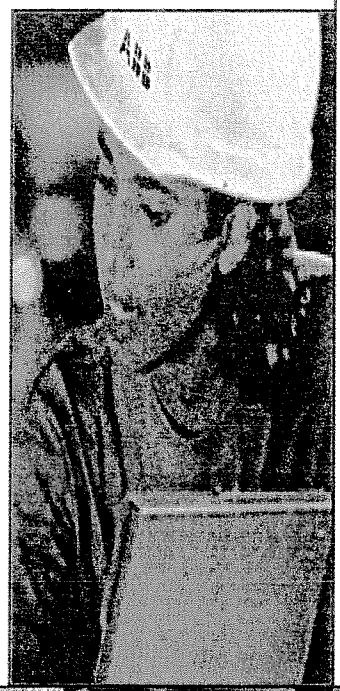


HUNTSMAN PETROCHEMICALS OLEFINS Manufacturing Area Phase 1b/2 IPPC Site Report

Huntsman Petrochemicals
Olefins Manufacturing Area
Phase 1b/2
IPPC Site Report

Report:	Number:	ILM114-1b/2-01
	Version:	1.1
	Date:	11 March 2003

Prepared for:

Huntsman Petrochemicals
Wilton Site
Olefins Offices,
PO Box 99,
Redcar
TS10 4YA

Prepared by

ABB Eutech
Daresbury Park
Daresbury
Warrington
Cheshire WA4 4BT
United Kingdom

Issued by — Paul Noble
Approved by — John Raine

TABLE OF CONTENTS

List of Tables

List of Figures

List of Appendices

1.0 Introduction

ABB Eutech was appointed by Huntsman Petrochemicals Ltd to prepare a Phase 1b/2 Baseline Site Report (BSR) in support of an Integrated Pollution Prevention and Control (IPPC) submission for the Olefins Manufacturing Area, Wilton Site, Redcar. A Phase 1a Site Report (ABB Report No ILM078-01) for the Olefins Manufacturing Area has already been issued and should be referred to in conjunction with this report (ref 1).

The Olefins Manufacturing Area consists of three geographically discrete operating areas:

- Olefins 6, Butadiene 3 Plants and 'off plots' storage;
- Wilton Ethylene Control (WEC);
- Central Control.

Figure 1 illustrates the locations of these facilities while area / plant layouts are presented in Figures 2A-2C. The boundaries shown on these figures for the different parts of the installation have been adopted for the Olefins Manufacturing Area IPPC initial site report.

The Olefins 6 plant converts a range of feedstocks into olefins products, mainly ethylene and propylene. By-products include hydrogen, methane, a mixed C4 stream (consisting of a mixture of butadiene and butenes), raw gasoline and fuel oil. The mixed C4 stream is further processed on the Butadiene 3 plant for the extraction of butadiene with a C4 raffinate (butenes) by-product. The raw gasoline is processed on the Gasoline Treatment Unit to produce a range of gasoline components.

Wilton Ethylene Control (WEC) comprises six underground cavities used for storage of ethylene and mixed C4 hydrocarbons, as well as above ground storage of:

- refrigerated butadiene,
- raffinate (butenes),
- naphtha .

Central Control (CC) comprises above ground storage and distribution facilities for a range of feedstocks and products including raw and hydrotreated C5s, paraxylene, depentanised hydrotreated gasoline (DPHG) and raw gasoline.

In terms of potential soil and groundwater contaminant source areas, key features within the plants are as follows:

1. Process areas, including linear potential sources which are difficult to delineate in a specific area such as live product intraplant pipelines and effluent drains;
2. Bulk Chemical Storage (all above ground with the exception of the underground cavities, which are situated at depths of over 600m below ground level). In particular, earth (usually clay) lined tank bunds;
3. Effluent drains, in particular oil – water separators;
4. Any of 1-3 above where there is evidence of historical spills or leaks.

During the Phase 1a assessment, a number of potential contaminant source areas were identified, all of which fit into groups 1-4 above (see section 3 for summary of Phase 1a assessment). Given that these potential source areas are evenly distributed through the three Olefins operating areas, the site report presents baseline conditions for each area rather than sub-dividing the operating areas further. In the case of Wilton Ethylene control, only part of the geographic area is used actively for storage, in this case, only the active parts of the plant were investigated.

The Olefins Manufacturing Area also operates a number of pipeline systems. Two long-distance ethylene pipelines (the TPEP- Trans-Pennine Ethylene pipeline to Runcorn and the WGEP – Wilton Grangemouth Ethylene Pipeline) are controlled from WEC, although these are not part of the IPPC installation. Additionally a number of interplant pipelines (within the site and to other sites) are operated by Olefins.

Under the new IPPC regulations there is a requirement for a baseline site report (BSR) prior to the award of an IPPC permit by the Environment Agency (EA) to operate certain installations and processes. IPPC permits also stipulate certain compliance conditions such as emission limit values and discharge consents for wastewaters. This report forms the statement of baseline conditions, the baseline site report or BSR. It is based in intrusive investigations and monitoring carried out in Dec 01 – Feb 02 and follow-up monitoring in Feb 03.

To surrender an IPPC permit, an operator is required to produce a closure site condition report (CSR) to document soil and groundwater conditions prior to permit surrender. It is envisaged within the regulations that if there has been a deterioration of the soil or groundwater quality as a direct result of the licensed operations, then the operator may have to remediate the site to the initial site report baseline conditions before the permit can be surrendered.

2.0 Phase 1b/2 Assessment Objectives

The Phase 1b/2 Assessment objectives were to define the initial baseline site conditions as detailed in EA IPPC guidance (ref 2). In particular, the objectives were to:

- Obtain soil and groundwater samples at locations of potential contaminant source areas, up and down assumed hydraulic gradient boundaries and general plant areas;
- Obtain samples during different sampling events (March 2002 and February 2003) to check for concentration variation;
- Conduct the appropriate laboratory analyses that will identify the potential presence of chemicals relating to current site processes in soil and groundwater beneath the site;
- Make a statement as to the baseline conditions on site prior to issue of the IPPC licence.

3.0 Summary of Phase 1a Assessment

3.1 Site Setting

The Wilton International Site is situated on the south side of the River Tees on the river flood plain 4 - 5 km from Teesmouth. It covers an area of approximately 800 hectares in total, with approximately one quarter used as arable farmland and the rest occupied by chemical plant, chemical storage, warehouses, contractor facilities, office space and roads. It measures approximately 3 km from east to west and 3.5 km from north to south. The infrastructure of the site is managed by Enron Teesside Operations Limited (ETOL) who provide most of the central site services.

Land use surrounding the site is as follows:

- To the south and east there is farmland and woodlands and residential areas including, Kirkleatham, Dormanstown and Wilton village (all within 1 km from the site boundary).

- To the north is the Corus Lackenby Works and other generally open industrial land (including various former and current landfill sites);

- To the west are the residential areas of Grangetown and Lazenby village.

Land use surrounding each of the Olefins Manufacturing area plants is as follows (including approximate distances from plant boundaries):

PLANT	NORTH	EAST	SOUTH	WEST
Olefins 6	Du Pont -SA Polyester Plants, 200m	Site boundary, 300m WEC	Wilton Centre, 200m	Basell polypropylene plant, 250m (permanently shut down from May 2002 in process of demolition in October 2002)
WEC	Open land, former propathene plants, 100m, Dow Offices, 50m	Mains Dyke and site boundary, 100m ETOL pipeline corridor	B7 (Off-plot) Storage tanks, 300m from active areas of WEC excluding wellheads	Du Pont -SA Polyester Plant, 200m
CC	Site boundary, 50m	Open land, former Petroleum Resins plant on land adjacent to east. Buffer Tanks, 100m, Mill Race & site boundary, 300m	Paraxylene IV Plant, 50m Paraxylene V Plant (south west)	Central Control and Paraxylene area flare stacks, 100 – 300m, Site boundary, 300m, Lackenby Steel plant, 500m

Inter-plant and inter-site pipelines are operated by Huntsman or other businesses and are located on land owned by ETOL. These pipelines transfer materials between producing and/or consuming plants either on Wilton or to and from plants located at North Tees and Billingham.

3.2 Geology

According to published geological information, the Wilton site is underlain by up to 20m of drift comprising glacial and alluvial deposits. The drift deposits overlay a sequence of Jurassic mudstones & siltstones dipping towards the east. The Jurassic mudstones are underlain by a thick sequence of Permo-Triassic deposits including the Sherwood Sandstone Group, marls and anhydrite/halite deposits.

The geological sequence (based on deep boreholes in the Olefins 5 area and published geological information) is summarised below, with depth ranges from ground level:

DRIFT

Glacial & Alluvial deposits **Up to 20m**

JURASSIC

Redcar Mudstone Formation (Lias Group) **17m to 94m**

Mudstones & siltstones, calcareous sandstones with subsidiary thin limestone (the Calcareous Shales), sandstones and ironstones.

PERMO-TRIASSIC

Penarth Group & Mercia Mudstone Group **19m to 307m**

Mudstones and siltstones, with subsidiary sandstones and thin limestones (in Penarth Group).

Sherwood Sandstone Group **307m to 560m**

Three informal units differentiated on lithological grounds. Upper unit of silty sandstones; middle unit of poorly to well sorted fine to coarse grained sandstones; lower unit of silty clayey fine grained sandstones.

Roxby Formation **562m to 636m**

Formerly known as the Upper Permian Marls

Sherburn Anhydrite **636m to 640m**

Mixed marls with anhydrite and halite **640m to 645m**

"Boulby" Halite **645 to at least 680m**

This rock unit is the layer used for storage of ethylene and mixed-C4s in cavities.

According to geotechnical borehole records reviewed as part of the Phase 1a assessment, made ground deposits and fill materials (where fill is defined as materials placed for engineering purposes) are present associated with foundations, underground services and below ground structures (e.g. interceptors) beneath most areas of the developed areas of the site, especially in areas previously developed for the earlier Olefins plants (i.e. around Central Control for Olefins 1 to 4, Petroleum Resins and within WEC for Olefins 5).

Made ground and fill materials are generally granular and less than 0.5m thick, but have been proved during the Phase 1b/2 investigation to be over 2m thick in some areas, mainly associated with interceptors and footings of large structures (for full Phase 1b/2 ground condition results – see section 5).

The drift deposits comprise predominately stiff boulder clays and undifferentiated clays. Geotechnical boreholes and the Phase 1b/2 investigation encountered sand lenses within the drift deposits, these were mainly encountered beneath Olefins 6. The drift deposits generally thin northwards to less than 3m close to the northern boundary of Central Control. The drift deposits encountered by the Phase 1b/2 site investigation are further discussed in Section 5.0. The Phase 1b/2 investigation only proved the Lias Group in Central Control.

3.3 Hydrogeology

Perched groundwater is typically present in made ground and fill materials above clay deposits. Groundwater is also present within sand lenses with the boulder clay sequence. Laterally continuous sand lenses were only encountered beneath Olefins 6.

Groundwater flow in the drift deposits and made ground/fill is likely to be northerly, which is consistent with the topographical gradient towards the River Tees. However, these groundwaters are likely to be influenced locally by the presence and distribution of made ground, permeable sand lenses or sandy partings within the clay dominated drift deposits and potential leakage of utilities (e.g. cooling water, potable water, drainage).

The Lias Group is classified by the EA as a non-aquifer, although the Calcareous Shales, sandstones and ironstones are expected to contain groundwater. The Penarth group is also classified as a non-aquifer. The Mercia Mudstone is effectively a non-aquifer, although it can yield limited quantities of groundwater for domestic or small-scale agricultural use in other areas.

The Sherwood Sandstone Group is classified as a major aquifer. The underlying Permian deposits are non-aquifers. The area is classified as a non-aquifer on the EA groundwater vulnerability map based on the presence of drift deposits and the Lias Group at or near-surface.

Environment Agency records indicate that there are no groundwater (source) protection zones on site or in the surrounding area and that there are no licensed groundwater abstractions within a 2 km radius of the site. Given the geological conditions of the Wilton area, impacts to groundwater abstractions at distances greater than 2km from the site due to on-site contaminant source areas are considered unlikely (see conceptual site model, Section 6). The local authority environmental health department report that they are not aware of any unlicensed private abstractions in this area.

3.4 Hydrology

Within the developed areas of the site, surface water run-off is generally collected by site-specific drainage systems (complete with necessary interceptors or other treatment facilities, where appropriate).

Outside of the process areas, surface water runoff collects in various drainage ditches and is either passed to soak-away, intercepted by site drainage systems, or fed into one of the watercourses running through the site. Plant drainage systems include sub-surface land drains (e.g. within earth bunds), which discharge to the plant, and then site drainage systems. Older land drains associated with the previous agricultural land use may also be present with overall flow direction expected to be towards the north.

In addition to the drainage ditches, named watercourses at the site include:

- Kettle Beck. This runs inside the western boundary and leaves the site at the west end of the northern boundary,
- Mains Dike. This enters and runs alongside the eastern boundary of the site to link into the Mill Race that leaves the site at the east end of the northern boundary to run north to northwest to the River Tees.

The surface water drainage ditches and streams are too small to be classified under the EA General Quality Assessment (GQA) scheme. The River Tees is not classified under the GQA scheme, as it is tidal in this area. Although there has been considerable improvement in the water quality of the Tees Estuary in recent years, the EA reported that water quality was poor for the stretch between the Tees Barrage to the Teesport area in 1999 (EA website, Water Quality on Teesside Report; May 2002). However, it is estimated that approximately 26,000 migratory fish (salmon and sea trout) passed through the estuary in 1999.

Environment Agency records indicate that there are no licensed surface water abstractions within a 2 km radius of the site. Abstractions beyond this distance are unlikely to be impacted by contaminant migration in normal operating conditions.

3.5 Site Layout and Description

The layout of Olefins 6, Wilton Ethylene Control and Central Control is shown in Figures 2A to 2C of this report.

A summary of the operations in each area is provided in the introduction to this report (Section 1) and in greater detail in the Phase 1a Assessment Report (ABB Report No ILM078-01, ref 1).

3.6 Source Pathway-Target relationships

3.6.1 Potential Sources

A number of areas have been identified as potential sources of contamination, these are listed below: (from Phase 1a Assessment)

Table 1A. Potential Sources for Olefins 6 Area

POTENTIAL SOURCE AREA REFERENCE FIGURE 2A	POTENTIAL SOURCE AREA & POTENTIAL CONTAMINANT
S1	Day Tanks Area: Caustic, Petrinex, Fuel oil, naphtha
S2	Caustic oil water separator, general oils, caustic soda
S3	Olefins 6 Oil water separator: General hydrocarbons, Red oil, recovered oil, light oil
S4	General hydrocarbons
S5	F1705 catchpot, "flushing oil"
S6	H,J, K, P Furnaces: Liquid hydrocarbons
S7	Storage tanks in west : GTU Petrol Product, Gasoline, Benzene, Topanol
S8	J1702 / J1703 Lube oil
S9	F1721, gasoline
S10	Butadiene 3, N-methyl pyrrolidone
S11	Heat exchangers, naphtha
S12	Flare knock out drum, gasoline : potential leakage
S13	Plant link / vein lines, gasoline - reported gasoline leaks south east of control room

POTENTIAL SOURCE AREA REFERENCE FIGURE 2A	POTENTIAL SOURCE AREA & POTENTIAL CONTAMINANT
S14	Flare area, gasoline, potential drainage of drum bottoms to ground
S15	Equipment wash bay / oil water interceptor
S16	B7 / Off-plots area, gasoline, naphtha

Table 1B. Potential Sources for Wilton Ethylene Control Area

POTENTIAL SOURCE AREA REFERENCE FIGURE 2B	POTENTIAL SOURCE AREA & POTENTIAL CONTAMINANT
WEC : S1	BF5 tank, Naphtha
WEC : S2	Visible localised compressor oil & RBS oil water separator, general oils
WEC : S3	WEC Oil water separator, general oils

Table 1C. Potential Sources for Centrol Control Area

POTENTIAL SOURCE AREA REFERENCE FIGURE 2C	POTENTIAL SOURCE AREA & POTENTIAL CONTAMINANT
CC : S1	Bf2 bund: DPHG/Paraxylene,
CC : S2	Nf 1 bund, Hydro treated or Raw C5s
CC : S3	Former Leaking Valve, (Discounted)
CC : S4	Southern Oil-Water Separator, general oils, Paraxylene
CC : S5	Northern Oil-Water Separator, general oils
CC : S6	Nf 48 tank, Light Reject Naphtha (C5, C6, olefins, 17% hexane, 2% benzene) & former benzene tank

3.6.2 Potential Pathways and Receptors

Potential receptors of contamination from the three operating areas which make up the Olefins Manufacturing area, and potential contaminant migration pathways which may link the potential contaminant source areas to these receptors are listed below:

- On-site workers involved in excavation works in source areas (e.g. interceptors) this scenario could be managed through appropriate site health and safety procedures;

- Off-site workers down gradient of the plants involved in excavation could be exposed to contaminants migrating north in shallow groundwater within the permeable made ground, sand/gravel horizons within the drift deposits and former land drains dating from the period when the land was used for agricultural purposes. However, most of these land drains will no longer be operative due to their age and the subsequent development of the site which will have damaged or removed these features. Given the likely discontinuous nature of the shallow groundwater deposits, this pathway is considered unlikely to be operating to a significant extent;

- Surface watercourses to the east including The Mill Race and Mains Dyke. However, drainage from the plants is unlikely to reach these receptors due to the discontinuous nature of shallow groundwater flow and the fact that plant drainage would intercept surface water flow before contaminants could reach these receptors;

- The River Tees estuary. Contaminated water within permeable surrounds of the plant drains and the main site drainage system and former land drains (potential preferential pathways) could migrate into Dabholme Gut (discharges within the drains are regulated through the EA-registered discharge consent). This pathway is also considered unlikely to be operative due to the large distance that contaminants would have to travel within the drainage surrounds to reach Dabholm Gut (1.5km). In addition, the drainage system includes sumps and manholes which are likely to provide barriers to the permeable surrounds of the plant and site drains as this permeable material does not extend to the surrounds of the manholes and sumps which are likely to be installed within natural clay;

- Deeper groundwater deposits are not considered to be at risk of impact from site contaminants due to thick, low-permeability, non-aquifers which are present beneath the site.

4.0 Intrusive Investigation

4.1 Programme of Intrusive works

The investigation work was divided into the following work elements:

- Shallow soil sampling using percussion driven window-sampling techniques at over 32 locations to depths of up 4m below ground level (mbgl).
- Installation of 35mm diameter PVC groundwater monitoring wells into eleven selected window sample bores.
- Near surface soil sampling from hand dug trial pits at two locations within a tankage bund at WEC.
- Installation of 50mm diameter groundwater monitoring wells into 22 bores constructed using a JCB mounted solid/hollow stem rotary auger drilling rig to depths of up to 8 mbgl.
- Borehole logging and on-site PID headspace testing.
- Soil sampling for laboratory analysis.
- Monitoring well gauging.
- Groundwater sampling for laboratory analysis in March 2002 and February 2003.

The site works were performed under the Huntsman work permit system. The intrusive locations were cleared for underground services and structures by Huntsman under the Huntsman excavation certificate system.

The drilling and monitoring well installation works were undertaken by a specialist environmental drilling sub-contractor, Cape Site Services Limited, under the supervision of WD Environmental Limited and ABB Eutech.

Borehole logging, on-site soil testing and soil sampling was undertaken during the period 4th December 2001 to 31st January 2002. Groundwater sampling was undertaken during the period 25th March 2002 to 4th April 2002 and 3rd to 6th February 2003.

4.2 Sampling Strategy

Borehole and well locations are presented on Figures 3A-3C and tabulated below. The locations of each intrusive sampling point were selected to:

- Target potential historical sources
- Target specific and general process areas
- Achieve overall geographic site coverage
- Provide coverage up & down groundwater gradient of main plant areas
- Sample groundwater wells at different times in order to present a baseline from more than a single sampling event

It is noted that no groundwater monitoring wells were installed within earth bunds due to the possibility of providing a vertical migration pathway and compromising the integrity of the bund. No drilling at all took place in certain hazardous process areas and in concrete bunds or within 1m of major underground services.

Sampling locations, reference numbers, drilling techniques and installations are summarised below:

Olefins 6

Table 2A. Sampling locations, techniques and installations for Olefins 6 Area

WINDOW SAMPLING	WELL INSTALLATION	ROTARY AUGER DRILLING	WELL INSTALLATION
OL101	No	OL201	50mm PVC
OL102	35mm	OL202	50mm PVC
OL103	35mm	OL203	35mm
OL104	35mm	OL204	50mm PVC
OL105	No	OL206	50mm PVC
OL106	No	OL207	50mm PVC
OL107	35mm	OL208	50mm PVC
OL108	No	OL210	50mm PVC
OL109	No	OL211	50mm PVC
OL110	No	OL212	50mm PVC
OL111	No	OL213	50mm PVC
OL114	35mm	OL214	50mm PVC
OL115	35mm	OL215	50mm PVC
		OL217	50mm PVC

Wilton Ethylene Control

Table 2B. Sampling locations, techniques and installations for Wilton Ethylene Control Area

WINDOW SAMPLING	WELL INSTALLATION	ROTARY AUGER DRILLING	WELL INSTALLATION
WEC101 (Hand Dug)	No	WEC201	50mm PVC
WEC102 (Hand Dug)	No	WEC203	50mm PVC
WEC103	35mm	WEC204	50mm PVC
WEC105A	No	WEC104	50mm PVC
WEC105B	35mm		
WEC202	No		

Central Control

Table 2C. Sampling locations, techniques and installations for Central Control Area

WINDOW SAMPLING	WELL INSTALLATION	ROTARY AUGER DRILLING	WELL INSTALLATION
CC101	No	CC201	50mm PVC
CC102	No	CC202	50mm PVC
CC103	No	CC203	50mm PVC
CC104	No	CC204	50mm PVC
CC105	35mm		
C106	No		
CC107	No		
CC108	No		
CC109	35mm		
CC110	No		
CC111	No		
CC111A	No		
CC112	No		
CC113	35mm		
CC114	No		

As previously mentioned, the areas that were identified by the Phase 1a assessment as being potential contamination sources are detailed in Tables 1A – 1C. In order to establish the rationale between the potential sources in Phase 1a and the sampling strategy of Phase 1b/2, Tables 3A – 3C show potential source areas together with their corresponding sampling locations.

Table 3A. Sampling locations and corresponding source area / potential contaminants for Olefins 6 Area

POTENTIAL SOURCE AREA	BH NO (S)	POTENTIAL SOURCE AREA AND POTENTIAL CONTAMINANTS
S1	OL101, OL205, OL206	Day Tanks Area: Caustic, Petrinex, Fuel Oil, Naphtha
S2	OL105	Caustic oil water separator: general oils, caustic soda
S3	OL107, OL108, OL212	Olefins 6 oil water separator: general hydrocarbons, red oil, recovered oil, light oil.
S4	OL104, OL209	General hydrocarbons
S5	-	F1705 catchpot: 'flushing oil'
S6	OL103, OL207, OL208	Furnace area: general hydrocarbons
S7	OL211	Storage tanks in west: GTU Petrol Product, Gasoline, Benzene, Topanol
S8	No access possible for safety reasons	J1702 / J1703: Lube oil
S9	OL215	F1721: Gasoline
S10	OL109	Butadiene 3, N methyl pyrrolidone
S11	OL106, OL210	Heat exchangers, naphtha, Quench oil, localised oil staining on ground
S12	OL115	knock out drum, gasoline : potential leakage
S13	OL213	Plant link / vein lines, gasoline - reported gasoline leaks south east of control room
S14	OL115	Flare area, gasoline, potential drainage of drum bottoms to ground
S15	OL201	Equipment wash bay / oil water interceptor
S16	OL110, OL111, OL112, OL216, OL217	B7 / Off-plots area, gasoline
-	OL214, OL202, OL203, OL204	Up-gradient and down gradient coverage

Table 3B. Sampling locations and corresponding source area / potential contaminants for Wilton ethylene Control Area

POTENTIAL SOURCE AREA	BH NO (S)	POTENTIAL SOURCE AREA AND POTENTIAL CONTAMINANTS
S1	WEC101, WEC102, WEC201, WEC203	BF5 tank, Naphtha
S2	WEC103, WEC105	Visible localised compressor oil & RBS oil water separator, general oils
S3	WEC104, WEC202	WEC Oil water separator, general oils
-	WEC 204	Down gradient coverage

Table 3C. Sampling locations and corresponding source area / potential contaminants for Central Control

POTENTIAL SOURCE AREA	BH NO (S)	POTENTIAL SOURCE AREA AND POTENTIAL CONTAMINANTS
S1	CC101, CC102, CC106, CC107, CC108, CC110	Bf2 bund : gasoline/para Xylene, C5s
S2	CC103	Nf 1 bund, Hydro treated C5s
S4	CC109	Southern Oil-Water Separator, general oils
S5	CC203	Northern Oil-Water Separator, general oils
S6	CC104	Nf 48 tank, Light Reject Naphtha (C5, C6, olefins, 17% hexane, 2% benzene) & former benzene tank
-	CC202, CC204	Down gradient coverage

Due to access restrictions, underground obstruction and underground services, it was not possible to complete the boreholes at the following locations (all located in Olefins 6):

- OL105 Concrete encountered at a depth of <1mbgl
- OL112 Underground Services
- OL113 Underground Services
- OL205 Underground Services
- OL209 Concrete encountered at a depth of <1mbgl
- OL216 Concrete encountered at a depth of <1mbgl

4.3 Field Methods Used During Intrusive Site Works

4.3.1 Borehole Drilling

The window-sampling rig comprised a hand-held hydraulic drive hammer unit powered by a remote portable diesel unit (complete with Chelwyn valves & spark arrestors) and operated by a two-man drilling crew. The rig advanced steel window sample tubes of 60mm (reducing to 36mm diameter) and 1m to 1.2m in length to depths of up to 4 mbgl. Removal of the sample tubes was achieved via a hydraulic jacking unit (using the same power unit) to provide undisturbed soil profile cores. Soils were then accessed through open sections along the length of each window sampler tube.

The rotary auger rig comprised a drilling mast mounted on a JCB-type excavator. The drill rig was diesel-hydraulic powered and fitted with a spark arrestor and Chelwyn valve. The drill rig is capable of utilising hollow stem augers and solid continuous augers. All the augers were 1.5m in length. The hollow stem augers had a nominal outside diameter of 400mm and a nominal internal diameter of 200mm. The solid stem augers had a nominal outside diameter of 100mm.

Where the ground surface was concrete, a corer was used to cut an access hole to allow access for the drilling equipment. Power for the coring unit was provided by an 110V direct diesel generator fitted with spark arrestor and Chelwyn valves.

Down-hole drilling tools were cleaned with a water washer between drilling locations. The location of the wash down area was agreed with Huntsman operational staff.

4.3.2 Soil Sampling and Field Testing

The soil profile at each location was logged in accordance with BS 5930:1999.'Code of Practice for Site Investigations'. Soil samples were screened on-site for total ionisable volatile organic compounds (VOCs) using a 10.2 eV photo-ionisation detector (PID). Each location was photographed during the investigation and selected images of the locations are presented in Appendix A.

During borehole construction, disturbed soil samples were selected for possible subsequent laboratory analysis. The samples were placed in laboratory-supplied containers at the sampling location. The types of sample container utilised varied according to the type of analysis required, as shown below:

- 125 ml Glass Vial - Petrol Range Organics (PRO) & VOCs
- 500 ml Glass Amber Wide Mouthed Jar - Other Organic Analyses
- 250 ml Plastic Tubs - Metals

The selection of samples for possible subsequent laboratory analysis was made by the environmental engineer at each location based on the requirements of the sampling strategy, surrounding structures & processes, bore depth, lithological sequence, visual inspection, olfactory evidence, PID readings and the need to provide analytical results from different soil types across the site. Details of the soil sampling schedule are presented in Tables 4A-4C.

The samples were stored in cooler boxes and transported to the laboratory by arranged courier under chain of custody documentation.

To provide flexibility in sample selection for actual analysis, samples were often recovered from a number of depths and lithologies within a specific borehole. Again, sample selection was made on a location specific basis.

Borehole logs, including details of the PID screening, soil sampling for laboratory analysis and water strikes, are presented in Appendix B. The monitoring well completion details are summarised on the borehole logs.

4.3.3 Monitoring Well Installation

On completion of the window sampling, selected window sample locations were completed as 35mm diameter monitoring wells comprising PVC slotted well screen, PVC plain standpipe, 1mm to 2mm filter sand, bentonite seals and steel monitoring well covers.

The window bores to be completed as wells were selected on the basis of the sampling strategy, surrounding structures & processes, location of adjacent wells & boreholes, bore depth, lithological sequence, visual inspection, olfactory evidence, PID readings and the need to provide well coverage across the site. A list of narrow diameter monitoring wells is presented in Tables 2A-2C (section 4.2 above).

Window sample bores not completed as monitoring wells were backfilled and sealed with bentonite and concrete as required.

On competition of rotary auger drilling, the bores were completed as 50mm monitoring wells comprising PVC slotted well screen, PVC plain standpipe, 1mm to 2mm filter sand, bentonite seals and steel monitoring well covers. A list of standard diameter monitoring wells (i.e. 50mm) is presented in Tables 2A-2C (section 4.2 above).

All wells were designed on-site on a borehole specific basis according to sampling strategy, lithologies, groundwater strikes, potential contamination encountered, surrounding structures & processes, location of adjacent wells & boreholes and investigation objectives.

The borehole logs, including details of water strikes and well installations, are presented in Appendix B.

4.4 Groundwater Monitoring and Sampling

All the installed monitoring wells were gauged relative to top of well casing (TOC) and ground level using a water-product interface meter. The wells selected for groundwater sampling are detailed in Tables 5A-5C.

Due to the lack of groundwater recharge into the wells selected for sampling, it was not possible to "purge" the wells completely prior to sampling and only half to one well volume of groundwater was typically removed prior to sampling. Disposable bailers were used for purging and sampling. Prior to purging, the wells were gauged using a product interface meter.

Groundwater samples were placed in laboratory supplied containers and labelled with a unique ID, date & location. The type of sample container utilised varied according to the type of analysis required, as shown below:

- 125 ml Glass Vial - Petrol Range Organics (PRO) & VOCs
- 1000 ml Glass Amber Winchester Style Bottles - Other Analyses

The samples were stored in cooler boxes and transported to the laboratory by laboratory arranged couriers under chain of custody documentation

4.5 Selection of Analytical Determinants

The selection of analytical determinants for samples from particular boreholes was guided by the findings from intrusive works and the Phase 1a Assessment (ref 1). The soil and water analyses were submitted to Alcontrol of Chester. The rationale for the sampling strategy is described in Section 4.3.2

Selected soil and groundwater samples were scheduled for the following determinants:

- Benzene, toluene, ethyl-benzene and xylenes (BTEX) by GC/FID
- Petroleum Range Organics (PRO) by GC/FID
- Diesel Range Organics (DRO) by GC/FID
- Volatile organic compounds (VOC) by GC/MS
- Semi volatile organic compound (SVOC) by GC/MS
- Heavy metals suite (arsenic, cadmium, total chromium, copper, lead, mercury, nickel, zinc, selenium) by ICP OES
- Water soluble Boron by colorimetry

Details for the schedule of analyses for the soil and groundwater samples are given below in Tables 4A – 4C and 5A-5C respectively.

Table 4A – Olefins 6 Soil Analytical Suite

Sample Identity	Depth (m)	DRO by GC/FID	PRO by GC/FID	BTEX by GC/FID	SVOC inc TIC by MS	VOC inc TIC by MS	ICP Heavy Metals	Boron (H2O Sol)
OL101 D1	0.20		X	X				
OL101 D2	0.10-0.20	X						
OL101 D3	3.25		X	X				
OL101 D5	3.20-3.50	X					X	X
OL102 D1	1.20		X	X				
OL102 D4	1.80-1.90		X	X				
OL102 D5	1.70-1.90	X						
OL103 D1	0.05		X	X				
OL103 D3	0.00-0.10	X						
OL103 D6	1.40-1.50		X	X				
OL104 D1	3.40-3.50		X	X				
OL104 D3	3.00-3.40	X						
OL105 D1	0.40		X	X				
OL105 D2	0.30-0.40	X			X		X	X
OL106 D1	1.40-1.50	X			X		X	X
OL106 D2	1.60		X	X				
OL107 D1	1.70-1.80		X	X				
OL107 D3	1.60-1.90	X			X		X	X
OL108 D4	2.40		X	X				
OL108 D6	2.30-2.50	X					X	X
OL109 D1	0.20					X		
OL109 D2	0.20-0.30				X			
OL110 D2	0.15		X	X				
OL110 D3	0.10-0.20	X						
OL111 D1	0.55		X	X				
OL111 D3	0.50-0.60	X			X		X	X
OL114 D1	0.10-0.20	X					X	X
OL114 D2	2.50		X	X				
OL115 D1	1.60		X	X				
OL115 D3	1.50-1.60	X					X	X
OL115 D4	2.90		X	X				
OL201	4.20-4.50	X	X	X				
OL202 D1	1.40-1.50	X						
OL202 D2	1.40		X	X				
OL203 D1	1.50-1.60	X						
OL203 D2	1.50		X	X				
OL204 D2	5.40-5.70	X	X	X				
OL206	4.40-5.00		X	X			X	X
OL208	3.00-3.50	X	X	X				
OL210	0.3 - 0.4	X						
OL214 D1	2.40-2.50	X						
OL214 D2	2.90		X	X				

Table 4B – WEC Soil Analytical Suite

Sample Identity	Depth (m)	DRO by GC/FID	PRO by GC/FID	BTEX by GC/FID	SVOC inc TIC by MS	VOC inc TIC by MS	ICP Heavy Metals	B (H2O Sol)
WEC 103	0.60-	X						
WEC 103	0.60		X	X				
WEC 104	0.10-	X						
WEC 104	0.30		X	X				
WEC 104	1.70-	X			X		X	X
WEC104	4.50-	X	X	X		X		
WEC 105	2.10		X	X				
WEC201	5.00-	X	X	X			X	X
WEC203	4.50-	X	X	X		X		
WEC204	7.50-	X					X	X

Table 4C – CC Soil Analytical Suite

Sample Identity	Depth (m)	DRO by GC/FID	PRO by GC/FID	BTEX by GC/FID	SVOC inc TIC by MS	VOC inc TIC by MS	ICP Heavy Metals	B (H2O Sol)
CC101 D1	0.10-	X			X		X	X
CC101 D2	0.40		X	X				
CC101 D4	0.80		X	X				
CC101 D6	1.70		X	X				
CC101	0.70-	X			X		X	X
CC102 D1	0.30		X	X				
CC103 D1	0.15		X	X				
CC103 D3	0.10-	X						
CC105D1	2.80		X	X				
CC105 D2	2.70-	X						
CC106 D1	0.45		X	X				
CC106 D2	1.80		X	X				
CC107 D1	0.30		X	X				
CC108 D1	1.40		X	X				
CC 109 D2	1.60-	X					X	X
CC109 D3	1.90		X	X				
CC109 D4	2.80-	X					X	X
CC110 D1	0.20		X	X				
CC111 D1	0.10		X	X				
CC111 D3	0.05-	X						
CC112	1.10-	X						
CC112	1.10		X	X				
CC113	0.60-	X						
CC113	0.70		X	X				
CC201	2.30-	X	X	X	X	X	X	X
CC201	3.50-	X	X	X				
CC202	5.50-	X					X	X
CC203	0.00-	X	X	X			X	X

Table 5A. Olefins 6 Groundwater Analytical Suite

Sample Identity	DRO by GC/FID		PRO by GC/FID		BTEX by GC/FID		SVOC inc TIC by MS	VOC inc TIC by MS	Metals
Date	Mar 02	Feb 03	Mar 02	Feb 03	Mar 02	Feb 03	Mar 02	Mar 02	Mar 02
OL102	X	X	X	X	X	X			X
OL104	X	X	X	X	X	X	X	X	
OL107	X		X		X		X	X	X
OL114	X	X	X	X	X	X	X	X	
OL201	X		X		X		X	X	X
OL204	X	X	X	X	X	X			
OL206	X	X	X	X	X	X			
OL207	X	X	X	X	X	X	X	X	X
OL208	X		X		X				
OL211	X	X	X	X	X	X			
OL213	X	X	X	X	X	X			
OL214	X	X	X	X	X	X			
OL215	X		X		X		X	X	X
OL217	X		X		X		X	X	X

Table 5B. Wilton Ethylene Control Groundwater Analytical Suite

Sample Identity	DRO by GC/FID		PRO by GC/FID		BTEX by GC/FID		SVOC inc TIC by MS	VOC inc TIC by MS	Metals
Date	Mar 02	Feb 03	Mar 02	Feb 03	Mar 02	Feb 03	Mar 02	Mar 02	Mar 02
WEC105B	X	PR	X	PR	X	PR	X	X	X
WEC201	X		X		X				X
WEC203	X		X		X				X
WEC204	X		X		X				X

PR = product sample analysed

Table 5C. Central Control Groundwater Analytical Suite

Sample Identity	DRO by GC/FID		PRO by GC/FID		BTEX by GC/FID		SVOC inc TIC by MS	VOC inc TIC by MS	Metals
DATE	Mar 02	Feb 03	Mar 02	Feb 03	Mar 02	Feb 03	Mar 02	Mar 02	Mar 02
CC104	X		X		X				
CC105	X		X		X				
CC109	X	X	X	X	X	X	X	X	X
CC113	X	X	X	X	X	X			
CC201	X		X		X				
CC202	X		X		X		X	X	X
CC203	X	X	X	X	X	X	X	X	X
CC204	X		X		X		X	X	X

4.6 QA/QC procedures

4.6.1 Field

Field methods and procedures used on site were based on accepted industry standards (e.g. BS 5930, 10175, refs 3 and 4) and were detailed in the project method statements (ref 5).

All soil and water samples were given a unique reference that included the site reference, sampling location, date of sampling and name of sampler. Samples were placed in cooler boxes with ice packs. Cooler boxes were transported to the laboratory by couriers under chain of custody documentation. Details of the chain of custody sheets are presented in Appendix C.

4.6.2 Laboratory

The laboratory providing the analytical services was Alcontrol of Chester, who are accredited by UKAS (United Kingdom Accreditation Service) for all methods used in this investigation. UKAS provides a standard for accuracy, precision, reproducibility and general competency based on approved methods and procedures.

As part of their standard QA/QC procedures, every fifth sample is run in duplicate by the laboratory, but not reported to provide a check on the reliability of the analytical results. The use of certified materials under the WRC (Water Research Council) laboratory proficiency programme allows checking for bias within the testing for all methods. The results of the proficiency testing of Alcontrol for the period in which the samples were analysed along with method summaries are detailed in Appendix C.

5.0 Investigation Results

5.1 Intrusive Investigation

5.1.1 Ground Conditions

The lithologies encountered in each of the areas are summarised in Tables 6A to 6C and presented on the borehole logs in Appendix B.

Table 6A - Summary of Lithologies Encountered in Olefins 6

LITHOLOGICAL UNITS	DESCRIPTION	DEPTH TO BASE MBGL	THICKNESS MIN TO MAX
Made Ground	Sometimes absent. When present it is mainly associated with structures. Composition variable from clayey gravel to gravelly clay. Where made ground is thicker, it often contains perched groundwater (e.g. interceptors)	0m to 1.8m	0m to 1.8m
Clay Drift Deposits	Predominately stiff red-brown to brown sandy gravelly clay (Boulder Clay). Sandy clays up to 0.8m thick present in some bores. Rare minor groundwater seepages associated with sandy partings	> 6m	> 5.5m
Sand Drift Deposits	A laterally extensive water bearing strata found in most boreholes across Olefins 6 typically comprising a silty fine to medium sand lens within the boulder clay sequence	2.7m to > 5.7m	0.2m to > 1.8m
Lias Group	Not encountered	Not Proven	Not Proven

Table 6B - Summary of Lithologies Encountered in Wilton Ethylene Control

LITHOLOGICAL UNITS	DESCRIPTION	DEPTH TO BASE MBGL	THICKNESS MIN TO MAX
Made Ground	Often absent. When present it is associated with structures, especially around the interceptors. Composition variable from clayey gravel to gravelly clay. Where made ground is thicker, it often contains perched groundwater	0m to 2.2m	0m to 2.2m
Drift deposits	Predominately stiff red-brown to brown sandy gravelly clay (Boulder Clay). Sandy clay up to 1.3m thick present at depth (c.5m) in WEC-201 & WEC-203 Rare minor groundwater seepages associated with sandy partings	> 7.8m	> 7m
Lias Group	Not encountered	Not Proven	Not Proven

Table 6C - Summary of Lithologies Encountered in Central Control

LITHOLOGICAL UNITS	DESCRIPTION	DEPTH TO BASE MBGL	THICKNESS MIN TO MAX
Made Ground	Often absent. When present it is associated with structures, especially around the interceptors. Composition variable from clayey gravel to gravelly clay. Where made ground is thicker, it often contains perched groundwater (e.g. interceptors)	0m to 2.7m	0m to 2.7m
Drift deposits	Predominately stiff red-brown to brown sandy gravelly clay (Boulder Clay). Sandy clays up to 0.8m thick present in some bores. Rare minor groundwater seepages associated with sandy partings	3.3 to > 5.5m	2.4 to > 5.5m
Lias Group	Possibly strong grey Mudstone	Proved in CC202 & CC204	Not Proved

5.2 Field Evidence of Contamination

Qualitative evidence of hydrocarbon related soil and groundwater contamination (based on headspace screening and soil condition) is summarised in Table 7 below. The results of the headspace tests in ppm by volume (ppm(v)) are presented on the borehole logs in Appendix B.

With the exception of oil product identified in WEC105B in February 2003 and minor contamination in OL103 (oily sheens up to 0.3m), no gross hydrocarbon impact was encountered in the boreholes constructed in Olefins 6 and WEC. Field evidence of contamination was observed in the boreholes constructed in Central Control in made ground and clay deposits in the following areas:

- Main interceptor in the southwest corner of Central Control (CC105, CC109, CC113 & CC201)
- Interceptor adjacent to the northern boundary of Central Control (CC203)
- In the parts of the main tankage bund (CC101 and CC 111)

Table 7 – Field Evidence of Contamination in Olefins 6 and Central Control

BOREHOLE	DEPTH (MBGL)	DESCRIPTION	QUALITATIVE ASSESSMENT	NOTES MAX. PID PPM (V)*
OL-103	0.0 - 0.5	Made Ground & Clay	Oily Sheens	46 ppm (v)
CC-101	0.0 - 0.8	Made Ground & Organic Clay	Sheens & strong petrol odours	81 ppm (v)
CC-105	1.5 - 2.5	Made Ground	Sheens & very strong petrol odours	489 ppm (v)
CC-109	0.5 - 2.7	Made Ground	Oily product & strong solvent odours	380 ppm (v)
CC-111	0.0 - .25	Made Ground	Petrol odours	66 ppm (v)
CC-113	0.4 - 1.0	Sandy Gravelly Clay	Impacted by hydrocarbons	955 ppm (v)
CC-201	2.0 - 3.5	Sandy Gravelly Clay	Very strong hydrocarbon & solvent odours	2,500 ppm (v)
CC-203	0 – 1.5	Made ground and slightly gravely sandy clay	Shallow groundwater impacted by oily hydrocarbons	Unable to measure due to natural soils being impacted by perched contaminated waters

5.3 Groundwater Monitoring

The results from the groundwater gauging of the monitoring wells are presented in Table 8A – 8B.

Groundwater in Central Control and WEC was mainly related to made ground and sandier horizons within the boulder clay sequence. The groundwater flow direction in these areas is likely to be locally influenced by site drainage systems. The effect of potential leaks (e.g. fire water ring mains and process waters) on groundwater levels and water balance is also likely to be locally significant.

Groundwater at Olefins 6 was present within a laterally persistent sand lens encountered at depths of between 2 mbgl and 6 mbgl. The monitoring data suggest that the groundwater is confined or semi-confined. Perched groundwaters were also encountered within made ground deposits. The groundwater flow direction is likely to be locally influenced by site drainage systems. The effect of leaks on groundwater levels and water balance is also likely to be significant.

Table 8A – Summary of Groundwater Monitoring Field Results (March 2002)

WELL	WELL DIAMETER	WELL DEPTH	DEPTH TO WATER (MBGL)	COMMENTS
CC105	35mm	2.9m	1.390	Oily sheens
CC109	35mm	2.9m	1.070	Slight sheens
CC113	35mm	2m	0.620	Oily sheens
CC201	50mm PVC	3.5m	1.035	Slight solvent odours
CC202	50mm PVC	5.5m	0.520	-
CC203	50mm PVC	1.5m	0.420	Oily sheens
CC204	50mm PVC	2.5m	0.830	-
WEC103	35mm	2.3	0.910	-
WEC104	50mm PVC	6	1.275	-
WEC105B	35mm	4	1.430	-
WEC201	50mm PVC	6.2	0.410	-
WEC203	50mm PVC	6	0.820	-
WEC204	50mm PVC	3.5	1.560	-
OL102	35mm	2.8	1.225	-
OL103	35mm	1.2	0.120	-
OL104	35mm	4	1.380	-
OL107	35mm	3	0.970	-
OL114	35mm	3.5	1.390	-
OL115	35mm	3	0.305	-
OL201	50mm PVC	5	2.376	-
OL202	50mm PVC	4.5	2.520	-
OL203	35mm	2.2	1.728	-
OL204	50mm PVC	5.9	2.030	-
OL206	50mm PVC	6	1.255	-
OL207	50mm PVC	6	1.815	-
OL208	50mm PVC	4.5	1.425	-
OL210	50mm PVC	4.5	1.270	-
OL211	50mm PVC	3.5	1.160	-
OL212	50mm PVC	4.8	-	No Access
OL213	50mm PVC	5	2.020	-
OL214	50mm PVC	4.5	0.930	-
OL215	50mm PVC	3.6	1.610	-
OL217	50mm PVC	4.5	3.125	-

Table 8B – Summary of Groundwater Monitoring Field Results (February 2003)

WELL	WELL DIAMETER	WELL DEPTH (M)	DEPTH TO WATER (MBGL)	COMMENTS
CC105	35mm	2.9	1.34	-
CC109	35mm	2.9	1.07	-
CC113	35mm	2	0.33	-
CC201	50mm PVC	3.5	0.97	-
CC202	50mm PVC	5.5	0.27	-
CC203	50mm PVC	1.5	0.37	-
CC204	50mm PVC	2.5	0.86	-
WEC103	35mm	2.3	0.90	-
WEC104	50mm PVC	6	1.24	-
WEC105B	35mm	4	(1.48 – 1.64)	0.16m thickness of product measured
WEC201	50mm PVC	6.2	0.34	-
WEC203	50mm PVC	6	0.69	-
WEC204	50mm PVC	3.5	1.36	-
OL102	35mm	2.8	1.1	-
OL103	35mm	1.2	0.04	-
OL104	35mm	4	0.96	-
OL107	35mm	3	1.09	-
OL114	35mm	3.5	1.25	-
OL115	35mm	3	0.27	-
OL201	50mm PVC	5	2.3	-
OL202	50mm PVC	4.5	2.37	-
OL203	35mm	2.2	1.51	-
OL204	50mm PVC	5.9	1.84	-
OL206	50mm PVC	6	1.24	-
OL207	50mm PVC	6	1.6	-
OL208	50mm PVC	4.5	1.34	-
OL210	50mm PVC	4.5	1.27	Gravel had to be cleared prior to sampling
OL211	50mm PVC	3.5	1.0	-
OL212	50mm PVC	4.8	-	No Access
OL213	50mm PVC	5	1.86	-
OL214	50mm PVC	4.5	0	Flooded
OL215	50mm PVC	3.6	1.1	-
OL217	50mm PVC	4.5	3.12	-

5.4 Laboratory Analyses

The results from the soil analyses are summarised below, presented in full in Appendix D (Tables D1-D12) and illustrated in schematic form as Figures 5A to 5C.

Soils Summary

VOC and SVOC

The total VOC and SVOC (Semi-volatile organic compounds) concentrations detected in the samples were generally <1mg/kg.

PRO & DRO

The highest (>100 mg/kg) concentrations of PRO (C_5-C_{12}) and DRO (>C_8-C_{35}) were detected in soil samples in the following areas:

Olefins 6

- In made ground at OL103 with a maximum PRO concentration of 101 mg/kg and a maximum DRO concentration of 1,117 mg/kg. Total BTEX (Benzene, toluene, ethyl benzene and xylene) concentration was <1 mg/kg.
- All the remaining samples yielded PRO concentrations of <15 mg/kg
- In made ground at OL101 with a maximum DRO concentration of 926 mg/kg.
- In made ground at OL114 with a maximum DRO concentration of 180 mg/kg.
- The remaining DRO concentrations were between 5 mg/kg and 91 mg/kg.

WEC

- All the samples yielded PRO concentrations <3 mg/kg
- All the samples yielded DRO concentrations <70 mg/kg

Central Control

- In made ground and clay deposits around the main interceptor in the southwest corner of Central Control (CC105, CC109, CC113 & CC201), with concentrations of up to 2,831 mg/kg PRO and up to 2,938 mg/kg DRO. Total BTEX concentration was up to 1,612 mg/kg (98% xylenes).
- In made ground adjacent to the interceptor next to the northern boundary of Central Control (CC203), with concentrations of up to 4,569 mg/kg DRO. Total BTEX concentration was <1 mg/kg.
- In made ground in the eastern part of the main tankage bund (CC101 & CC103) with concentrations of up to 583 mg/kg PRO and up to 180 mg/kg DRO. Total BTEX concentration was up to 32 mg/kg (63% xylenes).

Groundwaters Summary

The majority of the groundwater samples from Central Control and WEC were recovered from perched waters in made ground. The majority of the water samples from Olefins 6 were recovered from the laterally persistent sand lens within the boulder clay sequence.

Of all the laboratory testing, the PRO and DRO analyses are considered to have yielded the most significant results and these are discussed further below.

The total SVOC concentrations detected in the samples were generally <1mg/l, with the exception of 2 mg/l of fluorene detected in perched groundwater in CC203 located adjacent to the northern interceptor.

PRO & DRO (March 2002)

The highest (>1 mg/l) concentrations of PRO (C_5-C_{12}) and DRO (>C_8-C_{35}) were detected in groundwater samples in the following areas:

Olefins 6

- In groundwater in the sand lens at OL104 with a concentration of 0.356 mg/l PRO and 0.016 mg/l DRO (identified as a discrete C_{15} Peak). Total BTEX <0.01 mg/l.
- All the remaining samples yielded PRO concentrations <0.01 mg/l
- All the remaining samples yielded DRO concentrations <0.015 mg/l

WEC

- In perched groundwater associated with made ground adjacent to an interceptor in the RBS area (WEC105), with concentrations of <0.1 mg/l PRO and 8.5 mg/l DRO (identified as a discrete C_{15} Peak). Total BTEX <0.01 mg/l.
- All the remaining samples yielded PRO concentrations <0.01 mg/l

Central Control

- In perched groundwater associated with made ground and clay deposits around the main interceptor in the southwest corner of Central Control (CC105, CC109, CC113 & CC201), with concentrations of up to 387 mg/l PRO and up to 123 mg/l DRO. Total BTEX up to 42 mg/l.
- In perched groundwater associated with made ground adjacent to the interceptor next to the northern boundary of Central Control (CC203), with concentrations of 17.8 mg/l PRO and 3.6 mg/l DRO. Total BTEX <0.01 mg/l.
- Wells were not installed in made ground in the eastern part of the main tankage bund where DRO/PRO soil impact was identified in CC101 & CC103. Dissolved phase PRO & DRO are expected to be present in this area.
- All the remaining samples yielded DRO concentrations <0.1 mg/l.

PRO & DRO (February 2003)

The highest concentrations of PRO (C_5-C_{12}) and DRO (>C_8-C_{35}) were detected in groundwater samples in the following areas:

Olefins 6

- OL114 (hot fractionation) with a concentration of 0.19 mg/l total volatiles (PRO), OL204 (north east of site), 0.11 mg/l, OL213 (east of site) 0.06 mg/l and OL102 (Dilution and VLP steam area), 0.05 mg/l;
- All the remaining samples yielded PRO concentrations <0.01 mg/l;
- OL214 (Gasoline Treatment Unit) with a concentration of 4.3 mg/l DRO;
- All the remaining samples yielded DRO concentrations in the range 0.01 – 0.06 mg/l.

WEC

- 0.16m of product was measured in monitoring well WEC105B, located adjacent to the interceptor in the RBS area.
- no other samples were collected in this area during this sampling round.

Central Control

- In perched groundwater associated with made ground and clay deposits around the main interceptor in the southwest corner of Central Control (CC105, CC109, CC113 & CC201), concentrations of up to 25 mg/l PRO and up to 4.6 mg/l DRO. Total BTEX up to 1.7 mg/l.

Comparison of March 2002 and February 2003 Results

It is proposed that both sets of results make up the overall baseline conditions for the site (see section 6). Inspection of the two sets of results allows the following observations to be made:

- In OL6, nearly all water PRO / DRO results were <0.04 in March 2002. The results of February 2003 are slightly higher but generally do not exceed a concentration of 0.19 mg/l. The exception is OL 214, where the sample collected contained a DRO concentration of 4.3 mg/l;

- In WEC in February 2003, only one sample was collected from WEC105B, this was a product sample (rather than a groundwater sample) as 0.16m of product was measured in this monitoring well. No product was detected in this well in March 2002 (see also free product discussion below);

- Concentrations detected in samples collected from monitoring wells within the Central Control area in February 2003 are generally one to two orders of magnitude lower than those detected in March 2002.

Free Phase Product

Free product can occur if a contaminant is present at a fraction (sometimes as low as 1%) of its solubility in water. Depending on the volume of product present and the geological strata, the product can occur as a mobile phase (discrete layers in which the product can overcome capillary forces and potentially move into a monitoring well if the screen is positioned correctly) or as an immobile phase (sorbed to formation material or as isolated lenses of product in either the saturated or unsaturated zone).

The presence of sheens or even small amounts of free product (i.e. not in a measurable layer) is an indication that a component of the hydrocarbon mixture has a low solubility which has been exceeded. This effect is possible for hydrocarbon mixtures above relatively low concentrations (e.g. <1 mg/l) due to the following:

- Some components of the hydrocarbon mixtures present on-site have very low solubility (e.g. n-decane <0.1mg/l, dodecane, <0.005 mg/l);
- Where a mixture of compounds is present, the solubility of each compound within the mixture reduces in accordance with Raoult's Law.

During the IPPC investigation, where a discrete layer of product was measured in a monitoring well, no water sample was collected, however, in cases were indications of product were observed during well installation, water samples were collected and analysed.

If immobile or residual free product is present in the vicinity of a monitoring well, significant variability may be seen in the analytical results for groundwater samples due to the nature of sampling a shallow groundwater monitoring well which has small, isolated pools of free product present local to the monitoring well. Hence, for a sensible baseline in such instances, it is proposed that analytical results are treated with caution and that a note is made of the small quantities of hydrocarbon product that are present but not to an extent that a discrete layer of product can be measured in monitoring wells. In such cases, the following comment is applied: "hydrocarbon product present, thickness in monitoring well <0.01m" (see also Section 6.2).

During the March 2002 monitoring round and the well installation exercise, no discrete product layers were measured. However, evidence of free product was observed in the form of visible oily product / oily sheens and strong odours within the soil and groundwater samples at well locations listed in Section 5.2 above (Table 7).

Groundwater monitoring wells were also checked for the presence of free phase (hydrocarbon) product during the February 2003 monitoring round. In this case, well WEC105B in the RBS area contained a product thickness of 0.16m. The source of this product is thought to be historical leakage from the adjacent oil-water separator. Migration into the well must have taken place between March 2002 and February 2003 – the mechanism for this is unclear.

6.0 Conclusions

6.1 Discussion of Findings

The main objective of the report was to determine the current baseline conditions prior to issue of an IPPC permit.

6.1.1 Shallow Geology

Olefins 6

The shallow geology within the Olefins 6 area typically comprises made ground to depths of up to 1.8m with underlying clay drift deposits to depths greater than 6m and of thickness greater than 5.5m. Olefins 6 area also includes a laterally continuous water bearing sand drift deposit at depths from 2.7m to 5.7m and thickness ranging between 0.2m and 1.8m.

Wilton Ethylene Control

This area contains made ground, typically associated with structures (e.g. interceptors), but is also absent in places. The shallow geology predominantly comprises gravelly boulder clay although some sandy clay was found in boreholes WEC-201 and WEC-203 at a depth of approximately 0.5m and up to a thickness of 1.3m.

Central Control

Made ground is often absent. Where present, it is usually associated with the interceptors. Beneath the made ground, the shallow geology is predominantly stiff sandy gravelly boulder clay at depths of between 3.3 and >5.5m and of thickness 2.4 to >5.5m. Sandy clays of up to 0.8m thick were present in some boreholes. At depths of 3-5m, the investigation encountered stiff grey clay which is likely to be the upper layer of mudstone bedrock (Lias age).

6.1.2 Shallow Hydrogeology

In general the groundwater inflow to monitoring wells installed for sampling purposes was limited as indicated by the difficulties in purging the monitoring wells prior to sampling (section 4.4). Groundwater was found in all monitoring wells at depths of between 0.1m and 3m. Contamination of the groundwater with hydrocarbon substances was only evident in the field (PID, visible and odour) in the Central Control area.

Groundwater within the Olefins 6 area was present within a laterally persistent sand lens whilst in Central Control and Wilton Ethylene Control areas it was mainly related to made ground and within sandier laterally discontinuous horizons within the boulder clay sequence.

6.1.3 Extent of Investigation

In total, approximately 60 intrusive sampling locations were investigated across the three areas. Boreholes and monitoring well installations were situated in areas where chemicals are used, for example, process areas, chemical storage compounds, effluent interceptors etc. Selection of these areas was based on an assessment of potential contaminant source areas as defined in the initial Phase 1a Assessment. Selected boreholes were also installed outside of chemical operating/storage areas, but within the plant boundary, in order to provide a background level of soil/groundwater conditions and to provide a comparison of conditions up and down hydraulic gradient of potential contaminant source areas.

6.1.4 Summary of Analytes

Samples obtained from soils and groundwater samples were analysed for a range of potential contaminants based on the chemical substances used and/or stored in the respective plant areas. These included:

- Volatile organic compounds (VOC), including, benzene, toluene, ethyl benzene, xylene isomers, trimethylbenzene isomers, styrene, butyl benzene, naphthalene, C_4–C_5 aliphatic hydrocarbon fractions and C_9–C_{12} aromatic isomers.
- Semi volatile organic compounds (SVOC), including, naphthalene, phenanthrene, flouranthrene, pyrene, 2-methylnaphthalene, Di-n-butylphthalate, Bis(2ethylhexyl)- phthalate
- Diesel and Petrol range hydrocarbons;
- Metals, including, arsenic, cadmium, chromium, copper, mercury, nickel, lead, selenium and zinc.

6.2 Baseline Conditions Statement

Analysis of soil samples for specific substances from the VOC and SVOC target range of compounds generally resulted in highest detected concentrations of 1mg/kg for a single substance. In many cases analysis for single substances was below the level of detection of the analysis methods used.

Similarly, heavy metal concentrations were detected at levels considered consistent with typical made ground and natural drift deposits with the exception of selected chromium and arsenic concentrations in soil samples (the made ground / former foundry slag waste deposits) of Olefins 6 and Central Control. Baseline values for metals are not discussed as heavy metal-containing chemicals are not used for site processes.

The soil baseline condition is therefore proposed on the basis of diesel range organics (DRO), petrol range organics (PRO) and benzene, toluene, ethyl benzene and xylenes range organics (BTEX) as these are the key chemical groups used within past and present manufacturing processes at the site.

Groundwater samples from the Olefins 6 area were typically obtained from the laterally persistent sand lens within the boulder clay sequence. Groundwater samples from Wilton Ethylene Control and Central Control were typically obtained from perched groundwater samples within the made ground. Groundwater and free product monitoring took place in March 2002 and February 2003 thus the groundwater/product baseline is based on two sets of data.

The statement of baseline conditions is expressed in three parts:

- Concentration ranges summarised in the tables below;
- Concentrations detected in samples collected from the locations plotted on plan as Figures 5A-5C;
- Full analytical results, Appendix D, Tables D1 – D12.

Concentration Ranges detected in samples collected from the OL 6 area:

Table No.	Analyte:	Concentration Range (mg/kg or mg/l)	Comments
D1	VOCs, Soils	<0.001	Limited analysis few target compounds used on site
D2	VOCs, Groundwater	Target compounds <0.001, Tentatively Identified Compounds (TICs) 0.14 – 0.23	
D3	VOC Target List		
D4	SVOCs, Soils	Target compounds <0.001 – 0.5 TICs 2.6 – 142	
D5	SVOCs, Groundwater	<0.001	
D6	SVOC Target List		
D9	DRO, Soils	5 – 1,117	Despite the fact that oily sheens were noted at very shallow depths when OL103 was installed, water results do not indicate the presence of free product
D10	DRO, Groundwater	<0.01 – 4.3	
D11	PRO, Soils	<0.01 – 101	
D12	PRO, Groundwater	<0.01 – 0.36	

Concentration Ranges detected in samples collected from Wilton Ethylene Control:

Table No.	Analyte:	Concentration Range (mg/kg or mg/l)	Comments
D1	VOCs, Soils	<0.001 – 0.036	Limited analysis due to lack of target compounds used on site
D2	VOCs, Groundwater	Target compounds <0.001 – 0.006 TICs 0.08 – 2.98	Limited analysis due to lack of target compounds used on site
D3	VOC Target List		
D4	SVOCs, Soils	Target compounds <0.001 – 0.2 TICs 0.8 – 10.8	Limited analysis due to lack of target compounds used on site
D5	SVOCs, Groundwater	Target compounds <0.001 TICs 0.07 – 1.1	Limited analysis due to lack of target compounds used on site
D6	SVOC Target List		
D9	DRO, Soils	6 – 68	0.16 m of product was detected in monitoring well WEC 105B, this should be treated as the baseline condition at this location
D10	DRO, Groundwater	<0.01 – 8.5	
D11	PRO, Soils	<0.01 – 2.8	
D12	PRO, Groundwater	<0.01	

Concentration Ranges detected in samples collected from Central Control:

Table No.	Analyte:	Concentration Range (mg/kg or mg/l)	Comments
D1	VOCs, Soils	<0.001 – 52	Limited analysis due to lack of target compounds used on site
D2	VOCs, Groundwater	Target compounds <0.001 – 7.1 TICs 0.025 – 64.1	
D3	VOC Target List		
D4	SVOCs, Soils	Target compounds <0.001 – 0.47 TICs 0.09 - 178	
D5	SVOCs, Groundwater	Target compounds <0.02 TICs 0.001 – 5.22	
D6	SVOC Target List		
D9	DRO, Soils	41 – 4,659	* In select locations, the maximum concentration detected was probably influenced by the presence of entrained free phase product (thickness in monitoring well not measurable). Hence, monitoring results from these locations are likely to be variable and a baseline comment is applied: "hydrocarbon product present, thickness in monitoring well <0.01m"
D10	DRO, Groundwater	<0.01 – 124	
D11	PRO, Soils	<0.01 – 2,832	
D12	PRO, Groundwater	<0.01 – 387	

* In the case of wells CC105, CC109, CC113 and CC201 in the area of the southern oil-water inceptor and possibly 203 in the area of the northern oil-water interceptor, it is proposed that the laboratory analysis be treated with caution and an addition baseline is noted in words as in the table above.

6.3 Limitations of Baseline Conditions Statement

In some of the chemical process and storage areas that could not be sampled during this investigation (e.g. adjacent to hazardous process equipment, where difficulties arose in drilling boreholes due underlying ground conditions or the presence of underground services) chemicals could be present in the ground at concentrations close to the maximum values listed above or possibly higher than these values.

Similarly, chemicals may be present at concentrations higher than the maximum values listed above in contaminant source areas not identified by the Phase 1a assessment and therefore not sampled by this investigation. However, the IPPC site report assessment process has been designed to identify key potential contaminant source areas as well as giving a representative view of soil and groundwater quality.

6.4 Updated Conceptual Site Model

The number of contaminant source areas identified during this investigation has reduced relative to the corresponding number of such areas identified during the Phase 1a assessment. On the basis of the potential contaminant source areas identified by the Phase 1a assessment and inspection of the results of the Phase 1b/2 investigation, an updated list of contaminant source areas is presented below:

Olefins 6:

No significant contaminant source areas identified on the basis of the Phase 1b/2 investigation. Further potential source areas could be present under hazardous processing areas which are likely to remain inaccessible while the plants are operating.

WEC:

One contaminant source area (S2) from the Phase 1a was identified after a thickness of 0.16m of free product was detected in monitoring well 105B in February 2003.

CC:

On the basis of the results of the Phase 1b/2 investigation, three contaminant source areas were identified, the 'southern' oil water separator (S4), the 'northern' oil water separator (S5) and the Bf2 tank bund (S1).

Potential Contaminant Migration Pathways and Receptors

Potential contaminant migration pathways and receptors identified as part of Phase 1a have been modified following assessment of the results of Phase 1b/2. Although no source-pathway-receptor relationships are considered likely to result in significant harm to human health or the environment under normal site operating conditions, a number of such relationships are considered to remain plausible in linking potential source areas to receptors as follows:

- On-site workers involved in excavation works in source areas (e.g. interceptors) – this scenario should be managed through appropriate site health and safety procedures;

- Off-site workers down gradient of selected Olefins areas involved in excavation could be exposed to contaminants migrating north in shallow groundwater within the permeable made ground, sand/gravel horizons within the drift deposits and former land drains dating from the period when the land was used for agricultural purposes. However, these land drains are unlikely to remain operative as contaminant migration pathways due to their age and the subsequent development of the site which is likely to have damaged or removed these features. Moreover, given the likely discontinuous nature of the shallow groundwater deposits, this pathway is considered unlikely to be operating to a significant extent;

- The River Tees estuary. Contaminated water within permeable surrounds of the plant drains and the main site drainage system and former land drains (potential preferential pathways) could migrate into Dabholme Gut (discharges within the drains are regulated through the EA-registered discharge consent). This pathway is also considered unlikely to be operative due to the large distance that contaminants would have to travel within the drainage surrounds to reach Dabholme Gut (1.5km). In addition, the drainage system includes sumps and manholes which are likely to provide barriers to the permeable surrounds of the plant and site drains. The permeable material in the surrounds of these services is not likely to extend to the surrounds of the manholes and sumps which are likely to be installed within natural clay. One possible way in which contaminants could migrate to the river would be if the drains integrity were breached and contaminants in the surrounds of the drains migrated into the drainage system. It is anticipated that routine drainage monitoring would identify such a scenario and use of the drainage containment procedures (e.g. buffer tanks, diversions) could be implemented to reduce the potential impact of this scenario, should it present an issue in the future.

7.0 Main Limitations and Constraints

Any intrusive ground investigation is a limited sampling of the site to the locations that have been chosen and it is possible that an area of contamination remains undetected and has not been sampled. However, this investigation has been designed to include potential sources of contamination that were identified during the Phase 1a assessment (ref 1) and other general plant areas in order to give as accurate representation of baseline site conditions as possible.

Analyses have only been carried out for the determinants selected. The design of the schedule of analyses was based on the Phase 1a assessment (ref 1), as well as taking into account field observations made during the intrusive work.

It was not possible to position exploratory holes to target all of the identified potential source areas, mainly due to physical and operational constraints relating to access and underground services. This means that assessment of ground conditions under some of the active plant areas has been restricted due to the unavoidable constraints of investigating an operational site. In these areas it is possible that baseline conditions are higher than those presented in this report.

References

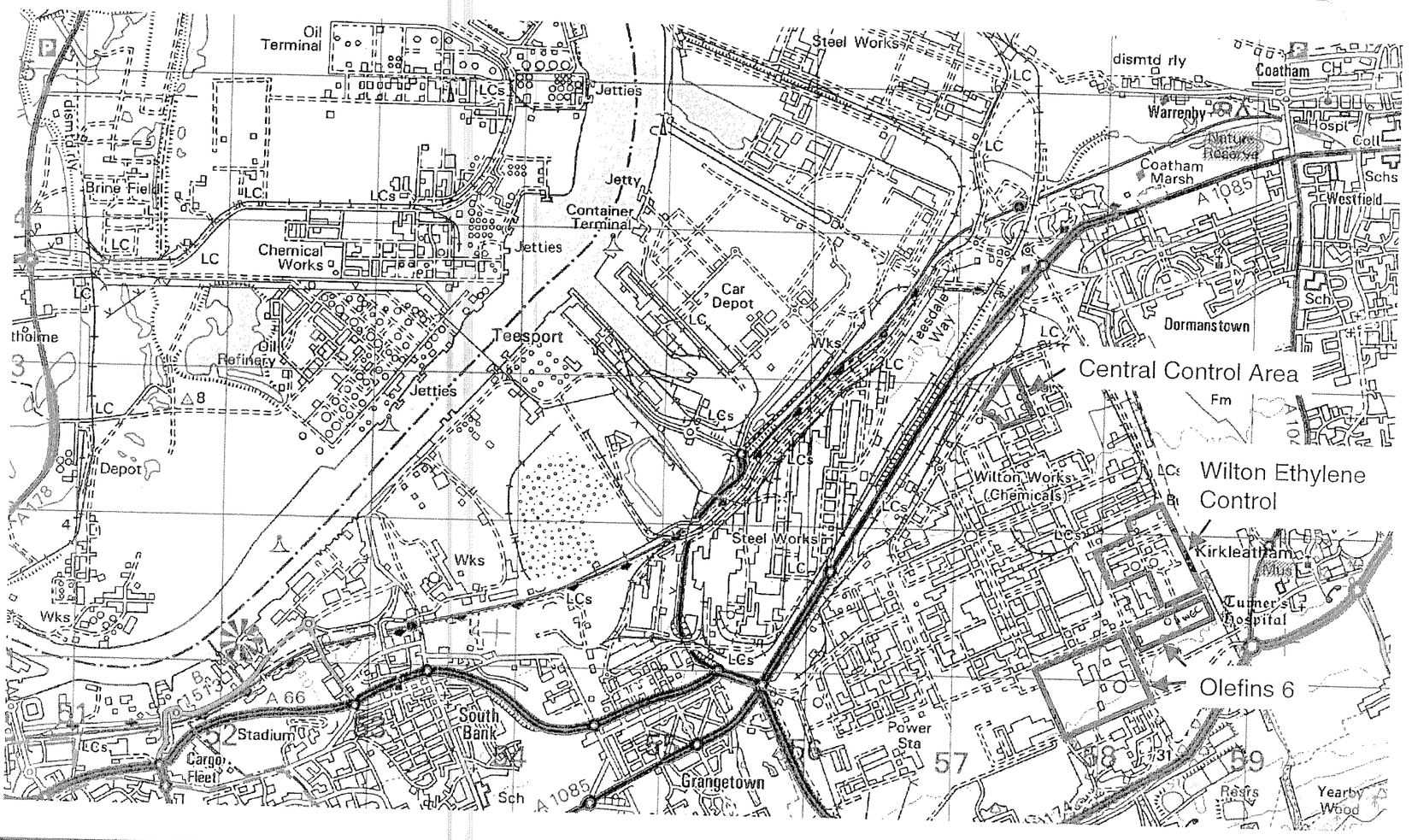
1. ABB Eutech Limited. February 2002. Olefins Manufacturing Area, Phase 1a IPPC Site Report, Huntsman Petrochemicals. ILM089/1a.

2. Environment Agency. Dec 2000. IPPC Application Form, Guide for Applicants. Part A(1) Installations. Version 2.

3. BS5930 :1999 Code of Practice for Site Investigations

4. BS10175 :2001 Investigation of Potentially Contaminated Sites – A Code of Practice

5. Project Method statements, see project file, ABB Eutech, ILM089, 2002.



ABB

Site Location
Olefins Manufacturing Areas

Figure: 1

DRAWING No. ILM089/01/Fig 2A(i) REV

CDM REGULATIONS/SAFETY NOTES

FIRE ACCESS ROAD

FILTER TUBE BUNDLE CLEANING BAY & ELEMENTAL WORKSHOP

CHEMICAL STORE

F1783B F1783A F1783B F1783A

B1707 BOILER CHIMNEY

ANALYSER HOUSE

ROAD 322.500 SOUTH

ROAD 483.500 EAST

METERING BAY

METERING PROVER ACCESS BAY

FUTURE EXTENSION

COMPRESSOR AIR STATION (EXISTING)

SWITCHROOM (EXISTING)

ROAD 314.000 SOUTH (1030'-0") (EXISTING)

GATE HOUSE

TANKER LOADING LAY-BY

LOADING PLATFORM

FILLING FACILITIES LAY-BY

ROAD 513.500 EAST

ROAD 364.350 SOUTH

FURNACE B1702C

UFT BY-PCD

PIPE BAY

ROAD 365.000 SOUTH

ROAD 253.750 EAST

FIRE WALL / STEAM CURTAIN BY ICI

ROAD 385.650 EAST

TRANSFORMERS

CONTROL BUILDING

MAINTENANCE BUILDING

ROAD 603.500 EAST

CAR PARK

ROAD 419.500 SOUTH

ESCAPE LADDER

ROAD 430.500 SOUTH

DROPOUT AREA

ROAD 381.500 EAST

PIPERACK AT GRADE

FUTURE G.T.U. SUBSTATION

ROAD 495.000 SOUTH

PLATFORM EL.108.000M

ROAD 395.550 EAST

FUTURE EXTENSION

COOLING WATER SUB-STATION

CABLE BRIDGE

FUTURE EXTENSION

CW SUPPLY

531.000 SOUTH EVAPORATORS

CHLORINATOR DRUM STORAGE CHEMICAL STORE

COOLING WATER DOSING STATION

No.3 BUTADIENE PLANT

ROAD 551.000 EAST

ROAD 624.000 EAST

ROAD

COOLING WATER TOWER

No.3 BUTADIENE PLANT

ROAD

LAY BY FOR METERING BAY

S1 S2 S3 S4 S5 S6 S7 S8 S9 S10 S11 S12 S13 S14 S15

0 20 40 60 80 100

SCALE: METRES

DRG TITLE: POTENTIAL CONTAMINANT SOURCE AREAS. SITE LAYOUT

PROJECT No: ILM089/01

SITE:	PLANT:
BUSINESS:	AREA:
SCALES: 1:500	
CAD DISK REF: ILM08901.dwg	
DRG TYPE:	DO LOC:
DRAWN: SJD	DATE: Nov 2002
CHECKED: PN/DA	DATE: Nov 2002
APPROVED	SECTION / DATE

ABB

DRG SIZE A0

DRAWING No. ILM089/01/Fig 2A(i) REV

REV. | REVISION | DRAWN | CHK'D | APP. | DATE | GRID

REFERENCE DRAWINGS | REFERENCE DRAWING No.

DRAWING No.	REV
ILM089/01/Fig 2A(ii)	

CDM REGULATIONS/SAFETY NOTES

BL

REV.	REVISION	DRAWN	CHK'D	APP.	DATE	GRID REV.	REVISION

AMENDS

DRG TITLE: POTENTIAL CONTAMINANT SOURCE AREAS. SITE LAYOU

PROJECT No: ILM089/01

SITE:	PLANT:
BUSINESS:	AREA:
SCALES: 1:1000	
CAD DISK REF:	
DRG TYPE:	DO LOC:
DRAWN: SJD	DATE: Nov 2002
CHECKED: PH/DA	DATE: Nov 2002
APPROVED	SECTION / DATE

ABB

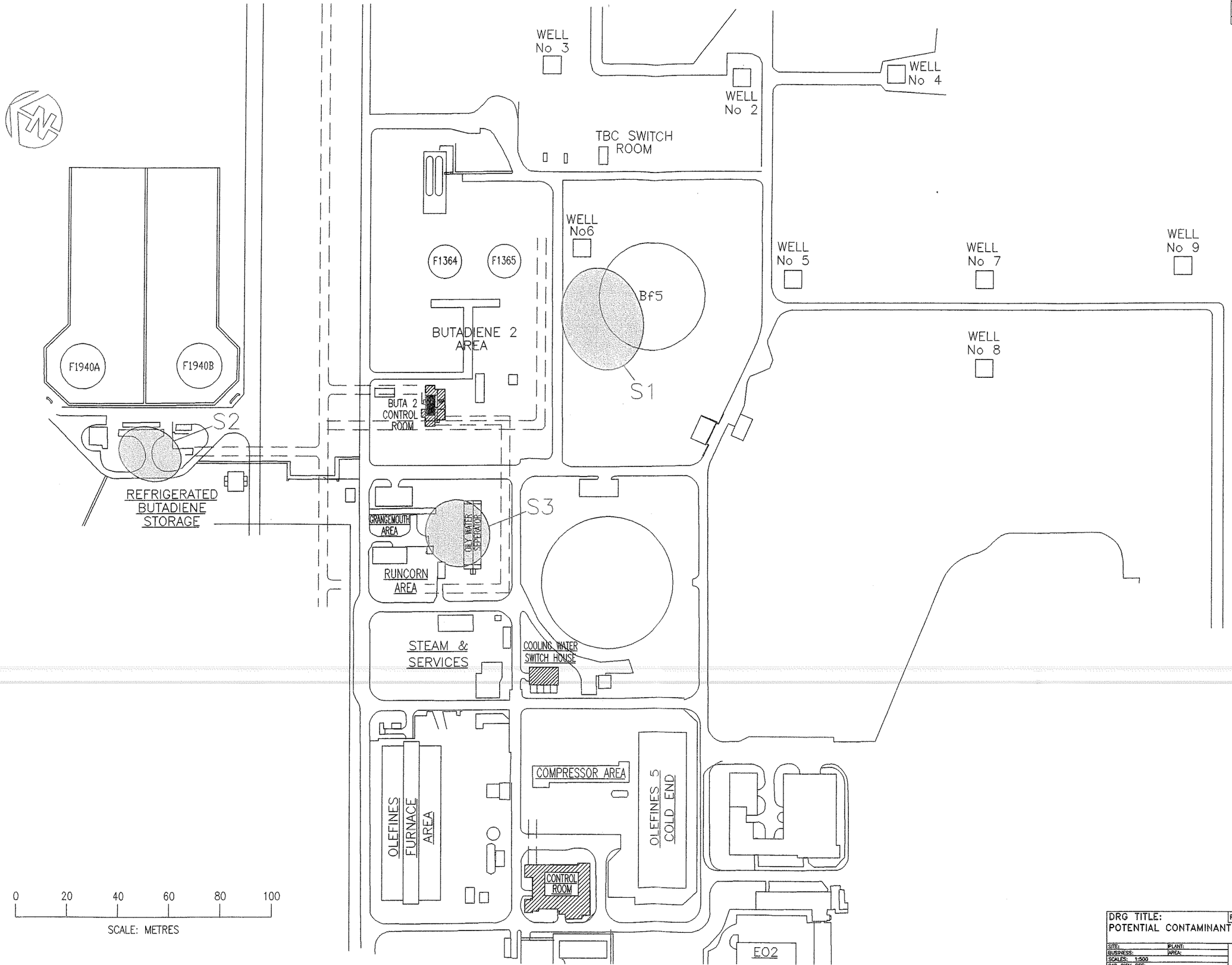
DRAWING No. ILM089/01/Fig 2A(ii)

DRG N A(

REV

DRAWING No. ILM089/01/Fig 2B REV

CDM REGULATIONS/SAFETY NOTES



DRG TITLE: POTENTIAL CONTAMINANT SOURCE AREAS. SITE LAYOUT

PROJECT No: ILM089/01

SITE:	PLANT:
BUSINESS:	AREA:
SCALES: 1:500	
CAD DISK REF:	
DRG TYPE:	DO LOC:
DRAWN: SJD	DATE: Nov 2002
CHECKED: PN/DA	DATE: Nov 2002
APPROVED	SECTION / DATE

ABB

DRAWING No ILM089/01/Fig 2B REV A

REV.	REVISION	DRAWN	CHK'D	APP.	DATE	GRID	REV.

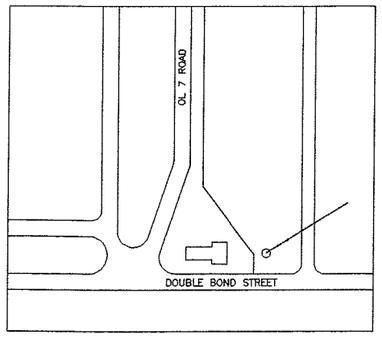
REFERENCE DRAWINGS

REFERENCE DRAWING No.

REFERENCE DRAWINGS

DRAWING No. ILM089/01/Fig 2C REV

CDM REGULATIONS/SAFETY NOTES



BOUNDARY ROAD

PIPE CORRIDOR

S5

S6

TANKER LOADING BAYS

CATCHPITS

BUTAKON WEST SUB-STATION

Bf4

Bf1

Bf29

Bf24

OL 4 ROAD

S1

Bf2

Nf25

Nf28

S3

S2

Nf17

Nf1

Nf2

Nf3

Nf4

B450 FLARE STACK

PARA-XYLENE COOLING TOWER (REDUNDANT)

OL.2 COOLING TOWER (REDUNDANT)

E-W PIPE CORRIDOR

OIL SEPARATOR No. 01

S4

FUEL GAS MONITORING STATION

PARAXYLENE 5 OFFPLOTS

B205 FLARE STACK

OL.1 COOLING TOWER (REDUNDANT)

OFFICE

BUTADIENE SW/HOUSE

OL 2 ROAD

E-W PIPE CORRIDOR

0 20 40 60 80 100

SCALE: METRES

DRG TITLE: POTENTIAL CONTAMINANT SOURCE AREAS. SITE LAYOUT

PROJECT No: ILM089/01

SITE:	PLANT:
BUSINESS:	AREA:
SCALES: 1:500	
CAD DISK REF:	
DRG TYPE:	DO LOC:
DRAWN: SJD	DATE: Nov 2002
CHECKED: PN/DA	DATE: Nov 2002
APPROVED	SECTION / DATE

ABB

DRG SIZE A0

DRAWING No. ILM089/01/Fig 2C REV

REV.	REVISION	DRAWN	CHK'D	APP.	DATE	GRID

REFERENCE DRAWINGS

REFERENCE DRAWING No.

REFERENCE DRAWINGS

WCL	Ware Consulting Limited 53 Longfield Road Tring Hertfordshire, HP23 4DF	Site Hunstman Olefins 6	Number OL104

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
-in Window Sampler	80mm to 1.00m 60mm to 3.00m 40mm to		Huntsman Petrochemicals	ABB
	Location OL6	**Dates** 31/01/02	**Engineer** ABB Eutech Limited	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
			1		0.05	MADE GROUND. Loose brown sandy angular fine to coarse gravel.			
					(0.55)	Soft to firm dark grey mottled black sandy CLAY. (UNDIFFERENTIATED DRIFT).			
			1		0.60	..... becoming light grey from 0.5m			
			1		(1.00)	Stiff to very stiff brown slightly sandy slightly gravelly CLAY with occassional pocket of firm grey sandy clay. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).			
			1		1.60	Stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).			
			1		(0.40) 2.00	Firm to stiff brown CLAY. (UNDIFFERENTIATED DRIFT).			
					(0.90)			▽1	
			Water strike(1) at 2.90m.		2.90	Possibly medium dense brown slightly silty fine to medium SAND. (UNDIFFERENTIATED DRIFT).			
-3.50	D1		1						
-3.50	D2				(1.10)	..... silty between 3.4m and 3.5m			
-3.50	D3								
			1		4.00	Complete at 4.00m			

Remarks
Field records by 10.2 eV PID in ppm(v)
Location cleared for services by Huntsman
150mm Square Steel Monitoring Well Cover

Scale (approx)	Logged By
1:25	DJD

Figure No.
ABB.OL104

WCL	Ware Consulting Limited 53 Longfield Road Tring Hertfordshire, HP23 4DF	Site Hunstman Olefins 6	Number OL105

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Push-in Window Sampler	80mm to 0.60m		Huntsman Petrochemicals	ABB
	Location	**Dates**	**Engineer**	**Sheet**
	OL6	31/01/02	ABB Eutech Limited	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.15) 0.15	CONCRETE.		
			Water strike(1) at 0.20m.			MADE GROUND. Loose brown slightly clayey sandy angular fine to coarse gravel		▽1
0.30-0.40 0.40-0.40	D2 D1		6		(0.35)			
					0.50 0.60	CONCRETE.		
						Complete at 0.60m		

Remarks
Field records by 10.2 eV PID in ppm(v)
Location cleared for services by Huntsman
Backfilled with concrete.

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.OL105

WCL

Ware Consulting Limited
53 Longfield Road
Tring
Hertfordshire, HP23 4DF

Excavation Method	Dimensions	Ground Level (mOD)	Site	Number
Dando-in Window Sampler	80mm to 1.00m 60mm to 1.50m		Hunstman Olefins 6	OL106
	Location	**Dates**	**Client**	**Job Number**
	OL6	10/12/01	Huntsman Petrochemicals	ABB
			Engineer	**Sheet**
			ABB Eutech Limited	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.60)	MADE GROUND. Loose grey sandy fine to coarse angular to subangular gravel.		▽1
0.40-0.50	D1		Medium from MG(1) at 0.30m.					
			1		0.60			
0.60-0.60	D3					Stiff becoming very stiff red brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).		
0.60-0.60	D2							
			1		(0.90)			
			1		1.50	Refusal on clay Complete at 1.50m		

Remarks
150mm Square Steel Monitoring Well Cover
Location cleared for services by Huntsman
Backfilled with bentonite

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.OL106

WCL	Ware Consulting Limited 53 Longfield Road Tring Hertfordshire, HP23 4DF	Site Hunstman Olefins 6	Number OL107
Excavation Method Window Sampler	Dimensions 80mm to 1.00m 60mm to 3.00m	Ground Level (mOD)	Client Huntsman Petrochemicals	Job Number ABB
	Location OL6	Dates 10/12/01	Engineer ABB Eutech Limited	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
			3		(0.90)	MADE GROUND. Loose to possibly medium dense grey brown slightly clayey sandy fine to medium angular to subrounded gravel.			
			1		0.90	Soft becoming stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).			
1.60-1.90 1.70-1.80 1.70-1.80	D3 D1 D2		1		(1.50)	.... Grey Shale cobble at 1.7m			
			1			..... becoming very soft from 2.3		▽1	
			Medium(1) at 2.40m. 3		2.40 (0.60)	Possibly medium dense brown well sorted fine to medium SAND. (UNDIFFERENTIATED DRIFT).			
					3.00	Refusal on sand Complete at 3.00m			

Remarks
Field records by 10.2 eV PID in ppm(v)
Location cleared for services by Huntsman
150mm Square Steel Monitoring Well Cover

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.OL107

WCL

Ware Consulting Limited
53 Longfield Road
Tring
Hertfordshire, HP23 4DF

Excavation Method: -in Window Sampler	Dimensions: 80mm to 1.00m, 60mm to 2.60m	Ground Level (mOD)	Site: Hunstman Olefins 6
	Location: OL6	Dates: 10/12/01	Client: Huntsman Petrochemicals
			Engineer: ABB Eutech Limited

Number: OL108
Job Number: ABB
Sheet: 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
			3		0.05	MADE GROUND. Loose dark grey sandy fine gravel.		
			1			Very stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).		
			1		(2.20)	....becoming soft from 1.2m		
1.40	D2							
1.40	D1							
1.40-1.50	D3		1					
						.... becoming very soft from 2.0m		
			3					▽1
2.30-2.50	D6		Water strike(1) at 2.25m.		2.25	Loose to possibly medium dense brown grey well sorted fine to medium SAND. (UNDIFFERENTIATED DRIFT).		
2.40-2.40	D5				(0.35)			
2.40-2.40	D4				2.60	Refusal on sand Complete at 2.60m		

Remarks
Field records ov 10.2 eV PID in ppm(v)
Location cleared for services by Huntsman
Backfilled with bentonite

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.OL108

WCL	Ware Consulting Limited 53 Longfield Road Tring Hertfordshire, HP23 4DF	Site Hunstman Olefins 6	Number OL109

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Dando-in Window Sampler	80mm to 1.00m 60mm to 2.00m		Huntsman Petrochemicals	ABB
	Location OL6	**Dates** 13/12/01	**Engineer** ABB Eutech Limited	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.20-0.20 0.20-0.30	D1 D2		2 Slight seepage MG(1) at 0.20m. 2		0.10 (0.30)	MADE GROUND. Loose grey slightly sandy angular fine to medium gravel of limestone. MADE GROUND. Stiff brown sandy gravelly clay.		▽1
			1		0.40 (0.20) 0.60	Stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).		
			1		(1.40)	Stiff to very stiff red brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).		
			1		2.00	Refusal on clay Complete at 2.00m		

Remarks
Location cleared for services by Huntsman
Backfilled with bentonite
Field records by 10.2 eV PID in ppm(v)

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.OL109

WCL	Ware Consulting Limited 53 Longfield Road Tring Hertfordshire, HP23 4DF	Site Hunstman Olefins 6	Number OL110

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
-in Window Sampler	80mm to 1.00m		Huntsman Petrochemicals	ABB
	Location OL6	**Dates** 13/12/01	**Engineer** ABB Eutech Limited	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10-0.20 0.15-0.15 0.15-0.15	D3 D1 D2				(0.35)	Very stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).		
					0.35			
			1		0.40	Loose brown slightly clayey medium SAND. (UNDIFFERENTIATED DRIFT).		
					(0.60)	Stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).		
			1		1.00	Refusal on clay Complete at 1.00m		

Remarks
Field records by 10.2 eV PID in ppm(v)
Backfilled with bentonite
Location cleared for services by Huntsman

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.OL110

WCL	Ware Consulting Limited 53 Longfield Road Tring Hertfordshire, HP23 4DF	Site Hunstman Olefins 6	Number OL111
Excavation Method Drive-in Window Sampler	Dimensions 80mm to 1.00m	Ground Level (mOD)	Client Huntsman Petrochemicals	Job Number ABB
	Location OL6	Dates 13/12/01	Engineer ABB Eutech Limited	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.50)	Stiff brown slightly mottled black sandy CLAY. (UNDIFFERENTIATED DRIFT).		
0.50-0.60 0.55-0.55 0.55-0.55	D3 D1 D2		1		0.50 0.60	Loose brown slightly clayey medium SAND. (UNDIFFERENTIATED DRIFT).		
					(0.40)	Very stiff red brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).		
			1		1.00	Refusal on clay Complete at 1.00m		

Remarks
Field records by 10.2 eV PID in ppm(v)
Backfilled with bentonite
Location cleared for services by Huntsman

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.OL111

WCL	Ware Consulting Limited 53 Longfield Road Tring Hertfordshire, HP23 4DF	Site Hunstman Olefins 6	Number OL114
Excavation Method Drive-in Window Sampler	Dimensions 80mm to 1.00m 60mm to 3.00m 40mm to 3.50m	Ground Level (mOD)	Client Huntsman Petrochemicals	Job Number ABB
	Location OL6	Dates 31/01/02	Engineer ABB Eutech Limited	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.10-0.20	D1		2		(0.20) 0.20	MADE GROUND. Loose brown sandy angular to subrounded fine to medium gravel.			
			2		(0.70) 0.90	Stiff to very stiff brown to red brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).			
			1			Firm to stiff dark brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).			
			2		(1.10)				
			Water strike(1) at 2.00m. 1		2.00	Possibly medium dense brown slightly silty well sorted fine to medium SAND. (UNDIFFERENTIATED DRIFT).		▽1	
2.45-2.45	D2		1		(1.40)				
			1						
			1		3.40 (0.10) 3.50	Soft red brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).			
						Complete at 3.50m			

Remarks
Field records by 10.2 eV PID in ppm(v)
Location cleared for services by Huntsman
150mm Square Steel Monitoring Well Cover

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.OL114

WCL

Ware Consulting Limited
53 Longfield Road
Tring
Hertfordshire, HP23 4DF

Excavation Method: D[illegible]-in Window Sampler	Dimensions: 80mm to 1.00m, 60mm to 3.00m	Ground Level (mOD)	Site: Hunstman Olefins 6
	Location: OL6	Dates: 31/01/02	Client: Huntsman Petrochemicals
			Engineer: ABB Eutech Limited

Number: OL115
Job Number: ABB
Sheet: 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
			Water strike(1) at 0.15m.			MADE GROUND. Loose grey brown slightly clayey angular fine to coarse gravel with some pockets of stiff sandy clay.		▽1	
			1		(0.80)				
					0.80	Soft brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).			
			1		(0.45)				
			Water strike(2) at 1.25m.		1.25	Possibly medium dense brown slightly silty well sorted medium SAND. (UNDIFFERENTIATED DRIFT).		▽2	
1.50-1.60	D3		1						
1.60-1.60	D2								
1.60-1.60	D1					..... becoming dark brown from 1.8m			
			1		(1.75)				
						..... becoming dense from 2.2m			
			1						
2.90-2.90	D4								
			1		3.00				
						Complete at 3.00m			

Remarks
150mm Square Steel Monitoring Well Cover
Location cleared for services by Huntsman
Field records by 10.2 eV PID in ppm(v)

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.OL115

WCL	Ware Consulting Limited 53 Longfield Road Tring Hertfordshire, HP23 4DF	Site Hunstman Olefins 6	Number OL201
Excavation Method JCB Mounted Rotary Solid Auger	Dimensions 100mm to 6.00m	Ground Level (mOD)	Client Huntsman Petrochemicals	Job Number ABB
	Location OL6	Dates 19/12/01	Engineer ABB Eutech Limited	Sheet 1/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
					(0.40)	MADE GROUND. Possibly dense brown grey sandy angular fine to coarse gravel.			
					0.40	Stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).			
			1						
			5		(1.90)				
			5						
					2.30	Stiff red brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).			
			5						
			5		(1.50)				
					3.80	Soft to firm brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).			
					(0.40)				
4.20-4.50	D2		Water strike(1) at 4.20m.		4.20			▽1	
4.20-4.50	D1		1		(0.30)	Loose to possibly medium dense very silty fine to medium SAND. (UNDIFFERENTIATED DRIFT).			
					4.50	Stiff red brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).			

Remarks
150mm Square Steel Monitoring Well Cover
Location cleared for services by Huntsman
Field records by 10.2 eV PID in ppm(v)

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.OL201

WCL	Ware Consulting Limited 53 Longfield Road Tring Hertfordshire, HP23 4DF	Site Hunstman Olefins 6	Number OL201
Excavation Method JCB Mounted Rotary Solid Auger	Dimensions 100mm to 6.00m	Ground Level (mOD)	Client Huntsman Petrochemicals	Job Number ABB
	Location OL6	Dates 19/12/01	Engineer ABB Eutech Limited	Sheet 2/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
					(1.50)				
			2		6.00	Complete at 6.00m			

Remarks

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.OL201

WCL

Ware Consulting Limited
53 Longfield Road
Tring
Hertfordshire, HP23 4DF

Excavation Method: Drive in Window Sampler 7/2001 to 2.5m; Mounted Rotary Solid Stem Auger (200mm/100mm) 21/1/2002 to 4.5m	Dimensions: 80mm to 1.00m, 60mm to 2.50m, 100mm to 4.50m; Location: OL6	Ground Level (mOD); Dates: 13/12/01-21/01/02	Site: Hunstman Olefins 6; Client: Huntsman Petrochemicals; Engineer: ABB Eutech Limited	Number: OL202; Job Number: ABB; Sheet: 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
			4		0.10	MADE GROUND. Loose brown gravelly coarse sand. Gravel is fine to medium angular of shale.			
					(0.60)	Soft brown slightly mottled grey black slightly sandy CLAY. (UNDIFFERENTIATED DRIFT).			
						..... sandy between 0.5m and 0.6m			
					0.70				
					(0.20)	Soft brown mottled black slightly sandy CLAY. (UNDIFFERENTIATED DRIFT).			
					0.90				
			1		(0.30)	Soft to firm red brown slightly mottled grey slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).			
					1.20				
1.40 -1.50	D1 D2				(0.30)	Very soft grey green mottled black sandy CLAY. (UNDIFFERENTIATED DRIFT).			
			1		1.50	Soft becoming stiff red brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).			
			1						
			2		(1.80)				
						..... becoming very stiff from 2.5m			
			1					▽1	
			Slow from sand(1) at 3.30m. 1		3.30	Loose brown very silty fine SAND. (UNDIFFERENTIATED DRIFT).			
					(0.20)				
					3.50	Stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).			
			1		(1.00)				
			1		4.50	Complete at 4.50m			

Remarks
Field records by 10.2 eV PID in ppm(v)
Location cleared for services by Huntsman
150mm Square Steel Monitoring Well Cover

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.OL202

WCL

Ware Consulting Limited
53 Longfield Road
Tring
Hertfordshire, HP23 4DF

Excavation Method: Drive-in Window Sampler	Dimensions: 80mm to 1.00m, 60mm to 2.20m	Ground Level (mOD)	Site: Hunstman Olefins 6	Number: OL203
			Client: Huntsman Petrochemicals	Job Number: ABB
	Location: OL6	Dates: 10/12/01	Engineer: ABB Eutech Limited	Sheet: 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
					(0.40)	MADE GROUND. Loose grey very sandy subrounded fine to medium gravel of clinker.			
			1		0.40	MADE GROUND. Loose brown clayey sandy angular to subrounded fine to coarse gravel of clinker shale sandstone.			
			1		(1.40)				
1.00-1.50 1.50-1.60	D2 D1		Medium(1) at 1.50m. 7					▽1	
					1.80	Stiff red brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).			
			1		(0.40)				
					2.20	Complete at 2.20m			

Remarks
Field records ov 10.2 eV PID in ppm(v)
Location cleared for services by Huntsman
150mm Square Steel Monitoring Well Cover

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.OL203

WCL	Ware Consulting Limited 53 Longfield Road Tring Hertfordshire, HP23 4DF	Site Hunstman Olefins 6	Number OL204

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
JCB Mounted Rotary Solid Auger	100mm to 4.50m		Huntsman Petrochemicals	ABB
	Location OL6	**Dates** 21/01/02	**Engineer** ABB Eutech Limited	**Sheet** 1/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
					(0.50)	MADE GROUND. Loose brown sandy fine to medium subrounded gravel.			
			1		0.50	Firm to stiff brown to red brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).			
					(0.50)				
			1		1.00	Soft to firm dark grey very sandy CLAY. (UNDIFFERENTIATED DRIFT).			
					(0.50)				
			1		1.50	Soft to firm becoming stiff dark brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).			
			1						
			1						
			1						
			1						

Remarks
150mm Square Steel Monitoring Well Cover
Location cleared for services by Huntsman
Field records by 10.2 eV PID in ppm(v)

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.OL204

WCL	Ware Consulting Limited 53 Longfield Road Tring Hertfordshire, HP23 4DF	Site Hunstman Olefins 6	Number OL204
Excavation Method [illegible] Mounted Rotary Solid Auger	Dimensions 100mm to 4.50m	Ground Level (mOD)	Client Huntsman Petrochemicals	Job Number ABB
	Location OL6	Dates 21/01/02	Engineer ABB Eutech Limited	Sheet 2/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
					(3.90)				
5.40-5.70 5.40-5.70	D2 D1		Water strike(1) at 5.40m. 1		5.40 (0.30)	Possibly medium dense brown silty fine SAND. (UNDIFFERENTIATED DRIFT).		▽1	
			1		5.70 (0.60)	Firm to stiff brown slightly sandy slightly gravelly. CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).			
					6.30	Complete at 6.30m			

Remarks

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.OL204

WCL	Ware Consulting Limited 53 Longfield Road Tring Hertfordshire, HP23 4DF	Site Hunstman Olefins 6	Number OL206

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
JCB Mounted Rotary Solid Auger	100mm to 6.00m		Huntsman Petrochemicals	ABB
	Location	**Dates**	**Engineer**	**Sheet**
	OL6	24/01/02	ABB Eutech Limited	1/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
					(0.20) 0.20	CONCRETE.			
					(0.30)	MADE GROUND. Loose grey angular sandy medium to coarse gravel.			
			1		0.50				
					(0.40)	Soft to firm brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).			
			1		0.90				
						Firm to stiff red brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).			
			1						
			1						
			1						
					(3.50)				
			1						
						..... possible sand lens at 3.3m			
			1						
			1						
4.40-5.00	D2		Water strike(1) at 4.40m.					▽1	
4.40-5.00	D1								
4.40-5.00	D3		1		4.40	Possibly medium dense brown silty fine to medium SAND interbedded with sandy clay and clayey sand. (UNDIFFERENTIATED DRIFT).			

Remarks
200mm Round Steel Monitoring Well Cover
Location cleared for services by Huntsman
Field records by 10.2 eV PID in ppm(v)

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.OL206

WCL

Ware Consulting Limited
53 Longfield Road
Tring
Hertfordshire, HP23 4DF

Excavation Method: JCR Mounted Rotary Solid Stem Auger	Dimensions: 100mm to 6.00m	Ground Level (mOD)	Site: Hunstman Olefins 6
	Location: OL6	Dates: 24/01/02	Client: Huntsman Petrochemicals
			Engineer: ABB Eutech Limited

Number: OL206
Job Number: ABB
Sheet: 2/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
			1		(1.60)				
			1		6.00	Complete at 6.00m			

Remarks

Scale (approx)	Logged By
1:25	DJD

Figure No.
ABB.OL206

WCL

Ware Consulting Limited
53 Longfield Road
Tring
Hertfordshire, HP23 4DF

Excavation Method: Mounted Rotary Solid Auger	Dimensions: 100mm to 6.00m	Ground Level (mOD):	Site: Hunstman Olefins 6	Number: OL207
	Location: OL6	Dates: 23/01/02	Client: Huntsman Petrochemicals	Job Number: ABB
			Engineer: ABB Eutech Limited	Sheet: 1/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
					(0.20) 0.20	CONCRETE.			
					(0.10) 0.30	MADE GROUND. Loose grey sandy angular fine to coarse gravel.			
			2		0.40 (0.10)	Firm dark brown grey slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).			
			1			Firm to stiff dark brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).			
			1						
			1						
			2		(3.60)				
			1						
			Water strike(1) at 4.00m. 1		4.00			▽1	
			1		(0.70)	Possibly medium dense brown very silty fine to medium SAND with lenses of sandy clay. (UNDIFFERENTIATED DRIFT).			
					4.70	Firm brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).			

Remarks
Field records by 10.2 eV PID in ppm(v)
Location cleared for services by Huntsman
200mm Round Steel Monitoring Well Cover

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.OL207

WCL

Ware Consulting Limited
53 Longfield Road
Tring
Hertfordshire, HP23 4DF

Excavation Method: Mounted Rotary Solid Auger	Dimensions: 100mm to 6.00m	Ground Level (mOD):	Site: Hunstman Olefins 6
	Location: OL6	Dates: 23/01/02	Client: Huntsman Petrochemicals
			Engineer: ABB Eutech Limited

Number: OL207
Job Number: ABB
Sheet: 2/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
					(0.40) 5.10				
						Stiff red brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).			
					(0.90)				
			1		6.00				
						Complete at 6.00m			

Remarks

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.OL207

WCL

Ware Consulting Limited
53 Longfield Road
Tring
Hertfordshire, HP23 4DF

Excavation Method: JCB Mounted Rotary Solid m Auger	Dimensions: 100mm to 4.50m	Ground Level (mOD):	Site: Hunstman Olefins 6
			Client: Huntsman Petrochemicals
	Location: OL6	Dates: 23/01/02	Engineer: ABB Eutech Limited

Number: OL208
Job Number: ABB
Sheet: 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
					(0.40)	MADE GROUND. Loose brown very sandy subrounded to rounded fine to coarse gravel.			
			2		0.40				
					(0.60)	Firm olive green slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).			
			2		1.00	Firm to stiff brown to red brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).			
			1			..... becoming dark brown from 1.5m			
			1		(2.00)				
			1			..... becoming soft to firm from 2.5m			
3.00-3.50 3.00-3.50	D1 D2		Water strike(1) at 3.00m. 1		3.00			▽1	
					(0.50)	Possibly medium dense brown very silty fine to medium SAND. (UNDIFFERENTIATED DRIFT).			
			1		3.50				
			1		(1.00)	Stiff to very stiff red brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).			
			1		4.50				
						Complete at 4.50m			

Remarks
Field records by 10.2 eV PID in ppm(v)
Location cleared for services by Huntsman
150mm Square Steel Monitoring Well Cover

Scale (approx): 1:25
Logged By: DJD

Figure No.
ABB.OL208

WCL

Ware Consulting Limited
53 Longfield Road
Tring
Hertfordshire, HP23 4DF

Excavation Method: JCB Mounted Rotary Solid Auger	Dimensions: 100mm to 4.00m	Ground Level (mOD)	Site: Hunstman Olefins 6
	Location: OL6	Dates: 23/01/02	Client: Huntsman Petrochemicals
			Engineer: ABB Eutech Limited

Number: OL210
Job Number: ABB
Sheet: 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.40-0.40	D1		1		(0.80)	MADE GROUND. Loose brown grey very sandy subrounded to rounded fine to coarse gravel.			
			2		0.80	Firm to stiff brown to red brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).			
			1		(1.50)				
			1		2.30	Firm dark grey slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).			
			1		(0.70)				
			Water strike(1) at 3.00m. 1		3.00	Possibly medium dense brown very silty fine to medium SAND. (UNDIFFERENTIATED DRIFT).		▽1	
			1		(0.50)				
					3.50	Stiff to very stiff red brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).			
			1		(0.50)				
					4.00	Complete at 4.00m			

Remarks
150mm Square Steel Monitoring Well Cover
Location cleared for services by Huntsman
Field records by 10.2 eV PID in ppm(v)

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.OL210

WCL	Ware Consulting Limited 53 Longfield Road Tring Hertfordshire, HP23 4DF	Site Hunstman Olefins 6	Number OL211
Excavation Method JCB Mounted Rotary Solid Auger	Dimensions 100mm to 4.50m	Ground Level (mOD)	Client Huntsman Petrochemicals	Job Number ABB
	Location OL6	Dates 23/01/02	Engineer ABB Eutech Limited	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						CONCRETE.			
					(0.19) 0.19	MADE GROUND. Possibly medium dense grey sandy subrounded fine to coarse gravel.			
			2		(0.41) 0.60	Firm to stiff brown to red brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).			
			2						
			1		(1.40)				
			Water strike(1) at 2.00m.					▽1	
			1		2.00	Possibly medium dense brown very silty fine to medium SAND. (UNDIFFERENTIATED DRIFT).			
			1		(0.80)				
			1		2.80	Soft to firm brown to red brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).			
			1						
			1		(1.70)				
			1		4.50	Complete at 4.50m			

Remarks
200mm Round Steel Monitoring Well Cover
Location cleared for services by Huntsman
Field records by 10.2 eV PID in ppm(v)

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.OL211

WCL

Ware Consulting Limited
53 Longfield Road
Tring
Hertfordshire, HP23 4DF

Excavation Method: JCB Mounted Rotary Solid Auger	Dimensions: 100mm to 4.80m	Ground Level (mOD):	Site: Hunstman Olefins 6
	Location: OL6	Dates: 21/01/02	Client: Huntsman Petrochemicals
			Engineer: ABB Eutech Limited

Number: OL212
Job Number: ABB
Sheet: 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
					(0.40)	MADE GROUND. Loose brown grey very sandy angular coarse gravel of roadstone type fill.			
			2		0.40	Stiff brown becoming dark brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).			
			1						
			1		(2.10)				
			1						
			2		2.50	Soft brown very sandy CLAY. Sand is fine to medium. (UNDIFFERENTIATED DRIFT).			
					(0.50)				
			Water strike(1) at 3.00m. 1		3.00	Possibly medium dense brown fine to medium SAND. (UNDIFFERENTIATED DRIFT).		▽1	
			1		(1.00)				
			1		4.00	Soft to firm to stiff brown very sandy CLAY. (UNDIFFERENTIATED DRIFT).			
			1		(0.80)				
					4.80	Complete at 4.80m			

Remarks
Field records by 10.2 eV PID in ppm(v)
Location cleared for services by Huntsman
150mm Square Steel Monitoring Well Cover

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.OL212

WCL	Ware Consulting Limited 53 Longfield Road Tring Hertfordshire, HP23 4DF	Site Hunstman Olefins 6	Number OL213
Excavation Method JCB Mounted Rotary Solid Auger	Dimensions 100mm to 5.00m	Ground Level (mOD)	Client Huntsman Petrochemicals	Job Number ABB
	Location OL6	Dates 19/12/01	Engineer ABB Eutech Limited	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
					(0.60)	MADE GROUND. Possibly dense grey sandy angular fine to coarse gravel.			
					0.60	Firm to stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).			
			1						
			1						
			1						
			1		(3.40)				
			1						
			Water strike(1) at 4.00m.		4.00	Loose to possibly medium dense slightly silty fine to medium SAND. (UNDIFFERENTIATED DRIFT).		▽1	
			1		(0.50)				
					4.50	Firm to stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).			
					(0.50)				
					5.00				

Remarks
Field records by 10.2 eV PID in ppm(v)
Location cleared for services by Huntsman
150mm Square Steel Monitoring Well Cover

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.OL213

WCL

Ware Consulting Limited
53 Longfield Road
Tring
Hertfordshire, HP23 4DF

Excavation Method: Drive in Window Sampler 2/2001 to 2.5m; Mounted Rotary Hollow Stem Auger (200mm/100mm) 21/1/2002 to 4.5m	Dimensions: 80mm to 1.00m, 60mm to 2.50m, 200mm to 4.50m	Ground Level (mOD)	Site: Hunstman Olefins 6	Number: OL214
	Location: OL6	Dates: 13/12/01-20/12/01	Client: Huntsman Petrochemicals	Job Number: ABB
			Engineer: ABB Eutech Limited	Sheet: 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
			2		0.05	MADE GROUND. Loose grey angular medium gravel of limestone.			
					0.10 (0.05)	CONCRETE.			
					0.20 (0.10)	MADE GROUND. Loose light brown sandy fine to medium gravel.			
			1		(1.40)	Stiff brown to red brown slightly mottled grey slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).			
			1		1.60	Stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).			
			1		(0.80)				
2.40-2.40 2.40-2.50	D1 D2		Water strike(1) at 2.40m. 2		2.40			▽1	
					(0.30)	Possibly medium dense brown well sorted fine to medium SAND. (UNDIFFERENTIATED DRIFT).			
			1		2.70	Firm to stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).			
			1		(1.80)				
			1						
			1		4.50	Complete at 4.50m			

Remarks
150mm Square Steel Monitoring Well Cover
Location cleared for services by Huntsman
Field records by 10.2 eV PID in ppm(v)

Scale (approx)	Logged By
1:25	DJD

Figure No.
ABB.OL214

WCL

Ware Consulting Limited
53 Longfield Road
Tring
Hertfordshire, HP23 4DF

Excavation Method: JCB Mounted Rotary Solid Auger	Dimensions: 100mm to 3.60m	Ground Level (mOD)	Site: Hunstman Olefins 6	Number: OL215
	Location: OL6	Dates: 19/12/01	Client: Huntsman Petrochemicals	Job Number: ABB
			Engineer: ABB Eutech Limited	Sheet: 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
					(0.40)	MADE GROUND. Loose grey sandy angular fine to medium gravel.			
					0.40 (0.20)	CONCRETE.			
					0.60 (0.40)	MADE GROUND. Loose brown slightly gravelly medium sand.			
			1		1.00	Firm to stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).			
			1		(1.50)				
			1						
			Water strike(1) at 2.50m. 1		2.50	Possibly medium dense slightly silty fine to medium SAND. (UNDIFFERENTIATED DRIFT).		▽1	
			1		(1.10)				
			1						
					3.60	Complete at 3.60m			

Remarks
Field records by 10.2 eV PID in ppm(v)
Location cleared for services by Huntsman
150mm Square Steel Monitoring Well Cover

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.OL215

WCL

Ware Consulting Limited
53 Longfield Road
Tring
Hertfordshire, HP23 4DF

Excavation Method	Dimensions	Ground Level (mOD)	Site	Number
JCB Mounted Rotary Solid S' Auger	100mm to 0.80m		Hunstman Olefins 6	OL216
	Location	**Dates**	**Client**	**Job Number**
	OL6 Off-Plots	24/01/02	Huntsman Petrochemicals	ABB
			Engineer	**Sheet**
			ABB Eutech Limited	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.70)	MADE GROUND. Possibly medium dense very sandy angular to subrounded fine to coarse gravel.		
					0.70 (0.10) 0.80	CONCRETE.		
						Complete at 0.80m		

Remarks
Backfilled with bentonite
Location cleared for services by Huntsman

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.OL216

WCL	Ware Consulting Limited 53 Longfield Road Tring Hertfordshire, HP23 4DF	Site Hunstman Olefins 6	Number OL217
Excavation Method JCB Mounted Rotary Solid Stem Auger	Dimensions 100mm to 5.00m	Ground Level (mOD)	Client Huntsman Petrochemicals	Job Number ABB
	Location OL6	Dates 25/01/02	Engineer ABB Eutech Limited	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
			1		(0.90)	MADE GROUND. Possibly dense grey angular to subrounded fine to coarse gravel of clinker with cobble and boulder of clinker up to 300mm.			
			1		0.90 (1.00)	Possibly medium dense brown very clayey fine to medium SAND. (UNDIFFERENTIATED DRIFT).			
			1		1.90 (0.30)	Possibly medium dense brown well sorted fine to medium SAND. (UNDIFFERENTIATED DRIFT).			
			1		2.20 (1.00)	Firm to stiff dark brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).			
			1					▽1	
			Water strike(1) at 3.20m.		3.20				
			1		(0.50)	Possibly medium dense dark grey clayey fine to medium SAND. (UNDIFFERENTIATED DRIFT).			
			1		3.70 (1.30)	Possibly dense dark brown clayey fine to medium SAND interbedded with sandy clay. (UNDIFFERENTIATED DRIFT).			
			1		5.00				

Remarks
Field records by 10.2 eV PID in ppm(v)
Location cleared for services by Huntsman
150mm Square Steel Monitoring Well Cover

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.OL217

WCL	Ware Consulting Limited 53 Longfield Road Tring Hertfordshire, HP23 4DF	Site Hunstman Olefins 6	Number WEC101

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Hand dug trial pit			Huntsman Petrochemicals	ABB
	Location WEC	**Dates** 17/01/02	**Engineer** ABB Eutech Limited	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					0.05 (0.25)	MADE GROUND. Loose brown sandy rounded fine to medium gravel.		
					0.30	MADE GROUND. Possibly very dense black cobble (Flint? Foundry Waste?).		
						Refusal on made ground Complete at 0.30m		

Remarks
Location cleared for services by Huntsman

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.WEC101

WCL	Ware Consulting Limited 53 Longfield Road Tring Hertfordshire, HP23 4DF	Site Hunstman Olefins 6	Number WEC102

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Hand dug trial pit			Huntsman Petrochemicals	ABB
	Location WEC	**Dates** 17/01/02	**Engineer** ABB Eutech Limited	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					0.05 (0.25)	MADE GROUND. Loose brown sandy rounded fine to medium gravel.		
					0.30	MADE GROUND. Possibly very dense black cobble (Flint? Foundry Waste?).		
						Refusal on made ground Complete at 0.30m		

Remarks
Location cleared for services by Huntsman

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.WEC102

WCL

Ware Consulting Limited
53 Longfield Road
Tring
Hertfordshire, HP23 4DF

Excavation Method	Dimensions	Ground Level (mOD)	Site	Number
Drive-in Window Sampler	80mm to 1.00m 60mm to 2.40m		Hunstman Olefins 6	WEC103
	Location	Dates	Client	Job Number
	WEC	06/12/01	Huntsman Petrochemicals	ABB
			Engineer	Sheet
			ABB Eutech Limited	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						MADE GROUND. Loose to possibly medium dense brown clayey fine to coarse angular to subrounded shale, sandstone, concrete gravel.			
			1						
0.60-0.60	D2				(1.20)				
0.60-0.80	D1		1						
					1.20				
					(0.35)	Stiff brown mottled grey slightly sandy CLAY. (BOULDER CLAY).			
			1		1.55				
					(0.35)	Stiff to very stiff red brown slightly mottled grey and black slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).			
					1.90				
			1			Stiff to very stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).			
2.10-2.10	D4				(0.50)				
2.10-2.10	D3								
2.10-2.20	D5								
					2.40	Refusal on very stiff clay.			
						Complete at 2.40m			

Remarks
150mm Square Steel Monitoring Well Cover
Location cleared for services by Huntsman
Field records by 10.2 eV PID in ppm(v)
No groundwater strikes

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB:WEC103

WCL	Ware Consulting Limited 53 Longfield Road Tring Hertfordshire, HP23 4DF	Site Hunstman Olefins 6	Number WEC104
Excavation Method Drive in Window Sampler 5/12/2001 to 2.0m Mounted Rotary Solid Stem Auger (100mm) 19/12/2001 to 6.0m	Dimensions 80mm to 1.00m 60mm to 2.00m Location WEC	Ground Level (mOD) Dates 05/12/01- 19/12/01	Client Huntsman Petrochemicals Engineer ABB Eutech Limited	Job Number ABB Sheet 1/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.10-0.30	D1		4		(0.40)	Stiff dark brown mottled black slightly organic CLAY. (UNDIFFERENTIATED DRIFT).			
0.30-0.30	D2								
0.30-0.30	D3				0.40				
			4		(1.00)	Stiff brown slightly sandy slightly gravelly CLAY. Gravel is coarse subrounded gravel of quartzite. (BOULDER CLAY).			
					1.40				
1.70-1.90	D4		4			Very stiff chocolate brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium subrounded of fine grained sandstone. (BOULDER CLAY).			
			2		(2.80)				
			2						
			2						
			Minor(1) at 4.20m.		4.20			▽1	
4.50-4.80	D7		1			Soft brown very sandy CLAY. Sand is fine to medium. (UNDIFFERENTIATED DRIFT).			
4.50-4.80	D6								
4.50-4.80	D5								

Remarks
Heavy rain during window sampling drilling
Field records by 10.2 eV PID in ppm(v)
Location cleared for services by Huntsman
150mm Square Steel Monitoring Well Cover

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.WEC104

WCL	Ware Consulting Limited 53 Longfield Road Tring Hertfordshire, HP23 4DF	Site Hunstman Olefins 6	Number WEC104
Excavation Method Drive in Window Sampler 5/12/2001 to 2.0m Mounted Rotary Solid Stem Auger (100mm) 19/12/2001 to 6.0m	Dimensions 80mm to 1.00m 60mm to 2.00m Location WEC	Ground Level (mOD) Dates 05/12/01- 19/12/01	Client Huntsman Petrochemicals Engineer ABB Eutech Limited	Job Number ABB Sheet 2/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
					(1.30)				
			5		5.50	Stiff red brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).			
					(0.50)				
					6.00	Complete at 6.00m			

Remarks

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.WEC104

WCL

Ware Consulting Limited
53 Longfield Road
Tring
Hertfordshire, HP23 4DF

Site: Hunstman Olefins 6			Number: WEC105
Excavation Method: Drive-in Window Sampler	Dimensions: 80mm to 1.00m, 60mm to 3.00m, 40mm to	Ground Level (mOD):	Client: Huntsman Petrochemicals
	Location: WEC	Dates: 05/12/01	Engineer: ABB Eutech Limited
			Job Number: ABB
			Sheet: 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
					(0.90)	POSSIBLY MADE GROUND. Stiff red brown slightly gravelly clay.			
					0.90	POSSIBLY MADE GROUND. Very soft brown very gravelly clay.			
			Fast(1) at 1.50m.		(1.30)			▽1	
2.10-2.10 2.10-2.10	D1 D2					Wet black oily impact.			
					2.20	Stiff to very stiff red brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium subangular to subrounded of fine grained sandstone. (BOULDER CLAY).			
					(1.80)				
					4.00	Complete at 4.00m			

Remarks
150mm Square Steel Monitoring Well Cover
Heavy rain during drilling
PID failure in rain
Location cleared for services by Huntsman

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.WEC105

WCL	Ware Consulting Limited 53 Longfield Road Tring Hertfordshire, HP23 4DF	Site Hunstman Olefins 6	Number WEC201
Excavation Method JCB Mounted Rotary Solid Auger	Dimensions 100mm to 6.20m	Ground Level (mOD)	Client Huntsman Petrochemicals	Job Number ABB
	Location Central Control	Dates 18/12/01	Engineer ABB Eutech Limited	Sheet 1/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
					(0.50)	MADE GROUND. Loose brown sandy gravel.			
			2		0.50	Soft to firm brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).			
			2						
			2						
					(4.50)				
			Slight seepage 3.0 to 3.5(1) at 3.00m. 2					▽1	
			1						
					5.00				

Remarks
Field records by 10.2 eV PID in ppm(v)
Location cleared for services by Huntsman
150mm Square Steel Monitoring Well Cover

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.CC201

WCL	Ware Consulting Limited 53 Longfield Road Tring Hertfordshire, HP23 4DF	Site Hunstman Olefins 6	Number WEC201
avation Method JCB Mounted Rotary Solid S Auger	Dimensions 100mm to 6.20m	Ground Level (mOD)	Client Huntsman Petrochemicals	Job Number ABB
	Location Central Control	Dates 18/12/01	Engineer ABB Eutech Limited	Sheet 2/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
5.00-5.50 5.00-5.50 5.00-5.50	D3 D1 D2		Minor(2) at 5.00m.		(0.90) 5.90	Very soft brown very sandy CLAY. Sand is fine. (UNDIFFERENTIATED DRIFT).		▽2	
			1		(0.30) 6.20	Stiff red brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).			
						Complete at 6.20m			

Remarks

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.CC201

WCL	Ware Consulting Limited 53 Longfield Road Tring Hertfordshire, HP23 4DF	Site Hunstman Olefins 6	Number WEC202
avation Method Drive-in Window Sampler	Dimensions 80mm to 1.00m 60mm to 2.50m	Ground Level (mOD)	Client Huntsman Petrochemicals
	Location WEC	Dates 05/12/01	Engineer ABB Eutech Limited

Job Number: ABB

Sheet: 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
			Slight seepage(1) at 0.05m.		0.10	MADE GROUND Soft grey gravelly clay. Gravel is fine to coarse angular clinker.		▽1
			2		(0.10)			
			2		0.20	Stiff brown mottled black slightly organic CLAY. (UNDIFFERENTIATED DRIFT).		
			3			Stiff brown mottled grey slightly sandy slightly gravelly CLAY. Gravel is fine to medium subangular to subrounded of shale and sandstone. (BOULDER CLAY).		
			3					
					(2.30)			
			4					
			4					
			4		2.50	Refusal on very stiff clay. Complete at 2.50m		

Remarks
Location cleared for services by Huntsman
Field records by 10.2 eV PID in ppm(v)
Bore backfilled with bentonite pellets
groundwater strikes in natural ground
avy rain during drilling

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB:WEC202

WCL

Ware Consulting Limited
53 Longfield Road
Tring
Hertfordshire, HP23 4DF

Excavation Method: JCB Mounted Rotary Solid Stem Auger	Dimensions: 100mm to 6.00m	Ground Level (mOD):	Site: Hunstman Olefins 6	Number: WEC203
	Location: Central Control	Dates: 19/12/01	Client: Huntsman Petrochemicals	Job Number: ABB
			Engineer: ABB Eutech Limited	Sheet: 1/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
					0.10	Tarmacadam			
			1		(0.60)	MADE GROUND. Possibly dense grey clayey very sandy fine to coarse gravel.			
			2		0.70	Stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).			
			2		(3.80)				
			2						
			1						
4.50-5.00 4.50-5.00 4.50-5.00	D2 D1 D3		Minor(1) at 4.50m.		4.50	Soft brown grey very sandy CLAY. Sand is fine to medium. (UNDIFFERENTIATED DRIFT).		▽1	

Remarks
200mm Round Traffic Rated Monitoring Well Cover
Location cleared for services by Huntsman
Field records by 10.2 eV PID in ppm(v)

Scale (approx)	Logged By
1:25	DJD

Figure No.
ABB:CO203

WCL

Ware Consulting Limited
53 Longfield Road
Tring
Hertfordshire, HP23 4DF

Excavation Method: JCB Mounted Rotary Solid Auger	Dimensions: 100mm to 6.00m	Ground Level (mOD):	Site: Hunstman Olefins 6	Number: WEC203
	Location: Central Control	Dates: 19/12/01	Client: Huntsman Petrochemicals	Job Number: ABB
			Engineer: ABB Eutech Limited	Sheet: 2/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
					(1.00)				
					5.50	Stiff red brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).			
			1		(0.50)				
					6.00	Complete at 6.00m			

Remarks

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.CC203

WCL

Ware Consulting Limited
53 Longfield Road
Tring
Hertfordshire, HP23 4DF

Site	Number
Hunstman Olefins 6	WEC204

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
JCB Mounted Rotary Solid Stem Auger	100mm to 7.80m		Huntsman Petrochemicals	ABB

Location	Dates	Engineer	Sheet
Central Control	18/12/01	ABB Eutech Limited	1/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
					(0.50)	MADE GROUND. Loose sandy angular to subangular fine to coarse gravel.			
			2		0.50 (0.30)	Soft to stiff dark grey mottled black sandy organic CLAY with rare traces of fibrous plant remains. (UNDIFFERENTIATED DRIFT).			
			2		0.80 (1.40)	Stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).			
			2						
			2		2.20 (0.50)	Stiff red brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).			
			1		2.70 (0.20)	Stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).			
			1		2.90	Stiff red brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).			
			1						

Remarks
Field records by 10.2 eV PID in ppm(v)
Location cleared for services by Huntsman
150mm Square Steel Monitoring Well Cover

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.CC204

WCL	Ware Consulting Limited 53 Longfield Road Tring Hertfordshire, HP23 4DF	Site Hunstman Olefins 6	Number WEC204
Excavation Method JCB Mounted Rotary Solid Stem Auger	Dimensions 100mm to 7.80m	Ground Level (mOD)	Client Huntsman Petrochemicals	Job Number ABB
	Location Central Control	Dates 18/12/01	Engineer ABB Eutech Limited	Sheet 2/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
			1		(4.90)	..... becoming brown from 5.2m			
			1						
7.50-7.80	D1				7.80	Complete at 7.80m			

Remarks

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.CC204

WCL	Ware Consulting Limited 53 Longfield Road Tring Hertfordshire, HP23 4DF	Site Hunstman Olefins 6	Number CC101
Excavation Method Drive-in Window Sampler	Dimensions 80mm to 1.00m 60mm to 2.00m	Ground Level (mOD)	Client Huntsman Petrochemicals	Job Number ABB
	Location Central Control	Dates 11/12/01	Engineer ABB Eutech Limited	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10-0.40	D1		Medium from MG(1) at 0.10m. 45		(0.40)	MADE GROUND. Loose slightly clayey sandy angular medium gravel. Sheens and very strong petrol odours.		▽1
0.40-0.40	D2		81		0.40			
0.40-0.40	D3					Very soft grey slightly sandy organic CLAY with rare plant stems. Sand is fine. (UNDIFFERENTIATED DRIFT).		
0.70-0.90	D6		45					
0.80-0.80	D4		25		(0.80)			
0.80-0.80	D5							
			15					
			10		1.20			
						Soft red brown slightly mottled grey slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).		
			5		(0.80)			
1.70-1.70	D7					.... becoming stiff from 1.6m		
						.... becoming very stiff from 1.8m		
			1		2.00			
						Refusal on clay Complete at 2.00m		

Remarks
Field records by 10.2 eV PID in ppm(v)
Backfilled with bentonite
Location cleared for services by Huntsman

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.CC101

WCL

Ware Consulting Limited
53 Longfield Road
Tring
Hertfordshire, HP23 4DF

Excavation Method: Drive-in Window Sampler	Dimensions: 80mm to 1.00m, 60mm to 1.80m	Ground Level (mOD)	Site: Hunstman Olefins 6
	Location: Central Control	Dates: 11/12/01	Client: Huntsman Petrochemicals
			Engineer: ABB Eutech Limited
			Number: CC102
			Job Number: ABB
			Sheet: 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.30-0.30 0.30-0.30	D1 D2		2		(0.90)	Very soft brown slightly mottled grey slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY). .... becoming soft from 0.4m .... becoming stiff from 0.6m .... becoming very stiff from 0.8m		
			1		0.90	Very stiff red brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).		
			1		(1.10)			
			1		2.00	Refusal on clay Complete at 1.80m		

Remarks
Field records by 10.2 eV PID in ppm(v)
Backfilled with bentonite
Location cleared for services by Huntsman

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.CC102

WCL	Ware Consulting Limited 53 Longfield Road Tring Hertfordshire, HP23 4DF	Site Hunstman Olefins 6	Number CC103
Excavation Method Drive-in Window Sampler	Dimensions 80mm to 1.00m 60mm to 2.00m	Ground Level (mOD)	Client Huntsman Petrochemicals	Job Number ABB
	Location Central Control	Dates 11/12/01	Engineer ABB Eutech Limited	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10-0.20 0.15-0.15 0.15-0.15	D3 D2 D1				(0.30)	MADE GROUND. Soft brown gravelly clay. Gravel is fine to coarse angular to subrounded of mudstone.		
0.35-0.35 0.35-0.35	D4 D5				0.30 (0.20)	Soft becoming firm brown mottled black slightly sandy CLAY. (UNDIFFERENTIATED DRIFT).		
			1		0.50	Firm becoming stiff brown mottled grey slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).		
			1		(1.50)			
			1			.... becoming very stiff from 1.0m		
			1		2.00	Refusal on clay Complete at 2.00m		

Remarks
Field records by 10.2 eV PID in ppm(v)
Backfilled with bentonite
Location cleared for services by Huntsman

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.CC103

WCL	Ware Consulting Limited 53 Longfield Road Tring Hertfordshire, HP23 4DF	Site Hunstman Olefins 6	Number CC104
Excavation Method Drive-in Window Sampler	Dimensions 80mm to 1.00m 60mm to 2.50m	Ground Level (mOD)	Client Huntsman Petrochemicals	Job Number ABB
	Location Central Control	Dates 04/12/01	Engineer ABB Eutech Limited	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
			0.8		(0.20) 0.20	MADE GROUND. Soft to firm dark brown clay.		
0.30-0.50	D1		0.8		(0.10) 0.30	MADE GROUND. Soft dark brown gravelly clay. Gravel is medium to coarse angular shale.		
			4		(0.25) 0.55	Soft to firm dark grey to black mottled brown slightly organic CLAY. (UNDIFFERENTIATED DRIFT).		
					(0.45) 1.00	Stiff light brown slightly mottled grey sandy CLAY. Sand is fine. (BOULDER CLAY).		
1.30-1.50	D2		4		(1.50) 2.50	Firm becoming very stiff red brown mottled grey slightly sandy slightly gravelly CLAY. Gravel is fine to coarse angular to rounded of sandstone, shale and mudstone. (BOULDER CLAY).		
2.30-2.50	D3		4			Refusal on very stiff clay. Complete at 2.50m		

Remarks
No groundwater strikes
Field records by 10.2 eV PID in ppm(v)
Location cleared for services by Huntsman
Bore backfilled with bentonite pellets

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.CC104

WCL	Ware Consulting Limited 53 Longfield Road Tring Hertfordshire, HP23 4DF	Site Hunstman Olefins 6	Number CC105
Excavation Method Drive-in Window Sampler	Dimensions 80mm to 1.00m 60mm to 3.00m	Ground Level (mOD)	Client Huntsman Petrochemicals	Job Number ABB
	Location Central Control	Dates 12/12/01	Engineer ABB Eutech Limited	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
			1		(0.55)	MADE GROUND. Loose grey sandy subangular fine to coarse gravel of clinker.			
			2		0.55	MADE GROUND. Loose to possibly medium dense brown clayey sandy subangular fine to medium gravel.			
			1		(0.95)				
			22		1.50	POSSIBLE MADE GROUND. Soft brown slightly gravelly sandy CLAY.		▽1	
			Slow from MG(1) at 1.60m.		(0.10)				
			290		1.60	POSSIBLE MADE GROUND. Very soft dark grey slightly gravelly sandy CLAY. Oily sheens, very strong petrol odours.			
			489		(0.85)				
			300		2.45				
			5			Very stiff red brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).			
2.70-2.90	D2				(0.55)				
2.80-2.80	D1								
			1		3.00	Refusal on clay Complete at 3.00m			

Remarks
Field records by 10.2 eV PID in ppm(v)
150mm Square Steel Monitoring Well Cover
Location cleared for services by Huntsman

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB:CC105

WCL	Ware Consulting Limited 53 Longfield Road Tring Hertfordshire, HP23 4DF	Site Hunstman Olefins 6	Number CC106
Excavation Method Drive-in Window Sampler	Dimensions 80mm to 1.00m 60mm to 1.90m	Ground Level (mOD)	Client Huntsman Petrochemicals	Job Number ABB
	Location Central Control	Dates 12/12/01	Engineer ABB Eutech Limited	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.40)	Stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).		
0.45-0.45	D1		1		0.40 (0.20) 0.60	Soft to firm grey mottled black sandy CLAY. (UNDIFFERENTIATED DRIFT).		
			1		(1.30)	Stiff red brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY). .... becoming very stiff from 1.1m		
1.80-1.80	D2		1		1.90	Refusal on clay Complete at 1.90m		

Remarks
Location cleared for services by Huntsman
Backfilled with bentonite
Field records by 10.2 eV PID in ppm(v)

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.CC106

WCL	Ware Consulting Limited 53 Longfield Road Tring Hertfordshire, HP23 4DF	Site Hunstman Olefins 6	Number CC107
avation Method Drive-in Window Sampler	Dimensions 80mm to 1.00m 60mm to 1.80m	Ground Level (mOD)	Client Huntsman Petrochemicals	Job Number ABB
	Location Central Control	Dates 11/12/01	Engineer ABB Eutech Limited	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.30-0.30	D1		2		(0.50) 0.50	Very soft light brown mottled grey sandy CLAY. (UNDIFFERENTIATED DRIFT).		
			1		(1.30)	Stiff becoming very stiff red brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).		
			1		1.80	Refusal on clay Complete at 1.80m		

Remarks
Field records by 10.2 eV PID in ppm(v)
Backfilled with bentonite
Location cleared for services by Huntsman

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.CC107

WCL

Ware Consulting Limited
53 Longfield Road
Tring
Hertfordshire, HP23 4DF

Excavation Method: Drive-in Window Sampler	Dimensions: 80mm to 1.00m, 60mm to 1.60m	Ground Level (mOD):	Site: Hunstman Olefins 6
	Location: Central Control	Dates: 11/12/01	Client: Huntsman Petrochemicals
			Engineer: ABB Eutech Limited

Number: CC108
Job Number: ABB
Sheet: 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
			1		(1.60)	Soft brown mottled grey slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).		
			1			.... becoming stiff from 0.8m		
1.30-1.40	D3					.... becoming very stiff from 1.0m		
1.40	D1							
1.40	D2		1					
					1.60	Refusal on clay Complete at 1.60m		

Remarks
Field records by 10.2 eV PID in ppm(v)
Location cleared for services by Huntsman
Backfilled with bentonite

Scale (approx): 1:25
Logged By: CJD

Figure No.
ABB.CC108

WCL	Ware Consulting Limited 53 Longfield Road Tring Hertfordshire, HP23 4DF	Site Hunstman Olefins 6	Number CC109
Excavation Method Drive-in Window Sampler	Dimensions 80mm to 1.00m 60mm to 3.00m 40mm to	Ground Level (mOD)	Client Huntsman Petrochemicals	Job Number ABB
	Location Central Control	Dates 04/12/01	Engineer ABB Eutech Limited	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.30-0.40	D1		38			MADE GROUND. Loose grey becoming dark brown clayey angular fine to medium gravel. Gravel of grey shale, brown mudstone and fine grained sandstone.			
			39		(1.50)				
			102						
			Fast(1) at 1.00m.					▽1	
			42						
					1.50				
1.60-1.90	D2		350			MADE GROUND. Loose dark grey medium to coarse angular shale and mudstone gravel (roadstone type fill). Very oily product and strong solvent odours.			
1.90-1.90	D3		380						
					(1.20)				
			32						
					2.70				
2.80-2.90	D4					Soft grey mottled dark brown CLAY. (UNDIFFERENTIATED DRIFT).			
			4		(0.80)				
			2		3.50				
					3.55	Possibly medium dense light brown slightly clayey fine SAND. (UNDIFFERENTIATED DRIFT).			
					(0.45)	Firm red brown slightly sandy slightly gravelly CLAY. (BOULDER CLAY).			
					4.00				
						Complete at 4.00m			

Remarks
150mm square steel monitoring well cover
Location cleared for services by Huntsman
Field records by 10.2 eV PID in ppm(v)

Scale (approx)	Logged By
1:25	DJD

Figure No.
ABB.WEC109

WCL	Ware Consulting Limited 53 Longfield Road Tring Hertfordshire, HP23 4DF	Site Hunstman Olefins 6	Number CC110
Excavation Method Drive-in Window Sampler	Dimensions 80mm to 1.00m 60mm to 2.00m	Ground Level (mOD)	Client Huntsman Petrochemicals	Job Number ABB
	Location Central Control	Dates 11/12/01	Engineer ABB Eutech Limited	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.20-0.20	D1				(0.30)	Soft brown mottled black sandy CLAY. (UNDIFFERENTIATED DRIFT).		
			1		0.30 (0.60)	Stiff brown mottled grey slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).		
			1		0.90 (1.10)	Stiff to very stiff red brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).		
			1		2.00	Refusal on clay Complete at 2.00m		

Remarks
Field records by 10.2 eV PID in ppm(v)
Backfilled with bentonite
Location cleared for services by Huntsman

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.CC110

WCL

Ware Consulting Limited
53 Longfield Road
Tring
Hertfordshire, HP23 4DF

Excavation Method	Dimensions	Ground Level (mOD)	Site	Number
Drive-in Window Sampler	80mm to 1.00m 60mm to 2.00m		Hunstman Olefins 6	CC111
	Location	Dates	Client	Job Number
	Central Control	17/01/02	Huntsman Petrochemicals	ABB
			Engineer	Sheet
			ABB Eutech Limited	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.05-0.15 0.10-0.10 0.10-0.10	D3 D2 D1		66 Damp MG(1) at 0.20m. 23		(0.25)	MADE GROUND. Loose grey slightly clayey sandy rounded fine to medium gravel. Petrol odours.		▽1
			1		0.25 (0.35)	Soft dark grey brown sandy CLAY. (UNDIFFERENTIATED DRIFT).		
			1		0.60 (0.40)	Soft to firm brown mottled grey slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).		
			1		1.00	Stiff red brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).		
			1		(1.00)	.... becoming very stiff from 1.5m		
			1		2.00	Refusal on clay Complete at 2.00m		

Remarks
Location cleared for services by Huntsman
Backfilled with bentonite
Field records by 10.2 eV PID in ppm(v)

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.CC111

WCL	Ware Consulting Limited 53 Longfield Road Tring Hertfordshire, HP23 4DF	Site Hunstman Olefins 6	Number CC111A

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive-in Window Sampler	80mm to 1.00m 60mm to 2.00m		Huntsman Petrochemicals	ABB
	Location Central Control	**Dates** 17/01/02	**Engineer** ABB Eutech Limited	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					0.05	TOPSOIL		
			1			Stiff to very stiff brown to dark brown slightly mottled grey slightly sandy slightly gravelly CLAY. Gravel is fine anguiar to subrounded sandstone and shale. (BOULDER CLAY).		
			1		(1.95)			
			1					
			1		2.00	Refusal on clay Complete at 2.00m		

Remarks
Location cleared for services by Huntsman
Backfilled with bentonite
Field records by 10.2 eV PID in ppm(v)

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.CC111A

WCL

Ware Consulting Limited
53 Longfield Road
Tring
Hertfordshire, HP23 4DF

Site	Number
Hunstman Olefins 6	CC112

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive-in Window Sampler	80mm to 1.00m 60mm to 2.80m		Huntsman Petrochemicals	ABB

Location	Dates	Engineer	Sheet
Central Control	17/01/02	ABB Eutech Limited	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
			1		(0.90)	Very stiff brown to red brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).		
					0.90 0.95	Possibly dense grey green sandy angular gravel. (UNDIFFERENTIATED DRIFT).		
1.10-1.10 0-1.20	D1 D2		1			Soft brown very sandy CLAY. (UNDIFFERENTIATED DRIFT).		
					(0.75)	.... becoming firm from 1.5m		
			1		1.70	Firm to stiff red brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).		
					(1.10)			
			1					
					2.80	Refusal on clay Complete at 2.80m		

Remarks
Field records by 10.2 eV PID in ppm(v)
Backfilled with bentonite
Location cleared for services by Huntsman

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.CC112

WCL	Ware Consulting Limited 53 Longfield Road Tring Hertfordshire, HP23 4DF	Site Hunstman Olefins 6	Number CC113
Excavation Method Drive-in Window Sampler	Dimensions 80mm to 1.00m 60mm to 2.00m	Ground Level (mOD)	Client Huntsman Petrochemicals	Job Number ABB
	Location Central Control	Dates 12/12/01	Engineer ABB Eutech Limited	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
					0.05	MADE GROUND. Loose brown rounded cobbles.			
					0.15	CONCRETE.			
					0.20				
			3		(0.05)	MADE GROUND. Loose brown sandy angular fine to medium gravel.			
					(0.40)				
			45			Loose brown slightly gravelly sandy CLAY. Gravel is fine angular. (UNDIFFERENTIATED DRIFT).			
0.60-0.70	D2		Water strike(1) at 0.60m.		0.60			▽1	
0.70-0.70	D1		800		(0.30)	Soft grey green stained black sandy gravelly CLAY. Highly impacted by hydrocarbons with strong hydrocarbon odours. (UNDIFFERENTIATED DRIFT).			
			955						
			600		0.90				
			42			Firm red brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).			
						.... becoming stiff from 1.2m			
			15		(1.10)	.... becoming very stiff from 1.5m			
			4						
			1		2.00				
						Refusal on clay Complete at 2.00m			

Remarks
Field records by 10.2 eV PID in ppm(v)
150mm Square Steel Monitoring Well Cover
Location cleared for services by Huntsman

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB:CC113

WCL	Ware Consulting Limited 53 Longfield Road Tring Hertfordshire, HP23 4DF	Site Hunstman Olefins 6	Number CC114

avation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive-in Window Sampler	80mm to 1.00m 60mm to 3.00m		Huntsman Petrochemicals	ABB
	Location Central Control	**Dates** 17/01/02	**Engineer** ABB Eutech Limited	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.15) 0.15	MADE GROUND. Loose brown sandy clayey angular fine to coarse gravel.		
			2		(1.05)	MADE GROUND. Loose light orange angular cobbles of fire brick.		
			1		1.20			
			1		(0.40)	Stiff to very stiff brown becoming red brown mottled grey slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).		
					1.60 1.70	Stiff dark brown mottled black sandy CLAY. (BOULDER CLAY).		
			1		(1.30)	Stiff to very stiff red brown mottled grey slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).		
			1		3.00	Refusal on clay Complete at 3.00m		

Remarks
Location cleared for services by Huntsman
Backfilled with bentonite
Field records by 10.2 eV PID in ppm(v)

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB:CC114

WCL	Ware Consulting Limited 53 Longfield Road Tring Hertfordshire, HP23 4DF	Site Hunstman Olefins 6	Number CC201
Excavation Method JCB Mounted Rotary Solid Stem Auger	Dimensions 100mm to 4.00m	Ground Level (mOD)	Client Huntsman Petrochemicals	Job Number ABB
	Location Central Control	Dates 18/12/01	Engineer ABB Eutech Limited	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
			2		(0.40)	Soft light brown sandy CLAY. (UNDIFFERENTIATED DRIFT).			
					0.40	Soft brown sandy CLAY. (UNDIFFERENTIATED DRIFT).			
			3		(1.30)				
			5		1.70	Soft brown grey slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY). Very strong hydrocarbons and solvent odours from 2.m			
			500						
2.30-2.70	D1								
2.30-2.70	D2								
2.30-2.70	D3								
			2500		(1.80)				
			250			.... becoming stiff from 3.2m			
-4.00	D4		60		3.50				
-4.00	D5					Stiff red brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY). Appears unimpacted by hydrocarbons and solvents.			
3.50-4.00	D6				(0.50)				
					4.00	Complete at 4.00m			

Remarks
150mm Square Steel Monitoring Well Cover
Location cleared for services by Huntsman
Field records by 10.2 eV PID in ppm(v)

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.CC201

WCL

Ware Consulting Limited
53 Longfield Road
Tring
Hertfordshire, HP23 4DF

Excavation Method: JCB Mounted Rotary Solid Stem Auger	Dimensions: 100mm to 5.60m	Ground Level (mOD)	Site: Hunstman Olefins 6	Number: CC202
	Location: Central Control	Dates: 17/12/01	Client: Huntsman Petrochemicals	Job Number: ABB
			Engineer: ABB Eutech Limited	Sheet: 1/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
			1			Stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).			
			1		(2.00)				
			1						
			1		2.00	Stiff red brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).			
			1		(1.50)				
			1						
			1		3.50	Stiff red brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).			
			1		(1.50)				
			1						
					5.00				

Remarks
Field records by 10.2 eV PID in ppm(v)
Location cleared for services by Huntsman
150mm Square Steel Monitoring Well Cover

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.CC202

WCL

Ware Consulting Limited
53 Longfield Road
Tring
Hertfordshire, HP23 4DF

Excavation Method	Dimensions	Ground Level (mOD)	Site	Number
JCB Mounted Rotary Solid Stem Auger	100mm to 5.60m		Hunstman Olefins 6	CC202
	Location	Dates	Client	Job Number
	Central Control	17/12/01	Huntsman Petrochemicals	ABB
			Engineer	Sheet
			ABB Eutech Limited	2/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
					(0.50)	Stiff grey slightly sandy CLAY. (BOULDER CLAY).			
5.50-5.60	D1		1		5.50 5.60	Possibly moderately strong grey MUDSTONE. (JURASSIC REDCAR MUDSTONE FORMATION)			
						Complete at 5.60m			

Remarks

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.CC202

WCL	Ware Consulting Limited 53 Longfield Road Tring Hertfordshire, HP23 4DF	Site Hunstman Olefins 6	Number CC203
Excavation Method JCB Mounted Rotary Solid Stem Auger	Dimensions 100mm to 1.50m	Ground Level (mOD)	Client Huntsman Petrochemicals	Job Number ABB
	Location Central Control	Dates 17/12/01	Engineer ABB Eutech Limited	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00-0.15 0.00-0.15 0.00-0.15	D1 D2 D3		Fast from MG(1) at 0.05m. 11		(0.15) 0.15	MADE GROUND. Loose black grey sandy angular fine to coarse. Heavily impacted by oily hydrocarbons.		▽1	
					(1.35)	Stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).			
					1.50	Drilling stopped due to impacted perched waters Complete at 1.50m			

Remarks
Unable to do headspace PID testing on natural soils due to perched waters cross contaminating drill returns
Field records by 10.2 eV PID in ppm(v)
Location cleared for services by Huntsman
150mm Square Steel Monitoring Well Cover

Scale (approx)	Logged By
1:25	CJD

Figure No.
ABB.CC203

WCL

Ware Consulting Limited
53 Longfield Road
Tring
Hertfordshire, HP23 4DF

Excavation Method	Dimensions	Ground Level (mOD)	Site	Number
JCB Mounted Rotary Solid Stem Auger	100mm to 3.55m		Hunstman Olefins 6	CC204
	Location	**Dates**	**Client**	**Job Number**
	Central Control	17/12/01	Huntsman Petrochemicals	ABB
			Engineer	**Sheet**
			ABB Eutech Limited	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
			2		(0.90)	MADE GROUND. Loose clayey sandy gravel.			
			2		0.90	Soft to firm brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).			
			2		(1.30)			▽1	
			Slight minor seepage(1) at 2.00m. 2		2.20	Stiff red brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).			
			2		(1.10)				
			2						
3.40-3.40 3.40-3.40	D2 D1		6		3.30 (0.20) 3.50	Very stiff grey CLAY. (BOULDER CLAY).			
					3.55	Possibly strong grey MUDSTONE. (JURASSIC REDCAR MUDSTONE FORMATION)			
						Refusal on mudstone Complete at 3.55m			

Remarks
Field records by 10.2 eV PID in ppm(v)
Location cleared for services by Huntsman
150mm Square Steel Monitoring Well Cover

Scale (approx)	Logged By
1:25	CJD

Figure No:
ABB.CC204

APPENDIX C

QA/QC FORMS

CHAIN OF CUSTODY
AND SELECTED LAB QA/QC CHECKS

GEOTRACE

SAMPLING AND CHAIN OF CUSTODY RECORD

ALcontrol Geochem

Chester Street, Chester CH4 8RD, England
tel: (01244) 671121 fax: (01244) 683306
website: www.geochem.com email: mkt@geochem.com

Client:

Contact:

Address:

Tel: Fax:

Site/Project Ref:

DATE day/month/year	GEOCHEM REF	SAMPLE REF. ID	DEPTH	Matrix Type: Water	Soil/Sediment	Other (Specify in Comments Column)	Type of Analysis: PAH	DRO	DTEX	VOC	SVOC	METALS					Sample Concentration Low Medium or High (L,M,H)	Sample Preservation (specify)	Comments	Samplers Signature

RELINQUISHED (sign)

DATE AND TIME

COURIER:

GEOCHEM SC or JOB No.: (if known)

TURNAROUND	TICK
*< 5 DAY (specify)	
* 5 DAY	
* 6-10 DAYS (specify)	
10-12 days	X

*SURCHARGE WILL APPLY UNLESS OTHERWISE AGREED

REPORT FORMAT

RESULTS BY e-mail: YES ☐ NO ☒

e-mail address:

OTHER FORMAT (specify):

ALCONTROL GEOCHEM USE ONLY

RECEIVED AT LAB (sign) .....

DATE AND TIME: .....

SAMPLE CONDITION: .....

.....

GEOTRACE

SAMPLING AND CHAIN OF CUSTODY RECORD

ALcontrol Geochem

Chester Street, Chester CH4 8RD, England
tel: (01244) 671121 fax: (01244) 683306
website: www.geochem.com email: mkt@geochem.com

Client: ...

Contact: ...

Address: ...

Tel: ... Fax: ...

Site/Project Ref: ...

DATE day/month/year	GEOCHEM REF	SAMPLE REF. ID	DEPTH	Matrix Type: Water	Soil/Sediment	Other (Specify in Comments Column)	Type of Analysis: B259	B260	BTEX	VOCs	SVOCs	METALS					Sample Concentration Low, Medium or High (L,M,H)	Sample Preservation (specify)	Comments	Samplers Signature
					X		X													
					X														HOLD for 3 MONTHS	
					X			X											Metals	
					X		X													
					X					X										
					X			X			X	X								
					X		X													
					X			X												
					/		X													
					X														HOLD for 3 MONTHS	
					X							X								
					X		X													
					X														HOLD for 3 MONTHS	
					X			X				X								
					X		X													

RELINQUISHED (sign) ...

DATE AND TIME ...

COURIER: ...

GEOCHEM SC or JOB No.: ... (if known)

TURNAROUND	TICK
*< 5 DAY (specify)	
* 5 DAY	
* 6-10 DAYS (specify)	
10-12 days	X

*SURCHARGE WILL APPLY UNLESS OTHERWISE AGREED

REPORT FORMAT

RESULTS BY e-mail: YES ☐ NO ☒

e-mail address:

OTHER FORMAT (specify):

ALCONTROL GEOCHEM USE ONLY

RECEIVED AT LAB (sign) ...

DATE AND TIME: ...

SAMPLE CONDITION: ...

GEOTRACE

SAMPLING AND CHAIN OF CUSTODY RECORD

Client:

Contact:

Address:

Tel: Fax:

Site/Project Ref:

ALcontrol Geochem

Chester Street, Chester CH4 8RD, England
tel: (01244) 671121 fax: (01244) 683306
website: www.geochem.com email: mkt@geochem.com

DATE day/month/year	GEOCHEM REF.	SAMPLE REF. ID	DEPTH	Matrix Type: Water	Soil/Sediment	Other (Specify in Comments Column)	Type of Analysis: PAH	DRO	GRO	VOC	SVOC	METALS					Sample Concentration (Low Medium or High (L,M,H))	Sample Preservation (specify)	Comments	Samplers Signature
					X														HOLD FOR 3 MONTHS	
					X														HOLD FOR 3 MONTHS	
					X														HOLD FOR 3 MONTHS.	
					X														HOLD FOR 3 MONTHS	
					X														HOLD FOR 3 MONTHS	
					X														HOLD FOR 3 MONTHS	
					X		X													
					X					X	X	X								
					X			X												
					X		X													
					X			X												
					X		X													
					X			X												

RELINQUISHED (sign)

DATE AND TIME

COURIER:

GEOCHEM SC or JOB No.: (If Known)

TURNAROUND	TICK
*< 5 DAY (specify)	
* 5 DAY	
* 6-10 DAYS (specify)	
10-12 days	X

*SURCHARGE WILL APPLY UNLESS OTHERWISE AGREED

REPORT FORMAT

RESULTS BY e-mail: YES ☐ NO ☒

e-mail address:

OTHER FORMAT (specify):

ALCONTROL GEOCHEM USE ONLY

RECEIVED AT LAB (sign) .....

DATE AND TIME: .....

SAMPLE CONDITION: .....

.....

GEOTRACE

SAMPLING AND CHAIN OF CUSTODY RECORD

ALcontrol Geochem

Chester Street, Chester CH4 8RD, England
tel: (01244) 671121 fax: (01244) 683306
website: www.geochem.com email: mkt@geochem.com

Client: PAUL NOBLE
Contact: ABS WYG
Address: DAVENTRY
WARRINGTON
Tel: 01925 741014 Fax:
Site/Project Ref: HPB1

DATE day/month/year	GEOCHEM REF.	SAMPLE REF. ID	DEPTH	Matrix Type: Water	Soil/Sediment	Other (Specify in Comments Column)	Type of Analysis: PRO	DRO	BTEX	SVOC	METAL	OTHER* (SEE COMMENTS)	Sample Concentration Low Medium or High (L,M,H)	Sample Preservation (specify)
13/12/01		OL109 D1	0-2									X		
13/12/01		OL109 D2	0-2/0-3											
13/12/01		OL 214 D1	2-4				X							
13/12/01		OL 214 D2	2-4/2-5					X						
13/12/01		OL 111 D1	0-55				X							
13/12/01		OL 111 D2	0-55						X					
13/12/01		OL 111 D3	0-5/0-6					X		X	X			
13/12/01		OL 110 D1	0-15				X							
13/12/01		OL 110 D2	0-15						X					
13/12/01		OL 110 D3	0-1/0-2					X						
14/12/01		OL 101 D1	0-2				X							
14/12/01		OL 101 D2	0-1/0-2					X						
14/12/01		OL 101 D3	3-25				X							
14/12/01		OL/01 D4	3-25						X					
14/12/01		OL/01 D5	3-1/3-25					X			X			

Comments	Samplers Signature
ANALYSE TO DETECT N Methyl pyrolidone	
NOTE HOLD 3 MONTHS.	

RELINQUISHED (sign) .....
DATE AND TIME 14/12/01
COURIER .....
GEOCHEM SC or JOB No.: (If known) .....

TURNAROUND	TICK
*< 5 DAY (specify)	
* 5 DAY	
* 6-10 DAYS (specify)	
10-12 days	

*SURCHARGE WILL APPLY UNLESS OTHERWISE AGREED

REPORT FORMAT
RESULTS BY e-mail: YES ☐ NO ☐
e-mail address:
OTHER FORMAT (specify):

ALCONTROL GEOCHEM USE ONLY
RECEIVED AT LAB (sign) .....
DATE AND TIME: .....
SAMPLE CONDITION: .....
.....

GEOTRACE — SAMPLING AND CHAIN OF CUSTODY RECORD

GEOCHEM GROUP LIMITED,
CHESTER STREET,
CHESTER CH4 8RD.
Tel: 01244 671121
Fax: 01244 683306

GEOCHEM LABORATORY RETAIN COPY

Client: .....
Contact: .....
Address: .....
.....
.....
Tel: ..... Fax: .....
Site/Project Ref: .....

DATE day/month/year	GEOCHEM REF.	SAMPLE REF. ID	DEPTH	Matrix Type: Water	Soil/Sediment	Other (Specify in Comments column)	Type of Analysis	Sample concentration Low, Medium or High (L,M,H)	Sample Preservation (specify)	Comments	Samplers Signature
					X		X			D1	
					X					D1	
					X		X			D2	
					X		X			D3	
					X					D1 HOLD 3 MONTHS	
					X					D2 HOLD 3 MONTHS	
										HOLD 3 MONTHS	

RELINQUISHED (sign) .....
DATE AND TIME .....
COURIER : .....
GEOCHEM SC or JOB No. : .....
(if known)

TURNAROUND	TICK
*< 5 DAY (specify)	
*5 DAY	
*6 - 10 DAYS(specify)	
10 - 12 Days	X
*SURCHARGE WILL APPLY UNLESS OTHERWISE AGREED	

REPORT FORMAT

RESULTS BY e-mail: Yes ☐ No ☐

e-mail address:

OTHER FORMAT (specify):

GEOCHEM USE ONLY

RECEIVED AT LAB (sign) .....

DATE AND TIME: .....

SAMPLE CONDITION: .....
.....

Ref:F:\div\Johnfiles\M0003

HSA EC

GEOTRACE

SAMPLING AND CHAIN OF CUSTODY RECORD

ALcontrol Geochem

Chester Street, Chester CH4 8RD, England
tel: (01244) 671121 fax: (01244) 683306
website: www.geochem.com email: mkt@geochem.com

Client: [illegible]
Contact: [illegible]
Address: [illegible]
Tel: [illegible] Fax:
Site/Project Ref: [illegible]

DATE day/month/year	GEOCHEM REF.	SAMPLE REF. ID	DEPTH	Water	Soil/Sediment	Other (Specify in Comments Column)	PRO	DRO	BTEX	SVOC	METALS	VOCs	Sample Concentration Low Medium or High (L,M,H)	Sample Preservation (specify)	Comments	Samplers Signature
[illegible]		[illegible]	[illegible]		X			X			X					[signature]
[illegible]		[illegible]	[illegible]		X		X									[signature]
[illegible]		[illegible]	[illegible]		X										HOLD 3 MONTHS	[signature]
[illegible]		[illegible]	[illegible]		X			X			X					[signature]
[illegible]		[illegible]	[illegible]		X		X									[signature]
[illegible]		[illegible]	[illegible]		X							X				[signature]
[illegible]		[illegible]	[illegible]		X			X								[signature]
[illegible]		[illegible]	[illegible]				X									[signature]
[illegible]		[illegible]	[illegible]									X				[signature]
[illegible]		[illegible]	[illegible]					X								[signature]

RELINQUISHED (sign) [signature]
DATE AND TIME [illegible]
COURIER:
GEOCHEM SC or JOB No.: (If known)

TURNAROUND	TICK
*< 5 DAY (specify)	
* 5 DAY	
* 6-10 DAYS (specify)	
10-12 days	X

*SURCHARGE WILL APPLY UNLESS OTHERWISE AGREED

REPORT FORMAT

RESULTS BY e-mail: YES ☐ NO ☐
e-mail address:
OTHER FORMAT (specify):

ALCONTROL GEOCHEM USE ONLY

RECEIVED AT LAB (sign) ....
DATE AND TIME: ....
SAMPLE CONDITION: ....

HSA

GEOTRACE

SAMPLING AND CHAIN OF CUSTODY RECORD

Client: ARL [illegible]

Contact: [illegible]

Address: [illegible]

Tel: [illegible] Fax: [illegible]

Site/Project Ref: [illegible]

ALcontrol Geochem

Chester Street, Chester CH4 8RD, England
tel: (01244) 671121 fax: (01244) 683306
website: www.geochem.com email: mkt@geochem.com

DATE (day/month/year)	GEOCHEM REF.	SAMPLE REF. ID	DEPTH	Matrix Type: Water	Soil/Sediment	Other (Specify in Comments Column)	Type of Analysis: PAH	DRO	BTEX	SVOC	METALS	Sample Concentration (Low, Medium or High (L,M,H))	Sample Preservation (specify)	Comments	Samplers Signature
[illegible]		[illegible]	[illegible]		X		X								
[illegible]		[illegible]	[illegible]		X			X							

RELINQUISHED (sign) [illegible]

DATE AND TIME [illegible]

COURIER: [illegible]

GEOCHEM SC or JOB No.: [illegible]
(if known)

TURNAROUND	TICK
*< 5 DAY (specify)	
* 5 DAY	
* 6-10 DAYS (specify)	
10-12 days	X

*SURCHARGE WILL APPLY UNLESS OTHERWISE AGREED

REPORT FORMAT

RESULTS BY e-mail: YES ☐ NO ☐

e-mail address:

OTHER FORMAT (specify):

ALCONTROL GEOCHEM USE ONLY

RECEIVED AT LAB (sign) .....

DATE AND TIME: .....

SAMPLE CONDITION: .....

.....

GEOTRACE

SAMPLING AND CHAIN OF CUSTODY RECORD

Client: CRP

Contact:

Address:

Tel: Fax:

Site/Project Ref:

ALcontrol Geochem

Chester Street, Chester CH4 8RD, England
tel: (01244) 671121 fax: (01244) 683306
website: www.geochem.com email: mkt@geochem.com

DATE daymonth/year	GEOCHEM REF.	SAMPLE REF. ID	DEPTH	Matrix Type: Water	Soil/Sediment	Other (Specify in Comments Column)	Type of Analysis: PCB	BTEX	VOC's	SVOC's	METALS					Sample Concentration (Low Medium or High (L.M.H))	Sample Preservation (specify)	Comments	Samplers Signature
					X			X			X							PCB + METALS	
					X		X												
					X		X												
					/													HOLD FOR 3 MONTHS	
					X			X										30-3 A. DEPTH	
					X		X												
					X			X		X	X								

RELINQUISHED (sign)

DATE AND TIME

COURIER:

GEOCHEM SC or JOB No.: (if known)

TURNAROUND	TICK
*< 5 DAY (specify)	
* 5 DAY	
* 6-10 DAYS (specify)	
10-12 days	

*SURCHARGE WILL APPLY UNLESS OTHERWISE AGREED

REPORT FORMAT	
RESULTS BY e-mail:	YES ☐ NO ☐
e-mail address:	
OTHER FORMAT (specify):	

ALCONTROL GEOCHEM USE ONLY
RECEIVED AT LAB (sign)
DATE AND TIME:
SAMPLE CONDITION:

GEOTRACE

SAMPLING AND CHAIN OF CUSTODY RECORD

ALcontrol Geochem

Chester Street, Chester CH4 8RD, England
tel: (01244) 671121 fax: (01244) 683306
website: www.geochem.com email: mkt@geochem.com

Client: [illegible]
Contact: [illegible]
Address: [illegible]
Tel: [illegible] Fax:
Site/Project Ref: [illegible]

DATE day/month/year	GEOCHEM REF	SAMPLE REF ID	DEPTH	Water	Soil/Sediment	Other (Specify in Comments Column)	PRO	DRO	BTEX	SVOC	METALS						Sample Concentration Low Medium or High (L,M,H)	Sample Preservation (specify)	Comments	Samplers Signature
[illegible]		[illegible] D1	1.4		X														HOLD 3 MONTHS	[signature]
[illegible]		[illegible] D2	1.4		X														HOLD 3 MONTHS	[signature]
[illegible]		[illegible]	[illegible]		X														HOLD 3 MONTHS	[signature]
[illegible]		[illegible]	2.4		X		X													[signature]
[illegible]		[illegible]	2.4		X				X											[signature]
[illegible]		[illegible]	[illegible]		X			X			X									[signature]
[illegible]		[illegible]	[illegible]		X		X													[signature]
[illegible]		[illegible]	[illegible]		X				X											[signature]
[illegible]		[illegible]	[illegible]		X			X		X	X								DEPTH 1.6 – 1.9m	[signature]
[illegible]		[illegible]	[illegible]		X			X		X	X								DEPTH 0.4 – 0.5m	[signature]
[illegible]		[illegible]	0.6		X		X													[signature]
[illegible]		[illegible]	0.6		X				X											[signature]

RELINQUISHED (sign) [signature]
DATE AND TIME ....
COURIER: ....
GEOCHEM SC or JOB No.: (if known) ....

TURNAROUND	TICK
* < 5 DAY (specify)	
* 5 DAY	
* 6-10 DAYS (specify)	
10-12 days	X

*SURCHARGE WILL APPLY UNLESS OTHERWISE AGREED

REPORT FORMAT

RESULTS BY e-mail: YES ☐ NO ☐
e-mail address:
OTHER FORMAT (specify):

ALCONTROL GEOCHEM USE ONLY

RECEIVED AT LAB (sign) ....
DATE AND TIME: ....
SAMPLE CONDITION: ....

GEOTRACE

SAMPLING AND CHAIN OF CUSTODY RECORD

ALcontrol Geochem

Chester Street, Chester CH4 8RD, England
tel: (01244) 671121 fax: (01244) 683306
website: www.geochem.com email: mkt@geochem.com

Client:
Contact:
Address:
Tel: Fax:
Site/Project Ref:

DATE day/month/year	GEOCHEM REF.	SAMPLE REF. ID	DEPTH	Matrix Type: Water	Soil/Sediment	Other (Specify in Comments Column)	Type of Analysis: 2EQ	DRO	BTEX	SVOC	METALS							Sample Concentration (Low Medium or High (L.M.H))	Sample Preservation (specify)	Comments	Samplers Signature
							X														
								X													
																				HOLD 2 MONTHS.	
							X														
								X													
								X													
																				HOLD 3 MONTHS	
																				HOLD 3 MONTHS	
							X														
							X														
								X													
							X														
							X														
							X														

RELINQUISHED (sign)
DATE AND TIME
COURIER
GEOCHEM SC or JOB No.: (if known)

TURNAROUND	TICK
*< 5 DAY (specify)	
* 5 DAY	
* 6-10 DAYS (specify)	
10-12 days	

*SURCHARGE WILL APPLY UNLESS OTHERWISE AGREED

REPORT FORMAT

RESULTS BY e-mail: YES ☐ NO ☐

e-mail address:

OTHER FORMAT (specify):

ALCONTROL GEOCHEM USE ONLY

RECEIVED AT LAB (sign) .....

DATE AND TIME: .....

SAMPLE CONDITION: .....

.....

GEOTRACE

SAMPLING AND CHAIN OF CUSTODY RECORD

Client:
Contact:
Address:
Tel: Fax:
Site/Project Ref:

ALcontrol Geochem

Chester Street, Chester CH4 8RD, England
tel: (01244) 671121 fax: (01244) 683306
website: www.geochem.com email: mkt@geochem.com

DATE day/month/year	GEOCHEM REF.	SAMPLE REF. ID	DEPTH	Matrix Type: Water	Soil/Sediment	Other (Specify in Comments Column)	Type of Analysis: B20	ACID	BTEX	SVOC	METALS	Sample Concentration Low Medium or High (L,M,H)	Sample Preservation (specify)	Comments	Samplers Signature
								X		X	X				
									X						
							X								
							X								
									X						
								X		X	X				
							X								
							X								
									X						
								X							
							X								
								X							

RELINQUISHED (sign)
DATE AND TIME
COURIER:
GEOCHEM SC or JOB No.: (if known)

TURNAROUND	TICK
*< 5 DAY (specify)	
* 5 DAY	
* 6-10 DAYS (specify)	
10-12 days	X

*SURCHARGE WILL APPLY UNLESS OTHERWISE AGREED

REPORT FORMAT

RESULTS BY e-mail: YES ☐ NO ☐

e-mail address:

OTHER FORMAT (specify):

ALCONTROL GEOCHEM USE ONLY

RECEIVED AT LAB (sign) .....

DATE AND TIME: .....

SAMPLE CONDITION: .....

GEOTRACE

SAMPLING AND CHAIN OF CUSTODY RECORD

Client:

Contact:

Address:

Tel: Fax:

Site/Project Ref:

ALcontrol Geochem

Chester Street, Chester CH4 8RD, England
tel: (01244) 671121 fax: (01244) 683306
website: www.geochem.com email: mkt@geochem.com

DATE day/month/year	GEOCHEM REF.	SAMPLE REF. ID	DEPTH	Matrix Type: Water	Soil/Sediment	Other (Specify in Comments Column)	Type of Analysis: PAH	VOC	BTEX	SVOC	METALS							Sample Concentration Low Medium or High (L,M,H)	Sample Preservation (specify)	Comments	Samplers Signature
																				HOLD 2 MONTHS	
																				HOLD 2 MONTHS	
																				HOLD 2 MONTHS	

RELINQUISHED (sign)

DATE AND TIME

COURIER

GEOCHEM SC or JOB No.: (if known)

TURNAROUND	TICK
*< 5 DAY (specify)	
* 5 DAY	
* 6-10 DAYS (specify)	
10-12 days	X
*SURCHARGE WILL APPLY UNLESS OTHERWISE AGREED	

REPORT FORMAT

RESULTS BY e-mail: YES ☐ NO ☐

e-mail address:

OTHER FORMAT (specify):

ALCONTROL GEOCHEM USE ONLY

RECEIVED AT LAB (sign)

DATE AND TIME:

SAMPLE CONDITION:

GEOTRACE

SAMPLING AND CHAIN OF CUSTODY RECORD

Client:
Contact:
Address:
Tel: Fax:
Site/Project Ref:

ALcontrol Geochem

Chester Street, Chester CH4 8RD, England
tel: (01244) 671121 fax: (01244) 683306
website: www.geochem.com email: mkt@geochem.com

DATE day/month/year	GEOCHEM REF.	SAMPLE REF. ID	DEPTH	Matrix Type: Water	Soil/Sediment	Other (Specify in Comments Column)	Type of Analysis: TPH	PAH	BTEX	VOC	METALS	Sample Concentration Low, Medium or High (L,M,H)	Sample Preservation (specify)	Comments	Samplers Signature
					X									HOLD 3 MONTHS	
					X			X			X				
					X		X		X						
					X			X			X				
					X									HOLD 3 MONTHS	
					X									HOLD 3 MONTHS	
					X									HOLD 3 MONTHS	
								X							
					X		X								
					X			X							
					X									HOLD 3 MONTHS	
					X		X			X	X				
					X		X								
					X			X							

RELINQUISHED (sign)
DATE AND TIME
COURIER
GEOCHEM SO or JOB No.: (if known)

TURNAROUND	TICK
*< 5 DAY (specify)	
* 5 DAY	
* 6-10 DAYS (specify)	
10-12 days	

*SURCHARGE WILL APPLY UNLESS OTHERWISE AGREED

REPORT FORMAT

RESULTS BY e-mail: YES ☐ NO ☐

e-mail address:

OTHER FORMAT (specify):

ALCONTROL GEOCHEM USE ONLY

RECEIVED AT LAB (sign) .....

DATE AND TIME: .....

SAMPLE CONDITION: .....

.....

GEOTRACE

SAMPLING AND CHAIN OF CUSTODY RECORD

ALcontrol Geochem

Chester Street, Chester CH4 8RD, England
tel: (01244) 671121 fax: (01244) 683306
website: www.geochem.com email: mkt@geochem.com

Client:
Contact:
Address:
Tel: Fax:
Site/Project Ref:

DATE day/month/year	GEOCHEM REF	SAMPLE REF ID	DEPTH	Matrix Type: Water	Soil/Sediment	Other (Specify in Comments Column)	Type of Analysis: ACID	DRO	RTEX	SVOC	METALS	Sample Concentration Low, Medium or High (L,M,H)	Sample Preservation (specify)	Comments	Samplers Signature
					X			X							
					X		X								
					X			X							
									X						
									X						
														HOLD 3 months	
														HOLD 3 months	
							X								
								X							
							X								
									X						
														HOLD 3 months	
														HOLD 3 months	
							X								

RELINQUISHED (sign)
DATE AND TIME
COURIER:
GEOCHEM SC or JOB No.: (If known)

TURNAROUND	TICK
*< 5 DAY (specify)	
* 5 DAY	
* 6-10 DAYS (specify)	
10-12 days	X

*SURCHARGE WILL APPLY UNLESS OTHERWISE AGREED

REPORT FORMAT

RESULTS BY e-mail: YES ☐ NO ☐
e-mail address:
OTHER FORMAT (specify):

ALCONTROL GEOCHEM USE ONLY

RECEIVED AT LAB (sign)
DATE AND TIME:
SAMPLE CONDITION:

GEOTRACE

SAMPLING AND CHAIN OF CUSTODY RECORD

Client: ARC

Contact:

Address:

Tel: Fax:

Site/Project Ref:

ALcontrol Geochem

Chester Street, Chester CH4 8RD, England
tel: (01244) 671121 fax: (01244) 683306
website: www.geochem.com email: mkt@geochem.com

DATE day/month/year	GEOCHEM REF.	SAMPLE REF. ID	DEPTH	Matrix Type: Water	Soil/Sediment	Other (Specify in Comments Column)	Type of Analysis	Sample Concentration (Low, Medium or High (L,M,H))	Sample Preservation (specify)	Comments	Samplers Signature
										SEE DUCT TO FOLLOW	

RELINQUISHED (sign):

DATE AND TIME:

COURIER:

GEOCHEM SO or JOB No.: (if known)

TURNAROUND	TICK
*< 5 DAY (specify)	
* 5 DAY	
* 6-10 DAYS (specify)	
10-12 days	X

*SURCHARGE WILL APPLY UNLESS OTHERWISE AGREED

REPORT FORMAT

RESULTS BY e-mail: YES ☐ NO ☒

e-mail address:

OTHER FORMAT (specify):

ALCONTROL GEOCHEM USE ONLY

RECEIVED AT LAB (sign):

DATE AND TIME:

SAMPLE CONDITION:

GEOTRACE

SAMPLING AND CHAIN OF CUSTODY RECORD

Client: ...

Contact: ...

Address: ...

Tel: ... Fax: ...

Site/Project Ref: ...

DATE day/month/year	GEOCHEM REF	SAMPLE REF. ID	DEPTH	Matrix Type: Water	Soil/Sediment	Other (Specify in Comments Column)	Type of Analysis	Sample Concentration Low Medium or High (L,M,H)	Sample Preservation (specify)	Comments	Samplers Signature

ALcontrol Geochem

Chester Street, Chester CH4 8RD, England
tel: (01244) 671121 fax: (01244) 683306
website: www.geochem.com email: mkt@geochem.com

RELINQUISHED (sign): ...

DATE AND TIME: ...

COURIER: ...

GEOCHEM SCH or JOB No: ... (if known)

TURNAROUND	TICK
*< 5 DAY (specify)	
* 5 DAY	
* 6-10 DAYS (specify)	
10-12 days	X

*SURCHARGE WILL APPLY UNLESS OTHERWISE AGREED

REPORT FORMAT

RESULTS BY e-mail: YES ☐ NO ☒

e-mail address:

OTHER FORMAT (specify):

ALCONTROL GEOCHEM USE ONLY

RECEIVED AT LAB (sign) ...

DATE AND TIME: ...

SAMPLE CONDITION: ...

GEOTRACE

SAMPLING AND CHAIN OF CUSTODY RECORD

ALcontrol Geochem

Chester Street, Chester CH4 8RD, England
tel: (01244) 671121 fax: (01244) 683306
website: www.geochem.com email: mkt@geochem.com

Client: ARR
Contact: [illegible]
Address: [illegible]
Tel: [illegible] Fax:
Site/Project Ref: [illegible]

DATE day/month/year	GEOCHEM REF.	SAMPLE REF. ID	DEPTH	Matrix Type: Water	Matrix Type: Soil/Sediment	Matrix Type: Other (Specify in Comments Column)	Type of Analysis										Sample Concentration Low Medium or High (L,M,H)	Sample Preservation (specify)	Comments	Samplers Signature
[illegible]		CC202 S1		X															SEQUENCE TO FOLLOW	[signature]
[illegible]		CC202 S2		X															↓	[signature]
[illegible]		CC202 S3		X																[signature]
[illegible]		CC202 S4		X																[signature]
[illegible]		CC203 S1		X																[signature]
[illegible]		CC203 S2		X																[signature]
[illegible]		CC203 S3		X																[signature]
[illegible]		CC203 S4		X																[signature]
[illegible]		CC204 S1		X																[signature]
[illegible]		CC204 S2		X																[signature]
[illegible]		CC204 S3		X																[signature]
[illegible]		CC204 S4		X																[signature]

RELINQUISHED (sign) [signature]
DATE AND TIME [illegible]
COURIER: [illegible]
GEOCHEM SC or JOB No.: (if known) [illegible]

TURNAROUND	TICK
* < 5 DAY (specify)	
* 5 DAY	
* 6-10 DAYS (specify)	
10-12 days	X

*SURCHARGE WILL APPLY UNLESS OTHERWISE AGREED

REPORT FORMAT

RESULTS BY e-mail: YES ☐ NO ☒
e-mail address:
OTHER FORMAT (specify):

ALCONTROL GEOCHEM USE ONLY

RECEIVED AT LAB (sign) ....
DATE AND TIME: ....
SAMPLE CONDITION: ....

GEOTRACE

SAMPLING AND CHAIN OF CUSTODY RECORD

Client: ...

Contact: ...

Address: ...

...

Tel: ... Fax: ...

Site/Project Ref: ...

DATE day/month/year	GEOCHEM REF.	SAMPLE REF. ID	DEPTH	Matrix Type: Water	Soil/Sediment	Other (Specify in Comments Column)	Type of Analysis	Sample Concentration (Low Medium or High (L,M,H))	Sample Preservation (specify)
				X					
				X					
				X					
				X					
				X					
				X					
				X					
				X					
				X					
				X					
				X					
				X					
				X					
				X					
				X					
				X					

ALcontrol Geochem

Chester Street, Chester CH4 8RD, England
tel: (01244) 671121 fax: (01244) 683306
website: www.geochem.com email: mkt@geochem.com

Comments	Samplers Signature
Schedule to Follow	

RELINQUISHED (sign) ...

DATE AND TIME ...

COURIER: ...

GEOCHEM SC or JOB No.: ... (if known)

...

TURNAROUND	TICK
*< 5 DAY (specify)	
* 5 DAY	
* 6-10 DAYS (specify)	
10-12 days	X

*SURCHARGE WILL APPLY UNLESS OTHERWISE AGREED

REPORT FORMAT

RESULTS BY e-mail: YES ☐ NO ☒

e-mail address:

OTHER FORMAT (specify):

ALCONTROL GEOCHEM USE ONLY

RECEIVED AT LAB (sign) ...

DATE AND TIME: ...

SAMPLE CONDITION: ...

...

LABORATORY PERFORMANCE DATA

The following section presents precision and bias data for the test methods used in the investigation. Precision and Bias parameters are within accepted UKAS and MCerts (where proposed) limits.

BIAS – is the difference between the analytical result and the actual concentration expressed as a percentage (the actual concentration is assessed using a standard of known concentration). The bias is usually less than 10% depending on the method – see following data.

PRECISION – the reproducibility of an analytical result by a method, the standard deviation expressed as a percentage of the known concentration, usually less than 15% depending on the method – see following data.

Parameter	TPH by GC-FID (DRO)
Abstract of method	UKAS accredited Prior to this method, appropriate sample solvent extraction techniques must be used, eg microwave extraction, accelerated solvent extraction (ASE) or soxhlet extraction for soil/oil based cutting samples . A known volume of the sample extract is injected into a Gas Chromatograph (GC) and is analysed by temperature programmed capillary chromatography and flame ionisation detection (FID). Quantification is carried out by means of the Internal Standard technique using Heptamethylnonane at a known concentration. 1-Chlorooctadecane and Squalane are incorporated as surrogate standards. Total Petroleum Hydrocarbons (TPH) is the sum of all components detected within the carbon number range C10 – C40.
Soil : Extractant ratio	Dried & crushed 5-10g : 30ml-40ml HEXANE
Extraction Time & Temp	Accelerated solvent extraction (ASE) or soxhlet extraction ASE 15mins @ 200psi ,120°C Soxhlet 6 hours
Matrix	Soil
Certified Reference Material	Suitable CRM unavailable at present
Performance	See Performance data
Limit of detection	Reporting detection limits are stated below (method detection levels are all lower than reporting detection limit) 10 mg/kg
Standard deviation	See Performance data
Bias	See Performance data
Degrees of freedom	See Performance data
Details of validation procedure	Internal Method Validation Procedure GLS 036 Version 3.0 - Uncontrolled document enclosed References include: AWWA 19th Edition, EA Validation of methods for the Analysis of contaminated soils (draft) 1998
Details of routine AQC	AQC analysed every 10 samples

Parameter	TPH by GC-FID (DRO)
Abstract of method	UKAS accredited Prior to this method, appropriate sample solvent extraction techniques must be used, eg solid phase extraction (SPE) or liquid/liquid extraction for water/leachate samples. A known volume of the sample extract is injected into a Gas Chromatograph (GC) and is analysed by temperature programmed capillary chromatography and flame ionisation detection (FID). Quantification is carried out by means of the Internal Standard technique using Heptamethylnonane at a known concentration. 1-Chlorooctadecane and Squalane are incorporated as surrogate standards. Total Petroleum Hydrocarbons (TPH) is the sum of all components detected within the carbon number range C10 – C40.
Soil : Extractant ratio	300 500mls extracted through a solid phase extraction cartrige followed by elution with DCM or liquid/liquid extraction using DCM
Extraction Time & Temp	
Matrix	Water
Certified Reference Material	Suitable CRM unavailable at present
Performance	See Performance data
Limit of detection	Reporting detection limits are stated below (method detection levels are all lower than reporting detection limit) 10 ug/l
Standard deviation	See Performance data
Bias	See Performance data
Degrees of freedom	See Performance data
Details of validation procedure	Internal Method Validation Procedure GLS 036 Version 3.0 - Uncontrolled document enclosed References include: AWWA 19th Edition, EA Validation of methods for the Analysis of contaminated soils (draft) 1998
Details of routine AQC	AQC analysed every 10 samples

DRO by GC-FID in Soil Summary

	DRO
	mg/l
UCL (MEAN + 3 X SD)	758
UWL (MEAN +2 X SD)	706
AQC ACTUAL CONC.	600
LWL (MEAN -2 X SD)	494
LCL (MEAN - 3 X SD)	442

DAY	
1	603
2	631
3	636
4	590
5	618
6	594
7	562
8	521
9	599
10	538
11	523
12	572
13	603
14	556
15	572
16	670
17	505
18	480
19	472
20	544

MEAN mg/l	569	
STANDARD DEVIATION mg/l	53	
RSD %	9.3	
BIAS mg/l	30.6	
n	20	MCERTS
Precision %	8.8	Recommended %
Bias %	5.1	15
		30

Parameter	GRO (PRO) including BTEX by HS GC-FID UKAS accredited
Abstract of method	This method describes a procedure for the determination of the conentration of GasolineRange Organic Hydrocarbons (GRO), in the carbon number range C4 to C12, including BTEX components namely Benzene, Toluene, Ethyl Benzene and Xylene isomers (o-, m- and p- isomers), and MTBE (t-Butyl methyl ether) in samples of water, soil and other materials. A portion of sample and a known volume of internal standard are sealed in a septum sealed glass vial. The glass vial is subjected to agitation and heat for 10 minutes, in order to release the volatile components from the sample into the headspace. After this time, a known volume of headspace is sampled , by the autosampler using a gas-tight syringe and injected into a Gas Chromatograph (GC) and analysed by temperature and pressure programmed capillary chromatography and flame ionisation detection (FID). Quantification of the components is carried out by means of the internal standard technique. The relative response of the detector to the various components is taken into consideration in the calculations, together with any dilution factor which may be required.
Soil : Extractant ratio Extraction Time & Temp	Wet as received soil preferably sent in a volatile vial
Matrix	Soil
Certified Reference Material	Suitable CRM unavailable at present
Performance	See Performance data
Limit of detection	Reporting detection limits are stated below (method detection levels are all lower than reporting detection limit) 10 mg/kg
Standard deviation	See Performance data
Bias	See Performance data
Degrees of freedom	See Performance data
Details of validation procedure	Internal Method Validation Procedure GLS 036 Version 3.0 - Uncontrolled document enclosed References include: AWWA 19th Edition, EA Validation of methods for the Analysis of contaminated soils (draft) 1998
Details of routine AQC	AQC analysed every 10 samples

PRO INCLUDING BTEX BY GC-FID

SOILS

	BENZENE	TOLUENE	ETHYL BENZENE	M/P XYLENE	O XYLENE
	mg/l	mg/l	mg/l	mg/l	mg/l
UCL (MEAN + 3 X SD)	9.9	10.2	10.6	21.0	10.2
UWL (MEAN +2 X SD)	9.3	9.5	9.7	19.4	9.5
AQC ACTUAL CONC.	8.0	8.0	8.0	16.0	8.0
LWL (MEAN -2 X SD)	6.7	6.5	6.3	12.6	6.5
LCL (MEAN - 3 X SD)	6.1	5.8	5.4	11.0	5.8

	BENZENE	TOLUENE	ETHYL BENZENE	M/P XYLENE	O XYLENE
1	7.6	7.3	7.0	14.1	7.1
2	9.0	8.9	9.0	18.1	8.7
3	9.0	8.9	8.9	17.9	8.8
4	9.0	8.9	9.2	18.3	8.9
5	8.8	8.8	9.1	18.3	8.9
6	8.7	8.6	8.8	17.5	8.5
7	8.6	8.5	8.7	17.3	8.4
8	7.9	7.6	7.6	15.3	7.6
9	7.1	6.8	6.7	13.6	6.8
10	8.4	8.2	8.4	16.8	8.1
11	8.7	8.3	8.3	16.6	8.2
MEAN mg/l	8.4	8.3	8.3	16.7	8.2
STANDARD DEVIATION mg/l	0.63	0.73	0.86	1.68	0.73
RSD %	7.4	8.8	10.4	10.1	8.9
BIAS mg/l	-0.4	-0.3	-0.3	-0.7	-0.2
n	11	11	11	11	11
Precision %	7.9	9.1	10.8	10.5	9.1
Bias %	-5.4	-3.2	-4.2	-4.5	-2.4

PRO INCLUDING BTEX BY GC-FID

WATERS	BENZENE	TOLUENE	ETHYL BENZENE	M/P XYLENE	O XYLENE
	mg/l	mg/l	mg/l	mg/l	mg/l
UCL (MEAN + 3 X SD)	10.0	10.2	10.8	21.4	10.1
UWL (MEAN +2 X SD)	9.4	9.5	9.9	19.6	9.4
AQC ACTUAL CONC.	8.0	8.0	8.0	16.0	8.0
LWL (MEAN -2 X SD)	6.6	6.5	6.1	12.4	6.6
LCL (MEAN - 3 X SD)	6.0	5.8	5.2	10.6	5.9

	BENZENE	TOLUENE	ETHYL BENZENE	M/P XYLENE	O XYLENE
1	7.5	7.5	7.7	15.3	7.6
2	8.7	8.8	9.2	18.2	8.7
3	8.7	9.0	9.8	19.3	9.1
4	7.5	7.4	7.4	14.8	7.4
5	6.3	6.3	6.3	12.6	6.5
6	7.8	7.9	8.3	16.4	8.1
7	7.4	7.2	7.2	14.4	7.3
8	8.0	7.8	7.9	15.7	7.9
9	8.0	7.9	8.1	16.1	7.9
10	8.1	8.1	8.4	16.6	8.0
11	8.4	8.2	8.3	16.5	8.3
MEAN mg/l	7.8	7.8	8.0	16.0	7.9
STANDARD DEVIATION mg/l	0.68	0.73	0.93	1.80	0.69
RSD %	8.6	9.3	11.6	11.3	8.7
BIAS mg/l	0.15	0.17	-0.05	0.02	0.09
n	11	11	11	11	11
Precision %	8.5	9.1	11.7	11.3	8.6
Bias %	1.9	2.1	-0.6	0.1	1.1

Parameter	Semi Volatile Organic Compounds
Abstract of method	UKAS accredited Prior to application of this method, appropriate sample solvent extraction techniques must be used . A known volume of the sample extract is injected into a Gas Chromatograph (GC) and is analysed by temperature programmed capillary chromatography, using a suitable capillary column, and Mass Selective Detection (MSD). Identification is performed using Scan Mode and quantification of the components is carried out by means of the Internal Standard technique, using 6 deuterated Internal Standards, Biphenyl-d10 is, also, available as a surrogate standard when required (see Table 1 for details). The relative response of the detector to the various components is taken into consideration in the calculations together with any dilution factors required. In the case of uncalibrated compounds being identified within the sample, a response factor of 1 will be assumed relative to the nearest Internal Standard.
Soil : Extractant ratio	Wet as recieved 5-10g : 40ml-100ml DCM
Extraction Time & Temp	Soxhlet 3-6 hours
Matrix	Soil
Certified Reference Material	Suitable CRM unavailable at present
Performance	See Performance data
Limit of detection	Reporting detection limits are stated below (method detection levels are all lower than reporting detection limit) 100ug/kg
Standard deviation	See Performance data
Bias	See Performance data
Degrees of freedom	See Performance data
Details of validation procedure	Internal Method Validation Procedure GLS 036 Version 3.0 - Uncontrolled document enclosed References include: AWWA 19th Edition, EA Validation of methods for the Analysis of contaminated soils (draft) 1998
Details of routine AQC	AQC analysed every 10 samples

Parameter	
Abstract of method	**Semi Volatile Organic Compounds** **UKAS accredited** Prior to application of this method, appropriate sample solvent extraction techniques must be used . A known volume of the sample extract is injected into a Gas Chromatograph (GC) and is analysed by temperature programmed capillary chromatography, u Identification is performed using Scan Mode and quantification of the components is carried out by means of the Internal Standard technique, using 6 deuterated Internal Standards, Biphenyl-d10 is, also, available as a surrogate standard when required
Volume extracted Extraction Time & Temp	300-1000mls extracted through a solid phase extraction cartrige followed by elution with DCM: Ethyl acetate (1:1) or liquid/liquid extraction using DCM
Matrix	Water
Certified Reference Material	Suitable CRM unavailable at present
Performance	See Performance data
Limit of detection	Reporting detection limits are stated below (method detection levels are all lower than reporting detection limit) 0.01 ug/l
Standard deviation	See Performance data
Bias	See Performance data
Degrees of freedom	See Performance data
Details of validation procedure	Internal Method Validation Procedure GLS 036 Version 3.0 - Uncontrolled document enclosed References include: AWWA 19th Edition, EA Validation of methods for the Analysis of contaminated soils (draft) 1998
Details of routine AQC	AQC analysed every 10 samples

SVOC BY GCMS in Soil & Water Summary

	Phenol	Nitrobenzene	Naphthalene	Benzo(a)anthracene	Dimethyl phthalate	Bis(2-ethylhexyl)phthalate	Bis(2-chloroethoxy)methane
	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
UCL (MEAN + 3 X SD)	6819	7501	6008	6147	6872	6832	6786
UWL (MEAN +2 X SD)	6213	6667	5672	5765	6248	6222	6191
AQC ACTUAL CONC.	5000	5000	5000	5000	5000	5000	5000
LWL (MEAN -2 X SD)	3787	3333	4328	4235	3752	3778	3809
LCL (MEAN - 3 X SD)	3181	2499	3992	3853	3128	3168	3214
DAY							
1	5195	5005	4755	4065	4525	4959	4869
2	4968	5463	5033	4605	5422	4401	6350
3	4432	3373	4917	4706	6528	4179	5216
4	4996	6435	5062	5169	5121	4688	5122
5	5133	5403	5134	4832	4965	4185	5385
6	5612	4758	5077	4927	5230	4874	6127
7	4900	4900	5099	4970	5309	6270	5627
8	5193	5438	5237	4945	5207	4559	5853
9	5231	5454	5205	5004	5473	5327	5658
10	5579	5728	5239	5026	5007	4965	5692
11	3420	4021	4067	4022	3993	4309	4234
MEAN mg/l	4969	5089	4984	4752	5162	4792	5467
STANDARD DEVIATION mg/l	606	834	336	382	624	611	595
RSD %	12.2	16.4	6.7	8.0	12.1	12.7	10.9
BIAS mg/l	-31.00	88.91	-15.91	-248.09	161.82	-207.64	466.64
n	10	10	10	10	10	10	11
Precision %	12.1	16.7	6.7	7.6	12.5	12.2	11.9
Bias %	0.6	1.8	0.3	5.0	3.2	4.2	9.3

Parameter	Headspace Volatiles by GCMS UKAS accredited
Abstract of method	The vials, containing the samples, are first heated to 80°C and shaken for 15 minutes using a Hewlett Packard HP7694 Headspace Sampler, during this time any volatile organic compounds present are partitioned into the headspace in the vial. After this t
Soil : Extractant ratio	Samples received wet in a volatile vial
Extraction Time & Temp	Heated at 80°C and shaken for 15 minutes on GC autosampler
Matrix	Soil
Certified Reference Material	Suitable CRM unavailable at present
Performance	See Performance data
Limit of detection	Reporting detection limits are stated below (method detection levels are all lower than reporting detection limit) 1 ug/kg
Standard deviation	See Performance data
Bias	See Performance data
Degrees of freedom	See Performance data
Details of validation procedure	Internal Method Validation Procedure GLS 036 Version 3.0 - Uncontrolled document enclosed References include: AWWA 19th Edition, EA Validation of methods for the Analysis of contaminated soils (draft) 1998
Details of routine AQC	AQC analysed every 10 samples

Parameter	**Headspace Volatiles by GCMS**
Abstract of method	**UKAS accredited** The vials, containing the samples, are first heated to 80°C and shaken for 15 minutes using a Hewlett Packard HP7694 Headspace Sampler, during this time any volatile organic compounds present are partitioned into the headspace in the vial. After this t
Extraction Time & Temp	Heated at 80°C and shaken for 15 minutes on GC autosampler
Matrix Certified Reference Material	Suitable CRM unavailable at present
Performance	See Performance data
Limit of detection	Reporting detection limits are stated below (method detection levels are all lower than reporting detection limit) 1 ug/l
Standard deviation	See Performance data
Bias	See Performance data
Degrees of freedom	See Performance data
Details of validation procedure	Internal Method Validation Procedure GLS 036 Version 3.0 - Uncontrolled document enclosed References include: AWWA 19th Edition, EA Validation of methods for the Analysis of contaminated soils (draft) 1998
Details of routine AQC	AQC analysed every 10 samples

C BY HS-GCMS in Soil & Water S ıary

	Trichlorofluoromethane	Chloroform	Toluene	Tetrachloroethene	Isopropylbenzene	1,2-Dichlorobenzene	Hexachlorobutadiene
	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
UCL	625	625	625	625	625	625	625
AQC ACTUAL CONC.	500	500	500	500	500	500	500
LCL	375	375	375	375	375	375	375
DAY							
1	581	562	565	609	560	492	558
2	442	469	478	475	492	506	480
3	600	611	617	594	572	549	575
4	528	560	518	555	526	492	523
5	529	493	516	485	540	545	534
6	460	508	487	487	485	488	467
7	522	509	535	518	498	494	511
8	497	493	514	462	494	467	450
9	507	506	518	498	519	461	480
10	545	541	524	483	524	524	497
11	483	481	497	475	499	466	494
12	509	486	572	522	528	491	470
13	543	500	584	591	542	547	506
14	507	529	512	443	498	499	449
15	464	514	450	506	532	513	506
16	477	558	524	504	531	505	524
17	558	480	575	523	534	467	511
18	595	611	594	568	556	577	599
19	538	498	515	541	521	494	499
20	485	476	481	485	485	475	461
21	466	466	507	484	523	488	445
22	409	439	534	505	524	494	459
23	506	525	573	458	496	535	445
24	506	515	485	485	541	526	488
25	536	498	514	493	531	557	545
26	465	466	497	511	495	488	481
27	509	513	515	488	492	503	496
28	499	540	517	503	502	494	492
MEAN mg/l	509	512	526	509	519	505	498
STANDARD DEVIATION mg/l	45	41	39	42	24	30	39
RSD %	8.7	8.0	7.4	8.2	4.6	5.9	7.8
BIAS mg/l	9.4	12.4	25.7	8.9	19.3	4.9	-2.0
n	28	28	28	28	28	28	28
Precision %	8.9	8.2	7.8	8.3	4.8	6.0	7.8
Bias %	1.9	2.5	5.1	1.8	3.9	1.0	0.4

Parameter	METALS by ICP-OES
Abstract of method	**UKAS accredited method** A known aliquot of dried soil is digested in aqua regia to produce an aqueous solution for the analysis of trace metals. After filtering and diluting the acid solution to a known volume it is submitted for ICP-OES analysis. As, Cd, Cr, Cu, Hg*, Ni, Pb, Se*, V, Zn *Screening analysis only
Soil : Extractant ratio	Dried & Crushed soil **5g : 30ml** Hydrochloric acid & 10ml Nitric acid
Extraction Time & Temp	Reflux 2 hours
Matrix	Soil
Certified Reference Material	LGC 6138
Performance	See Performance data
Limit of detection	Reporting detection limits are stated below (method detection levels are all lower than reporting detection limit) 1 mg/kg IN SOIL FOR ALL METALS EXCEPT As, Se & Cd = 0.5mg/kg, Hg = 0.3 mg/kg
Standard deviation	See Performance data
Bias	See Performance data
Degrees of freedom	See Performance data
Details of validation procedure	Internal Method Validation Procedure GLS 036 Version 3.0 - Uncontrolled document enclosed References include: AWWA 19th Edition, EA Validation of methods for the Analysis of contaminated soils (draft) 1998
Details of routine AQC	AQC analysed every 10 samples Soil QC extracted & analysed daily

AQC Data from Standard Solutions for Metals by ICP-OES

	ARSENIC	CADMIUM	CHROMIUM	COPPER	NICKEL	MERCURY	LEAD	SELENIUM	VANADIUM	ZINC
	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
UCL (MEAN + 3 X SD)	59.8	69.9	10.8	39.8	32.7	2.11	53.3	42.4	8.0	26.6
UWL (MEAN +2 X SD)	58.2	68.2	10.6	38.2	31.8	2.07	52.2	41.6	7.8	26.0
AQC ACTUAL CONC.	55	65	10	35	30	2.00	50	40	7.5	25
LWL (MEAN -2 X SD)	51.8	61.8	9.4	31.8	28.2	1.93	47.8	38.4	7.2	24.0
LCL (MEAN - 3 X SD)	50.2	60.1	9.2	30.2	27.3	1.89	46.7	37.6	7.0	23.4
DAY										
1	57.9	63.6	8.9	31.5	28.7	1.91	51.6	40.6	7.7	24.3
2	58.9	65.4	9.4	35.3	30.3	1.79	47.7	37.9	7.3	24.6
3	58.7	65.4	9.4	34.1	30.2	1.89	51.1	40.2	7.7	24.6
4	57.1	64.2	9.2	33.6	29.7	1.90	50.7	40.4	7.6	24.2
5	56.9	64.7	9.2	33.6	29.7	1.88	50.7	39.9	7.8	24.4
6	57.9	64.0	9.2	33.7	29.6	1.83	49.2	38.8	7.6	24.0
7	57.4	62.2	8.7	30.3	28.0	1.87	49.8	39.7	7.7	23.8
8	57.9	60.3	8.6	30.3	27.6	1.89	50.1	39.9	7.5	23.1
9	55.5	64.7	9.3	34.0	29.9	1.88	50.1	39.5	7.5	24.4
10	56.1	62.7	9.0	33.0	28.8	1.88	50.8	39.8	7.5	23.5
11	53.3	61.7	8.9	32.6	28.7	1.85	49.2	38.8	7.3	23.3
MEAN mg/l	57.1	63.5	9.1	32.9	29.2	1.87	50.1	39.6	7.6	24.0
STANDARD DEVIATION mg/l	1.60	1.62	0.278	1.59	0.887	0.037	1.10	0.808	0.172	0.524
RSD %	2.8	2.5	3.1	4.8	3.0	2.0	2.2	2.0	2.3	2.2
BIAS mg/l	2.06	-1.48	-0.92	-2.09	-0.81	-0.13	0.07	-0.41	0.07	-0.98
n	11	11	11	11	11	11	11	11	11	11
Precision %	2.9	2.5	2.8	4.5	3.0	1.8	2.2	2.0	2.3	2.1
Bias %	3.7	2.3	9.2	6.0	2.7	6.6	0.1	1.0	1.0	3.9

n = Number of measurements

CRM LGC 6138 Data for Metals by ICP-OES

	ARSENIC	CHROMIUM	*COPPER	LEAD	ZINC	SELENIUM
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
UCL (MEAN + 3 X SD)	38.6	125.5	151.9	562.0	593.9	3.6
UWL (MEAN +2 X SD)	37.3	116.8	145.2	538.0	547.9	2.9
CERTIFIED ASSESSED VALUE mg/kg	34.5	99.3	132	490	456	1.5
LWL (MEAN -2 X SD)	31.7	81.8	118.8	442.0	364.1	0.1
LCL (MEAN - 3 X SD)	30.4	73.1	112.1	418.0	318.1	-0.6
CRM Uncertainty	2.7	14	34	20	25	0.2
DAY						
1	38.9	98	88	447	395	0.9
2	38.7	97	84	461	397	1.9
3	36.4	98	84	468	393	1.4
4	36.3	94	78	481	392	1.7
5	37.9	78	75	482	372	2.9
6	36.1	77	78	446	407	2.1
7	35.6	96	79	531	504	2.9
8	35.3	83	91	469	391	3.0
9	36.4	78	82	450	379	2.0
10	35.4	82	73	475	495	1.8
11	34.9	88	94	482	451	1.4
MEAN mg/kg	36.5	88.1	82.4	472.0	416.0	2.0
STANDARD DEVIATION mg/kg	1.38	8.73	6.62	24.00	45.97	0.69
RSD %	3.8	9.9	8.0	5.1	11.0	34.3
BIAS mg/kg	2.0	-11.2	-49.6	-18.0	-40.0	0.5
n	11	11	11	11	11	11
Precision %	4.0	8.8	5.0	4.9	10.1	45.7
Bias %	5.9	11.3	37.6	3.7	8.8	33.3

*Spent oxides sample , have known negative bias effects.

Parameter	WATER SOLUBLE BORON
Abstract of method	**UKAS accredited method** (method submitted pending accreditation in March 2001) BG Method A portion of dried soil sample is mixed with water and heated. Any water soluble boron present in the soil, leaches into the water and is analysed by ICP-OES.
Soil : Extractant ratio Extraction Time & Temp	Dried & Crushed soil **10g :100ml** Deionised water Boil ~ 5mins
Matrix	Soil
Certified Reference Material	TGC 6177 Landfill Leachate
Performance	See Performance data
Limit of detection	Reporting detection limits are stated below (method detection levels are all lower than reporting detection limit) 1 mg/kg
Standard deviation	See Performance data
Bias	See Performance data
Degrees of freedom	See Performance data
Details of validation procedure	Internal Method Validation Procedure GLS 036 Version 3.0 - Uncontrolled document enclosed References include: AWWA 19th Edition, EA Validation of methods for the Analysis of contaminated soils (draft) 1998
Details of routine AQC	AQC analysed every 10 samples Soil QC extracted & analysed daily

AQC Data from Standard Solutions for Water Soluble Boron by ICP-OES

WATER SOLUBLE BORON	mg/l
UCL (MEAN + 3 X SD)	22.4
UWL (MEAN +2 X SD)	21.6
AQC ACTUAL CONC.	20.0
LWL (MEAN -2 X SD)	18.4
LCL (MEAN - 3 X SD)	17.6

DAY	
1	18.8
2	19.7
3	20.1
4	19.4
5	19.1
6	21.0
7	20.2
8	19.4
9	18.2
10	18.5
11	20.0

MEAN mg/l	19.5
STANDARD DEVIATION mg/l	0.81
RSD %	4.2
BIAS mg/l	-0.52
n	11
Precision %	4.1
Bias %	2.6

CRM LGC 6177- Landfill Leachate Data for Water Soluble Boron by ICP-OES

WATER SOLUBLE BORON	mg/l
UCL (MEAN + 3 X SD)	2.16
UWL (MEAN +2 X SD)	2.09
CERTIFIED ASSESSED VALUE mg/l	1.96
LWL (MEAN -2 X SD)	1.83
LCL (MEAN - 3 X SD)	1.76
CRM Uncertainty	0.1

DAY	
1	1.90
2	2.02
3	2.05
4	2.04
5	1.99
6	2.08
7	2.08
8	2.04
9	2.08
10	1.90
11	2.03

MEAN mg/l	2.02
STANDARD DEVIATION mg/l	0.065
RSD %	3.2
BIAS mg/l	0.06
n	11
Precision %	3.3
Bias %	3.0

APPENDIX D

CONCENTRATION OF CONTAMINANTS DETECTED IN SOIL AND GROUNDWATER SAMPLES

TABLE D1: VOLATILE ORGANIC COMPOUNDS - SOIL Units = mg/kg

OLEFINS 6

SAMPLE REF	DEPTH	SOIL TYPE	ALL TARGETED COMPOUNDS
OL109	0.4m	Made Ground	<0.001

WILTON ETHYLENE CONTROL

			TARGETED COMPOUNDS				TENTATIVELY IDENTIFIED COMPOUNDS
SAMPLE REF	DEPTH	SOIL TYPE	Ethylbenzene	p/m-Xylene	o-Xylene	1,3,5-Trimethylbenzene	Carbon Disulphide
WEC104	4.5 - 4.8m	Sandy Clay	0.003	0.036	0.012	0.003	0.002
WEC203	4.5 - 5.0m	Sandy Clay	<0.001	0.006	<0.001	<0.001	-

CENTRAL CONTROL

			TARGETED COMPOUNDS										TENTATIVELY IDENTIFIED COMPOUNDS	
SAMPLE REF	DEPTH	SOIL TYPE	Benzene	Toluene	Ethyl-benzene	p/m Xylene	Styrene	o Xylene	1,2,4 Trimethylbenzene	1,3,5 Trimethylbenzene	n-Butylbenzene	Napthalene	C4-C5 Hydrocarbon Fraction	C9-C12 Aromatic isomers
CC201	2.3 - 2.7m	Boulder Clay	0.155	1.44	5.95	51.9	0.046	14.4	0.428	2.02	0.015	0.229	0.825	17.4

<0.001 Below Limit of Detection
- Not detected by TIC Screen
For VOCs target compound is only listed if detected in one or more sample (for full list see table E3)

TABLE D2: VOLATILE ORGANIC COMPOUNDS - WATERS

Units = mg/l

OLEFINS 6

SAMPLE REF	TARGETED COMPOUNDS								TENTATIVELY IDENTIFIED COMPOUNDS	
	Benzene	Toluene	Ethylbenzene	p/m Xylene	o Xylene	1,2,4 Trimethylbenzene	1,3,5 Trimethylbenzene	Naphthalene	C9-C12 Aromatic Isomers	C4-C7Hydrocarbon Fraction
OL104	<0.001	<0.001	<0.001	<0.001	0.025	<0.001	<0.001	<0.001	0.230	0.135
OL107	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-
OL114	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-
OL201	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-
OL207	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-
OL215	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-
OL217	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-

WILTON ETHYLENE CONTROL

SAMPLE REF	TARGETED COMPOUNDS								TENTATIVELY IDENTIFIED COMPOUNDS	
	Benzene	Toluene	Ethylbenzene	p/m Xylene	o Xylene	1,2,4 Trimethylbenzene	1,3,5 Trimethylbenzene	Naphthalene	C12-C13 Hydrocarbon Fraction	Chlorodifluromethane
WEC105B	<0.001	<0.001	<0.001	<0.001	0.006	<0.001	<0.001	<0.001	2.98	0.080

CENTRAL CONTROL

SAMPLE REF	TARGETED COMPOUNDS								TENTATIVELY IDENTIFIED COMPOUNDS	
	Benzene	Toluene	Ethylbenzene	p/m Xylene	o Xylene	1,2,4 Trimethylbenzene	1,3,5 Trimethylbenzene	Naphthalene	C9-C13 Hydrocarbon Fraction	Endo-Bicyclopentadiene
CC109	0.092	0.031	0.054	2.35	0.752	0.448	7.10	0.229	64.1	-
CC202	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-
CC203	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	17.4	-
CC204	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	0.025

<0.001 Below Limit of Detection

\- Not detected by TIC Screen

For VOCs target compound is only listed if detected in one or more sample (for full list see table E3)

TABLE D3: VOLATILE ORGANIC COMPOUNDS - TARGET COMPOUNDS

CAS NUMBER	COMPOUND
75-71-8	Dichlorofluoromethane
74-87-3	Chloromethane
75-01-4	Vinyl Chloride
74-83-9	Bromomethane
75-00-3	Chloroethane
75-69-4	Trichlorofluoromethane
156-60-5	trans-1,2-Dichloroethene
75-09-2	Dichloromethane
75-15-0	Carbon disulphide
75-35-4	1,1-Dichloroethene
75-34-3	1,1-Dichloroethane
1634-04-4	tert-butyl methyl ether
156-59-2	cis-1,2-Dichloroethene
74-97-5	Bromochloromethane
67-66-3	Chloroform
594-20-7	2,2-Dichloropropane
107-06-2	1,2-Dichloroethane
71-55-6	1,1,1-Trichloroethane
563-58-6	1,1 - Dichloropropene
71-43-2	Benzene
56-23-5	Carbontetrachloride
74-95-3	Dibromomethane
78-87-5	1,2-Dichloropropane
75-27-4	Bromodichloromethane
79-01-6	Trichloroethene
10061-01-5	cis-1,3-Dichloropropene
10061-02-6	trans-1,3-Dichloropropene
79-00-5	1,1,2-Trichloroethane
108-88-3	Toluene
142-28-9	1,3-Dichloropropane
124-48-1	Dibromochloromethane

CAS NUMBER	COMPOUND
106-93-4	1,2-Dibromoethane
127-18-4	Tetrachloroethene
630-20-6	1,1,1,2-Tetrachloroethane
108-90-7	Chlorobenzene
100-41-4	Ethylbenzene
108-38-3*	p/m-Xylene
75-25-2	Bromoform
100-42-5	Styrene
79-34-5	1,1,2,2-Tetrachloroethane
95-47-6	o-Xylene
96-18-4	1,2,3-Trichloropropane
98-82-8	Isopropylbenzene
108-86-1	Bromobenzene
95-49-8	2-Chlorotoluene
103-65-1	Propylbenzene
106-42-4	4-Chlorotoluene
95-63-6	1,2,4-Trimetylbenzene
99-87-6	4-Isopropyltoluene
108-67-8	1,3,5-Trimetylbenzene
541-73-1	1,3-Dichlorobenzene
106-46-7	1,4-Dichlorobenzene
135-98-8	sec-Butylbenzene
98-06-6	tert-Butylbenzene
95-50-1	1,2-Dichlorobenzene
104-51-8	n-Butylbenzene
96-12-8	1,2-Dibromo-3-chloropropane
120-82-1	1,2,4-Trichlorobenzene
91-20-3	Naphthalene
87-61-6	1,2,3-Trichlorobenzene
87-68-3	Hexachlorobutadiene

N.B. * Also CAS No. 106-42-3

TABLE D4: SEMIVOLATILE ORGANIC COMPOUNDS - SOILS

OLEFINS 6

Units = mg/kg

			TARGETED COMPOUNDS						TENTATIVELY IDENTIFIED COMPOUNDS (TICs)					
SAMPLE REF	DEPTH	SOIL TYPE	Naphthalene	Phenanthrene	Fluoranthene	Pyrene	Di-n-butylphthalate	Bis(2ethylhexyl)-phthalate	C9-C12 Aromatic Hydrocarbons	C11-C28 Hydrocarbons 10% Aromatic 90% Aliphatic	C14-C28 Hydrocarbons 10% Aromatic 90% Aliphatic	C14-C28 Hydrocarbons 100% Aliphatic	C13-C27 Hydrocarbons 10% Aromatic 90% Aliphatic	C16-C24 Hydrocarbons
OL105	0.3 - 0.4m	Made Ground	<0.1	<0.1	<0.1	<0.1	<0.1	0.122	2.62	-	-	-	-	10.2
OL106	1.4 - 1.5m	Boulder Clay	<0.1	0.121	0.14	0.118	<0.1	0.275	-	14.2	-	-	-	-
OL107	1.6 - 1.9m	Boulder Clay	<0.1	0.185	0.186	0.15	0.129	0.242	-	-	17.8	-	-	-
OL109	0.2 - 0.3m	Made Ground	<0.1	<0.1	<0.1	<0.1	<0.1	0.514	-	-	-	142	-	-
OL111	0.5 - 0.6m	Sand	0.106	<0.1	<0.1	<0.1	<0.1	0.22	-	-	-	-	13.1	-

WILTON ETHYLENE CENTRAL

			TARGETED COMPOUNDS		TICs	
SAMPLE REF	DEPTH	SOIL TYPE	Di-n-butylphthalate	Bis(2ethylhexyl)-phthalate	C14-C30 Hydrocarbons 20% Aromatic 80% Aliphatic	Molecular Sulphur
WEC104	1.7 - 1.9m	Boulder Clay	0.112	0.203	10.8	0.87

CENTRAL CONTROL

			TARGETED COMPOUNDS							TENTATIVELY IDENTIFIED COMPOUNDS				
SAMPLE REF	DEPTH	SOIL TYPE	Naphthalene	Phenanthrene	Fluoranthene	Pyrene	2-Methylnaphthalene	Di-n-butylphthalate	Bis(2ethylhexyl)-phthalate	C10-C28 Hydrocarbons 10% Aromatic 90% Aliphatic	C8-C30 Hydrocarbons 30% Aromatic 70% Aliphatic	C14-C28 Hydrocarbons	Molecular Sulphur	Tri-isopropylbenzene
CC101	0.1 - 0.4m	Surface Sample	0.47	0.22	0.237	0.221	0.131	<0.1	0.244	178	-	-	-	-
CC101	0.7 - 0.9m	Surface Sample	<0.1	0.126	<0.1	0.159	<0.1	0.206	0.248	-	-	19.6	-	0.089
CC201	2.3 - 2.7m	Boulder Clay	0.164	0.14	<0.1	<0.1	<0.1	<0.1	<0.1	-	49.7	-	1.03	-

<0.1 Below Limit of Detection
\- Not detected by TIC Screen
For SVOCs target compound is only listed if detected in one or more sample (for full list see table E6)

TABLE D5: SEMIVOLATILE ORGANIC COMPOUNDS - WATERS

Units = mg/l

OLEFINS 6

SAMPLE REF	ALL TARGETED COMPOUNDS	TENTATIVELY IDENTIFIED COMPOUNDS
OL104	<0.001	Samples OL104, and OL114 show spikes at rentention times relating to unknown compounds, all at a concentration lower than 0.005.OL 201 shows unresolved complex matter with a concentration of 0.009
OL107	<0.001	
OL114	<0.001	
OL201	<0.001	
OL207	<0.001	
OL215	<0.001	
OL217	<0.001	

WILTON ETHYLENE CONTROL

SAMPLE REF	ALL TARGETED COMPOUNDS	TENTATIVELY IDENTIFIED COMPOUNDS			
		C9-C10 Aromatic Hydrocarbons	C10-C26 Unresolved Hydrocarbons	Molecular Sulphur	isomers of benzenediol
WEC 105B	<0.001	0.067	1.07	0.004	0.130

CENTRAL CONTROL

SAMPLE REF	TARGETED COMPOUNDS						
	Naphthalene	Acenaphthalene	Acenapthene	Flourene	Phenanthrene	Pyrene	2-Methylnaphthalene
CC109	0.006	0.003	0.007	0.009	0.005	0.001	0.020
CC202	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
CC203	<0.001	<0.001	<0.001	2.000	<0.001	<0.001	<0.001
CC204	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

SAMPLE REF	TENTATIVELY IDENTIFIED COMPOUNDS									
	C9-C12 Aromatic Hydrocarbons	methyl Indanones	methyl Indanones isomer	methyl Indanones isomer	dimethyl Indanones isomer	C9-C30 Hydrocarbons	Molecular Sulphur	C10-C26 Unresolved Hydrocarbons	Bicyclopentadiene	Dicyclopentadiene
CC109	5.22	0.550	0.206	0.167	0.167	-	-	-	-	-
CC202	-	-	-	-	-	-	-	-	-	-
CC203	-	-	-	-	-	3.580	0.032	-	-	-
CC204	-	-	-	-	-	-	-	0.032	0.002	0.001

<0.001 Below Limit of Detection

\- Not detected by TIC Screen

For SVOCs target compound is only listed if detected in one or more sample (for full list see table E6)

TABLE D6: SEMI VOLATILE ORGANIC COMPOUNDS - TARGET COMPOUNDS

CAS NUMBER	COMPOUND
108-95-2	Phenol
95-57-8	2-Chlorophenol
95-48-7	2-Methylphenol
106-44-5	4-Methylphenol
88-75-5	2-Nitrophenol
100-02-7	4-Nitrophenol
120-83-2	2,4-Dichlorophenol
105-67-9	2,4-Dimethylphenol
59-50 7	4-Chloro-3-methylphenol
88-06-2	2,4,6-Trichlorophenol
95-95-4	2,4,5-Trichlorophenol
87-86-5	Pentachlorophenol
541-73-1	1,3-Dichlorobenzene
106-46-7	1,4-Dichlorobenzene
95-50-1	1,2-Dichlorobenzene
120-82-1	1,2,4-Trichlorobenzene
98-95-3	Nitrobenzene
103-33-3	Azobenzene
118-74-1	Hexachlorobenzene
91-20-3	Naphthalene
208-96-8	Acenaphthylene
83-32-9	Acenapthene
86-73-7	Fluorene
85-01-8	Phenanthrene
120-12-7	Anthracene
206-44-0	Fluoranthene
129-00-0	Pyrene
56-55-3	Benzo(a)anthracene
218-01-9	Chrysene
205-99-2	Benzo(b)fluoranthene

CAS NUMBER	COMPOUND
207-08-9	Benzo(k)fluoranthene
50-32-8	Benzo(a)pyrene
193-39-5	Indeno(1,2,3-cd)pyrene
53-70-3	Dibenzo(a,h)anthracene
191-24-2	Benzo(ghi)perylene
91-58-7	2-Chloronaphthalene
91-57-6	2-Methylnaphthalene
86-74-8	Carbazole
78-59-1	Isophorone
132-64-9	Dibenzofuran
131-11-3	Dimethyl phthalate
84-66-2	Diethyl phthalate
84-74-2	Di-n-butylphthalate
117-84-0	Di-n-octylphthalate
117-81-7	Bis(2-ethylhexyl)phthalate
85-68-7	Butylbenzylphthalate
106-47-8	4-Chloroaniline
88-74-4	2-Nitroaniline
99-09-2	3-Nitroaniline
100-01-6	4-Nitroaniline
121-14-2	2,4-Dinitrotoluene
606-20-2	2,6-Dinitrotoluene
111-44-4	Bis(2-chloroethyl)ether
101-55-3	4-Bromophenylphenylether
7005-72-3	4-Chlorophenylphenylether
67-72-1	Hexachloroethane
87-68-3	Hexachlorobutadiene
77-47-4	Hexachlorocyclopentadiene
111-91-1	Bis(2-chloroethoxy)methane
621-64-7	N-nitrosodi-n-propylamine

TABLE D7: METALS - SOILS

Units = mg/kg

OLEFINS 6

SAMPLE REF	DEPTH	SOIL TYPE	Arsenic	Boron (Water Soluble)	Cadmium	Chromium	Copper	Mercury	Nickel	Lead	Selenium	Zinc
OL101	3.2-3.5m	Sand	11	<1	<1	17	19	<1	30	18	<1	59
OL105	0.30-0.40m	Made Ground	63	<1	<1	65	33	<1	24	29	<1	44
OL106	1.4-1.5m	Boulder Clay	50	2	<1	12	<1	<1	9	22	<1	7
OL107	1.6-1.9m	Boulder Clay	6	<1	<1	16	10	<1	16	8	<1	35
OL108	2.3-2.5m	Sand	4	<1	<1	7	10	<1	15	7	<1	37
OL111	0.5-0.6m	Sand	9	<1	<1	18	12	<1	25	13	2	45
OL114	0.10-0.20m	Made Ground	87	1	<1	29	<1	<1	15	38	<1	36
OL115	1.50-1.60m	Sand	3	<1	<1	5	7	<1	13	6	<1	26
OL206	4.40-5.00m	Sand	11	<1	<1	19	14	<1	30	15	<1	48

WILTON ETHYLENE CONTROL

SAMPLE REF	DEPTH	SOIL TYPE	Arsenic	Boron (Water Soluble)	Cadmium	Chromium	Copper	Mercury	Nickel	Lead	Selenium	Zinc
WEC104	1.7-1.9m	Boulder Clay	15	<1	<1	26	20	<1	39	21	<1	55
WEC201	5.0-5.5m	Sandy Clay	16	<1	<1	30	22	<1	35	23	<1	67
WEC204	7.5-7.8m	Boulder Clay	17	2	<1	27	17	<1	37	16	<1	51

CENTRAL CONTROL

SAMPLE REF	DEPTH	SOIL TYPE	Arsenic	Boron (Water Soluble)	Cadmium	Chromium	Copper	Mercury	Nickel	Lead	Selenium	Zinc
CC101	0.1-0.4m	Made Ground	9	<1	<1	16	10	<1	20	14	<1	70
CC101	0.7-0.9m	Organic Clay	11	<1	<1	16	9	<1	22	18	2	32
CC109	1.6-1.9m	Made Ground	174	<1	3	153	18	<1	154	39	<1	150
CC109	2.8-2.9m	Grey Clay	19	<1	<1	24	23	<1	44	25	<1	72
CC201	2.3-2.7m	Boulder Clay	23	<1	<1	30	18	<1	35	34	<1	72
CC202	5.5-5.6m	Possible Mudstone	16	2	<1	13	24	<1	30	9	<1	22
CC203	0-0.15m	Made Ground	57	<1	<1	17	2	<1	16	35	<1	23

TABLE D8: METALS-WATERS

OLEFINS 6

Sample Ref	Boron	Selenium	Zinc	Mercury Low Dutch Target AA*	Arsenic Low Level by AA	Cadmium by ICP-USN*	Chromium by ICP-USN*	Copper by ICP-USN*	Nickel by ICP-USN*	Lead by ICP-USN*
OL102	0.07	<0.05	<0.05	<0.05	<0.002	<0.0004	<0.001	0.006	<0.01	<0.005
OL107	0.05	<0.05	<0.05	<0.05	<0.002	<0.0004	<0.001	<0.005	<0.01	<0.005
OL201	-	-	-	<0.05	-	-	-	-	-	-
OL201	0.06	<0.05	<0.05	-	<0.002	<0.0004	<0.001	<0.005	<0.01	<0.005
OL207	-	-	-	<0.05	-	-	-	-	-	-
OL207	0.19	<0.05	<0.05	-	0.004	<0.0004	<0.001	0.005	<0.01	0.005
OL215	-	-	-	<0.05	-	-	-	-	-	-
OL215	0.15	<0.05	<0.05	-	<0.002	<0.0004	<0.001	0.006	<0.01	0.010
OL217	-	-	-	<0.05	-	-	-	-	-	-
OL217	0.63	<0.05	<0.05	-	<0.002	<0.004	<0.001	<0.005	<0.01	<0.005

WILTON ETHYLENE CONTROL

Sample Ref	Boron	Selenium	Zinc	Mercury Low Dutch Target AA*	Arsenic Low Level by AA	Cadmium by ICP-USN*	Chromium by ICP-USN*	Copper by ICP-USN*	Nickel by ICP-USN*	Lead by ICP-USN*
WEC105B	<0.05	<0.05	<0.05	<0.05	<0.002	<0.0004	<0.001	<0.005	<0.01	0.005
WEC201	0.56	<0.05	<0.05	0.12	<0.002	<0.0004	0.002	<0.005	<0.01	<0.005
WEC203	0.24	<0.05	<0.05	<0.05	<0.002	<0.0004	<0.001	<0.005	<0.01	<0.005
WEC204	0.12	<0.05	<0.05	<0.05	<0.002	<0.0004	<0.001	0.006	<0.01	<0.005

CENTRAL CONTROL

Sample Ref	Boron	Selenium	Zinc	Mercury Low Dutch Target AA*	Arsenic Low Level by AA	Cadmium by ICP-USN*	Chromium by ICP-USN*	Copper by ICP-USN*	Nickel by ICP-USN*	Lead by ICP-USN*
CC109	0.12	<0.05	<0.05	<0.05	0.005	<0.0004	<0.001	<0.005	<0.01	0.006
CC202	0.42	0.05	<0.05	<0.05	<0.002	<0.0004	<0.001	<0.005	<0.01	0.064
CC203	0.20	<0.05	<0.05	<0.05	<0.002	<0.0004	<0.001	<0.005	<0.01	0.006
CC204	0.53	0.07	<0.05	<0.05	<0.002	<0.0004	<0.001	0.006	<0.01	0.005

Units = mg/l * = µg/l

TABLE D9: DIESEL RANGE ORGANICS - SOIL Units = mg/kg

OLEFINS 6

Sample Identity	Depth	Soil Type	Diesel Range Hydrocarbons	Interpretation
OL101	0.1-0.2m	Made Ground	926	Lube oil
OL101	3.2-3.5m	Sandy Clay	91	unknown pattern detected
OL102	1.7-1.9m	Sand	68	unknown pattern detected
OL103	0.0-0.1m	Made Ground	1117	diesel/lube oil
OL104	3.0-3.4m	Sand	45	1 discrete Peak at approx C25
OL105	0.3-0.4m	Made Ground	7	No identfication possible
OL106	1.4-1.5m	Boulder Clay	10	unknown pattern detected
OL107	1.6-1.9m	Boulder Clay	47	unknown pattern detected
OL108	2.3-2.5m	Sand	61	unknown pattern detected
OL110	0.1-0.2m	Boulder Clay	26	unknown pattern detected
OL111	0.5-0.6m	Sand	65	unknown pattern detected
OL114	0.1-0.2m	Made Ground	180	Biodegraded Diesel
OL115	1.5-1.6m	Sand	5	No identfication possible
OL201	4.2-4.5m	Silty Sand	122	Possible Gasolene Residue / Possible Kerosene Type Residue/ Biodegraded Diesel/ Poss Lube Oil
OL202	1.4-1.5m	Sandy Clay	32	unknown pattern detected
OL203	1.5-1.6m	Made Ground	96	unknown pattern detected
OL204	5.4 - 5.7m	Silty Sand	17	unknown pattern detected
OL208	3.0 - 3.5m	Silty Sand	14	unknown pattern detected
OL210	0.3-0.4m	Made Ground	120	Biodegraded Diesel
OL214	2.4-2.5m	Sand	37	unknown pattern detected

WILTON ETHYLENE CONTROL

Sample Identity	Depth	Soil Type	Diesel Range Hydrocarbons	Interpretation
WEC103	0.6-0.8m	Made Ground	6	Possible Lube oil
WE 104	0.1-0.3m	Organic Clay	57	possible humic acids
WEC104	1.7-1.9m	Boulder Clay	54	possible Biodegraded Diesel
WEC104	4.5-4.8m	Sandy Clay	63	Possible Gasolene Residue / Possible Kerosene Type Residue/ Biodegraded Diesel/ Poss Lube Oil
WEC201	5.0-5.5m	Sandy Clay	68	Possible Gasolene Residue / Possible Kerosene Type Residue/ Biodegraded Diesel/ Poss Lube Oil
WEC203	4.5-5.0m	Sandy Clay	47	Possible Gasolene Residue / Possible Kerosene Type Residue/ Biodegraded Diesel
WEC204	7.5-7.8m	Boulder Clay	57	Possible Gasolene Residue / Possible Kerosene Type Residue/ Possible Biodegraded Diesel

CENTRAL CONTROL

Sample Identity	Depth	Soil Type	Diesel Range Hydrocarbons	Interpretation
CC101	0.1-0.4m	Made Ground	1,039	Biodegraded Diesel/Lube oil
CC101	0.7-0.9m	Sandy Organic Clay	45	unknown pattern detected
CC103	0.1-0.2m	Made Ground	180	unknown pattern detected
CC105	2.7-2.9m	Boulder Clay	1,670	PAH'S/Lube oil
CC 109	1.6-1.9m	Made Ground	2,307	unknown pattern detected/lube oil
CC109	2.8-2.9m	Grey Clay	207	Possible kerosene type residue/possible lube oil
CC111	0.05-0.15m	Made Ground	41	unknown pattern detected
CC112	1.1-1.2m	Sandy Clay	53	Possible PAH's
CC113	0.6-0.7m	Sandy Clay	2,938	Lube oil/Possible Biodegraded Diesel
CC201	2.3-2.7m	Boulder Clay	157	possible gasoline residues/ diesel/ possible Lube Oil /Possible Humic acids
CC201	3.5-4.0m	Boulder Clay	73	Possible Gasolene Residue/Possible kerosene type Residue / Possible Biodegraded Diesel
CC202	5.5-5.6m	Possible Mudstone	71	possible gasolene Residue/possible kerosene residue
CC203	0-0.15m	Made Ground	4,659	Biodegraded Diesel/ lube oil

TABLE D10: DIESEL RANGE ORGANICS - WATERS Units mg/l

OLEFINS 6

Sample Identity	Diesel Range Hydrocarbons	Interpretation
OL102	< 0.010	No Identification Possible
OL104	0.016	unknown pattern detected
OL107	< 0.010	No Identification Possible
OL114	0.012	unknown pattern detected
OL201	0.012	unknown pattern detected
OL204	< 0.010	No Identification Possible
OL206	< 0.010	No Identification Possible
OL207	< 0.010	No Identification Possible
OL208	< 0.010	No Identification Possible
OL211	< 0.010	No Identification Possible
OL213	< 0.010	No Identification Possible
OL214	< 0.010	No Identification Possible
OL215	< 0.010	No Identification Possible
OL217	< 0.010	No Identification Possible

OLEFINS 6 (Feb 03)

Sample Identity	Diesel Range Hydrocarbons	Interpretation
OL102	0.013	unknown pattern detected
OL104	0.038	unknown pattern detected
OL114	0.014	unknown pattern detected
OL204	0.015	unknown pattern detected
OL206	0.013	unknown pattern detected
OL207	0.012	unknown pattern detected
OL211	0.064	unknown pattern detected
OL213	0.011	unknown pattern detected
OL214	4.306	unknown pattern detected

WILTON ETHYLENE CONTROL

Sample Identity	Diesel Range Hydrocarbons	Interpretation
WEC105B	8.53	1 Discrete Peak at C15/ Lube Oil
WEC201	0.084	Possible Lube oil
WEC203	0.050	unknown pattern detected/ Possible Lube Oil
WEC204	< 0.010	No Identification Possible

CENTRAL CONTROL

Sample Identity	Diesel Range Hydrocarbons	Interpretation
CC104	< 0.010	No Identification Possible
CC105	5.35	Gasoline Residues/Naphthalene/Methyl Naphthalene/Possible Lube Oil
CC109	8.65	Gasoline Residues
CC113	124	Gasoline Residues/ Lube Oil
CC201	2.99	Gasoline Residues/ Lube Oil
CC202	0.212	Lube oil
CC203	3.65	Biodegraded Diesel/ lube oil
CC204	0.143	unknown pattern detected

CENTRAL CONTROL (Feb 03)

Sample Identity	Diesel Range Hydrocarbons	Interpretation
CC109	0.618	possible gasoline residue/possible lube oil
CC113	4.615	biodegraded diesel/possible lube oil
CC203	0.023	unknown pattern detected

TABLE D11: PETROL RANGE ORGANICS - SOILS

Units = mg/kg

OLEFINS 6

Sample Identity	Depth	Soil Type	Total Volatiles C_4 to C_{13}	Benzene	Toluene	Ethyl Benzene	Total Xylene
OL101	0.2m	Made Ground	<0.010	<0.010	<0.010	<0.010	<0.010
OL101	3.25m	Sand	<0.010	<0.010	<0.010	<0.010	<0.010
OL102	1.2m	Sand	<0.010	<0.010	<0.010	<0.010	<0.010
OL102	1.8-1.9m	Boulder Clay	<0.010	<0.010	<0.010	<0.010	<0.010
OL103	0.05m	Made Ground	101	<0.010	0.033	0.100	0.549
OL103	1.4-1.5m	Sand	<0.010	<0.010	<0.010	<0.010	<0.010
OL104	3.4-3.5m	Sand	0.598	0.088	0.036	0.058	0.189
OL105	0.4m	Made Ground	14.4	0.051	0.098	<0.010	0.047
OL106	0.6m	Boulder Clay	0.300	<0.010	<0.010	<0.010	<0.010
OL107	1.7-1.8m	Boulder Clay	0.680	0.489	0.022	<0.010	0.029
OL108	2.4m	Sand	2.98	1.35	0.052	<0.010	0.032
OL110	0.15m	Boulder Clay	<0.010	<0.010	<0.010	<0.010	<0.010
OL111	0.55m	Sand	<0.010	<0.010	<0.010	<0.010	<0.010
OL114	2.5m	Sand	3.10	2.92	<0.010	<0.010	0.033
OL115	1.6m	Sand	0.410	0.019	<0.010	<0.010	0.089
OL115	2.9m	Sand	0.516	0.035	0.025	<0.010	0.182
OL201	4.2-4.5m	Silty Sand	0.313	<0.010	<0.010	<0.010	0.130
OL202	1.4m	Sandy clay	<0.010	<0.010	<0.010	<0.010	<0.010
OL203	1.5m	Made Ground	6.37	<0.010	<0.010	0.011	0.378
OL204	5.4 - 5.7m	Silty Sand	<0.010	<0.010	<0.010	<0.010	<0.010
OL206	4.4 - 5.0m	Silty Sand	0.033	<0.010	<0.010	<0.010	0.033
OL208	3.0 - 3.5m	Silty Sand	0.453	0.250	<0.010	<0.010	0.059
OL214	2.9m	Boulder Clay	0.045	<0.010	0.014	<0.010	0.021

WILTON ETHYLENE CONTROL

Sample Identity	Depth	Soil Type	Total Volatiles C_4 to C_{13}	Benzene	Toluene	Ethyl Benzene	Total Xylene
WEC103	0.6m	Made Ground	0.128	<0.010	<0.010	0.042	<0.010
WEC104	0.3m	Organic Clay	<0.010	<0.010	<0.010	<0.010	<0.010
WEC104	4.5-4.8m	Sandy Clay	<0.010	<0.010	<0.010	<0.010	<0.010
WEC105	2.1m	Made Ground	2.825	<0.010	<0.010	<0.010	0.072
WEC 201	5.0-5.5m	Sandy Clay	<0.010	<0.010	<0.010	<0.010	<0.010
WEC203	4.5-5.0m	Sandy Clay	<0.010	<0.010	<0.010	<0.010	<0.010

CENTRAL CONTROL

Sample Identity	Depth	Soil Type	Total Volatiles C_4 to C_{13}	Benzene	Toluene	Ethyl Benzene	Total Xylene
CC101	0.4m	Made Ground	583.330	0.477	1.061	11.439	19.089
CC101	0.8m	Organic Clay	26.434	0.030	<0.010	0.161	0.285
CC101	1.7m	Boulder Clay	0.137	<0.010	<0.010	0.053	0.075
CC102	0.3m	Boulder Clay	<0.010	<0.010	<0.010	<0.010	<0 010
CC103	0.15m	Made Ground	8.155	<0.010	<0.010	<0.010	<0.010
CC105	2.8m	Boulder Clay	552.590	0.113	0.414	17.137	154.709
CC106	0.45m	Sandy Clay	1.379	<0.010	<0.010	0.016	0.137
CC106	1.8m	Boulder Clay	<0.010	<0.010	<0.010	<0.010	<0.010
CC107	0.3m	Sandy Clay	<0.010	<0.010	<0.010	<0.010	<0.010
CC108	1.4m	Boulder Clay	0.547	<0.010	<0.010	<0.010	0.484
CC109	1.9m	Made Ground	1,157	0.109	0.104	3.092	23.078
CC110	0.2m	Sandy Clay	<0.010	<0.010	<0.010	<0.010	<0.010
CC111	0.1m	Made Ground	2.906	0.016	<0.010	<0.010	0.116
CC112	1.1m	Sandy Clay	0.178	<0.010	<0.010	<0.010	0.044
CC113	0.7m	Sandy Clay	177.388	0.888	<0.010	3.380	3.941
CC201	2.3-2.7m	Boulder Clay	2,831.740	0.380	13.020	12.590	1,586.625
CC201	3.5-4.0m	Boulder Clay	5.757	0.014	0.112	0.626	4.937
CC203	0.15m	Made Ground	25.118	<0.010	<0.010	<0.010	0.130

TABLE D12: PETROL RANGE ORGANICS - WATERS

Units mg/l

OLEFINS 6

Sample Identity	Total Volatiles C_4 to C_{13}	Benzene	Toluene	Ethyl Benzene	Total Xylene
OL102	<0.010	<0.010	<0.010	<0.010	<0.010
OL104	0.356	0.036	<0.010	<0.010	0.089
OL107	<0.010	<0.010	<0.010	<0.010	<0.010
OL114	<0.010	<0.010	<0.010	<0.010	<0.010
OL201	<0.010	<0.010	<0.010	<0.010	<0.010
OL204	<0.010	<0.010	<0.010	<0.010	<0.010
OL206	<0.010	<0.010	<0.010	<0.010	<0.010
OL207	<0.010	<0.010	<0.010	<0.010	<0.010
OL208	<0.010	<0.010	<0.010	<0.010	<0.010
OL211	<0.010	<0.010	<0.010	<0.010	<0.010
OL213	<0.010	<0.010	<0.010	<0.010	<0.010
OL214	<0.010	<0.010	<0.010	<0.010	<0.010
OL215	<0.010	<0.010	<0.010	<0.010	<0.010
OL217	<0.010	<0.010	<0.010	<0.010	<0.010

OLEFINS 6 (Feb 03)

Sample Identity	Total Volatiles C_4 to C_{13}	Benzene	Toluene	Ethyl Benzene	Total Xylene
OL102	0.046	<0.01	<0.01	<0.01	<0.01
OL104	<0.01	<0.01	<0.01	<0.01	<0.01
OL114	0.194	<0.01	<0.01	<0.01	<0.01
OL204	0.112	<0.01	<0.01	<0.01	<0.01
OL206	<0.01	<0.01	<0.01	<0.01	<0.01
OL207	<0.01	<0.01	<0.01	<0.01	<0.01
OL211	<0.01	<0.01	<0.01	<0.01	<0.01
OL213	0.064	<0.01	<0.01	<0.01	<0.01
OL214	<0.01	<0.01	<0.01	<0.01	<0.01

WILTON ETHYLENE CONTROL

Sample Identity	Total Volatiles C_4 to C_{13}	Benzene	Toluene	Ethyl Benzene	Total Xylene
WEC105B	<0.010	<0.010	<0.010	<0.010	<0.010
WEC201	<0.010	<0.010	<0.010	<0.010	<0.010
WEC203	<0.010	<0.010	<0.010	<0.010	<0.010
WEC204	<0.010	<0.010	<0.010	<0.010	<0.010

CENTRAL CONTROL

Sample Identity	Total Volatiles C_4 to C_{13}	Benzene	Toluene	Ethyl Benzene	Total Xylene
CC104	<0.010	<0.010	<0.010	<0.010	<0.010
CC105	28.8	0.224	0.071	0.205	7.77
CC109	88.1	0.101	0.035	0.085	5.19
CC113	387	1.69	23.4	7.18	10.48
CC201	6.85	0.080	0.036	<0.010	4.90
CC202	<0.010	<0.010	<0.010	<0.010	<0.010
CC203	17.8	<0.010	<0.010	<0.010	<0.010
CC204	<0.010	<0.010	<0.010	<0.010	<0.010

CENTRAL CONTROL (Feb 03)

Sample Identity	Total Volatiles C_4 to C_{13}	Benzene	Toluene	Ethyl Benzene	Total Xylene
CC109	11.7	0.048	< 0.01	0.070	0.486
CC113	25.9	0.074	0.111	0.601	0.884
CC203	1.917	<0.01	< 0.01	<0.01	< 0.01