

# ENVIRONMENTAL

RWE npower

Phase I Environmental Risk Assessment  
Barnsley Interchange

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## CONTENTS PAGE

|            |                                                                                                                                                                                                            |           |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| <b>1.0</b> | <b>INTRODUCTION</b>                                                                                                                                                                                        | <b>1</b>  |
| 1.1        | <i>Instruction</i>                                                                                                                                                                                         | 1         |
| 1.2        | <i>Objectives</i>                                                                                                                                                                                          | 1         |
| 1.3        | <i>Limitations</i>                                                                                                                                                                                         | 1         |
| 1.4        | <i>Guidance</i>                                                                                                                                                                                            | 1         |
| 1.5        | <i>Judicial Precedents and Legislation</i>                                                                                                                                                                 | 2         |
| 1.6        | <i>Technical Competence</i>                                                                                                                                                                                | 2         |
| 1.7        | <i>Scope of Work</i>                                                                                                                                                                                       | 3         |
| <b>2.0</b> | <b>AVAILABLE INFORMATION</b>                                                                                                                                                                               | <b>5</b>  |
| <b>3.0</b> | <b>THE SITE</b>                                                                                                                                                                                            | <b>6</b>  |
| 3.1        | <i>Site Location</i>                                                                                                                                                                                       | 6         |
| 3.2        | <i>Site Description</i>                                                                                                                                                                                    | 6         |
| 3.3        | <i>Site Reconnaissance Visit</i>                                                                                                                                                                           | 7         |
| 3.3.1      | <i>General Site Description:</i>                                                                                                                                                                           | 7         |
| 3.3.2      | <i>The Oil Tank</i>                                                                                                                                                                                        | 8         |
| 3.3.3      | <i>The lean too shelter</i>                                                                                                                                                                                | 8         |
| 3.3.4      | <i>The “L” Shaped Terrace Of Garage Sized Storage Buildings</i>                                                                                                                                            | 8         |
| 3.3.5      | <i>The Central Building</i>                                                                                                                                                                                | 9         |
| 3.4        | <i>Proposed Redevelopment</i>                                                                                                                                                                              | 9         |
| <b>4.0</b> | <b>SITE HISTORY</b>                                                                                                                                                                                        | <b>10</b> |
| 4.1        | <i>OS Plans</i>                                                                                                                                                                                            | 10        |
| 4.2        | <i>Aerial Photographs</i>                                                                                                                                                                                  | 12        |
| 4.3        | <i>Previous Investigation Reports</i>                                                                                                                                                                      | 12        |
| 4.3.1      | <i>Ground Investigation for a Site at Harborough Hill Road Barnsley, South Yorkshire: Soil Mechanics, May 2001.</i>                                                                                        | 12        |
| 4.3.2      | <i>Harborough Hill Road, Barnsley, Mining Report: Wardell Armstrong, June 2001.</i>                                                                                                                        | 13        |
| 4.3.3      | <i>Environmental Assessment Yorkshire Electricity Depot, Harborough Hill, Barnsley; Waterman Environmental, July 2001.</i>                                                                                 | 13        |
| 4.3.4      | <i>DRAFT Summary of The Site Investigation Reports And Assessment Of Abnormal Geotechnical And Contamination Issues At Harborough Hill Road, Barnsley; Waterman BBT Consulting Engineers, August 2001.</i> | 13        |
| <b>5.0</b> | <b>REGULATORY REVIEW</b>                                                                                                                                                                                   | <b>14</b> |
| 5.1        | <i>Envirocheck® report No. 14081101-1-1</i>                                                                                                                                                                | 14        |
| 5.2        | <i>Local Authority Contaminated Land Team</i>                                                                                                                                                              | 14        |

|            |                                                      |           |
|------------|------------------------------------------------------|-----------|
| 5.3        | <i>Local Planning Authority</i>                      | 15        |
| <b>6.0</b> | <b>GROUND CONDITIONS</b>                             | <b>16</b> |
| 6.1        | <i>Geology</i>                                       | 16        |
| 6.2        | <i>Hydrogeology</i>                                  | 16        |
| 6.3        | <i>Hydrology</i>                                     | 16        |
| 6.4        | <i>Ground Gas</i>                                    | 17        |
| 6.5        | <i>Mining</i>                                        | 17        |
| <b>7.0</b> | <b>PHASE I ENVIRONMENTAL RISK ASSESSMENT</b>         | <b>18</b> |
| 7.1        | <i>Pollutant Sources</i>                             | 18        |
| 7.2        | <i>Pathways</i>                                      | 20        |
| 7.3        | <i>Receptors</i>                                     | 20        |
| 7.4        | <i>Preliminary Conceptual Site Model</i>             | 21        |
| 7.5        | <i>Hazard Assessment</i>                             | 21        |
| 7.6        | <i>Risk Evaluation</i>                               | 21        |
| 7.7        | <i>Risk to Human Health</i>                          | 22        |
| 7.7.1      | <i>Contamination in the Soils</i>                    | 22        |
| 7.7.2      | <i>Contamination in the Surface and Groundwater</i>  | 22        |
| 7.8        | <i>Risk to Controlled Waters</i>                     | 22        |
| 7.8.1      | <i>Contamination in the Soils</i>                    | 22        |
| 7.8.2      | <i>Contamination in the Surface and Ground Water</i> | 22        |
| 7.9        | <i>Risk to Buildings and Services</i>                | 23        |
| 7.9.1      | <i>Contamination in the Soils</i>                    | 23        |
| 7.9.2      | <i>Contamination in the Surface and Ground Water</i> | 23        |
| 7.10       | <i>Risk Categorisation</i>                           | 23        |
| <b>8.0</b> | <b>CONCLUSIONS AND RECOMMENDATIONS</b>               | <b>24</b> |

## **CONTENTS PAGE**

### **TABLES**

|                |                                                    |
|----------------|----------------------------------------------------|
| <b>Table 1</b> | <b>Key Points of Site Development History</b>      |
| <b>Table 2</b> | <b>Key Points of Regulatory Review</b>             |
| <b>Table 3</b> | <b>Pollutant Linkages associated with the site</b> |
| <b>Table 4</b> | <b>Risk Evaluation Matrix</b>                      |
| <b>Table 5</b> | <b>DoE Risk Categorisations</b>                    |

### **FIGURES**

|                 |                                                   |
|-----------------|---------------------------------------------------|
| <b>Figure 1</b> | <b>Site Location Plan (included in main text)</b> |
| <b>Figure 2</b> | <b>Current Site Layout</b>                        |
| <b>Figure 3</b> | <b>Proposed Post Development Site Layout</b>      |
| <b>Figure 4</b> | <b>Aerial Photograph</b>                          |

### **APPENDICES**

|                   |                                             |
|-------------------|---------------------------------------------|
| <b>Appendix 1</b> | <b>Site Photographs</b>                     |
| <b>Appendix 2</b> | <b>Historical Maps</b>                      |
| <b>Appendix 3</b> | <b>Envirocheck® report No. 14081101-1-1</b> |
| <b>Appendix 4</b> | <b>Regulatory Responses</b>                 |
| <b>Appendix 5</b> | <b>Coal Authority Report</b>                |

## **1.0 INTRODUCTION**

### **1.1 Instruction**

BWB Consulting (BWB) was instructed by RWE npower (the Client) to carry out a Phase I Environmental Risk Assessment in relation to potential redevelopment of the site at Harborough Hill Road, Barnsley.

### **1.2 Objectives**

The purpose of the review is to assess the environmental risks and liabilities associated with the site. The environmental assessment considers any likely contamination of soil and/or groundwater on the site in order to produce a preliminary Conceptual Site Model (CSM) of the site and an interpretative qualitative environmental risk assessment.

This report will also advise on any additional work that may be required.

### **1.3 Limitations**

This report is limited to the data collected from proprietary sources, the contacted Statutory Authorities and observations made during the site walkover. All of the comments and opinions contained in this report, including any conclusions, are based on the information obtained by BWB during our investigations. The conclusions drawn by BWB could therefore differ if the information obtained is found to be misrepresentative, inaccurate, or misleading.

Except as otherwise requested by the Client, BWB is not obliged and disclaims any obligation to update the report for events taking place after:

- a) the date on which this assessment was undertaken; and
- b) the date on which the final report is delivered

BWB makes no representation whatsoever concerning the legal significance of its findings or to other legal matters referred to in the following report.

### **1.4 Guidance**

BWB Consulting Ltd is a registered Engineering Practice and is regulated by the Institute of Civil Engineers.

This report has been prepared in accordance with:

- o CLR11 – Model Procedures
- o Contamination and Environmental Matters - Their implications for Property Professionals (2nd Edition RICS Nov 2003)

- **Brownfields – Managing the development of previously developed land – A client’s guide, CIRIA 2002**
- **DEFRA and Environment Agency publications CLR7 – 10, supported by the TOX guides and SGV guides, dated March 2002**
- **DETR Circular 02/2000, Contaminated Land: Implementation of Part IIA of the Environmental Protection Act 1990**
- **Environment Agency technical advice to third parties on Pollution of Controlled Waters for Part IIA of the EPA1990, May 2002**

**And any other protocols advised by DEFRA and the EA and guidance’s prepared by BSI, CERTA, BURA, and other industry advisory bodies including BS5930 and BS10175.**

## **1.5 Judicial Precedents and Legislation**

**The following non-exhaustive list of legislative framework documents has been considered in the compilation of this document.**

- **The Environment Act (1995)**
- **The Environment Protection Act (1990)**
- **The Water Resources Act (1991)**
- **The Radioactive Substances Act (1993)**
- **The Pollution Prevention and Control (England and Wales) Regulations (2000)**
- **The Contaminated Land (England) Act (2000)**
- **The Environment Act 1995 (Commencement No.16 and Saving Provision) (England) Order (2000)**
- **The Contaminated Land (England) (Amendment) Regulations (2001)**
- **The Landfill Regulations (England and Wales) Regulations (2002)**
- **The Landfill (England and Wales) (Amendment) Regulations (2004)**
- **Rylands v Fletcher - Private Nuisance, Escape**
- **Health and Safety at Work Act**
- **The Building Regulations 1991, Part C of Schedule 1**
- **The controlled Waste Regulations 1992**
- **Special Waste Regulations 1996.**

**Neither the list of guidance documents nor the list of judicial precedents and legislation should be considered exclusive or comprehensive. There are approximately 85 individual items of legislation regulating contaminated land work. BWB makes every effort to ensure that all are adhered to in the preparation and presentation of this report.**

## **1.6 Technical Competence**

**BWB is a leading specialist multi-disciplinary engineering practice working in the contaminated land market. Most of the workload undertaken by BWB is within the commercial property development market dealing with brownfield re-**

**development and associated environmental and geotechnical issues.**

**Established in 1990, BWB is at the forefront of environmental asset management providing expertise in Environmental Risk Assessments, Environmental Site Investigations, Geotechnical Site Investigations and Remediation Strategies.**

**BWB's staff come from a wide variety of backgrounds within the geotechnical and environmental sectors and are all degree qualified. Specialists include Geotechnical Engineers, Geologists, Environmental Engineers, IEMA Auditors, Chartered Environmental Surveyors, Chartered Engineers; up to SiLC (Specialist in Land Condition) accreditation.**

**BWB's technical protocols are described in our reports and are strictly adhered to by quality control checks in the field and in the laboratory. BWB only uses UKAS and MCERTS accredited laboratories for all methods used to derive determinant concentrations.**

**BWB operates a quality assurance process under ISO9001:2000 which facilitates rigorous in-house administrative and technical protocols and is assessed externally every 6 months. BWB also initiates a robust health and safety program for each site and are an Investor in People ensuring the regular training of staff in new guidance's and techniques.**

## **1.7 Scope of Work**

**It is proposed to undertake a Phase I Environmental Risk Assessment of the site, which will:**

- Provide background information on past and present uses of the site in the context of its environmental setting;**
- Determine the nature and potential hazards and physical constraints of the site;**
- Provide background information on the geology, hydrogeology and hydrology of the site;**
- Identify receptors (targets), potential sources of contamination and plausible pathways and features of immediate concern;**
- Make informed decisions about the need for specialist assessment e.g. intrusive investigations, ecological and archaeological; and**
- Provide information relevant to worker health and safety and protection of the environment during on-site investigations;**

**And comprise of the following elements of work:**

- A review of existing data;**
- A site walkover survey undertaken by a qualified geo-environmental engineer;**
- An interpretative review of historical uses of the site;**

- 0     **An interpretative review of regulatory information;**
- 0     **Interpretation of the environmental setting of the site (geology, hydrology, hydrogeology, etc);**
- 0     **Enquiries of the Local Planning Authority (LPA);**
- 0     **Enquiries of the local Contaminated Land Officer (CLO);**
- 0     **If applicable, enquiries of the local Petroleum Officer (PO);**
- 0     **A qualitative environmental risk based assessment;**
- 0     **Recommendation and subsequent scope of any further intrusive investigation, and**
- 0     **Identify the need to involve statutory or other regulatory bodies during any subsequent exploratory investigation.**

**The results of the Phase I Environmental Risk Assessment will be used to develop a preliminary Conceptual Site Model (CSM) of the nature and extent of any contamination at the site.**

## **2.0 AVAILABLE INFORMATION**

The following sources of available information have been reviewed as part of this desk study:

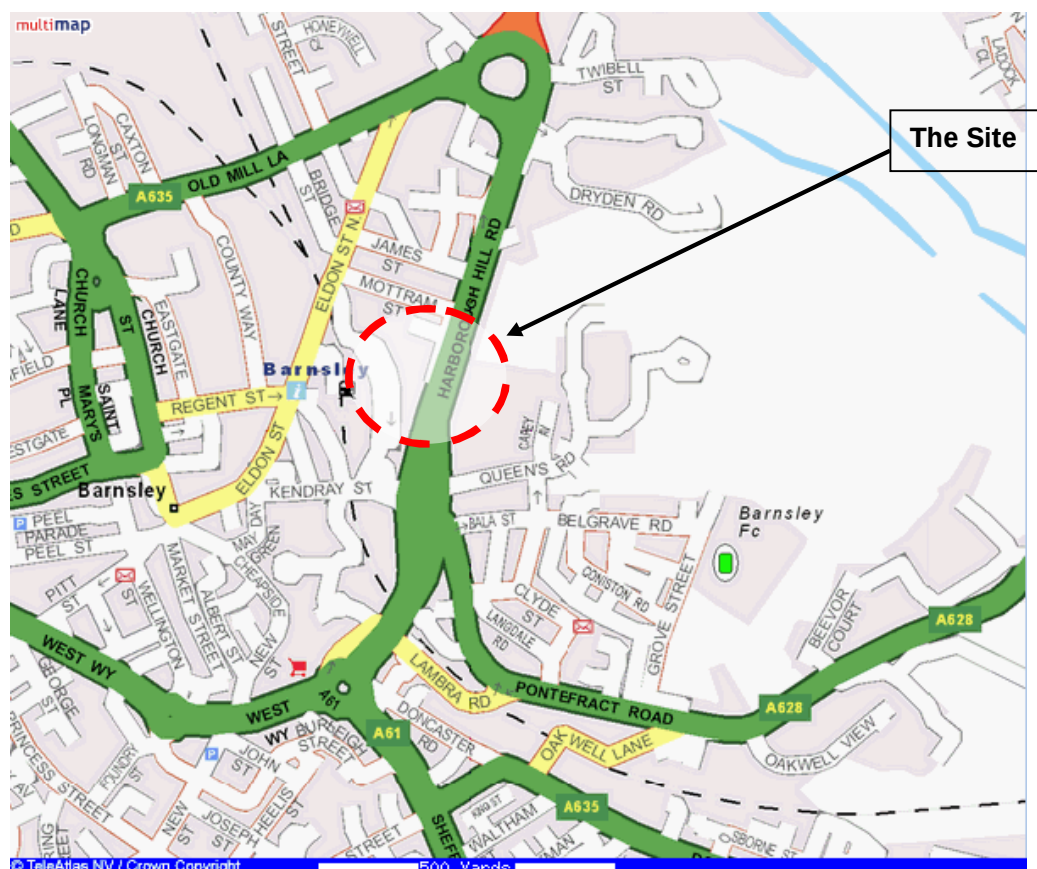
- **Project Report 101009, “Ground Investigation for a Site at Harborough Hill Road Barnsley, South Yorkshire”, prepared for Bett Brothers Limited by Soil Mechanics, May 2001.**
- **Project Report Sd01-0058-Rep, “Harborough Hill Road, Barnsley, Mining Report”, prepared for Waterman BBT by Wardell Armstrong, June 2001.**
- **Project Report R/EN1906.PS.1.2.1, “Environmental Assessment Yorkshire Electricity Depot, Harborough Hill, Barnsley”, prepared for Bett Properties by Waterman Environmental, July 2001.**
- **Project Report ANP/SEF/9211, “DRAFT Summary of The Site Investigation Reports And Assessment Of Abnormal Geotechnical And Contamination Issues At Harborough Hill Road, Barnsley”, prepared for Bett Properties by Waterman BBT Consulting Engineers, August 2001.**
- **Envirocheck® Report,19651921-1-1 , “Report on Harborough Hill Road, Barnsley May 2006**
- **1:50,000 scale solid and drift geological map, Sheet 86, published by the Geological Survey of England and Wales, edition.**
- **1:10,000 scale solid and drift geological map, sheet SK37 SE, published by the British Geological Survey, dated 1997.**

### 3.0 THE SITE

#### 3.1 Site Location

The site is located at national grid reference (NGR) 434810, 406640, between Barnsley Bus Station to the west and Harborough Hill Road to the east, on the outskirts of Barnsley Town Centre, as shown in Figure 1 below.

Figure 1: Site Location Plan



Reproduced from the Ordnance Survey 1:10,000 Scale map with the permission of the controller of Her Majesty's Stationery Office crown copyright reserved. OS Licence number 100013665

The site covers an area of approximately 2.25 Hectares varies in ground level by between 3 and 4 meters (m), (sloping to the north) centred on approximately 100m Above Ordnance Datum (AOD).

#### 3.2 Site Description

The site is located between Barnsley Bus Station to the west and Harborough Hill Road, a dual carriage to the east. Mottram Street forms the northern boundary of the site with some of its houses numbers 17 - 61 backing onto the site.

At the southern boundary of the site are an electricity sub-station and a club. Access to the site is off of the northern bound carriage way of Harborough Hill Road. The site is elevated approximately 4.0m higher than the bus station to its west and slopes gently southwards.

The current site layout is provided as Figure 2.

### **3.3 Site Reconnaissance Visit**

A site walkover was carried out by BWB on Friday 5<sup>th</sup> May 2006.

#### **3.3.1 General Site Description:**

The site is shaped as an approximate triangle with one side due north running parallel with a footpath behind the houses of Mottram Street. The Eastern face of the site runs parallel with Harborough Hill Road. The South of the site is bounded by an electricity sub-station, with associated heavy cabling. From the North West corner of the site running half way down the western side of the site the soil has recently been engineered into a sharp ground slope of approximately 45 degrees. This is some eight metres at its highest point. This slope runs from the current site boundary fence down into a newly constructed road way and bus depot that run along the west of the site.

Access to the site is from two metal gates situated in the north east corner. These gates connect the site to Harborough Hill Road via a small tarmac car park. The area between Harborough Hill Road up to and including the site is formerly of light industrial and domestic usage.

The site surface is predominantly hard standing concrete with some asphalt covering evident to the North. It is surrounded by wire or palisade fencing of 2.5m in height that has required covering with shutter board at the Northwest corner. This fence is intact but for one 3m wide section half way down the western side adjacent to the new bus depot. Within the site boundary above the new slope joining the bus depot, a series of small exploratory holes have been broken into the concrete.

These holes suggest that the concrete is reinforced and of circa 30mm in thickness. This area of the site also has had two new manholes fitted adjacent to the site boundary. These manholes may suggest an, as yet, unrecorded drainage pathway on or near the site.

Structures on the site include a flower bed that runs along the northern perimeter fence that is 3m to 4m in width and contains soft planted herbaceous layer plants and some trees. A large single story building of some 35m square and 10m in height is located centrally within the site. Numerous manholes are dispersed across the site and on a former perimeter road that encircle the central building. A small road island is situated between this building and the flower bed. This island bears some soft plants and shrubs in an ash based soil. The

island has situated on it some palisade fencing in a 3m square that houses some old furniture. A lean too shelter exists against the western perimeter fence at or near the same height as the central building.

There is an “L” shaped terrace of garage sized storage buildings that delineate the south western corner of the site in front of the sub station. Some small brick built sheds house works associated with the sub-station at the most southern point of the site. North of this and east of the terrace of storage buildings is a bunded tank complex comprising one elevated 4m long barrel shaped tank with associated pipe work. A 1m high bund surrounds this and an adjacent plant room. The site is approximately level but has a slope that runs from the lean too shelter down to the top north west corner at an angle approximately 20%.

The site is generally thinly dispersed with domestic rubbish and contains several neat piles of building materials. Just inside the main entrance to the left as one passes through the north east gates are two pallets of new house bricks and looking forward towards the central building a pile of broken glass has been delineated by road cones. Progressing south from these a set of some 10 new concrete drainage pipes of 750mm diameter and 2.50m in length have been put against the wall of the central building. Progressing south still a little further a complete derelict street lamp has been abandoned against the inside of the perimeter fence and towards the farthest extreme of the eastern side a pallet has been left loaded with some 20 or 30 new 100mm PVC pipes of 4m length and associated 200mm soil ducting.

### **3.3.2 The Oil Tank**

Despite being above ground the tank has no evidence of former covering. It is gray in colour with several visible rust patches. The bund is only of one brick in thickness i.e. (20mm). The integrity of the surrounding bund is not stable with full height cracks on all of its sides. No visible evidence of oil exists, however mildew covered patches possible conceals former precipitate. The adjacent plant room houses rubbish and broken pipes that can be seen to connect to the tank.

### **3.3.3 The lean too shelter**

This is constructed of metal and concrete and covers a row of three large square manholes suggesting that possibly this was used as an area for servicing vehicles or a machine sump.

### **3.3.4 The “L” Shaped Terrace Of Garage Sized Storage Buildings**

These are generally in a poor state of repair with cracks in the concrete construction evident. Broken wiring and light fittings cover the surface features and general rubbish and shelving are dispersed throughout. Signage indicates

that these were used to store oils and propane gas.

### **3.3.5 The Central Building**

The central building is approximately 35m square and has an elevated floor of approximately 1.0 to 1.50m above ground level it is brick built with a metal roof that extends half way down the southern wall. The roof is further extended upwards by two building long sky lights of glass and fibreglass. These are commonly broken and the inside of the building while predominantly empty is covered with broken glass, fibreglass and numerous lengths of metal caballing. A small partitioned area exists to the western side of this building that is built from breeze blocks this houses some derelict office furniture and filing cabinets. There is no machinery present but for one redundant photocopier. The building appears to have suffered fire damage. Adjacent to the entrance on the eastern is an area of what appears to be solidified bitumen tar. There are three former points of entry on the northern side and these all have signage that state the building contains asbestos. This exterior wall also has one head high window of some half meter depth with fitted fans and a security grill. The building has a loading bay on its western side.

Photographs taken during the site walkover are presented in Appendix 1.

### **3.4 Proposed Redevelopment**

The proposed redevelopment site layout is provided on Figure 3.

This development profile has been used in the human health assessment for this site.

## 4.0 SITE HISTORY

### 4.1 OS Plans

All readily available historical Ordnance Survey (OS) mapping for the site area have been obtained and reviewed. The key points of the site development history and the potential environmental impact to soil and groundwater at the site are summarised in Table 1. Copies of historical maps are presented in Appendix 2.

**Table 1: Key Points of Site Development History**

| Dates       | Scale    | Detail                                                                                                                                    |                                                                                                                                                                                                                                                                                                            |
|-------------|----------|-------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|             |          | <i>On Site:</i>                                                                                                                           | <i>Surrounding Area:</i>                                                                                                                                                                                                                                                                                   |
| 1855        | 1:10,560 | The site is occupied open fields and plantations with several small buildings including Harborough cottage.                               | The site is located on the eastern outskirts of Barnsley town. Barnsley RAILWAY STATION with sidings lies at the western boundary of the site. To the north, east and south are open fields, small buildings and plantations. Harborough Hill Road marks the eastern boundary of the site.                 |
| 1892 – 1893 | 1:2,500  | The site is occupied by Harborough Hill House with gardens and plantations.                                                               | RAILWAY LINES lie along the eastern boundary of the site. An ENGINE SHED is found 40m away. Approximately 100m to the south east are a RAILWAY FOUNDARY AND TIMBER YARD. Located to the south is Harborough House with gardens. Fields occupy the north and east.                                          |
| 1906        | 1:2,500  | There are no significant variations from the previous edition.                                                                            | There are no significant variations from the previous edition. Apart from the development of houses 35m to the north.                                                                                                                                                                                      |
| 1931        | 1:2,500  | The site is occupied by allotment gardens. An existing small building to the south east of the site is named a club, gardens surround it. | Mottram Street and houses have been developed and mark the northern boundary of the site. Harborough House to the south is marked “club”. The RAILWAY FOUNDARY is not marked on the map instead there is an EXCHANGE STATION AND TRAVEL CRANE. Approximately 170m to the east of the site is BORO COLLIERY |

| Dates        | Scale    | Detail                                                                                                                                            |                                                                                                                                                                                                                                   |
|--------------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|              |          | <i>On Site:</i>                                                                                                                                   | <i>Surrounding Area:</i>                                                                                                                                                                                                          |
| 1955 – 1956  | 1:10,560 | There are no significant variations from the previous edition.                                                                                    | There are no significant variations identified at this scale from the previous edition. Apart from the development of houses on the east side of Harborough Hill Road and the demolition of THE EXCHANGE STATION AND TIMBER YARD. |
| 1961         | 1:1,250  | The site is occupied by open ground a number of small unidentified buildings are found along the northern edge and north west corner of the site. | A BUS STATION occupies the grounds of the former foundry and timber yard to the south east of the site.                                                                                                                           |
| 1968 to 1972 | 1:1,250  | The site is occupied by the ELECTRICITY BOARD DEPOT.                                                                                              | A bowling club has been developed 30m south of the site. A COAL AND COKE YARD is located approximately 60m to the south west of the site boundary.                                                                                |
| 1987         | 1:1,250  | There are no significant variations from the previous edition.                                                                                    | Harborough Hill Road has become a dual carriage way.                                                                                                                                                                              |
| 1991         | 1:1,250  | Several small buildings appear in the south west corner of the site                                                                               | A BUS STATION is found adjacent to the western boundary of the site.                                                                                                                                                              |
| 2004         | 1:10,000 | There are no significant variations from the previous edition.                                                                                    | There are no significant variations from the previous edition.                                                                                                                                                                    |

Historical ordnance survey plans show the site remained relatively undeveloped until the late 1960's to early 1970's. The site use up to this period was residential with open gardens and plantations. This was replaced with an electricity board depot the buildings of which still remain today.

The surrounding area to the west has been developed since the mid nineteenth century. The land immediately adjacent to the site has been railway land up to about 1987 with associated heavy industries existing into the mid twentieth century. Industrial works known to have existed were a foundry and a timber yard. The north, east and south of the site have seen development as a mixed residential and commercial area since the early part of the 1900's. A small colliery "Boro Colliery" existed from the 1930's until the 1960's located approximately 150m east of the site. Today the surrounding area is of mixed residential and commercial properties with a bus and railway station's located adjacent to the western boundary of the site.

## **4.2 Aerial Photographs**

An aerial photograph has been reviewed and is provided as Figure 4.

This shows the site in its present layout.

## **4.3 Previous Investigation Reports**

Previous site investigations undertaken at the site in question of Harborough Hill Road are:

- Project Report 101009, "Ground Investigation for a Site at Harborough Hill Road Barnsley, South Yorkshire", prepared for Bett Brothers Limited by Soil Mechanics, May 2001.
- Project Report Sd01-0058-Rep, "Harborough Hill Road, Barnsley, Mining Report", prepared for Waterman BBT by Wardell Armstrong, June 2001.
- Project Report R/EN1906.PS.1.2.1, "Environmental Assessment Yorkshire Electricity Depot, Harborough Hill, Barnsley", prepared for Bett Properties by Waterman Environmental, July 2001.
- Project Report ANP/SEF/9211, "DRAFT Summary of The Site Investigation Reports And Assessment Of Abnormal Geotechnical And Contamination Issues At Harborough Hill Road, Barnsley", prepared for Bett Properties by Waterman BBT Consulting Engineers, August 2001.

These have been reviewed in the chronological order in which they are dated.

Copies of these reports are not included within this document.

### **4.3.1 Ground Investigation for a Site at Harborough Hill Road Barnsley, South Yorkshire: Soil Mechanics, May 2001.**

This report was undertaken primarily for geotechnical purposes.

In summary this investigation comprised five cable tool boreholes, six deep rotary boreholes by open hole methods, three window sampling holes and nine trial pits. Gas monitoring standpipes were installed in all rotary boreholes.

Laboratory geotechnical and chemical testing was undertaken on soil samples obtained during this investigation. This included classification testing, quick undrained triaxial compression testing, compaction tests, and pH and soil sulphate contents. A brief initial soil contaminant screening was undertaken and included inorganic and organic chemical contaminant testing and ground gas analysis. These results were not reviewed as part of this report.

This investigation recorded typically <1.0m of made ground overlying weathered coal measure mudstones with subordinate sandstones, siltstones and coal seams.

The made ground comprised sandy gravel sub base material of limestone and sandstone.

Deep drilling within the coal measures recorded up to 7 coal seams present beneath the site. They were encountered at depths of between just below the made ground to 60m and ranged in thickness from 0.1 to 1.3m.

No evidence of deep or shallow coal mining was recorded during this investigation.

Exploratory holes recorded some perched groundwater as seepage over the lower coal measures. Piezometric water levels within the coal measures were recorded between 5.75m and 15.7m bgl.

Contamination results were not reviewed as part of this report.

#### **4.3.2 Harborough Hill Road, Barnsley, Mining Report: Wardell Armstrong, June 2001.**

This report covers the potential mining impacts on this site.

It indicates the outcropping of two Coal seams beneath the site. The Top Beamshaw and Winter seams and highlights the potential for unrecorded shallow mine workings particularly within the winter seam in the east part of the site.

#### **4.3.3 Environmental Assessment Yorkshire Electricity Depot, Harborough Hill, Barnsley; Waterman Environmental, July 2001.**

The protocols utilised in this assessment are now either redundant (Kellys) or withdrawn (ICRCL). Reference is made to an earlier desk study, but a copy has not been provided. This report falls short of current best practice, but best practice approaches have moved on significantly since this report was written in 2001.

#### **4.3.4 DRAFT Summary of The Site Investigation Reports And Assessment Of Abnormal Geotechnical And Contamination Issues At Harborough Hill Road, Barnsley; Waterman BBT Consulting Engineers, August 2001.**

This report attempts to summarise the preceding documents and offer a dialogue on the impacts these may have on the development of the site. Due to the age of the other reports, this in turn, has no real providence itself.

## 5.0 REGULATORY REVIEW

### 5.1 Envirocheck® report No. 14081101-1-1

The factors that could influence the environmental status of a site are described in Table 2 below. A full listing of these factors including discharge consents, pollution incidences and other environmental information is presented in Appendix 3.

**Table 2: Key Points of Regulatory Review**

| Feature                                   | Nº and distance from site boundary             | Closest to site*                                                                                                      | Comments                                                                 |
|-------------------------------------------|------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| Discharge Consents                        | There are 5 within 250m of the site            | 184m south of the site                                                                                                | Not considered relevant to the site.                                     |
| Water Abstractions                        | One between 251 and 500m of the site           | 391m North East of the site                                                                                           | Not considered relevant to the site.                                     |
| Pollution incident to controlled waters.  | There is 1 incident within 250m of the site.   | 196m South East of the site. Pollutant oils-Diesel into a fresh water stream. Recorded as a category 3 minor incident | Not considered relevant to the site.                                     |
| Substantiated Pollution Incident Register | One incident between 501 and 1000m of the site | 885m North of the site                                                                                                | Not considered relevant to the site.                                     |
| Registered Fuel Stations                  | There are 2 within 251 to 500m of the site     | 453m north of the site                                                                                                | Not considered relevant to the site.                                     |
| Waste Management Facilities               | One recorded on site                           |                                                                                                                       | The site was registered as a waste transfer station between 1992 to 1999 |
| Registered Landfill sites                 | two recorded between 251 and 500m              | 316m North West of the site                                                                                           | Not considered relevant to the site.                                     |

\*All directions and distances pertain to the site boundary and are approximate.

The regulatory review indicates that the land uses immediately surrounding the site present a negligible risk with respect to potential environmental impacts to the site and its environment.

### 5.2 Local Authority Contaminated Land Team

A request has been made to Sheffield City Council to review information held by the Environmental Protection Service. Available information relating to the following matters were requested:

- Known contamination on the site or the surrounding area.
- Council remediation strategies for the site.
- Previous contamination investigations, as part of planning applications.
- Complaints to the Contaminated Land Team with regards to the site.
- Recorded landfill sites on or within the immediate surrounding area.
- Process Authorisations or permits, with regards to industrial operations on or within 500 metres of the site?
- Consents in force to discharge effluent from the site or the surrounding area.
- Pollution incidents on the site or within the immediate surrounding area.

**At the time of writing, the report has not been received.**

### **5.3 Local Planning Authority**

**A request has been made to Sheffield City Council in regards to the following information held by the planning department:**

- Details of any current planning applications.
- Details of any historic planning consents, whether granted or refused.
- Details of any restrictions on development of the site or immediate surrounding area.

**At the time of writing, the report has not been received.**

## **6.0 GROUND CONDITIONS**

### **6.1 Geology**

Given the known history of the site it is not anticipated that significant thicknesses of Made Ground will be present on site.

The BGS 1:50,000 solid and drift sheet 86 Barnsley, indicates there are no superficial deposits underlying the site and that the solid geology is of Carboniferous Lower Westphalian coal measures.

The Envirocheck® report indicates that the solid geology underlying the site is Lower Westphalian productive coal measures.

The Envirocheck® report records that there are likely to be moderate hazards from Compressible Ground, no potential Ground Dissolution and low hazards from shrinking/Swelling clays and running sand ground stability.

### **6.2 Hydrogeology**

The underlying Lower Coal Measures are identified as a Minor Aquifer. These are not generally used for significant abstraction but can be important for local supply and in providing base flow to rivers.

No groundwater abstraction points are present within 500m of the site. The site does not lie within a source protection zone.

Soils underlying the site are ascribed a high leaching potential with a worst case vulnerability classification (U) until proven otherwise, this rated is given due to the urban nature of the site and the lack of data obtainable from these urban areas.

Previous investigative works encountered perched groundwater as seepage over the lower coal measures rockhead. Subsequent groundwater monitoring within the coal measures recorded piezometric levels of between 76.0m AOD and 86.0m AOD.

### **6.3 Hydrology**

The nearest water course is the River Don, located some 800m north east of the site. The site does not lie within the floodplain of the River Don. Environment Agency flood risk maps indicate that the chance of flooding is less than 0.1%.

This is not considered to represent a receptor for any potential on site contamination due to the distance involved.

## **6.4 Ground Gas**

The NRPB-W26 'Radon Atlas of England and Wales' 2002 edition indicates that less than 1% of homes in the area around the site have recorded radon levels above the recommended action level.

BRE211 'Radon: guidance on protective measures for new dwellings' 1999 edition indicates basic radon protection may be required. A geological assessment should be carried out and consideration given to installing basic measures if the assessment shows that they are necessary.

## **6.5 Mining**

The Envirocheck® report records that the site lies within a zone affected by coal mining. The risk from shallow mining is considered low to moderate.

A previous Wardell Armstrong report was undertaken specifically relating to mining issues and this Environmental Risk Assessment defers to that report.

A Coal Authority Report has been commissioned by BWB, a copy of which is attached as Appendix 6.

The report indicates that the site is not within the zone of influence of past mine workings, however coal is believed to exist under the site, at or close to the surface that may have been worked historically.

The site does not lie within the zone of influence of present underground or surface mine working. No licence to extract coal exists for this area, although the reserves of coal present beneath the site could be worked in the future, subject to feasibility, licenses and planning.

There are no known shafts or adits within the site or within 20m of the site boundary.

No records of faults or other lines of weakness that may affect the stability of the property are kept by the Coal Authority.

The Coal Authority holds no records of any damage notice or claim having been made in respects of the property since 1984.

## **7.0 PHASE I ENVIRONMENTAL RISK ASSESSMENT**

The risk posed by any contaminants in soil or groundwater will depend on the nature of the hazard, the probability of exposure, the pathway by which exposure occurs, and the likely effects on the receptors. A contaminant is defined in the Contaminated Land Exposure Assessment model (CLEA) as a substance that has the potential to cause harm, while a risk is considered to exist if such a substance is present in sufficient concentration to cause harm and a pathway exists for a receptor to be exposed to the substance.

The following sections discuss all the identified potential sources, pathways and receptors in the context of the site and plausible pollutant linkages which may represent a risk to human health and/or controlled waters from the data gained from the desk study. At this stage the assessment is qualitative and aimed to determine all pollutant linkages, irrespective of significance or allowing for uncertainty.

Three impact potentials exist for any given site, these are:

- Ø The site impacting upon itself;
- Ø The site impacting on its surroundings, and;
- Ø The surroundings impacting on the site.

All three impacts need to be considered in a risk assessment.

### **7.1 Pollutant Sources**

The DoE produced a Consultation Paper in dated May 1991: entitled 'Public Registers of Land which may be Contaminated'. This document provided a schedule of contaminative uses.

From this list the following contaminative uses are associated with the site.

#### **Sub Station**

C.3e) Electricity and sub-station.

#### **Fuel Tanks**

C.14c) Dismantling, repairing or maintenance of road transport and road haulage; Garages and filling stations.

#### **Demolition**

C.16c) Demolition of buildings, plant or equipment used for any of the activities included in the schedule.

From this list the following contaminative uses are associated with the surrounding area.

**Colliery & Coal Yard**

C.2a) Extracting, handling and storage of carbonaceous materials such as coal, lignite, petroleum, natural gas, or bituminous shale (not including the underground workings).

**Timber Yard**

C.11a) Chemical treatment and coating of timber and timber products.

**Railway Land**

C.14a) Marshalling, dismantling, repairing or maintenance of railway rolling stock.

**Railway Foundry**

C.8a) Manufacture of metal goods, including mechanical engineering industrial plant or steelworks, motor vehicles, ships, railway or tramway vehicles, aircraft, aerospace equipment or similar equipment.

**Bus Depot**

C.14c) Dismantling, repairing or maintenance of road transport and road haulage; Garages and filling stations.

The main sources of contaminants at the site relevant to any assignable pollutant linkages are likely to be associated with demolition of small industries that have previously occupied the site and the adjacent area.

In 2002, as part of the CLEA programme, DEFRA produced a series of Contaminated Land Reports (CLRs). CLR8 entitled 'Potential Contaminants for the Assessment of Land' lists the likely contaminants that can be expected from a variety of contaminative industries. The then DoE also produced a series of Industry Profiles. Where such a profile exists, consideration has been given to these documents.

This list is not exhaustive, nor is it definitive, that is to say, listed contaminants only have a potential to be present, their presence is not assured, nor does this list exclude other contaminants from being present.

From this list the following contaminants have a potential to be encountered:

Metals, (Cadmium, Chromium, Copper, Zinc, Mercury, Nickel, Vanadium) semi-metals and non-metals, (Arsenic, and Boron) and inorganic chemicals (free Cyanide, Nitrate, Sulphate and Sulphide). Asbestos may also be associated with the demolition material.

Important organic chemicals that may be associated with a previous industrial land use include Phenol, Oil/fuel hydrocarbons, aromatic hydrocarbons, polycyclic aromatic hydrocarbons (PAHs), chlorinated aromatic hydrocarbons (CAH) and polychlorinated biphenyls (PCB's).

Any intrusive testing programme should include these contaminants as a minimum requirement.

## **7.2 Pathways**

Potential pathways by which human and environmental receptors may be impacted upon are identified as follows:

- Ingestion
- Skin contact
- Inhalation

These pathways arise through direct contact with contaminated soils, contact with contaminated groundwater or inhalation of airborne dusts, fibres or gases.

## **7.3 Receptors**

The potential human receptors at the site are:

- Current occupiers of the site
- Future occupants of the site
- Neighbouring residents
- Construction workers
- Services personnel working in trenches

Construction materials may be affected by contaminants. These receptors are:

- Plastic water pipes, which may be attacked by organic compounds such as PAH and TPH.
- Buried concrete, which may be affected by high levels of sulphate and/or low pH in site soils or groundwater.

Potential water receptors include:

- Groundwater underlying the site designated a Minor Aquifer.

An assessment of these pollutant linkages has been made and is presented in Section 7.4 below.

#### 7.4 Preliminary Conceptual Site Model

The preliminary CSM is formulated on the basis of potential sources of contamination identified on site, potential receptors that may be the recipient of contamination arising from those sources and any pathways that may exist, thus creating a source-pathway-receptor (target) pollutant linkage.

The following pollutant linkages have been identified as being attributed to this CSM and are presented in Table 3 below:

**Table 3: Pollutant Linkages Associated With The Site**

|   | Source                                         | Pathway                               | Receptor                        |
|---|------------------------------------------------|---------------------------------------|---------------------------------|
| 1 | Contaminants contained within the made ground. | Vertical migration through site soils | Underlying Minor Aquifer        |
| 2 | Contaminants contained within the made ground. | Direct contact                        | Existing site users             |
| 3 | Contaminants contained within the made ground. | Direct contact                        | Ground workers                  |
| 4 | Contaminants contained within the made ground. | Surface run off                       | On and off site drainage system |
| 5 | Contaminants contained within the made ground. | Lateral migration through site soils  | Existing buildings on site      |

No significance or uncertainty is attributed to any pollutant linkage identified.

#### 7.5 Hazard Assessment

The Hazard Assessment has identified the potential presence of contaminants associated with made ground as the most significant hazard associated with the environmental setting of the site, in respect to the potential for direct contact by site users, contamination of the site soils and the contamination of the underlying Aquifer.

Additionally asbestos present on site also represent a hazard but of a less significant nature.

#### 7.6 Risk Evaluation

A simple matrix can provide a consistent basis for decision-making. It should of course be used with caution, recognising the over-simplification that it will normally represent. The probability and consequences are defined according to parameters relevant to the situation; the boundaries of risk acceptability (and tolerability, where relevant) indicated on the matrix provide in Table 4 can be tailored to the factors influencing the significance of the risk. Individual

situations are mapped onto the matrix to provide a ready and consistent indication of their acceptability or tolerability.

**Table 4: Risk Evaluation Matrix**

|             | CONSEQUENCES   |                |              |            |
|-------------|----------------|----------------|--------------|------------|
| PROBABILITY | Severe         | Medium         | Mild         | Negligible |
| High        | Very High      | Very High/High | Moderate/Low | Negligible |
| Medium      | Very High/High | Moderate       | Moderate/Low | Negligible |
| Slight      | High/Moderate  | Moderate/Low   | Low          | Negligible |
| Negligible  | High/Moderate  | Low            | Low          | Negligible |

These attributes are evaluated qualitatively against individual hazard assessments to determine the likelihood of a given hazard occurring.

The following evaluations have therefore been made:

## **7.7 Risk to Human Health**

### **7.7.1 Contamination in the Soils**

Due to the historical use of the site, they have been attributed a **MEDIUM** probability with **MEDIUM** consequences resulting in a **MODERATE** risk.

### **7.7.2 Contamination in the Surface and Groundwater**

Due to the historical use of the site, they have been attributed a **MEDIUM** probability with **MEDIUM** consequences resulting in a **MODERATE** risk.

## **7.8 Risk to Controlled Waters**

### **7.8.1 Contamination in the Soils**

Due to the historical use of the site, they have been attributed a **MEDIUM** probability with **MEDIUM** consequences resulting in a **MODERATE** risk.

### **7.8.2 Contamination in the Surface and Ground Water**

Due to the historical use of the site, they have been attributed a **MEDIUM** probability with **MEDIUM** consequences resulting in a **MODERATE** risk.

## 7.9 Risk to Buildings and Services

### 7.9.1 Contamination in the Soils

Due to the historical use of the site, they have been attributed a **MEDIUM** probability with **MEDIUM** consequences resulting in a **MODERATE** risk.

### 7.9.2 Contamination in the Surface and Ground Water

Due to the historical use of the site, they have been attributed a **MEDIUM** probability with **MILD** consequences resulting in a **LOW to MODERATE** risk.

## 7.10 Risk Categorisation

The pollutant linkages assessment combined with the historical use of the site indicates that in its present state the site represents a **MODERATE** human health risk, a **MODERATE** risk controlled waters risk and a **LOW to MODERATE** risk to site structures.

During redevelopment the risk to human health will rise to **HIGH to MODERATE** due to demolition activities associated with earthworks and construction activities over the site.

Post development, all risks should be reduced to no greater than **LOW**.

These ratings are set against the following categories provided in Table 5 as defined by, the then, Department of the Environment in CLR2 and subsequently amended.

Table 5: DoE Risk Categorisations

| RATING            | DEFINITION                                                                                                                                                                                                                                                       |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Very High Risk    | This is a <i>high probability</i> that <i>severe harm</i> could arise to a designated receptor from an identified hazard at the site without appropriate remedial action.                                                                                        |
| High Risk         | <i>Harm</i> is likely to arise to a designated receptor from an identified hazard at the site without appropriate remedial action.                                                                                                                               |
| Moderate Risk     | It is possible that without appropriate remedial action <i>harm</i> could arise to a designated receptor. It is relatively unlikely that any such harm would be severe, and if any harm were to occur it is more likely that such harm would be relatively mild. |
| Low Risk          | It is possible that <i>harm</i> could arise to a designated receptor from an identified hazard. It is likely that, at worst, if any harm was realised any effect would be mild.                                                                                  |
| Negligible Risk   | The presence of an identified hazard does not give rise to the potential to cause <i>harm</i> to a designated receptor.                                                                                                                                          |
| No Potential Risk | There is no potential risk if no pollution linkage has been established.                                                                                                                                                                                         |

## **8.0 CONCLUSIONS AND RECOMMENDATIONS**

Although a MODERATE risk rating has been attributed to the site in its present state, it would be prudent to investigate further for specific contaminants and areas of contamination present prior to disturbing the made ground during re-development. A localised small scale intrusive investigation targeted at these potential sources would clarify these matters.

Ground/construction workers may be subjected to an elevated risk during ground preparation works. The appropriate use of personal protective equipment (PPE), such as boots and gloves; normal health and safety protocols, such as not eating on site, washing hands, etc; will reduce this risk to acceptable levels.

Consideration should be given to the use of appropriate materials should buried services traverse through the area if deleterious contaminants are identified.

Asbestos may be present on site within the made ground and as a result of the demolition of existing buildings. A specialist contractor should assess the risk posed by this potential contaminant source. All recommendations made in the independent asbestos report should be adhered to.

It is unlikely that this site would be designated as contaminated land as defined in Part IIA of the EPA and should therefore not appear on any register of contaminated sites.

This report should be submitted to the local statutory authorities as part of the planning application.

Prior to any redevelopment the site should be investigated further.

## FIGURES

**FIGURE 2**

**CURRENT SITE LAYOUT**

**FIGURE 3**

**PROPOSED DEVELOPMENT PLAN**

**FIGURE 4**

**AERIAL PHOTOGRAPH**

## **APPENDICES**

## **APPENDIX 1**

### **SITE PHOTOGRAPHS**

**APPENDIX 2**

**HISTORICAL MAPS**

**APPENDIX 3**

**ENVIROCHECK REPORT**

**APPENDIX 4**

**REGULATOR RESPONSES**

## **APPENDIX 5**

### **COAL AUTHORITY REPORT**