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March 04, 2024

Ms. Denise Kirkpatrick
Hazardous Materials Section Supervisor
Montana Department of Environmental Quality
Waste Management Bureau
P.O. Box 200901
Helena, MT 59620-0901

RE: AOC-16 Interim Measure 4th Quarter 2023 Monitoring Report No. 8

Submitted via Montana File Transfer Service with Hard Copy to follow

Dear Ms. Kirkpatrick,

Please find attached Calumet Montana Refining LLC's (CMR) AOC-16 Interim Measure (IM) 4th Quarter 2023 Monitoring Report (QMR) No. 8 for review and approval. The report documents the operations, maintenance, and monitoring activities completed for the dual phase extraction (DPE) remediation system, passive treatment trench, and light non-aqueous phase liquid (LNAPL) recovery trench between October 2023 and December 2023. In addition, this report presents an evaluation of AOC-16 IM remediation system performance during this period and discusses continued system optimization and monitoring activities.

Please contact me at your earliest convenience if you have any questions.

Sincerely,

Michael Gipson

Mike Gipson
Environmental Specialist

cc: Joe Dauner – CMR
Mark Cheesman – CMR

Attachments: AOC-16 Interim Measure 4th Quarter 2023 Monitoring Report No. 8

AOC-16 INTERIM MEASURE 4TH QUARTER 2023 MONITORING REPORT NO. 8

CALUMET MONTANA REFINING, LLC
GREAT FALLS, MONTANA

March 4, 2024

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ACRONYMNS AND ABBREVIATIONS

AOC-16	Area of Concern-16
BOD	biochemical oxygen demand
BTEX	benzene, toluene, ethylbenzene, and xylene
CMR	Calumet Montana Refining, LLC
COC	constituent of concern
DEQ-7 HHS	Montana Department of Environmental Quality-7 Human Health Standards
DO	dissolved oxygen
DPE	dual-phase extraction
EPH	extractable petroleum hydrocarbon
gpm	gallons per minute
IM	Interim Measures
in-Hg	inches of mercury
LEL	lower explosive limit
LNAPL	light non-aqueous phase liquid
µg/L	microgram per liter
MDEQ	Montana Department of Environmental Quality
mg/L	milligrams per liter
mL/min	milliliters per minute
MS/MSD	matrix spike/matrix spike duplicate
mV	millivolts
NTu	nephelometric turbidity unit
OM&M	operations, maintenance, and monitoring
ORP	oxidation reduction potential
Pace	Pace Analytical Services, LLC
PID	photoionization detector
PLC	programmable logic controller
PRT	primary recovery trench
PTT	passive treatment trench
QAPP	Quality Assurance Project Plan
QA/QC	quality assurance/quality control
QMR	Quarterly Monitoring Report
RBSL	Risk-Based Screening Levels
RCRA	Resource Conservation Recovery Act
RFI	RCRA Facility Investigation
Ramboll	Ramboll Americas Engineering Solutions, Inc.
ROI	radius of influence
SCFM	standard cubic per minute
SRCO	Self-Recuperative Catalytic Oxidizer
SVOC	semi-volatile organic compound
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound
VPH	volatile petroleum hydrocarbon
WWTP	wastewater treatment plant

SIGNATORY PAGE

I certify under penalty of law that this document and all attachments were prepared under my direct supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature:	Terry Pearsall Digitally signed by Terry Pearsall Date: 2024.03.01 13:48:33 -07'00'
Name:	Terry Pearsall
Title:	Operations Manager – Calumet Montana Refining, LLC
Date:	

EXECUTIVE SUMMARY

Ramboll Americas Engineering Solutions, Inc. (Ramboll), on behalf of Calumet Montana Refining, LLC (CMR), has prepared this Area of Concern-16 (AOC-16) Interim Measure (IM) 4th Quarter 2023 Monitoring Report (QMR) No. 8 to summarize the operations of the AOC-16 Dual Phase Extraction (DPE) system and the Passive Treatment Trench (PTT). This QMR has been prepared in accordance with Section 6.2 of the Operations Maintenance and Monitoring (OM&M) Plan for the AOC-16 IM.

During the 4th quarter of 2023, the DPE system operated approximately 38% of the available time. The DPE system extracted and discharged approximately 23,093 gallons of total fluids to CMR's wastewater treatment plant (WWTP). During this reporting period the DPE system also removed approximately 1.4 pounds of petroleum vapor. It also removed less than 0.05 pounds of volatile organic compounds (VOCs), 0.02 pounds of semi-volatile organic compounds (SVOCs), 1.8 pounds of volatile petroleum hydrocarbons (VPH), and 216 pounds of extractable petroleum hydrocarbons (EPH) in the form of liquid effluent. Initial mass removal rates indicate that the DPE system is accomplishing the AOC-16 IM objectives of recovering free phase Light Non-Aqueous Phase Liquid (LNAPL) mass and reducing the LNAPL within the vadose and saturated zone soil matrix.

Quarterly groundwater sampling was conducted at the PTT performance monitoring wells on September 20, 2023. Sampling was conducted at upgradient well MW-41S, PTT well MW-106, and downgradient compliance well MW-105. Samples collected from these monitoring wells were analyzed for petroleum constituents of concern (COCs) – VOCs, SVOCs, VPH, and EPH. Samples from PTT well MW-106 was also analyzed for biodegradation parameters.

The monitoring well upgradient of the passive treatment trench (MW-41S) reported benzene concentrations exceeding the DEQ-7 Human Health Standards – Groundwater (DEQ-7 HHS) and the Risk-Based Screening Levels (RBSLs) of 5 µg/L. Benzene was not detected from monitoring well MW-106 installed within the trench. Monitoring well MW-105 installed downgradient of the passive treatment trench reported benzene at 11.7 µg/L just exceeding the DEQ-7 HHS and RBSL of 5 µg/L. Within the trench (MW-106), VPH and C5-C8 Aliphatics were at the same concentration of 67.1 µg/L. The C5-C8 Aliphatics concentration was below the RBSL of 650 µg/L. Downgradient of the PTT (MW-105), the VPH concentration was 825 ug/L with a C5-C8 Aliphatic concentration of 523 µg/L, less than the RBSL of 650 µg/L. Concentrations of COCs at the downgradient well MW-105 appear decreasing with time with some seasonal variability.

OM&M of the IM will continue to document the performance of the IM's and will include periodic performance reporting to the Montana Department of Environmental Quality (MDEQ) to ensure the IM objectives are continuing to be met. Further investigation/evaluation at the AOC-16 Truck Rack Source Area will be completed as part of the upcoming Resource Conservation Recovery Act (RCRA) Facility Investigation (RFI) activities. The results from the RFI and ongoing IM performance monitoring will be evaluated in the Corrective Measures Study to determine if operational modifications are necessary or if a request to the MDEQ to cease recovery and place the DPE system in standby mode is warranted.

1. INTRODUCTION

Ramboll Americas Engineering Solutions, Inc. (Ramboll), on behalf of Calumet Montana Refining, LLC (CMR), has prepared this Area of Concern-16 (AOC-16) Interim Measure (IM) Quarterly Monitoring Report (QMR) No. 8 for the Calumet Great Falls Montana Refining facility located at 1900 10th Street NE, Great Falls, Montana to summarize the fourth quarter of operations in 2023 (October 1 through December 31, 2023) for the AOC-16 IM remedy selected to address petroleum releases at AOC-16.

The CMR refinery is comprised of 82.7 acres of industrial/refinery operations and office buildings. The refinery produces gasoline, middle distillates, and asphalt for distribution in Washington, Montana, Idaho, and Alberta, Canada. AOC-16, referred to as the "Gasoline and Light Oil Loading Rack" or "truck loading rack," is located within an approximately 7.6-acre parcel to the east of the active refinery and is owned by CMR (Figure 1).

Activities were completed in accordance with the Corrective Action Order on Consent issued to Montana Refining Company, Inc. by the Montana Department of Environmental Quality (MDEQ) to govern the performance of Resource Conservation Recovery Act (RCRA) corrective action activities at the site. In 2016, petroleum related vapors were detected in an offsite residential property along 11th Street NE. The MDEQ issued an IM letter on October 11, 2016, directing CMR to address imminent threats to human health and/or the environment stemming from petroleum release near CMR's Loading Rack (MDEQ, 2016). Immediate action consisting of relocating and filling an existing sanitary sewer to prevent migration of contaminants was undertaken. Between 2016 and 2019, in coordination with the MDEQ, investigation activities were undertaken, and alternative remedies were evaluated to address the petroleum release near the Loading Rack. Ultimately, an IM remedy approach was recommended consisting of dual-phase extraction (DPE) in the existing primary recovery trench (PRT) in the Truck Rack Area and Light non-aqueous phase liquid (LNAPL) recovery and a passive treatment trench (PTT) just north of North River Road.

Construction of the AOC-16 IM remedies commenced in July 2021 and were completed in October 2021 as documented in the *AOC-16 Interim Measures AOC-16 IM Construction Documentation Report* (CMR, 2022a). Construction activities included the installation of following IM remedies:

- DPE remediation system in the Truck Rack Area, and
- LNAPL recovery trench and PTT utilizing colloidal activated carbon at an area along North River Road.

Commissioning of the AOC-16 IM was conducted from October 2021 through December 2021 and routine operations of the DPE system commenced on January 1, 2022. A 25-foot LNAPL recovery trench extension was completed between July 25, 2022 and July 29, 2022. Documentation of the extension construction activities were provided in the *AOC-16 IM Construction Documentation Report Addendum 1* (CMR, 2022b).

Corrective action remedial goals were developed as part of the AOC-16 Interim Measures Evaluation Report (CMR, 2019) to protect human health and the environment. The AOC-16 IM goals specific to each treatment area include:

- Truck Rack Area (DPE System)
  - Recover free phase LNAPL mass present in the area south of the Truck Rack to stabilize the LNAPL plume.
  - Reduce LNAPL within the vadose and saturated zone soil matrix to stabilize the dissolved phase plume.
- North River Road Area (LNAPL recovery trench and PTT)
  - Mitigate dissolved phase groundwater impacts migrating from the Truck Rack Area towards the Missouri River.

This AOC-16 IM 4th Quarter 2023 Monitoring Report No. 8 summarizes the sampling results, operations, and performance monitoring data that were gathered for the AOC-16 IM from October 1, 2023 through December 31, 2023, and presents: 1) system runtime for the DPE System; 2) DPE system operational data; 3) identification of operational problems, the length of any shutdowns, and a summary of actions taken to rectify or prevent these problems; 4) influent vapor and liquid sampling results and estimated contaminant mass removal rates for the DPE system; and 5) groundwater concentrations of constituents of concern (COC) in the PTT point of compliance well (MW-105) and PTT well (MW-106). The activities outlined in this report were performed in accordance with the Operations, Maintenance, and Monitoring (OM&M) Plan (CMR, 2021b).

2. DPE SYSTEM OPERATIONS SUMMARY

2.1 System Runtime

During the period of October 1, 2023 through December 31, 2023, the DPE system was in operation approximately 38% of the time and extracted and discharged approximately 23,093 gallons of total fluids to CMR's wastewater treatment plan (WWTP). Table 1 provides a summary of operations during this reporting period. A summary of the routine and non-routine system shutdowns is discussed below.

2.1.1 Planned Shutdowns for Routine and Corrective Maintenance

Brief shutdowns of the DPE system were performed to conduct maintenance activities, including filter replacement and level switch cleaning, monthly preventative maintenance, and inspection of equipment.

2.1.2 Non-Routine/Unplanned Shutdowns

As noted in the previous Quarterly Monitoring Report (CMR, 2023), the SRCO (self-recuperating catalytic oxidizer) experienced a failure in August 2023. Troubleshooting was performed and it was determined that the cause of the SRCO failure was carryover of liquid NAPL from the knock-out tank into the SRCO unit. Between October 10 and 11, 2023, the following repairs were made:

- The failed catalyst element was removed, the catalyst chamber was cleaned and a replacement catalyst was re-installed.
- The lines from the knockout tank to the SRCO were cleaned.
- The inline filters, screens, and level switches were cleaned/replaced.
- The high-high level shut-off switch was lowered approximately 6 inches in the knock-out tank to lower the maximum height the water/NAPL level in the tank can reach during operation.

The system was restarted on October 12, 2023 and ran until October 21, 2023 when it automatically shutdown following a high-high level alarm condition. After the October 21, 2023 alarm, the system components were re-inspected and visible liquid carryover was observed in the vapor piping immediately following the knock-out tank. Additional troubleshooting was performed and it was determined that the liquid carryover was likely caused by a poorly performing demister filter within the knockout tank. The demister filter was subsequently replaced. A review of vendor information indicated that the demister filter should be treated with an adhesive following cleaning to maintain removal efficiency. The alarm interlocks were also modified such that the high-alarm now shuts down the system instead of closing the actuated header valves. It is believed the former interlock valve actuation sequence may have contributed to process overpressure and relief cycle. This caused large swings in vacuum pressure, leading to violent liquid level pulsation in the knockout tank and subsequent liquid carryover through the demister filter. With this interlock modification, the high-high alarm now serves as a redundant shut-down in the case of a high-alarm failure, and prevents incidental liquid carry over past the demister filter.

The system was subsequently restarted on December 6, 2023 and ran for the remainder of December 2023.

2.2 System Operation and Monitoring

DPE system performance monitoring and sampling were conducted in accordance with the OM&M Plan (CMR, 2021b and CMR, 2021c) to document system operation effectiveness. It included monitoring of operations data, and periodic vapor and effluent sampling to document contaminant mass recovery. Note that groundwater gauging of nearby monitoring wells and vacuum readings at adjacent monitoring wells are also part of the performance monitoring plan; however, these readings were not collected during the fourth quarter of 2023. Calumet has engaged a third-party contractor for 2024 to assure that the recommended performance monitoring data get collected on a timely basis. Performance monitoring parameters are discussed in the following sections.

Intermittent operation of the system was necessary during this reporting period to facilitate repairs to the system and to troubleshoot the identified issue with liquid carryover. As such, the system was run with additional dilution air to confirm safe operation resulting in the system not operating at an optimal level during this reporting period. However, during performance monitoring/sampling, system dilution was decreased over time to maximize adequate subsurface vacuum influence, flow, and vapor collection, representative of subsurface conditions. The DPE system performance monitoring data is further discussed below.

2.2.1 DPE Influent and Effluent Sampling Results

Monitoring of contaminant mass removal is the primary metric for optimizing DPE system performance and gauging the AOC-16 IM objective of free-phase LNAPL mass recovery and LNAPL plume stabilization.

Vapor

Vapor/air extraction flow rates were continuously monitored and recorded by the system programmable logic controller (PLC) and influent vapor sampling was periodically conducted to evaluate mass removal.

The concentrations of volatile organic compound (VOCs) in the vapor phase were measured periodically on each DPE influent line (DPE-1 through DPE-8) using a photoionization detector (PID) to measure relative vapor concentrations from each DPE well. PID measurements were also collected from sample port SP-301 on the inlet side of the blowers. PID measurements from the DPE wells and SP-301 port are summarized on Figures 2A and 2B. PID readings at all wells have dropped from greater than 400 parts per million (ppm) upon startup in October 2021 to less than 75 ppm in the fourth quarter of 2023. The highest PID reading during the reporting period was recorded at DPE-3 (66.2 ppm) on December 27, 2023.

Vapor samples were collected in October and December 2023 from SP-301. The samples were submitted to Pace National Laboratory located in Mount Juliet, Tennessee. The samples were analyzed for VOCs by the United States Environmental Protection Agency (USEPA) Method TO-15. Analytical results for detected compounds from the influent vapor samples are summarized in Table 2. Laboratory reports are included in Appendix A1. Historical analytical results and mass removal are included in Appendix B.

Concentrations of benzene, toluene, ethylbenzene, and xylene (BTEX), n-hexane, and n-heptane in influent vapor over time are shown on Figure 3. These compounds were selected to evaluate vapor influent concentration trends as their concentrations were the highest as compared to other VOCs during the start-up sampling. Concentrations during the 4th quarter of 2023 of BTEX, n-hexane, and n-

heptane are approximately four orders of magnitude less than the concentrations at startup in October 2021. For example, benzene concentrations decreased from 2,850,000 µg/m^3 in October 2021 to 49,100 µg/m^3 in December 2022. Concentrations in 2023 have ranged from a low of 206 µg/m^3 in May 2023 to a high of 25,700µg/m^3 in October 2023. Similarly, n-hexane concentrations have decreased from 7,840,000 µg/m^3 in October 2021 to 169,000 µg/m^3 in December 2022. In 2023, n-hexane values varied between a high of 16,600 µg/m^3 in March 2023 and a low of 395 µg/m^3 in December 2023. Concentrations of BTEX, n-hexane, and n-heptane have also decreased from the previous sampling round conducted during the 3rd quarter 2023.

As described above, due to the operational issues, the system was operated with more dilution air than optimal for contaminant recovery (and thus at lower overall vacuum) to confirm safe operation. Therefore, reducing the dilution air, increasing vacuum, and optimizing flow recovery is recommended to maximize VOC recovery.

The combination of vapor flow rates, system runtime, and vapor VOC concentrations were used to calculate the mass of contaminants removed. During the reporting period, the DPE system removed approximately 1.4 pounds of VOCs in the vapor phase as shown on Figure 4. As noted above, influent vapor concentrations (Table 2 and Figure 3) have dropped one to two orders of magnitude between the 4th quarter of 2022 and the 4th quarter of 2023.

The post-catalyst outlet temperature on the Self-Recuperative Catalytic Oxidizer (SRCO) unit also serves as a continuous relative indicator of contaminant mass with higher temperatures corresponding to relatively greater contaminant mass (Figure 5). Prior to January 2023 as shown in previous Quarterly Monitoring Reports, the post-catalyst process air temperature consistently exceeded 800 degrees F. During the fourth quarter of 2023, the SRCO post-catalyst outlet temperature has remained at 650 degrees F while in operation thereby indicating reduced mass and/or shift from average lighter end to average heavier end hydrocarbon loading to the SRCO unit. This result corroborates the analytical data collected; however as noted above, the system was run with more dilution air than optimal for contaminant recover. As the dilution valve is closed with time, the mass recover and SRCO temperature is anticipated to increase.

Influent VOC concentrations as measured through vapor VOC sampling, PID readings at individual wells, and post-catalyst outlet temperature have decreased with time. Flow balancing and reduction of dilution air is recommended to maximize drawdown throughout the trench to influence the residual contamination in the zone of water table fluctuation.

Liquid

Effluent samples of groundwater were collected from the discharge side of the transfer pump in October and December 2023 and submitted to the Pace National Laboratory located in Mount Juliet, Tennessee for analysis of VOCs, semi-volatile organic compounds (SVOCs), volatile petroleum hydrocarbons (VPH), and extractable petroleum hydrocarbons (EPHs). Analytical results from the effluent sampling are summarized in Table 3. Laboratory reports are included in Appendix A2. Historical analytical results and mass removal estimates are included in Appendix C.

The combination of fluid recoveries and contaminant concentrations were used to calculate the mass of contaminants removed in the dissolved phase. In the dissolved phase during the reporting period, the DPE system removed less than 0.05 pounds of VOCs, 0.02 pounds of SVOCs, 1.8 pounds of VPH, and 217 pounds of EPH. Very limited mass recovery of all compounds were recorded in October 2023,

but concentrations appeared to rebound in December 2023, especially EPH. Concentration trends indicate that liquid recovery is shifting to heavier end compounds (i.e. EPH) as compared to more volatile compounds (i.e. VOCs). Further monitoring of this trend is recommended.

Separate phase LNAPL recovery is not quantified. Total fluids (combined LNAPL and water) in the effluent are pumped to the refinery's on-site WWTP where oil-water separation occurs. However, visual observations of LNAPL in the DPE system knockout tank (T-23100) sight glass serve as a qualitative indicator of LNAPL recovery. One to two inches of LNAPL was observed within the knock-out tank sight glass. Qualitatively, the amount of LNAPL observed in the sight glass is lower than in previous quarters.

As shown on Figure 4, total VOC, SVOC, VPH, and EPH mass removed in the vapor and dissolved phase since DPE system startup in October 2021 and through December 31, 2023, is calculated to be approximately 2,903 pounds, 13.8 pounds, 217 pounds, and 2,726 pounds, respectively.

2.2.4 Overall System Performance and Optimization

This section compares the primary design parameters to the observed/measured values during the reporting period to evaluate the system performance. These parameters are discussed in detail in following sections and summarized in Table 1.

Liquid Extraction Rate

The average design flow rate for the DPE system is between 0.25 gallons per minute (gpm) during steady-state operation and 21 gpm during rainfall events. The combination of fluid recoveries and system run time was used to calculate liquid flow rate during the reporting period. The DPE system extracted fluids at an average rate of 0.46 gpm which is within the design flow rate.

Vapor Influent Flow Rate and Applied Vacuum

The design vapor influent flow rate and applied vacuum are 200 standard cubic per minute (SCFM) and 17 inches of mercury (in-Hg), respectively. System flow rate and system vacuum at the header during the reporting period are shown on Figure 7. The vacuum averaged 11.7 in-Hg in October and 10.0 in-Hg in December slightly below the design vacuum of 17 in-Hg. Flows in October 2023 averaged 23 SCFM while flows in December averaged 43 SCFM. The low flow rates and vacuums are attributable to the high dilution air rates to confirm safe operation while restarting the system following the liquid carryover issue.

SRCO Performance Monitoring

The SRCO has a design destruction efficiency of 99% per manufacturer's specifications. To show compliance with the air permit, the SRCO pre- and post-catalyst process air temperature is monitored. The pre-catalyst process air temperature must be greater than 650°F to ensure a destruction efficiency of 99%. The SRCO temperature monitoring results during the reporting period is shown on Figure 5. As shown on Figure 5, the pre-catalyst process air temperature at least 650°F while the system was in operation.

During operation, the system was determined to be functioning appropriately given the adjustments to the influent dilution air that were made to bring the system back to its optimal operating range in a safe and effective manner. DPE system optimization will continue, as needed, based on DPE well vapor concentrations, mass removal, and liquid extraction rates.

3. LNAPL RECOVERY TRENCH AND PTT

3.1 LNAPL Monitoring and Passive LNAPL Recovery

The 11 original LNAPL collection wells located in the LNAPL recovery trench and 6 additional LNAPL trench extension collection wells are supposed to be gauged periodically. During this reporting period, the wells were not gauged and passive skimmers were not emptied due to staffing limitations. Calumet has engaged a third-party contractor for 2024 to assure that the recommended performance monitoring data get collected on a consistent basis.[1]

3.2 Groundwater Monitoring

The primary goal of the PTT is to mitigate dissolved phase groundwater impacts from migrating towards the Missouri River. Quarterly groundwater sampling was conducted on September 19 and 20, 2023, at upgradient well MW-41S, PTT well MW-106, and compliance well MW-105 (Figure 1).

3.2.1 Monitoring Well Sampling

Monitoring wells MW-105 and MW-41S were purged dry on December 6, 2023. The wells recharged over a 24-hour period and groundwater samples, along with a sample from MW-106, were collected on December 7, 2023. During the purging of each well, field measurements were collected for water quality parameters, including dissolved oxygen (DO), pH, specific conductance, temperature, turbidity, and oxidation reduction potential (ORP). The field measurements were recorded every 5 minutes during well purging. The physical and chemical field measurements collected when purging the monitoring wells are summarized in the groundwater sampling logs in Appendix D.

After all the samples were collected, they were sealed, labeled, and placed on ice, pending delivery under chain-of-custody procedures to Pace located in West Columbia, South Carolina. The groundwater samples were analyzed for VOCs (via USEPA Method SW8260D), SVOCs (via USEPA Method SW 8270D), MDEQ VPH (via Method MDEQ VPH), and MDEQ EPH (via Method MDEQ EPH) by the Pace National Laboratory located in Mount Juliet, Tennessee. At MW-105, insufficient groundwater recovery was achieved to collect a sample for EPH analysis. Samples from MW-106 (PTT well) were also analyzed for the following parameters to assess the biodegradation dynamics of the COCs: filtered and unfiltered total iron, total manganese, dissolved iron, and dissolved manganese (via USEPA Method 6020B), sulfate and nitrate (via USEPA Method 9056A), biological oxygen demand (BOD) (via USEPA Method 5210B), methane (via method RSK - 175), and carbon dioxide (via USEPA Method 4500-CO2).

The wells did not yield enough volume to facilitate the collection of field duplicate samples or a matrix spike/matrix spike duplicate (MS/MSD) sample. One trip blank was submitted along with each laboratory cooler for quality assurance/quality control (QA/QC) purposes. Methods and procedures for collecting, handling, and analyzing samples are provided in the Quality Assurance Project Plan (QAPP) (CMR, 2018). Treatment and disposal of purge water generated during monitoring well sampling was handled consistent with existing project procedures.

3.2.2 Groundwater Analytical Results – December 2023

The groundwater analytical results for detected compounds from the September 2023 sampling event are provided in Table 6. Previous quarterly groundwater sampling results from October 2021 through September 2023 are also provided in Table 6 for comparison purposes. Analytical compounds that met

[1] Note that no NAPL was identified in any of the recovery wells or passive skimmer devices during an early 2024 gauging event.

or exceeded the respective MDEQ -7 HHS (May 2017) and/or MDEQ Tier 1 Groundwater Risk-Based Screening Levels (RBSLs) are bolded and/or shaded, respectively, for reference. Laboratory reports are included in Appendix A3.

The following subsections provide a summary of the analytical parameters detected in the monitoring wells in December 2023 and compare those detections to the DEQ-7 HHS in groundwater and RBSLs.

VOCs

Of the VOCs detected during the December 2023 groundwater sampling event at AOC-16, only benzene was detected above its respective groundwater screening standard.[2]

The monitoring well upgradient of the passive treatment trench (MW-41S) reported benzene at 535 micrograms per liter (µg/L) exceeding the DEQ-7 HHS and RBSL of 5 µg/L. Benzene was not detected from the location (MW-106) installed within the trench. The monitoring well (MW-105) installed downgradient of the passive treatment trench reported benzene at 11.7 µg/L just exceeding the DEQ-7 HHS and RBSL of 5 µg/L.

SVOCs

In December 2023, 1-methylnaphtalene exceeded the RBSL at upgradient well MW-41S. No other SVOCs were detected at concentrations exceeding the DEQ-7 HHS or the RBSLs.

TPH, VPH, and EPH

The upgradient monitoring well (MW-41S) had detectable concentrations of volatile petroleum hydrocarbons (VPH) via method MTDEQ VPH of 6,150 µg/L with a C5-C8 Aliphatic concentration (adjusted) of 869 µg/L which exceeds the RBSL of 650 µg/L. Within the trench (MW-106), VPH and C5-C8 Aliphatics were detected at concentrations of 67.1 µg/L and 67.1 µg/L, respectively. The C5-C8 Aliphatics concentration was below the RBSL of 650 µg/L. Downgradient of the PTT (MW-105), the VPH concentration was 825 µg/L with a C5-C8 Aliphatic concentration of 523 µg/L, not exceeding the RBSL of 650 µg/L.

3.2.3 Evaluation of Concentration Trends Over Time

To evaluate concentration trends over time, the concentrations of benzene and VPH were plotted for each of the three passive treatment trench monitoring wells. Baseline sampling data from June 2020 through October 2021 are included on Figures 7A through 7C along with post-remediation data. This historical data was previously reported in the *2020/2021 Annual Groundwater Sampling Summary Report* (CMR, 2021a) and Construction Documentation Report (CMR, 2022a). Benzene and C5-C8 Aliphatics (adjusted) were selected as indicator compounds because they were the two compounds that exceed DEQ-7 HHSs and/or RBSLs during the baseline sampling event in October 2021. While there are no DEQ-7 HHSs and RBSLs for VPH, VPH represents a range of hydrocarbons and serves as an overall indicator of contaminant loading to the PTT.

The benzene, C5-C8 Aliphatics and VPH sampling results at upgradient well MW-41S showed the following changes between October 2021 and December 2023:

- Benzene decreased from 1,900 µg/L in October 2021 to 535 µg/L in December 2023.

[2] All VOC results reported in this section are from USEPA Method 8260B.

- VPH has remained relatively consistent with some variability between sampling events with a maximum value of 9,800 µg/L in June 2022 and a minimum value of 3,100 µg/L in March 2022.
- C5-C8 Aliphatic have remained relatively consistent between sampling events with a minimum value of 869 µg/L in December 2023 and a maximum value of 3,090 µg/L in March 2023.

The benzene, C5-C8 Aliphatics and VPH sampling results at well MW-106 located in the PTT showed the following changes between October 2021 and December 2023:

- Benzene has not been detected during any sampling events.
- VPH had not been detected between October 2021 and June 2022, but was detected at concentration of 189 µg/L in August 2022, 108 µg/L in December 2022, 85.9 µg/L in June 2023, and 533 µg/L in September 2023, and 67.1 µg/L in December 2023.
- C5-C8 Aliphatic had not been detected between October 2021 and June 2022, but was detected in August 2022 a concentration of 153 µg/L, in December 2022 at a concentration of 80 µg/L, in June 2023 at a concentration of 85.9 µg/L, in September 2023 at a concentration of 495 µg/L, and in December 2023 at a concentration of 67.1 µg/L. Detected results remain less than the RBSL of 650 µg/L and no trend is apparent at this time.

The benzene, C5-C8 Aliphatics, and VPH sampling results at well MW-105 located downgradient of the PTT showed the following changes between October 2021 and December 2023:

- Benzene has decreased from 250 µg/L in October 2021 to 11.7 µg/L in December 2023. Trends generally are decreasing with time since the installation of the PTT with some variability between sampling events. Trends appear to indicate that concentrations are higher in summer/fall months than in winter months.
- VPH appears variable with a maximum concentration of 1,900 µg/L in October 2021 and a minimum concentration 146 µg/L in December 2022. Trends may indicate that concentrations are higher in summer months than in winter months, but further data collection and analysis is needed to verify this trend.
- C5-C8 Aliphatics appear variable with a maximum concentration of 1,800 µg/L in February 2021 and a minimum concentration 63.9 µg/L December 2022. Trends may indicate that concentrations are higher in summer months than in winter months, but further data collection and analysis is needed to verify this trend.

Analytical results from groundwater samples collected from monitoring wells located up-gradient, down-gradient and from within the PTT indicate that the concentration of dissolved phase petroleum COCs decreased across the PTT initially meeting the goal of the PTT to mitigate the dissolved phase groundwater impacts from migrating from the Truck Rack to the Missouri River. Concentrations of COCs appear to be fluctuating with time at the down-gradient compliance point. Initial trends indicate that there is seasonable variability in concentrations at downgradient well MW-105.

Biodegradation Parameters

Field parameters including pH, conductivity, turbidity, ORP, and dissolved oxygen are provided in Table 5. Low dissolved oxygen (generally less than 0.5 mg/L) and low or negative ORP values serve as indicators of the presence of reducing conditions. The lower the ORP and DO, the greater the potential for a reducing and anaerobic environment. During the last two sampling events at all three wells, ORP was negative and dissolved oxygen was equal to zero indicating reducing conditions.

The groundwater analytical results for detected biodegradation parameters from December 2023 sampling event are provided in Table 6. Groundwater sampling results from previous sampling events are also provided in Table 6 for comparison purposes. Laboratory reports are included in Appendix A3.

As noted above, the PTT remediates groundwater utilizing a two-step process. As groundwater flows through the PTT, hydrocarbons and BTEX will partition from the dissolved phase by adsorption to the activated carbon particles. The contaminants are then anaerobically biodegraded through chemical oxidation stimulated by the added bio-stimulating electron acceptors (nitrate and sulfate). The order that petroleum degrading microbes utilize electron acceptors follows with their redox potential in the following order 1) aerobic degradation; 2) denitrification; 3) manganese reduction; 4) iron reduction; 5) sulfate reduction; and 6) methanogenesis.

Relative to the baseline October 2021 monitoring event, the following parameters indicate ongoing biodegradation within the trench between October 2021 and December 2023 as follows:

- Nitrate concentrations initially decreased from 210,000 µg/L in October 2021 to 4,700 µg/L in June 2022 to 750 µg/L in December 2022. Concentrations rebounded 19,000 µg/L in June 2023 before decreasing to 480 µg/L in December 2023. Sulfate concentrations also initially decreased from 2,900,000 µg/L in October 2021 to 210,000 µg/L in June 2022. Since June 2023, sulfate concentrations have remained between 140,000 (December 2022) and 410,000 ug/L in June 2023. This reduction in the amended electron acceptor concentration was expected and serves as a positive indicator that biodegradation is occurring via denitrification and sulfate reduction. While sulfate concentrations have decreased, concentrations remain sufficiently elevated indicating that the amended electron acceptor is still available to continue to promote biodegradation. These results may indicate biodegradation processes have shifted from denitrification to sulfate reduction.
- Carbon dioxide is a byproduct of degradation reactions and serves as an indicator of ongoing degradation. Concentrations are variable ranging from a high of 960,000 µg/L in June 2023 to a low of 110,000 µg/L in December 2022. These elevated concentrations serve as a positive indicator of ongoing biodegradation. Trends will continue to be monitored.
- Methane concentrations initially appear to be increasing (5.8 µg/L in October 2021, 62 µg/L in June 2022, 110 µg/L in December 2022, 71 µg/L in June 2023, and 252 µg/L in December 2023). Increases in methane concentration are expected when the aquifer reaches methanogenic conditions. Increases in methane concentrations may serve as an early indicator that methanogenesis is becoming a more dominant biodegradation pathway[3].
- Both dissolved iron and manganese concentrations appear have increased since PTT installation. Dissolved iron has increased from 65 µg/L in October 2021 to 1300 µg/L in June 2023 to 3180 µg/L in December 2023. Dissolved manganese has increased from 1400 ug/L µg/L in October 2021 to 2700 µg/L in December 2023. Increased concentrations of iron and manganese in groundwater indicate that iron and manganese reduction is occurring because the reduced forms of these compounds have greater solubility than the oxidized forms. The increases in iron and

[3] Note that while methane concentrations are increasing, the concentrations observed to date do not indicate that explosive conditions are present within the well or confined spaces. The United States Department of Interior (2001) has established a warning level of 10,000 micrograms per liter (µg/L) of methane in groundwater, while concentrations of methane greater than 28,000 µg/L indicates that potentially explosive or flammable quantities of the gas are being liberated at the well and/or may be liberated in confined spaces. The concentrations observed to date (maximum of 252 µg/L) are well below these warning and action levels. Monitoring on a semi-annual basis will be continued to verify that methane concentrations remain well below these levels.

manganese concentrations indicate that iron and manganese reduction are becoming a more dominant biodegradation pathway.

4. CONCLUSION AND RECOMMENDATIONS

During this reporting period from October 1, 2023 through December 31, 2023, the DPE system operated approximately 38% of the available time. The system was down for the majority of the reporting period due to troubleshooting and repair following an SRCO system failure caused by carryover of liquid NAPL from the knock-out tank into the SRCO unit, which resulted in damage to the SRCO catalyst module. During this reporting period, the DPE system extracted and discharged approximately 23,093 gallons of total fluids to CMR's WWTP while in operation.

DPE System Performance

Initial mass removal rates indicate that the DPE system in the Truck Rack Area is meeting the AOC-16 IM goals of recovering free phase LNAPL mass and reducing the LNAPL within the vadose and saturated zone soil matrix.

During the reporting period, the DPE system removed approximately 1.4 pounds of VOCs in the vapor phase, and less than 0.05 pounds of VOCs, 0.02 pounds of SVOCs, 1.8 pounds of VPH, and 217 pounds of EPH in the liquid phase. Total VOC, SVOC, VPH, and EPH mass removed in the vapor and dissolved phase since DPE system startup in October 2021 and through December 31, 2023, is calculated to be approximately 2,903 pounds, 13.8 pounds, 217 pounds, and 2,726 pounds, respectively. Total influent vapor VOC concentrations were approximately 4 orders of magnitude lower than during startup during this quarter. Reductions in contaminant mass recovery may be due to a combination of the submerged DPE wells, reduced manifold vacuum, seasonal fate and transport mechanisms, and reduced contaminant mass present.

The pre-catalyst SRCO temperature remained greater than 650°F while in operation indicating at least 99% destruction efficiency of the extracted petroleum vapors prior to being discharged to the atmosphere.

During operation, maintenance activities will be performed and documented to ensure optimal performance of the system. DPE system optimization will be performed based on trench liquid elevations, DPE well vapor concentrations, mass removal, and liquid extraction rates.

PTT Performance

Analytical results from groundwater samples collected from monitoring wells located up-gradient, down-gradient and from within the PTT indicate that the concentration of dissolved phase petroleum COCs decreased across the PTT meeting the goal of mitigating the dissolved phase groundwater impacts from migrating from the Truck Rack to the Missouri River. Concentration trends are decreasing at downgradient performance monitoring well MW-105 with some seasonable variability.

OM&M of the interim measures will continue to document the performance of the IM's and will include periodic performance reporting to the MDEQ to ensure the IM objectives are being met. Further investigation/evaluation of the petroleum impacts at the AOC-16 Truck Rack Area will be completed as part of the upcoming RCRA RFI activities. The results from the RFI and ongoing IM performance monitoring will be evaluated to determine if operational modifications are necessary or if a request to the MDEQ to cease recovery and place the DPE system in standby mode is warranted.

5. REFERENCES

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CMR. 2021c. AOC-16 Interim Measure Self-Recuperative Catalytic Oxidizer Operations, Maintenance, and Monitoring Plan. October.

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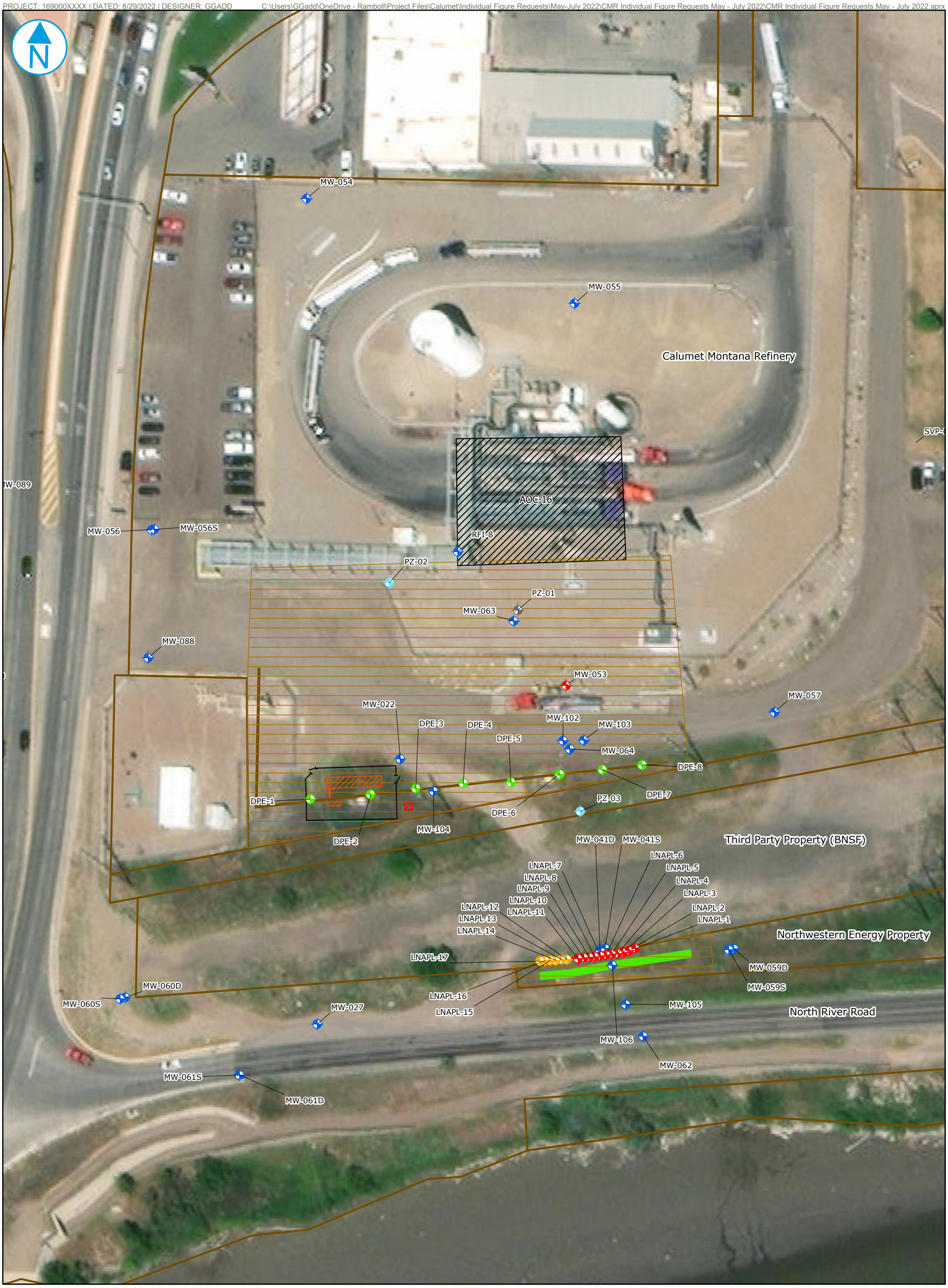
MDEQ. 2016. Immediate Interim Measures Petroleum Release Near CMR's Loading Rack. October 11.

United States Department of the Interior. 2001. Office of Surface Mining Reclamation and Enforcement. Technical Measures for the Investigation and Mitigation of Fugitive Methane Hazards in Areas of Coal Mining. September.

FIGURES



LNAPL Recovery Well - Installed 2022
LNAPL Recovery Well - Installed 2021
DPE Recovery Well - Installed 2021
Abandoned Well
Piezometer
Monitoring Well
DPE Fence

Property Line
Corrective Action
Passive Recovery Trench
Primary Recovery Trench
DPE - CATOX Unit
DPE Transformer
AOC

0 25 50 100 Feet

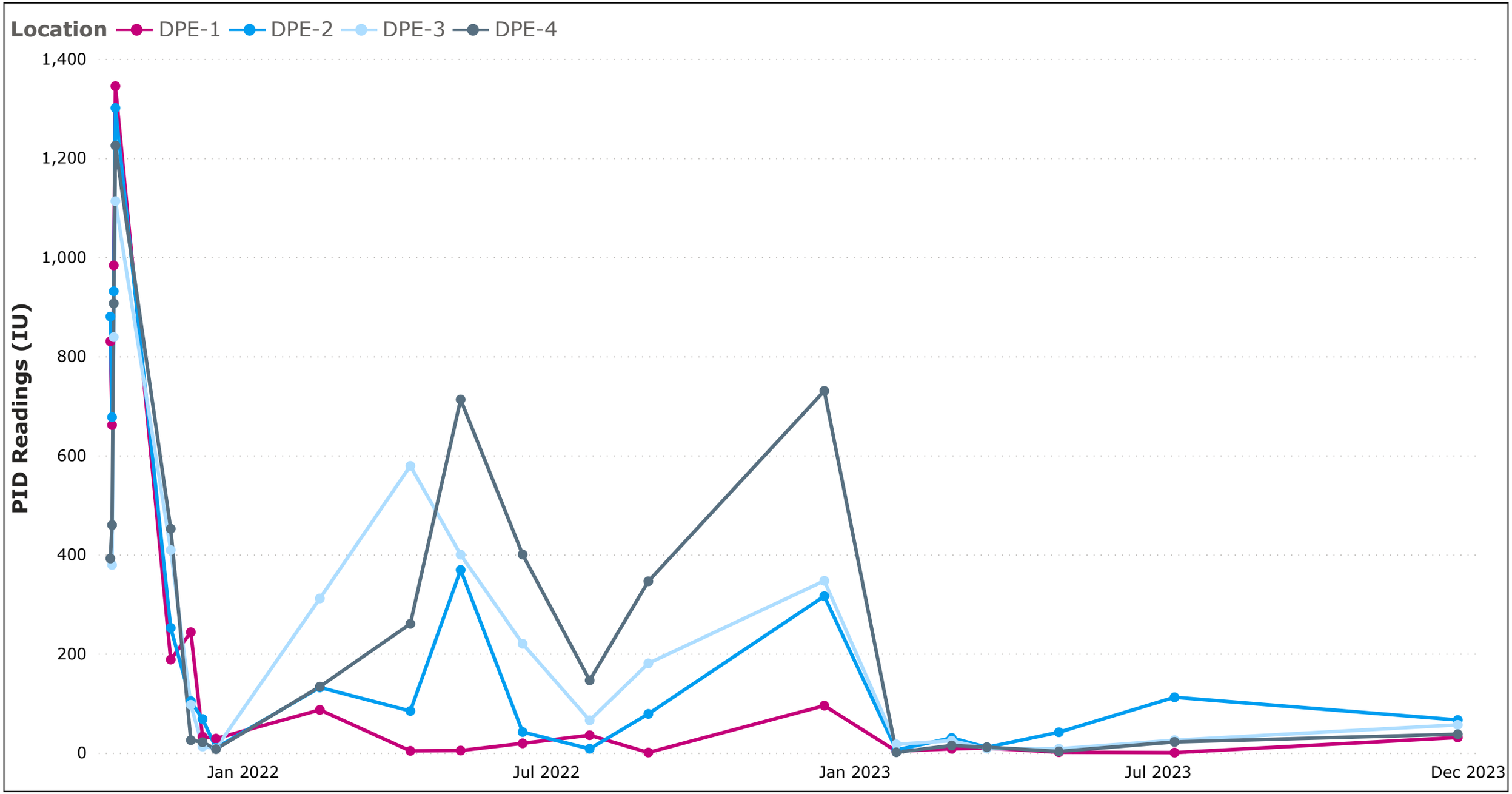
AOC 16 SITE LAYOUT

FIGURE 01

RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC

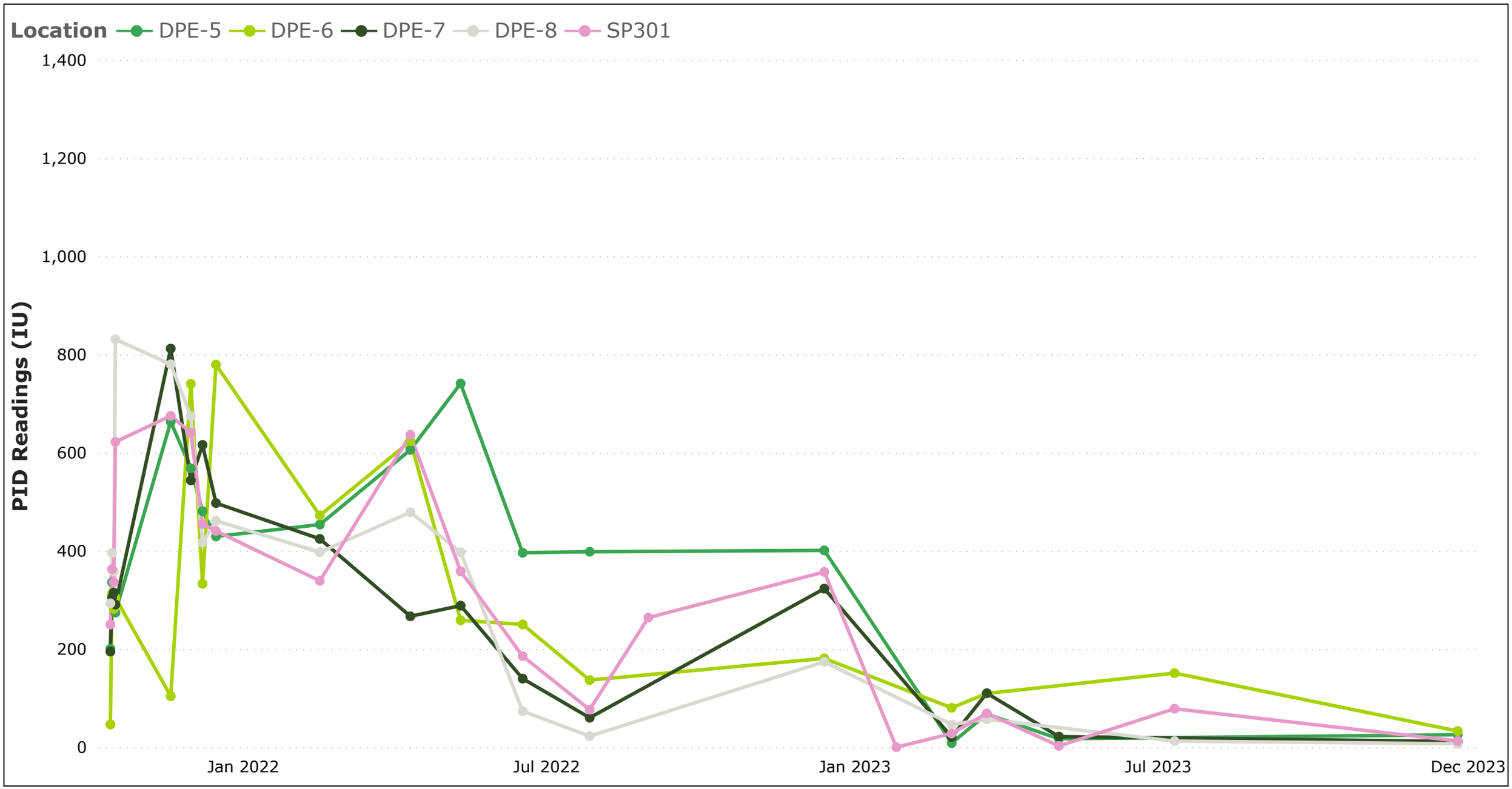
Calumet Montana Refining, LLC
1900 10th Street Northeast
Great Falls, Montana

Figure 2A: DPE System Influent Vapor PID Readings (DPE-1 through DPE-4)



Notes:
IU: Instrument Units
PID: photoionization detector

Figure 2B: DPE System Influent Vapor PID Readings (DPE-5 through DPE-8 and SP-301)



Notes:
IU: Instrument Units
PID: photoionization detector

Figure 3: DPE System Influent Vapor Concentration Trend

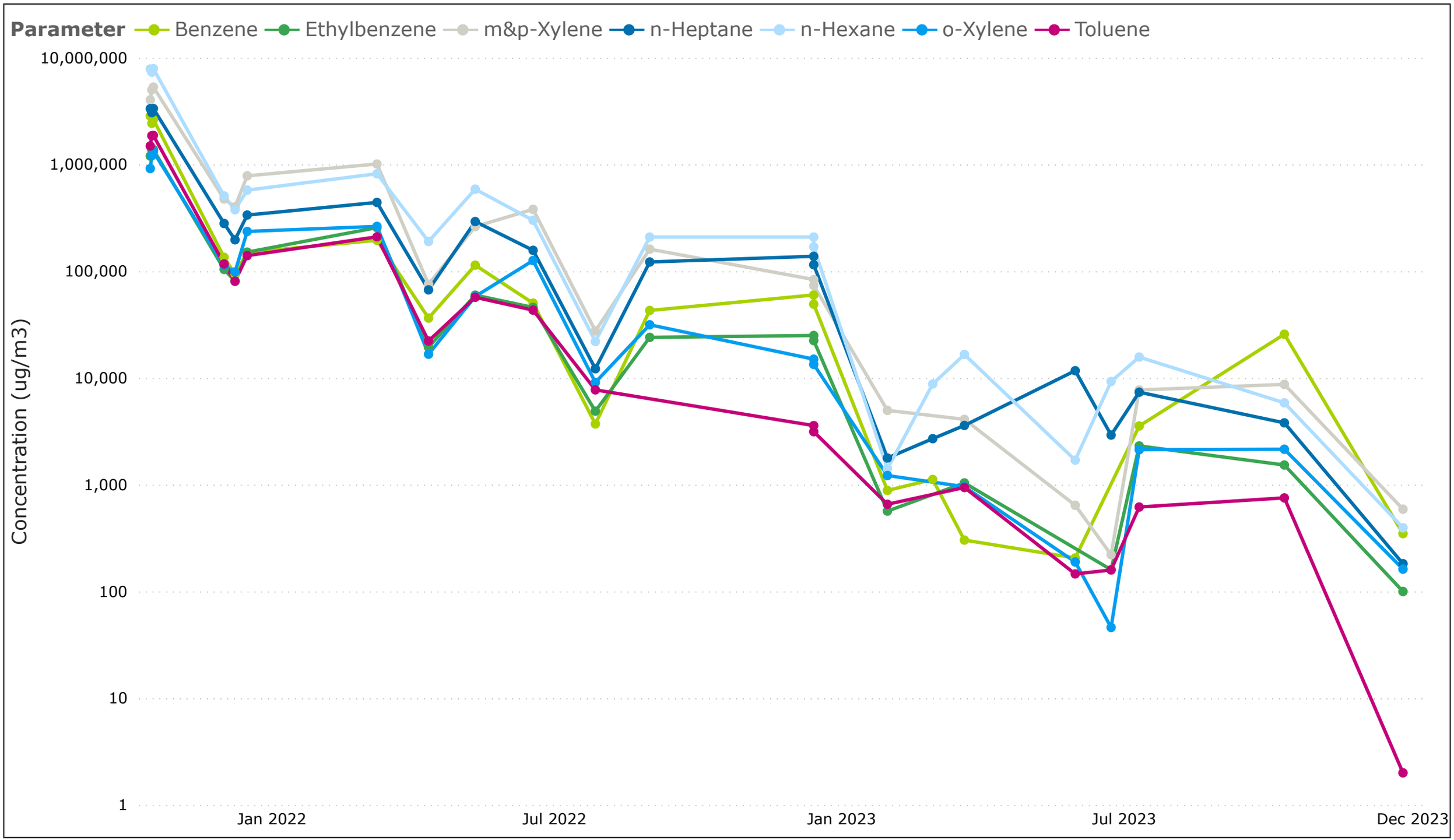
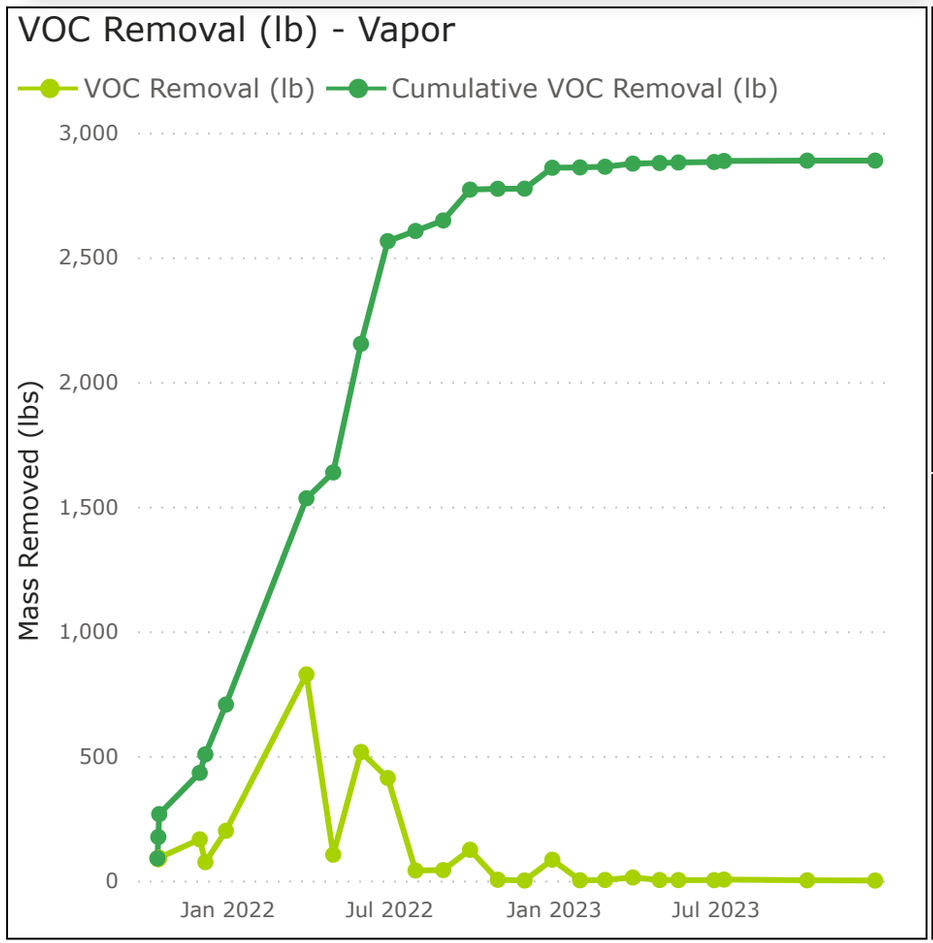
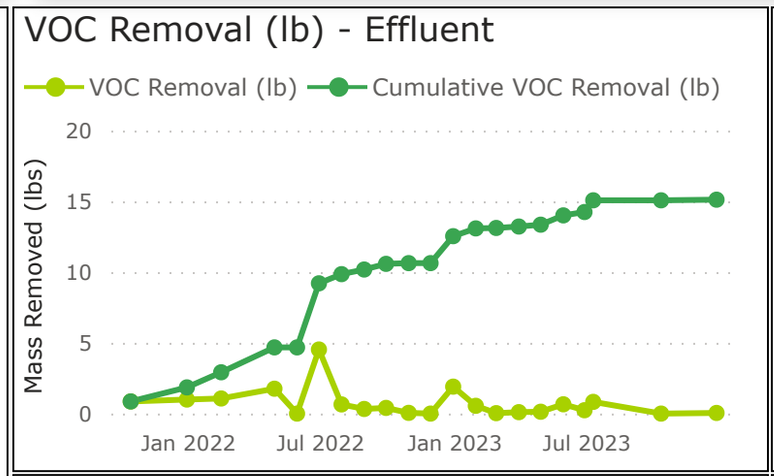


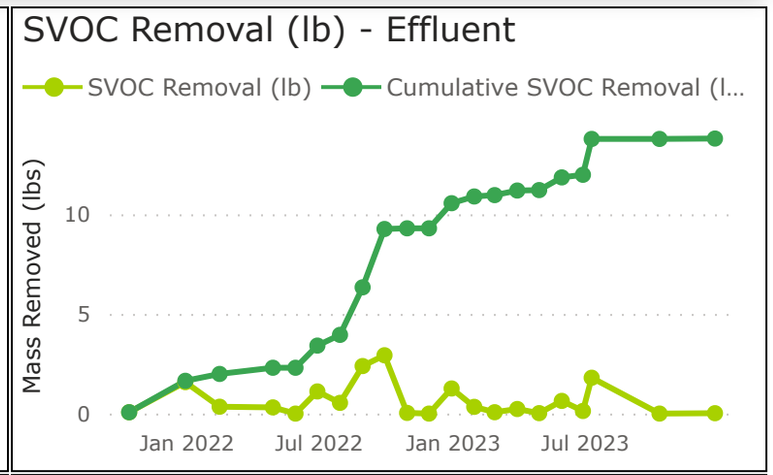
Figure 4: Vapor and Liquid Effluent Mass Removal

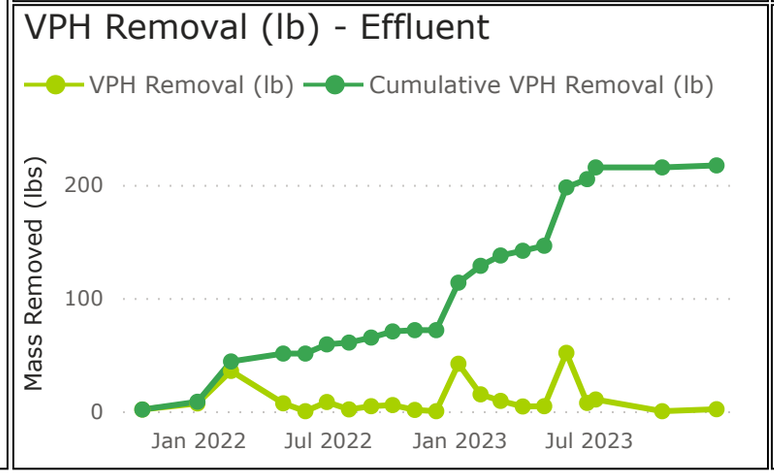
Vapor Mass Removal

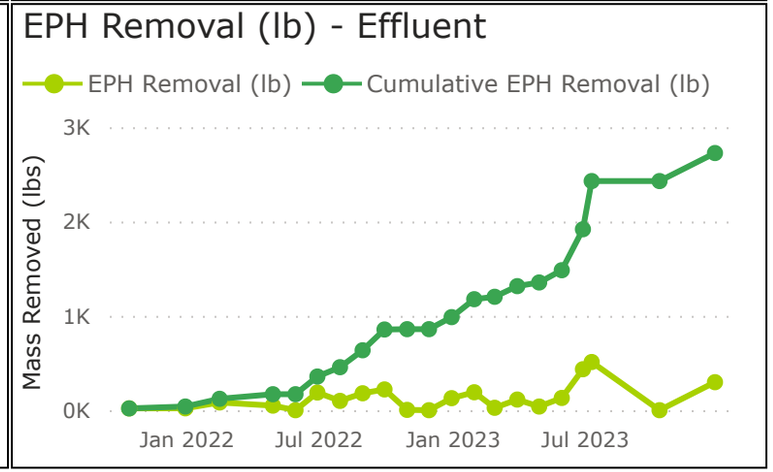


Liquid Effluent Mass Removal







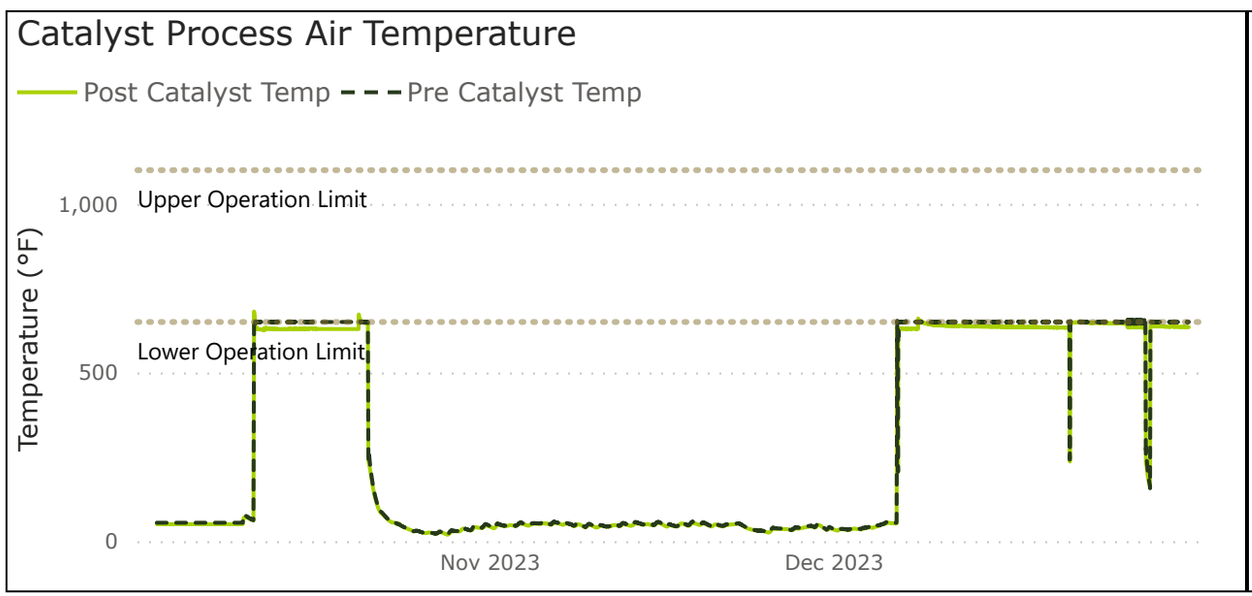


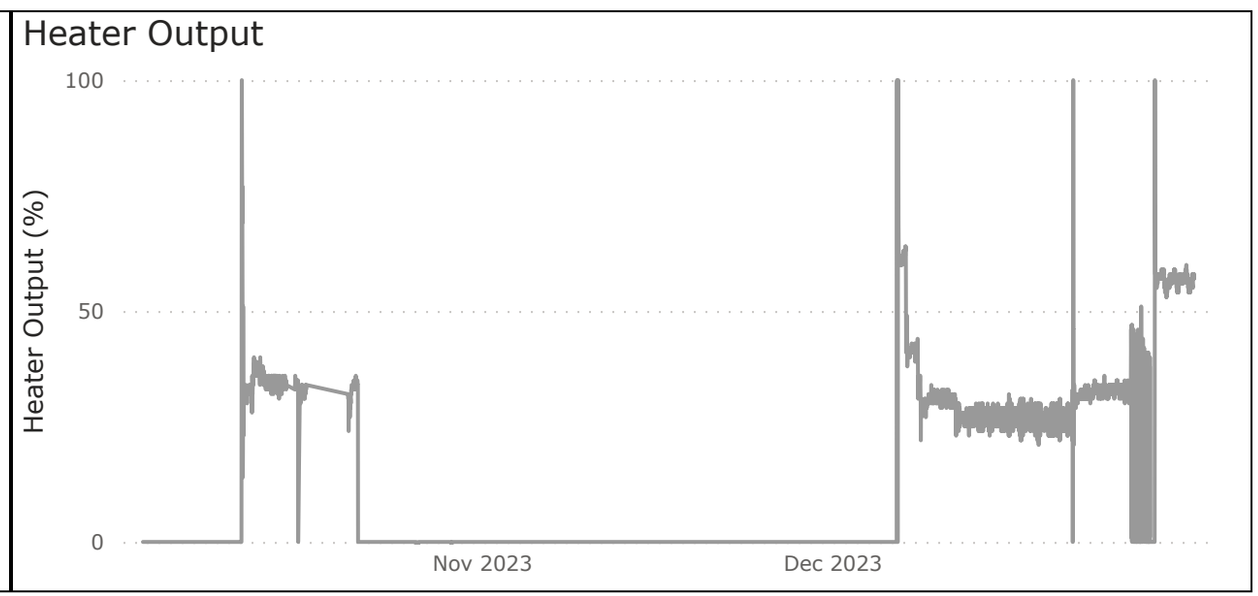
Total VOCs Removed (lbs)	Total SVOCs Removed (lbs)	Total VPHs Removed (lbs)	Total EPHs Removed (lbs)
2,903	13.8	217	2,726

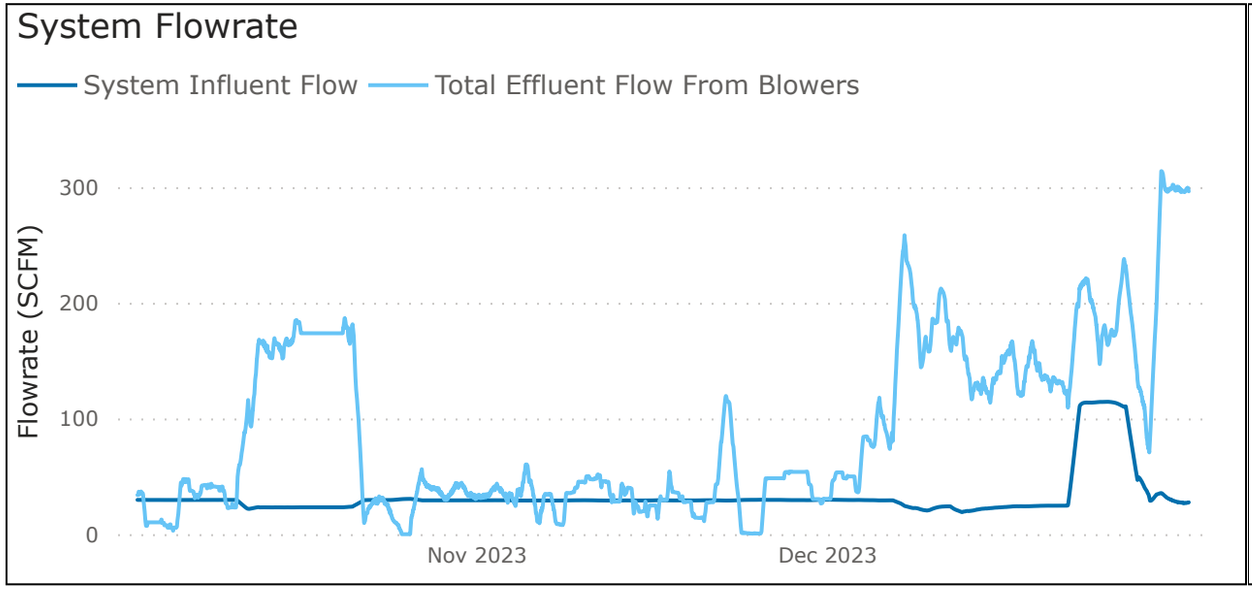
Notes:

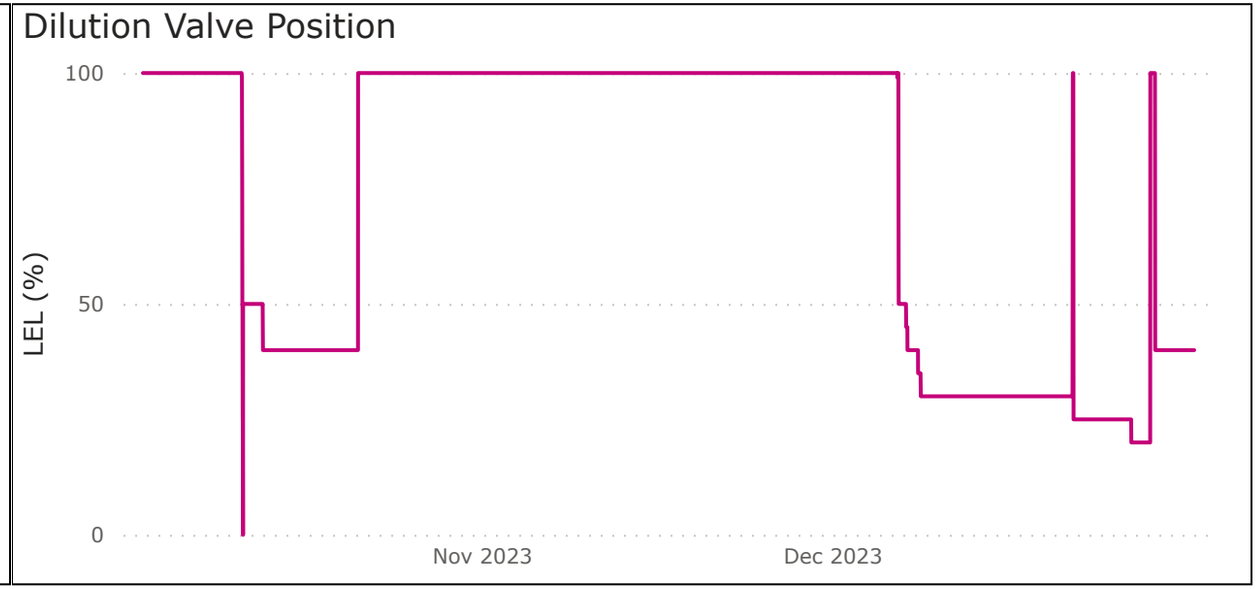
- Vapor samples were collected from SP-301. The combination of vapor flow rates, system runtime, and vapor VOC concentrations were used to calculate the mass of contaminants removed.
- Liquid effluent samples were collected from the discharge side of the transfer pump (SP-200). The combination of fluid recoveries and contaminant concentrations were used to calculate the mass of contaminants removed.

Figure 5: SRCO Operational Parameters







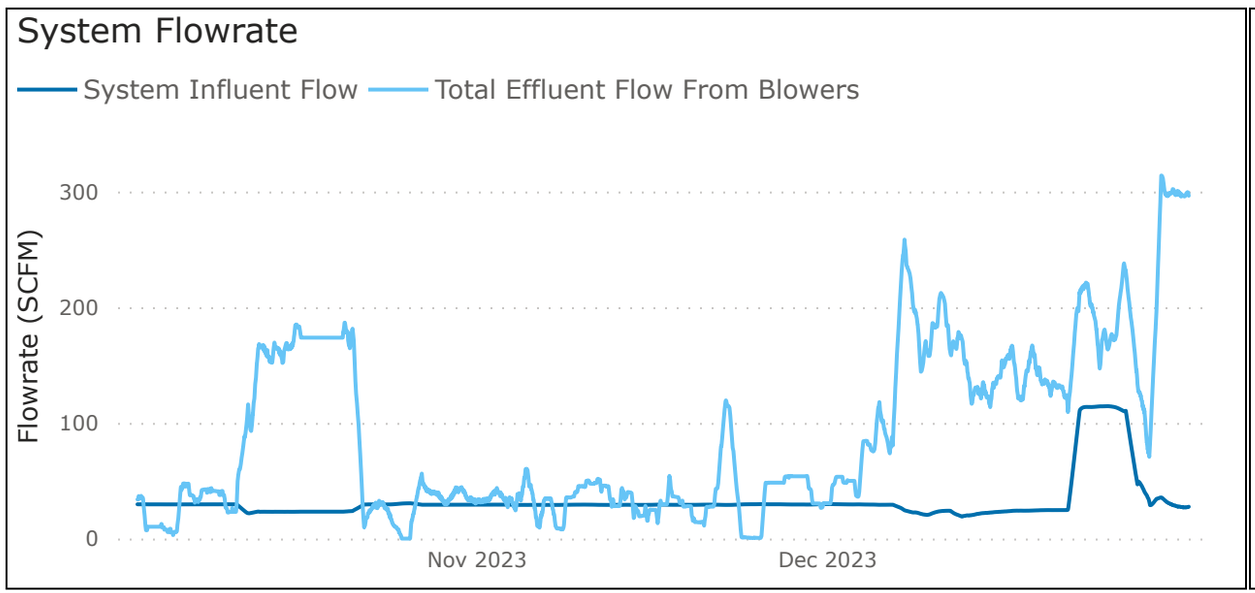


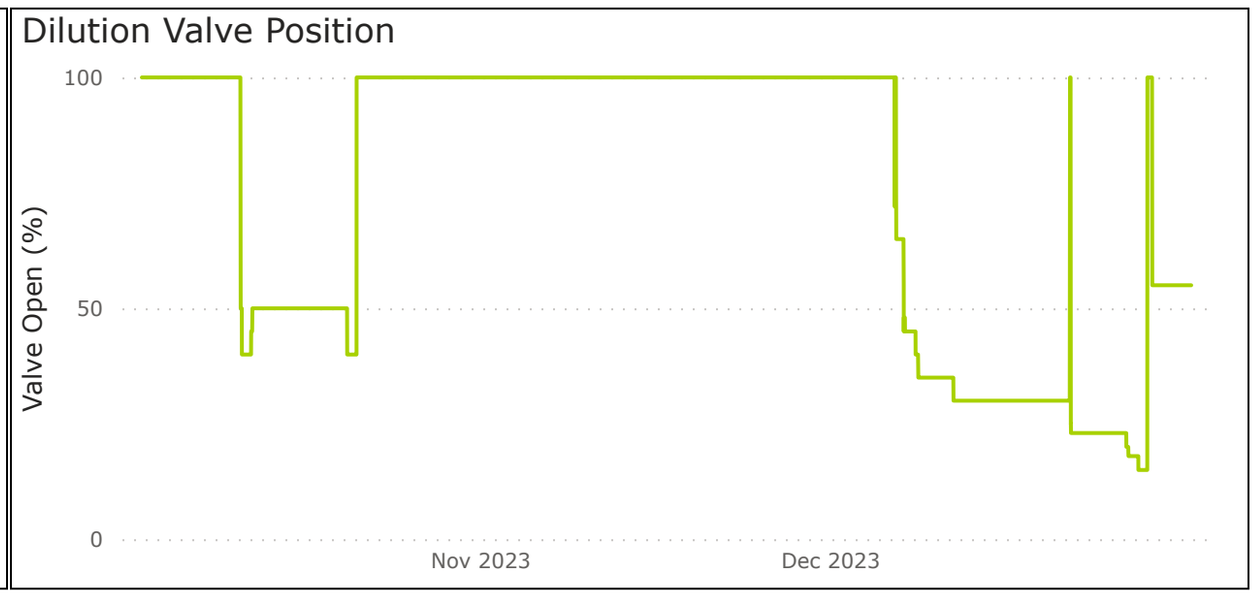
Notes:

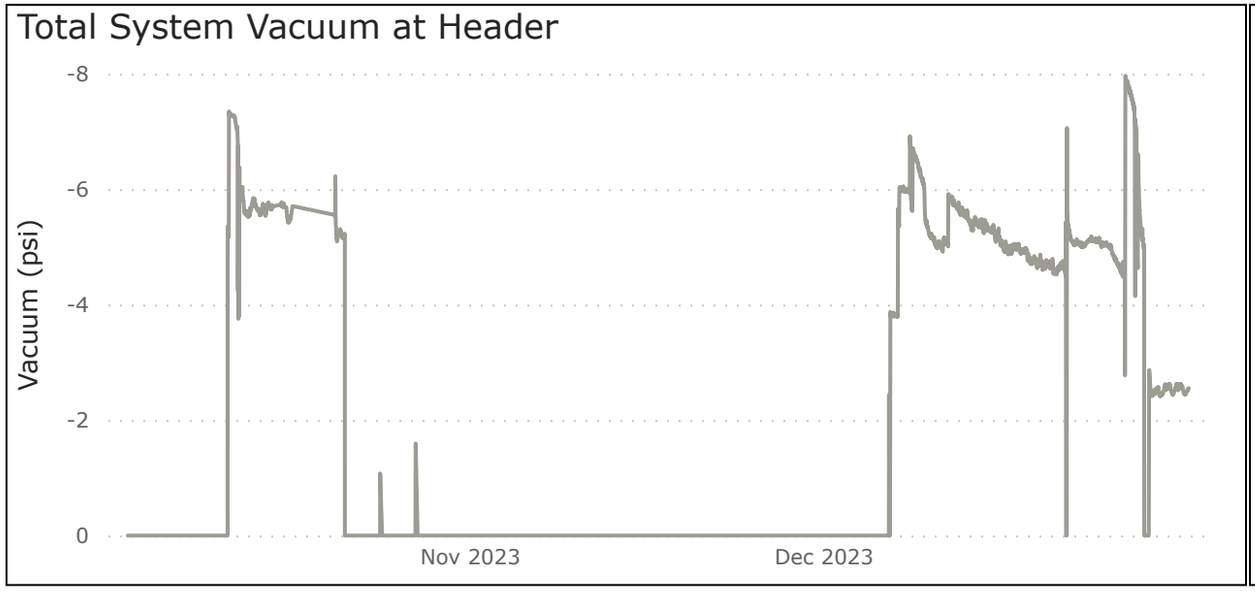
- Post-catalyst process air temperature is based on TT-23702 reading.
- System flow is from FT-23401 (prior to dilution). Total Flow from blowers is based on readings from FT-23405 and FT-2306.
- Heater Output is based on H-2303 and H-2304 readings.
- Heater Output represents % energy supplied by CATOX to maintain catalyst temperature.
- Dilution valve position represents FV23702 valve position (% open).

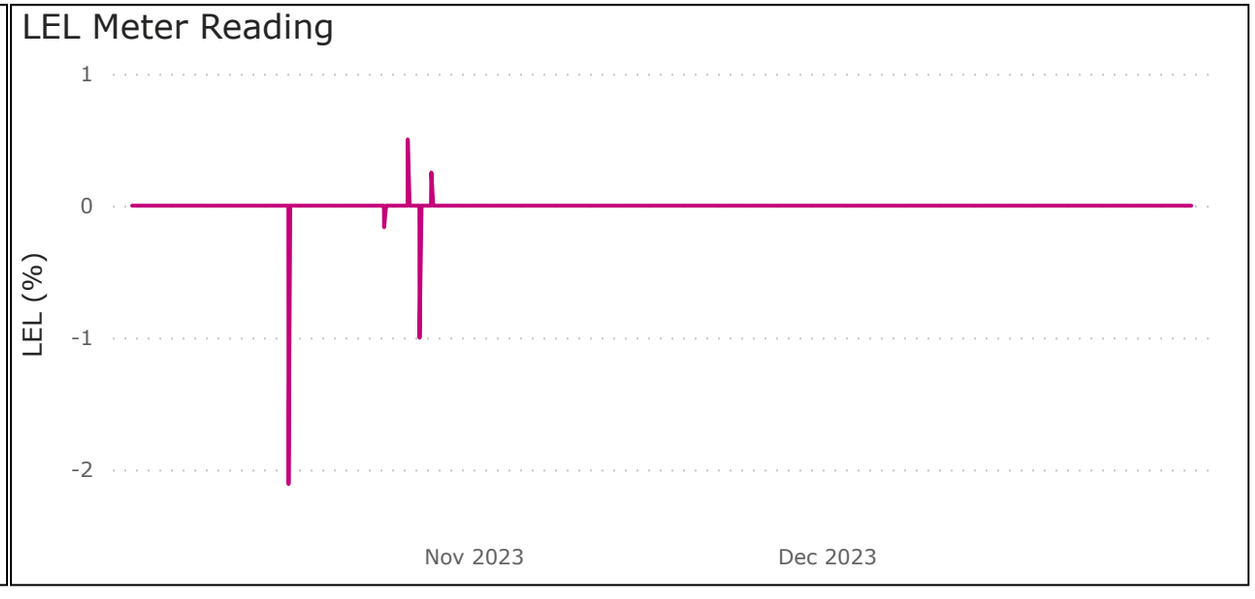
10/1/2023 12/31/2023

Figure 6: DPE System Operational Parameters









10/1/2023 12/31/2023

Notes:

- System flow is from FT-23401 (prior to dilution). Total Flow from blowers is based on readings from FT-23405 and FT-2306.
- Dilution valve position represents FV23904 valve position (% open).
- Total System Vacuum is measured at PT23623.

Figure 7A: Groundwater Concentration Trend Graph - Benzene

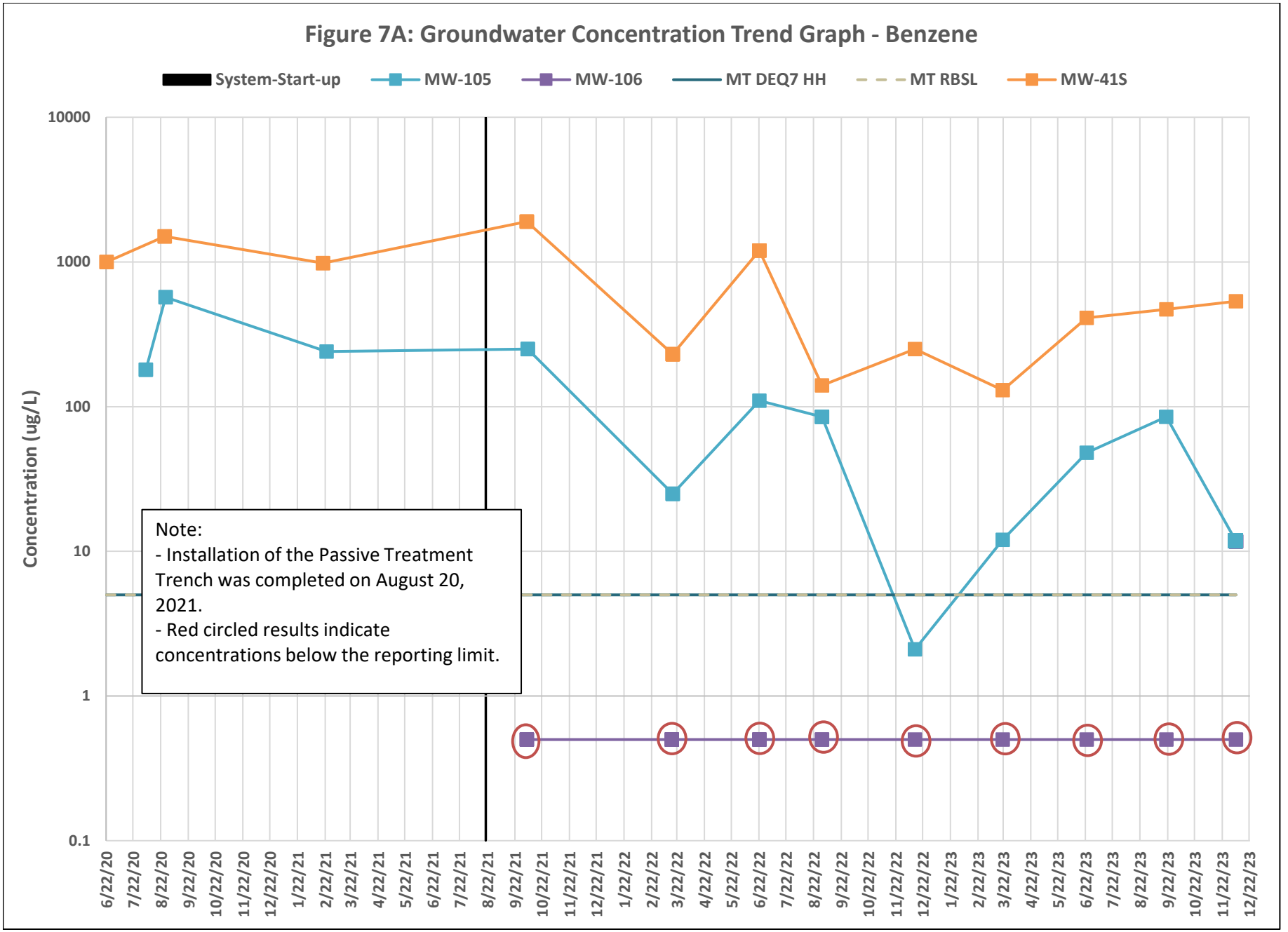


Figure 7B: Groundwater Concentration Trend Graph - C5-C8 Aliphatics

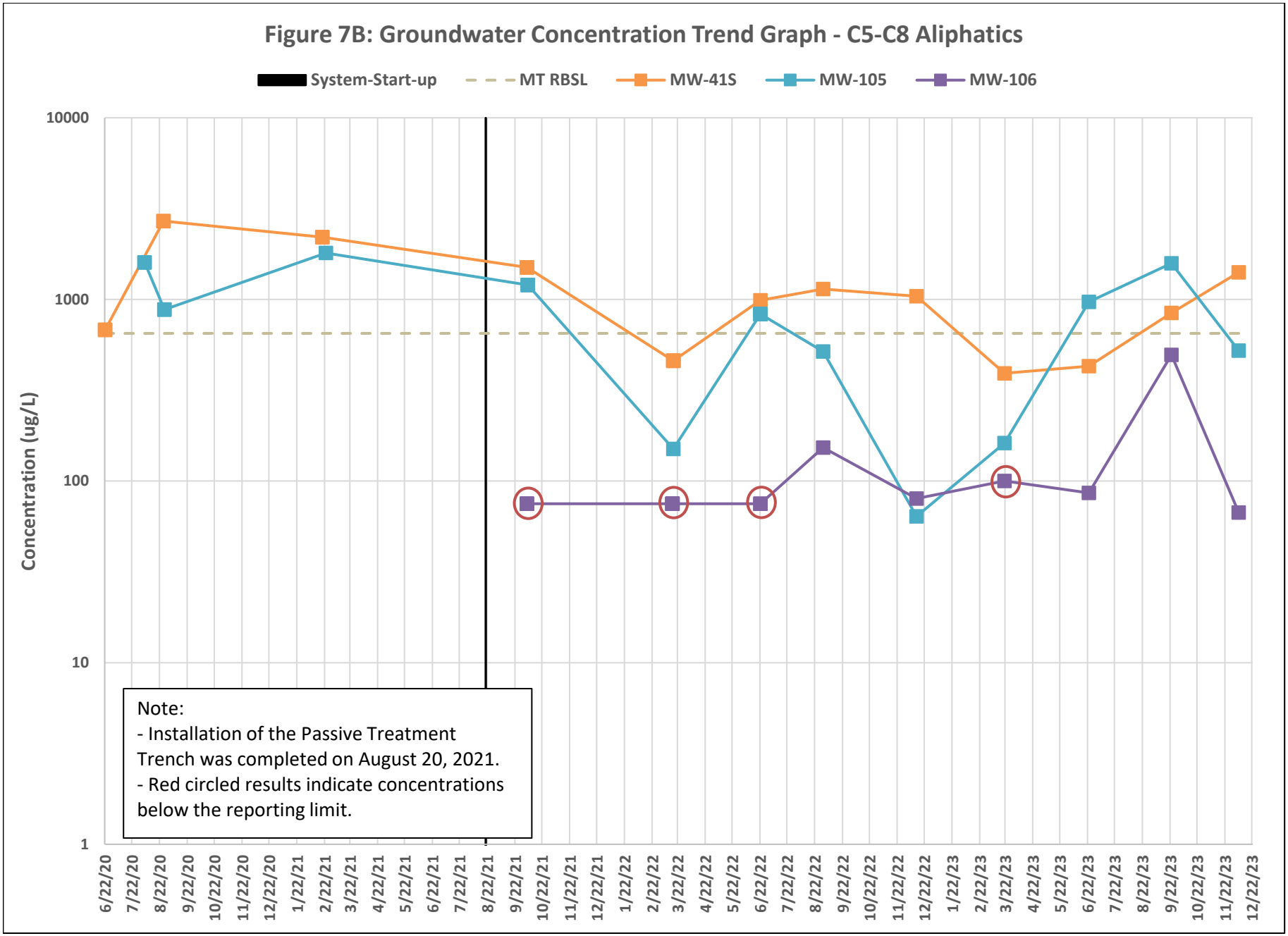
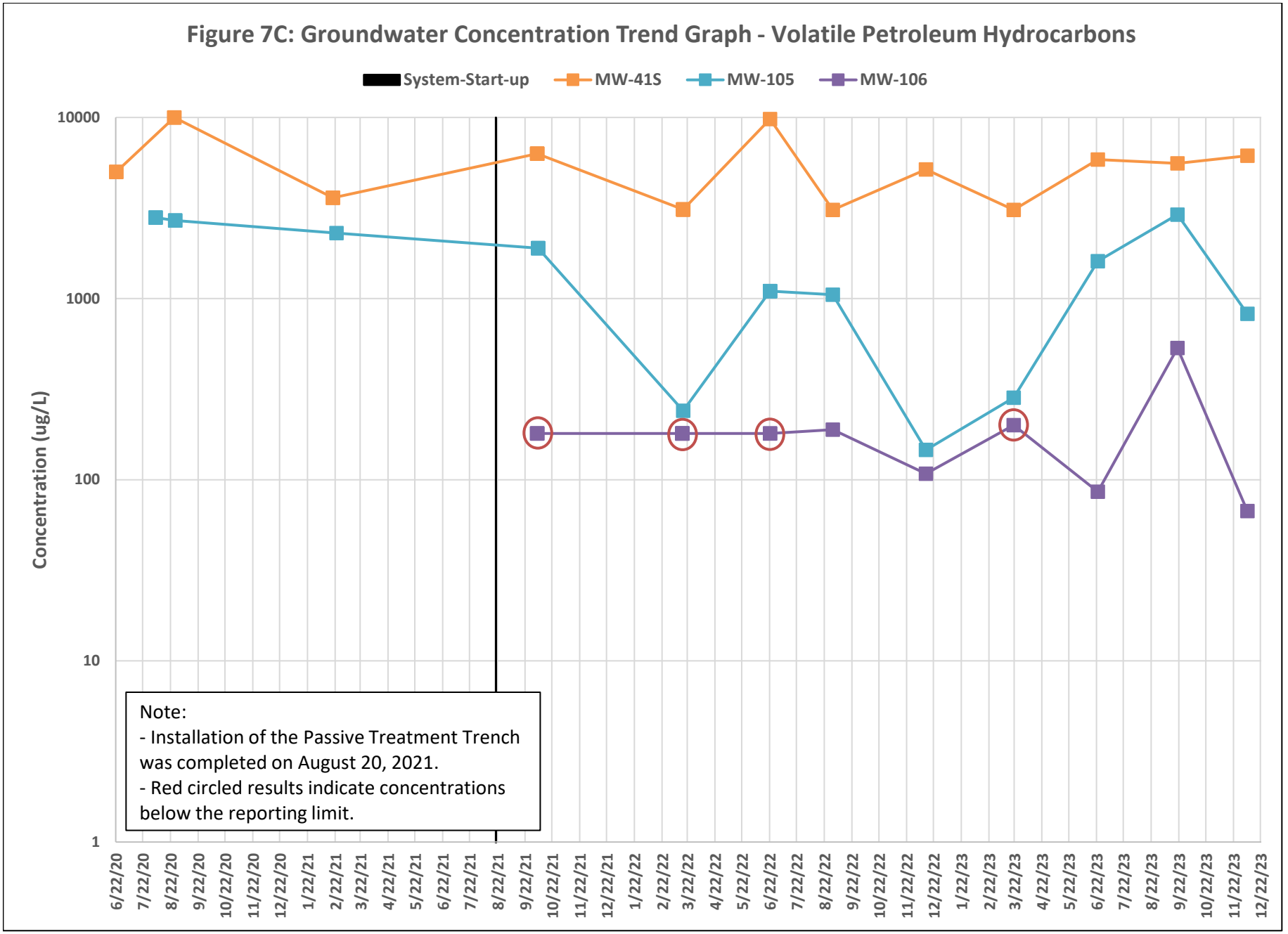


Figure 7C: Groundwater Concentration Trend Graph - Volatile Petroleum Hydrocarbons



TABLES

Table 1
DPE System Operational Data
Calumet Montana Refining, LLC - Great Falls, Montana

Operational Period	Percent Operational[a]	System Flowrate[b] (SCFM)	Average System Vacuum at Header[c] (in-Hg)	Liquid Extraction Rate (gpm)	Total Fluids Discharged During the Operational Period (gallons)	Total Water Discharged Since Start-up[d] (gallons)	Average Post-Catalyst Process Air Temperature When System is Operational[e] (°F)
Design Values	**--**	**200**	**17**	**0.25 to 21**	**--**	**--**	**--**
October 1 - 31, 2023	32%	23	11.7	0.62	8,810	458,579	627
November 1 - 30, 2023	0%	NA	NA	NA	NA		NA
December 1 - 31, 2023	80%	43	10.0	0.40	14,283		636
October 1, 2023 - December 31, 2023	**38%**	**33**	**10.3**	**0.46**	**23,093**		**632**

Notes:
a. Percent operational is calculated using the system run-time hours (as logged by the system PLC) divided by the number of available operational hours in the time period.
b. System flow is from FT-23401 (prior to dilution).
c. Total System Vacuum is measured at PT23623.
d. Commissioning and start-up testing of the DPE system commenced on October 14, 2021.
e. Post-catalyst process air temperature is based on TT-23702 reading.

Abbreviations:
in-Hg = inches of mercury
NA = not applicable, system was not operational during time period
gpm = gallons per minute
scfm = standard cubic feet per minute

Table 2
Summary of Analytical Results and Contaminant Mass Removal - Vapor
Calumet Montana Refining, LLC - Great Falls, Montana

Location		SP301		SP301	
Ramboll Sample ID		CMR-SB-301-101223		CMR-SP301-122723	
Sample Date		10/12/2023		12/27/2023	
Average Blower Flow (scfm)[1]		26		41	
Period Operational Time (hrs)[2]		238		595	
Notes					
VOCs	CAS No.	Result (ug/m^3)	Mass (lb)	Result (ug/m^3)	Mass (lb)
1,1,1-Trichloroethane	71-55-6	1 U	0.00	1 U	0.00
1,1,2,2-Tetrachloroethane	79-34-5	550 U	0.00	1 U	0.00
1,1,2-Trichloroethane	79-00-5	1 U	0.00	1 U	0.00
1,1,2-Trichlorotrifluoroethane	76-13-1	2	0.00	2 U	0.00
1,1-Dichloroethane	75-34-3	1 U	0.00	1 U	0.00
1,1-Dichloroethene	75-35-4	1 U	0.00	1 U	0.00
1,2,4-Trichlorobenzene	120-82-1	1,870 U	0.00	5 U	0.00
1,2,4-Trimethylbenzene	95-63-6	795	0.02	59	0.01
1,2-Dibromoethane (EDB)	106-93-4	2 U	0.00	2 U	0.00
1,2-Dichlorobenzene	95-50-1	481 U	0.00	1 U	0.00
1,2-Dichloroethane	107-06-2	18	0.00	1 U	0.00
1,2-Dichloropropane	78-87-5	1 U	0.00	1 U	0.00
1,3,5-Trimethylbenzene	108-67-8	712	0.02	75	0.01
1,3-Butadiene	106-99-0	4 U	0.00	4 U	0.00
1,3-Dichlorobenzene	541-73-1	481 U	0.00	1 U	0.00
1,4-Dichlorobenzene	106-46-7	481 U	0.00	1 U	0.00
2-Butanone (MEK)	78-93-3	81	0.00	11	0.00
2-Hexanone	591-78-6	5 U	0.00	5 U	0.00
2-Propanol	67-63-0	17	0.00	10	0.00
4-Ethyltoluene	622-96-8	445	0.01	27	0.00
4-Methyl-2-pentanone (MIBK)	108-10-1	5 U	0.00	5 U	0.00
Acetone	67-64-1	3 U	0.00	3 U	0.00
Benzene	71-43-2	25,700	0.59	348	0.03
Benzyl chloride	100-44-7	416 U	0.00	1 U	0.00
Bromodichloromethane	75-27-4	1 U	0.00	1 U	0.00
Bromoform	75-25-2	2,480 U	0.00	6 U	0.00
Bromomethane	74-83-9	1 U	0.00	1 U	0.00
Carbon disulfide	75-15-0	28	0.00	2	0.00
Carbon tetrachloride	56-23-5	1 U	0.00	1 U	0.00
Chlorobenzene	108-90-7	287	0.01	1 U	0.00
Chloroethane	75-00-3	2	0.00	1 U	0.00
Chloroform	67-66-3	1 U	0.00	1 U	0.00
Chloromethane	74-87-3	9	0.00	0 U	0.00
cis-1,2-Dichloroethene	156-59-2	1 U	0.00	1 U	0.00
cis-1,3-Dichloropropene	10061-01-5	1 U	0.00	1 U	0.00
Cyclohexane	110-82-7	3,550	0.08	479	0.04
Dibromochloromethane	124-48-1	2 U	0.00	2 U	0.00
Dichlorodifluoromethane	75-71-8	2	0.00	2	0.00
Dichlorotetrafluoroethane	76-14-2	1 U	0.00	1 U	0.00
Ethanol	64-17-5	42	0.00	43	0.00
Ethyl acetate	141-78-6	-- --	--	-- --	--
Ethylbenzene	100-41-4	1,530	0.04	100	0.01
Hexachloro-1,3-butadiene	87-68-3	2,690 U	0.00	7 U	0.00
m&p-Xylene	179601-23-1	8,710	0.20	590	0.05
Methylene Chloride	75-09-2	1 U	0.00	1 U	0.00
Methyl-tert-butyl ether	1634-04-4	1 U	0.00	1 U	0.00
Naphthalene	91-20-3	1,320 U	0.00	3 U	0.00
n-Heptane	142-82-5	3,800	0.09	182	0.02
n-Hexane	110-54-3	5,850	0.13	395	0.04
o-Xylene	95-47-6	2,150	0.05	162	0.01
Propylene	115-07-1	122	0.00	2 U	0.00
Styrene	100-42-5	340 U	0.00	1 U	0.00
Tetrachloroethene	127-18-4	1 U	0.00	1 U	0.00
Tetrahydrofuran	109-99-9	1 U	0.00	1 U	0.00
Toluene	108-88-3	753 U	0.00	2 U	0.00
trans-1,2-Dichloroethene	156-60-5	1 U	0.00	9	0.00
trans-1,3-Dichloropropene	10061-02-6	1 U	0.00	1 U	0.00

Table 2
Summary of Analytical Results and Contaminant Mass Removal - Vapor
Calumet Montana Refining, LLC - Great Falls, Montana

Location		**SP301**		**SP301**	
Ramboll Sample ID		**CMR-SB-301-101223**		**CMR-SP301-122723**	
Sample Date		**10/12/2023**		**12/27/2023**	
Average Blower Flow (scfm)[1]		**26**		**41**	
Period Operational Time (hrs)[2]		**238**		**595**	
Notes					
VOCs	**CAS No.**	**Result (ug/m^3)**	**Mass (lb)**	**Result (ug/m^3)**	**Mass (lb)**
Trichloroethene	79-01-6	1 U	0.00	1 U	0.00
Trichlorofluoromethane	75-69-4	1	0.00	1	0.00
Vinyl acetate	108-05-4	2 U	0.00	2 U	0.00
Vinyl chloride	75-01-4	1 U	0.00	1 U	0.00
Total VOCs	--	--	1.24	--	0.23
Period Total VOC Mass Removed (lbs)		**1.2**		**0.2**	
Cumulative Total VOC Mass Removed (lbs)[4]		**2,887**		**2,888**	

Notes:

1. Blower flowrate is continuously recorded by the system PLC. Average blower flowrate during the period is used for the calculations

2. Operational time represents system runtime (in hour) for the month during with the sample
3. Historical analytical results and mass recoveries are included in Appendix B.
4. Cumulative Total VOC Mass Removed represents total mass removed since system start-up (October 2021).

U: The analyte was not detected in the sample at the estimated detection limit

VOCs : Volatile Organic Compounds

ug/m^3 : micrograms per cubic meter

Sample Calculation

$$\boldsymbol{Mass\ Removed\ (lb) = 340000\ \frac{ug}{m^3} \times\ 10^{-6}\ \frac{g}{ug}\ \times \frac{1}{453.6}\ \frac{lb}{g} \times 41\ \frac{ft^3}{min} \times 0.02832\ \frac{m^3}{ft^3} \times 26\ hr\ \times 60\ \frac{min}{hr}}$$

Table 3
Summary of Analytical Results and Contaminant Mass Removal - Liquid
Calumet Montana Refining, LLC - Great Falls, Montana

Location		SP200		SP200	
Ramboll Sample ID		CMQ-SP200-101223		CUR-SP200-122723	
Sample Date		10/12/2023		12/27/2023	
Effluent Volume (L)*		33,349		54,067	
Notes					
Analyte	**CAS No.**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**
VOCs					
1,1,1-TRICHLOROETHANE	71-55-6	ND	--	ND	--
1,1,2,2-TETRACHLOROETHANE	79-34-5	ND	--	ND	--
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	76-13-1	ND	--	ND	--
1,1,2-TRICHLOROETHANE	79-00-5	ND	--	ND	--
1,1-DICHLOROETHANE	75-34-3	ND	--	ND	--
1,1-DICHLOROETHENE	75-35-4	ND	--	ND	--
1,2,3-TRICHLOROBENZENE	87-61-6	ND	--	ND	--
1,2,4-TRICHLOROBENZENE	120-82-1	ND	--	ND	--
1,2-DIBROMO-3-CHLOROPROPANE	96-12-8	ND	--	ND	--
1,2-DIBROMOETHANE	106-93-4	ND	--	ND	--
1,2-DICHLOROBENZENE	95-50-1	ND	--	ND	--
1,2-DICHLOROETHANE	107-06-2	ND	--	ND	--
1,2-DICHLOROPROPANE	78-87-5	ND	--	ND	--
1,3-DICHLOROBENZENE	541-73-1	ND	--	ND	--
1,4-DICHLOROBENZENE	106-46-7	ND	--	ND	--
1,4-DIOXANE	123-91-1	--	--	--	--
2-BUTANONE	78-93-3	ND	--	ND	--
2-HEXANONE	591-78-6	--	--	ND	--
4-METHYL-2-PENTANONE	108-10-1	ND	--	ND	--
ACETONE	67-64-1	ND	--	ND	--
BENZENE	71-43-2	0.452	0.00003	300	0.0358
BROMOCHLOROMETHANE	74-97-5	--	--	ND	--
BROMODICHLOROMETHANE	75-27-4	ND	--	ND	--
BROMOFORM	75-25-2	ND	--	ND	--
BROMOMETHANE	74-83-9	ND	--	ND	--
CARBON DISULFIDE	75-15-0	--	--	1.35	0.0002
CARBON TETRACHLORIDE	56-23-5	ND	--	ND	--
CHLOROBENZENE	108-90-7	ND	--	ND	--
CHLOROETHANE	75-00-3	ND	--	ND	--
CHLOROFORM	67-66-3	ND	--	ND	--
CHLOROMETHANE	74-87-3	ND	--	ND	--
CIS-1,2-DICHLOROETHENE	156-59-2	ND	--	ND	--
CIS-1,3-DICHLOROPROPENE	10061-01-5	ND	--	ND	--
CUMENE	98-82-8	ND	--	3.42	0.0004
CYCLOHEXANE	110-82-7	--	--	--	--
DIBROMOCHLOROMETHANE	124-48-1	ND	--	ND	--
DICHLORODIFLUOROMETHANE	75-71-8	ND	--	ND	--
ETHYL BENZENE	100-41-4	ND	--	23.70	0.0028
M,P-XYLENE	179601-23-1	--	--	--	--
METHYL ACETATE	79-20-9	--	--	--	--
METHYL TERT-BUTYL ETHER	1634-04-4	ND	--	ND	--
METHYLCYCLOHEXANE	108-87-2	--	--	--	--
METHYLENE CHLORIDE	75-09-2	ND	--	ND	--
NAPHTHALENE	91-20-3	0.357	0.00003	47.60	0.0057
ORTHO-XYLENE	95-47-6	--	--	--	--
STYRENE	100-42-5	ND	--	ND	--
TETRACHLOROETHENE	127-18-4	ND	--	ND	--
TOLUENE	108-88-3	ND	--	ND	--
TRANS-1,2-DICHLOROETHENE	156-60-5	ND	--	ND	--
TRANS-1,3-DICHLOROPROPENE	10061-02-6	ND	--	ND	--
TRICHLOROETHENE	79-01-6	ND	--	ND	--
TRICHLOROFLUOROMETHANE	75-69-4	ND	--	ND	--
VINYL CHLORIDE	75-01-4	ND	--	ND	--
XYLENES (TOTAL)	1330-20-7	--	--	--	--
Total VOCs	--	--	**0.000059**	--	**0.045**
Period Total VOC Mass Removed (lbs)		**0.000059**		**0.045**	
Cumulative Total VOC Mass Removed (lbs)		**15.08**		**15.12**	

Table 3
Summary of Analytical Results and Contaminant Mass Removal - Liquid
Calumet Montana Refining, LLC - Great Falls, Montana

	Location	SP200		SP200	
	Ramboll Sample ID	CMQ-SP200-101223		CUR-SP200-122723	
	Sample Date	10/12/2023		12/27/2023	
	Effluent Volume (L)*	33,349		54,067	
	Notes				
Analyte	CAS No.	Result (ug/L)	Mass (lb)	Result (ug/L)	Mass (lb)
SVOCs					
1,2,4,5-TETRACHLOROBENZENE	95-94-3	--	--	ND	--
1,2,4-TRICHLOROBENZENE	120-82-1	ND	--	ND	--
1,2-DICHLOROBENZENE	95-50-1	ND	--	--	--
1,3-DICHLOROBENZENE	541-73-1	ND	--	--	--
1,4-DICHLOROBENZENE	106-46-7	ND	--	--	--
2,2'-OXYBIS(1-CHLOROPROPANE)	108-60-1	ND	--	ND	--
2,3,4,6-TETRACHLOROPHENOL	58-90-2	--	--	ND	--
2,4,5-TRICHLOROPHENOL	95-95-4	--	--	ND	--
2,4,6-TRICHLOROPHENOL	88-06-2	ND	--	ND	--
2,4-DICHLOROPHENOL	120-83-2	ND	--	ND	--
2,4-DIMETHYLPHENOL	105-67-9	ND	--	46.70	0.0056
2,4-DINITROPHENOL	51-28-5	ND	--	ND	--
2,4-DINITROTOLUENE	121-14-2	ND	--	ND	--
2,6-DINITROTOLUENE	606-20-2	ND	--	ND	--
2-CHLORONAPHTHALENE	91-58-7	ND	--	ND	--
2-CHLOROPHENOL	95-57-8	ND	--	ND	--
2-METHYLNAPHTHALENE	91-57-6	--	--	57.00	0.0068
2-METHYLPHENOL	95-48-7	--	--	ND	--
2-NITROANILINE	88-74-4	--	--	ND	--
2-NITROPHENOL	88-75-5	ND	--	ND	--
3,3'-DICHLOROBENZIDINE	91-94-1	ND	--	ND	--
3-NITROANILINE	99-09-2	--	--	ND	--
4,6-DINITRO-2-METHYLPHENOL	534-52-1	ND	--	ND	--
4-BROMOPHENYL-PHENYL ETHER	101-55-3	ND	--	ND	--
4-CHLORO-3-METHYLPHENOL	59-50-7	ND	--	ND	--
4-CHLOROPHENYL-PHENYL ETHER	7005-72-3	ND	--	ND	--
4-METHYLPHENOL	106-44-5	--	--	--	--
4-NITROANILINE	100-01-6	--	--	ND	--
4-NITROPHENOL	100-02-7	ND	--	ND	--
ACENAPHTHENE	83-32-9	ND	--	8.24	0.0010
ACENAPHTHYLENE	208-96-8	ND	--	ND	--
ANTHRACENE	120-12-7	ND	--	ND	--
BENZO(A)ANTHRACENE	56-55-3	ND	--	ND	--
BENZO(A)PYRENE	50-32-8	ND	--	ND	--
BENZO(B)FLUORANTHENE	205-99-2	ND	--	ND	--
BENZO(G,H,I)PERYLENE	191-24-2	ND	--	ND	--
BENZO(K)FLUORANTHENE	207-08-9	ND	--	ND	--
BIS(2-CHLOROETHOXY)METHANE	111-91-1	ND	--	ND	--
BIS(2-CHLOROETHYL) ETHER	111-44-4	ND	--	ND	--
BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	ND	--	ND	--
BUTYLBENZYLPHTHALATE	85-68-7	ND	--	ND	--
CARBAZOLE	86-74-8	--	--	--	--
CHRYSENE	218-01-9	ND	--	ND	--
DIBENZ(A,H)ANTHRACENE	53-70-3	ND	--	ND	--
DIBENZOFURAN	132-64-9	--	--	ND	--
DIETHYLPHTHALATE	84-66-2	ND	--	ND	--
DIMETHYLPHTHALATE	131-11-3	ND	--	ND	--
DI-N-BUTYLPHTHALATE	84-74-2	ND	--	ND	--
DI-N-OCTYLPHTHALATE	117-84-0	ND	--	ND	--
FLUORANTHENE	206-44-0	ND	--	ND	--
FLUORENE	86-73-7	ND	--	15.70	0.0019
HEXACHLOROBENZENE	118-74-1	ND	--	ND	--
HEXACHLOROBUTADIENE	87-68-3	ND	--	ND	--
HEXACHLOROCYCLOPENTADIENE	77-47-4	ND	--	ND	--
HEXACHLOROETHANE	67-72-1	ND	--	ND	--
INDENO(1,2,3-CD)PYRENE	193-39-5	ND	--	ND	--
ISOPHORONE	78-59-1	ND	--	ND	--
NAPHTHALENE	91-20-3	7.30	0.0005	19.00	0.0023
NITROBENZENE	98-95-3	ND	--	ND	--
N-NITROSO-DI-N-PROPYLAMINE	621-64-7	ND	--	ND	--
N-NITROSODIPHENYLAMINE	86-30-6	ND	--	ND	--
PENTACHLOROPHENOL	87-86-5	ND	--	ND	--
PHENANTHRENE	85-01-8	ND	--	10.50	0.0013
PHENOL	108-95-2	ND	--	ND	--
PYRENE	129-00-0	ND	--	3.78	0.0005
Total SVOCs	--	--	**0.00054**	--	**0.019**
Period Total SVOC Mass Removed (lbs)		**0.00054**		**0.019**	
Cumulative Total VOC Mass Removed (lbs)		**13.79**		**13.81**	

Table 3
Summary of Analytical Results and Contaminant Mass Removal - Liquid
Calumet Montana Refining, LLC - Great Falls, Montana

Location		**SP200**		**SP200**	
Ramboll Sample ID		**CMQ-SP200-101223**		**CUR-SP200-122723**	
Sample Date		**10/12/2023**		**12/27/2023**	
Effluent Volume (L)*		**33,349**		**54,067**	
Notes					
Analyte	**CAS No.**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**
EPH					
C11 THROUGH C22 AROMATIC HYDROCARBONS	AROMATIC11-22A	--	--	1,170,000	139.46
C19 THROUGH C36 ALIPHATIC HYDROCARBONS	ALIPHATIC19-36U	--	--	102,000	12.16
C9 THROUGH C18 ALIPHATIC HYDROCARBONS	ALIPHATIC09-18U	--	--	306,000	36.47
TOTAL EXTRACTABLE HYDROCARBON (POST FRACTIONATION)	68334-30-5	--	--	--	--
TOTAL EXTRACTABLE HYDROCARBON	68334-30-5E	508	0.0373	914,000	108.94
Total EPHs	--	--	**0.037**	--	**297.03**
Period Total EPH Mass Removed (lbs)		**0.037**		**297.0**	
Cumulative Total EPH Mass Removed (lbs)		**2429.4**		**2726.4**	
VPH					
C5 THROUGH C8 ALIPHATIC HYDROCARBONS (ADJUSTED)	C05-C08-ALIP-J	ND	--	ND	--
C9 THROUGH C12 ALIPHATIC HYDROCARBONS (ADJUSTED)	C09-C12-ALIP-J	43.4	0.0032	10,300	1.23
C5-C8 ALIPHATICS (UNADJUSTED)	C05-C08-ALIP-U	ND	--	598	0.07
C9 THROUGH C10 AROMATIC HYDROCARBONS (UNADJUSTED)	C09-C10-AROM-U	30.3	0.0022	3,790	0.45
C9 THROUGH C12 ALIPHATIC HYDROCARBONS (UNADJUSTED)	C09-C12-ALIP-U	44.5	0.0033	10,400	1.24
TOTAL PETROLEUM HYDROCARBONS	TPH	74.8	0.0055	14,800	1.76
Total VPHss	--	--	**0.0055**	--	**1.76**
Period Total VPH Mass Removed (lbs)		**0.0055**		**1.76**	
Cumulative Total VPH Mass Removed (lbs)		**215.4**		**217.2**	

Notes:
*Effluent volumes represent volume extracted during the month which the sample was taken.
1. Historical analytical results and mass recoveries are included in Appendix B.
2. Cumulative Total VOC Mass Removed represents total mass removed since system start-up (October 2021).
Sample Calculation

$$\textbf{Mass Removed } (lb) = 1800 \frac{ug}{L} \times 10^{-6} \frac{g}{ug} \times \frac{1}{453.6} \frac{lb}{g} \times 21138\ L$$

Abbreviations:

EPH : Extractable Petroleum Hydrocarbon
ND : Non Detect
SVOCs : Semi-volatile Organic Compounds
ug/L : micrograms per liter
VOCs : Volatile Organic Compounds
VPH : Volatile Petroleum Hydrocarbons

Table 4
Summary of Groundwater Analytical Results - Petroleum COCs
Calumet Montana Refining, LLC - Great Falls, Montana

Location			MW-041S	MW-041S	MW-041S	MW-041S	MW-041S	MW-041S	MW-041S	MW-041S	MW-041S
Field Sample ID	Montana DEQ-7 Human Health Standards - Groundwater	Montana DEQ Tier 1 Groundwater RBSLs	CMR-MW41S-211005	CMR-MW141S-220317	MW41S-GW-220622	CMR-MW41S-220831	CMR-MW-41S-221213-L1569525	CMR-MW-415-230321	CMR-MW-41S-270623	CMR-MW-41S-092023	CMR-MW-415-231207-L1685777
Lab Sample ID			WJ08015-001	XC21009-002	XF23073-001	XI01059-003	XL14017-003	YC22023-003	YF29005-005	YI21013-003	L1685777-03
Sample Method			Low Flow	Low Flow	Low Flow	Low Flow	Low Flow	Low Flow	Low Flow	Low Flow	Low Flow
Sample Date			10/5/2021	3/17/2022	6/22/2022	8/31/2022	12/13/2022	3/21/2023	6/27/2023	9/20/2023	12/7/2023
Comments											
VOC											
Acetone			U (80)	76 (20)	HU (80)	88 (4)	35 J (20)	U (20)	40 H (4)	U (200)	23.2 J (11.3)
Benzene	5	5	**1900 (8)**	**230 (2)**	**1200 H (8)**	**140 (0.4)**	**250 (2)**	**130 (0.4)**	**410 (2)**	**470 (20)**	**535 (1.88)**
Bromoform	80		U (8)	U (2)	HU (8)	U (0.4)	U (2)	U (0.4)	U (2)	U (20)	U (0.129)
2-Butanone			U (40)	28 J (10)	HU (40)	16 (2)	14 J (10)	U (2)	18 H (2)	U (100)	U (1.19)
n-Butylbenzene			---	---	---	---	---	---	---	---	6.9 (0.157)
sec-Butylbenzene			---	---	---	---	---	---	---	---	8.12 (0.125)
Carbon Disulfide			U (8)	U (2)	HU (8)	4.2 (0.4)	U (2)	U (0.4)	U (2)	U (20)	0.363 J (0.0962)
Chloroform	70		U (8)	U (2)	HU (8)	U (0.4)	U (2)	U (0.4)	U (2)	U (20)	U (0.111)
Chloromethane	600		U (8)	U (2)	HU (8)	U (0.4)	U (2)	U (0.4)	U (2)	U (20)	U (0.96)
Cumene			14 (8)	U (2)	16 H (8)	0.57 (0.4)	U (2)	0.55 (0.4)	5.6 (2)	U (20)	8.52 (0.105)
Cyclohexane			110 (8)	15 (2)	22 H (8)	27 (0.4)	33 (2)	18 (2)	17 (2)	45 (20)	---
p-Cymene			---	---	---	---	---	---	---	---	6.35 (0.12)
cis-1,2-Dichloroethene	70		U (8)	U (2)	HU (8)	0.48 J (0.4)	U (2)	U (0.4)	U (2)	U (20)	U (0.126)
Ethyl Benzene	700	700	450 (8)	15 (2)	410 H (8)	21 (0.4)	50 (2)	16 (0.4)	150 (2)	170 (20)	191 (2.74)
n-Hexane			---	---	---	---	---	---	---	---	U (0.749)
Iodomethane			---	---	---	---	---	---	---	---	2.19 B J (0.554)
4-Methyl-2-pentanone			U (40)	U (10)	HU (40)	2.4 J (2)	U (10)	U (2)	U (10)	U (100)	2.78 J (0.478)
Methylcyclohexane			57 J (8)	9.4 J (2)	12 (8)	18 (0.4)	34 (2)	12 (0.4)	15 J (2)	33 J (20)	---
Methylene Chloride	5		U (8)	U (2)	HU (8)	U (0.4)	U (2)	U (0.4)	U (2)	U (20)	U (0.43)
Naphthalene	100	100	35 (8)	31 (2)	77 H (8)	3.4 (0.4)	27 (2)	18 (0.4)	35 (2)	30 (20)	63.7 (0.174)
n-Propylbenzene			---	---	---	---	---	---	---	---	21.1 (0.0993)
Styrene	100		U (8.2)	U (2.1)	HU (8.2)	U (0.41)	U (2.1)	U (0.41)	4.8 (2.1)	U (21)	U (0.118)
Toluene	1000	1000	270 (8)	44 (2)	180 H (8)	11 (0.4)	9.5 (2)	2.2 (0.4)	3.4 (2)	U (20)	6.45 (0.278)
1,1,2-Trichloroethane	3		U (8)	U (2)	HU (8)	U (0.4)	U (2)	U (0.4)	U (2)	U (20)	U (0.158)
1,2,3-Trimethylbenzene			---	---	---	---	---	---	---	---	248 (2.08)
1,2,4-Trimethylbenzene			---	---	---	---	---	---	---	---	613 (6.44)
1,3,5-Trimethylbenzene			---	---	---	---	---	---	---	---	83.3 (0.104)
m,p-xylene			640 (8)	580 (2)	2000 H (8)	150 (0.4)	730 (2)	320 (2)	470 (2)	590 (20)	---
ortho-xylene	10000		200 (8)	300 (2)	750 H (8)	67 (0.4)	300 (2)	150 (2)	150 (2)	200 (20)	---
Xylenes (total)	10000	10000	840 (8)	870 (2)	2700 H (8)	220 (0.4)	1000 (2)	460 (2)	630 (2)	790 (20)	987 (3.48)
SVOC											
Acenaphthene	70	70	U (0.2)	U (0.8)	U (2)	U (0.04)	U (0.8)	U (0.8)	0.34 J (0.2)	0.65 J (0.2)	0.788 J (0.0886)
Acenaphthylene			U (0.2)	U (0.8)	U (2)	U (0.04)	U (0.8)	U (0.8)	U (0.2)	U (0.2)	U (0.0921)
Benzo(a)anthracene	0.5	0.5	U (0.2)	U (0.8)	U (2)	U (0.04)	U (0.8)	U (0.8)	U (0.2)	U (0.2)	U (0.199)
Benzo(a)pyrene	0.05	0.05	U (0.35)	U (1.4)	U (3.5)	U (0.04)	U (0.8)	U (0.8)	U (0.2)	U (0.2)	U (0.0381)
Benzo(b)fluoranthene	0.5	0.5	U (0.2)	U (0.8)	U (2)	U (0.04)	U (0.8)	U (0.8)	U (0.2)	U (0.2)	U (0.13)
Benzo(g,h,i)perylene			U (0.2)	U (0.8)	U (2)	U (0.04)	U (0.8)	U (0.8)	U (0.2)	U (0.2)	U (0.121)
1,1-Biphenyl			---	---	---	U (0.21)	U (4.2)	U (4.2)	1.4 J (1.1)	U (1.1)	---
bis(2-Ethylhexyl)phthalate	6		U (5)	U (40)	U (100)	3.8 BJ (1.5)	U (30)	U (30)	U (7.5)	U (7.5)	U (0.895)
Chrysene	50	50	U (0.15)	U (0.6)	U (1.5)	U (0.04)	U (0.8)	U (0.8)	U (0.2)	U (0.2)	U (0.13)
Dibenzofuran			U (2.5)	U (10)	U (25)	U (0.16)	U (3.2)	U (3.2)	U (0.8)	U (0.8)	0.55 J (0.097)
Diethylphthalate	600		U (2.5)	U (10)	U (25)	U (0.19)	U (3.8)	U (3.8)	U (0.95)	U (0.95)	U (0.287)
2,4-Dimethylphenol	100		U (2.4)	**160 (9.6)**	36 J (24)	U (0.15)	100 (3)	60 (3)	8.3 (0.75)	75 (0.75)	15.8 (0.0636)
Di-n-butylphthalate	20		U (2.5)	U (10)	U (25)	U (0.42)	U (8.4)	U (8.4)	U (2.1)	U (2.1)	U (0.453)
Fluoranthene	20	20	U (0.5)	U (2)	U (5)	U (0.04)	U (0.8)	U (0.8)	U (0.2)	U (0.2)	U (0.102)
Fluorene	50	50	0.63 BJ (0.15)	U (0.6)	2.3 J (1.5)	U (0.04)	U (0.8)	1.2 J (0.8)	0.67 J (0.2)	1.4 (0.2)	0.914 J (0.0844)
Indeno(1,2,3-cd)pyrene	0.5	0.5	U (0.2)	U (0.8)	U (2)	U (0.04)	U (0.8)	U (0.8)	U (0.2)	U (0.2)	U (0.279)
1-Methylnaphthalene		11	---	---	---	0.065 J (0.04)	12 (0.8)	14 (0.8)	10 (0.2)	7.3 (0.2)	31 (0.0687)
2-Methylnaphthalene		36	1.7 B (0.2)	7.7 (0.8)	33 (2)	0.11 J (0.04)	6.7 (0.8)	11 (0.8)	12 (0.2)	0.74 J (0.2)	13.3 (0.117)
2-Methylphenol			U (1.1)	U (4.2)	U (11)	U (0.21)	U (4.2)	U (4.2)	U (1.1)	U (1.1)	U (0.0929)
Naphthalene	100	100	15 B (0.25)	18 (1)	60 (2.5)	U (0.04)	19 (0.8)	11 (0.8)	15 (0.2)	6.9 (0.2)	27.1 (0.159)
Phenanthrene			U (0.3)	U (1.2)	U (3)	U (0.04)	U (0.8)	U (0.8)	0.42 J (0.2)	U (0.2)	0.555 J (0.112)
Phenol	4000		5.6 (2.5)	15 J (10)	U (25)	U (0.19)	9.1 J (3.8)	U (3.8)	U (0.95)	15 (0.95)	4.95 J (4.33)
Pyrene	20	20	U (0.5)	U (2)	U (5)	U (0.04)	U (0.8)	U (0.8)	U (0.2)	U (0.2)	U (0.107)
MTDEQ VPH											
C5-C8 Aliphatics, Unadjusted		650	---	---	---	1460 (33.3)	1050 (33.3)	516 (33.3)	850 (167)	1310 (33.3)	1410 (33.3)
C5-C8 Aliphatics		650	1500 (150)	460 J (150)	990 (150)	1140 (33.3)	1040 (33.3)	392 (33.3)	429 J (167)	842 (33.3)	869 (33.3)
C9-C12 Aliphatics, Unadjusted		1400	---	---	---	1200 (33.3)	2060 (33.3)	1330 (33.3)	3100 (167)	2510 (33.3)	3560 (33.3)
C9-C12 Aliphatics		1400	370 J (150)	730 J (150)	710 J (150)	625 (33.3)	405 (33.3)	456 (33.3)	U (167)	844 (33.3)	2380 (33.3)
C09-C10 Aromatics, Unadjusted			---	---	---	530 (33.3)	1570 (33.3)	1240 (167)	1910 (167)	1750 (33.3)	1180 (33.3)
Volatile Petroleum Hydrocarbons			6300 (350)	3100 (350)	9800 (350)	3190 (66.7)	5170 (66.7)	3090 (333)	5860 (333)	5570 (66.7)	6150 (66.7)
MTDEQ EPH											
C9-C18 Aliphatics		1400	---	---	990 (100)	---	---	---	---	---	U (200)
C19-C36 Aliphatics		1000	---	---	U (100)	---	---	---	---	---	---
C11-C22 Aromatics unadjusted		1100	---	---	---	---	375 (200)	506 J (222)	425 JJ3 (200)	397 J (200)	813 (200)
C11-C22 Aromatics		1100	---	---	4000 (100)	---	375 (200)	506 J (222)	---	397 J (200)	700 (200)
UNADJUSTED TOTAL PETROLEUM HYDROCARBONS			---	---	---	---	375 (200)	506 J (222)	425 J (200)	397 J (200)	813 (200)
Petroleum Hydrocarbons (Total)			---	---	---	---	375 (200)	506 J (222)	425 J (200)	397 J (200)	700 (200)
Petroleum Hydrocarbons (Extractable)			---	---	5700 (2000)	5560 (500)	---	5640 (111)	5490 (100)	5660 (100)	6840 (100)
Extractable Petroleum Hydrocarbons (Frac)			---	---	5000 B (100)	---	4460 Q (100)	---	---	---	---

Notes:

1 All concentrations are presented in ug/L.

2 Only compounds with at least one detection are shown.

3 Concentrations that exceed the Montana DEQ-7 Human Health Standards - Groundwater are **boldfaced**.

4 Concentrations that exceed the Montana DEQ Tier 1 Groundwater RBSLs are underlined.

U -- Not Detected.

J -- Estimated Concentration.

( ) -- Reporting Detection Limit.

--- -- Not Analyzed.

Table 4
Summary of Groundwater Analytical Results - Petroleum COCs
Calumet Montana Refining, LLC - Great Falls, Montana

	Location			MW-105	MW-105	MW-105	MW-105	MW-105	MW-105	MW-105	MW-105	MW-105	MW-105	MW-105	MW-105
	Field Sample ID			CMR-MW105-08052020	CMR-MW105-200827	CMR-MW105-210223	CMR-MW105S-211006	CMR-MW105-220317	MW105-GW-220622	CMR-MW105-220831	CMR-MW-105-221213-L1569525	CMR-MW-105-230321	CMR-MW-105-270623	CMR-MW-105-092023	CMR-MW-105-231207-L1685777
	Lab Sample ID	Montana DEQ-7 Human Health Standards - Groundwater	Montana DEQ Tier 1 Groundwater RBSLs	VH07016-001	VH28044-018	WB25040-009	WJ08015-002	XC21009-003	XF23073-003	XI01059-001	XL14017-001	YC22023-001	YF29005-003	YI21013-001	L1685777-01
	Sample Method			Low Flow	Low Flow	Low Flow	Low Flow	Low Flow	Low Flow	Low Flow	Low Flow	Low Flow	Low Flow	Low Flow	Low Flow
	Sample Date			8/5/2020	8/27/2020	2/23/2021	10/6/2021	3/17/2022	6/22/2022	8/31/2022	12/13/2022	3/21/2023	6/27/2023	9/20/2023	12/7/2023
	Comments														
VOC															
	Acetone			110 (4)	43 J (40)	65 J (40)	58 H (20)	6.8 J (4)	U (4)	77 (4)	8 J (4)	U (4)	21 H (4)	U (200)	U (11.3)
	Benzene	5	5	**180 (0.4)**	**570 (4)**	**240 (4)**	**250 H (2)**	**25 (0.4)**	**110 (0.4)**	**85 (0.4)**	2.1 (0.4)	**12 (0.4)**	**48 (0.4)**	**85 (20)**	**11.7 (0.0941)**
	Bromoform	80		U (0.4)	U (4)	U (4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (20)	U (0.129)
	2-Butanone			15 (2)	U (20)	U (20)	17 (2)	U (2)	3 J (2)	U (2)	U (2)	U (2)	3.2 J (2)	U (100)	U (1.19)
	n-Butylbenzene			---	---	---	---	---	---	---	---	---	---	---	0.247 J (0.157)
	sec-Butylbenzene			---	---	---	---	---	---	---	---	---	---	---	0.191 J (0.125)
	Carbon Disulfide			0.56 (0.4)	U (4)	U (4)	HU (2)	U (0.4)	1.4 (0.4)	0.55 (0.4)	5.8 (0.4)	U (0.4)	U (0.4)	U (20)	0.197 J (0.0962)
	Chloroform	70		U (0.4)	U (4)	U (4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (20)	U (0.111)
	Chloromethane	600		29 (0.4)	U (4)	U (4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	1.5 (0.4)	U (20)	U (0.96)
	Cumene			4.6 (0.4)	5.4 (4)	5.5 (4)	2.4 (0.4)	U (0.4)	2.9 (0.4)	0.67 (0.4)	U (0.4)	U (0.4)	0.72 (0.4)	U (20)	1.73 (0.105)
	Cyclohexane			59 (0.4)	55 J (4)	70 (4)	59 (0.4)	3 (0.4)	50 (0.4)	26 (0.4)	3.4 (0.4)	6.6 (0.4)	9.4 H (0.4)	96 (20)	---
	p-Cymene			---	---	---	---	---	---	---	---	---	---	---	0.165 J (0.12)
	cis-1,2-Dichloroethene	70		U (0.4)	U (4)	U (4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (20)	U (0.126)
	Ethyl Benzene	700	700	240 (2)	320 (4)	160 (4)	150 (0.4)	20 (0.4)	200 (0.4)	120 (0.4)	7.9 (0.4)	21 (0.4)	15 (0.4)	570 (20)	75 (0.137)
	n-Hexane			---	---	---	---	---	---	---	---	---	---	---	1.41 J (0.749)
	Iodomethane			---	---	---	---	---	---	---	---	---	---	---	U (0.554)
	4-Methyl-2-pentanone			U (2)	U (20)	U (20)	U (2)	U (2)	U (2)	U (2)	U (2)	U (2)	U (2)	U (100)	U (0.478)
	Methylcyclohexane			26 (0.4)	17 J (4)	37 J (4)	25 (0.4)	0.85 J (0.4)	14 (0.4)	8.1 (0.4)	0.91 J (0.4)	1.7 J (0.4)	3.8 J (0.4)	28 J (20)	---
	Methylene Chloride	5		U (0.4)	U (4)	U (4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (20)	U (0.43)
	Naphthalene	100	100	9.4 (0.4)	9.1 (4)	12 (4)	8.5 (0.4)	0.86 (0.4)	4.9 (0.4)	4.9 (0.4)	U (0.4)	0.57 (0.4)	1.5 (0.4)	U (20)	0.374 J (0.174)
	n-Propylbenzene			---	---	---	---	---	---	---	---	---	---	---	5.33 (0.0993)
	Styrene	100		U (0.41)	U (4.1)	U (4.1)	U (0.41)	U (0.41)	U (0.41)	U (0.41)	U (0.41)	U (0.41)	U (0.41)	U (21)	U (0.118)
	Toluene	1000	1000	25 (0.4)	42 (4)	15 (4)	14 (0.4)	2 (0.4)	12 (0.4)	9.9 (0.4)	U (0.4)	1.5 (0.4)	2.2 (0.4)	20 J (20)	1.78 (0.278)
	1,1,2-Trichloroethane	3		U (0.4)	U (4)	U (4)	U (0.4)	U (0.4)	U (0.4)	0.51 (0.4)	U (0.4)	U (0.4)	U (0.4)	U (20)	U (0.158)
	1,2,3-Trimethylbenzene			---	---	---	---	---	---	---	---	---	---	---	1.1 (0.104)
	1,2,4-Trimethylbenzene			---	---	---	---	---	---	---	---	---	---	---	2.33 (0.322)
	1,3,5-Trimethylbenzene			---	---	---	---	---	---	---	---	---	---	---	U (0.104)
	m,p-xylene			250 (2)	260 (4)	55 (4)	41 (0.4)	6.7 (0.4)	28 (0.4)	12 (0.4)	0.57 (0.4)	3.6 (0.4)	4.7 (0.4)	U (20)	---
	ortho-xylene	10000		16 (0.4)	20 (4)	5.7 (4)	3.8 (0.4)	2.3 (0.4)	3.9 (0.4)	3.9 (0.4)	0.44 J (0.4)	0.57 (0.4)	1.2 (0.4)	U (20)	---
	Xylenes (total)	10000	10000	290 (0.4)	280 (4)	61 (4)	45 (0.4)	9 (0.4)	31 (0.4)	16 (0.4)	1 (0.4)	4.1 (0.4)	5.9 (0.4)	U (20)	2.43 (0.174)
SVOC															
	Acenaphthene	70	70	---	U (0.2)	0.065 J (0.04)	U (0.4)	U (0.04)	U (0.25)	U (0.8)	U (0.2)	U (0.2)	U (0.2)	U (0.2)	0.102 J (0.0886)
	Acenaphthylene			---	U (0.2)	U (0.04)	U (0.4)	U (0.04)	U (0.25)	U (0.8)	U (0.2)	U (0.2)	U (0.2)	U (0.2)	U (0.0921)
	Benzo(a)anthracene	0.5	0.5	---	U (0.2)	U (0.04)	U (0.4)	U (0.04)	U (0.25)	U (0.8)	U (0.2)	U (0.2)	U (0.2)	U (0.2)	U (0.199)
	Benzo(a)pyrene	0.05	0.05	---	U (0.35)	U (0.07)	U (0.7)	U (0.07)	U (0.44)	U (0.8)	U (0.2)	U (0.2)	U (0.2)	U (0.2)	U (0.0381)
	Benzo(b)fluoranthene	0.5	0.5	---	U (0.2)	U (0.04)	U (0.4)	U (0.04)	U (0.25)	U (0.8)	U (0.2)	U (0.2)	U (0.2)	U (0.2)	U (0.13)
	Benzo(g,h,i)perylene			---	U (0.2)	U (0.04)	U (0.4)	U (0.04)	U (0.25)	U (0.8)	U (0.2)	U (0.2)	U (0.2)	U (0.2)	U (0.121)
	1,1-Biphenyl			---	---	---	---	---	---	U (4.2)	U (1.1)	U (1.1)	U (1.1)	U (1.1)	---
	bis(2-Ethylhexyl)phthalate	6		---	U (2.5)	U (0.5)	U (20)	U (2)	U (13)	U (30)	U (7.5)	U (7.5)	U (7.5)	U (7.5)	U (0.895)
	Chrysene	50	50	---	U (0.15)	U (0.03)	U (0.3)	U (0.03)	U (0.19)	U (0.8)	U (0.2)	U (0.2)	U (0.2)	U (0.2)	U (0.13)
	Dibenzofuran			---	U (2.5)	U (0.5)	U (5)	U (0.5)	U (3.1)	U (3.2)	U (0.8)	U (0.8)	U (0.8)	U (0.8)	U (0.097)
	Diethylphthalate	600		---	U (2.5)	U (0.5)	U (5)	U (0.5)	U (3.1)	U (3.8)	U (0.95)	U (0.95)	U (0.95)	U (0.95)	0.309 J (0.287)
	2,4-Dimethylphenol	100		---	U (2.4)	1.1 (0.48)	U (4.8)	0.63 J (0.48)	U (3)	37 (3)	U (0.75)	U (0.75)	U (0.75)	31 (0.75)	3.08 J (0.0636)
	Di-n-butylphthalate	20		---	U (2.5)	U (0.5)	U (5)	U (0.5)	U (3.1)	U (8.4)	U (2.1)	U (2.1)	U (2.1)	U (2.1)	U (0.453)
	Fluoranthene	20	20	---	U (0.5)	U (0.1)	U (1)	U (0.1)	U (0.63)	U (0.8)	U (0.2)	U (0.2)	U (0.2)	U (0.2)	U (0.102)
	Fluorene	50	50	---	U (0.15)	0.15 J (0.03)	U (0.3)	U (0.03)	U (0.19)	U (0.8)	U (0.2)	U (0.2)	U (0.2)	U (0.2)	U (0.0844)
	Indeno(1,2,3-cd)pyrene	0.5	0.5	---	U (0.2)	U (0.04)	U (0.4)	U (0.04)	U (0.25)	U (0.8)	U (0.2)	U (0.2)	U (0.2)	U (0.2)	U (0.279)
	1-Methylnaphthalene		11	---	---	---	---	---	---	1.3 J (0.8)	U (0.2)	U (0.2)	0.73 J (0.2)	4 (0.2)	---
	2-Methylnaphthalene		36	---	0.77 J (0.2)	2.4 (0.04)	U (0.4)	U (0.04)	U (0.25)	1.9 J (0.8)	U (0.2)	U (0.2)	0.31 J (0.2)	0.29 J (0.2)	U (0.117)
	2-Methylphenol			---	U (1.1)	0.24 J (0.21)	U (2.1)	U (0.21)	U (1.3)	U (4.2)	U (1.1)	U (1.1)	U (1.1)	U (1.1)	U (0.0929)
	Naphthalene	100	100	---	6.6 (0.25)	6.1 (0.05)	3.1 (0.5)	0.42 (0.05)	2.1 (0.31)	1.5 J (0.8)	U (0.2)	0.23 J (0.2)	0.91 (0.2)	4 (0.2)	0.293 J (0.159)
	Phenanthrene			---	U (0.3)	0.088 J (0.06)	U (0.6)	U (0.06)	U (0.38)	U (0.8)	U (0.2)	U (0.2)	U (0.2)	U (0.2)	U (0.112)
	Phenol	4000		---	U (2.5)	3.4 (0.5)	U (5)	U (0.5)	U (3.1)	U (3.8)	U (0.95)	U (0.95)	1.2 J (0.95)	3.3 J (0.95)	U (4.33)
	Pyrene	20	20	---	U (0.5)	U (0.1)	U (1)	U (0.1)	U (0.63)	U (0.8)	U (0.2)	U (0.2)	U (0.2)	U (0.2)	U (0.107)
MTDEQ VPH															
	C5-C8 Aliphatics, Unadjusted		650	---	---	---	---	---	---	650 (33.3)	63.9 J (33.3)	178 (33.3)	1050 (33.3)	1580 (33.3)	523 (33.3)
	C5-C8 Aliphatics		650	1600 (15)	880 (75)	1800 (75)	1200 (75)	150 (15)	830 (15)	517 (33.3)	63.9 J (33.3)	162 (33.3)	969 (33.3)	1490 (33.3)	510 (33.3)
	C9-C12 Aliphatics, Unadjusted		1400	---	---	---	---	---	---	240 B (33.3)	U (33.3)	106 (33.3)	377 (33.3)	955 (33.3)	231 (33.3)
	C9-C12 Aliphatics		1400	180 (15)	200 J (75)	210 J (75)	130 (15)	21 J (15)	37 J (15)	140 B (33.3)	U (33.3)	67.5 J (33.3)	117 (33.3)	396 (33.3)	154 (33.3)
	C09-C10 Aromatics, Unadjusted			---	---	---	---	---	---	158 (33.3)	51 J (33.3)	U (33.3)	185 (33.3)	375 (33.3)	70.6 J (33.3)
	Volatile Petroleum Hydrocarbons			2800 (35)	2700 (180)	2300 (180)	1900 (180)	240 (35)	1100 (35)	1050 (66.7)	146 J (66.7)	284 (66.7)	1610 (66.7)	2910 (66.7)	825 (66.7)
MTDEQ EPH															
	C9-C18 Aliphatics		1400	---	U (480)	---	---	---	---	---	---	---	---	---	---
	C19-C36 Aliphatics		1000	---	740 (480)	---	---	---	---	---	---	---	---	---	---
	C11-C22 Aromatics unadjusted		1100	---	---	---	---	---	---	---	---	U (200)	UJ3 (200)	U (200)	---
	C11-C22 Aromatics		1100	---	U (480)	---	---	---	---	---	---	U (200)	U (200)	U (200)	---
	UNADJUSTED TOTAL PETROLEUM HYDROCARBONS			---	---	---	---	---	---	---	---	U (200)	U (200)	U (200)	---
	Petroleum Hydrocarbons (Total)			---	---	---	---	---	---	---	---	U (200)	U (200)	U (200)	---
	Petroleum Hydrocarbons (Extractable)			---	1900 (950)	470 (240)	---	---	---	---	---	374 (100)	638 (100)	843 (100)	---
	Extractable Petroleum Hydrocarbons (Frac)			---	880 J (480)	---	---	---	---	---	---	---	---	---	---

Notes:

1 All concentrations are presented in ug/L.

2 Only compounds with at least one detection are shown.

3 Concentrations that exceed the Montana DEQ-7 Human Health Standards - Groundwater are **boldfaced**.

4 Concentrations that exceed the Montana DEQ Tier 1 Groundwater RBSLs are underlined.

U -- Not Detected.

J -- Estimated Concentration.

( ) -- Reporting Detection Limit.

--- -- Not Analyzed.

Table 4
Summary of Groundwater Analytical Results - Petroleum COCs
Calumet Montana Refining, LLC - Great Falls, Montana

Location			MW-106	MW-106	MW-106	MW-106	MW-106	MW-106	MW-106	MW-106	MW-106	MW-106	MW-106
Field Sample ID	Montana DEQ-7 Human Health Standards - Groundwater	Montana DEQ Tier 1 Groundwater RBSLs	CMR-MW106-211005	CMR-MW106-220316	MW106-GW-220622	CMR-MW106-220831	CMR-MW-106-221213-L1569525	CMR-DS1-221213	CMR-MW-106-230321	CMR-DUP-1-230321	CMR-MW-106-280623	CMR-MW-106-092023	CMR-MW-106-231207-L1685777
Lab Sample ID			WJ08009-001	XC21009-001	XF23073-002	XI01059-002	XL14017-002	XL14017-004	YC22023-002	YC22023-004	YF29005-001	YI21013-002	L1685777-02
Sample Method			Low Flow	Low Flow	Low Flow	Low Flow	Low Flow	Low Flow	Low Flow	Low Flow	Low Flow	Low Flow	Low Flow
Sample Date			10/5/2021	3/16/2022	6/22/2022	8/31/2022	12/13/2022	12/13/2022	3/21/2023	3/21/2023	6/28/2023	9/20/2023	12/7/2023
Comments								Field Duplicate		Field Duplicate			
VOC													
Acetone			6.9 J (4)	U (4)	U (4)	U (4)	14 (4)	12 (4)	U (4)	U (4)	U (4)	13 (4)	U (11.3)
Benzene	5	5	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.0941)
Bromoform	80		U (0.4)	U (0.4)	U (0.4)	U (0.4)	0.96 (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.129)
2-Butanone			U (2)	U (2)	U (2)	U (2)	U (2)	U (2)	U (2)	U (2)	U (2)	U (2)	U (1.19)
n-Butylbenzene			---	---	---	---	---	---	---	---	---	---	U (0.157)
sec-Butylbenzene			---	---	---	---	---	---	---	---	---	---	U (0.125)
Carbon Disulfide			U (0.4)	U (0.4)	U (0.4)	U (0.4)	4.2 (0.4)	3.2 (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.0962)
Chloroform	70		U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.111)
Chloromethane	600		U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.96)
Cumene			U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.105)
Cyclohexane			U (0.4)	U (0.4)	U (0.4)	7.2 (0.4)	2.8 (0.4)	2.6 (0.4)	U (0.4)	U (0.4)	U (0.4)	1.7 (0.4)	---
p-Cymene			---	---	---	---	---	---	---	---	---	---	U (0.12)
cis-1,2-Dichloroethene	70		U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.126)
Ethyl Benzene	700	700	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.137)
n-Hexane			---	---	---	---	---	---	---	---	---	---	U (0.749)
Iodomethane			---	---	---	---	---	---	---	---	---	---	2.23 B J (0.554)
4-Methyl-2-pentanone			U (2)	U (2)	U (2)	U (2)	U (2)	U (2)	U (2)	U (2)	U (2)	3.8 J (2)	3.21 J (0.478)
Methylcyclohexane			U (0.4)	U (0.4)	U (0.4)	1.7 J (0.4)	1 J (0.4)	1.1 J (0.4)	U (0.4)	U (0.4)	U (0.4)	0.5 J (0.4)	---
Methylene Chloride	5		0.47 J (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	0.49 J (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.43)
Naphthalene	100	100	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.174)
n-Propylbenzene			---	---	---	---	---	---	---	---	---	---	U (0.0993)
Styrene	100		U (0.41)	U (0.41)	U (0.41)	U (0.41)	U (0.41)	U (0.41)	U (0.41)	U (0.41)	U (0.41)	U (0.41)	U (0.118)
Toluene	1000	1000	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.278)
1,1,2-Trichloroethane	3		U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.158)
1,2,3-Trimethylbenzene			---	---	---	---	---	---	---	---	---	---	U (0.104)
1,2,4-Trimethylbenzene			---	---	---	---	---	---	---	---	---	---	U (0.322)
1,3,5-Trimethylbenzene			---	---	---	---	---	---	---	---	---	---	U (0.104)
m,p-xylene			U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	---
ortho-xylene	10000		U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	---
Xylenes (total)	10000	10000	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.4)	U (0.174)
SVOC													
Acenaphthene	70	70	U (0.04)	U (0.04)	U (0.2)	U (0.04)	U (0.2)	---	U (0.2)	---	U (0.2)	U (0.2)	U (0.0886)
Acenaphthylene			U (0.04)	U (0.04)	U (0.2)	U (0.04)	U (0.2)	---	U (0.2)	---	U (0.2)	U (0.2)	U (0.0921)
Benzo(a)anthracene	0.5	0.5	U (0.04)	0.084 J (0.04)	U (0.2)	U (0.04)	U (0.2)	---	U (0.2)	---	U (0.2)	U (0.2)	U (0.199)
Benzo(a)pyrene	0.05	0.05	U (0.07)	**0.17 J (0.07)**	U (0.35)	U (0.04)	U (0.2)	---	U (0.2)	---	U (0.2)	U (0.2)	U (0.0381)
Benzo(b)fluoranthene	0.5	0.5	U (0.04)	0.2 (0.04)	U (0.2)	U (0.04)	U (0.2)	---	U (0.2)	---	U (0.2)	U (0.2)	U (0.13)
Benzo(g,h,i)perylene			U (0.04)	0.12 J (0.04)	U (0.2)	U (0.04)	U (0.2)	---	U (0.2)	---	U (0.2)	U (0.2)	U (0.121)
1,1-Biphenyl			---	---	---	U (0.21)	U (1.1)	---	U (1.1)	---	U (1.1)	U (1.1)	---
bis(2-Ethylhexyl)phthalate	6		U (1)	U (2)	U (10)	2 BJ (1.5)	U (7.5)	---	U (7.5)	---	U (7.5)	U (7.5)	U (0.895)
Chrysene	50	50	U (0.03)	0.042 J (0.03)	U (0.15)	U (0.04)	U (0.2)	---	U (0.2)	---	U (0.2)	U (0.2)	U (0.13)
Dibenzofuran			U (0.5)	U (0.5)	U (2.5)	U (0.16)	U (0.8)	---	U (0.8)	---	U (0.8)	U (0.8)	U (0.097)
Diethylphthalate	600		U (0.5)	U (0.5)	U (2.5)	0.21 J (0.19)	U (0.95)	---	U (0.95)	---	U (0.95)	U (0.95)	U (0.287)
2,4-Dimethylphenol	100		U (0.48)	U (0.48)	U (2.4)	U (0.15)	U (0.75)	---	U (0.75)	---	U (0.75)	U (0.75)	U (0.0636)
Di-n-butylphthalate	20		U (0.5)	U (0.5)	U (2.5)	U (0.42)	U (2.1)	---	U (2.1)	---	U (2.1)	U (2.1)	U (0.453)
Fluoranthene	20	20	U (0.1)	0.16 J (0.1)	U (0.5)	U (0.04)	U (0.2)	---	U (0.2)	---	U (0.2)	U (0.2)	U (0.102)
Fluorene	50	50	U (0.03)	U (0.03)	U (0.15)	U (0.04)	U (0.2)	---	U (0.2)	---	U (0.2)	U (0.2)	U (0.0844)
Indeno(1,2,3-cd)pyrene	0.5	0.5	U (0.04)	0.15 J (0.04)	U (0.2)	U (0.04)	U (0.2)	---	U (0.2)	---	U (0.2)	U (0.2)	U (0.279)
1-Methylnaphthalene		11	---	---	---	0.061 J (0.04)	U (0.2)	---	U (0.2)	---	U (0.2)	U (0.2)	U (0.0687)
2-Methylnaphthalene		36	0.044 BJ (0.04)	U (0.04)	U (0.2)	0.1 J (0.04)	U (0.2)	---	U (0.2)	---	U (0.2)	U (0.2)	U (0.117)
2-Methylphenol			U (0.21)	U (0.21)	U (1.1)	U (0.21)	U (1.1)	---	U (1.1)	---	U (1.1)	U (1.1)	U (0.0929)
Naphthalene	100	100	U (0.05)	U (0.05)	U (0.25)	0.045 J (0.04)	U (0.2)	---	U (0.2)	---	U (0.2)	U (0.2)	U (0.159)
Phenanthrene			U (0.06)	U (0.06)	U (0.3)	U (0.04)	U (0.2)	---	U (0.2)	---	U (0.2)	U (0.2)	U (0.112)
Phenol	4000		U (0.5)	U (0.5)	U (2.5)	U (0.19)	U (0.95)	---	U (0.95)	---	U (0.95)	U (0.95)	U (4.33)
Pyrene	20	20	U (0.1)	U (0.1)	U (0.5)	U (0.04)	U (0.2)	---	U (0.2)	---	U (0.2)	U (0.2)	U (0.107)
MTDEQ VPH													
C5-C8 Aliphatics, Unadjusted		650	---	---	---	153 (33.3)	80 J (33.3)	---	U (33.3)	---	85.9 J (33.3)	495 (33.3)	67.1 J (33.3)
C5-C8 Aliphatics		650	U (15)	U (15)	U (15)	153 (33.3)	80 J (33.3)	---	U (33.3)	---	85.9 J (33.3)	495 (33.3)	67.1 J (33.3)
C9-C12 Aliphatics, Unadjusted		1400	---	---	---	36 B J (33.3)	U (33.3)	---	U (33.3)	---	U (33.3)	U (33.3)	U (33.3)
C9-C12 Aliphatics		1400	U (15)	U (15)	U (15)	36 B J (33.3)	U (33.3)	---	U (33.3)	---	U (33.3)	U (33.3)	U (33.3)
C09-C10 Aromatics, Unadjusted			---	---	---	U (33.3)	U (33.3)	---	U (33.3)	---	U (33.3)	38.4 J (33.3)	U (33.3)
Volatile Petroleum Hydrocarbons			U (35)	U (35)	U (35)	189 J (66.7)	108 J (66.7)	---	U (66.7)	---	85.9 J (66.7)	533 (66.7)	67.1 J (66.7)
MTDEQ EPH													
C9-C18 Aliphatics		1400	---	---	U (100)	---	---	---	---	---	---	---	U (200)
C19-C36 Aliphatics		1000	---	---	U (100)	---	---	---	---	---	---	---	---
C11-C22 Aromatics unadjusted		1100	---	---	---	---	U (200)	---	U (222)	---	UJ3 (200)	U (200)	U (200)
C11-C22 Aromatics		1100	---	---	U (100)	---	U (200)	---	U (222)	---	U (200)	U (200)	U (200)
UNADJUSTED TOTAL PETROLEUM HYDROCARBONS			---	---	---	---	U (200)	---	U (222)	---	U (200)	U (200)	U (200)
Petroleum Hydrocarbons (Total)			---	---	---	---	U (200)	---	U (222)	---	U (200)	U (200)	U (200)
Petroleum Hydrocarbons (Extractable)			U (200)	U (200)	U (200)	U (100)	---	---	U (111)	---	1650 (100)	17000 (100)	5630 (100)
Extractable Petroleum Hydrocarbons (Frac)			---	---	U (100)	---	U (100)	---	---	---	---	---	---

Notes:

1 All concentrations are presented in ug/L.

2 Only compounds with at least one detection are shown.

3 Concentrations that exceed the Montana DEQ-7 Human Health Standards - Groundwater are **boldfaced**.

4 Concentrations that exceed the Montana DEQ Tier 1 Groundwater RBSLs are underlined.

U -- Not Detected.

J -- Estimated Concentration.

( ) -- Reporting Detection Limit.

--- -- Not Analyzed.

Table 5
Summary of Groundwater Analytical Results - Field Parameters
Calumet Montana Refining, LLC - Great Falls, Montana

Location	MW-041S	MW-041S	MW-041S	MW-041S	MW-041S	MW-041S	MW-041S	MW-041S	MW-041S
Field Sample ID	CMR-MW41S-211005	CMR-MW141S-220317	MW41S-GW-220622	CMR-MW41S-220831	CMR-MW-41S-221213	CMR-MW-41S-230321	CMR-MW-41S-230627	CMR-MW-41S-092023	CMR-MW-41S-231207
Sample Method	Low Flow	Low Flow	Low Flow	Low Flow	Low Flow	Low Flow	Low Flow	Low Flow	Low Flow
Sample Date	10/5/2021	3/17/2022	6/22/2022	8/31/2022	########	3/21/2023	6/27/2023	9/20/2023	12/7/2023
FIELD PARAMETERS									
Specific Conductivity (Field Analysis)	1.26	0.00	1.40	1.40	1.76	1.22	0.00	1.38	1.33
Dissolved Oxygen	0.00	5.65	2.99	0.00	8.56	0.76	8.16	0.00	0.00
Oxidation Reduction Potential	-93	-40	-123	-127	-139	-149	-26	-147	-78
pH (Field Analysis)	7.22	5.32	7	6.34	7.17	7.24	6.22	7.18	7.99
Turbidity (Field Parameters)	0.8	221.0	55	1.7	78.0	19.0	664.0	26	0

Location	MW-105	MW-105	MW-105	MW-105	MW-105	MW-105	MW-105	MW-105	MW-105
Field Sample ID	CMR-MW105S-211006	CMR-MW105-220317	MW105-GW-220622	CMR-MW105-220831	CMR-MW-105-221213	CMR-MW-105-230321	CMR-MW-105-230627	CMR-MW-105-092023	CMR-MW-105-231207
Sample Method	Low Flow	Low Flow	Low Flow	Low Flow	Low Flow	Low Flow	Low Flow	Low Flow	Low Flow
Sample Date	10/6/2021	3/17/2022	6/22/2022	8/31/2022	########	3/21/2023	6/27/2023	9/20/2023	12/7/2023
FIELD PARAMETERS									
Specific Conductivity (Field Analysis)	1.99	1.98	2.16	2.19	2.25	2.16	0.00	---	2.06
Dissolved Oxygen	0.00	0.00	1.81	0.00	0.00	4.20	8.25	6.31	0.00
Oxidation Reduction Potential	-107	-81	-113	-53	49	121	144	98	-44
pH (Field Analysis)	7.57	7.36	7.31	6.10	7.14	7.32	6.30	7.12	7.91
Turbidity (Field Parameters)	2.7	0	12.9	0	139	0	369	---	0

Location	MW-106	MW-106	MW-106	MW-106	MW-106	MW-106	MW-106	MW-106	MW-106
Field Sample ID	CMR-MW106-	CMR-MW106-	MW106-GW-220622	CMR-MW106-	CMR-MW-106-221213	CMR-MW-106-230321	CMR-MW-106-230628	CMR-MW-106-092023	CMR-MW-106-231207
Sample Method	Low Flow	Low Flow	Low Flow	Low Flow	Low Flow	Low Flow	Low Flow	Low Flow	Low Flow
Sample Date	10/5/2021	3/16/2022	6/22/2022	8/31/2022	########	3/21/2023	6/28/2023	9/20/2023	12/7/2023
FIELD PARAMETERS									
Specific Conductivity (Field Analysis)	6.91	2.01	2.35	2.28	2.29	2.09	0.00	2.18	2.23
Dissolved Oxygen	0.00	0.02	0.85	0.00	8.16	2.90	9.03	0.00	0.00
Oxidation Reduction Potential	13	14	17	34	31	39	47	-127	-79
pH (Field Analysis)	8.07	7.50	7.27	6.57	7.54	7.23	6.74	7.35	7.82
Turbidity (Field Parameters)	3.1	0	101	423	90	0	519	159	0

Abbreviations:
NTU -- Nephelometric Turbidity unit,
mg/L -- milligram per liter
mS/cm -- millisiemens per centimeter
mV -- millivolt

Table 6
Summary of Groundwater Analytical Results - Biodegradation Indicators
Calumet Montana Refining, LLC - Great Falls, Montana

Location	MW-106	MW-106	MW-106	MW-106	MW-106
Field Sample ID	MR-MW106-211005	MW106-GW-220622	6-221213-L1569525	MR-MW-106-280623	6-231207-L1685777
Lab Sample ID	WJ08009-001	XF23073-002	XL14017-002	YF29005-001	L1685777-02
Sample Method	Low Flow	Low Flow	Low Flow	Low Flow	Low Flow
Sample Date	10/5/2021	6/22/2022	12/13/2022	6/28/2023	12/7/2023
Comments					
Attenuation Parameters					
Alkalinity [MG CACO3/L]	500 (20)	830 (20)	120 (20)	1000 (20)	---
BOD (FIVE DAY)	13000 (180)	26000 7 (180)	U (180)	2800 (180)	9610 (3330)
Carbon Dioxide	470000 (27000)	810000 (27000)	110000 (27000)	960000 (27000)	126000 (6670)
Iron	65 B (13)	15 J (13)	130 (13)	1300 B (130)	3030 (28.1)
Iron (dissolved)	36 J (13)	130 J (130)	U (13)	1200 (130)	3180 (28.1)
Manganese	1400 (13)	880 (1.3)	1700 (13)	2700 (13)	2490 (0.704)
Manganese (dissolved)	1400 (13)	890 (13)	1500 (13)	2800 (13)	2700 (0.704)
Nitrate (as N)	210000 (500)	4700 B (5)	750 H (50)	12000 H (25)	480 (48)
Sulfate	2900000 (25000)	210000 (13000)	140000 (250)	410000 (1300)	129000 (594)
Methane	5.8 J (2.5)	62 B (2.5)	110 (2.5)	71 (2.5)	252 (2.91)

Notes:
1 All concentrations are presented in ug/L except where otherwise noted.
2 Only compounds with at least one detection are shown.

Abbreviations:
U -- Not Detected.
J -- Estimated Concentration.
H -- Hold Time Exceeded.
7 -- Result Biased Low.
( ) -- Reporting Detection Limit.

APPENDIX A
LABORATORY ANALYTICAL REPORTS

A1: Dual-Phase Extraction Vapor Analytical Results

A2: Dual-Phase Extraction Effluent Liquid Analytical Results

A3: Passive Treatment Trench Groundwater Analytical Results

APPENDIX A1

DUAL-PHASE EXTRACTION VAPOR ANALYTICAL RESULTS

Pace Project Numbers:

L1666140, L1691710

ANALYTICAL REPORT

October 25, 2023

Ramboll - Chicago, IL

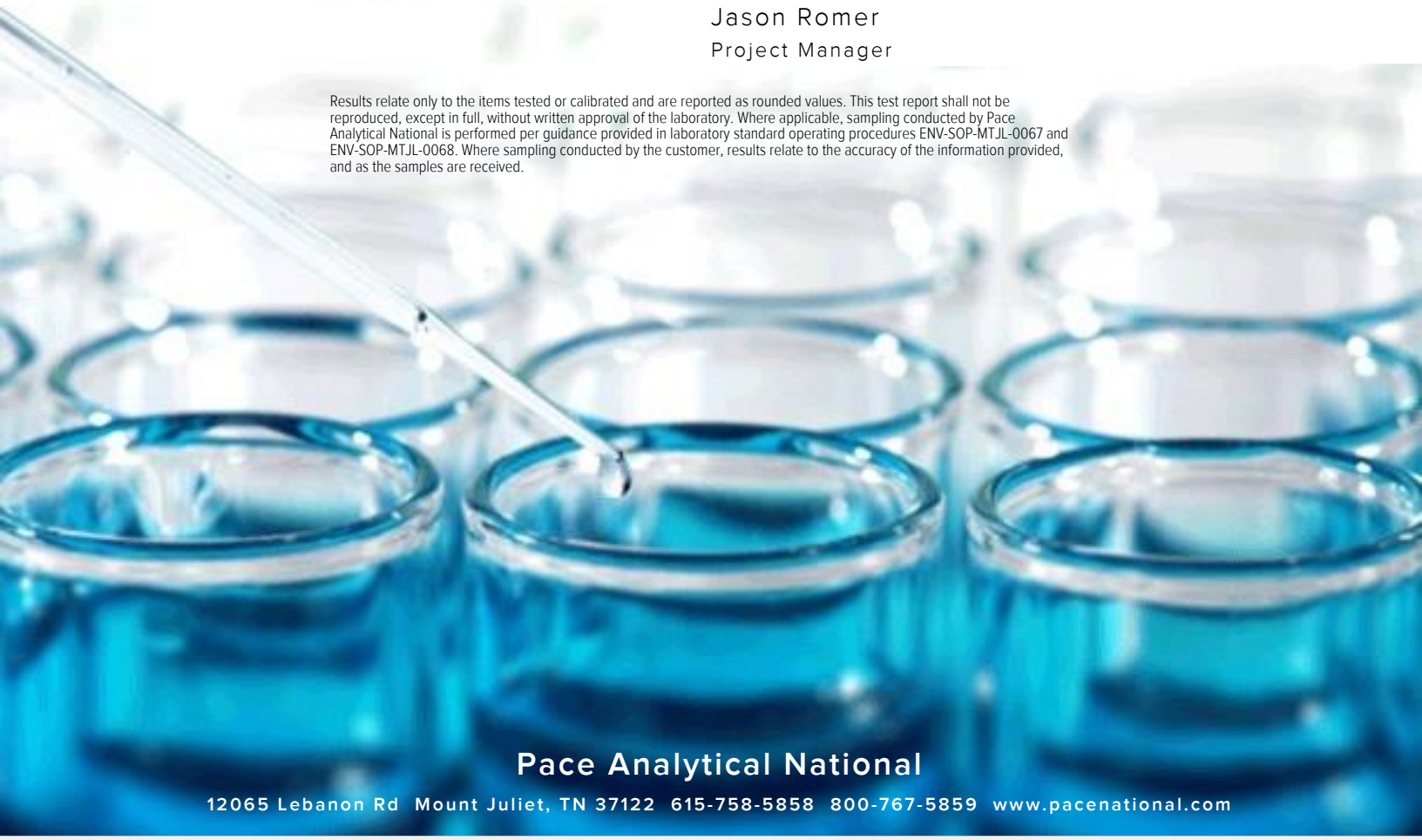
Sample Delivery Group:	L1666140
Samples Received:	10/13/2023
Project Number:	1690029636-002AOC-16
Description:	Calumet Montana Refinery

Report To:

Ruta Deshpande
333 West Wacker Drive
Suite 2700
Chicago, IL 60606

Entire Report Reviewed By:

Jason Romer
Project Manager



Pace Analytical National
12065 Lebanon Rd Mount Juliet, TN 37122 615-758-5858 800-767-5859 www.pacenational.com

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SAMPLE SUMMARY

CMR-SB-301-101223 L1666140-01 Air

Collected by: Eric Poissant
Collected date/time: 10/12/23 10:15
Received date/time: 10/13/23 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (MS) by Method TO-15	WG2155233	1	10/20/23 20:03	10/20/23 20:03	JAP	Mt. Juliet, TN
Volatile Organic Compounds (MS) by Method TO-15	WG2157093	400	10/24/23 19:20	10/24/23 19:20	DAH	Mt. Juliet, TN

CASE NARRATIVE

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Jason Romer
Project Manager

Volatile Organic Compounds (MS) by Method TO-15

Analyte	CAS #	Mol. Wt.	RDL1 ppbv	RDL2 ug/m3	Result ppbv	Result ug/m3	Qualifier	Dilution	Batch
Acetone	67-64-1	58.10	1.25	2.97	ND	ND		1	WG2155233
Allyl chloride	107-05-1	76.53	0.200	0.626	ND	ND		1	WG2155233
Benzene	71-43-2	78.10	80.0	256	8040	25700		400	WG2157093
Benzyl Chloride	100-44-7	127	80.0	416	ND	ND		400	WG2157093
Bromodichloromethane	75-27-4	164	0.200	1.34	ND	ND		1	WG2155233
Bromoform	75-25-2	253	240	2480	ND	ND		400	WG2157093
Bromomethane	74-83-9	94.90	0.200	0.776	ND	ND		1	WG2155233
1,3-Butadiene	106-99-0	54.10	2.00	4.43	ND	ND		1	WG2155233
Carbon disulfide	75-15-0	76.10	0.200	0.622	9.05	28.2		1	WG2155233
Carbon tetrachloride	56-23-5	154	0.200	1.26	ND	ND		1	WG2155233
Chlorobenzene	108-90-7	113	0.200	0.924	62.1	287		1	WG2155233
Chloroethane	75-00-3	64.50	0.200	0.528	0.602	1.59		1	WG2155233
Chloroform	67-66-3	119	0.200	0.973	ND	ND		1	WG2155233
Chloromethane	74-87-3	50.50	0.200	0.413	4.57	9.44		1	WG2155233
2-Chlorotoluene	95-49-8	126	80.0	412	ND	ND		400	WG2157093
Cyclohexane	110-82-7	84.20	80.0	276	1030	3550		400	WG2157093
Dibromochloromethane	124-48-1	208	0.200	1.70	ND	ND		1	WG2155233
1,2-Dibromoethane	106-93-4	188	0.200	1.54	ND	ND		1	WG2155233
1,2-Dichlorobenzene	95-50-1	147	80.0	481	ND	ND		400	WG2157093
1,3-Dichlorobenzene	541-73-1	147	80.0	481	ND	ND		400	WG2157093
1,4-Dichlorobenzene	106-46-7	147	80.0	481	ND	ND		400	WG2157093
1,2-Dichloroethane	107-06-2	99	0.200	0.810	4.37	17.7		1	WG2155233
1,1-Dichloroethane	75-34-3	98	0.200	0.802	ND	ND		1	WG2155233
1,1-Dichloroethene	75-35-4	96.90	0.200	0.793	ND	ND		1	WG2155233
cis-1,2-Dichloroethene	156-59-2	96.90	0.200	0.793	ND	ND		1	WG2155233
trans-1,2-Dichloroethene	156-60-5	96.90	0.200	0.793	ND	ND		1	WG2155233
1,2-Dichloropropane	78-87-5	113	0.200	0.924	ND	ND		1	WG2155233
cis-1,3-Dichloropropene	10061-01-5	111	0.200	0.908	ND	ND		1	WG2155233
trans-1,3-Dichloropropene	10061-02-6	111	0.200	0.908	ND	ND		1	WG2155233
1,4-Dioxane	123-91-1	88.10	0.630	2.27	ND	ND		1	WG2155233
Ethanol	64-17-5	46.10	2.50	4.71	22.4	42.2		1	WG2155233
Ethylbenzene	100-41-4	106	80.0	347	353	1530		400	WG2157093
4-Ethyltoluene	622-96-8	120	80.0	393	90.6	445		400	WG2157093
Trichlorofluoromethane	75-69-4	137.40	0.200	1.12	0.212	1.19		1	WG2155233
Dichlorodifluoromethane	75-71-8	120.92	0.200	0.989	0.326	1.61		1	WG2155233
1,1,2-Trichlorotrifluoroethane	76-13-1	187.40	0.200	1.53	0.265	2.03		1	WG2155233
1,2-Dichlorotetrafluoroethane	76-14-2	171	0.200	1.40	ND	ND		1	WG2155233
Heptane	142-82-5	100	80.0	327	929	3800		400	WG2157093
Hexachloro-1,3-butadiene	87-68-3	261	252	2690	ND	ND		400	WG2157093
n-Hexane	110-54-3	86.20	252	888	1660	5850		400	WG2157093
Isopropylbenzene	98-82-8	120.20	80.0	393	ND	ND		400	WG2157093
Methylene Chloride	75-09-2	84.90	0.200	0.694	ND	ND		1	WG2155233
Methyl Butyl Ketone	591-78-6	100	1.25	5.11	ND	ND		1	WG2155233
2-Butanone (MEK)	78-93-3	72.10	1.25	3.69	27.3	80.5		1	WG2155233
4-Methyl-2-pentanone (MIBK)	108-10-1	100.10	1.25	5.12	ND	ND		1	WG2155233
Methyl methacrylate	80-62-6	100.12	0.200	0.819	ND	ND		1	WG2155233
MTBE	1634-04-4	88.10	0.200	0.721	ND	ND		1	WG2155233
Naphthalene	91-20-3	128	252	1320	ND	ND		400	WG2157093
2-Propanol	67-63-0	60.10	1.25	3.07	7.09	17.4		1	WG2155233
Propene	115-07-1	42.10	1.25	2.15	70.9	122		1	WG2155233
Styrene	100-42-5	104	80.0	340	ND	ND		400	WG2157093
1,1,2,2-Tetrachloroethane	79-34-5	168	80.0	550	ND	ND		400	WG2157093
Tetrachloroethylene	127-18-4	166	0.200	1.36	ND	ND		1	WG2155233
Tetrahydrofuran	109-99-9	72.10	0.200	0.590	ND	ND		1	WG2155233
Toluene	108-88-3	92.10	200	753	ND	ND		400	WG2157093
1,2,4-Trichlorobenzene	120-82-1	181	252	1870	ND	ND		400	WG2157093

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Volatile Organic Compounds (MS) by Method TO-15

Analyte	CAS #	Mol. Wt.	RDL1 ppbv	RDL2 ug/m3	Result ppbv	Result ug/m3	Qualifier	Dilution	Batch
1,1,1-Trichloroethane	71-55-6	133	0.200	1.09	ND	ND		1	WG2155233
1,1,2-Trichloroethane	79-00-5	133	0.200	1.09	ND	ND		1	WG2155233
Trichloroethylene	79-01-6	131	0.200	1.07	ND	ND		1	WG2155233
1,2,4-Trimethylbenzene	95-63-6	120	80.0	393	162	795		400	WG2157093
1,3,5-Trimethylbenzene	108-67-8	120	80.0	393	145	712		400	WG2157093
2,2,4-Trimethylpentane	540-84-1	114.22	80.0	374	8180	38200		400	WG2157093
Vinyl chloride	75-01-4	62.50	0.200	0.511	ND	ND		1	WG2155233
Vinyl Bromide	593-60-2	106.95	0.200	0.875	ND	ND		1	WG2155233
Vinyl acetate	108-05-4	86.10	0.630	2.22	ND	ND		1	WG2155233
Xylenes, Total	1330-20-7	106.16	240	1040	2510	10900		400	WG2157093
m&p-Xylene	1330-20-7	106	160	694	2010	8710		400	WG2157093
o-Xylene	95-47-6	106	80.0	347	495	2150		400	WG2157093
(S) 1,4-Bromofluorobenzene	*460-00-4*	*175*	*60.0-140*		*226*		J1		WG2155233
(S) 1,4-Bromofluorobenzene	*460-00-4*	*175*	*60.0-140*		*98.3*				WG2157093

Sample Narrative:

L1666140-01 WG2155233: Surrogate failure due to matrix interference

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Method Blank (MB)

(MB) R3989636-3 10/20/23 12:47

Analyte	MB Result ppbv	MB Qualifier	MB MDL ppbv	MB RDL ppbv
Acetone	U		0.584	1.25
Allyl chloride	U		0.114	0.200
Bromodichloromethane	U		0.0702	0.200
Bromomethane	U		0.0982	0.200
1,3-Butadiene	U		0.104	2.00
Carbon disulfide	U		0.102	0.200
Carbon tetrachloride	U		0.0732	0.200
Chlorobenzene	U		0.0832	0.200
Chloroethane	U		0.0996	0.200
Chloroform	U		0.0717	0.200
Chloromethane	U		0.103	0.200
Dibromochloromethane	U		0.0727	0.200
1,2-Dibromoethane	U		0.0721	0.200
1,2-Dichloroethane	U		0.0700	0.200
1,1-Dichloroethane	U		0.0723	0.200
1,1-Dichloroethene	U		0.0762	0.200
cis-1,2-Dichloroethene	U		0.0784	0.200
trans-1,2-Dichloroethene	U		0.0673	0.200
1,2-Dichloropropane	U		0.0760	0.200
cis-1,3-Dichloropropene	U		0.0689	0.200
trans-1,3-Dichloropropene	U		0.0728	0.200
1,4-Dioxane	U		0.0833	0.630
Ethanol	0.458	J	0.265	2.50
Trichlorofluoromethane	U		0.0819	0.200
Dichlorodifluoromethane	U		0.137	0.200
1,1,2-Trichlorotrifluoroethane	U		0.0793	0.200
1,2-Dichlorotetrafluoroethane	U		0.0890	0.200
Methylene Chloride	0.114	J	0.0979	0.200
Methyl Butyl Ketone	U		0.133	1.25
2-Butanone (MEK)	U		0.0814	1.25
4-Methyl-2-pentanone (MIBK)	U		0.0765	1.25
Methyl methacrylate	U		0.0876	0.200
MTBE	U		0.0647	0.200
2-Propanol	U		0.264	1.25
Propene	U		0.0932	1.25
Tetrachloroethylene	U		0.0814	0.200
Tetrahydrofuran	U		0.0734	0.200
1,1,1-Trichloroethane	U		0.0736	0.200
1,1,2-Trichloroethane	U		0.0775	0.200
Trichloroethylene	U		0.0680	0.200

Method Blank (MB)

(MB) R3989636-3 10/20/23 12:47

Analyte	MB Result ppbv	MB Qualifier	MB MDL ppbv	MB RDL ppbv
Vinyl chloride	U		0.0949	0.200
Vinyl Bromide	U		0.0852	0.200
Vinyl acetate	U		0.116	0.630
(S) 1,4-Bromofluorobenzene	*99.4*			*60.0-140*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3989636-1 10/20/23 11:51 • (LCSD) R3989636-2 10/20/23 12:20

Analyte	Spike Amount ppbv	LCS Result ppbv	LCSD Result ppbv	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Acetone	3.75	3.86	3.81	103	102	70.0-130			1.30	25
Allyl chloride	3.75	3.76	3.76	100	100	70.0-130			0.000	25
Bromodichloromethane	3.75	3.74	3.66	99.7	97.6	70.0-130			2.16	25
Bromomethane	3.75	3.76	3.76	100	100	70.0-130			0.000	25
1,3-Butadiene	3.75	3.85	3.79	103	101	70.0-130			1.57	25
Carbon disulfide	3.75	4.24	4.19	113	112	70.0-130			1.19	25
Carbon tetrachloride	3.75	3.87	3.84	103	102	70.0-130			0.778	25
Chlorobenzene	3.75	3.71	3.62	98.9	96.5	70.0-130			2.46	25
Chloroethane	3.75	3.85	3.68	103	98.1	70.0-130			4.52	25
Chloroform	3.75	3.85	3.81	103	102	70.0-130			1.04	25
Chloromethane	3.75	3.80	3.72	101	99.2	70.0-130			2.13	25
Dibromochloromethane	3.75	3.86	3.77	103	101	70.0-130			2.36	25
1,2-Dibromoethane	3.75	3.78	3.75	101	100	70.0-130			0.797	25
1,2-Dichloroethane	3.75	3.82	3.69	102	98.4	70.0-130			3.46	25
1,1-Dichloroethane	3.75	3.78	3.73	101	99.5	70.0-130			1.33	25
1,1-Dichloroethene	3.75	3.89	3.78	104	101	70.0-130			2.87	25
cis-1,2-Dichloroethene	3.75	3.88	3.83	103	102	70.0-130			1.30	25
trans-1,2-Dichloroethene	3.75	3.81	3.70	102	98.7	70.0-130			2.93	25
1,2-Dichloropropane	3.75	3.69	3.62	98.4	96.5	70.0-130			1.92	25
cis-1,3-Dichloropropene	3.75	4.28	3.83	114	102	70.0-130			11.1	25
trans-1,3-Dichloropropene	3.75	3.86	3.83	103	102	70.0-130			0.780	25
1,4-Dioxane	3.75	4.31	4.04	115	108	70.0-140			6.47	25
Ethanol	3.75	4.16	4.10	111	109	55.0-148			1.45	25
Trichlorofluoromethane	3.75	3.83	3.79	102	101	70.0-130			1.05	25
Dichlorodifluoromethane	3.75	3.90	3.82	104	102	64.0-139			2.07	25
1,1,2-Trichlorotrifluoroethane	3.75	3.88	3.82	103	102	70.0-130			1.56	25
1,2-Dichlorotetrafluoroethane	3.75	3.93	3.82	105	102	70.0-130			2.84	25
Methylene Chloride	3.75	3.72	3.66	99.2	97.6	70.0-130			1.63	25
Methyl Butyl Ketone	3.75	4.13	4.02	110	107	70.0-149			2.70	25

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3989636-1 10/20/23 11:51 • (LCSD) R3989636-2 10/20/23 12:20

Analyte	Spike Amount ppbv	LCS Result ppbv	LCSD Result ppbv	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
2-Butanone (MEK)	3.75	3.92	3.88	105	103	70.0-130			1.03	25
4-Methyl-2-pentanone (MIBK)	3.75	3.74	3.76	99.7	100	70.0-139			0.533	25
Methyl methacrylate	3.75	3.97	3.93	106	105	70.0-130			1.01	25
MTBE	3.75	3.93	3.90	105	104	70.0-130			0.766	25
2-Propanol	3.75	3.86	3.85	103	103	70.0-139			0.259	25
Propene	3.75	3.88	3.75	103	100	64.0-144			3.41	25
Tetrachloroethylene	3.75	3.81	3.72	102	99.2	70.0-130			2.39	25
Tetrahydrofuran	3.75	4.04	4.05	108	108	70.0-137			0.247	25
1,1,1-Trichloroethane	3.75	3.82	3.76	102	100	70.0-130			1.58	25
1,1,2-Trichloroethane	3.75	3.64	3.67	97.1	97.9	70.0-130			0.821	25
Trichloroethylene	3.75	3.81	3.72	102	99.2	70.0-130			2.39	25
Vinyl chloride	3.75	3.84	3.73	102	99.5	70.0-130			2.91	25
Vinyl Bromide	3.75	3.85	3.84	103	102	70.0-130			0.260	25
Vinyl acetate	3.75	3.62	3.65	96.5	97.3	70.0-130			0.825	25
(S) 1,4-Bromofluorobenzene				*102*	*102*	*60.0-140*				

Method Blank (MB)

(MB) R3990729-2 10/24/23 10:26

Analyte	MB Result ppbv	MB Qualifier	MB MDL ppbv	MB RDL ppbv
Benzene	U		0.0715	0.200
Benzyl Chloride	U		0.0598	0.200
Bromoform	U		0.0732	0.600
2-Chlorotoluene	U		0.0828	0.200
Cyclohexane	U		0.0753	0.200
1,2-Dichlorobenzene	U		0.128	0.200
1,3-Dichlorobenzene	U		0.182	0.200
1,4-Dichlorobenzene	U		0.0557	0.200
Ethylbenzene	U		0.0835	0.200
4-Ethyltoluene	U		0.0783	0.200
Heptane	U		0.104	0.200
Hexachloro-1,3-butadiene	U		0.105	0.630
n-Hexane	U		0.206	0.630
Isopropylbenzene	U		0.0777	0.200
Naphthalene	U		0.350	0.630
Styrene	U		0.0788	0.200
1,1,2,2-Tetrachloroethane	U		0.0743	0.200
Toluene	U		0.0870	0.500
1,2,4-Trichlorobenzene	U		0.148	0.630
1,2,4-Trimethylbenzene	U		0.0764	0.200
1,3,5-Trimethylbenzene	U		0.0779	0.200
2,2,4-Trimethylpentane	U		0.133	0.200
Xylenes, Total	U		0.135	0.600
m&p-Xylene	U		0.135	0.400
o-Xylene	U		0.0828	0.200
(S) 1,4-Bromofluorobenzene	*87.5*			*60.0-140*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3990729-1 10/24/23 09:58 • (LCSD) R3990729-3 10/24/23 10:56

Analyte	Spike Amount ppbv	LCS Result ppbv	LCSD Result ppbv	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Benzene	3.75	3.90	3.87	104	103	70.0-130			0.772	25
Benzyl Chloride	3.75	2.69	2.89	71.7	77.1	70.0-152			7.17	25
Bromoform	3.75	2.68	2.80	71.5	74.7	70.0-130			4.38	25
2-Chlorotoluene	3.75	3.80	3.97	101	106	70.0-130			4.38	25
Cyclohexane	3.75	4.55	3.94	121	105	70.0-130			14.4	25
1,2-Dichlorobenzene	3.75	3.79	4.00	101	107	70.0-130			5.39	25
1,3-Dichlorobenzene	3.75	3.68	4.08	98.1	109	70.0-130			10.3	25

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3990729-1 10/24/23 09:58 • (LCSD) R3990729-3 10/24/23 10:56

Analyte	Spike Amount ppbv	LCS Result ppbv	LCSD Result ppbv	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
1,4-Dichlorobenzene	3.75	3.74	4.11	99.7	110	70.0-130			9.43	25
Ethylbenzene	3.75	3.63	3.77	96.8	101	70.0-130			3.78	25
4-Ethyltoluene	3.75	3.95	4.21	105	112	70.0-130			6.37	25
Heptane	3.75	4.08	4.05	109	108	70.0-130			0.738	25
Hexachloro-1,3-butadiene	3.75	3.46	3.66	92.3	97.6	70.0-151			5.62	25
n-Hexane	3.75	3.87	3.92	103	105	70.0-130			1.28	25
Isopropylbenzene	3.75	3.62	3.81	96.5	102	70.0-130			5.11	25
Naphthalene	3.75	3.93	4.11	105	110	70.0-159			4.48	25
Styrene	3.75	3.83	3.99	102	106	70.0-130			4.09	25
1,1,2,2-Tetrachloroethane	3.75	3.80	3.41	101	90.9	70.0-130			10.8	25
Toluene	3.75	3.70	3.53	98.7	94.1	70.0-130			4.70	25
1,2,4-Trichlorobenzene	3.75	3.67	3.78	97.9	101	70.0-160			2.95	25
1,2,4-Trimethylbenzene	3.75	3.90	4.25	104	113	70.0-130			8.59	25
1,3,5-Trimethylbenzene	3.75	3.92	4.22	105	113	70.0-130			7.37	25
2,2,4-Trimethylpentane	3.75	4.70	4.03	125	107	70.0-130			15.3	25
Xylenes, Total	11.3	11.1	11.1	98.2	98.2	70.0-130			0.000	25
m&p-Xylene	7.50	7.24	7.46	96.5	99.5	70.0-130			2.99	25
o-Xylene	3.75	3.85	3.62	103	96.5	70.0-130			6.16	25
(S) 1,4-Bromofluorobenzene				*96.5*	*100*	*60.0-140*				

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

GLOSSARY OF TERMS

Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state “ND” (Not Detected) or “BDL” (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

Qualifier	Description
J	The identification of the analyte is acceptable; the reported value is an estimate.
J1	Surrogate recovery limits have been exceeded; values are outside upper control limits.

ACCREDITATIONS & LOCATIONS

Pace Analytical National 12065 Lebanon Rd Mount Juliet, TN 37122

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN000032021-1
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey–NELAP	TN002
California	2932	New Mexico [1]	TN00003
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina [1]	DW21704
Georgia	NELAP	North Carolina [3]	41
Georgia [1]	923	North Dakota	R-140
Idaho	TN00003	Ohio–VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LAO000356
Kentucky [1 6]	KY90010	South Carolina	84004002
Kentucky [2]	16	South Dakota	n/a
Louisiana	AI30792	Tennessee [1 4]	2006
Louisiana	LA018	Texas	T104704245-20-18
Maine	TN00003	Texas [5]	LAB0152
Maryland	324	Utah	TN000032021-11
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	110033
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	998093910
Montana	CERT0086	Wyoming	A2LA
A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 [5]	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA–Crypto	TN00003		

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [6] Wastewater n/a Accreditation not applicable

* Not all certifications held by the laboratory are applicable to the results reported in the attached report.

* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace Analytical.

Company Name/Address:
Ramboll - Chicago, IL

333 West Wacker Drive

Suite 2700

Billing Information:
Ruta Deshpande
333 West Wacker Drive

Suite 2700
Chicago, IL 60606

Report To:
Ruta Deshpande

Email To:
rdeshpande@ramboll.com;eleister@ramboll.com;ASMALL@ramboll.com;EDDPrinceton@ramboll.com

Project Description: Calumet Montana Refining

City/State Collected: Great Falls MT

Please Circle: PT MT CT ET

Phone: **312-288-3854**

Client Project #: **1690029636-002AOC-16**

Lab Project #: **RAMBOLLCIL-169002963**

Collected by (print): Eric Boissat

Site/Facility ID #

P.O. #

Collected by (signature):

Rush? (Lab MUST Be Notified)
___ Same Day ___ Three Day
___ Next Day ___ Five Day
___ Two Day

Date Results Needed: Standard

Sample ID	Can #	Flow Cont. #	Collection Date	Collection Time	Canister Pressure/Vacuum Initial	Canister Pressure/Vacuum Final
CMR-SG301-101223	24608	011046	10-12-23	1015	28	4

Sample Receipt Checklist
COC Seal Present/Intact: __Y__N
COC Signed/Accurate: __Y__N
Bottles arrive intact: __Y__N
Correct bottles used: __Y__N
Sufficient volume sent: __Y__N
RA Screen <0.5 mR/hr: __Y__N
If Applicable
VOA Zero Headspace: __Y__N
Pres. Correct/Check: __Y__N
Trk# 6040 5551 2852

Analysis
TO-15 Summa

Chain of Custody Page ___ of ___

Pace
PEOPLE ADVANCING SCIENCE
MT JULIET, TN
12065 Lebanon Road Mt Juliet, TN 37122
Phone: 615-758-5858 Alt: 800-767-5859
Submitting a sample via this chain of custody constitutes acknowledgment and acceptance of the Pace Terms and Conditions found at: https://info.pacelabs.com/hubfs/pas-standard-terms.pdf

SDG # L1666140
G007

Acctnum: **RAMBOLLCIL**
Template: **T224808**
Prelogin: **P1004778**
PM: **3828 - Jennifer A McCurdy**
PB: AD 7-11-23
Shipped Via: **FedEx Ground**

Rem./Contaminant	Sample # (lab only)
	01

Remarks:

Relinquished by : (Signature): Employee Ramboll — Date: 10-12-23 — Time: 1200

Relinquished by : (Signature) — Date: — Time:

Relinquished by : (Signature) — Date: — Time:

Samples returned via: __ UPS X FedEx __ Courier __ _____

Received by: (Signature)

Received by: (Signature): Brendan Hegyesi — Date: 10/13/23 — Time: 0900

Received for lab by: (Signature) — Date: — Time:

Tracking #

Date: — Time:

Hold #

Condition: (lab use only) U

COC Seal Intact: ___Y ___N ___NA

NCF:

ANALYTICAL REPORT

January 09, 2024

Ramboll - Chicago, IL

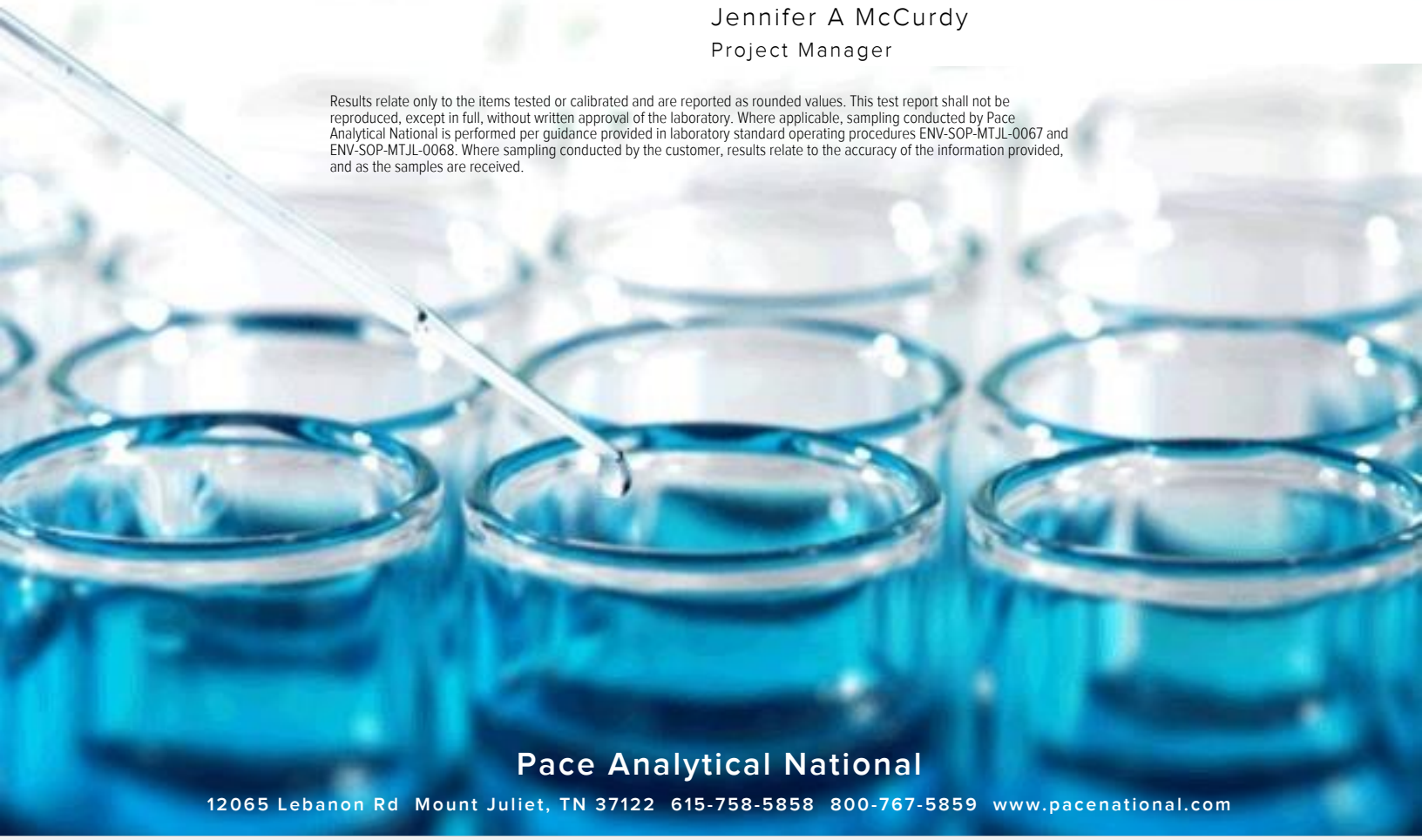
Sample Delivery Group:	L1691710
Samples Received:	12/28/2023
Project Number:	1690029636-002AOC-16
Description:	Calumet Refinery

Report To:

Ruta Deshpande
333 West Wacker Drive
Suite 2700
Chicago, IL 60606

Entire Report Reviewed By:

Jennifer A McCurdy
Project Manager



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SAMPLE SUMMARY

CMR-SP301-122723 L1691710-01 Air

Collected by: Mike Gipson
Collected date/time: 12/27/23 16:18
Received date/time: 12/28/23 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (MS) by Method TO-15	WG2199884	1	01/03/24 21:02	01/03/24 21:02	DAH	Mt. Juliet, TN
Volatile Organic Compounds (MS) by Method TO-15	WG2201498	20	01/05/24 21:22	01/05/24 21:22	DAH	Mt. Juliet, TN

CASE NARRATIVE

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Jennifer A McCurdy
Project Manager

Volatile Organic Compounds (MS) by Method TO-15

Analyte	CAS #	Mol. Wt.	RDL1 ppbv	RDL2 ug/m3	Result ppbv	Result ug/m3	Qualifier	Dilution	Batch
Acetone	67-64-1	58.10	1.25	2.97	ND	ND		1	WG2199884
Allyl chloride	107-05-1	76.53	0.200	0.626	ND	ND		1	WG2199884
Benzene	71-43-2	78.10	4.00	12.8	109	348		20	WG2201498
Benzyl Chloride	100-44-7	127	0.200	1.04	ND	ND		1	WG2199884
Bromodichloromethane	75-27-4	164	0.200	1.34	ND	ND		1	WG2199884
Bromoform	75-25-2	253	0.600	6.21	ND	ND		1	WG2199884
Bromomethane	74-83-9	94.90	0.200	0.776	ND	ND		1	WG2199884
1,3-Butadiene	106-99-0	54.10	2.00	4.43	ND	ND		1	WG2199884
Carbon disulfide	75-15-0	76.10	0.200	0.622	0.673	2.09		1	WG2199884
Carbon tetrachloride	56-23-5	154	0.200	1.26	ND	ND		1	WG2199884
Chlorobenzene	108-90-7	113	0.200	0.924	ND	ND		1	WG2199884
Chloroethane	75-00-3	64.50	0.200	0.528	ND	ND		1	WG2199884
Chloroform	67-66-3	119	0.200	0.973	ND	ND		1	WG2199884
Chloromethane	74-87-3	50.50	0.200	0.413	ND	ND		1	WG2199884
2-Chlorotoluene	95-49-8	126	0.200	1.03	ND	ND		1	WG2199884
Cyclohexane	110-82-7	84.20	4.00	13.8	139	479		20	WG2201498
Dibromochloromethane	124-48-1	208	0.200	1.70	ND	ND		1	WG2199884
1,2-Dibromoethane	106-93-4	188	0.200	1.54	ND	ND		1	WG2199884
1,2-Dichlorobenzene	95-50-1	147	0.200	1.20	ND	ND		1	WG2199884
1,3-Dichlorobenzene	541-73-1	147	0.200	1.20	ND	ND		1	WG2199884
1,4-Dichlorobenzene	106-46-7	147	0.200	1.20	ND	ND		1	WG2199884
1,2-Dichloroethane	107-06-2	99	0.200	0.810	ND	ND		1	WG2199884
1,1-Dichloroethane	75-34-3	98	0.200	0.802	ND	ND		1	WG2199884
1,1-Dichloroethene	75-35-4	96.90	0.200	0.793	ND	ND		1	WG2199884
cis-1,2-Dichloroethene	156-59-2	96.90	0.200	0.793	ND	ND		1	WG2199884
trans-1,2-Dichloroethene	156-60-5	96.90	0.200	0.793	2.37	9.39		1	WG2199884
1,2-Dichloropropane	78-87-5	113	0.200	0.924	ND	ND		1	WG2199884
cis-1,3-Dichloropropene	10061-01-5	111	0.200	0.908	ND	ND		1	WG2199884
trans-1,3-Dichloropropene	10061-02-6	111	0.200	0.908	ND	ND		1	WG2199884
1,4-Dioxane	123-91-1	88.10	0.630	2.27	ND	ND		1	WG2199884
Ethanol	64-17-5	46.10	2.50	4.71	22.7	42.8		1	WG2199884
Ethylbenzene	100-41-4	106	0.200	0.867	23.1	100		1	WG2199884
4-Ethyltoluene	622-96-8	120	0.200	0.982	5.57	27.3		1	WG2199884
Trichlorofluoromethane	75-69-4	137.40	0.200	1.12	0.226	1.27		1	WG2199884
Dichlorodifluoromethane	75-71-8	120.92	0.200	0.989	0.400	1.98		1	WG2199884
1,1,2-Trichlorotrifluoroethane	76-13-1	187.40	0.200	1.53	ND	ND		1	WG2199884
1,2-Dichlorotetrafluoroethane	76-14-2	171	0.200	1.40	ND	ND		1	WG2199884
Heptane	142-82-5	100	4.00	16.4	44.5	182		20	WG2201498
Hexachloro-1,3-butadiene	87-68-3	261	0.630	6.73	ND	ND		1	WG2199884
n-Hexane	110-54-3	86.20	12.6	44.4	112	395		20	WG2201498
Isopropylbenzene	98-82-8	120.20	0.200	0.983	ND	ND		1	WG2199884
Methylene Chloride	75-09-2	84.90	0.200	0.694	ND	ND		1	WG2199884
Methyl Butyl Ketone	591-78-6	100	1.25	5.11	ND	ND		1	WG2199884
2-Butanone (MEK)	78-93-3	72.10	1.25	3.69	3.58	10.6		1	WG2199884
4-Methyl-2-pentanone (MIBK)	108-10-1	100.10	1.25	5.12	ND	ND		1	WG2199884
Methyl methacrylate	80-62-6	100.12	0.200	0.819	ND	ND		1	WG2199884
MTBE	1634-04-4	88.10	0.200	0.721	ND	ND		1	WG2199884
Naphthalene	91-20-3	128	0.630	3.30	ND	ND		1	WG2199884
2-Propanol	67-63-0	60.10	1.25	3.07	3.98	9.78		1	WG2199884
Propene	115-07-1	42.10	1.25	2.15	ND	ND		1	WG2199884
Styrene	100-42-5	104	0.200	0.851	ND	ND		1	WG2199884
1,1,2,2-Tetrachloroethane	79-34-5	168	0.200	1.37	ND	ND		1	WG2199884
Tetrachloroethylene	127-18-4	166	0.200	1.36	ND	ND		1	WG2199884
Tetrahydrofuran	109-99-9	72.10	0.200	0.590	ND	ND		1	WG2199884
Toluene	108-88-3	92.10	0.500	1.88	ND	ND		1	WG2199884
1,2,4-Trichlorobenzene	120-82-1	181	0.630	4.66	ND	ND		1	WG2199884

Volatile Organic Compounds (MS) by Method TO-15

Analyte	CAS #	Mol. Wt.	RDL1 ppbv	RDL2 ug/m3	Result ppbv	Result ug/m3	Qualifier	Dilution	Batch
1,1,1-Trichloroethane	71-55-6	133	0.200	1.09	ND	ND		1	WG2199884
1,1,2-Trichloroethane	79-00-5	133	0.200	1.09	ND	ND		1	WG2199884
Trichloroethylene	79-01-6	131	0.200	1.07	ND	ND		1	WG2199884
1,2,4-Trimethylbenzene	95-63-6	120	0.200	0.982	12.1	59.4		1	WG2199884
1,3,5-Trimethylbenzene	108-67-8	120	0.200	0.982	15.3	75.1		1	WG2199884
2,2,4-Trimethylpentane	540-84-1	114.22	4.00	18.7	1710	7990		20	WG2201498
Vinyl chloride	75-01-4	62.50	0.200	0.511	ND	ND		1	WG2199884
Vinyl Bromide	593-60-2	106.95	0.200	0.875	ND	ND		1	WG2199884
Vinyl acetate	108-05-4	86.10	0.630	2.22	ND	ND		1	WG2199884
Xylenes, Total	1330-20-7	106.16	0.600	2.61	173	751		1	WG2199884
m&p-Xylene	179601-23-1	106	0.400	1.73	136	590		1	WG2199884
o-Xylene	95-47-6	106	0.200	0.867	37.3	162		1	WG2199884
(S) 1,4-Bromofluorobenzene	*460-00-4*	*175*	*60.0-140*		*144*		J1		WG2199884
(S) 1,4-Bromofluorobenzene	*460-00-4*	*175*	*60.0-140*		*99.6*				WG2201498

Sample Narrative:

L1691710-01 WG2199884: Surrogate failure due to matrix interference

Method Blank (MB)

(MB) R4019592-3 01/03/24 10:44

Analyte	MB Result ppbv	MB Qualifier	MB MDL ppbv	MB RDL ppbv
Acetone	U		0.584	1.25
Allyl chloride	U		0.114	0.200
Benzyl Chloride	U		0.0598	0.200
Bromodichloromethane	U		0.0702	0.200
Bromoform	U		0.0732	0.600
Bromomethane	U		0.0982	0.200
1,3-Butadiene	U		0.104	2.00
Carbon disulfide	U		0.102	0.200
Carbon tetrachloride	U		0.0732	0.200
Chlorobenzene	U		0.0832	0.200
Chloroethane	U		0.0996	0.200
Chloroform	U		0.0717	0.200
Chloromethane	U		0.103	0.200
2-Chlorotoluene	U		0.0828	0.200
Dibromochloromethane	U		0.0727	0.200
1,2-Dibromoethane	U		0.0721	0.200
1,2-Dichlorobenzene	U		0.128	0.200
1,3-Dichlorobenzene	U		0.182	0.200
1,4-Dichlorobenzene	U		0.0557	0.200
1,2-Dichloroethane	U		0.0700	0.200
1,1-Dichloroethane	U		0.0723	0.200
1,1-Dichloroethene	U		0.0762	0.200
cis-1,2-Dichloroethene	U		0.0784	0.200
trans-1,2-Dichloroethene	U		0.0673	0.200
1,2-Dichloropropane	U		0.0760	0.200
cis-1,3-Dichloropropene	U		0.0689	0.200
trans-1,3-Dichloropropene	U		0.0728	0.200
1,4-Dioxane	U		0.0833	0.630
Ethanol	0.377	J	0.265	2.50
Ethylbenzene	U		0.0835	0.200
4-Ethyltoluene	U		0.0783	0.200
Trichlorofluoromethane	U		0.0819	0.200
Dichlorodifluoromethane	U		0.137	0.200
1,1,2-Trichlorotrifluoroethane	U		0.0793	0.200
1,2-Dichlorotetrafluoroethane	U		0.0890	0.200
Hexachloro-1,3-butadiene	U		0.105	0.630
Isopropylbenzene	U		0.0777	0.200
Methylene Chloride	U		0.0979	0.200
Methyl Butyl Ketone	U		0.133	1.25
2-Butanone (MEK)	U		0.0814	1.25

Method Blank (MB)

(MB) R4019592-3 01/03/24 10:44

Analyte	MB Result ppbv	MB Qualifier	MB MDL ppbv	MB RDL ppbv
4-Methyl-2-pentanone (MIBK)	U		0.0765	1.25
Methyl methacrylate	U		0.0876	0.200
MTBE	U		0.0647	0.200
Naphthalene	U		0.350	0.630
2-Propanol	U		0.264	1.25
Propene	U		0.0932	1.25
Styrene	U		0.0788	0.200
1,1,2,2-Tetrachloroethane	U		0.0743	0.200
Tetrachloroethylene	U		0.0814	0.200
Tetrahydrofuran	U		0.0734	0.200
Toluene	U		0.0870	0.500
1,2,4-Trichlorobenzene	U		0.148	0.630
1,1,1-Trichloroethane	U		0.0736	0.200
1,1,2-Trichloroethane	U		0.0775	0.200
Trichloroethylene	U		0.0680	0.200
1,2,4-Trimethylbenzene	U		0.0764	0.200
1,3,5-Trimethylbenzene	U		0.0779	0.200
Vinyl chloride	U		0.0949	0.200
Vinyl Bromide	U		0.0852	0.200
Vinyl acetate	U		0.116	0.630
Xylenes, Total	U		0.135	0.600
m&p-Xylene	U		0.135	0.400
o-Xylene	U		0.0828	0.200
(S) 1,4-Bromofluorobenzene	*93.3*			*60.0-140*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R4019592-1 01/03/24 08:38 • (LCSD) R4019592-2 01/03/24 09:07

Analyte	Spike Amount ppbv	LCS Result ppbv	LCSD Result ppbv	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Acetone	3.75	3.72	3.77	99.2	101	70.0-130			1.34	25
Allyl chloride	3.75	3.73	3.60	99.5	96.0	70.0-130			3.55	25
Benzyl Chloride	3.75	3.64	3.58	97.1	95.5	70.0-152			1.66	25
Bromodichloromethane	3.75	3.52	3.47	93.9	92.5	70.0-130			1.43	25
Bromoform	3.75	3.55	3.51	94.7	93.6	70.0-130			1.13	25
Bromomethane	3.75	3.65	3.57	97.3	95.2	70.0-130			2.22	25
1,3-Butadiene	3.75	3.57	3.56	95.2	94.9	70.0-130			0.281	25
Carbon disulfide	3.75	4.21	4.13	112	110	70.0-130			1.92	25
Carbon tetrachloride	3.75	3.61	3.60	96.3	96.0	70.0-130			0.277	25

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R4019592-1 01/03/24 08:38 • (LCSD) R4019592-2 01/03/24 09:07

Analyte	Spike Amount ppbv	LCS Result ppbv	LCSD Result ppbv	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Chlorobenzene	3.75	3.67	3.63	97.9	96.8	70.0-130			1.10	25
Chloroethane	3.75	3.65	3.57	97.3	95.2	70.0-130			2.22	25
Chloroform	3.75	3.70	3.72	98.7	99.2	70.0-130			0.539	25
Chloromethane	3.75	3.56	3.54	94.9	94.4	70.0-130			0.563	25
2-Chlorotoluene	3.75	3.81	3.76	102	100	70.0-130			1.32	25
Dibromochloromethane	3.75	3.52	3.54	93.9	94.4	70.0-130			0.567	25
1,2-Dibromoethane	3.75	3.71	3.65	98.9	97.3	70.0-130			1.63	25
1,2-Dichlorobenzene	3.75	3.77	3.66	101	97.6	70.0-130			2.96	25
1,3-Dichlorobenzene	3.75	3.86	3.79	103	101	70.0-130			1.83	25
1,4-Dichlorobenzene	3.75	3.86	3.84	103	102	70.0-130			0.519	25
1,2-Dichloroethane	3.75	3.62	3.55	96.5	94.7	70.0-130			1.95	25
1,1-Dichloroethane	3.75	3.72	3.61	99.2	96.3	70.0-130			3.00	25
1,1-Dichloroethene	3.75	3.72	3.70	99.2	98.7	70.0-130			0.539	25
cis-1,2-Dichloroethene	3.75	3.90	3.83	104	102	70.0-130			1.81	25
trans-1,2-Dichloroethene	3.75	3.79	3.72	101	99.2	70.0-130			1.86	25
1,2-Dichloropropane	3.75	3.59	3.54	95.7	94.4	70.0-130			1.40	25
cis-1,3-Dichloropropene	3.75	3.63	3.83	96.8	102	70.0-130			5.36	25
trans-1,3-Dichloropropene	3.75	3.76	3.68	100	98.1	70.0-130			2.15	25
1,4-Dioxane	3.75	3.97	3.77	106	101	70.0-140			5.17	25
Ethanol	3.75	3.61	3.52	96.3	93.9	55.0-148			2.52	25
Ethylbenzene	3.75	3.92	3.86	105	103	70.0-130			1.54	25
4-Ethyltoluene	3.75	4.07	3.96	109	106	70.0-130			2.74	25
Trichlorofluoromethane	3.75	3.64	3.64	97.1	97.1	70.0-130			0.000	25
Dichlorodifluoromethane	3.75	3.67	3.62	97.9	96.5	64.0-139			1.37	25
1,1,2-Trichlorotrifluoroethane	3.75	3.71	3.70	98.9	98.7	70.0-130			0.270	25
1,2-Dichlorotetrafluoroethane	3.75	3.62	3.68	96.5	98.1	70.0-130			1.64	25
Hexachloro-1,3-butadiene	3.75	3.52	3.55	93.9	94.7	70.0-151			0.849	25
Isopropylbenzene	3.75	3.83	3.81	102	102	70.0-130			0.524	25
Methylene Chloride	3.75	3.63	3.64	96.8	97.1	70.0-130			0.275	25
Methyl Butyl Ketone	3.75	3.94	3.92	105	105	70.0-149			0.509	25
2-Butanone (MEK)	3.75	4.05	3.93	108	105	70.0-130			3.01	25
4-Methyl-2-pentanone (MIBK)	3.75	3.89	3.99	104	106	70.0-139			2.54	25
Methyl methacrylate	3.75	3.84	3.82	102	102	70.0-130			0.522	25
MTBE	3.75	4.09	3.93	109	105	70.0-130			3.99	25
Naphthalene	3.75	4.02	3.99	107	106	70.0-159			0.749	25
2-Propanol	3.75	3.76	3.66	100	97.6	70.0-139			2.70	25
Propene	3.75	3.69	3.69	98.4	98.4	64.0-144			0.000	25
Styrene	3.75	3.93	3.90	105	104	70.0-130			0.766	25
1,1,2,2-Tetrachloroethane	3.75	3.74	3.66	99.7	97.6	70.0-130			2.16	25
Tetrachloroethylene	3.75	3.62	3.60	96.5	96.0	70.0-130			0.554	25

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R4019592-1 01/03/24 08:38 • (LCSD) R4019592-2 01/03/24 09:07

Analyte	Spike Amount ppbv	LCS Result ppbv	LCSD Result ppbv	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Tetrahydrofuran	3.75	4.03	4.01	107	107	70.0-137			0.498	25
Toluene	3.75	3.82	3.81	102	102	70.0-130			0.262	25
1,2,4-Trichlorobenzene	3.75	3.81	3.82	102	102	70.0-160			0.262	25
1,1,1-Trichloroethane	3.75	3.69	3.64	98.4	97.1	70.0-130			1.36	25
1,1,2-Trichloroethane	3.75	3.54	3.58	94.4	95.5	70.0-130			1.12	25
Trichloroethylene	3.75	3.68	3.65	98.1	97.3	70.0-130			0.819	25
1,2,4-Trimethylbenzene	3.75	3.95	3.98	105	106	70.0-130			0.757	25
1,3,5-Trimethylbenzene	3.75	3.97	3.90	106	104	70.0-130			1.78	25
Vinyl chloride	3.75	3.64	3.57	97.1	95.2	70.0-130			1.94	25
Vinyl Bromide	3.75	3.69	3.67	98.4	97.9	70.0-130			0.543	25
Vinyl acetate	3.75	3.61	3.55	96.3	94.7	70.0-130			1.68	25
Xylenes, Total	11.3	12.0	11.8	106	104	70.0-130			1.68	25
m&p-Xylene	7.50	7.92	7.84	106	105	70.0-130			1.02	25
o-Xylene	3.75	4.04	3.95	108	105	70.0-130			2.25	25
(S) 1,4-Bromofluorobenzene				*101*	*99.5*	*60.0-140*				

Method Blank (MB)

(MB) R4020307-3 01/05/24 10:32

Analyte	MB Result ppbv	MB Qualifier	MB MDL ppbv	MB RDL ppbv
Benzene	U		0.0715	0.200
Cyclohexane	U		0.0753	0.200
Heptane	U		0.104	0.200
n-Hexane	U		0.206	0.630
2,2,4-Trimethylpentane	U		0.133	0.200
(S) 1,4-Bromofluorobenzene	*83.1*			*60.0-140*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R4020307-1 01/05/24 09:30 • (LCSD) R4020307-2 01/05/24 10:02

Analyte	Spike Amount ppbv	LCS Result ppbv	LCSD Result ppbv	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Benzene	3.75	3.98	3.85	106	103	70.0-130			3.32	25
Cyclohexane	3.75	3.91	3.74	104	99.7	70.0-130			4.44	25
Heptane	3.75	4.24	4.16	113	111	70.0-130			1.90	25
n-Hexane	3.75	4.03	3.93	107	105	70.0-130			2.51	25
2,2,4-Trimethylpentane	3.75	4.17	4.12	111	110	70.0-130			1.21	25
(S) 1,4-Bromofluorobenzene				*105*	*106*	*60.0-140*				

GLOSSARY OF TERMS

Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state “ND” (Not Detected) or “BDL” (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

Qualifier	Description
J	The identification of the analyte is acceptable; the reported value is an estimate.
J1	Surrogate recovery limits have been exceeded; values are outside upper control limits.

ACCREDITATIONS & LOCATIONS

Pace Analytical National 12065 Lebanon Rd Mount Juliet, TN 37122

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN000032021-1
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey–NELAP	TN002
California	2932	New Mexico [1]	TN00003
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina [1]	DW21704
Georgia	NELAP	North Carolina [3]	41
Georgia [1]	923	North Dakota	R-140
Idaho	TN00003	Ohio–VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LAO000356
Kentucky [1 6]	KY90010	South Carolina	84004002
Kentucky [2]	16	South Dakota	n/a
Louisiana	AI30792	Tennessee [1 4]	2006
Louisiana	LA018	Texas	T104704245-20-18
Maine	TN00003	Texas [5]	LAB0152
Maryland	324	Utah	TN000032021-11
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	110033
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	998093910
Montana	CERT0086	Wyoming	A2LA
A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 [5]	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA–Crypto	TN00003		

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [6] Wastewater n/a Accreditation not applicable

* Not all certifications held by the laboratory are applicable to the results reported in the attached report.

* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace Analytical.

Pace® Location Requested (City/State):

Air CHAIN-OF-CUSTODY Analytical Request Document

Chain-of-Custody is a LEGAL DOCUMENT - Complete all relevant fields

LAB USE ONLY- Affix Workorder/Login Label Here

L1691710

Scan QR code for instructions

G087

Company Name: Ramboll - Chicago, IL	Contact/Report To: Ruta Deshpande
Street Address: 333 West Wacker Drive	Phone #: 312-288-3854
	E-Mail: rdeshpande@ramboll.com;eleister@ramboll.com;ASMALL@ramboll.com;EDDPrinceton@ramboll.com
City, State Zip:	Cc E-Mail:
Customer Project #: 1690029636-002AOC-16	Invoice to:
Project Name: Calumet Refinery	Invoice E-Mail:
Site Collection Info/Facility ID (as applicable): RAMBOLLCIL-169002963	Purchase Order # (if applicable):
	Quote #:
Time Zone Collected: [ ]AK [ ]PT [X] MT [ ]CT [ ]ET	State origin of sample(s):
Data Deliverables: [ ] Level II [ ] Level III [ ]Level IV [ ] EQUIS Inquire w/ Ruta [ ] Other	Regulatory Program (CAA, RCRA, etc.) as applicable: RCRA / MT DEQ
	Rush (Pre-approval required): 2 Day 3 day 5 day Other
	Date Results Requested: Inquire w/ Ruta
	Permit # as applicable:
	Units for Reporting: ug/m³ PPBV mg/m³ PPMV Inquire w/ Ruta

AN 1/18/23

Proj. Manager: 3828 - Jennifer A McCurdy

AcctNum / Client ID: RAMBOLLCIL

Table #:

Profile / Template: T224808

Prelog / Bottle Ord. ID: P1028920

Lab Use Only

* Matrix Codes (Insert in Matrix box below): Ambient (A), Indoor (I), Soil Vapor (SV), Other (O)

Customer Sample ID	Matrix *	Summa Canister ID	Flow Controller ID	Begin Collection Date	Begin Collection Time	End Collection Date	End Collection Time	Field Information: Canister Pressure / Vacuum — Start Pressure / Vacuum (in Hg)	Canister Pressure / Vacuum — End Pressure / Vacuum (in Hg)	PUF / FILTER — Duration (minutes)	PUF / FILTER — Flow Rate m³/min or L/min	PUF / FILTER — Total Volume Sampled m³ or L	Analyses Requested: TO-15 Summa	Sample Comment
CMR-SP301-122723	air	02206	02243	12/27/2023	14:00	12/27/2023	16:18	26.5	10.5	18			X	01

Sample Receipt Checklist

COC Seal Present/Intact: Y N Airs
COC Signed/Accurate: Y N Size: 1L 6L 1.4L
Bottles arrive intact: Y N Tage Color: G W P B
Correct bottles used: Y N Tubing Shunt
T/P#:

Customer Remarks / Special Conditions / Possible Hazards:

Please contact Ruta Deshpande to discuss TAT, Data level, units, etc.

Collected By:

Printed Name: Mike Gipson

Signature:

Additional Instructions from Pace®:

Coolers: Thermometer ID: Correction Factor (°C): Obs. Temp. (°C): Corrected Temp. (°C):

Relinquished by/Company: (Signature) Calumet	Date/Time: 12/27/23 17:00	Received by/Company: (Signature)	Date/Time:
Relinquished by/Company: (Signature)	Date/Time:	Received by/Company: (Signature)	Date/Time:
Relinquished by/Company: (Signature)	Date/Time:	Received by/Company: (Signature)	Date/Time: 12/28 0900
Relinquished by/Company: (Signature)	Date/Time:	Received by/Company: (Signature)	Date/Time:

Tracking Number:

Delivered by: In- Person Courier FedEX UPS Other

Page: ____ of: ____

Submitting a sample via this chain of custody constitutes acknowledgment and acceptance of the Pace® Terms and Conditions found at https://www.pacelabs.com/resource-library/resource/pace-terms-and-conditions/

APPENDIX A2

DUAL-PHASE EXTRACTION EFFLUENT LIQUID ANALYTICAL RESULTS

Pace Project Numbers:

L1666384, L1691901

ANALYTICAL REPORT

October 25, 2023

Ramboll - Chicago, IL

Sample Delivery Group:	L1666384
Samples Received:	10/13/2023
Project Number:	1690029636-002ACC-16
Description:	Calumet Montana

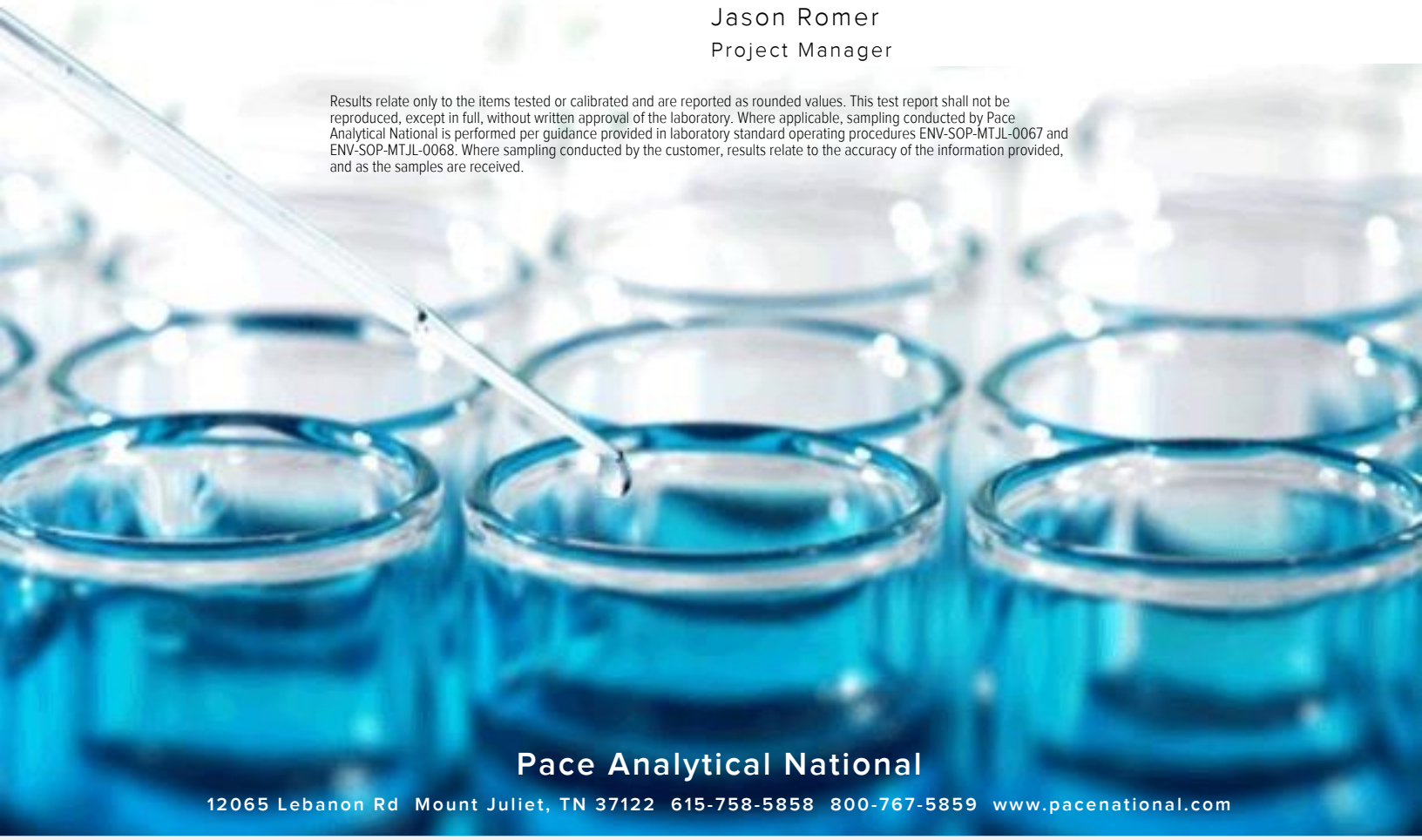
Report To:

Ruta Deshpande
333 West Wacker Drive
Suite 2700
Chicago, IL 60606

Entire Report Reviewed By:

Jason Romer
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.



Pace Analytical National
12065 Lebanon Rd Mount Juliet, TN 37122 615-758-5858 800-767-5859 www.pacenational.com

TABLE OF CONTENTS

SAMPLE SUMMARY

CMQ-SP200-101223 L1666384-01 GW

Collected by: Eric Poissant
Collected date/time: 10/12/23 11:00
Received date/time: 10/13/23 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Petroleum Hydrocarbons by Method MTDEQ VPH	WG2154349	50	10/20/23 04:28	10/20/23 04:28	ADM	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG2152063	50	10/16/23 17:48	10/16/23 17:48	JCP	Mt. Juliet, TN
TPH by Method MTDEQ EPH	WG2154058	158	10/23/23 15:50	10/25/23 08:16	JAS	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG2152442	5000	10/18/23 04:28	10/19/23 23:05	AMG	Mt. Juliet, TN

CASE NARRATIVE

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Jason Romer
Project Manager

Project Narrative

Due to multiple preparation procedures, calculated analytes are not reported in the quality control samples for EPH and VPH Methods.

Sample Delivery Group (SDG) Narrative

An aliquot for analysis was taken from the original container received due to volume requirements of the laboratory's procedure. Rinsing of the original sample container for inclusion in the sample extraction was not performed.

Lab Sample ID	Project Sample ID	Method
L1666384-01	CMQ-SP200-101223	8270C

An aliquot for analysis was taken from the original container received due to the level of sediment present in the sample. Rinsing of the original sample container for inclusion in the sample extraction was not performed.

Lab Sample ID	Project Sample ID	Method
L1666384-01	CMQ-SP200-101223	MTDEQ EPH

Volatile Petroleum Hydrocarbons by Method MTDEQ VPH

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Unadjusted C5-C8 Aliphatics	ND		5.00	50	10/20/2023 04:28	WG2154349
Unadjusted C9-C12 Aliphatics	44.5		5.00	50	10/20/2023 04:28	WG2154349
Unadjusted C9-C10 Aromatics	30.3		5.00	50	10/20/2023 04:28	WG2154349
Adjusted C5-C8 Aliphatics	ND		5.00	50	10/20/2023 04:28	WG2154349
Adjusted C9-C12 Aliphatics	43.4		5.00	50	10/20/2023 04:28	WG2154349
Total VPH	74.8		10.0	50	10/20/2023 04:28	WG2154349
(S) 2,5-Dibromotoluene(FID)	*83.9*		*70.0-130*		*10/20/2023 04:28*	WG2154349
(S) 2,5-Dibromotoluene(PID)	*84.4*		*70.0-130*		*10/20/2023 04:28*	WG2154349

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Acetone	ND	J4	2.50	50	10/16/2023 17:48	WG2152063
Acrolein	ND		2.50	50	10/16/2023 17:48	WG2152063
Acrylonitrile	ND		0.500	50	10/16/2023 17:48	WG2152063
Benzene	0.452		0.0500	50	10/16/2023 17:48	WG2152063
Bromobenzene	ND		0.0500	50	10/16/2023 17:48	WG2152063
Bromodichloromethane	ND		0.0500	50	10/16/2023 17:48	WG2152063
Bromoform	ND		0.0500	50	10/16/2023 17:48	WG2152063
Bromomethane	ND		0.250	50	10/16/2023 17:48	WG2152063
n-Butylbenzene	ND		0.0500	50	10/16/2023 17:48	WG2152063
sec-Butylbenzene	0.0689		0.0500	50	10/16/2023 17:48	WG2152063
tert-Butylbenzene	ND		0.0500	50	10/16/2023 17:48	WG2152063
Carbon tetrachloride	ND		0.0500	50	10/16/2023 17:48	WG2152063
Chlorobenzene	ND		0.0500	50	10/16/2023 17:48	WG2152063
Chlorodibromomethane	ND		0.0500	50	10/16/2023 17:48	WG2152063
Chloroethane	ND		0.250	50	10/16/2023 17:48	WG2152063
Chloroform	ND		0.250	50	10/16/2023 17:48	WG2152063
Chloromethane	ND	J4	0.125	50	10/16/2023 17:48	WG2152063
2-Chlorotoluene	ND		0.0500	50	10/16/2023 17:48	WG2152063
4-Chlorotoluene	ND		0.0500	50	10/16/2023 17:48	WG2152063
1,2-Dibromo-3-Chloropropane	ND		0.250	50	10/16/2023 17:48	WG2152063
1,2-Dibromoethane	ND		0.0500	50	10/16/2023 17:48	WG2152063
Dibromomethane	ND		0.0500	50	10/16/2023 17:48	WG2152063
1,2-Dichlorobenzene	ND		0.0500	50	10/16/2023 17:48	WG2152063
1,3-Dichlorobenzene	ND		0.0500	50	10/16/2023 17:48	WG2152063
1,4-Dichlorobenzene	ND		0.0500	50	10/16/2023 17:48	WG2152063
Dichlorodifluoromethane	ND		0.250	50	10/16/2023 17:48	WG2152063
1,1-Dichloroethane	ND		0.0500	50	10/16/2023 17:48	WG2152063
1,2-Dichloroethane	ND		0.0500	50	10/16/2023 17:48	WG2152063
1,1-Dichloroethene	ND		0.0500	50	10/16/2023 17:48	WG2152063
cis-1,2-Dichloroethene	ND		0.0500	50	10/16/2023 17:48	WG2152063
trans-1,2-Dichloroethene	ND		0.0500	50	10/16/2023 17:48	WG2152063
1,2-Dichloropropane	ND		0.0500	50	10/16/2023 17:48	WG2152063
1,1-Dichloropropene	ND		0.0500	50	10/16/2023 17:48	WG2152063
1,3-Dichloropropane	ND		0.0500	50	10/16/2023 17:48	WG2152063
cis-1,3-Dichloropropene	ND		0.0500	50	10/16/2023 17:48	WG2152063
trans-1,3-Dichloropropene	ND		0.0500	50	10/16/2023 17:48	WG2152063
2,2-Dichloropropane	ND		0.0500	50	10/16/2023 17:48	WG2152063
Di-isopropyl ether	ND		0.0500	50	10/16/2023 17:48	WG2152063
Ethylbenzene	ND		0.0500	50	10/16/2023 17:48	WG2152063
Hexachloro-1,3-butadiene	ND		0.0500	50	10/16/2023 17:48	WG2152063
Isopropylbenzene	ND		0.0500	50	10/16/2023 17:48	WG2152063
p-Isopropyltoluene	ND		0.0500	50	10/16/2023 17:48	WG2152063
2-Butanone (MEK)	ND		0.500	50	10/16/2023 17:48	WG2152063

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Methylene Chloride	ND		0.250	50	10/16/2023 17:48	WG2152063
4-Methyl-2-pentanone (MIBK)	ND		0.500	50	10/16/2023 17:48	WG2152063
Methyl tert-butyl ether	ND		0.0500	50	10/16/2023 17:48	WG2152063
Naphthalene	0.357		0.250	50	10/16/2023 17:48	WG2152063
n-Propylbenzene	ND		0.0500	50	10/16/2023 17:48	WG2152063
Styrene	ND		0.0500	50	10/16/2023 17:48	WG2152063
1,1,1,2-Tetrachloroethane	ND		0.0500	50	10/16/2023 17:48	WG2152063
1,1,2,2-Tetrachloroethane	ND		0.0500	50	10/16/2023 17:48	WG2152063
1,1,2-Trichlorotrifluoroethane	ND		0.0500	50	10/16/2023 17:48	WG2152063
Tetrachloroethene	ND		0.0500	50	10/16/2023 17:48	WG2152063
Toluene	ND		0.0500	50	10/16/2023 17:48	WG2152063
1,2,3-Trichlorobenzene	ND		0.0500	50	10/16/2023 17:48	WG2152063
1,2,4-Trichlorobenzene	ND		0.0500	50	10/16/2023 17:48	WG2152063
1,1,1-Trichloroethane	ND		0.0500	50	10/16/2023 17:48	WG2152063
1,1,2-Trichloroethane	ND		0.0500	50	10/16/2023 17:48	WG2152063
Trichloroethene	ND		0.0500	50	10/16/2023 17:48	WG2152063
Trichlorofluoromethane	ND		0.250	50	10/16/2023 17:48	WG2152063
1,2,3-Trichloropropane	ND		0.125	50	10/16/2023 17:48	WG2152063
1,2,4-Trimethylbenzene	1.99		0.0500	50	10/16/2023 17:48	WG2152063
1,2,3-Trimethylbenzene	0.912		0.0500	50	10/16/2023 17:48	WG2152063
1,3,5-Trimethylbenzene	0.577		0.0500	50	10/16/2023 17:48	WG2152063
Vinyl chloride	ND		0.0500	50	10/16/2023 17:48	WG2152063
Xylenes, Total	1.09		0.150	50	10/16/2023 17:48	WG2152063
(S) Toluene-d8	*82.6*		*80.0-120*		*10/16/2023 17:48*	WG2152063
(S) 4-Bromofluorobenzene	*119*		*77.0-126*		*10/16/2023 17:48*	WG2152063
(S) 1,2-Dichloroethane-d4	*111*		*70.0-130*		*10/16/2023 17:48*	WG2152063

TPH by Method MTDEQ EPH

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
EPH Screen	508		47.4	158	10/25/2023 08:16	WG2154058
(S) o-Terphenyl	*0.000*	J7	*40.0-140*		*10/25/2023 08:16*	WG2154058

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Acenaphthene	ND		5.00	5000	10/19/2023 23:05	WG2152442
Acenaphthylene	ND		5.00	5000	10/19/2023 23:05	WG2152442
Anthracene	ND		5.00	5000	10/19/2023 23:05	WG2152442
Benzidine	ND	J4	50.0	5000	10/19/2023 23:05	WG2152442
Benzo(a)anthracene	ND		5.00	5000	10/19/2023 23:05	WG2152442
Benzo(b)fluoranthene	ND		5.00	5000	10/19/2023 23:05	WG2152442
Benzo(k)fluoranthene	ND		5.00	5000	10/19/2023 23:05	WG2152442
Benzo(g,h,i)perylene	ND		5.00	5000	10/19/2023 23:05	WG2152442
Benzo(a)pyrene	ND		5.00	5000	10/19/2023 23:05	WG2152442
Bis(2-chlorethoxy)methane	ND		50.0	5000	10/19/2023 23:05	WG2152442
Bis(2-chloroethyl)ether	ND		50.0	5000	10/19/2023 23:05	WG2152442
2,2-Oxybis(1-Chloropropane)	ND		50.0	5000	10/19/2023 23:05	WG2152442
4-Bromophenyl-phenylether	ND		50.0	5000	10/19/2023 23:05	WG2152442
2-Chloronaphthalene	ND		5.00	5000	10/19/2023 23:05	WG2152442
4-Chlorophenyl-phenylether	ND		50.0	5000	10/19/2023 23:05	WG2152442
Chrysene	ND		5.00	5000	10/19/2023 23:05	WG2152442
Dibenz(a,h)anthracene	ND		5.00	5000	10/19/2023 23:05	WG2152442
1,2-Dichlorobenzene	ND		50.0	5000	10/19/2023 23:05	WG2152442
1,3-Dichlorobenzene	ND		50.0	5000	10/19/2023 23:05	WG2152442

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
1,4-Dichlorobenzene	ND		50.0	5000	10/19/2023 23:05	WG2152442
3,3-Dichlorobenzidine	ND		50.0	5000	10/19/2023 23:05	WG2152442
2,4-Dinitrotoluene	ND		50.0	5000	10/19/2023 23:05	WG2152442
2,6-Dinitrotoluene	ND		50.0	5000	10/19/2023 23:05	WG2152442
Fluoranthene	ND		5.00	5000	10/19/2023 23:05	WG2152442
Fluorene	ND		5.00	5000	10/19/2023 23:05	WG2152442
Hexachlorobenzene	ND		5.00	5000	10/19/2023 23:05	WG2152442
Hexachloro-1,3-butadiene	ND		50.0	5000	10/19/2023 23:05	WG2152442
Hexachlorocyclopentadiene	ND		50.0	5000	10/19/2023 23:05	WG2152442
Hexachloroethane	ND		50.0	5000	10/19/2023 23:05	WG2152442
Indeno(1,2,3-cd)pyrene	ND		5.00	5000	10/19/2023 23:05	WG2152442
Isophorone	ND		50.0	5000	10/19/2023 23:05	WG2152442
Naphthalene	7.30		5.00	5000	10/19/2023 23:05	WG2152442
Nitrobenzene	ND		50.0	5000	10/19/2023 23:05	WG2152442
n-Nitrosodimethylamine	ND		50.0	5000	10/19/2023 23:05	WG2152442
n-Nitrosodiphenylamine	ND		50.0	5000	10/19/2023 23:05	WG2152442
n-Nitrosodi-n-propylamine	ND		50.0	5000	10/19/2023 23:05	WG2152442
Phenanthrene	ND		5.00	5000	10/19/2023 23:05	WG2152442
Benzylbutyl phthalate	ND		15.0	5000	10/19/2023 23:05	WG2152442
Bis(2-ethylhexyl)phthalate	ND		15.0	5000	10/19/2023 23:05	WG2152442
Di-n-butyl phthalate	ND		15.0	5000	10/19/2023 23:05	WG2152442
Diethyl phthalate	ND		15.0	5000	10/19/2023 23:05	WG2152442
Dimethyl phthalate	ND		15.0	5000	10/19/2023 23:05	WG2152442
Di-n-octyl phthalate	ND		15.0	5000	10/19/2023 23:05	WG2152442
Pyrene	ND		5.00	5000	10/19/2023 23:05	WG2152442
1,2,4-Trichlorobenzene	ND		50.0	5000	10/19/2023 23:05	WG2152442
4-Chloro-3-methylphenol	ND		50.0	5000	10/19/2023 23:05	WG2152442
2-Chlorophenol	ND		50.0	5000	10/19/2023 23:05	WG2152442
2,4-Dichlorophenol	ND		50.0	5000	10/19/2023 23:05	WG2152442
2,4-Dimethylphenol	ND		50.0	5000	10/19/2023 23:05	WG2152442
4,6-Dinitro-2-methylphenol	ND		50.0	5000	10/19/2023 23:05	WG2152442
2,4-Dinitrophenol	ND		50.0	5000	10/19/2023 23:05	WG2152442
2-Nitrophenol	ND		50.0	5000	10/19/2023 23:05	WG2152442
4-Nitrophenol	ND		50.0	5000	10/19/2023 23:05	WG2152442
Pentachlorophenol	ND		50.0	5000	10/19/2023 23:05	WG2152442
Phenol	ND		50.0	5000	10/19/2023 23:05	WG2152442
2,4,6-Trichlorophenol	ND		50.0	5000	10/19/2023 23:05	WG2152442
(S) 2-Fluorophenol	*0.000*	J7	*10.0-120*		*10/19/2023 23:05*	WG2152442
(S) Phenol-d5	*0.000*	J7	*10.0-120*		*10/19/2023 23:05*	WG2152442
(S) Nitrobenzene-d5	*0.000*	J7	*10.0-127*		*10/19/2023 23:05*	WG2152442
(S) 2-Fluorobiphenyl	*0.000*	J7	*10.0-130*		*10/19/2023 23:05*	WG2152442
(S) 2,4,6-Tribromophenol	*0.000*	J7	*10.0-155*		*10/19/2023 23:05*	WG2152442
(S) p-Terphenyl-d14	*0.000*	J7	*10.0-128*		*10/19/2023 23:05*	WG2152442

Sample Narrative:

L1666384-01 WG2152442: Dilution due to matrix

Method Blank (MB)

(MB) R3989268-3 10/19/23 14:49

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Unadjusted C5-C8 Aliphatics	U		0.0333	0.100
Unadjusted C9-C12 Aliphatics	U		0.0333	0.100
Unadjusted C9-C10 Aromatics	U		0.0333	0.100
Adjusted C5-C8 Aliphatics	U		0.0333	0.100
Adjusted C9-C12 Aliphatics	U		0.0333	0.100
Total VPH	U		0.0667	0.200
(S) 2,5-Dibromotoluene(FID)	*81.9*			*70.0-130*
(S) 2,5-Dibromotoluene(PID)	*77.8*			*70.0-130*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3989268-1 10/19/23 12:32 • (LCSD) R3989268-2 10/19/23 13:07

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Unadjusted C5-C8 Aliphatics	1.20	1.15	1.20	95.8	100	70.0-130			4.26	50
Unadjusted C9-C12 Aliphatics	1.40	1.21	1.16	86.4	82.9	70.0-130			4.22	50
Unadjusted C9-C10 Aromatics	0.200	0.212	0.208	106	104	70.0-130			1.90	50
Total VPH	2.80	2.57	2.57	91.8	91.8	70.0-130			0.000	50
(S) 2,5-Dibromotoluene(FID)				*86.5*	*88.5*	*70.0-130*				
(S) 2,5-Dibromotoluene(PID)				*82.5*	*84.3*	*70.0-130*				

L1666379-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1666379-01 10/19/23 19:56 • (MS) R3989268-4 10/20/23 07:19 • (MSD) R3989268-5 10/20/23 07:53

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Unadjusted C5-C8 Aliphatics	1.20	ND	1.64	1.30	137	108	1	70.0-130	J5		23.1	50
Unadjusted C9-C12 Aliphatics	1.40	ND	1.61	1.22	115	87.1	1	70.0-130			27.6	50
Unadjusted C9-C10 Aromatics	0.200	ND	0.250	0.187	125	93.5	1	70.0-130			28.8	50
Total VPH	2.80	ND	3.50	2.71	125	96.8	1	70.0-130			25.4	50
(S) 2,5-Dibromotoluene(FID)					*91.9*	*92.3*		*70.0-130*				
(S) 2,5-Dibromotoluene(PID)					*85.6*	*86.0*		*70.0-130*				

Method Blank (MB)

(MB) R3987163-3 10/16/23 09:56

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Acetone	U		0.0113	0.0500
Acrolein	U		0.00254	0.0500
Acrylonitrile	U		0.000671	0.0100
Benzene	U		0.0000941	0.00100
Bromobenzene	U		0.000118	0.00100
Bromodichloromethane	U		0.000136	0.00100
Bromoform	U		0.000129	0.00100
Bromomethane	U		0.000605	0.00500
n-Butylbenzene	U		0.000157	0.00100
sec-Butylbenzene	U		0.000125	0.00100
tert-Butylbenzene	U		0.000127	0.00100
Carbon tetrachloride	U		0.000128	0.00100
Chlorobenzene	U		0.000116	0.00100
Chlorodibromomethane	U		0.000140	0.00100
Chloroethane	U		0.000192	0.00500
Chloroform	U		0.000111	0.00500
Chloromethane	U		0.000960	0.00250
2-Chlorotoluene	U		0.000106	0.00100
4-Chlorotoluene	U		0.000114	0.00100
1,2-Dibromo-3-Chloropropane	U		0.000276	0.00500
1,2-Dibromoethane	U		0.000126	0.00100
Dibromomethane	U		0.000122	0.00100
1,2-Dichlorobenzene	U		0.000107	0.00100
1,3-Dichlorobenzene	U		0.000110	0.00100
1,4-Dichlorobenzene	U		0.000120	0.00100
Dichlorodifluoromethane	U		0.000374	0.00500
1,1-Dichloroethane	U		0.000100	0.00100
1,2-Dichloroethane	U		0.0000819	0.00100
1,1-Dichloroethene	U		0.000188	0.00100
cis-1,2-Dichloroethene	U		0.000126	0.00100
trans-1,2-Dichloroethene	U		0.000149	0.00100
1,2-Dichloropropane	U		0.000149	0.00100
1,1-Dichloropropene	U		0.000142	0.00100
1,3-Dichloropropane	U		0.000110	0.00100
cis-1,3-Dichloropropene	U		0.000111	0.00100
trans-1,3-Dichloropropene	U		0.000118	0.00100
2,2-Dichloropropane	U		0.000161	0.00100
Di-isopropyl ether	U		0.000105	0.00100
Ethylbenzene	U		0.000137	0.00100
Hexachloro-1,3-butadiene	U		0.000337	0.00100

Method Blank (MB)

(MB) R3987163-3 10/16/23 09:56

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Isopropylbenzene	U		0.000105	0.00100
p-Isopropyltoluene	U		0.000120	0.00100
2-Butanone (MEK)	U		0.00119	0.0100
Methylene Chloride	U		0.000430	0.00500
4-Methyl-2-pentanone (MIBK)	U		0.000478	0.0100
Methyl tert-butyl ether	U		0.000101	0.00100
Naphthalene	U		0.00100	0.00500
n-Propylbenzene	U		0.0000993	0.00100
Styrene	U		0.000118	0.00100
1,1,1,2-Tetrachloroethane	U		0.000147	0.00100
1,1,2,2-Tetrachloroethane	U		0.000133	0.00100
1,1,2-Trichlorotrifluoroethane	U		0.000180	0.00100
Tetrachloroethene	U		0.000300	0.00100
Toluene	U		0.000278	0.00100
1,2,3-Trichlorobenzene	U		0.000230	0.00100
1,2,4-Trichlorobenzene	U		0.000481	0.00100
1,1,1-Trichloroethane	U		0.000149	0.00100
1,1,2-Trichloroethane	U		0.000158	0.00100
Trichloroethene	U		0.000190	0.00100
Trichlorofluoromethane	U		0.000160	0.00500
1,2,3-Trichloropropane	U		0.000237	0.00250
1,2,4-Trimethylbenzene	U		0.000322	0.00100
1,2,3-Trimethylbenzene	U		0.000104	0.00100
1,3,5-Trimethylbenzene	U		0.000104	0.00100
Vinyl chloride	U		0.000234	0.00100
Xylenes, Total	U		0.000174	0.00300
(S) Toluene-d8	*86.9*			*80.0-120*
(S) 4-Bromofluorobenzene	*104*			*77.0-126*
(S) 1,2-Dichloroethane-d4	*105*			*70.0-130*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3987163-1 10/16/23 08:52 • (LCSD) R3987163-2 10/16/23 09:13

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Acetone	0.0250	0.0417	0.0412	167	165	19.0-160	J4	J4	1.21	27
Acrolein	0.0250	0.0235	0.0218	94.0	87.2	10.0-160			7.51	26
Acrylonitrile	0.0250	0.0365	0.0353	146	141	55.0-149			3.34	20
Benzene	0.00500	0.00533	0.00539	107	108	70.0-123			1.12	20

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3987163-1 10/16/23 08:52 • (LCSD) R3987163-2 10/16/23 09:13

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Bromobenzene	0.00500	0.00441	0.00443	88.2	88.6	73.0-121			0.452	20
Bromodichloromethane	0.00500	0.00564	0.00547	113	109	75.0-120			3.06	20
Bromoform	0.00500	0.00454	0.00472	90.8	94.4	68.0-132			3.89	20
Bromomethane	0.00500	0.00498	0.00509	99.6	102	10.0-160			2.18	25
n-Butylbenzene	0.00500	0.00395	0.00398	79.0	79.6	73.0-125			0.757	20
sec-Butylbenzene	0.00500	0.00414	0.00419	82.8	83.8	75.0-125			1.20	20
tert-Butylbenzene	0.00500	0.00383	0.00381	76.6	76.2	76.0-124			0.524	20
Carbon tetrachloride	0.00500	0.00529	0.00540	106	108	68.0-126			2.06	20
Chlorobenzene	0.00500	0.00466	0.00459	93.2	91.8	80.0-121			1.51	20
Chlorodibromomethane	0.00500	0.00438	0.00452	87.6	90.4	77.0-125			3.15	20
Chloroethane	0.00500	0.00537	0.00572	107	114	47.0-150			6.31	20
Chloroform	0.00500	0.00570	0.00567	114	113	73.0-120			0.528	20
Chloromethane	0.00500	0.00725	0.00736	145	147	41.0-142	J4	J4	1.51	20
2-Chlorotoluene	0.00500	0.00457	0.00451	91.4	90.2	76.0-123			1.32	20
4-Chlorotoluene	0.00500	0.00421	0.00421	84.2	84.2	75.0-122			0.000	20
1,2-Dibromo-3-Chloropropane	0.00500	0.00451	0.00449	90.2	89.8	58.0-134			0.444	20
1,2-Dibromoethane	0.00500	0.00459	0.00448	91.8	89.6	80.0-122			2.43	20
Dibromomethane	0.00500	0.00573	0.00575	115	115	80.0-120			0.348	20
1,2-Dichlorobenzene	0.00500	0.00444	0.00448	88.8	89.6	79.0-121			0.897	20
1,3-Dichlorobenzene	0.00500	0.00444	0.00445	88.8	89.0	79.0-120			0.225	20
1,4-Dichlorobenzene	0.00500	0.00479	0.00455	95.8	91.0	79.0-120			5.14	20
Dichlorodifluoromethane	0.00500	0.00674	0.00665	135	133	51.0-149			1.34	20
1,1-Dichloroethane	0.00500	0.00565	0.00574	113	115	70.0-126			1.58	20
1,2-Dichloroethane	0.00500	0.00611	0.00630	122	126	70.0-128			3.06	20
1,1-Dichloroethene	0.00500	0.00488	0.00496	97.6	99.2	71.0-124			1.63	20
cis-1,2-Dichloroethene	0.00500	0.00548	0.00528	110	106	73.0-120			3.72	20
trans-1,2-Dichloroethene	0.00500	0.00546	0.00547	109	109	73.0-120			0.183	20
1,2-Dichloropropane	0.00500	0.00551	0.00574	110	115	77.0-125			4.09	20
1,1-Dichloropropene	0.00500	0.00540	0.00538	108	108	74.0-126			0.371	20
1,3-Dichloropropane	0.00500	0.00439	0.00444	87.8	88.8	80.0-120			1.13	20
cis-1,3-Dichloropropene	0.00500	0.00510	0.00532	102	106	80.0-123			4.22	20
trans-1,3-Dichloropropene	0.00500	0.00442	0.00435	88.4	87.0	78.0-124			1.60	20
2,2-Dichloropropane	0.00500	0.00541	0.00536	108	107	58.0-130			0.929	20
Di-isopropyl ether	0.00500	0.00622	0.00637	124	127	58.0-138			2.38	20
Ethylbenzene	0.00500	0.00453	0.00441	90.6	88.2	79.0-123			2.68	20
Hexachloro-1,3-butadiene	0.00500	0.00460	0.00537	92.0	107	54.0-138			15.4	20
Isopropylbenzene	0.00500	0.00455	0.00462	91.0	92.4	76.0-127			1.53	20
p-Isopropyltoluene	0.00500	0.00421	0.00423	84.2	84.6	76.0-125			0.474	20
2-Butanone (MEK)	0.0250	0.0365	0.0348	146	139	44.0-160			4.77	20
Methylene Chloride	0.00500	0.00504	0.00512	101	102	67.0-120			1.57	20

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3987163-1 10/16/23 08:52 • (LCSD) R3987163-2 10/16/23 09:13

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
4-Methyl-2-pentanone (MIBK)	0.0250	0.0290	0.0281	116	112	68.0-142			3.15	20
Methyl tert-butyl ether	0.00500	0.00556	0.00589	111	118	68.0-125			5.76	20
Naphthalene	0.00500	0.00380	0.00364	76.0	72.8	54.0-135			4.30	20
n-Propylbenzene	0.00500	0.00426	0.00422	85.2	84.4	77.0-124			0.943	20
Styrene	0.00500	0.00436	0.00428	87.2	85.6	73.0-130			1.85	20
1,1,1,2-Tetrachloroethane	0.00500	0.00469	0.00464	93.8	92.8	75.0-125			1.07	20
1,1,2,2-Tetrachloroethane	0.00500	0.00424	0.00423	84.8	84.6	65.0-130			0.236	20
1,1,2-Trichlorotrifluoroethane	0.00500	0.00569	0.00588	114	118	69.0-132			3.28	20
Tetrachloroethene	0.00500	0.00412	0.00423	82.4	84.6	72.0-132			2.63	20
Toluene	0.00500	0.00431	0.00417	86.2	83.4	79.0-120			3.30	20
1,2,3-Trichlorobenzene	0.00500	0.00399	0.00379	79.8	75.8	50.0-138			5.14	20
1,2,4-Trichlorobenzene	0.00500	0.00392	0.00398	78.4	79.6	57.0-137			1.52	20
1,1,1-Trichloroethane	0.00500	0.00554	0.00568	111	114	73.0-124			2.50	20
1,1,2-Trichloroethane	0.00500	0.00461	0.00436	92.2	87.2	80.0-120			5.57	20
Trichloroethene	0.00500	0.00529	0.00568	106	114	78.0-124			7.11	20
Trichlorofluoromethane	0.00500	0.00620	0.00664	124	133	59.0-147			6.85	20
1,2,3-Trichloropropane	0.00500	0.00440	0.00418	88.0	83.6	73.0-130			5.13	20
1,2,4-Trimethylbenzene	0.00500	0.00429	0.00421	85.8	84.2	76.0-121			1.88	20
1,2,3-Trimethylbenzene	0.00500	0.00460	0.00442	92.0	88.4	77.0-120			3.99	20
1,3,5-Trimethylbenzene	0.00500	0.00423	0.00410	84.6	82.0	76.0-122			3.12	20
Vinyl chloride	0.00500	0.00592	0.00565	118	113	67.0-131			4.67	20
Xylenes, Total	0.0150	0.0138	0.0138	92.0	92.0	79.0-123			0.000	20
(S) Toluene-d8				*86.9*	*84.2*	*80.0-120*				
(S) 4-Bromofluorobenzene				*111*	*108*	*77.0-126*				
(S) 1,2-Dichloroethane-d4				*103*	*105*	*70.0-130*				

Method Blank (MB)

(MB) R3990659-1 10/24/23 14:54

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
EPH Screen	U		0.100	0.300
(S) o-Terphenyl	*61.0*			*40.0-140*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3990659-2 10/24/23 15:07 • (LCSD) R3990659-3 10/24/23 15:20

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
EPH Screen	3.10	2.44	2.76	78.7	89.0	40.0-140			12.3	25
(S) o-Terphenyl				*64.5*	*68.3*	*40.0-140*				

L1666097-17 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1666097-17 10/24/23 18:26 • (MS) R3990659-4 10/24/23 18:39 • (MSD) R3990659-5 10/24/23 18:58

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
EPH Screen	3.10	0.647	2.59	2.42	62.7	57.8	1	40.0-140			6.79	50
(S) o-Terphenyl					*49.2*	*41.4*		*40.0-140*				

Sample Narrative:

OS: Sample produced emulsion during Extraction process, low surr/spike recoveries due to matrix.

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Method Blank (MB)

(MB) R3988990-2 10/19/23 15:12

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Acenaphthene	U		0.0000886	0.00100
Acenaphthylene	U		0.0000921	0.00100
Anthracene	U		0.0000804	0.00100
Benzidine	U		0.00374	0.0100
Benzo(a)anthracene	U		0.000199	0.00100
Benzo(b)fluoranthene	U		0.000130	0.00100
Benzo(k)fluoranthene	U		0.000120	0.00100
Benzo(g,h,i)perylene	U		0.000121	0.00100
Benzo(a)pyrene	U		0.0000381	0.00100
Bis(2-chlorethoxy)methane	U		0.000116	0.0100
Bis(2-chloroethyl)ether	U		0.000137	0.0100
2,2-Oxybis(1-Chloropropane)	U		0.000210	0.0100
4-Bromophenyl-phenylether	U		0.0000877	0.0100
2-Chloronaphthalene	U		0.0000648	0.00100
4-Chlorophenyl-phenylether	U		0.0000926	0.0100
Chrysene	U		0.000130	0.00100
Dibenz(a,h)anthracene	U		0.0000644	0.00100
1,2-Dichlorobenzene	U		0.0000713	0.0100
1,3-Dichlorobenzene	U		0.000132	0.0100
1,4-Dichlorobenzene	U		0.0000942	0.0100
3,3-Dichlorobenzidine	U		0.000212	0.0100
2,4-Dinitrotoluene	U		0.0000983	0.0100
2,6-Dinitrotoluene	U		0.000250	0.0100
Fluoranthene	U		0.000102	0.00100
Fluorene	U		0.0000844	0.00100
Hexachlorobenzene	U		0.0000755	0.00100
Hexachloro-1,3-butadiene	U		0.0000968	0.0100
Hexachlorocyclopentadiene	U		0.0000598	0.0100
Hexachloroethane	U		0.000127	0.0100
Indeno(1,2,3-cd)pyrene	U		0.000279	0.00100
Isophorone	U		0.000143	0.0100
Naphthalene	U		0.000159	0.00100
Nitrobenzene	U		0.000297	0.0100
n-Nitrosodimethylamine	U		0.000998	0.0100
n-Nitrosodiphenylamine	U		0.00237	0.0100
n-Nitrosodi-n-propylamine	U		0.000261	0.0100
Phenanthrene	U		0.000112	0.00100
Benzylbutyl phthalate	U		0.000765	0.00300
Bis(2-ethylhexyl)phthalate	U		0.000895	0.00300
Di-n-butyl phthalate	U		0.000453	0.00300

Method Blank (MB)

(MB) R3988990-2 10/19/23 15:12

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Diethyl phthalate	U		0.000287	0.00300
Dimethyl phthalate	U		0.000260	0.00300
Di-n-octyl phthalate	U		0.000932	0.00300
Pyrene	U		0.000107	0.00100
1,2,4-Trichlorobenzene	U		0.0000698	0.0100
4-Chloro-3-methylphenol	U		0.000131	0.0100
2-Chlorophenol	U		0.000133	0.0100
2,4-Dichlorophenol	U		0.000102	0.0100
2,4-Dimethylphenol	U		0.0000636	0.0100
4,6-Dinitro-2-methylphenol	U		0.00112	0.0100
2,4-Dinitrophenol	U		0.00593	0.0100
2-Nitrophenol	U		0.000117	0.0100
4-Nitrophenol	U		0.000143	0.0100
Pentachlorophenol	U		0.000313	0.0100
Phenol	U		0.00433	0.0100
2,4,6-Trichlorophenol	U		0.000100	0.0100
(S) 2-Fluorophenol	*36.2*			*10.0-120*
(S) Phenol-d5	*21.8*			*10.0-120*
(S) Nitrobenzene-d5	*62.9*			*10.0-127*
(S) 2-Fluorobiphenyl	*61.1*			*10.0-130*
(S) 2,4,6-Tribromophenol	*66.0*			*10.0-155*
(S) p-Terphenyl-d14	*81.1*			*10.0-128*

Laboratory Control Sample (LCS)

(LCS) R3988990-1 10/19/23 14:51

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Acenaphthene	0.0500	0.0240	48.0	41.0-120	
Acenaphthylene	0.0500	0.0243	48.6	43.0-120	
Anthracene	0.0500	0.0264	52.8	45.0-120	
Benzidine	0.100	0.00799	7.99	10.0-120	J4
Benzo(a)anthracene	0.0500	0.0307	61.4	47.0-120	
Benzo(b)fluoranthene	0.0500	0.0303	60.6	46.0-120	
Benzo(k)fluoranthene	0.0500	0.0298	59.6	46.0-120	
Benzo(g,h,i)perylene	0.0500	0.0276	55.2	48.0-121	
Benzo(a)pyrene	0.0500	0.0288	57.6	47.0-120	
Bis(2-chlorethoxy)methane	0.0500	0.0249	49.8	33.0-120	
Bis(2-chloroethyl)ether	0.0500	0.0316	63.2	23.0-120	

Laboratory Control Sample (LCS)

(LCS) R3988990-1 10/19/23 14:51

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
2,2-Oxybis(1-Chloropropane)	0.0500	0.0254	50.8	28.0-120	
4-Bromophenyl-phenylether	0.0500	0.0281	56.2	45.0-120	
2-Chloronaphthalene	0.0500	0.0236	47.2	37.0-120	
4-Chlorophenyl-phenylether	0.0500	0.0261	52.2	44.0-120	
Chrysene	0.0500	0.0303	60.6	48.0-120	
Dibenz(a,h)anthracene	0.0500	0.0293	58.6	47.0-120	
1,2-Dichlorobenzene	0.0500	0.0226	45.2	20.0-120	
1,3-Dichlorobenzene	0.0500	0.0224	44.8	17.0-120	
1,4-Dichlorobenzene	0.0500	0.0236	47.2	18.0-120	
3,3-Dichlorobenzidine	0.100	0.0672	67.2	44.0-120	
2,4-Dinitrotoluene	0.0500	0.0298	59.6	49.0-124	
2,6-Dinitrotoluene	0.0500	0.0303	60.6	46.0-120	
Fluoranthene	0.0500	0.0285	57.0	51.0-120	
Fluorene	0.0500	0.0253	50.6	47.0-120	
Hexachlorobenzene	0.0500	0.0289	57.8	44.0-120	
Hexachloro-1,3-butadiene	0.0500	0.0193	38.6	19.0-120	
Hexachlorocyclopentadiene	0.0500	0.0138	27.6	15.0-120	
Hexachloroethane	0.0500	0.0230	46.0	15.0-120	
Indeno(1,2,3-cd)pyrene	0.0500	0.0280	56.0	49.0-122	
Isophorone	0.0500	0.0226	45.2	36.0-120	
Naphthalene	0.0500	0.0206	41.2	27.0-120	
Nitrobenzene	0.0500	0.0237	47.4	27.0-120	
n-Nitrosodimethylamine	0.0500	0.0213	42.6	10.0-120	
n-Nitrosodiphenylamine	0.0500	0.0264	52.8	47.0-120	
n-Nitrosodi-n-propylamine	0.0500	0.0282	56.4	31.0-120	
Phenanthrene	0.0500	0.0266	53.2	46.0-120	
Benzylbutyl phthalate	0.0500	0.0318	63.6	43.0-121	
Bis(2-ethylhexyl)phthalate	0.0500	0.0307	61.4	43.0-122	
Di-n-butyl phthalate	0.0500	0.0312	62.4	49.0-121	
Diethyl phthalate	0.0500	0.0291	58.2	48.0-122	
Dimethyl phthalate	0.0500	0.0292	58.4	48.0-120	
Di-n-octyl phthalate	0.0500	0.0303	60.6	42.0-125	
Pyrene	0.0500	0.0292	58.4	47.0-120	
1,2,4-Trichlorobenzene	0.0500	0.0184	36.8	24.0-120	
4-Chloro-3-methylphenol	0.0500	0.0247	49.4	40.0-120	
2-Chlorophenol	0.0500	0.0262	52.4	25.0-120	
2,4-Dichlorophenol	0.0500	0.0228	45.6	36.0-120	
2,4-Dimethylphenol	0.0500	0.0222	44.4	33.0-120	
4,6-Dinitro-2-methylphenol	0.0500	0.0340	68.0	38.0-138	
2,4-Dinitrophenol	0.0500	0.0379	75.8	10.0-120	

Laboratory Control Sample (LCS)

(LCS) R3988990-1 10/19/23 14:51

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
2-Nitrophenol	0.0500	0.0268	53.6	31.0-120	
4-Nitrophenol	0.0500	0.0117	23.4	10.0-120	
Pentachlorophenol	0.0500	0.0203	40.6	23.0-120	
Phenol	0.0500	0.0112	22.4	10.0-120	
2,4,6-Trichlorophenol	0.0500	0.0256	51.2	42.0-120	
(S) 2-Fluorophenol			*33.2*	*10.0-120*	
(S) Phenol-d5			*21.3*	*10.0-120*	
(S) Nitrobenzene-d5			*45.8*	*10.0-127*	
(S) 2-Fluorobiphenyl			*45.7*	*10.0-130*	
(S) 2,4,6-Tribromophenol			*56.0*	*10.0-155*	
(S) p-Terphenyl-d14			*60.8*	*10.0-128*	

L1666902-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1666902-01 10/19/23 20:14 • (MS) R3988990-3 10/19/23 20:35 • (MSD) R3988990-4 10/19/23 20:56

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Acenaphthene	0.0500	ND	0.0281	0.0368	54.9	72.3	1	28.0-120		J3	26.8	25
Acenaphthylene	0.0500	ND	0.0269	0.0356	53.8	71.2	1	31.0-121		J3	27.8	25
Anthracene	0.0500	ND	0.0302	0.0388	60.4	77.6	1	36.0-120		J3	24.9	23
Benzidine	0.100	ND	ND	ND	5.42	0.000	1	10.0-120	J6	J3 J6	200	37
Benzo(a)anthracene	0.0500	ND	0.0328	0.0417	65.6	83.4	1	39.0-120		J3	23.9	23
Benzo(b)fluoranthene	0.0500	ND	0.0327	0.0437	65.4	87.4	1	37.0-120		J3	28.8	23
Benzo(k)fluoranthene	0.0500	ND	0.0313	0.0416	62.6	83.2	1	37.0-120		J3	28.3	26
Benzo(g,h,i)perylene	0.0500	ND	0.0283	0.0318	56.6	63.6	1	37.0-123			11.6	25
Benzo(a)pyrene	0.0500	ND	0.0320	0.0411	64.0	82.2	1	37.0-120		J3	24.9	24
Bis(2-chlorethoxy)methane	0.0500	ND	0.0242	0.0324	48.4	64.8	1	17.0-120			29.0	31
Bis(2-chloroethyl)ether	0.0500	ND	0.0243	0.0357	48.6	71.4	1	14.0-120		J3	38.0	33
2,2-Oxybis(1-Chloropropane)	0.0500	ND	0.0245	0.0343	49.0	68.6	1	18.0-120			33.3	34
4-Bromophenyl-phenylether	0.0500	ND	0.0332	0.0417	66.4	83.4	1	37.0-120			22.7	24
2-Chloronaphthalene	0.0500	ND	0.0266	0.0347	53.2	69.4	1	29.0-120			26.4	28
4-Chlorophenyl-phenylether	0.0500	ND	0.0292	0.0373	58.4	74.6	1	36.0-120		J3	24.4	23
Chrysene	0.0500	ND	0.0312	0.0413	62.4	82.6	1	38.0-120		J3	27.9	23
Dibenz(a,h)anthracene	0.0500	ND	0.0302	0.0353	60.4	70.6	1	36.0-121			15.6	24
1,2-Dichlorobenzene	0.0500	ND	0.0221	0.0311	44.2	62.2	1	18.0-120			33.8	40
1,3-Dichlorobenzene	0.0500	ND	0.0218	0.0302	43.6	60.4	1	15.0-120			32.3	40
1,4-Dichlorobenzene	0.0500	ND	0.0233	0.0329	44.2	63.4	1	17.0-120			34.2	40
3,3-Dichlorobenzidine	0.100	ND	0.0480	0.0433	48.0	43.3	1	10.0-134			10.3	30
2,4-Dinitrotoluene	0.0500	ND	0.0297	0.0410	59.4	82.0	1	39.0-125		J3	32.0	25

L1666902-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1666902-01 10/19/23 20:14 • (MS) R3988990-3 10/19/23 20:35 • (MSD) R3988990-4 10/19/23 20:56

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
2,6-Dinitrotoluene	0.0500	ND	0.0304	0.0418	60.8	83.6	1	36.0-120		J3	31.6	27
Fluoranthene	0.0500	ND	0.0304	0.0386	60.8	77.2	1	41.0-121		J3	23.8	22
Fluorene	0.0500	ND	0.0281	0.0383	55.4	75.8	1	37.0-120		J3	30.7	24
Hexachlorobenzene	0.0500	ND	0.0329	0.0419	65.8	83.8	1	35.0-122		J3	24.1	24
Hexachloro-1,3-butadiene	0.0500	ND	0.0205	0.0276	41.0	55.2	1	12.0-120			29.5	34
Hexachlorocyclopentadiene	0.0500	ND	0.0163	0.0227	32.6	45.4	1	10.0-120			32.8	33
Hexachloroethane	0.0500	ND	0.0240	0.0330	48.0	66.0	1	10.0-120			31.6	40
Indeno(1,2,3-cd)pyrene	0.0500	ND	0.0286	0.0330	57.2	66.0	1	38.0-125			14.3	24
Isophorone	0.0500	ND	0.0222	0.0297	44.4	59.4	1	21.0-120		J3	28.9	27
Naphthalene	0.0500	0.00179	0.0224	0.0303	41.2	57.0	1	10.0-120			30.0	31
Nitrobenzene	0.0500	ND	0.0232	0.0302	46.4	60.4	1	12.0-120			26.2	30
n-Nitrosodimethylamine	0.0500	ND	0.0158	0.0207	31.6	41.4	1	10.0-120			26.8	40
n-Nitrosodiphenylamine	0.0500	ND	0.0314	0.0408	62.8	81.6	1	37.0-120		J3	26.0	24
n-Nitrosodi-n-propylamine	0.0500	ND	0.0265	0.0398	53.0	79.6	1	16.0-120		J3	40.1	30
Phenanthrene	0.0500	ND	0.0308	0.0395	61.3	78.7	1	33.0-120		J3	24.8	22
Benzylbutyl phthalate	0.0500	ND	0.0385	0.0515	77.0	103	1	34.0-126		J3	28.9	24
Bis(2-ethylhexyl)phthalate	0.0500	ND	0.0343	0.0480	65.5	92.9	1	33.0-126		J3	33.3	25
Di-n-butyl phthalate	0.0500	ND	0.0356	0.0472	71.2	94.4	1	35.0-128		J3	28.0	23
Diethyl phthalate	0.0500	ND	0.0320	0.0434	62.8	85.6	1	39.0-125		J3	30.2	24
Dimethyl phthalate	0.0500	ND	0.0303	0.0401	60.6	80.2	1	37.0-120		J3	27.8	24
Di-n-octyl phthalate	0.0500	ND	0.0338	0.0448	67.6	89.6	1	25.0-135		J3	28.0	26
Pyrene	0.0500	ND	0.0344	0.0452	68.8	90.4	1	39.0-120		J3	27.1	22
1,2,4-Trichlorobenzene	0.0500	ND	0.0194	0.0253	38.8	50.6	1	15.0-120			26.4	31
4-Chloro-3-methylphenol	0.0500	ND	0.0214	0.0319	42.8	63.8	1	26.0-120		J3	39.4	27
2-Chlorophenol	0.0500	ND	0.0211	0.0311	42.2	62.2	1	18.0-120		J3	38.3	34
2,4-Dichlorophenol	0.0500	ND	0.0200	0.0282	40.0	56.4	1	19.0-120		J3	34.0	27
2,4-Dimethylphenol	0.0500	ND	0.0194	0.0301	37.6	59.0	1	15.0-120		J3	43.2	28
4,6-Dinitro-2-methylphenol	0.0500	ND	0.0347	0.0465	69.4	93.0	1	10.0-144			29.1	39
2,4-Dinitrophenol	0.0500	ND	0.0351	0.0487	70.2	97.4	1	10.0-120			32.5	40
2-Nitrophenol	0.0500	ND	0.0249	0.0341	49.8	68.2	1	20.0-120		J3	31.2	30
4-Nitrophenol	0.0500	ND	0.0101	0.0138	20.2	27.6	1	10.0-120			31.0	40
Pentachlorophenol	0.0500	ND	0.0266	0.0373	53.2	74.6	1	10.0-128			33.5	37
Phenol	0.0500	ND	ND	0.0118	17.0	23.6	1	10.0-120			32.7	40
2,4,6-Trichlorophenol	0.0500	ND	0.0278	0.0356	55.6	71.2	1	26.0-120			24.6	31
(S) 2-Fluorophenol					*26.6*	*35.9*		*10.0-120*				
(S) Phenol-d5					*17.3*	*23.8*		*10.0-120*				
(S) Nitrobenzene-d5					*45.5*	*58.4*		*10.0-127*				
(S) 2-Fluorobiphenyl					*53.0*	*65.6*		*10.0-130*				
(S) 2,4,6-Tribromophenol					*64.5*	*84.0*		*10.0-155*				
(S) p-Terphenyl-d14					*69.8*	*94.4*		*10.0-128*				

GLOSSARY OF TERMS

Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state “ND” (Not Detected) or “BDL” (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

Qualifier	Description
J3	The associated batch QC was outside the established quality control range for precision.
J4	The associated batch QC was outside the established quality control range for accuracy.
J5	The sample matrix interfered with the ability to make any accurate determination; spike value is high.
J6	The sample matrix interfered with the ability to make any accurate determination; spike value is low.
J7	Surrogate recovery cannot be used for control limit evaluation due to dilution.

ACCREDITATIONS & LOCATIONS

Pace Analytical National 12065 Lebanon Rd Mount Juliet, TN 37122

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN000032021-1
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey–NELAP	TN002
California	2932	New Mexico [1]	TN00003
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina [1]	DW21704
Georgia	NELAP	North Carolina [3]	41
Georgia [1]	923	North Dakota	R-140
Idaho	TN00003	Ohio–VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LAO000356
Kentucky [1 6]	KY90010	South Carolina	84004002
Kentucky [2]	16	South Dakota	n/a
Louisiana	AI30792	Tennessee [1 4]	2006
Louisiana	LA018	Texas	T104704245-20-18
Maine	TN00003	Texas [5]	LAB0152
Maryland	324	Utah	TN000032021-11
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	110033
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	998093910
Montana	CERT0086	Wyoming	A2LA
A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 [5]	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA–Crypto	TN00003		

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [6] Wastewater n/a Accreditation not applicable

* Not all certifications held by the laboratory are applicable to the results reported in the attached report.

* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace Analytical.

E148

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PACE ANALYTICAL SERVICES, LLC
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www.pacelabs.com

Number 129348

Ramboll - Chicago IL

Client: 333 West Wacker Drive	Report to Contact: Rita Deshpande / Abby Small	Telephone No. / E-mail: 312-288-3854	Quote No.
Address: Suite 2700	Sampler's Signature: x Eric Poissant	Analysis (Attach list if more space is needed)	Page 1 of 1
City: Chicago / State: IL / Zip Code	Printed Name: Eric Poissant		Lot # Bar Code (lab use only): L1666384
Project Name: Calumet Montana			
Project No.: 16900 29636-002 Acc-16	P.O. No.: 16900 29636		

Sample ID / Description (Containers for each sample may be combined on one line.)	Collection Date(s)	Collection Time (Military)	G=Grab C=Composite	# of Containers	Matrix: Aqueous	Solid	Non-Aqueous	No of Containers by Preservative Type: Unpres.	H2SO4	HNO3	HCl	NaOH	5035 Kit	Field Filtered	VOC	SVOC	VPH	EPH	Remarks / Cooler I.D.
CMR-SB200-101223	10/12/23	1100	G	10	X			X			X				X	X	X	X	-01

Sample Receipt Checklist

COC Seal Present/Intact:	Y N	If Applicable	
COC Signed/Accurate:	Y N	VOA Zero Headspace:	Y N
Bottles arrive intact:	Y N	Pres. Correct/Check:	Y N
Correct bottles used:	Y N		
Sufficient volume sent:	Y N		
RA Screen <0.5 mR/hr:	Y N	4.4+0=4.6	

Turn Around Time Required (Prior lab approval required for expedited TAT.): X Standard ☐ Rush (Specify)

Sample Disposal: ☐ Return to Client X Disposal by Lab

Possible Hazard Identification: X Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison ☐ Unknown

QC Requirements (Specify)

1. Relinquished by: Ramboll	Date: 10/12/23	Time: 1200	1. Received by	Date	Time
2. Relinquished by	Date	Time	2. Received by	Date	Time
3. Relinquished by	Date	Time	3. Received by	Date	Time
4. Relinquished by	Date	Time	4. Laboratory received by: Alexa Mitchell	Date: 10/13	Time: 0900

Note: All samples are retained for four weeks from receipt unless other arrangements are made.

LAB USE ONLY
Received on ice (Circle) Yes No Ice Pack
Receipt Temp._____ °C
Temp Blank ☐ Y ☐ N

DISTRIBUTION: WHITE & YELLOW-Return to laboratory with Sample(s); PINK-Field/Client Copy

T# 6727 18957 6662

Document Number: ME003N2-01

ANALYTICAL REPORT

January 19, 2024

Ramboll US Consulting, Inc. - Denver

Sample Delivery Group:	L1691901
Samples Received:	12/28/2023
Project Number:	1690029636-001
Description:	Calumet Refinery
Site:	GREAT FALLS, MT
Report To:	Abby Small 1999 Broadway Suite 2225 Denver, CO 80202

Entire Report Reviewed By:

Kelly Mercer
Project Manager

Pace Analytical National
12065 Lebanon Rd Mount Juliet, TN 37122 615-758-5858 800-767-5859 www.pacenational.com

TABLE OF CONTENTS

CUR-SP200-122723 L1691901-01 GW

Collected by: Mike Gipson
Collected date/time: 12/27/23 14:30
Received date/time: 12/28/23 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Petroleum Hydrocarbons by Method MTDEQ VPH	WG2200274	10	01/04/24 01:51	01/04/24 01:51	ADM	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG2199286	10	01/02/24 18:16	01/02/24 18:16	DYW	Mt. Juliet, TN
TPH by Method MTDEQ EPH	WG2197717	50	01/03/24 08:24	01/04/24 15:17	KAP	Mt. Juliet, TN
TPH by Method MTDEQ EPH	WG2203276	250	01/03/24 08:24	01/18/24 16:34	DMG	Mt. Juliet, TN
TPH by Method MTDEQ EPH	WG2203276	50	01/03/24 08:24	01/18/24 15:46	DMG	Mt. Juliet, TN
TPH by Method MTDEQ EPH	WG2203276	500	01/03/24 08:24	01/18/24 16:10	DMG	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG2197441	10	12/29/23 12:05	01/06/24 03:20	DSH	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG2197441	10	12/29/23 12:05	12/31/23 21:17	SAW	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM	WG2198234	3	01/02/24 16:10	01/03/24 06:48	AGW	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM	WG2198234	60	01/02/24 16:10	01/09/24 18:37	AGW	Mt. Juliet, TN

CASE NARRATIVE

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Kelly Mercer
Project Manager

Project Narrative

Due to multiple preparation procedures, calculated analytes are not reported in the quality control samples for EPH and VPH Methods.

L1691901-01: Sample is reporting from a batch with critically low recovery for Benzidine.

Sample Delivery Group (SDG) Narrative

The following analysis were performed from an unpreserved, insufficiently or inadequately preserved sample.

Lab Sample ID	Project Sample ID	Method
L1691901-01	CUR-SP200-122723	MTDEQ EPH

Volatile Petroleum Hydrocarbons by Method MTDEQ VPH

Analyte	Result ug/l	Qualifier	MDL ug/l	RDL ug/l	Dilution	Analysis date / time	Batch
Unadjusted C5-C8 Aliphatics	598	J	333	1000	10	01/04/2024 01:51	WG2200274
Unadjusted C9-C12 Aliphatics	10400		333	1000	10	01/04/2024 01:51	WG2200274
Unadjusted C9-C10 Aromatics	3790	B	333	1000	10	01/04/2024 01:51	WG2200274
Adjusted C5-C8 Aliphatics	U	J	333	1000	10	01/04/2024 01:51	WG2200274
Adjusted C9-C12 Aliphatics	10300		333	1000	10	01/04/2024 01:51	WG2200274
Total VPH	14800		667	2000	10	01/04/2024 01:51	WG2200274
(S) 2,5-Dibromotoluene(FID)	*112*			*70.0-130*		*01/04/2024 01:51*	WG2200274
(S) 2,5-Dibromotoluene(PID)	*59.7*	J2		*70.0-130*		*01/04/2024 01:51*	WG2200274

Sample Narrative:

L1691901-01 WG2200274: Dilution due to foam.

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result ug/l	Qualifier	MDL ug/l	RDL ug/l	Dilution	Analysis date / time	Batch
Acetone	U		113	250	10	01/02/2024 18:16	WG2199286
Acrylonitrile	U		6.71	50.0	10	01/02/2024 18:16	WG2199286
Benzene	300		0.941	5.00	10	01/02/2024 18:16	WG2199286
Bromobenzene	U		1.18	5.00	10	01/02/2024 18:16	WG2199286
Bromodichloromethane	U		1.36	5.00	10	01/02/2024 18:16	WG2199286
Bromochloromethane	U		1.28	5.00	10	01/02/2024 18:16	WG2199286
Bromoform	U		1.29	5.00	10	01/02/2024 18:16	WG2199286
Bromomethane	U		6.05	25.0	10	01/02/2024 18:16	WG2199286
n-Butylbenzene	15.7		1.57	5.00	10	01/02/2024 18:16	WG2199286
sec-Butylbenzene	9.90		1.25	5.00	10	01/02/2024 18:16	WG2199286
tert-Butylbenzene	U		1.27	5.00	10	01/02/2024 18:16	WG2199286
Carbon disulfide	1.35	B J	0.962	5.00	10	01/02/2024 18:16	WG2199286
Carbon tetrachloride	U		1.28	5.00	10	01/02/2024 18:16	WG2199286
Chlorobenzene	U		1.17	5.00	10	01/02/2024 18:16	WG2199286
Chlorodibromomethane	U		1.40	5.00	10	01/02/2024 18:16	WG2199286
Chloroethane	U		1.92	25.0	10	01/02/2024 18:16	WG2199286
2-Chloroethyl vinyl ether	U		5.75	500	10	01/02/2024 18:16	WG2199286
Chloroform	U		1.11	5.00	10	01/02/2024 18:16	WG2199286
Chloromethane	U		9.60	12.5	10	01/02/2024 18:16	WG2199286
2-Chlorotoluene	U		1.06	5.00	10	01/02/2024 18:16	WG2199286
4-Chlorotoluene	U		1.14	5.00	10	01/02/2024 18:16	WG2199286
1,2-Dibromo-3-Chloropropane	U		2.76	25.0	10	01/02/2024 18:16	WG2199286
1,2-Dibromoethane	U		1.26	5.00	10	01/02/2024 18:16	WG2199286
Dibromomethane	U		1.22	5.00	10	01/02/2024 18:16	WG2199286
1,2-Dichlorobenzene	U		1.07	5.00	10	01/02/2024 18:16	WG2199286
1,3-Dichlorobenzene	U		2.99	5.00	10	01/02/2024 18:16	WG2199286
1,4-Dichlorobenzene	U		1.20	5.00	10	01/02/2024 18:16	WG2199286
Dichlorodifluoromethane	U		3.74	25.0	10	01/02/2024 18:16	WG2199286
1,1-Dichloroethane	U		1.00	5.00	10	01/02/2024 18:16	WG2199286
1,2-Dichloroethane	U	J4	0.819	5.00	10	01/02/2024 18:16	WG2199286
1,1-Dichloroethene	U		1.88	5.00	10	01/02/2024 18:16	WG2199286
cis-1,2-Dichloroethene	U		1.26	5.00	10	01/02/2024 18:16	WG2199286
trans-1,2-Dichloroethene	U		1.49	5.00	10	01/02/2024 18:16	WG2199286
1,2-Dichloropropane	U		1.49	5.00	10	01/02/2024 18:16	WG2199286
1,1-Dichloropropene	U		1.42	5.00	10	01/02/2024 18:16	WG2199286
1,3-Dichloropropane	U		1.09	10.0	10	01/02/2024 18:16	WG2199286
cis-1,3-Dichloropropene	U		1.11	5.00	10	01/02/2024 18:16	WG2199286
trans-1,3-Dichloropropene	U		1.18	5.00	10	01/02/2024 18:16	WG2199286
trans-1,4-Dichloro-2-butene	U		4.67	50.0	10	01/02/2024 18:16	WG2199286
2,2-Dichloropropane	U		1.61	5.00	10	01/02/2024 18:16	WG2199286

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result ug/l	Qualifier	MDL ug/l	RDL ug/l	Dilution	Analysis date / time	Batch
Di-isopropyl ether	U		1.05	5.00	10	01/02/2024 18:16	WG2199286
Ethylbenzene	23.7		1.37	5.00	10	01/02/2024 18:16	WG2199286
Hexachloro-1,3-butadiene	U		3.37	10.0	10	01/02/2024 18:16	WG2199286
2-Hexanone	U		7.87	50.0	10	01/02/2024 18:16	WG2199286
n-Hexane	U		7.49	50.0	10	01/02/2024 18:16	WG2199286
Iodomethane	U		5.54	50.0	10	01/02/2024 18:16	WG2199286
Isopropylbenzene	3.42	J	1.05	5.00	10	01/02/2024 18:16	WG2199286
p-Isopropyltoluene	15.2		1.20	5.00	10	01/02/2024 18:16	WG2199286
2-Butanone (MEK)	U		11.9	50.0	10	01/02/2024 18:16	WG2199286
Methylene Chloride	U		4.30	25.0	10	01/02/2024 18:16	WG2199286
4-Methyl-2-pentanone (MIBK)	U		4.78	50.0	10	01/02/2024 18:16	WG2199286
Methyl tert-butyl ether	U		1.01	5.00	10	01/02/2024 18:16	WG2199286
Naphthalene	47.6		1.74	25.0	10	01/02/2024 18:16	WG2199286
n-Propylbenzene	5.74		0.993	5.00	10	01/02/2024 18:16	WG2199286
Styrene	U		1.18	5.00	10	01/02/2024 18:16	WG2199286
1,1,1,2-Tetrachloroethane	U		1.47	5.00	10	01/02/2024 18:16	WG2199286
1,1,2,2-Tetrachloroethane	U		1.33	5.00	10	01/02/2024 18:16	WG2199286
1,1,2-Trichlorotrifluoroethane	U		1.80	5.00	10	01/02/2024 18:16	WG2199286
Tetrachloroethene	U		3.00	5.00	10	01/02/2024 18:16	WG2199286
Toluene	U		2.78	5.00	10	01/02/2024 18:16	WG2199286
1,2,3-Trichlorobenzene	U		1.64	5.00	10	01/02/2024 18:16	WG2199286
1,2,4-Trichlorobenzene	U		4.81	10.0	10	01/02/2024 18:16	WG2199286
1,1,1-Trichloroethane	U		1.49	5.00	10	01/02/2024 18:16	WG2199286
1,1,2-Trichloroethane	U		1.58	5.00	10	01/02/2024 18:16	WG2199286
Trichloroethene	U		1.90	5.00	10	01/02/2024 18:16	WG2199286
Trichlorofluoromethane	U		1.60	25.0	10	01/02/2024 18:16	WG2199286
1,2,3-Trichloropropane	U		2.37	25.0	10	01/02/2024 18:16	WG2199286
1,2,4-Trimethylbenzene	296		3.22	5.00	10	01/02/2024 18:16	WG2199286
1,2,3-Trimethylbenzene	163		1.04	5.00	10	01/02/2024 18:16	WG2199286
1,3,5-Trimethylbenzene	43.3		1.04	5.00	10	01/02/2024 18:16	WG2199286
Vinyl acetate	U	J4	6.92	50.0	10	01/02/2024 18:16	WG2199286
Vinyl chloride	U		2.34	5.00	10	01/02/2024 18:16	WG2199286
Xylenes, Total	110		1.74	15.0	10	01/02/2024 18:16	WG2199286
(S) Toluene-d8	*99.3*			*80.0-120*		*01/02/2024 18:16*	WG2199286
(S) 4-Bromofluorobenzene	*126*			*77.0-126*		*01/02/2024 18:16*	WG2199286
(S) 1,2-Dichloroethane-d4	*121*			*70.0-130*		*01/02/2024 18:16*	WG2199286

TPH by Method MTDEQ EPH

Analyte	Result ug/l	Qualifier	MDL ug/l	RDL ug/l	Dilution	Analysis date / time	Batch
EPH Screen	914000		5000	15000	50	01/04/2024 15:17	WG2197717
Unadjusted C9-C18 Aliphatics	306000		50000	150000	250	01/18/2024 16:34	WG2203276
Unadjusted C19-C36 Aliphatics	102000		10000	30000	50	01/18/2024 15:46	WG2203276
Unadjusted C11-C22 Aromatics	1170000		100000	300000	500	01/18/2024 16:10	WG2203276
Unadjusted Total Petroleum Hydrocarbons	1580000		50000	150000	250	01/18/2024 16:34	WG2203276
Adjusted C11-C22 Aromatics	1170000		100000	300000	500	01/18/2024 16:10	WG2203276
Adjusted Total Petroleum Hydrocarbons	1580000		50000	150000	250	01/18/2024 16:34	WG2203276
(S) o-Terphenyl	*0.000*	J7		*40.0-140*		*01/04/2024 15:17*	WG2197717
(S) o-Terphenyl	*0.000*	J7		*40.0-140*		*01/18/2024 16:10*	WG2203276
(S) 1-Chloro-octadecane	*0.000*	J7		*40.0-140*		*01/18/2024 15:46*	WG2203276
(S) 1-Chloro-octadecane	*0.000*	J7		*40.0-140*		*01/18/2024 16:34*	WG2203276
(S) 2-Fluorobiphenyl	*0.000*	J7		*40.0-140*		*01/18/2024 16:10*	WG2203276
(S) 2-Bromonaphthalene	*0.000*	J7		*40.0-140*		*01/18/2024 16:10*	WG2203276

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
Acenaphthene	8.24	J	0.886	10.0	10	12/31/2023 21:17	WG2197441
Acenaphthylene	U		0.921	10.0	10	12/31/2023 21:17	WG2197441
Anthracene	U		0.804	10.0	10	12/31/2023 21:17	WG2197441
Benzidine	U	J4	37.4	100	10	12/31/2023 21:17	WG2197441
Benzo(a)anthracene	U		1.99	10.0	10	12/31/2023 21:17	WG2197441
Benzo(b)fluoranthene	U		1.30	10.0	10	12/31/2023 21:17	WG2197441
Benzo(k)fluoranthene	U		1.20	10.0	10	12/31/2023 21:17	WG2197441
Benzo(g,h,i)perylene	U		1.21	10.0	10	12/31/2023 21:17	WG2197441
Benzo(a)pyrene	U		0.381	10.0	10	12/31/2023 21:17	WG2197441
Bis(2-chlorethoxy)methane	U		1.16	100	10	12/31/2023 21:17	WG2197441
Bis(2-chloroethyl)ether	U		1.37	100	10	12/31/2023 21:17	WG2197441
2,2-Oxybis(1-Chloropropane)	U		2.10	100	10	12/31/2023 21:17	WG2197441
4-Bromophenyl-phenylether	U		0.877	100	10	12/31/2023 21:17	WG2197441
2-Chloronaphthalene	U		0.648	10.0	10	12/31/2023 21:17	WG2197441
4-Chlorophenyl-phenylether	U		0.926	100	10	12/31/2023 21:17	WG2197441
Chrysene	U		1.30	10.0	10	12/31/2023 21:17	WG2197441
Dibenz(a,h)anthracene	U		0.644	10.0	10	12/31/2023 21:17	WG2197441
3,3-Dichlorobenzidine	U		2.12	100	10	12/31/2023 21:17	WG2197441
2,4-Dinitrotoluene	U		0.983	100	10	12/31/2023 21:17	WG2197441
2,6-Dinitrotoluene	U		2.50	100	10	12/31/2023 21:17	WG2197441
Fluoranthene	U		1.02	10.0	10	12/31/2023 21:17	WG2197441
Fluorene	15.7		0.844	10.0	10	12/31/2023 21:17	WG2197441
Hexachlorobenzene	U		0.755	10.0	10	12/31/2023 21:17	WG2197441
Hexachloro-1,3-butadiene	U		0.968	100	10	12/31/2023 21:17	WG2197441
Hexachlorocyclopentadiene	U		0.598	100	10	12/31/2023 21:17	WG2197441
Hexachloroethane	U		1.27	100	10	12/31/2023 21:17	WG2197441
Indeno(1,2,3-cd)pyrene	U	J4	2.79	10.0	10	12/31/2023 21:17	WG2197441
Isophorone	U		1.43	100	10	12/31/2023 21:17	WG2197441
Naphthalene	19.0		1.59	10.0	10	12/31/2023 21:17	WG2197441
Nitrobenzene	U		2.97	100	10	12/31/2023 21:17	WG2197441
n-Nitrosodimethylamine	U		9.98	100	10	12/31/2023 21:17	WG2197441
n-Nitrosodiphenylamine	U		23.7	100	10	12/31/2023 21:17	WG2197441
n-Nitrosodi-n-propylamine	U		2.61	100	10	12/31/2023 21:17	WG2197441
Phenanthrene	10.5		1.12	10.0	10	12/31/2023 21:17	WG2197441
Benzylbutyl phthalate	U		7.65	30.0	10	12/31/2023 21:17	WG2197441
Bis(2-Ethylhexyl)phthalate	U		8.95	30.0	10	12/31/2023 21:17	WG2197441
Di-n-butyl phthalate	U		4.53	30.0	10	12/31/2023 21:17	WG2197441
Diethyl phthalate	U		2.87	30.0	10	12/31/2023 21:17	WG2197441
Dimethyl phthalate	U		2.60	30.0	10	12/31/2023 21:17	WG2197441
Di-n-octyl phthalate	U	J4	9.32	30.0	10	12/31/2023 21:17	WG2197441
Pyrene	3.78	J	1.07	10.0	10	12/31/2023 21:17	WG2197441
1,2,4-Trichlorobenzene	U		0.698	100	10	12/31/2023 21:17	WG2197441
Aniline	U		16.5	100	10	12/31/2023 21:17	WG2197441
1,2-Diphenylhydrazine	U	N2	1.05	100	10	12/31/2023 21:17	WG2197441
Benzyl alcohol	U		5.63	100	10	12/31/2023 21:17	WG2197441
4-Chloroaniline	U		2.34	100	10	12/31/2023 21:17	WG2197441
4-Chloro-3-methylphenol	U		1.31	100	10	12/31/2023 21:17	WG2197441
2-Chlorophenol	U		1.33	100	10	12/31/2023 21:17	WG2197441
Dibenzofuran	U		0.970	100	10	12/31/2023 21:17	WG2197441
2,4-Dichlorophenol	U		1.02	100	10	12/31/2023 21:17	WG2197441
2,4-Dimethylphenol	46.7	J	0.636	100	10	12/31/2023 21:17	WG2197441
4,6-Dinitro-2-methylphenol	U		11.2	100	10	12/31/2023 21:17	WG2197441
2,4-Dinitrophenol	U		59.3	100	10	12/31/2023 21:17	WG2197441
2-Methylnaphthalene	57.0		1.17	10.0	10	12/31/2023 21:17	WG2197441
2-Methylphenol	U		0.929	100	10	12/31/2023 21:17	WG2197441
3&4-Methyl Phenol	U		1.68	100	10	12/31/2023 21:17	WG2197441

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
2-Nitroaniline	U		1.02	100	10	12/31/2023 21:17	WG2197441
3-Nitroaniline	U		0.869	100	10	12/31/2023 21:17	WG2197441
4-Nitroaniline	U		0.910	100	10	12/31/2023 21:17	WG2197441
2-Nitrophenol	U		1.17	100	10	12/31/2023 21:17	WG2197441
4-Nitrophenol	U		1.43	100	10	12/31/2023 21:17	WG2197441
Pentachlorophenol	U		3.13	100	10	12/31/2023 21:17	WG2197441
Phenol	U		43.3	100	10	12/31/2023 21:17	WG2197441
Pyridine	U		6.27	100	10	12/31/2023 21:17	WG2197441
2,4,6-Trichlorophenol	U		1.00	100	10	12/31/2023 21:17	WG2197441
Acetophenone	U		2.08	100	10	12/31/2023 21:17	WG2197441
2-Acetylaminofluorene	U		2.53	100	10	01/06/2024 03:20	WG2197441
4-Aminobiphenyl	U		4.61	100	10	01/06/2024 03:20	WG2197441
Chlorobenzilate	U		38.4	500	10	01/06/2024 03:20	WG2197441
Diallate	U		5.24	100	10	01/06/2024 03:20	WG2197441
2,6-Dichlorophenol	U		1.02	100	10	01/06/2024 03:20	WG2197441
Dimethoate	U		50.5	500	10	01/06/2024 03:20	WG2197441
P-(Dimethylamino) Azobenzene	U		36.9	100	10	01/06/2024 03:20	WG2197441
Dimethylbenz (A) Anthracene	U		17.1	100	10	01/06/2024 03:20	WG2197441
3,3-Dimethylbenzidine	U		33.9	100	10	01/06/2024 03:20	WG2197441
a,a-Dimethylphenethylamine	U	J4	31.3	500	10	01/06/2024 03:20	WG2197441
1,3-Dinitrobenzene	U		3.59	100	10	01/06/2024 03:20	WG2197441
Diphenylamine	U		23.7	100	10	12/31/2023 21:17	WG2197441
Dinoseb	U		80.1	500	10	01/06/2024 03:20	WG2197441
Disulfoton	U		2.67	100	10	01/06/2024 03:20	WG2197441
Ethyl methanesulfonate	U		3.26	100	10	01/06/2024 03:20	WG2197441
Ethyl Parathion	U		3.79	100	10	01/06/2024 03:20	WG2197441
Famphur	U		39.2	200	10	01/06/2024 03:20	WG2197441
Hexachloropropene	U		1.49	500	10	01/06/2024 03:20	WG2197441
Hexachlorophene	U	J4	14.4	500	10	01/06/2024 03:20	WG2197441
Isodrin	U		41.1	100	10	01/06/2024 03:20	WG2197441
Isosafrole	U		38.8	100	10	01/06/2024 03:20	WG2197441
Kepone	U		26.6	200	10	01/06/2024 03:20	WG2197441
Methapyrilene	U		100	500	10	01/06/2024 03:20	WG2197441
3-Methylcholanthrene	U		1.64	100	10	01/06/2024 03:20	WG2197441
Methyl methanesulfonate	U		34.0	500	10	01/06/2024 03:20	WG2197441
Methyl parathion	U		2.13	100	10	01/06/2024 03:20	WG2197441
1,4-Naphthoquinone	U	J4	55.6	500	10	01/06/2024 03:20	WG2197441
1-Naphthylamine	U		2.89	100	10	01/06/2024 03:20	WG2197441
2-Naphthylamine	U		44.8	100	10	01/06/2024 03:20	WG2197441
5-Nitro-o-toluidine	U		19.9	100	10	01/06/2024 03:20	WG2197441
4-Nitroquinoline 1-oxide	U		20.3	100	10	01/06/2024 03:20	WG2197441
n-Nitrosodiethylamine	U		35.7	100	10	01/06/2024 03:20	WG2197441
n-Nitrosodi-n-butylamine	U		39.1	100	10	01/06/2024 03:20	WG2197441
n-Nitrosomethylethylamine	U		32.5	100	10	01/06/2024 03:20	WG2197441
n-Nitrosomorpholine	U		32.5	100	10	01/06/2024 03:20	WG2197441
n-Nitrosopiperidine	U		37.2	100	10	01/06/2024 03:20	WG2197441
n-Nitrosopyrrolidine	U		33.9	100	10	01/06/2024 03:20	WG2197441
Pentachlorobenzene	U		41.5	100	10	01/06/2024 03:20	WG2197441
Pentachloroethane	U		28.3	500	10	01/06/2024 03:20	WG2197441
Pentachloronitrobenzene	U		41.5	100	10	01/06/2024 03:20	WG2197441
Phenacetin	U		46.6	100	10	01/06/2024 03:20	WG2197441
p-Phenylenediamine	U	J4	3870	69000	10	01/06/2024 03:20	WG2197441
Phorate	U		48.6	500	10	01/06/2024 03:20	WG2197441
2-Picoline	U		68.3	500	10	01/06/2024 03:20	WG2197441
Pronamide	U		42.1	100	10	01/06/2024 03:20	WG2197441
Safrole	U		36.8	100	10	01/06/2024 03:20	WG2197441

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
Sulfotep	U		39.9	500	10	01/06/2024 03:20	WG2197441
1,2,4,5-Tetrachlorobenzene	U		0.647	100	10	12/31/2023 21:17	WG2197441
2,3,4,6-Tetrachlorophenol	U		2.31	100	10	12/31/2023 21:17	WG2197441
Thionazin	U		40.7	100	10	01/06/2024 03:20	WG2197441
o-Toluidine	U		35.3	100	10	01/06/2024 03:20	WG2197441
2,4,5-Trichlorophenol	U		1.09	100	10	12/31/2023 21:17	WG2197441
O,O,O-Triethyl Phosphorothioate	U		29.3	100	10	01/06/2024 03:20	WG2197441
1,3,5-Trinitrobenzene	U		13.2	100	10	01/06/2024 03:20	WG2197441
(S) 2-Fluorophenol	*31.4*			*10.0-120*		*12/31/2023 21:17*	WG2197441
(S) Phenol-d5	*32.4*			*10.0-120*		*12/31/2023 21:17*	WG2197441
(S) Nitrobenzene-d5	*121*			*10.0-127*		*12/31/2023 21:17*	WG2197441
(S) 2-Fluorobiphenyl	*40.1*			*10.0-130*		*12/31/2023 21:17*	WG2197441
(S) 2,4,6-Tribromophenol	*57.1*			*10.0-155*		*12/31/2023 21:17*	WG2197441
(S) p-Terphenyl-d14	*40.9*			*10.0-128*		*12/31/2023 21:17*	WG2197441

Sample Narrative:

L1691901-01 WG2197441: Dilution due to matrix

Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
Anthracene	U		0.0570	0.150	3	01/03/2024 06:48	WG2198234
Acenaphthene	U		1.14	3.00	60	01/09/2024 18:37	WG2198234
Acenaphthylene	U		1.03	3.00	60	01/09/2024 18:37	WG2198234
Benzo(a)anthracene	0.205		0.0609	0.150	3	01/03/2024 06:48	WG2198234
Benzo(a)pyrene	U		1.10	3.00	60	01/09/2024 18:37	WG2198234
Benzo(b)fluoranthene	U		1.01	3.00	60	01/09/2024 18:37	WG2198234
Benzo(g,h,i)perylene	U		1.10	3.00	60	01/09/2024 18:37	WG2198234
Benzo(k)fluoranthene	U		1.21	3.00	60	01/09/2024 18:37	WG2198234
Chrysene	0.200		0.0537	0.150	3	01/03/2024 06:48	WG2198234
Dibenz(a,h)anthracene	U		0.960	3.00	60	01/09/2024 18:37	WG2198234
Fluoranthene	1.21		0.0810	0.300	3	01/03/2024 06:48	WG2198234
Fluorene	37.8		1.01	3.00	60	01/09/2024 18:37	WG2198234
Indeno(1,2,3-cd)pyrene	U		0.948	3.00	60	01/09/2024 18:37	WG2198234
Naphthalene	44.5		0.275	0.750	3	01/03/2024 06:48	WG2198234
Phenanthrene	23.9		0.0540	0.150	3	01/03/2024 06:48	WG2198234
Pyrene	9.25		0.0507	0.150	3	01/03/2024 06:48	WG2198234
1-Methylnaphthalene	140		0.206	0.750	3	01/03/2024 06:48	WG2198234
2-Methylnaphthalene	103		0.202	0.750	3	01/03/2024 06:48	WG2198234
2-Chloronaphthalene	U		4.09	15.0	60	01/09/2024 18:37	WG2198234
(S) Nitrobenzene-d5	*0.000*	J2		*31.0-160*		*01/03/2024 06:48*	WG2198234
(S) Nitrobenzene-d5	*0.000*	J7		*31.0-160*		*01/09/2024 18:37*	WG2198234
(S) 2-Fluorobiphenyl	*0.000*	J2		*48.0-148*		*01/03/2024 06:48*	WG2198234
(S) 2-Fluorobiphenyl	*0.000*	J7		*48.0-148*		*01/09/2024 18:37*	WG2198234
(S) p-Terphenyl-d14	*82.7*			*37.0-146*		*01/03/2024 06:48*	WG2198234
(S) p-Terphenyl-d14	*104*	J7		*37.0-146*		*01/09/2024 18:37*	WG2198234

Sample Narrative:

L1691901-01 WG2198234: Dilution and surrogate failure due to matrix interference.

L1691901-01 WG2198234: IS/SURR failed on lower dilution.

Method Blank (MB)

(MB) R4019744-3 01/03/24 18:18

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Unadjusted C5-C8 Aliphatics	U		33.3	100
Unadjusted C9-C12 Aliphatics	U		33.3	100
Unadjusted C9-C10 Aromatics	53.3	J	33.3	100
Adjusted C5-C8 Aliphatics	U		33.3	100
Adjusted C9-C12 Aliphatics	U		33.3	100
Total VPH	U		66.7	200
(S) 2,5-Dibromotoluene(FID)	*84.8*			*70.0-130*
(S) 2,5-Dibromotoluene(PID)	*72.9*			*70.0-130*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R4019744-1 01/03/24 15:50 • (LCSD) R4019744-2 01/03/24 16:27

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Unadjusted C5-C8 Aliphatics	1200	1280	1540	107	128	70.0-130			18.4	50
Unadjusted C9-C12 Aliphatics	1400	1470	1730	105	124	70.0-130			16.3	50
Unadjusted C9-C10 Aromatics	200	156	196	78.0	98.0	70.0-130			22.7	50
Total VPH	2800	2910	3470	104	124	70.0-130			17.6	50
(S) 2,5-Dibromotoluene(FID)				*103*	*84.3*	*70.0-130*				
(S) 2,5-Dibromotoluene(PID)				*89.6*	*73.5*	*70.0-130*				

Method Blank (MB)

(MB) R4020279-3 01/02/24 10:30

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Acetone	U		11.3	25.0
Acrylonitrile	U		0.671	5.00
Benzene	U		0.0941	0.500
Bromobenzene	U		0.118	0.500
Bromodichloromethane	U		0.136	0.500
Bromochloromethane	U		0.128	0.500
Bromoform	U		0.129	0.500
Bromomethane	U		0.605	2.50
n-Butylbenzene	U		0.157	0.500
sec-Butylbenzene	U		0.125	0.500
tert-Butylbenzene	U		0.127	0.500
Carbon disulfide	0.371	J	0.0962	0.500
Carbon tetrachloride	U		0.128	0.500
Chlorobenzene	U		0.117	0.500
Chlorodibromomethane	U		0.140	0.500
Chloroethane	U		0.192	2.50
2-Chloroethyl vinyl ether	U		0.575	50.0
Chloroform	U		0.111	0.500
Chloromethane	U		0.960	1.25
2-Chlorotoluene	U		0.106	0.500
4-Chlorotoluene	U		0.114	0.500
1,2-Dibromo-3-Chloropropane	U		0.276	2.50
1,2-Dibromoethane	U		0.126	0.500
Dibromomethane	U		0.122	0.500
1,2-Dichlorobenzene	U		0.107	0.500
1,3-Dichlorobenzene	U		0.299	0.500
1,4-Dichlorobenzene	U		0.120	0.500
Dichlorodifluoromethane	U		0.374	2.50
1,1-Dichloroethane	U		0.100	0.500
1,2-Dichloroethane	U		0.0819	0.500
1,1-Dichloroethene	U		0.188	0.500
cis-1,2-Dichloroethene	U		0.126	0.500
trans-1,2-Dichloroethene	U		0.149	0.500
1,2-Dichloropropane	U		0.149	0.500
1,1-Dichloropropene	U		0.142	0.500
1,3-Dichloropropane	U		0.109	1.00
cis-1,3-Dichloropropene	U		0.111	0.500
trans-1,3-Dichloropropene	U		0.118	0.500
trans-1,4-Dichloro-2-butene	U		0.467	5.00
2,2-Dichloropropane	U		0.161	0.500

Method Blank (MB)

(MB) R4020279-3 01/02/24 10:30

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Di-isopropyl ether	U		0.105	0.500
Ethylbenzene	U		0.137	0.500
Hexachloro-1,3-butadiene	U		0.337	1.00
2-Hexanone	U		0.787	5.00
n-Hexane	U		0.749	5.00
Iodomethane	U		0.554	5.00
Isopropylbenzene	U		0.105	0.500
p-Isopropyltoluene	U		0.120	0.500
2-Butanone (MEK)	U		1.19	5.00
Methylene Chloride	U		0.430	2.50
4-Methyl-2-pentanone (MIBK)	U		0.478	5.00
Methyl tert-butyl ether	U		0.101	0.500
Naphthalene	U		0.174	2.50
n-Propylbenzene	U		0.0993	0.500
Styrene	U		0.118	0.500
1,1,1,2-Tetrachloroethane	U		0.147	0.500
1,1,2,2-Tetrachloroethane	U		0.133	0.500
1,1,2-Trichlorotrifluoroethane	U		0.180	0.500
Tetrachloroethene	U		0.300	0.500
Toluene	U		0.278	0.500
1,2,3-Trichlorobenzene	U		0.164	0.500
1,2,4-Trichlorobenzene	U		0.481	1.00
1,1,1-Trichloroethane	U		0.149	0.500
1,1,2-Trichloroethane	U		0.158	0.500
Trichloroethene	U		0.190	0.500
Trichlorofluoromethane	U		0.160	2.50
1,2,3-Trichloropropane	U		0.237	2.50
1,2,4-Trimethylbenzene	U		0.322	0.500
1,2,3-Trimethylbenzene	U		0.104	0.500
1,3,5-Trimethylbenzene	U		0.104	0.500
Vinyl acetate	U		0.692	5.00
Vinyl chloride	U		0.234	0.500
Xylenes, Total	U		0.174	1.50
(S) Toluene-d8	*104*			*80.0-120*
(S) 4-Bromofluorobenzene	*118*			*77.0-126*
(S) 1,2-Dichloroethane-d4	*118*			*70.0-130*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R4020279-1 01/02/24 09:26 • (LCSD) R4020279-2 01/02/24 09:47

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Acetone	25.0	16.6	19.6	66.4	78.4	19.0-160			16.6	27
Acrylonitrile	25.0	30.0	30.7	120	123	55.0-149			2.31	20
Benzene	5.00	5.53	5.69	111	114	70.0-123			2.85	20
Bromobenzene	5.00	4.16	4.30	83.2	86.0	73.0-121			3.31	20
Bromodichloromethane	5.00	5.66	5.73	113	115	75.0-120			1.23	20
Bromochloromethane	5.00	5.93	6.10	119	122	76.0-122			2.83	20
Bromoform	5.00	4.20	4.26	84.0	85.2	68.0-132			1.42	20
Bromomethane	5.00	3.19	3.33	63.8	66.6	10.0-160			4.29	25
n-Butylbenzene	5.00	4.26	4.49	85.2	89.8	73.0-125			5.26	20
sec-Butylbenzene	5.00	4.01	4.30	80.2	86.0	75.0-125			6.98	20
tert-Butylbenzene	5.00	4.25	4.50	85.0	90.0	76.0-124			5.71	20
Carbon disulfide	5.00	5.64	5.63	113	113	61.0-128			0.177	20
Carbon tetrachloride	5.00	5.74	6.07	115	121	68.0-126			5.59	20
Chlorobenzene	5.00	4.57	4.78	91.4	95.6	80.0-121			4.49	20
Chlorodibromomethane	5.00	4.52	4.66	90.4	93.2	77.0-125			3.05	20
Chloroethane	5.00	4.94	5.31	98.8	106	47.0-150			7.22	20
2-Chloroethyl vinyl ether	25.0	33.5	34.8	134	139	51.0-160			3.81	20
Chloroform	5.00	5.69	5.79	114	116	73.0-120			1.74	20
Chloromethane	5.00	5.18	5.38	104	108	41.0-142			3.79	20
2-Chlorotoluene	5.00	4.24	4.41	84.8	88.2	76.0-123			3.93	20
4-Chlorotoluene	5.00	4.10	4.31	82.0	86.2	75.0-122			4.99	20
1,2-Dibromo-3-Chloropropane	5.00	3.39	3.50	67.8	70.0	58.0-134			3.19	20
1,2-Dibromoethane	5.00	4.30	4.51	86.0	90.2	80.0-122			4.77	20
Dibromomethane	5.00	5.34	5.56	107	111	80.0-120			4.04	20
1,2-Dichlorobenzene	5.00	4.26	4.45	85.2	89.0	79.0-121			4.36	20
1,3-Dichlorobenzene	5.00	4.10	4.30	82.0	86.0	79.0-120			4.76	20
1,4-Dichlorobenzene	5.00	4.26	4.45	85.2	89.0	79.0-120			4.36	20
Dichlorodifluoromethane	5.00	6.72	6.64	134	133	51.0-149			1.20	20
1,1-Dichloroethane	5.00	5.89	5.98	118	120	70.0-126			1.52	20
1,2-Dichloroethane	5.00	6.22	6.48	124	130	70.0-128		J4	4.09	20
1,1-Dichloroethene	5.00	5.27	5.42	105	108	71.0-124			2.81	20
cis-1,2-Dichloroethene	5.00	5.65	5.76	113	115	73.0-120			1.93	20
trans-1,2-Dichloroethene	5.00	5.38	5.62	108	112	73.0-120			4.36	20
1,2-Dichloropropane	5.00	5.82	5.86	116	117	77.0-125			0.685	20
1,1-Dichloropropene	5.00	5.52	5.61	110	112	74.0-126			1.62	20
1,3-Dichloropropane	5.00	4.79	4.80	95.8	96.0	80.0-120			0.209	20
cis-1,3-Dichloropropene	5.00	5.65	5.78	113	116	80.0-123			2.27	20
trans-1,3-Dichloropropene	5.00	4.79	5.00	95.8	100	78.0-124			4.29	20
trans-1,4-Dichloro-2-butene	5.00	5.64	5.48	113	110	33.0-144			2.88	20
2,2-Dichloropropane	5.00	6.13	6.31	123	126	58.0-130			2.89	20

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R4020279-1 01/02/24 09:26 • (LCSD) R4020279-2 01/02/24 09:47

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Di-isopropyl ether	5.00	6.45	6.59	129	132	58.0-138			2.15	20
Ethylbenzene	5.00	4.40	4.75	88.0	95.0	79.0-123			7.65	20
Hexachloro-1,3-butadiene	5.00	4.60	4.72	92.0	94.4	54.0-138			2.58	20
2-Hexanone	25.0	20.1	21.4	80.4	85.6	67.0-149			6.27	20
n-Hexane	5.00	5.68	5.95	114	119	57.0-133			4.64	20
Iodomethane	25.0	19.2	21.3	76.8	85.2	33.0-147			10.4	26
Isopropylbenzene	5.00	4.52	4.85	90.4	97.0	76.0-127			7.04	20
p-Isopropyltoluene	5.00	4.27	4.52	85.4	90.4	76.0-125			5.69	20
2-Butanone (MEK)	25.0	22.1	23.7	88.4	94.8	44.0-160			6.99	20
Methylene Chloride	5.00	5.18	5.35	104	107	67.0-120			3.23	20
4-Methyl-2-pentanone (MIBK)	25.0	25.9	27.0	104	108	68.0-142			4.16	20
Methyl tert-butyl ether	5.00	5.92	6.03	118	121	68.0-125			1.84	20
Naphthalene	5.00	3.29	3.57	65.8	71.4	54.0-135			8.16	20
n-Propylbenzene	5.00	4.07	4.30	81.4	86.0	77.0-124			5.50	20
Styrene	5.00	4.37	4.55	87.4	91.0	73.0-130			4.04	20
1,1,1,2-Tetrachloroethane	5.00	4.55	4.63	91.0	92.6	75.0-125			1.74	20
1,1,2,2-Tetrachloroethane	5.00	3.98	4.09	79.6	81.8	65.0-130			2.73	20
1,1,2-Trichlorotrifluoroethane	5.00	5.49	5.73	110	115	69.0-132			4.28	20
Tetrachloroethene	5.00	4.78	5.21	95.6	104	72.0-132			8.61	20
Toluene	5.00	4.65	4.93	93.0	98.6	79.0-120			5.85	20
1,2,3-Trichlorobenzene	5.00	4.01	4.26	80.2	85.2	50.0-138			6.05	20
1,2,4-Trichlorobenzene	5.00	3.96	4.20	79.2	84.0	57.0-137			5.88	20
1,1,1-Trichloroethane	5.00	5.75	5.97	115	119	73.0-124			3.75	20
1,1,2-Trichloroethane	5.00	4.59	4.66	91.8	93.2	80.0-120			1.51	20
Trichloroethene	5.00	5.67	5.71	113	114	78.0-124			0.703	20
Trichlorofluoromethane	5.00	5.70	6.02	114	120	59.0-147			5.46	20
1,2,3-Trichloropropane	5.00	3.89	4.10	77.8	82.0	73.0-130			5.26	20
1,2,4-Trimethylbenzene	5.00	4.12	4.38	82.4	87.6	76.0-121			6.12	20
1,2,3-Trimethylbenzene	5.00	4.03	4.21	80.6	84.2	77.0-120			4.37	20
1,3,5-Trimethylbenzene	5.00	4.24	4.48	84.8	89.6	76.0-122			5.50	20
Vinyl acetate	25.0	38.9	41.6	156	166	11.0-160		J4	6.71	20
Vinyl chloride	5.00	5.21	5.78	104	116	67.0-131			10.4	20
Xylenes, Total	15.0	13.4	14.4	89.3	96.0	79.0-123			7.19	20
(S) Toluene-d8				*98.9*	*101*	*80.0-120*				
(S) 4-Bromofluorobenzene				*113*	*115*	*77.0-126*				
(S) 1,2-Dichloroethane-d4				*121*	*118*	*70.0-130*				

L1691296-11 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1691296-11 01/02/24 15:25 • (MS) R4020279-4 01/02/24 18:38 • (MSD) R4020279-5 01/02/24 18:59

Analyte	Spike Amount ug/l	Original Result ug/l	MS Result ug/l	MSD Result ug/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Acetone	25.0	U	17.1	15.9	68.4	63.6	1	10.0-160			7.27	35
Acrylonitrile	25.0	U	31.0	29.5	124	118	1	21.0-160			4.96	32
Benzene	5.00	U	4.88	4.69	97.6	93.8	1	17.0-158			3.97	27
Bromobenzene	5.00	U	3.97	3.90	79.4	78.0	1	30.0-149			1.78	28
Bromodichloromethane	5.00	U	5.43	5.34	109	107	1	31.0-150			1.67	27
Bromochloromethane	5.00	U	5.12	4.88	102	97.6	1	38.0-142			4.80	26
Bromoform	5.00	U	3.96	3.92	79.2	78.4	1	29.0-150			1.02	29
Bromomethane	5.00	U	2.14	2.32	42.8	46.4	1	10.0-160			8.07	38
n-Butylbenzene	5.00	U	4.26	4.25	85.2	85.0	1	31.0-150			0.235	30
sec-Butylbenzene	5.00	U	4.14	4.06	82.8	81.2	1	33.0-155			1.95	29
tert-Butylbenzene	5.00	U	4.23	4.22	84.6	84.4	1	34.0-153			0.237	28
Carbon disulfide	5.00	0.125	1.87	1.77	34.9	32.9	1	10.0-156			5.49	28
Carbon tetrachloride	5.00	U	5.40	5.30	108	106	1	23.0-159			1.87	28
Chlorobenzene	5.00	U	4.31	4.19	86.2	83.8	1	33.0-152			2.82	27
Chlorodibromomethane	5.00	U	4.30	4.22	86.0	84.4	1	37.0-149			1.88	27
Chloroethane	5.00	U	3.57	3.49	71.4	69.8	1	10.0-160			2.27	30
2-Chloroethyl vinyl ether	25.0	U	U	U	0.000	0.000	1	10.0-160	J6	J6	0.000	31
Chloroform	5.00	U	5.49	5.55	110	111	1	29.0-154			1.09	28
Chloromethane	5.00	U	3.49	3.43	69.8	68.6	1	10.0-160			1.73	29
2-Chlorotoluene	5.00	U	4.04	4.01	80.8	80.2	1	32.0-153			0.745	28
4-Chlorotoluene	5.00	U	4.02	4.01	80.4	80.2	1	32.0-150			0.249	28
1,2-Dibromo-3-Chloropropane	5.00	U	3.37	3.22	67.4	64.4	1	22.0-151			4.55	34
1,2-Dibromoethane	5.00	U	3.88	3.79	77.6	75.8	1	34.0-147			2.35	27
Dibromomethane	5.00	U	4.84	4.82	96.8	96.4	1	30.0-151			0.414	27
1,2-Dichlorobenzene	5.00	U	4.23	4.19	84.6	83.8	1	34.0-149			0.950	28
1,3-Dichlorobenzene	5.00	U	4.10	3.99	82.0	79.8	1	36.0-146			2.72	27
1,4-Dichlorobenzene	5.00	U	4.14	4.15	82.8	83.0	1	35.0-142			0.241	27
Dichlorodifluoromethane	5.00	U	5.46	4.93	109	98.6	1	10.0-160			10.2	29
1,1-Dichloroethane	5.00	U	5.49	5.39	110	108	1	25.0-158			1.84	27
1,2-Dichloroethane	5.00	U	5.75	5.63	115	113	1	29.0-151			2.11	27
1,1-Dichloroethene	5.00	U	4.36	4.09	87.2	81.8	1	11.0-160			6.39	29
cis-1,2-Dichloroethene	5.00	U	5.22	4.93	104	98.6	1	10.0-160			5.71	27
trans-1,2-Dichloroethene	5.00	U	4.09	4.03	81.8	80.6	1	17.0-153			1.48	27
1,2-Dichloropropane	5.00	U	5.49	5.21	110	104	1	30.0-156			5.23	27
1,1-Dichloropropene	5.00	U	4.74	4.63	94.8	92.6	1	25.0-158			2.35	27
1,3-Dichloropropane	5.00	U	4.48	4.38	89.6	87.6	1	38.0-147			2.26	27
cis-1,3-Dichloropropene	5.00	U	4.82	4.88	96.4	97.6	1	34.0-149			1.24	28
trans-1,3-Dichloropropene	5.00	U	4.12	4.16	82.4	83.2	1	32.0-149			0.966	28
trans-1,4-Dichloro-2-butene	5.00	U	5.25	4.90	105	98.0	1	10.0-157			6.90	37
2,2-Dichloropropane	5.00	U	5.73	5.72	115	114	1	24.0-152			0.175	29

L1691296-11 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1691296-11 01/02/24 15:25 • (MS) R4020279-4 01/02/24 18:38 • (MSD) R4020279-5 01/02/24 18:59

Analyte	Spike Amount ug/l	Original Result ug/l	MS Result ug/l	MSD Result ug/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Di-isopropyl ether	5.00	U	6.48	6.17	130	123	1	21.0-160			4.90	28
Ethylbenzene	5.00	U	4.07	4.13	81.4	82.6	1	30.0-155			1.46	27
Hexachloro-1,3-butadiene	5.00	U	4.80	4.56	96.0	91.2	1	20.0-154			5.13	34
2-Hexanone	25.0	U	20.0	19.7	80.0	78.8	1	21.0-160			1.51	29
n-Hexane	5.00	U	2.99	2.85	59.8	57.0	1	10.0-153			4.79	28
Iodomethane	25.0	U	10.9	11.8	43.6	47.2	1	10.0-160			7.93	40
Isopropylbenzene	5.00	U	4.43	4.47	88.6	89.4	1	28.0-157			0.899	27
p-Isopropyltoluene	5.00	U	4.20	4.21	84.0	84.2	1	30.0-154			0.238	29
2-Butanone (MEK)	25.0	U	22.8	21.4	91.2	85.6	1	10.0-160			6.33	32
Methylene Chloride	5.00	U	4.43	4.32	88.6	86.4	1	23.0-144			2.51	28
4-Methyl-2-pentanone (MIBK)	25.0	U	26.3	25.2	105	101	1	29.0-160			4.27	29
Methyl tert-butyl ether	5.00	U	5.68	5.56	114	111	1	28.0-150			2.14	29
Naphthalene	5.00	U	3.88	3.57	77.6	71.4	1	12.0-156			8.32	35
n-Propylbenzene	5.00	U	3.93	3.95	78.6	79.0	1	31.0-154			0.508	28
Styrene	5.00	U	4.07	4.07	81.4	81.4	1	33.0-155			0.000	28
1,1,1,2-Tetrachloroethane	5.00	U	4.37	4.39	87.4	87.8	1	36.0-151			0.457	29
1,1,2,2-Tetrachloroethane	5.00	U	4.21	4.15	84.2	83.0	1	33.0-150			1.44	28
1,1,2-Trichlorotrifluoroethane	5.00	U	5.30	5.08	106	102	1	23.0-160			4.24	30
Tetrachloroethene	5.00	U	4.09	3.98	81.8	79.6	1	10.0-160			2.73	27
Toluene	5.00	U	4.13	4.11	82.6	82.2	1	26.0-154			0.485	28
1,2,3-Trichlorobenzene	5.00	U	4.19	4.35	83.8	87.0	1	17.0-150			3.75	36
1,2,4-Trichlorobenzene	5.00	U	4.36	4.02	87.2	80.4	1	24.0-150			8.11	33
1,1,1-Trichloroethane	5.00	U	5.57	5.47	111	109	1	23.0-160			1.81	28
1,1,2-Trichloroethane	5.00	U	4.52	4.49	90.4	89.8	1	35.0-147			0.666	27
Trichloroethene	5.00	U	4.80	4.60	96.0	92.0	1	10.0-160			4.26	25
Trichlorofluoromethane	5.00	U	5.07	4.94	101	98.8	1	17.0-160			2.60	31
1,2,3-Trichloropropane	5.00	U	4.09	4.03	81.8	80.6	1	34.0-151			1.48	29
1,2,4-Trimethylbenzene	5.00	U	4.12	3.93	82.4	78.6	1	26.0-154			4.72	27
1,2,3-Trimethylbenzene	5.00	U	4.00	3.90	80.0	78.0	1	32.0-149			2.53	28
1,3,5-Trimethylbenzene	5.00	U	4.02	4.00	80.4	80.0	1	28.0-153			0.499	27
Vinyl acetate	25.0	U	48.4	47.2	194	189	1	12.0-160	J5	J5	2.51	31
Vinyl chloride	5.00	U	4.10	3.74	82.0	74.8	1	10.0-160			9.18	27
Xylenes, Total	15.0	U	12.5	12.2	83.3	81.3	1	29.0-154			2.43	28
(S) Toluene-d8					*99.1*	*100*		*80.0-120*				
(S) 4-Bromofluorobenzene					*114*	*114*		*77.0-126*				
(S) 1,2-Dichloroethane-d4					*119*	*121*		*70.0-130*				

Method Blank (MB)

(MB) R4019790-1 01/04/24 08:46

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
	ug/l		ug/l	ug/l
EPH Screen	U		100	300
(S) o-Terphenyl	*77.8*			*40.0-140*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R4019790-2 01/04/24 09:00 • (LCSD) R4019790-3 01/04/24 09:14

Analyte	Spike Amount	LCS Result	LCSD Result	LCS Rec.	LCSD Rec.	Rec. Limits	LCS Qualifier	LCSD Qualifier	RPD	RPD Limits
	ug/l	ug/l	ug/l	%	%	%			%	%
EPH Screen	3100	2950	3090	95.2	99.7	40.0-140			4.64	25
(S) o-Terphenyl				*72.6*	*71.3*	*40.0-140*				

L1691296-11 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1691296-11 01/04/24 13:10 • (MS) R4019790-4 01/04/24 13:24 • (MSD) R4019790-5 01/04/24 13:38

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
	ug/l	ug/l	ug/l	ug/l	%	%		%			%	%
EPH Screen	3100	U	3420	3300	110	105	1	40.0-140			3.57	50
(S) o-Terphenyl					*75.0*	*68.1*		*40.0-140*				

Method Blank (MB)

(MB) R4024136-1 01/18/24 11:37

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Unadjusted C9-C18 Aliphatics	U		200	600
Unadjusted C19-C36 Aliphatics	U		200	600
(S) 1-Chloro-octadecane	*52.5*			*40.0-140*

Method Blank (MB)

(MB) R4024136-4 01/18/24 12:50

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Unadjusted C11-C22 Aromatics	U		200	600
(S) o-Terphenyl	*64.1*			*40.0-140*
(S) 2-Fluorobiphenyl	*67.0*			*40.0-140*
(S) 2-Bromonaphthalene	*63.7*			*40.0-140*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R4024136-2 01/18/24 12:01 • (LCSD) R4024136-3 01/18/24 12:25

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Unadjusted C9-C18 Aliphatics	600	361	391	60.2	65.2	40.0-140			7.98	25
Unadjusted C19-C36 Aliphatics	800	706	759	88.2	94.9	40.0-140			7.24	25
(S) 1-Chloro-octadecane				*57.3*	*62.8*	*40.0-140*				

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R4024136-5 01/18/24 13:14 • (LCSD) R4024136-6 01/18/24 13:38

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Unadjusted C11-C22 Aromatics	1700	1400	1550	82.4	91.2	40.0-140			10.2	25
(S) o-Terphenyl				*72.0*	*79.0*	*40.0-140*				
(S) 2-Fluorobiphenyl				*78.6*	*82.5*	*40.0-140*				
(S) 2-Bromonaphthalene				*73.8*	*77.9*	*40.0-140*				

Method Blank (MB)

(MB) R4019241-2 12/31/23 14:12

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Acenaphthene	U		0.0886	1.00
Acenaphthylene	U		0.0921	1.00
Anthracene	U		0.0804	1.00
Benzidine	U		3.74	10.0
Benzo(a)anthracene	U		0.199	1.00
Benzo(b)fluoranthene	U		0.130	1.00
Benzo(k)fluoranthene	U		0.120	1.00
Benzo(g,h,i)perylene	U		0.121	1.00
Benzo(a)pyrene	U		0.0381	1.00
Bis(2-chlorethoxy)methane	U		0.116	10.0
Bis(2-chloroethyl)ether	U		0.137	10.0
2,2-Oxybis(1-Chloropropane)	U		0.210	10.0
4-Bromophenyl-phenylether	U		0.0877	10.0
2-Chloronaphthalene	U		0.0648	1.00
4-Chlorophenyl-phenylether	U		0.0926	10.0
Chrysene	U		0.130	1.00
Dibenz(a,h)anthracene	U		0.0644	1.00
3,3-Dichlorobenzidine	U		0.212	10.0
2,4-Dinitrotoluene	U		0.0983	10.0
2,6-Dinitrotoluene	U		0.250	10.0
Fluoranthene	U		0.102	1.00
Fluorene	U		0.0844	1.00
Hexachlorobenzene	U		0.0755	1.00
Hexachloro-1,3-butadiene	U		0.0968	10.0
Hexachlorocyclopentadiene	U		0.0598	10.0
Hexachloroethane	U		0.127	10.0
Indeno(1,2,3-cd)pyrene	U		0.279	1.00
Isophorone	U		0.143	10.0
Naphthalene	U		0.159	1.00
Nitrobenzene	U		0.297	10.0
n-Nitrosodimethylamine	U		0.998	10.0
n-Nitrosodiphenylamine	U		2.37	10.0
n-Nitrosodi-n-propylamine	U		0.261	10.0
Phenanthrene	U		0.112	1.00
Benzylbutyl phthalate	U		0.765	3.00
Bis(2-Ethylhexyl)phthalate	U		0.895	3.00
Di-n-butyl phthalate	U		0.453	3.00
Diethyl phthalate	U		0.287	3.00
Dimethyl phthalate	U		0.260	3.00
Di-n-octyl phthalate	U		0.932	3.00

Method Blank (MB)

(MB) R4019241-2 12/31/23 14:12

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Pyrene	U		0.107	1.00
1,2,4-Trichlorobenzene	U		0.0698	10.0
Aniline	U		1.65	10.0
1,2-Diphenylhydrazine	U	N2	0.105	10.0
Benzyl alcohol	U		0.563	10.0
4-Chloroaniline	U		0.234	10.0
4-Chloro-3-methylphenol	U		0.131	10.0
2-Chlorophenol	U		0.133	10.0
Dibenzofuran	U		0.0970	10.0
2,4-Dichlorophenol	U		0.102	10.0
2,4-Dimethylphenol	U		0.0636	10.0
4,6-Dinitro-2-methylphenol	U		1.12	10.0
2,4-Dinitrophenol	U		5.93	10.0
2-Methylnaphthalene	U		0.117	1.00
2-Methylphenol	U		0.0929	10.0
3&4-Methyl Phenol	U		0.168	10.0
2-Nitroaniline	U		0.102	10.0
3-Nitroaniline	U		0.0869	10.0
4-Nitroaniline	U		0.0910	10.0
2-Nitrophenol	U		0.117	10.0
4-Nitrophenol	U		0.143	10.0
Pentachlorophenol	U		0.313	10.0
Phenol	U		4.33	10.0
Pyridine	U		0.627	10.0
2,4,6-Trichlorophenol	U		0.100	10.0
Acetophenone	U		0.208	10.0
Diphenylamine	U		2.37	10.0
1,2,4,5-Tetrachlorobenzene	U		0.0647	10.0
2,3,4,6-Tetrachlorophenol	U		0.231	10.0
2,4,5-Trichlorophenol	U		0.109	10.0
(S) 2-Fluorophenol	*32.0*			*10.0-120*
(S) Phenol-d5	*19.8*			*10.0-120*
(S) Nitrobenzene-d5	*55.3*			*10.0-127*
(S) 2-Fluorobiphenyl	*57.3*			*10.0-130*
(S) 2,4,6-Tribromophenol	*54.5*			*10.0-155*
(S) p-Terphenyl-d14	*72.0*			*10.0-128*

Method Blank (MB)

(MB) R4020228-2 01/05/24 00:46

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
2-Acetylaminofluorene	U		0.253	10.0
4-Aminobiphenyl	U		0.461	10.0
Chlorobenzilate	U		3.84	50.0
Diallate	U		0.524	10.0
2,6-Dichlorophenol	U		0.102	10.0
Dimethoate	U		5.05	50.0
P-(Dimethylamino) Azobenzene	U		3.69	10.0
Dimethylbenz (A) Anthracene	U		1.71	10.0
3,3-Dimethylbenzidine	U		3.39	10.0
a,a-Dimethylphenethylamine	U		3.13	50.0
1,3-Dinitrobenzene	U		0.359	10.0
Diphenylamine	U		2.37	10.0
Dinoseb	U		8.01	50.0
Disulfoton	U		0.267	10.0
Ethyl methanesulfonate	U		0.326	10.0
Ethyl Parathion	U		0.379	10.0
Famphur	U		3.92	20.0
Hexachloropropene	U		0.149	50.0
Hexachlorophene	U		1.44	50.0
Isodrin	U		4.11	10.0
Isosafrole	U		3.88	10.0
Kepone	U		2.66	20.0
Methapyrilene	U		10.0	50.0
3-Methylcholanthrene	U		0.164	10.0
Methyl methanesulfonate	U		3.40	50.0
Methyl parathion	U		0.213	10.0
1,4-Naphthoquinone	U		5.56	50.0
1-Naphthylamine	U		0.289	10.0
2-Naphthylamine	U		4.48	10.0
5-Nitro-o-toluidine	U		1.99	10.0
4-Nitroquinoline 1-oxide	U		2.03	10.0
n-Nitrosodiethylamine	U		3.57	10.0
n-Nitrosodi-n-butylamine	U		3.91	10.0
n-Nitrosomethylethylamine	U		3.25	10.0
n-Nitrosomorpholine	U		3.25	10.0
n-Nitrosopiperidine	U		3.72	10.0
n-Nitrosopyrrolidine	U		3.39	10.0
Pentachlorobenzene	U		4.15	10.0
Pentachloroethane	U		2.83	50.0
Pentachloronitrobenzene	U		4.15	10.0

Method Blank (MB)

(MB) R4020228-2 01/05/24 00:46

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Phenacetin	U		4.66	10.0
p-Phenylenediamine	U		387	6900
Phorate	U		4.86	50.0
2-Picoline	U		6.83	50.0
Pronamide	U		4.21	10.0
Safrole	U		3.68	10.0
Sulfotep	U		3.99	50.0
Thionazin	U		4.07	10.0
o-Toluidine	U		3.53	10.0
O,O,O-Triethyl Phosphorothioate	U		2.93	10.0
1,3,5-Trinitrobenzene	U		1.32	10.0

Laboratory Control Sample (LCS)

(LCS) R4019241-1 12/31/23 13:50

Analyte	Spike Amount ug/l	LCS Result ug/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Acenaphthene	50.0	23.7	47.4	41.0-120	
Acenaphthylene	50.0	24.3	48.6	43.0-120	
Anthracene	50.0	26.3	52.6	45.0-120	
Benzidine	100	4.72	4.72	10.0-120	J4
Benzo(a)anthracene	50.0	27.7	55.4	47.0-120	
Benzo(b)fluoranthene	50.0	27.4	54.8	46.0-120	
Benzo(k)fluoranthene	50.0	25.2	50.4	46.0-120	
Benzo(g,h,i)perylene	50.0	27.0	54.0	48.0-121	
Benzo(a)pyrene	50.0	24.8	49.6	47.0-120	
Bis(2-chlorethoxy)methane	50.0	21.6	43.2	33.0-120	
Bis(2-chloroethyl)ether	50.0	23.6	47.2	23.0-120	
2,2-Oxybis(1-Chloropropane)	50.0	22.3	44.6	28.0-120	
4-Bromophenyl-phenylether	50.0	25.5	51.0	45.0-120	
2-Chloronaphthalene	50.0	21.8	43.6	37.0-120	
4-Chlorophenyl-phenylether	50.0	26.6	53.2	44.0-120	
Chrysene	50.0	25.2	50.4	48.0-120	
Dibenz(a,h)anthracene	50.0	26.8	53.6	47.0-120	
3,3-Dichlorobenzidine	100	57.5	57.5	44.0-120	
2,4-Dinitrotoluene	50.0	29.5	59.0	49.0-124	
2,6-Dinitrotoluene	50.0	26.4	52.8	46.0-120	
Fluoranthene	50.0	28.1	56.2	51.0-120	
Fluorene	50.0	27.3	54.6	47.0-120	

Laboratory Control Sample (LCS)

(LCS) R4019241-1 12/31/23 13:50

Analyte	Spike Amount ug/l	LCS Result ug/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Hexachlorobenzene	50.0	24.6	49.2	44.0-120	
Hexachloro-1,3-butadiene	50.0	17.6	35.2	19.0-120	
Hexachlorocyclopentadiene	50.0	11.4	22.8	15.0-120	
Hexachloroethane	50.0	18.3	36.6	15.0-120	
Indeno(1,2,3-cd)pyrene	50.0	22.9	45.8	49.0-122	J4
Isophorone	50.0	22.3	44.6	36.0-120	
Naphthalene	50.0	20.2	40.4	27.0-120	
Nitrobenzene	50.0	22.0	44.0	27.0-120	
n-Nitrosodimethylamine	50.0	14.3	28.6	10.0-120	
n-Nitrosodiphenylamine	50.0	25.8	51.6	47.0-120	
n-Nitrosodi-n-propylamine	50.0	25.0	50.0	31.0-120	
Phenanthrene	50.0	26.1	52.2	46.0-120	
Benzylbutyl phthalate	50.0	24.9	49.8	43.0-121	
Bis(2-Ethylhexyl)phthalate	50.0	22.4	44.8	43.0-122	
Di-n-butyl phthalate	50.0	27.4	54.8	49.0-121	
Diethyl phthalate	50.0	26.9	53.8	48.0-122	
Dimethyl phthalate	50.0	27.0	54.0	48.0-120	
Di-n-octyl phthalate	50.0	20.0	40.0	42.0-125	J4
Pyrene	50.0	25.3	50.6	47.0-120	
1,2,4-Trichlorobenzene	50.0	19.1	38.2	24.0-120	
Aniline	50.0	13.9	27.8	13.0-120	
1,2-Diphenylhydrazine	50.0	27.8	55.6	41.0-126	N2
Benzyl alcohol	50.0	19.2	38.4	25.0-120	
4-Chloroaniline	50.0	18.4	36.8	25.0-120	
4-Chloro-3-methylphenol	50.0	21.8	43.6	40.0-120	
2-Chlorophenol	50.0	20.1	40.2	25.0-120	
Dibenzofuran	50.0	26.1	52.2	44.0-120	
2,4-Dichlorophenol	50.0	21.5	43.0	36.0-120	
2,4-Dimethylphenol	50.0	22.7	45.4	33.0-120	
4,6-Dinitro-2-methylphenol	50.0	29.9	59.8	38.0-138	
2,4-Dinitrophenol	50.0	26.9	53.8	10.0-120	
2-Methylnaphthalene	50.0	20.9	41.8	33.0-120	
2-Methylphenol	50.0	18.4	36.8	28.0-120	
3&4-Methyl Phenol	50.0	20.4	40.8	31.0-120	
2-Nitroaniline	50.0	28.0	56.0	43.0-120	
3-Nitroaniline	50.0	26.5	53.0	38.0-120	
4-Nitroaniline	50.0	29.4	58.8	18.0-160	
2-Nitrophenol	50.0	23.1	46.2	31.0-120	
4-Nitrophenol	50.0	12.4	24.8	10.0-120	
Pentachlorophenol	50.0	20.0	40.0	23.0-120	

Laboratory Control Sample (LCS)

(LCS) R4019241-1 12/31/23 13:50

Analyte	Spike Amount ug/l	LCS Result ug/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Phenol	50.0	9.92	19.8	10.0-120	
Pyridine	50.0	9.14	18.3	10.0-120	
2,4,6-Trichlorophenol	50.0	25.2	50.4	42.0-120	
Acetophenone	50.0	25.9	51.8	29.0-120	
Diphenylamine	50.0	25.8	51.6	35.0-120	
1,2,4,5-Tetrachlorobenzene	50.0	24.3	48.6	31.0-121	
2,3,4,6-Tetrachlorophenol	50.0	28.0	56.0	42.0-132	
2,4,5-Trichlorophenol	50.0	26.9	53.8	44.0-120	
(S) 2-Fluorophenol			*29.3*	*10.0-120*	
(S) Phenol-d5			*20.5*	*10.0-120*	
(S) Nitrobenzene-d5			*44.5*	*10.0-127*	
(S) 2-Fluorobiphenyl			*50.6*	*10.0-130*	
(S) 2,4,6-Tribromophenol			*55.0*	*10.0-155*	
(S) p-Terphenyl-d14			*52.1*	*10.0-128*	

Laboratory Control Sample (LCS)

(LCS) R4020228-1 01/04/24 23:55

Analyte	Spike Amount ug/l	LCS Result ug/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
2-Acetylaminofluorene	50.0	42.5	85.0	32.0-120	
4-Aminobiphenyl	50.0	25.1	50.2	20.0-120	
Chlorobenzilate	50.0	32.0	64.0	29.0-128	
Diallate	50.0	27.9	55.8	30.0-120	
2,6-Dichlorophenol	50.0	23.4	46.8	19.0-136	
Dimethoate	50.0	32.2	64.4	11.0-134	
P-(Dimethylamino) Azobenzene	50.0	33.2	66.4	27.0-120	
Dimethylbenz (A) Anthracene	50.0	29.1	58.2	14.0-124	
3,3-Dimethylbenzidine	50.0	21.1	42.2	13.0-120	
a,a-Dimethylphenethylamine	50.0	0.225	0.450	10.0-129	J4
1,3-Dinitrobenzene	50.0	31.0	62.0	34.0-120	
Diphenylamine	50.0	31.5	63.0	35.0-120	
Dinoseb	50.0	31.9	63.8	39.0-120	
Disulfoton	50.0	34.0	68.0	32.0-120	
Ethyl methanesulfonate	50.0	19.5	39.0	10.0-120	
Ethyl Parathion	50.0	37.4	74.8	46.0-130	
Famphur	50.0	38.1	76.2	32.0-120	
Hexachloropropene	50.0	10.7	21.4	10.0-120	
Hexachlorophene	100	8.96	8.96	10.0-120	J4

Laboratory Control Sample (LCS)

(LCS) R4020228-1 01/04/24 23:55

Analyte	Spike Amount ug/l	LCS Result ug/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Isodrin	50.0	25.2	50.4	22.0-157	
Isosafrole	50.0	25.2	50.4	25.0-133	
Kepone	50.0	24.6	49.2	10.0-120	
Methapyrilene	50.0	8.82	17.6	10.0-120	
3-Methylcholanthrene	50.0	35.8	71.6	30.0-160	
Methyl methanesulfonate	50.0	14.7	29.4	10.0-120	
Methyl parathion	50.0	41.6	83.2	42.0-120	
1,4-Naphthoquinone	50.0	2.25	4.50	50.0-150	J4
1-Naphthylamine	50.0	25.2	50.4	19.0-120	
2-Naphthylamine	50.0	13.1	26.2	10.0-120	
5-Nitro-o-toluidine	50.0	39.3	78.6	34.0-120	
4-Nitroquinoline 1-oxide	50.0	30.4	60.8	10.0-159	
n-Nitrosodiethylamine	50.0	23.4	46.8	10.0-120	
n-Nitrosodi-n-butylamine	50.0	31.8	63.6	13.0-143	
n-Nitrosomethylethylamine	50.0	19.5	39.0	10.0-120	
n-Nitrosomorpholine	50.0	20.6	41.2	10.0-120	
n-Nitrosopiperidine	50.0	22.5	45.0	10.0-160	
n-Nitrosopyrrolidine	50.0	25.1	50.2	10.0-124	
Pentachlorobenzene	50.0	24.6	49.2	25.0-120	
Pentachloroethane	50.0	18.5	37.0	10.0-120	
Pentachloronitrobenzene	50.0	30.6	61.2	34.0-132	
Phenacetin	50.0	28.0	56.0	34.0-127	
p-Phenylenediamine	50.0	0.000	0.000	50.0-150	J4
Phorate	50.0	36.7	73.4	13.0-160	
2-Picoline	50.0	14.5	29.0	10.0-120	
Pronamide	50.0	31.0	62.0	38.0-130	
Safrole	50.0	22.9	45.8	21.0-120	
Sulfotep	50.0	34.7	69.4	52.0-120	
Thionazin	50.0	37.0	74.0	38.0-121	
o-Toluidine	50.0	20.3	40.6	10.0-120	
O,O,O-Triethyl Phosphorothioate	50.0	25.6	51.2	11.0-135	
1,3,5-Trinitrobenzene	50.0	31.8	63.6	37.0-147	

L1691834-06 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1691834-06 12/31/23 17:44 • (MS) R4019241-3 12/31/23 18:06 • (MSD) R4019241-4 12/31/23 18:27

Analyte	Spike Amount ug/l	Original Result ug/l	MS Result ug/l	MSD Result ug/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Acenaphthene	47.6	U	16.2	18.9	34.0	39.7	1	28.0-120			15.4	25
Acenaphthylene	47.6	U	16.7	19.4	35.1	40.8	1	31.0-121			15.0	25
Anthracene	47.6	U	15.6	19.9	32.8	41.8	1	36.0-120	J6	J3	24.2	23
Benzidine	95.2	U	U	U	0.000	0.000	1	10.0-120	J6	J6	0.000	37
Benzo(a)anthracene	47.6	U	10.7	15.0	22.5	31.5	1	39.0-120	J6	J3 J6	33.5	23
Benzo(b)fluoranthene	47.6	U	9.36	14.4	19.7	30.3	1	37.0-120	J6	J3 J6	42.4	23
Benzo(k)fluoranthene	47.6	U	8.23	12.4	17.3	26.1	1	37.0-120	J6	J3 J6	40.4	26
Benzo(g,h,i)perylene	47.6	U	7.61	11.8	16.0	24.8	1	37.0-123	J6	J3 J6	43.2	25
Benzo(a)pyrene	47.6	U	8.48	13.1	17.8	27.5	1	37.0-120	J6	J3 J6	42.8	24
Bis(2-chlorethoxy)methane	47.6	U	17.7	19.2	37.2	40.3	1	17.0-120			8.13	31
Bis(2-chloroethyl)ether	47.6	U	18.3	18.7	38.4	39.3	1	14.0-120			2.16	33
2,2-Oxybis(1-Chloropropane)	47.6	U	16.9	17.4	35.5	36.6	1	18.0-120			2.92	34
4-Bromophenyl-phenylether	47.6	U	15.0	19.3	31.5	40.5	1	37.0-120	J6	J3	25.1	24
2-Chloronaphthalene	47.6	U	15.3	17.5	32.1	36.8	1	29.0-120			13.4	28
4-Chlorophenyl-phenylether	47.6	U	15.8	19.5	33.2	41.0	1	36.0-120	J6		21.0	23
Chrysene	47.6	U	9.24	13.6	19.4	28.6	1	38.0-120	J6	J3 J6	38.2	23
Dibenz(a,h)anthracene	47.6	U	8.02	12.3	16.8	25.8	1	36.0-121	J6	J3 J6	42.1	24
3,3-Dichlorobenzidine	95.2	U	U	U	0.000	0.000	1	10.0-134	J6	J6	0.000	30
2,4-Dinitrotoluene	47.6	U	22.7	29.2	47.7	61.3	1	39.0-125			25.0	25
2,6-Dinitrotoluene	47.6	U	21.1	26.0	44.3	54.6	1	36.0-120			20.8	27
Fluoranthene	47.6	U	15.1	20.7	31.7	43.5	1	41.0-121	J6	J3	31.3	22
Fluorene	47.6	U	17.9	21.2	37.6	44.5	1	37.0-120			16.9	24
Hexachlorobenzene	47.6	U	11.0	15.2	23.1	31.9	1	35.0-122	J6	J3 J6	32.1	24
Hexachloro-1,3-butadiene	47.6	U	10.5	11.9	22.1	25.0	1	12.0-120			12.5	34
Hexachlorocyclopentadiene	47.6	U	8.32	9.96	17.5	20.9	1	10.0-120			17.9	33
Hexachloroethane	47.6	U	12.0	13.8	25.2	29.0	1	10.0-120			14.0	40
Indeno(1,2,3-cd)pyrene	47.6	U	6.83	10.8	14.3	22.7	1	38.0-125	J6	J3 J6	45.0	24
Isophorone	47.6	U	18.5	21.2	38.9	44.5	1	21.0-120			13.6	27
Naphthalene	47.6	U	15.0	16.2	31.5	34.0	1	10.0-120			7.69	31
Nitrobenzene	47.6	U	20.6	22.4	43.3	47.1	1	12.0-120			8.37	30
n-Nitrosodimethylamine	47.6	U	9.65	10.5	20.3	22.1	1	10.0-120			8.44	40
n-Nitrosodiphenylamine	47.6	U	18.7	23.7	39.3	49.8	1	37.0-120			23.6	24
n-Nitrosodi-n-propylamine	47.6	U	20.7	21.6	43.5	45.4	1	16.0-120			4.26	30
Phenanthrene	47.6	U	16.8	21.6	35.3	45.4	1	33.0-120		J3	25.0	22
Benzylbutyl phthalate	47.6	U	13.5	18.9	28.4	39.7	1	34.0-126	J6	J3	33.3	24
Bis(2-Ethylhexyl)phthalate	47.6	U	6.97	10.9	14.6	22.9	1	33.0-126	J6	J3 J6	44.0	25
Di-n-butyl phthalate	47.6	U	15.2	20.9	31.9	43.9	1	35.0-128	J6	J3	31.6	23
Diethyl phthalate	47.6	U	19.3	24.7	40.5	51.9	1	39.0-125		J3	24.5	24
Dimethyl phthalate	47.6	U	19.4	23.7	40.8	49.8	1	37.0-120			20.0	24
Di-n-octyl phthalate	47.6	U	6.81	10.2	14.3	21.4	1	25.0-135	J6	J3 J6	39.9	26

L1691834-06 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1691834-06 12/31/23 17:44 • (MS) R4019241-3 12/31/23 18:06 • (MSD) R4019241-4 12/31/23 18:27

Analyte	Spike Amount ug/l	Original Result ug/l	MS Result ug/l	MSD Result ug/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Pyrene	47.6	U	14.3	19.5	30.0	41.0	1	39.0-120	J6	J3	30.8	22
1,2,4-Trichlorobenzene	47.6	U	13.0	14.4	27.3	30.3	1	15.0-120			10.2	31
Aniline	47.6	U	3.11	U	6.53	0.000	1	10.0-120	J6	J3 J6	200	39
1,2-Diphenylhydrazine	47.6	U	18.1	23.0	38.0	48.3	1	28.0-129	N2	N2	23.8	25
Benzyl alcohol	47.6	U	15.0	15.3	31.5	32.1	1	14.0-120			1.98	38
4-Chloroaniline	47.6	U	8.52	8.55	17.9	18.0	1	10.0-120			0.352	31
4-Chloro-3-methylphenol	47.6	U	14.0	16.4	29.4	34.5	1	26.0-120			15.8	27
2-Chlorophenol	47.6	U	11.2	12.2	23.5	25.6	1	18.0-120			8.55	34
Dibenzofuran	47.6	U	17.6	20.6	37.0	43.3	1	32.0-120			15.7	26
2,4-Dichlorophenol	47.6	U	13.0	14.2	27.3	29.8	1	19.0-120			8.82	27
2,4-Dimethylphenol	47.6	U	14.8	13.6	31.1	28.6	1	15.0-120			8.45	28
4,6-Dinitro-2-methylphenol	47.6	U	19.8	25.9	41.6	54.4	1	10.0-144			26.7	39
2,4-Dinitrophenol	47.6	U	20.7	26.8	43.5	56.3	1	10.0-120			25.7	40
2-Methylnaphthalene	47.6	U	15.1	16.5	31.7	34.7	1	17.0-120			8.86	28
2-Methylphenol	47.6	U	12.2	11.7	25.6	24.6	1	10.0-120			4.18	30
3&4-Methyl Phenol	47.6	U	14.1	13.7	29.6	28.8	1	10.0-120			2.88	36
2-Nitroaniline	47.6	U	18.7	22.3	39.3	46.8	1	33.0-120			17.6	27
3-Nitroaniline	47.6	U	14.9	18.0	31.3	37.8	1	20.0-120			18.8	27
4-Nitroaniline	47.6	U	9.42	11.5	19.8	24.2	1	10.0-160			19.9	26
2-Nitrophenol	47.6	U	15.0	16.5	31.5	34.7	1	20.0-120			9.52	30
4-Nitrophenol	47.6	U	10.7	13.1	22.5	27.5	1	10.0-120			20.2	40
Pentachlorophenol	47.6	U	16.9	23.3	35.5	48.9	1	10.0-128			31.8	37
Phenol	47.6	U	7.23	7.76	15.2	16.3	1	10.0-120			7.07	40
Pyridine	47.6	U	2.26	1.61	4.75	3.38	1	10.0-120	J6	J6	33.6	37
2,4,6-Trichlorophenol	47.6	U	15.5	18.2	32.6	38.2	1	26.0-120			16.0	31
Acetophenone	47.6	0.671	21.2	22.0	43.1	44.8	1	20.0-120			3.70	35
Diphenylamine	47.6	U	18.7	23.7	39.3	49.8	1	35.0-120			23.6	30
1,2,4,5-Tetrachlorobenzene	47.6	U	16.2	18.2	34.0	38.2	1	19.0-122			11.6	32
2,3,4,6-Tetrachlorophenol	47.6	U	17.4	23.0	36.6	48.3	1	17.0-142			27.7	34
2,4,5-Trichlorophenol	47.6	U	16.2	20.4	34.0	42.9	1	33.0-120			23.0	31
(S) 2-Fluorophenol					*19.1*	*20.2*		*10.0-120*				
(S) Phenol-d5					*15.9*	*15.8*		*10.0-120*				
(S) Nitrobenzene-d5					*39.3*	*41.7*		*10.0-127*				
(S) 2-Fluorobiphenyl					*35.7*	*39.5*		*10.0-130*				
(S) 2,4,6-Tribromophenol					*38.2*	*49.9*		*10.0-155*				
(S) p-Terphenyl-d14					*24.6*	*35.3*		*10.0-128*				

Method Blank (MB)

(MB) R4020150-3 01/03/24 00:16

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Anthracene	U		0.0190	0.0500
Acenaphthene	U		0.0190	0.0500
Acenaphthylene	U		0.0171	0.0500
Benzo(a)anthracene	U		0.0203	0.0500
Benzo(a)pyrene	U		0.0184	0.0500
Benzo(b)fluoranthene	U		0.0168	0.0500
Benzo(g,h,i)perylene	U		0.0184	0.0500
Benzo(k)fluoranthene	U		0.0202	0.0500
Chrysene	U		0.0179	0.0500
Dibenz(a,h)anthracene	U		0.0160	0.0500
Fluoranthene	U		0.0270	0.100
Fluorene	U		0.0169	0.0500
Indeno(1,2,3-cd)pyrene	U		0.0158	0.0500
Naphthalene	U		0.0917	0.250
Phenanthrene	U		0.0180	0.0500
Pyrene	U		0.0169	0.0500
1-Methylnaphthalene	U		0.0687	0.250
2-Methylnaphthalene	U		0.0674	0.250
2-Chloronaphthalene	U		0.0682	0.250
(S) Nitrobenzene-d5	*88.0*			*31.0-160*
(S) 2-Fluorobiphenyl	*89.5*			*48.0-148*
(S) p-Terphenyl-d14	*100*			*37.0-146*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R4020150-1 01/02/24 23:37 • (LCSD) R4020150-2 01/02/24 23:57

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Anthracene	2.00	1.69	1.72	84.5	86.0	67.0-150			1.76	20
Acenaphthene	2.00	1.65	1.66	82.5	83.0	65.0-138			0.604	20
Acenaphthylene	2.00	1.74	1.76	87.0	88.0	66.0-140			1.14	20
Benzo(a)anthracene	2.00	1.79	1.82	89.5	91.0	61.0-140			1.66	20
Benzo(a)pyrene	2.00	1.81	1.85	90.5	92.5	60.0-143			2.19	20
Benzo(b)fluoranthene	2.00	1.75	1.86	87.5	93.0	58.0-141			6.09	20
Benzo(g,h,i)perylene	2.00	1.70	1.73	85.0	86.5	52.0-153			1.75	20
Benzo(k)fluoranthene	2.00	1.71	1.70	85.5	85.0	58.0-148			0.587	20
Chrysene	2.00	1.87	1.88	93.5	94.0	64.0-144			0.533	20
Dibenz(a,h)anthracene	2.00	1.82	1.83	91.0	91.5	52.0-155			0.548	20
Fluoranthene	2.00	1.76	1.79	88.0	89.5	69.0-153			1.69	20

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R4020150-1 01/02/24 23:37 • (LCSD) R4020150-2 01/02/24 23:57

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Fluorene	2.00	1.77	1.77	88.5	88.5	64.0-136			0.000	20
Indeno(1,2,3-cd)pyrene	2.00	1.86	1.91	93.0	95.5	54.0-153			2.65	20
Naphthalene	2.00	1.81	1.84	90.5	92.0	61.0-137			1.64	20
Phenanthrene	2.00	1.85	1.85	92.5	92.5	62.0-137			0.000	20
Pyrene	2.00	1.88	1.90	94.0	95.0	60.0-142			1.06	20
1-Methylnaphthalene	2.00	1.87	1.88	93.5	94.0	66.0-142			0.533	20
2-Methylnaphthalene	2.00	1.97	1.98	98.5	99.0	62.0-136			0.506	20
2-Chloronaphthalene	2.00	1.77	1.77	88.5	88.5	64.0-140			0.000	20
(S) Nitrobenzene-d5				*89.0*	*86.5*	*31.0-160*				
(S) 2-Fluorobiphenyl				*89.0*	*87.5*	*48.0-148*				
(S) p-Terphenyl-d14				*96.0*	*94.5*	*37.0-146*				

GLOSSARY OF TERMS

Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state “ND” (Not Detected) or “BDL” (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

Qualifier	Description
B	The same analyte is found in the associated blank.
J	The identification of the analyte is acceptable; the reported value is an estimate.
J2	Surrogate recovery limits have been exceeded; values are outside lower control limits.
J3	The associated batch QC was outside the established quality control range for precision.
J4	The associated batch QC was outside the established quality control range for accuracy.
J5	The sample matrix interfered with the ability to make any accurate determination; spike value is high.
J6	The sample matrix interfered with the ability to make any accurate determination; spike value is low.
J7	Surrogate recovery cannot be used for control limit evaluation due to dilution.
N2	Analyte reported using a calibration and validation based on Azobenzene (CAS 103-33-3). 1,2-Diphenylhydrazine decomposes into Azobenzene during the analysis.

ACCREDITATIONS & LOCATIONS

Pace Analytical National 12065 Lebanon Rd Mount Juliet, TN 37122

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN000032021-1
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey–NELAP	TN002
California	2932	New Mexico [1]	TN00003
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina [1]	DW21704
Georgia	NELAP	North Carolina [3]	41
Georgia [1]	923	North Dakota	R-140
Idaho	TN00003	Ohio–VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LAO000356
Kentucky [1 6]	KY90010	South Carolina	84004002
Kentucky [2]	16	South Dakota	n/a
Louisiana	AI30792	Tennessee [1 4]	2006
Louisiana	LA018	Texas	T104704245-20-18
Maine	TN00003	Texas [5]	LAB0152
Maryland	324	Utah	TN000032021-11
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	110033
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	998093910
Montana	CERT0086	Wyoming	A2LA
A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 [5]	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA–Crypto	TN00003		

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [6] Wastewater n/a Accreditation not applicable

* Not all certifications held by the laboratory are applicable to the results reported in the attached report.

* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace Analytical.

Pace Analytical®

PACE ANALYTICAL SERVICES, LLC

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Telephone No. 803-791-9700 Fax No. 803-791-9111
www.pacelabs.com

Number 142107

D152

Client	Report to Contact	Telephone No. / E-mail	Quote No.
Calumet Refining, LLC	Abigail small	608-438-8658 ASMALL@ramboll.com	

Address: 807 3rd St. NW

City: Great Falls State: MT Zip Code: 59404

Project Name: Calumet Refinery

Project No.: 1690029636-001

P.O. No.:

Sampler's Signature: [signature]

Printed Name: Mike Gipson

Analysis (Attach list if more space is needed)

Page 1 of 1

Lot # Bar Code (lab use only): L1691901

Sample ID / Description (Containers for each sample may be combined on one line.)	Collection Date(s)	Collection Time (Military)	G=Grab C=Composite	Matrix: Aqueous	Solid	Non-Aqueous	Unpres.	H2SO4	HNO3	HCl	NaOH	5035 Kit	Field Filtered	VOCs	SVOCs	VPH	EPH						Remarks / Cooler I.D.
CMR-SP200-122723	12/27/23	14:30	G	X			X			X				X	X	X	X						-01

Sample Receipt Checklist

		If Applicable	
COC Seal Present/Intact:	Y N	VOA Zero Headspace:	Y N
COC Signed/Accurate:	✓ N	Pres. Correct/Check:	Y N
Bottles arrive intact:	✓ N		
Correct bottles used:	✓ N		
Sufficient volume sent:	✓ N		
RA Screen <0.5 mR/hr:	✓ Y N		

1.7+0=1.7

Turn Around Time Required (Prior lab approval required for expedited TAT.)
☒ Standard ☐ Rush (Specify)

Sample Disposal: ☐ Return to Client ☒ Disposal by Lab

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison ☒ Unknown

QC Requirements (Specify)

Relinquished by	Date	Time	Received by	Date	Time
1. [signature]	12/26/23	17:00	1. FedEx		
2.			2.		
3.			3.		
4.			4. Laboratory received by Alexa Mitchell	12/28/23	0900

Note: All samples are retained for four weeks from receipt unless other arrangements are made.

LAB USE ONLY
Received on ice (Circle) Yes No Ice Pack
Receipt Temp.________°C
Temp Blank ☐ Y ☐ N

DISTRIBUTION: WHITE & YELLOW-Return to laboratory with Sample(s); PINK-Field/Client Copy

Document Number: ME003N2-01

APPENDIX A3

PASSIVE TREATMENT TRENCH GROUNDWATER ANALYTICAL RESULTS

Pace Project Number:

L1685777

ANALYTICAL REPORT

January 03, 2024

Ramboll US Consulting, Inc. - Denver

Sample Delivery Group:	L1685777
Samples Received:	12/08/2023
Project Number:	1690029636-001
Description:	CMR Great Falls - 2023 RFI Soil Sampling
Site:	GREAT FALLS, MT
Report To:	Abby Small 1999 Broadway Suite 2225 Denver, CO 80202

Entire Report Reviewed By:

Kelly Mercer
Project Manager

Pace Analytical National
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CMR-MW-105-231207 L1685777-01 GW

Collected by: Mike Gipson | Collected date/time: 12/07/23 11:45 | Received date/time: 12/08/23 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Petroleum Hydrocarbons by Method MTDEQ VPH	WG2189374	1	12/15/23 01:59	12/15/23 01:59	ADM	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG2188169	1	12/13/23 15:27	12/13/23 15:27	DYW	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG2187205	1	12/12/23 11:06	12/15/23 18:11	AMG	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG2187205	1	12/12/23 11:06	12/19/23 02:24	AMG	Mt. Juliet, TN

CMR-MW-106-231207 L1685777-02 GW

Collected by: Mike Gipson | Collected date/time: 12/07/23 13:50 | Received date/time: 12/08/23 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 4500CO2 D-2011	WG2188521	1	12/13/23 13:37	12/13/23 13:37	BJM	Mt. Juliet, TN
Wet Chemistry by Method 5210 B-2016	WG2185949	1	12/08/23 16:27	12/13/23 13:21	NAH	Mt. Juliet, TN
Wet Chemistry by Method 9056A	WG2186038	1	12/09/23 06:17	12/09/23 06:17	GEB	Mt. Juliet, TN
Metals (ICPMS) by Method 6020	WG2186709	1	12/12/23 12:24	12/13/23 01:55	JPD	Mt. Juliet, TN
Metals (ICPMS) by Method 6020	WG2186724	1	12/12/23 09:25	12/12/23 19:51	LD	Mt. Juliet, TN
Volatile Petroleum Hydrocarbons by Method MTDEQ VPH	WG2189374	1	12/15/23 02:34	12/15/23 02:34	ADM	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method RSK175	WG2187197	1	12/12/23 10:09	12/12/23 10:09	CCM	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG2188329	1	12/13/23 15:53	12/13/23 15:53	ADM	Mt. Juliet, TN
TPH by Method MTDEQ EPH	WG2186818	1	12/13/23 09:05	12/14/23 01:21	KAP	Mt. Juliet, TN
TPH by Method MTDEQ EPH	WG2192821	1	12/13/23 09:05	01/02/24 13:50	DMG	Mt. Juliet, TN
TPH by Method MTDEQ EPH	WG2192821	1	12/13/23 09:05	01/02/24 14:03	DMG	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG2187205	1	12/12/23 11:06	12/15/23 18:32	AMG	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG2187205	1	12/12/23 11:06	12/19/23 02:41	AMG	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM	WG2188864	1	12/14/23 14:20	12/15/23 00:18	AGW	Mt. Juliet, TN

CMR-MW-415-231207 L1685777-03 GW

Collected by: Mike Gipson | Collected date/time: 12/07/23 14:40 | Received date/time: 12/08/23 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Petroleum Hydrocarbons by Method MTDEQ VPH	WG2189374	1	12/15/23 03:09	12/15/23 03:09	ADM	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG2188329	1	12/13/23 16:14	12/13/23 16:14	ADM	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG2189222	20	12/14/23 19:51	12/14/23 19:51	ACG	Mt. Juliet, TN
TPH by Method MTDEQ EPH	WG2186818	1	12/13/23 09:05	12/14/23 03:02	KAP	Mt. Juliet, TN
TPH by Method MTDEQ EPH	WG2192821	1	12/13/23 09:05	01/02/24 14:14	DMG	Mt. Juliet, TN
TPH by Method MTDEQ EPH	WG2192821	1	12/13/23 09:05	01/03/24 07:18	DMG	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG2187205	1	12/12/23 11:06	12/15/23 18:53	AMG	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG2187205	1	12/12/23 11:06	12/19/23 02:58	AMG	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM	WG2188864	1	12/14/23 14:20	12/15/23 00:36	AGW	Mt. Juliet, TN

TRIP BLANK L1685777-04 GW

Collected by: Mike Gipson | Collected date/time: 12/07/23 00:00 | Received date/time: 12/08/23 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Petroleum Hydrocarbons by Method MTDEQ VPH	WG2189374	1	12/14/23 16:34	12/14/23 16:34	ADM	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG2188329	1	12/13/23 09:11	12/13/23 09:11	ADM	Mt. Juliet, TN

CASE NARRATIVE

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Kelly Mercer
Project Manager

Project Narrative

Due to multiple preparation procedures, calculated analytes are not reported in the quality control samples for EPH and VPH Methods.

L1685777-01 through -03: Benzidine, a,a-Dimethylphenethylamine, p-Phenylenediamine, 1,4-Naphthoquinone, and Methapyrilene are reporting with critically low recovery in the laboratory control sample(s). These compounds are a method defined poor performer. Results are estimated.

Sample Delivery Group (SDG) Narrative

The following analysis were performed from an unpreserved, insufficiently or inadequately preserved sample.

Lab Sample ID	Project Sample ID	Method
L1685777-02	CMR-MW-106-231207	MTDEQ EPH

Volatile Petroleum Hydrocarbons by Method MTDEQ VPH

Analyte	Result ug/l	Qualifier	MDL ug/l	RDL ug/l	Dilution	Analysis date / time	Batch
Unadjusted C5-C8 Aliphatics	523		33.3	100	1	12/15/2023 01:59	WG2189374
Unadjusted C9-C12 Aliphatics	231		33.3	100	1	12/15/2023 01:59	WG2189374
Unadjusted C9-C10 Aromatics	70.6	J	33.3	100	1	12/15/2023 01:59	WG2189374
Adjusted C5-C8 Aliphatics	510		33.3	100	1	12/15/2023 01:59	WG2189374
Adjusted C9-C12 Aliphatics	154		33.3	100	1	12/15/2023 01:59	WG2189374
Total VPH	825		66.7	200	1	12/15/2023 01:59	WG2189374
(S) 2,5-Dibromotoluene(FID)	*101*			*70.0-130*		*12/15/2023 01:59*	WG2189374
(S) 2,5-Dibromotoluene(PID)	*101*			*70.0-130*		*12/15/2023 01:59*	WG2189374

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result ug/l	Qualifier	MDL ug/l	RDL ug/l	Dilution	Analysis date / time	Batch
Acetone	U		11.3	25.0	1	12/13/2023 15:27	WG2188169
Acrylonitrile	U		0.671	5.00	1	12/13/2023 15:27	WG2188169
Benzene	11.7		0.0941	0.500	1	12/13/2023 15:27	WG2188169
Bromobenzene	U		0.118	0.500	1	12/13/2023 15:27	WG2188169
Bromodichloromethane	U		0.136	0.500	1	12/13/2023 15:27	WG2188169
Bromochloromethane	U	J4	0.128	0.500	1	12/13/2023 15:27	WG2188169
Bromoform	U		0.129	0.500	1	12/13/2023 15:27	WG2188169
Bromomethane	U		0.605	2.50	1	12/13/2023 15:27	WG2188169
n-Butylbenzene	0.247	J	0.157	0.500	1	12/13/2023 15:27	WG2188169
sec-Butylbenzene	0.191	J	0.125	0.500	1	12/13/2023 15:27	WG2188169
tert-Butylbenzene	U		0.127	0.500	1	12/13/2023 15:27	WG2188169
Carbon disulfide	0.197	J	0.0962	0.500	1	12/13/2023 15:27	WG2188169
Carbon tetrachloride	U		0.128	0.500	1	12/13/2023 15:27	WG2188169
Chlorobenzene	U		0.117	0.500	1	12/13/2023 15:27	WG2188169
Chlorodibromomethane	U		0.140	0.500	1	12/13/2023 15:27	WG2188169
Chloroethane	U		0.192	2.50	1	12/13/2023 15:27	WG2188169
2-Chloroethyl vinyl ether	U		0.575	50.0	1	12/13/2023 15:27	WG2188169
Chloroform	U		0.111	0.500	1	12/13/2023 15:27	WG2188169
Chloromethane	U		0.960	1.25	1	12/13/2023 15:27	WG2188169
2-Chlorotoluene	U		0.106	0.500	1	12/13/2023 15:27	WG2188169
4-Chlorotoluene	U		0.114	0.500	1	12/13/2023 15:27	WG2188169
1,2-Dibromo-3-Chloropropane	U		0.276	2.50	1	12/13/2023 15:27	WG2188169
1,2-Dibromoethane	U		0.126	0.500	1	12/13/2023 15:27	WG2188169
Dibromomethane	U		0.122	0.500	1	12/13/2023 15:27	WG2188169
1,2-Dichlorobenzene	U		0.107	0.500	1	12/13/2023 15:27	WG2188169
1,3-Dichlorobenzene	U		0.299	0.500	1	12/13/2023 15:27	WG2188169
1,4-Dichlorobenzene	U		0.120	0.500	1	12/13/2023 15:27	WG2188169
Dichlorodifluoromethane	U		0.374	2.50	1	12/13/2023 15:27	WG2188169
1,1-Dichloroethane	U		0.100	0.500	1	12/13/2023 15:27	WG2188169
1,2-Dichloroethane	U		0.0819	0.500	1	12/13/2023 15:27	WG2188169
1,1-Dichloroethene	U		0.188	0.500	1	12/13/2023 15:27	WG2188169
cis-1,2-Dichloroethene	U		0.126	0.500	1	12/13/2023 15:27	WG2188169
trans-1,2-Dichloroethene	U		0.149	0.500	1	12/13/2023 15:27	WG2188169
1,2-Dichloropropane	U		0.149	0.500	1	12/13/2023 15:27	WG2188169
1,1-Dichloropropene	U		0.142	0.500	1	12/13/2023 15:27	WG2188169
1,3-Dichloropropane	U		0.109	1.00	1	12/13/2023 15:27	WG2188169
cis-1,3-Dichloropropene	U		0.111	0.500	1	12/13/2023 15:27	WG2188169
trans-1,3-Dichloropropene	U		0.118	0.500	1	12/13/2023 15:27	WG2188169
trans-1,4-Dichloro-2-butene	U		0.467	5.00	1	12/13/2023 15:27	WG2188169
2,2-Dichloropropane	U		0.161	0.500	1	12/13/2023 15:27	WG2188169
Di-isopropyl ether	U		0.105	0.500	1	12/13/2023 15:27	WG2188169
Ethylbenzene	75.0		0.137	0.500	1	12/13/2023 15:27	WG2188169
Hexachloro-1,3-butadiene	U		0.337	1.00	1	12/13/2023 15:27	WG2188169

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result ug/l	Qualifier	MDL ug/l	RDL ug/l	Dilution	Analysis date / time	Batch
2-Hexanone	U		0.787	5.00	1	12/13/2023 15:27	WG2188169
n-Hexane	1.41	J	0.749	5.00	1	12/13/2023 15:27	WG2188169
Iodomethane	U		0.554	5.00	1	12/13/2023 15:27	WG2188169
Isopropylbenzene	1.73		0.105	0.500	1	12/13/2023 15:27	WG2188169
p-Isopropyltoluene	0.165	J	0.120	0.500	1	12/13/2023 15:27	WG2188169
2-Butanone (MEK)	U		1.19	5.00	1	12/13/2023 15:27	WG2188169
Methylene Chloride	U		0.430	2.50	1	12/13/2023 15:27	WG2188169
4-Methyl-2-pentanone (MIBK)	U		0.478	5.00	1	12/13/2023 15:27	WG2188169
Methyl tert-butyl ether	U		0.101	0.500	1	12/13/2023 15:27	WG2188169
Naphthalene	0.374	J	0.174	2.50	1	12/13/2023 15:27	WG2188169
n-Propylbenzene	5.33		0.0993	0.500	1	12/13/2023 15:27	WG2188169
Styrene	U		0.118	0.500	1	12/13/2023 15:27	WG2188169
1,1,1,2-Tetrachloroethane	U		0.147	0.500	1	12/13/2023 15:27	WG2188169
1,1,2,2-Tetrachloroethane	U	J4	0.133	0.500	1	12/13/2023 15:27	WG2188169
1,1,2-Trichlorotrifluoroethane	U		0.180	0.500	1	12/13/2023 15:27	WG2188169
Tetrachloroethene	U	J4	0.300	0.500	1	12/13/2023 15:27	WG2188169
Toluene	1.78		0.278	0.500	1	12/13/2023 15:27	WG2188169
1,2,3-Trichlorobenzene	U		0.164	0.500	1	12/13/2023 15:27	WG2188169
1,2,4-Trichlorobenzene	U		0.481	1.00	1	12/13/2023 15:27	WG2188169
1,1,1-Trichloroethane	U		0.149	0.500	1	12/13/2023 15:27	WG2188169
1,1,2-Trichloroethane	U		0.158	0.500	1	12/13/2023 15:27	WG2188169
Trichloroethene	U	J4	0.190	0.500	1	12/13/2023 15:27	WG2188169
Trichlorofluoromethane	U		0.160	2.50	1	12/13/2023 15:27	WG2188169
1,2,3-Trichloropropane	U		0.237	2.50	1	12/13/2023 15:27	WG2188169
1,2,4-Trimethylbenzene	2.33		0.322	0.500	1	12/13/2023 15:27	WG2188169
1,2,3-Trimethylbenzene	1.10		0.104	0.500	1	12/13/2023 15:27	WG2188169
1,3,5-Trimethylbenzene	U		0.104	0.500	1	12/13/2023 15:27	WG2188169
Vinyl acetate	U		0.692	5.00	1	12/13/2023 15:27	WG2188169
Vinyl chloride	U		0.234	0.500	1	12/13/2023 15:27	WG2188169
Xylenes, Total	2.43		0.174	1.50	1	12/13/2023 15:27	WG2188169
(S) Toluene-d8	*116*			*80.0-120*		*12/13/2023 15:27*	WG2188169
(S) 4-Bromofluorobenzene	*116*			*77.0-126*		*12/13/2023 15:27*	WG2188169
(S) 1,2-Dichloroethane-d4	*99.1*			*70.0-130*		*12/13/2023 15:27*	WG2188169

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result ug/l	Qualifier	MDL ug/l	RDL ug/l	Dilution	Analysis date / time	Batch
Acenaphthene	0.102	J	0.0886	1.00	1	12/15/2023 18:11	WG2187205
Acenaphthylene	U		0.0921	1.00	1	12/15/2023 18:11	WG2187205
Anthracene	U		0.0804	1.00	1	12/15/2023 18:11	WG2187205
Benzidine	U	J4	3.74	10.0	1	12/15/2023 18:11	WG2187205
Benzo(a)anthracene	U		0.199	1.00	1	12/15/2023 18:11	WG2187205
Benzo(b)fluoranthene	U		0.130	1.00	1	12/15/2023 18:11	WG2187205
Benzo(k)fluoranthene	U		0.120	1.00	1	12/15/2023 18:11	WG2187205
Benzo(g,h,i)perylene	U		0.121	1.00	1	12/15/2023 18:11	WG2187205
Benzo(a)pyrene	U		0.0381	1.00	1	12/15/2023 18:11	WG2187205
Bis(2-chlorethoxy)methane	U		0.116	10.0	1	12/15/2023 18:11	WG2187205
Bis(2-chloroethyl)ether	U		0.137	10.0	1	12/15/2023 18:11	WG2187205
2,2-Oxybis(1-Chloropropane)	U		0.210	10.0	1	12/15/2023 18:11	WG2187205
4-Bromophenyl-phenylether	U		0.0877	10.0	1	12/15/2023 18:11	WG2187205
2-Chloronaphthalene	U		0.0648	1.00	1	12/15/2023 18:11	WG2187205
4-Chlorophenyl-phenylether	U		0.0926	10.0	1	12/15/2023 18:11	WG2187205
Chrysene	U		0.130	1.00	1	12/15/2023 18:11	WG2187205
Dibenz(a,h)anthracene	U		0.0644	1.00	1	12/15/2023 18:11	WG2187205
3,3-Dichlorobenzidine	U		0.212	10.0	1	12/15/2023 18:11	WG2187205
2,4-Dinitrotoluene	U		0.0983	10.0	1	12/15/2023 18:11	WG2187205

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
2,6-Dinitrotoluene	U		0.250	10.0	1	12/15/2023 18:11	WG2187205
Fluoranthene	U		0.102	1.00	1	12/15/2023 18:11	WG2187205
Fluorene	U		0.0844	1.00	1	12/15/2023 18:11	WG2187205
Hexachlorobenzene	U		0.0755	1.00	1	12/15/2023 18:11	WG2187205
Hexachloro-1,3-butadiene	U		0.0968	10.0	1	12/15/2023 18:11	WG2187205
Hexachlorocyclopentadiene	U		0.0598	10.0	1	12/15/2023 18:11	WG2187205
Hexachloroethane	U		0.127	10.0	1	12/15/2023 18:11	WG2187205
Indeno(1,2,3-cd)pyrene	U		0.279	1.00	1	12/15/2023 18:11	WG2187205
Isophorone	U		0.143	10.0	1	12/15/2023 18:11	WG2187205
Naphthalene	0.293	J	0.159	1.00	1	12/15/2023 18:11	WG2187205
Nitrobenzene	U		0.297	10.0	1	12/15/2023 18:11	WG2187205
n-Nitrosodimethylamine	U		0.998	10.0	1	12/15/2023 18:11	WG2187205
n-Nitrosodiphenylamine	U		2.37	10.0	1	12/15/2023 18:11	WG2187205
n-Nitrosodi-n-propylamine	U		0.261	10.0	1	12/15/2023 18:11	WG2187205
Phenanthrene	U		0.112	1.00	1	12/15/2023 18:11	WG2187205
Benzylbutyl phthalate	U		0.765	3.00	1	12/15/2023 18:11	WG2187205
Bis(2-Ethylhexyl)phthalate	U		0.895	3.00	1	12/15/2023 18:11	WG2187205
Di-n-butyl phthalate	U		0.453	3.00	1	12/15/2023 18:11	WG2187205
Diethyl phthalate	0.309	J	0.287	3.00	1	12/15/2023 18:11	WG2187205
Dimethyl phthalate	U		0.260	3.00	1	12/15/2023 18:11	WG2187205
Di-n-octyl phthalate	U		0.932	3.00	1	12/15/2023 18:11	WG2187205
Pyrene	U		0.107	1.00	1	12/15/2023 18:11	WG2187205
1,2,4-Trichlorobenzene	U		0.0698	10.0	1	12/15/2023 18:11	WG2187205
Aniline	U		1.65	10.0	1	12/15/2023 18:11	WG2187205
1,2-Diphenylhydrazine	U	N2	0.105	10.0	1	12/15/2023 18:11	WG2187205
Benzyl alcohol	U		0.563	10.0	1	12/15/2023 18:11	WG2187205
4-Chloroaniline	U		0.234	10.0	1	12/15/2023 18:11	WG2187205
4-Chloro-3-methylphenol	U		0.131	10.0	1	12/15/2023 18:11	WG2187205
2-Chlorophenol	U		0.133	10.0	1	12/15/2023 18:11	WG2187205
Dibenzofuran	U		0.0970	10.0	1	12/15/2023 18:11	WG2187205
2,4-Dichlorophenol	U		0.102	10.0	1	12/15/2023 18:11	WG2187205
2,4-Dimethylphenol	3.08	J	0.0636	10.0	1	12/15/2023 18:11	WG2187205
4,6-Dinitro-2-methylphenol	U		1.12	10.0	1	12/15/2023 18:11	WG2187205
2,4-Dinitrophenol	U		5.93	10.0	1	12/15/2023 18:11	WG2187205
2-Methylnaphthalene	U		0.117	1.00	1	12/15/2023 18:11	WG2187205
2-Methylphenol	U		0.0929	10.0	1	12/15/2023 18:11	WG2187205
3&4-Methyl Phenol	U		0.168	10.0	1	12/15/2023 18:11	WG2187205
2-Nitroaniline	U		0.102	10.0	1	12/15/2023 18:11	WG2187205
3-Nitroaniline	U		0.0869	10.0	1	12/15/2023 18:11	WG2187205
4-Nitroaniline	U		0.0910	10.0	1	12/15/2023 18:11	WG2187205
2-Nitrophenol	U		0.117	10.0	1	12/15/2023 18:11	WG2187205
4-Nitrophenol	U		0.143	10.0	1	12/15/2023 18:11	WG2187205
Pentachlorophenol	U		0.313	10.0	1	12/15/2023 18:11	WG2187205
Phenol	U		4.33	10.0	1	12/15/2023 18:11	WG2187205
Pyridine	U		0.627	10.0	1	12/15/2023 18:11	WG2187205
2,4,6-Trichlorophenol	U		0.100	10.0	1	12/15/2023 18:11	WG2187205
Acetophenone	U		0.208	10.0	1	12/15/2023 18:11	WG2187205
2-Acetylaminofluorene	U		0.253	10.0	1	12/19/2023 02:24	WG2187205
4-Aminobiphenyl	U		0.461	10.0	1	12/19/2023 02:24	WG2187205
Chlorobenzilate	U		3.84	50.0	1	12/19/2023 02:24	WG2187205
Diallate	U		0.524	10.0	1	12/19/2023 02:24	WG2187205
2,6-Dichlorophenol	U		0.102	10.0	1	12/19/2023 02:24	WG2187205
Dimethoate	U		5.05	50.0	1	12/19/2023 02:24	WG2187205
P-(Dimethylamino) Azobenzene	U		3.69	10.0	1	12/19/2023 02:24	WG2187205
Dimethylbenz (A) Anthracene	U		1.71	10.0	1	12/19/2023 02:24	WG2187205
3,3-Dimethylbenzidine	U		3.39	10.0	1	12/19/2023 02:24	WG2187205

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
a,a-Dimethylphenethylamine	U	J4	3.13	50.0	1	12/19/2023 02:24	WG2187205
1,3-Dinitrobenzene	U		0.359	10.0	1	12/19/2023 02:24	WG2187205
Diphenylamine	U		2.37	10.0	1	12/15/2023 18:11	WG2187205
Dinoseb	U		8.01	50.0	1	12/19/2023 02:24	WG2187205
Disulfoton	U		0.267	10.0	1	12/19/2023 02:24	WG2187205
Ethyl methanesulfonate	U		0.326	10.0	1	12/19/2023 02:24	WG2187205
Ethyl Parathion	U		0.379	10.0	1	12/19/2023 02:24	WG2187205
Famphur	U		3.92	20.0	1	12/19/2023 02:24	WG2187205
Hexachloropropene	U		0.149	50.0	1	12/19/2023 02:24	WG2187205
Hexachlorophene	U		1.44	50.0	1	12/19/2023 02:24	WG2187205
Isodrin	U		4.11	10.0	1	12/19/2023 02:24	WG2187205
Isosafrole	U		3.88	10.0	1	12/19/2023 02:24	WG2187205
Kepone	U		2.66	20.0	1	12/19/2023 02:24	WG2187205
Methapyrilene	U	J4	10.0	50.0	1	12/19/2023 02:24	WG2187205
3-Methylcholanthrene	U		0.164	10.0	1	12/19/2023 02:24	WG2187205
Methyl methanesulfonate	U		3.40	50.0	1	12/19/2023 02:24	WG2187205
Methyl parathion	U		0.213	10.0	1	12/19/2023 02:24	WG2187205
1,4-Naphthoquinone	U	J4	5.56	50.0	1	12/19/2023 02:24	WG2187205
1-Naphthylamine	U		0.289	10.0	1	12/19/2023 02:24	WG2187205
2-Naphthylamine	U		4.48	10.0	1	12/19/2023 02:24	WG2187205
5-Nitro-o-toluidine	U		1.99	10.0	1	12/19/2023 02:24	WG2187205
4-Nitroquinoline 1-oxide	U		2.03	10.0	1	12/19/2023 02:24	WG2187205
n-Nitrosodiethylamine	U		3.57	10.0	1	12/19/2023 02:24	WG2187205
n-Nitrosodi-n-butylamine	U		3.91	10.0	1	12/19/2023 02:24	WG2187205
n-Nitrosomethylethylamine	U		3.25	10.0	1	12/19/2023 02:24	WG2187205
n-Nitrosomorpholine	U		3.25	10.0	1	12/19/2023 02:24	WG2187205
n-Nitrosopiperidine	U		3.72	10.0	1	12/19/2023 02:24	WG2187205
n-Nitrosopyrrolidine	U		3.39	10.0	1	12/19/2023 02:24	WG2187205
Pentachlorobenzene	U		4.15	10.0	1	12/19/2023 02:24	WG2187205
Pentachloroethane	U		2.83	50.0	1	12/19/2023 02:24	WG2187205
Pentachloronitrobenzene	U		4.15	10.0	1	12/19/2023 02:24	WG2187205
Phenacetin	U		4.66	10.0	1	12/19/2023 02:24	WG2187205
p-Phenylenediamine	U	J4	387	6900	1	12/19/2023 02:24	WG2187205
Phorate	U		4.86	50.0	1	12/19/2023 02:24	WG2187205
2-Picoline	U		6.83	50.0	1	12/19/2023 02:24	WG2187205
Pronamide	U		4.21	10.0	1	12/19/2023 02:24	WG2187205
Safrole	U		3.68	10.0	1	12/19/2023 02:24	WG2187205
Sulfotep	U		3.99	50.0	1	12/19/2023 02:24	WG2187205
1,2,4,5-Tetrachlorobenzene	U		0.0647	10.0	1	12/15/2023 18:11	WG2187205
2,3,4,6-Tetrachlorophenol	U		0.231	10.0	1	12/15/2023 18:11	WG2187205
Thionazin	U		4.07	10.0	1	12/19/2023 02:24	WG2187205
o-Toluidine	U		3.53	10.0	1	12/19/2023 02:24	WG2187205
2,4,5-Trichlorophenol	U		0.109	10.0	1	12/15/2023 18:11	WG2187205
O,O,O-Triethyl Phosphorothioate	U		2.93	10.0	1	12/19/2023 02:24	WG2187205
1,3,5-Trinitrobenzene	U		1.32	10.0	1	12/19/2023 02:24	WG2187205
(S) 2-Fluorophenol	*23.9*			*10.0-120*		*12/15/2023 18:11*	WG2187205
(S) Phenol-d5	*16.0*			*10.0-120*		*12/15/2023 18:11*	WG2187205
(S) Nitrobenzene-d5	*42.5*			*10.0-127*		*12/15/2023 18:11*	WG2187205
(S) 2-Fluorobiphenyl	*52.4*			*10.0-130*		*12/15/2023 18:11*	WG2187205
(S) 2,4,6-Tribromophenol	*65.4*			*10.0-155*		*12/15/2023 18:11*	WG2187205
(S) p-Terphenyl-d14	*62.4*			*10.0-128*		*12/15/2023 18:11*	WG2187205

Wet Chemistry by Method 4500CO2 D-2011

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Free Carbon Dioxide	126000	B T8	20000	1	12/13/2023 13:37	WG2188521

Sample Narrative:
L1685777-02 WG2188521: Endpoint pH 4.5

Wet Chemistry by Method 5210 B-2016

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
BOD	9.61		3.33	1	12/13/2023 13:21	WG2185949

Wet Chemistry by Method 9056A

Analyte	Result ug/l	Qualifier	MDL ug/l	RDL ug/l	Dilution	Analysis date / time	Batch
Nitrate as (N)	480		48.0	100	1	12/09/2023 06:17	WG2186038
Sulfate	129000		594	5000	1	12/09/2023 06:17	WG2186038

Metals (ICPMS) by Method 6020

Analyte	Result ug/l	Qualifier	MDL ug/l	RDL ug/l	Dilution	Analysis date / time	Batch
Iron	3030		28.1	100	1	12/12/2023 19:51	WG2186724
Iron,Dissolved	3180		28.1	100	1	12/13/2023 01:55	WG2186709
Manganese	2490		0.704	5.00	1	12/12/2023 19:51	WG2186724
Manganese,Dissolved	2700		0.704	5.00	1	12/13/2023 01:55	WG2186709

Volatile Petroleum Hydrocarbons by Method MTDEQ VPH

Analyte	Result ug/l	Qualifier	MDL ug/l	RDL ug/l	Dilution	Analysis date / time	Batch
Unadjusted C5-C8 Aliphatics	67.1	J	33.3	100	1	12/15/2023 02:34	WG2189374
Unadjusted C9-C12 Aliphatics	U		33.3	100	1	12/15/2023 02:34	WG2189374
Unadjusted C9-C10 Aromatics	U		33.3	100	1	12/15/2023 02:34	WG2189374
Adjusted C5-C8 Aliphatics	67.1	J	33.3	100	1	12/15/2023 02:34	WG2189374
Adjusted C9-C12 Aliphatics	U		33.3	100	1	12/15/2023 02:34	WG2189374
Total VPH	67.1	J	66.7	200	1	12/15/2023 02:34	WG2189374
(S) 2,5-Dibromotoluene(FID)	*105*			*70.0-130*		*12/15/2023 02:34*	WG2189374
(S) 2,5-Dibromotoluene(PID)	*106*			*70.0-130*		*12/15/2023 02:34*	WG2189374

Volatile Organic Compounds (GC) by Method RSK175

Analyte	Result ug/l	Qualifier	MDL ug/l	RDL ug/l	Dilution	Analysis date / time	Batch
Methane	252		2.91	10.0	1	12/12/2023 10:09	WG2187197

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result ug/l	Qualifier	MDL ug/l	RDL ug/l	Dilution	Analysis date / time	Batch
Acetone	U		11.3	25.0	1	12/13/2023 15:53	WG2188329
Acrylonitrile	U		0.671	5.00	1	12/13/2023 15:53	WG2188329
Benzene	U		0.0941	0.500	1	12/13/2023 15:53	WG2188329
Bromobenzene	U		0.118	0.500	1	12/13/2023 15:53	WG2188329
Bromodichloromethane	U		0.136	0.500	1	12/13/2023 15:53	WG2188329
Bromochloromethane	U		0.128	0.500	1	12/13/2023 15:53	WG2188329
Bromoform	U		0.129	0.500	1	12/13/2023 15:53	WG2188329
Bromomethane	U		0.605	2.50	1	12/13/2023 15:53	WG2188329
n-Butylbenzene	U		0.157	0.500	1	12/13/2023 15:53	WG2188329

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
sec-Butylbenzene	U		0.125	0.500	1	12/13/2023 15:53	WG2188329
tert-Butylbenzene	U		0.127	0.500	1	12/13/2023 15:53	WG2188329
Carbon disulfide	U		0.0962	0.500	1	12/13/2023 15:53	WG2188329
Carbon tetrachloride	U		0.128	0.500	1	12/13/2023 15:53	WG2188329
Chlorobenzene	U		0.117	0.500	1	12/13/2023 15:53	WG2188329
Chlorodibromomethane	U		0.140	0.500	1	12/13/2023 15:53	WG2188329
Chloroethane	U		0.192	2.50	1	12/13/2023 15:53	WG2188329
2-Chloroethyl vinyl ether	U		0.575	50.0	1	12/13/2023 15:53	WG2188329
Chloroform	U		0.111	0.500	1	12/13/2023 15:53	WG2188329
Chloromethane	U		0.960	1.25	1	12/13/2023 15:53	WG2188329
2-Chlorotoluene	U		0.106	0.500	1	12/13/2023 15:53	WG2188329
4-Chlorotoluene	U		0.114	0.500	1	12/13/2023 15:53	WG2188329
1,2-Dibromo-3-Chloropropane	U		0.276	2.50	1	12/13/2023 15:53	WG2188329
1,2-Dibromoethane	U		0.126	0.500	1	12/13/2023 15:53	WG2188329
Dibromomethane	U		0.122	0.500	1	12/13/2023 15:53	WG2188329
1,2-Dichlorobenzene	U		0.107	0.500	1	12/13/2023 15:53	WG2188329
1,3-Dichlorobenzene	U		0.299	0.500	1	12/13/2023 15:53	WG2188329
1,4-Dichlorobenzene	U		0.120	0.500	1	12/13/2023 15:53	WG2188329
Dichlorodifluoromethane	U		0.374	2.50	1	12/13/2023 15:53	WG2188329
1,1-Dichloroethane	U		0.100	0.500	1	12/13/2023 15:53	WG2188329
1,2-Dichloroethane	U		0.0819	0.500	1	12/13/2023 15:53	WG2188329
1,1-Dichloroethene	U		0.188	0.500	1	12/13/2023 15:53	WG2188329
cis-1,2-Dichloroethene	U		0.126	0.500	1	12/13/2023 15:53	WG2188329
trans-1,2-Dichloroethene	U		0.149	0.500	1	12/13/2023 15:53	WG2188329
1,2-Dichloropropane	U		0.149	0.500	1	12/13/2023 15:53	WG2188329
1,1-Dichloropropene	U		0.142	0.500	1	12/13/2023 15:53	WG2188329
1,3-Dichloropropane	U		0.109	1.00	1	12/13/2023 15:53	WG2188329
cis-1,3-Dichloropropene	U		0.111	0.500	1	12/13/2023 15:53	WG2188329
trans-1,3-Dichloropropene	U		0.118	0.500	1	12/13/2023 15:53	WG2188329
trans-1,4-Dichloro-2-butene	U		0.467	5.00	1	12/13/2023 15:53	WG2188329
2,2-Dichloropropane	U		0.161	0.500	1	12/13/2023 15:53	WG2188329
Di-isopropyl ether	U		0.105	0.500	1	12/13/2023 15:53	WG2188329
Ethylbenzene	U		0.137	0.500	1	12/13/2023 15:53	WG2188329
Hexachloro-1,3-butadiene	U		0.337	1.00	1	12/13/2023 15:53	WG2188329
2-Hexanone	U		0.787	5.00	1	12/13/2023 15:53	WG2188329
n-Hexane	U		0.749	5.00	1	12/13/2023 15:53	WG2188329
Iodomethane	2.23	B J	0.554	5.00	1	12/13/2023 15:53	WG2188329
Isopropylbenzene	U		0.105	0.500	1	12/13/2023 15:53	WG2188329
p-Isopropyltoluene	U		0.120	0.500	1	12/13/2023 15:53	WG2188329
2-Butanone (MEK)	U		1.19	5.00	1	12/13/2023 15:53	WG2188329
Methylene Chloride	U		0.430	2.50	1	12/13/2023 15:53	WG2188329
4-Methyl-2-pentanone (MIBK)	3.21	J	0.478	5.00	1	12/13/2023 15:53	WG2188329
Methyl tert-butyl ether	U		0.101	0.500	1	12/13/2023 15:53	WG2188329
Naphthalene	U	J4	0.174	2.50	1	12/13/2023 15:53	WG2188329
n-Propylbenzene	U		0.0993	0.500	1	12/13/2023 15:53	WG2188329
Styrene	U		0.118	0.500	1	12/13/2023 15:53	WG2188329
1,1,1,2-Tetrachloroethane	U		0.147	0.500	1	12/13/2023 15:53	WG2188329
1,1,2,2-Tetrachloroethane	U		0.133	0.500	1	12/13/2023 15:53	WG2188329
1,1,2-Trichlorotrifluoroethane	U		0.180	0.500	1	12/13/2023 15:53	WG2188329
Tetrachloroethene	U		0.300	0.500	1	12/13/2023 15:53	WG2188329
Toluene	U		0.278	0.500	1	12/13/2023 15:53	WG2188329
1,2,3-Trichlorobenzene	U	J4	0.164	0.500	1	12/13/2023 15:53	WG2188329
1,2,4-Trichlorobenzene	U	J4	0.481	1.00	1	12/13/2023 15:53	WG2188329
1,1,1-Trichloroethane	U		0.149	0.500	1	12/13/2023 15:53	WG2188329
1,1,2-Trichloroethane	U		0.158	0.500	1	12/13/2023 15:53	WG2188329
Trichloroethene	U		0.190	0.500	1	12/13/2023 15:53	WG2188329

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result ug/l	Qualifier	MDL ug/l	RDL ug/l	Dilution	Analysis date / time	Batch
Trichlorofluoromethane	U		0.160	2.50	1	12/13/2023 15:53	WG2188329
1,2,3-Trichloropropane	U		0.237	2.50	1	12/13/2023 15:53	WG2188329
1,2,4-Trimethylbenzene	U		0.322	0.500	1	12/13/2023 15:53	WG2188329
1,2,3-Trimethylbenzene	U		0.104	0.500	1	12/13/2023 15:53	WG2188329
1,3,5-Trimethylbenzene	U		0.104	0.500	1	12/13/2023 15:53	WG2188329
Vinyl acetate	U		0.692	5.00	1	12/13/2023 15:53	WG2188329
Vinyl chloride	U		0.234	0.500	1	12/13/2023 15:53	WG2188329
Xylenes, Total	U		0.174	1.50	1	12/13/2023 15:53	WG2188329
(S) Toluene-d8	*109*			*80.0-120*		*12/13/2023 15:53*	WG2188329
(S) 4-Bromofluorobenzene	*102*			*77.0-126*		*12/13/2023 15:53*	WG2188329
(S) 1,2-Dichloroethane-d4	*97.4*			*70.0-130*		*12/13/2023 15:53*	WG2188329

TPH by Method MTDEQ EPH

Analyte	Result ug/l	Qualifier	MDL ug/l	RDL ug/l	Dilution	Analysis date / time	Batch
EPH Screen	5630		100	300	1	12/14/2023 01:21	WG2186818
Unadjusted C9-C18 Aliphatics	U		200	600	1	01/02/2024 13:50	WG2192821
Unadjusted C19-C36 Aliphatics	U		200	600	1	01/02/2024 13:50	WG2192821
Unadjusted C11-C22 Aromatics	U		200	600	1	01/02/2024 14:03	WG2192821
Unadjusted Total Petroleum Hydrocarbons	U		200	600	1	01/02/2024 13:50	WG2192821
Adjusted C11-C22 Aromatics	U		200	600	1	01/02/2024 14:03	WG2192821
Adjusted Total Petroleum Hydrocarbons	U		200	600	1	01/02/2024 13:50	WG2192821
(S) o-Terphenyl	*65.0*			*40.0-140*		*12/14/2023 01:21*	WG2186818
(S) o-Terphenyl	*90.0*			*40.0-140*		*01/02/2024 14:03*	WG2192821
(S) 1-Chloro-octadecane	*34.7*	J2		*40.0-140*		*01/02/2024 13:50*	WG2192821
(S) 2-Fluorobiphenyl	*108*			*40.0-140*		*01/02/2024 14:03*	WG2192821
(S) 2-Bromonaphthalene	*114*			*40.0-140*		*01/02/2024 14:03*	WG2192821

Sample Narrative:

L1685777-02 WG2192821: Sample produced emulsion during Extraction process, low surr/spike recoveries due to matrix.

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result ug/l	Qualifier	MDL ug/l	RDL ug/l	Dilution	Analysis date / time	Batch
Acenaphthene	U		0.0886	1.00	1	12/15/2023 18:32	WG2187205
Acenaphthylene	U		0.0921	1.00	1	12/15/2023 18:32	WG2187205
Anthracene	U		0.0804	1.00	1	12/15/2023 18:32	WG2187205
Benzidine	U	J4	3.74	10.0	1	12/15/2023 18:32	WG2187205
Benzo(a)anthracene	U		0.199	1.00	1	12/15/2023 18:32	WG2187205
Benzo(b)fluoranthene	U		0.130	1.00	1	12/15/2023 18:32	WG2187205
Benzo(k)fluoranthene	U		0.120	1.00	1	12/15/2023 18:32	WG2187205
Benzo(g,h,i)perylene	U		0.121	1.00	1	12/15/2023 18:32	WG2187205
Benzo(a)pyrene	U		0.0381	1.00	1	12/15/2023 18:32	WG2187205
Bis(2-chlorethoxy)methane	U		0.116	10.0	1	12/15/2023 18:32	WG2187205
Bis(2-chloroethyl)ether	U		0.137	10.0	1	12/15/2023 18:32	WG2187205
2,2-Oxybis(1-Chloropropane)	U		0.210	10.0	1	12/15/2023 18:32	WG2187205
4-Bromophenyl-phenylether	U		0.0877	10.0	1	12/15/2023 18:32	WG2187205
2-Chloronaphthalene	U		0.0648	1.00	1	12/15/2023 18:32	WG2187205
4-Chlorophenyl-phenylether	U		0.0926	10.0	1	12/15/2023 18:32	WG2187205
Chrysene	U		0.130	1.00	1	12/15/2023 18:32	WG2187205
Dibenz(a,h)anthracene	U		0.0644	1.00	1	12/15/2023 18:32	WG2187205
3,3-Dichlorobenzidine	U		0.212	10.0	1	12/15/2023 18:32	WG2187205
2,4-Dinitrotoluene	U		0.0983	10.0	1	12/15/2023 18:32	WG2187205
2,6-Dinitrotoluene	U		0.250	10.0	1	12/15/2023 18:32	WG2187205

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
Fluoranthene	U		0.102	1.00	1	12/15/2023 18:32	WG2187205
Fluorene	U		0.0844	1.00	1	12/15/2023 18:32	WG2187205
Hexachlorobenzene	U		0.0755	1.00	1	12/15/2023 18:32	WG2187205
Hexachloro-1,3-butadiene	U		0.0968	10.0	1	12/15/2023 18:32	WG2187205
Hexachlorocyclopentadiene	U		0.0598	10.0	1	12/15/2023 18:32	WG2187205
Hexachloroethane	U		0.127	10.0	1	12/15/2023 18:32	WG2187205
Indeno(1,2,3-cd)pyrene	U		0.279	1.00	1	12/15/2023 18:32	WG2187205
Isophorone	U		0.143	10.0	1	12/15/2023 18:32	WG2187205
Naphthalene	U		0.159	1.00	1	12/15/2023 18:32	WG2187205
Nitrobenzene	U		0.297	10.0	1	12/15/2023 18:32	WG2187205
n-Nitrosodimethylamine	U		0.998	10.0	1	12/15/2023 18:32	WG2187205
n-Nitrosodiphenylamine	U		2.37	10.0	1	12/15/2023 18:32	WG2187205
n-Nitrosodi-n-propylamine	U		0.261	10.0	1	12/15/2023 18:32	WG2187205
Phenanthrene	U		0.112	1.00	1	12/15/2023 18:32	WG2187205
Benzylbutyl phthalate	U		0.765	3.00	1	12/15/2023 18:32	WG2187205
Bis(2-Ethylhexyl)phthalate	U		0.895	3.00	1	12/15/2023 18:32	WG2187205
Di-n-butyl phthalate	U		0.453	3.00	1	12/15/2023 18:32	WG2187205
Diethyl phthalate	U		0.287	3.00	1	12/15/2023 18:32	WG2187205
Dimethyl phthalate	U		0.260	3.00	1	12/15/2023 18:32	WG2187205
Di-n-octyl phthalate	U		0.932	3.00	1	12/15/2023 18:32	WG2187205
Pyrene	U		0.107	1.00	1	12/15/2023 18:32	WG2187205
1,2,4-Trichlorobenzene	U		0.0698	10.0	1	12/15/2023 18:32	WG2187205
Aniline	U		1.65	10.0	1	12/15/2023 18:32	WG2187205
1,2-Diphenylhydrazine	U	N2	0.105	10.0	1	12/15/2023 18:32	WG2187205
Benzyl alcohol	U		0.563	10.0	1	12/15/2023 18:32	WG2187205
4-Chloroaniline	U		0.234	10.0	1	12/15/2023 18:32	WG2187205
4-Chloro-3-methylphenol	U		0.131	10.0	1	12/15/2023 18:32	WG2187205
2-Chlorophenol	U		0.133	10.0	1	12/15/2023 18:32	WG2187205
Dibenzofuran	U		0.0970	10.0	1	12/15/2023 18:32	WG2187205
2,4-Dichlorophenol	U		0.102	10.0	1	12/15/2023 18:32	WG2187205
2,4-Dimethylphenol	U		0.0636	10.0	1	12/15/2023 18:32	WG2187205
4,6-Dinitro-2-methylphenol	U		1.12	10.0	1	12/15/2023 18:32	WG2187205
2,4-Dinitrophenol	U		5.93	10.0	1	12/15/2023 18:32	WG2187205
2-Methylnaphthalene	U		0.117	1.00	1	12/15/2023 18:32	WG2187205
2-Methylphenol	U		0.0929	10.0	1	12/15/2023 18:32	WG2187205
3&4-Methyl Phenol	U		0.168	10.0	1	12/15/2023 18:32	WG2187205
2-Nitroaniline	U		0.102	10.0	1	12/15/2023 18:32	WG2187205
3-Nitroaniline	U		0.0869	10.0	1	12/15/2023 18:32	WG2187205
4-Nitroaniline	U		0.0910	10.0	1	12/15/2023 18:32	WG2187205
2-Nitrophenol	U		0.117	10.0	1	12/15/2023 18:32	WG2187205
4-Nitrophenol	U		0.143	10.0	1	12/15/2023 18:32	WG2187205
Pentachlorophenol	U		0.313	10.0	1	12/15/2023 18:32	WG2187205
Phenol	U		4.33	10.0	1	12/15/2023 18:32	WG2187205
Pyridine	U		0.627	10.0	1	12/15/2023 18:32	WG2187205
2,4,6-Trichlorophenol	U		0.100	10.0	1	12/15/2023 18:32	WG2187205
Acetophenone	U		0.208	10.0	1	12/15/2023 18:32	WG2187205
2-Acetylaminofluorene	U		0.253	10.0	1	12/19/2023 02:41	WG2187205
4-Aminobiphenyl	U		0.461	10.0	1	12/19/2023 02:41	WG2187205
Chlorobenzilate	U		3.84	50.0	1	12/19/2023 02:41	WG2187205
Diallate	U		0.524	10.0	1	12/19/2023 02:41	WG2187205
2,6-Dichlorophenol	U		0.102	10.0	1	12/19/2023 02:41	WG2187205
Dimethoate	U		5.05	50.0	1	12/19/2023 02:41	WG2187205
P-(Dimethylamino) Azobenzene	U		3.69	10.0	1	12/19/2023 02:41	WG2187205
Dimethylbenz (A) Anthracene	U		1.71	10.0	1	12/19/2023 02:41	WG2187205
3,3-Dimethylbenzidine	U		3.39	10.0	1	12/19/2023 02:41	WG2187205
a,a-Dimethylphenethylamine	U	J4	3.13	50.0	1	12/19/2023 02:41	WG2187205

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
1,3-Dinitrobenzene	U		0.359	10.0	1	12/19/2023 02:41	WG2187205
Diphenylamine	U		2.37	10.0	1	12/15/2023 18:32	WG2187205
Dinoseb	U		8.01	50.0	1	12/19/2023 02:41	WG2187205
Disulfoton	U		0.267	10.0	1	12/19/2023 02:41	WG2187205
Ethyl methanesulfonate	U		0.326	10.0	1	12/19/2023 02:41	WG2187205
Ethyl Parathion	U		0.379	10.0	1	12/19/2023 02:41	WG2187205
Famphur	U		3.92	20.0	1	12/19/2023 02:41	WG2187205
Hexachloropropene	U		0.149	50.0	1	12/19/2023 02:41	WG2187205
Hexachlorophene	U		1.44	50.0	1	12/19/2023 02:41	WG2187205
Isodrin	U		4.11	10.0	1	12/19/2023 02:41	WG2187205
Isosafrole	U		3.88	10.0	1	12/19/2023 02:41	WG2187205
Kepone	U		2.66	20.0	1	12/19/2023 02:41	WG2187205
Methapyrilene	U	J4	10.0	50.0	1	12/19/2023 02:41	WG2187205
3-Methylcholanthrene	U		0.164	10.0	1	12/19/2023 02:41	WG2187205
Methyl methanesulfonate	U		3.40	50.0	1	12/19/2023 02:41	WG2187205
Methyl parathion	U		0.213	10.0	1	12/19/2023 02:41	WG2187205
1,4-Naphthoquinone	U	J4	5.56	50.0	1	12/19/2023 02:41	WG2187205
1-Naphthylamine	U		0.289	10.0	1	12/19/2023 02:41	WG2187205
2-Naphthylamine	U		4.48	10.0	1	12/19/2023 02:41	WG2187205
5-Nitro-o-toluidine	U		1.99	10.0	1	12/19/2023 02:41	WG2187205
4-Nitroquinoline 1-oxide	U		2.03	10.0	1	12/19/2023 02:41	WG2187205
n-Nitrosodiethylamine	U		3.57	10.0	1	12/19/2023 02:41	WG2187205
n-Nitrosodi-n-butylamine	U		3.91	10.0	1	12/19/2023 02:41	WG2187205
n-Nitrosomethylethylamine	U		3.25	10.0	1	12/19/2023 02:41	WG2187205
n-Nitrosomorpholine	U		3.25	10.0	1	12/19/2023 02:41	WG2187205
n-Nitrosopiperidine	U		3.72	10.0	1	12/19/2023 02:41	WG2187205
n-Nitrosopyrrolidine	U		3.39	10.0	1	12/19/2023 02:41	WG2187205
Pentachlorobenzene	U		4.15	10.0	1	12/19/2023 02:41	WG2187205
Pentachloroethane	U		2.83	50.0	1	12/19/2023 02:41	WG2187205
Pentachloronitrobenzene	U		4.15	10.0	1	12/19/2023 02:41	WG2187205
Phenacetin	U		4.66	10.0	1	12/19/2023 02:41	WG2187205
p-Phenylenediamine	U	J4	387	6900	1	12/19/2023 02:41	WG2187205
Phorate	U		4.86	50.0	1	12/19/2023 02:41	WG2187205
2-Picoline	U		6.83	50.0	1	12/19/2023 02:41	WG2187205
Pronamide	U		4.21	10.0	1	12/19/2023 02:41	WG2187205
Safrole	U		3.68	10.0	1	12/19/2023 02:41	WG2187205
Sulfotep	U		3.99	50.0	1	12/19/2023 02:41	WG2187205
1,2,4,5-Tetrachlorobenzene	U		0.0647	10.0	1	12/15/2023 18:32	WG2187205
2,3,4,6-Tetrachlorophenol	U		0.231	10.0	1	12/15/2023 18:32	WG2187205
Thionazin	U		4.07	10.0	1	12/19/2023 02:41	WG2187205
o-Toluidine	U		3.53	10.0	1	12/19/2023 02:41	WG2187205
2,4,5-Trichlorophenol	U		0.109	10.0	1	12/15/2023 18:32	WG2187205
O,O,O-Triethyl Phosphorothioate	U		2.93	10.0	1	12/19/2023 02:41	WG2187205
1,3,5-Trinitrobenzene	U		1.32	10.0	1	12/19/2023 02:41	WG2187205
(S) 2-Fluorophenol	*19.6*			*10.0-120*		*12/15/2023 18:32*	WG2187205
(S) Phenol-d5	*15.5*			*10.0-120*		*12/15/2023 18:32*	WG2187205
(S) Nitrobenzene-d5	*59.7*			*10.0-127*		*12/15/2023 18:32*	WG2187205
(S) 2-Fluorobiphenyl	*46.4*			*10.0-130*		*12/15/2023 18:32*	WG2187205
(S) 2,4,6-Tribromophenol	*54.5*			*10.0-155*		*12/15/2023 18:32*	WG2187205
(S) p-Terphenyl-d14	*47.7*			*10.0-128*		*12/15/2023 18:32*	WG2187205

Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
Anthracene	U		0.0190	0.0500	1	12/15/2023 00:18	WG2188864
Acenaphthene	U		0.0190	0.0500	1	12/15/2023 00:18	WG2188864
Acenaphthylene	0.133		0.0171	0.0500	1	12/15/2023 00:18	WG2188864
Benzo(a)anthracene	U		0.0203	0.0500	1	12/15/2023 00:18	WG2188864
Benzo(a)pyrene	U		0.0184	0.0500	1	12/15/2023 00:18	WG2188864
Benzo(b)fluoranthene	U		0.0168	0.0500	1	12/15/2023 00:18	WG2188864
Benzo(g,h,i)perylene	U		0.0184	0.0500	1	12/15/2023 00:18	WG2188864
Benzo(k)fluoranthene	U		0.0202	0.0500	1	12/15/2023 00:18	WG2188864
Chrysene	U		0.0179	0.0500	1	12/15/2023 00:18	WG2188864
Dibenz(a,h)anthracene	U		0.0160	0.0500	1	12/15/2023 00:18	WG2188864
Fluoranthene	U		0.0270	0.100	1	12/15/2023 00:18	WG2188864
Fluorene	U		0.0169	0.0500	1	12/15/2023 00:18	WG2188864
Indeno(1,2,3-cd)pyrene	U		0.0158	0.0500	1	12/15/2023 00:18	WG2188864
Naphthalene	0.129	J	0.0917	0.250	1	12/15/2023 00:18	WG2188864
Phenanthrene	U		0.0180	0.0500	1	12/15/2023 00:18	WG2188864
Pyrene	U		0.0169	0.0500	1	12/15/2023 00:18	WG2188864
1-Methylnaphthalene	U		0.0687	0.250	1	12/15/2023 00:18	WG2188864
2-Methylnaphthalene	0.0866	J	0.0674	0.250	1	12/15/2023 00:18	WG2188864
2-Chloronaphthalene	U		0.0682	0.250	1	12/15/2023 00:18	WG2188864
(S) Nitrobenzene-d5	*108*			*31.0-160*		*12/15/2023 00:18*	WG2188864
(S) 2-Fluorobiphenyl	*109*			*48.0-148*		*12/15/2023 00:18*	WG2188864
(S) p-Terphenyl-d14	*105*			*37.0-146*		*12/15/2023 00:18*	WG2188864

Volatile Petroleum Hydrocarbons by Method MTDEQ VPH

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
Unadjusted C5-C8 Aliphatics	1410		33.3	100	1	12/15/2023 03:09	WG2189374
Unadjusted C9-C12 Aliphatics	3560		33.3	100	1	12/15/2023 03:09	WG2189374
Unadjusted C9-C10 Aromatics	1180		33.3	100	1	12/15/2023 03:09	WG2189374
Adjusted C5-C8 Aliphatics	869		33.3	100	1	12/15/2023 03:09	WG2189374
Adjusted C9-C12 Aliphatics	2380		33.3	100	1	12/15/2023 03:09	WG2189374
Total VPH	6150		66.7	200	1	12/15/2023 03:09	WG2189374
(S) 2,5-Dibromotoluene(FID)	*107*			*70.0-130*		*12/15/2023 03:09*	WG2189374
(S) 2,5-Dibromotoluene(PID)	*108*			*70.0-130*		*12/15/2023 03:09*	WG2189374

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
Acetone	23.2	J	11.3	25.0	1	12/13/2023 16:14	WG2188329
Acrylonitrile	U		0.671	5.00	1	12/13/2023 16:14	WG2188329
Benzene	535		1.88	10.0	20	12/14/2023 19:51	WG2189222
Bromobenzene	U		0.118	0.500	1	12/13/2023 16:14	WG2188329
Bromodichloromethane	U		0.136	0.500	1	12/13/2023 16:14	WG2188329
Bromochloromethane	U		0.128	0.500	1	12/13/2023 16:14	WG2188329
Bromoform	U		0.129	0.500	1	12/13/2023 16:14	WG2188329
Bromomethane	U		0.605	2.50	1	12/13/2023 16:14	WG2188329
n-Butylbenzene	6.90		0.157	0.500	1	12/13/2023 16:14	WG2188329
sec-Butylbenzene	8.12		0.125	0.500	1	12/13/2023 16:14	WG2188329
tert-Butylbenzene	U		0.127	0.500	1	12/13/2023 16:14	WG2188329
Carbon disulfide	0.363	J	0.0962	0.500	1	12/13/2023 16:14	WG2188329
Carbon tetrachloride	U		0.128	0.500	1	12/13/2023 16:14	WG2188329
Chlorobenzene	U		0.117	0.500	1	12/13/2023 16:14	WG2188329
Chlorodibromomethane	U		0.140	0.500	1	12/13/2023 16:14	WG2188329
Chloroethane	U		0.192	2.50	1	12/13/2023 16:14	WG2188329
2-Chloroethyl vinyl ether	U		0.575	50.0	1	12/13/2023 16:14	WG2188329
Chloroform	U		0.111	0.500	1	12/13/2023 16:14	WG2188329
Chloromethane	U		0.960	1.25	1	12/13/2023 16:14	WG2188329
2-Chlorotoluene	U		0.106	0.500	1	12/13/2023 16:14	WG2188329
4-Chlorotoluene	U		0.114	0.500	1	12/13/2023 16:14	WG2188329
1,2-Dibromo-3-Chloropropane	U		0.276	2.50	1	12/13/2023 16:14	WG2188329
1,2-Dibromoethane	U		0.126	0.500	1	12/13/2023 16:14	WG2188329
Dibromomethane	U		0.122	0.500	1	12/13/2023 16:14	WG2188329
1,2-Dichlorobenzene	U		0.107	0.500	1	12/13/2023 16:14	WG2188329
1,3-Dichlorobenzene	U		0.299	0.500	1	12/13/2023 16:14	WG2188329
1,4-Dichlorobenzene	U		0.120	0.500	1	12/13/2023 16:14	WG2188329
Dichlorodifluoromethane	U		0.374	2.50	1	12/13/2023 16:14	WG2188329
1,1-Dichloroethane	U		0.100	0.500	1	12/13/2023 16:14	WG2188329
1,2-Dichloroethane	U		0.0819	0.500	1	12/13/2023 16:14	WG2188329
1,1-Dichloroethene	U		0.188	0.500	1	12/13/2023 16:14	WG2188329
cis-1,2-Dichloroethene	U		0.126	0.500	1	12/13/2023 16:14	WG2188329
trans-1,2-Dichloroethene	U		0.149	0.500	1	12/13/2023 16:14	WG2188329
1,2-Dichloropropane	U		0.149	0.500	1	12/13/2023 16:14	WG2188329
1,1-Dichloropropene	U		0.142	0.500	1	12/13/2023 16:14	WG2188329
1,3-Dichloropropane	U		0.109	1.00	1	12/13/2023 16:14	WG2188329
cis-1,3-Dichloropropene	U		0.111	0.500	1	12/13/2023 16:14	WG2188329
trans-1,3-Dichloropropene	U		0.118	0.500	1	12/13/2023 16:14	WG2188329
trans-1,4-Dichloro-2-butene	U		0.467	5.00	1	12/13/2023 16:14	WG2188329
2,2-Dichloropropane	U		0.161	0.500	1	12/13/2023 16:14	WG2188329
Di-isopropyl ether	U		0.105	0.500	1	12/13/2023 16:14	WG2188329
Ethylbenzene	191		2.74	10.0	20	12/14/2023 19:51	WG2189222
Hexachloro-1,3-butadiene	U		0.337	1.00	1	12/13/2023 16:14	WG2188329

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
2-Hexanone	U		0.787	5.00	1	12/13/2023 16:14	WG2188329
n-Hexane	U		0.749	5.00	1	12/13/2023 16:14	WG2188329
Iodomethane	2.19	B J	0.554	5.00	1	12/13/2023 16:14	WG2188329
Isopropylbenzene	8.52		0.105	0.500	1	12/13/2023 16:14	WG2188329
p-Isopropyltoluene	6.35		0.120	0.500	1	12/13/2023 16:14	WG2188329
2-Butanone (MEK)	U		1.19	5.00	1	12/13/2023 16:14	WG2188329
Methylene Chloride	U		0.430	2.50	1	12/13/2023 16:14	WG2188329
4-Methyl-2-pentanone (MIBK)	2.78	J	0.478	5.00	1	12/13/2023 16:14	WG2188329
Methyl tert-butyl ether	U		0.101	0.500	1	12/13/2023 16:14	WG2188329
Naphthalene	63.7	J4	0.174	2.50	1	12/13/2023 16:14	WG2188329
n-Propylbenzene	21.1		0.0993	0.500	1	12/13/2023 16:14	WG2188329
Styrene	U		0.118	0.500	1	12/13/2023 16:14	WG2188329
1,1,1,2-Tetrachloroethane	U		0.147	0.500	1	12/13/2023 16:14	WG2188329
1,1,2,2-Tetrachloroethane	U		0.133	0.500	1	12/13/2023 16:14	WG2188329
1,1,2-Trichlorotrifluoroethane	U		0.180	0.500	1	12/13/2023 16:14	WG2188329
Tetrachloroethene	U		0.300	0.500	1	12/13/2023 16:14	WG2188329
Toluene	6.45		0.278	0.500	1	12/13/2023 16:14	WG2188329
1,2,3-Trichlorobenzene	U	J4	0.164	0.500	1	12/13/2023 16:14	WG2188329
1,2,4-Trichlorobenzene	U	J4	0.481	1.00	1	12/13/2023 16:14	WG2188329
1,1,1-Trichloroethane	U		0.149	0.500	1	12/13/2023 16:14	WG2188329
1,1,2-Trichloroethane	U		0.158	0.500	1	12/13/2023 16:14	WG2188329
Trichloroethene	U		0.190	0.500	1	12/13/2023 16:14	WG2188329
Trichlorofluoromethane	U		0.160	2.50	1	12/13/2023 16:14	WG2188329
1,2,3-Trichloropropane	U		0.237	2.50	1	12/13/2023 16:14	WG2188329
1,2,4-Trimethylbenzene	613		6.44	10.0	20	12/14/2023 19:51	WG2189222
1,2,3-Trimethylbenzene	248		2.08	10.0	20	12/14/2023 19:51	WG2189222
1,3,5-Trimethylbenzene	83.3		0.104	0.500	1	12/13/2023 16:14	WG2188329
Vinyl acetate	U		0.692	5.00	1	12/13/2023 16:14	WG2188329
Vinyl chloride	U		0.234	0.500	1	12/13/2023 16:14	WG2188329
Xylenes, Total	987		3.48	30.0	20	12/14/2023 19:51	WG2189222
(S) Toluene-d8	*102*			*80.0-120*		*12/13/2023 16:14*	WG2188329
(S) Toluene-d8	*105*			*80.0-120*		*12/14/2023 19:51*	WG2189222
(S) 4-Bromofluorobenzene	*102*			*77.0-126*		*12/13/2023 16:14*	WG2188329
(S) 4-Bromofluorobenzene	*102*			*77.0-126*		*12/14/2023 19:51*	WG2189222
(S) 1,2-Dichloroethane-d4	*97.8*			*70.0-130*		*12/13/2023 16:14*	WG2188329
(S) 1,2-Dichloroethane-d4	*104*			*70.0-130*		*12/14/2023 19:51*	WG2189222

TPH by Method MTDEQ EPH

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
EPH Screen	6840		100	300	1	12/14/2023 03:02	WG2186818
Unadjusted C9-C18 Aliphatics	U		200	600	1	01/02/2024 14:14	WG2192821
Unadjusted C19-C36 Aliphatics	U		200	600	1	01/02/2024 14:14	WG2192821
Unadjusted C11-C22 Aromatics	813		200	600	1	01/03/2024 07:18	WG2192821
Unadjusted Total Petroleum Hydrocarbons	813		200	600	1	01/03/2024 07:18	WG2192821
Adjusted C11-C22 Aromatics	700		200	600	1	01/03/2024 07:18	WG2192821
Adjusted Total Petroleum Hydrocarbons	700		200	600	1	01/03/2024 07:18	WG2192821
(S) o-Terphenyl	*62.1*			*40.0-140*		*12/14/2023 03:02*	WG2186818
(S) o-Terphenyl	*80.5*			*40.0-140*		*01/03/2024 07:18*	WG2192821
(S) 1-Chloro-octadecane	*34.5*	J2		*40.0-140*		*01/02/2024 14:14*	WG2192821
(S) 2-Fluorobiphenyl	*112*			*40.0-140*		*01/03/2024 07:18*	WG2192821
(S) 2-Bromonaphthalene	*114*			*40.0-140*		*01/03/2024 07:18*	WG2192821

Sample Narrative:

TPH by Method MTDEQ EPH

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	

L1685777-03 WG2192821: Sample produced emulsion during Extraction process, low surr/spike recoveries due to matrix.

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
Acenaphthene	0.788	J	0.0886	1.00	1	12/15/2023 18:53	WG2187205
Acenaphthylene	U		0.0921	1.00	1	12/15/2023 18:53	WG2187205
Anthracene	U		0.0804	1.00	1	12/15/2023 18:53	WG2187205
Benzidine	U	J4	3.74	10.0	1	12/15/2023 18:53	WG2187205
Benzo(a)anthracene	U		0.199	1.00	1	12/15/2023 18:53	WG2187205
Benzo(b)fluoranthene	U		0.130	1.00	1	12/15/2023 18:53	WG2187205
Benzo(k)fluoranthene	U		0.120	1.00	1	12/15/2023 18:53	WG2187205
Benzo(g,h,i)perylene	U		0.121	1.00	1	12/15/2023 18:53	WG2187205
Benzo(a)pyrene	U		0.0381	1.00	1	12/15/2023 18:53	WG2187205
Bis(2-chlorethoxy)methane	U		0.116	10.0	1	12/15/2023 18:53	WG2187205
Bis(2-chloroethyl)ether	U		0.137	10.0	1	12/15/2023 18:53	WG2187205
2,2-Oxybis(1-Chloropropane)	U		0.210	10.0	1	12/15/2023 18:53	WG2187205
4-Bromophenyl-phenylether	U		0.0877	10.0	1	12/15/2023 18:53	WG2187205
2-Chloronaphthalene	U		0.0648	1.00	1	12/15/2023 18:53	WG2187205
4-Chlorophenyl-phenylether	U		0.0926	10.0	1	12/15/2023 18:53	WG2187205
Chrysene	U		0.130	1.00	1	12/15/2023 18:53	WG2187205
Dibenz(a,h)anthracene	U		0.0644	1.00	1	12/15/2023 18:53	WG2187205
3,3-Dichlorobenzidine	U		0.212	10.0	1	12/15/2023 18:53	WG2187205
2,4-Dinitrotoluene	U		0.0983	10.0	1	12/15/2023 18:53	WG2187205
2,6-Dinitrotoluene	U		0.250	10.0	1	12/15/2023 18:53	WG2187205
Fluoranthene	U		0.102	1.00	1	12/15/2023 18:53	WG2187205
Fluorene	0.914	J	0.0844	1.00	1	12/15/2023 18:53	WG2187205
Hexachlorobenzene	U		0.0755	1.00	1	12/15/2023 18:53	WG2187205
Hexachloro-1,3-butadiene	U		0.0968	10.0	1	12/15/2023 18:53	WG2187205
Hexachlorocyclopentadiene	U		0.0598	10.0	1	12/15/2023 18:53	WG2187205
Hexachloroethane	U		0.127	10.0	1	12/15/2023 18:53	WG2187205
Indeno(1,2,3-cd)pyrene	U		0.279	1.00	1	12/15/2023 18:53	WG2187205
Isophorone	U		0.143	10.0	1	12/15/2023 18:53	WG2187205
Naphthalene	27.1		0.159	1.00	1	12/15/2023 18:53	WG2187205
Nitrobenzene	U		0.297	10.0	1	12/15/2023 18:53	WG2187205
n-Nitrosodimethylamine	U		0.998	10.0	1	12/15/2023 18:53	WG2187205
n-Nitrosodiphenylamine	U		2.37	10.0	1	12/15/2023 18:53	WG2187205
n-Nitrosodi-n-propylamine	U		0.261	10.0	1	12/15/2023 18:53	WG2187205
Phenanthrene	0.555	J	0.112	1.00	1	12/15/2023 18:53	WG2187205
Benzylbutyl phthalate	U		0.765	3.00	1	12/15/2023 18:53	WG2187205
Bis(2-Ethylhexyl)phthalate	U		0.895	3.00	1	12/15/2023 18:53	WG2187205
Di-n-butyl phthalate	U		0.453	3.00	1	12/15/2023 18:53	WG2187205
Diethyl phthalate	U		0.287	3.00	1	12/15/2023 18:53	WG2187205
Dimethyl phthalate	U		0.260	3.00	1	12/15/2023 18:53	WG2187205
Di-n-octyl phthalate	U		0.932	3.00	1	12/15/2023 18:53	WG2187205
Pyrene	U		0.107	1.00	1	12/15/2023 18:53	WG2187205
1,2,4-Trichlorobenzene	U		0.0698	10.0	1	12/15/2023 18:53	WG2187205
Aniline	U		1.65	10.0	1	12/15/2023 18:53	WG2187205
1,2-Diphenylhydrazine	U	N2	0.105	10.0	1	12/15/2023 18:53	WG2187205
Benzyl alcohol	U		0.563	10.0	1	12/15/2023 18:53	WG2187205
4-Chloroaniline	U		0.234	10.0	1	12/15/2023 18:53	WG2187205
4-Chloro-3-methylphenol	U		0.131	10.0	1	12/15/2023 18:53	WG2187205
2-Chlorophenol	U		0.133	10.0	1	12/15/2023 18:53	WG2187205
Dibenzofuran	0.550	J	0.0970	10.0	1	12/15/2023 18:53	WG2187205
2,4-Dichlorophenol	U		0.102	10.0	1	12/15/2023 18:53	WG2187205
2,4-Dimethylphenol	15.8		0.0636	10.0	1	12/15/2023 18:53	WG2187205

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
4,6-Dinitro-2-methylphenol	U		1.12	10.0	1	12/15/2023 18:53	WG2187205
2,4-Dinitrophenol	U		5.93	10.0	1	12/15/2023 18:53	WG2187205
2-Methylnaphthalene	13.3		0.117	1.00	1	12/15/2023 18:53	WG2187205
2-Methylphenol	U		0.0929	10.0	1	12/15/2023 18:53	WG2187205
3&4-Methyl Phenol	U		0.168	10.0	1	12/15/2023 18:53	WG2187205
2-Nitroaniline	U		0.102	10.0	1	12/15/2023 18:53	WG2187205
3-Nitroaniline	U		0.0869	10.0	1	12/15/2023 18:53	WG2187205
4-Nitroaniline	U		0.0910	10.0	1	12/15/2023 18:53	WG2187205
2-Nitrophenol	U		0.117	10.0	1	12/15/2023 18:53	WG2187205
4-Nitrophenol	U		0.143	10.0	1	12/15/2023 18:53	WG2187205
Pentachlorophenol	U		0.313	10.0	1	12/15/2023 18:53	WG2187205
Phenol	4.95	J	4.33	10.0	1	12/15/2023 18:53	WG2187205
Pyridine	U		0.627	10.0	1	12/15/2023 18:53	WG2187205
2,4,6-Trichlorophenol	U		0.100	10.0	1	12/15/2023 18:53	WG2187205
Acetophenone	U		0.208	10.0	1	12/15/2023 18:53	WG2187205
2-Acetylaminofluorene	U		0.253	10.0	1	12/19/2023 02:58	WG2187205
4-Aminobiphenyl	U		0.461	10.0	1	12/19/2023 02:58	WG2187205
Chlorobenzilate	U		3.84	50.0	1	12/19/2023 02:58	WG2187205
Diallate	U		0.524	10.0	1	12/19/2023 02:58	WG2187205
2,6-Dichlorophenol	U		0.102	10.0	1	12/19/2023 02:58	WG2187205
Dimethoate	U		5.05	50.0	1	12/19/2023 02:58	WG2187205
P-(Dimethylamino) Azobenzene	U		3.69	10.0	1	12/19/2023 02:58	WG2187205
Dimethylbenz (A) Anthracene	U		1.71	10.0	1	12/19/2023 02:58	WG2187205
3,3-Dimethylbenzidine	U		3.39	10.0	1	12/19/2023 02:58	WG2187205
a,a-Dimethylphenethylamine	U	J4	3.13	50.0	1	12/19/2023 02:58	WG2187205
1,3-Dinitrobenzene	U		0.359	10.0	1	12/19/2023 02:58	WG2187205
Diphenylamine	U		2.37	10.0	1	12/15/2023 18:53	WG2187205
Dinoseb	U		8.01	50.0	1	12/19/2023 02:58	WG2187205
Disulfoton	U		0.267	10.0	1	12/19/2023 02:58	WG2187205
Ethyl methanesulfonate	U		0.326	10.0	1	12/19/2023 02:58	WG2187205
Ethyl Parathion	U		0.379	10.0	1	12/19/2023 02:58	WG2187205
Famphur	U		3.92	20.0	1	12/19/2023 02:58	WG2187205
Hexachloropropene	U		0.149	50.0	1	12/19/2023 02:58	WG2187205
Hexachlorophene	U		1.44	50.0	1	12/19/2023 02:58	WG2187205
Isodrin	U		4.11	10.0	1	12/19/2023 02:58	WG2187205
Isosafrole	U		3.88	10.0	1	12/19/2023 02:58	WG2187205
Kepone	U		2.66	20.0	1	12/19/2023 02:58	WG2187205
Methapyrilene	U	J4	10.0	50.0	1	12/19/2023 02:58	WG2187205
3-Methylcholanthrene	U		0.164	10.0	1	12/19/2023 02:58	WG2187205
Methyl methanesulfonate	U		3.40	50.0	1	12/19/2023 02:58	WG2187205
Methyl parathion	U		0.213	10.0	1	12/19/2023 02:58	WG2187205
1,4-Naphthoquinone	U	J4	5.56	50.0	1	12/19/2023 02:58	WG2187205
1-Naphthylamine	U		0.289	10.0	1	12/19/2023 02:58	WG2187205
2-Naphthylamine	U		4.48	10.0	1	12/19/2023 02:58	WG2187205
5-Nitro-o-toluidine	U		1.99	10.0	1	12/19/2023 02:58	WG2187205
4-Nitroquinoline 1-oxide	U		2.03	10.0	1	12/19/2023 02:58	WG2187205
n-Nitrosodiethylamine	U		3.57	10.0	1	12/19/2023 02:58	WG2187205
n-Nitrosodi-n-butylamine	U		3.91	10.0	1	12/19/2023 02:58	WG2187205
n-Nitrosomethylethylamine	U		3.25	10.0	1	12/19/2023 02:58	WG2187205
n-Nitrosomorpholine	U		3.25	10.0	1	12/19/2023 02:58	WG2187205
n-Nitrosopiperidine	U		3.72	10.0	1	12/19/2023 02:58	WG2187205
n-Nitrosopyrrolidine	U		3.39	10.0	1	12/19/2023 02:58	WG2187205
Pentachlorobenzene	U		4.15	10.0	1	12/19/2023 02:58	WG2187205
Pentachloroethane	U		2.83	50.0	1	12/19/2023 02:58	WG2187205
Pentachloronitrobenzene	U		4.15	10.0	1	12/19/2023 02:58	WG2187205
Phenacetin	U		4.66	10.0	1	12/19/2023 02:58	WG2187205

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
p-Phenylenediamine	U	J4	387	6900	1	12/19/2023 02:58	WG2187205
Phorate	U		4.86	50.0	1	12/19/2023 02:58	WG2187205
2-Picoline	U		6.83	50.0	1	12/19/2023 02:58	WG2187205
Pronamide	U		4.21	10.0	1	12/19/2023 02:58	WG2187205
Safrole	U		3.68	10.0	1	12/19/2023 02:58	WG2187205
Sulfotep	U		3.99	50.0	1	12/19/2023 02:58	WG2187205
1,2,4,5-Tetrachlorobenzene	U		0.0647	10.0	1	12/15/2023 18:53	WG2187205
2,3,4,6-Tetrachlorophenol	U		0.231	10.0	1	12/15/2023 18:53	WG2187205
Thionazin	U		4.07	10.0	1	12/19/2023 02:58	WG2187205
o-Toluidine	U		3.53	10.0	1	12/19/2023 02:58	WG2187205
2,4,5-Trichlorophenol	U		0.109	10.0	1	12/15/2023 18:53	WG2187205
O,O,O-Triethyl Phosphorothioate	U		2.93	10.0	1	12/19/2023 02:58	WG2187205
1,3,5-Trinitrobenzene	U		1.32	10.0	1	12/19/2023 02:58	WG2187205
(S) 2-Fluorophenol	*28.3*			*10.0-120*		*12/15/2023 18:53*	WG2187205
(S) Phenol-d5	*18.4*			*10.0-120*		*12/15/2023 18:53*	WG2187205
(S) Nitrobenzene-d5	*59.3*			*10.0-127*		*12/15/2023 18:53*	WG2187205
(S) 2-Fluorobiphenyl	*40.8*			*10.0-130*		*12/15/2023 18:53*	WG2187205
(S) 2,4,6-Tribromophenol	*58.2*			*10.0-155*		*12/15/2023 18:53*	WG2187205
(S) p-Terphenyl-d14	*46.9*			*10.0-128*		*12/15/2023 18:53*	WG2187205

Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
Anthracene	U		0.0190	0.0500	1	12/15/2023 00:36	WG2188864
Acenaphthene	1.07		0.0190	0.0500	1	12/15/2023 00:36	WG2188864
Acenaphthylene	U		0.0171	0.0500	1	12/15/2023 00:36	WG2188864
Benzo(a)anthracene	U		0.0203	0.0500	1	12/15/2023 00:36	WG2188864
Benzo(a)pyrene	U		0.0184	0.0500	1	12/15/2023 00:36	WG2188864
Benzo(b)fluoranthene	U		0.0168	0.0500	1	12/15/2023 00:36	WG2188864
Benzo(g,h,i)perylene	U		0.0184	0.0500	1	12/15/2023 00:36	WG2188864
Benzo(k)fluoranthene	U		0.0202	0.0500	1	12/15/2023 00:36	WG2188864
Chrysene	U		0.0179	0.0500	1	12/15/2023 00:36	WG2188864
Dibenz(a,h)anthracene	U		0.0160	0.0500	1	12/15/2023 00:36	WG2188864
Fluoranthene	U		0.0270	0.100	1	12/15/2023 00:36	WG2188864
Fluorene	1.45		0.0169	0.0500	1	12/15/2023 00:36	WG2188864
Indeno(1,2,3-cd)pyrene	U		0.0158	0.0500	1	12/15/2023 00:36	WG2188864
Naphthalene	50.6		0.0917	0.250	1	12/15/2023 00:36	WG2188864
Phenanthrene	0.592		0.0180	0.0500	1	12/15/2023 00:36	WG2188864
Pyrene	0.0504		0.0169	0.0500	1	12/15/2023 00:36	WG2188864
1-Methylnaphthalene	31.0		0.0687	0.250	1	12/15/2023 00:36	WG2188864
2-Methylnaphthalene	28.4		0.0674	0.250	1	12/15/2023 00:36	WG2188864
2-Chloronaphthalene	U		0.0682	0.250	1	12/15/2023 00:36	WG2188864
(S) Nitrobenzene-d5	*151*			*31.0-160*		*12/15/2023 00:36*	WG2188864
(S) 2-Fluorobiphenyl	*94.2*			*48.0-148*		*12/15/2023 00:36*	WG2188864
(S) p-Terphenyl-d14	*96.3*			*37.0-146*		*12/15/2023 00:36*	WG2188864

Volatile Petroleum Hydrocarbons by Method MTDEQ VPH

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
Unadjusted C5-C8 Aliphatics	U		33.3	100	1	12/14/2023 16:34	WG2189374
Unadjusted C9-C12 Aliphatics	U		33.3	100	1	12/14/2023 16:34	WG2189374
Unadjusted C9-C10 Aromatics	U		33.3	100	1	12/14/2023 16:34	WG2189374
Adjusted C5-C8 Aliphatics	U		33.3	100	1	12/14/2023 16:34	WG2189374
Adjusted C9-C12 Aliphatics	U		33.3	100	1	12/14/2023 16:34	WG2189374
Total VPH	U		66.7	200	1	12/14/2023 16:34	WG2189374
(S) 2,5-Dibromotoluene(FID)	*97.3*			*70.0-130*		*12/14/2023 16:34*	WG2189374
(S) 2,5-Dibromotoluene(PID)	*101*			*70.0-130*		*12/14/2023 16:34*	WG2189374

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
Acetone	U		11.3	25.0	1	12/13/2023 09:11	WG2188329
Acrylonitrile	U		0.671	5.00	1	12/13/2023 09:11	WG2188329
Benzene	U		0.0941	0.500	1	12/13/2023 09:11	WG2188329
Bromobenzene	U		0.118	0.500	1	12/13/2023 09:11	WG2188329
Bromodichloromethane	U		0.136	0.500	1	12/13/2023 09:11	WG2188329
Bromochloromethane	U		0.128	0.500	1	12/13/2023 09:11	WG2188329
Bromoform	U		0.129	0.500	1	12/13/2023 09:11	WG2188329
Bromomethane	U		0.605	2.50	1	12/13/2023 09:11	WG2188329
n-Butylbenzene	U		0.157	0.500	1	12/13/2023 09:11	WG2188329
sec-Butylbenzene	U		0.125	0.500	1	12/13/2023 09:11	WG2188329
tert-Butylbenzene	U		0.127	0.500	1	12/13/2023 09:11	WG2188329
Carbon disulfide	U		0.0962	0.500	1	12/13/2023 09:11	WG2188329
Carbon tetrachloride	U		0.128	0.500	1	12/13/2023 09:11	WG2188329
Chlorobenzene	U		0.117	0.500	1	12/13/2023 09:11	WG2188329
Chlorodibromomethane	U		0.140	0.500	1	12/13/2023 09:11	WG2188329
Chloroethane	U		0.192	2.50	1	12/13/2023 09:11	WG2188329
2-Chloroethyl vinyl ether	U		0.575	50.0	1	12/13/2023 09:11	WG2188329
Chloroform	U		0.111	0.500	1	12/13/2023 09:11	WG2188329
Chloromethane	U		0.960	1.25	1	12/13/2023 09:11	WG2188329
2-Chlorotoluene	U		0.106	0.500	1	12/13/2023 09:11	WG2188329
4-Chlorotoluene	U		0.114	0.500	1	12/13/2023 09:11	WG2188329
1,2-Dibromo-3-Chloropropane	U		0.276	2.50	1	12/13/2023 09:11	WG2188329
1,2-Dibromoethane	U		0.126	0.500	1	12/13/2023 09:11	WG2188329
Dibromomethane	U		0.122	0.500	1	12/13/2023 09:11	WG2188329
1,2-Dichlorobenzene	U		0.107	0.500	1	12/13/2023 09:11	WG2188329
1,3-Dichlorobenzene	U		0.299	0.500	1	12/13/2023 09:11	WG2188329
1,4-Dichlorobenzene	U		0.120	0.500	1	12/13/2023 09:11	WG2188329
Dichlorodifluoromethane	U		0.374	2.50	1	12/13/2023 09:11	WG2188329
1,1-Dichloroethane	U		0.100	0.500	1	12/13/2023 09:11	WG2188329
1,2-Dichloroethane	U		0.0819	0.500	1	12/13/2023 09:11	WG2188329
1,1-Dichloroethene	U		0.188	0.500	1	12/13/2023 09:11	WG2188329
cis-1,2-Dichloroethene	U		0.126	0.500	1	12/13/2023 09:11	WG2188329
trans-1,2-Dichloroethene	U		0.149	0.500	1	12/13/2023 09:11	WG2188329
1,2-Dichloropropane	U		0.149	0.500	1	12/13/2023 09:11	WG2188329
1,1-Dichloropropene	U		0.142	0.500	1	12/13/2023 09:11	WG2188329
1,3-Dichloropropane	U		0.109	1.00	1	12/13/2023 09:11	WG2188329
cis-1,3-Dichloropropene	U		0.111	0.500	1	12/13/2023 09:11	WG2188329
trans-1,3-Dichloropropene	U		0.118	0.500	1	12/13/2023 09:11	WG2188329
trans-1,4-Dichloro-2-butene	U		0.467	5.00	1	12/13/2023 09:11	WG2188329
2,2-Dichloropropane	U		0.161	0.500	1	12/13/2023 09:11	WG2188329
Di-isopropyl ether	U		0.105	0.500	1	12/13/2023 09:11	WG2188329
Ethylbenzene	U		0.137	0.500	1	12/13/2023 09:11	WG2188329
Hexachloro-1,3-butadiene	U		0.337	1.00	1	12/13/2023 09:11	WG2188329

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
2-Hexanone	U		0.787	5.00	1	12/13/2023 09:11	WG2188329
n-Hexane	U		0.749	5.00	1	12/13/2023 09:11	WG2188329
Iodomethane	2.32	B J	0.554	5.00	1	12/13/2023 09:11	WG2188329
Isopropylbenzene	U		0.105	0.500	1	12/13/2023 09:11	WG2188329
p-Isopropyltoluene	U		0.120	0.500	1	12/13/2023 09:11	WG2188329
2-Butanone (MEK)	U		1.19	5.00	1	12/13/2023 09:11	WG2188329
Methylene Chloride	U		0.430	2.50	1	12/13/2023 09:11	WG2188329
4-Methyl-2-pentanone (MIBK)	U		0.478	5.00	1	12/13/2023 09:11	WG2188329
Methyl tert-butyl ether	U		0.101	0.500	1	12/13/2023 09:11	WG2188329
Naphthalene	U	J4	0.174	2.50	1	12/13/2023 09:11	WG2188329
n-Propylbenzene	U		0.0993	0.500	1	12/13/2023 09:11	WG2188329
Styrene	U		0.118	0.500	1	12/13/2023 09:11	WG2188329
1,1,1,2-Tetrachloroethane	U		0.147	0.500	1	12/13/2023 09:11	WG2188329
1,1,2,2-Tetrachloroethane	U		0.133	0.500	1	12/13/2023 09:11	WG2188329
1,1,2-Trichlorotrifluoroethane	U		0.180	0.500	1	12/13/2023 09:11	WG2188329
Tetrachloroethene	U		0.300	0.500	1	12/13/2023 09:11	WG2188329
Toluene	U		0.278	0.500	1	12/13/2023 09:11	WG2188329
1,2,3-Trichlorobenzene	U	J4	0.164	0.500	1	12/13/2023 09:11	WG2188329
1,2,4-Trichlorobenzene	U	J4	0.481	1.00	1	12/13/2023 09:11	WG2188329
1,1,1-Trichloroethane	U		0.149	0.500	1	12/13/2023 09:11	WG2188329
1,1,2-Trichloroethane	U		0.158	0.500	1	12/13/2023 09:11	WG2188329
Trichloroethene	U		0.190	0.500	1	12/13/2023 09:11	WG2188329
Trichlorofluoromethane	U		0.160	2.50	1	12/13/2023 09:11	WG2188329
1,2,3-Trichloropropane	U		0.237	2.50	1	12/13/2023 09:11	WG2188329
1,2,4-Trimethylbenzene	U		0.322	0.500	1	12/13/2023 09:11	WG2188329
1,2,3-Trimethylbenzene	U		0.104	0.500	1	12/13/2023 09:11	WG2188329
1,3,5-Trimethylbenzene	U		0.104	0.500	1	12/13/2023 09:11	WG2188329
Vinyl acetate	U		0.692	5.00	1	12/13/2023 09:11	WG2188329
Vinyl chloride	U		0.234	0.500	1	12/13/2023 09:11	WG2188329
Xylenes, Total	U		0.174	1.50	1	12/13/2023 09:11	WG2188329
(S) Toluene-d8	*111*			*80.0-120*		*12/13/2023 09:11*	WG2188329
(S) 4-Bromofluorobenzene	*105*			*77.0-126*		*12/13/2023 09:11*	WG2188329
(S) 1,2-Dichloroethane-d4	*93.4*			*70.0-130*		*12/13/2023 09:11*	WG2188329

Method Blank (MB)

(MB) R4012044-3 12/13/23 13:09

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Free Carbon Dioxide	13200	J	6670	20000

Sample Narrative:

BLANK: Endpoint pH 4.5

L1686730-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1686730-01 12/13/23 13:23 • (DUP) R4012044-5 12/13/23 13:32

Analyte	Original Result ug/l	DUP Result ug/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Free Carbon Dioxide	ND	ND	1	0.000		20

Sample Narrative:

OS: Endpoint pH 4.5 Headspace

DUP: Endpoint pH 4.5

L1687051-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1687051-01 12/13/23 15:21 • (DUP) R4012044-7 12/13/23 15:25

Analyte	Original Result ug/l	DUP Result ug/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Free Carbon Dioxide	21700	21400	1	1.33		20

Sample Narrative:

OS: Endpoint pH 4.5 Headspace

DUP: Endpoint pH 4.5

Method Blank (MB)

(MB) R4012119-1 12/13/23 09:49

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
BOD	U		0.200	0.200

L1685742-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1685742-01 12/13/23 12:49 • (DUP) R4012119-3 12/13/23 12:52

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
BOD	ND	ND	1	0		30

L1685777-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1685777-02 12/13/23 13:21 • (DUP) R4012119-4 12/13/23 13:23

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
BOD	9.61	9.54	1	0.731		30

Laboratory Control Sample (LCS)

(LCS) R4012119-2 12/13/23 12:11

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
BOD	198	176	89	84.6-115	

Laboratory Control Sample (LCS)

(LCS) R4012119-5 12/13/23 13:26

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
BOD	198	192	97.2	84.6-115	

Method Blank (MB)

(MB) R4012969-2 12/09/23 02:27

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Nitrate as (N)	U		48.0	100
Sulfate	U		594	5000

L1685766-03 Original Sample (OS) • Duplicate (DUP)

(OS) L1685766-03 12/09/23 04:42 • (DUP) R4012969-4 12/09/23 04:58

Analyte	Original Result ug/l	DUP Result ug/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Nitrate as (N)	2090	2080	1	0.556		15
Sulfate	96800	96900	1	0.110		15

Laboratory Control Sample (LCS)

(LCS) R4012969-3 12/09/23 02:43

Analyte	Spike Amount ug/l	LCS Result ug/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Nitrate as (N)	8000	7740	96.8	80.0-120	
Sulfate	40000	39300	98.2	80.0-120	

L1685766-03 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1685766-03 12/09/23 04:42 • (MS) R4012969-5 12/09/23 05:46 • (MSD) R4012969-6 12/09/23 06:01

Analyte	Spike Amount ug/l	Original Result ug/l	MS Result ug/l	MSD Result ug/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Nitrate as (N)	8000	2090	8820	9230	84.1	89.2	1	80.0-120			4.53	15
Sulfate	40000	96800	115000	116000	45.5	48.7	1	80.0-120	J6	J6	1.12	15

Method Blank (MB)

(MB) R4011737-1 12/13/23 00:20

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
	ug/l		ug/l	ug/l
Iron,Dissolved	U		28.1	100
Manganese,Dissolved	U		0.704	5.00

Laboratory Control Sample (LCS)

(LCS) R4011737-2 12/13/23 00:23

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
	ug/l	ug/l	%	%	
Iron,Dissolved	1000	1080	108	80.0-120	
Manganese,Dissolved	50.0	56.1	112	80.0-120	

L1685730-06 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1685730-06 12/13/23 00:27 • (MS) R4011737-4 12/13/23 00:33 • (MSD) R4011737-5 12/13/23 00:37

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
	ug/l	ug/l	ug/l	ug/l	%	%		%			%	%
Iron,Dissolved	1000	U	1040	1060	104	106	1	75.0-125			1.77	20
Manganese,Dissolved	50.0	13.4	65.4	67.3	104	108	1	75.0-125			2.84	20

Method Blank (MB)

(MB) R4011539-1 12/12/23 19:31

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Iron	U		28.1	100
Manganese	1.41	J	0.704	5.00

Laboratory Control Sample (LCS)

(LCS) R4011539-2 12/12/23 19:34

Analyte	Spike Amount ug/l	LCS Result ug/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Iron	1000	1050	105	80.0-120	
Manganese	50.0	51.9	104	80.0-120	

L1685803-10 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1685803-10 12/12/23 19:38 • (MS) R4011539-4 12/12/23 19:44 • (MSD) R4011539-5 12/12/23 19:48

Analyte	Spike Amount ug/l	Original Result ug/l	MS Result ug/l	MSD Result ug/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Iron	1000	146	1200	1200	105	106	1	75.0-125			0.508	20
Manganese	50.0	4.29	56.5	57.4	104	106	1	75.0-125			1.58	20

Method Blank (MB)

(MB) R4013026-3 12/14/23 13:49

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Unadjusted C5-C8 Aliphatics	U		33.3	100
Unadjusted C9-C12 Aliphatics	U		33.3	100
Unadjusted C9-C10 Aromatics	U		33.3	100
Adjusted C5-C8 Aliphatics	U		33.3	100
Adjusted C9-C12 Aliphatics	U		33.3	100
Total VPH	U		66.7	200
(S) 2,5-Dibromotoluene(FID)	*96.9*			*70.0-130*
(S) 2,5-Dibromotoluene(PID)	*99.6*			*70.0-130*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R4013026-1 12/14/23 10:57 • (LCSD) R4013026-2 12/14/23 11:33

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Unadjusted C5-C8 Aliphatics	1200	994	1210	82.8	101	70.0-130			19.6	50
Unadjusted C9-C12 Aliphatics	1400	1120	1420	80.0	101	70.0-130			23.6	50
Unadjusted C9-C10 Aromatics	200	192	230	96.0	115	70.0-130			18.0	50
Total VPH	2800	2310	2860	82.5	102	70.0-130			21.3	50
(S) 2,5-Dibromotoluene(FID)				*93.8*	*99.6*	*70.0-130*				
(S) 2,5-Dibromotoluene(PID)				*97.6*	*104*	*70.0-130*				

Method Blank (MB)

(MB) R4011211-2 12/12/23 09:28

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Methane	U		2.91	10.0

L1685739-03 Original Sample (OS) • Duplicate (DUP)

(OS) L1685739-03 12/12/23 09:48 • (DUP) R4011211-3 12/12/23 11:22

Analyte	Original Result ug/l	DUP Result ug/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Methane	U	U	1	0.000		20

L1685861-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1685861-01 12/12/23 11:25 • (DUP) R4011211-4 12/12/23 12:12

Analyte	Original Result ug/l	DUP Result ug/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Methane	U	U	1	0.000		20

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R4011211-1 12/12/23 09:25 • (LCSD) R4011211-5 12/12/23 12:15

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Methane	67.8	63.5	62.2	93.7	91.7	85.0-115			2.07	20

Method Blank (MB)

(MB) R4012604-2 12/13/23 08:25

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Acetone	U		11.3	25.0
Acrylonitrile	U		0.671	5.00
Benzene	U		0.0941	0.500
Bromobenzene	U		0.118	0.500
Bromodichloromethane	U		0.136	0.500
Bromochloromethane	U		0.128	0.500
Bromoform	U		0.129	0.500
Bromomethane	U		0.605	2.50
n-Butylbenzene	U		0.157	0.500
sec-Butylbenzene	U		0.125	0.500
tert-Butylbenzene	U		0.127	0.500
Carbon disulfide	U		0.0962	0.500
Carbon tetrachloride	U		0.128	0.500
Chlorobenzene	U		0.117	0.500
Chlorodibromomethane	U		0.140	0.500
Chloroethane	U		0.192	2.50
2-Chloroethyl vinyl ether	U		0.575	50.0
Chloroform	U		0.111	0.500
Chloromethane	U		0.960	1.25
2-Chlorotoluene	U		0.106	0.500
4-Chlorotoluene	U		0.114	0.500
1,2-Dibromo-3-Chloropropane	U		0.276	2.50
1,2-Dibromoethane	U		0.126	0.500
Dibromomethane	U		0.122	0.500
1,2-Dichlorobenzene	U		0.107	0.500
1,3-Dichlorobenzene	U		0.299	0.500
1,4-Dichlorobenzene	U		0.120	0.500
Dichlorodifluoromethane	U		0.374	2.50
1,1-Dichloroethane	U		0.100	0.500
1,2-Dichloroethane	U		0.0819	0.500
1,1-Dichloroethene	U		0.188	0.500
cis-1,2-Dichloroethene	U		0.126	0.500
trans-1,2-Dichloroethene	U		0.149	0.500
1,2-Dichloropropane	U		0.149	0.500
1,1-Dichloropropene	U		0.142	0.500
1,3-Dichloropropane	U		0.109	1.00
cis-1,3-Dichloropropene	U		0.111	0.500
trans-1,3-Dichloropropene	U		0.118	0.500
trans-1,4-Dichloro-2-butene	U		0.467	5.00
2,2-Dichloropropane	U		0.161	0.500

Method Blank (MB)

(MB) R4012604-2 12/13/23 08:25

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Di-isopropyl ether	U		0.105	0.500
Ethylbenzene	U		0.137	0.500
Hexachloro-1,3-butadiene	U		0.337	1.00
2-Hexanone	U		0.787	5.00
n-Hexane	U		0.749	5.00
Iodomethane	U		0.554	5.00
Isopropylbenzene	U		0.105	0.500
p-Isopropyltoluene	U		0.120	0.500
2-Butanone (MEK)	U		1.19	5.00
Methylene Chloride	U		0.430	2.50
4-Methyl-2-pentanone (MIBK)	U		0.478	5.00
Methyl tert-butyl ether	U		0.101	0.500
Naphthalene	U		0.174	2.50
n-Propylbenzene	U		0.0993	0.500
Styrene	U		0.118	0.500
1,1,1,2-Tetrachloroethane	U		0.147	0.500
1,1,2,2-Tetrachloroethane	U		0.133	0.500
1,1,2-Trichlorotrifluoroethane	U		0.180	0.500
Tetrachloroethene	U		0.300	0.500
Toluene	U		0.278	0.500
1,2,3-Trichlorobenzene	U		0.164	0.500
1,2,4-Trichlorobenzene	U		0.481	1.00
1,1,1-Trichloroethane	U		0.149	0.500
1,1,2-Trichloroethane	U		0.158	0.500
Trichloroethene	U		0.190	0.500
Trichlorofluoromethane	U		0.160	2.50
1,2,3-Trichloropropane	U		0.237	2.50
1,2,4-Trimethylbenzene	U		0.322	0.500
1,2,3-Trimethylbenzene	U		0.104	0.500
1,3,5-Trimethylbenzene	U		0.104	0.500
Vinyl acetate	U		0.692	5.00
Vinyl chloride	U		0.234	0.500
Xylenes, Total	U		0.174	1.50
(S) Toluene-d8	*120*			*80.0-120*
(S) 4-Bromofluorobenzene	*120*			*77.0-126*
(S) 1,2-Dichloroethane-d4	*101*			*70.0-130*

Laboratory Control Sample (LCS)

(LCS) R4012604-1 12/13/23 07:21

Analyte	Spike Amount ug/l	LCS Result ug/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Acetone	25.0	19.9	79.6	19.0-160	
Acrylonitrile	25.0	21.8	87.2	55.0-149	
Benzene	5.00	4.88	97.6	70.0-123	
Bromobenzene	5.00	3.70	74.0	73.0-121	
Bromodichloromethane	5.00	4.87	97.4	75.0-120	
Bromochloromethane	5.00	6.27	125	76.0-122	J4
Bromoform	5.00	5.81	116	68.0-132	
Bromomethane	5.00	4.00	80.0	10.0-160	
n-Butylbenzene	5.00	5.11	102	73.0-125	
sec-Butylbenzene	5.00	4.32	86.4	75.0-125	
tert-Butylbenzene	5.00	4.82	96.4	76.0-124	
Carbon disulfide	5.00	4.11	82.2	61.0-128	
Carbon tetrachloride	5.00	5.86	117	68.0-126	
Chlorobenzene	5.00	5.82	116	80.0-121	
Chlorodibromomethane	5.00	5.90	118	77.0-125	
Chloroethane	5.00	4.29	85.8	47.0-150	
2-Chloroethyl vinyl ether	25.0	21.7	86.8	51.0-160	
Chloroform	5.00	4.84	96.8	73.0-120	
Chloromethane	5.00	3.67	73.4	41.0-142	
2-Chlorotoluene	5.00	4.00	80.0	76.0-123	
4-Chlorotoluene	5.00	3.94	78.8	75.0-122	
1,2-Dibromo-3-Chloropropane	5.00	3.99	79.8	58.0-134	
1,2-Dibromoethane	5.00	5.45	109	80.0-122	
Dibromomethane	5.00	4.91	98.2	80.0-120	
1,2-Dichlorobenzene	5.00	5.19	104	79.0-121	
1,3-Dichlorobenzene	5.00	5.04	101	79.0-120	
1,4-Dichlorobenzene	5.00	5.23	105	79.0-120	
Dichlorodifluoromethane	5.00	4.42	88.4	51.0-149	
1,1-Dichloroethane	5.00	4.62	92.4	70.0-126	
1,2-Dichloroethane	5.00	4.77	95.4	70.0-128	
1,1-Dichloroethene	5.00	4.75	95.0	71.0-124	
cis-1,2-Dichloroethene	5.00	5.26	105	73.0-120	
trans-1,2-Dichloroethene	5.00	5.08	102	73.0-120	
1,2-Dichloropropane	5.00	4.59	91.8	77.0-125	
1,1-Dichloropropene	5.00	4.88	97.6	74.0-126	
1,3-Dichloropropane	5.00	4.90	98.0	80.0-120	
cis-1,3-Dichloropropene	5.00	4.59	91.8	80.0-123	
trans-1,3-Dichloropropene	5.00	4.60	92.0	78.0-124	
trans-1,4-Dichloro-2-butene	5.00	3.45	69.0	33.0-144	
2,2-Dichloropropane	5.00	4.15	83.0	58.0-130	

Laboratory Control Sample (LCS)

(LCS) R4012604-1 12/13/23 07:21

Analyte	Spike Amount ug/l	LCS Result ug/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Di-isopropyl ether	5.00	4.64	92.8	58.0-138	
Ethylbenzene	5.00	5.79	116	79.0-123	
Hexachloro-1,3-butadiene	5.00	5.81	116	54.0-138	
2-Hexanone	25.0	22.6	90.4	67.0-149	
n-Hexane	5.00	4.11	82.2	57.0-133	
Iodomethane	25.0	21.3	85.2	33.0-147	
Isopropylbenzene	5.00	5.91	118	76.0-127	
p-Isopropyltoluene	5.00	4.75	95.0	76.0-125	
2-Butanone (MEK)	25.0	20.6	82.4	44.0-160	
Methylene Chloride	5.00	4.74	94.8	67.0-120	
4-Methyl-2-pentanone (MIBK)	25.0	24.0	96.0	68.0-142	
Methyl tert-butyl ether	5.00	4.66	93.2	68.0-125	
Naphthalene	5.00	4.04	80.8	54.0-135	
n-Propylbenzene	5.00	3.92	78.4	77.0-124	
Styrene	5.00	5.67	113	73.0-130	
1,1,1,2-Tetrachloroethane	5.00	6.07	121	75.0-125	
1,1,2,2-Tetrachloroethane	5.00	3.16	63.2	65.0-130	J4
1,1,2-Trichlorotrifluoroethane	5.00	5.23	105	69.0-132	
Tetrachloroethene	5.00	7.60	152	72.0-132	J4
Toluene	5.00	5.55	111	79.0-120	
1,2,3-Trichlorobenzene	5.00	5.23	105	50.0-138	
1,2,4-Trichlorobenzene	5.00	5.18	104	57.0-137	
1,1,1-Trichloroethane	5.00	5.36	107	73.0-124	
1,1,2-Trichloroethane	5.00	5.58	112	80.0-120	
Trichloroethene	5.00	6.91	138	78.0-124	J4
Trichlorofluoromethane	5.00	5.36	107	59.0-147	
1,2,3-Trichloropropane	5.00	3.87	77.4	73.0-130	
1,2,4-Trimethylbenzene	5.00	4.19	83.8	76.0-121	
1,2,3-Trimethylbenzene	5.00	4.15	83.0	77.0-120	
1,3,5-Trimethylbenzene	5.00	4.44	88.8	76.0-122	
Vinyl acetate	25.0	11.4	45.6	11.0-160	
Vinyl chloride	5.00	4.61	92.2	67.0-131	
Xylenes, Total	15.0	17.3	115	79.0-123	
(S) Toluene-d8			*116*	*80.0-120*	
(S) 4-Bromofluorobenzene			*117*	*77.0-126*	
(S) 1,2-Dichloroethane-d4			*95.2*	*70.0-130*	

Method Blank (MB)

(MB) R4012242-3 12/13/23 07:34

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Acetone	U		11.3	25.0
Acrylonitrile	U		0.671	5.00
Benzene	U		0.0941	0.500
Bromobenzene	U		0.118	0.500
Bromodichloromethane	U		0.136	0.500
Bromochloromethane	U		0.128	0.500
Bromoform	U		0.129	0.500
Bromomethane	U		0.605	2.50
n-Butylbenzene	U		0.157	0.500
sec-Butylbenzene	U		0.125	0.500
tert-Butylbenzene	U		0.127	0.500
Carbon disulfide	U		0.0962	0.500
Carbon tetrachloride	U		0.128	0.500
Chlorobenzene	U		0.117	0.500
Chlorodibromomethane	U		0.140	0.500
Chloroethane	U		0.192	2.50
2-Chloroethyl vinyl ether	U		0.575	50.0
Chloroform	U		0.111	0.500
Chloromethane	U		0.960	1.25
2-Chlorotoluene	U		0.106	0.500
4-Chlorotoluene	U		0.114	0.500
1,2-Dibromo-3-Chloropropane	U		0.276	2.50
1,2-Dibromoethane	U		0.126	0.500
Dibromomethane	U		0.122	0.500
1,2-Dichlorobenzene	U		0.107	0.500
1,3-Dichlorobenzene	U		0.299	0.500
1,4-Dichlorobenzene	U		0.120	0.500
Dichlorodifluoromethane	U		0.374	2.50
1,1-Dichloroethane	U		0.100	0.500
1,2-Dichloroethane	U		0.0819	0.500
1,1-Dichloroethene	U		0.188	0.500
cis-1,2-Dichloroethene	U		0.126	0.500
trans-1,2-Dichloroethene	U		0.149	0.500
1,2-Dichloropropane	U		0.149	0.500
1,1-Dichloropropene	U		0.142	0.500
1,3-Dichloropropane	U		0.109	1.00
cis-1,3-Dichloropropene	U		0.111	0.500
trans-1,3-Dichloropropene	U		0.118	0.500
trans-1,4-Dichloro-2-butene	U		0.467	5.00
2,2-Dichloropropane	U		0.161	0.500

Method Blank (MB)

(MB) R4012242-3 12/13/23 07:34

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Di-isopropyl ether	U		0.105	0.500
Ethylbenzene	U		0.137	0.500
Hexachloro-1,3-butadiene	U		0.337	1.00
2-Hexanone	U		0.787	5.00
n-Hexane	U		0.749	5.00
Iodomethane	2.42	J	0.554	5.00
Isopropylbenzene	U		0.105	0.500
p-Isopropyltoluene	U		0.120	0.500
2-Butanone (MEK)	U		1.19	5.00
Methylene Chloride	U		0.430	2.50
4-Methyl-2-pentanone (MIBK)	U		0.478	5.00
Methyl tert-butyl ether	U		0.101	0.500
Naphthalene	U		0.174	2.50
n-Propylbenzene	U		0.0993	0.500
Styrene	U		0.118	0.500
1,1,1,2-Tetrachloroethane	U		0.147	0.500
1,1,2,2-Tetrachloroethane	U		0.133	0.500
1,1,2-Trichlorotrifluoroethane	U		0.180	0.500
Tetrachloroethene	U		0.300	0.500
Toluene	U		0.278	0.500
1,2,3-Trichlorobenzene	U		0.164	0.500
1,2,4-Trichlorobenzene	U		0.481	1.00
1,1,1-Trichloroethane	U		0.149	0.500
1,1,2-Trichloroethane	U		0.158	0.500
Trichloroethene	U		0.190	0.500
Trichlorofluoromethane	U		0.160	2.50
1,2,3-Trichloropropane	U		0.237	2.50
1,2,4-Trimethylbenzene	U		0.322	0.500
1,2,3-Trimethylbenzene	U		0.104	0.500
1,3,5-Trimethylbenzene	U		0.104	0.500
Vinyl acetate	U		0.692	5.00
Vinyl chloride	U		0.234	0.500
Xylenes, Total	U		0.174	1.50
(S) Toluene-d8	*110*			*80.0-120*
(S) 4-Bromofluorobenzene	*104*			*77.0-126*
(S) 1,2-Dichloroethane-d4	*91.8*			*70.0-130*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R4012242-1 12/13/23 06:33 • (LCSD) R4012242-2 12/13/23 06:53

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Acetone	25.0	30.3	30.1	121	120	19.0-160			0.662	27
Acrylonitrile	25.0	24.6	24.4	98.4	97.6	55.0-149			0.816	20
Benzene	5.00	5.40	5.19	108	104	70.0-123			3.97	20
Bromobenzene	5.00	5.24	5.37	105	107	73.0-121			2.45	20
Bromodichloromethane	5.00	5.08	5.08	102	102	75.0-120			0.000	20
Bromochloromethane	5.00	5.65	5.53	113	111	76.0-122			2.15	20
Bromoform	5.00	5.08	5.00	102	100	68.0-132			1.59	20
Bromomethane	5.00	4.39	4.03	87.8	80.6	10.0-160			8.55	25
n-Butylbenzene	5.00	5.43	5.08	109	102	73.0-125			6.66	20
sec-Butylbenzene	5.00	5.68	5.50	114	110	75.0-125			3.22	20
tert-Butylbenzene	5.00	5.62	5.54	112	111	76.0-124			1.43	20
Carbon disulfide	5.00	5.52	5.38	110	108	61.0-128			2.57	20
Carbon tetrachloride	5.00	5.57	5.37	111	107	68.0-126			3.66	20
Chlorobenzene	5.00	5.41	5.45	108	109	80.0-121			0.737	20
Chlorodibromomethane	5.00	5.24	5.21	105	104	77.0-125			0.574	20
Chloroethane	5.00	5.28	5.16	106	103	47.0-150			2.30	20
2-Chloroethyl vinyl ether	25.0	26.4	25.8	106	103	51.0-160			2.30	20
Chloroform	5.00	5.18	5.11	104	102	73.0-120			1.36	20
Chloromethane	5.00	5.80	5.68	116	114	41.0-142			2.09	20
2-Chlorotoluene	5.00	5.46	5.41	109	108	76.0-123			0.920	20
4-Chlorotoluene	5.00	5.25	5.29	105	106	75.0-122			0.759	20
1,2-Dibromo-3-Chloropropane	5.00	4.98	5.02	99.6	100	58.0-134			0.800	20
1,2-Dibromoethane	5.00	5.42	5.35	108	107	80.0-122			1.30	20
Dibromomethane	5.00	5.20	5.07	104	101	80.0-120			2.53	20
1,2-Dichlorobenzene	5.00	5.34	5.44	107	109	79.0-121			1.86	20
1,3-Dichlorobenzene	5.00	5.28	5.28	106	106	79.0-120			0.000	20
1,4-Dichlorobenzene	5.00	5.24	5.31	105	106	79.0-120			1.33	20
Dichlorodifluoromethane	5.00	5.84	5.69	117	114	51.0-149			2.60	20
1,1-Dichloroethane	5.00	5.35	5.24	107	105	70.0-126			2.08	20
1,2-Dichloroethane	5.00	5.13	5.15	103	103	70.0-128			0.389	20
1,1-Dichloroethene	5.00	5.52	5.45	110	109	71.0-124			1.28	20
cis-1,2-Dichloroethene	5.00	5.33	5.18	107	104	73.0-120			2.85	20
trans-1,2-Dichloroethene	5.00	5.44	5.39	109	108	73.0-120			0.923	20
1,2-Dichloropropane	5.00	5.28	5.16	106	103	77.0-125			2.30	20
1,1-Dichloropropene	5.00	5.56	5.35	111	107	74.0-126			3.85	20
1,3-Dichloropropane	5.00	5.34	5.41	107	108	80.0-120			1.30	20
cis-1,3-Dichloropropene	5.00	4.86	4.75	97.2	95.0	80.0-123			2.29	20
trans-1,3-Dichloropropene	5.00	4.98	5.08	99.6	102	78.0-124			1.99	20
trans-1,4-Dichloro-2-butene	5.00	3.39	3.46	67.8	69.2	33.0-144			2.04	20
2,2-Dichloropropane	5.00	4.67	4.68	93.4	93.6	58.0-130			0.214	20

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R4012242-1 12/13/23 06:33 • (LCSD) R4012242-2 12/13/23 06:53

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Di-isopropyl ether	5.00	5.08	5.03	102	101	58.0-138			0.989	20
Ethylbenzene	5.00	5.50	5.55	110	111	79.0-123			0.905	20
Hexachloro-1,3-butadiene	5.00	5.66	5.89	113	118	54.0-138			3.98	20
2-Hexanone	25.0	26.0	26.5	104	106	67.0-149			1.90	20
n-Hexane	5.00	5.14	4.73	103	94.6	57.0-133			8.31	20
Iodomethane	25.0	25.4	26.0	102	104	33.0-147			2.33	26
Isopropylbenzene	5.00	5.51	5.60	110	112	76.0-127			1.62	20
p-Isopropyltoluene	5.00	5.69	5.56	114	111	76.0-125			2.31	20
2-Butanone (MEK)	25.0	26.8	26.1	107	104	44.0-160			2.65	20
Methylene Chloride	5.00	5.29	5.28	106	106	67.0-120			0.189	20
4-Methyl-2-pentanone (MIBK)	25.0	26.2	26.5	105	106	68.0-142			1.14	20
Methyl tert-butyl ether	5.00	5.16	5.09	103	102	68.0-125			1.37	20
Naphthalene	5.00	7.14	7.32	143	146	54.0-135	J4	J4	2.49	20
n-Propylbenzene	5.00	5.55	5.45	111	109	77.0-124			1.82	20
Styrene	5.00	5.41	5.47	108	109	73.0-130			1.10	20
1,1,1,2-Tetrachloroethane	5.00	5.17	5.14	103	103	75.0-125			0.582	20
1,1,2,2-Tetrachloroethane	5.00	5.28	5.16	106	103	65.0-130			2.30	20
1,1,2-Trichlorotrifluoroethane	5.00	4.88	4.65	97.6	93.0	69.0-132			4.83	20
Tetrachloroethene	5.00	5.71	5.53	114	111	72.0-132			3.20	20
Toluene	5.00	5.37	5.28	107	106	79.0-120			1.69	20
1,2,3-Trichlorobenzene	5.00	8.12	8.51	162	170	50.0-138	J4	J4	4.69	20
1,2,4-Trichlorobenzene	5.00	6.53	6.95	131	139	57.0-137		J4	6.23	20
1,1,1-Trichloroethane	5.00	5.37	5.14	107	103	73.0-124			4.38	20
1,1,2-Trichloroethane	5.00	5.61	5.56	112	111	80.0-120			0.895	20
Trichloroethene	5.00	5.67	5.56	113	111	78.0-124			1.96	20
Trichlorofluoromethane	5.00	5.38	5.25	108	105	59.0-147			2.45	20
1,2,3-Trichloropropane	5.00	5.40	5.39	108	108	73.0-130			0.185	20
1,2,4-Trimethylbenzene	5.00	5.49	5.39	110	108	76.0-121			1.84	20
1,2,3-Trimethylbenzene	5.00	5.55	5.62	111	112	77.0-120			1.25	20
1,3,5-Trimethylbenzene	5.00	5.45	5.38	109	108	76.0-122			1.29	20
Vinyl acetate	25.0	20.4	17.5	81.6	70.0	11.0-160			15.3	20
Vinyl chloride	5.00	5.63	5.49	113	110	67.0-131			2.52	20
Xylenes, Total	15.0	16.2	16.4	108	109	79.0-123			1.23	20
(S) Toluene-d8				*106*	*107*	*80.0-120*				
(S) 4-Bromofluorobenzene				*100*	*101*	*77.0-126*				
(S) 1,2-Dichloroethane-d4				*94.3*	*94.7*	*70.0-130*				

L1685604-07 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1685604-07 12/13/23 12:09 • (MS) R4012242-4 12/13/23 16:54 • (MSD) R4012242-5 12/13/23 17:15

Analyte	Spike Amount ug/l	Original Result ug/l	MS Result ug/l	MSD Result ug/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Acetone	25.0	U	22.5	22.0	90.0	88.0	1	10.0-160			2.25	35
Acrylonitrile	25.0	U	29.2	28.8	117	115	1	21.0-160			1.38	32
Benzene	5.00	U	5.10	6.06	102	121	1	17.0-158			17.2	27
Bromobenzene	5.00	U	5.48	6.00	110	120	1	30.0-149			9.06	28
Bromodichloromethane	5.00	U	5.31	5.84	106	117	1	31.0-150			9.51	27
Bromochloromethane	5.00	U	5.91	6.32	118	126	1	38.0-142			6.70	26
Bromoform	5.00	U	5.64	5.55	113	111	1	29.0-150			1.61	29
Bromomethane	5.00	U	3.46	3.66	69.2	73.2	1	10.0-160			5.62	38
n-Butylbenzene	5.00	U	5.08	5.85	102	117	1	31.0-150			14.1	30
sec-Butylbenzene	5.00	U	5.58	6.44	112	129	1	33.0-155			14.3	29
tert-Butylbenzene	5.00	U	5.45	6.49	109	130	1	34.0-153			17.4	28
Carbon disulfide	5.00	U	4.32	5.43	86.4	109	1	10.0-156			22.8	28
Carbon tetrachloride	5.00	U	5.31	6.58	106	132	1	23.0-159			21.4	28
Chlorobenzene	5.00	U	5.46	6.14	109	123	1	33.0-152			11.7	27
Chlorodibromomethane	5.00	U	5.71	6.03	114	121	1	37.0-149			5.45	27
Chloroethane	5.00	U	4.70	5.76	94.0	115	1	10.0-160			20.3	30
2-Chloroethyl vinyl ether	25.0	U	U	U	0.000	0.000	1	10.0-160	J6	J6	0.000	31
Chloroform	5.00	U	5.16	6.02	103	120	1	29.0-154			15.4	28
Chloromethane	5.00	U	4.33	5.19	86.6	104	1	10.0-160			18.1	29
2-Chlorotoluene	5.00	U	5.37	6.40	107	128	1	32.0-153			17.5	28
4-Chlorotoluene	5.00	U	5.34	6.05	107	121	1	32.0-150			12.5	28
1,2-Dibromo-3-Chloropropane	5.00	U	5.73	5.75	115	115	1	22.0-151			0.348	34
1,2-Dibromoethane	5.00	U	5.97	5.99	119	120	1	34.0-147			0.334	27
Dibromomethane	5.00	U	5.45	5.79	109	116	1	30.0-151			6.05	27
1,2-Dichlorobenzene	5.00	U	5.52	6.11	110	122	1	34.0-149			10.1	28
1,3-Dichlorobenzene	5.00	U	5.25	5.91	105	118	1	36.0-146			11.8	27
1,4-Dichlorobenzene	5.00	U	5.12	5.83	102	117	1	35.0-142			13.0	27
Dichlorodifluoromethane	5.00	U	3.61	4.99	72.2	99.8	1	10.0-160		J3	32.1	29
1,1-Dichloroethane	5.00	U	5.31	6.19	106	124	1	25.0-158			15.3	27
1,2-Dichloroethane	5.00	U	5.58	5.97	112	119	1	29.0-151			6.75	27
1,1-Dichloroethene	5.00	U	5.31	6.57	106	131	1	11.0-160			21.2	29
cis-1,2-Dichloroethene	5.00	U	5.21	5.91	104	118	1	10.0-160			12.6	27
trans-1,2-Dichloroethene	5.00	U	5.01	6.12	100	122	1	17.0-153			19.9	27
1,2-Dichloropropane	5.00	U	5.29	6.03	106	121	1	30.0-156			13.1	27
1,1-Dichloropropene	5.00	U	5.07	6.36	101	127	1	25.0-158			22.6	27
1,3-Dichloropropane	5.00	U	5.78	5.87	116	117	1	38.0-147			1.55	27
cis-1,3-Dichloropropene	5.00	U	4.83	5.22	96.6	104	1	34.0-149			7.76	28
trans-1,3-Dichloropropene	5.00	U	5.20	5.40	104	108	1	32.0-149			3.77	28
trans-1,4-Dichloro-2-butene	5.00	U	3.78	4.08	75.6	81.6	1	10.0-157			7.63	37
2,2-Dichloropropane	5.00	U	4.26	5.07	85.2	101	1	24.0-152			17.4	29

L1685604-07 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1685604-07 12/13/23 12:09 • (MS) R4012242-4 12/13/23 16:54 • (MSD) R4012242-5 12/13/23 17:15

Analyte	Spike Amount ug/l	Original Result ug/l	MS Result ug/l	MSD Result ug/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Di-isopropyl ether	5.00	U	5.55	5.96	111	119	1	21.0-160			7.12	28
Ethylbenzene	5.00	U	5.47	6.21	109	124	1	30.0-155			12.7	27
Hexachloro-1,3-butadiene	5.00	U	5.72	6.09	114	122	1	20.0-154			6.27	34
2-Hexanone	25.0	U	27.8	27.6	111	110	1	21.0-160			0.722	29
n-Hexane	5.00	U	4.21	5.16	84.2	103	1	10.0-153			20.3	28
Iodomethane	25.0	2.34	20.0	26.7	70.6	97.4	1	10.0-160			28.7	40
Isopropylbenzene	5.00	U	5.37	6.43	107	129	1	28.0-157			18.0	27
p-Isopropyltoluene	5.00	U	5.46	6.42	109	128	1	30.0-154			16.2	29
2-Butanone (MEK)	25.0	U	25.3	25.6	101	102	1	10.0-160			1.18	32
Methylene Chloride	5.00	U	5.04	5.84	101	117	1	23.0-144			14.7	28
4-Methyl-2-pentanone (MIBK)	25.0	U	31.5	31.1	126	124	1	29.0-160			1.28	29
Methyl tert-butyl ether	5.00	U	5.60	5.76	112	115	1	28.0-150			2.82	29
Naphthalene	5.00	U	6.81	7.33	136	147	1	12.0-156			7.36	35
n-Propylbenzene	5.00	U	5.25	6.35	105	127	1	31.0-154			19.0	28
Styrene	5.00	U	5.43	6.06	109	121	1	33.0-155			11.0	28
1,1,1,2-Tetrachloroethane	5.00	U	5.44	5.95	109	119	1	36.0-151			8.96	29
1,1,2,2-Tetrachloroethane	5.00	U	6.26	6.29	125	126	1	33.0-150			0.478	28
1,1,2-Trichlorotrifluoroethane	5.00	U	4.59	6.02	91.8	120	1	23.0-160			27.0	30
Tetrachloroethene	5.00	U	5.16	6.26	103	125	1	10.0-160			19.3	27
Toluene	5.00	U	5.28	6.03	106	121	1	26.0-154			13.3	28
1,2,3-Trichlorobenzene	5.00	U	6.73	7.99	135	160	1	17.0-150		J5	17.1	36
1,2,4-Trichlorobenzene	5.00	U	5.89	6.78	118	136	1	24.0-150			14.0	33
1,1,1-Trichloroethane	5.00	U	5.26	6.41	105	128	1	23.0-160			19.7	28
1,1,2-Trichloroethane	5.00	U	6.06	6.30	121	126	1	35.0-147			3.88	27
Trichloroethene	5.00	U	5.05	6.16	101	123	1	10.0-160			19.8	25
Trichlorofluoromethane	5.00	U	4.96	6.22	99.2	124	1	17.0-160			22.5	31
1,2,3-Trichloropropane	5.00	U	6.26	6.42	125	128	1	34.0-151			2.52	29
1,2,4-Trimethylbenzene	5.00	U	5.43	6.22	109	124	1	26.0-154			13.6	27
1,2,3-Trimethylbenzene	5.00	U	5.63	6.32	113	126	1	32.0-149			11.5	28
1,3,5-Trimethylbenzene	5.00	U	5.31	6.29	106	126	1	28.0-153			16.9	27
Vinyl acetate	25.0	U	35.9	36.9	144	148	1	12.0-160			2.75	31
Vinyl chloride	5.00	U	4.61	5.91	92.2	118	1	10.0-160			24.7	27
Xylenes, Total	15.0	U	16.4	18.4	109	123	1	29.0-154			11.5	28
(S) Toluene-d8					*108*	*106*		*80.0-120*				
(S) 4-Bromofluorobenzene					*104*	*100*		*77.0-126*				
(S) 1,2-Dichloroethane-d4					*95.9*	*96.8*		*70.0-130*				

L1685617-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1685617-01 12/13/23 12:50 • (MS) R4012242-6 12/13/23 17:35 • (MSD) R4012242-7 12/13/23 17:55

Analyte	Spike Amount ug/l	Original Result ug/l	MS Result ug/l	MSD Result ug/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Acetone	25.0	U	15.5	17.7	62.0	70.8	1	10.0-160			13.3	35
Acrylonitrile	25.0	U	19.8	22.7	79.2	90.8	1	21.0-160			13.6	32
Benzene	5.00	U	3.85	4.43	77.0	88.6	1	17.0-158			14.0	27
Bromobenzene	5.00	U	4.16	4.54	83.2	90.8	1	30.0-149			8.74	28
Bromodichloromethane	5.00	U	3.93	4.45	78.6	89.0	1	31.0-150			12.4	27
Bromochloromethane	5.00	U	4.17	4.70	83.4	94.0	1	38.0-142			12.0	26
Bromoform	5.00	U	3.76	4.23	75.2	84.6	1	29.0-150			11.8	29
Bromomethane	5.00	U	2.67	3.26	53.4	65.2	1	10.0-160			19.9	38
n-Butylbenzene	5.00	U	3.86	4.55	77.2	91.0	1	31.0-150			16.4	30
sec-Butylbenzene	5.00	U	4.12	4.75	82.4	95.0	1	33.0-155			14.2	29
tert-Butylbenzene	5.00	U	4.09	4.75	81.8	95.0	1	34.0-153			14.9	28
Carbon disulfide	5.00	U	3.83	4.30	76.6	86.0	1	10.0-156			11.6	28
Carbon tetrachloride	5.00	U	4.09	4.76	81.8	95.2	1	23.0-159			15.1	28
Chlorobenzene	5.00	U	4.03	4.51	80.6	90.2	1	33.0-152			11.2	27
Chlorodibromomethane	5.00	U	3.99	4.58	79.8	91.6	1	37.0-149			13.8	27
Chloroethane	5.00	U	4.11	4.47	82.2	89.4	1	10.0-160			8.39	30
2-Chloroethyl vinyl ether	25.0	U	U	U	0.000	0.000	1	10.0-160	J6	J6	0.000	31
Chloroform	5.00	U	3.95	4.46	79.0	89.2	1	29.0-154			12.1	28
Chloromethane	5.00	U	4.10	4.56	82.0	91.2	1	10.0-160			10.6	29
2-Chlorotoluene	5.00	U	4.07	4.68	81.4	93.6	1	32.0-153			13.9	28
4-Chlorotoluene	5.00	U	3.87	4.44	77.4	88.8	1	32.0-150			13.7	28
1,2-Dibromo-3-Chloropropane	5.00	U	3.96	4.49	79.2	89.8	1	22.0-151			12.5	34
1,2-Dibromoethane	5.00	U	4.15	4.68	83.0	93.6	1	34.0-147			12.0	27
Dibromomethane	5.00	U	3.86	4.55	77.2	91.0	1	30.0-151			16.4	27
1,2-Dichlorobenzene	5.00	U	4.16	4.58	83.2	91.6	1	34.0-149			9.61	28
1,3-Dichlorobenzene	5.00	U	3.91	4.52	78.2	90.4	1	36.0-146			14.5	27
1,4-Dichlorobenzene	5.00	U	3.92	4.47	78.4	89.4	1	35.0-142			13.1	27
Dichlorodifluoromethane	5.00	U	4.46	5.14	89.2	103	1	10.0-160			14.2	29
1,1-Dichloroethane	5.00	U	3.96	4.63	79.2	92.6	1	25.0-158			15.6	27
1,2-Dichloroethane	5.00	U	4.12	4.57	82.4	91.4	1	29.0-151			10.4	27
1,1-Dichloroethene	5.00	U	4.13	4.76	82.6	95.2	1	11.0-160			14.2	29
cis-1,2-Dichloroethene	5.00	0.134	3.95	4.59	76.3	89.1	1	10.0-160			15.0	27
trans-1,2-Dichloroethene	5.00	0.184	4.19	4.63	80.1	88.9	1	17.0-153			9.98	27
1,2-Dichloropropane	5.00	U	3.96	4.44	79.2	88.8	1	30.0-156			11.4	27
1,1-Dichloropropene	5.00	U	4.01	4.76	80.2	95.2	1	25.0-158			17.1	27
1,3-Dichloropropane	5.00	U	4.13	4.71	82.6	94.2	1	38.0-147			13.1	27
cis-1,3-Dichloropropene	5.00	U	3.63	4.15	72.6	83.0	1	34.0-149			13.4	28
trans-1,3-Dichloropropene	5.00	U	3.74	4.30	74.8	86.0	1	32.0-149			13.9	28
trans-1,4-Dichloro-2-butene	5.00	U	2.46	3.17	49.2	63.4	1	10.0-157			25.2	37
2,2-Dichloropropane	5.00	U	3.72	4.27	74.4	85.4	1	24.0-152			13.8	29

L1685617-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1685617-01 12/13/23 12:50 • (MS) R4012242-6 12/13/23 17:35 • (MSD) R4012242-7 12/13/23 17:55

Analyte	Spike Amount ug/l	Original Result ug/l	MS Result ug/l	MSD Result ug/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Di-isopropyl ether	5.00	U	4.00	4.54	80.0	90.8	1	21.0-160			12.6	28
Ethylbenzene	5.00	U	4.07	4.66	81.4	93.2	1	30.0-155			13.5	27
Hexachloro-1,3-butadiene	5.00	U	4.57	5.15	91.4	103	1	20.0-154			11.9	34
2-Hexanone	25.0	U	18.7	21.8	74.8	87.2	1	21.0-160			15.3	29
n-Hexane	5.00	U	3.92	4.41	78.4	88.2	1	10.0-153			11.8	28
Iodomethane	25.0	2.27	18.4	20.8	64.5	74.1	1	10.0-160			12.2	40
Isopropylbenzene	5.00	U	4.06	4.65	81.2	93.0	1	28.0-157			13.5	27
p-Isopropyltoluene	5.00	U	4.13	4.80	82.6	96.0	1	30.0-154			15.0	29
2-Butanone (MEK)	25.0	U	17.4	20.0	69.6	80.0	1	10.0-160			13.9	32
Methylene Chloride	5.00	U	3.74	4.21	74.8	84.2	1	23.0-144			11.8	28
4-Methyl-2-pentanone (MIBK)	25.0	U	21.5	24.8	86.0	99.2	1	29.0-160			14.3	29
Methyl tert-butyl ether	5.00	U	4.03	4.50	80.6	90.0	1	28.0-150			11.0	29
Naphthalene	5.00	U	4.79	5.42	95.8	108	1	12.0-156			12.3	35
n-Propylbenzene	5.00	U	4.08	4.62	81.6	92.4	1	31.0-154			12.4	28
Styrene	5.00	U	3.84	4.48	76.8	89.6	1	33.0-155			15.4	28
1,1,1,2-Tetrachloroethane	5.00	U	3.95	4.56	79.0	91.2	1	36.0-151			14.3	29
1,1,2,2-Tetrachloroethane	5.00	U	4.36	4.91	87.2	98.2	1	33.0-150			11.9	28
1,1,2-Trichlorotrifluoroethane	5.00	0.687	4.32	4.87	72.7	83.7	1	23.0-160			12.0	30
Tetrachloroethene	5.00	8.07	12.3	12.8	84.6	94.6	1	10.0-160			3.98	27
Toluene	5.00	U	3.98	4.47	79.6	89.4	1	26.0-154			11.6	28
1,2,3-Trichlorobenzene	5.00	U	5.20	5.94	104	119	1	17.0-150			13.3	36
1,2,4-Trichlorobenzene	5.00	U	4.56	5.24	91.2	105	1	24.0-150			13.9	33
1,1,1-Trichloroethane	5.00	U	4.00	4.50	80.0	90.0	1	23.0-160			11.8	28
1,1,2-Trichloroethane	5.00	U	4.32	4.94	86.4	98.8	1	35.0-147			13.4	27
Trichloroethene	5.00	U	3.92	4.54	78.4	90.8	1	10.0-160			14.7	25
Trichlorofluoromethane	5.00	U	4.14	4.73	82.8	94.6	1	17.0-160			13.3	31
1,2,3-Trichloropropane	5.00	U	4.29	4.91	85.8	98.2	1	34.0-151			13.5	29
1,2,4-Trimethylbenzene	5.00	U	3.98	4.51	79.6	90.2	1	26.0-154			12.5	27
1,2,3-Trimethylbenzene	5.00	U	4.16	4.66	83.2	93.2	1	32.0-149			11.3	28
1,3,5-Trimethylbenzene	5.00	U	3.98	4.56	79.6	91.2	1	28.0-153			13.6	27
Vinyl acetate	25.0	U	25.5	28.9	102	116	1	12.0-160			12.5	31
Vinyl chloride	5.00	U	4.28	4.95	85.6	99.0	1	10.0-160			14.5	27
Xylenes, Total	15.0	U	11.9	13.7	79.3	91.3	1	29.0-154			14.1	28
(S) Toluene-d8					*106*	*107*		*80.0-120*				
(S) 4-Bromofluorobenzene					*101*	*101*		*77.0-126*				
(S) 1,2-Dichloroethane-d4					*96.9*	*94.9*		*70.0-130*				

Method Blank (MB)

(MB) R4013044-3 12/14/23 15:08

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Benzene	U		0.0941	0.500
Ethylbenzene	U		0.137	0.500
1,2,4-Trimethylbenzene	U		0.322	0.500
1,2,3-Trimethylbenzene	U		0.104	0.500
Xylenes, Total	U		0.174	1.50
(S) Toluene-d8	*109*			*80.0-120*
(S) 4-Bromofluorobenzene	*101*			*77.0-126*
(S) 1,2-Dichloroethane-d4	*104*			*70.0-130*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R4013044-1 12/14/23 14:07 • (LCSD) R4013044-2 12/14/23 14:28

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Benzene	5.00	5.16	5.04	103	101	70.0-123			2.35	20
Ethylbenzene	5.00	5.12	5.21	102	104	79.0-123			1.74	20
1,2,4-Trimethylbenzene	5.00	5.33	5.14	107	103	76.0-121			3.63	20
1,2,3-Trimethylbenzene	5.00	5.32	5.35	106	107	77.0-120			0.562	20
Xylenes, Total	15.0	15.5	15.3	103	102	79.0-123			1.30	20
(S) Toluene-d8				*104*	*105*	*80.0-120*				
(S) 4-Bromofluorobenzene				*98.3*	*103*	*77.0-126*				
(S) 1,2-Dichloroethane-d4				*106*	*105*	*70.0-130*				

Method Blank (MB)

(MB) R4012491-1 12/13/23 23:25

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
EPH Screen	U		100	300
(S) o-Terphenyl	*69.3*			*40.0-140*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R4012491-2 12/13/23 23:39 • (LCSD) R4012491-3 12/13/23 23:54

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
EPH Screen	3100	1920	2120	61.9	68.4	40.0-140			9.90	25
(S) o-Terphenyl				*71.0*	*74.8*	*40.0-140*				

Method Blank (MB)

(MB) R4019008-1 01/02/24 11:51

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Unadjusted C11-C22 Aromatics	U		200	600
(S) o-Terphenyl	*108*			*40.0-140*
(S) 2-Fluorobiphenyl	*111*			*40.0-140*
(S) 2-Bromonaphthalene	*117*			*40.0-140*

Method Blank (MB)

(MB) R4019012-1 01/02/24 11:27

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Unadjusted C9-C18 Aliphatics	U		200	600
Unadjusted C19-C36 Aliphatics	U		200	600
(S) 1-Chloro-octadecane	*75.0*			*40.0-140*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R4019008-2 01/02/24 12:13 • (LCSD) R4019008-3 01/02/24 12:35

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Unadjusted C11-C22 Aromatics	1700	1820	1640	107	96.5	40.0-140			10.4	25
(S) o-Terphenyl				*106*	*103*	*40.0-140*				
(S) 2-Fluorobiphenyl				*113*	*107*	*40.0-140*				
(S) 2-Bromonaphthalene				*120*	*110*	*40.0-140*				

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R4019012-2 01/02/24 11:51 • (LCSD) R4019012-3 01/02/24 12:15

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Unadjusted C9-C18 Aliphatics	600	411	429	68.5	71.5	40.0-140			4.29	25
Unadjusted C19-C36 Aliphatics	800	750	825	93.8	103	40.0-140			9.52	25
(S) 1-Chloro-octadecane				*68.5*	*70.7*	*40.0-140*				

Method Blank (MB)

(MB) R4013745-3 12/15/23 17:49

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Acenaphthene	U		0.0886	1.00
Acenaphthylene	U		0.0921	1.00
Anthracene	U		0.0804	1.00
Benzidine	U		3.74	10.0
Benzo(a)anthracene	U		0.199	1.00
Benzo(b)fluoranthene	U		0.130	1.00
Benzo(k)fluoranthene	U		0.120	1.00
Benzo(g,h,i)perylene	U		0.121	1.00
Benzo(a)pyrene	U		0.0381	1.00
Bis(2-chlorethoxy)methane	U		0.116	10.0
Bis(2-chloroethyl)ether	U		0.137	10.0
2,2-Oxybis(1-Chloropropane)	U		0.210	10.0
4-Bromophenyl-phenylether	U		0.0877	10.0
2-Chloronaphthalene	U		0.0648	1.00
4-Chlorophenyl-phenylether	U		0.0926	10.0
Chrysene	U		0.130	1.00
Dibenz(a,h)anthracene	U		0.0644	1.00
3,3-Dichlorobenzidine	U		0.212	10.0
2,4-Dinitrotoluene	U		0.0983	10.0
2,6-Dinitrotoluene	U		0.250	10.0
Fluoranthene	U		0.102	1.00
Fluorene	U		0.0844	1.00
Hexachlorobenzene	U		0.0755	1.00
Hexachloro-1,3-butadiene	U		0.0968	10.0
Hexachlorocyclopentadiene	U		0.0598	10.0
Hexachloroethane	U		0.127	10.0
Indeno(1,2,3-cd)pyrene	U		0.279	1.00
Isophorone	U		0.143	10.0
Naphthalene	U		0.159	1.00
Nitrobenzene	U		0.297	10.0
n-Nitrosodimethylamine	U		0.998	10.0
n-Nitrosodiphenylamine	U		2.37	10.0
n-Nitrosodi-n-propylamine	U		0.261	10.0
Phenanthrene	U		0.112	1.00
Benzylbutyl phthalate	U		0.765	3.00
Bis(2-Ethylhexyl)phthalate	U		0.895	3.00
Di-n-butyl phthalate	U		0.453	3.00
Diethyl phthalate	U		0.287	3.00
Dimethyl phthalate	U		0.260	3.00
Di-n-octyl phthalate	U		0.932	3.00

Method Blank (MB)

(MB) R4013745-3 12/15/23 17:49

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Pyrene	U		0.107	1.00
1,2,4-Trichlorobenzene	U		0.0698	10.0
Aniline	U		1.65	10.0
1,2-Diphenylhydrazine	U	N2	0.105	10.0
Benzyl alcohol	U		0.563	10.0
4-Chloroaniline	U		0.234	10.0
4-Chloro-3-methylphenol	U		0.131	10.0
2-Chlorophenol	U		0.133	10.0
Dibenzofuran	U		0.0970	10.0
2,4-Dichlorophenol	U		0.102	10.0
2,4-Dimethylphenol	U		0.0636	10.0
4,6-Dinitro-2-methylphenol	U		1.12	10.0
2,4-Dinitrophenol	U		5.93	10.0
2-Methylnaphthalene	U		0.117	1.00
2-Methylphenol	U		0.0929	10.0
3&4-Methyl Phenol	U		0.168	10.0
2-Nitroaniline	U		0.102	10.0
3-Nitroaniline	U		0.0869	10.0
4-Nitroaniline	U		0.0910	10.0
2-Nitrophenol	U		0.117	10.0
4-Nitrophenol	U		0.143	10.0
Pentachlorophenol	U		0.313	10.0
Phenol	U		4.33	10.0
Pyridine	U		0.627	10.0
2,4,6-Trichlorophenol	U		0.100	10.0
Acetophenone	U		0.208	10.0
Diphenylamine	U		2.37	10.0
1,2,4,5-Tetrachlorobenzene	U		0.0647	10.0
2,3,4,6-Tetrachlorophenol	U		0.231	10.0
2,4,5-Trichlorophenol	U		0.109	10.0
(S) 2-Fluorophenol	*23.3*			*10.0-120*
(S) Phenol-d5	*14.0*			*10.0-120*
(S) Nitrobenzene-d5	*30.3*			*10.0-127*
(S) 2-Fluorobiphenyl	*30.2*			*10.0-130*
(S) 2,4,6-Tribromophenol	*35.3*			*10.0-155*
(S) p-Terphenyl-d14	*38.3*			*10.0-128*

Method Blank (MB)

(MB) R4015539-2 12/18/23 21:29

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
2-Acetylaminofluorene	U		0.253	10.0
4-Aminobiphenyl	U		0.461	10.0
Chlorobenzilate	U		3.84	50.0
Diallate	U		0.524	10.0
2,6-Dichlorophenol	U		0.102	10.0
Dimethoate	U		5.05	50.0
P-(Dimethylamino) Azobenzene	U		3.69	10.0
Dimethylbenz (A) Anthracene	U		1.71	10.0
3,3-Dimethylbenzidine	U		3.39	10.0
a,a-Dimethylphenethylamine	U		3.13	50.0
1,3-Dinitrobenzene	U		0.359	10.0
Diphenylamine	U		2.37	10.0
Dinoseb	U		8.01	50.0
Disulfoton	U		0.267	10.0
Ethyl methanesulfonate	U		0.326	10.0
Ethyl Parathion	U		0.379	10.0
Famphur	U		3.92	20.0
Hexachloropropene	U		0.149	50.0
Hexachlorophene	U		1.44	50.0
Isodrin	U		4.11	10.0
Isosafrole	U		3.88	10.0
Kepone	U		2.66	20.0
Methapyrilene	U		10.0	50.0
3-Methylcholanthrene	U		0.164	10.0
Methyl methanesulfonate	U		3.40	50.0
Methyl parathion	U		0.213	10.0
1,4-Naphthoquinone	U		5.56	50.0
1-Naphthylamine	U		0.289	10.0
2-Naphthylamine	U		4.48	10.0
5-Nitro-o-toluidine	U		1.99	10.0
4-Nitroquinoline 1-oxide	U		2.03	10.0
n-Nitrosodiethylamine	U		3.57	10.0
n-Nitrosodi-n-butylamine	U		3.91	10.0
n-Nitrosomethylethylamine	U		3.25	10.0
n-Nitrosomorpholine	U		3.25	10.0
n-Nitrosopiperidine	U		3.72	10.0
n-Nitrosopyrrolidine	U		3.39	10.0
Pentachlorobenzene	U		4.15	10.0
Pentachloroethane	U		2.83	50.0
Pentachloronitrobenzene	U		4.15	10.0

Method Blank (MB)

(MB) R4015539-2 12/18/23 21:29

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Phenacetin	U		4.66	10.0
p-Phenylenediamine	U		387	6900
Phorate	U		4.86	50.0
2-Picoline	U		6.83	50.0
Pronamide	U		4.21	10.0
Safrole	U		3.68	10.0
Sulfotep	U		3.99	50.0
Thionazin	U		4.07	10.0
o-Toluidine	U		3.53	10.0
O,O,O-Triethyl Phosphorothioate	U		2.93	10.0
1,3,5-Trinitrobenzene	U		1.32	10.0

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R4013745-1 12/15/23 17:07 • (LCSD) R4013745-2 12/15/23 17:28

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Acenaphthene	50.0	25.6	28.1	51.2	56.2	41.0-120			9.31	22
Acenaphthylene	50.0	25.9	28.7	51.8	57.4	43.0-120			10.3	22
Anthracene	50.0	26.1	28.6	52.2	57.2	45.0-120			9.14	20
Benzidine	100	3.96	4.46	3.96	4.46	10.0-120	J4	J4	11.9	36
Benzo(a)anthracene	50.0	29.8	31.8	59.6	63.6	47.0-120			6.49	20
Benzo(b)fluoranthene	50.0	28.9	32.1	57.8	64.2	46.0-120			10.5	20
Benzo(k)fluoranthene	50.0	27.4	29.2	54.8	58.4	46.0-120			6.36	21
Benzo(g,h,i)perylene	50.0	30.7	33.3	61.4	66.6	48.0-121			8.13	20
Benzo(a)pyrene	50.0	28.7	30.6	57.4	61.2	47.0-120			6.41	20
Bis(2-chlorethoxy)methane	50.0	23.7	25.8	47.4	51.6	33.0-120			8.48	24
Bis(2-chloroethyl)ether	50.0	22.4	24.7	44.8	49.4	23.0-120			9.77	33
2,2-Oxybis(1-Chloropropane)	50.0	23.4	25.6	46.8	51.2	28.0-120			8.98	31
4-Bromophenyl-phenylether	50.0	29.7	31.4	59.4	62.8	45.0-120			5.56	20
2-Chloronaphthalene	50.0	24.4	27.1	48.8	54.2	37.0-120			10.5	25
4-Chlorophenyl-phenylether	50.0	30.4	33.0	60.8	66.0	44.0-120			8.20	20
Chrysene	50.0	28.7	30.7	57.4	61.4	48.0-120			6.73	20
Dibenz(a,h)anthracene	50.0	31.6	34.1	63.2	68.2	47.0-120			7.61	20
3,3-Dichlorobenzidine	100	57.0	61.7	57.0	61.7	44.0-120			7.92	20
2,4-Dinitrotoluene	50.0	32.6	35.8	65.2	71.6	49.0-124			9.36	20
2,6-Dinitrotoluene	50.0	29.7	32.5	59.4	65.0	46.0-120			9.00	21
Fluoranthene	50.0	28.4	30.5	56.8	61.0	51.0-120			7.13	20
Fluorene	50.0	27.9	30.7	55.8	61.4	47.0-120			9.56	20

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R4013745-1 12/15/23 17:07 • (LCSD) R4013745-2 12/15/23 17:28

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Hexachlorobenzene	50.0	30.1	32.7	60.2	65.4	44.0-120			8.28	20
Hexachloro-1,3-butadiene	50.0	24.4	26.4	48.8	52.8	19.0-120			7.87	32
Hexachlorocyclopentadiene	50.0	24.7	28.3	49.4	56.6	15.0-120			13.6	31
Hexachloroethane	50.0	19.1	21.1	38.2	42.2	15.0-120			9.95	37
Indeno(1,2,3-cd)pyrene	50.0	28.9	30.9	57.8	61.8	49.0-122			6.69	20
Isophorone	50.0	25.3	27.3	50.6	54.6	36.0-120			7.60	23
Naphthalene	50.0	20.8	22.8	41.6	45.6	27.0-120			9.17	27
Nitrobenzene	50.0	22.0	24.1	44.0	48.2	27.0-120			9.11	29
n-Nitrosodimethylamine	50.0	16.0	16.2	32.0	32.4	10.0-120			1.24	40
n-Nitrosodiphenylamine	50.0	25.2	27.4	50.4	54.8	47.0-120			8.37	20
n-Nitrosodi-n-propylamine	50.0	24.7	27.5	49.4	55.0	31.0-120			10.7	28
Phenanthrene	50.0	26.2	28.3	52.4	56.6	46.0-120			7.71	20
Benzylbutyl phthalate	50.0	27.3	29.2	54.6	58.4	43.0-121			6.73	20
Bis(2-Ethylhexyl)phthalate	50.0	26.9	28.7	53.8	57.4	43.0-122			6.47	20
Di-n-butyl phthalate	50.0	29.4	30.9	58.8	61.8	49.0-121			4.98	20
Diethyl phthalate	50.0	30.1	32.4	60.2	64.8	48.0-122			7.36	20
Dimethyl phthalate	50.0	29.8	32.1	59.6	64.2	48.0-120			7.43	20
Di-n-octyl phthalate	50.0	25.2	26.6	50.4	53.2	42.0-125			5.41	20
Pyrene	50.0	27.2	29.2	54.4	58.4	47.0-120			7.09	20
1,2,4-Trichlorobenzene	50.0	22.3	24.3	44.6	48.6	24.0-120			8.58	29
Aniline	50.0	14.5	15.4	29.0	30.8	13.0-120			6.02	31
1,2-Diphenylhydrazine	50.0	26.8	28.9	53.6	57.8	41.0-126	N2	N2	7.54	20
Benzyl alcohol	50.0	19.7	20.2	39.4	40.4	25.0-120			2.51	26
4-Chloroaniline	50.0	23.5	23.2	47.0	46.4	25.0-120			1.28	25
4-Chloro-3-methylphenol	50.0	27.0	28.2	54.0	56.4	40.0-120			4.35	21
2-Chlorophenol	50.0	22.3	23.9	44.6	47.8	25.0-120			6.93	35
Dibenzofuran	50.0	27.9	30.8	55.8	61.6	44.0-120			9.88	22
2,4-Dichlorophenol	50.0	24.7	27.0	49.4	54.0	36.0-120			8.90	26
2,4-Dimethylphenol	50.0	25.5	28.8	51.0	57.6	33.0-120			12.2	26
4,6-Dinitro-2-methylphenol	50.0	34.3	36.8	68.6	73.6	38.0-138			7.03	25
2,4-Dinitrophenol	50.0	36.5	38.4	73.0	76.8	10.0-120			5.07	39
2-Methylnaphthalene	50.0	23.1	25.5	46.2	51.0	33.0-120			9.88	25
2-Methylphenol	50.0	20.6	21.7	41.2	43.4	28.0-120			5.20	29
3&4-Methyl Phenol	50.0	22.7	23.8	45.4	47.6	31.0-120			4.73	30
2-Nitroaniline	50.0	31.3	33.9	62.6	67.8	43.0-120			7.98	22
3-Nitroaniline	50.0	29.5	29.7	59.0	59.4	38.0-120			0.676	21
4-Nitroaniline	50.0	31.3	33.1	62.6	66.2	18.0-160			5.59	21
2-Nitrophenol	50.0	26.4	29.3	52.8	58.6	31.0-120			10.4	29
4-Nitrophenol	50.0	13.9	13.6	27.8	27.2	10.0-120			2.18	33
Pentachlorophenol	50.0	25.8	27.4	51.6	54.8	23.0-120			6.02	25

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R4013745-1 12/15/23 17:07 • (LCSD) R4013745-2 12/15/23 17:28

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Phenol	50.0	10.3	10.8	20.6	21.6	10.0-120			4.74	36
Pyridine	50.0	7.06	9.26	14.1	18.5	10.0-120			27.0	38
2,4,6-Trichlorophenol	50.0	30.4	33.6	60.8	67.2	42.0-120			10.0	23
Acetophenone	50.0	25.6	28.2	51.2	56.4	29.0-120			9.67	28
Diphenylamine	50.0	25.2	27.4	50.4	54.8	35.0-120			8.37	20
1,2,4,5-Tetrachlorobenzene	50.0	30.7	33.6	61.4	67.2	31.0-121			9.02	27
2,3,4,6-Tetrachlorophenol	50.0	34.2	36.2	68.4	72.4	42.0-132			5.68	22
2,4,5-Trichlorophenol	50.0	31.6	34.5	63.2	69.0	44.0-120			8.77	22
(S) 2-Fluorophenol				*29.1*	*25.2*	*10.0-120*				
(S) Phenol-d5				*18.7*	*20.0*	*10.0-120*				
(S) Nitrobenzene-d5				*41.0*	*45.7*	*10.0-127*				
(S) 2-Fluorobiphenyl				*46.6*	*55.1*	*10.0-130*				
(S) 2,4,6-Tribromophenol				*62.0*	*67.0*	*10.0-155*				
(S) p-Terphenyl-d14				*58.7*	*64.8*	*10.0-128*				

Laboratory Control Sample (LCS)

(LCS) R4015539-1 12/18/23 21:12

Analyte	Spike Amount ug/l	LCS Result ug/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
2-Acetylaminofluorene	50.0	50.7	101	32.0-120	
4-Aminobiphenyl	50.0	20.9	41.8	20.0-120	
Chlorobenzilate	50.0	40.9	81.8	29.0-128	
Diallate	50.0	27.7	55.4	30.0-120	
2,6-Dichlorophenol	50.0	31.8	63.6	19.0-136	
Dimethoate	50.0	33.0	66.0	11.0-134	
P-(Dimethylamino) Azobenzene	50.0	33.0	66.0	27.0-120	
Dimethylbenz (A) Anthracene	50.0	28.7	57.4	14.0-124	
3,3-Dimethylbenzidine	50.0	7.89	15.8	13.0-120	
a,a-Dimethylphenethylamine	50.0	0.000	0.000	10.0-129	J4
1,3-Dinitrobenzene	50.0	40.0	80.0	34.0-120	
Diphenylamine	50.0	31.1	62.2	35.0-120	
Dinoseb	50.0	46.0	92.0	39.0-120	
Disulfoton	50.0	28.8	57.6	32.0-120	
Ethyl methanesulfonate	50.0	20.6	41.2	10.0-120	
Ethyl Parathion	50.0	45.1	90.2	46.0-130	
Famphur	50.0	40.5	81.0	32.0-120	
Hexachloropropene	50.0	21.9	43.8	10.0-120	
Hexachlorophene	100	35.8	35.8	10.0-120	

Laboratory Control Sample (LCS)

(LCS) R4015539-1 12/18/23 21:12

Analyte	Spike Amount ug/l	LCS Result ug/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Isodrin	50.0	22.5	45.0	22.0-157	
Isosafrole	50.0	27.6	55.2	25.0-133	
Kepone	50.0	21.5	43.0	10.0-120	
Methapyrilene	50.0	0.982	1.96	10.0-120	J4
3-Methylcholanthrene	50.0	36.5	73.0	30.0-160	
Methyl methanesulfonate	50.0	16.6	33.2	10.0-120	
Methyl parathion	50.0	51.6	103	42.0-120	
1,4-Naphthoquinone	50.0	1.36	2.72	50.0-150	J4
1-Naphthylamine	50.0	18.9	37.8	19.0-120	
2-Naphthylamine	50.0	10.3	20.6	10.0-120	
5-Nitro-o-toluidine	50.0	41.3	82.6	34.0-120	
4-Nitroquinoline 1-oxide	50.0	39.1	78.2	10.0-159	
n-Nitrosodiethylamine	50.0	22.5	45.0	10.0-120	
n-Nitrosodi-n-butylamine	50.0	26.2	52.4	13.0-143	
n-Nitrosomethylethylamine	50.0	20.0	40.0	10.0-120	
n-Nitrosomorpholine	50.0	21.0	42.0	10.0-120	
n-Nitrosopiperidine	50.0	25.7	51.4	10.0-160	
n-Nitrosopyrrolidine	50.0	23.7	47.4	10.0-124	
Pentachlorobenzene	50.0	22.3	44.6	25.0-120	
Pentachloroethane	50.0	20.9	41.8	10.0-120	
Pentachloronitrobenzene	50.0	38.7	77.4	34.0-132	
Phenacetin	50.0	38.2	76.4	34.0-127	
p-Phenylenediamine	50.0	0.000	0.000	50.0-150	J4
Phorate	50.0	31.6	63.2	13.0-160	
2-Picoline	50.0	10.7	21.4	10.0-120	
Pronamide	50.0	38.7	77.4	38.0-130	
Safrole	50.0	29.2	58.4	21.0-120	
Sulfotep	50.0	34.4	68.8	52.0-120	
Thionazin	50.0	36.0	72.0	38.0-121	
o-Toluidine	50.0	20.2	40.4	10.0-120	
O,O,O-Triethyl Phosphorothioate	50.0	30.5	61.0	11.0-135	
1,3,5-Trinitrobenzene	50.0	53.3	107	37.0-147	

Method Blank (MB)

(MB) R4014395-3 12/14/23 21:56

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Anthracene	U		0.0190	0.0500
Acenaphthene	U		0.0190	0.0500
Acenaphthylene	U		0.0171	0.0500
Benzo(a)anthracene	U		0.0203	0.0500
Benzo(a)pyrene	U		0.0184	0.0500
Benzo(b)fluoranthene	U		0.0168	0.0500
Benzo(g,h,i)perylene	U		0.0184	0.0500
Benzo(k)fluoranthene	U		0.0202	0.0500
Chrysene	U		0.0179	0.0500
Dibenz(a,h)anthracene	U		0.0160	0.0500
Fluoranthene	U		0.0270	0.100
Fluorene	U		0.0169	0.0500
Indeno(1,2,3-cd)pyrene	U		0.0158	0.0500
Naphthalene	U		0.0917	0.250
Phenanthrene	U		0.0180	0.0500
Pyrene	U		0.0169	0.0500
1-Methylnaphthalene	U		0.0687	0.250
2-Methylnaphthalene	U		0.0674	0.250
2-Chloronaphthalene	U		0.0682	0.250
(S) Nitrobenzene-d5	*118*			*31.0-160*
(S) 2-Fluorobiphenyl	*114*			*48.0-148*
(S) p-Terphenyl-d14	*109*			*37.0-146*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R4014395-1 12/14/23 21:20 • (LCSD) R4014395-2 12/14/23 21:38

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Anthracene	2.00	2.14	2.29	107	115	67.0-150			6.77	20
Acenaphthene	2.00	2.08	2.20	104	110	65.0-138			5.61	20
Acenaphthylene	2.00	2.18	2.26	109	113	66.0-140			3.60	20
Benzo(a)anthracene	2.00	2.31	2.43	115	122	61.0-140			5.06	20
Benzo(a)pyrene	2.00	2.08	2.19	104	109	60.0-143			5.15	20
Benzo(b)fluoranthene	2.00	2.02	2.08	101	104	58.0-141			2.93	20
Benzo(g,h,i)perylene	2.00	1.81	1.87	90.5	93.5	52.0-153			3.26	20
Benzo(k)fluoranthene	2.00	1.89	1.99	94.5	99.5	58.0-148			5.15	20
Chrysene	2.00	2.20	2.32	110	116	64.0-144			5.31	20
Dibenz(a,h)anthracene	2.00	1.90	1.99	95.0	99.5	52.0-155			4.63	20
Fluoranthene	2.00	2.49	2.71	124	135	69.0-153			8.46	20

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R4014395-1 12/14/23 21:20 • (LCSD) R4014395-2 12/14/23 21:38

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Fluorene	2.00	2.18	2.40	109	120	64.0-136			9.61	20
Indeno(1,2,3-cd)pyrene	2.00	2.08	2.14	104	107	54.0-153			2.84	20
Naphthalene	2.00	2.11	2.21	105	111	61.0-137			4.63	20
Phenanthrene	2.00	2.18	2.33	109	117	62.0-137			6.65	20
Pyrene	2.00	2.23	2.32	111	116	60.0-142			3.96	20
1-Methylnaphthalene	2.00	2.27	2.40	114	120	66.0-142			5.57	20
2-Methylnaphthalene	2.00	2.32	2.42	116	121	62.0-136			4.22	20
2-Chloronaphthalene	2.00	2.17	2.25	108	112	64.0-140			3.62	20
(S) Nitrobenzene-d5				*111*	*113*	*31.0-160*				
(S) 2-Fluorobiphenyl				*109*	*113*	*48.0-148*				
(S) p-Terphenyl-d14				*94.5*	*98.0*	*37.0-146*				

GLOSSARY OF TERMS

Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state “ND” (Not Detected) or “BDL” (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

Qualifier	Description
B	The same analyte is found in the associated blank.
J	The identification of the analyte is acceptable; the reported value is an estimate.
J2	Surrogate recovery limits have been exceeded; values are outside lower control limits.
J3	The associated batch QC was outside the established quality control range for precision.
J4	The associated batch QC was outside the established quality control range for accuracy.
J5	The sample matrix interfered with the ability to make any accurate determination; spike value is high.
J6	The sample matrix interfered with the ability to make any accurate determination; spike value is low.
N2	Analyte reported using a calibration and validation based on Azobenzene (CAS 103-33-3). 1,2-Diphenylhydrazine decomposes into Azobenzene during the analysis.
T8	Sample(s) received past/too close to holding time expiration.

ACCREDITATIONS & LOCATIONS

Pace Analytical National 12065 Lebanon Rd Mount Juliet, TN 37122

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN000032021-1
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey–NELAP	TN002
California	2932	New Mexico [1]	TN00003
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina [1]	DW21704
Georgia	NELAP	North Carolina [3]	41
Georgia [1]	923	North Dakota	R-140
Idaho	TN00003	Ohio–VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LAO000356
Kentucky [1 6]	KY90010	South Carolina	84004002
Kentucky [2]	16	South Dakota	n/a
Louisiana	AI30792	Tennessee [1 4]	2006
Louisiana	LA018	Texas	T104704245-20-18
Maine	TN00003	Texas [5]	LAB0152
Maryland	324	Utah	TN000032021-11
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	110033
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	998093910
Montana	CERT0086	Wyoming	A2LA
A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 [5]	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA–Crypto	TN00003		

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [6] Wastewater n/a Accreditation not applicable

* Not all certifications held by the laboratory are applicable to the results reported in the attached report.

* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace Analytical.

Ramboil US Consulting, Inc. - Denver

1999 Broadway Suite 2225
Denver, CO 80202

Billing Information:
Accounts Payable
PO Box 4229
Indianapolis, IN 46242

Report to: Abby Small

Email To: asmall@ramboll.com;rdeshpande@ramboll.com

Project Description: CMR Great Falls - 2023 RFI Soil Sampling

City/State Collected: Great Falls, MT

Please Circle: PT (MT) CT ET

Phone: 303-382-5474

Client Project # 16900296.36-001

Lab Project # ENVIRONCO-CALUMET GW

Collected by (print): Mike Gipson

Site/Facility ID # GREAT FALLS, MT

P.O. #

Collected by (signature):

Rush? (Lab MUST be Notified)
___ Same Day ___ Five Day
___ Next Day ___ 5 Day (Rad Only)
___ Two Day ___ 10 Day (Rad Only)
___ Three Day

Quote #

Date Results Needed

Immediately Packed on Ice N ___ Y X

Pres Chk

Analysis / Container / Preservative

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	**BOD 500mlHDPE-NoPres	**Nitrate, Sulfate 125mlHDPE-NoPres	8270AP9 100ml Amb NoPres	CO2 40mlAmb-NoPres	Diss Fe, Mn 6020 250mlHDPE-HNO3	Extract/Hold PAHs 40mlAmb-NoPres-WT	RSK175 (Methane) 40mlAmb HCl	SVEPHSMT 1L-Amb-Add HCl	Total Fe, Mn 6020 250mlHDPE-HNO3	V8260LL 40mlAmb-HCl	Remarks	Sample # (lab only)
CMR-MW-105-231207	G	GW		12/7/23	11:45	9			X			X				X	VPH 2	40-mL VOAs -01
CMR-MW-106-231207	G	GW		12/7/23	13:50	20	X	X	X	X	X	X	X	X	X	X	VPH	-02
CMR-MW-415-231207	G	GW		12/7/23	14:40	11			X			X		X		X	VPH	-03
TRIP BLANK	—	GW	—	12/7/23	—	2										X	NO BOD	-04
		GW																
		GW																
TRIP BLANK		GW																
TRIP BLANK 2		GW																

* Matrix:
SS - Soil AIR - Air F - Filter
GW - Groundwater B - Bioassay
WW - WasteWater
DW - Drinking Water
OT - Other_____

Remarks: **BOD and Nitrate= 48 hour hold time

pH _____ Temp _____

Flow _____ Other _____

Samples returned via: __ UPS X FedEx __ Courier _____

Tracking # 7155 0297 1820

Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)
	12/7/23	16:30	
Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)
Relinquished by : (Signature)	Date:	Time:	Received for lab by: (Signature)

Trip Blank Received: (Yes) / No
2 (HCL) / MeoH
TBR

Temp: °C Bottles Received: 39

LCA 85310-5.3

Date: 12-8-23 Time: 0900

If preservation required by Login: Date/Time

Hold:

Condition: NCF / (OK)

Sample Receipt Checklist

COC Seal Present/Intact:	NP	Y N
COC Signed/Accurate:		Y N
Bottles arrive intact:		Y N
Correct bottles used:		Y N
Sufficient volume sent:		Y N
If Applicable		
VOA Zero Headspace:		Y N
Preservation Correct/Checked:		Y N
RAD Screen <0.5 mR/hr:		Y N

Chain of Custody Page 1 of 1

Pace
PEOPLE ADVANCING SCIENCE

MT JULIET, TN
12065 Lebanon Rd Mount Juliet, TN 37122
Submitting a sample via this chain of custody constitutes acknowledgment and acceptance of the Pace Terms and Conditions found at: https://info.pacelabs.com/hubfs/pas-standard-terms.pdf

SDG # L1668577
C195

Acctnum: ENVIRONCO
Template: T242668
Prelogin: P1041267
PM: 841 - Kelly Mercer
PB: 11/30/23

Shipped Via: FedEX Standard

APPENDIX B

HISTORICAL ANALYTICAL RESULTS AND CONTAMINANT MASS REMOVAL - VAPOR

Appendix B
Historical Analytical Results and Contaminant Mass Removal - Vapor
Calumet Montana Refining, LLC - Great Falls, Montana

Location		SP301		SP301		SP301	
Ramboll Sample ID		CMR-SP301-211015		CMR-SP301-211016		CMR-SP301-211017	
Sample Date		10/15/2021		10/16/2021		10/17/2021	
Blower Flow (scfm)		41		41		41	
Period Operational Time (hrs)		26		24		24	
Notes							
VOCs	**CAS No.**	**Result (ug/m^3)**	**Mass (lb)**	**Result (ug/m^3)**	**Mass (lb)**	**Result (ug/m^3)**	**Mass (lb)**
1,1,1-Trichloroethane	71-55-6	18,100 U	0.00	18,600 U	0.00	19,600 U	0.00
1,1,2,2-Tetrachloroethane	79-34-5	22,800 U	0.00	23,400 U	0.00	24,700 U	0.00
1,1,2-Trichloroethane	79-00-5	9,040 U	0.00	9,290 U	0.00	9,800 U	0.00
1,1,2-Trichlorotrifluoroethane	76-13-1	25,400 U	0.00	26,100 U	0.00	27,600 U	0.00
1,1-Dichloroethane	75-34-3	13,400 U	0.00	13,800 U	0.00	14,500 U	0.00
1,1-Dichloroethene	75-35-4	13,100 U	0.00	13,500 U	0.00	14,200 U	0.00
1,2,4-Trichlorobenzene	120-82-1	123,000 U	0.00	126,000 U	0.00	133,000 U	0.00
1,2,4-Trimethylbenzene	95-63-6	340,000	1.36	471,000	1.73	562,000	2.07
1,2-Dibromoethane (EDB)	106-93-4	12,700 U	0.00	13,100 U	0.00	13,800 U	0.00
1,2-Dichlorobenzene	95-50-1	49,800 U	0.00	51,200 U	0.00	54,100 U	0.00
1,2-Dichloroethane	107-06-2	13,400 U	0.00	13,800 U	0.00	14,500 U	0.00
1,2-Dichloropropane	78-87-5	15,300 U	0.00	15,700 U	0.00	16,600 U	0.00
1,3,5-Trimethylbenzene	108-67-8	179,000	0.71	225,000	0.83	272,000	1.00
1,3-Butadiene	106-99-0	7,330 U	0.00	7,530 U	0.00	7,950 U	0.00
1,3-Dichlorobenzene	541-73-1	49,800 U	0.00	51,200 U	0.00	54,100 U	0.00
1,4-Dichlorobenzene	106-46-7	49,800 U	0.00	51,200 U	0.00	54,100 U	0.00
2-Butanone (MEK)	78-93-3	48,800 U	0.00	50,200 U	0.00	53,000 U	0.00
2-Hexanone	591-78-6	67,700 U	0.00	69,600 U	0.00	73,500 U	0.00
2-Propanol	67-63-0	40,700 U	0.00	41,900 U	0.00	44,200 U	0.00
4-Ethyltoluene	622-96-8	171,000	0.68	222,000	0.82	257,000	0.95
4-Methyl-2-pentanone (MIBK)	108-10-1	88,300	0.35	81,400	0.30	84,900	0.31
Acetone	67-64-1	98,300 U	0.00	101,000 U	0.00	107,000 U	0.00
Benzene	71-43-2	2,850,000 E	11.36	2,430,000 E	8.94	2,640,000 E	9.71
Benzyl chloride	100-44-7	42,800 U	0.00	44,000 U	0.00	46,500 U	0.00
Bromodichloromethane	75-27-4	22,100 U	0.00	22,800 U	0.00	24,000 U	0.00
Bromoform	75-25-2	85,500 U	0.00	87,900 U	0.00	92,700 U	0.00
Bromomethane	74-83-9	12,800 U	0.00	13,200 U	0.00	13,900 U	0.00
Carbon disulfide	75-15-0	10,300 U	0.00	10,600 U	0.00	11,200 U	0.00
Carbon tetrachloride	56-23-5	20,800 U	0.00	21,400 U	0.00	22,600 U	0.00
Chlorobenzene	108-90-7	15,200 U	0.00	15,700 U	0.00	16,500 U	0.00
Chloroethane	75-00-3	8,730 U	0.00	8,970 U	0.00	9,470 U	0.00
Chloroform	67-66-3	8,080 U	0.00	8,300 U	0.00	8,760 U	0.00
Chloromethane	74-87-3	6,840 U	0.00	7,030 U	0.00	7,420 U	0.00
cis-1,2-Dichloroethene	156-59-2	13,100 U	0.00	13,500 U	0.00	14,200 U	0.00
cis-1,3-Dichloropropene	10061-01-5	37,600 U	0.00	38,700 U	0.00	40,800 U	0.00
Cyclohexane	110-82-7	28,500 U	0.00	29,300 U	0.00	30,900 U	0.00
Dibromochloromethane	124-48-1	28,200 U	0.00	29,000 U	0.00	30,600 U	0.00
Dichlorodifluoromethane	75-71-8	16,400 U	0.00	16,900 U	0.00	17,800 U	0.00
Dichlorotetrafluoroethane	76-14-2	23,100 U	0.00	23,800 U	0.00	25,100 U	0.00
Ethanol	64-17-5	31,300 U	0.00	32,100 U	0.00	33,900 U	0.00
Ethyl acetate	141-78-6	11,900 U	0.00	12,300 U	0.00	12,900 U	0.00
Ethylbenzene	100-41-4	1,200,000	4.78	1,360,000	5.00	1,380,000	5.08
Hexachloro-1,3-butadiene	87-68-3	88,200 U	0.00	90,700 U	0.00	95,700 U	0.00
m&p-Xylene	179601-23-1	4,030,000	16.06	5,010,000	18.43	5,310,000	19.54
Methylene Chloride	75-09-2	57,500 U	0.00	59,100 U	0.00	62,400 U	0.00
Methyl-tert-butyl ether	1634-04-4	59,600 U	0.00	61,300 U	0.00	64,700 U	0.00
Naphthalene	91-20-3	43,300 U	0.00	44,500 U	0.00	47,000 U	0.00
n-Heptane	142-82-5	3,330,000 E	13.27	3,060,000 E	11.26	3,340,000 E	12.29
n-Hexane	110-54-3	7,840,000 E	31.25	7,320,000 E	26.93	7,900,000 E	29.07
o-Xylene	95-47-6	916,000	3.65	1,210,000	4.45	1,320,000	4.86
Propylene	115-07-1	14,200 U	0.00	14,600 U	0.00	15,500 U	0.00
Styrene	100-42-5	14,100 U	0.00	14,500 U	0.00	15,300 U	0.00
Tetrachloroethene	127-18-4	11,200 U	0.00	11,500 U	0.00	12,200 U	0.00
Tetrahydrofuran	109-99-9	9,770 U	0.00	10,000 U	0.00	10,600 U	0.00
Toluene	108-88-3	1,490,000	5.94	1,860,000	6.84	1,870,000	6.88
trans-1,2-Dichloroethene	156-60-5	13,100 U	0.00	13,500 U	0.00	14,200 U	0.00
trans-1,3-Dichloropropene	10061-02-6	37,600 U	0.00	38,700 U	0.00	40,800 U	0.00
Trichloroethene	79-01-6	17,800 U	0.00	18,300 U	0.00	19,300 U	0.00
Trichlorofluoromethane	75-69-4	18,600 U	0.00	19,100 U	0.00	20,100 U	0.00
Vinyl acetate	108-05-4	11,700 U	0.00	12,000 U	0.00	12,600 U	0.00
Vinyl chloride	75-01-4	4,230 U	0.00	4,350 U	0.00	4,590 U	0.00
Total VOCs	--	--	89.42	--	85.54	--	91.74
Period Total VOC Mass Removed (lbs)		**89.4**		**85.5**		**91.7**	
Cumulative Total VOC Mass Removed (lbs)		**89**		**175**		**267**	

Appendix B
Historical Analytical Results and Contaminant Mass Removal - Vapor
Calumet Montana Refining, LLC - Great Falls, Montana

	Location	SP301		SP301		SP301	
	Ramboll Sample ID	CMR-SP301-2		CMR-SP301-211201		CMR-SP301-211208	
	Sample Date	11/19/2021		12/1/2021		12/8/2021	
	Blower Flow (scfm)	41		56		65	
	Period Operational Time (hrs)	--		283		144	
	Notes						
VOCs	CAS No.	Result (ug/m^3)	Mass (lb)	Result (ug/m^3)	Mass (lb)	Result (ug/m^3)	Mass (lb)
1,1,1-Trichloroethane	71-55-6	158 R	0.00	9,290 U	0.00	9,800 U	0.00
1,1,2,2-Tetrachloroethane	79-34-5	199 R	0.00	11,700 U	0.00	12,400 U	0.00
1,1,2-Trichloroethane	79-00-5	79 R	0.00	4,650 U	0.00	4,900 U	0.00
1,1,2-Trichlorotrifluoroethane	76-13-1	222 R	0.00	13,100 U	0.00	13,800 U	0.00
1,1-Dichloroethane	75-34-3	117 R	0.00	6,890 U	0.00	7,270 U	0.00
1,1-Dichloroethene	75-35-4	115 R	0.00	6,750 U	0.00	7,120 U	0.00
1,2,4-Trichlorobenzene	120-82-1	1,070 R	0.00	63,100 U	0.00	66,600 U	0.00
1,2,4-Trimethylbenzene	95-63-6	7,720 R	0.00	49,600	2.95	50,300	1.76
1,2-Dibromoethane (EDB)	106-93-4	111 R	0.00	6,540 U	0.00	6,900 U	0.00
1,2-Dichlorobenzene	95-50-1	435 R	0.00	25,600 U	0.00	27,000 U	0.00
1,2-Dichloroethane	107-06-2	117 R	0.00	6,890 U	0.00	7,270 U	0.00
1,2-Dichloropropane	78-87-5	134 R	0.00	7,860 U	0.00	8,290 U	0.00
1,3,5-Trimethylbenzene	108-67-8	3,310 R	0.00	27,100	1.61	27,900	0.98
1,3-Butadiene	106-99-0	64 R	0.00	3,770 U	0.00	3,970 U	0.00
1,3-Dichlorobenzene	541-73-1	435 R	0.00	25,600 U	0.00	27,000 U	0.00
1,4-Dichlorobenzene	106-46-7	435 R	0.00	25,600 U	0.00	27,000 U	0.00
2-Butanone (MEK)	78-93-3	427 R	0.00	25,100 U	0.00	26,500 U	0.00
2-Hexanone	591-78-6	592 R	0.00	34,800 U	0.00	36,700 U	0.00
2-Propanol	67-63-0	356 R	0.00	20,900 U	0.00	22,100 U	0.00
4-Ethyltoluene	622-96-8	1,180 R	0.00	26,600	1.58	26,700	0.93
4-Methyl-2-pentanone (MIBK)	108-10-1	592 R	0.00	34,800 U	0.00	36,700 U	0.00
Acetone	67-64-1	859 R	0.00	50,600 U	0.00	53,300 U	0.00
Benzene	71-43-2	51 R	0.00	135,000	8.04	94,100	3.29
Benzyl chloride	100-44-7	374 R	0.00	22,000 U	0.00	23,200 U	0.00
Bromodichloromethane	75-27-4	193 R	0.00	11,400 U	0.00	12,000 U	0.00
Bromoform	75-25-2	747 R	0.00	43,900 U	0.00	46,400 U	0.00
Bromomethane	74-83-9	112 R	0.00	6,600 U	0.00	6,970 U	0.00
Carbon disulfide	75-15-0	90 R	0.00	5,300 U	0.00	5,590 U	0.00
Carbon tetrachloride	56-23-5	182 R	0.00	10,700 U	0.00	11,300 U	0.00
Chlorobenzene	108-90-7	133 R	0.00	7,840 U	0.00	8,270 U	0.00
Chloroethane	75-00-3	76 R	0.00	11,200 U	0.00	11,800 U	0.00
Chloroform	67-66-3	71 R	0.00	4,150 U	0.00	4,380 U	0.00
Chloromethane	74-87-3	60 R	0.00	3,520 U	0.00	3,710 U	0.00
cis-1,2-Dichloroethene	156-59-2	115 R	0.00	6,750 U	0.00	7,120 U	0.00
cis-1,3-Dichloropropene	10061-01-5	328 R	0.00	19,300 U	0.00	20,400 U	0.00
Cyclohexane	110-82-7	3,940 R	0.00	945,000	56.27	687,000	24.03
Dibromochloromethane	124-48-1	246 R	0.00	14,500 U	0.00	15,300 U	0.00
Dichlorodifluoromethane	75-71-8	144 R	0.00	8,450 U	0.00	8,920 U	0.00
Dichlorotetrafluoroethane	76-14-2	202 R	0.00	11,900 U	0.00	12,500 U	0.00
Ethanol	64-17-5	273 R	0.00	16,100 U	0.00	17,000 U	0.00
Ethyl acetate	141-78-6	104 R	0.00	6,140 U	0.00	6,470 U	0.00
Ethylbenzene	100-41-4	1,520 R	0.00	104,000	6.19	80,800	2.83
Hexachloro-1,3-butadiene	87-68-3	771 R	0.00	45,400 U	0.00	47,900 U	0.00
m&p-Xylene	179601-23-1	7,210 R	0.00	475,000	28.28	401,000	14.02
Methylene Chloride	75-09-2	502 R	0.00	29,600 U	0.00	31,200 U	0.00
Methyl-tert-butyl ether	1634-04-4	520 R	0.00	30,600 U	0.00	32,300 U	0.00
Naphthalene	91-20-3	378 R	0.00	44,600 U	0.00	47,100 U	0.00
n-Heptane	142-82-5	847 R	0.00	280,000	16.67	197,000	6.89
n-Hexane	110-54-3	274 R	0.00	507,000	30.19	377,000	13.19
o-Xylene	95-47-6	4,140 R	0.00	113,000	6.73	98,400	3.44
Propylene	115-07-1	124 R	0.00	7,320 U	0.00	7,730 U	0.00
Styrene	100-42-5	308 R	0.00	7,250 U	0.00	7,650 U	0.00
Tetrachloroethene	127-18-4	98 R	0.00	5,770 U	0.00	6,090 U	0.00
Tetrahydrofuran	109-99-9	85 R	0.00	5,020 U	0.00	5,300 U	0.00
Toluene	108-88-3	352 R	0.00	117,000	6.97	80,500	2.82
trans-1,2-Dichloroethene	156-60-5	115 R	0.00	6,750 U	0.00	7,120 U	0.00
trans-1,3-Dichloropropene	10061-02-6	328 R	0.00	19,300 U	0.00	20,400 U	0.00
Trichloroethene	79-01-6	78 R	0.00	4,570 U	0.00	4,820 U	0.00
Trichlorofluoromethane	75-69-4	162 R	0.00	9,540 U	0.00	10,100 U	0.00
Vinyl acetate	108-05-4	102 R	0.00	5,990 U	0.00	6,320 U	0.00
Vinyl chloride	75-01-4	37 R	0.00	4,350 U	0.00	4,590 U	0.00
Total VOCs	--	--	0.00	--	165.48	--	74.17
Period Total VOC Mass Removed (lbs)		0.0		165.5		74.2	
Cumulative Total VOC Mass Removed (lbs)		267		432		506	

Appendix B
Historical Analytical Results and Contaminant Mass Removal - Vapor
Calumet Montana Refining, LLC - Great Falls, Montana

Location		**SP301**		**SP301**		**SP301**	
Ramboll Sample ID		**CMR-SP301-211216**		**CMR-SP301-220216**		**CMR-SP301-110309**	
Sample Date		**12/31/2021**		**2/16/2022**		**3/9/2022**	
Blower Flow (scfm)		**61**		**66**		**70**	
Period Operational Time (hrs)		**334**		**--**		**949**	
Notes							
VOCs	**CAS No.**	**Result (ug/m^3)**	**Mass (lb)**	**Result (ug/m^3)**	**Mass (lb)**	**Result (ug/m^3)**	**Mass (lb)**
1,1,1-Trichloroethane	71-55-6	46,400 U	0.00	3 R	0.00	12,300 U	0.00
1,1,2,2-Tetrachloroethane	79-34-5	23,400 U	0.00	4 R	0.00	15,500 U	0.00
1,1,2-Trichloroethane	79-00-5	46,400 U	0.00	2 R	0.00	6,160 U	0.00
1,1,2-Trichlorotrifluoroethane	76-13-1	26,100 U	0.00	4 R	0.00	17,300 U	0.00
1,1-Dichloroethane	75-34-3	13,800 U	0.00	2 R	0.00	9,130 U	0.00
1,1-Dichloroethene	75-35-4	13,500 U	0.00	2 R	0.00	8,940 U	0.00
1,2,4-Trichlorobenzene	120-82-1	253,000 U	0.00	41 R	0.00	167,000 U	0.00
1,2,4-Trimethylbenzene	95-63-6	121,000	9.22	378 R	0.00	50,700	12.63
1,2-Dibromoethane (EDB)	106-93-4	26,200 U	0.00	2 R	0.00	8,670 U	0.00
1,2-Dichlorobenzene	95-50-1	51,200 U	0.00	8 R	0.00	34,000 U	0.00
1,2-Dichloroethane	107-06-2	13,800 U	0.00	2 R	0.00	9,130 U	0.00
1,2-Dichloropropane	78-87-5	39,300 U	0.00	3 R	0.00	10,400 U	0.00
1,3,5-Trimethylbenzene	108-67-8	75,900	5.79	218 R	0.00	43,300	10.79
1,3-Butadiene	106-99-0	7,530 U	0.00	1 R	0.00	4,990 U	0.00
1,3-Dichlorobenzene	541-73-1	51,200 U	0.00	8 R	0.00	34,000 U	0.00
1,4-Dichlorobenzene	106-46-7	102,000 U	0.00	8 R	0.00	34,000 U	0.00
2-Butanone (MEK)	78-93-3	50,200 U	0.00	16 R	0.00	33,300 U	0.00
2-Hexanone	591-78-6	69,600 U	0.00	11 R	0.00	46,200 U	0.00
2-Propanol	67-63-0	41,900 U	0.00	7 R	0.00	27,700 U	0.00
4-Ethyltoluene	622-96-8	51,900	3.96	41 R	0.00	32,200	8.02
4-Methyl-2-pentanone (MIBK)	108-10-1	69,600 U	0.00	11 R	0.00	46,200 U	0.00
Acetone	67-64-1	101,000 U	0.00	37 R	0.00	67,000 U	0.00
Benzene	71-43-2	150,000	11.44	4 R	0.00	195,000	48.57
Benzyl chloride	100-44-7	88,100 U	0.00	7 R	0.00	29,200 U	0.00
Bromodichloromethane	75-27-4	22,800 U	0.00	4 R	0.00	15,100 U	0.00
Bromoform	75-25-2	176,000 U	0.00	14 R	0.00	58,300 U	0.00
Bromomethane	74-83-9	13,200 U	0.00	2 R	0.00	8,760 U	0.00
Carbon disulfide	75-15-0	10,600 U	0.00	2 R	0.00	7,020 U	0.00
Carbon tetrachloride	56-23-5	21,400 U	0.00	4 R	0.00	14,200 U	0.00
Chlorobenzene	108-90-7	15,700 U	0.00	3 R	0.00	10,400 U	0.00
Chloroethane	75-00-3	8,970 U	0.00	2 R	0.00	5,950 U	0.00
Chloroform	67-66-3	8,300 U	0.00	1 R	0.00	5,500 U	0.00
Chloromethane	74-87-3	17,600 U	0.00	1 R	0.00	4,660 U	0.00
cis-1,2-Dichloroethene	156-59-2	13,500 U	0.00	2 R	0.00	8,940 U	0.00
cis-1,3-Dichloropropene	10061-01-5	38,700 U	0.00	6 R	0.00	25,600 U	0.00
Cyclohexane	110-82-7	29,300 U	0.00	5 R	0.00	19,400 U	0.00
Dibromochloromethane	124-48-1	29,000 U	0.00	5 R	0.00	19,200 U	0.00
Dichlorodifluoromethane	75-71-8	16,900 U	0.00	3 R	0.00	11,200 U	0.00
Dichlorotetrafluoroethane	76-14-2	23,800 U	0.00	4 R	0.00	15,800 U	0.00
Ethanol	64-17-5	32,100 U	0.00	8 R	0.00	21,300 U	0.00
Ethyl acetate	141-78-6	12,300 U	0.00	2 R	0.00	8,130 U	0.00
Ethylbenzene	100-41-4	151,000	11.51	29 R	0.00	256,000	63.76
Hexachloro-1,3-butadiene	87-68-3	90,700 U	0.00	15 R	0.00	60,100 U	0.00
m&p-Xylene	179601-23-1	783,000	59.70	186 R	0.00	1,010,000	251.57
Methylene Chloride	75-09-2	59,100 U	0.00	10 R	0.00	39,200 U	0.00
Methyl-tert-butyl ether	1634-04-4	61,300 U	0.00	10 R	0.00	40,600 U	0.00
Naphthalene	91-20-3	44,500 U	0.00	15 R	0.00	29,500 U	0.00
n-Heptane	142-82-5	336,000	25.62	19 R	0.00	441,000	109.84
n-Hexane	110-54-3	575,000	43.84	12 R	0.00	819,000	204.00
o-Xylene	95-47-6	236,000	17.99	148 R	0.00	263,000	65.51
Propylene	115-07-1	14,600 U	0.00	2 R	0.00	9,710 U	0.00
Styrene	100-42-5	14,500 U	0.00	6 R	0.00	9,610 U	0.00
Tetrachloroethene	127-18-4	11,500 U	0.00	2 R	0.00	7,650 U	0.00
Tetrahydrofuran	109-99-9	10,000 U	0.00	132 R	0.00	6,660 U	0.00
Toluene	108-88-3	140,000	10.67	13 R	0.00	210,000	52.31
trans-1,2-Dichloroethene	156-60-5	33,700 U	0.00	2 R	0.00	8,940 U	0.00
trans-1,3-Dichloropropene	10061-02-6	38,700 U	0.00	6 R	0.00	25,600 U	0.00
Trichloroethene	79-01-6	18,300 U	0.00	2 R	0.00	6,060 U	0.00
Trichlorofluoromethane	75-69-4	19,100 U	0.00	3 R	0.00	12,700 U	0.00
Vinyl acetate	108-05-4	12,000 U	0.00	2 R	0.00	7,950 U	0.00
Vinyl chloride	75-01-4	21,700 U	0.00	1 R	0.00	2,890 U	0.00
Total VOCs	--	--	199.73	--	0.00	--	826.99
Period Total VOC Mass Removed (lbs)		**199.7**		**0.0**		**827.0**	
Cumulative Total VOC Mass Removed (lbs)		**706**		**706**		**1,533**	

Appendix B
Historical Analytical Results and Contaminant Mass Removal - Vapor
Calumet Montana Refining, LLC - Great Falls, Montana

Location		SP301		SP301		SP301	
Ramboll Sample ID		CMR-SP301-2022411		CMR-SP301-220511		CMR-SP301-220617	
Sample Date		4/11/2022		5/11/2022		6/17/2022	
Blower Flow (scfm)		102		128		172	
Period Operational Time (hrs)		632		742		517	
Notes							
VOCs	**CAS No.**	**Result (ug/m^3)**	**Mass (lb)**	**Result (ug/m^3)**	**Mass (lb)**	**Result (ug/m^3)**	**Mass (lb)**
1,1,1-Trichloroethane	71-55-6	1,680 U	0.00	6,520 U	0.00	13,000 U	0.00
1,1,2,2-Tetrachloroethane	79-34-5	2,120 U	0.00	8,230 U	0.00	16,500 U	0.00
1,1,2-Trichloroethane	79-00-5	842 U	0.00	3,260 U	0.00	6,520 U	0.00
1,1,2-Trichlorotrifluoroethane	76-13-1	2,370 U	0.00	9,170 U	0.00	18,300 U	0.00
1,1-Dichloroethane	75-34-3	1,250 U	0.00	4,840 U	0.00	9,670 U	0.00
1,1-Dichloroethene	75-35-4	1,220 U	0.00	4,740 U	0.00	9,470 U	0.00
1,2,4-Trichlorobenzene	120-82-1	11,400 U	0.00	44,300 U	0.00	88,600 U	0.00
1,2,4-Trimethylbenzene	95-63-6	2,310	0.56	9,770	3.48	68,600	22.79
1,2-Dibromoethane (EDB)	106-93-4	1,180 U	0.00	4,590 U	0.00	9,180 U	0.00
1,2-Dichlorobenzene	95-50-1	4,640 U	0.00	18,000 U	0.00	36,000 U	0.00
1,2-Dichloroethane	107-06-2	1,250 U	0.00	4,840 U	0.00	9,670 U	0.00
1,2-Dichloropropane	78-87-5	1,420 U	0.00	5,520 U	0.00	11,000 U	0.00
1,3,5-Trimethylbenzene	108-67-8	2,090	0.50	10,000	3.56	55,200	18.34
1,3-Butadiene	106-99-0	683 U	0.00	2,640 U	0.00	5,290 U	0.00
1,3-Dichlorobenzene	541-73-1	4,640 U	0.00	18,000 U	0.00	36,000 U	0.00
1,4-Dichlorobenzene	106-46-7	4,640 U	0.00	18,000 U	0.00	36,000 U	0.00
2-Butanone (MEK)	78-93-3	4,550 U	0.00	17,600 U	0.00	35,300 U	0.00
2-Hexanone	591-78-6	6,310 U	0.00	24,400 U	0.00	48,900 U	0.00
2-Propanol	67-63-0	3,790 U	0.00	14,700 U	0.00	29,400 U	0.00
4-Ethyltoluene	622-96-8	3,790 U	0.00	14,700 U	0.00	29,400 U	0.00
4-Methyl-2-pentanone (MIBK)	108-10-1	6,310 U	0.00	24,400 U	0.00	48,900 U	0.00
Acetone	67-64-1	9,160 U	0.00	35,500 U	0.00	71,000 U	0.00
Benzene	71-43-2	36,400	8.77	114,000	40.58	50,200	16.68
Benzyl chloride	100-44-7	3,990 U	0.00	15,500 U	0.00	30,900 U	0.00
Bromodichloromethane	75-27-4	2,060 U	0.00	7,990 U	0.00	16,000 U	0.00
Bromoform	75-25-2	7,960 U	0.00	30,800 U	0.00	61,700 U	0.00
Bromomethane	74-83-9	1,200 U	0.00	4,640 U	0.00	9,270 U	0.00
Carbon disulfide	75-15-0	960 U	0.00	3,720 U	0.00	7,440 U	0.00
Carbon tetrachloride	56-23-5	1,940 U	0.00	7,520 U	0.00	15,000 U	0.00
Chlorobenzene	108-90-7	1,420 U	0.00	5,500 U	0.00	11,000 U	0.00
Chloroethane	75-00-3	813 U	0.00	7,880 U	0.00	6,300 U	0.00
Chloroform	67-66-3	752 U	0.00	2,910 U	0.00	5,830 U	0.00
Chloromethane	74-87-3	637 U	0.00	2,470 U	0.00	4,940 U	0.00
cis-1,2-Dichloroethene	156-59-2	1,220 U	0.00	4,740 U	0.00	9,470 U	0.00
cis-1,3-Dichloropropene	10061-01-5	3,500 U	0.00	13,600 U	0.00	27,100 U	0.00
Cyclohexane	110-82-7	2,650 U	0.00	10,300 U	0.00	20,600 U	0.00
Dibromochloromethane	124-48-1	2,620 U	0.00	10,200 U	0.00	20,300 U	0.00
Dichlorodifluoromethane	75-71-8	1,530 U	0.00	5,930 U	0.00	11,900 U	0.00
Dichlorotetrafluoroethane	76-14-2	2,150 U	0.00	8,340 U	0.00	16,700 U	0.00
Ethanol	64-17-5	2,910 U	0.00	11,300 U	0.00	22,600 U	0.00
Ethyl acetate	141-78-6	1,110 U	0.00	4,310 U	0.00	8,610 U	0.00
Ethylbenzene	100-41-4	19,400	4.68	59,700	21.25	45,800	15.22
Hexachloro-1,3-butadiene	87-68-3	8,220 U	0.00	31,800 U	0.00	63,700 U	0.00
m&p-Xylene	179601-23-1	75,500	18.20	262,000	93.25	380,000	126.25
Methylene Chloride	75-09-2	5,350 U	0.00	20,700 U	0.00	41,500 U	0.00
Methyl-tert-butyl ether	1634-04-4	5,550 U	0.00	21,500 U	0.00	43,000 U	0.00
Naphthalene	91-20-3	4,030 U	0.00	15,600 U	0.00	31,300 U	0.00
n-Heptane	142-82-5	66,900	16.12	292,000	103.93	157,000	52.16
n-Hexane	110-54-3	190,000	45.79	587,000	208.93	300,000	99.67
o-Xylene	95-47-6	16,700	4.02	58,000	20.64	126,000	41.86
Propylene	115-07-1	1,330 U	0.00	5,140 U	0.00	10,300 U	0.00
Styrene	100-42-5	1,310 U	0.00	5,090 U	0.00	10,200 U	0.00
Tetrachloroethene	127-18-4	1,050 U	0.00	4,050 U	0.00	13,000	4.32
Tetrahydrofuran	109-99-9	910 U	0.00	3,530 U	0.00	7,050 U	0.00
Toluene	108-88-3	22,200	5.35	57,000	20.29	43,200	14.35
trans-1,2-Dichloroethene	156-60-5	1,220 U	0.00	4,740 U	0.00	9,470 U	0.00
trans-1,3-Dichloropropene	10061-02-6	3,500 U	0.00	13,600 U	0.00	27,100 U	0.00
Trichloroethene	79-01-6	828 U	0.00	3,210 U	0.00	6,420 U	0.00
Trichlorofluoromethane	75-69-4	1,730 U	0.00	6,700 U	0.00	13,400 U	0.00
Vinyl acetate	108-05-4	1,090 U	0.00	4,210 U	0.00	8,410 U	0.00
Vinyl chloride	75-01-4	394 U	0.00	3,060 U	0.00	3,060 U	0.00
Total VOCs	--	--	103.99	--	515.90	--	411.66
Period Total VOC Mass Removed (lbs)		**104.0**		**515.9**		**411.7**	
Cumulative Total VOC Mass Removed (lbs)		**1,637**		**2,153**		**2,565**	

Appendix B
Historical Analytical Results and Contaminant Mass Removal - Vapor
Calumet Montana Refining, LLC - Great Falls, Montana

Location		SP301		SP301		SP301	
Ramboll Sample ID		CMR-SP301-220727		CMR-SP301-083122		CMR-SP301-083122	
Sample Date		7/27/2022		8/31/2022		9/30/2022[a]	
Blower Flow (scfm)		155		37		76	
Period Operational Time (hrs)		715		506		720	
Notes							
VOCs	**CAS No.**	**Result (ug/m^3)**	**Mass (lb)**	**Result (ug/m^3)**	**Mass (lb)**	**Result (ug/m^3)**	**Mass (lb)**
1,1,1-Trichloroethane	71-55-6	1,490 U	0.00	10,700 U	0.00	10,700 U	0.00
1,1,2,2-Tetrachloroethane	79-34-5	1,880 U	0.00	13,500 U	0.00	13,500 U	0.00
1,1,2-Trichloroethane	79-00-5	746 U	0.00	5,370 U	0.00	5,370 U	0.00
1,1,2-Trichlorotrifluoroethane	76-13-1	2,100 U	0.00	15,100 U	0.00	15,100 U	0.00
1,1-Dichloroethane	75-34-3	1,110 U	0.00	7,960 U	0.00	7,960 U	0.00
1,1-Dichloroethene	75-35-4	1,080 U	0.00	7,800 U	0.00	7,800 U	0.00
1,2,4-Trichlorobenzene	120-82-1	10,100 U	0.00	73,000 U	0.00	73,000 U	0.00
1,2,4-Trimethylbenzene	95-63-6	3,710	1.54	9,670 U	0.00	9,670 U	0.00
1,2-Dibromoethane (EDB)	106-93-4	1,050 U	0.00	7,560 U	0.00	7,560 U	0.00
1,2-Dichlorobenzene	95-50-1	4,110 U	0.00	29,600 U	0.00	29,600 U	0.00
1,2-Dichloroethane	107-06-2	1,110 U	0.00	7,960 U	0.00	7,960 U	0.00
1,2-Dichloropropane	78-87-5	1,260 U	0.00	9,090 U	0.00	9,090 U	0.00
1,3,5-Trimethylbenzene	108-67-8	2,610	1.08	10,100	0.71	10,100	2.08
1,3-Butadiene	106-99-0	605 U	0.00	4,350 U	0.00	4,350 U	0.00
1,3-Dichlorobenzene	541-73-1	4,110 U	0.00	29,600 U	0.00	29,600 U	0.00
1,4-Dichlorobenzene	106-46-7	4,110 U	0.00	29,600 U	0.00	29,600 U	0.00
2-Butanone (MEK)	78-93-3	4,030 U	0.00	29,000 U	0.00	29,000 U	0.00
2-Hexanone	591-78-6	5,590 U	0.00	40,300 U	0.00	40,300 U	0.00
2-Propanol	67-63-0	3,360 U	0.00	24,200 U	0.00	24,200 U	0.00
4-Ethyltoluene	622-96-8	3,360 U	0.00	24,200 U	0.00	24,200 U	0.00
4-Methyl-2-pentanone (MIBK)	108-10-1	5,590 U	0.00	40,300 U	0.00	40,300 U	0.00
Acetone	67-64-1	8,120 U	0.00	58,400 U	0.00	58,400 U	0.00
Benzene	71-43-2	3,710	1.54	42,900	3.02	42,900	8.84
Benzyl chloride	100-44-7	3,530 U	0.00	25,400 U	0.00	25,400 U	0.00
Bromodichloromethane	75-27-4	1,830 U	0.00	13,200 U	0.00	13,200 U	0.00
Bromoform	75-25-2	7,060 U	0.00	50,800 U	0.00	50,800 U	0.00
Bromomethane	74-83-9	1,060 U	0.00	7,630 U	0.00	7,630 U	0.00
Carbon disulfide	75-15-0	851 U	0.00	6,130 U	0.00	6,130 U	0.00
Carbon tetrachloride	56-23-5	1,720 U	0.00	12,400 U	0.00	12,400 U	0.00
Chlorobenzene	108-90-7	1,260 U	0.00	9,060 U	0.00	9,060 U	0.00
Chloroethane	75-00-3	720 U	0.00	5,190 U	0.00	5,190 U	0.00
Chloroform	67-66-3	667 U	0.00	4,800 U	0.00	4,800 U	0.00
Chloromethane	74-87-3	564 U	0.00	4,060 U	0.00	4,060 U	0.00
cis-1,2-Dichloroethene	156-59-2	1,080 U	0.00	7,800 U	0.00	7,800 U	0.00
cis-1,3-Dichloropropene	10061-01-5	3,100 U	0.00	22,400 U	0.00	22,400 U	0.00
Cyclohexane	110-82-7	2,350 U	0.00	16,900 U	0.00	16,900 U	0.00
Dibromochloromethane	124-48-1	2,330 U	0.00	16,700 U	0.00	16,700 U	0.00
Dichlorodifluoromethane	75-71-8	1,360 U	0.00	9,770 U	0.00	9,770 U	0.00
Dichlorotetrafluoroethane	76-14-2	1,910 U	0.00	13,700 U	0.00	13,700 U	0.00
Ethanol	64-17-5	2,580 U	0.00	18,600 U	0.00	18,600 U	0.00
Ethyl acetate	141-78-6	985 U	0.00	7,090 U	0.00	7,090 U	0.00
Ethylbenzene	100-41-4	4,890	2.03	24,000	1.69	24,000	4.94
Hexachloro-1,3-butadiene	87-68-3	7,280 U	0.00	52,400 U	0.00	52,400 U	0.00
m&p-Xylene	179601-23-1	27,600	11.44	161,000	11.33	161,000	33.17
Methylene Chloride	75-09-2	4,740 U	0.00	34,200 U	0.00	34,200 U	0.00
Methyl-tert-butyl ether	1634-04-4	4,920 U	0.00	35,400 U	0.00	35,400 U	0.00
Naphthalene	91-20-3	4,490	1.86	25,700 U	0.00	25,700 U	0.00
n-Heptane	142-82-5	12,200	5.06	122,000	8.58	122,000	25.14
n-Hexane	110-54-3	22,000	9.12	209,000	14.70	209,000	43.06
o-Xylene	95-47-6	9,100	3.77	31,500	2.22	31,500	6.49
Propylene	115-07-1	1,180 U	0.00	8,470 U	0.00	8,470 U	0.00
Styrene	100-42-5	1,160 U	0.00	8,380 U	0.00	8,380 U	0.00
Tetrachloroethene	127-18-4	926 U	0.00	6,670 U	0.00	6,670 U	0.00
Tetrahydrofuran	109-99-9	806 U	0.00	5,810 U	0.00	5,810 U	0.00
Toluene	108-88-3	7,740	3.21	7,410 U	0.00	7,410 U	0.00
trans-1,2-Dichloroethene	156-60-5	1,080 U	0.00	7,800 U	0.00	7,800 U	0.00
trans-1,3-Dichloropropene	10061-02-6	3,100 U	0.00	22,400 U	0.00	22,400 U	0.00
Trichloroethene	79-01-6	734 U	0.00	5,280 U	0.00	5,280 U	0.00
Trichlorofluoromethane	75-69-4	1,530 U	0.00	11,000 U	0.00	11,000 U	0.00
Vinyl acetate	108-05-4	2,400 U	0.00	17,300 U	0.00	17,300 U	0.00
Vinyl chloride	75-01-4	349 U	0.00	2,520 U	0.00	2,520 U	0.00
Total VOCs	--	--	40.64	--	42.25	--	123.72
Period Total VOC Mass Removed (lbs)		**40.6**		**42.2**		**123.7**	
Cumulative Total VOC Mass Removed (lbs)		**2,605**		**2,648**		**2,771**	

Appendix B
Historical Analytical Results and Contaminant Mass Removal - Vapor
Calumet Montana Refining, LLC - Great Falls, Montana

Location		SP301		SP301		SP301		SP301
Ramboll Sample ID		CMR-SP301-221214		CMR-SP301-221214		CMR-SP301-221214		CMR-DS3-221214
Sample Date		10/31/2022		11/30/2022		12/14/2022		12/14/2022
Blower Flow (scfm)		22		11		88		--
Period Operational Time (hrs)		75		20		469		--
Notes								Field Duplicate
VOCs	CAS No.	Result (ug/m^3)	Mass (lb)	Result (ug/m^3)	Mass (lb)	Result (ug/m^3)	Mass (lb)	Result (ug/m^3)
1,1,1-Trichloroethane	71-55-6	4,310 U	0.00	4,310 U	0.00	4,310 U	0.00	2,810 U
1,1,2,2-Tetrachloroethane	79-34-5	5,430 U	0.00	5,430 U	0.00	5,430 U	0.00	3,550 U
1,1,2-Trichloroethane	79-00-5	2,150 U	0.00	2,150 U	0.00	2,150 U	0.00	1,410 U
1,1,2-Trichlorotrifluoroethane	76-13-1	6,050 U	0.00	6,050 U	0.00	6,050 U	0.00	3,960 U
1,1-Dichloroethane	75-34-3	3,190 U	0.00	3,190 U	0.00	3,190 U	0.00	2,090 U
1,1-Dichloroethene	75-35-4	3,130 U	0.00	3,130 U	0.00	3,130 U	0.00	2,040 U
1,2,4-Trichlorobenzene	120-82-1	29,200 U	0.00	29,200 U	0.00	29,200 U	0.00	19,100 U
1,2,4-Trimethylbenzene	95-63-6	5,870	0.04	5,870	0.00	5,870	0.90	3,400
1,2-Dibromoethane (EDB)	106-93-4	3,030 U	0.00	3,030 U	0.00	3,030 U	0.00	1,980 U
1,2-Dichlorobenzene	95-50-1	11,900 U	0.00	11,900 U	0.00	11,900 U	0.00	7,760 U
1,2-Dichloroethane	107-06-2	3,190 U	0.00	3,190 U	0.00	3,190 U	0.00	2,090 U
1,2-Dichloropropane	78-87-5	3,640 U	0.00	3,640 U	0.00	3,640 U	0.00	2,380 U
1,3,5-Trimethylbenzene	108-67-8	5,060	0.03	5,060	0.00	5,060	0.78	3,240
1,3-Butadiene	106-99-0	1,750 U	0.00	1,750 U	0.00	1,750 U	0.00	1,140 U
1,3-Dichlorobenzene	541-73-1	11,900 U	0.00	11,900 U	0.00	11,900 U	0.00	7,760 U
1,4-Dichlorobenzene	106-46-7	11,900 U	0.00	11,900 U	0.00	11,900 U	0.00	7,760 U
2-Butanone (MEK)	78-93-3	11,600 U	0.00	11,600 U	0.00	11,600 U	0.00	7,610 U
2-Hexanone	591-78-6	16,100 U	0.00	16,100 U	0.00	16,100 U	0.00	10,500 U
2-Propanol	67-63-0	9,700 U	0.00	9,700 U	0.00	9,700 U	0.00	6,340 U
4-Ethyltoluene	622-96-8	9,700 U	0.00	9,700 U	0.00	9,700 U	0.00	6,340 U
4-Methyl-2-pentanone (MIBK)	108-10-1	16,100 U	0.00	16,100 U	0.00	16,100 U	0.00	10,500 U
Acetone	67-64-1	23,400 U	0.00	23,400 U	0.00	23,400 U	0.00	15,300 U
Benzene	71-43-2	59,900	0.37	59,900	0.05	59,900	9.21	49,100
Benzyl chloride	100-44-7	10,200 U	0.00	10,200 U	0.00	10,200 U	0.00	6,670 U
Bromodichloromethane	75-27-4	5,270 U	0.00	5,270 U	0.00	5,270 U	0.00	3,450 U
Bromoform	75-25-2	20,400 U	0.00	20,400 U	0.00	20,400 U	0.00	13,300 U
Bromomethane	74-83-9	3,060 U	0.00	3,060 U	0.00	3,060 U	0.00	2,000 U
Carbon disulfide	75-15-0	2,460 U	0.00	2,460 U	0.00	2,460 U	0.00	1,610 U
Carbon tetrachloride	56-23-5	4,960 U	0.00	4,960 U	0.00	4,960 U	0.00	3,250 U
Chlorobenzene	108-90-7	3,630 U	0.00	3,630 U	0.00	3,630 U	0.00	2,370 U
Chloroethane	75-00-3	2,080 U	0.00	2,080 U	0.00	2,080 U	0.00	1,360 U
Chloroform	67-66-3	1,920 U	0.00	1,920 U	0.00	1,920 U	0.00	1,260 U
Chloromethane	74-87-3	1,630 U	0.00	1,630 U	0.00	1,630 U	0.00	1,070 U
cis-1,2-Dichloroethene	156-59-2	3,130 U	0.00	3,130 U	0.00	3,130 U	0.00	2,040 U
cis-1,3-Dichloropropene	10061-01-5	8,960 U	0.00	8,960 U	0.00	8,960 U	0.00	5,860 U
Cyclohexane	110-82-7	6,790 U	0.00	6,790 U	0.00	6,790 U	0.00	4,440 U
Dibromochloromethane	124-48-1	6,710 U	0.00	6,710 U	0.00	6,710 U	0.00	4,390 U
Dichlorodifluoromethane	75-71-8	3,920 U	0.00	3,920 U	0.00	3,920 U	0.00	2,560 U
Dichlorotetrafluoroethane	76-14-2	5,510 U	0.00	5,510 U	0.00	5,510 U	0.00	3,600 U
Ethanol	64-17-5	7,450 U	0.00	7,450 U	0.00	7,450 U	0.00	4,870 U
Ethyl acetate	141-78-6	2,840 U	0.00	2,840 U	0.00	2,840 U	0.00	1,860 U
Ethylbenzene	100-41-4	25,000	0.16	25,000	0.02	25,000	3.85	22,400
Hexachloro-1,3-butadiene	87-68-3	21,000 U	0.00	21,000 U	0.00	21,000 U	0.00	13,700 U
m&p-Xylene	179601-23-1	83,500	0.52	83,500	0.07	83,500	12.84	73,500
Methylene Chloride	75-09-2	13,700 U	0.00	13,700 U	0.00	13,700 U	0.00	8,950 U
Methyl-tert-butyl ether	1634-04-4	14,200 U	0.00	14,200 U	0.00	14,200 U	0.00	9,280 U
Naphthalene	91-20-3	10,300 U	0.00	10,300 U	0.00	10,300 U	0.00	6,750 U
n-Heptane	142-82-5	138,000	0.86	138,000	0.11	138,000	21.23	115,000
n-Hexane	110-54-3	209,000	1.30	209,000	0.17	209,000	32.15	169,000
o-Xylene	95-47-6	15,000	0.09	15,000	0.01	15,000	2.31	13,400
Propylene	115-07-1	3,390 U	0.00	3,390 U	0.00	3,390 U	0.00	2,220 U
Styrene	100-42-5	3,360 U	0.00	3,360 U	0.00	3,360 U	0.00	2,200 U
Tetrachloroethene	127-18-4	2,670 U	0.00	2,670 U	0.00	2,670 U	0.00	1,750 U
Tetrahydrofuran	109-99-9	2,330 U	0.00	2,330 U	0.00	2,330 U	0.00	1,520 U
Toluene	108-88-3	3,580	0.02	3,580	0.00	3,580	0.55	3,140
trans-1,2-Dichloroethene	156-60-5	3,130 U	0.00	3,130 U	0.00	3,130 U	0.00	2,040 U
trans-1,3-Dichloropropene	10061-02-6	8,960 U	0.00	8,960 U	0.00	8,960 U	0.00	5,860 U
Trichloroethene	79-01-6	2,120 U	0.00	2,120 U	0.00	2,120 U	0.00	1,380 U
Trichlorofluoromethane	75-69-4	4,420 U	0.00	4,420 U	0.00	4,420 U	0.00	2,890 U
Vinyl acetate	108-05-4	2,780 U	0.00	2,780 U	0.00	2,780 U	0.00	1,820 U
Vinyl chloride	75-01-4	1,010 U	0.00	1,010 U	0.00	1,010 U	0.00	659 U
Total VOCs	--	--	3.40	--	0.45	--	83.81	--
Period Total VOC Mass Removed (lbs)		**3.4**		**0.4**		**83.8**		**--**
Cumulative Total VOC Mass Removed (lbs)		**2,775**		**2,775**		**2,859**		**--**

Appendix B
Historical Analytical Results and Contaminant Mass Removal - Vapor
Calumet Montana Refining, LLC - Great Falls, Montana

Location		SP301		SP301		SP301	
Ramboll Sample ID		CMR-SP301-230130		CMR-SP301-230228		CMR-SP301-230321	
Sample Date		1/30/2023		2/28/2023		3/21/2023	
Blower Flow (scfm)		44		105		147	
Period Operational Time (hrs)		703		534		734	
Notes							
VOCs	**CAS No.**	**Result (ug/m^3)**	**Mass (lb)**	**Result (ug/m^3)**	**Mass (lb)**	**Result (ug/m^3)**	**Mass (lb)**
1,1,1-Trichloroethane	71-55-6	78 U	0.00	1,340 U	0.00	1 U	0.00
1,1,2,2-Tetrachloroethane	79-34-5	99 U	0.00	1,690 U	0.00	1 U	0.00
1,1,2-Trichloroethane	79-00-5	39 U	0.00	671 U	0.00	1 U	0.00
1,1,2-Trichlorotrifluoroethane	76-13-1	110 U	0.00	1,890 U	0.00	2 U	0.00
1,1-Dichloroethane	75-34-3	58 U	0.00	996 U	0.00	1 U	0.00
1,1-Dichloroethene	75-35-4	57 U	0.00	975 U	0.00	1 U	0.00
1,2,4-Trichlorobenzene	120-82-1	532 U	0.00	9,120 U	0.00	5 U	0.00
1,2,4-Trimethylbenzene	95-63-6	114	0.01	1,210 U	0.00	491 U	0.00
1,2-Dibromoethane (EDB)	106-93-4	55 U	0.00	945 U	0.00	2 U	0.00
1,2-Dichlorobenzene	95-50-1	216 U	0.00	3,700 U	0.00	1 U	0.00
1,2-Dichloroethane	107-06-2	58 U	0.00	996 U	0.00	1 U	0.00
1,2-Dichloropropane	78-87-5	66 U	0.00	1,140 U	0.00	1 U	0.00
1,3,5-Trimethylbenzene	108-67-8	144	0.02	1,210 U	0.00	388	0.16
1,3-Butadiene	106-99-0	32 U	0.00	544 U	0.00	4 U	0.00
1,3-Dichlorobenzene	541-73-1	216 U	0.00	3,700 U	0.00	1 U	0.00
1,4-Dichlorobenzene	106-46-7	216 U	0.00	3,700 U	0.00	1 U	0.00
2-Butanone (MEK)	78-93-3	212 U	0.00	3,630 U	0.00	4 U	0.00
2-Hexanone	591-78-6	293 U	0.00	5,030 U	0.00	5 U	0.00
2-Propanol	67-63-0	176 U	0.00	3,020 U	0.00	7	0.00
4-Ethyltoluene	622-96-8	176 U	0.00	3,020 U	0.00	205	0.08
4-Methyl-2-pentanone (MIBK)	108-10-1	293 U	0.00	5,030 U	0.00	5 U	0.00
Acetone	67-64-1	426 U	0.00	7,310 U	0.00	33	0.01
Benzene	71-43-2	884	0.10	1,120	0.24	303	0.12
Benzyl chloride	100-44-7	185 U	0.00	3,180 U	0.00	1 U	0.00
Bromodichloromethane	75-27-4	96 U	0.00	1,650 U	0.00	1 U	0.00
Bromoform	75-25-2	370 U	0.00	6,350 U	0.00	6 U	0.00
Bromomethane	74-83-9	56 U	0.00	954 U	0.00	1 U	0.00
Carbon disulfide	75-15-0	45 U	0.00	766 U	0.00	12	0.00
Carbon tetrachloride	56-23-5	90 U	0.00	1,550 U	0.00	1 U	0.00
Chlorobenzene	108-90-7	66 U	0.00	1,130 U	0.00	1 U	0.00
Chloroethane	75-00-3	38 U	0.00	648 U	0.00	1 U	0.00
Chloroform	67-66-3	35 U	0.00	600 U	0.00	1 U	0.00
Chloromethane	74-87-3	30 U	0.00	508 U	0.00	0 U	0.00
cis-1,2-Dichloroethene	156-59-2	57 U	0.00	975 U	0.00	1 U	0.00
cis-1,3-Dichloropropene	10061-01-5	163 U	0.00	2,790 U	0.00	1 U	0.00
Cyclohexane	110-82-7	123 U	0.00	2,120 U	0.00	8,020	3.24
Dibromochloromethane	124-48-1	122 U	0.00	2,090 U	0.00	2 U	0.00
Dichlorodifluoromethane	75-71-8	71 U	0.00	1,220 U	0.00	2	0.00
Dichlorotetrafluoroethane	76-14-2	100 U	0.00	1,720 U	0.00	1 U	0.00
Ethanol	64-17-5	212	0.02	2,320 U	0.00	35	0.01
Ethyl acetate	141-78-6	52 U	0.00	887 U	0.00	-- --	--
Ethylbenzene	100-41-4	566	0.07	1,070 U	0.00	1,040	0.42
Hexachloro-1,3-butadiene	87-68-3	382 U	0.00	6,560 U	0.00	7 U	0.00
m&p-Xylene	179601-23-1	4,970	0.57	2,140 U	0.00	-- --	--
Methylene Chloride	75-09-2	249 U	0.00	4,270 U	0.00	1 U	0.00
Methyl-tert-butyl ether	1634-04-4	258 U	0.00	4,430 U	0.00	1 U	0.00
Naphthalene	91-20-3	188 U	0.00	3,220 U	0.00	3 U	0.00
n-Heptane	142-82-5	1,780	0.21	2,700	0.57	3,590	1.45
n-Hexane	110-54-3	1,410	0.16	8,780	1.85	16,600	6.70
o-Xylene	95-47-6	1,220	0.14	1,070 U	0.00	958	0.39
Propylene	115-07-1	62 U	0.00	1,060 U	0.00	2 U	0.00
Styrene	100-42-5	61 U	0.00	1,050 U	0.00	1 U	0.00
Tetrachloroethene	127-18-4	49 U	0.00	833 U	0.00	1 U	0.00
Tetrahydrofuran	109-99-9	42 U	0.00	726 U	0.00	1 U	0.00
Toluene	108-88-3	656	0.08	927 U	0.00	942 U	0.00
trans-1,2-Dichloroethene	156-60-5	57 U	0.00	975 U	0.00	1 U	0.00
trans-1,3-Dichloropropene	10061-02-6	163 U	0.00	2,790 U	0.00	1 U	0.00
Trichloroethene	79-01-6	39 U	0.00	660 U	0.00	1 U	0.00
Trichlorofluoromethane	75-69-4	80 U	0.00	1,380 U	0.00	1 U	0.00
Vinyl acetate	108-05-4	51 U	0.00	866 U	0.00	1 U	0.00
Vinyl chloride	75-01-4	18 U	0.00	314 U	0.00	1 U	0.00
Total VOCs	--	--	1.38	--	2.65	--	12.59
Period Total VOC Mass Removed (lbs)		**1.4**		**2.7**		**12.6**	
Cumulative Total VOC Mass Removed (lbs)		**2,860**		**2,863**		**2,876**	

Appendix B
Historical Analytical Results and Contaminant Mass Removal - Vapor
Calumet Montana Refining, LLC - Great Falls, Montana

	Location	**SP301**		**SP301**		**SP301**	
	Ramboll Sample ID	**CMR-SP301-230531**		**CMR-SP301-230531**		**CMR-SP301-290623**	
	Sample Date	**4/30/2023**		**5/31/2023**		**6/29/2023**	
	Blower Flow (scfm)	**81**		**75**		**70**	
	Period Operational Time (hrs)	**533**		**510**		**449**	
	Notes						
VOCs	**CAS No.**	**Result (ug/m^3)**	**Mass (lb)**	**Result (ug/m^3)**	**Mass (lb)**	**Result (ug/m^3)**	**Mass (lb)**
1,1,1-Trichloroethane	71-55-6	1 U	0.00	1 U	0.00	1 U	0.00
1,1,2,2-Tetrachloroethane	79-34-5	275 U	0.00	275 U	0.00	1 U	0.00
1,1,2-Trichloroethane	79-00-5	1 U	0.00	1 U	0.00	1 U	0.00
1,1,2-Trichlorotrifluoroethane	76-13-1	2 U	0.00	2 U	0.00	2 U	0.00
1,1-Dichloroethane	75-34-3	1 U	0.00	1 U	0.00	1 U	0.00
1,1-Dichloroethene	75-35-4	1 U	0.00	1 U	0.00	1 U	0.00
1,2,4-Trichlorobenzene	120-82-1	933 U	0.00	933 U	0.00	5 U	0.00
1,2,4-Trimethylbenzene	95-63-6	196 U	0.00	196 U	0.00	4	0.00
1,2-Dibromoethane (EDB)	106-93-4	2 U	0.00	2 U	0.00	2 U	0.00
1,2-Dichlorobenzene	95-50-1	240 U	0.00	240 U	0.00	1 U	0.00
1,2-Dichloroethane	107-06-2	1 U	0.00	1 U	0.00	1 U	0.00
1,2-Dichloropropane	78-87-5	1 U	0.00	1 U	0.00	1 U	0.00
1,3,5-Trimethylbenzene	108-67-8	196 U	0.00	196 U	0.00	2	0.00
1,3-Butadiene	106-99-0	4 U	0.00	4 U	0.00	4 U	0.00
1,3-Dichlorobenzene	541-73-1	240 U	0.00	240 U	0.00	1 U	0.00
1,4-Dichlorobenzene	106-46-7	240 U	0.00	240 U	0.00	1 U	0.00
2-Butanone (MEK)	78-93-3	22	0.00	22	0.00	4 U	0.00
2-Hexanone	591-78-6	5 U	0.00	5 U	0.00	5 U	0.00
2-Propanol	67-63-0	13	0.00	13	0.00	3 U	0.00
4-Ethyltoluene	622-96-8	196 U	0.00	196 U	0.00	1 U	0.00
4-Methyl-2-pentanone (MIBK)	108-10-1	5 U	0.00	5 U	0.00	5 U	0.00
Acetone	67-64-1	3 U	0.00	3 U	0.00	3 U	0.00
Benzene	71-43-2	206	0.03	206	0.03	1 U	0.00
Benzyl chloride	100-44-7	208 U	0.00	208 U	0.00	1 U	0.00
Bromodichloromethane	75-27-4	1 U	0.00	1 U	0.00	1 U	0.00
Bromoform	75-25-2	1,240 U	0.00	1,240 U	0.00	6 U	0.00
Bromomethane	74-83-9	1 U	0.00	1 U	0.00	1 U	0.00
Carbon disulfide	75-15-0	6	0.00	6	0.00	1 U	0.00
Carbon tetrachloride	56-23-5	1 U	0.00	1 U	0.00	1 U	0.00
Chlorobenzene	108-90-7	1 U	0.00	1 U	0.00	1 U	0.00
Chloroethane	75-00-3	1 U	0.00	1 U	0.00	1 U	0.00
Chloroform	67-66-3	1 U	0.00	1 U	0.00	1 U	0.00
Chloromethane	74-87-3	0 U	0.00	0 U	0.00	1	0.00
cis-1,2-Dichloroethene	156-59-2	1 U	0.00	1 U	0.00	1 U	0.00
cis-1,3-Dichloropropene	10061-01-5	1 U	0.00	1 U	0.00	1 U	0.00
Cyclohexane	110-82-7	278	0.05	278	0.04	3,120	0.37
Dibromochloromethane	124-48-1	2 U	0.00	2 U	0.00	2 U	0.00
Dichlorodifluoromethane	75-71-8	3	0.00	3	0.00	2	0.00
Dichlorotetrafluoroethane	76-14-2	1 U	0.00	1 U	0.00	1 U	0.00
Ethanol	64-17-5	60	0.01	60	0.01	13	0.00
Ethyl acetate	141-78-6	-- --	--	-- --	--	-- --	--
Ethylbenzene	100-41-4	173 U	0.00	173 U	0.00	160	0.02
Hexachloro-1,3-butadiene	87-68-3	1,350 U	0.00	1,350 U	0.00	7 U	0.00
m&p-Xylene	179601-23-1	642	0.10	642	0.09	221	0.03
Methylene Chloride	75-09-2	1 U	0.00	1 U	0.00	1 U	0.00
Methyl-tert-butyl ether	1634-04-4	1 U	0.00	1 U	0.00	1 U	0.00
Naphthalene	91-20-3	660 U	0.00	660 U	0.00	3 U	0.00
n-Heptane	142-82-5	11,700	1.90	11,700	1.67	2,920	0.34
n-Hexane	110-54-3	1,700	0.28	1,700	0.24	9,270	1.09
o-Xylene	95-47-6	189	0.03	189	0.03	46	0.01
Propylene	115-07-1	27	0.00	27	0.00	15	0.00
Styrene	100-42-5	170 U	0.00	170 U	0.00	1 U	0.00
Tetrachloroethene	127-18-4	4	0.00	4	0.00	1 U	0.00
Tetrahydrofuran	109-99-9	1 U	0.00	1 U	0.00	1 U	0.00
Toluene	108-88-3	146	0.02	146	0.02	159	0.02
trans-1,2-Dichloroethene	156-60-5	1 U	0.00	1 U	0.00	1 U	0.00
trans-1,3-Dichloropropene	10061-02-6	1 U	0.00	1 U	0.00	1 U	0.00
Trichloroethene	79-01-6	1 U	0.00	1 U	0.00	1 U	0.00
Trichlorofluoromethane	75-69-4	1	0.00	1	0.00	1	0.00
Vinyl acetate	108-05-4	1 U	0.00	1 U	0.00	1 U	0.00
Vinyl chloride	75-01-4	1 U	0.00	1 U	0.00	1 U	0.00
Total VOCs	--	--	2.43	--	2.14	--	1.87
Period Total VOC Mass Removed (lbs)		**2.4**		**2.1**		**1.9**	
Cumulative Total VOC Mass Removed (lbs)		**2,878**		**2,880**		**2,882**	

Appendix B
Historical Analytical Results and Contaminant Mass Removal - Vapor
Calumet Montana Refining, LLC - Great Falls, Montana

Location		SP301		SP301		SP301	
Ramboll Sample ID		CMR-SP301-110723		CMR-SB-301-101223		CMR-SP301-122723	
Sample Date		7/11/2023		10/12/2023		12/27/2023	
Blower Flow (scfm)		78		26		41	
Period Operational Time (hrs)		310		238		595	
Notes							
VOCs	**CAS No.**	**Result (ug/m^3)**	**Mass (lb)**	**Result (ug/m^3)**	**Mass (lb)**	**Result (ug/m^3)**	**Mass (lb)**
1,1,1-Trichloroethane	71-55-6	22 U	0.00	1 U	0.00	1 U	0.00
1,1,2,2-Tetrachloroethane	79-34-5	28 U	0.00	550 U	0.00	1 U	0.00
1,1,2-Trichloroethane	79-00-5	22 U	0.00	1 U	0.00	1 U	0.00
1,1,2-Trichlorotrifluoroethane	76-13-1	31 U	0.00	2	0.00	2 U	0.00
1,1-Dichloroethane	75-34-3	16 U	0.00	1 U	0.00	1 U	0.00
1,1-Dichloroethene	75-35-4	16 U	0.00	1 U	0.00	1 U	0.00
1,2,4-Trichlorobenzene	120-82-1	93 U	0.00	1,870 U	0.00	5 U	0.00
1,2,4-Trimethylbenzene	95-63-6	638	0.06	795	0.02	59	0.01
1,2-Dibromoethane (EDB)	106-93-4	31 U	0.00	2 U	0.00	2 U	0.00
1,2-Dichlorobenzene	95-50-1	24 U	0.00	481 U	0.00	1 U	0.00
1,2-Dichloroethane	107-06-2	16 U	0.00	18	0.00	1 U	0.00
1,2-Dichloropropane	78-87-5	19 U	0.00	1 U	0.00	1 U	0.00
1,3,5-Trimethylbenzene	108-67-8	408	0.04	712	0.02	75	0.01
1,3-Butadiene	106-99-0	89 U	0.00	4 U	0.00	4 U	0.00
1,3-Dichlorobenzene	541-73-1	24 U	0.00	481 U	0.00	1 U	0.00
1,4-Dichlorobenzene	106-46-7	24 U	0.00	481 U	0.00	1 U	0.00
2-Butanone (MEK)	78-93-3	74 U	0.00	81	0.00	11	0.00
2-Hexanone	591-78-6	102 U	0.00	5 U	0.00	5 U	0.00
2-Propanol	67-63-0	62 U	0.00	17	0.00	10	0.00
4-Ethyltoluene	622-96-8	287	0.03	445	0.01	27	0.00
4-Methyl-2-pentanone (MIBK)	108-10-1	102 U	0.00	5 U	0.00	5 U	0.00
Acetone	67-64-1	59 U	0.00	3 U	0.00	3 U	0.00
Benzene	71-43-2	3,550	0.32	25,700	0.59	348	0.03
Benzyl chloride	100-44-7	21 U	0.00	416 U	0.00	1 U	0.00
Bromodichloromethane	75-27-4	27 U	0.00	1 U	0.00	1 U	0.00
Bromoform	75-25-2	124 U	0.00	2,480 U	0.00	6 U	0.00
Bromomethane	74-83-9	16 U	0.00	1 U	0.00	1 U	0.00
Carbon disulfide	75-15-0	12 U	0.00	28	0.00	2	0.00
Carbon tetrachloride	56-23-5	25 U	0.00	1 U	0.00	1 U	0.00
Chlorobenzene	108-90-7	19 U	0.00	287	0.01	1 U	0.00
Chloroethane	75-00-3	11 U	0.00	2	0.00	1 U	0.00
Chloroform	67-66-3	20 U	0.00	1 U	0.00	1 U	0.00
Chloromethane	74-87-3	8 U	0.00	9	0.00	0 U	0.00
cis-1,2-Dichloroethene	156-59-2	16 U	0.00	1 U	0.00	1 U	0.00
cis-1,3-Dichloropropene	10061-01-5	18 U	0.00	1 U	0.00	1 U	0.00
Cyclohexane	110-82-7	6,100	0.55	3,550	0.08	479	0.04
Dibromochloromethane	124-48-1	34 U	0.00	2 U	0.00	2 U	0.00
Dichlorodifluoromethane	75-71-8	20 U	0.00	2	0.00	2	0.00
Dichlorotetrafluoroethane	76-14-2	28 U	0.00	1 U	0.00	1 U	0.00
Ethanol	64-17-5	94 U	0.00	42	0.00	43	0.00
Ethyl acetate	141-78-6	-- --	--	-- --	--	-- --	--
Ethylbenzene	100-41-4	2,310	0.21	1,530	0.04	100	0.01
Hexachloro-1,3-butadiene	87-68-3	135 U	0.00	2,690 U	0.00	7 U	0.00
m&p-Xylene	179601-23-1	7,720	0.70	8,710	0.20	590	0.05
Methylene Chloride	75-09-2	14 U	0.00	1 U	0.00	1 U	0.00
Methyl-tert-butyl ether	1634-04-4	14 U	0.00	1 U	0.00	1 U	0.00
Naphthalene	91-20-3	66 U	0.00	1,320 U	0.00	3 U	0.00
n-Heptane	142-82-5	7,360	0.66	3,800	0.09	182	0.02
n-Hexane	110-54-3	15,700	1.42	5,850	0.13	395	0.04
o-Xylene	95-47-6	2,130	0.19	2,150	0.05	162	0.01
Propylene	115-07-1	43 U	0.00	122	0.00	2 U	0.00
Styrene	100-42-5	17 U	0.00	340 U	0.00	1 U	0.00
Tetrachloroethene	127-18-4	27 U	0.00	1 U	0.00	1 U	0.00
Tetrahydrofuran	109-99-9	12 U	0.00	1 U	0.00	1 U	0.00
Toluene	108-88-3	618	0.06	753 U	0.00	2 U	0.00
trans-1,2-Dichloroethene	156-60-5	16 U	0.00	1 U	0.00	9	0.00
trans-1,3-Dichloropropene	10061-02-6	18 U	0.00	1 U	0.00	1 U	0.00
Trichloroethene	79-01-6	21 U	0.00	1 U	0.00	1 U	0.00
Trichlorofluoromethane	75-69-4	23 U	0.00	1	0.00	1	0.00
Vinyl acetate	108-05-4	14 U	0.00	2 U	0.00	2 U	0.00
Vinyl chloride	75-01-4	10 U	0.00	1 U	0.00	1 U	0.00
Total VOCs	--	--	4.22	--	1.24	--	0.23
Period Total VOC Mass Removed (lbs)		**4.2**		**1.2**		**0.2**	
Cumulative Total VOC Mass Removed (lbs)		**2,886**		**2,887**		**2,888**	

Appendix B
Summary of Analytical Results and Contaminant Mass Removal - Vapor
Calumet Montana Refining, LLC - Great Falls, Montana

1. Blower flowrate is continuously recorded by the system PLC. Average blower flowrate during the period is used for the calculations
2. Operational time during system start-up and comissioning (October, 2021 through December 2021) is the number of hours the system operated between each sampling event. Opertational time during the standard system opration (beginning January 2022) represents system runtime (in hour) for the month during with the sample was taken.
3. Results from November 19, 2021 and February 16, 2022 appear anomalously low as PID readings from these two events were consistent with PID readings from the other sampling events. Therfore, these results were rejected.
4. Sample was not collected during September 2022, therefore results from August 2022 were used for mass removal calculations.
5. Sample was not collected during October 2022 and November 2022, therefore results from December 2022 were used for mass removal calculations.
6. Sample collected for April 2023 was received by the lab outside the allowable vacuum range so sample was not analyzed; therefore results from May 2023 were used for mass removal calculations.
7. Samples were not collected in August and September 2023 due to system shutdown.
8. Samples were not collected in November 2023 due to system shutdown.

E: Analyte concentration exceeded the calibration range. The reported result is estimated.
R: Result rejected.
U: The analyte was not detected in the sample at the estimated detection limit.
VOCs : Volatile Organic Compounds
ug/m^3 : micrograms per cubic meter
Sample Calculation

$$\boldsymbol{Mass\ Removed}\ (\boldsymbol{lb}) = \mathbf{340000}\ \frac{\boldsymbol{ug}}{\boldsymbol{m^3}} \times\ \mathbf{10^{-6}}\ \frac{\boldsymbol{g}}{\boldsymbol{ug}}\ \times \frac{\mathbf{1}}{\mathbf{453.6}}\ \frac{\boldsymbol{lb}}{\boldsymbol{g}} \times \mathbf{41}\ \frac{\boldsymbol{ft^3}}{\boldsymbol{min}} \times \mathbf{0.02832}\ \frac{\boldsymbol{m^3}}{\boldsymbol{ft^3}} \times \mathbf{26}\ \boldsymbol{hr}\ \times \mathbf{60}\ \frac{\boldsymbol{min}}{\boldsymbol{hr}}$$

APPENDIX C

HISTORICAL ANALYTICAL RESULTS AND CONTAMINANT MASS REMOVAL - LIQUID

Appendix C
Historical Analytical Results and Contaminant Mass Removal - Liquid
Calumet Montana Refining, LLC - Great Falls, Montana

Location		SP200		SP200		SP200		SP200	
Ramboll Sample ID		CMR-SP200-211015		CMR-SP200-211208		CMR-SP200-220216		CMR-SP200-220411	
Sample Date		10/15/2021		12/8/2021		2/16/2022		4/11/2022	
Effluent Volume (L)*		21,138		43,176		80,754		137,543	
Notes									
Analyte	**CAS No.**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**
VOCs									
1,1,1-TRICHLOROETHANE	71-55-6	ND	--	ND	--	ND	--	ND	--
1,1,2,2-TETRACHLOROETHANE	79-34-5	ND	--	ND	--	ND	--	ND	--
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	76-13-1	ND	--	ND	--	ND	--	ND	--
1,1,2-TRICHLOROETHANE	79-00-5	ND	--	ND	--	ND	--	ND	--
1,1-DICHLOROETHANE	75-34-3	ND	--	ND	--	ND	--	ND	--
1,1-DICHLOROETHENE	75-35-4	ND	--	ND	--	ND	--	ND	--
1,2,3-TRICHLOROBENZENE	87-61-6	ND	--	ND	--	ND	--	ND	--
1,2,4-TRICHLOROBENZENE	120-82-1	ND	--	ND	--	ND	--	ND	--
1,2-DIBROMO-3-CHLOROPROPANE	96-12-8	ND	--	ND	--	ND	--	ND	--
1,2-DIBROMOETHANE	106-93-4	ND	--	ND	--	ND	--	ND	--
1,2-DICHLOROBENZENE	95-50-1	ND	--	ND	--	ND	--	ND	--
1,2-DICHLOROETHANE	107-06-2	ND	--	ND	--	ND	--	ND	--
1,2-DICHLOROPROPANE	78-87-5	ND	--	ND	--	ND	--	ND	--
1,3-DICHLOROBENZENE	541-73-1	ND	--	ND	--	ND	--	ND	--
1,4-DICHLOROBENZENE	106-46-7	ND	--	ND	--	ND	--	ND	--
1,4-DIOXANE	123-91-1	ND	--	ND	--	ND	--	ND	--
2-BUTANONE	78-93-3	ND	--	ND	--	ND	--	ND	--
2-HEXANONE	591-78-6	ND	--	ND	--	ND	--	ND	--
4-METHYL-2-PENTANONE	108-10-1	ND	--	ND	--	ND	--	ND	--
ACETONE	67-64-1	ND	--	ND	--	ND	--	ND	--
BENZENE	71-43-2	2,300	0.11	350	0.03	420	0.07	540	0.16
BROMOCHLOROMETHANE	74-97-5	ND	--	ND	--	ND	--	ND	--
BROMODICHLOROMETHANE	75-27-4	ND	--	ND	--	ND	--	ND	--
BROMOFORM	75-25-2	ND	--	ND	--	ND	--	ND	--
BROMOMETHANE	74-83-9	ND	--	ND	--	ND	--	ND	--
CARBON DISULFIDE	75-15-0	ND	--	ND	--	ND	--	ND	--
CARBON TETRACHLORIDE	56-23-5	ND	--	ND	--	ND	--	ND	--
CHLOROBENZENE	108-90-7	ND	--	ND	--	ND	--	ND	--
CHLOROETHANE	75-00-3	ND	--	ND	--	ND	--	ND	--
CHLOROFORM	67-66-3	ND	--	ND	--	ND	--	ND	--
CHLOROMETHANE	74-87-3	ND	--	ND	--	ND	--	ND	--
CIS-1,2-DICHLOROETHENE	156-59-2	ND	--	79	0.01	ND	--	ND	--
CIS-1,3-DICHLOROPROPENE	10061-01-5	ND	--	ND	--	ND	--	ND	--
CUMENE	98-82-8	ND	--	130	0.01	ND	--	ND	--
CYCLOHEXANE	110-82-7	160	0.01	72	0.01	ND	--	ND	--
DIBROMOCHLOROMETHANE	124-48-1	ND	--	ND	--	ND	--	ND	--
DICHLORODIFLUOROMETHANE	75-71-8	ND	--	ND	--	ND	--	ND	--
ETHYL BENZENE	100-41-4	1,100	0.05	730	0.07	450	0.08	590	0.18
M,P-XYLENE	179601-23-1	5,100	0.24	5,400	0.51	3,200	0.57	3,200	0.97
METHYL ACETATE	79-20-9	ND	--	ND	--	ND	--	ND	--
METHYL TERT-BUTYL ETHER	1634-04-4	ND	--	ND	--	ND	--	ND	--
METHYLCYCLOHEXANE	108-87-2	71	0.00	43	0.00	ND	--	ND	--
METHYLENE CHLORIDE	75-09-2	ND	--	ND	--	ND	--	ND	--
NAPHTHALENE	91-20-3	290	0.01	1,500	0.14	460	0.08	510	0.15
ORTHO-XYLENE	95-47-6	1,400	0.07	1,800	0.17	1,100	0.20	960	0.29
STYRENE	100-42-5	ND	--	ND	--	ND	--	ND	--
TETRACHLOROETHENE	127-18-4	ND	--	ND	--	ND	--	ND	--
TOLUENE	108-88-3	1,500	0.07	330	0.03	370	0.07	ND	--
TRANS-1,2-DICHLOROETHENE	156-60-5	ND	--	ND	--	ND	--	ND	--
TRANS-1,3-DICHLOROPROPENE	10061-02-6	ND	--	ND	--	ND	--	ND	--
TRICHLOROETHENE	79-01-6	ND	--	ND	--	ND	--	ND	--
TRICHLOROFLUOROMETHANE	75-69-4	ND	--	ND	--	ND	--	ND	--
VINYL CHLORIDE	75-01-4	ND	--	ND	--	ND	--	ND	--
XYLENES (TOTAL)	1330-20-7	6,500	0.30	--	--	--	--	--	--
Total VOCs	--	--	**0.86**	--	**0.99**	--	**1.07**	--	**1.76**
Period Total VOC Mass Removed (lbs)			**0.9**		**1.0**		**1.1**		**1.8**
Cumulative Total VOC Mass Removed (lbs)			**0.9**		**1.9**		**2.9**		**4.7**

Appendix C
Historical Analytical Results and Contaminant Mass Removal - Liquid
Calumet Montana Refining, LLC - Great Falls, Montana

Location		SP200		SP200		SP200		SP200	
Ramboll Sample ID		CMR-SP200-211015		CMR-SP200-211208		CMR-SP200-220216		CMR-SP200-220411	
Sample Date		10/15/2021		12/8/2021		2/16/2022		4/11/2022	
Effluent Volume (L)*		21,138		43,176		80,754		137,543	
Notes									
Analyte	**CAS No.**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**
SVOCs									
1,2,4,5-TETRACHLOROBENZENE	95-94-3	ND	--	ND	--	ND	--	ND	--
1,2,4-TRICHLOROBENZENE	120-82-1	ND	--	ND	--	ND	--	ND	--
1,2-DICHLOROBENZENE	95-50-1	ND	--	ND	--	ND	--	ND	--
1,3-DICHLOROBENZENE	541-73-1	ND	--	ND	--	ND	--	ND	--
1,4-DICHLOROBENZENE	106-46-7	ND	--	ND	--	ND	--	ND	--
2,2'-OXYBIS(1-CHLOROPROPANE)	108-60-1	ND	--	ND	--	ND	--	ND	--
2,3,4,6-TETRACHLOROPHENOL	58-90-2	ND	--	ND	--	ND	--	ND	--
2,4,5-TRICHLOROPHENOL	95-95-4	ND	--	ND	--	ND	--	ND	--
2,4,6-TRICHLOROPHENOL	88-06-2	ND	--	ND	--	ND	--	ND	--
2,4-DICHLOROPHENOL	120-83-2	ND	--	ND	--	ND	--	ND	--
2,4-DIMETHYLPHENOL	105-67-9	ND	--	ND	--	590	0.11	270	0.08
2,4-DINITROPHENOL	51-28-5	ND	--	ND	--	ND	--	ND	--
2,4-DINITROTOLUENE	121-14-2	ND	--	ND	--	ND	--	ND	--
2,6-DINITROTOLUENE	606-20-2	ND	--	ND	--	ND	--	ND	--
2-CHLORONAPHTHALENE	91-58-7	ND	--	ND	--	ND	--	ND	--
2-CHLOROPHENOL	95-57-8	ND	--	ND	--	ND	--	ND	--
2-METHYLNAPHTHALENE	91-57-6	710	0.03	9,700	0.92	710	0.13	340	0.10
2-METHYLPHENOL	95-48-7	ND	--	ND	--	ND	--	ND	--
2-NITROANILINE	88-74-4	ND	--	ND	--	ND	--	ND	--
2-NITROPHENOL	88-75-5	ND	--	ND	--	ND	--	ND	--
3,3'-DICHLOROBENZIDINE	91-94-1	ND	--	ND	--	ND	--	ND	--
3-NITROANILINE	99-09-2	ND	--	ND	--	ND	--	ND	--
4,6-DINITRO-2-METHYLPHENOL	534-52-1	ND	--	ND	--	ND	--	ND	--
4-BROMOPHENYL-PHENYL ETHER	101-55-3	ND	--	ND	--	ND	--	ND	--
4-CHLORO-3-METHYLPHENOL	59-50-7	ND	--	ND	--	ND	--	ND	--
4-CHLOROPHENYL-PHENYL ETHER	7005-72-3	ND	--	ND	--	ND	--	ND	--
4-METHYLPHENOL	106-44-5	ND	--	ND	--	ND	--	ND	--
4-NITROANILINE	100-01-6	ND	--	ND	--	ND	--	ND	--
4-NITROPHENOL	100-02-7	ND	--	ND	--	ND	--	ND	--
ACENAPHTHENE	83-32-9	ND	--	ND	--	14	0.00	ND	--
ACENAPHTHYLENE	208-96-8	38	0.00	ND	--	ND	--	ND	--
ANTHRACENE	120-12-7	ND	--	ND	--	ND	--	ND	--
BENZO(A)ANTHRACENE	56-55-3	ND	--	ND	--	ND	--	ND	--
BENZO(A)PYRENE	50-32-8	ND	--	ND	--	ND	--	ND	--
BENZO(B)FLUORANTHENE	205-99-2	ND	--	ND	--	ND	--	ND	--
BENZO(G,H,I)PERYLENE	191-24-2	ND	--	ND	--	ND	--	ND	--
BENZO(K)FLUORANTHENE	207-08-9	ND	--	ND	--	ND	--	ND	--
BIS(2-CHLOROETHOXY)METHANE	111-91-1	ND	--	ND	--	ND	--	ND	--
BIS(2-CHLOROETHYL) ETHER	111-44-4	ND	--	ND	--	ND	--	ND	--
BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	ND	--	ND	--	ND	--	ND	--
BUTYLBENZYLPHTHALATE	85-68-7	ND	--	ND	--	ND	--	ND	--
CARBAZOLE	86-74-8	ND	--	ND	--	ND	--	ND	--
CHRYSENE	218-01-9	ND	--	ND	--	ND	--	ND	--
DIBENZ(A,H)ANTHRACENE	53-70-3	ND	--	ND	--	ND	--	ND	--
DIBENZOFURAN	132-64-9	ND	--	ND	--	ND	--	ND	--
DIETHYLPHTHALATE	84-66-2	ND	--	ND	--	ND	--	ND	--
DIMETHYLPHTHALATE	131-11-3	ND	--	ND	--	ND	--	ND	--
DI-N-BUTYLPHTHALATE	84-74-2	ND	--	ND	--	ND	--	ND	--
DI-N-OCTYLPHTHALATE	117-84-0	ND	--	ND	--	ND	--	ND	--
FLUORANTHENE	206-44-0	ND	--	ND	--	ND	--	ND	--
FLUORENE	86-73-7	30	0.00	360	0.03	ND	--	13	0.00
HEXACHLOROBENZENE	118-74-1	ND	--	ND	--	ND	--	ND	--
HEXACHLOROBUTADIENE	87-68-3	ND	--	ND	--	ND	--	ND	--
HEXACHLOROCYCLOPENTADIENE	77-47-4	ND	--	ND	--	ND	--	ND	--
HEXACHLOROETHANE	67-72-1	ND	--	ND	--	ND	--	ND	--
INDENO(1,2,3-CD)PYRENE	193-39-5	ND	--	ND	--	ND	--	ND	--
ISOPHORONE	78-59-1	ND	--	ND	--	ND	--	ND	--
NAPHTHALENE	91-20-3	610	0.03	5,800	0.55	560	0.10	330	0.10
NITROBENZENE	98-95-3	ND	--	ND	--	ND	--	ND	--
N-NITROSO-DI-N-PROPYLAMINE	621-64-7	ND	--	ND	--	ND	--	ND	--
N-NITROSODIPHENYLAMINE	86-30-6	ND	--	ND	--	ND	--	ND	--
PENTACHLOROPHENOL	87-86-5	ND	--	ND	--	ND	--	ND	--
PHENANTHRENE	85-01-8	48	0.00	610	0.06	53	0.01	22	0.01
PHENOL	108-95-2	ND	--	ND	--	ND	--	47	0.01
PYRENE	129-00-0	12	0.00	110	0.01	7	0.00	3	0.00
Total SVOCs	--	--	**0.07**	--	**1.58**	--	**0.34**	--	**0.31**
Period Total SVOC Mass Removed (lbs)			**0.1**		**1.6**		**0.3**		**0.3**
Cumulative Total VOC Mass Removed (lbs)			**0.1**		**1.6**		**2.0**		**2.3**

Appendix C
Historical Analytical Results and Contaminant Mass Removal - Liquid
Calumet Montana Refining, LLC - Great Falls, Montana

Location		SP200		SP200		SP200		SP200	
Ramboll Sample ID		CMR-SP200-211015		CMR-SP200-211208		CMR-SP200-220216		CMR-SP200-220411	
Sample Date		10/15/2021		12/8/2021		2/16/2022		4/11/2022	
Effluent Volume (L)*		21,138		43,176		80,754		137,543	
Notes									
Analyte	**CAS No.**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**
EPH									
C11 THROUGH C22 AROMATIC HYDROCARBONS	C11-C22-AROM	89,000	4.15	32,000	3.05	81,000	14.42	56,000	16.98
C19 THROUGH C36 ALIPHATIC HYDROCARBONS	C19-C36-ALIP	50,000	2.33	28,000	2.67	55,000	9.79	17,000	5.15
C9 THROUGH C18 ALIPHATIC HYDROCARBONS	C09-C18-ALIP	190,000	8.85	130,000	12.37	320,000	56.97	87,000	26.38
TOTAL EXTRACTABLE HYDROCARBON (POST FRACTIONATION)	68334-30-5S	330,000	15.38	--	--	460,000	81.89	160,000	48.52
TOTAL EXTRACTABLE HYDROCARBON	68334-30-5E	410,000	19.11	210,000	19.99	460,000	81.89	160,000	48.52
Total EPHs	--	--	**19.11**	--	**19.99**	--	**81.89**	--	**48.52**
Period Total EPH Mass Removed (lbs)			**19.1**		**20.0**		**81.9**		**48.5**
Cumulative Total EPH Mass Removed (lbs)			**19.1**		**39.1**		**121.0**		**169.5**
VPH									
BENZENE	71-43-2	1,800	0.08	230	0.02	480	0.09	430	0.13
C5 THROUGH C8 ALIPHATIC HYDROCARBONS (ADJUSTED)	C05-C08-ALIP-J	3,900	0.18	2,600	0.25	12,000	2.14	1,500	0.45
C9 THROUGH C10 AROMATIC HYDROCARBONS	C09-C10-AROM	9,300	0.43	40,000	3.81	88,000	15.67	9,400	2.85
C9 THROUGH C12 ALIPHATIC HYDROCARBONS (ADJUSTED)	C09-C12-ALIP-J	9,400	0.44	26,000	2.47	130,000	23.14	6,800	2.06
ETHYL BENZENE	100-41-4	990	0.05	650	0.06	1,200	0.21	600	0.18
M,P-XYLENE	179601-23-1	4,100	0.19	4,100	0.39	5,900	1.05	3,200	0.97
METHYL TERT-BUTYL ETHER	1634-04-4	ND	--	ND	--	ND	--	ND	--
NAPHTHALENE	91-20-3	510	0.02	2,300	0.22	5,200	0.93	470	0.14
ORTHO-XYLENE	95-47-6	1,300	0.06	1,700	0.16	2,200	0.39	1,000	0.30
TOLUENE	108-88-3	1,100	0.05	300	0.03	530	0.09	300	0.09
TOTAL PETROLEUM HYDROCARBONS	TPH	32,000	1.49	72,000	6.85	200,000	35.61	23,000	6.97
Total VPHss	--	--	**1.49**	--	**6.85**	--	**35.61**	--	**6.97**
Period Total VPH Mass Removed (lbs)			**1.5**		**6.9**		**35.6**		**7.0**
Cumulative Total VPH Mass Removed (lbs)			**1.5**		**8.3**		**44.0**		**50.9**

Appendix C
Historical Analytical Results and Contaminant Mass Removal - Liquid
Calumet Montana Refining, LLC - Great Falls, Montana

Location		SP200		SP200		SP200		SP200	
Ramboll Sample ID		CMR-SP200-220517		CMR-SP200-220617		CMR-SP200-220727		CMR-SP200-220830	
Sample Date		5/17/2022		6/17/2022		7/27/2022		8/30/2022	
Effluent Volume (L)*		0		126,978		76,011		31,926	
Notes									
Analyte	**CAS No.**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**
VOCs									
1,1,1-TRICHLOROETHANE	71-55-6	ND R	--	ND	--	ND	--	ND	--
1,1,2,2-TETRACHLOROETHANE	79-34-5	ND R	--	ND	--	ND	--	ND	--
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	76-13-1	ND R	--	ND	--	ND	--	ND	--
1,1,2-TRICHLOROETHANE	79-00-5	ND R	--	ND	--	ND	--	ND	--
1,1-DICHLOROETHANE	75-34-3	ND R	--	ND	--	ND	--	ND	--
1,1-DICHLOROETHENE	75-35-4	ND R	--	ND	--	ND	--	ND	--
1,2,3-TRICHLOROBENZENE	87-61-6	ND R	--	ND	--	ND	--	ND	--
1,2,4-TRICHLOROBENZENE	120-82-1	ND R	--	ND	--	ND	--	ND	--
1,2-DIBROMO-3-CHLOROPROPANE	96-12-8	ND R	--	ND	--	ND	--	ND	--
1,2-DIBROMOETHANE	106-93-4	ND R	--	ND	--	ND	--	ND	--
1,2-DICHLOROBENZENE	95-50-1	ND R	--	ND	--	ND	--	ND	--
1,2-DICHLOROETHANE	107-06-2	ND R	--	ND	--	ND	--	ND	--
1,2-DICHLOROPROPANE	78-87-5	ND R	--	ND	--	ND	--	ND	--
1,3-DICHLOROBENZENE	541-73-1	ND R	--	ND	--	ND	--	ND	--
1,4-DICHLOROBENZENE	106-46-7	ND R	--	ND	--	ND	--	ND	--
1,4-DIOXANE	123-91-1	ND R	--	ND	--	ND	--	ND	--
2-BUTANONE	78-93-3	ND R	--	ND	--	ND	--	26	0.00
2-HEXANONE	591-78-6	ND R	--	ND	--	ND	--	ND	--
4-METHYL-2-PENTANONE	108-10-1	ND R	--	ND	--	ND	--	ND	--
ACETONE	67-64-1	ND R	--	100	0.03	ND	--	91	0.01
BENZENE	71-43-2	310 R	--	120	0.03	19	0.00	94	0.01
BROMOCHLOROMETHANE	74-97-5	ND R	--	ND	--	ND	--	ND	--
BROMODICHLOROMETHANE	75-27-4	ND R	--	ND	--	ND	--	ND	--
BROMOFORM	75-25-2	ND R	--	ND	--	ND	--	ND	--
BROMOMETHANE	74-83-9	ND R	--	ND	--	ND	--	ND	--
CARBON DISULFIDE	75-15-0	ND R	--	ND	--	ND	--	ND	--
CARBON TETRACHLORIDE	56-23-5	ND R	--	ND	--	ND	--	ND	--
CHLOROBENZENE	108-90-7	ND R	--	ND	--	ND	--	ND	--
CHLOROETHANE	75-00-3	ND R	--	ND	--	ND	--	0	0.00
CHLOROFORM	67-66-3	ND R	--	ND	--	ND	--	ND	--
CHLOROMETHANE	74-87-3	ND R	--	ND	--	ND	--	0	0.00
CIS-1,2-DICHLOROETHENE	156-59-2	ND R	--	ND	--	ND	--	ND	--
CIS-1,3-DICHLOROPROPENE	10061-01-5	ND R	--	ND	--	ND	--	ND	--
CUMENE	98-82-8	ND R	--	99	0.03	22	0.00	58	0.00
CYCLOHEXANE	110-82-7	ND R	--	320	0.09	49	0.01	170	0.01
DIBROMOCHLOROMETHANE	124-48-1	ND R	--	ND	--	ND	--	ND	--
DICHLORODIFLUOROMETHANE	75-71-8	ND R	--	ND	--	ND	--	ND	--
ETHYL BENZENE	100-41-4	340 R	--	660	0.18	95	0.02	330	0.02
M,P-XYLENE	179601-23-1	2,600 R	--	8,200	2.30	1,900	0.32	2,500	0.18
METHYL ACETATE	79-20-9	ND R	--	ND	--	ND	--	ND	--
METHYL TERT-BUTYL ETHER	1634-04-4	ND R	--	ND	--	ND	--	ND	--
METHYLCYCLOHEXANE	108-87-2	ND R	--	340	0.10	50	0.01	220	0.02
METHYLENE CHLORIDE	75-09-2	ND R	--	ND	--	ND	--	ND	--
NAPHTHALENE	91-20-3	280 R	--	3,200	0.90	960	0.16	350	0.02
ORTHO-XYLENE	95-47-6	800 R	--	2,900	0.81	740	0.12	780	0.05
STYRENE	100-42-5	ND R	--	ND	--	ND	--	ND	--
TETRACHLOROETHENE	127-18-4	ND R	--	ND	--	ND	--	ND	--
TOLUENE	108-88-3	170 R	--	240	0.07	34	0.01	24	0.00
TRANS-1,2-DICHLOROETHENE	156-60-5	ND R	--	ND	--	ND	--	ND	--
TRANS-1,3-DICHLOROPROPENE	10061-02-6	ND R	--	ND	--	ND	--	ND	--
TRICHLOROETHENE	79-01-6	ND R	--	ND	--	ND	--	ND	--
TRICHLOROFLUOROMETHANE	75-69-4	ND R	--	ND	--	ND	--	ND	--
VINYL CHLORIDE	75-01-4	ND R	--	ND	--	ND	--	ND	--
XYLENES (TOTAL)	1330-20-7	-- R	--	--	--	--	--	--	--
Total VOCs	--	--	**0.00**	--	**4.53**	--	**0.65**	--	**0.33**
Period Total VOC Mass Removed (lbs)		**0.0**		**4.5**		**0.6**		**0.3**	
Cumulative Total VOC Mass Removed (lbs)		**4.7**		**9.2**		**9.9**		**10.2**	

Appendix C
Historical Analytical Results and Contaminant Mass Removal - Liquid
Calumet Montana Refining, LLC - Great Falls, Montana

Location		SP200		SP200		SP200		SP200	
Ramboll Sample ID		CMR-SP200-220517		CMR-SP200-220617		CMR-SP200-220727		CMR-SP200-220830	
Sample Date		5/17/2022		6/17/2022		7/27/2022		8/30/2022	
Effluent Volume (L)*		0		126,978		76,011		31,926	
Notes									
Analyte	**CAS No.**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**
SVOCs									
1,2,4,5-TETRACHLOROBENZENE	95-94-3	ND R	--	ND	--	--	--	--	--
1,2,4-TRICHLOROBENZENE	120-82-1	ND R	--	ND	--	--	--	--	--
1,2-DICHLOROBENZENE	95-50-1	ND R	--	ND	--	--	--	--	--
1,3-DICHLOROBENZENE	541-73-1	ND R	--	ND	--	--	--	--	--
1,4-DICHLOROBENZENE	106-46-7	ND R	--	ND	--	--	--	--	--
2,2'-OXYBIS(1-CHLOROPROPANE)	108-60-1	ND R	--	ND	--	ND	--	ND	--
2,3,4,6-TETRACHLOROPHENOL	58-90-2	ND R	--	ND	--	--	--	--	--
2,4,5-TRICHLOROPHENOL	95-95-4	ND R	--	ND	--	ND	--	ND	--
2,4,6-TRICHLOROPHENOL	88-06-2	ND R	--	ND	--	ND	--	ND	--
2,4-DICHLOROPHENOL	120-83-2	ND R	--	ND	--	ND	--	ND	--
2,4-DIMETHYLPHENOL	105-67-9	ND R	--	ND	--	ND	--	ND	--
2,4-DINITROPHENOL	51-28-5	ND R	--	ND	--	ND	--	ND	--
2,4-DINITROTOLUENE	121-14-2	ND R	--	ND	--	ND	--	ND	--
2,6-DINITROTOLUENE	606-20-2	ND R	--	ND	--	ND	--	ND	--
2-CHLORONAPHTHALENE	91-58-7	ND R	--	ND	--	ND	--	ND	--
2-CHLOROPHENOL	95-57-8	ND R	--	ND	--	ND	--	ND	--
2-METHYLNAPHTHALENE	91-57-6	20,000 R	--	2,400	0.67	2,000	0.34	21,000	1.48
2-METHYLPHENOL	95-48-7	ND R	--	ND	--	ND	--	ND	--
2-NITROANILINE	88-74-4	ND R	--	ND	--	ND	--	ND	--
2-NITROPHENOL	88-75-5	ND R	--	ND	--	ND	--	ND	--
3,3'-DICHLOROBENZIDINE	91-94-1	ND R	--	ND	--	ND	--	ND	--
3-NITROANILINE	99-09-2	ND R	--	ND	--	ND	--	ND	--
4,6-DINITRO-2-METHYLPHENOL	534-52-1	ND R	--	ND	--	ND	--	ND	--
4-BROMOPHENYL-PHENYL ETHER	101-55-3	ND R	--	ND	--	ND	--	ND	--
4-CHLORO-3-METHYLPHENOL	59-50-7	ND R	--	ND	--	ND	--	ND	--
4-CHLOROPHENYL-PHENYL ETHER	7005-72-3	ND R	--	ND	--	ND	--	ND	--
4-METHYLPHENOL	106-44-5	ND R	--	ND	--	ND	--	ND	--
4-NITROANILINE	100-01-6	ND R	--	ND	--	ND	--	ND	--
4-NITROPHENOL	100-02-7	ND R	--	ND	--	ND	--	ND	--
ACENAPHTHENE	83-32-9	380 R	--	93	0.03	ND	--	ND	--
ACENAPHTHYLENE	208-96-8	ND R	--	ND	--	ND	--	ND	--
ANTHRACENE	120-12-7	ND R	--	ND	--	ND	--	ND	--
BENZO(A)ANTHRACENE	56-55-3	ND R	--	ND	--	ND	--	ND	--
BENZO(A)PYRENE	50-32-8	ND R	--	ND	--	ND	--	ND	--
BENZO(B)FLUORANTHENE	205-99-2	ND R	--	ND	--	ND	--	ND	--
BENZO(G,H,I)PERYLENE	191-24-2	ND R	--	ND	--	ND	--	ND	--
BENZO(K)FLUORANTHENE	207-08-9	ND R	--	ND	--	ND	--	ND	--
BIS(2-CHLOROETHOXY)METHANE	111-91-1	ND R	--	ND	--	ND	--	ND	--
BIS(2-CHLOROETHYL) ETHER	111-44-4	ND R	--	ND	--	ND	--	ND	--
BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	ND R	--	ND	--	ND	--	ND	--
BUTYLBENZYLPHTHALATE	85-68-7	ND R	--	ND	--	ND	--	ND	--
CARBAZOLE	86-74-8	ND R	--	ND	--	ND	--	ND	--
CHRYSENE	218-01-9	ND R	--	ND	--	ND	--	ND	--
DIBENZ(A,H)ANTHRACENE	53-70-3	ND R	--	ND	--	ND	--	ND	--
DIBENZOFURAN	132-64-9	ND R	--	ND	--	ND	--	ND	--
DIETHYLPHTHALATE	84-66-2	ND R	--	ND	--	ND	--	ND	--
DIMETHYLPHTHALATE	131-11-3	ND R	--	ND	--	ND	--	ND	--
DI-N-BUTYLPHTHALATE	84-74-2	ND R	--	ND	--	ND	--	ND	--
DI-N-OCTYLPHTHALATE	117-84-0	ND R	--	ND	--	ND	--	ND	--
FLUORANTHENE	206-44-0	ND R	--	ND	--	ND	--	ND	--
FLUORENE	86-73-7	910 R	--	130	0.04	110	0.02	1,100	0.08
HEXACHLOROBENZENE	118-74-1	ND R	--	ND	--	ND	--	ND	--
HEXACHLOROBUTADIENE	87-68-3	ND R	--	ND	--	ND	--	ND	--
HEXACHLOROCYCLOPENTADIENE	77-47-4	ND R	--	ND	--	ND	--	ND	--
HEXACHLOROETHANE	67-72-1	ND R	--	ND	--	ND	--	ND	--
INDENO(1,2,3-CD)PYRENE	193-39-5	ND R	--	ND	--	ND	--	ND	--
ISOPHORONE	78-59-1	ND R	--	ND	--	ND	--	ND	--
NAPHTHALENE	91-20-3	12,000 R	--	1,100	0.31	830	0.14	9,800	0.69
NITROBENZENE	98-95-3	ND R	--	ND	--	ND	--	ND	--
N-NITROSO-DI-N-PROPYLAMINE	621-64-7	ND R	--	ND	--	ND	--	ND	--
N-NITROSODIPHENYLAMINE	86-30-6	ND R	--	ND	--	ND	--	ND	--
PENTACHLOROPHENOL	87-86-5	ND R	--	ND	--	ND	--	ND	--
PHENANTHRENE	85-01-8	1,500 R	--	250	0.07	230	0.04	2,000	0.14
PHENOL	108-95-2	ND R	--	ND	--	ND	--	ND	--
PYRENE	129-00-0	230 R	--	ND	--	44	0.01	ND	--
Total SVOCs	--	--	**0.00**	--	**1.11**	--	**0.54**	--	**2.39**
Period Total SVOC Mass Removed (lbs)		**0.0**		**1.1**		**0.5**		**2.4**	
Cumulative Total VOC Mass Removed (lbs)		**2.3**		**3.4**		**4.0**		**6.3**	

Appendix C
Historical Analytical Results and Contaminant Mass Removal - Liquid
Calumet Montana Refining, LLC - Great Falls, Montana

Location		SP200		SP200		SP200		SP200	
Ramboll Sample ID		CMR-SP200-220517		CMR-SP200-220617		CMR-SP200-220727		CMR-SP200-220830	
Sample Date		5/17/2022		6/17/2022		7/27/2022		8/30/2022	
Effluent Volume (L)*		0		126,978		76,011		31,926	
Notes									
Analyte	**CAS No.**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**
EPH									
C11 THROUGH C22 AROMATIC HYDROCARBONS	C11-C22-AROM	740,000 R	--	530,000	148.36	120,000	20.11	--	--
C19 THROUGH C36 ALIPHATIC HYDROCARBONS	C19-C36-ALIP	660,000 R	--	37,000	10.36	80,000	13.41	--	--
C9 THROUGH C18 ALIPHATIC HYDROCARBONS	C09-C18-ALIP	3,700,000 R	--	240,000	67.18	340,000	56.97	--	--
TOTAL EXTRACTABLE HYDROCARBON (POST FRACTIONATION)	68334-30-5S	5,100,000 R	--	810,000	226.75	540,000	90.49	--	--
TOTAL EXTRACTABLE HYDROCARBON	68334-30-5E	5,900,000 R	--	670,000	187.56	590,000	98.87	2,550,000	179.48
Total EPHs	--	--	**0.00**	--	**187.56**	--	**98.87**	--	**179.48**
Period Total EPH Mass Removed (lbs)		**0.0**		**187.6**		**98.9**		**179.5**	
Cumulative Total EPH Mass Removed (lbs)		**169.5**		**357.1**		**455.9**		**635.4**	
VPH									
BENZENE	71-43-2	330 R	--	58	0.02	ND	--	--	--
C5 THROUGH C8 ALIPHATIC HYDROCARBONS (ADJUSTED)	C05-C08-ALIP-J	2,600 R	--	1,300	0.36	ND	--	2,860	0.20
C9 THROUGH C10 AROMATIC HYDROCARBONS	C09-C10-AROM	29,000 R	--	20,000	5.60	5,700	0.96	--	--
C9 THROUGH C12 ALIPHATIC HYDROCARBONS (ADJUSTED)	C09-C12-ALIP-J	28,000 R	--	8,600	2.41	4,300	0.72	29,500	2.08
ETHYL BENZENE	100-41-4	510 R	--	110	0.03	ND	--	--	--
M,P-XYLENE	179601-23-1	3,200 R	--	1,300	0.36	310	0.05	--	--
METHYL TERT-BUTYL ETHER	1634-04-4	ND R	--	ND	--	ND	--	--	--
NAPHTHALENE	91-20-3	1,600 R	--	1,300	0.36	550	0.09	--	--
ORTHO-XYLENE	95-47-6	1,100 R	--	550	0.15	160	0.03	--	--
TOLUENE	108-88-3	180 R	--	52	0.01	ND	--	--	--
TOTAL PETROLEUM HYDROCARBONS	TPH	56,000 R	--	29,000	8.12	9,500	1.59	62,800	4.42
Total VPHss	--	--	**0.00**	--	**8.12**	--	**1.59**	--	**4.42**
Period Total VPH Mass Removed (lbs)		**0.0**		**8.1**		**1.6**		**4.4**	
Cumulative Total VPH Mass Removed (lbs)		**50.9**		**59.0**		**60.6**		**65.1**	

Appendix C
Historical Analytical Results and Contaminant Mass Removal - Liquid
Calumet Montana Refining, LLC - Great Falls, Montana

Location		SP200		SP200		SP200		SP200		SP200
Ramboll Sample ID		CMR-SP200-220830		CMR-SP200-221214		CMR-SP200-221214		CMR-SP200-221214		CMR-DS2-12/14/2022
Sample Date		9/30/2022		10/31/2022		11/30/2022		12/14/2022		--
Effluent Volume (L)*		39,179		4,319		17		159,877		
Notes										Field Duplicate
Analyte	**CAS No.**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**
VOCs										
1,1,1-TRICHLOROETHANE	71-55-6	ND	--	ND	--	ND	--	ND	--	ND
1,1,2,2-TETRACHLOROETHANE	79-34-5	ND	--	ND	--	ND	--	ND	--	ND
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	76-13-1	ND	--	ND	--	ND	--	ND	--	ND
1,1,2-TRICHLOROETHANE	79-00-5	ND	--	ND	--	ND	--	ND	--	ND
1,1-DICHLOROETHANE	75-34-3	ND	--	ND	--	ND	--	ND	--	ND
1,1-DICHLOROETHENE	75-35-4	ND	--	ND	--	ND	--	ND	--	ND
1,2,3-TRICHLOROBENZENE	87-61-6	ND	--	ND	--	ND	--	ND	--	ND
1,2,4-TRICHLOROBENZENE	120-82-1	ND	--	ND	--	ND	--	ND	--	ND
1,2-DIBROMO-3-CHLOROPROPANE	96-12-8	ND	--	ND	--	ND	--	ND	--	ND
1,2-DIBROMOETHANE	106-93-4	ND	--	ND	--	ND	--	ND	--	ND
1,2-DICHLOROBENZENE	95-50-1	ND	--	ND	--	ND	--	ND	--	ND
1,2-DICHLOROETHANE	107-06-2	ND	--	ND	--	ND	--	ND	--	ND
1,2-DICHLOROPROPANE	78-87-5	ND	--	ND	--	ND	--	ND	--	ND
1,3-DICHLOROBENZENE	541-73-1	ND	--	ND	--	ND	--	ND	--	ND
1,4-DICHLOROBENZENE	106-46-7	ND	--	ND	--	ND	--	ND	--	ND
1,4-DIOXANE	123-91-1	ND	--	ND	--	ND	--	ND	--	ND
2-BUTANONE	78-93-3	26	0.00	ND	--	ND	--	ND	--	ND
2-HEXANONE	591-78-6	ND	--	ND	--	ND	--	ND	--	ND
4-METHYL-2-PENTANONE	108-10-1	ND	--	ND	--	ND	--	ND	--	ND
ACETONE	67-64-1	91	0.01	ND	--	ND	--	ND	--	ND
BENZENE	71-43-2	94	0.01	200	0.00	200	0.00	200	0.07	180
BROMOCHLOROMETHANE	74-97-5	ND	--	ND	--	ND	--	ND	--	ND
BROMODICHLOROMETHANE	75-27-4	ND	--	ND	--	ND	--	ND	--	ND
BROMOFORM	75-25-2	ND	--	ND	--	ND	--	ND	--	ND
BROMOMETHANE	74-83-9	ND	--	ND	--	ND	--	ND	--	ND
CARBON DISULFIDE	75-15-0	ND	--	ND	--	ND	--	ND	--	ND
CARBON TETRACHLORIDE	56-23-5	ND	--	ND	--	ND	--	ND	--	ND
CHLOROBENZENE	108-90-7	ND	--	ND	--	ND	--	ND	--	ND
CHLOROETHANE	75-00-3	0	0.00	ND	--	ND	--	ND	--	ND
CHLOROFORM	67-66-3	ND	--	ND	--	ND	--	ND	--	ND
CHLOROMETHANE	74-87-3	0	0.00	ND	--	ND	--	ND	--	ND
CIS-1,2-DICHLOROETHENE	156-59-2	ND	--	ND	--	ND	--	ND	--	ND
CIS-1,3-DICHLOROPROPENE	10061-01-5	ND	--	ND	--	ND	--	ND	--	ND
CUMENE	98-82-8	58	0.01	81	0.00	81	0.00	81	0.03	21
CYCLOHEXANE	110-82-7	170	0.01	190	0.00	190	0.00	190	0.07	53
DIBROMOCHLOROMETHANE	124-48-1	ND	--	ND	--	ND	--	ND	--	ND
DICHLORODIFLUOROMETHANE	75-71-8	ND	--	ND	--	ND	--	ND	--	ND
ETHYL BENZENE	100-41-4	330	0.03	490	0.00	490	0.00	490	0.17	210
M,P-XYLENE	179601-23-1	2,500	0.22	2,700	0.03	2,700	0.00	2,700	0.95	1,000
METHYL ACETATE	79-20-9	ND	--	ND	--	ND	--	ND	--	ND
METHYL TERT-BUTYL ETHER	1634-04-4	ND	--	ND	--	ND	--	ND	--	ND
METHYLCYCLOHEXANE	108-87-2	220	0.02	240	0.00	240	0.00	240	0.08	52
METHYLENE CHLORIDE	75-09-2	ND	--	ND	--	ND	--	ND	--	ND
NAPHTHALENE	91-20-3	350	0.03	890	0.01	890	0.00	890	0.31	270
ORTHO-XYLENE	95-47-6	780	0.07	590	0.01	590	0.00	590	0.21	250
STYRENE	100-42-5	ND	--	ND	--	ND	--	ND	--	ND
TETRACHLOROETHENE	127-18-4	ND	--	ND	--	ND	--	ND	--	ND
TOLUENE	108-88-3	24	0.00	22	0.00	22	0.00	22	0.01	ND
TRANS-1,2-DICHLOROETHENE	156-60-5	ND	--	ND	--	ND	--	ND	--	ND
TRANS-1,3-DICHLOROPROPENE	10061-02-6	ND	--	ND	--	ND	--	ND	--	ND
TRICHLOROETHENE	79-01-6	ND	--	ND	--	ND	--	ND	--	ND
TRICHLOROFLUOROMETHANE	75-69-4	ND	--	ND	--	ND	--	ND	--	ND
VINYL CHLORIDE	75-01-4	ND	--	ND	--	ND	--	ND	--	ND
XYLENES (TOTAL)	1330-20-7	--	--	--	--	--	--	--	--	--
Total VOCs	--	--	**0.40**	--	**0.05**	--	**0.00**	--	**1.90**	--
Period Total VOC Mass Removed (lbs)			**0.4**		**0.1**		**0.0**		**1.9**	--
Cumulative Total VOC Mass Removed (lbs)			**10.6**		**10.6**		**10.6**		**12.5**	--

Appendix C
Historical Analytical Results and Contaminant Mass Removal - Liquid
Calumet Montana Refining, LLC - Great Falls, Montana

Location		SP200		SP200		SP200		SP200		SP200
Ramboll Sample ID		CMR-SP200-220830		CMR-SP200-221214		CMR-SP200-221214		CMR-SP200-221214		CMR-DS2-12/14/2022
Sample Date		9/30/2022		10/31/2022		11/30/2022		12/14/2022		--
Effluent Volume (L)*		39,179		4,319		17		159,877		
Notes										Field Duplicate
Analyte	**CAS No.**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**
SVOCs										
1,2,4,5-TETRACHLOROBENZENE	95-94-3	--	--	--	--	--	--	--	--	--
1,2,4-TRICHLOROBENZENE	120-82-1	--	--	--	--	--	--	--	--	--
1,2-DICHLOROBENZENE	95-50-1	--	--	--	--	--	--	--	--	--
1,3-DICHLOROBENZENE	541-73-1	--	--	--	--	--	--	--	--	--
1,4-DICHLOROBENZENE	106-46-7	--	--	--	--	--	--	--	--	--
2,2'-OXYBIS(1-CHLOROPROPANE)	108-60-1	ND	--	ND	--	ND	--	ND	--	ND
2,3,4,6-TETRACHLOROPHENOL	58-90-2	--	--	--	--	--	--	--	--	--
2,4,5-TRICHLOROPHENOL	95-95-4	ND	--	ND	--	ND	--	ND	--	ND
2,4,6-TRICHLOROPHENOL	88-06-2	ND	--	ND	--	ND	--	ND	--	ND
2,4-DICHLOROPHENOL	120-83-2	ND	--	ND	--	ND	--	ND	--	ND
2,4-DIMETHYLPHENOL	105-67-9	ND	--	ND	--	ND	--	ND	--	ND
2,4-DINITROPHENOL	51-28-5	ND	--	ND	--	ND	--	ND	--	ND
2,4-DINITROTOLUENE	121-14-2	ND	--	ND	--	ND	--	ND	--	ND
2,6-DINITROTOLUENE	606-20-2	ND	--	ND	--	ND	--	ND	--	ND
2-CHLORONAPHTHALENE	91-58-7	ND	--	ND	--	ND	--	ND	--	ND
2-CHLOROPHENOL	95-57-8	ND	--	ND	--	ND	--	ND	--	ND
2-METHYLNAPHTHALENE	91-57-6	21,000	1.81	2,000	0.02	2,000	0.00	2,000	0.70	2,000
2-METHYLPHENOL	95-48-7	ND	--	ND	--	ND	--	ND	--	ND
2-NITROANILINE	88-74-4	ND	--	ND	--	ND	--	ND	--	ND
2-NITROPHENOL	88-75-5	ND	--	ND	--	ND	--	ND	--	ND
3,3'-DICHLOROBENZIDINE	91-94-1	ND	--	ND	--	ND	--	ND	--	ND
3-NITROANILINE	99-09-2	ND	--	ND	--	ND	--	ND	--	ND
4,6-DINITRO-2-METHYLPHENOL	534-52-1	ND	--	ND	--	ND	--	ND	--	ND
4-BROMOPHENYL-PHENYL ETHER	101-55-3	ND	--	ND	--	ND	--	ND	--	ND
4-CHLORO-3-METHYLPHENOL	59-50-7	ND	--	ND	--	ND	--	ND	--	ND
4-CHLOROPHENYL-PHENYL ETHER	7005-72-3	ND	--	ND	--	ND	--	ND	--	ND
4-METHYLPHENOL	106-44-5	ND	--	ND	--	ND	--	ND	--	ND
4-NITROANILINE	100-01-6	ND	--	ND	--	ND	--	ND	--	ND
4-NITROPHENOL	100-02-7	ND	--	ND	--	ND	--	ND	--	ND
ACENAPHTHENE	83-32-9	ND	--	51	0.00	51	0.00	51	0.02	ND
ACENAPHTHYLENE	208-96-8	ND	--	ND	--	ND	--	ND	--	ND
ANTHRACENE	120-12-7	ND	--	ND	--	ND	--	ND	--	ND
BENZO(A)ANTHRACENE	56-55-3	ND	--	ND	--	ND	--	ND	--	ND
BENZO(A)PYRENE	50-32-8	ND	--	ND	--	ND	--	ND	--	ND
BENZO(B)FLUORANTHENE	205-99-2	ND	--	ND	--	ND	--	ND	--	ND
BENZO(G,H,I)PERYLENE	191-24-2	ND	--	ND	--	ND	--	ND	--	ND
BENZO(K)FLUORANTHENE	207-08-9	ND	--	ND	--	ND	--	ND	--	ND
BIS(2-CHLOROETHOXY)METHANE	111-91-1	ND	--	ND	--	ND	--	ND	--	ND
BIS(2-CHLOROETHYL) ETHER	111-44-4	ND	--	ND	--	ND	--	ND	--	ND
BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	ND	--	ND	--	ND	--	ND	--	ND
BUTYLBENZYLPHTHALATE	85-68-7	ND	--	ND	--	ND	--	ND	--	ND
CARBAZOLE	86-74-8	ND	--	ND	--	ND	--	ND	--	ND
CHRYSENE	218-01-9	ND	--	ND	--	ND	--	ND	--	ND
DIBENZ(A,H)ANTHRACENE	53-70-3	ND	--	ND	--	ND	--	ND	--	ND
DIBENZOFURAN	132-64-9	ND	--	ND	--	ND	--	ND	--	ND
DIETHYLPHTHALATE	84-66-2	ND	--	ND	--	ND	--	ND	--	ND
DIMETHYLPHTHALATE	131-11-3	ND	--	ND	--	ND	--	ND	--	ND
DI-N-BUTYLPHTHALATE	84-74-2	ND	--	ND	--	ND	--	ND	--	ND
DI-N-OCTYLPHTHALATE	117-84-0	ND	--	ND	--	ND	--	ND	--	ND
FLUORANTHENE	206-44-0	ND	--	ND	--	ND	--	ND	--	ND
FLUORENE	86-73-7	1,100	0.10	170	0.00	170	0.00	170	0.06	110
HEXACHLOROBENZENE	118-74-1	ND	--	ND	--	ND	--	ND	--	ND
HEXACHLOROBUTADIENE	87-68-3	ND	--	ND	--	ND	--	ND	--	ND
HEXACHLOROCYCLOPENTADIENE	77-47-4	ND	--	ND	--	ND	--	ND	--	ND
HEXACHLOROETHANE	67-72-1	ND	--	ND	--	ND	--	ND	--	ND
INDENO(1,2,3-CD)PYRENE	193-39-5	ND	--	ND	--	ND	--	ND	--	ND
ISOPHORONE	78-59-1	ND	--	ND	--	ND	--	ND	--	ND
NAPHTHALENE	91-20-3	9,800	0.85	1,100	0.01	1,100	0.00	1,100	0.39	1,000
NITROBENZENE	98-95-3	ND	--	ND	--	ND	--	ND	--	ND
N-NITROSO-DI-N-PROPYLAMINE	621-64-7	ND	--	ND	--	ND	--	ND	--	ND
N-NITROSODIPHENYLAMINE	86-30-6	ND	--	ND	--	ND	--	ND	--	ND
PENTACHLOROPHENOL	87-86-5	ND	--	ND	--	ND	--	ND	--	ND
PHENANTHRENE	85-01-8	2,000	0.17	220	0.00	220	0.00	220	0.08	210
PHENOL	108-95-2	ND	--	ND	--	ND	--	ND	--	ND
PYRENE	129-00-0	ND	--	34	0.00	34	0.00	34	0.01	33
Total SVOCs	--	--	**2.93**	--	**0.03**	--	**0.00**	--	**1.26**	--
Period Total SVOC Mass Removed (lbs)			**2.9**		**0.0**		**0.0**		**1.3**	--
Cumulative Total VOC Mass Removed (lbs)			**9.3**		**9.3**		**9.3**		**10.6**	--

Appendix C
Historical Analytical Results and Contaminant Mass Removal - Liquid
Calumet Montana Refining, LLC - Great Falls, Montana

Location		SP200		SP200		SP200		SP200		SP200
Ramboll Sample ID		CMR-SP200-220830		CMR-SP200-221214		CMR-SP200-221214		CMR-SP200-221214		CMR-DS2-12/14/2022
Sample Date		9/30/2022		10/31/2022		11/30/2022		12/14/2022		--
Effluent Volume (L)*		39,179		4,319		17		159,877		Field Duplicate
Notes										
Analyte	**CAS No.**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**
EPH										
C11 THROUGH C22 AROMATIC HYDROCARBONS	C11-C22-AROM	--	--	103,000	0.98	103,000	0.00	103,000	36.30	--
C19 THROUGH C36 ALIPHATIC HYDROCARBONS	C19-C36-ALIP	--	--	50,100	0.48	50,100	0.00	50,100	17.66	--
C9 THROUGH C18 ALIPHATIC HYDROCARBONS	C09-C18-ALIP	--	--	264,000	2.51	264,000	0.01	264,000	93.05	--
TOTAL EXTRACTABLE HYDROCARBON (POST FRACTIONATION)	68334-30-5S	--	--	417,000	3.97	417,000	0.02	417,000	146.98	--
TOTAL EXTRACTABLE HYDROCARBON	68334-30-5E	2,550,000	220.25	362,000	3.45	362,000	0.01	362,000	127.59	--
Total EPHs	--	--	**220.25**	--	**3.45**	--	**0.01**	--	**127.59**	--
Period Total EPH Mass Removed (lbs)			**220.3**		**3.4**		**0.0**		**127.6**	--
Cumulative Total EPH Mass Removed (lbs)			**855.7**		**859.1**		**859.1**		**986.7**	--
VPH										
BENZENE	71-43-2	--	--	--	--	--	--	--	--	--
C5 THROUGH C8 ALIPHATIC HYDROCARBONS (ADJUSTED)	C05-C08-ALIP-J	2,860	0.25	ND	--	ND	--	ND	--	7,480
C9 THROUGH C10 AROMATIC HYDROCARBONS	C09-C10-AROM	--	--	--	--	--	--	--	--	--
C9 THROUGH C12 ALIPHATIC HYDROCARBONS (ADJUSTED)	C09-C12-ALIP-J	29,500	2.55	42,500	0.40	42,500	0.00	42,500	14.98	65,500
ETHYL BENZENE	100-41-4	--	--	--	--	--	--	--	--	--
M,P-XYLENE	179601-23-1	--	--	--	--	--	--	--	--	--
METHYL TERT-BUTYL ETHER	1634-04-4	--	--	--	--	--	--	--	--	--
NAPHTHALENE	91-20-3	--	--	--	--	--	--	--	--	--
ORTHO-XYLENE	95-47-6	--	--	--	--	--	--	--	--	--
TOLUENE	108-88-3	--	--	--	--	--	--	--	--	--
TOTAL PETROLEUM HYDROCARBONS	TPH	62,800	5.42	119,000	1.13	119,000	0.00	119,000	41.94	163,000
Total VPHss	--	--	**5.42**	--	**1.13**	--	**0.00**	--	**41.94**	--
Period Total VPH Mass Removed (lbs)			**5.4**		**1.1**		**0.0**		**41.9**	--
Cumulative Total VPH Mass Removed (lbs)			**70.5**		**71.6**		**71.6**		**113.6**	--

Appendix C
Historical Analytical Results and Contaminant Mass Removal - Liquid
Calumet Montana Refining, LLC - Great Falls, Montana

Location		SP200		SP200		SP200		SP200	
Ramboll Sample ID		CMR-SP200-230126		CMR-SP200-230228		CMR-SP200-230321		CMR-SP200-230503	
Sample Date		1/26/2023		2/28/2023		3/21/2023		5/3/2023	
Effluent Volume (L)*		88,291		48,336		89,975		127,742	
Notes									
Analyte	**CAS No.**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**
VOCs									
1,1,1-TRICHLOROETHANE	71-55-6	ND	--	ND	--	ND	--	ND	--
1,1,2,2-TETRACHLOROETHANE	79-34-5	ND	--	ND	--	ND	--	1.9	0.00
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	76-13-1	ND	--	ND	--	ND	--	ND	--
1,1,2-TRICHLOROETHANE	79-00-5	ND	--	ND	--	ND	--	ND	--
1,1-DICHLOROETHANE	75-34-3	ND	--	ND	--	ND	--	ND	--
1,1-DICHLOROETHENE	75-35-4	ND	--	ND	--	ND	--	ND	--
1,2,3-TRICHLOROBENZENE	87-61-6	ND	--	ND	--	ND	--	ND	--
1,2,4-TRICHLOROBENZENE	120-82-1	ND	--	ND	--	ND	--	ND	--
1,2-DIBROMO-3-CHLOROPROPANE	96-12-8	ND	--	ND	--	ND	--	ND	--
1,2-DIBROMOETHANE	106-93-4	ND	--	ND	--	ND	--	ND	--
1,2-DICHLOROBENZENE	95-50-1	ND	--	ND	--	ND	--	ND	--
1,2-DICHLOROETHANE	107-06-2	ND	--	ND	--	ND	--	ND	--
1,2-DICHLOROPROPANE	78-87-5	ND	--	ND	--	ND	--	ND	--
1,3-DICHLOROBENZENE	541-73-1	ND	--	ND	--	ND	--	ND	--
1,4-DICHLOROBENZENE	106-46-7	ND	--	ND	--	ND	--	ND	--
1,4-DIOXANE	123-91-1	ND	--	ND	--	ND	--	ND	--
2-BUTANONE	78-93-3	ND	--	ND	--	ND	--	18	0.01
2-HEXANONE	591-78-6	ND	--	ND	--	ND	--	9.8	0.00
4-METHYL-2-PENTANONE	108-10-1	ND	--	ND	--	ND	--	5	0.00
ACETONE	67-64-1	40	0.01	ND	--	ND	--	45	0.01
BENZENE	71-43-2	23	0.00	6	0.00	21	0.00	90	0.03
BROMOCHLOROMETHANE	74-97-5	ND	--	ND	--	ND	--	ND	--
BROMODICHLOROMETHANE	75-27-4	ND	--	ND	--	ND	--	0	0.00
BROMOFORM	75-25-2	5	0.00	ND	--	ND	--	ND	--
BROMOMETHANE	74-83-9	ND	--	ND	--	ND	--	ND	--
CARBON DISULFIDE	75-15-0	ND	--	ND	--	ND	--	ND	--
CARBON TETRACHLORIDE	56-23-5	ND	--	ND	--	ND	--	ND	--
CHLOROBENZENE	108-90-7	ND	--	ND	--	ND	--	ND	--
CHLOROETHANE	75-00-3	ND	--	ND	--	ND	--	ND	--
CHLOROFORM	67-66-3	ND	--	ND	--	ND	--	ND	--
CHLOROMETHANE	74-87-3	ND	--	ND	--	ND	--	ND	--
CIS-1,2-DICHLOROETHENE	156-59-2	ND	--	ND	--	ND	--	ND	--
CIS-1,3-DICHLOROPROPENE	10061-01-5	ND	--	ND	--	ND	--	ND	--
CUMENE	98-82-8	15	0.00	ND	--	ND	--	3	0.00
CYCLOHEXANE	110-82-7	39	0.01	ND	--	ND	--	5	0.00
DIBROMOCHLOROMETHANE	124-48-1	ND	--	ND	--	ND	--	ND	--
DICHLORODIFLUOROMETHANE	75-71-8	ND	--	ND	--	ND	--	ND	--
ETHYL BENZENE	100-41-4	34	0.01	ND	--	37	0.01	29	0.01
M,P-XYLENE	179601-23-1	1,000	0.19	100	0.01	240	0.05	140	0.04
METHYL ACETATE	79-20-9	ND	--	ND	--	ND	--	ND	--
METHYL TERT-BUTYL ETHER	1634-04-4	ND	--	ND	--	ND	--	ND	--
METHYLCYCLOHEXANE	108-87-2	44	0.01	ND	--	ND	--	5	0.00
METHYLENE CHLORIDE	75-09-2	ND	--	ND	--	ND	--	ND	--
NAPHTHALENE	91-20-3	1,300	0.25	130	0.01	110	0.02	61	0.02
ORTHO-XYLENE	95-47-6	310	0.06	48	0.01	81	0.02	40	0.01
STYRENE	100-42-5	ND	--	ND	--	ND	--	1	0.00
TETRACHLOROETHENE	127-18-4	ND	--	ND	--	ND	--	ND	--
TOLUENE	108-88-3	15	0.00	ND	--	20	0.00	11	0.00
TRANS-1,2-DICHLOROETHENE	156-60-5	ND	--	ND	--	ND	--	ND	--
TRANS-1,3-DICHLOROPROPENE	10061-02-6	ND	--	ND	--	ND	--	ND	--
TRICHLOROETHENE	79-01-6	ND	--	ND	--	ND	--	ND	--
TRICHLOROFLUOROMETHANE	75-69-4	ND	--	ND	--	ND	--	ND	--
VINYL CHLORIDE	75-01-4	ND	--	ND	--	ND	--	ND	--
XYLENES (TOTAL)	1330-20-7	--	--	--	--	--	--	--	--
Total VOCs	--	**--**	**0.55**	**--**	**0.03**	**--**	**0.10**	**--**	**0.13**
Period Total VOC Mass Removed (lbs)			**0.5**		**0.03**		**0.10**		**0.13**
Cumulative Total VOC Mass Removed (lbs)			**13.1**		**13.1**		**13.2**		**13.4**

Appendix C
Historical Analytical Results and Contaminant Mass Removal - Liquid
Calumet Montana Refining, LLC - Great Falls, Montana

Location		SP200		SP200		SP200		SP200	
Ramboll Sample ID		CMR-SP200-230126		CMR-SP200-230228		CMR-SP200-230321		CMR-SP200-230503	
Sample Date		1/26/2023		2/28/2023		3/21/2023		5/3/2023	
Effluent Volume (L)*		88,291		48,336		89,975		127,742	
Notes									
Analyte	**CAS No.**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**
SVOCs									
1,2,4,5-TETRACHLOROBENZENE	95-94-3	--	--	--	--	--	--	--	--
1,2,4-TRICHLOROBENZENE	120-82-1	--	--	--	--	--	--	--	--
1,2-DICHLOROBENZENE	95-50-1	--	--	--	--	--	--	--	--
1,3-DICHLOROBENZENE	541-73-1	--	--	--	--	--	--	--	--
1,4-DICHLOROBENZENE	106-46-7	--	--	--	--	--	--	--	--
2,2'-OXYBIS(1-CHLOROPROPANE)	108-60-1	ND	--	ND	--	ND	--	ND	--
2,3,4,6-TETRACHLOROPHENOL	58-90-2	--	--	--	--	--	--	--	--
2,4,5-TRICHLOROPHENOL	95-95-4	ND	--	ND	--	ND	--	ND	--
2,4,6-TRICHLOROPHENOL	88-06-2	ND	--	ND	--	ND	--	ND	--
2,4-DICHLOROPHENOL	120-83-2	ND	--	ND	--	ND	--	ND	--
2,4-DIMETHYLPHENOL	105-67-9	ND	--	ND	--	450	0.09	ND	--
2,4-DINITROPHENOL	51-28-5	ND	--	ND	--	ND	--	ND	--
2,4-DINITROTOLUENE	121-14-2	ND	--	ND	--	ND	--	ND	--
2,6-DINITROTOLUENE	606-20-2	ND	--	ND	--	ND	--	ND	--
2-CHLORONAPHTHALENE	91-58-7	ND	--	ND	--	ND	--	ND	--
2-CHLOROPHENOL	95-57-8	ND	--	ND	--	ND	--	ND	--
2-METHYLNAPHTHALENE	91-57-6	1,100	0.21	390	0.04	440	0.09	ND	--
2-METHYLPHENOL	95-48-7	ND	--	ND	--	ND	--	ND	--
2-NITROANILINE	88-74-4	ND	--	ND	--	ND	--	ND	--
2-NITROPHENOL	88-75-5	ND	--	ND	--	ND	--	ND	--
3,3'-DICHLOROBENZIDINE	91-94-1	ND	--	ND	--	ND	--	ND	--
3-NITROANILINE	99-09-2	ND	--	ND	--	ND	--	ND	--
4,6-DINITRO-2-METHYLPHENOL	534-52-1	ND	--	ND	--	ND	--	ND	--
4-BROMOPHENYL-PHENYL ETHER	101-55-3	ND	--	ND	--	ND	--	ND	--
4-CHLORO-3-METHYLPHENOL	59-50-7	ND	--	ND	--	ND	--	ND	--
4-CHLOROPHENYL-PHENYL ETHER	7005-72-3	ND	--	ND	--	ND	--	ND	--
4-METHYLPHENOL	106-44-5	ND	--	ND	--	ND	--	22	0.01
4-NITROANILINE	100-01-6	ND	--	ND	--	ND	--	ND	--
4-NITROPHENOL	100-02-7	ND	--	ND	--	ND	--	ND	--
ACENAPHTHENE	83-32-9	ND	--	10	0.00	ND	--	ND	--
ACENAPHTHYLENE	208-96-8	ND	--	ND	--	ND	--	ND	--
ANTHRACENE	120-12-7	ND	--	ND	--	ND	--	ND	--
BENZO(A)ANTHRACENE	56-55-3	ND	--	ND	--	ND	--	ND	--
BENZO(A)PYRENE	50-32-8	ND	--	ND	--	ND	--	ND	--
BENZO(B)FLUORANTHENE	205-99-2	ND	--	ND	--	ND	--	ND	--
BENZO(G,H,I)PERYLENE	191-24-2	ND	--	ND	--	ND	--	ND	--
BENZO(K)FLUORANTHENE	207-08-9	ND	--	ND	--	ND	--	ND	--
BIS(2-CHLOROETHOXY)METHANE	111-91-1	ND	--	ND	--	ND	--	ND	--
BIS(2-CHLOROETHYL) ETHER	111-44-4	ND	--	ND	--	ND	--	ND	--
BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	ND	--	ND	--	ND	--	17	0.00
BUTYLBENZYLPHTHALATE	85-68-7	ND	--	ND	--	ND	--	ND	--
CARBAZOLE	86-74-8	ND	--	ND	--	ND	--	ND	--
CHRYSENE	218-01-9	ND	--	ND	--	ND	--	ND	--
DIBENZ(A,H)ANTHRACENE	53-70-3	ND	--	ND	--	ND	--	ND	--
DIBENZOFURAN	132-64-9	ND	--	ND	--	ND	--	ND	--
DIETHYLPHTHALATE	84-66-2	ND	--	ND	--	ND	--	ND	--
DIMETHYLPHTHALATE	131-11-3	ND	--	ND	--	ND	--	ND	--
DI-N-BUTYLPHTHALATE	84-74-2	ND	--	ND	--	ND	--	ND	--
DI-N-OCTYLPHTHALATE	117-84-0	ND	--	ND	--	ND	--	ND	--
FLUORANTHENE	206-44-0	14	0.00	ND	--	ND	--	ND	--
FLUORENE	86-73-7	ND	--	29	0.00	ND	--	ND	--
HEXACHLOROBENZENE	118-74-1	ND	--	ND	--	ND	--	ND	--
HEXACHLOROBUTADIENE	87-68-3	ND	--	ND	--	ND	--	ND	--
HEXACHLOROCYCLOPENTADIENE	77-47-4	ND	--	ND	--	ND	--	ND	--
HEXACHLOROETHANE	67-72-1	ND	--	ND	--	ND	--	ND	--
INDENO(1,2,3-CD)PYRENE	193-39-5	ND	--	ND	--	ND	--	ND	--
ISOPHORONE	78-59-1	ND	--	ND	--	ND	--	ND	--
NAPHTHALENE	91-20-3	460	0.09	160	0.02	220	0.04	ND	--
NITROBENZENE	98-95-3	ND	--	ND	--	ND	--	ND	--
N-NITROSO-DI-N-PROPYLAMINE	621-64-7	ND	--	ND	--	ND	--	ND	--
N-NITROSODIPHENYLAMINE	86-30-6	ND	--	ND	--	ND	--	25	0.01
PENTACHLOROPHENOL	87-86-5	ND	--	ND	--	ND	--	ND	--
PHENANTHRENE	85-01-8	130	0.03	45	0.00	40	0.01	ND	--
PHENOL	108-95-2	ND	--	ND	--	ND	--	12	0.00
PYRENE	129-00-0	32	0.01	8	0.00	9	0.00	3	0.00
Total SVOCs	--	--	**0.34**	--	**0.07**	--	**0.23**	--	**0.02**
Period Total SVOC Mass Removed (lbs)			**0.3**		**0.1**		**0.2**		**0.0**
Cumulative Total VOC Mass Removed (lbs)			**10.9**		**11.0**		**11.2**		**11.2**

Appendix C
Historical Analytical Results and Contaminant Mass Removal - Liquid
Calumet Montana Refining, LLC - Great Falls, Montana

Location		SP200		SP200		SP200		SP200	
Ramboll Sample ID		CMR-SP200-230126		CMR-SP200-230228		CMR-SP200-230321		CMR-SP200-230503	
Sample Date		1/26/2023		2/28/2023		3/21/2023		5/3/2023	
Effluent Volume (L)*		88,291		48,336		89,975		127,742	
Notes									
Analyte	**CAS No.**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**
EPH									
C11 THROUGH C22 AROMATIC HYDROCARBONS	C11-C22-AROM	209,000	40.68	49,500	5.27	92,500	18.35	22,300	6.28
C19 THROUGH C36 ALIPHATIC HYDROCARBONS	C19-C36-ALIP	--	--	--	--	--	--	--	--
C9 THROUGH C18 ALIPHATIC HYDROCARBONS	C09-C18-ALIP	--	--	--	--	--	--	--	--
TOTAL EXTRACTABLE HYDROCARBON (POST FRACTIONATION)	68334-30-5S	713,000	138.78	200,000	21.31	560,000	111.08	99,100	27.91
TOTAL EXTRACTABLE HYDROCARBON	68334-30-5E	977,000	190.17	240,000	25.57	569,000	112.87	138,000	38.86
Total EPHs	--	--	**190.17**	--	**25.57**	--	**112.87**	--	**38.86**
Period Total EPH Mass Removed (lbs)			**190.2**		**25.6**		**112.9**		**38.9**
Cumulative Total EPH Mass Removed (lbs)			**1176.9**		**1202.5**		**1315.3**		**1354.2**
VPH									
BENZENE	71-43-2	--	--	--	--	--	--	--	--
C5 THROUGH C8 ALIPHATIC HYDROCARBONS (ADJUSTED)	C05-C08-ALIP-J	1,690	0.33	ND	--	894	0.18	718	0.20
C9 THROUGH C10 AROMATIC HYDROCARBONS	C09-C10-AROM	--	--	--	--	--	--	--	--
C9 THROUGH C12 ALIPHATIC HYDROCARBONS (ADJUSTED)	C09-C12-ALIP-J	38,400	7.47	42,000	4.48	10,500	2.08	8,120	2.29
ETHYL BENZENE	100-41-4	--	--	--	--	--	--	--	--
M,P-XYLENE	179601-23-1	--	--	--	--	--	--	--	--
METHYL TERT-BUTYL ETHER	1634-04-4	--	--	--	--	--	--	--	--
NAPHTHALENE	91-20-3	--	--	--	--	--	--	--	--
ORTHO-XYLENE	95-47-6	--	--	--	--	--	--	--	--
TOLUENE	108-88-3	--	--	--	--	--	--	--	--
TOTAL PETROLEUM HYDROCARBONS	TPH	76,500	14.89	85,600	9.12	21,100	4.19	15,700	4.42
Total VPHss	--	--	**14.89**	--	**9.12**	--	**4.19**	--	**4.42**
Period Total VPH Mass Removed (lbs)			**14.9**		**9.1**		**4.2**		**4.4**
Cumulative Total VPH Mass Removed (lbs)			**128.4**		**137.6**		**141.8**		**146.2**

Appendix C
Historical Analytical Results and Contaminant Mass Removal - Liquid
Calumet Montana Refining, LLC - Great Falls, Montana

Location		SP200		SP200		SP200		SP200		SP200	
Ramboll Sample ID		CMR-SP200-230531		CMR-SP200-290623		CMR-SP200-110723		CMQ-SP200-101223		CUR-SP200-122723	
Sample Date		5/31/2023		6/23/2023		7/11/2023		10/12/2023		12/27/2023	
Effluent Volume (L)*		151,878		306,490		125,244		33,349		54,067	
Notes											
Analyte	**CAS No.**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**
VOCs											
1,1,1-TRICHLOROETHANE	71-55-6	ND	--	ND	--	ND	--	ND	--	ND	--
1,1,2,2-TETRACHLOROETHANE	79-34-5	ND	--	ND	--	21	0.01	ND	--	ND	--
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	76-13-1	ND	--	ND	--	ND	--	ND	--	ND	--
1,1,2-TRICHLOROETHANE	79-00-5	ND	--	ND	--	ND	--	ND	--	ND	--
1,1-DICHLOROETHANE	75-34-3	ND	--	ND	--	ND	--	ND	--	ND	--
1,1-DICHLOROETHENE	75-35-4	ND	--	ND	--	ND	--	ND	--	ND	--
1,2,3-TRICHLOROBENZENE	87-61-6	ND	--	ND	--	ND	--	ND	--	ND	--
1,2,4-TRICHLOROBENZENE	120-82-1	ND	--	ND	--	ND	--	ND	--	ND	--
1,2-DIBROMO-3-CHLOROPROPANE	96-12-8	ND	--	ND	--	ND	--	ND	--	ND	--
1,2-DIBROMOETHANE	106-93-4	ND	--	ND	--	ND	--	ND	--	ND	--
1,2-DICHLOROBENZENE	95-50-1	ND	--	ND	--	ND	--	ND	--	ND	--
1,2-DICHLOROETHANE	107-06-2	ND	--	ND	--	ND	--	ND	--	ND	--
1,2-DICHLOROPROPANE	78-87-5	ND	--	ND	--	ND	--	ND	--	ND	--
1,3-DICHLOROBENZENE	541-73-1	ND	--	ND	--	ND	--	ND	--	ND	--
1,4-DICHLOROBENZENE	106-46-7	ND	--	ND	--	ND	--	ND	--	ND	--
1,4-DIOXANE	123-91-1	ND	--	ND	--	ND	--	--	--	--	--
2-BUTANONE	78-93-3	ND	--	ND	--	ND	--	ND	--	ND	--
2-HEXANONE	591-78-6	ND	--	ND	--	ND	--	--	--	ND	--
4-METHYL-2-PENTANONE	108-10-1	ND	--	ND	--	ND	--	ND	--	ND	--
ACETONE	67-64-1	ND	--	ND	--	ND	--	ND	--	ND	--
BENZENE	71-43-2	27	0.01	85	0.06	53	0.01	0.452	0.00003	300	0.0358
BROMOCHLOROMETHANE	74-97-5	ND	--	ND	--	ND	--	--	--	ND	--
BROMODICHLOROMETHANE	75-27-4	ND	--	ND	--	ND	--	ND	--	ND	--
BROMOFORM	75-25-2	ND	--	ND	--	ND	--	ND	--	ND	--
BROMOMETHANE	74-83-9	ND	--	ND	--	ND	--	ND	--	ND	--
CARBON DISULFIDE	75-15-0	ND	--	ND	--	ND	--	--	--	1.35	0.0002
CARBON TETRACHLORIDE	56-23-5	ND	--	ND	--	ND	--	ND	--	ND	--
CHLOROBENZENE	108-90-7	ND	--	ND	--	ND	--	ND	--	ND	--
CHLOROETHANE	75-00-3	ND	--	ND	--	ND	--	ND	--	ND	--
CHLOROFORM	67-66-3	ND	--	ND	--	ND	--	ND	--	ND	--
CHLOROMETHANE	74-87-3	ND	--	ND	--	ND	--	ND	--	ND	--
CIS-1,2-DICHLOROETHENE	156-59-2	ND	--	ND	--	ND	--	ND	--	ND	--
CIS-1,3-DICHLOROPROPENE	10061-01-5	ND	--	ND	--	ND	--	ND	--	ND	--
CUMENE	98-82-8	17	0.01	9	0.01	37	0.01	ND	--	3.42	0.0004
CYCLOHEXANE	110-82-7	16	0.01	ND	--	28	0.01	--	--	--	--
DIBROMOCHLOROMETHANE	124-48-1	ND	--	ND	--	ND	--	ND	--	ND	--
DICHLORODIFLUOROMETHANE	75-71-8	ND	--	ND	--	ND	--	ND	--	ND	--
ETHYL BENZENE	100-41-4	78	0.03	101	0.07	300	0.08	ND	--	23.70	0.0028
M,P-XYLENE	179601-23-1	770	0.26	--	--	1,500	0.41	--	--	--	--
METHYL ACETATE	79-20-9	ND	--	ND	--	ND	--	--	--	--	--
METHYL TERT-BUTYL ETHER	1634-04-4	ND	--	ND	--	ND	--	ND	--	ND	--
METHYLCYCLOHEXANE	108-87-2	19	0.01	ND	--	35	0.01	--	--	--	--
METHYLENE CHLORIDE	75-09-2	ND	--	ND	--	ND	--	ND	--	ND	--
NAPHTHALENE	91-20-3	760	0.25	--	--	430	0.12	0.357	0.00003	47.60	0.0057
ORTHO-XYLENE	95-47-6	270	0.09	157	0.11	550	0.15	--	--	--	--
STYRENE	100-42-5	ND	--	ND	--	17	0.00	ND	--	ND	--
TETRACHLOROETHENE	127-18-4	ND	--	ND	--	ND	--	ND	--	ND	--
TOLUENE	108-88-3	6	0.00	ND	--	29	0.01	ND	--	ND	--
TRANS-1,2-DICHLOROETHENE	156-60-5	ND	--	ND	--	ND	--	ND	--	ND	--
TRANS-1,3-DICHLOROPROPENE	10061-02-6	ND	--	ND	--	ND	--	ND	--	ND	--
TRICHLOROETHENE	79-01-6	ND	--	ND	--	ND	--	ND	--	ND	--
TRICHLOROFLUOROMETHANE	75-69-4	ND	--	ND	--	ND	--	ND	--	ND	--
VINYL CHLORIDE	75-01-4	ND	--	ND	--	ND	--	ND	--	ND	--
XYLENES (TOTAL)	1330-20-7	--	--	--	--	--	--	--	--	--	--
Total VOCs	--	--	**0.66**	--	**0.24**	--	**0.83**	--	**0.000059**	--	**0.045**
Period Total VOC Mass Removed (lbs)			**0.66**		**0.24**		**0.83**		**0.000059**		**0.045**
Cumulative Total VOC Mass Removed (lbs)			**14.0**		**14.2**		**15.1**		**15.08**		**15.12**

Appendix C
Historical Analytical Results and Contaminant Mass Removal - Liquid
Calumet Montana Refining, LLC - Great Falls, Montana

Location		SP200		SP200		SP200		SP200		SP200	
Ramboll Sample ID		CMR-SP200-230531		CMR-SP200-290623		CMR-SP200-110723		CMQ-SP200-101223		CUR-SP200-122723	
Sample Date		5/31/2023		6/23/2023		7/11/2023		10/12/2023		12/27/2023	
Effluent Volume (L)*		151,878		306,490		125,244		33,349		54,067	
Notes											
Analyte	**CAS No.**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**
SVOCs											
1,2,4,5-TETRACHLOROBENZENE	95-94-3	--	--	--	--	--	--	--	--	ND	--
1,2,4-TRICHLOROBENZENE	120-82-1	--	--	--	--	--	--	ND	--	ND	--
1,2-DICHLOROBENZENE	95-50-1	--	--	--	--	--	--	ND	--	--	--
1,3-DICHLOROBENZENE	541-73-1	--	--	--	--	--	--	ND	--	--	--
1,4-DICHLOROBENZENE	106-46-7	--	--	--	--	--	--	ND	--	--	--
2,2'-OXYBIS(1-CHLOROPROPANE)	108-60-1	ND	--	ND	--	ND	--	ND	--	ND	--
2,3,4,6-TETRACHLOROPHENOL	58-90-2	--	--	--	--	--	--	--	--	ND	--
2,4,5-TRICHLOROPHENOL	95-95-4	ND	--	ND	--	ND	--	--	--	ND	--
2,4,6-TRICHLOROPHENOL	88-06-2	ND	--	ND	--	ND	--	ND	--	ND	--
2,4-DICHLOROPHENOL	120-83-2	ND	--	ND	--	ND	--	ND	--	ND	--
2,4-DIMETHYLPHENOL	105-67-9	ND	--	28	0.02	ND	--	ND	--	46.70	0.0056
2,4-DINITROPHENOL	51-28-5	ND	--	ND	--	ND	--	ND	--	ND	--
2,4-DINITROTOLUENE	121-14-2	ND	--	ND	--	ND	--	ND	--	ND	--
2,6-DINITROTOLUENE	606-20-2	ND	--	ND	--	ND	--	ND	--	ND	--
2-CHLORONAPHTHALENE	91-58-7	ND	--	ND	--	ND	--	ND	--	ND	--
2-CHLOROPHENOL	95-57-8	ND	--	ND	--	ND	--	ND	--	ND	--
2-METHYLNAPHTHALENE	91-57-6	1,200	0.40	80	0.05	4,000	1.10	--	--	57.00	0.0068
2-METHYLPHENOL	95-48-7	ND	--	ND	--	ND	--	--	--	ND	--
2-NITROANILINE	88-74-4	ND	--	ND	--	ND	--	--	--	ND	--
2-NITROPHENOL	88-75-5	ND	--	ND	--	ND	--	ND	--	ND	--
3,3'-DICHLOROBENZIDINE	91-94-1	ND	--	ND	--	ND	--	ND	--	ND	--
3-NITROANILINE	99-09-2	ND	--	ND	--	ND	--	--	--	ND	--
4,6-DINITRO-2-METHYLPHENOL	534-52-1	ND	--	ND	--	ND	--	ND	--	ND	--
4-BROMOPHENYL-PHENYL ETHER	101-55-3	ND	--	ND	--	ND	--	ND	--	ND	--
4-CHLORO-3-METHYLPHENOL	59-50-7	ND	--	ND	--	ND	--	ND	--	ND	--
4-CHLOROPHENYL-PHENYL ETHER	7005-72-3	ND	--	ND	--	ND	--	ND	--	ND	--
4-METHYLPHENOL	106-44-5	ND	--	--	--	ND	--	--	--	--	--
4-NITROANILINE	100-01-6	ND	--	ND	--	ND	--	--	--	ND	--
4-NITROPHENOL	100-02-7	ND	--	ND	--	ND	--	ND	--	ND	--
ACENAPHTHENE	83-32-9	ND	--	ND	--	ND	--	ND	--	8.24	0.0010
ACENAPHTHYLENE	208-96-8	ND	--	ND	--	ND	--	ND	--	ND	--
ANTHRACENE	120-12-7	ND	--	ND	--	ND	--	ND	--	ND	--
BENZO(A)ANTHRACENE	56-55-3	ND	--	ND	--	ND	--	ND	--	ND	--
BENZO(A)PYRENE	50-32-8	ND	--	ND	--	ND	--	ND	--	ND	--
BENZO(B)FLUORANTHENE	205-99-2	ND	--	ND	--	ND	--	ND	--	ND	--
BENZO(G,H,I)PERYLENE	191-24-2	ND	--	ND	--	ND	--	ND	--	ND	--
BENZO(K)FLUORANTHENE	207-08-9	ND	--	ND	--	ND	--	ND	--	ND	--
BIS(2-CHLOROETHOXY)METHANE	111-91-1	ND	--	ND	--	ND	--	ND	--	ND	--
BIS(2-CHLOROETHYL) ETHER	111-44-4	ND	--	ND	--	ND	--	ND	--	ND	--
BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	ND	--	ND	--	ND	--	ND	--	ND	--
BUTYLBENZYLPHTHALATE	85-68-7	ND	--	ND	--	ND	--	ND	--	ND	--
CARBAZOLE	86-74-8	ND	--	ND	--	ND	--	--	--	--	--
CHRYSENE	218-01-9	ND	--	ND	--	ND	--	ND	--	ND	--
DIBENZ(A,H)ANTHRACENE	53-70-3	ND	--	ND	--	ND	--	ND	--	ND	--
DIBENZOFURAN	132-64-9	ND	--	ND	--	ND	--	--	--	ND	--
DIETHYLPHTHALATE	84-66-2	ND	--	ND	--	ND	--	ND	--	ND	--
DIMETHYLPHTHALATE	131-11-3	ND	--	ND	--	ND	--	ND	--	ND	--
DI-N-BUTYLPHTHALATE	84-74-2	ND	--	ND	--	ND	--	ND	--	ND	--
DI-N-OCTYLPHTHALATE	117-84-0	ND	--	ND	--	ND	--	ND	--	ND	--
FLUORANTHENE	206-44-0	ND	--	ND	--	ND	--	ND	--	ND	--
FLUORENE	86-73-7	ND	--	6	0.00	ND	--	ND	--	15.70	0.0019
HEXACHLOROBENZENE	118-74-1	ND	--	ND	--	ND	--	ND	--	ND	--
HEXACHLOROBUTADIENE	87-68-3	ND	--	ND	--	ND	--	ND	--	ND	--
HEXACHLOROCYCLOPENTADIENE	77-47-4	ND	--	ND	--	ND	--	ND	--	ND	--
HEXACHLOROETHANE	67-72-1	ND	--	ND	--	ND	--	ND	--	ND	--
INDENO(1,2,3-CD)PYRENE	193-39-5	ND	--	ND	--	ND	--	ND	--	ND	--
ISOPHORONE	78-59-1	ND	--	ND	--	ND	--	ND	--	ND	--
NAPHTHALENE	91-20-3	570	0.19	74	0.05	2,100	0.58	7.30	0.0005	19.00	0.0023
NITROBENZENE	98-95-3	ND	--	ND	--	ND	--	ND	--	ND	--
N-NITROSO-DI-N-PROPYLAMINE	621-64-7	ND	--	ND	--	ND	--	ND	--	ND	--
N-NITROSODIPHENYLAMINE	86-30-6	ND	--	ND	--	ND	--	ND	--	ND	--
PENTACHLOROPHENOL	87-86-5	ND	--	ND	--	ND	--	ND	--	ND	--
PHENANTHRENE	85-01-8	110	0.04	5	0.00	350	0.10	ND	--	10.50	0.0013
PHENOL	108-95-2	ND	--	ND	--	ND	--	ND	--	ND	--
PYRENE	129-00-0	22	0.01	1	0.00	67	0.02	ND	--	3.78	0.0005
Total SVOCs	--	--	**0.64**	--	**0.13**	--	**1.80**	--	**0.00054**	--	**0.019**
Period Total SVOC Mass Removed (lbs)			**0.6**		**0.1**		**1.8**		**0.00054**		**0.019**
Cumulative Total VOC Mass Removed (lbs)			**11.9**		**12.0**		**13.8**		**13.79**		**13.81**

Appendix C
Historical Analytical Results and Contaminant Mass Removal - Liquid
Calumet Montana Refining, LLC - Great Falls, Montana

Location		SP200		SP200		SP200		SP200		SP200	
Ramboll Sample ID		CMR-SP200-230531		CMR-SP200-290623		CMR-SP200-110723		CMQ-SP200-101223		CUR-SP200-122723	
Sample Date		5/31/2023		6/23/2023		7/11/2023		10/12/2023		12/27/2023	
Effluent Volume (L)*		151,878		306,490		125,244		33,349		54,067	
Notes											
Analyte	**CAS No.**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**	**Result (ug/L)**	**Mass (lb)**
EPH											
C11 THROUGH C22 AROMATIC HYDROCARBONS	C11-C22-AROM	77,000	25.78	83,500	56.42	331,000	91.39	--	--	1,170,000	139.46
C19 THROUGH C36 ALIPHATIC HYDROCARBONS	C19-C36-ALIP	--	--	--	--	--	--	--	--	102,000	12.16
C9 THROUGH C18 ALIPHATIC HYDROCARBONS	C09-C18-ALIP	--	--	--	--	--	--	--	--	306,000	36.47
TOTAL EXTRACTABLE HYDROCARBON (POST FRACTIONATION)	68334-30-5S	348,000	116.52	354,000	239.19	--	--	--	--	--	--
TOTAL EXTRACTABLE HYDROCARBON	68334-30-5E	388,000	129.91	643,000	434.46	1,850,000	510.81	508.0	0.037	914,000	108.94
Total EPHs	--	--	**129.91**	--	**434.46**	--	**510.81**	--	**0.037**	--	**297.03**
Period Total EPH Mass Removed (lbs)			**129.9**		**434.5**		**510.8**		**0.037**		**297.0**
Cumulative Total EPH Mass Removed (lbs)			**1484.1**		**1918.6**		**2429.4**		**2429.4**		**2726.4**
VPH											
BENZENE	71-43-2	--	--	--	--	--	--	--	--	--	--
C5 THROUGH C8 ALIPHATIC HYDROCARBONS (ADJUSTED)	C05-C08-ALIP-J	3,690	1.24	ND	--	2,160	0.60	ND	--	ND	--
C9 THROUGH C10 AROMATIC HYDROCARBONS	C09-C10-AROM	--	--	--	--	--	--	30.3	0.00	3,790	0.45
C9 THROUGH C12 ALIPHATIC HYDROCARBONS (ADJUSTED)	C09-C12-ALIP-J	112,000	37.50	3,790	2.56	12,300	3.40	43.4	0.00	10,300	1.23
ETHYL BENZENE	100-41-4	--	--	--	--	--	--	--	--	--	--
M,P-XYLENE	179601-23-1	--	--	--	--	--	--	--	--	--	--
METHYL TERT-BUTYL ETHER	1634-04-4	--	--	--	--	--	--	--	--	--	--
NAPHTHALENE	91-20-3	--	--	--	--	--	--	--	--	--	--
ORTHO-XYLENE	95-47-6	--	--	--	--	--	--	--	--	--	--
TOLUENE	108-88-3	--	--	--	--	--	--	--	--	--	--
TOTAL PETROLEUM HYDROCARBONS	TPH	154,000	51.56	10,800	7.30	37,500	10.35	74.8	0.0055	14,800	1.76
Total VPHss	--	--	**51.56**	--	**7.30**	--	**10.35**	--	**0.0055**	--	**1.76**
Period Total VPH Mass Removed (lbs)			**51.6**		**7.3**		**10.4**		**0.0055**		**1.76**
Cumulative Total VPH Mass Removed (lbs)			**197.7**		**205.0**		**215.4**		**215.4**		**217.2**

Appendix C
Summary of Analytical Results and Contaminant Mass Removal - Liquid
Calumet Montana Refining, LLC - Great Falls, Montana

Notes:

*Effluent volumes represent volume of groundwater extracted during the start-up (October 2021), commissioning (November 2021 - December 2021), and first quarter of standard operation (January 2022 - March 2022). Effluent volumes beginning April 2022 represent volume extracted during the month which the sample was taken.

1. Results from May 17, 2022 appear anomalously high and separate phase non-aqueous phase liquid was identified in the sampling jar; therefore, these results do not appear representative of dissolved phase concentrations and were rejected. Due to the rejected May 2022 results, the effluent volume associated with the April 2022 sampling event represents the volume recovered from April 1, 2022 - May 15, 2022 and effluent volume associated with the June 17, 2022 sampling event represents the volume recovered from May 16, 2022 through June 30, 2022.

2. Sample was not collected during September 2022, therefore results from August 2022 were used for mass removal calculations.

3. Sample was not collected during October 2022 and November 2022, therefore results from December 2022 were used for mass removal calculations.

4. April 2023 sample was collected on May 3, 2023

5. Samples were not collected during August and September 2023, therefore results from July 2023 were used for mass removal calculations

Sample Calculation

$$\boldsymbol{Mass\ Removed\ (lb) = 1800\ \frac{ug}{L} \times 10^{-6}\ \frac{g}{ug}\ \times \frac{1}{453.6}\ \frac{lb}{g} \times 21138\ L}$$

Abbreviations:

EPH : Extractable Petroleum Hydrocarbon
ND : Non Detect
SVOCs : Semi-volatile Organic Compounds
ug/L : micrograms per liter
VOCs : Volatile Organic Compounds
VPH : Volatile Petroleum Hydrocarbons

APPENDIX D
GROUNDWATER SAMPLING PURGE LOGS

RAMBOLL

Calumet Montana Refinery, LLC
Great Falls, Montana

Low Flow Groundwater Sampling Field Log

Monitoring Well - **MW-106**

Sampling Information

Date (MM/DD/YY) - **December 7, 2023**
Personnel - **Mike Gipson (CMR)**
Weather - **Cloudy 42 F**
Sampling Device - **Geotech Peristaltic Pump**

Pump on - **13:14**
Pump off - **14:10**

Well Information

Well Casing PID - **--** ppm
Well Diameter - **2** inch
Screened Zone - **2 - 12** ft BGS

Measured Depth to Bottom - **12.38** ft BTOC
Depth to LNAPL - **--** ft BTOC
Depth to Water - **4.35** ft BTOC
Depth to Pump Intake - **11.5** ft BTOC

Well Evacuation Data

Stabilization Criteria			± 0.1 SU	± 3 %	± 10 % < 5 NTU	N/A	± 10 mV	± 10 % <0.5 mg/L	0.3 ft	
Time	**Vol.** L	**Rate** ml/min	**pH** Std	**Cond.** ms/cm	**Turb.** NTU	**Temp.** C	**ORP** mV	**DO** mg/L	**DTW** ft	**Appearance or Comments**
13:19	1.3	260	8.49	2.11	19.10	11.88	-77	0.00		Clear
13:24	2.6	260	8.21	2.15	12.90	11.66	-78	0.00		Clear
13:29	3.9	260	8.05	2.18	3.60	11.54	-78	0.00		Clear
13:34	5.2	260	7.91	2.19	0.00	11.54	-77	0.00		Clear
13:39	6.5	260	7.88	2.20	0.00	11.64	-77	0.00		Clear
13:44	7.8	260	7.83	2.23	0.00	11.56	-79	0.00		Clear
13:49	9.1	260	7.82	2.23	0.00	11.68	-79	0.00		Clear
13:54	***SAMPLE***	260	7.82	2.230	0	11.68	-79	0.00		Clear

Notes / Sample Information

Appearance at Start - **Clear**
Appearance After Purging - **Clear**

Sample ID - CMR-MW-106-231207
Sample Time - 13:50

Total Volume Purged - **9.1** L
Purge Rate - **300** ml/min

Additional Sample -
Additional Sample ID -

Analysis - VOCs (8260);
VPH (Montana VPH);
SVOCs (8270);
EPH (Montana EPH)
SO4, NO3, Total Fe/Mn, Diss Fe/Mn, CO2, CH4, BOD,
Ext HOLD PAHs

Equipment Information

Multi-Gas Meter / PID # - **NA**
Water Quality Meter # - **Horiba**

Oil / Water Interface Probe # - **Heron**
Peristaltic Pump # - **GeoTech**

Notes

RAMBOLL

Calumet Montana Refinery, LLC
Great Falls, Montana

Low Flow Groundwater Sampling Field Log

Monitoring Well - **MW-41S**

Sampling Information

Date (MM/DD/YY) - **December 7, 2023**
Personnel - **Mike Gipson**
Weather - **Cloudy 42 F**
Sampling Device - **Geotech Peristaltic Pump**

Pump on - **11:09**
Pump off - **12:22**

Well Information

Well Casing PID - **--** ppm
Well Diameter - **2** inch
Screened Zone - **4 - 14** ft BGS

Measured Depth to Bottom - **16.70** ft BTOC
Depth to LNAPL - **--** ft BTOC
Depth to Water - **6.35** ft BTOC
Depth to Pump Intake - **14.3** ft BTOC

Well Evacuation Data

Stabilization Criteria			± 0.1 SU	± 3 %	± 10 % < 5 NTU	N/A	± 10 mV	± 10 % <0.5 mg/L	0.3 ft	
Time	**Vol.** L	**Rate** ml/min	**pH** Std	**Cond.** ms/cm	**Turb.** NTU	**Temp.** C	**ORP** mV	**DO** mg/L	**DTW** ft	**Appearance or Comments**
11:14	1.1	255	9.79	1.300	15	13.93	-47	0.00		Clear
11:19	2.2	255	9.08	1.290	9	13.74	-56	0.00		Clear
11:24	3.3	255	8.72	1.280	4	13.81	-71	0.00		Clear
11:29	4.4	255	8.46	1.290	1	13.82	-73	0.00		Clear
11:34	5.5	255	8.24	1.300	0	13.97	-71	0.00		Clear
11:39	6.6	255	8.10	1.321	0	14.07	-75	0.00		Clear
11:44	7.7	255	7.99	1.330	0	14.20	-78	0.00		Clear
11:49	***SAMPLE***	255	7.99	1.330	0	14.20	-78	0.00		Clear

Notes / Sample Information

Appearance at Start - **Clear**
Appearance After Purging - **Clear**

Total Volume Purged - **7.7** L
Purge Rate - **255** ml/min

Analysis - VOCs (8260);
VPH (Montana VPH);
SVOCs (8270);
EPH (Montana EPH)

Sample ID - CMR-MW-41S-231207
Sample Time - 14:40

Additional Sample -
Additional Sample ID -

Equipment Information

Multi-Gas Meter / PID # - **NA**
Water Quality Meter # - **Horiba**

Oil / Water Interface Probe # - **Heron**
Peristaltic Pump # - **GeoTech**

Notes **Purged dry 12:22 12/6, Sampled next day w/o purging**

RAMBOLL

Calumet Montana Refinery, LLC
Great Falls, Montana

Low Flow Groundwater Sampling Field Log

Monitoring Well - **MW-105**

Sampling Information

Date (MM/DD/YY) - **December 7, 2023**
Personnel - **Mike Gipson**
Weather - **Cloudy 42 F**
Sampling Device - **Geotech Peristaltic Pump**

Pump on - **12:54**
Pump off - **13:11**

Well Information

Well Casing PID - **--** ppm
Well Diameter - **2** inch
Screened Zone - **5 - 10** ft BGS

Measured Depth to Bottom - **9.90** ft BTOC
Depth to LNAPL - **--** ft BTOC
Depth to Water - **5.39** ft BTOC
Depth to Pump Intake - **7.7** ft BTOC

Well Evacuation Data

Stabilization Criteria			± 0.1 SU	± 3 %	± 10 % < 5 NTU	N/A	± 10 mV	± 10 % <0.5 mg/L	0.3 ft	
Time	**Vol.** L	**Rate** ml/min	**pH** Std	**Cond.** ms/cm	**Turb.** NTU	**Temp.** C	**ORP** mV	**DO** mg/L	**DTW** ft	**Appearance or Comments**
12:59	1.5	300	8.12	2.050	0.00	14.02	36	0.00		CLEAR
13:04	3.0	300	8.02	2.050	0.00	13.91	34	0.00		CLEAR
13:09	4.5	300	7.91	2.060	0.00	14.17	-44	0.00		CLEAR
13:10	DRY									
13:14	***SAMPLE***	300	7.91	2.06	0.00	14.17	-44	0.00		CLEAR

Notes / Sample Information

Appearance at Start - **CLEAR**
Appearance After Purging - **CLEAR**

Total Volume Purged - **4.5** L
Purge Rate - **300** ml/min

Analysis - VOCs (8260);
VPH (Montana VPH);
SVOCs (8270);

Sample ID - CMR-MW-105-231207
Sample Time - 11:45

Additional Sample -
Additional Sample ID -

Equipment Information

Multi-Gas Meter / PID # - **NA**
Water Quality Meter # - **Horiba**

Oil / Water Interface Probe # - **Heron**
Peristaltic Pump # - **GeoTech**

Notes

Purged dry 13:10 12/6 - sampled next day 11:45 DTW=9.21. 0.69 ' Recovery from previous day.
Well ran dry; EPH Not collected