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1. INTRODUCTION

Ground Solutions Group (GSG) was commissioned by Jamestown Metal Resources to undertake a Contamination Assessment on a proposed redevelopment site known as Pogmoor Works situated in Barnsley, South Yorkshire. The proposed redevelopment of the site is to a residential end use with private gardens.

The site had been subject to both a desk study and previous ground investigation. The most recent study of the site was carried out in 2004 by White Young Green (Geo-Environmental Desk Study). In addition an intrusive investigation was carried out at the site as part of the IPPC permit process in order to determine base line conditions. These reports were reviewed as part of this study.

The purpose of the contamination assessment was to determine the environmental setting of the site in terms of potential sources, pathways and receptors of pollution, and to collect representative soil samples for contamination testing. The results of the soil testing have been used to carry out an assessment of contamination issues based upon current contaminated land legislation.

The study comprised the following core activities:

- Review of previous reports;
- Limited further desk study information collection and site walkover;
- Intrusive investigation;
- Contamination risk assessment.

2. SITE LOCATION AND LAYOUT

The site is located off Stocks Lane, Barnsley approximately 1.5km to the west of Barnsley Town Centre and is centred on National Grid Reference SE 332 065 (Figure 1). The site is surrounded on three sides by playing fields to the north, west and south. To the east of the site is residential housing.

The site is currently occupied by an operational lead reprocessing works. It is approximately 1.1ha in size and consists of two main works buildings and an office building (Figure 2). The site is relatively flat with a gentle slope rising up from the southeast to the north west of the site. The majority of the site is covered with hardstanding (tarmac/concrete) although the northern and western edges of the site comprised soft ground.

At the north west of the site is a 2 metre high embankment constructed of fill material, this embankment is overgrown with scrub, in particular, Japanese Knotweed (*Fallopia japonica*).

The oldest building is to the west of the site, which is an old red-brick built building in poor condition. It is believed that this is an old mine building which was later used as part of a brick works before its current use as a workshop and storage building (see Section 3). The other works building is the main building of operations; it is more modern and consists of 2 linked large open warehouse type structures. At the south of the site adjacent to the main works building is the site office building. The buildings included features which may have been formed from asbestos, including drain pipes and roof material.

3. SITE HISTORY

An historic map search was undertaken for the WYG Geo-Environmental Desk Study and extracts of the Ordnance Survey maps were obtained. The maps have been reproduced in Appendix 1. Key changes to the site as depicted on the maps have been summarised below.

The earliest Ordnance Survey map available of the site was dated 1855. The map showed the site to be undeveloped. Stocks Lane was shown leading to the site to the east. The Barnsley Branch railway was shown to run east to west approximately 100m south of the site. Open fields surrounded the site.

By 1893 map showed the east area of the site as Slackhills Colliery with a raised area and with 4 small structures and 2 shafts indicated. To the south and east of the site there had been limited residential development probably for mine employees.

By 1906/07 maps indicated that there were 2 large buildings (likely to be associated with the mine) at the south of the site and a large pit filled with water at the north of the site. Summer Lane Brickworks was shown to the southwest of the site.

The 1931 and 1938 maps no longer showed the mining related features. The site was occupied by a brickworks, which comprised a large clay pit to the northwest, extending onto the western area of the site. There were 3 main buildings, a number of smaller ancillary buildings, 2 chimneys and a tramway at the west. The water filled pit at the north of the site was not shown. A "Refuse Destructor (Barnsley Corporation)" was shown to be on the site of the Summer Lane Brickworks with the old pit shown as a refuse heap. There was extensive residential development in the area and a recreational ground was shown directly adjacent to the north of the site.

The1956 map showed that the tramway had been removed. Two thirds of the clay pit was shown to be filled with water.

By 1960 to 1966 maps indicated that the building in the south-eastern area of the site had been replaced by 2 new structures. The layout of the buildings was the same as those that currently occupy the site. The third of the clay pit to the west of the site was designated as spoil with the final map of the series indicating that the pond had been drained.

By 1971 to 1973 maps indicated that the large clay pit to the west of the site had been filled in.

Between 1983 and 2000 historical Ordnance Survey maps indicated no significant changes were shown. However since 2000, there has been an extension of the main processing building at the east of the site, which now extends to the sites boundary. The site is currently in use as a lead processing works.

4. ENVIRONMENTAL SETTING

4.1 GEOLOGY

Reference to the British Geological Survey 1:50,000 Series, Sheet 87, indicated that the site is underlain by north and north-easterly dipping strata of the Middle Coal Measures. These comprise cyclical sequences dominated by mudstones but supplemented by sandstones, siltstones and thin coal seams. A sandstone horizon is understood to sub-crop in the east of the site, and mudstone beneath the west of the site. The exact thickness of the sandstone beneath the site is not known.

Geological maps also indicate that there is not likely to be significant drift deposits present on the site.

The investigation carried out for the IPPC licence found that there were some patches of sandy clay and stiff grey clay (completely weathered mudstone), but most of the site consisted of made ground underlain directly by Mudstone. The Made Ground comprised gravel, clay and sand layers containing some brick and ash. The thickness of the Made Ground varied across the site reaching 5.6 m to 5.7 m (BGL) in the west and between 0.5 m and 2 m (BGL) across the remainder.

4.2 GROUNDWATER

Reference to the Environment Agency 1:100,000 scale Groundwater Vulnerability Map, Sheet 11, South Pennines, indicated that the strata underlying the site are classified as a Minor Aquifer.

Minor aquifers will seldom produce large quantities of water for abstraction. However, they can be important for both local supplies and in supplying base flow to rivers.

Soils on the site are classified as Soils of High Leaching Potential (U) – Soil information for restored mineral workings and urban areas is based on fewer observations than elsewhere. A worst case vulnerability classification (H) is therefore assumed until proven otherwise.

Environment Agency records show that the site does not lie within a groundwater Source Protection Zone (SPZ).

The mining and quarrying history in the area is likely to have impacted on groundwater quality in the area.

4.3 SURFACE WATER

The nearest major surface watercourse, the River Dearne is located approximately 3 km from the site in a easterly direction.

The Environment Agency's General Quality Assessment Scheme provides assessments for both chemical and biological indicators of water quality for rivers and canals in England and Wales. Based on the 2001 data the stretch of water nearest to the site is classified as non-compliant. Details are provided below.

Site details:

River name	River Dearne
River stretch	New Lodge Old Mill
Years	2000 to 2002
Upstream grid ref.	X:433979, Y:408458
Downstream grid ref.	X:435637, Y:407028
Length	3

Sampling results:

	Average	Standard deviation	Percentile 95	Percentile 90	Percentile 10	Number of samples	Grade
Biochemical oxygen demand (mg/l)	3.00	2.03		5.46		32	C
Ammonia (mgN/l)	0.404	0.332		0.784		31	C
Dissolved oxygen (%age saturation)	82.62	15.86			62.28	32	C

The nearest watercourse to the site is a stream located approximately 150m to the south of the site. This steam is not classified under the EA GQA scheme.

4.4 RADON

Reference to the National Radiological Protection Board's "Radon Atlas of England and Wales" indicated that between 1% and 3% of houses within the 5 km square, which includes the site, have radon concentrations above the action level of 200 Bq/m^3. Based on published guidance it is considered that no special measures, such as radon sump, need be incorporated into buildings.

4.5 OTHER ENVIRONMENTAL INFORMATION

Reference was made to the Envirocheck report provided in WYG report, extracts from which are provided in Appendix 2. Relevant information relating to the sites environmental sensitivity is summarised as follows:

- Water Abstractions: There were 5 abstraction licences recorded within a 2km of the site. However only 1 of these is currently in use, approximately 610m to the southeast of the site.
- Waste: Fourteen landfill sites were recorded within 1km of the site as well as a number of waste management and transfer sites. Of these seven landfills were recorded within 150 m of the site with some recorded within the site itself.
- Nitrate Vulnerable Zones: The site is located in a nitrate vulnerable zone.
- Mining: The site is upon ground subject to mining instability.

5. INTRUSIVE INVESTIGATION

5.1 FIELDWORK

The site works were carried out between 4th and 6th April 2005 comprised the following:

- 4 cable percussion boreholes;
- 16 no. Window Sample Holes (WS1 to WS17);
- Soil Gas Survey.

The positions of the above works on the site are indicated on Figure 2, Exploratory Hole Location Plan.

Due to the presence of Japanese Knotweed on much of the embankment (forming the northern boundary), intrusive works in this area was not possible due to the risk of spreading the plant across the site and other sites.

Cable percussion boreholes

Four boreholes (BH 1 to BH4) were excavated to depths of between 3 to 6 metres below existing ground level using cable percussion drilling techniques.

During boring temporary steel casing was used to support the sides of the bores. Disturbed samples were recovered at 1 metre intervals or every change in strata for description and subsequent laboratory inspection and testing purposes.

Upon completion all four boreholes were fitted with groundwater and gas-monitoring standpipes. The site was revisited after the completion of site works and gas and water levels monitored.

Engineering logs of the borehole are presented in Appendix 3.

Window Sample Holes

Sixteen sample holes (WS1 to W16) were sunk at the site to depths of between 1.5m and 6m using a tracked Archway Competitor rig. The window sampler system involved driving lengths of steel sample barrel into the ground by the action of a percussive hammer. The sample barrels were withdrawn after every successive 1.0 m drive and the recovered material logged. Representative samples were taken for subsequent laboratory inspection and testing.

Groundwater and gas monitoring installations were fitted in WS 1,4,9,10 and 15.

Window sample hole logs are presented in Appendix 4.

Soil Gas Survey

Soil gas monitoring of the window sample holes and boreholes was undertaken on site after site works had been completed. The soil gas was monitored for concentrations of carbon dioxide CO_2, methane CH_4, and oxygen, O_2 using portable gas monitoring equipment (GA2000).

The site was revisited twice after the completion of site works and gas levels monitored.

The gas monitoring results are presented in Appendix 5.

5.2 SUMMARY OF GROUND CONDITIONS

The site works proved the anticipated ground conditions at the site. Much of the site is covered with tarmac or hardstanding, below which is made ground down to depths of 0.36 (BGL) at its shallowest to 5.7m (BGL) at its deepest. The Made Ground comprised brick, ash, coal and slag in a matrix of sand, clay and/or gravel. The Made Ground was encountered at its greatest depth at the west of the site adjacent to the embankment.

The embankment comprised of much brick and fill material with a similar consistency to the rest of the site.

Groundwater was encountered during the investigation and during subsequent monitoring at depths of 2.5 m to 3.5 mbgl depending upon the location of the borehole. Information relating to groundwater levels is recorded on the borehole logs (Appendix 3).

Groundwater levels may vary due to seasonal fluctuations in rainfall, but in the shorter term, can be affected by antecedent weather conditions or other causes.

6. LABORATORY TESTING

6.1 ANALYTICAL TESTING

Forty-five samples were selected and scheduled for chemical analysis, which was undertaken by Chemtest, Newmarket. All soil samples were analysed for contaminants considered appropriate to the past history of the site:

Toxic Metals	Phytotoxic Metals	Inorganic Compounds	Organic Compounds
Arsenic Cadmium Chromium (total and hexavalent) Lead Mercury Selenium Nickel	Copper Zinc Nickel Boron (water soluble)	pH Sulphate (soluble)	Polycyclic Aromatic Hydrocarbons (PAH) (speciated) Total Petroleum Hydrocarbons (TPH (carbon banded))

Selected samples were also subject to leachate testing.

The results of the analytical testing are presented in Appendix 6.

7. GROUND CONTAMINATION ASSESSMENT

7.1 GUIDELINES ON CONTAMINANT LEVELS

The UKs primary contaminated land guidance is contained within the Contaminated Land Exposure Assessment (CLEA) framework. Within this framework a number of Soil Guideline Values (SGVs) have been published for key contaminants along with toxicological guideline values relating to intake thresholds. The soil guideline values provided by the CLEA model represent intervention values for end uses based upon potential human exposure and soil concentrations of a contaminant above these values might represent an unacceptable risk to the health of the site users.

The Environment Agency has an ongoing programme of SGV publication with associated toxicological information for key contaminants. Where SGVs are available then they should be used as the basis for any human health risk assessment. Toxicological information has also been published within the CLEA framework for a range of organic contaminants for which SGVs have not been produced, although the data can be used as the basis for a risk assessment. Published SGVs (in mg/kg) are provided in the table below.

	Proposed site end use			
	Residential (plant uptake)	Residential (no plant uptake)	Allotments	Industrial/ commercial
Arsenic	20	20	20	500
Cadmium (pH 6)	1	30	1	1400
Cadmium (pH 7)	2		2	
Cadmium (pH 8)	8		8	
Chromium (tot)	130	200	130	5000
Lead	450	450	450	750
Mercury	8	15	8	480
Nickel	50	75	50	5000
Selenium	35	260	35	8000

CLEA does not provide guidance for total Polycyclic Aromatic Hydrocarbons (PAHs). CLEA does however provide an index dose for benzo(a)pyrene (BaP) considered to be one of the more toxic of the PAH family of chemicals.

Using the default soil settings (loam, pH 7.0, organic matter 5%) the following initial in house screening values for BaP in a range of potential end uses have been estimated.

	Residential with plant uptake	Residential without plant uptake	Allotments	Commercial/ Industrial
Benzo-a-pyrene (mg/kg)	1.0	1.2	1.2	10

The Landfill (England and Wales) (Amendment) Regulations 2004 provides waste acceptance criteria, which set the limits of contaminants permitted in various waste categories going to landfill. These criteria are of particular use where CLEA guidance has not yet been provided.

For risk assessment purposes we would consider that any materials (soils) containing concentrations of potential contaminants that would result in them being classified as inert would be considered as uncontaminated and therefore representing a low risk to human health. Similarly such material would not be considered to represent a significant risk to water resources. Selected inert waste acceptance criteria as detailed in The Landfill (England and Wales) (Amended) Regulations 2004 are provided below.

Landfill acceptance criteria for inert waste (mg/kg)	
Total organic carbon (TOC)	30,000
BTEX compounds	6
Mineral oils (C10 – C40)	500
pH	>6
PAH	100*

*proposed value

This table is of particular value for assessing soil containing detectible concentrations of petroleum hydrocarbons. Petroleum Hydrocarbons represents a more complex situation being a mixture of a range of compounds, the relative concentrations of which may change over time.

The CLEA framework does not provide a method for the assessment of phytotoxic risks to plants. However maximum permissible concentrations have been published in the Sludge (Use in Agriculture) Regulations 1989 (SI 1989, No. 1263). This legislation enforces the provisions of the EC Directive 86/278/EEC for potentially toxic elements (PTEs) on soils for agricultural use where sewage sludge has been applied (see table below). These limits relate to the potential risk to plants and not human health for which CLEA is the overriding risk assessment model.

Maximum permissible concentration in agricultural soils following sewage sludge application (mg/kg).				
	pH 5.0<5.5	pH 5.5<6.0	pH 6.0-7.0	pH >7.0
Zinc	200	200	200	300
Copper	80	100	135	200
Nickel	50	60	75	110

The potential risks to buried concrete can be assessed by reference to the BRE Special Digest 1 (SD1) entitled 'Concrete in Aggressive Ground'. This document provides a methodology for the specification of concrete based on the ground conditions encountered and is based upon chemical analysis and associated factors (e.g. groundwater). The guidance provides a Design Sulphate Class (DS) based upon the ground conditions and it is considered that a low concentration of sulphate and pH (i.e. DS – 1 and DS – 2) is considered to represent a low risk to buildings.

In addition, where water is supplied in plastic pipes which could come into contact with contaminated ground then this can lead to premature failures, resulting in leakage and loss of water quality. The Water Regulations Advisory Scheme (WRAS) has published an Information and Guidance Note (The Selection of Materials for Water Supply Pipes to be Laid in Contaminated Land (No 9-04-03)) which provides a table of threshold values. If these threshold values are exceeded then consideration should be given to the selection of pipe material. The WRAS threshold values are presented in the table below for a range of potential hazards.

Organic contaminants	Threshold level (mg/kg)	Corrosion	Threshold level (mg/kg)
Coal tar	50	Sulphate	2000
CEM	50	Sulphur	5000
Phenol	5	Sulphide	250
PAH	50	pH	< 5 > 8
TEM	510		
Petroleum hydrocarbons	50		

Soil carbon dioxide and methane concentrations can be compared to the guidance levels stipulated in the British Research Establishment (BRE) Report BR 212 (1991). This document states that for situations where carbon dioxide is present in soil gas concentrations greater than 5% by volume or methane concentrations in excess of 1% by volume, gas protection measures are required. In circumstances where carbon dioxide concentrations exceed 1.5% by volume gas protection measures should be considered.

The analytical and monitoring results have been compared to CLEA Soil Guideline Values for residential end use with plant uptake.

7.2 SOIL QUALITY

Toxic Metals

The concentrations of the potentially toxic metals chromium, mercury and selenium were all below their respective CLEA Soil Guideline Values for a "Residential with Plant Uptake" end use. These metals are therefore not considered to pose a significant risk of significant harm to human health in the context of Part 2A. Elevated concentrations of arsenic, lead, cadmium and nickel were recorded in a number of samples.

The methodology provided in the Environment Agency's R&D Publication 7 "Assessment of Risks to Human Health from Land Contamination: An Overview of the Development of Soil Guideline Values and Related Research" (CLR7) was followed in order to carry out a Mean and Maximum Value Tests for the arsenic, cadmium, lead and nickel datasets. This test provides a 'true mean' concentration with a 95% confidence based on the data available. The results of these calculations are presented in Appendix 7.

Application of the Mean Value Test for all samples analysed gave the following true mean soil concentrations:

Analyte	Mean Value* (mg/kg)	Maximum Value (mg/kg)	SGV residential (with plant uptake)
Arsenic	32	87	20
Cadmium (pH 7)	0.8	8.4	2
Lead	1442	16000	450
Nickel	46	190	50

Calculated using procedure given in "Assessment of Risks to Human Health from Land Contamination: An Overview of the Development of Soil Guideline Values and Related Research" (CLR7)

The calculated mean values for cadmium and nickel in both zones were less than the respective CLEA SGV and these metals are therefore not considered to present a significant risk of significant harm to human health in the context of Part 2A.

Further inspection of the distribution of the data indicated that the site could be treated as two distinct areas, zones A and B (Shown in Figure 3).

Application of the Mean Value Test on the data obtained for samples analysed from the two zones gave the following mean value concentrations:

Analyte	Zone A		Zone B		SGV residential (with plant uptake)
	Mean Value* (mg/kg)	Maximum Value (mg/kg)	Mean Value* (mg/kg)	Maximum Value (mg/kg)	
Arsenic	43	87	27	57	20
Lead	3128	16000	255	1500	450

Calculated using procedure given in "Assessment of Risks to Human Health from Land Contamination: An Overview of the Development of Soil Guideline Values and Related Research" (CLR7)

Arsenic exceeded the respective CLEA SGV in both Zones. Lead exceeded the CLEA SGV in Zone A but not in Zone B. The implications of the elevated concentrations of lead and arsenic are discussed in Section 8 of this report.

Phytotoxic Metals

Zinc, copper and nickel are considered to be potentially phytotoxic to plants in high concentrations. The Sludge (Use in Agriculture) Regulations 1989 (SI 1989, No. 1263) are used as guidelines for phytotoxic metals since the withdrawal of ICRCL guidelines.

The methodology provided in the Environment Agency's (CLR7) was followed in order to carry out a Mean and Maximum Value Tests for the zinc, copper and nickel datasets. This test provides a 'true mean' concentration with a 95% confidence based on the data available. The results of these calculations are presented in Appendix 9.

Application of the Mean Value Test gave the following true mean soil concentrations of samples analysed:

Analyte	Mean Value* (mg/kg)	Maximum Value (mg/kg)	Sludge disposal limit (pH >7)
Zinc	165	850	300
Copper	81	380	200
Nickel	46	190	110

* *calculated using procedure given in "Assessment of Risks to Human Health from Land Contamination: An Overview of the Development of Soil Guideline Values and Related Research" (CLR7)*

The results of the mean value tests indicated that although occasional elevated concentrations of zinc, copper or nickel were recorded these metals are do not represent gross contamination of the site as a whole and would not be considered to present a significant risk of significant harm to plant health.

Organic Compounds

Concentrations of organic compounds were generally low over the whole site with a maximum concentration for total PAH of 500 mg/kg being recorded in WS9 (0.2 m) and a maximum TPH concentration of 1500 mg/kg in WS9 (1.0 m).

Mean concentrations (using the Mean Value Test) for TPH and PAH were calculated for all samples over the site, these were 302.53 mg/kg and 44.75 mg/kg respectively. The results of these calculations are presented in Appendix 7.

A maximum concentration of Benzo(a)pyrene of 45 mg/kg was recorded with all other concentrations being less than 6.4 mg/kg. The mean concentration (calculated using the Mean Value Test) upon all samples over the site for BaP was 3.87 mg/kg. The calculated mean values for Benzo(a)pyrene was greater than the respective in-house SGV and are therefore considered to present a significant risk of significant harm to human health in the context of Part 2A.

Comparison of the total TPH data with the values given in The Landfill (England and Wales) (Amendment) Regulations 2004 for mineral oils (C10 – C40) indicated that the site is not grossly contaminated with petroleum derived hydrocarbons and that the site would not be considered to pose a significant risk of significant harm to human health in the context of Part 2A.

Inorganic Compounds

The concentrations of water-soluble sulphate were generally low and ranged from 0.02 g/l to 1.19 g/l. pH values upon all samples over the site were generally alkaline and ranged from 5 to 11.4 units.

Soil Gas

The results obtained from the soil gas monitoring indicated that concentrations of methane ranged from <0.25% (v/v) to 0.3% (v/v) and carbon dioxide ranged from <0.25% (v/v) to 6.3% (v/v).

Carbon dioxide was recorded in concentrations in excess of 1.5% (v/v) in 6 of 9 monitoring wells.

Gas flow rates were negligible, ranging from <0.2 to 0.4 l/h.

The gas regime is considered to be moderate.

8. CONTAMINATION RISK ASSESSMENT

This risk assessment has been undertaken with due regard to the advice relating to groundwater as provided in the Environment Agency's "Methodology for the Derivation of Remedial Targets for Soil and Groundwater to Protect Water Resources", the advice provided in the Contaminated Land (England) Regulations 2000, and the associated statutory guidance and Model Procedures fort the Management of Contaminated Land (CLR11). The guidance defines contaminated land as any land that is in such a condition that by reason of substances in, on or under the land:

- significant harm is being caused or there is a significant possibility of such harm being caused; or
- pollution of controlled water is being, or is likely to be caused.

This definition is based on the principles of risk assessment defined as a combination of the probability (or frequency) of occurrence of a defined hazard and the magnitude (including the seriousness) of the consequences. Central to the risk assessment process is the concept of pollutant linkage, that is a linkage between a contaminant and a receptor by means of a pathway.

Statutory definitions relating to pollution linkage.	
Contaminant	"a substance which is in, on or under the land and which has the potential to cause harm or to cause pollution of controlled waters."
Receptor	"a living organism, a group of living organisms, and ecological system or a piece of property" which meets given criteria. "controlled waters which are, or could be, polluted by a contaminant".
Pathway	"one or more routes or means by, or through, which a receptor: • is being exposed to, or affected by, a contaminant, or • could be so exposed or affected".

The relationship between these components is discussed below in order to identify the existence of any source-pathway-receptor linkage on the site, and hence the potential risks associated with any contamination. This risk assessment is based on the proposed redevelopment of the site for residential properties with private gardens.

The significance of the risks to the receptors/targets identified is based on an evaluation of the potential pathways between the contaminant source and receptors based on an residential end use with plant uptake. This represents a detailed quantitative risk assessment.

Potential receptors/targets at the site and in the area in which the site is located include:

- future occupants and the general public;
- construction/maintenance workers;
- groundwater resources and surface watercourses;
- underground services in and around the site;
- built structures at the site.

8.1 CONTAMINANT SOURCES

Potential sources of contamination associated with the site include:

- subsurface contamination of ground due to the operations of the site as an lead processing works, coal mine and clay works.
- surface, and subsurface contamination, from the depositions of lead works and coal mine related wastes.
- gas generated in landfill areas in and adjacent to the site.

During site works slag material consistent with the operation of the lead works including ash and clinker was identified.

8.2 RISK TO HUMAN HEALTH

In terms of any proposed development, the results of the analysis of the selected soil samples recovered during the site works indicated that the concentrations of metals considered to be potentially toxic to humans were varied.

However, particularly high concentrations of lead, and to a lesser extent other potential metal contaminants were recorded in Zone A, but lower concentrations were recorded in Zone B.

Application of the mean value test indicated that lead was present at potentially harmful concentrations across the whole of the site, with arsenic only a significant potential hazard to human health in Zone A.

In order to reduce the risks to acceptable levels for a residential ensue some level of remediation will be necessary across the whole of the site. Potential remediation measures are considered in Section 9

The concentrations of organic compounds were generally low although there is considered to be a potential risk to human health due to elevated PAH (notably BaP).

Elevated concentrations of carbon dioxide were recorded in a number of monitoring positions. These values exceeded the BRE guidelines and therefore gas control/management measures are recommended. The monitoring indicted that flow rates were low and therefore it is considered that passive control measures, such as vented floor slabs, should be incorporated into the design of nay buildings.

Site workers involved in the redevelopment of the site may potentially be at greater risk as they could be exposed to a variety of exposure pathways such as direct dermal contact and inhalation of dust. However, it is considered that the provision of standard personal protective equipment and hygiene facilities would adequately control these risks. In particular the age of some of the buildings at the site and the potential for demolition arisings from historic building to be in the made ground means that asbestos could be present.

An asbestos survey of existing buildings should be carried out prior to any demolition works. All site workers involved in ground works should be made aware of the potential hazards associated with potential contamination in the Made Ground at the site.

The risks to future site users is considered low if an industrial use were to be retained at the site however, the risk if the site were redeveloped to a residential end use are considered high. These risks would be reduced to low following the implementation of appropriate remediation measures (Section 9).

8.3 RISKS TO PLANTS

Although some individual samples recorded elevated concentrations the mean concentrations of potentially phytotoxic metals were all below their respective guideline values.

The site was, where sufficient soil was present, covered with healthy vegetation including grasses, shrubs and, around the margins, trees. This observation would suggest no significant phytotoxic risks to be associated with the site. Furthermore, the pH of the site was generally alkaline, and under such conditions the solubility and therefore bioavailability of phytotoxic metals would be reduced.

The generally poor condition of soil across much of the site would mean that topsoil would have to be imported to aid the establishment of ground cover in garden areas and any soft landscaped areas. This clean material would further reduce the risks to plants by providing clean rooting material for plants.

The residual risk to plants following the implementation of the necessary remedial works is considered low.

8.4 RISKS TO WATER RESOURCES

8.4.1 General

Concentrations of potentially mobile inorganic and organic compound contaminants were generally low. The pH of the soils across the site was slightly alkaline and under such conditions the solubility of metals (with the exception of arsenic) would be expected to be reduced.

Furthermore, the results of the leachate testing indicted that, with the exception of only two samples, all leachates tested were within drinking water standards. Given that significant dilution would occur when any leachate from the ground were to enter underlying groundwater the risks to groundwater is considered to be very low especially as the quality of the receiving groundwater is likely to be poor due to historic mining/waste disposal activities in the area.

8.4.2 Foundations

Guidance on the risk assessment for piled foundations solutions are provided in the Environment Agency's "Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention". This document identifies six potential source - pathway - receptor linkages although also notes that others may exist in particular circumstances. The six potential pollutant linkages are:

1. Creation of preferential pathways, through a low permeability layer (an aquitard), to allow potential contamination of an underlying aquifer;
2. Creation of preferential pathways, through a low permeability surface layer, to allow upward migration of landfill gas, soil gas or contaminant vapours to the surface;
3. Direct contact of site workers and other with contaminated soil arisings which have been brought to the surface;
4. Direct contact of piles or engineered structures with contaminated soil or leachate causing degradation of pile materials (where the secondary effects are to increase the potential for contaminant migration);
5. The driving of solid contaminants into an aquifer during pile driving; and
6. Contamination of groundwater and, subsequently, surface waters by concrete, cement paste or grout.

Given the presence of fill materials it is considered that piled foundations may be required. The Environment Agency summarises the associated indicative hazards associated with piled foundations as follows:

EA – Use of Piles on Contaminated sites		
Pollutant linkage (as above)	Displacement piles	Non Displacement piles
1	B-D (dependant on details of method)	B-C
2	B	B
3	A	B-C
4	B-C (dependant on pile materials and contaminants)	C (dependant on pile materials and contaminants)
5	B	A
6	A	C-D

KEY

A: Pollution scenario not likely to be an issue if using displacement piles provided workmanship and QA/QC measures are appropriate.

B: Subject to appropriate workmanship, mitigation and QA/QC measures, to be outlined in the Foundation Works Risk Assessment report and incorporated in the design and contract specification, this method is acceptable.

C: This method may be considered acceptable, depending on the specific type used and subject to appropriate workmanship, mitigation and QA/QC measures, to be outlined in the Foundation Works Risk Assessment report. However a more suitable piling method may be available.

D: This method should normally be avoided on sites where this pollution scenario is likely to be an issue.

Given the measured low solubility of potentially mobile contaminants the risks to groundwater are, if piled foundations are used, considered to be low.

8.5 RISKS TO BUILDINGS & SERVICES

Based on the results of the investigation, it is considered that there is a low/moderate risk of potential contamination affecting buried services at the site from organic compounds such as TPHs, which can degrade/permeate plastics, and other polymeric materials used to supply potable water.

A number of samples recorded concentrations of arsenic, cadmium, lead, mercury, total PAH, petroleum hydrocarbons and pH values above the WRAS threshold levels. Therefore consideration should be given to the selection of pipe material and other risk management measures for potable water supply pipes. The laying of pipes in any clean capping layer would adequately reduce the risk, as would the use of non-plastic (i.e. ductile copper) or laying pipes in clean trench fill.

In addition, organic contamination was limited to the near surface materials. The removal of this prior to any redevelopment would therefore removing the source. Even if this material were reused on site as part of any remediation scheme, the dilution of the organic contamination would reduce the potential risks.

The risks to the buried services are therefore considered to be low if the recommendations outlined are followed.

In accordance with BRE Special Digest 1 (SD1) entitled 'Concrete in Aggressive Ground' a design sulphate class for the surface soils of DS-1 is recommended. Using SD1 an ACEC (Aggressive Chemical Environment for Concrete) class of AC-1 is recommended.

8.6 WASTE DISPOSAL

Should an excess volume of soil be required to be disposed of off-site then a formal waste classification from the Environment Agency (EA) may be required.

Depending on the final disposal point, materials may need to be subjected to leachate testing which would give an indication to the soluble component of contaminants and, therefore those most toxic to the environment in the waste. The classification will then allow the appropriate disposal pathway to a suitably licensed disposal facility to be determined.

Based on the results obtained in this investigation, the majority of material requiring off site disposal are likely to be classified as non-hazardous/ non-inert waste depending on its source within the site boundary and assuming soils are removed by blading/box-scrapper to avoid disturbing the underlying materials. This method of removal will result in some mixing. Therefore retesting of soils for off-site disposal will be necessary after removal.

Japanese Knotweed was noted at the site and this is considered a contaminant of affected soils. Based on EA guidelines the zone of influence extends some 7 m around the perimeter of plants and to a depth of 3 m. Knotweed infected soils are classified as non-hazardous, non-inert wastes although special disposal management activities are required by the EA.

A programme of knotweed eradication has been initiated at the site and, by the time of site development, all knotweed should have been eliminated. The status of knotweed at the site should be reviewed prior to any site redevelopment works.

9. REMEDIATION OPTIONS

9.1 INTRODUCTION

It is proposed that the site is redeveloped to a residential land use, incorporating private gardens, access roads and parking, and areas of soft landscaping. Due to the potential risks to human health associated with the elevated concentrations of some, notably lead, recorded at the site some remediation is considered necessary.

The data also indicated that the site could be split into two zones with respect to contamination. Zone A to the west of the site was significantly more contaminated with lead than Zone B. It should be noted that the coverage of the investigation was limited in Zone A due to the presence of Japanese knotweed, which left much of the embankment un-investigated.

The remediation options outlined below assumes that ground conditions in the embankment are generally similar, especially in terms of contaminant levels as the rest of Zone A.

The main remediation options considered suitable for this site are:

(i) Site strip of top 1m of fill/made ground to remove most sources of contamination followed by placement of appropriate ground cover. Disposal of arisings to suitably licensed waste management facility (landfill).

(ii) Zoned site strip, removing all of most contaminated materials.

(iii) Leave the bulk of contaminated material on site and cover with a suitable engineered cap.

Any final remediation scheme would require the approval of the Environment Agency particularly where waste licensing regulations are concerned.

The options are described in outline below.

9.2 OPTION 1

This option would result in the removal of the contamination source thereby severing any pollutant linkage. The site would require a significant volume of material to be removed and thereby incur significant costs.

Validation testing and completion reporting would be required to prove that all contaminated material had been removed and that the potential risks had been adequately managed.

9.3 OPTION 2

This approach would result in the removal, and subsequent off site disposal of the most contaminated materials. The scrapping of the Made Ground horizon could result in mixing with cleaner material and therefore the material should be retested to ensure that the appropriate waste disposal route is selected.

Mixing during the recovery of this material may result in a downgrading of the waste disposal classification due to dilution with clean materials.

Upon completion of strip retesting of stockpiled materials would be required to reassess the potential risks associated with it and waste disposal options. The retesting may identify material that would be suitable for reuse on site.

9.4 OPTION 3

Given the topography of the site and the local surroundings it may be possible to raise levels across the site. This would allow the placement of an engineered capping layer, thereby reducing the need to remove a significant volume of material off site.

It is likely that any cap approved by the Statutory Authorities would incorporate a capillary break layer overlain by a clean low permeability barrier layer, overlain by subsoil and topsoil. Soils would only be required in garden and soft landscaped areas. In building and road/car-parking areas then an appropriate structural support layer could replace the soil layers. The final design and thickness of the capping layers would have to be agreed with the EA. However we would anticipate a total thickness of 1 m adequate given the nature of the contamination identified and measured low solubility.

It is likely that demolition rubble from the removal of site buildings and the concrete slab could be recycled and for incorporated into the cap, in particular crushed and graded demolition arisings could be suitable for use in a capillary break layer.

It may also be possible to use material currently forming the embankment at the north and west of the site in the cap. However, this would have to be confirmed by chemical testing of this material following the eradication of the knotweed.

Imported materials may also be eligible for a waste management licensing exemption, or equivalent due to the nature of the works.

9.5 OTHER CONSIDERATIONS

Given that the contamination at the site represents a greater risk in Zone A consideration could be given to alterations in site layout. The aim of any changes would be co-locate low sensitivity uses (i.e. parking) and high contaminant levels. The low sensitivity use affords far less potential pollutant linkages than high sensitivity uses (i.e. gardens) and therefore the remediation requirements may be reduced.

Similarly public open spaces/landscaping could be incorporated into Zone A where again potential pollutant pathways are reduced and therefore reductions can be made in the level of remediation.

The recycling of demolition arising, comprising both building materials and crushed concreted, would represent a cost effective, sustainable approach to construction thereby fitting in with Government lead aggregate recycling initiatives (i.e. Aggregates programme, a part of the Waste and Resources Action Programme (WRAP)).

10. CONCLUSIONS AND RECOMMENDATIONS

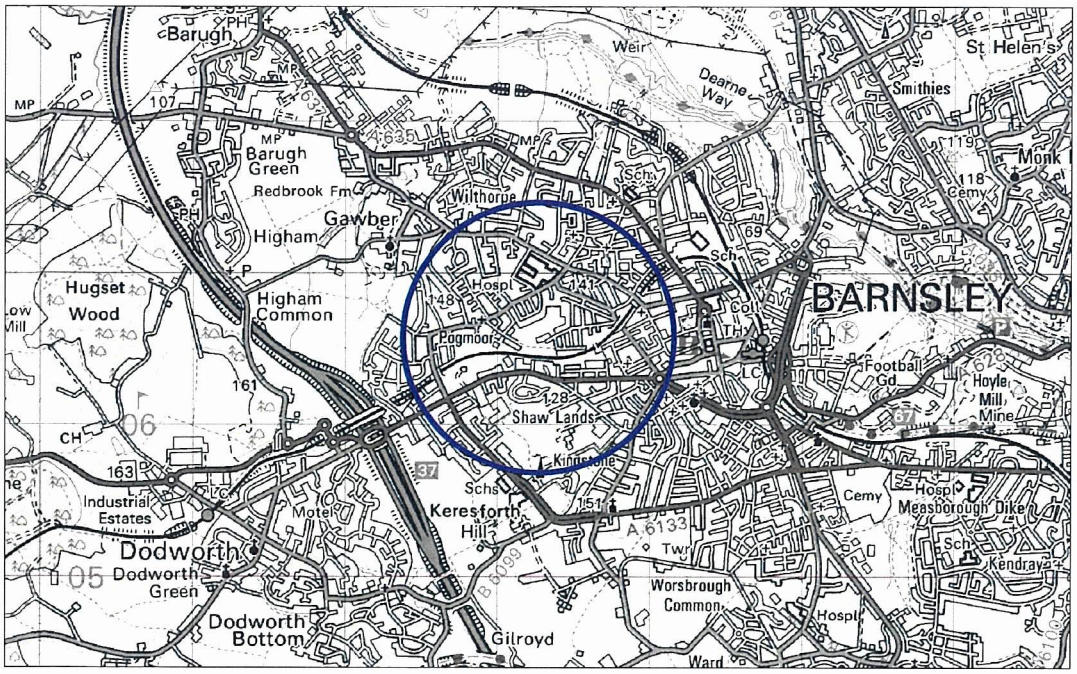
The conclusions and recommendations, which can be drawn from the Contamination Assessment of the site occupied by Pogmoor Works, Barnsley, South Yorkshire are as follows:

- The site is underlain by north and north-easterly dipping strata of the middle coal measures. These comprise cyclical sequences dominated by mudstones but supplemented by sandstones, siltstones and thin coal seams. A sandstone horizon is understood to sub-crop in the east of the site, and mudstone beneath the west of the site.
- The site had been used for coal mining related activities, which ceased operations by 1931.
- The site had been used as a brick works and clay pit, which ceased operations by 1956.
- Due to the potential risks to human health associated with the elevated concentrations of some determinants, notably lead, recorded at the site remediation works are considered necessary. These could include a strip of contaminated material from the site and the placement of clean material, or the direct placement of an engineered cap across the site.
- Concentrations were such that the site has been zoned, the most contaminated areas (Zone A) forming the west of the site with the less contaminated ground to the centre and east of the site (Zone B).
- It may be possible to utilise the site zoning to alter the site layout co-locating low sensitivity uses with high-risk areas and low contamination with sensitive end uses.
- It would be possible to reuse demolition arisings in any capping layer and also import further construction materials within the framework of a waste management license exemption.
- The concentrations of potentially toxic organic compounds such as TPH and PAHs were generally below their respective guideline values, although slightly elevated concentrations of Benzo-a-pyrene was recorded.
- The concentrations of the potentially harmful soil gas carbon dioxide were above the levels at which gas protection measures are required and passive gas control measures should be incorporated into the design of any building constructed on the site.
- The risks to plants are considered to be low following implementation of an appropriate remediation programme.
- The pH at the site was alkaline and concentrations of potential contaminants in leachate samples were low. The risks to water resources are therefore considered to be low.
- Any materials requiring off site disposal are likely to be classified as non-hazardous/non-inert waste. However, a formal classification by the Environment Agency would be required to confirm this. To obtain this further testing may be required after removal but prior to off-site disposal.

- Knotweed has been identified at the site and a programme of eradication started. The status of knotweed should be reviewed prior to any ground works at the site.
- The presence of knotweed resulted in the north western edge of the site not been investigated. Additional works in this area will be required to fully characterise the site. These should be undertaken following satisfactory treatment of the knotweed.
- Construction (Design and Management) Regulations (1994) hazard considerations are provided at Appendix 8.

Based on the principles and definitions outlined under Section 57 of the Environment Act 1995, the site, following the implementation of appropriate remediation would not be considered to be "Contaminated Land" based on its redevelopment to the planned residential end use.

FIGURE 1 - Site Location Plan

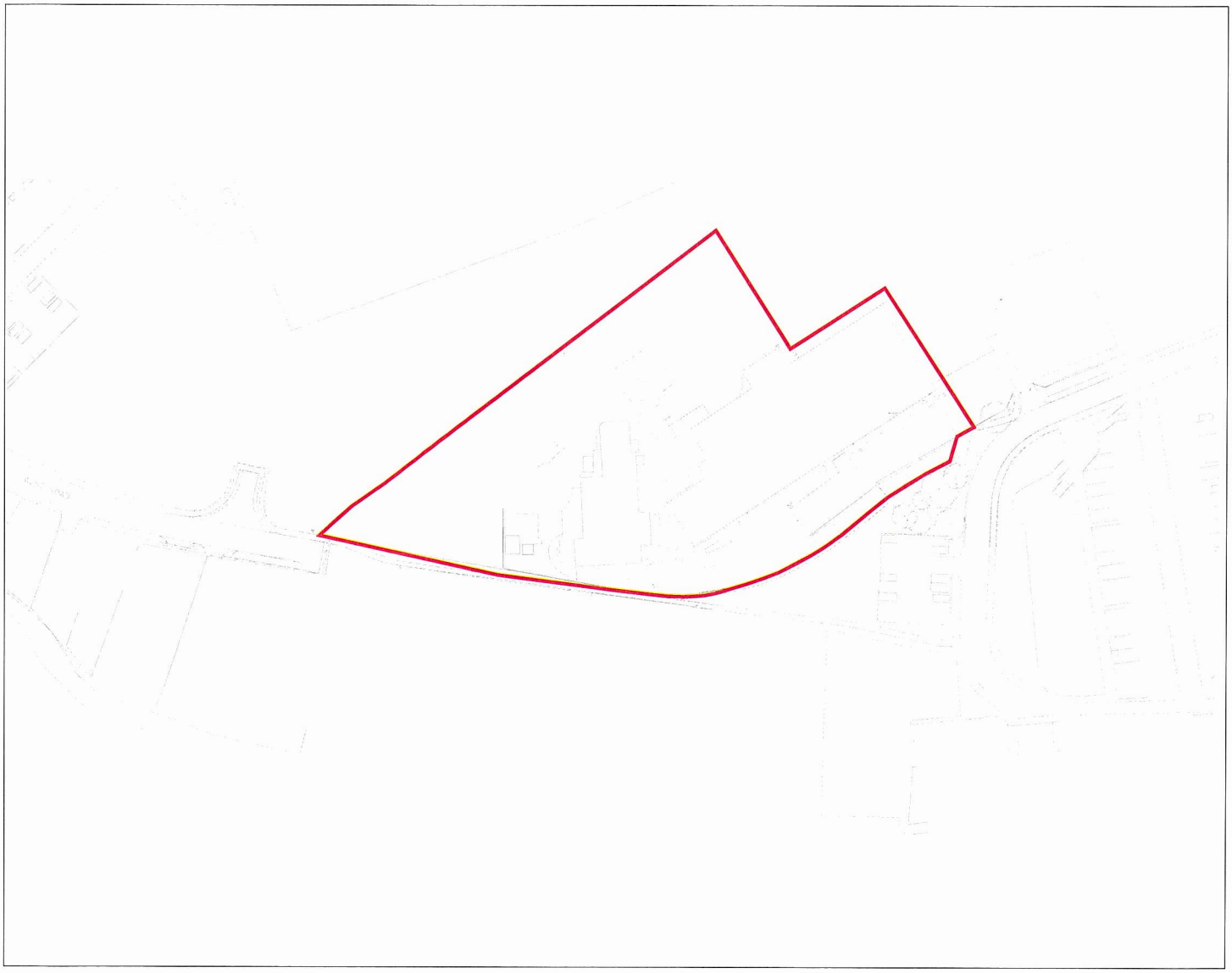


N

Key

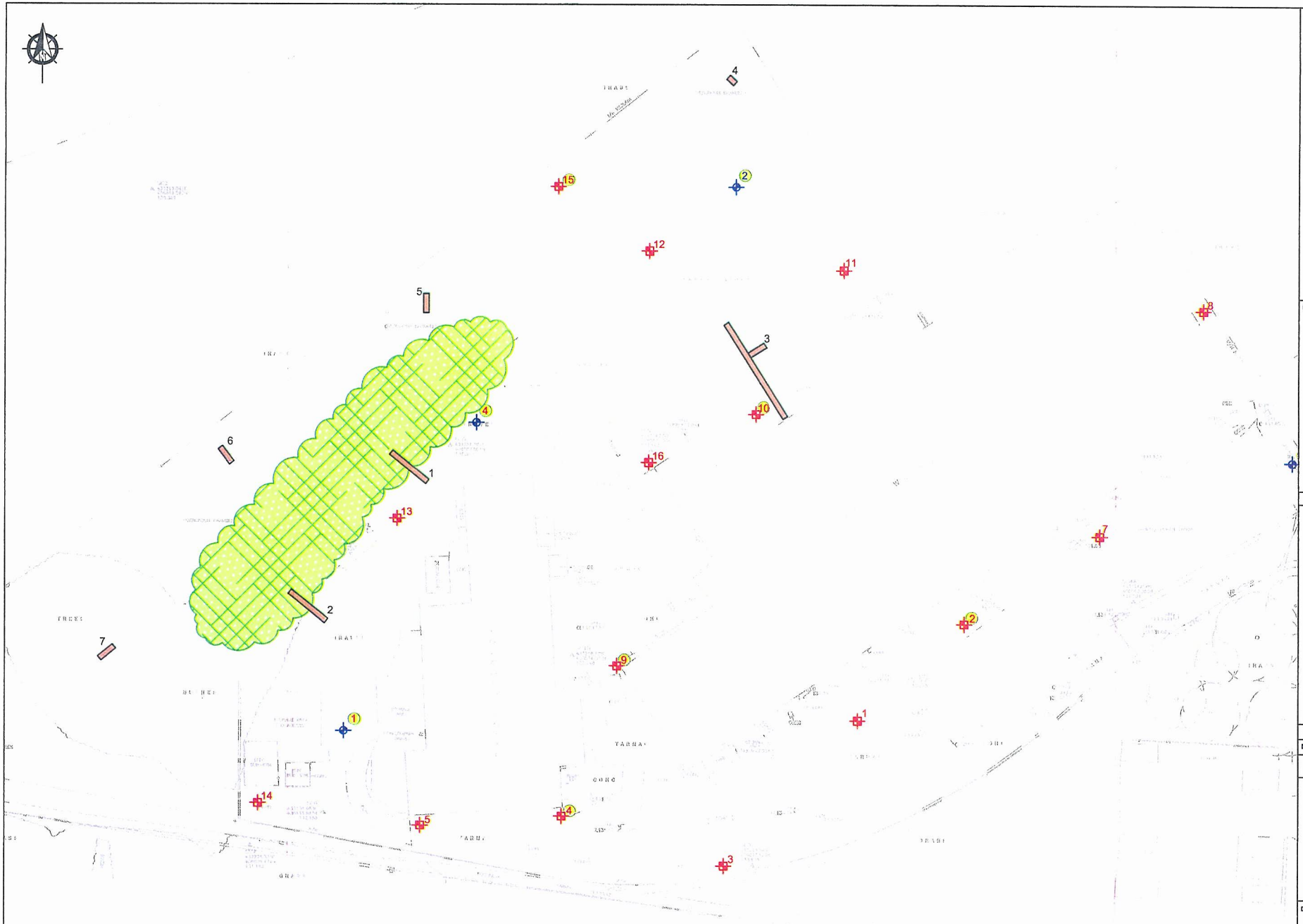
Site boundary

Site Location



GROUND SOLUTIONS GROUP Topographical Survey, Site Investigation & Environmental Consultancy Hanover Close, Cobbs Wood Estate, Ashford, KENT. TN23 1EJ Tel:01233–658270/277 Fax:01233–658280 Web:www.groundsolutions.co.uk	SCALE: 1:50,000 & 1:2,000 Source: OS LANDRANGER SHEET 111	Location: Pogmoor Works, Barnsley, West Yorkshire
	Reproduced from Ordnance Survey's 1:50,00 map of 2001 with the permission of the controller of Her Majesty's Stationary Office. Crown copyright AL550426. Ground Solutions Group Ltd. Station Road, Ashfor, Kent, TN23 1PP	Project No.: D108892 SITE LOCATION PLAN
	Date: 10.05.10	Figure 1

FIGURE 2 – Exploratory Hole Location Plan



Legend (where applicable)

- Window Sample
- Borehole
- Trial Pit
- Monitoring equipment installed
- Approximate area of knotweed infestation

Notes

Drawing No.	Reference Drawings

Revision Details	By / Check	Date	Rev.

POGMOOR WORKS BARNSLEY

FIGURE 2 EXPLORATORY HOLE LOCATION PLAN

Drawing No.	REV.
D108892/GSG/02	0

Scale (unless otherwise shown) 1:500

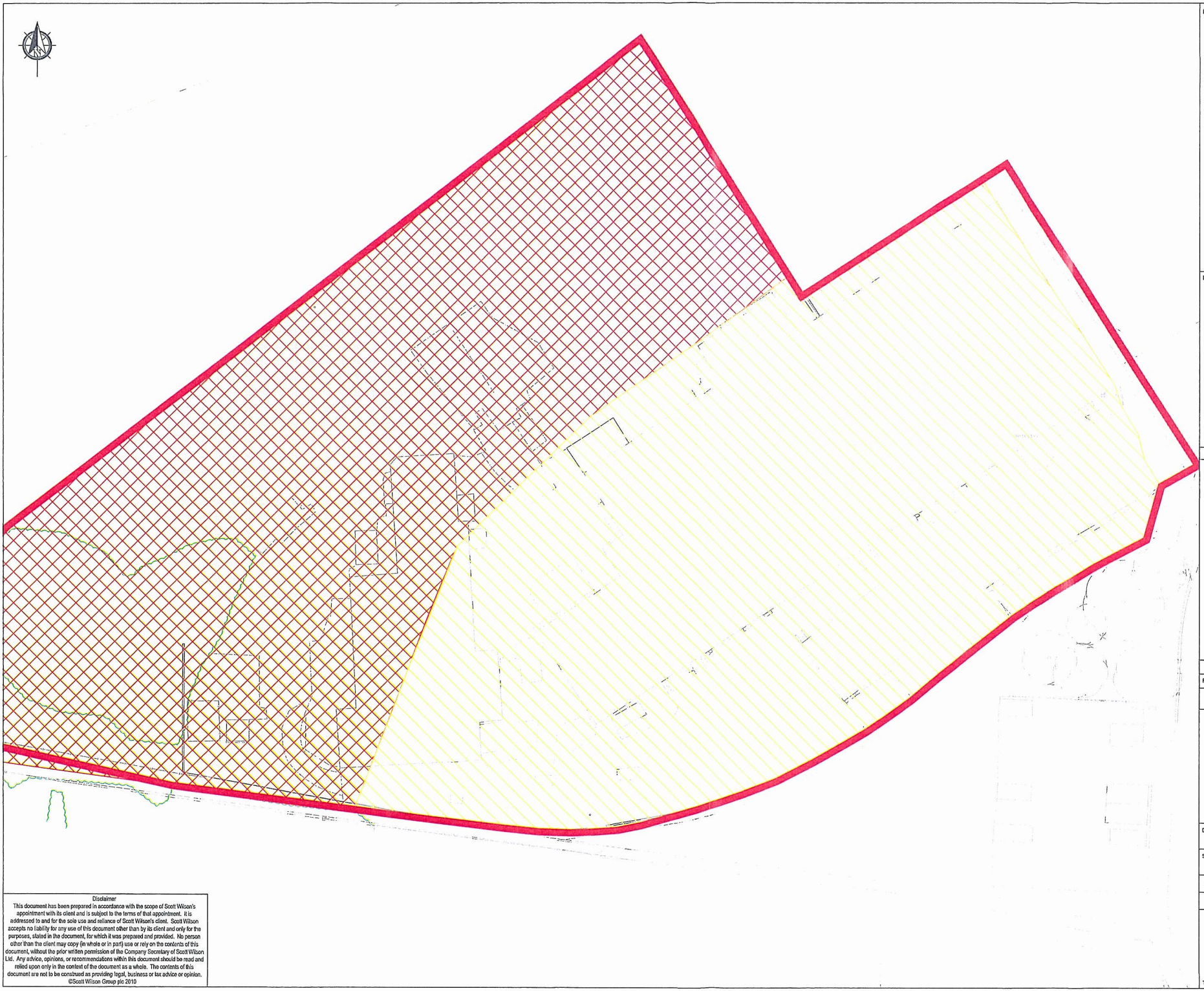
Surveyed		Drawn	BTW	Checked	

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Topographical Survey, Site Investigation & Environmental Consultancy
Hanover Close, Cobbs Wood Estate, Ashford, KENT. TN23 1EJ
Tel:01233-636270/277 Fax:01233-650220 Web:www.groundsolutions.co.uk

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FIGURE 3 – Site Zoning Plan



Legend (where applicable)

- Site boundary
- High hazard
- Medium hazard
- Low hazard

Notes

Drawing No.	Reference Drawings

Revision Details	By / Check	Date	Rev.

POGMOOR WORKS
BARNSLEY

FIGURE 3
GEOTECHNICAL HAZARD ZONING

Drawing No.	REV.
D108892/GSG/10	0

Scale (unless otherwise shown) 1:500

Surveyed		Drawn	BTW	Checked	AMM

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Topographical Survey, Site Investigation & Environmental Consultancy
Hanover Close, Cobbs Wood Estate, Ashford, KENT. TN23 1EJ
Tel:01233–658270/277 Fax:01233–658280 Web:www.groundsolutions.co.uk

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Appendix 1 – Historical Maps

Not Available – Included in the Phase 1 Report

Appendix 2 – Environmental Database Information

Not Available – Included in the Phase 1 Report

Appendix 3 – Borehole Logs

Ground Solutions Group
Hanover Close
Cobbs Wood Estate
Ashford, Kent, TN23 1EJ
Tel: 01233 658270/277
Fax: 01233 658299
eMail: gsg@groundsolutions.co.uk

Borehole No. BH1

Sheet: 1 of 2

Equipment & Methods.
Cable percussion drilling rigSupport Used:None

Project Name: Pogmoor Works Contamination Assessment
Project Location: Stocks Lane, Barnsley, Yorkshire
Client: Jamestown Metal Resources Ltd

Job No: D108892

Co-ordinates:
E:
N:

Ground Level (m): 132.25 AOD

Date Started:04/04/2005
Date Completed:04/04/2005

Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)
Depth (m)	No.	Type	Result					
0.50 - 0.51		D			MADE GROUND. Dense brick, ash and stone fill.			(1.30)
1.35 - 1.36		D				130.95		1.30
1.50 - 1.51		D			Very weak, thinly laminated brown/grey SANDSTONE.			
2.50 - 2.51		D						(2.70)
3.50 - 3.51		D						
4.00 - 4.01		D				128.25		4.00
					End of Borehole 4.00 m (Thickness of basal layer not proven)			

Remarks:
Groundwater/soil gas monitoring standpipe installed.

Logged By: GL
Checked By:
Scale: 1:35
Approved By:
FIG No. .1

Notes: For explanation of symbols and abbreviations, see Key Sheet.

GSG STANDARD BOREHOLE LOG V2 POGGMOOR WORKS.GPJ GSG-AGS3-STD TEMPLATE.GDT 10/5/10

Ground Solutions Group
Hanover Close
Cobbs Wood Estate
Ashford, Kent, TN23 1EJ
Tel: 01233 658270/277
Fax: 01233 658299
eMail: gsg@groundsolutions.co.uk

Borehole No. BH1

Sheet: 2 of 2

Equipment & Methods.
Cable percussion drilling rigSupport Used:None

Project Name: Pogmoor Works Contamination Assessment
Project Location: Stocks Lane, Barnsley, Yorkshire
Client: Jamestown Metal Resources Ltd

Job No: D108892

Co-ordinates:
E:
N:

Ground Level (m): 132.25 AOD

Date Started:04/04/2005
Date Completed:04/04/2005

Remarks:
Groundwater/soil gas monitoring standpipe installed.

Logged By: GL
Checked By:
Scale: 1:35
Approved By:
FIG No. .2

Notes: For explanation of symbols and abbreviations, see Key Sheet.

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Hanover Close
Cobbs Wood Estate
Ashford, Kent, TN23 1EJ
Tel: 01233 658270/277
Fax: 01233 658299
eMail: gsg@groundsolutions.co.uk

Borehole No. BH2

Sheet: 1 of 2

Equipment & Methods.
Cable percussion drilling rigSupport Used:None

Project Name: Pogmoor Works Contamination Assessment
Project Location: Stocks Lane, Barnsley, Yorkshire
Client: Jamestown Metal Resources Ltd

Job No: D108892

Co-ordinates:
E:
N:

Ground Level (m): 132.01 AOD

Date Started:04/04/2005
Date Completed:04/04/2005

Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)
Depth (m)	No.	Type	Result					
0.50 - 0.51		D			MADE GROUND. Dense brick and stone fill.			(0.90)
1.00 - 1.01		D			MADE GROUND. Dense black ash and brick fill.	131.11		0.90
2.00 - 2.01		D						
3.00 - 3.01		D						(4.80)
4.00 - 4.01		D						
5.00 - 5.01		D						
5.75 - 5.76		D			Very weak, thinly laminated brown/grey SANDSTONE.	126.31		5.70
6.00 - 6.01		D						(0.30)
						126.01		6.00

End of Borehole 6.00 m
(Thickness of basal layer not proven)

Remarks:
Groundwater/soil gas monitoring standpipe installed.

Logged By: GL
Checked By:
Scale: 1:35
Approved By:
FIG No. .1

Notes: For explanation of symbols and abbreviations, see Key Sheet.

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Hanover Close
Cobbs Wood Estate
Ashford, Kent, TN23 1EJ
Tel: 01233 658270/277
Fax: 01233 658299
eMail: gsg@groundsolutions.co.uk

Borehole No. BH2

Sheet: 2 of 2

Equipment & Methods.
Cable percussion drilling rigSupport Used:None

Project Name: Pogmoor Works Contamination Assessment
Project Location: Stocks Lane, Barnsley, Yorkshire
Client: Jamestown Metal Resources Ltd

Job No: D108892

Co-ordinates:
E:
N:

Ground Level (m): 132.01 AOD

Date Started:04/04/2005
Date Completed:04/04/2005

Water Strike Table

Depth of Strike (m)	Casing Depth (m)	Date	Time	Post Strike Depth (m)	Minutes After Strike	Sealed At (m)	Remarks
1.30	2.20	4-4-05			15		
1.30	2.20	4-4-05			20		
1.40	2.20	4-4-05			10		
1.50	2.20	4-4-05			5		
2.50	2.20	4-4-05			0		very fast

Remarks:
Groundwater/soil gas monitoring standpipe installed.

Logged By: GL
Checked By:
Scale: 1:35
Approved By:
FIG No. .2

Notes: For explanation of symbols and abbreviations, see Key Sheet.

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Ground Solutions Group
Hanover Close
Cobbs Wood Estate
Ashford, Kent, TN23 1EJ
Tel: 01233 658270/277
Fax: 01233 658299
eMail: gsg@groundsolutions.co.uk

Borehole No. BH3

Sheet: 1 of 2

Equipment & Methods.
Cable percussion drilling rigSupport Used:None

Project Name: Pogmoor Works Contamination Assessment
Project Location: Stocks Lane, Barnsley, Yorkshire
Client: Jamestown Metal Resources Ltd

Job No: D108892

Co-ordinates:
E:
N:

Ground Level (m): 131.30 AOD

Date Started:05/04/2005
Date Completed:04/04/2005

Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)
Depth (m)	No.	Type	Result					
0.50 - 0.51		D			MADE GROUND. Dense sand, ash and fill material.			(0.80)
						130.50		0.80
1.00 - 1.01		D			MADE GROUND. Dense grey ashey clay fill material.			
2.00 - 2.01		D						(2.60)
3.00 - 3.01		D						
3.50 - 3.51		D			Very weak, thinly laminated brown/grey MUDSTONE.	127.90		3.40
4.50 - 4.51		D						(1.60)
5.00 - 5.01		D				126.30		5.00

End of Borehole 5.00 m
(Thickness of basal layer not proven)

Remarks:
Groundwater/soil gas monitoring standpipe installed.

Logged By: GL
Checked By:
Scale: 1:35
Approved By:
FIG No. .1

Notes: For explanation of symbols and abbreviations, see Key Sheet.

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Cobbs Wood Estate
Ashford, Kent, TN23 1EJ
Tel: 01233 658270/277
Fax: 01233 658299
eMail: gsg@groundsolutions.co.uk

Borehole No. BH3

Sheet: 2 of 2

Equipment & Methods.
Cable percussion drilling rigSupport Used:None

Project Name: Pogmoor Works Contamination Assessment
Project Location: Stocks Lane, Barnsley, Yorkshire
Client: Jamestown Metal Resources Ltd

Job No: D108892

Co-ordinates:
E:
N:

Ground Level (m): 131.30 AOD

Date Started:05/04/2005
Date Completed:04/04/2005

Water Strike Table

Depth of Strike (m)	Casing Depth (m)	Date	Time	Post Strike Depth (m)	Minutes After Strike	Sealed At (m)	Remarks
3.10	3.00				10		
3.10	3.00				15		
3.10	3.00				20		
3.20	3.00				5		
3.40	3.00				0	4.00	FAST

Remarks:
Groundwater/soil gas monitoring standpipe installed.

Logged By: GL
Checked By:
Scale: 1:35
Approved By:
FIG No. .2

Notes: For explanation of symbols and abbreviations, see Key Sheet.

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Cobbs Wood Estate
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Tel: 01233 658270/277
Fax: 01233 658299
eMail: gsg@groundsolutions.co.uk

Borehole No. BH4

Sheet: 1 of 2

Equipment & Methods.
Cable percussion drilling rigSupport Used:None

Project Name: Pogmoor Works Contamination Assessment
Project Location: Stocks Lane, Barnsley, Yorkshire
Client: Jamestown Metal Resources Ltd

Job No: D108892

Co-ordinates:
E:
N:

Ground Level (m): 131.70 AOD

Date Started:05/04/2005
Date Completed:04/04/2005

Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)
Depth (m)	No.	Type	Result					
0.30 - 0.31		D			MADE GROUND. Dense sand, ash and fill material.			(0.50)
0.60 - 0.61		D			MADE GROUND. Dense grey ashey clay fill material.	131.20		0.50 (0.90)
1.50 - 1.51		D			Very weak, thinly laminated brown/grey MUDSTONE.	130.30		1.40 (1.60)
2.50 - 3.00		D				128.70		3.00

End of Borehole 3.00 m
(Thickness of basal layer not proven)

Remarks:
Groundwater/soil gas monitoring standpipe installed.

Logged By: GL
Checked By:
Scale: 1:35
Approved By:
FIG No. .1

Notes: For explanation of symbols and abbreviations, see Key Sheet.

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Ground Solutions Group
Hanover Close
Cobbs Wood Estate
Ashford, Kent, TN23 1EJ
Tel: 01233 658270/277
Fax: 01233 658299
eMail: gsg@groundsolutions.co.uk

Borehole No. BH4

Sheet: 2 of 2

Equipment & Methods. Cable percussion drilling rigSupport Used:None	Project Name: Pogmoor Works Contamination Assessment Project Location: Stocks Lane, Barnsley, Yorkshire Client: Jamestown Metal Resources Ltd	Job No: D108892
Co-ordinates: E: N:	Ground Level (m): 131.70 AOD	Date Started:05/04/2005 Date Completed:04/04/2005

Remarks:
Groundwater/soil gas monitoring standpipe installed.

Logged By: GL	Checked By:
Scale: 1:35	Approved By:
FIG No. .2	

Notes: For explanation of symbols and abbreviations, see Key Sheet.

GSG STANDARD BOREHOLE LOG V2 POGGMOOR WORKS.GPJ GSG-AGS3-STD TEMPLATE.GDT 10/5/10

Appendix 4 – Window Sample Logs

Ground Solutions Group
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Tel: 01233 658270/277
Fax: 01233 658299
eMail: gsg@groundsolutions.co.uk

Window Sampler Log No. WS1

Sheet: 1 of 1

Equipment & Methods.
Track mounted window sampling rig.Support Used:None

Project Name: Pogmoor Works Contamination Assessment
Project Location: Stocks Lane, Barnsley, Yorkshire
Client: Jamestown Metal Resources Ltd

Job No: D108892

Co-ordinates:
E:
N:

Ground Level (m): 131.10 AOD

Date Started:04/04/2005
Date Completed:04/04/2005

Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)
Depth (m)	No.	Type	Result					
0.20 - 0.21		D			MADE GROUND. Dense sand, ash and fill material.	131.00		(0.10)
					MADE GROUND. Dense brick, ash and coal.			(0.65)
						130.35		(0.05)
0.90 - 0.90		D			MADE GROUND. Soft reworked grey clay.	130.30		0.80
1.30 - 1.31		D			Very stiff orange mottled grey CLAY, becoming slightly sandy from 1.5m.			(1.20)
2.00 - 2.01		D				129.10		2.00
					Very weak, thinly laminated brown/grey SANDSTONE.			(0.20)
						128.90		2.20

End of W/S 2.20 m
(Thickness of basal layer not proven)

Remarks:

Logged By: GL
Checked By:
Scale: 1:35
Approved By:
FIG No.

Notes: For explanation of symbols and abbreviations, see Key Sheet.

GSG STANDARD WINDOW SAMPLER LOG V2 POGGMOOR WORKS.GPJ GSG-AGS3-STD TEMPLATE.GDT 10/5/10

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Window Sampler Log No. WS10

Sheet: 1 of 1

Equipment & Methods.
Track mounted window sampling rig.Support Used:None

Project Name: Pogmoor Works Contamination Assessment
Project Location: Stocks Lane, Barnsley, Yorkshire
Client: Jamestown Metal Resources Ltd

Job No: D108892

Co-ordinates:
E:
N:

Ground Level (m): 132.00 AOD

Date Started:06/04/2005
Date Completed:06/04/2005

Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)
Depth (m)	No.	Type	Result					
0.20 - 0.21		D			MADE GROUND. Dense sand, ash and fill.			(0.75)
0.80 - 0.81		D			MADE GROUND. Dense brick and ash.	131.25		0.75 (1.05)
1.50 - 1.51		D			Weak thinly laminated MUDSTONE.	130.20		1.80 (1.20)
2.50 - 2.51		D				129.00		3.00

End of W/S 3.00 m
(Thickness of basal layer not proven)

Remarks:
Groundwater/soil gas monitoring standpipe installed.

Logged By: GL
Checked By:
Scale: 1:35
Approved By:
FIG No.

Notes: For explanation of symbols and abbreviations, see Key Sheet.

GSG STANDARD WINDOW SAMPLER LOG V2 POGGMOOR WORKS.GPJ GSG-AGS3-STD TEMPLATE.GDT 10/5/10

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Fax: 01233 658299
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Window Sampler Log No. WS11

Sheet: 1 of 1

Equipment & Methods.
Track mounted window sampling rig.Support Used:None

Project Name: Pogmoor Works Contamination Assessment
Project Location: Stocks Lane, Barnsley, Yorkshire
Client: Jamestown Metal Resources Ltd

Job No: D108892

Co-ordinates:
E:
N:

Ground Level (m): 132.12 AOD

Date Started:06/04/2005
Date Completed:06/04/2005

Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)
Depth (m)	No.	Type	Result					
0.20 - 0.21		D			MADE GROUND. Very stiff reworked clay containing much brick and mudstone/sandstone fragments.	131.82		(0.30)
					MADE GROUND. Crushed brick.	131.62		0.30 (0.20) 0.50
0.90 - 0.91		D			MADE GROUND. Loose ash, slag, brick and coal.			
1.30 - 1.31		D						(2.00)
2.10 - 2.11		D						
2.70 - 2.71		D			Weak, thinly laminated MUDSTONE.	129.62		2.50 (0.70)
						128.92		3.20

End of W/S 3.20 m
(Thickness of basal layer not proven)

Remarks:

Logged By: GL
Checked By:
Scale: 1:35
Approved By:
FIG No.

Notes: For explanation of symbols and abbreviations, see Key Sheet.

GSG STANDARD WINDOW SAMPLER LOG V2 POGGMOOR WORKS.GPJ GSG-AGS3-STD TEMPLATE.GDT 10/5/10

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Window Sampler Log No. WS12

Sheet: 1 of 1

Equipment & Methods.
Track mounted window sampling rig.Support Used:None

Project Name: Pogmoor Works Contamination Assessment
Project Location: Stocks Lane, Barnsley, Yorkshire
Client: Jamestown Metal Resources Ltd

Job No: D108892

Co-ordinates:
E:
N:

Ground Level (m): 131.70 AOD

Date Started:05/04/2005
Date Completed:05/04/2005

Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)
Depth (m)	No.	Type	Result					
0.50 - 0.51		D			MADE GROUND. Thin layer of grass covered topsoil.	131.60		(0.10)
					MADE GROUND. Mixture of brick, stiff grey clay, ash, coal, slag and reworked mudstone and sandstone.			(4.00)
1.50 - 1.51		D						
2.50 - 2.51		D						
3.50 - 3.51		D						
					Weak thinly laminated MUDSTONE.	127.60		4.10
						127.50		(0.10) 4.20

End of W/S 4.20 m
(Thickness of basal layer not proven)

Remarks:

Logged By: GL
Checked By:
Scale: 1:35
Approved By:
FIG No.

Notes: For explanation of symbols and abbreviations, see Key Sheet.

GSG STANDARD WINDOW SAMPLER LOG V2 POGGMOOR WORKS.GPJ GSG-AGS3-STD TEMPLATE.GDT 10/5/10

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Window Sampler Log No. WS13

Sheet: 1 of 1

Equipment & Methods.
Track mounted window sampling rig.Support Used:None

Project Name: Pogmoor Works Contamination Assessment
Project Location: Stocks Lane, Barnsley, Yorkshire
Client: Jamestown Metal Resources Ltd

Job No: D108892

Co-ordinates:
E:
N:

Ground Level (m): 132.18 AOD

Date Started:06/04/2005
Date Completed:06/04/2005

Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)
Depth (m)	No.	Type	Result					
0.50 - 0.51		D			MADE GROUND. Mixture of brick, stiff grey clay, ash, coal and slag.			
2.00 - 2.01		D						(6.00)
3.50 - 3.51		D						
5.10 - 5.10		D				126.18		6.00

End of W/S 6.00 m
(Thickness of basal layer not proven)

Remarks:

Logged By: GL
Checked By:
Scale: 1:35
Approved By:
FIG No.

Notes: For explanation of symbols and abbreviations, see Key Sheet.

GSG STANDARD WINDOW SAMPLER LOG V2 POGGMOOR WORKS.GPJ GSG-AGS3-STD TEMPLATE.GDT 10/5/10

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Fax: 01233 658299
eMail: gsg@groundsolutions.co.uk

Window Sampler Log No. WS14

Sheet: 1 of 1

Equipment & Methods.
Track mounted window sampling rig.Support Used:None

Project Name: Pogmoor Works Contamination Assessment
Project Location: Stocks Lane, Barnsley, Yorkshire
Client: Jamestown Metal Resources Ltd

Job No: D108892

Co-ordinates:
E:
N:

Ground Level (m): 132.15 AOD

Date Started:06/04/2005
Date Completed:06/04/2005

Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)
Depth (m)	No.	Type	Result					
0.20 - 0.21		D			MADE GROUND. Dense fill containing brick, ash and topsoil.			(1.20)
0.80 - 0.81		D				130.95		1.20
1.30 - 1.31		D			Very stiff grey mottled orange CLAY becoming weak bands of thinly layered mudstone from 1.9m.			(1.80)
1.80 - 1.81		D						
2.30 - 2.31		D				129.15		3.00

End of W/S 3.00 m
(Thickness of basal layer not proven)

Remarks:

Logged By: GL
Checked By:
Scale: 1:35
Approved By:
FIG No.

Notes: For explanation of symbols and abbreviations, see Key Sheet.

GSG STANDARD WINDOW SAMPLER LOG V2 POGGMOOR WORKS.GPJ GSG-AGS3-STD TEMPLATE.GDT 10/5/10

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Cobbs Wood Estate
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Window Sampler Log No. WS15

Sheet: 1 of 1

Equipment & Methods.
Track mounted window sampling rig.Support Used:None

Project Name: Pogmoor Works Contamination Assessment
Project Location: Stocks Lane, Barnsley, Yorkshire
Client: Jamestown Metal Resources Ltd

Job No: D108892

Co-ordinates:
E:
N:

Ground Level (m): 134.60 AOD

Date Started:05/04/2005
Date Completed:05/04/2005

Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)
Depth (m)	No.	Type	Result					
0.20 - 0.21		D			MADE GROUND. Thin layer of grassed topsoil.	134.50		(0.10)
					MADE GROUND. Mixture of brick, stiff grey clay, ash, coal, slag and reworked mudstone and sandstone.			
0.80 - 0.81		D						
1.20 - 1.21		D						
1.80 - 1.81		D						
2.20 - 2.21		D						(4.90)
2.80 - 2.81		D						
3.20 - 3.21		D						
3.80 - 3.81		D						
4.20 - 4.21		D						
4.80 - 4.81		D						
					MADE GROUND (No Recovery)	129.60		5.00
								(1.00)
						128.60		6.00
					End of W/S 6.00 m (Thickness of basal layer not proven)			

Remarks:
No recovery between 5 and 6 m.
Groundwater/soil gas monitoring standpipe installed.

Logged By: GL
Checked By:
Scale: 1:35
Approved By:
FIG No.

Notes: For explanation of symbols and abbreviations, see Key Sheet.

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Window Sampler Log No. WS16

Sheet: 1 of 1

Equipment & Methods.
Track mounted window sampling rig.Support Used:None

Project Name: Pogmoor Works Contamination Assessment
Project Location: Stocks Lane, Barnsley, Yorkshire
Client: Jamestown Metal Resources Ltd

Job No: D108892

Co-ordinates:
E:
N:

Ground Level (m): 132.05 AOD

Date Started:05/04/2005
Date Completed:05/04/2005

Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)
Depth (m)	No.	Type	Result					
					MADE GROUND. Concrete.	131.80		(0.25) 0.25
0.50 - 0.51		D			MADE GROUND. Dolomite hardcore.			(0.50)
						131.30		0.75
1.00 - 1.01		D			Very stiff grey CLAY with thinly laminated mudstone bands and natural bands of coal at 1.75m.			(1.25)
1.50 - 1.51		D						
						130.05		2.00

End of W/S 2.00 m
(Thickness of basal layer not proven)

Remarks:

Logged By: GL
Checked By:
Scale: 1:35
Approved By:
FIG No.

Notes: For explanation of symbols and abbreviations, see Key Sheet.

GSG STANDARD WINDOW SAMPLER LOG V2 POGGMOOR WORKS.GPJ GSG-AGS3-STD TEMPLATE.GDT 10/5/10

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Window Sampler Log No. WS2

Sheet: 1 of 1

Equipment & Methods.
Track mounted window sampling rig.Support Used:None

Project Name: Pogmoor Works Contamination Assessment
Project Location: Stocks Lane, Barnsley, Yorkshire
Client: Jamestown Metal Resources Ltd

Job No: D108892

Co-ordinates:
E:
N:

Ground Level (m): 131.19 AOD

Date Started:04/04/2005
Date Completed:04/04/2005

Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)
Depth (m)	No.	Type	Result					
0.20 - 0.21		D			MADE GROUND. Tarmac.	131.09		(0.10)
					MADE GROUND. Stiff reworked grey clay containing much ash, coal and brick.			(0.80)
0.80 - 0.81		D				130.29		0.90
					Stiff grey mottled orange CLAY with mudstone fragments.			(1.00)
1.50 - 1.51		D		Faint hydrocarbon odour.		129.29		1.90
					Weak thinly laminated MUDSTONE and sandstone layers.			(1.00)
2.50 - 2.51		D				128.29		2.90

End of W/S 2.90 m
(Thickness of basal layer not proven)

Remarks:
Groundwater/soil gas monitoring standpipe installed.

Logged By: GL
Checked By:
Scale: 1:35
Approved By:
FIG No.

Notes: For explanation of symbols and abbreviations, see Key Sheet.

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Fax: 01233 658299
eMail: gsg@groundsolutions.co.uk

Window Sampler Log No. WS3

Sheet: 1 of 1

Equipment & Methods.
Track mounted window sampling rig.Support Used:None

Project Name: Pogmoor Works Contamination Assessment
Project Location: Stocks Lane, Barnsley, Yorkshire
Client: Jamestown Metal Resources Ltd

Job No: D108892

Co-ordinates:
E:
N:

Ground Level (m): 130.93 AOD

Date Started:04/04/2005
Date Completed:04/04/2005

Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)
Depth (m)	No.	Type	Result					
					MADE GROUND. Concrete.	130.83		(0.10)
					MADE GROUND. Dolomite hardcore.			(0.28)
0.40 - 0.41		D				130.55		0.38
					MADE GROUND. Dense purple lead slag.			(0.22)
						130.33		0.60
0.80 - 0.81		D			MADE GROUND. Dense brick, ash and coal slag.			(0.50)
						129.83		1.10
					Very stiff grey mottled red CLAY with thin laminations of MUDSTONE and sandstone bands from 1.5m.			
1.50 - 1.51		D						(1.40)
						128.43		2.50
2.50 - 2.51		D			Weak, thinly laminated brown/grey layers of MUDSTONE and SANDSTONE.			(0.50)
						127.93		3.00

End of W/S 3.00 m
(Thickness of basal layer not proven)

Remarks:

Logged By: GL
Checked By:
Scale: 1:35
Approved By:
FIG No.

Notes: For explanation of symbols and abbreviations, see Key Sheet.

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Fax: 01233 658299
eMail: gsg@groundsolutions.co.uk

Window Sampler Log No. WS4

Sheet: 1 of 1

Equipment & Methods.
Track mounted window sampling rig.Support Used:None

Project Name: Pogmoor Works Contamination Assessment
Project Location: Stocks Lane, Barnsley, Yorkshire
Client: Jamestown Metal Resources Ltd

Job No: D108892

Co-ordinates:
E:
N:

Ground Level (m): 131.75 AOD

Date Started:04/04/2005
Date Completed:04/04/2005

Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)
Depth (m)	No.	Type	Result					
0.20 - 0.21		D			MADE GROUND. Concrete.	131.65		(0.10)
					MADE GROUND. Dense brick, ash and reworked soft grey clay.			(1.00)
0.80 - 0.81		D				130.65		1.10
					MADE GROUND. Dense purple lead slag material.			(0.80)
1.50 - 1.51		D				129.85		1.90
					Weak thinly laminated bands of SANDSTONE/MUDSTONE.			(1.10)
2.50 - 2.51		D				128.75		3.00

End of W/S 3.00 m
(Thickness of basal layer not proven)

Remarks:
Groundwater/soil gas monitoring standpipe installed.

Logged By: GL
Checked By:
Scale: 1:35
Approved By:
FIG No.

Notes: For explanation of symbols and abbreviations, see Key Sheet.

GSG STANDARD WINDOW SAMPLER LOG V2 POGGMOOR WORKS.GPJ GSG-AGS3-STD TEMPLATE.GDT 10/5/10

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Fax: 01233 658299
eMail: gsg@groundsolutions.co.uk

Window Sampler Log No. WS5

Sheet: 1 of 1

Equipment & Methods.
Track mounted window sampling rig.Support Used:None

Project Name: Pogmoor Works Contamination Assessment
Project Location: Stocks Lane, Barnsley, Yorkshire
Client: Jamestown Metal Resources Ltd

Job No: D108892

Co-ordinates:
E:
N:

Ground Level (m): 131.90 AOD

Date Started:04/04/2005
Date Completed:04/04/2005

Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)
Depth (m)	No.	Type	Result					
0.20 - 0.21		D			MADE GROUND. Concrete.	131.80		(0.10)
					MADE GROUND. Dense brick, ash and reworked soft grey clay.			(1.00)
0.80 - 0.81		D				130.80		1.10
					Very stiff grey mottled orange CLAY with occasional weak thinly laminated sandstone or siltstone bands.			(0.80)
1.50 - 1.51		D				130.00		1.90
					Weak thinly laminated bands of SANDSTONE/MUDSTONE.			(1.10)
2.50 - 2.51		D				128.90		3.00
					End of W/S 3.00 m (Thickness of basal layer not proven)			

Remarks:

Logged By: GL
Checked By:
Scale: 1:35
Approved By:
FIG No.

Notes: For explanation of symbols and abbreviations, see Key Sheet.

GSG STANDARD WINDOW SAMPLER LOG V2 POGGMOOR WORKS.GPJ GSG-AGS3-STD TEMPLATE.GDT 10/5/10

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Window Sampler Log No. WS6

Sheet: 1 of 1

Equipment & Methods.
Track mounted window sampling rig.Support Used:None

Project Name: Pogmoor Works Contamination Assessment
Project Location: Stocks Lane, Barnsley, Yorkshire
Client: Jamestown Metal Resources Ltd

Job No: D108892

Co-ordinates:
E:
N:

Ground Level (m): 130.35 AOD

Date Started:05/04/2005
Date Completed:05/04/2005

Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)
Depth (m)	No.	Type	Result					
					MADE GROUND. Topsoil.	130.25		(0.10)
0.30 - 0.31		D			MADE GROUND. Dense ash, coal, brick and slag material.			(0.40)
						129.85		0.50
					MADE GROUND. Weak thin reworked grey mudstone.			(0.25)
0.80 - 0.81		D				129.60		0.75
					MADE GROUND. Stiff reworked clay containing much ash, coal and brick.			(0.25)
						129.35		1.00
					Soft to firm white mottled orange CLAY.			(0.50)
1.50 - 1.51		D				128.85		1.50
					Bands of weak thinly laminated MUDSTONE and hard clay.			(1.50)
2.50 - 2.51		D						
						127.35		3.00

End of W/S 3.00 m
(Thickness of basal layer not proven)

Remarks:
Groundwater/soil gas monitoring standpipe installed.

Logged By: GL
Checked By:
Scale: 1:35
Approved By:
FIG No.

Notes: For explanation of symbols and abbreviations, see Key Sheet.

GSG STANDARD WINDOW SAMPLER LOG V2 POGGMOOR WORKS.GPJ GSG-AGS3-STD TEMPLATE.GDT 10/5/10

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Fax: 01233 658299
eMail: gsg@groundsolutions.co.uk

Window Sampler Log No. WS7

Sheet: 1 of 1

Equipment & Methods.
Track mounted window sampling rig.Support Used:None

Project Name: Pogmoor Works Contamination Assessment
Project Location: Stocks Lane, Barnsley, Yorkshire
Client: Jamestown Metal Resources Ltd

Job No: D108892

Co-ordinates:
E:
N:

Ground Level (m): 131.55 AOD

Date Started:05/04/2005
Date Completed:05/04/2005

Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)
Depth (m)	No.	Type	Result					
0.20 - 0.21		D			MADE GROUND. Stiff reworked clay containing much brick and mudstone fragments.			(1.50)
0.90 - 0.91		D						
1.20 - 1.21		D				130.05		1.50
					MADE GROUND. Dense ash, coal, brick and slag.			(0.50)
1.90 - 1.91		D				129.55		2.00
					Very stiff grey CLAY with weak mudstone and sandstone bands.			(1.10)
2.50 - 2.51		D				128.45		3.10

End of W/S 3.10 m
(Thickness of basal layer not proven)

Remarks:

Logged By: GL
Checked By:
Scale: 1:35
Approved By:
FIG No.

Notes: For explanation of symbols and abbreviations, see Key Sheet.

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eMail: gsg@groundsolutions.co.uk

Window Sampler Log No. WS8

Sheet: 1 of 1

Equipment & Methods.
Track mounted window sampling rig.Support Used:None

Project Name: Pogmoor Works Contamination Assessment
Project Location: Stocks Lane, Barnsley, Yorkshire
Client: Jamestown Metal Resources Ltd

Job No: D108892

Co-ordinates:
E:
N:

Ground Level (m): 131.69 AOD

Date Started:05/04/2005
Date Completed:05/04/2005

Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)
Depth (m)	No.	Type	Result					
0.20 - 0.21		D			MADE GROUND. Turfed topsoil.	131.59		(0.10)
					MADE GROUND. Dense ash, coal, brick and slag.			(0.65)
0.70 - 0.71		D				130.94		0.75
					Very stiff orange mottled grey CLAY with weak mudstone bands.			
1.50 - 1.51		D						(1.75)
2.50 - 2.51		D				129.19		2.50
					End of W/S 2.50 m (Thickness of basal layer not proven)			

Remarks:

Logged By: GL
Checked By:
Scale: 1:35
Approved By:
FIG No.

Notes: For explanation of symbols and abbreviations, see Key Sheet.

GSG STANDARD WINDOW SAMPLER LOG V2 POGGMOOR WORKS.GPJ GSG-AGS3-STD TEMPLATE.GDT 10/5/10

Ground Solutions Group
Hanover Close
Cobbs Wood Estate
Ashford, Kent, TN23 1EJ
Tel: 01233 658270/277
Fax: 01233 658299
eMail: gsg@groundsolutions.co.uk

Window Sampler Log No. WS9

Sheet: 1 of 1

Equipment & Methods.
Track mounted window sampling rig.Support Used:None

Project Name: Pogmoor Works Contamination Assessment
Project Location: Stocks Lane, Barnsley, Yorkshire
Client: Jamestown Metal Resources Ltd

Job No: D108892

Co-ordinates:
E:
N:

Ground Level (m): 132.05 AOD

Date Started:05/04/2005
Date Completed:05/04/2005

Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)
Depth (m)	No.	Type	Result					
					MADE GROUND. Concrete.	131.95		(0.10)
					MADE GROUND. Crushed concrete and hardcore.			(0.50)
0.50 - 0.51		D				131.45		0.60
					Very stiff grey CLAY becoming weak weathered mudstone from 1.2 m.			
1.00 - 1.01		D						(1.00)
1.50 - 1.51		D				130.45		1.60

Remarks:
Groundwater/soil gas monitoring standpipe installed.

Logged By: GL
Checked By:
Scale: 1:35
Approved By:
FIG No.

Notes: For explanation of symbols and abbreviations, see Key Sheet.

GSG STANDARD WINDOW SAMPLER LOG V2 POGGMOOR WORKS.GPJ GSG-AGS3-STD TEMPLATE.GDT 10/5/10

Appendix 5 – Soil Gas Monitoring Results

SOIL GAS SURVEY

Project: Pogmoor Works
Location: Barnsley
Job No/JEN D108892

Date: 13/05/2005
Weather: Sunny
Temp: 16c

Equipment Used GA2000
PID

(insert serial numbers)

Monitoring Point No.	CH_4 (% v/v)	O_2 (% v/v)	CO_2 (% v/v)	Flow (l/hr)	H_2S	CO	Photo Ionisation Detector (ppm) *	Depth to Ground Water (mbd)
BH1	NF	NF	NF	NF				-
BH2	0.3	17.3	2.3	<0.2				-
BH3	<0.25	19.5	<0.25	<0.2				-
BH4	0.3	12.7	6.3	0.4				-
WS2	0.3	17.3	2.3	<0.2				
WS4	<0.25	17.3	4.1	<0.2				-
WS6	<0.25	18.3	0.4	<0.2				-
WS9	<0.25	18.6	<0.25	<0.2				-
WS10	<0.25	18.0	1.4	<0.2				-
WS15	0.3	16.6	1.9	0.4				

Site Observations

Time	*Barometric Pressure*
Start	1012 mb
Finish	1012mb

Datum Description:
Elevation of datum wrt ground level:

Comments

NF - BH 1 cover not found

Tested by: GL
Checked by: AMM

mbd = metres below datum

GROUND SOLUTIONS GROUP

Notes: * For indicative purposes only

Accuracy of Readings:- **0-5% CH_4**: the greater of 10% reading or 0.25% CH_4; **5-50% CH_4**: the greater of 10% reading or 1% CH_4; **50-100% CH_4**: 5% reading
0-30% O_2: 0.5% O_2
0-5% CO_2: the greater of 10% reading or 0.25% CO_2; **5-30% CO_2**: the greater of 10% reading or 1% CO_2; **30-100% CO2**: 6% reading

SOIL GAS SURVEY

Project: Pogmoor Works
Location: Barnsley
Job No/JEN D108892

Date: 25/04/2005
Weather: Sunny
Temp: 13c

Equipment Used GA2000 PID

(insert serial numbers)

Monitoring Point No.	CH_4 (% v/v)	O_2 (% v/v)	CO_2 (% v/v)	Flow (l/hr)	H_2S	CO	Photo Ionisation Detector (ppm) *	Depth to Ground Water (mbd)
BH1	<0.25	11.4	6	<0.2				2.3
BH2	<0.25	16.9	2.6	<0.2				2.6
BH3	<0.25	19.5	0.6	<0.2				1.9
BH4	<0.25	15.2	3.8	<0.2				N/D
WS2	<0.25	18.3	2.3	<0.2				1.6
WS4	<0.25	17.0	3.5	<0.2				2.1
WS6	<0.25	19.9	0.6	<0.2				1.3
WS9	<0.25	18.4	<0.25	<0.2				1.1
WS10	<0.25	17.7	1.3	<0.2				2.5
WS15	<0.25	17.6	2.1	<0.2				4.1

Site Observations

Time	*Barometric Pressure*
Start	997mb
Finish	997mb

Datum Description:
Elevation of datum wrt ground level:

Comments

Tested by: GL
Checked by: AMM

mbd = metres below datum

GROUND SOLUTIONS GROUP

Notes: * For indicative purposes only

Accuracy of Readings:- **0-5% CH_4**: the greater of 10% reading or 0.25% CH_4; **5-50% CH_4**: the greater of 10% reading or 1% CH_4; **50-100% CH_4**: 5% reading
0-30% O_2: 0.5% O_2
0-5% CO_2: the greater of 10% reading or 0.25% CO_2; **5-30% CO_2**: the greater of 10% reading or 1% CO_2; **30-100% CO2**: 6% reading

Appendix 6 – Analytical Testing Results

Ground Solutions Group
Hanover Close
Cobbs Wood Estate
Ashford
Kent TN23 1EJ
FAO Adrian Milton

10 May 2010

Dear Adrian Milton

Test Report Number **17700**
Your Project Reference **Pogmoor Works**

Please find enclosed the results of analysis for samples received 14/04/05.

All soil samples will be retained for a period of one month and all water samples will be retained for 14 days following the date of the test report. Should you require an extended retention period then please detail your requirements in an email to karl.salter@chemtest.co.uk. Please be aware that charges may be applicable for extended sample storage.

If you require any further assistance, please do not hesitate to contact Amanda Flack in Customer Services.

Yours sincerely

Phil Hellier – Operations Director
Authorised signatory

UKAS TESTING
2183

Notes to accompany report:

- *The sign < means 'less than'*
- *Tests marked [1] are outside of the current scope of UKAS accreditation*
- *Tests marked [2] were subcontracted to a laboratory holding UKAS accreditation for this test*
- *Tests marked [3] were subcontracted to a laboratory not holding UKAS accreditation for this test*
- *ne means 'not evaluated'*
- *I/S means 'insufficient sample'*
- *Comments or interpretations are not UKAS accredited*
- *The results relate only to the items tested*

Ground Solutions Group
Hanover Close
Cobbs Wood Estate
Ashford
Kent TN23 1EJ
FAO Adrian Milton

LABORATORY TEST REPORT

Results of analysis of samples received
14/04/05 test report number **17700**
Your Project Reference **Pogmoor Works**

Report date
10 May 2010

LIMS ID			AA69217	AA69218	AA69219	AA69220	AA69221	AA69222	AA69223	AA69224
Sample ID			**BH1**	**BH1**	**BH2**	**BH2**	**BH2**	**BH2**	**BH3**	**BH3**
Sample no										
Depth			**0.5m**	**1.5m**	**0.5m**	**2.0m**	**4.0m**	**5.75m**	**0.50m**	**1.0m**
Sample matrix			**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**
Determinand	**SOP No.**	**Units**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Arsenic	2450	mg kg^{-1}	16	8.1	24	70	36	11	11	15
Cadmium	2450	mg kg^{-1}	0.50	<0.1	0.17	<0.1	0.74	<0.1	0.24	0.17
Chromium	2450	mg kg^{-1}	49	21	31	34	19	12	<2	32
Copper	2450	mg kg^{-1}	130	23	57	84	50	21	38	39
Lead	2450	mg kg^{-1}	2500	210	250	50	48	16	53	62
Mercury	2450	mg kg^{-1}	0.80	0.11	<0.1	1.3	0.18	<0.1	0.97	0.94
Nickel	2450	mg kg^{-1}	48	30	45	57	37	34	31	28
Selenium	2450	mg kg^{-1}	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Zinc	2450	mg kg^{-1}	590	120	110	41	37	78	72	70
Boron (hot water soluble)	2120	mg kg^{-1}	0.5	<0.4	<0.4	<0.4	0.4	0.8	<0.4	<0.4
Benzo[a]pyrene	2700	mg kg^{-1}	<0.1	<0.1	<0.1	1.0	0.8	1.0	0.1	0.3
PAH (total EPA 16)	2700	mg kg^{-1}	7.5	<2	3.2	12	12	39	5.0	6.0
pH	2010	-	8.3	7.8	7.6	8.1	8.1	8.4	7.7	7.8
Sulfate (2:1 extract)	2210	g l^{-1}	0.07	0.03	0.02	0.04	0.05	<0.01	0.02	0.04
Total Petroleum Hydrocarbons	2670	mg kg^{-1}	380	64	73	100	93	35	230	430
Diesel Range Organics	2670	%	94	80	63	73	83	75	93	88
Gasoline Range Organics	2670	%	6.4	20	21	24	22	37	30	23
Lube oil Range Organics[1]	2670	%	20	19	49	36	26	24	14	20

Ground Solutions Group
Hanover Close
Cobbs Wood Estate
Ashford
Kent TN23 1EJ
FAO Adrian Milton

LABORATORY TEST REPORT

Results of analysis of samples received
14/04/05 test report number **17700**
Your Project Reference **Pogmoor Works**

Report date
10 May 2010

LIMS ID			AA69225	AA69226	AA69227	AA69228	AA69229	AA69230	AA69231	AA69232
Sample ID			**BH3**	**BH4**	**BH4**	**WS1**	**WS1**	**WS2**	**WS2**	**WS3**
Sample no										
Depth			**3.0m**	**0.3m**	**0.6m**	**0.2m**	**0.9m**	**0.2m**	**1.5m**	**1.5m**
Sample matrix			**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**
Determinand	**SOP No.**	**Units**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Arsenic	2450	mg kg^{-1}	32	34	36	26	3.6	25	---	26
Cadmium	2450	mg kg^{-1}	<0.1	3.3	0.44	<0.1	<0.1	<0.1	---	<0.1
Chromium	2450	mg kg^{-1}	<2	31	32	<2	12	<2	---	14
Copper	2450	mg kg^{-1}	52	75	100	33	20	48	---	55
Lead	2450	mg kg^{-1}	51	16000	3100	55	25	29	---	150
Mercury	2450	mg kg^{-1}	0.41	0.26	0.52	<0.1	<0.1	<0.1	---	0.58
Nickel	2450	mg kg^{-1}	29	38	50	16	22	25	---	33
Selenium	2450	mg kg^{-1}	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	---	<0.1
Zinc	2450	mg kg^{-1}	81	250	150	35	63	46	---	47
Boron (hot water soluble)	2120	mg kg^{-1}	0.7	0.6	0.5	0.9	<0.4	0.4	<0.4	0.7
Benzo[a]pyrene	2700	mg kg^{-1}	0.5	0.7	7.5	1.2	<0.1	<0.1	<0.1	6.9
PAH (total EPA 16)	2700	mg kg^{-1}	14	9.0	100	12	<2	8.7	<2	49
pH	2010	-	7.5	9.5	8.5	5.9	6.4	5.5	5.0	7.6
Sulfate (2:1 extract)	2210	g l^{-1}	0.34	0.15	0.15	0.13	0.12	0.07	0.04	0.08
Total Petroleum Hydrocarbons	2670	mg kg^{-1}	540	400	750	200	20	1800	82	200
Diesel Range Organics	2670	%	89	18	58	78	79	91	88	69
Gasoline Range Organics	2670	%	27	3.5	5.5	30	57	23	18	18
Lube oil Range Organics[1]	2670	%	17	93	65	28	22	15	15	47

Ground Solutions Group
Hanover Close
Cobbs Wood Estate
Ashford
Kent TN23 1EJ
FAO Adrian Milton

LABORATORY TEST REPORT

Results of analysis of samples received
14/04/05 test report number **17700**
Your Project Reference **Pogmoor Works**

Report date
10 May 2010

LIMS ID			AA69233	AA69234	AA69235	AA69236	AA69237	AA69238	AA69239	AA69240
Sample ID			**WS4**	**WS4**	**WS5**	**WS5**	**WS6**	**WS6**	**WS7**	**WS7**
Sample no										
Depth			**0.2m**	**1.5m**	**0.2m**	**0.8m**	**0.3m**	**0.8m**	**0.2m**	**1.2m**
Sample matrix			**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**
Determinand	**SOP No.**	**Units**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Arsenic	2450	mg kg^{-1}	5.6	22	9.2	53	16	52	35	17
Cadmium	2450	mg kg^{-1}	<0.1	<0.1	<0.1	<0.1	<0.1	1.3	<0.1	0.46
Chromium	2450	mg kg^{-1}	14	27	16	16	18	57	8.0	13
Copper	2450	mg kg^{-1}	21	70	26	110	39	160	52	30
Lead	2450	mg kg^{-1}	26	350	31	120	81	550	290	130
Mercury	2450	mg kg^{-1}	<0.1	0.16	<0.1	0.12	0.10	0.94	0.15	<0.1
Nickel	2450	mg kg^{-1}	24	35	27	63	29	38	27	22
Selenium	2450	mg kg^{-1}	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Zinc	2450	mg kg^{-1}	120	110	76	72	76	280	53	72
Boron (hot water soluble)	2120	mg kg^{-1}	0.5	1.1	0.4	0.7	0.5	0.7	0.7	<0.4
Benzo[a]pyrene	2700	mg kg^{-1}	<0.1	6.4	<0.1	1.0	1.9	2.4	<0.1	1.3
PAH (total EPA 16)	2700	mg kg^{-1}	<2	58	<2	12	15	33	4.4	17
pH	2010	-	7.6	7.7	7.4	7.6	7.8	7.5	7.1	7.9
Sulfate (2:1 extract)	2210	g l^{-1}	0.05	0.13	0.05	0.11	0.02	0.06	0.02	0.08
Total Petroleum Hydrocarbons	2670	mg kg^{-1}	28	280	24	31	45	91	35	40
Diesel Range Organics	2670	%	67	62	56	79	70	79	87	82
Gasoline Range Organics	2670	%	37	12	52	17	25	20	19	21
Lube oil Range Organics[1]	2670	%	35	56	37	34	34	36	23	25

Ground Solutions Group
Hanover Close
Cobbs Wood Estate
Ashford
Kent TN23 1EJ
FAO Adrian Milton

LABORATORY TEST REPORT

Results of analysis of samples received
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Your Project Reference **Pogmoor Works**

Report date
10 May 2010

LIMS ID			AA69241	AA69242	AA69243	AA69244	AA69245	AA69246	AA69247	AA69248
Sample ID			**WS7**	**WS7**	**WS8**	**WS8**	**WS9**	**WS9**	**WS10**	**WS10**
Sample no										
Depth			**1.9m**	**2.5m**	**0.2m**	**1.5m**	**0.5m**	**1.0m**	**0.2m**	**0.8m**
Sample matrix			**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**
Determinand	**SOP No.**	**Units**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Arsenic	2450	mg kg^{-1}	57	12	3.3	26	11	12	<2	7.6
Cadmium	2450	mg kg^{-1}	<0.1	<0.1	<0.1	<0.1	<0.1	0.17	<0.1	0.25
Chromium	2450	mg kg^{-1}	<2	13	19	13	14	50	14	17
Copper	2450	mg kg^{-1}	36	33	47	120	23	33	28	79
Lead	2450	mg kg^{-1}	34	26	27	66	17	1500	32	1000
Mercury	2450	mg kg^{-1}	0.20	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	2450	mg kg^{-1}	9.1	41	64	31	28	41	34	26
Selenium	2450	mg kg^{-1}	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Zinc	2450	mg kg^{-1}	24	75	110	65	59	53	76	160
Boron (hot water soluble)	2120	mg kg^{-1}	0.5	<0.4	<0.4	<0.4	<0.4	0.6	<0.4	1.1
Benzo[a]pyrene	2700	mg kg^{-1}	<0.1	<0.1	<0.1	5.7	<0.1	45	0.6	<0.1
PAH (total EPA 16)	2700	mg kg^{-1}	12	<2	<2	72	<2	500	6.7	2.1
pH	2010	-	5.9	6.6	6.6	8.0	6.6	11.4	7.8	7.0
Sulfate (2:1 extract)	2210	g l^{-1}	0.18	0.07	0.03	0.02	0.11	1.19	0.08	0.12
Total Petroleum Hydrocarbons	2670	mg kg^{-1}	200	22	<20	240	<20	1500	<20	47
Diesel Range Organics	2670	%	93	85	ne	76	ne	73	ne	48
Gasoline Range Organics	2670	%	25	14	ne	16	ne	1.1	ne	9.1
Lube oil Range Organics[1]	2670	%	12	25	ne	34	ne	57	ne	59

Ground Solutions Group
Hanover Close
Cobbs Wood Estate
Ashford
Kent TN23 1EJ
FAO Adrian Milton

LABORATORY TEST REPORT

Results of analysis of samples received
14/04/05 test report number **17700**
Your Project Reference **Pogmoor Works**

Report date
10 May 2010

LIMS ID			AA69249	AA69250	AA69251	AA69252	AA69253	AA69254	AA69255	AA69256
Sample ID			**WS11**	**WS11**	**WS11**	**WS12**	**WS12**	**WS12**	**WS13**	**WS13**
Sample no										
Depth			**0.2m**	**1.3m**	**2.7m**	**0.5m**	**1.5m**	**3.5m**	**0.5m**	**2.0m**
Sample matrix			**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**
Determinand	**SOP No.**	**Units**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Arsenic	2450	mg kg^{-1}	10	54	10	47	23	19	21	46
Cadmium	2450	mg kg^{-1}	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.50
Chromium	2450	mg kg^{-1}	11	19	13	33	16	16	3.9	19
Copper	2450	mg kg^{-1}	29	72	47	74	32	31	54	61
Lead	2450	mg kg^{-1}	150	20	33	360	57	88	740	820
Mercury	2450	mg kg^{-1}	<0.1	<0.1	<0.1	0.12	<0.1	<0.1	0.94	2.7
Nickel	2450	mg kg^{-1}	31	50	55	44	30	25	23	31
Selenium	2450	mg kg^{-1}	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Zinc	2450	mg kg^{-1}	83	72	120	110	67	65	130	79
Boron (hot water soluble)	2120	mg kg^{-1}	<0.4	0.8	0.5	0.7	0.4	0.6	0.4	0.5
Benzo[a]pyrene	2700	mg kg^{-1}	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	2.4	1.1
PAH (total EPA 16)	2700	mg kg^{-1}	2.0	<2	<2	<2	<2	<2	25	11
pH	2010	-	7.9	8.0	7.7	7.4	8.0	8.0	7.9	8.1
Sulfate (2:1 extract)	2210	g l^{-1}	0.02	0.04	0.02	0.05	0.01	0.02	0.03	0.06
Total Petroleum Hydrocarbons	2670	mg kg^{-1}	34	29	<20	20	<20	<20	280	170
Diesel Range Organics	2670	%	51	50	ne	86	ne	ne	46	36
Gasoline Range Organics	2670	%	6.7	17	ne	16	ne	ne	16	7.7
Lube oil Range Organics[1]	2670	%	58	52	ne	18	ne	ne	61	81

Ground Solutions Group
Hanover Close
Cobbs Wood Estate
Ashford
Kent TN23 1EJ
FAO Adrian Milton

LABORATORY TEST REPORT

Results of analysis of samples received
14/04/05 test report number **17700**
Your Project Reference **Pogmoor Works**

Report date
10 May 2010

LIMS ID			AA69257	AA69258	AA69259	AA69260	AA69261	AA69262
Sample ID			**WS14**	**WS14**	**WS15**	**WS15**	**WS15**	**WS15**
Sample no								
Depth			**0.2m**	**1.3m**	**0.2m**	**1.2m**	**2.8m**	**4.8m**
Sample matrix			**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**
Determinand	**SOP No.**	**Units**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Arsenic	2450	mg kg^{-1}	85	17	17	17	87	29
Cadmium	2450	mg kg^{-1}	0.62	<0.1	0.25	0.21	8.4	0.59
Chromium	2450	mg kg^{-1}	30	12	17	18	54	38
Copper	2450	mg kg^{-1}	150	32	63	68	380	140
Lead	2450	mg kg^{-1}	1000	1900	3000	720	840	490
Mercury	2450	mg kg^{-1}	0.43	0.15	<0.1	<0.1	0.98	0.79
Nickel	2450	mg kg^{-1}	64	25	40	40	190	57
Selenium	2450	mg kg^{-1}	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Zinc	2450	mg kg^{-1}	140	85	160	140	850	360
Boron (hot water soluble)	2120	mg kg^{-1}	0.8	0.9	<0.4	<0.4	6.4	3.4
Benzo[a]pyrene	2700	mg kg^{-1}	1.4	0.2	0.1	0.2	1.6	3.5
PAH (total EPA 16)	2700	mg kg^{-1}	14	2.2	<2	3.8	21	42
pH	2010	-	7.8	7.3	7.7	7.9	7.4	8.0
Sulfate (2:1 extract)	2210	g l^{-1}	0.05	0.02	0.02	0.1	0.41	0.14
Total Petroleum Hydrocarbons	2670	mg kg^{-1}	66	<20	<20	36	630	120
Diesel Range Organics	2670	%	35	ne	ne	83	14	59
Gasoline Range Organics	2670	%	4.7	ne	ne	13	<1	6.1
Lube oil Range Organics[1]	2670	%	75	ne	ne	34	96	70

Ground Solutions Group
Hanover Close
Cobbs Wood Estate
Ashford
Kent TN23 1EJ
FAO Adrian Milton

LABORATORY TEST REPORT

Results of analysis of samples received
14/04/05 test report number **17700**
Your Project Reference **Pogmoor Works**

Report date
10 May 2010

LIMS ID			AA69263	AA69264	AA69265	AA69266	AA69267	AA69268	AA69269	AA69270
Sample ID			**BH1**	**WS2**	**WS6**	**WS10**	**WS11**	**WS12**	**WS13**	**WS14**
Sample no										
Depth			**0.5m**	**1.5m**	**0.8m**	**0.8m**	**1.3m**	**0.5m**	**2.0m**	**0.2m**
Sample matrix			**LEACHATE**	**LEACHATE**	**LEACHATE**	**LEACHATE**	**LEACHATE**	**LEACHATE**	**LEACHATE**	**LEACHATE**
Determinand	**SOP No.**	**Units**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Arsenic	1450	µg l^{-1}	6.0	1.3	5.6	1.8	17	16	19	29
Boron	1450	µg l^{-1}	49	<20	<20	<20	<20	<20	22	<20
Cadmium	1450	µg l^{-1}	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	1450	µg l^{-1}	13	18	1.4	1.8	5.1	6.7	16	15
Copper	1450	µg l^{-1}	26	13	82	2.6	<1	10	12	1.1
Lead	1450	µg l^{-1}	260	3.0	74	35	<1	10	71	18
Mercury	1450	µg l^{-1}	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nickel	1450	µg l^{-1}	5.7	12	5.2	3.3	3.5	6.0	5.2	3.2
Selenium	1450	µg l^{-1}	1.1	<1	<1	<1	<1	<1	<1	1.3
Zinc	1450	µg l^{-1}	170	29	37	35	14	46	22	13
Acenaphthene[1]	1700	µg l^{-1}	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene[1]	1700	µg l^{-1}	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene[1]	1700	µg l^{-1}	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo[a]anthracene[1]	1700	µg l^{-1}	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo[a]pyrene[1]	1700	µg l^{-1}	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo[b]fluoranthene[1]	1700	µg l^{-1}	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo[g,h,i]perylene[1]	1700	µg l^{-1}	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo[k]fluoranthene[1]	1700	µg l^{-1}	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene[1]	1700	µg l^{-1}	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo[a,h]anthracene[1]	1700	µg l^{-1}	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene[1]	1700	µg l^{-1}	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene[1]	1700	µg l^{-1}	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Indeno[1,2,3-cd]pyrene[1]	1700	µg l^{-1}	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Naphthalene[1]	1700	µg l^{-1}	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene[1]	1700	µg l^{-1}	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene[1]	1700	µg l^{-1}	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total PAHs[1]	1700	µg l^{-1}	<2	<2	<2	<2	<2	<2	<2	<2

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LABORATORY TEST REPORT

Results of analysis of samples received
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Your Project Reference **Pogmoor Works**

Report date
10 May 2010

LIMS ID			AA69263	AA69264	AA69265	AA69266	AA69267	AA69268	AA69269	AA69270
Sample ID			**BH1**	**WS2**	**WS6**	**WS10**	**WS11**	**WS12**	**WS13**	**WS14**
Sample no										
Depth			**0.5m**	**1.5m**	**0.8m**	**0.8m**	**1.3m**	**0.5m**	**2.0m**	**0.2m**
Sample matrix			**LEACHATE**	**LEACHATE**	**LEACHATE**	**LEACHATE**	**LEACHATE**	**LEACHATE**	**LEACHATE**	**LEACHATE**
Determinand	**SOP No.**	**Units**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Ammonium[1]	1410	mg l^{-1}	0.06	0.10	0.10	0.09	0.41	0.10	0.34	0.15
Chloride	1210	mg l^{-1}	1.1	0.3	0.9	2.9	0.9	0.4	0.9	0.6
Cyanide (free)[1]	1310	mg l^{-1}	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chemical Oxygen Demand[1]	1100	mg O_2 l^{-1}	20	<10	20	14	27	19	11	29
Electrical Conductivity	1020	µS cm^{-1}	120	37	87	140	99	57	280	140
Iron[1]	1450	µg l^{-1}	5100	7400	590	35	1800	3100	3700	1000
pH in waters	1010	-	9.10	6.30	7.20	6.80	7.70	7.60	7.90	8.20
Phenols (total)[1]	1920	mg l^{-1}	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Sulfate	1210	mg l^{-1}	10	10	4.4	28	6.1	6.5	9.5	4.4

Appendix 7 – Mean Value Test Sheets

Job number *D108892*
Site *Pogmoor Works*
Parameter *Arsenic B*

Concentrations		
N	X	Y=log(X)
1	11	1.041
2	15	1.176
3	32	1.505
4	26	1.415
5	3.6	0.556
6	25	1.398
7	26	1.415
8	5.6	0.748
9	22	1.342
10	9.2	0.964
11	53	1.724
12	16	1.204
13	52	1.716
14	35	1.544
15	17	1.230
16	57	1.756
17	12	1.079
18	3.3	0.519
19	26	1.415
20	11	1.041
21	12	1.079
22	2	0.301
23	7.6	0.881
24	10	1.000
25	54	1.732
26	10	1.000

Mean X =	21.3	1.2
Standard Dev. Sx=	16.7	0.4
Max value=	57.0	1.756

n=	26
t=	1.708

Max value note:
If the value of T (calc) is smaller the critical value (T crit), then the maximum value may be accepted (at the prescribed level of confidence) as a member of the underlying population from which the other measurements were drawn.
If T (calc) is greater than the T(crit) value then the maximum value may be treated as an outlier.

	T (Crit) 5% for N = 2.56
	T (Calc) = 1.48

Compiled by:	GL
Checked by:	AMM
Approved by:	

Job number *D108892*
Site *Pogmoor Works*
Parameter *BaP B*

Concentrations		
N	X	Y=log(X)
1	0.1	-1.000
2	0.3	-0.523
3	0.5	-0.301
4	1.2	0.079
5	0.1	-1.000
6	0.1	-1.000
7	0.1	-1.000
8	6.9	0.839
9	0.1	-1.000
10	6.4	0.806
11	0.1	-1.000
12	1	0.000
13	1.9	0.279
14	2.4	0.380
15	0.1	-1.000
16	1.3	0.114
17	0.1	-1.000
18	0.1	-1.000
19	0.1	-1.000
20	0.1	-1.000
21	5.7	0.756
22	0.1	-1.000
23	45	1.653
24	0.6	-0.222
25	0.1	-1.000
26	0.1	-1.000
27	0.1	-1.000

Mean X =	2.8	-0.4
Standard Dev. Sx=	8.7	0.8
Max value=	45.0	1.653

n=	27
t=	1.706

Max value note:
If the value of T (calc) is smaller the critical value (T crit), then the maximum value may be accepted (at the prescribed level of confidence) as a member of the underlying population from which the other measurements were drawn.
If T (calc) is greater than the T(crit) value then the maximum value may be treated as an outlier.

T (Crit) 5% for N =	2.56
T (Calc) =	2.66

Compiled by:	GL
Checked by:	AMM
Approved by:	

Job number *D108892*
Site *Pogmoor Works*
Parameter *PAH B*

Concentrations		
N	X	Y=log(X)
1	5	0.699
2	6	0.778
3	7.5	0.875
4	12	1.079
5	2	0.301
6	8.7	0.940
7	2	0.301
8	49	1.690
9	2	0.301
10	58	1.763
11	2	0.301
12	12	1.079
13	15	1.176
14	33	1.519
15	4.4	0.643
16	17	1.230
17	12	1.079
18	2	0.301
19	2	0.301
20	72	1.857
21	2	0.301
22	500	2.699
23	6.7	0.826
24	2.1	0.322
25	2	0.301
26	2	0.301
27	2	0.301

Mean X =	31.1	0.9
Standard Dev. Sx=	95.5	0.6
Max value=	500.0	2.699

n=	27
t=	1.706

Max value note:
If the value of T (calc) is smaller the critical value (T crit), then the maximum value may be accepted (at the prescribed level of confidence) as a member of the underlying population from which the other measurements were drawn.
If T (calc) is greater than the T(crit) value then the maximum value may be treated as an outlier.

T (Crit) 5% for N =	2.56
T (Calc) =	2.93

Compiled by:	GL
Checked by:	AMM
Approved by:	

Job number *D108892*
Site *Pogmoor Works*
Parameter *TPH B*

Concentrations		
N	X	Y=log(X)
1	230	2.362
2	430	2.633
3	540	2.732
4	200	2.301
5	20	1.301
6	1800	3.255
7	82	1.914
8	200	2.301
9	28	1.447
10	280	2.447
11	24	1.380
12	31	1.491
13	45	1.653
14	91	1.959
15	35	1.544
16	40	1.602
17	200	2.301
18	22	1.342
19	20	1.301
20	240	2.380
21	20	1.301
22	1500	3.176
23	20	1.301
24	47	1.672
25	34	1.531
26	29	1.462
27	20	1.301

Mean X =	230.7	1.9
Standard Dev. Sx=	432.7	0.6
Max value=	1800.0	3.255

n=	27
t=	1.706

Max value note:
If the value of T (calc) is smaller the critical value (T crit), then the maximum value may be accepted (at the prescribed level of confidence) as a member of the underlying population from which the other measurements were drawn.
If T (calc) is greater than the T(crit) value then the maximum value may be treated as an outlier.

	T (Crit) 5% for N = 2.56
	T (Calc) = 2.26

Compiled by:	GL
Checked by:	AMM
Approved by:	

Job number *D108892*
Site *Pogmoor Works*
Parameter *Nickel B*

Concentrations		
N	X	Y=log(X)
1	31	1.491
2	28	1.447
3	29	1.462
4	16	1.204
5	22	1.342
6	25	1.398
7	33	1.519
8	24	1.380
9	35	1.544
10	27	1.431
11	63	1.799
12	29	1.462
13	38	1.580
14	27	1.431
15	22	1.342
16	9.1	0.959
17	41	1.613
18	64	1.806
19	31	1.491
20	28	1.447
21	41	1.613
22	34	1.531
23	26	1.415
24	31	1.491
25	50	1.699
26	55	1.740

Mean X =	33.0	1.5
Standard Dev. Sx=	13.0	0.2
Max value=	64.0	1.806

n=	26
t=	1.708

Max value note:
If the value of T (calc) is smaller the critical value (T crit), then the maximum value may be accepted (at the prescribed level of confidence) as a member of the underlying population from which the other measurements were drawn.
If T (calc) is greater than the T(crit) value then the maximum value may be treated as an outlier.

T (Crit) 5% for N =	2.56
T (Calc) =	1.80

Compiled by:	GL
Checked by:	AMM
Approved by:	

Job number *D108892*
Site *Pogmoor Works*
Parameter *Lead B*

Concentrations		
N	X	Y=log(X)
1	53	1.724
2	62	1.792
3	51	1.708
4	55	1.740
5	25	1.398
6	29	1.462
7	150	2.176
8	26	1.415
9	350	2.544
10	31	1.491
11	120	2.079
12	81	1.908
13	550	2.740
14	290	2.462
15	130	2.114
16	34	1.531
17	26	1.415
18	27	1.431
19	66	1.820
20	17	1.230
21	1500	3.176
22	32	1.505
23	100	2.000
24	150	2.176
25	20	1.301
26	33	1.519

Mean X =	154.2	1.8
Standard Dev. Sx=	300.6	0.5
Max value=	1500.0	3.176

n=	26
t=	1.708

Max value note:
If the value of T (calc) is smaller the critical value (T crit), then the maximum value may be accepted (at the prescribed level of confidence) as a member of the underlying population from which the other measurements were drawn.
If T (calc) is greater than the T(crit) value then the maximum value may be treated as an outlier.

	T (Crit) 5% for N = 2.56
	T (Calc) = 2.76

Compiled by:	GL
Checked by:	AMM
Approved by:	

Job number *D108892*
Site *Pogmoor Works*
Parameter *TPH A*

Concentrations		
N	X	Y=log(X)
1	380	2.580
2	64	1.806
3	73	1.863
4	100	2.000
5	93	1.968
6	35	1.544
7	400	2.602
8	750	2.875
9	20	1.301
10	20	1.301
11	20	1.301
12	280	2.447
13	170	2.230
14	66	1.820
15	20	1.301
16	20	1.301
17	36	1.556
18	630	2.799
19	120	2.079

Mean X =	173.5	1.9
Standard Dev. Sx=	217.3	0.5
Max value=	750.0	2.875

n=	19
t=	1.734

Max value note:
If the value of T (calc) is smaller the critical value (T crit), then the maximum value may be accepted (at the prescribed level of confidence) as a member of the underlying population from which the other measurements were drawn.
If T (calc) is greater than the T(crit) value then the maximum value may be treated as an outlier.

T (Crit) 5% for N =	2.5
T (Calc) =	1.76

Compiled by:	GL
Checked by:	AMM
Approved by:	

Job number *D108892*
Site *Pogmoor Works*
Parameter *BaP A*

Concentrations		
N	X	Y=log(X)
1	0.1	-1.000
2	0.1	-1.000
3	0.1	-1.000
4	1	0.000
5	0.8	-0.097
6	1	0.000
7	0.7	-0.155
8	7.5	0.875
9	0.1	-1.000
10	0.1	-1.000
11	0.1	-1.000
12	2.4	0.380
13	1.1	0.041
14	1.4	0.146
15	0.2	-0.699
16	0.1	-1.000
17	0.2	-0.699
18	1.6	0.204
19	3.5	0.544

Mean X =	1.2	-0.3
Standard Dev. Sx=	1.8	0.6
Max value=	7.5	0.875

n=	19
t=	1.734

Max value note:
If the value of T (calc) is smaller the critical value (T crit), then the maximum value may be accepted (at the prescribed level of confidence) as a member of the underlying population from which the other measurements were drawn.
If T (calc) is greater than the T(crit) value then the maximum value may be treated as an outlier.

T (Crit) 5% for N =	2.5
T (Calc) =	1.94

Compiled by:	GL
Checked by:	AMM
Approved by:	

MEAN AND MAXIMUM VALUE TEST

Job number *D108892*
Site *Pogmoor Works*
Parameter *PAH A*

Concentrations		
N	X	Y=log(X)
1	7.5	0.875
2	2	0.301
3	3.2	0.505
4	12	1.079
5	12	1.079
6	39	1.591
7	9	0.954
8	100	2.000
9	2	0.301
10	2	0.301
11	2	0.301
12	25	1.398
13	11	1.041
14	14	1.146
15	2.2	0.342
16	2	0.301
17	3.8	0.580
18	21	1.322
19	42	1.623

Mean X =	16.4	0.9
Standard Dev. Sx=	23.6	0.5
Max value=	100.0	2.000

n=	19
t=	1.734

Max value note:
If the value of T (calc) is smaller the critical value (T crit), then the maximum value may be accepted (at the prescribed level of confidence) as a member of the underlying population from which the other measurements were drawn.
If T (calc) is greater than the T(crit) value then the maximum value may be treated as an outlier.

MEAN VALUE	US_{95}= 25.80

MAX VALUE	T (Crit) 5% for N = 2.5
	T (Calc) = 2.06

Compiled by:	GL
Checked by:	AMM
Approved by:	

Appendix 8 – CDM Hazard Considerations

CDM Hazard Considerations

Job Title	Date	Job Number
Pogmoor Works	16/05/05	D108892

Hazard	Observation	Mitigation
Asbestos	Age of current buildings indicates possible presence of asbestos containing materials	Asbestos survey prior to any demolition works.
Contaminated ground	Elevated levels of contaminants recorded in made ground across the site. Possible presence of asbestos from demolition of buildings that used to be on site.	Ensure all groundwork staff are aware of potential hazards and issue appropriate PPE.