ANNUAL SPMP MONITORING REPORT - 2021

PUMA ENERGY UK LTD, MILFORD HAVEN TERMINAL

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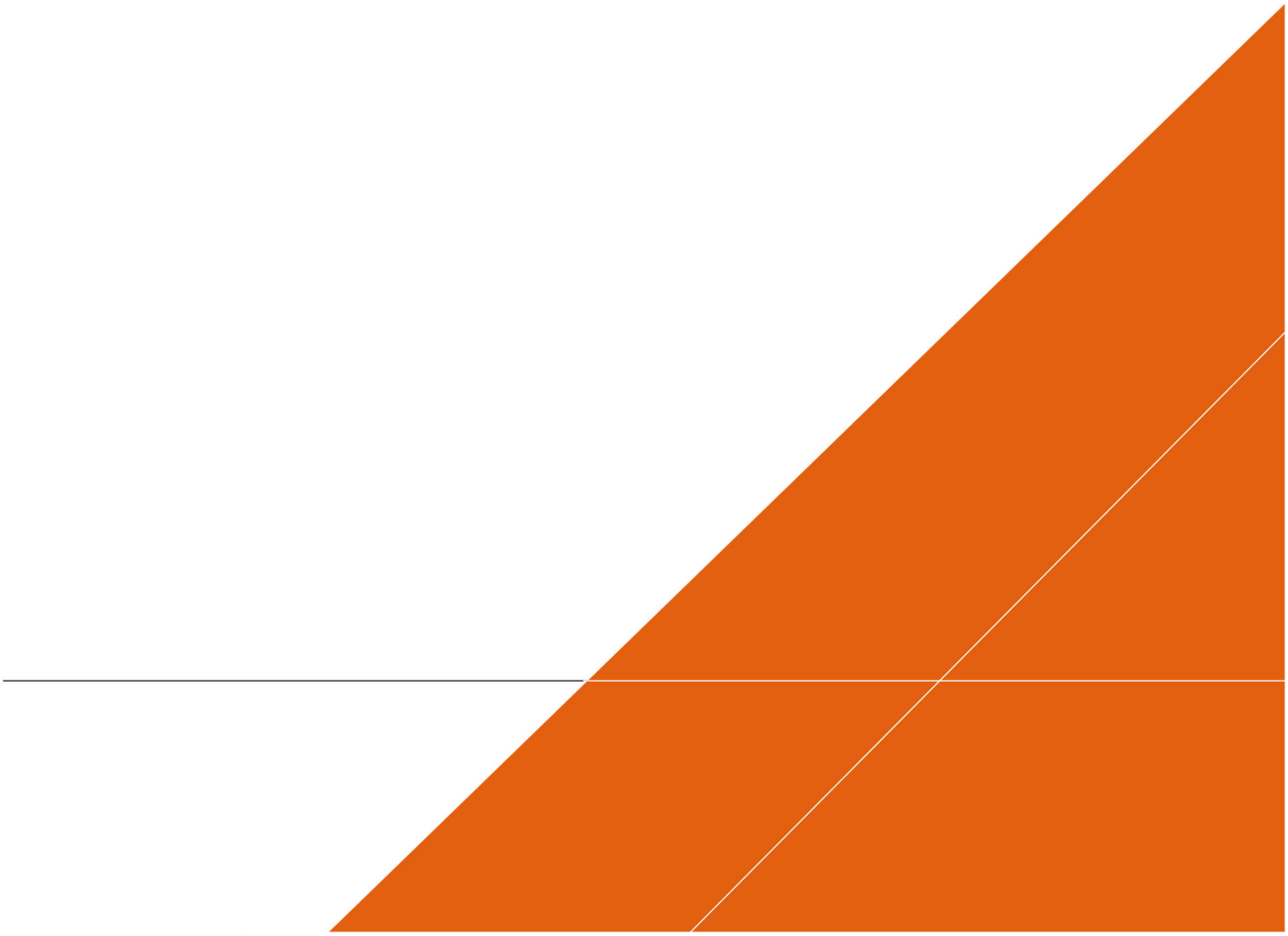

CONTACTS

PAUL HAMER
Project Manager

m +44 (0)7812371979
e paul.hamer@arcadis.com

Arcadis.
3rd Floor, Charter House
62-68 Hills Road
Cambridge
CB2 1LA

VERSION CONTROL

Version	Date	Author	Changes
01	August 2021	Pranjal Jain	First draft for client review
02	September 2021	Pranjal Jain	Client informed update to Site's Environmental Permit No.

Executive Summary

Introduction

Arcadis (UK) Limited (Arcadis) was commissioned by Puma Energy UK Limited (Puma Energy) to produce the eighth annual report for groundwater and surface water monitoring in relation to the Site Protection and Monitoring Programme (SPMP) for Milford Haven Terminal, Milford Haven, Pembrokeshire SA73 3FB (the Site).

The groundwater and surface water monitoring was undertaken as part of the Site's Environmental Permit (EP) (Permit number: EPR/KP3036AX) requirements under Condition 2.8. Groundwater monitoring was undertaken by Arcadis while surface water monitoring was conducted directly by Puma Energy. Monitoring was undertaken in line with the updated SPMP design, which was revised in 2020 in accordance with Condition 2.8.2, which specifies a review and update (if required) of the SPMP every four years.

Objectives

The objective of the updated SPMP was to demonstrate to Natural Resources Wales (NRW) that there has been no significant deterioration in groundwater and surface water quality since baseline conditions were established in 2007. In this respect, reference to and comparison with 2007 baseline data is an important objective within the reporting scope of work.

Monitoring Works

Groundwater monitoring and sampling was undertaken by Arcadis over the 21st, 22nd and 23rd June 2021. Surface water sampling was undertaken by Puma Energy UK Limited (Puma Energy) on 21st and 22nd June 2021. Fourteen groundwater samples (monitoring wells BHB701, BHC101, BHC401, BHD201, BHD401(S), BHD401(D), BHE601, BHE701, BHC, BHJ, BH02, BH06, BHE301 and BHM) and three out of four surface water samples (sample locations SW2, SW5 and SW13) were collected in line with the Site's updated SPMP. SW7 was dry during the sampling event, with no sample collected.

Surface water and groundwater samples were analysed for Total Petroleum Hydrocarbons (TPH), Benzene, Toluene, Ethylbenzene, Total Xylenes (BTEX), Methyl tert-Butyl Ether (MTBE) and Polycyclic Aromatic Hydrocarbons (PAHs). The groundwater sample from well location BHC101 was additionally analysed for a full Volatile Organic Compounds (VOC) suite. The analysis was scheduled based on the requirements of the updated SPMP recommendations.

Discussion

Comparison of the data was undertaken against SPMP monitoring events undertaken between July 2013 and June 2020 and against the baseline data collected in June 2007, to identify potentially significant trends in CoC concentrations over time. The following summarises trends in measured concentrations of CoC overtime, in groundwater and surface water, with respect to baseline conditions.

Groundwater

The groundwater quality in the majority of wells is not considered to have deteriorated significantly since conditions were baselined in 2007, with low level detections of MTBE observed since the baseline dataset considered likely to be a result of improved analytical methods and reduced laboratory MDL as opposed any 'new' contamination.

The concentration of sum TPH (20,700 µg/l) in BHC101 remains significantly higher than the 2007 baseline (180 µg/l), although concentrations remain broadly stable following a high of 33,000 µg/l measured in June 2016, after which source removal activities were undertaken.

Surface Water

Concentrations of TPH in the three collected surface water samples (SW2, SW5 and SW13) remained below the laboratory MDLs, consistent with previous data collected since the 2007 baseline. The marginal TPH detections measured in 2019 were not repeated.

Recommendations

To satisfy the Site's Environmental Permit and to continue to monitor and understand the behaviour of several of the on-Site wells, it is recommended that continued annual monitoring of groundwater and surface water be undertaken, as detailed within the current SPMP.

The passive bailer installed should continue to be inspected routinely at monthly intervals. These inspections should be documented and any reoccurrence of LNAPL recorded and removed. Further annual monitoring and LNAPL evaluation will be required to confirm the conclusion that residual LNAPL within the local vadose / unsaturated zone is related to historical activities as opposed being indicative of a new LNAPL source.

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1 INTRODUCTION

Arcadis (UK) Limited (Arcadis) was commissioned by Puma Energy UK Limited (Puma Energy) to undertake groundwater and surface water quality monitoring in relation to the Site Protection and Monitoring Programme (SPMP) for Milford Haven Terminal, Milford Haven, Pembrokeshire SA73 3FB (the Site). The groundwater and surface water sampling was conducted as part of the Terminal's Environmental Permit (EP) (Permit number: EPR/KP3036AX) requirements under Condition 2.8.

The ownership and management of the Site was transferred to Puma Energy UK Limited on 1st July 2015. It has since been converted to, and is operating as, a 'Hydrocarbon Storage and Distribution Facility' and is now referred to as Milford Haven Terminal (MHT). The Environmental Permit has been updated accordingly, however, permit conditions; including the continued requirement for the SPMP, remain. The on-going collection of groundwater quality data from boreholes BHC101, BHB701, BHC401 and BHD201 will be pertinent in evaluating any demonstrable impact to groundwater from the dismantling of the former "Process Area", completed in December 2019, which centred on areas C1, C2 and C3.

This report details the 2021 annual SPMP monitoring event following the collection of baseline data in June 2007. It additionally incorporates updates made to the SPMP design in December 2020, as summarised in Section 2. The analytical data is provided in Appendix A, whilst the associated borehole locations and surface water sampling locations presented on Figures 1 and 2 respectively, in Appendix B. The work was carried out with reference to the relevant Welsh legislation and regulatory guidance for the assessment of land contamination and environmental permitting, applicable at the time of writing.

1.1 Objectives

The objective of the annual groundwater and surface water monitoring is to demonstrate to Natural Resources Wales (NRW) that there is a robust monitoring programme in place to identify any significant changes in groundwater and surface water quality associated with the permitted activities at the Site since baseline conditions were established in 2007. In this respect, reference to and comparison between 2007 baseline data is an important objective within the reporting scope of work.

Annual monitoring data will be sent to NRW by the 31st August each year along with the results of the data assessment and any recommendations for amendments to the Monitoring Programme.

1.2 Scope of Work

The overall scope of works includes the collection of groundwater and surface water samples from the identified sampling locations prior to the production of a report detailing the findings of the monitoring and review of data trends.

The scope of works undertaken directly by Puma Energy comprised the collection of three surface water samples in support of the updated SPMP (the fourth proposed location, SW7, was found to be dry during the sampling visit), whilst the following works were conducted by Arcadis:

- Collection of fourteen (no. 14) groundwater samples in support of the updated SPMP from previously installed monitoring wells, using low-flow techniques; and,
- Arranging for the analysis of all groundwater and surface water samples collected at a UKAS accredited laboratory for potential Contaminants of Concern (CoC), as detailed within the updated SPMP.

In addition to the above, Arcadis was required to review, interpret and provide recommendations on groundwater and surface water data collated following annual monitoring events on-site. Comparison between 2007 baseline conditions and subsequent years' data was used to identify trends and demonstrate, where appropriate, the stability of the groundwater and surface water regime at each of the monitoring locations designated within the SPMP.

1.3 Reliability of Information / Limitations

Arcadis' liability, pursuant to the terms of the appointment of Arcadis by Puma Energy, is strictly limited to the work undertaken by Arcadis and the matters contained and specifically referred to in this report.

A copy of Arcadis' study limitations is presented in Appendix C.

2 UPDATES TO THE SPMP - 2020

The SPMP was reviewed in December 2020, in line with Condition 2.8.2 of the Site's PPC permit, which specifies that the SPMP should be reviewed every four years. The review was conducted by Arcadis and documented in the following report:

- *Milford Haven Terminal Site Protection and Monitoring Programme_4 Year Review (2020)*, Letter to Puma Energy, Document Ref. 10044010-AUK-XX-XX-CO-ZZ-0001-01, dated 11 December 2020.

The review comprised an assessment of current and historical Site data and evaluation of any changes in Site activities, including the storage and/or use of materials on Site, with consideration also given to any environmental releases of significance over the previous 4 years. Overall, the location of groundwater and surface water sampling and the analytical testing suite were considered to remain appropriate. However, the following pertinent updates were made to the SPMP as detailed below:

- *Three additional groundwater monitoring wells (BHE301, BH02 and BH06) were added to the SPMP following a loss of 27,200 litres of biodiesel at the eastern Site boundary in 2019. These locations were considered to provide a robust characterisation of the spill area based upon;*
  - *BH02: Found to contain low-level but measurable LNAPL and the highest local dissolved phase hydrocarbon concentrations in post-incident investigations;*
  - *BH06: Located between BH02 (potential source) and the eastern Site boundary, to act as a sentinel for potential off-site contaminant migration given the anticipated east to south-easterly flow direction; and,*
  - *BHE301: A historical well located to the south of BH02. Measured dissolved phase concentrations in BHE301 were the highest recorded in 2019, outside of the immediate BH02 source area.*
- *Review of trends in the CoC included in the analytical suites over the last four years indicates that measured concentrations of VOCs comprise mainly benzene, toluene, ethylbenzene and xylene (BTEX) and MTBE along with petroleum hydrocarbons such as trimethylbenzenes. Chlorinated hydrocarbons have been measured in BHC101 only. As such, it was proposed that VOC analysis be reduced to a suite of BTEX and MTBE analysis in the majority of wells, with continued total petroleum hydrocarbon (TPH) analysis. In BHC101, a full VOC suite to include chlorinated hydrocarbons should continue to confirm that conditions are not changing.*
- *Review of trends in the CoC included in the analytical suites over the last four years indicates that measured concentrations of SVOCs comprise predominantly polycyclic aromatic hydrocarbons (PAHs). As such, it was recommended that the existing SVOC analytical suite be replaced by a focussed PAH suite going forwards.*

It is anticipated that the SPMP for groundwater and surface water will be reviewed again in 2024 in line with the current PPC permit.

3 MONITORING INVESTIGATION

3.1 Monitoring Methodology

The methodology and process for the collection of the groundwater and surface water samples collected is summarised below. The surface water sampling works were undertaken independently by Puma Energy personnel.

3.1.1 Groundwater Sampling

Data	Information
Date sampled	21st – 23rd June 2021
Sampled by	Arcadis (all groundwater samples)
Monitoring wells sampled	Groundwater samples were collected from monitoring wells BHB701, BHC101, BHC401, BHE701, BHD201, BHD401(S), BHD401(D), BHE601, BH02, BHE301, BH06, BHJ, BHC and BHM in accordance with the sampling strategy outlined in the updated SPMP (2020). The groundwater monitoring wells sampled during this phase of works are presented on Figure 1 in Appendix B.
Sampling method	A peristaltic pump was set to a low flow rate. Sampling of groundwater was undertaken from the approximate mid-point in water column. This minimal drawdown sampling technique reduces turbidity and mixing of the water column, and thus reduces the potential for variability in results. The groundwater recharge rate within monitoring well BHC401 was noted to be insufficient to support collection of a compliant low-flow sample, and therefore a 'grab' sample was collected via the same dedicated peristaltic pump tubing at a low-flow rate prior to the well running dry but before the hydrogeochemical parameters had stabilised.
Details recorded	Presence and depth of LNAPL / groundwater and water quality parameters, including Dissolved Oxygen (DO), Oxidation Reduction Potential (ORP), electrical conductivity and pH. Water quality parameters were measured using a multi-parameter meter, whereby readings were taken at approximately five-minute intervals until the parameters from three readings differed by less than 10%. Once the readings had stabilised, the water passing through the low flow pump was considered to be representative of the surrounding aquifer (rather than stagnant water in the well) and the groundwater samples were collected.

3.1.2 Surface Water Sampling

Data	Information
Date sampled	21st – 22nd June 2021
Sampled by	Puma Energy UK Ltd Personnel

Data	Information
Locations sampled	SW2, SW5 and SW13 in accordance with the sampling strategy outlined in the updated SPMP (2020) and as presented on Figure 2 within Appendix B. The fourth sampling point (SW7) was noted to be dry during the sampling event with no water available for collection.
Sampling method	Surface water monitoring involved the inspection of selected surface water features for the presence of free phase product followed by collection of water samples. Samples were collected using dedicated sampling containers. The containers were extended into the surface water feature and rinsed out with surface water. A sample of stream water was then taken ensuring, as far as practicable, that sediment and organic debris was excluded.

3.2 Storage, Preservation and Transport of Samples

Arcadis undertook the following measures to ensure the quality of the samples from collection to receipt of the samples by ALS Laboratories (formerly ALcontrol Laboratories). Puma Energy reported to Arcadis that they undertook the same measures for surface water sample storage, preservation and transport.

Task	Groundwater Samples
Storage	Glass vials supplied by the laboratory were used for the collection of samples to be analysed for volatile compounds. Samples to be analysed for lower volatility compounds were stored in laboratory prepared glass bottles or plastic containers as appropriate. Samples were subsequently stored in dedicated sample boxes with cooling aides provided by the laboratory.
Preservation	To minimise the loss of Volatile Organic Compounds (VOCs), air space was kept to a minimum by filling the glass bottles and vials as far as reasonably practicable. Combined with low storage temperature, this minimised the potential for volatilisation or biodegradation of compounds prior to analysis.
Decontamination	Groundwater samples were collected using dedicated LDPE tubing. The silicone tubing used to connect the pump to the dedicated LDPE tubing was changed between monitoring well locations to prevent cross-contamination.
Transport	Samples and analytical requests were recorded on the laboratory chain of custody form prior to dispatching to laboratory for analysis. Samples were picked up from the Site on a regular basis with samples sent on the same day as being collected where possible.

3.3 Analytical Strategy

Chemical analysis was undertaken in line with the proposed strategy in the updated SPMP (2020), as detailed below:

Data	Information
Chemical laboratory	ALS
Accreditation	United Kingdom Accredited Service (UKAS) and Monitoring Certification Scheme (MCerts) for selected chemical analyses. In addition, ALS are an Arcadis Approved Supplier.

Chemical analyses for groundwater samples:*	• Total Petroleum Hydrocarbons Criteria Working Group (TPH CWG) by Gas Chromatography-Flame Ionisation Detection (GC-FID); • Benzene, Toluene, Ethylbenzene, Total Xylenes (BTEX) and Methyl tertiary-Butyl Ether (MTBE) by Gas Chromatography Mass Spectrometry (GC-MS); • Volatile Organic Compounds (VOCs) by GC-MS – monitoring well BHC101 only; • Polycyclic Aromatic Hydrocarbons (PAHs) by GC-MS.
Chemical analyses for surface water	• TPH CWG by GC-FID; • BTEX and MTBE by GC-MS; • PAH by GC-MS.

* In accordance with the updated SPMP (2020), no analytical testing was undertaken for the SVOC suite.

3.4 Quality Assurance and Quality Control (QA/QC)

Samples were submitted to a UKAS and MCerts accredited laboratory (as detailed above). Samples were submitted with chain of custody documentation identifying Arcadis as the client, the project reference, the samplers name and the sample matrix (i.e. groundwater or surface water).

Quality Assurance/Quality Control (QA/QC) at the laboratory is carried out as part of their standard procedures certified as part of their International Organization for Standardization (ISO) 17025 and MCerts accreditation for methodologies, where applicable.

4 GROUNDWATER MONITORING – RESULTS

4.1 Groundwater Occurrence

Data	Findings
Range in depth to groundwater	0.391 m bgl (monitoring well BHC) to 8.797 m bgl (monitoring well BHE701). The groundwater elevation data collected during the June 2021 monitoring visit is presented in Table 1 in Appendix A.

4.2 Groundwater Flow

No definitive groundwater flow direction could be determined based on the groundwater elevations recorded during the June 2021 groundwater elevation survey due to the complex nature of the geology underlying the Site and the limited number of data points included within the annual monitoring. This is consistent with the findings of previous SPMP reports for the Site.

4.3 Groundwater Quality

Data	Findings
Field Observations:	BHC401 did not display sufficient recharge to allow for full low-flow sampling, with a grab sample collected prior to the well running dry during pumping. A reddish-orange colour was noted on the sample collected from BH06.
LNAPL:	None of the wells monitored in this event contained a measurable thickness of LNAPL. However, the passive bailer installed at BHC101 (which is checked and emptied routinely by Puma Energy), contained a 6mm thickness of LNAPL which was removed and appropriately disposed of prior to well gauging. A further 10mm thickness of LNAPL had been removed by Puma in Q1 2021, as part of the Site's routine internal monitoring.
Laboratory Analysis:	The results are presented in Tables 2 and 3 in Appendix A and a summary of the sum TPH concentrations over time is presented in Table A overleaf. Laboratory certificates are presented in Appendix D.

Table A – Summary of Groundwater Sum TPH Concentrations to Date

Table A Summary of Groundwater TPH Results (µg/l)									
Date Monitoring Location	Jun 2007*	Jul 2013	May 2015	Jun 2016	Jun 2017	Jun 2018	Jun 2019	Jun 2020	Jun 2021
BHB701	140	32	<10	98.0	96.0	<10	<10	<10	<10
BHC101	180	4,530	15,100	33,000	12,900	6,380	17,300	14,351	20,700
BHC401	760	318	96.0	802	209+	337	<10	<10	214
BHD201	<10	<10	<10	<10	<10	<10	16.0	<10	<10
BHD401(S)	<10	DRY	<10	14	<10	<10	<10	<10	<10
BHD401(D)	2,900**	932	458	147	840	634	731	682	539
BHE601	<10	<10	<10	<10	<10	<10	18.0	<10	<10
BHE701	<10	DRY	<10	<10	76.0	745	<10	<10	<10
BH02	-	-	-	-	-	-	1,050[A]	8,400[B]	<10
BH06	-	-	-	-	-	-	89.0[A]	<10[B]	<10
BHE301	<10	-	-	-	-	-	617[A]	<10[B]	<10
C	13	<10	<10	<10	27.0	<10	<10	<10	<10
J	<10	DRY	DRY	<10	<10	<10	24.0	<10	<10
M	<10	<10	<10	<10	<10	<10	13.0	<10	<10

Notes:

TPH	Total Petroleum Hydrocarbons comprises aliphatics and aromatics in the range >C5 - C35.
*	Baseline Sum TPH comprises aliphatic and aromatic hydrocarbons in the range >C5 - C40.
**	No baseline results available for this location. Given the proximity of BHD401(D) to BHD402(D), the baseline data from BHD402(D) has been utilised for comparison to BHD401(D).
##	Sample collected from J5 in line with original SPMP
DRY	No sample collected due to insufficient quantity of groundwater present
+	Resample result
A	Sampled December 2019 as part of separate phase of works
B	Sampled October 2020 as part of separate phase of works

4.4 Surface Water Quality

Data	Findings
Field observations	No visual or olfactory evidence of contamination was observed on the surface water samples collected during the June 2021 visit.
LNAPL	No LNAPL was observed within the surface water bodies sampled in June 2021.
Laboratory analysis	The results are presented in Tables 2 and 3 in Appendix A and a summary of total TPH concentration over time is presented in Table B below. Laboratory certificates are presented in Appendix D.

Table B – Summary of Surface Water Sum TPH Concentrations to Date

Table B Summary of Surface Water TPH Results (µg/l)										
Date Monitoring Location	Jun 2007*	Jul 2013	Jul 2014	May 2015	Jun 2016	Jun 2017	Jun 2018	Jun 2019	Jun 2020	Jun 2021
SW2	<10	<10	<10	<10	<10	<10	<10	10	<10	<10
SW5	84	677	633	<10	508	409	301	120	<10	<10
SW7	<10	DRY	DRY	<10	<10	<10	<10	19	<10	DRY
SW13	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

Notes:

TPH	Total Petroleum Hydrocarbons comprises aliphatics and aromatics in the range >C5 - C35.
*	Baseline Sum TPH comprises aliphatic and aromatic hydrocarbons in the range >C5 - C40.
DRY	No sample taken due to insufficient surface water availability

5 DISCUSSION

5.1 Groundwater Quality

The following section summarises trends in the measured concentrations of CoC over the annual groundwater monitoring events undertaken between July 2013 and June 2021, compared with baseline conditions obtained in June 2007.

TPH & LNAPL

Comparison of measured concentrations of sum TPH from the most recent groundwater monitoring event in June 2021 with baseline concentrations (measured in June 2007) and previous SPMP monitoring events indicates the following:

- In BHD401(S), BHE601, BHE701, BHD201, C, M and J, concentrations have generally remained at or below the laboratory method detection limit (10 µg/l) since the 2007 baseline, with minor sporadic detections observed in occasional monitoring events.
- The concentration of TPH in BHB701 remained below the laboratory MDL (<10 µg/l) for the fourth year in a row, representing a sustained decrease from the 2007 baseline concentration of 140 µg/l and two detections of 98 µg/l and 96 µg/l in 2015 and 2016 respectively.
- The concentration of TPH in BHC401 was above the laboratory MDL (10 µg/l) for the first time in two years. However, the measured concentration of 214 µg/l, comprising predominantly heavy-end aliphatic compounds, remains below the 2007 baseline value (760 µg/l) and within the range of historical variation observed at this location. Furthermore, it should be noted that given the well recharge rate was unable to support full low-flow sample collection, there is a greater risk of sediment entrainment and a 'false positive' within the grab sample ultimately collected.
- The concentration of TPH in BHD401(D) (539 µg/l) is below the 2007 baseline value (2,900 µg/l) and remains consistent with the magnitude of detections encountered over recent years.
- Each of the three additional rail siding monitoring wells added to the SPMP in 2021 recorded sum TPH concentrations below the laboratory MDL indicative of a significant improvement in groundwater quality since the 2019 biodiesel spill.

In BHC101 (in the former refinery area), sum TPH was measured at a concentration of 180 µg/l during the baseline groundwater monitoring event in June 2007 and increased to a maximum concentration of 33,000 µg/l in June 2016. As a result, remedial works including LNAPL removal was undertaken, with a passive bailer installed for on-going capture and removal. The TPH concentration measured in this latest round of monitoring (20,700 µg/l) is higher than that recorded over the previous 4 years, however the presence of residual LNAPL in this monitoring well is considered likely to heavily influence the variation in dissolved phase groundwater quality observed during monitoring events. TPH concentrations have ranged from a minimum of 6,380 µg/l to a maximum of 33,000 µg/l since 2015. Furthermore, the volume of recovering residual free-phase product has been observed to decrease with time, with only 6mm of LNAPL captured within the product skimmer immediately prior to the June 2021 sampling event. Regular passive bailer inspection / LNAPL removal and continued monitoring will evaluate whether this downward trend continues for the long-term and validates effective source removal.

VOC

The groundwater sample collected from BHC101 only was further screened for a full VOC suite as per the revised SPMP design. Continued elevated concentrations of several VOCs were observed, predominantly comprising 1,2,4-trimethylbenzene (1,830 µg/l), 1,3,5-trimethylbenzene (109 µg/l) and total xylenes (37 µg/l). These concentrations are broadly comparable to the findings of previous sampling events completed since May 2014 onwards and potentially attributable to the residual LNAPL present in the vicinity of BHC101. As such, the presence of these compounds is not considered to represent deterioration of ground conditions associated with any current permitted activity.

PAHs

Low-level but measurable PAH concentrations were identified above the respective laboratory MDLs (>0.005 – 0.01 µg/l) in the majority of the monitoring wells sampled, with the most elevated detections identified within BHC101, comprising predominantly naphthalene (49.7 µg/l). These concentrations are again broadly comparable to the findings of previous sampling events and potentially attributable to the residual LNAPL present in the vicinity of BHC101. As such, the presence of these compounds is not considered to represent deterioration of ground conditions associated with any current permitted activity.

MTBE

MTBE was not detected in the baseline analysis from 2007 but has been detected in several wells during the following subsequent visits (although it is noted that the concentrations are relatively low and generally stable):

- Ranging from 8.42 µg/l to 29.1 µg/l in monitoring well C between May 2014 and June 2021;
- Ranging from 2.57 µg/l to 4.47 µg/l in monitoring well J between May 2014 and June 2021; and,
- Ranging from 3.69 µg/l to 16.9 µg/l in monitoring well BHD401(D) between June 2017 and June 2021.

MTBE is analysed and reported under both the TPH CWG analytical suite (analysis by GC-FID) and VOC analytical suite (analysis by GC-MS), where GC-MS analysis is considered more accurate with a lower laboratory MDL. During the acquisition of the baseline data, analysis was undertaken only by GC-FID, whereas subsequently, analysis by both GC-FID and GC-MS has been undertaken (NB: only the GC-MS results have been reported for the purposes of this 2021 summary report).

As such, and given the consistently low concentrations reported, the difference in MTBE concentrations from baseline measurements of 2007 (where analysis was by GC-FID) could potentially be associated in part with the improvement in analytical method rather than a new on-site source. This is further supported by the fact that MTBE has not been stored at the Terminal since 2003, so unlikely to stem from operations at the Site since the 2007 baseline was conducted after this. Given this reasoning and the limited concentrations measured, groundwater quality beneath the Terminal in relation to MTBE is not considered to have deteriorated since the 2007 baseline monitoring.

5.2 Surface Water Quality

The following section summarises trends in measured concentrations of CoC over the annual surface water monitoring events with respect to baseline conditions.

TPH

No measurable TPH concentrations were detected in any samples collected in June 2021 from sample locations SW2, SW5 or SW13. The trend in surface water quality at sample locations SW2 and SW13 is largely consistent with previous visits and in respect to the baseline conditions, with the low-level detections encountered at SW2 (10 µg/l) and SW7 (19 µg/l) in June 2019 appearing to represent a sporadic outlier. No sample was collected from SW7 during this monitoring event as it was dry.

Surface water sample SW5 had a baseline concentration of 84 µg/l in June 2007, which rose to 677 µg/l in July 2013 before steadily decreasing to 120 µg/l in June 2019. With no TPH detections measured in June 2020 and June 2021, we have observed a consistent improvement in surface water quality at this location since June 2016.

PAHs

A single detection of pyrene in surface water from location SW5 was found to be marginally above the laboratory MDL (0.005 µg/l) at 0.0379 µg/l. Given the isolated nature of this low level detection, it's occurrence is not anticipated to be significant, and likely a function of the 'grab' sampling technique employed.

6 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

Comparison of the 2021 annual SPMP dataset with previous annual SPMP groundwater monitoring (collected 2013-2020) and the baseline data collected in June 2007 was undertaken to identify any significant trends in contaminant concentrations over time. The following trends were identified in the groundwater and surface water samples collected:

Groundwater

Groundwater quality in the majority of wells is not considered to have deteriorated significantly since conditions were baselined in 2007. Low level detections of MTBE observed since the baseline dataset are considered likely to be a result of improved analytical methods and reduced laboratory MDL, whilst sum TPH detections are considered to be within the range of historic variation across the Site.

The concentration of sum TPH in BHC101 remains significantly higher than the 2007 baseline. Concentrations show a decreasing trend since a high of 33,000 µg/l measured in June 2016, after which source removal activities were undertaken. The volume of recovering residual free-phase product continues to decrease with time, with only 6mm of LNAPL captured within the product skimmer immediately prior to the June 2021 sampling event. Furthermore, no new primary sources at this location have been identified, such that the on-going presence of residual LNAPL is considered a consequence of changes in groundwater elevation remobilising residual LNAPL within the local unsaturated zone.

Groundwater samples collected at BH02, BH06 and BHE301 located in the vicinity of the 2019 biodiesel spill at the rail sidings did not contain measurable TPH concentrations, indicative of a continued improvement in groundwater quality within this portion of the Site.

Surface Water

Concentrations of CoC in three surface water samples remained low with the vast majority of CoC below the laboratory MDLs, consistent with previous data collected since the 2007 baseline.

A measurable concentration of pyrene was observed at SW5, but no other CoC were identified above their laboratory MDL. Arcadis propose that the frequency of SPMP surface water sampling will continue to be undertaken annually, unless specified otherwise in any new Environmental Permit.

Change in Site Use

Monitoring locations BHC101, BHB701, BHC401C and BHD201 are located within the former refinery processing area which has since been decommissioned and demolished, with no significant deterioration observed in the local shallow groundwater quality assessed since.

6.2 Recommendations

To satisfy the Site's Environmental Permit and to continue to monitor and understand the trends in groundwater quality across the Site, it is recommended that continued annual monitoring of groundwater and surface water be undertaken.

Given the presence of residual, intermittent LNAPL within BHC101, Arcadis recommend that the passive bailer already installed should be inspected at a regular frequency (ideally monthly) to support the on-going assessment and removal of residual product. These inspections should document any reoccurrence of LNAPL within the well and record the total volume of LNAPL removed within the bailer each time. Further annual monitoring and LNAPL evaluation will be required to confirm the conclusion that residual LNAPL within the local vadose / unsaturated zone is related to historical activities.

Appendix A

Table 1 Ground Water Elevations

Table 2 Measured Concentrations of TPH, BTEX, VOC and Fuel Additives in Groundwater (µg/l)

Table 3 Measured Concentrations of TPH, BTEX, VOC and Fuel Additives in Surface Water (µg/l)

Table 1

Ground Water Elevations

Date	21 - 23 June 2021					
Monitoring Well	Ground Elevation (m AOD)	DTP (m bgl)	LNAPL Thickness (m)	DTW (m bgl)	DTB (m bgl)	GWE (m AOD)
BHD401(D)	44.87	-	-	2.347	9.30	42.52
BHD401(S)	44.88	-	-	2.127	3.92	42.76
J	NA	-	-	3.326	8.53	-
BHB701	46.90	-	-	3.096	5.47	43.80
BHC101	52.00	-	-	3.884	6.07	48.11
BHC401	49.25	-	-	3.712	4.42	45.53
BHE601	47.08	-	-	0.776	5.55	46.30
BHE701	57.75	-	-	8.797	9.97	48.95
BHD201	57.23	-	-	3.476	5.90	53.75
BH02	47.08	-	-	2.426	5.02	44.65
BH06	47.03	-	-	2.338	4.28	44.69
BHE301	47.15	-		2.757	5.91	44.39
C	29.32	-	-	0.391	8.43	28.93
M	48.40	-	-	2.854	10.37	45.54

Notes:

m bgl	Metres below ground level
m AOD	Metres Above Ordance Datum
-	No LNAPL encountered
DTW	Depth to Water
GWE	Groundwater Elevation
LNAPL	Light Non-Aqueous Phase Liquid
NA	Data not available
DTP	Depth to Product
DTB	Depth to Base

Table 2

Measured Concentrations of TPH, BTEX, VOCs, SVOCs and Fuel Additives in Groundwater (µg/l)

Sample ID	Chemical Name	Method Detechtion Limit (µg/L)	Groundwater Samples													
			BH02	BH06	BHB701	BHC	BHC101	BHC401	BHD201	BHD401D	BHD401S	BHE301	BHE601	BHE701	BHJ	BHM
Sample Date			22/06/2021	23/06/2021	21/06/2021	21/06/2021	22/06/2021	22/06/2021	23/06/2021	22/06/2021	22/06/2021	23/06/2021	23/06/2021	21/06/2021	22/06/2021	21/06/2021
BTEX and MTBE#	Benzene	1	<1	<1	<1	<1	3.01	<1	<1	3.82	<1	<1	<1	<1	<1	<1
	Toluene	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Ethylbenzene	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Xylene (m & p)	1	<1	<1	<1	<1	31.1	<1	<1	1.42	<1	<1	<1	<1	<1	<1
	Xylene (o)	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Xylene Total	2	<2	<2	<2	<2	31.1	<2	<2	<2	<2	<2	<2	<2	<2	<2
	MTBE	1	1.12	<1	<1	29.1	<1	<1	<1	12.3	<1	<1	<1	<1	3.06	<1
PAH	Naphthalene	0.01	<0.01	<0.01	<0.01	<0.01	49.7	<0.01	<0.01	0.0514	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Acenaphthene	0.005	<0.005	<0.005	<0.005	<0.005	1.44	<0.005	<0.005	0.173	<0.005	0.0113	<0.005	<0.005	<0.005	0.0114
	Acenaphthylene	0.005	<0.005	<0.005	<0.005	<0.005	0.547	<0.005	<0.005	0.0137	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	Fluoranthene	0.005	<0.005	<0.005	<0.005	<0.005	0.37	0.0273	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	Anthracene	0.005	<0.005	<0.005	<0.005	<0.005	0.735	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	Phenanthrene	0.005	<0.005	<0.005	<0.005	<0.005	3.00	<0.005	0.00704	0.0717	<0.005	<0.005	<0.005	<0.005	<0.005	0.0135
	Fluorene	0.005	<0.005	<0.005	<0.005	<0.005	3.53	<0.005	<0.005	0.0994	<0.005	0.0168	<0.005	<0.005	<0.005	0.0117
	Chrysene	0.005	<0.005	<0.005	<0.005	<0.005	0.0462	0.0148	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	Pyrene	0.005	0.0088	<0.005	0.0289	<0.005	0.606	0.0422	<0.005	0.00966	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	Benzo(a)anthracene	0.005	<0.005	<0.005	<0.005	<0.005	0.105	0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	Benzo(b)fluoranthene	0.005	<0.005	<0.005	<0.005	<0.005	0.0658	0.0317	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	Benzo(k)fluoranthene	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0132	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	Benzo(a)pyrene	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.0182	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
	Dibenz(a,h)anthracene	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	Benzo(g,h,i)perylene	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0192	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	Indeno(1,2,3-c,d)pyrene	0.005	<0.005	<0.005	<0.005	<0.005	0.0388	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	PAH 16 Total	0.082	<0.082	<0.082	<0.082	<0.082	60.2	0.177	<0.082	0.418	<0.082	<0.082	<0.082	<0.082	<0.082	<0.082
TPH CWG	>C5-C6 Aliphatics	10	<10	<10	<10	<10	50	<10	<10	144	<10	<10	<10	<10	<10	<10
	>C6-C8 Aliphatics	10	<10	<10	<10	<10	1,240	<10	<10	257	<10	<10	<10	<10	<10	<10
	>C8-C10 Aliphatics	10	<10	<10	<10	<10	1,660	<10	<10	36.0	<10	<10	<10	<10	<10	<10
	>C10-C12 Aliphatics	10	<10	<10	<10	<10	3,300	<10	<10	32.0	<10	<10	<10	<10	<10	<10
	>C12-C16 Aliphatics	10	<10	<10	<10	<10	4,110	<10	<10	<10	<10	<10	<10	<10	<10	<10
	>C16-C21 Aliphatics	10	<10	<10	<10	<10	3,630	34.0	<10	<10	<10	<10	<10	<10	<10	<10
	>C21-C35 Aliphatics	10	<10	<10	<10	<10	1,380	180	<10	<10	<10	<10	<10	<10	<10	<10
	>C16-C35 Aliphatics	10	<10	<10	<10	<10	5,010	214	<10	<10	<10	<10	<10	<10	<10	<10
	Total Aliphatics >C12-C35	10	<10	<10	<10	<10	9,120	214	<10	<10	<10	<10	<10	<10	<10	<10
	>EC5-EC7 Aromatics	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
	>EC7-EC8 Aromatics	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
	>EC8-EC10 Aromatics	10	<10	<10	<10	<10	1,140	<10	<10	26.0	<10	<10	<10	<10	<10	<10
	>EC10-EC12 Aromatics	10	<10	<10	<10	<10	2,200	<10	<10	21.0	<10	<10	<10	<10	<10	<10
	>EC12-EC16 Aromatics	10	<10	<10	<10	<10	1,080	<10	<10	13.0	<10	<10	<10	<10	<10	<10
	>EC16-EC21 Aromatics	10	<10	<10	<10	<10	663	<10	<10	<10	<10	<10	<10	<10	<10	<10
	>EC21-EC35 Aromatics	10	<10	<10	<10	<10	257	<10	<10	<10	<10	<10	<10	<10	<10	<10
	Total Aromatics >EC12-EC35	10	<10	<10	<10	<10	2,000	<10	<10	13.0	<10	<10	<10	<10	<10	<10
	TPH >C5-C35 Aliphatics/Aromatics	10	<10	<10	<10	<10	20,700	214	<10	539	<10	<10	<10	<10	<10	<10
VOC	Styrene	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	cis-1,3-dichloropropene	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	trans-1,3-dichloropropene	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	1,1,1,2-tetrachloroethane	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	1,1,1-trichloroethane	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	1,1,2,2-tetrachloroethane	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	1,1,2-trichloroethane	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	1,1-dichloroethane	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	1,1-dichloroethene	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	1,1-dichloropropene	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	1,2,3-trichloropropane	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	1,2,4-trimethylbenzene	1	-	-	-	-	1,830	-	-	-	-	-	-	-	-	-
	1,2-dibromo-3-chloropropane	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	1,2-dibromoethane	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	1,2-dichloroethane	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	1,2-dichloropropane	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	1,3,5-trimethylbenzene	1	-	-	-	-	109	-	-	-	-	-	-	-	-	-
	1,3-dichloropropane	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	2,2-dichloropropane	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	2-chlorotoluene	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	4-chlorotoluene	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	Bromobenzene	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	Bromochloromethane	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	Bromodichloromethane	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	Bromoform	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	Bromomethane	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	Carbon disulfide	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	Carbon tetrachloride	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	Chlorodibromomethane	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	Chloroethane	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	Chloroform	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	Chloromethane	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	cis-1,2-dichloroethene	1	-	-	-	-	15.9	-	-	-	-	-	-	-	-	-
	Dibromomethane	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	Dichlorodifluoromethane	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	Dichloromethane	3	-	-	-	-	<3	-	-	-	-	-	-	-	-	-
	Isopropylbenzene	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	n-butylbenzene	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	n-propylbenzene	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	p-isopropyltoluene	1	-	-	-	-	1.33	-	-	-	-	-	-	-	-	-
	sec-butylbenzene	1	-	-	-	-	2.4	-	-	-	-	-	-	-	-	-
	Trichloroethene	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	tert-butylbenzene	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	Tetrachloroethene	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	trans-1,2-dichloroethene	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	Trichlorofluoromethane	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	Vinyl chloride	1	-	-	-	-	6.22	-	-	-	-	-	-	-	-	-
	tert-Amyl methyl ether	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	1,2,3-trichlorobenzene	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	1,2,4-trichlorobenzene	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	1,2-dichlorobenzene	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	1,3,5-Trichlorobenzene	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	1,3-dichlorobenzene	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	1,4-dichlorobenzene	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	Chlorobenzene	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-
	Hexachlorobutadiene	1	-	-	-	-	<1	-	-	-	-	-	-	-	-	-

Notes:

<1.23	Result less than method detection limit
-	Not analysed
#	Results presented analysed by Gas Chromatography Mass Spectrometry (GC MS)
TPH	Total Petroleum Hydrocarbons. The sum of Aliphatics and Aromatics (EC5-EC35).
MTBE	Methyl tertiary butyl ether
VOC	Volatile Organic Compound

All results are reported to the Method Detection Limit or 3 significant figures.

Table

Measured Concentrations of TPH and BTEX in Surface water (µg/l)

Sample ID	Chemical Name	Method Detechtion Limit (µg/L)	Groundwater Samples		
			SW13	SW2	SW5
Sample Date			22/06/2021	22/06/2021	21/06/2021
BTEX and MTBE#	Benzene	1	<1	<1	<1
	Toluene	1	<1	<1	<1
	Ethylbenzene	1	<1	<1	<1
	Xylene (m & p)	1	<1	<1	<1
	Xylene (o)	1	<1	<1	<1
	Xylene Total	2	<2	<2	<2
	MTBE	1	<1	<1	<1
PAH	Naphthalene	0.01	<0.01	<0.01	<0.01
	Acenaphthene	0.005	<0.005	<0.005	<0.005
	Acenaphthylene	0.005	<0.005	<0.005	<0.005
	Fluoranthene	0.005	<0.005	<0.005	<0.005
	Anthracene	0.005	<0.005	<0.005	<0.005
	Phenanthrene	0.005	<0.005	<0.005	<0.005
	Fluorene	0.005	<0.005	<0.005	<0.005
	Chrysene	0.005	<0.005	<0.005	<0.005
	Pyrene	0.005	<0.005	<0.005	0.0379
	Benzo(a)anthracene	0.005	<0.005	<0.005	<0.005
	Benzo(b)fluoranthene	0.005	<0.005	<0.005	<0.005
	Benzo(k)fluoranthene	0.005	<0.005	<0.005	<0.005
	Benzo(a)pyrene	0.002	<0.002	<0.002	<0.002
	Dibenz(a,h)anthracene	0.005	<0.005	<0.005	<0.005
	Benzo(g,h,i)perylene	0.005	<0.005	<0.005	<0.005
	Indeno(1,2,3-c,d)pyrene	0.005	<0.005	<0.005	<0.005
	PAH 16 Total	0.082	<0.082	<0.082	<0.082
TPH CWG	>C5-C6 Aliphatics	10	<10	<10	<10
	>C6-C8 Aliphatics	10	<10	<10	<10
	>C8-C10 Aliphatics	10	<10	<10	<10
	>C10-C12 Aliphatics	10	<10	<10	<10
	>C12-C16 Aliphatics	10	<10	<10	<10
	>C16-C21 Aliphatics	10	<10	<10	<10
	>C21-C35 Aliphatics	10	<10	<10	<10
	>C16-C35 Aliphatics	10	<10	<10	<10
	Total Aliphatics >C12-C35	10	<10	<10	<10
	>EC5-EC7 Aromatics	10	<10	<10	<10
	>EC7-EC8 Aromatics	10	<10	<10	<10
	>EC8-EC10 Aromatics	10	<10	<10	<10
	>EC10-EC12 Aromatics	10	<10	<10	<10
	>EC12-EC16 Aromatics	10	<10	<10	<10
	>EC16-EC21 Aromatics	10	<10	<10	<10
	>EC21-EC35 Aromatics	10	<10	<10	<10
	Total Aromatics >EC12-EC35	10	<10	<10	<10
	TPH >C5-C35 Aliphatics/Aromatics	10	<10	<10	<10

Notes:

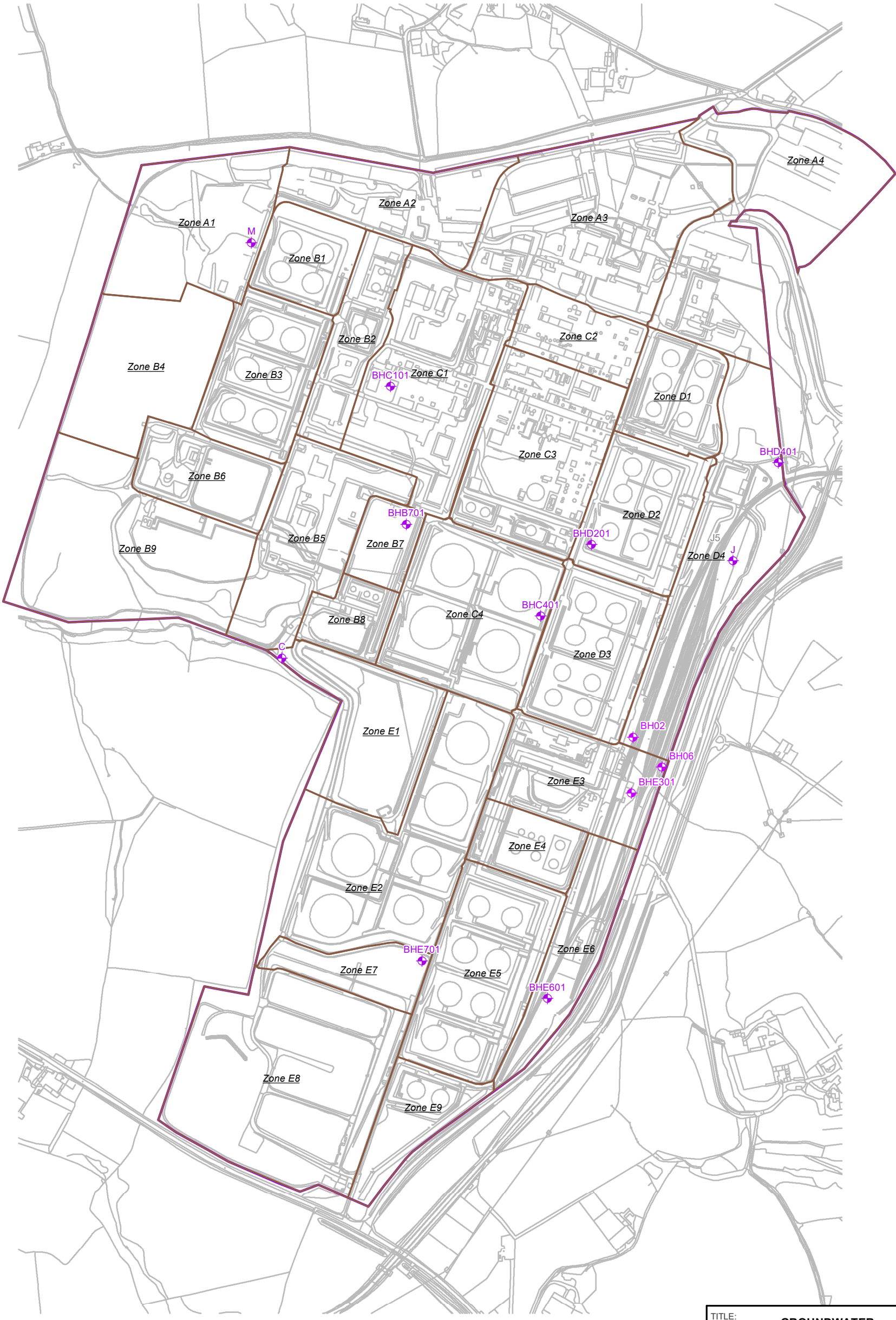
<1.23	Result less than method detection limit
TPH	Total Petroleum Hydrocarbons. The sum of Aliphatics and Aromatics (EC5-EC35).
MTBE	Methyl tertiary butyl ether
#	Results presented analysed by Gas Chromatography Mass Spectrometry (GC MS)

All results are reported to the Method Detection Limit or 3 significant figures.

Appendix B

Figure 1 Borehole Location Plan

Figure 2 Surface Water Sampling Location Plan



LEGEND

- SITE PROTECTION MONITORING PLAN MONITORING WELLS
- SITE ZONES
- SITE BOUNDARY

NOTES

SYMBOLS FOR BOREHOLES, TRIAL PITS AND OTHER SPECIFIC FEATURES ARE REPRESENTATIONS OF LOCATION ONLY AND UNLESS OTHERWISE SPECIFIED, DO NOT REPRESENT THE TRUE SIZE OF THE FEATURE.

0 25 50 100 150 200 250 Metres

N

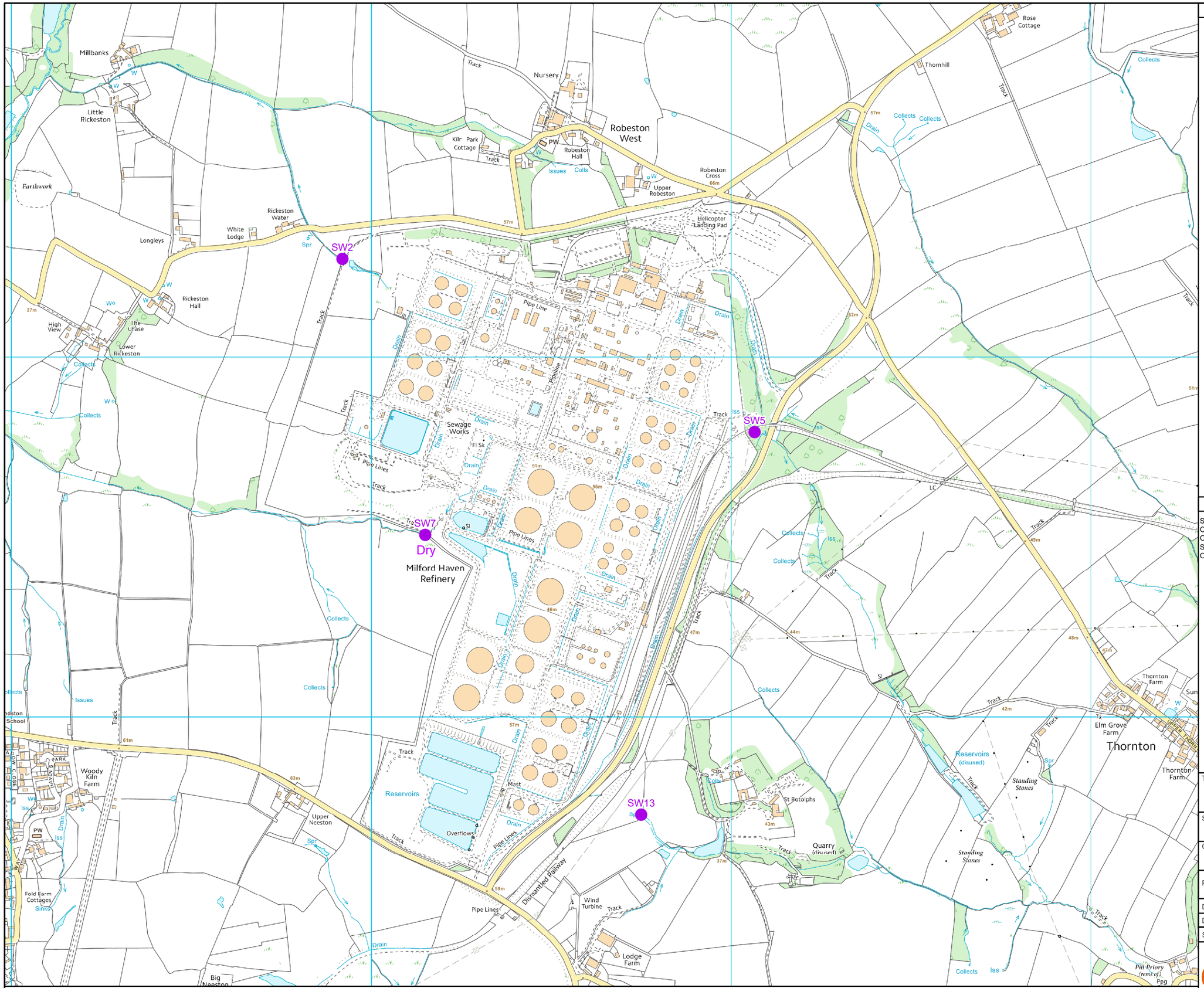
TITLE: **GROUNDWATER SAMPLING LOCATION PLAN**

SITE : **MILFORD HAVEN**

CLIENT : **PUMA ENERGY**

PROJECT :	**10049410**	**FIGURE 1**	
DATE :	04/08/21	DRAWN BY :	AP
DRG No. :	10049410-AUK-XX-XX-DR-ZZ-002-P1		
SCALE :	**1 : 7,000**	PRINT :	**A3**

ARCADIS Design & Consultancy for natural and built assets



LEGEND

- SITE PROTECTION MONITORING PLAN SURFACE WATER SAMPLING LOCATIONS

NOTES

SYMBOLS FOR BOREHOLES, TRIAL PITS AND OTHER SPECIFIC FEATURES ARE REPRESENTATIONS OF LOCATION ONLY AND UNLESS OTHERWISE SPECIFIED, DO NOT REPRESENT THE TRUE SIZE OF THE FEATURE.

N

0 40 80 160 240 320 400 Metres

TITLE:
SURFACE WATER SAMPLING LOCATION PLAN

SITE :
MILFORD HAVEN TERMINAL

CLIENT :
MURCO PETROLEUM LIMITED

PROJECT :	10049410	FIGURE 2	
DATE :	05/08/21	DRAWN BY :	BNB
DRG No. :	10049410-AUK-XX-XX-DR-ZZ-001-P1		
SCALE :	1 : 10,000	PRINT :	A3

ARCADIS Design & Consultancy for natural and built assets

Appendix C

Arcadis' Study Limitations

Arcadis' Study Limitations

IMPORTANT. This section should be read before reliance is placed on any of the information, opinions, advice, recommendations or conclusions contained in this report.

1. This report has been prepared by Arcadis (UK) Ltd ('Arcadis'), with all reasonable skill, care and diligence within the terms of the Appointment and with the resources agreed with Puma Energy UK Ltd (the 'Client'). Arcadis does not accept responsibility for any matters outside the agreed scope.
2. This report has been prepared for the sole benefit of the Client unless agreed otherwise in writing. The contents of this report may not be used or relied upon by any person other than this party without the express written consent and authorisation of Arcadis.
3. Unless stated otherwise, no consultations with authorities or funders or other interested third parties have been carried out. Arcadis is unable to give categorical assurance that the findings will be accepted by these third parties as such bodies may have unpublished, more stringent objectives. Further work may be required by these parties.
4. All work carried out in preparing this report has used, and is based on, Arcadis' professional knowledge and understanding of current relevant legislation. Changes in legislation or regulatory guidance may cause the opinion or advice contained in this report to become inappropriate or incorrect. In giving opinions and advice, pending changes in legislation, of which Arcadis is aware, have been considered. Following delivery of the report, Arcadis has no obligation to advise the Client or any other party of such changes or their repercussions.
5. This report is only valid when used in its entirety. Any information or advice included in the report should not be relied upon until considered in the context of the whole report.
6. Whilst this report and the opinions made are correct to the best of Arcadis' belief, Arcadis cannot guarantee the accuracy or completeness of any information provided by third parties. Arcadis has taken reasonable steps to ensure that the information used for this assessment provided accurate information, and has therefore assumed this to be the case.
7. This report has been prepared based on the information reasonably available during the project programme. All information relevant to the scope may not have been received.
8. This report refers, within the limitations stated, to the condition of the Site at the time of the inspection. No warranty is given as to the possibility of changes in the condition of the Site since the time of the investigation.
9. The content of this report represents the professional opinion of experienced environmental consultants. Arcadis does not provide specialist legal or other professional advice. The advice of other professionals may be required.
10. Where intrusive investigation techniques have been employed they have been designed to provide a reasonable level of assurance on the conditions. Given the discrete nature of sampling, no investigation technique is capable of identifying all conditions present in all areas. In some cases the investigation is further limited by Site operations, underground obstructions and above ground structures. Unless otherwise stated, areas beyond the boundary of the Site have not been investigated.
11. Unless otherwise stated the report provides no comment on the nature of building materials, operational integrity of the facility or on any regulatory compliance issues.
12. Unless otherwise stated, an inspection of the Site has not been undertaken and there may be conditions present at the Site which have not been identified within the scope of this assessment.
13. Unless otherwise stated, samples from the Site (soil, groundwater, building fabric or other samples) have not been obtained.
14. Arcadis has relied upon the accuracy of documents, oral information and other material and information provided by the Client and others, and Arcadis assumes no liability for the accuracy of such data, although in the event of apparent conflicts in information, Arcadis would highlight this and seek to resolve.
15. Unless otherwise stated, the scope of works has not included an environmental compliance review, health and safety compliance review, hazardous building materials assessment, interviews or contacting Local Authority, requests for information to the petroleum officer, sampling or analyses of soil, ground water, surface water, air or hazardous building materials or a chain of title review.
16. Unless otherwise stated, this assessment has considered the ongoing use of the Site and has not been prepared for the purposes of redevelopment which may act as a trigger for Site investigation and remediation works not needed for ongoing use.

Appendix D

Laboratory Certificates

Unit 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
CH5 3US
Tel: (01244) 528700
Fax: (01244) 528701
email: hawardencustomerservices@alsglobal.com
Website: www.alsenvironmental.co.uk

ARCADIS UK Ltd
Charter House
62-68 Hills Road
Cambridge
CB2 1LA

Attention: Paul Hamer

CERTIFICATE OF ANALYSIS

Date of report Generation:	02 July 2021
Customer:	ARCADIS UK Ltd
Sample Delivery Group (SDG):	210625-123
Your Reference:	10049410
Location:	MILFORD - HAVEN, WALES
Report No:	604145

We received 10 samples on Friday June 25, 2021 and 10 of these samples were scheduled for analysis which was completed on Thursday July 01, 2021. 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.

Chemical testing (unless subcontracted) performed at ALS Environmental Hawarden (Method codes TM) or ALS Environmental Aberdeen (Method codes S).

All sample data is provided by the customer. The reported results relate to the sample supplied, and on the basis that this data is correct.
Incorrect sampling dates and/or sample information will affect the validity of results.

Approved By:

Sonia McWhan

Operations Manager

CERTIFICATE OF ANALYSIS

SDG:	210625-123	**Client Reference:**	10049410	**Report Number:**	604145
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
24514394	BH06		3.50 - 3.50	23/06/2021
24514383	BHC101		5.00 - 5.00	22/06/2021
24514384	BHC401		4.40 - 4.40	22/06/2021
24514402	BHD201		5.00 - 5.00	23/06/2021
24514388	BHD401S		0.00 - 3.00	22/06/2021
24514392	BHE301		5.00 - 5.00	23/06/2021
24514400	BHE601		4.00 - 4.00	23/06/2021
24514387	SW2			22/06/2021
24514397	SW5			21/06/2021
24514386	SW13			22/06/2021

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

Validated

CERTIFICATE OF ANALYSIS

SDG:	210625-123	**Client Reference:**	10049410	**Report Number:**	604145
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Results Legend

X Test

N No Determination Possible

Sample Types -
S - Soil/Solid
UNS - Unspecified Solid
GW - Ground Water
SW - Surface Water
LE - Land Leachate
PL - Prepared Leachate
PR - Process Water
SA - Saline Water
TE - Trade Effluent
TS - Treated Sewage
US - Untreated Sewage
RE - Recreational Water
DW - Drinking Water Non-regulatory
UNL - Unspecified Liquid
SL - Sludge
G - Gas
OTH - Other

Lab Sample No(s)			24514394		24514383		24514384		24514402		24514388		24514392		24514400		24514387		24514397		24514386	
Customer Sample Reference			BH06		BHC101		BHC401		BHD201		BHD401S		BHE301		BHE601		SW2		SW5		SW13	
AGS Reference																						
Depth (m)			3.50 - 3.50		5.00 - 5.00		4.40 - 4.40		5.00 - 5.00		0.00 - 3.00		5.00 - 5.00		4.00 - 4.00							
Container			0.5l glass bottle (ALE227)	Vial (ALE297)	0.5l glass bottle (ALE227)	Vial (ALE297)	0.5l glass bottle (ALE227)	Vial (ALE297)	0.5l glass bottle (ALE227)	Vial (ALE297)	0.5l glass bottle (ALE227)	Vial (ALE297)	0.5l glass bottle (ALE227)	Vial (ALE297)	0.5l glass bottle (ALE227)	Vial (ALE297)	0.5l glass bottle (ALE227)	Vial (ALE297)	0.5l glass bottle (ALE227)	Vial (ALE297)	0.5l glass bottle (ALE227)	Vial (ALE297)
Sample Type			GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	SW	SW	SW	SW	SW	SW
EPH CWG (Aliphatic) Aqueous GC (W)	All	NDPs: 0 Tests: 10	X		X		X		X		X		X		X		X		X		X	
EPH CWG (Aromatic) Aqueous GC (W)	All	NDPs: 0 Tests: 10	X		X		X		X		X		X		X		X		X		X	
GRO by GC-FID (W)	All	NDPs: 0 Tests: 10		X		X		X		X		X		X		X		X		X		X
PAH Spec MS - Aqueous (W)	All	NDPs: 0 Tests: 10	X		X		X		X		X		X		X		X		X		X	
TPH CWG (W)	All	NDPs: 0 Tests: 10	X		X		X		X		X		X		X		X		X		X	
VOC MS (W)	All	NDPs: 0 Tests: 10		X		X		X		X		X		X		X		X		X		X

CERTIFICATE OF ANALYSIS

SDG:	210625-123	**Client Reference:**	10049410	**Report Number:**	604145
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

PAH Spec MS - Aqueous (W)

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted - refer to subcontractor report for accreditation status.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4+5@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	BH06	BHC101	BHC401	BHD201	BHD401S	BHE301
			Depth (m)	3.50 - 3.50	5.00 - 5.00	4.40 - 4.40	5.00 - 5.00	0.00 - 3.00	5.00 - 5.00
			Sample Type	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)
			Date Sampled	23/06/2021	22/06/2021	22/06/2021	23/06/2021	22/06/2021	23/06/2021
			Sampled Time	.	.	.	.	.	.
			Date Received	25/06/2021	25/06/2021	25/06/2021	25/06/2021	25/06/2021	25/06/2021
			SDG Ref	210625-123	210625-123	210625-123	210625-123	210625-123	210625-123
			Lab Sample No.(s)	24514394	24514383	24514384	24514402	24514388	24514392
			AGS Reference						
Naphthalene (aq)	<0.01 µg/l	TM178		<0.01 #	49.7 #	<0.01 #	<0.01 #	<0.01 #	<0.01 #
Acenaphthene (aq)	<0.005 µg/l	TM178		<0.005 #	1.44 #	<0.005 #	<0.005 #	<0.005 #	0.0113 #
Acenaphthylene (aq)	<0.005 µg/l	TM178		<0.005 #	0.547 #	<0.005 #	<0.005 #	<0.005 #	<0.005 #
Fluoranthene (aq)	<0.005 µg/l	TM178		<0.005 #	0.37 #	0.0273 #	<0.005 #	<0.005 #	<0.005 #
Anthracene (aq)	<0.005 µg/l	TM178		<0.005 #	0.735 #	<0.005 #	<0.005 #	<0.005 #	<0.005 #
Phenanthrene (aq)	<0.005 µg/l	TM178		<0.005 #	3 #	<0.005 #	0.00704 #	<0.005 #	<0.005 #
Fluorene (aq)	<0.005 µg/l	TM178		<0.005 #	3.53 #	<0.005 #	<0.005 #	<0.005 #	0.0168 #
Chrysene (aq)	<0.005 µg/l	TM178		<0.005 #	0.0462 #	0.0148 #	<0.005 #	<0.005 #	<0.005 #
Pyrene (aq)	<0.005 µg/l	TM178		<0.005 #	0.606 #	0.0422 #	<0.005 #	<0.005 #	<0.005 #
Benzo(a)anthracene (aq)	<0.005 µg/l	TM178		<0.005 #	0.105 #	0.01 #	<0.005 #	<0.005 #	<0.005 #
Benzo(b)fluoranthene (aq)	<0.005 µg/l	TM178		<0.005 #	0.0658 #	0.0317 #	<0.005 #	<0.005 #	<0.005 #
Benzo(k)fluoranthene (aq)	<0.005 µg/l	TM178		<0.005 #	<0.005 #	0.0132 #	<0.005 #	<0.005 #	<0.005 #
Benzo(a)pyrene (aq)	<0.002 µg/l	TM178		<0.002 #	<0.002 #	0.0182 #	<0.002 #	<0.002 #	<0.002 #
Dibenzo(a,h)anthracene (aq)	<0.005 µg/l	TM178		<0.005 #	<0.005 #	<0.005 #	<0.005 #	<0.005 #	<0.005 #
Benzo(g,h,i)perylene (aq)	<0.005 µg/l	TM178		<0.005 #	<0.005 #	0.0192 #	<0.005 #	<0.005 #	<0.005 #
Indeno(1,2,3-cd)pyrene (aq)	<0.005 µg/l	TM178		<0.005 #	0.0388 #	<0.005 #	<0.005 #	<0.005 #	<0.005 #
PAH, Total Detected USEPA 16 (aq)	<0.082 µg/l	TM178		<0.082 #	60.2 #	0.177 #	<0.082 #	<0.082 #	<0.082 #

CERTIFICATE OF ANALYSIS

SDG:	210625-123	**Client Reference:**	10049410	**Report Number:**	604145
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

PAH Spec MS - Aqueous (W)

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted - refer to subcontractor report for accreditation status.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4+5@	Sample deviation (see appendix)

Customer Sample Ref.	BHE601	SW2	SW5	SW13		
Depth (m)	4.00 - 4.00	.	.	.		
Sample Type	Ground Water (GW)	Surface Water (SW)	Surface Water (SW)	Surface Water (SW)		
Date Sampled	23/06/2021	22/06/2021	21/06/2021	22/06/2021		
Sampled Time	.	.	.	.		
Date Received	25/06/2021	25/06/2021	25/06/2021	25/06/2021		
SDG Ref	210625-123	210625-123	210625-123	210625-123		
Lab Sample No.(s)	24514400	24514387	24514397	24514386		
AGS Reference						

Component	LOD/Units	Method						
Naphthalene (aq)	<0.01 µg/l	TM178	<0.01 #	<0.01 #	<0.01 #	<0.01 #		
Acenaphthene (aq)	<0.005 µg/l	TM178	<0.005 #	<0.005 #	<0.005 #	<0.005 #		
Acenaphthylene (aq)	<0.005 µg/l	TM178	<0.005 #	<0.005 #	<0.005 #	<0.005 #		
Fluoranthene (aq)	<0.005 µg/l	TM178	<0.005 #	<0.005 #	<0.005 #	<0.005 #		
Anthracene (aq)	<0.005 µg/l	TM178	<0.005 #	<0.005 #	<0.005 #	<0.005 #		
Phenanthrene (aq)	<0.005 µg/l	TM178	<0.005 #	<0.005 #	<0.005 #	<0.005 #		
Fluorene (aq)	<0.005 µg/l	TM178	<0.005 #	<0.005 #	<0.005 #	<0.005 #		
Chrysene (aq)	<0.005 µg/l	TM178	<0.005 #	<0.005 #	<0.005 #	<0.005 #		
Pyrene (aq)	<0.005 µg/l	TM178	<0.005 #	<0.005 #	0.0379 #	<0.005 #		
Benzo(a)anthracene (aq)	<0.005 µg/l	TM178	<0.005 #	<0.005 #	<0.005 #	<0.005 #		
Benzo(b)fluoranthene (aq)	<0.005 µg/l	TM178	<0.005 #	<0.005 #	<0.005 #	<0.005 #		
Benzo(k)fluoranthene (aq)	<0.005 µg/l	TM178	<0.005 #	<0.005 #	<0.005 #	<0.005 #		
Benzo(a)pyrene (aq)	<0.002 µg/l	TM178	<0.002 #	<0.002 #	<0.002 #	<0.002 #		
Dibenzo(a,h)anthracene (aq)	<0.005 µg/l	TM178	<0.005 #	<0.005 #	<0.005 #	<0.005 #		
Benzo(g,h,i)perylene (aq)	<0.005 µg/l	TM178	<0.005 #	<0.005 #	<0.005 #	<0.005 #		
Indeno(1,2,3-cd)pyrene (aq)	<0.005 µg/l	TM178	<0.005 #	<0.005 #	<0.005 #	<0.005 #		
PAH, Total Detected USEPA 16 (aq)	<0.082 µg/l	TM178	<0.082 #	<0.082 #	<0.082 #	<0.082 #		

CERTIFICATE OF ANALYSIS

SDG:	210625-123	**Client Reference:**	10049410	**Report Number:**	604145
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

TPH CWG (W)

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted - refer to subcontractor report for accreditation status.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4+5@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	BH06	BHC101	BHC401	BHD201	BHD401S	BHE301
			Depth (m)	3.50 - 3.50	5.00 - 5.00	4.40 - 4.40	5.00 - 5.00	0.00 - 3.00	5.00 - 5.00
			Sample Type	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)
			Date Sampled	23/06/2021	22/06/2021	22/06/2021	23/06/2021	22/06/2021	23/06/2021
			Sampled Time	.	.	.	.	.	.
			Date Received	25/06/2021	25/06/2021	25/06/2021	25/06/2021	25/06/2021	25/06/2021
			SDG Ref	210625-123	210625-123	210625-123	210625-123	210625-123	210625-123
			Lab Sample No.(s)	24514394	24514383	24514384	24514402	24514388	24514392
			AGS Reference						
GRO Surrogate % recovery**	%	TM245		103	96	101	99	100	102
GRO >C5-C12	<50 µg/l	TM245		<50 #	9600 #	<50 #	<50 #	<50 #	<50 #
Methyl tertiary butyl ether (MTBE)	<3 µg/l	TM245		<3 #	<3 #	<3 #	<3 #	<3 #	<3 #
Benzene	<7 µg/l	TM245		<7 #	<7 #	<7 #	<7 #	<7 #	<7 #
Toluene	<4 µg/l	TM245		<4 #	<4 #	<4 #	<4 #	<4 #	<4 #
Ethylbenzene	<5 µg/l	TM245		<5 #	<5 #	<5 #	<5 #	<5 #	<5 #
m,p-Xylene	<8 µg/l	TM245		<8 #	37 #	<8 #	<8 #	<8 #	<8 #
o-Xylene	<3 µg/l	TM245		<3 #	<3 #	<3 #	<3 #	<3 #	<3 #
Sum of detected Xylenes	<11 µg/l	TM245		<11	37	<11	<11	<11	<11
Sum of detected BTEX	<28 µg/l	TM245		<28	37	<28	<28	<28	<28
Aliphatics >C5-C6	<10 µg/l	TM245		<10	50	<10	<10	<10	<10
Aliphatics >C6-C8	<10 µg/l	TM245		<10	1240	<10	<10	<10	<10
Aliphatics >C8-C10	<10 µg/l	TM245		<10	1660	<10	<10	<10	<10
Aliphatics >C10-C12	<10 µg/l	TM245		<10	3300	<10	<10	<10	<10
Aliphatics >C12-C16 (aq)	<10 µg/l	TM174		<10	4110	<10	<10	<10	<10
Aliphatics >C16-C21 (aq)	<10 µg/l	TM174		<10	3630	34	<10	<10	<10
Aliphatics >C21-C35 (aq)	<10 µg/l	TM174		<10	1380	180	<10	<10	<10
Total Aliphatics >C12-C35 (aq)	<10 µg/l	TM174		<10	9120	214	<10	<10	<10
Aromatics >EC5-EC7	<10 µg/l	TM245		<10	<10	<10	<10	<10	<10
Aromatics >EC7-EC8	<10 µg/l	TM245		<10	<10	<10	<10	<10	<10
Aromatics >EC8-EC10	<10 µg/l	TM245		<10	1140	<10	<10	<10	<10
Aromatics >EC10-EC12	<10 µg/l	TM245		<10	2200	<10	<10	<10	<10
Aromatics >EC12-EC16 (aq)	<10 µg/l	TM174		<10	1080	<10	<10	<10	<10
Aromatics >EC16-EC21 (aq)	<10 µg/l	TM174		<10	663	<10	<10	<10	<10
Aromatics >EC21-EC35 (aq)	<10 µg/l	TM174		<10	257	<10	<10	<10	<10
Total Aromatics >EC12-EC35 (aq)	<10 µg/l	TM174		<10	2000	<10	<10	<10	<10
Total Aliphatics & Aromatics >C5-35 (aq)	<10 µg/l	TM174		<10	20700	214	<10	<10	<10
Aliphatics >C16-C35 Aqueous	<10 µg/l	TM174		<10	5010	214	<10	<10	<10

CERTIFICATE OF ANALYSIS

SDG:	210625-123	**Client Reference:**	10049410	**Report Number:**	604145
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

TPH CWG (W)

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted - refer to subcontractor report for accreditation status.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4+5@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	BHE601	SW2	SW5	SW13		
			Depth (m)	4.00 - 4.00	.	.	.		
			Sample Type	Ground Water (GW)	Surface Water (SW)	Surface Water (SW)	Surface Water (SW)		
			Date Sampled	23/06/2021	22/06/2021	21/06/2021	22/06/2021		
			Sampled Time	.	.	.	.		
			Date Received	25/06/2021	25/06/2021	25/06/2021	25/06/2021		
			SDG Ref	210625-123	210625-123	210625-123	210625-123		
			Lab Sample No.(s)	24514400	24514387	24514397	24514386		
			AGS Reference						
GRO Surrogate % recovery**	%	TM245		101	86	99	95		
GRO >C5-C12	<50 µg/l	TM245		<50 #	<50 #	<50 #	<50 #		
Methyl tertiary butyl ether (MTBE)	<3 µg/l	TM245		<3 #	<3 #	<3 #	<3 #		
Benzene	<7 µg/l	TM245		<7 #	<7 #	<7 #	<7 #		
Toluene	<4 µg/l	TM245		<4 #	<4 #	<4 #	<4 #		
Ethylbenzene	<5 µg/l	TM245		<5 #	<5 #	<5 #	<5 #		
m,p-Xylene	<8 µg/l	TM245		<8 #	<8 #	<8 #	<8 #		
o-Xylene	<3 µg/l	TM245		<3 #	<3 #	<3 #	<3 #		
Sum of detected Xylenes	<11 µg/l	TM245		<11	<11	<11	<11		
Sum of detected BTEX	<28 µg/l	TM245		<28	<28	<28	<28		
Aliphatics >C5-C6	<10 µg/l	TM245		<10	<10	<10	<10		
Aliphatics >C6-C8	<10 µg/l	TM245		<10	<10	<10	<10		
Aliphatics >C8-C10	<10 µg/l	TM245		<10	<10	<10	<10		
Aliphatics >C10-C12	<10 µg/l	TM245		<10	<10	<10	<10		
Aliphatics >C12-C16 (aq)	<10 µg/l	TM174		<10	<10	<10	<10		
Aliphatics >C16-C21 (aq)	<10 µg/l	TM174		<10	<10	<10	<10		
Aliphatics >C21-C35 (aq)	<10 µg/l	TM174		<10	<10	<10	<10		
Total Aliphatics >C12-C35 (aq)	<10 µg/l	TM174		<10	<10	<10	<10		
Aromatics >EC5-EC7	<10 µg/l	TM245		<10	<10	<10	<10		
Aromatics >EC7-EC8	<10 µg/l	TM245		<10	<10	<10	<10		
Aromatics >EC8-EC10	<10 µg/l	TM245		<10	<10	<10	<10		
Aromatics >EC10-EC12	<10 µg/l	TM245		<10	<10	<10	<10		
Aromatics >EC12-EC16 (aq)	<10 µg/l	TM174		<10	<10	<10	<10		
Aromatics >EC16-EC21 (aq)	<10 µg/l	TM174		<10	<10	<10	<10		
Aromatics >EC21-EC35 (aq)	<10 µg/l	TM174		<10	<10	<10	<10		
Total Aromatics >EC12-EC35 (aq)	<10 µg/l	TM174		<10	<10	<10	<10		
Total Aliphatics & Aromatics >C5-35 (aq)	<10 µg/l	TM174		<10	<10	<10	<10		
Aliphatics >C16-C35 Aqueous	<10 µg/l	TM174		<10	<10	<10	<10		

CERTIFICATE OF ANALYSIS

SDG:	210625-123	**Client Reference:**	10049410	**Report Number:**	604145
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

VOC MS (W)

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted - refer to subcontractor report for accreditation status.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4+5@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	BH06	BHC101	BHC401	BHD201	BHD401S	BHE301
			Depth (m)	3.50 - 3.50	5.00 - 5.00	4.40 - 4.40	5.00 - 5.00	0.00 - 3.00	5.00 - 5.00
			Sample Type	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)
			Date Sampled	23/06/2021	22/06/2021	22/06/2021	23/06/2021	22/06/2021	23/06/2021
			Sampled Time	.	.	.	.	.	.
			Date Received	25/06/2021	25/06/2021	25/06/2021	25/06/2021	25/06/2021	25/06/2021
			SDG Ref	210625-123	210625-123	210625-123	210625-123	210625-123	210625-123
			Lab Sample No.(s)	24514394	24514383	24514384	24514402	24514388	24514392
			AGS Reference						
Dibromofluoromethane**	%	TM208			108				
Toluene-d8**	%	TM208		97.6	96.9	98.3	97.5	98	97.9
4-Bromofluorobenzene**	%	TM208			101				
Dichlorodifluoromethane	<1 µg/l	TM208			<1 #				
Chloromethane	<1 µg/l	TM208			<1 #				
Vinyl chloride	<1 µg/l	TM208			6.22 #				
Bromomethane	<1 µg/l	TM208			<1 #				
Chloroethane	<1 µg/l	TM208			<1 #				
Trichlorofluoromethane	<1 µg/l	TM208			<1 #				
1,1-Dichloroethene	<1 µg/l	TM208			<1 #				
Carbon disulphide	<1 µg/l	TM208			<1 #				
Dichloromethane	<3 µg/l	TM208			<3 #				
Methyl tertiary butyl ether (MTBE)	<1 µg/l	TM208		<1 #	<1 #	<1 #	<1 #	<1 #	<1 #
trans-1,2-Dichloroethene	<1 µg/l	TM208			<1 #				
1,1-Dichloroethane	<1 µg/l	TM208			<1 #				
cis-1,2-Dichloroethene	<1 µg/l	TM208			15.9 #				
2,2-Dichloropropane	<1 µg/l	TM208			<1				
Bromochloromethane	<1 µg/l	TM208			<1 #				
Chloroform	<1 µg/l	TM208			<1 #				
1,1,1-Trichloroethane	<1 µg/l	TM208			<1 #				
1,1-Dichloropropene	<1 µg/l	TM208			<1 #				
Carbontetrachloride	<1 µg/l	TM208			<1 #				
1,2-Dichloroethane	<1 µg/l	TM208			<1 #				
Benzene	<1 µg/l	TM208		<1 #	3.01 #	<1 #	<1 #	<1 #	<1 #
Trichloroethene	<1 µg/l	TM208			<1 #				
1,2-Dichloropropane	<1 µg/l	TM208			<1 #				
Dibromomethane	<1 µg/l	TM208			<1 #				
Bromodichloromethane	<1 µg/l	TM208			<1 #				
cis-1,3-Dichloropropene	<1 µg/l	TM208			<1 #				
Toluene	<1 µg/l	TM208		<1 #	<1 #	<1 #	<1 #	<1 #	<1 #
trans-1,3-Dichloropropene	<1 µg/l	TM208			<1 #				
1,1,2-Trichloroethane	<1 µg/l	TM208			<1 #				

CERTIFICATE OF ANALYSIS

SDG:	210625-123	**Client Reference:**	10049410	**Report Number:**	604145
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

VOC MS (W)

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted - refer to subcontractor report for accreditation status.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4+5@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	BH06	BHC101	BHC401	BHD201	BHD401S	BHE301
			Depth (m)	3.50 - 3.50	5.00 - 5.00	4.40 - 4.40	5.00 - 5.00	0.00 - 3.00	5.00 - 5.00
			Sample Type	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)
			Date Sampled	23/06/2021	22/06/2021	22/06/2021	23/06/2021	22/06/2021	23/06/2021
			Sampled Time	.	.	.	.	.	.
			Date Received	25/06/2021	25/06/2021	25/06/2021	25/06/2021	25/06/2021	25/06/2021
			SDG Ref	210625-123	210625-123	210625-123	210625-123	210625-123	210625-123
			Lab Sample No.(s)	24514394	24514383	24514384	24514402	24514388	24514392
			AGS Reference						
1,3-Dichloropropane	<1 µg/l	TM208			<1 #				
Tetrachloroethene	<1 µg/l	TM208			<1 #				
Dibromochloromethane	<1 µg/l	TM208			<1 #				
1,2-Dibromoethane	<1 µg/l	TM208			<1 #				
Chlorobenzene	<1 µg/l	TM208			<1 #				
1,1,1,2-Tetrachloroethane	<1 µg/l	TM208			<1 #				
Ethylbenzene	<1 µg/l	TM208	<1 #	<1 #	<1 #	<1 #	<1 #	<1 #	
m,p-Xylene	<1 µg/l	TM208	<1 #	31.1 #	<1 #	<1 #	<1 #	<1 #	
o-Xylene	<1 µg/l	TM208	<1 #	<1 #	<1 #	<1 #	<1 #	<1 #	
Styrene	<1 µg/l	TM208			<1 #				
Bromoform	<1 µg/l	TM208			<1 #				
Isopropylbenzene	<1 µg/l	TM208			<1 #				
1,1,2,2-Tetrachloroethane	<1 µg/l	TM208			<1 #				
1,2,3-Trichloropropane	<1 µg/l	TM208			<1 #				
Bromobenzene	<1 µg/l	TM208			<1 #				
Propylbenzene	<1 µg/l	TM208			<1 #				
2-Chlorotoluene	<1 µg/l	TM208			<1 #				
1,3,5-Trimethylbenzene	<1 µg/l	TM208			109 #				
4-Chlorotoluene	<1 µg/l	TM208			<1 #				
tert-Butylbenzene	<1 µg/l	TM208			<1 #				
1,2,4-Trimethylbenzene	<1 µg/l	TM208			1830 #				
sec-Butylbenzene	<1 µg/l	TM208			2.4 #				
4-iso-Propyltoluene	<1 µg/l	TM208			1.33 #				
1,3-Dichlorobenzene	<1 µg/l	TM208			<1 #				
1,4-Dichlorobenzene	<1 µg/l	TM208			<1 #				
n-Butylbenzene	<1 µg/l	TM208			<1 #				
1,2-Dichlorobenzene	<1 µg/l	TM208			<1 #				
1,2-Dibromo-3-chloropropane	<1 µg/l	TM208			<1				
1,2,4-Trichlorobenzene	<1 µg/l	TM208			<1 #				
Hexachlorobutadiene	<1 µg/l	TM208			<1 #				
tert-Amyl methyl ether (TAME)	<1 µg/l	TM208			<1 #				
Naphthalene	<1 µg/l	TM208			39 #				

CERTIFICATE OF ANALYSIS

SDG:	210625-123	**Client Reference:**	10049410	**Report Number:**	604145
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

VOC MS (W)

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted - refer to subcontractor report for accreditation status.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4+5@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	BH06	BHC101	BHC401	BHD201	BHD401S	BHE301
			Depth (m)	3.50 - 3.50	5.00 - 5.00	4.40 - 4.40	5.00 - 5.00	0.00 - 3.00	5.00 - 5.00
			Sample Type	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)
			Date Sampled	23/06/2021	22/06/2021	22/06/2021	23/06/2021	22/06/2021	23/06/2021
			Sampled Time	.	.	.	.	.	.
			Date Received	25/06/2021	25/06/2021	25/06/2021	25/06/2021	25/06/2021	25/06/2021
			SDG Ref	210625-123	210625-123	210625-123	210625-123	210625-123	210625-123
			Lab Sample No.(s)	24514394	24514383	24514384	24514402	24514388	24514392
			AGS Reference						
1,2,3-Trichlorobenzene	<1 µg/l	TM208			<1 #				
1,3,5-Trichlorobenzene	<1 µg/l	TM208			<1				
Sum of BTEX	<5 µg/l	TM208		<5	34.1	<5	<5	<5	<5

CERTIFICATE OF ANALYSIS

SDG:	210625-123	**Client Reference:**	10049410	**Report Number:**	604145
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

VOC MS (W)

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted - refer to subcontractor report for accreditation status.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4+5@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	BHE601	SW2	SW5	SW13		
			Depth (m)	4.00 - 4.00	.	.	.		
			Sample Type	Ground Water (GW)	Surface Water (SW)	Surface Water (SW)	Surface Water (SW)		
			Date Sampled	23/06/2021	22/06/2021	21/06/2021	22/06/2021		
			Sampled Time	.	.	.	.		
			Date Received	25/06/2021	25/06/2021	25/06/2021	25/06/2021		
			SDG Ref	210625-123	210625-123	210625-123	210625-123		
			Lab Sample No.(s)	24514400	24514387	24514397	24514386		
			AGS Reference						
Toluene-d8**	%	TM208		97.8	99.1	102	97.8		
Methyl tertiary butyl ether (MTBE)	<1 µg/l	TM208		<1 #	<1 #	<1 #	<1 #		
Benzene	<1 µg/l	TM208		<1 #	<1 #	<1 #	<1 #		
Toluene	<1 µg/l	TM208		<1 #	<1 #	<1 #	<1 #		
Ethylbenzene	<1 µg/l	TM208		<1 #	<1 #	<1 #	<1 #		
m,p-Xylene	<1 µg/l	TM208		<1 #	<1 #	<1 #	<1 #		
o-Xylene	<1 µg/l	TM208		<1 #	<1 #	<1 #	<1 #		
Sum of BTEX	<5 µg/l	TM208		<5	<5	<5	<5		

Table of Results - Appendix

Method No	Reference	Description
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
TM208	Modified: US EPA Method 8260b & 624	Determination of Volatile Organic Compounds by Headspace / GC-MS in Waters
TM245	By GC-FID	Determination of GRO by Headspace in waters

NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Environmental Hawarden (Method codes TM) or ALS Environmental Aberdeen (Method codes S).

CERTIFICATE OF ANALYSIS

SDG:	210625-123	**Client Reference:**	10049410	**Report Number:**	604145
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Test Completion Dates

Lab Sample No(s)	24514394	24514383	24514384	24514402	24514388	24514392	24514400	24514387	24514397	24514386
Customer Sample Ref.	BH06	BHC101	BHC401	BHD201	BHD401S	BHE301	BHE601	SW2	SW5	SW13
AGS Ref.										
Depth	3.50 - 3.50	5.00 - 5.00	4.40 - 4.40	5.00 - 5.00	0.00 - 3.00	5.00 - 5.00	4.00 - 4.00			
Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Surface Water	Surface Water	Surface Water
EPH CWG (Aliphatic) Aqueous GC (W)	01-Jul-2021	01-Jul-2021	01-Jul-2021	01-Jul-2021	01-Jul-2021	01-Jul-2021	01-Jul-2021	01-Jul-2021	01-Jul-2021	01-Jul-2021
EPH CWG (Aromatic) Aqueous GC (W)	01-Jul-2021	01-Jul-2021	01-Jul-2021	01-Jul-2021	01-Jul-2021	01-Jul-2021	01-Jul-2021	01-Jul-2021	01-Jul-2021	01-Jul-2021
GRO by GC-FID (W)	30-Jun-2021	30-Jun-2021	30-Jun-2021	30-Jun-2021	30-Jun-2021	30-Jun-2021	30-Jun-2021	30-Jun-2021	30-Jun-2021	30-Jun-2021
PAH Spec MS - Aqueous (W)	30-Jun-2021	30-Jun-2021	30-Jun-2021	30-Jun-2021	30-Jun-2021	30-Jun-2021	30-Jun-2021	30-Jun-2021	30-Jun-2021	30-Jun-2021
TPH CWG (W)	01-Jul-2021	01-Jul-2021	01-Jul-2021	01-Jul-2021	01-Jul-2021	01-Jul-2021	01-Jul-2021	01-Jul-2021	01-Jul-2021	01-Jul-2021
VOC MS (W)	30-Jun-2021	01-Jul-2021	30-Jun-2021	30-Jun-2021	30-Jun-2021	30-Jun-2021	30-Jun-2021	30-Jun-2021	30-Jun-2021	30-Jun-2021

ASSOCIATED AQC DATA

EPH CWG (Aliphatic) Aqueous GC (W)

Component	Method Code	QC 2481
Total Aliphatics >C10-C40	TM174	**97.52** 68.59 : 134.82

EPH CWG (Aromatic) Aqueous GC (W)

Component	Method Code	QC 2482
Total Aromatics >EC10-EC40	TM174	**85.85** 60.75 : 129.09

GRO by GC-FID (W)

Component	Method Code	QC 2407	QC 2447
Benzene by GC	TM245	**100.0** 83.48 : 117.21	**94.0** 83.48 : 117.21
Ethylbenzene by GC	TM245	**101.5** 84.11 : 114.89	**92.0** 84.11 : 114.89
m & p Xylene by GC	TM245	**102.0** 83.73 : 116.33	**92.0** 83.73 : 116.33
MTBE GC-FID	TM245	**95.0** 84.42 : 117.50	**96.5** 84.42 : 117.50
o Xylene by GC	TM245	**103.0** 85.03 : 117.59	**95.0** 85.03 : 117.59
QC	TM245	**84.75** 60.71 : 137.65	**83.28** 60.71 : 137.65
Toluene by GC	TM245	**100.5** 84.73 : 116.85	**92.5** 84.73 : 116.85

PAH Spec MS - Aqueous (W)

Component	Method Code	QC 2489
Acenaphthene by GCMS	TM178	**110.4** 90.45 : 118.63
Acenaphthylene by GCMS	TM178	**110.4** 90.13 : 116.27
Anthracene by GCMS	TM178	**106.4** 92.40 : 114.00
Benz(a)anthracene by GCMS	TM178	**103.6** 89.51 : 117.69
Benzo(a)pyrene by GCMS	TM178	**108.0** 89.43 : 118.57
Benzo(b)fluoranthene by GCMS	TM178	**106.8** 87.80 : 121.80
Benzo(ghi)perylene by GCMS	TM178	**102.8** 87.10 : 119.30
Benzo(k)fluoranthene by GCMS	TM178	**110.4** 93.23 : 123.57

PAH Spec MS - Aqueous (W)

		QC 2489
Chrysene by GCMS	TM178	**110.0** 88.68 : 116.92
Dibenzo(ah)anthracene by GCMS	TM178	**106.4** 86.24 : 118.56
Fluoranthene by GCMS	TM178	**106.4** 86.04 : 121.96
Fluorene by GCMS	TM178	**110.8** 90.76 : 121.24
Indeno(123cd)pyrene by GCMS	TM178	**100.0** 88.39 : 119.61
Naphthalene by GCMS	TM178	**114.4** 89.40 : 121.80
Phenanthrene by GCMS	TM178	**110.0** 90.41 : 119.19
Pyrene by GCMS	TM178	**107.6** 91.00 : 120.20

VOC MS (W)

Component	Method Code	QC 2417	QC 2451	QC 2408
1,1,1,2-Tetrachloroethane	TM208	**104.0** 87.71 : 111.59	**101.5** 87.41 : 110.84	**102.5** 87.71 : 111.59
1,1,1-Trichloroethane	TM208	**102.5** 82.66 : 112.06	**96.5** 81.01 : 112.00	**98.0** 82.66 : 112.06
1,1-Dichloroethane	TM208	**105.0** 79.99 : 118.57	**94.5** 82.09 : 116.41	**97.0** 79.99 : 118.57
1,2-Dichloroethane	TM208	**106.0** 79.35 : 124.02	**91.5** 80.28 : 123.63	**99.0** 79.35 : 124.02
2-Chlorotoluene	TM208	**103.0** 79.67 : 114.74	**99.5** 83.31 : 110.91	**103.0** 79.67 : 114.74
4-Chlorotoluene	TM208	**103.5** 80.15 : 113.42	**99.0** 84.01 : 111.46	**102.0** 80.15 : 113.42
Benzene	TM208	**105.0** 82.57 : 114.10	**97.5** 87.46 : 118.30	**99.0** 82.57 : 114.10
Bromomethane	TM208	**103.0** 78.77 : 123.20	**92.5** 76.99 : 118.39	**103.0** 78.77 : 123.20
Carbontetrachloride	TM208	**104.0** 79.73 : 118.91	**100.5** 81.73 : 114.22	**104.0** 79.73 : 118.91
Chlorobenzene	TM208	**104.0** 88.28 : 110.81	**101.5** 90.24 : 109.71	**103.5** 88.28 : 110.81
Chloroform	TM208	**104.0** 82.31 : 120.71	**96.0** 83.67 : 118.08	**100.0** 82.31 : 120.71
Chloromethane	TM208	**105.5** 62.46 : 124.98	**92.5** 70.42 : 127.06	**97.5** 62.46 : 124.98
Cis-1,2-Dichloroethene	TM208	**103.5** 83.75 : 118.91	**94.0** 83.95 : 112.60	**100.0** 83.75 : 118.91
Dichloromethane	TM208	**103.0** 81.20 : 120.83	**90.0** 81.65 : 120.83	**98.5** 81.20 : 120.83
Ethylbenzene	TM208	**99.5** 80.54 : 112.31	**96.5** 85.59 : 106.44	**97.0** 80.54 : 112.31
Hexachlorobutadiene	TM208	**102.5** 73.65 : 117.84	**96.0** 66.83 : 108.27	**102.0** 73.65 : 117.84
o-Xylene	TM208	**102.5** 87.93 : 111.69	**97.0** 78.40 : 110.68	**101.5** 87.93 : 111.69

VOC MS (W)

		QC 2417	QC 2451	QC 2408
p/m-Xylene	TM208	**101.75** 83.09 : 113.86	**97.0** 82.64 : 112.12	**100.0** 83.09 : 113.86
Tert-butyl methyl ether	TM208	**98.5** 70.94 : 119.66	**85.0** 68.23 : 127.69	**86.5** 70.94 : 119.66
Tetrachloroethene	TM208	**103.5** 84.41 : 112.73	**101.0** 81.10 : 112.63	**106.5** 84.41 : 112.73
Toluene	TM208	**102.5** 81.59 : 111.56	**97.5** 87.40 : 109.78	**100.0** 81.59 : 111.56
Trichloroethene	TM208	**104.0** 87.25 : 109.75	**97.0** 81.17 : 111.80	**102.0** 87.25 : 109.75
Vinyl Chloride	TM208	**100.5** 71.92 : 126.73	**89.0** 72.73 : 123.40	**96.5** 71.92 : 126.73

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.

CERTIFICATE OF ANALYSIS

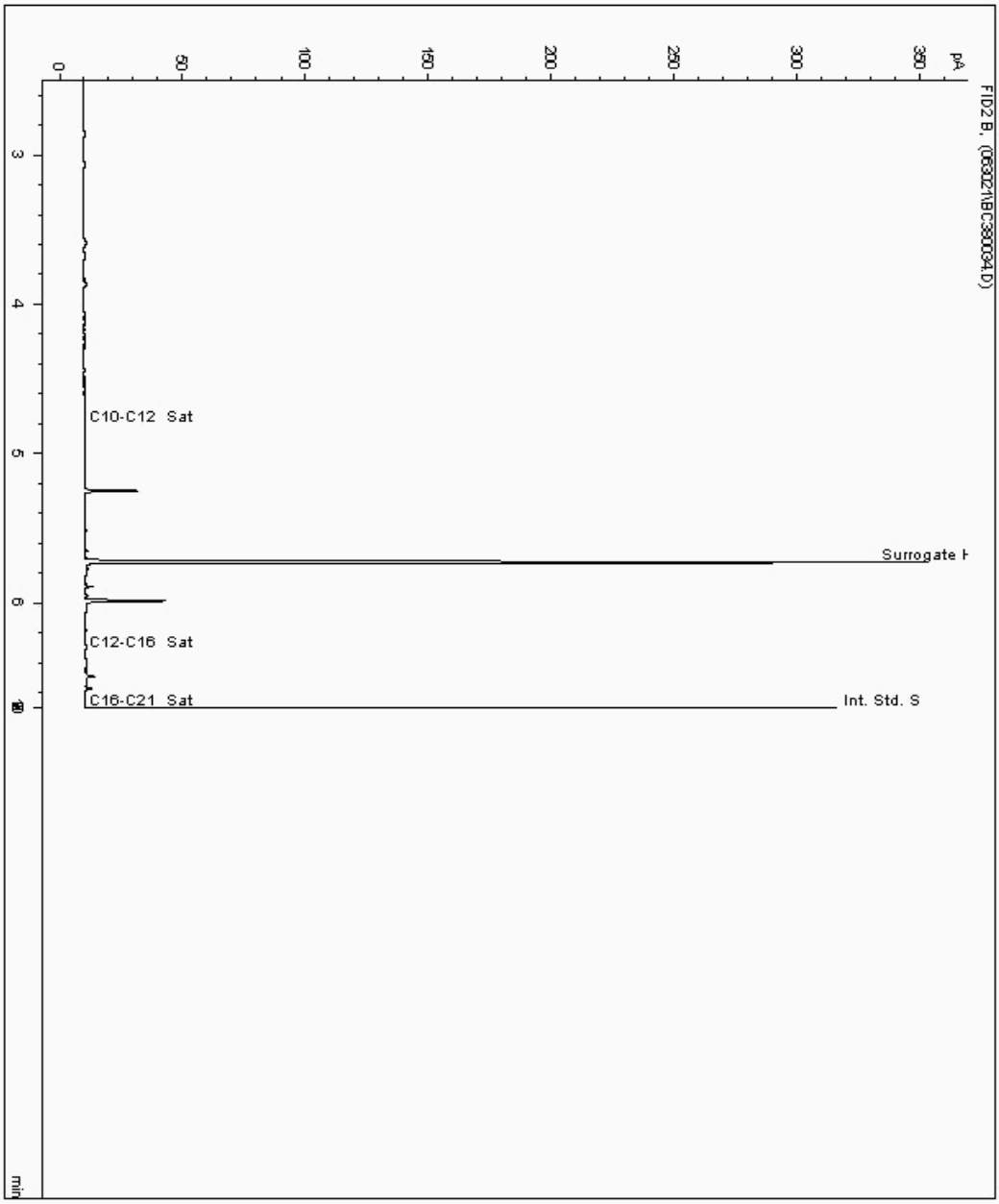
SDG:	210625-123	**Client Reference:**	10049410	**Report Number:**	604145
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: EPH CWG (Aliphatic) Aqueous GC (W) **Sample No :** 24525049 **Sample ID :** BH06 **Depth :** 3.50 - 3.50

Speciated TPH - SATS (C12 - C40)

Sample Identity: 22952557-
Date Acquired : 01/07/21 06:47:14 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.025



CERTIFICATE OF ANALYSIS

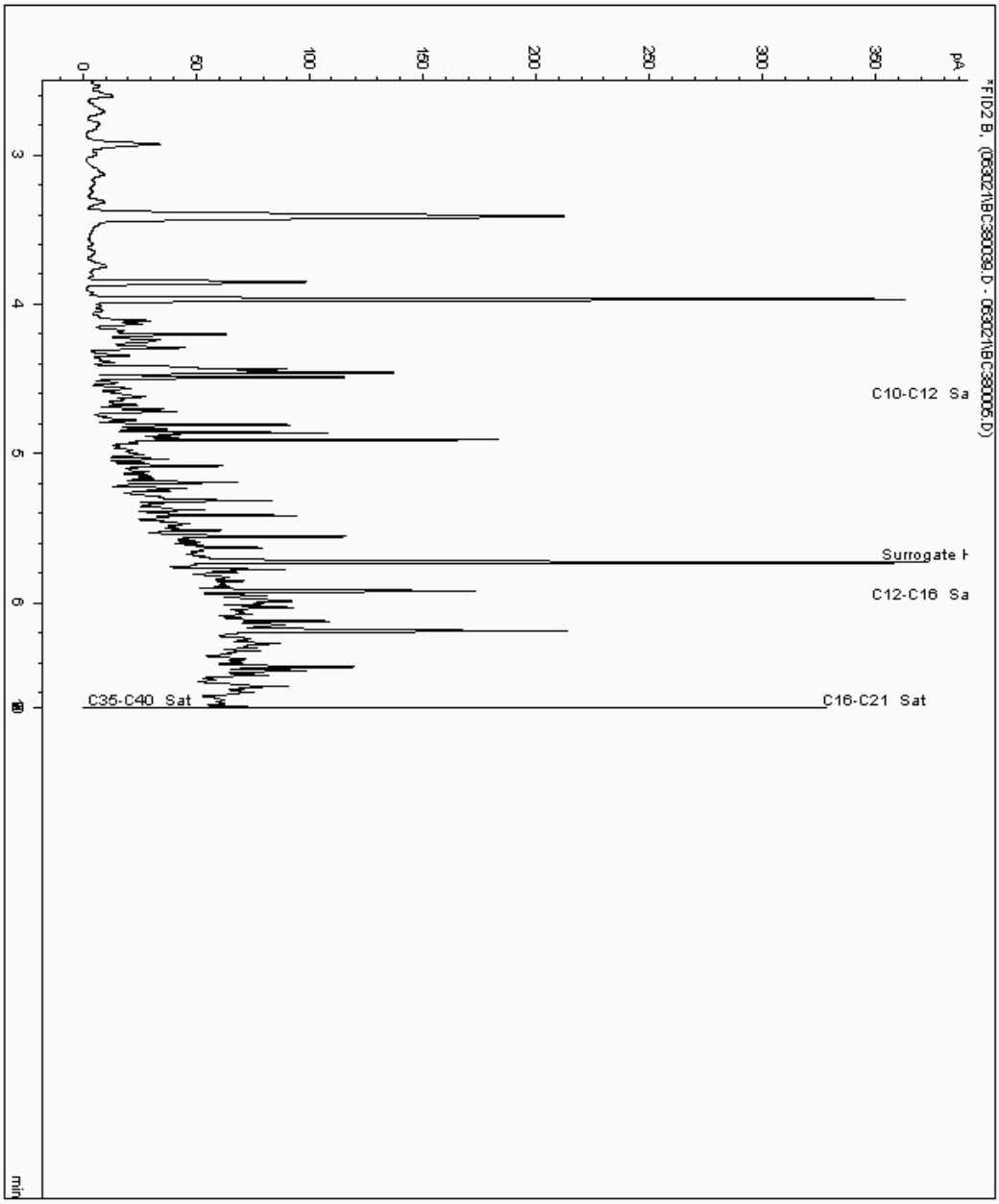
SDG:	210625-123	**Client Reference:**	10049410	**Report Number:**	604145
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: EPH CWG (Aliphatic) Aqueous GC (W) **Sample No :** 24525052 **Sample ID :** BHC101 **Depth :** 5.00 - 5.00

Speciated TPH - SATS (C12 - C40)

Sample Identity: 22952491-
Date Acquired : 01/07/21 08:42:54 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.025



CERTIFICATE OF ANALYSIS

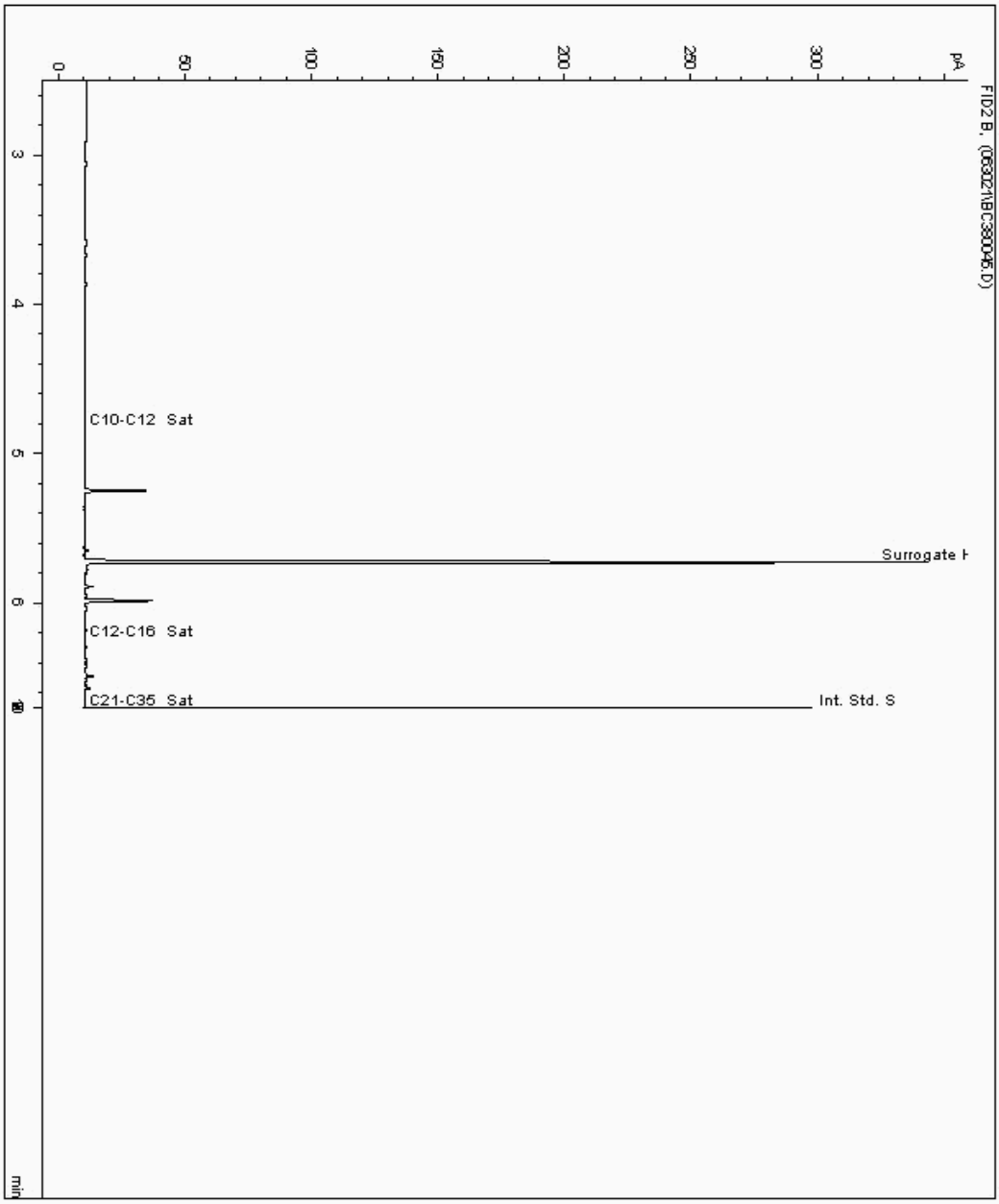
SDG:	210625-123	**Client Reference:**	10049410	**Report Number:**	604145
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: EPH CWG (Aliphatic) Aqueous GC (W) **Sample No :** 24525054 **Sample ID :** SW13 **Depth :**

Speciated TPH - SATS (C12 - C40)

Sample Identity: 22952523-
Date Acquired : 01/07/21 11:02:24 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.025



CERTIFICATE OF ANALYSIS

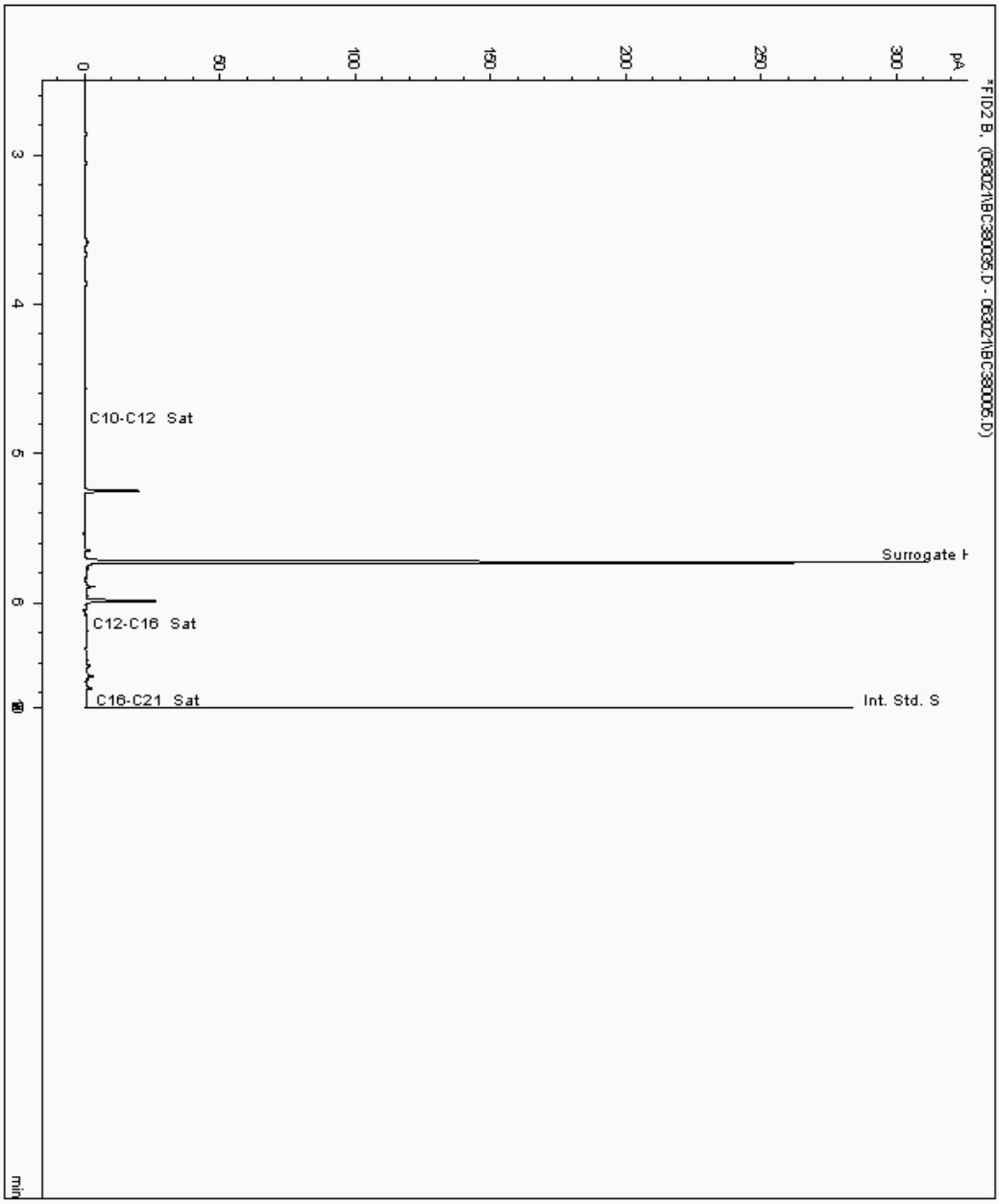
SDG:	210625-123	**Client Reference:**	10049410	**Report Number:**	604145
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: EPH CWG (Aliphatic) Aqueous GC (W) **Sample No :** 24525055 **Sample ID :** BHC401 **Depth :** 4.40 - 4.40

Speciated TPH - SATS (C12 - C40)

Sample Identity: 22952504-
Date Acquired : 01/07/21 07:10:25 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.025



CERTIFICATE OF ANALYSIS

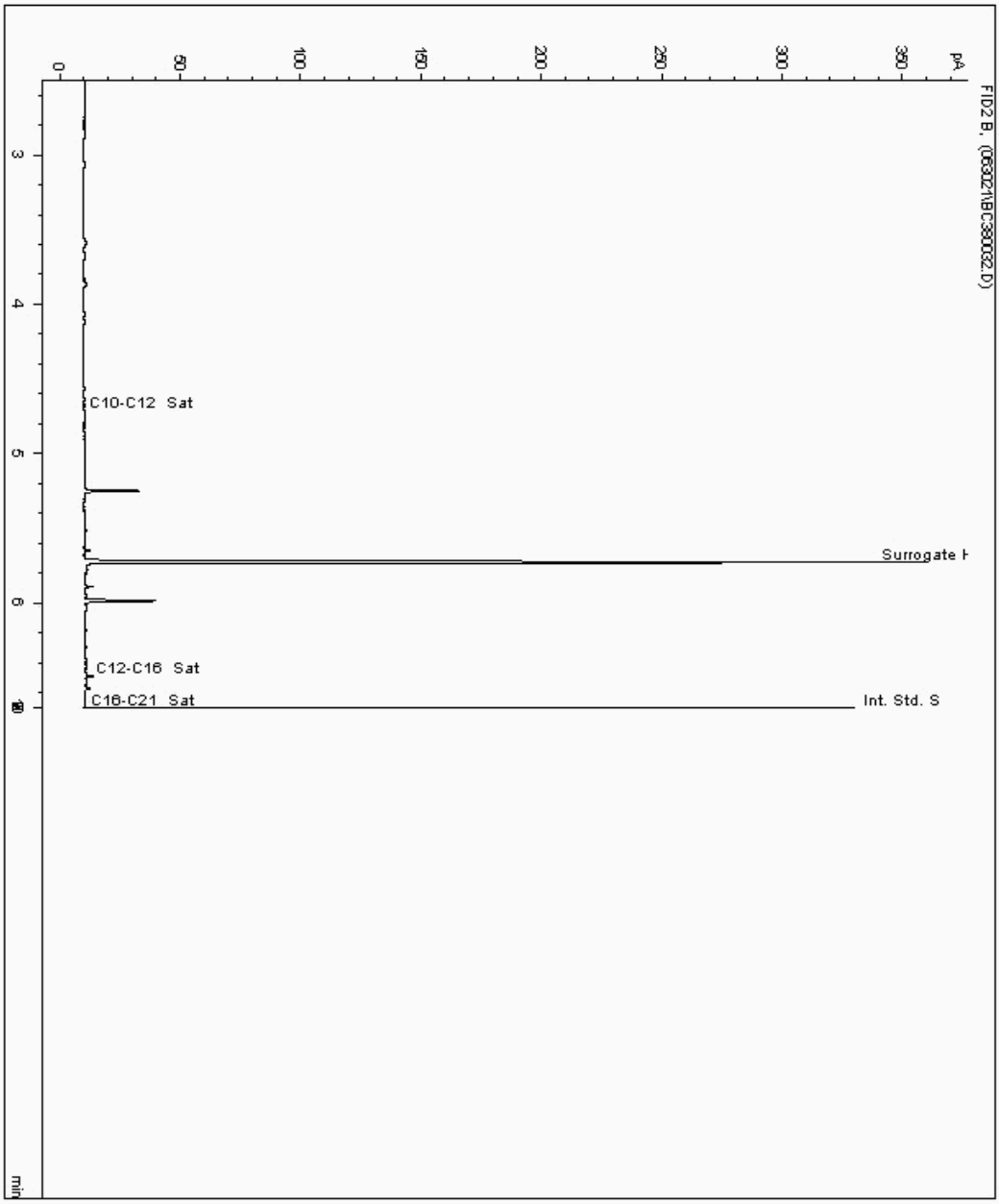
SDG:	210625-123	**Client Reference:**	10049410	**Report Number:**	604145
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: EPH CWG (Aliphatic) Aqueous GC (W) **Sample No :** 24525057 **Depth :**
Sample ID : SW2

Speciated TPH - SATS (C12 - C40)

Sample Identity: 22952536-
Date Acquired : 01/07/21 06:01:03 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.025



CERTIFICATE OF ANALYSIS

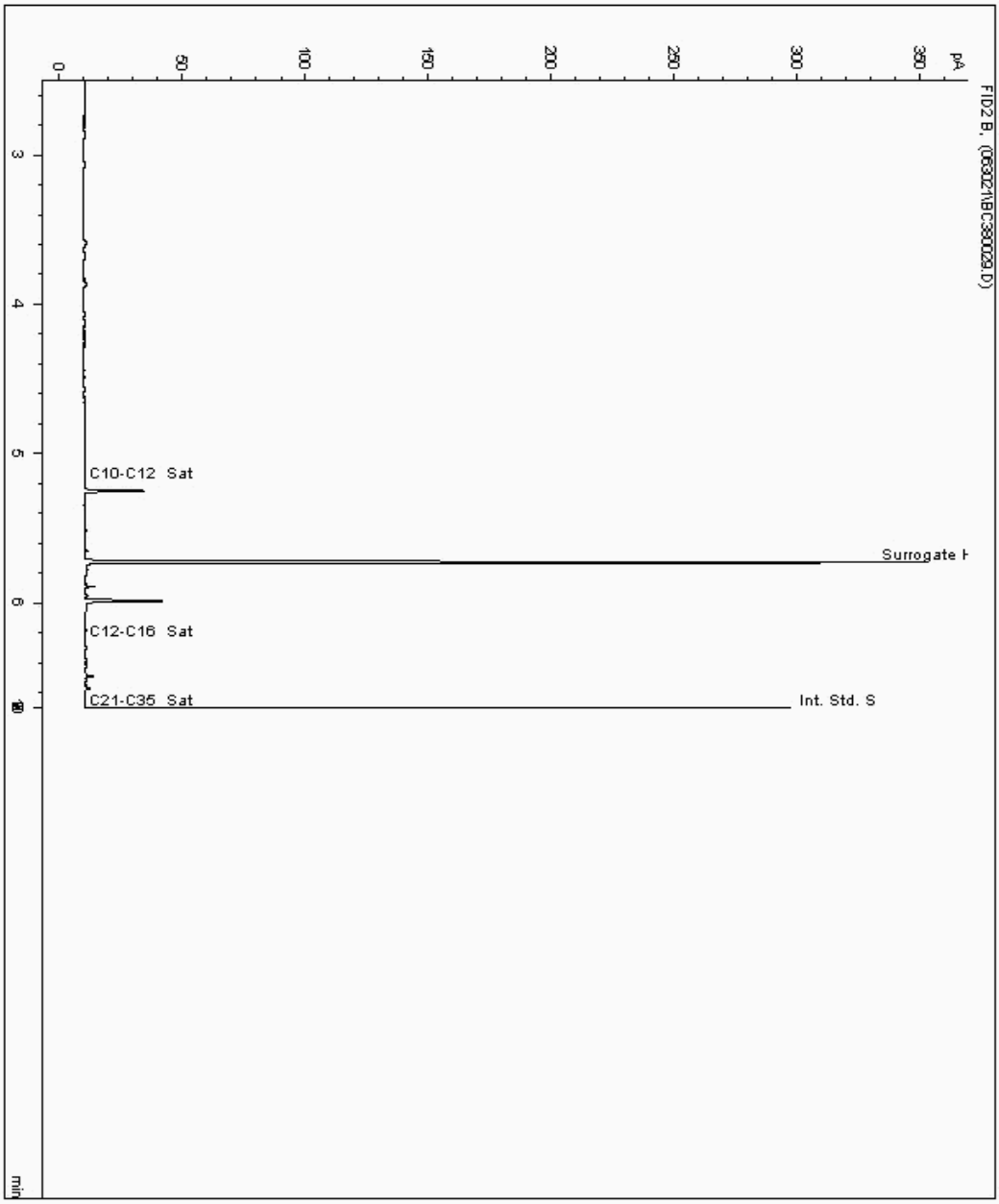
SDG:	210625-123	**Client Reference:**	10049410	**Report Number:**	604145
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: EPH CWG (Aliphatic) Aqueous GC (W) **Sample No :** 24525060 **Sample ID :** BHD401S **Depth :** 0.00 - 3.00

Speciated TPH - SATS (C12 - C40)

Sample Identity: 22952543-
Date Acquired : 01/07/21 04:52:06 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.025



CERTIFICATE OF ANALYSIS

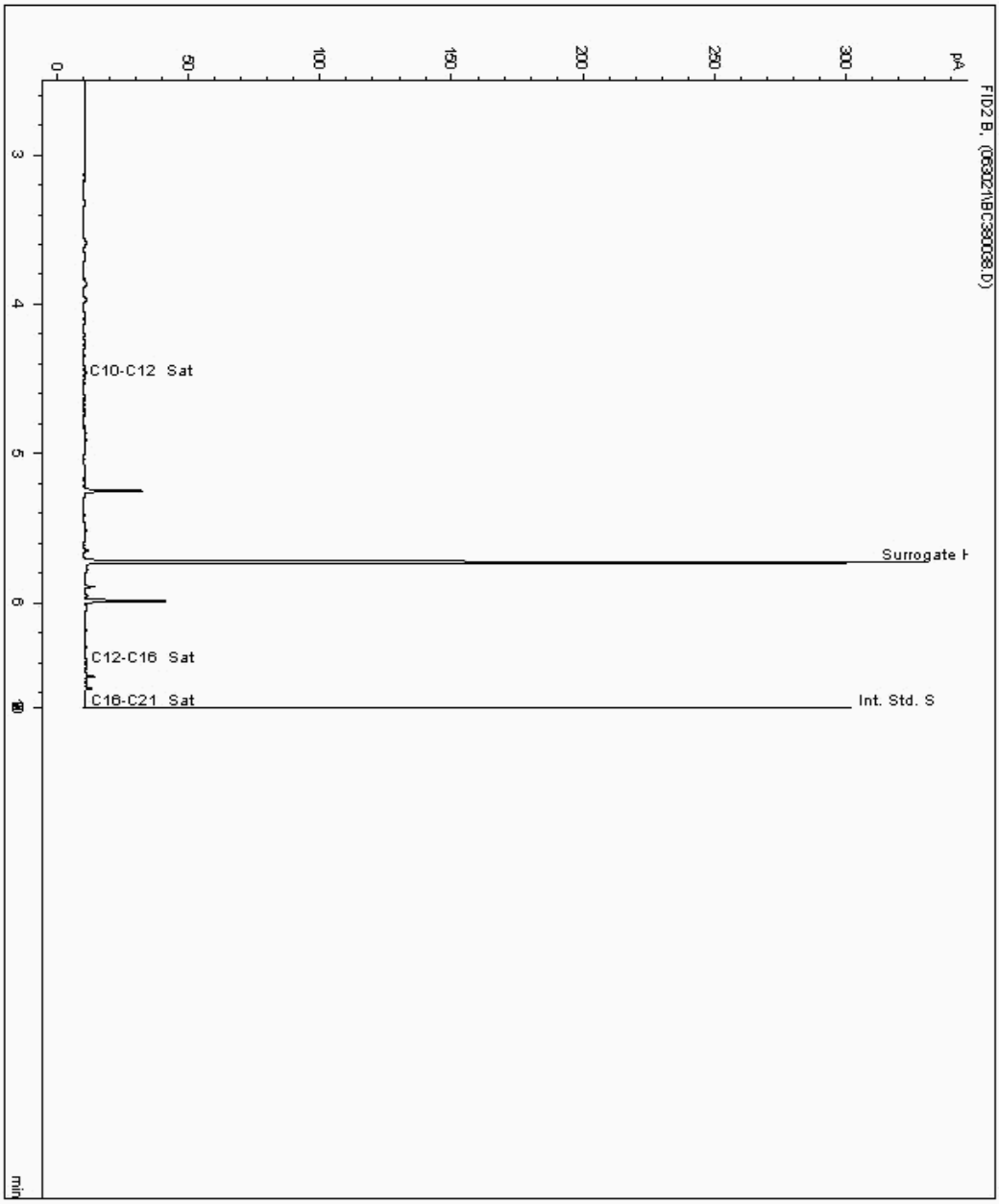
SDG:	210625-123	**Client Reference:**	10049410	**Report Number:**	604145
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: EPH CWG (Aliphatic) Aqueous GC (W) **Sample No :** 24525062 **Sample ID :** BHE601 **Depth :** 4.00 - 4.00

Speciated TPH - SATS (C12 - C40)

Sample Identity: 22952580-
Date Acquired : 01/07/21 08:19:50 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.025



CERTIFICATE OF ANALYSIS

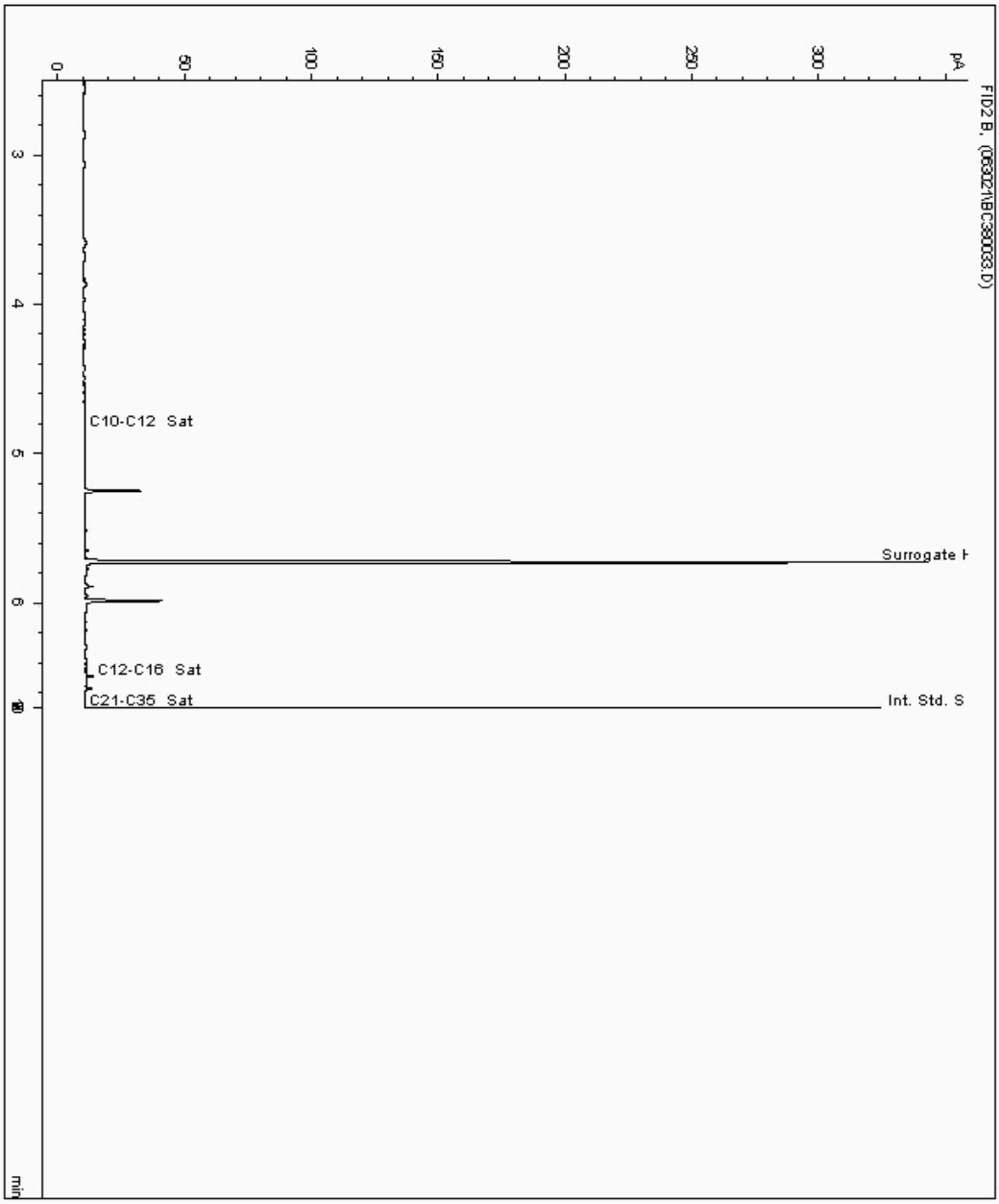
SDG:	210625-123	**Client Reference:**	10049410	**Report Number:**	604145
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: EPH CWG (Aliphatic) Aqueous GC (W) **Sample No :** 24525064 **Sample ID :** BHE301 **Depth :** 5.00 - 5.00

Speciated TPH - SATS (C12 - C40)

Sample Identity: 22952550-
Date Acquired : 01/07/21 06:24:00 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.025



CERTIFICATE OF ANALYSIS

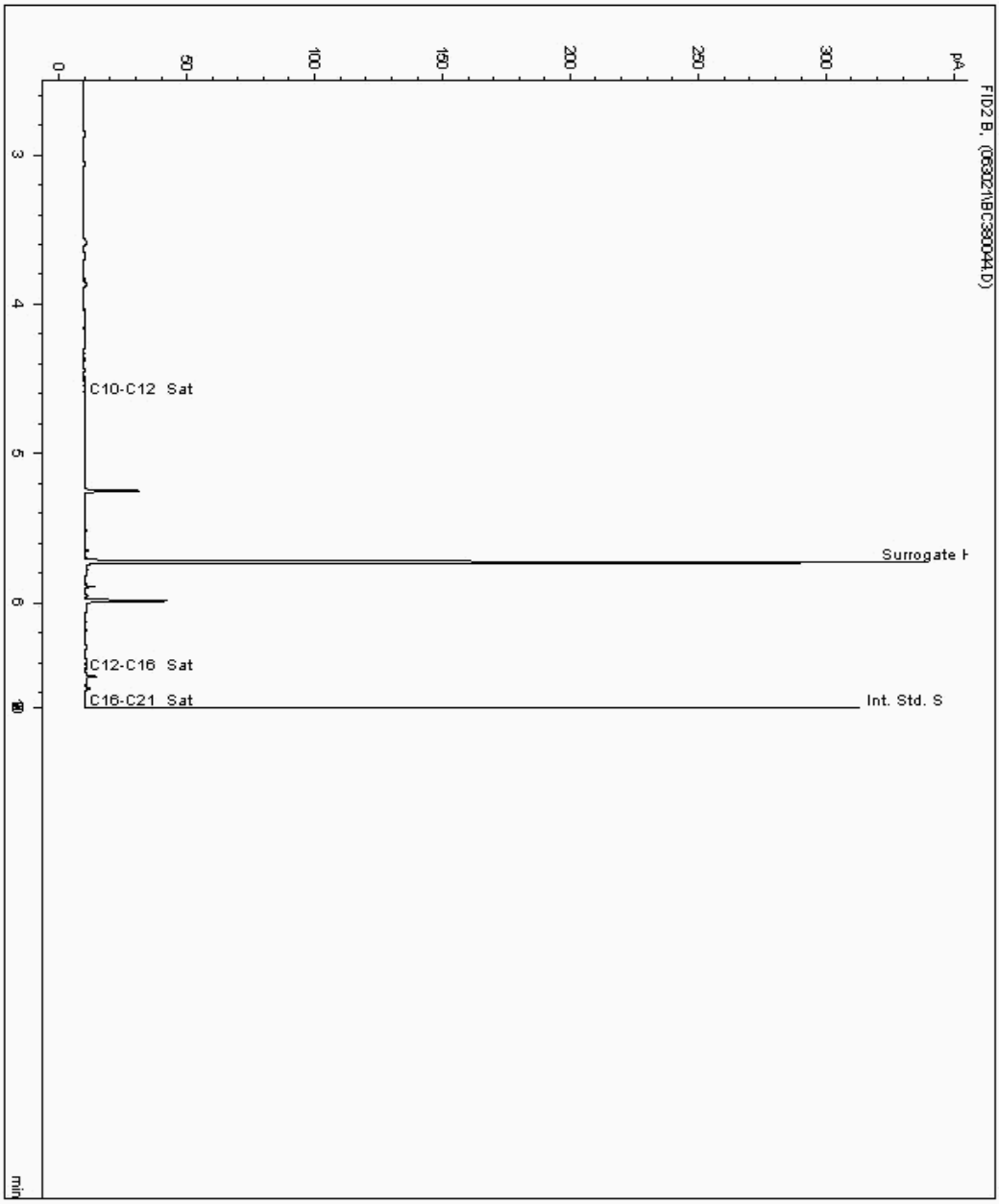
SDG:	210625-123	**Client Reference:**	10049410	**Report Number:**	604145
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: EPH CWG (Aliphatic) Aqueous GC (W) **Sample No :** 24525066 **Sample ID :** SW5 **Depth :**

Speciated TPH - SATS (C12 - C40)

Sample Identity: 22952568-
Date Acquired : 01/07/21 10:39:10 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.025



CERTIFICATE OF ANALYSIS

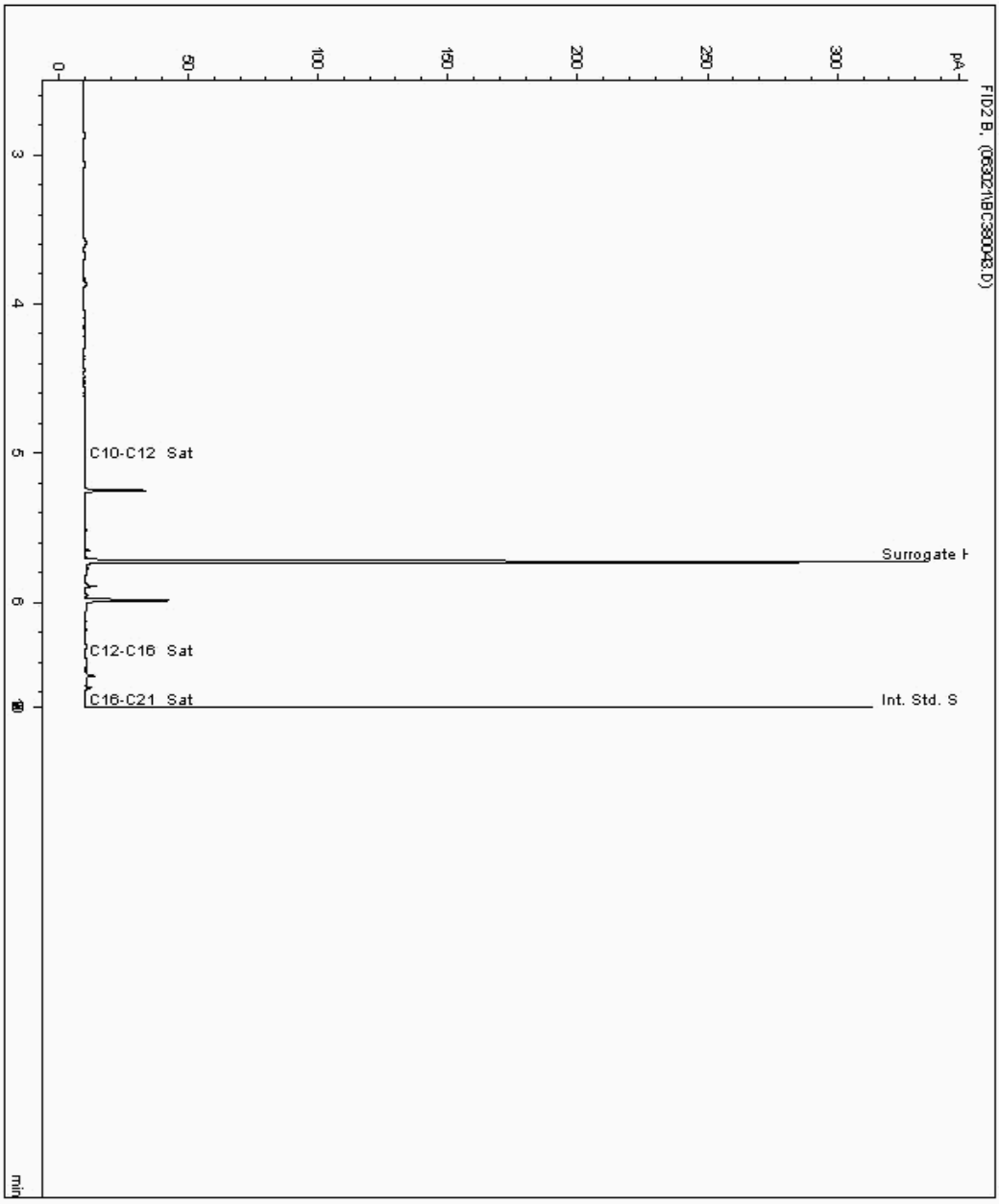
SDG:	210625-123	**Client Reference:**	10049410	**Report Number:**	604145
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: EPH CWG (Aliphatic) Aqueous GC (W) **Sample No :** 24525068 **Sample ID :** BHD201 **Depth :** 5.00 - 5.00

Speciated TPH - SATS (C12 - C40)

Sample Identity: 22952590-
Date Acquired : 01/07/21 10:15:59 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.025



CERTIFICATE OF ANALYSIS

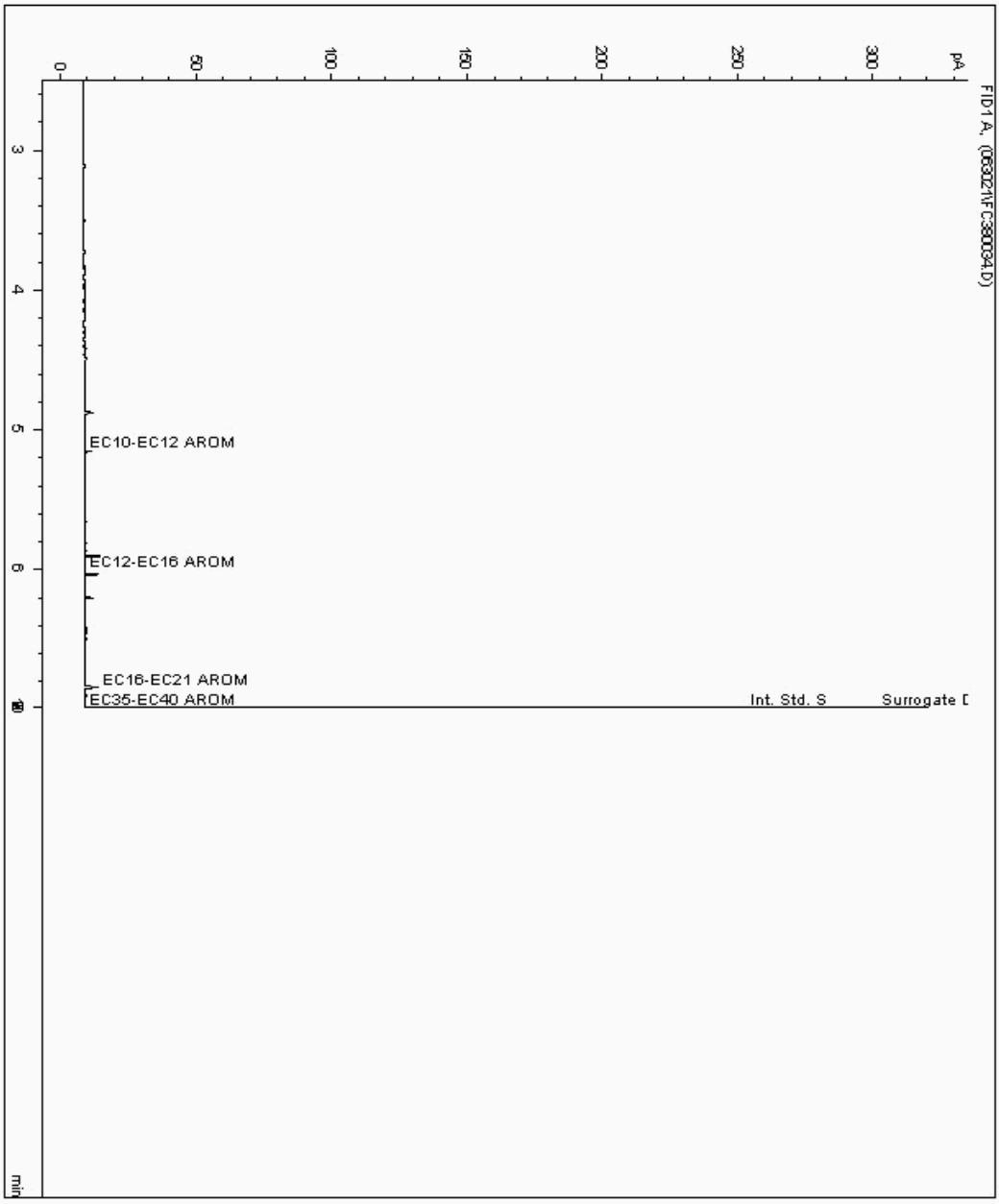
SDG:	210625-123	**Client Reference:**	10049410	**Report Number:**	604145
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: EPH CWG (Aromatic) Aqueous GC (W) **Sample No :** 24525049 **Sample ID :** BH06 **Depth :** 3.50 - 3.50

Speciated TPH - AROM (C12 - C40)

Sample Identity: 22952558-
Date Acquired : 01/07/21 06:47:14 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.025



CERTIFICATE OF ANALYSIS

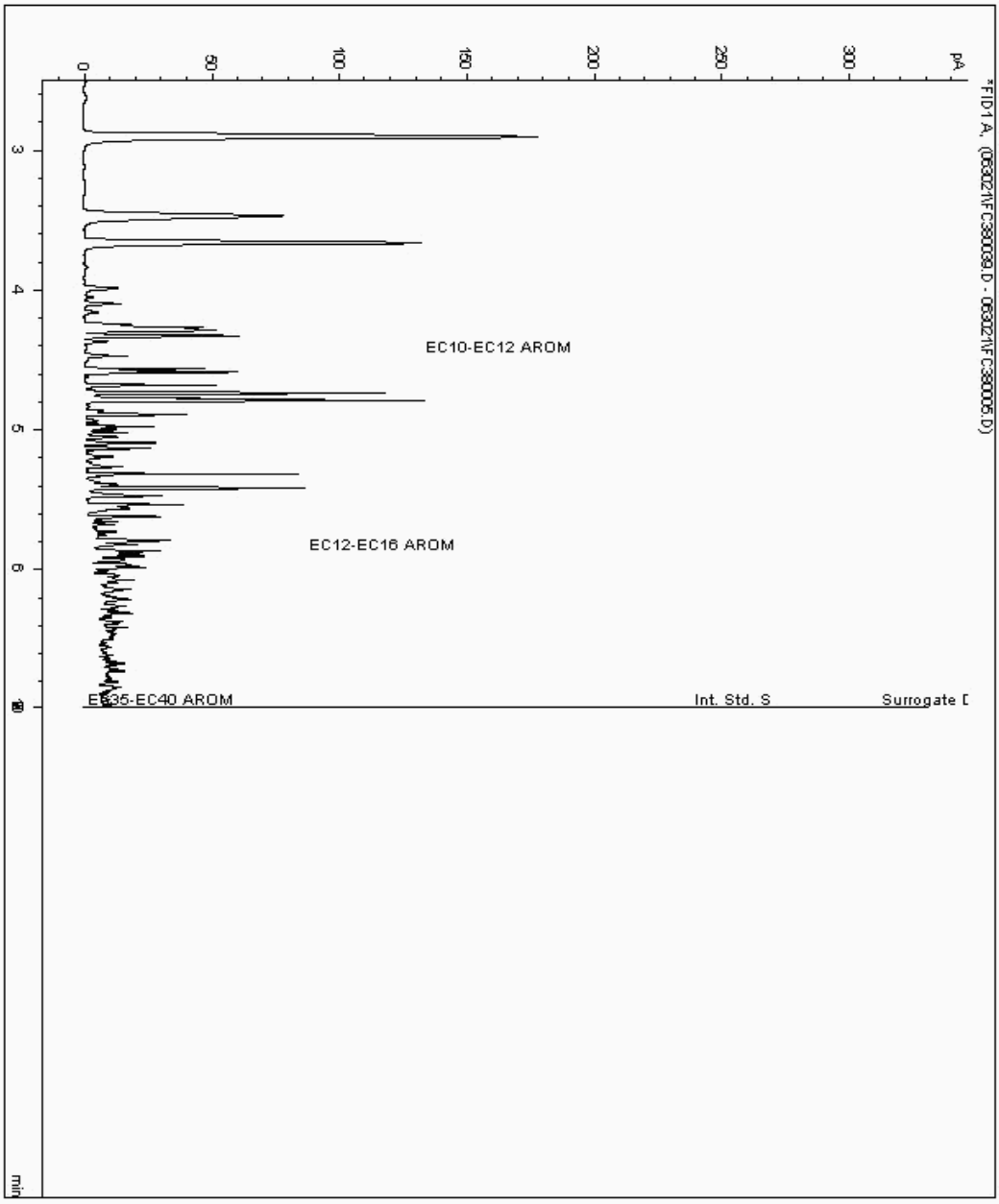
SDG:	210625-123	**Client Reference:**	10049410	**Report Number:**	604145
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: EPH CWG (Aromatic) Aqueous GC (W) **Sample No :** 24525052 **Sample ID :** BHC101 **Depth :** 5.00 - 5.00

Speciated TPH - AROM (C12 - C40)

Sample Identity: 22952492-
Date Acquired : 01/07/21 08:42:53 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.025



CERTIFICATE OF ANALYSIS

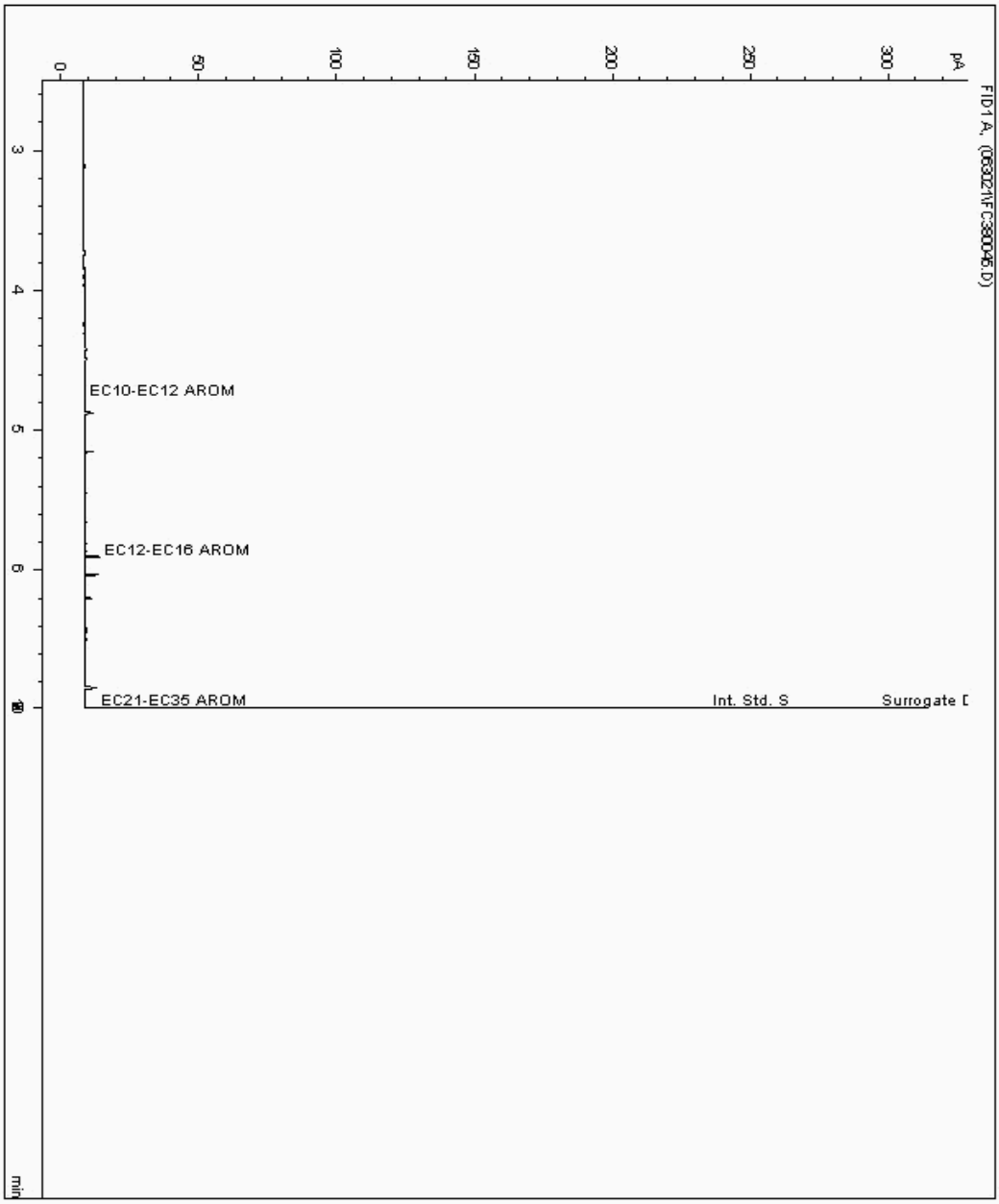
SDG:	210625-123	**Client Reference:**	10049410	**Report Number:**	604145
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: EPH CWG (Aromatic) Aqueous GC (W) **Sample No :** 24525054 **Depth :**
Sample ID : SW13

Speciated TPH - AROM (C12 - C40)

Sample Identity: 22952524-
Date Acquired : 01/07/21 11:02:24 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.025



CERTIFICATE OF ANALYSIS

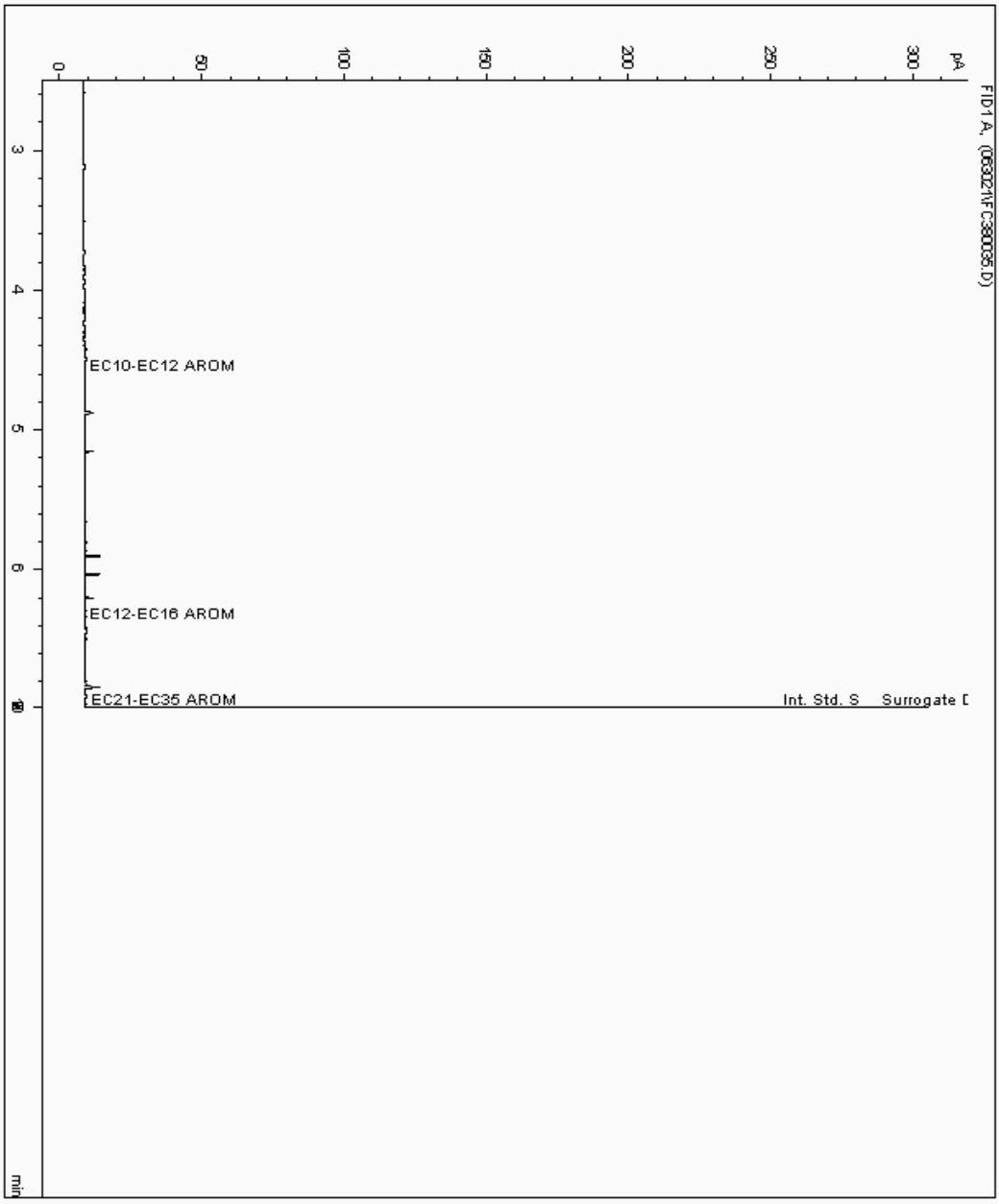
SDG:	210625-123	**Client Reference:**	10049410	**Report Number:**	604145
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: EPH CWG (Aromatic) Aqueous GC (W) **Sample No :** 24525055 **Sample ID :** BHC401 **Depth :** 4.40 - 4.40

Speciated TPH - AROM (C12 - C40)

Sample Identity: 22952505-
Date Acquired : 01/07/21 07:10:25 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.025



CERTIFICATE OF ANALYSIS

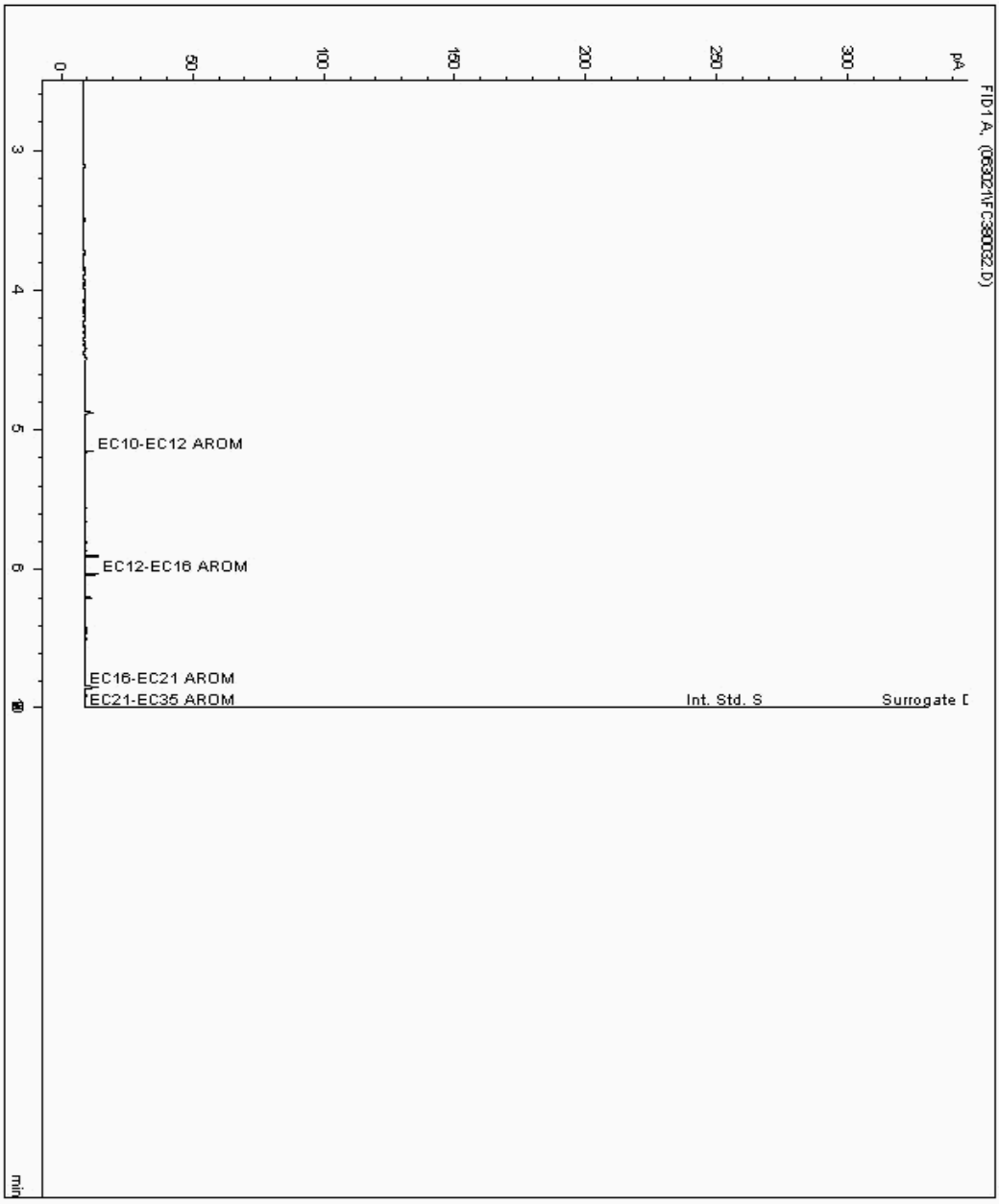
SDG:	210625-123	**Client Reference:**	10049410	**Report Number:**	604145
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: EPH CWG (Aromatic) Aqueous GC (W) **Sample No :** 24525057 **Depth :**
Sample ID : SW2

Speciated TPH - AROM (C12 - C40)

Sample Identity: 22952537-
Date Acquired : 01/07/21 06:01:03 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.025



CERTIFICATE OF ANALYSIS

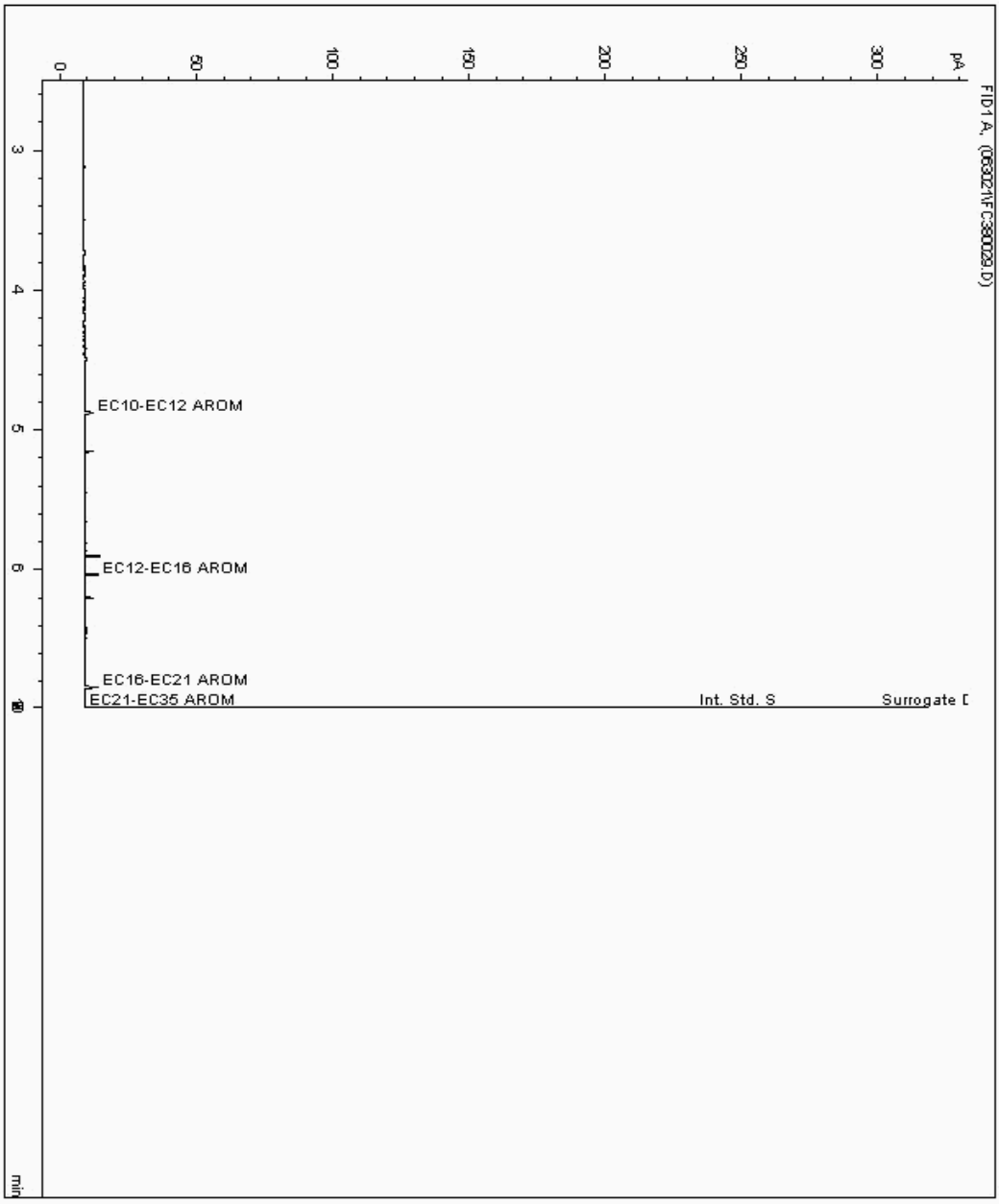
SDG:	210625-123	**Client Reference:**	10049410	**Report Number:**	604145
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: EPH CWG (Aromatic) Aqueous GC (W) **Sample No :** 24525060 **Sample ID :** BHD401S **Depth :** 0.00 - 3.00

Speciated TPH - AROM (C12 - C40)

Sample Identity: 22952544-
Date Acquired : 01/07/21 04:52:06 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.025



CERTIFICATE OF ANALYSIS

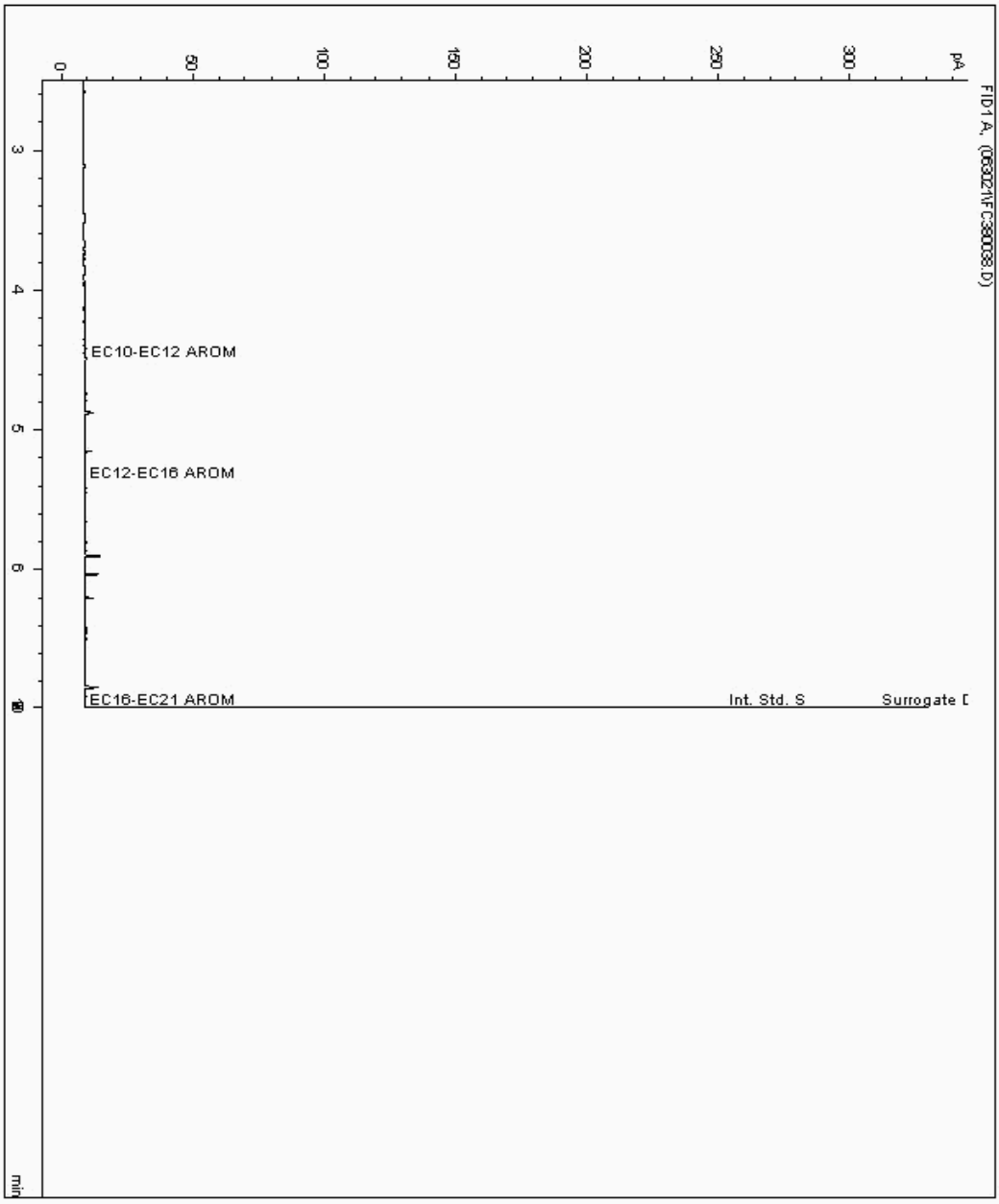
SDG:	210625-123	**Client Reference:**	10049410	**Report Number:**	604145
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: EPH CWG (Aromatic) Aqueous GC (W) **Sample No :** 24525062 **Sample ID :** BHE601 **Depth :** 4.00 - 4.00

Speciated TPH - AROM (C12 - C40)

Sample Identity: 22952581-
Date Acquired : 01/07/21 08:19:50 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.025



CERTIFICATE OF ANALYSIS

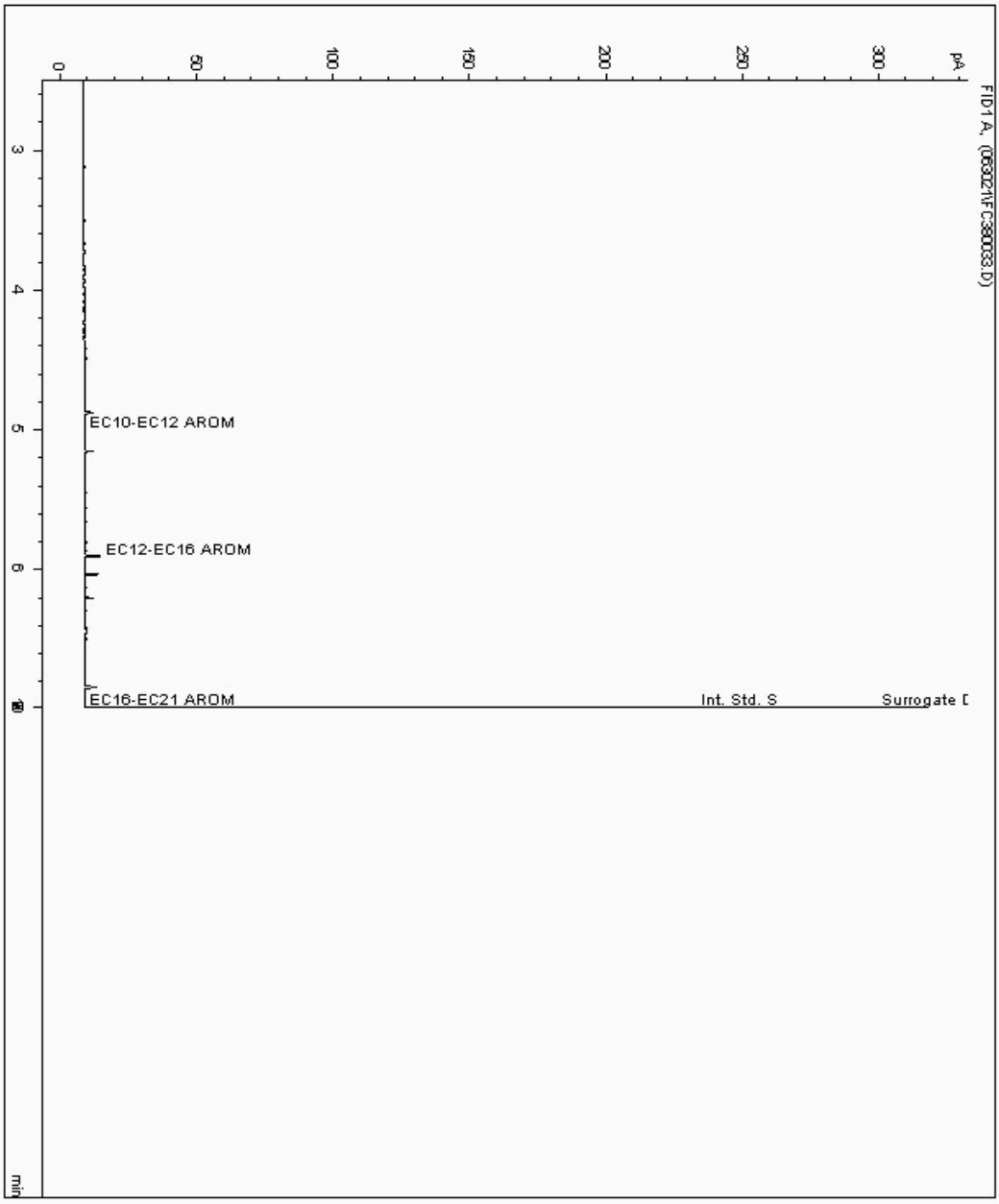
SDG:	210625-123	**Client Reference:**	10049410	**Report Number:**	604145
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: EPH CWG (Aromatic) Aqueous GC (W) **Sample No :** 24525064 **Sample ID :** BHE301 **Depth :** 5.00 - 5.00

Speciated TPH - AROM (C12 - C40)

Sample Identity: 22952551-
Date Acquired : 01/07/21 06:24:00 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.025



CERTIFICATE OF ANALYSIS

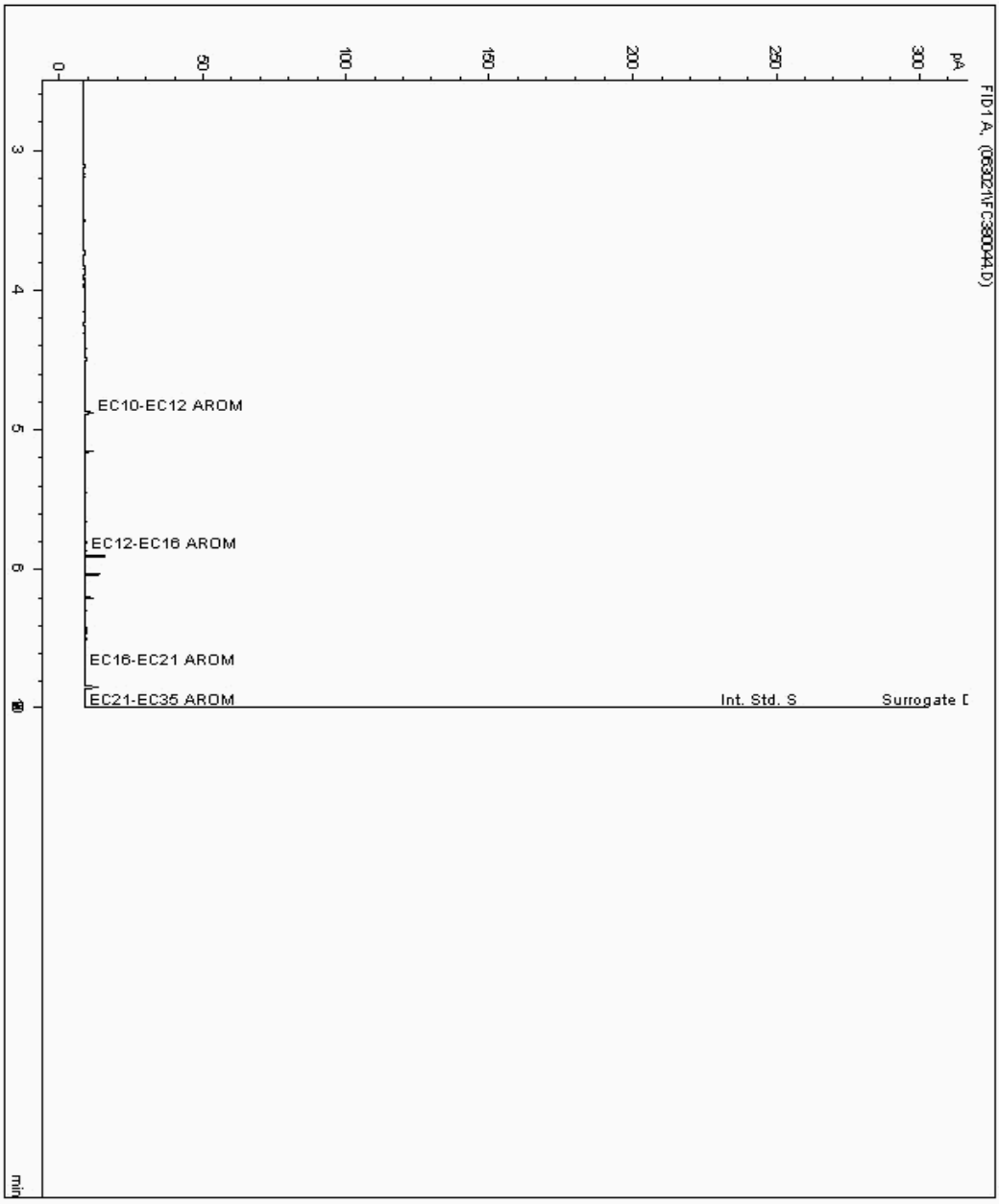
SDG:	210625-123	**Client Reference:**	10049410	**Report Number:**	604145
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: EPH CWG (Aromatic) Aqueous GC (W) **Sample No :** 24525066 **Depth :**
Sample ID : SW5

Speciated TPH - AROM (C12 - C40)

Sample Identity: 22952569-
Date Acquired : 01/07/21 10:39:10 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.025



CERTIFICATE OF ANALYSIS

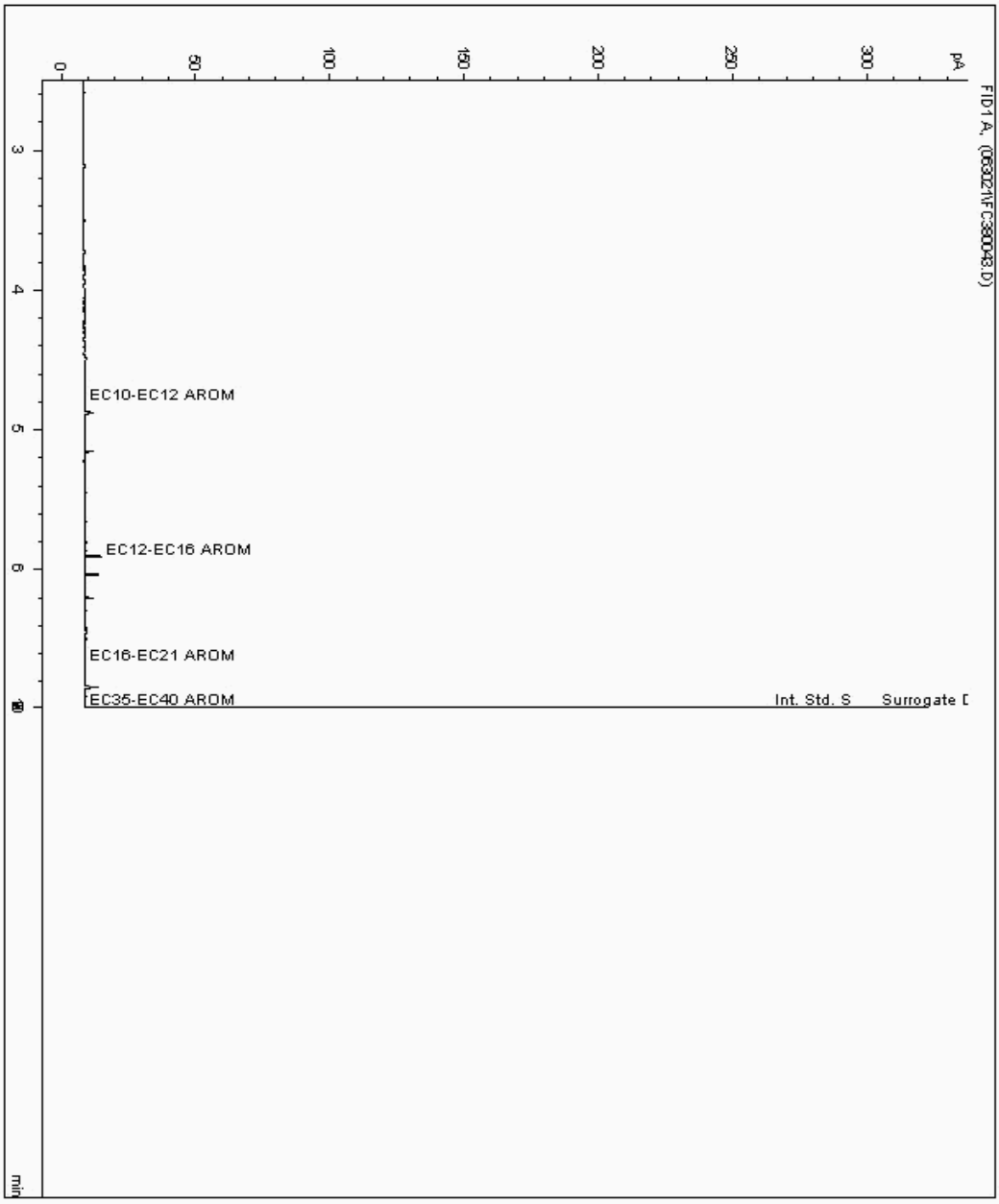
SDG:	210625-123	**Client Reference:**	10049410	**Report Number:**	604145
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: EPH CWG (Aromatic) Aqueous GC (W) **Sample No :** 24525068 **Sample ID :** BHD201 **Depth :** 5.00 - 5.00

Speciated TPH - AROM (C12 - C40)

Sample Identity: 22952591-
Date Acquired : 01/07/21 10:15:59 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.025



CERTIFICATE OF ANALYSIS

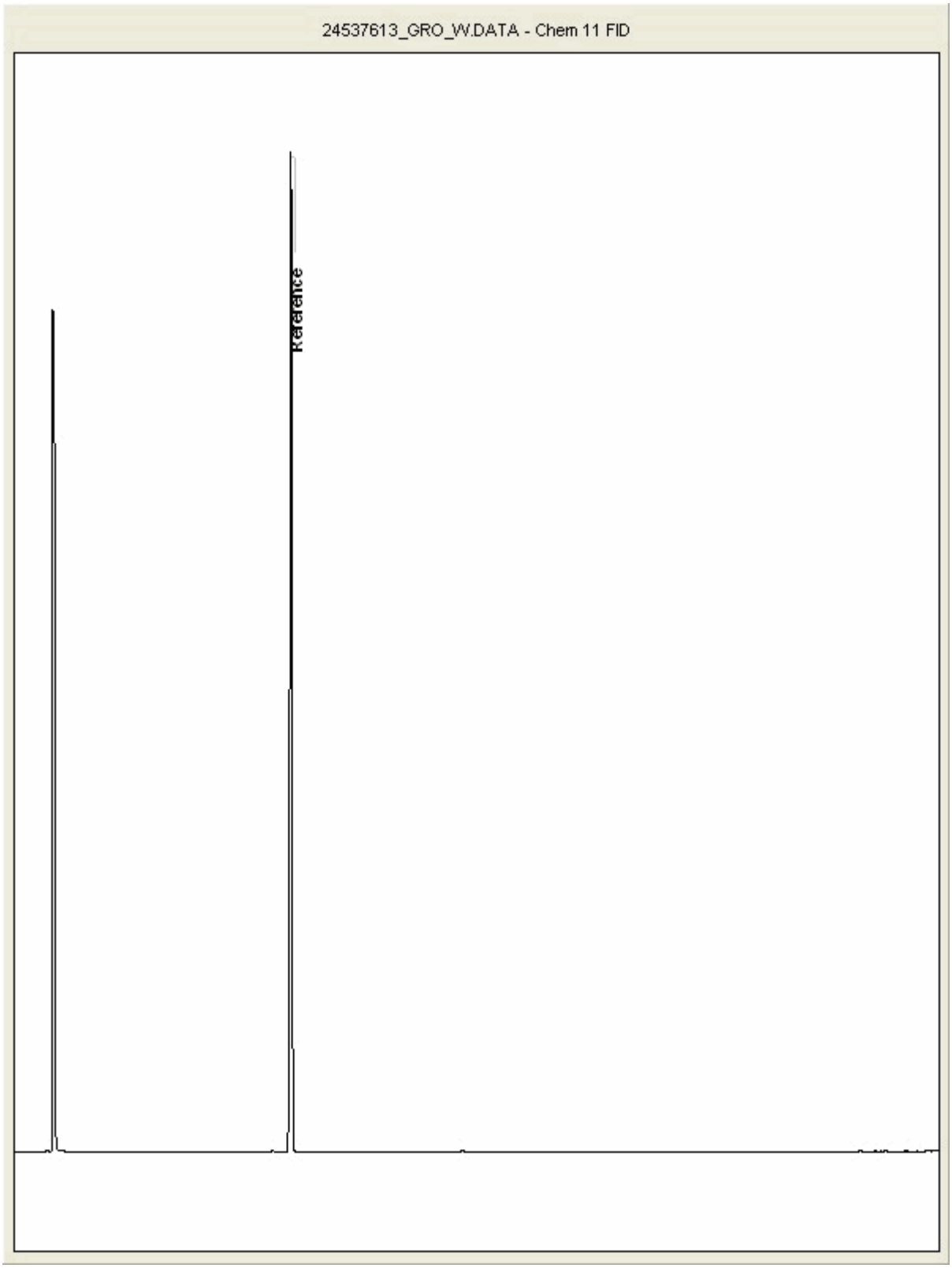
SDG:	210625-123	**Client Reference:**	10049410	**Report Number:**	604145
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 24537613
Sample ID : SW13

Depth :

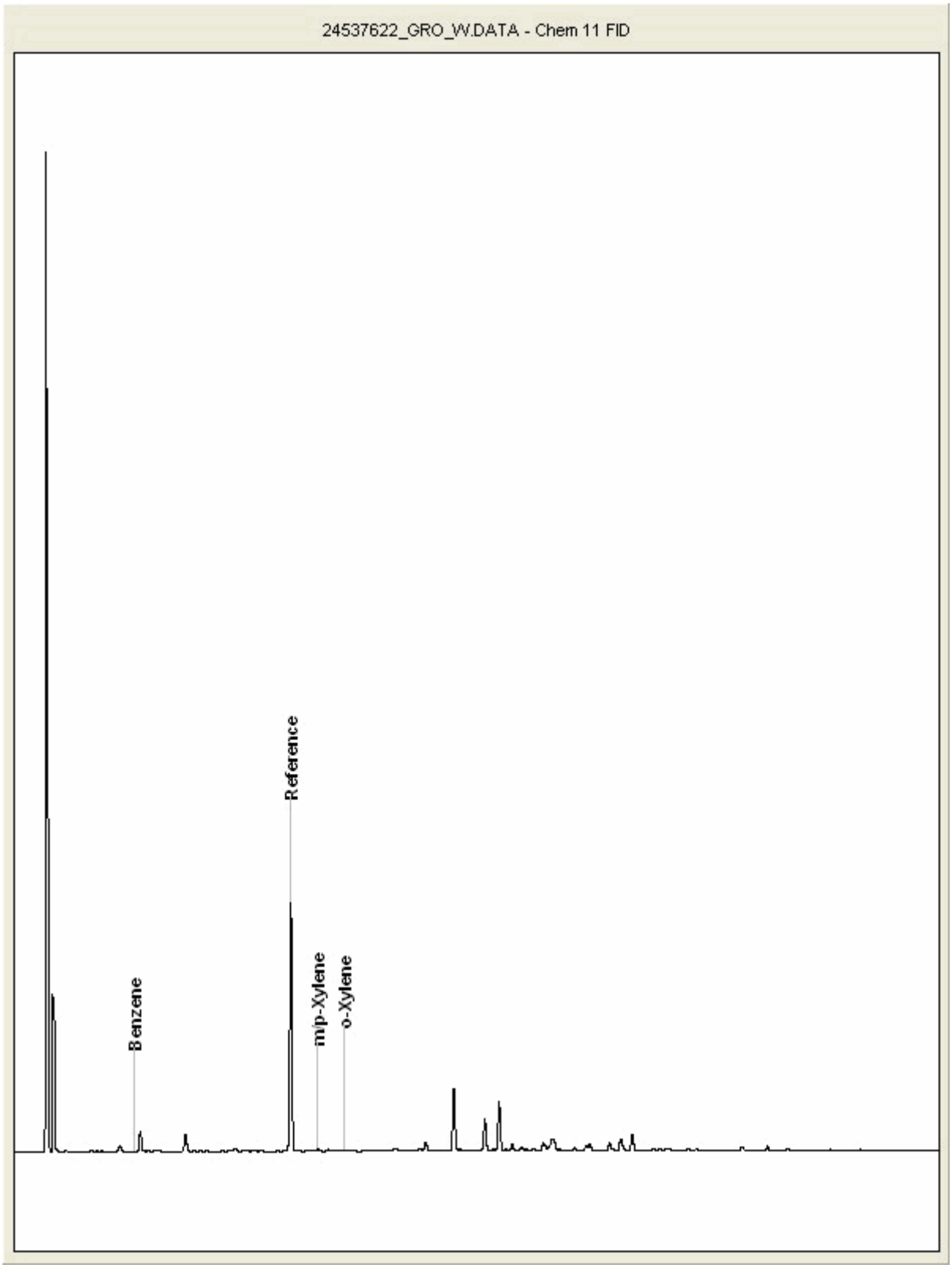


CERTIFICATE OF ANALYSIS

SDG:	210625-123	**Client Reference:**	10049410	**Report Number:**	604145
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: GRO by GC-FID (W) **Sample No :** 24537622 **Sample ID :** BHC101 **Depth :** 5.00 - 5.00



CERTIFICATE OF ANALYSIS

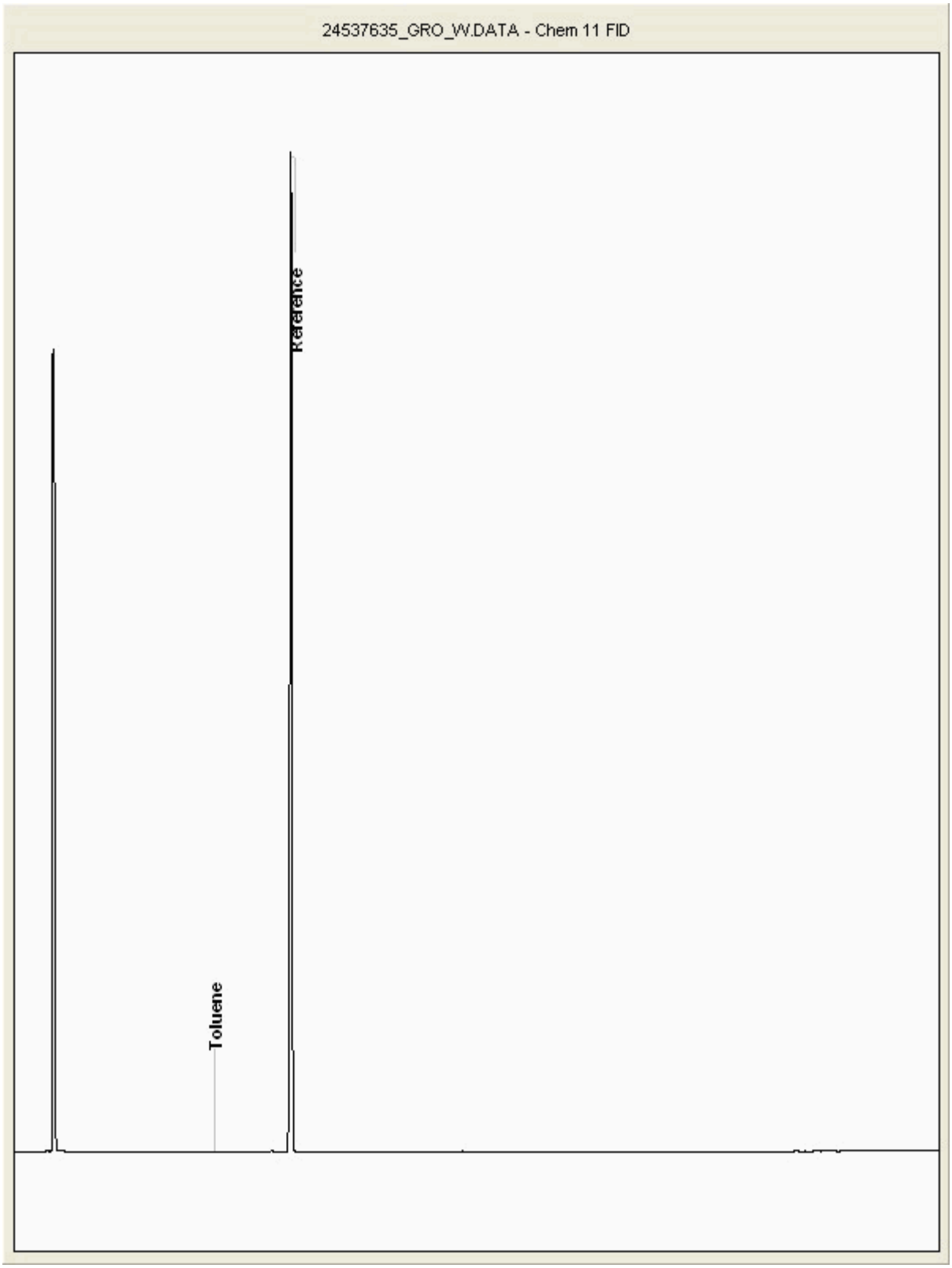
SDG:	210625-123	**Client Reference:**	10049410	**Report Number:**	604145
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 24537635
Sample ID : BHC401

Depth : 4.40 - 4.40



CERTIFICATE OF ANALYSIS

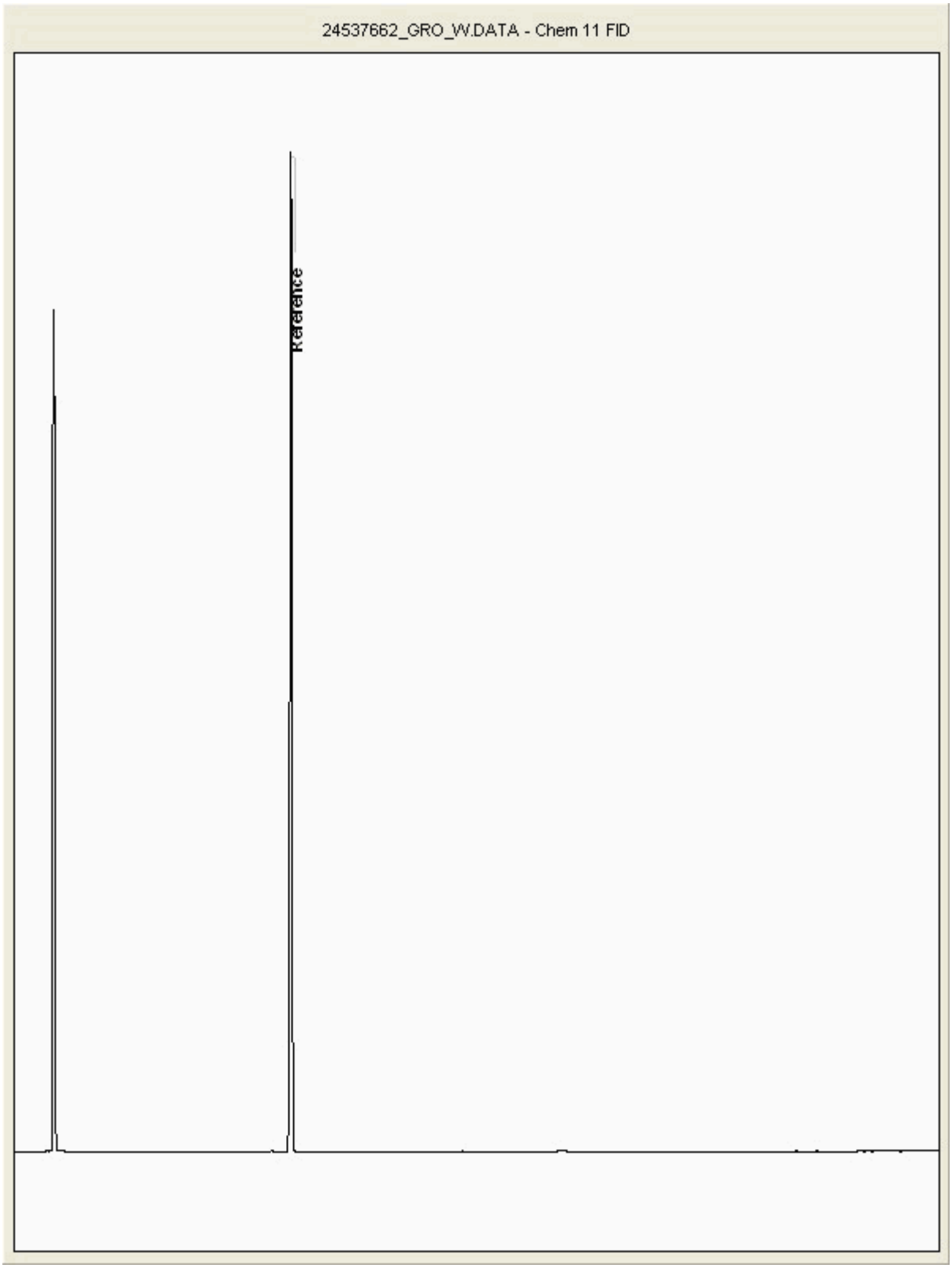
SDG:	210625-123	**Client Reference:**	10049410	**Report Number:**	604145
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 24537662
Sample ID : SW2

Depth :



CERTIFICATE OF ANALYSIS

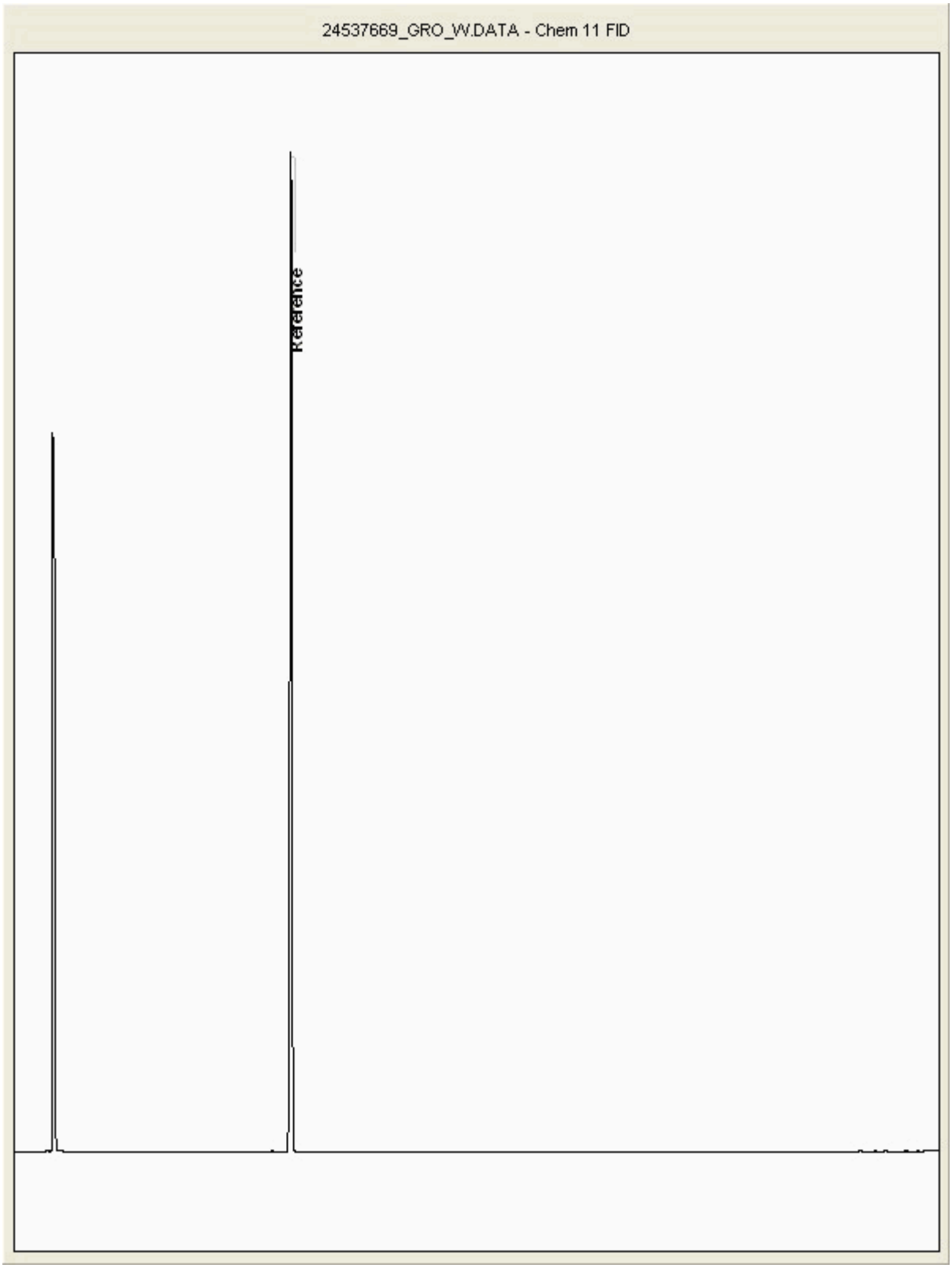
SDG:	210625-123	**Client Reference:**	10049410	**Report Number:**	604145
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 24537669
Sample ID : BH06

Depth : 3.50 - 3.50



CERTIFICATE OF ANALYSIS

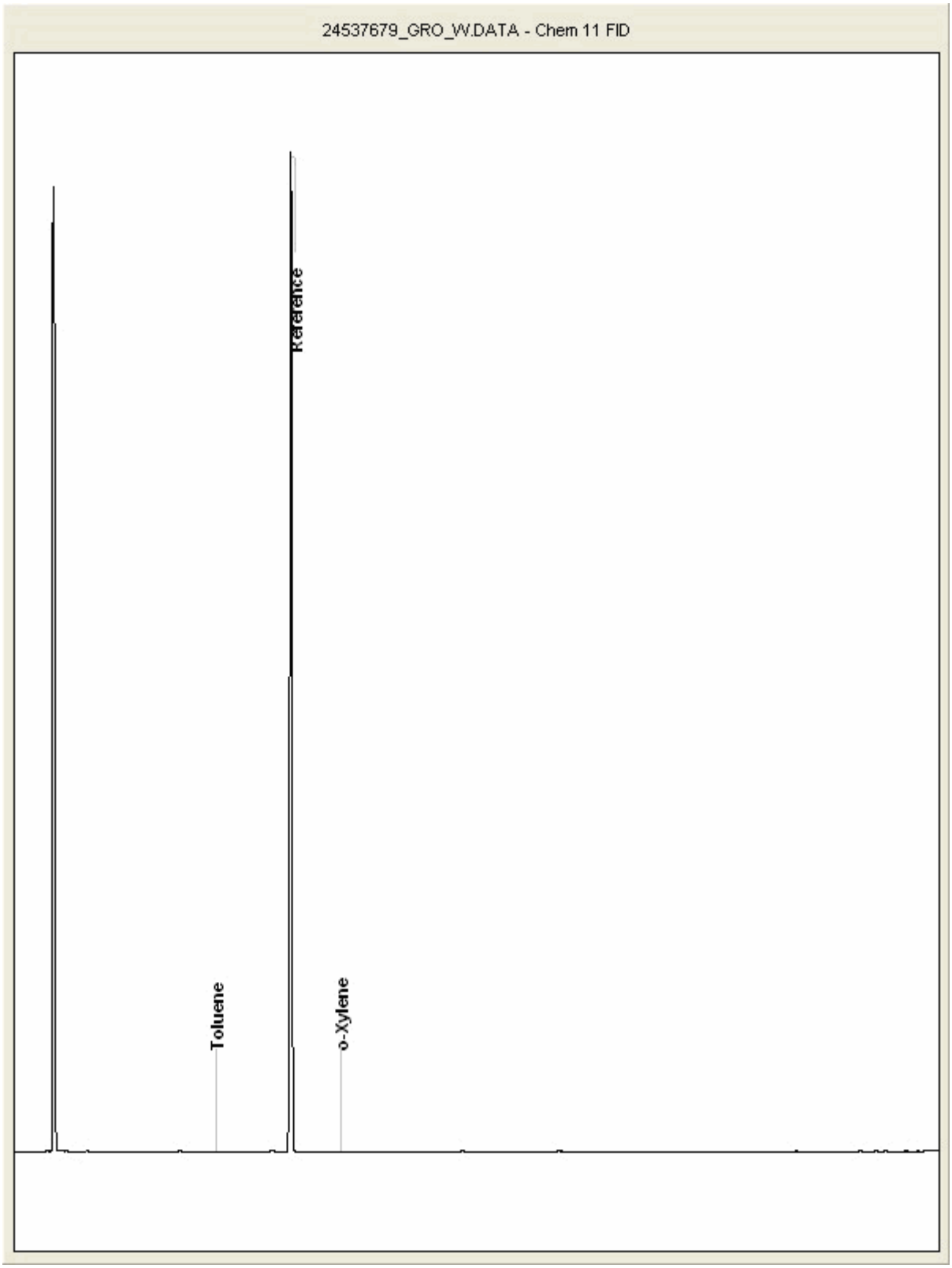
SDG:	210625-123	**Client Reference:**	10049410	**Report Number:**	604145
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 24537679
Sample ID : BHD401S

Depth : 0.00 - 3.00



CERTIFICATE OF ANALYSIS

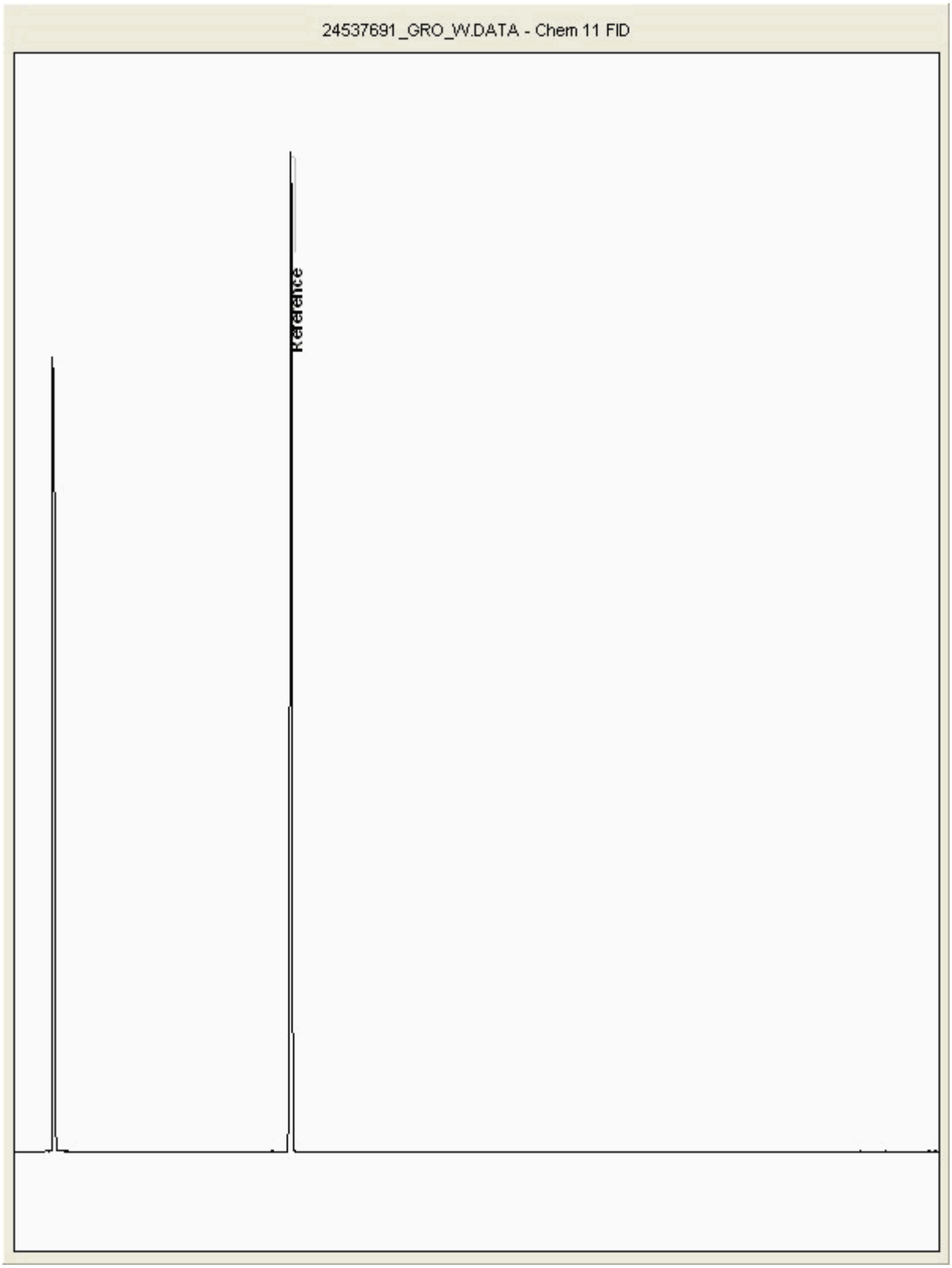
SDG:	210625-123	**Client Reference:**	10049410	**Report Number:**	604145
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 24537691
Sample ID : BHE601

Depth : 4.00 - 4.00



CERTIFICATE OF ANALYSIS

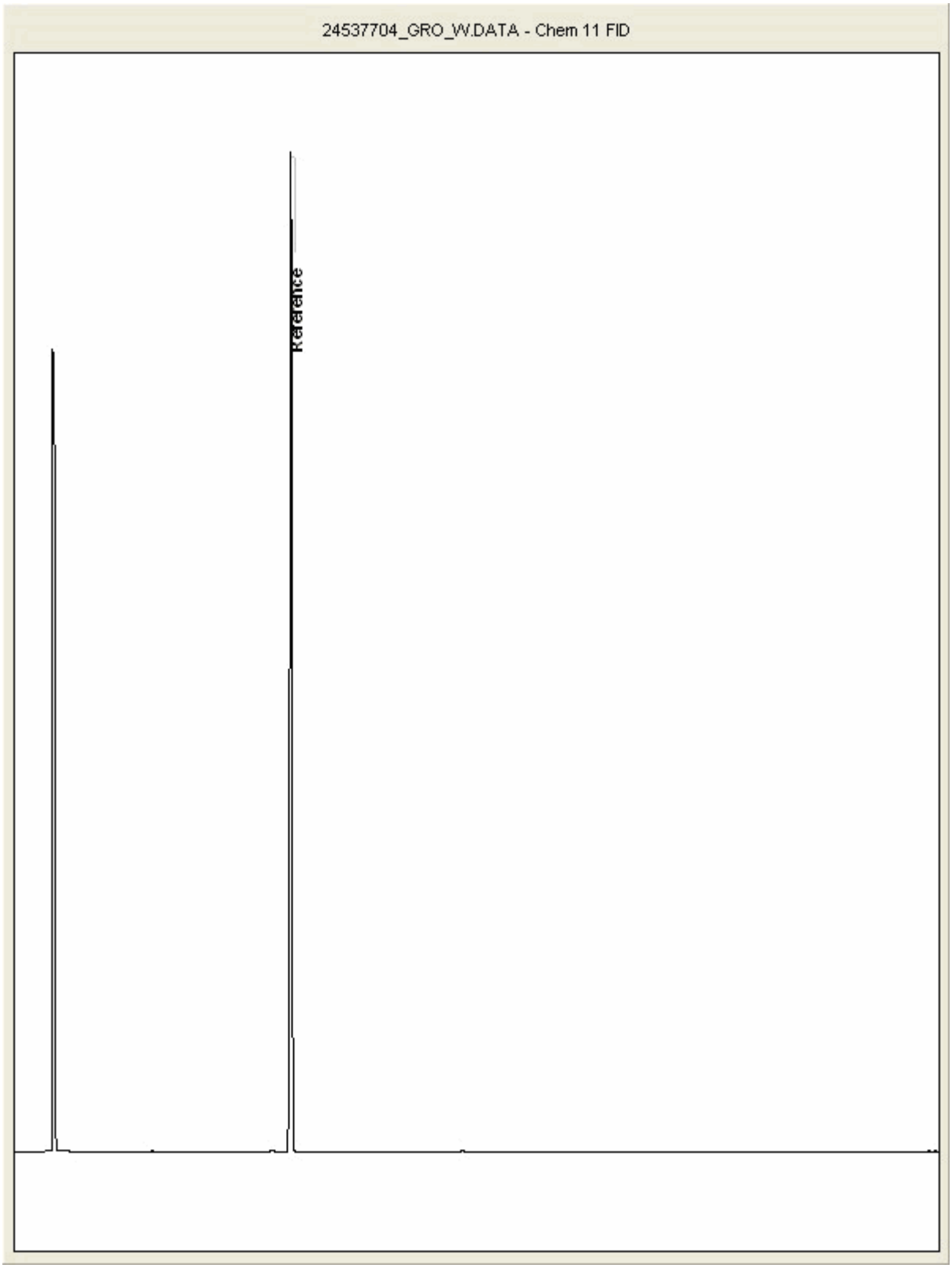
SDG:	210625-123	**Client Reference:**	10049410	**Report Number:**	604145
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 24537704
Sample ID : BHD201

Depth : 5.00 - 5.00



CERTIFICATE OF ANALYSIS

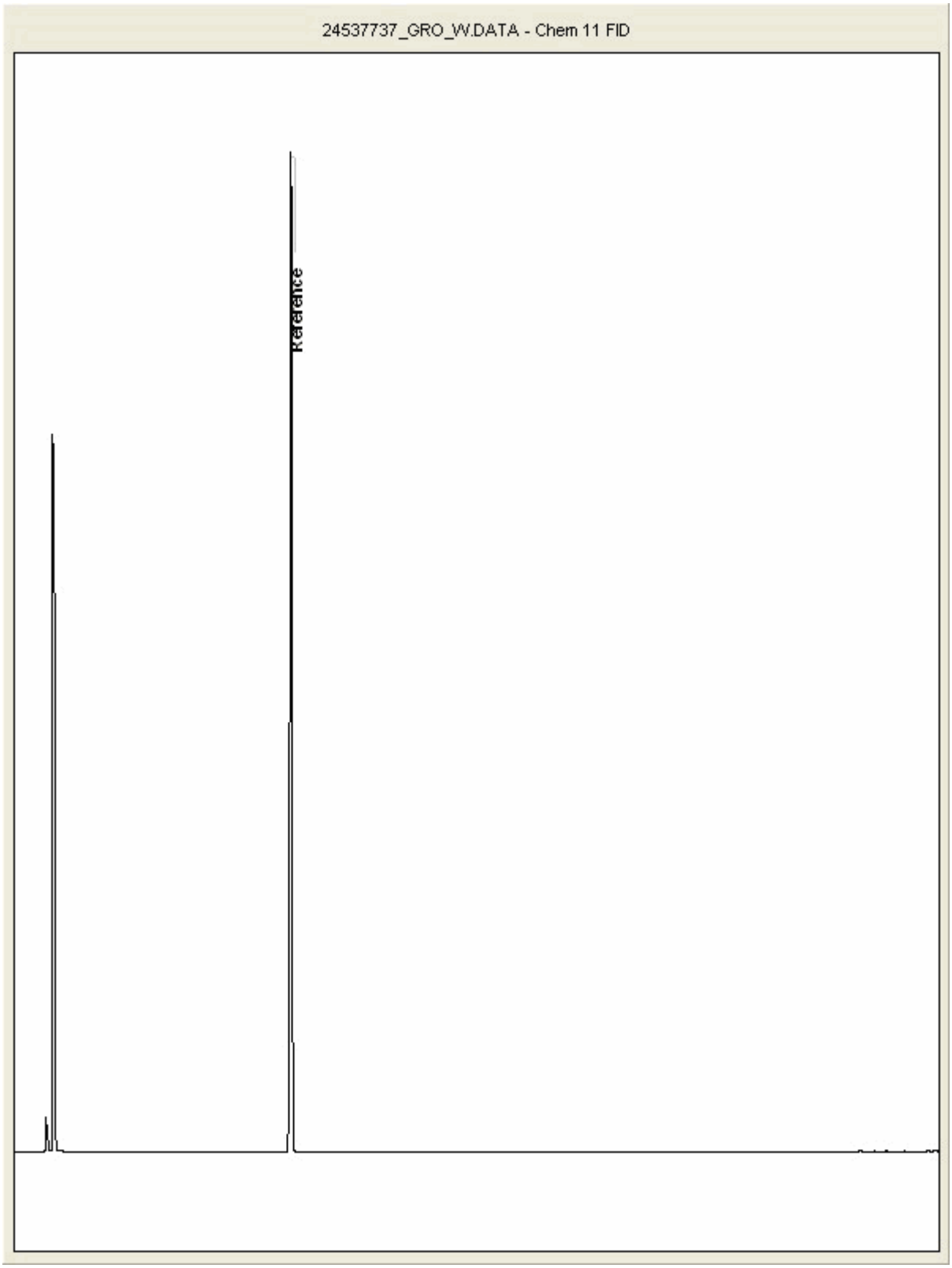
SDG:	210625-123	**Client Reference:**	10049410	**Report Number:**	604145
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 24537737
Sample ID : BHE301

Depth : 5.00 - 5.00



CERTIFICATE OF ANALYSIS

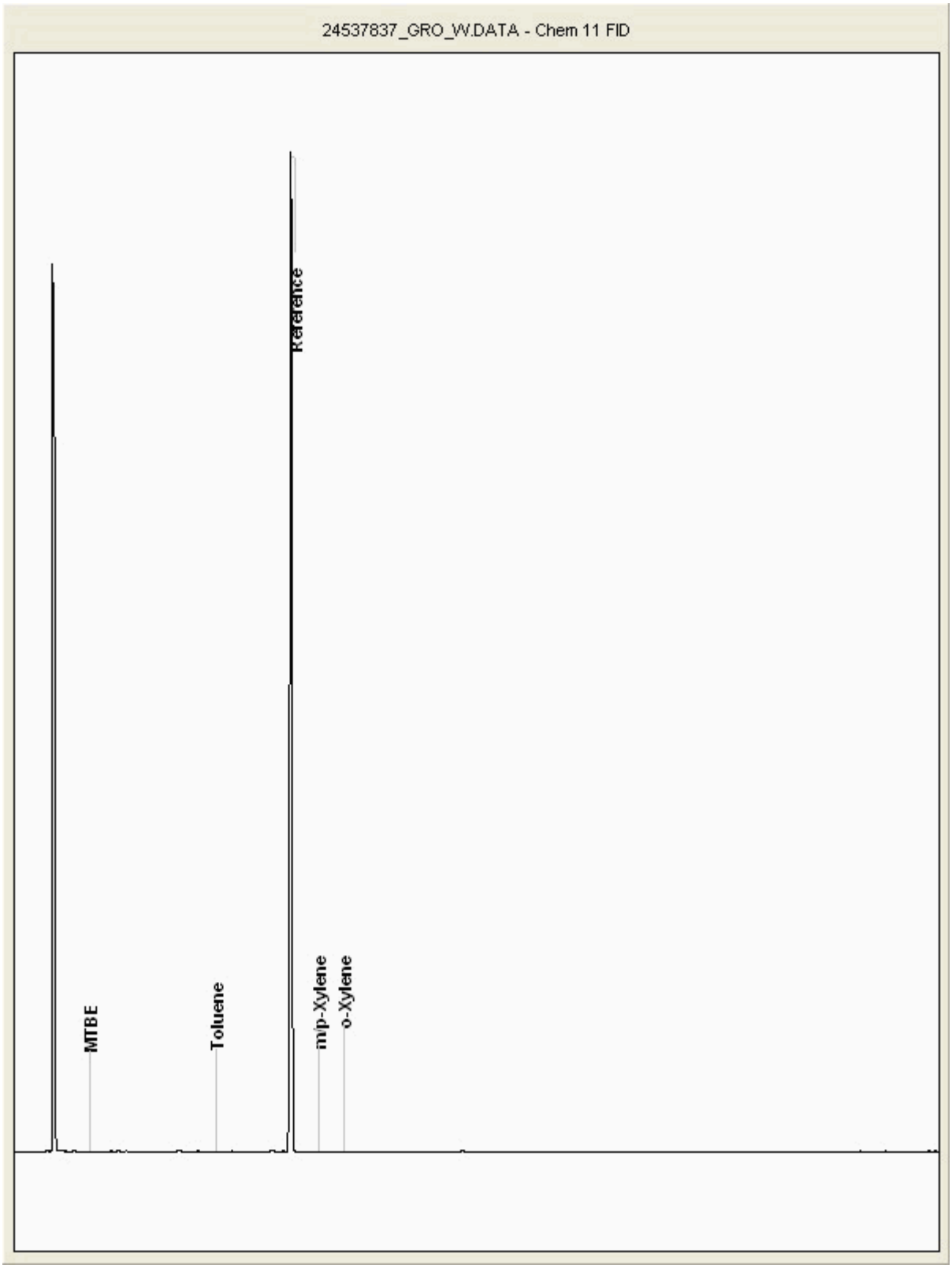
SDG:	210625-123	**Client Reference:**	10049410	**Report Number:**	604145
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 24537837
Sample ID : SW5

Depth :



Appendix General

1. Results are expressed on a dry weight basis (dried at 35ºC) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH4 by the BRE method, VOC TICs and SVOC TICs.

2. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples 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. ALS reserve the right to charge for samples received and stored but not analysed.

3. 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.

4. 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.

5. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

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

7. Results relate only to the items tested.

8. LoDs (Limit of Detection) for wet tests reported on a dry weight basis are not corrected for moisture content.

9. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

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

11. 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.

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

13. For leachate preparations other than Zero Headspace Extraction (ZHE) volatile loss may occur.

14. 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.

15. 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 C5-C12 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.

16. 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.

17. **Tentatively Identified Compounds (TICs)** are non-target peaks in VOC and SVOC analysis. All non-target peaks detected with a concentration above the LoD are subjected to a mass spectral library search. Non-target peaks with a library search confidence of >75% are reported based on the best mass spectral library match. When a non-target peak with a library search confidence of <75% is detected it is reported as "mixed hydrocarbons". Non-target compounds identified from the scan data are semi-quantified relative to one of the deuterated internal standards, under the same chromatographic conditions as the target compounds. This result is reported as a semi-quantitative value and reported as Tentatively Identified Compounds (TICs). TICs are outside the scope of UKAS accreditation and are not moisture corrected.

18. **Sample Deviations**

If a sample is classed as deviated then the associated results may be compromised.

1	**Container with Headspace provided for volatiles analysis**
2	**Incorrect container received**
3	**Deviation from method**
4	**Matrix interference**
♦	**Sample holding time exceeded in laboratory**
@	**Sample holding time exceeded due to late arrival of instructions or samples**
§	**Sampled on date not provided**

19. **Asbestos**

When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

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

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.

Respirable Fibres

Respirable fibres are defined as fibres of <3 µm diameter, longer than 5 µm and with aspect ratios of at least 3:1 that can be inhaled into the lower regions of the lung and are generally acknowledged to be most important predictor of hazard and risk for cancers of the lung.
Standing Committee of Analysts, *The Quantification of Asbestos in Soil (2017).*

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils 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.

Unit 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
CH5 3US
Tel: (01244) 528700
Fax: (01244) 528701
email: hawardencustomerservices@alsglobal.com
Website: www.alsenvironmental.co.uk

ARCADIS UK Ltd
Charter House
62-68 Hills Road
Cambridge
CB2 1LA

Attention: Paul Hamer

CERTIFICATE OF ANALYSIS

Date of report Generation:	02 July 2021
Customer:	ARCADIS UK Ltd
Sample Delivery Group (SDG):	210625-131
Your Reference:	10049410
Location:	MILFORD - HAVEN, WALES
Report No:	604146

We received 8 samples on Friday June 25, 2021 and 8 of these samples were scheduled for analysis which was completed on Thursday July 01, 2021. 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.

Chemical testing (unless subcontracted) performed at ALS Environmental Hawarden (Method codes TM) or ALS Environmental Aberdeen (Method codes S).

All sample data is provided by the customer. The reported results relate to the sample supplied, and on the basis that this data is correct.
Incorrect sampling dates and/or sample information will affect the validity of results.

Approved By:

Sonia McWhan

Operations Manager

CERTIFICATE OF ANALYSIS

SDG:	210625-131	**Client Reference:**	10049410	**Report Number:**	604146
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
24514764	BH02		4.00 - 4.00	22/06/2021
24514762	BHB701		4.00 - 4.00	21/06/2021
24514769	BHC		4.00 - 4.00	21/06/2021
24514759	BHD401D		6.00 - 6.00	22/06/2021
24514767	BHE701		9.00 - 9.00	21/06/2021
24514758	BHJ		6.00 - 6.00	22/06/2021
24514757	BHM		6.50 - 6.50	21/06/2021
24514761	DUBLICATE			

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

CERTIFICATE OF ANALYSIS

SDG:	210625-131	**Client Reference:**	10049410	**Report Number:**	604146
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Results Legend

X **Test**

N **No Determination Possible**

Sample Types -
S - Soil/Solid
UNS - Unspecified Solid
GW - Ground Water
SW - Surface Water
LE - Land Leachate
PL - Prepared Leachate
PR - Process Water
SA - Saline Water
TE - Trade Effluent
TS - Treated Sewage
US - Untreated Sewage
RE - Recreational Water
DW - Drinking Water Non-regulatory
UNL - Unspecified Liquid
SL - Sludge
G - Gas
OTH - Other

			Lab Sample No(s)	24514764		24514762		24514769		24514759		24514767		24514758		24514757		24514761	
			Customer Sample Reference	BH02		BHB701		BHC		BHD401D		BHE701		BHJ		BHM		DUBLICATE	
			AGS Reference																
			Depth (m)	4.00 - 4.00		4.00 - 4.00		4.00 - 4.00		6.00 - 6.00		9.00 - 9.00		6.00 - 6.00		6.50 - 6.50			
			Container	0.5l glass bottle (ALE227)	Vial (ALE297)	0.5l glass bottle (ALE227)	Vial (ALE297)	0.5l glass bottle (ALE227)	Vial (ALE297)	0.5l glass bottle (ALE227)	Vial (ALE297)	0.5l glass bottle (ALE227)	Vial (ALE297)	0.5l glass bottle (ALE227)	Vial (ALE297)	0.5l glass bottle (ALE227)	Vial (ALE297)	0.5l glass bottle (ALE227)	Vial (ALE297)
			Sample Type	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW
EPH CWG (Aliphatic) Aqueous GC (W)	All	NDPs: 0 Tests: 8		X		X		X		X		X		X		X		X	
EPH CWG (Aromatic) Aqueous GC (W)	All	NDPs: 0 Tests: 8		X		X		X		X		X		X		X		X	
GRO by GC-FID (W)	All	NDPs: 0 Tests: 8			X		X		X		X		X		X		X		X
PAH Spec MS - Aqueous (W)	All	NDPs: 0 Tests: 8		X		X		X		X		X		X		X		X	
TPH CWG (W)	All	NDPs: 0 Tests: 8		X		X		X		X		X		X		X		X	
VOC MS (W)	All	NDPs: 0 Tests: 8			X		X		X		X		X		X		X		X

CERTIFICATE OF ANALYSIS

SDG:	210625-131	**Client Reference:**	10049410	**Report Number:**	604146
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

PAH Spec MS - Aqueous (W)

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted - refer to subcontractor report for accreditation status.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4+5@	Sample deviation (see appendix)

Customer Sample Ref.	BH02	BHB701	BHC	BHD401D	BHE701	BHJ
Depth (m)	4.00 - 4.00	4.00 - 4.00	4.00 - 4.00	6.00 - 6.00	9.00 - 9.00	6.00 - 6.00
Sample Type	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)
Date Sampled	22/06/2021	21/06/2021	21/06/2021	22/06/2021	21/06/2021	22/06/2021
Sampled Time	.	.	.	.	.	.
Date Received	25/06/2021	25/06/2021	25/06/2021	25/06/2021	25/06/2021	25/06/2021
SDG Ref	210625-131	210625-131	210625-131	210625-131	210625-131	210625-131
Lab Sample No.(s)	24514764	24514762	24514769	24514759	24514767	24514758
AGS Reference						

Component	LOD/Units	Method						
Naphthalene (aq)	<0.01 µg/l	TM178	<0.01 #	<0.01 #	<0.01 #	0.0514 #	<0.01 #	<0.01 #
Acenaphthene (aq)	<0.005 µg/l	TM178	<0.005 #	<0.005 #	<0.005 #	0.173 #	<0.005 #	<0.005 #
Acenaphthylene (aq)	<0.005 µg/l	TM178	<0.005 #	<0.005 #	<0.005 #	0.0137 #	<0.005 #	<0.005 #
Fluoranthene (aq)	<0.005 µg/l	TM178	<0.005 #	<0.005 #	<0.005 #	<0.005 #	<0.005 #	<0.005 #
Anthracene (aq)	<0.005 µg/l	TM178	<0.005 #	<0.005 #	<0.005 #	<0.005 #	<0.005 #	<0.005 #
Phenanthrene (aq)	<0.005 µg/l	TM178	<0.005 #	<0.005 #	<0.005 #	0.0717 #	<0.005 #	<0.005 #
Fluorene (aq)	<0.005 µg/l	TM178	<0.005 #	<0.005 #	<0.005 #	0.0994 #	<0.005 #	<0.005 #
Chrysene (aq)	<0.005 µg/l	TM178	<0.005 #	<0.005 #	<0.005 #	<0.005 #	<0.005 #	<0.005 #
Pyrene (aq)	<0.005 µg/l	TM178	0.0088 #	0.0289 #	<0.005 #	0.00966 #	<0.005 #	<0.005 #
Benzo(a)anthracene (aq)	<0.005 µg/l	TM178	<0.005 #	<0.005 #	<0.005 #	<0.005 #	<0.005 #	<0.005 #
Benzo(b)fluoranthene (aq)	<0.005 µg/l	TM178	<0.005 #	<0.005 #	<0.005 #	<0.005 #	<0.005 #	<0.005 #
Benzo(k)fluoranthene (aq)	<0.005 µg/l	TM178	<0.005 #	<0.005 #	<0.005 #	<0.005 #	<0.005 #	<0.005 #
Benzo(a)pyrene (aq)	<0.002 µg/l	TM178	<0.002 #	<0.002 #	<0.002 #	<0.002 #	<0.002 #	<0.002 #
Dibenzo(a,h)anthracene (aq)	<0.005 µg/l	TM178	<0.005 #	<0.005 #	<0.005 #	<0.005 #	<0.005 #	<0.005 #
Benzo(g,h,i)perylene (aq)	<0.005 µg/l	TM178	<0.005 #	<0.005 #	<0.005 #	<0.005 #	<0.005 #	<0.005 #
Indeno(1,2,3-cd)pyrene (aq)	<0.005 µg/l	TM178	<0.005 #	<0.005 #	<0.005 #	<0.005 #	<0.005 #	<0.005 #
PAH, Total Detected USEPA 16 (aq)	<0.082 µg/l	TM178	<0.082 #	<0.082 #	<0.082 #	0.418 #	<0.082 #	<0.082 #

CERTIFICATE OF ANALYSIS

SDG:	210625-131	**Client Reference:**	10049410	**Report Number:**	604146
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

PAH Spec MS - Aqueous (W)

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted - refer to subcontractor report for accreditation status.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4+5@	Sample deviation (see appendix)

Customer Sample Ref.	BHM	DUBLICATE
Depth (m)	6.50 - 6.50	.
Sample Type	Ground Water (GW)	Ground Water (GW)
Date Sampled	21/06/2021	-
Sampled Time	.	.
Date Received	25/06/2021	25/06/2021
SDG Ref	210625-131	210625-131
Lab Sample No.(s)	24514757	24514761
AGS Reference		

Component	LOD/Units	Method						
Naphthalene (aq)	<0.01 µg/l	TM178	<0.01	#	<0.01	§ #		
Acenaphthene (aq)	<0.005 µg/l	TM178	0.0114	#	<0.005	§ #		
Acenaphthylene (aq)	<0.005 µg/l	TM178	<0.005	#	<0.005	§ #		
Fluoranthene (aq)	<0.005 µg/l	TM178	<0.005	#	<0.005	§ #		
Anthracene (aq)	<0.005 µg/l	TM178	<0.005	#	<0.005	§ #		
Phenanthrene (aq)	<0.005 µg/l	TM178	0.0135	#	<0.005	§ #		
Fluorene (aq)	<0.005 µg/l	TM178	0.0117	#	<0.005	§ #		
Chrysene (aq)	<0.005 µg/l	TM178	<0.005	#	<0.005	§ #		
Pyrene (aq)	<0.005 µg/l	TM178	<0.005	#	0.00922	§ #		
Benzo(a)anthracene (aq)	<0.005 µg/l	TM178	<0.005	#	<0.005	§ #		
Benzo(b)fluoranthene (aq)	<0.005 µg/l	TM178	<0.005	#	<0.005	§ #		
Benzo(k)fluoranthene (aq)	<0.005 µg/l	TM178	<0.005	#	<0.005	§ #		
Benzo(a)pyrene (aq)	<0.002 µg/l	TM178	<0.002	#	<0.002	§ #		
Dibenzo(a,h)anthracene (aq)	<0.005 µg/l	TM178	<0.005	#	<0.005	§ #		
Benzo(g,h,i)perylene (aq)	<0.005 µg/l	TM178	<0.005	#	<0.005	§ #		
Indeno(1,2,3-cd)pyrene (aq)	<0.005 µg/l	TM178	<0.005	#	<0.005	§ #		
PAH, Total Detected USEPA 16 (aq)	<0.082 µg/l	TM178	<0.082	#	<0.082	§ #		

CERTIFICATE OF ANALYSIS

SDG:	210625-131	**Client Reference:**	10049410	**Report Number:**	604146
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

TPH CWG (W)

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted - refer to subcontractor report for accreditation status.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4+5@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	BH02	BHB701	BHC	BHD401D	BHE701	BHJ
			Depth (m)	4.00 - 4.00	4.00 - 4.00	4.00 - 4.00	6.00 - 6.00	9.00 - 9.00	6.00 - 6.00
			Sample Type	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)
			Date Sampled	22/06/2021	21/06/2021	21/06/2021	22/06/2021	21/06/2021	22/06/2021
			Sampled Time	.	.	.	.	.	.
			Date Received	25/06/2021	25/06/2021	25/06/2021	25/06/2021	25/06/2021	25/06/2021
			SDG Ref	210625-131	210625-131	210625-131	210625-131	210625-131	210625-131
			Lab Sample No.(s)	24514764	24514762	24514769	24514759	24514767	24514758
			AGS Reference						
GRO Surrogate % recovery**	%	TM245		94	97	97	99	100	101
GRO >C5-C12	<50 µg/l	TM245		<50 #	<50 #	<50 #	526 #	<50 #	<50 #
Methyl tertiary butyl ether (MTBE)	<3 µg/l	TM245		<3 #	<3 #	22 #	<3 #	<3 #	4 #
Benzene	<7 µg/l	TM245		<7 #	<7 #	<7 #	8 #	<7 #	<7 #
Toluene	<4 µg/l	TM245		<4 #	<4 #	<4 #	<4 #	<4 #	<4 #
Ethylbenzene	<5 µg/l	TM245		<5 #	<5 #	<5 #	<5 #	<5 #	<5 #
m,p-Xylene	<8 µg/l	TM245		<8 #	<8 #	<8 #	<8 #	<8 #	<8 #
o-Xylene	<3 µg/l	TM245		<3 #	<3 #	<3 #	<3 #	<3 #	<3 #
Sum of detected Xylenes	<11 µg/l	TM245		<11	<11	<11	<11	<11	<11
Sum of detected BTEX	<28 µg/l	TM245		<28	<28	<28	<28	<28	<28
Aliphatics >C5-C6	<10 µg/l	TM245		<10	<10	<10	144	<10	<10
Aliphatics >C6-C8	<10 µg/l	TM245		<10	<10	<10	257	<10	<10
Aliphatics >C8-C10	<10 µg/l	TM245		<10	<10	<10	36	<10	<10
Aliphatics >C10-C12	<10 µg/l	TM245		<10	<10	<10	32	<10	<10
Aliphatics >C12-C16 (aq)	<10 µg/l	TM174		<10	<10	<10	<10	<10	<10
Aliphatics >C16-C21 (aq)	<10 µg/l	TM174		<10	<10	<10	<10	<10	<10
Aliphatics >C21-C35 (aq)	<10 µg/l	TM174		<10	<10	<10	<10	<10	<10
Total Aliphatics >C12-C35 (aq)	<10 µg/l	TM174		<10	<10	<10	<10	<10	<10
Aromatics >EC5-EC7	<10 µg/l	TM245		<10	<10	<10	<10	<10	<10
Aromatics >EC7-EC8	<10 µg/l	TM245		<10	<10	<10	<10	<10	<10
Aromatics >EC8-EC10	<10 µg/l	TM245		<10	<10	<10	26	<10	<10
Aromatics >EC10-EC12	<10 µg/l	TM245		<10	<10	<10	21	<10	<10
Aromatics >EC12-EC16 (aq)	<10 µg/l	TM174		<10	<10	<10	13	<10	<10
Aromatics >EC16-EC21 (aq)	<10 µg/l	TM174		<10	<10	<10	<10	<10	<10
Aromatics >EC21-EC35 (aq)	<10 µg/l	TM174		<10	<10	<10	<10	<10	<10
Total Aromatics >EC12-EC35 (aq)	<10 µg/l	TM174		<10	<10	<10	13	<10	<10
Total Aliphatics & Aromatics >C5-35 (aq)	<10 µg/l	TM174		<10	<10	<10	539	<10	<10
Aliphatics >C16-C35 Aqueous	<10 µg/l	TM174		<10	<10	<10	<10	<10	<10

CERTIFICATE OF ANALYSIS

SDG:	210625-131	**Client Reference:**	10049410	**Report Number:**	604146
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

TPH CWG (W)

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted - refer to subcontractor report for accreditation status.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4+5@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	BHM	DUBLICATE				
			Depth (m)	6.50 - 6.50	.				
			Sample Type	Ground Water (GW)	Ground Water (GW)				
			Date Sampled	21/06/2021	-				
			Sampled Time	.	.				
			Date Received	25/06/2021	25/06/2021				
			SDG Ref	210625-131	210625-131				
			Lab Sample No.(s)	24514757	24514761				
			AGS Reference						
GRO Surrogate % recovery**	%	TM245		101	102 §				
GRO >C5-C12	<50 µg/l	TM245		<50 #	<50 § #				
Methyl tertiary butyl ether (MTBE)	<3 µg/l	TM245		<3 #	<3 § #				
Benzene	<7 µg/l	TM245		<7 #	<7 § #				
Toluene	<4 µg/l	TM245		<4 #	<4 § #				
Ethylbenzene	<5 µg/l	TM245		<5 #	<5 § #				
m,p-Xylene	<8 µg/l	TM245		<8 #	<8 § #				
o-Xylene	<3 µg/l	TM245		<3 #	<3 § #				
Sum of detected Xylenes	<11 µg/l	TM245		<11	<11 §				
Sum of detected BTEX	<28 µg/l	TM245		<28	<28 §				
Aliphatics >C5-C6	<10 µg/l	TM245		<10	<10 §				
Aliphatics >C6-C8	<10 µg/l	TM245		<10	<10 §				
Aliphatics >C8-C10	<10 µg/l	TM245		<10	<10 §				
Aliphatics >C10-C12	<10 µg/l	TM245		<10	<10 §				
Aliphatics >C12-C16 (aq)	<10 µg/l	TM174		<10	<10 §				
Aliphatics >C16-C21 (aq)	<10 µg/l	TM174		<10	<10 §				
Aliphatics >C21-C35 (aq)	<10 µg/l	TM174		<10	<10 §				
Total Aliphatics >C12-C35 (aq)	<10 µg/l	TM174		<10	<10 §				
Aromatics >EC5-EC7	<10 µg/l	TM245		<10	<10 §				
Aromatics >EC7-EC8	<10 µg/l	TM245		<10	<10 §				
Aromatics >EC8-EC10	<10 µg/l	TM245		<10	<10 §				
Aromatics >EC10-EC12	<10 µg/l	TM245		<10	<10 §				
Aromatics >EC12-EC16 (aq)	<10 µg/l	TM174		<10	<10 §				
Aromatics >EC16-EC21 (aq)	<10 µg/l	TM174		<10	<10 §				
Aromatics >EC21-EC35 (aq)	<10 µg/l	TM174		<10	<10 §				
Total Aromatics >EC12-EC35 (aq)	<10 µg/l	TM174		<10	<10 §				
Total Aliphatics & Aromatics >C5-35 (aq)	<10 µg/l	TM174		<10	<10 §				
Aliphatics >C16-C35 Aqueous	<10 µg/l	TM174		<10	<10 §				

CERTIFICATE OF ANALYSIS

SDG:	210625-131	**Client Reference:**	10049410	**Report Number:**	604146
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

VOC MS (W)

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted - refer to subcontractor report for accreditation status.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4+5@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	BH02	BHB701	BHC	BHD401D	BHE701	BHJ
			Depth (m)	4.00 - 4.00	4.00 - 4.00	4.00 - 4.00	6.00 - 6.00	9.00 - 9.00	6.00 - 6.00
			Sample Type	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)
			Date Sampled	22/06/2021	21/06/2021	21/06/2021	22/06/2021	21/06/2021	22/06/2021
			Sampled Time	.	.	.	.	.	.
			Date Received	25/06/2021	25/06/2021	25/06/2021	25/06/2021	25/06/2021	25/06/2021
			SDG Ref	210625-131	210625-131	210625-131	210625-131	210625-131	210625-131
			Lab Sample No.(s)	24514764	24514762	24514769	24514759	24514767	24514758
			AGS Reference						
Toluene-d8**	%	TM208		100	99.5	99.9	99.6	99	97.9
Methyl tertiary butyl ether (MTBE)	<1 µg/l	TM208		1.12 #	<1 #	29.1 #	12.3 #	<1 #	3.06 #
Benzene	<1 µg/l	TM208		<1 #	<1 #	<1 #	3.82 #	<1 #	<1 #
Toluene	<1 µg/l	TM208		<1 #	<1 #	<1 #	<1 #	<1 #	<1 #
Ethylbenzene	<1 µg/l	TM208		<1 #	<1 #	<1 #	<1 #	<1 #	<1 #
m,p-Xylene	<1 µg/l	TM208		<1 #	<1 #	<1 #	1.42 #	<1 #	<1 #
o-Xylene	<1 µg/l	TM208		<1 #	<1 #	<1 #	<1 #	<1 #	<1 #
Sum of BTEX	<5 µg/l	TM208		<5	<5	<5	5.24	<5	<5

CERTIFICATE OF ANALYSIS

SDG:	210625-131	**Client Reference:**	10049410	**Report Number:**	604146
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

VOC MS (W)

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted - refer to subcontractor report for accreditation status.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4+5@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	BHM	DUBLICATE
			Depth (m)	6.50 - 6.50	.
			Sample Type	Ground Water (GW)	Ground Water (GW)
			Date Sampled	21/06/2021	-
			Sampled Time	.	.
			Date Received	25/06/2021	25/06/2021
			SDG Ref	210625-131	210625-131
			Lab Sample No.(s)	24514757	24514761
			AGS Reference		
Toluene-d8**	%	TM208		99.9	98.3 §
Methyl tertiary butyl ether (MTBE)	<1 µg/l	TM208		<1 #	<1 § #
Benzene	<1 µg/l	TM208		<1 #	<1 § #
Toluene	<1 µg/l	TM208		<1 #	<1 § #
Ethylbenzene	<1 µg/l	TM208		<1 #	<1 § #
m,p-Xylene	<1 µg/l	TM208		<1 #	<1 § #
o-Xylene	<1 µg/l	TM208		<1 #	<1 § #
Sum of BTEX	<5 µg/l	TM208		<5	<5 §

Table of Results - Appendix

Method No	Reference	Description
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
TM208	Modified: US EPA Method 8260b & 624	Determination of Volatile Organic Compounds by Headspace / GC-MS in Waters
TM245	By GC-FID	Determination of GRO by Headspace in waters

NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Environmental Hawarden (Method codes TM) or ALS Environmental Aberdeen (Method codes S).

CERTIFICATE OF ANALYSIS

SDG:	210625-131	**Client Reference:**	10049410	**Report Number:**	604146
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Test Completion Dates

Lab Sample No(s)	24514764	24514762	24514769	24514759	24514767	24514758	24514757	24514761
Customer Sample Ref.	BH02	BHB701	BHC	BHD401D	BHE701	BHJ	BHM	DUBLICATE
AGS Ref.								
Depth	4.00 - 4.00	4.00 - 4.00	4.00 - 4.00	6.00 - 6.00	9.00 - 9.00	6.00 - 6.00	6.50 - 6.50	
Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
EPH CWG (Aliphatic) Aqueous GC (W)	01-Jul-2021	01-Jul-2021	29-Jun-2021	29-Jun-2021	01-Jul-2021	01-Jul-2021	01-Jul-2021	01-Jul-2021
EPH CWG (Aromatic) Aqueous GC (W)	01-Jul-2021	01-Jul-2021	29-Jun-2021	29-Jun-2021	01-Jul-2021	01-Jul-2021	01-Jul-2021	01-Jul-2021
GRO by GC-FID (W)	30-Jun-2021	30-Jun-2021	30-Jun-2021	30-Jun-2021	30-Jun-2021	30-Jun-2021	30-Jun-2021	30-Jun-2021
PAH Spec MS - Aqueous (W)	30-Jun-2021	30-Jun-2021	29-Jun-2021	29-Jun-2021	30-Jun-2021	30-Jun-2021	30-Jun-2021	30-Jun-2021
TPH CWG (W)	01-Jul-2021	01-Jul-2021	30-Jun-2021	30-Jun-2021	01-Jul-2021	01-Jul-2021	01-Jul-2021	01-Jul-2021
VOC MS (W)	30-Jun-2021	30-Jun-2021	30-Jun-2021	30-Jun-2021	30-Jun-2021	30-Jun-2021	30-Jun-2021	30-Jun-2021

ASSOCIATED AQC DATA

EPH CWG (Aliphatic) Aqueous GC (W)

Component	Method Code	QC 2492	QC 2481
Total Aliphatics >C10-C40	TM174	**97.03** 65.58 : 141.57	**97.52** 68.59 : 134.82

EPH CWG (Aromatic) Aqueous GC (W)

Component	Method Code	QC 2493	QC 2482
Total Aromatics >EC10-EC40	TM174	**96.83** 60.75 : 129.09	**85.85** 60.75 : 129.09

GRO by GC-FID (W)

Component	Method Code	QC 2407
Benzene by GC	TM245	**100.0** 83.48 : 117.21
Ethylbenzene by GC	TM245	**101.5** 84.11 : 114.89
m & p Xylene by GC	TM245	**102.0** 83.73 : 116.33
MTBE GC-FID	TM245	**95.0** 84.42 : 117.50
o Xylene by GC	TM245	**103.0** 85.03 : 117.59
QC	TM245	**84.75** 60.71 : 137.65
Toluene by GC	TM245	**100.5** 84.73 : 116.85

PAH Spec MS - Aqueous (W)

Component	Method Code	QC 2498	QC 2489
Acenaphthene by GCMS	TM178	**110.4** 90.45 : 118.63	**110.4** 90.45 : 118.63
Acenaphthylene by GCMS	TM178	**110.4** 90.13 : 116.27	**110.4** 90.13 : 116.27
Anthracene by GCMS	TM178	**109.2** 92.40 : 114.00	**106.4** 92.40 : 114.00
Benz(a)anthracene by GCMS	TM178	**108.4** 89.51 : 117.69	**103.6** 89.51 : 117.69
Benzo(a)pyrene by GCMS	TM178	**109.2** 89.43 : 118.57	**108.0** 89.43 : 118.57
Benzo(b)fluoranthene by GCMS	TM178	**108.4** 87.80 : 121.80	**106.8** 87.80 : 121.80
Benzo(ghi)perylene by GCMS	TM178	**108.4** 87.10 : 119.30	**102.8** 87.10 : 119.30
Benzo(k)fluoranthene by GCMS	TM178	**109.6** 93.23 : 123.57	**110.4** 93.23 : 123.57

PAH Spec MS - Aqueous (W)

		QC 2498	QC 2489
Chrysene by GCMS	TM178	**110.0** 88.68 : 116.92	**110.0** 88.68 : 116.92
Dibenzo(ah)anthracene by GCMS	TM178	**109.2** 86.24 : 118.56	**106.4** 86.24 : 118.56
Fluoranthene by GCMS	TM178	**108.8** 86.04 : 121.96	**106.4** 86.04 : 121.96
Fluorene by GCMS	TM178	**108.0** 90.76 : 121.24	**110.8** 90.76 : 121.24
Indeno(123cd)pyrene by GCMS	TM178	**110.4** 88.39 : 119.61	**100.0** 88.39 : 119.61
Naphthalene by GCMS	TM178	**111.2** 89.40 : 121.80	**114.4** 89.40 : 121.80
Phenanthrene by GCMS	TM178	**110.8** 90.41 : 119.19	**110.0** 90.41 : 119.19
Pyrene by GCMS	TM178	**109.6** 91.00 : 120.20	**107.6** 91.00 : 120.20

VOC MS (W)

Component	Method Code	QC 2417
1,1,1,2-Tetrachloroethane	TM208	**104.0** 87.71 : 111.59
1,1,1-Trichloroethane	TM208	**102.5** 82.66 : 112.06
1,1-Dichloroethane	TM208	**105.0** 79.99 : 118.57
1,2-Dichloroethane	TM208	**106.0** 79.35 : 124.02
2-Chlorotoluene	TM208	**103.0** 79.67 : 114.74
4-Chlorotoluene	TM208	**103.5** 80.15 : 113.42
Benzene	TM208	**105.0** 82.57 : 114.10
Bromomethane	TM208	**103.0** 78.77 : 123.20
Carbontetrachloride	TM208	**104.0** 79.73 : 118.91
Chlorobenzene	TM208	**104.0** 88.28 : 110.81
Chloroform	TM208	**104.0** 82.31 : 120.71
Chloromethane	TM208	**105.5** 62.46 : 124.98
Cis-1,2-Dichloroethene	TM208	**103.5** 83.75 : 118.91
Dichloromethane	TM208	**103.0** 81.20 : 120.83
Ethylbenzene	TM208	**99.5** 80.54 : 112.31
Hexachlorobutadiene	TM208	**102.5** 73.65 : 117.84
o-Xylene	TM208	**102.5** 87.93 : 111.69

VOC MS (W)

		QC 2417
p/m-Xylene	TM208	**101.75** 83.09 : 113.86
Tert-butyl methyl ether	TM208	**98.5** 70.94 : 119.66
Tetrachloroethene	TM208	**103.5** 84.41 : 112.73
Toluene	TM208	**102.5** 81.59 : 111.56
Trichloroethene	TM208	**104.0** 87.25 : 109.75
Vinyl Chloride	TM208	**100.5** 71.92 : 126.73

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.

CERTIFICATE OF ANALYSIS

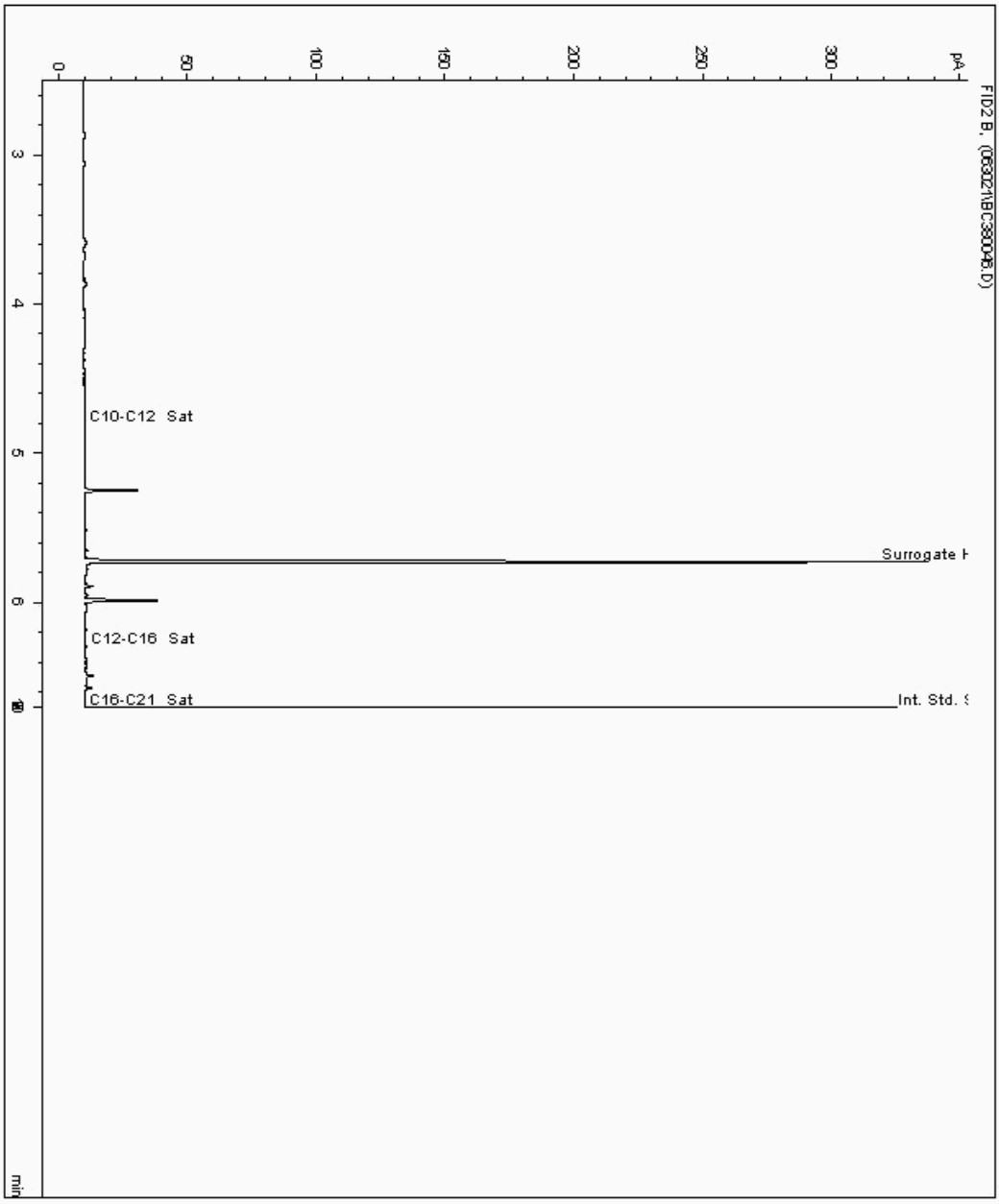
SDG:	210625-131	**Client Reference:**	10049410	**Report Number:**	604146
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: EPH CWG (Aliphatic) Aqueous GC (W) **Sample No :** 24524918 **Depth :** 6.50 - 6.50
Sample ID : BHM

Speciated TPH - SATS (C12 - C40)

Sample Identity: 22952617-
Date Acquired : 01/07/21 11:25:26 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.025



CERTIFICATE OF ANALYSIS

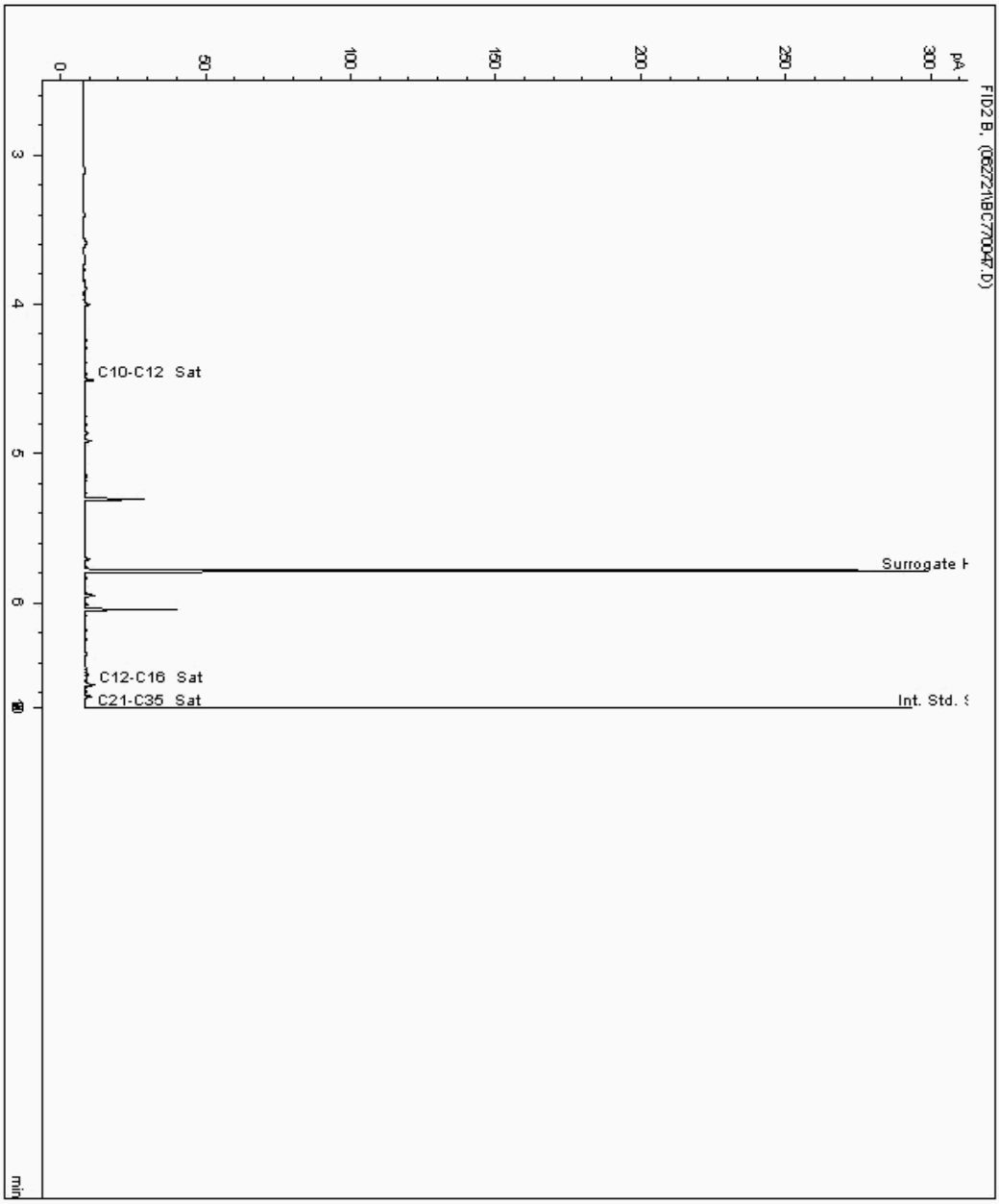
SDG:	210625-131	**Client Reference:**	10049410	**Report Number:**	604146
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: EPH CWG (Aliphatic) Aqueous GC (W) **Sample No :** 24524919 **Sample ID :** BHD401D **Depth :** 6.00 - 6.00

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

Sample Identity: 22952631-
Date Acquired : 6/29/2021 5:09:58 AM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.025



CERTIFICATE OF ANALYSIS

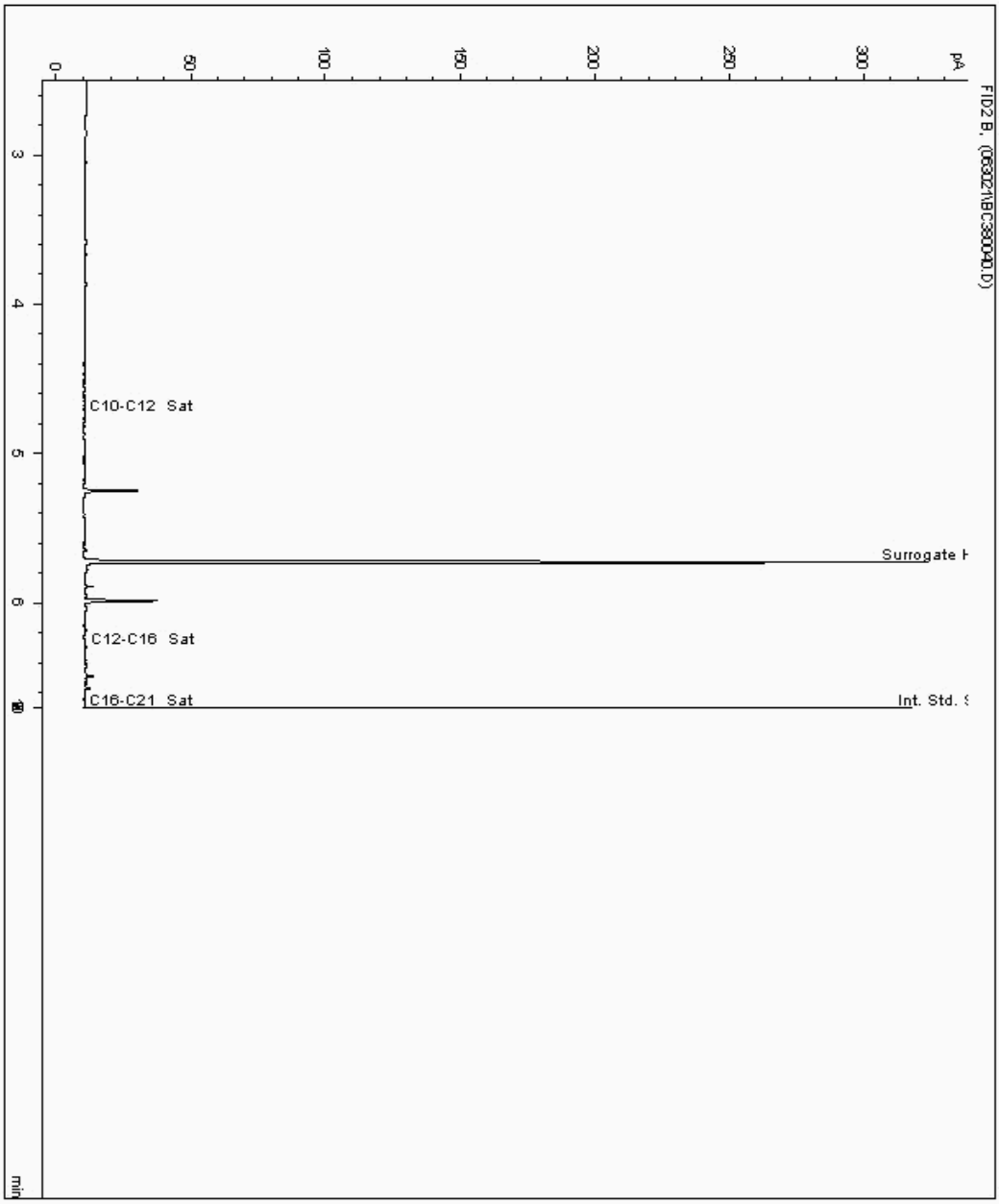
SDG:	210625-131	**Client Reference:**	10049410	**Report Number:**	604146
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: EPH CWG (Aliphatic) Aqueous GC (W) **Sample No :** 24524920 **Depth :**
Sample ID : DUBLICATE

Speciated TPH - SATS (C12 - C40)

Sample Identity: 2295264l-
Date Acquired : 01/07/21 09:06:15 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.025



CERTIFICATE OF ANALYSIS

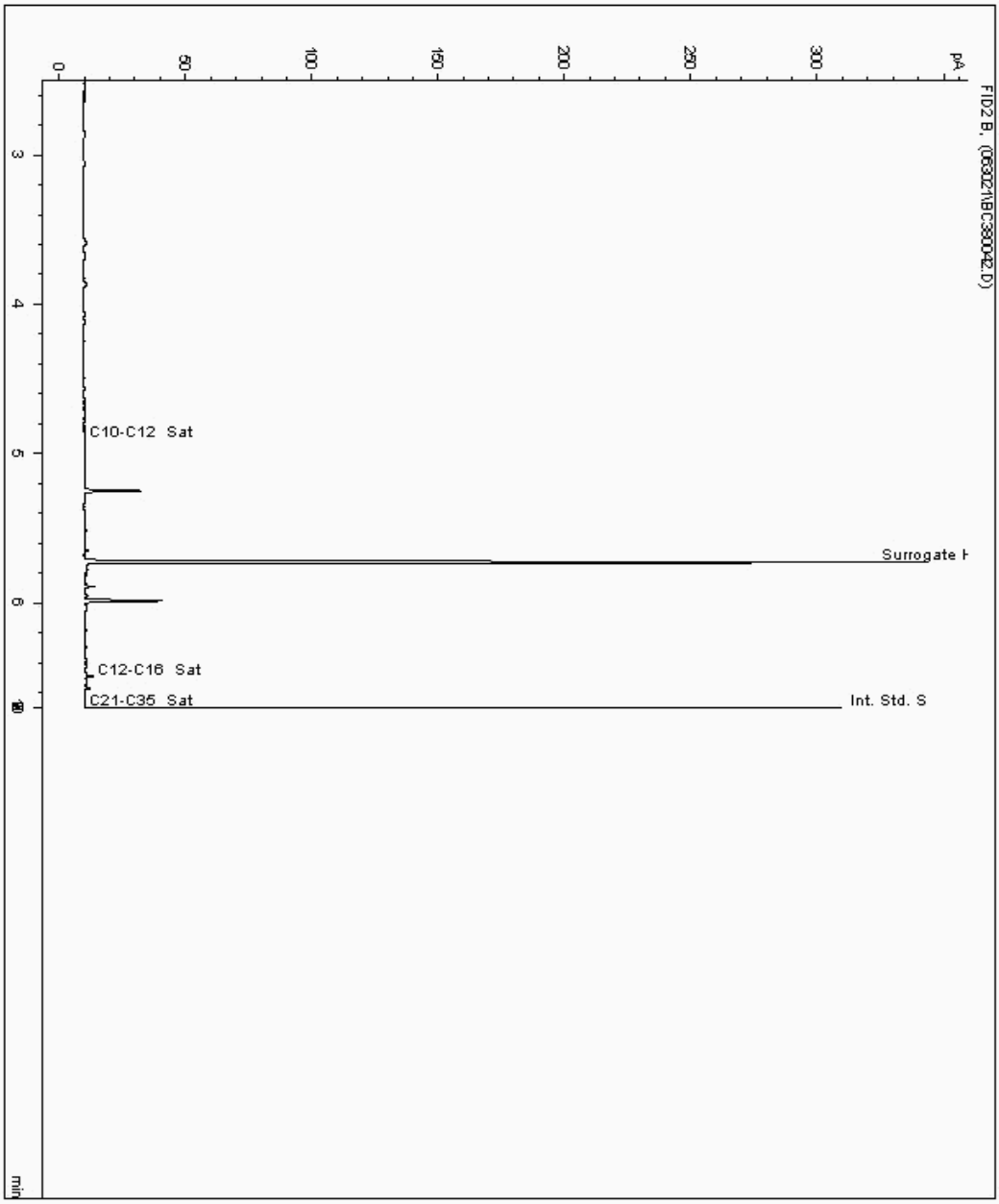
SDG:	210625-131	**Client Reference:**	10049410	**Report Number:**	604146
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: EPH CWG (Aliphatic) Aqueous GC (W) **Sample No :** 24524921 **Depth :** 6.00 - 6.00
Sample ID : BHJ

Speciated TPH - SATS (C12 - C40)

Sample Identity: 22952624-
Date Acquired : 01/07/21 09:52:36 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.025



CERTIFICATE OF ANALYSIS

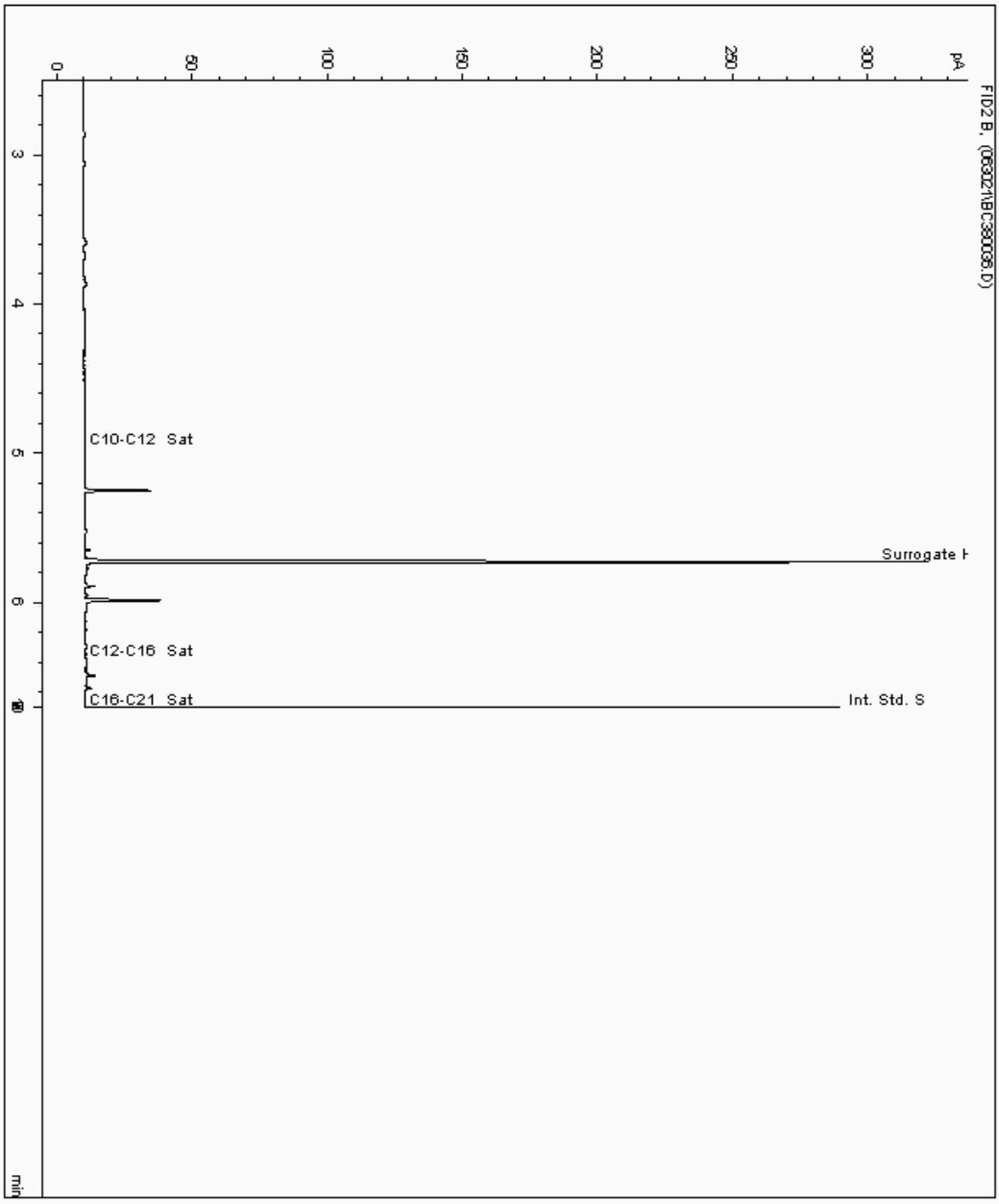
SDG:	210625-131	**Client Reference:**	10049410	**Report Number:**	604146
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: EPH CWG (Aliphatic) Aqueous GC (W) **Sample No :** 24524923 **Sample ID :** BHB701 **Depth :** 4.00 - 4.00

Speciated TPH - SATS (C12 - C40)

Sample Identity: 22952648-
Date Acquired : 01/07/21 07:33:33 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.025



CERTIFICATE OF ANALYSIS

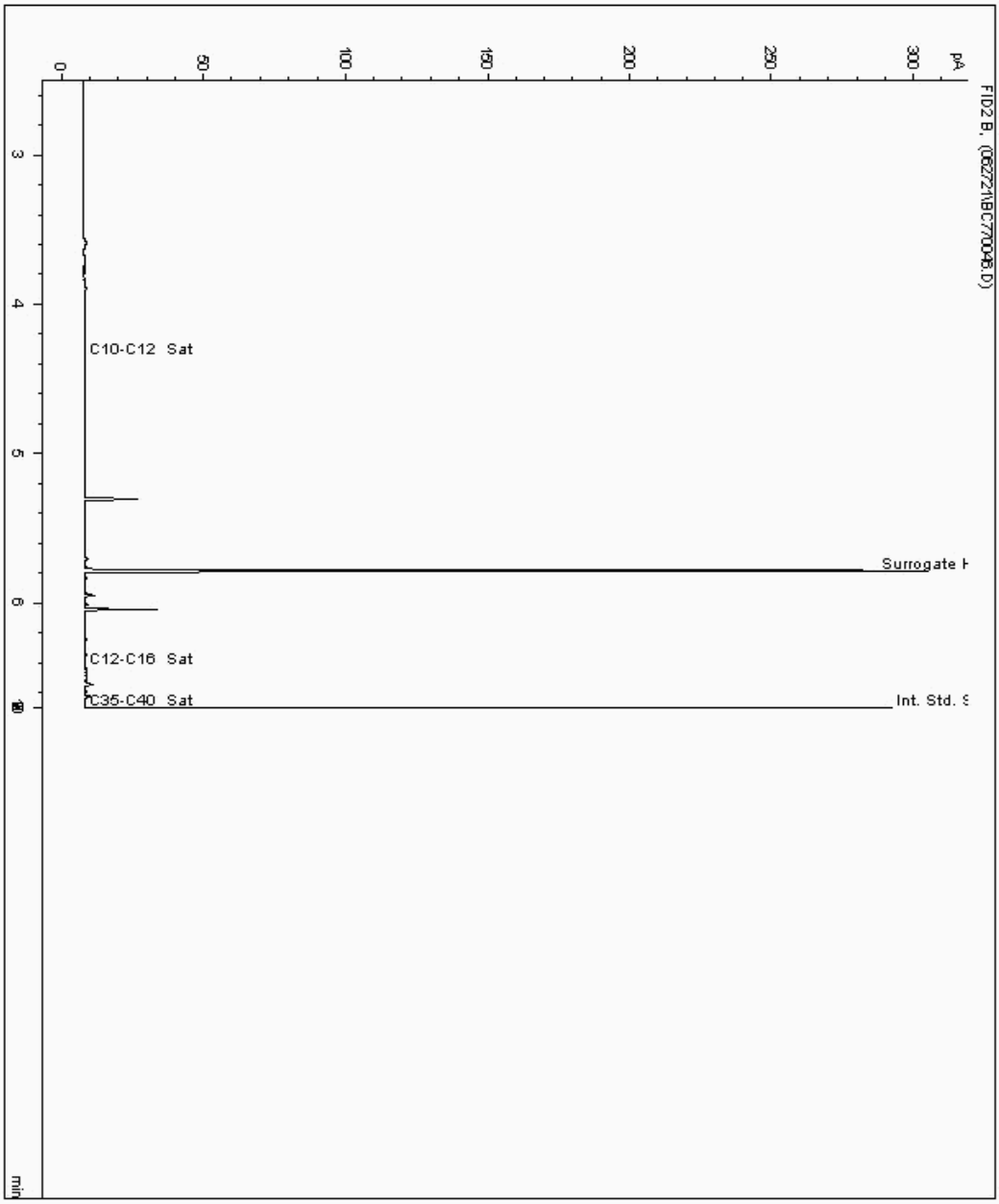
SDG:	210625-131	**Client Reference:**	10049410	**Report Number:**	604146
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: EPH CWG (Aliphatic) Aqueous GC (W) **Sample No :** 24524926 **Depth :** 4.00 - 4.00
Sample ID : BHC

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

Sample Identity: 22952669-
Date Acquired : 6/29/2021 4:46:14 AM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.025



CERTIFICATE OF ANALYSIS

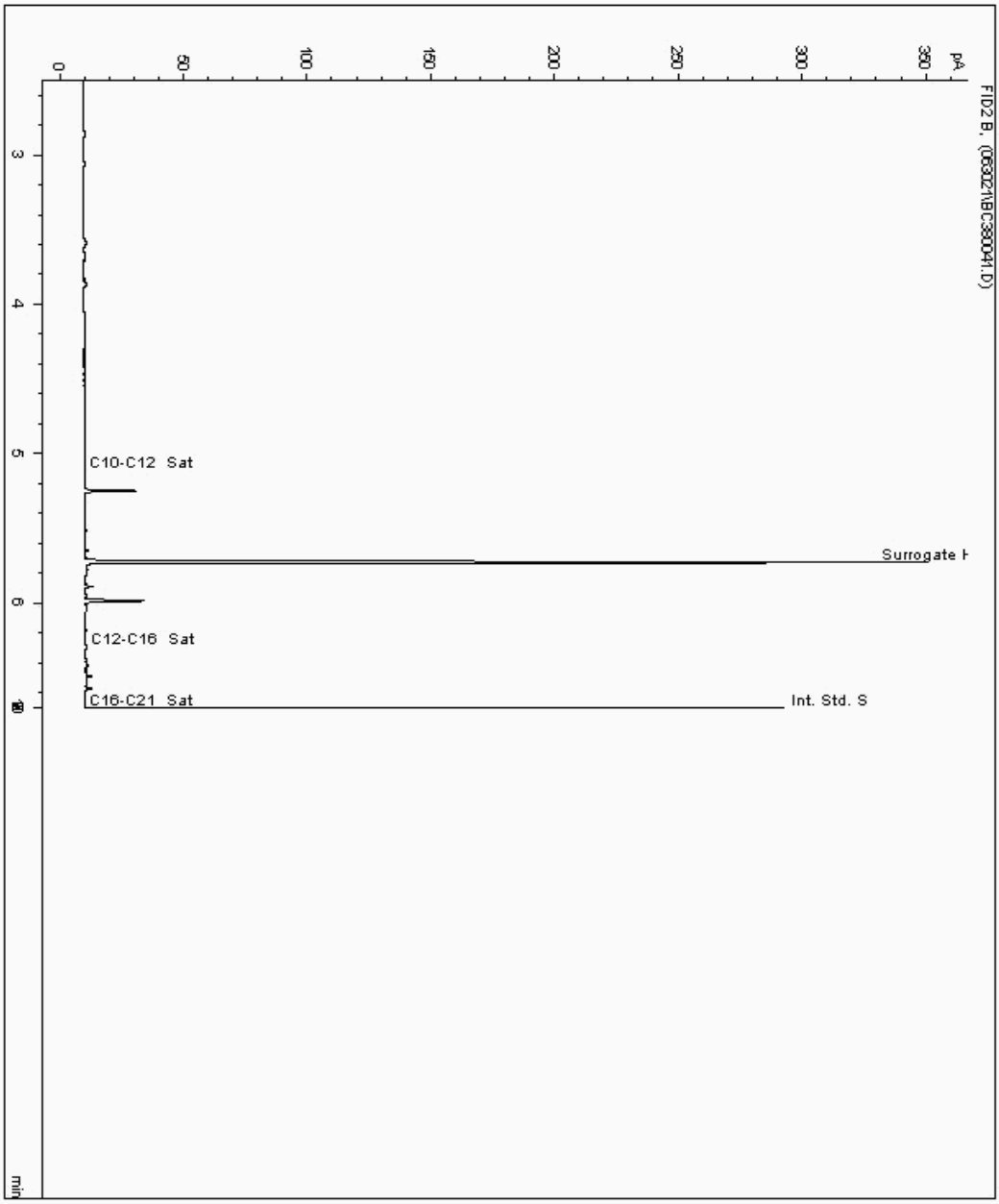
SDG:	210625-131	**Client Reference:**	10049410	**Report Number:**	604146
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: EPH CWG (Aliphatic) Aqueous GC (W) **Sample No :** 24524930 **Depth :** 4.00 - 4.00
Sample ID : BH02

Speciated TPH - SATS (C12 - C40)

Sample Identity: 22952655-
Date Acquired : 01/07/21 09:29:26 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.025



CERTIFICATE OF ANALYSIS

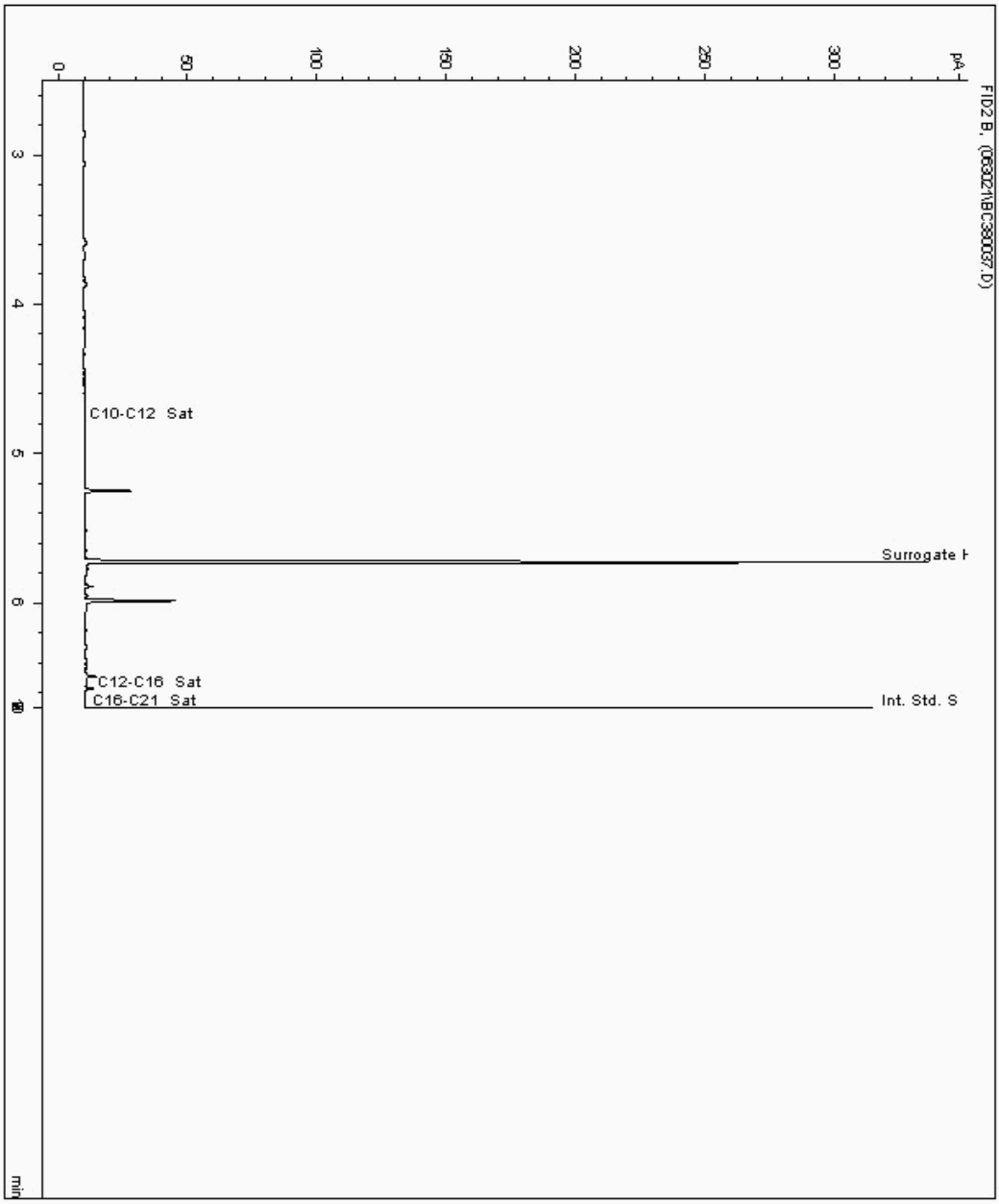
SDG:	210625-131	**Client Reference:**	10049410	**Report Number:**	604146
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: EPH CWG (Aliphatic) Aqueous GC (W) **Sample No :** 24524935 **Sample ID :** BHE701 **Depth :** 9.00 - 9.00

Speciated TPH - SATS (C12 - C40)

Sample Identity: 22952662-
Date Acquired : 01/07/21 07:56:48 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.025



CERTIFICATE OF ANALYSIS

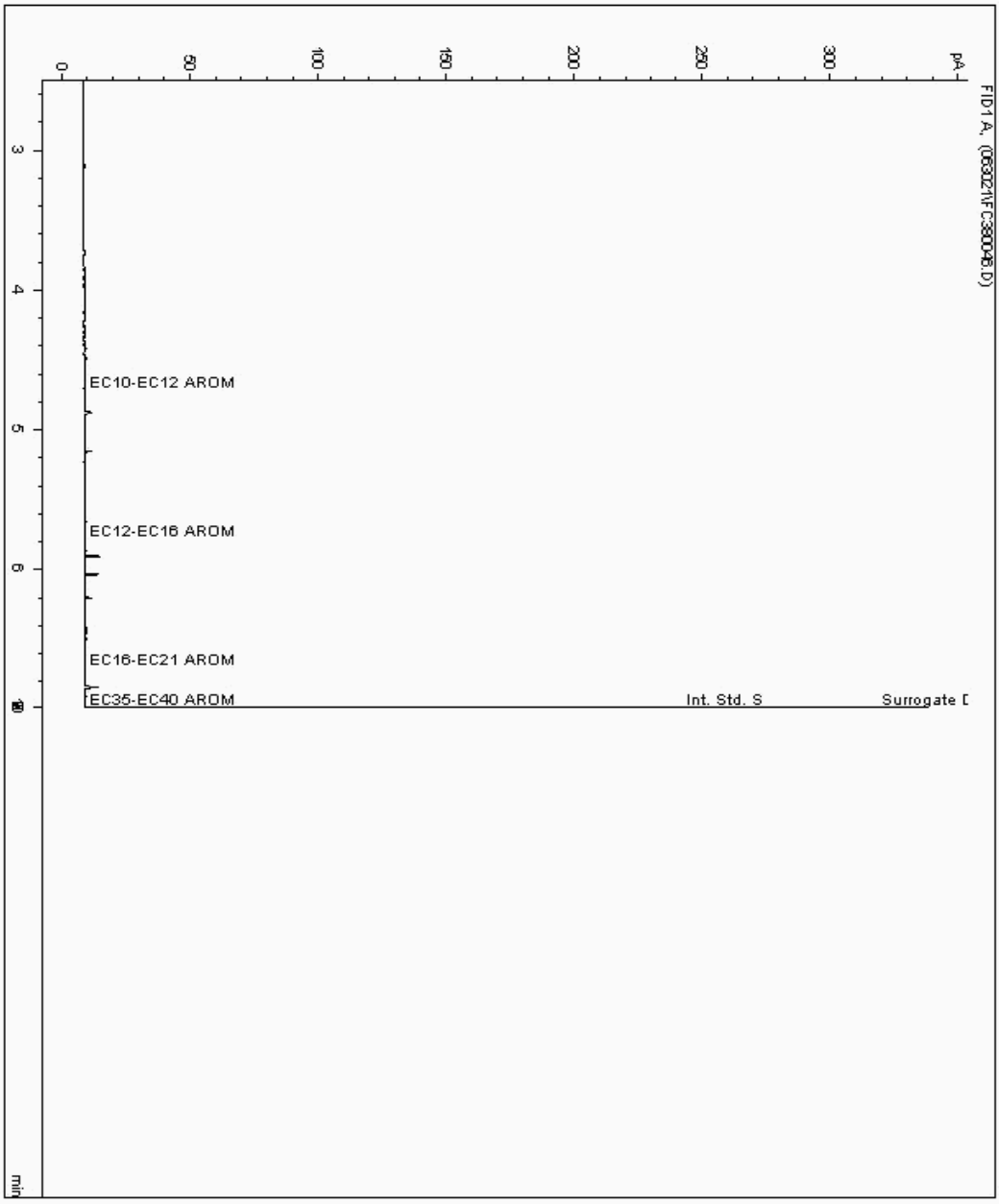
SDG:	210625-131	**Client Reference:**	10049410	**Report Number:**	604146
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: EPH CWG (Aromatic) Aqueous GC (W) **Sample No :** 24524918 **Sample ID :** BHM **Depth :** 6.50 - 6.50

Speciated TPH - AROM (C12 - C40)

Sample Identity: 22952618-
Date Acquired : 01/07/21 11:25:26 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.025



CERTIFICATE OF ANALYSIS

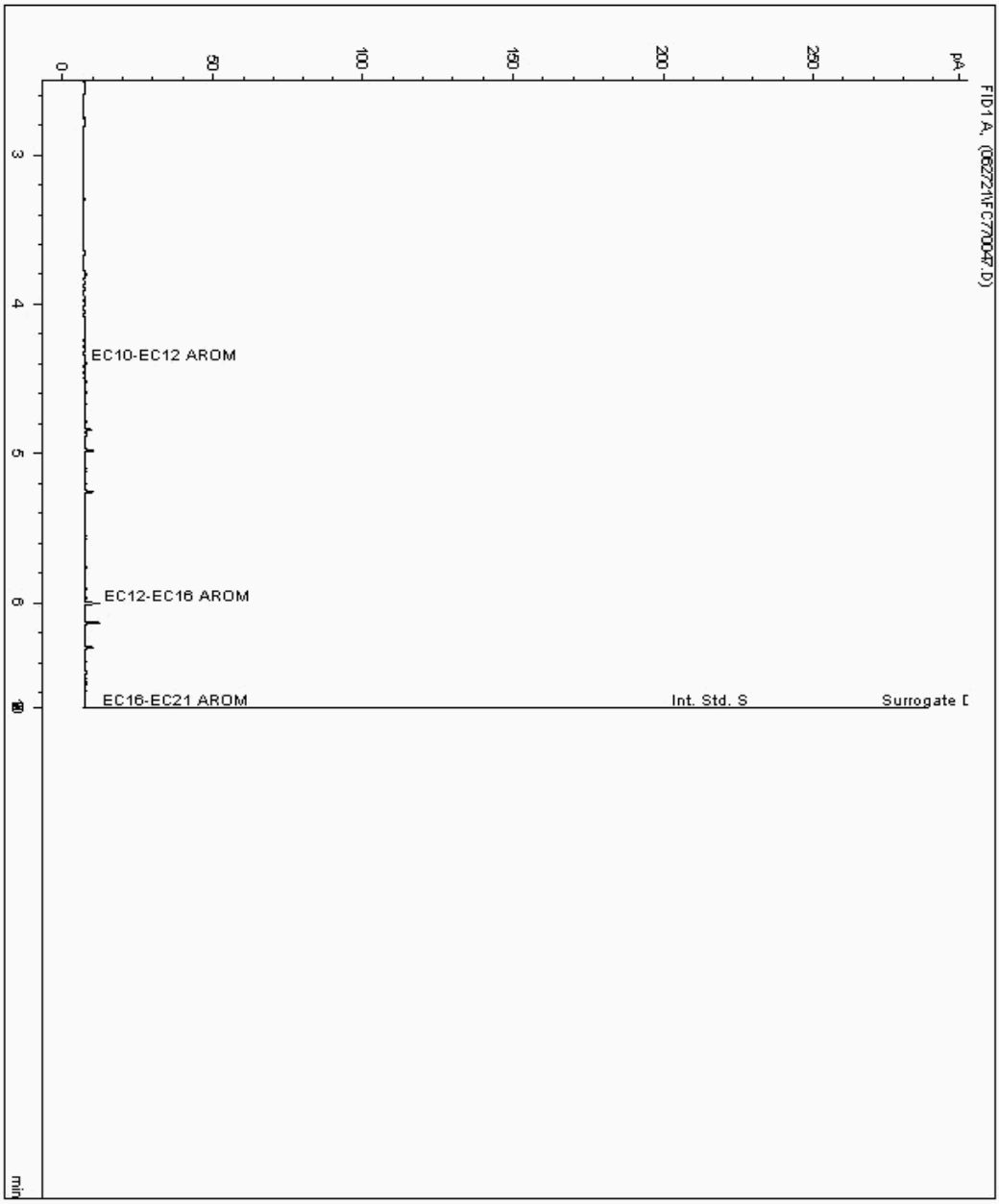
SDG:	210625-131	**Client Reference:**	10049410	**Report Number:**	604146
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: EPH CWG (Aromatic) Aqueous GC (W) **Sample No :** 24524919 **Sample ID :** BHD401D **Depth :** 6.00 - 6.00

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

Sample Identity: 22952632-
Date Acquired : 6/29/2021 5:09:58 AM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.025



CERTIFICATE OF ANALYSIS

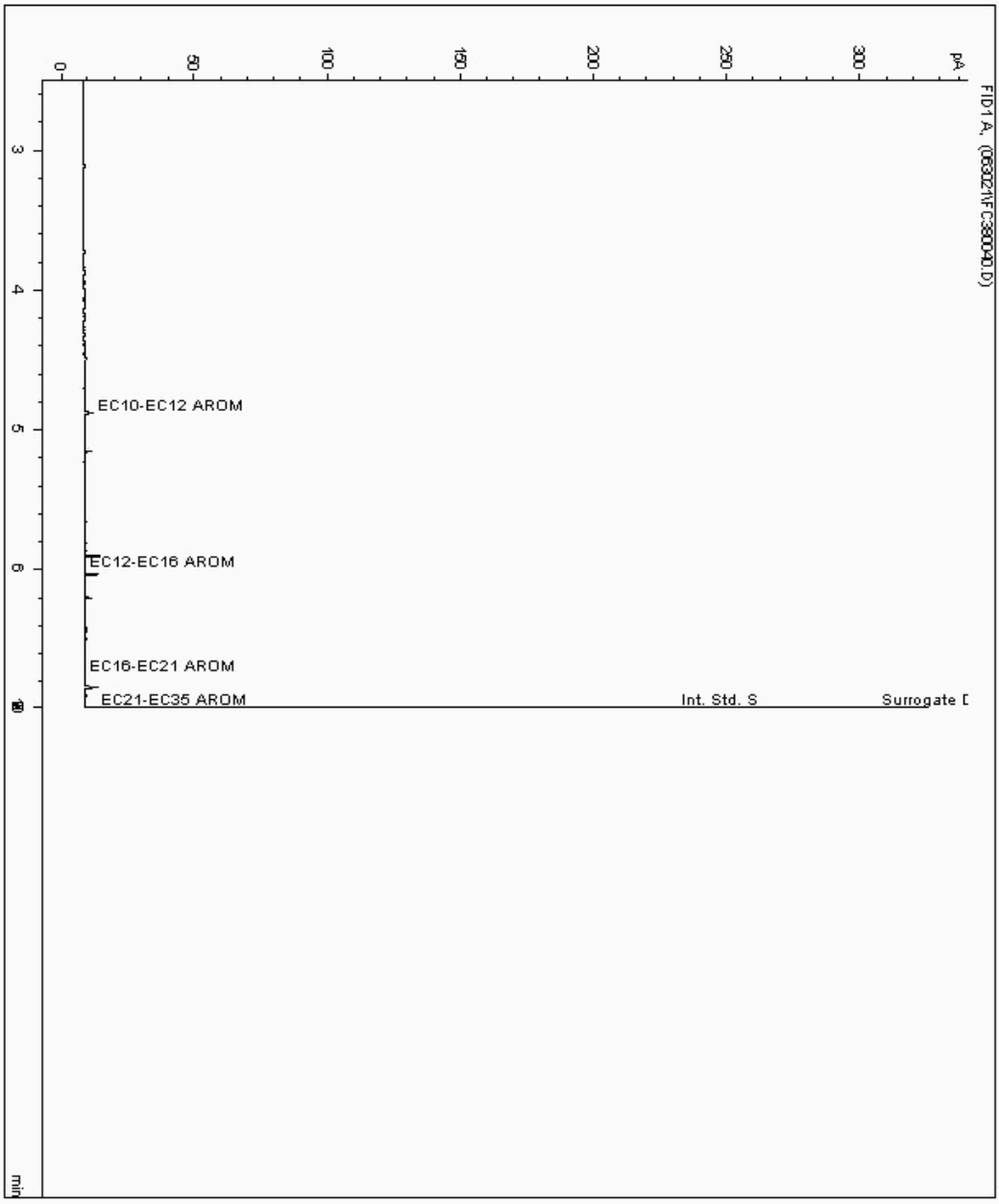
SDG:	210625-131	**Client Reference:**	10049410	**Report Number:**	604146
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: EPH CWG (Aromatic) Aqueous GC (W) **Sample No :** 24524920 **Depth :**
Sample ID : DUBLICATE

Speciated TPH - AROM (C12 - C40)

Sample Identity: 22952642-
Date Acquired : 01/07/21 09:06:16 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.025



CERTIFICATE OF ANALYSIS

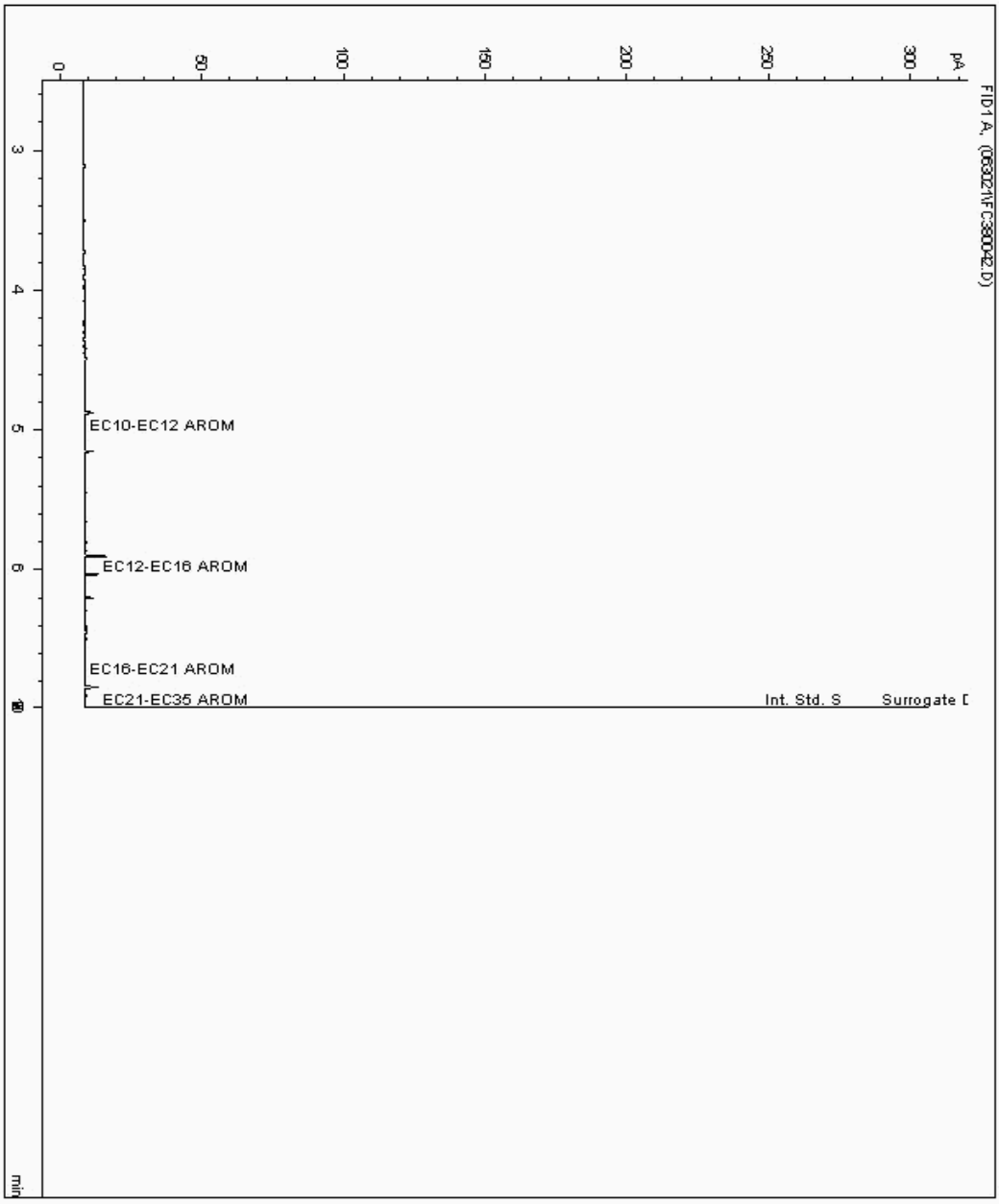
SDG:	210625-131	**Client Reference:**	10049410	**Report Number:**	604146
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: EPH CWG (Aromatic) Aqueous GC (W) **Sample No :** 24524921 **Sample ID :** BHJ **Depth :** 6.00 - 6.00

Speciated TPH - AROM (C12 - C40)

Sample Identity: 22952625-
Date Acquired : 01/07/21 09:52:37 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.025



CERTIFICATE OF ANALYSIS

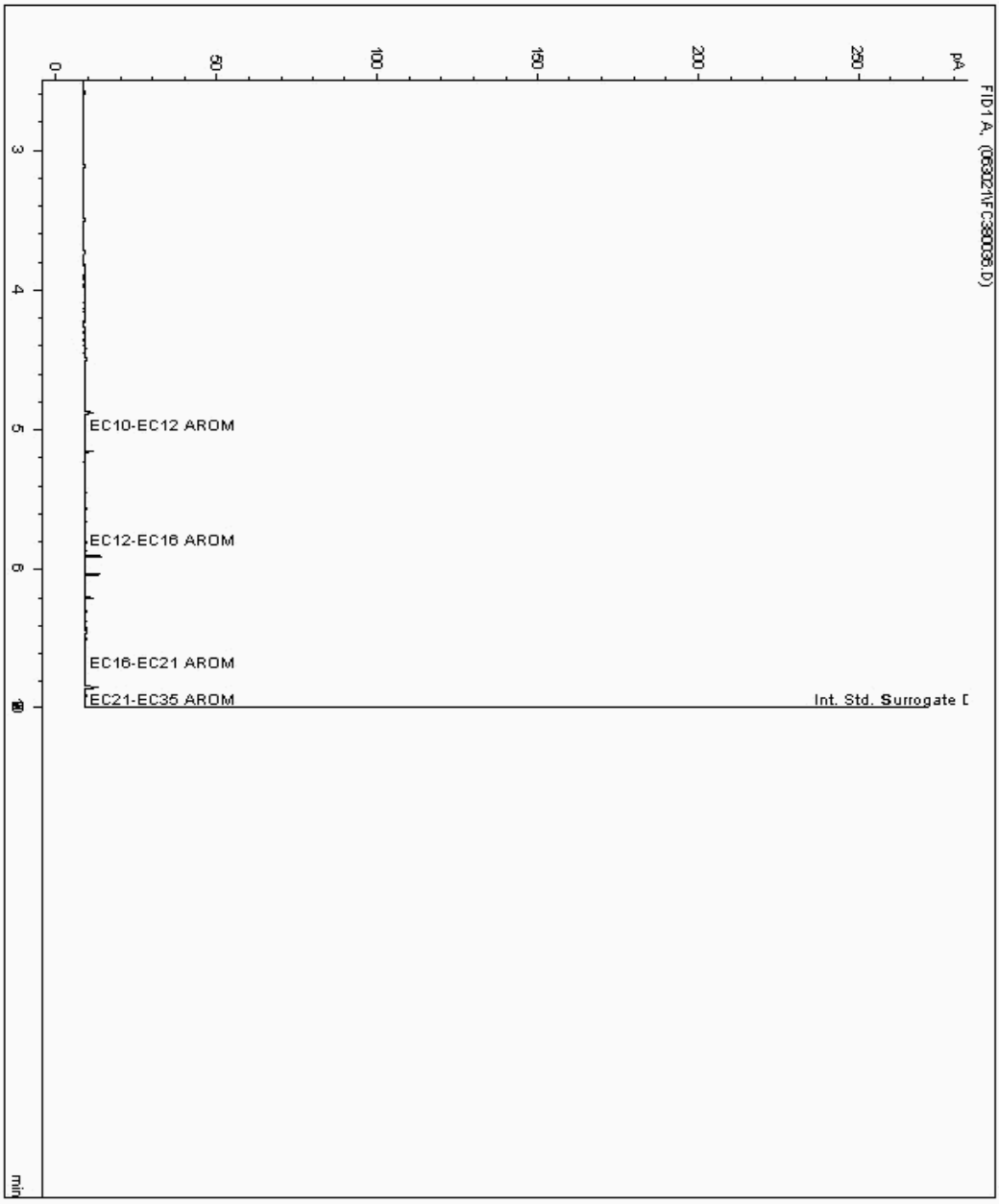
SDG:	210625-131	**Client Reference:**	10049410	**Report Number:**	604146
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: EPH CWG (Aromatic) Aqueous GC (W) **Sample No :** 24524923 **Sample ID :** BHB701 **Depth :** 4.00 - 4.00

Speciated TPH - AROM (C12 - C40)

Sample Identity: 22952649-
Date Acquired : 01/07/21 07:33:33 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.025



CERTIFICATE OF ANALYSIS

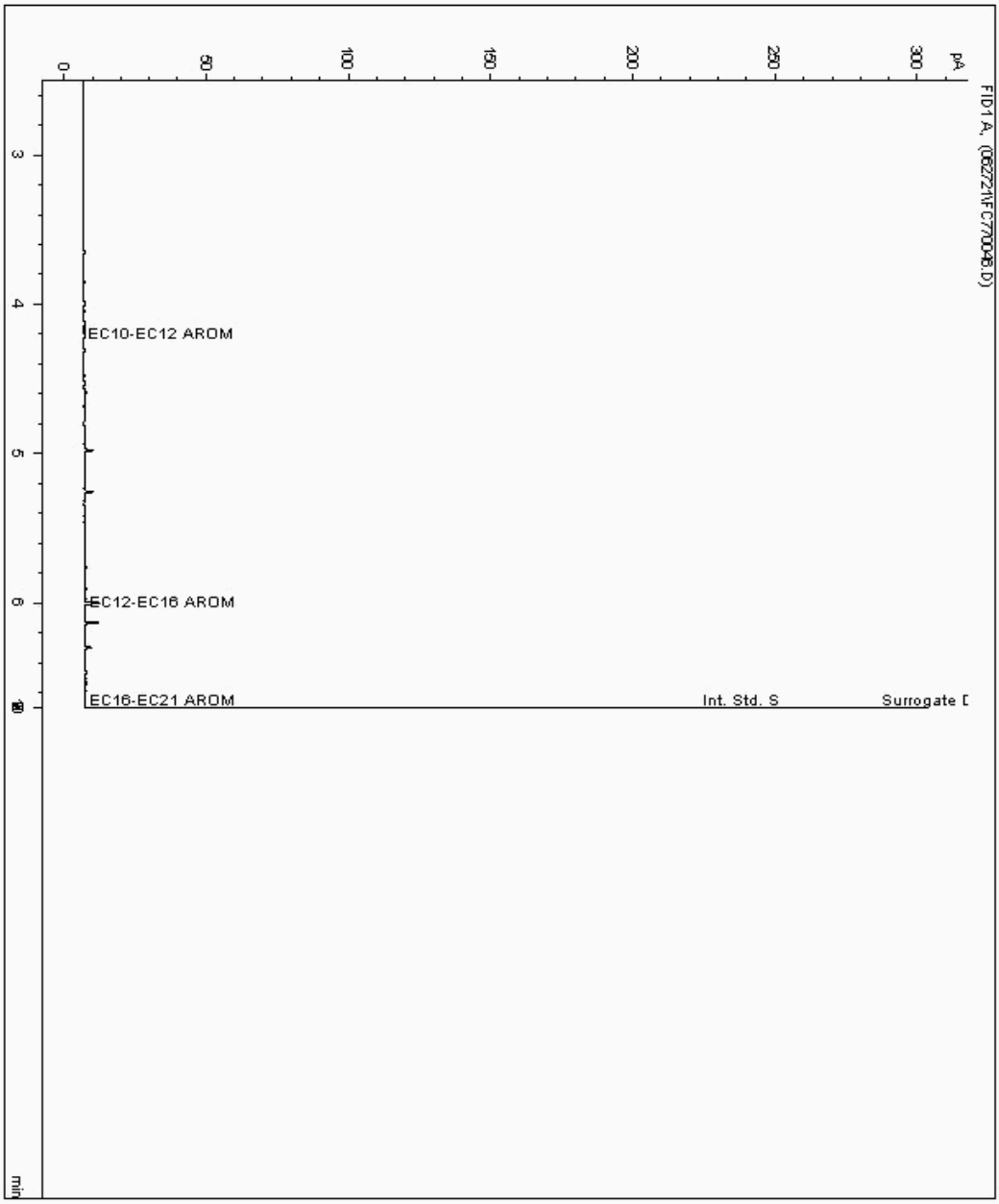
SDG:	210625-131	**Client Reference:**	10049410	**Report Number:**	604146
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: EPH CWG (Aromatic) Aqueous GC (W) **Sample No :** 24524926 **Depth :** 4.00 - 4.00
Sample ID : BHC

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

Sample Identity: 22952670-
Date Acquired : 6/29/2021 4:46:14 AM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.025



CERTIFICATE OF ANALYSIS

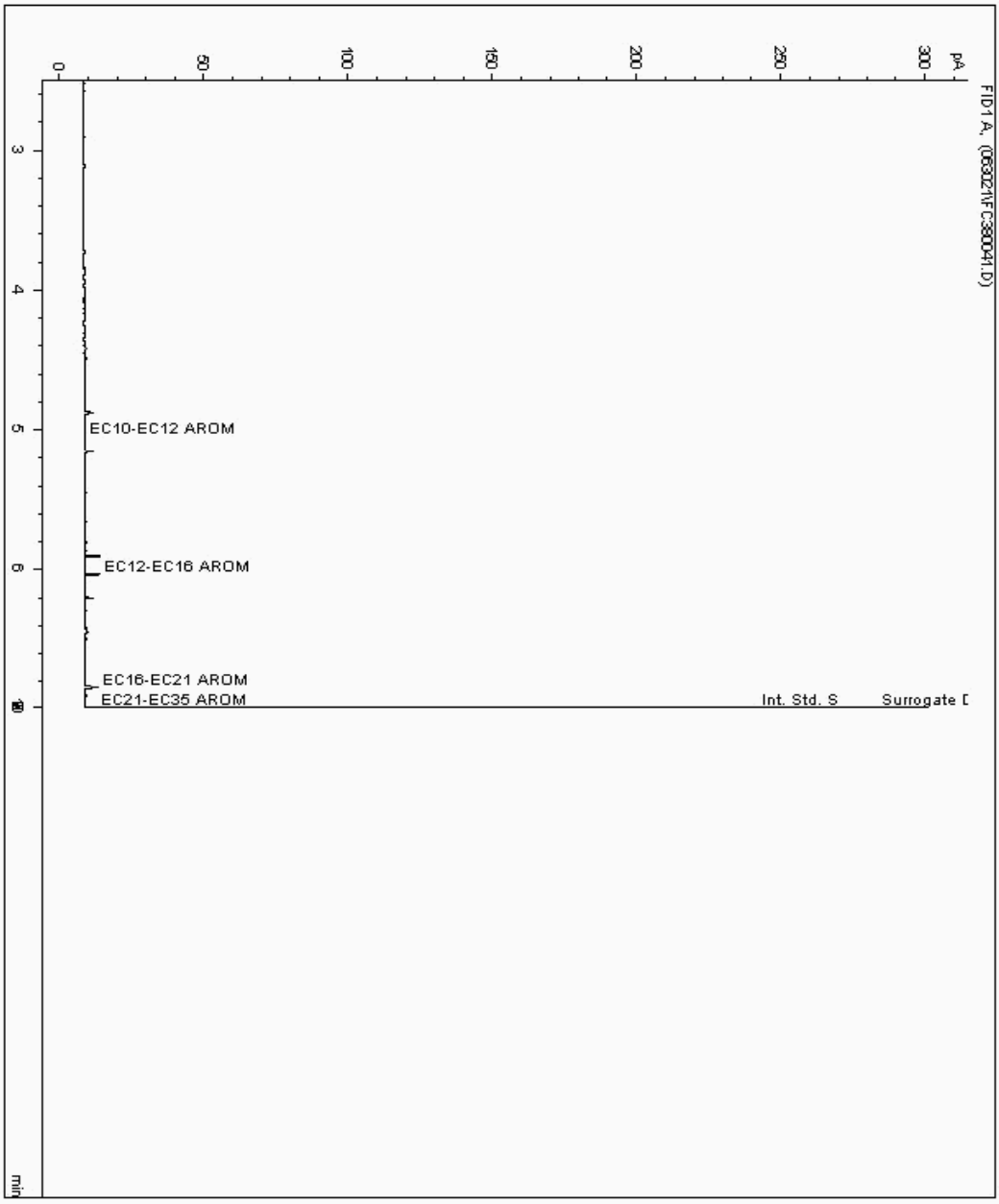
SDG:	210625-131	**Client Reference:**	10049410	**Report Number:**	604146
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: EPH CWG (Aromatic) Aqueous GC (W) **Sample No :** 24524930 **Sample ID :** BH02 **Depth :** 4.00 - 4.00

Speciated TPH - AROM (C12 - C40)

Sample Identity: 22952656-
Date Acquired : 01/07/21 09:29:26 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.025



CERTIFICATE OF ANALYSIS

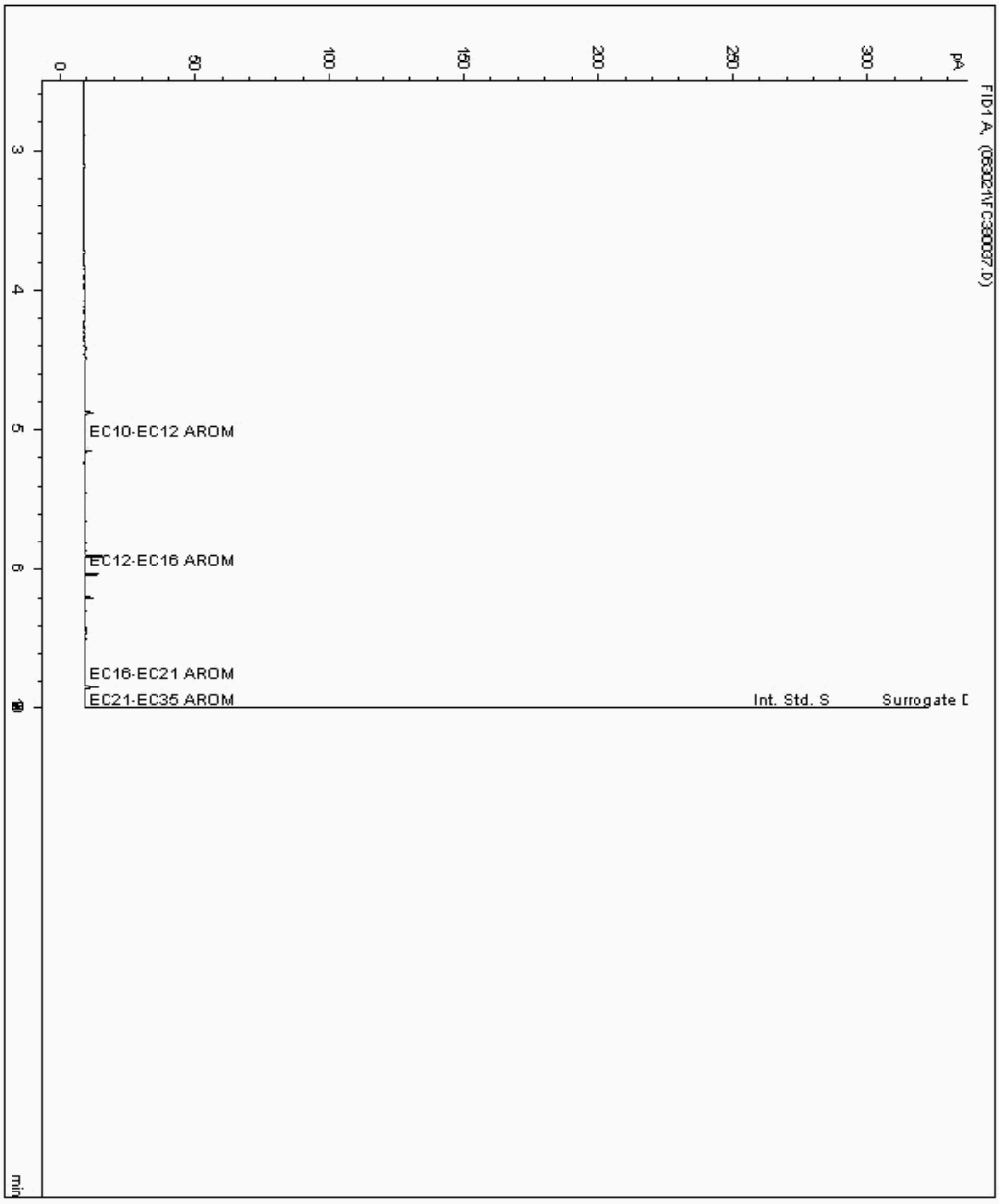
SDG:	210625-131	**Client Reference:**	10049410	**Report Number:**	604146
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: EPH CWG (Aromatic) Aqueous GC (W) **Sample No :** 24524935 **Sample ID :** BHE701 **Depth :** 9.00 - 9.00

Speciated TPH - AROM (C12 - C40)

Sample Identity: 22952663-
Date Acquired : 01/07/21 07:56:49 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.025



CERTIFICATE OF ANALYSIS

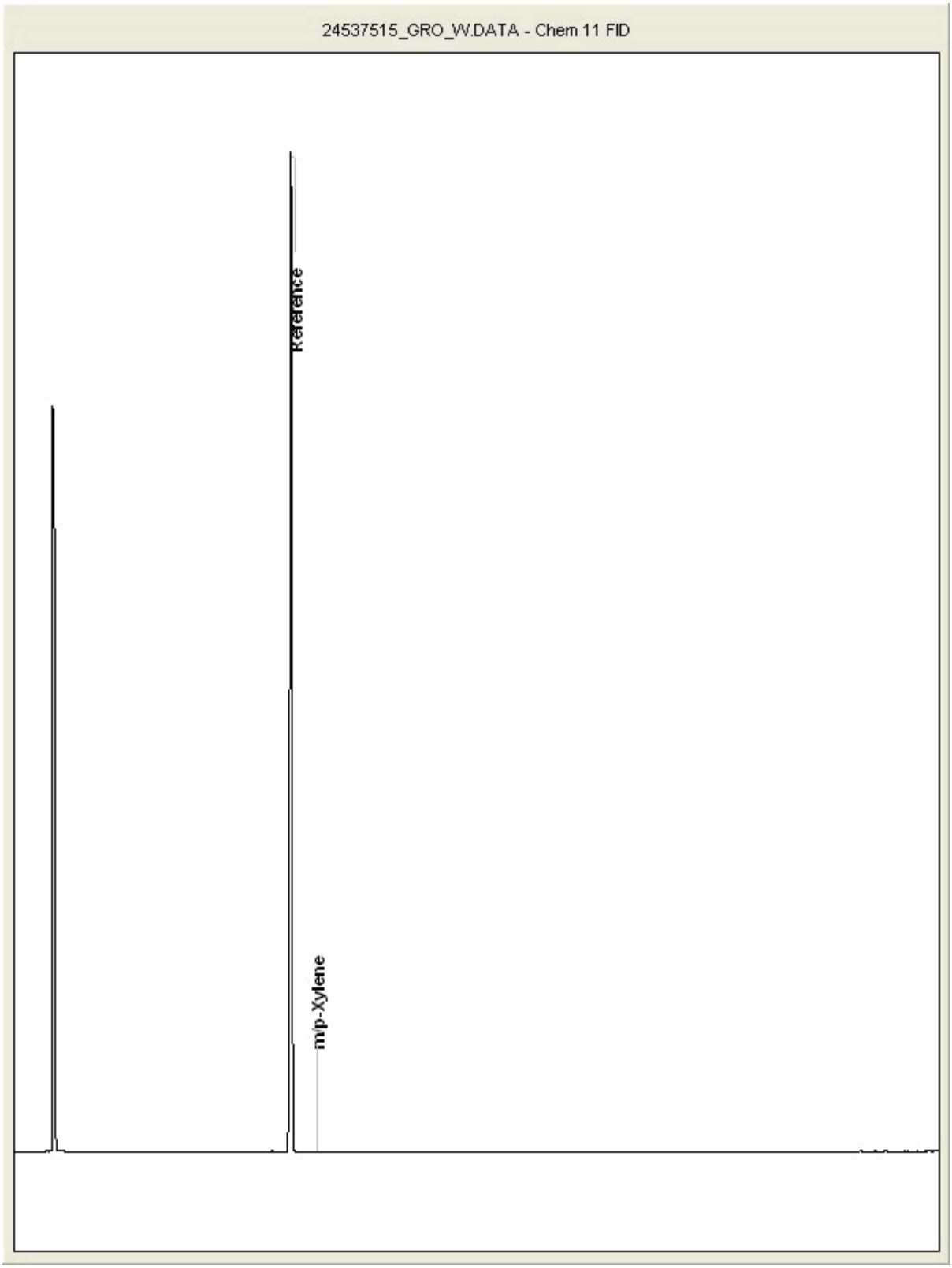
SDG:	210625-131	**Client Reference:**	10049410	**Report Number:**	604146
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 24537515
Sample ID : BHM

Depth : 6.50 - 6.50

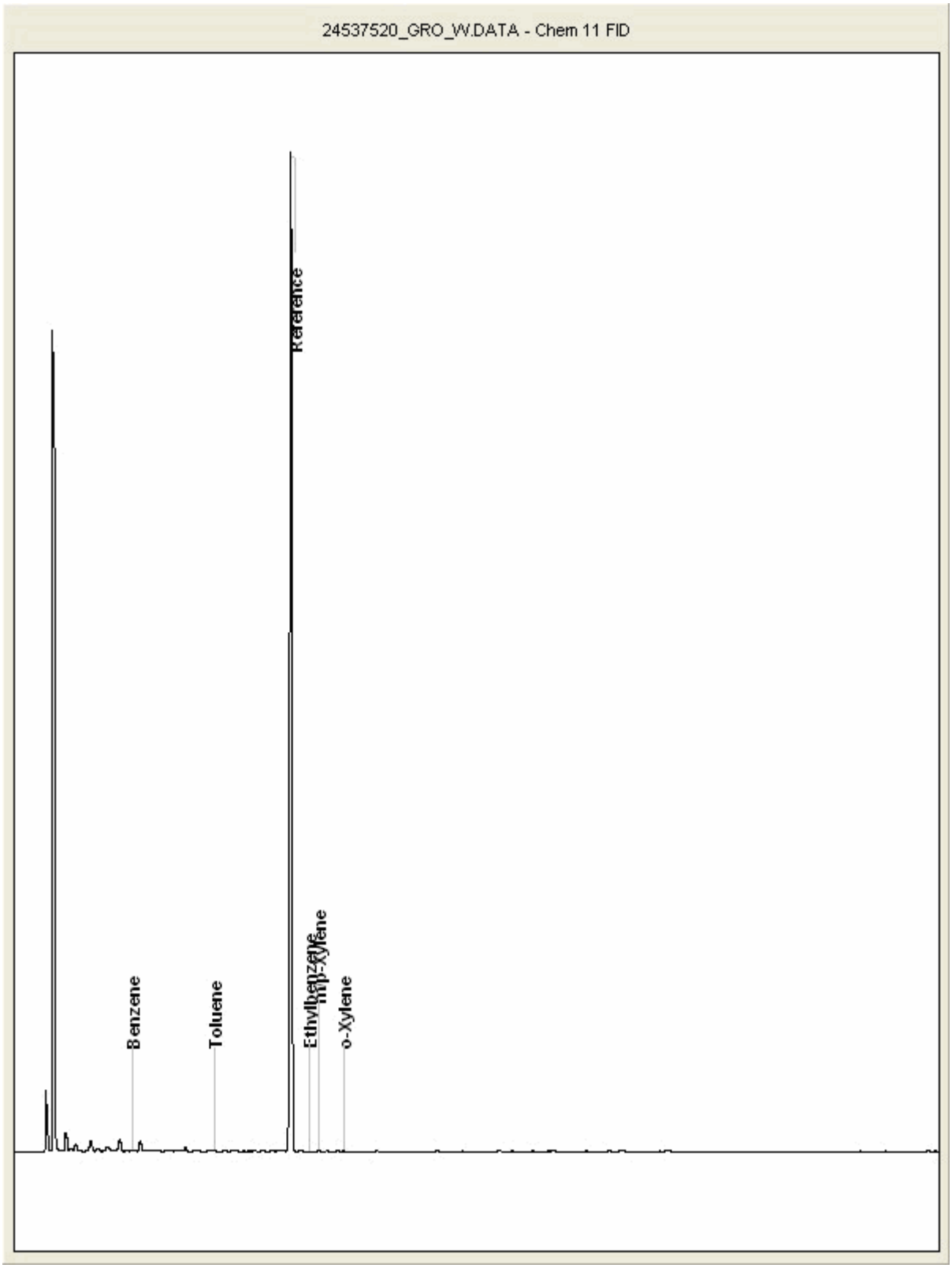


CERTIFICATE OF ANALYSIS

SDG:	210625-131	**Client Reference:**	10049410	**Report Number:**	604146
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: GRO by GC-FID (W) **Sample No :** 24537520 **Sample ID :** BHD401D **Depth :** 6.00 - 6.00



CERTIFICATE OF ANALYSIS

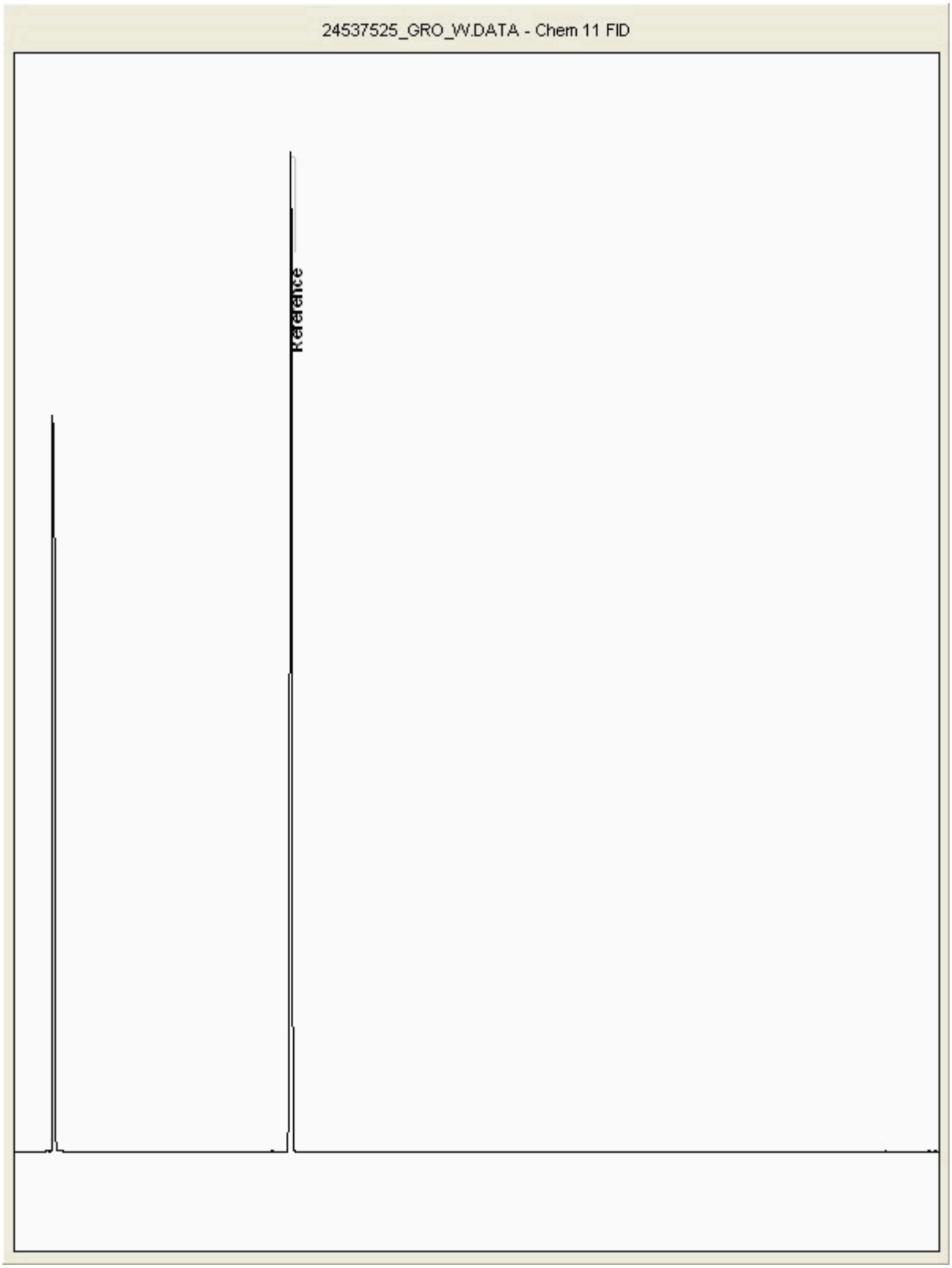
SDG:	210625-131	**Client Reference:**	10049410	**Report Number:**	604146
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 24537525
Sample ID : BHE701

Depth : 9.00 - 9.00



CERTIFICATE OF ANALYSIS

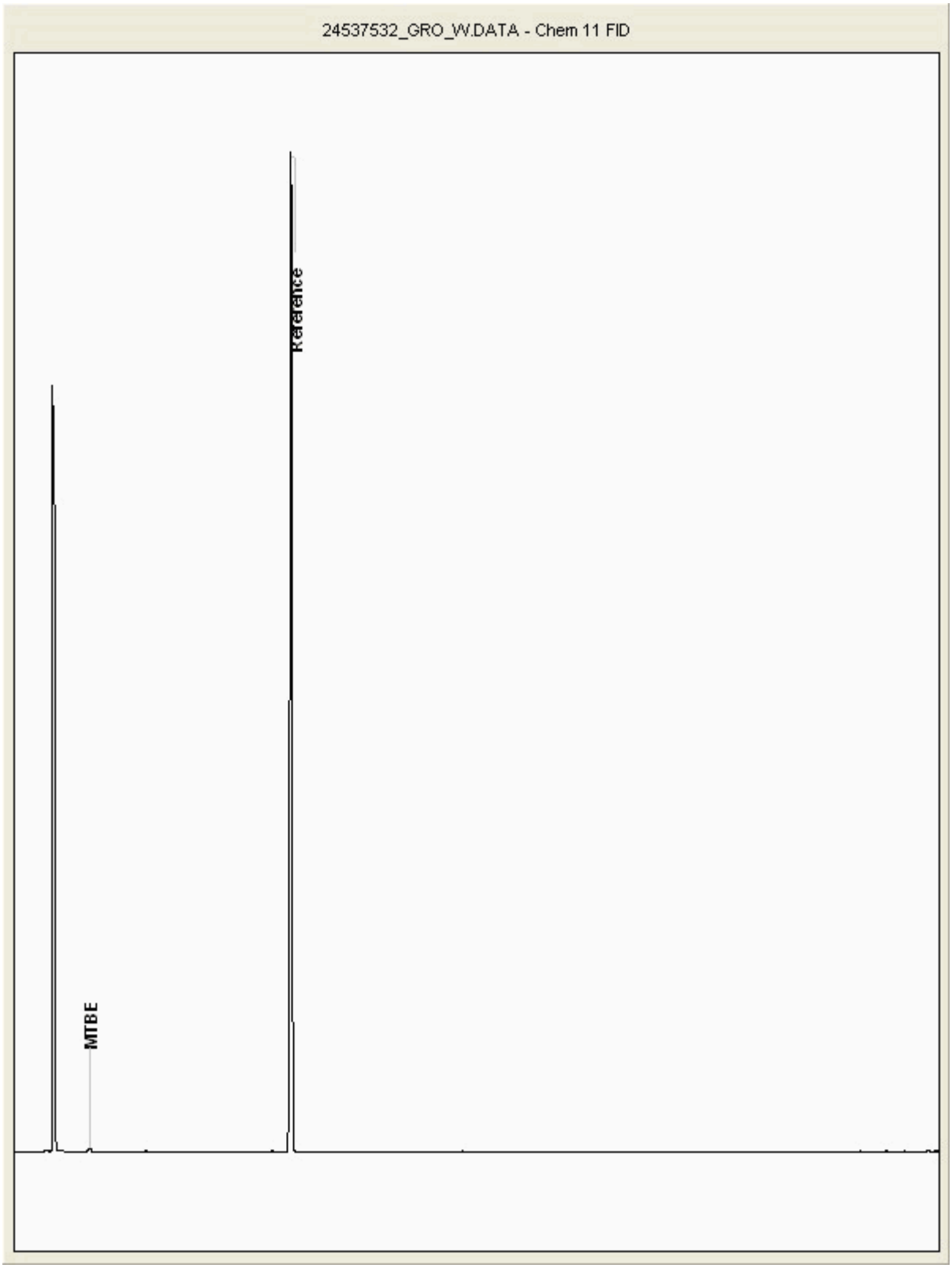
SDG:	210625-131	**Client Reference:**	10049410	**Report Number:**	604146
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 24537532
Sample ID : BHC

Depth : 4.00 - 4.00

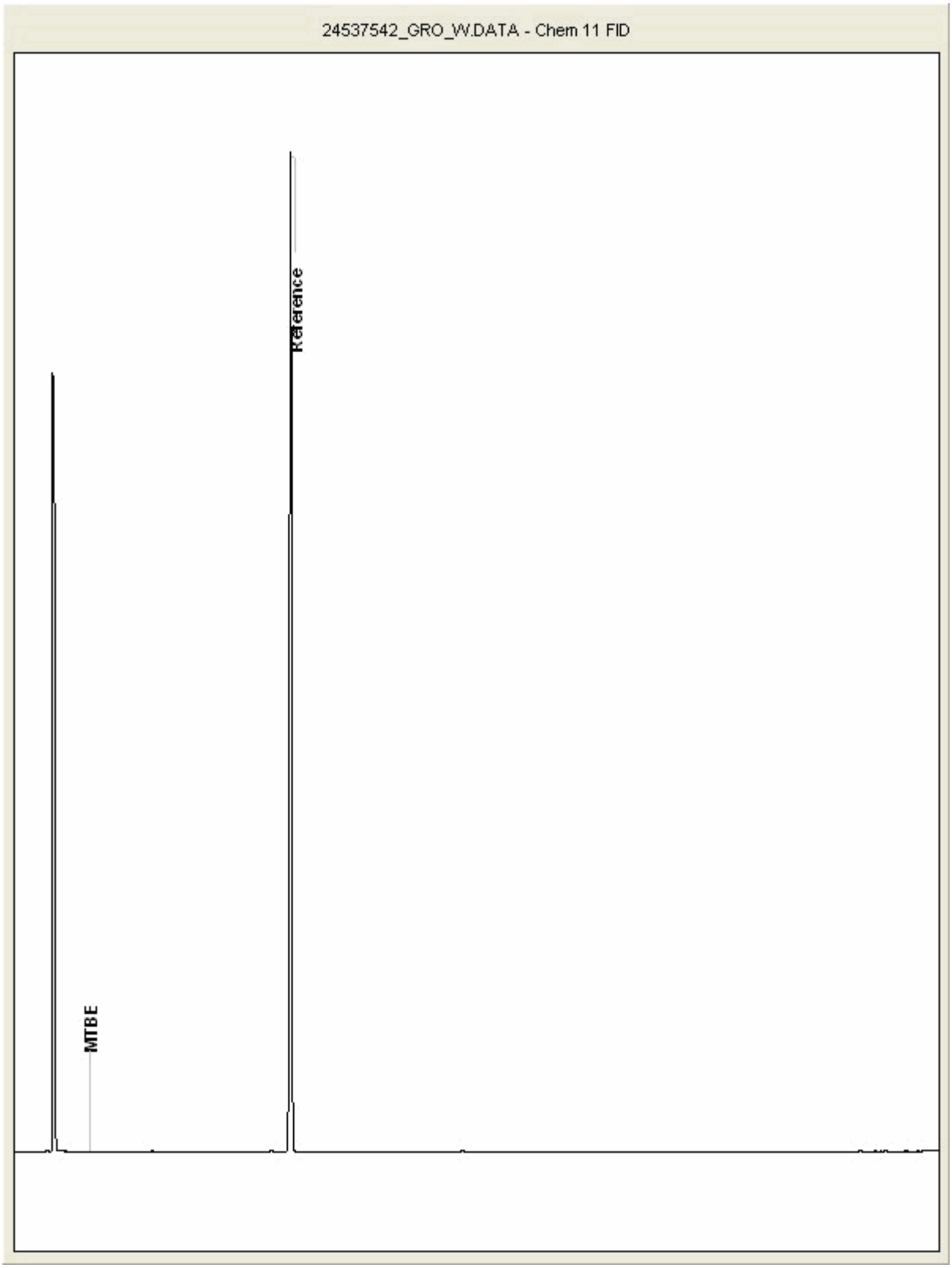


CERTIFICATE OF ANALYSIS

SDG:	210625-131	**Client Reference:**	10049410	**Report Number:**	604146
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: GRO by GC-FID (W) **Sample No :** 24537542 **Depth :** 4.00 - 4.00
Sample ID : BH02



CERTIFICATE OF ANALYSIS

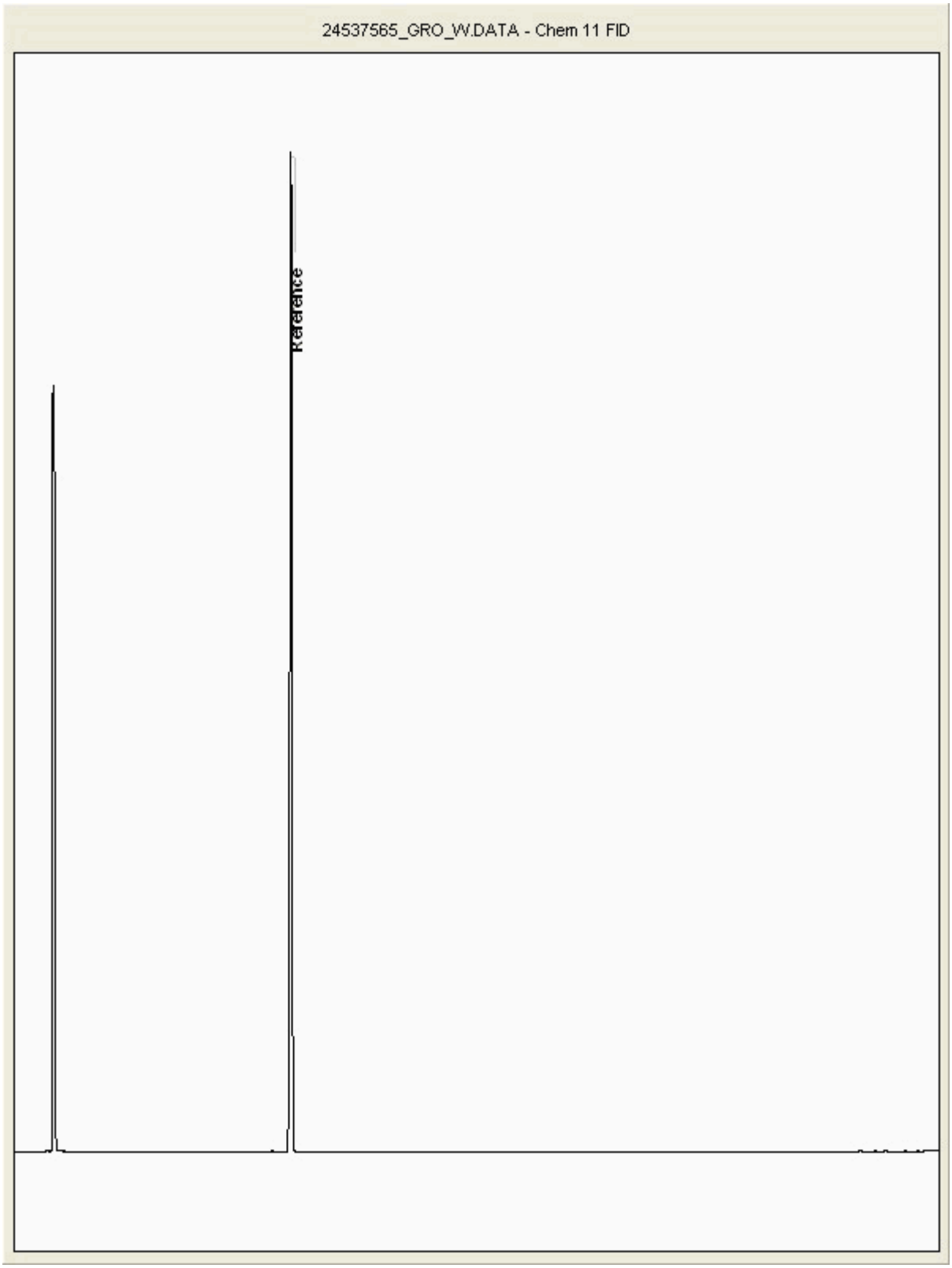
SDG:	210625-131	**Client Reference:**	10049410	**Report Number:**	604146
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 24537565
Sample ID : BHB701

Depth : 4.00 - 4.00



CERTIFICATE OF ANALYSIS

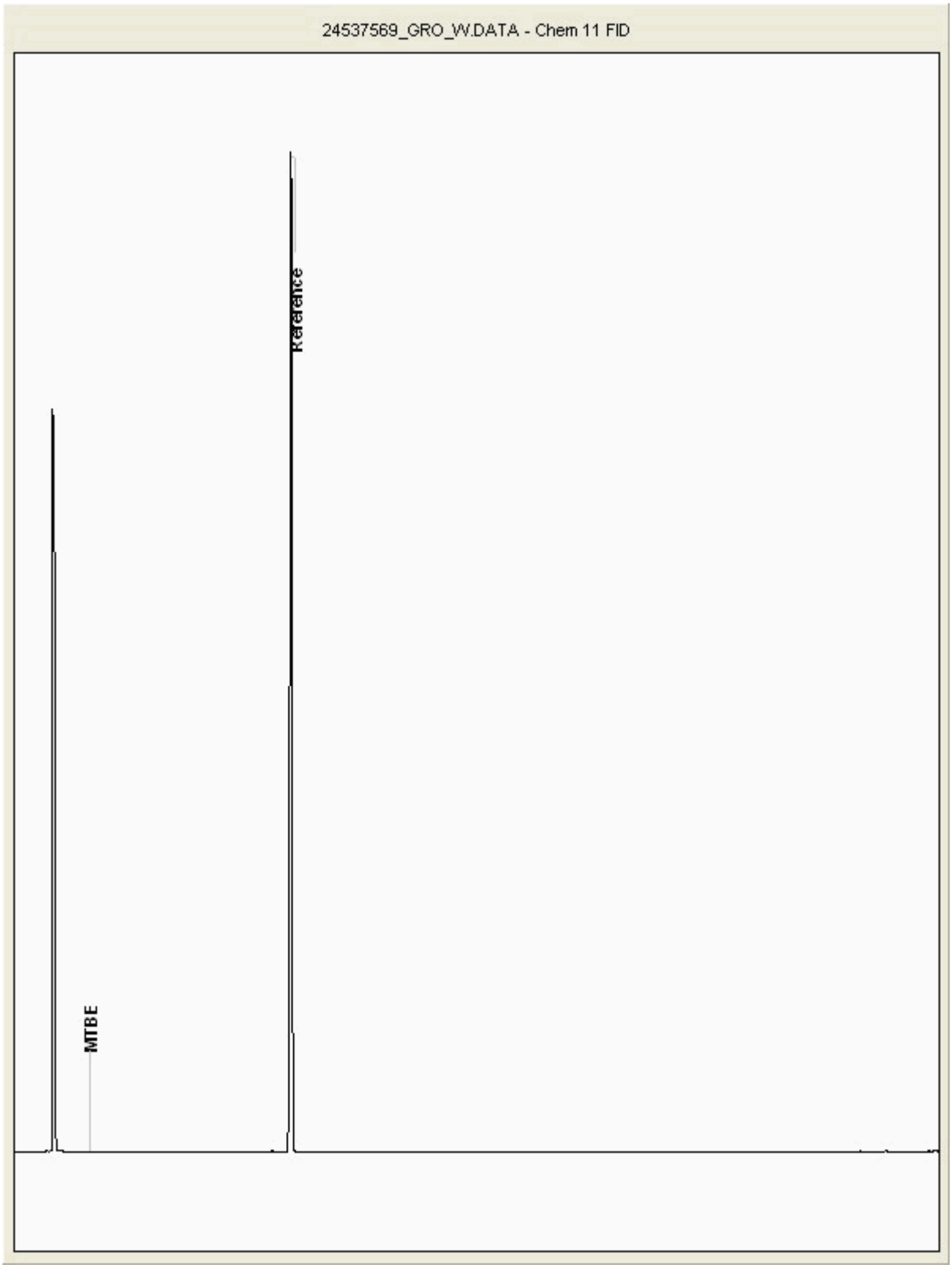
SDG:	210625-131	**Client Reference:**	10049410	**Report Number:**	604146
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 24537569
Sample ID : DUBLICATE

Depth :



CERTIFICATE OF ANALYSIS

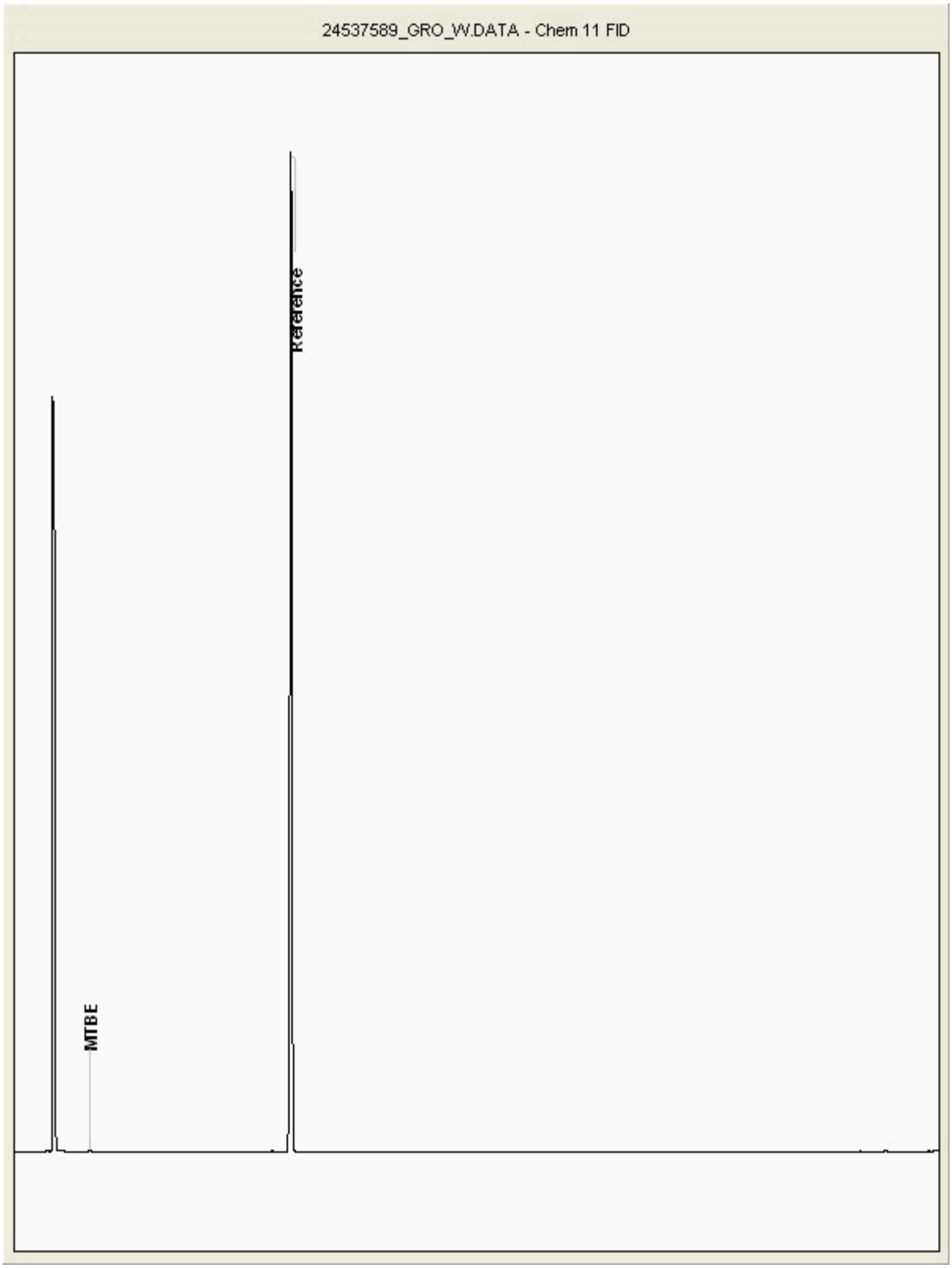
SDG:	210625-131	**Client Reference:**	10049410	**Report Number:**	604146
Location:	MILFORD - HAVEN, WALE	**Order Number:**	10049410	**Superseded Report:**	

Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 24537589
Sample ID : BHJ

Depth : 6.00 - 6.00



Appendix General

1. Results are expressed on a dry weight basis (dried at 35ºC) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH4 by the BRE method, VOC TICs and SVOC TICs.

2. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples 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. ALS reserve the right to charge for samples received and stored but not analysed.

3. 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.

4. 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.

5. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

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

7. Results relate only to the items tested.

8. LoDs (Limit of Detection) for wet tests reported on a dry weight basis are not corrected for moisture content.

9. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

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

11. 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.

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

13. For leachate preparations other than Zero Headspace Extraction (ZHE) volatile loss may occur.

14. 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.

15. 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 C5-C12 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.

16. 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.

17. **Tentatively Identified Compounds (TICs)** are non-target peaks in VOC and SVOC analysis. All non-target peaks detected with a concentration above the LoD are subjected to a mass spectral library search. Non-target peaks with a library search confidence of >75% are reported based on the best mass spectral library match. When a non-target peak with a library search confidence of <75% is detected it is reported as "mixed hydrocarbons". Non-target compounds identified from the scan data are semi-quantified relative to one of the deuterated internal standards, under the same chromatographic conditions as the target compounds. This result is reported as a semi-quantitative value and reported as Tentatively Identified Compounds (TICs). TICs are outside the scope of UKAS accreditation and are not moisture corrected.

18. **Sample Deviations**

If a sample is classed as deviated then the associated results may be compromised.

1	**Container with Headspace provided for volatiles analysis**
2	**Incorrect container received**
3	**Deviation from method**
4	**Matrix interference**
♦	**Sample holding time exceeded in laboratory**
@	**Sample holding time exceeded due to late arrival of instructions or samples**
§	**Sampled on date not provided**

19. **Asbestos**

When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

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

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.

Respirable Fibres

Respirable fibres are defined as fibres of <3 µm diameter, longer than 5 µm and with aspect ratios of at least 3:1 that can be inhaled into the lower regions of the lung and are generally acknowledged to be most important predictor of hazard and risk for cancers of the lung.
Standing Committee of Analysts, *The Quantification of Asbestos in Soil (2017).*

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils 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.

Arcadis (UK) Limited

3rd Floor, Charter House
62-68 Hills Road
Cambridge
CB2 1LA
U.K

T: +44 (0) 1223 935011

www.arcadis.com