



Project Number 49319164

Comprehensive Groundwater Monitoring Event

Shell Fontwell

NPS: 10018981



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Shell UK Oil Products Ltd

Prepared by:

URS Corporation Ltd.

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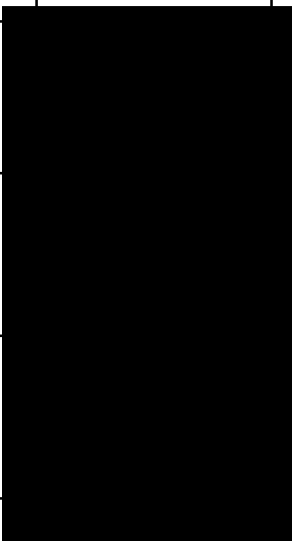
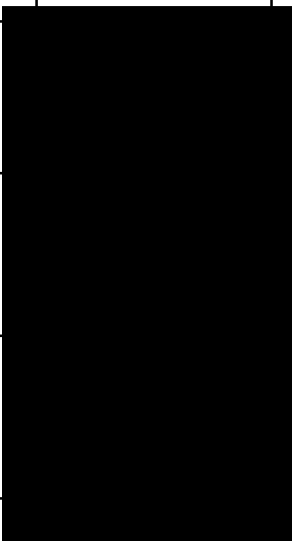
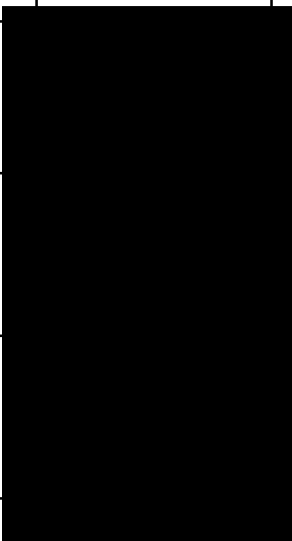
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Where field investigations have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the services. The results of any measurements taken may vary spatially or with time and further confirmatory measurements should be made after any significant delay in using this Report.

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EXECUTIVE SUMMARY

Introduction and Objectives

URS Corporation Ltd. (URS) has undertaken a Groundwater Monitoring Event (GME) at Shell Fontwell located at Arundel Road, Fontwell, Arundel, West Sussex, BN18 0SB at the request of Shell UK Oil Products Ltd. (Shell). The information contained herein is in accordance with the requirements of a Comprehensive GME report. As such the following objectives were set:

- Characterise the site, develop a Conceptual Site Model and provide information to potentially support a Local Town Planning application for future site redevelopment; and
- Assess potential liabilities in regards to the current environmental condition of the site.

Scope of Work

To meet the objectives stated above the following scope of work was undertaken:

- Review of existing Environmental Site Assessment (ESA) reports for the site completed in 2007 and 2008;
- Completion of a GME on 11 January 2011 to collect groundwater samples from accessible on-site monitoring wells (MW2, MW4, MW5 and MW7); and
- Static and active potable water sampling from site supply.

Background Information

- Site ID NPS 10018981;
- Site area 0.34 hectares (ha); and
- The site contains seven (7) operational single walled steel Underground Storage Tanks (USTs) installed in 1990 and three (3) above ground LPG tanks.

Geology and Hydrogeology

- 0 to 0.6 metres below ground level (mbgl) – Made ground: Concrete or tarmac over orangey brown course sand (occasionally silty) with minor brick or flint fragments;
- 0.5 to >5.2 mbgl – Natural: Orangey brown coarse SAND;
- 3.0 to >7.0 – Natural: Red to brown with grey mottled CLAY; and
- Groundwater was measure at 0.5 and 1.9 metres below top of casing (mbtoc), with relative groundwater levels calculated to range from 47.3 to 49.3 m above site specific temporary bench mark (TBM).

Laboratory Analytical Results

The assessment presented in this report is based on the results of the recent GME undertaken by URS. While no soil sampling has been undertaken at the site by URS, the results of soil analyses undertaken during an intrusive investigation at the site by RSK in August 2007 have also been included.

Human Health

- Concentrations of Chemicals of Potential Concern (CoPC) did not exceed the drinking water standards in the static and active water supply samples;
- Concentrations of CoPC in soil did not exceed the screening criteria for human health (based on a continued petroleum use); and

Controlled Waters

- Aromatic TPH C₁₆-C₂₁ fraction was reported above the Controlled Waters GAC in most soil samples. The Controlled Waters screening criteria are based upon the potential for TPH to leach from soil into the underlying aquifer. Aromatic TPH C₁₆-C₂₁ was not reported above the laboratory MDL in any groundwater samples and as such, it is shown that a pathway from the source to the receptor is not complete and there is no risk to Controlled Waters based on the current monitoring results.
- Concentrations of heavy metals were reported in groundwater samples marginally above the Controlled Water GAC. These results were not considered to indicate a significant risk given the nearest surface water receptor is 200 metres from the site and that elevated metals are not typically associated with petrol station usage.

Conclusion

The principal conclusions of this assessment of source – pathway – pollutant linkages are summarised below:

- No exceedances of the human health based GAC were reported and as such no potentially complete pollutant linkages were identified. There is however the potential for CoPC to be identified around tanks or under infrastructure at concentrations higher than those reported in this assessment and there is a potential pathway to contractors doing excavations on site. This pathway would usually be mitigated by the use of PPE by contractors; and
- No CoPC were reported in groundwater above the Controlled Waters GAC and metal concentrations were considered to be representative of natural groundwater conditions.
- Based on the results of this assessment no significant risks to human health (based on continued petroleum use) or Controlled Waters have been identified.

1. INTRODUCTION

URS Corporation Ltd. (URS) have undertaken a Comprehensive Groundwater Monitoring Event (GME) with potable water sampling of Shell Fontwell, Arundel Road, Fontwell, Arundel, West Sussex, BN18 0SB at the request of Shell UK Oil Products Ltd (Shell) in accordance with Purchase Order 4503592555. The work was authorised by Nigel Clarke (Shell ES Programme Manager, on 29 November 2010).

1.1. Objectives

The objectives of this Comprehensive GME report detailed herein are:

- characterise the site, develop a Conceptual Site Model and provide information to potentially support a Local Town Planning application for future site redevelopment; and
- Assess potential liabilities in regards to the current environmental condition of the site.

This report has been collated to support Shell with its environmental asset management activities and possible future site redevelopment.

1.2. Scope of Work

The Scope of Work for this Comprehensive GME included:

- Review of existing Environmental Site Assessment (ESA) reports for the site completed in 2007 and 2008;
- Completion of a GME on 11 January 2011 to collect groundwater samples from accessible on-site monitoring wells;
- Collection of static and active potable water sampling from site supply; and
- Preparation of this Comprehensive GME report.

2. BACKGROUND INFORMATION

2.1. Site Identification Details

Table A: Summary of Key Site Information	
Site Name	Shell Fontwell
Network Planning System ID	10018981
Site Address	Arundel Road, Fontwell, Arundel, West Sussex, BN18 0SB Figure 1 provides a summary plan of the area surrounding the site.
Grid Co-ordinates	495190, 107080
Reported Site Area	Approximately 0.34ha Figure 2 provides a Site Features Plan.
Freehold/Leasehold	URS understands the site is leased to Shell - 30 yrs from 1 st September 1990 as shown on Figure 2.
Land Use Zoning	Continued Petroleum Usage (CPU)

2.2. Chronology of Activities

Table B: Previous Site Assessment and Key Site Redevelopments		
Activity	Date	Summary (Appendix A provides a list of all known historical investigation reports)
Dates of accidental release or known source of Chemicals of Potential Concern (CoPC)	May 1992	The Petroleum Officer (PO) indicated the following minor spillages are recorded for the site: – During inspection of pump 7 a possible minor release was detected on the unleaded inlet suction line and was raised with the site for investigation.
	February 2006	– West Sussex County Council (WSCC) Fire and Rescue Service attended site to deal with a motor caravan fire on the forecourt. The PO did not attend but no spillage of fuel was reported.
	February 2007	– WSCC Fire and Rescue Service attended site to deal with a LPG release from a car. Again the PO did not attend. The incident was due to a faulty valve on the vehicle which had been disconnected from the delivery hose. Evidence of staining around the pumps during a preliminary site investigation by RSK in June 2007 and in site walkover in January 2011.
Dates of closure, tank removal, soil removal etc	Not Applicable	None reported.
Historical reports	February 2008	RSK (February 2008) <i>Comprehensive Environmental Site Assessment Report</i> (ref. 310493 – R1 (02)). (Reference 2) Seven boreholes were drilled by RSK during a Phase II investigation in August 2007 to a maximum depth of 12 metres. Monitoring wells were installed in five of the boreholes and the remaining two were backfilled. The report concluded that based on analytical results of soil and groundwater samples collected no unacceptable risks were identified and that the site may continue to operate without any remediation work.

Table B: Previous Site Assessment and Key Site Redevelopments

Activity	Date	Summary (Appendix A provides a list of all known historical investigation reports)
	January 2011	URS Corporation Ltd, 25 February 2011. <i>Phase 1 Investigation Report – Shell Fontwell, West Sussex - Final</i> (Report Ref: R49319164) URS undertook a Phase 1 ESA of the site in January 2011. The outcomes of the investigation include the following: The site is located in an area of mixed land use, including low density residential properties to the east and south of the site boundaries and commercial properties adjacent to the western and northern site boundaries. There is a pond (potential surface water receptor) reported to be situated approximately 210m west of the site, although this was not confirmed during the URS site walkover in January 2011. Potential groundwater receptors include the underlying superficial deposits (undifferentiated head deposit, Secondary Aquifer), bedrock geology (Lambeth Group, Secondary Aquifer) and nearby Tarrant Chalk Member (Principal Aquifer). The site is not located within a Source Protection Zone for the protection of drinking water supply. The overall site sensitivity was classified as Moderate. The following potentially complete pollutant linkages for continued petroleum use were identified: • Migration of hydrocarbon vapour and possibly subsequent inhalation by site workers, off site residents and off site restaurant and hotel workers/visitors; • Permeation of CoPC into plastic potable water supply pipes with subsequent ingestion; • Particulate ingestion, inhalation, and dermal contact by contractors during site excavation; • Leaching and migration of CoPC from soil into shallow and deep groundwater; and • Leaching and migration of CoPC from soil into shallow and deep groundwater followed by migration to surface water.

Table B: Previous Site Assessment and Key Site Redevelopments

Activity	Date	Summary (Appendix A provides a list of all known historical investigation reports)
Details of previous groundwater monitoring events	August 2007	A single groundwater monitoring round was undertaken as part of the Comprehensive ESA undertaken by RSK. No unacceptable risks were identified as port of the generic quantitative risk assessment (GQRA) (Reference 2).
Dates and summaries of any other significant activities	Not Applicable	None reported.

2.3. Site Equipment – Storage Tank Summary

Table C: Summary of On-site Fuel Infrastructure

Tank number	Tank 1	Tank 2	Tank 3	Tank 4	Tank 5	Tank 6	Tank 7	Tank 8	Tank 9	Tank 10
Tank type	SW Steel	SW Steel	SW Steel	SW Steel	SW Steel	SW Steel	SW Steel	Steel	Steel	Steel
Tank size (litres)	24,700	24,700	24,700	12,350	12,171	24,700	24,700	1 tonne	1 tonne	1 tonne
Product stored	Unleaded	Diesel	Unleaded	V-Power	V-Power Diesel	Unleaded	Diesel	LPG	LPG	LPG
Status	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational
Installation date	1990	1990	1990	1990	1990	1990	1990	2004	2004	2004
Removal or abandonment date	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Notes: SW Steel – Single Walled Steel

N/A – Not Applicable (no tanks are known to have been removed or abandoned)

3. FIELD WORK

3.1. Summary of Field Work

Table D: Summary of Field Works	
Details of existing groundwater monitoring network	The site was reported to have five (5) accessible monitoring boreholes (MW1, MW2, MW4, MW5, MW7) installed within the superficial aquifer (Reference 2). However, when URS visited the site to undertake groundwater monitoring MW1 was found to have been decommissioned.
Groundwater sampling	Groundwater samples were collected using low-flow pumping methods.
Potable water supply sampling	Two samples of potable water were obtained from a tap within the staff kitchen area. A static sample was collected upon arriving at the site and an active sample after the tap had been run for at least five minutes.
Field groundwater quality parameters	A Summary of field groundwater quality parameters are included as Table 1 of Appendix B. A summary of the GME undertaken in January 2011 is presented below: • Dissolved oxygen (DO) concentrations range from 0.08 mg/l (MW2) to 3.63 mg/l (MW5). These results are indicative of an aerobic groundwater environment. • Field redox measurements of groundwater ranged from 53.9 mV (MW7) to 89.5 mV (MWC). • Electrical conductivity of groundwater ranged from 85.4 µS/cm (MW5) to 246.5 µS/cm (MW2). • Groundwater pH ranges from 6.61 (MW2) to 6.86 (MW7) and is relatively neutral. • Groundwater temperature ranges from 7.3 °C (MW4) to 12.3 °C (MW7).

3.2. Hydrogeological Information

Table E: Site Hydrogeology Information**Summary of site geology**

The bedrock beneath the site is indicated to comprise the Lambeth Group (**Reference 3**). This is classified as a Secondary A Aquifer by the Environment Agency. Approximately 100m to the north of the site and underlying Lambeth Group is the Tarrant Chalk Member, which is a Principal Aquifer.

A Secondary A aquifer is defined as permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.

BGS borehole logs located within 500m of the site (borehole numbers SU90NW620A and SU90NW144), were reported as being drilled to depths of between 11 and 60 m bgl. The Chalk encountered is described as Chalk and marl or Chalk and flints, or very fine grained limestone. (**Reference 3**).

The overlying natural superficial deposits are indicated to comprise undifferentiated head of gravel, sand, silt and clay (**Reference 3**). The geological sequence summarised below is taken borehole records provided in the Comprehensive ESA prepared for the site in 2008 by RSK (**Reference 2**). Depth to bedrock was not confirmed.

Unit	Description	Depth to Top of Unit (m)	Thickness (m)
Made Ground	Tarmac	0.0	0.08 – 0.1
Made Ground	Concrete	0.1	0.1
Made Ground	Orangey brown coarse sand (occasionally silty) with minor brick or flint fragments	0.3	0.1 – 0.6
Natural	Orangey brown coarse SAND (occasionally silty)	0.5 – 0.8	3.0 - >5.2
Natural	Red to brown with grey mottled CLAY.	3.0 – 5.0	>3.0

Table E: Site Hydrogeology Information	
Phase separate hydrocarbons (PSH)	No PSH was reported at the site during this GME or during monitoring undertaken as part of the RSK Comprehensive ESA in August 2007.
Depth to groundwater	The depth to groundwater recorded on the site in 11 January 2011 ranges between 0.5 metres below top of case (mbtoc) (MW2) and 1.9 mbtoc (MW7), with an average depth of 1.0 mbtoc. The shallowest saturated deposits on the site are the natural superficial deposits, in which groundwater is inferred to be generally unconfined. Groundwater depths recorded in August 2007 were substantially different from those recorded in January 2011. In August 2007 MW4 and MW7 were flooded (had water to the top of the casing) due to large volumes of standing water over the wells. The deepest water level recorded was 1.7 mbtoc (MW5).
Inferred groundwater flow	The inferred groundwater flow direction could not be accurately determined based on the gauging data obtained. Groundwater levels relative to a site specific temporary bench mark (TBM) ranged from 47.31 (MW7) to 49.35 m above TBM. Local recharge is potentially influencing the groundwater levels across the site and this is supported by the low conductivity concentrations reported during field groundwater quality measurements.
Hydraulic gradient	As groundwater contours could not be obtained based on the gauging data obtained it was not possible to calculate the hydraulic gradient across the site.
Hydraulic conductivity	No hydraulic conductivity testing was undertaken during this GME or the Comprehensive ESA undertaken in 2007.

4. LABORATORY ANALYTICAL RESULTS

4.1. Groundwater Analytical Results

Table F: Summary of Groundwater Analytical Results		
Analytical Laboratory	Primary groundwater samples were analysed by Alcontrol Laboratories, Chester. A triplicate sample was submitted to Jones Environmental Laboratory for the same suite of analysis as the primary samples.	
Analytical Schedule	The following schedule of analysis was completed for this GME:	
	Analysis	Number of Samples
	TPH Health risk fractions	4
	BTEX compounds	4
	Fuel Oxygenates (MtBE, ETBE, TAME, TBA, DIPE, Ethanol)	4
	Polycyclic aromatic Hydrocarbons (PAH) 16 Speciated	4
	Metals (As, Bo, Cd, Cr, Co, Cu, Pb, Hg, Mo, Ni, Se, Sn, Zn)	4

Table F: Summary of Groundwater Analytical Results

QAQC Sampling	The following groundwater quality control samples were collected as part of this GME: • 1 equipment blank; • 1 field duplicate (obtained from MW7); and • 1 field triplicate (obtained from MW7). The calculated relative percentage difference (RPD) between the primary sample and the corresponding duplicate and triplicate were generally within acceptable limits with minor exceedances for zinc and chromium. All laboratory surrogate recovery data was within the acceptable limits. An equipment blank sample was collected by running the water used to decontaminate the equipment between sample locations through the groundwater pump. Some dissolved metals were reported in the equipment blank sample however these are a result of natural concentrations in the tap water that was used.
Discussion of Results	Table G includes a summary of the results of the analysis from this recent GME with monitoring results from August 2007 for comparison. Appendix B provides the original laboratory analysis reports. These results were compared with URS Generic Assessment Criteria (GAC) protective of on-site workers and Controlled Waters receptors. These are included in Table 2 in Appendix B. Dissolved phase concentrations reported above the relevant GAC are highlighted in these tables. Concentrations of CoPC in groundwater samples obtained from the site during the recent monitoring event were below applicable human health based GAC. However, the concentrations of several heavy metals exceeded Controlled Waters GAC as summarised below.
Metals	The reported concentrations of cadmium, chromium, copper and zinc marginally exceed their respective GAC based on Environmental Quality Standards (EQS). It is noted that these EQS are based on concentrations for surface water and are hardness dependent. As hardness data have not been obtained, the EQS presented below (which are derived for minimum hardness) may be overly conservative for the site setting. It is further noted that elevated metals are not typically associated with petrol station usage and that these concentrations may reflect background concentrations.

4.2. Groundwater Statistical Data Analysis

Table G: Statistical Data Summary for Groundwater Samples Exceeding Screening Criteria

Constituents of Potential Concern (COPCs)	Screening Criteria (µg/L)*	Number of Samples	Number of samples > GAC	Minimum Detection (µg/L)**	Maximum Detection (µg/L)	Average Concentration (µg/L)***
Cadmium	0.08	4	2	0.10	0.31	0.10
Chromium	5	4	2	4.13	7.99	5.29
Copper	1	4	3	0.93	2.85	1.22
Zinc	8	4	1	2.33	27.3	4.3

* Screening criteria taken from URS Stage 2 Spreadsheet

** The minimum detection is reported for concentrations recorded above the laboratory Method Detection Limit (MDL)

*** Average concentrations are reported as arithmetic means where more than 5 data points are available, and medians where not. Where the minimum detection is below the MDL, the MDL has been used for statistical analysis

4.3. Potable Water Analytical Results

Table H: Summary of Potable Water Analytical Results

Analytical Laboratory	A static and active sample obtained from site potable water supply were analysed by Alcontrol Laboratories, Chester.	
Analytical Schedule	The following schedule of analysis was completed for this GME:	
	Analysis	Number of Samples
	TPH Health risk fractions	2
	BTEX compounds	2
	Fuel Oxygenates (MtBE, ETBE, TAME, TBA, DIPE, Ethanol)	2
	Polycyclic aromatic Hydrocarbons (PAH) 16 Speciated	2

Table H: Summary of Potable Water Analytical Results

	Metals (As, Bo, Cd, Cr, Co, Cu, Pb, Hg, Mo, Ni, Se, Sn, Zn)	2
Discussion of Results	Appendix B provides the original laboratory analysis reports. The results were compared with Drinking Water Standards (DWS) and are included in Table 3 of Appendix B. With the exception of a number of metals, the reported concentrations of all CoPC are below laboratory method detection limits (MDL). The concentrations of metals reported above MDLs (arsenic, boron, chromium, cobalt, copper, lead, molybdenum, nickel, selenium, tin and zinc) are below applicable DWS.	

4.4. Historical Soil Analytical Results

Soil samples were collected from boreholes across the site as part of a Comprehensive ESA undertaken in 2007 (**Reference 2**). To enable consistent screening these results were screened against URS Stage 2 GAC derived for the protection of human health and the water environment and are included in Table 4 of **Appendix B**.

Table I: Summary of Historical Soil Analytical Results

Analytical Laboratory	Soil samples collected by RSK were analysed by Alcontrol Laboratories.	
Analytical Schedule	The following schedule of analysis was completed for the ESA by RSK	
	Analysis	Number of Samples
	TPH Health risk fractions	18
	BTEX compounds	18
	Fuel Oxygenates (TEL, MtBE, TAME)	18

Table I: Summary of Historical Soil Analytical Results

Discussion of Results	These results were compared with URS Generic Assessment Criteria (GAC) protective of on-site workers and Controlled Waters receptors and are included in Table 2 of Appendix B. CoPC concentrations reported above the relevant GAC are highlighted in these tables. Aromatic TPH C₁₆-C₂₁ fraction was reported above the Controlled Waters GAC in most soil samples. However, exceedance of the GAC only indicates a theoretical risk exists that TPH may leach into groundwater. Aromatic TPH C₁₆-C₂₁ fraction was not reported above the laboratory MDL in groundwater samples from the same locations indicating that TPH is not leaching into groundwater. BTEX and fuel oxygenates (TEL, MtBE and TAME) were not reported above the MDL in any samples analysed. Aromatic TPH fractions C₂₁-C₂₅ and aliphatic TPH fractions C₁₆-C₂₁ and C₂₁-C₃₅ were reported above the laboratory MDL but below the GAC. No other TPH fractions were reported above the laboratory MDL.
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5. CONCEPTUAL SITE MODEL

5.1. Introduction

The Conceptual Site Model (CSM) presented here is based on potential site specific sources, pathways and receptors identified during the Phase I Investigation undertaken by URS (**Reference 3**) and results of the recent GME. No further intrusive investigation has been undertaken at the site by URS. The soil results from the RSK intrusive investigation have been compared against URS Stage 2 GAC derived for the protection of human health and the water environment. The CSM should be revised if further evidence of impacted ground is identified.

As no significant exceedances of human health based GAC applicable to continued petroleum usage or Controlled Waters were recorded during the recent GME, or from screening of RSK's soil analytical data, a Stage 3 human health or Controlled Waters DQRA has not been undertaken.

A visual representation of the Conceptual Site Model is presented as **Figure 4**.

The source>pathway>pollutant linkages are assessed in *Section 6* of this report.

5.2. Conceptual Site Model

5.2.1. Potential Chemicals of Concern

1. TPH – Petroleum hydrocarbons;
2. BTEX — Benzene, toluene, ethylbenzene and xylenes;
3. Petroleum Additives – Methyl tertiary butyl ether (MTBE) and tertiary amyl methyl ether (TAME);
4. PAHs – Polycyclic aromatic hydrocarbons; and
5. Heavy metals.



5.2.2. Potential Sources

The following is a list of potential on-site sources of CoPC:

1. Operational underground Storage Tanks (There are no records of any historic / decommissioned storage tanks on site);
2. Accidental releases to ground from off-set fill points, located in north of site adjacent to HGV fuel pump 10;
3. Accidental releases to ground to ground from dispenser pumps: 4 Fuel Islands under the canopy, and two Fuel Islands for HGVs at the northern end of the site;
4. Accidental releases to ground from fuel lines: fuel lines located underneath the canopy, and to the north and west of the canopy;
5. Drainage gullies running in a north-south orientation to the east and west of the canopy, and across the entrance and exit to the forecourt;
6. Site interceptor and associated drains located near the western boundary of the site;
7. The soakaway located near the south west boundary of the site that collects discharge from the site interceptor, surface water from the site and storm water;
8. Site Drainage; and
9. Made Ground of unknown origin used during site construction.

5.2.3. Potential Pathways

Human Health

1. Vapours – Potential migration of vapours through made ground to above ground buildings;
2. Particulate – Potential ingestion, inhalation, dermal contact, with soil particulates; and
3. Permeation – Potential migration of hydrocarbon substances through plastic potable water supply pipes.



Controlled Waters

1. Leaching – Potential migration of hydrocarbon substances from soils into shallow (and potentially deep) aquifers;
2. Potential migration of impacted perched water into shallow (and potentially deep) aquifers;
3. Potential leaching – Migration of hydrocarbon substances from soils into shallow groundwater, followed by migration to surface water; and
4. Direct entry of impacted surface water to shallow (and potentially deep) aquifers through excavations – i.e. through the soakaway or releases from fuel infrastructure sited on underlying aquifer.

5.2.4. Potential Receptors

Human Health

1. Retail shop staff;
2. The general public and visiting staff (such as contractors, including those undertaking potential site excavation works);
3. Residents in properties adjacent to the site (located approximately 40m east and south and potential more distant receptors further to the east); and
4. Workers in the hotel and restaurant adjacent to the western and northern site boundary.

Controlled Waters

1. Groundwater within the undifferentiated head deposits on site (Secondary aquifer);
2. Groundwater within the Lambeth Group (Secondary aquifer); and
3. Groundwater within the Tarrant Chalk Member (Principal Aquifer).



6. RISK ASSESSMENT

6.1. Introduction

A Generic Quantitative Risk Assessment (GQRA) has been completed for the site based on the results of this GME and screening of historical soil samples. The CSM identified potential sources, pathways, and receptors for the site, in order to assess the potential risks posed by identified sources to human health and / or controlled waters receptors. When required, the viability of the source – pathway – receptor pollutant linkage must be evaluated further to assess whether a significant potential risk is likely to be present.

URS has undertaken this GQRA based upon a Continued Petroleum Use scenario.

6.2. Review of Potential Source – Pathway – Receptor Linkages

Based on the available information, the following pollutant linkages have been evaluated.

Table J: Summary of Source Pathway Pollutant Linkages - Human Health			
Source	Pathway	Receptor	Assessment of Pollutant Linkage
Potentially impacted shallow soils / groundwater (hydrocarbons)	1. Vapours – Migration of vapours through made ground to above ground buildings	On-site shop staff	Incomplete – No exceedances of HH GAC in soil.
		Off-site residents 40m to the east and south of the site	Incomplete – No exceedances of HH GAC in soil.
		Off-site restaurant and hotel workers immediately to the west and north of the site	Incomplete – No exceedances of HH GAC in soil.
	2. Particulate – Ingestion, inhalation, dermal contact, with soil particulates.	On-site shop staff and visiting staff	Incomplete – No exceedances of HH GAC in soil.
		Visiting contractors excavating ground	Unlikely – Impact could potentially be identified around tanks or under



Shell Fontwell
Comprehensive Groundwater Monitoring Event

Table J: Summary of Source Pathway Pollutant Linkages - Human Health			
Source	Pathway	Receptor	Assessment of Pollutant Linkage
			infrastructure at concentrations higher than those reported in this assessment.
	3. Permeation – Migration of hydrocarbon substances through plastic potable water supply pipes	On-site shop staff (ingestion of drinking water onsite)	Incomplete – no CoPC identified in potable water samples.

Table K: Summary of Source Pathway Pollutant Linkages - Controlled Waters			
Source	Pathway	Receptor	Assessment of Pollutant Linkage
Potentially impacted shallow soils / groundwater (hydrocarbons)	4a. Leaching - Migration of hydrocarbon substances from soils into shallow (and potentially deep) groundwater	Shallow and deep aquifers	Incomplete – No CoPC identified in shallow groundwater.
	4b Migration of impacted perched water into shallow (and potentially deep) groundwater		Incomplete – No CoPC identified in shallow groundwater. Reported metals concentrations are inferred to be representative of natural conditions.
	5a Leaching - Migration of hydrocarbon substances from soils into shallow groundwater, followed by migration to surface water	Surface water (pond approximately 210m to the west of the site)	Incomplete – No CoPC identified in shallow groundwater
	5b Migration of impacted perched water into shallow groundwater, followed by migration to surface water		Incomplete – No CoPC identified in shallow groundwater. Reported metals concentrations are inferred to be representative of natural conditions.

7. CONCLUSIONS

URS attended site to obtain groundwater samples from four accessible monitoring wells (MW2, MW4, MW5 and MW7) on the 11 January 2011. During these works, two potable water (passive and active) samples were also collected from the site shop kitchen tap. The assessment presented in this report is based on the results of the recent GME undertaken by URS. While no soil sampling has been undertaken at the site by URS, the results of soil analyses undertaken during an intrusive investigation at the site by RSK in August 2007 have also been included.

Groundwater was intercepted at the site between 0.5 and 1.9 mbtoc, with relative groundwater levels calculated to range from 47.3 to 49.3 m above TBM. As there was a 2 metre variation in groundwater standing level across the site it was not possible to accurately measure groundwater flow direction. The variation is potentially the result of localised recharge and this is supported by field quality measurements of low groundwater conductivity.

The analytical results of this GME and historical soil analysis (**Reference 2**) were assessed against URS GAC for continued petroleum use and Controlled Waters. No exceedances of human health based GAC were recorded. Minor exceedances of the Controlled Water GAC for aromatic TPH C₁₆-C₂₁ fraction were reported in most soil samples. The Controlled Waters screening criteria are based upon the potential for TPH to leach from soil into the underlying aquifer. Aromatic TPH C₁₆-C₂₁ was not reported above the laboratory MDL in any groundwater samples and as such, it is shown that a pathway from the source to the receptor is not complete and there is no significant risk to Controlled Waters based on the current monitoring results.

Potable water supply at the site was not found to contain any CoPC above laboratory MDL and no metals were reported above the relevant Drinking Water Standards (DWS).

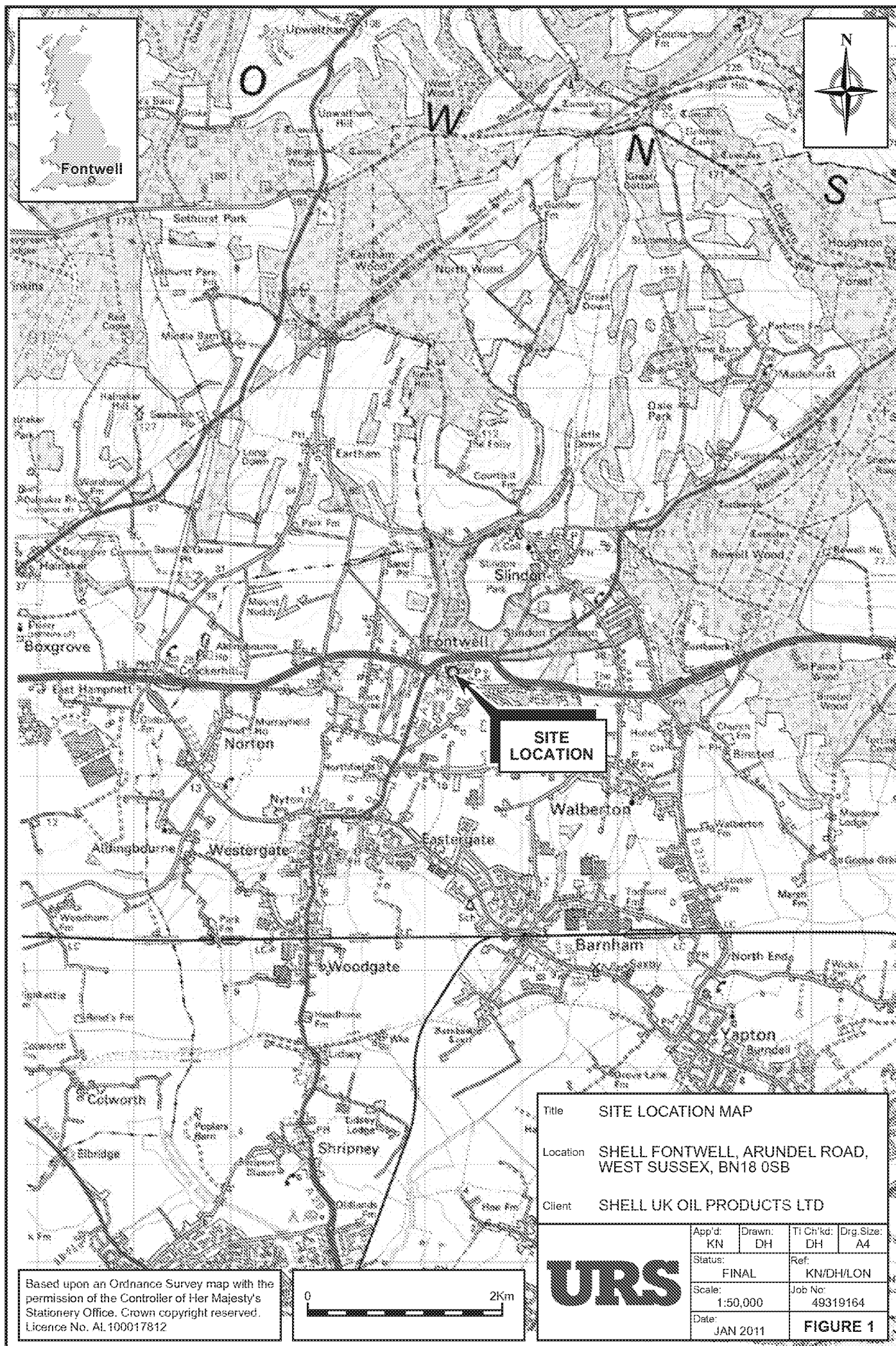
The principal conclusions of this assessment of source – pathway – pollutant linkages are summarised below:

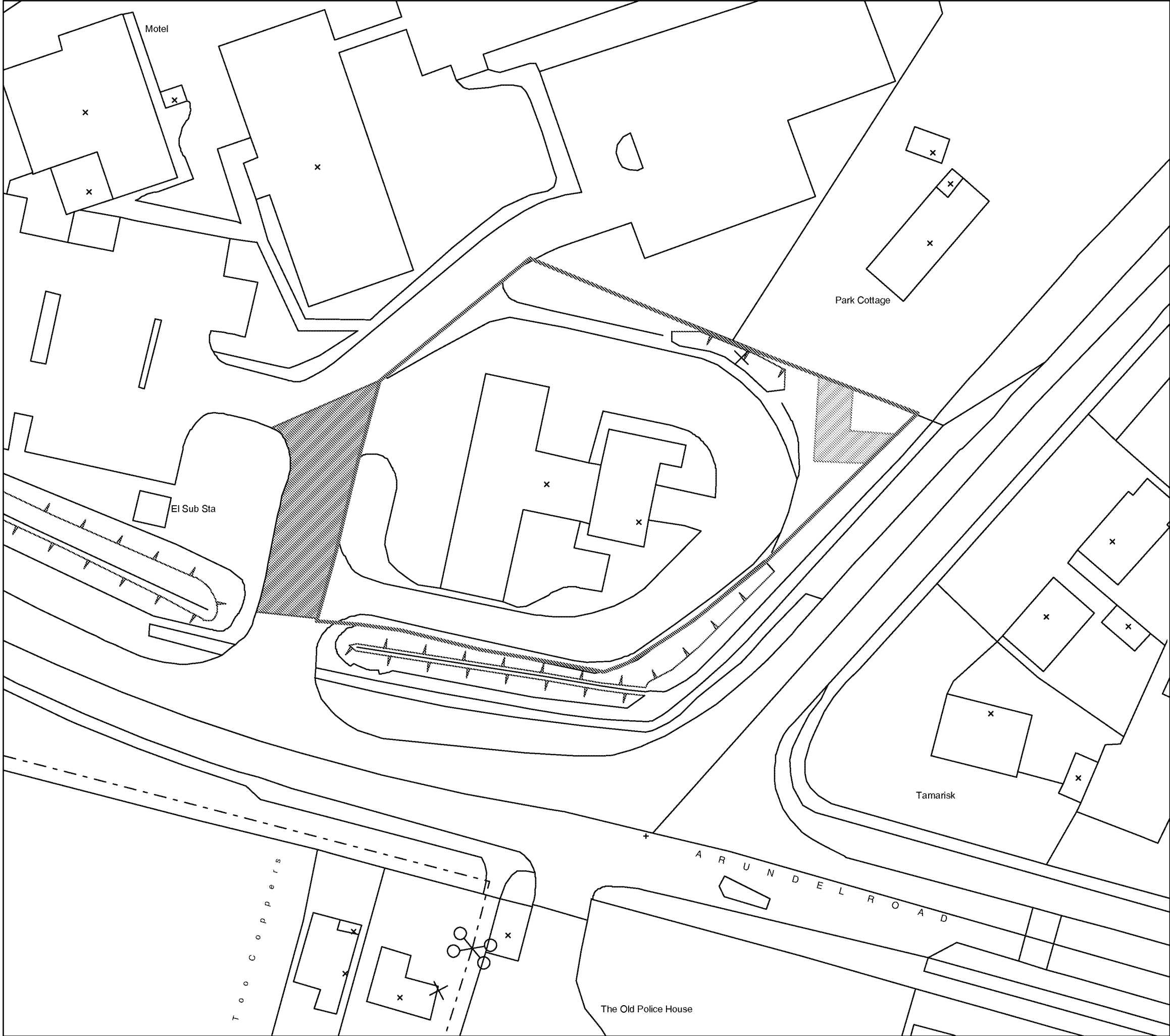
- No exceedances of the human health based GAC were reported and as such no potentially complete pollutant linkages were identified. There is however the potential for CoPC to be identified around tanks or under infrastructure at concentrations higher than those reported in this assessment and there is a potential pathway to contractors doing excavations on site. This pathway would usually be mitigated by the use of PPE by contractors; and
- No CoPC were reported in groundwater above the Controlled Waters GAC and metal concentrations were considered to be representative of natural groundwater conditions.

Based on the results of this assessment no significant risks to human health (based on Continued Petroleum Use) or Controlled Waters have been identified.

Figures

Figure 1	Site Location Map
Figure 2	Site Title Plan
Figure 3	Site Features Plan
Figure 4	Conceptual Site Model





LEGEND

- SITE BOUNDARY
- RIGHT OF WAY FOR SHELL TO ACCESS THEIR DEMISED PREMISES
- RIGHT OF WAY RESERVED - SHELL HAVE RIGHT TO CONSTRUCT A ROADWAY

CONSULTING ENGINEERS

URS

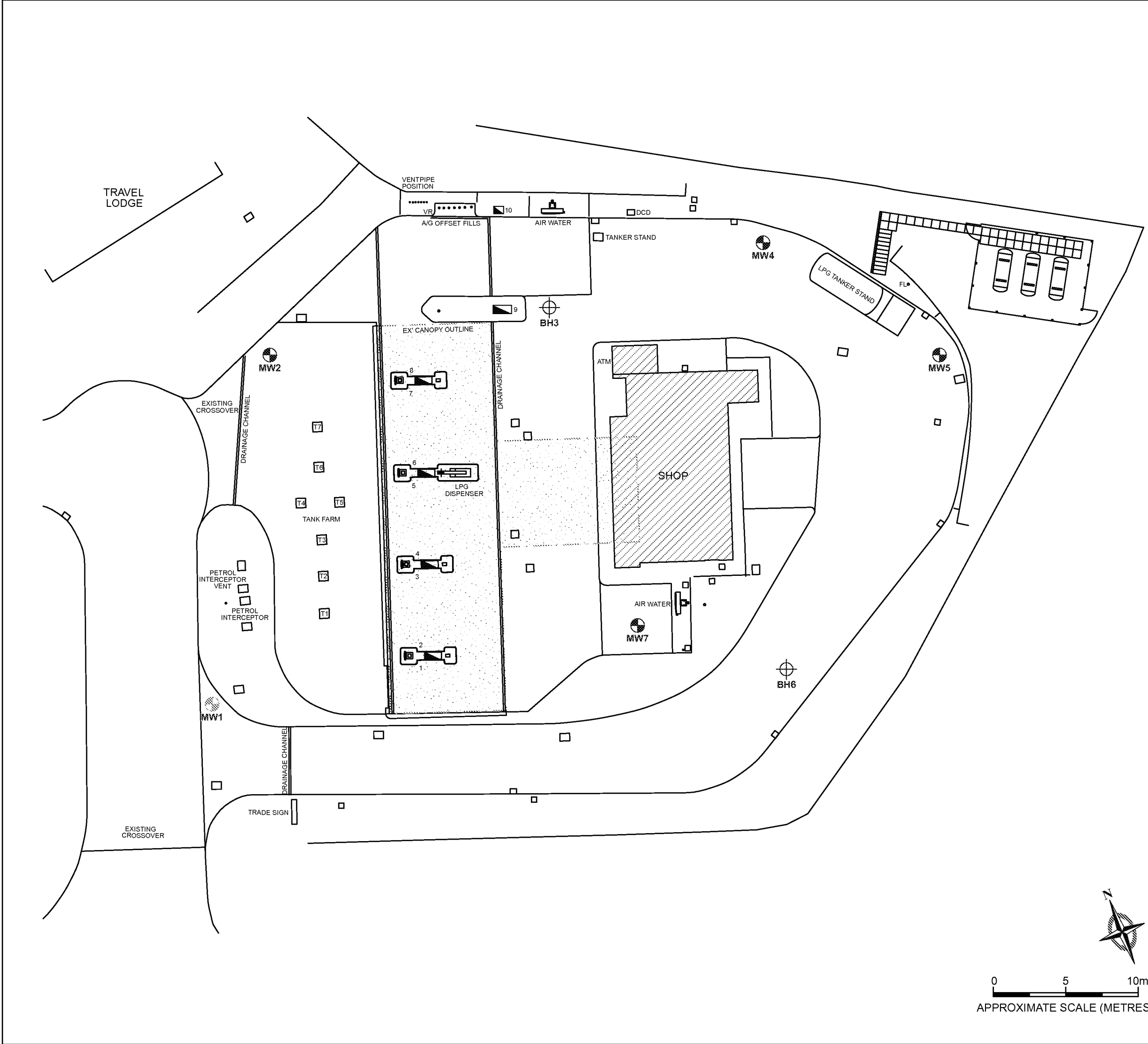
ST. GEORGES HOUSE, 5 ST GEORGES ROAD,
WIMBLEDON, SW19 4DR
TEL - 020 8944 3300 FAX - 020 8944 3301

CLIENT
SHELL UK OIL PRODUCTS LTD
PO BOX 430
STAINES
TW18 3ZB

PROJECT
SHELL FONTWELL,
ARUNDEL ROAD,
WEST SUSSEX,
BN18 0SB

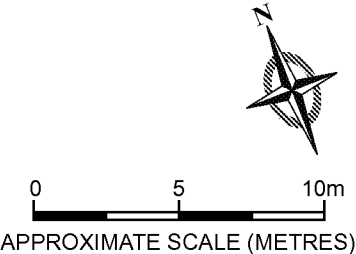
DRAWING TITLE
FIGURE 2 - SITE TITLE PLAN

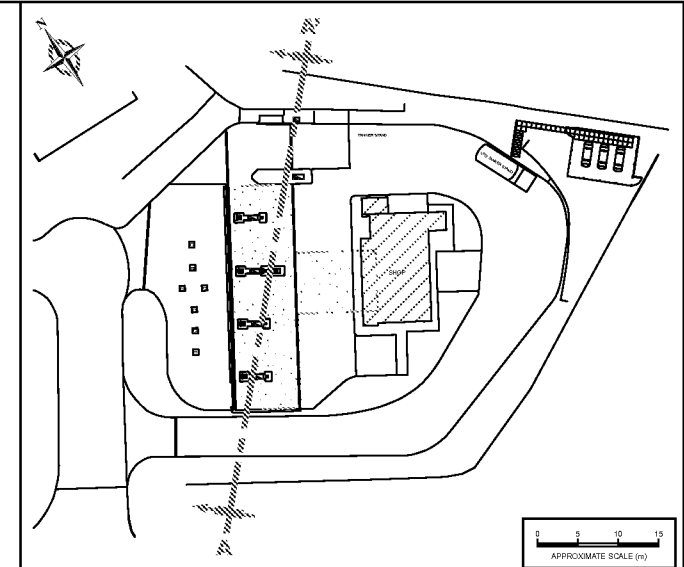
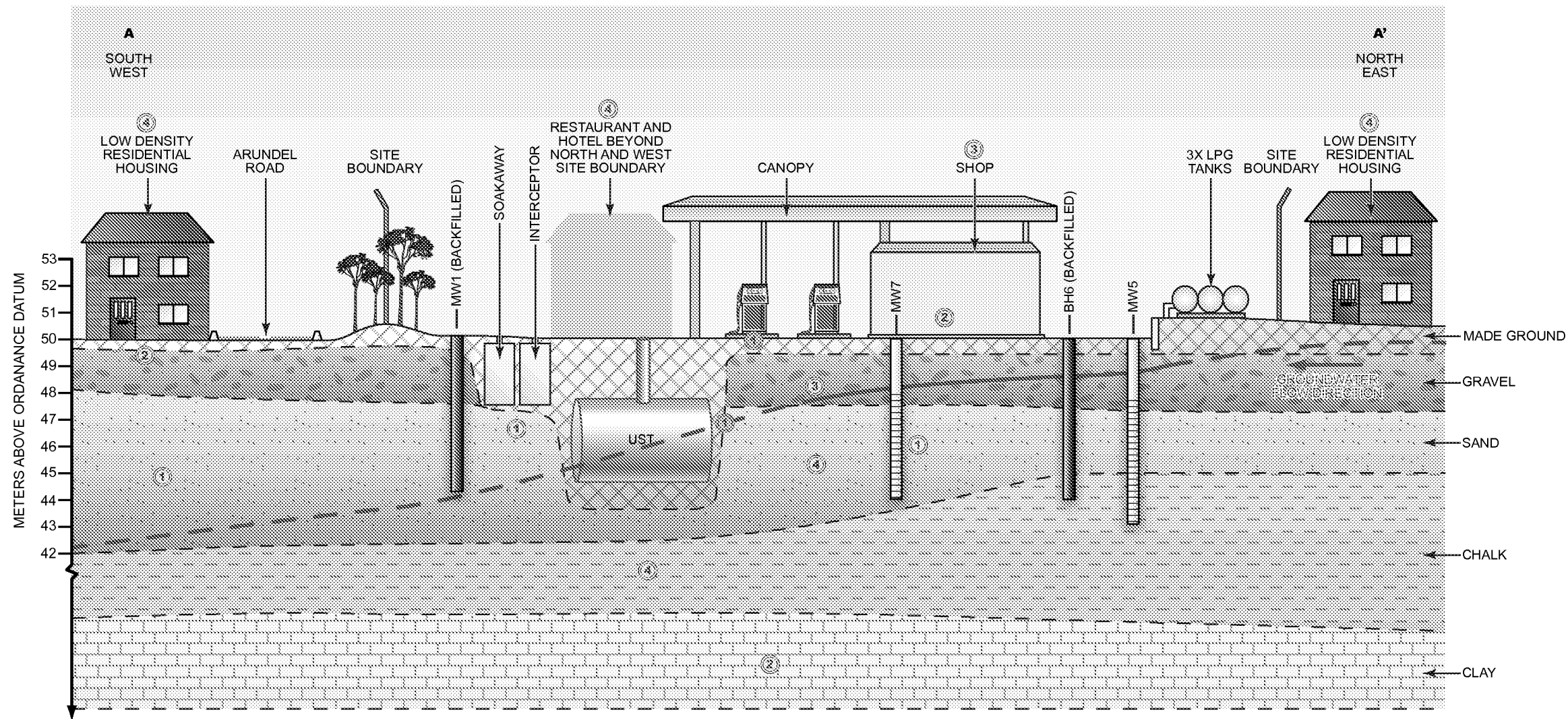
DRAWN DH	TRACED	CHECKED	APPROVED	DATE JAN 2011
SCALE NTS	DRG NO. 49319164 / FIGURE 2			REV.



- LEGEND**
- PUMP ISLAND
 - UNDERGROUND STORAGE TANK MANHOLE
 - FORMER CANOPY EXTENT
 - BUILDING
 - MW2 MONITORING WELL LOCATION WITH WELL ID
 - MW1 FORMER MONITORING WELL LOCATION WITH WELL ID
 - BH6 BOREHOLE LOCATION WITH BOREHOLE ID
- WELL LOCATIONS ARE APPROXIMATE
 - MAP SOURCE: AECOM

CONSULTING ENGINEERS				
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CLIENT SHELL UK OIL PRODUCTS LTD PO BOX 430 STAINES TW18 3ZB				
PROJECT SHELL FONTWELL, ARUNDEL ROAD, WEST SUSSEX, BN18 0SB				
DRAWING TITLE FIGURE 3 - SITE FEATURES PLAN				
DRAWN DH	TRACED	CHECKED	APPROVED	DATE JAN 2011
SCALE AS SHOWN	DRG NO. 49319164 / FIGURE 3			REV.





- SOURCES**
- ① POTENTIALLY IMPACTED SHALLOW SOILS AND GROUNDWATER
- PATHWAYS**
- ① VAPOUR FROM GROUNDWATER
 - ② VAPOUR FROM SOILS
 - ③ LEACHING FROM SOILS TO GROUNDWATER
 - ④ GROUNDWATER MIGRATION
- RECEPTORS**
- ① SECONDARY AQUIFER (UNDIFFERENTIATED HEAD DEPOSIT AND LAMBETH GROUP)
 - ② PRINCIPAL AQUIFER (TARRANT CHALK MEMBER)
 - ③ ON-SITE WORKERS
 - ④ OFF-SITE RESIDENTS AND HOTEL / RESTAURANT WORKERS

Potential Chemicals of Concern

- TPH – Petroleum hydrocarbons.
- BTEX – Benzene, toluene, ethylbenzene and xylenes.
- Petroleum Additives – Methyl tertiary butyl ether (MTBE) and tertiary amyl methyl ether (TAME).
- PAHs – Polycyclic aromatic hydrocarbons.
- Heavy metals.

Potential Sources

- Operational underground Storage Tanks.
- Accidental releases to ground from off-set fill points.
- Accidental releases to ground to ground from dispenser pumps.
- Accidental releases to ground from fuel lines.
- Drainage gullies running in a north-south orientation to the east and west of the canopy, and across the entrance and exit to the forecourt.
- Site interceptor and associated drains located near the western boundary of the site.
- The soakaway located near the south west boundary of the site that collects discharge from the site interceptor, surface water from the site and storm water.
- Site Drainage.
- Made Ground of unknown origin used during site construction.

Potential Pathways

Human Health

- Vapours – Potential migration of vapours through made ground to above ground buildings.
- Particulate – Potential ingestion, inhalation, dermal contact, with soil particulates. and
- Permeation – Potential migration of hydrocarbon substances through plastic potable water supply pipes.

Controlled Waters

- Leaching – Potential migration of hydrocarbon substances from soils into shallow (and potentially deep) aquifers.
- Potential migration of impacted perched water into shallow (and potentially deep) aquifers.
- Potential leaching – Migration of hydrocarbon substances from soils into shallow groundwater, followed by migration to surface water.
- Direct entry of impacted surface water to shallow (and potentially deep) aquifers through excavations – i.e. through the soakaway or leaks from base of tanks sited on underlying aquifer.

Potential Receptors

Human Health

- Retail shop staff.
- The general public and visiting staff (such as contractors, including those undertaking potential site excavation works).
- Residents in properties adjacent to the site (located approximately 40m east and south and potential more distant receptors further to the east).
- Workers in the hotel and restaurant adjacent to the western and northern site boundary.

Controlled Waters

- Groundwater within the undifferentiated head deposits on site (Secondary aquifer).
- Groundwater within the Lambeth Group (Secondary aquifer).
- Groundwater within the Tarrant Chalk Member (Principal Aquifer).

Potential Complete Pollutant Linkages

Human Health

- Particulate – Ingestion, inhalation, dermal contact, with soil particulates by visiting contractors when excavating ground.
- Controlled Waters
- No complete pollutant linkages identified.

CONSULTING ENGINEERS

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PROJECT
SHELL FONTWELL,
ARUNDEL ROAD,
WEST SUSSEX,
BN18 0SB

DRAWING TITLE
FIGURE 4 - CONCEPTUAL SITE MODEL

DRAWN DH	TRACED	CHECKED	APPROVED	DATE FEB 2011
SCALE NTS	DRG NO. 49319164 / FIGURE 4			REV. B

Appendix A - References

- Reference 1** RSK, May 2007. *Preliminary Investigation Report: BU 308301 – Shell Fontwell - Draft* (Report Ref: 310435 – R1 (01)).
- Reference 2** RSK, February 2008. *Comprehensive Environmental Site Assessment Report – Shell Fontwell - Final* (Report Ref: 310493 – R1 (02)).
- Reference 3** URS Corporation Ltd, 10 March 2011. *Phase 1 Investigation Report – Shell Fontwell, West Sussex* (Report Ref: MARP0001)

Appendix B - Summary Tables and Laboratory Analytical Results

TABLE 1
GROUNDWATER LEVELS AND QUALITY MEASUREMENTS

Site	Shell Fontwell
Sample Round	January 2011
Sample Date	11 January 2011

Borehole	Screened Section	Depth to base (mb TOC)	Depth to product (mb TOC)	Depth to water (mb TOC)	Borehole elevation (m ASD) ²	Groundwater elevation (m ASD)	Purge Volume (l)	pH	Temperature (°C)	Conductivity (µS/cm)	ORP (mV)	ORP (mV) Corrected	Dissolved Oxygen (mg/L)	Comments
MW1														DECOMMISSIONED
MW2	2.0 - 6.0	5.36	-	0.524	49.873	49.349	9	6.61	10.90	246.5	63	274.7	0.08	Low to moderate orange/ brown turbidity. Well dry after 15L. NVO.
MW4	2.0 - 6.0	2.41	-	0.626	49.967	49.341	4	7.00	7.20	142.2	91.2	302.9	2.01	Very low turbidity. NVO.
							8	6.92	7.30	151.3	90.3	302.0	1.78	
							12	6.81	7.30	145.9	89.5	301.2	1.87	
MW5	2.0 - 7.0	6.80	-	1.194	49.890	48.696	12	6.84	8.00	80.3	79.6	291.3	2.89	Clear. NVO.
							24	6.79	7.90	85.7	80.1	291.8	3.90	
							36	6.76	7.80	85.4	82.5	294.2	3.63	
MW7	2.0 - 7.0	5.35	-	1.902	49.212	47.310	7	7.04	12.40	199.3	50.3	262.0	0.68	Low orange/brown turbidity. NVO.
							14	6.95	12.40	194.0	52.4	264.1	0.71	
							21	6.86	12.30	189.8	53.9	265.6	0.70	

Legend

°C - degrees celsius
 L - Litres
 m ASD - metres Above Site Datum
 NVO - no visible or olfactory evidence of impact

mb TOC - metres below Top of Casing
 mg/L - milligrams per litre
 µS - micro siemens
 mV - milli volts

ORP - Oxidation Reduction Potential
 pH - potential of Hydrogen (dimensionless)

Notes

1 = Well installation details taken from logs produced by RSK in 2008
 2 = Survey data completed by RSK in 2008

TABLE 2
GROUNDWATER ANALYTICAL DATA

Stage 2 Human Health	Human Health CPU
Stage 2 Controlled Waters	EQS
Sample Round	August 2007 and January 2011
Site	Shell Fontwell

Chem Class	Analyte	HH	CW	MDL	Units	MW2		MW4		MW5		MW7	
						08/08/2007	11/01/2011	08/08/2007	11/01/2011	08/08/2007	11/01/2011	08/08/2007	11/01/2011
						W	W	W	W	W	W	W	W
BTEX	Benzene	23500	10	1	µg/l	ND	NT	ND	ND	ND	ND	ND	ND
	TOLUENE	>Sat	50	1	µg/l	ND	NT	ND	ND	ND	ND	ND	ND
	ETHYLBENZENE	>Sat	20	1	µg/l	ND	NT	ND	ND	ND	ND	ND	ND
	M P XYLENE	>Sat	30	1	µg/l	1	NT	ND	ND	ND	ND	ND	ND
	O XYLENE	>Sat	30	1	µg/l	ND	NT	ND	ND	ND	ND	ND	ND
PAH	ACENAPHTHENE	>Sat	2200	0.015	µg/l	NT	ND	NT	ND	NT	ND	NT	ND
	ACENAPHTHYLENE	>Sat	90	0.011	µg/l	NT	ND	NT	ND	NT	ND	NT	ND
	ANTHRACENE	>Sat	0.1	0.015	µg/l	NT	ND	NT	ND	NT	ND	NT	ND
	BENZO A ANTHRACENE	>Sat	0.029	0.017	µg/l	NT	ND	NT	ND	NT	ND	NT	ND
	BENZO A PYRENE	>Sat	0.05	0.009	µg/l	NT	ND	NT	ND	NT	ND	NT	ND
	BENZO B FLUORANTHENE	>Sat	0.025	0.023	µg/l	NT	ND	NT	ND	NT	ND	NT	ND
	BENZO G H I PERYLENE	>Sat	0.025	0.016	µg/l	NT	ND	NT	ND	NT	ND	NT	ND
	BENZO K FLUORANTHENE	>Sat	0.025	0.027	µg/l	NT	ND	NT	ND	NT	ND	NT	ND
	CHRYSENE	>Sat	2.9	0.013	µg/l	NT	ND	NT	ND	NT	ND	NT	ND
	DIBENZ A H ANTHRACENE	>Sat	0.0029	0.016	µg/l	NT	ND	NT	ND	NT	ND	NT	ND
	Fluoranthene	>Sat	0.1	0.017	µg/l	NT	ND	NT	ND	NT	ND	NT	ND
	FLUORENE	>Sat	1500	0.014	µg/l	NT	ND	NT	ND	NT	ND	NT	ND
	INDENO 1 2 3 CD PYRENE	>Sat	0.025	0.014	µg/l	NT	ND	NT	ND	NT	ND	NT	ND
	NAPHTHALENE	16700	2.4	0.1	µg/l	NT	ND	NT	ND	NT	ND	NT	ND
	PHENANTHRENE	>Sat	90	0.022	µg/l	NT	ND	NT	ND	NT	ND	NT	ND
	PYRENE	>Sat	1100	0.015	µg/l	NT	ND	NT	ND	NT	ND	NT	ND
	TOTAL PAH	(blank)	(blank)	0.1	µg/l	NT	ND	NT	ND	NT	ND	NT	ND
VOC	TETRAETHYL LEAD	(blank)	(blank)	1	µg/l	ND	NT	ND	NT	ND	NT	ND	NT
	DIPE	535000	120	1	µg/l	NT	ND	NT	ND	NT	ND	NT	ND
	ETBE	733000	40	50	µg/l	NT	ND	NT	ND	NT	ND	NT	ND
	ETHANOL	(blank)	1100000	100	µg/l	NT	ND	NT	ND	NT	ND	NT	ND
	MTBE	7240000	30	1	µg/l	ND	ND	ND	ND	ND	ND	ND	ND
	TAME	248000	140	1	µg/l	ND	ND	ND	ND	ND	ND	ND	ND
	TBA	17400000	40	10	µg/l	NT	ND	NT	ND	NT	ND	NT	ND

ND: Not detected above MDL

HH: Human Health

CW: Controlled Waters

NP: No pathway

NT: Not tested

>Sat: Unacceptable risk not achieved due to calculated saturation of vapour pathway

(blank): No criteria

TABLE 2
GROUNDWATER ANALYTICAL DATA

Stage2 Human Health	Human Health CPU
Stage2 Controlled Waters	EQS
Sample Round	August 2007 and January 2011
Site	Shell Fontwell

Chem Class	Analyte	HH	CW	MDL	Units	MW2		MW4		MW5		MW7	
						08/08/2007	11/01/2011	08/08/2007	11/01/2011	08/08/2007	11/01/2011	08/08/2007	11/01/2011
						W	W	W	W	W	W	W	W
METALDIS	ARSENIC	NP	50	0.12	µg/l	???	0.391	???	0.245	???	0.26	???	0.429
	BORON	NP	2000	9.4	µg/l	???	25.8	???	87.9	???	12.8	???	41.2
	CADMIUM	NP	0.08	0.1	µg/l	???	0.102	???	ND	???	ND	???	0.31
	CHROMIUM	NP	5	0.22	µg/l	???	5.73	???	4.13	???	7.99	???	4.83
	COBALT	NP	730	0.06	µg/l	???	0.215	???	0.153	???	0.141	???	1.27
	COPPER	NP	1	0.85	µg/l	???	0.931	???	1.24	???	2.85	???	1.2
	LEAD	NP	7.2	0.02	µg/l	???	0.088	???	0.044	???	0.032	???	0.091
	MERCURY	NP	1	0.01	µg/l	???	ND	???	ND	???	ND	???	ND
	MOLYBDENUM	NP	70	0.24	µg/l	???	3.12	???	2.96	???	0.808	???	3.17
	NICKEL	NP	20	0.15	µg/l	???	2.3	???	1.44	???	0.709	???	2.12
	SELENIUM	NP	20	0.39	µg/l	???	1.96	???	1.41	???	0.443	???	1.65
	TIN	NP	25	0.36	µg/l	???	ND	???	ND	???	ND	???	ND
	ZINC	NP	8	0.41	µg/l	???	2.48	???	2.33	???	27.3	???	6.09
RISKTPH	RISK TPH C6 C7 AROM	>Sat	10	1	µg/l	ND	ND	ND	ND	5	ND	ND	ND
	RISK TPH C7 C8 AROM	>Sat	50	1	µg/l	ND	ND	ND	ND	ND	ND	ND	ND
	RISK TPH C8 C10 AROM	>Sat	300	1	µg/l	1	ND	ND	ND	ND	ND	1	ND
	RISK TPH C10 C12 AROM	>Sat	90	10	µg/l	ND	ND	ND	ND	ND	ND	ND	ND
	RISK TPH C12 C16 AROM	>Sat	90	10	µg/l	ND	ND	ND	ND	ND	ND	ND	ND
	RISK TPH C16 C21 AROM	>Sat	90	10	µg/l	ND	ND	ND	ND	ND	ND	ND	ND
	RISK TPH C21 C35 AROM	>Sat	90	10	µg/l	ND	ND	ND	ND	ND	ND	ND	ND
	RISK TPH C6 C35 AROM	(blank)	(blank)	5	µg/l	1	ND	ND	ND	ND	ND	1	ND
	RISK TPH C5 C6 ALI	>Sat	15000	1	µg/l	1	ND	1	ND	ND	ND	1	ND
	RISK TPH C6 C8 ALI	>Sat	15000	1	µg/l	ND	ND	ND	ND	ND	ND	ND	ND
	RISK TPH C8 C10 ALI	>Sat	300	1	µg/l	3	ND	ND	ND	ND	ND	5	ND
	RISK TPH C10 C12 ALI	>Sat	300	10	µg/l	ND	ND	ND	ND	ND	ND	ND	ND
	RISK TPH C12 C16 ALI	>Sat	300	10	µg/l	ND	ND	ND	ND	ND	ND	ND	ND
	RISK TPH C16 C21 ALI	>Sat	300	10	µg/l	ND	ND	ND	ND	ND	ND	ND	ND
	RISK TPH C21 C35 ALI	>Sat	300	10	µg/l	ND	ND	ND	ND	ND	ND	ND	ND
	RISK TPH C5 C35 ALI	(blank)	(blank)	5	µg/l	4	ND	1	ND	ND	ND	6	ND
	TPH_STAGE2 HI	1	(blank)	10	ratio	0.0021	0.0046	0.0019	0.0046	0.0019	0.0046	0.0025	0.0046

XX	Exceeds Human Health & Controlled Waters
	Exceeds Human Health Criteria
XX	Exceeds Controlled Waters Criteria

CSM / Assumptions:

Soil 1% SOM (0.58% TOC)
 Soil properties for "sand"
 Commercial site area 0.5ha
 Soil gas ingress rates calculated by model
 Infinite groundwater source at 1m.bgl for groundwater GAC
 High density residential assume vapour exposure pathways only
 CPU scenario modified from modelled commercial scenario by:
 Building dimensions (l x w x h): 14m x 6.5m x 2.4m
 Differential pressure: 2.6 pascals
 Only vapour exposure pathways considered viable
 Derived November 2010 using Human7.1 Issue9. MTF.

ND: Not detected above MDL

HH: Human Health

CW: Controlled Waters

NP: No pathway

NT: Not tested

>Sat: Unacceptable risk not achieved due to calculated saturation of vapour pathway

(blank): No criteria

TABLE 3
TAP WATER
ANALYTICAL DATA

Sample Round	January 2011
Site	Shell Fontwell

Chem Class	Analyte	Criteria	Units	MDL	Source	ACTIVE	STATIC
						11/01/2011 W	11/01/2011 W
BTEX	Benzene	1	µg/l	1.3	UK DWS (2010)	ND	ND
	TOLUENE	700	µg/l	1.4	SEPA GW RPV 2009 / WHO DWS	ND	ND
	ETHYLBENZENE	300	µg/l	2.5	SEPA GW RPV 2009 / WHO DWS	ND	ND
	M. P. XYLENE	500	µg/l	2.5	SEPA GW RPV 2009 / WHO DWS	ND	ND
	O. XYLENE	500	µg/l	1.7	SEPA GW RPV 2009 / WHO DWS	ND	ND
PAH	ACENAPHTHENE	2200	µg/l	0.015	USEPA RSL	ND	ND
	ACENAPHTHYLENE	90	µg/l	0.011	WHO Petroleum Products in DW 2008	ND	ND
	ANTHRACENE	10000	µg/l	0.015	Ireland IGV (2003)	ND	ND
	BENZO. A. ANTHRACENE	0.029	µg/l	0.017	USEPA RSL	ND	ND
	BENZO. A. PYRENE	0.01	µg/l	0.009	UK DWS (2010)	ND	ND
	BENZO. B. FLUORANTHENE	0.025	µg/l	0.023	0.25 x Sum 4 PAHs UK DWS (2010)	ND	ND
	BENZO. G. H. I. PERYLENE	0.025	µg/l	0.016	0.25 x Sum 4 PAHs UK DWS (2010)	ND	ND
	BENZO. K. FLUORANTHENE	0.025	µg/l	0.027	0.25 x Sum 4 PAHs UK DWS (2010)	ND	ND
	CHRYSENE	2.9	µg/l	0.013	USEPA RSL	ND	ND
	DIBENZ. A. H. ANTHRACENE	0.0029	µg/l	0.016	USEPA RSL	ND	ND
	Fluoranthene	0.2	µg/l	0.017	UK DWS (2010)	ND	ND
	FLUORENE	1500	µg/l	0.014	USEPA RSL	ND	ND
	INDENO. 1. 2. 3. CD. PYRENE	0.025	µg/l	0.014	0.25 x Sum 4 PAHs UK DWS (2010)	ND	ND
	NAPHTHALENE	1	µg/l	0.1	Ireland IGV (2003)	ND	ND
	PHENANTHRENE	90	µg/l	0.022	WHO Petroleum Products in DW 2008	ND	ND
	PYRENE	1100	µg/l	0.015	USEPA RSL	ND	ND
VOC	DIPE	120	µg/l	1	Gasoline Oxygenate Additives: Health Information Summary, 2009, ref ARD-EHP-32	ND	ND
	ETHANOL	1100000	µg/l	100	ref ARD-EHP-32	ND	ND
	MTBE	30	µg/l	1.6	Ireland IGV (2003)	ND	ND
	TAME	140	µg/l	1	Gasoline Oxygenate Additives: Health Information Summary, 2009, ref ARD-EHP-32	ND	ND
	TBA	40	µg/l	10	Gasoline Oxygenate Additives: Health Information Summary, 2009, ref ARD-EHP-32	ND	ND
	ETBE	40	µg/l	50	Gasoline Oxygenate Additives: Health Information Summary, 2009, ref ARD-EHP-32	ND	ND

ND: Not detected above MDL
NT: Not tested
(blank): No criteria

TABLE 3
TAP WATER
ANALYTICAL DATA

Sample Round	January 2011
Site	Shell Fontwell

Chem Class	Analyte	Criteria	Units	MDL	Source	ACTIVE	STATIC
						11/01/2011	11/01/2011
						W	W
RISKTPH	RISK TPH C6 C7 AROM	1	µg/l	10	UK DWS (2010)	ND	ND
	RISK TPH C7 C8 AROM	700	µg/l	10	WHO Petroleum Products in DW 2008	ND	ND
	RISK TPH C8 C10 AROM	300	µg/l	10	WHO Petroleum Products in DW 2008	ND	ND
	RISK TPH C10 C12 AROM	90	µg/l	10	WHO Petroleum Products in DW 2008	ND	ND
	RISK TPH C12 C16 AROM	90	µg/l	10	WHO Petroleum Products in DW 2008	ND	ND
	RISK TPH C16 C21 AROM	90	µg/l	10	WHO Petroleum Products in DW 2008	ND	ND
	RISK TPH C21 C35 AROM	90	µg/l	10	WHO Petroleum Products in DW 2008	ND	ND
	RISK TPH C5 C6 ALI	15000	µg/l	10	WHO Petroleum Products in DW 2008	ND	ND
	RISK TPH C6 C8 ALI	15000	µg/l	10	WHO Petroleum Products in DW 2008	ND	ND
	RISK TPH C8 C10 ALI	300	µg/l	10	WHO Petroleum Products in DW 2008	ND	ND
	RISK TPH C10 C12 ALI	300	µg/l	10	WHO Petroleum Products in DW 2008	ND	ND
	RISK TPH C12 C16 ALI	300	µg/l	10	WHO Petroleum Products in DW 2008	ND	ND
	RISK TPH C16 C21 ALI	300	µg/l	10	WHO Petroleum Products in DW 2008	ND	ND
	RISK TPH C21 C35 ALI	2000	µg/l	10	WHO Petroleum Products in DW 2008	ND	ND
METALDIS	ARSENIC	10	µg/l	0.12	UK DWS (2010)	0.714	0.937
	BORON	1000	µg/l	9.4	UK DWS (2010)	41.4	45
	CADMIUM	5	µg/l	0.1	UK DWS (2010)	ND	ND
	CHROMIUM	50	µg/l	0.22	UK DWS (2010)	5.97	5.34
	COBALT	11	µg/l	0.06	USEPA RSL	0.16	0.211
	COPPER	2000	µg/l	0.85	UK DWS (2010)	139	157
	LEAD	25	µg/l	0.02	UK DWS (2010)	0.65	0.867
	MERCURY	1	µg/l	0.01	UK DWS	ND	ND
	MOLYBDENUM	70	µg/l	0.24	WHO DWS	0.376	1.02
	NICKEL	20	µg/l	0.15	UK DWS (2010)	2.38	2.44
	SELENIUM	10	µg/l	0.39	UK DWS (2010)	2.41	2.87
	TIN	22000	µg/l	0.36	USEPA RSL	0.492	1.07
	ZINC	5000	µg/l	0.41	UK DWS (2010)	12.6	15.3

ND: Not detected above MDL
NT: Not tested
(blank): No criteria

TABLE 4
HISTORICAL SOIL ANALYTICAL DATA (RSK)

Stage2 Human Health GAC	Human Health CPU
Stage2 Controlled Waters GAC	Low foc <1% EQS
Sample Round	Fontwell Historical Data
Site	Fontwell

					Location	BH6			MW1			MW2		
Chem Class	Analyte	HH	CW	MDL	Depth	2	4	5	2	4	5	2	4	6
					Units	08/08/2007	08/08/2007	08/08/2007	08/08/2007	08/08/2007	08/08/2007	08/08/2007	08/08/2007	08/08/2007
BTEX	Benzene	2.73	0.00179	0.01	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
	TOLUENE	>Sat	0.0226	0.01	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
	ETHYLBENZENE	>Sat	0.0188	0.01	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
	M P XYLENE	613	0.0285	0.01	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
	O XYLENE	>Sat	0.0285	0.01	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
RISKT PH														
	RISK TPH C6 C7 AROM	>Sat	0.00179	0.01	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RISK TPH C7 C8 AROM	>Sat	0.0226	0.01	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RISK TPH C8 C10 AROM	387	0.969	0.01	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RISK TPH C10 C12 AROM	>Sat	0.456	0.1	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RISK TPH C12 C16 AROM	>Sat	0.905	0.1	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RISK TPH C16 C21 AROM	>Sat	2.55	0.1	mg/kg	3.4	2.9	2.6	2.2	3	3.1	3.4	4.4	4
	RISK TPH C21 C35 AROM	>Sat	22.7	0.1	mg/kg	3.9	ND	ND	ND	1.7	2.3	2.3	2.6	3.6
	RISK TPH C6 C35 AROM	(blank)	(blank)	0.1	mg/kg	7.31	2.9	2.6	2.2	4.7	5.4	5.7	7	7.6
	RISK TPH C5 C6 ALI	369	60.1	0.01	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RISK TPH C6 C8 ALI	>Sat	160	0.01	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RISK TPH C8 C10 ALI	>Sat	19.5	0.01	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RISK TPH C10 C12 ALI	>Sat	146	0.01	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RISK TPH C12 C16 ALI	>Sat	3230	0.1	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RISK TPH C16 C21 ALI	>Sat	379000	0.1	mg/kg	3.9	3.3	3	15.9	3	3.5	3.8	3.9	4
	RISK TPH C21 C35 ALI	>Sat	4550000	0.1	mg/kg	ND	ND	0.8	74	0.9	3.9	ND	4.8	ND
	RISK TPH C5 C35 ALI	(blank)	(blank)	0.1	mg/kg	3.9	3.3	3.8	89.9	3.9	7.4	3.8	8.7	4
	TPH STAGE2 HI	1	(blank)	0.1	ratio	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
VOC	TETRAETHYL LEAD	(blank)	(blank)	0.01	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
	MTBE	685	0.00302	0.01	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
	TAME	20.8	0.0181	0.01	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND

XX	Exceeds Human Health & Controlled Waters
	Exceeds Human Health Criteria
XX	Exceeds Controlled Waters Criteria

CSM / Assumptions:

Soil 1% SOM (0.58% TOC)

Soil properties for "sand"

Commercial site area 0.5ha

Soil gas ingress rates calculated by model

Infinite groundwater source at 1m.bgl for groundwater GAC

High density residential assume vapour exposure pathways only

CPU scenario modified from modelled commercial scenario by:

Building dimensions (l x w x h): 14m x 6.5m x 2.4m

Differential pressure: 2.6 pascals

Only vapour exposure pathways considered viable

Derived November 2010 using Human7.1 Issue9. MTF.

ND: Not detected above MDL

HH: Human Health

GAC: Generic Assessment Criteria

(blank): No criteria

NP: No pathway

>Sat: Unacceptable risk not achieved due to calculated saturation of vapour pathway

NT: Not tested

TABLE 4
HISTORICAL SOIL ANALYTICAL DATA (RSK)

Stage2 Human Health GAC	Human Health CPU
Stage2 Controlled Waters GAC	Low foc <1% EQS
Sample Round	Fontwell Historical Data
Site	Fontwell

Chem Class	Analyte	HH	CW	MDL	Location	MW4			MW5			MW7		
					Depth Units	2	4	6	2	4	7	2	4	6
BTEX	Benzene	2.73	0.00179	0.01	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
	TOLUENE	>Sat	0.0226	0.01	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
	ETHYLBENZENE	>Sat	0.0188	0.01	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
	M. P. XYLENE	613	0.0285	0.01	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
	O. XYLENE	>Sat	0.0285	0.01	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
RISKT PH	RISK TPH C6 C7 AROM	>Sat	0.00179	0.01	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RISK TPH C7 C8 AROM	>Sat	0.0226	0.01	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RISK TPH C8 C10 AROM	387	0.969	0.01	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RISK TPH C10 C12 AROM	>Sat	0.456	0.1	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RISK TPH C12 C16 AROM	>Sat	0.905	0.1	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RISK TPH C16 C21 AROM	>Sat	2.55	0.1	mg/kg	3	2.8	2.4	3.7	3.2	3.9	3.8	2.9	2.3
	RISK TPH C21 C35 AROM	>Sat	22.7	0.1	mg/kg	ND	ND	2.7	3.7	0.4	ND	3.8	ND	ND
	RISK TPH C6 C35 AROM	(blank)	(blank)	0.1	mg/kg	3	2.8	5.1	7.4	3.6	3.9	7.6	2.9	2.3
	RISK TPH C5 C6 ALI	369	60.1	0.01	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RISK TPH C6 C8 ALI	>Sat	160	0.01	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RISK TPH C8 C10 ALI	>Sat	19.5	0.01	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RISK TPH C10 C12 ALI	>Sat	146	0.01	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RISK TPH C12 C16 ALI	>Sat	3230	0.1	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RISK TPH C16 C21 ALI	>Sat	379000	0.1	mg/kg	3	3.5	2.4	3.7	2.9	3.9	3.8	3.6	3
	RISK TPH C21 C35 ALI	>Sat	4550000	0.1	mg/kg	ND	ND	ND	ND	ND	ND	ND	1.1	ND
	RISK TPH C5 C35 ALI	(blank)	(blank)	0.1	mg/kg	3	3.5	2.4	3.7	2.9	3.9	3.8	4.7	3
	TPH. STAGE2 HI	1	(blank)	0.1	ratio	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
VOC	TETRAETHYL LEAD	(blank)	(blank)	0.01	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
	MTBE	685	0.00302	0.01	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
	TAME	20.8	0.0181	0.01	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND

XX	Exceeds Human Health & Controlled Waters
XX	Exceeds Human Health Criteria
XX	Exceeds Controlled Waters Criteria

CSM / Assumptions:

Soil 1% SOM (0.58% TOC)
 Soil properties for "sand"
 Commercial site area 0.5ha
 Soil gas ingress rates calculated by model
 Infinite groundwater source at 1m.bgl for groundwater GAC
 High density residential assume vapour exposure pathways only
 CPU scenario modified from modelled commercial scenario by:
 Building dimensions (l x w x h): 14m x 6.5m x 2.4m
 Differential pressure: 2.6 pascals
 Only vapour exposure pathways considered viable
 Derived November 2010 using Human7.1 Issue9. MTF.

ND: Not detected above MDL
 HH: Human Health
 GAC: Generic Assessment Criteria
 (blank): No criteria
 NP: No pathway
 >Sat: Unacceptable risk not achieved due to calculated saturation of vapour pathway
 NT: Not tested



URS Corporation Limited
St. George's House
2nd Floor
5 St. George's Road
Wimbledon
Greater London
SW19 4DR

Attention: Ben Schultz

CERTIFICATE OF ANALYSIS

Date: 18 January 2011
Customer: H_URS_WIM
Sample Delivery Group (SDG): 110113-22
Your Reference: 49319164
Location: shell fontwell
Report No: 111453

We received 9 samples on Thursday January 13, 2011 and 8 of these samples were scheduled for analysis which was completed on Tuesday January 18, 2011. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

All chemical testing (unless subcontracted) is performed at ALcontrol Hawarden Laboratories.

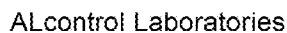
Asbestos testing - we are not accredited for screening soil samples for asbestos fibres. We are only accredited to identify asbestos fibres in bulk material (ACM).

Approved By:

Sonia McWhan

Laboratory Manager





Validated

SDG: 110113-22
Job: H_URS_WIM-60
Client Reference: 49319164

Location: shell fontwell
Customer: URS Corporation Limited
Attention: Ben Schultz

Order Number:
Report Number: 111453
Superseded Report:

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
2677326	ACTIVE			11/01/2011
2677322	DUP-01			11/01/2011
2677324	EQUIPMENT			11/01/2011
2677318	MW2			11/01/2011
2677319	MW4			11/01/2011
2677320	MW5			11/01/2011
2677321	MW7			11/01/2011
2677325	STATIC			11/01/2011
2677323	TRIP BLANK			11/01/2011

Only received samples which have had analysis scheduled will be shown on the following pages.

SDG: 110113-22
Job: H_URS_WIM-60
Client Reference: 49319164

Location: shell fontwell
Customer: URS Corporation Limited
Attention: Ben Schultz

Order Number:
Report Number: 111453
Superseded Report:

Test Schedule

[illegible]

Location: shell fontwell
Customer: URS Corporation Limited
Attention: Ben Schultz

SDG: 110113-22
Job: H_URS_WIM-60
Client Reference: 49319164

Order Number:
Report Number: 111453
Superseded Report:

ARUN DISTRICT COUNCIL WA/92/117
14.05.30 18/01/2011

Order Number:
Report Number: 111453
Superseded Report:

ARUN DISTRICT COUNCIL WA/92/117
14.05.30 18/01/2011

Order Number:
Report Number: 111453
Superseded Report:

ARUN DISTRICT COUNCIL WA/92/117
14:05:30 18/01/2011

Order Number:
Report Number: 111453
Superseded Report:

STATIC

Water(GW/SW)
11/01/2011
13/01/2011
110113-22
2677325

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Order Number:
Report Number: 111453
Superseded Report:

ACTIVE	DUP-01	EQUIPMENT	MW2	MW4	MW5
Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)
11/01/2011	11/01/2011	11/01/2011	11/01/2011	11/01/2011	11/01/2011
13/01/2011	13/01/2011	13/01/2011	13/01/2011	13/01/2011	13/01/2011
110113-22	110113-22	110113-22	110113-22	110113-22	110113-22
2677326	2677322	2677324	2677318	2677319	2677320

ARUN DISTRICT COUNCIL WA/92/117
14.05.30 18/01/2011

Order Number:
Report Number: 111453
Superseded Report:

STATIC

Water(GW/SW)
11/01/2011
13/01/2011
110113-22
2677325

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Order Number:
Report Number: 111453
Superseded Report:

Page 10 of 58

Order Number:
Report Number: 111453
Superseded Report:

STATIC

2677325

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Order Number:
Report Number: 111453
Superseded Report:

ARUN DISTRICT COUNCIL WA/92/117
14.05.30 18/01/2011

Order Number:
Report Number: 111453
Superseded Report:

~~~~~  
STATIC

Water(GW/SW)  
11/01/2011  
13/01/2011  
110113-22  
2677325

Page 13 of 58

Order Number:  
Report Number: 111453  
Superseded Report:

ARUN DISTRICT COUNCIL WA/92/117  
14:05:30 18/01/2011

Order Number:  
Report Number: 111453  
Superseded Report:

~~~~~  
STATIC

Water(GW/SW)
11/01/2011
13/01/2011
110113-22
2677325

ARUN DISTRICT COUNCIL WA/92/117
14.05.30 18/01/2011

Location: shell fontwell
Customer: URS Corporation Limited
Attention: Ben Schultz

SDG: 110113-22
Job: H_URS_WIM-60
Client Reference: 49319164

Order Number:
Report Number: 111453
Superseded Report:

[illegible]

Order Number:
Report Number: 111453
Superseded Report:

ARUN DISTRICT COUNCIL WA/92/117
14.05.30 18/01/2011

SDG: 110113-22
Job: H_URS_WIM-60
Client Reference: 49319164

Location: shell fontwell
Customer: URS Corporation Limited
Attention: Ben Schultz

Order Number:
Report Number: 111453
Superseded Report:

Table of Results - Appendix

REPORT KEY

REPORT KEY						Results expressed as (e.g.) 1.03E-07 is equivalent to 1.03x10 ⁻⁷	
NDP	No Determination Possible	A	ISO 17025 Accredited	S	Subcontracted Test	MC	MCERTS Accredited
NFD	No Fibres Detected	PF	Possible Fibres Detected	R	Result previously reported (Incremental reports only)	EC	Equivalent Carbon (Aromatics C8-C35)

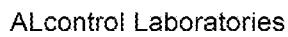
Note: Method detection limits are not always achievable due to various circumstances beyond our control

Method No.	Reference	Description	Writing Partner	Sampling Contracted
SUB		Subcontracted Test		
TM061	Method for the Determination of EPH, Massachusetts Dept. of EP, 1998	Determination of Extractable Petroleum Hydrocarbons by GC-FID (C10-C40)		
TM152	Method 3125B, AWWA/APHA, 20th Ed., 1999	Analysis of Aqueous Samples by ICP-MS		
TM172	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	EPH in Waters		
TM174	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	Determination of Speciated Extractable Petroleum Hydrocarbons in Waters by GC-FID		
TM178	Modified: US EPA Method 8100	Determination of Polynuclear Aromatic Hydrocarbons (PAH) by GC-MS in Waters		
TM183	BS EN 23506:2002, (BS 6068-2.74:2002) ISBN 0 580 38924 3	Determination of Trace Level Mercury in Waters and Leachates by PSA Cold Vapour Atomic Fluorescence Spectrometry		
TM208	Modified: US EPA Method 8260b & 624	Determination of Volatile Organic Compounds by Headspace / GC-MS in Waters		
TM232	USEPA Method No. 8260b 'Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC-MS)'	Determination of Volatile Alcohols, Acetates and Ketones in Waters by Headspace GC-MS		
TM245	By GC-FID	Determination of GRO by Headspace in waters		

¹ Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = not applicable.

Order Number:
Report Number: 111453
Superseded Report:

[illegible]



Validated

CERTIFICATE OF ANALYSIS

Order Number:
Report Number: 111453
Superseded Report:

ASSOCIATED AQC DATA



CERTIFICATE OF ANALYSIS

SDG: 110113-22
Job: H_URS_WIM-60
Client Reference: 49319164

Location: shell fontwell
Customer: URS Corporation Limited
Attention: Ben Schultz

Order Number:
Report Number: 111453
Superseded Report:

Dissolved Metals by ICP-MS

Component	Method Code	QC 23	QC 26	QC 22
Aluminium	TM152	100.75 85.00 : 115.00	97.28 85.00 : 115.00	100.83 85.00 : 115.00
Antimony	TM152	95.80 85.00 : 115.00	96.49 85.00 : 115.00	96.51 85.00 : 115.00
Arsenic	TM152	101.75 85.00 : 115.00	102.47 85.00 : 115.00	102.12 85.00 : 115.00
Barium	TM152	104.27 85.00 : 115.00	105.23 85.00 : 115.00	103.25 85.00 : 115.00
Beryllium	TM152	100.21 85.00 : 115.00	104.43 85.00 : 115.00	101.52 85.00 : 115.00
Bismuth	TM152	102.12 85.00 : 115.00	104.60 85.00 : 115.00	100.24 85.00 : 115.00
Boron	TM152	101.27 85.00 : 115.00	101.51 85.00 : 115.00	100.67 85.00 : 115.00
Cadmium	TM152	101.84 85.00 : 115.00	101.87 85.00 : 115.00	102.77 85.00 : 115.00
Chromium	TM152	102.57 85.00 : 115.00	100.80 85.00 : 115.00	103.79 85.00 : 115.00
Cobalt	TM152	102.44 85.00 : 115.00	100.95 85.00 : 115.00	103.55 85.00 : 115.00
Copper	TM152	101.83 85.00 : 115.00	99.47 85.00 : 115.00	103.57 85.00 : 115.00
Lead	TM152	101.05 85.00 : 115.00	106.71 85.00 : 115.00	99.13 85.00 : 115.00
Lithium	TM152	105.57 85.00 : 115.00	105.43 85.00 : 115.00	101.32 85.00 : 115.00
Manganese	TM152	102.27 85.00 : 115.00	102.64 85.00 : 115.00	102.65 85.00 : 115.00
Molybdenum	TM152	90.83 85.00 : 115.00	103.11 85.00 : 115.00	90.73 85.00 : 115.00
Nickel	TM152	101.15 85.00 : 115.00	97.24 85.00 : 115.00	102.32 85.00 : 115.00
Phosphorus	TM152	102.89 85.00 : 115.00	99.49 85.00 : 115.00	100.24 85.00 : 115.00
Selenium	TM152	102.32 85.00 : 115.00	102.67 85.00 : 115.00	101.64 85.00 : 115.00
Silver	TM152	99.19 85.00 : 115.00	99.71 85.00 : 115.00	99.81 85.00 : 115.00
Strontium	TM152	105.47 85.00 : 115.00	105.32 85.00 : 115.00	103.41 85.00 : 115.00
Tellurium	TM152	105.60 85.00 : 115.00	106.08 85.00 : 115.00	102.03 85.00 : 115.00
Thallium	TM152	101.31 85.00 : 115.00	104.93 85.00 : 115.00	100.67 85.00 : 115.00
Tin	TM152	93.60 85.00 : 115.00	94.24 85.00 : 115.00	94.77 85.00 : 115.00
Titanium	TM152	101.23 85.00 : 115.00	101.15 85.00 : 115.00	102.15 85.00 : 115.00
Uranium	TM152	102.73 85.00 : 115.00	105.36 85.00 : 115.00	103.63 85.00 : 115.00
Vanadium	TM152	102.51 85.00 : 115.00	97.73 85.00 : 115.00	102.89 85.00 : 115.00
Zinc	TM152	101.53 85.00 : 115.00	104.13 85.00 : 115.00	103.96 85.00 : 115.00

Order Number:
Report Number: 111453
Superseded Report:

66.32 : 108.71

71.03 : 104.04

65.00 : 117.38

79.41 : 116.68

SDG: 110113-22
Job: H_URS_WIM-60
Client Reference: 49319164

Location: shell fontwell
Customer: URS Corporation Limited
Attention: Ben Schultz

Order Number:
Report Number: 111453
Superseded Report:

PAH Spec MS - Aqueous Wt

Component	Method Code	QC 29
Acenaphthene by GCMS	TM178	97.17 82.69 : 106.11
Acenaphthylene by GCMS	TM178	95.81 82.16 : 104.82
Anthracene by GCMS	TM178	96.30 77.85 : 105.75
Benz(a)anthracene by GCMS	TM178	87.71 75.32 : 108.18
Benzo(a)pyrene by GCMS	TM178	97.93 86.69 : 118.58
Benzo(b)fluoranthene by GCMS	TM178	96.26 87.25 : 114.25
Benzo(ghi)perylene by GCMS	TM178	105.60 82.05 : 112.05
Benzo(k)fluoranthene by GCMS	TM178	104.02 87.20 : 122.40
Chrysene by GCMS	TM178	99.99 83.22 : 112.82
Dibenzo(ah)anthracene by GCMS	TM178	94.17 72.40 : 118.55
Fluoranthene by GCMS	TM178	95.53 87.00 : 105.75
Fluorene by GCMS	TM178	97.66 83.12 : 110.71
Indeno(123cd)pyrene by GCMS	TM178	99.17 82.25 : 114.75
Naphthalene by GCMS	TM178	98.55 84.07 : 108.07
Phenanthrene by GCMS	TM178	99.06 86.79 : 108.29
Pyrene by GCMS	TM178	97.06 84.55 : 108.55
Volume	TM178	15000.00

The above information details the reference name of the analytical quality control sample (AQC) that has been run with the samples contained in this report for the different methods of analysis.

The figure detailed is the percentage recovery result for the AQC.

The subscript numbers below are the percentage recovery lower control limit (LCL) and the upper control limit (UCL). The percentage recovery result for the AQC should be between these limits to be statistically in control.

SDG: 110113-22
Job: H_URS_WIM-60
Client Reference: 49319164

Location: shell fontwell
Customer: URS Corporation Limited
Attention: Ben Schultz

Order Number:
Report Number: 111453
Superseded Report:

Chromatogram

Analysis: EPH CWG (Aliphatic) Aqueous GC (W)

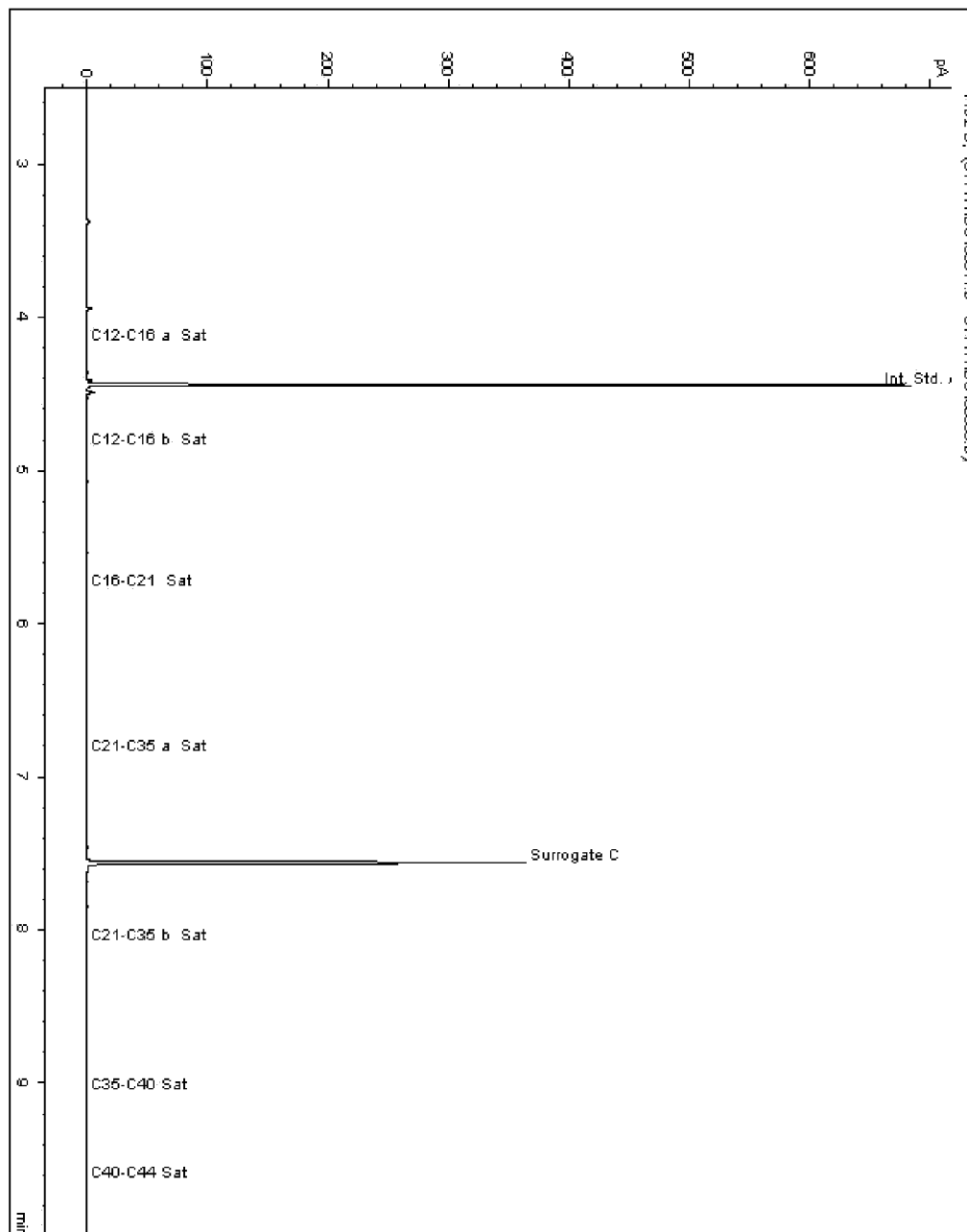
Sample No : 2679758

Depth :

Sample ID : STATIC

Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 2762647-2679758
Date Acquired : 15/01/11 00:31:47 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.017



Order Number:
Report Number: 111453
Superseded Report:

Depth :

Page 25 of 58

CERTIFICATE OF ANALYSIS

SDG: 110113-22
Job: H_URS_WIM-60
Client Reference: 49319164

Location: shell fontwell
Customer: URS Corporation Limited
Attention: Ben Schultz

Order Number:
Report Number: 111453
Superseded Report:

Chromatogram

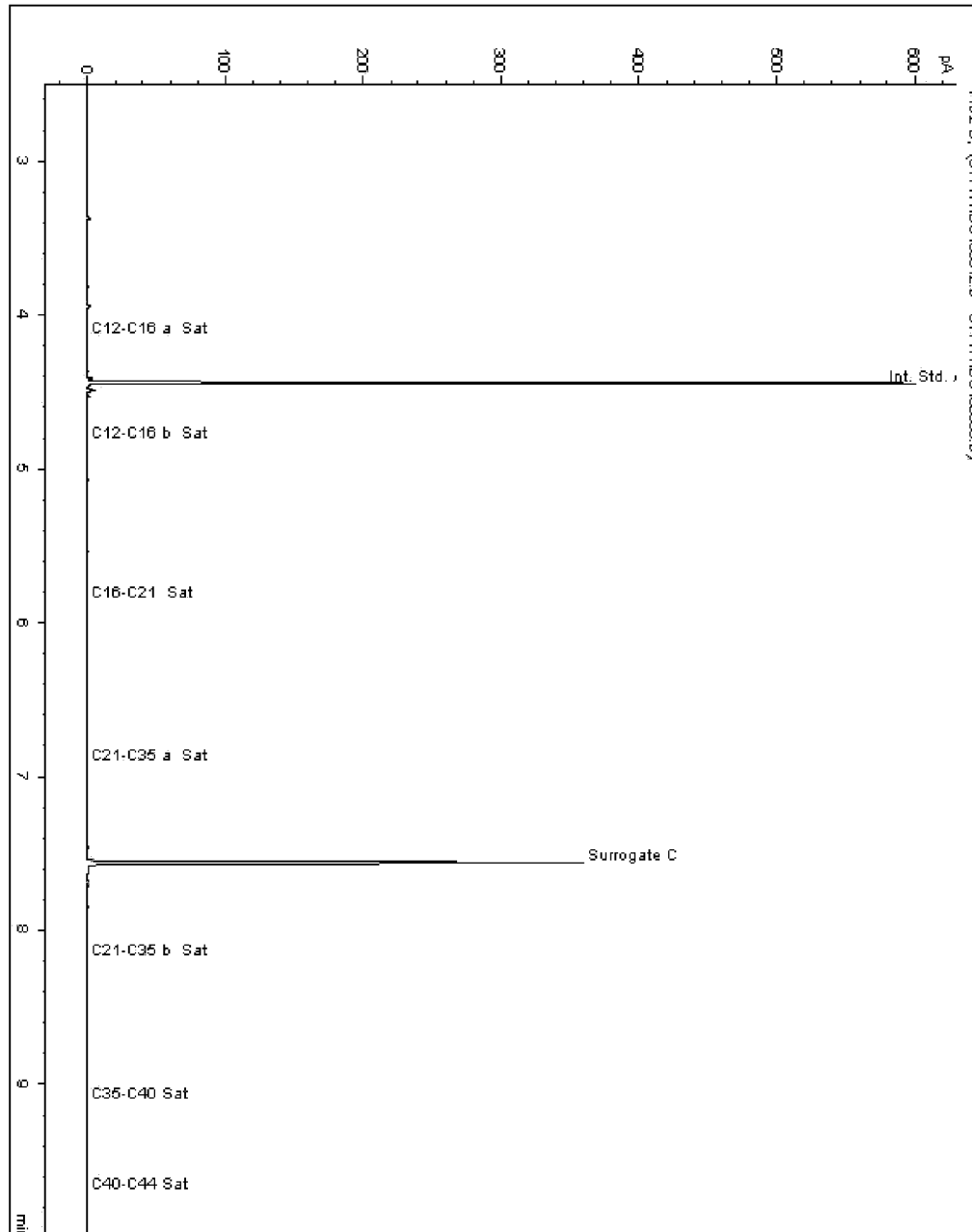
Analysis: EPH CWG (Aliphatic) Aqueous GC (W)

Sample No : 2679777
Sample ID : ACTIVE

Depth :

Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 2762659-2679777
Date Acquired : 15/01/11 00:50:24 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.017



CERTIFICATE OF ANALYSIS

SDG: 110113-22
Job: H_URS_WIM-60
Client Reference: 49319164

Location: shell fontwell
Customer: URS Corporation Limited
Attention: Ben Schultz

Order Number:
Report Number: 111453
Superseded Report:

Chromatogram

Analysis: EPH CWG (Aliphatic) Aqueous GC (W)

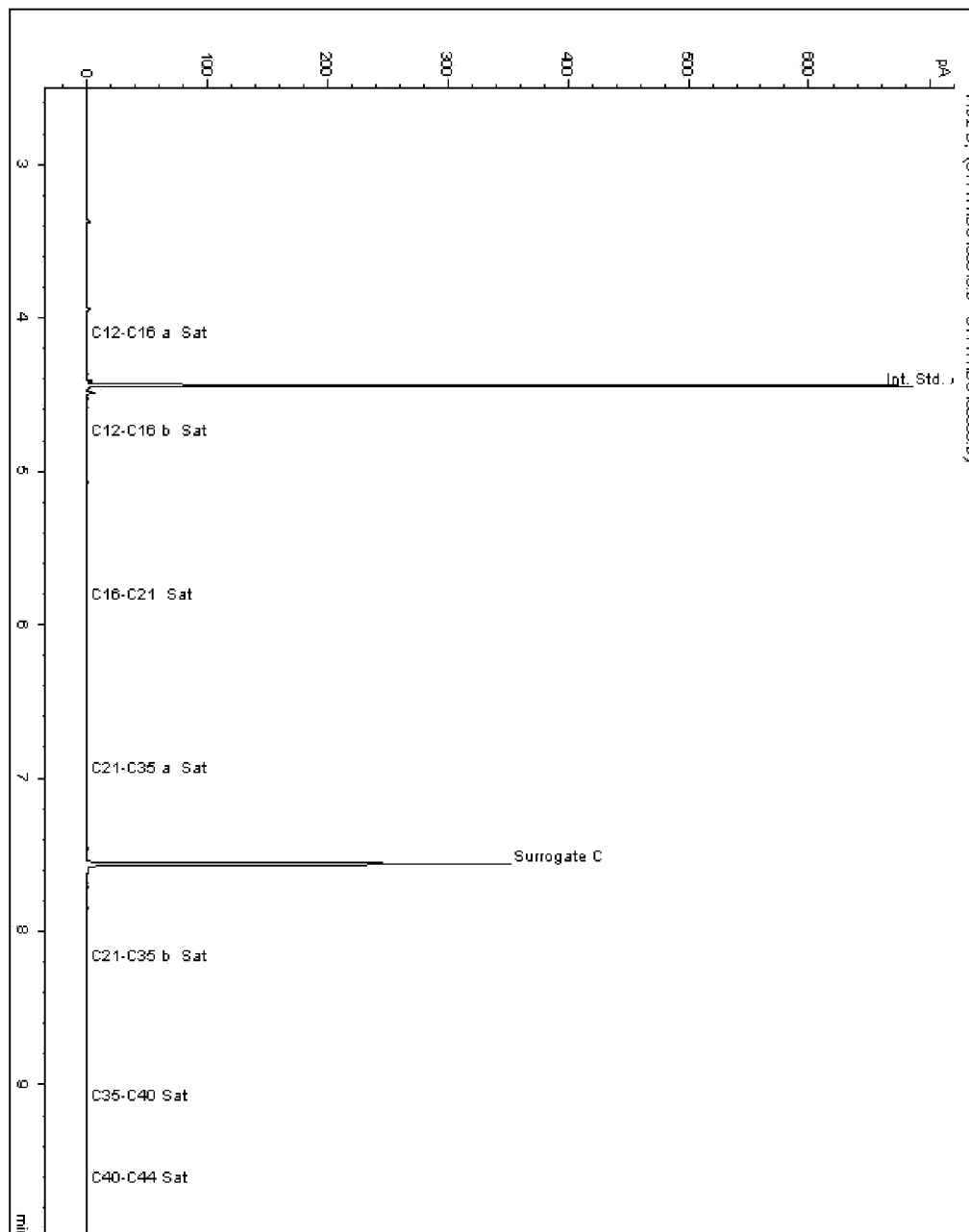
Sample No : 2679782

Depth :

Sample ID : DUP-01

Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 2762605-2679782
Date Acquired : 15/01/11 02:05:07 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.017



SDG: 110113-22
Job: H_URS_WIM-60
Client Reference: 49319164

Location: shell fontwell
Customer: URS Corporation Limited
Attention: Ben Schultz

Order Number:
Report Number: 111453
Superseded Report:

Chromatogram

Analysis: EPH CWG (Aliphatic) Aqueous GC (W)

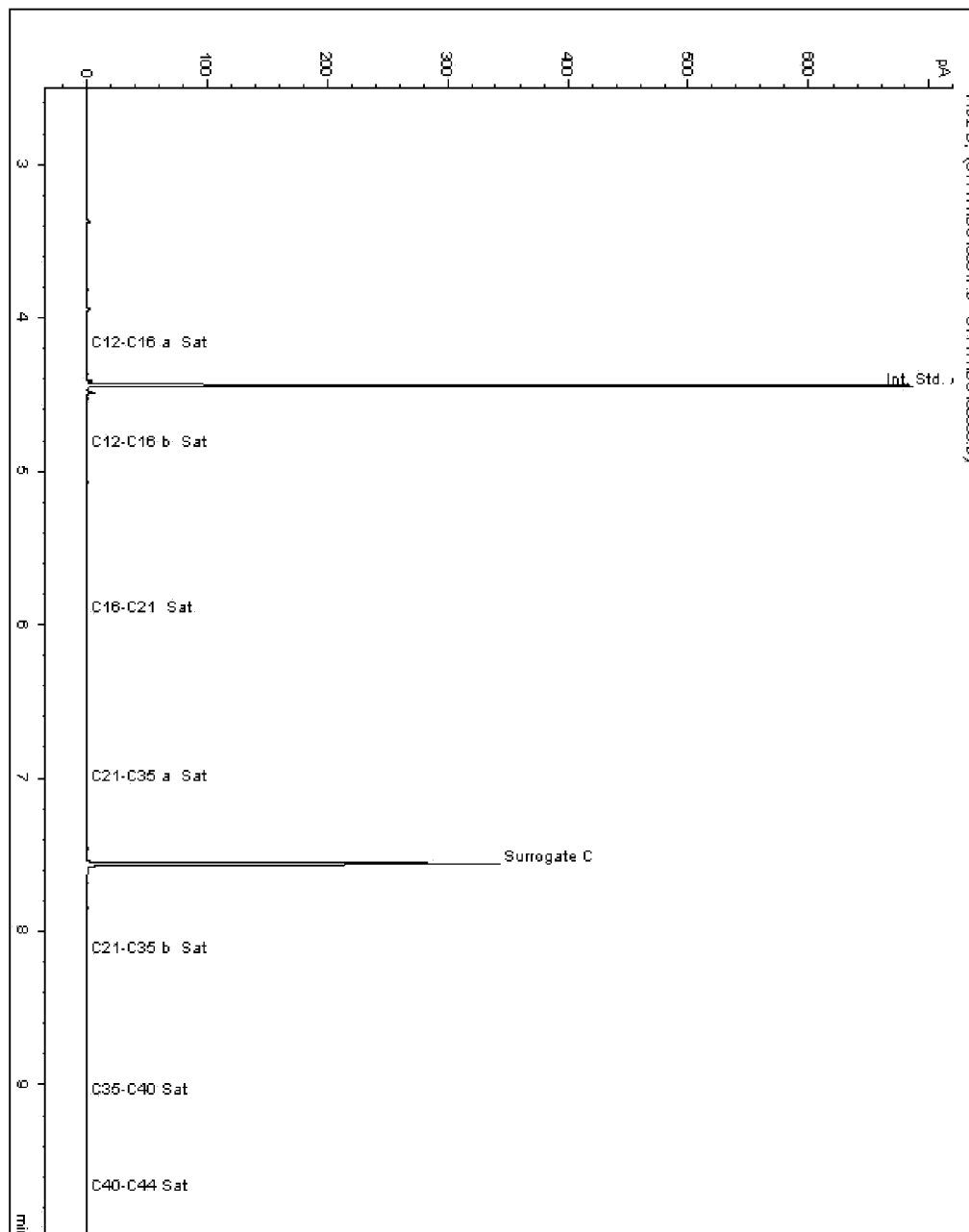
Sample No : 2679797

Depth :

Sample ID : MW7

Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 2762588-2679797
Date Acquired : 15/01/11 02:23:58 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.017



CERTIFICATE OF ANALYSIS

SDG: 110113-22
Job: H_URS_WIM-60
Client Reference: 49319164

Location: shell fontwell
Customer: URS Corporation Limited
Attention: Ben Schultz

Order Number:
Report Number: 111453
Superseded Report:

Chromatogram

Analysis: EPH CWG (Aliphatic) Aqueous GC (W)

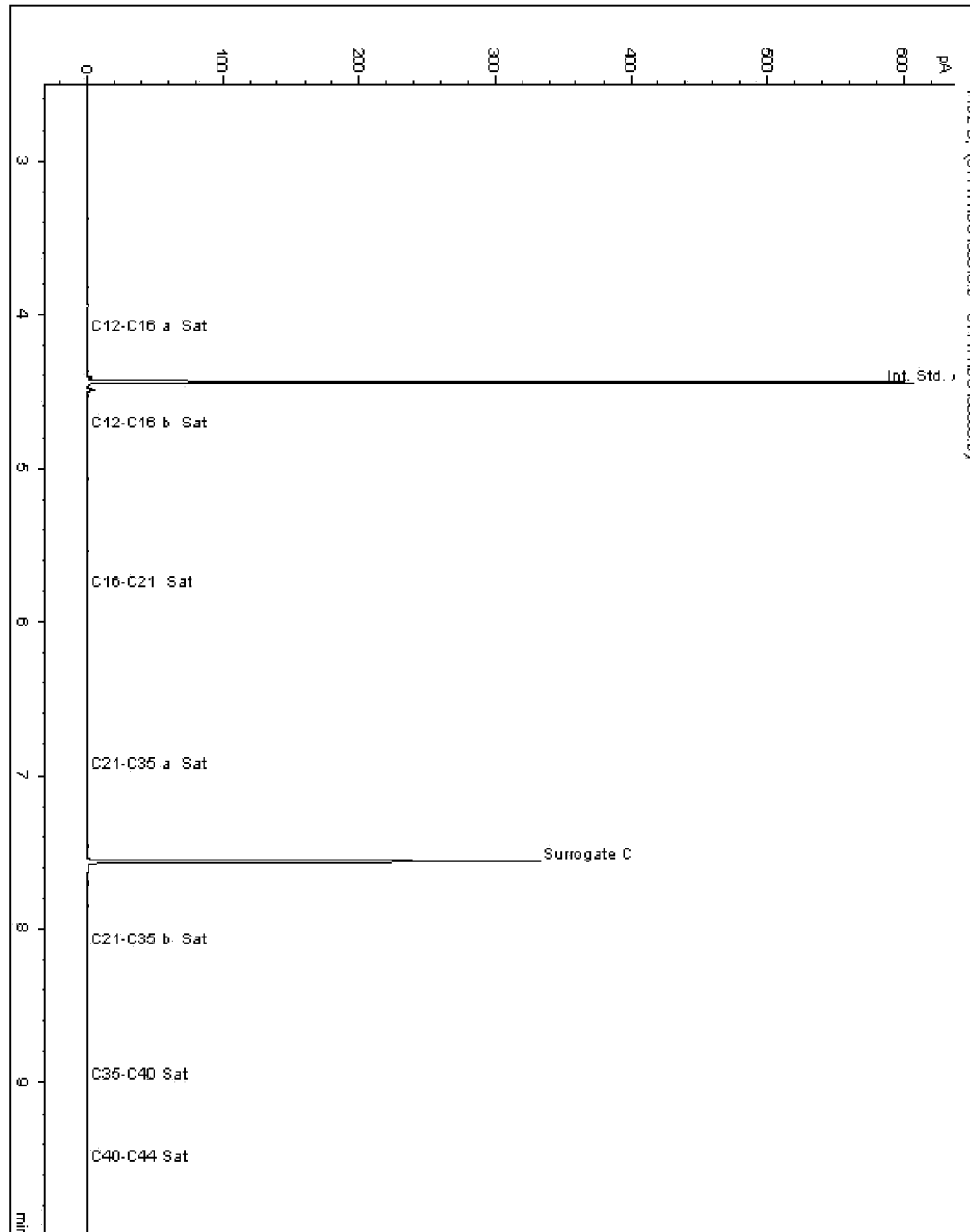
Sample No : 2679802

Depth :

Sample ID : EQUIPMENT

Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 2762625-2679802
Date Acquired : 15/01/11 01:46:27 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.017



SDG: 110113-22
Job: H_URS_WIM-60
Client Reference: 49319164

Location: shell fontwell
Customer: URS Corporation Limited
Attention: Ben Schultz

Order Number:
Report Number: 111453
Superseded Report:

Chromatogram

Analysis: EPH CWG (Aliphatic) Aqueous GC (W)

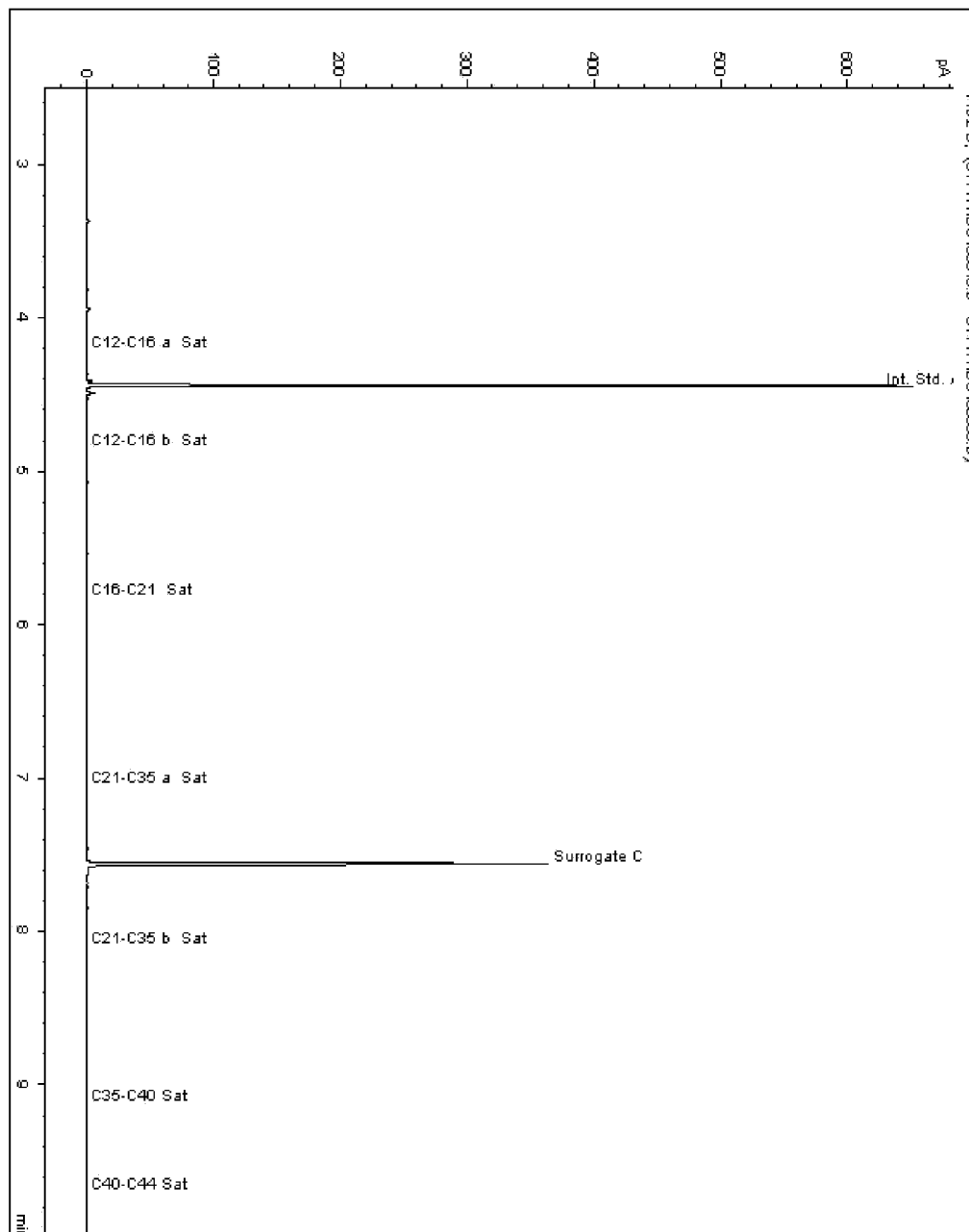
Sample No : 2679812

Depth :

Sample ID : MW4

Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 2762539-2679812
Date Acquired : 15/01/11 01:09:11 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.017



SDG: 110113-22
Job: H_URS_WIM-60
Client Reference: 49319164

Location: shell fontwell
Customer: URS Corporation Limited
Attention: Ben Schultz

Order Number:
Report Number: 111453
Superseded Report:

Chromatogram

Analysis: EPH CWG (Aliphatic) Aqueous GC (W)

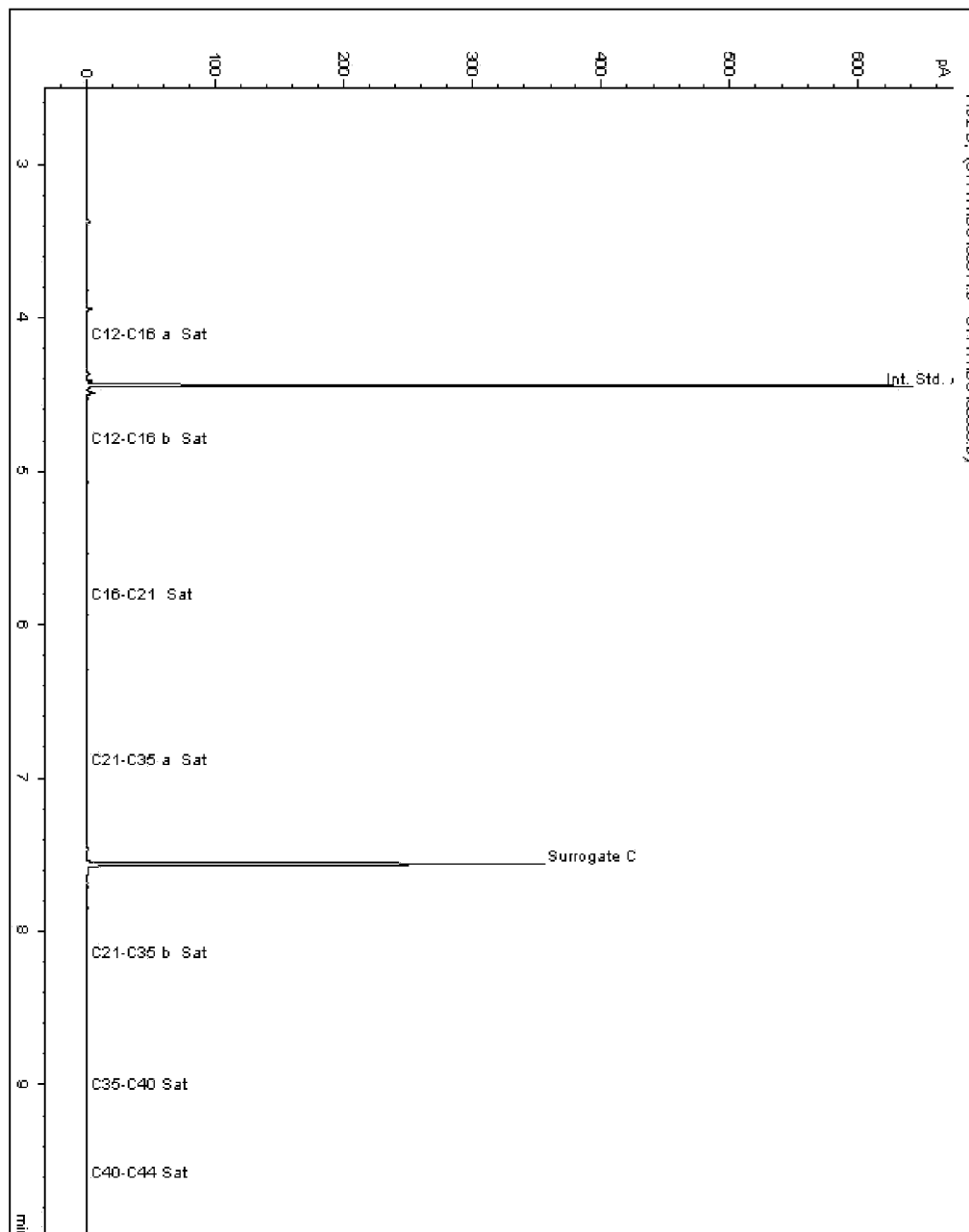
Sample No : 2679828

Depth :

Sample ID : MW2

Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 2762514-2679828
Date Acquired : 15/01/11 01:27:50 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.017



CERTIFICATE OF ANALYSIS

SDG: 110113-22
Job: H_URS_WIM-60
Client Reference: 49319164

Location: shell fontwell
Customer: URS Corporation Limited
Attention: Ben Schultz

Order Number:
Report Number: 111453
Superseded Report:

Chromatogram

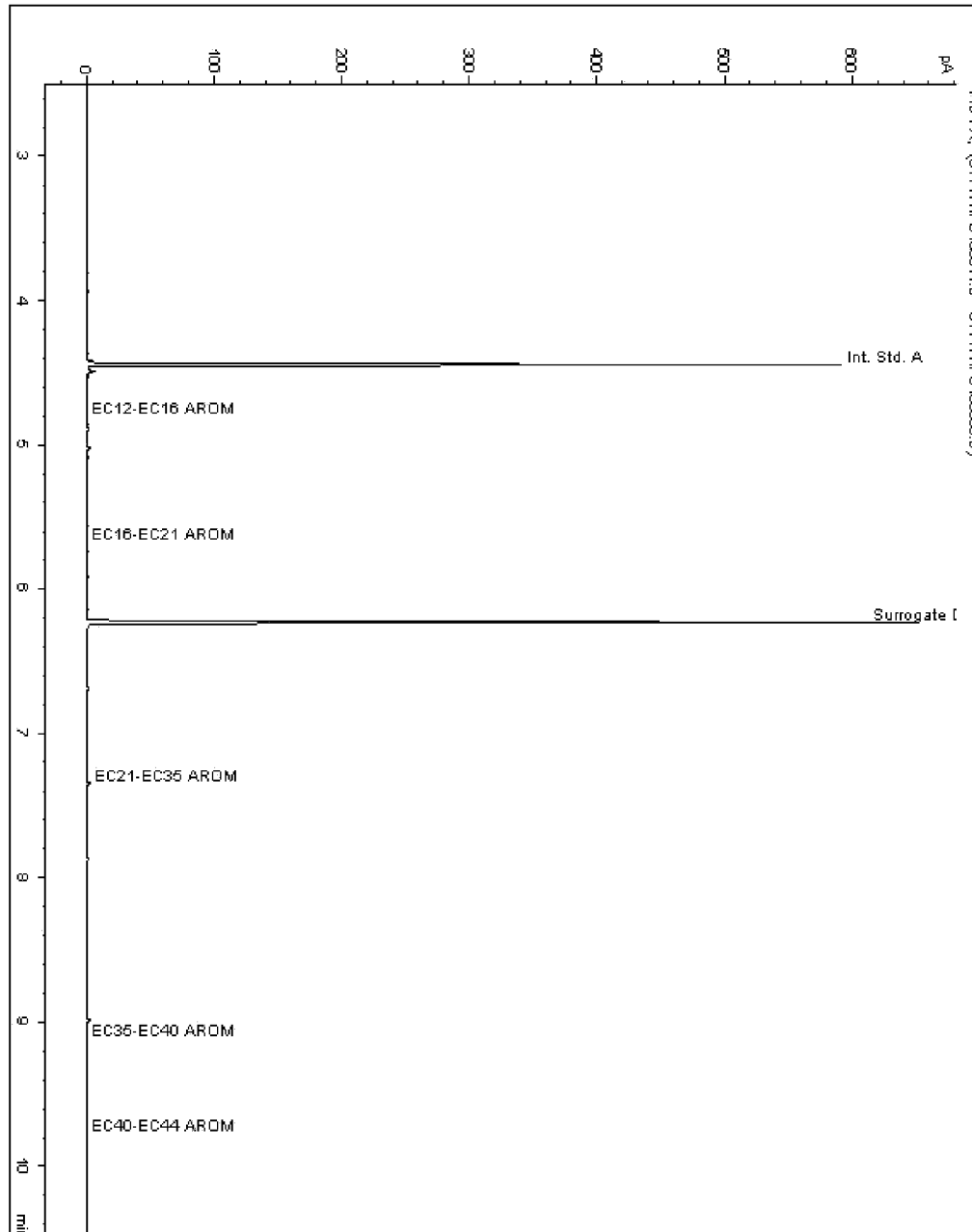
Analysis: EPH CWG (Aromatic) Aqueous GC (W)

Sample No : 2679758
Sample ID : STATIC

Depth :

Alcontrol/Geochem Analytical Services
Speciated TPH - AROM (C12 - C40)

Sample Identity: 2762648-2679758
Date Acquired : 15/01/11 00:31:48 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.017



Order Number:
Report Number: 111453
Superseded Report:

Analysis: EPH CWG (Aromatic) Aqueous GC (W)

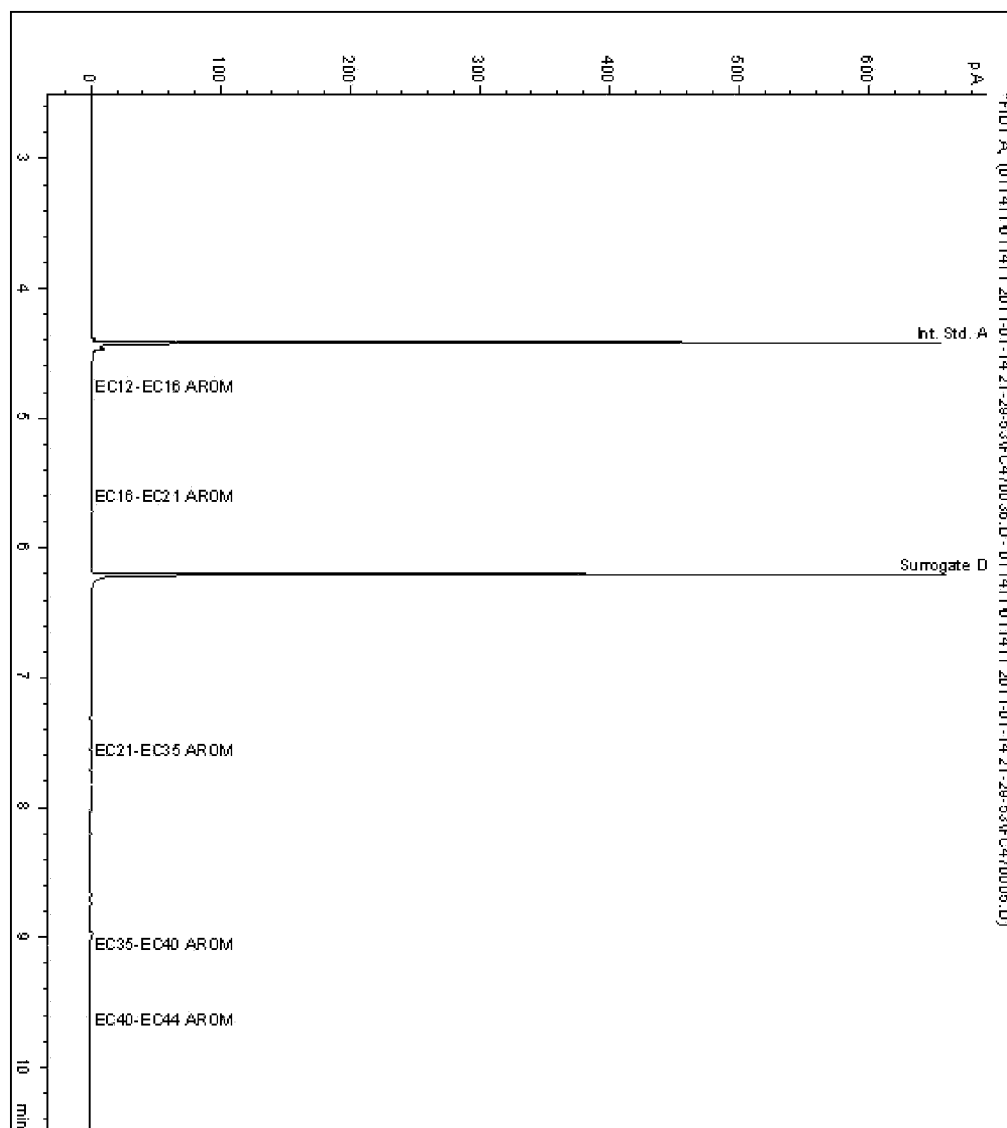
Sample No : 2679770

Depth :

Sample ID : MW5

Alcontrol/Geochem Analytical Services
Speciated TPH - AROM (C12 - C40)

Sample Identity: 2762563-2679770
Date Acquired : 15/01/11 08:25:21
Units :
Dilution :
CF : 1
Multiplier : 0.017



SDG: 110113-22
Job: H_URS_WIM-60
Client Reference: 49319164

Location: shell fontwell
Customer: URS Corporation Limited
Attention: Ben Schultz

Order Number:
Report Number: 111453
Superseded Report:

Chromatogram

Analysis: EPH CWG (Aromatic) Aqueous GC (W)

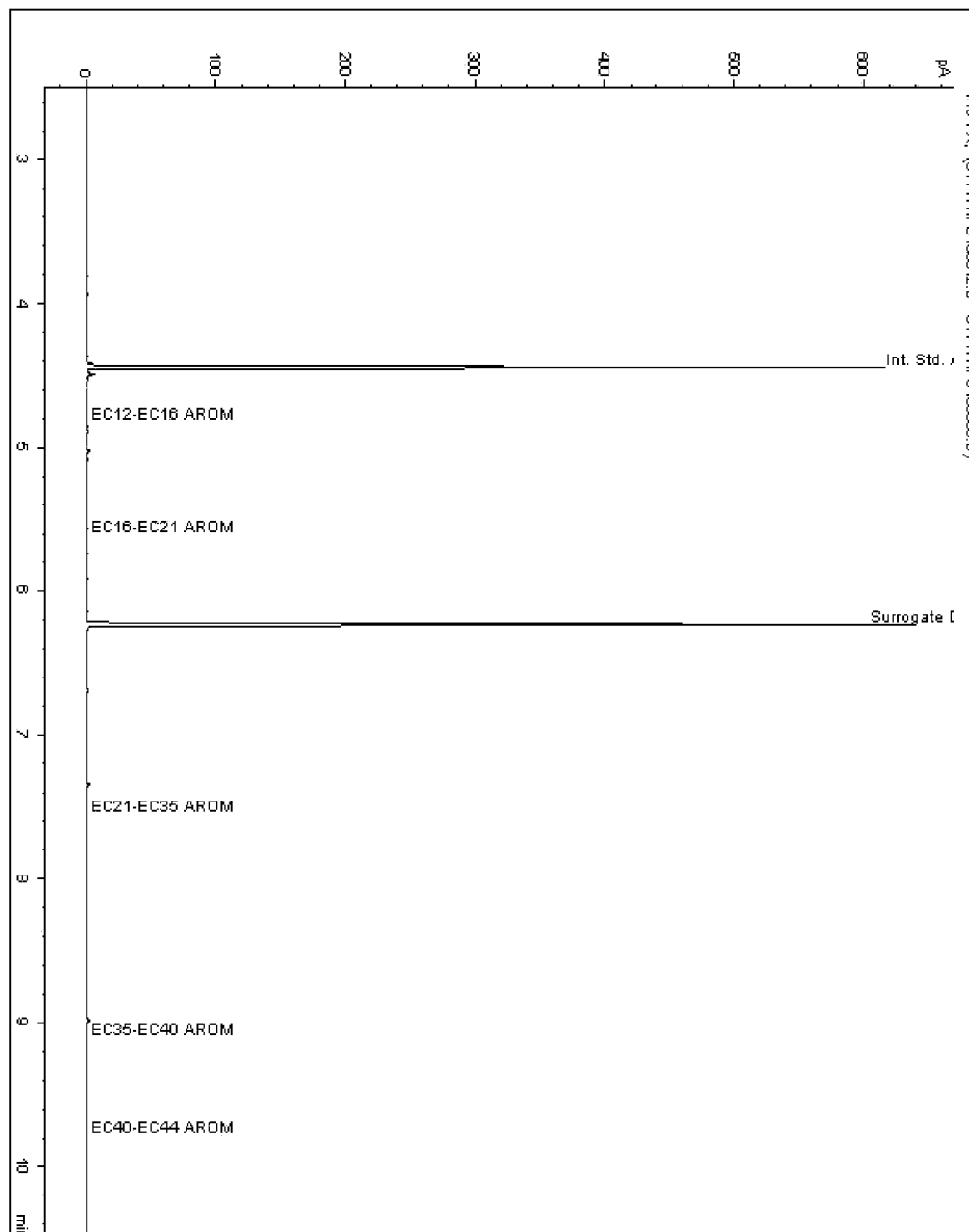
Sample No : 2679777

Depth :

Sample ID : ACTIVE

Alcontrol/Geochem Analytical Services
Speciated TPH - AROM (C12 - C40)

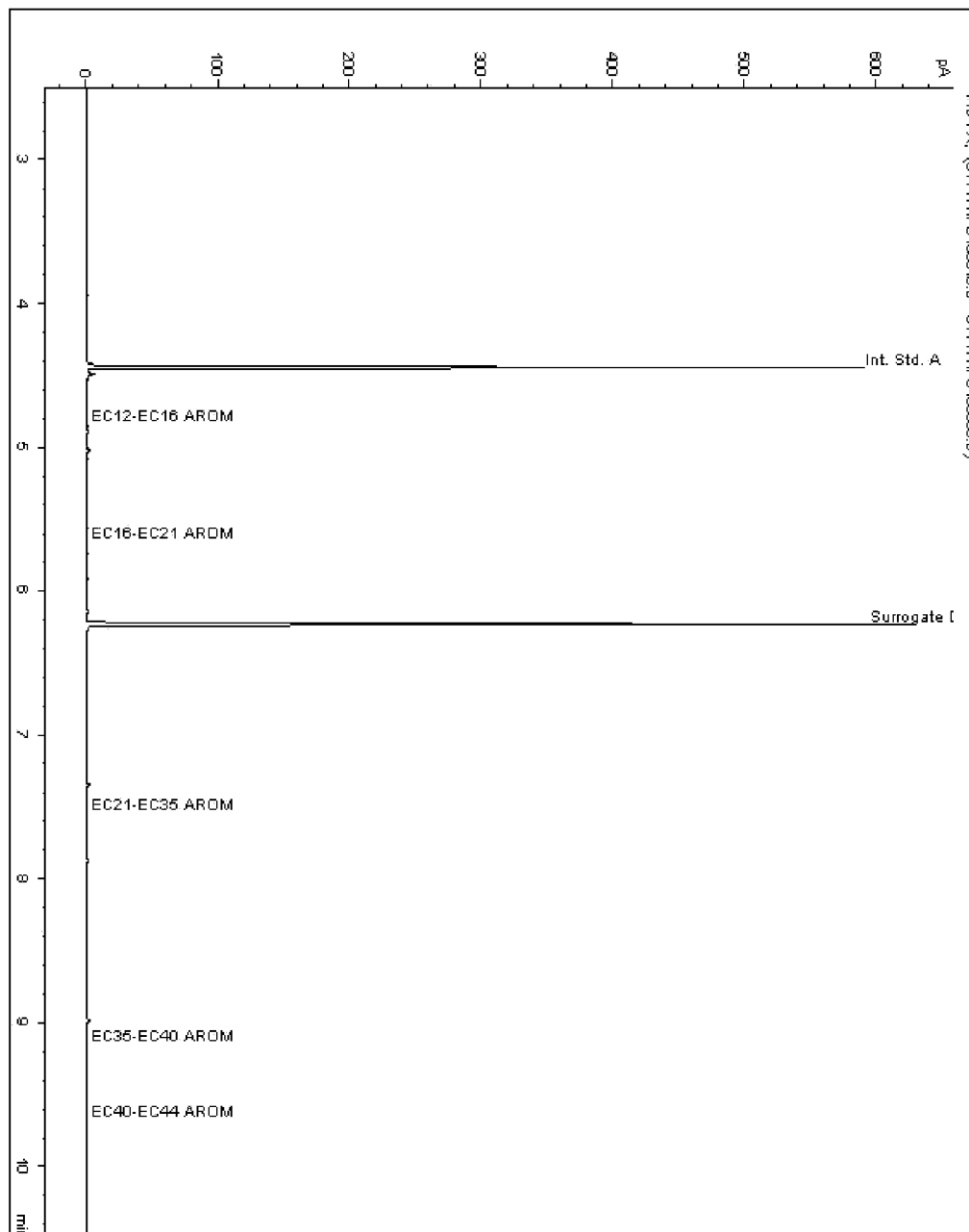
Sample Identity: 2762660-2679777
Date Acquired : 15/01/11 00:50:25 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.017



Order Number:
Report Number: 111453
Superseded Report:

Depth :

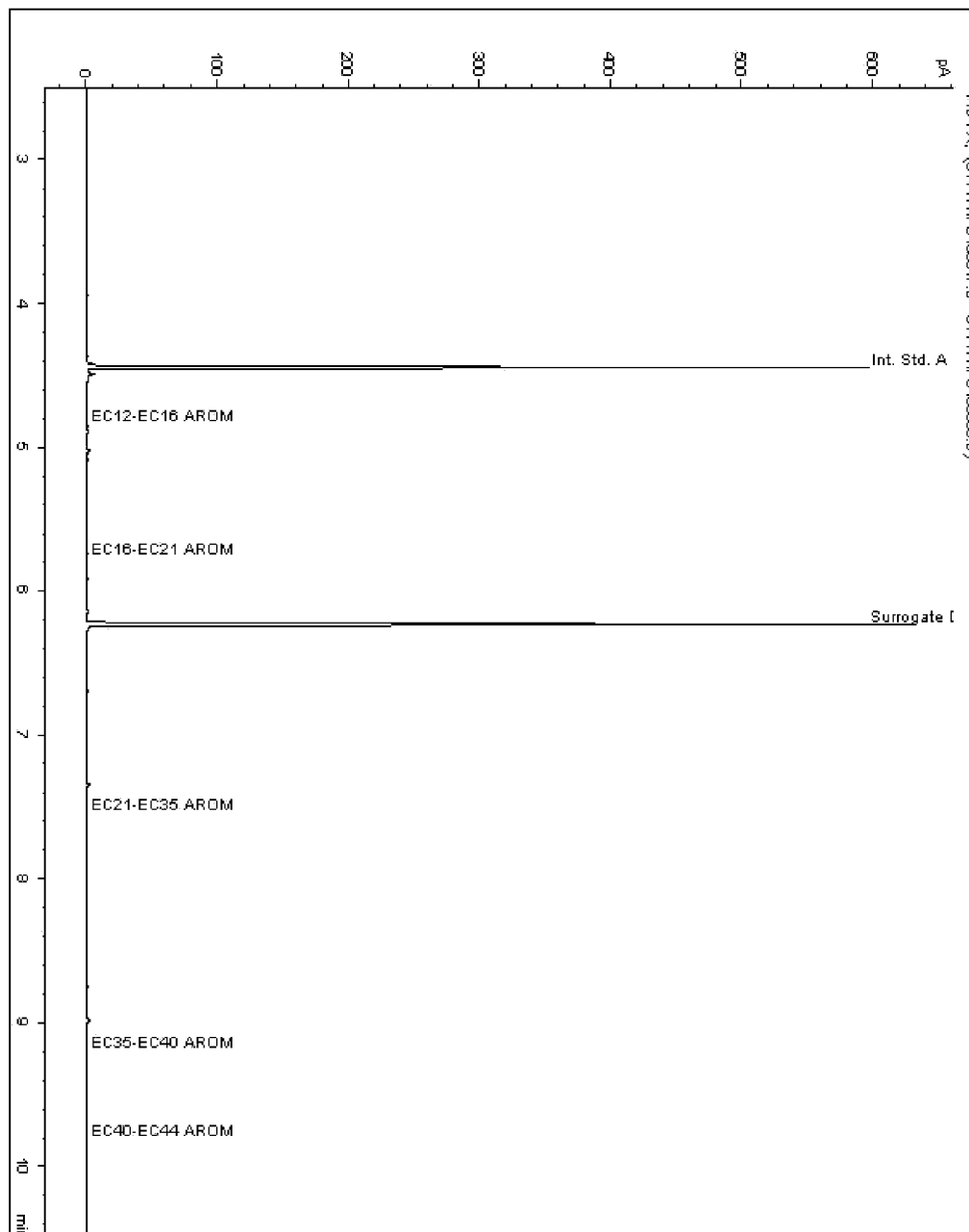
Sample Identity: 2762606-2679782
Date Acquired : 15/01/11 02:05:07 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.017



Order Number:
Report Number: 111453
Superseded Report:

Depth :

Sample Identity: 2762589-2679797
Date Acquired : 15/01/11 02:23:58 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.017





CERTIFICATE OF ANALYSIS

SDG: 110113-22
Job: H_URS_WIM-60
Client Reference: 49319164

Location: shell fontwell
Customer: URS Corporation Limited
Attention: Ben Schultz

Order Number:
Report Number: 111453
Superseded Report:

Chromatogram

Analysis: EPH CWG (Aromatic) Aqueous GC (W)

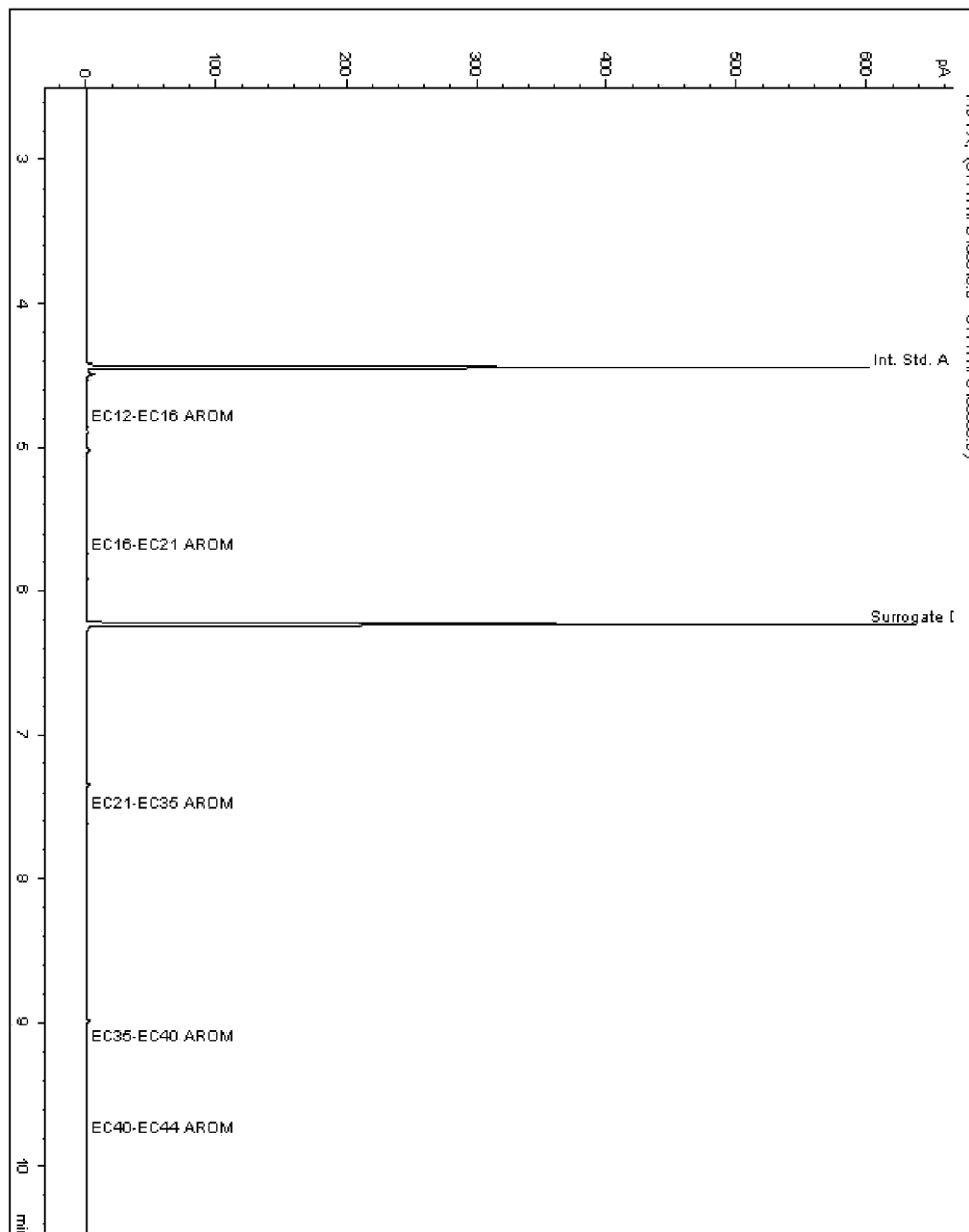
Sample No : 2679802

Depth :

Sample ID : EQUIPMENT

Alcontrol/Geochem Analytical Services
Speciated TPH - AROM (C12 - C40)

Sample Identity: 2762626-2679802
Date Acquired : 15/01/11 01:46:27 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.017



SDG: 110113-22
Job: H_URS_WIM-60
Client Reference: 49319164

Location: shell fontwell
Customer: URS Corporation Limited
Attention: Ben Schultz

Order Number:
Report Number: 111453
Superseded Report:

Chromatogram

Analysis: EPH CWG (Aromatic) Aqueous GC (W)

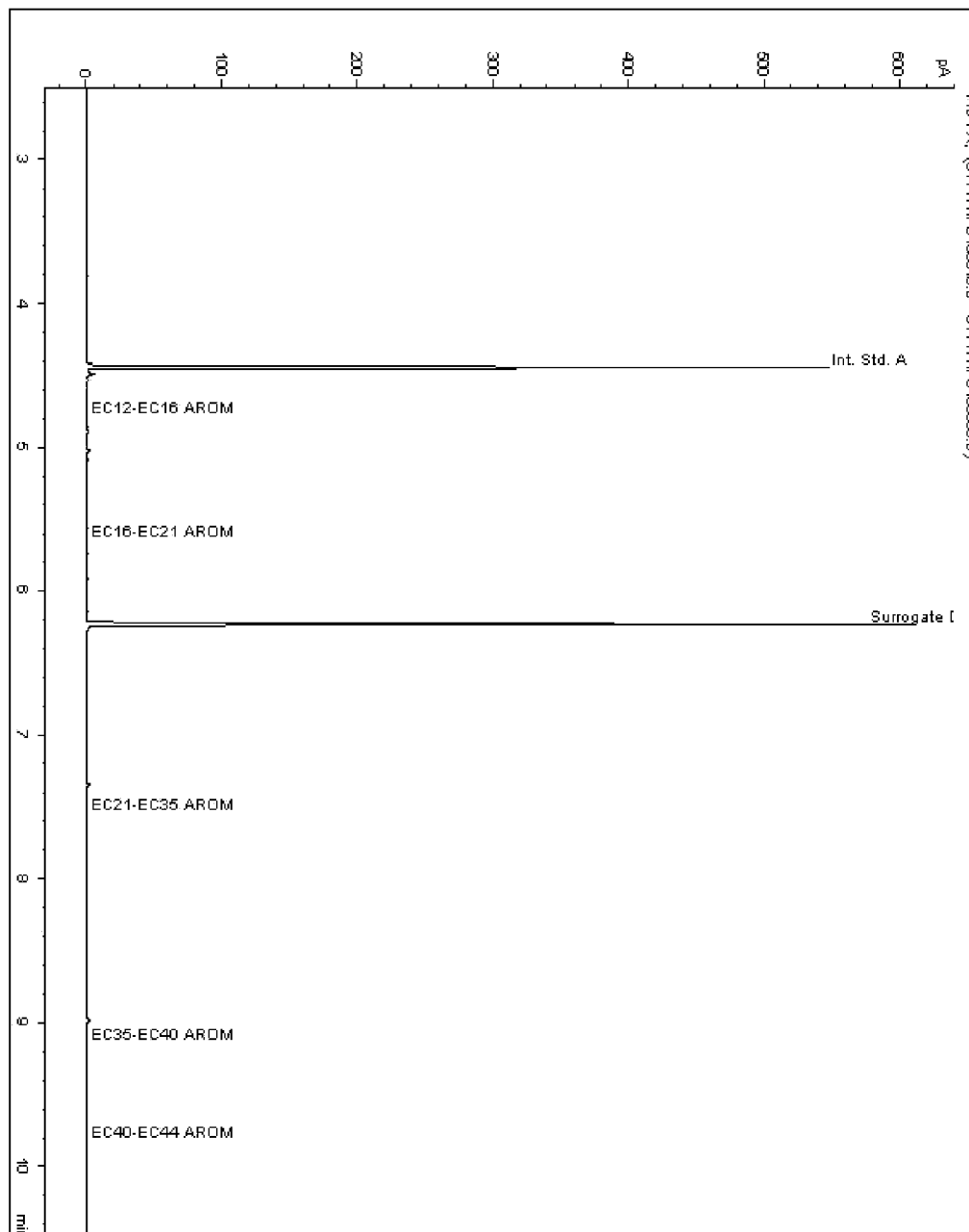
Sample No : 2679812

Depth :

Sample ID : MW4

Alcontrol/Geochem Analytical Services
Speciated TPH - AROM (C12 - C40)

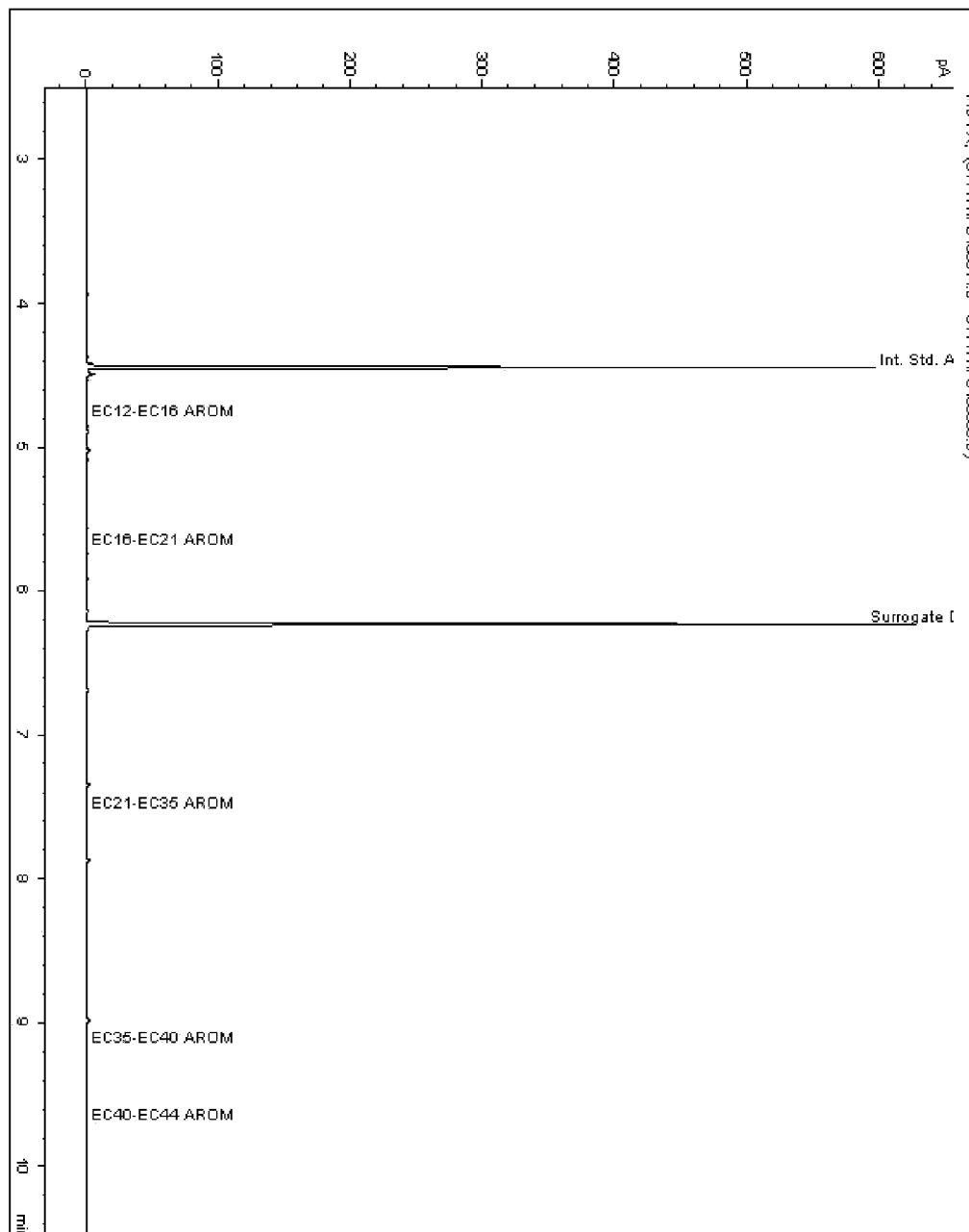
Sample Identity: 2762540-2679812
Date Acquired : 15/01/11 01:09:11 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.017



Order Number:
Report Number: 111453
Superseded Report:

Depth :

Sample Identity: 2762515-2679828
Date Acquired : 15/01/11 01:27:50 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.017



SDG: 110113-22
Job: H_URS_WIM-60
Client Reference: 49319164

Location: shell fontwell
Customer: URS Corporation Limited
Attention: Ben Schultz

Order Number:
Report Number: 111453
Superseded Report:

Chromatogram

Analysis: EPH (DRO) (C10-C40) Aqueous (W)

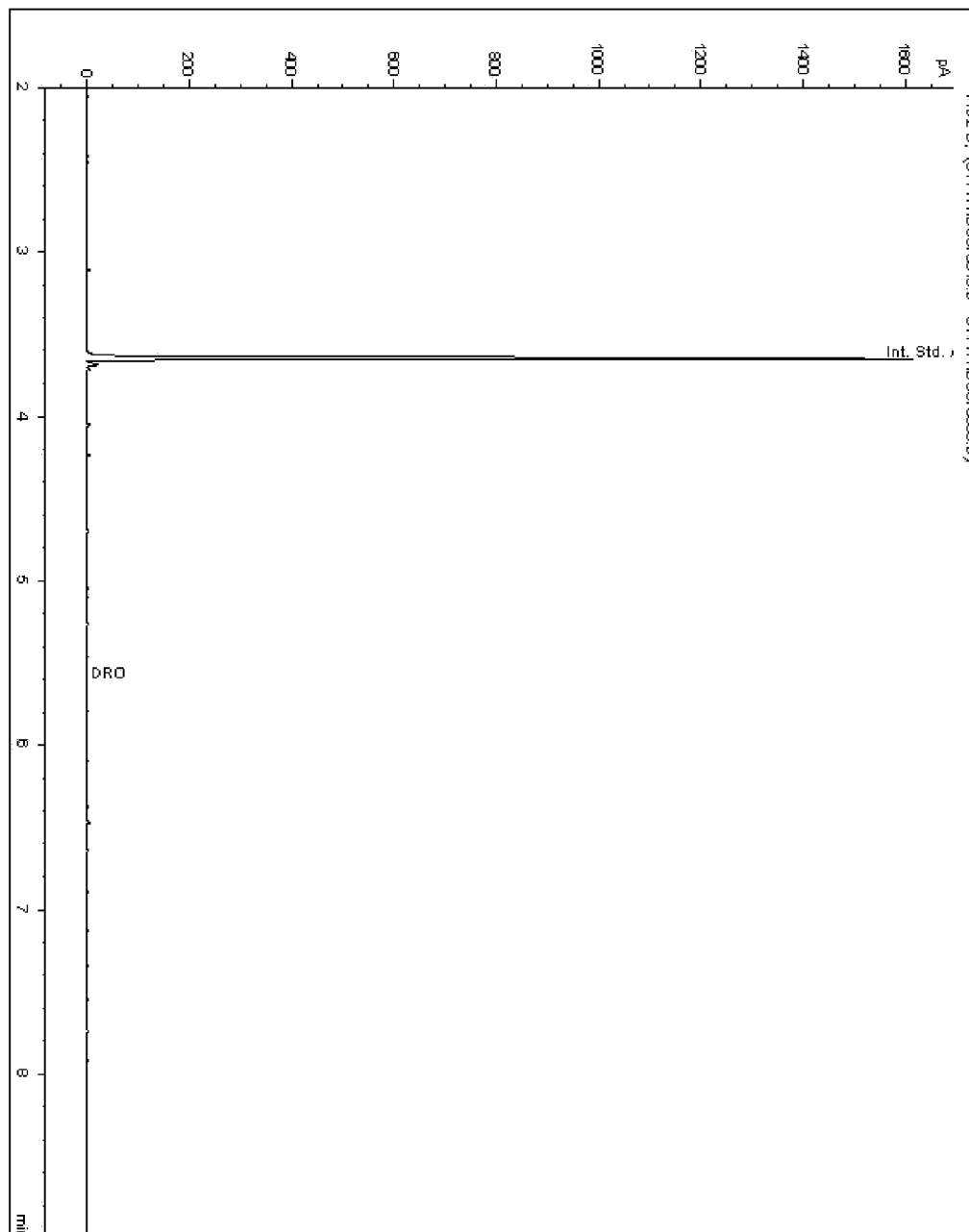
Sample No : 2679758

Depth :

Sample ID : STATIC

Alcontrol Analytical Services
EPH Range Organics (C10 - C40)

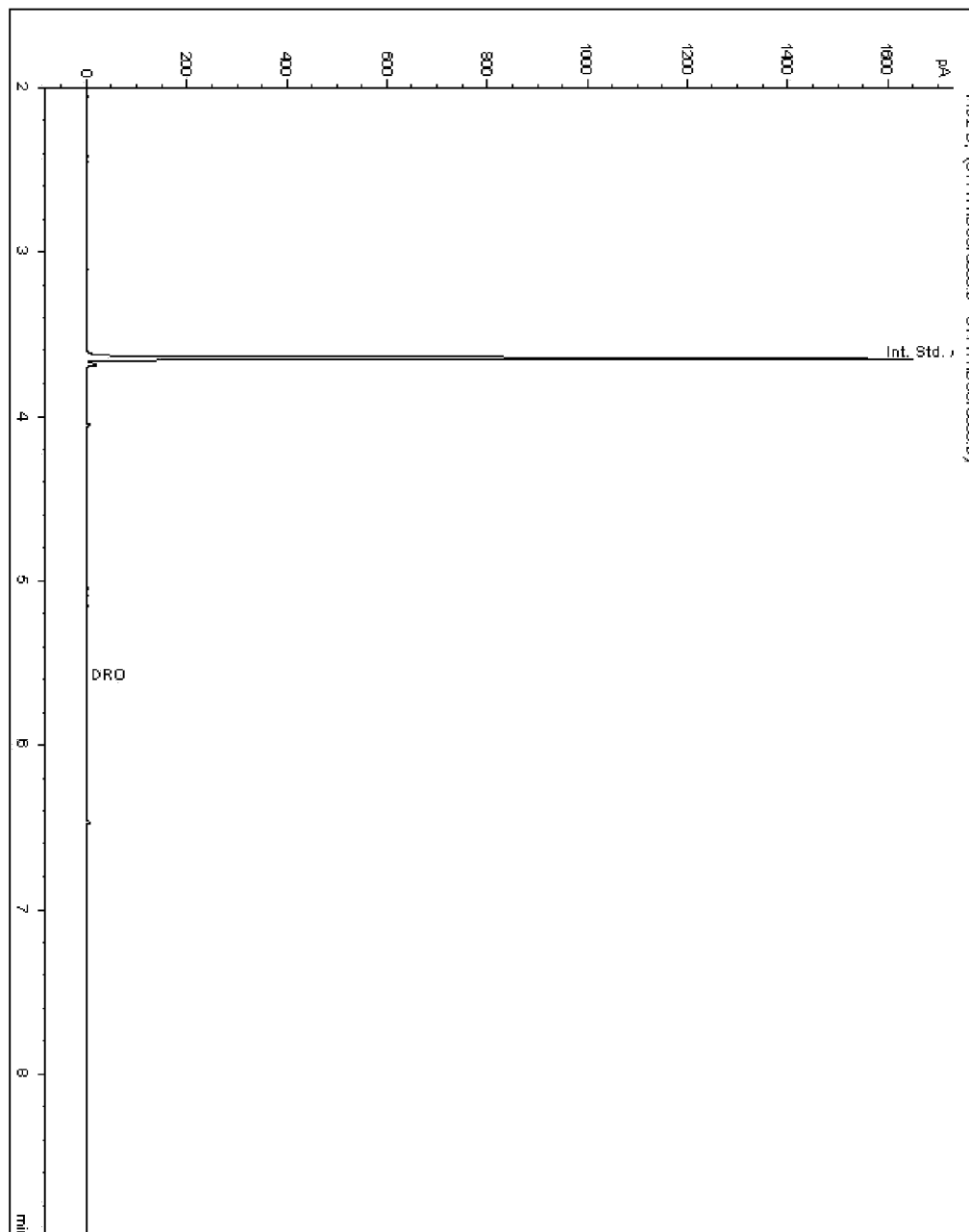
Sample Identity: 2762652-2679758
Date Acquired : 14/01/11 16:13:43 PM
Units : mg/l
Sample Volume: 0 ml's
Dilution:



Order Number:
Report Number: 111453
Superseded Report:

Depth :

Sample Identity: 2762567-2679770
Date Acquired : 14/01/11 22:35:04 PM
Units : mg/l
Sample Volume: 0 ml's
Dilution:



Order Number:
Report Number: 111453
Superseded Report:

Analysis: EPH (DRO) (C10-C40) Aqueous (W)

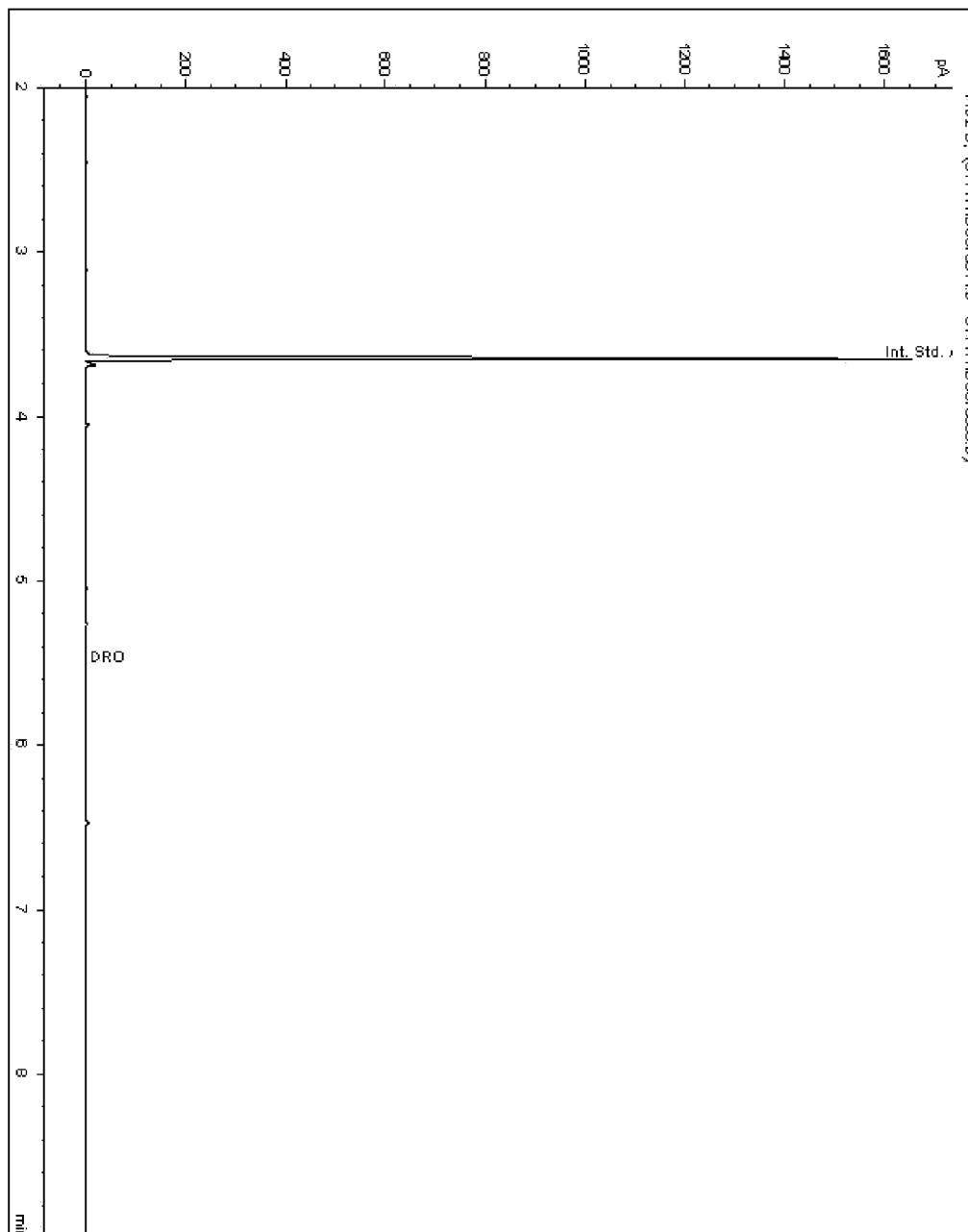
Sample No : 2679777

Depth :

Sample ID : ACTIVE

Alcontrol Analytical Services
EPH Range Organics (C10 - C40)

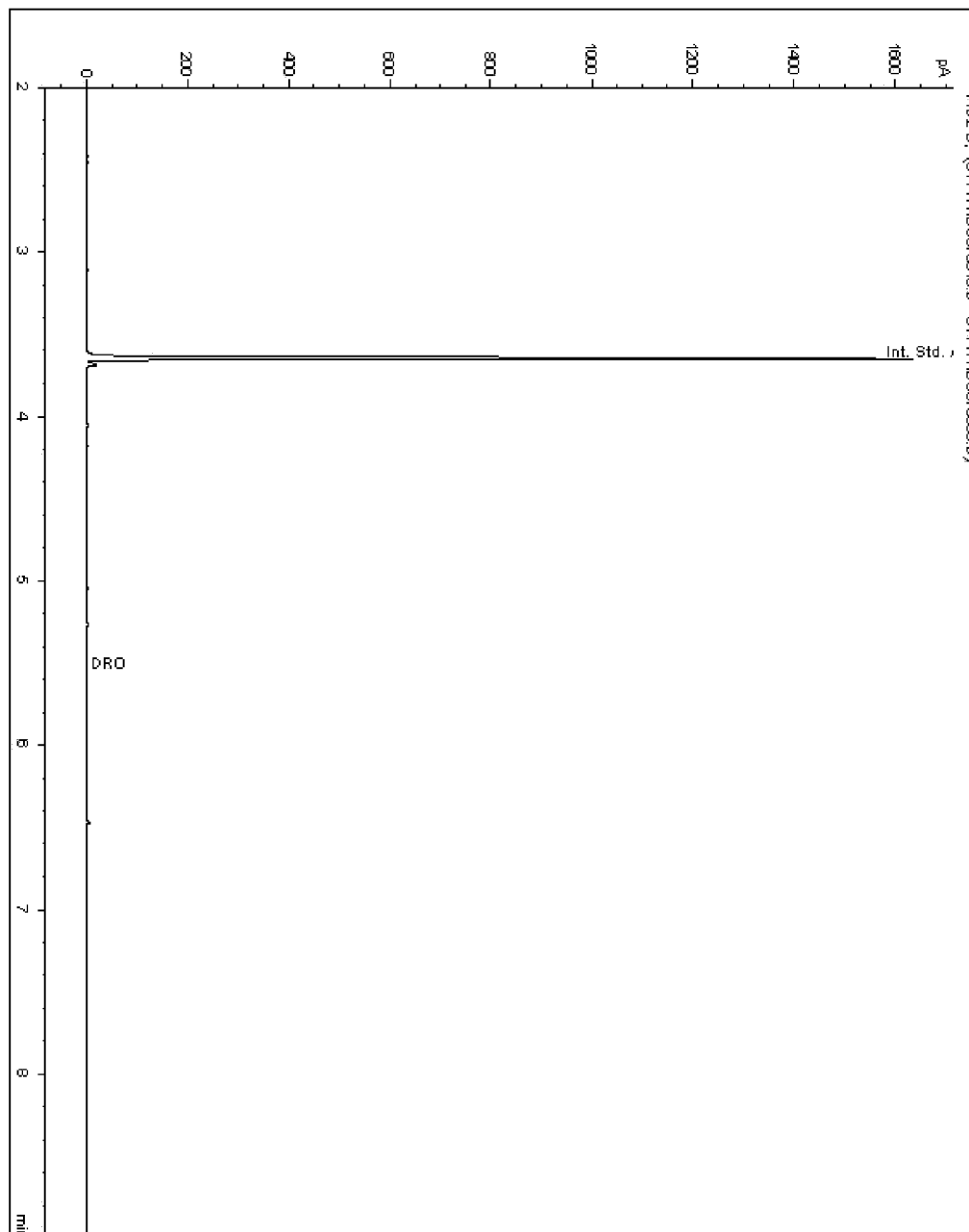
Sample Identity: 2762664-2679777
Date Acquired : 14/01/11 16:35:16 PM
Units : mg/l
Sample Volume: 0 ml's
Dilution:



Order Number:
Report Number: 111453
Superseded Report:

Depth :

Sample Identity: 2762610-2679782
Date Acquired : 14/01/11 18:02:16 PM
Units : mg/l
Sample Volume: 0 ml's
Dilution:



CERTIFICATE OF ANALYSIS

SDG: 110113-22
Job: H_URS_WIM-60
Client Reference: 49319164

Location: shell fontwell
Customer: URS Corporation Limited
Attention: Ben Schultz

Order Number:
Report Number: 111453
Superseded Report:

Chromatogram

Analysis: EPH (DRO) (C10-C40) Aqueous (W)

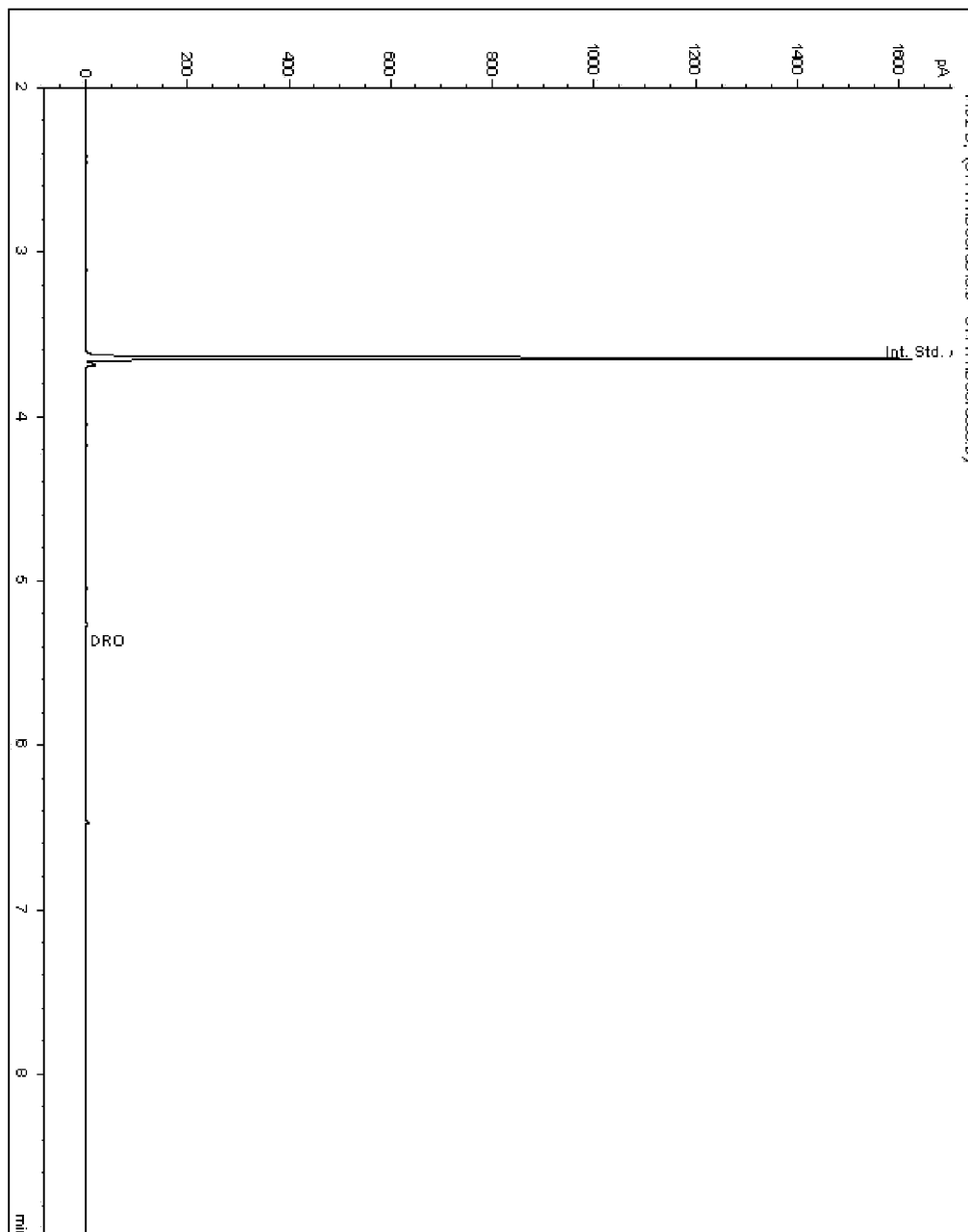
Sample No : 2679797

Depth :

Sample ID : MW7

Alcontrol Analytical Services
EPH Range Organics (C10 - C40)

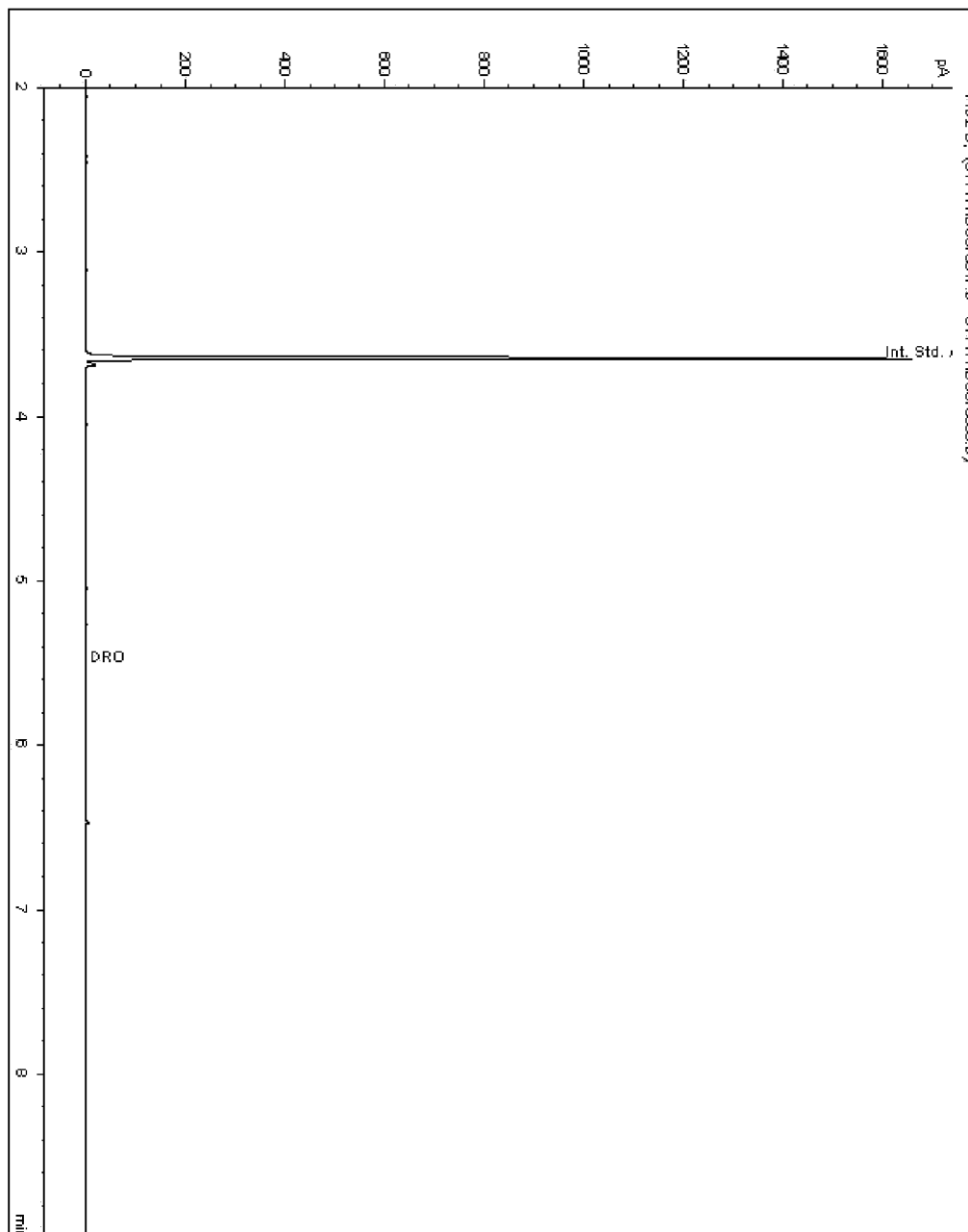
Sample Identity: 2762593-2679797
Date Acquired : 14/01/11 18:24:19 PM
Units : mg/l
Sample Volume: 0 ml's
Dilution:



Order Number:
Report Number: 111453
Superseded Report:

Depth :

Sample Identity: 2762630-2679802
Date Acquired : 14/01/11 17:40:54 PM
Units : mg/l
Sample Volume: 0 ml's
Dilution:



SDG: 110113-22
Job: H_URS_WIM-60
Client Reference: 49319164

Location: shell fontwell
Customer: URS Corporation Limited
Attention: Ben Schultz

Order Number:
Report Number: 111453
Superseded Report:

Chromatogram

Analysis: EPH (DRO) (C10-C40) Aqueous (W)

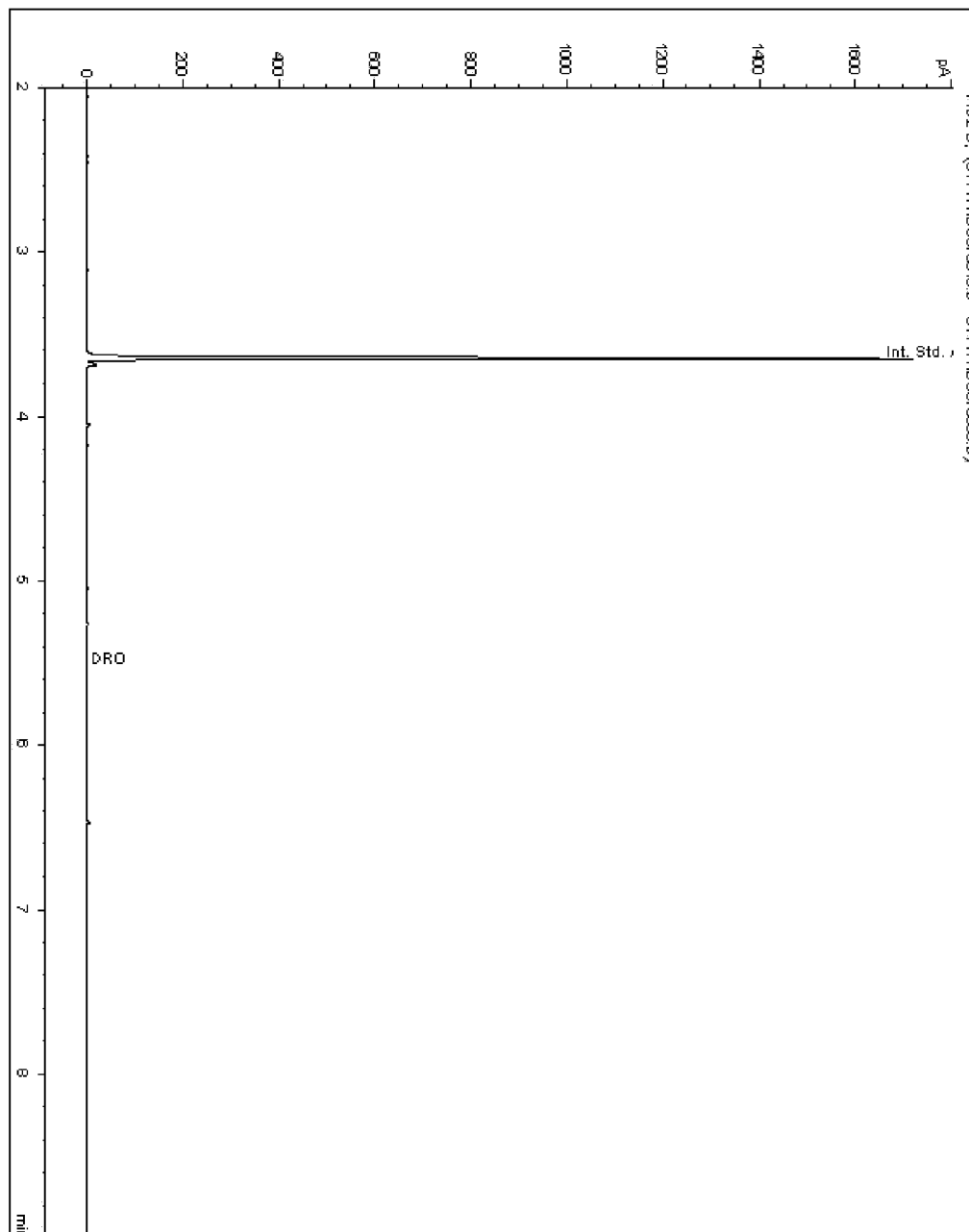
Sample No : 2679812

Depth :

Sample ID : MW4

Alcontrol Analytical Services
EPH Range Organics (C10 - C40)

Sample Identity: 2762544-2679812
Date Acquired : 14/01/11 16:56:42 PM
Units : mg/l
Sample Volume: 0 ml's
Dilution:



SDG: 110113-22
Job: H_URS_WIM-60
Client Reference: 49319164

Location: shell fontwell
Customer: URS Corporation Limited
Attention: Ben Schultz

Order Number:
Report Number: 111453
Superseded Report:

Chromatogram

Analysis: EPH (DRO) (C10-C40) Aqueous (W)

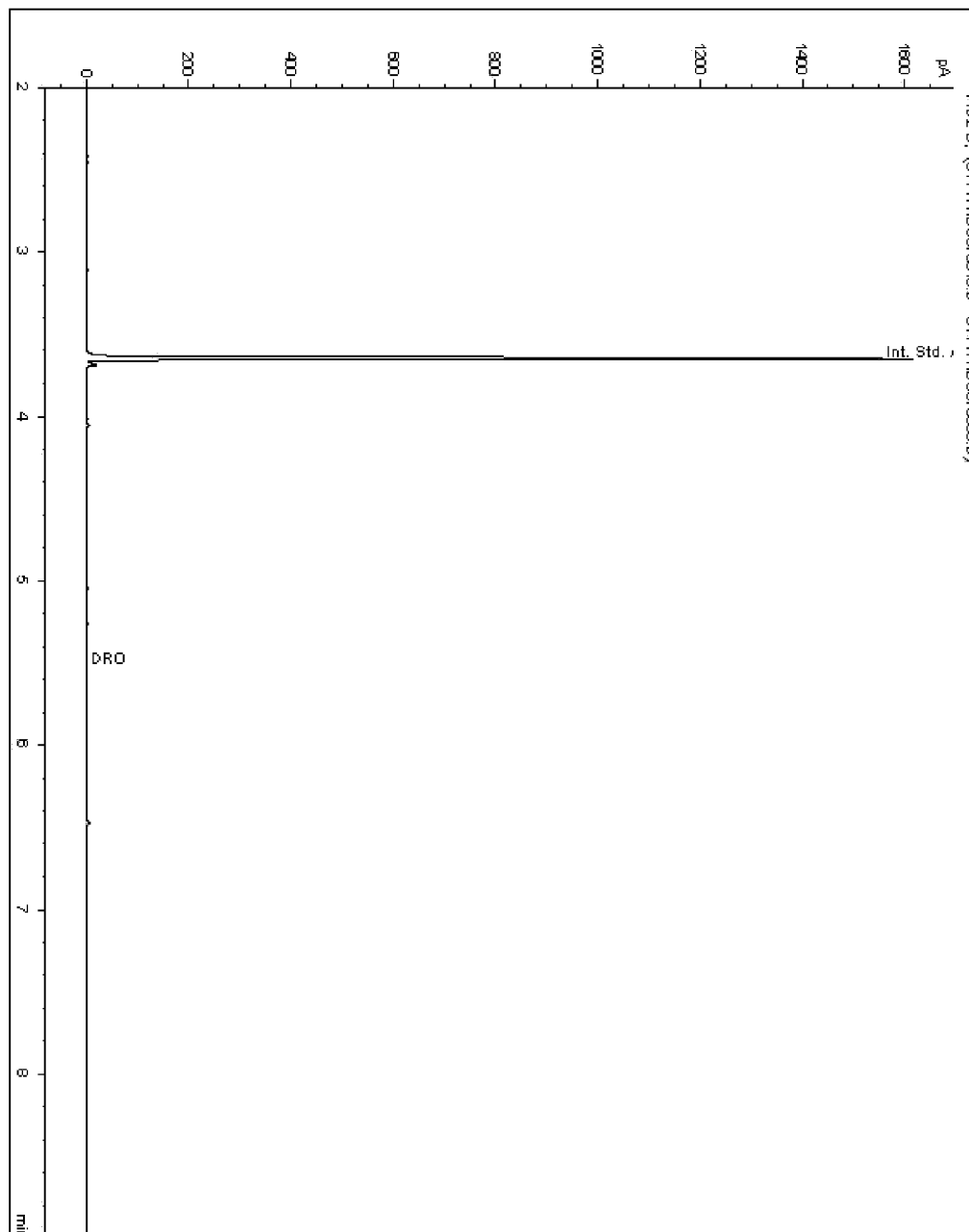
Sample No : 2679828

Depth :

Sample ID : MW2

Alcontrol Analytical Services
EPH Range Organics (C10 - C40)

Sample Identity: 2762519-2679828
Date Acquired : 14/01/11 17:18:55 PM
Units : mg/l
Sample Volume: 0 ml's
Dilution:



SDG: 110113-22
Job: H_URS_WIM-60
Client Reference: 49319164

Location: shell fontwell
Customer: URS Corporation Limited
Attention: Ben Schultz

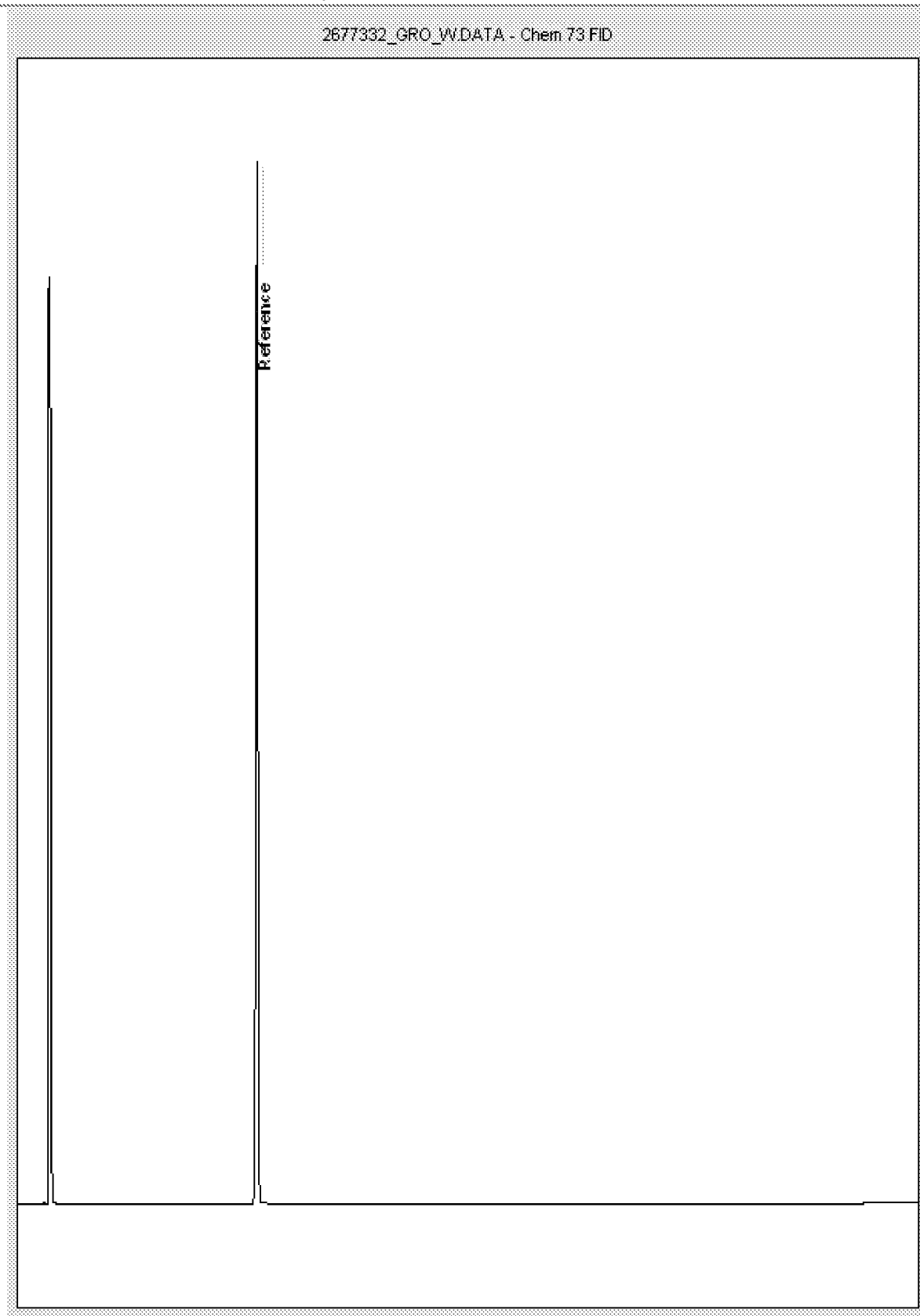
Order Number:
Report Number: 111453
Superseded Report:

Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 2677332
Sample ID : MW2

Depth :



SDG: 110113-22
Job: H_URS_WIM-60
Client Reference: 49319164

Location: shell fontwell
Customer: URS Corporation Limited
Attention: Ben Schultz

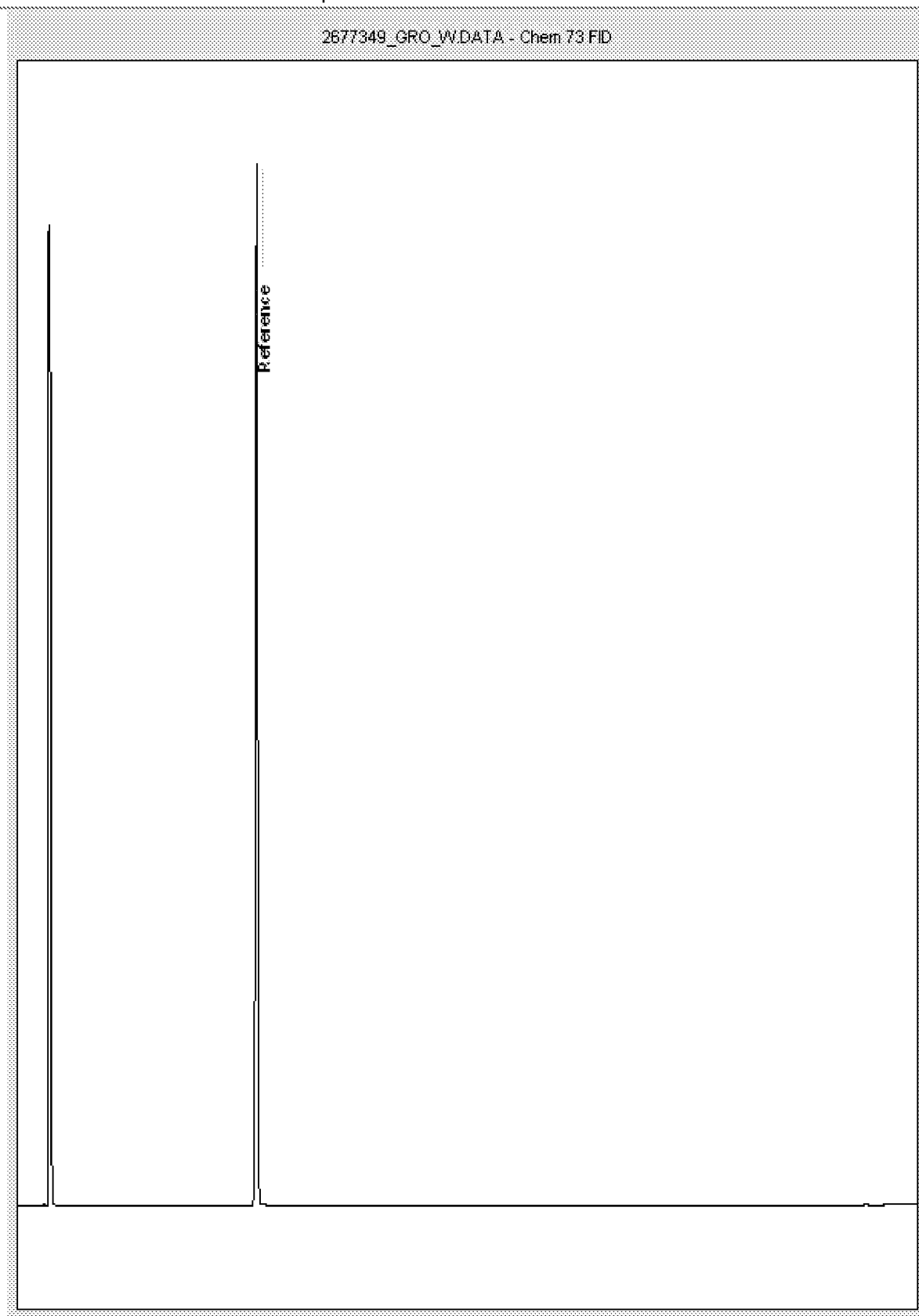
Order Number:
Report Number: 111453
Superseded Report:

Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 2677349
Sample ID : MW4

Depth :



SDG: 110113-22
Job: H_URS_WIM-60
Client Reference: 49319164

Location: shell fontwell
Customer: URS Corporation Limited
Attention: Ben Schultz

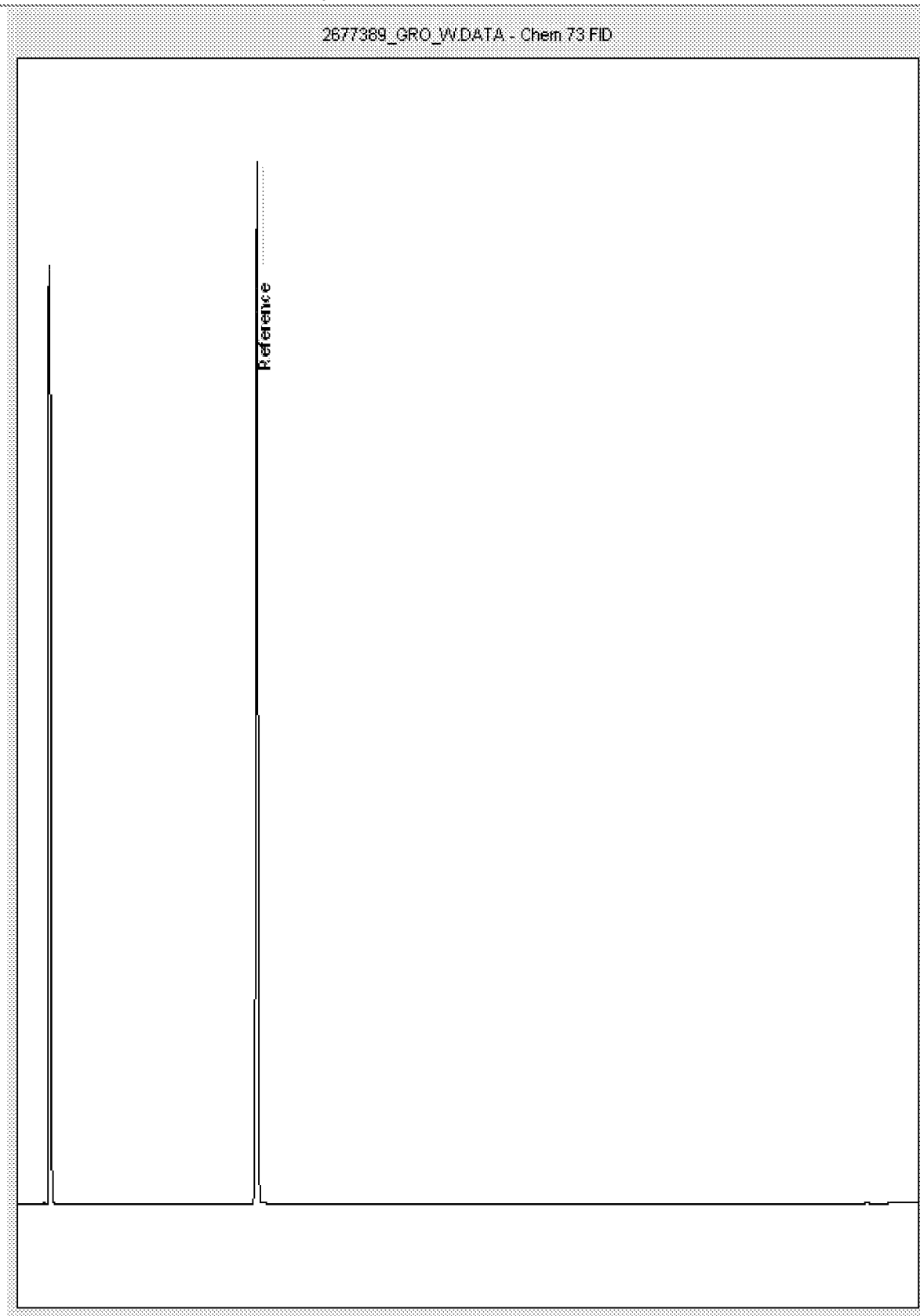
Order Number:
Report Number: 111453
Superseded Report:

Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 2677389
Sample ID : MW5

Depth :





CERTIFICATE OF ANALYSIS

SDG: 110113-22
Job: H_URS_WIM-60
Client Reference: 49319164

Location: shell fontwell
Customer: URS Corporation Limited
Attention: Ben Schultz

Order Number:
Report Number: 111453
Superseded Report:

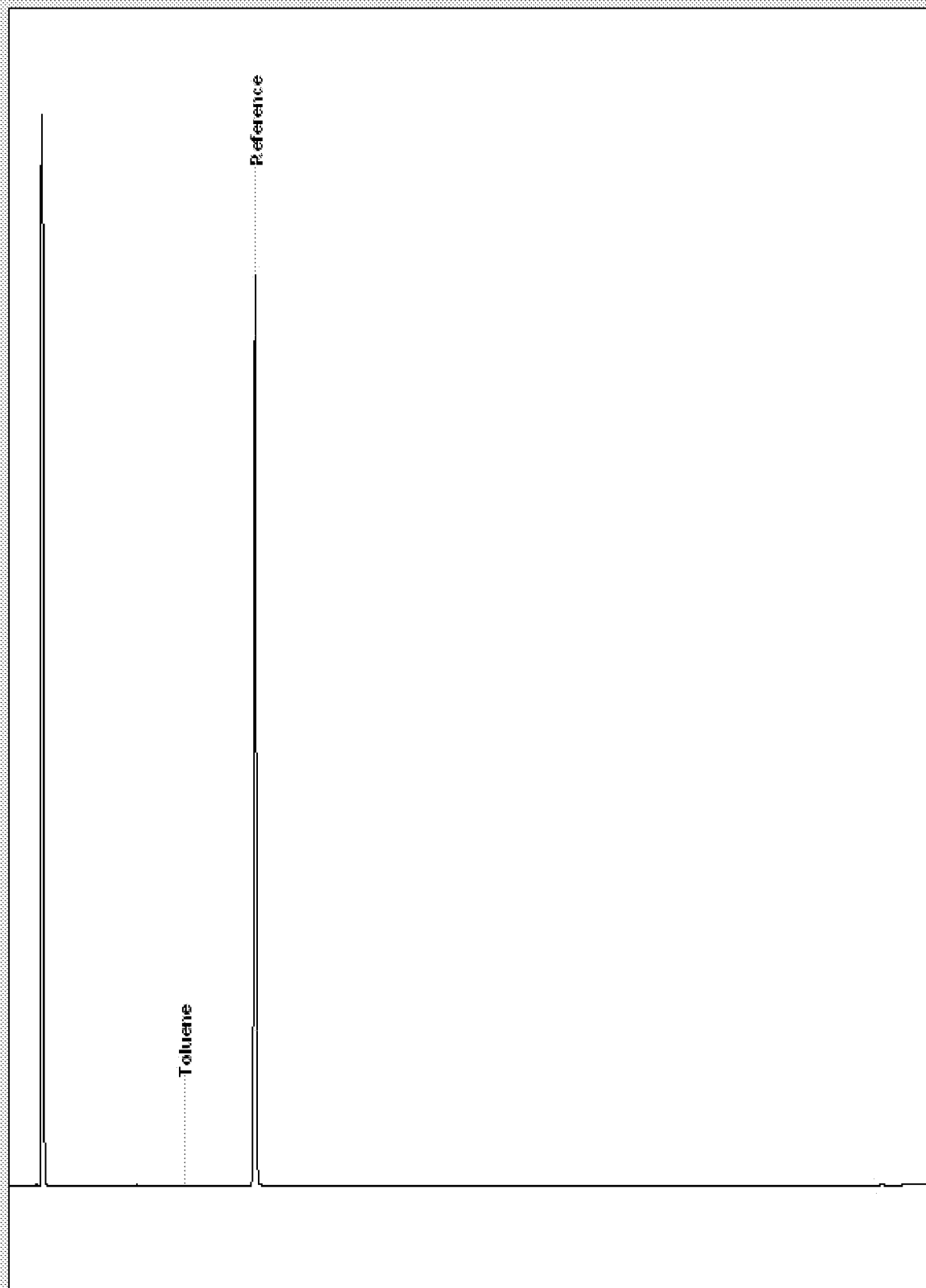
Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 2677412
Sample ID : MW7

Depth :

2677412_GRO_W.DATA - Chem 73 FID



SDG: 110113-22
Job: H_URS_WIM-60
Client Reference: 49319164

Location: shell fontwell
Customer: URS Corporation Limited
Attention: Ben Schultz

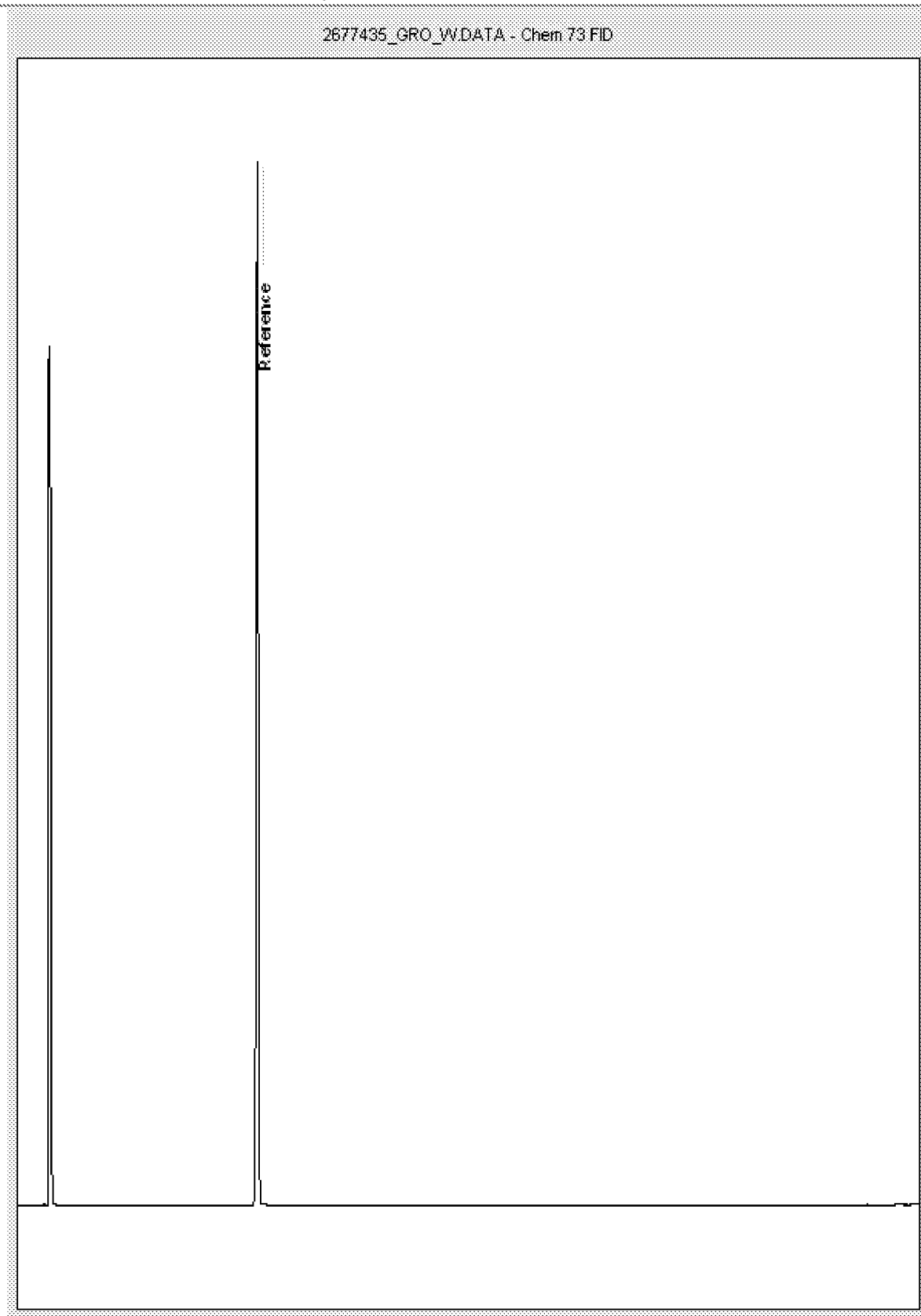
Order Number:
Report Number: 111453
Superseded Report:

Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 2677435
Sample ID : DUP-01

Depth :





CERTIFICATE OF ANALYSIS

SDG: 110113-22
Job: H_URS_WIM-60
Client Reference: 49319164

Location: shell fontwell
Customer: URS Corporation Limited
Attention: Ben Schultz

Order Number:
Report Number: 111453
Superseded Report:

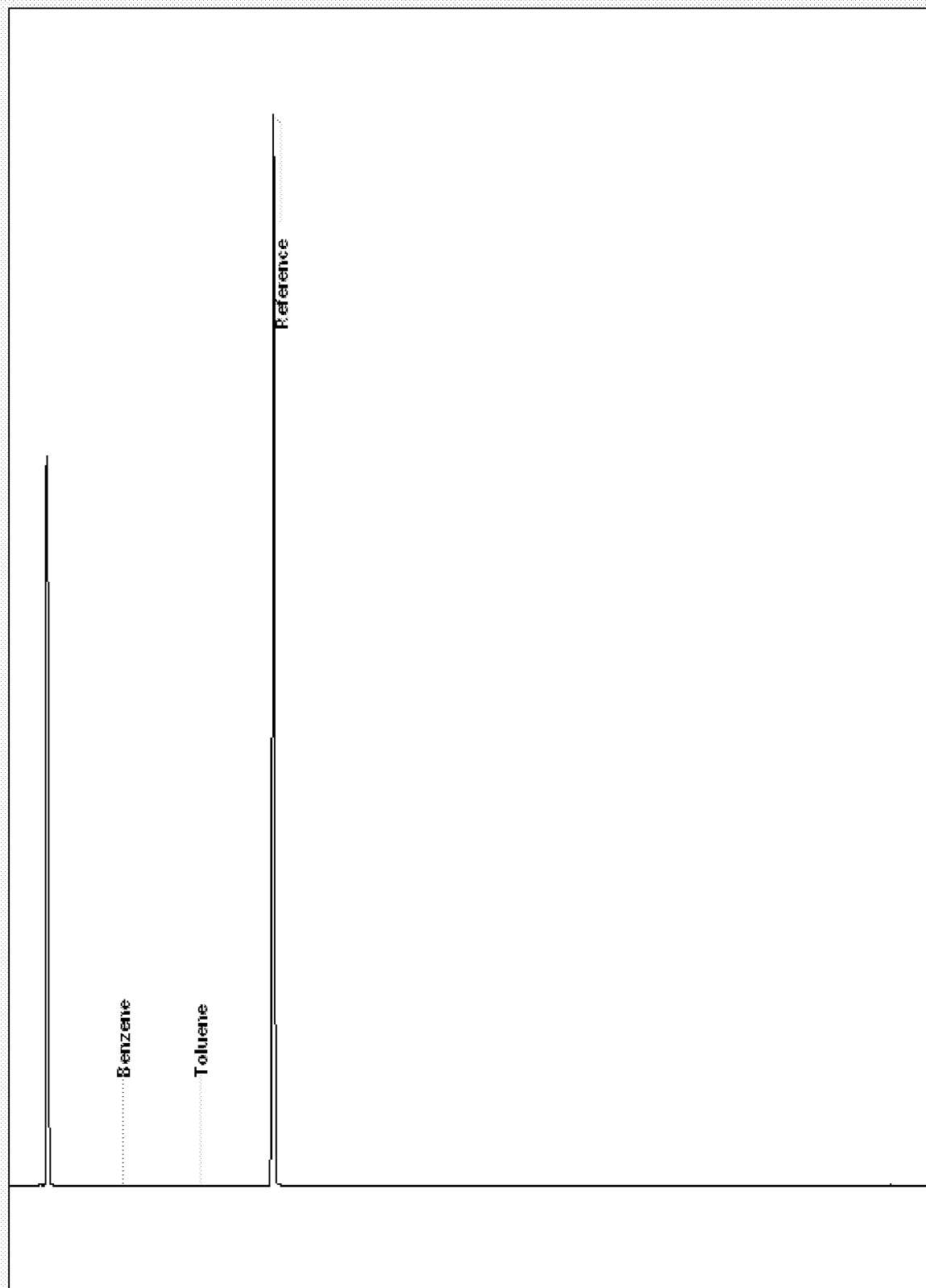
Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 2677498
Sample ID : EQUIPMENT

Depth :

2677498_GRO_W.D\\DATA - Chem 63 FID



SDG: 110113-22
Job: H_URS_WIM-60
Client Reference: 49319164

Location: shell fontwell
Customer: URS Corporation Limited
Attention: Ben Schultz

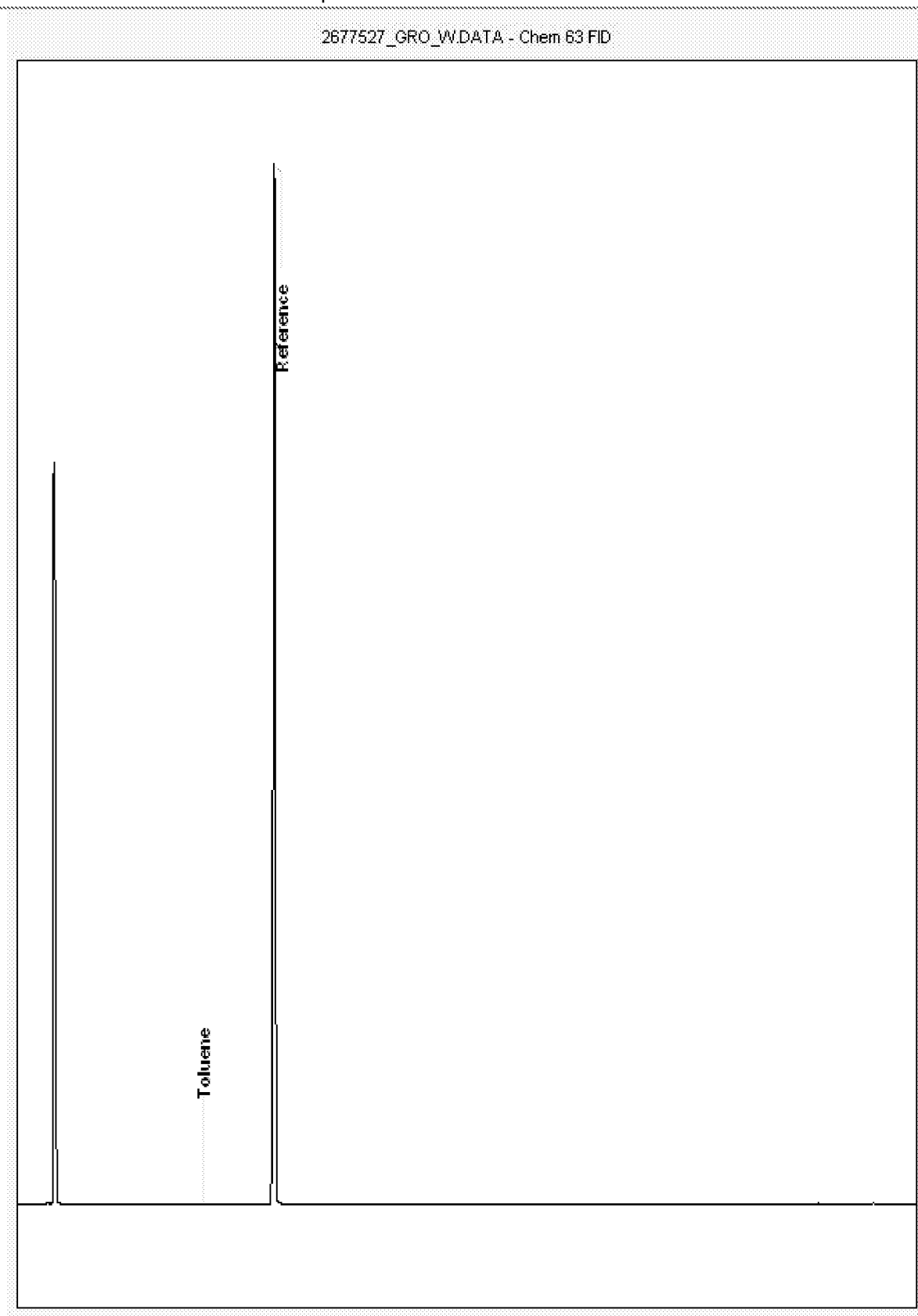
Order Number:
Report Number: 111453
Superseded Report:

Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 2677527
Sample ID : STATIC

Depth :





CERTIFICATE OF ANALYSIS

SDG: 110113-22
Job: H_URS_WIM-60
Client Reference: 49319164

Location: shell fontwell
Customer: URS Corporation Limited
Attention: Ben Schultz

Order Number:
Report Number: 111453
Superseded Report:

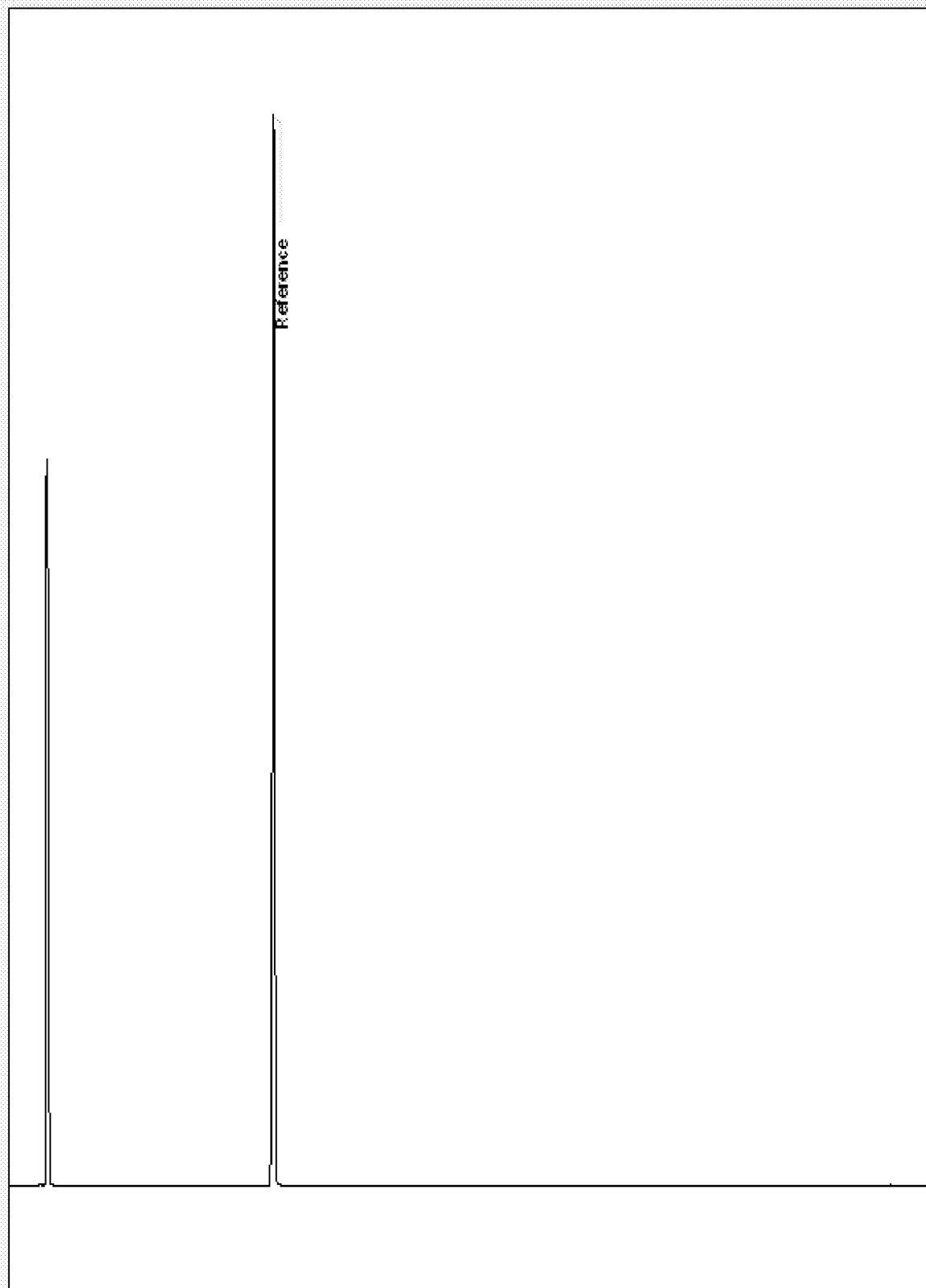
Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 2677549
Sample ID : ACTIVE

Depth :

2677549_GRO_W.D\\DATA - Chem 63 FID





Scientific Analysis Laboratories

Certificate of Analysis

Hadfield House
Hadfield Street
Cornbrook
Manchester

Scientific Analysis Laboratories is a
limited company registered in England and
Wales (No 2514789) whose address is at
Hadfield House, Hadfield Street, Manchester M18 8FE

Report Number: 224558-1

Date of Report: 17-Jan-2011

Customer: ALcontrol Laboratories Ltd
Units 7-8 Hawarden Business Park
Manor Road
(Off Manor Road)
Hawarden
Deeside
Flintshire
CH5 3US

Customer Contact: Hawarden Subcontracts

Customer Job Reference: 4400

Customer Purchase Order: 163319

Date Job Received at SAL: 14-Jan-2011

Date Analysis Started: 14-Jan-2011

Date Analysis Completed: 17-Jan-2011

The results reported relate to samples received in the laboratory
This report should not be reproduced except in full without the written approval of the laboratory
Tests covered by this certificate were conducted in accordance with SAL SOPs



Report checked
and authorised by :
Caroline Haworth
Project Manager

Issued by :
Caroline Haworth
Project Manager

SAL Reference: 224558													
Customer Reference: 4400													
Water		Analysed as Water											
Miscellaneous													
SAL Reference				224558 001	224558 002	224558 003	224558 004	224558 005	224558 006	224558 007	224558 008		
Customer Sample Reference				2679037 2677318-MW2	2679051 2677319-MW4	2679063 2677320-MW5	2679069 2677321-MW7	2679099 2677324-EQUIPMENT	2679104 2677325-STATIC	2679105 2677326-ACTIVE	2679110 2677322-DUP		
Date Sampled				Deviating	Deviating	Deviating	Deviating	Deviating	Deviating	Deviating	Deviating		
Determinand	Method	Test Sample	LOD	Units									
Diisopropyl ether	T54	AR	1	µg/l	<1	<1	<1	<1	<1	<1	<1	<1	<1

Index to symbols used in 224558-1

Value	Description
AR	As Received
N	Analysis is not UKAS accredited

Notes

The date of sampling has not been provided and therefore the time from sampling to analysis is unknown. It is possible therefore that the results provided may be compromised

Method Index

Value	Description
T54	GC/MS (Headspace)

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	SAL References
Diisopropyl ether	T54	AR	1	µg/l	N	001-008



CERTIFICATE OF ANALYSIS

SDG: 110113-22
Job: H_URS_WIM-60
Client Reference: 49319164

Location: shell fontwell
Customer: URS Corporation Limited
Attention: Ben Schultz

Order Number:
Report Number: 111453
Superseded Report:

Appendix

1. Results are expressed on a dry weight basis (dried at 35°C) for all soil analyses except for the following: NRA Leach tests, flash point, ammonium as NH₄ by the BRE method, VOC TICS, SVOC TICS, TOF-MS SCAN/SEARCH and TOF-MS TICS.

2. Samples will be run in duplicate upon request, but an additional charge may be incurred.

3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for both soil jars, tubs and volatile jars. All waters and vials will be discarded 10 days after the analysis is completed (e-mailed). All material removed during an asbestos containing material screen and analysed for the presence of asbestos will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALcontrol Laboratories reserve the right to charge for samples received and stored but not analysed.

4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

6. When requested, the individual sub sample scheduled will be screened in house for the presence of large asbestos containing material fragments/pieces. If no asbestos containing material is found this will be reported as 'no asbestos containing material detected'. If asbestos containing material is detected it will be removed and analysed by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If asbestos containing material is present no further analysis will be undertaken. At no point is the fibre content of the soil sample determined.

7. If no separate volatile sample is supplied by the client, the integrity of the data may be compromised if the laboratory is required to create a sub-sample from the bulk sample -similarly, if a headspace or sediment is present in the volatile sample. This will be flagged up as an invalid VOC on the test schedule or recorded on the log sheet.

8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.

9. NDP -No determination possible due to insufficient/unsuitable sample.

10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals -total metals must be requested separately.

11. A table containing the date of analysis for each parameter is not routinely included with the report, but is available upon request.

12. Results relate only to the items tested

13. **Surrogate recoveries** -Most of our organic methods include surrogates, the recovery of which is monitored and reported. For EPH, MO, PAH, GRO and VOCs on soils the result is not surrogate corrected, but a percentage recovery is quoted. Acceptable limits for most organic methods are 70 -130 %.

14. **Product analyses** -Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors employed.

15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethylphenol, 3,5 Dimethylphenol).

16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 14).

17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

18. Our MCERTS accreditation for PAHs by GCMS applies to all product types apart from Kerosene, where naphthalene only is not accredited.

19. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

20. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

21. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

22. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.

23. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials -whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

24. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C₄ -C₁₀ range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

SOLID MATRICES EXTRACTION SUMMARY

ANALYSES	DIC OR WET	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSES
SOLVENT EXTRACTABLE MATTER	D&C	DCM	SOX THERM	GRAVIMETRIC
CYCLOHEXANE EXT. MATTER	D&C	CYCLOHEXANE	SOX THERM	GRAVIMETRIC
THIN LAYER CHROMATOGRAPHY	D&C	DCM	SOX THERM	ATROSCAN
ELEMENTAL SULPHUR	D&C	DCM	SOX THERM	HPLC
PHENOLS BY GCMS	WET	DCM	SOX THERM	GCMS
HERBICIDES	D&C	HEXANE/ACETONE	SOX THERM	GCMS
PESTICIDES	D&C	HEXANE/ACETONE	SOX THERM	GCMS
EPH (DRO)	D&C	HEXANE/ACETONE	END OVER/END	GC/FID
EPH (MIN OIL)	D&C	HEXANE/ACETONE	END OVER/END	GC/FID
EPH (CLEANED UP)	D&C	HEXANE/ACETONE	END OVER/END	GC/FID
EPH CAG BY GC	D&C	HEXANE/ACETONE	END OVER/END	GC/FID
PCB TOT / PCB CON	D&C	HEXANE/ACETONE	END OVER/END	GCMS
POLYAROMATIC HYDROCARBONS (MS)	WET	HEXANE/ACETONE	MICROWAVE TM218	GCMS
C8-C40 (C6-C40) EZ FLASH	WET	HEXANE/ACETONE	SHAKER	GC/EZ
POLYAROMATIC HYDROCARBONS RAPID GC	WET	HEXANE/ACETONE	SHAKER	GC/EZ
SEM VOLATILE/ORGANIC COMPOUNDS	WET	DCM/ACETONE	SONICATE	GCMS

LIQUID MATRICES EXTRACTION SUMMARY

ANALYSES	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSES
PAHMS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCMS
EPH	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC/FID
EPH CAG	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC/FID
MINERAL OIL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC/FID
PCB 7 CONGENERS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCMS
PCB TOTAL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCMS
SVOC	DCM	LIQUID/LIQUID SHAKE	GCMS
FREESULPHUR	DCM	SOLID PHASE EXTRACTION	HPLC
PEST COP/OPP	DCM	LIQUID/LIQUID SHAKE	GCMS
TRAZINE HERBS	DCM	LIQUID/LIQUID SHAKE	GCMS
PHENOLS MS	DCM	SOLID PHASE EXTRACTION	GCMS
TPH by INFRARED (IR)	TCE	LIQUID/LIQUID SHAKE	HPLC
MINERAL OIL by IR	TCE	LIQUID/LIQUID SHAKE	HPLC
GLYCOLS	NONE	DIRECT INJECTION	GCMS

Identification of Asbestos in Bulk Materials

The results for asbestos identification for soil samples are obtained from possible Asbestos Containing Material, removed during the 'Screening of soils for Asbestos Containing Materials', which have been examined to determine the presence of asbestos fibres using ALcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace -Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in MDHS 100.

The identification of asbestos containing materials falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anorthophyllite	-
Fibrous Tremolite	-



Jones Environmental Laboratory

Unit 5 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA



No.4225

URS Corporation
St George's House
5 St. George's Road
Wimbledon
London
SW19 4DR

Attention : Ben Shultz
Date : 19th January 2011
Your reference : 49319164
Our reference : Test Report 11/125
Location : Shell Fontwell
Date samples received : 13th January 2011
Status : Final Report
Issue : 1

One sample was received for analysis on 13th January 2011 which was completed on 19th January 2011. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced.
All interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.



J W Farrell- Jones CChem FRSC
Chartered Chemist

Jones Environmental Laboratory

Client Name: URS Corporation

Report : Liquids

Reference: 49319164

Location: Shell Fontwell

Contact: Ben Shultz

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle

JE Job No.: 11/125

H=H₂SO₄, Z=ZnAc, N=NaOH, HN=HNO₃

J E Sample No.	1-3										Please see attached notes for all abbreviations and acronyms		
Sample ID	Dup 02												
Depth	-												
COC No / misc													
Containers	V HN G												
Sample Date	11/01/11												
Sample Type	Water												
Batch Number	1										LOD	Units	Method No.
Date of Receipt	13/01/11												
EPH (C8-C40) (dissolved) #SS	<10										<10	µg/ l	TM5/PM9
BTEX # MS											<1-3	µg/ l	TM2/PM7
MTBE #	<2										<2	µg/ l	TM2/PM7
Benzene #	<1										<1	µg/ l	TM2/PM7
Toluene #	<2										<2	µg/ l	TM2/PM7
Ethyl benzene #	<2										<2	µg/ l	TM2/PM7
m/p-Xylene #	<3										<3	µg/ l	TM2/PM7
o-Xylene #	<2										<2	µg/ l	TM2/PM7
ETBE	<5										<5	µg/l	TM2/PM7
DIPE	<5										<5	µg/l	TM2/PM7
TBA	<5										<5	µg/l	TM2/PM7
TAME	<5										<5	µg/l	TM2/PM7
Ethyl Alcohol	<5										<5	µg/l	TM2/PM7
PAH 16 (Dissolved) MS													
Naphthalene #	<0.014										<0.014	µg/l	TM4/PM30
Acenaphthylene #	<0.013										<0.013	µg/l	TM4/PM30
Acenaphthene #	<0.013										<0.013	µg/l	TM4/PM30
Fluorene #	<0.014										<0.014	µg/l	TM4/PM30
Phenanthrene #	<0.011										<0.011	µg/l	TM4/PM30
Anthracene #	<0.013										<0.013	µg/l	TM4/PM30
Fluoranthene #	<0.012										<0.012	µg/l	TM4/PM30
Pyrene #	<0.013										<0.013	µg/l	TM4/PM30
Benz(a)anthracene #	<0.015										<0.015	µg/l	TM4/PM30
Chrysene #	<0.011										<0.011	µg/l	TM4/PM30
Benzo(bk)fluoranthene #	<0.018										<0.018	µg/l	TM4/PM30
Benzo(a)pyrene #	<0.016										<0.016	µg/l	TM4/PM30
Indeno(123cd)pyrene #	<0.011										<0.011	µg/l	TM4/PM30
Dibenzo(ah)anthracene #	<0.01										<0.010	µg/l	TM4/PM30
Benzo(ghi)perylene #	<0.011										<0.011	µg/l	TM4/PM30
PAH 16 Total	<0.195										<0.195	µg/l	TM4/PM30

Please include all sections of this report if it is reproduced

All solid results are expressed on a dry weight basis unless stated otherwise.

Jones Environmental Laboratory

Client Name: URS Corporation
Reference: 49319164
Location: Shell Fontwell
Contact: Ben Shultz
JE Job No.: 11/125

Report : Liquids

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H₂SO₄, Z=ZnAc, N=NaOH, HN=HNO₃

J E Sample No.	1-3										Please see attached notes for all abbreviations and acronyms		
Sample ID	Dup 02												
Depth	-												
COC No / misc													
Containers	V HN G												
Sample Date	11/01/11												
Sample Type	Water												
Batch Number	1												
Date of Receipt	13/01/11										LOD	Units	Method No.
Arsenic - dissolved #	<2.5										<2.5	µg/l	TM 030W
Boron - dissolved	33										<12	µg/l	TM 030W
Cadmium - dissolved #	<0.5										<0.5	µg/l	TM 030W
Total Chromium - dissolved#	<1.5										<1.5	µg/l	TM 030W
Copper - dissolved #	<7										<7	µg/l	TM 030W
Mercury - dissolved #	<1										<1	µg/l	TM 030W
Nickel - dissolved #	<2										<2	µg/l	TM 030W
Lead - dissolved #	<5										<5	µg/l	TM 030W
Selenium - dissolved #	<3										<3	µg/l	TM 030W
Zinc - dissolved #	37										<3	µg/l	TM 030W
Cobalt - dissolved #	<2										<2	µg/l	TM 030W
Molybdenum - dissolved #	<2										<2	µg/l	TM 030W
Tin - dissolved	<5										<5	µg/l	TM 030W
<u>TPH CWG - Aliphatics</u>													
>C5-C6	<5										<5	µg/ l	TM36/PM12
>C6-C8	<5										<5	µg/ l	TM36/PM12
>C8-C10	<5										<5	µg/ l	TM36/PM12
>C10-C12	<5										<5	µg/ l	TM5/PM9
>C12-C16	<10										<10	µg/l	TM5/PM9
>C16-C21	<10										<10	µg/l	TM5/PM9
>C21-C35	<10										<10	µg/l	TM5/PM9
Total aliphatics C5-35	<10										<10	µg/l	
<u>TPH CWG - Aromatics</u>													
>C5-EC7	<5										<5	µg/ l	TM36/PM12
>EC7-EC8	<5										<5	µg/ l	TM36/PM12
>EC8-EC10	<5										<5	µg/ l	TM36/PM12
>EC10-EC12	<5										<5	µg/ l	TM5/PM9
>EC12-EC16	<10										<10	µg/ l	TM5/PM9
>EC16-EC21	<10										<10	µg/ l	TM5/PM9
>EC21-EC35	<10										<10	µg/l	TM5/PM9
Total aromatics C5-35	<10										<10	µg/ l	
Total aliphatics and aromatics(C5-35)	<10										<10	µg/l	

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

SOILS

Please note we are only MCERTS accredited for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. Your final report will reflect this, with non-MCERTS results on separate pages.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. If we are instructed to keep samples, a storage charge of £1 (1.5 Euros) per sample per month will be applied until we are asked to dispose of them.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Asbestos screens where requested will be undertaken by a UKAS accredited laboratory.

WATERS

Please note we are not a Drinking Water Inspectorate (DWI) Approved Laboratory. It is important that detection limits are carefully considered when requesting water analysis.

UKAS accreditation applies to surface water and groundwater and one other matrix which is analysis specific, any other liquids are outside our scope of accreditation

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples. All samples are treated as groundwaters and analysis performed on settled samples unless we are instructed otherwise.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any analysis that may be compromised highlighted on your schedule/ report by the use of a symbol.

The use of any of the following symbols indicates that the sample was deviating and the test result may be unreliable:

- \$ sample temperature on receipt considered inappropriate for analysis requested
- ^ samples exceeding recommended holding times
- & samples received in inappropriate containers (e.g. volatile samples not submitted in VOC jars/vials)
- ~ no sampling date given, unable to confirm if samples are with acceptable holding times

ABBREVIATIONS and ACRONYMS USED

- # - UKAS accredited
- M - MCERTS accredited
- NAD - No Asbestos Detected
- ND - None Detected (usually refers to VOC and/SVOC TICs)
- SS - Calibrated against a single substance
- * - analysis subcontracted to a Jones Environmental approved laboratory.
- W - Results expressed on as received basis
- + Failed AQC results should be considered as indicative only and are not accredited.
- ++ Result outside calibration range, may be possible to re-run with higher detection limits