)fluoranthene	mg/kg	0.2	ISO 17025	0.33	1.6	1.1	0.45	4.6
Benzo(a)pyrene	mg/kg	0.3	MCERTS	< 0.30	0.54	0.32	< 0.30	1.9
Indeno(1,2,3-cd)pyrene	mg/kg	0.2	ISO 17025	< 0.20	0.37	0.27	< 0.20	1.1
Dibenz(a,h)anthracene	mg/kg	0.2	ISO 17025	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Benzo(ghi)perylene	mg/kg	0.5	ISO 17025	< 0.50	< 0.50	< 0.50	< 0.50	1.5
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	2.0	9.2	7.4	2.2	40
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	2	MCERTS	7.4	29	17	16	27
Boron (water soluble)	mg/kg	0.2	MCERTS	0.9	1.0	0.5	0.5	0.8
Cadmium (aqua regia extractable)	mg/kg	0.6	MCERTS	< 0.6	< 0.6	< 0.6	< 0.6	1.9
Chromium (aqua regia extractable)	mg/kg	5	MCERTS	18	23	18	16	17
Copper (aqua regia extractable)	mg/kg	2	MCERTS	39	120	95	98	97
Lead (aqua regia extractable)	mg/kg	3	MCERTS	31	140	95	61	140
Mercury (aqua regia extractable)	mg/kg	0.8	MCERTS	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Nickel (aqua regia extractable)	mg/kg	3	MCERTS	13	19	19	15	19
Selenium (aqua regia extractable)	mg/kg	3	MCERTS	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Zinc (aqua regia extractable)	mg/kg	2	MCERTS	47	130	140	65	400

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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 08-14763

Project / Site name: Pot 2-Eskdale Avenue

Lab Sample Number				103900				
Sample Reference				HA807				
Sample Number				CS1				
Depth				0.10-0.35				
Date Sampled				None Supplied				
Time Taken				None Supplied				
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Moisture Content	%	N/A	NONE	17				
Total mass of sample recieved	kg	2	NONE	< 2.0				
Asbestos (Screen)	P/A	N/A	NONE	Not Suspected				
General Inorganics								
pH	pH Units	N/A	MCERTS	6.8				
Total Cyanide	mg/kg	1	MCERTS	< 1.0				
Total Sulphate as SO_4	mg/kg	100	MCERTS	360				
Sulphide	mg/kg	1	NONE	< 1.0				
Elemental Sulphur	mg/kg	20	MCERTS	< 20				
Fraction Organic Carbon (FOC)		0.001	NONE	0.018				
Total Phenols								
Total Phenols (monohydric)	mg/kg	2	MCERTS	< 2.0				
Speciated PAHs								
Naphthalene	mg/kg	0.05	ISO 17025	< 0.05				
Acenaphthylene	mg/kg	0.2	ISO 17025	< 0.20				
Acenaphthene	mg/kg	0.1	MCERTS	< 0.10				
Fluorene	mg/kg	0.2	ISO 17025	< 0.20				
Phenanthrene	mg/kg	0.3	ISO 17025	< 0.30				
Anthracene	mg/kg	0.1	ISO 17025	0.22				
Fluoranthene	mg/kg	0.2	MCERTS	0.52				
Pyrene	mg/kg	0.2	ISO 17025	0.46				
Benzo(a)anthracene	mg/kg	0.2	MCERTS	< 0.20				
Chrysene	mg/kg	0.3	ISO 17025	< 0.30				
Benzo(b)fluoranthene	mg/kg	0.5	ISO 17025	< 0.50				
Benzo(k)fluoranthene	mg/kg	0.2	ISO 17025	0.44				
Benzo(a)pyrene	mg/kg	0.3	MCERTS	< 0.30				
Indeno(1,2,3-cd)pyrene	mg/kg	0.2	ISO 17025	< 0.20				
Dibenz(a,h)anthracene	mg/kg	0.2	ISO 17025	< 0.20				
Benzo(ghi)perylene	mg/kg	0.5	ISO 17025	< 0.50				
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	1.6				
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	2	MCERTS	9.9				
Boron (water soluble)	mg/kg	0.2	MCERTS	0.4				
Cadmium (aqua regia extractable)	mg/kg	0.6	MCERTS	< 0.6				
Chromium (aqua regia extractable)	mg/kg	5	MCERTS	21				
Copper (aqua regia extractable)	mg/kg	2	MCERTS	67				
Lead (aqua regia extractable)	mg/kg	3	MCERTS	53				
Mercury (aqua regia extractable)	mg/kg	0.8	MCERTS	< 0.8				
Nickel (aqua regia extractable)	mg/kg	3	MCERTS	26				
Selenium (aqua regia extractable)	mg/kg	3	MCERTS	< 3.0				
Zinc (aqua regia extractable)	mg/kg	2	MCERTS	84				

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Analytical Report Number: 08-14763

Project / Site name: Pot 2-Eskdale Avenue

Lab Sample Number	Sample Reference	Sample Number	Depth	Sample Description
103895	HA801	CS1	0.10-0.45	Brown topsoil with vegetation.
103896	HA802	CS1	0.10-0.70	Brown topsoil and gravel with vegetation and stones.
103897	HA804	CS1	0.10-0.70	Brown topsoil and gravel with chalk and stones.
103898	HA805	CS1	0.10-0.35	Brown topsoil and gravel with vegetation and stones.
103899	HA806	CS1	0.10-0.25	Brown topsoil and gravel with vegetation and stones.
103900	HA807	CS1	0.10-0.35	Brown topsoil and gravel with vegetation and stones.

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Analytical Report Number: 08-14763

Project / Site name: Pot 2-Eskdale Avenue

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
(Poland) Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	in-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
(Poland) Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L038-PL	D	MCERTS
(Poland) Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L006-PL	W	MCERTS
(Poland) pH in soil	Determination of pH in soil by addition of water followed by electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests""	L005-PL	W	MCERTS
(Poland) Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	in-house method based on USEPA 8270	L064-PL	D	ISO 17025
(Poland) Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode.	in-house method	L010-PL	D	NONE
(Poland) Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L007-PL	W	MCERTS
(Poland) Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests""	L038-PL	D	MCERTS
Elemental sulphur in soil	Determination of elemental sulphur in soil by extraction in dichloromethane followed by HPLC.	in-house method based on Secondsite Property Holdings Guidance for Assessing and Managing Potential	L021-UK	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests""	L019-UK	W	NONE

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

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APPENDIX G

CAT WASTE SOIL RESULTS

CAT-WASTE SOIL

Classification Assessment Tool of Soil Wastes - Hazard Summary Sheet

McArdle ATKINS

Site Name	Plot 2 - Small plot of land off Eskdale Avenue
Location	Carr Mill, St. Helens
Site ID	
Job Number	6561
Date	5/20/2008 3:49:18 PM
User Name	matt.uttley@gmgu.org.uk
Company Name	Urban Vision Partnership Ltd

Hole ID	Sample Depth	Hazardous Waste Y/N	H1	H2	H3A	H3B	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13	H14
HA801	0.10-0.45m	N	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
HA802	0.10-0.70m	N	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
HA804	0.10-0.70m	N	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
HA805	0.10-0.35m	N	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
HA806	0.10-0.25m	N	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
HA807	0.10-0.35m	N	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False

CAT-WASTE SOIL

Classification Assessment Tool of Soil Wastes - Individual Compound Information

McArdle ATKINS

Site Name	Plot 2 - Small plot of land off Eskdale Avenue
Location	Carr Mill, St Helens
Site ID	
Job Number	6561
Date	5/20/2008 3:49:18 PM
User Name	matt.uttley@gmgu.org.uk
Company Name	Urban Vision Partnership Ltd

Hole ID	Sample Depth	Contaminant	Contaminant Concentration (%)	Hazardous Waste Y/N	Hazard Class	Risk Phrases Exceeded	Additive Risk Phrases Exceeded	Additional Risk Phrases (see notes section)
HA801	0.10-0.45m	Boron	0.002083333	N				R14 (this risk phrase alone will not constitute a waste as being hazardous)
HA801	0.10-0.45m	Chromium (Total)	0.00263081	N				R43 see comment
HA801	0.10-0.45m	Nickel	0.003427366	N				R42 see comment, R43 see comment
HA802	0.10-0.70m	Boron	0.002314815	N				R14 (this risk phrase alone will not constitute a waste as being hazardous)
HA802	0.10-0.70m	Chromium (Total)	0.00336159	N				R43 see comment
HA802	0.10-0.70m	Nickel	0.005009227	N				R42 see comment, R43 see comment
HA804	0.10-0.70m	Boron	0.001157407	N				R14 (this risk phrase alone will not constitute a waste as being hazardous)
HA804	0.10-0.70m	Chromium (Total)	0.00263081	N				R43 see comment
HA804	0.10-0.70m	Nickel	0.005009227	N				R42 see comment, R43 see comment
HA805	0.10-0.35m	Boron	0.001157407	N				R14 (this risk phrase alone will not constitute a waste as being hazardous)
HA805	0.10-0.35m	Chromium (Total)	0.002338497	N				R43 see comment
HA805	0.10-0.35m	Nickel	0.003954653	N				R42 see comment, R43 see comment
HA806	0.10-0.25m	Boron	0.001851852	N				R14 (this risk phrase alone will not constitute a waste as being hazardous)
HA806	0.10-0.25m	Chromium (Total)	0.002484654	N				R43 see comment
HA806	0.10-0.25m	Nickel	0.005009227	N				R42 see comment, R43 see comment
HA807	0.10-0.35m	Boron	0.0009259259	N				R14 (this risk phrase alone will not constitute a waste as being hazardous)
HA807	0.10-0.35m	Chromium (Total)	0.003069278	N				R43 see comment
HA807	0.10-0.35m	Nickel	0.006854733	N				R42 see comment, R43 see comment

CAT-WASTE SOIL

McArdle ATKINS

Notes - Additional Information on Risk Phrases

R1 to R6	Test for explosives except when the waste is covered by the Explosives Act 1875	Test to establish whether a substance or preparation presents a danger of explosion when submitted to the effect of a flame (thermal sensitivity), impact or friction. Undertake Test Method A14 from EC Directive 92/62/EEC
R7, R8 and R9	Test/calculation for oxides	Applicable to solid compounds that are not explosive, highly flammable, organic peroxides or combustible. A test for the compounds oxidising properties as described in Directive 92/69/EEC, Test Method A17. For organic peroxides calculate the available oxygen content (%). For liquids and oxidising materials not covered by those previously listed no testing available.
R10	R10 test flash point	Flashpoint test as per Directive 92/62/EEC, Test Method A9
R11	R11 test flash point	For liquid substances, undertake the flashpoint test as per Directive 92/62/EEC, Test Method A9. For solid substances undertake flammability test as per directive 92/62/EEC, Test Method A10
R12	R12 test flammability	Flammability of gasses test as per Directive 92/62/EEC Test Method A11.
R15	R15 test flammability	To test the flammability of a substance when in contact with water test as per Directive 92/62/EEC, Test Method A12.
R16	R16 test for explosives	Test to establish whether a substance or preparation present a danger of explosion when submitted to the effect of a flame (thermal sensitivity), impact or friction. Undertake Test Method A14 from EC Directive 92/62/EEC
R17	R17 pyrophoric test	To test the pyrophoric properties of solids and liquids test as per Directive 92/62/EEC, Test Method A13.
R18	R18 test for flammable explosive vapour air mixture	Test to establish whether a substance or preparation presents a danger of explosion when submitted to the effect of a flame (thermal sensitivity), impact or friction. Undertake Test Method A14 from EC Directive 92/62/EEC
R19	R19 test for flammable explosive peroxides	Test to establish whether a substance or preparation present a danger of explosion when submitted to the effect of a flame (thermal sensitivity), impact or friction. Undertake Test Method A14 from EC Directive 92/62/EEC
R29	R29 test or calculation	Undertake test as per Directive 92/62/EEC, Test Method A12.
R31	R31 test or calculation	Undertake testing as per Directive 92/62/EEC, Test Method A12 modified to replace water with an acid which will not cause a displacement reaction to occur. Method to measure SO2 evolved when a waste is in contact with an acid (see Environment Agency SWEN 068).
R32	R32 test or calculation	Undertake testing as per Directive 92/62/EEC, Test Method A12 modified to replace water with an acid which will not cause a displacement reaction to occur).
R42 and R43	No test available	No test available for sensitisation
R44	R44 test for explosives	Test to establish whether a substance or preparation present a danger of explosion when submitted to the effect of a flame (thermal sensitivity), impact or friction. Undertake Test Method A14 from EC Directive 92/62/EEC
R54 to R58	see comment	Classification of waste as ecotoxic (on the basis of terrestrial non-aquatic toxicity) is not applicable due to the lack of detailed information. Until more data becomes available R54 to R58 should not be considered when assessing the ecotoxic hazard of wastes and classifications should be based upon aquatic toxicity data. Where there is reason to believe that a waste contains substances that only have effects on the terrestrial environment, guidance on the approapriate test method should be obtained from the Environment Agency.

Notes:

Testing of compounds which would be classified under H14 should only be undertaken where the hazards cannot be adequately identified. (i.e. where the waste contains a substance/s for which there is no aquatic toxicity data and/or where the waste is an uncharacterised mixture and/or there is the potential that the waste may contain unknown substances or breakdown products.
Aquatic toxicity testing should be undertaken in accordance with the Environmental Health and Safety Publication, series on Testing and Assessment No. 23 ENV/JM/MONO(2000) 6 June 2000

APPENDIX H

RISK ASSESSMENT MATRIX

RISK ASSESSMENT AND MANAGEMENT

A clear and pragmatic framework to environmental risk assessment can transform a detailed and complex process into a practical aid to decision-making. DETR *et al*. (2000) sets out a tiered approach to risk assessment, which has five key stages:

1. *Hazard identification*: In the context of this assessment the hazard is soil, groundwater and ground gas contamination.
2. *Identification of consequences*: Potential consequences that may arise from any given hazard are inherent to that hazard. It is important at this stage to consider the broad impacts to human health, controlled waters and the environment.
3. *Estimation of magnitude of consequences*: May be actual or potential harm to human health, controlled waters or the environment. Initially, this will be a qualitative process, which will become quantified as the risk assessment proceeds.
4. *Estimation of probability of consequences*: The probability of receptors being exposed to the hazard is a determination of the possible pollutant linkages between contaminant and receptor. The probability of harm resulting from exposure to the hazard is dependent on the likely susceptibility of an individual receptor to the hazard and the duration of exposure. Initially, this should be a reasonable worst case scenario, which can be refined as more definite information becomes available.
5. *Evaluating the significance of a risk*: Value judgments are made against a justifiable standard (e.g. SGV or EQS) in order to characterise the risk.

A risk assessment matrix provides a useful structure to the processes of risk identification and estimation detailed in stages 1-5 above. Risk estimation for each separate hazard is a result of combining the probability and the magnitude of the consequences. Each component will, to some extent, be based on judgments and experience, but a simple matrix provides a consistent basis for decision making.

	Consequences			
	Severe	**Moderate**	**Mild**	**Negligible**
Probability				
High	high	high	medium/low	negligible
Medium	high	medium	low	negligible
Low	high/medium	medium/low	low	negligible
Negligible	high/medium/low	medium/low	low	negligible

Adapted from: DETR *et al*. (2000) 'Guidelines for Environmental Risk Assessment and Management'.

APPENDIX I

SOIL CONTAMINATION RESULTS COMPARED TO HUMAN HEALTH ASSESSMENT CRITERIA

Soil Contamination Results Compared to Human Health Assessment Criteria

Note:			Lab Sample Number			103895	103896	103897	103898	103899	103900
LOD above SGV / GAC			Sample Reference			HA801	HA802	HA804	HA805	HA806	HA807
			Sample Number			CS1	CS1	CS1	CS1	CS1	CS1
Result exceeds assessment criteria			Depth			0.10-0.45	0.10-0.70	0.10-0.70	0.10-0.35	0.10-0.25	0.10-0.35
No assessment criteria available and result exceeds limit of detection											
				CLEA SGV	LQM GAC						
Contaminant	**Units**	**LoD**	**Accreditation**	for Residential with plant uptake (same units as results)							
Moisture Content	%	n/a	NONE	-	-	15	14	16	16	19	17
Total mass received	kg	2	NONE			< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Asbestos Presence Screen	P/A	n/a	NONE	-	-	Not Suspected	Not Suspected	Not Suspected	Not Suspected	Not Suspected	Not Suspected
General Inorganics											
pH Value	pH Units	N/A	MCERTS	-	-	7.0	6.9	6.8	6.8	6.5	6.8
Total Cyanide	mg/kg	1	MCERTS	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Sulphate as SO4	mg/kg	100	NONE	-	-	150	340	500	460	1100	360
Sulphide	mg/kg	1	NONE	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Elemental Sulphur	mg/kg	20	MCERTS	-	-	< 20	< 20	< 20	< 20	< 20	< 20
Fraction Organic Carbon (FOC)	unit	0.001	NONE	-	-	0.0076	0.014	0.018	0.017	0.032	0.018
SOM (based on FOC)						1.310344828	2.413793103	3.103448276	2.931034483	5.517241379	3.103448276
Total Phenols											
Total Phenols (monohydric)	mg/kg	2	MCERTS	SOM 1%: 78 SOM 2.5%: 150 SOM 5%: 280	-	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Speciated PAHs											
Naphthalene	mg/kg	0.05	MCERTS	-	SOM 1%: 3.47 SOM 2.5%: 8.4 SOM 5%: 17	< 0.05	< 0.05	< 0.05	< 0.05	0.73	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	-	-	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Acenaphthene	mg/kg	0.05	MCERTS	-	-	< 0.10	< 0.10	< 0.10	< 0.10	1.7	< 0.10
Fluorene	mg/kg	0.05	MCERTS	-	SOM 1%: 38.4 SOM 2.5%: 91.4 SOM 5%: 18.4	< 0.20	< 0.20	< 0.20	< 0.20	0.86	< 0.20
Phenanthrene	mg/kg	0.05	MCERTS	-	-	< 0.30	0.46	0.37	< 0.30	4.6	< 0.30
Anthracene	mg/kg	0.05	MCERTS	-	-	0.13	< 0.10	< 0.10	< 0.10	0.62	0.22
Fluoranthene	mg/kg	0.1	MCERTS	-	-	0.38	1.6	0.98	0.43	6.1	0.52
Pyrene	mg/kg	0.05	MCERTS	-	-	0.31	1.4	0.91	0.38	5.2	0.46
Benz(a)anthracene	mg/kg	0.2	MCERTS	-	-	0.30	0.60	0.91	0.40	2.2	< 0.20
Chrysene	mg/kg	0.05	MCERTS	-	-	0.42	0.76	1.2	0.55	2.7	< 0.30
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	-	-	< 0.50	2.0	1.3	< 0.50	6.4	< 0.50
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	-	-	0.33	1.6	1.1	0.45	4.6	0.44
Benzo(a)pyrene	mg/kg	0.1	MCERTS	-	SOM 1%: 1.12 SOM 2.5%: 1.08 SOM 5%: 1.09	< 0.30	0.54	0.32	< 0.30	1.9	< 0.30
Indeno(123cd)pyrene	mg/kg	0.05	MCERTS	-	-	< 0.20	0.37	0.27	< 0.20	1.1	< 0.20
Dibenzo(ah)anthracene	mg/kg	0.05	MCERTS	-	SOM 1%: 1.14 SOM 2.5%: 1.13 SOM 5%: 1.10	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	-	< 0.50	< 0.50	< 0.50	< 0.50	1.5	< 0.50
Total PAH											
Speciated total EPA-16 PAHs	mg/kg	1.6	MCERTS	-	-	2.0	9.2	7.4	2.2	40	1.6
Heavy Metals/ Metalloids											
Arsenic	mg/kg	2	MCERTS	20	-	7.4	29	17	16	27	9.9
Boron Water Soluble	mg/kg	0.2	NONE	20	-	0.9	1.0	0.5	0.5	0.8	0.4
Cadmium	mg/kg	0.3	MCERTS	pH7:2	-	< 0.6	< 0.6	< 0.6	< 0.6	1.9	< 0.6
Chromium	mg/kg	5	MCERTS	130	-	18	23	18	16	17	21
Copper	mg/kg	10	MCERTS	-	SOM 1%: 111	39	120	95	98	97	67
Lead	mg/kg	5	MCERTS	450	-	31	140	95	61	140	53
Mercury	mg/kg	0.2	MCERTS	8	-	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Nickel	mg/kg	2	MCERTS	50	-	13	19	19	15	19	26
Selenium	mg/kg	3	MCERTS	35	-	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Zinc	mg/kg	7	MCERTS	-	SOM 1%: 330	47	130	140	65	400	84

APPENDIX J

STATISTICAL OUTPUT SHEET

CLR 7 SOIL SCREENING

Site Name: Small plot of land off Eskdale Avenue
Site Location: Carr Mill, St Helens
Client: St Helens MBC
Job Number: 6561
Date: May-08

End Use Scenario: Residential With Vegetable Growth and Ingestion
Sample Population: Made Ground

		Number	Average	St Dev	t-value	Max	UBV(95th)	Screening Value	Max > GV	UBV > GV	Max Value Outlier	Reference
pH		6	6.80						within range			
Metals												
Arsenic		6	17.72	8.77	2.02	29	24.93	20.00	Yes	Yes	no	1
Chromium (total)		6	18.83	2.64	2.02	23	21.00	130.00	No	No	no	1
Copper		6	86.00	28.54	2.02	120	109.48	111.00	Yes	No	no	1
Lead		6	1.88	0.26	2.02	2.146128	2.09	2.65	No	No	no	1
Mercury		6	0.80	0.00	2.02	0.8	0.80	8.00	No	No	no	1
Nickel		6	18.50	4.46	2.02	26	22.17	50.00	No	No	no	1,4
Selenium		6	3.00	0.00	2.02	3	3.00	35.00	No	No	no	1
Zinc		6	144.33	130.38	2.02	400	251.59	330.00	Yes	No	no	1
PAHs												
Benzo(a)pyrene		6	0.29	0.17	2.02	0.54	0.43	1.08	No	No	yes	5
PAH (total of 16)		6	10.40	14.84	2.02	40	22.61	40.00	No	No	no	2

All concentrations in mg/kg
NC - not calculated

Lead reported as log values

Max > GV Column "Yes","No" - Indicates if the maximum value exceeds the Tier 1 Value.
UBV > GV Column "Yes","No" - Indicates if the upper bound value at the 95th percentile exceeds the Tier 1 Value.
Outlier Column "Yes","No" - Records YES if the maxium value within the sample population is an outlier

Screening Value Data Sources
(1) CLEA Soil Guildeline Values
(1a) SGE Interim Soil Guildline Values
(2) Adjusted Dutch Intervention Values
(3) USEPA Region IX Preliminary Remediation Goals (adjusted to 10^{-5} cancer risk)
(4) ICRCL Phytotoxic Risk (Any Uses where plants are to be grown)
(5) LQM GAC Values

APPENDIX K

WRAS ASSESSMENT

Soil Contamination Results Compared to WRAS Threshold Values

				Lab Sample Number	103895	103896	103897	103898	103899	103900	
Result exceeds threshold				Sample Reference	HA801	HA802	HA804	HA805	HA806	HA807	
				Sample Number	CS1	CS1	CS1	CS1	CS1	CS1	
				Depth	0.10-0.45	0.10-0.70	0.10-0.70	0.10-0.35	0.10-0.25	0.10-0.35	
Contaminant	**Units**	**LoD**	**Accreditation**	**WRAS material threshold**							
General Inorganics											
pH Value	pH Units	N/A	MCERTS	<5 or >8	7.0	6.9	6.8	6.8	6.5	6.8	
Total Sulphate as SO4	mg/kg	100	NONE	2000	150	340	500	460	1100	360	
Sulphide	mg/kg	1	NONE	250	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
Elemental Sulphur	mg/kg	20	MCERTS	5000	< 20	< 20	< 20	< 20	< 20	< 20	
Total Phenols											
Total Phenols (monohydric)	mg/kg	4	MCERTS	5	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	
Total PAH											
Speciated total EPA-16 PAHs	mg/kg	1.6	MCERTS	50	2.0	9.2	7.4	2.2	40	1.6	
Heavy Metals/ Metalloids											
Arsenic	mg/kg	2	MCERTS	10*	7.4	29	17	16	27	9.9	
Cadmium	mg/kg	0.3	MCERTS	3	< 0.6	< 0.6	< 0.6	< 0.6	1.9	< 0.6	
Chromium	mg/kg	5	MCERTS	600	18	23	18	16	17	21	
Lead	mg/kg	5	MCERTS	500	31	140	95	61	140	53	
Mercury	mg/kg	0.2	MCERTS	1	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	
Selenium	mg/kg	1	MCERTS	3	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	