

Confidential

**OXFORD ROAD,
CANNOCK, STAFFORDSHIRE**

**GEOENVIRONMENTAL DESKTOP
& PART 2A APPRAISAL**



For



Project No: 10734_01

May 2011

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Site Location *Oxford Road, Rumer Hill, Cannock, Staffordshire, WS11 8ER*



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EXECUTIVE SUMMARY

Site Location	The site is primarily situated along Oxford Road (WS11 8ER), Rumer Hill, located approximately 400m to the east of Cannock National Rail Station. The site is centred on an OS GR of 398949 ^E , 309640 ^N and comprises an area of 2.24 hectares.
Environmental Setting	<p>The site is set in an area of overall Medium environmental sensitivity based upon the following:</p> <ul style="list-style-type: none"> • Medium Sensitivity with regards to hydrogeological receptors primarily due to the underlying Secondary A (Bedrock) Aquifer. It is noted that the Aquifer is expected to be underlain by a significant thickness of Glacial Till and is not situated within Source Protection; • Medium Sensitivity for hydrological receptors as the nearest primary river is 250m from site; and, • Low Sensitivity with regards to ecological receptors – no such receptors have been identified within 250m of site.
Current Use and History	<p>The site is currently occupied by (pre-1994) housing and allotment gardens. Historically, the site is understood to have been occupied by a Brickyard from as early as 1883 which included a chimney and a number of onsite buildings believed to be associated with brick manufacturing. It later became disused and the surface excavations backfilled with unknown materials.</p> <p>Demolition of the brickyard buildings and restoration of the surface workings occurred from as early as 1938 with the site being fully redeveloped to its current use by 1956.</p> <p>Offsite, the general area has been heavily affected by landfilling of a variety of wastes, including industrial, special and liquid sludge waste.</p>
Contamination Issues	<p>The primary contamination risks to the site comprise:</p> <ul style="list-style-type: none"> • contamination arising from the unknown nature of backfilled materials onsite which may include waste materials; • contamination associated with potential ash and clinker may have been used to fertilize allotment gardens; and, • elevated levels of hazardous ground gases which have been recorded at Rumer Hill Landfill directly adjacent to the site.
Preliminary Conceptual Model & Risk Assessment	<p>A Preliminary (Qualitative) Risk Assessment, for the purpose of Part 2A determination, has been undertaken based upon available desktop information. The following risks, as defined herein, have been identified:</p> <ul style="list-style-type: none"> • Medium – High Risk to Human Health; • Low – Medium Risk to Controlled Waters; and, • Medium – High Risk to Buildings.
Recommendations	<p>Based on the above information, and in line with current Statutory Guidance, the following recommendations have been developed:</p> <ul style="list-style-type: none"> • undertake an intrusive site investigation as detailed herein; and, • provide a <i>Quantitative Risk Assessment</i> of the site investigation data to inform (amongst other considerations) whether the site is <i>Contaminated Land</i> as defined under the Statutory Guidance.

1.0 INTRODUCTION

Terms of Reference

1.1. This report has been produced by Campbell Reith Hill LLP (CampbellReith) on behalf of Cannock Chase District Council ('the Client'), in order to provide a Geoenvironmental Desktop Study and Part 2A Appraisal of Oxford Road, Rumer Hill, Cannock. WS11 8ER (hereafter referred to as 'the site'). Collectively, the site encompasses sixty residential properties and 0.50 hectares of allotment gardens as follows:

- N^o 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 50 -60, 62, 64 & 66 Oxford Road, which comprise semi-detached residential housing with private gardens;
- N^o 2, 4 & 6 Salop Drive comprising semi-detached residential housing;
- N^o 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61 & 62 Lincoln Drive;
- N^o 13, 15, 17, 19, 21 & 23 York Road; and,
- Rumer Hill Allotment Gardens which occupy the northeast of the site.

1.2. All properties were constructed prior to 1994 and the implementation of PPS23¹. As such, contamination appraisals and any necessary remedial measures are unlikely to have been addressed under planning. With regards to the allotments, planning consent was granted pre-1994, and similarly, the suitability of the land for this use is unlikely to have been previously appraised.

Purpose

1.3. This report has been specifically produced to assist in the delivery of the Client's obligations under Part 2A of the Environmental Protection Act 1990. Specifically, the site is known by the Local Authority to be potentially affected by contaminative historical uses, and as such, has been highlighted as a **priority site**² for further appraisal in line with their Contaminated Land Strategy, June 2001. The purpose of this report is to:

- provide a *Geoenvironmental Desktop Study*, including a summary of the site's environmental setting, historical development and current Conceptual Site Model in accordance with CLR 11³;

¹ Office of the Deputy Prime Minister, *Planning Policy Statement 23: Planning and Pollution Control*, 2004.

² Priority Sites are determined by the Local Authority where an 'unacceptable risk' to Human Health may be present (as oppose to sites where a risk to Controlled Waters or Ecological Receptors may be present).

³ Department for Food, Environment and Rural Affairs (Defra) & Environment Agency, *Contaminated Land Report (CLR) 11: Model Procedures for the Management of Land Contamination*, 2004.

- undertake a *Qualitative Risk Assessment* to determine the likelihood of whether the site may satisfy the legal definition of 'Contaminated Land' as provided in Section 78A(2) of the Environmental Protection Act 1990⁴; and,
- where a high risk / significant probability is determined, provide recommendations for further works, including intrusive site investigation.

Sources of Information

- 1.4. This report has been primarily based upon the following sources of information, as summarised under Table 1.1. In addition, a site walkover has been undertaken, the findings of which are provided under the site description, Section 2.0.

TABLE 1.1: SUMMARY OF DESKTOP INFORMATION

Ref	Document	Document Reference	Date	Appendix
[1]	GroundSure EnviroInsight, GeoInsight and MapInsight reports.	EMS_126445_172881	Apr. 2011	C
[2]	British Geological Survey borehole logs for Rumer Hill (offsite), obtained from www.bgs.ac.uk/data/boreholescans.html	SJ90NE/20 SJ90NE/17	Undated	N/A
[3]	Environment Agency website, www.environment-agency.gov.uk	No Reference	Apr. 2011	N/A
[4]	Multi Agency Geographical Information for the Countryside (MAGIC) website, www.magic.gov.uk	No Reference	Apr. 2011	N/A
[5]	Babtie Geotechnical, <i>Rumer Hill Landfill Site Risk Assessment – Interpretative Report.</i>	BGE016782/CH/ABH	Jun. 1996	*
[6]	Babtie Group, <i>Risk Assessment – Interpretative Report Addendum: Gas Monitoring and Extraction System.</i>	BGE016782/H/26.1.98	Jan. 1998	*
[7]	Landfill monitoring data for Rumer Hill Landfill provided by Staffordshire County Council covering the period 01/09.10 – 30/11/10 and 01/01/11 – 31/03/11.	No Reference	2011	*
* Due to copyright restrictions, it is not possible to provide this data within the Appendices. A summary of the most pertinent points has been provided under Section 4.0 and the entire documents may be viewed via appointment with Staffordshire County Council.				

⁴ The legal definition of contaminated land is provided in Section 78A(2) of Part 2A of the Environmental Protection Act 1990. Contaminated Land is 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: (a) *Significant Harm* is being caused or there is a significant possibility of such harm being caused; or (b) pollution of controlled waters is being, or is likely to be caused. It is noted that the Statutory Guidance relating to Contaminated Land is currently in the process of revision. The regulations require local authorities, such as Cannock Chase District Council, to inspect land in its District for contamination and this process is detailed under the Cannock Chase Contaminated Land Strategy (June 2001).

2.0 SITE DESCRIPTION

Site Location

- 2.1. The site is primarily situated along Oxford Road (WS11 8ER), Rumer Hill, located approximately 400m to the east of Cannock National Rail Station. The site is centred on an OS GR of 398949^E, 309640^N and comprises a total area of 2.24 hectares. The site location and an annotated layout plan are presented as Figures 1 and 2 respectively (Appendix A).

Site Description

- 2.2. A site walkover was undertaken by a representative of CampbellReith on Wednesday 11th May 2011 and forms the basis of the following site description. The annotated site layout plan (Figure 2, Appendix A) should be read in conjunction with the following text. Where referenced, photographs are provided under Appendix B.

Site Layout

- 2.3. The site is irregular in shape and broadly orientated on a north-south alignment on either side of Oxford Road. The site also includes housing fronting on to the east side of Lincoln Drive and north of York Road. The residential area largely comprises semi-detached housing with open front lawns and private rear gardens. A number of buildings in the north of the site appeared to form two storey blocks of flats, however, this could not be confirmed at the time of the walkover.
- 2.4. An approximately 0.50 hectare allotment area, *Rumer Hill Allotments* [Photograph 6], forms the north-eastern portion of site. The gates were locked at the time of the site walkover and an inspection of the plots was not possible.

Site Topography

- 2.5. The site topography is generally at 140m Above Ordnance Datum (AOD) and undulates in a north-south direction along Oxford Road varying from 137m AOD – 143m AOD⁵.

⁵ Site topography data has been obtained from Google Earth Pro © and is approximate.

Site Access & Car Parking

- 2.6. The site is primarily accessed off Lichfield Road (A5190) via Devon Road. On-street car parking is available at the site, with a larger area in the southeast corner of the site [Photograph 2] adjacent to the children's play area (detailed below).

Surrounding Land-Use

- 2.7. A description of the surrounding area is provided under Table 2.1 below:

TABLE 2.1: SUMMARY OF SURROUNDING LAND USE

Direction	Description
North	The immediate north of the site is formed by a recreational area (open grass land) [Photograph 7] and residential housing along Oxford Green. A further 100m beyond, Lichfield Road (A5910) runs on an east-west orientation.
East	An electricity sub-station is located directly adjacent to the southeast of the site, opposite a children's play area (also offsite). The remaining land to the east of the site is largely bordered by an overgrown and steeply banked wood, which falls in ground level from the site to Eastern Way (A460). This area of land is known to comprise an historic landfill, <i>Rumer Hill Landfill</i> . Beyond Eastern Way, Poplars Landfill (operational) is present approximately 40m from site.
South	The south of the site is formed by overgrown and undulating wooded land and an electricity transformer compound approximately 30m from site. The compound is heavily secured and accessed off York Road.
West	The west of the site is formed by housing similar in style to the site. The railway line and Cannock station are present approximately 250m to the west of the site.

3.0 ENVIRONMENTAL SETTING

Geology

- 3.1. The site geology is summarised under Table 3.1 below. The associated references are presented under Section 1.4.

TABLE 3.1: SUMMARY OF GEOLOGY

Type	Description	Depth to Base	Ref
Made Ground	A variable thickness of Made Ground should be anticipated in parts of the site coincident with infilled land and former development. Ground data provided under Reference 5 for Rumer Hill Landfill, directly to the east and southeast of the site, describes two distinct units of Made Ground as follows: rock-fill / coal waste (opencast backfill) which is variously termed 'mudstone clay fill / clay ash and coal fill / clay and mudstone fill / clay fill'; and, landfill waste described as tip-fill.	Unknown	[5]
Superficial Deposits	The site is indicated to be underlain by Till (Devensian). Available BGS borehole logs onsite (illustrated in Figure 2) generally describe the Till as orange-brown sand and pebbles with occasional clay and fragments of coal. These deposits are absent in the northern parts of the site.	10 – 14m bgl	[1] - [2]
Solid Deposits	Solid geology comprises Pennine Middle Coal Measures Formation , which is formed of mudstone, siltstone and sandstone. These measures correspond with the Westphalian B and C sequence. This strata outcrops in the north of the site where superficial deposits are absent.	Unknown	[1]
Ground Workings (Onsite)			
The site is known to have been formerly used as a Brick Works including the opencast extraction of clay and shale raw materials. The approximate extent of these works is illustrated in Figure 3, <i>Historical Composite Plan</i> (Appendix A). The works are inferred to have become disused c. 1900 and the redundant pit left open. Following this closure, the pit was infilled with unknown materials prior to the construction of the current housing c.1956. The nature and thickness of fill is unknown but is likely to have resulted in a reduced thickness of clay at the site. A detailed discussion of the site's historical development is provided under Section 4.0.			[1]

Hydrogeology

- 3.2. The site hydrogeology is summarised in Table 3.2 and the associated references under Table 1.1.

TABLE 3.2: SUMMARY OF HYDROGEOLOGY

Type	Distance / Direction	Description	Ref
Superficial Aquifers	Onsite	Superficial Aquifers have not been identified and underlying drift deposits are classified as ' Unproductive Strata '.	[1] & [3]
	225m / W	Narrow deposits of Alluvium and Glaciofluvial Deposits are present to the west of the site and are classified as a Superficial 'Secondary A' Aquifer .	[1] & [3]
Bedrock Aquifers	Onsite	The site and surrounding area is underlain by a ' Secondary A' Bedrock Aquifer . These aquifers comprise permeable layers of rock 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'.	[1] & [3]
Source Protection Zone	2.4km / NE	The nearest Source Protection Zone (Total Catchment) is situated over 2km from site.	[1] & [3]
Abstractions	250m / SW	The nearest groundwater abstraction is located at Mid Cannock Colliery and is used for "Transfer Between Sources (Post Water Act 2003)". Permitting extraction volumes are not recorded. It is noted that this is a non-potable use and no potable abstractions have been identified within 2km of the site.	[1]

- 3.5. Reference [2] indicates that groundwater may be present at 5.5m bgl within the granular Till deposits, rising to 2.5m bgl. Whilst not classified as an aquifer (possibly due to the variable nature of the Till deposits) groundwater may be in continuity with the underlying Secondary Aquifer. Furthermore, historical mapping (discussed under Section 4.0) indicates a pond to have formed onsite within the former brick pit, likely to relate to inflow of perched groundwater.
- 3.6. Based upon the above information, and in accordance with Environment Agency Guidance, the site is considered to have a '**Medium**' sensitivity with respect to hydrogeology.

Hydrology

- 3.7. The site hydrological setting is summarised under Table 3.3 below.

TABLE 3.3: SUMMARY OF HYDROLOGICAL SETTING

Type	Distance / Direction	Description	Ref
Rivers	250m / NW	Ridings Brook (Primary River) is located to the northwest of the site.	[1] & [3]

Cont...\

TABLE 3.2: SUMMARY OF HYDROLOGICAL SETTING (Cont.)

Type	Distance / Direction	Description	Ref
EA General Quality Assessment (GQA) Data	>1km	No Environment Agency GQA data monitoring locations and/or data have been identified within a 1km radius of the site.	[1] & [3]
Other Surface Water Features	60m / E	Ponds adjacent to Eastern Way (A460).	[1] & [3]

- 3.8. Based upon the above information, the site is considered to have a '**Medium**' sensitivity with respect to hydrology.

Ecological Setting & Statutory Receptors

- 3.9. *Ecological Receptors* within Part 2A are listed in Table A of the Statutory Guidance (this is revised to 'Table 1' in the revised Guidance and it is noted that the content has been slightly reduced). In summary, these comprise any ecological system, or living organism forming part of such as system, within a location which is:

- a Site of Special Scientific Interest (SSSI) notified under section 28 of the Wildlife and Countryside Act 1981;
- a National Nature Reserve (declared under section 35 of the above act);
- a Marine Nature Reserve (designated under section 36 of the above act);
- an area of special protection for birds (under section 3 of the above act);
- any habitat or site afforded policy protection under paragraph 6 of Planning Policy Statement 9 (PPS 9) on nature conservation;
- any nature reserve established under section 21 of the National Parks and Access to the Countryside Act 1949; or,
- a *European Site* - i.e. a Special Area of Conservation or a Special Protection Area within the meaning of Regulation 10 of the Conservation (Natural Habitats etc.) Regulations 1994; or, any candidate Special areas of Conservation or Special Protection Areas given equivalent protection).

- 3.10. No *Ecological Receptors* under the context of Part 2A determination have been identified within 250m of site [1] & [4]. As such, the site is considered to be of '**Low**' sensitivity with regards to Ecological Receptors.

Summary

- 3.11. Overall, the site is considered to be of '**Medium**' environmental sensitivity.

4.0 SITE HISTORY AND INDUSTRIAL SETTING

Site History

- 4.1. The following description of the site's historical development has been derived by reference to Ordnance Survey mapping contained within Reference [1] (Appendix C) dated 1883 – 2011 of 1:2,500, 1:10,000 and 1:10,560 scales. A *Historical Composite Plan* is presented under Appendix A (Figure 3) and should be read in conjunction with the following description.

TABLE 4.1: SITE HISTORY

Date	Development
1883 - 1884	Earliest mapping indicates a Brick Yard to have been present onsite from at least 1883. The Brick Yard comprised a series of rectangular shaped buildings within the southwest of the site and a large area of surface ground workings across the majority of the remaining site area to the north. By 1884, a Pond appears on the northern section of the site.
1900 – 1902	By 1900, the Brick Yard is indicated to be disused , however, the site buildings and area of surface ground workings remain at this time.
1915 - 1938	By 1915, the number and layout of the buildings in the southwest of the site are indicated to have changed, and now comprise one long rectangular building with a smaller rectangular building and Chimney (Chy.) which appears from 1918. By 1938, the area of surface workings is greatly reduced and appears to have been infilled . In addition to the two rectangular structures and chimney which were present in the southwest of the site, a small rectangular structure is present in the northwest which is accessed via a footpath which leads to Rumer Hill Road.
1956 - 2011	By 1956, the entire site is indicated to have been redeveloped and now comprises residential properties which – with the exception of minor extensions etc. – have remained relatively unchanged since. 2011 mapping identifies the northeast of the site as Allotments , although this land use is known from anecdotal sources to pre-date 1994.

- 4.2. Notable and / or potentially contaminative historical adjacent land uses are summarised under Table 4.2 below.

TABLE 4.2: SURROUNDING LAND HISTORY

Date	Distance / Direction	Development
1883 - c.1960	30m / East	Birmingham Canal Navigations - Cannock Extension. Based upon the general land usage, it is likely that the Canal was used to transport bricks and similar materials. It is assumed the canal was infilled prior to the construction of the A460.

Cont...\

TABLE 4.2: SURROUNDING LAND HISTORY (Cont.)

Date	Distance / Direction	Development
1883 - 1915	50m / South - Southeast	<p>Two Brick and Tile Works located in the vicinity of the site which comprised two distinct areas of surface workings; numerous buildings; and, round structures that resemble storage tanks. These structures are indicated to have been demolished by 1915 (with the pits remaining open and later flooding to ponds c.1956).</p> <p>This area of land was redeveloped c. 1978 to the present day Electricity Substation discussed under Table 2.1.</p>
1883 - 1915	75m / West	Small Gravel Pit present from 1883 and appears to have been later abandoned and allowed to infill over time.
1883 - 1938	75m / North	Several Limekilns, including outbuildings and a chimney, located to the north of the site. These were largely demolished c.1938 with later housing named <i>Limehouse</i> .
1883 - 1986	300m / Northwest	<p>A Gas Works was present from as early as 1883, by which time it appears to have been substantially developed to include multiple buildings and retorts. By 1915, the works is named <i>Gas Works (Cannock, Hednesford & Dist. Gas Co)</i>.</p> <p>By 1967 is labelled Gas Holder Station – suggesting a marked change in the use of the site from manufacturing / processing to storage.</p> <p>By 1986, the gas holder station is no longer indicated to be present and the site is now occupied by a Depot which remains to the present day.</p>
1883 - 1978	400m / Southeast	<p>Mid Cannock Colliery (indicated to be 'disused' during 1883). By 1915, the colliery appears to have undergone expansion and by 1971 has extended into the former Brick and Tile Works and tramways constructed into the adjacent opencast workings.</p> <p>By 1978, the entire Colliery is indicated to have been demolished and redeveloped to offices. It is noted that the timing of the Colliery closure broadly coincides with the commencement of restoration / land-filling of the adjacent opencast workings (discussed below).</p>
1971 – Ongoing	80 – 500m / East	<p>Landfill first appears approximately 500m to the east coinciding with the former Cannock & Leacroft Colliery.</p> <p>During this time, expansive Opencast Workings associated with the Mid Cannock Colliery occupied the entire land to the immediate southeast of the site.</p> <p>By 1981, the Cannock & Leacroft landfill appears to have been restored and the Cannock Colliery since closed. Later mapping (1993) indicates the former Leacroft landfill as a Disused Tip; however, the extent of this tip is larger than that indicated by 1971 mapping, with the boundaries now extending to the area of open cast workings.</p> <p>The former opencast workings are also shown to be partly restored and land-filled. By 1988, this landfill is designated as a Refuse Tip (which remains the current use).</p>

Current Industrial Setting

- 4.3. The sites current industrial setting and offsite (within 250m) potentially contaminating incidents / activities are summarised under Table 4.3 below.

TABLE 4.3: SUMMARY OF CURRENT INDUSTRIAL SETTING (≤250M OFFSITE)

Category	Comment / Description	Significance	Ref
Contemporary Trade Records	Eleven <i>Potentially Contaminative Industrial Sites</i> have been identified within 250m off site. Of these, six relate to Electricity Sub Stations with the remainder relating to light industrial, motoring and container storage uses. No heavy industrial sites, petrol and / or fuel sites or underground high pressure oil and gas pipelines have been identified within 500m of site.	Low	[1]
Waste Operations	<p><u>Poplars Landfill</u></p> <p>Poplars Landfill is currently located approximately 35m to the southeast of the site (adjacent to the A460) and is currently in use as a refuse tip. The landfill is also recorded as a 'Type 1A' (co-disposal) <i>Environment Agency Historic Landfill</i> which has received inert, industrial, household, special and liquid sludge waste types.</p> <p>Poplars Landfill was acquired for refuse disposal during the mid to late 1970s and Staffordshire County Council Waste Disposal Authority commenced landfilling operations in 1978, with an approximate annual input of 264,000 tonnes/annum of household and commercial waste. Information provided under Reference 5 indicates that the former opencast void extends 35m in depth. Whilst the landfill cells have been lined with clay on the sides, no basal liner is present to the cells. Tipping commenced in the centre of the site (Phases 1 – 4) directly onto the backfilled opencast excavation. Details of the thickness or compaction state of the opencast backfill are not readily available, although it is likely that this contains pockets of 'old' refuse locally. Tipping proceeded westward, toward Rumer Hill and the site in the late 1980s (Phases 5, 5a, 6 and 6a from 1988).</p> <p>Poplars Landfill boundary includes a number of smaller historical and operational landfill entries, generally relating to household waste. It is believed that these represent specific and localised landfilling within the Poplars Landfill, and for the purposes of this report, are collectively assessed under Poplars Landfill. Further details on the specifics of each landfill record are available from Reference 1.</p> <p>The current phases of municipal solid waste landfilling includes gas collection systems and the operator is undertaking monitoring to the immediate east of the A460 bypass. Current data indicates the presence of methane and/or carbon dioxide.</p> <p><u>Beatwaste Ltd</u></p> <p>Beatwaste Ltd is a BGS / DoE non-operational landfill site located approximately 300m to the northwest of the site. The record states that there is a 'risk to minor aquifer'. The nature and origin of backfilled materials is not stated.</p>	High	[1] & [5]

Cont... \

TABLE 4.3: SUMMARY OF CURRENT INDUSTRIAL SETTING ($\leq 250\text{M}$ OFFSITE) (Cont.)

Category	Comment / Description	Significance	Ref
Waste Operations (Cont.)	<p>Rumer Hill Landfill</p> <p>Rumer Hill Landfill generally comprises the strip of land between the site and the A460. The following description has been taken from <i>Babtie Risk Assessment Interpretative Report</i>, June 1996:</p> <p><i>"No specific records exist concerning the age, extent or type of waste deposited at Rumer Hill. Evidence of the Rumer Hill waste was revealed during a ground investigation related to the construction of the A460 bypass (borehole data from 1981) and an embankment failure (borehole data from 1989) of the Cannock Eastern Bypass.</i></p> <p><i>Later specific gas migration investigations of perimeter conditions at Rumer Hill (1991) and Poplars (1993) encountered the wastes in a number of boreholes. It is understood that waste materials were deposited during the later 1960's and 1970's. At this time opencast workings were underway in the general area via the Poplars (1956 – 1958), Poplars North (1958 – 1961), Poplars West (1961 – 1964), Poplars East and Poplars North-west pits. The workings, specifically those of Poplars and Poplars East pits encroached on the south and east boundaries of Rumer Hill. Information obtained from National Coal Board, during a feasibility study for the development of Churchbridge Employment Park further south suggests that refuse and old tyres were deposited during backfilling of the workings, by end tipping from the crest of the excavation walls. The location details of these filling materials are not available".</i></p>	High	[5]
Environment Agency Recorded Pollution Incidents	<p>Three pollution incidents have been recorded onsite, all of which are dated December 2001 and relate to Landfill Odour resulting in 'minor' (Category 3) impacts to air.</p> <p>Offsite, a further thirty pollution incidents are recorded, however, none of which resulted in an impact greater than 'minor'. Of particular note, seventeen of these are related to Atmospheric Pollutants and Effects with four of these described as either Effects on Humans or Effects on Animals.</p> <p>This is supported by the Local Authority who stated</p>	High	[1]
Licensed Discharge Consents	Two Licensed Discharge Consents have been recorded within 250m of the site. Both records (situated 200m west and 230m northwest of the site) are for Sewage Discharges – Sewer Storm Overflow into Ridings Brook.	Low	[1]
Radioactive Substance Licenses	A single record has been identified 180m southwest of the site, registered to UK Coal Mining Ltd, Mid Cannock Disposal Point, Rumer Hill Road, WS11 3EX. The license (permission number AV2951) is for the 'keeping and use of radioactive materials'; however, it has since been revoked /cancelled .	Low	[1]

- 4.4. In addition to the above information, desktop research did not identify any records of the following within 250m of site: historic IPC (Integrated Pollution Control) authorisations; Part A(1) and IPPC (Integrated Pollution Prevention and Control) authorised activities; water industry referrals; Red List discharge consents (potentially harmful discharges to Controlled Waters); List 1

or List 2 dangerous substances inventory sites; Part A(2) and Part B Activities and Enforcements; Dangerous or Hazardous Sites (COMAH & NIHHS entries); or, sites determined as 'Contaminated Land' under Section 78R of the Environmental Protection Act 1990.

Pre-existing Site Investigation Information

- 4.5. Due to properties having been constructed pre 1994, there is no available site investigation information for the site. Detailed contamination appraisals are not likely to have been undertaken in the absence of relevant legislation, industry guidance or planning requirements. As such, the chemical nature of underlying ground conditions at the site, including the depth and extent of fill materials, is currently unknown.
- 4.6. Site investigations and contamination appraisals which may have been undertaken to satisfy planning requirements for neighbouring (post 1994) developments, have not been identified.

Regulatory Consultation

- 4.7. Staffordshire County Council (SCC) have been consulted as part of this study, primarily in relation to *Rumer Hill Landfill Site*, which occupied a 550m by 50m strip of land between the site and the A460 to the east. SCC are known to be managing the landfill and have provided the following reports for our review:
- Babtie, *Rumer Hill Landfill Site, Risk Assessment, Interpretative Report* (Report Ref: BGE016782/CH/ABH, Issue 1 - Draft Version, dated 3rd June 1996;
 - Babtie Group, *Rumer Hill Landfill Site: Risk Assessment – Interpretative Report Addendum: Gas Monitoring and Extraction System*, Report Ref: BGE016782/H/26.1.98, dated 26th January 1998. Report has been provided with Figure 7 only;

Gas Monitoring Data

- 4.8. Rumer Hill and Poplars Landfill gas monitoring locations are illustrated on Figure 2. A brief summary of the available background data has been reproduced below, as summarised by Babtie Geotechnical under Reference [5].

(A) Poplars Landfill

- 4.9. This summary is primarily based on monthly monitoring data (reference [7]) including methane, carbon dioxide and oxygen; collected between September 1993 and April 1997 for 32 monitoring locations placed along the western boundary of Poplars landfill along the bypass.

"Poplars Landfill boreholes 12 to 21 yield very high methane levels. These have been recorded in excess of 80% by volume...The methane concentrations vary greatly and trends are difficult to observe...The methane levels in Poplars Landfill Boreholes 22 to 29 have recorded less gas than [boreholes] 12 to 21 on a more irregular basis.

In 1996, methane levels generally declined after July. Apart from temperature/time of year one of the possible controlling factor is the new landfill gas control system installed at Poplars about this time. Further monitoring will be needed to evaluate whether this is only a temporary trend in methane levels".

(B) Rumer Hill Landfill

- 4.10. SCC monitoring boreholes have been installed on Rumer Hill and have also generated variable gas readings, including **methane concentrations up to 94.6% v/v**.

"For observation purposes, these boreholes can be split into groups:

- (i) SCC13 – SCC17 inclusive (located north of the site, adjacent to Rumer Hill Houses) – monitoring data suggests that very little or no methane is present (2 of 10 readings over 1% methane since monitoring began.*
- (ii) SCC2, - SSC4 inclusive (located on the southern west boundary) – typically yield 60 – 80% methane.*
- (iii) SCC5 – SCC7 inclusive (located centre of site) – typically fluctuate between 25 and 80% methane.*
- (iv) SCC8, SCC11 & SCC12 (located in the north part of site) – fluctuate between 50 and 70%.*
- (v) SCC1, SCC9 and SCC10 – fluctuate widely (1 to 9a damaged).*

Carbon dioxide levels tend to be in the range of 15 – 25% for the majority of 'gassing boreholes'. Chemical analysis of the bulk and trace component gases were undertaken in 1993/1994 by Southern Science Laboratories. Gas samples from both the Poplars and Rumer Hill perimeter boreholes were analysed, finding a presence of coal gas, mixed with landfill gas in the borehole samples.

The data suggests that the gas is under pressure and that subsequent migration towards the housing may occur".

Supplementary Site Investigation

- 4.11. Babbie recommended that *"...in order to refine the assessment of gas sources and migration routes, it would be beneficial to supplement the existing monitoring boreholes with installations which are sealed into different strata horizons e.g. bedrock, Rumer Hill waste, opencast backfill, and, sand and gravel. This would allow discretion over gas sampling and analysis so improving the chances of determining whether any particular horizon or material is contributing significantly more gas"*.
- 4.12. These supplementary site investigation works were carried out by Norwest Holst Soil Engineering Ltd between 16th February 1997 and 18th March 1997. A factual report containing the results of the fieldwork, monitoring and laboratory test results was presented by NWH in May 1997; however, a copy of this is not currently available for review.
- 4.13. Interpretation of the supplementary site works undertaken by Babbie concluded:
- (i) The risk assessment has identified gas sources, which have migrated through backfill material in former open cast mine areas. Furthermore, gas has also migrated from the opencast backfill into the permeable natural strata.
 - (ii) Gas has been detected in the natural strata some 50m from the nearest properties (onsite) and some 40m from the electricity sub-station adjacent to York Road. Granular strata occur near the surface under the housing estate closest to the old open cast workings and it is therefore concluded that there is a direct pathway to a source of gas which presents a risk to inhabitants.
 - (iii) The most practical and cost effective method of protecting occupants of the Rumer Hill Estate (the current study site) from the risk of gas migration is breaking the critical pathway between source and receptors with the construction of a gas barrier. The extent of the barrier is subjective. It is recommended that in the first instance, the barrier extend as shown on Figure 7. Monitoring behind and beyond the barrier should continue to demonstrate that gas migration onsite is not occurring. The barrier could be extended in length in the future should monitoring reveal the presence of gas near the barrier extremities. The barrier could be formed by slurry trench with a membrane of compacted clay.

Implementation of Mitigation Measures

- 4.14. The preferred course of mitigation via the construction of a gas permeable 'cut off trench' adjacent to the housing was not considered to be a feasible option due to the density of existing services in the area, along with the limited available land-take. Consequently, a strategy comprising gas monitoring and extraction was put forward for consideration. This has since been implemented and validatory gas monitoring data over the period 1st September 2010 – 30th November 2010 & 1st January – 31st March 2011 has been provided for review (Reference [7]).

- 4.15. The typical range of concentrations recorded across the Rumer Hill Landfill are summarised under Table 4.4 below.

TABLE 4.4: TYPICAL RANGE OF GAS CONCENTRATIONS DETECTED ON RUMER HILL LANDFILL

Gas / Measurement	Min. Concentration (% v/v)	Max. Concentration (% v/v)	Max. Location
Carbon Dioxide	0.00	30.00	B/H SCC12D
Methane	0.00	89.59	B/H SCC6

- 4.16. In specific relation to those monitoring locations (shown in Figure 2) directly adjacent to the site, the recent monitoring data is summarised under Table 4.5 below:

TABLE 4.5: SUMMARY OF MONITORING DATA DIRECTLY ADJACENT TO SITE

Monitoring Location	Range of Gas Concentrations (% v/v) (Min. / Max.)			Gas Flow Rate (l/hr) (Min. / Max.)
	CO ₂	CH ₄	O ₂	
SCC12	0.00 / 30.00	0.00 / 79.96	0.00 / 20.79	1.58 / 4.49
SCC12A	0.15 / 4.38	0.00 / 1.14	0.41 / 20.92	2.09 / 4.20
SSC12B	0.00 / 16.14	0.00 / 62.28	0.22 / 20.93	0.91 / 3.68
SSC12C	0.00 / 3.96	0.00 / 10.71	0.28 / 20.93	0.89 / 3.80
SCC12D	0.00 / 30.00	0.00 / 77.78	0.00 / 20.93	1.23 / 3.84
SCC13	0.17 / 2.80	0.00 / 0.24	0.19 / 20.79	2.09 / 4.22
SCC13A	0.11 / 2.11	0.00 / 0.12	0.45 / 20.80	1.83 / 3.92
SCC14	1.20 / 3.25	0.00 / 0.10	0.18 / 19.86	2.12 / 4.28
SCC15	0.96 / 3.09	0.00 / 0.06	0.34 / 20.07	2.15 / 4.16
SCC16	0.81 / 2.92	0.00 / 0.06	0.45 / 19.32	2.13 / 4.22

- 4.17. In relation to the above data, it is understood from discussions with SCC that:

- SCC12A – SCC12D and SCC13A were supplementary locations installed by Babbie after elevated gas concentrations were recorded at SCC12 and SCC13;
- SCC consider that the additional data collected from these supplementary locations on the southern boundary of the site, do not infer gas migration on to the housing estate to be occurring; however, CampbellReith note that elevated gas concentrations have been recorded at SCC12B – SCC12D; and,
- A gas extraction system has been installed but is not continuously operated but tested on an annual basis for maintenance purposes. When operated, the levels of gas extracted have not been sufficient to allow ignition of the flare. Given the levels of gas detected within the monitoring installations on the southern boundary of the site, it is possible that the extraction system design does not fully protect properties on the Rumer Hill Estate. The operation and status of the installed gas extraction system should be clarified with SCC.

Site Implications

- 4.18. Whilst the gas generated at Rumer Hill landfill is currently under management, the data available confirms that:
- a) the nature of backfilled wastes are capable of producing highly elevated levels of ground gas (see Table 4.4 & Table 4.5);
 - b) these elevated levels of gas have been detected directly adjacent to site (see Table 4.5); and,
 - c) the underlying geology is sufficiently permeable to provide a gas migration pathway. Likewise, it may also present a risk from contaminated groundwater / leachate emanating from the landfill. Should similar waste materials have been used during the infilling works at this study site, it is possible that elevated levels of ground gas and /or leachate may be currently generated.

5.0 CONCEPTUAL SITE MODEL

- 5.1. Current practice for land contamination evaluation involves the development of a Conceptual Site Model (CSM) to appraise contaminant source-pathway-receptor pollutant linkages. The CSM is summarised below, based upon information presented herein, and the preliminary Part 2A assessment is presented under Section 6.0.

Potential Sources of Contamination

- 5.2. Table 5.1 summarises the primary potential contamination sources that have been identified on or near the site.

TABLE 5.1: PRIMARY POTENTIAL SOURCES OF CONTAMINATION

Feature on or near site	Description & Potential Contaminants
Historical use of the site as a Brick Yard , including surface workings and subsequent backfilling, pre-1883 – c.1938.	<p>The majority of the site has been previously occupied as a Brick Yard that was in-filled with materials of unknown origin.</p> <p>Given the proximity of the site to the opencast colliery to the south, it is possible that the site was backfilled with waste material from this activity as opposed to the Poplar Landfill, which first received waste in the mid to late 1970s; after the Oxford Road residential development had been built. Potential contaminative materials may comprise mining waste, ash, slag, and clinker.</p> <p>Subject to the nature and origin of the waste materials, Hazardous Ground Gases, most notably Carbon Dioxide and Methane, may also be generated. It is noted that pollution incidents relating to 'Landfill Odour' have been recorded onsite, however, these are likely to relate to odours generated via processing and tipping at Poplar Landfill rather than ground gas generation and sub-surface migration to site.</p> <p>In addition to the above, a number of buildings and a chimney were present in the south of the site during the operational period of the Brick Yard, suggesting a degree of onsite processing / manufacturing to have occurred. As such, the potential for soil based contaminants including ash, clinker and heavy metals should also be considered in this area.</p> <p>Other potential contaminants include Asbestos Containing Materials (associated with backfilled construction / demolition wastes) and Polychlorinated Biphenyls (PCBs) (associated with certain industrial electrical wastes and components).</p>
Use of part of the site as Allotment Gardens .	A significant proportion of the Allotment Gardens coincide with the area of infilled land. Potential contaminants may comprise waste .

Cont...\

TABLE 5.1: POTENTIAL SOURCES OF CONTAMINATION (Cont.)

Feature on or near site	Description & Potential Contaminants
Rumer Hill Landfill (directly adjacent to site) which is currently under monitoring and known to be gassing.	Rumer Hill is known to be producing significant levels of carbon dioxide and methane within close proximity of the site. The former landfill is currently under monitoring by Staffordshire County Council who have provided the most recent gas monitoring data which is discussed under Tables 4.4 and 4.5. It is understood that a gas extraction and flare system has been installed but is only operated on an annual basis for maintenance purposes. When operated, levels of gas extracted are not sufficient to allow ignition of the flare – suggesting that the extraction design may not intersect the main gas bearing strata.
Poplar Landfill (Offsite Landfill) to the east of the site c.1971 and currently ongoing.	Poplar Landfill is known to have accepted a wide variety of wastes including inert, industrial, household, special and liquid sludge . The primary Hazardous Ground Gas contaminants comprise Carbon Dioxide and Methane .

Receptors

- 5.3. Based upon the current site usage and environmental setting, potential receptors have been summarised under Table 5.2 below.

TABLE 5.2: POTENTIAL RECEPTORS

Receptor	Description
Human Health High Sensitivity	The site comprises residential properties with access to private gardens and allotment gardens.
Hydrogeological Medium Sensitivity	The site is underlain by a Secondary A Bedrock Aquifer, however, is not situated within a Source Protection Zone. Groundwater is within granular superficial deposits and may be in hydraulic continuity with the groundwater in the aquifer and nearby watercourses.
Hydrological Medium Sensitivity	Ridings Brook (Primary River) is situated 250m from the site.
Buildings Medium – High Sensitivity	The status of the current buildings onsite, including the provision and integrity of gas membranes, damp proof membranes (which may also be acting as gas membranes) and foundation solutions – is unknown and therefore buildings may be at risk from potential ingress of hazardous ground gases. The majority of onsite properties comprise houses rather than flats.

- 5.4. It is noted that ecological receptors have not been identified within the proximity of the site and are therefore excluded from the current Conceptual Site Model. For further details, see Section 3.0.

Pathways

- 5.5. In the context of the current site use, the potential pathways presented in Table 5.3 are considered applicable and have been considered in the further qualitative risk assessment.

TABLE 5.3: EXPOSURE PATHWAYS

Pathway		Receptor
Ingestion of soil/dust particles generated from on site surface soils / exposed ground.	Outdoor	HH
	Indoor	HH
Inhalation of soil/dust particles generated from on site surface soils / exposed ground.	Outdoor	HH
	Indoor	HH
Inhalation of vapour from soil / groundwater based volatile contaminants.	Outdoor	HH
	Indoor	HH
Dermal contact with soil and / or dust particles.	Outdoor	HH
	Indoor	HH
Inhalation of hazardous gases following migration and ingress within confined spaces.	Indoor	HH / B
Consumption of home grown vegetables / plants.		HH
Migration of hazardous ground gasses on- and / or off-site. It is noted that there is a buried water supply pipe that extends across the allotments could potentially act as a conduit facilitating gas migration. In addition, the strip of land to the immediate east of the site (Rumer Hill Landfill) is expected to contain a number of services (see Section 4.14) which may also act as conduits where these extend onsite.		HH / B
Leaching of contamination from Made Ground and subsequent lateral and downward migration as water borne contamination.		HG / HH / B
Direct contact between soils and groundwater based contaminants and service infrastructure pipework (including potable water supplies).		HH / B
Notes: HH Human Health. HG Hydrogeological. H Hydrological. B Buildings & Infrastructure.		

6.0 PART 2A PRELIMINARY RISK ASSESSMENT

Statutory & Technical Framework

- 6.1. Section 78A(2) of Part 2A of the Environmental Protection Act⁶ defines “contaminated Land” as “any land which appears to the local authority in whose area the land is situated to be in such a condition, by reason of substances in, on or under the land, that (a) significant harm is being caused or there is a significant possibility of such harm being caused; or (b) pollution of controlled waters is being, or is likely to be, caused”.
- 6.2. The Statutory Guidance⁷ broadly describes what is meant by *significant harm* and forms the basis of the following risk assessment. The aim of these definitions is to isolate cases of *problematic land*. In order to achieve this, Part 2A does not:
- apply to sites where low levels of contaminants (natural or anthropogenic) are present (as is the case on the majority of sites) and where there is no appreciable risk present; or,
 - define *Contaminated Land* based solely on concentration thresholds of contaminants. The resultant risk is based on other factors such as the sensitivity of receptors, potential pathways and exposure frequency. As such, a *risk based* approach is required.

TABLE 6.1: SUMMARY OF POTENTIAL AFFECTS OF SIGNIFICANT HARM

Statutory Receptor	Description of Harm to Receptor that is to be Regarded as <i>Significant</i>
Human Beings	Death, disease, serious injury, genetic mutation, birth defects or the impairment of reproductive functions. For these purposes, disease is to be taken to mean an unhealthy condition of the body or part of it and can include, for example, cancer, liver dysfunction or extensive skin ailments. Mental dysfunction is included insofar as it is attributable to the effects of a pollutant on the body of the person concerned.
Controlled Water	Section 78A(9) defines the pollution of Controlled Waters as “the entry into controlled waters of any poisonous, noxious or polluting matter or any solid waste matter”. Land should not be designated as <i>Contaminated Land</i> where: (a) a substance is already present in Controlled Waters; (b) entry into Controlled Waters of that substance from the land has ceased; and, (c) it is not likely that further entry will take place. Substances should be considered as having entered Controlled Waters where: (a) they are dissolved or suspended in those waters; or, (b) if they are immiscible with water, they have direct contact with those waters on or beneath the surface of the water.

Cont...\

⁶ “Part 2A” was inserted into the 1990 Act by Section 57 of the Environment Act 1995.

⁷ The *Statutory Guidance* was issued by the Department for Environment, Food and Rural Affairs (Defra), *Environmental Protection Act 1990: Part 2A, Contaminated Land*, Circular 01/2006, September 2006. This guidance is currently under review under public consultation.

TABLE 6.1: SUMMARY OF POTENTIAL AFFECTS OF SIGNIFICANT HARM (Cont.)

Statutory Receptor	Description of Harm to Receptor that is to be Regarded as <i>Significant</i>
Ecological Receptors	For any protected location: harm which results in an irreversible adverse change, or in some other substantial adverse change, in the functioning of the ecological system within any part of that location; or, harm which affects any species of special interest within that location and which endangers the long-term maintenance of the population of that species at that location. In the case of a protected location which is a European Site (or a candidate Special Area of Conservation or a potential Special Protection Area), harm which is incompatible with the favourable conservation status of natural habitats at that location or species typically found there.
Buildings	Structural failure, substantial damage or substantial interference with any right of occupation. For this purpose, the Local Authority should regard substantial damage or substantial interference as occurring when any part of the building ceases to be capable of being used for the purpose for which it was intended.

- 6.3. It is noted that the Statutory Guidance is currently under revision⁸ following the close of public consultation on 15th March 2011. Significant revisions are likely to result, and as such, this assessment should be re-appraised as necessary in due course. CampbellReith are involved in the consultation process and have recently attended meetings with the head of Defra's Contaminated Land Policy Division. Initial indications suggested that the revised guidance will be formally released in October 2011. The anticipated changes are referenced where applicable, although for obvious reasons they are used for indicative purposes only and cannot be relied upon until they become policy.

Part 2A Qualitative (Preliminary) Risk Assessment

- 6.4. In accordance with the Statutory Guidance, the Local Authority must satisfy itself that a **Pollutant Linkage**⁹ exists in relation to the land, *prior* to formal determination as *Contaminated Land*. Furthermore, in determining whether a particular possibility of significant harm is *significant*, it is necessary to take into account other factors such as: the nature and degree of harm; the susceptibility of the receptors to which the harm might be caused; and, the timescales within which the harm might occur. The revised guidance goes further and requires, amongst other things, the socio-economic aspects of the site to be considered.
- 6.5. The relevant risk assessments for the site are summarised in Tables 6.2 - 6.4. These detail the potential contaminants, pollutant linkages and receptors that have been considered at the site. For the purpose of this assessment, the descriptions of risk listed below have been utilised, which

⁸ Department for Environment, Food and Rural Affairs (Defra), *Public consultation on changes to the Contaminated Land Regime under Part 2A of the Environmental Protection Act 1990*, December 2010.

⁹ The Statutory Guidance requires that before the Local Authority can make the judgement that any land appears to be *Contaminated Land* on the basis that *Significant Harm* is being caused, or that there is a *Significant Possibility of Significant Harm (SPOSH)* of such harm being caused, the authority must identify a *Significant Pollutant Linkage*

take into account the magnitude of the potential source contamination identified, likelihood of exposure via a pathway and significance of harm likely to result on the given receptor¹⁰, in the context of Part 2A. It is noted that these descriptions may change to accord with those proposed in the revised guidance if they are introduced; the proposed assessments are categorised from 1 – 4, with corresponding colours (red, red-amber, green-amber, and green). It is not recommended that these are used until the revised guidance is formalised. It is also noted that this Desktop Study is only indicative at this stage, and the decision to determine a site should be based upon the findings of further investigations and assessments.

- **High Risk.** Pollutant linkage is likely to exist, with the potential for *Significant Possibility of Significant Harm (SPOSH)* and/or *Significant Possibility of Significant Pollution (SPOSP)* - as applicable to Controlled Waters under the revised Guidance).
- **Medium Risk.** Pollutant linkage is likely to exist but SPOSH/SPOSP is unlikely.
- **Low Risk.** Pollutant linkage may exist but no appreciable harm is likely.

¹⁰ IEH 'Guidelines for Environmental Risk Assessment and Management' and CIRIA 552 'Contaminated Land Risk Assessment, Guide to Good Practice'. Section 6 of CIRIA 552 presents matrices for risk assessment. These have been simplified herein.

TABLE 6.2: RISK ASSESSMENT: HUMAN HEALTH (RESIDENTIAL) INCLUDING ALLOTMENT GARDENS

Pathway	Risk	Description / Comment
Ingestion of soil/dust particles generated from on site surface soils / exposed ground.	Medium – High	Based on the desktop information available, there is considered to be the potential for contamination to be present within shallow soils (<1m bgl) on site primarily as a result of: <ul style="list-style-type: none"> the former site use as a Brick Yard including the potential for manufacturing onsite, as suggested by the presence of a chimney stack and a number of onsite buildings; and, the restoration of former surface workings with materials of unknown nature and origin, although backfilling occurred prior to the opening of Poplars Landfill.
Inhalation of soil/dust particles generated from on site surface soils / exposed ground.	Medium – High	
Inhalation of vapour from soil / groundwater based volatile contaminants.	Low*	
Dermal contact with soil and / or dust particles.	Medium - High	Given the unknown nature of the backfilled materials, a wide range of contaminants may be present. Furthermore, given the age of the properties onsite, it is unlikely that a contamination risk appraisal and – if required – suitable cover systems in private gardens, were implemented.
Consumption of home grown vegetables / plants.	High	With regards to the Allotment Gardens, a significant portion of these coincide with the area of suspected infilled land. *Given the potential contaminants described under Table 5.1, the risk from volatile contaminants is considered to be reduced.
Direct contact between soils and service infrastructure pipework (including potable water supplies) resulting in contamination of potable water supplies.	Low – Medium	Where organic contaminants may be present on site and in contact with potable water supply pipework, drinking water quality may become impaired.
Inhalation of hazardous gases following migration and ingress within confined spaces. In addition, hazardous ground gases present a physical risk where concentrations build to within Explosive Limits.	High	Landfilled materials are known to be present both onsite and immediately to the east (Rumer Hill and Poplars Landfill). Given the age of the buildings onsite, it is considered unlikely that suitable gas protection measures have been installed. Both landfills are known to be generating significant levels of hazardous ground gases, with the former currently under monitoring by Staffordshire County Council.
OVERALL (default to worst case risk rating)	Medium - High	There is the potential for SPOSH at the site, due to the risk from soil based contaminants and elevated ground gas concentrations. Further information and site data is required to prove this.

TABLE 6.3: RISK ASSESSMENT: CONTROLLED WATER RECEPTORS (UNDERLYING BEDROCK SECONDARY A AQUIFER & PRIMARY RIVER 250m NW)

Pathway	Risk	Description / Comment
Leaching of contamination from Made Ground / backfilled materials and subsequent migration to underlying Secondary A Bedrock Aquifer and lateral migration towards the Primary River.	Low - Medium	The anticipated geological sequence comprises a superficial layer of Till which is indicated to comprise a matrix of sand and pebbles with variable permeability.
OVERALL (default to worst case risk rating)	Low - Medium	Although it is possible that leaching of any potential contaminants may still be occurring it is not considered that this would constitute SPOSH.

TABLE 6.4: RISK ASSESSMENT: BUILDINGS

Pathway	Risk	Description / Comment
Migration of soil gasses on- and / or off-site.	Medium - High	The potential for hazardous ground gases to be generated both onsite (relating to the unknown backfilled materials) and at the adjacent Poplars Landfill. Gas protection measures to the residential properties onsite are not likely to be present given the age of the properties.
Direct contact between soils and groundwater based contaminants and service infrastructure pipework (including potable water supplies).	Medium	Services infrastructure and pipework may be degraded by the presence of soil and leachate based contaminants, particularly organic compounds.
OVERALL (default to worst case risk rating)	Medium - High	It is noted that current gas monitoring data provided by Staffordshire County Council confirms that elevated gas levels are present. As such, there is the potential for SPOSH at the site due to the risk from elevated ground gas concentrations either migrating onsite or being generated within the backfilled fill.

7.0 CONCLUSIONS & RECOMMENDATIONS

Conclusions

- 7.1. Readily available desktop information has been compiled and a preliminary environmental risk assessment for the purpose of a Part 2A appraisal has been undertaken in accordance with current Statutory Guidance. Where applicable, the proposed revised guidance (yet to be issued released), which is currently in draft form and undergoing finalisation, has been referred to. The key findings of this study are summarised under Table 7.1 below:

TABLE 7.1: CONCLUSIONS & KEY FINDINGS

Conclusions / Findings	Description
Environmental Setting	The site is considered to be situated within an area of overall Medium environmental sensitivity comprising a Secondary A Bedrock Aquifer and Primary River 250m from site.
Current Use	The site comprises a total of sixty (pre-1994) residential properties and an Allotment Garden measuring approximately 0.50 Hectares.
Main Historical Potentially Contaminative Uses	The site is currently occupied by housing and allotment gardens. Historically, the site is understood to have been occupied by a Brick Yard from as early as 1883 until it later became disused and the surface excavations backfilled materials of unknown origin (possibly waste). Historical landfills are known to be present immediately adjacent to the site with land filling currently ongoing to the east.
Preliminary Risk Assessment	A Preliminary (Qualitative) Risk Assessment, for the purpose of supporting Part 2A investigations, has been undertaken based upon available desktop information. The following risks, as defined herein, have been identified: <ul style="list-style-type: none"> • Medium - High Risk to Human Health; • Low - Medium Risk to Controlled Waters (Underlying Secondary A Bedrock Aquifer and nearby watercourse); and, • Medium - High Risk to Buildings.
Contamination Issues	The most relevant contamination issues from a Part 2A perspective relate to the nature of the unknown backfill materials onsite, the potential for elevated contaminated due to unknown fill materials within the Allotment Gardens and the potential for ground gases to be generated onsite. In addition, there is a risk from the migration of ground gases and impacted groundwater / leachate onsite from the adjacent Rumer Hill and Poplars Landfills. The risk to human receptors, and, to a lesser degree, to the buildings across the site, requires further assessment, primarily via intrusive site investigation and monitoring.

Recommendations

- 7.2. The following recommendations are based upon the findings of this report (as summarised under Table 7.1) and in line with the Statutory Guidance technical procedures for the identification and appraisal of Contaminated Land.

Site Investigation

- 7.3. The Preliminary Risk Assessment has identified the potential for significant pollutant linkages to be present at site. As such, and in accordance with Section B.18 (Annex 3) of the Statutory Guidance, it is recommended that a detailed investigation of the land should be undertaken in order to establish whether that land appears to be *Contaminated Land*.
- 7.4. The intrusive site investigation works should be designed and implemented in accordance with BS5930:2001¹¹ and BS10175:2011¹² in addition to Environment Agency non-statutory technical guidance¹³. Based upon current information, the site investigation should include the following aspects of work, as illustrated under the *Proposed Exploratory Hole Location Plan*, Figure 4:

TABLE 7.2: RECOMMENDED SCOPE OF INVESTIGATION

Site Investigation Work	Purpose / Rationale
Installation of 7 Groundwater & Ground Gas Dual Monitoring Wells (CRH-WS1 & CRH-WS3 - CRH-WS6, CRH-WS8-CRH-WS9) and 2 GGS GasClam® Continuous Gas Monitoring Installations (CRH-WS2 & CRH-WS7).	<p>All monitoring wells will be installed by Windowless Sampling rigs to 6m bgl or refusal (whichever is greatest). The aim of the installations is to penetrate the full depth of Made Ground and into the underlying Till deposits. In order to improve cost efficiency and quality of data, each dual monitoring well will be installed with individual gas and groundwater installations i.e. two monitoring stand pipes per location.</p> <p>The GGS GasClam® locations have been positioned in proximity of the suspected areas of infill and adjacent to Rumer Hill Landfill. This will provide a cost effective method of collecting a robust data set to inform potential determination and represents leading field monitoring technology.</p>
CRH-WS1 / 6m bgl	Monitoring location positioned at the north of the site as a control point and to allow shallow soil sampling of allotment gardens.
CRH-WS2 / 6m bgl	Positioned in close proximity to area the Brick Pit Infill onsite to assess gas and leachate generation potential. Borehole records will also provide insight to the nature of materials backfilled. This monitoring location has also been positioned in a front lawn to minimise disturbance to residents.

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¹¹ British Standard 5930, *Investigation of Potentially Contaminated Sites – Code of Practice*, 2011.

¹² British Standard 10175, *Investigation of Potentially Contaminated Sites – Code of Practice*, 2002. *Currently under revision.

¹³ Environment Agency, *Technical Aspects of Site Investigation (Volumes 1 & 2)*, Ref: TR P5-065/TR, 2002.

TABLE 7.2: RECOMMENDED SCOPE OF INVESTIGATION (Cont.)

Site Investigation Work	Purpose / Rationale
CRH-WS3 / 6m bgl	Positioned adjacent to area of suspected Brick Pit Infill to assess gas and leachate generation potential. The location will also be used to collect shallow soil samples from the allotment garden areas.
CRH-WS4 / 6m bgl	Positioned on the eastern site boundary within the allotment gardens, remote of the area of infill onsite but closer to Rumer Hill and Poplars Landfills . Location will also allow shallow soil sampling within allotment gardens. Gas monitoring data from SCC17 is expected to support readings from this location.
CRH-WS5 / 6m bgl	The monitoring installations will also allow triangulation of data, including an indication of 'background' levels remote of the main infilled area onsite.
CRH-WS6 / 6m bgl	Monitoring location positioned within area Brick Pit Infill onsite and communal landscaping. Installations to provide gas and leachate generation potential data and allow sampling of shallow soils.
CRH-WS7 / 6m bgl	Positioned to ascertain ground gas levels in the vicinity of elevated levels in SCC12D.
CRH-WS8 / 6m bgl	Monitoring location positioned in proximity to Rumer Hill Landfill to allow appraisal of whether gas concentrations are migrating onsite. Also, this location will be used to collect groundwater / leachate data and collection of shallow soil samples.
CRH-WS9 / 6m bgl	Positioned to ascertain ground gas levels in the vicinity of elevated levels in SCC12B.
10 Hand augering locations as summarised below. Augering / Hand Digging is considered to be the most cost effective method for collecting shallow soil samples from within the allotment garden areas and also be of minimum disruption to existing gardens .	
CRH-HA1	Locations to allow shallow soil sampling within allotment garden areas.
CRH-HA2	
CRH-HA3	
CRH-HA4	Positioned in proximity to the former brick yard buildings (suspected manufacturing buildings) to provide ground condition data and allow shallow sampling within areas of communal soft landscaping onsite.
CRH-HA5	Locations positioned in private rear gardens to allow collection of shallow soil samples.
CRH-HA6	
CRH-HA7	
CRH-HA8	
CRH-HA9	
CRH-HA10	
Environmental sampling with appropriate sample preparation, storage and dispatching in accordance with MCERTs requirements. The data obtained shall be used to inform a Tier 2 (generic quantitative) risk assessment.	

Cont...\

TABLE 7.2: RECOMMENDED SCOPE OF INVESTIGATION (Cont.)

Site Investigation Work	Purpose / Rationale
Soil Sampling	Soil sampling shall be undertaken at each exploratory hole location and as a minimum (subject to completed depths) comprise the following rate of sampling: 0 – 0.15m in topsoil or surface layer; at 0.25m into each soil layer beneath (to be revised to a central position when the soil layer is less than 0.4m thick); and, minimum of two sample within Made Ground at a maximum of 1.0m intervals.
Groundwater Sampling	Groundwater samples are to be recovered from all exploratory holes where groundwater is encountered during site investigation works.
Laboratory Analysis at an UKAS accredited facility with MCERTs accredited methods adopted where available.	
27 No. Soil Analysis	Estimates allow for approximately two tests per window sample exploratory location and one test per hand auger location. Made Ground soil samples will be analysed at a rate of 3 samples for every two locations. Chemical suites to include: inorganic metals; TPH (total and CWG banding); Polynuclear Aromatic Hydrocarbons (PAH); and, asbestos. Complete chemical listings are presented in Appendix D.
4 No. Groundwater Analysis	Provisionally, it is intended that four groundwater samples are selected for analysis of the following determinands: Inorganic General Suite (As, Cd, Cr, (total and hexavalent), Cu, Cn, Pb, Hg, Ni, Se, Zn and CN (total and free); total TPH; and, total PAH. This suite should allow a primary assessment to be made on whether groundwaters are significantly impacted or not.
Ground Gas Monitoring in accordance with CIRIA C665 ¹⁴ , C682 ¹⁵ and BS8485 ¹⁶ .	
CRH-WS2 & CRH-WS7 GGs GasClam® 4 Weeks Monitoring	The GasClam® will be used to collect the following data on a 'constant' frequency over a period of four weeks: methane; carbon dioxide; oxygen; hydrogen sulphide; carbon monoxide; total volatile organic compounds; atmospheric pressure; borehole pressure; and, temperature. It is intended that the continuous monitoring will capture a minimum of 2 low pressure weather systems during the course of the 4 weeks.
CRH-WS1 & CRH-WS3 - CRH-WS6, CRH-WS8- CRH-WS9 6 visits over 2 months (approximately weekly frequency)	Although the proposed frequency does not accord with the generally accepted monitoring frequency as detailed in C665 ¹⁷ ; this frequency has been selected primarily as a 'spot check' against the continuous data being provided via the GasClam installations (which will form the basis of subsequent risk assessment). A secondary function of the monitoring visits will be to determine gas concentrations at the perimeter of the site, remote of the most immediate potential gas generation sources. It is noted that the first and fourth gas monitoring visits will be undertaken in conjunction with the deployment and demobilisation of the GasClams, thereby significantly reducing third party monitoring costs.
Gas Analysis	Comprising four bulk gas tests and three isotopic analysis to determine the source of any ground gas contamination.

¹⁴ Construction Industry Research and Information Association (CIRIA), *Assessing Risks Posed by Hazardous Ground Gases to Buildings*, Document Ref: C665, 2007.

¹⁵ Construction Industry Research and Information Association (CIRIA), *VOCs Handbook: Investigating, Assessing and Managing Risks from Inhalation of VOCs at Land Affected by Contamination*, Document Ref: C682, 2009.

¹⁶ British Standards Institute, *Code of Practice for the Characterisation and Remediation from Ground Gas in Affected Developments*, BS8485, 2007.

¹⁷ CIRIA C665 recommends twenty-four visits over twelve months for developments of a 'High' sensitivity (Residential with Gardens) and sites of a 'High' generation potential. This would be reduced to twelve visits should the site be considered as 'Moderate' in terms of gas generation potential.

-
- 7.5 It is noted that the site assessment was tendered by Cannock Chase Council utilising the Homes & Communities Agency's (HCA) framework consultants. As such, suppliers have been pre-qualified and assessed with regards to value for money and technical capabilities.
- 7.6 The site investigation shall be carried out by Harrison Environmental Group with whom CampbellReith hold a long standing partnering relationship. A Designers Risk Assessment will be produced prior to site works in order to identify the main elements of risk. In the meantime, general Method Statements and Risk Assessments for the above site work methods are included within Appendix D. A GGS GasClam information sheet has also been provided for review.

Interpretative Reporting

- 7.7 Following completion of the site investigation, it will be necessary to interpret the analytical data and site records in order to establish whether a *Significant Possibility of Significant Harm or Significant Possibility of Significant Pollution to Controlled Waters* is present. For this purpose, the following documents should be utilised:

- Environment Agency / Department for Environment, Food and Rural Affairs (Defra), *Contaminated Land Report (CLR) 11: Model Procedures for the Management of Land Contamination*, 2004; and,
- Chartered Institute of Environmental Health (CIEH), *Contaminated Land – Guidance on Comparing Soil Data with a Critical Concentration*, 2008.

- 7.8 It is noted that part of the assessment will require appraisal of detailed continuous gas data sets (obtained via the GasClam® monitoring locations). These works are currently at the leading edge of ground gas assessment and somewhat beyond the applicability of traditional generic risk assessment methodologies. As such, the assessment of this data will require a significant interpretative input.
- 7.9 Where the site is found to be *Contaminated Land*, the Local Authority will be required to produce a *Record of Determination* prior to proceeding with remediation as outlined under Chapter C (Annex 3) of the Statutory Guidance.

Cost Proposal

- 7.10 Based upon the above scope, a cost of £22,965.05 for the completion of works (as described under Table 7.2) has been provided - a detailed breakdown of which is provided in Appendix D.

LIMITATIONS

This report provides available factual data for the site obtained only from the sources described in the text and related to the site on the basis of the location information provided by the Client.

Where any data or information supplied by the Client or other external source, including that from previous desk studies or reports, has been used, it has been assumed that the information is correct. No responsibility can be accepted by CampbellReith for inaccuracies within this data or information. In relation to historic maps it should be recognised that the accuracy of maps cannot be guaranteed and it should be recognised that different conditions on site may have existed between and subsequent to the various map surveys.

This report is limited to those aspects of historical land use and enquiries related to environmental matters reported on and no liability is accepted for any other aspects. The opinions expressed cannot be absolute due to the limit of time and resources implicit within the agreed brief and the possibility of unrecorded previous uses of the site and adjacent land.

The material encountered and samples obtained during on-site investigations represent only a small proportion of the materials present on the site. There may be other conditions prevailing at the site which have not been revealed and which have therefore not been taken into account in this report. These risks can be minimised and reduced by additional investigations. If significant variations become evident, additional specialist advice should be sought to assess the implications of these few findings

The generalised soil conditions described in the text are intended to convey trends in subsurface conditions. The boundaries between strata are approximate and have been developed on interpretations of the exploration locations and samples collected.

Water level and soil gas readings have been taken at times and under conditions stated on the exploration logs. It must be noted that fluctuations in the level of groundwater or soil gas may occur due to a variety of factors which may differ from those prevailing at the time the measurements were taken.

The findings and opinions expressed are relevant to those dates of the reported enquiries and site work and should not be relied upon to represent conditions at substantially later dates.

Please note that CampbellReith cannot accept any liability for observations or opinions expressed regarding the absence or presence of asbestos or on any product or waste that may contain asbestos. We recommend that an asbestos specialist, with appropriate professional indemnity insurance, is employed directly by the client in every case where asbestos may be present on the site or within the buildings or installations. Any comments made in this report with respect to asbestos, or asbestos containing materials, are only included to assist the client with the initial appraisal of the project and should not be relied upon in any way.

This report is produced solely for the benefit of the Client and no liability is accepted for any reliance placed upon it by any other party unless specifically agreed in writing.

APPENDICES

Appendix A Figures

Figure 1 Site Location Plan

Figure 2 Annotated Site Layout Plan

Figure 3 Historical Composite Plan

Figure 4 Proposed Exploratory Hole Location Plan

Appendix B Site Photographs

Appendix C Desktop Information (CD)

GroundSure EnviroInsight, GeoInsight and MapInsight reports ref: EMS_126445_172881 dated April 2001

Appendix D Site Investigation Costs

Detailed Site Investigation Cost Breakdown

Harrison Group Environmental Ltd Method Statements & Risk Assessments

GGs GasClam® Information Fact Sheet

APPENDIX A

FIGURES



notes

- 1 Do not scale this drawing. Work from figured dimensions only.
- 2 No deviation from the details shown on this drawing is allowed without Campbell Reith Hill's prior permission in writing.
- 3 All work is to be in accordance with the relevant specifications issued by Campbell Reith Hill, British Standard Codes or Practice, Statutory requirements and the Contract Documents.

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Ordnance Survey (100019754)

Legend

Site Boundary

Status/Rev.	Description	Date	By
A	First Issue	17/05/11	SC

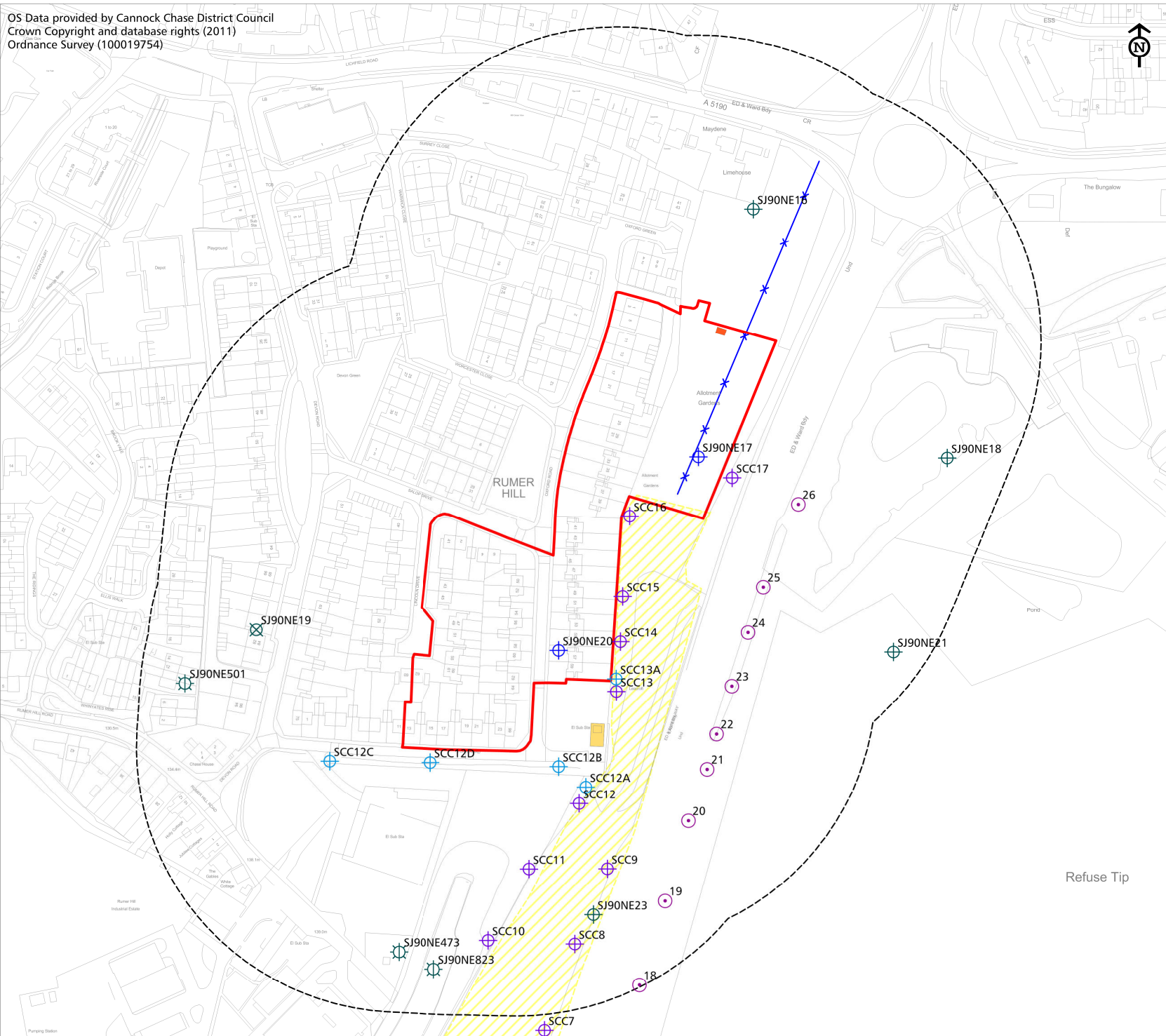
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consulting engineers

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 REDHILL 01737 784 500 • BIRMINGHAM 0121 766 8009
 BRISTOL 0117 916 1066 • www.campbellreith.com

Job Title	Oxford Road, Cannock
Client	Cannock Chase District Council

Figure 1:
Site Location Plan

Job No.	Scale	Date	Drawn by	Checked
10734/01	1:25000@A4	May 2011	SC	RW
Diag No.	File loc.	Status/Rev.		
GIS001	C:\110508 - 10734\10734 - NCA Cannock Chase\Oxford Rd York Rd\Workspaces	A		



notes

- Do not scale this drawing. Work from figured dimensions only.

Legend

- Site Boundary
- 150m buffer
- x Buried Water Supply
- Electricity Sub Station
- Cabin
- Rumer Hill Landfill Site (approximate extents)

BGS Borehole Record locations

- ⊕ Utilised in production of Desktop Study. 10-30m
- ⊗ 0-10m
- ⊕ 10-30m
- ⊗ unknown

Rumer Hill Gas Monitoring

- ⊕ Gas Monitoring Locations
- ⊕ Supplementary Monitoring Locations installed by Babtie
- ⊙ Poplars Landfill Monitoring Locations

Status/Rev.	Description	Date	By
A	First Issue	17/05/11	SC

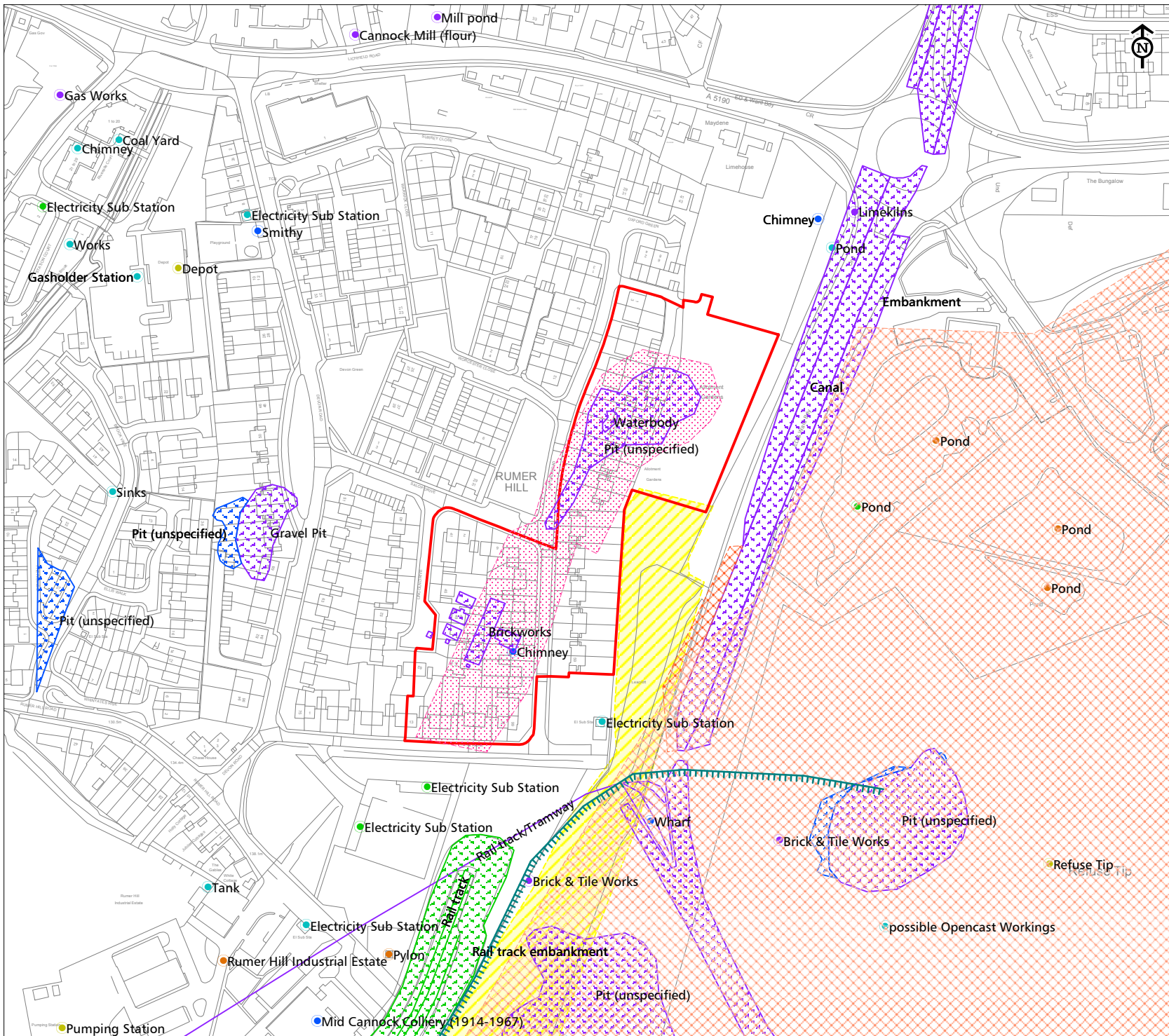
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Job Title	Oxford Road, Cannock
Client	Cannock Chase District Council

Figure 2:
Site Layout Plan

Job No.	Scale	Date	Drawn by	Checked
10734/01	1:3000@A4	May 2011	SC	RW
Diag No.	File loc.	Status/Rev.		
GIS002	0:\10500 - 10734\10734 - HCA Cannock Chase\Oxford Rd York Rd\Workspaces	A		













notes

1 Do not scale this drawing. Work from figured dimensions only.

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Legend

Approximate location and year of historical feature
(point, line or region features)

-  1883-1884
-  1902-1918
-  1956-1967
-  1971-1980
-  1986-2002
-  2011
-  Limit of opencast pit (Babtie)
-  Indicative Area of Infilled Ground - Extents of Infilling Provided by Cannock Chase Council
-  Rumer Hill Landfill Site
-  Extent of current and historic landfill operations at Poplar Landfill (approx)

A	First Issue	17/05/11	SC
Status/Rev.	Description	Date	By

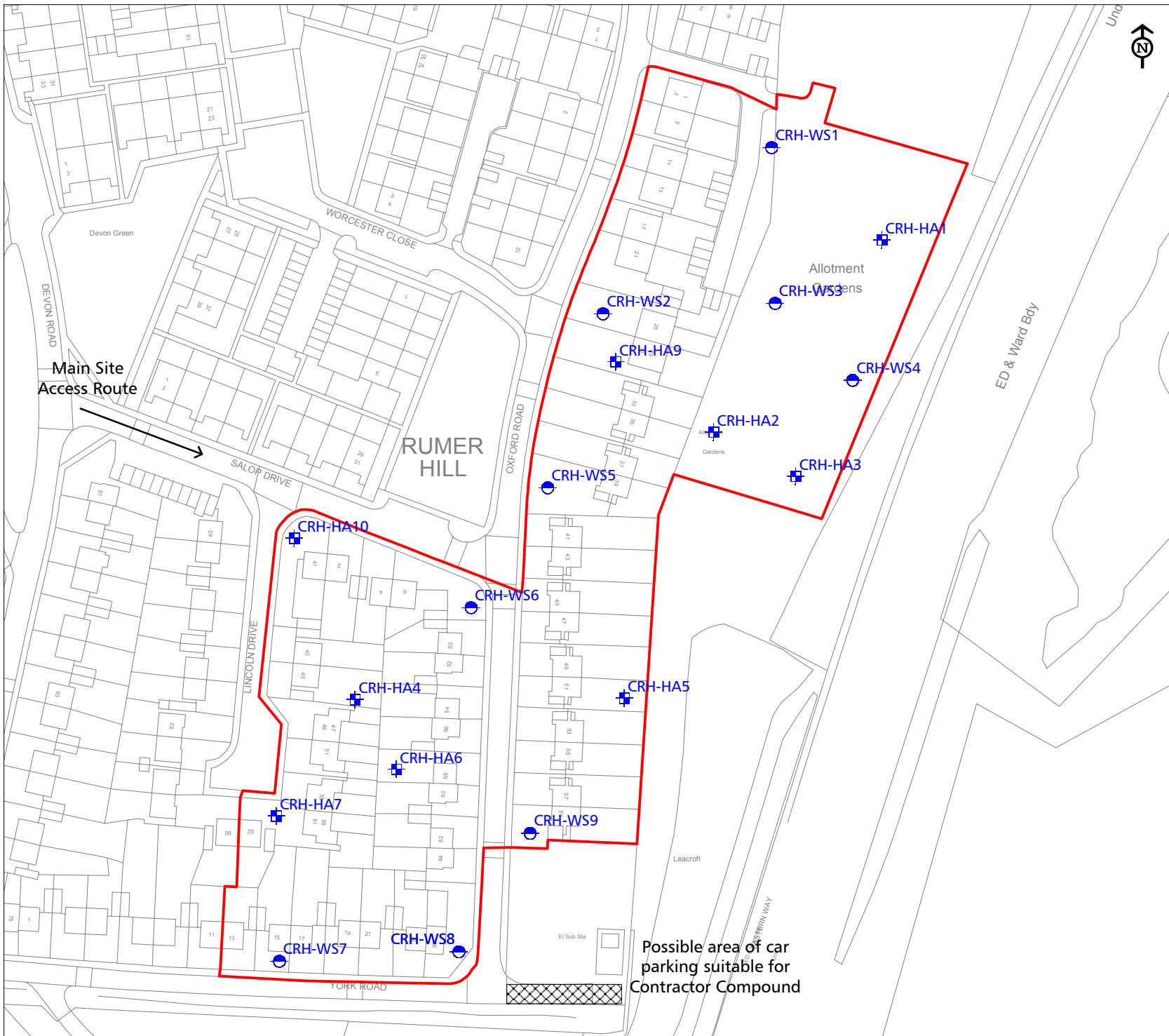
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Figure 3:
Historical Composite Plan

Job No.	Scale	Date	Drawn by	Checked
10734/01	1:3000@A4	May 2011	SC	RW
Diag No.	File loc.	Status/Rev.		
GIS003	0:\10500 - 10749\10734 - HCA Cannock Chase\Oxford Rd York_Rd\Workspaces	A		



notes

1 Do not scale this drawing. Work from figured dimensions only.

OS Data provided by Cannock Chase District Council
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 Ordnance Survey (100019754)

Legend

Site Boundary

Window Sample
 WS1, WS3 to WS8: dual monitoring installations for gas and groundwater monitoring.
 WS2: to be fitted with GGS GasClam to allow high frequency monitoring of gas.

Hand Auger
 Hand Augering to a depth of 0.6m bgl to allow sampling of shallow soils.

A	First Issue	17/05/11	SC
Status/Rev.	Description	Date	By

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**Figure 4:
 Proposed Exploratory
 Hole Location Plan**

Job No. 10734/01	Scale 1:1500@A4	Date May 2011	Drawn by SC	Checked RW
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Diag No. GIS007	File loc. 0:\10550 - 10749\10734 - HCA Cannock Chase\Oxford Rd York Rd\Workspaces	Status/Rev. A
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APPENDIX B

SITE PHOTOGRAPHS



Photograph 1: View looking north along Oxford Road from York Road in the south. Children's play are (right of image) is located offsite adjacent to an electricity sub-station.



Photograph 2: Area of general car parking located at the eastern end of York Road,

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Job Title
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Client
Cannock Chase District Council

**Site Photographs
 1– 2**

Job No.	Scale	Date	Drawn by	Checked by
10734	NTS	2011	RW	RW
Diag No.	File loc.	Status/Rev.		
N/A	N/A	F1		



Photograph 3: View looking southwest down Oxford Road and across to Salop Drive. The area of open communal landscaping to the right of the photograph is not situated on the subject site.



Photograph 4: View looking up the northern end of Oxford Road and across the unmarked access road which leads to *Rumer Hill Allotment Gardens* which form the northeast of the site area.

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Client
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Site Photographs
3– 4

Job No.	Scale	Date	Drawn by	Checked by
10734	NTS	2011	RW	RW
Diag No.	File loc.	Status/Rev.		
N/A	N/A	F1		



Photograph 5: View looking up access road to *Rumer Hill Allotment Gardens* access gates.



Photograph 6: *Rumer Hill Allotment Gardens* which form the northeast site area. Access is via gates which were locked at the time of the site walkover. As such, inspection of the plots was not possible.

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Job Title
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Client
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Site Photographs
5 – 6

Job No. 10734	Scale NTS	Date 2011	Drawn by RW	Checked by RW
Diag No. N/A	File loc. N/A	Status/Rev. F1		



Photograph 7: View looking across recreational ground (offsite) to the north of *Rumer Hill Allotment Gardens*.



Photograph 8: View looking north along Lincoln Drive.

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Job Title
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Site Photographs 7 – 8

Job No. 10734	Scale NTS	Date 2011	Drawn by RW	Checked by RW
Diag No. N/A	File loc. N/A	Status/Rev. F1		

APPENDIX C
DESKTOP INFORMATION (CD)

APPENDIX D
SITE INVESTIGATION COSTS

10734-01 OXFORD ROAD, CANNOCK, WS11 8ER
PART 2A APPLICATION BUDGET COSTINGS

Number	Item Description	Unit	Quantity	Rate	Amount £
P	Preparation Work and Project Management				
	Project start-up meeting and pre-SI walkover to confirm access arrangements etc. Liaison with residents (letter + open evening (inc prep) + door-knocking for any non-respondees)		1	£1,850.00	£1,850.00

Total section P carried to summary £1,850.00

Number	Item Description	Unit	Quantity	Rate	Amount £
A	General items and provisional sums				
A1	Welfare facilities (portaloo)	sum	-	-	£400.00
A3	Full time supervision	days	2	£325.00	£650.00
A5	One master copy of the Factual records including PDF copies and digital data	sum	-	-	£200.00
A17	Provision of specialist service clearance.	day	1	£750.00	£750.00
A18	Provision of health and safety documentation in accordance with CDM	sum	-	-	£50.00

Total section A carried to summary £2,050.00

Number	Item Description	Unit	Quantity	Rate	Amount £
F	In situ testing				
	Window Sampling / Probing				
F24a	Bring window sampling / dynamic probing equipment (DPH or DPSH) to the site.	day	2	£600.00	£1,200.00
F24b	E.O. item F24a for the provision of liners	m	54	£4.00	£216.00

Total section F carried to summary £1,416.00

Number	Item Description	Unit	Quantity	Rate	Amount £
G	Instrumentation and monitoring				
	<u>Standpipes and piezometers (in WS holes only)</u>				
G1	Backfill exploratory hole with cement/bentonite pellets below standpipe or standpipe piezometer	m		£8.00	£0.00
G2	Standpipe	m		£12.00	£0.00
G3	Standpipe piezometer (19mm) for standard installations (7 No.)	m	42	£9.00	£378.00
G4	Gas monitoring standpipe (38mm) for standard installations (7 No.)	m	28	£9.00	£252.00
G5	150mm protective cover (flush) for standard installations (7 No.)	nr	7	£50.00	£350.00
G4a	Gas monitoring standpipe (50mm) for Gas Clam installations (2 No.)	m	12	£9.00	£108.00
G5a	200mm protective cover (flush) for Gas Clam installations (2 No.)	nr	2	£100.00	£200.00
G10	Gas and groundwater monitoring and sampling in standpipe or standpipe piezometer after completion of fieldwork in accordance with specification.	visit	4	£300.00	£1,200.00
G10a	E.O. item G10 for provision of Tedlar bag or similar and obtain gas sample *	nr	9	£12.00	£108.00
GA1	Deployment and collection of Gas Clams	nr	1	£595.00	£595.00
GA2	High frequency monitoring to include bulk gases; trace gases (incl. TVOC); atmospheric pressure, borehole pressure and temperature; purge and recovery test	nr	2	£1,500.00	£3,000.00
GA3	Basic health and safety provisions for Gas Clam works	nr	1	£100.00	£100.00
GA3b	Provision of high frequency groundwater level monitoring equipment	nr	2	£400.00	£800.00
GA4	Provision of Factual Information as a GGS DataPack	nr	1	£500.00	£500.00

* assumes only 25% of the monitoring of the 7 WS locations will exceed trigger levels and require sampling.

Total section G carried to summary £7,591.00

Number	Item Description	Unit	Quantity	Rate	Amount £
I	Chemical testing for contaminated ground				
	<u>Soils</u>				
I.1	Inorganic General Suite (As, Cd, Cr (tot. and hex., Cu, Cn, Pb, Hg, Ni, Se, Zn, and CN (tot. and	nr	27	19.00	513.00
I.2	TPH (Spec. TPH CWG for aromatic/aliphatic)	nr	10	37.50	375.00
I.2A	Total TPH	nr	27	10.00	270.00
I.3a	PAH (Spec 16)	nr	27	18.50	499.50
I.6	Phenol (Total)	nr	27	3.50	94.50
I.7	Asbestos	nr	18	10.00	180.00
I.9	pH	nr	27	1.50	40.50
	<u>Waters</u>				
I.21	Inorganic General Suite (As, Cd, Cr (tot. and hex., Cu, Cn, Pb, Hg, Ni, Se, Zn, and CN (tot. and free)	nr	4	19.00	76.00
I.22	Total TPH	nr	4	20.00	80.00
I.23a	PAH (Spec 16)	nr		18.50	0.00
I.24	Phenol (Total)	nr		5.00	0.00
I.28	pH	nr		1.50	0.00
	<u>Gases</u>				
I.40	Bulk Gas (CH ₄ , CO, CO ₂ , O ₂)	nr	4	30.00	120.00
I.42	VOC (Speciated)	nr	4	57.50	230.00
IG.50	Isotopic Analysis	nr	3.00	220.00	660.00

Total section I carried to summary £3,138.50

Number	Item Description	Unit	Quantity	Rate	Amount £
R	Data Interpretation and Reporting				
	Full interpretative report including: statistical assessment of all data sets (soils, groundwater and ground gas); specialist interpretation of continuous ground gas monitoring; and, where appropriate, flux calculations and detailed quantitative risk assessment(s).	nr	1	£5,500.00	£5,500.00

Total section R carried to summary £5,500.00

P.	Preparation Work and Project Management	£1,850.00
A.	General items and provisional sums	£2,050.00
F.	In situ testing	£1,416.00
G.	Instrumentation and monitoring	£7,591.00
I.	Chemical testing for contaminated ground	£3,138.50
R.	Data Interpretation and Reporting	£5,500.00
	10% Contingency to SI Costs only (items A, F, G and I)	£1,419.55

TOTAL COST OF WORKS

£22,965.05

Cannock Chase - Site Investigation Construction Phase Risk Assessment

Introduction

Description and detail of investigation purpose, techniques, quantities and specific hazards.

Detail of works given below:

Exploratory hole No.	Location	Borehole Depth (m)	Nominal Depth of Standpipe piezometer (M)
CRH-WS1 to CRH-WS8 CRH-HA1 to CRH-HA10	Oxford Road, Stafford as set out on Campbell Reith Hill Proposed Exploratory Hole Location Plan Ref. 10734/01 GIS007	TBC (Nominally 6m)	TBC (nominally 0.50m)
CRH-WS1 to CRH-WS8 CRH-HA1 to CRH-HA10	Heather Close, Rugeley as set out on Campbell Reith Hill Proposed Exploratory Hole Location Plan Ref. 10734/01 GIS008		
CRH-WS1 to CRH-WS13 CRH-HA1 to CRH-HA12	Hednesford Hills, Cannock Chase as set out on Campbell Reith Hill Proposed Exploratory Hole Location Plan Ref. 10734/01 GIS015		

Risk Assessment

There are several risks associated with carrying out ground investigations, due to vehicles, equipment and machinery, site conditions and the uncertain nature of the ground conditions that may be encountered. Provided reinstatement is adequate, no additional risks have been identified for the site following completion of the site investigation works.

The table on the following pages describes the risks associated with carrying out the site investigation works, using the standard HSE rating system, detailed below and details measures to make the risks acceptable.

Risk Rating

The outcome of Likelihood and Severity gives the Risk Rating.

		Likelihood		
		H	M	L
Severity	H	3	3	2
	M	3	2	1
	L	2	1	1

Severity	
H	Fatality, Major injury causing long term disability
M	Injury or illness causing short term disability
L	Other injury or illness
Likelihood	
H	Certain or near certain
M	Reasonably likely
L	Very seldom or never

Cannock Chase - Site Investigation Construction Phase Risk Assessment

Risk Rating	
3	High risk - Action required to reduce risk
2	Medium risk - Action required unless good reason
1	Low risk - No action required but review if high severity

Cannock Chase - Site Investigation Construction Phase Risk Assessment

Activity, Process, Material Describe including appropriate references where appropriate	Hazard/Risk Outline what the potential to cause harm as a result of column 1	Initial Risk Rating See Matrix and Information above	Actions by Contractor to Reduce Risk Rating Is the initial risk rating >1? If yes consider as a priority the need to avoid risks and reduce risks. Can the risk be reasonably avoided by changing the design, specification or working practices? If yes explain how and change it. Can changing the design, specification or working practices reasonably reduce the risk? If yes explain how and change it. If the final risk rating is >1, explain why and what is needed to be done to minimise risk.	Final Risk Rating See matrix, If >1 info required for H&S plan/file	Is the Final Risk Rating 2 or 3? If so, information needs to be passed to Planning Supervisor
General access and site control	Harm to HGE personnel and third parties	2	<p>The exploratory locations are in non secure areas that may be accessible by the public and other site users.</p> <p>Working areas to be suitable signed and cordoned / fenced off. Access routes identified and prioritised. Site operatives to act as banksman during equipment moves. Full time professional supervision to be provided by HGE.</p> <p>Open excavations are not to be left unattended. Site to be left in a tidy state upon completion. HGE to work under licence from SCC</p> <p>Other workers on the site should be informed of the potential risks involved and instructed to remain clear of the working locations. Residents to be notified in advance of any works.</p>	1	No
Site occupiers vehicles	Damage to vehicles and injury	2	Residents to be notified in advance of the works. High visibility clothing to be worn. Site operatives to be observant for site traffic & pedestrians. Site operatives to act as banksman during equipment moves.	1	No.
Buried services	Damaging services from borehole operations	2	Third party specialist service clearance crews to clear exploratory hole positions prior to breaking ground. Service plans to be obtained prior to commencement and utility provider asked to attend site if doubt still exists. Area to be checked with cable avoidance tool (CAT) prior to excavation and starter pit to be hand excavated to 1.2m depth. Borehole supervision to prevent services being damaged.	1	No
Potentially contaminated soil and	Acute Health Risks, Inhalation,	2	The site has been provisionally classified as GREEN/YELLOW in accordance with BDA guidelines. Suitable PPE and welfare facilities to be provided. Method statement for drilling on Green/Yellow Sites to be followed. All personnel to be	1	No

Cannock Chase - Site Investigation Construction Phase Risk Assessment

Activity, Process, Material Describe including appropriate references where appropriate	Hazard/Risk Outline what the potential to cause harm as a result of column 1	Initial Risk Rating See Matrix and Information above	Actions by Contractor to Reduce Risk Rating Is the initial risk rating >1? If yes consider as a priority the need to avoid risks and reduce risks. Can the risk be reasonably avoided by changing the design, specification or working practices? If yes explain how and change it. Can changing the design, specification or working practices reasonably reduce the risk? If yes explain how and change it. If the final risk rating is >1, explain why and what is needed to be done to minimise risk.	Final Risk Rating See matrix, If >1 info required for H&S plan/file	Is the Final Risk Rating 2 or 3? If so, information needs to be passed to Planning Supervisor
groundwater	ingestion,		suitably experienced and undergo site induction training.		
Use of mechanical drilling equipment	Working with machinery, falling objects	3	Personnel working on the site to have the required experience and training to use all equipment, and the works to be supervised by competent personnel. Equipment to have necessary certificates and be suitable for use.	1	No
Working on slopes	Instability of slope	2	Working on slopes to be avoided where possible. Provide temporary support where necessary to provide support to equipment.	1	No
Uncontrolled waste and spillages	Slips, trips, falls and introducing contamination to the environment	2	Site hygiene to be maintained at all times. Spoil to be bagged up and stored clear of the immediate working area of the machine. Fuel / liquid containers not to be left in non bunded areas. Spill kits to be available on site.	1	No
Noise and dust	Deafness inhalation of dust	3	Ear defenders to be worn at all times during plant operation. Dust suppression to be utilised if significant potential for generation.	1	No.
Manual Handling	Risk from excessive loads	2	Manual handling regulations should be followed (HSE - L23 Manual handling. Manual Handling Operations Regulation 1992).	1	No
Use of cementitious materials and bentonite	Contact with skin Inhalation of	2	Observe guidance on use of cementitious material (HSE - HS(G)46 Guide for small contractors - Site safety and concrete construction). Suitable PPE to be worn at all times.	1	No

Cannock Chase - Site Investigation Construction Phase Risk Assessment

Activity, Process, Material Describe including appropriate references where appropriate	Hazard/Risk Outline what the potential to cause harm as a result of column 1	Initial Risk Rating See Matrix and Information above	Actions by Contractor to Reduce Risk Rating Is the initial risk rating >1? If yes consider as a priority the need to avoid risks and reduce risks. Can the risk be reasonably avoided by changing the design, specification or working practices? If yes explain how and change it. Can changing the design, specification or working practices reasonably reduce the risk? If yes explain how and change it. If the final risk rating is >1, explain why and what is needed to be done to minimise risk.	Final Risk Rating See matrix, If >1 info required for H&S plan/file	Is the Final Risk Rating 2 or 3? If so, information needs to be passed to Planning Supervisor
	dust				
Asbestos	Inhalation	3	There is a possibility of encountering buried asbestos during the works. (HSE - L27 The Control of Asbestos at Work: AcoP). Suitable PPE to be worn at all times. Dust suppression measures and wearing of face masks required if dust is being generated.	1	No
Stagnant water and rats	Weils disease	1	Rats urine carries the disease and it can be contracted through open cuts and abrasions. All cuts and abrasions should be covered. Suitable first aid facilities to be present on site at all times.	1	No
Soil Gas	Explosion	2	Explosive concentrations of gas can accumulate in excavations, smoking and other ignition sources will not be permitted at working locations.	1	No
	Suffocation	2	Asphyxiation is a possibility in enclosed spaces. Personnel not to enter any confined spaces on the site.	1	No




METHOD STATEMENT

WINDOW SAMPLING

PREMIER TRACKED 110 RIG

MS/GL15688/034c

Revision	Comments	Prepared By	QA Review	Approved by	Issued By
A	INITIAL ISSUE	INIT AS SIGN DATE 18/05/07	INIT HDC SIGN DATE 18/05/07	INIT HDC SIGN DATE 18/05/07	INIT HDC SIGN DATE 18/05/07
B	EMERGENCY CONTACTS	INIT HDC SIGN DATE 07/11/08	INIT HDC SIGN DATE 07/11/08	INIT SPW SIGN DATE 07/11/08	INIT HDC SIGN DATE 07/11/08
C	RIG LEVER SAFETY AWARENESS	INIT HDC SIGN DATE 04/06/10	INIT HDC SIGN DATE 04/06/10	INIT SPW SIGN DATE 04/06/10	INIT HDC SIGN DATE 04/06/10
		INIT SIGN DATE	INIT SIGN DATE	INIT SIGN DATE	INIT SIGN DATE

	harrisongroup	Method Statement
Document Ref No: MS/GL15688/034c	Project: Oxford Road, Heather Close and Hednesford Hills, Cannock Chase.	
Work Sequence: Window and Windowless Sampling	Contractor: Harrison Group Environmental Limited	
Trade/Skill: Site operative	Client: Cannock Chase District Council c/o Campbell Reith Hill LLP	

This Method Statement must be read in conjunction with [RA-118a](#) (General Site Risk Assessment),

This statement describes the activities to be undertaken by Harrison Group Environmental Ltd. during the drilling of window sampler boreholes using a Premier Tracked 110 drilling rig.

The purpose of window sampling is to drill small diameter boreholes – in the order of 50-90mm – to shallow depths, typically no greater than 5m so that soil / water samples can be obtained for subsequent analysis. If conditions are suitable monitoring wells can be installed in the borehole.


Persons responsible for supervision of process/contacts:
Project Engineer
Site Supervisor

- Equipment be used:**
- i. Premier Tracker 110. This is a portable, dual-purpose machine for driving dynamic probe rods and steel soil sampling tubes into the ground. The rig is track mounted and can be manoeuvred around site remotely. It is a hydraulically operated system and has its own in-built power source – a petrol driven Honda engine, and a hydraulic jacking system.
 - ii. Window and windowless sample tubes: - 1m in length with diameters from 50mm to 90mm.
 - iii. Solid steel rods, 1m in length. Rods can be interconnected by means of a threaded stud.
 - iv. Cable avoidance tool.

Method and sequence to be used:

The site set up consists of a 2-person crew, with van and equipment.

- Transportation, loading /offloading and preparation of rig using proprietary ramps or suitable towing trailer.**
- a. Ensure that operators are fully conversant with securing the rig in the transportation position within the testing services hi-top van, to include stowing periphery attachments, equipment and ramps in a non-hazardous and secure manner.
 - b. Securing straps are to be utilised and van weight limits are to be adhered to. Ramps are to be fitted to their respective attachment points on the rear of the van.
 - c. The handbrake of the van is to be serviceable and applied during loading/offloading.
 - d. Great care is to be taken during tracking on and off the van via the ramps and the umbilical remote control is to be extended by the operator to ensure that they have an unimpeded view of the ramp area.
 - e. Personnel are to remain outside of the rear load area during the load/unload operation.
 - f. The ramps and Premier Rig are to be subjected to daily and pre-use checks to confirm serviceability and the rig is **Not** to be used if any of the safety devices or operating systems are


	harrisongroup	Method Statement
Document Ref No: MS/GL15688/034c	Project: Oxford Road, Heather Close and Hednesford Hills, Cannock Chase.	
Work Sequence: Window and Windowless Sampling	Contractor: Harrison Group Environmental Limited	
Trade/Skill: Site operative	Client: Cannock Chase District Council c/o Campbell Reith Hill LLP	

missing or damaged.

- g. Refuelling of the Premier rig must be undertaken in well ventilated spaces and petrol is to be decanted from a proprietary petrol can via a suitable funnel to reduce chances of spillage. Refuelling should always be undertaken prior to starting of the engine whilst still cold, to avoid petrol coming in contact with hot exhaust area from the rig engine.
- h. No smoking is allowed during any Rig operations.

Premier Rig Operations


- i. Prior to mobilising to site, check that all operatives are fully conversant with task requirements and Premier Rig usage, the equipment and PPE is serviceable and has the required calibration / safety certificates. This procedure must also be adhered to when equipment is hired.
- ii. Mobilise to site on agreed date to arrive at the agreed time.
- iii. Check that access to, and working space at, the required locations is suitable.
- iv. Set up at required location. Clear positions of services. CAT position in all cases and dig inspection pit.
- v. Hands clothing and PPE are to be kept clear of all moving parts to avoid entrapment, pinching, bruising or crushing etc. **Particular care must be taken to not lean across the track control levers by the operators whilst attempting to adjust any periphery equipment. This will cause the rig to move in the selected direction and could cause injury or impact through uncontrolled rig transversing.** (A suggested modification to the controls in the form of an interlock or guard has been submitted to the manufacturer early 2010)
- vi. The window sample tubes/rods are fitted with a drive head, which is placed under the anvil assembly of the Premier Tracked 110 drilling rig.
- vii. Install window sampler boreholes to the depths indicated on the site instructions. This is done by percussive blows of the free falling 63.5Kg drop weight, driving the window sample tubes into the ground to the required depth and then removing them by means of the hydraulic jack.
- viii. The hole is progressed to depth by inserting and jacking out a combination of window samplers of differing diameters (starting with the largest). As the borehole becomes deeper, window sampler rods are attached and removed as required.
- ix. Take soil samples at required intervals and place in plastic tubs or retain plastic liners. Label all samples/liners with project reference name and number, position no., sample no., date, sample type, sample depth.
- x. Fill in a written window sampler log of the soils encountered during the drilling operation,

	harrisongroup	Method Statement
Document Ref No: MS/GL15688/034c	Project: Oxford Road, Heather Close and Hednesford Hills, Cannock Chase.	
Work Sequence: Window and Windowless Sampling	Contractor: Harrison Group Environmental Limited	
Trade/Skill: Site operative	Client: Cannock Chase District Council c/o Campbell Reith Hill LLP	

<p>with sample type and depths.</p> <p>xi. Take water sample if required and label in a similar way to the above.</p> <p>xii. Install monitoring well (if required) – this is usually in the form of interconnecting 1m lengths of 38mm diameter slotted and plain uPVC pipe, with a gravel surround. Install gas tap and cement in the stopcock cover.</p> <p>xiii. If there is no requirement for a monitoring well, backfill borehole with spoil or bentonite as required. Clear and tidy the working area. Remove any excess materials from site.</p> <p>xiv. Mobilise crew and equipment off site.</p>
<p>Protective Clothing & Equipment Required:</p> <p>Hardhat, eye protection (where necessary), ear protection, safety footwear, gloves, overalls, high visibility vests/jacket, mobile telephone.</p> <p>There may be additional /particular requirements for some sites.</p>
<p>Emergency Response Information Summary (to be confirmed and completed below)</p> <p>Nearest Hospital Accident & Emergency Information : Stafford Hospital, Weston Road, Stafford, Staffordshire, ST16 3SA Tel: 01785 257 731 Closest welfare and First Aid facilities: TBC Emergency Procedures and contact names/numbers are to be documented and distributed prior to commencement of work:</p>

**Emergency Response Information Summary
EMERGENCY CONTACTS LIST**

Emergency Response Team			
Harrison's Office Norwich		01603 613111	
Harrison's Office London		0207 537 9233	
Client: Campbell Reith Hill LLP		020 7340 1700	
Harrison's (24/7)		TBC	
Senior Project Engineer: John Keay		07767 776 103	
Business Services Manager: Henry Chapman		07876 505 471	
Project Engineer: Glenn Pursey		07796 172 591	
Chubb Insurance - International Emergency Assistance Policy Number 64797259 e-mail: medicalassistance@chubb.com		0044 (0) 207 895 3364	
HOSPITAL- Stafford Hospital Weston Road, Stafford	01785 257 731	BT	0800 9173993
EON	0800 0150921	National Grid	0800 7312961
EDF Energy	0800 780078	Gas	0800 111999

	harrisongroup	Method Statement
Document Ref No: MS/GL15688/034c		Project: Oxford Road, Heather Close and Hednesford Hills, Cannock Chase.
Work Sequence: Window and Windowless Sampling		Contractor: Harrison Group Environmental Limited
Trade/Skill: Site operative		Client: Cannock Chase District Council c/o Campbell Reith Hill LLP

Severn Trent	0800 783 4444	South Staffordshire Water	0800 389 10 11
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The Harrison's Project Engineer for the job will ensure that the operators have received appropriate training and instruction and that the following elements are completed and signed for before commencement of work. The completed hard-copy will be held within the job-file in the Health & Safety section. In addition, the signed copy is to be converted to PDF and held on the appropriate electronic job folder in the Health & Safety section.

Harrison's Job Number: GL15688

Client Name & Address: Cannock Chase District Council c/o Campbell Reith Hill LLP, Artillery House, 11-19 Artillery Row, London, SW1P 1RT

Issued by (Print Name): Alex Partridge	Approved by (Print Name): John Keay
Position: Senior Geotechnical Engineer	Position: Associate Director Geotechnical
Signature:	Signature:
Date:	Date:

The signature blocks below are to be completed by the applicable operatives and supervisors to verify that they have read and understood this assessment and will comply with it. In addition, any suggested deviations or improvements are to be forwarded to the Harrison Group Environmental Ltd, QSE Manager for approval and incorporation as an amendment as applicable.

Name of Recipient Operative (Print)	Position	Date	Signature




METHOD STATEMENT

HAND DUG TRIAL PITS

MS/GL15688/008c

Revision	Comments	Prepared By	QA Review	Approved by	Issued By
A	INITIAL ISSUE	INIT AWC SIGN DATE 13/06/02	INIT WIS SIGN DATE 13/06/02	INIT SPW SIGN DATE 13/06/02	INIT SPW SIGN DATE 13/06/02
B	EMERGENCY PROCEDURES	INIT HDC SIGN DATE 29/10/08	INIT HDC SIGN DATE 29/10/08	INIT SPW SIGN DATE 29/10/08	INIT HDC SIGN DATE 29/10/08
C	Updated Emergency Contact	INIT HDC SIGN DATE 06/01/10	INIT HDC SIGN DATE 06/01/10	INIT SPW SIGN DATE 06/01/10	INIT HDC SIGN DATE 06/01/10
		INIT SIGN DATE	INIT SIGN DATE	INIT SIGN DATE	INIT SIGN DATE
		INIT SIGN DATE	INIT SIGN DATE	INIT SIGN DATE	INIT SIGN DATE

	harrisongroup	Method Statement
Document Ref No: MS/GL15688/008		Project: Oxford Road, Heather Close and Hednesford Hills, Cannock Chase
Work Sequence: Hand Dug Trial Pits		Contractor: Harrison Group Environmental Limited
Trade/Skill: Geotechnical Engineer, Site Operative		Client: Cannock Chase District Council c/o Campbell Reith Hill LLP

This Method Statement must be read in conjunction with [Risk Assessment 118a](#)

This statement describes the activities to be undertaken by Harrison Group Environmental Ltd. during the process of hand digging trial pits.

Hand dug trial pits are carried out mainly to expose the footings of buildings and to excavate material in sensitive areas where there may be a problem with underground services. They are also dug in areas where there is insufficient access for a mechanical excavator.

Persons responsible for supervision of process/contacts:

Project Engineer: John Keay (020 7537 9233)
 Geotechnical Engineer: Glen Pursey
 Site operatives: tbc

Equipment be used:

- i. Post Holers
- ii. Cable Avoidance Tool
- iii. Hydraulic breaker where necessary
- iv. Spade
- v. Trowel
- vi. Tape measure
- vii. Hand Vane (optional)
- viii. Sample tubs
- ix. Sample bags
- x. Sample labels
- xi. Bag ties
- xii. Clipboard
- xiii. Logging sheets
- xiv. Pen / pencil
- xv. Camera (optional)
- xvi. Photo Board
- xvii. Levelling Staff
- xviii. Tarpaulin (or similar)



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Method Statement

Document Ref No: MS/GL15688/008

Project: Oxford Road, Heather Close and Hednesford Hills, Cannock Chase

Work Sequence: Hand Dug Trial Pits

Contractor: Harrison Group Environmental Limited

Trade/Skill: Geotechnical Engineer, Site Operative

Client: Cannock Chase District Council c/o Campbell Reith Hill LLP

Method and sequence to be used:

The site set up consists of a two man crew, with van and equipment.

- i. Prior to mobilising to site, check that all equipment and PPE is serviceable and has the required calibration / safety certificates. This procedure must also be adhered to when equipment is hired
- ii. Mobilise to site on agreed date to arrive at the agreed time.
- iii. Check that access to, and working space at, the required location(s) is suitable.
- iv. Set up at required location. CAT position as a precautionary measure.
- v. Break out concrete where necessary.
- vi. Carry out hand digging to take samples, reveal foundation / service detail as necessary. The pit will not exceed a depth of 1.2m unless suitable shoring is put in place.
- vii. The top 200mm of topsoil is to be removed and placed separate from all other spoil excavated. All other spoil is to be placed to one side. On certain sites this will be laid out a suitable tarpaulin/plastic sheet to aid in cleanliness of the site.
- viii. Samples to be suitably contained and bagged up, labelled with project name, project no., trial pit no., sample depth, sample type, sample no., date and removed from site.
- ix. On completion of the excavation and when all relevant notes have been taken, a photograph shall be taken. A photo board and levelling staff (for reference) shall be included in the photograph which shall detail all relevant project information, the hole ID and the date of excavation.
- x. Backfill pit and tamp down the material to compact, reinstate ground surface as appropriate. Take any excess material off site and leave the working area as tidy as is reasonably practicable.
- xi. **Note.** Any excavation deeper than 1.2m will not be entered unless suitably shored.

Protective Clothing & Equipment Required:

Hardhat, eye protection (where necessary), ear protection, safety footwear, gloves, overalls, high visibility vests/jacket, mobile telephone.

There may be additional /particular requirements for some sites.



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Method Statement

Document Ref No: MS/GL15688/008

Project: Oxford Road, Heather Close and Hednesford Hills, Cannock Chase

Work Sequence: Hand Dug Trial Pits

Contractor: Harrison Group Environmental Limited

Trade/Skill: Geotechnical Engineer, Site Operative

Client: Cannock Chase District Council c/o Campbell Reith Hill LLP

Emergency Response Information Summary (to be confirmed and completed below)

Nearest Hospital Accident & Emergency Information :

Stafford Hospital, Weston Road, Stafford, Staffordshire, ST16 3SA

Tel: 01785 257 731

Closest welfare and First Aid facilities: TBC

Emergency Procedures and contact names/numbers are to be documented and distributed prior to commencement of work:

**Emergency Response Information Summary
EMERGENCY CONTACTS LIST**

Emergency Response Team			
Harrison's Office Norwich		01603 613111	
Harrison's Office London		0207 537 9233	
Client: Campbell Reith Hill LLP		020 7340 1700	
Harrison's (24/7)		TBC	
Senior Project Engineer: John Key		07767 776 103	
Business Services Manager: Henry Chapman		07876 505 471	
Project Engineer: Glenn Pursey		07796 172 591	
Chubb Insurance - International Emergency Assistance		0044 (0) 207 895 3364	
Policy Number 64797259 e-mail: medicalassistance@chubb.com			
HOSPITAL- Stafford Hospital, Weston Road, Stafford	01785 257 731	BT	0800 9173993
EON	0800 0150921	National Grid	0800 7312961
EDF Energy	0800 780078	Gas	0800 111999
Severn Trent	0800 783 4444	South Staffordshire Water	0800 389 10 11

The Harrison's Project Engineer for the job will ensure that the operators have received appropriate training and instruction and that the following elements are completed and signed for before commencement of work. The completed hard-copy will be held within the job-file in the Health & Safety section. In addition, the signed copy is to be converted to PDF and held on the appropriate electronic job folder in the Health & Safety section.

Harrison's Job Number: GL15688

Client Name & Address: Cannock Chase District Council c/o Campbell Reith Hill LLP, Artillery House, 11-19 Artillery Row, London, SW1P 1RT

Issued by (Print Name): Alex Partridge	Approved by (Print Name): John Key
Position: Senior Geotechnical Engineer	Position: Associate Director Geotechnical
Signature:	Signature:
Date:	Date:

GGG GasClam® Instrumentation Overview & Deployment Information



Introduction

GGG GasClam® instruments are high frequency in-situ borehole gas monitoring devices, suitable for detection of a wide range of ground gases commonly found in borehole monitoring. The equipment is ATEX approved and IP68 rated and can operate safely in explosive atmospheres and survive flooding environments. They can also be secured to building walls or placed internally to monitor sub-floor spaces or indoor air.

GGG currently have three versions of the instrument, a bulk gas version which monitors methane, carbon dioxide and oxygen; a trace gas version which also includes sensors for hydrogen sulphide, carbon monoxide and total volatile organic compounds; and a specialized instrument that can monitor methane and carbon dioxide between 0 – 5%v/v at a high resolution of 0.05% in addition to the other gases. All versions record atmospheric pressure, borehole pressure and temperature as standard.

Should your site be influenced by water level changes (e.g. tidal or flooding), GGS can also provide water level logging alongside the high frequency ground gas data if required.

GasClam® Sensor Specifications, Service and Maintenance

The GGS GasClam® instruments are serviced and calibrated annually. Routine maintenance including the replacement of filters and operational checks are carried out at regular intervals and prior to deployment at a site. Copies of the calibration certificates for the instruments used on site are included as standard within reporting. Details of the sensor specification are provided below:

Sensor	Method / Type	Range	Resolution
Methane (0-100%)	Infrared	0 - 100%v/v	1% of measuring range above 50%, 0.5% below 50%
*Methane (0-5%)	Infrared	0-5%v/v	0.05%
Carbon Dioxide (0-100%)	Infrared	0 - 100%v/v	1% of measuring range above 50%, 0.5% below 50%
*Carbon Dioxide (0-5%)	Infrared	0-5%v/v	0.05%
Oxygen	Electrochemical	0 - 25%v/v	0.1%
*Hydrogen Sulphide	Electrochemical	0 - 100ppmv	1ppmv
*Carbon Monoxide	Electrochemical	0 - 1000ppmv	1ppmv
*Total Volatile Organic Compounds	PID	0 - 4000ppmv	1ppmv
Atmospheric Pressure	Piezoelectric	800 - 1200mb	1mBar
Borehole Pressure	Piezoelectric	800 - 1200mb	1mBar
Temperature	Internal chip	-5°C to +50°C	1°C

* Only installed on the 0-5% High Resolution GasClam® * Only installed in VOC GasClam®

The GGS GasClam® equipment is battery powered and runs off two D cell batteries. The bulk gas versions can take approximately 1350 readings (approximately 8 weeks based on hourly sampling), with the other versions taking approximately 600 readings (approximately 3.5 weeks based on hourly sampling) before the batteries need replacing.

Deployment Requirements (IMPORTANT)

For GGS GasClam® instruments to be deployed, standard 50mm installation standpipes are required (larger diameter boreholes can be accommodated for). Headworks with enough clearance and a suitable secure cover are also required. GGS recommend that a minimum 8 inch diameter flush fit cover (for example MW8 covers available from Stuart Wells <http://wellservices.stuartgroup.ltd.uk/>) be used. A minimum 100mm clearance is required from the top of the 50mm standpipe to the underside of the cover. A minimum 150mm internal headworks diameter is required (75mm clear radius from centre of stand pipe). We also recommend that minimum standing water level is greater than 0.8m below the standpipe top due to the instrument halting gas sampling automatically to avoid taking water internally.

GGG can also deploy GasClam® instruments within buildings or fix them to external walls within protective and secure housing should you wish to monitor indoor air or subfloor void spaces of existing buildings or for verification purposes.

If the above requirements cannot be achieved, please contact GGS to discuss site specific deployment options – there probably is one!

GasClam Insurance

GGG carry specific insurance to cover the instruments against theft from site and is included as standard as part of our service.

Ground-Gas Solutions Ltd
Williams House
Manchester Science Park
Lloyd Street North
Manchester
M15 6SE

Telephone: 0161 232 7465
E-mail: info@ground-gassolutions.co.uk
Web: www.ground-gassolutions.co.uk



www.campbellreith.com

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