

Report
Quarterly Compliance Monitoring—QM-95
WWP Central Steam Plant
Oil Spill Remediation
Spokane, Washington

February 24, 2023

Prepared for

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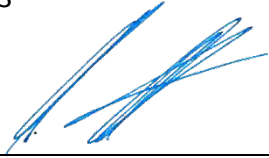
Report
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LIST OF ABBREVIATIONS AND ACRONYMS

Apex	Apex Laboratories, LLC
ARI	Analytical Resources, Inc.
Avista	Avista Corporation
CAP	cleanup action plan
cfm	cubic feet per minute
City	City of Spokane
CO ₂	carbon dioxide
CP	condensate pump
CSO	combined sewer overflow
Ecology	Washington State Department of Ecology
EPA	US Environmental Protection Agency
FOG	fats, oil, and grease
ft	feet
HEM	N-Hexane Extractable Material
in-H ₂ O	inches of water
Landau	Landau Associates, Inc.
mg/L	milligrams per liter
MTCA	Model Toxics Control Act
NWTPH-Dx	Northwest gasoline-range total petroleum hydrocarbon extended
O ₂	oxygen
PLC	primary logic controller
QM	quarter of monitoring
QM-95	95 th quarter of monitoring
RL	reporting limit
SCADA	Supervisory Control and Data Acquisition
SCAPCA	Spokane County Air Pollution Control Authority
SGT-HEM	Silica Gel-Treated N-Hexane Extractable Material
site	Central Steam Plant site
SMC	Spokane Municipal Code
SRCAA	Spokane Regional Clean Air Agency
TPH	total petroleum hydrocarbons
UST	underground storage tank
VOC	volatile organic compound
WWP	Washington Water Power Company

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1.0 INTRODUCTION

Landau Associates, Inc. (Landau) prepared this quarterly compliance monitoring report for Avista Corporation (Avista), formerly the Washington Water Power Company (WWP), to support cleanup activities at the Central Steam Plant site in Spokane, Washington (site; Figure 1). The report presents the results of compliance monitoring conducted during the 95th quarter (QM-95), July through September 2021.

1.1 Background

The Central Steam Plant was constructed in 1915 and provided steam heat and electrical power to downtown Spokane until operations ceased in 1986. Seven concrete underground storage tanks (USTs) were used to store Bunker C fuel oil for steam plant operations. In June of 1982, WWP reported a release of Bunker C from one of the USTs to the Washington State Department of Ecology (Ecology).

Site cleanup activities are being performed in accordance with the cleanup action plan (CAP) developed by Ecology (Ecology 1996a), per the terms presented in the WWP/Ecology Amended Consent Decree (Ecology 1996b). By November 21, 1997, construction of the mechanical systems related to cleanup action remediation were substantially completed, and startup of the hydraulic control, free product recovery, bioventing, and stormwater control systems had been initiated. A Supervisory Control and Data Acquisition (SCADA) system continuously monitors mechanical remediation-system parameters, including groundwater extraction rates and elevations, free product recovery, and bioventing system parameters including airflow, pressures, and oxygen (O₂) and carbon dioxide (CO₂) concentrations. Demonstration, validation, and calibration of the systems were performed during October–December 1997, and the cleanup action construction was summarized in the Final Cleanup Action Report (AGI 1998).

Since 1997, the remediation systems have operated per the CAP, and quarterly compliance monitoring activities have been performed in accordance with the final compliance monitoring plan (AGI 1998).

1.2 Compliance Monitoring and the Purpose of This Report

This report presents the results of all compliance monitoring conducted at the site during QM-95 in accordance with the final compliance monitoring plan (AGI 1998) and Model Toxics Control Act (MTCA) Cleanup Regulations, Washington Administrative Code 173-340-410 (Ecology 1996c). The two types of compliance monitoring addressed in this report are described below.

- **Protection monitoring** confirms that human health and the environment are adequately protected during construction and operation of the cleanup action. Protection monitoring includes semiannual groundwater monitoring and previously included quarterly air monitoring.

- **Performance monitoring** is conducted to determine when cleanup standards have been met. In accordance with the final compliance monitoring plan, performance monitoring includes groundwater, stormwater, hydraulic control, and bioventing monitoring.

Further discussion of protection and performance monitoring is included in Sections 2 and 3, respectively.

After the first 3 years of system operation (QM-1 through QM-12), the performance monitoring program was reevaluated, and changes to the groundwater monitoring schedule were proposed in the QM-12 annual data summary report (Landau 2001a). Currently, groundwater sampling and elevation monitoring are conducted semiannually in accordance with the revised monitoring schedule accepted by Ecology (Ecology 2001) and presented in the QM-13 report (Landau 2001b). Although groundwater monitoring can be categorized as both protection and performance monitoring, it is discussed only in Section 3.1.

1.3 Operations and Maintenance Activities Completed During the Reporting Period

To ensure effective operation of the four remediation mechanical systems (hydraulic control, free product recovery, bioventing, and stormwater control), scheduled and unscheduled operation and maintenance site visits are periodically conducted. GeoEngineers completed the following operation and maintenance activities during QM-95 (GeoEngineers 2021; Appendix C):

August 4-5, 2021

- Removed accumulated water and free product from product-recovery vault floors and product recovery reservoirs at belt skimmer locations EW1, EW2, EW3, and OR3 (Figure 3).
- The primary logic controller (PLC) was reset due to the groundwater pumps in EW1, EW2, and EW3 not running on August 4 and 5, 2021. The extraction wells were restarted and functioned properly, displaying real-time flow pressure and flow rates on the SCADA system. Periodic monitoring of the extraction well's groundwater pump operation was requested by Avista following the reset on the PLC.
- The PZ2 transducer was reported to require troubleshooting because of a water elevation reading about 10 feet lower than PZ1 and PZ3.
- The EW1 belt skimmer was adjusted because the belt was loose and slipping on the head pulley. A thick layer of free product was removed from the skimmer via hand spinning the skimmer belt after adjustment. The EW1 belt skimmer operated properly after adjustment. Belt skimmers in other extraction wells were observed to be operating properly.
- EW2 and EW3 product-recovery tank-level transmitters were not functioning properly and were cleaned. The EW2 transmitter continued to report an incorrect level in the SCADA system after being cleaned, and the EW3 transmitter was operating within normal limits

after being cleaned. All other product-recovery tank-level transmitters were operating within normal limits.

- Performed remedial system-component operational and calibration checks.
- The stormwater detention tank's pump remained off. The detention tank's level was reported to read 18 inches on the SCADA system. GeoEngineers reports that the detention tank's level and pump operation will continue to be monitored.

August 26, 2021

- Removed accumulated water and free product from product-recovery vault floors and product-recovery reservoirs at belt skimmer locations EW1, EW2, and EW3.
- Upon arrival, the PZ2 vault was approximately half full of stormwater. Approximately 30 gallons of stormwater was removed from the vault using a drum-mounted vacuum pump. Corroded transducer connections in the vault were repaired. Following repair of the transducer connections, PZ-2 continued to report incorrect water levels as read on the SCADA system. The transducer in PZ-2 was recommended to be replaced by GeoEngineers.
- The EW1 belt skimmer was adjusted because the belt was loose and slipping on the head pulley. A thick layer of free product was removed from the skimmer via hand spinning after adjustment. The EW1 belt skimmer was operating properly after adjustment. All other belt skimmers were operating properly.
- The condensate pump (CP) was not operating properly to remove water from bioventing system knockout. The CP was removed for repair.
- The EW2 product-recovery tank-level transmitter was continuing to malfunction. The sensor was removed and cleaned but continued to read incorrectly. GeoEngineers recommends troubleshooting the sensor with a SCADA technician.
- Performed remedial system-component operational and calibration checks.

2.0 PROTECTION MONITORING

From 1997 to 2016, air protection monitoring was performed to ensure that discharge from the bioventing system complied with the requirements of the Spokane Regional Clean Air Agency (SRCAA; formerly the Spokane County Air Pollution Control Authority [SCAPCA]). As reported in the QM-74 report (Landau 2016), a letter from the SRCAA to Avista, dated April 13, 2016, stated that registration of the bioventing system would no longer be necessary because volatile organic compound (VOC) concentrations had decreased to less than 1 pound per year (SRCAA 2016).

3.0 PERFORMANCE MONITORING COMPLIANCE

This section includes a description of the various types of performance monitoring completed during QM-95. Figures 2, 3, and 4 show the approximate locations of the monitoring wells, the hydraulic control system, and the free product-recovery wells, respectively. The figures have been updated to reflect changes in property ownership and development.

3.1 Groundwater Performance Monitoring

As defined in the Amended Consent Decree (Ecology 1996a), the site consists of the area affected by petroleum hydrocarbons in soil above MTCA Method A cleanup levels. Because hazardous substances are contained on the site, the groundwater point of compliance was established as close as practicable to the edge of the contained hazardous substances, not to exceed the northern boundary of Steam Plant Square (AGI 1998). Groundwater performance monitoring is conducted to evaluate whether groundwater performance standards have been met. Groundwater performance monitoring includes groundwater sampling and laboratory analysis, and measurement of groundwater elevations. Groundwater monitoring is conducted semiannually in accordance with the revised schedule specified by Ecology (Ecology 2001).

Additional laboratory analysis was conducted in QM-95 to support evaluation of previous results that indicated inconsistencies with historical data. Historically, groundwater analytical samples have been submitted to Analytical Resources, Inc. (ARI), of Tukwila, Washington, where they have been analyzed for diesel-, bunker C-, and motor oil-range total petroleum hydrocarbons (TPH) using the Ecology-approved analytical method Northwest total petroleum hydrocarbon diesel-range extended (NWTPH-Dx) with acid wash and silica gel cleanup. Detections of motor oil-range petroleum hydrocarbons and/or Bunker C were reported above the laboratory reporting limit (RL) during QM-92 (in monitoring wells MW-006, MW-007, and MW-025) and QM-93 (in monitoring wells MW-006, MW-007, MW-021, MW-023, MW-025, MW-028, and MW-030), and Bunker C-range petroleum hydrocarbons were reported above the site groundwater performance standard (1.0 milligrams per liter [mg/L]) in monitoring well MW-025 during QM-92 and in MW-021, MW-025, and MW-028 during QM-93. Prior to this, the most recent exceedances of groundwater performance standards downgradient of the point of compliance were reported in QM-81 in 2018 and QM-29 in 2005.

All detections during QM-92 and QM-93 were identified by ARI as a response of unknown alkanes in the C24-C32 range. The detections were not identified as a petroleum fuel product but were reported in the Bunker C- and motor-oil ranges because the responses occurred within those hydrocarbon ranges. Following receipt of the QM-92 and QM-93 laboratory data packages from ARI, the chromatograms were sent to the director of forensic services at Apex Laboratories, LLC (Apex), of Tigard, Oregon. Based on their review of the chromatograms, Apex concluded that the detections were characteristic of a wax dominant laboratory contaminant. Apex found that the laboratory contaminant was also present in samples collected from monitoring wells MW-12, MW-20, MW-21,

MW-27 and from MW-30 during QM-92 and from MW-012, MW-016, MW-017, MW-020, and MW-027 as well as in the field duplicate collected from MW-023 during QM-93 but was not quantifiable above the analytical reporting limit.

Because these detections were identified as a wax-dominant laboratory contaminant, the motor-oil range and Bunker-C range TPH detected in QM-92 and QM-93 were not considered to be associated with the Bunker C release. However, additional laboratory analysis was conducted in QM-95 to verify this conclusion.

3.1.1 Groundwater Sampling

Landau performed QM-95 semiannual groundwater sampling on September 15, 2021. Groundwater samples were collected from 10 monitoring wells (MW-006, MW-007, MW-012, MW-020, MW-021, MW-023, MW-025, MW-027, MW-028, and MW-030), and one field duplicate was collected from monitoring well MW-023. Split samples were also collected at select monitoring wells (MW-021, MW-025, and MW-028). A free product sample was collected from oil recovery vault OR-1.

One set of samples from each monitoring well and from the field duplicate were submitted to ARI for NWTPH-Dx analysis with acid wash and silica gel cleanup. Samples collected from two monitoring wells (MW-021 and MW-025) were also submitted to ARI for NWTPH-Dx analysis without acid wash and silica gel cleanup.

Split samples collected from MW-021, MW-025, and MW-028 were submitted to Apex for analysis to verify that any quantifiable detections in samples collected from these monitoring wells were not due to laboratory contaminants, as well as to allow Landau to compare analytical results between the laboratories. These samples were analyzed for diesel-, bunker C-, and motor oil-range TPH using the NWTPH-Dx method with and without acid wash and silica gel cleanup. The free product sample collected from OR-1 was submitted to Apex.

3.1.2 Groundwater Analytical Results

QM-95 groundwater sampling results are summarized in Table 1. Laboratory analytical data underwent US Environmental Protection Agency (EPA) Level IIA-equivalent validation and verification. Validation of data was performed in accordance with guidance from applicable portions of the *National Functional Guidelines for Organic Superfund Methods Data Review* (EPA 2020), analytical methods, and Landau data validation standard operating procedures. All samples were received by the laboratory in good condition, and prepared and analyzed within holding times. The sample results were compared with the site total petroleum hydrocarbon (TPH) groundwater performance standard of 1.0 mg/L, which is also applicable to groundwater performance monitoring downgradient of the barrier wall.

Diesel-range, Bunker C-range, and motor oil-range TPH were not detected at concentrations above the laboratory reporting limit in any samples, with the exception of a motor oil-range TPH detection in

the split sample collected at MW-028, analyzed by Apex without silica gel and acid wash cleanup. This detection is below the site performance standard of 1.0 mg/L. Motor oil-range petroleum hydrocarbons were not detected in the sample collected from MW-028 analyzed with acid wash and silica gel cleanup by ARI or Apex. No Bunker C was identified in any of the samples analyzed by Apex, and so a calibration curve using the free product sample collected from OR-1 to quantify Bunker C in the samples was not performed. Apex included a statement in the case narrative of their analytical report stating that the reporting limit of Bunker C would have been approximately 0.300 mg/L, with no detections in samples collected from monitoring wells MW-021, MW-025, and MW-028. A copy of the ARI laboratory analytical report is included as Appendix A and a copy of the Apex laboratory analytical report is included as Appendix B.

3.1.3 Groundwater Elevation Monitoring

Landau performed groundwater elevation and free product thickness monitoring on September 15 and 16, 2021 in conjunction with semiannual groundwater sampling. The elevation data are presented in Table 2. The conditions observed were consistent with previous observations at all wells, and the water levels measured in monitoring wells along 1st Avenue were consistent with historical measurements.

3.2 Stormwater Performance Monitoring

Stormwater monitoring is conducted to confirm that stormwater discharged to the combined sewer overflow (CSO) system complies with City of Spokane (City) discharge criteria. In accordance with the final compliance monitoring plan, an annual stormwater sample is collected from the site stormwater detention basin during operation of the cleanup action and is analyzed for fats, oil, and grease (FOG) by EPA Method 1664A N-Hexane Extractable Material and Silica Gel-Treated N-Hexane Extractable Material (HEM and SGT-HEM). A stormwater sample was not collected from the detention basin during QM-95. The next stormwater sampling is scheduled for QM-96.

3.3 Hydraulic Control Monitoring

Groundwater pumps in extraction wells EW1, EW2, and EW3 convey groundwater upgradient of the subsurface barrier wall to the CSO. Hydraulic monitoring is conducted to confirm that an inward gradient with respect to shallow groundwater is maintained across the barrier wall. Extracted groundwater from the hydraulic control system is sampled annually and analyzed for FOG using EPA Method 1664A HEM and SGT-HEM.

3.3.1 Groundwater Elevation Monitoring

The groundwater elevations in extraction wells EW1, EW2, and EW3 and piezometer wells PZ1, PZ2, and PZ3 are continuously recorded by the SCADA system to monitor performance of the hydraulic control system and water levels upgradient of the barrier wall. During semiannual groundwater sampling, the groundwater elevation in monitoring wells MW-012, MW-027, and MW-030 are also

manually measured to verify that the groundwater elevation north of the barrier wall is above the groundwater elevation south of the wall, indicating an inward hydraulic gradient is present. Hydraulic control piezometer and extraction well locations are shown on Figure 3. Table 3 summarizes groundwater elevation data, collected by the SCADA system, as well as the groundwater elevations of MW-012, MW-027, and MW-030 (located north of the barrier wall) measured during QM-95 semiannual groundwater sampling. Water levels recorded by the SCADA system in piezometer PZ2 were approximately 10 feet (ft) lower than the levels recorded from piezometers PZ1 and PZ3, and a manual water level measurement was not collected during QM-95 to verify the transducer reading; therefore, based on SCADA system readings, the transducer in PZ2 was determined to not be functioning during QM-95, and so groundwater elevations at PZ2 during QM-95 are not presented. This transducer will be replaced during QM-96 (GeoEngineers 2021).

Groundwater levels remained below the elevation of the weir in the barrier wall, indicating containment of groundwater upgradient of the barrier wall was maintained throughout QM-95. Extraction wells EW1, EW2, and EW3 were not functioning, as indicated by no flow recorded in the SCADA system on August 3 and 4, August 14 through 23, and September 13 through 29, 2021. The recorded groundwater elevation data presented in Table 3 display monthly averages with and without the extraction wells functioning, respectively. The monthly averages, displayed in Table 3, when the extraction wells were not functioning are above historical levels. However, the highest water level recorded by the SCADA system during QM-95 (1,856.46 ft at PZ3 on September 29) remained below the elevation of the weir in the barrier wall (1,860 ft), indicating containment of groundwater upgradient of the barrier wall was maintained.

According to the hourly data generated by the SCADA system, the groundwater elevations in PZ1 and PZ3 were above the groundwater elevations measured on September 15, 2021 at monitoring wells MW-012, MW-027, and MW-030 (located north of the barrier wall); however, the groundwater elevation of all extraction wells was below the measured elevation of MW-030. Because a single groundwater elevation measurement was collected from the monitoring wells north of the barrier wall during QM-95, it is unclear if an inward hydraulic gradient was maintained across the barrier wall during periods when the extraction wells were not functioning. Groundwater elevations recorded by the SCADA system for the extraction wells and piezometers were consistent with historical levels and below historical levels measured in MW-012, MW-027, and MW-030 when one or more extraction wells were functioning, indicating an inward hydraulic gradient was maintained across the barrier wall during these periods.

3.3.2 Extracted Groundwater Monitoring

Sampling and analysis of extracted groundwater is performed to ensure FOG in groundwater discharged to the City's CSO system does not exceed the 100 mg/L cleanup standard per Spokane Municipal Code (SMC) 13.03A.0201(B)(19). Extracted groundwater was not sampled and analyzed for FOG during QM-95. Extracted groundwater will be sampled in QM-96.

3.4 Product-Recovery Monitoring

The SCADA system monitors free product recovery at groundwater extraction wells EW1, EW2, and EW3 and at oil recovery wells OR1 and OR3 to ensure performance of the belt skimmers and to track oil recovery trends. When necessary, free product is removed by pumping directly from an individual well (well extraction).

3.4.1 Belt Skimmer Monitoring

Free product-recovery well locations are shown on Figure 4. Table 2 summarizes free product-recovery data for QM-95. The product recovered by the belt skimmers includes water but is reported as total free product recovery because of the difficulty in quantifying the amount of recovered liquid that is free product. As noted in Section 1.3, the EW2 product-recovery tank-level transmitter was not functioning during QM-95 and no product recovery was recorded by the SCADA system. As reported by the SCADA system, approximately 188.5 gallons of free product were recovered by the belt skimmers during QM-95. The volume of fluid removed from oil recovery well reservoir tanks is listed in GeoEngineers' Third Quarter 2021 operation and maintenance report.

In accordance with the CAP (Ecology 1996b), product recovery is considered impracticable if less than 1 gallon of product is recovered per well during 2 consecutive quarters. Groundwater from the extraction wells is sent to the City's CSO system, and product recovery from these wells, however small, is intended to be maintained throughout operation of the hydraulic control system.

3.4.2 Well Extraction

Well extraction was not conducted during QM-95.

3.5 Bioventing Performance Monitoring

Concentrations of CO₂ and O₂ are monitored in bioventing extraction wells to evaluate the performance of the bioventing system. O₂ is injected into the subsurface to enhance the activity of indigenous microorganisms and promote biodegradation of petroleum hydrocarbons. The optimal range of O₂ concentration (10 percent to 15 percent by volume; AGI 1998) should promote biodegradation. CO₂ is a byproduct of aerobic respiration from hydrocarbon-degrading bacteria, and a concentration of 0.20 percent by volume in the extraction wells indicates that biodegradation of petroleum hydrocarbons is occurring at the designed rate, assuming all other performance standards are met (AGI 1998).

3.5.1 Bioventing Extraction Wells

Air extracted from the 10 bioventing extraction wells (BE1–BE10; Figure 5) is monitored by the SCADA system to evaluate performance of the bioventing system and to measure biodegradation of Bunker C fuel oil.

As reported in quarterly monitoring reports QM-93 and QM-94, the SCADA system did not record accurate O₂ and CO₂ percent by volume concentrations for bioventing wells BE1 through BE10 from February 13 of QM-93 through May 11 of QM-94 (both O₂ and CO₂ were recorded as 0.00 percent by volume). On May 12, the SCADA system resumed recording O₂ and CO₂ percent by volume concentrations; CO₂ recorded concentrations were at historically high levels, and O₂ recorded concentrations began steadily increasing but are still below historical levels. On August 26 of QM-95 an increase in both O₂ and CO₂ was recorded by the SCADA system in all bioventing wells. These increased values were also recorded in GeoEngineers' quarterly O&M report for QM-95, although no additional information was provided. Because the recorded O₂ and CO₂ concentrations presented in Table 5 are monthly averages and include the increase in both concentrations recorded on August 26, the monthly averages displayed in Table 5 are above historical levels for CO₂ in August and September but below historical levels for O₂ throughout QM-95.

During QM-95, the average O₂ concentration for the 10 bioventing wells was 3.33 percent (Table 5), which is below the performance standard of 10 percent to 15 percent by volume, as well as below historical levels of approximately 13.5 percent by volume. During the same reporting period, the average CO₂ concentration for the 10 bioventing wells was 2.03 percent by volume, which is greater than the estimated optimal concentration of 0.20 percent by volume as well as greater than historical levels of 0.46 to 0.95 percent by volume.

The estimated total volume of Bunker C oil biodegraded by the bioventing system as reported by the SCADA system is calculated using the relative percentages of O₂ and CO₂ and total airflow, with CO₂ having the greatest influence on the SCADA calculation for oil volume biodegraded. Because of the elevated recorded CO₂ levels from August 26 through the end of QM-95, the estimated total volume of Bunker C biodegraded was above historical levels and is likely not representative of the actual volume of Bunker C degraded by the system. The estimated total volume of Bunker C oil biodegraded as reported by the SCADA system during QM-95 was approximately 1,352.19 gallons (Table 5); this value represents a biodegradation rate above the historical average of approximately 80 to 100 gallons per month.

3.5.2 Bioventing Injection Wells

Air injected into the subsurface through the seven bioventing injection wells (BI1–BI7; Figure 5) is monitored to ensure satisfactory performance of the bioventing system. Data collected by the SCADA system during QM-95 are presented in Table 6.

Average monthly bioventing injection well pressures for QM-95 ranged between 0.26 and 6.27 inches of water (in-H₂O). Although the range extended outside of the anticipated operating range of 3-10 in-H₂O (AGI 1998), the average pressure of all bioventing injection wells was 5.10 in-H₂O, which was within the anticipated operating range. The average reported total air flow rate for QM-95 was 137.03 cubic feet per minute (cfm).

4.0 ACTIVITIES PLANNED FOR QM-96

The following monitoring and maintenance activities are planned for QM-96:

- Perform scheduled system operation and maintenance.
- Replace the transducer in piezometer PZ2.
- Perform system component operational and calibration checks.
- Collection of annual stormwater performance monitoring sample from the site stormwater detention basin.
- Collection of annual extracted groundwater sample from EW1.

5.0 SUMMARY AND CONCLUSIONS—QM-95

5.1 Summary

The following is a summary of the compliance monitoring data collected during QM-95:

- Groundwater elevation data collected by the SCADA system indicate that an inward gradient was maintained across the barrier wall during QM-95 when one or more extraction wells were functioning, and that hydraulic control was maintained during this period. Groundwater elevation data indicate that water levels were above historical levels in piezometers PZ1 and PZ3 during periods when extraction wells EW1, EW2, and EW3 were not functioning. Groundwater levels remained below the weir elevation during QM-95, and containment of groundwater was preserved
- Active belt skimmers recovered approximately 188.5 gallons of liquid, including free product and entrained water, from extraction and oil recovery wells, as reported by the SCADA system, during QM-95.
- The SCADA system recorded an average O₂ level of 3.33 percent in bioventing extraction wells. The average O₂ level is below the performance standard of 10-15 percent by volume. The SCADA system recorded an average CO₂ level of 2.03 percent in bioventing extraction wells. This average exceeds the optimal CO₂ concentration of 0.20 percent. The bioventing monitoring system will be monitored during subsequent quarters to evaluate the accuracy of the data recorded by the SCADA system.
- Bioventing injection well pressures ranged between 0.26 and 6.27 in-H₂O. The average pressure of all bioventing injection wells was 5.10 in-H₂O, which is within the anticipated operating range of 3-10 in-H₂O. The average total airflow rate for the reporting period was 137.03 cfm.
- The estimated total volume of Bunker C oil degraded by the bioventing system as reported by the SCADA system during QM-95 was approximately 1,352.19 gallons.

5.2 Conclusions

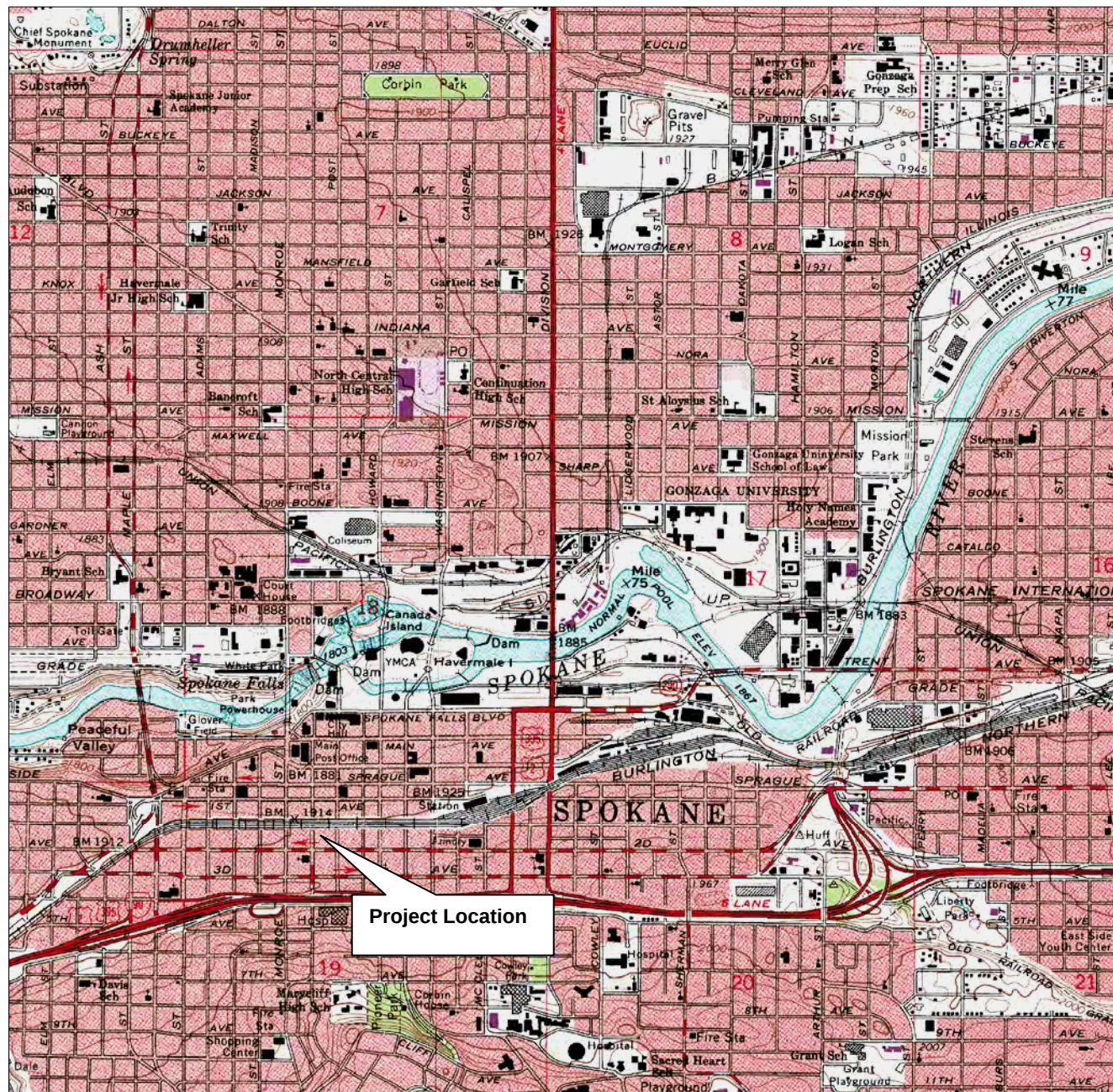
Results of compliance monitoring performed during QM-95 indicate that the Central Steam Plant Oil Spill remediation system is operating in accordance with regulatory criteria and permit levels.

6.0 USE OF THIS REPORT

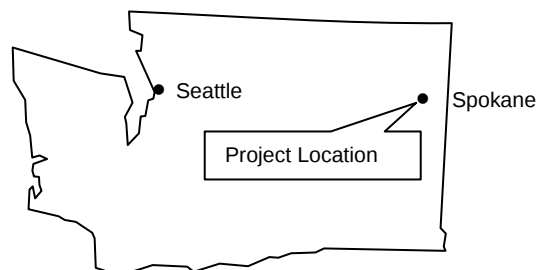
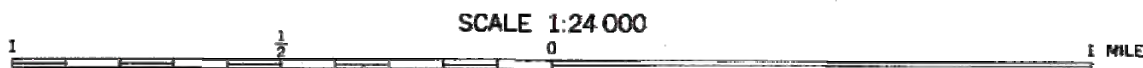
This report has been prepared for the exclusive use of Avista Corporation for specific application to the WWP Central Steam Plant site in Spokane, Washington. The reuse of information, conclusions, and recommendations provided herein for extensions of the project or for any other project, without review and authorization by Landau, shall be at the user's sole risk. Landau warrants that within the limitations of scope, schedule, and budget, our services have been provided in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions as this project. We make no other warranty, either express or implied.

7.0 REFERENCES

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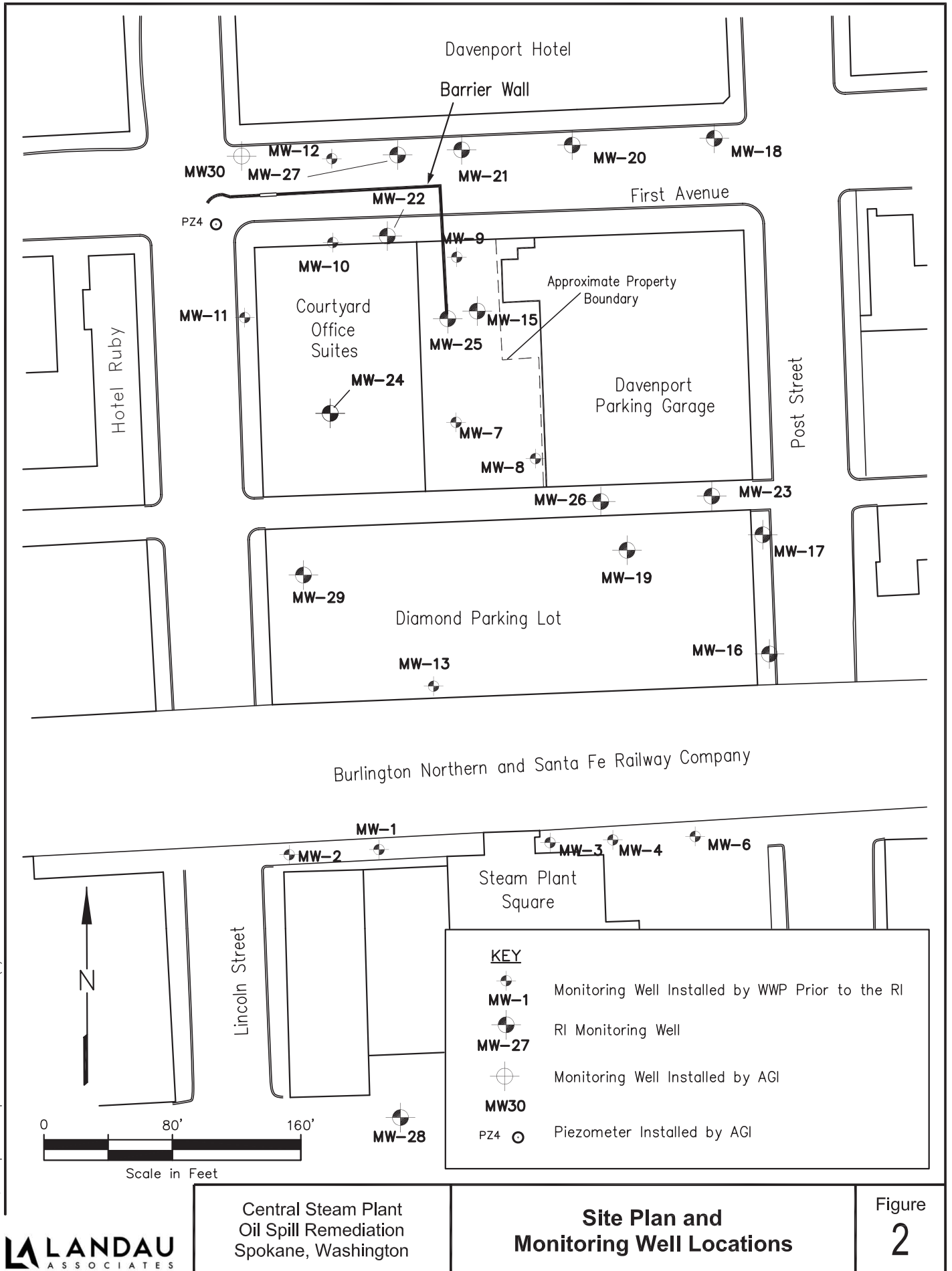
Source: USGS Spokane NW, WA Quad, 1974; PR 1986. Scale 1:24,000

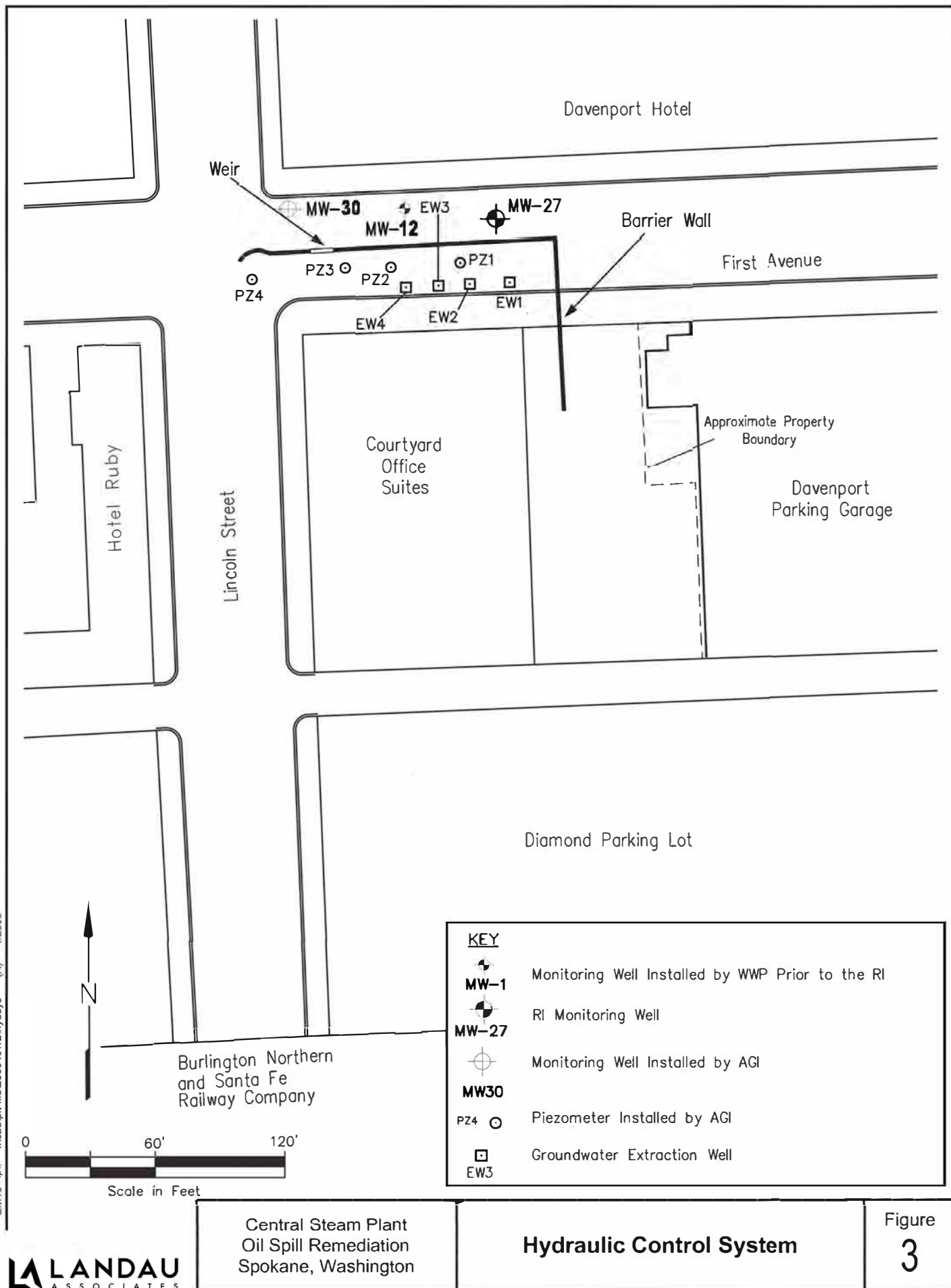


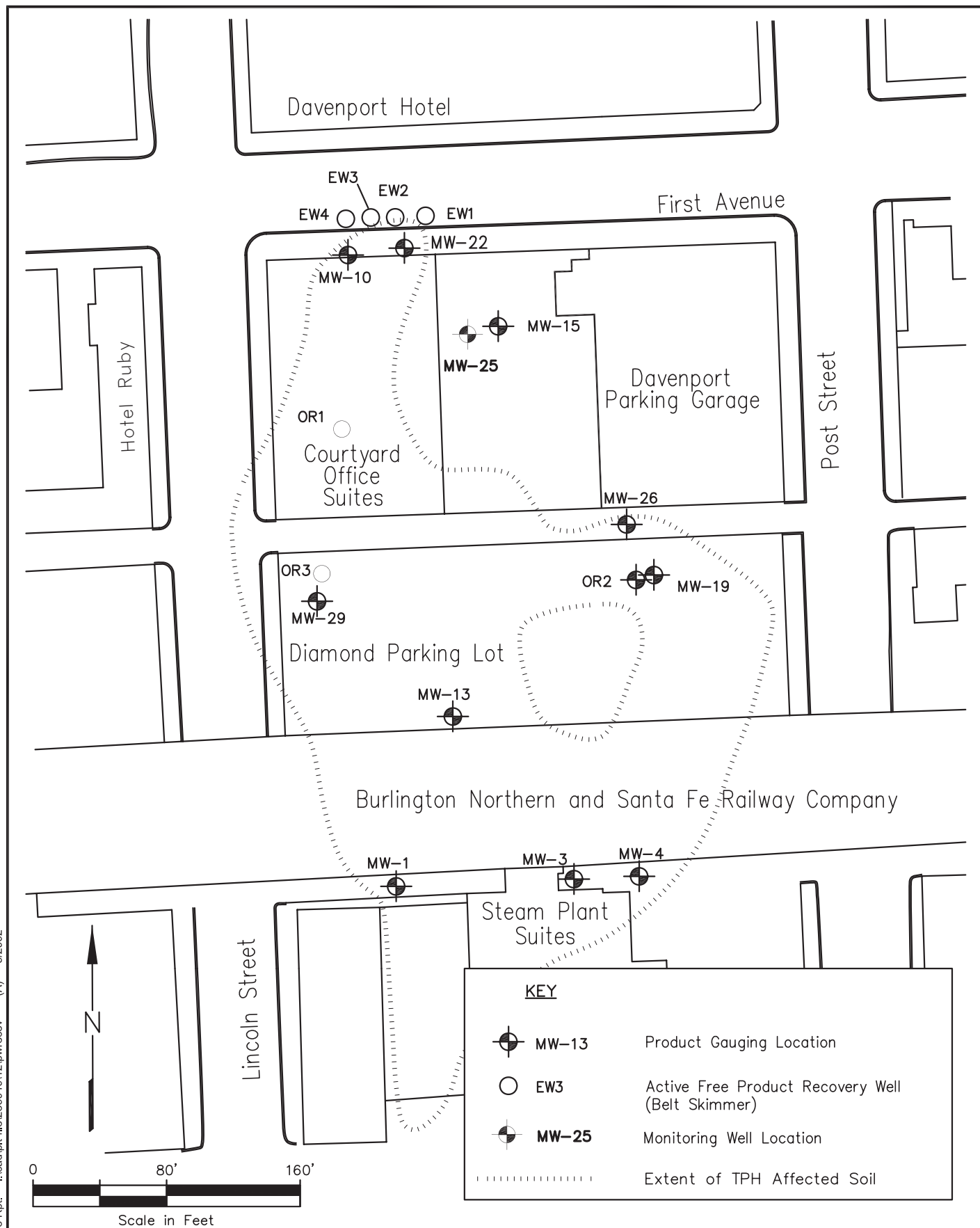
Central Steam Plant Oil Spill
Remediation
Spokane, Washington

Site Location Map

Figure
1







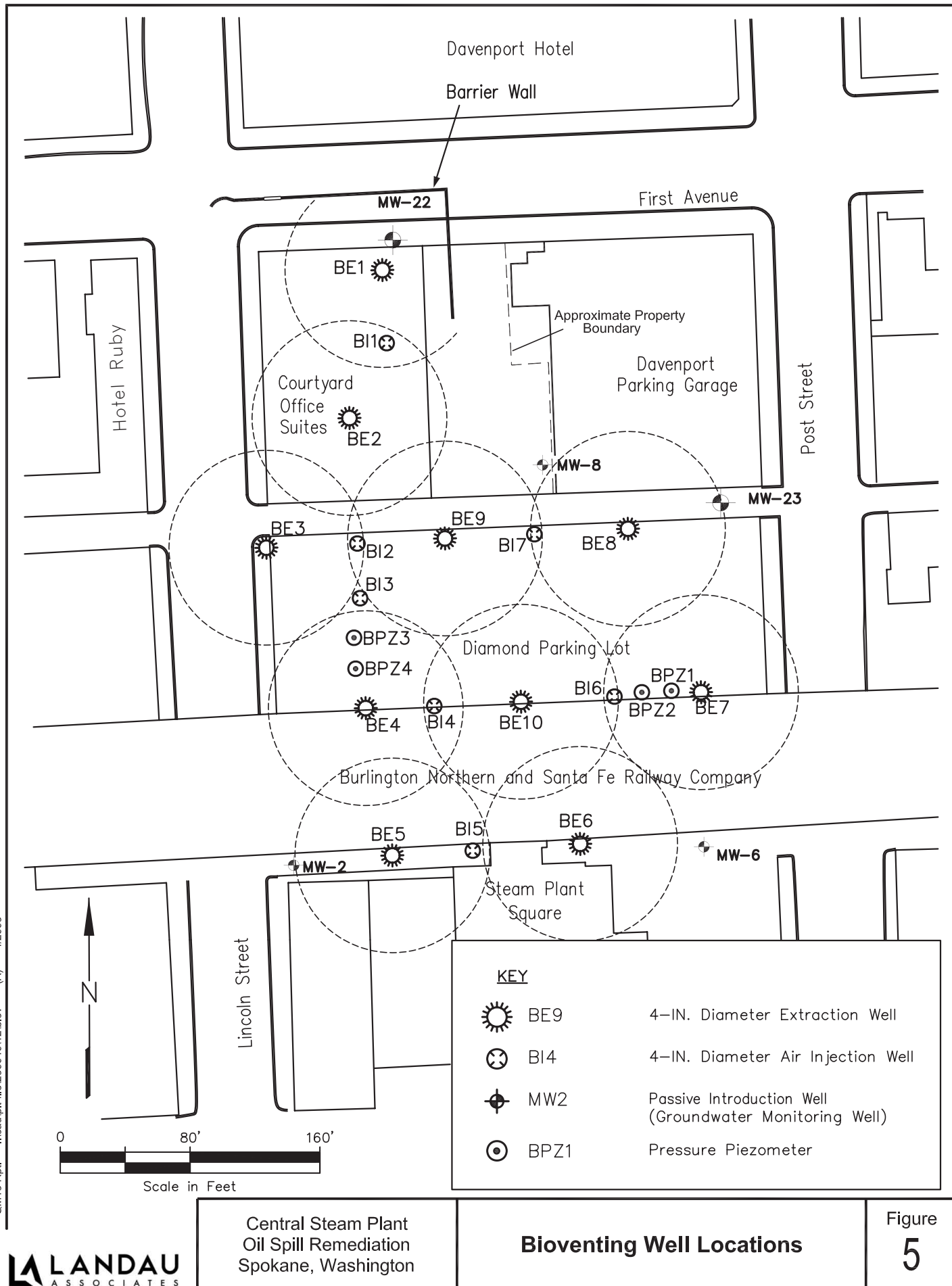


Table 1
QM-95 Groundwater Sampling Results
WWP Central Steam Plant Oil Spill Remediation
Spokane, Washington

Sample Location	Date Sampled	Laboratory	QM-95 Total Petroleum Hydrocarbons ¹		
			Diesel-Range	Bunker C-Range	Motor Oil-Range
			mg/L		
MW-006	9/15/2021	ARI	0.100 U	0.500 U	0.200 U
MW-007	9/15/2021	ARI	0.100 U	0.500 U	0.200 U
MW-012	9/15/2021	ARI	0.100 U	0.500 U	0.200 U
MW-020	9/15/2021	ARI	0.100 U	0.500 U	0.200 U
MW-021 ³	9/15/2021	ARI	0.100 U/0.100 U	0.500 U/0.500 U	0.200 U/0.200 U
	9/15/2021	Apex	0.076 U/0.076 U	-- ⁴	0.152 U/0.152 U
Duplicate ²	9/15/2021	ARI	0.100 U	0.500 U	0.200 U
MW-023	9/15/2021	ARI	0.100 U	0.500 U	0.200 U
MW-025 ³	9/15/2021	ARI	0.100 U/0.100 U	0.500 U/0.500 U	0.200 U/0.200 U
	9/15/2021	Apex	0.076 U/0.076 U	-- ⁴	0.152 U/0.152 U
MW-027	9/15/2021	ARI	0.100 U	0.500 U	0.200 U
MW-028 ³	9/15/2021	ARI	0.100 U	0.500 U	0.200 U
	9/15/2021	Apex	0.076 U/0.076 U	-- ⁴	0.243 J /0.151 U
MW-030	9/15/2021	ARI	0.100 U	0.500 U	0.200 U
Performance Standard			1.0	1.0	1.0

Notes:

¹ Total petroleum hydrocarbons analyzed using method NWTPH-Dx with acid wash and silica gel cleanup.

² Field duplicate sample of MW-021.

³ Sample analysis reported without and with silica gel wash and acid cleanup, respectively.

⁴ Because no Bunker C was identified in samples analyzed by Apex, a calibration curve using the free product sample collected from OR-1 to quantify Bunker C in the samples was not performed. Apex included a statement in the case narrative of their analytical report stating that the reporting limit of Bunker C would have been approximately 0.300 mg/L with no detections in samples collected from monitoring wells MW-021, MW-025, and MW-028

Bold = detected compound

A free product sample standard collected from extraction well EW-3 on October 24, 2018, is used by the laboratory to curve instrument analysis and compare results to detections of Bunker C in associated groundwater samples.

Abbreviations and Acronyms:

Apex = Apex Laboratories, LLC

ARI = Analytical Resources, Incorporated

EW = extraction well

J = The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.

OR = oil recovery well

mg/L = milligrams per liter

MW = monitoring well

-- = not analyzed

NWTPH-Dx = Northwest total petroleum hydrocarbon diesel-range extended

QM = quarterly monitoring

U = The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.

Table 2

QM-95

**Groundwater Elevation Monitoring
WWP Central Steam Plant Oil Spill Remediation
Spokane, Washington**

Well	Measurement Date	QM-95 Elevation	QM-95 Product Presence
MW-001	9/16/2021	Dry	No
MW-002	9/16/2021	Dry	No
MW-003	9/16/2021	1879.19	No
MW-004 (1)	9/16/2021	Dry	No
MW-006	9/15/2021	1879.75	No
MW-007	9/15/2021	1869.78	No
MW-008	NM	NM	No
MW-009	NM	NM	No
MW-010	9/16/2021	1854.88	Sig
MW-011	NM	NM	No
MW-012	9/15/2021	1854.89	No
MW-013	9/16/2021	Dry	No
MW-015	9/16/2021	1871.93	No
MW-016	9/16/2021	1871.80	No
MW-017	9/16/2021	1869.46	No
MW-018	9/15/2021	1863.86	No
MW-019	9/16/2021	1866.42	Sig
MW-020	9/15/2021	1854.96	No
MW-021	9/15/2021	1854.90	No
MW-022	NM	NM	Trace
MW-023	9/15/2021	1870.25	No
MW-025	9/15/2021	1865.49	No
MW-026	9/16/2021	1866.48	Trace
MW-027	9/15/2021	1854.88	No
MW-028	9/15/2021	1889.49	No
MW-029	9/16/2021	NA	Sig
MW-030	9/15/2021	1855.42	No

Notes and Abbreviations:

NA = no water - free product only

NM = not measured

No = no visual evidence of free product

QM = quarterly monitoring

Trace = trace of free product visible in water column

Table 3
QM-95 Hydraulic Control Monitoring
WWP Central Steam Plant Oil Spill Remediation
Spokane, Washington

Well	QM-95 Groundwater Elevation (Feet)				
	July	August ¹		September ¹	
EW1	1849.06	1849.38	1854.83	1849.08	1855.14
EW2	1852.44	1850.02	1855.02	1850.21	1855.31
EW3	1852.94	1852.14	1855.21	1851.60	1855.54
PZ1	1853.04	1852.85	1855.57	1852.74	1855.89
PZ2	-	-	-	-	-
PZ3	1855.03	1855.11	1855.86	1855.14	1856.14
MW-012	NM	NM		1854.89	
MW-027	NM	NM		1854.88	
MW-030	NM	NM		1855.42	

Notes:

¹ Average groundwater elevation with and without extraction wells functioning, respectively.

Data from extraction wells EW1, EW2, and EW3 and piezometer wells.

PZ1, PZ2, and PZ3 recorded by SCADA system.

PZ2 was not recording accurate groundwater elevations during QM-95

Extraction wells EW1, EW2, and EW3 were not functioning on 8/3, 8/4, 8/14 - 8/23, and 9/13 - 9/29 during QM-95.

WEIR elevation = 1,860 feet

Elevation datum is North American Vertical Datum of 1988 (NAVD88).

Values are average monthly water elevations for EW1–EW3 and PZ1–PZ3.

MW-012, MW-027, and MW-030 groundwater elevation hand-measured September 15, 2021. MW-012, MW-027, and MW-030 are located north of the barrier wall.

Abbreviations and Acronyms:

EW = extraction well

MW = monitoring well

NM = not measured

PZ = piezometer

QM = quarterly monitoring

SCADA = Supervisory Control and Data Acquisition

Table 4
QM-95 Free Product Recovery Data
WWP Central Steam Plant Oil Spill Remediation
Spokane, Washington

Location	Monthly Product Recovery (gal)			QM-95 Total (gal)
	July	August	September	
Belt Skimmer				
EW1	4.8	1.3	3.6	9.7
EW2 ¹	0.0	0.0	0.0	0.0
EW3	63.7	36.0	76.8	176.5
OR1	0.9	0.4	0.8	2.1
OR3	0.0	0.0	0.0	0.1
Total	69.5	37.8	81.2	188.5

Notes:

Data recorded by SCADA system.

Values are rounded to tenth of a gallon.

Recovery measurements are for total liquids (including water entrained within the product).

Accuracy for belt skimmer volumes is 0.1 gallons. Production data are based on physical recovery rates from measurement of oil level in reservoir tanks.

Volume of fluid removed from reservoir tanks is listed in GeoEngineers Third Quarter 2021 operation and maintenance report.

¹ EW2 product-recovery tank-level transmitter was not functioning during QM-95.

Abbreviations and Acronyms:

EW = extraction well

gal = gallons

OR = oil recovery well

QM = quarterly monitoring

SCADA = Supervisory Control and Data Acquisition

Table 5
QM-95 Bioventing System Data - Extraction Well Monitoring
WWP Central Steam Plant Oil Spill Remediation
Spokane, Washington

		QM-95 Extraction Well Monitoring				
		July	August	September	Average	Total
Oil Volume Biodegraded (gal) ¹		208.79	302.80	840.60	450.73	1,352.19
Average Total Flow (cfm)		109.69	109.04	111.60	110.11	NA
BE1	Avg. pressure (in-H ₂ O)	-3.58	-5.39	-7.79	-5.59	NA
	O ₂ (%)	2.76	3.01	3.53	3.10	NA
	CO ₂ (%)	0.95	1.38	3.77	2.04	NA
BE2	Avg. pressure (in-H ₂ O)	-0.18	-0.46	-2.01	-0.88	NA
	O ₂ (%)	2.66	2.86	3.38	2.97	NA
	CO ₂ (%)	0.95	1.38	3.77	2.03	NA
BE3	Avg. pressure (in-H ₂ O)	-2.34	-2.34	-1.92	-2.20	NA
	O ₂ (%)	2.72	2.97	3.52	3.07	NA
	CO ₂ (%)	0.95	1.39	3.78	2.04	NA
BE4	Avg. pressure (in-H ₂ O)	-1.38	-1.30	-0.82	-1.17	NA
	O ₂ (%)	3.24	3.53	4.13	3.63	NA
	CO ₂ (%)	0.95	1.38	3.76	2.03	NA
BE5	Avg. pressure (in-H ₂ O)	0.05	-1.22	-8.64	-3.27	NA
	O ₂ (%)	3.05	3.31	3.85	3.40	NA
	CO ₂ (%)	0.95	1.38	3.76	2.03	NA
BE6	Avg. pressure (in-H ₂ O)	-0.50	-0.57	-0.90	-0.66	NA
	O ₂ (%)	3.23	3.61	4.37	3.74	NA
	CO ₂ (%)	0.95	1.38	3.75	2.03	NA
BE7	Avg. pressure (in-H ₂ O)	-0.84	-0.78	-1.24	-0.95	NA
	O ₂ (%)	3.17	3.49	4.11	3.59	NA
	CO ₂ (%)	0.95	1.38	3.76	2.03	NA
BE8	Avg. pressure (in-H ₂ O)	-0.16	-1.01	-6.59	-2.59	NA
	O ₂ (%)	2.89	3.08	3.24	3.07	NA
	CO ₂ (%)	0.95	1.39	3.79	2.04	NA
BE9	Avg. pressure (in-H ₂ O)	-3.48	-3.45	-3.01	-3.31	NA
	O ₂ (%)	2.59	2.82	3.35	2.92	NA
	CO ₂ (%)	0.96	1.39	3.78	2.04	NA
BE10	Avg. pressure (in-H ₂ O)	-1.20	-1.21	-1.00	-1.14	NA
	O ₂ (%)	3.40	3.63	4.25	3.76	NA
	CO ₂ (%)	0.95	1.37	3.75	2.02	NA
Average	Avg. pressure (in-H ₂ O)	-1.36	-1.77	-3.39	-2.18	NA
	O ₂ (%)	2.97	3.23	3.77	3.33	NA
	CO ₂ (%)	0.95	1.38	3.77	2.03	NA

Notes:

Data recorded by SCADA system.

Total flow, pressure, O₂, and CO₂ values represent monthly averages

¹ On 8/26 an increase in both O₂ and CO₂ was recorded by the SCADA system in all bioventing wells. Increased values were recorded for the remainder of QM-95 which resulted in higher than historical average of oil volume biodegraded

Abbreviations and Acronyms:

% = percent of total air volume

Avg = average

BE = bioventing extraction well

cfm = cubic feet per minute

CO₂ = carbon dioxide

gal = gallon

in-H₂O = inches of water

NA = not applicable

O₂ = oxygen

QM = quarterly monitoring

SCADA = Supervisory Control and Data Acquisition

Table 6
QM-95 Bioventing System Data - Injection Well Monitoring
WWP Central Steam Plant Oil Spill Remediation
Spokane, Washington

	QM-95 Injection Well Monitoring		
	July	August	September
Average Total Flow (cfm)	132.83	137.78	140.49
Average Well Pressure (in-H ₂ O)			
Injection Well			
BI1	0.27	0.27	0.26
BI2	5.62	6.06	6.26
BI3	5.34	5.79	6.02
BI4	5.62	6.04	6.27
BI5	5.66	6.10	6.27
BI6	5.45	5.89	6.08
BI7	5.57	6.02	6.19

Notes:

Data recorded by SCADA system.

Total flow and pressure values represent monthly averages

Abbreviations and Acronyms:

BI = bioventing injection well

cfm = cubic feet per minute

in-H₂O = inches of water

QM = quarterly monitoring

SCADA = Supervisory Control and Data Acquisition

**QM-95 Groundwater Sampling
Laboratory Analytical Report
Analytical Resources, Incorporated**



Analytical Resources, Incorporated
Analytical Chemists and Consultants

15 October 2021

Shane Kostka
Landau Associates, Inc. - Spokane
10 North Post Street, Suite 218
Spokane, WA 99201

RE: Avista Steam Plant

Please find enclosed sample receipt documentation and analytical results for samples from the project referenced above.

Sample analyses were performed according to ARI's Quality Assurance Plan and any provided project specific Quality Assurance Plan. Each analytical section of this report has been approved and reviewed by an analytical peer, the appropriate Laboratory Supervisor or qualified substitute, and a technical reviewer.

Should you have any questions or problems, please feel free to contact us at your convenience.

Associated Work Order(s)
2110223

Associated SDG ID(s)
N/A

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed in the enclose Narrative. ARI, an accredited laboratory, certifies that the report results for which ARI is accredited meets all the requirements of the accrediting body. A list of certified analyses, accreditations, and expiration dates is included in this report.

Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his/her designee, as verified by the following signature.

Analytical Resources, Inc.

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Kelly Bottem, Client Services Manager





Landau Associates, Inc. - Spokane
10 North Post Street, Suite 218
Spokane WA, 99201

Project: Avista Steam Plant
Project Number: Avista Steam Plant
Project Manager: Shane Kostka

Reported:
15-Oct-2021 15:41

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-30-091521	21I0223-01	Water	15-Sep-2021 10:30	17-Sep-2021 12:09
MW-12-091521	21I0223-02	Water	15-Sep-2021 11:00	17-Sep-2021 12:09
MW-27-091521	21I0223-03	Water	15-Sep-2021 11:35	17-Sep-2021 12:09
MW-21-091521	21I0223-04	Water	15-Sep-2021 12:00	17-Sep-2021 12:09
MW-21-091521	21I0223-05	Water	15-Sep-2021 12:00	17-Sep-2021 12:09
MW-20-091521	21I0223-06	Water	15-Sep-2021 12:35	17-Sep-2021 12:09
MW-23-091521	21I0223-07	Water	15-Sep-2021 14:00	17-Sep-2021 12:09
MW-6-091521	21I0223-08	Water	15-Sep-2021 14:30	17-Sep-2021 12:09
MW-28-091521	21I0223-09	Water	15-Sep-2021 15:20	17-Sep-2021 12:09
MW-7-091521	21I0223-10	Water	15-Sep-2021 16:30	17-Sep-2021 12:09
MW-25-091521	21I0223-11	Water	15-Sep-2021 17:10	17-Sep-2021 12:09
MW-25-091521	21I0223-12	Water	15-Sep-2021 17:10	17-Sep-2021 12:09
DUP-091521	21I0223-13	Water	15-Sep-2021 08:00	17-Sep-2021 12:09



Landau Associates, Inc. - Spokane
10 North Post Street, Suite 218
Spokane WA, 99201

Project: Avista Steam Plant
Project Number: Avista Steam Plant
Project Manager: Shane Kostka

Reported:
15-Oct-2021 15:41

Case Narrative

Diesel/Heavy Oil Range Organics - WA-Ecology Method NW-TPHDx

The sample(s) were extracted and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The surrogate percent recoveries were within control limits.

The method blank(s) were clean at the reporting limits.

The blank spike (BS/LCS) percent recoveries were within control limits.

The matrix spike (MS) percent recoveries and the duplicate (DUP) relative percent difference (RPD) were within advisory control limits.



Cooler Receipt Form

ARI Client: Landau Associates

Project Name: Arista CSP

COC No(s): _____ (NA)

Delivered by: Fed-Ex UPS Courier Hand Delivered Other: _____

Assigned ARI Job No: 2170223

Tracking No: 2837 8722 8571 NA

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of the cooler? YES NO

Were custody papers included with the cooler? YES NO

Were custody papers properly filled out (ink, signed, etc.) YES NO

Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry)

Time 1209

1.9 0.6

If cooler temperature is out of compliance fill out form 00070F

Temp Gun ID#: DOO-5009708

Cooler Accepted by: RB Date: 9/17/21 Time: 1209

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler? YES NO

What kind of packing material was used? ... Bubble Wrap Wet Ice Gel Packs Baggies Foam Block Paper Other: _____

Was sufficient ice used (if appropriate)? NA YES NO

How were bottles sealed in plastic bags? Individually Grouped Not

Did all bottles arrive in good condition (unbroken)? YES NO

Were all bottle labels complete and legible? YES NO

Did the number of containers listed on COC match with the number of containers received? YES NO

Did all bottle labels and tags agree with custody papers? YES NO

Were all bottles used correct for the requested analyses? YES NO

Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs) ... NA YES NO

Were all VOC vials free of air bubbles? NA YES NO

Was sufficient amount of sample sent in each bottle? YES NO

Date VOC Trip Blank was made at ARI: NA

Were the sample(s) split by ARI? NA YES Date/Time: _____ Equipment: _____ Split by: _____

Samples Logged by: JSW Date: 09/17/2021 Time: 1542 Labels checked by: JSW

**** Notify Project Manager of discrepancies or concerns ****

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions:

By: _____

Date: _____



Landau Associates, Inc. - Spokane
10 North Post Street, Suite 218
Spokane WA, 99201

Project: Avista Steam Plant
Project Number: Avista Steam Plant
Project Manager: Shane Kostka

Reported:
15-Oct-2021 15:41

MW-30-091521
2110223-01 (Water)

Petroleum Hydrocarbons

Method: NWTPH-Dx

Sampled: 09/15/2021 10:30

Instrument: FID4

Analyzed: 12-Oct-2021 21:40

Sample Preparation: Preparation Method: EPA 3510C SepF
Preparation Batch: BJI0575 Sample Size: 500 mL
Prepared: 22-Sep-2021 Final Volume: 1 mL

Sample Cleanup: Cleanup Method: Silica Gel
Cleanup Batch: CJJ0067 Initial Volume: 1 mL
Cleaned: 10-Oct-2021 Final Volume: 1 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)	DRO	1	0.100	ND	mg/L	U
Motor Oil Range Organics (C24-C38)	RRO	1	0.200	ND	mg/L	U
Bunker C Range Organics (C10-C38)		1	0.500	ND	mg/L	U
Surrogate: o-Terphenyl			50-150 %	109	%	

Data File: \\target\share\chem2\fid4a.i\20211012a.b\421J1231.D

Page 1

Date : 12-OCT-2021 21:40

Client ID:

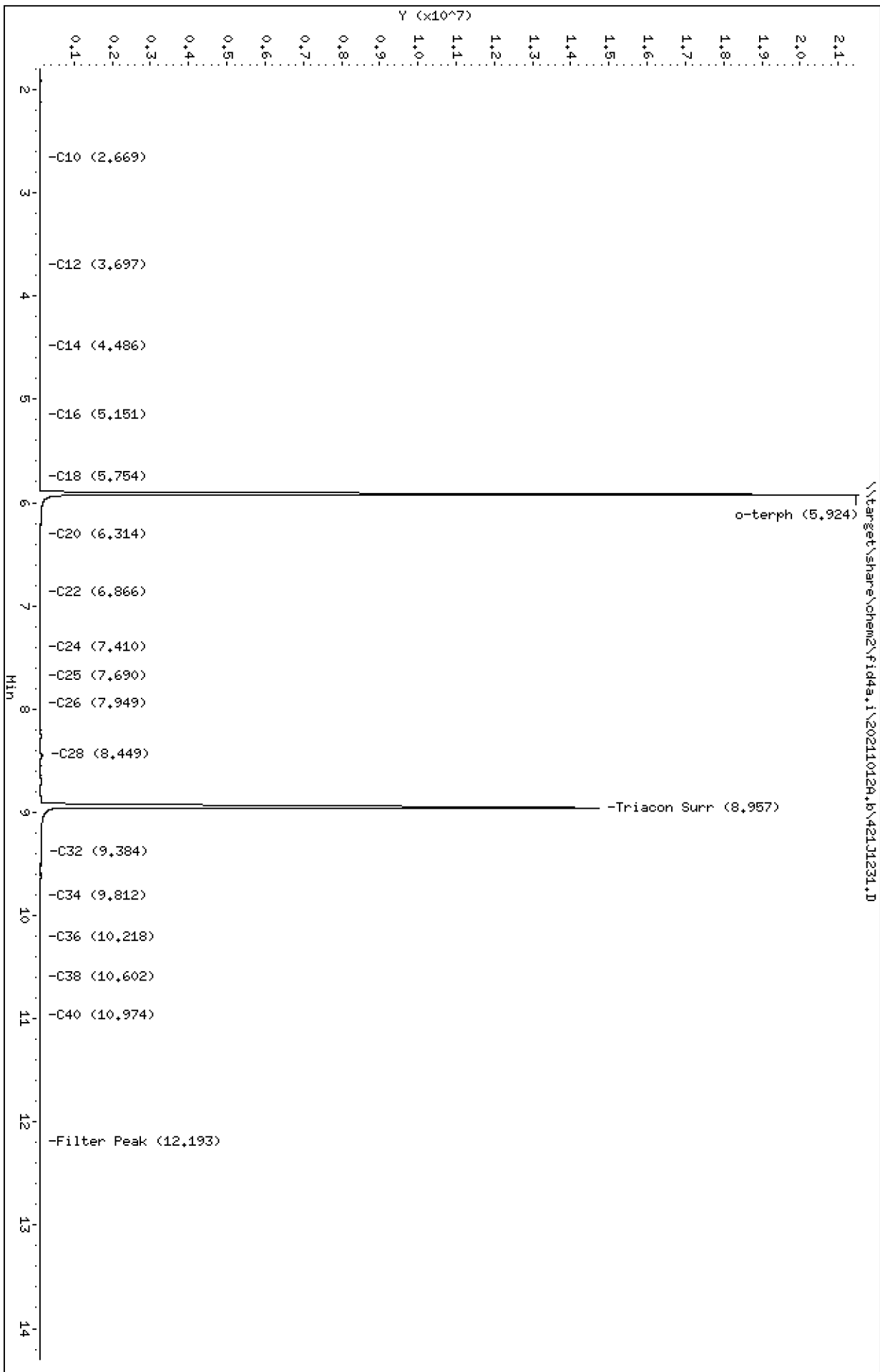
Instrument: fid4a.i

Sample Info: 2110223-01

Operator: TWC

Column phase: RTX-1

Column diameter: 0.25



Analytical Resources Inc.
TPH Quantitation Report

Data file: 20211012A.b/421J1231.D

Method: 20211012A.b\FID4TPH.m

Instrument: fid4a.i, TWC

Report Date: 10/14/2021

Macro: 09-SEP-2019

Calibration Dates: Gas:XX-XXX-XXXX Diesel:07-SEP-2021 M.Oil:14-APR-2021

ARI ID: 21I0223-01

Client ID:

Injection: 12-OCT-2021 21:40

Dilution Factor: 1

RT Std: 419H1603.D

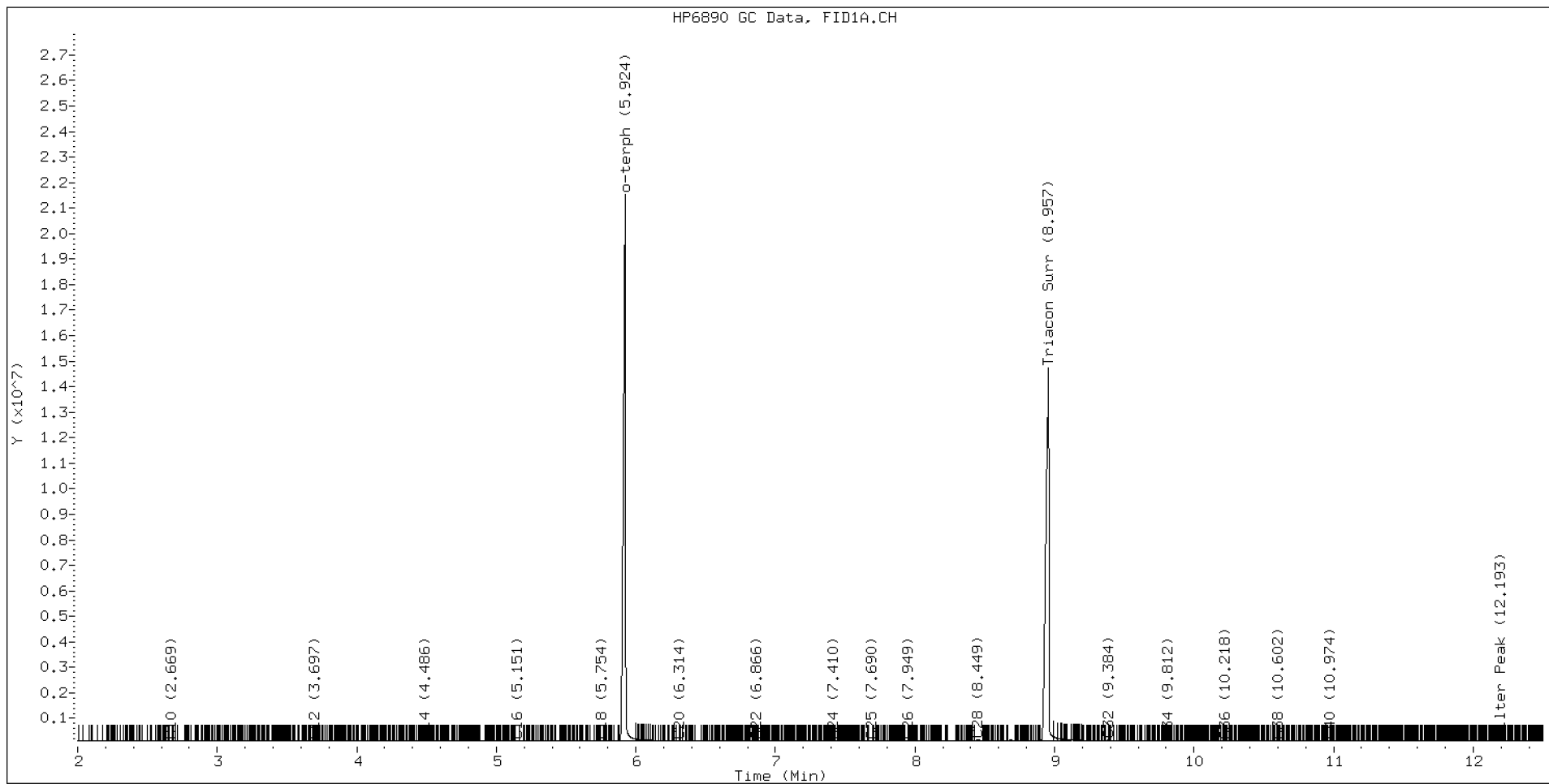
FID:4A RESULTS								
Compound	RT	Shift	Height	Area	Method	Range	Total Area	Conc (mg/L)
C8	1.340	-0.014	75381	189319	WATPHD	(C12-C24)	1052379	6.6
C10	2.669	0.004	3352	4306	WATPHM	(C24-C38)	3332433	25.4
C12	3.697	-0.002	3700	545				
C14	4.486	-0.001	2027	979				
C16	5.151	-0.006	1816	1624				
C18	5.754	-0.003	2315	2519				
C20	6.314	0.002	11748	5824				
C22	6.866	0.001	1756	419				
C24	7.410	0.000	4790	1620				
C25	7.690	0.011	12193	18436				
C26	7.949	0.008	11996	12849				
C28	8.449	0.000	58318	112534				
C32	9.384	-0.001	35530	31504				
C34	9.812	-0.003	16222	4845				
Filter Peak	12.193	-0.002	2616	517	BUNKERC	(C10-C38)	4626520	76.3
C36	10.218	-0.003	14623	3583				
C38	10.602	-0.002	9729	2412				
C40	10.974	-0.004	7179	5225				
o-terph	5.924	0.002	21423075	23275644				
Triacon Surr	8.957	-0.001	14627533	21872555				

Range Times: NW Diesel(3.699 - 7.410) AK102(2.66 - 7.68) Jet A(2.66 - 5.76)
NW M.Oil(7.41 - 10.60) AK103(7.68 - 10.22) OR Diesel(2.66 - 8.45)

Surrogate	Area	Amount
o-Terphenyl	23275644	122.4
Triacontane	21872555	103.3

M Indicates the peak was manually integrated

Analyte	RF	Curve Date
o-Terph Surr	190151.8	07-SEP-2021
Triacon Surr	211827.9	25-OCT-2019
Gas	15000.0	XX-XXX-XXXX
Diesel	158608.3	07-SEP-2021
Motor Oil	131440.7	14-APR-2021
Bunker C	60657.6	13-OCT-2021





Landau Associates, Inc. - Spokane
10 North Post Street, Suite 218
Spokane WA, 99201

Project: Avista Steam Plant
Project Number: Avista Steam Plant
Project Manager: Shane Kostka

Reported:
15-Oct-2021 15:41

MW-12-091521
2110223-02 (Water)

Petroleum Hydrocarbons

Method: NWTPH-Dx

Sampled: 09/15/2021 11:00

Instrument: FID4

Analyzed: 12-Oct-2021 22:40

Sample Preparation: Preparation Method: EPA 3510C SepF
Preparation Batch: BJI0575 Sample Size: 500 mL
Prepared: 22-Sep-2021 Final Volume: 1 mL

Sample Cleanup: Cleanup Method: Silica Gel
Cleanup Batch: CJJ0067 Initial Volume: 1 mL
Cleaned: 10-Oct-2021 Final Volume: 1 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)	DRO	1	0.100	ND	mg/L	U
Motor Oil Range Organics (C24-C38)	RRO	1	0.200	ND	mg/L	U
Bunker C Range Organics (C10-C38)		1	0.500	ND	mg/L	U
Surrogate: o-Terphenyl			50-150 %	103	%	

Data File: \\target\share\chem2\fid4a.i\20211012a.b\421J1234.D

Page 1

Date : 12-OCT-2021 22:40

Client ID:

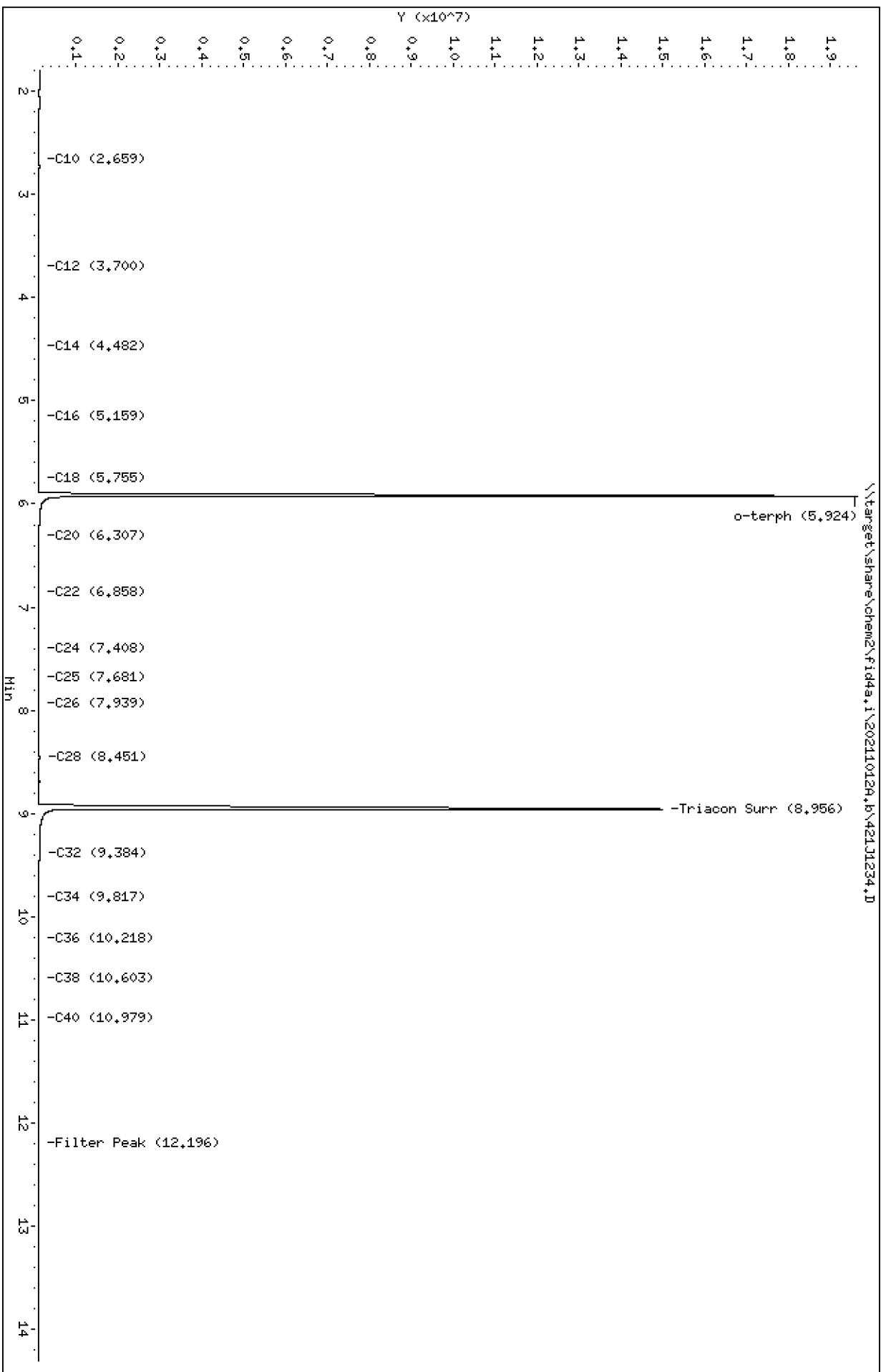
Instrument: fid4a.i

Sample Info: 2110223-02

Operator: TWC

Column phase: RTX-1

Column diameter: 0.25



Analytical Resources Inc.
TPH Quantitation Report

Data file: 20211012A.b/421J1234.D

Method: 20211012A.b\FID4TPH.m

Instrument: fid4a.i, TWC

Report Date: 10/14/2021

Macro: 09-SEP-2019

Calibration Dates: Gas:XX-XXX-XXXX Diesel:07-SEP-2021 M.Oil:14-APR-2021

ARI ID: 21I0223-02

Client ID:

Injection: 12-OCT-2021 22:40

Dilution Factor: 1

RT Std: 419H1603.D

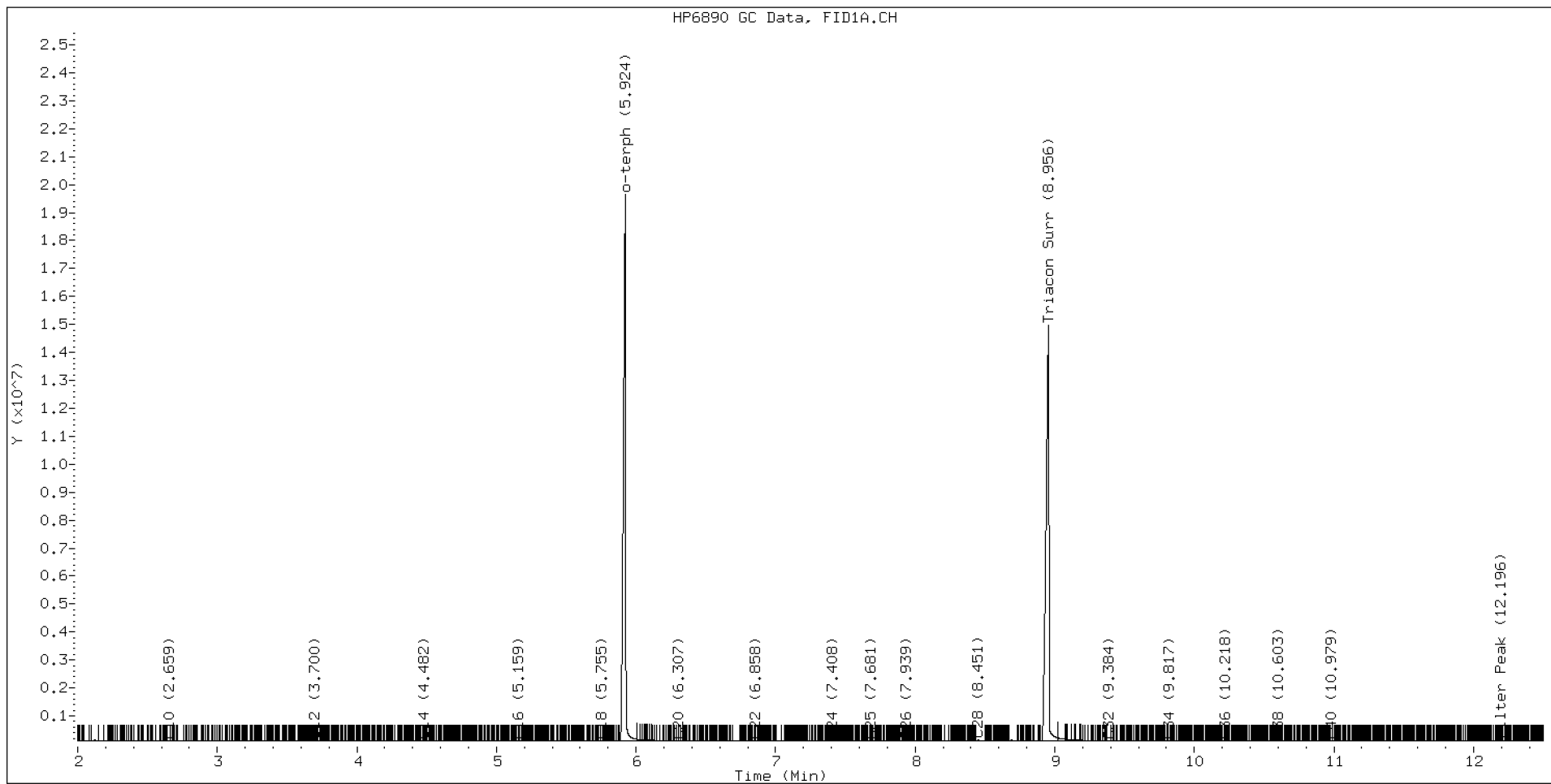
FID:4A RESULTS								
Compound	RT	Shift	Height	Area	Method	Range	Total Area	Conc (mg/L)
C8	1.341	-0.013	86105	222921	WATPHD	(C12-C24)	1154817	7.3
C10	2.659	-0.006	13025	14828	WATPHM	(C24-C38)	2021792	15.4
C12	3.700	0.001	10958	4357				
C14	4.482	-0.005	5006	2229				
C16	5.159	0.003	1208	583				
C18	5.755	-0.002	1434	1052				
C20	6.307	-0.005	10691	7203				
C22	6.858	-0.007	1826	1434				
C24	7.408	-0.002	1889	717				
C25	7.681	0.002	2338	1320				
C26	7.939	-0.002	2977	719				
C28	8.451	0.003	39947	68482				
C32	9.384	-0.002	24095	39883				
C34	9.817	0.003	10007	5944				
Filter Peak	12.196	0.001	11142	3315	BUNKERC	(C10-C38)	4007897	66.1
C36	10.218	-0.002	9526	2848				
C38	10.603	-0.001	9959	2466				
C40	10.979	0.001	11378	7329				
o-terph	5.924	0.002	19542448	22037627				
Triacon Surr	8.956	-0.002	14876447	22016947				

Range Times: NW Diesel(3.699 - 7.410) AK102(2.66 - 7.68) Jet A(2.66 - 5.76)
NW M.Oil(7.41 - 10.60) AK103(7.68 - 10.22) OR Diesel(2.66 - 8.45)

Surrogate	Area	Amount
o-Terphenyl	22037627	115.9
Triacontane	22016947	103.9

M Indicates the peak was manually integrated

Analyte	RF	Curve Date
o-Terph Surr	190151.8	07-SEP-2021
Triacon Surr	211827.9	25-OCT-2019
Gas	15000.0	XX-XXX-XXXX
Diesel	158608.3	07-SEP-2021
Motor Oil	131440.7	14-APR-2021
Bunker C	60657.6	13-OCT-2021





Landau Associates, Inc. - Spokane
10 North Post Street, Suite 218
Spokane WA, 99201

Project: Avista Steam Plant
Project Number: Avista Steam Plant
Project Manager: Shane Kostka

Reported:
15-Oct-2021 15:41

MW-27-091521
2110223-03 (Water)

Petroleum Hydrocarbons

Method: NWTPH-Dx

Sampled: 09/15/2021 11:35

Instrument: FID4

Analyzed: 12-Oct-2021 23:00

Sample Preparation: Preparation Method: EPA 3510C SepF
Preparation Batch: BJ10575 Sample Size: 500 mL
Prepared: 22-Sep-2021 Final Volume: 1 mL

Sample Cleanup: Cleanup Method: Silica Gel
Cleanup Batch: CJJ0067 Initial Volume: 1 mL
Cleaned: 10-Oct-2021 Final Volume: 1 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)	DRO	1	0.100	ND	mg/L	U
Motor Oil Range Organics (C24-C38)	RRO	1	0.200	ND	mg/L	U
Bunker C Range Organics (C10-C38)		1	0.500	ND	mg/L	U
Surrogate: o-Terphenyl			50-150 %	110	%	

Data File: \\target\share\chem2\fid4a.i\20211012a.b\421J1235.D

Page 1

Date : 12-OCT-2021 23:00

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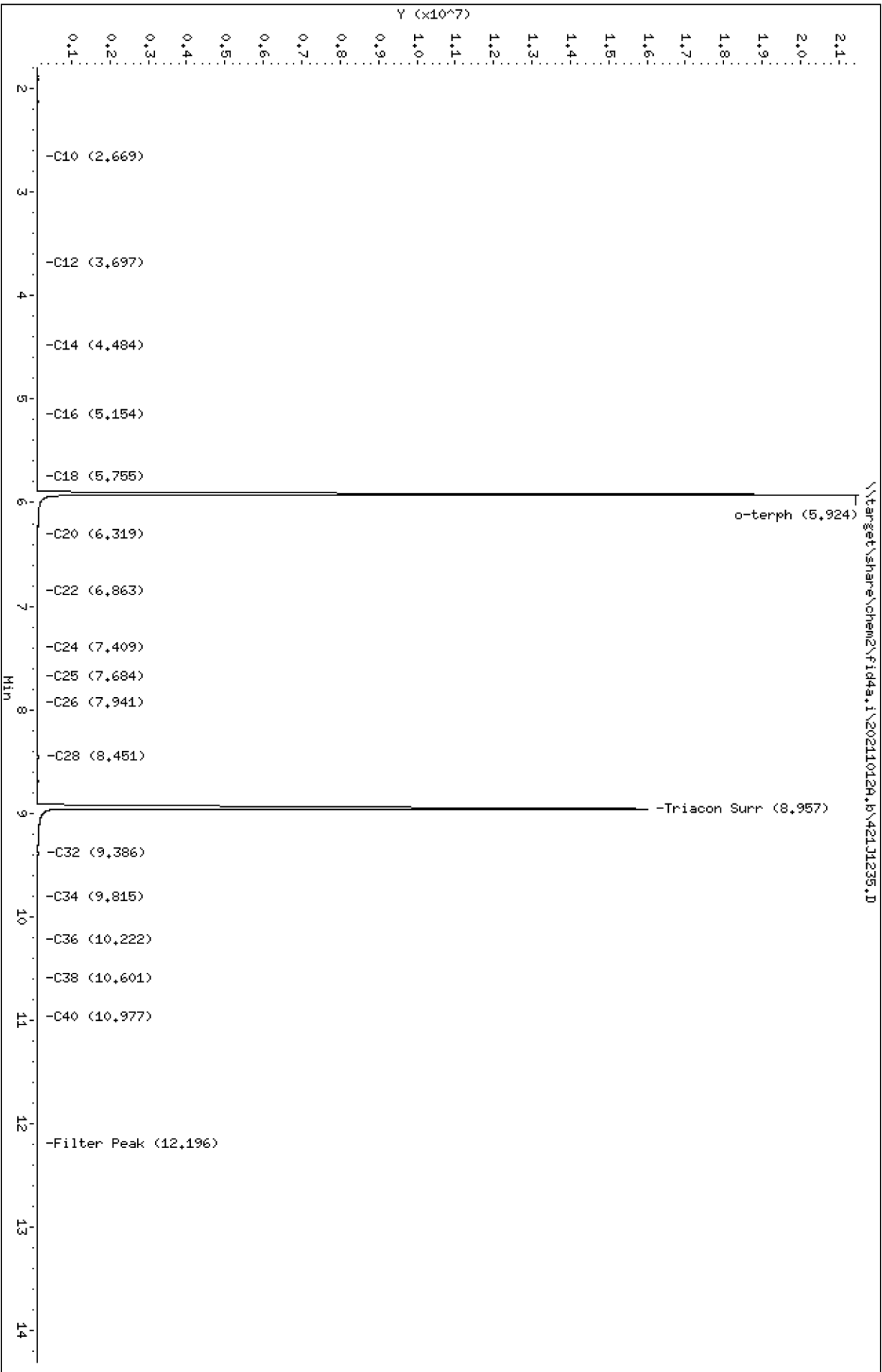
Instrument: fid4a.i

Sample Info: 2110223-03

Operator: TWC

Column phase: RTX-1

Column diameter: 0.25



Analytical Resources Inc.
TPH Quantitation Report

Data file: 20211012A.b/421J1235.D

Method: 20211012A.b\FID4TPH.m

Instrument: fid4a.i, TWC

Report Date: 10/14/2021

Macro: 09-SEP-2019

Calibration Dates: Gas:XX-XXX-XXXX Diesel:07-SEP-2021 M.Oil:14-APR-2021

ARI ID: 21I0223-03

Client ID:

Injection: 12-OCT-2021 23:00

Dilution Factor: 1

RT Std: 419H1603.D

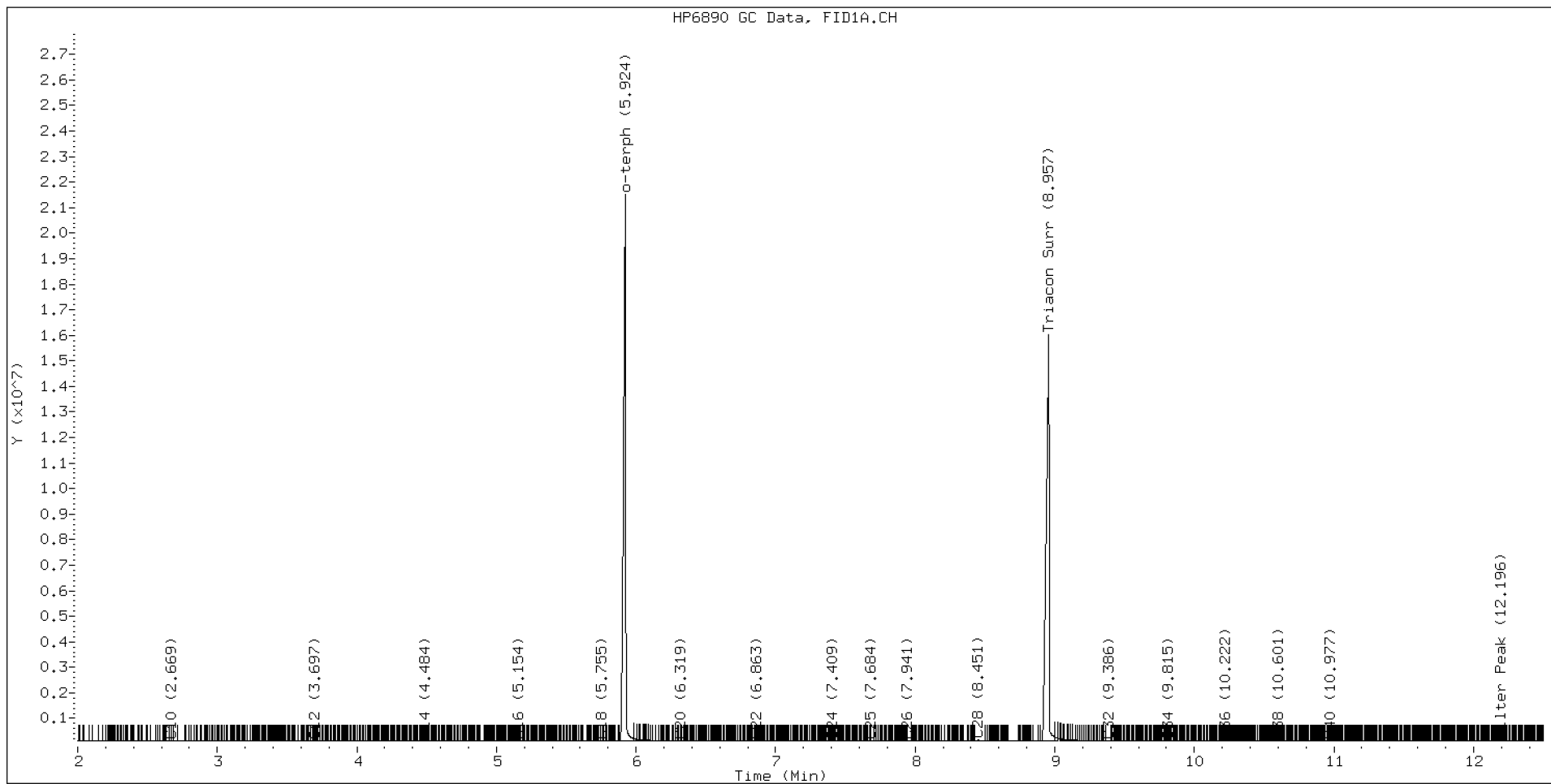
FID:4A RESULTS								
Compound	RT	Shift	Height	Area	Method	Range	Total Area	Conc (mg/L)
C8	1.341	-0.013	77303	182126	WATPHD	(C12-C24)	1324013	8.3
C10	2.669	0.004	5236	4707	WATPHM	(C24-C38)	1840801	14.0
C12	3.697	-0.002	6246	2165				
C14	4.484	-0.002	4617	2725				
C16	5.154	-0.002	2850	1344				
C18	5.755	-0.002	3523	3403				
C20	6.319	0.007	12588	8973				
C22	6.863	-0.002	2209	983				
C24	7.409	-0.001	1505	288				
C25	7.684	0.005	1533	600				
C26	7.941	0.000	1632	453				
C28	8.451	0.003	42082	66019				
C32	9.386	0.001	22098	44731				
C34	9.815	0.001	8040	1981				
Filter Peak	12.196	0.001	8427	3710	BUNKERC	(C10-C38)	3543883	58.4
C36	10.222	0.002	8140	4000				
C38	10.601	-0.002	8404	4936				
C40	10.977	-0.002	9789	5315				
o-terph	5.924	0.003	21405568	23615021				
Triacon Surr	8.957	-0.001	15907242	22771978				

Range Times: NW Diesel(3.699 - 7.410) AK102(2.66 - 7.68) Jet A(2.66 - 5.76)
NW M.Oil(7.41 - 10.60) AK103(7.68 - 10.22) OR Diesel(2.66 - 8.45)

Surrogate	Area	Amount
o-Terphenyl	23615021	124.2
Triacontane	22771978	107.5

M Indicates the peak was manually integrated

Analyte	RF	Curve Date
o-Terph Surr	190151.8	07-SEP-2021
Triacon Surr	211827.9	25-OCT-2019
Gas	15000.0	XX-XXX-XXXX
Diesel	158608.3	07-SEP-2021
Motor Oil	131440.7	14-APR-2021
Bunker C	60657.6	13-OCT-2021





Landau Associates, Inc. - Spokane
10 North Post Street, Suite 218
Spokane WA, 99201

Project: Avista Steam Plant
Project Number: Avista Steam Plant
Project Manager: Shane Kostka

Reported:
15-Oct-2021 15:41

MW-21-091521
2110223-04 (Water)

Petroleum Hydrocarbons

Method: NWTPH-Dx

Sampled: 09/15/2021 12:00

Instrument: FID4

Analyzed: 12-Oct-2021 23:20

Sample Preparation: Preparation Method: EPA 3510C SepF
Preparation Batch: BJ10575 Sample Size: 500 mL
Prepared: 22-Sep-2021 Final Volume: 1 mL

Sample Cleanup: Cleanup Method: Silica Gel
Cleanup Batch: CJJ0067 Initial Volume: 1 mL
Cleaned: 10-Oct-2021 Final Volume: 1 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)	DRO	1	0.100	ND	mg/L	U
Motor Oil Range Organics (C24-C38)	RRO	1	0.200	ND	mg/L	U
Bunker C Range Organics (C10-C38)		1	0.500	ND	mg/L	U
Surrogate: o-Terphenyl			50-150 %	109	%	

Data File: \\target\share\chem2\fid4a.i\20211012a.b\421J1236.D

Page 1

Date : 12-OCT-2021 23:20

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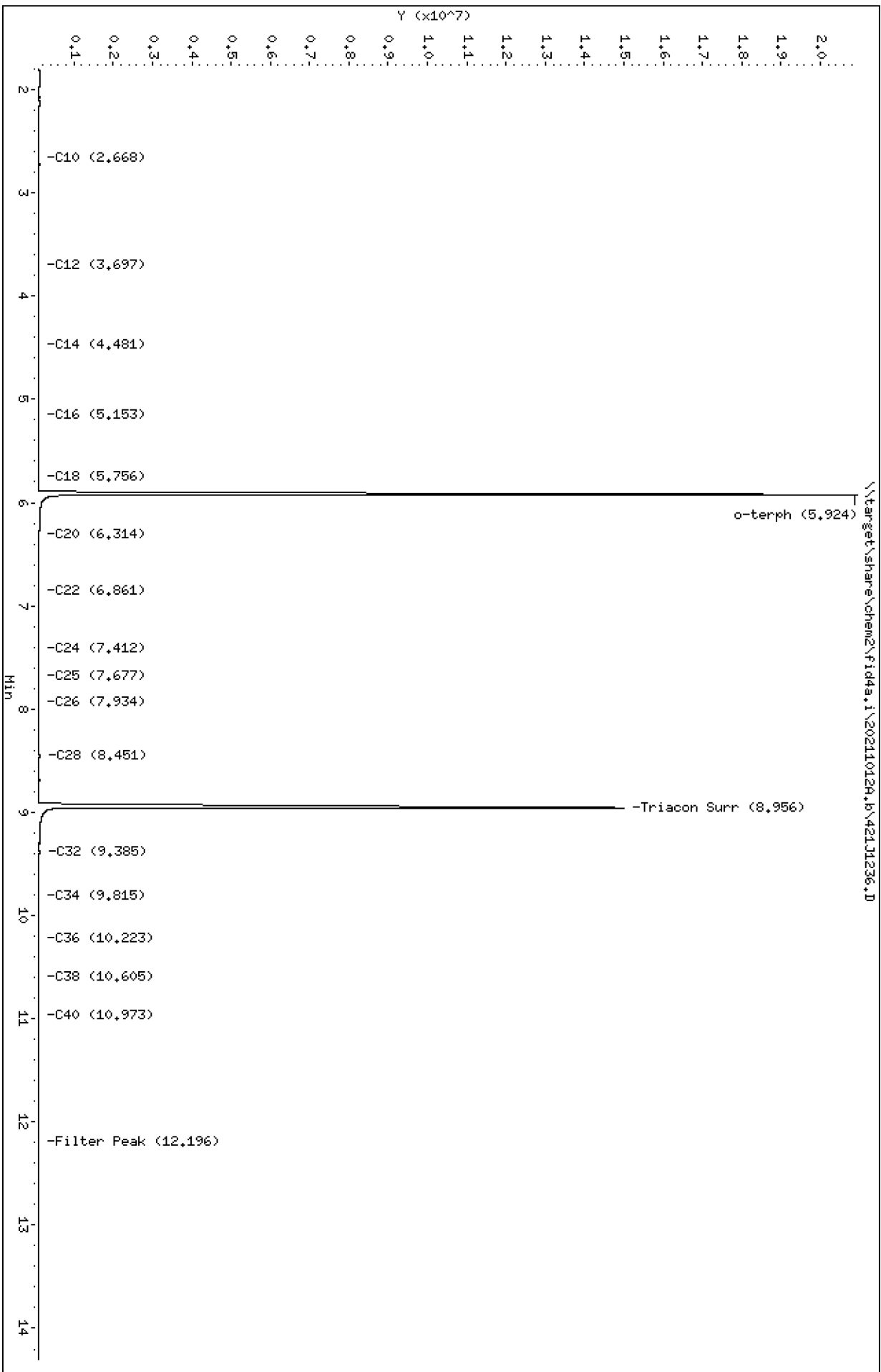
Instrument: fid4a.i

Sample Info: 2110223-04

Operator: TWC

Column phase: RTX-1

Column diameter: 0.25



Analytical Resources Inc.
TPH Quantitation Report

Data file: 20211012A.b/421J1236.D

Method: 20211012A.b\FID4TPH.m

Instrument: fid4a.i, TWC

Report Date: 10/14/2021

Macro: 09-SEP-2019

Calibration Dates: Gas:XX-XXX-XXXX Diesel:07-SEP-2021 M.Oil:14-APR-2021

ARI ID: 21I0223-04

Client ID:

Injection: 12-OCT-2021 23:20

Dilution Factor: 1

RT Std: 419H1603.D

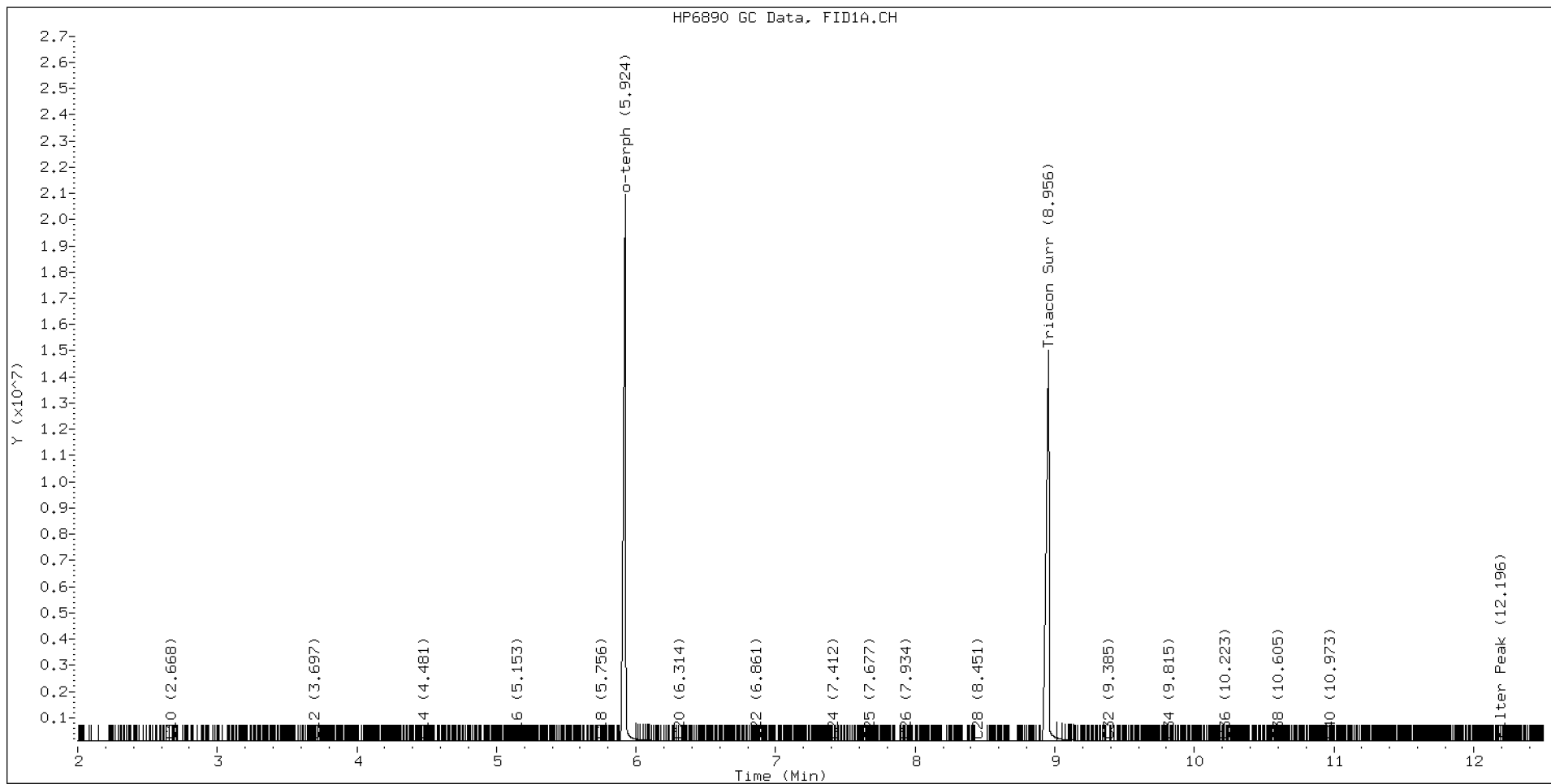
FID:4A RESULTS								
Compound	RT	Shift	Height	Area	Method	Range	Total Area	Conc (mg/L)
C8	1.340	-0.014	85875	218630	WATPHD	(C12-C24)	2169755	13.7
C10	2.668	0.004	12908	15747	WATPHM	(C24-C38)	1655925	12.6
C12	3.697	-0.002	13152	3270				
C14	4.481	-0.006	11266	6162				
C16	5.153	-0.004	9686	6204				
C18	5.756	-0.001	8999	4819				
C20	6.314	0.002	15515	20540				
C22	6.861	-0.004	2708	1430				
C24	7.412	0.002	1066	503				
C25	7.677	-0.002	456	155				
C26	7.934	-0.007	473	212				
C28	8.451	0.003	37144	61067				
C32	9.385	-0.001	20243	29645				
C34	9.815	0.001	8148	4824				
Filter Peak	12.196	0.001	10671	2651	BUNKERC	(C10-C38)	4635999	76.4
C36	10.223	0.003	8888	6134				
C38	10.605	0.001	9010	1798				
C40	10.973	-0.006	10755	6967				
o-terph	5.924	0.002	20848590	23348819				
Triacon Surr	8.956	-0.001	14899886	22018290				

Range Times: NW Diesel(3.699 - 7.410) AK102(2.66 - 7.68) Jet A(2.66 - 5.76)
NW M.Oil(7.41 - 10.60) AK103(7.68 - 10.22) OR Diesel(2.66 - 8.45)

Surrogate	Area	Amount
o-Terphenyl	23348819	122.8
Triacontane	22018290	103.9

M Indicates the peak was manually integrated

Analyte	RF	Curve Date
o-Terph Surr	190151.8	07-SEP-2021
Triacon Surr	211827.9	25-OCT-2019
Gas	15000.0	XX-XXX-XXXX
Diesel	158608.3	07-SEP-2021
Motor Oil	131440.7	14-APR-2021
Bunker C	60657.6	13-OCT-2021





Landau Associates, Inc. - Spokane
10 North Post Street, Suite 218
Spokane WA, 99201

Project: Avista Steam Plant
Project Number: Avista Steam Plant
Project Manager: Shane Kostka

Reported:
15-Oct-2021 15:41

MW-21-091521
2110223-05 (Water)

Petroleum Hydrocarbons

Method: NWTPH-Dx

Sampled: 09/15/2021 12:00

Instrument: FID4

Analyzed: 12-Oct-2021 16:40

Sample Preparation: Preparation Method: EPA 3510C SepF
Preparation Batch: BJI0576 Sample Size: 500 mL
Prepared: 22-Sep-2021 Final Volume: 1 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)	DRO	1	0.100	ND	mg/L	U
Motor Oil Range Organics (C24-C38)	RRO	1	0.200	ND	mg/L	U
Bunker C Range Organics (C10-C38)		1	0.500	ND	mg/L	U
Surrogate: o-Terphenyl			50-150 %	104	%	

Data File: \\target\share\chem2\fid4a,1\20211012,b\421J1216.D

Page 1

Date : 12-OCT-2021 16:40

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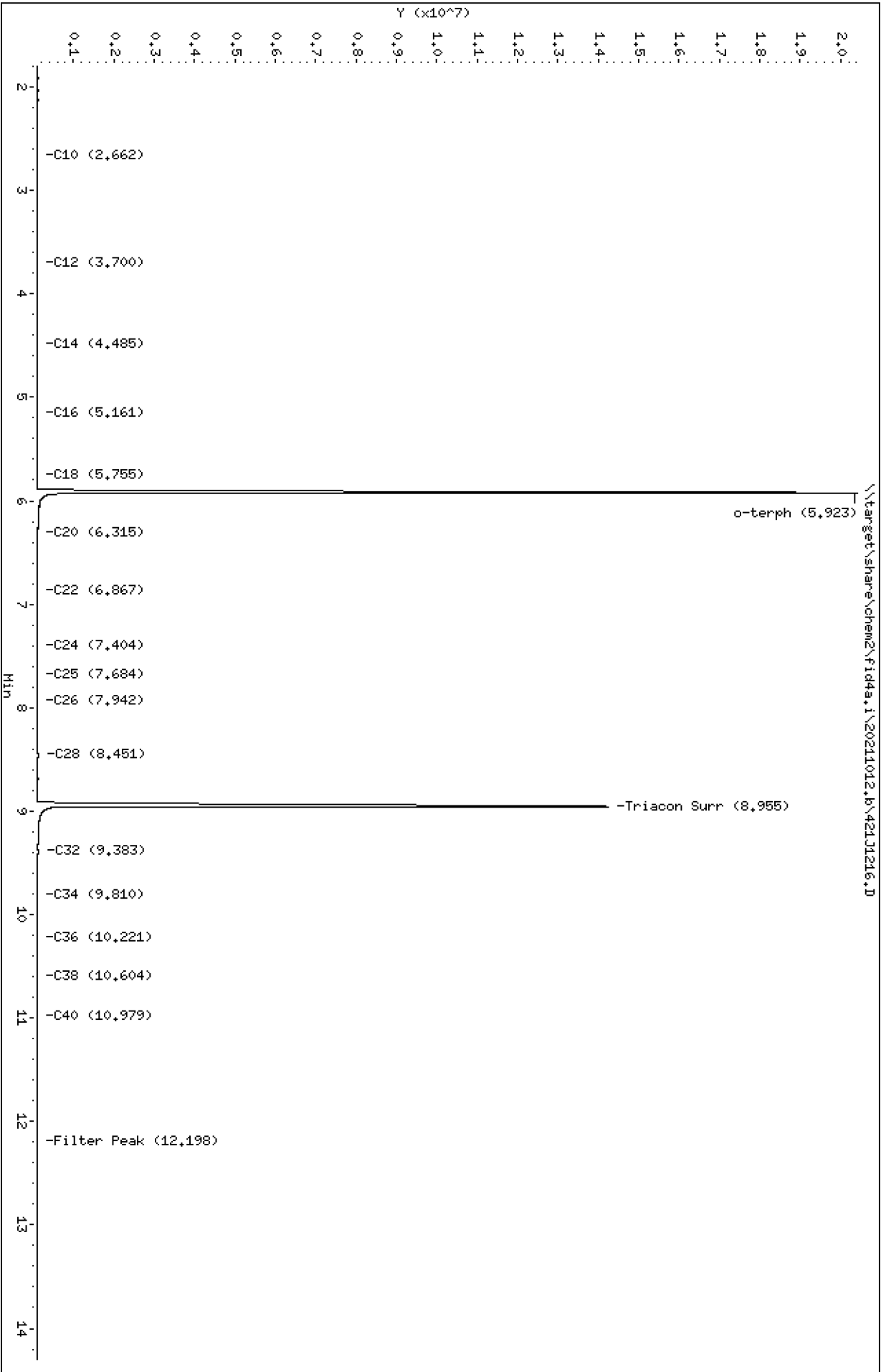
Instrument: fid4a,1

Sample Info: 2110223-05

Operator: TWC

Column phase: RTX-1

Column diameter: 0.25



Analytical Resources Inc.
TPH Quantitation Report

Data file: 20211012.b/421J1216.D

Method: 20211012.b\FID4TPH.m

Instrument: fid4a.i, TWC

Report Date: 10/14/2021

Macro: 09-SEP-2019

Calibration Dates: Gas:XX-XXX-XXXX Diesel:07-SEP-2021 M.Oil:14-APR-2021

ARI ID: 21I0223-05

Client ID:

Injection: 12-OCT-2021 16:40

Dilution Factor: 1

RT Std: 419H1603.D

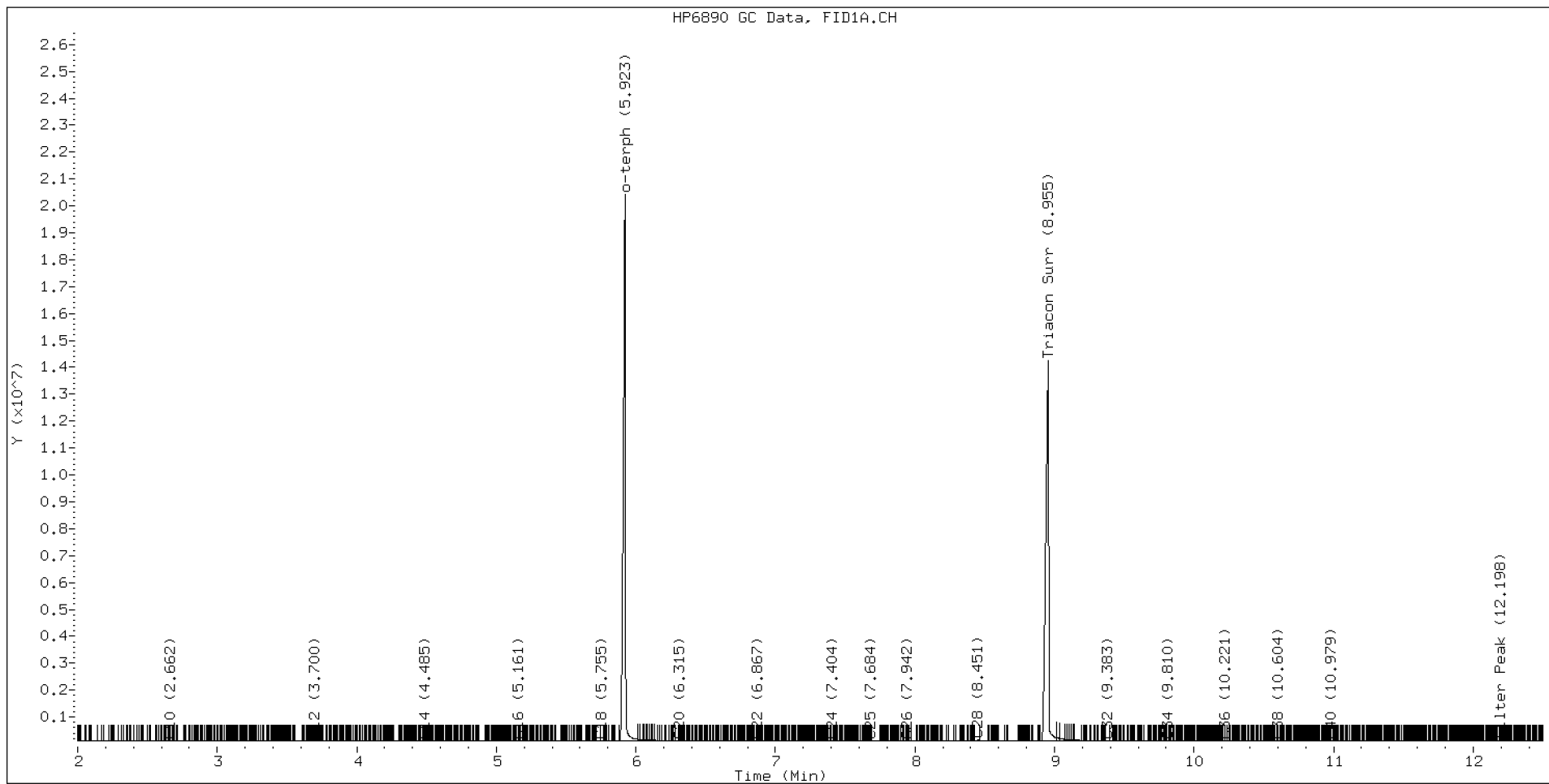
FID:4A RESULTS								
Compound	RT	Shift	Height	Area	Method	Range	Total Area	Conc (mg/L)
C8	1.339	-0.016	157458	245238	WATPHD	(C12-C24)	1348348	8.5
C10	2.662	-0.002	1872	459	WATPHM	(C24-C38)	2054079	15.6
C12	3.700	0.001	3286	1280				
C14	4.485	-0.002	2321	456				
C16	5.161	0.004	2101	820				
C18	5.755	-0.002	4524	4642				
C20	6.315	0.003	14184	4235				
C22	6.867	0.002	6123	4524				
C24	7.404	-0.006	5305	3864				
C25	7.684	0.005	4386	2334				
C26	7.942	0.001	3926	1540				
C28	8.451	0.003	38945	47256				
C32	9.383	-0.002	21382	36112				
C34	9.810	-0.004	8890	5246				
Filter Peak	12.198	0.003	10779	4281	BUNKERC	(C10-C38)	3579994	49.6
C36	10.221	0.001	9146	1817				
C38	10.604	0.000	10324	8613				
C40	10.979	0.000	12974	7707				
o-terph	5.923	0.001	20316248	22195738				
Triacon Surr	8.955	-0.002	14160818	20764709				

Range Times: NW Diesel(3.699 - 7.410) AK102(2.66 - 7.68) Jet A(2.66 - 5.76)
NW M.Oil(7.41 - 10.60) AK103(7.68 - 10.22) OR Diesel(2.66 - 8.45)

Surrogate	Area	Amount
o-Terphenyl	22195738	116.7
Triacontane	20764709	98.0

M Indicates the peak was manually integrated

Analyte	RF	Curve Date
o-Terph Surr	190151.8	07-SEP-2021
Triacon Surr	211827.9	25-OCT-2019
Gas	15000.0	XX-XXX-XXXX
Diesel	158608.3	07-SEP-2021
Motor Oil	131440.7	14-APR-2021
Bunker C	72152.7	14-OCT-2021





Landau Associates, Inc. - Spokane
10 North Post Street, Suite 218
Spokane WA, 99201

Project: Avista Steam Plant
Project Number: Avista Steam Plant
Project Manager: Shane Kostka

Reported:
15-Oct-2021 15:41

MW-20-091521
2110223-06 (Water)

Petroleum Hydrocarbons

Method: NWTPH-Dx

Sampled: 09/15/2021 12:35

Instrument: FID4

Analyzed: 12-Oct-2021 23:40

Sample Preparation: Preparation Method: EPA 3510C SepF
Preparation Batch: BJI0575 Sample Size: 500 mL
Prepared: 22-Sep-2021 Final Volume: 1 mL

Sample Cleanup: Cleanup Method: Silica Gel
Cleanup Batch: CJJ0067 Initial Volume: 1 mL
Cleaned: 10-Oct-2021 Final Volume: 1 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)	DRO	1	0.100	ND	mg/L	U
Motor Oil Range Organics (C24-C38)	RRO	1	0.200	ND	mg/L	U
Bunker C Range Organics (C10-C38)		1	0.500	ND	mg/L	U
Surrogate: o-Terphenyl			50-150 %	87.4	%	

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Page 1

Date : 12-OCT-2021 23:40

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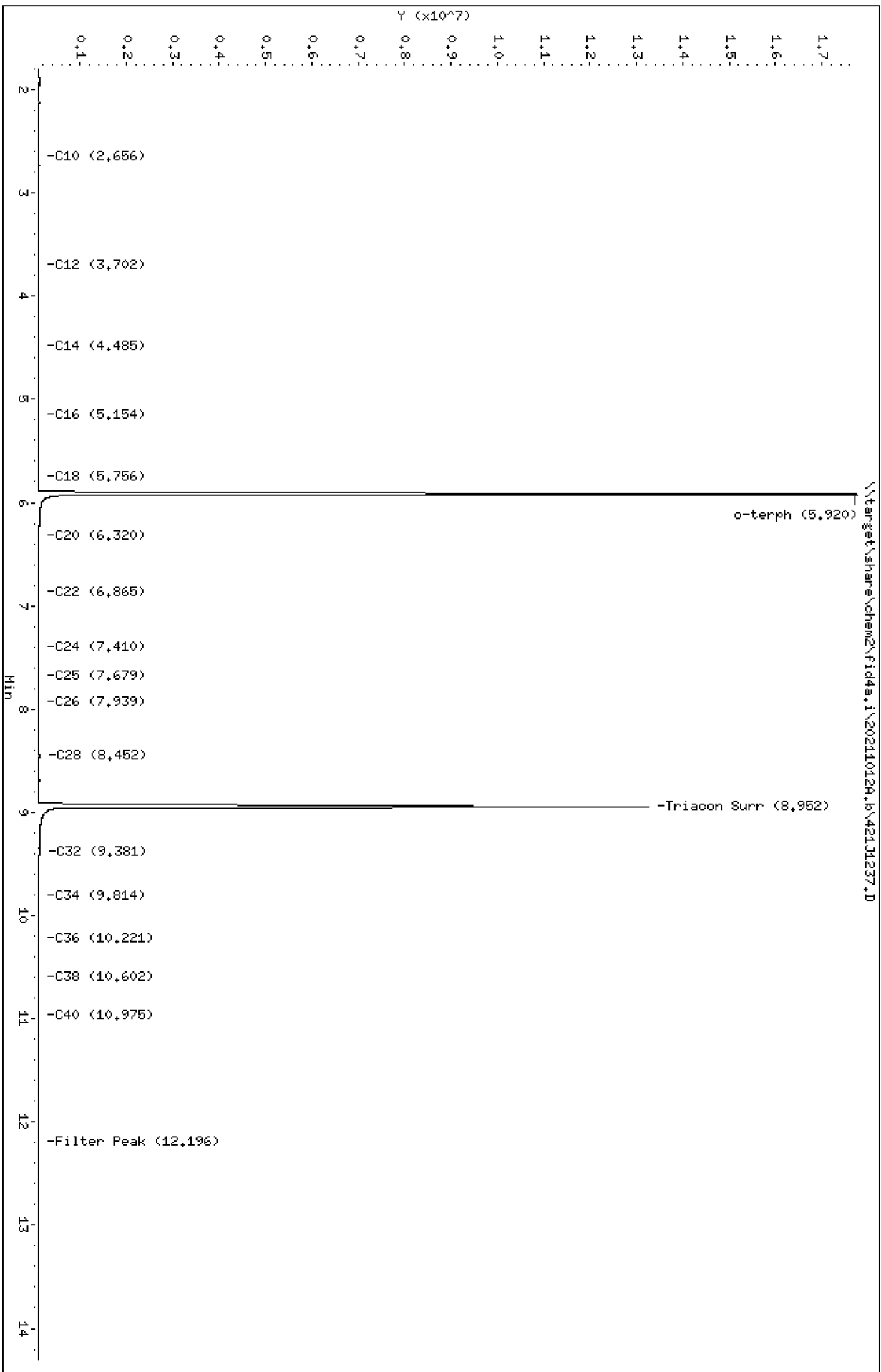
Instrument: fid4a.i

Sample Info: 2110223-06

Operator: TWC

Column phase: RTX-1

Column diameter: 0.25



Analytical Resources Inc.
TPH Quantitation Report

Data file: 20211012A.b/421J1237.D

Method: 20211012A.b\FID4TPH.m

Instrument: fid4a.i, TWC

Report Date: 10/14/2021

Macro: 09-SEP-2019

Calibration Dates: Gas:XX-XXX-XXXX Diesel:07-SEP-2021 M.Oil:14-APR-2021

ARI ID: 21I0223-06

Client ID:

Injection: 12-OCT-2021 23:40

Dilution Factor: 1

RT Std: 419H1603.D

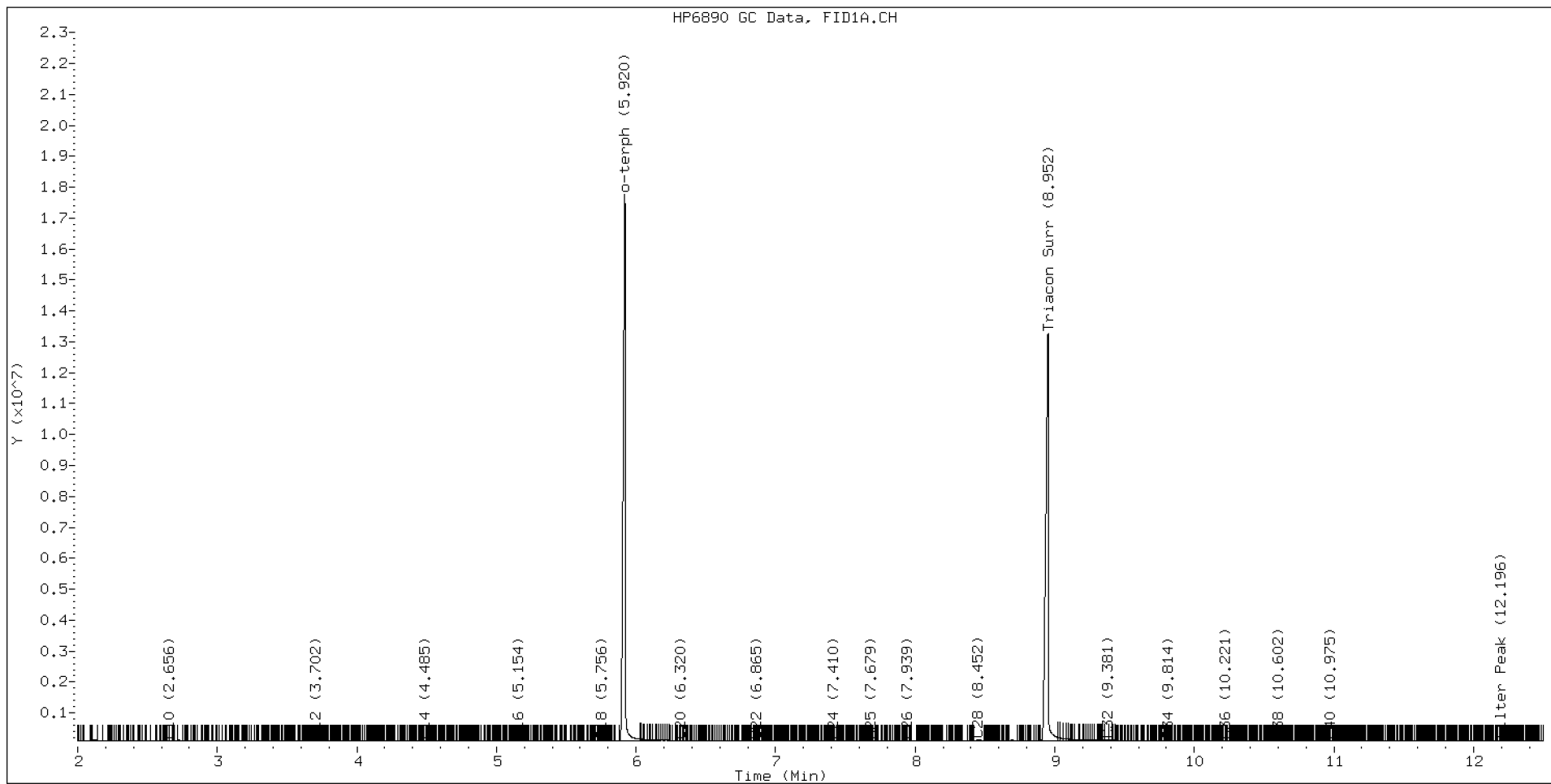
FID:4A RESULTS								
Compound	RT	Shift	Height	Area	Method	Range	Total Area	Conc (mg/L)
C8	1.342	-0.012	80231	193598	WATPHD	(C12-C24)	861525	5.4
C10	2.656	-0.008	1985	1379	WATPHM	(C24-C38)	1626508	12.4
C12	3.702	0.002	4517	2180				
C14	4.485	-0.002	3626	2300				
C16	5.154	-0.003	1628	741				
C18	5.756	-0.002	2127	1267				
C20	6.320	0.008	9356	2309				
C22	6.865	0.000	939	217				
C24	7.410	0.000	993	188				
C25	7.679	0.000	939	227				
C26	7.939	-0.002	1382	261				
C28	8.452	0.003	31389	53111				
C32	9.381	-0.004	18462	29413				
C34	9.814	0.000	6818	1696				
Filter Peak	12.196	0.001	8294	1650	BUNKERC	(C10-C38)	2715518	44.8
C36	10.221	0.001	6728	3594				
C38	10.602	-0.002	6568	1621				
C40	10.975	-0.003	8287	6130				
o-terph	5.920	-0.002	17661909	18694763				
Triacon Surr	8.952	-0.006	13160495	17822287				

Range Times: NW Diesel(3.699 - 7.410) AK102(2.66 - 7.68) Jet A(2.66 - 5.76)
NW M.Oil(7.41 - 10.60) AK103(7.68 - 10.22) OR Diesel(2.66 - 8.45)

Surrogate	Area	Amount
o-Terphenyl	18694763	98.3
Triacontane	17822287	84.1

M Indicates the peak was manually integrated

Analyte	RF	Curve Date
o-Terph Surr	190151.8	07-SEP-2021
Triacon Surr	211827.9	25-OCT-2019
Gas	15000.0	XX-XXX-XXXX
Diesel	158608.3	07-SEP-2021
Motor Oil	131440.7	14-APR-2021
Bunker C	60657.6	13-OCT-2021





Landau Associates, Inc. - Spokane
10 North Post Street, Suite 218
Spokane WA, 99201

Project: Avista Steam Plant
Project Number: Avista Steam Plant
Project Manager: Shane Kostka

Reported:
15-Oct-2021 15:41

MW-23-091521
2110223-07 (Water)

Petroleum Hydrocarbons

Method: NWTPH-Dx

Sampled: 09/15/2021 14:00

Instrument: FID4

Analyzed: 13-Oct-2021 00:00

Sample Preparation: Preparation Method: EPA 3510C SepF
Preparation Batch: BJ10575 Sample Size: 500 mL
Prepared: 22-Sep-2021 Final Volume: 1 mL

Sample Cleanup: Cleanup Method: Silica Gel
Cleanup Batch: CJJ0067 Initial Volume: 1 mL
Cleaned: 10-Oct-2021 Final Volume: 1 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)	DRO	1	0.100	ND	mg/L	U
Motor Oil Range Organics (C24-C38)	RRO	1	0.200	ND	mg/L	U
Bunker C Range Organics (C10-C38)		1	0.500	ND	mg/L	U
Surrogate: o-Terphenyl			50-150 %	110	%	

Data File: \\target\share\chem2\fid4a.i\20211012a.b\421J1238.D

Page 1

Date : 13-OCT-2021 00:00

Client ID:

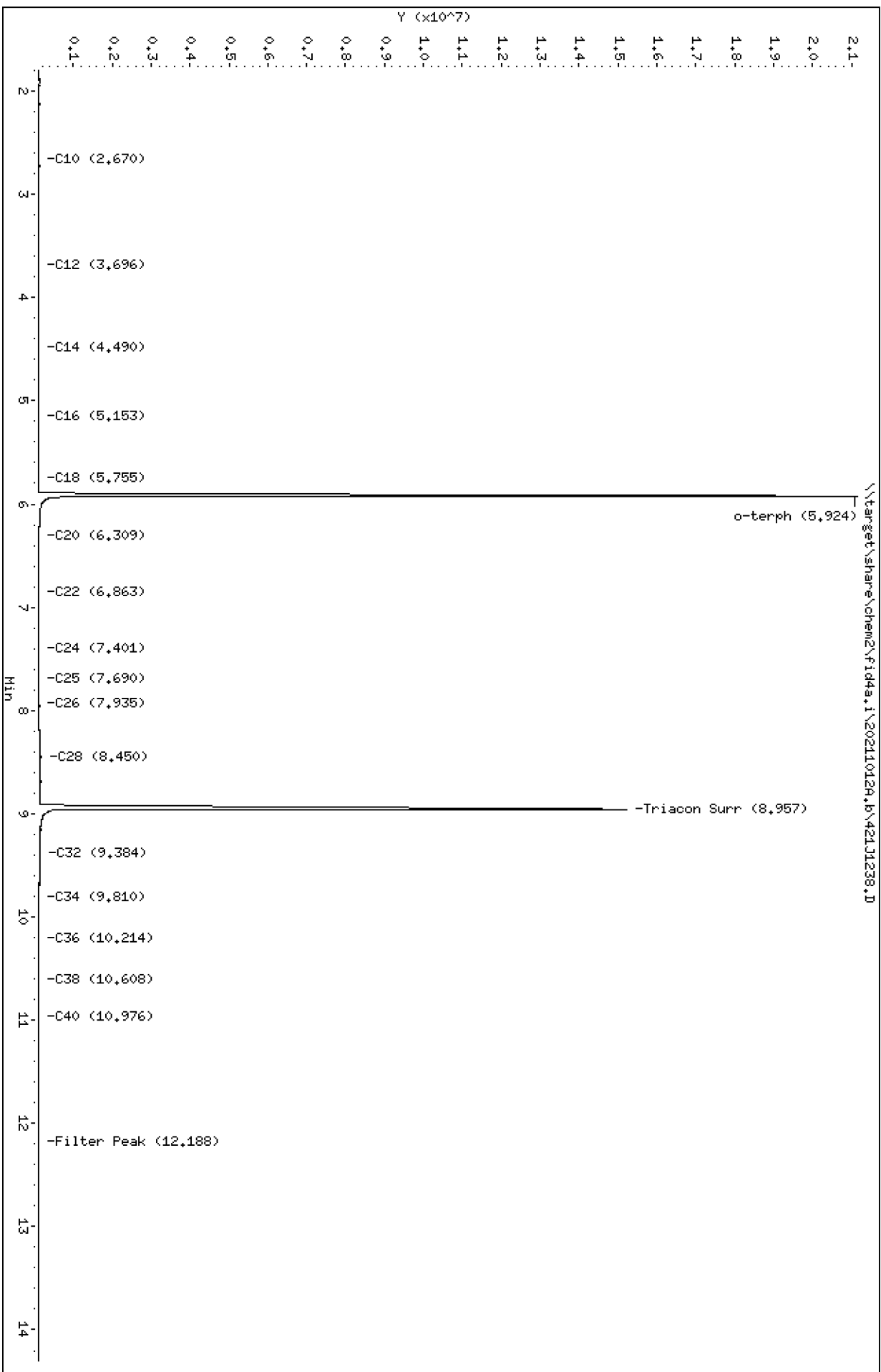
Instrument: fid4a.i

Sample Info: 2110223-07

Operator: TWC

Column phase: RTX-1

Column diameter: 0.25



Analytical Resources Inc.
TPH Quantitation Report

Data file: 20211012A.b/421J1238.D

Method: 20211012A.b\FID4TPH.m

Instrument: fid4a.i, TWC

Report Date: 10/14/2021

Macro: 09-SEP-2019

Calibration Dates: Gas:XX-XXX-XXXX Diesel:07-SEP-2021 M.Oil:14-APR-2021

ARI ID: 21I0223-07

Client ID:

Injection: 13-OCT-2021 00:00

Dilution Factor: 1

RT Std: 419H1603.D

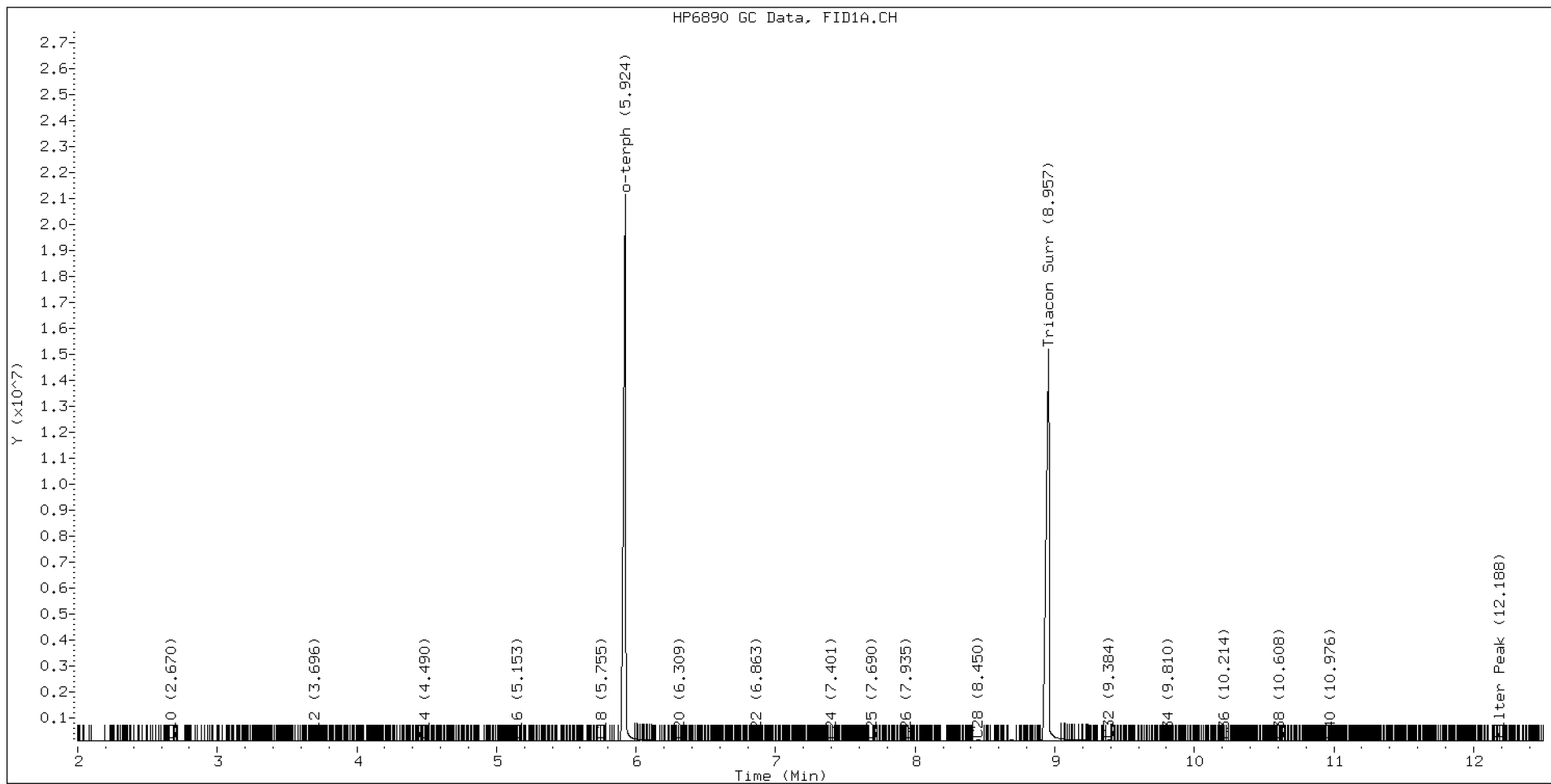
FID:4A RESULTS								
Compound	RT	Shift	Height	Area	Method	Range	Total Area	Conc (mg/L)
C8	1.341	-0.013	79775	198184	WATPHD	(C12-C24)	1528821	9.6
C10	2.670	0.006	6040	10380	WATPHM	(C24-C38)	3501322	26.6
C12	3.696	-0.003	6065	2100				
C14	4.490	0.003	4232	1644				
C16	5.153	-0.004	2690	1746				
C18	5.755	-0.003	4550	5700				
C20	6.309	-0.003	12865	10673				
C22	6.863	-0.002	5233	1034				
C24	7.401	-0.009	9323	5456				
C25	7.690	0.011	14856	20240				
C26	7.935	-0.007	14885	7915				
C28	8.450	0.001	64571	162043				
C32	9.384	-0.002	41200	74025				
C34	9.810	-0.004	16085	7188				
Filter Peak	12.188	-0.007	429	106	BUNKERC	(C10-C38)	5447096	89.8
C36	10.214	-0.007	11218	2220				
C38	10.608	0.004	6502	3544				
C40	10.976	-0.002	4109	1821				
o-terph	5.924	0.002	21052553	23543846				
Triacon Surr	8.957	-0.001	15111852	23106157				

Range Times: NW Diesel(3.699 - 7.410) AK102(2.66 - 7.68) Jet A(2.66 - 5.76)
NW M.Oil(7.41 - 10.60) AK103(7.68 - 10.22) OR Diesel(2.66 - 8.45)

Surrogate	Area	Amount
o-Terphenyl	23543846	123.8
Triacontane	23106157	109.1

M Indicates the peak was manually integrated

Analyte	RF	Curve Date
o-Terph Surr	190151.8	07-SEP-2021
Triacon Surr	211827.9	25-OCT-2019
Gas	15000.0	XX-XXX-XXXX
Diesel	158608.3	07-SEP-2021
Motor Oil	131440.7	14-APR-2021
Bunker C	60657.6	13-OCT-2021





Landau Associates, Inc. - Spokane
10 North Post Street, Suite 218
Spokane WA, 99201

Project: Avista Steam Plant
Project Number: Avista Steam Plant
Project Manager: Shane Kostka

Reported:
15-Oct-2021 15:41

MW-6-091521
2110223-08 (Water)

Petroleum Hydrocarbons

Method: NWTPH-Dx

Sampled: 09/15/2021 14:30

Instrument: FID4

Analyzed: 13-Oct-2021 01:20

Sample Preparation: Preparation Method: EPA 3510C SepF
Preparation Batch: BJ10575 Sample Size: 500 mL
Prepared: 22-Sep-2021 Final Volume: 1 mL

Sample Cleanup: Cleanup Method: Silica Gel
Cleanup Batch: CJJ0067 Initial Volume: 1 mL
Cleaned: 10-Oct-2021 Final Volume: 1 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)	DRO	1	0.100	ND	mg/L	U
Motor Oil Range Organics (C24-C38)	RRO	1	0.200	ND	mg/L	U
Bunker C Range Organics (C10-C38)		1	0.500	ND	mg/L	U
Surrogate: o-Terphenyl			50-150 %	108	%	

Data File: \\target\share\chem2\fid4a.i\20211012a.b\421J1242.D

Page 1

Date : 13-OCT-2021 01:20

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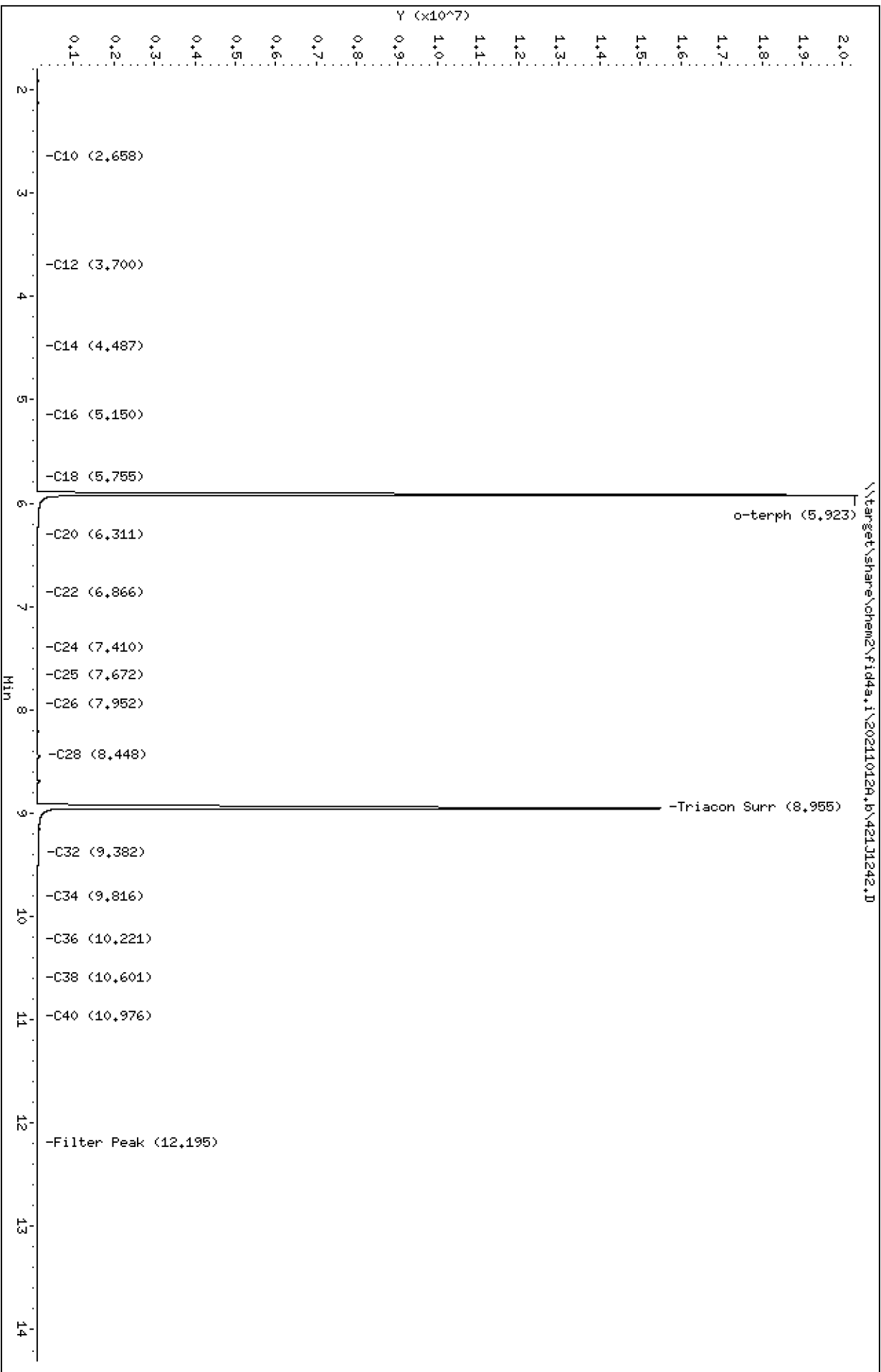
Instrument: fid4a.i

Sample Info: 2110223-08

Operator: TWC

Column phase: RTX-1

Column diameter: 0.25



Analytical Resources Inc.
TPH Quantitation Report

Data file: 20211012A.b/421J1242.D

Method: 20211012A.b\FID4TPH.m

Instrument: fid4a.i, TWC

Report Date: 10/14/2021

Macro: 09-SEP-2019

Calibration Dates: Gas:XX-XXX-XXXX Diesel:07-SEP-2021 M.Oil:14-APR-2021

ARI ID: 21I0223-08

Client ID:

Injection: 13-OCT-2021 01:20

Dilution Factor: 1

RT Std: 419H1603.D

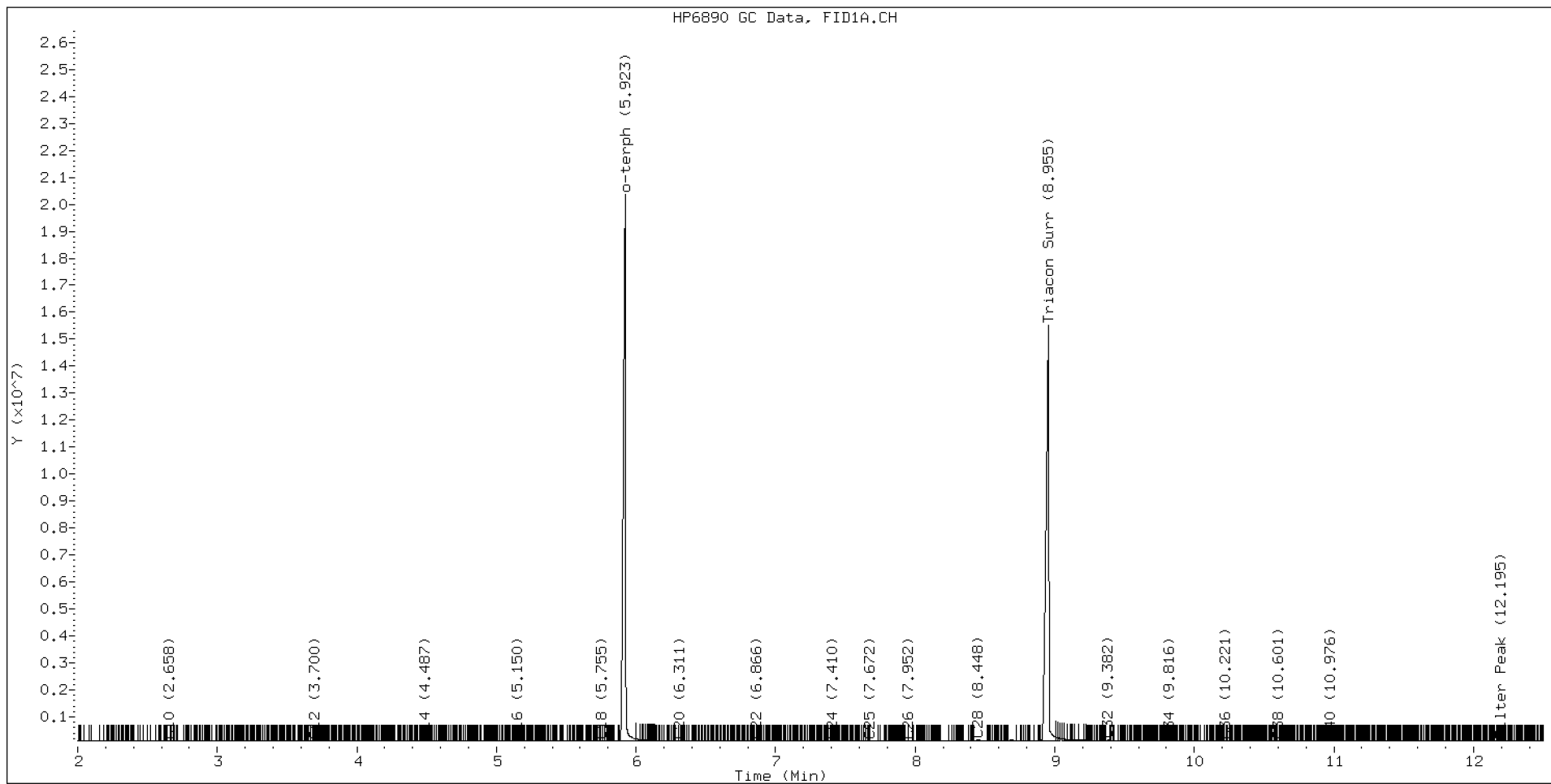
FID:4A RESULTS								
Compound	RT	Shift	Height	Area	Method	Range	Total Area	Conc (mg/L)
C8	1.341	-0.013	76202	170776	WATPHD	(C12-C24)	1358342	8.6
C10	2.658	-0.006	2672	2171	WATPHM	(C24-C38)	2759465	21.0
C12	3.700	0.000	5271	1807				
C14	4.487	0.000	3776	749				
C16	5.150	-0.007	2492	1503				
C18	5.755	-0.003	4555	4618				
C20	6.311	-0.001	13474	12247				
C22	6.866	0.000	3889	1502				
C24	7.410	-0.000	4253	1231				
C25	7.672	-0.007	4672	1368				
C26	7.952	0.011	12281	11404				
C28	8.448	-0.000	64998	130678				
C32	9.382	-0.003	31162	56470				
C34	9.816	0.001	12996	3238				
Filter Peak	12.195	-0.000	9575	4295	BUNKERC	(C10-C38)	4407227	72.7
C36	10.221	0.001	12819	6982				
C38	10.601	-0.003	11806	7481				
C40	10.976	-0.002	11428	6245				
o-terph	5.923	0.001	20256779	23136113				
Triacon Surr	8.955	-0.003	15404776	22108934				

Range Times: NW Diesel(3.699 - 7.410) AK102(2.66 - 7.68) Jet A(2.66 - 5.76)
NW M.Oil(7.41 - 10.60) AK103(7.68 - 10.22) OR Diesel(2.66 - 8.45)

Surrogate	Area	Amount
o-Terphenyl	23136113	121.7
Triacontane	22108934	104.4

M Indicates the peak was manually integrated

Analyte	RF	Curve Date
o-Terph Surr	190151.8	07-SEP-2021
Triacon Surr	211827.9	25-OCT-2019
Gas	15000.0	XX-XXX-XXXX
Diesel	158608.3	07-SEP-2021
Motor Oil	131440.7	14-APR-2021
Bunker C	60657.6	13-OCT-2021





Landau Associates, Inc. - Spokane
10 North Post Street, Suite 218
Spokane WA, 99201

Project: Avista Steam Plant
Project Number: Avista Steam Plant
Project Manager: Shane Kostka

Reported:
15-Oct-2021 15:41

MW-28-091521
2110223-09 (Water)

Petroleum Hydrocarbons

Method: NWTPH-Dx

Sampled: 09/15/2021 15:20

Instrument: FID4

Analyzed: 13-Oct-2021 01:40

Sample Preparation: Preparation Method: EPA 3510C SepF
Preparation Batch: BJI0575 Sample Size: 500 mL
Prepared: 22-Sep-2021 Final Volume: 1 mL

Sample Cleanup: Cleanup Method: Silica Gel
Cleanup Batch: CJJ0067 Initial Volume: 1 mL
Cleaned: 10-Oct-2021 Final Volume: 1 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)	DRO	1	0.100	ND	mg/L	U
Motor Oil Range Organics (C24-C38)	RRO	1	0.200	ND	mg/L	U
Bunker C Range Organics (C10-C38)		1	0.500	ND	mg/L	U
Surrogate: o-Terphenyl			50-150 %	112	%	

Data File: \\target\share\chem2\fid4a.i\20211012a.b\421J1243.D

Page 1

Date : 13-OCT-2021 01:40

Client ID:

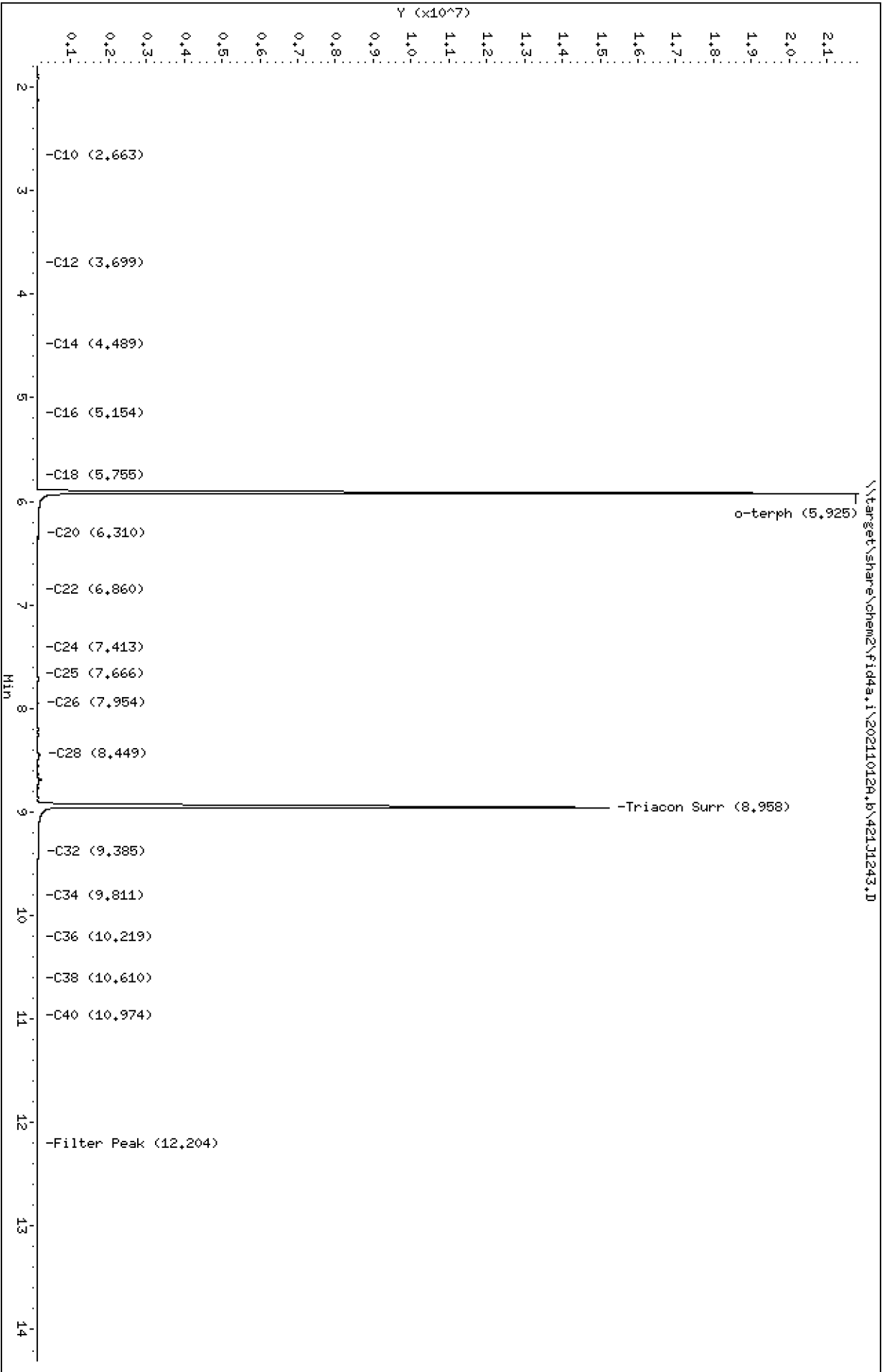
Instrument: fid4a.i

Sample Info: 2110223-09

Operator: TWC

Column phase: RTX-1

Column diameter: 0.25



Analytical Resources Inc.
TPH Quantitation Report

Data file: 20211012A.b/421J1243.D

Method: 20211012A.b\FID4TPH.m

Instrument: fid4a.i, TWC

Report Date: 10/14/2021

Macro: 09-SEP-2019

Calibration Dates: Gas:XX-XXX-XXXX Diesel:07-SEP-2021 M.Oil:14-APR-2021

ARI ID: 21I0223-09

Client ID:

Injection: 13-OCT-2021 01:40

Dilution Factor: 1

RT Std: 419H1603.D

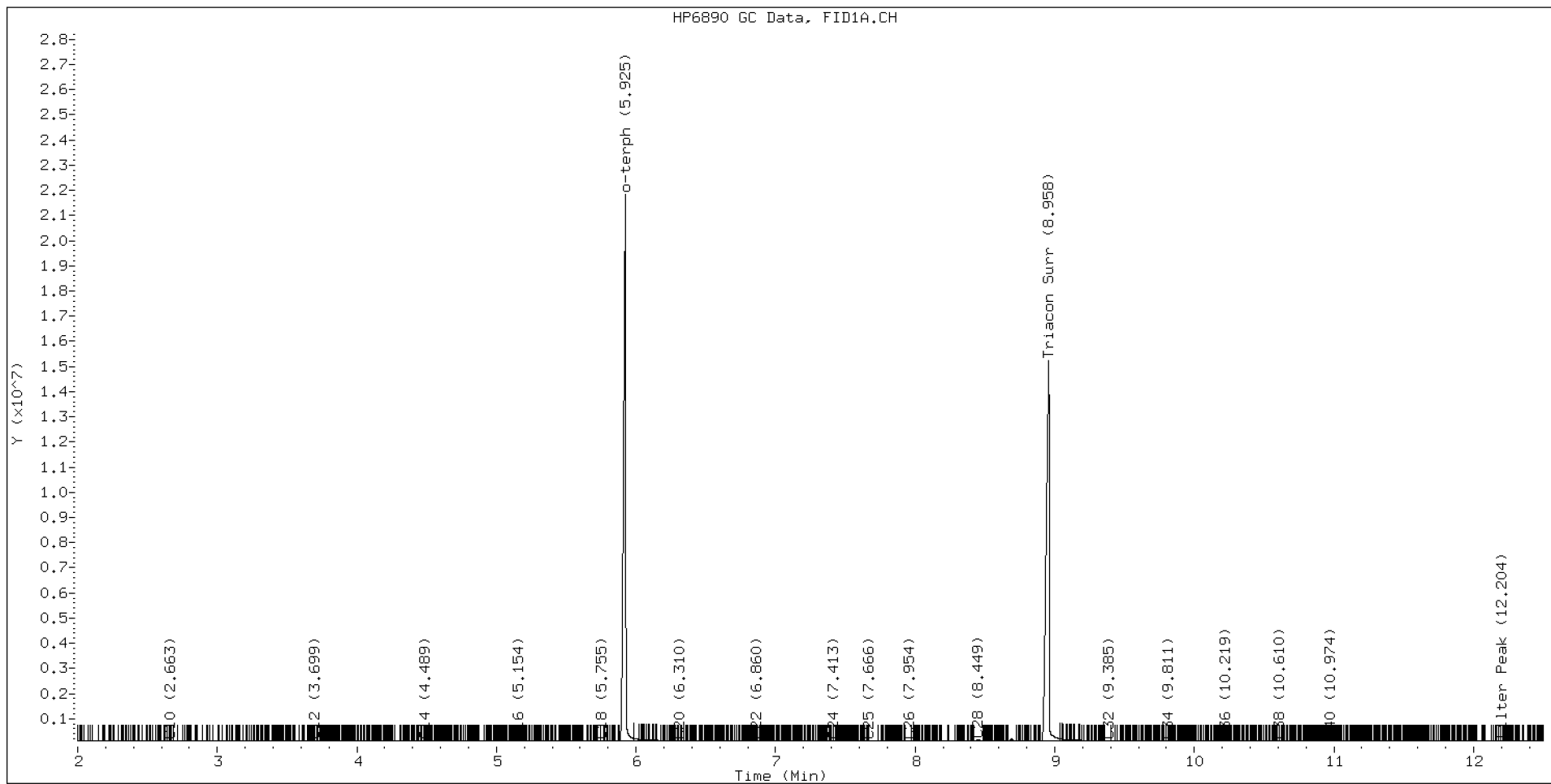
FID:4A RESULTS								
Compound	RT	Shift	Height	Area	Method	Range	Total Area	Conc (mg/L)
C8	1.342	-0.012	82699	195181	WATPHD	(C12-C24)	2258419	14.2
C10	2.663	-0.002	4364	1652	WATPHM	(C24-C38)	2907244	22.1
C12	3.699	-0.001	5824	1729				
C14	4.489	0.002	4003	1577				
C16	5.154	-0.003	4863	2569				
C18	5.755	-0.002	10616	10556				
C20	6.310	-0.002	19857	15482				
C22	6.860	-0.005	10929	5417				
C24	7.413	0.003	12134	9190				
C25	7.666	-0.013	11584	5059				
C26	7.954	0.013	18637	38334				
C28	8.449	0.000	65151	131739				
C32	9.385	0.000	32821	67794				
C34	9.811	-0.003	10985	5981				
Filter Peak	12.204	0.008	357	136	BUNKERC	(C10-C38)	5553569	91.6
C36	10.219	-0.002	8242	1640				
C38	10.610	0.006	4248	1449				
C40	10.974	-0.005	2624	522				
o-terph	5.925	0.003	21725303	23971895				
Triacon Surr	8.958	0.000	15138217	22420451				

Range Times: NW Diesel(3.699 - 7.410) AK102(2.66 - 7.68) Jet A(2.66 - 5.76)
NW M.Oil(7.41 - 10.60) AK103(7.68 - 10.22) OR Diesel(2.66 - 8.45)

Surrogate	Area	Amount
o-Terphenyl	23971895	126.1
Triacontane	22420451	105.8

M Indicates the peak was manually integrated

Analyte	RF	Curve Date
o-Terph Surr	190151.8	07-SEP-2021
Triacon Surr	211827.9	25-OCT-2019
Gas	15000.0	XX-XXX-XXXX
Diesel	158608.3	07-SEP-2021
Motor Oil	131440.7	14-APR-2021
Bunker C	60657.6	13-OCT-2021





Landau Associates, Inc. - Spokane
10 North Post Street, Suite 218
Spokane WA, 99201

Project: Avista Steam Plant
Project Number: Avista Steam Plant
Project Manager: Shane Kostka

Reported:
15-Oct-2021 15:41

MW-7-091521
2110223-10 (Water)

Petroleum Hydrocarbons

Method: NWTPH-Dx

Sampled: 09/15/2021 16:30

Instrument: FID4

Analyzed: 13-Oct-2021 02:00

Sample Preparation: Preparation Method: EPA 3510C SepF
Preparation Batch: BJI0575 Sample Size: 500 mL
Prepared: 22-Sep-2021 Final Volume: 1 mL

Sample Cleanup: Cleanup Method: Silica Gel
Cleanup Batch: CJJ0067 Initial Volume: 1 mL
Cleaned: 10-Oct-2021 Final Volume: 1 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)	DRO	1	0.100	ND	mg/L	U
Motor Oil Range Organics (C24-C38)	RRO	1	0.200	ND	mg/L	U
Bunker C Range Organics (C10-C38)		1	0.500	ND	mg/L	U
Surrogate: o-Terphenyl			50-150 %	108	%	

Data File: \\target\share\chem2\fid4a.i\20211012a.b\421J1244.D

Page 1

Date : 13-OCT-2021 02:00

Client ID:

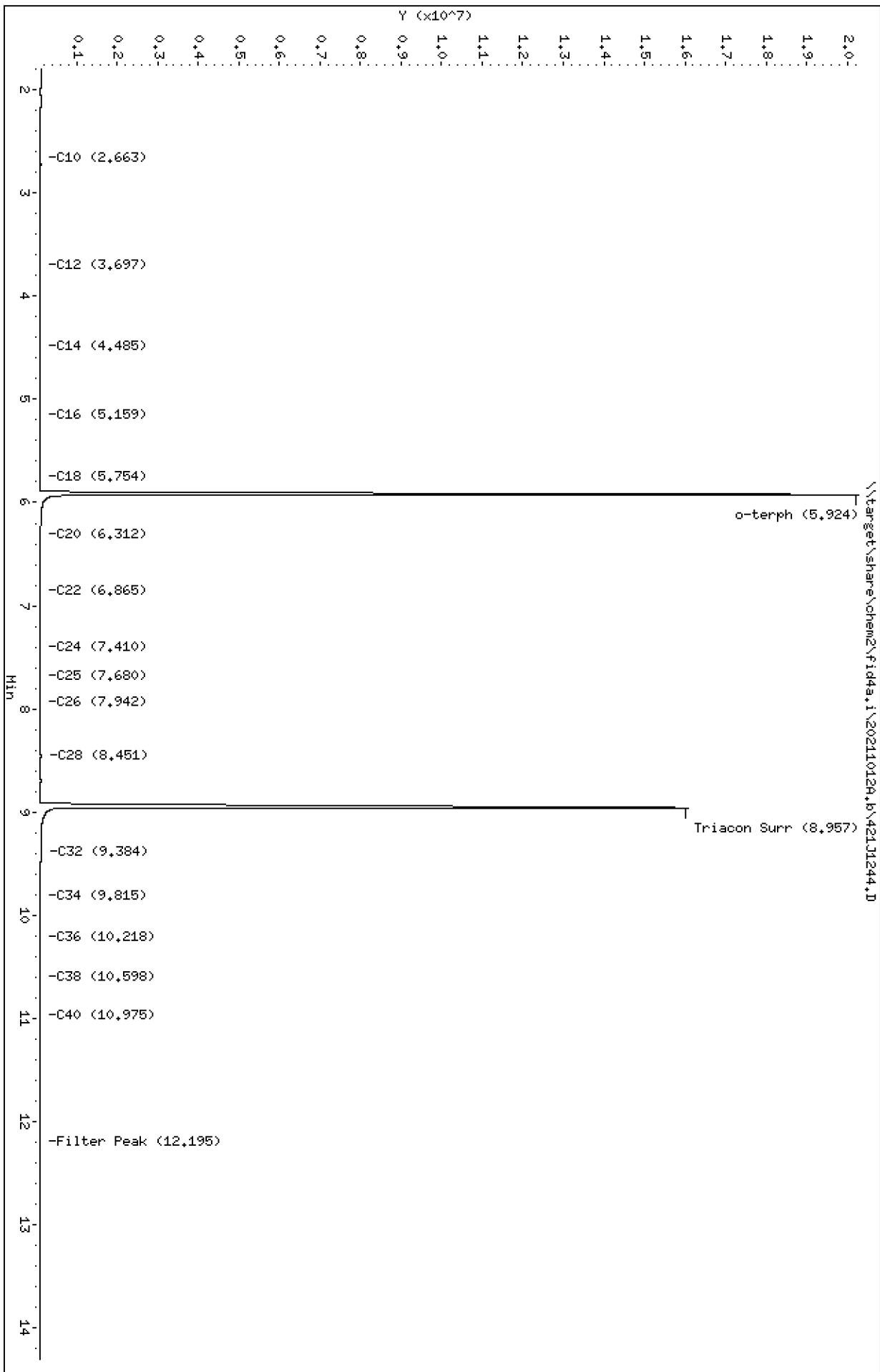
Sample Info: 2110223-10

Instrument: fid4a.i

Operator: TWC

Column diameter: 0.25

Column phase: RTX-1



Analytical Resources Inc.
TPH Quantitation Report

Data file: 20211012A.b/421J1244.D

Method: 20211012A.b\FID4TPH.m

Instrument: fid4a.i, TWC

Report Date: 10/14/2021

Macro: 09-SEP-2019

Calibration Dates: Gas:XX-XXX-XXXX Diesel:07-SEP-2021 M.Oil:14-APR-2021

ARI ID: 21I0223-10

Client ID:

Injection: 13-OCT-2021 02:00

Dilution Factor: 1

RT Std: 419H1603.D

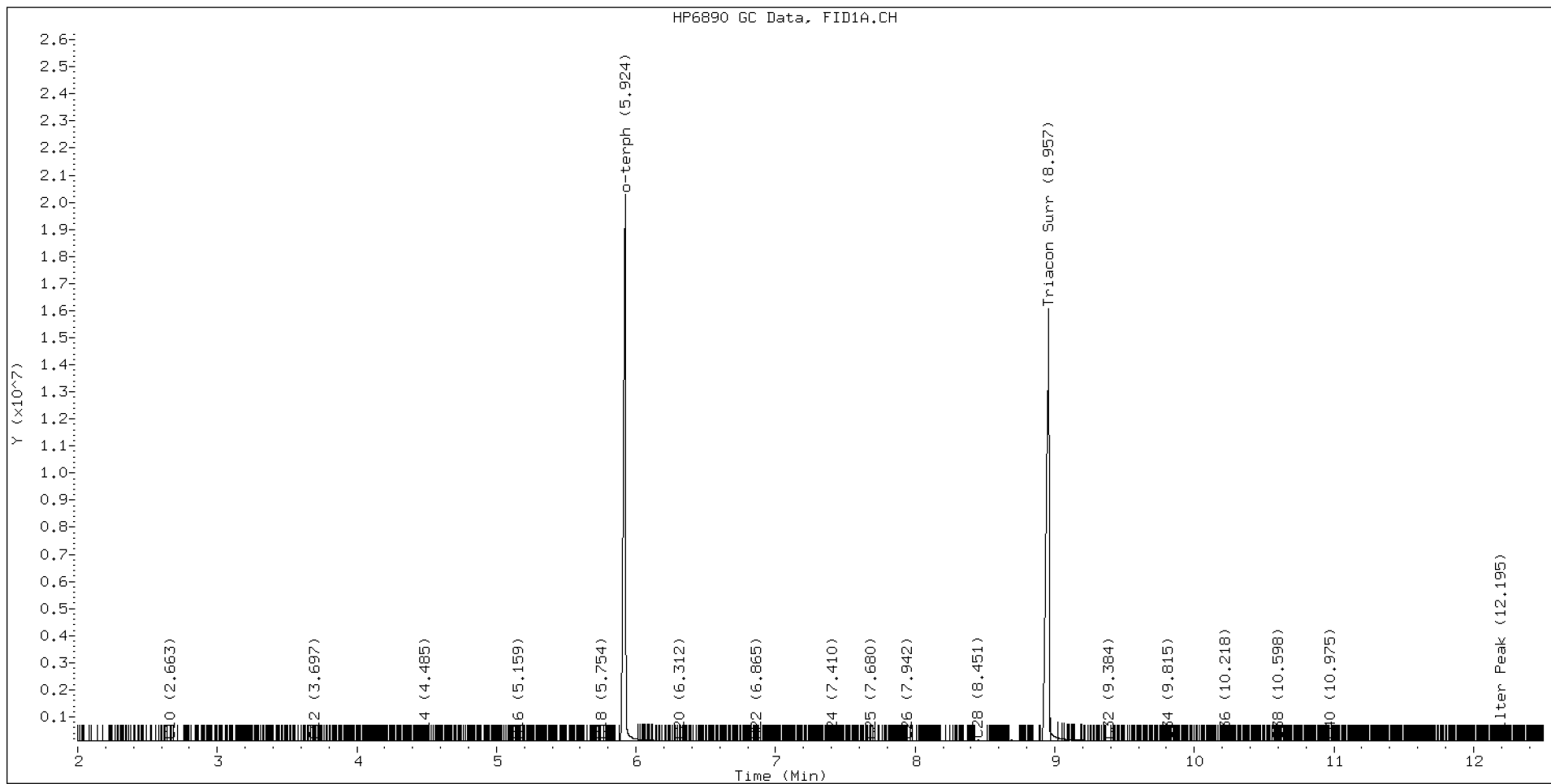
FID:4A RESULTS								
Compound	RT	Shift	Height	Area	Method	Range	Total Area	Conc (mg/L)
C8	1.340	-0.014	90510	229941	WATPHD	(C12-C24)	1041636	6.6
C10	2.663	-0.002	10907	1632	WATPHM	(C24-C38)	2763030	21.0
C12	3.697	-0.002	6615	2604				
C14	4.485	-0.002	2972	875				
C16	5.159	0.002	878	273				
C18	5.754	-0.004	2271	2273				
C20	6.312	0.000	11876	8080				
C22	6.865	-0.001	2407	1232				
C24	7.410	-0.001	2603	881				
C25	7.680	0.001	2795	680				
C26	7.942	0.001	3587	1051				
C28	8.451	0.003	46031	85289				
C32	9.384	-0.002	26962	49515				
C34	9.815	0.001	11044	2740				
Filter Peak	12.195	-0.001	10159	2530	BUNKERC	(C10-C38)	4389779	72.4
C36	10.218	-0.002	10488	6241				
C38	10.598	-0.006	10164	5029				
C40	10.975	-0.004	11086	5503				
o-terph	5.924	0.002	20179154	23005952				
Triacon Surr	8.957	-0.001	15988796	22002675				

Range Times: NW Diesel(3.699 - 7.410) AK102(2.66 - 7.68) Jet A(2.66 - 5.76)
NW M.Oil(7.41 - 10.60) AK103(7.68 - 10.22) OR Diesel(2.66 - 8.45)

Surrogate	Area	Amount
o-Terphenyl	23005952	121.0
Triacontane	22002675	103.9

M Indicates the peak was manually integrated

Analyte	RF	Curve Date
o-Terph Surr	190151.8	07-SEP-2021
Triacon Surr	211827.9	25-OCT-2019
Gas	15000.0	XX-XXX-XXXX
Diesel	158608.3	07-SEP-2021
Motor Oil	131440.7	14-APR-2021
Bunker C	60657.6	13-OCT-2021





Landau Associates, Inc. - Spokane
10 North Post Street, Suite 218
Spokane WA, 99201

Project: Avista Steam Plant
Project Number: Avista Steam Plant
Project Manager: Shane Kostka

Reported:
15-Oct-2021 15:41

MW-25-091521
21I0223-11 (Water)

Petroleum Hydrocarbons

Method: NWTPH-Dx

Sampled: 09/15/2021 17:10

Instrument: FID4

Analyzed: 13-Oct-2021 02:20

Sample Preparation: Preparation Method: EPA 3510C SepF
Preparation Batch: BJI0575 Sample Size: 500 mL
Prepared: 22-Sep-2021 Final Volume: 1 mL

Sample Cleanup: Cleanup Method: Silica Gel
Cleanup Batch: CJJ0067 Initial Volume: 1 mL
Cleaned: 10-Oct-2021 Final Volume: 1 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)	DRO	1	0.100	ND	mg/L	U
Motor Oil Range Organics (C24-C38)	RRO	1	0.200	ND	mg/L	U
Bunker C Range Organics (C10-C38)		1	0.500	ND	mg/L	U
Surrogate: o-Terphenyl			50-150 %	109	%	

Data File: \\target\share\chem2\fid4a.i\20211012a.b\421J1245.D

Page 1

Date : 13-OCT-2021 02:20

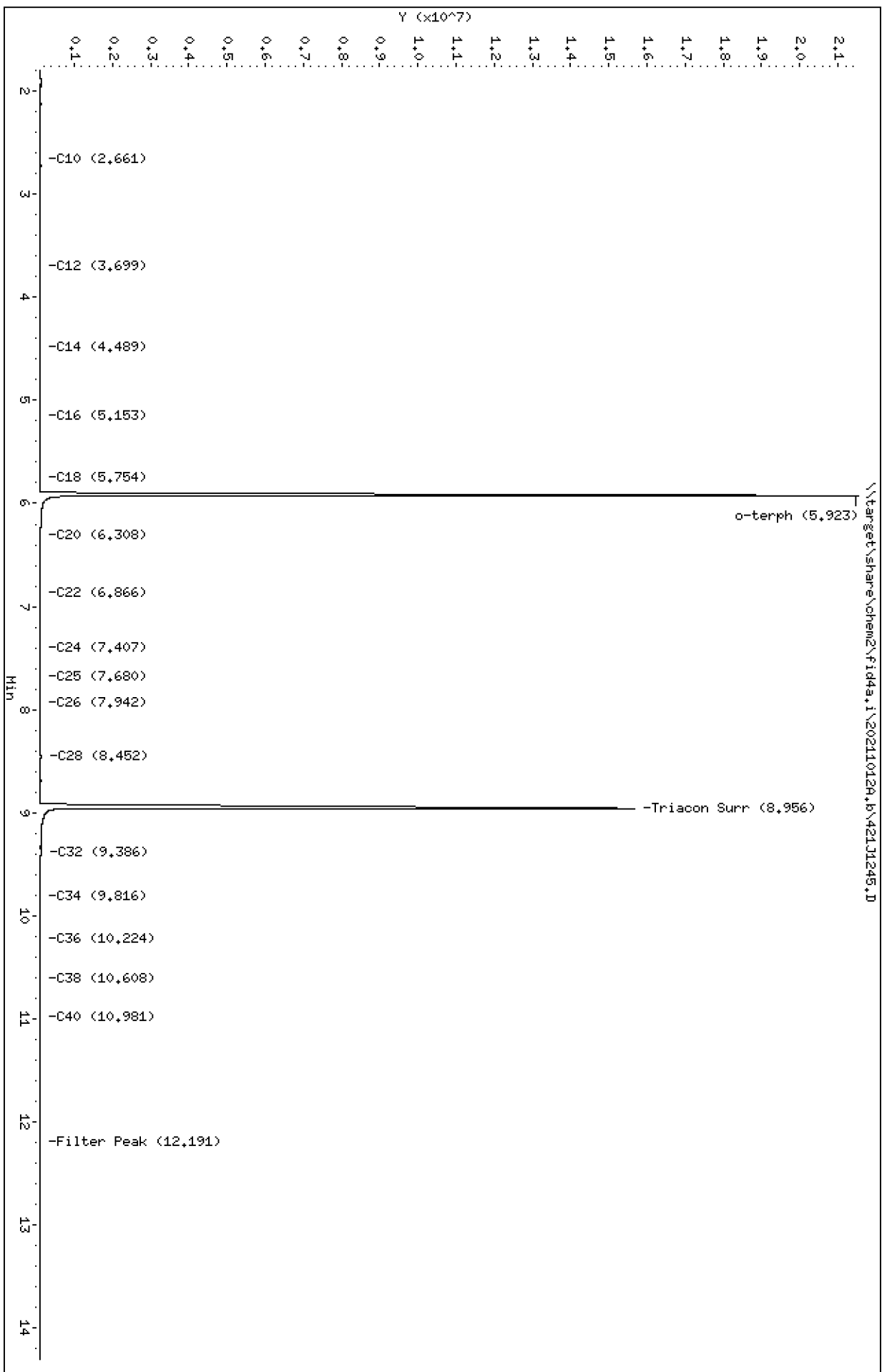
Client ID:

Instrument: fid4a.i

Sample Info: 2110223-11

Column phase: RTX-1

Operator: TWC
Column diameter: 0.25



Analytical Resources Inc.
TPH Quantitation Report

Data file: 20211012A.b/421J1245.D

Method: 20211012A.b\FID4TPH.m

Instrument: fid4a.i, TWC

Report Date: 10/14/2021

Macro: 09-SEP-2019

Calibration Dates: Gas:XX-XXX-XXXX Diesel:07-SEP-2021 M.Oil:14-APR-2021

ARI ID: 21I0223-11

Client ID:

Injection: 13-OCT-2021 02:20

Dilution Factor: 1

RT Std: 419H1603.D

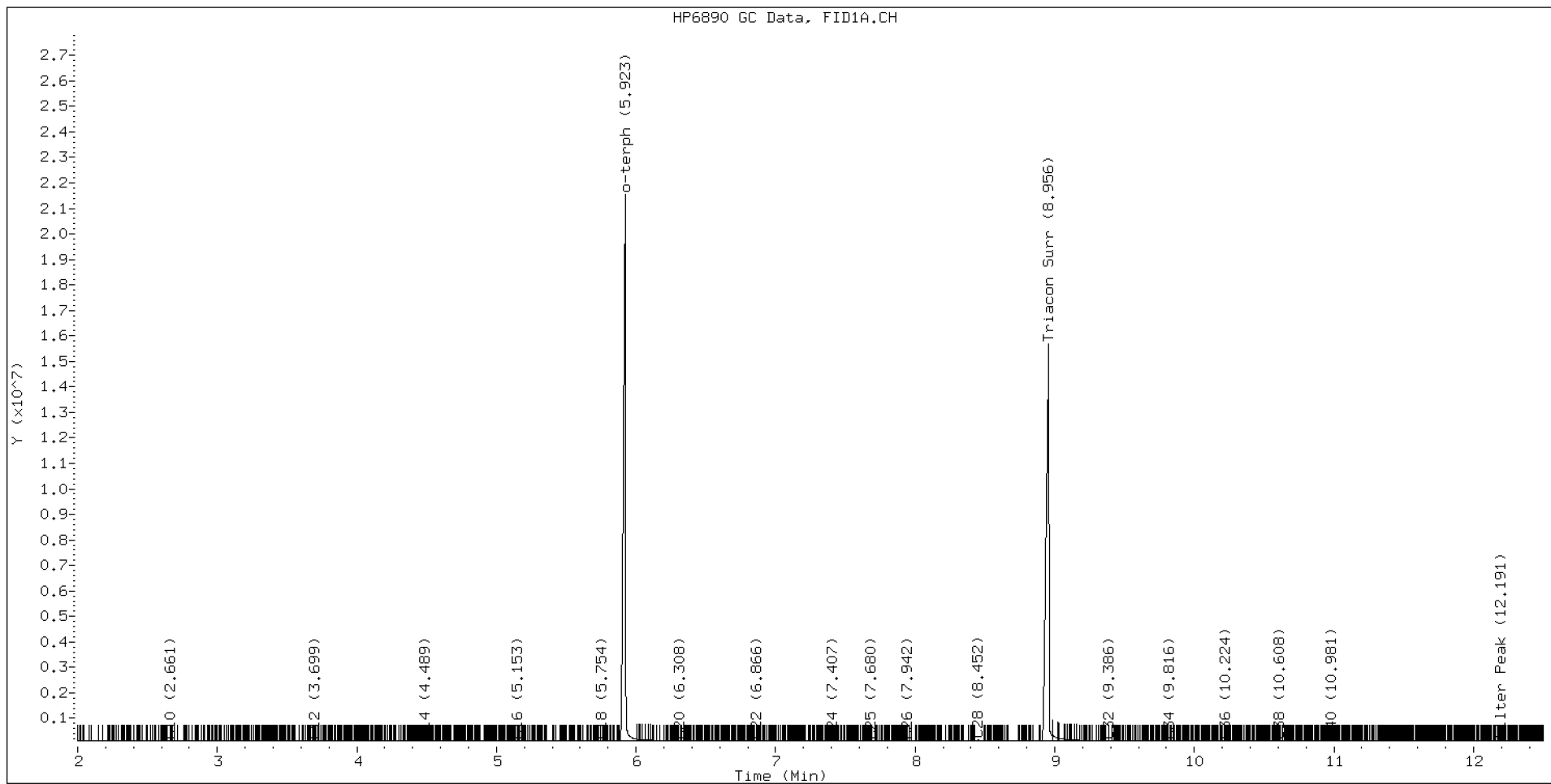
FID:4A RESULTS								
Compound	RT	Shift	Height	Area	Method	Range	Total Area	Conc (mg/L)
C8	1.341	-0.013	82881	197619	WATPHD	(C12-C24)	1378590	8.7
C10	2.661	-0.004	6410	7635	WATPHM	(C24-C38)	2328580	17.7
C12	3.699	-0.001	7938	3522				
C14	4.489	0.002	6036	1775				
C16	5.153	-0.004	3368	997				
C18	5.754	-0.004	4260	3903				
C20	6.308	-0.004	13673	9675				
C22	6.866	0.001	2119	833				
C24	7.407	-0.003	1836	927				
C25	7.680	0.000	1703	417				
C26	7.942	0.001	2505	727				
C28	8.452	0.004	40582	64566				
C32	9.386	0.001	22783	30392				
C34	9.816	0.001	9164	6281				
Filter Peak	12.191	-0.004	4099	1015	BUNKERC	(C10-C38)	4211460	69.4
C36	10.224	0.004	8891	5260				
C38	10.608	0.004	8599	2531				
C40	10.981	0.003	9544	4249				
o-terph	5.923	0.001	21435926	23298899				
Triacon Surr	8.956	-0.001	15583493	21944794				

Range Times: NW Diesel(3.699 - 7.410) AK102(2.66 - 7.68) Jet A(2.66 - 5.76)
NW M.Oil(7.41 - 10.60) AK103(7.68 - 10.22) OR Diesel(2.66 - 8.45)

Surrogate	Area	Amount
o-Terphenyl	23298899	122.5
Triacontane	21944794	103.6

M Indicates the peak was manually integrated

Analyte	RF	Curve Date
o-Terph Surr	190151.8	07-SEP-2021
Triacon Surr	211827.9	25-OCT-2019
Gas	15000.0	XX-XXX-XXXX
Diesel	158608.3	07-SEP-2021
Motor Oil	131440.7	14-APR-2021
Bunker C	60657.6	13-OCT-2021





Landau Associates, Inc. - Spokane
10 North Post Street, Suite 218
Spokane WA, 99201

Project: Avista Steam Plant
Project Number: Avista Steam Plant
Project Manager: Shane Kostka

Reported:
15-Oct-2021 15:41

MW-25-091521
2110223-12 (Water)

Petroleum Hydrocarbons

Method: NWTPH-Dx

Sampled: 09/15/2021 17:10

Instrument: FID4

Analyzed: 12-Oct-2021 17:00

Sample Preparation: Preparation Method: EPA 3510C SepF
Preparation Batch: BJI0576 Sample Size: 500 mL
Prepared: 22-Sep-2021 Final Volume: 1 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)	DRO	1	0.100	ND	mg/L	U
Motor Oil Range Organics (C24-C38)	RRO	1	0.200	ND	mg/L	U
Bunker C Range Organics (C10-C38)		1	0.500	ND	mg/L	U
Surrogate: o-Terphenyl			50-150 %	113	%	

Data File: \\target\share\chem2\fid4a,1\20211012,b\421J1217.D

Page 1

Date : 12-OCT-2021 17:00

Client ID:

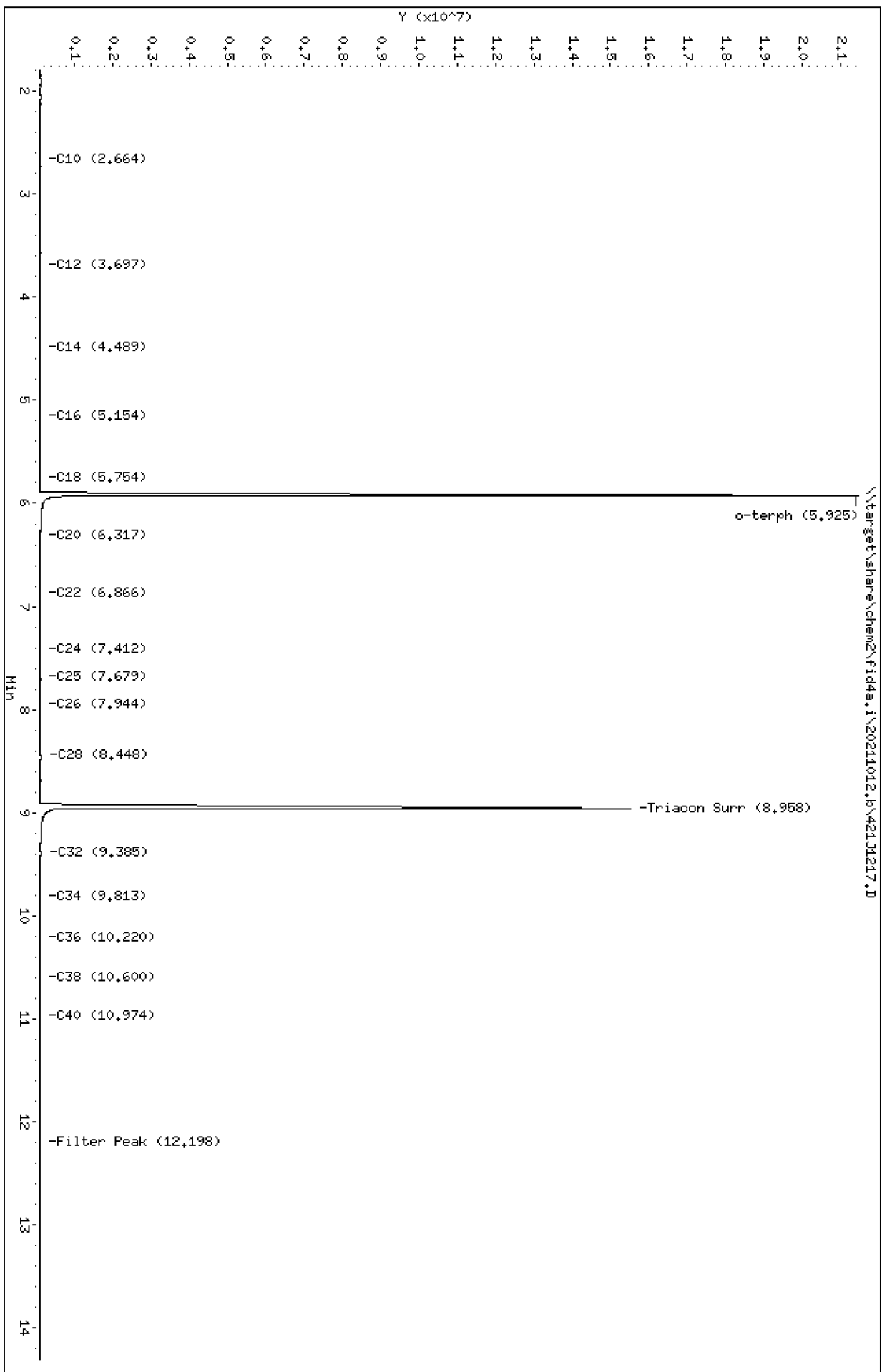
Instrument: fid4a,1

Sample Info: 2110223-12

Operator: TWC

Column phase: RTX-1

Column diameter: 0.25



Analytical Resources Inc.
TPH Quantitation Report

Data file: 20211012.b/421J1217.D

Method: 20211012.b\FID4TPH.m

Instrument: fid4a.i, TWC

Report Date: 10/14/2021

Macro: 09-SEP-2019

Calibration Dates: Gas:XX-XXX-XXXX Diesel:07-SEP-2021 M.Oil:14-APR-2021

ARI ID: 21I0223-12

Client ID:

Injection: 12-OCT-2021 17:00

Dilution Factor: 1

RT Std: 419H1603.D

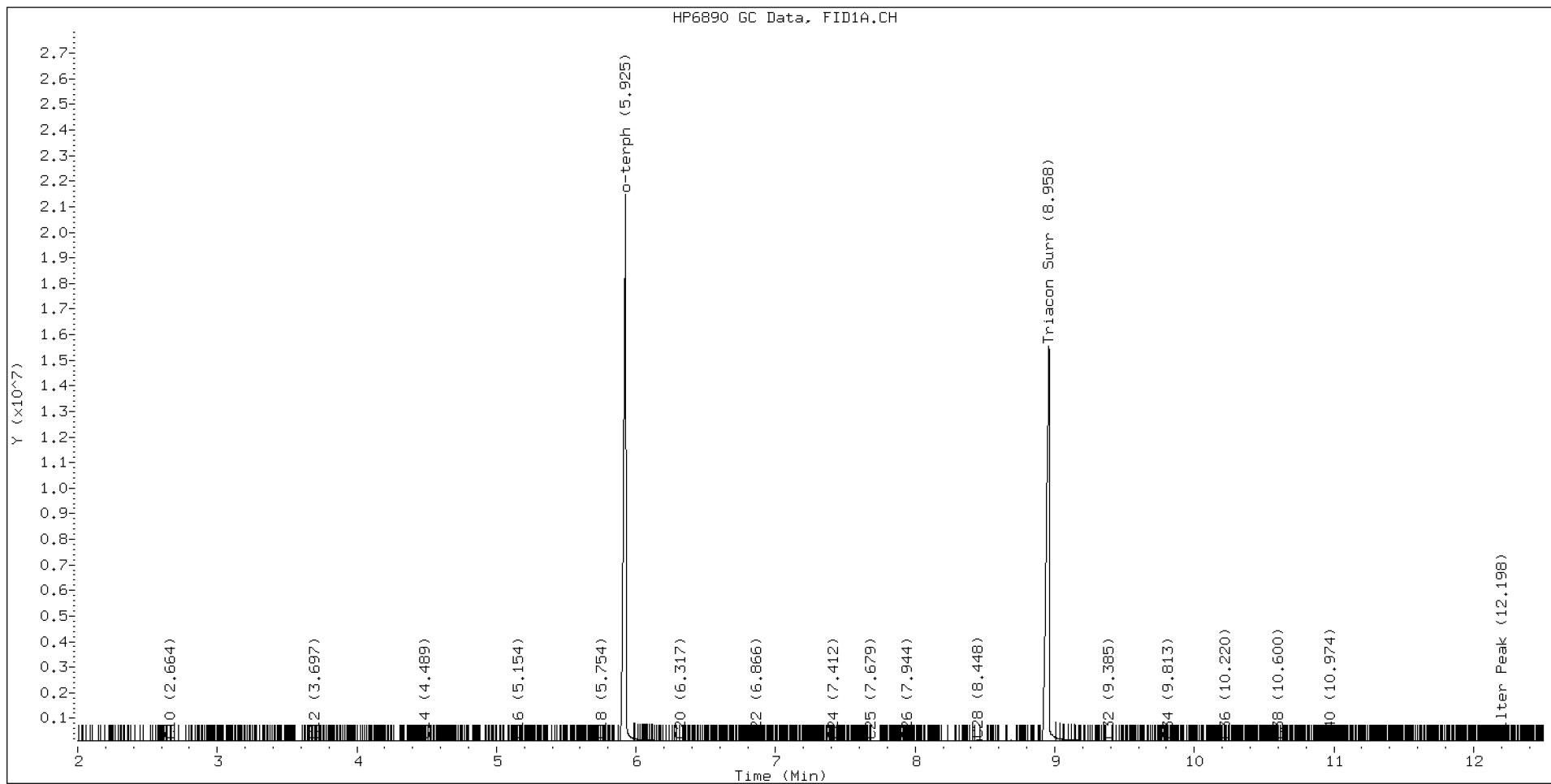
FID:4A RESULTS								
Compound	RT	Shift	Height	Area	Method	Range	Total Area	Conc (mg/L)
C8	1.356	0.002	99673	204111	WATPHD	(C12-C24)	1600834	10.1
C10	2.664	-0.000	8814	2170	WATPHM	(C24-C38)	2210372	16.8
C12	3.697	-0.003	8204	4090				
C14	4.489	0.002	2749	669				
C16	5.154	-0.003	782	421				
C18	5.754	-0.003	3707	3326				
C20	6.317	0.005	15428	16394				
C22	6.866	0.001	7008	2748				
C24	7.412	0.002	6743	2280				
C25	7.679	-0.000	6665	2190				
C26	7.944	0.003	6626	4359				
C28	8.448	-0.000	49706	56301				
C32	9.385	-0.000	24602	50517				
C34	9.813	-0.002	8284	1647				
Filter Peak	12.198	0.003	8984	1341	BUNKERC	(C10-C38)	4418287	61.2
C36	10.220	-0.000	9148	5331				
C38	10.600	-0.003	8888	3082				
C40	10.974	-0.004	10420	5662				
o-terph	5.925	0.003	21369336	24225428				
Triacon Surr	8.958	0.001	15432004	22740595				

Range Times: NW Diesel(3.699 - 7.410) AK102(2.66 - 7.68) Jet A(2.66 - 5.76)
NW M.Oil(7.41 - 10.60) AK103(7.68 - 10.22) OR Diesel(2.66 - 8.45)

Surrogate	Area	Amount
o-Terphenyl	24225428	127.4
Triacontane	22740595	107.4

M Indicates the peak was manually integrated

Analyte	RF	Curve Date
o-Terph Surr	190151.8	07-SEP-2021
Triacon Surr	211827.9	25-OCT-2019
Gas	15000.0	XX-XXX-XXXX
Diesel	158608.3	07-SEP-2021
Motor Oil	131440.7	14-APR-2021
Bunker C	72152.7	14-OCT-2021





Landau Associates, Inc. - Spokane
10 North Post Street, Suite 218
Spokane WA, 99201

Project: Avista Steam Plant
Project Number: Avista Steam Plant
Project Manager: Shane Kostka

Reported:
15-Oct-2021 15:41

DUP-091521
2110223-13 (Water)

Petroleum Hydrocarbons

Method: NWTPH-Dx

Sampled: 09/15/2021 08:00

Instrument: FID4

Analyzed: 13-Oct-2021 02:40

Sample Preparation: Preparation Method: EPA 3510C SepF
Preparation Batch: BJI0575 Sample Size: 500 mL
Prepared: 22-Sep-2021 Final Volume: 1 mL

Sample Cleanup: Cleanup Method: Silica Gel
Cleanup Batch: CJJ0067 Initial Volume: 1 mL
Cleaned: 10-Oct-2021 Final Volume: 1 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)	DRO	1	0.100	ND	mg/L	U
Motor Oil Range Organics (C24-C38)	RRO	1	0.200	ND	mg/L	U
Bunker C Range Organics (C10-C38)		1	0.500	ND	mg/L	U
Surrogate: o-Terphenyl			50-150 %	112	%	

Data File: \\target\share\chem2\fid4a.i\20211012a.b\421J1246.D

Page 1

Date : 13-OCT-2021 02:40

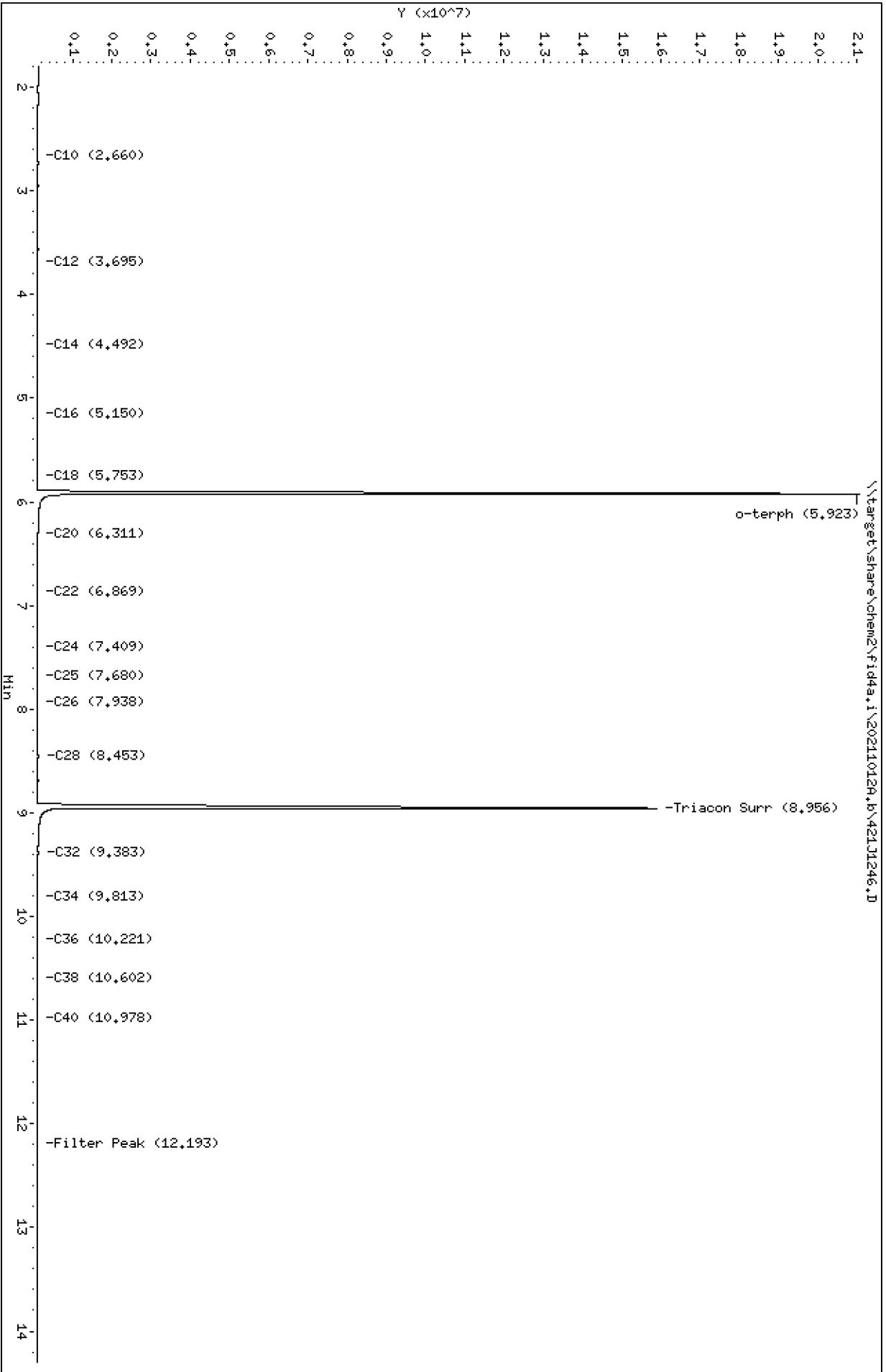
Client ID:

Instrument: fid4a.i

Sample Info: 2110223-13

Column phase: RTX-1

Operator: TWC
Column diameter: 0.25



Analytical Resources Inc.
TPH Quantitation Report

Data file: 20211012A.b/421J1246.D

Method: 20211012A.b\FID4TPH.m

Instrument: fid4a.i, TWC

Report Date: 10/14/2021

Macro: 09-SEP-2019

Calibration Dates: Gas:XX-XXX-XXXX Diesel:07-SEP-2021 M.Oil:14-APR-2021

ARI ID: 21I0223-13

Client ID:

Injection: 13-OCT-2021 02:40

Dilution Factor: 1

RT Std: 419H1603.D

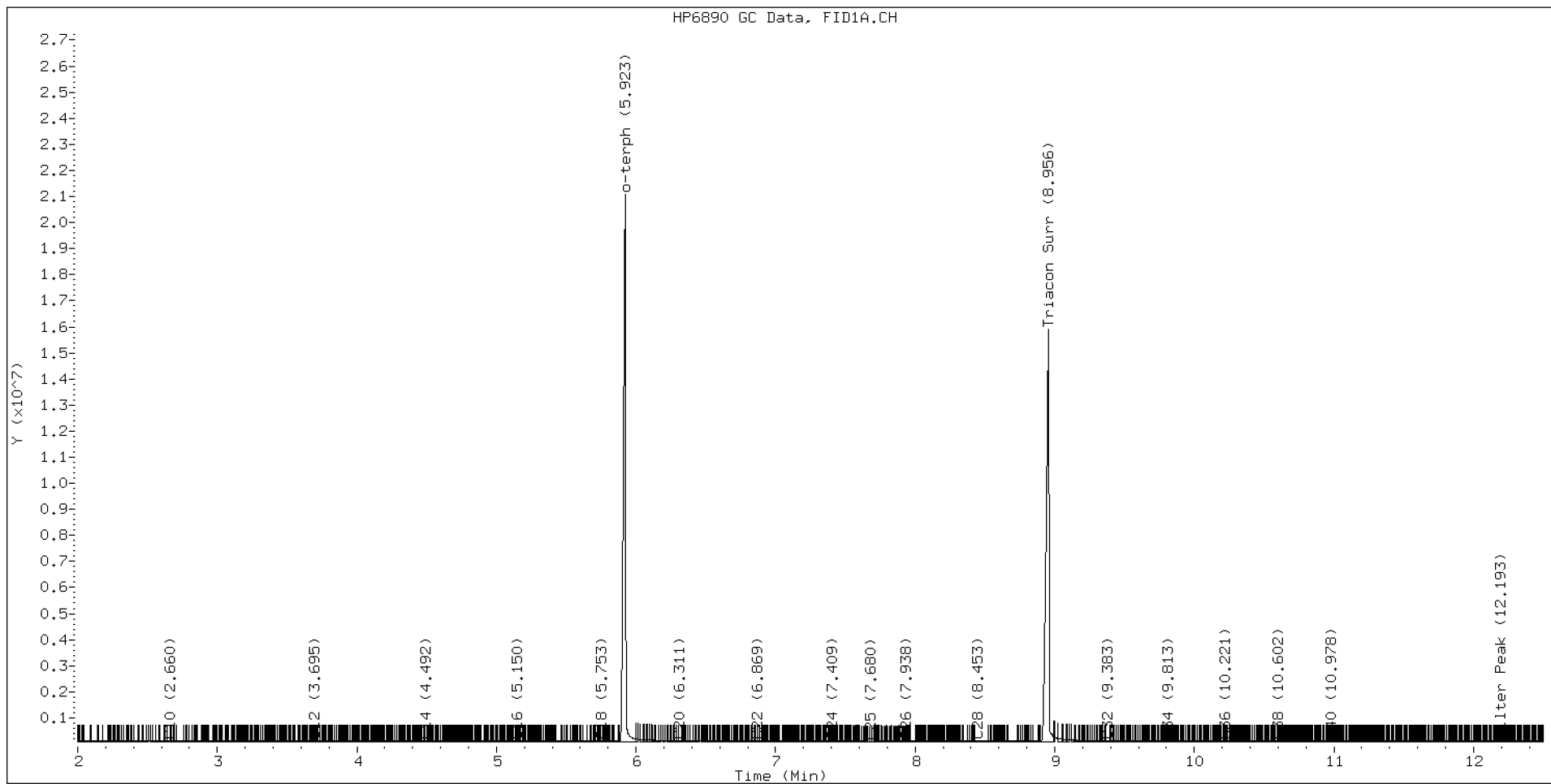
FID:4A RESULTS								
Compound	RT	Shift	Height	Area	Method	Range	Total Area	Conc (mg/L)
C8	1.319	-0.035	335305	510983	WATPHD	(C12-C24)	2407139	15.2
C10	2.660	-0.004	14058	19221	WATPHM	(C24-C38)	1748823	13.3
C12	3.695	-0.004	15640	6998				
C14	4.492	0.005	14347	11305				
C16	5.150	-0.007	12130	8374				
C18	5.753	-0.004	10669	9290				
C20	6.311	-0.001	17301	24443				
C22	6.869	0.004	3587	875				
C24	7.409	-0.001	1155	547				
C25	7.680	0.001	334	142				
C26	7.938	-0.003	439	126				
C28	8.453	0.004	31007	53532				
C32	9.383	-0.002	19665	28309				
C34	9.813	-0.001	8182	4819				
Filter Peak	12.193	-0.002	10891	3798	BUNKERC	(C10-C38)	5182286	85.4
C36	10.221	0.001	8098	2000				
C38	10.602	-0.002	8672	3456				
C40	10.978	-0.000	10507	2609				
o-terph	5.923	0.002	20967951	23910769				
Triacon Surr	8.956	-0.002	15809271	22047049				

Range Times: NW Diesel(3.699 - 7.410) AK102(2.66 - 7.68) Jet A(2.66 - 5.76)
NW M.Oil(7.41 - 10.60) AK103(7.68 - 10.22) OR Diesel(2.66 - 8.45)

Surrogate	Area	Amount
o-Terphenyl	23910769	125.7
Triacontane	22047049	104.1

M Indicates the peak was manually integrated

Analyte	RF	Curve Date
o-Terph Surr	190151.8	07-SEP-2021
Triacon Surr	211827.9	25-OCT-2019
Gas	15000.0	XX-XXX-XXXX
Diesel	158608.3	07-SEP-2021
Motor Oil	131440.7	14-APR-2021
Bunker C	60657.6	13-OCT-2021





Landau Associates, Inc. - Spokane
10 North Post Street, Suite 218
Spokane WA, 99201

Project: Avista Steam Plant
Project Number: Avista Steam Plant
Project Manager: Shane Kostka

Reported:
15-Oct-2021 15:41

Petroleum Hydrocarbons - Quality Control

Batch BJI0575 - EPA 3510C SepF

Instrument: FID4

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJI0575-BLK1)				Prepared: 22-Sep-2021 Analyzed: 12-Oct-2021 20:40						
Diesel Range Organics (C12-C24)	ND	0.100	mg/L							U
Motor Oil Range Organics (C24-C38)	ND	0.200	mg/L							U
Bunker C Range Organics (C10-C38)	ND	0.500	mg/L							U
Surrogate: o-Terphenyl	0.234		mg/L	0.225		104	50-150			

Data File: \\target\share\chem2\fid4a.i\20211012a.b\421J1228.D

Page 1

Date : 12-OCT-2021 20:40

Client ID:

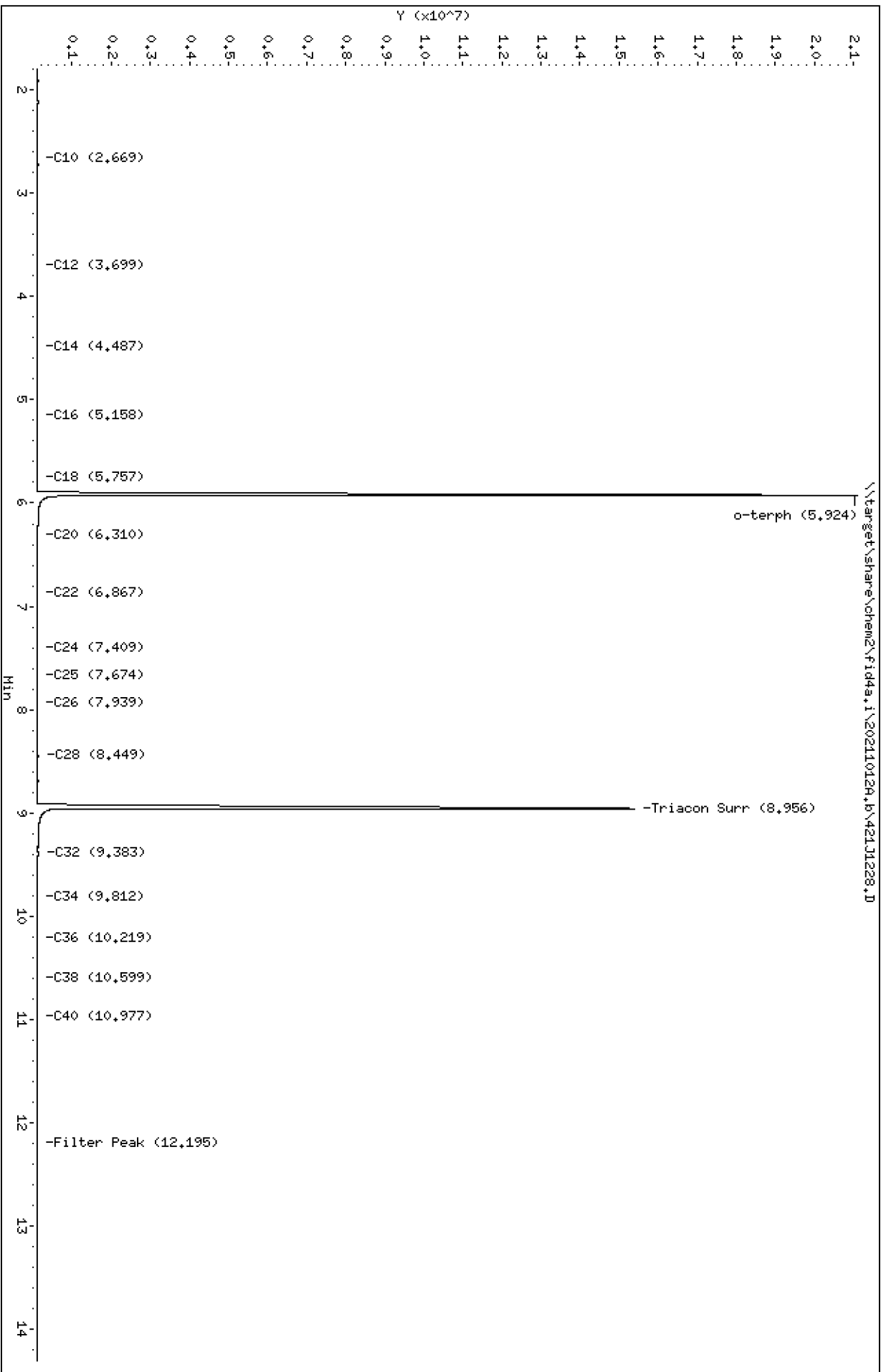
Instrument: fid4a.i

Sample Info: BJ10575-BLK1

Operator: TWC

Column phase: RTX-1

Column diameter: 0.25



Analytical Resources Inc.
TPH Quantitation Report

Data file: 20211012A.b/421J1228.D

Method: 20211012A.b\FID4TPH.m

Instrument: fid4a.i, TWC

Report Date: 10/14/2021

Macro: 09-SEP-2019

Calibration Dates: Gas:XX-XXX-XXXX Diesel:07-SEP-2021 M.Oil:14-APR-2021

ARI ID: BJI0575-BLK1

Client ID:

Injection: 12-OCT-2021 20:40

Dilution Factor: 1

RT Std: 419H1603.D

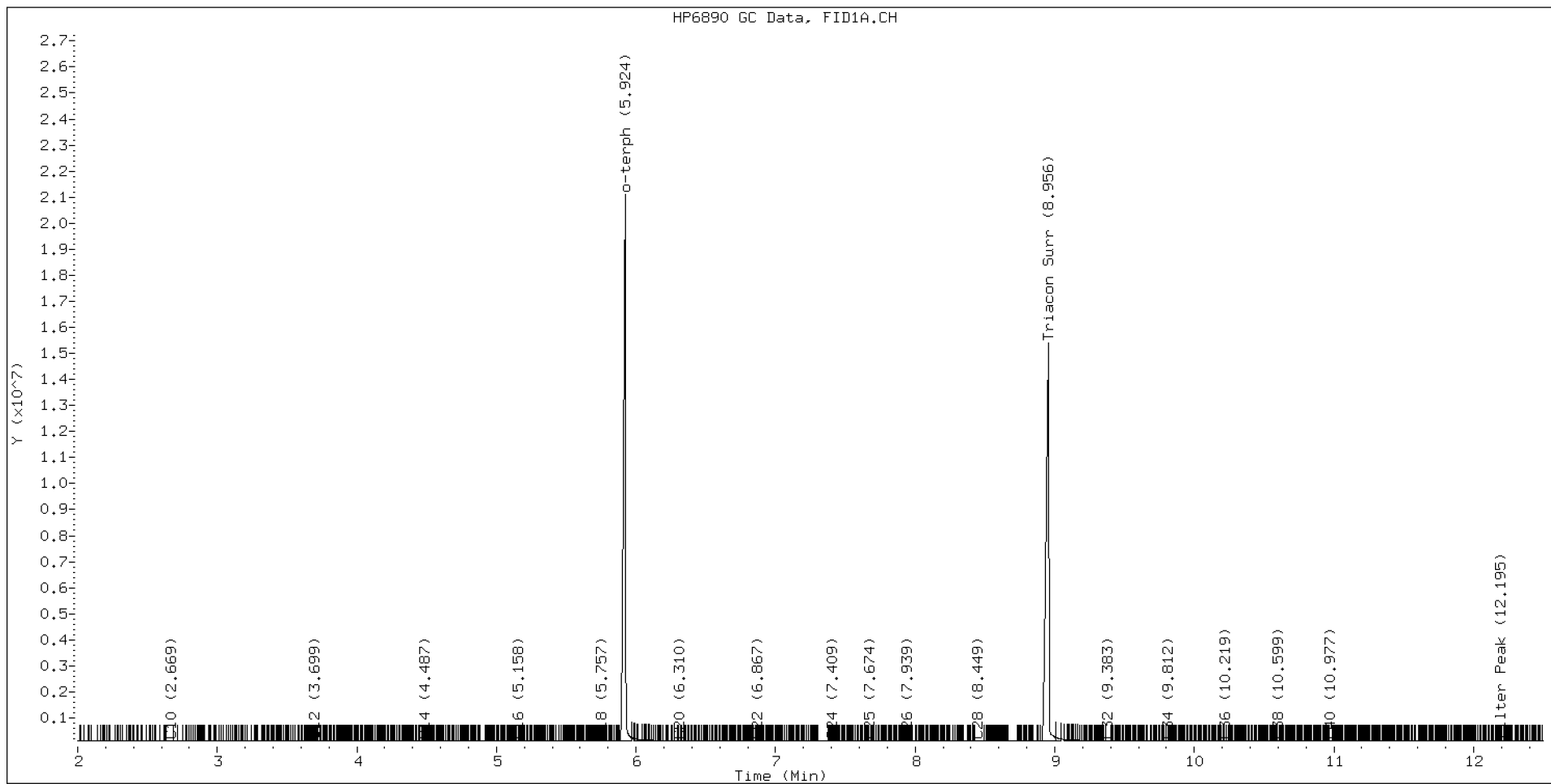
FID:4A RESULTS								
Compound	RT	Shift	Height	Area	Method	Range	Total Area	Conc (mg/L)
C8	1.340	-0.014	72845	176995	WATPHD	(C12-C24)	1319338	8.3
C10	2.669	0.005	7593	14377	WATPHM	(C24-C38)	1829174	13.9
C12	3.699	-0.001	7538	3737				
C14	4.487	-0.000	5114	1497				
C16	5.158	0.001	2276	339				
C18	5.757	-0.001	2865	1993				
C20	6.310	-0.002	11741	12179				
C22	6.867	0.002	972	346				
C24	7.409	-0.001	520	158				
C25	7.674	-0.005	569	263				
C26	7.939	-0.002	1345	483				
C28	8.449	0.001	32937	51414				
C32	9.383	-0.002	22126	41509				
C34	9.812	-0.003	10013	5433				
Filter Peak	12.195	-0.000	5034	3230	BUNKERC	(C10-C38)	3570955	58.9
C36	10.219	-0.001	10366	9130				
C38	10.599	-0.004	9689	7201				
C40	10.977	-0.002	10120	10369				
o-terph	5.924	0.002	20994439	22270814				
Triacon Surr	8.956	-0.002	15288852	21965948				

Range Times: NW Diesel(3.699 - 7.410) AK102(2.66 - 7.68) Jet A(2.66 - 5.76)
NW M.Oil(7.41 - 10.60) AK103(7.68 - 10.22) OR Diesel(2.66 - 8.45)

Surrogate	Area	Amount
o-Terphenyl	22270814	117.1
Triacontane	21965948	103.7

M Indicates the peak was manually integrated

Analyte	RF	Curve Date
o-Terph Surr	190151.8	07-SEP-2021
Triacon Surr	211827.9	25-OCT-2019
Gas	15000.0	XX-XXX-XXXX
Diesel	158608.3	07-SEP-2021
Motor Oil	131440.7	14-APR-2021
Bunker C	60657.6	13-OCT-2021





Landau Associates, Inc. - Spokane
10 North Post Street, Suite 218
Spokane WA, 99201

Project: Avista Steam Plant
Project Number: Avista Steam Plant
Project Manager: Shane Kostka

Reported:
15-Oct-2021 15:41

Petroleum Hydrocarbons - Quality Control

Batch BJI0575 - EPA 3510C SepF

Instrument: FID4

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS (BJI0575-BS1)						Prepared: 22-Sep-2021 Analyzed: 12-Oct-2021 21:00				
Diesel Range Organics (C12-C24)	2.78	0.100	mg/L	3.00		92.7	56-120			
Surrogate: o-Terphenyl	0.241		mg/L	0.225		107	50-150			

Data File: \\target\share\chem2\fid4a.i\20211012a.b\421J1229.D

Date : 12-OCT-2021 21:00

Client ID:

Sample Info: BJ10575-B51

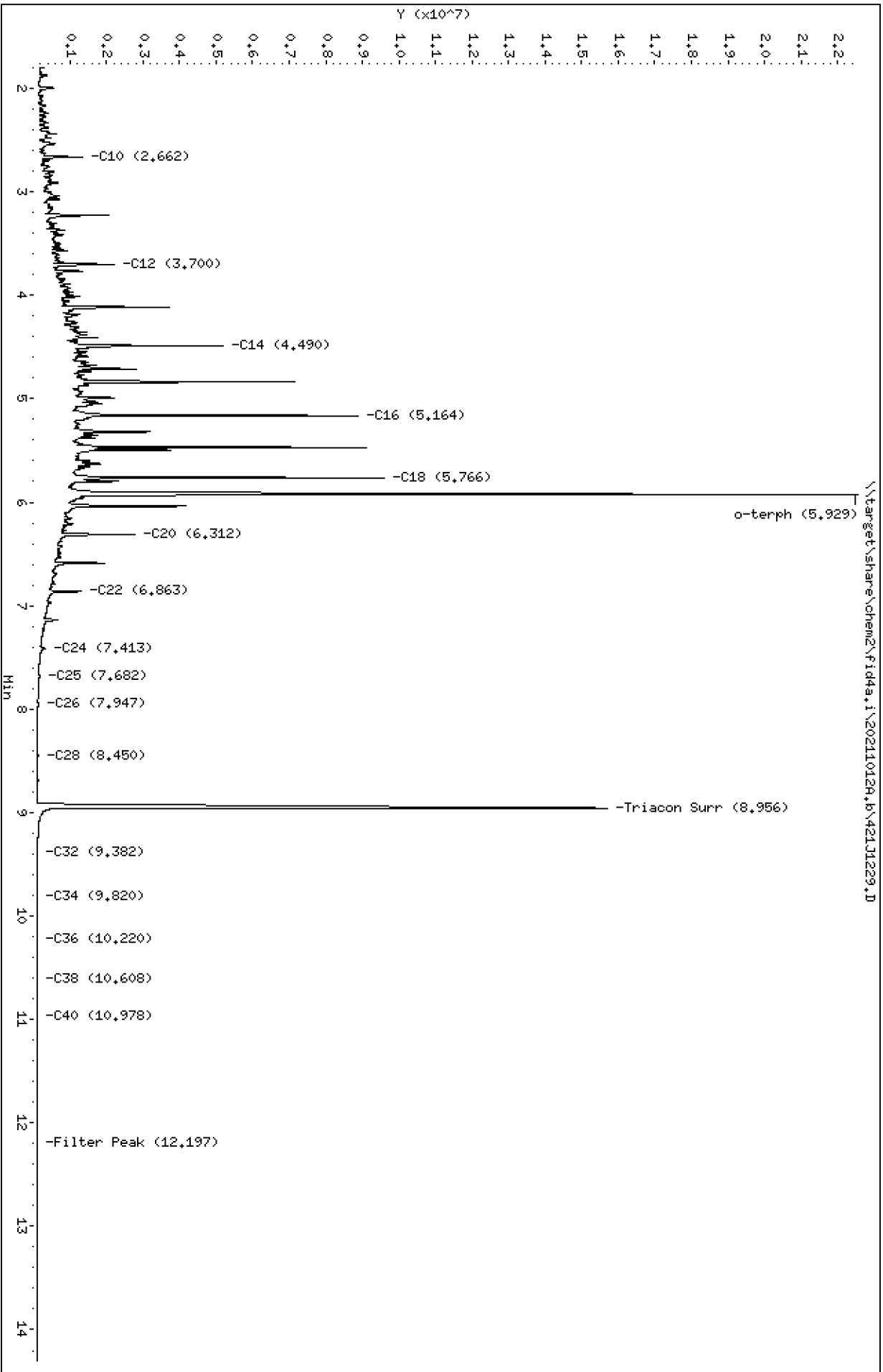
Column phase: RTX-1

Instrument: fid4a.i

Operator: TWC

Column diameter: 0.25

Page 1



Analytical Resources Inc.
TPH Quantitation Report

Data file: 20211012A.b/421J1229.D

Method: 20211012A.b\FID4TPH.m

Instrument: fid4a.i, TWC

Report Date: 10/14/2021

Macro: 09-SEP-2019

Calibration Dates: Gas:XX-XXX-XXXX Diesel:07-SEP-2021 M.Oil:14-APR-2021

ARI ID: BJI0575-BS1

Client ID:

Injection: 12-OCT-2021 21:00

Dilution Factor: 1

RT Std: 419H1603.D

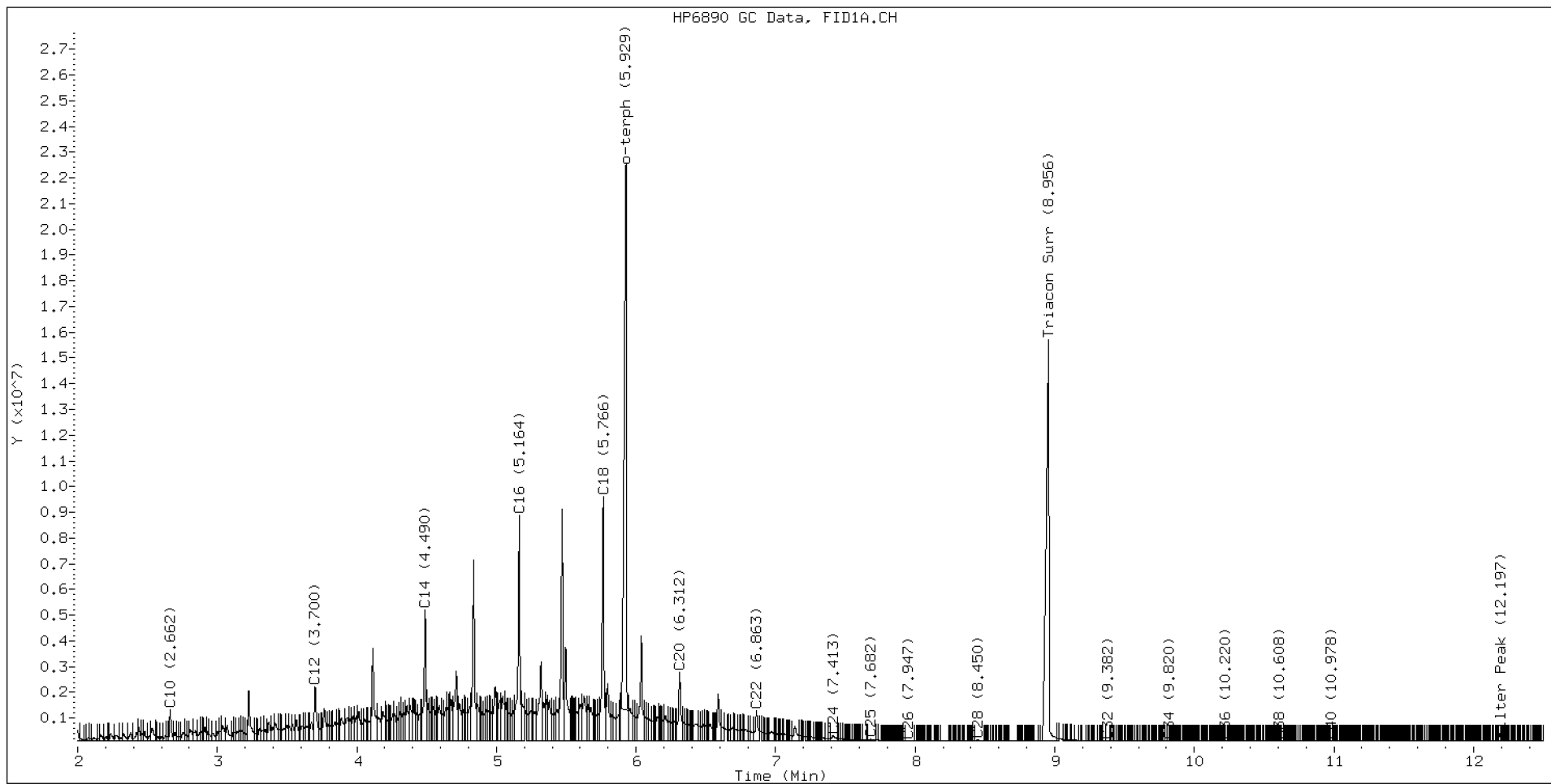
FID:4A RESULTS								
Compound	RT	Shift	Height	Area	Method	Range	Total Area	Conc (mg/L)
C8	1.353	-0.001	123394	98229	WATPHD	(C12-C24)	220427907	1389.8
C10	2.662	-0.002	1244489	1095589	WATPHM	(C24-C38)	2583533	19.7
C12	3.700	0.001	2117357	2681900				
C14	4.490	0.003	5082855	5077171				
C16	5.164	0.007	8770325	8967538				
C18	5.766	0.009	9497407	9527240				
C20	6.312	0.000	2663002	3100804				
C22	6.863	-0.002	1187446	1614824				
C24	7.413	0.003	211178	422168				
C25	7.682	0.003	79427	198672				
C26	7.947	0.006	33596	92272				
C28	8.450	0.002	45283	63636				
C32	9.382	-0.003	16982	24641				
C34	9.820	0.005	4016	1987				
Filter Peak	12.197	0.002	7657	3003	BUNKERC	(C10-C38)	252187335	4157.6
C36	10.220	-0.001	4428	1512				
C38	10.608	0.004	5631	1671				
C40	10.978	-0.001	7415	4732				
o-terph	5.929	0.007	21241969	22944716				
Triacon Surr	8.956	-0.001	15615443	22449756				

Range Times: NW Diesel(3.699 - 7.410) AK102(2.66 - 7.68) Jet A(2.66 - 5.76)
NW M.Oil(7.41 - 10.60) AK103(7.68 - 10.22) OR Diesel(2.66 - 8.45)

Surrogate	Area	Amount
o-Terphenyl	22944716	120.7 M
Triacontane	22449756	106.0

M Indicates the peak was manually integrated

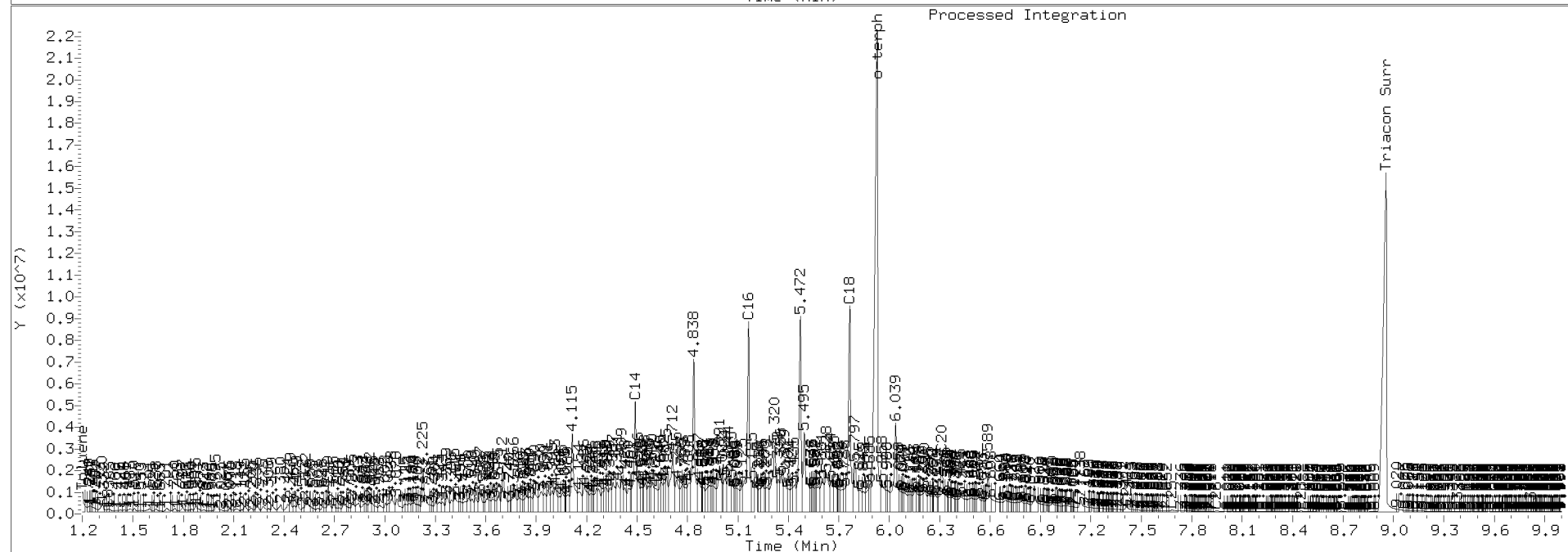
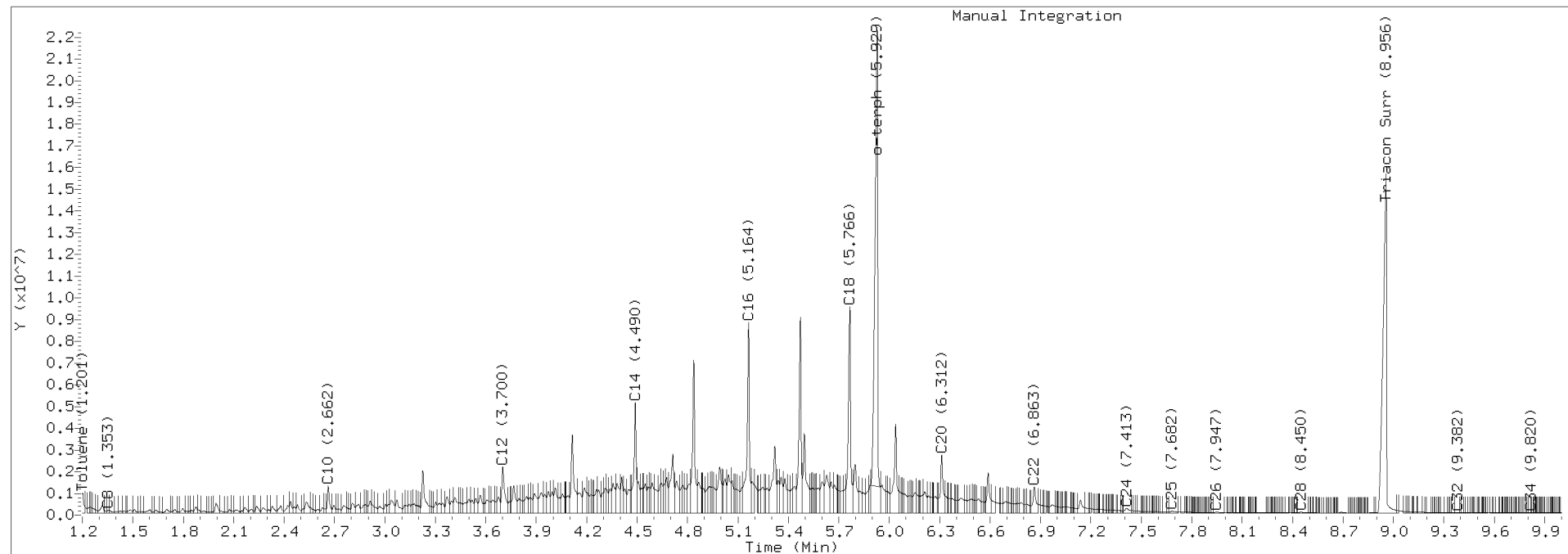
Analyte	RF	Curve Date
o-Terph Surr	190151.8	07-SEP-2021
Triacon Surr	211827.9	25-OCT-2019
Gas	15000.0	XX-XXX-XXXX
Diesel	158608.3	07-SEP-2021
Motor Oil	131440.7	14-APR-2021
Bunker C	60657.6	13-OCT-2021



TPH Manual Integrations Report

Datafile: FID4A, 20211012A.b/421J1229.D Injection: 12-OCT-2021 21:00

Lab ID:BJI0575-BS1





Landau Associates, Inc. - Spokane
10 North Post Street, Suite 218
Spokane WA, 99201

Project: Avista Steam Plant
Project Number: Avista Steam Plant
Project Manager: Shane Kostka

Reported:
15-Oct-2021 15:41

Petroleum Hydrocarbons - Quality Control

Batch BJI0575 - EPA 3510C SepF

Instrument: FID4

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS Dup (BJI0575-BSD1)				Prepared: 22-Sep-2021 Analyzed: 12-Oct-2021 21:20						
Diesel Range Organics (C12-C24)	2.84	0.100	mg/L	3.00		94.7	56-120	2.20	30	
Surrogate: o-Terphenyl	0.248		mg/L	0.225		110	50-150			

Data File: \\target\share\chem2\fid4a.i\20211012a.b\421J1230.D

Date : 12-OCT-2021 21:20

Client ID:

Sample Info: BJ10575-BSD1

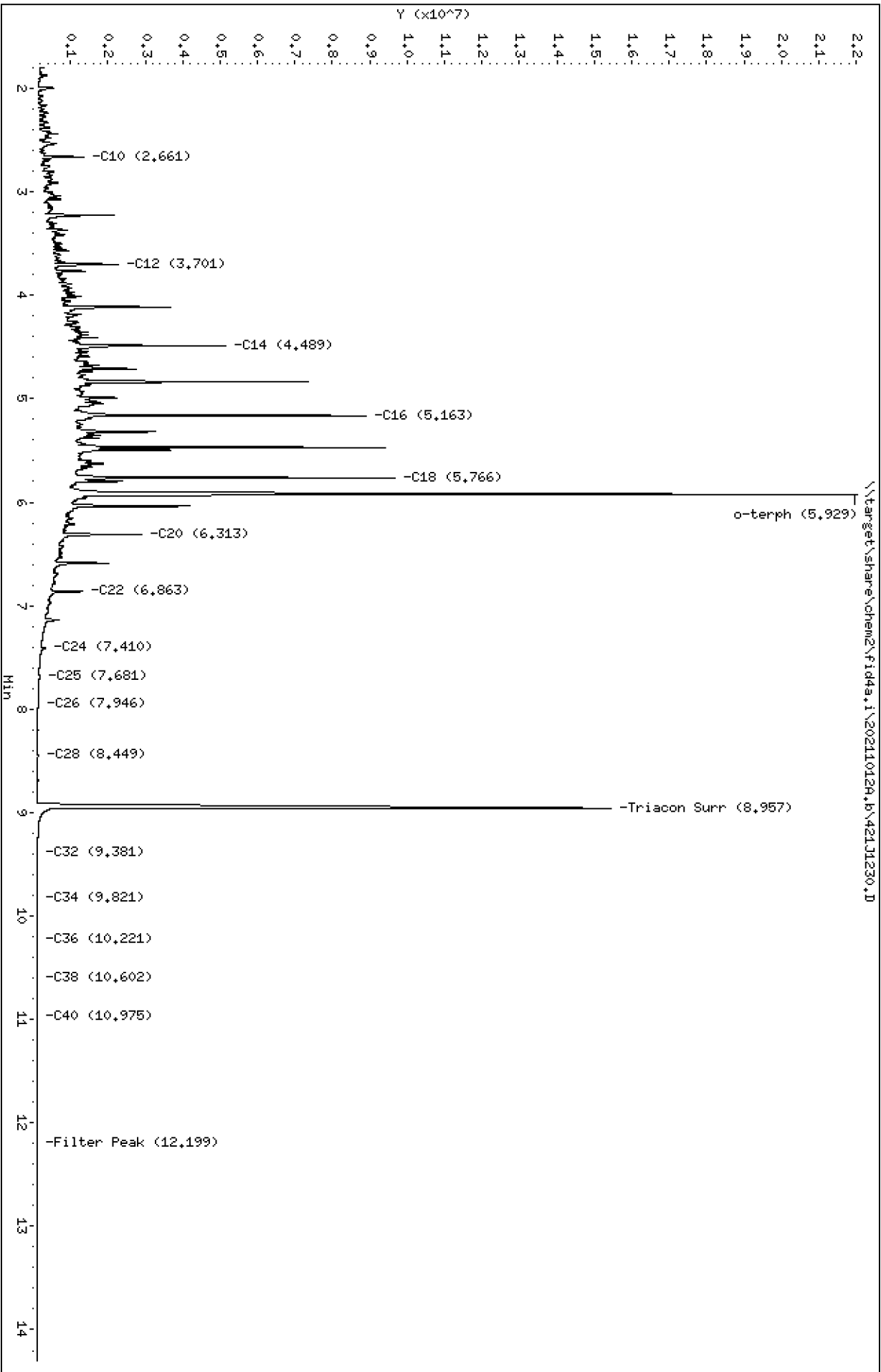
Column phase: RTX-1

Instrument: fid4a.i

Operator: TWC

Column diameter: 0.25

Page 1



Analytical Resources Inc.
TPH Quantitation Report

Data file: 20211012A.b/421J1230.D

Method: 20211012A.b\FID4TPH.m

Instrument: fid4a.i, TWC

Report Date: 10/14/2021

Macro: 09-SEP-2019

Calibration Dates: Gas:XX-XXX-XXXX Diesel:07-SEP-2021 M.Oil:14-APR-2021

ARI ID: BJI0575-BSD1

Client ID:

Injection: 12-OCT-2021 21:20

Dilution Factor: 1

RT Std: 419H1603.D

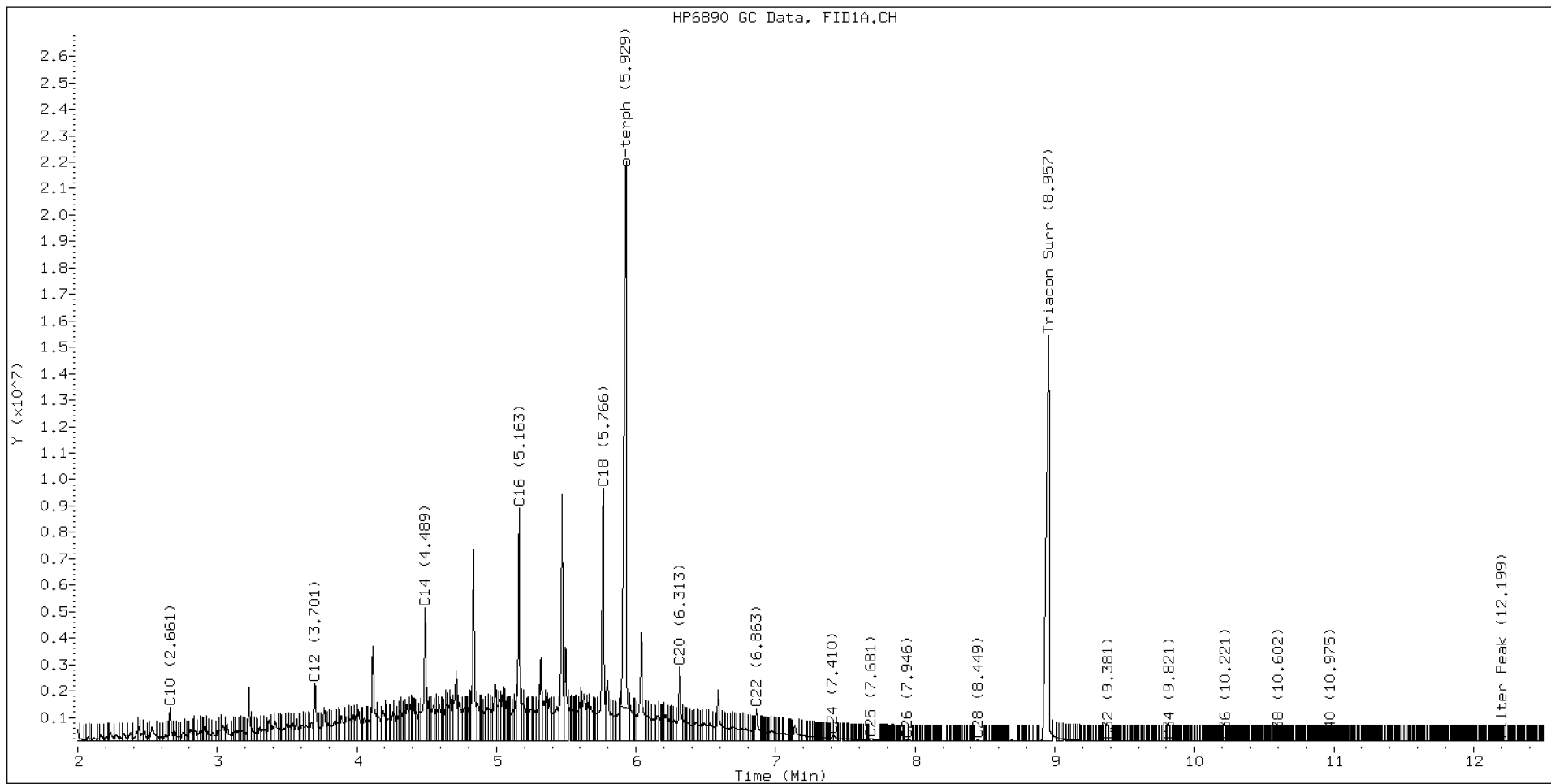
FID:4A RESULTS								
Compound	RT	Shift	Height	Area	Method	Range	Total Area	Conc (mg/L)
C8	1.353	-0.001	117686	98735	WATPHD	(C12-C24)	225336933	1420.7
C10	2.661	-0.003	1267616	1119742	WATPHM	(C24-C38)	2577776	19.6
C12	3.701	0.001	2182957	2705927				
C14	4.489	0.002	5025652	5414216				
C16	5.163	0.006	8801414	7941152				
C18	5.766	0.009	9555794	10737261				
C20	6.313	0.001	2802705	3341138				
C22	6.863	-0.002	1209481	1793994				
C24	7.410	-0.000	211351	178690				
C25	7.681	0.002	84329	274788				
C26	7.946	0.005	36560	50929				
C28	8.449	0.000	46929	68230				
C32	9.381	-0.004	15931	20105				
C34	9.821	0.006	2422	478				
Filter Peak	12.199	0.004	5206	2815	BUNKERC	(C10-C38)	257336585	4242.4
C36	10.221	0.000	2126	1349				
C38	10.602	-0.001	2894	1531				
C40	10.975	-0.004	4302	844				
o-terph	5.929	0.007	20670636	23556005				
Triacon Surr	8.957	-0.000	15342410	22503578				

Range Times: NW Diesel(3.699 - 7.410) AK102(2.66 - 7.68) Jet A(2.66 - 5.76)
NW M.Oil(7.41 - 10.60) AK103(7.68 - 10.22) OR Diesel(2.66 - 8.45)

Surrogate	Area	Amount
o-Terphenyl	23556005	123.9 M
Triacontane	22503578	106.2

M Indicates the peak was manually integrated

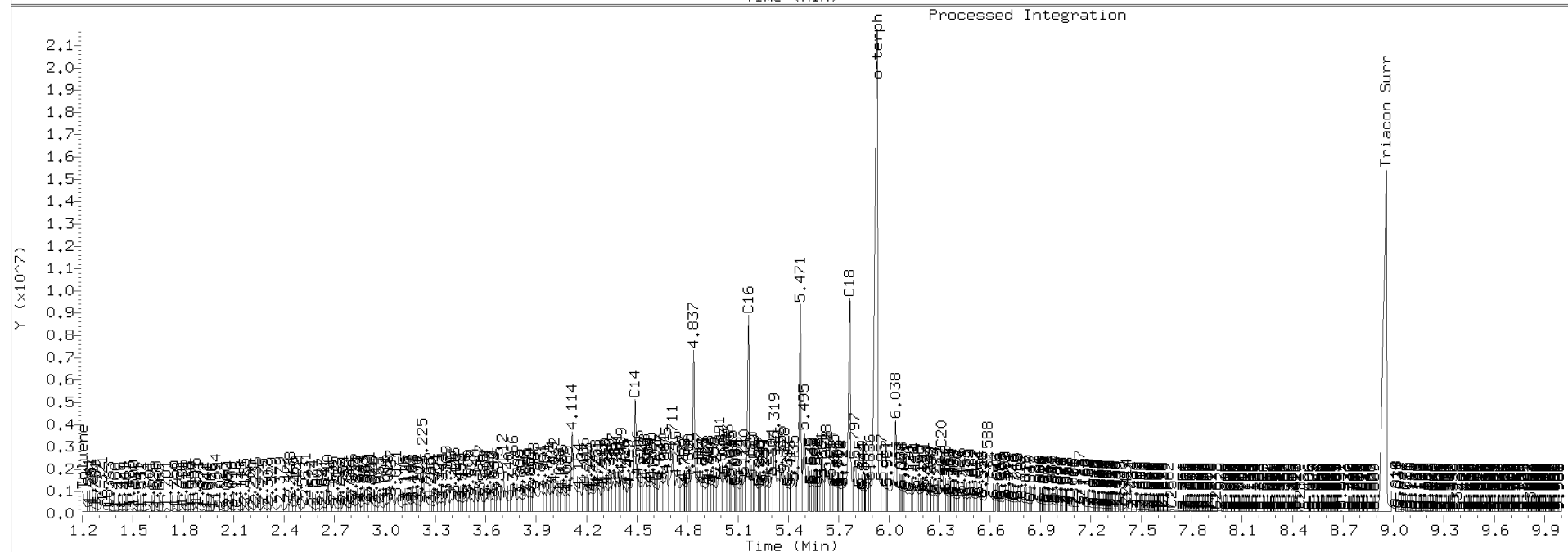
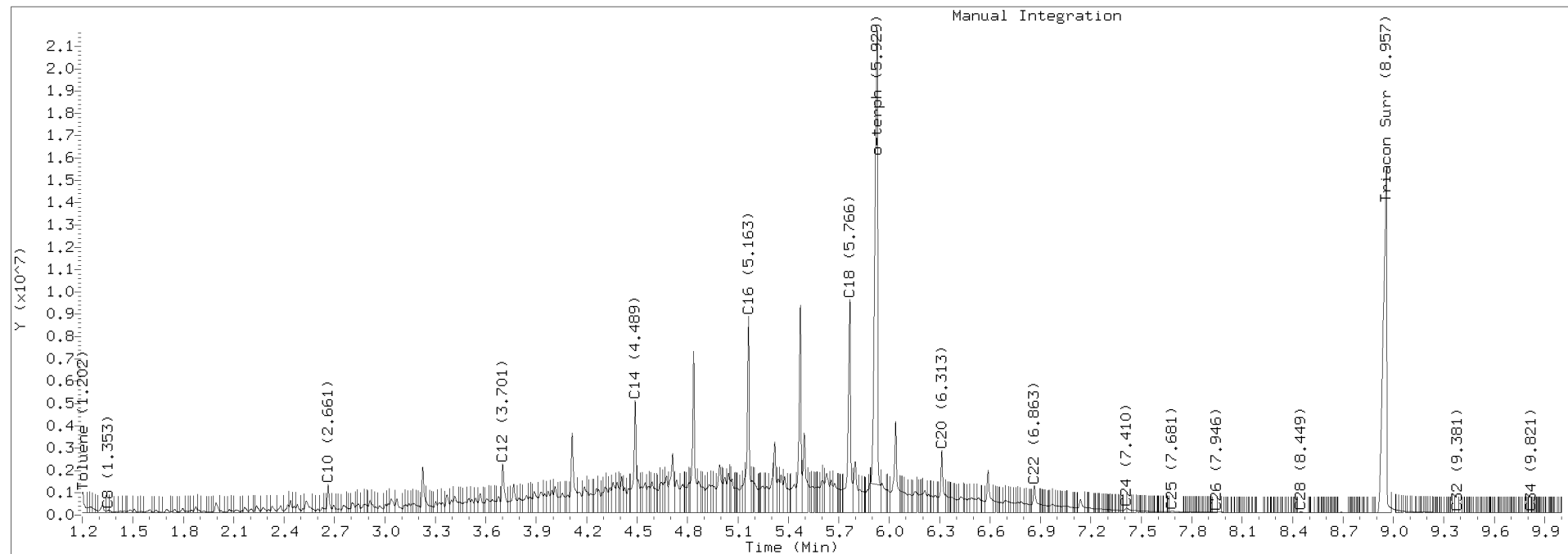
Analyte	RF	Curve Date
o-Terph Surr	190151.8	07-SEP-2021
Triacon Surr	211827.9	25-OCT-2019
Gas	15000.0	XX-XXX-XXXX
Diesel	158608.3	07-SEP-2021
Motor Oil	131440.7	14-APR-2021
Bunker C	60657.6	13-OCT-2021



TPH Manual Integrations Report

Datafile: FID4A, 20211012A.b/421J1230.D Injection: 12-OCT-2021 21:20

Lab ID:BJI0575-BSD1





Landau Associates, Inc. - Spokane
10 North Post Street, Suite 218
Spokane WA, 99201

Project: Avista Steam Plant
Project Number: Avista Steam Plant
Project Manager: Shane Kostka

Reported:
15-Oct-2021 15:41

Petroleum Hydrocarbons - Quality Control

Batch BJI0575 - EPA 3510C SepF

Instrument: FID4

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Matrix Spike (BJI0575-MS1)		Source: 2110223-01		Prepared: 22-Sep-2021		Analyzed: 12-Oct-2021 22:00				
Diesel Range Organics (C12-C24)	2.74	0.100	mg/L	3.00	ND	91.5	56-120			
Surrogate: o-Terphenyl	0.239		mg/L	0.225	0.245	106	50-150			

Recovery limits for target analytes in MS/MSD QC samples are advisory only.

Data File: \\target\share\chem2\fid4a.i\20211012a.b\421J1232.D

Date : 12-OCT-2021 22:00

Client ID:

Sample Info: BJ10575-HS1

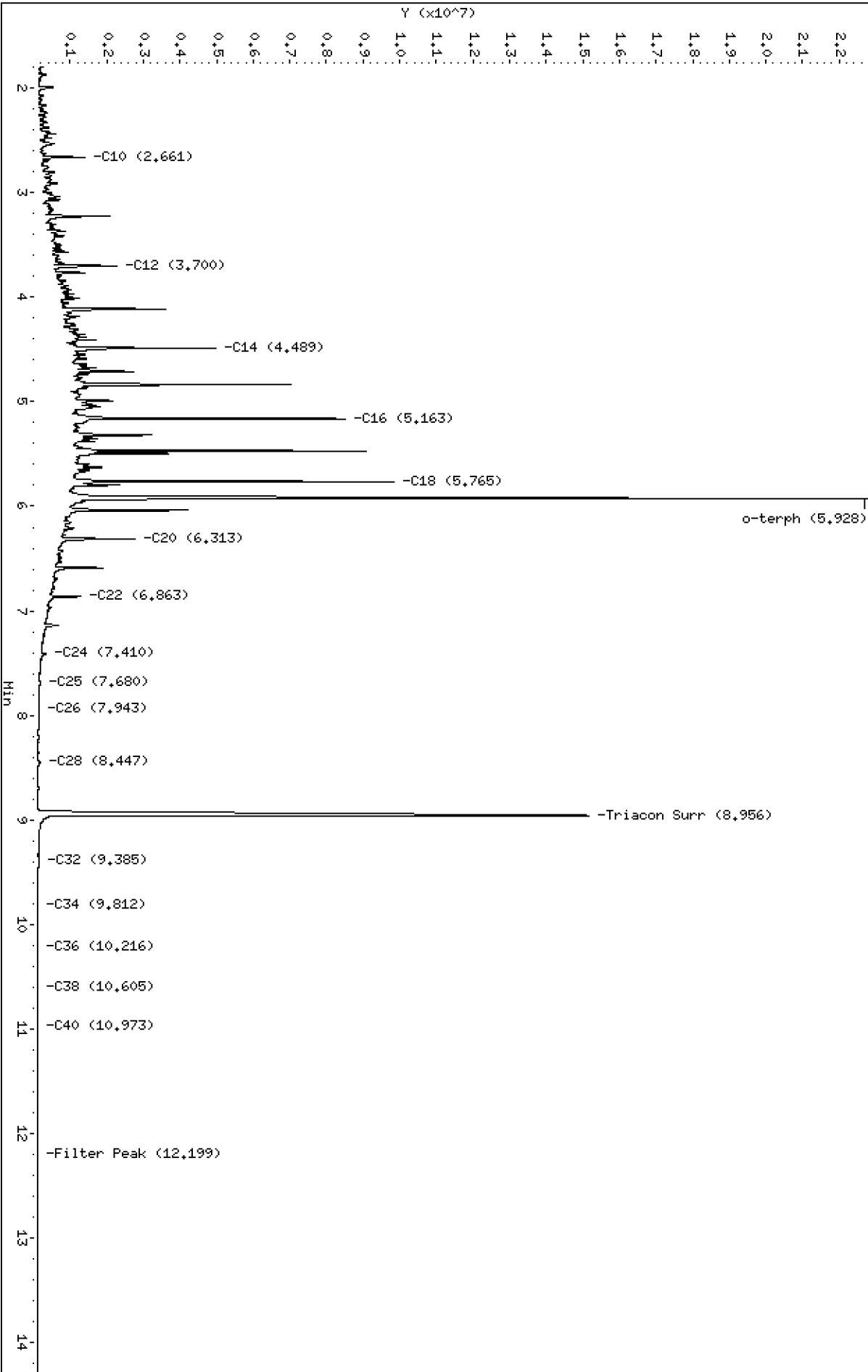
Instrument: fid4a.i

Operator: TWC

Column diameter: 0.25

Column phase: RTX-1

\\target\share\chem2\fid4a.i\20211012a.b\421J1232.D



Analytical Resources Inc.
TPH Quantitation Report

Data file: 20211012A.b/421J1232.D

Method: 20211012A.b\FID4TPH.m

Instrument: fid4a.i, TWC

Report Date: 10/14/2021

Macro: 09-SEP-2019

Calibration Dates: Gas:XX-XXX-XXXX Diesel:07-SEP-2021 M.Oil:14-APR-2021

ARI ID: BJI0575-MS1

Client ID:

Injection: 12-OCT-2021 22:00

Dilution Factor: 1

RT Std: 419H1603.D

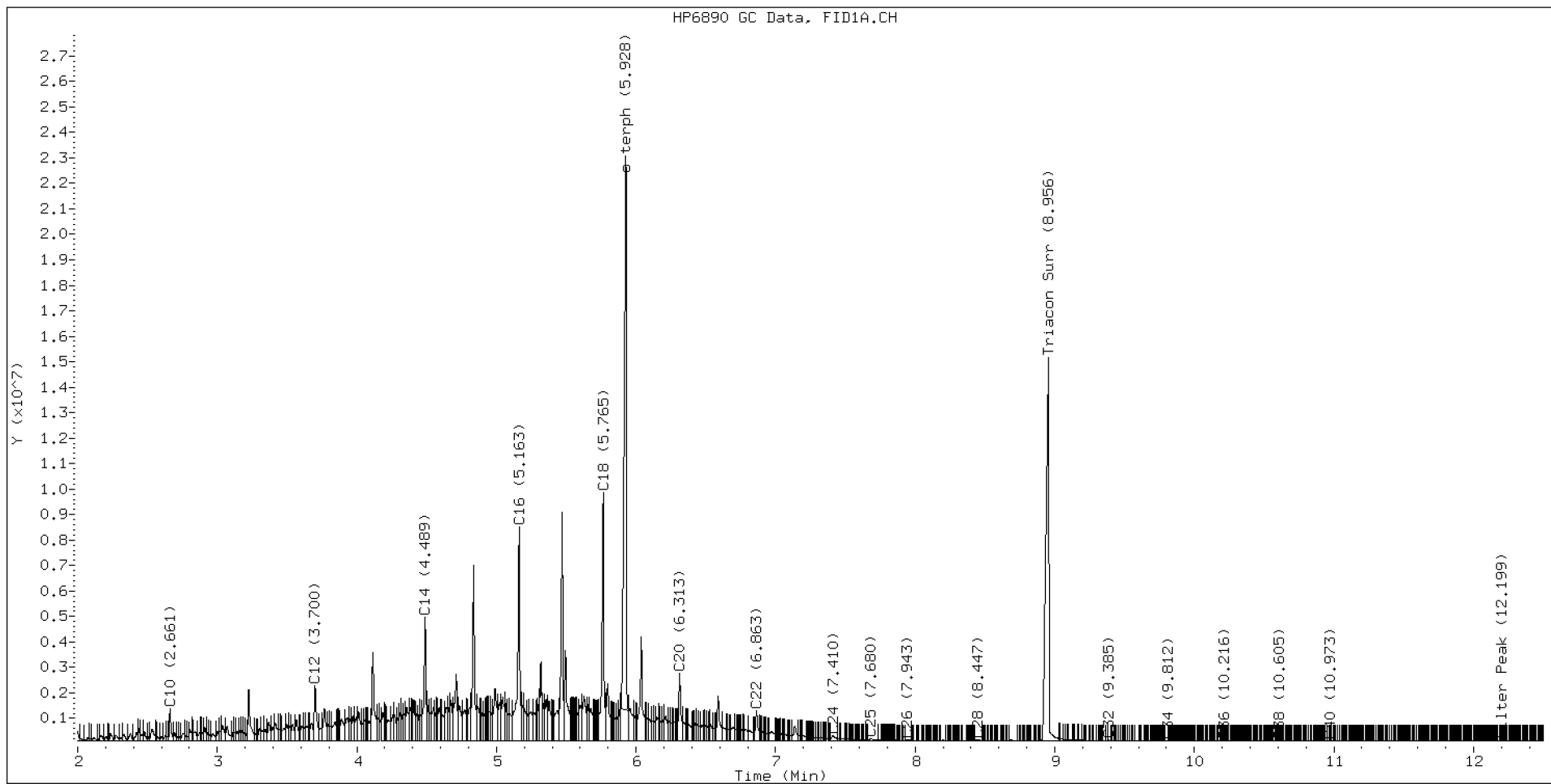
FID:4A RESULTS								
Compound	RT	Shift	Height	Area	Method	Range	Total Area	Conc (mg/L)
C8	1.353	-0.002	116433	103422	WATPHD	(C12-C24)	217573346	1371.8
C10	2.661	-0.003	1274116	1073635	WATPHM	(C24-C38)	4196688	31.9
C12	3.700	0.001	2157085	2728959				
C14	4.489	0.002	4849813	4948000				
C16	5.163	0.006	8415821	9836381				
C18	5.765	0.008	9744786	9991566				
C20	6.313	0.001	2672535	2986897				
C22	6.863	-0.002	1173141	1445730				
C24	7.410	0.000	219881	446321				
C25	7.680	0.000	89424	254597				
C26	7.943	0.002	45294	102148				
C28	8.447	-0.002	65382	112776				
C32	9.385	0.000	30909	30073				
C34	9.812	-0.002	11733	4651				
Filter Peak	12.199	0.003	757	336	BUNKERC	(C10-C38)	250254583	4125.7
C36	10.216	-0.004	11020	4832				
C38	10.605	0.002	7058	2737				
C40	10.973	-0.006	5132	3684				
o-terph	5.928	0.006	21452855	22746719				
Triacon Surr	8.956	-0.002	15069455	22548721				

Range Times: NW Diesel(3.699 - 7.410) AK102(2.66 - 7.68) Jet A(2.66 - 5.76)
NW M.Oil(7.41 - 10.60) AK103(7.68 - 10.22) OR Diesel(2.66 - 8.45)

Surrogate	Area	Amount
o-Terphenyl	22746719	119.6 M
Triacontane	22548721	106.4

M Indicates the peak was manually integrated

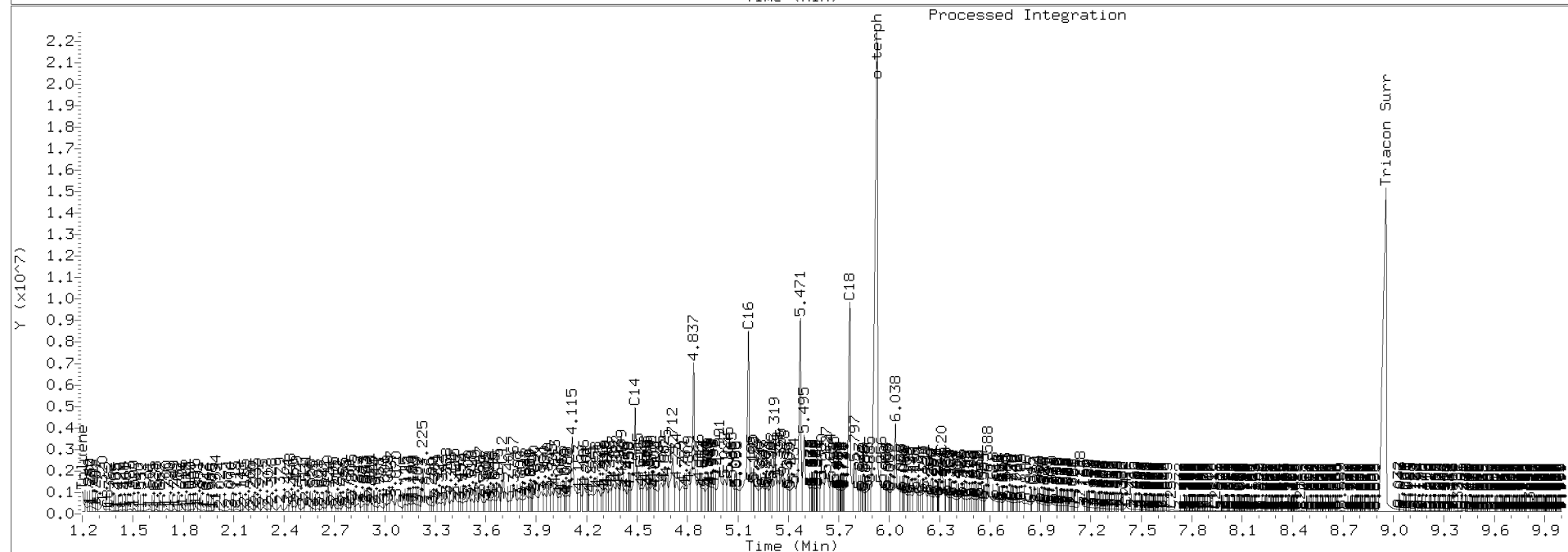
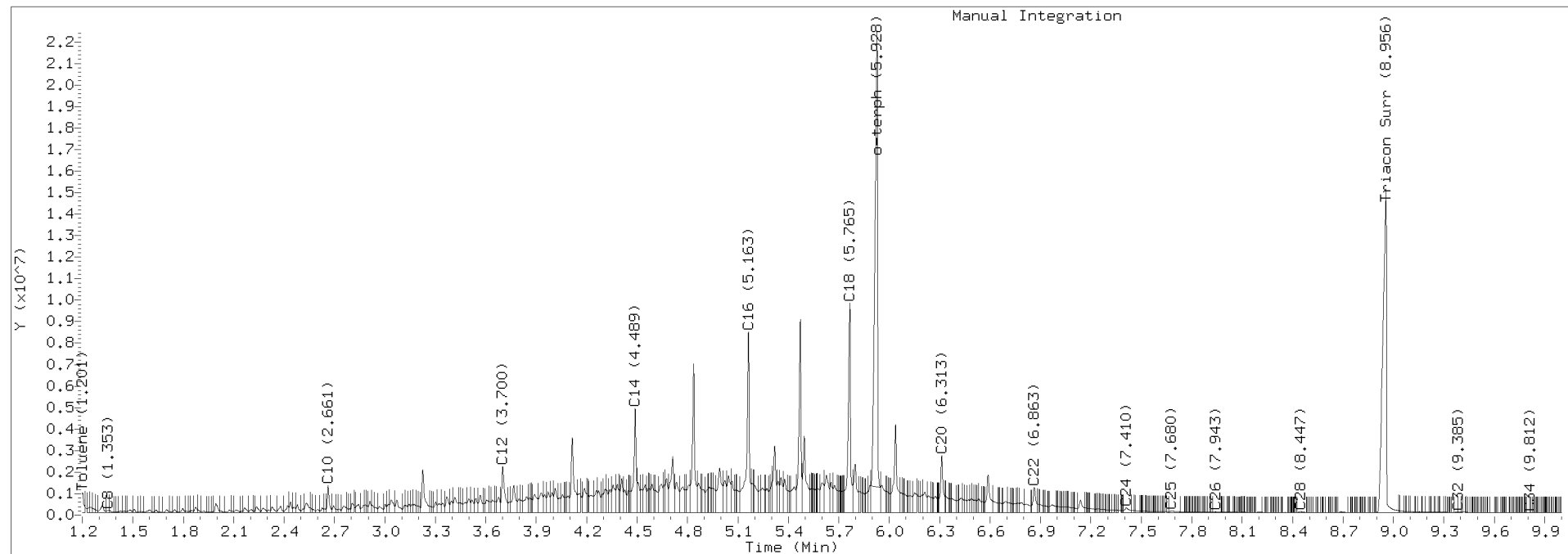
Analyte	RF	Curve Date
o-Terph Surr	190151.8	07-SEP-2021
Triacon Surr	211827.9	25-OCT-2019
Gas	15000.0	XX-XXX-XXXX
Diesel	158608.3	07-SEP-2021
Motor Oil	131440.7	14-APR-2021
Bunker C	60657.6	13-OCT-2021



TPH Manual Integrations Report

Datafile: FID4A, 20211012A.b/421J1232.D Injection: 12-OCT-2021 22:00

Lab ID:BJI0575-MS1





Landau Associates, Inc. - Spokane
10 North Post Street, Suite 218
Spokane WA, 99201

Project: Avista Steam Plant
Project Number: Avista Steam Plant
Project Manager: Shane Kostka

Reported:
15-Oct-2021 15:41

Petroleum Hydrocarbons - Quality Control

Batch BJI0575 - EPA 3510C SepF

Instrument: FID4

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Matrix Spike Dup (BJI0575-MSD1)		Source: 2110223-01		Prepared: 22-Sep-2021		Analyzed: 12-Oct-2021 22:20				
Diesel Range Organics (C12-C24)	2.80	0.100	mg/L	3.00	ND	93.4	56-120	2.12	30	
Surrogate: o-Terphenyl	0.253		mg/L	0.225	0.245	112	50-150			

Recovery limits for target analytes in MS/MSD QC samples are advisory only.

Data File: \\target\share\chem2\fid4a.i\20211012a.b\421J1233.D

Date: 12-OCT-2021 22:20

Client ID:

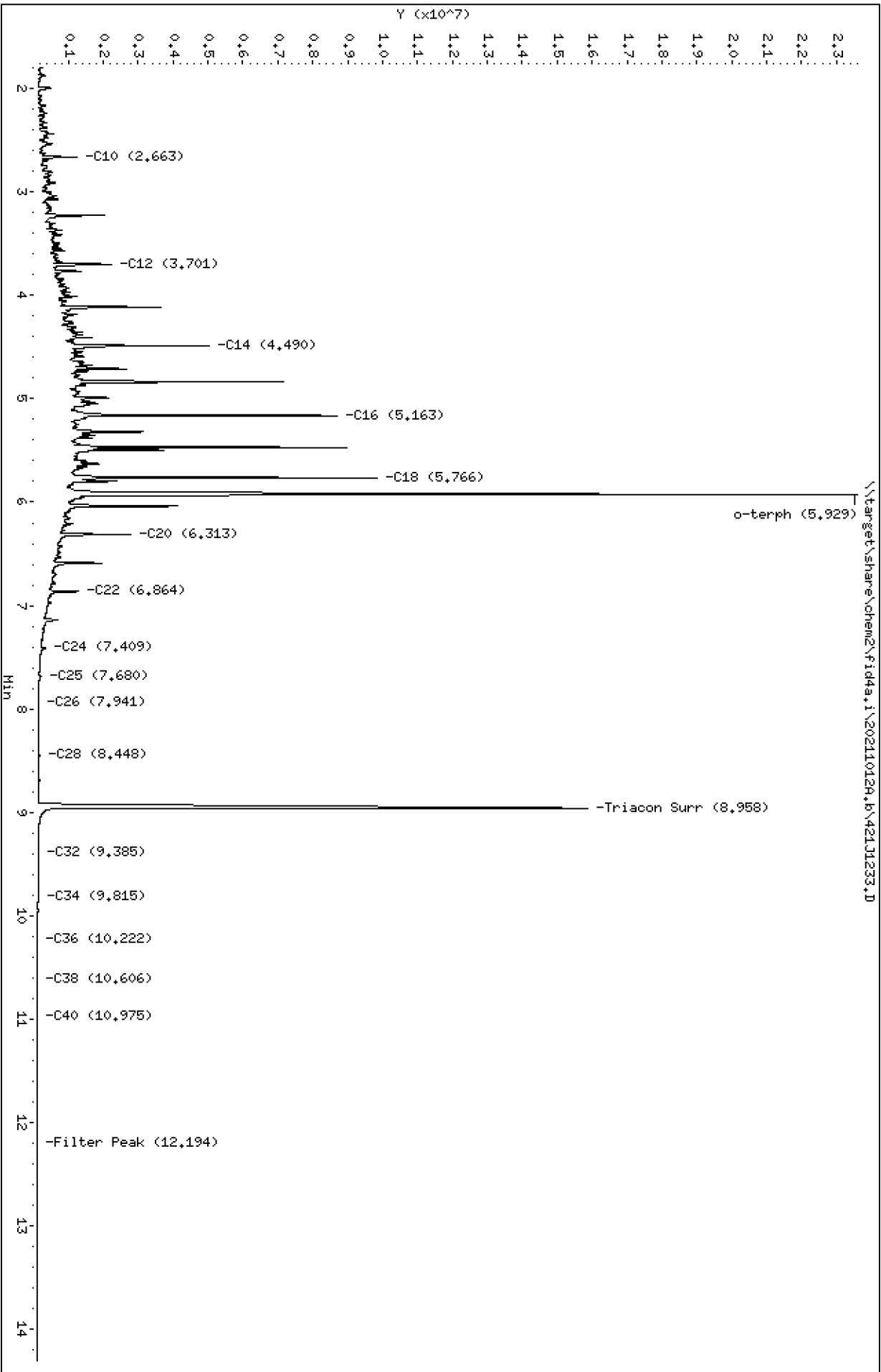
Sample Info: BJ10575-MSD1

Column phase: RTX-1

Instrument: fid4a.i

Operator: TWC

Column diameter: 0.25



Analytical Resources Inc.
TPH Quantitation Report

Data file: 20211012A.b/421J1233.D

Method: 20211012A.b\FID4TPH.m

Instrument: fid4a.i, TWC

Report Date: 10/14/2021

Macro: 09-SEP-2019

Calibration Dates: Gas:XX-XXX-XXXX Diesel:07-SEP-2021 M.Oil:14-APR-2021

ARI ID: BJI0575-MSD1

Client ID:

Injection: 12-OCT-2021 22:20

Dilution Factor: 1

RT Std: 419H1603.D

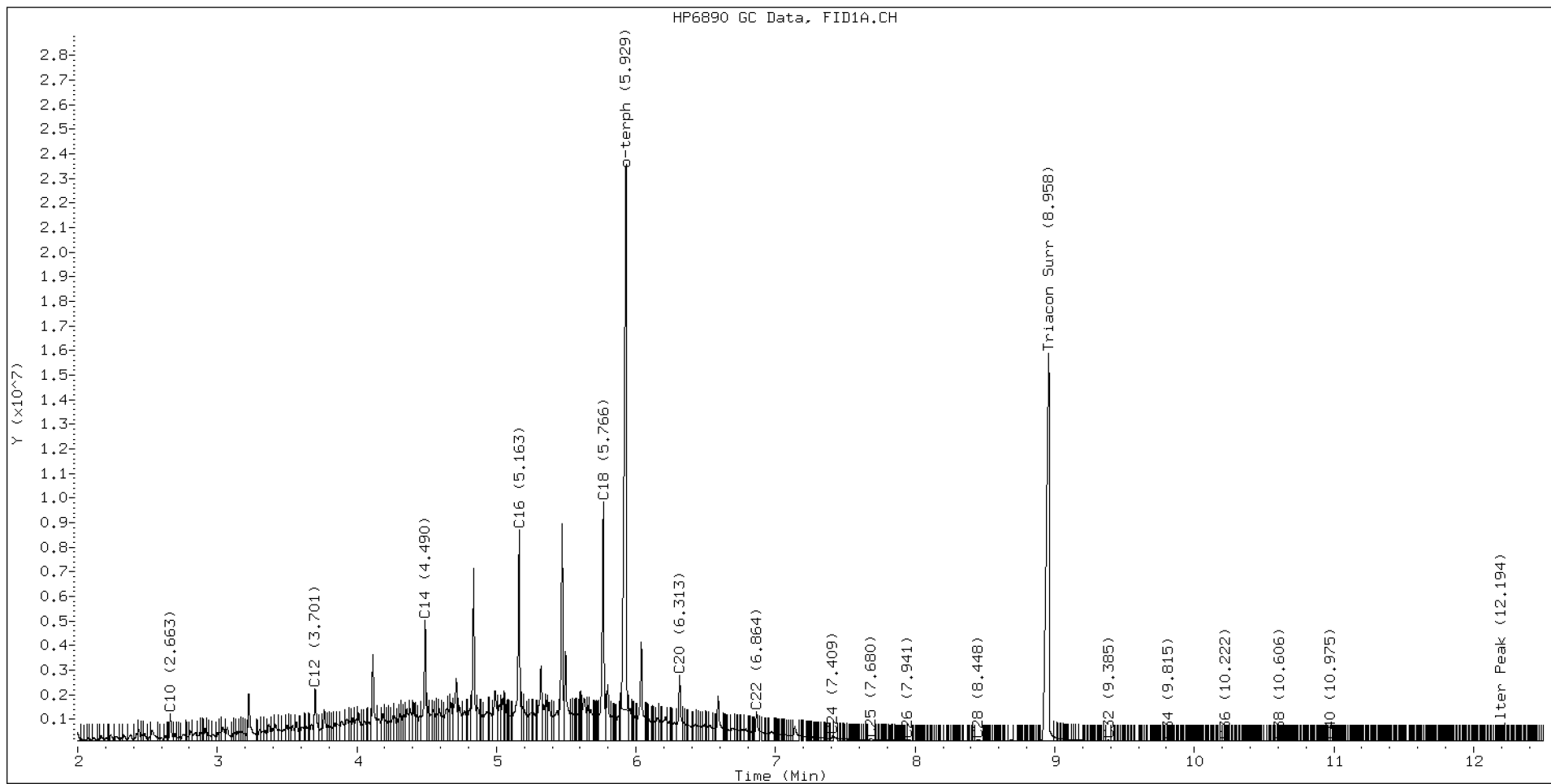
FID:4A RESULTS								
Compound	RT	Shift	Height	Area	Method	Range	Total Area	Conc (mg/L)
C8	1.354	-0.001	111657	86760	WATPHD	(C12-C24)	222244680	1401.2
C10	2.663	-0.002	1126386	1016957	WATPHM	(C24-C38)	5989943	45.6
C12	3.701	0.002	2121729	2675714				
C14	4.490	0.003	4912330	5378602				
C16	5.163	0.006	8603243	10100147				
C18	5.766	0.008	9745536	10442225				
C20	6.313	0.001	2685908	3322480				
C22	6.864	-0.002	1198661	1627762				
C24	7.409	-0.002	232165	247595				
C25	7.680	0.001	101505	244505				
C26	7.941	0.000	56175	45714				
C28	8.448	-0.001	76266	158609				
C32	9.385	-0.001	42337	75169				
C34	9.815	0.000	20322	6047				
Filter Peak	12.194	-0.002	727	291	BUNKERC	(C10-C38)	256534174	4229.2
C36	10.222	0.002	18026	10586				
C38	10.606	0.003	11315	5618				
C40	10.975	-0.004	7951	6198				
o-terph	5.929	0.007	22240332	24053660				
Triacon Surr	8.958	0.000	15774437	23241169				

Range Times: NW Diesel(3.699 - 7.410) AK102(2.66 - 7.68) Jet A(2.66 - 5.76)
NW M.Oil(7.41 - 10.60) AK103(7.68 - 10.22) OR Diesel(2.66 - 8.45)

Surrogate	Area	Amount
o-Terphenyl	24053660	126.5 M
Triacontane	23241169	109.7

M Indicates the peak was manually integrated

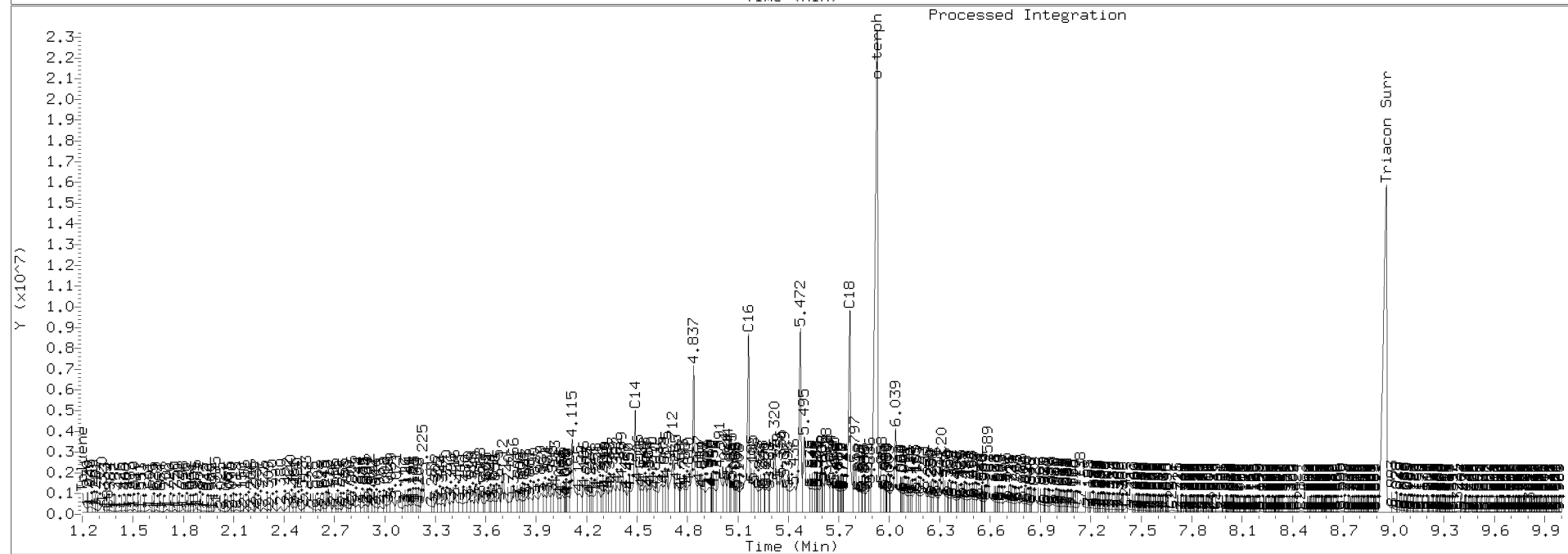
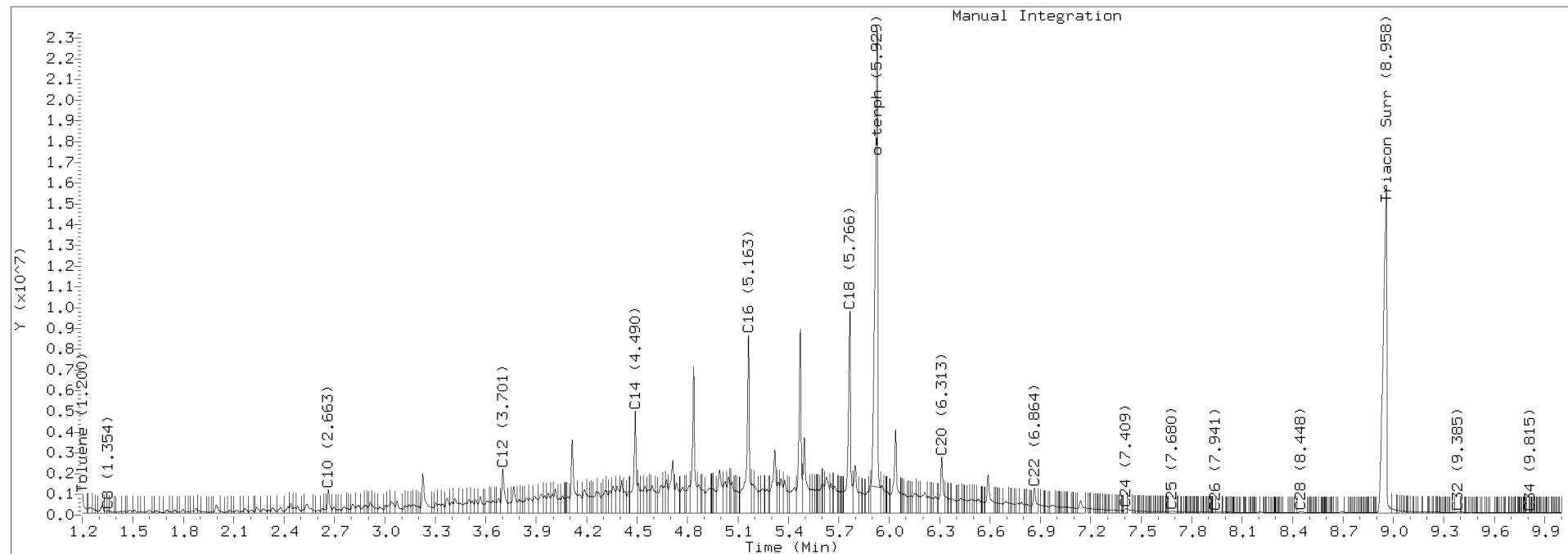
Analyte	RF	Curve Date
o-Terph Surr	190151.8	07-SEP-2021
Triacon Surr	211827.9	25-OCT-2019
Gas	15000.0	XX-XXX-XXXX
Diesel	158608.3	07-SEP-2021
Motor Oil	131440.7	14-APR-2021
Bunker C	60657.6	13-OCT-2021



TPH Manual Integrations Report

Datafile: FID4A, 20211012A.b/421J1233.D Injection: 12-OCT-2021 22:20

Lab ID:BJI0575-MSD1





Landau Associates, Inc. - Spokane
10 North Post Street, Suite 218
Spokane WA, 99201

Project: Avista Steam Plant
Project Number: Avista Steam Plant
Project Manager: Shane Kostka

Reported:
15-Oct-2021 15:41

Petroleum Hydrocarbons - Quality Control

Batch BJI0576 - EPA 3510C SepF

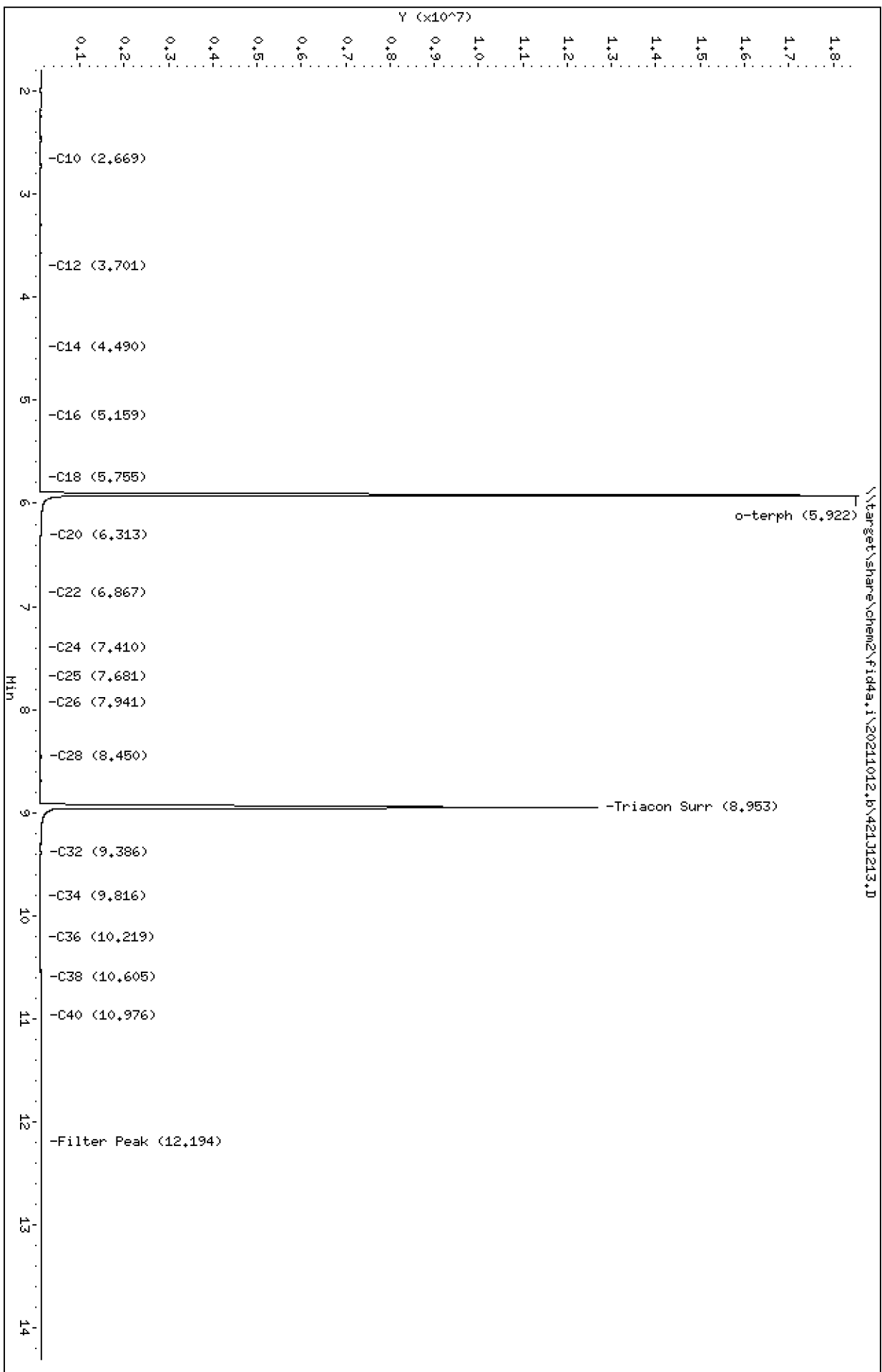
Instrument: FID4

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJI0576-BLK1)				Prepared: 22-Sep-2021 Analyzed: 12-Oct-2021 15:40						
Diesel Range Organics (C12-C24)	ND	0.100	mg/L							U
Motor Oil Range Organics (C24-C38)	ND	0.200	mg/L							U
Bunker C Range Organics (C10-C38)	ND	0.500	mg/L							U
Surrogate: o-Terphenyl	0.203		mg/L	0.225		90.0	50-150			

Data File: \\target\share\chem2\fid4a.i\20211012.b\421J1213.D
Date : 12-OCT-2021 15:40
Client ID:
Sample Info: BJ10576-BLK1

Column phase: RTX-1

Instrument: fid4a.i
Operator: TWC
Column diameter: 0.25



Analytical Resources Inc.
TPH Quantitation Report

Data file: 20211012.b/421J1213.D

Method: 20211012.b\FID4TPH.m

Instrument: fid4a.i, TWC

Report Date: 10/14/2021

Macro: 09-SEP-2019

Calibration Dates: Gas:XX-XXX-XXXX Diesel:07-SEP-2021 M.Oil:14-APR-2021

ARI ID: BJI0576-BLK1

Client ID:

Injection: 12-OCT-2021 15:40

Dilution Factor: 1

RT Std: 419H1603.D

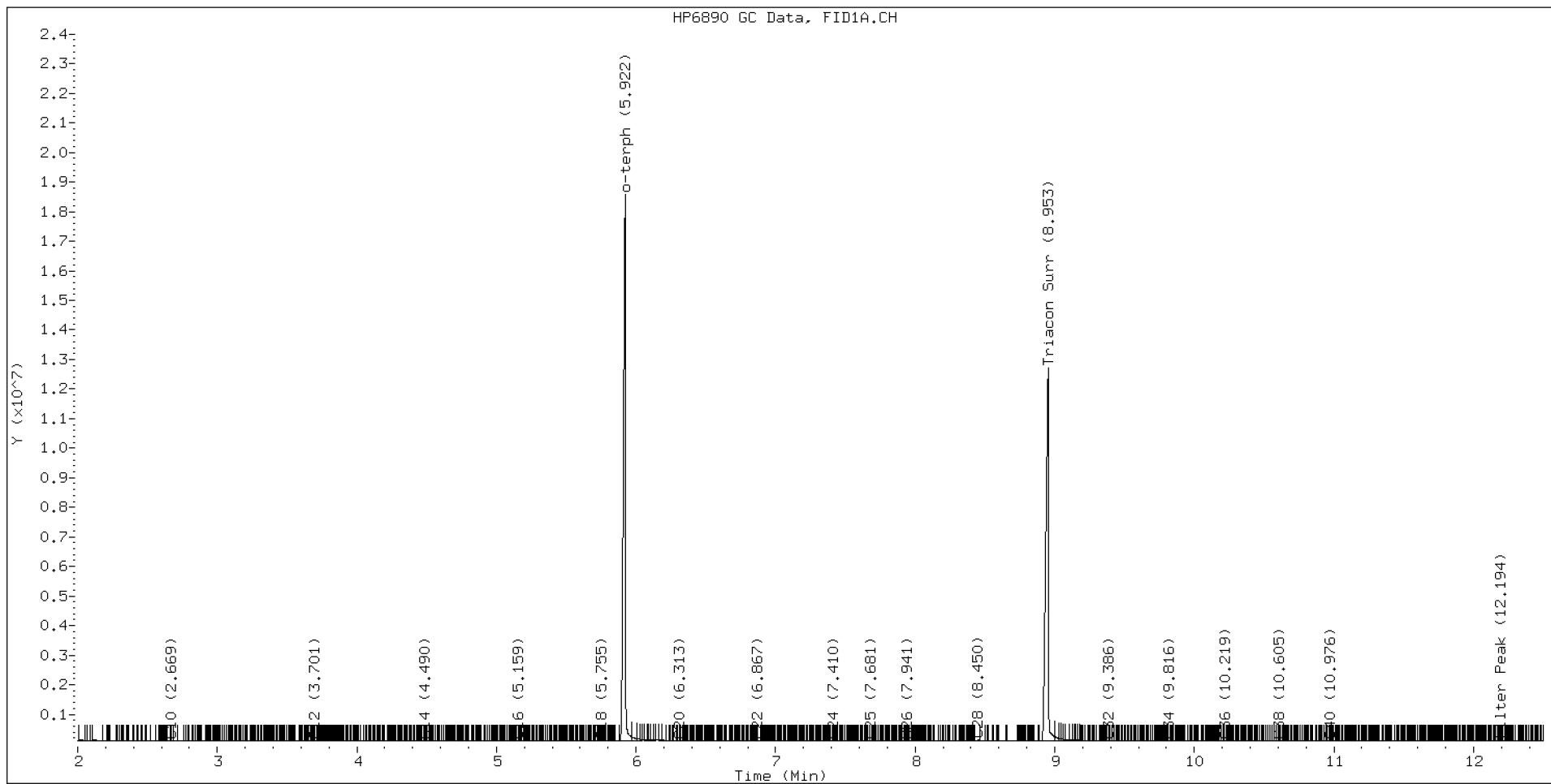
FID:4A RESULTS								
Compound	RT	Shift	Height	Area	Method	Range	Total Area	Conc (mg/L)
C8	1.358	0.003	124548	189748	WATPHD	(C12-C24)	2418022	15.2
C10	2.669	0.004	12838	5645	WATPHM	(C24-C38)	1847511	14.1
C12	3.701	0.002	14245	11970				
C14	4.490	0.003	11865	6443				
C16	5.159	0.002	9283	3230				
C18	5.755	-0.003	8796	4370				
C20	6.313	0.001	15526	4630				
C22	6.867	0.002	4930	2199				
C24	7.410	-0.000	2494	369				
C25	7.681	0.002	1662	831				
C26	7.941	-0.000	715	177				
C28	8.450	0.002	28160	30931				
C32	9.386	0.001	17497	10130				
C34	9.816	0.002	9511	9286				
Filter Peak	12.194	-0.002	19325	12389	BUNKERC	(C10-C38)	5124915	71.0
C36	10.219	-0.002	12482	12732				
C38	10.605	0.002	15937	10300				
C40	10.976	-0.003	20149	10019				
o-terph	5.922	-0.000	18474743	19257988				
Triacon Surr	8.953	-0.005	12599898	17132770				

Range Times: NW Diesel(3.699 - 7.410) AK102(2.66 - 7.68) Jet A(2.66 - 5.76)
NW M.Oil(7.41 - 10.60) AK103(7.68 - 10.22) OR Diesel(2.66 - 8.45)

Surrogate	Area	Amount
o-Terphenyl	19257988	101.3 M
Triacontane	17132770	80.9

M Indicates the peak was manually integrated

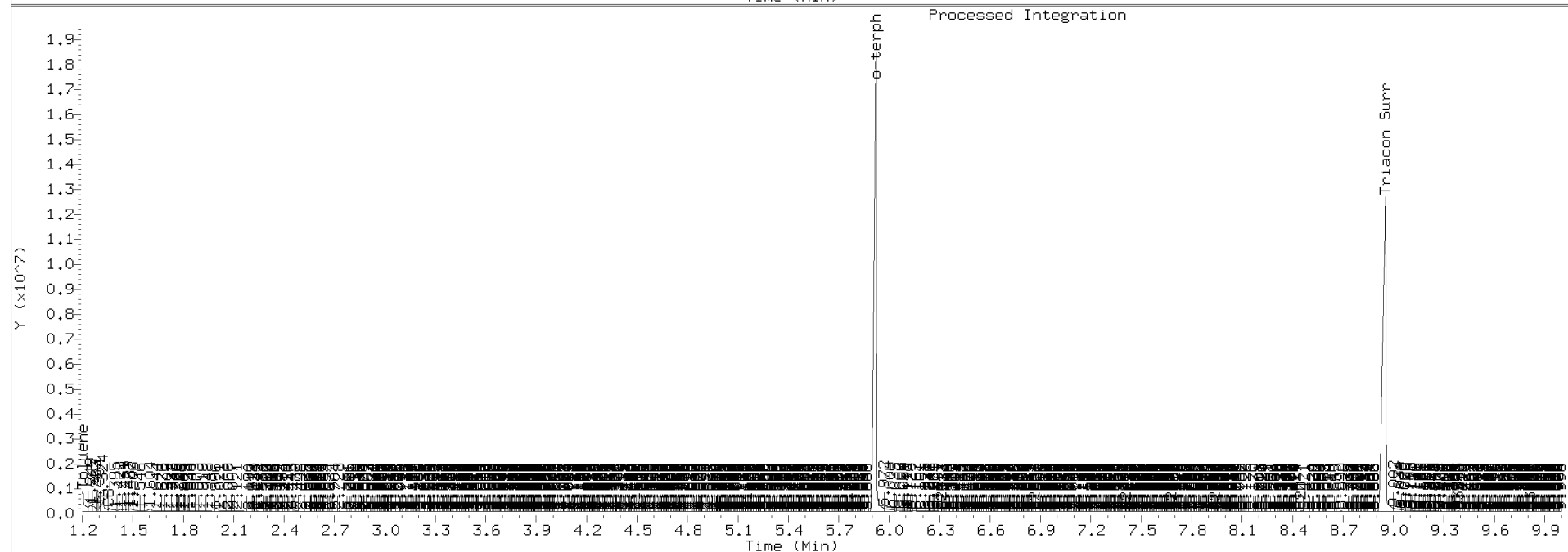
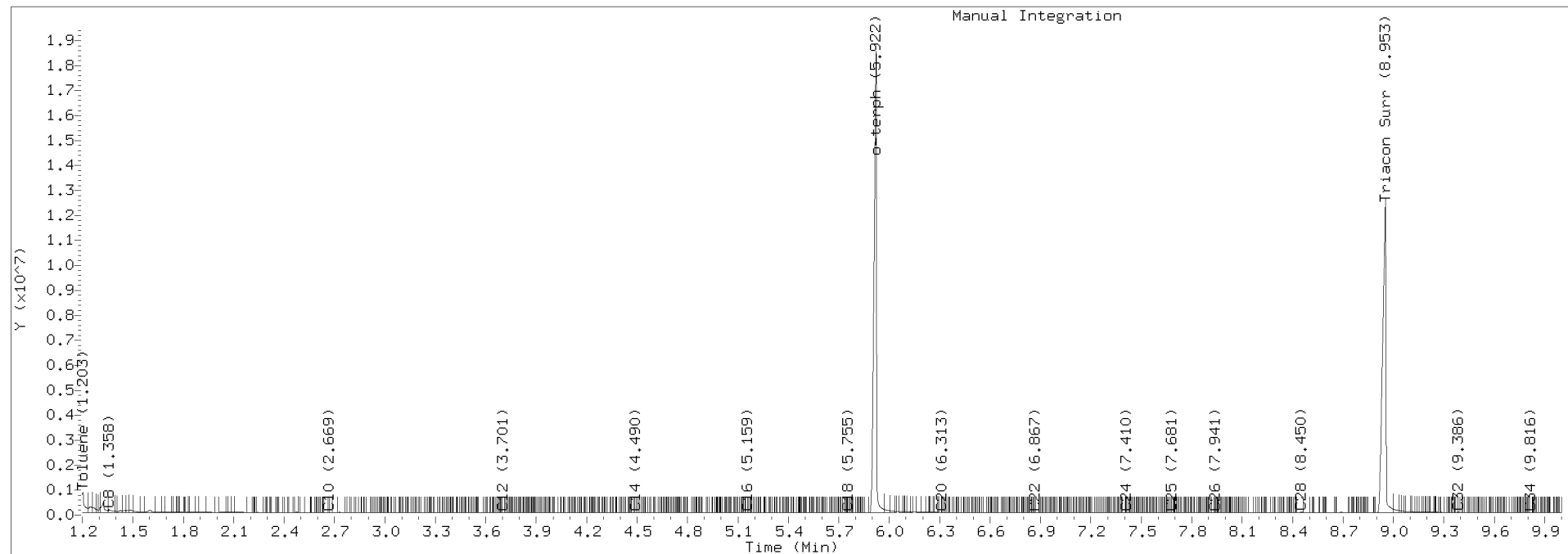
Analyte	RF	Curve Date
o-Terph Surr	190151.8	07-SEP-2021
Triacon Surr	211827.9	25-OCT-2019
Gas	15000.0	XX-XXX-XXXX
Diesel	158608.3	07-SEP-2021
Motor Oil	131440.7	14-APR-2021
Bunker C	72152.7	14-OCT-2021



TPH Manual Integrations Report

Datafile: FID4A, 20211012.b/421J1213.D Injection: 12-OCT-2021 15:40

Lab ID:BJI0576-BLK1





Landau Associates, Inc. - Spokane
10 North Post Street, Suite 218
Spokane WA, 99201

Project: Avista Steam Plant
Project Number: Avista Steam Plant
Project Manager: Shane Kostka

Reported:
15-Oct-2021 15:41

Petroleum Hydrocarbons - Quality Control

Batch BJI0576 - EPA 3510C SepF

Instrument: FID4

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS (BJI0576-BS1)					Prepared: 22-Sep-2021 Analyzed: 12-Oct-2021 16:00					
Diesel Range Organics (C12-C24)	2.35	0.100	mg/L	3.00		78.3	56-120			
Surrogate: o-Terphenyl	0.207		mg/L	0.225		91.8	50-150			

Data File: \\target\share\chem2\fid4a.i\20211012.b\421J1214.D

Date : 12-OCT-2021 16:00

Client ID:

Sample Info: BJ10576-BS1

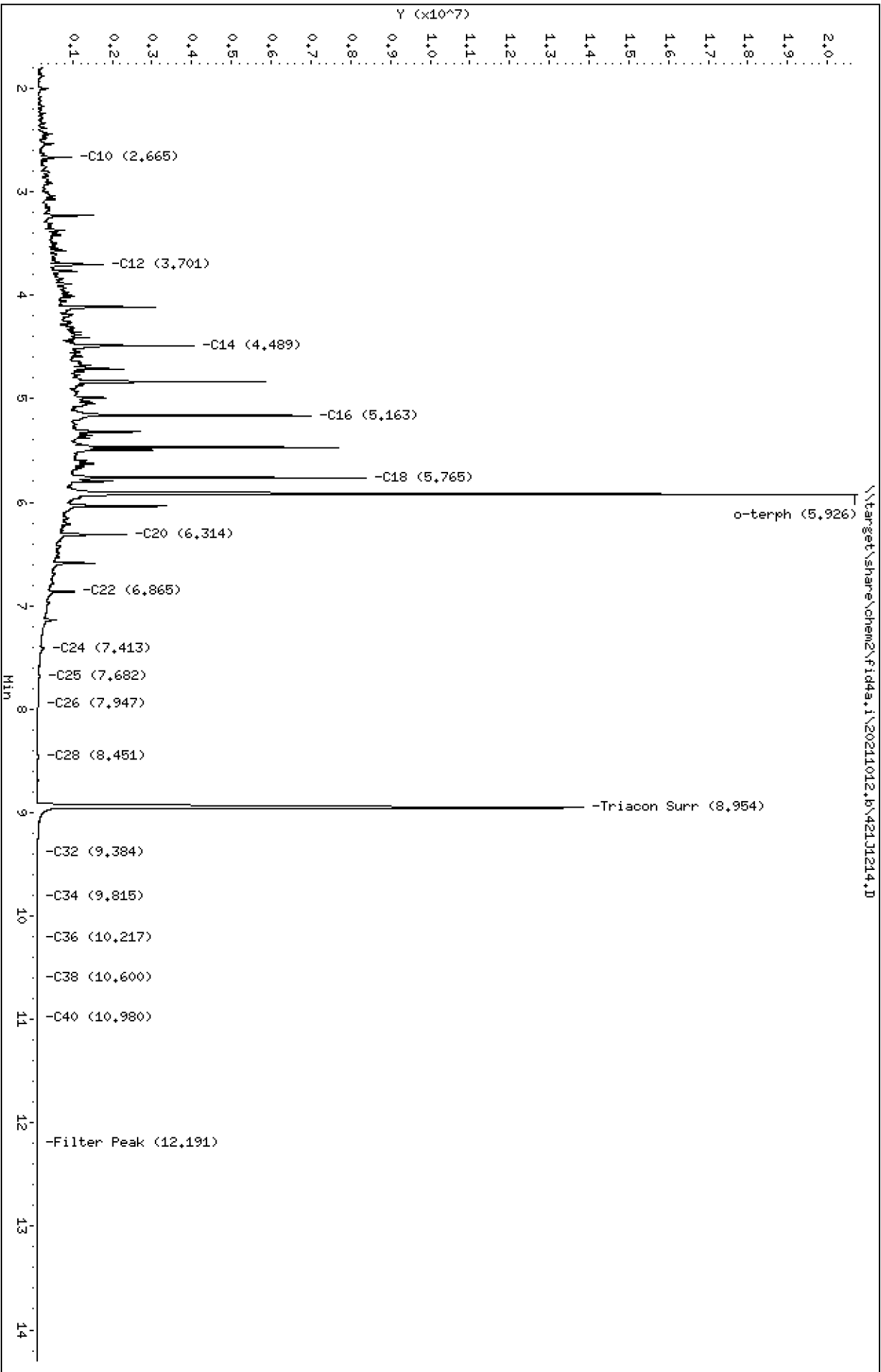
Column phase: RTX-1

Instrument: fid4a.i

Operator: TWC

Column diameter: 0.25

Page 1



Analytical Resources Inc.
TPH Quantitation Report

Data file: 20211012.b/421J1214.D

Method: 20211012.b\FID4TPH.m

Instrument: fid4a.i, TWC

Report Date: 10/14/2021

Macro: 09-SEP-2019

Calibration Dates: Gas:XX-XXX-XXXX Diesel:07-SEP-2021 M.Oil:14-APR-2021

ARI ID: BJI0576-BS1

Client ID:

Injection: 12-OCT-2021 16:00

Dilution Factor: 1

RT Std: 419H1603.D

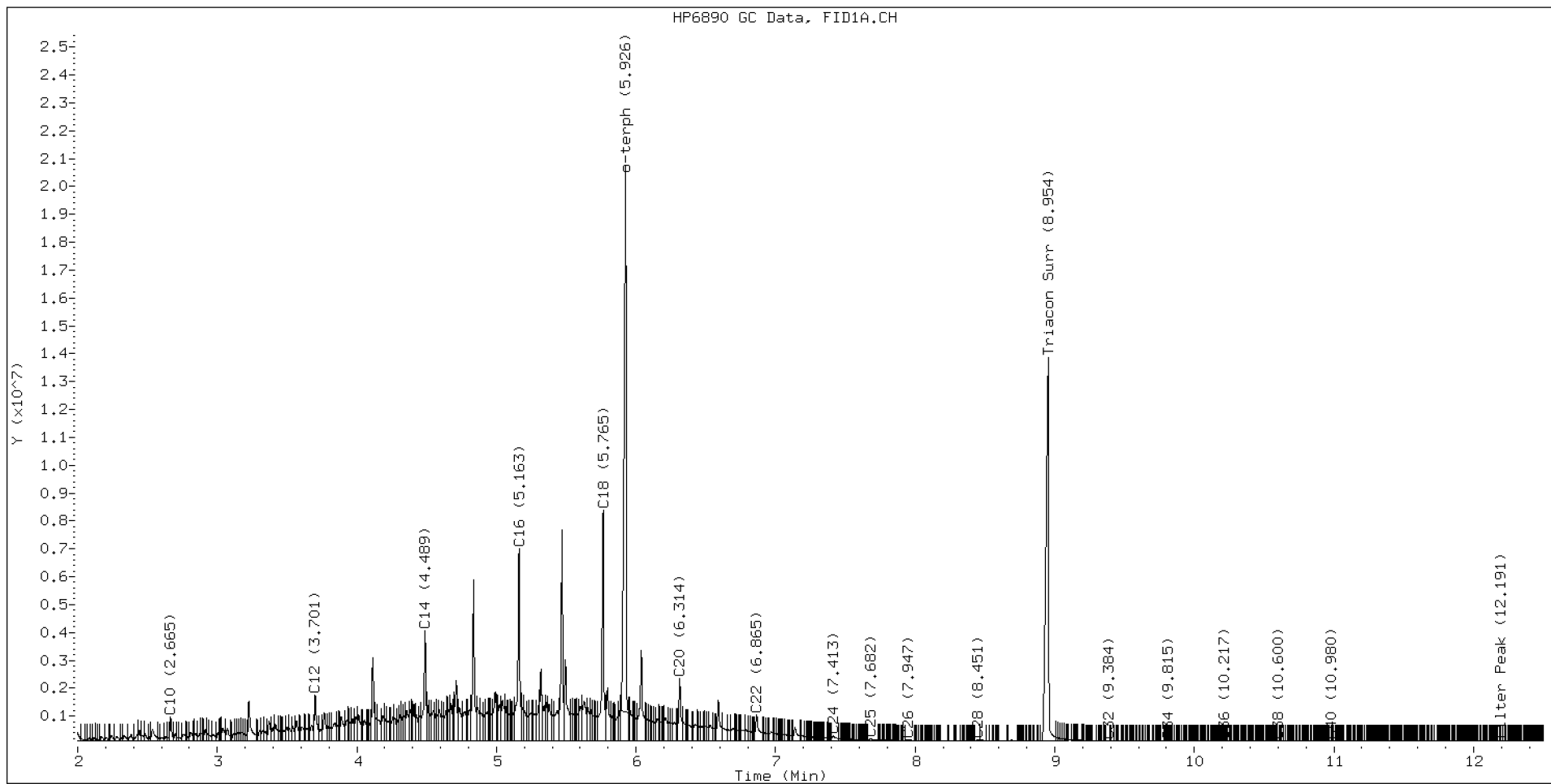
FID:4A RESULTS								
Compound	RT	Shift	Height	Area	Method	Range	Total Area	Conc (mg/L)
C8	1.360	0.006	89930	62439	WATPHD	(C12-C24)	186240360	1174.2
C10	2.665	0.001	867723	765507	WATPHM	(C24-C38)	2643886	20.1
C12	3.701	0.002	1656358	2040439				
C14	4.489	0.002	3949360	4219533				
C16	5.163	0.006	6892984	7227756				
C18	5.765	0.007	8272161	8480784				
C20	6.314	0.002	2239411	2610038				
C22	6.865	-0.001	948295	1635972				
C24	7.413	0.003	171468	407058				
C25	7.682	0.003	69417	208116				
C26	7.947	0.006	31317	87840				
C28	8.451	0.003	42819	50851				
C32	9.384	-0.002	15886	24089				
C34	9.815	0.000	3040	1488				
Filter Peak	12.191	-0.004	565	274	BUNKERC	(C10-C38)	210946288	2923.6
C36	10.217	-0.003	2155	1142				
C38	10.600	-0.003	1643	1289				
C40	10.980	0.002	2195	627				
o-terph	5.926	0.004	19605294	19633407				
Triacon Surr	8.954	-0.004	13759689	18727656				

Range Times: NW Diesel(3.699 - 7.410) AK102(2.66 - 7.68) Jet A(2.66 - 5.76)
NW M.Oil(7.41 - 10.60) AK103(7.68 - 10.22) OR Diesel(2.66 - 8.45)

Surrogate	Area	Amount
o-Terphenyl	19633407	103.3 M
Triacontane	18727656	88.4

M Indicates the peak was manually integrated

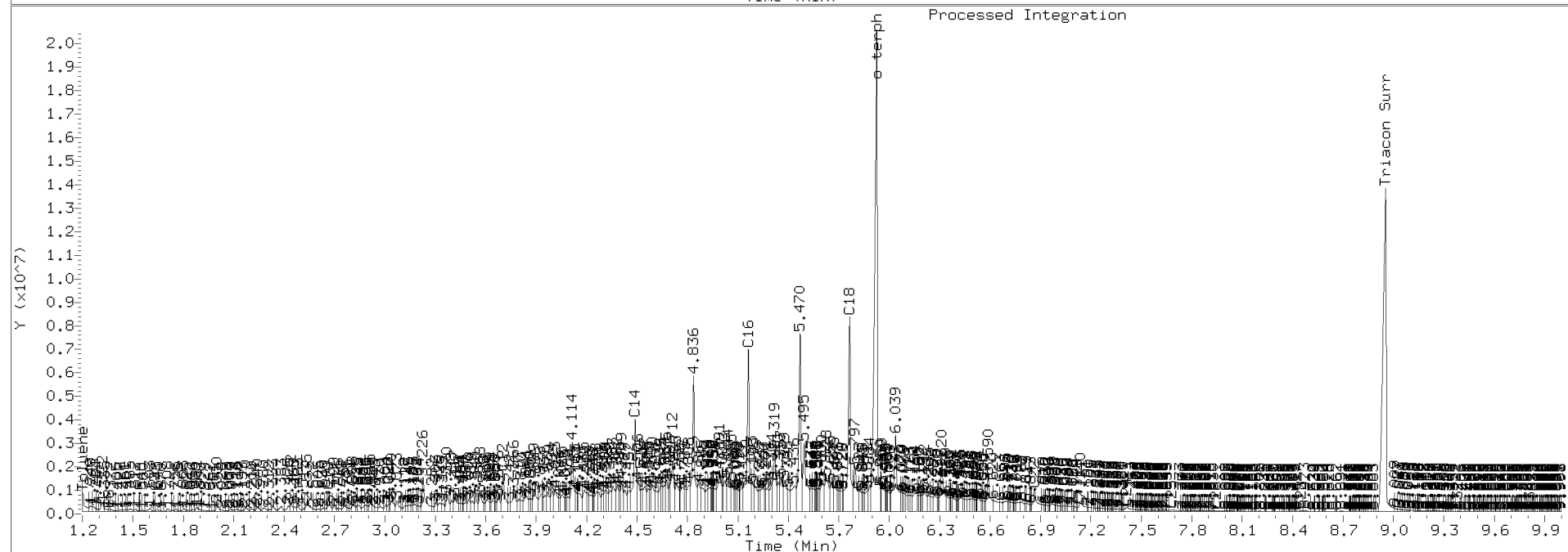
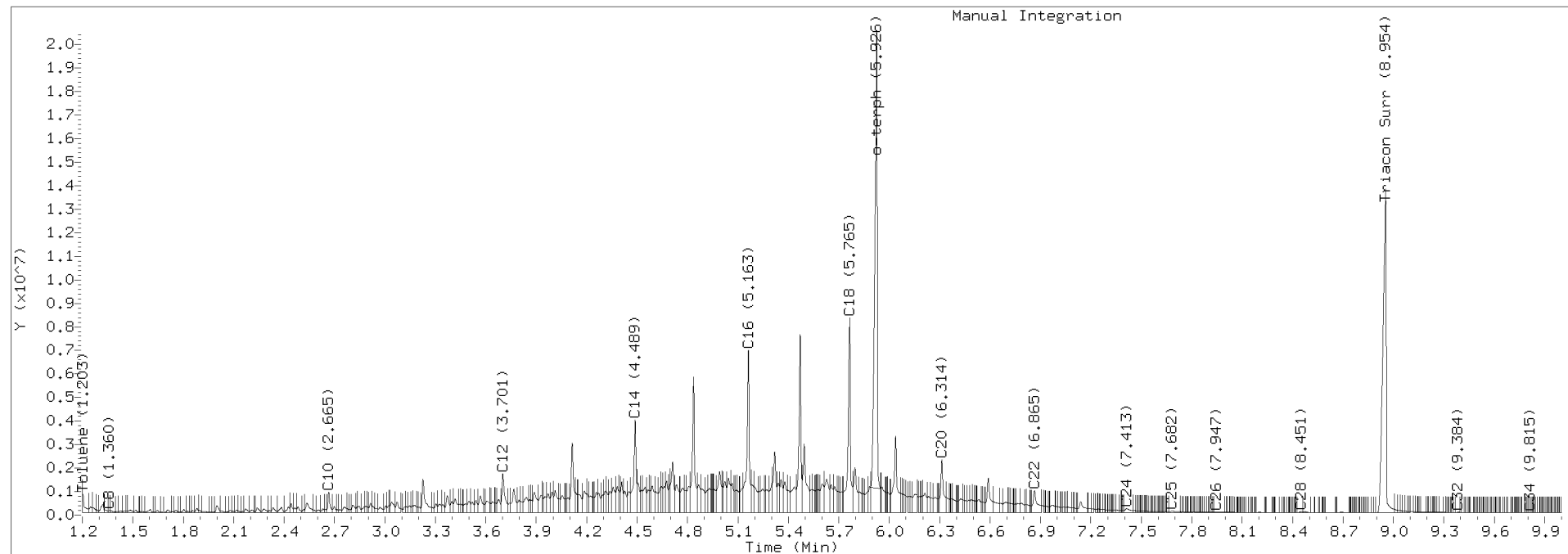
Analyte	RF	Curve Date
o-Terph Surr	190151.8	07-SEP-2021
Triacon Surr	211827.9	25-OCT-2019
Gas	15000.0	XX-XXX-XXXX
Diesel	158608.3	07-SEP-2021
Motor Oil	131440.7	14-APR-2021
Bunker C	72152.7	14-OCT-2021



TPH Manual Integrations Report

Datafile: FID4A, 20211012.b/421J1214.D Injection: 12-OCT-2021 16:00

Lab ID:BJI0576-BS1





Landau Associates, Inc. - Spokane
10 North Post Street, Suite 218
Spokane WA, 99201

Project: Avista Steam Plant
Project Number: Avista Steam Plant
Project Manager: Shane Kostka

Reported:
15-Oct-2021 15:41

Petroleum Hydrocarbons - Quality Control

Batch BJI0576 - EPA 3510C SepF

Instrument: FID4

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS Dup (BJI0576-BSD1)					Prepared: 22-Sep-2021 Analyzed: 12-Oct-2021 16:20					
Diesel Range Organics (C12-C24)	2.79	0.100	mg/L	3.00		92.9	56-120	17.00	30	
Surrogate: o-Terphenyl	0.223		mg/L	0.225		99.3	50-150			

Data File: \\target\share\chem2\fid4a.i\20211012.b\421J1215.D

Date : 12-OCT-2021 16:20

Client ID:

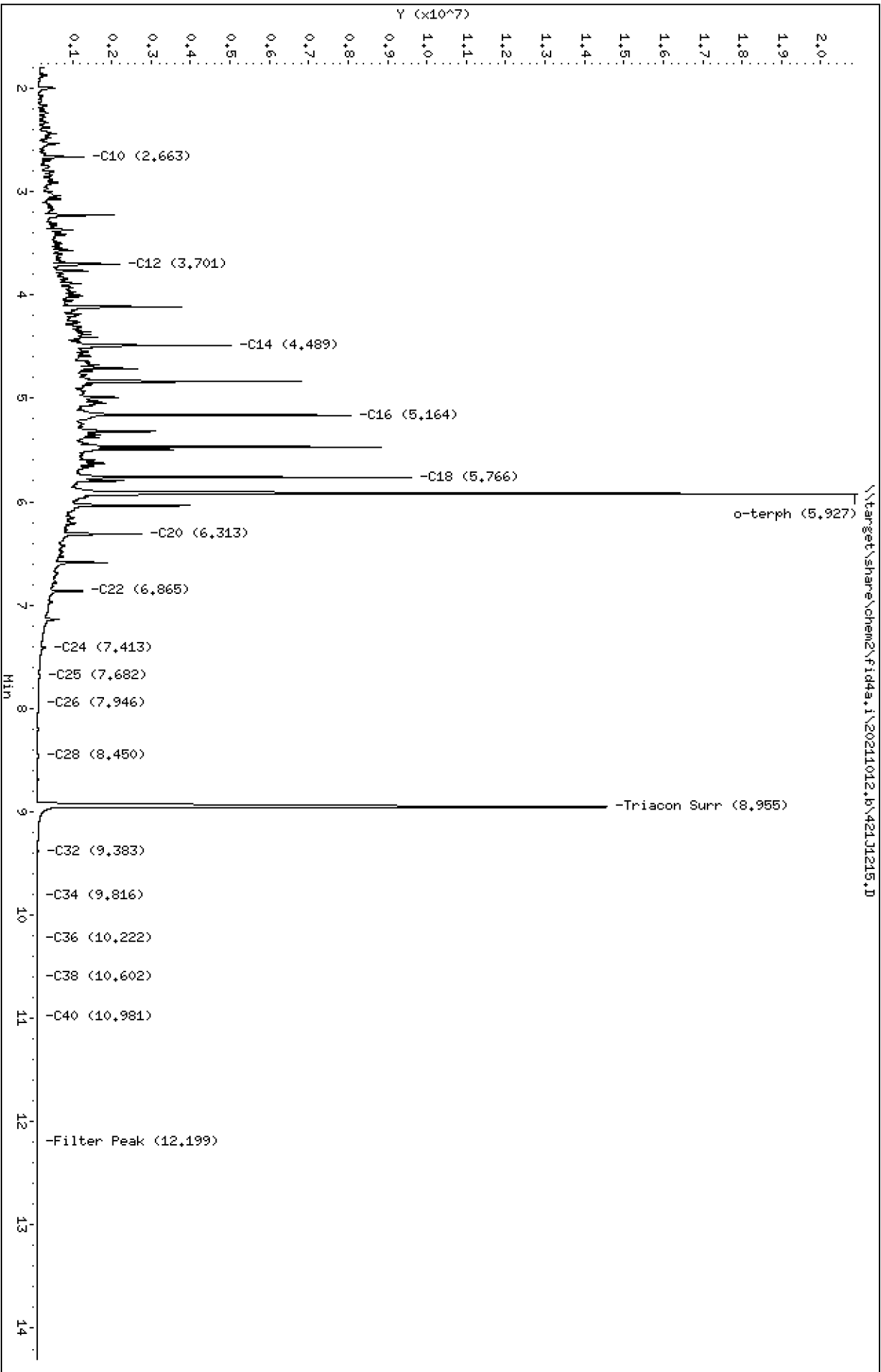
Sample Info: BJ10576-BSD1

Column phase: RTX-1

Instrument: fid4a.i

Operator: TWC

Column diameter: 0.25



Analytical Resources Inc.
TPH Quantitation Report

Data file: 20211012.b/421J1215.D

Method: 20211012.b\FID4TPH.m

Instrument: fid4a.i, TWC

Report Date: 10/14/2021

Macro: 09-SEP-2019

Calibration Dates: Gas:XX-XXX-XXXX Diesel:07-SEP-2021 M.Oil:14-APR-2021

ARI ID: BJI0576-BSD1

Client ID:

Injection: 12-OCT-2021 16:20

Dilution Factor: 1

RT Std: 419H1603.D

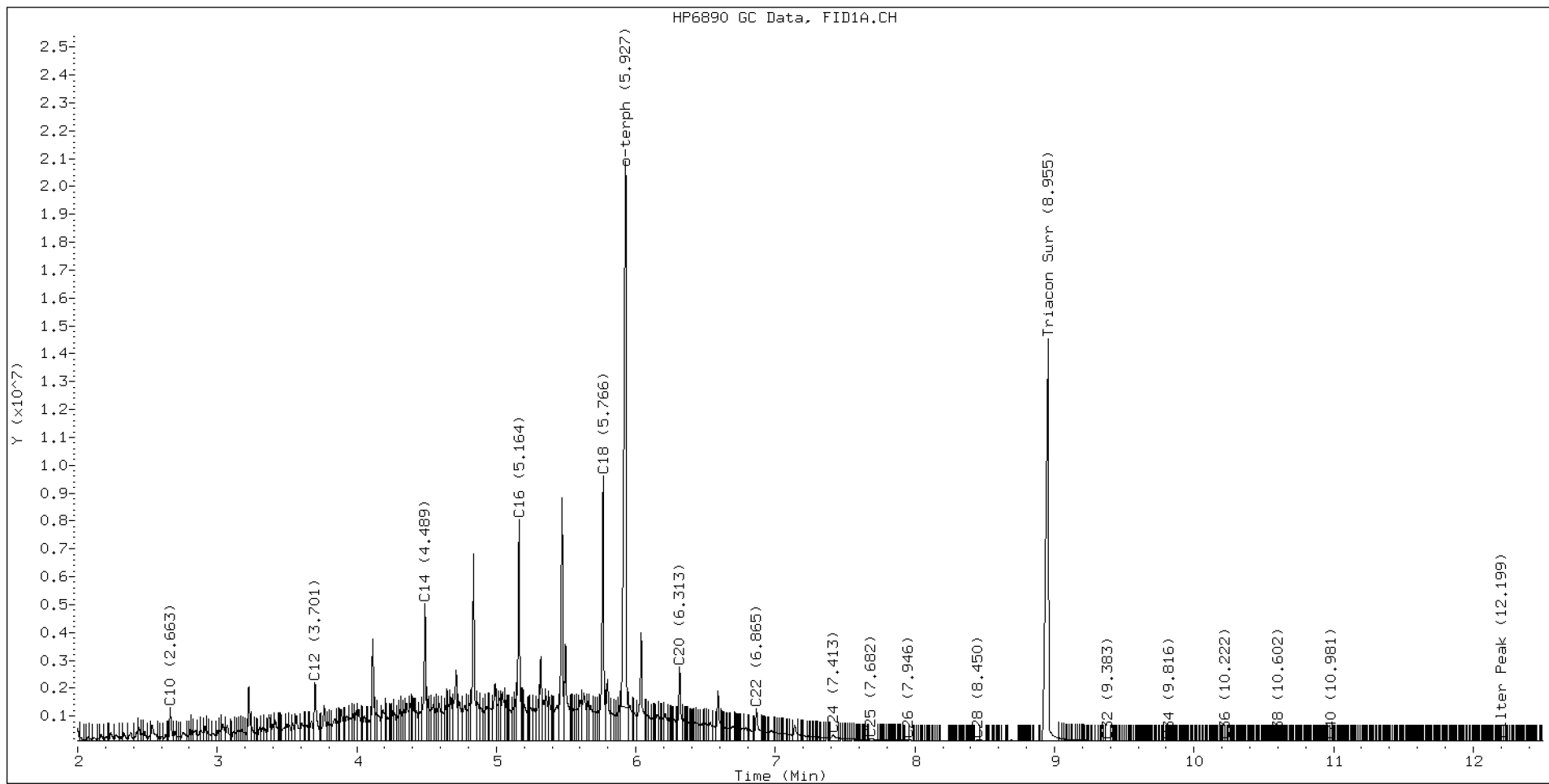
FID:4A RESULTS								
Compound	RT	Shift	Height	Area	Method	Range	Total Area	Conc (mg/L)
C8	1.355	0.000	240489	299975	WATPHD	(C12-C24)	220911682	1392.8
C10	2.663	-0.001	1187236	1040076	WATPHM	(C24-C38)	3039569	23.1
C12	3.701	0.001	2110515	2572760				
C14	4.489	0.002	4919878	5047094				
C16	5.164	0.007	7951895	7525216				
C18	5.766	0.009	9505654	9019057				
C20	6.313	0.001	2662072	2868904				
C22	6.865	-0.000	1162613	1764945				
C24	7.413	0.003	215933	515727				
C25	7.682	0.003	85034	250860				
C26	7.946	0.005	37777	66206				
C28	8.450	0.001	47182	58913				
C32	9.383	-0.002	18554	33234				
C34	9.816	0.001	6195	1232				
Filter Peak	12.199	0.004	578	311	BUNKERC	(C10-C38)	252061702	3493.4
C36	10.222	0.002	5465	2124				
C38	10.602	-0.001	4716	2798				
C40	10.981	0.003	4207	2838				
o-terph	5.927	0.005	19609487	21235442				
Triacon Surr	8.955	-0.003	14445807	20214419				

Range Times: NW Diesel(3.699 - 7.410) AK102(2.66 - 7.68) Jet A(2.66 - 5.76)
NW M.Oil(7.41 - 10.60) AK103(7.68 - 10.22) OR Diesel(2.66 - 8.45)

Surrogate	Area	Amount
o-Terphenyl	21235442	111.7 M
Triacotane	20214419	95.4

M Indicates the peak was manually integrated

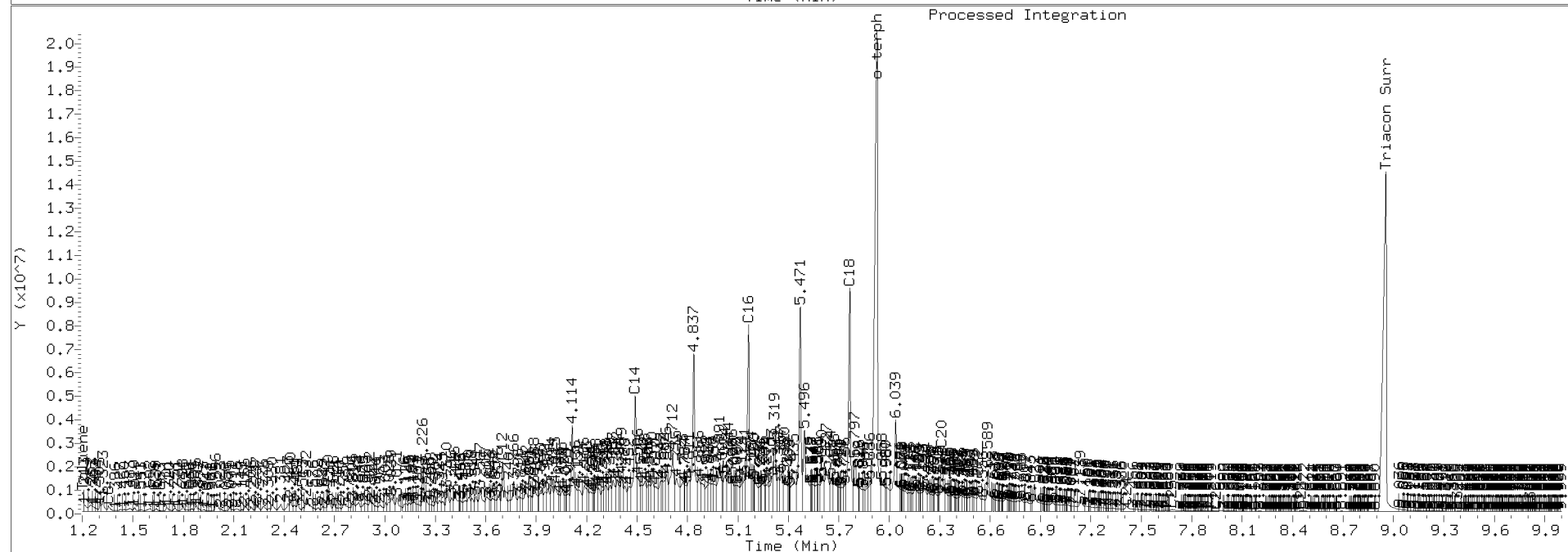
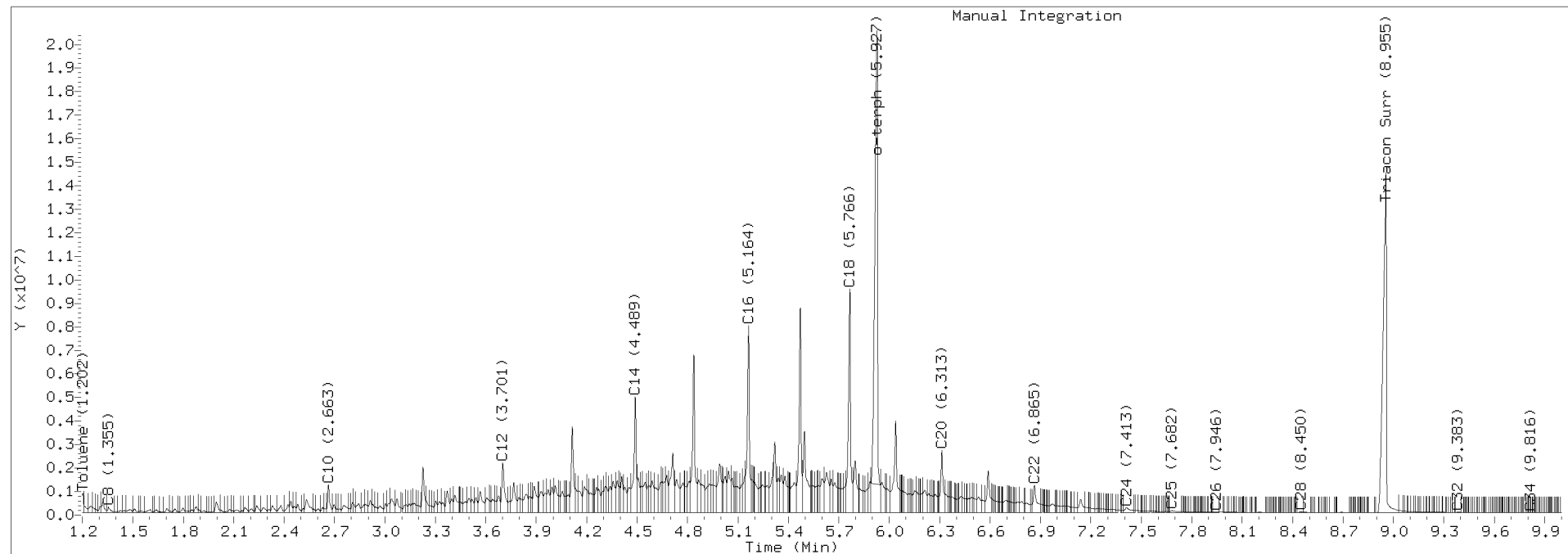
Analyte	RF	Curve Date
o-Terph Surr	190151.8	07-SEP-2021
Triacon Surr	211827.9	25-OCT-2019
Gas	15000.0	XX-XXX-XXXX
Diesel	158608.3	07-SEP-2021
Motor Oil	131440.7	14-APR-2021
Bunker C	72152.7	14-OCT-2021



TPH Manual Integrations Report

Datafile: FID4A, 20211012.b/421J1215.D Injection: 12-OCT-2021 16:20

Lab ID:BJI0576-BSD1





Landau Associates, Inc. - Spokane
10 North Post Street, Suite 218
Spokane WA, 99201

Project: Avista Steam Plant
Project Number: Avista Steam Plant
Project Manager: Shane Kostka

Reported:
15-Oct-2021 15:41

Certified Analyses included in this Report

Analyte	Certifications
NWTPH-Dx in Water	
Diesel Range Organics (C12-C24)	DoD-ELAP,NELAP,WADOE
Diesel Range Organics (C10-C25)	DoD-ELAP,NELAP,WADOE
Diesel Range Organics (Tol-C18)	DoD-ELAP,NELAP,WADOE
Diesel Range Organics (C10-C24)	DoD-ELAP,NELAP,WADOE
Diesel Range Organics (C10-C28)	DoD-ELAP,NELAP,WADOE
Diesel Range Organics (C12-C22)	DoD-ELAP
Diesel Range Organics (C12-C25)	DoD-ELAP
Motor Oil Range Organics (C24-C38)	DoD-ELAP,NELAP,WADOE
Motor Oil Range Organics (C25-C36)	DoD-ELAP,NELAP,WADOE
Motor Oil Range Organics (C24-C40)	DoD-ELAP,NELAP,WADOE
Residual Range Organics (C23-C32)	DoD-ELAP
Mineral Spirits Range Organics (Tol-C12)	DoD-ELAP,NELAP,WADOE
Mineral Oil Range Organics (C16-C28)	DoD-ELAP,NELAP,WADOE
Kerosene Range Organics (Tol-C18)	DoD-ELAP,NELAP,WADOE
JP8 Range Organics (C8-C18)	DoD-ELAP,NELAP,WADOE
JP5 Range Organics (C10-C16)	DoD-ELAP,NELAP,WADOE
JP4 Range Organics (Tol-C14)	DoD-ELAP,NELAP,WADOE
Jet-A Range Organics (C10-C18)	DoD-ELAP,NELAP,WADOE
Creosote Range Organics (C12-C22)	DoD-ELAP,NELAP,WADOE
Bunker C Range Organics (C10-C38)	DoD-ELAP,NELAP,WADOE
Stoddard Range Organics (C8-C12)	DoD-ELAP,NELAP,WADOE
Transformer Oil Range Organics (C12-C28)	DoD-ELAP,NELAP,WADOE

Code	Description	Number	Expires
ADEC	Alaska Dept of Environmental Conservation	17-015	03/28/2023
DoD-ELAP	DoD-Environmental Laboratory Accreditation Program	66169	02/28/2022
NELAP	ORELAP - Oregon Laboratory Accreditation Program	WA100006-012	05/12/2022
WADOE	WA Dept of Ecology	C558	06/30/2022
WA-DW	Ecology - Drinking Water	C558	06/30/2022



Landau Associates, Inc. - Spokane
10 North Post Street, Suite 218
Spokane WA, 99201

Project: Avista Steam Plant
Project Number: Avista Steam Plant
Project Manager: Shane Kostka

Reported:
15-Oct-2021 15:41

Notes and Definitions

U	This analyte is not detected above the reporting limit (RL) or if noted, not detected above the limit of detection (LOD).
D	The reported value is from a dilution
*	Flagged value is not within established control limits.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
[2C]	Indicates this result was quantified on the second column on a dual column analysis.

**QM-95 Groundwater Sampling
Laboratory Analytical Report
Apex Laboratories, LLC**

November 9, 2021

Shane Kostka
Landau Associates
10 N Post St, Ste 218
Spokane, WA 99201

Dear Mr. Kostka:

Included are the results from the characterization of the water, liquid, and solid samples for your Avista CSP, 0236040 project. The samples MW-21-091521, MW-25-091521, MW-28-091521, OR-1-091621, Bailer, and Twine were submitted in good condition to Apex Forensics on September 17, 2021. The samples were assigned work order number A1I0767 and placed in a refrigerator maintained at 6°C until removed for sample processing.

PRODUCT SAMPLE ANALYSIS SUMMARY

The liquid sample OR-1-091621 was analyzed using the American Society for Testing and Materials (ASTM) Method D2887-14. This testing was completed in order to determine the boiling range and chemical composition of the fuel or fuels present in the sample OR-1-091621. An aliquot of the sample was diluted with carbon disulfide and analyzed using an Agilent 6890 Gas Chromatograph (GC) fitted with a Flame Ionization Detector (FID). The GC/FID trace generated for the sample is enclosed as Appendix A. GC/FID traces of the method blank associated with the analytical batch as well as reference standards are also provided.

The GC/FID traces of the sample yielded detailed information on the boiling range and general chemical composition of the material that elutes under the ASTM Method 2887-14 GC/FID conditions between 36°C and 545°C. A detailed summary characterizing the material identified in the sample OR-1-091621 is enclosed.

In addition, the liquid sample OR-1-091621 was analyzed for diesel and oil hydrocarbons using GC/FID following WADOE Method NWTPH-Dx. The results of this testing, including the associated quality assurance, are enclosed in Appendix B. The GC/FID traces generated from this analysis are enclosed as Appendix C.

WATER SAMPLE ANALYSIS SUMMARY

The water samples MW-21-091521, MW-25-091521, and MW-28-091521 were analyzed for diesel and oil hydrocarbons, with and without silica gel cleanup, using GC/FID following WADOE Method NWTPH-Dx. The results of this testing, including the associated quality assurance, are enclosed in Appendix B. The GC/FID traces generated from this analysis are enclosed as Appendix D.

WATER SOLUBLE FRACTION ANALYSIS SUMMARY

The water soluble fraction (WSF) of the liquid sample OR-1-091621 was analyzed for diesel and oil hydrocarbons using GC/FID following WADOE Method NWTPH-Dx. The results of the WSF analysis are enclosed in Appendix B. The GC/FID traces generated from this analysis are enclosed as Appendix E.

In preparation for the WSF analysis, approximately 20 milliliters (mL) of the product sample OR-1-091621 and 900 mL of deionized (DI) water were placed into a glass bottle. The bottle was shaken by hand for two minutes and the shaking process was repeated an additional four times throughout the day. The sample dispersed into small globules ranging in size from approximately two millimeters to two centimeters. The mixture was allowed to equilibrate for approximately 48 hours. The water layer was then passed through a funnel containing glass wool to retain the product and collected in a one liter amber glass bottle. Not all of the water layer was transferred into the bottle to minimize product contamination in the water.

Please contact us if additional consultation is needed by our firm in the interpretation of the analytical results provided or if you would like to arrange for long term storage of the samples. We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Respectfully,



Kurt Johnson, Senior Chemist
Director of Forensic Services
Apex Laboratories, LLC
Enclosures

Date of Report: 11/09/21
Date Received: 09/17/21
Project: Avista CSP, 0236040, A1I0767
Date Extracted: 09/29/21
Date Analyzed: 09/29/21

**RESULTS FROM THE ANALYSIS OF THE LIQUID SAMPLE
FOR FORENSIC EVALUATION
BY CAPILLARY GAS CHROMATOGRAPHY
USING A FLAME IONIZATION DETECTOR (FID)
BY ASTM METHOD D2887-14**

Sample ID

GC Characterization

OR-1-091621

A1I0767-04

The GC trace using the flame ionization detector (FID) showed the presence of medium to high boiling compounds. The patterns displayed by these peaks are indicative of a high boiling product such as Bunker C or similar materials.

The medium to high boiling compounds appear as an irregular pattern of peaks on top of a broad hump or unresolved complex mixture (UCM). This material elutes from *n*-C₁₀ to beyond *n*-C₄₄ showing a maximum near *n*-C₂₅. This correlates with a temperature range of approximately 174°C to beyond 545°C with a maximum near 402°C.

Within this range, peaks are present which are indicative of isoprenoids such as norpristane, pristane, and phytane. An identifiable pattern of peaks characteristic of the normal alkanes was not present. The abundance of isoprenoids in conjunction with the apparent absence of normal alkanes indicates that the fuel present has undergone substantial biological degradation.

The large peak seen near 25.2 minutes on the GC trace is pentacosane, added as a retention time marker and quality assurance check for this GC analysis. The peak at 1.6 minutes corresponds to the extraction solvent, carbon disulfide.

APPENDIX A

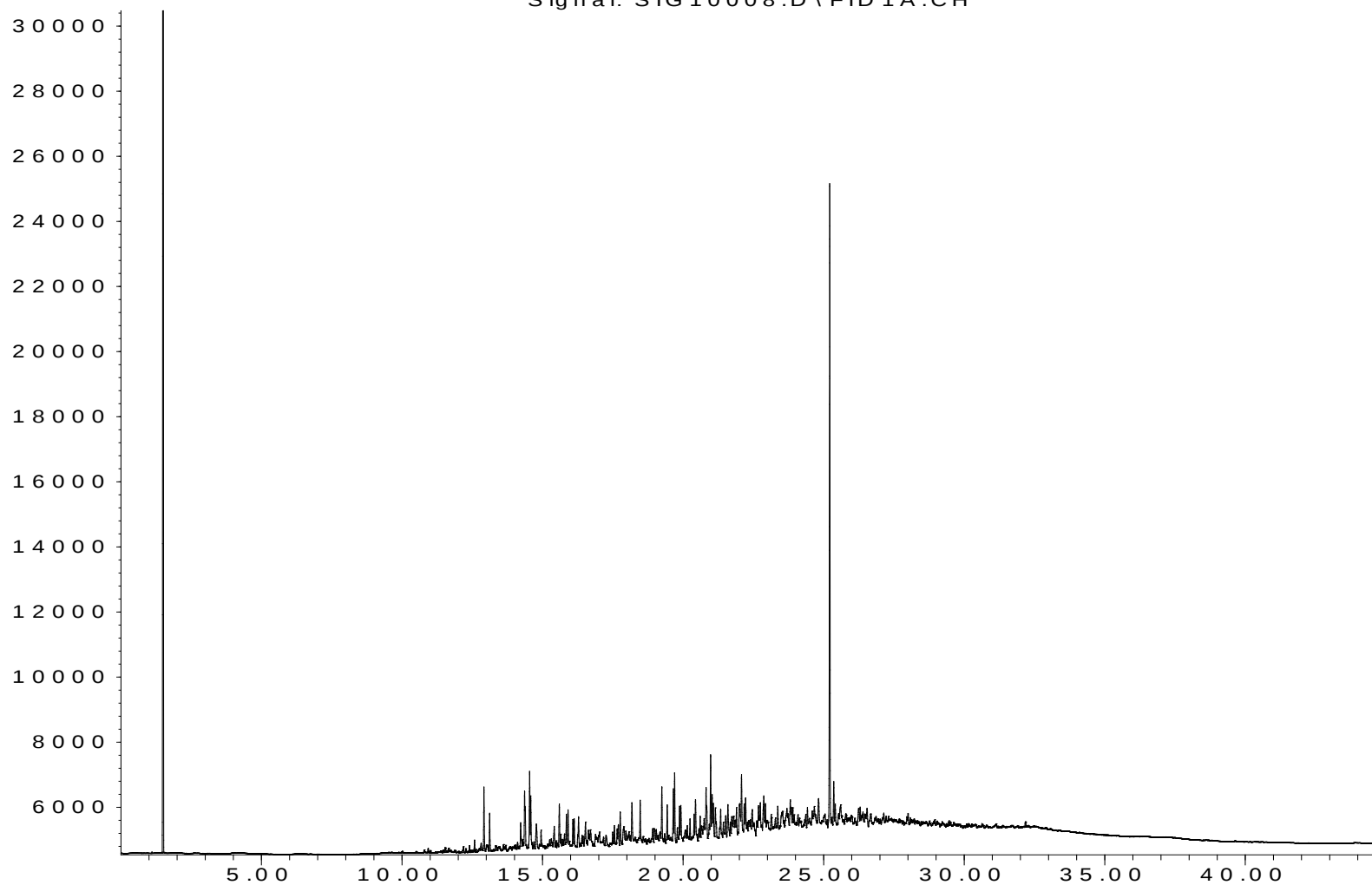
Liquid Sample: OR-1-091621 (A1I0767-04)

Landau Associates - Avista CSP

Sequence Date: September 29, 2021

Signal: SIG10008.D\FID1A.CH

Response_

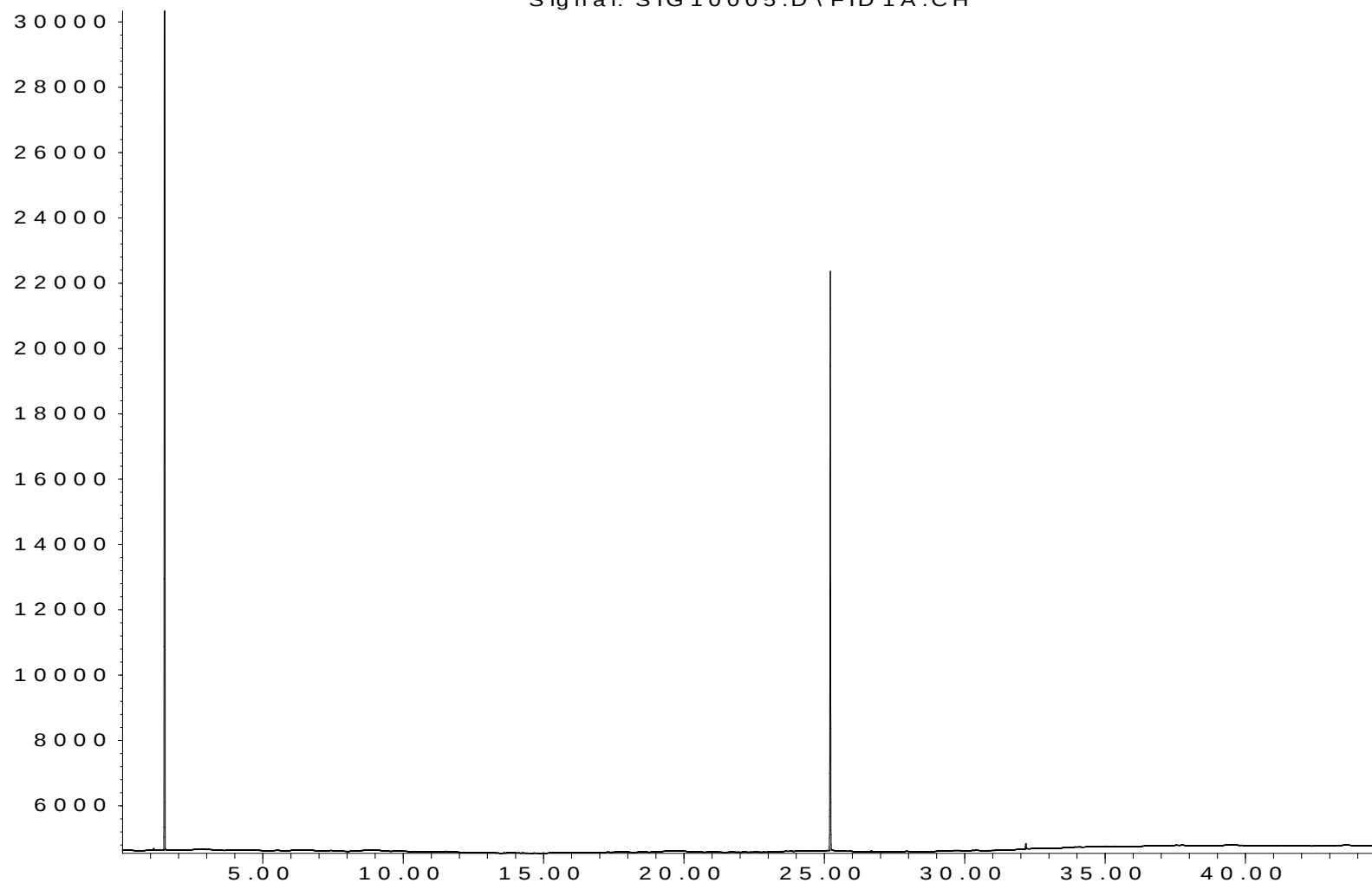


Time

QC Sample: Method Blank
Landau Associates - Avista CSP
Sequence Date: September 29, 2021

Response_

Signal: SIG10005.D\FID1A.CH

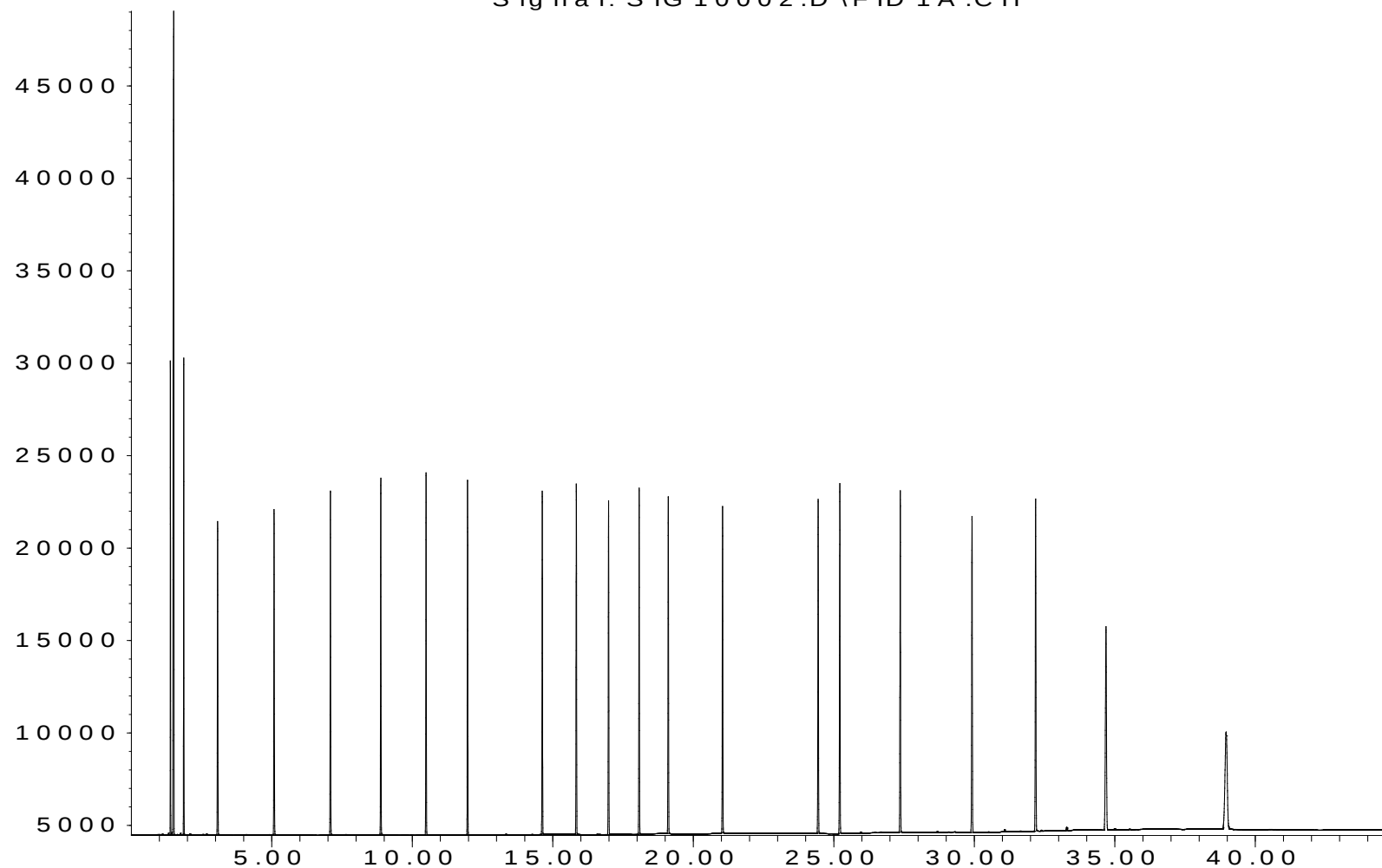


Time

ASTM Reference Sample: 2887 Alk A
Landau Associates - Avista CSP
Sequence Date: September 29, 2021

Response_

Signal: SIG 10002.D\FID 1A.CH

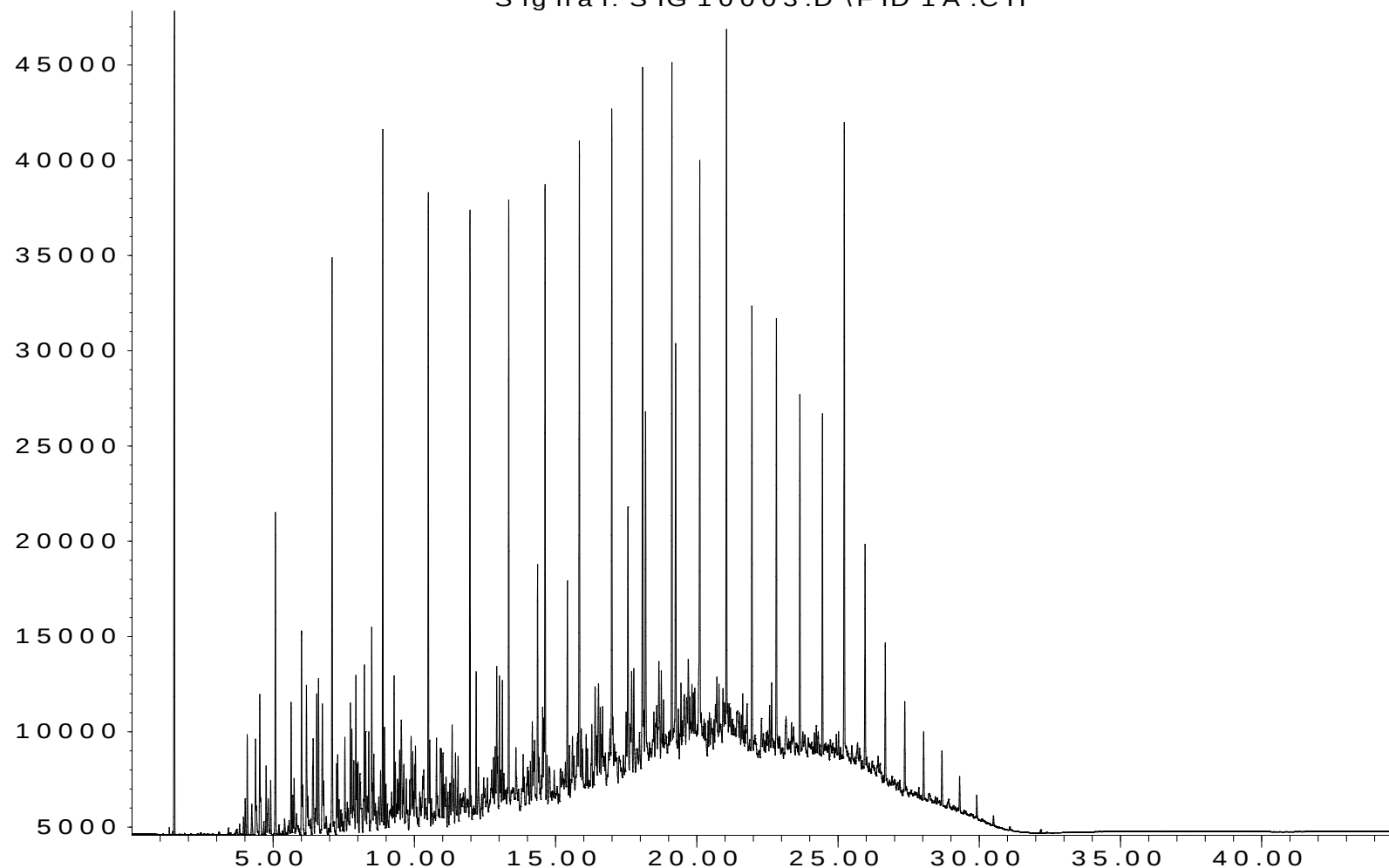


Time

ASTM Reference Sample: 2887 Gas/Oil A
Landau Associates - Avista CSP
Sequence Date: September 29, 2021

Response_

Signal: SIG 10003.D\FID 1A.CH



Time

APPENDIX B



ANALYTICAL REPORT

Apex Laboratories, LLC

6700 S.W. Sandburg Street

Tigard, OR 97223

503-718-2323

ORELAP ID: OR100062

Tuesday, November 9, 2021

Shane Kostka

Landau Associates

10 N Post St, Ste 218

Spokane, WA 99201

RE: A110767 - Avista CSP - 0236040

Thank you for using Apex Laboratories. We greatly appreciate your business and strive to provide the highest quality services to the environmental industry.

Enclosed are the results of analyses for work order A110767, which was received by the laboratory on 9/17/2021 at 10:55:00AM.

If you have any questions concerning this report or the services we offer, please feel free to contact me by email at: mpoquiz@apex-labs.com, or by phone at 503-718-2323.

Please note: All samples will be disposed of within 30 days of sample receipt, unless prior arrangements have been made.

Cooler Receipt Information

(See Cooler Receipt Form for details)

Cooler #1

1.8 degC

This Final Report is the official version of the data results for this sample submission, unless superseded by a subsequent, labeled amended report.

All other deliverables derived from this data, including Electronic Data Deliverables (EDDs), CLP-like forms, client requested summary sheets, and all other products are considered secondary to this report.



Apex Laboratories

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Michele Poquiz For Kurt Johnson, Senior Chemist

**ANALYTICAL REPORT****Apex Laboratories, LLC**6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323

ORELAP ID: OR100062

Landau Associates
10 N Post St, Ste 218
Spokane, WA 99201Project: **Avista CSP**
Project Number: **0236040**
Project Manager: **Shane Kostka****Report ID:**
A110767 - 11 09 21 0936**ANALYTICAL REPORT FOR SAMPLES****SAMPLE INFORMATION**

Client Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-21-091521	A110767-01	Water	09/15/21 12:00	09/17/21 10:55
MW-25-091521	A110767-02	Water	09/15/21 17:10	09/17/21 10:55
MW-28-091521	A110767-03	Water	09/15/21 15:20	09/17/21 10:55
OR-1-091621	A110767-04	Liquid	09/15/21 07:48	09/17/21 10:55
OR-1-091621 (WSF)	A110767-07	Water	09/30/21 07:48	09/17/21 10:55

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Michele Poquiz For Kurt Johnson, Senior Chemist



ANALYTICAL REPORT

Apex Laboratories, LLC

6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323

ORELAP ID: OR100062

Landau Associates
10 N Post St, Ste 218
Spokane, WA 99201

Project: **Avista CSP**
Project Number: **0236040**
Project Manager: **Shane Kostka**

Report ID:
A110767 - 11 09 21 0936

ANALYTICAL CASE NARRATIVE

Work Order: A110767

Diesel and Oil Hydrocarbons by NWTPH-Dx Note:

As requested, we have reviewed the GC/FID chromatograms generated for the water samples MW-21-091521 and MW-25-091521. These GC/FID traces showed the presence of peaks eluting between approximately 5.4 and 9.0 minutes which did not quantify above the reporting limit for the analysis. Within this range, peaks are present which are indicative of normal alkanes which show a maximum at approximately 7.5 minutes. Based on the boiling range and general composition of the trace level of material present in the samples MW-21-091521 and MW-25-09152, this material is characteristic of a wax dominant laboratory contaminant. This pattern of peaks was also present on the chromatogram generated for the associated method blank.

We have also reviewed the GC/FID chromatogram generated for the water sample MW-28-091521. The material present in this sample is likely due to medium to high boiling polar organics presumably originating from breakdown of a petroleum product.

It was also requested that we review NWTPH-Dx data generated by Analytical Resources Inc. (ARI) for water samples historically collected at the Site. It should be noted that a very similar pattern of peaks to those identified above as being attributable to a wax dominant laboratory contaminant was also identified on several of ARI's GC/FID traces. However, the ARI summary report appears to have quantified this lab contamination as a detection in their report without further qualification.

Lastly, it was requested that an estimate be provided regarding the Bunker C reporting limit if this quantitation had been performed at Apex as part of the NWTPH-Dx analysis. Based on the data generated, we estimate that the reporting limit of Bunker C would have been approximately 300 ppb with no detections in the samples MW-21-091521, MW-25-091521 or MW-28-091521.

Michele Poquiz
Forensic Services Technical Specialist
11/8/21

Apex Laboratories

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Michele Poquiz For Kurt Johnson, Senior Chemist



ANALYTICAL REPORT

Apex Laboratories, LLC

6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323

ORELAP ID: OR100062

Landau Associates
10 N Post St, Ste 218
Spokane, WA 99201Project: Avista CSP
Project Number: **0236040**
Project Manager: **Shane Kostka****Report ID:**
A110767 - 11 09 21 0936

ANALYTICAL SAMPLE RESULTS

Diesel and/or Oil Hydrocarbons by NWTPH-Dx

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-21-091521 (A110767-01)				Matrix: Water		Batch: 1090838		
Diesel	ND	---	76.2	ug/L	1	09/23/21 01:47	NWTPH-Dx LL	
Oil	ND	---	152	ug/L	1	09/23/21 01:47	NWTPH-Dx LL	
Surrogate: o-Terphenyl (Surr)		Recovery: 90 %		Limits: 50-150 %	1	09/23/21 01:47	NWTPH-Dx LL	
MW-25-091521 (A110767-02)				Matrix: Water		Batch: 1090838		
Diesel	ND	---	75.5	ug/L	1	09/23/21 02:07	NWTPH-Dx LL	
Oil	ND	---	151	ug/L	1	09/23/21 02:07	NWTPH-Dx LL	
Surrogate: o-Terphenyl (Surr)		Recovery: 92 %		Limits: 50-150 %	1	09/23/21 02:07	NWTPH-Dx LL	
MW-28-091521 (A110767-03)				Matrix: Water		Batch: 1090838		
Diesel	ND	---	75.5	ug/L	1	09/23/21 02:28	NWTPH-Dx LL	
Oil	243	---	151	ug/L	1	09/23/21 02:28	NWTPH-Dx LL	F-13
Surrogate: o-Terphenyl (Surr)		Recovery: 90 %		Limits: 50-150 %	1	09/23/21 02:28	NWTPH-Dx LL	
OR-1-091621 (A110767-04)				Matrix: Liquid		Batch: 1091132		
Diesel	ND	---	200000	mg/kg	100	09/30/21 00:56	NWTPH-Dx	
Oil	570000	---	400000	mg/kg	100	09/30/21 00:56	NWTPH-Dx	F-13
Surrogate: o-Terphenyl (Surr)		Recovery: %		Limits: 50-150 %	100	09/30/21 00:56	NWTPH-Dx	S-01

Apex Laboratories

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Michele Poquiz For Kurt Johnson, Senior Chemist



ANALYTICAL REPORT

Apex Laboratories, LLC

6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323

ORELAP ID: OR100062

Landau Associates
10 N Post St, Ste 218
Spokane, WA 99201Project: Avista CSP
Project Number: **0236040**
Project Manager: **Shane Kostka****Report ID:**
A110767 - 11 09 21 0936

ANALYTICAL SAMPLE RESULTS

Diesel and/or Oil Hydrocarbons by NWTPH-Dx with Silica Gel Column Cleanup

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-21-091521 (A110767-01)				Matrix: Water		Batch: 1090859		
Diesel	ND	---	76.2	ug/L	1	09/22/21 22:22	NWTPH-Dx/SGC	
Oil	ND	---	152	ug/L	1	09/22/21 22:22	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		Recovery: 86 %		Limits: 50-150 %	1	09/22/21 22:22	NWTPH-Dx/SGC	
MW-25-091521 (A110767-02)				Matrix: Water		Batch: 1090859		
Diesel	ND	---	75.5	ug/L	1	09/22/21 22:43	NWTPH-Dx/SGC	
Oil	ND	---	151	ug/L	1	09/22/21 22:43	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		Recovery: 85 %		Limits: 50-150 %	1	09/22/21 22:43	NWTPH-Dx/SGC	
MW-28-091521 (A110767-03)				Matrix: Water		Batch: 1090859		
Diesel	ND	---	75.5	ug/L	1	09/22/21 23:03	NWTPH-Dx/SGC	
Oil	ND	---	151	ug/L	1	09/22/21 23:03	NWTPH-Dx/SGC	
Surrogate: o-Terphenyl (Surr)		Recovery: 72 %		Limits: 50-150 %	1	09/22/21 23:03	NWTPH-Dx/SGC	

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Michele Poquiz For Kurt Johnson, Senior Chemist



ANALYTICAL REPORT

Apex Laboratories, LLC

6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323

ORELAP ID: OR100062

Landau Associates
10 N Post St, Ste 218
Spokane, WA 99201Project: Avista CSP
Project Number: **0236040**
Project Manager: **Shane Kostka**Report ID:
A110767 - 11 09 21 0936

ANALYTICAL SAMPLE RESULTS

Water Soluble Diesel and/or Oil Hydrocarbons by NWTPH-Dx

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
OR-1-091621 (WSF) (A110767-07RE1)				Matrix: Water		Batch: 21J0020		
Diesel	ND	---	222	ug/L	1	10/07/21 08:10	NWTPH-Dx	
Oil	7720	---	444	ug/L	1	10/07/21 08:10	NWTPH-Dx	F-13
<i>Surrogate: o-Terphenyl (Surr)</i>		<i>Recovery: 108 %</i>		<i>Limits: 50-150 %</i>	<i>1</i>	<i>10/07/21 08:10</i>	<i>NWTPH-Dx</i>	

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Michele Poquiz For Kurt Johnson, Senior Chemist

Page 6 of 18



ANALYTICAL REPORT

Apex Laboratories, LLC

6700 S.W. Sandburg Street

Tigard, OR 97223

503-718-2323

ORELAP ID: OR100062

Landau Associates

10 N Post St, Ste 218

Spokane, WA 99201

Project: Avista CSP

Project Number: 0236040

Project Manager: Shane Kostka

Report ID:

A110767 - 11 09 21 0936

QUALITY CONTROL (QC) SAMPLE RESULTS

Diesel and/or Oil Hydrocarbons by NWTPH-Dx

Analyte	Result	Detection L Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes	
Batch 1090838 - EPA 3510C (Fuels/Acid Ext.)						Water							
Blank (1090838-BLK1)			Prepared: 09/22/21 10:18 Analyzed: 09/22/21 23:44										
NWTPH-Dx LL													
Diesel	ND	---	72.7	ug/L	1	---	---	---	---	---	---		
Oil	ND	---	145	ug/L	1	---	---	---	---	---	---		
Surr: o-Terphenyl (Surr)		Recovery: 65 %		Limits: 50-150 %		Dilution: 1x							
LCS (1090838-BS1)			Prepared: 09/22/21 10:18 Analyzed: 09/23/21 00:05										
NWTPH-Dx LL													
Diesel	416	---	80.0	ug/L	1	500	---	83	36-132%	---	---		
Surr: o-Terphenyl (Surr)		Recovery: 89 %		Limits: 50-150 %		Dilution: 1x							
LCS Dup (1090838-BSD1)			Prepared: 09/22/21 10:18 Analyzed: 09/23/21 00:25										Q-19
NWTPH-Dx LL													
Diesel	401	---	80.0	ug/L	1	500	---	80	36-132%	4	30%		
Surr: o-Terphenyl (Surr)		Recovery: 93 %		Limits: 50-150 %		Dilution: 1x							
Batch 1091132 - EPA 3580A						Liquid							
Blank (1091132-BLK1)			Prepared: 09/29/21 16:25 Analyzed: 09/30/21 00:15										
NWTPH-Dx													
Diesel	ND	---	1000	mg/kg	1	---	---	---	---	---	---		
Oil	ND	---	2000	mg/kg	1	---	---	---	---	---	---		
Surr: o-Terphenyl (Surr)		Recovery: 101 %		Limits: 50-150 %		Dilution: 1x							
LCS (1091132-BS1)			Prepared: 09/29/21 16:25 Analyzed: 09/30/21 00:35										
NWTPH-Dx													
Diesel	12200	---	2000	mg/kg	1	12500	---	98	38-132%	---	---		
Surr: o-Terphenyl (Surr)		Recovery: 107 %		Limits: 50-150 %		Dilution: 1x							
Duplicate (1091132-DUP1)			Prepared: 09/29/21 16:25 Analyzed: 09/30/21 01:16										
QC Source Sample: OR-1-091621 (A110767-04)													
NWTPH-Dx													
Diesel	ND	---	105000	mg/kg	100	---	ND	---	---	---	30%		
Oil	509000	---	211000	mg/kg	100	---	570000	---	---	11	30%	F-13	

Apex Laboratories

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Michele Poquiz For Kurt Johnson, Senior Chemist

Page 7 of 18



ANALYTICAL REPORT

Apex Laboratories, LLC

6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323

ORELAP ID: OR100062

Landau Associates
10 N Post St, Ste 218
Spokane, WA 99201

Project: Avista CSP
Project Number: **0236040**
Project Manager: **Shane Kostka**

Report ID:
A110767 - 11 09 21 0936

QUALITY CONTROL (QC) SAMPLE RESULTS

Diesel and/or Oil Hydrocarbons by NWTPH-Dx

Analyte	Result	Detection L Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 1091132 - EPA 3580A							Liquid					
Duplicate (1091132-DUP1)			Prepared: 09/29/21 16:25 Analyzed: 09/30/21 01:16									
<u>QC Source Sample: OR-1-091621 (A110767-04)</u>												
Surr: o-Terphenyl (Surr)			Recovery: %	Limits: 50-150 %	Dilution: 100x						S-01	

Apex Laboratories

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Michele Poquiz For Kurt Johnson, Senior Chemist



ANALYTICAL REPORT

Apex Laboratories, LLC

6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323

ORELAP ID: OR100062

Landau Associates
10 N Post St, Ste 218
Spokane, WA 99201Project: Avista CSP
Project Number: **0236040**
Project Manager: **Shane Kostka****Report ID:**
A110767 - 11 09 21 0936

QUALITY CONTROL (QC) SAMPLE RESULTS

Diesel and/or Oil Hydrocarbons by NWTPH-Dx with Silica Gel Column Cleanup

Analyte	Result	Detection L Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 1090859 - EPA 3510C (Fuels/Acid Ext.) w/Silica Gel Column						Water						
Blank (1090859-BLK1)			Prepared: 09/22/21 10:18 Analyzed: 09/22/21 21:21									
<u>NWTPH-Dx/SGC</u>												
Diesel	ND	---	72.7	ug/L	1	---	---	---	---	---	---	
Oil	ND	---	145	ug/L	1	---	---	---	---	---	---	
Surr: o-Terphenyl (Surr)		Recovery: 82 %		Limits: 50-150 %		Dilution: 1x						
LCS (1090859-BS1)			Prepared: 09/22/21 10:18 Analyzed: 09/22/21 21:41									
<u>NWTPH-Dx/SGC</u>												
Diesel	392	---	80.0	ug/L	1	500	---	78	36-132%	---	---	
Surr: o-Terphenyl (Surr)		Recovery: 85 %		Limits: 50-150 %		Dilution: 1x						
LCS Dup (1090859-BSD1)			Prepared: 09/22/21 10:18 Analyzed: 09/22/21 22:02									
<u>NWTPH-Dx/SGC</u>												
Diesel	356	---	80.0	ug/L	1	500	---	71	36-132%	10	30%	
Surr: o-Terphenyl (Surr)		Recovery: 85 %		Limits: 50-150 %		Dilution: 1x						

Apex Laboratories

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Michele Poquiz For Kurt Johnson, Senior Chemist



ANALYTICAL REPORT

Apex Laboratories, LLC

6700 S.W. Sandburg Street

Tigard, OR 97223

503-718-2323

ORELAP ID: OR100062

Landau Associates
10 N Post St, Ste 218
Spokane, WA 99201

Project: **Avista CSP**
Project Number: **0236040**
Project Manager: **Shane Kostka**

Report ID:
A110767 - 11 09 21 0936

QUALITY CONTROL (QC) SAMPLE RESULTS

Water Soluble Diesel and/or Oil Hydrocarbons by NWTPH-Dx

Analyte	Result	Detection L Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes	
Batch 21J0020 - EPA 3510C (Fuels/Acid Ext.)							Water						
Blank (21J0020-BLK2)			Prepared: 10/04/21 09:39 Analyzed: 10/05/21 11:47										
NWTPH-Dx													
Diesel	ND	---	182	ug/L	1	---	---	---	---	---	---		
Oil	ND	---	364	ug/L	1	---	---	---	---	---	---		
Surr: o-Terphenyl (Surr)		Recovery: 102 %		Limits: 50-150 %		Dilution: 1x							
LCS (21J0020-BS1)			Prepared: 10/04/21 09:39 Analyzed: 10/04/21 22:53										
NWTPH-Dx													
Diesel	1040	---	200	ug/L	1	1250	---	83	36-132%	---	---		
Surr: o-Terphenyl (Surr)		Recovery: 102 %		Limits: 50-150 %		Dilution: 1x							
LCS Dup (21J0020-BSD1)			Prepared: 10/04/21 09:39 Analyzed: 10/04/21 23:14										Q-19
NWTPH-Dx													
Diesel	1050	---	200	ug/L	1	1250	---	84	36-132%	2	30%		
Surr: o-Terphenyl (Surr)		Recovery: 103 %		Limits: 50-150 %		Dilution: 1x							

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Project Number: **0236040**
Project Manager: **Shane Kostka****Report ID:**
A110767 - 11 09 21 0936

SAMPLE PREPARATION INFORMATION

Diesel and/or Oil Hydrocarbons by NWTPH-Dx

Prep: EPA 3510C (Fuels/Acid Ext.)

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 1090838							
A110767-01	Water	NWTPH-Dx LL	09/15/21 12:00	09/22/21 10:18	1050mL/2mL	1000mL/2mL	0.95
A110767-02	Water	NWTPH-Dx LL	09/15/21 17:10	09/22/21 10:18	1060mL/2mL	1000mL/2mL	0.94
A110767-03	Water	NWTPH-Dx LL	09/15/21 15:20	09/22/21 10:18	1060mL/2mL	1000mL/2mL	0.94

Prep: EPA 3580A

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 1091132							
A110767-04	Liquid	NWTPH-Dx	09/15/21 07:48	09/29/21 16:25	0.1g/5mL	0.1g/5mL	1.00

Diesel and/or Oil Hydrocarbons by NWTPH-Dx with Silica Gel Column Cleanup

Prep: EPA 3510C (Fuels/Acid Ext.) w/Silica Gel Column

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 1090859							
A110767-01	Water	NWTPH-Dx/SGC	09/15/21 12:00	09/22/21 10:18	1050mL/2mL	1000mL/2mL	0.95
A110767-02	Water	NWTPH-Dx/SGC	09/15/21 17:10	09/22/21 10:18	1060mL/2mL	1000mL/2mL	0.94
A110767-03	Water	NWTPH-Dx/SGC	09/15/21 15:20	09/22/21 10:18	1060mL/2mL	1000mL/2mL	0.94

Water Soluble Diesel and/or Oil Hydrocarbons by NWTPH-Dx

Prep: EPA 3510C (Fuels/Acid Ext.)

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 21J0020							
A110767-07RE1	Water	NWTPH-Dx	09/30/21 07:48	10/04/21 14:05	900mL/5mL	1000mL/5mL	1.11

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Project Number: 0236040
Project Manager: Shane Kostka

Report ID:
A110767 - 11 09 21 0936

QUALIFIER DEFINITIONS

Client Sample and Quality Control (QC) Sample Qualifier Definitions:

Apex Laboratories

- F-13** The chromatographic pattern does not resemble the fuel standard used for quantitation
- Q-19** Blank Spike Duplicate (BSD) sample analyzed in place of Matrix Spike/Duplicate samples due to limited sample amount available for analysis.
- S-01** Surrogate recovery for this sample is not available due to sample dilution required from high analyte concentration and/or matrix interference.

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REPORTING NOTES AND CONVENTIONS:

Abbreviations:

DET Analyte DETECTED at or above the detection or reporting limit.
ND Analyte NOT DETECTED at or above the detection or reporting limit.
NR Result Not Reported
RPD Relative Percent Difference. RPDs for Matrix Spikes and Matrix Spike Duplicates are based on concentration, not recovery.

Detection Limits: Limit of Detection (LOD)

Limits of Detection (LODs) are normally set at a level of one half the validated Limit of Quantitation (LOQ).
If no value is listed ('-----'), then the data has not been evaluated below the Reporting Limit.

Reporting Limits: Limit of Quantitation (LOQ)

Validated Limits of Quantitation (LOQs) are reported as the Reporting Limits for all analyses where the LOQ, MRL, PQL or CRL are requested.
The LOQ represents a level at or above the low point of the calibration curve, that has been validated according to Apex Laboratories' comprehensive LOQ policies and procedures.

Reporting Conventions:

Basis: Results for soil samples are generally reported on a 100% dry weight basis.
The Result Basis is listed following the units as "dry", "wet", or " " (blank) designation.
"dry" Sample results and Reporting Limits are reported on a dry weight basis. (i.e. "ug/kg dry")
See Percent Solids section for details of dry weight analysis.
"wet" Sample results and Reporting Limits for this analysis are normally dry weight corrected, but have not been modified in this case.
" " Results without 'wet' or 'dry' designation are not normally dry weight corrected. These results are considered 'As Received'.

QC Source:

In cases where there is insufficient sample provided for Sample Duplicates and/or Matrix Spikes, a Lab Control Sample Duplicate (LCS Dup) may be analyzed to demonstrate accuracy and precision of the extraction batch.

Non-Client Batch QC Samples (Duplicates and Matrix Spike/Duplicates) may not be included in this report. Please request a Full QC report if this data is required.

Miscellaneous Notes:

" --- " QC results are not applicable. For example, % Recoveries for Blanks and Duplicates, % RPD for Blanks, Blank Spikes and Matrix Spikes, etc.
" *** " Used to indicate a possible discrepancy with the Sample and Sample Duplicate results when the %RPD is not available. In this case, either the Sample or the Sample Duplicate has a reportable result for this analyte, while the other is Non Detect (ND).

Blanks:

Standard practice is to evaluate the results from Blank QC Samples down to a level equal to ½ the Reporting Limit (RL).
-For Blank hits falling between ½ the RL and the RL (J flagged hits), the associated sample and QC data will receive a 'B-02' qualifier.
-For Blank hits above the RL, the associated sample and QC data will receive a 'B' qualifier, per Apex Laboratories' Blank Policy.

Apex Laboratories

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REPORTING NOTES AND CONVENTIONS (Cont.):

Blanks (Cont.):

Sample results flagged with a 'B' or 'B-02' qualifier are potentially biased high if the sample results are less than ten times the level found in the blank for inorganic analyses, or less than five times the level found in the blank for organic analyses.

'B' and 'B-02' qualifications are only applied to sample results detected above the Reporting Level.

Preparation Notes:

Mixed Matrix Samples:

Water Samples:

Water samples containing significant amounts of sediment are decanted or separated prior to extraction, and only the water portion analyzed, unless otherwise directed by the client.

Soil and Sediment Samples:

Soil and Sediment samples containing significant amounts of water are decanted prior to extraction, and only the solid portion analyzed, unless otherwise directed by the client.

Sampling and Preservation Notes:

Certain regulatory programs, such as National Pollutant Discharge Elimination System (NPDES), require that activities such as sample filtration (for dissolved metals, orthophosphate, hexavalent chromium, etc.) and testing of short hold analytes (pH, Dissolved Oxygen, etc.) be performed in the field (on-site) within a short time window. In addition, sample matrix spikes are required for some analyses, and sufficient volume must be provided, and billable site specific QC requested, if this is required. All regulatory permits should be reviewed to ensure that these requirements are being met.

Data users should be aware of which regulations pertain to the samples they submit for testing. If related sample collection activities are not approved for a particular regulatory program, results should be considered estimates. Apex Laboratories will qualify these analytes according to the most stringent requirements, however results for samples that are for non-regulatory purposes may be acceptable.

Samples that have been filtered and preserved at Apex Laboratories per client request are listed in the preparation section of the report with the date and time of filtration listed.

Apex Laboratories maintains detailed records on sample receipt, including client label verification, cooler temperature, sample preservation, hold time compliance and field filtration. Data is qualified as necessary, and the lack of qualification indicates compliance with required parameters.

Apex Laboratories

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Project Number: **0236040**
Project Manager: **Shane Kostka**

Report ID:
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LABORATORY ACCREDITATION INFORMATION

ORELAP Certification ID: OR100062 (Primary Accreditation) -

EPA ID: OR01039

All methods and analytes reported from work performed at Apex Laboratories are included on Apex Laboratories' ORELAP Scope of Certification, with the exception of any analyte(s) listed below:

Apex Laboratories

Matrix	Analysis	TNI_ID	Analyte	TNI_ID	Accreditation
<u>All reported analytes are included in Apex Laboratories' current ORELAP scope.</u>					

Secondary Accreditations

Apex Laboratories also maintains reciprocal accreditation with non-TNI states (Washington DOE), as well as other state specific accreditations not listed here.

Subcontract Laboratory Accreditations

Subcontracted data falls outside of Apex Laboratories' Scope of Accreditation.

Please see the Subcontract Laboratory report for full details, or contact your Project Manager for more information.

Field Testing Parameters

Results for Field Tested data are provided by the client or sampler, and fall outside of Apex Laboratories' Scope of Accreditation.

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Project: Avista CSP

Project Number: 0236040

Project Manager: Shane Kostka

Report ID:

A110767 - 11 09 21 0936

APEX LABS COOLER RECEIPT FORM

Client: Landau Associates Element WO#: A1 10767

Project/Project #: Avista CSP #0236040
acc 9/17/11

Delivery Info:

Date/time received: 9/17/11 @ 10:55 By: [Signature]

Delivered by: Apex Client ESS FedEx X UPS Swift Senvoy SDS Other

Cooler Inspection Date/time inspected: 9/17/11 @ 10:55 By: [Signature]

Chain of Custody included? Yes X No Custody seals? Yes X No

Signed/dated by client? Yes X No

Signed/dated by Apex? Yes X No

	Cooler #1	Cooler #2	Cooler #3	Cooler #4	Cooler #5	Cooler #6	Cooler #7
Temperature (°C)	1.8						
Received on ice? (Y/N)	Y						
Temp. blanks? (Y/N)	Y						
Ice type: (Gel/Real/Other)	Real						
Condition:	Good						

Cooler out of temp? (Y/N) Possible reason why: [Signature]

Green dots applied to out of temperature samples? Yes No

Out of temperature samples form initiated? Yes No

Sample Inspection: Date/time inspected: 9/17/11 @ 10:55 By: AKK

All samples intact? Yes X No Comments:

Bottle labels/COCs agree? Yes No X Comments: Baiter + Twine provided, not on col.

COC/container discrepancies form initiated? Yes No X

Containers/volumes received appropriate for analysis? Yes X No Comments:

Do VOA vials have visible headspace? Yes No NA X

Comments:

Water samples: pH checked: Yes X No NA pH appropriate? Yes X No NA

Comments:

Additional information: 2837 8716 8311

Labeled by: [Signature] Witness: [Signature] Cooler Inspected by: [Signature]

Apex Laboratories

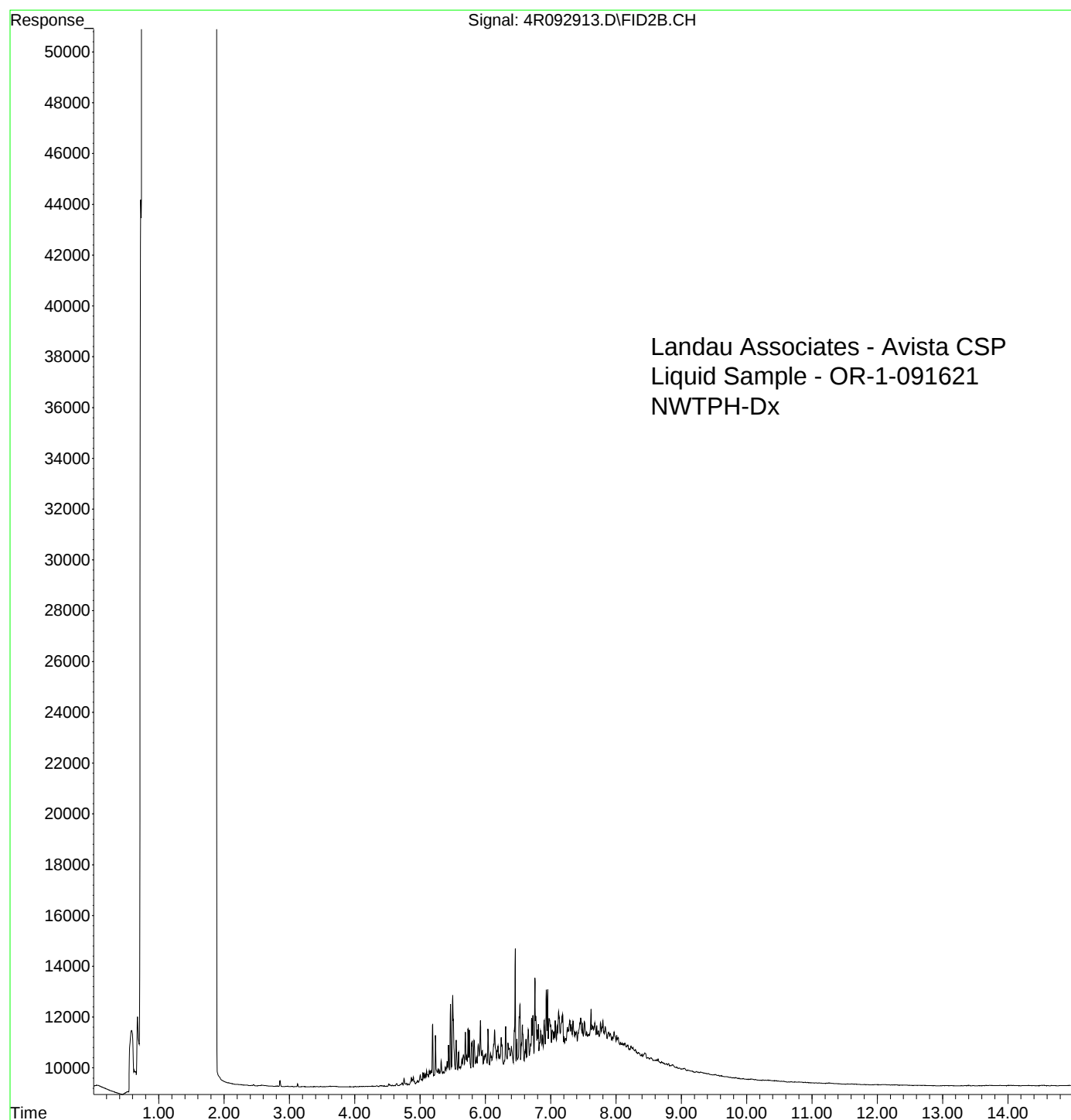
The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

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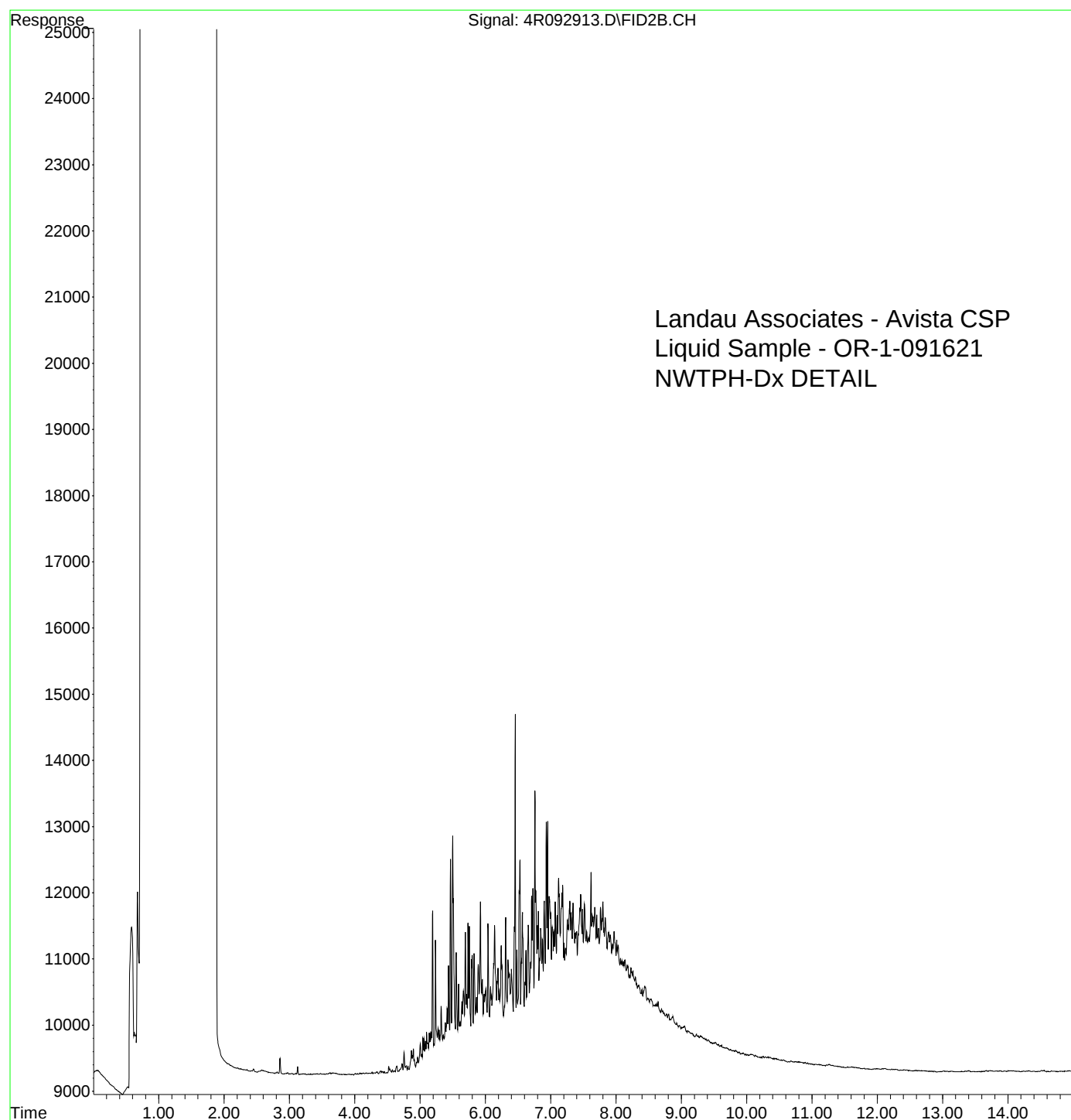
Page 18 of 18

APPENDIX C

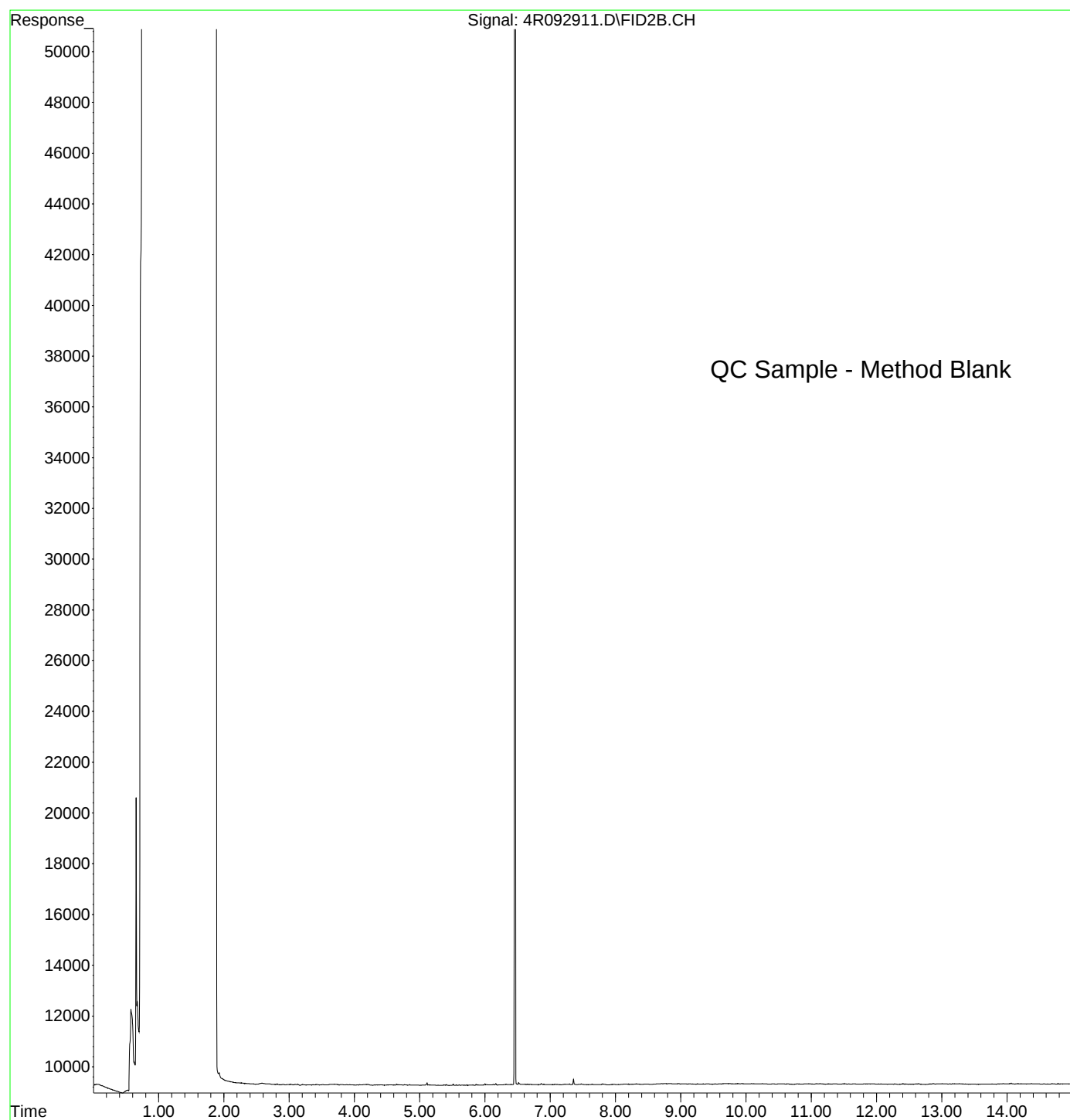
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Instrument : HP G1530A
Sample Name: A1I0767-04@100
Misc Info :
Vial Number: 57



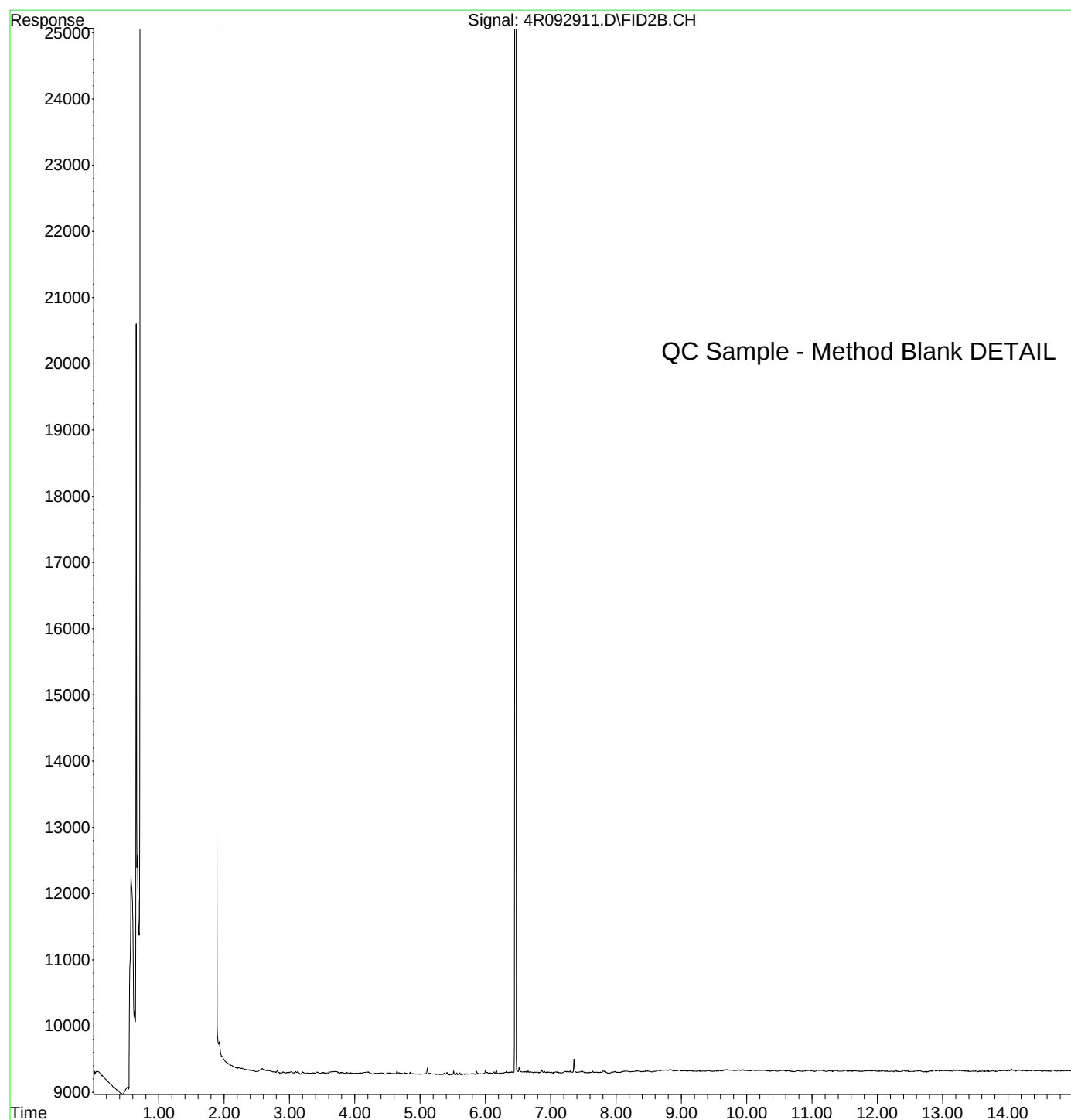
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Operator : BLL
Acquired : 30 Sep 2021 12:56 am using AcqMethod A4F60831.M
Instrument : HP G1530A
Sample Name: A1I0767-04@100
Misc Info :
Vial Number: 57



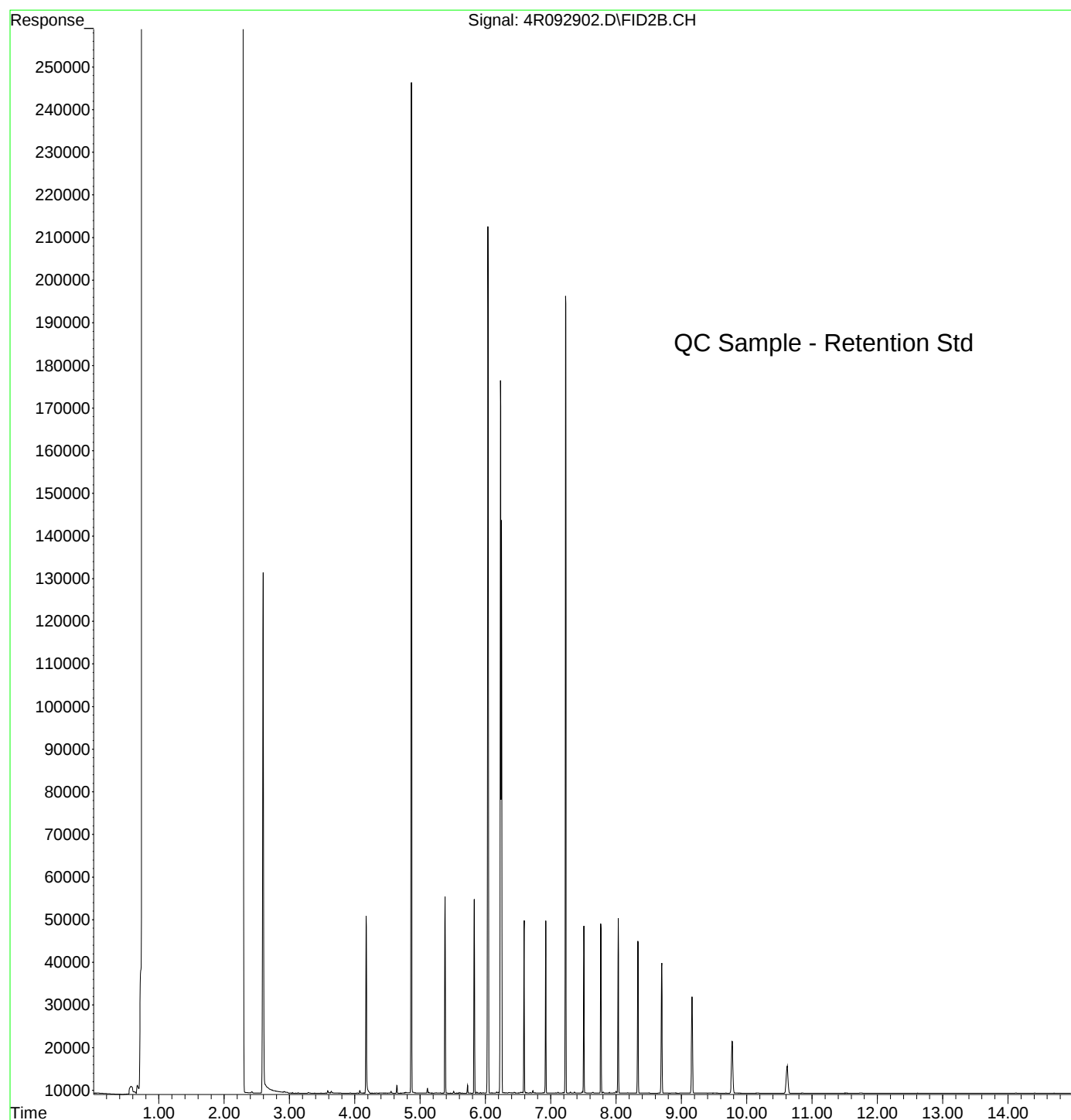
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Operator : BLL
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Instrument : HP G1530A
Sample Name: 1091132-BLK1
Misc Info :
Vial Number: 55



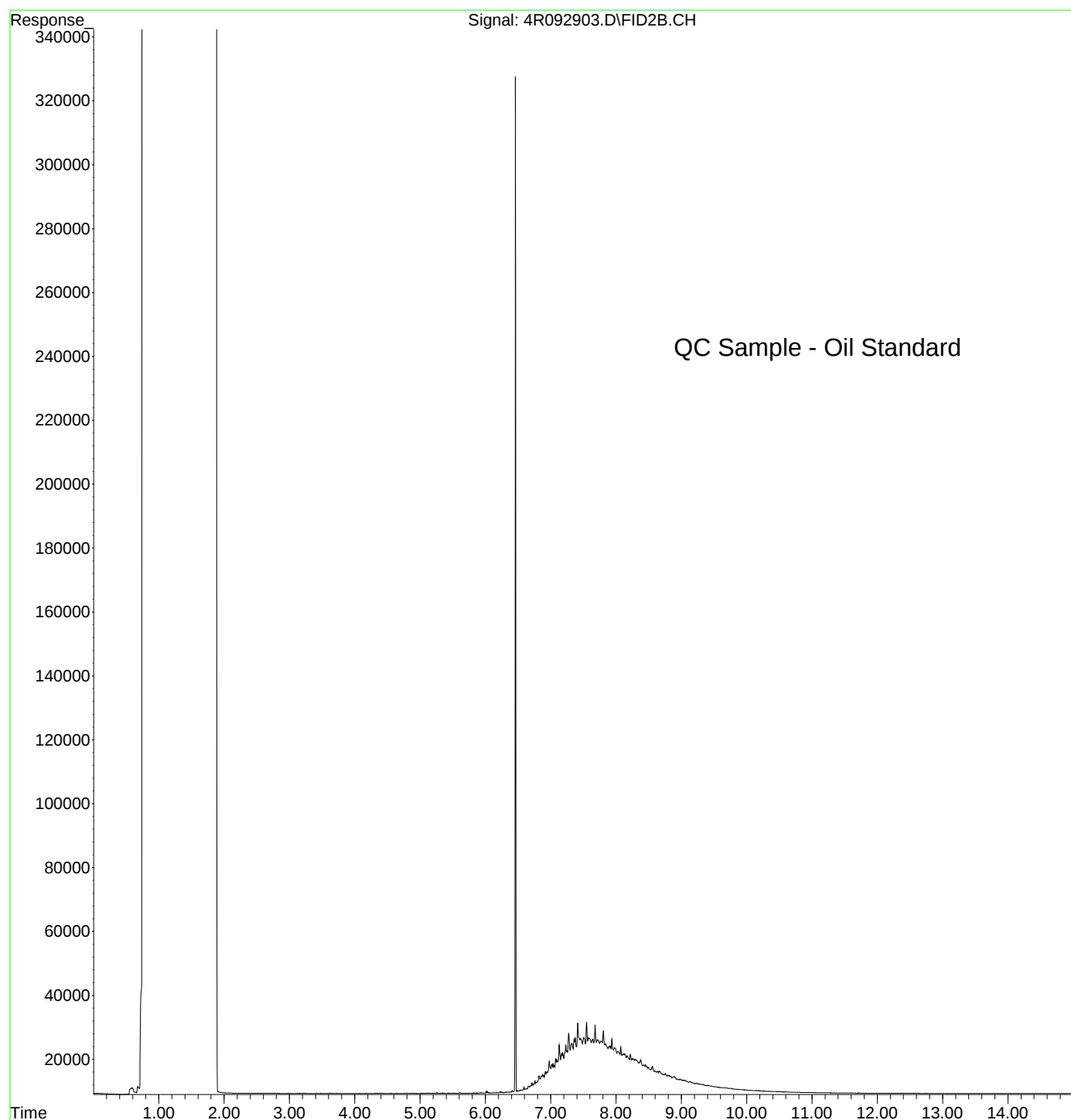
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Instrument : HP G1530A
Sample Name: 1091132-BLK1
Misc Info :
Vial Number: 55



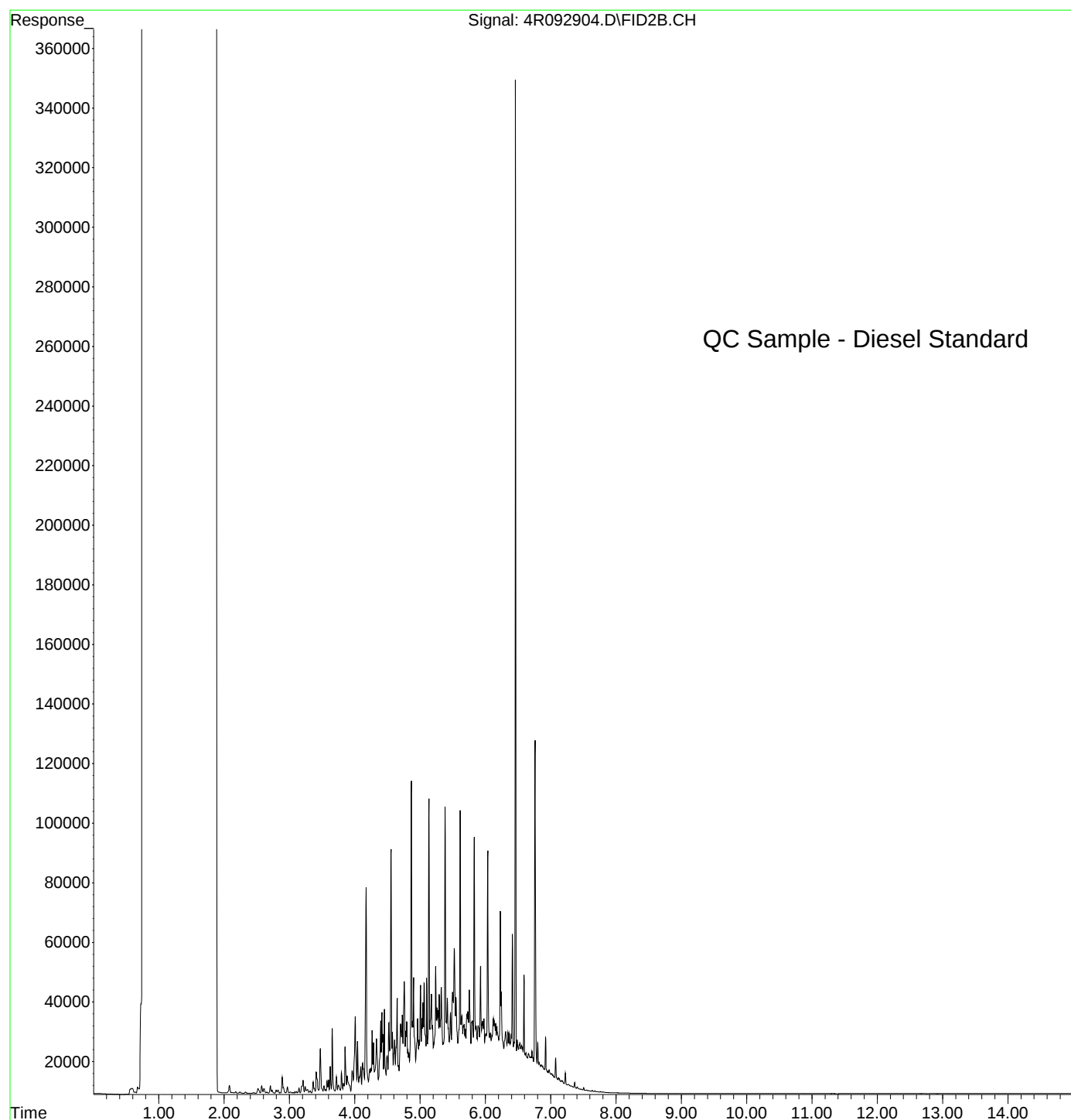
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Operator : BLL
Acquired : 29 Sep 2021 3:26 pm using AcqMethod A4F60831.M
Instrument : HP G1530A
Sample Name: 1I29052-RES1
Misc Info :
Vial Number: 95



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Operator : BLL
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Sample Name: 1I29052-CCV1
Misc Info :
Vial Number: 2

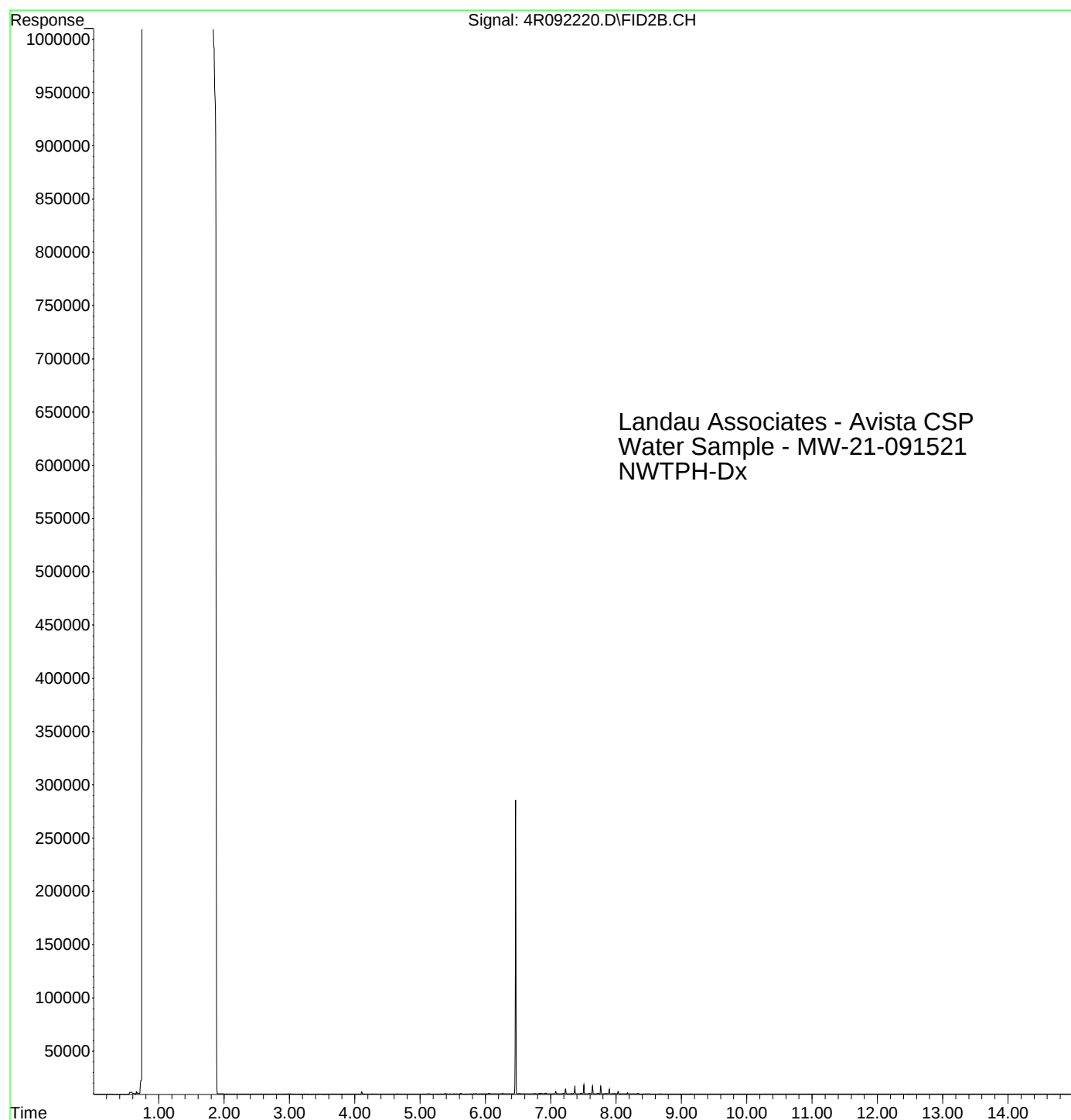


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Instrument : HP G1530A
Sample Name: 1I29052-CCV2
Misc Info :
Vial Number: 1

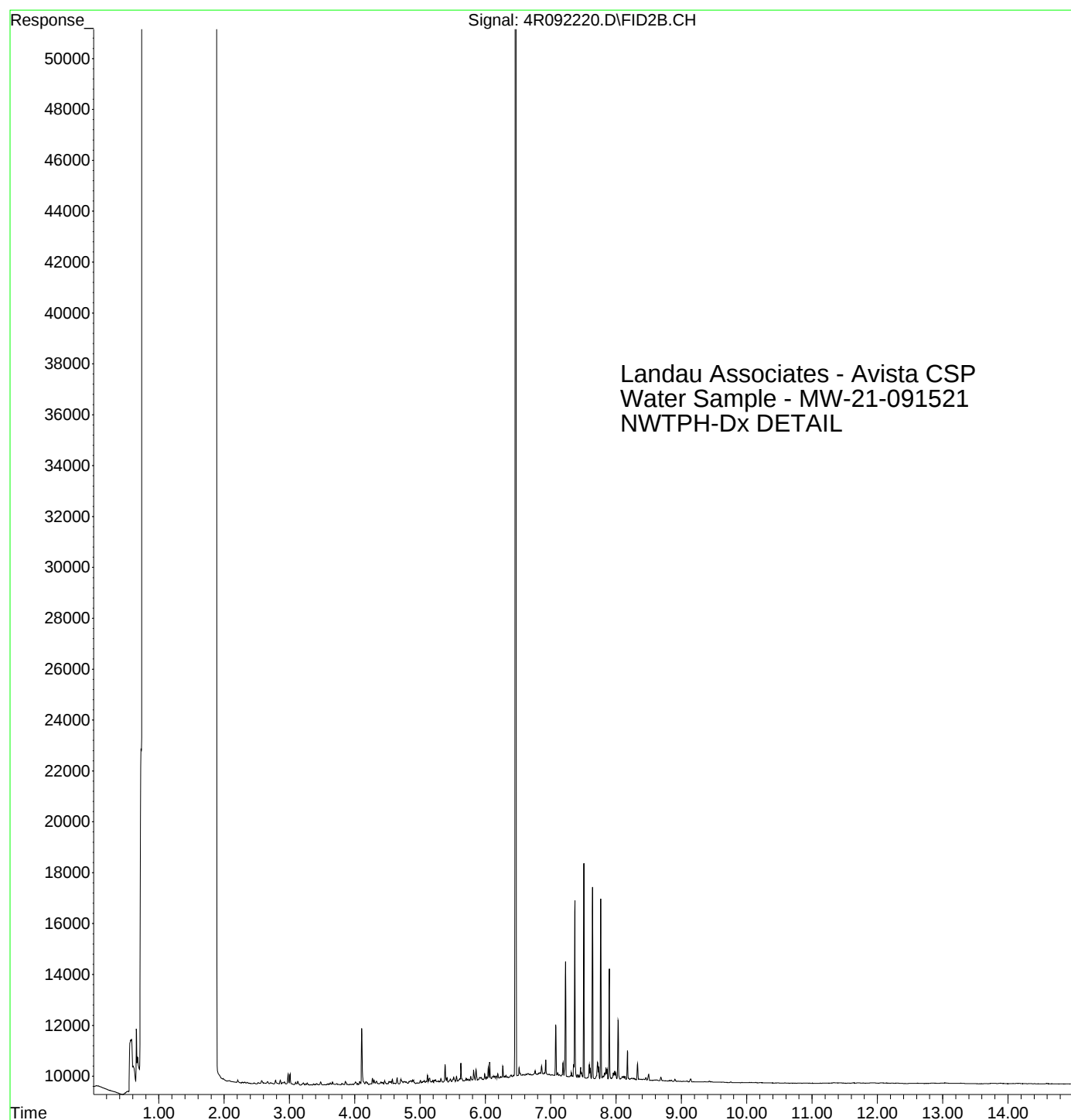


APPENDIX D

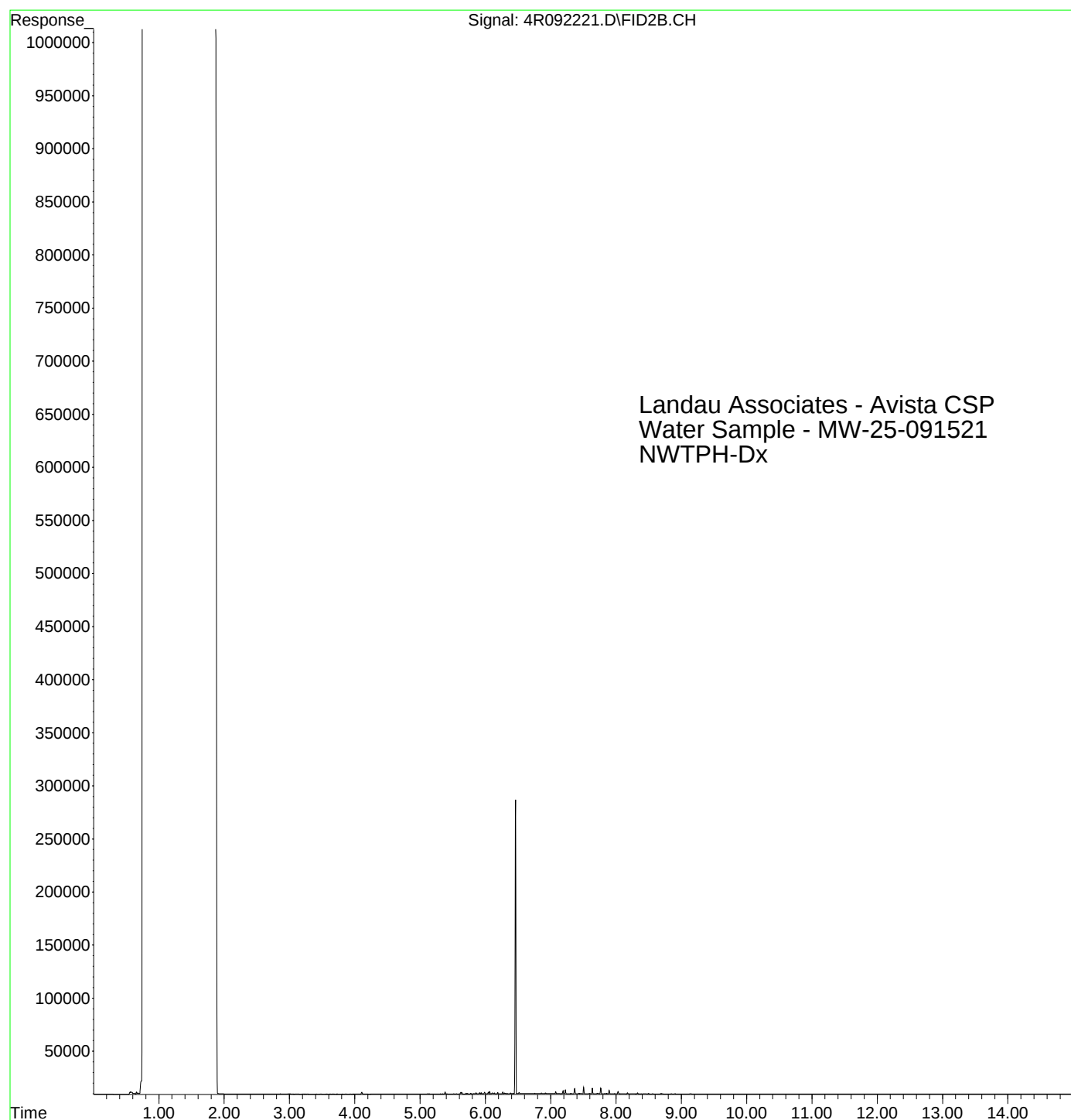
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Operator : BLL
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Instrument : HP G1530A
Sample Name: A1I0767-01
Misc Info :
Vial Number: 65



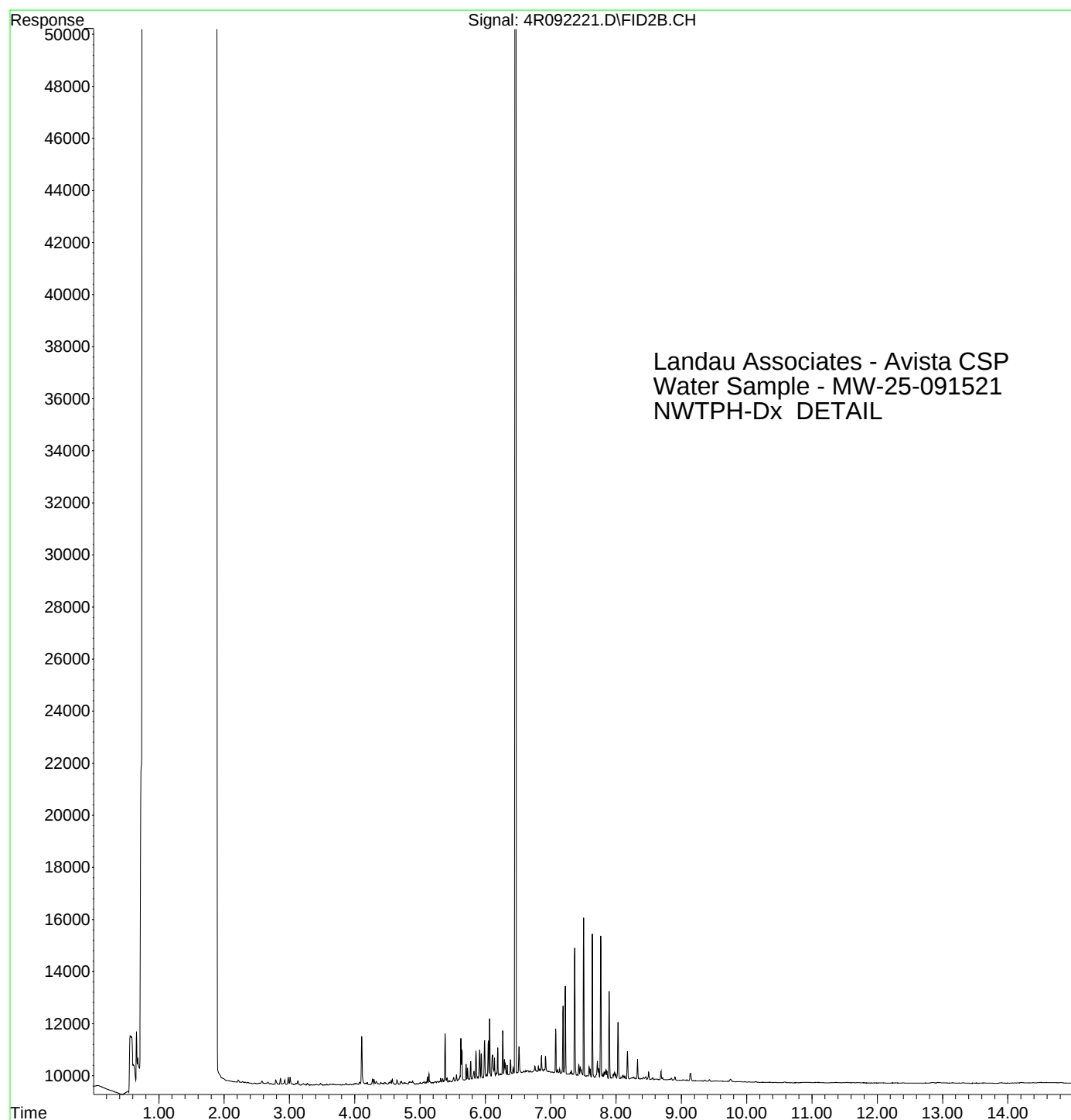
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Misc Info :
Vial Number: 65



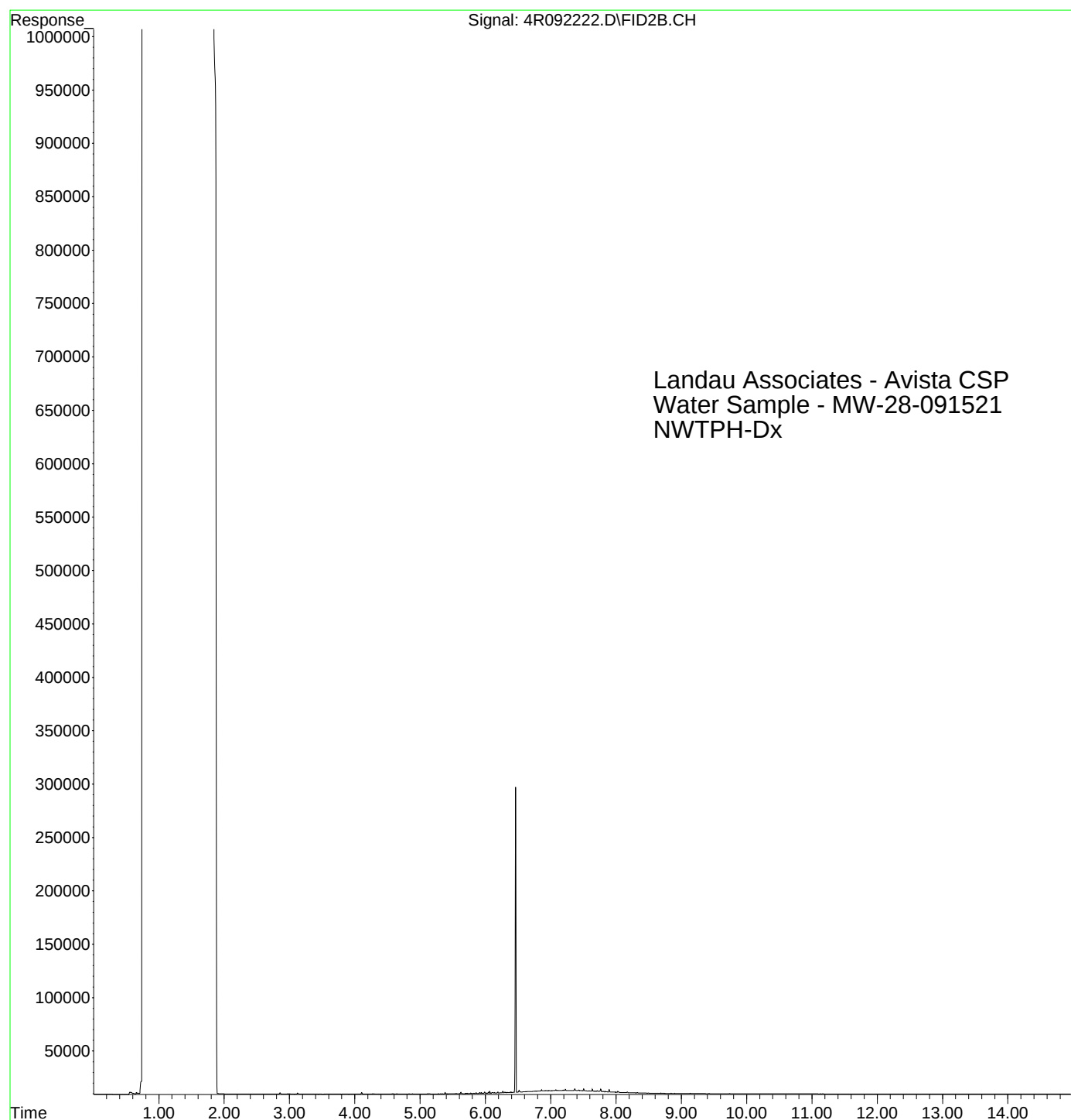
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Operator : BLL
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Instrument : HP G1530A
Sample Name: A1I0767-02
Misc Info :
Vial Number: 66



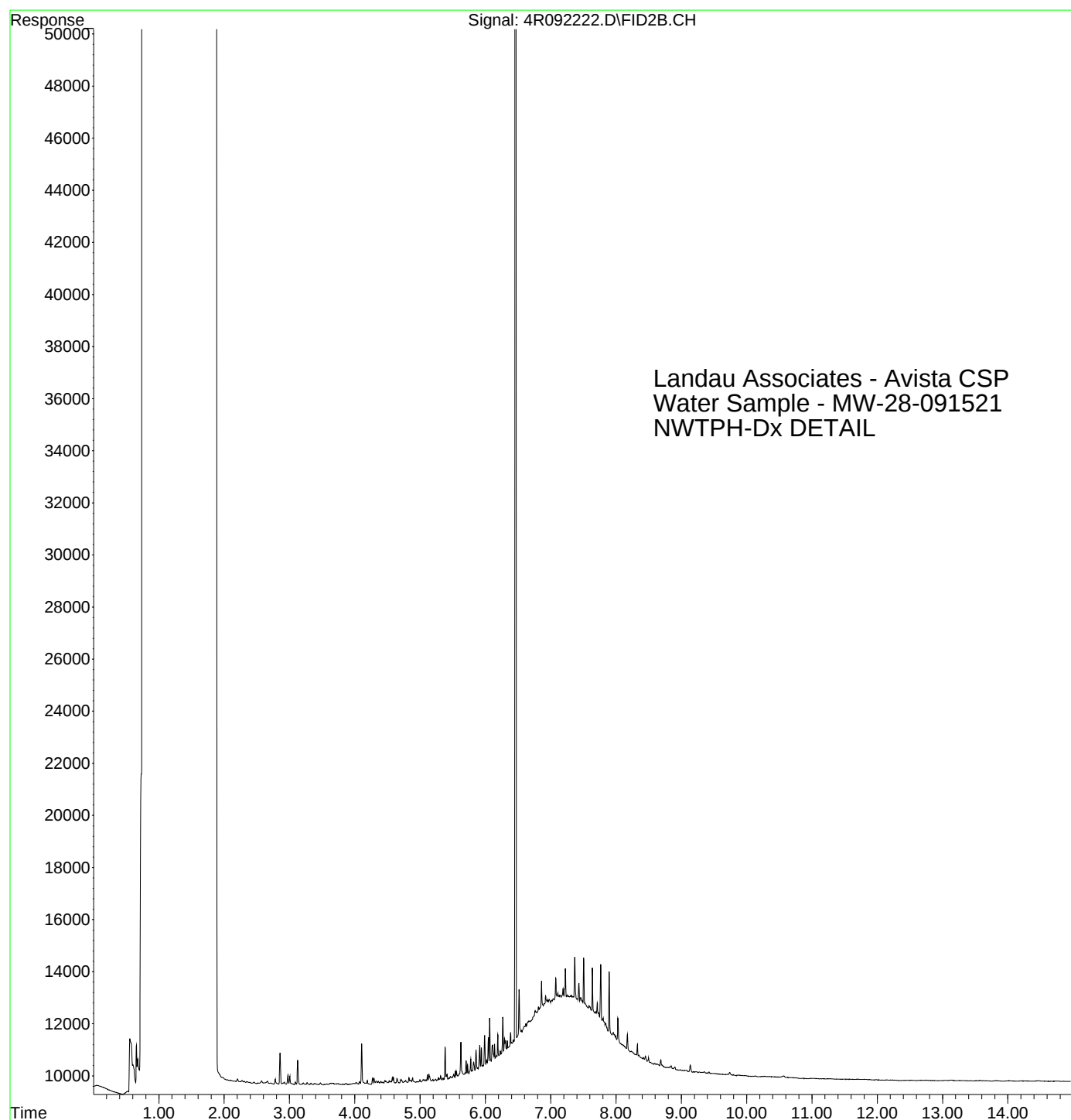
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Instrument : HP G1530A
Sample Name: A1I0767-02
Misc Info :
Vial Number: 66



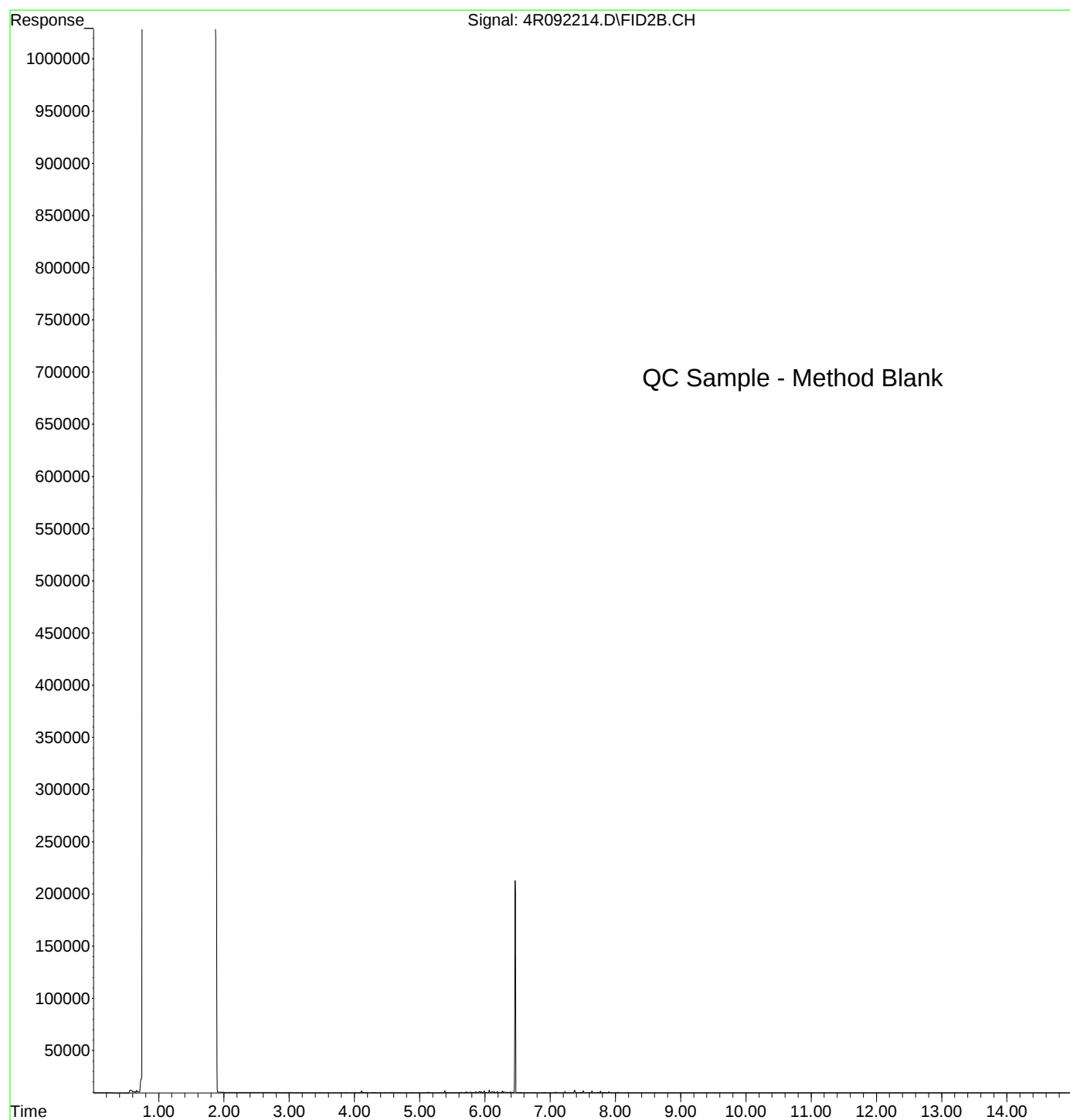
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Operator : BLL
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Instrument : HP G1530A
Sample Name: A1I0767-03
Misc Info :
Vial Number: 67



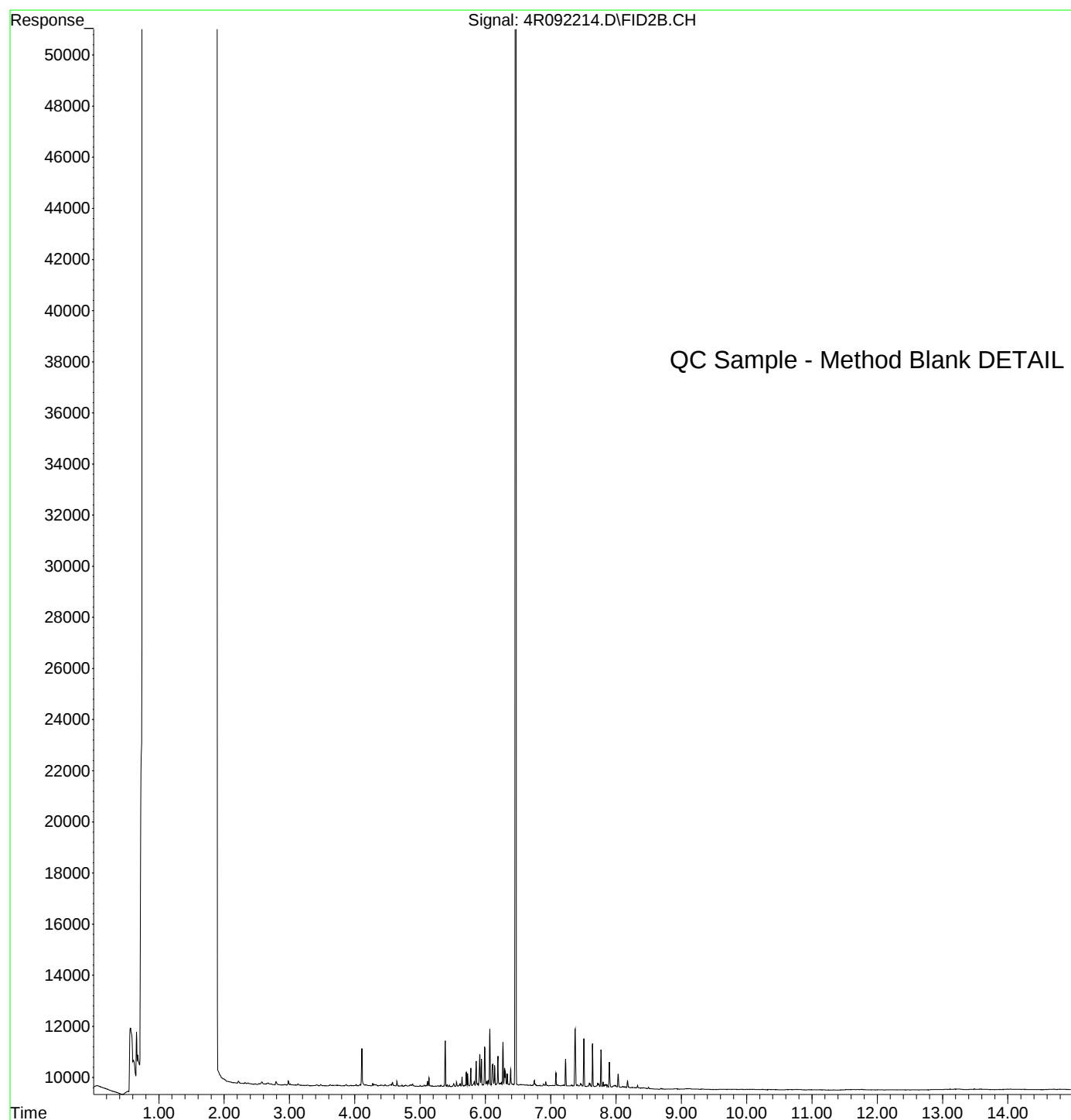
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Instrument : HP G1530A
Sample Name: A1I0767-03
Misc Info :
Vial Number: 67



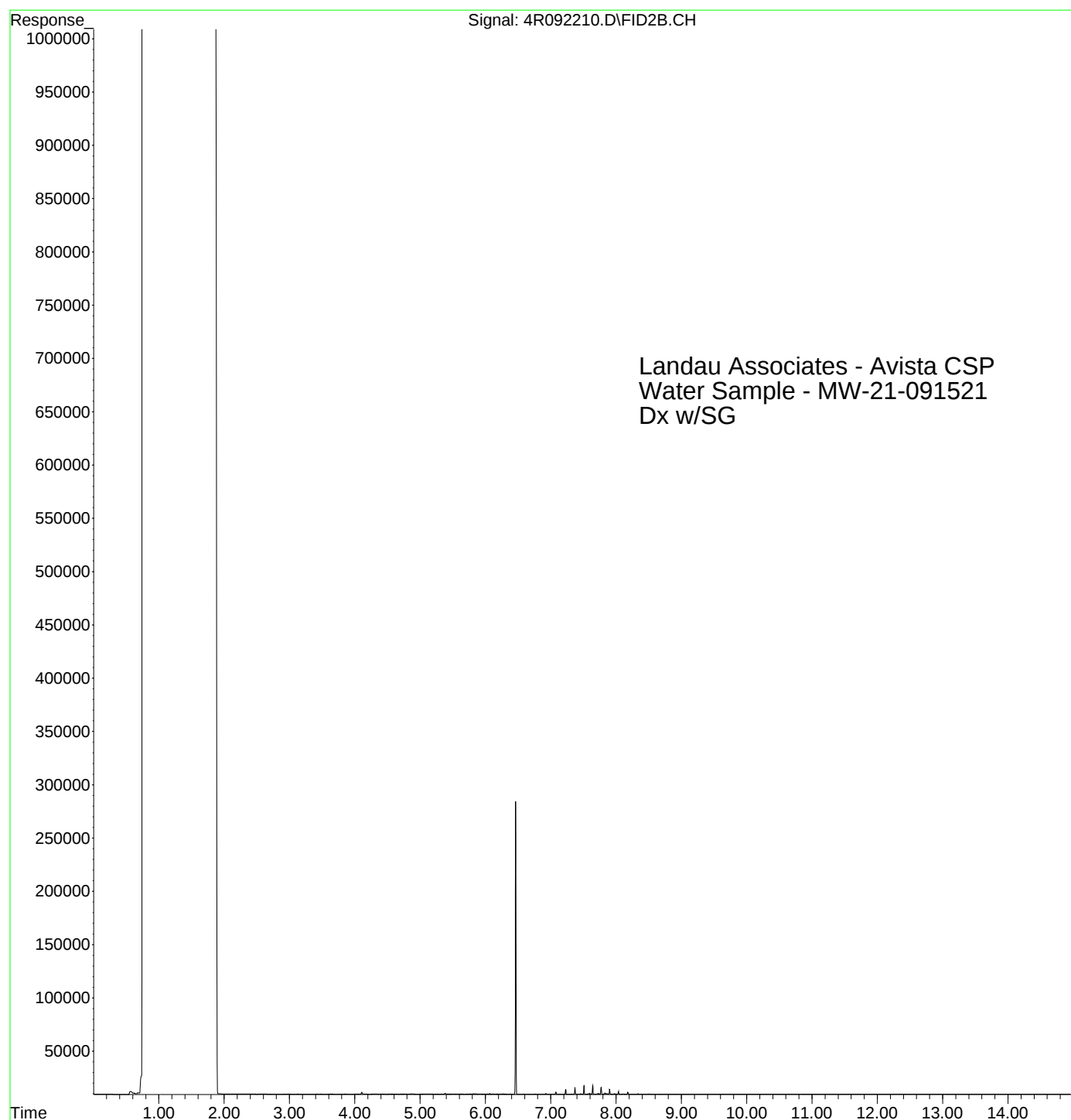
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Operator : BLL
Acquired : 22 Sep 2021 11:44 pm using AcqMethod A4F60831.M
Instrument : HP G1530A
Sample Name: 1090838-BLK1
Misc Info :
Vial Number: 59



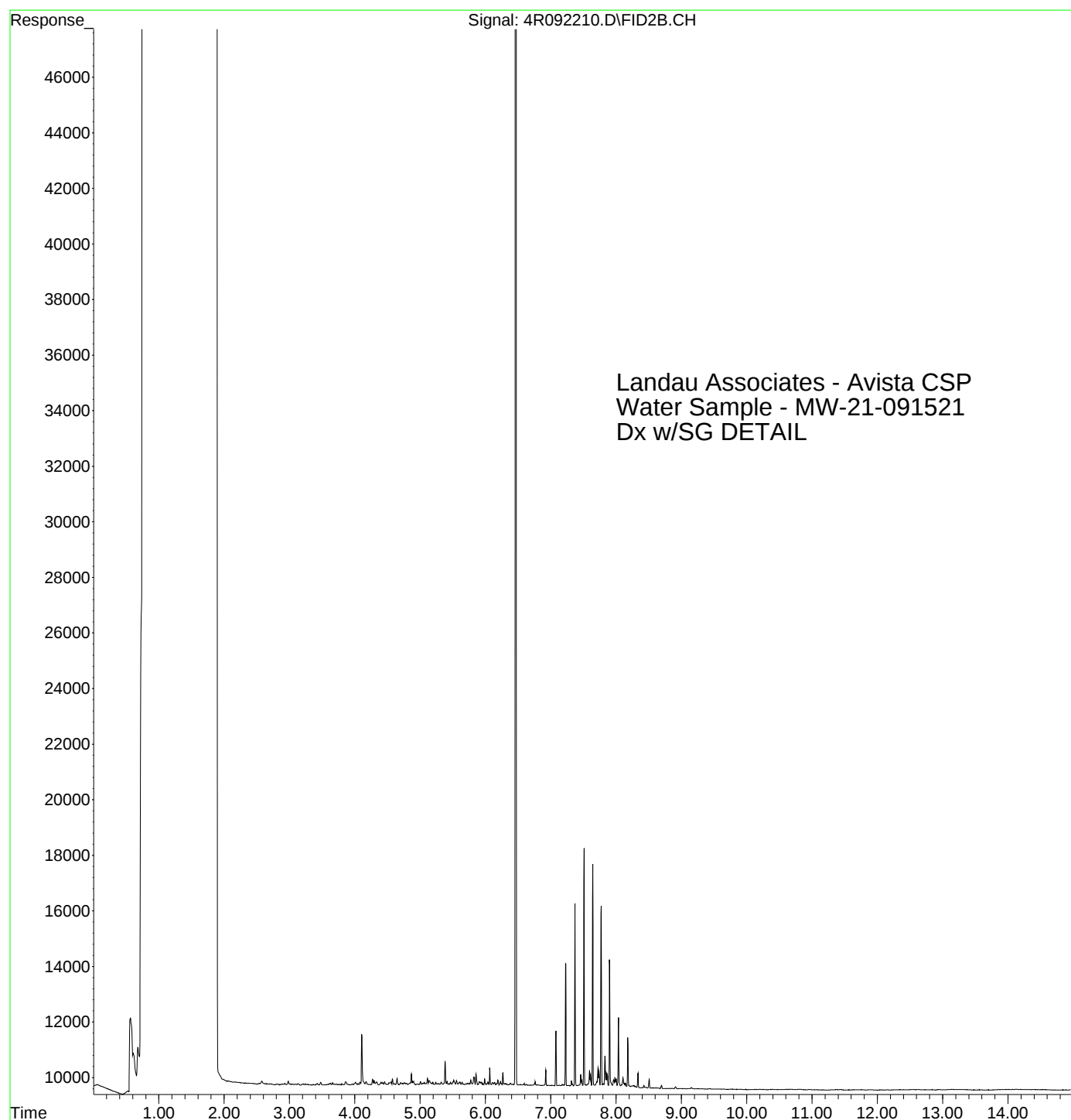
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Operator : BLL
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Instrument : HP G1530A
Sample Name: 1090838-BLK1
Misc Info :
Vial Number: 59



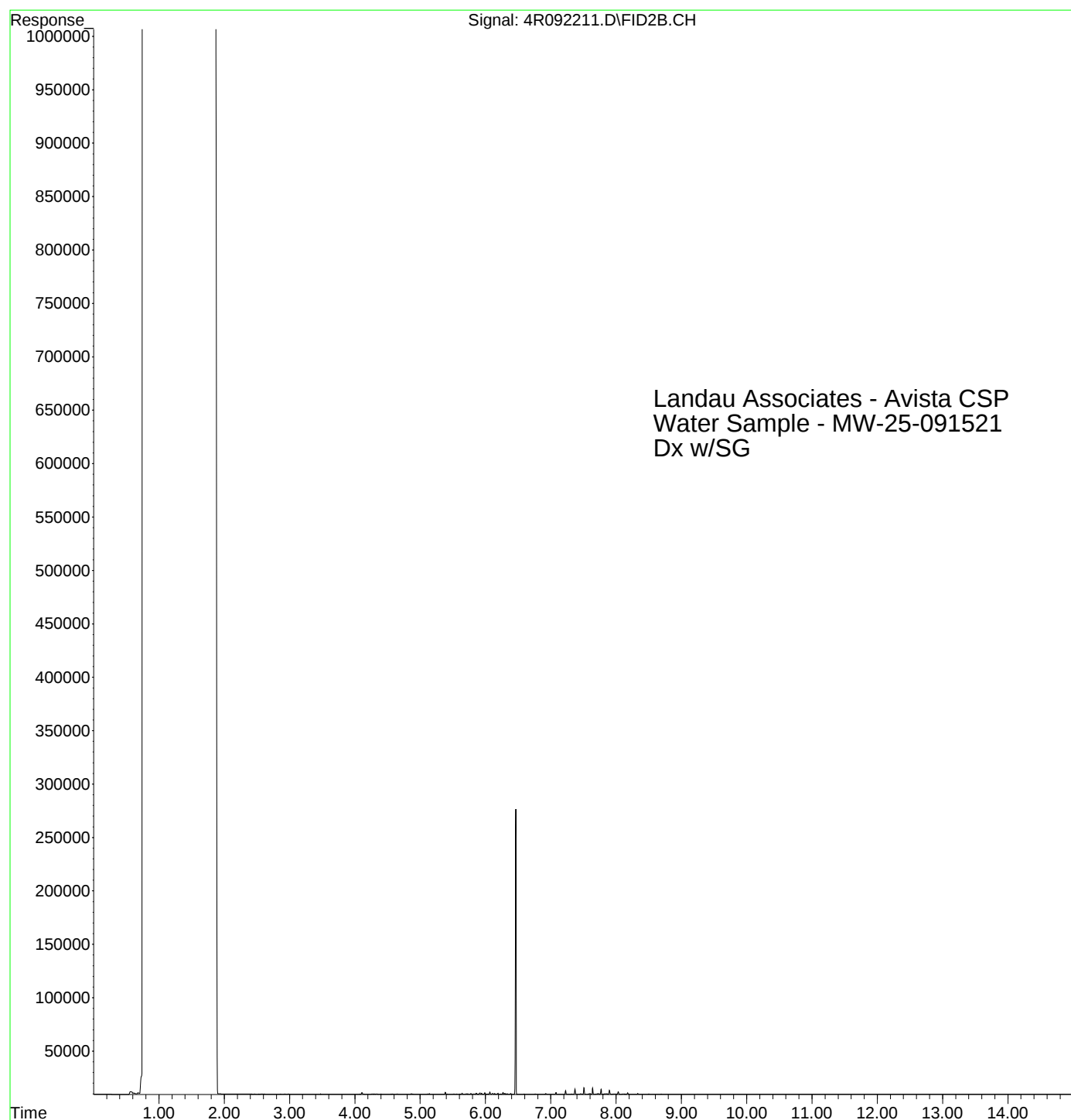
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Operator : BLL
Acquired : 22 Sep 2021 10:22 pm using AcqMethod A4F60831.M
Instrument : HP G1530A
Sample Name: A1I0767-01
Misc Info :
Vial Number: 56



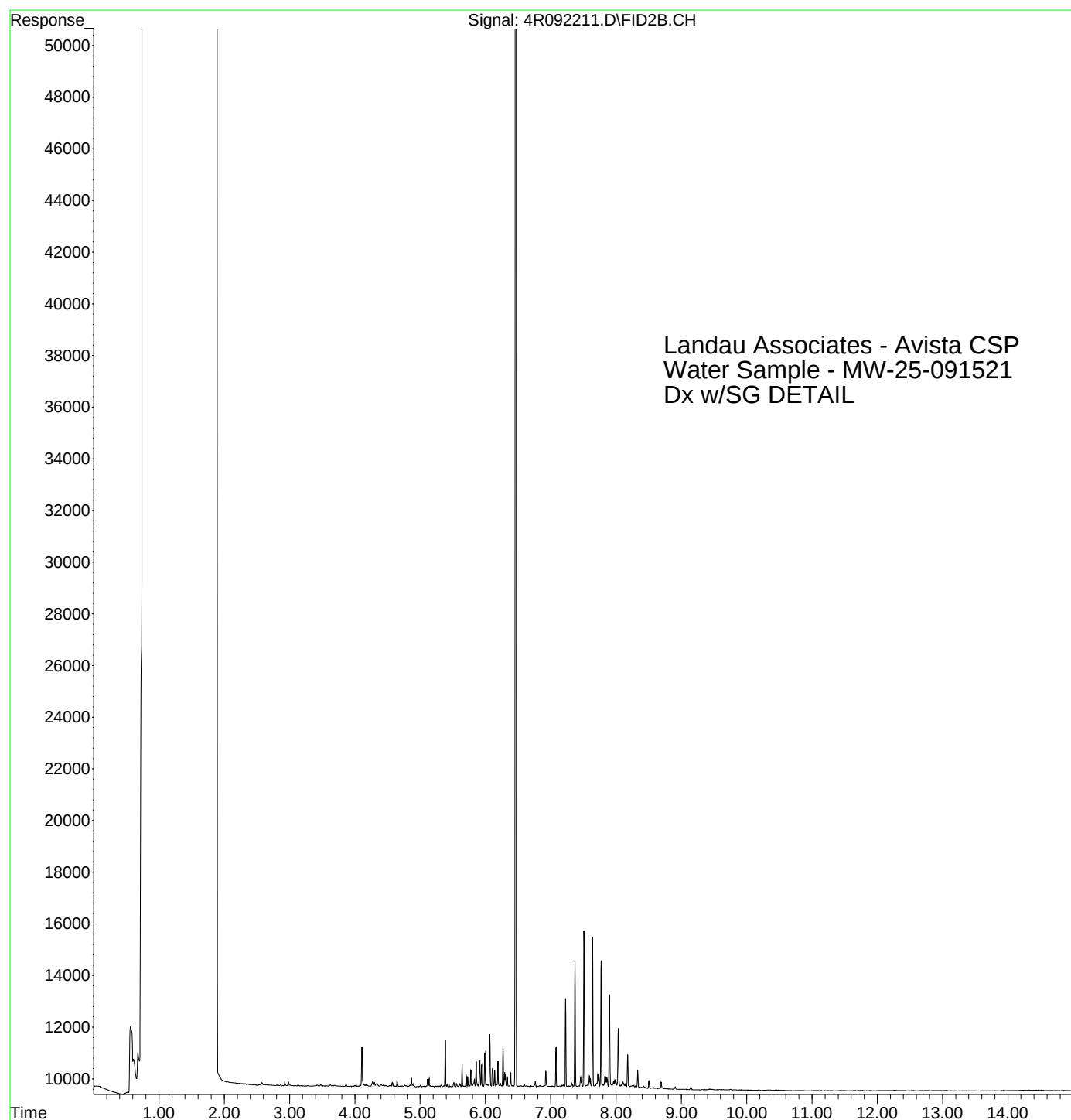
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Operator : BLL
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Instrument : HP G1530A
Sample Name: A1I0767-01
Misc Info :
Vial Number: 56



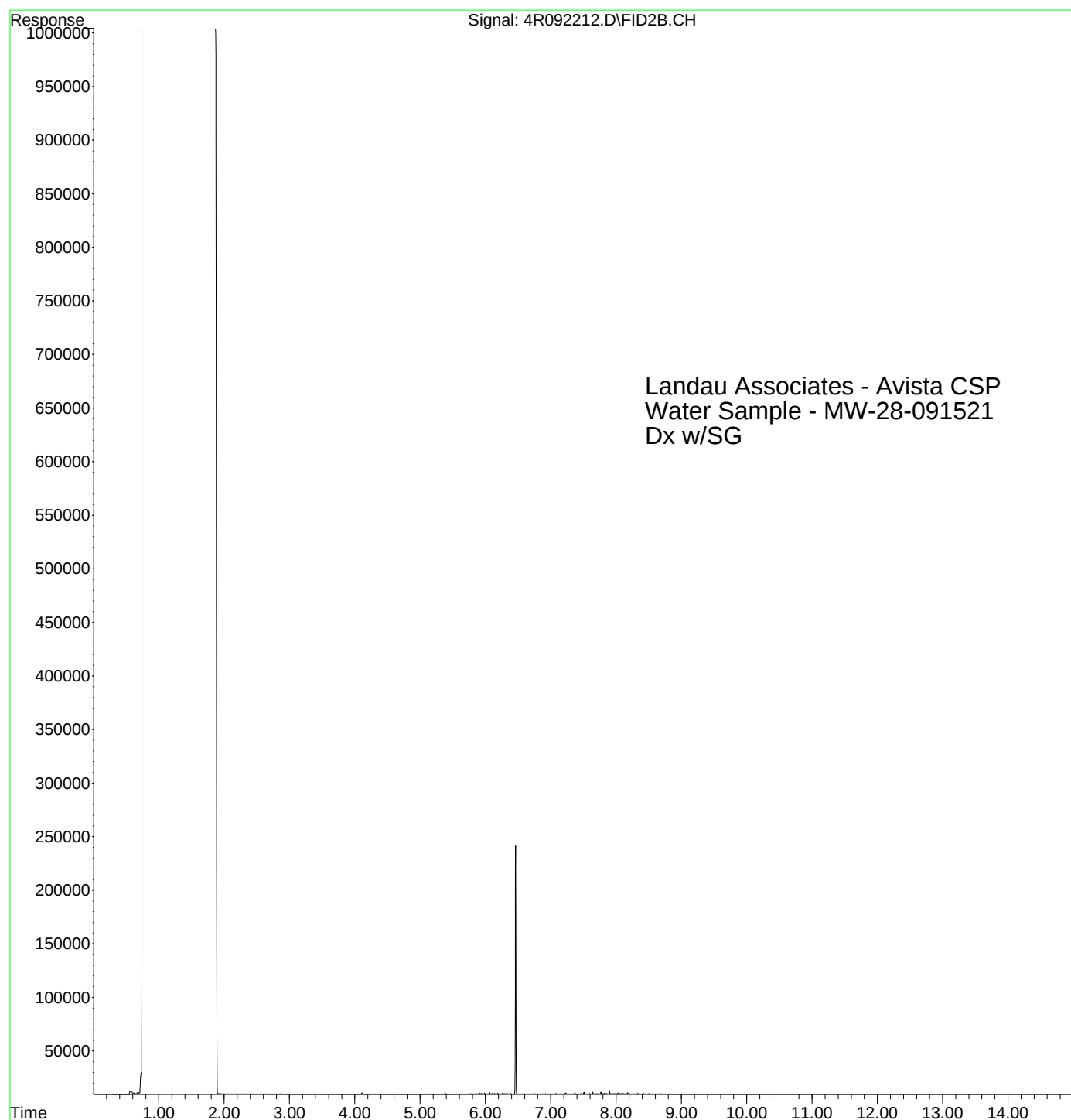
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Instrument : HP G1530A
Sample Name: A1I0767-02
Misc Info :
Vial Number: 57



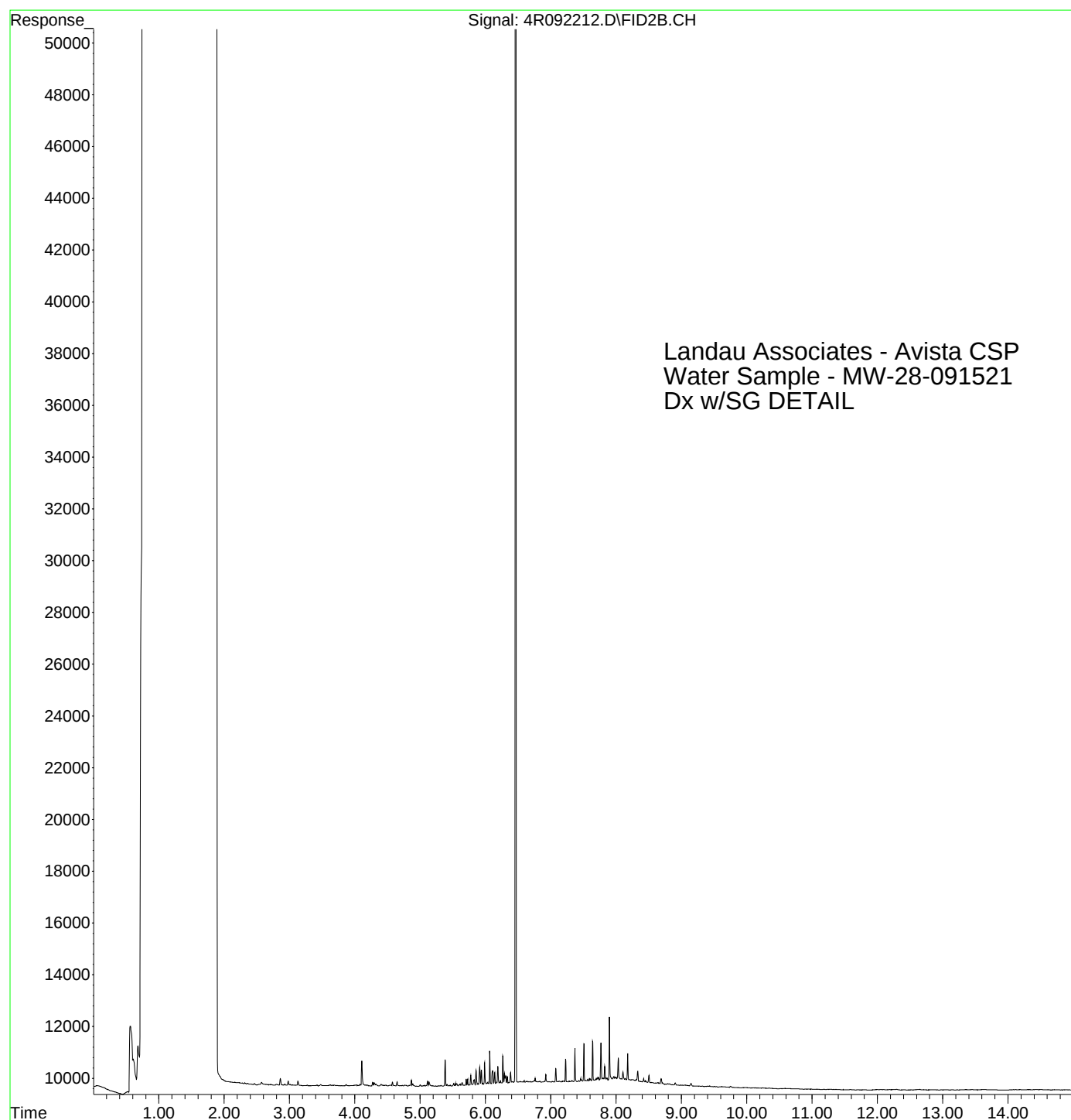
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Operator : BLL
Acquired : 22 Sep 2021 10:43 pm using AcqMethod A4F60831.M
Instrument : HP G1530A
Sample Name: A1I0767-02
Misc Info :
Vial Number: 57



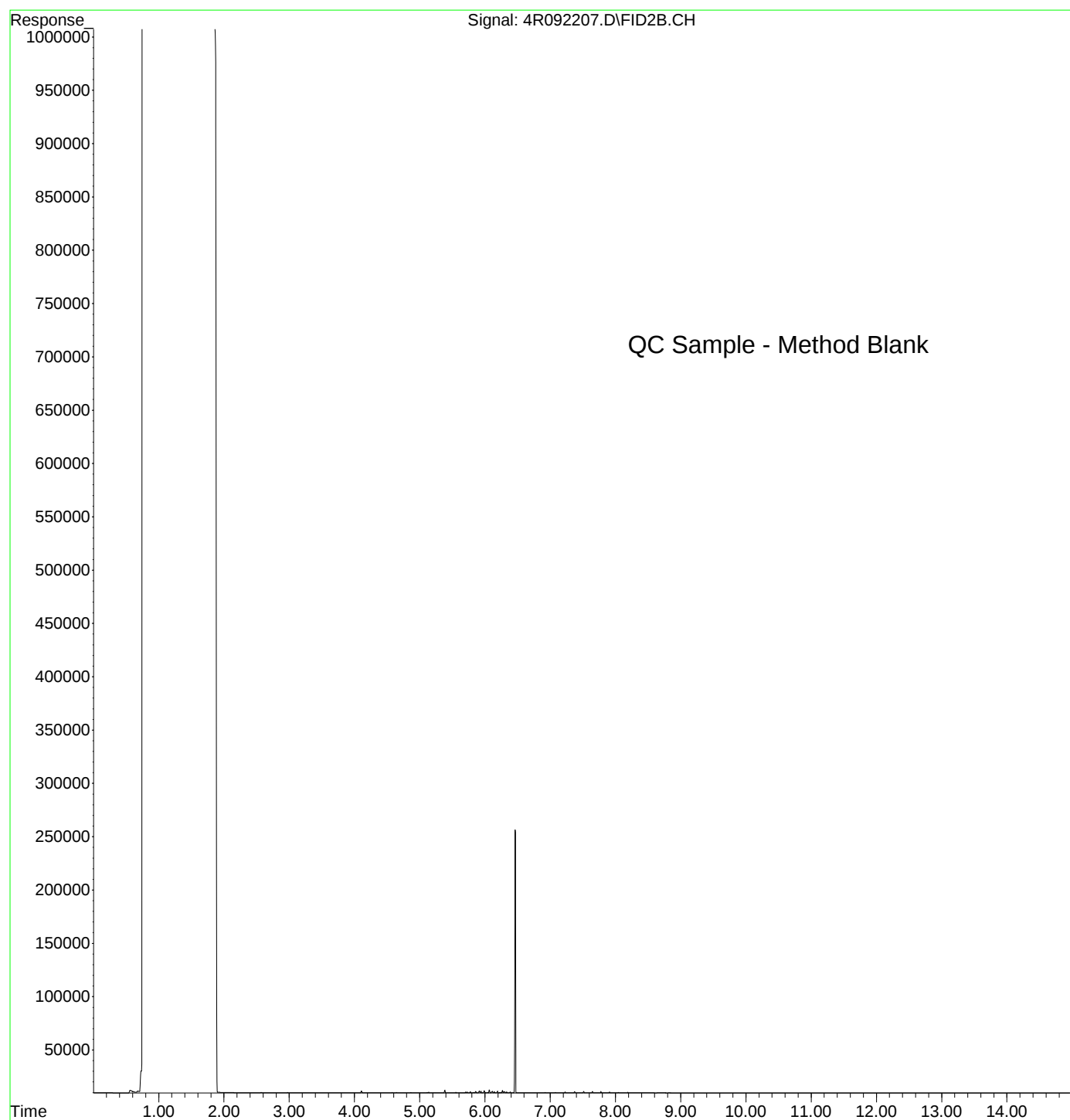
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Instrument : HP G1530A
Sample Name: A1I0767-03
Misc Info :
Vial Number: 58



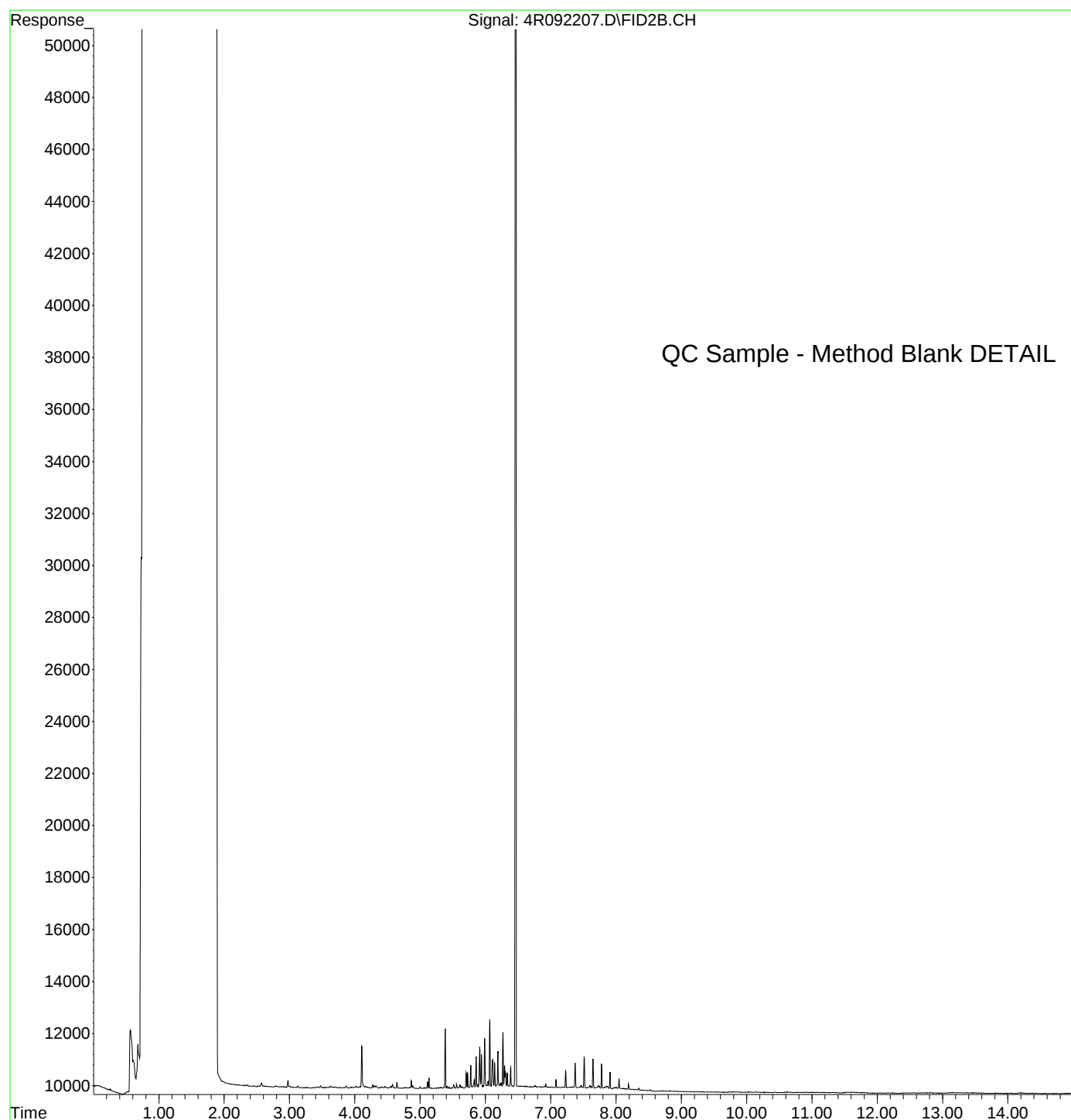
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Instrument : HP G1530A
Sample Name: A1I0767-03
Misc Info :
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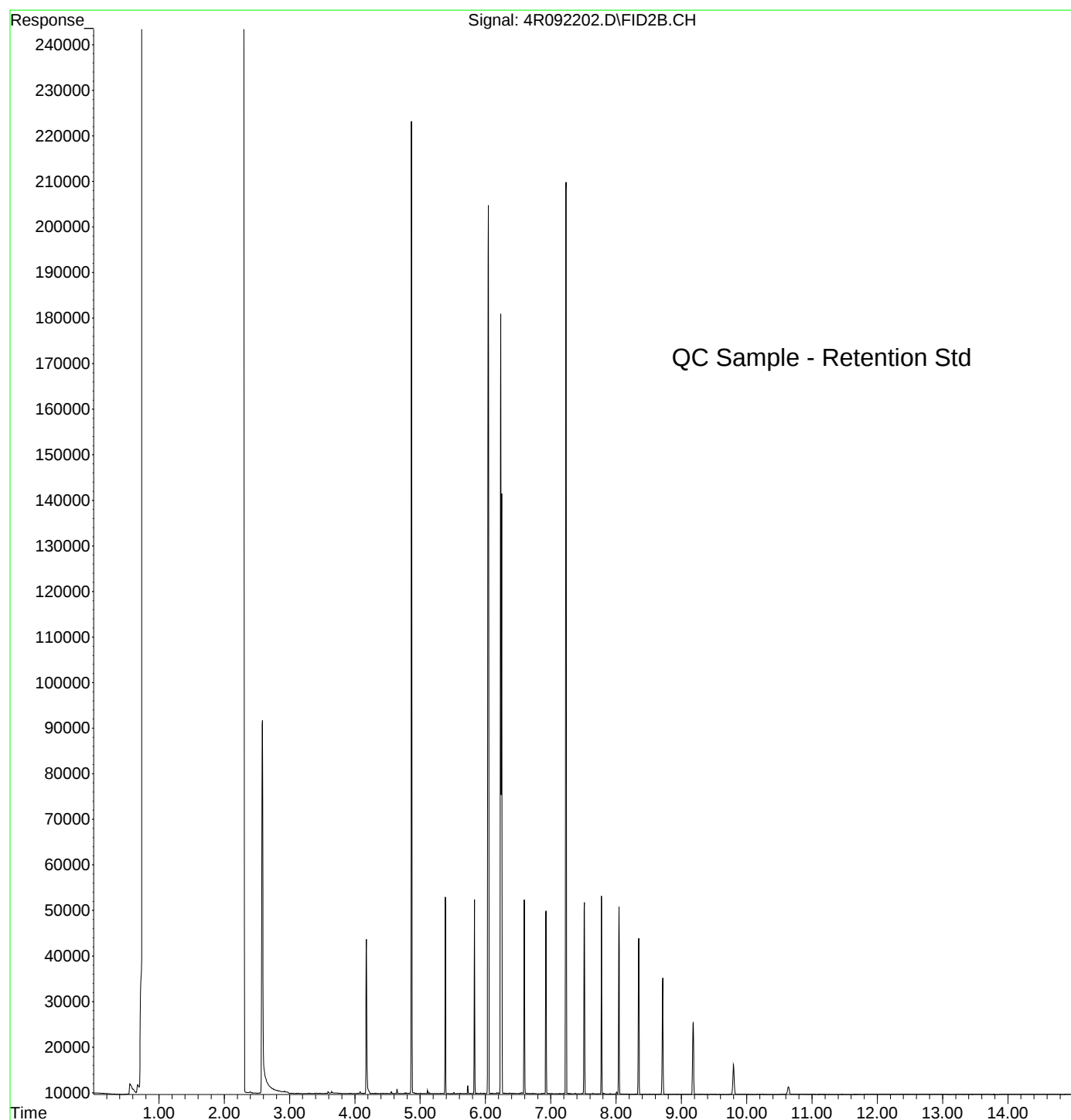
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Instrument : HP G1530A
Sample Name: 1090859-BLK1
Misc Info :
Vial Number: 53



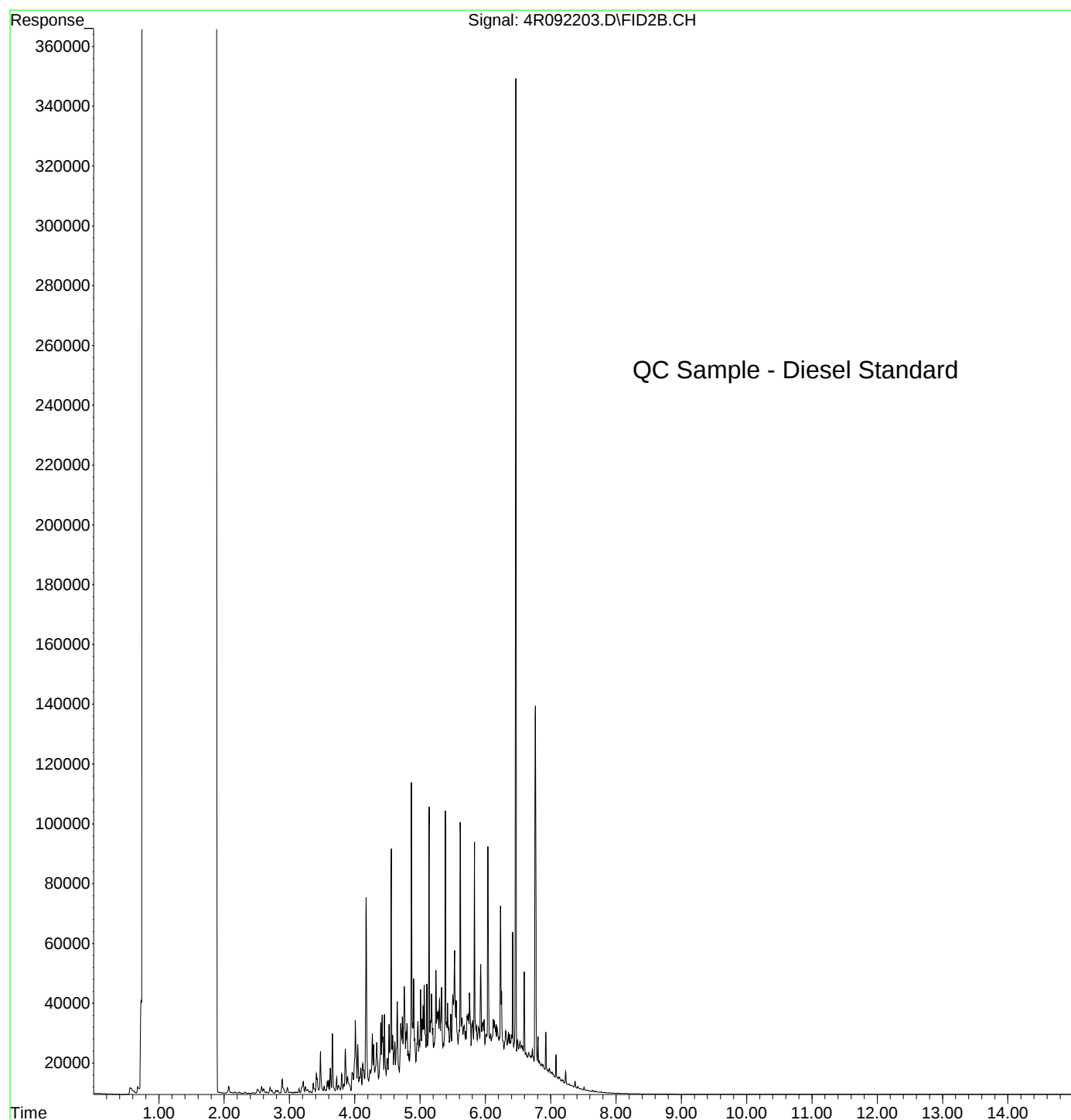
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Instrument : HP G1530A
Sample Name: 1090859-BLK1
Misc Info :
Vial Number: 53



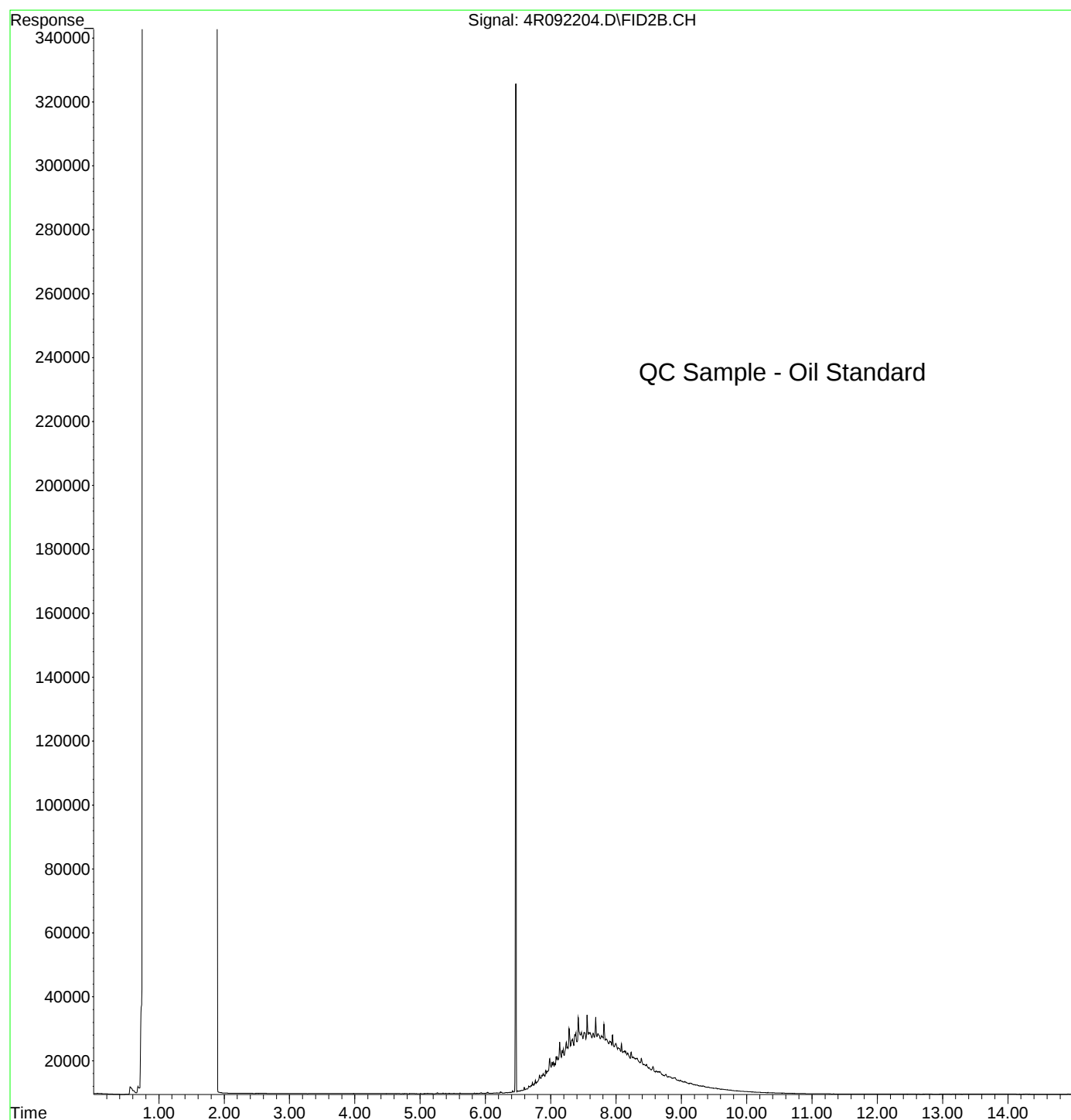
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Operator : BLL
Acquired : 22 Sep 2021 4:32 pm using AcqMethod A4F60831.M
Instrument : HP G1530A
Sample Name: 1I22056-RES1
Misc Info :
Vial Number: 95



File :C:\msdchem\1\data\2021-09\1I22056\4R092203.D
Operator : BLL
Acquired : 22 Sep 2021 4:53 pm using AcqMethod A4F60831.M
Instrument : HP G1530A
Sample Name: 1I22056-CCV1
Misc Info :
Vial Number: 51

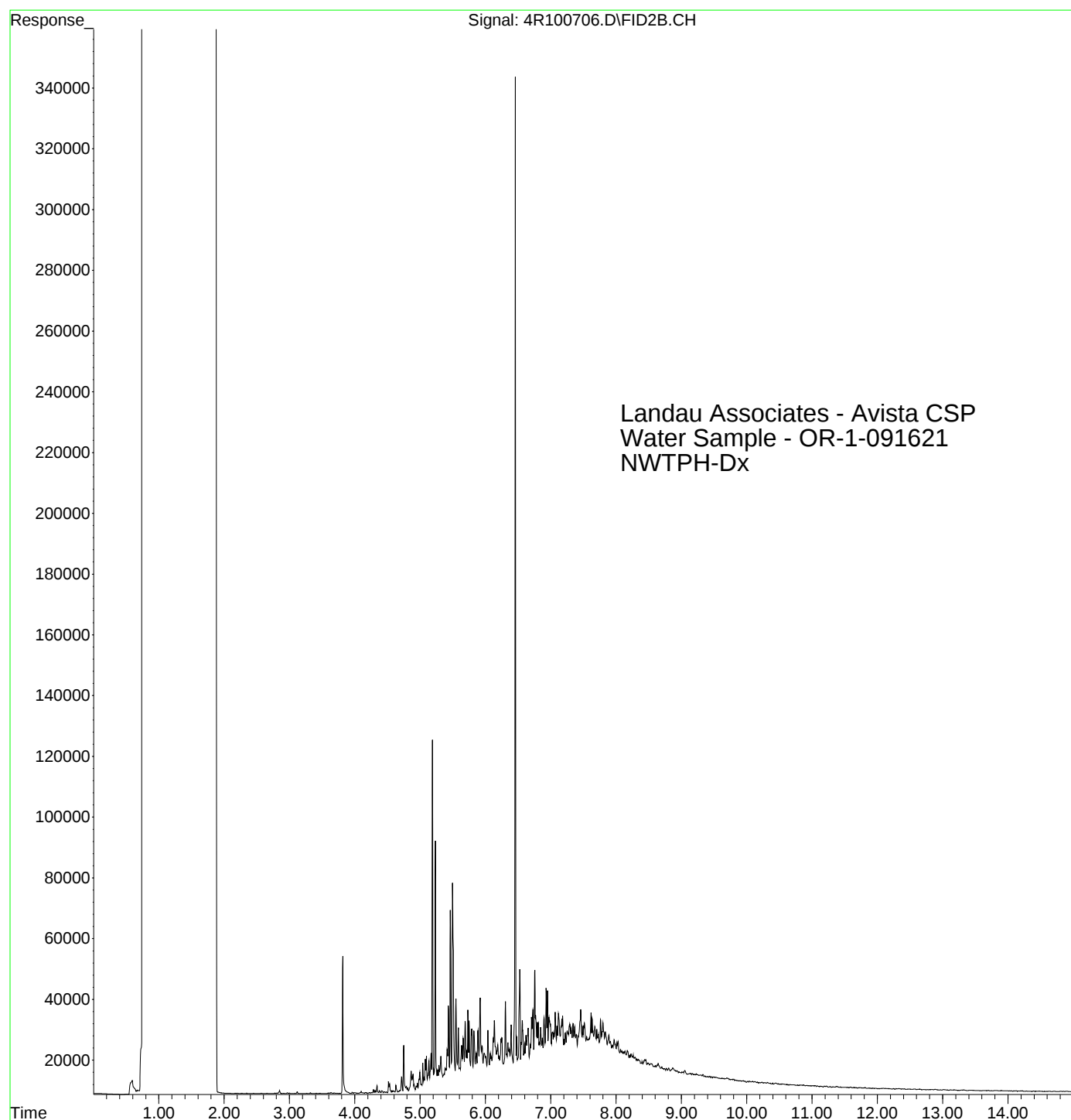


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Operator : BLL
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Instrument : HP G1530A
Sample Name: 1I22056-CCV2
Misc Info :
Vial Number: 52

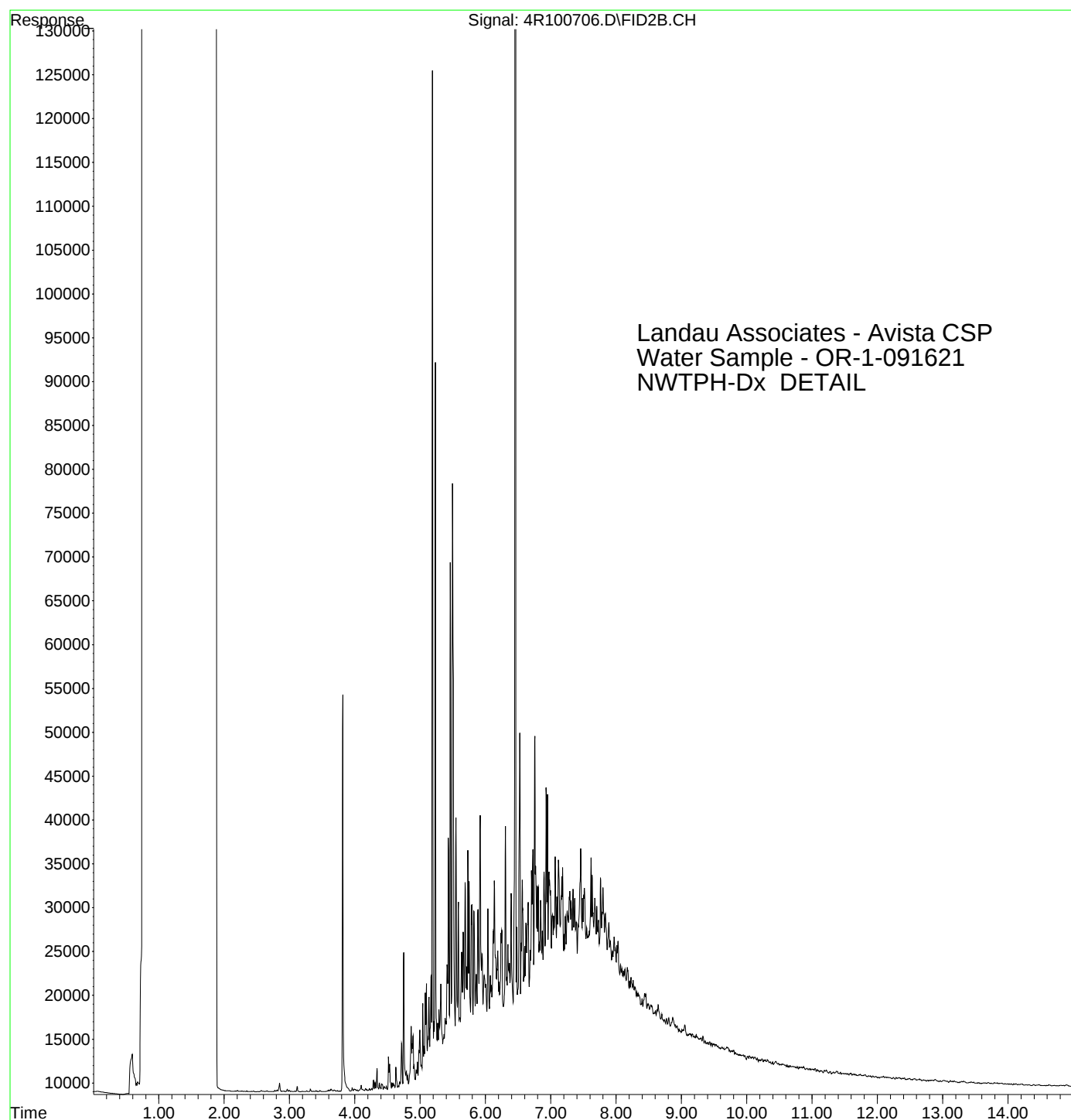


APPENDIX E

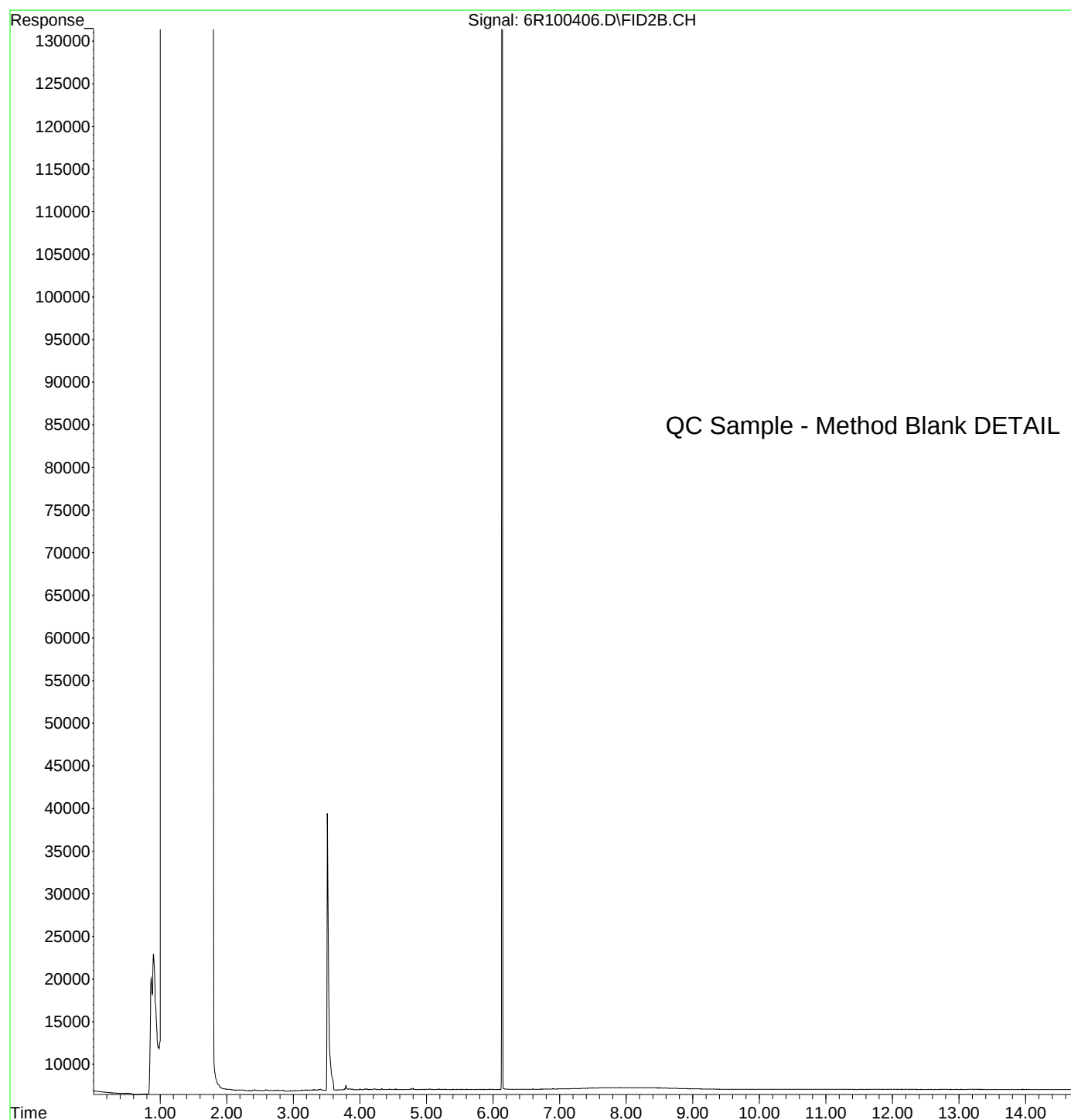
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Operator : BLL
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Instrument : HP G1530A
Sample Name: A1I0767-07RE1
Misc Info :
Vial Number: 51



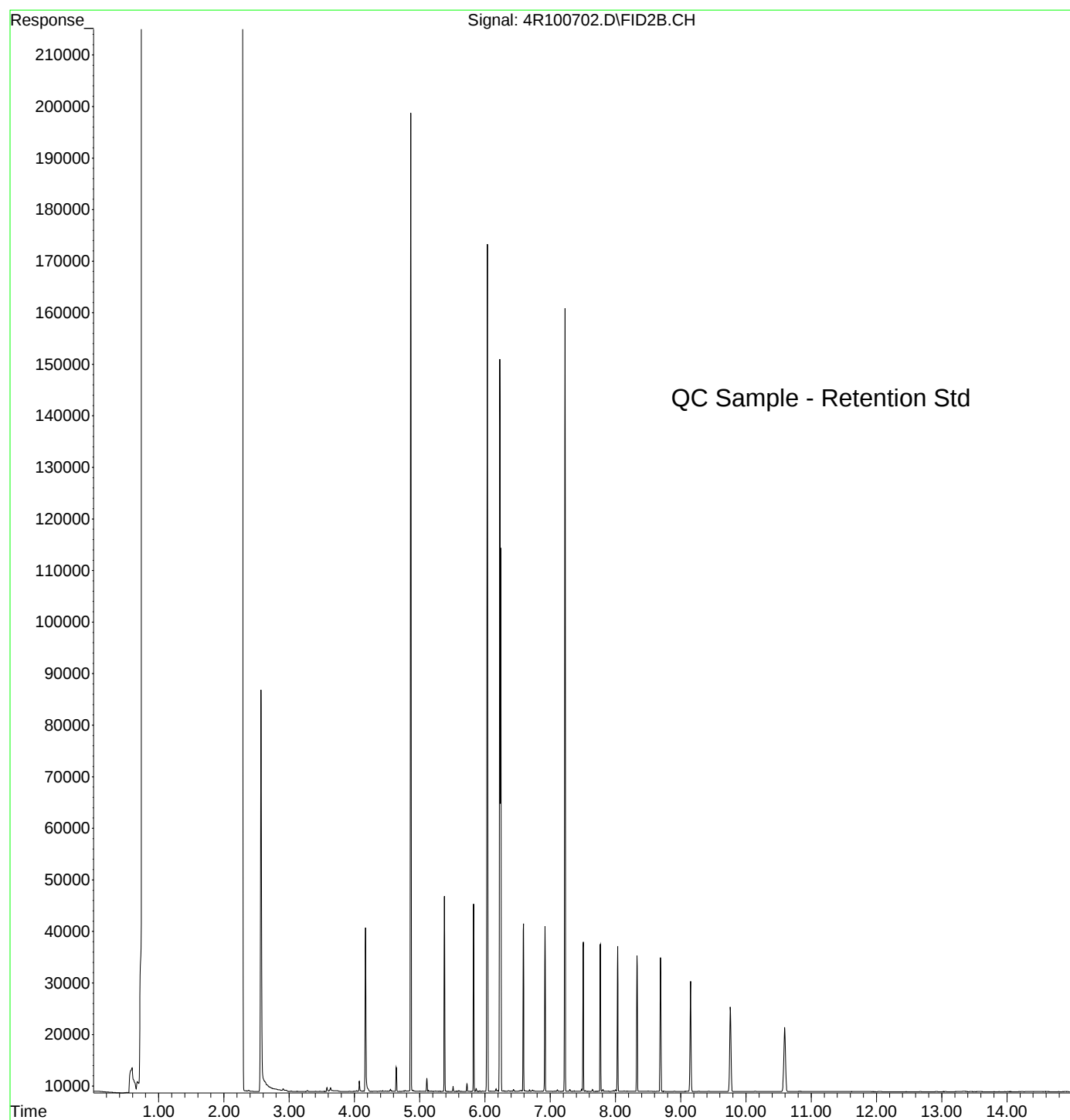
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Operator : BLL
Acquired : 07 Oct 2021 8:10 am using AcqMethod A4F60831.M
Instrument : HP G1530A
Sample Name: A1I0767-07RE1
Misc Info :
Vial Number: 51



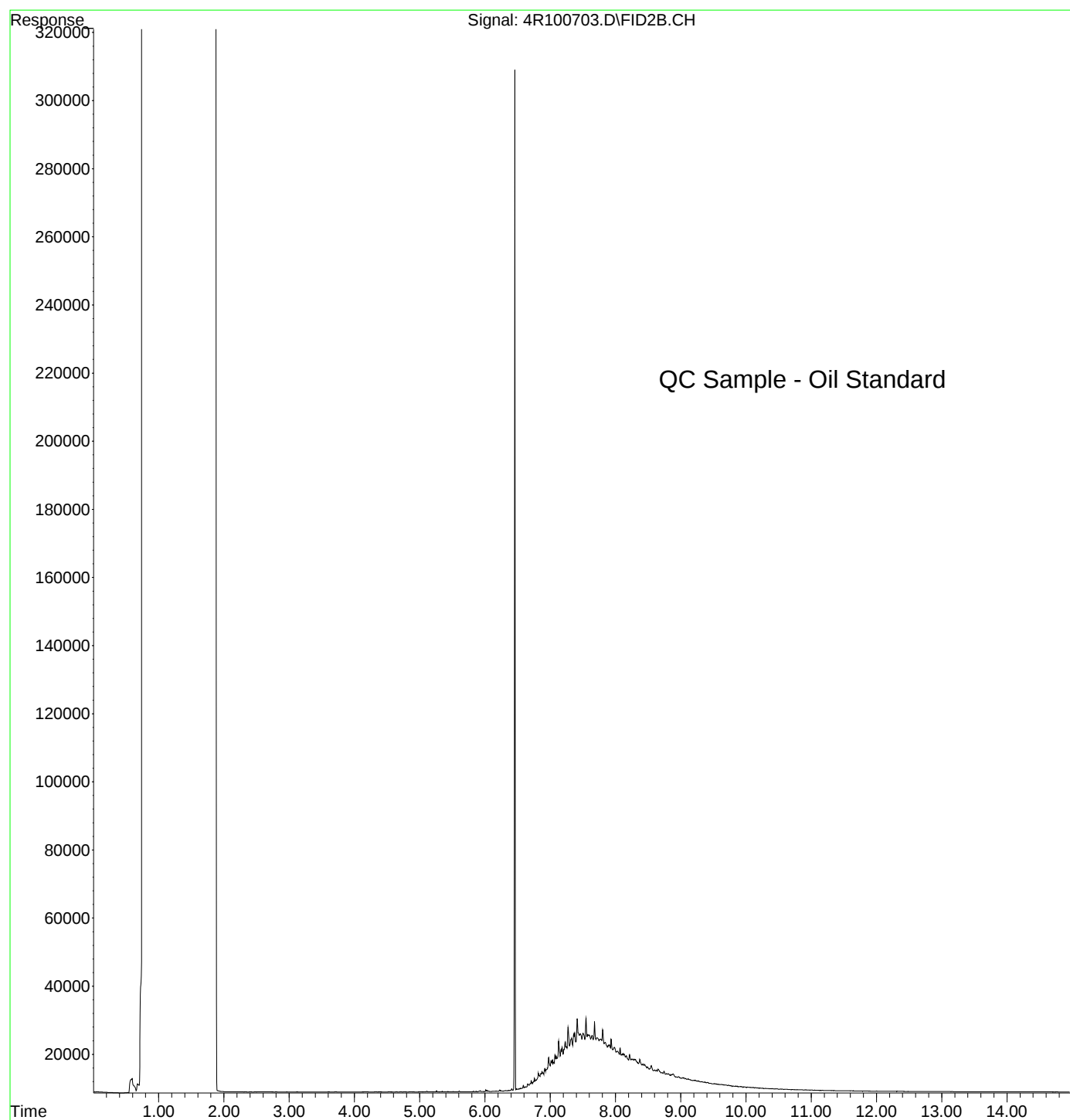
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Operator : BLL
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Instrument : HP G1530A
Sample Name: 21J0020-BLK1
Misc Info :
Vial Number: 51



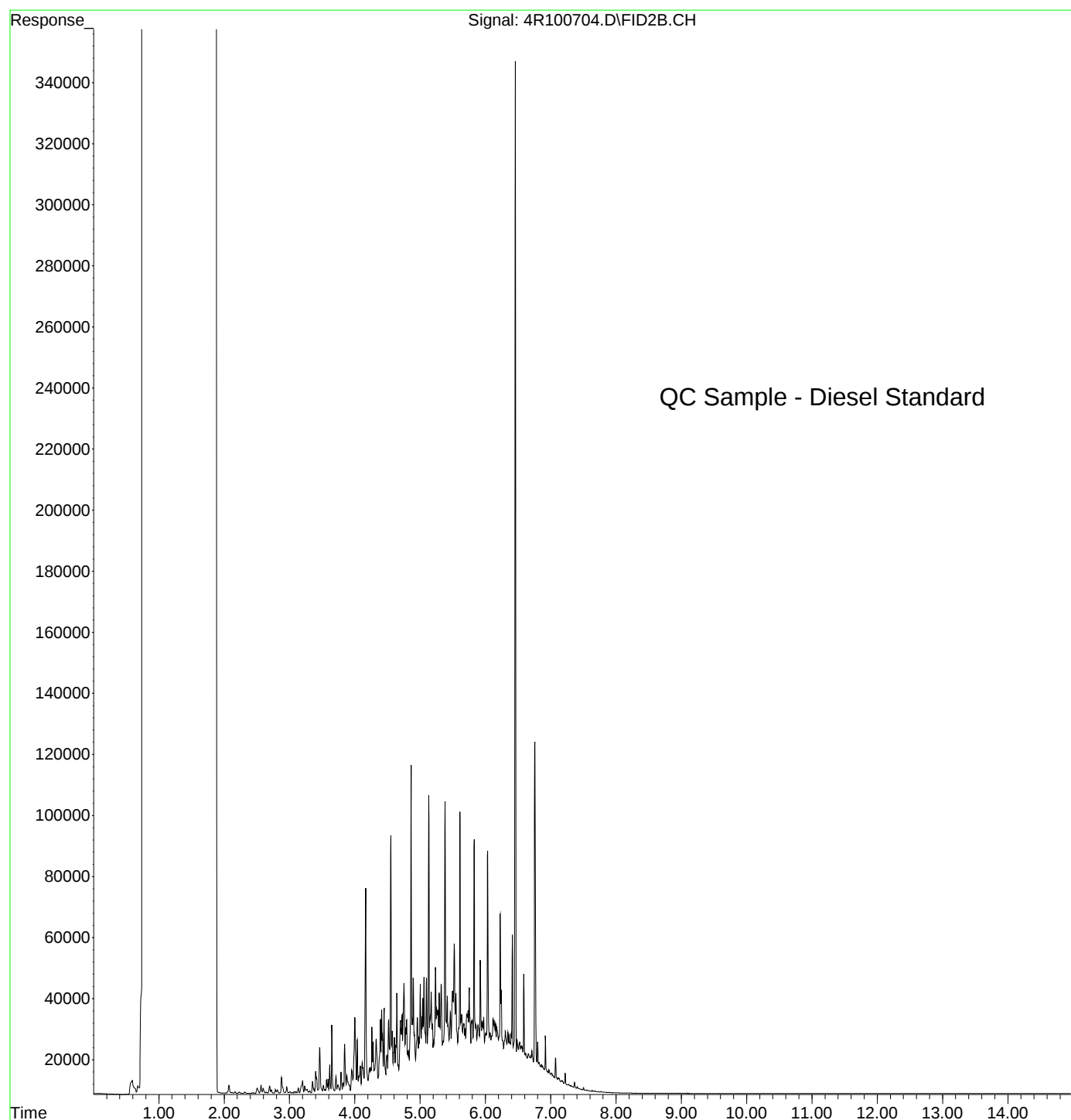
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Operator : BLL
Acquired : 07 Oct 2021 6:49 am using AcqMethod A4F60831.M
Instrument : HP G1530A
Sample Name: 1J07036-RES1
Misc Info :
Vial Number: 95



File :C:\msdchem\1\data\2021-10\1J07036\4R100703.D
Operator : BLL
Acquired : 07 Oct 2021 7:09 am using AcqMethod A4F60831.M
Instrument : HP G1530A
Sample Name: 1J07036-CCV1
Misc Info :
Vial Number: 2



File :C:\msdchem\1\data\2021-10\1J07036\4R100704.D
Operator : BLL
Acquired : 07 Oct 2021 7:30 am using AcqMethod A4F60831.M
Instrument : HP G1530A
Sample Name: 1J07036-CCV2
Misc Info :
Vial Number: 1



**GeoEngineers Report:
Quarterly Operation and Maintenance Report
Third Quarter 2021 (July through September 2021)
Central Steam Plant Oil Spill Remediation
Spokane, Washington**

Quarterly Operation and Maintenance Report

Third Quarter 2021
(July through September 2021)
Central Steamplant Oil Spill Remediation
Spokane, Washington

for
Avista Corporation

November 12, 2021



GEOENGINEERS 
Earth Science + Technology

Quarterly Operation and Maintenance Report

Third Quarter 2021
(July through September 2021)
Central Steamplant Oil Spill Remediation
Spokane, Washington

for

Avista Corporation

November 12, 2021



523 East Second Avenue
Spokane, Washington 99202
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Quarterly Operation and Maintenance Report

Third Quarter 2021 (July through September 2021) Central Steamplant Oil Spill Remediation Spokane, Washington

File No. 2522-013-05

November 12, 2021

Prepared for:

Avista Corporation
1411 East Mission Avenue
Spokane, Washington 99202

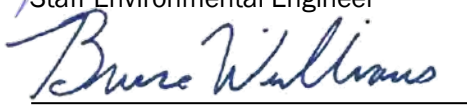
Attention: Bryce Robbert

Prepared by:

GeoEngineers, Inc.
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Senior Principal

JML:BDW:mce

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Appendix A. Maintenance and Calibration/Adjustment Logs

Appendix B. Product Vacuum Extraction

1.0 INTRODUCTION

GeoEngineers, Inc. (GeoEngineers) is pleased to present the operation and maintenance (O&M) results for the remedial system operating at the Avista Steamplant Oil Remediation Site (Site) during the third quarter of 2021 (July through September). Two O&M events were conducted on August 4 and 5, 2021 and August 26, 2021. In general, O&M activities for the quarter included:

1. Removing liquids from product recovery reservoirs and vaults using a drum-mounted vacuum pump;
2. Adjusting and monitoring belt skimmer operation;
3. Replacing belt skimmer components;
4. Monitoring oil recovery reservoir components;
5. Monitoring detention tank levels and components: and
6. Completing remedial system component operational and calibration checks.

2.0 O&M EVENT – AUGUST 4 AND 5, 2021

2.1. Personnel

- Joshua M. Lee, GeoEngineers Inc. (GeoEngineers)

2.2. Subcontractors

- Spokane Environmental Services (SES) (liquid removal and equipment maintenance)
- Spokane Traffic (traffic control)

2.3. Activities

GeoEngineers visited the Site on August 4 and 5, 2021 to document O&M activities. SES removed oil and water from the vault floors and product recovery reservoirs in vaults OR3, EW1, EW2 and EW3 using a 3-foot-long polyvinyl chloride (PVC) stinger connected to a drum-mounted vacuum. Vault OR1 had miniscule amounts of oil and water and did not warrant liquid removal. Liquid removed from the vault floors was a mix of infiltrated precipitation and overflow from product recovery tanks; liquid removed from the recovery tanks was a mixture of oil and water. The liquid from the product recovery tanks and vaults was pumped into 55-gallon drums and transported to Avista's storage yard for disposal. SES removed approximately 0 gallons of liquid from OR1, 8 gallons of liquid (about 3 gallons of oil) from OR3, 10 gallons of liquid (0.5 gallon of oil) from EW1, 15 gallons of liquid (about 1 gallon of oil) from EW2 and 30 gallons of liquid (about 2 gallons of oil) from EW3, as seen in Appendix B.

2.4. Hydraulic Control System

2.4.1. Groundwater Pumps

On arrival, the groundwater pumps in EW1, EW2 and EW3 were not running on August 4 and 5, 2021. The primary logic controller (PLC) was reset, and the extraction wells restarted and functioned properly displaying real-time pressure and flow rates on the supervisory control and data acquisition (SCADA) system. Avista requested periodic monitoring of extraction well groundwater pump operation.

The groundwater pump flow rate in extraction well EW1 was about 13.2 to 14.2 gallons per minute (gpm) with a pressure reading of 14.7 pounds per square inch (psi) on the SCADA control system. The groundwater pump flow rate in extraction well EW2 was 26.0 to 28.0 gpm with a pressure of 8.5 psi. The groundwater pump flow rate in extraction well EW3 was 10.2 to 10.3 gpm with a pressure of 0.0 psi.

2.4.2. Surfactant Pumps

Surfactant pumps in EW1, EW2 and EW3 were on and functioning upon arrival. The surfactant pumps remained on.

2.4.3. Piezometer Water Level Transducers

PZ1 and PZ3 water level transducers were functioning properly, and the SCADA system displayed elevations. The PZ2 water elevation read about 10 feet lower than PZ1 and PZ3 and the PZ2 transducer requires troubleshooting.

2.4.4. Detention Tank

On arrival, the detention tank pump remained off from the previous maintenance event. The detention tank level read 18 inches (approximately 36,000 gallons) on SCADA. Avista and GeoEngineers plan to continue to monitor detention tank levels and pump operation.

2.5. Free Product Recovery System

2.5.1. Belt Skimmers

SES inspected belts and belt skimmer components as described in Appendix A. The belt skimmers in OR1, OR3, EW2 and EW3 were on and operating properly. The EW1 belt skimmer was on upon arrival, but the belt was loose and slipping on the head pulley. SES adjusted the EW1 head pulley and belt tension. After repairs to the EW1 belt skimmer were made, SES hand spun the skimmer belt, removing a thick layer of oil. The EW1 belt skimmer was functioning properly.

2.5.2. Product Recovery Reservoirs

The accuracy of the product-recovery tank-level transmitters was checked by measuring the level of Light Nonaqueous Phase Liquid (LNAPL), or free product, accumulated in each oil recovery tank with respect to the tank's bottom both before and after liquid was removed by SES. These measurements were compared to tank-level transmitter readings. The sensors in vaults OR1, OR3 and EW1 were operating within normal limits. The sensor in vault EW2 displayed an initial product reservoir level of 34.4 inches on the SCADA system, although the product recovery reservoir was about 12 inches. The sensor in vault EW3 displayed an initial product reservoir level of 23.7 inches on the SCADA system, although the product recovery reservoir was overflowing (approximately 35 inches). SES cleaned the sensors in EW2 and EW3. The EW2 sensor was reading full with about 34.4 inches while the reservoir was empty. The EW3 sensor was reading correctly after the cleaning.

2.6. Quarterly Air Monitoring

The notice of construction (NOC) for the oil spill remediation (OSR) was voided by Spokane Regional Clean Air Authority (SRCAA) on April 13, 2016, so checks on the bioventing system and letters to SRCAA are no longer necessary. GeoEngineers recorded bioventing data from the SCADA system but did not perform field measurements on the bioventing system.

3.0 O&M EVENT – AUGUST 26, 2021

3.1. Personnel

- Joshua M. Lee, GeoEngineers

3.2. Subcontractors

- SES (liquid removal and equipment maintenance)
- Spokane Traffic (traffic control)

3.3. Activities

3.3.1. Detention Tank Maintenance

GeoEngineers visited the Site on August 26, 2021 to document O&M activities. SES removed oil and water from the vault floors and product recovery reservoirs in vaults EW1, EW2 and EW3 using a 3-foot-long PVC stinger connected to a drum-mounted vacuum. Vault OR1 had a miniscule amount of oil and water and did not warrant liquid removal. Vault OR3 was blocked by a vehicle and was not opened during this event. Liquid removed from the vault floors was a mix of infiltrated precipitation and overflow from product recovery tanks; liquid removed from the recovery tanks was a mixture of oil and water. The liquid from the product recovery tanks and vaults was pumped into 55-gallon drums and transported to Avista's storage yard for disposal. SES removed approximately 20 gallons of liquid (0.0 gallons of oil) from EW1, 10 gallons of liquid (about 0.5 gallons of oil) from EW2 and 12 gallons of liquid (about 2 gallons of oil) from EW3, as seen in Appendix B.

3.4. Hydraulic Control System

3.4.1. Groundwater Pumps

On arrival, the groundwater pumps in EW1, EW2 and EW2 were on and functioning properly displaying real-time pressure and flow rates on the SCADA system. The groundwater pump flow rate in extraction well EW1 was about 13.2 to 14.2 gpm with a pressure reading of 14.7 psi on the SCADA control system. The groundwater pump flow rate in extraction well EW2 was 26.2 to 28.0 gpm with a pressure of 8.5 psi. The groundwater pump flow rate in extraction well EW3 was 10.2 to 10.3 gpm with a pressure of 0.0 psi.

3.4.2. Surfactant Pumps

Surfactant pumps in EW1, EW2 and EW3 were on and functioning upon arrival. The surfactant pumps remained on.

3.4.3. Piezometer Water Level Transducers

PZ1 and PZ3 water level transducers were functioning properly, and the SCADA system displayed elevations.

SES opened the PZ2 vault, and the vault was about half full of stormwater. SES removed approximately 30 gallons of stormwater from the vault floor using a drum-mounted vacuum pump. SES repaired corroded transducer connections and SCADA reported an incorrect water level. SES recommended replacing the PZ2 transducer.

3.4.4. Detention Tank

The detention tank level read 21 inches (approximately 42,000 gallons) on SCADA. Avista and GeoEngineers plan to continue to monitor detention tank levels and pump operation.

3.5. Free Product Recovery System

3.5.1. Belt Skimmers

SES inspected belts and belt skimmer components, as described in Appendix A. The belt skimmers in OR1, OR3, EW2 and EW3 were on and operating properly. The EW1 belt skimmer was on upon arrival, but the belt was loose and slipping on the head pulley. SES adjusted the EW1 head pulley and belt tension. After repairs to the EW1 belt skimmer were made, SES hand spun the skimmer belt, removing a thick layer of oil. The EW1 belt skimmer was functioning properly.

3.5.2. Product Recovery Reservoirs

The accuracy of the product-recovery tank-level transmitters was checked by measuring the level of LNAPL, or free product, accumulated in each oil recovery tank with respect to the tank's bottom both before and after liquid was removed by SES. These measurements were compared to tank-level transmitter readings. The sensors in vaults OR1, OR3, EW1 and EW3 were operating within normal limits. The sensor in EW2 read oil reservoir at 34.4 inches and the actual reservoir level was about 12 inches. SES removed and cleaned the reservoir level sensor, but SCADA continued to report a higher level than actual.

3.6. Quarterly Air Monitoring

The NOC for the OSR was voided by SRCAA on April 13, 2016, so checks on the bioventing system and letters to SRCAA are no longer necessary. GeoEngineers recorded bioventing data from the SCADA system but did not perform field measurements on the bioventing system.

The condensate pump (CP) was not operating to remove water from the bioventing system knockout pot. SES troubleshooted the CP and the impellers were bad. SES removed the CP and will replace or repair the damaged CP impellers.

4.0 ACTION ITEMS – FOURTH QUARTER 2021

1. The next O&M event will be scheduled for October 2021.
2. Monitor extraction well (EW1, EW2 and EW3) operation and SCADA information.
3. Replace PZ2 transducer.
4. Troubleshoot EW2 level sensor with SCADA technician.
5. Repair and reinstall condensate pump (CP) impeller.
6. Sample detention tank and EW1 for fats, oils and grease (FOG).
7. Monitor detention tank level and pump operation.
8. Perform corrective maintenance to belt skimmer components, as necessary.

This report has been prepared on behalf of the Avista Corporation. Should you have any questions regarding the monitoring results or other aspects of this project, please do not hesitate to call us at your earliest convenience.

APPENDIX A

Maintenance and Calibration/Adjustment Logs

Maintenance Log
WWP Central Steam Plant/Oil Spill Remediation
Spokane, WA

Scheduled ?		Date	Time	System	Equipment Description	Action Taken (brief description)	Action Required (leave blank if none required)
Yes	No						
		8/5/2021	930	EW1	Surf Pump		
					Heater		
					Light		
					Vault	Pumped out product reservoir and storm water from vault	
					Belt Skimmer	Reset the PLC to restart pump on August 4 and 5, 2021; sample port disconnected from discharge pipe. Retapped and installed new sample port with small leak/drip.	Monitor pump and SCADA; Permanently repair sample port
					GW Pump		
		8/5/2021	1015	EW2	Surf Pump		
					Heater		
					Light		Repair upper outlet (electrician)
					Vault	Pumped out product reservoir and storm water from vault	
					Belt Skimmer		
					GW Pump	Reset the PLC to restart pump on August 4 and 5, 2021	Monitor pump and SCADA
		8/5/2021	1030	EW3	Surf Pump		
					Heater		
					Light		
					Vault	Pumped out product reservoir and storm water from vault	
					Belt Skimmer		
					GW Pump	Reset the PLC to restart pump on August 4 and 5, 2021	Monitor pump and SCADA
		8/4/2021	830	OR3	Vault	Pumped out product reservoir from vault	
					Belt Skimmer		
					Light		
					Heater		
				OR2	Vault		
		8/4/2021		OR1	Vault	Opened vault to check level	
					Belt Skimmer		
					Light		Repair conduit and light inside vault (electrician)
					Heater		
				PZ1	piezometer		
				PZ2	piezometer		Diagnose piezometer function
				PZ3	piezometer		
					Lift Station-P5		
					Lift Station-P6		
					Detention Tank-P7	Monitor tank level	Monitor tank level and pump operation
					Passive Skimmer-CB1		
					Passive Skimmer-CB2		
					Passive Skimmer-CB3		
				BV	Condensate Pump		

Calibration/Adjustment Log
WWP Central Steam Plant/Oil Spill Remediation
Spokane, Washington

[illegible]

Calibration/Adjustment Log
WWP Central Steam Plant/Oil Spill Remediation
Spokane, Washington

Date	Time	System	Equipment Description	Pressure		Flow			O2 (%)	CO2 (ppm)	RH (%)	Action Taken (brief description)	Action Required (leave blank if none required)
				Actual (in H2O)	PLC/SCADA (in H2O)	Velocity (FPM)	Actual Flow (CFM)	PLC/SCADA (CFM)					
8/4/2021	745	BV	Extraction-BE-1	-	-8.45	-	-	0.0	2.81	0.95	36.5		
			-BE-2	-	-0.20	-	-	0.0	2.75	0.95	37.3		
			-BE-3	-	-2.63	-	-	16.7	2.85	0.95	31.9		
			-BE-4	-	-1.51	-	-	20.1	3.41	0.95	31.2		
			-BE-5	-	0.04	-	-	0.0	3.19	0.95	32.6		
			-BE-6	-	-0.57	-	-	8.5	3.40	0.95	29.6		
			-BE-7	-	-0.90	-	-	7.3	3.33	0.95	28.0		
			-BE-8	-	-0.18	-	-	0.0	3.03	0.95	30.9		
			-BE-9	-	-3.90	-	-	15.9	2.73	0.95	32.6		
			-BE-10	-	-1.33	-	-	13.4	3.52	0.94	36.0		
			Injection-BI-1		0.28								
			-BI-2		5.64								
			-BI-3		5.35								
			-BI-4		5.59								
			-BI-5		5.72								
			-BI-6		5.50								
			-BI-7		5.59								
			Manifold	-	FPM								
			Manifold Temp	-	deg F								
			Vacuum - MS										
			Total Flow SCADA (BI)	33.1	CFM								
		BV	SCAPCA monitoring	Calibration check of OVM									
			Cal gas =	none	isobutylene								
			Background=	none	ppm								
			Result=	none	ppm								
			Total Flow SCADA (BE)=	108.3	CFM								
			Kurz=										

"-" = not measured.

Maintenance Log
WWP Central Steam Plant/Oil Spill Remediation
Spokane, WA

Scheduled ?		Date	Time	System	Equipment Description	Action Taken (brief description)	Action Required (leave blank if none required)
Yes	No						
		8/26/2021	900	EW1	Surf Pump		
					Heater		
					Light		
					Vault	Pumped out product reservoir and storm water from vault	
					Belt Skimmer		
					GW Pump	Reset the PLC to restart pump on August 23, 2021; sample port leak repaired by tightening to discharge.	Monitor pump and SCADA
				EW2	Surf Pump		
					Heater		
					Light	Electrician repaired outlet in vault.	
					Vault	Pumped out product reservoir and storm water from vault; cleaned level sensor.	
					Belt Skimmer		
					GW Pump	Reset the PLC to restart pump on August 23, 2021 GW pump did not restart, but Avista verified pump operation on August 25, 2021.	Monitor pump and SCADA
				EW3	Surf Pump		
					Heater		
					Light		
					Vault	Pumped out product reservoir and storm water from vault	
					Belt Skimmer		
					GW Pump	Reset the PLC to restart pump on August 23, 2021	Monitor pump and SCADA
				OR3	Vault	Vault not accessible.	
					Belt Skimmer		
					Light		
					Heater		
				OR2	Vault		
				OR1	Vault		
					Belt Skimmer		
					Light	Electrician repaired conduit and light in vault.	
					Heater		
				PZ1	piezometer		
				PZ2	piezometer	Vault was half full of stormwater; piezo connections were corroded and disconnected. Pumped out water and repaired connections. SCADA responded, but level appears incorrect.	Replace transducer and recalibrate with SCADA technician.
				PZ3	piezometer		
					Lift Station-P5		
					Lift Station-P6		
					Detention Tank-P7	Monitor tank level	Monitor tank level and pump operation
					Passive Skimmer-CB1		
					Passive Skimmer-CB2		
					Passive Skimmer-CB3		
				BV	Condensate Pump	Pump impeller damaged.	Rebuild pump and reinstall.

Calibration/Adjustment Log
WWP Central Steam Plant/Oil Spill Remediation
Spokane, Washington

[illegible]

Calibration/Adjustment Log
WWP Central Steam Plant/Oil Spill Remediation
Spokane, Washington

Date	Time	System	Equipment Description	Pressure		Flow			O2 (%)	CO2 (ppm)	RH (%)	Action Taken (brief description)	Action Required (leave blank if none required)
				Actual (in H2O)	PLC/SCADA (in H2O)	Velocity (FPM)	Actual Flow (CFM)	PLC/SCADA (CFM)					
8/26/2021	1200	BV	Extraction-BE-1	-	-3.17	-	-	8.3	3.80	3.79	37.0		
			-BE-2	-	-1.83	-	-	8.3	3.80	3.79	37.0		
			-BE-3	-	-1.71	-	-	16.7	3.80	3.79	37.1		
			-BE-4	-	-0.78	-	-	13.8	3.81	3.79	36.7		
			-BE-5	-	-8.52	-	-	4.2	3.82	3.79	37.0		
			-BE-6	-	-0.83	-	-	10.5	3.83	3.80	37.1		
			-BE-7	-	-1.15	-	-	11.1	3.85	3.80	37.1		
			-BE-8	-	-4.96	-	-	0.0	3.86	3.80	37.1		
			-BE-9	-	-2.66	-	-	13.6	3.87	3.80	37.0		
			-BE-10	-	-0.94	-	-	10.4	3.89	3.80	37.0		
			Injection-BI-1		0.28								
			-BI-2		5.64								
			-BI-3		5.35								
			-BI-4		5.59								
			-BI-5		5.72								
			-BI-6		5.50								
			-BI-7		5.59								
			Manifold	-	FPM								
			Manifold Temp	-	deg F								
			Vacuum - MS										
			Total Flow SCADA (BI)	33.1	CFM								
		BV	SCAPCA monitoring	Calibration check of OVM									
			Cal gas =	none	isobutylene								
			Background=	none	ppm								
			Result=	none	ppm								
			Total Flow SCADA (BE)=	100.5	CFM								
			Kurz=										

"-" = not measured.

APPENDIX B

Product Vacuum Extraction

Product Vacuum Extraction (Extraction and Recovery Wells)
WWP Central Steam Plant/Oil Spill Remediation
Spokane, Washington
Third Quarter 2021 (July to September)

Date	System	Estimated Removed (Gallons)		Total Liquid Removed (Gallons)
		Product	Water	
8/4/2021	OR3	3.0	5.0	8.0
8/5/2021	OR1	0.0	0.0	0.0
	EW1	0.5	9.5	10.0
	EW2	1.0	14.0	15.0
	EW3	2.0	28.0	30.0
8/26/2021	OR1	0.0	0.0	0.0
	OR3	0.0	0.0	0.0
	EW1	0.0	20.0	20.0
	EW2	0.5	9.5	10.0
	EW3	2.0	10.0	12.0
Totals		9	96	105

