



PRELIMINARY RISK ASSESSMENT

**STATION ROAD
BARNLEY**

350064-R01 (00)

BOWSALL LTD

AUGUST 2010



RSK STATS Geoconsult Ltd
 The Potteries
 Pottery Street
 Castleford
 West Yorkshire
 WF10 1NJ
 United Kingdom
 Telephone: +44 (0) 1977 878007
 Fax: +44 (0) 1977 552299
www.rsk.co.uk

PRELIMINARY RISK ASSESSMENT STATION ROAD, BARNSELY

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**Client : Bowsall Ltd
 3 King Street
 Salford
 M3 7DG**

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RSK STATS Geoconsult Ltd
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TABLE OF CONTENTS

EXECUTIVE SUMMARY.....	i
1. INTRODUCTION.....	1
1.1 Objectives	1
1.2 Scope	1
1.3 Limitations	2
1.4 Previous Work.....	2
2. SITE DETAILS	2
2.1 Site Location	2
2.2 Site Description	2
3. PRELIMINARY RISK ASSESSMENT	2
3.1 Geology.....	3
3.2 Hydrogeology	4
3.2.1 Groundwater Abstractions.....	4
3.2.2 Soil Leaching Potential.....	4
3.3 Hydrology	4
3.3.1 Surface Water Abstractions.....	5
3.3.2 Flooding	5
3.4 Sensitive Land Uses.....	5
3.5 Site History Review	5
3.5.1 Historic Maps	5
3.5.2 Database and Regulatory Information.....	7
3.5.3 Summary of Historic Potentially Contaminative Land Uses.....	8
3.6 Site Walkover	8
3.6.1 Observations Relevant to Environmental Assessment.....	8
3.7 Summary of Potential Contaminant Sources.....	9
3.8 Sensitive Receptors	9
3.9 Summary of Plausible Pathways.....	10
3.10 Data Gaps and Uncertainties	10
3.11 Outline Conceptual Model.....	10
3.12 Preliminary Risk Assessment Conclusions and Recommendations	14
4. REFERENCES.....	15

LIST OF TABLES

Table 1: Site History	6
Table 2: Risk Estimation for Potential Pollutant Linkages in Outline Conceptual Site Model.....	11

LIST OF FIGURES

Figure 1	Site Location Plan
Figure 2	Site Plan
Figure 3	Historical Map of 1906
Figure 4	Historical Map of 1976-1977
Figure 5	Historical Map of 1984-1988
Figure 6	Historical Map of 1993
Figure 7	Outline Conceptual Model

LIST OF APPENDICES

Appendix A	Summary of Legislation and Policy Relating to Contaminated Land
Appendix B	Service Constraints
Appendix C	Coal Authority Report
Appendix D	Site Photographs and Walkover Checklist
Appendix E	Methodology for Risk Assessment

EXECUTIVE SUMMARY

It is proposed to redevelop the land at Station Road, Barnsley. This assessment was carried out with the understanding that the site is to be redeveloped for residential use (social housing).

A Preliminary Risk Assessment (PRA) has been carried out based on a site walkover and review of published data, including historical maps and an environmental database.

The site is situated on Station Road in the village of Royston, approximately 6km north east of Barnsley, in a mixed residential and agricultural setting. It currently comprises undeveloped land covered in dense vegetation.

The site is indicated to be underlain directly by sandstone of the Mexborough Rock (Pennine Middle Coal Measures Formation). The geology is classed as a secondary A aquifer by the Environment Agency and the overlying soils are indicated to have high (urban) leaching potential. The site history indicates a former agricultural use. A former backfilled quarry is situated along the south western edge of the site and 10m west of the site.

The PRA undertaken by RSK has identified a number of potential sources of contamination, including ground gas/vapour from made ground from the backfilled former quarries on-site and adjacent to site, made ground from adjacent site redevelopment and from historical off-site landfills. Other potential sources identified include localised contamination associated with a former agricultural use, an off-site garage (70m east) and a historical railway (80m north).

The following potential pollutant linkages associated with the site were identified:

- Direct contact of the potential contamination within the soils to construction workers, neighbours and future site users;
- Direct contact of the potential contamination within the soils to potable water supplies;
- The leaching and lateral and vertical migration of impacted groundwater to shallow groundwater, the secondary A aquifer and vegetation on site;
- The lateral migration and inhalation of vapours from impacted groundwater by future site users, neighbours and construction/maintenance workers;
- Migration and inhalation of soil gas via permeable shallow geology by future site users, neighbours and construction/maintenance workers; and
- Migration and build up of methane within on-site and off-site buildings.

In order to investigate any unacceptable risk presented by these, an intrusive investigation is recommended.

1. INTRODUCTION

RSK STATS Geoconsult Limited (RSK) was commissioned by Bowsall Limited to carry out a Preliminary Risk Assessment of the land at Station Road, Barnsley. This assessment was carried out with the understanding that the site is to be redeveloped for a residential end use (social housing).

1.1 Objectives

The main objective of the investigation was to complete a PRA by reviewing information relating to the site, including the historical land uses and the environmental setting. The PRA allows an initial conceptual site model (CSM) to be defined, which indicates potential contaminant sources, pathways and receptors.

In the event that potential linkages are shown to be present by the initial CSM, subsequent intrusive investigation may be required in order to further assess the relevant pollutant linkages. The data gathered during the intrusive investigation would be used in undertaking a quantitative risk assessment and, where necessary, determining remedial options.

1.2 Scope

The scope of the investigation and layout of this report has been designed with CLR11 and PPS23 in mind and guidance issued by the Environment Agency in July 2005 for land contamination reports⁽¹⁾. A summary of relevant legislation and government policies applicable to land development is included in Appendix A.

The risk management process comprises up to three stages of risk assessment: preliminary, generic quantitative and detailed quantitative (PRA, GQRA and DQRA). The basis for the risk assessment is a conceptual model that is produced as part of the PRA and is updated throughout the risk management process.

The scope of work comprised the following:

- Desk based review of publicly available data (including an Environmental Database search sourced commercially from Landmark Information Group ⁽²⁾);
- A site walkover carried out on 2 August 2010;
- Review of reports relating to the site (Coal Authority Report); and
- Data appraisal and preparation of this report.

The PRA was undertaken in accordance with RSK proposal document 880091TL01, dated 30 June 2010.

1.3 Limitations

The comments given in this report and the opinions expressed are based on the information gathered during the desk-based assessment and on the findings of the site walkover. However, there may be conditions pertaining to the site that have not been disclosed by the assessment and therefore could not be taken into account.

This report is subject to the RSK STATS Geoconsult Limited service constraints given in Appendix B.

1.4 Previous Work

No previous reports were made available for review.

2. SITE DETAILS

The site location, description and future development are discussed below.

2.1 Site Location

The site is situated on Station Road and is located at 435940, 412140. The site is located in the village of Royston, 6km north east of Barnsley. The site is situated in a mixed residential and agricultural setting. A site location plan is presented as Figure 1.

2.2 Site Description

The site is approximately rectangular in shape and occupies an area of approximately 1ha. It comprises undeveloped land covered by dense vegetation, is at an elevation of 75m AOD⁽³⁾ and slopes downwards from the south east to the north west . Access to the site is via an unnamed road off Station Road. A site plan is presented as Figure 2.

The site is bounded to the north east by open fields and to the west by Station Road. To the south east is an unnamed road with a residential property at the end (10m east of site) Other residential properties close to the site include properties 20m south east and 10m west along Station Road.

3. PRELIMINARY RISK ASSESSMENT

The following describes the results of the review of available information for the site and the findings from the site inspection. The information together with that presented in Section 2 has been used to identify potential contaminant sources and sensitive receptors, from which an outline conceptual model has been developed.

3.1 Geology

Published records⁽⁴⁾ for the area indicated the geology of the site to be characterised by sandstone of the Mexborough Rock (Pennine Middle Coal Measures). A fault line is shown to bisect the site running from north east to south west with the downthrow side to the south east. An area of made ground is shown to the south east of the site, associated with a former quarry and is shown to underlie the south eastern part of the site.

The site is in an area which may be affected by coal mining activity. A Coal and Brine Report⁽⁵⁾ has been obtained and is produced in Appendix C. The report indicates the site is within the likely zone of influence from workings in 8 seams of coal at 250m and 530m depth, and last worked in 1981.

The report provides the following additional information:

- The property is not in the likely zone of influence of any present underground coal workings;
- The property is not in an area for which the Coal Authority is determining whether to grant a license or for which a license has been granted to remove coal using underground methods;
- 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 point 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;
- There are no known coal mine entries within, or within 20 metres of, the boundary of the property;
- The property is not within the boundary and does not lie within 200 metres of an opencast site from which coal has been removed by opencast methods;
- There is no record of a mine gas emission requiring action by the Coal Authority within the boundary of the property; and
- The property lies outside the Cheshire Brine Compensation District.

There is a record for an historical opencast quarry, positioned at 26m south within the Envirocheck report. This refers to a former sandstone quarry situated adjacent to the site at Windmill Hill.

Further geological information recorded in the Envirocheck report⁽²⁾ includes the following:

- The site has a low-moderate hazard potential for shallow mining hazards;
- The site has a very low hazard potential for compressible ground stability hazards;

- The site has a very low hazard potential for landslide ground stability hazards; and
- The site has a very low hazard potential for running sand ground stability hazards.

The British Geological Survey information contained within the environmental database indicates that the site is in a radon affected area as between 5 and 10% of properties in the area were above the radon action level. The information indicates that basic radon protective measures are necessary in the construction of new dwellings or extensions.

3.2 Hydrogeology

Information on the Environment Agency website⁽⁵⁾ shows geology under the site to be classified as a Secondary A aquifer defined as permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers. The aquifer designation relates to the underlying Pennine Middle Coal Measures Formation.

3.2.1 Groundwater Abstractions

The Environment Agency has defined source protection zones (SPZ) for nearly 2,000 groundwater sources used for public drinking water supply. The SPZ provides an indication of the potential risk of pollution. Three zones (Inner, Outer and Total Catchment) are usually defined. Information on the Environment Agency website⁽⁵⁾ indicates the site is not situated within a groundwater SPZ.

No groundwater abstractions were identified within a 2km radius of the site.

3.2.2 Soil Leaching Potential

The soils beneath the site are classified as having high (urban) leaching potential⁽²⁾. Soil information for restored mineral workings and urban areas is based on fewer observations than elsewhere, so a worst-case vulnerability classification is assumed until proven otherwise.

3.3 Hydrology

The nearest surface water feature to site is a drain situated approximately 110m to the west, which flows to the north towards another drain which flows towards the west. A small area of marshland is situated approximately 105m to the north.

Surface infiltration of rainwater will occur across the site area, as currently no buildings or areas of hardstanding are present. Movement of shallow perched water in fill

materials or near surface permeable soils is likely to be from south to north, consistent with the flow direction of the drains to the east of the site.

Water quality data are not available for the nearby drainage.

3.3.1 *Surface Water Abstractions*

The Envirocheck database lists six entries for a surface water abstraction situated approximately 1.1km east of the site, which refer to a license held by Monkton Coke & Chemical Co Ltd to extract water from the Aire and Calder Navigation.

3.3.2 *Flooding*

Information on the Environment Agency website⁽⁵⁾ indicates the site is situated within a Flood Zone 1 as there is a one in greater than one thousand year risk of flooding. The location of the site indicates that a Flood Risk Assessment is not required.

3.4 Sensitive Land Uses

An area of adopted green belt borders the site to the north. The site lies within a nitrate vulnerable zone.

3.5 Site History Review

A review of the site history has been carried out through the study of Ordnance Survey maps dating from the late 1800s, aerial photographs, and information from the regulatory authorities and trade directories. The review is designed to identify potential historic sources of contamination that may have impacted soil or groundwater quality beneath the site and to identify any potentially contaminative land uses in the area that may have impacted the site.

3.5.1 *Historic Maps*

A review of the historical maps for the site from between 1854 and 2010 were undertaken using the extracts provided within the Landmark Envirocheck report⁽²⁾. Selected maps are reproduced as Figures 3 to 6. These are not to scale, although all the evaluations in this report have been made from the scaled plans. A chronology of activities is presented in Table 1 below.

Table 1: Site History

Date	Scale	Site	Surrounding Area
1854 1893 1894-1895	1:10,560 1:2,500 1:10,560	The south westerly corner of site has been quarried, adjacent to Overcarr Lane which borders the site to the south west. The remainder of site has an agricultural appearance.	Predominantly greenfield land. Buildings of residential/agricultural appearance annotated as Guiseley Well adjacent to the north western corner of the site. Another quarried area is indicated across Overcarr Lane, 10m west. The Notton for Royston train station and associated railway is located 80m north of the site. An area annotated as Windmill Field is situated 50m south east.
1906 1907-1908	1:2,500 1:10,560	No significant change.	Residential properties along Windmill Terrace lie to the east of site. The quarry situated 10m west is larger.
1918 1932-1933 1938-1948	1:2,500 1:10,560 1:10,560	No significant change.	A small building lies close to the eastern border of the site. The quarry situated 10m west is now annotated Old Quarry
1961-1962 1965-1966	1:2,500 1:10,560	No significant change.	The building close to the easterly edge of site is no longer shown. Guiseley Well buildings are now gone. Overcarr Lane is now named Station Road. The quarry situated 10m west is no longer shown, indicating that it has been backfilled. Further residential development is shown to the south.

Date	Scale	Site	Surrounding Area
1970-1972	1:2,500	No significant change.	Further residential development is shown along Station Road to the west. Buildings annotated as Guiseley Wells are shown adjacent to site to the north. All except two of the properties along Windmill Terrace are no longer shown. The railway is indicated to be dismantled.
1976-1977 1980-1981	1:1,250 1:10,000	The edge of the former quarry along the western border is shown as a sloped embankment. The remainder of site is shown to be occupied by non-coniferous trees.	No significant change.
1984-1988	1:2,500	A quarried edge is indicated along the western border as previously.	No significant change.
1990-1991 1993 2000 2006 2010	1:10,000 1:1,250 1:10,000 1:10,000 1:10,000	The edge of the former quarry along the western border is shown as a sloped embankment.	No significant change.

3.5.2 Database and Regulatory Information

Further information obtained from the Envirocheck Report is summarised below:

- There are two listings for landfill sites within the vicinity of site. A historical landfill is indicated at Warren Walk situated 400m south east and a local authority recorded landfill site, situated 980m east, both operated by Barnsley Metropolitan Borough Council. No information is provided regarding the waste types or dates of input;

- There are eight records of discharge consents within 1km of the site. The nearest new consent is 164m north west, operated by Yorkshire Water Services for sewage discharge into Applehaigh Beck;
- There are eleven records of pollution incidents to controlled waters within 1km of the site. The nearest is situated 134m north west, involving sewage pollutant into a freshwater stream/river. This was classed as a Category 2 – significant incident in August 1991; and
- Contemporary trade directory entries include an active laundry, 136m east, an inactive coal and smokeless fuel merchants, 216m south, an inactive builders merchants, 221m south and active garages, 367m north and 376m south.

3.5.3 Summary of Historic Potentially Contaminative Land Uses

The review of the site history indicates the following potentially contaminative land uses: a backfilled former quarry and contamination associated with a possible former agricultural use. These land uses may have resulted in the ground being impacted by key contaminants including metals, inorganics, pH, oil/fuel hydrocarbons and ground gases.

Historic potentially contaminative land uses in the vicinity of the site were: a backfilled former quarry, a former railway and made ground associated with clearing of adjacent properties. These may have had the potential for the following contaminants to migrate on to the site: metals, inorganics, asbestos, pH, chlorinated aliphatic hydrocarbons, polycyclic aromatic hydrocarbons, polychlorinated biphenyls (PCBs) and ground gases.

3.6 Site Walkover

A site inspection was carried on 2 August 2010. The findings are summarised below and are supported by the photographs and walkover checklist presented in Appendix D.

3.6.1 Observations Relevant to Environmental Assessment

- The site surface slopes downwards from south east to north west;
- The site is covered with dense vegetation, predominantly ferns, with rough grass, brambles, small trees and a number of mature trees at the edges of the site;
- Footpaths used by members of the public including dog-walkers exist across the site;
- Exposed soils on-site comprised sandy gravelly topsoil to a depth of approximately 0.3m overlying weathered sandstone. Sandstone was also observed in an adjacent road cutting along Station Road at a similar level to the site;
- No evidence of underground services were observed on site. Overhead lines were present along the north eastern and south western border of site;

- Minimal evidence of fly-tipping was noted on-site;
- The site is bound to the north east by a wheat field, which is at a lower level to the site (approximately 2m);
- A densely vegetated area including a number of trees separates the south eastern edge of site from an unnamed unsurfaced road, beyond which lie residential properties;
- The site is bound to the west by Station Road and the western edge of the site is densely vegetated including several trees;
- Residential properties lie to the north (Guiseley Wells, 10m) east (10m), south east (20m) and west (10m) of site;
- A garage is located approximately 70m to the south east of the site;
- Japanese knotweed is a non-native, highly invasive species and spreads via rhizomes (underground 'stems') rather than seeds in the UK. It is found in a range of habitats across the UK including roadsides, riverbanks and derelict land. Japanese knotweed was not identified during the site visit.

3.7 Summary of Potential Contaminant Sources

On-site

In general terms the former probable agricultural use of the site indicates a low potential for ground contamination. Some moderate and localised contamination (e.g. oils or fuels) may have arisen from previous use on site. No information is available for materials used to backfill the former quarried area along the south western edge of the site; the potential for waste deposition to have occurred (and therefore landfill gas generation) is possible.

Off-site

The backfilled former quarry to the south west of the site is a potential source of landfill gas generation. Former landfills 400m south east and 980m east of site are also potential sources of ground gases. The potential contaminants associated with the former railway land 80m north of the site include metals, asbestos, Polycyclic Aromatic Hydrocarbon (PAH) and Polychlorinated Biphenyls (PCBs). Made ground associated with the clearing of adjacent properties is also a potential source of contaminants.

3.8 Sensitive Receptors

The following sensitive receptors have been identified to be potentially at risk with respect to the potential contamination hazards identified above:

- Construction/maintenance workers during redevelopment works;
- Neighbouring site occupiers (residential 10m east and 15m west);
- End-users of the site (occupants and services/buildings);

- Shallow perched groundwater in the made ground;
- Off-site surface water receptor (drain 110m west);
- Secondary A aquifer (Pennine Middle Coal Measures Formation) underlying the site;
- Ecological receptors (marshland 105m north and any proposed vegetated areas);
- Site potable water supply;
- Surface water abstraction (1.1km east); and

3.9 Summary of Plausible Pathways

A number of plausible pathways are present that could connect the identified sources and receptors:

- Direct contact (including ingestion, dermal contact and inhalation of dust);
- Surface water run-off and/or infiltration;
- Existing or proposed service runs;
- Lateral migration of groundwater through shallow site soils;
- Downwards vertical migration of groundwater;
- Gas migration;
- Vapour migration from volatile compounds within fill materials; and
- Leaching of contaminants from soil to groundwater.

3.10 Data Gaps and Uncertainties

The materials used to backfill the former quarries on-site and off-site is not known. Records of historical landfills situated 480m south east and 980m east of the site do not give any indication of the type of waste deposited or the dates of input.

3.11 Outline Conceptual Model

The information presented in Sections 2 and 3.1-3.9 has been used to compile an outline conceptual model. The identified potential contaminants and receptor have been considered with any possible pathways that may link them. The resulting pollutant linkages are considered in Table 2. The risk classification has been estimated in accordance with information in Appendix E.

The outline conceptual model is shown schematically in Figure 7 and the risk associated with each linkage is estimated in Table 2.

Table 2: Risk Estimation for Potential Pollutant Linkages in Outline Conceptual Site Model

Potential Source	Potential Receptor	Possible Pathway	Likelihood	Severity	Risk
Contaminants in site soils potentially containing heavy metals, hydrocarbons, inorganics, asbestos, pH, volatile organic compounds (VOCs) and PCBs.	Construction/ maintenance workers	Direct contact: – inhalation (dust and vapours) Dermal contact	Likely: Current site surface and proposed areas of soft landscaping exposed and not protected by hardstanding; (no break in pathway) and potential exposure to site soils and airborne dust is present.	Mild	Moderate/Low. May come into contact with soil that may be impacted, during typical work activities. Working practices and PPE relevant for site will minimise contact.
	Neighbouring site occupiers (residential and allotments)			Medium	Moderate. Dust may be created that could be contaminated
	Future site occupants (residential)			Medium	Moderate. May come into contact with soil, that may be impacted
	Underground potable water supply service pipe	Direct contact	Likely: Potentially impacted soils may be in direct contact with potential perched groundwater body	Medium	Moderate. Potential for permeation of water supply pipes from contaminants could create health risk
Impacted groundwater as a result of historical or current leaching of soil contaminants (see above)	Shallow perched groundwater in made ground (backfilled quarry)	Leaching and lateral and vertical migration	Likely: Potentially impacted soils may be in direct contact with potential perched groundwater body. The depth to groundwater has not yet been proven, however this remains a potential linkage until proven otherwise	Medium	Moderate: May result in migration of potential contamination off-site requiring clean-up to remove liabilities
Impacted groundwater as a result of historical or current leaching of soil contaminants (see above)	Secondary A aquifer (Pennine Middle Coal Measures Formation) and migration to surface water course (Drain 110m west and marshland 105m north)	Leaching and lateral and vertical migration	Likely: Presence of made ground associated with backfilled quarry and shallow soils with high (urban) leaching potential will promote vertical migration of shallow groundwater. Depth to groundwater within aquifer is unknown; this remains a potential linkage until proven otherwise	Medium	Moderate: It is likely that the presence of permeable made ground/ shallow soils beneath the site will facilitate downward migration of contaminants to the underlying secondary A aquifer

Potential Source	Potential Receptor	Possible Pathway	Likelihood	Severity	Risk
	Vegetation (current on-site and any proposed areas of gardens and soft landscaping)		Likely: Potential source is in direct contact with receptors		Moderate: Impacted soils and shallow groundwater could inhibit plant growth
	Future site occupiers (residential)	Lateral migration and inhalation of vapours from impacted groundwater	Likely: The presence of buildings and hardstanding will impede migration between potential source and receptor, however, a potential pathway remains in areas where hardstanding is absent	Medium	Moderate: Chronic damage to human health may occur if pathway is not broken
	Neighbouring site occupiers (residential to east and west)		Low likelihood: Migration of groundwater is inferred to be to the north, away from residential properties and allotments		Moderate/Low: Chronic damage to human health is unlikely to occur.
	Construction/ maintenance workers		Likely: Pathway between potential source and receptors is unbroken and potentially in direct contact		Moderate/Low. May come into contact with perched groundwater that may be impacted, during typical work activities. Working practices and PPE relevant for site will minimise contact
Hazardous ground gases include carbon dioxide and methane, and owing to the nature of potential contaminants may include hydrocarbon vapours generated from both on-site and off-site contaminated soils and groundwater	Future site occupiers (residential)	Migration and inhalation of soil gas via permeable shallow geology	Likely: Pathway between potential source and receptors is unbroken	Severe	Moderate/High: Although unproven, if a pathway exists there is a potential for a risk of asphyxiation (from carbon dioxide) if gas concentrations build up in confined spaces or explosion if there is a build up of methane. An acute risk to human health therefore potentially exists

Potential Source	Potential Receptor	Possible Pathway	Likelihood	Severity	Risk
	Neighbouring site occupiers (residential to east and west)	Migration via permeable shallow geology into properties			Moderate/High: Although unproven, if a pathway exists there is a potential for a risk of asphyxiation (from carbon dioxide) if gas concentrations build up in confined spaces or explosion if there is a build up of methane. An acute risk to human health therefore potentially exists
	Construction/ maintenance workers				Moderate/High: During construction phase, workers may enter excavations (e.g. laying services) where concentrations of bulk gases may concentrate, however working practices and PPE relevant for site will minimise risk
	On-site proposed buildings				Moderate/High: Build up of methane within properties could lead to explosion and catastrophic damage
	Off-site buildings	Migration via permeable shallow geology into properties			Moderate/High: Build up of methane within properties could lead to explosion and catastrophic damage

The conceptual model identifies the following potential pollutant linkages:

- Direct contact of the potential contamination within the soils to construction workers, neighbours and future site users;
- Direct contact of the potential contamination within the soils to potable water supplies;
- The leaching and lateral and vertical migration of impacted groundwater to shallow groundwater, the secondary A aquifer and vegetation on site;
- The lateral migration and inhalation of vapours from impacted groundwater by future site users, neighbours and construction/maintenance workers;
- Migration and inhalation of soil gas via permeable shallow geology by future site users, neighbours and construction/maintenance workers; and
- Migration and build up of methane within on-site and off-site buildings.

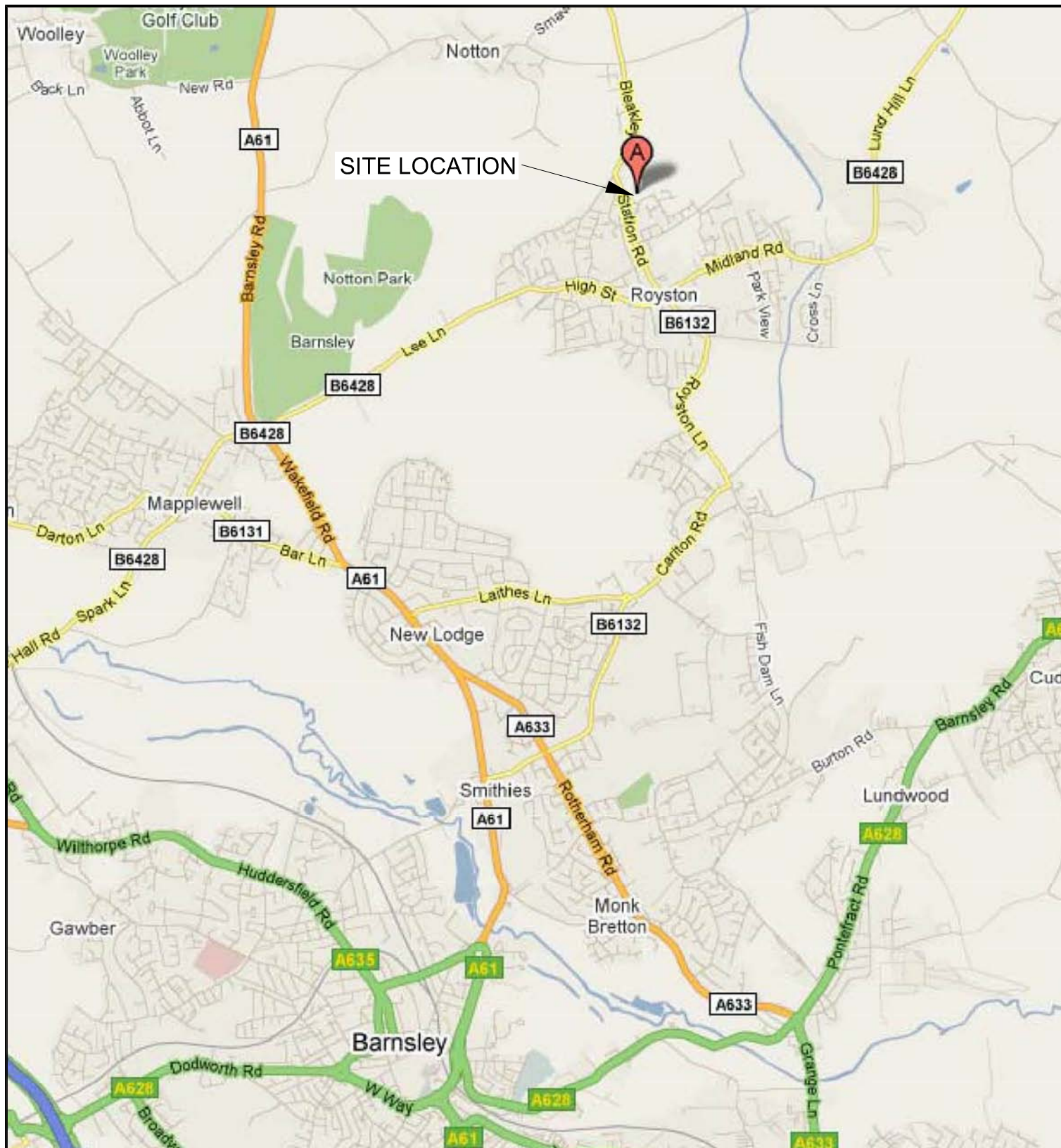
3.12 Preliminary Risk Assessment Conclusions and Recommendations

The review of information and the construction of the outline conceptual model highlight potential pollutant linkages. In order to investigate any unacceptable risk presented by these, an intrusive investigation is recommended. An intrusive investigation will be able to provide further information on actual contaminants present and viable pathways to sensitive receptors.

4. REFERENCES

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3. Ordnance Survey Landranger Map Sheffield & Doncaster. Sheet 111, 1:50,000, 2009.
4. British Geological Survey, Sheet Number 87 Barnsley, Solid and Drift Edition, 1:50,000, 1993.
5. The Coal Authority, Non-Residential Coal and Brine Report reference 00033584-10, July 2010.
6. www.environment-agency.gov.uk

FIGURES



RSK[®]



GROUP PLC

Spring Lodge
172 Chester Road
Helsby
Cheshire
WA6 0AR

Tel: +44 1928 726006
Fax: +44 1928 725633
Web: www.rsk.co.uk

Client

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Project Title

STATION ROAD, BARNSELY

Drawing Title

SITE LOCATION PLAN

Drawn Date
HD 03.08.10

Checked Date
NH 03.08.10

Approved Date
NH 03.08.10

Project No.
350064

Drawing File
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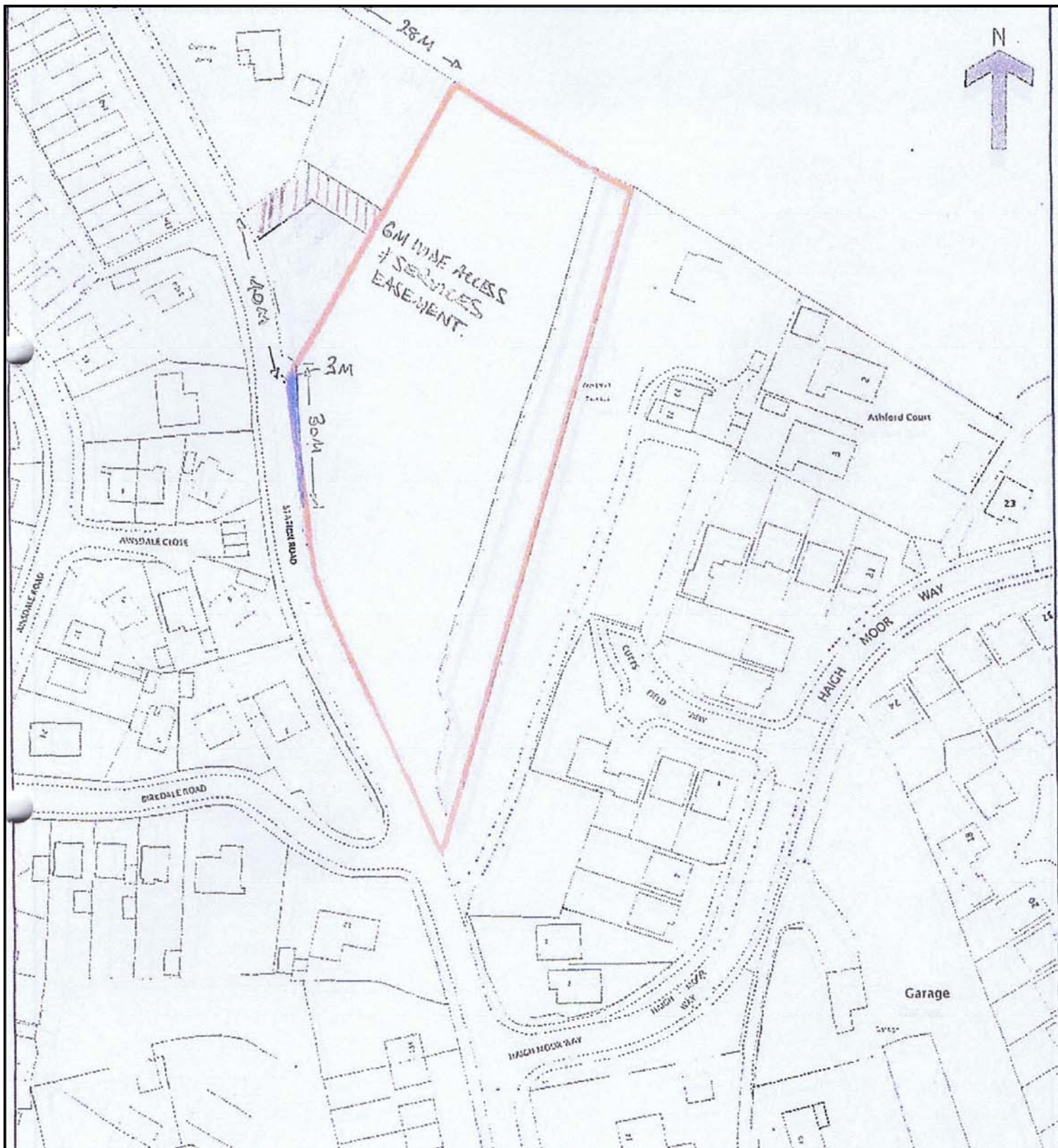
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Spring Lodge
172 Chester Road
Helsby
Cheshire
WA6 0AR

Tel: +44 1928 726006
Fax: +44 1928 725633
Web: www.rsk.co.uk

Client

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Project Title

STATION ROAD, BARNSELY

Drawing Title

SITE PLAN

Drawn
HD
Date
03.08.10

Checked
NH
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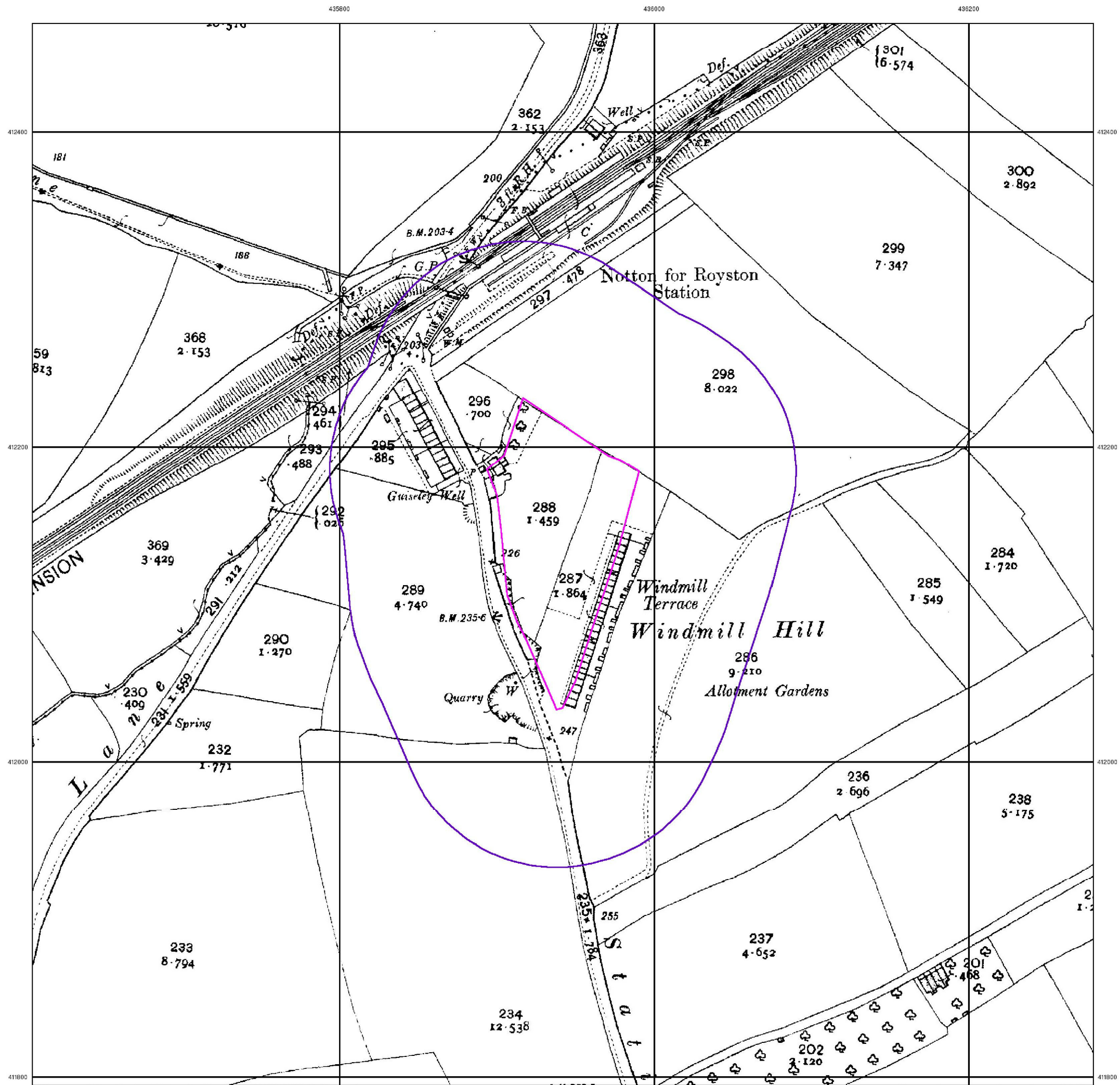
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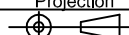
Orig Size
A4

Dimensions
—

Drawing No.
FIGURE 2

Rev.
A

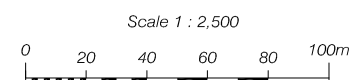


A	03.08.10	FIRST ISSUE	HD	NH	NH
REV	DATE	DESCRIPTION	BY	CHD.	APR.
Dimensions		Projection	Scale	Orig Size	
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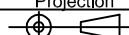
RSK
GROUP PLC

Spring Lodge
172 Chester Road
Helsby
Cheshire
WA6 0AR
Tel: +44 1928 726006
Fax: +44 1928 725633
Web: www.rsk.co.uk

CLIENT	BOWSALL LIMITED				
PROJECT	STATION ROAD, BARNSELY				
TITLE	HISTORICAL MAP OF 1906				
JOB No.:	350064		DRAWING FILE:		
				350064-R01(00)D003A	
BY:	DATE:	CONTRACT NO.	REV:		
HD	03.08.10		FIGURE 3		A



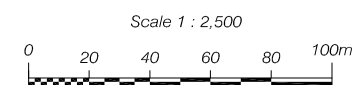


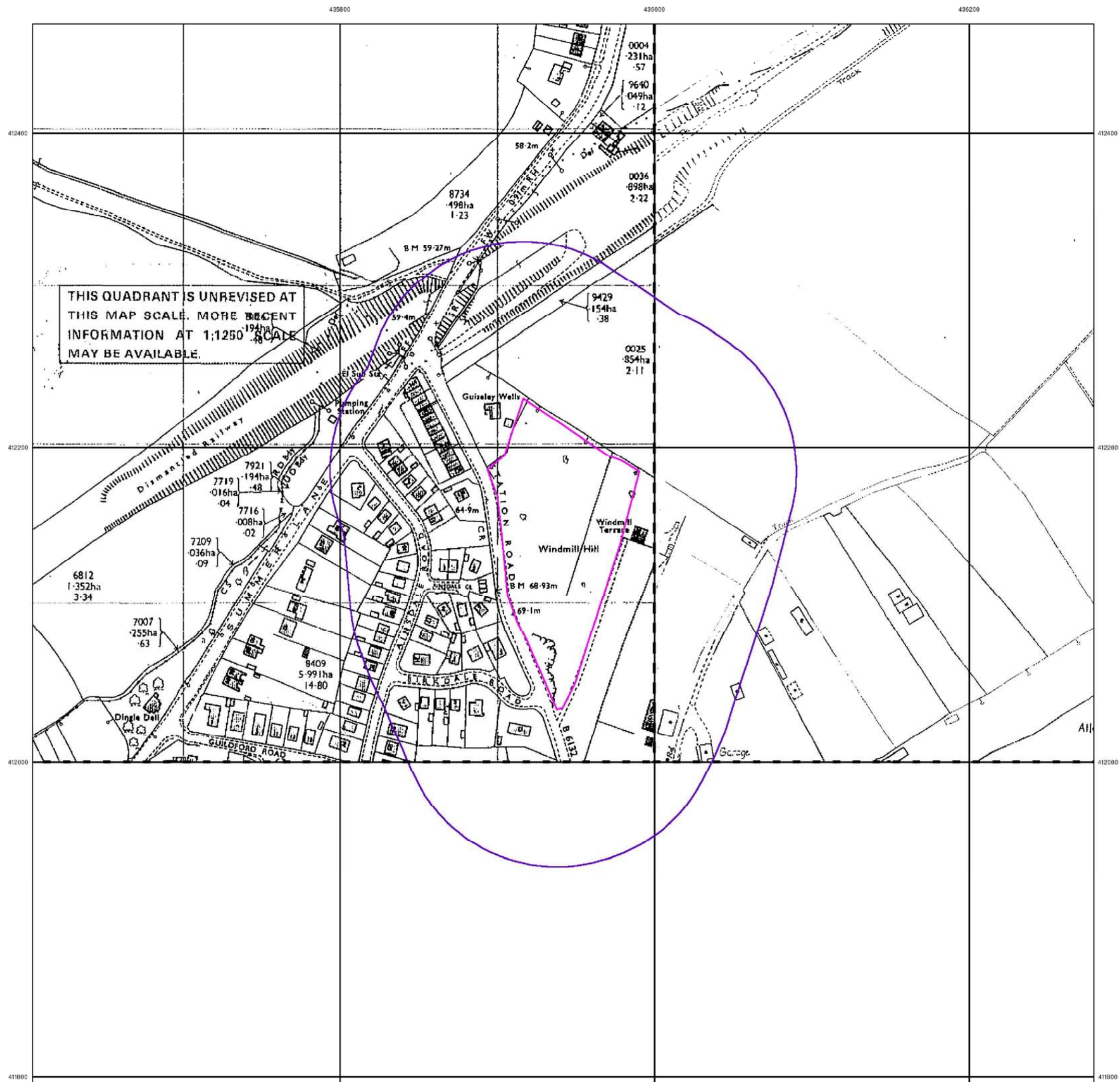
A	03.08.10	FIRST ISSUE	HD	NH	NH
REV	DATE	DESCRIPTION	BY	CHD	APR
Dimensions		Projection	Scale	Orig Size	
m			1:2,500	A3	

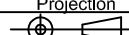


Spring Lodge
172 Chester Road
Helsby
Cheshire
WA6 0AR
Tel: +44 1928 726006
Fax: +44 1928 725633
Web: www.rsk.co.uk

CLIENT	BOWSALL LIMITED				
PROJECT	STATION ROAD, BARNSELY				
TITLE	HISTORICAL MAP OF 1976-1977				
JOB No.:	350064		DRAWING FILE: 350064-R01(00)D004A		
BY:	DATE:	CONTRACT NO.	REV:		
HD	03.08.10		FIGURE 4		A





A	03.08.10	FIRST ISSUE	HD	NH	NH
REV	DATE	DESCRIPTION	BY	CHD.	APR.
Dimensions		Projection	Scale	Orig Size	
m			1:2,500	A3	

RSK

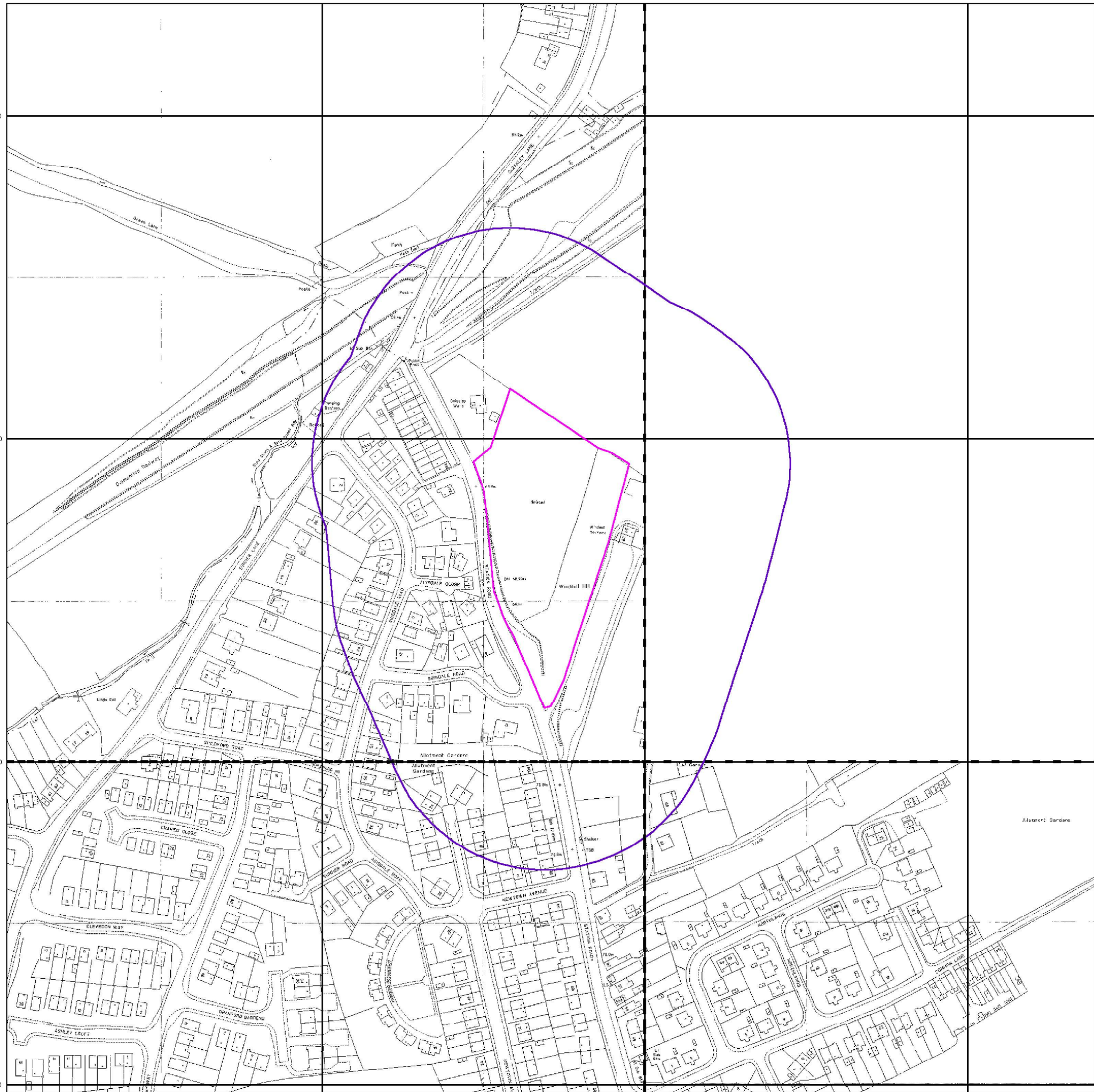
GROUP PLC

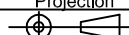
Spring Lodge
172 Chester Road
Helsby
Cheshire
WA6 0AR
Tel: +44 1928 726006
Fax: +44 1928 725633
Web: www.rsk.co.uk

CLIENT		BOWSALL LIMITED			
PROJECT		STATION ROAD, BARNSELY			
TITLE		HISTORICAL MAP OF 1984-1988			
JOB No.:		DRAWING FILE:			
350064		350064-R01(00)D005A			
BY:	DATE:	CONTRACT NO.	REV:		
HD	03.08.10		FIGURE 5		A

Scale 1 : 2,500





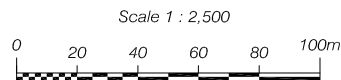
A	03.08.10	FIRST ISSUE	HD	NH	NH
REV	DATE	DESCRIPTION	BY	CHD.	APR.
Dimensions		Projection	Scale	Orig Size	
m			1:2,500	A3	

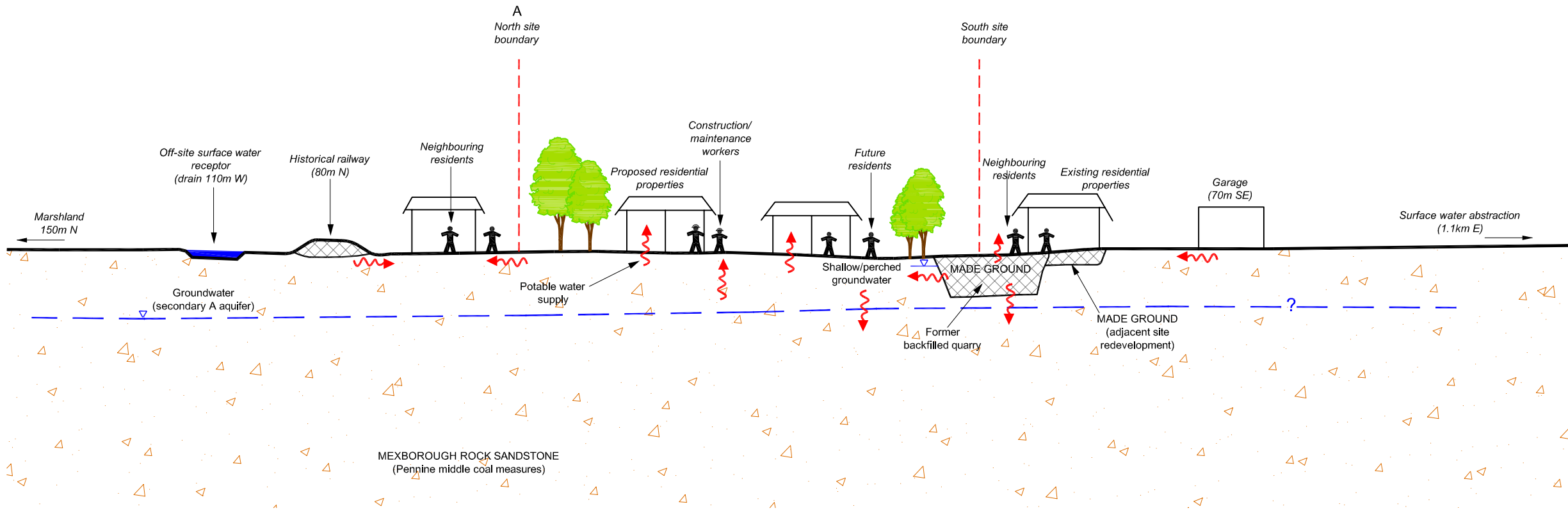


Spring Lodge
172 Chester Road
Helsby
Cheshire
WA6 0AR

Tel: +44 1928 726006
Fax: +44 1928 725633
Web: www.rsk.co.uk

CLIENT		BOWSALL LIMITED			
PROJECT		STATION ROAD, BARNSELY			
TITLE		HISTORICAL MAP OF 1993			
JOB No.:		DRAWING FILE:			
350064		350064-R01(00)D006A			
BY:	DATE:	CONTRACT NO.	FIGURE 6		REV:
HD	03.08.10				A





POTENTIAL CONTAMINATIVE SOURCES

ON SITE:

- S1** Localised contamination associated with former agricultural use; and
- S2** Former backfilled quarry (made ground).

OFF SITE:

- S3** Former backfilled quarry;
- S4** Made ground due to adjacent site redevelopment;
- S5** Garage (70m southeast); and
- S6** Historical railway (80m north).

POTENTIAL COMPLETE POLLUTANT LINKAGES:

- Direct contact of the potentially contaminated soils to end uses, construction workers and neighbours;
- Direct contact of the potentially contaminated soils to potable water supply;
- The leaching and lateral and migration of impacted groundwater to shallow groundwater, the secondary A aquifer and vegetation on site;
- The lateral migration and inhalation of vapours from impacted from impacted groundwater by future ends users, neighbours and construction/maintenance workers;
- Migration and inhalation of soil gas via permeable shallow geology by future site users, neighbours and construction/maintenance workers; and
- Migration and build up of methane within on-site and off-site buildings.

POTENTIAL PATHWAYS

- P1** Direct contact including ingestion, dermal contact and inhalation;
- P2** Surface water run-off and/or infiltration;
- P3** Existing or proposed service runs;
- P4** Lateral migration of groundwater through shallow site soils;
- P5** Downwards vertical migration of groundwater;
- P6** Gas migration;
- P7** Vapour migration from volatile compounds within fill materials; and
- P8** Leaching of contaminants from soil to groundwater.

POTENTIAL RECEPTORS

- R1** Construction/maintenance workers;
- R2** Neighbouring site occupiers;
- R3** End-users of the site (residential);
- R4** Shallow (perched) groundwater;
- R5** Off-site surface water feature (drain 110m west);
- R6** Secondary A aquifer;
- R7** Ecological receptors (marshlands 150m north and current/proposed vegetated areas);
- R8** Site potable water supply; and
- R9** Surface water abstractions (1.1km east).

A	03.08.10	FIRST ISSUE		HD	NH NH
REV	DATE	DESCRIPTION		BY	CHD. APR.
Dimensions		Projection	Scale	Orig Size	
m			NTS	A3	
RSK GROUP PLC Spring Lodge 172 Chester Road Helsby Cheshire WA6 0AR Tel: +44 1928 726006 Fax: +44 1928 725633 Web: www.rsk.co.uk					
CLIENT		BOWSALL LIMITED			
PROJECT		STATION ROAD, BARNSELEY			
TITLE		OUTLINE CONCEPTUAL SITE MODEL			
JOB No.:			DRAWING FILE:		
350064			350064-R01(00)D007A		
BY:	DATE:	CONTRACT NO.	FIGURE 7		REV:
HD	03.08.10				A

APPENDIX A

Summary of Legislation and Policy Relating to Contaminated Land

Summary of Legislation and Policy Relating to Contaminated Land

Part IIA of the Environmental Protection Act (EPA) and its associated Contaminated Land Regulations 2000 (SI 2000/227), which came into force in England on 1 April 2000, are the basis for the current regulatory framework and form the statutory regime for the identification and remediation of contaminated land. Part IIA of the EPA 1990 defines contaminated land as 'any land which appears to the Local Authority in whose area it is situated to be in such a condition by reason of substances in, on or under the land, that significant harm is being caused, or that there is significant possibility of significant harm being caused, or that pollution of controlled waters is being or is likely to be caused'. Controlled waters are considered all groundwater, inland waters and estuaries. The intention of the EPA 1990 Part IIA is to deal with contaminated land issues that are considered to cause significant harm, on land that is not undergoing development, (see circular 2-2000 for definitions of what is significant harm, website link - <http://www.defra.gov.uk/environment/land/contaminated/circ2-2000/index.htm>).

The Water Framework Directive 2000/60/EC (WFD) legislation aims to deliver long-term protection of the water environment and to improve the quality of all water bodies, including rivers, wetlands, coasts, estuaries, lakes, man-made structures and groundwater. The Water Resources Act 1991 (Amendment) (England and Wales) Regulations 2009 updated the Water Resources Act 1991 which introduced the offence of causing or knowingly permitting pollution of controlled waters. The Act provides the Environment Agency with powers to implement remediation necessary to protect controlled waters and recover all reasonable costs of doing so. The Groundwater Regulations (England & Wales) 2009, requires the Agency to exercise its functions in relation to permits for implementing the WFD and Groundwater Daughter Directive 2006/118/EC. Part 3 of the Regulations, Regulation 13 state: 'it is an offence to cause or knowingly permit the discharge of any hazardous substance or non-hazardous pollutant in circumstances that might lead to an indirect input of that hazardous substance or non-hazardous pollutant into groundwater unless it is carried on under and in accordance with a permit granted by the Agency under this regulation'.

Contaminated land is often dealt with through planning because of land redevelopment. This approach is documented in Planning Policy Statement: Planning and Pollution Control PPS23, which states that it remains the responsibility of the landowner and developer to identify land affected by contamination and carry out sufficient remediation to render the land suitable for use. The overall aim of the planning and pollution control policy is to promote the sustainable and beneficial use of land (in particular, encouraging reuse of previously developed land in preference to greenfield sites). Within this aim, polluting activities that are necessary for society and the economy should be so sited and planned, and subject to such planning conditions, that their adverse effects are minimised and contained to within acceptable limits.

APPENDIX B

Service Constraints

**RSK STATS GEOCONSULT LIMITED
SERVICE CONSTRAINTS**

1. This report and the site investigation carried out in connection with the report (together the "Services") were compiled and carried out by RSK STATS Geoconsult Limited (RSK) for Bowsall Limited (the "client") in accordance with the terms of a contract between RSK and the "client". The Services were performed by RSK with the skill and care ordinarily exercised by a reasonable environmental consultant at the time the Services were performed. Further, and in particular, the Services were performed by RSK taking into account the limits of the scope of works required by the client, the time scale involved and the resources, including financial and manpower resources, agreed between RSK and the client.
2. Other than that expressly contained in paragraph 1 above, RSK provides no other representation or warranty whether express or implied, in relation to the Services.
3. Unless otherwise agreed the Services were performed by RSK exclusively for the purposes of the client. RSK is not aware of any interest of or reliance by any party other than the client in or on the Services. Unless expressly provided in writing, RSK does not authorise, consent or condone any party other than the client relying upon the Services. Should this report or any part of this report, or otherwise details of the Services or any part of the Services be made known to any such party, and such party relies thereon that party does so wholly at its own and sole risk and RSK disclaims any liability to such parties. **Any such party would be** well advised to seek independent advice from a competent environmental consultant and/or lawyer.
4. It is RSK's understanding that this report is to be used for the purpose described in the introduction to the report. That purpose was a significant factor in determining the scope and level of the Services. Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of or reliance upon the report in those circumstances by the client without RSK's review and advice shall be at the client's sole and own risk. Should RSK be requested to review the report after the date hereof, RSK shall be entitled to additional payment at the then existing rates or such other terms as agreed between RSK and the client.
5. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of RSK. In the absence of such written advice of RSK, reliance on the report in the future shall be at the client's own and sole risk. Should RSK be requested to review the report in the future, RSK shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between RSK and the client.
6. The observations and conclusions described in this report are based solely upon the Services which were provided pursuant to the agreement between the client and RSK. RSK has not performed any observations, investigations, studies or testing not specifically set out or required by the contract between the client and RSK Limited. RSK is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the Services. For the avoidance of doubt, unless otherwise expressly referred to in the introduction to this report, RSK did not seek to evaluate the presence on or off the site of asbestos, electromagnetic fields, lead paint, heavy metals, radon gas or other radioactive or hazardous materials.
7. The Services are based upon RSK's observations of existing physical conditions at the Site gained from a walkover survey of the site together with RSK's interpretation of information including documentation, obtained from third parties and from the client on the history and usage of the site. The Services are also based on information and/or analysis provided by independent testing and information services or laboratories upon which RSK was reasonably entitled to rely. The Services clearly are limited by the accuracy of the information, including documentation, reviewed by RSK and the observations possible at the time of the walkover survey. Further RSK was not authorised and did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the Services. RSK is not liable for any inaccurate information or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to RSK and including the doing of any independent investigation of the information provided to RSK save as otherwise provided in the terms of the contract between the client and RSK.
8. The phase II or intrusive environmental site investigation aspects of the Services is a limited sampling of the site at pre-determined borehole and soil vapour locations based on the operational configuration of the site. The conclusions given in this report are based on information gathered at the specific test locations and can only be extrapolated to an undefined limited area around those locations. The extent of the limited area depends on the soil and groundwater conditions, together with the position of any current structures and underground facilities and natural and other activities on site. In addition chemical analysis was carried out for a limited number of parameters [as stipulated in the contract between the client and RSK] [based on an understanding of the available operational and historical information,] and it should not be inferred that other chemical species are not present.
9. Any site drawing(s) provided in this report is (are) not meant to be an accurate base plan, but is (are) used to present the general relative locations of features on, and surrounding, the site.

APPENDIX C

Coal Authority Report

Issued by:

The Coal Authority, Mining Reports Office, 200 Lichfield Lane, Berry Hill, Mansfield, Nottinghamshire NG18 4RG
ON-Line Service: www.groundstability.com - Phone: 0845 762 6848 - DX 716176 MANSFIELD 5

CUSTOMER SERVICES,
LANDMARK INFORMATION GROUP LIMITED,
ABBAY COURT UNIT 5/7,
EAGLE WAY,
SOWTON INDUSTRIAL ESTATE,
EXETER,
DEVON,
EX2 7HY

Person dealing with this matter:	Darren Moody
Our reference:	00033584-10
Your reference:	32021470
Electronic Ref:	EME_00014277990009_005
RRUID:	005.00014277990009
Date of your enquiry:	29 July 2010
Date we received your enquiry:	29 July 2010
Date of issue:	30 July 2010

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

Non-Residential Coal and Brine Report

Site At, Windmill Terrace, Royston, Barnsley, South Yorkshire

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 Compensation District	No

Information from the Coal Authority

Underground Coal Mining

Past

The property is in the likely zone of influence from workings in 8 seams of coal at 250m to 530m depth, and last worked in 1981.

Any ground movement from these coal workings should have stopped by now.

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.

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

There are no known coal mine entries within, or within 20 metres of, the boundary of the property.

Coal-mining geology

The Authority is not aware of any evidence of damage arising due to geological faults or other lines of weakness that have been affected by coal mining.

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 Authority is not aware of any request having been made to carry out preventive works 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 in an area for which notices of entitlement to withdraw support were published in 1957, 1951, 1960, 1951, 1977.

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.

Information from the Cheshire Brine Subsidence Compensation Board

The property lies outside the Cheshire Brine Compensation District.

Additional remarks

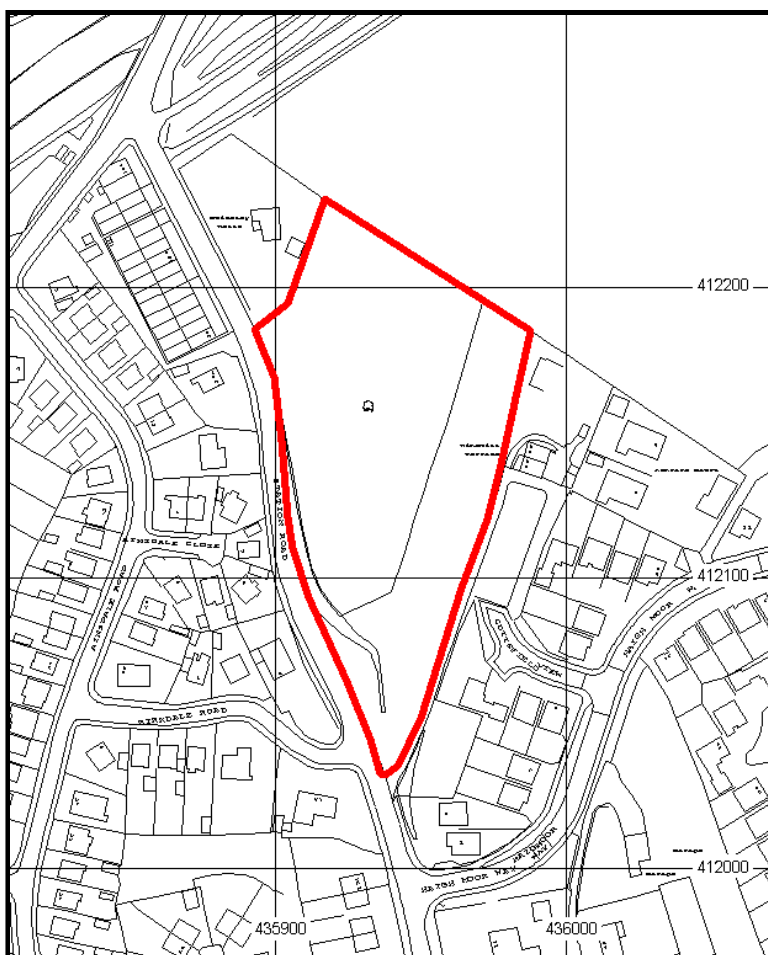
This report is prepared in accordance with the Law Society's Guidance Notes 2006, the User Guide 2006 and the Coal Authority and Cheshire Brine Board's Terms and Conditions 2006. The report is compliant with Home Information Pack requirements.

The Coal Authority owns the copyright in this report. The information we have used to write this report is protected by our database right. All rights are reserved and unauthorised use is prohibited. If we provide a report for you, this does not mean that copyright and any other rights will pass to you. However, you can use the report for your own purposes.

This is a detailed map of the Applehaigh Farm area in Barnsley. The map shows a network of roads, including Lee Lane and a road labeled 'B 6428'. A railway line runs through the area, with a station labeled 'Sch'. A green circle highlights a specific location on the map. Other labels include 'Barnsley Boundary Walk', 'Applehaigh Fm', 'Trans Pennine', and 'Ellis Lai'. Grid coordinates are visible at the bottom: 435000, 436000, and 437000.

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Approximate position of enquiry boundary shown



APPENDIX D

Site Photographs and Walkover Checklist

PHOTOGRAPHIC LOG

Photo No.	Date:	
1	02.08.10	
Direction Photo Taken: North		
Description: Access to site via unnamed road off Station Road		

Photo No.	Date:	
2	02.09.10	
Direction Photo Taken: North		
Description: Western border of site along Station Road, also showing sandstone in road cutting		

Photo No.	Date:	
3	02.08.10	
Direction Photo Taken: South east		
Description: Western border of site along Station Road		

Photo No.	Date:	
4	02.08.10	
Direction Photo Taken: South east		
Description: North east border of site with wheat field to the north		

Photo No. 5	Date: 02.08.10	
Direction Photo Taken: South west		
Description: Slope along north easterly edge of site		

Photo No.	Date:	
6	02.08.10	
Direction Photo Taken: South west		
Description:		
View across northern area of site		

Photo No.	Date:	
7	02.08.10	
Direction Photo Taken: West		
Description:		
General view across northern area of site towards residential properties along Station Road		

Photo No.	Date:	
8	02.08.10	
Direction Photo Taken: West		
Description: General view across site		

Photo No.	Date:	
9	02.08.10	
Direction Photo Taken: North		
Description: General view across site from the southern area		

Photo No.	Date:	
10	02.08.10	
Direction Photo Taken: ground		
Description:		
Exposed soil in pit in south western area of site		

WALKOVER SURVEY CHECKLIST

SITE NAME	SITE REFERENCE	NGR
------------------	-----------------------	------------

These inspections can provide useful information on:

- Potential geotechnical hazards
- Suitable and appropriate locations for investigation
- The groundwater and surface water environments
- Potentially sensitive receptors (targets) including issues that require further investigation e.g. ecology surveys
- Potential sources of contaminants
- Nature of contamination
- Potential migration routes (pathways)

Mark locations of features described on a map and give them a reference number.

Describe features in as much detail as possible. Continue on the back of the checklist if necessary, using the feature letter for reference. Take photos of site and relevant features in immediate surrounding area.

The walkover survey can also provide information for the environmental consultant in planning the site investigation.

Points that should be addressed in a walkover survey are as follows:

Features	Description	Photo No	Map Ref
a) Describe materials exposed in nearby road or railway cuttings, in pits and quarries and natural exposures of soils and rocks near to the site. <i>This will give an indication of the geology beneath the site</i>	Exposed soils in 0.4m deep pit of man-made appearance (i.e. not burrowing animals): Grey sandy gravelly topsoil 0.0 to 0.3m, overlying yellow weathered sandstone		
b) Describe surrounding properties/land use <i>This will identify any potential sources of contamination from adjacent sites and any sensitive receptors</i>	N: Guiseley Wells residential, 10m NE: wheat field E and SE: residential (10m and 20m) W: Station Road and residential (10m)		
c) Describe present land use <i>Especially crops, for consideration of appropriate timing for further investigation, compensation and reinstatement. Also note hardstanding, obstructions etc. Note any old buildings/ivy covered trees as these may be used by owls or bats</i>	Dense vegetation, not developed		

WALKOVER SURVEY CHECKLIST Continued

SITE NAME

SITE REFERENCE

NGR

Features	Description	Photo No	Map Ref
d) Describe the site in terms of ground slopes and changes in slope. <i>Old scarps or hummocky ground may be evidence of previous landslips that could be reactivated. A terraced appearance may be indicative of superficial solifluction movement or cambering.</i>	Site slopes downwards from SE to NW		
e) Describe the types and condition of surface vegetation. <i>Nettles may indicate an old cesspit for example or unhealthy vegetation may indicate the presence of phytotoxic fill or landfill gas. Note invasive weeds, e.g. Japanese knotweed. Refer to site pack cards for help identifying Japanese Knotweed. It is important to note any areas with the potential for nesting birds, roosting bats, water voles and badger setts.</i>	Dense vegetation: mostly ferns, brambles, grass, trees		
f) Note the number, location, height and species of trees and hedges. <i>This is important in terms of shrinking and swelling ground. Trees that are leaning may indicate instability or general slope movement. Trees and hedgerows may be protected, their condition should be noted along with any restrictions they will impose for site access.</i> <i>It is important to note any areas with the potential for nesting birds, roosting bats, water voles and badger setts.</i>	Number of small trees and several mature trees towards edges of site, especially SE and W		
g) Describe any evidence of animal activity. <i>For example obvious animal paths or areas of excavations and burrows.</i>	None observed		

WALKOVER SURVEY CHECKLIST Continued

SITE NAME

SITE REFERENCE

NGR

Features	Description	Photo No	Map Ref
h) Describe any damage to existing structures on site or adjacent to the site <i>For example, cracks in buildings both on the site and in the neighbourhood, and other evidence of settlement or differential settlement.</i> <i>Note presence of any suspected asbestos containing materials (ACM)</i>	None observed		
i) Note the remains of structures that have been demolished. Look for evidence of remnants of any historic structures. <i>This will provide valuable information on the location of previous foundations, processes etc.</i>	None observed		
j) Note any abrupt changes in ground level. <i>May indicate that minerals have been worked in surface excavations.</i>	Sloped edge NE and W but not abrupt		
k) Note any surface hollows. <i>Which may indicate the presence of solution features or swallow holes in rocks such as chalk limestone, gypsum and salt, or collapsed underground workings in these materials. May also indicate badger setts or other wildlife activity.</i>	Pit of hand-dug appearance (with spoil at side) in western part of site next to a footpath		
l) In areas of country underlain by coal or other minerals note any hummocky ground. <i>Which may be the remnants of spoil tips and surface depressions that may indicate collapse shallow workings. Areas of general unevenness may be evidence of waste disposal activities.</i>	None observed		

WALKOVER SURVEY CHECKLIST Continued

SITE NAME

SITE REFERENCE

NGR

Features	Description	Photo No	Map Ref
m) Note any evidence of gas from nearby landfill sites <i>Can be indicated for example by poor vegetation or gas bubbles in water filled trenches.</i>	None observed		
n) Note the location of streams, ponds, seepages and sinks and signs of previous flooding. <i>If ponds are present on site they may contain Great Crested Newts. Ditches, streams and rivers that border or run through a site may contain water voles, otters or white-clawed crayfish. Presence of water features on site may prompt the need for a survey during a site investigation.</i>	None observed		
o) All surface waters should be examined for evidence of contamination. <i>For example, oil sheen, silt, solid matter, discoloured sediment.</i>	None observed		
p) Note any discoloured ground. <i>This may provide evidence of contamination.</i>	None observed		
q) Identify any old structures, pipework etc wherever possible and, if safe, inspect for evidence of stored waste. <i>Old tanks may contain oil, old electricity transformers should be noted. Asbestos risk should be assessed together with the need for a specialist hazardous materials survey.</i>	None observed		
r) Examine surrounding areas for evidence of contamination which could migrate onto the site. <i>For example a leaking oil tank on an adjacent site.</i>	None observed		
s) Note the presence of any underground structures, services, mine workings, tunnels etc <i>From a safety point of view for development of the site and also as they may provide contaminant migration routes.</i>	None observed		

WALKOVER SURVEY CHECKLIST Continued

SITE NAME

SITE REFERENCE

NGR

Features	Description	Photo No	Map Ref
t) Note any anecdotal information in past uses of the site. <i>Local street names etc. can provide indicators of past industry or ground problems</i>	None observed		
u) Identify potential access routes to the site for plant for the site investigation <i>Excavators and drilling rigs may be required for the next stage of the investigation, or if the access is limited window sampling techniques may need to be specified. Note any specific obstructions such as unsafe/unstable ground, protected trees or hedgerows, or protected buildings.</i>	Best access from SE off unnamed road. Access from NW is alongside wheat field and slope onto site. Ok for JCB, tracked rig will require vegetation clearing		
v) Evidence of buried services (water, gas, electricity, telephone, cable, television, pipelines) <i>Both for safety considerations and in the case of water as supply for further investigation. As well as danger, there is the question of considerable expense, which can arise from an inadequate knowledge of the location of buried services. The locations and heights of overhead cables may be important when considering the movement of site equipment.</i>	None observed OH lines along NE and SE border		

Walkover Survey completed	Approved: _____ Signature _____ Name _____ Date
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Notes	Little evidence of fly-tipping. No Japanese knotweed observed.
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APPENDIX E

Methodology of Risk Assessment

Risk Assessment Methodology

CLR11 outlines the framework to be followed for risk assessment in the UK. The framework is designed to be consistent with UK legislation and policies including planning. Under CLR11, three stages of risk assessment exist: Preliminary, Generic Quantitative and Detailed Quantitative. An outline Conceptual Model should be formed at the preliminary risk assessment stage that collates all the existing information pertaining to a site in text, tabular or diagrammatic form. The outline conceptual model identifies potentially complete (termed possible) pollutant linkages (source–pathway–receptor) and is used as the basis for design of the site investigation. The outline Conceptual Model is updated as further information becomes available, for example as a result of the site investigation.

Production of a Conceptual Model requires an assessment of risk to be made. Risk is a combination of the likelihood of an event occurring and the magnitude of its consequences. Therefore, both the likelihood and the consequences of an event must be taken into account when assessing risk. RSK has adopted guidance provided in CIRIA C552 for use in the production of conceptual models.

The likelihood of an event can be classified on a four-point system using the following terms and definitions based on CIRIA C552:

- Highly likely: the event appears very likely in the short term and almost inevitable over the long term or there is evidence at the receptor of harm or pollution;
- Likely: it is probable that an event will occur or circumstances are such that the event is not inevitable, but possible in the short term and likely over the long term;
- Low likelihood: circumstances are possible under which an event could occur, but it is not certain even in the long term that an event would occur and it is less likely in the short term; and
- Unlikely: circumstances are such that it is improbable the event would occur even in the long term.

The severity can be classified using a similar system also based on CIRIA C552. The terms and definitions relating to severity are:

- Severe: short term (acute) risk to human health likely to result in 'significant harm' as defined by the Environment Protection Act 1990, Part IIA. Short-term risk of pollution of sensitive water resources. Catastrophic damage to buildings or property. Short-term risk to an ecosystem or organism forming part of that ecosystem (note definition of ecosystem in 'Draft Circular on Contaminated Land', DETR 2000);
- Medium: chronic damage to human health ('significant harm' as defined in 'Draft Circular on Contaminated Land', DETR 2000), pollution of sensitive water resources, significant change in an ecosystem or organism forming part of that ecosystem (note definition of ecosystem in 'Draft Circular on Contaminated Land', DETR 2000);

- Mild: pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services ('significant harm' as defined in 'Draft Circular on Contaminated Land', DETR 2000). Damage to sensitive buildings, structures or the environment; and
- Minor: harm, not necessarily significant, but that could result in financial loss or expenditure to resolve. Non-permanent human health effects easily prevented by use of personal protective clothing. Easily repairable damage to buildings, structures and services.

Once the likelihood of an event occurring and its severity have been classified, a risk category can be assigned the table below.

		Consequences			
		Severe	Medium	Mild	Minor
Pro bab ility	Highly likely	Very high	High	Moderate	Moderate/Low
	Likely	High	Moderate	Moderate/Low	Low
	Low likelihood	Moderate	Moderate/Low	Low	Very Low
	Unlikely	Moderate/Low	Low	Very Low	Very Low

Definitions of these risk categories are as follows together with an assessment of the further work that might be required:

- Very high: there is a high probability that severe harm could occur or there is evidence that severe harm is currently happening. This risk, if realised, could result in substantial liability and urgent investigation and remediation are likely to be required;
- High: harm is likely to occur. Realisation of the risk is likely to present a substantial liability and urgent investigation is required and remedial works may be necessary in the short term and are likely over the long term;
- Moderate: it is possible that harm could arise, but it is unlikely that the harm would be severe and it is more likely that the harm would be relatively mild. Investigation is normally required to clarify the risk and determine the liability. Some remedial works may be required in the longer term;
- Low: it is possible that harm could occur, but it is likely that if realised this harm would at worst normally be mild; and
- Very Low: there is a low possibility that harm could occur and if realised the harm is unlikely to be severe