Appendix 11.3

First Phase Reporting of the Site Protection and Monitoring Programme by WSP 2009

First Phase Reporting of the Site Protection and Monitoring Programme Where Reference Data is Required

Brunner Mond (UK) Limited, Lostock

August 2009

WSP

QM

Issue/revision	Issue 1	Revision 1	Revision 2	Revision 3
Remarks	Draft	Incorporating clients comments following meeting	Incorporating clients comments	
Date	December 2008	July 2009	August 2009	
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Project number	12091559/001	12091559/001	12091559/001	
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Contents

Executive Summary

This document represents the first phase report of the Site Protection and Monitoring Programme (SPMP) for Brunner Mond (UK) Limited, Lostock, submitted to the Environment Agency in pursuance of Condition 4.1.7 of IPPC Permit No SP3430BF (the 'Permit') authorising the production of sodium carbonate (soda ash) by the "Solvay ammonia-soda process".

The intrusive investigation was undertaken to characterise contaminants identified as being present, or potentially present, in or under the ground, in the Application Site Report (ASR) submitted with the Permit Application and in the revised Table D2A/B – Assessment of the Likelihood of Pollution (dated March 2008). The scope of the investigation was detailed in the Design SPMP and agreed with the Environment Agency. This document should be read in conjunction with all these documents.

The results from the monitoring undertaken concluded that the majority of determinands tested are within typical background concentrations. There is evidence of elevated concentrations of polycyclic aromatic hydrocarbons, calcium, chloride, mercury and pH in the soil, which are considered to be associated with current and / or historical activities. Elevated concentrations of total petroleum hydrocarbons, pH, arsenic, phenols, ammonia, chloride, calcium, sodium and sulphate were identified in the groundwater and are also considered to be associated with current and / or historical activities. The report provides a more detailed summary of the findings of the intrusive investigation for the installation in Section 2.4.

Confidentiality Statement

This report is addressed to and may be relied upon by the following parties:

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This assessment has been prepared for the sole use and reliance of the above named parties. This report shall not be relied upon or transferred to any other parties without the express written authorisation of WSP Environmental Limited. No responsibility will be accepted where this report is used, either in its entirety or in part, by any other party.

1 Introduction

Brunner Mond (UK) Limited, Lostock (hereafter 'Brunner Mond') is required to undertake a site investigation in line with the proposal in the previously submitted Design Site Protection and Monitoring Programme (SPMP) for the Lostock site. This first phase report of the SPMP has been produced by WSP Environmental Limited (WSPE) on behalf of the applicant (Brunner Mond) in pursuance of Condition 4.1.7 within the IPPC Permit Ref SP3430BF issued under Regulation 10 of the Pollution Prevention and Control Regulations 2000 (England and Wales).

This report is intended to be read in conjunction with the following supporting documents:

- Permit Application SP3430BF;
- Application Site Report;
- Assessment of the Likelihood of Pollution, dated March 2008; and
- Design Site Protection and Monitoring Programme March 2008.

1.1 SITE LOCATION

The installation is located at:

Lostock

Northwich

Cheshire

CW9 7NY

The centre of the site is at National Grid Reference SJ 6828 7403.

The site covers an area of 67.09 hectares and can be seen in Appendix A1.

2 Intrusive Investigation

2.1 INVESTIGATION AND SAMPLING STRATEGY

The investigation and sampling was undertaken at the site in general accordance with the Design SPMP. However, exploratory hole WS5 was not drilled as the area surrounding the diesel bund in the contractor's compound is located above numerous brine pipelines and therefore it was not possible to drill a window sample hole in this area. In addition, since the submission of the Design SPMP the diesel tank has been removed as it was no longer in use. An additional window sample hole (WS12) was drilled adjacent to the coke and limestone stockpiles to provide further coverage of this area. The only other minor changes occurred where locations had to be moved due to issues with access or to move the monitoring well closer to the potential source of pollution. Further details of these are provided in Section 2.1.2.

The locations of the monitoring wells are presented on Figure A2 in Appendix A.

2.1.1 General

The ground investigation took place between the 15th September and the 18th September 2008 (inclusive). The groundwater samples were collected on the 24th September 2008. A second groundwater sample was collected from WS2 in April 2009 due to a laboratory anomaly in the original set of results. The main parties involved and the works completed during the investigation are provided in Table 2.1.1.

Table 2.1.1: Summary of Key Personnel and their Roles

Company	Works	Equipment
WSPE	Supervision, client/site liaison, logging and sampling	N/A
SVS	Buried services survey	Electric current generator, cable avoidance tool
Precision Drilling	150mm diameter concrete coring	Concrete corer
Geo Site Surveys	Window sampling (11 positions)	Windowless Competitor drilling rig

The justification for the above boring techniques is provided within the Design SPMP.

2.1.2 Constraints on Investigation

The general limitations to the nature of the investigation are outlined in Appendix F. In addition, the following limitations are associated with the works undertaken:

- WS4 was moved approximately 45m north of the proposed window sample location to position the monitoring well closer to the storage tank.
- WS6 could not be installed as the window sample hole collapsed.
- WS7 was moved approximately 10m north of the proposed window sample hole location due to access restrictions.
- WS9 was moved approximately 25m north of the proposed window sample hole location due to access restrictions. As the window sample hole collapsed a second

attempt was made to drill and install this position (WS9a) however, this hole also collapsed and therefore could not be installed.

- WS10 was moved approximately 15m north of the proposed window sample hole to the edge of the stockpile of lime.
- WS11 was moved approximately 45m north west of the proposed window sample position to the edge of the coke stockpile.

2.1.3 Soil Investigation Sampling Techniques and Protocols

Soil investigation and sampling technique protocols were generally in accordance with the Design SPMP. A summary of the investigation techniques is presented in Table 2.1.3 and in Appendix B.

Table 2.1.3: Summary of Ground Investigation Works

Investigation Method	N° of Positions	Maximum Depth (m bgl*)	Monitoring Wells	Monitoring
Window Sample Hole	11	5.00	9 x 35mm	**WL

*m bgl – metres below ground level. **WL – standing groundwater level using an electric contact dip meter.

2.1.4 Groundwater Investigation Techniques and Protocols

Groundwater investigation and sampling technique protocols were generally in accordance with the Design SPMP.

Nine of the sampling positions were installed with 35mm diameter groundwater monitoring wells. Standing groundwater levels were recorded by use of an electronic contact dip meter on one occasion.

2.2 SAMPLE LOCATIONS

The sample locations generally remained the same as those detailed in the Design SPMP. WS5 could not be drilled due to brine pipeline obstructions in the vicinity of the diesel bund.

The sample locations were provisionally identified in the Design SPMP. The actual locations are shown on Figure A2 in Appendix A and summarised in Table 2.2.1, below.

Table 2.2.1: Summary of Borehole Locations

Location	Exploratory Hole	Installed (Y/N)	Shown on Figure
Diesel tank in the service zone (near to the coke stockpile)	WS1	Y	A2
Ammoniacal liquor delivery point	WS2	Y	A2
Off-loading area adjacent to the cooling tower water treatment chemical storage area	WS3	Y	A2
Diesel tank in the service zone (near the demolition area)	WS4	Y	A2
Diesel tank in the contractors compound	WS5	Not drilled	
Pipeline from feeder liquor tanks to the process vessels.	WS6	N	A2
Waste oil storage IBC	WS7	Y	A2
Pipeline transferring DBO liquid waste to the settlers.	WS8	Y	A2
Brine stock tank	WS9 / WS9a	N	A2
Limestone stockpile	WS10	Y	A2
Coke stockpile	WS11	Y	A2
Coke and limestone stockpiles	WS12	Y	A2

The findings of the investigations are discussed in Section 2.4 and all exploratory hole logs are reproduced in Appendix D.

2.3 ANALYTICAL STRATEGY

2.3.1 Justification of Analytical Suites

The samples recovered during the ground investigation were analysed for the analytical suite presented below to collect reference data:

- pH
- w/s chloride
- w/s ammonium
- Calcium
- TPH CWG (Total petroleum hydrocarbons criteria working group)
- Metals Suite (arsenic, cadmium, chromium, copper, mercury, nickel, lead, selenium, zinc)
- Phenols
- w/s sulphate
- Sodium
- Cyanide
- Speciated phenols
- PAH (Polycyclic aromatic Hydrocarbons)

2.3.2 Laboratory Accreditations / Quality Assurance and Quality Control

All analytical techniques, accreditation and relevant protocols are presented in Appendix C.

2.4 FINDINGS OF THE GROUND INVESTIGATION

The following sections provide a broad assessment of the site, including general ground conditions and statistical analysis (where appropriate) of laboratory results in order to identify any patterns/hotspots etc.

2.4.1 Summary of the Site Physical Conditions and Refinement of the Conceptual Model

The ground conditions encountered during the investigation are generally consistent with the anticipated sequence of strata and conceptual model information within the Application Site Report (ASR). Much of the area is "made ground" overlying alluvium with some glacial deposits and weathered mudstones.

The ground conditions at the site broadly comprise the following:

Concrete

Concrete was encountered at nine out of the eleven window sample holes at varying depths up to a maximum depth of 0.30m bgl at WS8. WS7, WS9 and WS9a were drilled directly into made ground.

Made Ground

Made ground was encountered in all of the window sample holes at varying depths to a maximum of 4.90m bgl. The made ground consisted of mixed lithologies including sand, gravel and clay and in some locations it contained sandstone, ash from incomplete combustion, concrete, clinker, brick, coke, slag, cobble and asphalt.

Alluvium

Alluvium was encountered in the following window sample holes:

- WS2 2.80-5.00m bgl
- WS3 4.90-5.00m bgl
- WS6 1.70-3.60M bgl
- WS7 2.70-3.00m bgl
- WS8 1.00-2.60m bgl

The alluvium generally consisted of slightly sandy gravelly clay. Gravel is subangular to subrounded fine to medium of mixed lithologies sandstone and mudstone. In WS7 sandstone cobble was encountered at 2.90m bgl and leaves and plant matter were encountered in WS8 2.10-2.50m bgl.

Glacial Deposits

Glacial deposits were encountered in 4 of the window sample holes at varying depths:

- WS1 3.25-4.00m bgl.
- WS8 2.60-3.50m bgl
- WS10 1.50-2.70M bgl
- WS11 1.00-3.80m bgl

The glacial deposits encountered generally consisted of slightly gravelly sandy clay. Gravel is subangular to subrounded fine to medium of mudstone and mixed lithologies.

Weathered Mudstone

Weathered mudstone was encountered in WS10 at 2.7m bgl and consisted of very stiff slightly gravelly clay. Gravel is angular to subangular fine to coarse of mudstone.

Contamination Observations

There was olfactory evidence of hydrocarbon, ammonia and solvent impact during the site investigation. Table 2.4.1 below details the contamination observations:

Table 2.4.1: Summary of Contamination Observations

Location	Depth	Stratum	Observation
WS1	1.45m – 1.65m bgl	Made ground	White paste
	2.75m – 2.85m bgl	Made ground	Old hydrocarbon odour
WS2	1.3m – 1.7m bgl	Made ground	Ammonia odour
	2.1m – 2.3m bgl	Made ground	Ammonia odour
	2.8m – 4.0m bgl	Alluvium	Black oily sheen and strong hydrocarbon odour encountered
	4.1m – 4.3m bgl	Alluvium	Ammonia odour
WS3	4.7m – 4.9m bgl	Made ground	White paste
WS4	2.0m – 2.3m bgl	Made ground	White paste
	3.5m – 3.7m bgl	Made ground	White paste
WS6	0.9m – 1.1m bgl	Made ground	Solvent odour
WS7	0.3m – 0.5m bgl	Made ground	Black oily sheen with hydrocarbon odour
	1.2m – 2.7m bgl	Made ground	Slight solvent odour
WS8	1.0m – 1.1m bgl	Alluvium	Organic odour and occasional black staining
	2.1m – 2.3m bgl	Alluvium	Organic odour and occasional black staining
WS9 / WS9a	-	-	No visual evidence of contamination
WS10	-	-	No visual evidence of contamination
WS11	0.3m – 0.5m bgl	Made ground	Organic odour
WS12	1.1m – 1.2m bgl	Made ground	White paste
	3.5m – 3.6m bgl	Made ground	White paste

Based on the above observations and with regard to the chemicals of concern, soil samples were subjected to specialist chemical analysis. The results are presented below and full analysis certificates are presented in Appendix E.

General Groundwater Conditions

Groundwater was encountered in 7 of the exploratory holes during drilling and 8 holes in subsequent monitoring. Details are summarised in the table below:

Table 2.4.2: Groundwater Levels during Drilling and Monitoring

Exploratory Hole	Water Strike During Drilling (m bgl)	Water Level During Monitoring (prior to purging wells) (m bgl))
WS1	No groundwater encountered	No groundwater encountered
WS2	2.50	1.88
WS3	3.0	2.72
WS4	3.0	1.97
WS6	1.0	The window sample hole was not installed as the hole collapsed
WS7	1.5	0.79
WS8	No groundwater encountered	0.2
WS9 / WS9a	No groundwater encountered	The window sample hole was not installed as the hole collapsed
WS10	No groundwater encountered	1.07
WS11	3.0	0.51
WS12	4.0	3.46

Groundwater samples were tested for the same suite of determinands as the soil samples.

2.5 DATA INTERPRETATION

An assessment of the total soil and groundwater concentrations has been completed to determine whether elevated concentrations of contaminants exist at the subject site. This has been completed in order to benchmark conditions at the site.

2.5.1 Statistical Analysis

The scope of investigation detailed within the Design SPMP proposed 11 exploratory hole positions within the site boundary. The ASR and the Revised Table D2A/B identified specific locations within the site where baseline data should be obtained. Given the level of analysis undertaken, statistical analysis is not considered appropriate at this stage, as potential contamination sources have generally been targeted by a limited number of boreholes.

2.5.2 Detailed Assessment

Introduction

The ASR and Table D2A/B identified potential sources of contamination. The Design Stage SPMP submitted to the Environment Agency in March 2008, updated the ASR and identified where there was a "likelihood of future contamination" following the detailed full assessment in line with the H7 criteria. Only the positions identified as having "reasonable likelihood" are required to have reference conditions set.

The Design Stage SPMP highlighted eleven areas as being potential sources of contamination, details of which are provided in Table 2.5.2.1 below. The exploratory hole WS5 was not drilled as there were access restrictions due to underground services and the tank has now been removed. The following section discusses those results obtained in this site investigation elevated above background concentrations for the site.

In all cases, only the results recorded above detection limits or background levels are discussed within this report. Full analytical test certificates are presented in Appendix E and a site plan showing the location of the exploratory holes is presented as Figure A2 in Appendix A.

2.5.2.1 Potential Sources of Contamination

Specific areas were identified in the Design SPMP where there was potential for impact on underlying soils and groundwater. These are summarised below in Table 2.5.2.1.

Table 2.5.2.1: Potential Sources of Contamination

Exploratory Hole	Potential Sources of Contamination	Determinands
WS1	Spillage during dispensing. There was evidence of a small amount of staining around the dispensing point.	pH, selenium, mercury, arsenic, calcium, cadmium, chromium, copper, sodium, nickel, lead, zinc, chloride, sulphate, PAH, TPH CWG
WS2	Spillage from road tanker or delivery pipework. There was evidence of a small amount of staining on the concrete hardstanding.	pH, cyanide, phenols, ammonical nitrogen, ammonium
WS3	Spillage from road tanker or delivery pipework. There was evidence of a small amount of staining on the concrete hardstanding.	pH, selenium, mercury, arsenic, calcium, cadmium, chromium, copper, sodium, nickel, lead, zinc, chloride, sulphate
WS4	Spillage during dispensing. There was evidence of a small amount of staining around the dispensing point.	pH, selenium, mercury, arsenic, calcium, cadmium, chromium, copper, sodium, nickel, lead, zinc, chloride, sulphate, PAH, TPH CWG
WS6	Failure of pipeline when transferring feeder liquor to the process vessels. Record of pollution in the late 1980's when a pipe fracture resulted in ammoniated liquor spillage to the Trent and Mersey canal.	pH, selenium, mercury, arsenic, cadmium, chromium, copper, sodium, nickel, lead, zinc, ammonium, chloride
WS7	Decanting waste oil into IBC. Evidence of oil in the rain water on the ground.	pH, selenium, mercury, arsenic, cadmium, chromium, copper, nickel, lead, zinc, PAH, TPH CWG

Exploratory Hole	Potential Sources of Contamination	Determinands
WS8	Failure of pipeline when transferring DBO liquid waste to the settlers. Record of pollution when expansion bellows failed on one occasion.	pH, selenium, mercury, arsenic, cadmium, chromium, copper, sodium, nickel, lead, zinc, ammonical nitrogen, ammonium, chloride
WS9	Failure and / or overfilling of the stock tank. Failure of pipeline when transferring the brine to point of use.	pH, sodium, chloride
WS10	Stockpiles of limestone however, it is not considered that there is a reasonable likelihood of pollution from this activity.	pH, selenium, mercury, arsenic, cadmium, chromium, copper, nickel, lead, zinc, PAH, TPH CWG
WS11	Stockpiles of coke however, it is not considered that there is a reasonable likelihood of pollution from this activity.	pH, selenium, mercury, arsenic, cadmium, chromium, copper, nickel, lead, zinc, PAH, TPH CWG
WS12	Stockpiles of coke and limestone however, it is not considered that there is a reasonable likelihood of pollution from this activity.	pH, selenium, mercury, arsenic, calcium, cadmium, chromium, copper, sodium, nickel, lead, zinc, chloride, sulphate, PAH, TPH CWG

2.5.2.2 Baseline Conditions

An assessment of baseline conditions of the site has been undertaken for future reference. The results from the monitoring undertaken concluded that the majority of determinands tested are within typical background concentrations. There is evidence of elevated concentrations of polycyclic aromatic hydrocarbons (PAHs), calcium, chloride, mercury and pH in the soil, which could be due to accidental releases associated with current and / or historical activities. Elevated concentrations of TPH, pH, arsenic, phenols, ammonia, chloride, calcium, sodium and sulphate were identified in the groundwater and are also considered to be associated with current and / or historical activities.

Table 2.5.2.2: Site Baseline Conditions

Determinands	Baseline Concentrations – Range of Concentrations Detected	Mean
Soil		
pH	7.1 pH units- 13 pH units (WS1, WS2, WS3, WS4, WS6, WS7, WS8, WS9, WS10,WS11,WS12)	10.9 pH units
Cyanide (total)	<5.0mg/kg (WS2)	-
Speciated phenols	<2.5mg/kg (WS2)	-
Selenium	<0.3mg/kg – 1.4mg/kg (WS1, WS3, WS4, WS6, WS7, WS8, WS10, WS11, WS12)	0.445mg/kg
Mercury	<0.2mg/kg – 2.5mg/kg (WS1, WS3, WS4, WS6, WS7, WS8, WS10, WS11, WS12)	0.478mg/kg
Arsenic	6.2mg/kg – 37mg/kg (WS1, WS3, WS4, WS6, WS7, WS8, WS10, WS11, WS12)	15.02mg/kg

Determinands	Baseline Concentrations – Range of Concentrations Detected	Mean
Calcium	340,000mg/kg – 540,000mg/kg (WS1, WS3, WS4, WS12)	445,000mg/kg
Cadmium	<0.25mg/kg – 2.4mg/kg (WS1, WS3, WS4, WS6, WS7, WS8, WS10, WS11, WS12)	0.594mg/kg
Chromium	6mg/kg – 43mg/kg (WS1, WS3, WS4, WS6, WS7, WS8, WS10, WS11, WS12)	22.22mg/kg
Copper	9.7mg/kg – 130mg/kg (WS1, WS3, WS4, WS6, WS7, WS8, WS10, WS11, WS12)	42.86mg/kg
Sodium	<500mg/kg – 9,700mg/kg (WS1, WS3, WS4, WS6, WS8, WS9, WS12)	2,138.57mg/kg
Nickel	4.5mg/kg – 90mg/kg kg (WS1, WS3, WS4, WS6, WS7, WS8, WS10, WS11, WS12)	28.84mg/kg
Lead	<2.5mg/kg – 120mg/kg (WS1, WS3, WS4, WS6, WS7, WS8, WS10, WS11, WS12)	36.056mg/kg
Zinc	<5mg/kg – 220mg/kg (WS1, WS3, WS4, WS6, WS7, WS8, WS10, WS11, WS12)	68.867mg/kg
w/s ammonium	5.7mg/kg – 220mg/kg (WS2, WS6, WS8)	85.23mg/kg
w/s chloride	<10mg/kg – 17,000mg/kg (WS1, WS3, WS4, WS6, WS8, WS9, WS12)	2,652.43mg/kg
w/s sulphate	<30mg/kg – 216mg/kg (WS1, WS3, WS4, WS12)	71.25mg/kg
PAH (total)	<3.0mg/kg – 240mg/kg (WS1, WS4, WS7, WS10, WS11, WS12)	45.62mg/kg
TPH CWG		
Benzene	<0.01mg/kg – 0.04mg/kg (WS1, WS4, WS7, WS10, WS11, WS12)	0.015mg/kg
Ethylbenzene	<0.01mg/kg – 0.04mg/kg (WS1, WS4, WS7, WS10, WS11, WS12)	0.015mg/kg
m+p-Xylene	<0.01mg/kg – 0.55mg/kg (WS1, WS4, WS7, WS10, WS11, WS12)	0.098mg/kg
MTBE	<0.01mg/kg (WS1, WS4, WS7, WS10, WS11, WS12)	-
o-Xylene	<0.01mg/kg – 0.28mg/kg (WS1, WS4, WS7, WS10, WS11, WS12)	0.055mg/kg
TAME	<0.01mg/kg (WS1, WS4, WS7, WS10, WS11, WS12)	-
Toluene	<0.01mg/kg – 0.52mg/kg (WS1, WS4, WS7, WS10, WS11, WS12)	0.095mg/kg
PRO (>C5-C6)	<10mg/kg (WS1, WS4, WS7, WS10, WS11, WS12)	-
PRO (>C6-C8)	<10mg/kg (WS1, WS4, WS7, WS10, WS11, WS12)	-
PRO (>C8-C10)	<10mg/kg (WS1, WS4, WS7, WS10, WS11, WS12)	-
PRO (>C5-C10)	<10mg/kg (WS1, WS4, WS7, WS10, WS11, WS12)	-
PRO (>C6-C10)	<10mg/kg (WS1, WS4, WS7, WS10, WS11, WS12)	-

Determinands	Baseline Concentrations – Range of Concentrations Detected	Mean
Total aliphatics (>C6-C44)	<290mg/kg – 1,000mg/kg (WS1, WS4, WS7, WS10, WS11, WS12)	408.33mg/kg
Total aromatics (>C6-C44)	<290mg/kg – 1,000mg/kg (WS1, WS4, WS7, WS10, WS11, WS12)	408.33mg/kg
Total TPH (>C6-C44)	<50mg/kg – 2,000mg/kg (WS1, WS4, WS7, WS10, WS11, WS12)	415mg/kg
Groundwater		
pH	7.5 pH units – 13 pH units (WS2, WS3, WS4, WS7, WS8, WS10, WS11, WS12)	9.725 pH units
Cyanide (total)	200,000µg/l (WS2)	-
Speciated phenols	828,000µg/l (WS2)	-
Selenium	<5.0µg/l (WS3, WS4, WS7, WS8, WS10, WS11, WS12)	-
Mercury	<0.2µg/l (WS3, WS4, WS7, WS8, WS10, WS11, WS12)	-
Arsenic	<10µg/l – 680µg/l (WS3, WS4, WS7, WS8, WS10, WS11, WS12)	250.67µg/l
Calcium	173,500µg/l – 912,800µg/l (WS3, WS4, WS12)	502,066.67µg/l
Cadmium	<0.5µg/l – 0.5µg/l (WS3, WS4, WS7, WS8, WS10, WS11, WS12)	0.5µg/l
Chromium	<10µg/l (WS3, WS4, WS7, WS8, WS10, WS11, WS12)	-
Copper	<5.0µg/l – 31µg/l (WS3, WS4, WS7, WS8, WS10, WS11, WS12)	13.21µg/l
Sodium	43,200µg/l – 7,837,000µg/l (WS3, WS4, WS8, WS12)	2,087,475µg/l
Nickel	<10µg/l – 33µg/l (WS3, WS4, WS7, WS8, WS10, WS11, WS12)	13.29µg/l
Lead	<10µg/l (WS3, WS4, WS7, WS8, WS10, WS11, WS12)	-
Zinc	<10µg/l (WS3, WS4, WS7, WS8, WS10, WS11, WS12)	-
Ammonical nitrogen	33mg/l - 15,000mg/l (WS2, WS8)	7,516mg/l
w/s chloride	110,000µg/l – 16,450,000µg/l (WS3, WS4, WS8, WS12)	4,328,400µg/l
w/s sulphate	46,930µg/l – 324,100µg/l (WS3, WS4, WS12)	183,543.33µg/l
PAH (total)	1.3µg/l – 33µg/l (WS4, WS7, WS10, WS11, WS12)	14.48µg/l
TPH CWG		
Benzene	<3.0µg/l (WS4, WS7, WS10, WS11, WS12)	-
Ethylbenzene	<3.0µg/l (WS4, WS7, WS10, WS11, WS12)	-
m+p-Xylene	<3.0µg/l (WS4, WS7, WS10, WS11, WS12)	-
MTBE	<3.0µg/l (WS4, WS7, WS10, WS11, WS12)	-
o-Xylene	<3.0µg/l (WS4, WS7, WS10, WS11, WS12)	-
TAME	<3.0µg/l (WS4, WS7, WS10, WS11, WS12)	-

Determinands	Baseline Concentrations – Range of Concentrations Detected	Mean
Toluene	<3.0µg/l (WS4, WS7, WS10, WS11, WS12)	-
PRO (>C5-C6)	<10µg/l (WS4, WS7, WS10, WS11, WS12)	-
PRO (>C6-C8)	<10µg/l (WS4, WS7, WS10, WS11, WS12)	-
PRO (>C8-C10)	<10µg/l (WS4, WS7, WS10, WS11, WS12)	-
PRO (>C5-C10)	<10µg/l (WS4, WS7, WS10, WS11, WS12)	-
PRO (>C6-C10)	<10µg/l (WS4, WS7, WS10, WS11, WS12)	-
Total aliphatics (>C6-C44)	126µg/l – 5,816µg/l (WS4, WS7, WS10, WS11, WS12)	1,335.6µg/l
Total aromatics (>C6-C44)	96µg/l – 815µg/l (WS4, WS7, WS10, WS11, WS12)	306µg/l

2.5.2.3 Elevated Contaminants

The following table highlights the potential contaminants identified within the SPMP along with those contaminants identified as being elevated above typical background concentrations during the investigation. Elevated contaminants in soils are shown on Figure A3 in Appendix A.

Table 2.5.2.3: Elevated Contaminants

Current Potential Contaminants	Identified Elevated Contaminants		Comments
Soil			
Hydrocarbons	Polycyclic Aromatic Hydrocarbons (total)	WS7 0.3 – 0.5m bgl (240mg/kg) WS11 0.3 – 0.5m bgl (6.9mg/kg) WS12 1.0 – 1.2m bgl (4.8mg/kg)	PAHs could be indicative of a number of contaminants / materials on site, including fuels, coke / coal residues and particularly ash from incomplete combustion.
Calcium chloride	Calcium	WS1 1.45 – 1.65m bgl (340,000mg/kg) WS3 4.7 – 4.9m bgl (440,000mg/kg) WS4 2.0 – 2.3m bgl (540,000mg/kg) WS12 1.0 – 1.2m bgl (460,000mg/kg)	Calcium is not specifically considered to be a contaminant however, this can be an indication of impact.

Current Potential Contaminants	Identified Elevated Contaminants		Comments
Calcium chloride	Chloride	WS8 2.1 – 2.3m bgl (17,000mg/kg)	Elevated chloride could be due to a number of sources, either current or historical.
N/A	Mercury	WS7 0.3 – 0.5m bgl (2.5mg/kg)	Mercury is not currently used on site; this is likely to be as a result of historical contamination.
Calcium chloride Water treatment chemicals	pH	WS1 1.45 – 1.65m bgl (13 pH units) WS3 4.7 – 4.9m bgl (13 pH units) WS4 2.0 – 2.3m bgl (13 pH units)	High pH could be associated with the presence of calcium or alkaline process chemicals / liquors which could be due to a number of sources, either current or historical. High pH could also be associated with the water treatment chemicals currently / previously used on site.
Groundwater			
Hydrocarbons	Total Aliphatics (C6-C44)	WS7 (5,816µg/l) WS10 (126µg/l) WS11 (433µg/l) WS12 (174µg/l)	Hydrocarbons are used on site. Slightly elevated concentrations detected could be associated with accidental releases either historically and / or currently due to storage or dispensing on site.
	Total Aromatics (C6-C44)	WS7 (815µg/l) WS10 (110µg/l) WS11 (264µg/l) WS12 (245µg/l)	
Calcium chloride Limestone	pH	WS4 (13 pH units) WS11 (12 pH units) WS12 (13 pH units)	High pH could be associated with the presence of calcium or alkaline process chemicals / liquors which could be due to a number of sources, either current or historical.

Current Potential Contaminants	Identified Elevated Contaminants		Comments
N/A	Arsenic	WS11 (680µg/l)	Arsenic is not currently used on site; this is likely to be as a result of historical contamination. Arsenic can be present in trace concentrations in coal, coke and ash from incomplete combustion.
Ammonia liquor	Phenols	WS2 (828,000µg/l)	Evidence of possible impact from ammoniacal liquors, either current and / or historical activities. Possible impact from the storage of phenols associated with historical activities.
Ammonia liquor	Ammonia (as NH4)	WS2 (15,000mg/l) WS8 (33mg/l)	Ammonia is currently used on site. Ammonium in groundwater can also be derived from a range of different effluents. Elevated concentration in WS2 suggests contamination from ammoniacal liquor (given the associated phenol and cyanide contamination).
Ammonia liquor	Total cyanide	WS2 210,000 µg/l	Cyanide is present within ammoniacal liquor. Given the additional presence of ammonium and phenol within WS2, ammoniacal liquor is the likely source of the elevated concentrations detected.
Calcium chloride	Chloride	WS3 (438,200µg/l)	Elevated chloride could be due to a number of sources, either current or historical.

Current Potential Contaminants	Identified Elevated Contaminants		Comments
	Calcium	WS3 (173,500µg/l) WS4 (912,800µg/l)	Elevated calcium could be due to a number of sources, either current or historical.
Sodium salts	Sodium	WS3 (220,800µg/l)	Sodium is not specifically considered to be a contaminant however, this can be an indication of impact.
DBO liquid waste	Sulphate	WS3 (324,100µg/l)	Evidence of possible impact from the DBO pipeline, either current and / or historical.

2.5.2.4 Confirmed Sources of Identified Elevated Levels of Contamination

Where the investigation has identified substances within the subsurface that are currently used on site, ongoing operations may be contributing to the elevated concentrations recorded. However, due to the age of the site, these could also be associated with historical activities. The most significant current and historical issues identified as a result of this investigation are discussed below:

Current Activities

The findings of the investigation have shown the following contaminants that may be associated with current activities:

TPH and PAH

Elevated concentrations of PAH were identified in soil samples from WS7, WS11 and WS12.

WS7 is located adjacent to the waste storage IBC where there was evidence of oil in the rain water on the concrete surface during the site reconnaissance and a black oily sheen with hydrocarbon odour was noted in the made ground at a shallow depth during the site investigation. This contamination may be as a result of small spillages during decanting waste oil into the IBC which have migrated into the ground over time.

WS11 and WS12 are both located in the areas where coke is stockpiled. This contamination may be as a result of coke residues however, it is considered that most of this contamination is due to ash from incomplete combustion which is as a result of historical activities.

Slightly elevated concentrations of TPH were also identified in the groundwater samples from WS7, WS10, WS11 and WS12. Hydrocarbons are not used in the area where WS10 is located therefore it is considered that these concentrations are as a result of historical activities.

Calcium and Chloride

Elevated concentrations of calcium were identified in the soil samples from WS1, WS3, WS4 and WS12. Elevated concentrations of chloride in the soil were identified in WS8. It is considered that the calcium and chloride identified in the soil samples is associated with waste from historical activities or from limestone in WS12.

Elevated concentrations of chloride were also identified in the groundwater samples from WS3. The concentrations recorded in WS3 are likely to be associated with waste from historical activities. During the site investigation white paste was identified within the made ground.

Slightly elevated concentrations of calcium were identified in the groundwater samples from WS3 and WS4, which are likely to be associated with historical activities.

pH

High pH was identified in the soil samples from WS1, WS3 and WS4.

WS3 is located adjacent to the water treatment chemical storage tanks where there was some evidence of staining of the concrete during the site reconnaissance. The elevated pH may be associated with small spills and leaks during road tanker off-loading.

During the site investigation there was evidence of white paste in WS1, WS3 and WS4. It is considered that the high pH in WS1 and WS4 is associated with waste from historical activities. The elevated pH in WS3 could be associated with current and / or historical activities.

High pH was identified in the groundwater samples from WS4, WS11 and WS12. It is considered that that the elevated pH is associated with waste from historical activities or from limestone in WS12.

Ammoniacal Liquor

Elevated concentrations of ammonium, phenols and cyanide were identified in the groundwater sample from WS2 which is located adjacent to the ammoniacal liquor delivery point (this was sampled twice due to a laboratory anomaly in the original set of results, the second sample was collected in April 2009). The concentrations recorded in WS2 indicate either a recent / ongoing source of contamination, a limited perched groundwater body with minimal dilution, or a combination of the two.

Since the ground investigation was undertaken, the concrete apron serving the ammoniacal liquor off-loading area, has been replaced to ensure that the likelihood of pollution associated with current off-loading activities is minimised. The contamination identified in WS2 is therefore considered to be associated with historical activities. In order to comprehensively benchmark the area in the vicinity of the ammoniacal liquor delivery point, it is proposed to undertake further intrusive investigations to determine the extent of contamination in this area.

Ammonia

Elevated concentrations of ammonia were identified in the groundwater sample from WS8. It is considered that the concentrations identified in WS8 may be as a result of small leaks from the distiller blow off (DBO) pipeline or as a result of historical activities.

Sodium

Elevated concentrations of sodium were identified in the groundwater sample from WS3. This contamination may indicate the presence of soda ash at depth however, it is considered that this is likely to be as a result of historical activities.

Historical Activities

The findings of the investigation have shown the following contaminants that may be present as a result of historical activities:

Mercury

Elevated concentrations of mercury were identified in the soil samples from WS7. Mercury is not currently used on site therefore it is likely that this contamination is a result of historical activities on site.

Arsenic

Elevated concentrations of arsenic were identified in the groundwater samples from WS11. Arsenic is not currently used on site and elevated concentrations are likely to be a result of historical activities on site.

As outlined in the Current Activities Section above some of the findings could also be associated with historical activities undertaken on the site. The site has been operating as a sodium carbonate plant since 1891 during which time the "house keeping" measures on site may not have been to the current required standards.

Summary

It is considered that the concentrations of TPH, PAH, calcium, chloride, pH, phenols, ammonia and sodium detected are likely to be present as a result of current activities and / or former "house-keeping" management protocols.

The concentrations of mercury and arsenic are considered to be as a result of historical activities as these materials are not currently used on site.

Statement of Reference Data

Reference Data for the site have been collected and are presented in summary in Section 2.5.2 – Detailed Assessment. Laboratory test certificates are presented in Appendix E.

2.6 SPECIFIC ASSESSMENTS OF IMPACTS ON GROUND FROM STORAGE OF COKE & LIMESTONE AND PIPE TRENCHES/CORRIDORS

2.6.1 Storage and Stockpiling of Coke and Limestone

The concentration of calcium in the soil from WS12 is slightly elevated and the pH of the groundwater is high indicating that there is slight impact. However, during the site investigation it was observed that there was a white paste in the made ground and therefore the concentrations of calcium identified and the high pH are likely to be associated with waste from historical activities rather than from the storage of limestone.

There is a slight elevation of PAH in soil and TPH in the groundwater samples from WS11 and WS12. These elevated concentrations may be as a result of coke residues

however, it is considered that most of this contamination is due to ash from incomplete combustion which is as a result of historical activities.

The analyses conclude that there is slight impact on the ground and groundwater however, it is considered that this is likely to be associated with historical activities. Therefore Brunner Mond does not propose any additional measures to prevent deterioration of the land in those locations due to surface mixing, leaching or other deposition. Brunner Mond will continue with good stockpile management practices.

2.6.2 Pipeline from Feeder Liquor Tanks to the Process Vessels (WS6)

There is no evidence of elevated concentrations of ammonium or chloride in the soil or groundwater samples from these locations suggesting that the pipeline here is not a source of contamination.

Based on these assessments, Brunner Mond plans no further remedial work other than continued analyses in these areas.

2.6.3 Pipeline Transferring DBO Liquid Waste to the Settlers (WS8)

There is no evidence of elevated concentrations of sodium, chloride or ammonium in the soil or groundwater samples from these locations suggesting that the pipeline here is not a source of contamination.

Based on these assessments, Brunner Mond plans no further remedial work other than continued analyses in these areas.

3 Inspection and Monitoring Regime

As a result of the investigations to collect Reference Data it is recommended that an on-going monitoring programme of the installed sample points is agreed with the Environment Agency. The aim of the monitoring programme is to provide a tool for assessing any potential emissions and ultimately to assess the effectiveness of the pollution control infrastructure and containment measures in place.

3.1 MONITORING PROGRAMME

3.1.1 Environmental Monitoring Programme

Routine Monitoring Programme

Groundwater monitoring should be undertaken for the duration of the permit from those locations where elevated concentrations of pollutants were identified in the groundwater. Samples should be collected from the newly installed monitoring wells at a frequency agreed with the Environment Agency (likely to be every 12 months).

Emergency Monitoring Programme

In the event of an incident resulting in emissions to land or the identification of contamination from routine monitoring, the site emergency monitoring plan will be implemented. The increased frequency of monitoring will be determined at that time based on the extent of the incident and the location and will continue until a decrease in the pollutant trend is identified. The Environment Agency will be informed of findings during the emergency monitoring plan.

See Appendix G for the Environmental Monitoring Protocols.

3.2 ENVIRONMENTAL MONITORING INFRASTRUCTURE

3.2.1 Location

The location of the monitoring wells is shown on Figure A2 in Appendix A.

3.2.2 Groundwater Monitoring

Exploratory hole records and the details of the groundwater monitoring wells are presented in Appendix D. The monitoring points have been fitted with a flush steel cover and a water tight bung to prevent the ingress of surface water.

3.2.3 Soil Monitoring

On-going soil monitoring is not required at the installation during the life of the permit other than after specific spillage or pollution incidents and/or at surrender of the permit. Should future intrusive works be undertaken, the data from any exploratory holes will be added to the Reference Data for the site.

3.3 INFRASTRUCTURE MONITORING PROGRAMME

In general, infrastructure will be monitored as part of the Maintenance and Environmental Management Systems on site.

Maintenance of plant and equipment is essential to minimise environmental impact, ensure safe working of plant and equipment and sustain the production of product to the required quality.

The Maintenance activity within the Plant is split between preventative, modification and corrective work. Work within these areas is managed by departmental Planners and Schedulers in conjunction with Plant Managers. Maintenance is carried out using both an internal Brunner Mond team and an external resource for specialist testing / inspections and for supplementing site teams.

Preventative work includes examination and testing required by appropriate statutory obligations, regulations, manufacturers and suppliers recommendations, major equipment overhauls and minor “services” of equipment. This is to maintain identified equipment in a safe, efficient and reliable manner.

Modification work is aimed at improving reliability and designing out maintenance.

Corrective work is the day to day repair works carried out on site. A three week rolling plan is in operation developed by the Corrective Planner and the Site Scheduler.

The Maintenance Management Team co-ordinate staff and relevant sub contractors. Competency of external specialists and contractors is reviewed by the Maintenance Team and the Procurement Department.

All maintenance tasks carried out by maintenance personnel are subject to a permit to work system. Contractors are required to submit a work method statement and where appropriate are issued with a permit to work. All maintenance tasks are subject to risk assessment. Any records of equipment inspected and tested are kept in the Maintenance Department.

Corrective emergency or breakdown work is reviewed on an immediate and daily basis. Upon discovery of a fault with plant or equipment, parties with an interest, e.g. Plant Manager, will liaise with the Corrective Maintenance Manager and Scheduler to discuss details of the work needed.

Any waste generated by maintenance activities is disposed of appropriately. Hazardous Waste will be contained and labelled and disposed of via an approved contractor.

The infrastructure monitoring programme is summarised in Appendix H and comprises the following inspection programmes:

Surfacing

The majority of the facility is covered with concrete hardstanding and / or tarmac although within the site there are also areas of vegetation for aesthetic purposes.

There are a number of site roads on which chemicals are transported. However only a few, over which liquids are carried, represent a potential hazard with regard to ground contamination. The low number of traffic movements, site speed limit of 15mph and past history indicate that the risk of an incident occurring is very low. The measures proposed reflect this low risk.

However, the condition of the concrete and tarmac is variable in places with areas of cracking and potholes visible particularly in the high wear areas.

To ensure the integrity of impermeable hardstanding a programme of visual inspections will be conducted as follows:

Regular visual inspection of chemical off-loading areas undertaken as part of routine operational site tour with failures recorded on check sheet for corrective action.

Periodic visual inspection of all road surfaces recording for action any major defects with the potential to cause a significant risk of ground contamination.

Subsurface Structures

There are no underground storage tanks in use on site.

The only other subsurface structures on site are the effluent drains and sumps.

The only site drain where process chemicals are present and therefore have the potential to pose a risk of ground contamination is Drain 8. Other site drains carry predominately cooling water and therefore their only emission is heat. Because of this, the inspection programme will focus on Drain 8.

CCTV inspection of drains is not proposed as it would be necessary to ensure a drain is dry and totally clear before a CCTV survey could be carried out. Brunner Mond does not accept that there is any value in removing material from a drain unless it is significantly restricting flow through that drain. In addition, the physical removal of material such as scale adhering to a drain may, in itself, compromise the integrity of that drain.

Regular inspection of the effluent drains and sumps will therefore comprise:

Visual inspections of sumps carried out when inspecting the relevant bund.

Periodic visual inspection of Drain 8 for high levels of liquor head or restriction to flow.

Secondary Containment

Some of the above ground storage tanks have secondary containment. There is a procedure in place for the inspection of main containment infrastructure which is linked to the environmental management system to ensure integrity is maintained.

Regular visual inspection (for leaks and cracks) as part of routine operational site tour with failures recorded on check sheet for corrective action.

Periodic full inspection of bunds / bunded areas designated as environmentally critical.

Tanks and Associated Pipe Work

There is a procedure in place for the inspection of main containment infrastructure which is linked to the Environmental Management System to maintain integrity. This covers the inspection of tanks and associated pipe work.

Regular visual inspection of tanks and pipe work as part of routine operational site tour with failures recorded on check sheet for corrective action.

Full external inspection of tanks in accordance with documented pressure vessel inspection schedules or environmentally critical routine (frequencies are established for individual vessels etc.)

3.3.1 Personnel Issues

Personnel responsible for the inspection, testing and maintenance of pollution prevention infrastructure are to be trained to an appropriate level to ensure compliance with the Infrastructure Monitoring Programme. They will be competent through training, qualifications or experience to know what to inspect for and in the event of an issue being identified, would know what actions to take.

The Corrective Maintenance Manager will manage the inspection programme relating to secondary containment, tanks and associated pipe work with the Environment Manager having overall responsibility of the site Environmental Management System.

The Lead Project Engineer supported by the Asset Manager East shall manage the inspection programme relating to road surfaces and subsurface drains.

3.4 ASSESSMENT AND REPORTING PROCEDURES

The assessment and reporting procedure will be carried out within the scope of the Environmental Management System for the site (ISO 14001).

3.4.1 Assessment Procedure

Analytical Data

If a long term monitoring programme is required by the Environment Agency the data assessment procedure will comprise a comparison of recorded concentrations with initial reference data, trigger data and against historic trends.

One round of monitoring has been conducted as part of the site investigation, the adequacy of this data for setting trigger values will need to be discussed with the Environment Agency. Once the adequacy of the data has been determined Brunner Mond will propose trigger values for agreement with the Environment Agency.

A summary of the monitoring data will be sent to the Environment Agency by the 31st of January each year along with the results of the data assessment and any recommendations for amendments.

Infrastructure Monitoring Data

For infrastructure, an assessment of the potential for containment infrastructure to fail will be undertaken. The assessment will be carried out by responsible persons with the suitable technical and operational experience.

A summary of infrastructure monitoring data indicating any noted dysfunction of pollution control measures and corrective actions will be forwarded to the Environment Agency.

3.4.2 Reporting Procedure

As part of the long term monitoring programme, the data from ongoing monitoring will be transcribed to a spreadsheet and sorted by zone / location. In the event that any environmental monitoring indicates that new pollution of the groundwater has occurred, an emergency reporting procedure will be followed. The Environment Agency will be informed of the incident and the necessary data supplied.

Infrastructure monitoring will be recorded as will summaries of any pollution incidents and failure of containment measures resulting in emissions.

Summaries of the monitoring data and results of the data assessment will be submitted to the Environment Agency on the 31st January each year following the initiation of the SPMP together with recommendations for any amendments to the SPMP.

3.4.3 Recording and Data Management

All paper copies of signed laboratory sheets will be documented and stored appropriately under the Environmental Management System. In addition electronic copies of the analyses will be stored on the site computer system. The results will be transcribed onto an electronic summary spreadsheet, which will be used to generate a summary hardcopy.

Any assessment sheets used for the infrastructure assessment will be stored in a secure location.

4 References

- Technical Guidance Note IPPC H7 Integrated Pollution Prevention and Control (IPPC). Guidance on the Protection of Land Under the PPC Regime: Application Site Report and Site Protection and Monitoring Programme. Environment Agency 2003.
- Technical Guidance Note IPPC H7 (Reporting Template 5). Integrated Pollution Prevention and Control (IPPC). Template for Reporting of the Site Protection and Monitoring Programme for Installations where Reference Data is Required. Environment Agency 2003.
- Drinking Water Standards (UK) (2004).

5 Glossary

ASR – Application Site Report

Bgl – Below Ground Level

CCTV – Closed Circuit Television

CSM – Conceptual Site Model

CWG – Criteria Working Group

DBO – Distiller Blow Off

EMS – Environmental Management System

MTBE – Methyl tertiary butyl ether

PAH – Polycyclic Aromatic Hydrocarbons

PID – Photo Ionisation Detector

PRO – Petroleum Range Organics

SPMP – Site Protection and Monitoring Programme

TAME – Tert-amylmethyl ether

TPH – Total Petroleum Hydrocarbon

WS – Window Sample

Appendix A Figures and Plans

Appendix B Investigation and Sampling Protocols

Appendix C Analytical Protocols and Laboratory Accreditation

Appendix D Exploratory Hole Logs

Appendix E Chemical Analysis

Appendix F Notes on Limitations

General

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

WSP Environmental Limited accepts no responsibility or liability for:

a) the consequences of this document being used for any purpose or project other than for which it was commissioned, and

b) this document to any third party with whom an agreement has not been executed.

Phase I Environmental Audits

The work undertaken to provide the basis of this report comprised a study of available documented information from a variety of sources (including the Client), together with (where appropriate) a brief walk over inspection of the site and meetings and discussions with relevant authorities and other interested parties. The opinions given in this report have been dictated by the finite data on which they are based and are relevant only to the purpose for which the report was commissioned. The information reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in this report, WSP Environmental Limited reserves the right to review such information and, if warranted, to modify the opinions accordingly.

It should be noted that any risks identified in this report are perceived risks based on the information reviewed; actual risks can only be assessed following a physical investigation of the site.

Phase II Environmental Audits

The investigation of the site has been carried out to provide sufficient information concerning the type and degree of contamination, and ground and groundwater conditions to allow a reasonable risk assessment to be made. The objectives of the investigation have been limited to establishing the risks associated with potential human targets, building materials, the environment (including adjacent land), and to surface and groundwater.

The amount of exploratory work and chemical testing undertaken has necessarily been restricted by the short timescale available, and the locations of exploratory holes have been restricted to the areas unoccupied by the building(s) on the site and by buried services. A more comprehensive investigation may be required if the site is to be redeveloped as, in addition to risk assessment, a number of important engineering and environmental issues may need to be resolved.

For these reasons if costs have been included in relation to site remediation these must be considered as tentative only and must, in any event, be confirmed by a qualified quantity surveyor.

The exploratory holes undertaken, which investigate only a small volume of the ground in relation to the size of the site, can only provide a general indication of site conditions. The number of sampling points and the methods of sampling and testing do not preclude the existence of localised "hotspots" of contamination where concentrations may be significantly higher than those actually encountered.

The risk assessment and opinions provided, inter alia, take in to consideration currently available guidance values relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values.

Geo-environmental Investigations

The investigation of the site has been carried out to provide sufficient information concerning the type and degree of contamination, geotechnical characteristics, and ground and groundwater conditions to provide a reasonable assessment of the environmental risks together with engineering and development implications.

If costs have been included in relation to site remediation these must be confirmed by a qualified quantity surveyor.

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

The comments made on groundwater conditions are based on observations made at the time that site work was carried out. It should be noted that groundwater levels will vary owing to seasonal, tidal and weather related effects.

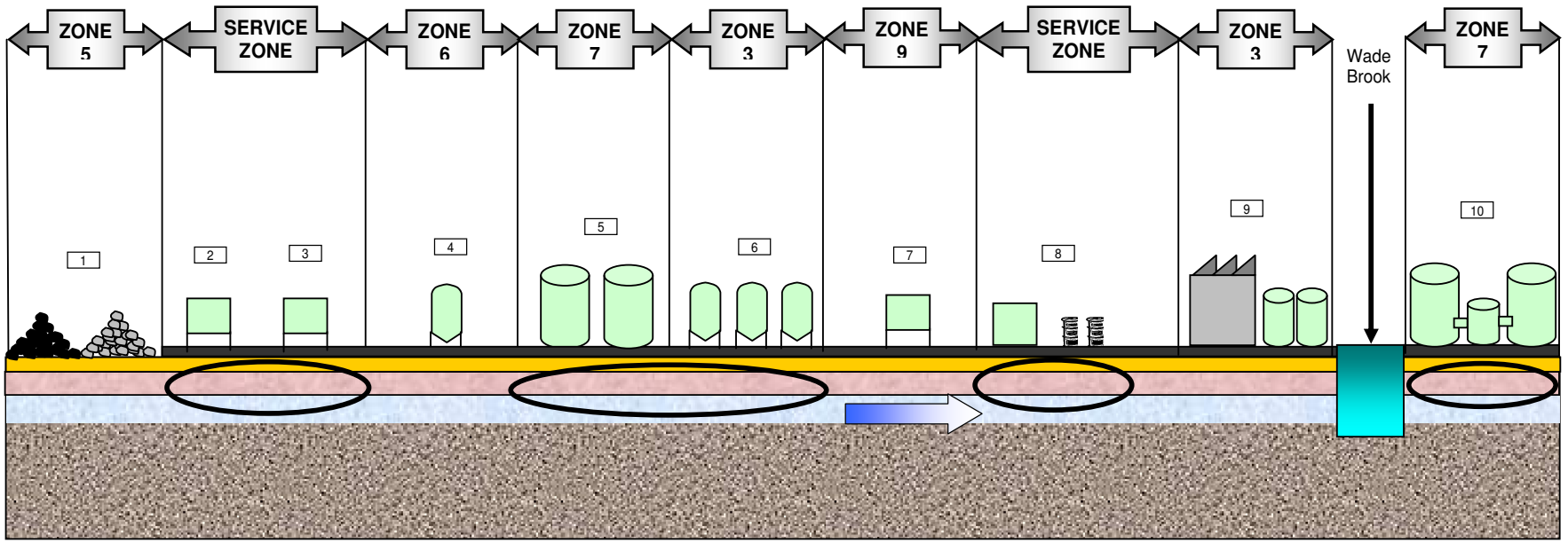
The scope of the investigation was selected on the basis of the specific development proposed by the Client and may be inappropriate to another form of development or scheme.

The risk assessment and opinions provided, inter alia, take in to consideration currently available guidance values relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values.

Appendix G Environmental Monitoring Protocols

Appendix H Infrastructure Monitoring Protocols

Appendix I Updated Conceptual Model



Concrete / tarmac

Made ground

1 Reference Note

Likely groundwater Flow direction

Alluvium

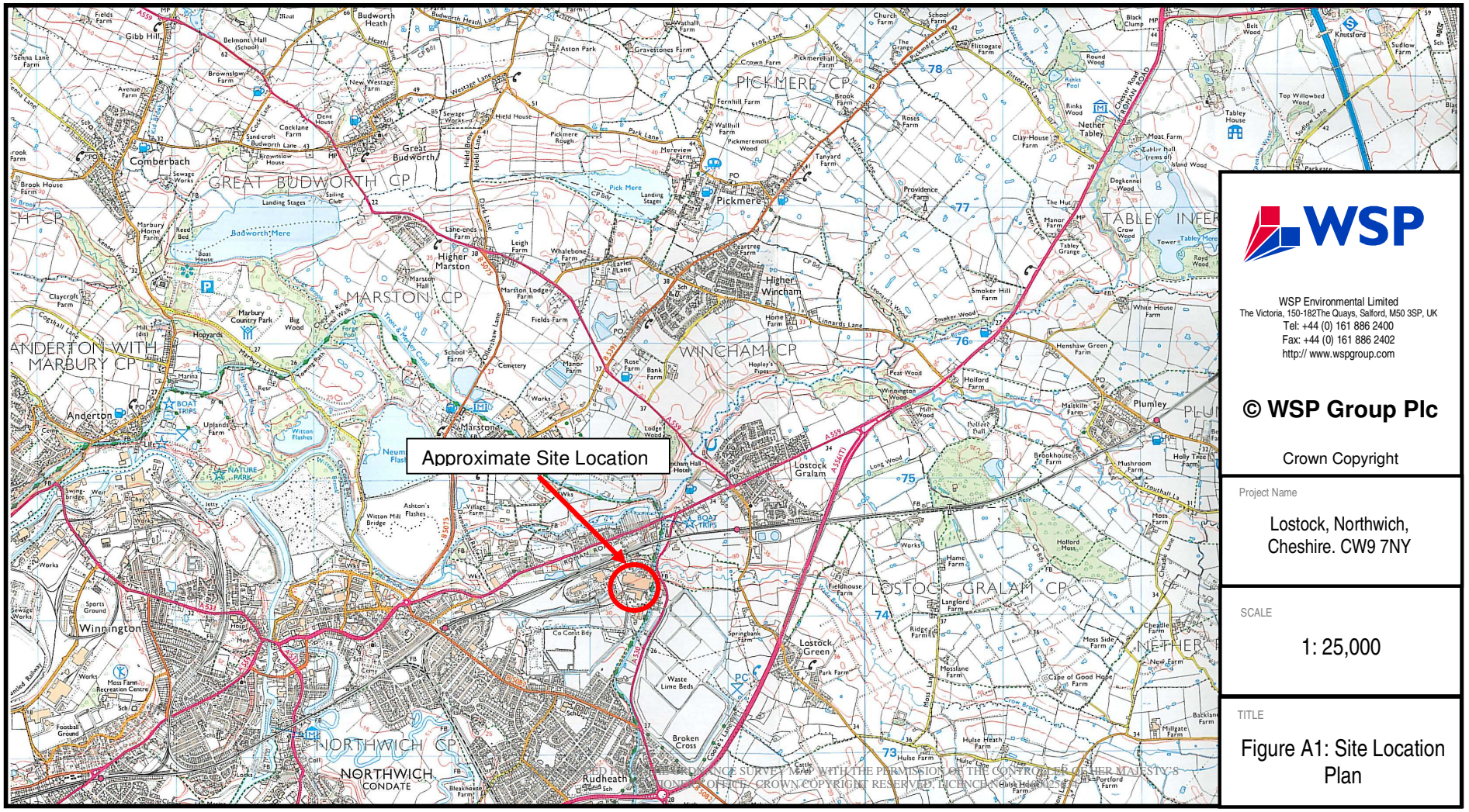
Glacial deposits

Potential contaminant source

Weathered Mudstone

Summary of Reference Points

1	Delivery by road / rail and stockpiles of coke and limestone	7	Contractors compound
2	Delivery, dispensing and storage of diesel	8	Waste oil storage and decanting
3	Delivery, dispensing and storage of diesel	9	Wetside
4	Delivery, transfer and storage of brine	10	Effluent waste treatment
5	Ammoniacal liquor delivery and storage		
6	Water treatment chemical storage area		



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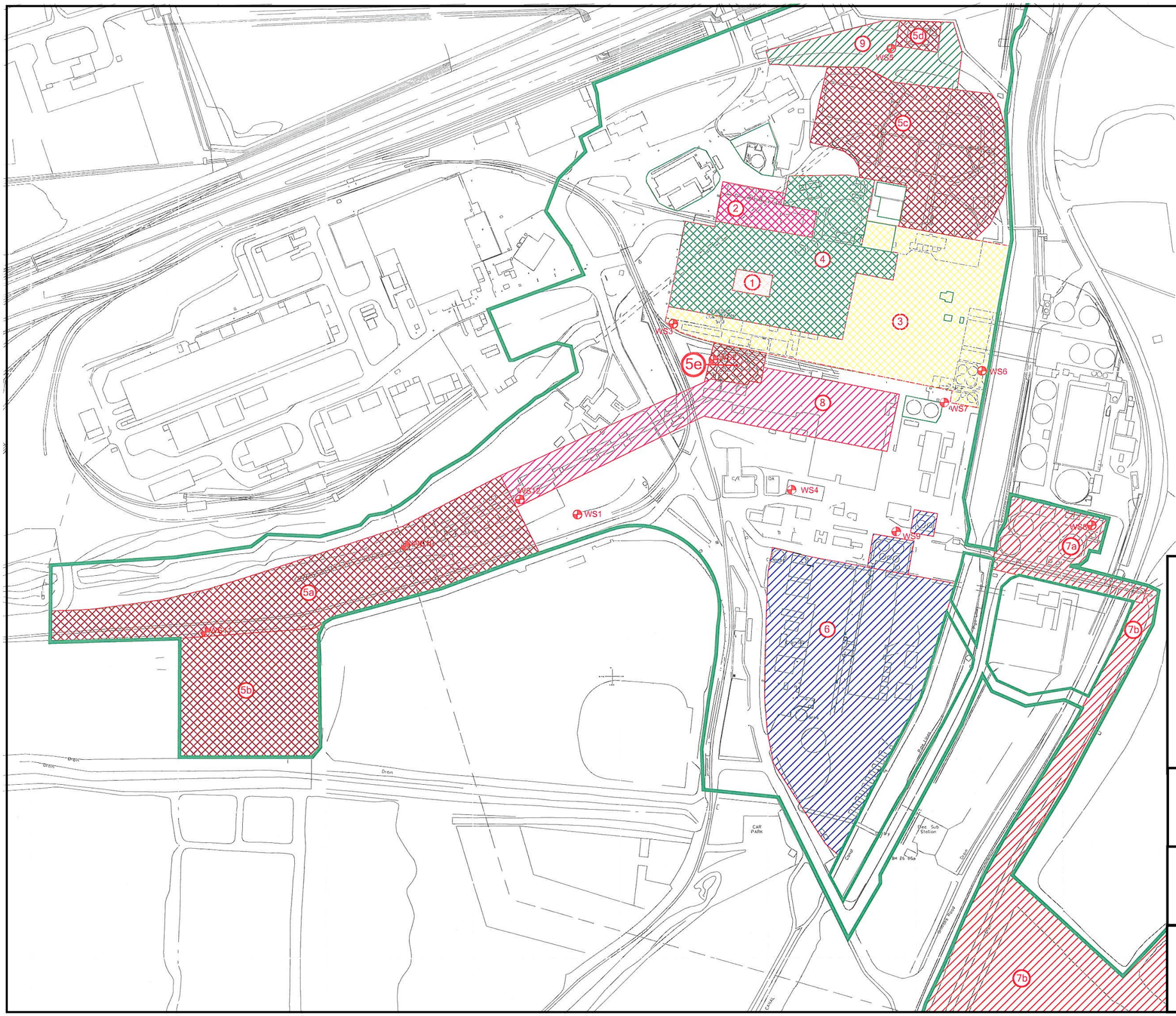
SCALE

1: 25,000

TITLE

Figure A1: Site Location Plan



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TITLE

Figure A2: Monitoring Well Location

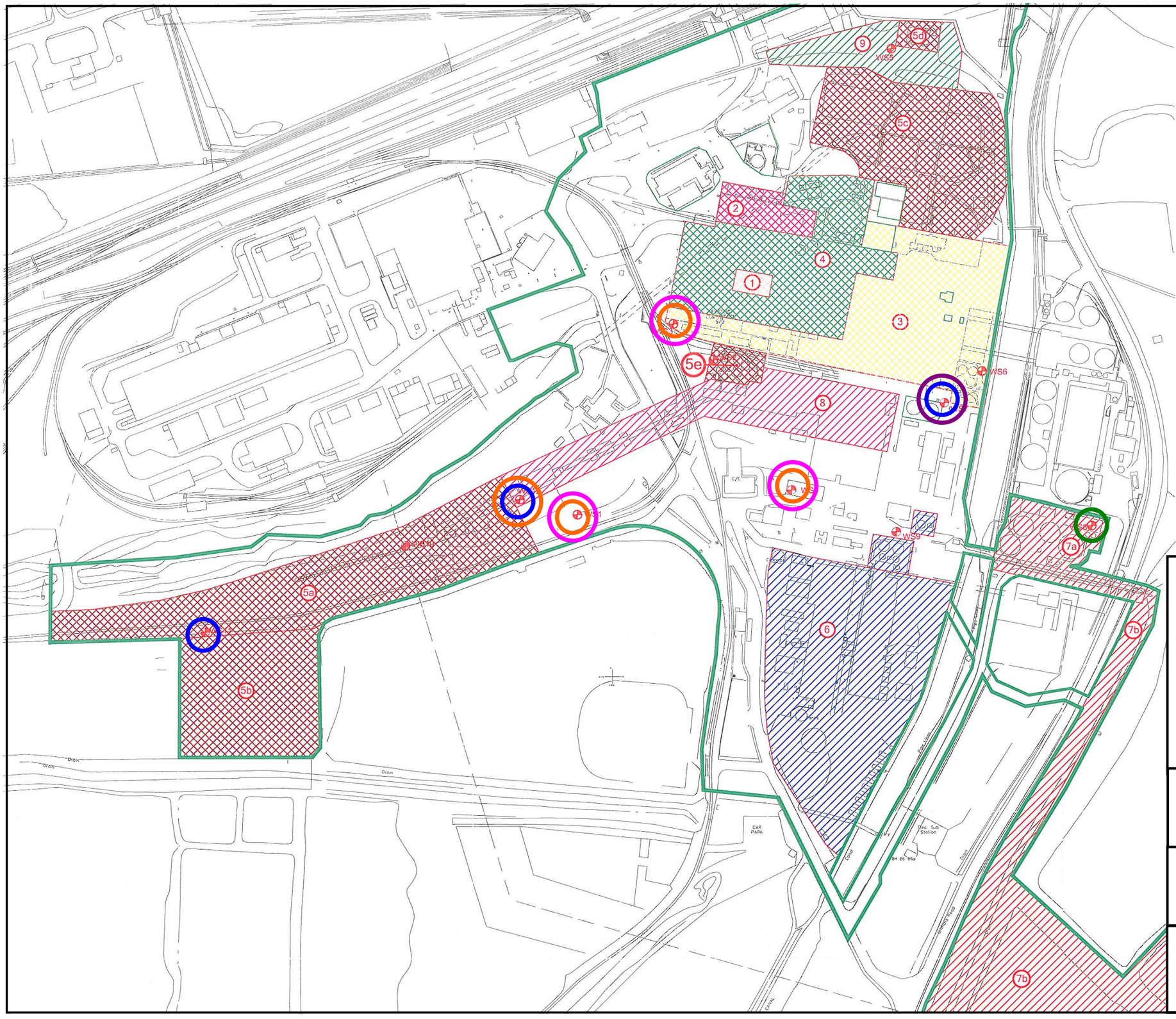

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Figure A3: Elevated Contaminants in Soil

Investigation Techniques

LIGHT CABLE PERCUSSION BORING

Light cable percussion boring is an adaptation of standard well-boring methods and uses a mobile rig specially designed for ground investigation work. The standard tripod rig is known as a cable percussion or shell and auger rig.

This technique is suitable for soils and weak rocks. The boreholes can be lined where required with steel casing and a wide variety of tools are used for different soil and rock types. Generally, borehole casings and tools are 120mm to 150mm in diameter and provide a maximum borehole depth of up to 40m in suitable strata.

The rig requires approximately 20m by 10m in order to enable set up and approximately 6m by 10m during operation. The rig is dismantled between holes and reduces to a 7m long by 2m wide trailer. The rig is moved using a 4 wheel drive Landrover type vehicle. Headroom requirements during operation are approximately 7.5m.

This type of exploratory hole is designed to provide information on ground conditions, soil and groundwater contamination and facilitate the installation of gas and groundwater monitoring wells.

GENERAL OPERATIONAL GUIDELINES

All site works shall be carried out in general accordance with BS5930: 1999 and BS10175: 2001. All exploratory holes will be logged by an appropriately experienced geologist / environmental consultant in general accordance with BS5930: 1999. Special consideration will also be given to the following general operational guidelines:

- a pressure washer shall be used to clean casing and tools between exploratory holes to minimise the potential for cross contamination between exploratory hole locations;
- when forming exploratory holes, care shall be taken to ensure that no significant pathways for contaminant migration are created by the exploratory technique being employed;
- Made Ground, Peat and soft / loose soils shall be proven / 'bottomed out' to the maximum possible extent of the exploratory hole technique being employed;
- typical depths of exploratory holes are as follows :

    i. trial pits (3 to 4m);
    ii. window sample holes (4 to 5m);
    iii. light cable percussion boreholes (10 to 20m dependent upon purpose); and,
    iv. rotary cored / openholes (30 to 50m dependent upon purpose).

- the construction of well installations shall be closely supervised;
- installations shall be designed with plain risers above slotted pipework installed across single specific water bodies as encountered;
- where shallow made ground / groundwater is encountered a 0.5m plain section of casing shall be employed to maximise the available response zone;

- the surround to the plain pipe section will comprise bentonite seals or cement bentonite grout;
- the surround to the slotted pipe section will comprise either ‘clean’ single sized pea gravel or filter sand dependant upon the characteristics of the horizon being monitored;
- a filter sock will be used on slotted pipework, where surrounding soils are fine grained silts / sands, to prolong the monitoring life of the installation unless hydrocarbon product is suspected in which case the filter sock may be omitted;
- dependent upon the objectives of the investigation, standpipes will be targeted at representative and differing horizons (e.g. made or natural ground and shallow or deep groundwater); and
- dual installations may be formed but only be employed within a minimum 150mm diameter borehole. The shallow and deep standpipes shall comprise 35mm and 50mm respectively which are separated by a minimum 2m thick bentonite seal.

Sampling and Monitoring Protocols

GENERAL

All operatives will be required to wear personal protective equipment (PPE) which is appropriate for the sampling or monitoring task being undertaken. Such equipment may include:

- protective boots;
- disposable overalls;
- fluorescent jacket or vest;
- hard hat;
- ear defenders;
- latex gloves, or similar; and,
- vapour / dust mask.

SOIL SAMPLING

Sampling shall be undertaken with the aim of adequately characterising each of the strata encountered on site. Broadly, where proposed ground levels are unlikely to change significantly from current levels the following soil sampling will be undertaken:

- one representative sample from the upper metre;
- sample other soils at engineers discretion to give representative sample population of key horizons encountered;
- targeted samples at visual / olfactory contamination; and,
- if contamination is identified a sample will be obtained from the next underlying 'clean' horizon.

Samples shall be obtained using the following methodology:

- all operatives shall wear disposable latex gloves, or similar, when sampling;
- all samples shall be taken using a stainless steel trowel;
- where no obvious visual / olfactory contamination is encountered the trowel shall be cleaned between samples using appropriate mechanical means (e.g. disposable paper towels);
- where obvious visual / olfactory contamination is encountered then the trowel shall be cleaned between samples using an appropriate detergent or cleaning agent; and,
- if the trowel cannot be cleaned using the above method then it will be replaced.

All sampling containers are designed to be used only once and when on site will be handled and stored in such a manner as to prevent exposure to dirt / contamination. The following sampling containers shall be used:

- 250ml amber glass jar for an inorganic screening suite;
- 250ml amber glass jar for a leachate and metals screening suite;
- 250ml amber glass jar for a suite of speciated hydrocarbons;
- 250ml amber glass jar for targeted hydrocarbon analysis (e.g. SVOC's); and,
- 40ml glass vial for volatile organic compounds.

GROUNDWATER SAMPLING

Prior to sampling of either perched or deep aquifers, wells will be left for at least one week after installation to allow groundwater to stabilise following formation. Before obtaining a sample the following preliminary observations and measurements will be made.

Initial Measurements

- general observations of borehole location relative to the surrounding area and site, including condition of the borehole casing;
- if specific gas monitoring readings are required these will be obtained before removing the gas valve;
- where there is cause for concern over volatile organic compounds (VOCs) an initial organic vapour reading will be taken using a Photo Ionisation Detector (PID) prior to removal of the gas valve;
- measure the diameter of the standpipe (in mm);
- where the presence of free product is suspected an interface probe shall be used to determine its apparent thickness;
- where encountered obtain a sample of free product using a bailer lowered gently into the water column;
- measure the depth to water from a marked ground level position and if necessary, the total depth of the well from the same position using an electronic depth to water meter; and,
- if necessary, calculate the volume of water in the well from the water column height and standpipe diameter including gravel pack ($\Pi r^2 h$).

All observations, measurements, readings and notes, etc. will be made in a field book for reference and photographs taken where deemed necessary.

It is anticipated that in-situ permeability testing of a number of boreholes will be performed in order to facilitate the risk assessment process. Depending on circumstances, this may entail either a falling or rising head test.

Purging the Borehole

Subject to the absence of free product, once the volume of the water standing in the borehole has been calculated the well may be purged. This entails removing a minimum of three water well volumes (the number will depend on the recharge characteristics of the well) using dedicated Watterra inertial pumps or bailers as appropriate.

The amount of water to be removed is dependent upon the 'recovery' rate of the well. If it is not possible to continuously pump, or the well is bailed dry, then the well will be allowed to recover for approximately 1 hour, and a sample recovered using a bailer.

Purged volumes will be measured by placing the discharged groundwater into a graduated container.

Following purging, the well will be allowed to recover sufficiently and sample obtained within an hour of purging completion.

Purged groundwater shall be disposed of in a manner agreed with the landowner and appropriate for any known / suspected contamination.

Sample Acquisition

All groundwater samples will be taken with a stainless steel or dedicated teflon bailer which will be lowered gently into the water column and allowed to fill. The bailer will be gently raised and the sample bottles filled to the top.

All sampling containers are to be used once only and when on site will be handled and stored in such a manner as to prevent exposure to dirt / contamination. The following sampling containers shall be used:

- 2no. 1000ml (or equivalent volume) plastic containers for an inorganic screening suite;
- 2no. 1000ml (or equivalent volume) amber glass containers for a suite of speciated hydrocarbons; and,
- 1no. 40ml glass vial for volatile organic compounds.

Within the practical constraints of the purging and sampling techniques employed, excessive disturbance of the groundwater will be minimised as this may affect the sample integrity. Bottles will be filled to the top avoiding air bubbles, especially in the VOC samples, and the top fastened securely as soon as possible to avoid the loss of VOCs.

SAMPLE HANDLING IN THE FIELD

No headspaces will be left in containers when laboratory testing of VOCs is proposed.

Significantly contaminated samples or those containing substances which may be airborne (e.g. asbestos fibres) will be 'double bagged' and appropriately labelled to prevent accidental exposure to laboratory staff.

All samples will be labelled with the following information:

- job name;
- job number;
- sample location;
- sample depth;
- date; and,
- engineers name or initials.

All sample handling will be conducted in the following manner:

- chemical samples will be placed in cool boxes with ice packs / blocks for transport to the laboratory;
- geotechnical samples will be handled in general accordance with BS5930 : 1999;
- packages of samples shall be accompanied by appropriate 'chain of custody' documentation, with comments provided in relation to suspected / obviously contaminated materials;
- if samples cannot be sent directly to the laboratory then sensitive samples which may degrade (e.g. hydrocarbons and water samples) shall be temporarily stored in a dedicated fridge to preserve their integrity;

Given that sample containers are 'clean' and are to be used only once, they are to be handled in a careful manner in the field, are glass (i.e. impermeable to significant background contamination) and transported in bubble wrap within cool boxes to the laboratory, it is considered that the use of field blanks is unnecessary.

SAMPLE HANDLING IN THE LABORATORY

Chemical

Upon receipt of a chemical testing schedule in our accredited laboratory, samples shall undergo the following:

- where necessary samples will be prepared and fixed using appropriate reagents;
- organic and water samples will be stored in a 'walk in' fridge until they can be tested;
- sample blanks (minimum 1 per 20 samples) follow the same 'route' through the laboratory to ensure that the test process does not cross-contaminate the samples;
- external elemental standards are used to calibrate the testing method and generate 3 to 4 point linear 'calibration' graphs upon which the samples can be compared to determine the concentration of respective determinands;
- soil chemical testing methods will generally be MCERTS accredited where reasonably possible. Where MCERTS accreditation is not held for a specific test method, the test will be performed in such a manner as to be compliant with MCERTS requirements.
- all methods are approved and undergo external independent checks by either UKAS or other proficiency testing organisations such as CONTEST or AQUACHECK.

Soils Methods

Method title	UKAS	MCERTS	Parameter	Reporting Limit (all mg/kg unless otherwise stated)	Uncertainty	%Bias	Method Description
Total Cyanide	Yes	No	Cyanide	2.0	0.08	0.0	Dried crushed soil is acidified with HCl and distilled into a NaOH trap. The resulting solution is made up to volume with distilled water, colour reagent is added and the Cyanide concentration determined by measuring the sample at 478nmon a UV/Vis spectro
Total Monohydric Phenols	Yes	No	Monohydric Phenols	2.50	0.071	1.0	Dried crushed soil is acidified with HCl and distilled into a NaOH trap. The resulting solution is made up to volume with distilled water, colour reagent is added and the Phenol concentration determined by measuring the sample at 508nm on a UV/Vis spectro
Total Mercury in Soil by Atomic Adsorption	No	No	Mercury	1.25			Dried crushed soil is aqua regia extracted.The extract is analysed by Hydride AA.
Total Selenium by Atomic Fluorescence	No	No	Selenium	0.5			Dried crushed soil is aqua regia extracted.The extract is analysed by Hydride Atomic Fluorescence.
Total metals in soil	Yes	No	Arsenic	2.50	0.034	-3.40	Dried crushed soil is aqua regia extracted.The extract is analysed by ICP-OES.
		No	Cadmium	0.25	0.0601	-6.10	
		Yes	Chromium	2.50	0.0728	-20.10	
		Yes	Copper	2.50	0.077	-9.60	
		Yes	Nickel	2.50	0.107	-0.20	
		Yes	Lead	2.50	0.0782	-6.40	
		Yes	Zinc	5.00	0.0401	-13.20	
		Yes	Barium	2.50	-	-	
		Yes	Berylium	2.50	-	-	
		Yes	Vanadium	2.50	-	-	
Total or Speciated PAH by GC-MS	Yes	Yes	Naphthalene	0.3	0.274	12.7	Dried crushed soil is extracted in DCM using ultrasonication. The resulting extract is analysed by
			Acenaphthylene	0.3	0.316	-13.7	
			Acenaphthene	0.3	0.490	-27.3	
			Flourene	0.3	0.380	-29.8	
			Phenanthrene	0.3	0.244	0.5	
			Anthracene	0.3	0.244	-11.4	
			Flouranthene	0.3	0.254	-1.2	
			Pyrene	0.3	0.240	2.6	
			Benzo (a) anthracene	0.3	0.330	-11.3	
			Chrysene	0.3	0.246	5.0	
			Benzo (k) fluoranthene	0.3	0.209	-0.2	
			Benzo (b) fluoranthene	0.3	0.379	-10.9	
			Benzo (a) pyrene	0.3	0.441	-29.1	
			Indeno [1,2,3-cd] fluoranthene	0.3	0.376	11.8	
			Dibenzo(a,h)anthracene	0.3	0.209	0.8	
			Benzo[ghi]perylene	0.3	0.374	8.1	
	No	No	Cyclopenta(cd)pyrene	0.3			
			Benzo(e)pyrene	0.3			
			Anthanthrene	0.3			
TPH by GC-FID	Yes	Yes	Kerosene (C_8 - C_{16})	50	-	-	Dried Crushed soil is extracted in Hexane/DCM using ultrasonication and analysed by GC-FID.
			Diesel (C_{12} -C_{35})	50	-	-	
			Mineral Oil (C_{24}-C_{40})	50	-	-	
Semi Volatile Oragnic Compounds (SVOC) in soil by GC-MS	No	No	Ethyl Methanesulfonate	1.3	-	-	As received soil is extracted in DCM using Soxtherm and analysed by GC-MS
			Aniline	1.3	-	-	
			Phenol	1.3	-	-	
			bis (2-chloroethyl) ether	1.3	-	-	
			2-chlorophenol	1.3	-	-	
			1,3-dichlorobenzene	1.3	-	-	
			1,4-dichlorobenzene	1.3	-	-	
			1,2-dichlorobenzene	1.3	-	-	
			2-methylphenol	1.3	-	-	
			acetophenone	1.3	-	-	
			nitrobenzene	1.3	-	-	
			n-nitrosopiperidine	1.3	-	-	
			isophorone	1.3	-	-	
			2-nitrophenol	1.3	-	-	
			bis-(2chloroethoxy) methane	1.3	-	-	
			2,4-dichlorophenol	1.3	-	-	
			1,2,4-trichlorobenzene	1.3	-	-	
			Naphthalene	1.3	-	-	
			2,6-dichlorophenol	1.3	-	-	
			hexachlorobutadiene	1.3	-	-	
			N-Nitroso-n-butylamine	1.3	-	-	
			4-chloro-3-methylphenol	1.3	-	-	
			2-methylnaphthalene	1.3	-	-	
			1,2,4,5-tetrachlorobenzene	1.3	-	-	
			2,4,6-trichlorophenol	1.3	-	-	
			2,4,5-trichlorophenol	1.3	-	-	
			2-chloronaphthalene	1.3	-	-	
			2-nitroaniline	1.3	-	-	
			dimethyl phthalate	1.3	-	-	
			acenaphthylene	1.3	-	-	
			2,6-dinitrotoluene	1.3	-	-	
			acenapthene	1.3	-	-	
			dibenzofuran	1.3	-	-	
			pentachlorophenol	1.3	-	-	
			2,4-dinitrotoluene	1.3	-	-	
			1-napthylamine	1.3	-	-	
			2,3,4,6-tetrachlorophenol	1.3	-	-	
			fluorene	1.3	-	-	
			4-chlorophenylphenyl ether	1.3	-	-	
			5-nitro-o-toluidine	1.3	-	-	
			diphenylamine	1.3	-	-	
			azobenzene	1.3	-	-	
			4-bromophenylphenyl ether	1.3	-	-	
			phenacetin	1.3	-	-	
			hexachlorobenzene	1.3	-	-	
			pentachlorophenol	1.3	-	-	
			pentachloronitrobenzene	1.3	-	-	
			phenanthrene	1.3	-	-	
			anthracene	1.3	-	-	
			fluoranthene	1.3	-	-	
			pyrene	1.3	-	-	
			dimethylaminoazobenzene	1.3	-	-	
			butyl benzylphthalate	1.3	-	-	
			2-acetylaminofluorene	1.3	-	-	
			benzo(a)anthracene	1.3	-	-	
			chrysene	1.3	-	-	
			di-n-octyl phthalate	1.3	-	-	
			benzo(b)fluoranthene	1.3	-	-	
			benzo(k)fluoranthene	1.3	-	-	
			benzo(a)pyrene	1.3	-	-	
			3-methylcholanthrene	1.3	-	-	
			indeno(1,2,3-cd)pyrene	1.3	-	-	
			Dibenzo(a,h)anthracene	1.3	-	-	
			benzo(ghi)perylene	1.3	-	-	

Method title	UKAS	MCERTS	Parameter	Reporting Limit (all mg/kg unless otherwise stated)	Uncertainty	%Bias	Method Description
Volatile Organic Compounds (VOC) Units in µg/Kg	No	No	Chloromethane	5.0	-	-	As-received sample is analysed by Headspace - GC MS
			Dichlorodifluoromethane	1.0	-	-	
			Vinyl Chloride	1.0	-	-	
			Bromomethane	5.0	-	-	
			Chloroethane	1.0	-	-	
			Trichlorofluoromethane	1.0	-	-	
			Methyl Tert-Butyl ether (MTBE)	1.0	0.238	-5.5	
			1,1-Dichloroethene	1.0	0.165	-0.8	
			Trans-1,2-Dichloroethene	1.0	0.155	-0.6	
			1,1-Dichloroethane	1.0	0.182	4.5	
			Cis-1,2-Dichloroethene	1.0	0.128	-0.4	
			2,2-Dichloropropane	10.0	-	-	
			Chloroform	5.0	0.252	8.8	
			Bromochloromethane	5.0	0.248	9.6	
			1,1,1-Trichloroethane	1.0	0.253	9.6	
			1,2-Dichloroethane	1.0	0.227	4.7	
			1,1-Dichloropropene	1.0	0.125	0.5	
			Benzene	1.0	0.135	1.2	
			Carbon Tetrachloride	1.0	0.341	19.9	
			Trichloroethene	1.0	0.292	3.2	
			1,2-Dichloropropane	1.0	0.157	3.6	
			Dibromomethane	1.0	0.213	4.2	
			Bromodichloromethane	5.0	-	-	
			Toluene	1.0	0.159	-2.4	
			1,1,2-Trichloroethane	1.0	1.362	-29.1	
			1,3-Dichloropropane	1.0	-	-	
			Dibromochloromethane	5.0	-	-	
			1,2-Dibromoethane	1.0	0.128	0.7	
			Tetrachloroethene	1.0	0.281	6.2	
			Chlorobenzene	1.0	-	-	
			1,1,1,2-Tetrachloroethane	1.0	0.190	10.0	
			Ethylbenzene	1.0	0.173	-3.4	
			o-Xylene	1.0	0.182	-4.4	
			Styrene	1.0	0.138	-0.2	
			Bromoform	5.0	-	-	
			m/p-Xylene	1.0	0.145	-1.2	
			1,1,2,2-Tetrachloroethane	5.0	0.195	7.1	
			1,2,3-Trichloropropane	5.0	-	-	
			Isopropylbenzene	1.0	-	-	
			Bromobenzene	1.0	0.152	7.1	
			n-Propylbenzene	1.0	-	-	
			2-Chlorotoluene	1.0	-	-	
			4-Chlorotoluene	1.0	-	-	
			1,3,5-Trimethylbenzene	1.0	0.191	-1.3	
			Tert-butylbenzene	1.0	-	-	
			1,2,4-Trimethylbenzene	1.0	-	-	
			sec-Butylbenzene	1.0	-	-	
			1,4-Dichlorobenzene	1.0	-	-	
			1,3-Dichlorobenzene	1.0	-	-	
			1,2-Dichlorobenzene	1.0	0.149	2.1	
			n-Butylbenzene	5.0	-	-	
			1,2-Dibromo-3-chloropropane	5.0	-	-	
			1,2,4-Trichlorobenzene	1.0	-	-	
			Naphthalene	5.0	0.161	0.6	
			Hexachlorobutadiene	10.0	-	-	
			1,2,3-Trichlorobenzene	1.0	0.139	0.2	
Petrol Range Organics (PRO) in Soil by Headspace GC-MS	No	No	Petrol Range Organics	0.2	-	-	As-received sample is analysed by Headspace - GC MS
pH of Soil	No	No	Soil pH	N/A	-	-	Dried, crushed soil is shaken with distilled water and the pH of the resulting suspension is determined using a glass pH electrode and pH meter.
Water Soluble Sulphate in Soil	Yes	Yes	Water Soluble Sulphate	100	-	-	Dried, crushed soil is shaken with distilled water and the concentration of sulphate is determined by ICP-OES.
Hot Water Soluble Boron in Soil	No	No	Hot Water Soluble Boron	0.5	-	-	Dried, crushed soil is extracted in boiling water. The filtrate is analyaed by ICP-OES.
Speciated Phenols in soil by HPLC	Yes	Yes	Phenol	0.4	-	-	As received soil is extracted with water methanol mix. The extract is analysed by HPLC.
		Yes	4 Nitrophenol	0.4	-	-	
		Yes	2,4 Dinitrophenol	0.4	-	-	
		Yes	2 Chlorophenol	0.4	-	-	
		Yes	2 Nitrophenol	0.4	-	-	
		No	2,4 Dimethylphenol	0.4	-	-	
		Yes	2 Methyl-4,6-Dinitorphenol	0.4	-	-	
		Yes	4 Chloro-3-methylphenol	0.4	-	-	
		Yes	2,4 Dichlorophenol	0.4	-	-	
		Yes	2-Methyl-4,6-dinitrophenol	0.4	-	-	
		Yes	Pentachlorophenol	0.4	-	-	
Water Soluble Chloride in Soil	No	No	Water Soluble Chloride	100	-	-	Dried, crushed soil is shaken with distilled water and the concentration of sulphate is determined by colourimetry.
Water Soluble Nitrate in Soil	No	No	Water Soluble Nitrate	2	-	-	Dried, crushed soil is shaken with distilled water and the concentration of Nitrate is determined by colourimetry.

Water and Leachate Methods

Method title	UKAS		Parameter	Reporting Limit (ug/l unless stated)	Uncert-ainty	Bias	Method Description
Total Cyanide	Yes		Cyanide	40	11.32	-0.02	Filtered water is acidified with HCl and distilled into a NaOH trap. The resulting solution is analysed by colourimetry
Monohydric Phenols	Yes		Monohydric Phenols	200	6.34	-0.5	Filtered water is acidified with HCl and distilled into a NaOH trap. The resulting solution is analysed by colourimetry
Metals	Yes		Arsenic	10	2.03	-0.4	Filtered sample is acidified with nitric acid. The solution is analysed by ICP-OES.
			Cadmium	5	2.95	-1.3	
			Chromium	5	2.66	0.4	
			Copper	5	2.33	-4.1	
			Nickel	5	2.46	-2.9	
			Lead	10	3.01	-4.2	
			Zinc	7	2.45	-1.5	
Mercury	No		Mercury	0.2	0.1103	1.3	Filtered sample is digested with concentrated HCl and KBrO3/KBr solution, then reduced and analysed by Atomic Fluorescence.
Volatile Organic Compounds (VOC) Waters Only	No		Chloromethane	2.0	-	-	As-received sample is analysed by Headspace - GC MS
			Dichlorodifluoromethane	1.0	-	-	
			Vinyl Chloride	1.0	-	-	
			Bromomethane	2.0	-	-	
			Chloroethane	1.0	-	-	
			Trichlorofluoromethane	1.0	-	-	
			Methyl Tert-Butyl ether (MTBE)	1.0	-	-	
			1,1-Dichloroethene	1.0	-	-	
			Trans-1,2-Dichloroethene	1.0	-	-	
			1,1-Dichloroethane	1.0	-	-	
			Cis-1,2-Dichloroethene	1.0	-	-	
			2,2-Dichloropropane	5.0	-	-	
			Chloroform	1.0	-	-	
			Bromochloromethane	1.0	-	-	
			1,1,1-Trichloroethane	1.0	-	-	
			1,2-Dichloroethane	1.0	-	-	
			1,1-Dichloropropene	1.0	-	-	
			Benzene	1.0	-	-	
			Carbon Tetrachloride	1.0	-	-	
			Trichloroethene	1.0	-	-	
			1,2-Dichloropropane	1.0	-	-	
			Dibromomethane	1.0	-	-	
			Bromodichloromethane	1.0	-	-	
			Toluene	1.0	-	-	
			1,1,2-Trichloroethane	1.0	-	-	
			1,3-Dichloropropane	1.0	-	-	
			Dibromochloromethane	1.0	-	-	
			1,2-Dibromoethane	1.0	-	-	
			Tetrachloroethene	1.0	-	-	
			Chlorobenzene	1.0	-	-	
			1,1,1,2-Tetrachloroethane	1.0	-	-	
			Ethylbenzene	1.0	-	-	
			m-Xylene	1.0	-	-	
			Styrene	1.0	-	-	
			Bromoform	2.0	-	-	
			o/p-Xylene	1.0	-	-	
			1,1,2,2-Tetrachloroethane	1.0	-	-	
			1,2,3-Trichloropropane	1.0	-	-	
			Isopropylbenzene	1.0	-	-	
			Bromobenzene	1.0	-	-	
			n-Propylbenzene	1.0	-	-	
			2-Chlorotoluene	1.0	-	-	
			4-Chlorotoluene	1.0	-	-	
			1,3,5-Trimethylbenzene	1.0	-	-	
			Tert-butylbenzene	1.0	-	-	
			1,2,4-Trimethylbenzene	1.0	-	-	
			sec-Butylbenzene	1.0	-	-	
			1,4-Dichlorobenzene	1.0	-	-	
			1,3-Dichlorobenzene	1.0	-	-	
			1,2-Dichlorobenzene	1.0	-	-	
			n-Butylbenzene	1.0	-	-	
			1,2-Dibromo-3-chloropropane	1.0	-	-	
			1,2,4-Trichlorobenzene	1.0	-	-	
			Naphthalene	2.0	-	-	
			Hexachlorobutadiene	5.0	-	-	
			1,2,3-Trichlorobenzene	1.0	-	-	
Selenium	No		Selenium	5	-	-	Filtered samples are analysed using Hydride Atomic Fluorescence
Boron	No		Boron	30	-	-	Filtered samples are analysed using ICP-OES
pH	No		pH	N/A	-	-	The pH of a filtered sample is determined using a glass pH electrode and pH meter.
Sulphate	No		Sulphate	20 mgl^{-1}	-	-	The concentration of sulphate in the filtered sample is determined by ICP-OES.
Petrol Range Organics (PRO) Waters Only	No		Petrol Range Organics	100	-	-	Samples are analysed by Headspace - GC MS.
Speciated Phenols	No		Phenol	0.1			Filtered samples are analysed by HPLC
			4 Nitrophenol				
			2,4 Dinitrophenol				
			2 Chlorophenol				
			2 Nitrophenol				
			2,4 Dimethylphenol				
			2 Methyl-4,6-Dinitrophenol				
			4 Chloro-3-methylphenol				
			2,4 Dichlorophenol				
			2-Methyl-4,6-dinitrophenol				
			Pentachlorophenol				
Chloride	No		Chloride	50 mg/l			Filtered sample is analysed by colorimetry
Ammonium	No		Ammonium	1.3 mg/l			Filterered sample is analysed using Hach-Lange test kit LCK305
Fluoride	No		Fluoride	0.1 mg/l			Filterered sample is analysed using Hach-Lange test kit LCK323
Nitrate	No		Nitrate	1.0 mg/l			Filterered sample is analysed using Hach-Lange test kit LCK339
Nitrite	No		Nitrite	0.05 mg/l			Filterered sample is analysed using Hach-Lange test kit LCK341
Ferrous Iron	No		Iron $^{3+}$	0.2 mg/l			Filterered sample is analysed using Hach-Lange test kit LCK320
Sulphide	No		Sulphide	0.1 mg/l			Filterered sample is analysed using Hach-Lange test kit LCK653

WSP Environmental
150-182 The Quays, Salford
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WINDOW SAMPLE LOG

Hole No. **WS1**

Project: Brunner Mond, Lostock SPMP

Sheet: 1 of 1

Job No: 12121577/001

Client: Brunner Mond

Date: 17-09-08

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates ()	Ground Level (m)
GSS	Window Sampler	Marie Jones		

SAMPLES & TESTS							STRATA						Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (m)	Depth (Thick-ness)	Description	Legend	Geology		Dia. mm
								0.15	Concrete. (MADE GROUND)		CONC		
0.30-0.50	ES							(1.25)	Black sandy subangular to subrounded fine to coarse gravel of ash, clinker, sandstone, slag and mixed lithologies. (MADE GROUND)		MG		
								1.40					
1.45-1.65	ES							1.65	White/grey/black sandy subangular to subrounded fine to coarse gravel of ash, clinker, sandstone and mixed lithologies. (MADE GROUND)		MG		
									1.40 - 1.65 White paste encountered.				
								(1.05)	Black sandy subangular to subrounded fine to coarse gravel of ash, clinker, sandstone, slag and mixed lithologies. (MADE GROUND)		MG		
								2.70					
2.75-2.85	ES							(0.30) 3.00	Soft black/brown slightly gravelly slightly sandy clay, Gravel is subangular to subrounded fine to coarse of mixed lithologies and occasional ash and clinker. (MADE GROUND)		MG		
									2.70 - 3.00 Old hydrocarbon odour encountered.		MG		
								3.25	Black sandy subangular to subrounded fine to coarse gravel of ash, clinker, sandstone, slag and mixed lithologies. (MADE GROUND)				
3.30-3.50	ES							(0.75)	Stiff red/brown slightly gravelly CLAY. Gravel is subangular to subrounded fine to medium of mudstone and mixed lithologies. (GLACIAL DEPOSITS)		GD		
								4.00					
									Borehole terminated at 4.00m bgl due to collapse to 3.30m bgl.				

Hole Diameter			Recovery			Water Strikes					
Depth	Diameter (mm)	Remarks	Core Top (m)	Core Base (m)	% Recovery	Date	Time	Strike	Minutes	Standing	Casing

General Remarks

Window sample terminated at 4.00m bgl due to collapse. No groundwater encountered during excavation. White paste encountered between 1.40 and 1.65m bgl. Old hydrocarbon odour encountered between 2.70 and 3.00m bgl. Window sample hole installed upon completion. Reponse zone between 0.50-3.00m bgl.

Scale 1:37.5

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

08 WSP WINDOW SAMPLE LOG LOGS.GPJ WSPETEMPLATE1.03.GDT 29/10/08

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WINDOW SAMPLE LOG

Hole No. **WS10**

Project: Brunner Mond, Lostock SPMP

Sheet: 1 of 1

Job No: 12121577/001

Client: Brunner Mond

Date: 16-09-08

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates ()	Ground Level (m)
GSS	Window Sampler	Marie Jones		

SAMPLES & TESTS							STRATA						Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (m)	Depth (Thick-ness)	Description	Legend	Geology		Dia. mm
								0.19	Concrete. (MADE GROUND)		CONC		
								0.30	Grey slightly sandy angular to subangular fine to coarse gravel of sandstone hardcore. (MADE GROUND)		MG		
0.30-0.50	ES							(0.50) 0.80	Black slightly sandy subangular to subrounded fine to medium gravel of ash, clinker, coke occasional slag and mixed lithologies. (MADE GROUND)		MG		
								(0.70) 1.50	Brown slightly gravelly medium sand. Gravel is subangular to subrounded fine to medium of coke, ash, clinker and slag. (MADE GROUND) 1.20 - 1.30 Band of gravelly sand encountered.		MG		
1.60-1.80	ES							(0.30) 1.80	Orange/brown medium SAND. (GLACIAL DEPOSITS)		GDU		
								(0.90) 2.70	Firm red/orange brown slightly sandy CLAY. (GLACIAL DEPOSITS) 1.90 - 2.70 Becoming stiff to very stiff towards 2.70m bgl. 2.30 Mottled grey.		GDU		
								(1.30) 4.00	Very stiff red/brown mottled grey slightly gravelly CLAY. Gravel is angular to subangular fine to coarse of mudstone. (WEATHERED MUDSTONE)		MMG		
									Borehole refused at 4.00m bgl on mudstone.				

Hole Diameter			Recovery			Water Strikes					
Depth	Diameter (mm)	Remarks	Core Top (m)	Core Base (m)	% Recovery	Date	Time	Strike	Minutes	Standing	Casing

General Remarks
Window sample complete at 4.00m bgl. No groundwater encountered during excavation.
No significant visual or olfactory evidence of contamination observed during excavation.
Window sample installed upon completion. Response zone between 1.50-4.00m bgl.

Scale 1:37.5

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

08 WSP WINDOW SAMPLE LOG LOGS.GPJ WSPETEMPLATE1.03.GDT 29/10/08

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WINDOW SAMPLE LOG

Hole No. **WS11**

Project: Brunner Mond, Lostock SPMP

Sheet: 1 of 1

Job No: 12121577/001

Client: Brunner Mond

Date: 16-09-08

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates ()	Ground Level (m)
GSS	Window Sampler	Marie Jones		

SAMPLES & TESTS							STRATA						Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (m)	Depth (Thick-ness)	Description	Legend	Geology		Dia. mm
								0.23	Concrete. (MADE GROUND)		CONC		
0.30-0.50	ES							(0.42) 0.65	Black sandy subangular to subrounded fine to medium gravel of ash, clinker, coke, slag, sandstone and mixed lithologies with many wood fragments and occasional metal fragments. (MADE GROUND) 0.25 - 0.65 Faint organic odour encountered.		MG		
								0.80	Red brick angular cobbles. (MADE GROUND)		MG		
								1.00	Brown/grey subangular to subrounded fine to coarse sandy gravel of sandstone quartz and mixed lithologies. (MADE GROUND) 0.80 Concrete cobble encountered.		MG		
1.10-1.90	ES							(0.90) 1.90	Red/ brown fine clayey SAND with occasional gravel of mixed lithologies. (GLACIAL DEPOSITS) 1.00 Concrete cobble.		GDU		
								(0.45) 2.35	Red/brown fine to medium SAND. (GLACIAL DEPOSITS)		GDU		
						1		(0.65) 3.00	Red/ brown fine clayey SAND with occasional gravel of mixed lithologies. (GLACIAL DEPOSITS) 2.80 - 3.00 Becoming more clayey towards 3.00m bgl.		GDU		
								(0.50) 3.50	Red/brown fine to medium SAND. (GLACIAL DEPOSITS)		GDU		
								(0.30) 3.80	Stiff red/brown slightly gravelly sandy CLAY. Gravel is subangular to subrounded fine to coarse of mixed lithologies. (GLACIAL DEPOSITS)		GDU		
									Borehole refused at 3.80m bgl on very stiff clay, collapsed back to 3.00m bgl.				

Hole Diameter			Recovery			Water Strikes					
Depth	Diameter (mm)	Remarks	Core Top (m)	Core Base (m)	% Recovery	Date	Time	Strike	Minutes	Standing	Casing
								3.00			

General Remarks

Window sample refused on very stiff clay at 3.80m bgl. Groundwater encountered at 3.00m bgl. Slight organic odour observed between 0.23-0.65m bgl. Window sample hole installed upon completion. Repsonse zone between 1.00-3.00m bgl.

Scale 1:37.5

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

08 WSP WINDOW SAMPLE LOG LOGS.GPJ WSPETEMPLATE1.03.GDT 29/10/08

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WINDOW SAMPLE LOG

Hole No. **WS12**

Project: Brunner Mond, Lostock SPMP

Sheet: 1 of 1

Job No: 12121577/001

Client: Brunner Mond

Date: 16-09-08

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates ()	Ground Level (m)
GSS	Window Sampler	Marie Jones		

SAMPLES & TESTS							STRATA						Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (m)	Depth (Thick-ness)	Description		Legend	Geology	Dia. mm
								0.19	Concrete. (MADE GROUND)			CONC	
								0.35	Grey brown slightly clayey slightly gravelly medium to coarse sand. Gravel is subangular to subrounded fine to medium of sandstone and mixed lithologies. (MADE GROUND)			MG	
								0.50				MG	
0.50-0.75	ES							0.75	Yellow/brown slightly clayey slightly gravelly medium to coarse sand. Gravel is subangular to subrounded fine to medium of sandstone and mixed lithologies. (MADE GROUND)			MG	
1.00-1.20	ES								Black gravelly coarse sand. Gravel is subangular to subrounded, fine to medium of ash, clinker and mixed lithologies. (MADE GROUND)				
									Soft white/grey/blue slightly gravelly clay. Gravel is subangular to subrounded fine to coarse of ash, clinker and occasional brick. (MADE GROUND)				
								(3.35)				MG	
									3.00 - 4.00 Patches of white/grey paste encountered.				
3.50-3.60	ES												
								4.10					
									No recovery, collapse to 4.00m bgl.				
								(0.90)					
								5.00					
									Borehole complete at 5.00m bgl.				

Hole Diameter			Recovery			Water Strikes					
Depth	Diameter (mm)	Remarks	Core Top (m)	Core Base (m)	% Recovery	Date	Time	Strike	Minutes	Standing	Casing
								4.00			

General Remarks

Window sample hole complete at 5.00m bgl and collapsed back to 4.00m bgl. Groundwater encountered at 4.00m bgl. White/grey paste encountered between 0.75-4.10m bgl. Window sample installed upon completion. Response zone between 0.10-4.00m bgl.

Scale 1:37.5

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

08 WSP WINDOW SAMPLE LOG LOGS.GPJ WSPETEMPLATE1.03.GDT 29/10/08

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WINDOW SAMPLE LOG

Hole No. **WS2**

Project: Brunner Mond, Lostock SPMP

Sheet: 1 of 1

Job No: 12121577/001

Client: Brunner Mond

Date: 17-09-08

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates ()	Ground Level (m)
GSS	Window Sampler	Marie Jones		

SAMPLES & TESTS							STRATA						Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (m)	Depth (Thick-ness)	Description		Legend	Geology	Dia. mm
								0.25	Concrete. (MADE GROUND)			CONC	
								0.40	Grey angular to subangular medium to coarse gravel of sandstone (hardcore). (MADE GROUND)			MG	
								(0.95)	Black slightly sandy angular to subrounded fine to coarse gravel of ash, clinker, slag and mixed lithologies. (MADE GROUND) 1.00 - 5.00 Faint ammonia odour encountered at 1.00m bgl becoming strong with depth.			MG	
								1.35					
1.50-1.70	ES							(0.65)	Yellow/brown slightly clayey sandy angular to subrounded fine to coarse gravel of ash, clinker, sandstone and slag. (MADE GROUND)			MG	
								2.00					
2.10-2.30	ES					▼1		(0.80)	Black sandy angular to subrounded fine to coarse gravel of ash, clinker, slag and mixed lithologies. (MADE GROUND) 2.00 - 2.80 Oily sheen with hydrocarbon odour encountered. 2.60 - 2.80 Becoming very sandy towards 2.80m bgl.			MG	
								2.80					
4.10-4.30	ES							(2.20)	Stiff red/brown slightly sandy gravelly CLAY, Gravel is subangular to subrounded fine to medium of mixed lithologies and mudstone. (ALLUVIUM) 2.80 - 4.00 Black oily sheen and strong hydrocarbon odour encountered.			ALV	
								5.00					
									Borehole complete at 5.00m bgl.				

Hole Diameter			Recovery			Water Strikes					
Depth	Diameter (mm)	Remarks	Core Top (m)	Core Base (m)	% Recovery	Date	Time	Strike	Minutes	Standing	Casing
								2.50			

General Remarks

Window sample complete at 5.00m bgl. Groundwater encountered at 2.50m bgl. Ammonia odour encountered from 1.00 to 5.00m bgl. Hydrocarbon odour encountered from 2.00 to 2.80m bgl. Oily sheen observed from 2.00 to 4.00m bgl. Window sample hole installed upon completion. Reponse zone between 1.00-5.00m bgl.

Scale 1:37.5

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

08 WSP WINDOW SAMPLE LOG LOGS.GPJ WSPETEMPLATE1.03.GDT 29/10/08

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WINDOW SAMPLE LOG

Hole No. **WS3**

Project: Brunner Mond, Lostock SPMP

Sheet: 1 of 1

Job No: 12121577/001

Client: Brunner Mond

Date: 17-09-08

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates ()	Ground Level (m)
GSS	Window Sampler	Marie Jones		

SAMPLES & TESTS							STRATA						Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (m)	Depth (Thick-ness)	Description		Legend	Geology	Dia. mm
								0.17	Concrete. (MADE GROUND)			CONC	
								0.30	Grey angular to subangular medium to coarse gravel of sandstone hardcore. (MADE GROUND)			MG	
0.30-0.50	ES							(1.20)	Black slightly sandy angular to subrounded fine to coarse gravel of ash, clinker, brick, slag, concrete, coke and sandstone. (MADE GROUND)			MG	
								1.50					
								(0.30)	Brown/yellow gravelly coarse sand. Gravel is subangular to subrounded fine to coarse of coke, ash, clinker and sandstone. (MADE GROUND)			MG	
								1.80					
								2.00	White/yellow/brown gravelly coarse sand. Gravel is angular to subrounded fine to coarse of slag, coke, ash, clinker and sandstone. (MADE GROUND)			MG	
						1		(2.00)	Black slightly sandy angular to subrounded fine to coarse gravel of ash, clinker, brick, slag, concrete, coke and sandstone. (MADE GROUND) 3.35 - 3.60 Grey colouring observed.			MG	
								4.00					
								(0.50)	No recovery.				
								4.50					
								4.70	Black slightly sandy angular to subrounded fine to coarse gravel of ash, clinker, brick, slag, concrete, coke and sandstone. (MADE GROUND)			MG	
4.70-4.90	ES							4.90	Soft white slightly sandy slightly gravelly clay. Gravel is subangular to subrounded fine to coarse of sandstone and mixed lithologies. (MADE GROUND)			MG	
								5.00	4.70 - 4.90 White paste encountered.			ALV	
									Stiff light brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to medium of mixed lithologies. (ALLUVIUM)				
									Borehole complete at 5.00m bgl. Collapse back to 3.50m bgl.				

Hole Diameter			Recovery			Water Strikes					
Depth	Diameter (mm)	Remarks	Core Top (m)	Core Base (m)	% Recovery	Date	Time	Strike	Minutes	Standing	Casing
								3.00			

General Remarks

Window sample hole complete at 5.00m bgl. Groundwater encountered at 3.00m bgl. White/grey paste encountered between 4.70 and 4.90m bgl. Borehole complete at 5.00m bgl. Response zone between 1.00-3.50m bgl.

Scale 1:37.5

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

08 WSP WINDOW SAMPLE LOG LOGS.GPJ WSPETEMPLATE1.03.GDT 29/10/08

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WINDOW SAMPLE LOG

Hole No. **WS4**

Project: Brunner Mond, Lostock SPMP

Sheet: 1 of 1

Job No: 12121577/001

Client: Brunner Mond

Date: 17-09-08

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates ()	Ground Level (m)
GSS	Window Sampler	Marie Jones		

SAMPLES & TESTS							STRATA						Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (m)	Depth (Thick-ness)	Description		Legend	Geology	Dia. mm
								0.10	Concrete. (MADE GROUND)			CONC	
0.30-0.50	ES							(1.15)	Black brown sandy subangular to subrounded fine to medium gravel of brick, sandstone, ash and clinker. (MADE GROUND)			MG	
								1.25	1.00 - 1.25 Occasional slag within gravel between 1.00 and 1.25m bgl.				
								1.45	Orange/light brown gravelly coarse sand, Gravel is subangular to subrounded fine to coarse of sandstone, coke and mixed lithologies. (MADE GROUND) 1.40 - 1.45 Layer of white paste encountered.			MG	
2.00-2.30	ES					▼1		(1.95)	Grey/which slightly clayey gravelly fine sand, Gravel is angular to subrounded medium coarse to cobble sized of sandstone, coke and mixed lithologies. (MADE GROUND) 1.45 - 4.00 Pockets of white paste encountered. 2.00 - 3.00 Increase in the presence of white paste.			MG	
								3.40					
3.50-3.70	ES							(0.60)	White/black sandy angular to subrounded fine to coarse gravel of sandstone, coke, ash and clinker. (MADE GROUND)			MG	
								4.00					
									Borehole terminated at 4.00m bgl as collapsed to 3.60m bgl and presence of cobbles between 1.45 and 3.40m bgl stopping further casing.				

Hole Diameter			Recovery			Water Strikes					
Depth	Diameter (mm)	Remarks	Core Top (m)	Core Base (m)	% Recovery	Date	Time	Strike	Minutes	Standing	Casing
								3.00			

General Remarks

Window sample hole terminated at 4.00m bgl due to hole collapsing in to 3.60m bgl. Groundwater encountered at 3.00m bgl. White/grey paste encountered between 1.40 and 4.00m bgl. Window sample hole installed upon completion. Response zone between 1.00-3.60m bgl.

Scale 1:37.5

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

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WINDOW SAMPLE LOG

Hole No. **WS6**

Project: Brunner Mond, Lostock SPMP

Sheet: 1 of 1

Job No: 12121577/001

Client: Brunner Mond

Date: 17-09-08

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates ()	Ground Level (m)
GSS	Window Sampler	Marie Jones		

SAMPLES & TESTS							STRATA						Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (m)	Depth (Thick-ness)	Description		Legend	Geology	Dia. mm
								0.22	Concrete. (MADE GROUND)			CONC	
								(0.68) 0.90	Grey slightly sandy angular to subangular fine to coarse of sandstone hardcore and gravel. (MADE GROUND)			MG	
0.90-1.10	ES					1		(0.80) 1.70	Grey brown sandy angular to subrounded fine to coarse gravel of sandstone, ash, clinker and mixed lithologies. (MADE GROUND) 0.90 - 1.70 Slight solvent odour encountered.			MG	
1.75-1.90	ES							(1.90) 3.60	Firm red brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of mixed lithologies and mudstone. (ALLUVIUM) 3.00 - 3.60 Becoming very stiff with occasional sand pockets towards 3.60m bgl.			ALV	
									Borehole refused at 3.60m bgl on very stiff clay.				

Hole Diameter			Recovery			Water Strikes					
Depth	Diameter (mm)	Remarks	Core Top (m)	Core Base (m)	% Recovery	Date	Time	Strike	Minutes	Standing	Casing
								1.00			

General Remarks
Window sample refused at 3.60m bgl on very stiff clay. Groundwater encountered at 1.00m bgl. Slight solvent odour observed between 0.90 and 1.70m bgl. Window sample backfilled upon completion. No installation due to collapse over piping.

Scale 1:37.5

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

08 WSP WINDOW SAMPLE LOG LOGS.GPJ WSPETEMPLATE1.03.GDT 29/10/08

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WINDOW SAMPLE LOG

Hole No. **WS7**

Project: Brunner Mond, Lostock SPMP

Sheet: 1 of 1

Job No: 12121577/001

Client: Brunner Mond

Date: 17-09-08

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates ()	Ground Level (m)
GSS	Window Sampler	Marie Jones		

SAMPLES & TESTS							STRATA						Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (m)	Depth (Thick-ness)	Description		Legend	Geology	Dia. mm
								(0.50) 0.50	Brown/black sandy angular to subangular fine to coarse gravel of sandstone. 0.30 - 0.50 Black oily sheen with hydrocarbon odour encountered.			MG	
0.30-0.50	ES							0.70	Black sandy angular to subrounded fine to coarse gravel of ash, clinker and mixed lithologies. (MADE GROUND)			MG	
1.20-1.50	ES					▼1		(2.00) 2.70	Red/brown gravelly coarse sand. Gravel is subangular to subrounded fine to coarse of brick, ash, clinker and mixed lithologies. (MADE GROUND) 0.90 - 1.20 Brick cobbles encountered between. 1.20 - 2.70 Slight solvent odour encountered between. 2.60 - 2.70 Brick cobble encountered at 2.60m bgl.			MG	
2.70-2.90	ES							(0.30) 3.00	Stiff red/brown slightly gravelly CLAY. Gravel is subangular to subrounded fine to medium of sandstone and mudstone. (ALLUVIUM) 2.90 - 3.00 Sandstone cobble encountered at 2.90m bgl.			ALV	
									Borehole refused at 3.00m bgl on sandstone. Collapse to 2.00m bgl.				

Hole Diameter			Recovery			Water Strikes					
Depth	Diameter (mm)	Remarks	Core Top (m)	Core Base (m)	% Recovery	Date	Time	Strike	Minutes	Standing	Casing
								1.50			

General Remarks

Window sample refused at 3.00m bgl on sandstone. Groundwater encountered at 1.50m bgl. Black sheen and hydrocarbon odour encountered from 0.30-0.50m bgl. Slight solvent odour observed between 1.20 and 2.70m bgl. Borehole refused at 3.00m bgl on sandstone. Window sample hole installed on completion. Response zone between 1.00-3.50m bgl.

Scale 1:37.5

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

08 WSP WINDOW SAMPLE LOG LOGS.GPJ WSPETEMPLATE1.03.GDT 29/10/08

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WINDOW SAMPLE LOG

Hole No. **WS8**

Project: Brunner Mond, Lostock SPMP

Sheet: 1 of 1

Job No: 12121577/001

Client: Brunner Mond

Date: 17-09-08

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates ()	Ground Level (m)
GSS	Window Sampler	Marie Jones		

SAMPLES & TESTS							STRATA						Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (m)	Depth (Thick-ness)	Description	Legend	Geology		Dia. mm
								(0.30) 0.30	Concrete. (MADE GROUND)		CONC		
								0.50	Grey angular fine to coarse conrete gravel. (MADE GROUND)		MG		
								(0.30) 0.80	No recovery.				
								0.90	Red brick cobble. (MADE GROUND)		MG		
								1.00	Grey/brown sandy angular to subangular fine to coarse gravel of brick, sandstone and mixed lithologies. (MADE GROUND)		MG		
1.00-1.10	ES							(1.60) 2.60	Very soft black/dark brown slightly gravelly sandy CLAY with occasional leaves and plant matter, Gravel is subangular to subrounded fine to medium of mixed lithologies. (ALLUVIUM) 1.00 - 2.60 Organic odour and occasional black staining encountered, becoming stronger with depth. 2.10 - 2.50 Much leaves and plant matter.		ALV		
2.10-2.30	ES												
2.70-2.90	ES							(0.90) 3.50	Stiff red/brown slightly gravelly sandy CLAY, Gravel is subangular to subrounded of mudstone coal and mixed lithologies. (GLACIAL DEPOSITS) 3.00 - 3.50 Becoming increasingly stiff with depth.		GT		
									Borehole refused at 3.50m bgl on very stiff clay.				

Hole Diameter			Recovery			Water Strikes					
Depth	Diameter (mm)	Remarks	Core Top (m)	Core Base (m)	% Recovery	Date	Time	Strike	Minutes	Standing	Casing

General Remarks
Window sample refused at 3.50m bgl on stiff clay. No groundwater encountered during excavation. Organic odour encountered between 1.00 and 2.50m bgl.

Scale 1:37.5

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

08 WSP WINDOW SAMPLE LOG LOGS.GPJ WSPETEMPLATE1.03.GDT 29/10/08

WSP Environmental
150-182 The Quays, Salford
M50 3SP
Telephone: 0161 886 2400
Fax: 0161 886 2402

WINDOW SAMPLE LOG

Hole No. **WS9**

Project: Brunner Mond, Lostock SPMP

Sheet: 1 of 1

Job No: 12121577/001

Client: Brunner Mond

Date: 17-09-08

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates ()	Ground Level (m)
GSS	Window Sampler	Marie Jones		

SAMPLES & TESTS							STRATA					Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (m)	Depth (Thick-ness)	Description	Legend	Geology	Dia. mm
								(1.50)	Black/red slightly sandy angular to subrounded fine to coarse gravel of asphalt, concrete and brick with brick cobbles. (MADE GROUND) 1.00 - 1.50 Increase in brick and concrete cobbles with depth.		MG	
								1.50	Borehole refused at 1.50m bgl.			

Hole Diameter			Recovery			Water Strikes					
Depth	Diameter (mm)	Remarks	Core Top (m)	Core Base (m)	% Recovery	Date	Time	Strike	Minutes	Standing	Casing

General Remarks

Window sample refused at 1.50m bgl. No groundwater encountered during excavation. No obvious visual of olfactory signs of contamination. Borehole backfilled on completion.

Scale 1:37.5

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

08 WSP WINDOW SAMPLE LOG LOGS.GPJ WSPETEMPLATE1.03.GDT 29/10/08

WSP Environmental
150-182 The Quays, Salford
M50 3SP
Telephone: 0161 886 2400
Fax: 0161 886 2402

WINDOW SAMPLE LOG

Hole No. **WS9a**

Project: Brunner Mond, Lostock SPMP

Sheet: 1 of 1

Job No: 12121577/001

Client: Brunner Mond

Date: 17-09-08

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates ()	Ground Level (m)
GSS	Window Sampler	Marie Jones		

SAMPLES & TESTS							STRATA					Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (m)	Depth (Thick-ness)	Description	Legend	Geology	Dia. mm
								0.20	Grey slightly sandy angular to subangular fine to coarse gravel of sandstone (hardcore). (MADE GROUND)		MG	
0.30-0.50	ES							(0.40) 0.60	Black slightly sandy angular to subrounded fine to coarse gravel of ash clinker, slag and brick. (MADE GROUND)		MG	
								(1.40) 2.00	Red brick cobbles and angular fine to coarse gravel of red brick. (MADE GROUND)		MG	
									Borehole terminated at 2.00m bgl due to collapse to 1.50m bgl and inability to case due to coarse brick gravel.			

Hole Diameter			Recovery			Water Strikes					
Depth	Diameter (mm)	Remarks	Core Top (m)	Core Base (m)	% Recovery	Date	Time	Strike	Minutes	Standing	Casing

General Remarks
Window sample terminated at 2.00m bgl due to instability. No groundwater encountered during excavation. No obvious visual or olfactory signs of contamination. Borehole backfilled on completion.

Scale 1:37.5

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

08 WSP WINDOW SAMPLE LOG LOGS.GPJ WSPETEMPLATE1.03.GDT 29/10/08

WSP Environmental Manchester
The Victoria
150-182 The Quays
Salford
Manchester
UK
M50 3SP

WSP
Environmental Laboratories

Certificate of Analysis

Job Number: 08-04742

Report Date:	8 October 2008
Project Number:	12121577 001
Customer:	Brunner Mond
Site Address:	Brunner Mond, Lostock Site, Northwich, Cheshire
Date of Sampling:	16 September 2008
Date of Analysis:	25 September 2008 - 8 October 2008

Dear Richard

Please find attached your results for the above project.
This report includes the samples we received at WSP Environmental Laboratories on 24/09/2008.

Your feedback is critical to the evolution and improvement of our business, so please feel free to email us you comments to: ideas_lab@wspgroup.com.

Results authorised by:

Paul Woodbridge
Chemistry Laboratory Manager

Any opinions or interpretations indicated are outside the scope of our UKAS accreditation. Chemical Analysis is undertaken in accordance with in-house technical procedures and is subject to quality control procedures.

WSP Environmental Laboratories
The Laboratory, 4/5 Lakeview, Lakeview Drive, Sherwood Park, Nottingham NG15 0ED.

WSP
Environmental Laboratories

Solid Samples

Job No: 08-04742
Site: Brunner Mond, Lostock Site, Northwich, Cheshire
Report Date: 08/10/2008

			Lab No.	63513	63514	63515	63516	63517	63518	63519	63520	63521
			Sample Date	16/09/2008	16/09/2008	16/09/2008	16/09/2008	16/09/2008	16/09/2008	16/09/2008	16/09/2008	16/09/2008
			Sample Ref	WS1	WS2	WS3	WS4	WS6	WS7	WS8	WS1	WS10
			Other ID									
			Depth (m)	2.75-2.85	4.1-4.3	4.7-4.9	2-2.3	0.9-1.1	0.3-0.5	2.1-2.3	1.45-1.65	0.3-0.5
Determination	**LOD**	**Units**	**Method**									
Solid Description				Loam	Loam	Clay	Clay	Granular	Granular	Loam	Granular	Granular
Moisture	0.1	%		17.3	10.5	43.1	36.3	5.5	7.9	47.8	21.3	19.3
pH		pH units	206	8.3	8.9	13	13	9.4	9.4	7.1	13	12
Cyanide, total, as CN	5	mg/kg		---	< 5.0	---	---	---	---	---	---	---
Phenols, Monohydric, as PhOH	2.5	mg/kg	202	---	< 2.5	---	---	---	---	---	---	---
Selenium, total, as Se	0.3	mg/kg	418	< 0.3	---	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	---	1.4
Mercury, total, as Hg	0.2	mg/kg	405	0.2	---	0.2	< 0.2	< 0.2	2.5	< 0.2	---	0.4
Arsenic, total, as As	2.5	mg/kg	406	6.2	---	20	6.8	7.0	8.7	13	---	37
Calcium, total, as Ca	50000	mg/kg	406	---	---	440000	540000	---	---	---	340000	---
Cadmium, total, as Cd	0.25	mg/kg	406	< 0.25	---	1.2	< 0.25	< 0.25	2.4	< 0.25	---	< 0.25
Chromium, total, as Cr	1	mg/kg	406	33	---	12	6.0	13	22	43	---	23
Copper, total, as Cu	2.5	mg/kg	406	18	---	36	9.7	11	46	25	---	94
Sodium, total, as Na	500	mg/kg	406	---	---	1700	< 500	< 500	---	9700	1100	---
Nickel, total, as Ni	2.5	mg/kg	406	30	---	11	4.5	7.9	17	35	---	56
Lead, total, as Pb	2.5	mg/kg	406	18	---	17	< 2.5	17	120	29	---	68
Zinc, total, as Zn	5	mg/kg	406	51	---	36	< 5.0	12	140	71	---	78
Ammonium, water soluble (2:1), as NH4	2	mg/kg		---	220	---	---	5.7	---	30	---	---
Chloride, water soluble (2:1), as Cl	10	mg/kg		---	---	1300	48	< 10	---	17000	89	---
Sulphate, water soluble (2:1), as SO4	30	mg/kg	216	---	---	85	< 30	---	---	---	< 30	---
Naphthalene	0.3	mg/kg	408	< 0.3	---	---	< 0.3	---	5.9	---	---	3.9
Acenaphthylene	0.3	mg/kg	408	< 0.3	---	---	< 0.3	---	8.3	---	---	0.3
Acenaphthene	0.3	mg/kg	408	< 0.3	---	---	< 0.3	---	4.5	---	---	< 0.3
Fluorene	0.3	mg/kg	408	< 0.3	---	---	< 0.3	---	24	---	---	< 0.3
Phenanthrene	0.3	mg/kg	408	0.3	---	---	1.5	---	82	---	---	2.3
Anthracene	0.3	mg/kg	408	< 0.3	---	---	< 0.3	---	13	---	---	0.4
Fluoranthene	0.3	mg/kg	408	< 0.3	---	---	0.5	---	47	---	---	< 0.3
Pyrene	0.3	mg/kg	408	< 0.3	---	---	< 0.3	---	28	---	---	1.8
Benzo(a)anthracene	0.3	mg/kg	408	< 0.3	---	---	< 0.3	---	5.3	---	---	1.3
Chrysene	0.3	mg/kg	408	< 0.3	---	---	< 0.3	---	4.2	---	---	1.2
Benzo(k)fluoranthene	0.3	mg/kg	408	< 0.3	---	---	< 0.3	---	3.2	---	---	0.8

Solid Samples

Job No: 08-04742
Site: Brunner Mond, Lostock Site, Northwich, Cheshire
Report Date: 08/10/2008

			Lab No.	63513	63514	63515	63516	63517	63518	63519	63520	63521
			Sample Date	16/09/2008	16/09/2008	16/09/2008	16/09/2008	16/09/2008	16/09/2008	16/09/2008	16/09/2008	16/09/2008
			Sample Ref	WS1	WS2	WS3	WS4	WS6	WS7	WS8	WS1	WS10
			Other ID									
			Depth (m)	2.75-2.85	4.1-4.3	4.7-4.9	2-2.3	0.9-1.1	0.3-0.5	2.1-2.3	1.45-1.65	0.3-0.5
Determination	**LOD**	**Units**	**Method**									
Benzo(b)fluoranthene	0.3	mg/kg	408	< 0.3	---	---	< 0.3	---	3.6	---	---	0.9
Benzo(a)pyrene	0.3	mg/kg	408	< 0.3	---	---	< 0.3	---	5.7	---	---	1.2
Indeno(1,2,3-c,d)pyrene	0.3	mg/kg	408	< 0.3	---	---	< 0.3	---	4.0	---	---	0.5
Dibenzo(a,h)anthracene	0.3	mg/kg	408	< 0.3	---	---	< 0.3	---	0.5	---	---	< 0.3
Benzo(g,h,i)perylene	0.3	mg/kg	408	< 0.3	---	---	< 0.3	---	3.0	---	---	0.5
PAH Total (EPA 16)	3	mg/kg	408	< 3.0	---	---	< 3.0	---	240	---	---	16
Benzene	0.01	mg/kg	401	< 0.01	---	---	< 0.01	---	0.04	---	---	< 0.01
Ethylbenzene	0.01	mg/kg	401	< 0.01	---	---	< 0.01	---	0.04	---	---	< 0.01
m+p-Xylene	0.01	mg/kg	401	< 0.01	---	---	< 0.01	---	0.55	---	---	< 0.01
MTBE	0.01	mg/kg	401	< 0.01	---	---	< 0.01	---	< 0.01	---	---	< 0.01
o-Xylene	0.01	mg/kg	401	< 0.01	---	---	< 0.01	---	0.28	---	---	< 0.01
TAME	0.01	mg/kg	401	< 0.01	---	---	< 0.01	---	< 0.01	---	---	< 0.01
Toluene	0.01	mg/kg	401	< 0.01	---	---	< 0.01	---	0.52	---	---	0.01
PRO (>C5-C6)	10	mg/kg	401	< 10	---	---	< 10	---	< 10	---	---	< 10
PRO (>C6-C8)	10	mg/kg	401	< 10	---	---	< 10	---	< 10	---	---	< 10
PRO (>C8-C10)	10	mg/kg	401	< 10	---	---	< 10	---	< 10	---	---	< 10
PRO (>C5-C10)	10	mg/kg	401	< 10	---	---	< 10	---	< 10	---	---	< 10
PRO (>C6-C10)	10	mg/kg	401	< 10	---	---	< 10	---	< 10	---	---	< 10
Aliphatic (>C5-C6)	0.2	mg/kg	419	< 0.2	---	---	< 0.2	---	< 0.2	---	---	< 0.2
Aliphatic (>C6-C8)	0.2	mg/kg	419	0.2	---	---	< 0.2	---	< 0.2	---	---	0.3
Aliphatic (>C8-C10)	0.2	mg/kg	419	2.2	---	---	0.6	---	2.4	---	---	3.9
Aliphatic (>C10-C12)	35	mg/kg	419	< 35	---	---	< 35	---	160	---	---	< 35
Aliphatic (>C12-C16)	50	mg/kg	419	< 50	---	---	< 50	---	360	---	---	< 50
Aliphatic (>C16-C21)	100	mg/kg	419	< 100	---	---	< 100	---	220	---	---	< 100
Aliphatic (>C21-C35)	100	mg/kg	419	< 100	---	---	< 100	---	220	---	---	< 100
Aliphatic (>C35-C40)	100	mg/kg	419	< 100	---	---	< 100	---	< 100	---	---	< 100
Aliphatic (>C40-C44)	100	mg/kg	419	< 100	---	---	< 100	---	< 100	---	---	< 100
Total Aliphatics (>C6-C44)	290	mg/kg	419	< 290	---	---	< 290	---	1000	---	---	< 290
Aromatic (>C6-C7)	0.01	mg/kg	419	< 0.01	---	---	< 0.01	---	0.04	---	---	< 0.01
Aromatic (>C7-C8)	0.01	mg/kg	419	< 0.01	---	---	< 0.01	---	0.52	---	---	0.01

WSP
Environmental Laboratories

Solid Samples

Job No: 08-04742
Site: Brunner Mond, Lostock Site, Northwich, Cheshire
Report Date: 08/10/2008

			Lab No.	63513	63514	63515	63516	63517	63518	63519	63520	63521
			Sample Date	16/09/2008	16/09/2008	16/09/2008	16/09/2008	16/09/2008	16/09/2008	16/09/2008	16/09/2008	16/09/2008
			Sample Ref	WS1	WS2	WS3	WS4	WS6	WS7	WS8	WS1	WS10
			Other ID									
			Depth (m)	2.75-2.85	4.1-4.3	4.7-4.9	2-2.3	0.9-1.1	0.3-0.5	2.1-2.3	1.45-1.65	0.3-0.5
Determination	**LOD**	**Units**	**Method**									
Aromatic (>C8-C10)	0.01	mg/kg	419	< 0.01	---	---	< 0.01	---	1.1	---	---	< 0.01
Aromatic (>C10-C12)	35	mg/kg	419	< 35	---	---	< 35	---	< 35	---	---	< 35
Aromatic (>C12-C16)	50	mg/kg	419	< 50	---	---	< 50	---	140	---	---	< 50
Aromatic (>C16-C21)	100	mg/kg	419	< 100	---	---	< 100	---	620	---	---	< 100
Aromatic (>C21-C35)	100	mg/kg	419	< 100	---	---	< 100	---	220	---	---	< 100
Aromatic (>C35-C40)	100	mg/kg	419	< 100	---	---	< 100	---	< 100	---	---	< 100
Aromatic (>C40-C44)	100	mg/kg	419	< 100	---	---	< 100	---	< 100	---	---	< 100
Total Aromatics (>C6-C44)	290	mg/kg	419	< 290	---	---	< 290	---	1000	---	---	< 290
Total TPH (>C6-C44)	50	mg/kg	419	< 50	---	---	< 50	---	2000	---	---	210
Dichlorodifluoromethane	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
Chloromethane	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
Chloroethane	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
Bromomethane	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
Trichlorofluoromethane	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
1,1-Dichloroethene	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
MTBE	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
Trans-1,2-Dichloroethene	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
1,1-Dichloroethane	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
Cis-1,2-Dichloroethene	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
2,2-Dichloropropane	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
Chloroform	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
Bromochloromethane	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
1,1,1-Trichloroethane	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
1,1-Dichloropropene	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
1,2-Dichloroethane	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
Benzene	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
1,2-Dichloropropane	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
Trichloroethene	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
Bromodichloromethane	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
Dibromomethane	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---

Solid Samples

Job No: 08-04742
Site: Brunner Mond, Lostock Site, Northwich, Cheshire
Report Date: 08/10/2008

			Lab No.	63513	63514	63515	63516	63517	63518	63519	63520	63521
			Sample Date	16/09/2008	16/09/2008	16/09/2008	16/09/2008	16/09/2008	16/09/2008	16/09/2008	16/09/2008	16/09/2008
			Sample Ref	WS1	WS2	WS3	WS4	WS6	WS7	WS8	WS1	WS10
			Other ID									
			Depth (m)	2.75-2.85	4.1-4.3	4.7-4.9	2-2.3	0.9-1.1	0.3-0.5	2.1-2.3	1.45-1.65	0.3-0.5
Determination	**LOD**	**Units**	**Method**									
TAME	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
Cis-1,3-Dichloropropene	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
Toluene	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
Trans-1,3-Dichloropropene	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
1,1,2-Trichloroethane	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
Carbon Tetrachloride	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
Vinyl Chloride	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
1,3-Dichloropropane	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
Tetrachloroethene	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
Dibromochloromethane	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
1,2-Dibromoethane	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
Chlorobenzene	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
1,1,1,2-Tetrachloroethane	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
Ethylbenzene	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
m,p-Xylene	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
o-Xylene	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
Styrene	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
Bromoform	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
Isopropylbenzene	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
1,1,2,2-Tetrachloroethane	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
1,2,3-Trichloropropane	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
n-Propylbenzene	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
Bromobenzene	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
2-Chlorotoluene	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
1,3,5-Trimethylbenzene	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
4-Chlorotoluene	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
Tert-Butylbenzene	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
1,2,4-Trimethylbenzene	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
sec-Butylbenzene	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
p-Isopropyltoluene	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---

Solid Samples

Job No: 08-04742
Site: Brunner Mond, Lostock Site, Northwich, Cheshire
Report Date: 08/10/2008

			Lab No.	63513	63514	63515	63516	63517	63518	63519	63520	63521
			Sample Date	16/09/2008	16/09/2008	16/09/2008	16/09/2008	16/09/2008	16/09/2008	16/09/2008	16/09/2008	16/09/2008
			Sample Ref	WS1	WS2	WS3	WS4	WS6	WS7	WS8	WS1	WS10
			Other ID									
			Depth (m)	2.75-2.85	4.1-4.3	4.7-4.9	2-2.3	0.9-1.1	0.3-0.5	2.1-2.3	1.45-1.65	0.3-0.5
Determination	**LOD**	**Units**	**Method**									
1,3-Dichlorobenzene	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
1,4-Dichlorobenzene	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
n-Butylbenzene	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
1,2-Dichlorobenzene	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
1,2-Dibromo-3-Chloropropane	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
1,2,4-Trichlorobenzene	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
Hexachlorobutadiene	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---
Naphthalene voc	0.01	mg/kg	421	---	---	---	---	0.06	---	---	---	---
1,2,3-Trichlorobenzene	0.01	mg/kg	421	---	---	---	---	< 0.01	---	---	---	---

Solid Samples

Job No: 08-04742
Site: Brunner Mond, Lostock Site, Northwich, Cheshire
Report Date: 08/10/2008

			Lab No.	63522	63523	63524
			Sample Date	16/09/2008	16/09/2008	16/09/2008
			Sample Ref	WS11	WS12	WS9
			Other ID			
			Depth (m)	0.3-0.5	1-1.2	0.3-0.5
Determination	**LOD**	**Units**	**Method**			
Solid Description				Granular	Clay	Granular
Moisture	0.1	%		28.4	33.7	14.8
pH		pH units	206	8.2	8.9	8.9
Cyanide, total, as CN	5	mg/kg		---	---	---
Phenols, Monohydric, as PhOH	2.5	mg/kg	202	---	---	---
Selenium, total, as Se	0.3	mg/kg	418	0.5	< 0.3	---
Mercury, total, as Hg	0.2	mg/kg	405	< 0.2	< 0.2	---
Arsenic, total, as As	2.5	mg/kg	406	29	7.5	---
Calcium, total, as Ca	50000	mg/kg	406	---	460000	---
Cadmium, total, as Cd	0.25	mg/kg	406	< 0.25	< 0.25	---
Chromium, total, as Cr	1	mg/kg	406	35	13	---
Copper, total, as Cu	2.5	mg/kg	406	130	16	---
Sodium, total, as Na	500	mg/kg	406	---	670	800
Nickel, total, as Ni	2.5	mg/kg	406	90	8.2	---
Lead, total, as Pb	2.5	mg/kg	406	39	14	---
Zinc, total, as Zn	5	mg/kg	406	220	6.8	---
Ammonium, water soluble (2:1), as NH4	2	mg/kg		---	---	---
Chloride, water soluble (2:1), as Cl	10	mg/kg		---	< 10	110
Sulphate, water soluble (2:1), as SO4	30	mg/kg	216	---	140	---
Naphthalene	0.3	mg/kg	408	1.3	< 0.3	---
Acenaphthylene	0.3	mg/kg	408	< 0.3	< 0.3	---
Acenaphthene	0.3	mg/kg	408	< 0.3	< 0.3	---
Fluorene	0.3	mg/kg	408	< 0.3	< 0.3	---
Phenanthrene	0.3	mg/kg	408	1.3	< 0.3	---
Anthracene	0.3	mg/kg	408	1.3	< 0.3	---
Fluoranthene	0.3	mg/kg	408	0.6	< 0.3	---
Pyrene	0.3	mg/kg	408	0.4	< 0.3	---
Benzo(a)anthracene	0.3	mg/kg	408	< 0.3	< 0.3	---
Chrysene	0.3	mg/kg	408	< 0.3	< 0.3	---
Benzo(k)fluoranthene	0.3	mg/kg	408	< 0.3	< 0.3	---

Solid Samples

Job No: 08-04742
Site: Brunner Mond, Lostock Site, Northwich, Cheshire
Report Date: 08/10/2008

			Lab No.	63522	63523	63524
			Sample Date	16/09/2008	16/09/2008	16/09/2008
			Sample Ref	WS11	WS12	WS9
			Other ID			
			Depth (m)	0.3-0.5	1-1.2	0.3-0.5
Determination	**LOD**	**Units**	**Method**			
Benzo(b)fluoranthene	0.3	mg/kg	408	< 0.3	< 0.3	---
Benzo(a)pyrene	0.3	mg/kg	408	< 0.3	1.2	---
Indeno(1,2,3-c,d)pyrene	0.3	mg/kg	408	< 0.3	1.0	---
Dibenzo(a,h)anthracene	0.3	mg/kg	408	< 0.3	0.4	---
Benzo(g,h,i)perylene	0.3	mg/kg	408	< 0.3	0.9	---
PAH Total (EPA 16)	3	mg/kg	408	6.9	4.8	---
Benzene	0.01	mg/kg	401	< 0.01	< 0.01	---
Ethylbenzene	0.01	mg/kg	401	< 0.01	< 0.01	---
m+p-Xylene	0.01	mg/kg	401	< 0.01	< 0.01	---
MTBE	0.01	mg/kg	401	< 0.01	< 0.01	---
o-Xylene	0.01	mg/kg	401	< 0.01	< 0.01	---
TAME	0.01	mg/kg	401	< 0.01	< 0.01	---
Toluene	0.01	mg/kg	401	< 0.01	< 0.01	---
PRO (>C5-C6)	10	mg/kg	401	< 10	< 10	---
PRO (>C6-C8)	10	mg/kg	401	< 10	< 10	---
PRO (>C8-C10)	10	mg/kg	401	< 10	< 10	---
PRO (>C5-C10)	10	mg/kg	401	< 10	< 10	---
PRO (>C6-C10)	10	mg/kg	401	< 10	< 10	---
Aliphatic (>C5-C6)	0.2	mg/kg	419	< 0.2	< 0.2	---
Aliphatic (>C6-C8)	0.2	mg/kg	419	< 0.2	< 0.2	---
Aliphatic (>C8-C10)	0.2	mg/kg	419	1.1	< 0.2	---
Aliphatic (>C10-C12)	35	mg/kg	419	< 35	< 35	---
Aliphatic (>C12-C16)	50	mg/kg	419	< 50	< 50	---
Aliphatic (>C16-C21)	100	mg/kg	419	< 100	< 100	---
Aliphatic (>C21-C35)	100	mg/kg	419	< 100	< 100	---
Aliphatic (>C35-C40)	100	mg/kg	419	< 100	< 100	---
Aliphatic (>C40-C44)	100	mg/kg	419	< 100	< 100	---
Total Aliphatics (>C6-C44)	290	mg/kg	419	< 290	< 290	---
Aromatic (>C6-C7)	0.01	mg/kg	419	< 0.01	< 0.01	---
Aromatic (>C7-C8)	0.01	mg/kg	419	< 0.01	< 0.01	---

Solid Samples

Job No: 08-04742
Site: Brunner Mond, Lostock Site, Northwich, Cheshire
Report Date: 08/10/2008

			Lab No.	63522	63523	63524
			Sample Date	16/09/2008	16/09/2008	16/09/2008
			Sample Ref	WS11	WS12	WS9
			Other ID			
			Depth (m)	0.3-0.5	1-1.2	0.3-0.5
Determination	**LOD**	**Units**	**Method**			
Aromatic (>C8-C10)	0.01	mg/kg	419	< 0.01	< 0.01	---
Aromatic (>C10-C12)	35	mg/kg	419	< 35	< 35	---
Aromatic (>C12-C16)	50	mg/kg	419	< 50	< 50	---
Aromatic (>C16-C21)	100	mg/kg	419	< 100	< 100	---
Aromatic (>C21-C35)	100	mg/kg	419	< 100	< 100	---
Aromatic (>C35-C40)	100	mg/kg	419	< 100	< 100	---
Aromatic (>C40-C44)	100	mg/kg	419	< 100	< 100	---
Total Aromatics (>C6-C44)	290	mg/kg	419	< 290	< 290	---
Total TPH (>C6-C44)	50	mg/kg	419	130	< 50	---
Dichlorodifluoromethane	0.01	mg/kg	421	---	---	---
Chloromethane	0.01	mg/kg	421	---	---	---
Chloroethane	0.01	mg/kg	421	---	---	---
Bromomethane	0.01	mg/kg	421	---	---	---
Trichlorofluoromethane	0.01	mg/kg	421	---	---	---
1,1-Dichloroethene	0.01	mg/kg	421	---	---	---
MTBE	0.01	mg/kg	421	---	---	---
Trans-1,2-Dichloroethene	0.01	mg/kg	421	---	---	---
1,1-Dichloroethane	0.01	mg/kg	421	---	---	---
Cis-1,2-Dichloroethene	0.01	mg/kg	421	---	---	---
2,2-Dichloropropane	0.01	mg/kg	421	---	---	---
Chloroform	0.01	mg/kg	421	---	---	---
Bromochloromethane	0.01	mg/kg	421	---	---	---
1,1,1-Trichloroethane	0.01	mg/kg	421	---	---	---
1,1-Dichloropropene	0.01	mg/kg	421	---	---	---
1,2-Dichloroethane	0.01	mg/kg	421	---	---	---
Benzene	0.01	mg/kg	421	---	---	---
1,2-Dichloropropane	0.01	mg/kg	421	---	---	---
Trichloroethene	0.01	mg/kg	421	---	---	---
Bromodichloromethane	0.01	mg/kg	421	---	---	---
Dibromomethane	0.01	mg/kg	421	---	---	---

Solid Samples

Job No: 08-04742
Site: Brunner Mond, Lostock Site, Northwich, Cheshire
Report Date: 08/10/2008

			Lab No.	63522	63523	63524
			Sample Date	16/09/2008	16/09/2008	16/09/2008
			Sample Ref	WS11	WS12	WS9
			Other ID			
			Depth (m)	0.3-0.5	1-1.2	0.3-0.5
Determination	**LOD**	**Units**	**Method**			
TAME	0.01	mg/kg	421	---	---	---
Cis-1,3-Dichloropropene	0.01	mg/kg	421	---	---	---
Toluene	0.01	mg/kg	421	---	---	---
Trans-1,3-Dichloropropene	0.01	mg/kg	421	---	---	---
1,1,2-Trichloroethane	0.01	mg/kg	421	---	---	---
Carbon Tetrachloride	0.01	mg/kg	421	---	---	---
Vinyl Chloride	0.01	mg/kg	421	---	---	---
1,3-Dichloropropane	0.01	mg/kg	421	---	---	---
Tetrachloroethene	0.01	mg/kg	421	---	---	---
Dibromochloromethane	0.01	mg/kg	421	---	---	---
1,2-Dibromoethane	0.01	mg/kg	421	---	---	---
Chlorobenzene	0.01	mg/kg	421	---	---	---
1,1,1,2-Tetrachloroethane	0.01	mg/kg	421	---	---	---
Ethylbenzene	0.01	mg/kg	421	---	---	---
m,p-Xylene	0.01	mg/kg	421	---	---	---
o-Xylene	0.01	mg/kg	421	---	---	---
Styrene	0.01	mg/kg	421	---	---	---
Bromoform	0.01	mg/kg	421	---	---	---
Isopropylbenzene	0.01	mg/kg	421	---	---	---
1,1,2,2-Tetrachloroethane	0.01	mg/kg	421	---	---	---
1,2,3-Trichloropropane	0.01	mg/kg	421	---	---	---
n-Propylbenzene	0.01	mg/kg	421	---	---	---
Bromobenzene	0.01	mg/kg	421	---	---	---
2-Chlorotoluene	0.01	mg/kg	421	---	---	---
1,3,5-Trimethylbenzene	0.01	mg/kg	421	---	---	---
4-Chlorotoluene	0.01	mg/kg	421	---	---	---
Tert-Butylbenzene	0.01	mg/kg	421	---	---	---
1,2,4-Trimethylbenzene	0.01	mg/kg	421	---	---	---
sec-Butylbenzene	0.01	mg/kg	421	---	---	---
p-Isopropyltoluene	0.01	mg/kg	421	---	---	---

Solid Samples

Job No: 08-04742
Site: Brunner Mond, Lostock Site, Northwich, Cheshire
Report Date: 08/10/2008

			Lab No.	63522	63523	63524
			Sample Date	16/09/2008	16/09/2008	16/09/2008
			Sample Ref	WS11	WS12	WS9
			Other ID			
			Depth (m)	0.3-0.5	1-1.2	0.3-0.5
Determination	**LOD**	**Units**	**Method**			
1,3-Dichlorobenzene	0.01	mg/kg	421	---	---	---
1,4-Dichlorobenzene	0.01	mg/kg	421	---	---	---
n-Butylbenzene	0.01	mg/kg	421	---	---	---
1,2-Dichlorobenzene	0.01	mg/kg	421	---	---	---
1,2-Dibromo-3-Chloropropane	0.01	mg/kg	421	---	---	---
1,2,4-Trichlorobenzene	0.01	mg/kg	421	---	---	---
Hexachlorobutadiene	0.01	mg/kg	421	---	---	---
Naphthalene voc	0.01	mg/kg	421	---	---	---
1,2,3-Trichlorobenzene	0.01	mg/kg	421	---	---	---

Comments Samples

Job No: 08-04742
Site: Brunner Mond, Lostock Site, Northwich, Cheshire
Report Date: 08/10/2008

Sample No	Comments
63517	Low internal standard and surrogate recovery for VOC due to matrix interference. Samples re-analysed in duplicate and results confirmed.

WSP Environmental Manchester
The Victoria
150-182 The Quays
Salford
Manchester
UK
M50 3SP

Environmental Laboratories

Certificate of Analysis

Job Number 08-04968

Report Date	31 October 2008
Project Number	12121577 001
Customer	Brunner Mond
Site Address	Brunner Mond, Lostock Site, Northwich, Cheshire
Date of Sampling	24 September 2008
Date of Analysis	16 October 2008 - 31 October 2008

Dear Richard

Please find attached your results for the above project.
This report includes the samples we received at WSP Environmental Laboratories on 16/10/2008.

Your feedback is critical to the evolution and improvement of our business, so please feel free to email us you comments to: ideas_lab@wspgroup.com.

Results authorised by

Mark Beastall
Geotechnical Laboratory Manager

UKAS TESTING
0206

Any opinions or interpretations indicated are outside the scope of our UKAS accreditation. Chemical Analysis is undertaken in accordance with in-house technical procedures and is subject to quality control procedures.

Water Samples

Environmental Laboratories

Job No: 08-04968
Site: Brunner Mond, Lostock Site, Northwich, Cheshire
Report Date: 31/10/2008

			Lab No.	65493	65494	65495	65496
			Sample Date	24/09/2008	24/09/2008	24/09/2008	24/09/2008
			Sample Ref	WS2	WS3	WS4	WS7
			Other ID				
			Depth (m)	0	0	0	0
Determination	**LOD**	**Units**	**Method**				
pH		pH units	305 *	10	8.1	13	7.5
Ammonical Nitrogen, soluble, as NH4	200	µg/l	518 *	< 200	---	---	---
Chloride, soluble, as Cl	5000	µg/l	518 *	---	438200	110000	---
Sulphate, soluble, as SO4	2000	µg/l	518 *	---	324100	46930	---
Arsenic, soluble, as As	10	µg/l	506 *	---	< 10	< 10	36
Cadmium, soluble, as Cd	0.5	µg/l	506 *	---	< 0.5	< 0.5	0.5
Calcium, soluble, as Ca	50000	µg/l	522	---	173500	912800	---
Chromium, soluble, as Cr	10	µg/l	506 *	---	< 10	< 10	< 10
Copper, soluble, as Cu	5	µg/l	506 *	---	< 5.0	8.0	12
Lead, soluble, as Pb	10	µg/l	506 *	---	< 10	< 10	< 10
Mercury, soluble, as Hg	0.2	µg/l	505	---	< 0.2	< 0.2	< 0.2
Nickel, soluble, as Ni	10	µg/l	506 *	---	< 10	< 10	< 10
Selenium, soluble, as Se	5	µg/l	512	---	< 5.0	< 5.0	< 5.0
Sodium, soluble, as Na	5000	µg/l	522	---	220800	43200	---
Zinc, soluble, as Zn	10	µg/l	506 *	---	< 10	< 10	< 10
Phenols, Monohydric, as PhOH	100	µg/l	302	828000	---	---	---
Total Cyanide, as CN	100	µg/l	301	< 100	---	---	---
PRO (>C5-C6)	10	µg/l	501	---	---	< 10	< 10
PRO (>C6-C8)	10	µg/l	501	---	---	< 10	< 10
PRO (>C8-C10)	10	µg/l	501	---	---	< 10	< 10
Benzene	3	µg/l	501	---	---	< 3.0	< 3.0
Toluene	3	µg/l	501	---	---	< 3.0	< 3.0
Ethylbenzene	3	µg/l	501	---	---	< 3.0	< 3.0
o-Xylene	3	µg/l	501	---	---	< 3.0	< 3.0
m+p-Xylene	3	µg/l	501	---	---	< 3.0	< 3.0
MTBE	3	µg/l	501	---	---	< 3.0	< 3.0
TAME	3	µg/l	501	---	---	< 3.0	< 3.0
Total PRO (>C5-C10)	10	µg/l	501	---	---	< 10	< 10
Total PRO (>C6-C10)	10	µg/l	501	---	---	< 10	< 10
Aliphatic (>C6-C8)	10	µg/l	501	---	---	< 10	< 10
Aliphatic (>C8-C10)	10	µg/l	501	---	---	< 10	< 10
Aliphatic (>C10-C12)	15	µg/l	519	---	---	< 15	300
Aliphatic (>C12-C16)	10	µg/l	519	---	---	29	3300
Aliphatic (>C16-C21)	15	µg/l	519	---	---	20	1600
Aliphatic (>C21-C35)	25	µg/l	519	---	---	< 25	560
Aliphatic (>C35-C40)	10	µg/l	519	---	---	< 10	20
Aliphatic (>C40-C44)	10	µg/l	519	---	---	< 10	16
Aromatic (>C6-C7)	10	µg/l	501	---	---	< 10	< 10
Aromatic (>C7-C8)	10	µg/l	501	---	---	< 10	< 10
Aromatic (>C8-C10)	10	µg/l	501	---	---	< 10	< 10
Aromatic (>C10-C12)	10	µg/l	519	---	---	< 10	120
Aromatic (>C12-C16)	10	µg/l	519	---	---	11	360
Aromatic (>C16-C21)	10	µg/l	519	---	---	< 10	210
Aromatic (>C21-C35)	15	µg/l	519	---	---	< 15	75
Aromatic (>C35-C40)	10	µg/l	519	---	---	< 10	< 10
Aromatic (>C40-C44)	10	µg/l	519	---	---	< 10	< 10
Acenaphthene	0.1	µg/l	306	---	---	9.1	1.9
Acenaphthylene	0.1	µg/l	306	---	---	0.3	0.5
Anthracene	0.1	µg/l	306	---	---	6.1	< 0.1
Benzo(a)anthracene	0.1	µg/l	306	---	---	< 0.1	0.1

Water Samples

Environmental Laboratories

Job No: 08-04968
Site: Brunner Mond, Lostock Site, Northwich, Cheshire
Report Date: 31/10/2008

			Lab No.	65493	65494	65495	65496
			Sample Date	24/09/2008	24/09/2008	24/09/2008	24/09/2008
			Sample Ref	WS2	WS3	WS4	WS7
			Other ID				
			Depth (m)	0	0	0	0
Determination	**LOD**	**Units**	**Method**				
Benzo(a)pyrene	0.1	µg/l	306	---	---	< 0.1	< 0.1
Benzo(b)fluoranthene	0.1	µg/l	306	---	---	< 0.1	< 0.1
Benzo(k)fluoranthene	0.1	µg/l	306	---	---	< 0.1	< 0.1
Benzo(g,h,i)perylene	0.1	µg/l	306	---	---	< 0.1	< 0.1
Chrysene	0.1	µg/l	306	---	---	< 0.1	0.1
Dibenzo(a,h)anthracene	0.1	µg/l	306	---	---	< 0.1	< 0.1
Fluoranthene	0.1	µg/l	306	---	---	0.6	1.6
Fluorene	0.1	µg/l	306	---	---	4.6	0.2
Indeno(1,2,3-c,d)pyrene	0.1	µg/l	306	---	---	< 0.1	< 0.1
Naphthalene	0.1	µg/l	306	---	---	1.1	< 0.1
Phenanthrene	0.1	µg/l	306	---	---	6.2	< 0.1
Pyrene	0.1	µg/l	306	---	---	0.3	1.2
PAH Total (EPA 16)	0.3	µg/l	306	---	---	29	6.3

Water Samples

Environmental Laboratories

Job No: 08-04968
Site: Brunner Mond, Lostock Site, Northwich, Cheshire
Report Date: 31/10/2008

			Lab No.	65497	65498	65499	65500
			Sample Date	24/09/2008	24/09/2008	24/09/2008	24/09/2008
			Sample Ref	WS8	WS10	WS11	WS12
			Other ID				
			Depth (m)	0	0	0	0
Determination	**LOD**	**Units**	**Method**				
pH		pH units	305 *	6.9	7.3	12	13
Ammonical Nitrogen, soluble, as NH4	200	µg/l	518 *	33200	---	---	---
Chloride, soluble, as Cl	5000	µg/l	518 *	16450000	---	---	315400
Sulphate, soluble, as SO4	2000	µg/l	518 *	---	---	---	179600
Arsenic, soluble, as As	10	µg/l	506 *	< 10	36	680	< 10
Cadmium, soluble, as Cd	0.5	µg/l	506 *	< 0.5	< 0.5	< 0.5	< 0.5
Calcium, soluble, as Ca	50000	µg/l	522	---	---	---	419900
Chromium, soluble, as Cr	10	µg/l	506 *	< 10	< 10	< 10	< 10
Copper, soluble, as Cu	5	µg/l	506 *	7.0	7.5	34	19
Lead, soluble, as Pb	10	µg/l	506 *	< 10	< 10	< 10	< 10
Mercury, soluble, as Hg	0.2	µg/l	505	< 0.2	< 0.2	< 0.2	< 0.2
Nickel, soluble, as Ni	10	µg/l	506 *	< 10	< 10	33	< 10
Selenium, soluble, as Se	5	µg/l	512	< 5.0	< 5.0	< 5.0	< 5.0
Sodium, soluble, as Na	5000	µg/l	522	7837000	---	---	248900
Zinc, soluble, as Zn	10	µg/l	506 *	< 10	< 10	< 10	< 10
Phenols, Monohydric, as PhOH	100	µg/l	302	---	---	---	---
Total Cyanide, as CN	100	µg/l	301	---	---	---	---
PRO (>C5-C6)	10	µg/l	501	---	< 10	< 10	< 10
PRO (>C6-C8)	10	µg/l	501	---	< 10	< 10	< 10
PRO (>C8-C10)	10	µg/l	501	---	< 10	< 10	< 10
Benzene	3	µg/l	501	---	< 3.0	< 3.0	< 3.0
Toluene	3	µg/l	501	---	< 3.0	< 3.0	< 3.0
Ethylbenzene	3	µg/l	501	---	< 3.0	< 3.0	< 3.0
o-Xylene	3	µg/l	501	---	< 3.0	< 3.0	< 3.0
m+p-Xylene	3	µg/l	501	---	< 3.0	< 3.0	< 3.0
MTBE	3	µg/l	501	---	< 3.0	< 3.0	< 3.0
TAME	3	µg/l	501	---	< 3.0	< 3.0	< 3.0
Total PRO (>C5-C10)	10	µg/l	501	---	< 10	< 10	< 10
Total PRO (>C6-C10)	10	µg/l	501	---	< 10	< 10	< 10
Aliphatic (>C6-C8)	10	µg/l	501	---	< 10	< 10	< 10
Aliphatic (>C8-C10)	10	µg/l	501	---	< 10	< 10	< 10
Aliphatic (>C10-C12)	15	µg/l	519	---	< 15	< 15	36
Aliphatic (>C12-C16)	10	µg/l	519	---	< 10	170	27
Aliphatic (>C16-C21)	15	µg/l	519	---	35	160	37
Aliphatic (>C21-C35)	25	µg/l	519	---	26	48	34
Aliphatic (>C35-C40)	10	µg/l	519	---	< 10	< 10	< 10
Aliphatic (>C40-C44)	10	µg/l	519	---	< 10	< 10	< 10
Aromatic (>C6-C7)	10	µg/l	501	---	< 10	< 10	< 10
Aromatic (>C7-C8)	10	µg/l	501	---	< 10	< 10	< 10
Aromatic (>C8-C10)	10	µg/l	501	---	< 10	< 10	< 10
Aromatic (>C10-C12)	10	µg/l	519	---	< 10	120	120
Aromatic (>C12-C16)	10	µg/l	519	---	22	56	45
Aromatic (>C16-C21)	10	µg/l	519	---	13	23	15
Aromatic (>C21-C35)	15	µg/l	519	---	< 15	< 15	< 15
Aromatic (>C35-C40)	10	µg/l	519	---	< 10	< 10	< 10
Aromatic (>C40-C44)	10	µg/l	519	---	< 10	< 10	< 10
Acenaphthene	0.1	µg/l	306	---	0.2	4.4	0.1
Acenaphthylene	0.1	µg/l	306	---	< 0.1	< 0.1	< 0.1
Anthracene	0.1	µg/l	306	---	0.4	0.6	< 0.1
Benzo(a)anthracene	0.1	µg/l	306	---	0.2	< 0.1	< 0.1

Water Samples

Environmental Laboratories

Job No: 08-04968
Site: Brunner Mond, Lostock Site, Northwich, Cheshire
Report Date: 31/10/2008

			Lab No.	65497	65498	65499	65500
			Sample Date	24/09/2008	24/09/2008	24/09/2008	24/09/2008
			Sample Ref	WS8	WS10	WS11	WS12
			Other ID				
			Depth (m)	0	0	0	0
Determination	**LOD**	**Units**	**Method**				
Benzo(a)pyrene	0.1	µg/l	306	---	0.2	< 0.1	< 0.1
Benzo(b)fluoranthene	0.1	µg/l	306	---	0.2	< 0.1	< 0.1
Benzo(k)fluoranthene	0.1	µg/l	306	---	0.2	< 0.1	< 0.1
Benzo(g,h,i)perylene	0.1	µg/l	306	---	0.1	< 0.1	< 0.1
Chrysene	0.1	µg/l	306	---	0.2	0.1	< 0.1
Dibenzo(a,h)anthracene	0.1	µg/l	306	---	0.1	< 0.1	< 0.1
Fluoranthene	0.1	µg/l	306	---	0.2	0.2	0.2
Fluorene	0.1	µg/l	306	---	0.2	2.4	< 0.1
Indeno(1,2,3-c,d)pyrene	0.1	µg/l	306	---	0.2	< 0.1	< 0.1
Naphthalene	0.1	µg/l	306	---	< 0.1	0.4	< 0.1
Phenanthrene	0.1	µg/l	306	---	0.4	0.7	0.3
Pyrene	0.1	µg/l	306	---	0.2	0.2	0.1
PAH Total (EPA 16)	0.3	µg/l	306	---	2.8	33	1.3

WSP Environmental Manchester
The Victoria
150-182 The Quays
Salford
Manchester
UK
M50 3SP

Environmental Laboratories

Certificate of Analysis

Job Number 09-06498

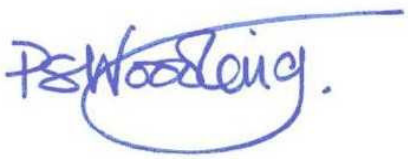
Report Date	30 April 2009
Project Number	12121577 001
Customer	Brunner Mond
Site Address	Brunner Mond, Lostock Site, Northwich, Cheshire
Date of Sampling	2 April 2009
Date of Analysis	7 April 2009 - 30 April 2009

Dear Richard

Please find attached your results for the above project.
This report includes the samples we received at WSP Environmental Laboratories on 07/04/2009.

Your feedback is critical to the evolution and improvement of our business, so please feel free to email us you comments to: ideas_lab@wspgroup.com.

Results authorised by



Paul Woodbridge
Chemistry Laboratory Manager

ISO 9001 BUREAU VERITAS Certification

ISO 14001 BUREAU VERITAS Certification

Chemical Analysis is undertaken in accordance with in-house technical procedures and is subject to quality control procedures. Any opinions or interpretations indicated are outside the scope of our UKAS accreditation.

Water Samples

Job No. 09-06498
Site: Brunner Mond, Lostock Site, Northwich, Cheshire
Report Date: 30/04/2009

			Lab No.	78242
			Sample Date	02/04/2009
			Sample Id	WS2
			Other ID	
			Depth (m)	0
Determination	**LOD**	**Units**	**Method**	
pH		pH units	305 *	10
Ammonical Nitrogen, soluble, as NH4	500	µg/l	518 *	15000000
Cyanide (Total)	0.005	mg/l	301	210
Free Cyanide, as CN	100	µg/l	315	< 100
Complex Cyanide, as CN	40	µg/l	301	14000
PRO (>C5-C6)	10	µg/l	501	1000
PRO (>C6-C8)	10	µg/l	501	20000
PRO (>C8-C10)	10	µg/l	501	20000
Total PRO (>C5-C10)	30	µg/l	501	42000
Total PRO (>C6-C10)	20	µg/l	501	41000
Benzene	3	µg/l	501	330
Toluene	3	µg/l	501	750
Ethylbenzene	3	µg/l	501	11
o-Xylene	3	µg/l	501	100
m+p-Xylene	3	µg/l	501	69
MTBE	3	µg/l	501	< 3.0
TAME	3	µg/l	501	< 3.0
Phenol	5	µg/l	510	290000
Catechol	5	µg/l	510	< 5.0
Resorcinol	5	µg/l	510	< 5.0
Total Cresols	5	µg/l	510	210000
Total Xylenols	10	µg/l	510	62000
Naphthol	5	µg/l	510	< 5.0
Trimethylphenol	5	µg/l	510	< 5.0
Total Phenols	50	µg/l	510	560000
Aliphatic (>C6-C8)	10	µg/l	501	19000
Aliphatic (>C8-C10)	10	µg/l	501	20000
Aliphatic (>C10-C12)	15	µg/l	519	< 15
Aliphatic (>C12-C16)	10	µg/l	519	140
Aliphatic (>C16-C21)	15	µg/l	519	830000
Aliphatic (>C21-C35)	25	µg/l	519	86
Aliphatic (>C35-C40)	10	µg/l	519	22
Aliphatic (>C40-C44)	10	µg/l	519	< 10
Aromatic (>C6-C7)	10	µg/l	501	330
Aromatic (>C7-C8)	10	µg/l	501	750
Aromatic (>C8-C10)	10	µg/l	501	180
Aromatic (>C10-C12)	10	µg/l	519	990
Aromatic (>C12-C16)	10	µg/l	519	590
Aromatic (>C16-C21)	10	µg/l	519	120
Aromatic (>C21-C35)	15	µg/l	519	100
Aromatic (>C35-C40)	10	µg/l	519	28
Aromatic (>C40-C44)	10	µg/l	519	< 10
Acenaphthene	0.1	µg/l	306	3.4
Acenaphthylene	0.1	µg/l	306	< 0.1
Anthracene	0.1	µg/l	306	2.2
Benzo(a)anthracene	0.1	µg/l	306	< 0.1
Benzo(a)pyrene	0.1	µg/l	306	< 0.1
Benzo(b)fluoranthene	0.1	µg/l	306	< 0.1
Benzo(k)fluoranthene	0.1	µg/l	306	< 0.1
Benzo(g,h,i)perylene	0.1	µg/l	306	< 0.1

Water Samples

Job No. 09-06498
Site: Brunner Mond, Lostock Site, Northwich, Cheshire
Report Date: 30/04/2009

			Lab No.	78242
			Sample Date	02/04/2009
			Sample Id	WS2
			Other ID	
			Depth (m)	0
Determination	**LOD**	**Units**	**Method**	
Chrysene	0.1	µg/l	306	< 0.1

Water Samples

Environmental Laboratories

Job No. 09-06498
Site: Brunner Mond, Lostock Site, Northwich, Cheshire
Report Date: 30/04/2009

			Lab No.	78242
			Sample Date	02/04/2009
			Sample Id	WS2
			Other ID	
			Depth (m)	0
Determination	**LOD**	**Units**	**Method**	
Dibenzo(a,h)anthracene	0.1	µg/l	306	< 0.1
Fluoranthene	0.1	µg/l	306	3.2
Fluorene	0.1	µg/l	306	2.4
Indeno(1,2,3-c,d)pyrene	0.1	µg/l	306	< 0.1
Naphthalene	0.1	µg/l	306	6.6
Phenanthrene	0.1	µg/l	306	16
Pyrene	0.1	µg/l	306	1.8
PAH Total (EPA 16)	0.3	µg/l	306	35

Environmental Monitoring Protocol

An ongoing monitoring programme is being proposed, following the results of the site investigation, in those locations where elevated concentrations of contaminants were identified in the groundwater samples. The following table provides an overview:

Monitoring Point	**Monitoring Frequency**
Routine Monitoring Programme	
Window sample holes	Initial analysis following implementation of the SPMP and then according to an agreed frequency based on the investigation results (likely to be annually). The exploratory holes were installed with a permanent monitoring well. Only groundwater from these permanent installations will be sampled. Sampling and Analytical protocols used during the monitoring will be the same as those outlined in Section 3.2.5 of the Design SPMP.
Emergency Monitoring Programme	
Window sample holes	Immediately after an incident the Environment Agency will be informed (as required under permit condition 5.1.1) and the exact details of the emergency monitoring programme agreed and recorded at the outset. The following is likely to be proposed: The installed boreholes will be monitored as soon as possible with continued monitoring for an agreed number of months thereafter. If the pollutant levels remain high a monthly frequency will continue. When a decreasing trend is identified monitoring will be reduced to every 3-6 months and then to the agreed (normal) frequency rate if pollutant levels are deemed low or negligible (based on reference data, historical trends and trigger values). Sampling and Analytical protocols used during the emergency monitoring plan will be the same as those outlined in Section 3.2.5 of the Design SPMP. Personnel responsible for the emergency monitoring plan will be trained to a suitable level to ensure appropriate compliance with sampling protocols.

Infrastructure Monitoring Protocols

Infrastructure	Protocol	Monitoring Frequency	Assessment Personnel
Roadways & hardstanding	Visual inspection	Regular visual inspection of chemical off-loading areas undertaken as part of routine operational site tour with failures recorded on check sheet for corrective action. Periodic visual inspection of all road surfaces recording for action any major defects with the potential to cause a significant risk of ground contamination.	Appropriately trained personnel
Sub surface structures	There are no underground storage tanks in use on site. The only other subsurface structures on site are the effluent drains and sumps.	Visual inspections of sumps carried out when inspecting the relevant bund. Periodic visual inspection of Drain 8 for high levels of liquor head or restriction to flow.	Appropriately trained personnel
Secondary containment (bunding arrangements)	Procedure for the inspection of main containment infrastructure which is linked to the environmental management system to maintain integrity.	Regular visual inspection (for leaks and cracks) as part of routine operational site tour with failures recorded on check sheet for corrective action. Periodic full inspection of bunds / bunded areas designated as environmentally critical.	Appropriately trained personnel
Pipe work and bulk tanks	Procedure for the inspection of main containment infrastructure which is linked to the environmental management system to maintain integrity.	Regular visual inspection of tanks and pipe work as part of routine operational site tour with failures recorded on check sheet for corrective action. Full external inspection of tanks in accordance with documented pressure vessel inspection schedules or environmentally critical routine (frequencies are established for individual vessels etc.)	Appropriately trained personnel