GROUNDWATER MONITORING REPORT – DRY SEASON 2023

RCRA CORRECTIVE ACTION PROGRAM
BOEING RENTON FACILITY
PROJECT # PS20203450.2023

Prepared for:

THE BOEING COMPANY

Seattle, Washington

NOVEMBER 27, 2023

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Prepared for:

The Boeing Company
Seattle, Washington

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November 27, 2023

This report was prepared by the staff of WSP USA Environment & Infrastructure Inc. under the supervision of the Hydrogeologist whose seal and signature appear hereon.

The findings, recommendations, specifications, or professional opinions are presented within the limits described by the client, in accordance with generally accepted professional engineering and geologic practice. No warranty is expressed or implied.

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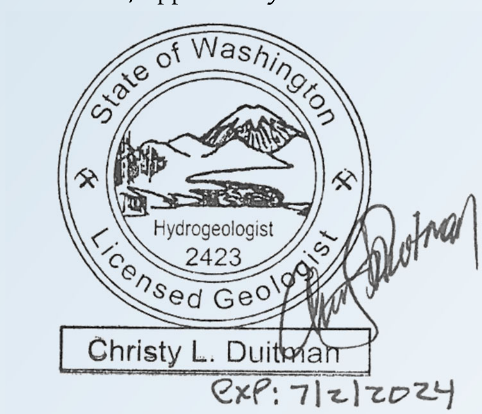

November 27, 2023

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

LIST OF ABBREVIATIONS AND ACRONYMS

µg/L	micrograms per liter
AMEC	AMEC Environment & Infrastructure, Inc
AMEC Foster Wheeler	Amec Foster Wheeler Environment & Infrastructure, Inc
AOC	area of concern
Boeing	The Boeing Company
CALIBRE	CALIBRE Systems, Inc.
CAP	Cleanup Action Plan
cis-1,2-DCE	cis-1,2-dichloroethene
CMP	Compliance Monitoring Plan
COC	constituent of concern
CPOC	conditional point of compliance
CUL	cleanup level
DO	dissolved oxygen
Ecology	Washington State Department of Ecology
EDR	Engineering Design Report
ERD	enhanced reductive dechlorination
Facility	Boeing Renton facility
MA	monitored attenuation
mg/L	milligrams per liter
MNA	monitored natural attenuation
Order	Agreed Order No. 8191
ORP	oxidation/reduction potential
PCE	tetrachloroethene
RCRA	Resource Conservation and Recovery Act
SVE	soil vapor extraction
SWMU	solid waste management unit
TCE	trichloroethene
TOC	total organic carbon
TPH	total petroleum hydrocarbons
VC	vinyl chloride
VOCs	volatile organic compounds
Wood	Wood Environment & Infrastructure Solutions, Inc.
WSP	WSP USA Environment & Infrastructure Inc.

1 INTRODUCTION

This report provides progress reporting in conformance with Section VII.B.1 of Agreed Order No. 8191 (Order) and summarizes cleanup actions and monitoring conducted during the dry season of 2023 at The Boeing Company (Boeing) Renton facility (Facility) (Figure 1). This work is required under the Resource Conservation and Recovery Act (RCRA) Corrective Action Program being performed at the Facility. Corrective action activities are performed for those solid waste management units (SWMUs), areas of concern (AOCs), and other areas where cleanup actions are ongoing. Monitoring, cleanup activities, and reporting are being conducted as part of the final remedy implementation described in the Engineering Design Report (EDR) (AMEC Environment & Infrastructure, Inc. [AMEC], 2014).

As approved by the Washington State Department of Ecology (Ecology) in a letter dated July 31, 2020, progress reporting is conducted on a semiannual basis in conjunction with monitoring, operations, and maintenance activities conducted pursuant to the Order and as outlined in the EDR.

The following documents summarize ongoing compliance activities conducted at the Facility:

- The original monitoring plan presented in Appendix D of the EDR (AMEC, 2014) was superseded by the Compliance Monitoring Plan (CMP) (Amec Foster Wheeler Environment & Infrastructure, Inc [Amec Foster Wheeler], 2016a), which was subsequently revised in the first addendum to the CMP (CMP Addendum #1) (Amec Foster Wheeler, 2017).
- The groundwater monitoring program was further revised in the second addendum to the CMP (CMP Addendum #2) (Wood Environment & Infrastructure Solutions, Inc [Wood], 2019a), which removed selected areas or wells from the sampling program. These changes were approved by Ecology (Maeng, 2019).
- Boeing submitted the third addendum to the CMP (CMP Addendum #3) (CALIBRE Systems, Inc. [CALIBRE], 2020) to Ecology on June 30, 2020. This addendum recommended further modifications to the groundwater monitoring program at the Facility and was approved by Ecology in July 2020.

Groundwater monitoring and cleanup actions are being conducted at the following areas (the ongoing remedies for each of these areas are noted in parentheses):

- SWMU-168: (monitored natural attenuation [MNA]);
- SWMU-172 and SWMU-174: (bioremediation and monitored attenuation [MA]; the soil vapor extraction [SVE] system was shut down October 2022, decommissioning pending approval from Ecology);
- Building 4-78/79 SWMU/AOC Group: (bioremediation and MA; SVE has been discontinued per Ecology's approval of the system decommissioning during the first quarter of 2019);
- Former Fuel Farm AOC Group: (MNA);
- AOC-001 and AOC-002 (to be determined following review of data generated from this sampling event);
- AOC-003: (MA);
- AOC-004: (MA);
- AOC-060: (bioremediation and MNA);
- AOC-090: (bioremediation and MA); and
- Apron A: (bioremediation and MA).

The background and investigation history for each affected unit or group of units is described in the Cleanup Action Plan (CAP) (AMEC, 2012) and/or EDR (AMEC, 2014).

Although Apron A was not included in the CAP or EDR, this report includes monitoring results for Apron A. Semiannual monitoring of Apron A started in the fourth quarter of 2016 (Amec Foster Wheeler, 2016b).

The goals for cleanup of groundwater at the Facility, as described in the CAP, include protection of groundwater for drinking water beneficial use at all areas of the site and demonstration of protection of surface water beneficial uses at the conditional points of compliance (CPOCs) for each SWMU and AOC. Cleanup goals and comparison with specific criteria are discussed in this report for each SWMU and AOC. Concentrations for protection of groundwater for beneficial use for each constituent of concern (COC) are based on site-specific cleanup levels (CULs) specified in the CAP. In June 2023, Ecology approved the implementation of an updated CUL of 8.0 micrograms per liter (µg/L) for arsenic (Cramer, 2023), which is the Puget Sound Basin background concentration according to Ecology's *Natural Background Groundwater Arsenic Concentrations in Washington State* guidance (2022). Previously, the CUL for arsenic was 1.0 µg/L. This currently applies to SWMU-172/174. Otherwise, the measured COC concentrations in groundwater presented in this report are compared to the CULs specified in the CAP.

This semiannual report:

- Describes work completed during the reporting period;
- Describes any deviations from corrective action tasks required under the Order and/or CAP;
- Describes revisions to the corrective action schedule;
- Describes work projected to occur during the next semiannual sampling event, including any planned deviation from the CAP;
- Discusses remediation operation and maintenance activities conducted at the Facility during the reporting period;
- Documents monitoring activities conducted during the reporting period;
- Describes and discusses trends in monitoring data;
- Assesses remediation at each area; and
- Assesses attainment of CULs at the CPOCs.

This report presents information based on monitoring activities conducted during the dry season 2023 for the period from May 1, 2023, through October 31, 2023. In accordance with the requirements of the Order, corrective action activities were conducted at the Facility as described in this report.

1.1 CHANGES IN KEY PERSONNEL

In 2023, Boeing selected WSP USA Environment & Infrastructure, Inc (WSP) to replace Landau Associates for sitewide groundwater sampling activities. WSP performed the on-facility groundwater sampling for the dry season 2023 event.

As detailed in this report, 15 monitoring wells were replaced in AOC-001/002 and -003 during this reporting period to replace those decommissioned as part of the Renton Facility Apron R construction work. Boeing contracted with Holocene Drilling, a licensed well driller in the state of Washington, to complete the drilling and installations of these monitoring wells with oversight from WSP. Monitoring well development and dry season 2023 sampling activities were conducted by WSP. The newly installed monitoring wells were surveyed by Duane Hartman & Associates, a licensed surveyor in the state of Washington. Additional information regarding the well installation and sampling activities are discussed in Section 3.5.1.

1.2 WORK COMPLETED IN THE DRY SEASON OF 2023

The following work was completed during the dry season of 2023 (the period from May 1, 2023, through October 31, 2023):

- Boeing submitted the 2022 wet season Groundwater Monitoring Report to Ecology and City of Renton on May 30, 2023.
- Boeing recommended discontinuation of the SVE system at SWMU 172/174 based on the discontinuation criteria in the EDR and CMP. Ecology approved discontinuation of the SVE system subject to the results of sub-slab vapor verification sampling and other criteria. The sub-slab vapor sampling at SWMU-172/174 took place in late April 2023. As requested, Ecology was notified in advance of this work. More information regarding the results of this sampling can be found in Appendix E.
- Upon completion of Apron R construction, 13 vertical monitoring wells were installed to replace previously decommissioned monitoring network wells (GW185S-R, GW190S-R, GW191D-R, GW192S-R, GW193S-R, GW195S-R, GW196D-R, GW197S-R, GW213S-R, GW214S-R, GW215S-R, GW245S-R, and GW246S-R) in AOC-001/002 and one vertical monitoring well was replaced (GW247S) in AOC-003. All replaced vertical monitoring wells were developed and sampled during this reporting period. Horizontal injection wells IPR1 and IRP2 were also replaced during this reporting period.
- Decommissioning of 30 wells at AOC-060, AOC-090, Apron A, Former Fuel Farm, SWMU-168, and SWMU-172/174 occurred in May 2023. This completed the list of wells planned for closure. More information regarding well decommissioning including a list of decommissioned wells is included in Appendix E.
- WSP completed the 2023 sitewide dry season sampling from August 14 through 24, 2023.

1.3 DEVIATIONS FROM REQUIRED TASKS

No deviations from tasks required in the Order occurred during this reporting period.

1.4 DEVIATIONS FROM CAP

No deviations from tasks required in the CAP occurred during this reporting period.

1.5 SCHEDULE OF MONITORING

Ecology approved the modifications to the monitoring plan in CMP Addendum #3 (CALIBRE, 2020) on July 31, 2020, changing to a sitewide semiannual sampling program with sampling events to occur during the wet and dry seasons (in February and August, respectively). The revised monitoring plan is detailed in Appendix A, Table A-1. This revised sampling schedule began in August 2020 and will continue until another CMP addendum is approved.

1.6 WORK PROJECTED FOR THE NEXT REPORTING PERIOD

The following work is projected for the upcoming 2023 wet season (November 1, 2023, to April 30, 2024):

- Upon receipt of sampling results from the 13 replaced monitoring wells in AOC-001/002, Boeing will consult with Ecology to evaluate whether continued enhanced reductive dechlorination (ERD) treatment is needed for volatile organic compounds (VOCs) in groundwater in AOC 001/002. The Apron R well abandonment memo provides more details of the wells decommissioned and replaced due to construction. (Wood, 2021). Plans for remediation and monitoring are forthcoming.

- Based on evaluation of the semiannual monitoring data in this report, the following areas are planned for continued ERD treatment of VOCs in groundwater: SWMU-172/174, Building 4-78/79 SWMU/AOC Group, AOC-090, and AOC-060. Pursuant to the CAP, AOC-003 is planned to transition from the ERD program to MA.
- Reporting will be completed in accordance with the Order, CAP, EDR, and changes approved by Ecology, including those modifications proposed in CMP Addendum #3 (CALIBRE, 2020).

2 GROUNDWATER SAMPLING METHODOLOGY

Groundwater was sampled and analyzed as described in Appendix A. These procedures are in accordance with the methods specified in the CMP (Amec Foster Wheeler, 2016a) and CMP Addendum #3 (CALIBRE, 2020). Table A-1 summarizes the current groundwater monitoring program and COCs specified in the CAP and revised in CMP Addendum #1 (Amec Foster Wheeler, 2017), CMP Addendum #2 (Wood, 2019a) and CMP Addendum #3 (CALIBRE, 2020) for all Facility corrective action areas. Table A-2 summarizes the current groundwater monitoring program for the corrective action areas that include MNA or MA as part of the cleanup remedy specified in the CAP. Tables A-1 and A-2 also specify monitoring requirements for Apron A, which was not included in the CAP. Any changes or exceptions to the sampling or analytical methods cited in Appendix A during the event is described in the applicable subsections in Section 3. The field data sheets, which document the groundwater sample collection and field parameter monitoring for each well sampled during this event, are included in Appendix B.

The analytical methods, field duplicate, lab duplicate, and matrix spike/matrix spike duplicate frequencies are specified in the Quality Assurance Project Plan (Amec Foster Wheeler, 2016c). The full analytical reports provided by the laboratory are provided separately on a secure online storage application, OneDrive. The data validation memoranda are included in Appendix C.

3 CORRECTIVE ACTION ACTIVITIES COMPLETED DURING THE REPORTING PERIOD

This section describes the corrective action activities conducted at the Facility during the dry season of 2023. Operation of the SVE system at SWMU-172/174 was discontinued during the last dry season, as discussed in Section 3.2.1.2. Compliance monitoring was conducted in accordance with the CMP (Amec Foster Wheeler, 2016a) and CMP Addendum #3 (CALIBRE, 2020).

3.1 SWMU-168

This section describes corrective action activities conducted at this SWMU. Figure 2 shows the locations of the groundwater monitoring wells at SWMU-168 for which sampling was required under CMP Addendum #3 (CALIBRE, 2020) and the groundwater elevation at the remaining well measured during this monitoring event. The cleanup remedy for SWMU-168 is MNA; therefore, cleanup activities consist of monitoring only.

3.1.1 CLEANUP ACTION ACTIVITIES

No installation/construction activities were conducted for this cleanup action area during this reporting period.

3.1.2 CMP DEVIATIONS

No deviations from the CMP occurred for this area during this reporting period. The well monitored in this SWMU and the COC remained unchanged.

3.1.3 WATER LEVELS

The groundwater elevation measured during this groundwater monitoring event at SWMU-168 is summarized in Table 1 and shown on Figure 2. Groundwater elevation contours are not shown because only one well, GW230I, is currently monitored in this WSMU. The general direction of groundwater flow depicted on Figure 2 is based on historical information.

3.1.4 GROUNDWATER MONITORING RESULTS

Results for primary geochemical indicators are presented in Table 2; the result for the single SWMU-168 COC, vinyl chloride (VC), is presented in Table 3; and COC results for sampling events in recent years are presented in Appendix D.

3.1.4.1 Natural Attenuation/Geochemical Indicators

The geochemical indicator results from CPOC well GW230I indicate that conditions are conducive to natural attenuation of VC in this SWMU. The pH value measured was slightly acidic at 6.31. The CPOC well GW230I showed reducing conditions, with low dissolved oxygen (DO) and a negative oxidation/reduction potential (ORP) reading. Reducing conditions are present in well GW230I, indicating conditions favorable for continued dechlorination of VOCs.

3.1.4.2 COC Results for Source Area

Groundwater samples were not collected from the source area well, GW228S, for SWMU-168 per CMP Addendum #3 (CALIBRE, 2020).

3.1.4.3 COC Results for CPOC Area

Table 3 lists the analytical result for the SWMU-168 area. The concentration of VC in the groundwater from CPOC area well GW230I was below the CUL of 0.11 µg/L, at 0.101 µg/L; Historical trends for VC in GW230I are shown in Appendix D and depicted on Figure 3. VC concentrations show an apparent historical seasonal pattern with higher concentrations in the dry season; the recent dry season concentration decreased slightly since the last monitoring event, departing from the trend.

3.2 SWMU-172 AND SWMU-174

This section describes corrective action activities conducted at these two SWMUs. The cleanup remedy for SWMU-172 and SWMU-174 is a combination of bioremediation and MA. SVE was used from 2015 through 2022. The SVE system has been shut down and is pending Ecology approval for decommissioning. Figure 4 shows the layout of the groundwater monitoring wells for which sampling is required under CMP Addendum #3 (CALIBRE, 2020) and the remediation system for these SWMUs.

3.2.1 CLEANUP ACTION ACTIVITIES

3.2.1.1 Installation/Construction Activities

Utility locate, concrete coring, and vapor pin installation was completed at proposed locations VP-01, VP-02, and VP-03 in May 2023. Additional details regarding installation and sampling are included in Appendix E.

3.2.1.2 SVE and Bioremediation Operations

The SVE system was in operation between April 17, 2015, and October 24, 2022. SVE was discontinued on October 24, 2022, as approved by Ecology (Cramer, 2022). Permanent discontinuation and decommissioning are subject to evaluation of the results of the sub-slab vapor sampling, which took place in May 2023. The most recent bioremediation injection was completed in May 2023, including ERD treatments. All of the SVE system equipment and infrastructure has been retained pending future discussions with Ecology regarding permanent discontinuation and removal.

3.2.2 CMP DEVIATIONS

No deviations from the CMP occurred for these areas during this reporting period. The wells monitored in these SWMUs and the COCs remained unchanged.

3.2.3 WATER LEVELS

The groundwater elevations measured during this groundwater monitoring event at SWMU-172 and SWMU-174 are summarized in Table 4 and shown on Figure 4. The groundwater elevation data show a flow direction generally to the northeast, toward the Cedar River Waterway; however, the sheet pile wall to the east of this area prevents a direct groundwater connection to the waterway, as depicted by the groundwater contours on Figure 4.

3.2.4 GROUNDWATER MONITORING RESULTS

Groundwater at these SWMUs is monitored following the analysis protocol presented in Tables A-1 and A-2 in Appendix A. Results for primary geochemical indicators are presented in Table 5; results for the SWMU-172 and SWMU-174 area COCs are presented in Table 6.

3.2.4.1 Monitored Attenuation/Geochemical Indicators

The geochemical indicator results are presented in Table 5. Specific conductivity ranged between 202 and 1,964 microsiemens per centimeter across SWMU-172 and SWMU-174, which are normal observed values for the groundwater in these SWMUs. pH was moderately to slightly acidic across SWMU-172 and SWMU-174. ORP was negative for all wells monitored; DO and ORP results indicate reducing conditions in the area and other natural attenuation parameter results were generally uniform across these SWMUs. Total organic carbon (TOC) concentrations ranged from 0.93 to 1745 milligrams per liter (mg/L) for all SWMU-172 and SWMU-174 monitoring wells.

3.2.4.2 COC Results for Source and Downgradient Plume Areas

Table 6 lists the analytical results for the SWMU-172 and SWMU-174 COCs. Historical trend plots for tetrachloroethene (PCE), trichloroethene (TCE), VC, and cis-1,2-dichloroethene (cis-1,2-DCE) in source area wells GW152S and GW153S are shown on Figure 5, in downgradient plume area wells GW172S and GW173S on Figure 6, and in downgradient plume area well GW226S on Figure 7. Groundwater flows generally from the vicinity of source area well GW152S to downgradient plume area well GW172S; groundwater from source area well GW153S is also expected to generally flow toward the downgradient plume area. PCE and TCE are chlorinated solvents that were used at the Facility, and cis-1,2-DCE and VC are breakdown products resulting from the biodegradation processes.

As shown in Figures 5 through 7, the concentrations of VOCs in groundwater from source area wells and downgradient plume area wells have generally remained stable or decreased over time.

Arsenic was detected above the CUL (8.0 µg/L) in the groundwater from source area well GW152S (39.8 µg/L) and downgradient plume area well GW172S (23.6 µg/L) and its associated duplicate sample (30 µg/L). As shown on Figure 8, the arsenic concentrations in groundwater from source and downgradient plume area wells have generally remained within historical range over the past two years, with the exception of source area well GW152S and its downgradient counterpart GW172S. Elevated concentrations of arsenic were detected in these two wells during this reporting period and are lower than the last increase observed in 2019.

Source area groundwater CUL exceedances (Table 6) consisted of:

- GW152S: cis-1,2-DCE, PCE, TCE, VC, arsenic, copper, and lead; and
- GW153S: cis-1,2-DCE.

Downgradient plume area groundwater site-specific CUL exceedances (Table 6) consisted of:

- GW172S: cis-1,2-DCE, PCE, TCE, VC, arsenic, copper, and lead;
- GW173S: cis-1,2-DCE, TCE, and VC.

3.2.4.3 COC Results for CPOC Area

As shown in Table 6, cis-1,2-DCE was detected above the CUL (0.03 µg/L) in the groundwater from all CPOC area wells ranging from 0.0473 µg/L to 0.225 µg/L. VC was detected above the CUL (0.11 µg/L) in the groundwater from GW232S (0.348 µg/L). VC was also detected in GW234S, GW235I, and GW236S, but below the CUL. TCE was also detected below the CUL (0.02 µg/L) in all CPOC area wells monitored. PCE was not detected at any CPOC area well monitored. Trend charts for cis-1,2-DCE, TCE, and VC for all CPOC area wells are presented in Figure 9. Figure 9 shows that the COCs in the CPOC area have primarily increased since the previous sampling event, in keeping with the historical patterns of higher concentrations detected during the dry season events, with the exception of GW235I, which exhibited lower concentrations of COCs during this dry season sampling event compared to the last wet season.

Arsenic and lead were detected in the groundwater from all CPOC area wells. Copper was detected below the CUL (3.5 µg/L) in all CPOC area wells except GW236S, where it was not detected. All arsenic detections in CPOC area wells were below the CUL and Puget Sound Basin natural occurring background (8.0 µg/L). All copper and lead detections in the CPOC area wells monitored were below their respective CUL. Figure 10 shows arsenic, copper, and lead concentration trends in groundwater from the CPOC area wells since the beginning of compliance monitoring. As shown in Figure 10, these COCs have remained within historical range or decreased since the last monitoring event, with the exception of GW232S, which showed a slight increase in arsenic since the last monitoring event.

3.3 BUILDING 4-78/79 SWMU/AOC GROUP

This section describes corrective action activities conducted at the Building 4-78/79 SWMU/AOC Group. The cleanup remedy for this SMWU/AOC group is bioremediation and MA as well as excavation of soils contaminated with total petroleum hydrocarbons (TPH); discontinuation of SVE was approved by Ecology on November 1, 2018, and the system was decommissioned during the first quarter of 2019. Figure 11 shows the location of the September 2021 TPH source area soil excavation; groundwater monitoring wells for which sampling is required under CMP Addendum #3 (CALIBRE, 2020); extraction wells; decommissioned wells; horizontal SVE wells; and bioremediation injection wells for this area.

3.3.1 CLEANUP ACTION ACTIVITIES

3.3.1.1 Installation/Construction Activities

No installation or construction activities were conducted in this SWMU/AOC Group during this reporting period.

3.3.1.2 SVE and Bioremediation Activities

SVE operations were discontinued in late 2018; the current remediation method is anaerobic biodegradation of benzene by nitrate/sulfate injections, which occurred in May 2023. Additional details regarding the injections can be found in Appendix E. Certain bioremediation injection wells are still sampled to monitor the status of COCs. Trend charts for cis-1,2-DCE and benzene in nitrate/sulfate injection wells are presented in Figure 12, and trend charts for TCE and VC in the injection wells are presented in Figure 13. Information regarding the injection that occurred during this reporting period can be found in Appendix E.

3.3.2 CMP DEVIATIONS

No deviations from the CMP occurred for this SWMU/AOC Group during this reporting period. The wells monitored in SWMU/AOC Group and the COCs remained the same.

3.3.3 WATER LEVELS

The groundwater elevations measured during this groundwater monitoring event at Building 4-78/79 SWMU/AOC Group are summarized in Table 7 and shown on Figure 11. The observed direction of groundwater flow from the source area during August 2023 was generally radially toward Building 4-79 and a piezometric low area near GW031S-R and GW244S-R.

3.3.4 GROUNDWATER MONITORING RESULTS

Groundwater in this area is monitored following the analysis protocol presented in Tables A-1 and A-2 in Appendix A. Results for primary geochemical indicators are presented in Table 8; results for Building 4-78/79 SWMU/AOC Group COCs are presented in Table 9.

3.3.4.1 Natural Attenuation/Geochemical Indicators

The geochemical indicator results are presented in Table 8. In general, source area and CPOC area wells had low levels of DO and moderate to high specific conductivity. The pH was slightly acidic, ranging between 6.17 and 6.45 standard units in all wells monitored. ORP was negative in all wells monitored. The source area wells showed reducing conditions favorable for dechlorination of VOCs. Results for the other primary geochemical indicators were generally consistent in all wells monitored. TOC concentrations in source area wells ranged from 4.63 to 14.55 mg/L.

3.3.4.2 COC Results for Source Area

Table 9 lists the analytical results for Building 4-78/79 SWMU/AOC Group COCs. Figures 14 and 15 are trend charts showing historical trends for COCs for the source area wells.

VC was detected at all three source area monitoring wells with concentrations ranging between 0.28 µg/L and 0.94 µg/L which are above the CUL (0.2 µg/L). Benzene was detected above the CUL (0.80 µg/L) in GW033S (8.85 µg/L) and its associated duplicate sample (9.44 µg/L). Cis-1,2-DCE was detected at two source area locations below the CUL (0.70 µg/L). TCE was not detected in any of the source area wells. TPH as gasoline was detected at one source area monitoring well, GW033S. Detected concentration of TPH at GW0332 and its duplicate sample were below the CUL of 800 µg/L. The continued downward trend of TPH levels since 2021 is likely a result of the removal of TPH-contaminated soil that took place in September 2021.

Figure 14 shows trends for VOCs in source area wells GW031S and GW033S. COCs in GW031S appear to be stabilizing over the past four monitoring events, while in GW033S COC concentrations appear to be exhibiting a seasonal pattern of higher COC concentrations detected during the dry season for the last three events.

Figure 15 shows trends for VOCs in source area wells GW034S and GW244S. TCE has remained undetected in GW034S for the last several years; however, detected concentrations of all other COCs in GW034S significantly increased during the last wet season event. The February 2023 results from GW034S appeared similar to recent prior monitoring results from nearby GW033S and results from GW033S appeared similar to recent prior monitoring results from GW034S.

The additional samples collected from GW034S and GW033S in April 2023 indicate that sample identification may have been inadvertently swapped in February 2023. The April 2023 results appear consistent with recent monitoring events prior to February 2023 (see Appendix E for more details). In addition, the August 2023 results show detections of COCs at GW033S and GW034S similar to monitoring events prior to February 2023, suggesting the February 2023 detections are anomalous or erroneous. Cis-1,2-DCE, benzene, and VC have returned to the generally stable levels observed before the significant increase in concentrations detected during the last monitoring event. Concentrations of COCs in GW244S appear to be overall decreasing since the start of compliance monitoring.

3.3.4.3 COC Results for CPOC Area

As shown in Table 9, VC was detected above the CUL (0.20 µg/L) in groundwater from GW237S (0.25 µg/L). All other detections of benzene and cis-1,2-DCE are below their respective CULs. TCE and TPH as gasoline were not detected in any CPOC area wells sampled.

Trend charts for CPOC area wells are shown in Figures 16 through 18.

Figure 16 shows that benzene and cis-1,2-DCE have been sporadically detected above the CUL in CPOC area wells GW237S and GW143S, respectively. No detections of benzene or cis-1,2-DCE were detected above their respective CULs during this reporting period.

Figure 17 shows that TCE has not been detected in the CPOC area for five consecutive events, with the exception of GW143S during the dry season 2022 sampling event. VC was detected in all CPOC wells during this event, with a CUL exceedance in GW237S, which has shown the highest levels of VC of the three wells for the last several monitoring events. Figure 18 shows that TPH as gasoline has been detected only in GW237S since monitoring began and has been generally decreasing over time, with no detections during this reporting period.

3.4 FORMER FUEL FARM AOC GROUP

This section describes corrective action activities conducted at the Former Fuel Farm AOC Group. Figure 19 shows the layout of the groundwater monitoring wells for which sampling is required under CMP Addendum #3 (CALIBRE, 2020). The final remedy for the Former Fuel Farm is MNA.

3.4.1 CLEANUP ACTION ACTIVITIES

No installation/construction activities were conducted for this AOC Group during this reporting period.

3.4.2 CMP DEVIATIONS

No deviations from the CMP occurred for this cleanup action area during this reporting period. The wells monitored and the COCs remained the same for this AOC Group.

3.4.3 WATER LEVELS

The groundwater elevations measured during this groundwater monitoring event at the Former Fuel Farm AOC Group are summarized in Table 10 and shown on Figure 19. Groundwater elevation contours are not shown because only three wells are monitored in this group and data are too limited to produce accurate contours. Groundwater flow direction to the northeast is based on historical information from this AOC.

3.4.4 GROUNDWATER MONITORING RESULTS

Groundwater at Former Fuel Farm AOC Group is monitored following the analysis protocol presented in Tables A-1 and A-2 in Appendix A. Results for primary geochemical indicators are presented in Table 11; results for the Former Fuel Farm AOC Group COCs are presented in Table 12.

3.4.4.1 Monitored Natural Attenuation Indicators

The geochemical indicator results are presented in Table 11. Results in Table 11 indicate that geochemical conditions are generally consistent throughout the Former Fuel Farm AOC Group. Specific conductivity was moderate for groundwater. Slightly acidic pH was observed in CPOC area wells ranging from 6.02 to 6.29 standard units. Low DO and negative ORP was observed in all monitored wells. The geochemical indicators indicate natural attenuation of the COCs for the Former Fuel Farm AOC Group is occurring.

3.4.4.2 COC Results for Source Area

The single source area well for this AOC Group was removed from the monitoring plan with Ecology's acceptance of CMP Addendum #3 (CALIBRE, 2020).

3.4.4.3 COC Results for CPOC Area

Table 12 presents the analytical results for the Former Fuel Farm AOC Group COCs. Figure 20 shows trend data for CPOC area wells GW211S, GW221S, and GW224S. Samples were analyzed for TPH as diesel, as motor oil, and as Jet A. TPH as diesel and as Jet A were detected above their respective CULs (0.5 mg/L) in GW224S (and its duplicate sample). TPH as motor oil was detected in GW224S at a concentration of 0.324 mg/L; no CULs are established for this analyte. Detected COCs TPH as diesel and as Jet A at CPOC area well GW221S were below their respective CUL (0.50 mg/L). No COCs were detected at CPOC area well GW211S. TPH as diesel and Jet A in GW211S have been below the CULs and/or non-detect for eleven events (Figure 20). Figure 20 shows COC concentrations in GW221S and GW224S remain within historical ranges since 2020.

3.5 AOC-001/002

This section describes corrective action activities conducted at AOC-001/002. The monitoring and future/continued cleanup actions (if necessary) for this AOC will be determined in the next CMP addendum prepared for Ecology approval. Figure 21 shows the layout of the groundwater monitoring wells.

3.5.1 CLEANUP ACTION ACTIVITIES

During summer 2023, Apron R construction was completed. Following construction completion, 13 monitoring wells (GW185S-R, GW190S-R, GW191D-R, GW192S-R, GW193S-R, GW195S-R, GW196D-R, GW197S-R, GW213S-R, GW214S-R, GW215S-R, GW245S-R, and GW246S-R) were replaced, developed, and sampled. Two horizontal injection wells (IPR1 and IPR2) were also replaced. Boeing's contracted with Holocene Drilling, Inc, a Washington State licensed well driller, to replace 13 monitoring wells with partial oversight from WSP to assure adherence to compliance monitoring requirements. WSP contracted Holocene Drilling, Inc. for well development, and Duane Hartman & Associates, Inc. for surveying of the new monitoring wells. WSP performed the dry season 2023 sampling of the compliance monitoring wells.

3.5.2 CMP DEVIATIONS

No deviations from the CMP occurred for AOC-001/002 during this reporting period.

3.5.3 WATER LEVELS

The groundwater elevations measured during this groundwater monitoring event at AOC-001 and AOC-002 are summarized in Table 13.

3.5.4 GROUNDWATER MONITORING RESULTS

Groundwater at this area is monitored following the analysis protocol presented in Tables A-1 and A-2 in Appendix A. Results for geochemical indicators are presented in Table 14; results for the AOC-001 and AOC-002 COCs are presented in Table 15.

3.5.4.1 Monitored Attenuation/Geochemical Indicators

The geochemical indicator results are presented in Table 14. High specific conductivity, negative ORP, and low DO were observed during this monitoring event, and pH readings varied from slightly acidic to basic, ranging from 6.28 to 9.26 standard units. TOC was measured between 5.5 mg/L and 36.46 mg/L. Based on the geochemical indicators, reducing conditions are occurring in this area.

3.5.4.2 COC Results for Source Area, Cross-Gradient, and Downgradient Plume Area

Table 15 lists the analytical results for the AOC-001 and AOC-002 COCs. Samples from wells in this group were analyzed for benzene, 1,1-Dichloroethene (1,1-DCE), cis-1,2-DCE, TCE and VC. Analytes present in Table 15 are the COCs analyzed during the last sampling event that all wells in AOC-001 and AOC-002 were sampled before decommissioning for construction (Wood, 2019b). No detections of benzene or 1,1-DCE were found in any of the source area, cross-gradient, or downgradient plume area wells. TCE detected in source area well GW193S-R (0.139 µg/L) and was not detected in any cross-gradient or downgradient plume area wells with the exception of GW192S-R (0.0519 µg/L). Cis-1,2-DCE was detected in all source area, cross-gradient, and downgradient plume area wells above the CUL of 0.02 µg/L. VC was detected above the CUL in all source area wells, all downgradient plume area wells, and in cross-gradient well GW213S-R. VC was also detected below the CUL in cross-gradient wells GW214S-R and GW215S-R. Figures 22 and 23 show the historical trends of cis-1,2-DCE, TCE, and VC concentrations in source area well GW193S and downgradient plume area wells compared to the concentrations detected during this monitoring period.

3.5.4.3 COC Results for CPOC Area

The concentrations of these analytes can be found in Table 15. Analytes present in Table 15 are the COCs analyzed during the last sampling event that all wells in AOC-001 and AOC-002 were sampled before decommissioning for construction (Wood, 2019b). Benzene was not detected in wells GW185S-R, GW195S-R, and GW196D-R, but was detected in GW197S-R (1.00 µg/L) and GW245S-R (0.81µg/L) above the CUL (0.80 µg/L). 1,1-DCE was detected only in well GW197S-R (0.489 µg/L), above the CUL (0.057 µg/L). Cis-1,2-DCE was detected above the CUL (0.02 µg/L) in all CPOC area wells. TCE was only detected in wells GW197S-R (1.36 µg/L) and GW245S-R (0.0406 µg/L). VC was detected above the CUL (0.05 µg/L) with the exception of GW196D-R, which was detected below the CUL. Figure 24 shows the historical trends of cis-1,2-DCE, TCE, and VC in all CPOC wells. VC and cis-1,2-DCE were detected at elevated concentrations compared to historic levels (124 µg/L and 127 µg/L, respectively) in GW197S-R. Plans for remedial actions are forthcoming and will be prepared for Ecology approval.

3.6 AOC-003

This section describes corrective action activities conducted at AOC-003. The cleanup remedy for this AOC is MA. Figure 25 shows the location of groundwater monitoring wells for which sampling is required under CMP Addendum #3 (CALIBRE, 2020) and bioremediation wells, as well as the groundwater elevations measured during this monitoring event.

3.6.1 CLEANUP ACTION ACTIVITIES

During repaving activities in 2022, GW247S was accidentally destroyed. GW247S-R was reinstalled, developed, and sampled this reporting period. This replacement well was installed with other replacement wells in AOC-001 and AOC-002. Details on the installation activities are available in Section 3.5.1.

3.6.2 CMP DEVIATIONS

No deviations from the CMP occurred in this AOC during this reporting period.

3.6.3 WATER LEVELS

The groundwater elevations measured during this groundwater monitoring event at AOC-003 are summarized in Table 16 and shown on Figure 25. Groundwater elevations measured during this event are consistent with historical groundwater flow directions to the northwest.

3.6.4 GROUNDWATER MONITORING RESULTS

Groundwater at this AOC is monitored following the analysis protocol presented in Tables A-1 and A-2 in Appendix A. Results for geochemical indicators are presented in Table 17; results for the AOC-003 COCs are presented in Table 18.

3.6.4.1 Monitored Attenuation/Geochemical Indicators

The geochemical indicator results are presented in Table 17. Results in Table 17 indicate that geochemical conditions are generally consistent throughout this AOC. High specific conductivity, low DO, and negative ORP were observed during this monitoring event, and pH readings were slightly acidic for all wells in this area, ranging between 6.26 and 6.35 standard units. TOC concentrations ranged from 11.97 to 12.72 mg/L. Based on the geochemical indicators, reducing conditions are occurring in this area.

3.6.4.2 COC Results for Source Area and Downgradient Plume Area

Table 18 lists the analytical results for the AOC-003 COCs. Samples from wells in this group were analyzed for cis-1,2-DCE, TCE, PCE, and VC. VC was detected above the CUL (0.24 µg/L) in GW249S (0.263 µg/L), and below the CUL in GW188S. No detected concentrations of TCE or PCE were observed in the source area and downgradient plume area wells. Cis-1,2-DCE was detected in both source area and downgradient plume wells below the CUL (0.78 µg/L). Figure 26 shows the historical trends for VC in source area well GW249S and downgradient plume area well GW188S.

3.6.4.3 COC Results for CPOC Area

VC was detected above the CUL (0.24 µg/L) in CPOC area wells GW247S-R (0.715 µg/L) and GW248I (0.482 µg/L) (Table 18). No detected concentrations of TCE or PCE were found in the CPOC area wells. Cis-1,2-DCE was detected in CPOC area well GW248I below the CUL (0.78 µg/L) and was not detected in GW247S-R.

Figure 27 shows the historical trends for VC in CPOC area wells GW247S and GW248I. GW247S-R results were added to the existing trend chart for GW247S; more results are needed to fully evaluate trends in the new well. VC concentrations in GW247S-R appear to be increasing since 2022 and decreasing in GW248I over the same timeframe.

3.7 AOC-004

This section describes corrective action activities conducted at AOC-004. The cleanup remedy for this AOC is MA. Figure 28 shows the location of the groundwater monitoring well for which sampling is required under CMP Addendum #3 (CALIBRE, 2020) and bioremediation wells, as well as the groundwater elevation measured during this monitoring event.

3.7.1 CLEANUP ACTION ACTIVITIES

No installation/construction activities were conducted for this AOC during this reporting period.

3.7.2 CMP DEVIATIONS

No deviations from the CMP occurred for this AOC during this reporting period and COCs remained the same for this AOC.

3.7.3 WATER LEVELS

The groundwater elevation measured during this groundwater monitoring event at AOC-004 is summarized in Table 19 and shown on Figure 28. Groundwater contouring and flow direction cannot be determined from the single groundwater elevation measurement, but a general direction of groundwater flow based on historical information is shown on Figure 28.

3.7.4 GROUNDWATER MONITORING RESULTS

Groundwater at AOC-004 is monitored following the analysis protocol presented in Tables A-1 and A-2 in Appendix A. Results for geochemical indicators are presented in Table 20; the result for the AOC-004 COC (lead) is presented in Table 21.

3.7.4.1 Monitored Attenuation/Geochemical Indicators

The geochemical indicator results are presented in Table 20. The pH reading was near neutral at 6.94 standard units. Moderate specific conductivity, negative ORP, and low DO readings were observed during this monitoring event.

3.7.4.2 COC Results for Source Area

Table 21 lists the analytical result for the AOC-004 COC. Lead was detected in the single source area monitoring well GW250S at 0.0570 µg/L (estimated), below the CUL of 1 µg/L. Figure 29 shows the historical trend chart for lead in GW250S.

3.8 AOC-060

This section describes corrective action activities conducted at AOC-060. The cleanup remedy for this AOC is bioremediation and MA. Figure 30 shows the location of groundwater monitoring wells for which sampling is required under CMP Addendum #3 (CALIBRE, 2020) and bioremediation wells, as well as the groundwater elevations measured during this monitoring event.

3.8.1 CLEANUP ACTION ACTIVITIES

3.8.1.1 INSTALLATION/CONSTRUCTION ACTIVITIES

No installation/construction activities were conducted for this cleanup action area during this reporting period.

3.8.1.2 BIOREMEDIATION ACTIVITIES

The current remediation method is bioremediation injections and ERD treatment. The most recent injection occurred in May 2023. Additional details regarding the injection can be found in Appendix E.

3.8.2 CMP DEVIATIONS

No deviations from the CMP occurred for this AOC during this reporting period. The well monitored and COC remained the same for this AOC.

3.8.3 WATER LEVELS

The groundwater elevations measured during this groundwater monitoring event at AOC-060 are summarized in Table 22 and shown on Figure 30. Groundwater flow direction is generally to the west-southwest toward the Cedar River Waterway.

3.8.4 GROUNDWATER MONITORING RESULTS

Groundwater at AOC-060 is monitored following the analysis protocol presented in Tables A-1 and A-2 in Appendix A. Results for geochemical indicators are presented in Table 23; results for the AOC-060 COCs are presented in Table 24.

3.8.4.1 Monitored Attenuation/Geochemical Indicators

The geochemical indicator results are presented in Table 23. Results during this monitoring event are consistent across the area, with the exception of specific conductivity, which ranged from 357 to 5,595 microsiemens per centimeter. The pH ranged between near neutral and acidic in this AOC, between 4.74 and 6.55 standard units. TOC results from all wells varied greatly, with a range from 3.86 to 15,640 mg/L.

3.8.4.2 COC Results for Source, Cross-Gradient, and Downgradient Plume Areas

Table 24 lists the analytical results for the AOC-060 COCs. Wells in this group were analyzed for cis-1,2-DCE, TCE, and VC. Groundwater from source area well GW009S, cross-gradient well GW012S, and downgradient plume area well GW147S exceeded their respective CULs for all three COCs. VC and cis-1,2-DCE were detected above their respective CULs in GW014S and its field duplicate.

Figure 31 shows historical trends for COCs in source area well GW009S, which have remained within historical ranges since monitoring began. Figures 31 and 32 show historical trends for COCs in downgradient plume area wells. COC results in GW014S have been generally within historical ranges since monitoring began, but GW012S and GW147S exhibit more fluctuation in COC concentrations, possibly due to seasonal groundwater flow variations. TCE in GW012S appears to have increasing fluctuation over the last five monitoring events, departing from the lows observed in 2018 and 2019, but concentrations remain within the historical range for TCE concentrations in this well.

3.8.4.3 COC Results for CPOC Area

As shown in Table 24, detected concentrations of cis-1,2-DCE exceeded the CUL (0.08 µg/L) in groundwater from CPOC area wells GW150S (0.0901 µg/L) and GW253I (0.0997 µg/L). TCE and VC were detected in groundwater from both CPOC area wells but did not exceed their respective CULs. Figure 33 shows historical trends for COCs in CPOC area wells GW150S and GW253I. Considerable fluctuation is still present for cis-1,2-DCE and VC, but TCE appears to be stabilizing in both CPOC area wells.

3.9 AOC-090

This section describes corrective action activities conducted at AOC-090. The cleanup remedy for this AOC is bioremediation and MA. Figure 34 shows the location of groundwater monitoring wells for which sampling is required under CMP Addendum #3 (CALIBRE, 2020) and bioremediation wells, as well as the groundwater elevations measured during this monitoring event.

3.9.1 CLEANUP ACTION ACTIVITIES

3.9.1.1 INSTALLATION/CONSTRUCTION ACTIVITIES

No installation/construction activities were conducted for this AOC during this reporting period.

3.9.1.2 BIOREMEDIATION ACTIVITIES

The current remediation method is bioremediation injections and ERD treatment. The most recent injection occurred in May 2023. Additional details regarding the injection can be found in Appendix E.

3.9.2 CMP DEVIATIONS

No deviations from the CMP occurred for this area during this reporting period. The wells monitored and COCs remained the same for this AOC.

3.9.3 WATER LEVELS

The groundwater elevations measured during this groundwater monitoring event at AOC-090 are summarized in Table 25 and shown on Figure 34. Groundwater flow direction is to the west toward the Cedar River Waterway; however, the sheet pile wall to the west of this area prevents a direct groundwater connection to the waterway, as depicted by the contours.

3.9.4 GROUNDWATER MONITORING RESULTS

Groundwater at AOC-090 is monitored following the analysis protocol presented in Tables A-1 and A-2 in Appendix A. Results for geochemical indicators are presented in Table 26; results for the AOC-090 COCs are presented in Table 27.

3.9.4.1 Monitored Attenuation/Geochemical Indicators

The geochemical indicator results are presented in Table 26. Results showed high specific conductivity and low DO values across the area. The pH was slightly acidic in this AOC, with all wells ranging between 5.98 and 6.35 standard units. TOC was measured at 4.63 mg/L in source area well GW189S. The trend plot for TOC in GW189S (Figure 35) shows TOC has decreased significantly since the last substrate injection in 2017.

3.9.4.2 COC Results for Source and Downgradient Plume Areas

Table 27 lists the analytical results for the AOC-090 COCs. Groundwater from source area well GW189S exceeded the CUL for TCE and VC. Historical trends for GW189S show chlorinated VOCs have been trending downward since the start of monitoring (Figure 35). Downgradient plume area well GW176S exceeded the CUL for VC.

3.9.4.3 COC Results for CPOC Area

VC was detected above the CUL in all CPOC area wells (Table 27).

3.10 APRON A AREA

This section describes corrective action activities conducted at the Apron A area. The cleanup remedy proposed for the Apron A area is bioremediation and MA. Figure 36 shows the locations of the groundwater monitoring wells in the Apron A area for which sampling is required under CMP Addendum #3 (CALIBRE, 2020).

3.10.1 CLEANUP ACTION ACTIVITIES

No construction or operations work was conducted in the Apron A area during this reporting period.

3.10.2 CMP DEVIATIONS

No deviations from the CMP occurred for this area during this reporting period. The wells monitored in this group and COCs remained the same.

3.10.3 WATER LEVELS

The groundwater elevation measurement from this groundwater monitoring event at Apron A is in Table 28 and shown on Figure 36. Groundwater flow direction is estimated based on historical information and an expected flow east toward the Cedar River Waterway.

3.10.4 GROUNDWATER MONITORING RESULTS

Groundwater at Apron A is monitored following the analysis protocol presented in Tables A-1 and A-2 in Appendix A. Results for primary geochemical indicators presented in Table 29; results for the Apron A area COCs are presented in Table 30.

3.10.4.1 Monitored Attenuation/Geochemical Indicators

The geochemical indicator results are presented in Table 29. Observations included high specific conductivity, low DO, slightly acidic pH, and a negative ORP reading. TOC was detected in GW264S at a concentration of 24.67 mg/L.

3.10.4.2 COC Results

Table 30 lists the analytical results for the Apron A area COCs (cis-1,2-DCE and VC) and both analytes are reported as non-detect (< 2.0 µg/L). Due to the foamy matrix of the sample collected, elevated reporting limits were provided by the laboratory. No detections of cis-1,2-DCE or VC were found above the method detection limits for each analyte (0.810 µg/L and 0.820 µg/L, respectively). Analytes from Apron A samples do not have established CULs because they were added to the monitoring program after the CMP (Amec Foster Wheeler, 2016a) was in place. Additional monitoring of the soil and groundwater in Apron A was completed in 2016 and included installation of the monitoring wells in this area (Amec Foster Wheeler, 2016b). Neither cis-1,2-DCE nor VC were detected in the groundwater from well GW264S. The trend plot for COCs in GW264S is shown in Figure 37. Cis-1,2-DCE has not been detected for five consecutive reporting periods, but VC still appears to fluctuate with the current VC results (August 2023) as non-detect.

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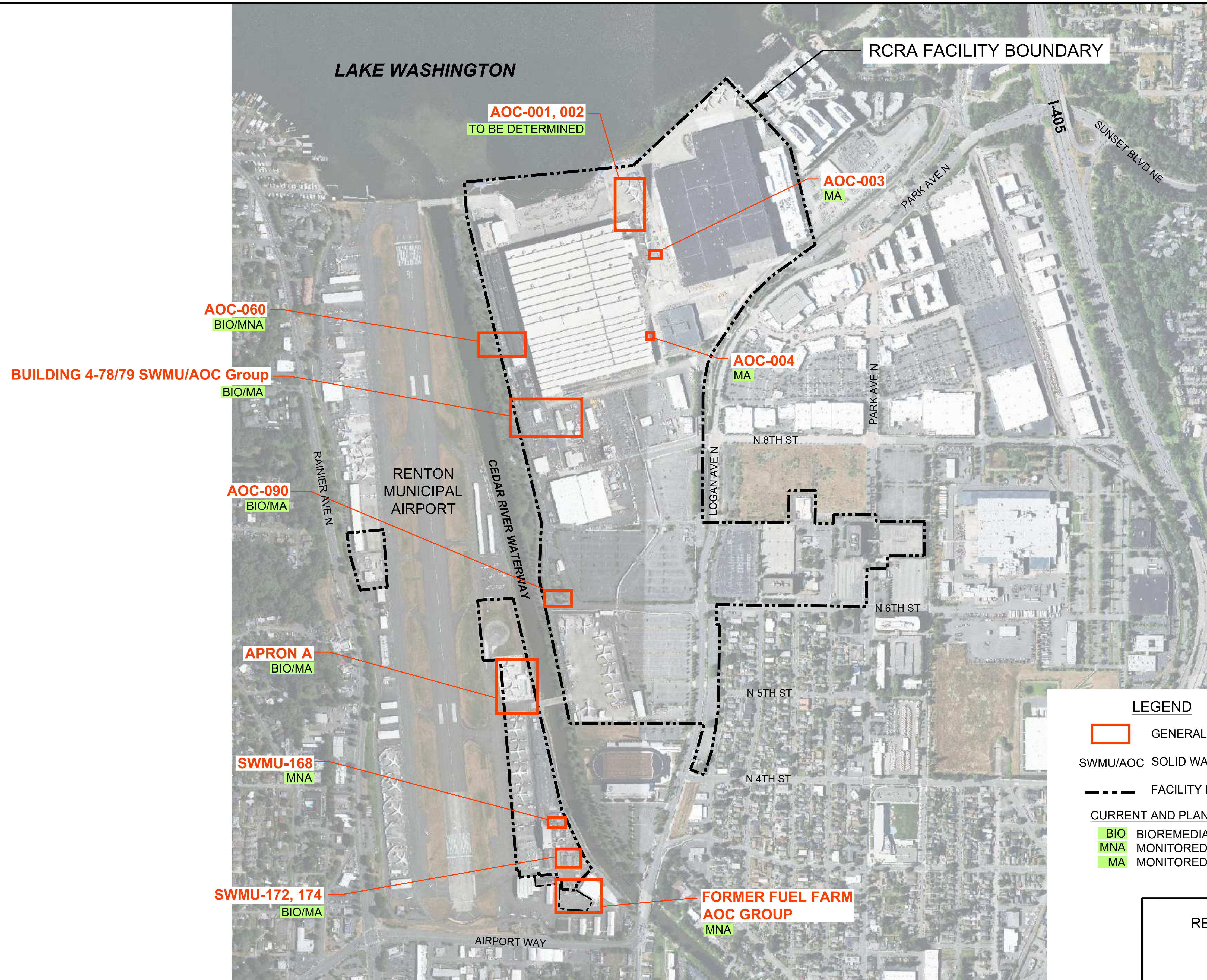
FIGURES



LEGEND

GENERAL LOCATION OF SWMUs AND AOCs

SWMU/AOC SOLID WASTE MANAGEMENT UNIT/AREA OF CONCERN

FACILITY BOUNDARY

CURRENT AND PLANNED CLEANUP REMEDIES:

- BIO BIOREMEDIATION
- MNA MONITORED NATURAL ATTENUATION
- MA MONITORED ATTENUATION

0 400 800

APPROXIMATE SCALE IN FEET

BOEING

RENTON SWMU AND AOC LOCATIONS

Boeing Renton Facility
Renton, Washington

By: APS/SD	Date: 11/16/23	Project No. PS20203450
WSP USA Environment & Infrastructure Inc.		Figure 1

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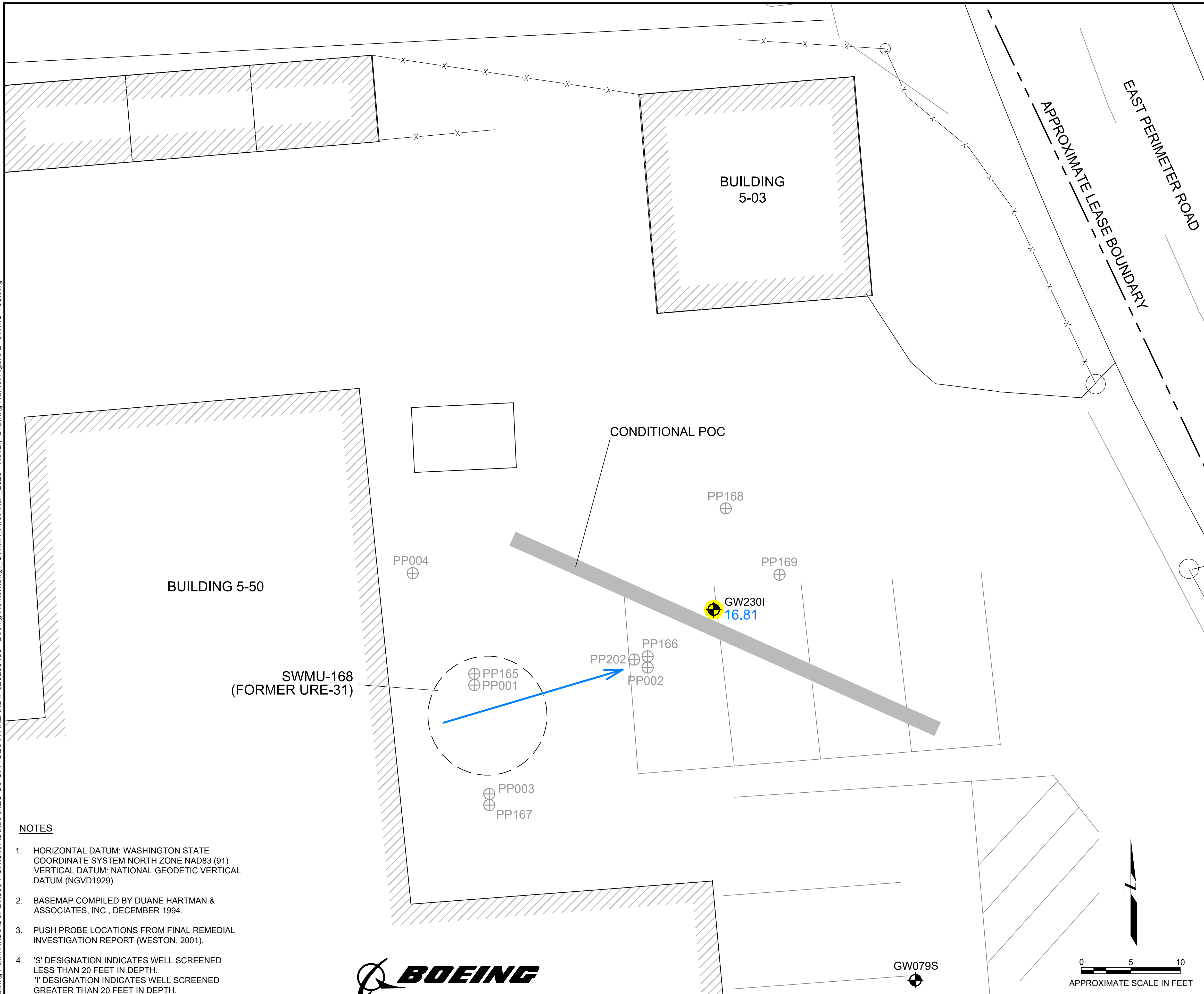
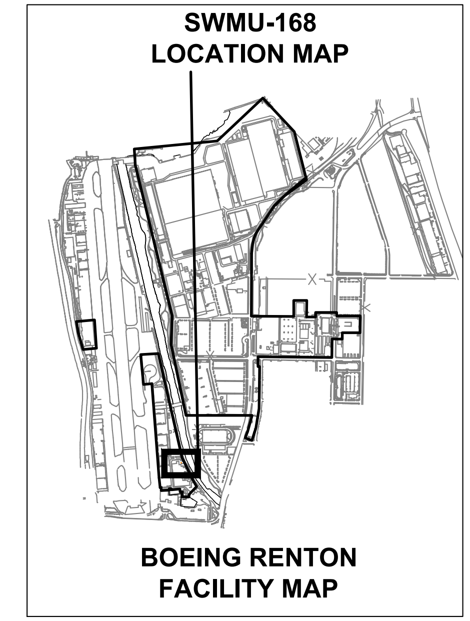




LEGEND

GW230I 16.81 — MONITORING WELL LOCATION WITH GROUNDWATER ELEVATION (NGVD-FEET)

GENERAL DIRECTION OF GROUNDWATER FLOW BASED ON HISTORICAL DATA

PP171 — PUSH-PROBE SAMPLE LOCATION

LIMITS OF FORMER EXCAVATION (SECOR 1994)

APPROXIMATE PROPERTY LINE

FENCE

CONDITIONAL POINT OF COMPLIANCE

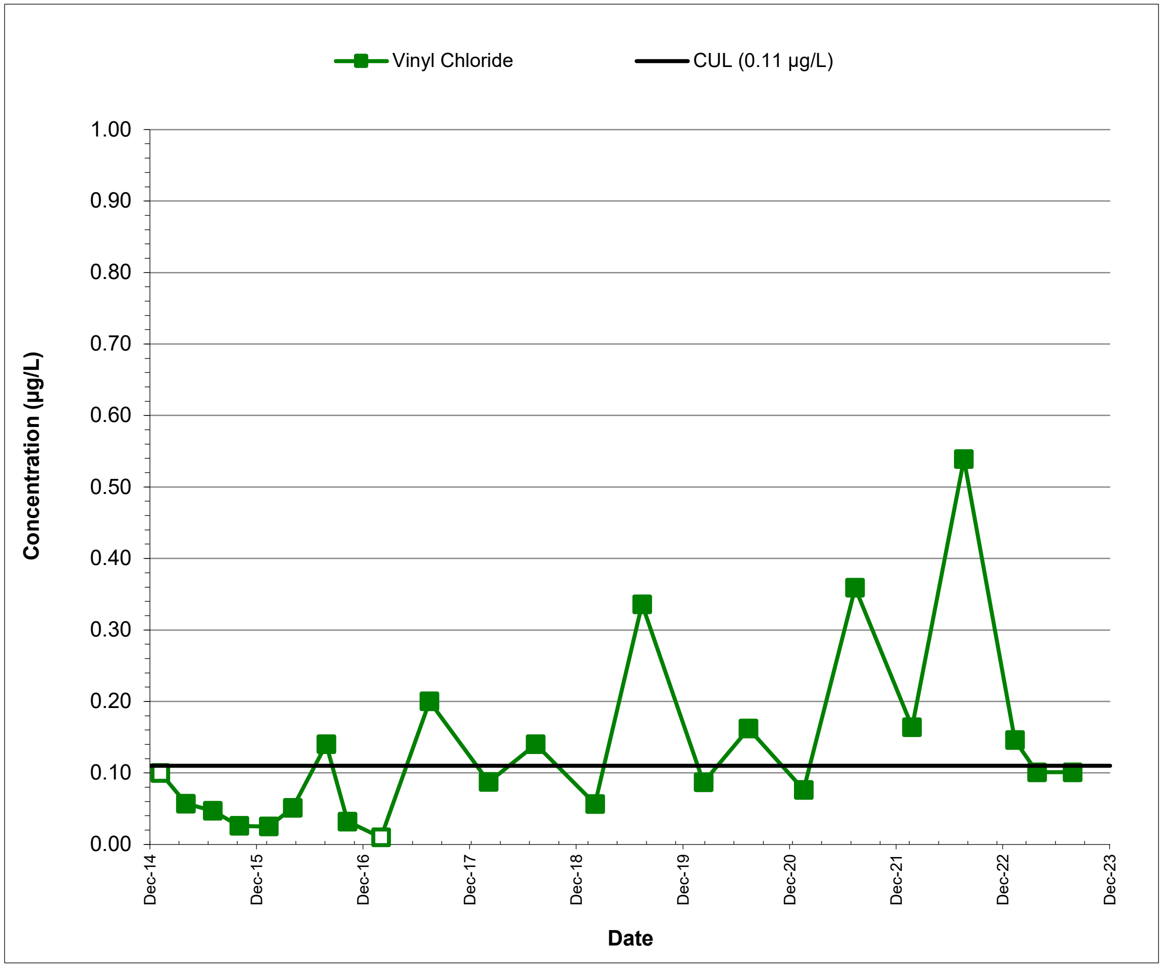
HIGHLIGHTED WELLS INCLUDED IN MONITORING NETWORK

NOTES

1. HORIZONTAL DATUM: WASHINGTON STATE COORDINATE SYSTEM NORTH ZONE NAD83 (91) VERTICAL DATUM: NATIONAL GEODETIC VERTICAL DATUM (NGVD1929)
2. BASEMAP COMPILED BY DUANE HARTMAN & ASSOCIATES, INC., DECEMBER 1994.
3. PUSH PROBE LOCATIONS FROM FINAL REMEDIAL INVESTIGATION REPORT (WESTON, 2001).
4. 'S' DESIGNATION INDICATES WELL SCREENED LESS THAN 20 FEET IN DEPTH. 'I' DESIGNATION INDICATES WELL SCREENED GREATER THAN 20 FEET IN DEPTH.

SWMU-168
MONITORING WELL LOCATIONS
AND GROUNDWATER ELEVATIONS
AUGUST 24, 2023
Boeing Renton Facility
Renton, Washington

By: SD	Date: 11/20/23	Project No. PS20203450
WSP USA Environment & Infrastructure Inc.		Figure 2

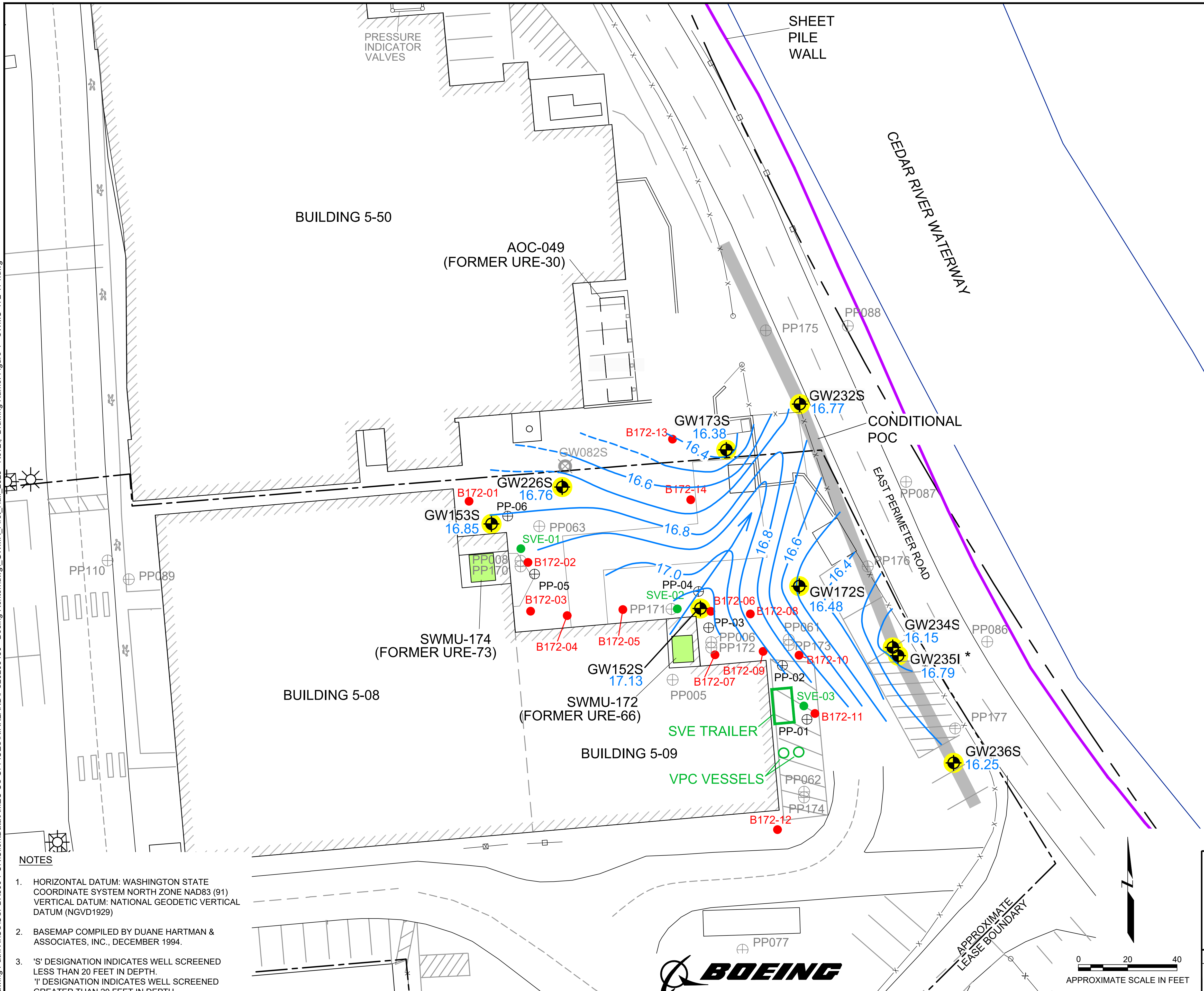


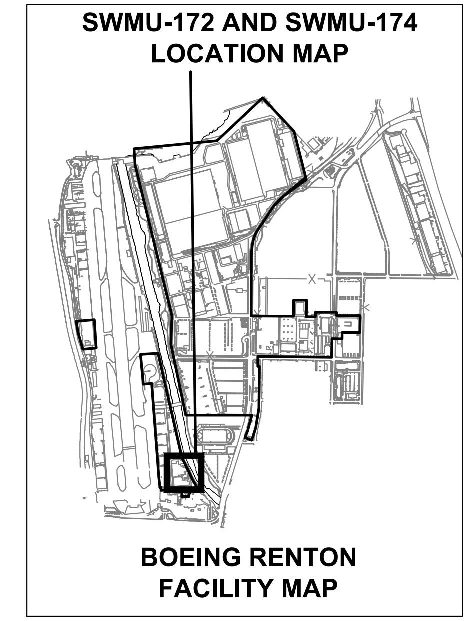
Note: Non-detected values shown at one-half the reporting limit and with an open symbol.

CPOC AREA WELL GW230I

wsp	SWMU-168 TREND PLOT FOR CPOC AREA WELL GW230I Boeing Renton Facility, Renton, Washington	Project No. PS20203450 Figure 3

\\corp.pbwan.net\GLB-E&I\US\USXHF100-SEA\SEA2-FS1-ProjectF$\8888 - Boeing Renton\3.0 Reports\ACTIVE Groundwater Monitoring\Semi-Annual Reports (2020-present)\2023_2SA\Figures\[Boeing_Renton_Charts (3-37)_ SCH Update.xlsm]Figure 3





LEGEND

- GW173S 16.38 — MONITORING WELL LOCATION WITH GROUNDWATER ELEVATION (NGVD-FEET)
- * WELL SCREENED IN UPPER AND LOWER PORTION OF AQUIFER, SO WATER LEVEL IS NOT USED FOR CONTOURING.
- 16.4 — GROUNDWATER ELEVATION CONTOUR (IN FEET) (DASHED WHERE INFERRED)
- GENERAL DIRECTION OF GROUNDWATER FLOW
- GW082S — DECOMMISSIONED MONITORING WELL
- APPROXIMATE PROPERTY LINE
- FENCE
- CONDITIONAL POINT OF COMPLIANCE
- APPROXIMATE LOCATION OF SHEET PILE WALL
- SOLID WASTE MANAGEMENT UNIT (SWMU)
- HIGHLIGHTED WELLS INCLUDED IN MONITORING NETWORK
- SVE-02 — SVE WELL
- B172-10 — BIOREMEDIATION INJECTION WELL
- PP171 — PUSH PROBE SAMPLING LOCATION
- PP-01 — PUSH PROBE SAMPLE LOCATION COMPLETED IN JUNE 2018

NOTES

1. HORIZONTAL DATUM: WASHINGTON STATE COORDINATE SYSTEM NORTH ZONE NAD83 (91) VERTICAL DATUM: NATIONAL GEODETIC VERTICAL DATUM (NGVD1929)
2. BASEMAP COMPILED BY DUANE HARTMAN & ASSOCIATES, INC., DECEMBER 1994.
3. 'S' DESIGNATION INDICATES WELL SCREENED LESS THAN 20 FEET IN DEPTH. 'I' DESIGNATION INDICATES WELL SCREENED GREATER THAN 20 FEET IN DEPTH.

SWMU-172 AND SWMU-174
MONITORING WELL LOCATIONS
AND GROUNDWATER ELEVATIONS
AUGUST 15-17, 2023
Boeing Renton Facility
Renton, Washington

By: SD	Date: 11/20/23	Project No. PS20203450
WSP USA Environment & Infrastructure Inc.		Figure 4

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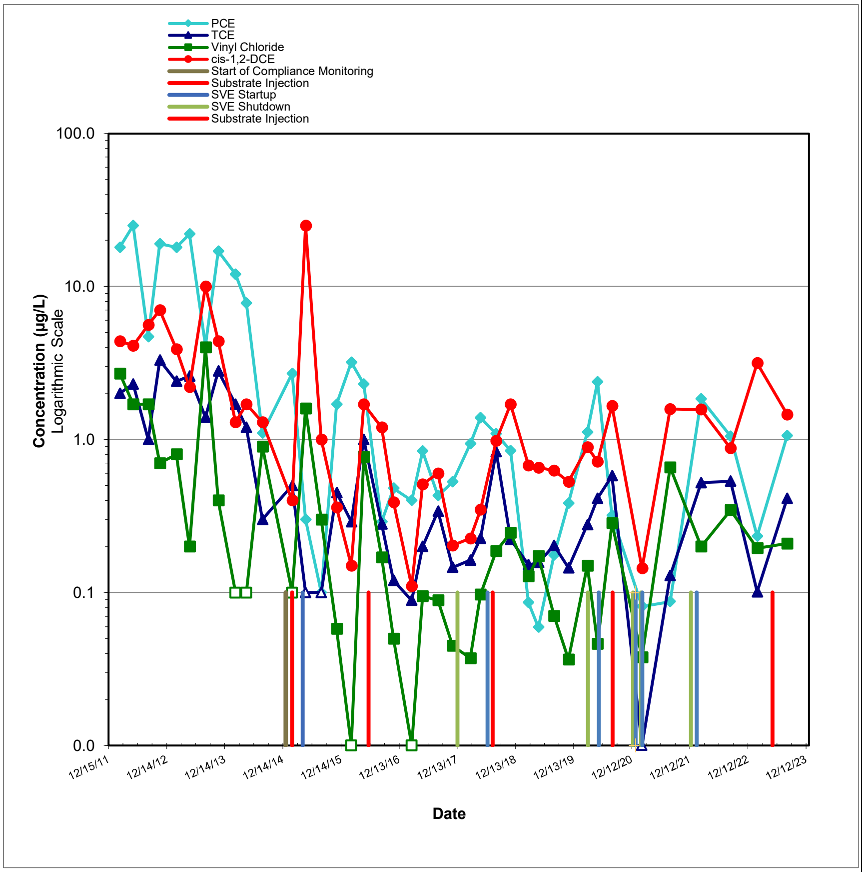
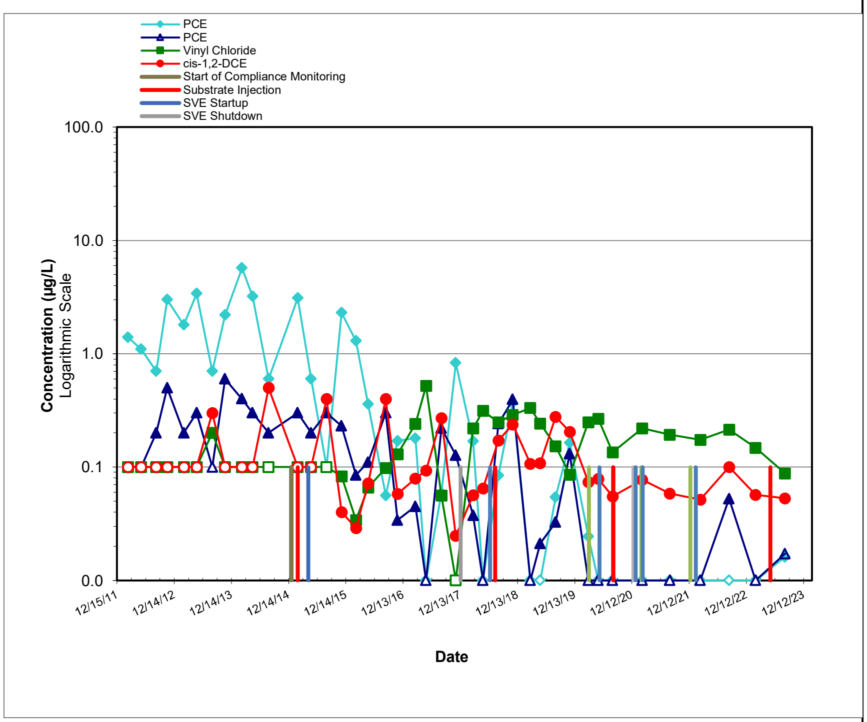


SOURCE AREA WELL GW152S

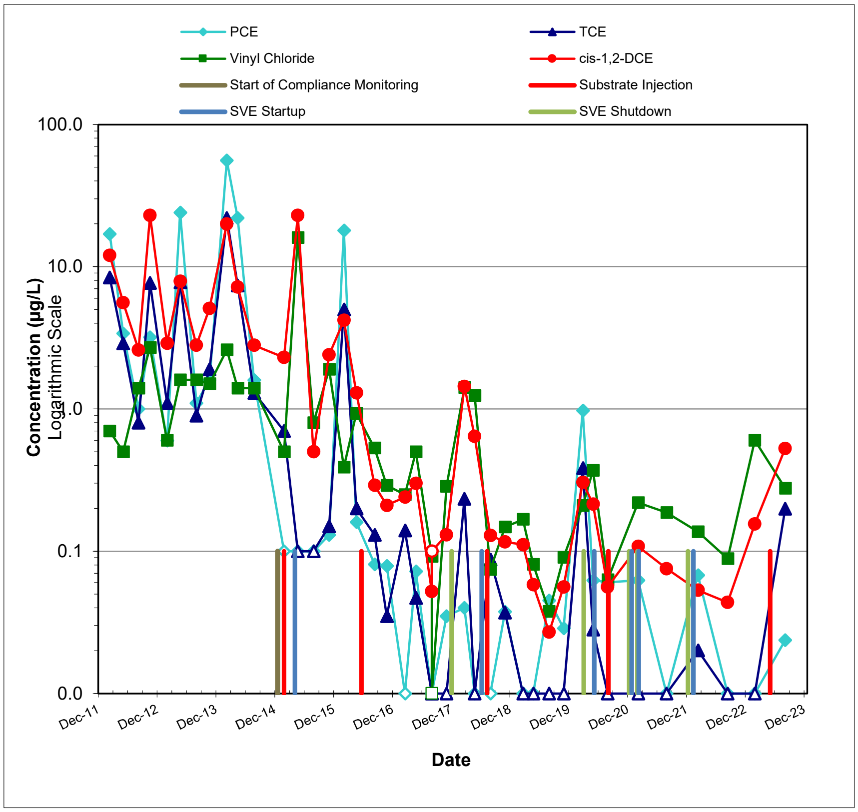


SOURCE AREA WELL GW153S

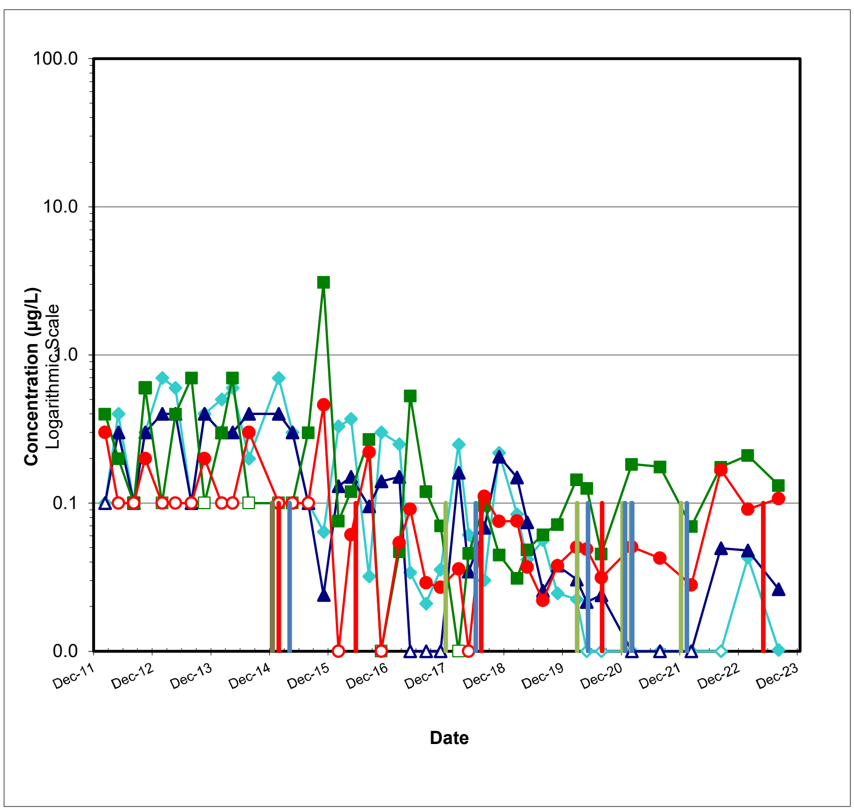
Note: Non-detected values shown at one-half the reporting limit and with an open symbol.

\\corp.pbwan.net\GLB-E&I\US\USXHF100-SEA\SEA2-FS1-ProjectF$\8888 - Boeing Renton\3.0 Reports\ACTIVE Groundwater Monitoring\Semi-Annual Reports (2020-present)\2023_2SA\Figures

wsp	SWMU-172 AND SWMU-174 TREND PLOTS FOR SOURCE AREA WELLS GW152S AND GW153S Boeing Renton Facility, Renton, Washington	Project No. PS20203450 Figure 5



DOWNGRADIENT PLUME AREA WELL GW172S

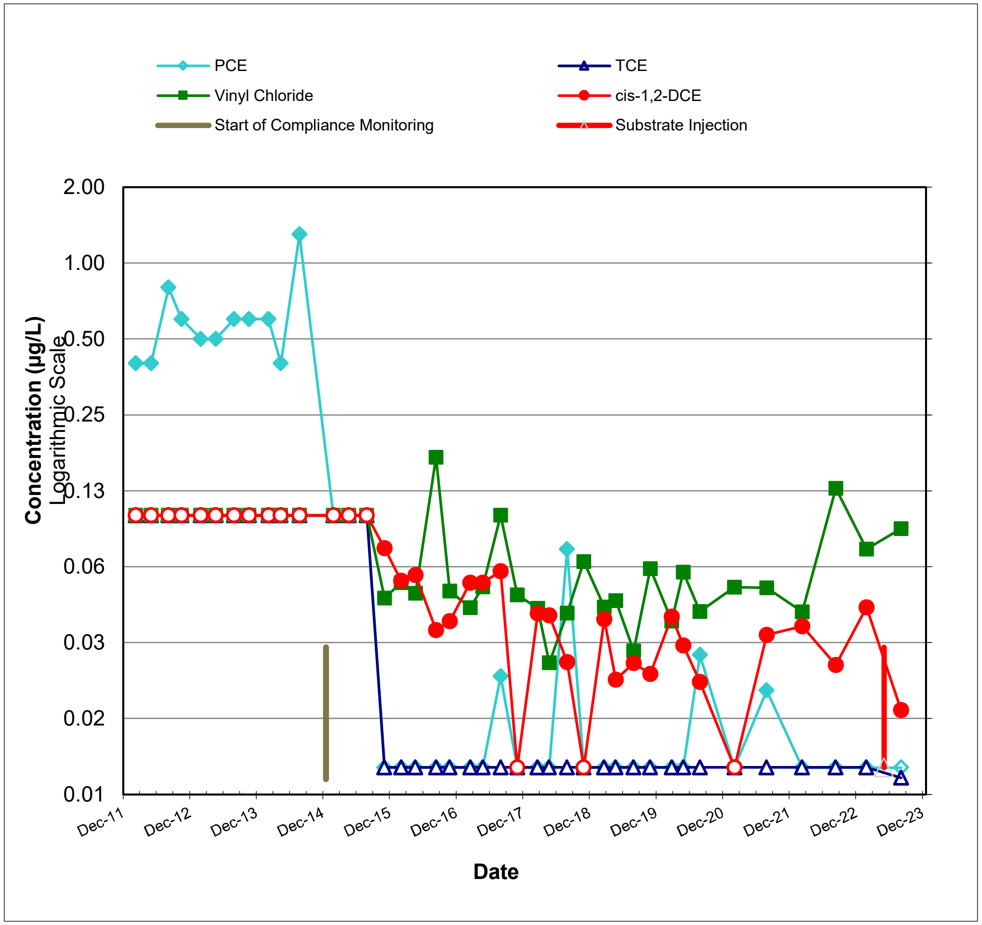


DOWNGRADIENT PLUME AREA WELL GW173S

Note: Non-detected values shown at one-half the reporting limit and with an open symbol.

wsp	SWMU-172 AND SWMU-174 TREND PLOTS FOR DOWNGRADIENT PLUME AREA WELLS GW172S AND GW173S Boeing Renton Facility, Renton, Washington	Project No. PS20203450 Figure 6

\\corp.pbwan.net\GLB-E&I\US\USXHF100-SEA\SEA2-FS1-ProjectF$\8888 - Boeing Renton\3.0 Reports\ACTIVE Groundwater Monitoring\Semi-Annual Reports (2020-present)\2023_2



Note: Non-detected values shown at one-half the reporting limit and with an open symbol.

DOWNGRADIENT PLUME AREA WELL GW226S

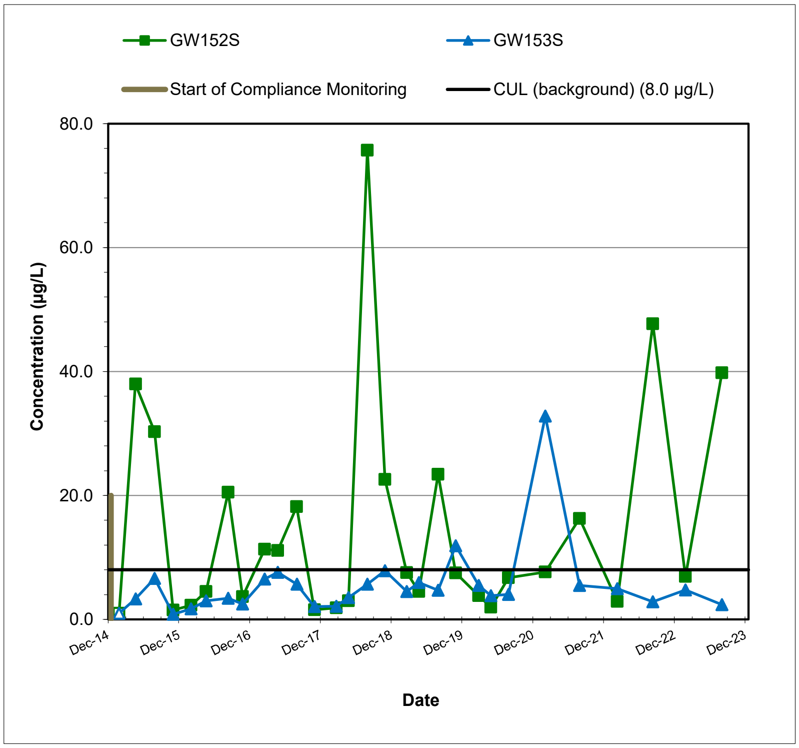
\\corp.pbwan.net\GLB-E&I\US\USXHF100-SEA\SEA2-FS1-Project\

wsp

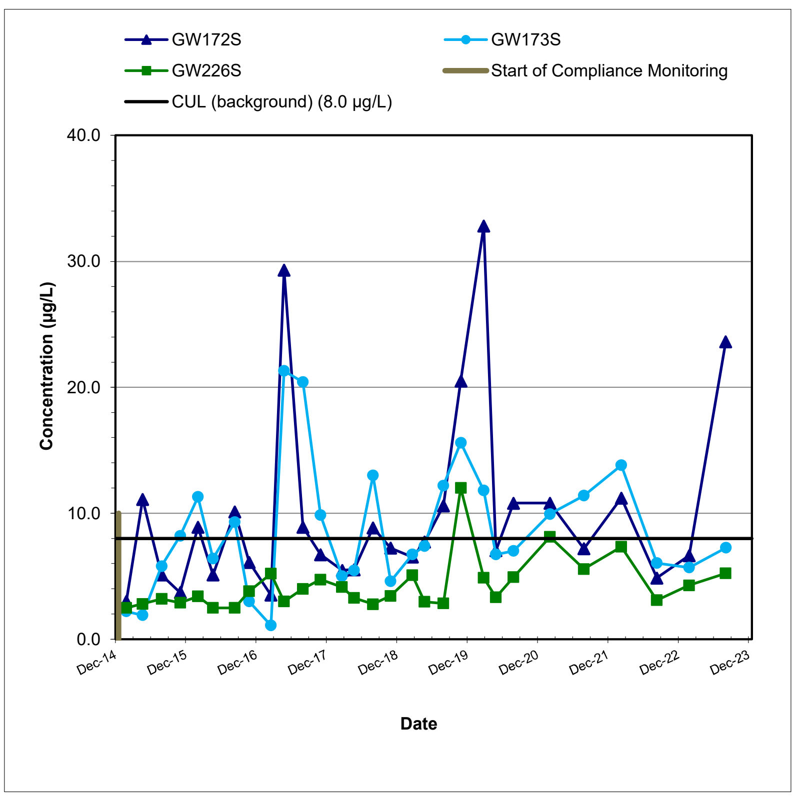
SWMU-172 AND SWMU-174 TREND PLOT FOR
DOWNGRADIENT PLUME AREA WELL GW226S
Boeing Renton Facility, Renton, Washington

Project No.
PS20203450

Figure
7



TOTAL ARSENIC IN SOURCE AREA WELLS

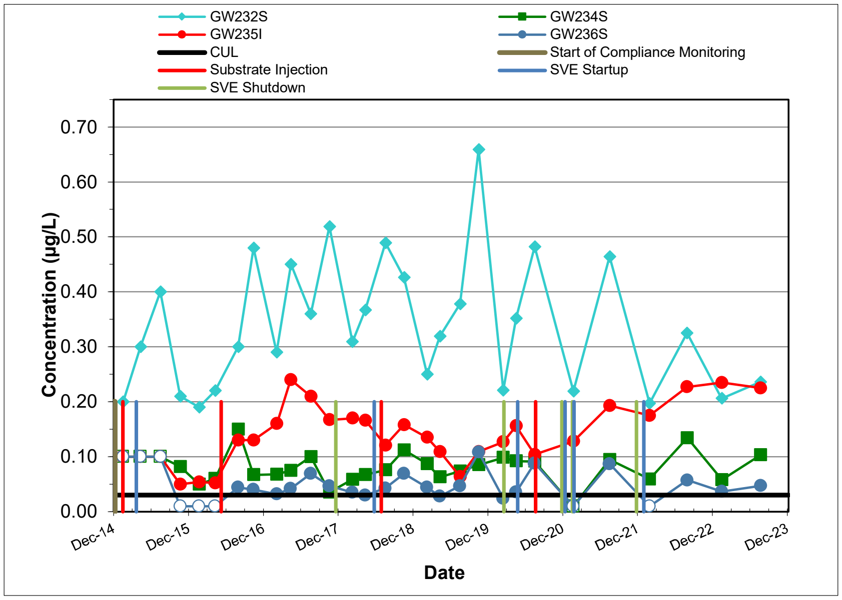


TOTAL ARSENIC IN DOWNGRADIENT PLUME AREA WELLS

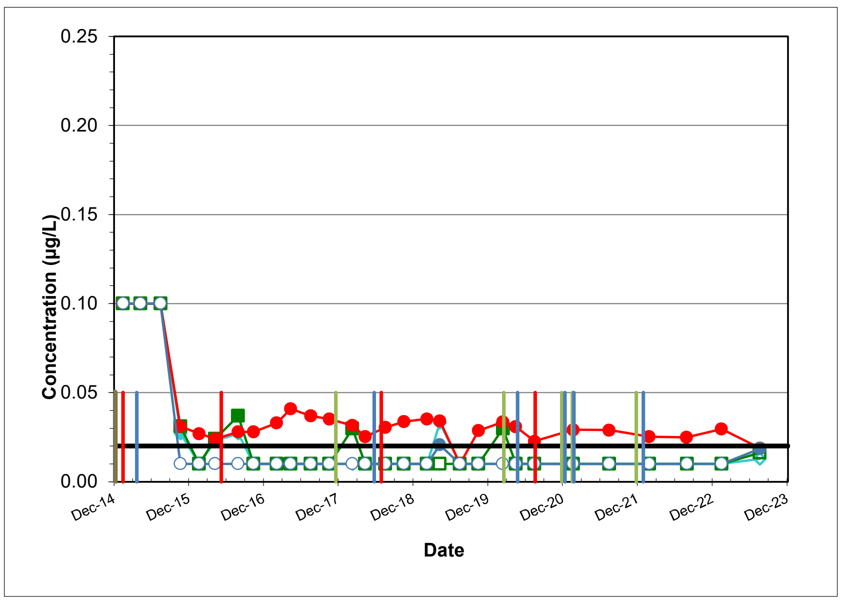
Note: Non-detected values shown at one-half the reporting limit and with an open symbol.

wsp	SWMU-172 AND SWMU-174 TREND PLOTS FOR ARSENIC IN SELECT SOURCE AREA AND DOWNGRADIENT PLUME AREA WELLS Boeing Renton Facility, Renton, Washington	Project No. PS20203450 Figure 8

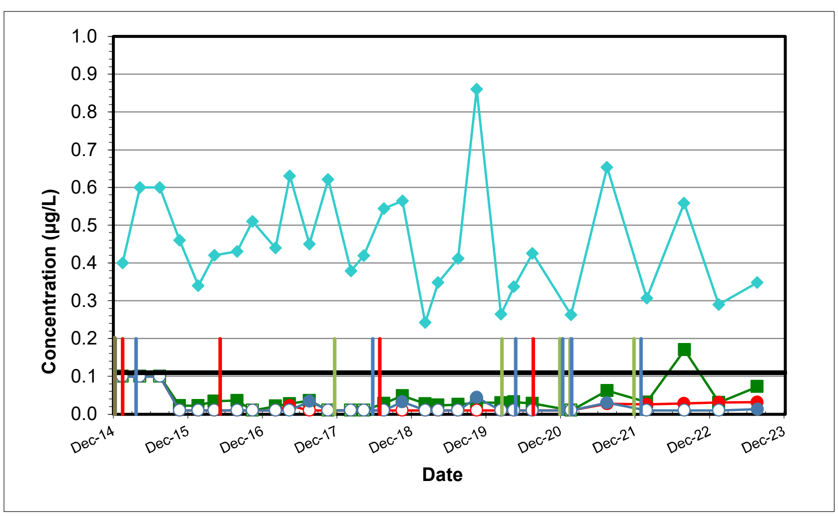
\\corp.pbwan.net\GLB-E&I\US\USXHF100-SEA\SEA2-FS1-ProjectF$\8888 - Boeing Renton\3.0 Reports\ACTIVE Groundwater Monitoring\Semi-Annual Reports (2020-present)\2023_2SA\Figi



cis-1,2-DCE



TCE

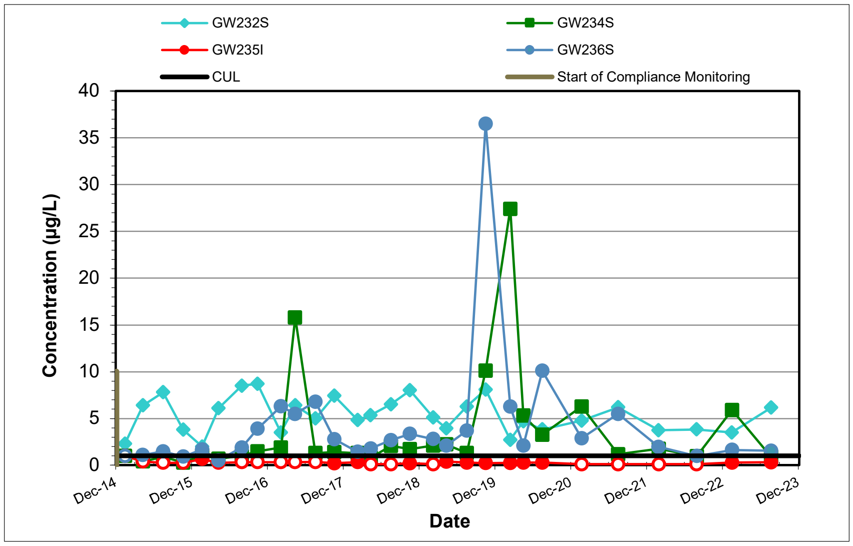


Vinyl Chloride

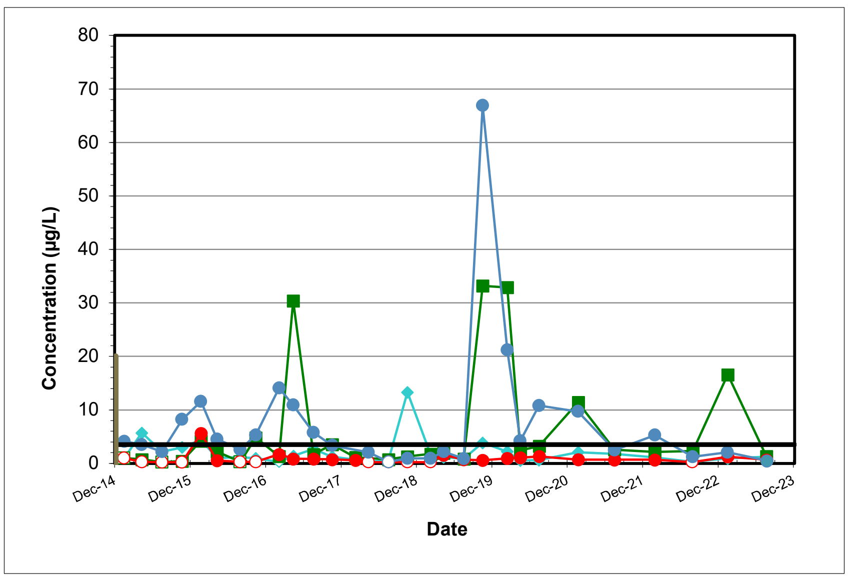
Note: Non-detected values shown at one-half the reporting limit and with an open symbol.

wsp	SWMU-172 AND SWMU-174 TREND PLOTS FOR CIS-1,2-DICHLROETHENE, TRICHLOROETHENE, AND VINYL CHLORIDE IN CPOC AREA WELLS Boeing Renton Facility, Renton, Washington	Project No. PS2020345 0 Figure 9

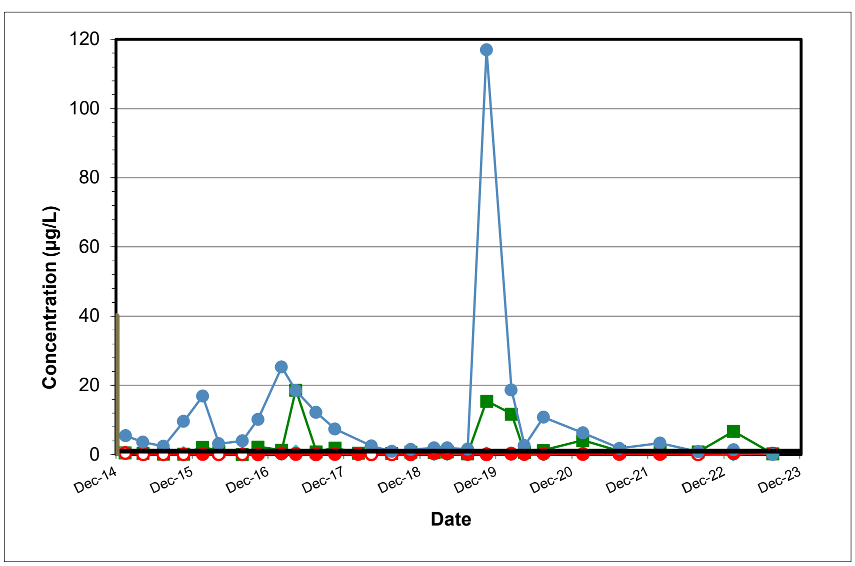
\\corp.pbwan.net\GLB-E&I\US\USXHF100-SEA\SEA2-FS1-ProjectF$\8888 - Boeing Renton\3.0 Reports\ACTIVE Groundwater Monitoring\Semi-Annual Reports (2020-present)\2023_2SA\



Arsenic



Copper

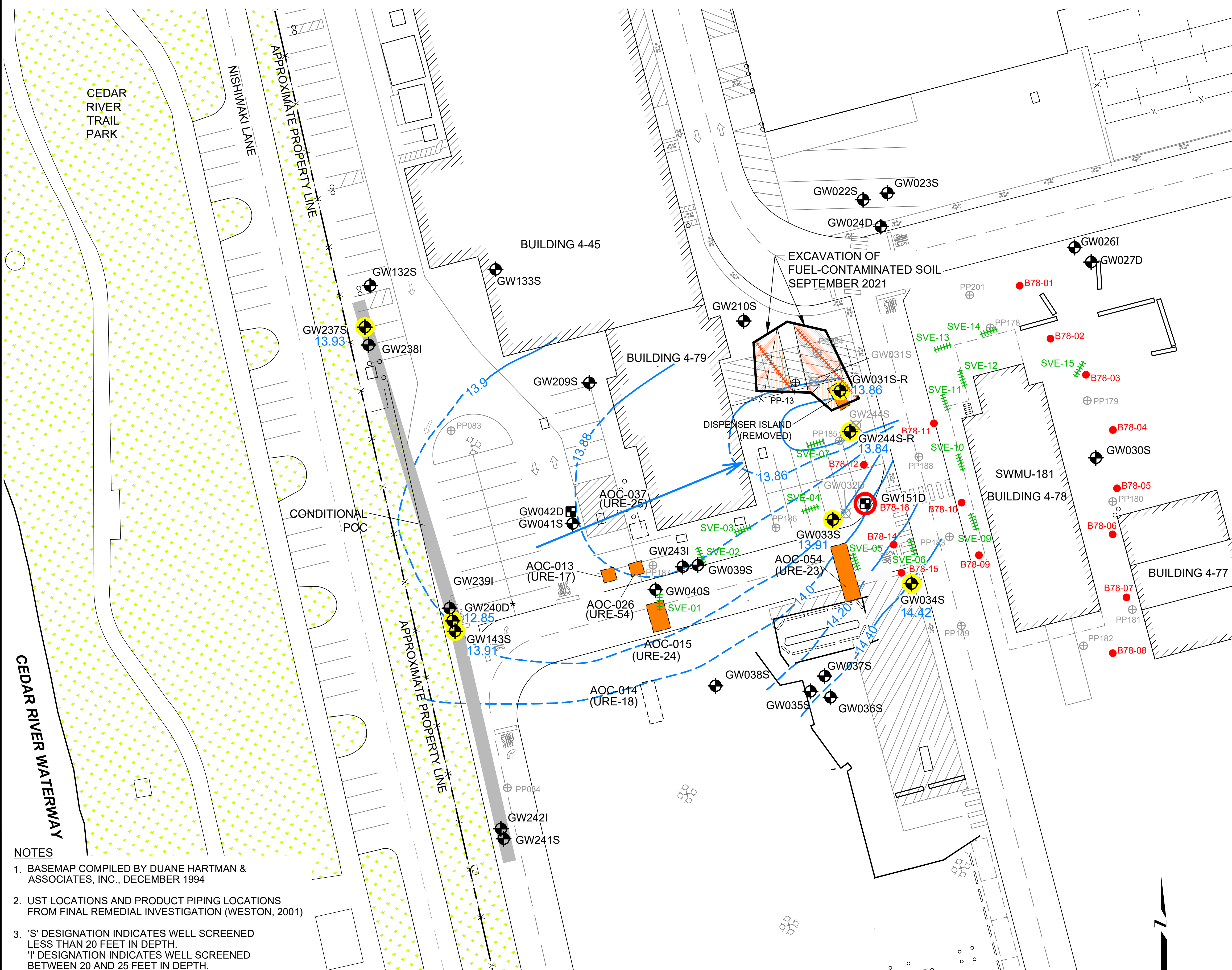


Lead

Note: Non-detected values shown at one-half the reporting limit and with an open symbol.

wsp	SWMU-172 AND SWMU-174 TREND PLOTS FOR ARSENIC, COPPER AND LEAD IN CPOC AREA WELLS Boeing Renton Facility, Renton, Washington	Project No. PS20203450 Figure 10

\\corp.pbwan.net\GLB-E&I\US\USXHF100-SEA\SEA2-FS1-ProjectF$\8888 - Boeing Renton\3.0 Reports\ACTIVE Groundwater Monitoring\Semi-Annual Reports (2020-present)\2023_2SA\Figure



NOTES

1. BASEMAP COMPILED BY DUANE HARTMAN & ASSOCIATES, INC., DECEMBER 1994
2. UST LOCATIONS AND PRODUCT PIPING LOCATIONS FROM FINAL REMEDIAL INVESTIGATION (WESTON, 2001)
3. 'S' DESIGNATION INDICATES WELL SCREENED LESS THAN 20 FEET IN DEPTH. 'I' DESIGNATION INDICATES WELL SCREENED BETWEEN 20 AND 25 FEET IN DEPTH. 'D' DESIGNATION INDICATES WELL SCREENED GREATER THAN 25 FEET IN DEPTH.
4. THE GROUNDWATER FLOW DIRECTION SHOWN IS BASED ON HISTORICAL GROUNDWATER DATA.

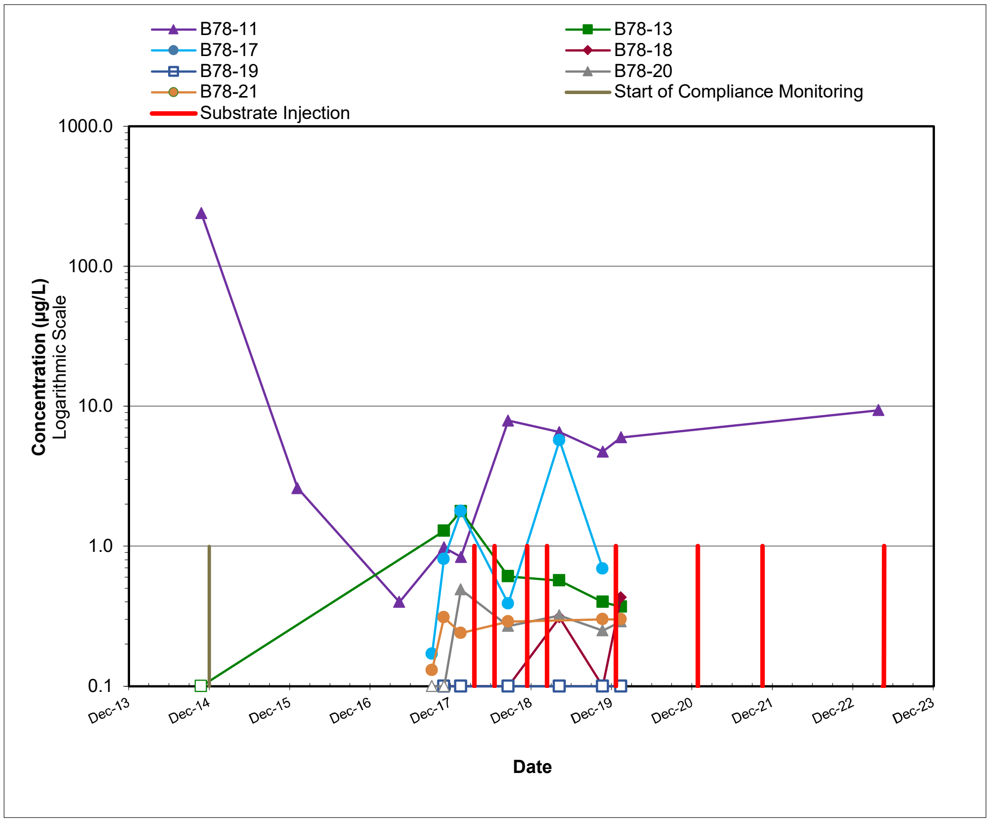
LEGEND

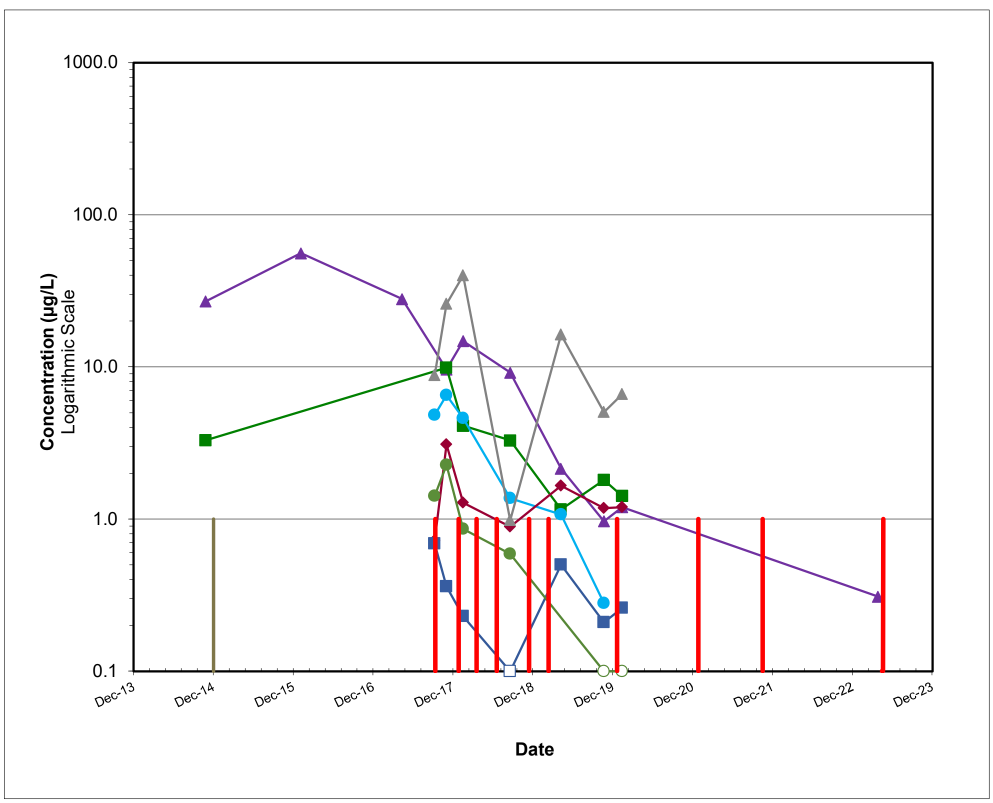
- GW033S 14.20 — MONITORING WELL LOCATION WITH GROUNDWATER ELEVATION (NGVD-FEET)
- NM — NOT MEASURED: SURVEY INFORMATION FOR REPLACEMENT WELLS NOT YET AVAILABLE.
- * — WELL SCREENED IN UPPER AND LOWER PORTION OF AQUIFER, SO WATER LEVEL IS NOT USED FOR CONTOURING.
- 14.30 — GROUNDWATER ELEVATION CONTOUR (IN FEET) (DASHED WHERE INFERRED)
- GENERAL GROUNDWATER FLOW DIRECTION
- GW042D — EXTRACTION WELL
- GW032D — DECOMMISSIONED MONITORING WELL
- SVE-15 — HORIZONTAL SVE WELL
- HORIZONTAL BIOREMEDIATION INJECTION WELL
- B78-12 — BIOREMEDIATION INJECTION WELL
- EXTRACTION WELL CONVERTED TO INJECTION WELL
- PP083 — PUSH-PROBE SAMPLE LOCATION
- x — FENCE
- APPROXIMATE FUEL AND NON-CHLORINATED VOC SOURCE AREAS
- REMOVED UST (WESTON, 2001)
- CONDITIONAL POINT OF COMPLIANCE
- HIGHLIGHTED WELLS INCLUDED IN MONITORING NETWORK

BUILDING 4-78/79 SWMU/AOC GROUP MONITORING WELL LOCATIONS AND GROUNDWATER ELEVATIONS AUGUST 18 & 22, 2023
Boeing Renton Facility
Renton, Washington

By: SD	Date: 10/24/23	Project No. PS20203450
WSP USA Environment & Infrastructure Inc.		Figure 11

Plot Date: 10/24/23 - 7:41am, Plotted by: USSD715014
Drawing Path: X:\US\USPDX800-POR\ClientData\AMEC US OFFICES\KIRKLAND\PS20203450 - Boeing Renton\dwg_GWMR_First_Half_2023 - Rev2\, Drawing Name: Figure 11 -Building 4-78-79.dwg





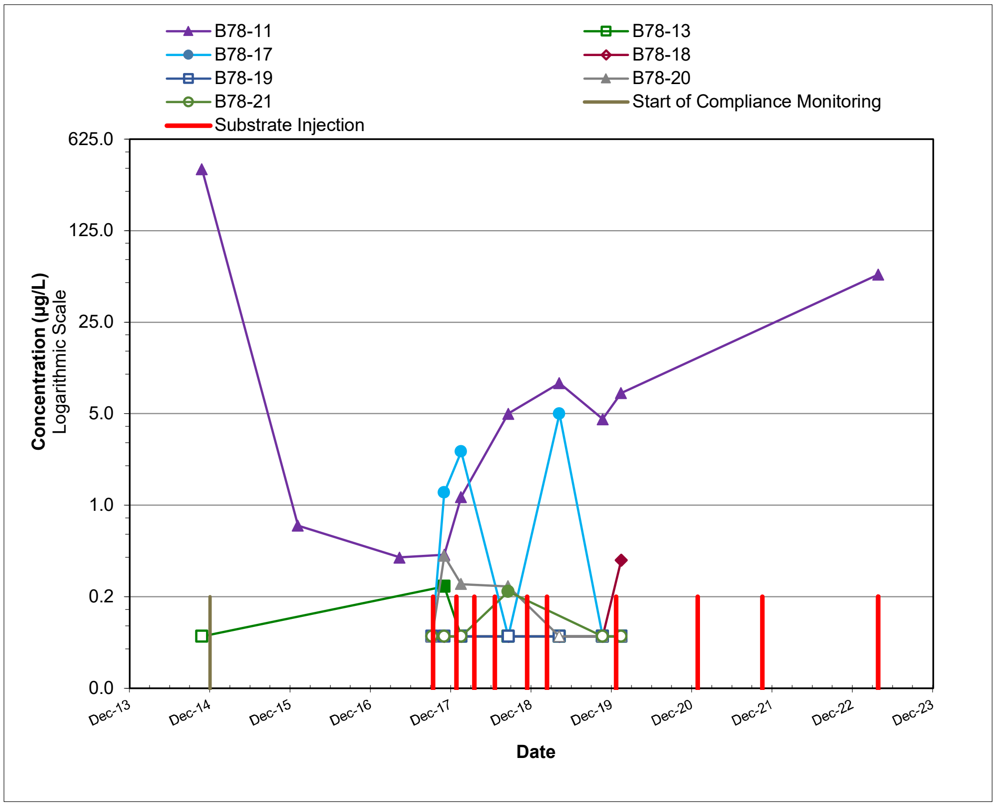
Benzene

Note: Non-detected values shown at one-half the reporting limit and with an open symbol.

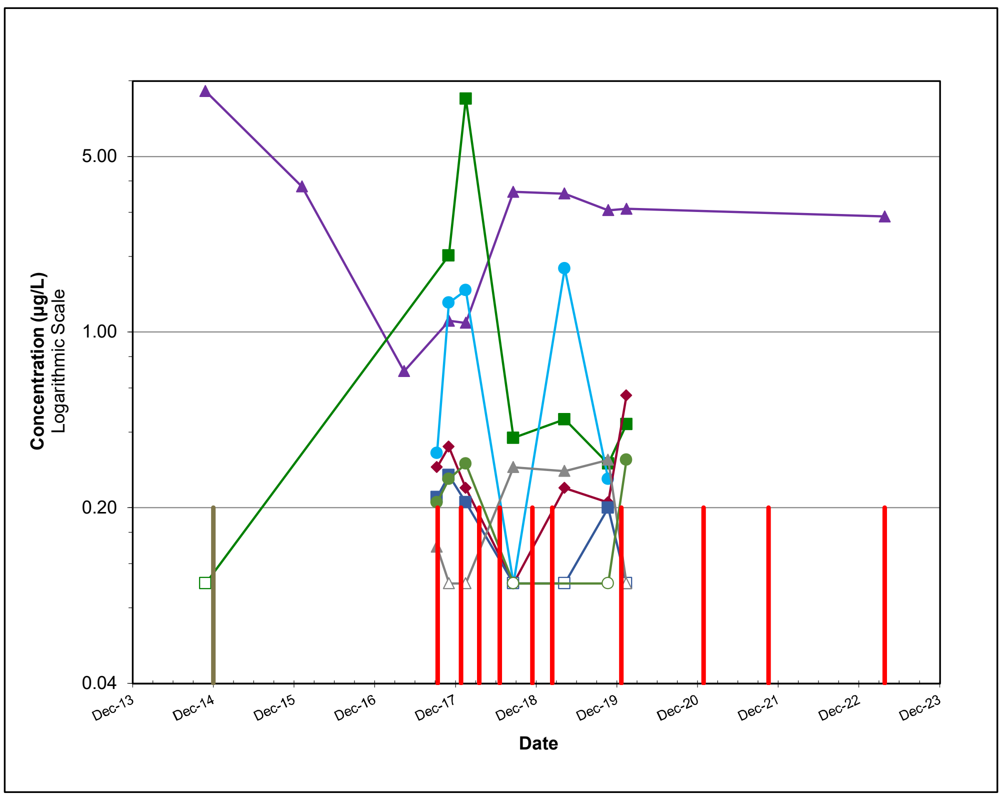
BUILDING 4-78/79 SWMU/AOC GROUP TREND PLOTS FOR CIS-1,2-DICHLOROETHENE AND BENZENE IN INJECTION WELLS
Boeing Renton Facility, Renton, Washington

Project No. PS20203450

Figure 12



TCE



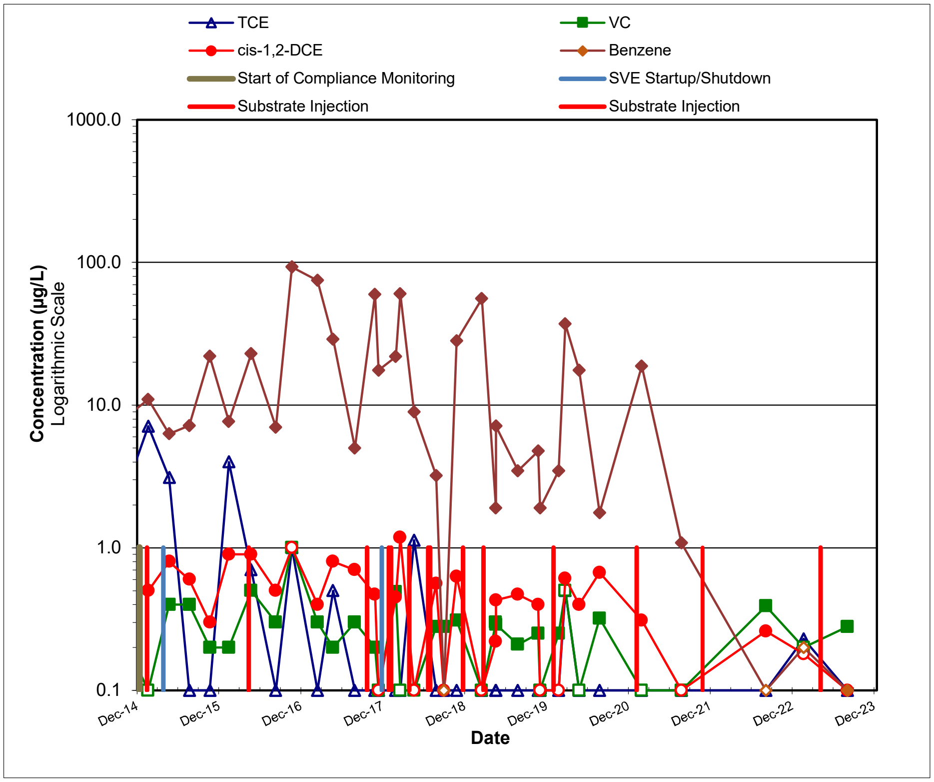
VC

Note: Non-detected values shown at one-half the reporting limit and with an open symbol.

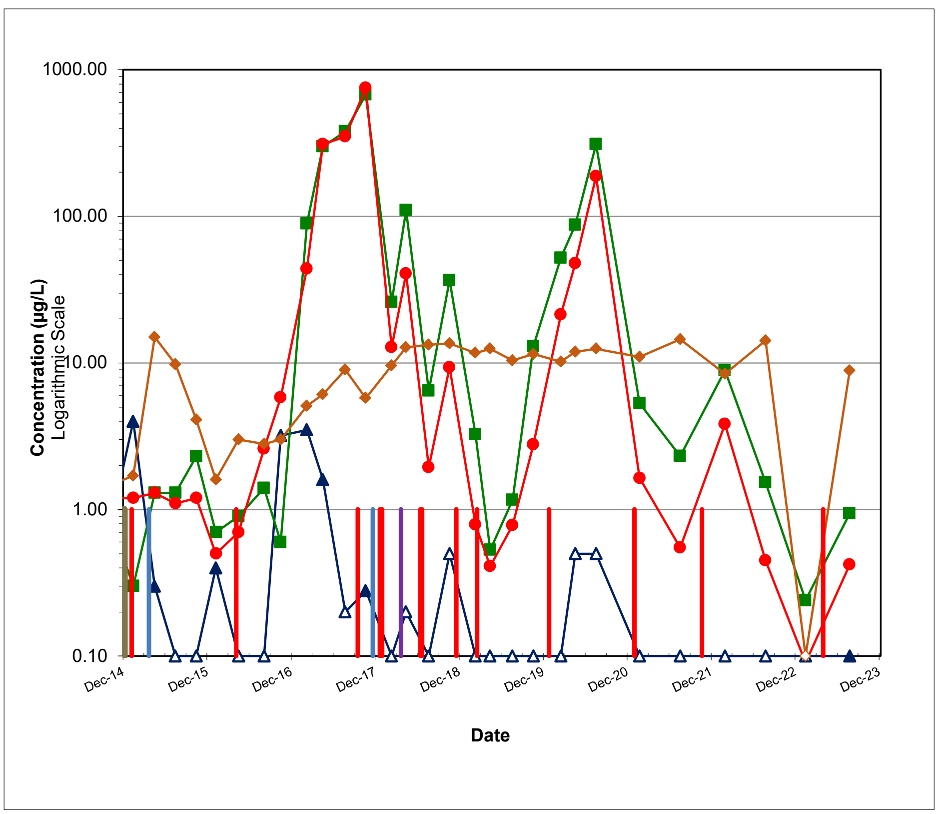
BUILDING 4-78/79 SWMU/AOC GROUP TREND PLOTS FOR TRICHLOROETHENE AND VINYL CHLORIDE IN INJECTION WELLS
Boeing Renton Facility, Renton, Washington

Project No. PS20203450

Figure 13



SOURCE AREA WELL GW031S

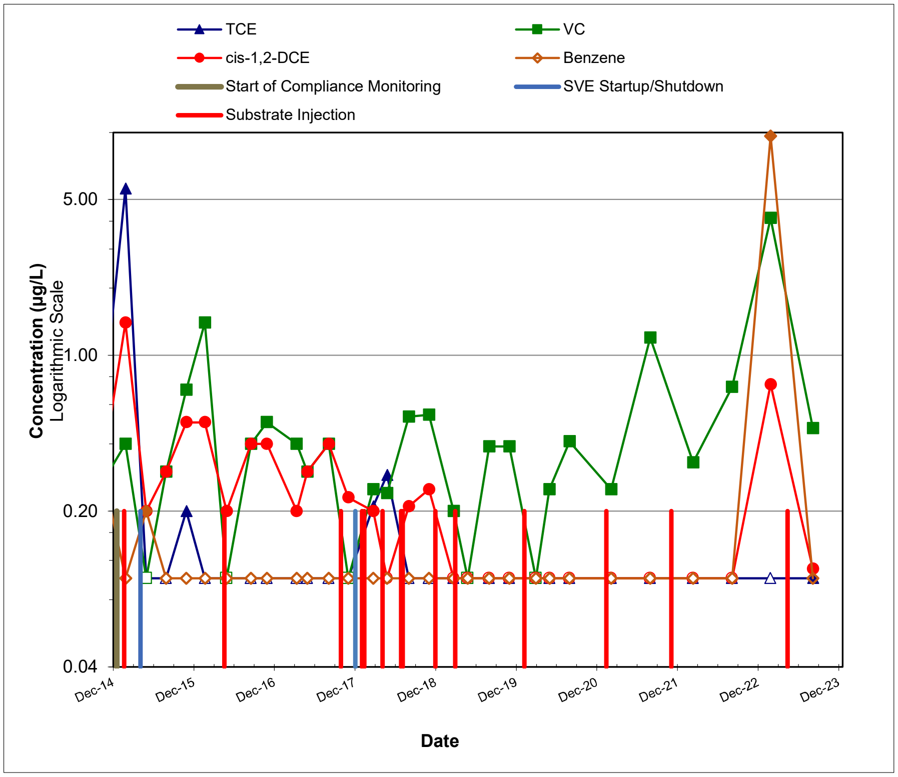


SOURCE AREA WELL GW033S

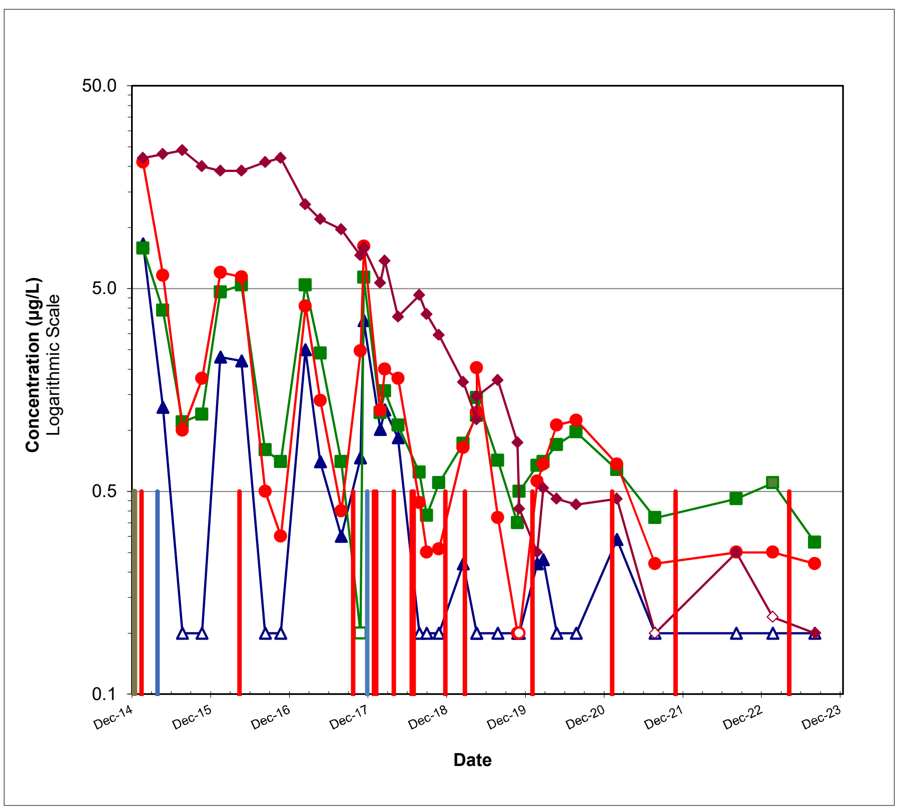
Note: Non-detected values shown at one-half the reporting limit and with an open symbol.

wsp	BUILDING 4-78/79 SWMU/AOC GROUP TREND PLOTS FOR SOURCE AREA WELLS GW031S AND GW033S Boeing Renton Facility, Renton, Washington	Project No. PS20203450 Figure 14

\\corp.pbwan.net\GLB-E&I\US\USXHF100-SEA\SEA2-FS1-ProjectF$\8888 - Boeing Renton\3.0 Reports\ACTIVE Groundwater Monitoring\Semi-Annual Reports (2020-present)\202:



SOURCE AREA WELL GW034S

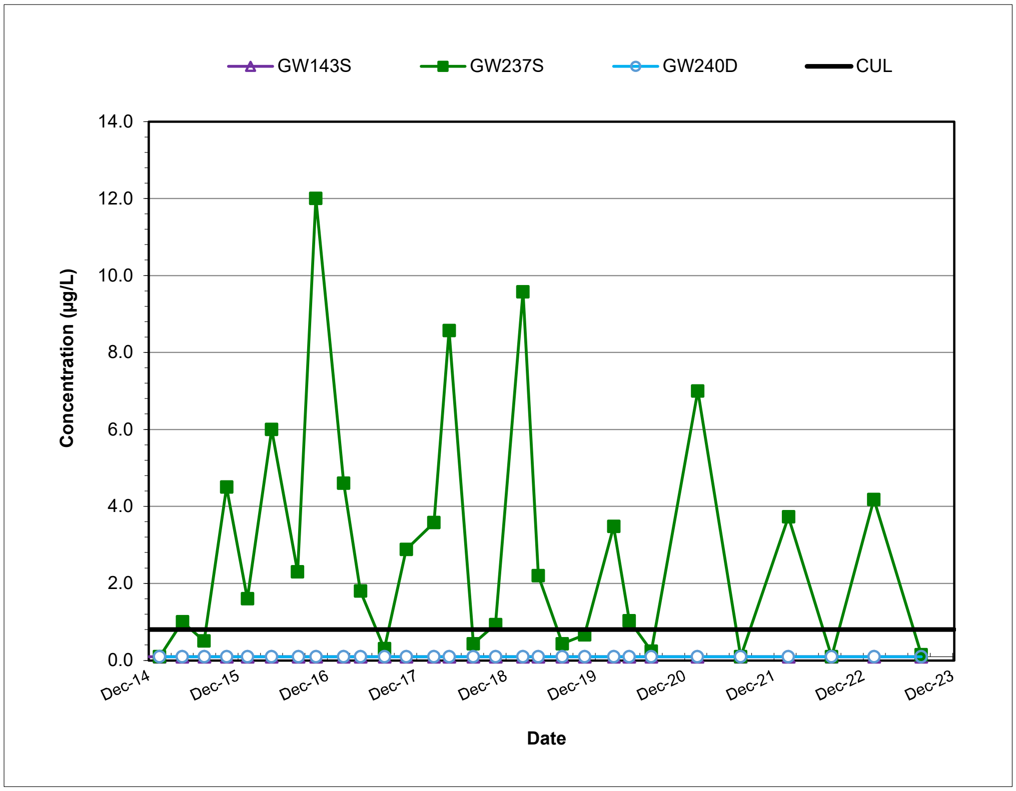


SOURCE AREA WELL GW244S

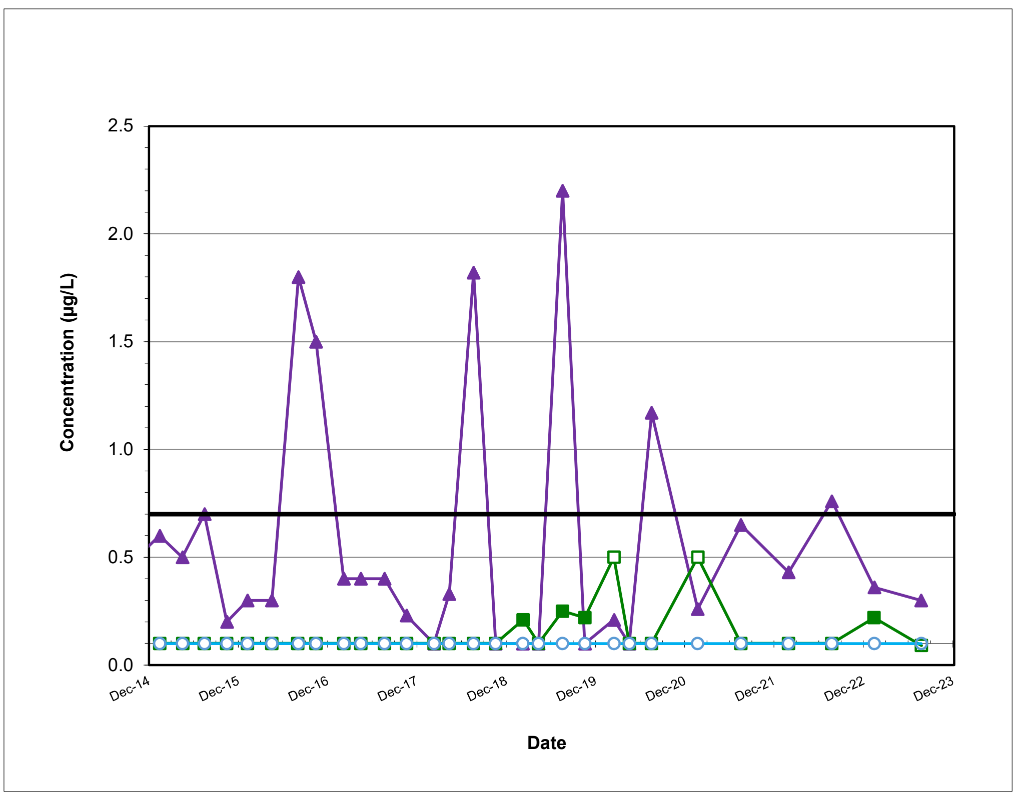
<u>Note</u>: Non-detected values shown at one-half the reporting limit and with an open symbol.

wsp	BLDG 4-78/79 SWMU/AOC GROUP TREND PLOTS FOR SOURCE AREA WELLS GW034S AND GW244S Boeing Renton Facility, Renton, Washington	Project No. PS20203450 Figure 15

\\corp.pbwan.net\GLB-E&I\US\USXHF100-SEA\SEA2-FS1-ProjectF$\8888 - Boeing Renton\3.0 Reports\ACTIVE Groundwater Monitoring\Semi-Annual Reports (2020-present)\2023_2S



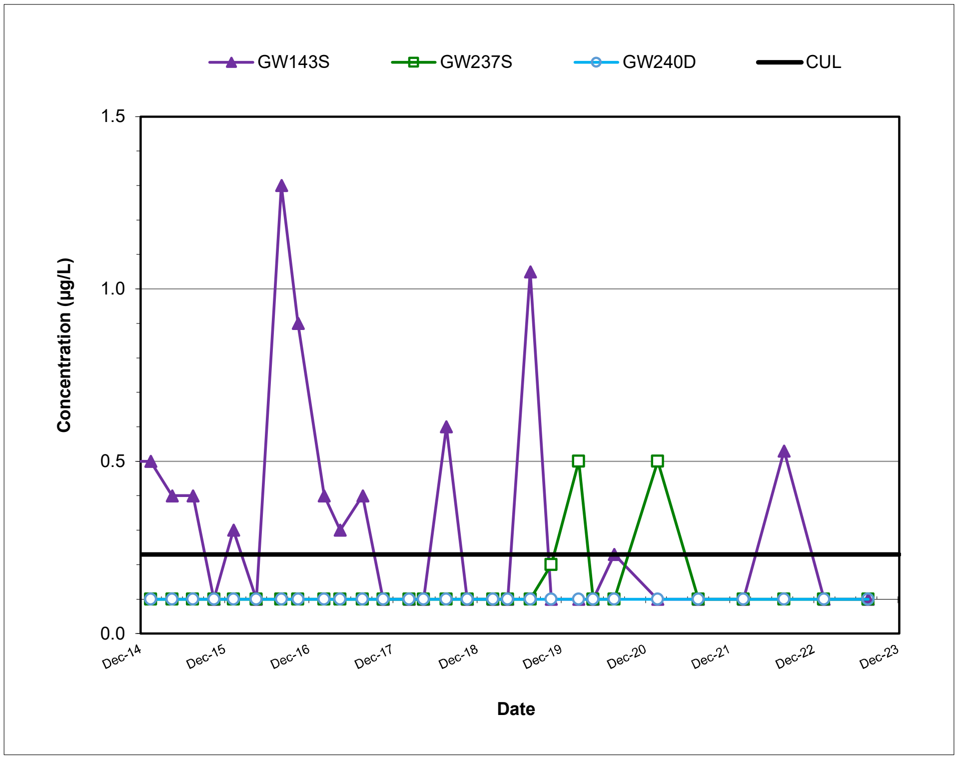
Benzene



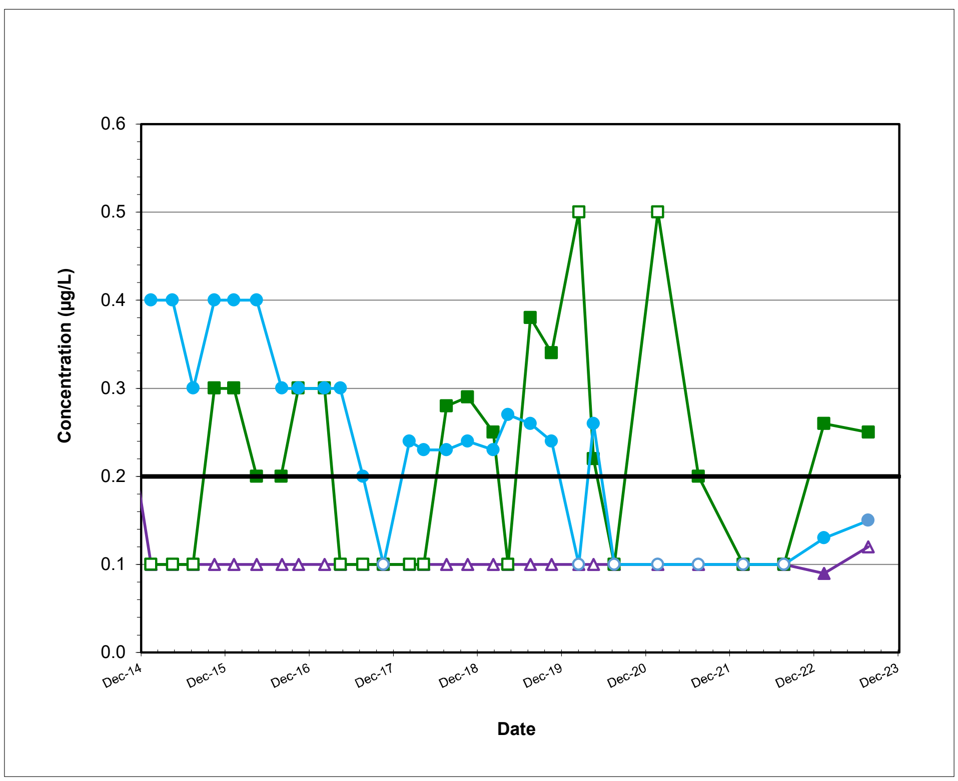
cis-1,2-DCE

Note: Non-detected values shown at one-half the reporting limit and with an open symbol.

wsp	BUILDING 4-78/79 SWMU/AOC GROUP TREND PLOTS FOR BENZENE AND CIS-1,2-DICHLOROETHENE IN CPOC AREA WELLS Boeing Renton Facility, Renton, Washington	Project No. PS20203450 Figure 16



TCE

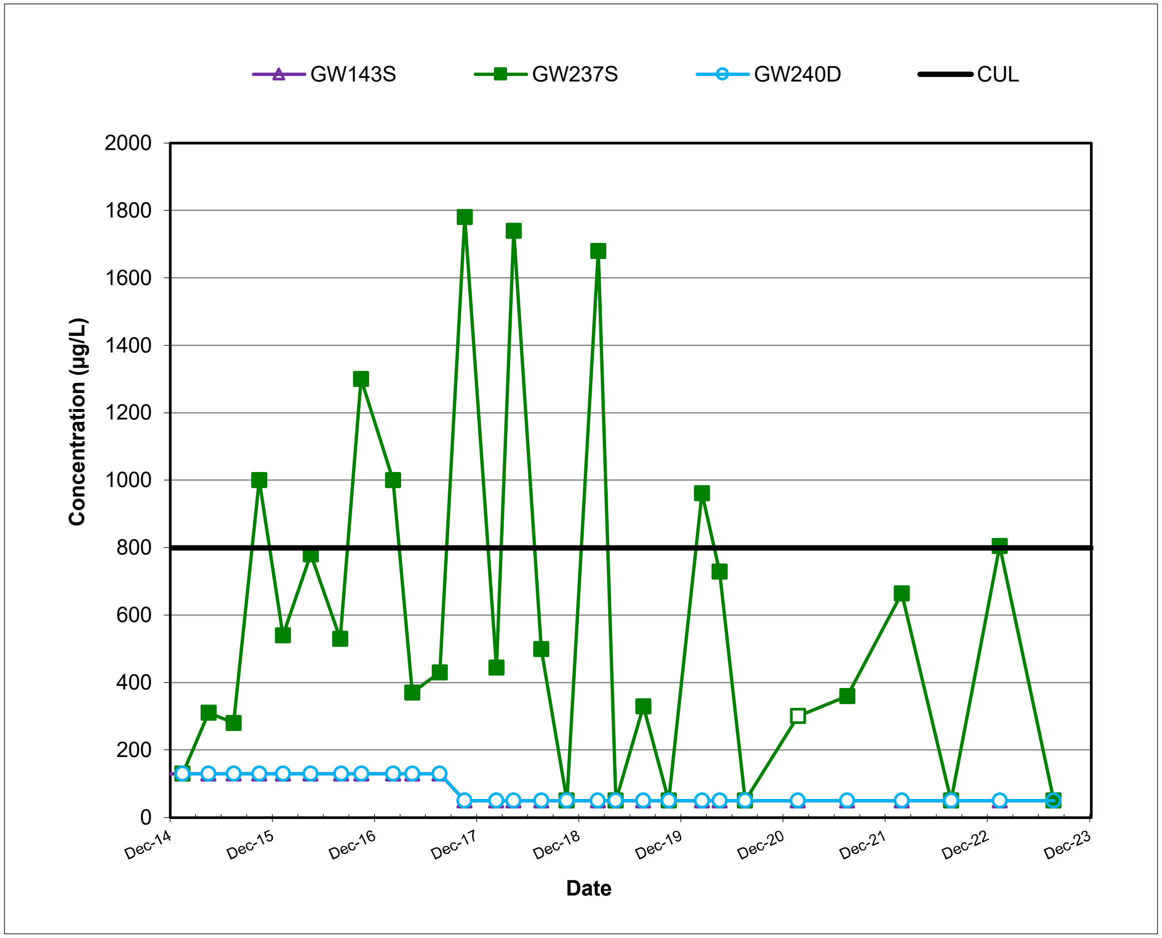


VC

Note: Non-detected values shown at one-half the reporting limit and with an open symbol.

wsp	BUILDING 4-78/79 SWMU/AOC GROUP TREND PLOTS FOR TRICHLOROETHENE AND VINYL CHLORIDE IN CPOC AREA WELLS Boeing Renton Facility, Renton, Washington	Project No. PS20203450 Figure 17

\\corp.pbwan.net\GLB-E&I\US\USXHF100-SEA\SEA2-FS1-ProjectF$\8888 - Boeing Renton\3.0 Reports\ACTIVE Groundwater Monitoring\Semi-Annual Reports (2020-present)\2023_2SA\

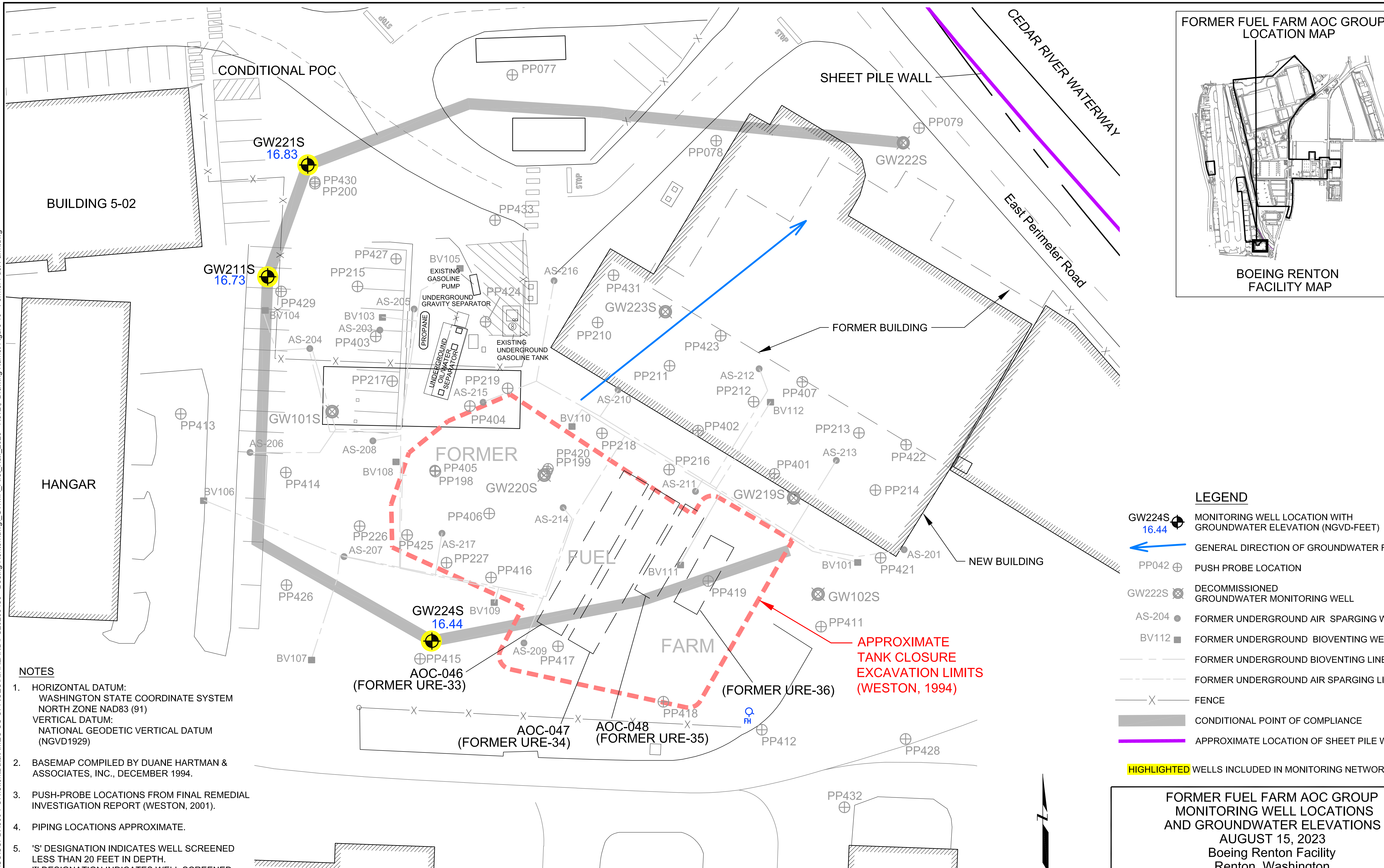


TPH as Gasoline

Note: Non-detected values shown at one-half the reporting limit and with an open symbol.

\\corp.pbwan.net\GLB-E&I\US\USXHF100-SEA\SEA2-FS1

wsp	BUILDING 4-78/79 SWMU/AOC GROUP TREND PLOTS FOR TPH AS GASOLINE IN CPOC AREA WELLS Boeing Renton Facility, Renton, Washington	Project No. PS20203450 Figure 18



LEGEND

- GW224S 16.44 — MONITORING WELL LOCATION WITH GROUNDWATER ELEVATION (NGVD-FEET)
- GENERAL DIRECTION OF GROUNDWATER FLOW
- PP042 — PUSH PROBE LOCATION
- GW222S — DECOMMISSIONED GROUNDWATER MONITORING WELL
- AS-204 — FORMER UNDERGROUND AIR SPARGING WELL
- BV112 — FORMER UNDERGROUND BIOVENTING WELL
- FORMER UNDERGROUND BIOVENTING LINE
- FORMER UNDERGROUND AIR SPARGING LINE
- FENCE
- CONDITIONAL POINT OF COMPLIANCE
- APPROXIMATE LOCATION OF SHEET PILE WALL

HIGHLIGHTED WELLS INCLUDED IN MONITORING NETWORK

NOTES

1. HORIZONTAL DATUM:
   WASHINGTON STATE COORDINATE SYSTEM
   NORTH ZONE NAD83 (91)
   VERTICAL DATUM:
   NATIONAL GEODETIC VERTICAL DATUM
   (NGVD1929)
2. BASEMAP COMPILED BY DUANE HARTMAN & ASSOCIATES, INC., DECEMBER 1994.
3. PUSH-PROBE LOCATIONS FROM FINAL REMEDIAL INVESTIGATION REPORT (WESTON, 2001).
4. PIPING LOCATIONS APPROXIMATE.
5. 'S' DESIGNATION INDICATES WELL SCREENED LESS THAN 20 FEET IN DEPTH.
   'I' DESIGNATION INDICATES WELL SCREENED GREATER THAN 20 FEET IN DEPTH.
6. THE GROUNDWATER FLOW DIRECTION SHOWN IS BASED ON HISTORICAL GROUNDWATER DATA.

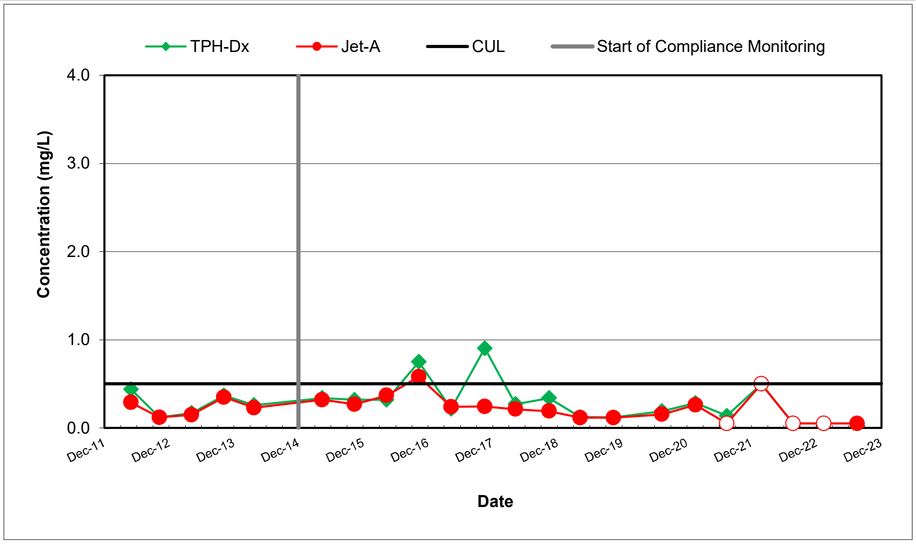
BOEING

FORMER FUEL FARM AOC GROUP MONITORING WELL LOCATIONS AND GROUNDWATER ELEVATIONS

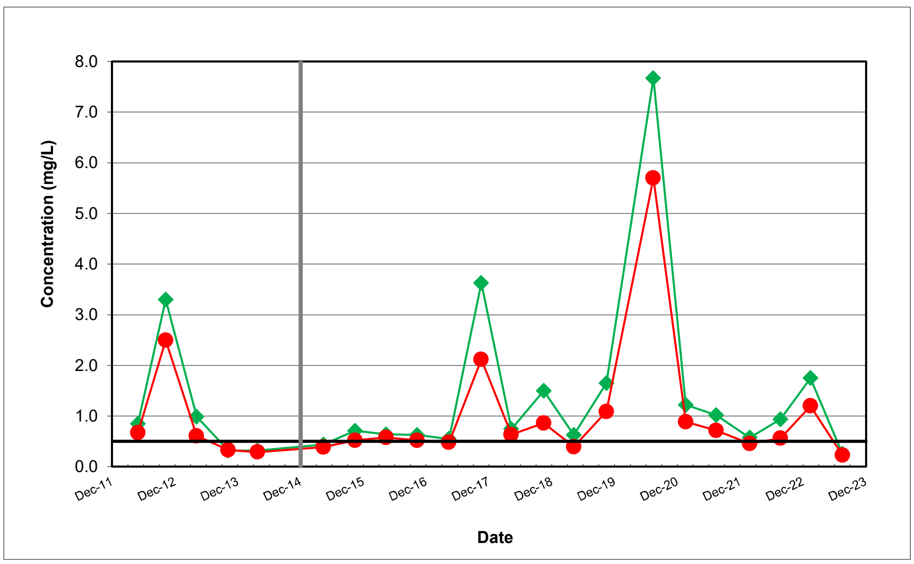
AUGUST 15, 2023
Boeing Renton Facility
Renton, Washington

By: SD	Date: 11/20/23	Project No. PS20203450
WSP USA Environment & Infrastructure Inc.		Figure 19

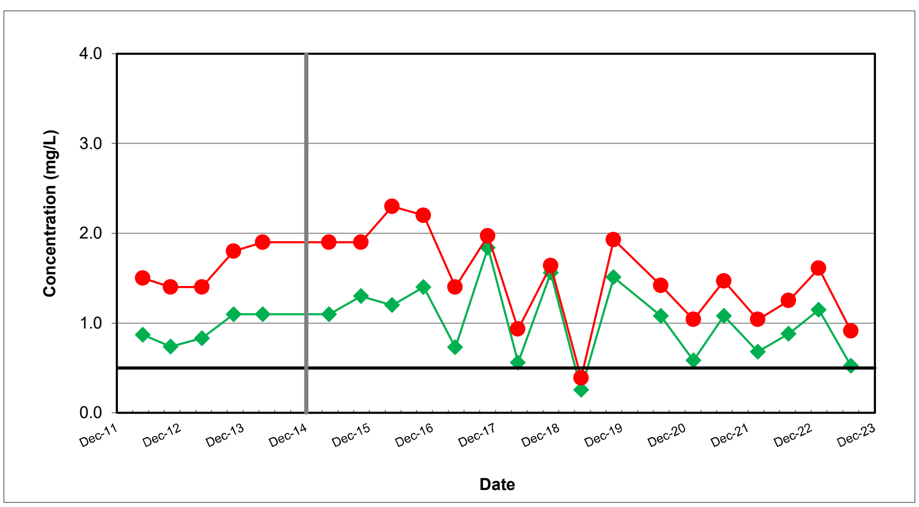
Plot Date: 11/20/23 - 1:04pm, Plotted by: USSD715014
Drawing Path: X:\US\USPDX800-POR\ClientData\AMEC US OFFICES\KIRKLAND\PS20203450 - Boeing Renton\dwg_GWMR_First_Half_2023 - Rev2\, Drawing Name: Figure 19 - Former Fuel Farm.dwg



CPOC WELL GW211S



CPOC WELL GW221S

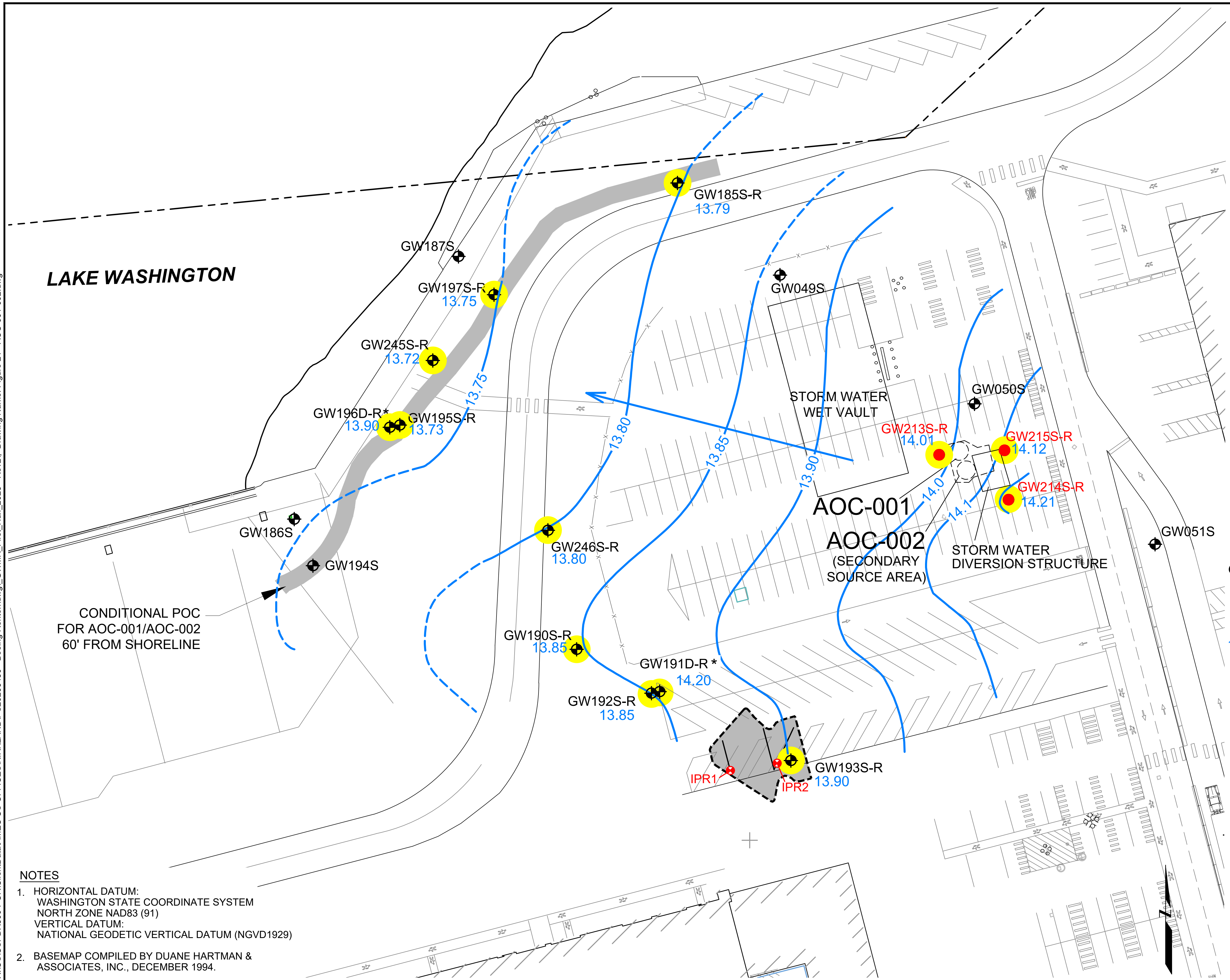


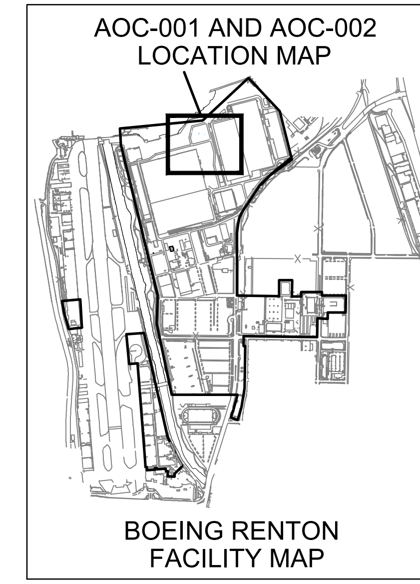
CPOC WELL GW224S

Note: Non-detected values shown at one-half the reporting limit and with an open symbol. Reporting limits were elevated for February 2022 results in GW211S.

\\corp.pbwan.net\GLB-E&I\US\USXHF100-SEA\SEA2-FS1-ProjectF$\8888 - Boeing Renton\3.0 Reports\ACTIVE Groundwater Monitoring\Semi-Annual Reports (2020-present)\2023_2SA\Figure

wsp	FORMER FUEL FARM AOC GROUP TREND PLOTS FOR CPOC AREA WELLS GW211S, GW221S, AND GW224S Boeing Renton Facility, Renton, Washington	Project No. PS20203450 Figure 20





LEGEND

- GW195S 13.92 — MONITORING WELL LOCATION WITH GROUNDWATER ELEVATION (NGVD-FEET)
- * — WELL SCREENED IN UPPER AND LOWER PORTION OF AQUIFER, SO WATER LEVEL IS NOT USED FOR CONTOURING.
- 14.1 — GROUNDWATER ELEVATION CONTOUR (IN FEET) (DASHED WHERE INFERRED)
- GENERAL DIRECTION OF GROUNDWATER FLOW
- GW215S — EXISTING ELECTRON DONOR INJECTION WELL
- IPR1 — EXISTING INJECTION PIPE RISER
- APPROXIMATE PROPERTY LINE
- FENCE LINE
- APPROXIMATE LIMIT OF NOVEMBER 2005 SOURCE AREA EXCAVATION
- AOC-001, AOC-002 CONDITIONAL POINT OF COMPLIANCE
- HIGHLIGHTED WELLS INCLUDED IN MONITORING NETWORK

NOTES

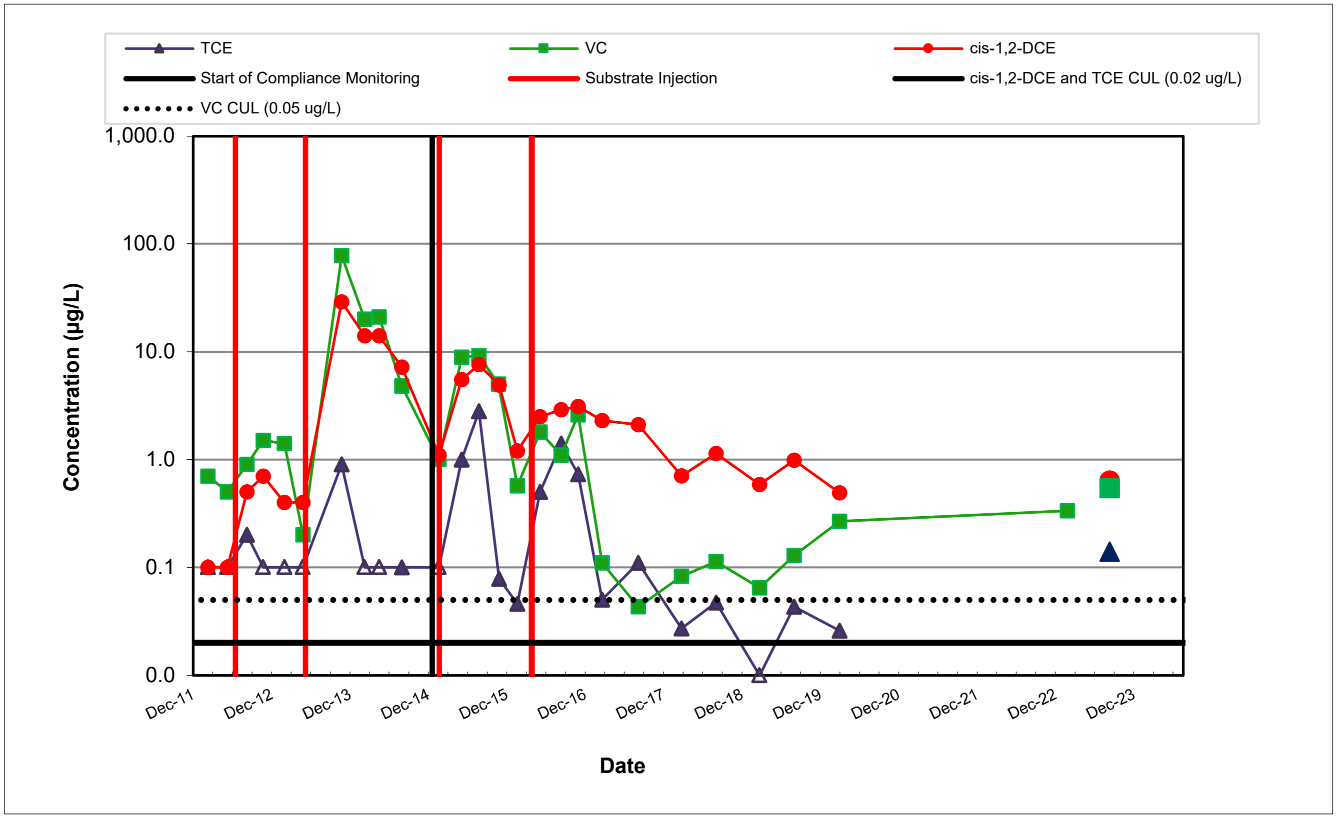
1. HORIZONTAL DATUM:
   WASHINGTON STATE COORDINATE SYSTEM
   NORTH ZONE NAD83 (91)
   VERTICAL DATUM:
   NATIONAL GEODETIC VERTICAL DATUM (NGVD1929)
2. BASEMAP COMPILED BY DUANE HARTMAN & ASSOCIATES, INC., DECEMBER 1994.
3. 'S' DESIGNATION INDICATES WELL SCREENED LESS THAN 25 FEET IN DEPTH.
   'D' DESIGNATION INDICATES WELL SCREENED GREATER THAN 25 FEET IN DEPTH.

BOEING

AOC-001 AND AOC-002
MONITORING WELL LOCATIONS
AND GROUNDWATER ELEVATIONS
AUGUST 22-24, 2023
Boeing Renton Facility
Renton, Washington

By: SD	Date: 10/24/23	Project No. PS20203450
WSP USA Environment & Infrastructure Inc.		Figure 21

Plot Date: 10/24/23 - 4:59pm, Plotted by: USAS719374
Drawing Path: X:\US\USPDX800-POR\ClientData\AMEC US OFFICES\KIRKLAND\PS20203450 - Boeing Renton\dwg_GWMR_First_Half_2023 - Rev2\, Drawing Name: Figure 21 - AOC-001-002.dwg

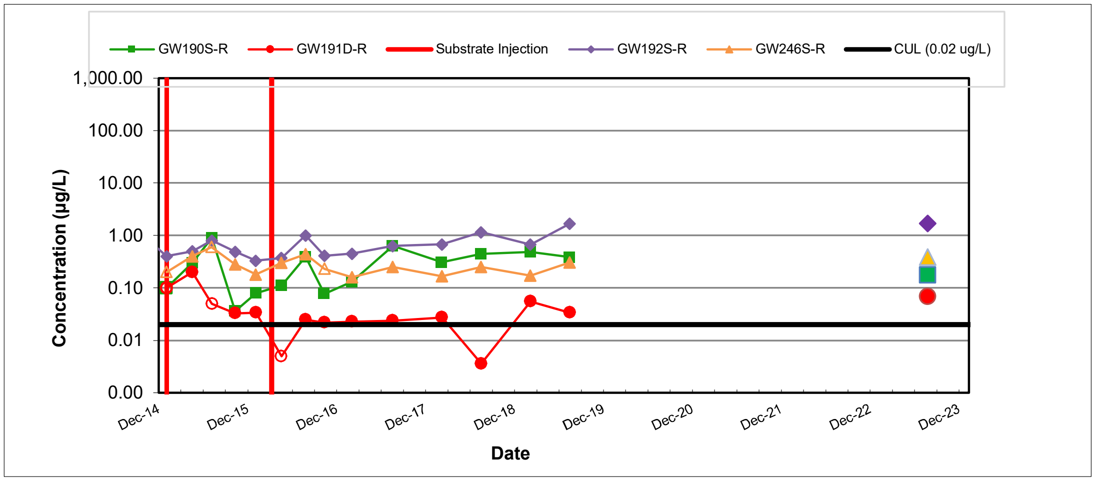


SOURCE AREA WELL GW193S-R

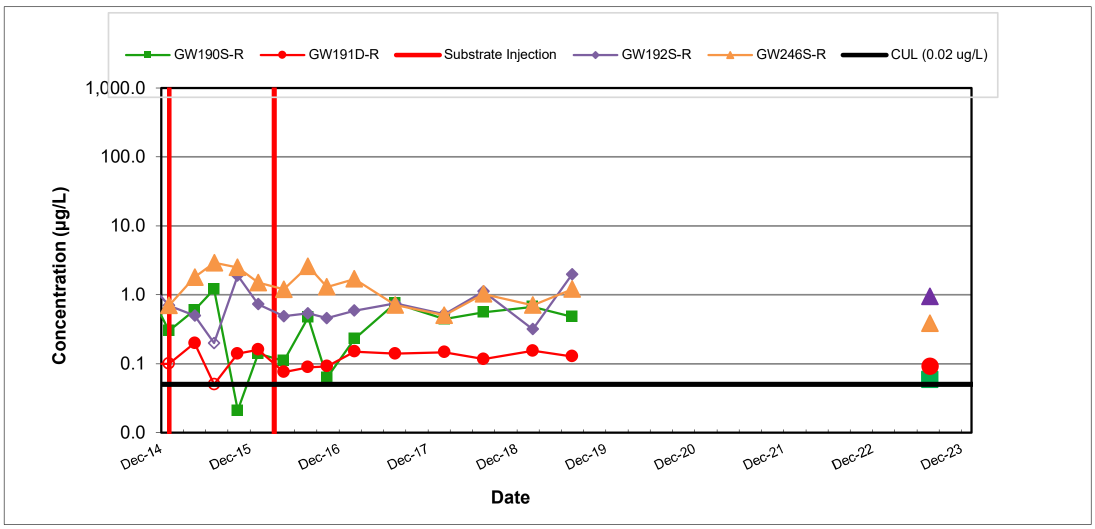
Note: non-detected values shown at one-half the reporting limit and are graphed with an open symbol. This well was replaced in July 2023; results from the new well are shown separated from original well results.

\\corp.pbwan.net\GLB-E&I\US\USXHF100-SEA\SEA2-FS1-I

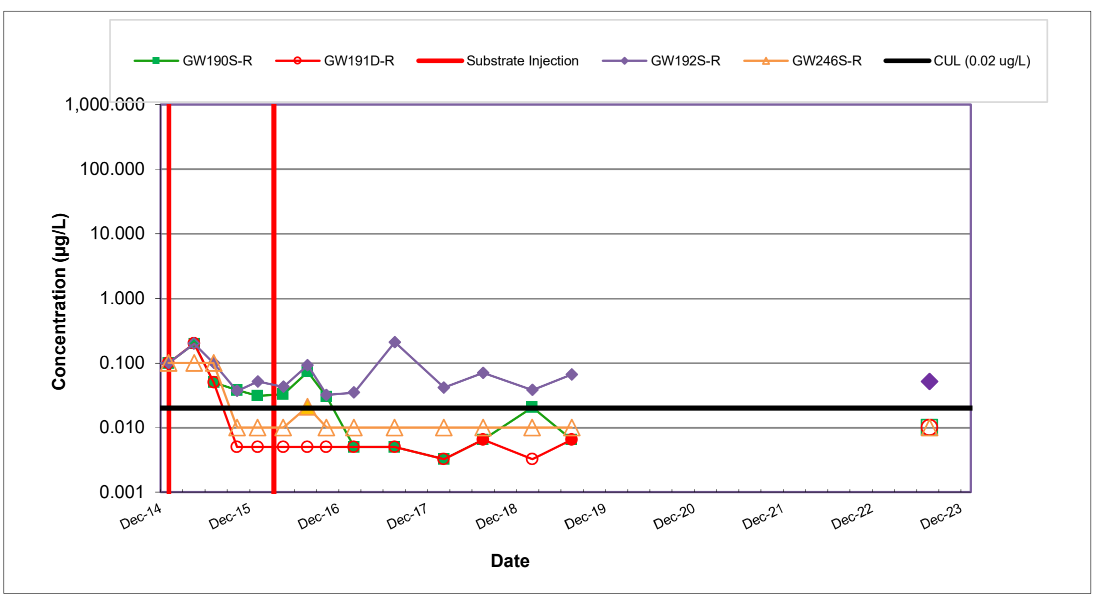
wsp	AOC-001 AND -002 TREND PLOT FOR SOURCE AREA WELL GW193S Boeing Renton Facility Renton, Washington	Project No. 8888 Figure 22



cis-1,2-DCE



VC

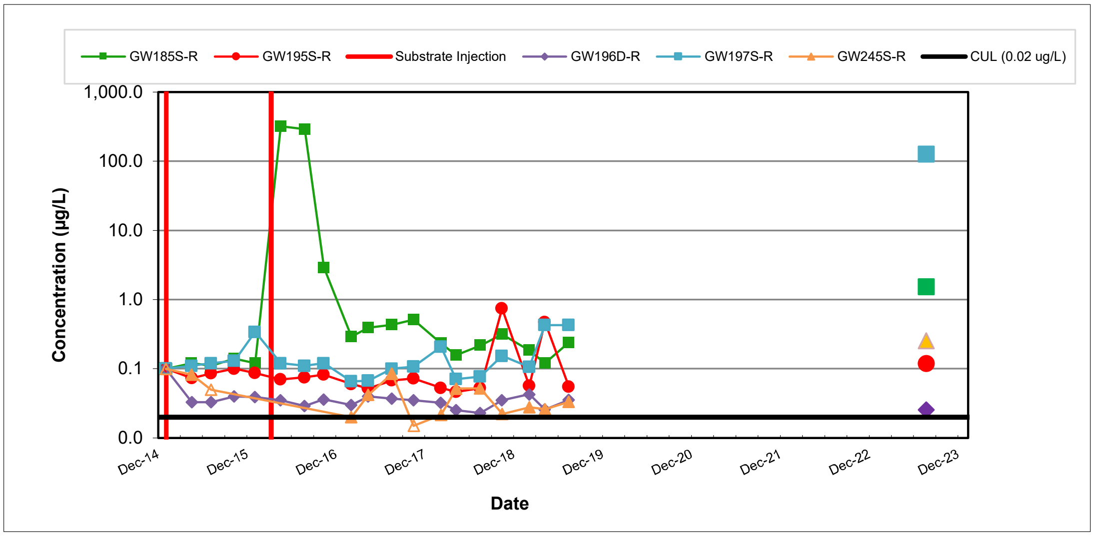


TCE

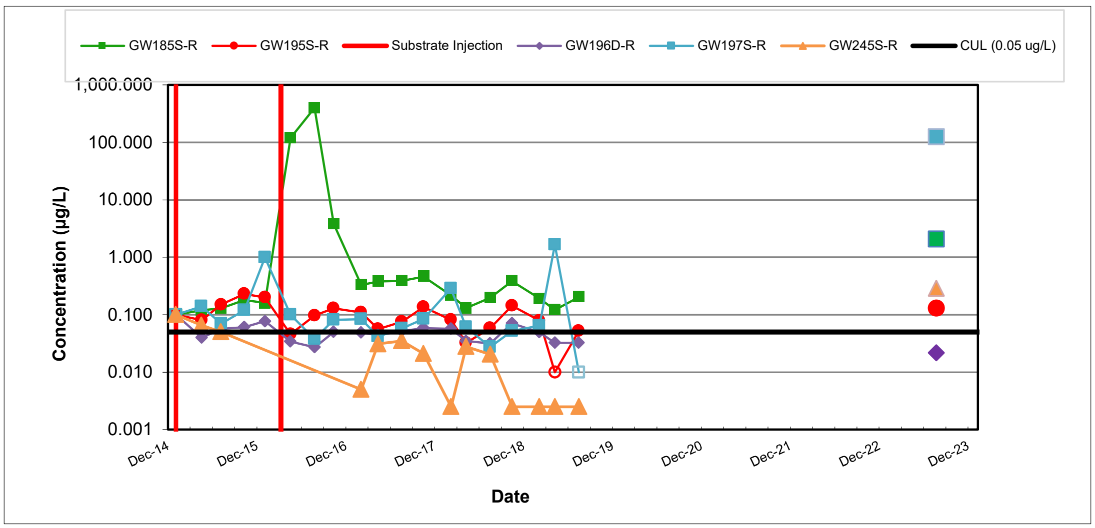
Note: non-detected values shown at one-half the reporting limit and graphed with an open symbol. Wells in this area were replaced in July 2023; results from the new wells are shown separated from original well results.

wsp	AOC-001 AND -002 TREND PLOTS FOR CIS-1,2-DICHLOROETHENE, TRICHLOROETHENE, AND VINYL CHLORIDE IN DOWNGRADIENT AREA WELLS Boeing Renton Facility Renton, Washington	Project No. 8888 Figure 23

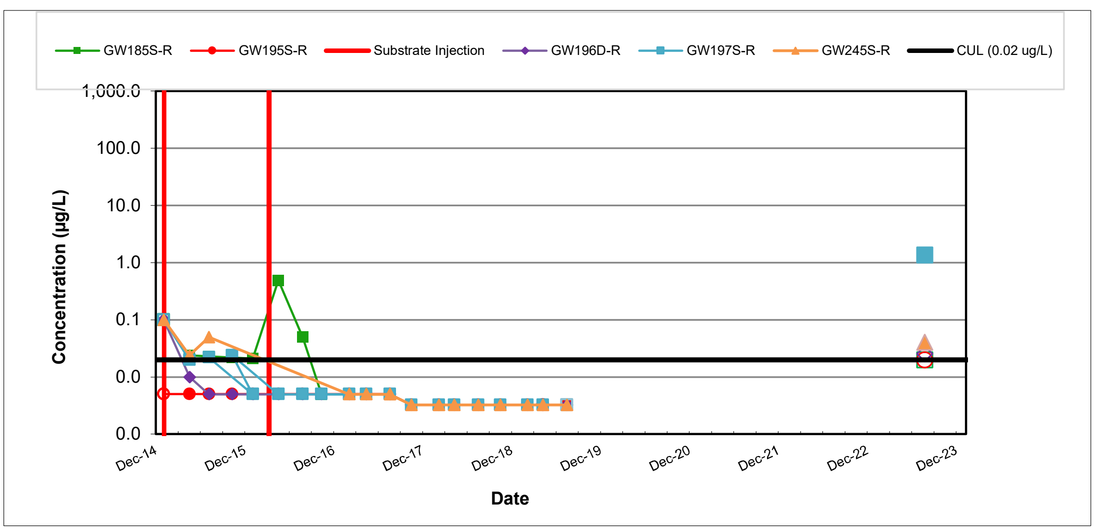
\\corp.pbwan.net\GLB-E&I\US\USXHF100-SEA\SEA2-FS1-ProjectF$\8888 - Boeing Renton\3.0 Reports\ACTIVE Groundwater Monitoring\Semi-Annual Reports (2020-present)\2023_2SA\Figure



cis-1,2-DCE



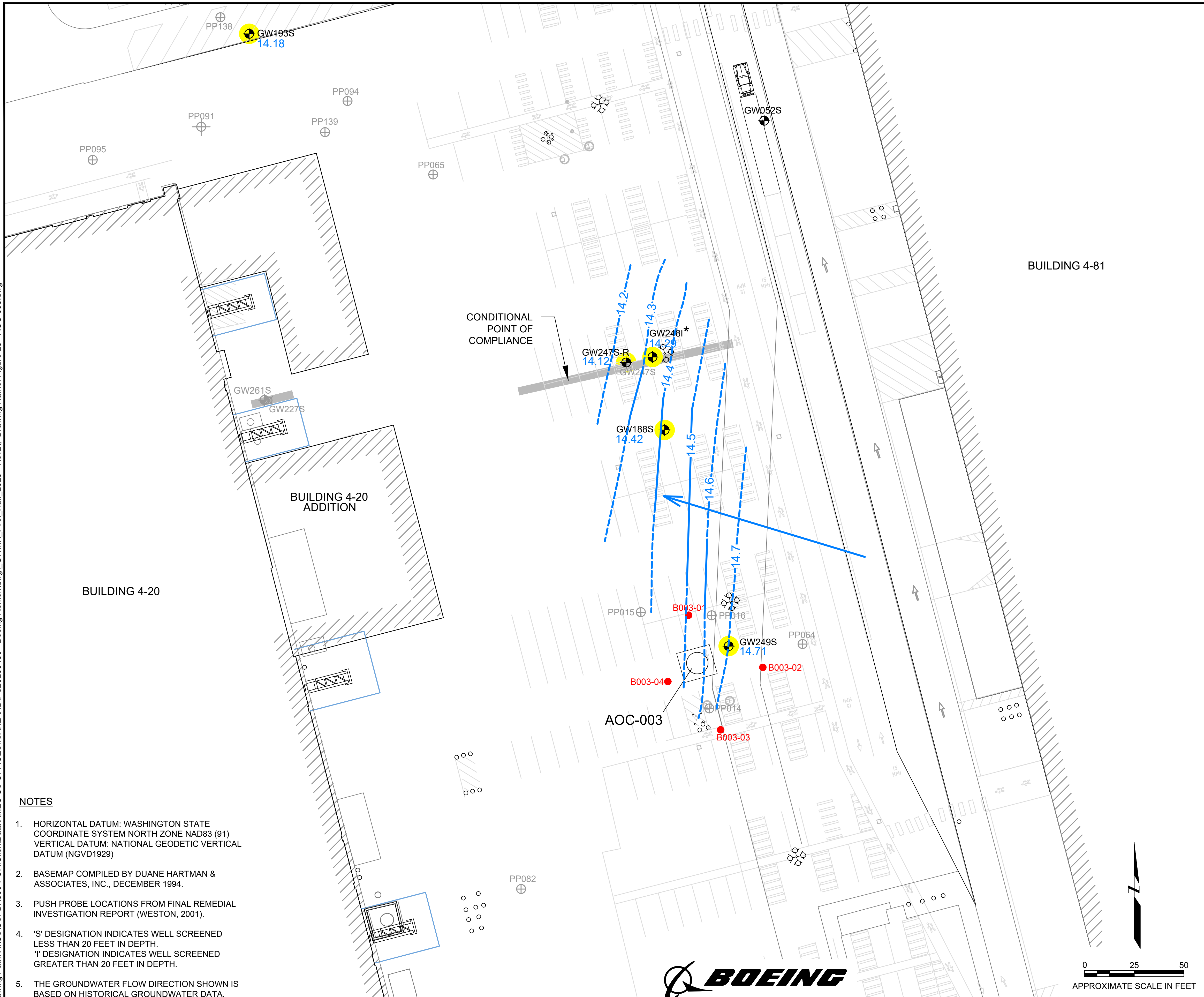
VC

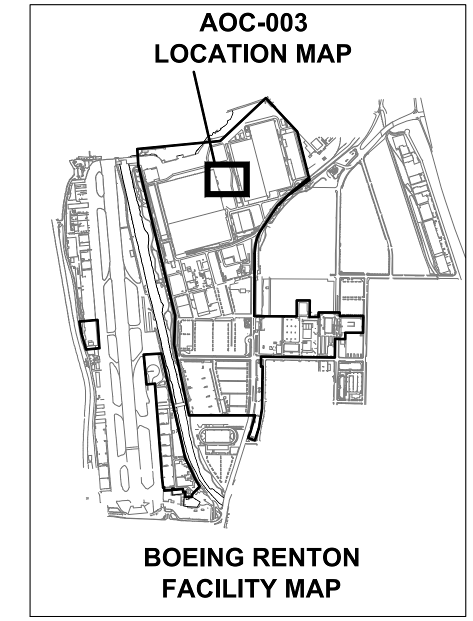


TCE

Note: non-detected values shown at one-half the reporting limit and graphed with an open symbol. Wells in this area were replaced in July 2023; results from the new wells are shown separated from original well results.

wsp	AOC-001 AND -002 TREND PLOTS FOR CIS-1,2-DICHLOROETHENE, TRICHLOROETHENE, AND VINYL CHLORIDE IN CPOC AREA WELLS Boeing Renton Facility Renton, Washington	Project No. 8888 Figure 24





LEGEND

GW249S 16.52	MONITORING WELL LOCATION WITH GROUNDWATER ELEVATION (NGVD-FEET)
*	WELL SCREENED IN UPPER AND LOWER PORTION OF AQUIFER, SO WATER LEVEL IS NOT USED FOR CONTOURING.
17.7	GROUNDWATER ELEVATION CONTOUR (IN FEET) (DASHED WHERE INFERRED)
	GENERAL DIRECTION OF GROUNDWATER FLOW
	CONDITIONAL POINT OF COMPLIANCE
GW227S	DECOMMISSIONED MONITORING WELL
B003-01	BIOREMEDIATION INJECTION WELL
PP011	PUSH PROBE SAMPLING LOCATION
HIGHLIGHTED	WELLS INCLUDED IN MONITORING NETWORK

NOTES

1. HORIZONTAL DATUM: WASHINGTON STATE COORDINATE SYSTEM NORTH ZONE NAD83 (91) VERTICAL DATUM: NATIONAL GEODETIC VERTICAL DATUM (NGVD1929)
2. BASEMAP COMPILED BY DUANE HARTMAN & ASSOCIATES, INC., DECEMBER 1994.
3. PUSH PROBE LOCATIONS FROM FINAL REMEDIAL INVESTIGATION REPORT (WESTON, 2001).
4. 'S' DESIGNATION INDICATES WELL SCREENED LESS THAN 20 FEET IN DEPTH. 'I' DESIGNATION INDICATES WELL SCREENED GREATER THAN 20 FEET IN DEPTH.
5. THE GROUNDWATER FLOW DIRECTION SHOWN IS BASED ON HISTORICAL GROUNDWATER DATA.

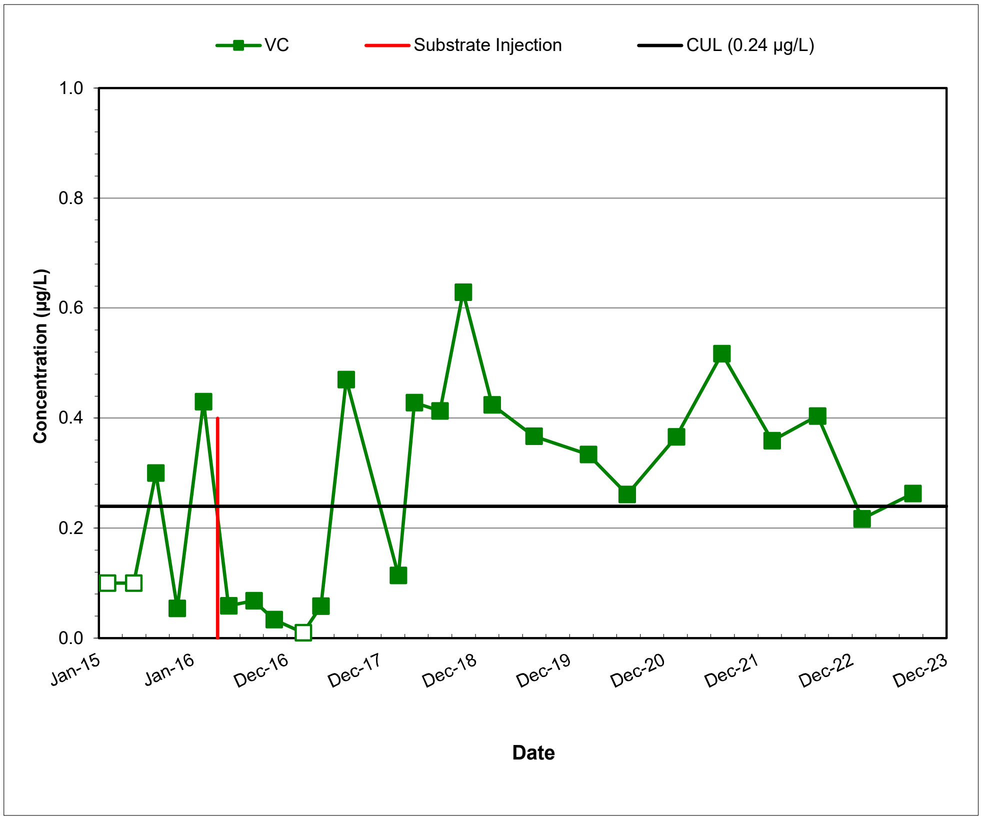
BOEING

0 25 50
APPROXIMATE SCALE IN FEET

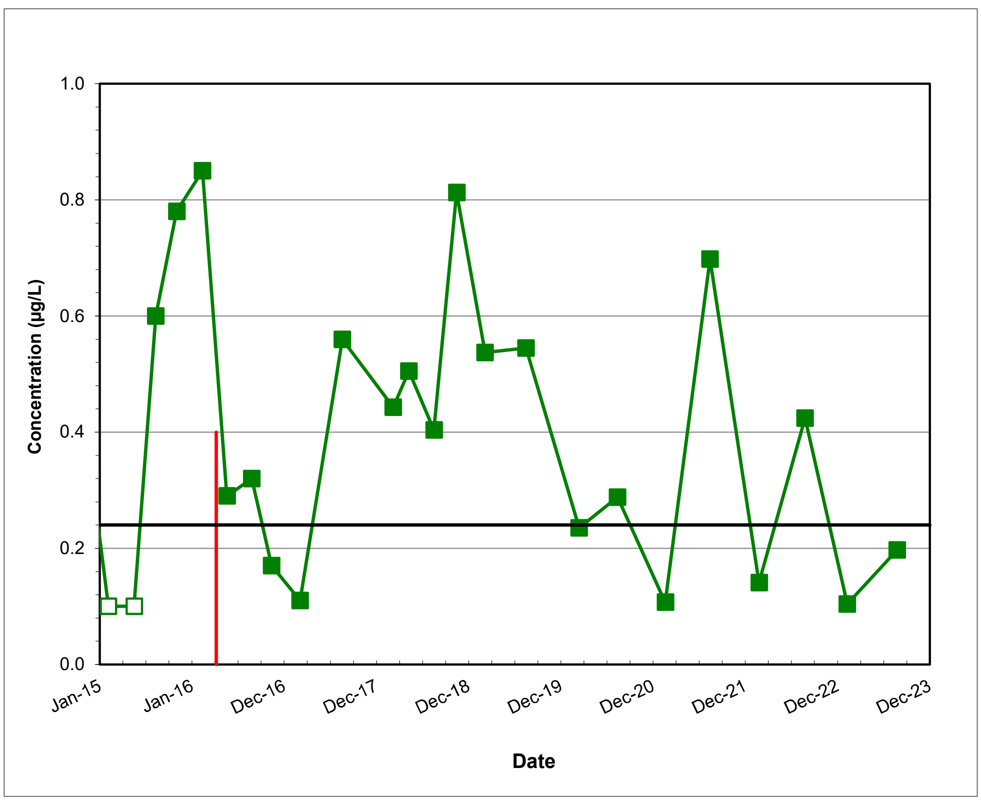
AOC-003
MONITORING WELL LOCATIONS
AND GROUNDWATER ELEVATIONS
AUGUST 22-24, 2023
Boeing Renton Facility
Renton, Washington

By: SD	Date: 11/20/23	Project No. PS20203450
WSP USA Environment & Infrastructure Inc.		Figure 25

Plot Date: 11/20/23 - 8:32am, Plotted by: USSD715014
Drawing Path: X:\US\USPDX800-POR\ClientData\AMEC US OFFICES\KIRKLAND\PS20203450 - Boeing Renton\dwg_GWMR_First_Half_2023 - Rev2\, Drawing Name: Figure 25 - AOC-003.dwg



SOURCE AREA WELL GW249S

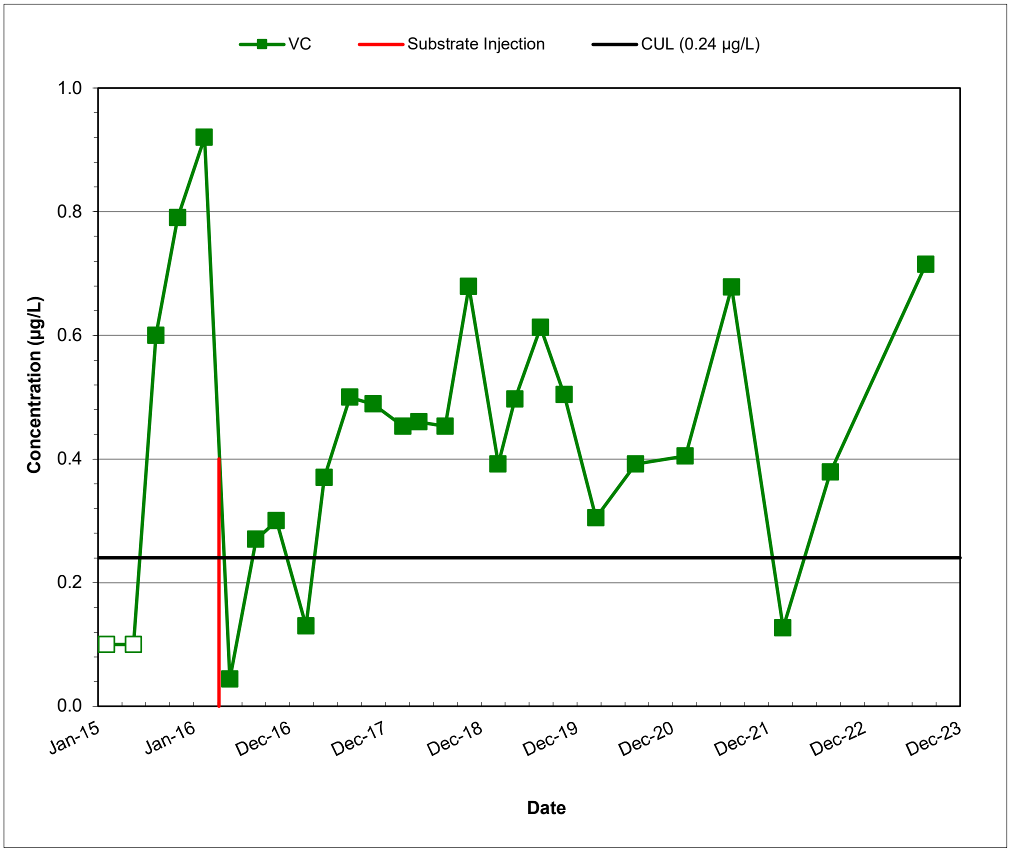


DOWNGRADIENT PLUME AREA WELL GW188S

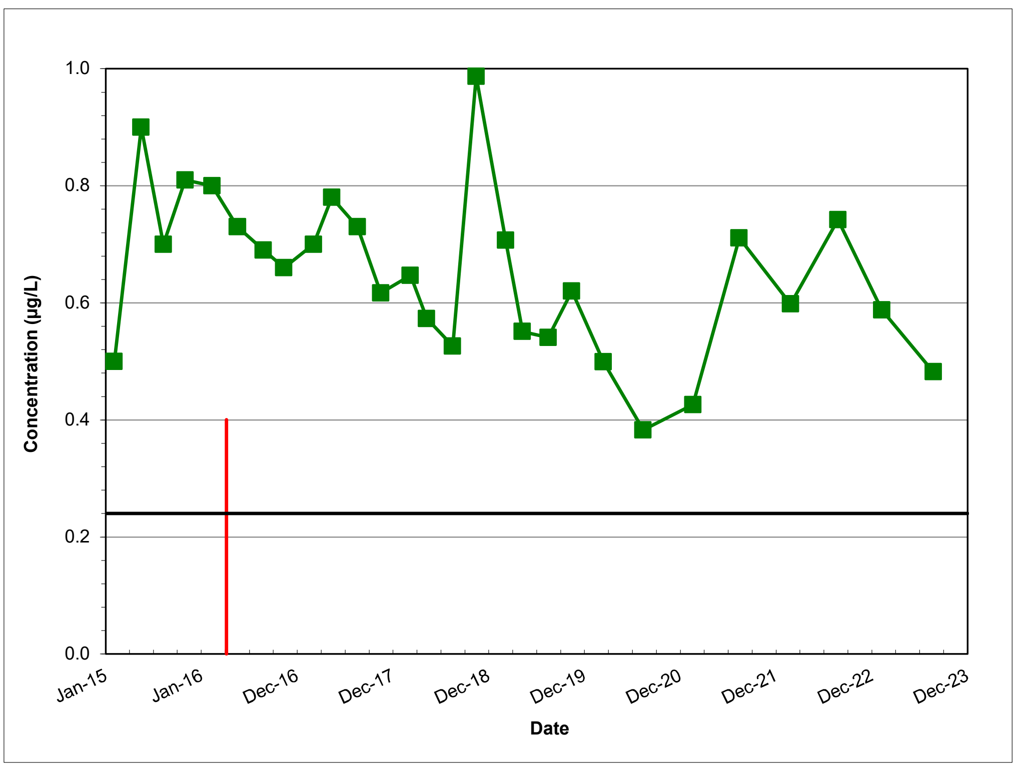
Note: Non-detected values shown at one-half the reporting limit and with an open symbol

wsp	AOC-003 TREND PLOTS FOR SOURCE AREA WELL GW249S AND DOWNGRADIENT PLUME AREA WELL GW188S Boeing Renton Facility, Renton, Washington	Project No. PS20203450 Figure 26

P:\8888 - Boeing Renton\9.0 Field & Lab Data Mgmt\Grapher and Excel Figure Files\excel\2022 Update\Figure 22 to 25_AOC 003-4.xlsx



CPOC WELL GW247S



CPOC WELL GW248I

Note: Non-detected values shown at one-half the reporting limit and with an open symbol

wsp	AOC-003 TREND PLOTS FOR CPOC WELLS GW247S AND GW248I Boeing Renton Facility, Renton, Washington	Project No. PS20203450 Figure 27

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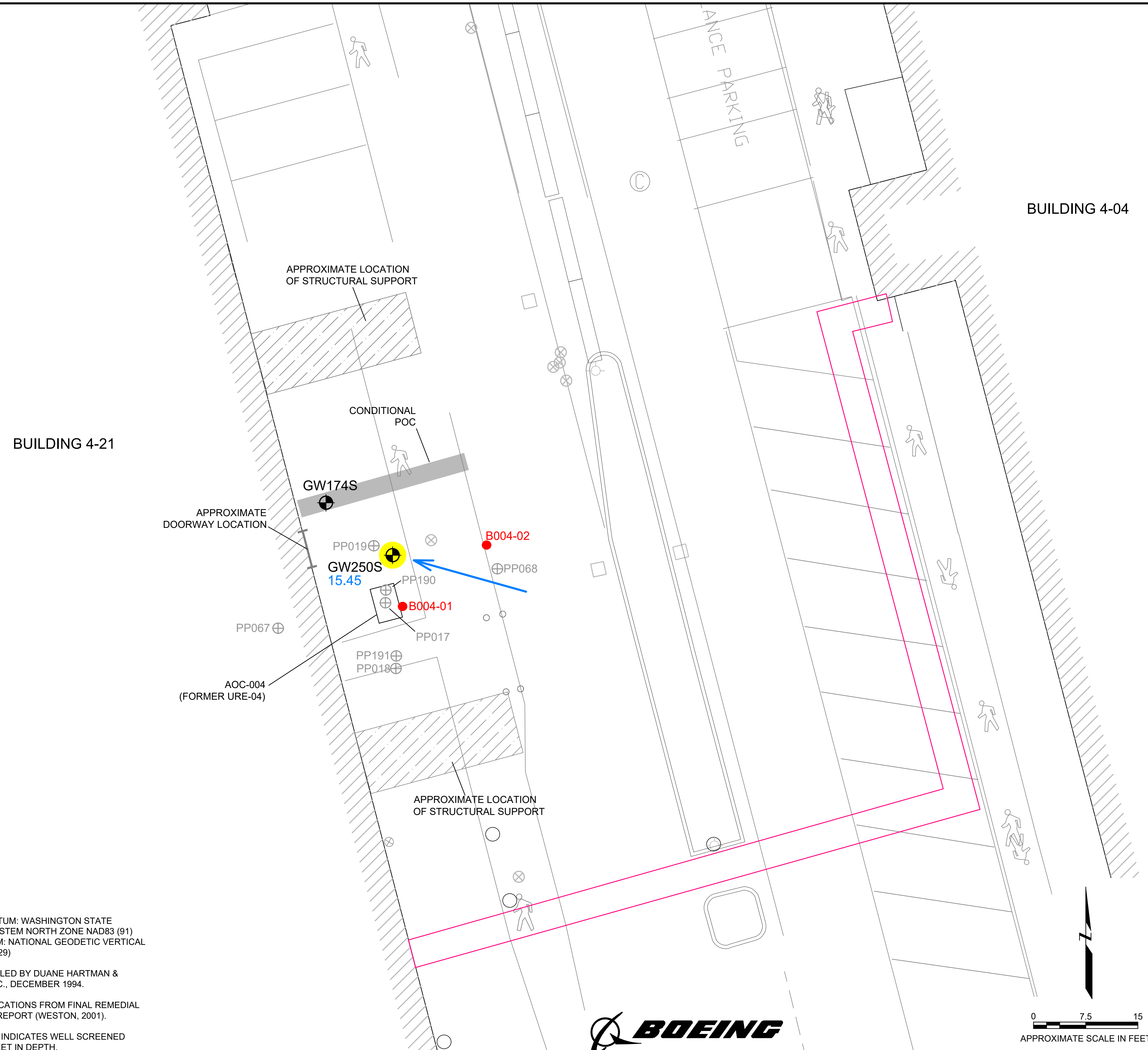
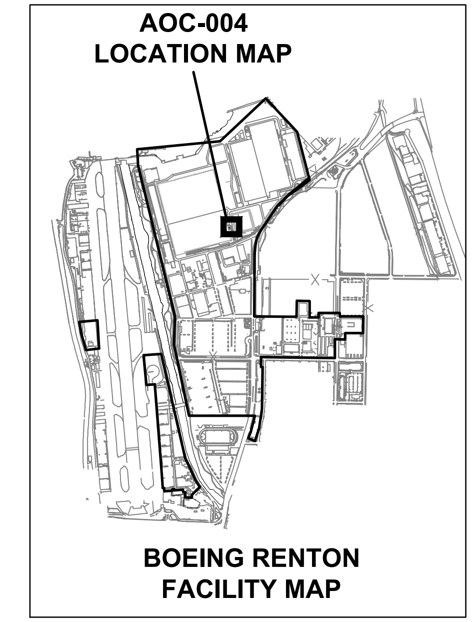




LEGEND

GW250S 15.45	MONITORING WELL LOCATION WITH GROUNDWATER ELEVATION (NGVD-FEET)
	GENERAL DIRECTION OF GROUNDWATER FLOW BASED ON HISTORICAL DATA
B004-01	BIOREMEDIATION INJECTION WELL
PP190	PUSH PROBE SAMPLING LOCATION
	APPROXIMATE PROPERTY LINE
	CONDITIONAL POINT OF COMPLIANCE
HIGHLIGHTED	WELLS INCLUDED IN MONITORING NETWORK

NOTES

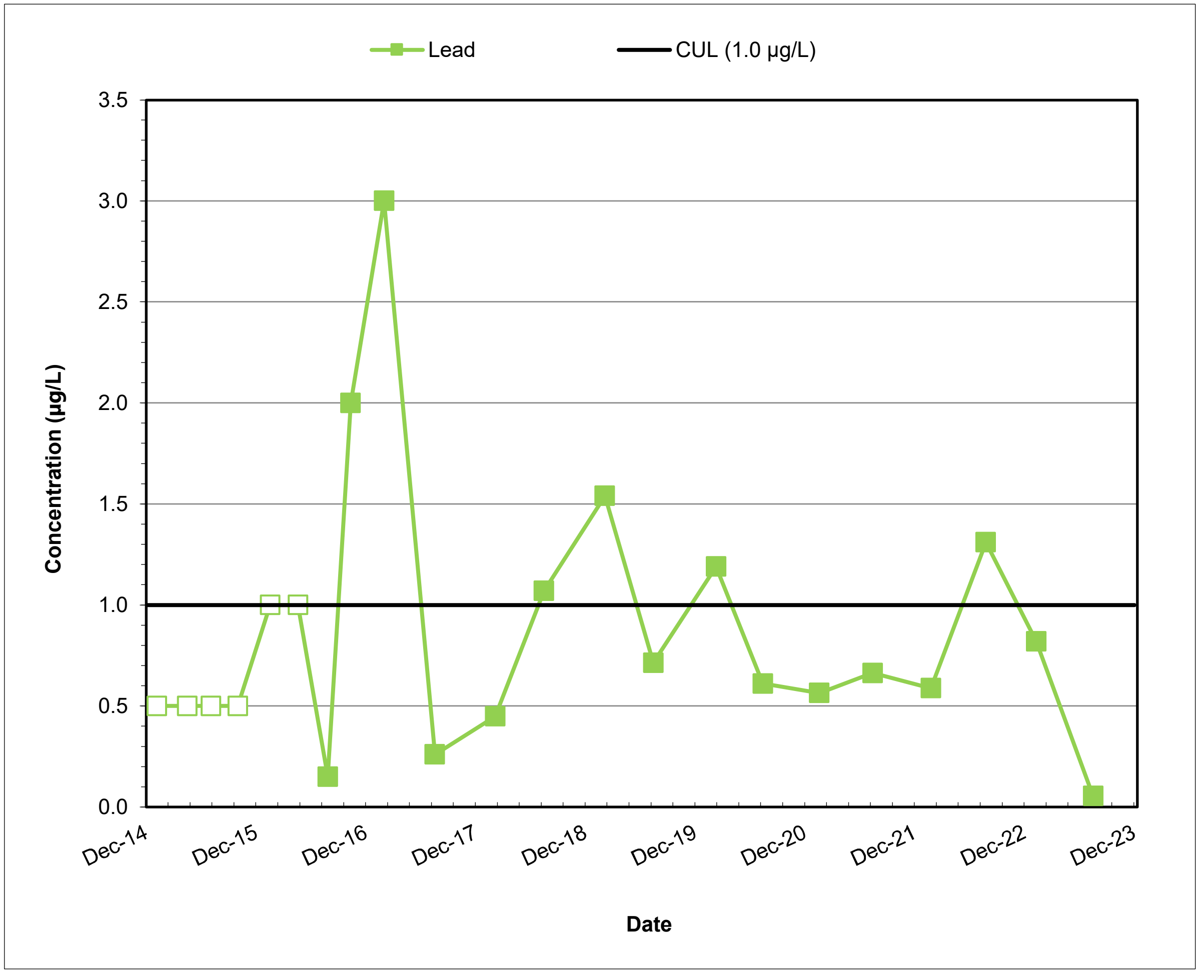
1. HORIZONTAL DATUM: WASHINGTON STATE COORDINATE SYSTEM NORTH ZONE NAD83 (91) VERTICAL DATUM: NATIONAL GEODETIC VERTICAL DATUM (NGVD1929)
2. BASEMAP COMPILED BY DUANE HARTMAN & ASSOCIATES, INC., DECEMBER 1994.
3. PUSH PROBE LOCATIONS FROM FINAL REMEDIAL INVESTIGATION REPORT (WESTON, 2001).
4. 'S' DESIGNATION INDICATES WELL SCREENED LESS THAN 10 FEET IN DEPTH.

BOEING

AOC-004
MONITORING WELL LOCATIONS
AND GROUNDWATER ELEVATIONS
AUGUST 14, 2023
Boeing Renton Facility
Renton, Washington

By: SD	Date: 11/16/23	Project No. PS20203450
WSP USA Environment & Infrastructure Inc.		Figure 28

Plot Date: 11/16/23 - 2:34pm, Plotted by: USAS719374
Drawing Path: X:\USPDX800-POR\ClientData\AMEC US OFFICES\KIRKLAND\PS20203450 - Boeing Renton\dwg_GWMR_First_Half_2023 - Rev2\, Drawing Name: Figure 28 - AOC-004.dwg



SOURCE AREA WELL GW250S

Note: Non-detected values shown at one-half the reporting limit and with an open symbol

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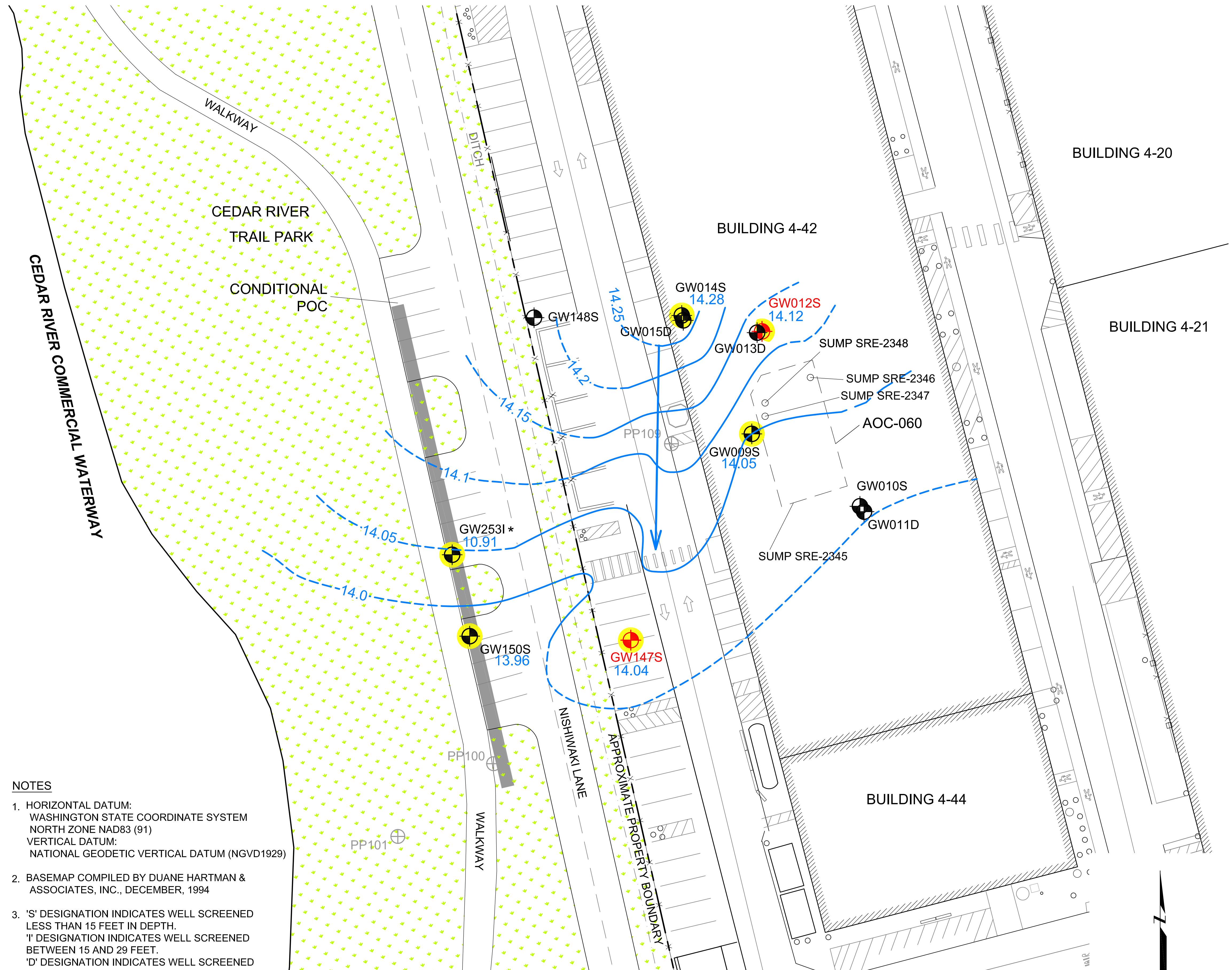
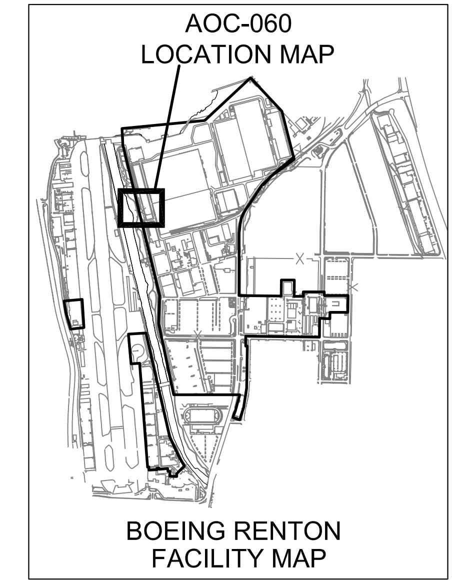
wsp	AOC-004 TREND PLOT FOR SOURCE AREA WELL GW250S Boeing Renton Facility, Renton, Washington	Project No. PS20203450 Figure 29





NOTES

1. HORIZONTAL DATUM:
   WASHINGTON STATE COORDINATE SYSTEM
   NORTH ZONE NAD83 (91)
   VERTICAL DATUM:
   NATIONAL GEODETIC VERTICAL DATUM (NGVD1929)
2. BASEMAP COMPILED BY DUANE HARTMAN & ASSOCIATES, INC., DECEMBER, 1994
3. 'S' DESIGNATION INDICATES WELL SCREENED LESS THAN 15 FEET IN DEPTH.
   'I' DESIGNATION INDICATES WELL SCREENED BETWEEN 15 AND 29 FEET.
   'D' DESIGNATION INDICATES WELL SCREENED GREATER THAN 29 FEET IN DEPTH.
4. THE GROUNDWATER FLOW DIRECTION SHOWN IS BASED ON HISTORICAL GROUNDWATER DATA.

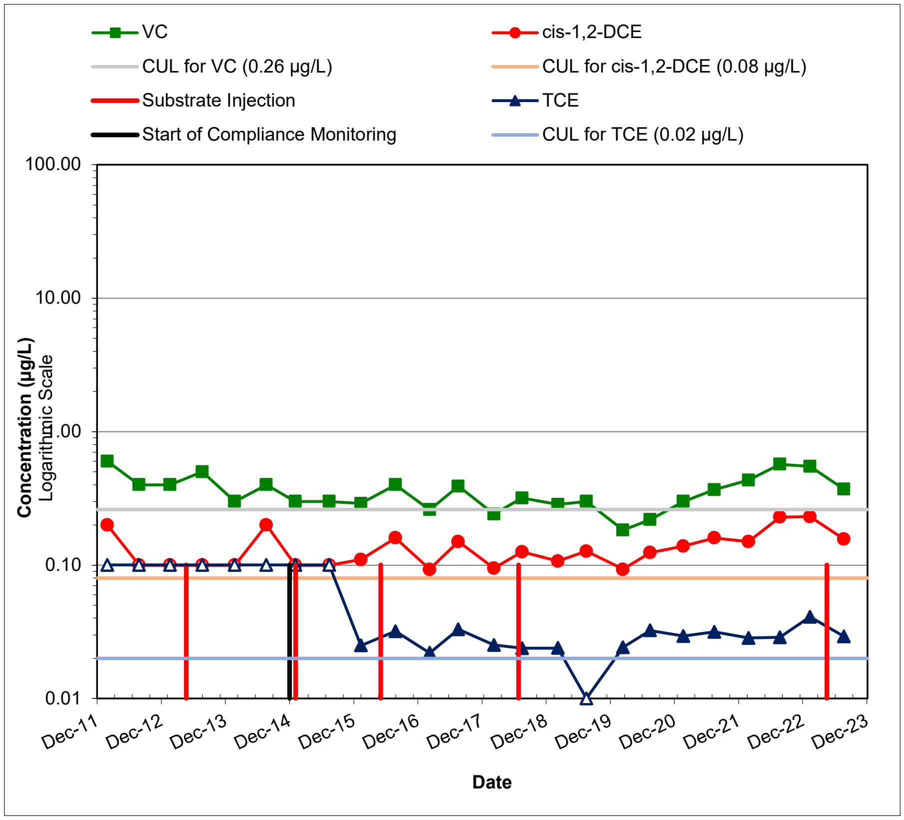
LEGEND

GW150S 13.96	MONITORING WELL LOCATION WITH GROUNDWATER ELEVATION (NGVD-FEET)
*	WELL SCREENED IN UPPER AND LOWER PORTION OF AQUIFER, SO WATER LEVEL IS NOT USED FOR CONTOURING.
GW147S	BIOREMEDIATION INJECTION WELL AND MONITORING WELL
14.1	GROUNDWATER ELEVATION CONTOUR (IN FEET) (DASHED WHERE INFERRED)
	GENERAL DIRECTION OF GROUNDWATER FLOW
PP109	PUSH PROBE SAMPLING LOCATION
	APPROXIMATE PROPERTY LINE
X	FENCE LINE
	CONDITIONAL POINT OF COMPLIANCE
HIGHLIGHTED	WELLS INCLUDED IN MONITORING NETWORK

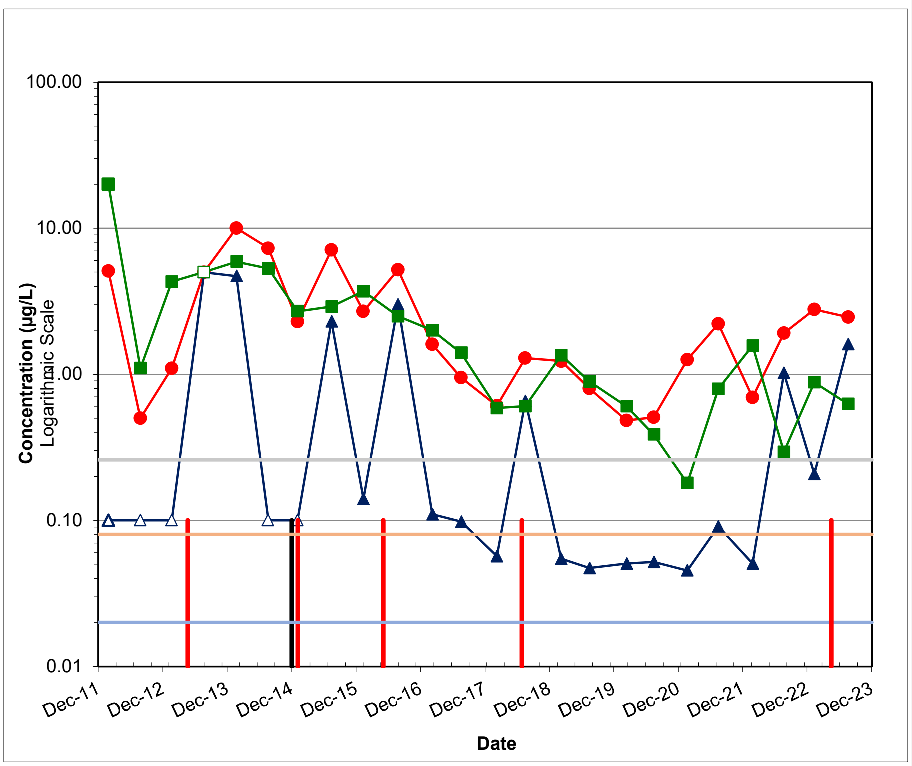
BOEING

AOC-060
MONITORING WELL LOCATIONS
AND GROUNDWATER ELEVATIONS
AUGUST 16-18 & 22, 2023
Boeing Renton Facility
Renton, Washington

By: SD	Date: 11/20/23	Project No. PS20203450
WSP USA Environment & Infrastructure Inc.		Figure 30



SOURCE AREA WELL GW009S



DOWNGRADIENT PLUME AREA WELL GW012S

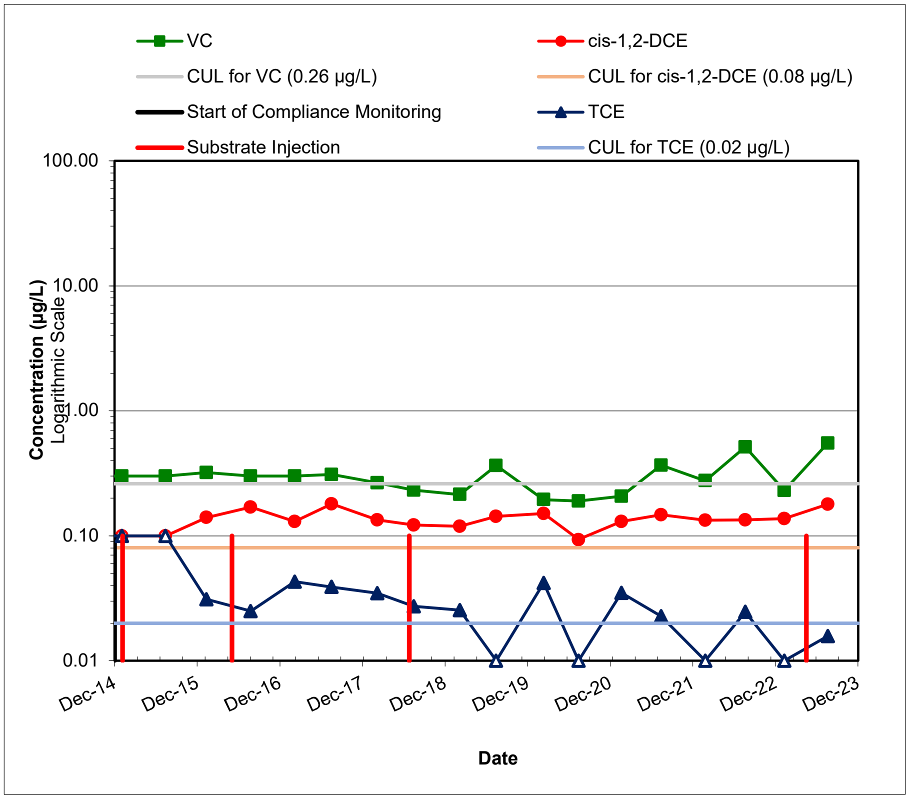
Note: Non-detected values shown at one-half the reporting limit and with an open symbol.

AOC-060 TREND PLOTS FOR
SOURCE AREA WELL GW009S AND
DOWNGRADIENT PLUME AREA WELL GW012S
Boeing Renton Facility, Renton, Washington

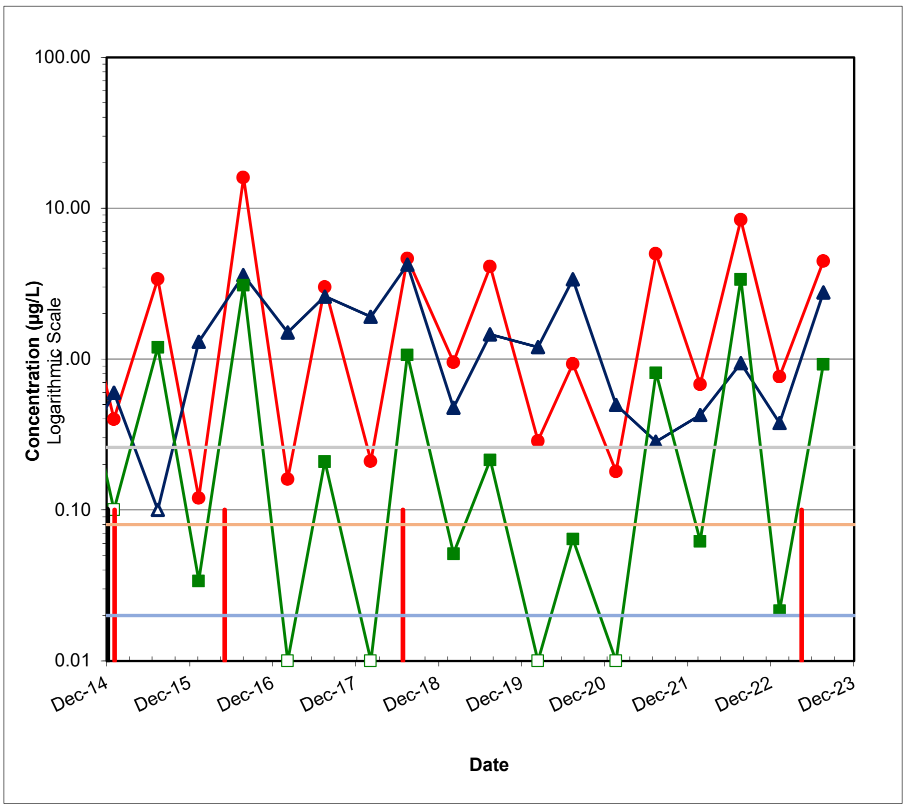
Project No.
PS2020345

Figure
31

\\corp.pbwan.net\GLB-E&I\US\USXHF100-SEA\SEA2-FS1-ProjectFS\8888 - Boeing Renton\3.0 Reports\ACTIVE Groundwater Monitoring\Semi-Annual Reports (2020-present)\202



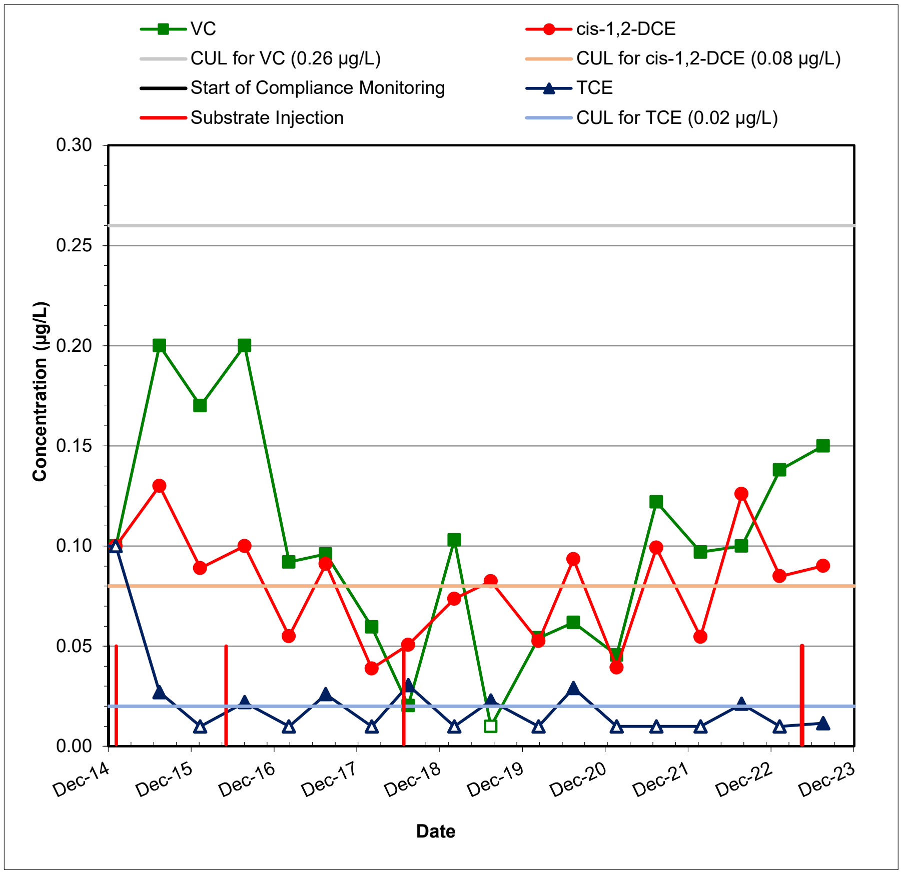
DOWNGRADIENT PLUME AREA WELL GW014S



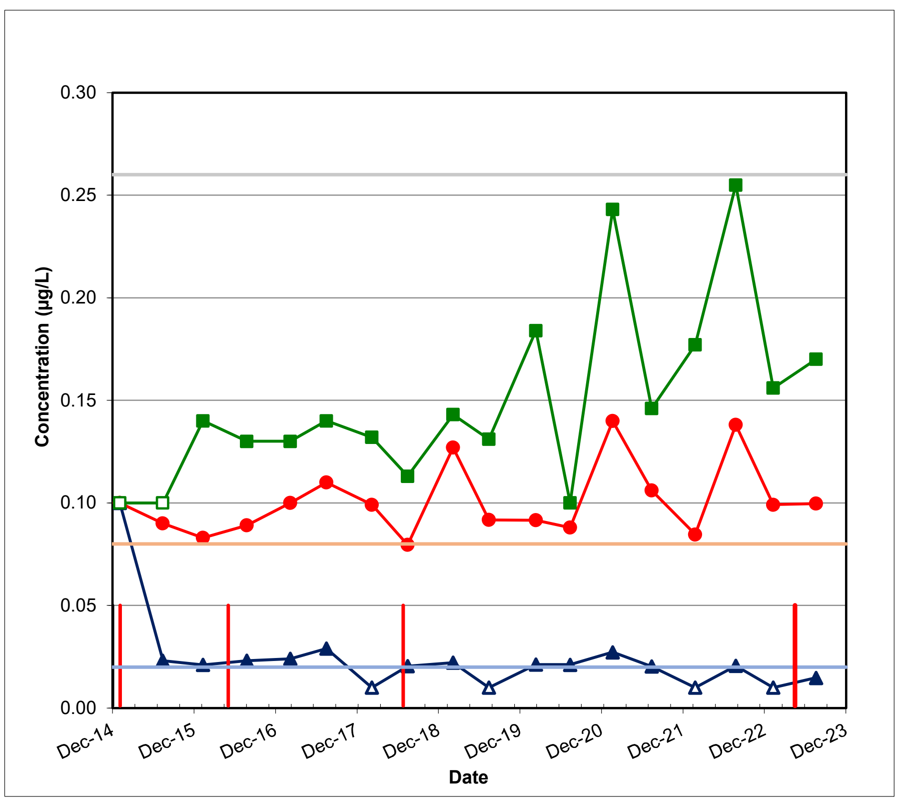
DOWNGRADIENT PLUME AREA WELL GW147S

Note: Non-detected values shown at one-half the reporting limit and with an open symbol.

wsp	AOC-060 TREND PLOTS FOR DOWNGRADIENT PLUME AREA WELLS GW014S AND GW147S Boeing Renton Facility, Renton, Washington	Project No. PS2020345 Figure 32



CPOC AREA WELL GW150S



CPOC AREA WELL GW253I

Note: Non-detected values shown at one-half the reporting limit and with an open symbol.

wsp

AOC-060 TREND PLOTS FOR
CPOC AREA WELLS GW150S AND GW253I
Boeing Renton Facility, Renton, Washington

Project No. PS2020345

Figure 33

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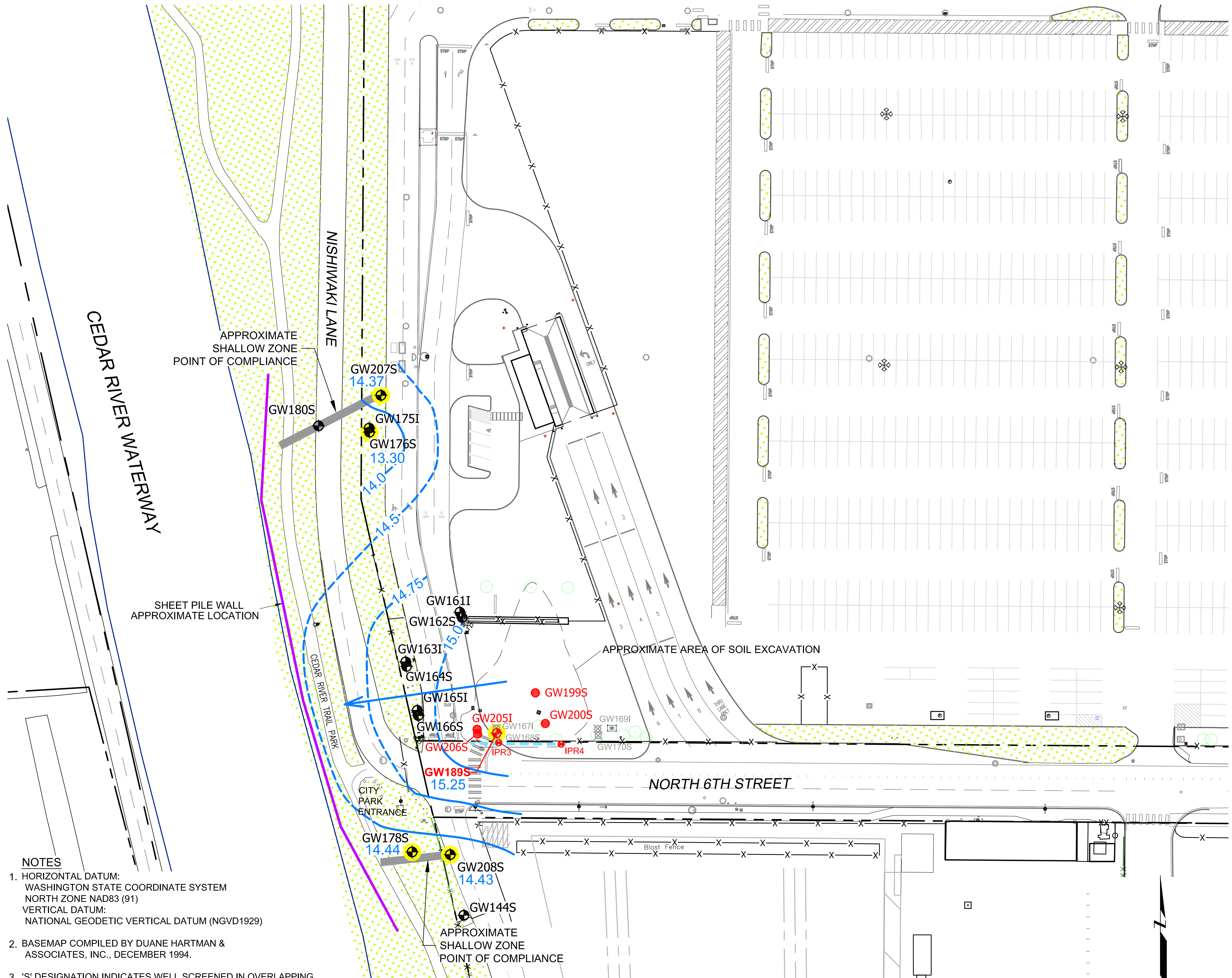
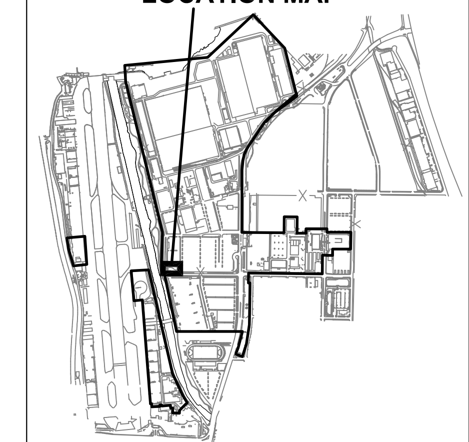




LEGEND

GW178S 14.44	MONITORING WELL LOCATION WITH GROUNDWATER ELEVATION (NGVD-FEET)
15.0	GROUNDWATER ELEVATION CONTOUR (IN FEET) (DASHED WHERE INFERRED)
	GENERAL DIRECTION OF GROUNDWATER FLOW
GW201S	EXISTING BIOREMEDIATION SUBSTRATE INJECTION WELL
GW189S 15.62	EXISTING BIOREMEDIATION SUBSTRATE INJECTION WELL AND MONITORING WELL GROUNDWATER ELEVATION (NGVD-FEET)
IPR4	EXISTING INJECTION PIPE RISER
GW170S	DECOMMISSIONED MONITORING WELL
	APPROXIMATE PROPERTY LINE
	FENCE
	APPROXIMATE LOCATION OF 4-INCH DIAMETER PERFORATED PIPE
	CONDITIONAL POINT OF COMPLIANCE
	APPROXIMATE LOCATION OF SHEET PILE WALL
HIGHLIGHTED	WELLS INCLUDED IN MONITORING NETWORK

NOTES

1. HORIZONTAL DATUM:
   WASHINGTON STATE COORDINATE SYSTEM
   NORTH ZONE NAD83 (91)
   VERTICAL DATUM:
   NATIONAL GEODETIC VERTICAL DATUM (NGVD1929)
2. BASEMAP COMPILED BY DUANE HARTMAN & ASSOCIATES, INC., DECEMBER 1994.
3. 'S' DESIGNATION INDICATES WELL SCREENED IN OVERLAPPING RANGES BETWEEN 18.5 TO 5.5 FEET ELEVATION (NGVD1929).
   'I' DESIGNATION INDICATES WELL SCREENED IN OVERLAPPING RANGES BETWEEN 1.0 TO -13.7 FEET IN ELEVATION (NGVD1929).

BOEING

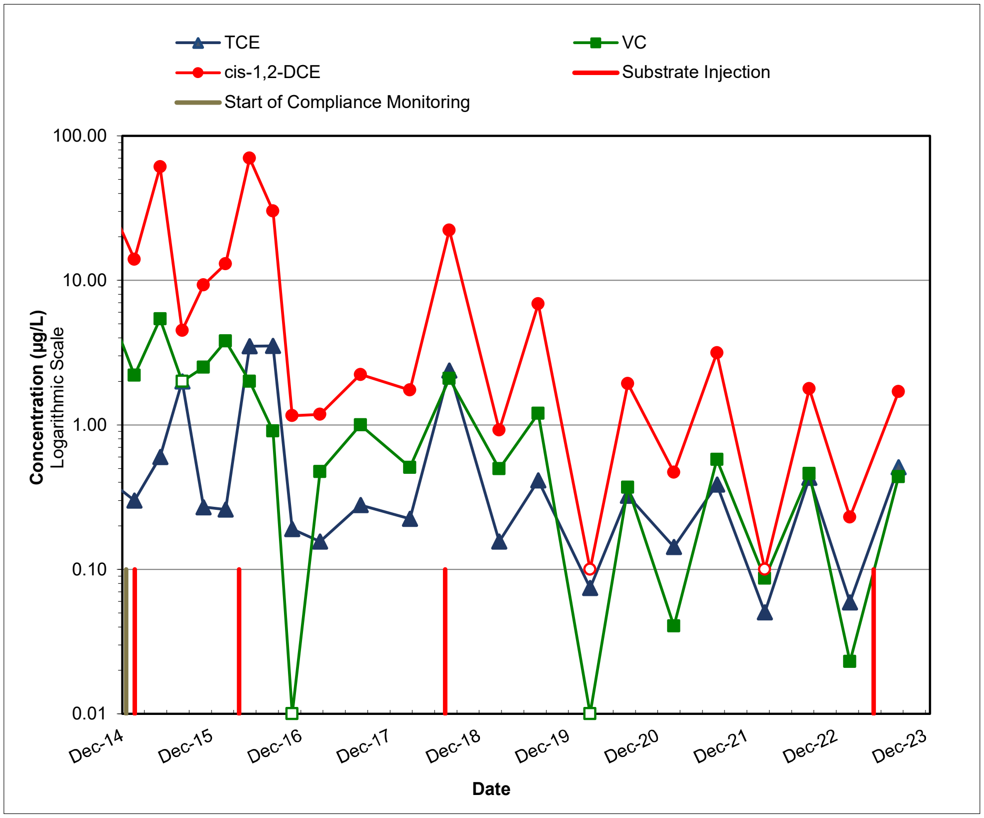
0 40 80
APPROXIMATE SCALE IN FEET

N

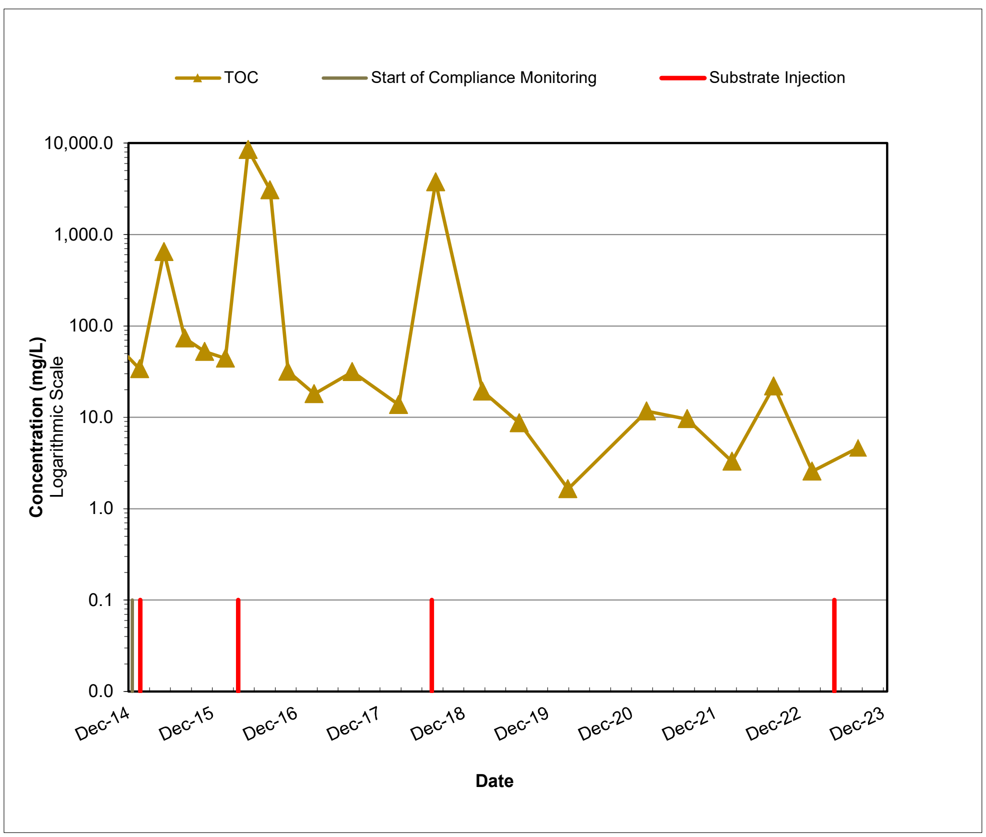
AOC-090
MONITORING WELL LOCATIONS AND GROUNDWATER ELEVATIONS
AUGUST 24, 2023
Boeing Renton Facility
Renton, Washington

By: SD	Date: 11/20/23	Project No. PS20203450
WSP USA Environment & Infrastructure Inc.		Figure 34

Plot Date: 11/20/23 - 1:18pm, Plotted by: USSD715014
Drawing Path: X:\US\USPDX800-POR\ClientData\AMEC US OFFICES\KIRKLAND\PS20203450 - Boeing Renton\dwg_GWMR_First_Half_2023 - Rev2\, Drawing Name: Figure 34 - AOC-090.dwg



SOURCE AREA WELL GW189S

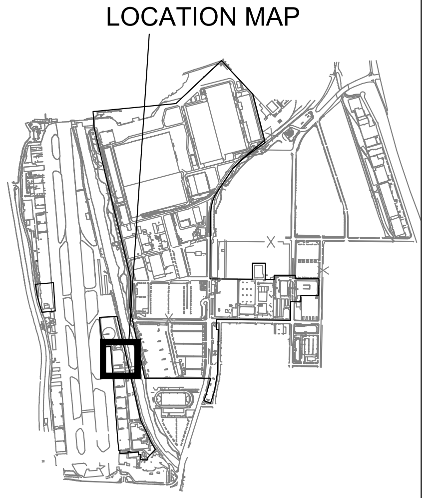


Note: Non-detected values shown at one-half the reporting limit and with an open symbol.

wsp	AOC-090 TREND PLOTS FOR SOURCE AREA WELL GW189S Boeing Renton Facility, Renton, Washington	Project No. PS20203450 Figure 35

\\corp.pbwan.net\GLB-E&I\US\USXHF100-SEA\SEA2-FS1-ProjectF$\8888 - Boeing Renton\3.0 Reports\ACTIVE Groundwater Monitoring\Semi-Annual Reports (2020-present)\2023_2S

APRON A
LOCATION MAP



BOEING RENTON
FACILITY MAP

LEGEND

GW264S 14.64	MONITORING WELL LOCATION WITH GROUNDWATER ELEVATION (NGVD-FEET)
	PRESUMED GENERAL DIRECTION OF GROUNDWATER FLOW
B-1	SOIL SAMPLE LOCATION
	APPROXIMATE PROPERTY LINE
x	FENCE

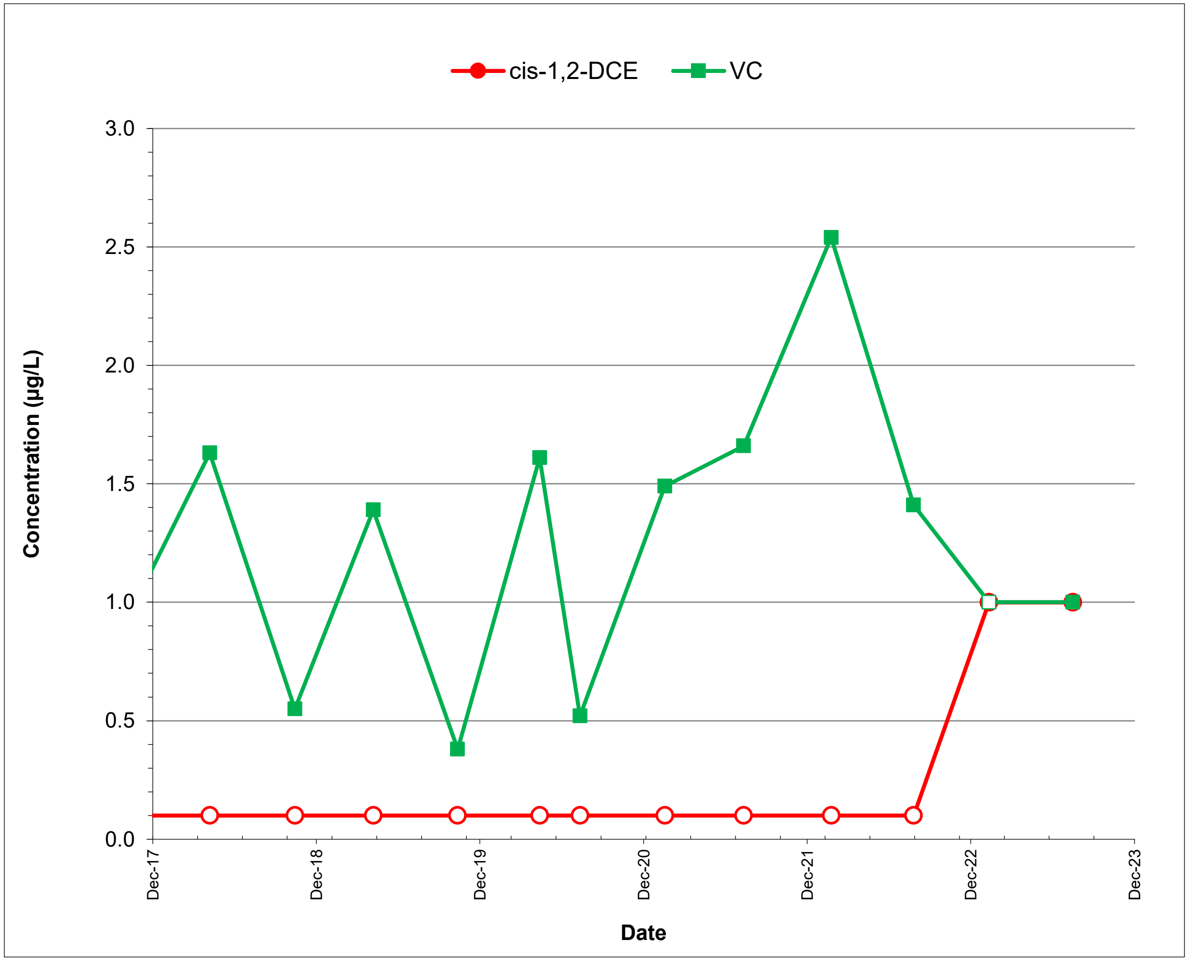
HIGHLIGHTED WELLS INCLUDED IN MONITORING NETWORK

NOTE:
1. 'S' DESIGNATION INDICATES WELL SCREENED LESS THAN 10 FEET IN DEPTH.

0 20 40
APPROXIMATE SCALE IN FEET

APRON A AREA
MONITORING WELL LOCATIONS AND
DEPTH TO GROUNDWATER
AUGUST 14, 2023
Boeing Renton Facility
Renton, Washington

By: SD	Date: 11/20/23	Project No. PS20203450
WSP USA Environment & Infrastructure Inc.		Figure 36



SOURCE AREA WELL GW264S

Note: Non-detected values shown at one-half the reporting limit and with an open symbol.

wsp	APRON A TREND PLOT FOR WELL GW264S Boeing Renton Facility Renton, Washington	Project No. PS20203450 Figure 37

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TABLES

Table 1: SWMU-168 Groundwater Elevation Data

August 24, 2023

Boeing Renton Facility, Renton, Washington

Well ID[1]	Screen Interval Depth (feet bgs)	TOC Elevation (feet)[2]	Depth to Groundwater (feet below TOC)	Groundwater Elevation (feet)[2]
GW230I	4 to 14	24.86	8.05	16.81

Notes:

1. I = intermediate well.
2. Elevations in feet relative to National Geodetic Vertical Datum of 1929.

Abbreviations:

bgs = below ground surface

SWMU = solid waste management unit

TOC = top of casing

Table 2: SWMU-168 Primary Geochemical Indicators[1]
August 24, 2023
Boeing Renton Facility, Renton, Washington

Parameter	Well ID [2]
	CPOC Area
	GW230I
Temperature (degrees C)	20.4
Specific Conductivity (µS/cm)	456
Dissolved Oxygen (mg/L)	0.82
pH (standard units)	6.31
Oxidation/Reduction Potential (mV)	-40.9

Notes:
1. Primary geochemical indicators are measured in the field.
2. I = intermediate well.

Abbreviations:
µS/cm = microsiemens per centimeter
CPOC = conditional point of compliance
degrees C = degrees Celsius
mg/L = milligrams per liter
mV = millivolts
SWMU = solid waste management unit

Table 3: SWMU-168 Concentrations of Constituents of Concern[1, 2]
August 24, 2023
Boeing Renton Facility, Renton, Washington

Analyte	Cleanup Level [1]	Well ID [2]
		CPOC Area
		GW230I
Volatile Organic Compounds (µg/L)		
Vinyl Chloride	0.11	0.101

Notes:
1. Cleanup levels obtained from Table 2 of the Cleanup Action Plan.
2. I = intermediate well.

Abbreviations:
µg/L = micrograms per liter
CPOC = conditional point of compliance
SWMU = solid waste management unit

Table 4: SWMU-172 and SWMU-174 Group Groundwater Elevation Data

August 15-17, 2023

Boeing Renton Facility, Renton, Washington

Well ID[1]	Screen Interval Depth (feet bgs)	TOC Elevation (feet)[3]	Depth to Groundwater (feet below TOC)	Groundwater Elevation (feet)[3]
GW152S	5 to 20[2]	26.98	9.85	17.13
GW153S	5 to 20[2]	27.47	10.62	16.85
GW172S	8 to 18[2]	26.44	9.96	16.48
GW173S	8 to 18[2]	26.51	10.13	16.38
GW226S	5 to 20[2]	26.86	10.10	16.76
GW232S	4 to 14	24.45	7.68	16.77
GW234S	3 to 13	24.95	8.80	16.15
GW235I	15 to 25	24.90	8.11	16.79
GW236S	5 to 15	24.36	8.11	16.25

Notes:

1. S = shallow well; I = intermediate well.
2. Screen intervals are approximate and based on database listings of the screen interval depths for these wells.
3. Elevations in feet relative to National Geodetic Vertical Datum of 1929.

Abbreviations:

bgs = below ground surface

SWMU = solid waste management unit

TOC = top of casing

Table 5: SWMU-172 and SWMU-174 Group Primary Geochemical Indicators[1]
August 15-17, 2023
Boeing Renton Facility, Renton, Washington

Parameter	Well ID[2]									
	Source Area		Downgradient Plume Area				CPOC Area			
	GW152S	GW153S	GW172S	GW172S (field dup.)	GW173S	GW226S	GW232S	GW234S	GW235I	GW236S
Temperature (degrees C)	20.6	18.2	19.1	NA	19.3	18.5	20.4	19.0	16.7	18.4
Specific Conductivity (µS/cm)	1964	288	391	NA	396	339	535	243	202	341
Dissolved Oxygen (mg/L)	0.89	0.78	0.75	NA	0.70	0.77	1.15	0.76	0.79	0.99
pH (standard units)	5.02	6.42	5.94	NA	6.49	6.37	6.33	6.36	6.69	6.56
Oxidation/Reduction Potential (mV)	-7.6	-84.6	-59.1	NA	-98.0	-99.3	-100.2	-55.6	-61.0	-92.4
Total Organic Carbon (mg/L)[3]	1745	5.35	85.85	85.70	18.43	9.11	8.25	2.21	0.93	1.47

Notes
1. Primary geochemical indicators are measured in the field, with the exception of total organic carbon, which is measured in the laboratory.
2. S = shallow well; I = intermediate well.
3. Data qualifiers are as follows:
J = the value is estimated.

Abbreviations
µS/cm = microsiemens per centimeter
CPOC = conditional point of compliance
degrees C = degrees Celsius
field dup. = field duplicate
mg/L = milligrams per liter
mV = millivolts
SWMU = solid waste management unit

Table 6: SWMU-172 and SWMU-174 Group Concentrations of Constituents of Concern [1, 2]
August 15-17, 2023
Boeing Renton Facility, Renton, Washington

Analyte	Cleanup Level [4]	Well ID [3]									
		Source Area		Downgradient Plume Area				CPOC Area			
		GW152S	GW153S	GW172S	GW172S duplicate	GW173S	GW226S	GW232S	GW234S	GW235I	GW236S
Volatile Organic Compounds (µg/L)											
cis -1,2-Dichloroethene	0.03	**1.46**	**0.0528**	**0.528**	**0.539**	**0.107**	0.0169 J	**0.236**	**0.103**	**0.225**	**0.0473**
Tetrachloroethene	0.02	**1.06**	0.0161 J	**0.0237**	**0.0236**	0.0102 J	0.0200 U	0.0200 U	0.0200 U	0.0200 U	0.0200 U
Trichloroethene	0.02	**0.412**	0.0172 J	**0.199**	**0.203**	**0.0262**	0.00910 J	0.0129 J	0.0163 J	0.0189 J	0.0187 J
Vinyl Chloride	0.11	**0.209**	0.0881	**0.277**	**0.283**	**0.132**	0.0886	**0.348**	0.0726	0.0313	0.0128 J
Total Metals (µg/L)											
Arsenic	8.0	**39.8**	2.39	**23.6**	**30**	7.26	5.22	6.16	0.93	0.318 J	1.55
Copper	3.5	**4.98 J**	0.408 J	**17.7**	**20.5**	1.09	1.31 J	1.26 J	1.3	0.676 J	1.00 U
Lead	1.0	**32.2**	0.200 U	**14.7 J**	**21.3 J**	0.384	0.500 U	0.285 J	0.27	0.224	0.160 J

Notes:
1. Data qualifiers are as follows:
U = The analyte was not detected at the reporting limit indicated.
J = the value is estimated.
2. **Bolded** values exceed the cleanup levels.
3. S = shallow well; I = intermediate well.
4. Cleanup levels obtained from Table 2 of the Cleanup Action Plan.

Abbreviations:
µg/L = micrograms per liter
CPOC = conditional point of compliance
SWMU = solid waste management unit

Table 7: Building 4-78/79 SWMU/AOC Group Groundwater Elevation Data

August 18 & 22, 2023

Boeing Renton Facility, Renton, Washington

Well ID[1]	Screen Interval Depth (feet bgs)	TOC Elevation (feet)[2]	Depth to Groundwater (feet below TOC)	Groundwater Elevation (feet)[2]
GW031S-R	5 to 25	19.59	5.73	13.86
GW033S	5 to 25	19.49	5.58	13.91
GW034S	5 to 25	19.65	5.68	14.42
GW143S	10 to 15	19.81	5.90	13.91
GW237S	5 to 15	18.85	4.92	13.93
GW240D	22 to 27	19.81	6.96	12.85
GW244S-R	5 to 15	19.42	5.58	13.84

Notes:

1. S = shallow well; D = deep well; R = replaced.
2. Elevations in feet relative to National Geodetic Vertical Datum of 1929.

Abbreviations:

AOC = area of concern
bgs = below ground surface
NA = not available
SWMU = solid waste management unit
TOC = top of casing

Table 8: Building 4-78/79 SWMU/AOC Group Primary Geochemical Indicators[1]
August 18 & 22, 2023
Boeing Renton Facility, Renton, Washington

Parameter	Well ID[2]							
	Source Area					CPOC Area		
	GW031S-R	GW033S	GW033S (field dup.)	GW034S	GW244S-R	GW143S	GW237S	GW240D
Temperature (degrees C)	17.4	18.5	NA	18.9	17.4	18.5	20.2	17.3
Specific Conductivity (µS/cm)	438	521	NA	398	523	455	346	305
Dissolved Oxygen (mg/L)	0.85	0.83	NA	0.82	0.82	0.81	0.70	0.77
pH (standard units)	6.17	6.20	NA	6.38	6.31	6.30	6.39	6.45
Oxidation/Reduction Potential (mV)	-58.1	-72.3	NA	-87.1	-83.6	-94.4	-82.6	-101.7
Total Organic Carbon (mg/L)[3]	11.76	14.32	14.55	9.29	12.42	9.75	7.38	4.63

Notes
1. Primary geochemical indicators are measured in the field, with the exception of total organic carbon, which is measured in the laboratory.
2. S = shallow well; D = deep well.
3. Data qualifiers are as follows:
J = the value is estimated.

Abbreviations
µS/cm = microsiemens per centimeter
AOC = area of concern
CPOC = conditional point of compliance
degrees C = degrees Celsius
field dup. = field duplicate
mg/L = milligrams per liter
mV = millivolts
NA = not analyzed
SWMU = solid waste management unit

Table 9: Building 4-78/79 SWMU/AOC Group Concentrations of Constituents of Concern [1, 2]
August 18 & 22, 2023
Boeing Renton Facility, Renton, Washington

Analyte	Cleanup Level [4]	Well ID [3]							
		Source Area					CPOC Area		
		GW031S-R	GW033S	GW033S (field dup.)	GW034S	GW244S-R	GW143S	GW237S	GW240D
Volatile Organic Compounds (µg/L)									
Benzene	0.80	0.200 U	**8.85**	**9.44**	0.200 U	0.200 U	0.200 U	0.150 J	0.200 U
cis -1,2-Dichloroethene	0.70	0.200 U	0.42	0.46	0.110 J	0.22	0.3	0.0900 J	0.200 U
Trichloroethene	0.23	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U
Vinyl Chloride	0.20	**0.28**	**0.94**	**0.93**	**0.47**	**0.28**	0.120 J	**0.25**	0.150 J
Total Petroleum Hydrocarbons (µg/L)									
TPH-G (C7-C12)	800	100 U	223	231	100 U	100 U	100 U	100 U	100 U

Notes:
1. Data qualifiers are as follows:
   U = The analyte was not detected at the reporting limit indicated.
   J = The value is estimated.
2. **Bolded** values exceed the cleanup levels.
3. S = shallow well; D = deep well.
4. Cleanup levels obtained from Table 2 of the Cleanup Action Plan.

Abbreviations:
µg/L = micrograms per liter
AOC = area of concern
CPOC = conditional point of compliance
field dup. = field duplicate
SWMU = solid waste management unit
TPH-G = total petroleum hydrocarbons as gasoline

Table 10: Former Fuel Farm Groundwater Elevation Data

August 15, 2023

Boeing Renton Facility, Renton, Washington

Well ID[1]	Screen Interval Depth (feet bgs)	TOC Elevation (feet)[2]	Depth to Groundwater (feet below TOC)	Groundwater Elevation (feet)[2]
GW211S	4.8 to 14.7	27.77	11.04	16.73
GW221S	5 to 15	27.93	11.10	16.83
GW224S	5 to 15	27.98	11.54	16.44

Notes

1. S = shallow well
2. Elevations in feet relative to National Geodetic Vertical Datum of 1929.

Abbreviations

bgs = below ground surface

TOC = top of casing

Table 11: Former Fuel Farm Primary Geochemical Indicators[1]
August 15, 2023
Boeing Renton Facility, Renton, Washington

Parameter	Well ID[2]		
	CPOC Area		
	GW211S	GW221S	GW224S
Temperature (degrees C)	17.7	19.6	19.7
Specific Conductivity (µS/cm)	225	254	203
Dissolved Oxygen (mg/L)	0.75	0.75	0.81
pH (standard units)	6.26	6.29	6.02
Oxidation/Reduction Potential (mV)	-115.6	-57.4	-49.6

Notes
1. Primary geochemical indicators are measured in the field.
2. S = shallow well.

Abbreviations
µS/cm = microsiemens per centimeter
CPOC = conditional point of compliance
degrees C = degrees Celsius
mg/L = milligrams per liter
mV = millivolts

Table 12: Former Fuel Farm Concentrations of Constituents of Concern [1, 2]

August 15, 2023

Boeing Renton Facility, Renton, Washington

Analyte	Cleanup Level [4]	Well ID[3]			
		CPOC Area			
		GW211S	GW221S	GW224S	GW224S (field dup.)
Total Petroleum Hydrocarbons (mg/L)					
TPH-D (C12-C24)	0.5	0.100 U	0.258	**0.526 J**	**0.805 J**
TPH-O (C24-C38)	NE	0.200 U	0.200 U	0.324	0.200 U
Jet A (C10-C18)	0.5	0.100 U	0.229	**0.913 J**	**1.360 J**

<u>Notes</u>

1. Data qualifiers are as follows:
   U = The analyte was not detected at the reporting limit indicated.
   J = The value is estimated.
2. **Bolded** values exceed the cleanup levels.
3. S = shallow well.
4. Cleanup levels obtained from Table 2 of the Cleanup Action Plan.

<u>Abbreviations</u>

CPOC = conditional point of compliance
field dup. = field duplicate
mg/L = milligrams per liter
NE = not established
TPH-D = total petroleum hydrocarbons as diesel
TPH-O = total petroleum hydrocarbons as motor oil

Table 13: AOC-001 and -002 Groundwater Elevation Data
August 22-24, 2023
Boeing Renton Facility, Renton, Washington

Well ID[1]	Screen Interval Depth (feet bgs)	TOC Elevation (feet)[2]	Depth to Groundwater (feet below TOC)	Groundwater Elevation (feet)[2]
GW185S-R	4.5 to 14.5	17.83	4.04	13.79
GW190S-R	3 to 13	17.97	4.12	13.85
GW191D-R	26 to 36	17.94	3.74	14.20
GW192S-R	4.5 to 9.5	17.67	3.82	13.85
GW193S-R	3 to 12.8	18.39	4.49	13.90
GW195S-R	7 to 12	18.45	4.72	13.73
GW196D-R	26 to 36	18.43	4.53	13.90
GW197S-R	7.5 to 12.5	18.34	4.59	13.75
GW213S-R	3 to 13	18.14	4.13	14.01
GW214S-R	3.5 to 13.5	18.27	4.06	14.21
GW215S-R	3 to 13	18.22	4.10	14.12
GW245S-R	3 to 13	18.32	4.60	13.72
GW246S-R	4 to 14	17.85	4.05	13.80

Notes:
1. S = shallow well; D = deep well.
2. Elevations in feet relative to National Geodetic Vertical Datum of 1929.

Abbreviations:
AOC = area of concern
bgs = below ground surface
NA = not applicable
NM = not measured
TOC = top of casing

Table 14: AOC-001, -002, and -003 Primary Geochemical Indicators[1]
August 22-24, 2023
Boeing Renton Facility, Renton, Washington

Parameter	Well ID[2]												
	AOC-001 / AOC-002 Cross-Gradient Wells			AOC-001 / AOC-002 Source Area Wells	AOC-001 / AOC-002 Downgradient Plume Wells				AOC-001 / AOC-002 CPOC Wells				
	GW213S-R	GW214S-R	GW215S-R	GW193S-R	GW190S-R	GW191D-R	GW192S-R	GW246S-R	GW185S-R	GW195S-R	GW196D-R	GW197S-R	GW245S-R
Temperature (degrees C)	20.0	20.7	20.0	21.8	22.8	19.5	23.6	22.0	22.5	20.8	17.8	21.1	21.6
Specific Conductivity (µS/cm)	689	674	682	828	647	397	268	660	934	534	536	314	499
Dissolved Oxygen (mg/L)	0.74	0.80	0.80	0.70	0.65	0.70	0.70	0.68	0.64	0.71	0.74	0.67	0.71
pH (standard units)	6.78	6.45	6.66	6.30	6.30	6.55	6.49	6.28	6.38	6.42	6.36	9.26	8.93
Oxidation/Reduction Potential (mV)	-63.1	-9.0	-45.9	-95.5	-83.3	-94.6	-5.3	-86.2	-104.7	-96.5	-81.7	-163.7	-235.9
Total Organic Carbon (mg/L)[3]	9.69	9.68	13.92	19.13	11.31	5.5	4.17	10.79	21.18	7.91	7.90	8.39	36.46

Notes
1. Primary geochemical indicators are measured in the field, with the exception of total organic carbon, which is measured in the laboratory.
2. S = shallow well; D = deep well.

Abbreviations
µS/cm = microsiemens per centimeter
AOC = area of concern
CPOC = conditional point of compliance
degrees C = degrees Celsius
mg/L = milligrams per liter
mV = millivolts
NA = not analyzed

Table 15: AOC -001 and -002 Concentrations of Constituents of Concern[1]
August 22-24, 2023
Boeing Renton Facility, Renton, Washington

Analyte	Cleanup Level[4]	Well ID[2]												
		AOC-001 / AOC-002 Source Area	AOC-001 / AOC-002 Cross-Gradient Wells			AOC-001 / AOC-002 Downgradient Plume Wells				AOC-001 / AOC-002 CPOC Wells				
		GW193S-R	GW213S-R	GW214S-R	GW215S-R	GW190S-R	GW191D-R	GW192S-R	GW246S-R	GW185S-R	GW195S-R	GW196D-R	GW197S-R	GW245S-R
Volatile Organic Compounds (µg/L)														
Benzene	0.80	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	1.00	0.81
1,1-Dichloroethene	0.057	0.0200 U	0.0200 U	0.0200 U	0.0200 U	0.0200 U	0.0200 U	0.0200 U	0.0200 U	0.0200 U	0.0200 U	0.0200 U	**0.489**	0.0200 U
cis-1,2-Dichloroethene	0.02	**0.635**	**0.262**	**0.0897**	**0.0789**	**0.177**	**0.0686**	**1.69**	**0.391**	**1.54**	**0.12**	**0.0256**	**127**	**0.255**
Trichloroethene	0.02	**0.139**	0.0200 U	0.0200 U	0.0200 U	0.0200 U	0.0200 U	**0.0519**	0.0200 U	0.0200 U	0.0200 U	0.0200 U	**1.36**	**0.0406**
Vinyl Chloride	0.05	**0.541**	**0.179**	0.0383	0.0319	**0.0589**	**0.0915**	**0.951**	**0.386**	**2.06**	**0.13**	0.0216	**124**	**0.288**

Notes:
1. Data qualifiers are as follows:
   U = The analyte was not detected at the reporting limit indicated.
   J = The value is estimated.
2. **Bolded** values exceed the cleanup levels.
3. S = shallow well; I = intermediate well.
4. Cleanup levels obtained from Table 2 of the Cleanup Action Plan.

Abbreviations:
µg/L = micrograms per liter
AOC = area of concern
CPOC = conditional point of compliance
NA = not analyzed
NE = not established

Table 16: AOC-003 Groundwater Elevation Data

August 22-23, 2023

Boeing Renton Facility, Renton, Washington

Well ID[1]	Screen Interval Depth (feet bgs)	TOC Elevation (feet)[2]	Depth to Groundwater (feet below TOC)	Groundwater Elevation (feet)[2]
GW188S	3.5 to 13.5	18.78	4.36	14.42
GW247S-R	4 to 14	18.93	4.81	14.12
GW248I	10 to 20	18.78	4.49	14.29
GW249S	4 to 14	18.85	4.14	14.71

Notes:

1. S = shallow well; I = intermediate well.
2. Elevations in feet relative to National Geodetic Vertical Datum of 1929.

Abbreviations:

AOC = area of concern
bgs = below ground surface
NA = not applicable
NM = not measured
TOC = top of casing

Table 17: AOC-003 Primary Geochemical Indicators[1]
August 22-23, 2023
Boeing Renton Facility, Renton, Washington

Parameter				
	AOC-003 Source Area	AOC-003 Downgradient Plume Area	AOC-003 CPOC Area	
	GW249S	GW188S	GW247S-R	GW248I
Temperature (degrees C)	18.0	18.0	18.4	17.0
Specific Conductivity (µS/cm)	367	471	546	540
Dissolved Oxygen (mg/L)	0.79	0.75	0.75	0.84
pH (standard units)	6.26	6.31	6.34	6.35
Oxidation/Reduction Potential (mV)	-63.8	-67.6	-95.4	-79.9
Total Organic Carbon (mg/L)[3]	12.38	11.97	12.72	12.15

Notes
1. Primary geochemical indicators are measured in the field, with the exception of total organic carbon, which is measured in the laboratory.
2. S = shallow well; I = intermediate well.

Abbreviations
µS/cm = microsiemens per centimeter
AOC = area of concern
CPOC = conditional point of compliance
degrees C = degrees Celsius
mg/L = milligrams per liter
mV = millivolts
NA = not analyzed

Table 18: AOC -003 Concentrations of Constituents of Concern[1]

August 22-23, 2023

Boeing Renton Facility, Renton, Washington

Analyte	Cleanup Level [4, 5]	Well ID[3]			
		AOC-003 Source Area	AOC-003 Downgradient Plume Area	AOC-003 CPOC Area	
		GW249S	GW188S	GW247S-R	GW248I
Volatile Organic Compounds (µg/L)					
cis-1,2-Dichloroethene	0.78	0.0529	0.0408	0.0200 U	0.0219
Trichloroethene	0.16	0.0200 U	0.0200 U	0.0200 U	0.0200 U
Tetrachloroethene	0.02	0.0200 U	0.0200 U	0.0200 U	0.0200 U
Vinyl Chloride	0.24	**0.263**	0.197	**0.715**	**0.482**

Notes:

1. Data qualifiers are as follows:
   U = The analyte was not detected at the reporting limit indicated.
   J = The value is estimated.
2. **Bolded** values exceed the cleanup levels.
3. S = shallow well; I = intermediate well.
4. Cleanup levels obtained from Table 2 of the Cleanup Action Plan.
5. Cleanup levels for cis, 1,2-dichloroethene, trichloroethene, and tetrachloroethene are established for wells in AOC-003 only.

Abbreviations:

µg/L = micrograms per liter
AOC = area of concern
CPOC = conditional point of compliance
NA = not analyzed
NE = not established

Table 19: AOC-004 Groundwater Elevation Data

August 14, 2023

Boeing Renton Facility, Renton, Washington

Well ID[1]	Screen Interval Depth (feet bgs)	TOC Elevation (feet)[2]	Depth to Groundwater (feet below TOC)	Groundwater Elevation (feet)[2]
GW250S	4 to 14	19.31	3.86	15.45

Notes:
1. S = shallow well.
2. Elevations in feet relative to National Geodetic Vertical Datum of 1929.

Abbreviations:

AOC = area of concern

bgs = below ground surface

TOC = top of casing

Table 20: AOC-004 Primary Geochemical Indicators[1]
August 14, 2023
Boeing Renton Facility, Renton, Washington

Parameter	Well ID [2]
	Source Area
	GW250S
Temperature (degrees C)	18.6
Specific Conductivity (µS/cm)	142
Dissolved Oxygen (mg/L)	0.70
pH (standard units)	6.94
Oxidation/Reduction Potential (mV)	-157.1

Notes:
1. Primary geochemical indicators are measured in the field.
2. S = shallow well.

Abbreviations:
µS/cm = microsiemens per centimeter
AOC = area of concern
degrees C = degrees Celsius
mg/L = milligrams per liter
mV = millivolts

Table 21: AOC-004 Concentrations of Constituents of Concern

August 14, 2023

Boeing Renton Facility, Renton, Washington

Analyte	Cleanup Level [3]	Well ID [2]
		Source Area
		GW250S
Metals (µg/L)		
Lead	1	0.0570 J

Notes:

1. Data qualifiers are as follows:
   J = The value is estimated.
2. S = shallow well.
3. Cleanup levels obtained from Table 2 of the Cleanup Action Plan.

Abbreviations:

AOC = area of concern

µg/L = micrograms per liter

Table 22: AOC-060 Groundwater Elevation Data

August 16-18 & 22, 2023

Boeing Renton Facility, Renton, Washington

Well ID[1]	Screen Interval Depth (feet bgs)	TOC Elevation (feet)[2]	Depth to Groundwater (feet below TOC)	Groundwater Elevation (feet)[2]
GW009S	4.5 to 14.5	19.36	5.31	14.05
GW010S	4.5 to 14.5	19.47	5.46	14.01
GW011D	29 to 39	19.49	5.47	14.02
GW012S	4.5 to 14.5	19.11	4.99	14.12
GW014S	4.5 to 14.5	19.24	4.96	14.28
GW147S	5 to 15	18.73	4.69	14.04
GW150S	5 to 15	19.10	5.14	13.96
GW253I	10 to 20	19.02	5.03	13.99

Notes:

1. S = shallow well; D = deep well; I = intermediate well.
2. Elevations in feet relative to National Geodetic Vertical Datum of 1929.

Abbreviations:

AOC = area of concern

bgs = below ground surface

TOC = top of casing

Table 23: AOC-060 Primary Geochemical Indicators[1]
August 16-18 & 22, 2023
Boeing Renton Facility, Renton, Washington

Parameter	Well ID [2]						
	Source Area	Downgradient Plume Area				CPOC Area	
	GW009S	GW012S	GW014S	GW014S (field dup.)	GW147S	GW150S	GW253I
Temperature (degrees C)	20.3	21.8	20.9	NA	25.0	18.1	17.4
Specific Conductivity (µS/cm)	357	5595	490	NA	2372	374	413
Dissolved Oxygen (mg/L)	0.81	0.69	0.66	NA	0.60	0.76	0.88
pH (standard units)	6.40	4.74	6.22	NA	4.89	6.55	6.54
Oxidation/Reduction Potential (mV)	-106.6	-18.5	-90.7	NA	-1.8	-112.9	-113.9
Total Organic Carbon (mg/L)	6.75	15640	5.21	5.30	2308	3.86	4.98

Notes:
1. Primary geochemical indicators are measured in the field, with the exception of total organic carbon, which is measured in the laboratory.
2. S = shallow well; I = intermediate well.

Abbreviations:
µS/cm = microsiemens per centimeter
AOC = area of concern
CPOC = conditional point of compliance
degrees C = degrees Celsius
field dup. = field duplicate
mg/L = milligrams per liter
mV = millivolts

Table 24: AOC-060 Concentrations of Constituents of Concern[1, 2]
August 17 & 18, 2023
Boeing Renton Facility, Renton, Washington

Analyte	Cleanup Levels [4]	Well ID [3]						
		Source Area	Cross-Gradient Wells			Downgradient Plume Well	CPOC Area	
		GW009S	GW012S	GW014S	GW014S (field dup.)	GW147S	GW150S	GW253I
Volatile Organic Compounds (µg/L)								
cis -1,2-Dichloroethene	0.08	**0.157**	**2.46**	**0.179**	**0.17**	**4.46**	**0.0901**	**0.0997**
Trichloroethene	0.02	**0.0292**	**1.61**	0.0158 J	0.0126 J	**2.76**	0.0115 J	0.0147 J
Vinyl Chloride	0.26	**0.371**	**0.625**	**0.551**	**0.519**	**0.928**	0.15	0.17

Notes:
1. Data qualifiers are as follows:
   J = The value is estimated.
2. **Bolded** values exceed the cleanup levels.
3. S = shallow well; I = intermediate well.
4. Cleanup levels obtained from Table 2 of the Cleanup Action Plan.

Abbreviations:
µg/L = micrograms per liter
AOC = area of concern
CPOC = conditional point of compliance
field dup. = field duplicate

Table 25: AOC-090 Groundwater Elevation Data

August 24, 2023

Boeing Renton Facility, Renton, Washington

Well ID[1]	Screen Interval Depth (feet bgs)	TOC Elevation (feet)[2]	Depth to Groundwater (feet below TOC)	Groundwater Elevation (feet)[2]
GW176S	10 to 14.3	20.15	6.85	13.3
GW178S	11.2 to 15.5	22.73	8.29	14.44
GW189S	4 to 14	22.01	6.76	15.25
GW207S	7.3 to 12	21.12	6.75	14.37
GW208S	6.3 to 11	22.45	8.02	14.43

Notes:

1. S = shallow well.
2. Elevations in feet relative to National Geodetic Vertical Datum of 1929.

Abbreviations:

AOC = area of concern

bgs = below ground surface

TOC = top of casing

Table 26: AOC-090 Primary Geochemical Indicators[1]
August 24, 2023
Boeing Renton Facility, Renton, Washington

Parameter	Well ID [2]				
	Source Area	Downgradient Plume Area	Shallow Zone CPOC Area		
	GW189S [3]	GW176S	GW178S	GW207S	GW208S
Temperature (degrees C)	18.8	19.2	16.3	22.3	19.1
Specific Conductivity (µS/cm)	428	559	416	480	477
Dissolved Oxygen (mg/L)	0.89	0.74	0.92	0.84	0.80
pH (standard units)	5.98	6.29	6.22	6.35	6.25
Oxidation/Reduction Potential (mV)	-25.7	-84.2	-28.2	-80.4	-69.3
Total Organic Carbon (mg/L)	4.63	NA	NA	NA	NA

Notes:
1. Primary geochemical indicators are measured in the field, with the exception of total organic carbon, which is measured in the laboratory.
2. S = shallow well.
3. GW189S is the replacement well for GW168S.

Abbreviations:
µS/cm = microsiemens per centimeter
AOC = area of concern
CPOC = conditional point of compliance
degrees C = degrees Celsius
mg/L = milligrams per liter
mV = millivolts
NA = not analyzed

Table 27: AOC-090 Concentrations of Constituents of Concern[1, 2]
August 24, 2023
Boeing Renton Facility, Renton, Washington

Analyte	Cleanup Levels[4]	Well ID[3]				
		Source Area	Downgradient Plume Area	Shallow Zone CPOC Area		
		GW189S[5]	GW176S	GW178S	GW207S	GW208S
Chlorinated Volatile Organic Compounds (µg/L)						
1,1,2,2-Tetrachloroethane	0.17	0.153	NA	NA	NA	NA
1,1,2-Trichloroethane	0.2	0.200 U	NA	NA	NA	NA
1,1-Dichloroethene	0.057	0.0322	NA	NA	NA	NA
Acetone	300	5.00 U	NA	NA	NA	NA
Benzene	0.8	0.200 U	NA	NA	NA	NA
Carbon Tetrachloride	0.23	0.200 U	NA	NA	NA	NA
Chloroform	2	0.200 U	NA	NA	NA	NA
cis-1,2-Dichloroethene	2.4	1.7	NA	NA	NA	NA
Methylene Chloride	2	1.00 U	NA	NA	NA	NA
Toluene	75	17.2 J	NA	NA	NA	NA
trans-1,2-Dichloroethene	53.9	0.200 U	NA	NA	NA	NA
Tetrachloroethene	0.05	0.0200 U	NA	NA	NA	NA
Trichloroethene	0.08	**0.511**	NA	NA	NA	NA
Vinyl Chloride	0.13	**0.438**	**0.314**	**0.343**	**0.293**	**0.242**
Total Petroleum Hydrocarbons (µg/L)						
TPH-G (C7-C12)	800	288	NA	NA	NA	NA
TPH-D (C12-C24)	500	100.0 U	NA	NA	NA	NA
TPH-O (C24-C40)	500	211	NA	NA	NA	NA

Notes:
1. Data qualifiers are as follows:
   U = The analyte was not detected at the reporting limit indicated.
   J = the value is estimated.
2. **Bolded** values exceed the cleanup levels.
3. S = shallow well.
4. Cleanup levels obtained from Table 2 of the Cleanup Action Plan.
5. GW189S is the replacement well for GW168S.

Abbreviations:
µg/L = micrograms per liter
AOC = area of concern
CPOC = conditional point of compliance
NA = not analyzed
TPH-D = total petroleum hydrocarbons as diesel
TPH-G = total petroleum hydrocarbons as gasoline
TPH-O = total petroleum hydrocarbons as motor oil

Table 28: Apron A Groundwater Elevation Data
August 14, 2023
Boeing Renton Facility, Renton, Washington

Well ID[1]	Screen Interval Depth (feet bgs)	TOC Elevation (feet)	Depth to Groundwater (feet below TOC)	Groundwater Elevation (feet)
GW263S	8 to 18	21.68	6.31	15.37
GW264S	8 to 18	21.55	6.91	14.64
GW265S	8 to 18	21.64	6.38	15.26

Notes
1. S = shallow well.

Abbreviations
bgs = below ground surface
NA = not available
TOC = top of casing

Table 29: Apron A Primary Geochemical Indicators[1]
August 14, 2023
Boeing Renton Facility, Renton, Washington

Parameter	Well ID[2]
	Source Area
	GW264S
Temperature (degrees C)	19.3
Specific Conductivity (µS/cm)	918
Dissolved Oxygen (mg/L)	0.93
pH (standard units)	6.08
Oxidation/Reduction Potential (mV)	-133.9
Total Organic Carbon (mg/L)	24.67

Notes

1. Primary geochemical indicators are measured in the field, with the exception of total organic carbon, which is measured in the laboratory.
2. S = shallow well.

Abbreviations

µS/cm = microsiemens per centimeter
degrees C = degrees Celsius
mg/L = milligrams per liter
mV = millivolts

Table 30: Apron A Concentrations of Constituents of Concern[1]

August 14, 2023

Boeing Renton Facility, Renton, Washington

Analyte	Cleanup Levels	Well ID[2] GW264S
Volatile Organic Compounds (µg/L)		
cis- 1,2-Dichloroethene	NE	2.00 U
Vinyl Chloride	NE	2.00 U

Notes

1. Data qualifiers are as follows:
   U = The analyte was not detected at the reporting limit indicated.
2. S = shallow well.

Abbreviations

µg/L = micrograms per liter

NE = not established

APPENDIX A

SUMMARY OF GROUNDWATER SAMPLING METHODOLOGY

TABLE A-1: GROUNDWATER COMPLIANCE MONITORING PLAN

Boeing Renton Facility, Renton, Washington

Cleanup Action Area	Monitoring Wells[1, 2]					Constituents of Concern[4]	Analyses[5]
	Cross-Gradient Wells	Source Area Wells	Downgradient Plume Wells	CPOC Wells	Additional Water Level Monitoring Wells[3]		
SWMU-168	NA	NA	NA	GW230I	NA	VC	SW8260D SIM
SWMU-172/ SWMU-174	NA	GW152S and GW153S	GW172S, GW173S, and GW226S	GW232S, GW234S, GW235I, and GW236S	NA	*cis* -1,2-DCE, PCE, TCE, VC	SW8260D SIM[7]
						Arsenic, copper, and lead	EPA 6020A
Building 4-78/79 SWMU/AOC Group	NA	GW031S-R, GW033S, GW034S, and GW244S-R	NA	GW143S, GW237S, and GW240D	NA	VC, TCE, *cis* -1,2-DCE, benzene	SW8260D
						TPH-gasoline	NWTPH-Gx
Former Fuel Farm SWMU/AOC Group	NA	NA	NA	GW211S, GW221S, and GW224S	NA	TPH-jet fuel, TPH-diesel	NWTPH-Dx
AOC-001/ AOC-002[6]	GW213S-R, GW214S-R, GW215S-R	GW193S-R	GW190S-R, GW191D-R, GW192S-R, and GW246S-R	GW185S-R, GW195S-R, GW196D-R, GW197S-R, and GW245S-R	NA	Benzene	SW8260D
						TCE, *cis* -1,2-DCE, 1,1-dichloroethene, VC	SW8260D SIM[7]
AOC-003	NA	GW249S	GW188S	GW247S-R and GW248I	NA	VC	SW8260D
AOC-004	NA	GW250S	NA	NA	NA	Lead	EPA 6020A
AOC-060	GW012S and GW014S	GW009S	GW147S	GW150S and GW253I	GW010S and GW011D	VC, TCE, cis-1,2-DCE	SW8260D SIM[7]
AOC-090[8]	NA	GW189S	GW176S	GW178S, GW207S, and GW208S	NA	1,1,2-Trichloroethane, acetone, benzene, toluene, carbon tetrachloride, chloroform, *cis* -1,2-DCE, *trans* -1,2-DCE, methylene chloride	SW8260D
						1,1-Dichloroethene, 1,1,2,2-tetrachloroethane, VC, PCE, TCE	SW8260D SIM[7]
						TPH-gasoline	NWPTH-Gx
						TPH-diesel, TPH-motor oil	NWTPH-Dx
Apron A	NA	GW264S	NA	NA	GW262S, GW263S, GW265S	*cis* -1,2-DCE and VC	SW8260D

Notes:

1. The EDR presents the groundwater monitoring frequency for each SWMU/AOC. All sites are monitored on a semi-annual basis with sampling events occurring in February and August.
2. Groundwater monitoring wells are also monitored for groundwater levels.
3. Additional wells are monitored for groundwater levels only.
4. In addition to COCs, primary geochemical indicators will be monitored during each regular monitoring event. Geochemical indicators are listed in Table A-2.
5. Details of analytical methods are specified in the Quality Assurance Project Plan, which is Appendix E to the Cleanup Action Plan (AMEC, 2012).
6. Monitoring wells were abandoned on 11/25/2019 prior to Apron R construction and were replaced upon completion of construction.
7. SIM methods will be used if the cleanup level is lower than the reporting limit achieved by the conventional 8021, 8260, or 8270 method. If cleanup levels become higher or if the conventional 8021, 8260, or 8270 methods are updated and able to achieve reporting limits below the cleanup levels, then the conventional method rather than the SIM method will be used.
8. GW189S will be sampled for CVOCs and TPH, all other wells will only be sampled for VC.

Abbreviations:

AOC = area of concern
cis -1,2-DCE = *cis* -1,2 dichloroethene
COCs = constituents of concern
CPOC = conditional point of compliance
CVOCs = chlorinated volatile organic compounds
EDR = Engineering Design Report
EPA = Environmental Protection Agency
NA = not applicable
PCE = tetrachloroethene
SIM = selected ion monitoring
SWMU = solid waste management unit
TCE = trichloroethene
TPH = total petroleum hydrocarbons
trans -1,2-DCE = *trans* -1,2 dichloroethene
VC = vinyl chloride

TABLE A-2: MONITORED NATURAL ATTENUATION/MONITORED ATTENUATION PLAN

Boeing Renton Facility, Renton, Washington

Cleanup Action Area	Groundwater Monitoring Wells				Primary Geochemical Parameters[1, 2]
	Cross-Gradient Wells	Source Area Wells	Downgradient Plume Wells	CPOC Wells	Indicators
SWMU-168	NA	NA	NA	GW230I	Dissolved oxygen, pH, ORP, temperature, specific conductance
SWMU-172/SWMU-174	NA	GW152S and GW153S	GW172S, GW173S, and GW226S	GW232S, GW234S, GW235I, and GW236S	Dissolved oxygen, pH, ORP, temperature, specific conductance, TOC
Building 4-78/79 SWMU/AOC Group	NA	GW031S-R, GW033S, GW034S, and GW244S-R	NA	GW143S, GW237S, and GW240D	Dissolved oxygen, pH, ORP, temperature, specific conductance, TOC
Former Fuel Farm SWMU/AOC Group	NA	NA	NA	GW211S, GW221S, and GW224S	Dissolved oxygen, pH, ORP, temperature, specific conductance
AOC-001/AOC-002[3]	GW213S-R, GW214S-R, GW215S-R	GW193S-R	GW190S-R, GW191D-R, GW192S-R, and GW246S-R	GW185S-R, GW195S-R, GW196D-R, GW197S-R, and GW245S-R	Dissolved oxygen, pH, ORP, temperature, specific conductance, TOC
AOC-003	NA	GW249S	GW188S	GW247S-R and GW248I	Dissolved oxygen, pH, ORP, temperature, specific conductance, TOC
AOC-004	NA	GW250S	NA	NA	Dissolved oxygen, pH, ORP, temperature, specific conductance
AOC-060	GW012S and GW014S	GW009S	GW147S	GW150S and GW253I	Dissolved oxygen, pH, ORP, temperature, specific conductance, TOC
AOC-090	NA	GW189S	GW176S	GW178S, GW207S, and GW208S	Dissolved oxygen, pH, ORP, temperature, specific conductance, TOC[4]
Apron A	NA	GW264S	NA	NA	Dissolved oxygen, pH, ORP, temperature, specific conductance, TOC

Notes:

1. In addition to COCs listed in Table A-1, primary geochemical indicators will be monitored during each regular monitoring event.
2. All primary geochemical indicators except TOC are monitored in the field during sampling. TOC is analyzed in the laboratory following methods specified in the Quality Assurance Project Plan, which is Appendix E to the Cleanup Action Plan (AMEC, 2012).
   The primary geochemical indicators differ slightly depending on whether the site is a fuel-related site or a solvent-related site.
   At a fuel-related site, TOC is not necessary; at a solvent-related site, TOC is a measure of how much electron donor remains present.
   All MNA parameters are measured semiannually in all wells on a wet season/dry season basis.
3. Monitoring wells were abandoned on 11/25/2019 prior to Apron R construction and were replaced upon completion of construction.
4. TOC will only be analyzed in the groundwater from the source area well (GW189S).

Abbreviations:

AOC = area of concern
COCs = constituents of concern
CPOC = conditional point of compliance
MNA = monitored natural attenuation
NA = not applicable
ORP = oxidation reduction potential
SWMU = solid waste management unit
TOC = total organic carbon

APPENDIX B

FIELD FORMS

Groundwater Monitoring Field Data Form
Site: Boeing Renton
737 Logan Avenue N, Renton, Washington98057

RGW185S-R

Date:	08/23/2023	Casing Material:	PVC	Depth to Water (ft bmp):	4.04
Purge Method:	Low Flow	Casing Diameter (in):	4	Well Depth (ft bmp)	N/A
Volume Units:	mL/min	Pump Intake (ft bmp)	9.5	Water Column (ft)	0
Screen Interval (ft bmp):	4.5 to 14.5	Water Quality Meter:	YSI		
Comments:	New well				

Sampling Summary

Sample Date:	08/23/2023	COC:	Benzene, TCE, cis-1,2DCE, 1,1DCE, VC, TOC
Sample Time:	15:45	Analysis:	8260D, 8260D SIM, SM5310 C
Sample ID:	RGW185S-R-08232023	Bottles:	6x HCl VOA, 1x 250mL H2SO4 amber
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A
Remarks:	New well		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
15:11		4.09	23.2	6.63	0.835	26.1	1.91	78.55	N/A
15:15		4.10	23.0	6.44	0.925	-37.6	0.94	37.47	N/A
15:19		4.13	23.0	6.41	0.933	-70.7	0.77	34.04	N/A
15:23		4.12	23.0	6.40	0.933	-84.1	0.71	29.73	N/A
15:27		4.12	23.0	6.39	0.933	-91.4	0.68	28.02	N/A
15:31		4.13	23.0	6.39	0.932	-96.4	0.66	25.44	N/A
15:35		4.12	22.9	6.38	0.933	-100.5	0.65	22.17	N/A
15:39		4.12	22.9	6.38	0.934	-102.8	0.64	20.07	N/A
15:43		4.12	22.5	6.38	0.934	-104.7	0.64	18.65	1.5 gal purged

Groundwater Monitoring Field Data Form

Site: Boeing Renton

737 Logan Avenue N, Renton, Washington98057

File No.: PS20203450

RGW188S

Date:	08/23/2023	Casing Material:	PVC	Depth to Water (ft bmp):	4.36
Purge Method:	Low Flow	Casing Diameter (in):	2	Well Depth (ft bmp)	13.95
Volume Units:	mL/min	Pump Intake (ft bmp)	8.5	Water Column (ft)	9.59
Screen Interval (ft bmp):	3.5 to 13.5	Water Quality Meter:	YSI		
Comments:	No exterior or interior id, lock rusted shut				

Sampling Summary

Sample Date:	08/23/2023	COC:	PCE, TCE, VC, cis-1,2DCE, TOC
Sample Time:	08:45	Analysis:	8260D SIM, SM5310 C
Sample ID:	RGW188S-082323	Bottles:	3x HCl VOA, 1x 250mL H2SO4 amber
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A
Remarks:	No exterior or interior id, lock rusted shut		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
08:17		4.57	17.6	6.20	0.538	13.6	2.13	42.84	N/A
08:22		4.67	17.6	6.32	0.504	-8.2	1.06	15.18	N/A
08:25		4.69	17.7	6.32	0.495	-28.3	0.95	12.20	N/A
08:29		4.68	17.8	6.32	0.485	-40.9	0.91	12.25	N/A
08:33		4.64	17.9	6.31	0.477	-54.3	0.86	16.91	N/A
08:36		4.69	18.0	6.31	0.474	-58.7	0.79	5.71	N/A
08:39		4.66	18	6.31	0.472	-63.3	0.78	5.50	N/A
08:42		4.62	18	6.31	0.471	-67.6	0.75	5.95	Sheen on top of purge water

Groundwater Monitoring Field Data Form

Site: Boeing Renton

737 Logan Avenue N, Renton, Washington98057

RGW190S-R

Date:	08/23/2023	Casing Material:	PVC	Depth to Water (ft bmp):	4.12
Purge Method:	Low Flow	Casing Diameter (in):	4	Well Depth (ft bmp)	13.07
Volume Units:	mL/min	Pump Intake (ft bmp)	8	Water Column (ft)	8.95
Screen Interval (ft bmp):	3 to 13	Water Quality Meter:	YSI		
Comments:	New well				

Sampling Summary

Sample Date:	08/23/2023	COC:	Benzene, TCE, cis-1,2DCE, 1,1DCE, VC, TOC
Sample Time:	09:45	Analysis:	8260D, 8260D SIM, SM5310 C
Sample ID:	RWG190S-R-082323	Bottles:	6x HCl VOA, 1x 250mL H2SO4 amber
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A
Remarks:	New well		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
09:12		4.15	22.1	6.28	0.632	-4.2	1.92	37.61	N/A
09:16		4.15	22.1	6.27	0.657	-29.0	0.93	8.82	N/A
09:20		4.15	22.2	6.29	0.656	-47.5	0.81	7.95	N/A
09:24		4.14	22.4	6.29	0.654	-59.4	0.74	7.84	N/A
09:28		4.16	22.5	6.29	0.653	-68.3	0.71	7.11	N/A
09:32		4.16	22.7	6.30	0.651	-74.9	0.68	7.10	N/A
09:36		4.16	22.7	6.3	0.649	-79.9	0.66	6.65	N/A
09:40		4.16	22.8	6.3	0.647	-83.3	0.65	6.66	1.5 gal purged

File No.: PS20203450

Groundwater Monitoring Field Data Form

Site: Boeing Renton

737 Logan Avenue N, Renton, Washington98057

RGW191D-R

Date:	08/22/2023	Casing Material:	PVC	Depth to Water (ft bmp):	3.74
Purge Method:	Low Flow	Casing Diameter (in):	4	Well Depth (ft bmp)	34.02
Volume Units:	mL/min	Pump Intake (ft bmp)	31	Water Column (ft)	30.28
Screen Interval (ft bmp):	26 to 36	Water Quality Meter:	YSI		
Comments:	New well				

Sampling Summary

Sample Date:	08/22/2023	COC:	Benzene, TCE, cis-1,2DCE, 1,1DCE, VC, TOC
Sample Time:	14:45	Analysis:	8260D, 8260D SIM, SM5310 C
Sample ID:	RGW191D-08222023	Bottles:	6x HCl VOA, 1x 250mL H2SO4 amber
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A
Remarks:	New well		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
14:23		3.77	20.4	6.79	0.355	-12.3	2.01	49.75	N/A
14:27		3.77	19.6	6.56	0.397	-11.5	1.15	21.10	N/A
14:31		3.74	19.7	6.56	0.401	-35.4	0.89	18.93	N/A
14:35		3.74	19.7	6.56	0.401	-55.7	0.81	16.844	N/A
14:39		3.75	19.6	6.56	0.402	-67.2	0.77	16.94	N/A
14:44		3.75	19.5	6.55	0.400	-78.4	0.74	13.62	N/A
14:48		3.74	19.5	6.55	0.399	-86.9	0.72	11.92	N/A
14:52		3.74	19.4	6.55	0.399	-91.3	0.71	9.91	N/A
14:56		3.73	19.5	6.55	0.397	-94.6	0.70	9.26	2gal purged

Groundwater Monitoring Field Data Form

Site: Boeing Renton
737 Logan Avenue N, Renton, Washington98057

RGW192S-R

Date:	08/22/2023	Casing Material:	PVC	Depth to Water (ft bmp):	3.82
Purge Method:	Low Flow	Casing Diameter (in):	4	Well Depth (ft bmp)	N/A
Volume Units:	mL/min	Pump Intake (ft bmp)	7	Water Column (ft)	0
Screen Interval (ft bmp):	4.5 to 9.5	Water Quality Meter:	YSI		
Comments:	N/A				

Sampling Summary

Sample Date:	08/22/2023	COC:	Benzene, TCE, cis-1,2DCE, 1,1DCE, VC, TOC
Sample Time:	15:45	Analysis:	8260D, 8260D SIM, SM5310 C
Sample ID:	RFW192S-R-08222023	Bottles:	6x HCl VOA, 1x 250mL H2SO4 amber
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A
Remarks:	N/A		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
15:14		4.01	22.9	6.89	0.275	-19.0	3.29	68.31	N/A
15:18		4.32	22.9	6.62	0.275	-9.5	1.04	60.09	N/A
15:22		4.52	23.3	6.57	0.273	-8.1	0.86	50.27	N/A
15:26		4.63	23.8	6.54	0.272	-7.8	0.77	45.88	N/A
15:30		4.73	23.8	6.53	0.271	-7.5	0.74	41.36	N/A
15:34		4.84	23.7	6.51	0.269	-6.2	0.72	38.09	N/A
15:38		4.95	23.6	6.49	0.268	-5.3	0.70	36.50	1.5 gal purged

Groundwater Monitoring Field Data Form

Site: Boeing Renton

737 Logan Avenue N, Renton, Washington98057

File No.: PS20203450

RGW193S-R

Date:	08/22/2023	Casing Material:	PVC	Depth to Water (ft bmp):	4.49
Purge Method:	Low Flow	Casing Diameter (in):	4	Well Depth (ft bmp)	12.29
Volume Units:	mL/min	Pump Intake (ft bmp)	7.9	Water Column (ft)	7.8
Screen Interval (ft bmp):	3 to 12.8	Water Quality Meter:	YSI		
Comments:	New well				

Sampling Summary

Sample Date:	08/22/2023	COC:	Benzene, TCE, cis-1,2DCE, 1,1DCE, VC, TOC
Sample Time:	13:45	Analysis:	8260D, 8260D SIM, SM5310 C
Sample ID:	RGW193S-R-08222023	Bottles:	6x HCl VOA, 1x 250mL H2SO4 amber
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A
Remarks:	New well		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
13:13		4.48	21.5	6.27	0.862	12.6	5.72	10.74	N/A
13:17		4.17	21.5	6.28	0.870	-68.1	1.42	10.79	N/A
13:32		4.49	21.4	6.27	0.870	-58.7	1.00	10.74	N/A
13:33		4.49	21.7	6.30	0.864	-80.1	1.17	10.48	Paused purging to fix tech issue
13:37		4.48	21.7	6.29	0.856	-83.6	1.00	9.96	N/A
13:41		4.48	21.7	6.29	0.851	-86.7	0.81	9.74	N/A
13:45		4.48	21.8	6.29	0.847	-89.6	0.85	9.52	N/A
13:49		4.48	21.7	6.29	0.852	-91.7	0.73	8.64	N/A
13:53		4.49	21.8	6.30	0.837	-93.9	0.72	8.37	N/A
13:57		4.49	21.8	6.30	0.828	-95.5	0.70	8.69	Slight Diesel odor from purged warer, 2 gal purged

Groundwater Monitoring Field Data Form

Site: Boeing Renton

737 Logan Avenue N, Renton, Washington98057

File No.: PS20203450

RGW195S-R

Date:	08/23/2023	Casing Material:	PVC	Depth to Water (ft bmp):	4.72
Purge Method:	Low Flow	Casing Diameter (in):	4	Well Depth (ft bmp)	11.68
Volume Units:	mL/min	Pump Intake (ft bmp)	9.5	Water Column (ft)	6.96
Screen Interval (ft bmp):	7 to 12	Water Quality Meter:	YSI		

Comments: New well, pen fell into well during sudden gust of wind and retrieved the next day

Sampling Summary

Sample Date:	08/23/2023	COC:	Benzene, TCE, cis-1,2DCE, 1,1DCE, VC, TOC
Sample Time:	12:45	Analysis:	8260D, 8260D SIM, SM5310 C
Sample ID:	RGW195S-R-08232023	Bottles:	6x HCl VOA, 1x 250mL H2SO4 amber
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A

Remarks: New well, pen fell into well during sudden gust of wind and retrieved the next day

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
12:15		4.73	21.2	6.49	0.480	-22.1	1.97	21.14	N/A
12:19		4.74	20.6	6.47	0.495	-36.4	1.01	10.65	N/A
12:23		4.74	20.7	6.46	0.499	-54.2	0.88	10.25	N/A
12:27		4.74	20.7	6.45	0.505	-67.8	0.81	10.63	N/A
12:31		4.74	20.7	6.44	0.508	-77.4	0.78	11.68	N/A
12:35		4.74	20.8	6.44	0.513	-85.0	0.75	10.92	N/A
12:39		4.73	20.9	6.43	0.519	-89.6	0.73	8.87	N/A
12:43		4.73	20.9	6.42	0.527	-93.6	0.72	8.97	N/A
12:47		4.74	20.8	6.42	0.534	-96.5	0.71	8.83	1.5 gal purged

Groundwater Monitoring Field Data Form
Site: Boeing Renton
737 Logan Avenue N, Renton, Washington98057

File No.: PS20203450

RGW196D-R

Date:	08/23/2023	Casing Material:	PVC	Depth to Water (ft bmp):	4.53
Purge Method:	Low Flow	Casing Diameter (in):	4	Well Depth (ft bmp)	34.34
Volume Units:	mL/min	Pump Intake (ft bmp)	31	Water Column (ft)	29.81
Screen Interval (ft bmp):	26 to 36	Water Quality Meter:	YSI		
Comments:	New well				

Sampling Summary

Sample Date:	08/23/2023	COC:	Benzene, TCE, cis-1,2DCE, 1,1DCE, VC, TOC
Sample Time:	11:50	Analysis:	8260D, 8260D SIM, SM5310 C
Sample ID:	RFW196D-R-08232023	Bottles:	6x HCl VOA, 1x 250mL H2SO4 amber
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A
Remarks:	New well		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
11:15		4.64	18.5	6.35	0.529	-2.8	1.34	38.37	N/A
11:19		4.63	18.3	6.35	0.536	-21.6	1.04	17.56	N/A
11:23		4.63	18.3	6.35	0.538	-36.8	0.89	14.82	N/A
11:27		4.64	18.4	6.36	0.539	-50.6	0.83	13.52	N/A
11:31		4.62	18.6	6.36	0.538	-60.9	0.79	13.71	N/A
11:35		4.64	18.7	6.36	0.539	-67.6	0.77	14.90	N/A
11:39		4.64	18.2	6.36	0.538	-73.7	0.76	11.22	N/A
11:43		4.63	18.0	6.36	0.537	-78.0	0.75	11.27	N/A
11:47		4.63	17.8	6.36	0.536	-81.7	0.74	11.29	2 gal purged, sheen on ourged water, no detectable odor

Groundwater Monitoring Field Data Form

Site: Boeing Renton

737 Logan Avenue N, Renton, Washington98057

File No.: PS20203450

RGW197S-R

Date:	08/23/2023	Casing Material:	PVC	Depth to Water (ft bmp):	4.59
Purge Method:	Low Flow	Casing Diameter (in):	4	Well Depth (ft bmp)	N/A
Volume Units:	mL/min	Pump Intake (ft bmp)	10	Water Column (ft)	0
Screen Interval (ft bmp):	7.5 to 12.5	Water Quality Meter:	YSI		
Comments:	New well				

Sampling Summary

Sample Date:		COC:	
Sample Time:		Analysis:	
Sample ID:		Bottles:	
Duplicate Sample ID:		Duplicate Sample Time:	
Remarks:	New well		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
14:10		4.61	22.4	8.98	0.271	-81.5	2.78	25.13	N/A
14:14		4.59	21.1	9.35	0.282	-122.3	1.08	25.91	N/A
14:18		4.59	21.1	9.34	0.286	-132.8	0.86	24.11	N/A
14:22		4.60	21.1	9.32	0.290	-138.7	0.79	21.90	N/A
14:26		4.59	21.1	9.39	0.277	-149.5	0.74	19.58	N/A
14:30		4.60	21.2	9.36	0.283	-152.4	0.72	19.80	N/A
14:34		4.60	21.1	9.30	0.300	-154.2	0.70	18.28	N/A
14:38		4.61	21.0	9.29	0.305	-157.8	0.69	17.06	N/A
14:42		4.59	21.0	9.28	0.309	-160.9	0.69	16.15	N/A
14:46		4.60	21.1	9.26	0.314	-163.7	0.67	16.08	1.5 gal purged

Groundwater Monitoring Field Data Form

Site: Boeing Renton

737 Logan Avenue N, Renton, Washington98057

File No.: PS20203450

RGW213S-R

Date:	08/24/2023	Casing Material:	PVC	Depth to Water (ft bmp):	4.13
Purge Method:	Low Flow	Casing Diameter (in):	4	Well Depth (ft bmp)	12.89
Volume Units:	mL/min	Pump Intake (ft bmp)	8	Water Column (ft)	8.76
Screen Interval (ft bmp):	3 to 13	Water Quality Meter:	YSI		
Comments:	N/A				

Sampling Summary

Sample Date:	08/24/2023	COC:	Benzene, TCE, cis-1,2DCE, 1,1DCE, VC, TOC
Sample Time:	08:30	Analysis:	8260D, 8260D SIM, SM5310 C
Sample ID:	RGW213S-R-08242023	Bottles:	6x HCl VOA, 1x 250mL H2SO4 amber
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A
Remarks:	N/A		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
07:38		4.19	20.1	7.24	0.765	27.8	2.52	45.52	N/A
07:42		4.29	20.8	6.93	0.839	36.0	1.24	45.80	N/A
07:46		4.41	21.0	6.90	0.843	30.7	1.02	44.44	N/A
07:50		4.49	21.0	6.88	0.843	18.3	0.92	46.45	N/A
07:54		4.58	21.1	6.88	0.844	2.0	0.87	47.78	N/A
07:58		4.63	20.9	6.87	0.844	-10.4	0.84	46.86	N/A
08:02		4.68	20.9	6.87	0.844	-20.2	0.82	47.87	N/A
08:06		4.73	20.8	6.85	0.838	-28.2	0.80	47.50	N/A
08:10		4.78	20.6	6.84	0.832	-36.7	0.78	47.83	N/A
08:14		4.81	20.6	6.84	0.820	-40.9	0.77	50.31	N/A
08:18		4.82	20.5	6.83	0.803	-45.8	0.78	49.80	N/A
08:22		4.86	20.6	6.83	0.791	-49.6	0.77	50.96	N/A
08:26		4.88	20.6	6.82	0.778	-53.1	0.76	49.90	N/A
08:30		4.92	20.4	6.81	0.755	-55.9	0.76	47.74	N/A
08:34		4.90	20.2	6.80	0.723	-58.8	0.76	49.58	N/A
08:38		4.89	20.2	6.79	0.706	-60.2	0.74	47.02	N/A
08:41		4.87	20.1	6.79	0.701	-59.1	0.74	45.32	N/A
08:44		4.85	20.0	6.78	0.689	-63.1	0.74	44.39	N/A

Groundwater Monitoring Field Data Form

Site: Boeing Renton

737 Logan Avenue N, Renton, Washington98057

File No.: PS20203450

RGW214S-R

Date:	08/24/2023	Casing Material:	PVC	Depth to Water (ft bmp):	4.06
Purge Method:	Low Flow	Casing Diameter (in):	4	Well Depth (ft bmp)	N/A
Volume Units:	mL/min	Pump Intake (ft bmp)		Water Column (ft)	0
Screen Interval (ft bmp):	3.5 to 13.5	Water Quality Meter:	YSI		
Comments:	N/A				

Sampling Summary

Sample Date:	08/24/2023	COC:	Benzene, TCE, cis-1,2DCE, 1,1DCE, VC, TOC
Sample Time:	10:35	Analysis:	8260D, 8260D SIM, SM5310 C
Sample ID:	RGW214S-R-08242023	Bottles:	6x HCl VOA, 1x 250mL H2SO4 amber
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A
Remarks:	N/A		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
10:09		4.18	20.8	6.51	0.619	2.4	2.22	30.94	N/A
10:13		4.22	20.4	6.46	0.682	2.5	1.26	25.49	N/A
10:17		4.3	20.4	6.45	0.685	-3.0	0.99	26.78	N/A
10:21		4.33	20.5	6.45	0.684	-3.0	0.88	27.55	N/A
10:25		4.37	20.6	6.45	0.680	-6.0	0.84	27.33	N/A
10:29		4.42	20.7	6.45	0.674	-9.0	0.80	30.24	N/A

File No.: PS20203450

Groundwater Monitoring Field Data Form

Site: Boeing Renton

737 Logan Avenue N, Renton, Washington98057

RGW215S-R

Date:	08/24/2023	Casing Material:	PVC	Depth to Water (ft bmp):	4.10
Purge Method:	Low Flow	Casing Diameter (in):	4	Well Depth (ft bmp)	12.88
Volume Units:	mL/min	Pump Intake (ft bmp)	8	Water Column (ft)	8.78
Screen Interval (ft bmp):	3 to 13	Water Quality Meter:	YSI		
Comments:	N/A				

Sampling Summary

Sample Date:	08/24/2023	COC:	Benzene, TCE, cis-1,2DCE, 1,1DCE, VC, TOC
Sample Time:	09:45	Analysis:	8260D, 8260D SIM, SM5310 C
Sample ID:	RGW215S-R-08242023	Bottles:	6x HCl VOA, 1x 250mL H2SO4 amber
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A
Remarks:	N/A		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
09:16		4.16	19.8	6.85	0.658	-21.6	2.72	21.72	N/A
09:20		4.19	19.7	6.69	0.712	-17.3	1.31	19.79	N/A
09:24		4.24	19.7	6.67	0.71	-21.7	1	20.79	N/A
09:28		4.27	19.8	6.67	0.706	-27.0	0.92	23.13	N/A
09:32		4.31	19.9	6.66	0.695	-36.1	0.85	23.23	N/A
09:36		4.32	19.9	6.66	0.690	-40.2	0.83	22.41	N/A
09:40		4.33	20.0	6.66	0.682	-45.9	0.80	23.16	1 gallon purged

File No.: PS20203450

Groundwater Monitoring Field Data Form

Site: Boeing Renton

737 Logan Avenue N, Renton, Washington98057

RGW245S-R

Date:	08/23/2023	Casing Material:	PVC	Depth to Water (ft bmp):	4.60
Purge Method:	Low Flow	Casing Diameter (in):	4	Well Depth (ft bmp)	12.59
Volume Units:	mL/min	Pump Intake (ft bmp)	8	Water Column (ft)	7.99
Screen Interval (ft bmp):	3 to 13	Water Quality Meter:	YSI		
Comments:	New well				

Sampling Summary

Sample Date:	08/23/2023	COC:	Benzene, TCE, cis-1,2DCE, 1,1DCE, VC, TOC
Sample Time:	13:45	Analysis:	8260D, 8260D SIM, SM5310 C
Sample ID:	RGW245S-R-08232023	Bottles:	6x HCl VOA, 1x 250mL H2SO4 amber
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A
Remarks:	New well		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
13:12		4.64	23.2	7.17	0.505	-51.6	3.53	15.49	N/A
13:16		4.67	22.1	8.59	0.506	-151.4	1.04	20.03	N/A
13:20		4.67	21.9	8.78	0.505	-182.8	0.87	17.39	N/A
13:24		4.68	21.7	8.85	0.506	-202.6	0.75	16.63	N/A
13:28		4.68	21.7	8.89	0.503	-214.3	0.71	14.85	N/A
13:32		4.69	21.3	8.93	0.501	-223.2	0.70	13.18	Sheen on purged water
13:36		4.69	21.2	8.95	0.498	-229.5	0.69	11.43	N/A
13:40		4.68	21.1	8.97	0.497	-234.5	0.68	11.37	N/A
13:44		4.68	21.6	8.93	0.499	-235.9	0.71	11.92	Moderate petroleum odor from purged water, 2 gal purged

Groundwater Monitoring Field Data Form

Site: Boeing Renton

737 Logan Avenue N, Renton, Washington98057

File No.: PS20203450

RGW246S-R

Date:	08/23/2023	Casing Material:	PVC	Depth to Water (ft bmp):	4.05
Purge Method:	Low Flow	Casing Diameter (in):	4	Well Depth (ft bmp)	13.25
Volume Units:	mL/min	Pump Intake (ft bmp)	9	Water Column (ft)	9.2
Screen Interval (ft bmp):	4 to 14	Water Quality Meter:	YSI		
Comments:	N/A				

Sampling Summary

Sample Date:	08/23/2023	COC:	Benzene, TCE, cis-1,2DCE, 1,1DCE, VC, TOC
Sample Time:	10:40	Analysis:	8260D, 8260D SIM, SM5310 C
Sample ID:	RGW246S-R-082323	Bottles:	6x HCl VOA, 1x 250mL H2SO4 amber
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A
Remarks:	N/A		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
10:07		4.08	22.1	6.29	0.615	-2.6	1.80	32.9	New well
10:11		4.09	21.9	6.27	0.656	-30.0	0.89	10.51	N/A
10:15		4.09	21.9	6.27	0.658	-48.6	0.80	8.22	N/A
10:19		4.09	21.9	6.28	0.66	-61.8	0.75	7.48	N/A
10:23		4.09	22	6.28	0.66	-70.2	0.72	7.15	N/A
10:27		4.09	21.9	6.28	0.66	-78.1	0.7	6.73	N/A
10:31		4.09	21.9	6.28	0.66	-82.2	0.69	6.38	N/A
10:35		4.09	22	6.28	0.66	-86.2	0.68	6.29	1.5 gal purged, sheen visible on water surface in casing

Groundwater Monitoring Field Data Form

Site: Boeing Renton
737 Logan Avenue N, Renton, Washington98057

File No.: PS20203450

RGW247S-R

Date:	08/22/2023	Casing Material:	PVC	Depth to Water (ft bmp):	4.81
Purge Method:	Low Flow	Casing Diameter (in):	4	Well Depth (ft bmp)	14.03
Volume Units:	mL/min	Pump Intake (ft bmp)	8	Water Column (ft)	9.22
Screen Interval (ft bmp):	4 to 14	Water Quality Meter:	YSI		
Comments:	N/A				

Sampling Summary

Sample Date:	08/22/2023	COC:	PCE, TCE, VC, cis-1,2DCE, TOC
Sample Time:	11:30	Analysis:	8260D SIM, SM5310 C
Sample ID:	RGW247S-R-08222023	Bottles:	3x HCl VOA, 1x 250mL H2SO4 amber
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A
Remarks:	N/A		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
11:00		4.86	18.8	6.36	0.509	-15.2	2.84	21.56	N/A
11:04		4.94	18.8	6.33	0.547	-37.4	1.06	13.40	N/A
11:08		4.93	18.7	6.33	0.548	-58.4	0.90	10.87	N/A
11:12		4.92	18.8	6.33	0.547	-72.7	0.83	9.61	N/A
11:16		4.96	18.9	6.34	0.547	-82.6	0.79	11.75	N/A
11:20		4.96	18.6	6.34	0.547	-87.9	0.78	7.62	N/A
11:24		4.93	18.5	6.34	0.546	-92.2	0.77	8.05	N/A
11:28		4.94	18.4	6.34	0.546	-95.4	0.75	8.69	2 gal purged

Groundwater Monitoring Field Data Form

File No.: PS20203450

Site: Boeing Renton
737 Logan Avenue N, Renton, Washington98057

RGW248I

Date:	08/22/2023	Casing Material:	PVC	Depth to Water (ft bmp):	4.49
Purge Method:	Low Flow	Casing Diameter (in):	2	Well Depth (ft bmp)	20
Volume Units:	mL/min	Pump Intake (ft bmp)	15	Water Column (ft)	15.51
Screen Interval (ft bmp):	10 to 20	Water Quality Meter:	YSI		
Comments:	N/A				

Sampling Summary

Sample Date:	08/22/2023	COC:	PCE, TCE, VC, cis-1,2DCE, TOC
Sample Time:	10:45	Analysis:	8260D SIM, SM5310 C
Sample ID:	RGW248I-08222023	Bottles:	3x HCl VOA, 1x 250mL H2SO4 amber
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A
Remarks:	N/A		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
10:14		4.83	18.2	6.42	0.564	14.7	2.41	86.61	N/A
10:20		4.97	17.1	6.36	0.553	-31.9	1.03	24.39	N/A
10:24		4.99	17.0	6.36	0.548	-45.1	0.96	11.67	N/A
10:28		4.91	17.0	6.35	0.545	-56.3	0.93	10.08	N/A
10:32		4.91	16.9	6.35	0.544	-64.7	0.90	8.52	N/A
10:36		4.98	16.6	6.35	0.541	-70.6	0.89	9.73	N/A
10:40		4.98	16.9	6.35	0.539	-76.3	0.85	4.49	N/A
10:44		5.0	17.0	6.35	0.540	-79.9	0.84	9.13	1.5 gal purged

Groundwater Monitoring Field Data Form

Site: Boeing Renton

737 Logan Avenue N, Renton, Washington98057

File No.: PS20203450

RGW249S

Date:	08/22/2023	Casing Material:	PVC	Depth to Water (ft bmp):	4.14
Purge Method:	Low Flow	Casing Diameter (in):	2	Well Depth (ft bmp)	14
Volume Units:	mL/min	Pump Intake (ft bmp)	9	Water Column (ft)	9.86
Screen Interval (ft bmp):	4 to 14	Water Quality Meter:	YSI		
Comments:	No lock present				

Sampling Summary

Sample Date:	08/22/2023	COC:	PCE, TCE, VC, cis-1,2DCE, TOC
Sample Time:	12:30	Analysis:	8260D SIM, SM5310 C
Sample ID:	RGW249S-08222023	Bottles:	3x HCl VOA, 1x 250mL H2SO4 amber
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A
Remarks:	No lock present		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
11:51		4.19	18.7	6.24	0.448	13.3	2.27	87.63	N/A
11:55		4.25	17.9	6.28	0.402	-7.2	1.13	38.37	N/A
11:59		4.16	18.0	6.28	0.381	-23.0	0.98	24.64	N/A
12:03		4.16	18.0	6.28	0.373	-35.2	0.91	23.02	N/A
12:07		4.16	18.0	6.27	0.369	-44.3	0.87	15.17	N/A
12:11		4.19	18.2	6.27	0.368	-51.1	0.84	17.46	N/A
12:15		4.18	18.2	6.26	0.368	-55.8	0.82	7.35	N/A
12:19		4.16	18.2	6.27	0.367	-60.5	0.81	5.41	N/A
12:23		4.17	18.0	6.26	0.367	-63.8	0.79	8.47	1.5 gal purged

Groundwater Monitoring Field Data Form

Site: Boeing Renton

737 Logan Avenue N, Renton, Washington98057

File No.: PS20203450

RGW250S

Date:	08/14/2023	Casing Material:	PVC	Depth to Water (ft bmp):	3.86
Purge Method:	Low Flow	Casing Diameter (in):	2	Well Depth (ft bmp)	14
Volume Units:	mL/min	Pump Intake (ft bmp)	8	Water Column (ft)	10.14
Screen Interval (ft bmp):	4 to 14	Water Quality Meter:	YSI		
Comments:	No bolts present				

Sampling Summary

Sample Date:	08/14/2023	COC:	Pb
Sample Time:	13:55	Analysis:	6020A
Sample ID:	RGW250S-08142023	Bottles:	1x 250mL HNO3 poly
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A
Remarks:	No bolts present		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
13:07		4.13	18.8	6.96	0.145	-142	1.07	663.13	N/A
13:21		4.71	18.8	6.99	0.143	-151.3	0.90	639.81	N/A
13:25		4.94	18.8	7.00	0.143	-156.7	0.83	50.26	N/A
13:29		5.01	18.8	6.99	0.142	-156.7	0.80	21.30	N/A
13:33		5.06	18.8	6.98	0.142	-156.6	0.77	13.32	N/A
13:37		5.06	18.7	6.98	0.142	-156.6	0.75	11.46	N/A
13:41		5.06	18.7	6.97	0.142	-157.3	0.73	6.72	N/A
13:45		5.19	18.7	6.97	0.142	-158.0	0.72	6.03	N/A
13:49		5.12	18.6	6.97	0.142	-158.2	0.71	5.62	N/A
13:53		5.19	18.6	6.94	0.142	-157.1	0.70	4.71	N/A

Groundwater Monitoring Field Data Form
Site: Boeing Renton
737 Logan Avenue N, Renton, Washington98057

File No.: PS20203450

RGW009S

Date:	08/18/2023	Casing Material:	PVC	Depth to Water (ft bmp):	5.31
Purge Method:	Low Flow	Casing Diameter (in):	2	Well Depth (ft bmp)	14.5
Volume Units:	mL/min	Pump Intake (ft bmp)	9.5	Water Column (ft)	9.19
Screen Interval (ft bmp):	4.5 to 14.5	Water Quality Meter:	YSI		

Comments: No internal or external id, underneath carpet tile under desk #1B14.11

Sampling Summary

Sample Date:	08/18/2023	COC:	Cis-1,2-DCE, TCE, VC
Sample Time:	08:15	Analysis:	8260D SIM, SM5310 C
Sample ID:	RGW009S-08182023	Bottles:	3x HCl VOA, 1x 250mL H2SO4 amber
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A

Remarks: No internal or external id, underneath carpet tile under desk #1B14.11

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
07:50		5.33	20.6	6.23	0.366	-4.3	2.10	4.23	N/A
07:54		5.36	20.5	6.35	0.366	-74.3	1.02	2.91	N/A
07:58		5.38	20.4	6.37	0.359	-89.1	0.91	3.36	N/A
08:02		5.34	20.4	6.39	0.360	-97.9	0.86	2.38	N/A
08:06		5.34	20.3	6.40	0.357	-102.8	0.83	2.12	N/A
08:10		5.33	20.3	6.40	0.357	-106.6	0.81	1.95	1 gal purged

Groundwater Monitoring Field Data Form

Site: Boeing Renton
737 Logan Avenue N, Renton, Washington98057

RGW010S

Date:	08/22/2023	Casing Material:	PVC	Depth to Water (ft bmp):	5.46
Purge Method:	N/A	Casing Diameter (in):	2	Well Depth (ft bmp)	14.5
Volume Units:	N/A	Pump Intake (ft bmp)	9.5	Water Column (ft)	9.04
Screen Interval (ft bmp):	4.5 to 14.5	Water Quality Meter:	N/A		

Comments: Missing all 3 bolts, no interior ID tag, lid likely switched with RGW011, under carpet in aisle in office

Sampling Summary

Sample Date:	N/A	COC:	N/A
Sample Time:	N/A	Analysis:	N/A
Sample ID:	N/A	Bottles:	N/A
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A

Remarks: Missing all 3 bolts, no interior ID tag, lid likely switched with RGW011, under carpet in aisle in office

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)		(mV)	(mg/l)		
Historical Range:									

Groundwater Monitoring Field Data Form

File No.: PS20203450

Site: Boeing Renton

737 Logan Avenue N, Renton, Washington98057

RGW011D

Date:	09/11/2023	Casing Material:	PVC	Depth to Water (ft bmp):	5.47
Purge Method:	N/A	Casing Diameter (in):	2	Well Depth (ft bmp)	39
Volume Units:	N/A	Pump Intake (ft bmp)	34	Water Column (ft)	33.53
Screen Interval (ft bmp):	29 to 39	Water Quality Meter:	N/A		

Comments: Under carpet in aisle, old lock 1g032- did not replace, missing 2 of 3 bolts, no exterior ID

Sampling Summary

Sample Date:	N/A	COC:	N/A
Sample Time:	N/A	Analysis:	N/A
Sample ID:	N/A	Bottles:	N/A
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A

Remarks: Under carpet in aisle, old lock 1g032- did not replace, missing 2 of 3 bolts, no exterior ID

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)		(mV)	(mg/l)		
Historical Range:									

Groundwater Monitoring Field Data Form

Site: Boeing Renton

737 Logan Avenue N, Renton, Washington98057

File No.: PS20203450

RGW012S

Date:	08/17/2023	Casing Material:	PVC	Depth to Water (ft bmp):	4.99
Purge Method:	Low Flow	Casing Diameter (in):	2	Well Depth (ft bmp)	14.5
Volume Units:	mL/min	Pump Intake (ft bmp)	9.5	Water Column (ft)	9.51
Screen Interval (ft bmp):	4.5 to 14.5	Water Quality Meter:	YSI		
Comments:	N/A				

Sampling Summary

Sample Date:	08/17/2023	COC:	Cis-1,2-DCE, TCE, VC
Sample Time:	15:45	Analysis:	8260D SIM, SM5310 C
Sample ID:	RGW012S-08172023	Bottles:	3x HCl VOA, 1x 250mL H2SO4 amber
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A
Remarks:	N/A		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
15:25		5.21	23.0	4.85	4.341	-2.5	1.64	157.28	N/A
15:29		5.64	23.0	4.75	5.336	-6.1	0.86	58.17	N/A
15:33		6.29	22.7	4.75	5.326	-12.8	0.75	52.28	N/A
15:37		6.23	22.3	4.75	5.470	-16.4	0.71	59.58	N/A
15:41		6.12	22.0	4.75	5.593	-17.7	0.70	55.11	N/A
15:45		6.14	21.8	4.74	5.595	-18.5	0.69	47.10	N/A

Groundwater Monitoring Field Data Form

Site: Boeing Renton
737 Logan Avenue N, Renton, Washington98057

RGW014S

Date:	08/17/2023	Casing Material:	PVC	Depth to Water (ft bmp):	4.96
Purge Method:	Low Flow	Casing Diameter (in):	2	Well Depth (ft bmp)	14.4
Volume Units:	mL/min	Pump Intake (ft bmp)	9.5	Water Column (ft)	9.44
Screen Interval (ft bmp):	4.5 to 14.5	Water Quality Meter:	YSI		
Comments:	No exterior or interior id, dedicated tubing is smaller diameter and attachable piece is very yellowed				

Sampling Summary

Sample Date:	08/17/2023	COC:	Cis-1,2-DCE, TCE, VC
Sample Time:	14:50	Analysis:	8260D SIM, SM5310 C
Sample ID:	RGW014S-08172023	Bottles:	3x HCl VOA, 1x 250mL H2SO4 amber
Duplicate Sample ID:	DUP04-08172023	Duplicate Sample Time:	01:00
Remarks:	No exterior or interior id, dedicated tubing is smaller diameter and attachable piece is very yellowed		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
14:30		5.16	22.3	6.09	0.572	-29.3	2.30	38.05	N/A
14:34		5.21	22.0	6.19	0.579	-59.5	0.94	29.82	N/A
14:38		5.29	21.7	6.21	0.580	-73.4	0.77	14.41	N/A
14:42		5.28	21.3	6.22	0.580	-79.9	0.73	5.97	N/A
14:46		5.32	21.1	6.23	0.566	-84.0	0.71	5.46	N/A
14:50		5.34	21.0	6.23	0.538	-87.7	0.69	4.01	N/A
14:54		5.28	20.9	6.22	0.516	-90.7	0.68	3.25	N/A
14:58		5.31	21.0	6.22	0.505	-93.1	0.67	3.06	N/A
15:02		5.29	21.0	6.22	0.495	-95.1	0.66	2.56	N/A
15:06		5.24	20.9	6.22	0.490	-96.8	0.66	2.35	2.5 gal purged, sheen on purged water

Groundwater Monitoring Field Data Form

Site: Boeing Renton

737 Logan Avenue N, Renton, Washington98057

File No.: PS20203450

RGW147S

Date:	08/17/2023	Casing Material:	PVC	Depth to Water (ft bmp):	4.69
Purge Method:	Low Flow	Casing Diameter (in):	2	Well Depth (ft bmp)	15.2
Volume Units:	mL/min	Pump Intake (ft bmp)	10	Water Column (ft)	10.51
Screen Interval (ft bmp):	5 to 15	Water Quality Meter:	YSI		
Comments:	No well id on exterior nor interior, 1 bolt missing, interior bolt holes dethreaded, in assigned ADA parking spot number 4209, smaller diameter dedicated tubing, tubing has pinching kink				

Sampling Summary

Sample Date:	08/17/2023	COC:	Cis-1,2-DCE, TCE, VC
Sample Time:	14:00	Analysis:	8260D SIM, SM5310 C
Sample ID:	RGW147S-08172023	Bottles:	3x HCl VOA, 1x 250mL H2SO4 amber
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A
Remarks:	No well id on exterior nor interior, 1 bolt missing, interior bolt holes dethreaded, in assigned ADA parking spot number 4209, smaller diameter dedicated tubing, tubing has pinching kink		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
13:23		4.71	22.8	4.82	1.536	60.0	1.57	227.28	Foul odor upon opening well ("garbage" smell)
13:27		4.74	21.9	4.82	3.253	32.0	0.87	296.95	N/A
13:31		4.73	21.4	4.82	3.133	22.6	0.81	113.32	N/A
13:35		4.73	21.1	4.84	2.829	15.8	0.76	65.50	N/A
13:39		4.72	21.1	4.85	2.628	12.0	0.74	62.81	N/A
13:44		4.76	21.4	4.87	2.418	8.0	0.71	86.23	N/A
13:48		4.73	21.9	4.88	2.324	5.4	0.69	73.66	N/A
13:52		4.72	22.7	4.89	2.317	3.4	0.68	83.28	N/A
13:56		4.72	23.0	4.88	2.340	2.4	0.66	34.08	Bubbles dislodged from sensor
14:01		4.69	24.0	4.88	2.345	0.10	0.64	30.62	N/A
14:05		4.68	25.0	4.89	2.372	-1.8	0.60	29.85	N/A

File No.: PS20203450

Groundwater Monitoring Field Data Form

Site: Boeing Renton

737 Logan Avenue N, Renton, Washington98057

RGW150S

Date:	08/17/2023	Casing Material:	PVC	Depth to Water (ft bmp):	5.14
Purge Method:	Low Flow	Casing Diameter (in):	2	Well Depth (ft bmp)	18.3
Volume Units:	mL/min	Pump Intake (ft bmp)	10	Water Column (ft)	13.16
Screen Interval (ft bmp):	5 to 15	Water Quality Meter:	YSI		
Comments:	No id card, one bolt missing, bolt holes stripped				

Sampling Summary

Sample Date:	08/17/2023	COC:	Cis-1,2-DCE, TCE, VC
Sample Time:	08:50	Analysis:	8260D SIM, SM5310 C
Sample ID:	RGW150S-08172023	Bottles:	3x HCl VOA, 1x 250mL H2SO4 amber
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A
Remarks:	No id card, one bolt missing, bolt holes stripped		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
08:27		5.15	19.5	6.35	0.324	-27.6	2.75	4.22	N/A
08:31		5.15	18.5	6.53	0.386	-91.8	1.00	3.71	N/A
08:35		5.13	18.3	6.54	0.382	-101.8	0.86	4.81	N/A
08:39		5.13	18.2	6.55	0.378	-107.1	0.81	6.98	N/A
08:43		5.14	18.2	6.55	0.376	-111.2	0.77	7.40	N/A
08:47		5.15	18.1	6.55	0.374	-112.9	0.76	10.36	2 gal purged

Groundwater Monitoring Field Data Form

Site: Boeing Renton
737 Logan Avenue N, Renton, Washington98057

File No.: PS20203450

RGW253I

Date:	08/17/2023	Casing Material:	PVC	Depth to Water (ft bmp):	5.03
Purge Method:	Low Flow	Casing Diameter (in):	2	Well Depth (ft bmp)	20
Volume Units:	mL/min	Pump Intake (ft bmp)	15	Water Column (ft)	14.97
Screen Interval (ft bmp):	10 to 20	Water Quality Meter:	YSI		
Comments:	N/A				

Sampling Summary

Sample Date:	08/17/2023	COC:	Cis-1,2-DCE, TCE, VC
Sample Time:	08:10	Analysis:	8260D SIM, SM5310 C
Sample ID:	RGW250I-08172023	Bottles:	3x HCl VOA, 1x 250mL H2SO4 amber
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A
Remarks:	N/A		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
07:38		5.03	19.1	6.61	0.382	-62.3	3.80	69.97	N/A
07:42		5.03	17.4	6.54	0.414	-96.9	1.84	91.59	N/A
07:46		5.02	17.4	6.54	0.415	-104.2	1.48	123.71	N/A
07:50		5.02	17.3	6.54	0.414	-107.9	1.28	145.59	N/A
07:54		5.02	17.3	6.54	0.414	-110.1	1.09	44.24	N/A
07:58		5.03	17.3	6.54	0.413	-112.1	0.96	69.51	N/A
08:02		5.02	17.3	6.54	0.413	-113.1	0.93	22.56	N/A
08:06		5.02	17.4	6.54	0.413	-113.9	0.88	5.38	Bubbles occluding turbidity sensor on and off- values under 10 once cleared, 1gal purged

Groundwater Monitoring Field Data Form
Site: Boeing Renton
737 Logan Avenue N, Renton, Washington98057

File No.: PS20203450

RGW176S

Date:	08/24/2023	Casing Material:	PVC	Depth to Water (ft bmp):	6.85
Purge Method:	Low Flow	Casing Diameter (in):	2	Well Depth (ft bmp)	14.8
Volume Units:	mL/min	Pump Intake (ft bmp)	12.15	Water Column (ft)	7.95
Screen Interval (ft bmp):	10 to 14.3	Water Quality Meter:	YSI		
Comments:	N/A				

Sampling Summary

Sample Date:	08/24/2023	COC:	VC
Sample Time:	14:00	Analysis:	8260D SIM
Sample ID:	RGW176S-082423	Bottles:	3x HCl VOA
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A
Remarks:	N/A		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
13:21		6.41	18.2	6.26	0.584	-13.2	2.13	30.72	N/A
13:25		6.28	17.5	6.25	0.571	-23.4	1.15	44.96	N/A
13:29		6.22	18.0	6.26	0.564	-35.6	0.95	22.53	N/A
13:34		6.18	18.2	6.27	0.561	-49.8	0.86	15.63	N/A
13:38		6.17	18.2	6.28	0.559	-59.32	0.82	14.72	N/A
13:43		6.16	18.3	6.28	0.558	-67.9	0.79	13.48	N/A
13:48		6.11	18.5	6.29	0.558	-75.3	0.77	12.33	N/A
13:52		6.11	18.8	6.29	0.558	-80	0.75	11.7	N/A
13:56		6.10	19.2	6.29	0.559	-84.2	0.74	11.84	N/A

Groundwater Monitoring Field Data Form
Site: Boeing Renton
737 Logan Avenue N, Renton, Washington98057

RGW178S

Date:	08/24/2023	Casing Material:	PVC	Depth to Water (ft bmp):	8.29
Purge Method:	Low Flow	Casing Diameter (in):	2	Well Depth (ft bmp)	15.1
Volume Units:	mL/min	Pump Intake (ft bmp)	13.35	Water Column (ft)	6.81
Screen Interval (ft bmp):	11.2 to 15.5	Water Quality Meter:	YSI		
Comments:	N/A				

Sampling Summary

Sample Date:	08/24/2023	COC:	VC
Sample Time:	16:25	Analysis:	8260D SIM
Sample ID:	RGW178S-08242023	Bottles:	3x HCl VOA
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A
Remarks:	N/A		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
15:38		8.41	17.8	6.18	0.386	42.9	5.95	46.05	N/A
15:42		8.43	16.4	6.21	0.438	38.1	2.25	54.77	N/A
15:46		8.48	16.4	6.22	0.430	31.3	1.67	36.89	N/A
15:50		8.42	16.3	6.22	0.421	18.9	1.38	21.09	N/A
15:54		8.46	16.4	6.22	0.419	13.2	1.30	19.69	N/A
15:58		8.44	16.4	6.22	0.417	4.0	1.19	15.05	N/A
16:02		8.48	16.4	6.22	0.416	-2.0	1.13	13.94	N/A
16:06		8.45	16.3	6.22	0.417	-8.6	1.08	15.06	N/A
16:10		8.44	16.4	6.22	0.417	-14.4	1.03	15.03	N/A
16:14		8.46	16.4	6.22	0.415	-19.7	0.99	13.57	N/A
16:18		8.45	16.3	6.22	0.416	-23.8	0.96	12.58	N/A
16:22		8.43	16.3	6.22	0.416	-28.2	0.92	12.62	Purged 1.5 gallon

Groundwater Monitoring Field Data Form

Site: Boeing Renton

737 Logan Avenue N, Renton, Washington98057

File No.: PS20203450

RGW189S

Date:	08/24/2023	Casing Material:	PVC	Depth to Water (ft bmp):	6.76
Purge Method:	Low Flow	Casing Diameter (in):	2	Well Depth (ft bmp)	14.1
Volume Units:	mL/min	Pump Intake (ft bmp)	9	Water Column (ft)	7.34
Screen Interval (ft bmp):	4 to 14	Water Quality Meter:	YSI		
Comments:	N/A				

Sampling Summary

Sample Date:	08/24/2023	COC:	112TCA, acetone, benzene, toluene, carbon tetrachloride, chloroform, cis-1,2DCE, trans-1,2DCE, MC, 1,1-DCE, 1,1,2,2-TCA, VC, PCE, TCE, TPH-G, TPH-D/TPH-O with SGC, TOC
Sample Time:	14:50	Analysis:	8260D, VOC8260D SIM, NWTPH-Dx, SM5310 C
Sample ID:	RGW189S-08242023	Bottles:	9x HCl VOA, 1x 250mL H2SO4 amber, 1x 500mL amber
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A
Remarks:	N/A		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
02:32		7.84	18.4	5.93	0.435	-3.5	1.10	14.99	N/A
14:28		7.20	18.2	5.73	0.406	18.1	2.01	28.24	N/A
14:36		8.10	18.6	5.95	0.430	-11.6	0.95	13.13	N/A
14:40		8.16	18.8	5.96	0.429	-16.4	0.91	12.71	N/A
14:44		8.34	18.9	5.97	0.428	-21.9	0.89	11.96	N/A
14:48		8.42	18.8	5.98	0.428	-25.7	0.89	13.13	N/A

Groundwater Monitoring Field Data Form

Site: Boeing Renton

737 Logan Avenue N, Renton, Washington98057

File No.: PS20203450

RGW207S

Date:	08/24/2023	Casing Material:	PVC	Depth to Water (ft bmp):	6.75
Purge Method:	Low Flow	Casing Diameter (in):	2	Well Depth (ft bmp)	12.6
Volume Units:	mL/min	Pump Intake (ft bmp)	9.65	Water Column (ft)	5.85
Screen Interval (ft bmp):	7.3 to 12	Water Quality Meter:	YSI		
Comments:	N/A				

Sampling Summary

Sample Date:	08/24/2023	COC:	VC
Sample Time:	13:05	Analysis:	8260D SIM
Sample ID:	RGW207S-08242023	Bottles:	3x HCl VOA
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A
Remarks:	N/A		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
12:11		6.95	18.3	6.48	0.428	-4.1	3.29	23.18	N/A
12:15		6.99	17.2	6.35	0.475	-9.7	1.99	20.61	N/A
12:19		6.97	17.1	6.35	0.480	-21.2	1.65	29.40	N/A
12:23		6.96	17.1	6.35	0.478	-32.5	1.48	23.49	N/A
12:27		6.80	17.4	6.36	0.477	-41.9	1.05	18.47	N/A
12:31		6.76	18.0	6.37	0.478	-49.7	1.01	19.6	N/A
12:35		6.78	18.5	6.37	0.478	-55.7	0.95	21.50	N/A
12:39		6.75	19.1	6.37	0.479	-61.0	0.91	21.86	N/A
12:43		6.75	19.7	6.37	0.479	-65.2	0.86	22.40	N/A
12:47		6.76	20.3	6.36	0.478	-69.7	0.79	26.45	N/A
12:51		6.74	20.8	6.36	0.477	-73.1	0.79	18.08	N/A
12:55		6.74	21.3	6.35	0.478	-76.0	0.78	12.14	N/A
12:59		6.72	21.8	6.35	0.479	-78.6	0.83	11.30	N/A
13:03		6.73	22.3	6.35	0.480	-80.4	0.84	11.17	N/A

Groundwater Monitoring Field Data Form

Site: Boeing Renton

737 Logan Avenue N, Renton, Washington98057

RGW208S

Date:	08/24/2023	Casing Material:	PVC	Depth to Water (ft bmp):	8.02
Purge Method:	Low Flow	Casing Diameter (in):	2	Well Depth (ft bmp)	11.4
Volume Units:	mL/min	Pump Intake (ft bmp)	8.65	Water Column (ft)	3.38
Screen Interval (ft bmp):	6.3 to 11	Water Quality Meter:	YSI		
Comments:	N/A				

Sampling Summary

Sample Date:	08/24/2023	COC:	VC
Sample Time:	17:15	Analysis:	8260D SIM
Sample ID:	RGW208S-08242023	Bottles:	3x HCl VOA
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A
Remarks:	N/A		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
16:36		8.11	19.2	6.21	0.528	7.7	2.97	17.03	N/A
16:40		8.13	18.7	6.21	0.587	-3.1	1.31	13.65	N/A
16:44		8.16	18.9	6.22	0.567	-15.9	1.02	11.66	N/A
16:48		8.19	18.9	6.23	0.542	-31.1	0.91	10.72	N/A
16:52		8.22	19.1	6.24	0.516	-42.4	0.86	10.42	N/A
16:56		8.25	19.1	6.24	0.504	-50.5	0.83	10.51	N/A
17:00		8.2	19.1	6.24	0.495	-57.0	0.82	10.24	N/A
17:04		8.26	19.1	6.25	0.481	-62.7	0.81	10.44	N/A
17:08		8.28	19.1	6.25	0.477	-66.9	0.80	10.41	N/A
17:12		8.24	19.1	6.25	0.477	-69.3	0.80	10.27	1.5 gal purged

Groundwater Monitoring Field Data Form

Site: Boeing Renton

737 Logan Avenue N, Renton, Washington98057

File No.: PS20203450

RGW263S

Date:	08/14/2023	Casing Material:	PVC	Depth to Water (ft bmp):	6.31
Purge Method:	N/A	Casing Diameter (in):	2	Well Depth (ft bmp)	N/A
Volume Units:	N/A	Pump Intake (ft bmp)	13	Water Column (ft)	0
Screen Interval (ft bmp):	8 to 18	Water Quality Meter:	N/A		
Comments:	N/A				

Sampling Summary

Sample Date:	N/A	COC:	N/A
Sample Time:	N/A	Analysis:	N/A
Sample ID:	N/A	Bottles:	N/A
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A
Remarks:	N/A		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)		(mV)	(mg/l)		
Historical Range:									

Groundwater Monitoring Field Data Form

Site: Boeing Renton

737 Logan Avenue N, Renton, Washington98057

File No.: PS20203450

RGW264S

Date:	08/14/2023	Casing Material:	PVC	Depth to Water (ft bmp):	6.91
Purge Method:	Low Flow	Casing Diameter (in):	2	Well Depth (ft bmp)	18
Volume Units:	mL/min	Pump Intake (ft bmp)	13	Water Column (ft)	11.09
Screen Interval (ft bmp):	8 to 18	Water Quality Meter:	YSI		
Comments:	N/A				

Sampling Summary

Sample Date:	08/14/2023	COC:	VC, cis-1,2-DCE, TOC
Sample Time:	11:40	Analysis:	8260D, SM5310 C
Sample ID:	RGW-264S-08142023	Bottles:	3x VOA HCl, 1x 240ml H2SO4 amber
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A
Remarks:	N/A		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
11:03		7.27	20.4	6.04	0.944	-1.392	1.43	23.78	Perisraltic, no dedicatedtubing present
11:22		8.31	19.5	6.08	0.920	-135.5	0.99	117.48	N/A
11:26		8.89	19.3	6.08	0.918	-133.9	0.93	245.41	N/A

Groundwater Monitoring Field Data Form

Site: Boeing Renton

737 Logan Avenue N, Renton, Washington98057

File No.: PS20203450

RGW265S

Date:	08/14/2023	Casing Material:	PVC	Depth to Water (ft bmp):	6.38
Purge Method:	N/A	Casing Diameter (in):	2	Well Depth (ft bmp)	N/A
Volume Units:	N/A	Pump Intake (ft bmp)	13	Water Column (ft)	0
Screen Interval (ft bmp):	8 to 18	Water Quality Meter:	N/A		
Comments:	Pressure build up inside casing				

Sampling Summary

Sample Date:	N/A	COC:	N/A
Sample Time:	N/A	Analysis:	N/A
Sample ID:	N/A	Bottles:	N/A
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A
Remarks:	Pressure build up inside casing		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)		(mV)	(mg/l)		
Historical Range:									

Groundwater Monitoring Field Data Form

Site: Boeing Renton

737 Logan Avenue N, Renton, Washington98057

RGW031S-R

Date:	08/22/2023	Casing Material:	PVC	Depth to Water (ft bmp):	5.73
Purge Method:	Low Flow	Casing Diameter (in):	2	Well Depth (ft bmp)	25
Volume Units:	mL/min	Pump Intake (ft bmp)	20	Water Column (ft)	19.27
Screen Interval (ft bmp):	5 to 25	Water Quality Meter:	YSI		
Comments:	No exterior id,				

Sampling Summary

Sample Date:	08/22/2023	COC:	Benzene, cis-1,2-DCE, TCE, VC, TPH-G, TOC
Sample Time:	08:30	Analysis:	8260D, TPH-G, NWTPH-Gx, SM5310 C
Sample ID:	RGW031S-R-08222023	Bottles:	6x HCl VOA, 1x 250mL H2SO4 amber
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A
Remarks:	No exterior id,		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
07:58		5.74	18.0	6.24	0.439	20.5	2.72	37.47	N/A
08:02		5.74	17.5	6.18	0.436	-12.6	1.23	44.61	N/A
08:06		5.73	17.5	6.18	0.436	-27.7	1.08	68.42	N/A
08:10		5.74	17.4	6.18	0.436	-36.7	0.99	62.90	N/A
08:14		5.74	17.4	6.18	0.436	-43.5	0.94	51.23	N/A
08:18		5.73	17.4	6.17	0.437	-48.6	0.93	49.70	N/A
08:22		5.74	17.4	6.17	0.437	-52.6	0.90	9.72	Bubbles cleared from sensor
08:26		5.75	17.4	6.17	0.438	-55.7	0.87	9.93	N/A
08:30		5.73	17.4	6.17	0.438	-58.1	0.85	10.67	Sheen on purged water, 2.5 gal purged

Groundwater Monitoring Field Data Form

Site: Boeing Renton

737 Logan Avenue N, Renton, Washington98057

File No.: PS20203450

RGW033S

Date:	08/18/2023	Casing Material:	PVC	Depth to Water (ft bmp):	5.58
Purge Method:	Low Flow	Casing Diameter (in):	2	Well Depth (ft bmp)	25
Volume Units:	mL/min	Pump Intake (ft bmp)	20	Water Column (ft)	19.42
Screen Interval (ft bmp):	5 to 25	Water Quality Meter:	YSI		
Comments:	No interior or exterior id, painted over, missing 2 bolts, lock rustedshut				

Sampling Summary

Sample Date:	08/18/2023	COC:	Benzene, cis-1,2-DCE, TCE, VC, TPH-G, TOC
Sample Time:	13:15	Analysis:	8260D, TPH-G, NWTPH-Gx, SM5310 C
Sample ID:	RGW033S-08182023	Bottles:	6x HCl VOA, 1x 250mL H2SO4 amber
Duplicate Sample ID:	DUP02-08182023	Duplicate Sample Time:	09:00
Remarks:	No interior or exterior id, painted over, missing 2 bolts, lock rustedshut		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
12:49		5.59	19.3	6.15	0.525	-13.1	1.33	37.14	N/A
12:53		5.61	18.6	6.19	0.518	-41.9	0.99	22.75	N/A
12:57		5.59	18.7	6.20	0.520	-55.0	0.92	27.35	N/A
13:01		5.61	18.5	6.20	0.520	-63.9	0.87	22.59	N/A
13:05		5.61	18.6	6.20	0.521	-68.4	0.84	25.33	N/A
13:09		5.60	18.5	6.20	0.521	-72.3	0.83	25.23	N/A

Groundwater Monitoring Field Data Form

Site: Boeing Renton

737 Logan Avenue N, Renton, Washington98057

File No.: PS20203450

RGW034S

Date:	08/18/2023	Casing Material:	PVC	Depth to Water (ft bmp):	5.68
Purge Method:	Low Flow	Casing Diameter (in):	2	Well Depth (ft bmp)	25
Volume Units:	mL/min	Pump Intake (ft bmp)	20	Water Column (ft)	19.32
Screen Interval (ft bmp):	5 to 25	Water Quality Meter:	YSI		
Comments:	N/A				

Sampling Summary

Sample Date:	08/18/2023	COC:	Benzene, cis-1,2-DCE, TCE, VC, TPH-G, TOC
Sample Time:	14:45	Analysis:	8260D, TPH-G, NWTPH-Gx, SM5310 C
Sample ID:	RGW034S-08182023	Bottles:	6x HCl VOA, 1x 250mL H2SO4 amber
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A
Remarks:	N/A		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
14:27		5.67	20.1	6.40	0.391	3.3	1.94	14.44	N/A
14:31		5.68	19.3	6.38	0.395	-44.9	1.16	6.90	N/A
14:35		5.67	19.2	6.80	0.396	-60.5	0.98	4.79	N/A
14:39		5.67	19.1	6.38	0.397	-72.3	0.92	4.20	N/A
14:42		5.67	19.0	6.38	0.398	-78.6	0.88	4.75	N/A
14:46		5.67	18.9	6.38	0.398	-83.1	0.85	5.86	N/A
14:50			18.9	6.38	0.398	-87.1	0.82	8.09	2.5gal purged

Groundwater Monitoring Field Data Form

Site: Boeing Renton
737 Logan Avenue N, Renton, Washington98057

RGW143S

Date:	08/18/2023	Casing Material:	PVC	Depth to Water (ft bmp):	5.90
Purge Method:	Low Flow	Casing Diameter (in):	2	Well Depth (ft bmp)	15.9
Volume Units:	mL/min	Pump Intake (ft bmp)	12.5	Water Column (ft)	10
Screen Interval (ft bmp):	10 to 15	Water Quality Meter:	YSI		

Comments: No internal or external id, lock rusted shut, no bolt holes, missing all 3 bolts

Sampling Summary

Sample Date:	08/18/2023	COC:	Benzene, cis-1,2-DCE, TCE, VC, TPH-G, TOC
Sample Time:	10:00	Analysis:	8260D, TPH-G, NWTPH-Gx, SM5310 C
Sample ID:	RGW143S-08182023	Bottles:	6x HCl VOA, 1x 250mL H2SO4 amber
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A

Remarks: No internal or external id, lock rusted shut, no bolt holes, missing all 3 bolts

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
09:42		5.91	20.0	6.39	0.483	-62.9	1.02	30.24	N/A
09:46		5.93	19.2	6.36	0.474	-74.8	0.90	24.62	N/A
09:50		5.92	18.8	6.34	0.465	-81.4	0.87	23.04	N/A
09:54		5.95	18.7	6.34	0.462	-88.1	0.84	27.99	N/A
09:58		5.94	18.8	6.34	0.461	-90.5	0.83	32.38	N/A
10:02		5.90	18.6	6.33	0.458	-92.9	0.83	21.36	N/A
10:06		5.93	18.6	6.33	0.457	-94.5	0.82	15.47	N/A
10:10		5.92	18.5	6.30	0.455	-94.4	0.81	18.06	N/A

Groundwater Monitoring Field Data Form

Site: Boeing Renton
737 Logan Avenue N, Renton, Washington98057

File No.: PS20203450

RGW237S

Date:	08/18/2023	Casing Material:	PVC	Depth to Water (ft bmp):	4.92
Purge Method:	Low Flow	Casing Diameter (in):	2	Well Depth (ft bmp)	15
Volume Units:	mL/min	Pump Intake (ft bmp)	10	Water Column (ft)	10.08
Screen Interval (ft bmp):	5 to 15	Water Quality Meter:	YSI		
Comments:	Nearby car running during sampling				

Sampling Summary

Sample Date:	08/18/2023	COC:	Benzene, cis-1,2-DCE, TCE, VC, TPH-G, TOC
Sample Time:	12:00	Analysis:	8260D, TPH-G, NWTPH-Gx, SM5310 C
Sample ID:	RGW237S-08182023	Bottles:	6x HCl VOA, 1x 250mL H2SO4 amber
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A
Remarks:	Nearby car running during sampling		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
11:25		4.92	21.3	6.37	0.315	8.90	2.38	389.62	N/A
11:29		4.91	20.3	6.38	0.338	-44.8	0.94	407.65	N/A
11:33		4.91	20.3	6.38	0.339	-57.6	0.83	64.88	N/A
11:37		4.92	20.3	6.39	0.343	-68.0	0.77	32.13	N/A
11:41		4.92	20.1	6.39	0.344	-74.4	0.74	17.10	N/A
11:45		4.92	20.2	6.39	0.345	-79.2	0.72	13.81	N/A
11:49		4.91	20.2	6.39	0.346	-82.6	0.70	15.70	1.5 gal purged, moderate cheesey odor

Groundwater Monitoring Field Data Form

Site: Boeing Renton

737 Logan Avenue N, Renton, Washington98057

File No.: PS20203450

RGW240D

Date:	08/18/2023	Casing Material:	PVC	Depth to Water (ft bmp):	6.96
Purge Method:	Low Flow	Casing Diameter (in):	2	Well Depth (ft bmp)	27
Volume Units:	mL/min	Pump Intake (ft bmp)	24.5	Water Column (ft)	20.04
Screen Interval (ft bmp):	22 to 27	Water Quality Meter:	YSI		
Comments:	N/A				

Sampling Summary

Sample Date:	08/18/2023	COC:	Benzene, cis-1,2-DCE, TCE, VC, TPH-G, TOC
Sample Time:	11:00	Analysis:	8260D, TPH-G, NWTPH-Gx, SM5310 C
Sample ID:	RGW240D-08182023	Bottles:	6x HCl VOA, 1x 250mL H2SO4 amber
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A
Remarks:	N/A		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
10:31		7.20	17.9	6.43	0.320	-34.5	1.62	600.98	N/A
10:35		7.89	17.3	6.48	0.315	-65.6	1.00	113.06	N/A
10:39		8.24	17.4	6.43	0.309	-81.3	0.87	66.47	N/A
10:43		8.31	17.4	6.44	0.305	-88.2	0.83	52.53	N/A
10:47		8.41	17.4	6.45	0.303	-94.7	0.83	24.76	N/A
10:51		8.40	17.4	6.44	0.305	-97.9	0.79	26.38	N/A
10:55		8.34	17.3	6.45	0.305	-101.7	0.77	24.8	Purged 2 gallons, moderate 'cheesy' smell to purged water

Groundwater Monitoring Field Data Form

File No.: PS20203450

Site: Boeing Renton
737 Logan Avenue N, Renton, Washington98057

RGW-244S-R

Date:	08/22/2023	Casing Material:	PVC	Depth to Water (ft bmp):	5.58
Purge Method:	Low Flow	Casing Diameter (in):	2	Well Depth (ft bmp)	15
Volume Units:	mL/min	Pump Intake (ft bmp)	10	Water Column (ft)	9.42
Screen Interval (ft bmp):	5 to 15	Water Quality Meter:	YSI		
Comments:	No extetior id				

Sampling Summary

Sample Date:	08/22/2023	COC:	Benzene, cis-1,2-DCE, TCE, VC, TPH-G, TOC
Sample Time:	09:30	Analysis:	8260D, TPH-G, NWTPH-Gx, SM5310 C
Sample ID:	RGW244S-R-08222023	Bottles:	6x HCl VOA, 1x 250mL H2SO4 amber
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A
Remarks:	No extetior id		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
08:56		5.58	18.6	6.30	0.531	4.1	3.64	30.66	N/A
09:00		5.59	17.7	6.28	0.546	-22.5	1.39	19.72	N/A
09:04		5.58	17.5	6.30	0.540	-42.5	1.10	31.37	N/A
09:08		5.58	17.4	6.30	0.536	-55.4	0.99	20.84	N/A
09:12		5.57	17.4	6.30	0.536	-64.0	0.92	26.65	N/A
09:16		5.58	17.3	6.31	0.532	-70.1	0.88	19.75	N/A
09:20		5.59	17.3	6.31	0.531	-75.0	0.89	12.97	N/A
09:24		5.58	17.4	6.31	0.528	-78.2	0.83	4.30	N/A
09:28		5.57	17.4	6.31	0.526	-81.4	0.81	6.97	N/A
09:32		5.57	17.4	6.31	0.523	-83.6	0.82	3.75	2.5 gql purged, distinct sheen on purged water, foul odor

Groundwater Monitoring Field Data Form

Site: Boeing Renton

737 Logan Avenue N, Renton, Washington98057

File No.: PS20203450

RGW211S

Date:	08/15/2023	Casing Material:	PVC	Depth to Water (ft bmp):	11.04
Purge Method:	Low Flow	Casing Diameter (in):	2	Well Depth (ft bmp)	14.75
Volume Units:	mL/min	Pump Intake (ft bmp)		Water Column (ft)	3.71
Screen Interval (ft bmp):	4.8 to 14.7	Water Quality Meter:	YSI		
Comments:	N/A				

Sampling Summary

Sample Date:	08/15/2023	COC:	TPH-D, TPH-O, Jet A
Sample Time:	10:25	Analysis:	TPH-Jet Fuel, TPH-D, NWTPH-Dx
Sample ID:	RGW211-08152023	Bottles:	2x 500mL amber
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A
Remarks:	N/A		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
09:44		11.03	19.1	6.50	0.356	-149.4	4.42	1269.72	Turbid, yellowish, grey, slight sheen on purgewater surface, no odor
09:48		11.05	18.2	6.46	0.238	-137.4	2.59	2867.23	N/A
09:52		11.03	18.0	6.42	0.230	-132.2	2.18	1348.75	N/A
09:56		11.03	18.0	6.38	0.224	-122.7	1.43	457.46	N/A
10:00		11.02	17.8	6.32	0.224	-120.2	1.33	149.11	N/A
10:04		11.05	17.7	6.31	0.224	-118.5	1.24	86.21	N/A
10:07		11.03	17.8	6.30	0.224	-117.4	1.19	60.84	N/A
10:12		11.08	17.7	6.29	0.225	-116.6	1.12	58.13	N/A
10:16		11.03	17.7	6.28	0.225	-115.6	1.07	43.52	N/A
10:20		11.03	17.7	6.27	0.225	-114.7	1.01	33.12	N/A
10:24		11.03	17.7	6.26	0.225	-113.9	0.75	23.90	N/A

Groundwater Monitoring Field Data Form

Site: Boeing Renton
737 Logan Avenue N, Renton, Washington98057

RGW221S

Date:	08/15/2023	Casing Material:	PVC	Depth to Water (ft bmp):	11.10
Purge Method:	Low Flow	Casing Diameter (in):	2	Well Depth (ft bmp)	15
Volume Units:	mL/min	Pump Intake (ft bmp)	10	Water Column (ft)	3.9
Screen Interval (ft bmp):	5 to 15	Water Quality Meter:	YSI		
Comments:	N/A				

Sampling Summary

Sample Date:	08/15/2023	COC:	TPH-D, TPH-O, Jet A
Sample Time:	13:10	Analysis:	TPH-Jet Fuel, TPH-D, NWTPH-Dx
Sample ID:	RGW221S-08152023	Bottles:	2x 500mL amber
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A
Remarks:	N/A		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
12:36		11.11	20.4	6.11	0.274	-26.6	1.73	76.13	N/A
12:41		11.12	19.7	6.25	0.264	-49.5	1.14	39.18	N/A
12:45		11.1	19.6	6.27	0.257	-51.5	0.97	8.07	N/A
12:49		11.10	19.7	6.28	0.255	-53.8	0.89	4.14	N/A
12:53		11.12	19.6	6.29	0.255	-55.2	0.84	2.70	N/A
12:57		11.11	19.6	6.29	0.254	-56.6	0.79	2.54	N/A
13:01		11.10	19.7	6.29	0.254	-56.9	0.77	2.46	N/A
13:05		11.19	19.6	6.29	0.254	-57.4	0.75	2.39	2gal purged

Groundwater Monitoring Field Data Form

Site: Boeing Renton

737 Logan Avenue N, Renton, Washington98057

File No.: PS20203450

RGW224S

Date:	08/15/2023	Casing Material:	PVC	Depth to Water (ft bmp):	11.54
Purge Method:	Low Flow	Casing Diameter (in):	2	Well Depth (ft bmp)	15
Volume Units:	mL/min	Pump Intake (ft bmp)	10	Water Column (ft)	3.46
Screen Interval (ft bmp):	5 to 15	Water Quality Meter:	YSI		
Comments:	N/A				

Sampling Summary

Sample Date:	08/15/2023	COC:	TPH-D, TPH-O, Jet A
Sample Time:	08:50	Analysis:	TPH-Jet Fuel, TPH-D, NWTPH-Dx
Sample ID:	RGW224S-08152023	Bottles:	2x 500mL amber
Duplicate Sample ID:	DUP03-08152023	Duplicate Sample Time:	09:00
Remarks:	N/A		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
08:25		11.72	21.5	5.76	0.193	-11.6	1.68	38.22	N/A
08:29		11.80	19.6	5.8	0.185	-27.4	1.01	14.06	N/A
08:33		11.86	19.7	5.91	0.194	-36.9	0.91	3.13	N/A
08:37		11.92	19.7	5.97	0.200	-43.7	0.86	2.22	N/A
08:41		11.90	19.7	6.00	0.203	-47.5	0.84	1.46	N/A
08:45		11.94	19.7	6.02	0.203	-49.6	0.81	1.27	1.5 gal purged

Groundwater Monitoring Field Data Form

Site: Boeing Renton
737 Logan Avenue N, Renton, Washington98057

File No.: PS20203450

RGW152S

Date:	08/15/2023	Casing Material:	PVC	Depth to Water (ft bmp):	9.85
Purge Method:	Low Flow	Casing Diameter (in):	2	Well Depth (ft bmp)	14.95
Volume Units:	mL/min	Pump Intake (ft bmp)	12.5	Water Column (ft)	5.1
Screen Interval (ft bmp):	5 to 20	Water Quality Meter:	YSI		
Comments:	N/A				

Sampling Summary

Sample Date:	08/15/2023	COC:	cis-1,2-DCE, PCE, TCE, VC, As, Cu, Pb
Sample Time:	15:30	Analysis:	8260D SIM, 6020A, SM5310 C
Sample ID:	RGW152S-08152023	Bottles:	3x HCl VOA, 1x 250mL H2SO4 amber, 1x 250mL HNO3 poly
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A
Remarks:	N/A		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
15:08		10.49	20.6	5.11	1.372	11.1	1.87	493.07	Strong "fertilizer" odor from purge water
15:12		11.64	20.1	5.06	1.771	-2.90	0.99	261.36	Cloudy white/grey purgewater
15:16			20.2	5.07	1.785	-5.7	0.90	243.12	N/A
15:20			20.1	5.03	1.897	-6.2	0.88	562.17	N/A
15:24			20.6	5.02	1.964	-7.6	0.89	262.68	Paused well at 3:27 pm...well ran dry

Groundwater Monitoring Field Data Form

Site: Boeing Renton

737 Logan Avenue N, Renton, Washington98057

File No.: PS20203450

RGW153S

Date:	08/15/2023	Casing Material:	PVC	Depth to Water (ft bmp):	10.62
Purge Method:	Low Flow	Casing Diameter (in):	2	Well Depth (ft bmp)	14.65
Volume Units:	mL/min	Pump Intake (ft bmp)	12.5	Water Column (ft)	4.03
Screen Interval (ft bmp):	5 to 20	Water Quality Meter:	YSI		
Comments:	N/A				

Sampling Summary

Sample Date:	08/15/2023	COC:	cis-1,2-DCE, PCE, TCE, VC, As, Cu, Pb
Sample Time:	14:30	Analysis:	8260D SIM, 6020A, SM5310 C
Sample ID:	RGW153S-08152023	Bottles:	3x HCl VOA, 1x 250mL H2SO4 amber, 1x 250mL HNO3 poly
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A
Remarks:	N/A		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
13:54		11.11	19.3	6.30	0.314	-48.2	4.00	66.81	N/A
14:02		11.35	18.6	6.37	0.299	-68.0	1.27	33.57	N/A
14:06		11.50	18.4	6.40	0.291	-72.6	0.99	17.79	N/A
14:10		11.58	18.2	6.40	0.293	-77.6	0.90	14.63	N/A
14:14		11.66	18.1	6.41	0.290	-79.8	0.85	7.27	N/A
14:18		11.66	18.1	6.41	0.289	-82.0	0.81	4.99	N/A
14:22		11.72	18.2	6.41	0.288	-83.0	0.80	3.73	N/A
14:26		11.71	18.2	6.42	0.288	-84.6	0.78	2.80	N/A

Groundwater Monitoring Field Data Form

File No.: PS20203450

Site: Boeing Renton

737 Logan Avenue N, Renton, Washington98057

RGW172S

Date:	08/16/2023	Casing Material:	PVC	Depth to Water (ft bmp):	9.96
Purge Method:	Low Flow	Casing Diameter (in):	2	Well Depth (ft bmp)	17.82
Volume Units:	mL/min	Pump Intake (ft bmp)	13	Water Column (ft)	7.86
Screen Interval (ft bmp):	8 to 18	Water Quality Meter:	YSI		
Comments:	N/A				

Sampling Summary

Sample Date:	08/16/2023	COC:	cis-1,2-DCE, PCE, TCE, VC, As, Cu, Pb
Sample Time:	10:00	Analysis:	8260D SIM, 6020A, SM5310 C
Sample ID:	RGW172S-08162023	Bottles:	3x HCl VOA, 1x 250mL H2SO4 amber, 1x 250mL HNO3 poly
Duplicate Sample ID:	DUP01-08162023	Duplicate Sample Time:	08:00
Remarks:	N/A		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
09:27		10.55	18.8	6.61	0.398	-134.8	1.53	144.43	N/A
09:31		11.11	18.2	6.61	0.300	-118.1	1.06	32.78	N/A
09:35		11.21	18.7	6.52	0.291	-105.3	0.92	16.40	N/A
09:39		11.12	19.0	6.38	0.297	-91.0	0.85	19.05	N/A
09:43		11.18	19.1	6.25	0.319	-80.1	0.82	21.26	N/A
09:47		11.24	19.0	6.11	0.355	-70.0	0.80	22.00	N/A
09:51		11.27	19.1	6.05	0.370	-65.3	0.78	23.64	N/A
09:55		11.16	19.0	6.00	0.379	-62.1	0.77	26.57	N/A
09:59		11.20	19.1	5.96	0.386	-60.1	0.76	28.04	N/A
10:03		11.26	19.1	5.94	0.391	-59.1	0.75	33.98	Manure odor during sampling following high turb

Groundwater Monitoring Field Data Form
Site: Boeing Renton
737 Logan Avenue N, Renton, Washington98057

RGW173S

Date:	08/17/2023	Casing Material:	PVC	Depth to Water (ft bmp):	10.13
Purge Method:	Low Flow	Casing Diameter (in):	2	Well Depth (ft bmp)	17.2
Volume Units:	mL/min	Pump Intake (ft bmp)	13	Water Column (ft)	7.07
Screen Interval (ft bmp):	8 to 18	Water Quality Meter:	YSI		
Comments:	No id card inside, no exterior id, interior of wellhead rusted out and flaking off and cracked, 1 bolt missing, bolt holes dethreaded				

Sampling Summary

Sample Date:	08/17/2023	COC:	cis-1,2-DCE, PCE, TCE, VC, As, Cu, Pb
Sample Time:	11:35	Analysis:	8260D SIM, 6020A, SM5310 C
Sample ID:	RGW173S-08172023	Bottles:	3x HCl VOA, 1x 250mL H2SO4 amber, 1x 250mL HNO3 poly
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A
Remarks:	No id card inside, no exterior id, interior of wellhead rusted out and flaking off and cracked, 1 bolt missing, bolt holes dethreaded		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
11:04		10.36	20.9	6.43	0.411	-70.6	3.26	122.10	N/A
11:08		10.56	19.2	6.59	0.388	-100.7	1.04	90.44	N/A
11:12		10.58	19.3	6.57	0.377	-100.4	0.85	46.27	N/A
11:16		10.51	19.2	6.55	0.381	-100.4	0.79	36.50	N/A
11:20		10.60	19.2	6.53	0.389	-99.1	0.76	24.57	N/A
11:24		10.61	19.2	6.51	0.392	-98.7	0.73	18.55	N/A
11:28		10.52	19.3	6.50	0.396	-98.1	0.72	17.64	N/A
11:32		18.51	19.3	6.49	0.396	-98.0	0.70	17.90	1.5 gal purged

Groundwater Monitoring Field Data Form

Site: Boeing Renton

737 Logan Avenue N, Renton, Washington98057

File No.: PS20203450

RGW226S

Date:	08/16/2023	Casing Material:	PVC	Depth to Water (ft bmp):	10.10
Purge Method:	Low Flow	Casing Diameter (in):	2	Well Depth (ft bmp)	20
Volume Units:	mL/min	Pump Intake (ft bmp)	12.5	Water Column (ft)	9.9
Screen Interval (ft bmp):	5 to 20	Water Quality Meter:	YSI		
Comments:	N/A				

Sampling Summary

Sample Date:	08/16/2023	COC:	cis-1,2-DCE, PCE, TCE, VC, As, Cu, Pb
Sample Time:	09:00	Analysis:	8260D SIM, 6020A, SM5310 C
Sample ID:	RGW226S-08162023	Bottles:	3x HCl VOA, 1x 250mL H2SO4 amber, 1x 250mL HNO3 poly
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A
Remarks:	N/A		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
08:09		10.18	22.4	6.25	0.358	-70.7	3.32	58.64	Strong manure odor
08:13		10.14	20.0	6.50	0.405	-127.8	1.73	113.36	N/A
08:17		10.19	19.9	6.50	0.389	-129.3	1.61	122.27	N/A
08:21		10.04	20.2	6.50	0.381	-126.6	1.59	153.90	N/A
08:25		10.0	20.7	6.51	0.381	-124.8	1.76	160.74	N/A
08:29		10.03	21.2	6.50	0.382	-124.2	1.37	143.30	N/A
08:33		10.0	21.6	6.51	0.382	-124.4	1.18	143.68	Pumping halted...resumed at 8:40
08:40		10.16	21.6	6.47	0.379	-117.7	0.91	246.90	N/A
08:44		10.25	18.5	6.46	0.357	-113.1	0.85	237.23	N/A
08:48		10.38	18.5	6.37	0.343	-102.6	0.80	264.31	N/A
08:52		10.32	18.5	6.36	0.340	-100.1	0.78	229.45	N/A
08:56		10.26	18.5	6.37	0.339	-99.3	0.77	286.22	No odor by end of purging, 1.5 gal purged

Groundwater Monitoring Field Data Form

Site: Boeing Renton

737 Logan Avenue N, Renton, Washington98057

File No.: PS20203450

RGW232S

Date:	08/16/2023	Casing Material:	PVC	Depth to Water (ft bmp):	7.68
Purge Method:	Low Flow	Casing Diameter (in):	2	Well Depth (ft bmp)	14
Volume Units:	mL/min	Pump Intake (ft bmp)	9	Water Column (ft)	6.32
Screen Interval (ft bmp):	4 to 14	Water Quality Meter:	YSI		
Comments:	N/A				

Sampling Summary

Sample Date:	08/16/2023	COC:	cis-1,2-DCE, PCE, TCE, VC, As, Cu, Pb
Sample Time:	14:25	Analysis:	8260D SIM, 6020A, SM5310 C
Sample ID:	RGW232S-08162023	Bottles:	3x HCl VOA, 1x 250mL H2SO4 amber, 1x 250mL HNO3 poly
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A
Remarks:	N/A		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
14:05		8.12	20.6	6.14	0.583	-67.2	2.78	6.98	N/A
14:09		8.91	19.7	6.30	0.57	-96.8	1.48	9.55	N/A
14:13		9.75	19.9	6.31	0.551	-100.5	1.22	12.83	N/A
14:17		10.51	20.4	6.33	0.535	-100.2	1.15	15.18	Well about to run dry, sample after reading, purge water has sheen, 1 gal purged

Groundwater Monitoring Field Data Form

Site: Boeing Renton

737 Logan Avenue N, Renton, Washington98057

RGW234S

Date:	08/16/2023	Casing Material:	PVC	Depth to Water (ft bmp):	8.80
Purge Method:	Low Flow	Casing Diameter (in):	2	Well Depth (ft bmp)	13
Volume Units:	mL/min	Pump Intake (ft bmp)	8	Water Column (ft)	4.2
Screen Interval (ft bmp):	3 to 13	Water Quality Meter:	YSI		
Comments:	N/A				

Sampling Summary

Sample Date:	08/16/2023	COC:	cis-1,2-DCE, PCE, TCE, VC, As, Cu, Pb
Sample Time:	12:10	Analysis:	8260D SIM, 6020A, SM5310 C
Sample ID:	RGW234S-08162023	Bottles:	3x HCl VOA, 1x 250mL H2SO4 amber, 1x 250mL HNO3 poly
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A
Remarks:	N/A		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
11:52		8.81	20.7	6.31	0.259	-41.7	1.44	294.51	N/A
11:56		8.82	18.9	6.35	0.237	-49.5	0.89	27.69	N/A
12:00		8.80	19.0	6.35	0.239	-51.9	0.83	11.41	N/A
12:04		8.81	19.0	6.36	0.242	-54.0	0.79	8.38	N/A
12:08		8.12	19.0	6.36	0.243	-55.6	0.76	8.97	1.5 gal purged

Groundwater Monitoring Field Data Form

Site: Boeing Renton

737 Logan Avenue N, Renton, Washington98057

File No.: PS20203450

RGW235I

Date:	08/16/2023	Casing Material:	PVC	Depth to Water (ft bmp):	8.11
Purge Method:	Low Flow	Casing Diameter (in):	2	Well Depth (ft bmp)	25
Volume Units:	mL/min	Pump Intake (ft bmp)	20	Water Column (ft)	16.89
Screen Interval (ft bmp):	15 to 25	Water Quality Meter:	YSI		
Comments:	N/A				

Sampling Summary

Sample Date:	08/16/2023	COC:	cis-1,2-DCE, PCE, TCE, VC, As, Cu, Pb
Sample Time:	11:30	Analysis:	8260D SIM, 6020A, SM5310 C
Sample ID:	RGW235I-08162023	Bottles:	3x HCl VOA, 1x 250mL H2SO4 amber, 1x 250mL HNO3 poly
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A
Remarks:	N/A		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
11:01		8.13	19.0	6.51	0.209	-32.5	1.64	40.52	N/A
11:05		8.11	16.9	6.67	0.204	-51.9	1.07	99.02	N/A
11:09		8.17	16.8	6.70	0.203	-56.2	0.93	238.22	N/A
11:13		8.15	16.7	6.70	0.203	-58.3	0.87	105.24	N/A
11:17		8.19	16.7	6.70	0.202	-58.9	0.83	25.13	N/A
11:21		8.20	16.7	6.69	0.203	-60.0	0.80	32.27	N/A
11:25		8.14	16.7	6.69	0.202	-61.0	0.79	39.84	2.5 gal purged

Groundwater Monitoring Field Data Form
Site: Boeing Renton
737 Logan Avenue N, Renton, Washington98057

File No.: PS20203450

RGW236S

Date:	08/17/2023	Casing Material:	PVC	Depth to Water (ft bmp):	8.11
Purge Method:	Low Flow	Casing Diameter (in):	2	Well Depth (ft bmp)	15
Volume Units:	mL/min	Pump Intake (ft bmp)	10	Water Column (ft)	6.89
Screen Interval (ft bmp):	5 to 15	Water Quality Meter:	YSI		
Comments:	N/A				

Sampling Summary

Sample Date:	08/17/2023	COC:	cis-1,2-DCE, PCE, TCE, VC, As, Cu, Pb
Sample Time:	10:15	Analysis:	8260D SIM, 6020A, SM5310 C
Sample ID:	RGW236S-08172023	Bottles:	3x HCl VOA, 1x 250mL H2SO4 amber, 1x 250mL HNO3 poly
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A
Remarks:	N/A		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
09:37		8.35	20.8	6.54	0.338	-20.6	5.16	136.65	N/A
09:41		8.89	17.2	6.71	0.475	-136.7	1.13	182.23	N/A
09:45		9.03	17.5	6.67	0.403	-136.8	0.96	100.98	N/A
09:49		9.19	17.7	6.60	0.351	-118.6	0.90	30.29	N/A
09:53		9.30	18.0	6.58	0.342	-107.2	0.87	17.41	N/A
09:57		9.22	18.3	6.57	0.342	-102.5	0.87	14.43	N/A
10:01		9.16	18.4	6.57	0.342	-100.0	0.89	11.09	N/A
10:05		9.08	18.4	6.57	0.342	-97.1	0.94	7.72	N/A
10:09		9.12	18.5	6.56	0.341	-94.1	0.98	5.54	N/A
10:13		9.13	18.4	6.56	0.341	-92.4	0.99	3.73	Purged 2 gal

Groundwater Monitoring Field Data Form

Site: Boeing Renton
737 Logan Avenue N, Renton, Washington98057

File No.: PS20203450

RGW230I

Date:	08/24/2023	Casing Material:	PVC	Depth to Water (ft bmp):	8.05
Purge Method:	Low Flow	Casing Diameter (in):	2	Well Depth (ft bmp)	14
Volume Units:	mL/min	Pump Intake (ft bmp)	9	Water Column (ft)	5.95
Screen Interval (ft bmp):	4 to 14	Water Quality Meter:	YSI		
Comments:	N/A				

Sampling Summary

Sample Date:	08/24/2023	COC:	
Sample Time:	18:25	Analysis:	8260 SIM
Sample ID:	RGW230I-082423	Bottles:	3 HCl VOA
Duplicate Sample ID:	N/A	Duplicate Sample Time:	N/A
Remarks:	N/A		

Field Stabilization Parameters

Time	Cuml Volume	DTW	Temp	pH	Conductivity	ORP	Dissolved Oxygen	Turbidity	Remarks
		(ft bmp)	(C)	(SU)	(uS/cm)	(mV)	(mg/l)		
Historical Range:									
17:54		8.12	21.2	6.05	0.455	36.8	2.94	63.00	N/A
17:58		8.17	19.8	6.30	0.472	-3.9	1.38	18.57	N/A
18:02		8.20	20.1	6.3	0.470	-15.9	1.06	14.11	N/A
18:06		8.11	20.3	6.3	0.467	-22.1	0.96	13.91	N/A
18:10		8.12	20.3	6.3	0.465	-27.2	0.91	13.73	N/A
18:14		8.09	20.4	6.3	0.461	-33.7	0.86	12.43	N/A
18:18		8.11	20.4	6.31	0.458	-37.6	0.83	11.78	N/A
18:22		8.11	20.4	6.31	0.456	-40.9	0.82	11.33	N/A

APPENDIX C

DATA VALIDATION MEMOS

Memo

To:	Patrick McCarthy, Project Manager	Project:	PS20203451.01
From:	Caitlin Riechmann	c:	Project File
Tel:	(503) 207-9629		
Date:	October 2, 2023		

Subject: Summary Data Quality Review
August 2023 Boeing Renton Groundwater Sampling
SWMU-168
ARI Work Order Number: 23H0612

This memo presents the summary data quality review of one primary groundwater sample and one trip blank sample collected on August 23 and 24, 2023. The samples were submitted to Analytical Resources, Inc. (ARI), located in Tukwila, Washington, a laboratory accredited by the Washington State Department of Ecology. The samples were analyzed for the volatile organic compound vinyl chloride by U.S. Environmental Protection Agency (EPA) Method 8260D with selected ion monitoring.

The samples and the analyses conducted on the samples are listed below.

Sample ID	Laboratory Sample ID	Requested Analyses
RGW230I-08242023	23H0612-01	vinyl chloride
Trip Blank	23H0612-02	vinyl chloride

Data were reviewed in accordance with the appropriate method procedures and criteria documented in the Quality Assurance Project Plan (QAPP) (Amec Foster Wheeler, 2016). The control limits provided in the QAPP are advisory limits; therefore, the most current control limits provided by the laboratory were used to evaluate the quality control data. In cases where the laboratory did not track limits for an analyte, the limits in the QAPP were used.

Holding times, method/trip blanks, surrogate recoveries, laboratory control samples (LCS) and laboratory control sample duplicates (LCSD), matrix spike/matrix spike duplicates (MS/MSD), field duplicates, and reporting limits were reviewed where available to assess compliance with applicable methods. If qualification was required, data were qualified based on the definitions and use of qualifying flags outlined in the EPA guidance documents (EPA, 2020).

ARI received the samples on August 25, 2023. The temperature of the cooler was recorded upon receipt and the cooler was below the maximum acceptable temperature of 6 degrees Celsius. Analyses were not specified on the chain of custody for the trip blank. ARI properly analyzed the trip blank for vinyl chloride.

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ORGANIC ANALYSES

Samples were analyzed for vinyl chloride. Laboratory data were evaluated for the following parameters:

1. Preservation and Holding Times – Acceptable
2. Blanks – Acceptable
3. Surrogates – Acceptable
4. LCS/LCSD – Acceptable
5. MS/MSD – Acceptable

   Extra volume was not submitted for analysis of MS/MSD samples. The project frequency requirement was achieved with MS/MSD analysis conducted at other sites included in this sampling event.

6. Field Duplicates – Acceptable

   Field duplicates were not collected at this site during this sampling event. The project frequency requirement of one field duplicate for every 20 samples was achieved with field duplicate samples collected at other sites included in this sampling event.

7. Reporting Limits and Laboratory Flags – Acceptable.

OVERALL ASSESSMENT OF DATA

The table below summarizes the data assessment. The completeness of ARI work order number 23H0612 is 100 percent. The usefulness of these data was evaluated based on EPA guidance documents listed in the introduction to this report. No problems were identified, and analytical performance was within specified limits.

Sample ID	Qualified Analyte
RGW230I-08242023	none
Trip Blank	none

REFERENCES

Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler), 2016, Quality Assurance Project Plan, Boeing Renton Facility, Renton, Washington: Prepared for the Boeing Company, February.

U.S. Environmental Protection Agency (EPA), 2020, U.S. EPA National Functional Guidelines for Organic Superfund Methods Data Review: EPA 540-R-20-005, November.

Memo

To:	Patrick McCarthy, Project Manager	Project:	PS20203451.01
From:	Caitlin Riechmann	c:	Project File
Tel:	(503) 207-9629		
Date:	September 28, 2023		

Subject: Summary Data Quality Review
August 2023 Boeing Renton Groundwater Sampling
SWMU-172/174
ARI Work Order Numbers: 23H0426, 23H0443, 23H0475

This memo presents the summary data quality review of nine primary groundwater samples, one groundwater field duplicate, and one trip blank sample collected between August 15 and 17, 2023. The samples were submitted to Analytical Resources, Inc. (ARI), located in Tukwila, Washington, a laboratory accredited by the Washington State Department of Ecology. The samples were analyzed for the following:

- Volatile organic compounds (VOCs) (cis-1,2-dichloroethene, tetrachloroethene, trichloroethene, and vinyl chloride) by U.S. Environmental Protection Agency (EPA) Method 8260D with selected ion monitoring;
- Total organic carbon (TOC) by Standard Method 5310B; and
- Total metals (arsenic, copper, and lead) by EPA Method 6020A.

The samples and the analyses conducted on the samples are listed below.

Sample ID	Laboratory Sample ID	Requested Analyses
RGW152S-08152023	23H0426-01	all
RGW153S-08152023	23H0426-02	all
RGW234S-08162023	23H0443-01	all
RGW235I-08162023	23H0443-02	all
RGW172S-08162023	23H0443-03	all
RGW226S-08162023	23H0443-04	all
RGW232S-08162023	23H0443-05	all
DUP01-08162023	23H0443-06	all
TRIP BLANKS	23H0443-07	VOCs
RGW236S-08172023	23H0475-01	all
RGW173S-08172023	23H0475-02	all

Data were reviewed in accordance with the appropriate method procedures and criteria documented in the Quality Assurance Project Plan (QAPP) (Amec Foster Wheeler, 2016). The control limits provided in the QAPP are advisory limits; therefore, the most current control limits provided by the laboratory were used to evaluate the quality control data. In cases where the laboratory did not track limits for an analyte, the limits in the QAPP were used.

Holding times, method/trip blanks, surrogate recoveries, laboratory control samples (LCS) and laboratory control sample duplicates (LCSD), matrix spike/matrix spike duplicates (MS/MSD), field duplicates, and reporting limits were reviewed where available to assess compliance with applicable methods. If qualification was required, data were qualified based on the definitions and use of qualifying flags outlined in the EPA guidance documents (EPA, 2020a and b).

ARI received the samples between August 15 and 17, 2023. The temperature of the coolers was recorded upon receipt and all coolers were below the maximum acceptable temperature of 6 degrees Celsius. According to the chain of custody, the trip blank should have been analyzed for metals and TOC, as well as VOCs. ARI properly analyzed the trip blank for VOCs only.

ORGANIC ANALYSES

Samples were analyzed for VOCs. Laboratory data were evaluated for the following parameters:

1. Preservation and Holding Times – Acceptable

   According to the cooler receipt form, the containers for metals and TOC analyses were labelled with the incorrect labels that indicated insufficient preservation. All containers were confirmed to be correctly preserved for analysis.

2. Blanks – Acceptable
3. Surrogates – Acceptable
4. LCS/LCSD – Acceptable
5. MS/MSD – Acceptable
6. Field Duplicates – Acceptable

   One field duplicate was submitted for each analysis during this sampling event, meeting the project frequency requirement of five percent, or one for every 20 samples. Primary and duplicate results are summarized in the table below. The project-specific control limit for field duplicate relative percent differences (RPDs) is 30 percent for concentrations greater than five times the reporting limit. The RPD is not calculated for results that are less than five times the reporting limit, as indicated on the table below by “NC.” In these cases, the absolute value of the difference between the primary and duplicate result should not exceed the value of the reporting limit. The field duplicate RPDs were within the control limits.

Sample ID/ Field Duplicate ID	Analyte	Primary Result (ng/L)	Duplicate Result (ng/L)	Reporting Limit (ng/L)	RPD (%)
RGW172S-08162023/ DUP01-08162023	vinyl chloride	277	283	20	2
	cis-1,2-dichloroethene	528	539	20	2
	trichloroethene	199	203	20	2
	tetrachloroethene	23.7	23.6	20	NC

Abbreviations
NC = not calculated
ng/L = nanograms per liter
RPD = relative percent difference

7. Reporting Limits and Laboratory Flags – Acceptable.

INORGANIC ANALYSES

Samples were analyzed for metals and TOC. Laboratory data were evaluated for the following parameters.

1. Preservation and Holding Times – Acceptable
2. Blanks – Acceptable
3. LCS – Acceptable
4. MS/MSD – Acceptable
5. Laboratory Duplicates – Acceptable
6. Field Duplicates – Acceptable except as noted:

   One field duplicate was submitted for each analysis during this sampling event, meeting the project frequency requirement of five percent, or one for every 20 samples. Primary and duplicate results are summarized in the table below. The project-specific control limit for field duplicate RPDs is 30 percent for concentrations greater than five times the reporting limit. The RPD is not calculated for results that are less than five times the reporting limit, as indicated on the table below by "NC." In these cases, the absolute value of the difference between the primary and duplicate result should not exceed the value of the reporting limit. The field duplicate RPDs were within control limits, except for total lead. The field duplicate for total lead results were above RPD control limits; primary and duplicate results for total lead are flagged with a "J."

Sample ID/ Field Duplicate ID	Analyte	Primary Result	Duplicate Result	Average Reporting Limit	RPD (%)
RGW172S-08162023/ DUP01-08162023	TOC	85.85 mg/L	85.70 mg/L	3.75 mg/L	0.2
	total arsenic	23.6 µg/L	30.0 µg/L	2.00 µg/L	24
	total copper	17.7 µg/L	20.5 µg/L	5.00 µg/L	NC
	total lead	14.7 µg/L	21.3 µg/L	1.00 µg/L	37

Abbreviations:
µg/L = micrograms per liter
mg/L = milligrams per liter
NC = not calculated
RPD = relative percent difference
TOC = total organic carbon

7. Reporting Limits and Laboratory Flags – Acceptable

OVERALL ASSESSMENT OF DATA

The table below summarizes the data assessment. The completeness of work order numbers 23H0426, 23H0443, and 23H0475 is 100 percent. The usefulness of these data was evaluated based on EPA guidance documents listed in the introduction to this report. Few problems were identified, and analytical performance was generally within specified limits. The data meet the project's data quality objectives.

Sample ID	Qualified Analyte	Reason for Qualifier	Qualified Result[1] (µg/L)
RGW152S-08152023	None	NA	NA
RGW153S-08152023	None	NA	NA
RGW234S-08162023	None	NA	NA
RGW235I-08162023	None	NA	NA
RGW172S-08162023	Total lead	High field duplicate RPD	14.7 J
RGW226S-08162023	None	NA	NA
RGW232S-08162023	None	NA	NA
DUP01-08162023	Total lead	High field duplicate RPD	21.3 J
TRIP BLANKS	None	NA	NA
RGW236S-08172023	None	NA	NA
RGW173S-08172023	None	NA	NA

Notes:
1. Data qualifiers are as follows:
   J = The value is an estimate

Abbreviations
µg/L = micrograms per liter
NA = not applicable
RPD = relative percent difference

REFERENCES

Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler), 2016, Quality Assurance Project Plan, Boeing Renton Facility, Renton, Washington: Prepared for the Boeing Company, February.

U.S. Environmental Protection Agency (EPA), 2020a, U.S. EPA National Functional Guidelines for Organic Superfund Methods Data Review: EPA 540-R-20-005, November.

EPA, 2020b, U.S. EPA National Functional Guidelines for Inorganic Superfund Methods Data Review: EPA 542-R-20-006, November.

Memo

To:	Patrick McCarthy, Project Manager	Project:	PS20203451.01
From:	Caitlin Riechmann	c:	Project File
Tel:	(503) 207-9629		
Date:	October 2, 2023		

Subject: Summary Data Quality Review
August 2023 Boeing Renton Groundwater Sampling
Building 4-78/79 SWMU/AOC Group
ARI Work Order Numbers: 23H0562, 23H0498

This memo presents the summary data quality review of seven primary groundwater samples, one groundwater field duplicate, and one trip blank sample collected on August 18 and 22, 2023. The samples were submitted to Analytical Resources, Inc. (ARI), located in Tukwila, Washington, a laboratory accredited by the Washington State Department of Ecology (Ecology). The samples were analyzed for the following:

– Volatile organic compounds (VOCs) (limited suite: benzene, vinyl chloride, cis-1,2-dichloroethene, and trichloroethene) by U.S. Environmental Protection Agency (EPA) Method 8260D;

– Total petroleum hydrocarbons as gasoline (TPH-G) by Ecology Method NWTPH Gx; and

– Total organic carbon (TOC) by Standard Method 5310B-00.

The samples and the analyses conducted on the samples are listed below.

Sample ID	Laboratory Sample ID	Requested Analyses
RGW031S-R-08222023	23H0562-01	all
RGW244S-R-08222023	23H0562-02	all
RGW143S-08182023	23H0498-01	all
RGW240D-08182023	23H0498-02	all
RGW237S-08182023	23H0498-03	all
RGW033S-08182023	23H0498-04	all
RGW034S-08182023	23H0498-05	all
DUP02-081823	23H0498-06	all
Trip Blanks	23H0498-07	VOCs, TPH-G

Data were reviewed in accordance with the appropriate method procedures and criteria documented in the Quality Assurance Project Plan (QAPP) (Amec Foster Wheeler, 2016). The control limits provided in the QAPP are advisory limits; therefore, the most current control limits provided by the laboratory were used to evaluate the quality control data. In cases where the laboratory did not track limits for an analyte, the limits in the QAPP were used.

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Holding times, method/trip blanks, surrogate recoveries, laboratory control samples (LCS) and laboratory control sample duplicates (LCSD), matrix spike/matrix spike duplicates (MS/MSD), field duplicates, and reporting limits were reviewed where available to assess compliance with applicable methods. If qualification was required, data were qualified based on the definitions and use of qualifying flags outlined in EPA guidelines (EPA, 2020a and b).

ARI received the samples on August 18 and 22, 2023. The temperature of the coolers was recorded upon receipt and all coolers were below the maximum acceptable temperature of 6 degrees Celsius. A trip blank was received with order number 23H0498 but was not included on the chain of custody, while a trip blank was noted on the chain of custody for order number 23H0562 but did not accompany that work order number. According to the chain of custody, the trip blank should have been analyzed for TOC, as well as TPH-G and VOCs. ARI properly analyzed the trip blank for TPH-G and VOCs.

ORGANIC ANALYSES

Samples were analyzed for VOCs and TPH-G. Laboratory data were evaluated for the following parameters:

1. Preservation and Holding Times – Acceptable
2. Blanks – Acceptable
3. Surrogates – Acceptable
4. LCS/LCSD – Acceptable
5. MS/MSD – Acceptable

   Extra volume was not submitted for analysis of MS/MSD samples. The project frequency requirement was achieved with MS/MSD analysis conducted at other sites included in this sampling event.

6. Field Duplicates – Acceptable

   One field duplicate was submitted for each analysis during this sampling event, meeting the project frequency requirement of five percent, or one for every 20 samples. Primary and duplicate results are summarized in the table below. The relative percent differences (RPDs) for the field duplicate are within the project-specific control limit of 30 percent for concentrations greater than five times the reporting limit. The RPD is not calculated for results that are less than five times the reporting limit, as indicated on the table below by "NC." In these cases, the absolute value of the difference between the primary and duplicate result should not exceed the value of the reporting limit. As shown in the table below, the field duplicate results are acceptable.

Sample ID/ Field Duplicate ID	Analyte	Primary Result (µg/L)	Duplicate Result (µg/L)	Reporting Limit (µg/L)	RPD (%)
RGW033S-08182023/ DUP02-08182023	vinyl chloride	0.94	0.93	0.20	NC
	cis-1,2-dichloroethene	0.42	0.46	0.20	NC
	benzene	8.85	9.44	0.20	NC
	trichloroethene	ND	ND	0.20	NC
	TPH-G	223	231	100	NC

<u>Abbreviations</u>
µg/L = micrograms per liter
NC = not calculated
ND = not detected
RPD = relative percent difference
TPH-G = total petroleum hydrocarbons as gasoline

7. Reporting Limits and Laboratory Flags – Acceptable.

INORGANIC ANALYSES

Samples were analyzed for TOC. Laboratory data were evaluated for the following parameters.

1. Preservation and Holding Times – Acceptable
2. Blanks – Acceptable
3. LCS – Acceptable
4. MS/MSD – Acceptable
5. Laboratory Duplicates – Acceptable
6. Field Duplicates – Acceptable

   One field duplicate was submitted for each analysis during this sampling event, meeting the project frequency requirement of five percent, or one for every 20 samples. Primary and duplicate results are summarized in the table below. The RPD is acceptable.

Sample ID/ Field Duplicate ID	Analyte	Primary Result (mg/L)	Duplicate Result (mg/L)	Reporting Limit (mg/L)	RPD (%)
RGW033S-08182023/ DUP02-08182023	TOC	14.32	14.55	0.50	2

Abbreviations:
mg/L = milligrams per liter
RPD = relative percent difference
TOC = total organic carbon

7. Reporting Limits and Laboratory Flags – Acceptable

OVERALL ASSESSMENT OF DATA

The table below summarizes the data assessment. The completeness of work order numbers 23H0562 and 23H0498 is 100 percent. Evaluation of the usefulness of these data is based on EPA guidance documents identified in the introduction to this report. No problems were identified, and analytical performance was within specified limits. The data meet the project's data quality objectives.

Sample ID	Qualified Analyte
RGW031S-R-08222023	none
RGW244S-R-08222023	none
RGW143S-08182023	none
RGW240D-08182023	none
RGW237S-08182023	none
RGW033S-08182023	none
RGW034S-08182023	none
DUP02-081823	none
Trip Blanks	none

REFERENCES

Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler), 2016, Quality Assurance Project Plan, Boeing Renton Facility, Renton, Washington: Prepared for the Boeing Company, February.

U.S. Environmental Protection Agency (EPA), 2020a, U.S. EPA National Functional Guidelines for Organic Superfund Methods Data Review: EPA 540-R-20-005, November.

EPA, 2020b, U.S. EPA National Functional Guidelines for Inorganic Superfund Methods Data Review: EPA 542-R-20-006, November.

Memo

To:	Patrick McCarthy, Project Manager	Project:	PS20203451.01
From:	Caitlin Riechmann	c:	Project File
Tel:	(503) 207-9629		
Date:	September 28, 2023		

Subject: Summary Data Quality Review
August 2023 Boeing Renton Groundwater Sampling
Former Fuel Farm AOC Group
ARI Work Order Number: 23H0427

This memo presents the summary data quality review of three primary groundwater samples and one field duplicate collected on August 15, 2023. The samples were submitted to Analytical Resources Inc. (ARI), a Washington State Department of Ecology (Ecology)-accredited laboratory located in Tukwila, Washington. The samples were analyzed for total petroleum hydrocarbons as diesel (TPH-D), plus motor oil (TPH-O) and Jet A (TPH-Jet A) ranges by Ecology Method NWTPH-Dx.

The samples and the analyses conducted on the samples are listed below.

Sample ID	Laboratory Sample ID	Requested Analyses
RGW211S-08152023	23H0427-01	all
RGW221S-08152023	23H0427-02	all
RGW224S-08152023	23H0427-03	all
DUP03-08152023	23H0427-04	all

Data were reviewed in accordance with the appropriate method procedures and criteria documented in the Quality Assurance Project Plan (QAPP) (Amec Foster Wheeler, 2016). The control limits provided in the QAPP are advisory limits; therefore, the most current control limits provided by the laboratory were used to evaluate the quality control data. In cases where the laboratory did not track limits for an analyte, the limits in the QAPP were used.

Holding times, method/trip blanks, surrogate recoveries, laboratory control samples (LCS) and laboratory control sample duplicates (LCSD), matrix spike/matrix spike duplicates (MS/MSD), field duplicates, and reporting limits were reviewed where available to assess compliance with applicable methods. If qualification was required, data were qualified based on the definitions and use of qualifying flags outlined in EPA guidelines (EPA, 2020).

ARI received the samples on August 15, 2023. The temperature of the cooler was recorded upon receipt and the cooler was below the maximum acceptable temperature of 6 degrees Celsius.

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ORGANIC ANALYSES

Samples were analyzed for TPH-D plus TPH-O and TPH-Jet A ranges. Laboratory data were evaluated for the following parameters:

1. Preservation and Holding Times – Acceptable except as noted:

   One sampling vial contained a bubble upon arrival at ARI. We assume that the lab used another vial with acceptable preservation and the samples were able to be analyzed normally with acceptable results. The data is not qualified for use.

2. Blanks – Acceptable
3. Surrogates – Acceptable
4. LCS/LCSD – Acceptable
5. MS/MSD – Acceptable

   Extra volume was not submitted for analysis of MS/MSD samples. The project frequency requirement was achieved with MS/MSD analysis conducted at other sites included in this sampling event.

6. Field Duplicates – Acceptable

   One field duplicate was submitted for each analysis during this sampling event, meeting the project frequency requirement of 5 percent, or one for every 20 samples. Primary and duplicate results are summarized in the table below. The project-specific control limit for field duplicate relative percent differences (RPDs) is 30 percent for concentrations greater than five times the reporting limit. The RPD is not calculated for results that are less than five times the reporting limit, as indicated on the table below by "NC." In these cases, the absolute value of the difference between the primary and duplicate result should not exceed the value of the reporting limit. The field duplicate RPDs were within control limits, except for TPH-D and TPH-Jet A. Primary and duplicate results for TPH-D and TPH-Jet A are flagged with a "J."

Sample ID/ Field Duplicate ID	Analyte	Primary Result (mg/L)	Duplicate Result (mg/L)	Reporting Limit (mg/L)	RPD (%)
RGW224S-08152023/ DUP03-08152023	TPH-D (C12–C24)	0.526	0.805	0.100	42
	TPH-O (C24–C38)	0.324	ND	0.200	NC
	TPH-Jet A (C10–C18)	0.913	1.36	0.100	39

Abbreviations
mg/L = milligrams per liter
NC = not calculated
ND = not detected
RPD = relative percent difference
TPH-D = total petroleum hydrocarbons as diesel
TPH-Jet A = total petroleum hydrocarbons in the Jet A range
TPH-O = total petroleum hydrocarbons as motor oil

7. Reporting Limits and Laboratory Flags – Acceptable.

OVERALL ASSESSMENT OF DATA

The table below summarizes the data assessment. The completeness of ARI work order number 23H0427 is 100 percent. Evaluation of the usefulness of these data is based on EPA guidance documents listed in the introduction to this report. Few problems were identified, and analytical performance was generally within specified limits. The data meet the project's data quality objectives.

Sample ID	Qualified Analyte	Reason for Qualifier	Qualified Result[1] (mg/L)
RGW211S-08152023	None	NA	NA
RGW221S-08152023	None	NA	NA
RGW224S-08152023	TPH-D	Field duplicate RPD	0.526 J
	TPH-Jet-A	Field duplicate RPD	0.913 J
DUP03-08152023	TPH-D	Field duplicate RPD	0.805 J
	TPH-Jet-A	Field duplicate RPD	1.36 J

Notes:

1. Data qualifiers are as follows:
   J = The value is an estimate.

Abbreviations

mg/L = milligrams per liter
NA = not applicable
RPD = relative percent difference
TPH-D = total petroleum hydrocarbons as diesel
TPH-Jet A = total petroleum hydrocarbons in the Jet A range

REFERENCES

Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler), 2016, Quality Assurance Project Plan, Boeing Renton Facility, Renton, Washington: Prepared for the Boeing Company, February.

U.S. Environmental Protection Agency (EPA), 2020, U.S. EPA National Functional Guidelines for Organic Superfund Methods Data Review: EPA 540-R-20-005, November.

Memo

To:	Patrick McCarthy, Project Manager	Project:	PS20203451.01
From:	Caitlin Riechmann	c:	Project File
Tel:	(503) 207-9629		
Date:	October 2, 2023		

Subject: Summary Data Quality Review
August 2023 Boeing Renton Groundwater Sampling
AOC -001, -002, and -003
ARI Work Order Numbers: 23H0560, 23H0591, 23H0616

This memo presents the summary data quality review of 17 primary groundwater samples and three trip blank samples collected between August 22 and 24, 2023. The samples were submitted to Analytical Resources, Inc. (ARI), located in Tukwila, Washington, a laboratory accredited by the Washington State Department of Ecology. The samples were analyzed for the following:

– Benzene (a volatile organic compound) by U.S. Environmental Protection Agency (EPA) Method 8260D;

– Volatile organic compounds (VOCs) (limited suite: vinyl chloride, 1,1 dichloroethene, cis 1,2 dichloroethene, trichloroethene, and/or tetrachloroethene) by U.S. Environmental Protection Agency (EPA) Method 8260D with selected ion monitoring; and

– Total organic carbon (TOC) by Standard Method 5310B 00.

The samples and the analyses conducted on the samples are listed below.

Sample ID	Laboratory Sample ID	Requested Analyses
RGW191D-R-08222023	23H0560-01	all
RGW192S-R-08222023	23H0560-02	all
RGW248I-08222023	23H0560-03	VOCs, TOC
RGW249S-08222023	23H0560-04	VOCs, TOC
RGW247S-R-08222023	23H0560-05	VOCs, TOC
RGW193S-R-08222023	23H0560-06	all
Trip Blanks	23H0560-07	benzene, VOCs
RGW188S-08232023	23H0591-01	VOCs, TOC
RGW190S-R-08232023	23H0591-02	all
RGW246S-R-08232023	23H0591-03	all
RGW196D-R-08232023	23H0591-04	all
RGW195S-R-08232023	23H0591-05	all

Sample ID	Laboratory Sample ID	Requested Analyses
RGW245S-R-08232023	23H0591-06	all
RGW185S-R-08232023	23H0591-07	all
RGW197S-R-08232023	23H0591-08	all
Trip Blanks	23H0591-09	VOCs, TOC
RGW213S-R-08242023	23H0616-01	all
RGW214S-R-08242023	23H0616-02	all
RGW215S-R-08242023	23H0616-03	all
Trip Blank	23H0616-04	Benzene, VOCs

Data were reviewed in accordance with the appropriate method procedures and criteria documented in the Quality Assurance Project Plan (QAPP) (Amec Foster Wheeler, 2016). The control limits provided in the QAPP are advisory limits; therefore, the most current control limits provided by the laboratory were used to evaluate the quality control data. In cases where the laboratory did not track limits for an analyte, the limits in the QAPP were used.

Holding times, method/trip blanks, surrogate recoveries, laboratory control samples (LCS) and laboratory control sample duplicates (LCSD), matrix spike/matrix spike duplicates (MS/MSD), field duplicates, and reporting limits were reviewed where available to assess compliance with applicable methods. If qualification was required, data were qualified based on the definitions and use of qualifying flags outlined in the EPA guidance documents (EPA, 2020a and b).

ARI received the samples between August 22 and 25, 2023. The temperature of the coolers was recorded upon receipt and all of the coolers were below the maximum acceptable temperature of 6 degrees Celsius. Analyses for the trip blanks were not specified on the chains of custody for work order numbers 23H0560 and 23H0616. The chain of custody for work order number 23H0591 specified that all analyses should be performed ARI properly analyzed all trip blanks for benzene and VOCs.

ORGANIC ANALYSES

Samples were analyzed for VOCs. Laboratory data were evaluated for the following parameters:

1. Preservation and Holding Times – Acceptable except as noted:

   Two sampling vials contained a bubble upon arrival at ARI. We assume that the lab used another vial with acceptable preservation and the samples were able to be analyzed normally with acceptable results. The data is not qualified for use.

   According to the cooler receipt form, the sample IDs, dates, and times listed on the container labels for samples RGW213S-R-08242023, RGW214S-R-08242023, and RGW215S-R-08242023 did not match the IDs, dates, and times listed on the COC. ARI logged the samples per the container labels.

2. Blanks – Acceptable
3. Surrogates – Acceptable
4. LCS/LCSD – Acceptable
5. MS/MSD – Acceptable

   Extra volume was not submitted for analysis of MS/MSD samples. The project frequency requirement was achieved with MS/MSD analysis conducted at other sites included in this sampling event.

6. Field Duplicates – Acceptable

   Field duplicates were not collected at this site during this sampling event. The project frequency requirement of one field duplicate for every 20 samples was achieved with field duplicate samples collected at other sites included in this sampling event.

7. Reporting Limits and Laboratory Flags – Acceptable.

INORGANIC ANALYSES

Samples were analyzed for TOC. Laboratory data were evaluated for the following parameters:

1. Preservation and Holding Times – Acceptable
2. Blanks – Acceptable
3. LCS – Acceptable
4. MS/MSD – Acceptable

   Extra volume was not submitted for analysis of MS/MSD samples. The project frequency requirement was achieved with MS/MSD analysis conducted at other sites included in this sampling event.

5. Laboratory Duplicates – Acceptable

   The laboratory did not perform duplicate analyses on the samples reviewed in this report.

6. Field Duplicates – Acceptable

   Field duplicates were not collected at this site during this sampling event. The project frequency requirement of one field duplicate for every 20 samples was achieved with field duplicate samples collected at other sites included in this sampling event.

7. Reporting Limits and Laboratory Flags – Acceptable

OVERALL ASSESSMENT OF DATA

The table below summarizes the data assessment. The completeness of work order numbers 23H0560, 23H0591, and 23H0616 is 100 percent. The usefulness of these data was evaluated based on EPA guidance documents listed in the introduction to this report. No problems were identified, and analytical performance was within specified limits.

Sample ID	Qualified Analyte
RGW191D-R-08222023	none
RGW192S-R-08222023	none
RGW248I-08222023	none
RGW249S-08222023	none
RGW247S-R-08222023	none
RGW193S-R-08222023	none
Trip Blanks	none
RGW188S-08232023	none
RGW190S-R-08232023	none

Sample ID	Qualified Analyte
RGW246S-R-08232023	none
RGW196D-R-08232023	none
RGW195S-R-08232023	none
RGW245S-R-08232023	none
RGW185S-R-08232023	none
RGW197S-R-08232023	none
Trip Blanks	none
RGW213S-R-08242023	none
RGW214S-R-08242023	none
RGW215S-R-08242023	none
Trip Blank	none

REFERENCES

Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler), 2016, Quality Assurance Project Plan, Boeing Renton Facility, Renton, Washington: Prepared for the Boeing Company, February.

U.S. Environmental Protection Agency (EPA), 2020a, U.S. EPA National Functional Guidelines for Organic Superfund Methods Data Review: EPA 540 R 20 005, November.

EPA, 2020b, U.S. EPA National Functional Guidelines for Inorganic Superfund Methods Data Review: EPA 542 R 20 006, November.

Memo

To:	Patrick McCarthy, Project Manager	Project:	PS20203451.01
From:	Caitlin Riechmann	c:	Project File
Tel:	(503) 207-9629		
Date:	September 28, 2023		

Subject: Summary Data Quality Review
August 2023 Boeing Renton Groundwater Sampling
AOC-004
ARI Work Order Number: 23H0396

This memo presents the summary data quality review of one primary groundwater sample collected on August 14, 2023. The sample was submitted to Analytical Resources, Inc. (ARI), located in Tukwila, Washington, a laboratory accredited by the Washington State Department of Ecology. The sample was analyzed for total lead by U.S. Environmental Protection Agency (EPA) Method 6020A.

The sample and the analyses conducted on the sample are listed below.

Sample ID	Laboratory Sample ID	Requested Analyses
RGW250S-08142023	23H0396-01	total lead

Data were reviewed in accordance with the appropriate method procedures and criteria documented in the Quality Assurance Project Plan (QAPP) (Amec Foster Wheeler, 2016). The control limits provided in the QAPP are advisory limits; therefore, the most current control limits provided by the laboratory were used to evaluate the quality control data. In cases where the laboratory did not track limits for an analyte, the limits in the QAPP were used.

Holding times, method/trip blanks, laboratory control samples (LCS) and laboratory control sample duplicates (LCSD), matrix spike/matrix spike duplicates (MS/MSD), field duplicates, and reporting limits were reviewed where available to assess compliance with applicable methods. If qualification was required, data were qualified based on the definitions and use of qualifying flags outlined in the EPA guidance documents (EPA, 2020).

ARI received the sample on August 15, 2023. The temperature of the cooler was recorded upon receipt and was below the maximum acceptable temperature of 6 degrees Celsius.

ORGANIC ANALYSES

Samples were analyzed for total lead. Laboratory data were evaluated for the following parameters:

1. Preservation and Holding Times – Acceptable
2. Blanks – Acceptable
3. LCS – Acceptable
4. MS – Acceptable

5. Laboratory Duplicates – Acceptable
6. Field Duplicates – Acceptable

   Field duplicates were not collected at this site during this sampling event. The project frequency requirement of one field duplicate for every 20 samples was achieved with field duplicate samples collected at other sites included in this sampling event.
7. Reporting Limits and Laboratory Flags – Acceptable.

OVERALL ASSESSMENT OF DATA

The table below summarizes the data assessment. The completeness of work order number 23H0396is 100 percent. The usefulness of these data was evaluated based on EPA guidance documents listed in the introduction to this report. No problems were identified, and analytical performance was within specified limits.

Sample ID	Qualified Analyte
RGW250S-08142023	none

REFERENCES

Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler), 2016, Quality Assurance Project Plan, Boeing Renton Facility, Renton, Washington: Prepared for the Boeing Company, February.

U.S. Environmental Protection Agency (EPA), 2020, U.S. EPA National Functional Guidelines for Organic Superfund Methods Data Review: EPA 540 R 20 005, November.

Memo

To:	Patrick McCarthy, Project Manager	Project:	PS20203451.01
From:	Caitlin Riechmann	c:	Project File
Tel:	(503) 207-9629		
Date:	October 2, 2023		

Subject: Summary Data Quality Review
August 2023 Boeing Renton Groundwater Sampling
AOC-060
ARI Work Order Numbers: 23H0477, 23H0500

This memo presents the summary data quality review of six primary groundwater samples, one field duplicate, and one trip blank sample collected on August 17 and 18, 2023. The samples were submitted to Analytical Resources, Inc. (ARI), located in Tukwila, Washington, a laboratory accredited by the Washington State Department of Ecology. The samples were selectively analyzed for the following:

- Volatile organic compounds (VOCs) (cis-1,2-dichloroethene, trichloroethene, and vinyl chloride) by U.S. Environmental Protection Agency (EPA) Method 8260D with selected ion monitoring; and
- Total organic carbon (TOC) by Standard Method 5310B-00.

The samples and the analyses conducted on the samples are listed below.

Sample ID	Laboratory Sample ID	Requested Analyses
RGW150S-08172023	23H0477-01	all
RGW253I-08172023	23H0477-02	all
RGW147S-08172023	23H0477-03	all
RGW014S-08172023	23H0477-04	all
DUP04-08142023	23H0477-05	all
RGW012S-08172023	23H0477-06	all
TRIP BLANKS	23H0477-07	VOCs
RGW009S-08182023	23H0500-01	all

Data were reviewed in accordance with the appropriate method procedures and criteria documented in the Quality Assurance Project Plan (QAPP) (Amec Foster Wheeler, 2016). The control limits provided in the QAPP are advisory limits; therefore, the most current control limits provided by the laboratory were used to evaluate the quality control data. In cases where the laboratory did not track limits for an analyte, the limits in the QAPP were used.

Hold times, method/trip blanks, surrogate recoveries, laboratory control samples (LCS) and laboratory control sample duplicates (LCSD), matrix spike/matrix spike duplicates (MS/MSD), field duplicates, and reporting limits were reviewed where available to assess compliance with applicable methods. If qualification was required, data were qualified based on the definitions and use of qualifying flags outlined in EPA guidelines (EPA, 2020a and b).

Samples were received by ARI on August 18, 2023. The temperature of the cooler was recorded upon receipt and was below the maximum acceptable temperature of 6 degrees Celsius. Analyses were not specified on the chain of custody for the trip blank. ARI properly analyzed the trip blank for VOCs.

ORGANIC ANALYSES

Samples were analyzed for VOCs. Laboratory data were evaluated for the following parameters:

1. Preservation and Holding Times – Acceptable
2. Blanks – Acceptable
3. Surrogates – Acceptable
4. LCS/LCSD – Acceptable
5. MS/MSD – Acceptable

   Extra volume was not submitted for analysis of MS/MSD samples. The project frequency requirement was achieved with MS/MSD analysis conducted at other sites included in this sampling event.

6. Field Duplicates – Acceptable

   One field duplicate was submitted for each analysis during this sampling event, meeting the project frequency requirement of five percent, or one for every 20 samples. Primary and duplicate results are summarized in the table below. The project-specific control limit for field duplicate relative percent differences (RPDs) is 30 percent for concentrations greater than five times the reporting limit. The RPD is not calculated for results that are less than five times the reporting limit, as indicated on the table below by "NC." In these cases, the absolute value of the difference between the primary and duplicate result should not exceed the value of the reporting limit. The field duplicate RPDs were within the control limits.

Sample ID/ Field Duplicate ID	Analyte	Primary Result (ng/L)	Duplicate Result (ng/L)	Reporting Limit (ng/L)	RPD (%)
RGW014S-08172023/ DUP04-08172023	vinyl chloride	551	519	20.0	6
	cis-1,2-dichloroethene	179	170	20.0	5
	trichloroethene	15.8 J	12.6 J	20.0	NC

Abbreviations
ng/L = nanograms per liter
NC = not calculated
RPD = relative percent difference

7. Reporting Limits and Laboratory Flags – Acceptable.

INORGANIC ANALYSES

Samples were analyzed for TOC. Laboratory data were evaluated for the following parameters:

1. Preservation and Holding Times –Acceptable except as noted:

   The vial for sample RGW012S-08172023 was received at a pH of >2. ARI adjusted the pH upon receipt and proceeded with analysis. No data were qualified.

2. Blanks – Acceptable

3. LCS – Acceptable
4. MS/MSD – Acceptable

   Extra volume was not submitted for analysis of MS/MSD samples. The project frequency requirement was achieved with MS/MSD analysis conducted at other sites included in this sampling event.

5. Laboratory Duplicates – Acceptable

   The laboratory did not perform duplicate analyses on the samples reviewed in this report.

6. Field Duplicates – Acceptable

   One field duplicate was submitted for TOC analysis during this sampling event, meeting the project frequency requirement of five percent, or one for every 20 samples. Primary and duplicate results are summarized in the table below. The project-specific control limit for field duplicate RPDs is 30 percent for concentrations greater than five times the reporting limit. The RPD is not calculated for results that are less than five times the reporting limit, as indicated on the table below by "NC." In these cases, the absolute value of the difference between the primary and duplicate result should not exceed the value of the reporting limit. The field duplicate RPD was within the control limits.

Sample ID/ Field Duplicate ID	Analyte	Primary Result (mg/L)	Duplicate Result (mg/L)	Reporting Limit (mg/L)	RPD (%)
RGW014S-08172023/ DUP04-08172023	TOC	5.21	5.30	0.50	2

Abbreviations
mg/L = milligrams per liter
RPD= relative percent difference
TOC = total organic carbon

7. Reporting Limits and Laboratory Flags – Acceptable

OVERALL ASSESSMENT OF DATA

The table below summarizes the data assessment. The completeness of work order numbers 23H0477 and 23H0500 is 100 percent. Evaluation of the usefulness of these data is based on the EPA guidance document listed in the introduction to this report. No problems were identified, and analytical performance was within specified limits. The data meet the project's data quality objectives.

Sample ID	Qualified Analyte
RGW150S-08172023	none
RGW253I-08172023	none
RGW147S-08172023	none
RGW014S-08172023	none
DUP04-08142023	none
RGW012S-08172023	none
TRIP BLANKS	none
RGW009S-08182023	none

REFERENCES

Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler), 2016, Quality Assurance Project Plan, Boeing Renton Facility, Renton, Washington: Prepared for the Boeing Company, February.

U.S. Environmental Protection Agency (EPA), 2020a, U.S. EPA National Functional Guidelines for Organic Superfund Methods Data Review: EPA 540 R 20 005, November.

EPA, 2020b, U.S. EPA National Functional Guidelines for Inorganic Superfund Methods Data Review: EPA 542 R 20 006, November.

Memo

To:	Patrick McCarthy, Project Manager	Project:	PS20203451.01
From:	Caitlin Riechmann	c:	Project File
Tel:	(503) 207-9629		
Date:	October 2, 2023		

Subject: Summary Data Quality Review
August 2023 Boeing Renton Groundwater Sampling
AOC-090
ARI Work Order Number: 23H0625

This memo summarizes the data quality review of five primary groundwater samples and one trip blank sample collected on August 23 and 24, 2023. The samples were submitted to Analytical Resources, Inc. (ARI), located in Tukwila, Washington, a laboratory accredited by the Washington State Department of Ecology (Ecology). The samples were selectively analyzed for the following:

- Volatile organic compounds (VOCs) (acetone, methylene chloride, trans 1,2 dichloroethene, cis 1,2 dichloroethene, chloroform, carbon tetrachloride, benzene, toluene, and 1,1,2 trichloroethane) by U.S. Environmental Protection Agency (EPA) Method 8260D);
- VOCs (vinyl chloride, 1,1 dichloroethene, trichloroethene, tetrachloroethene, and 1,1,2,2 tetrachloroethane) by EPA Method 8260D with selected ion monitoring (SIM);
- Total petroleum hydrocarbons in the gasoline range (TPH-G) by Ecology Method NWTPH Gx;
- Total petroleum hydrocarbons in the diesel and motor oil ranges (TPH-D and TPH-MO) by Ecology Method NWTPH Dx (with silica gel cleanup); and
- Total organic carbon (TOC) by Standard Method 5310B 00.

The samples and the analyses conducted on the samples are listed below.

Sample ID	Laboratory Sample ID	Requested Analyses
RGW176S-08242023	23H0625-01	Vinyl chloride
RGW178S-08242023	23H0625-02	Vinyl chloride
RGW207S-08242023	23H0625-03	Vinyl chloride
RGW208S-08242023	23H0625-04	Vinyl chloride
RGW189S-08242023	23H0625-05	All
Trip Blank	23H0625-06	VOCs

Data were reviewed in accordance with the appropriate method procedures and criteria documented in the Quality Assurance Project Plan Addendum (QAPP) (Amec Foster Wheeler, 2016). The control limits provided in the QAPP are advisory limits; therefore, the most current control limits provided by the laboratory were used to

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evaluate the quality control data. In cases where the laboratory did not track limits for an analyte, the limits in the QAPP were used.

Holding times, method/trip blanks, surrogate recoveries, laboratory control samples (LCS), laboratory duplicates (LCSD), matrix spike/matrix spike duplicates (MS/MSD), field duplicates, and reporting limits were reviewed where available to assess compliance with applicable methods. If qualification was required, data were qualified based on the definitions and use of qualifying flags outlined in EPA guidelines (EPA, 2020a and b).

ARI received the samples on August 25, 2023. The temperature of the cooler was recorded upon receipt and was below the maximum acceptable temperature of 6 degrees Celsius. Analyses for the trip blank were not specified on the chain of custody. ARI properly analyzed the trip blank for VOCs only.

ORGANIC ANALYSES

Samples were analyzed for VOCs and TPH-G, TPH-D, and TPH-MO. Laboratory data were evaluated for the following parameters:

1. Preservation and Holding Times – Acceptable
2. Blanks – Acceptable
3. Surrogates – Acceptable
4. LCS/LCSD – Acceptable
5. MS/MSD – Acceptable except as noted:

   Toluene recovery was high at 141% and 142% in the MS and MSD performed on sample RGW189S-08242023. The toluene result from sample RGW189S-08242023 is flagged with a “J.”

6. Field Duplicates – Acceptable

   Field duplicates were not collected at this site during this sampling event. The project frequency requirement of one field duplicate for every 20 samples was achieved with field duplicate samples collected at other sites included in this sampling event.

7. Reporting Limits and Laboratory Flags – Acceptable.

INORGANIC ANALYSES

Samples were analyzed for TOC. Laboratory data were evaluated for the following parameters:

1. Preservation and Holding Times –Acceptable
2. Blanks – Acceptable
3. LCS – Acceptable
4. MS – Acceptable
5. Laboratory Duplicates – Acceptable
6. Field Duplicates – Acceptable

   Field duplicates were not collected at this site during this sampling event. The project frequency requirement of one field duplicate for every 20 samples was achieved with field duplicate samples collected at other sites included in this sampling event.

7. Reporting Limits and Laboratory Flags – Acceptable

OVERALL ASSESSMENT OF DATA

The table below summarizes the data assessment. The completeness of ARI work order number 23H0625 is 100 percent. The usefulness of these data was evaluated based on EPA guidance documents listed in the introduction to this report. Few problems were identified, and analytical performance was generally within specified limits. The data, as qualified, meet the project's data quality objectives.

Sample ID	Qualified Analyte	Qualifier Reason	Qualified Result[1] (µg/L)
RGW176S-08242023	None	NA	NA
RGW178S-08242023	None	NA	NA
RGW207S-08242023	None	NA	NA
RGW208S-08242023	None	NA	NA
RGW189S-08242023	Toluene	High MS recovery	17.2 J
Trip Blank	None	NA	NA

Note:

1. Data qualifiers are as follows:
   J = The value is an estimate.

Abbreviations:
µg/L = micrograms per liter
MS = matrix spike
NA = not applicable

REFERENCES

Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler), 2016, Quality Assurance Project Plan, Boeing Renton Facility, Renton, Washington: Prepared for the Boeing Company, February.

U.S. Environmental Protection Agency (EPA), 2020a, U.S. EPA National Functional Guidelines for Organic Superfund Methods Data Review: EPA 540 R 20 005, November.

EPA, 2020b, U.S. EPA National Functional Guidelines for Inorganic Superfund Methods Data Review: EPA 542 R 20 006, November.

Memo

To:	Patrick McCarthy, Project Manager	Project:	PS20203451.01
From:	Caitlin Riechmann	c:	Project File
Tel:	(503) 207-9629		
Date:	October 2, 2023		

Subject: Summary Data Quality Review
August 2023 Boeing Renton Groundwater Sampling
Apron A
ARI Work Order Number: 23H0394

This memo presents the summary data quality review of one primary groundwater sample and one trip blank sample collected on August 14, 2023. The samples were submitted to Analytical Resources, Inc., (ARI), located in Tukwila, Washington, a laboratory accredited by the Washington State Department of Ecology. The samples were analyzed for the following:

- Volatile organic compounds (VOCs) (vinyl chloride and cis-1,2-dichloroethene) by U.S. Environmental Protection Agency (EPA) Method 8260D; and
- Total organic carbon (TOC) by Standard Method 5310B.

The samples and the analyses conducted on the samples are listed below.

Sample ID	Laboratory Sample ID	Requested Analyses
RGW264S-08142023	23H0394-01	all
Trip Blanks	23H0394-02	VOCs

Data were reviewed in accordance with the appropriate method procedures and criteria documented in the Quality Assurance Project Plan (QAPP) (Amec Foster Wheeler, 2016). The control limits provided in the QAPP are advisory limits; therefore, the most current control limits provided by the laboratory were used to evaluate the quality control data. In cases where the laboratory did not track limits for an analyte, the limits in the QAPP were used.

Holding times, method/trip blanks, surrogate recoveries, laboratory control samples (LCS) and laboratory control sample duplicates (LCSD), matrix spike/matrix spike duplicates (MS/MSD), field duplicates, and reporting limits were reviewed where available to assess compliance with applicable methods. If qualification was required, data were qualified based on the definitions and use of qualifying flags outlined in the EPA guidance documents (EPA, 2020a and b).

ARI received the samples on August 14, 2023. Sample RGW264S-08142023 was incorrectly logged by the laboratory as RGW2645-08142023. For the remainder of this report, the sample will be referred to as RGW264S-08142023. The temperature of the coolers was recorded upon receipt and was below the maximum acceptable temperature of 6 degrees Celsius (°C). Analyses for the trip blank were not specified on the chain of custody. ARI properly analyzed the trip blank for VOCs only.

ORGANIC ANALYSES

Samples were analyzed for VOCs. Laboratory data were evaluated for the following parameters:

1. Preservation and Holding Times – Acceptable

   Two sampling vials contained a bubble upon arrival at ARI. We assume that the lab used another vial with acceptable preservation and the sample was able to be analyzed normally with acceptable results. The data is not qualified for use.

2. Blanks – Acceptable
3. Surrogates – Acceptable
4. LCS/LCSD – Acceptable
5. MS/MSD – Acceptable except as noted:

   Extra volume was not submitted for analysis of MS/MSD samples. The project frequency requirement was achieved with MS/MSD analysis conducted at other sites included in this sampling event.

6. Field Duplicates – Acceptable

   Field duplicates were not collected at this site during this sampling event. The project frequency requirement of one field duplicate for every 20 samples was achieved with field duplicate samples collected at other sites included in this sampling event.

7. Reporting Limits and Laboratory Flags – Due to matrix interference (foam), ALS used a smaller initial sample volume for sample RGW-264S-08142023, resulting in a raised reporting limit.

INORGANIC ANALYSES

Samples were analyzed for TOC. Laboratory data were evaluated for the following parameters:

1. Preservation and Holding Times –Acceptable
2. Blanks – Acceptable
3. LCS – Acceptable
4. MS/MSD – Acceptable

   Extra volume was not submitted for analysis of MS/MSD samples. The project frequency requirement was achieved with MS/MSD analysis conducted at other sites included in this sampling event.

5. Laboratory Duplicates – Acceptable

   The laboratory did not perform duplicate analyses on the samples reviewed in this report.

6. Field Duplicates – Acceptable

   Field duplicates were not collected at this site during this sampling event. The project frequency requirement of one field duplicate for every 20 samples was achieved with field duplicate samples collected at other sites included in this sampling event.

7. Reporting Limits and Laboratory Flags – Acceptable.

OVERALL ASSESSMENT OF DATA

The table below summarizes the data assessment. The completeness of work order number 23H0394 is 100 percent. The usefulness of these data was evaluated based on EPA guidance documents listed in the introduction to this report. No problems were identified, and analytical performance was within specified limits. The data meet the project's data quality objectives.

Sample ID	Qualified Analyte
RGW264S-08142023	none
Trip Blanks	none

REFERENCES

Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler), 2016, Quality Assurance Project Plan, Boeing Renton Facility, Renton, Washington: Prepared for the Boeing Company, February.

U.S. Environmental Protection Agency (EPA), 2020a, U.S. EPA National Functional Guidelines for Organic Superfund Methods Data Review: EPA 540 R 20 005, November.

EPA, 2020b, U.S. EPA National Functional Guidelines for Inorganic Superfund Methods Data Review: EPA 542 R 20 006, November.

APPENDIX D

HISTORICAL GROUNDWATER DATA TABLES

TABLE D-1: SWMU-168 HISTORICAL CONCENTRATIONS OF CONSTITUENTS OF CONCERN[1, 2]

Boeing Renton Facility, Renton, Washington

Analyte	Current Cleanup Level[4]	Well ID[3] CPOC Area GW229S							
		11/7/2016	3/1/2017	8/14/2017	3/5/2018	8/13/2018	3/4/2019	8/12/2019	3/9/2020
Volatile Organic Compounds (µg/L)									
Vinyl Chloride	0.11	0.020 U	0.020 U	0.021	0.0273	0.020 U	0.0211	0.020 U	0.020 U

Analyte	Current Cleanup Level[4]	Well ID[3] CPOC Area GW230I							
		3/9/2020	8/10/2020	2/15/2021	8/10/2021	2/21/2022	8/17/2022	2/9/2023	8/24/2023
Volatile Organic Compounds (µg/L)									
Vinyl Chloride	0.11	0.087	**0.162**	0.076	0.359 J	**0.164**	**0.539 J**	**0.146**	0.101

Analyte	Current Cleanup Level[4]	Well ID[3] CPOC Area GW231S							
		11/7/2016	3/1/2017	8/14/2017	3/5/2018	8/13/2018	3/4/2019	8/12/2019	3/9/2020
Volatile Organic Compounds (µg/L)									
Vinyl Chloride	0.11	0.020 U	0.020 U	0.020 U	0.0393	0.0326	0.0327	0.026	0.020 U

Notes:

1. Data qualifiers are as follows:
   U = The analyte was not detected at the reporting limit indicated.
2. **Bolded** values exceed the cleanup levels.
3. S = shallow well; I = intermediate well.
4. Current cleanup levels obtained from Table 2 of the Cleanup Action Plan and are based on each individual SWMU or AOC.

Abbreviations:

µg/L = micrograms per liter
AOC = area of concern
CPOC = conditional point of compliance
SWMU = solid waste management unit

TABLE D-2: SWMU-172 AND SWMU-174 GROUP HISTORICAL CONCENTRATIONS OF CONSTITUENTS OF CONCERN[1, 2]

Boeing Renton Facility, Renton, Washington

Analyte	Current Cleanup Level[4]	Well ID[3] Source Area GW152S									GW153S								
		3/9/2020	8/10/2020	2/15/2021	8/10/2021	2/21/2022	2/21/2022	8/24/2022	2/8/2023	8/15/2023	3/9/2020	5/11/2020	8/10/2020	2/15/2021	8/10/2021	2/21/2022	8/24/2022	2/8/2023	8/15/2023
Volatile Organic Compounds (µg/L)																			
cis-1,2-Dichloroethene	0.03	0.892	1.66	0.144	1.330	1.57	1.59	0.877	3.16 J	1.46	0.0736	0.0789	0.0551	0.077	0.0582 J	0.0517	0.100	0.0569 J	0.0528
Tetrachloroethene	0.02	1.12	0.319	0.081	0.0872	1.84	1.71	1.05	0.234 J	1.06	0.024	0.020 U	0.020 U	0.020 U	0.020 UJ	0.0200 U	0.0200 U	0.0200 UJ	0.0161 J
Trichloroethene	0.02	0.278	0.579	0.020 U	0.129	0.522	0.497	0.534	0.101 J	0.412	0.02 U	0.020 U	0.020 U	0.020 U	0.020 UJ	0.0200 U	0.0525	0.0200 UJ	0.0172 J
Vinyl Chloride	0.11	0.15	0.284	0.0378	0.506	0.200	0.219	0.346	0.195 J	0.209	0.249	0.266	0.135	0.220	0.193 J	0.174	0.214	0.148 J	0.0881
Total Metals (µg/L)																			
Arsenic	1.0	3.84	6.72	7.67	16.3	2.88	2.34	47.7	6.92	39.8	5.48	3.85	4.05	32.8	32.8	4.98	2.85	4.76	2.39
Copper	3.5	8.03	7.45 J	17.2 J	9.08 J	5.07	3.88	9.17	6.61	4.98 J	3.09	1.73	1.68	33.9	33.9	1.45	0.641	1.14	0.408 J
Lead	1.0	6.13	3.89	12.5 J	5.38 J	2.78 J	1.90 J	5.75	4.24 J	32.2	0.712	0.372	0.326	5.80	5.80	0.302	0.123	0.256	0.200 U

Analyte	Current Cleanup Level[4]	Well ID[3] Downgradient Plume Area GW172S									GW173S								
		8/12/2019	5/11/2020	8/10/2020	2/15/2021	8/10/2021	2/21/2022	8/24/2022	2/8/2023	8/16/2023	3/9/2020	5/11/2020	8/10/2020	2/15/2021	8/10/2021	2/21/2022	8/24/2022	2/8/2023	8/17/2023
Volatile Organic Compounds (µg/L)																			
cis-1,2-Dichloroethene	0.03	0.027	0.214	0.0561	0.108	0.0746	0.0532	0.0436	0.155 J	0.528	0.0504	0.0488	0.0313	0.0505	0.0424 J	0.0280	0.168	0.0909 J	0.107
Tetrachloroethene	0.02	0.0451	0.0625	0.0603	0.0624	0.020 U	0.0677	0.0200 U	0.0200 UJ	0.0237	0.0224	0.020 U	0.020 U	0.020 U	0.020 UJ	0.0200 U	0.0200 U	0.0429 J	0.0102 J
Trichloroethene	0.02	0.020 U	0.028	0.020 U	0.020 U	0.020 U	0.0201	0.0200 U	0.0200 UJ	0.199	0.0305	0.0215	0.0239	0.020 U	0.020 UJ	0.0200 U	0.0496	0.0479 J	0.0262
Vinyl Chloride	0.11	0.0376	0.369	0.0628	0.219	0.155	0.137	0.0887	0.601 J	0.277	0.144	0.126	0.0455	0.183	0.176 J	0.0696	0.175	0.210 J	0.132
Total Metals (µg/L)																			
Arsenic	1.0	10.6	7.03	10.8	10.8	7.18	11.2	4.86	6.64	23.6	11.8	6.72	7.00	9.94	11.4	13.8	6.04	5.69	7.26
Copper	3.5	3.86	2.2	6.12	3.89	2.86	2.86	1.52	6.17	17.7	1.51	0.875	3.19	3.11	5.96	2.58	1.54	2.98	1.09
Lead	1.0	1.02	1.07	2.58	1.98	1.33	1.37	1.32	3.80	14.7 J	0.442	0.215	0.470	0.850	1.65	0.788	0.468	0.752	0.384

Analyte	Current Cleanup Level[4]	Well ID[3] Downgradient Plume Area GW226S									CPOC Area GW232S								
		8/12/2019	5/11/2020	8/10/2020	2/15/2021	8/10/2021	2/21/2022	8/24/2022	2/8/2023	8/16/2023	3/9/2020	5/11/2020	8/10/2020	2/15/2021	8/10/2021	2/21/2022	8/24/2022	2/8/2023	8/16/2023
Volatile Organic Compounds (µg/L)																			
cis-1,2-Dichloroethene	0.03	0.0259	0.0305	0.0218	0.020 U	0.0335 J	0.0363	0.0255	0.0431 J	0.0169 J	0.221	0.352	0.482	0.219	0.464 J	0.197	0.325	0.206 J	0.236
Tetrachloroethene	0.02	0.020 U	0.020 U	0.0279	0.020 U	0.0202 J	0.0200 U	0.0200 U	0.0200 UJ	0.0200 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 UJ	0.0200 U	0.0200 U	0.0200 UJ	0.0200 U
Trichloroethene	0.02	0.020 U	0.020 U	0.020 U	0.020 U	0.020 UJ	0.0200 U	0.0200 U	0.0200 UJ	0.00910 J	0.020 U	0.020 U	0.020 U	0.020 U	0.020 UJ	0.0200 U	0.0200 U	0.0200 UJ	0.0129 J
Vinyl Chloride	0.11	0.029	0.0594	0.0415	0.0519	0.0516 J	0.0414	0.128	0.0734 J	0.0886	0.264	0.337	0.425	0.263	0.653 J	0.307	0.558	0.290 J	0.348
Total Metals (µg/L)																			
Arsenic	1.0	2.85	3.33	4.93	8.12	5.57	7.33	3.09	4.28	5.22	2.73	4.71	3.83	4.78	6.19	3.75	3.83	3.51	6.16
Copper	3.5	0.626	0.704	1.48	3.92	1.48	2.40	0.500 U	0.500 U	1.31 J	2.22	0.539	0.627	2.09	1.79	1.09	0.500 U	0.915	1.26 J
Lead	1.0	0.100 U	0.190	0.136	0.513	0.124	0.237	0.100 U	0.100 U	0.500 U	0.354	0.100 U	0.100 U	0.318	0.262	0.234	0.122	0.124	0.285 J

TABLE D-2: SWMU-172 AND SWMU-174 GROUP HISTORICAL CONCENTRATIONS OF CONSTITUENTS OF CONCERN [1, 2]

Boeing Renton Facility, Renton, Washington

Analyte	Current Cleanup Level[4]	Well ID [3] CPOC Area GW234S 8/12/2019	5/11/2020	8/10/2020	2/15/2021	8/10/2021	2/21/2022	8/24/2022	2/9/2023	8/16/2023
Volatile Organic Compounds (µg/L)										
cis-1,2-Dichloroethene	0.03	**0.0738**	**0.092**	**0.0914**	0.020 U	**0.0892**	**0.0591**	**0.134**	**0.0581 J**	**0.103**
Tetrachloroethene	0.02	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.0200 U	0.0200 U	0.0200 UJ	0.0200 U
Trichloroethene	0.02	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.0200 U	0.0200 U	0.0200 UJ	0.0163 J
Vinyl Chloride	0.11	0.0252	0.032	0.0279	0.020 U	0.0497	0.0318	**0.170**	0.0304 J	0.0726
Total Metals (µg/L)										
Arsenic	1.0	**1.31**	**5.31**	**3.26**	**6.29**	**1.18**	**1.76**	0.974	**5.90**	0.93
Copper	3.5	0.869	2.43	3.21	**11.4**	2.58	2.13	2.31	**16.6**	1.3
Lead	1.0	0.280	0.671	**1.25**	**4.13**	**1.01**	0.930	0.830	**6.75**	0.27

Analyte	Current Cleanup Level[4]	Well ID [3] CPOC Area GW235I 3/9/2020	5/11/2020	8/10/2020	2/15/2021	8/10/2021	2/21/2022	8/24/2022	2/9/2023	8/16/2023
Volatile Organic Compounds (µg/L)										
cis-1,2-Dichloroethene	0.03	**0.127**	**0.156**	**0.104**	**0.128**	**0.179**	**0.175**	**0.227**	**0.235 J**	**0.225**
Tetrachloroethene	0.02	0.020 U	0.020 U	0.020 U	**0.0292**	0.020 U	0.0200 U	0.0200 U	0.0200 UJ	0.0200 U
Trichloroethene	0.02	**0.0336**	**0.031**	**0.0227**	0.020 U	**0.0285**	**0.0253**	**0.0250**	**0.0296 J**	0.0189 J
Vinyl Chloride	0.11	0.020 U	0.020 U	0.020 U	0.020 U	**0.24**	0.0259	0.0280	0.0310 J	0.0313
Total Metals (µg/L)										
Arsenic	1.0	0.251	0.289	0.288	0.200 U	0.200 U	0.200 U	0.200 U	0.283	0.318 J
Copper	3.5	0.935	1.08	1.30	0.727	0.689	0.687	0.500 U	1.23	0.676 J
Lead	1.0	0.235	0.223	0.304	0.174	0.179	0.159	0.100 U	0.332	0.224

Analyte	Current Cleanup Level[4]	Well ID [3] CPOC Area GW236S 8/12/2019	5/11/2020	8/10/2020	2/15/2021	8/10/2021	2/21/2022	8/24/2022	2/9/2023	8/17/2023
Volatile Organic Compounds (µg/L)										
cis-1,2-Dichloroethene	0.03	**0.0468**	**0.036**	**0.0881**	0.020 U	**0.0791**	0.0200 U	**0.0572**	**0.0364 J**	**0.0473**
Tetrachloroethene	0.02	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	**0.0206**	0.0200 U	0.0200 UJ	0.0200 U
Trichloroethene	0.02	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.0200 U	0.0200 U	0.0200 UJ	0.0187 J
Vinyl Chloride	0.11	0.020 U	0.020 U	0.020 U	0.020 U	0.0223	0.0200 U	0.0200 U	0.0200 UJ	0.0128 J
Total Metals (µg/L)										
Arsenic	1.0	**3.70**	**2.10**	**10.1**	**2.89**	**5.49**	**1.97**	**0.995**	**1.64**	**1.55**
Copper	3.5	0.893	**4.24**	**10.8**	**9.70**	2.47	**5.27**	1.22	2.07	1.00 U
Lead	1.0	**1.53**	**2.61**	**10.8**	**6.31**	**1.79**	**3.32**	**0.798**	**1.38**	0.160 J

Notes
1. Data qualifiers are as follows:
   U = The analyte was not detected at the reporting limit indicated.
   J = The value is an estimate.
2. **Bolded** values exceed the cleanup levels.
3. S = shallow well; I = intermediate well.
4. Current cleanup levels obtained from Table 2 of the Cleanup Action Plan and are based on each individual SWMU or AOC.

Abbreviations
µg/L = micrograms per liter
AOC = area of concern
CPOC = conditional point of compliance
SWMU = solid waste management unit

TABLE D-3: BUILDING 4-78/79 SWMU/AOC GROUP HISTORICAL CONCENTRATIONS OF CONSTITUENTS OF CONCERN[1, 2]

Boeing Renton Facility, Renton, Washington

Analyte	Current Cleanup Level[4]	Well ID[3] Source Area																	
		GW031S									GW033S								
		11/12/2019	3/11/2020	5/11/2020	8/11/2020	2/15/2021	8/11/2021	8/23/2022	2/7/2023	8/22/2023	5/11/2020	8/11/2020	2/16/2021	8/11/2021	2/22/2022	2/22/2022	8/17/2022	2/7/2023	8/18/2023
Volatile Organic Compounds (µg/L)																			
Benzene	0.80	**4.77**	**37.1**	**17.6**	**1.72 J**	**18.8 J**	**1.08**	0.20 U	0.20 U	0.200 U	**9.75**	**12.5**	**11.0**	**14.5**	**8.41**	**8.57**	**14.2 J**	0.20 U	**8.85**
cis-1,2-Dichloroethene	0.70	0.40	0.61	0.40 J	0.67 J	0.31 J	0.20 U	0.26	0.18 J	0.200 U	**39.5**	**188**	**1.64**	0.55	**3.82**	**4.04**	0.45 J	0.09 J	0.42
Trichloroethene	0.23	0.20 U	0.20 U	0.20 U	0.20 UJ	0.20 UJ	0.20 U	0.20 U	0.20 U	0.200 U	0.20 U	**0.25**	0.20 U	0.20 U	0.200 U	0.200 U	0.20 U	0.20 U	0.200 U
Vinyl Chloride	0.20	**0.25**	0.20 U	0.20 U	**0.32 J**	0.20 UJ	0.20 U	**0.39**	**0.26**	**0.28**	**87.3**	**310**	**5.31**	**2.31**	**8.90**	**9.28**	**1.53 J**	**0.24**	**0.94**
Total Petroleum Hydrocarbons (µg/L)																			
TPH-G (C7-C12)	800	**1540**	**2,980**	**1,880**	**1,160**	**2,340**	**1,540**	100 U	100 U	100 U	301	255	323	360	168	166	300 J	100 U	223

Analyte	Current Cleanup Level[4]	Well ID[3] Source Area																	
		GW034S									GW244S								
		3/11/2020	5/11/2020	8/11/2020	2/15/2021	8/11/2021	2/22/2022	8/17/2022	2/8/2023	8/18/2023	11/12/2019	3/11/2020	5/11/2020	8/11/2020	2/15/2021	8/11/2021	8/23/2022	2/7/2023	8/22/2023
Volatile Organic Compounds (µg/L)																			
Benzene	0.80	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.200 U	**1.47**	**9.62**	0.200 U	**0.87**	0.52	0.46	0.43	0.46	0.20 U	0.25	0.12 J	0.200 U
cis-1,2-Dichloroethene	0.70	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.200 U	**2.03**	**0.74**	0.110 J	0.20 U	0.68	**1.06**	**1.12**	0.68	0.22	0.25	0.25	0.22
Trichloroethene	0.23	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.200 U	0.20 U	0.20 U	0.200 U	0.20 U	0.23	0.20 U	0.20 U	**0.29**	0.20 U	0.20 U	0.20 U	0.200 U
Vinyl Chloride	0.20	0.20 U	**0.21**	**0.41**	**0.25**	**1.20**	**0.330**	**1.45**	**4.12**	**0.47**	**0.35**	**0.7**	**0.85**	**0.98**	**0.64**	**0.37**	**0.46**	**0.55**	**0.28**
Total Petroleum Hydrocarbons (µg/L)																			
TPH-G (C7-C12)	800	100 U	100 U	100 U	100 U	100 U	100 U	100 U	350	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U

Analyte	Current Cleanup Level[4]	Well ID[3] CPOC Area																	
		GW143S									GW237S								
		3/10/2020	5/11/2020	8/11/2020	2/15/2021	8/11/2021	2/22/2022	8/17/2022	2/7/2023	8/18/2023	3/10/2020	5/11/2020	8/11/2020	2/16/2021	8/11/2021	2/22/2022	8/17/2022	2/6/2023	8/18/2023
Volatile Organic Compounds (µg/L)																			
Benzene	0.80	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.200 U	0.20 U	0.20 U	0.200 U	**3.48**	**1.03**	0.24	**6.79 J**	0.20 U	**3.73**	0.20 U	**4.18**	0.150 J
cis-1,2-Dichloroethene	0.70	0.21	0.20 U	**1.17**	0.26	0.65	0.430	**0.76 J**	0.36	0.3	**1.00 U**	0.20 U	0.20 U	0.20 UJ	0.20 U	0.200 U	0.20 U	0.22	0.0900 J
Trichloroethene	0.23	0.20 U	0.20 U	0.23	0.20 U	0.20 U	0.200 U	**0.53 J**	0.10 J	0.200 U	**1.00 U**	0.20 U	0.20 U	0.20 UJ	0.20 U	0.200 U	0.20 U	0.20 U	0.200 U
Vinyl Chloride	0.20	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.200 U	0.20 U	0.09 J	0.120 J	**1.00 U**	0.20 U	0.20 U	**0.31 J**	0.20	0.200 U	0.20 U	**0.26**	**0.25**
Total Petroleum Hydrocarbons (µg/L)																			
TPH-G (C7-C12)	800	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	**961**	729	100 U	100 UJ	360	664	100 U	**805**	100 U

Analyte	Current Cleanup Level[4]	Well ID[3] CPOC Area								
		GW240D								
		3/10/2020	5/11/2020	8/11/2020	2/15/2021	8/11/2021	2/22/2022	8/17/2022	2/7/2023	8/18/2023
Volatile Organic Compounds (µg/L)										
Benzene	0.80	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.200 U	0.20 U	0.20 U	0.200 U
cis-1,2-Dichloroethene	0.70	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.200 U	0.20 U	0.20 U	0.200 U
Trichloroethene	0.23	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.200 U	0.20 U	0.20 U	0.200 U
Vinyl Chloride	0.20	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.200 U	0.20 U	0.13 J	0.150 J
Total Petroleum Hydrocarbons (µg/L)										
TPH-G (C7-C12)	800	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U

Notes

1. Data qualifiers are as follows:
   - U = The analyte was not detected at the reporting limit indicated.
   - UJ = The result is estimated and was not detected at the reporting limit indicated.
   - J = The value is an estimate.
2. **Bolded** values exceed the cleanup levels.
3. S = shallow well; D = deep well.
4. Current cleanup levels obtained from Table 2 of the Cleanup Action Plan and are based on each individual SWMU or AOC.

Abbreviations

µg/L = micrograms per liter
AOC = area of concern
CPOC = conditional point of compliance
SWMU = solid waste management unit
TPH-G = total petroleum hydrocarbons as gasoline

TABLE D-4: FORMER FUEL FARM HISTORICAL CONCENTRATIONS OF CONSTITUENTS OF CONCERN[1]

Boeing Renton Facility, Renton, Washington

Analyte	Current Cleanup Level[3]	Well ID[2] CPOC Area																	
		GW211S									GW221S								
		11/11/2019	5/11/2020	8/10/2020	2/15/2021	8/10/2021	2/21/2022	8/19/2022	2/9/2023	8/15/2023	11/11/2019	5/11/2020	8/10/2020	2/15/2021	8/10/2021	2/21/2022	8/19/2022	2/9/2023	8/15/2023
Total Petroleum Hydrocarbons (mg/L)																			
TPH-D (C12-C24)	0.5	0.120	0.282	0.192	0.284	0.140	1.00 U	0.100 U	0.100 U	0.100 U	**1.65**	**1.58**	**7.67**	**1.22**	**1.02**	**0.575**	**0.940**	**1.75**	0.258
Jet A	0.5	0.117	0.267	0.155	0.262	0.100 U	1.00 U	0.100 U	0.100 U	0.100 U	**1.09**	**1.09**	**5.70**	**0.89**	**0.718**	0.460	**0.562**	**1.20**	0.229

Analyte	Current Cleanup Level[3]	Well ID[2] CPOC Area								
		GW224S								
		5/11/2020	8/10/2020	2/15/2021	8/10/2021	2/21/2022	2/21/2022	8/19/2022	2/9/2023	8/15/2023
Total Petroleum Hydrocarbons (mg/L)										
TPH-D (C12-C24)	0.5	**0.675**	**1.08**	**0.584**	**1.08**	**0.682**	**1.01**	**0.881**	**1.15**	**0.526 J**
Jet A	0.5	**0.918 J**	**1.42**	**1.04**	**1.47**	**1.04**	**1.76**	**1.25**	**1.61**	**0.913 J**

Notes

1. **Bolded** values exceed the cleanup levels.
2. S = shallow well.
3. Current cleanup levels obtained from Table 2 of the Cleanup Action Plan and are based on each individual SWMU or AOC.

Abbreviations

AOC = area of concern
CPOC = conditional point of compliance
mg/L = milligrams per liter
SWMU = solid waste management unit
TPH-D = total petroleum hydrocarbons as diesel

TABLE D-5: AOC-003 HISTORICAL CONCENTRATIONS OF CONSTITUENTS OF CONCERN[1, 2]

Boeing Renton Facility, Renton, Washington

Analyte	Current Cleanup Level[4]	Well ID[3]																	
		Source Area									Downgradient Plume Area								
		GW249S									GW188S								
		8/14/2019	3/12/2020	8/10/2020	2/16/2021	8/12/2021	2/23/2022	8/24/2022	2/6/2023	8/22/2023	8/14/2019	3/12/2020	8/10/2020	2/16/2021	8/12/2021	2/22/2022	8/23/2022	2/6/2023	8/23/2023
Volatile Organic Compounds (µg/L)																			
cis-1,2-Dichloroethene	0.78	0.0526	0.0604	NA	NA	NA	NA	NA	NA	0.0529	0.0361	0.0362	NA	NA	NA	NA	NA	NA	0.0408
Tetrachloroethene	0.02	0.020 U	0.020 U	NA	NA	NA	NA	NA	NA	0.0200 U	0.020 U	0.0244	NA	NA	NA	NA	NA	NA	0.0200 U
Trichloroethene	0.16	0.020 U	0.020 U	NA	NA	NA	NA	NA	NA	0.0200 U	0.020 U	0.020 U	NA	NA	NA	NA	NA	NA	0.0200 U
Vinyl Chloride	0.24	**0.367**	**0.334**	**0.261**	**0.366**	**0.517**	**0.359 J**	**0.404 J**	0.217	**0.263**	**0.545**	**0.235**	**0.288**	**0.107**	**0.698**	0.141 J	**0.404**	0.104	0.197

Analyte	Current Cleanup Level[4]	Well ID[3]																	
		CPOC Area																	
		GW247S									GW248I								
		3/12/2020	5/13/2020	8/10/2020	2/16/2021	8/11/2021	2/23/2022	8/23/2022	2/6/2023	8/22/2023	3/12/2020	5/13/2020	8/10/2020	2/16/2021	8/11/2021	2/23/2022	8/23/2022	2/6/2023	8/22/2023
Volatile Organic Compounds (µg/L)																			
cis-1,2-Dichloroethene	0.78	0.039	0.584	NA	NA	NA	NA	NA	NA	0.0200 U	0.02 U	0.020 U	NA	NA	NA	NA	NA	NA	0.0219
Tetrachloroethene	0.02	0.02 U	0.020 U	NA	NA	NA	NA	NA	NA	0.0200 U	0.020 U	0.020 U	NA	NA	NA	NA	NA	NA	0.0200 U
Trichloroethene	0.16	0.02 U	0.020 U	NA	NA	NA	NA	NA	NA	0.0200 U	0.020 U	0.020 U	NA	NA	NA	NA	NA	NA	0.0200 U
Vinyl Chloride	0.24	**0.305**	**0.409**	**0.392**	**0.405**	**0.678**	0.127 J	**0.379**	NA	**0.715**	**0.499**	**0.546**	**0.383**	**0.426**	**0.711**	**0.598 J**	**0.742**	**0.588**	**0.482**

Analyte	Current Cleanup Level[4]	Well ID[3]	
		Source Area	
		GW193S	
		2/6/2023	8/22/2023
Volatile Organic Compounds (µg/L)			
benzene			0.20 U
cis-1,2-Dichloroethene	0.78	NA	0.6350
Tetrachloroethene	0.02	NA	NA
Trichloroethene	0.16	NA	0.139
Vinyl Chloride	0.24	**0.334**	**0.541**
1,1-Dichloroethene			0.020 U

Notes

1. Data qualifiers are as follows:
   U = The analyte was not detected at the reporting limit indicated.
2. **Bolded** values exceed the cleanup levels.
3. S = shallow well; I = intermediate well.
4. Current cleanup levels obtained from Table 2 of the Cleanup Action Plan and are based on each individual SWMU or AOC.

Abbreviations

µg/L = micrograms per liter
AOC = area of concern
CPOC = conditional point of compliance
NA = not analyzed
SWMU = solid waste management unit

TABLE D-6: AOC-004 HISTORICAL CONCENTRATIONS OF CONSTITUENTS OF CONCERN [1]

Boeing Renton Facility, Renton, Washington

Analyte	Current Cleanup Level[3]	Well ID[2] Source Area										
		GW250S										
		8/15/2018	3/5/2019	8/14/2019	3/9/2020	8/12/2020	2/16/2021	8/12/2021	2/22/2022	8/23/2022	2/7/2023	8/14/2023
Metals (mg/L)												
Lead	0.001	**0.00107**	**0.00154**	0.000714	**0.00119**	**0.000611**	**0.000564**	**0.000663**	0.000588	**0.00131**	0.000820	0.0570 J

Notes

1. **Bolded** values exceed the cleanup levels.
2. S = shallow well.
3. Current cleanup levels obtained from Table 2 of the Cleanup Action Plan and are based on each individual SWMU or AOC.

Abbreviations

mg/L = milligrams per liter

AOC = area of concern

CPOC = conditional point of compliance

SWMU = solid waste management unit

TABLE D-7: AOC-060 HISTORICAL CONCENTRATIONS OF CONSTITUENTS OF CONCERN[1, 2]

Boeing Renton Facility, Renton, Washington

Analyte	Current Cleanup Levels[4]	Well ID[3]																	
		Source Area									Downgradient Plume Area								
		GW009S									GW012S								
		8/14/2019	3/10/2020	8/11/2020	2/17/2021	8/11/2021	2/22/2022	8/19/2022	2/6/2023	8/18/2023	8/14/2019	3/10/2020	8/11/2020	2/17/2021	8/11/2021	2/22/2022	8/18/2022	2/6/2023	8/17/2023
Volatile Organic Compounds (µg/L)																			
cis-1,2-Dichloroethene	0.08	**0.127**	**0.093**	**0.124**	**0.139**	**0.368**	**0.15**	**0.229**	**0.231**	**0.157**	**0.798**	**0.482**	**0.508**	**1.260**	**2.210**	**0.693**	**1.91 J**	**2.78**	**2.46**
Trichloroethene	0.02	0.020 U	**0.0242**	**0.0324**	**0.0294**	**0.0316**	**0.0284**	**0.0288**	**0.0409**	**0.0292**	**0.0471**	**0.0505**	**0.0518**	**0.0454**	**0.0908**	**0.0506**	**1.02 J**	**0.208**	**1.61**
Vinyl Chloride	0.26	**0.300**	0.183	0.219	**0.300**	0.160	**0.434**	**0.570**	**0.550**	**0.371**	**0.893**	**0.603**	**0.387**	0.180	**0.795**	**1.57**	**0.294 J**	**0.881**	**0.625**

Analyte	Current Cleanup Levels[4]	Well ID[3]																	
		Downgradient Plume Area																	
		GW014S									GW147S								
		8/14/2019	3/10/2020	8/11/2020	2/17/2021	8/11/2021	2/22/2022	8/18/2022	2/6/2023	8/17/2023	8/14/2019	3/10/2020	8/11/2020	2/17/2021	8/11/2021	2/22/2022	8/19/2022	2/6/2023	8/17/2023
Volatile Organic Compounds (µg/L)																			
cis-1,2-Dichloroethene	0.08	**0.143**	**0.151**	**0.0932**	**0.130**	**0.147**	**0.133**	**0.134 J**	**0.137**	**0.179**	**4.11**	**0.287**	**0.931**	**0.180**	**0.180**	**0.679**	**8.37**	**0.766**	**4.46**
Trichloroethene	0.02	0.020 U	**0.0419**	0.020 U	**0.035**	**0.0227**	0.020 U	**0.0246 J**	0.0200 U	0.0158 J	**1.46**	**1.20**	**3.37**	**0.498**	**0.498**	**0.425**	**0.937**	**0.376**	**2.76**
Vinyl Chloride	0.26	**0.365**	0.195	0.190	0.207	**0.367**	**0.276**	**0.514 J**	0.231	**0.551**	0.215	0.020 U	0.0643	0.020 U	0.020 U	**0.0623**	**3.39**	0.0215	**0.928**

Analyte	Current Cleanup Levels[4]	Well ID[3]																	
		CPOC Area																	
		GW150S									GW253I								
		8/14/2019	3/10/2020	8/11/2020	2/17/2021	8/11/2021	2/22/2022	8/22/2022	2/6/2023	8/17/2023	8/14/2019	3/10/2020	8/11/2020	2/17/2021	8/11/2021	2/22/2022	8/22/2022	2/6/2023	8/17/2023
Volatile Organic Compounds (µg/L)																			
cis-1,2-Dichloroethene	0.08	**0.0824**	0.0525	**0.0935**	0.0393	**0.0991**	**0.0547**	**0.126**	**0.0849**	**0.0901**	**0.0917**	**0.0915**	**0.0879**	**0.140**	**0.106**	**0.0846**	**0.138**	**0.0991**	**0.0997**
Trichloroethene	0.02	**0.0228**	0.02 U	**0.0291**	0.020 U	0.020 U	0.020 U	**0.0212**	0.0200 U	0.0115 J	0.020 U	**0.0212**	**0.0211**	**0.0272**	**0.0202**	0.020 U	**0.0205**	0.0200 U	0.0147 J
Vinyl Chloride	0.26	0.020 U	0.0541	0.0619	0.0455	0.122	0.0969	0.100	0.138	0.15	0.131	0.184	0.100	0.243	0.146	0.177	0.255	0.156	0.17

Notes:

1. Data qualifiers are as follows:
   U = The analyte was not detected at the reporting limit indicated.
   J = The value is an estimate.
2. **Bolded** values exceed the cleanup levels.
3. S = shallow well; I = intermediate well.
4. Current cleanup levels obtained from Table 2 of the Cleanup Action Plan and are based on each individual SWMU or AOC.

Abbreviations:

µg/L = micrograms per liter
AOC = area of concern
CPOC = conditional point of compliance
SWMU = solid waste management unit

TABLE D-8: AOC-090 HISTORICAL CONCENTRATIONS OF CONSTITUENTS OF CONCERN[1, 2]

Boeing Renton Facility, Renton, Washington

Analyte	Current Cleanup Levels[4]	Well ID[3]																	
		Source Area									Downgradient Plume Area								
		GW189S[5]									GW176S								
		3/5/2019	8/12/2019	8/12/2020	2/17/2021	8/12/2021	2/23/2022	8/24/2022	2/7/2023	8/24/2023	8/12/2019	3/11/2020	8/12/2020	2/17/2021	8/17/2021	2/23/2022	8/23/2022	2/7/2023	8/24/2023
Volatile Organic Compounds (µg/L)																			
1,1,2,2-Tetrachloroethane	0.17	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.24 U	0.158	0.153	0.153	0.020 U	0.020 U	NM	NM	NM	NM	NM	NM	NA
1,1,2-Trichloroethane	0.2	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.200 U	0.200 U	0.20 U	0.20 U	NM	NM	NM	NM	NM	NM	NA
1,1-Dichloroethene	0.057	0.020 U	0.020 U	0.0529	0.020 U	0.020 U	0.0200 U	0.0432	0.0200 U	0.0322	0.020 U	0.020 U	NM	NM	NM	NM	NM	NM	NA
Acetone	300	5.00 U	5.0 U	5.00 U	10.6 J	5.00 U	5.00 U	6.28	5.00 U	5.00 U	5.0 U	5.0 U	NM	NM	NM	NM	NM	NM	NA
Benzene	0.8	0.20	0.49	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.200 U	0.200 U	0.20 U	0.20 U	NM	NM	NM	NM	NM	NM	NA
Carbon Tetrachloride	0.23	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.200 U	0.200 U	0.20 U	0.20 U	NM	NM	NM	NM	NM	NM	NA
Chloroform	2	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.200 U	0.200 U	0.20 U	0.20 U	NM	NM	NM	NM	NM	NM	NA
cis-1,2-Dichloroethene	2.4	0.92	**6.87**	1.93	0.47	**3.15**	0.20 U	1.78	0.230	1.7	0.27	0.25	NM	NM	NM	NM	NM	NM	NA
Methylene Chloride	2	1.00 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	NM	NM	NM	NM	NM	NM	NA
Tetrachloroethene	0.05	0.028	0.020 U	0.020 U	0.0283	0.020 U	0.0200 U	0.0206	0.200 U	17.2 J	0.020 U	0.020 U	NM	NM	NM	NM	NM	NM	NA
Toluene	75	4.96	3.11	1.05	5.21	2.42	0.47 J	43.7	0.690 J	0.200 U	0.20 U	0.20 U	NM	NM	NM	NM	NM	NM	NA
trans-1,2-Dichloroethene	53.9	0.20 U	0.39	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.200 U	0.0200 U	0.20 U	0.20 U	NM	NM	NM	NM	NM	NM	NA
Trichloroethene	0.08	**0.156**	**0.414**	**0.324**	**0.143**	**0.386**	0.0505 UJ	**0.43**	0.0593	**0.511**	0.020 U	0.020 U	NM	NM	NM	NM	NM	NM	NA
Vinyl Chloride	0.13	**0.50**	**1.20**	**0.369**	0.0405	**0.575**	0.0867 J	**0.460**	0.0230	**0.438**	**0.301**	**0.207**	**0.232**	**0.138**	**0.431**	**0.311 J**	**0.364**	**0.349**	**0.314**
Total Petroleum Hydrocarbons (µg/L)																			
TPH-G (C7-C12)	800	**1,070**	**943**	699	507	504	370 J	555	246	288	100 U	100 U	NM	NM	NM	NM	NM	NM	NA
TPH-D (C12-C24)	500	362	432	150	**2160**	390	192 J	521	**648 J**	100.0 U	100 U	100 U	NM	NM	NM	NM	NM	NM	NA
TPH-O (C24-C40)	500	**522**	**853**	379	**3990**	**689**	263 J	586	**1,120**	211	200 U	200 U	NM	NM	NM	NM	NM	NM	NA

Analyte	Current Cleanup Levels[4]	Well ID[3] Shallow Zone CPOC Area																										
		GW178S									GW207S								GW208S									
		3/5/2019	8/12/2019	8/12/2020	2/17/2021	8/12/2021	2/23/2022	8/24/2022	2/7/2023	8/24/2023	3/11/2020	8/12/2020	2/17/2021	8/12/2021	2/23/2022	8/23/2022	2/7/2023	8/24/2023	3/5/2019	8/12/2019	3/11/2020	8/12/2020	2/17/2021	8/12/2021	2/23/2022	8/24/2022	2/7/2023	8/24/2023
Volatile Organic Compounds (µg/L)																												
1,1,2,2-Tetrachloroethane	0.17	0.020 U	0.020 U	NM	NM	NM	NM	NM	NM	NA	0.020 U	NM	NM	NM	NM	NM	NM	NA	0.020 U	0.020 U	0.020 U	NM	NM	NM	NM	NM	NM	NA
1,1,2-Trichloroethane	0.2	0.20 U	0.20 U	NM	NM	NM	NM	NM	NM	NA	0.20 U	NM	NM	NM	NM	NM	NM	NA	0.20 U	0.20 U	0.20 U	NM	NM	NM	NM	NM	NM	NA
1,1-Dichloroethene	0.057	0.020 U	0.020 U	NM	NM	NM	NM	NM	NM	NA	0.020 U	NM	NM	NM	NM	NM	NM	NA	0.020 U	0.020 U	0.020 U	NM	NM	NM	NM	NM	NM	NA
Acetone	300	5.54	5.0 U	NM	NM	NM	NM	NM	NM	NA	5.0 U	NM	NM	NM	NM	NM	NM	NA	5.00 U	5.0 U	5.0 U	NM	NM	NM	NM	NM	NM	NA
Benzene	0.8	0.20 U	0.20 U	NM	NM	NM	NM	NM	NM	NA	0.20 U	NM	NM	NM	NM	NM	NM	NA	0.20 U	0.20 U	0.20 U	NM	NM	NM	NM	NM	NM	NA
Carbon Tetrachloride	0.23	0.20 U	0.20 U	NM	NM	NM	NM	NM	NM	NA	0.20 U	NM	NM	NM	NM	NM	NM	NA	0.20 U	0.20 U	0.20 U	NM	NM	NM	NM	NM	NM	NA
Chloroform	2	0.20 U	0.20 U	NM	NM	NM	NM	NM	NM	NA	0.20 U	NM	NM	NM	NM	NM	NM	NA	0.20 U	0.20 U	0.20 U	NM	NM	NM	NM	NM	NM	NA
cis-1,2-Dichloroethene	2.4	0.20 U	0.20 U	NM	NM	NM	NM	NM	NM	NA	0.20 U	NM	NM	NM	NM	NM	NM	NA	0.21	0.20 U	0.20 U	NM	NM	NM	NM	NM	NM	NA
Methylene Chloride	2	1.00 U	1.00 U	NM	NM	NM	NM	NM	NM	NA	1.00 U	NM	NM	NM	NM	NM	NM	NA	1.00 U	1.0 U	1.0 U	NM	NM	NM	NM	NM	NM	NA
Tetrachloroethene	0.05	0.020 U	0.020 U	NM	NM	NM	NM	NM	NM	NA	0.020 U	NM	NM	NM	NM	NM	NM	NA	0.020 U	0.020 U	0.020 U	NM	NM	NM	NM	NM	NM	NA
Toluene	75	0.20 U	0.20 U	NM	NM	NM	NM	NM	NM	NA	0.20 U	NM	NM	NM	NM	NM	NM	NA	0.20 U	0.20 U	0.20 U	NM	NM	NM	NM	NM	NM	NA
trans-1,2-Dichloroethene	53.9	0.20 U	0.20 U	NM	NM	NM	NM	NM	NM	NA	0.20 U	NM	NM	NM	NM	NM	NM	NA	0.20 U	0.20 U	0.20 U	NM	NM	NM	NM	NM	NM	NA
Trichloroethene	0.08	0.0213	0.020 U	NM	NM	NM	NM	NM	NM	NA	0.020 U	NM	NM	NM	NM	NM	NM	NA	0.020 U	0.0293	0.020 U	NM	NM	NM	NM	NM	NM	NA
Vinyl Chloride	0.13	**0.392**	**0.3840**	**0.141**	**0.224**	**0.182**	**0.361 J**	**0.390**	**0.531**	**0.343**	0.020 U	**0.377**	0.066	**0.232**	**0.356 J**	**0.326**	0.0200 U	**0.293**	**0.437**	**0.245**	**0.419**	**0.343**	**0.349**	**0.313**	**0.404 J**	**0.400**	**0.419**	**0.242**
Total Petroleum Hydrocarbons (µg/L)																												
TPH-G (C7-C12)	800	100 U	100 U	NM	NM	NM	NM	NM	NM	NA	100 U	NM	NM	NM	NM	NM	NM	NA	100 U	100 U	100 U	NM	NM	NM	NM	NM	NM	NA
TPH-D (C12-C24)	500	100 UJ	100 U	NM	NM	NM	NM	NM	NM	NA	100 U	NM	NM	NM	NM	NM	NM	NA	100 UJ	100 U	100 U	NM	NM	NM	NM	NM	NM	NA
TPH-O (C24-C40)	500	200 UJ	200 U	NM	NM	NM	NM	NM	NM	NA	200 U	NM	NM	NM	NM	NM	NM	NA	200 UJ	200 U	200 U	NM	NM	NM	NM	NM	NM	NA

Notes:
1. Data qualifiers are as follows:
   U = The analyte was not detected at the reporting limit indicated.
   J = The value is an estimate.
   UJ = The analyte was not detected at the estimated reporting limit indicated.
2. **Bolded** values exceed the cleanup levels.
3. S = shallow well.
4. Current cleanup levels obtained from Table 2 of the Cleanup Action Plan and are based on each individual SWMU or AOC.
5. GW189S is the replacement well for GW168S.

Abbreviations:
µg/L = micrograms per liter
AOC = area of concern
CPOC = conditional point of compliance
NM = Analyte not measured
SWMU = solid waste management unit
TPH-D = total petroleum hydrocarbons as diesel
TPH-G = total petroleum hydrocarbons as gasoline
TPH-O = total petroleum hydrocarbons as oil

TABLE D-9: APRON A HISTORICAL CONCENTRATIONS OF CONSTITUENTS OF CONCERN[1]

Boeing Renton Facility, Renton, Washington

Analyte	Well ID[2] GW264S								
	11/11/2019	5/12/2020	8/10/2020	2/15/2021	8/10/2021	2/21/2022	8/24/2022	2/8/2023	8/14/2023
Volatile Organic Compounds (µg/L)									
cis-1,2-Dichloroethene	0.20 U	0.20 U	0.52	0.20 U	0.20 U	0.200 U	0.200 U	2.00 U	2.00 U
Vinyl Chloride	0.38	1.48	0.20 U	1.49	1.37	2.54	1.41	2.00 U	2.00 U

Notes:

1. Data qualifiers are as follows:

   U = The analyte was not detected at the reporting limit indicated.

2. S = shallow well

Abbreviations:

µg/L = micrograms per liter

APPENDIX E

SUMMARY OF REMEDIAL ACTIONS AT THE BOEING RENTON FACILITY MAY 2023 – OCTOBER 2023

APPENDIX E

Summary of Remedial Actions at the Boeing Renton Facility
May 2023 – October 2023

Boeing Renton Site
Renton, Washington

Prepared for:
The Boeing Company
EHS Remediation

Prepared by:
CALIBRE Systems, Inc.
Project No. T0014538

November 22, 2023

Table of Contents

List of Tables

List of Figures

Acronyms

AOC	Area of Concern
Building 4-78/79	Building 4-78/4-79 SWMU/AOC Group
CALIBRE	CALIBRE Systems, Inc.
CMP	Compliance Monitoring Plan
EDR	Engineering Design Report
ERD	Enhanced Reductive Dechlorination
GAC	granular activated carbon
mg/L	milligrams per liter
PCE	Tetrachloroethene
PID	Photoionization detector
SVE	Soil Vapor Extraction
SWMU	Solid Waste Management Unit
TCE	Trichloroethene
Tech Memo	Technical Memorandum
VOCs	Volatile Organic Compounds
VPC	Vapor Phase Carbon

1.0 Introduction

CALIBRE Systems, Inc. (CALIBRE) prepared this Technical Memorandum (Tech Memo) for the Boeing Company to summarize remedial actions implemented at the Boeing Renton Facility between May 1, 2023 and October 31, 2023. The ongoing remedial actions include:

1. Soil vapor monitoring in the area of a soil vapor extraction (SVE) system located at Solid Waste Management Unit (SWMU) designated as SWMU-172/174;
2. Biological treatment to promote Enhanced Reductive Dechlorination (ERD) of volatile organic compounds (VOCs) in groundwater underway at several areas of concern (AOCs) located throughout the Renton Facility, and;
3. Anaerobic biodegradation of benzene by nitrate/sulfate injections at the Building 4-78/79.
4. Decommissioning of wells at various AOCs and SWMUs which are no longer required for investigative, bioremediation, or compliance monitoring purposes.

CALIBRE completed the work described in this Tech Memo to support remedial activities described in the Engineering Design Report (EDR), (AMEC, 2014) as supplemented by a Tech Memo describing the remedial approach for *in-situ* biodegradation treatment of benzene in groundwater near the Building 4-78/79 (CALIBRE 2017). A Tech Memo related to the well decommissioning completed during this period of performance was previously submitted and approved by Ecology in January 2022 (CALIBRE 2022a).

1.1 Facility Location and Background

The Boeing Renton Facility is used for assembly of 737 airplanes and is located at the southern end of Lake Washington in Renton, Washington. The location of the Renton Facility and the location of SWMU-172/174 within the Facility is shown on Figure 1-1~~. ~~. The locations of the other AOCs and SWMUs where groundwater treatment is ongoing are also presented in Figure 1-1.

1.2 Objectives and Organization

The objective for this Tech Memo is to summarize work completed in accordance with the EDR during the reporting period stated above~~. ~~. This includes soil vapor monitoring activities near the SVE system located at SWMU-172/174 and a summary of the ongoing biological treatment and monitoring of groundwater at the following areas:

SWMU-172/174
Building 4-78/4-79 SWMU/AOC Group (Building 4-78/79)
AOC-001/002
AOC-003
AOC-060
AOC-090
Apron A

Additional work completed during the period included decommissioning of 30 wells in June 2023 (Phase 3 of 3 of well decommissioning for the site; Phase 1 and Phase 2 were completed in May 2022 and September 2022, respectively). All planned well decommissioning work is complete.

This Tech Memo is organized as follows:
Section 1 – Introduction and Background
Section 2 – SVE System Operation and Monitoring
Section 3 – Groundwater Treatment
Section 4 – Well Decommissioning
Section 5 – Conclusions and Recommendations
Section 6 – References
Attachment A – SWMU-172/174 Vapor Pin Lab Packages, Sample Sheets, Installation Photos, and Prior Vapor Monitoring Work Plan
Attachment B – Groundwater Field Data Sheets
Attachment C – Groundwater Laboratory Data Packages

2.0 SVE Systems Operation and Monitoring

SVE systems were installed in the Building 4-78/79 and SWMU-172/174 areas and began operation in April 2015. During the last quarter of 2017, photoionization detector (PID) results from the Building 4-78/79 SVE system indicated that VOC concentrations had attained asymptotically low levels. A rebound test was conducted in early 2018 followed by collection of soil confirmation samples in June 2018. Ecology approved the recommended shutdown of the Building 4-78/79 SVE system (Ecology 2018) after review and evaluation of the soil confirmation results for that area (CALIBRE 2018a).

During the May 2021 to October 2021 operating period, PID monitoring results measured from the SWMU-172/174 SVE system indicated that VOC concentrations had attained asymptotically low levels. A rebound test for the system was conducted during December 2021 to January 2022. The rebound results showed marginal increases in PCE concentrations and a slight increase in mass removal after a 35-day rest period; mass removal was approximately 0.003 lbs/day prior to the rebound start and 0.005 lbs/day after the rest period. The slight increase in PCE mass removal was diminished back to prior asymptote levels after 16 days of operation. SVE system shutdown was recommended as the system continued to show asymptotic low level vapor concentrations following rebound testing. Ecology provided conditional approval for the SWMU-172/174 system shutdown on (Ecology 2022) and the system was turned off on October 24, 2022. As a condition to Ecology's approval to shut down the SVE system, Ecology requested additional soil vapor verification samples to evaluate the potential for indoor air intrusion in the buildings located in proximity to SWMU-172/174. The details of the soil vapor sampling are summarized below and in Attachment A.

Groundwater monitoring and ERD for groundwater treatment are on-going at the SWMU-172/174 area. The next ERD injection event is planned for Spring 2024. The following sections summarize the soil vapor verification samples collected during the May to October 2023 monitoring period.

2.1 SWMU-172/174 SVE System Soil Vapor Sample Locations

Boeing provided Ecology the Sub-Slab Soil Vapor Monitoring Plan in December 2022 (CALIBRE 2022b) per Ecology's request for additional soil vapor verification samples to evaluate the potential for vapor intrusion in the building located in proximity to SWMU-172/174. Following Ecology approval of the soil vapor monitoring work plan on February 8, 2023 (Ecology 2023), CALIBRE completed utility clearance and installation of three soil vapor monitoring locations in April and May 2023, see Figure 2-1. The Sub-Slab Soil Vapor Monitoring Plan and the sampling results are included in Attachment A.

Utility locate was completed on April 25, 2023 at the three proposed sub-slab vapor monitoring locations (VP-1, VP-2, and VP-3). On May 4, 2023 CALIBRE met Dakota Concrete Coring on Site and 4 inch cores were completed at the three locations. Asphalt in these locations was approximately 5 inches thick. Following coring, additional soil was removed from each location to a depth of approximately 19 inches to allow for vapor pin and monument installation (Attachment A includes photos of the vapor pin installation). Two inches of gravel was placed at the bottom of each location, the vapor pin was inserted, and an additional 10 inches of gravel was used to bury the vapor pin. A vapor barrier was installed on top of the gravel and vapor pin. The monument was then inserted, cemented in place, and allowed to cure for five days.

On May 9, 2023 one-liter summa canisters, received from Eurofins AirToxics in Folsom, CA, were used to collect the sub-slab vapor samples from VP-1, VP-2, and VP-3. The summa canisters included a flow controller calibrated for sample collection at a rate of approximately 50 milliliters per minute to achieve a 20-minute sample collection time.

Prior to sample collection, a helium tracer test using a shroud was completed at each sub-slab vapor sample location to confirm there were no appreciable leaks within the sample train. Helium leak testing of the sampling train was completed following the project standard operating procedures (SOPs, CALIBRE 2022b). No significant leaks were detected in any of the sample locations; i.e. helium detections within the sampling train were either 0 ppm or less than 5% of the helium concentrations within the shroud. Helium concentrations within the leak detection shrouds were between 31-91% helium and the highest helium detection (within the sample collection train) was 5,840 ppm, approximately 1.0% of the helium concentrations measured within the shrouds.

Following the helium leak testing, one-liter summa canisters were used to collect the sub-slab vapor samples. The sampling train from the sub-slab vapor connection point to the summa canister was purged with a hand pump prior to sample collection; the purge volume exceeded 3 liters, more than 30 times the volume of the sample line. A duplicate sample was collected from the VP-2 sub-slab location using a stainless-steel sampling "T" (provided by the laboratory) to allow the parent and duplicate sample to be collected at the same time. Sample sheets are provided in Attachment A.

2.1.1 TO-15 Laboratory Analysis of Soil Vapor Samples

The May and July 2023 summa canisters were shipped to Eurofins Air Toxics and the air samples were analyzed for VOCs by USEPA Method TO-15. The laboratory data packages for the samples are included in Attachment A.

Table 2-1 presents the monitoring results from May and July 2023 with a comparison to the MTCA Method C Sub Slab Screening Levels. Sample locations VP-1 and VP-3 show all results below these screening levels. Sample location VP-2 showed PCE and TCE above the Method C Sub Slab Screening Levels (May 2023). Following review and evaluation of the May 2023 sub-slab monitoring results, the Boeing Team met with Ecology on June 8, 2023 to review the results and discuss next steps. It was agreed that Boeing should collect a second sample from the VP-2 location to confirm the PCE and TCE concentrations initially observed at this location. The July 2023 confirmation sample from location VP-2 continued to show PCE and TCE above the Method C Sub Slab Screening Levels. Boeing recommends a follow up discussion with Ecology to discuss next steps for the VP-2 location.

3.0 Ongoing Groundwater Treatment (Building 4-78/79, SWMU-172-174, AOC-060, AOC-090)

Groundwater treatment is being implemented at several AOCs/SWMUs at the Renton Facility. The primary remedy being implemented is ERD of chlorinated solvents in targeted areas. The ERD treatment involves substrate injection using sucrose/fructose as a carbon source to stimulate biological degradation of the chlorinated solvents and nitrate/sulfate to anaerobically degrade benzene. Continued treatment is evaluated on a semi-annual basis following review of groundwater sampling results. Site-wide groundwater sampling was conducted as part of the biannual monitoring program during this reporting period and the results are discussed in the main text of the summary report. Table 3-1 presents a summary of those groundwater monitoring results, by area, and groundwater treatment recommendations for continued ERD implementation.

Beginning in late 2017, anaerobic biodegradation of benzene using nitrate and sulfate injections was implemented for a small area at the Building 4-78/79 location. Performance monitoring data was collected in this area in April 2023 to evaluate substrate availability and need for continued injection and those results are summarized in Table 3-2 (field sampling sheets included in Attachment B and laboratory data package included in Attachment C). The 2023 data for the Building 4-78/79 area showed reduced nitrate/sulfate concentrations in wells GW-031SR and GW-244SR which are downgradient or near the benzene treatment horizontal injection wells. Benzene in these wells were <0.2 µg/L in April 2023 and while benzene is reduced in this area, downgradient CPOC well GW237S had shown benzene at 4.37 µg/L in February 2023. Therefore, additional nitrate and sulfate injections were completed in May 2023 upgradient of this well (in the horizontal injection wells) to continue benzene treatment. The August 2023 benzene concentration at downgradient CPOC well GW237S reduced to 0.15 µg/L indicating effective benzene treatment. Upgradient treatment well B78-11 showed elevated TCE concentrations at 58 µg/L in April 2023 along with detections of degradation daughter products cis-1,2-DCE and VC. Downgradient ERD injection well B78-16 showed TCE reduced to 2.06 µg/L and elevated detections of degradation daughter products cis-1,2-DCE and VC indicating dechlorination of TCE is occurring in this area. In addition, all downgradient

CPOC wells continue to show TCE is fully degraded, and all wells were <0.2 µg/L in February and August 2023. Well B78-16 showed TOC concentrations nearing background levels (4.23 mg/L and background typically <10 mg/L). Additional ERD treatment was completed in this area in May 2023 to increase TOC concentrations and continue TCE treatment.

August 2023 monitoring results from AOC-001/002 showed elevated detections of cis-1,2-DCE and VC in monitoring well GW197S-R. In late, October 2023, additional samples were collected from AOC-001/002 wells GW185S-R and GW197S-R for comparison. The October 2023 results are presented in Table 3-3 and show similarly elevated detections of cis-1,2-DCE and VC at GW197S-R. Based on the recent results, we recommend re-starting ERD treatment in 2024 at the AOC-001/002 area.

February 2023 TOC results from treatment and nearby monitoring wells at SWMU-172/174, AOC-060, and AOC-090 indicated TOC concentrations near or at background levels (concentrations ranging from 2.56 mg/L to 43.1 mg/L, with background typically <10 mg/L). CVOC concentrations at each of these areas represented low levels of parent product PCE or TCE along with degradation daughter products cis-1,2-DCE and VC indicating dechlorination is occurring, e.g., SWMU-172/174 source area monitoring well GW152Sshowed PCE at 0.23 µg/L, cis-1,2-DCE at 3.16 µg/L and VC at 0.20 µg/L; AOC-060 source area treatment well GW012S showed TCE at 0.04 µg/L, cis-1,2-DCE at 0.23 µg/L, and VC at 0.55 µg/L; and AOC-090 source area treatment well GW189S showed TCE at 0.06 µg/L, cis-1,2-DCE at 0.23 µg/L, and VC at 0.02 µg/L. CPOC wells in these areas indicate that the parent product PCE or TCE is fully degraded with only low levels of daughter products cis-1,2-DCE or VC detected. Additional ERD treatment was completed in these areas in May 2023 to increase TOC concentrations and further treat residual PCE and TCE, as well as the daughter product concentrations.

The August 2023 semi-annual monitoring results for SWMU-172/174 show detections of cis-1,2-DCE above the CUL (0.03 µg/L) in the CPOC wells. We recommend ERD optimization for this area to drive the CVOCs lower towards CULs. We intend to collect Dehalococcoides samples from selected wells upgradient of the CPOC wells to determine if bioaugmentation is needed to accelerate CVOC degradation in these areas.

In addition, CPOC wells GW150S and GW253I, located at AOC-060, and GW178S and GW208S, located at AOC-090, continue to show low detections of cis-1,2-DCE and VC above CULs for their respective AOCs. We recommend installing a few, additional injection wells in both areas, upgradient of these CPOC wells to expand the ERD treatment footprint to promote further CVOC degradation.

3.1 Groundwater Treatment Completed May 2023 – October 2023

Substrate injections were completed at selected wells during this reporting period in May 2023 at SWMU-172/174, Building 4-78/79, AOC-60, and AOC-90. The list of wells by area including substrate volume and mass are summarized in Table 3-3.

The May 2023 injection event also enhanced anaerobic biodegradation of benzene using nitrate and sulfate injections for a small area at the Building 4-78/79 location via the two new horizontal injection wells and upgradient well B78-11. Injections were completed with a target concentration of 1,600 mg/L for nitrate and 800 mg/L for sulfate per well (similar to prior events) to provide additional nitrate and sulfate to the impacted area. The injection volumes and mass of nitrate/sulfate are included in Table 3-4.

4.0 Well Decommissioning

A technical memorandum recommending decommissioning of wells that are no longer required for investigative, bioremediation, or compliance monitoring purposes was submitted to Ecology on January 5, 2022 (CALIBRE, 2022a) and Ecology approved the well decommissioning plan on January 18, 2022. Additional work completed during the May 2023 to October 2023 period included decommissioning 30 wells in June 2023 (Phase 3 of 3 well decommissioning for the Site; Phase 1 and Phase 2 were completed in May 2022 and September 2022, respectively). Areas where well decommissioning occurred in June 2023 included: AOC-060, AOC-090, Apron A, the Former Fuel Farm, SWMU-168, and SWMU-172/174, see Table 4-1. The June 2023 well decommissioning work completed the list of proposed well closures and no additional wells are planned for closure related to the approved closure plan.

5.0 Conclusions and Recommendations

The sub-slab vapor sampling completed in May 2023 and July 2023 at the SWMU-172/174 SVE system show one location, VP-2, exceeding the Method C Sub-Slab screening levels. The other two locations, VP-1 and VP-3, were below the Method C Sub-Slab screening levels.

Additional substrate injections were completed for the SWMU-172/174, Building 4-78/79, AOC-60, and AOC-90 areas along with additional nitrate/sulfate injections for benzene treatment at the Building 4-78/79 area in May 2023. In addition, in June 2023 Boeing completed the final phase of well decommissioning originally proposed in the 2022 Decommissioning of Groundwater Wells Tech Memo.

6.0 References

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CALIBRE 2018a. Recommendation to shut down SVE system at Building 4-78/4-79 SWMU/AOC Group; Boeing Renton Site. Prepared by CALIBRE Systems, Inc. for The Boeing Company, EHS Remediation. October 2018.

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Ecology 2015. Washington State Water Quality Standards: Human Health Criteria and Implementation Tools. Prepared by the Washington Department of Ecology. Publication no. 14-10-058. January 2015.

Ecology 2018. Correspondence from Byung Maeng (Ecology) to Carl Bach (Boeing) approving the shutdown of the SVE System at the 4-78/79 Area. November 1, 2018.

Ecology 2022. Email from Val Cramer (Ecology) to Nick Garson (Boeing) approving the shutdown of the SWMU-172/174.SVE System. September 20, 2022.

Ecology 2023. Email from Val Cramer (Ecology) to Nick Garson (Boeing) approving the Sub-Slab Soil Vapor Monitoring Plan – SWMU-172/174. February 8, 2023.

Wood 2019. Quarterly report, third quarter 2019. RCRA Corrective Action Program Boeing Renton Facility. Prepared by Wood and CALIBRE Systems, Inc. for the Boeing Company, EHS Remediation. November 2019.

TABLES

Table 2-1 Measured Sub-slab VOC Concentrations at Renton SWMU-172/174 - May and July 2023

Sub Slab

Sample Date	Sample ID	PCE ($\mu g/m^3$)	TCE ($\mu g/m^3$)	cis-1,2-DCE ($\mu g/m^3$)	VC ($\mu g/m^3$)	Benzene ($\mu g/m^3$)	1,1-DCE ($\mu g/m^3$)	Methylene Chloride ($\mu g/m^3$)
MTCA Method C SubSlab Screening Level		***1,300***	***67***	***NA***	***3,300***	***1,000***	***6,700***	***20,000***
5/9/2023	VP-1	170	<5.3	<3.9	<2.5	9.1	<3.9	<34
5/9/2023	VP-2	**5,800**	**1,100**	500	50	<12	<15	<130
5/9/2023	DUP (VP-2)	**5,000**	**950**	460	23	<12	<15	<130
5/9/2023	VP-3	710	22	4.7	<2.6	<3.2	<4.0	<35
7/31/2023	VP-2	**4,400**	**700**	310	<6.2	<7.7	<9.6	<84
7/31/2023	Ambient Blank	<8.8	<7.0	<5.2	<3.3	<4.2	<5.2	<45

$\mu g/m^3$ = micrograms per cubic meter

PCE = tetrachloroethene

TCE = trichloroethene

cis-1,2-DCE = cis-1,2-Dichloroethene

VC = vinyl chloride

1,1-DCE = 1,1-Dichloroethene

Bold number indicates exceedance of MTCA Method C Sub-Slab Screening Level

NA = not applicable or not analyzed

Table 3-1 Groundwater Monitoring Results Summary August 2023 and Recommended ERD Treatment

GW Treatment Area	Source and down gradient MWs	CPOC wells	Treatment IWs	ERD Treatment Recommendation
SWMU-172/174	PCE at 1.1 ug/L and VC at 0.21 ug/L.	All detections are at or below 0.60 ug/L	*Prior data Feb 2022; North IW B172-01 is ND for CVOCs, South IW B172-08 near GW-152S show PCE at 1.6 ug/L and cisDCE at 0.3 ug/L. TOC near background.*	**Implement ERD optimization to drive CVOCs lower before the Site goes to MNA; consider DHC testing and evaluation, increased injection volume/mass in area of two CPOC wells GW232S and GW235I, and bioaugmentation to drive degradation process past cis-1,2-DCE.**
Building 4-78/4-79 SWMU/AOC Group	TCE is nondetect, cisDCE is under 0.5 ug/L; VC under 1.0 ug/L. Benzene at 9.4 ug/L in GW033S; benzene less than 0.20 ug/L in benzene treatment area.	TCE is nondetect. cisDCE and VC are below 0.30 ug/L; all other wells are ND. Benzene either nondectect or estimated at 0.15 ug/L.	*Prior data April 2023; B78-11 showed TCE at 52 ug/L and downgradient B78-16 showed TCE at 2.1 ug/L, cisDCE 34 ug/L, and VC at 71 ug/L.* This well and nearby others were injected with sucrose May 2023.	**No ERD/benzene treatment currently planned however continue monitoring in area of GW031S and GW033S to evaluate trends and evaluate the potential need/benefit of continued ERD/benzene treatment in this area.**
AOC-001/002	All wells with detections less than 2.1 ug/L with the exception of GW-197S-R which showed cisDCE at 127 ug/L and VC at 124 ug/L.	*Prior data Aug 2019: All detections below 0.30 ug/L.*	*Prior data Mar 2018, detections at or below 0.30 ug/L.*	**Recommend resampling area of GW-197S-R to confirm cisDCE and VC results.**
AOC-003	PCE and TCE nondetect, cisDCE less than 0.06 ug/L, VC below 0.26 ug/L.	PCE and TCE nondetect, cisDCE less than 0.03 ug/L, VC less than 0.72 ug/L.	*Prior data Feb 2022; B003-01 showed VC at <0.2 ug/L and TOC near background*	**No action at this time.**
AOC-60	Results are primarily cis-1,2DCE and VC. Treatment MWs with total CVOCs less than 10 ug/L, other MWs with total CVOCs less than 0.80 ug/L.	MW's with total CVOCs less than 0.30 ug/L, primarily as cis-1,2DCE and VC.	-	**CPOC wells GW150S and GW253I continue to show low detections of cis-1,2-DCE (~0.1 ug/L, versus CUL = 0.08 ug/L) therefore implement ERD optimization to drive CVOCs lower before Site goes to MNA. Consider installing two injection wells upgradient of these CPOC wells and increased injection volume/mass in area of two CPOC wells.**
AOC – 90	Source with total CVOCs of 2.8 ug/L; primarily cisDCE at 1.7 ug/L, VC of 0.44 ug/L, down gradient well with VC at 0.31 ug/L.	VC less than 0.35 ug/L.	-	**CPOC wells GW178S and GW208S continue to show low detections of VC (~0.5 ug/L, versus CUL = 0.13 ug/L) therefore implement ERD optimization to drive CVOCs lower before Site goes to MNA. Include installing two injection wells upgradient of these CPOC wells and increased injection volume/mass in area of two CPOC wells.**
Apron A	cis-1,2DCE and VC are nondetect	-	-	**No action at this time.**
SWMU-168	-	VC at 0.10 ug/L.	-	**No action at this time.**

Table 3-2 – Renton Performance Monitoring April 2023

AOC/SWMU Area	Sample ID	Date	TCE (µg/L)	cis-1,2-DCE (µg/L)	VC (µg/L)	Benzene (µg/L)	Nitrate-N (mg/L)	Nitrite-N (mg/L)	Sulfate (mg/L)	Total Organic Carbon (mg/L)	TPH-G (µg/L)
4-78/79	B78-11-042523	4/25/2023	58.0	9.38	2.89	0.31	<0.1	<0.1	38.0	--	--
4-78/79	GW-031SR-042523	4/25/2023	<0.2	0.20	0.40	<0.2	<0.1	<0.1	<0.1	--	--
4-78/79	GW-244SR-042523	4/25/2023	<0.2	0.28	0.63	<0.2	<0.1	<0.1	0.25	--	--
4-78/79	GW-033S-042523	4/25/2023	<0.2	0.42	1.88	10.4	--	--	--	--	320
4-78/79	GW-034S-042523	4/25/2023	<0.2	<0.2	0.36	<0.2	--	--	--	--	<100
4-78/79	B78-16-042523	4/25/2023	2.06	34.3	71.4	1.89	--	--	--	4.23	--
4-78/79	Dup01-042523 (B78-16)	4/25/2023	2.18	31.7	64.0	1.83	--	--	--	--	--

Notes
PCE = Tetrachloroethene
TCE = Trichloroethene
cis-1,2-DCE = cis-1,2-Dichloroethene
VC = Vinyl Chloride
µg/L = microgram/liter
mg/L = milligram/liter
-- = not analyzed

Table 3-3 – Renton AOC-001/002 Monitoring October 2023

AOC/SWMU Area	Sample ID	Date	PCE (µg/L)	TCE (µg/L)	cis-1,2-DCE (µg/L)	VC (µg/L)	1,1-DCE (µg/L)	Benzene (µg/L)
AOC-001/002	GW-185S-R-102623	10/26/2023	<0.2	<0.2	0.65	0.26	<0.2	0.08J
AOC-001/002	GW-197S-R-102623	10/26/2023	0.17J	5.07	236	153	1.10	0.69
AOC-001/002	DUP01-102623 (GW-197S-R)	10/26/2023	<0.2	4.91	240	153	1.11	0.68

Notes

PCE = Tetrachloroethene

TCE = Trichloroethene

cis-1,2-DCE = cis-1,2-Dichloroethene

VC = Vinyl Chloride

1,1-DCE = 1,1-Dichloroethene

µg/L = microgram/liter

Table 3-4 - May 2023 Injection Summary at Renton AOCs

Area	Injection Well	Volume of Solution - ERD (gallons)	Brix (°Bx)	Pounds Substrate in the Solution (lbs)
SWMU-172/174	B172-01	500	11.2	432
	B172-02	500	11.2	467
	B172-05	500	10.5	438
	B172-06	500	10.5	438
	B172-07	500	10.5	438
	B172-08	500	10.5	438
	B172-09	500	10.5	438
	B172-13	500	11.2	467
	B172-14	500	11.2	467
Building 4-78/79	B78-12	500	10.0	417
	B78-14	500	10.0	417
	B78-15	500	10.0	417
	B78-16	500	10.0	417
AOC-060	GW012S	732	12.3	751
	GW147S	711	12.3	729
AOC-090	IPR3	488	13.8	562
	IPR4	500	13.8	575
	GW 189S	427	13.8	491
	Total (gal)	9,358	Total (lbs)	8,799

Notes:

°Bx (degrees brix) is a measure of the sugar content in an aqueous solution. One degree Brix is 1 gram of sucrose in 100 grams of solution and represents the strength of the solution as percantage by mass.

Table 3-5 - May 2023 Injection Volumes at 4-78/79 Benzene Treatment Wells

Area	Injection Well	Volume Total (gal)	NaNO3 (lbs)	MgSO4 (lbs)	DAP (lbs)	Concentration NO3 Injected (mg/L)	Concentration SO4 Injected (mg/L)
Building 4-78/79	Injection Gallery A	2000	36.5	16.7	21.4	1,599	803
	Injection Gallery B	1500	27.4	12.5	16.1	1,599	803
	B78-11	250	4.6	2.1	2.7	1,599	803

Notes:

NaNO3 - Sodium Nitrate

MgSO4 - Magnesium Sulfate

DAP - Diammonium Phosphate

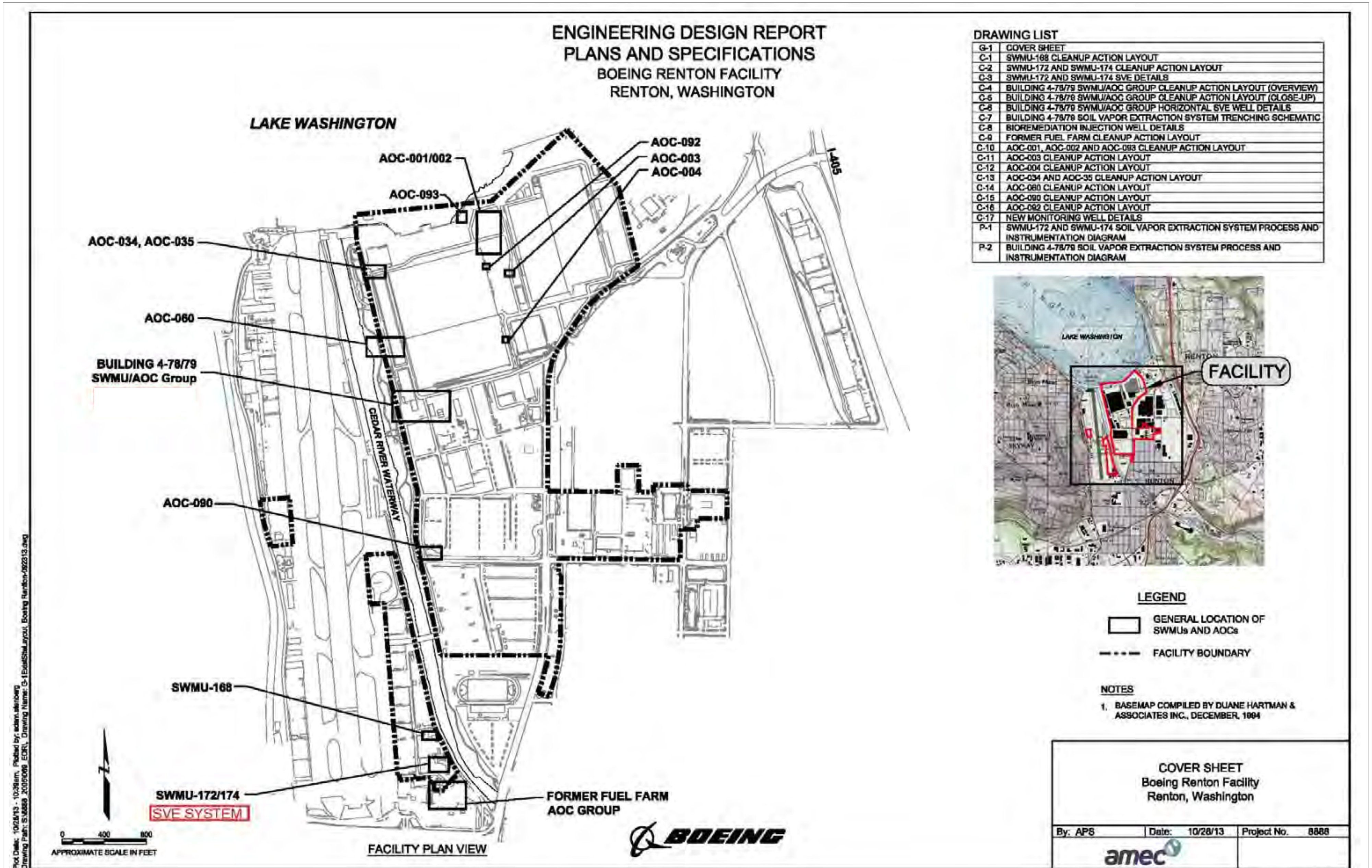
Table 4-1 Renton Well Decommissioning Summary

Area	Well	Date Decommissioned	Method	Phase
10-71	10-71-MW2	May-22	chip in place	1
10-71	10-71-MW3	May-22	chip in place	1
10-71	10-71-MW4	May-22	chip in place	1
AOC-004	B0004-01	May-22	chip in place	1
AOC-004	B0004-02	May-22	chip in place	1
AOC-004	GW174S	May-22	chip in place	1
AOC-034/035	GW216	May-22	chip in place	1
AOC-034/035	GW217	May-22	chip in place	1
AOC-034/035	GW218	May-22	chip in place	1
AOC-034/035	GW251S	May-22	chip in place	1
AOC-034/035	GW005	May-22	chip in place	1
AOC-060	GW148S	May-22	chip in place	1
AOC-060	GW013D	May-22	chip in place	1
AOC-060	GW015D	May-22	chip in place	1
AOC-090	GW144S	May-22	chip in place	1
AOC-090	GW161I	May-22	chip in place	1
AOC-090	GW162S	May-22	chip in place	1
AOC-090	GW163I	May-22	chip in place	1
AOC-090	GW164	May-22	chip in place	1
AOC-090	GW165I	May-22	chip in place	1
AOC-090	GW166	May-22	chip in place	1
AOC-090	GW175I	May-22	chip in place	1
AOC-092	GW261S	May-22	chip in place	1
Bldg 4-70	B70-1	May-22	chip in place	1
Bldg 4-70	B70-2	May-22	chip in place	1
Bldg 4-70	B70-3	May-22	chip in place	1
Bldg 4-70	B70-4	May-22	chip in place	1
Bldg 4-70	B70-5	May-22	chip in place	1
Bldg 4-70	GW259S	May-22	chip in place	1
Bldg 4-70	GW260S	May-22	chip in place	1
Bldg 4-78/79	GW037S	May-22	chip in place	1
Bldg 4-78/79	GW041S	May-22	chip in place	1
Bldg 4-78/79	GW042D	May-22	chip in place	1
Bldg 4-78/79	GW132S	May-22	chip in place	1
Bldg 4-78/79	GW133S	May-22	chip in place	1
Bldg 4-78/79	GW209S	May-22	chip in place	1
Bldg 4-78/79	GW210S	May-22	chip in place	1
Bldg 4-78/79	GW238I	May-22	chip in place	1
Bldg 4-78/79	GW239I	May-22	chip in place	1
Bldg 4-78/79	GW241S	May-22	chip in place	1
Bldg 4-78/79	GW242I	May-22	chip in place	1
Bldg 4-78/79	GW243I	May-22	chip in place	1
10-71	10-71-MW1	Sep-22	chip in place	2
AOC-034/035	GW007	Sep-22	Overdrill	2
Bldg 4-78/79	GW028S	Sep-22	Overdrill	2
Bldg 4-78/79	GW029	Sep-22	Overdrill	2
Bldg 4-78/79	GW030S	Sep-22	Overdrill	2
Bldg 4-78/79	GW038S	Sep-22	Overdrill	2
Bldg 4-78/79	GW022S	Sep-22	Overdrill	2
Bldg 4-78/79	GW024D	Sep-22	Overdrill	2
Bldg 4-78/79	GW026I	Sep-22	Overdrill	2
Bldg 4-78/79	GW027D	Sep-22	Overdrill	2

Table 4-1 Renton Well Decommissioning Summary

Area	Well	Date Decommissioned	Method	Phase
Bldg 4-78/79	GW023S	Sep-22	Overdrill	2
Bldg 4-78/79	GW039S	Sep-22	Overdrill	2
Bldg 4-78/79	GW040S	Sep-22	Overdrill	2
Bldg 4-78/79	GW035S	Sep-22	Overdrill	2
Bldg 4-78/79	GW036S	Sep-22	Overdrill	2
AOC-060	GW159S	Jun-23	chip in place, removed monument	3
AOC-060	GW160S	Jun-23	chip in place, removed monument	3
AOC-060	GW252S	Jun-23	chip in place, removed monument	3
AOC-060	GW254S	Jun-23	chip in place, removed monument	3
AOC-060	GW149S	Jun-23	chip in place, removed monument	3
AOC-090	GW177I	Jun-23	chip in place, removed monument	3
AOC-090	GW181I	Jun-23	chip in place, removed monument	3
AOC-090	GW182S	Jun-23	chip in place, removed monument	3
AOC-090	GW179I	Jun-23	chip in place, removed monument	3
AOC-090	GW180S	Jun-23	chip in place, removed monument	3
Apron A	GW262S	Jun-23	chip in place	3
FFF	GW183S	Jun-23	chip in place	3
FFF	GW184S	Jun-23	chip in place	3
FFF	GW225I	Jun-23	chip in place	3
FFF	GW257S	Jun-23	chip in place	3
FFF	GW255S	Jun-23	chip in place	3
FFF	GW256S	Jun-23	chip in place	3
FFF	GW212S	Jun-23	chip in place	3
FFF	GW258S	Jun-23	chip in place	3
SWMU-168	GW228S	Jun-23	chip in place	3
SWMU-168	GW229S	Jun-23	chip in place	3
SWMU-168	GW231S	Jun-23	chip in place	3
SWMU-172/174	GW079S	Jun-23	Overdrill	3
SWMU-172/174	GW171S	Jun-23	chip in place	3
SWMU-172/174	GW233I	Jun-23	chip in place	3
SWMU-172/174	GW080S	Jun-23	chip in place	3
SWMU-172/174	GW081S	Jun-23	chip in place	3
SWMU-172/174	GW083S	Jun-23	chip in place	3
SWMU-172/174	GW084S	Jun-23	chip in place	3
SWMU-172/174	GW136S	Jun-23	chip in place	3

FIGURES



CALIBRE Systems, Inc.

Figure 1-1 Site Location/ AOC Outlines

Source Area Wells	Downgradient Plume Area Wells	Conditional Point of Compliance Wells
GW152S	GW172S	GW232S
GW153S	GW173S	GW234S
	GW226S	GW235I
		GW236S

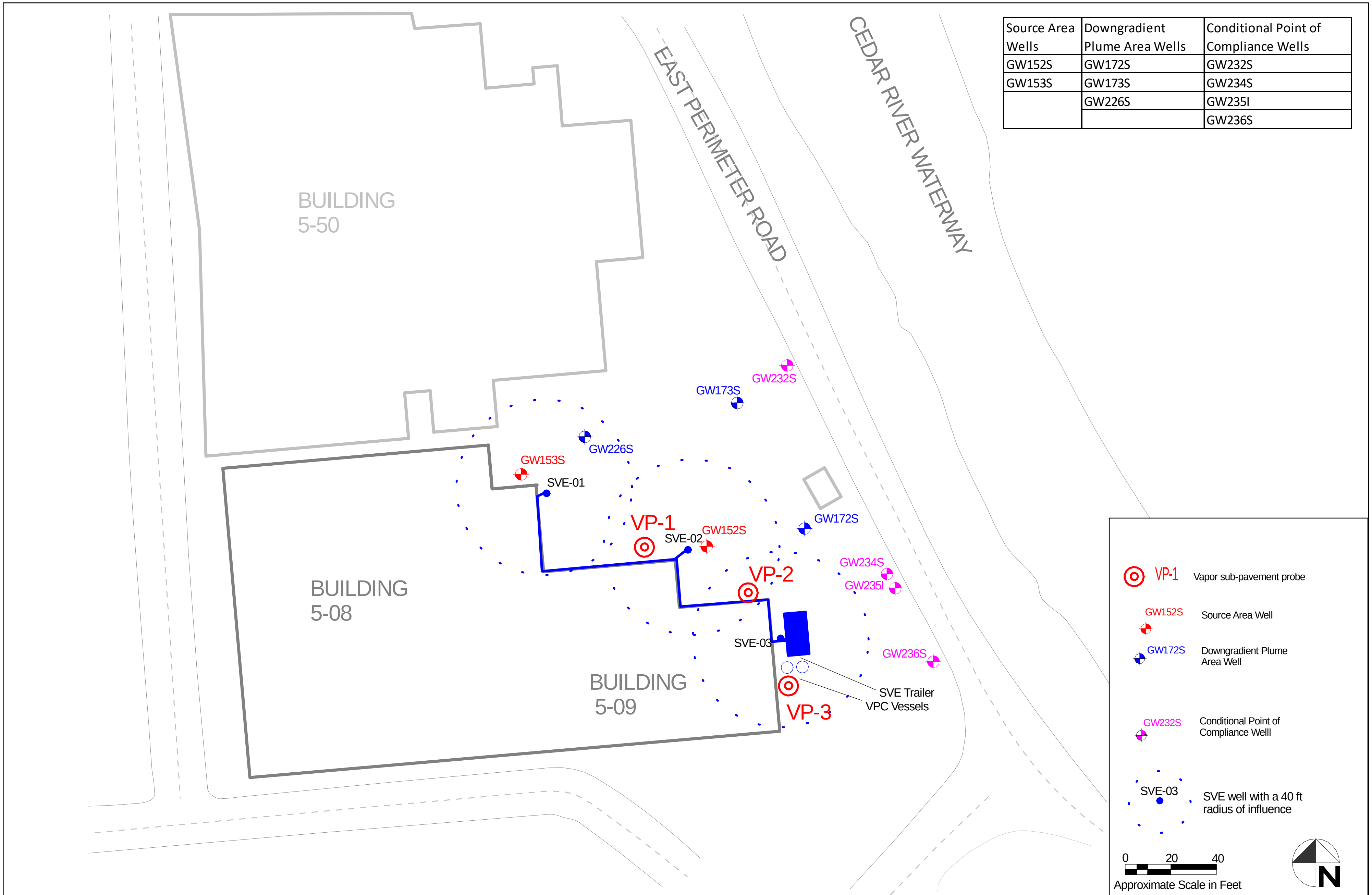


Figure 1 SWMU-172/174 Area (Bldg. 5-08/09)

Vapor Sub-Slab/Pavement Probes

Attachment A: SWMU-172/174 Vapor Pin Lab Packages, Sample Sheets, Installation Photos, and Prior Vapor Monitoring Work Plan

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5/23/2023
Mr. Justin Neste
CALIBRE, Environmental Technology Solutions
20926 Pugh Rd NE

Poulsbo WA 98370

Project Name: Boeing - Renton
Project #:
Workorder #: 2305214

Dear Mr. Justin Neste

The following report includes the data for the above referenced project for sample(s) received on 5/10/2023 at Eurofins Air Toxics LLC.

The data and associated QC analyzed by TO-15 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Eurofins Air Toxics LLC. for your air analysis needs. Eurofins Air Toxics Inc. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Monica Tran at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Monica Tran

Monica Tran
Project Manager

WORK ORDER #: 2305214

Work Order Summary

CLIENT:	Mr. Justin Neste CALIBRE, Environmental Technology Solutions 20926 Pugh Rd NE Poulsbo, WA 98370	**BILL TO:**	Accounts Payable CALIBRE, Environmental Technology Solutions 6354 Walker Lane, Suite 300 Metro Park
PHONE:	360-981-5606	**P.O. #**	
FAX:		**PROJECT #**	Boeing - Renton
DATE RECEIVED:	05/10/2023	**CONTACT:**	Monica Tran
DATE COMPLETED:	05/23/2023		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	VP-3-050923	TO-15	5.1 "Hg	9.9 psi
02A	VP-1-050923	TO-15	4.7 "Hg	10 psi
03A	VP-2-050923	TO-15	4.1 "Hg	9.8 psi
04A	Dup01-050923	TO-15	3.5 "Hg	9.7 psi
05A	Lab Blank	TO-15	NA	NA
06A	CCV	TO-15	NA	NA
07A	LCS	TO-15	NA	NA
07AA	LCSD	TO-15	NA	NA

CERTIFIED BY: Heidi Hayes DATE: 05/23/23

Technical Director

Certification numbers: AZ Licensure AZ0775, FL NELAP – E87680, LA NELAP – 02089, NH NELAP – 209222, NJ NELAP - CA016, NY NELAP - 11291, TX NELAP – T104704434-22-18, UT NELAP – CA009332022-14, VA NELAP - 12240, WA ELAP - C935
Name of Accreditation Body: NELAP/ORELAP (Oregon Environmental Laboratory Accreditation Program) CA300005-017
Eurofins Environment Testing Northern California, LLC certifies that the test results contained in this report meet all requirements of the 2016 TNI Standard.

LABORATORY NARRATIVE
EPA Method TO-15
CALIBRE, Environmental Technology Solutions
Workorder# 2305214

Four 1 Liter Summa Canister samples were received on May 10, 2023. The laboratory performed analysis via EPA Method TO-15 using GC/MS in the full scan mode.

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

A single point calibration for TPH referenced to Gasoline was performed for each daily analytical batch. Recovery is reported as 100% in the associated results for each CCV.

Non-standard compounds may have different acceptance criteria than the standard TO-14A/TO-15 compound list as per contract or verbal agreement.

Dilution was performed on samples VP-2-050923 and Dup01-050923 due to the presence of high level target species.

Definition of Data Qualifying Flags

Ten qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).
J - Estimated value.
E - Exceeds instrument calibration range.
S - Saturated peak.
Q - Exceeds quality control limits.
U - Compound analyzed for but not detected above the reporting limit, LOD, or MDL value. See data page for project specific U-flag definition.
UJ- Non-detected compound associated with low bias in the CCV
N - The identification is based on presumptive evidence.
M - Reported value may be biased due to apparent matrix interferences.
CN - See Case Narrative.

File extensions may have been used on the data analysis sheets and indicates as follows:
a-File was requantified
b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

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Summary of Detected Compounds
EPA METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: VP-3-050923

Lab ID#: 2305214-01A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Acetone	10	50	24	120
2-Butanone (Methyl Ethyl Ketone)	4.0	11	12	32
cis-1,2-Dichloroethene	1.0	1.2	4.0	4.7
1,1,1-Trichloroethane	1.0	2.5	5.5	14
Trichloroethene	1.0	4.1	5.4	22
Tetrachloroethene	1.0	100	6.8	710
TPH ref. to Gasoline (MW=100)	100	110	410	450

Client Sample ID: VP-1-050923

Lab ID#: 2305214-02A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Acetone	10	21	24	50
Hexane	1.0	5.3	3.5	19
2-Butanone (Methyl Ethyl Ketone)	4.0	4.2	12	12
Benzene	1.0	2.8	3.2	9.1
Toluene	2.0	11	7.5	40
Tetrachloroethene	1.0	25	6.7	170
m,p-Xylene	2.0	3.4	8.6	15
TPH ref. to Gasoline (MW=100)	100	100	410	410

Client Sample ID: VP-2-050923

Lab ID#: 2305214-03A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Vinyl Chloride	3.9	19	9.9	50
trans-1,2-Dichloroethene	3.9	3.8 J	15	15 J
cis-1,2-Dichloroethene	3.9	120	15	500
Trichloroethene	3.9	200	21	1100
Tetrachloroethene	3.9	850	26	5800

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Summary of Detected Compounds
EPA METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: Dup01-050923

Lab ID#: 2305214-04A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Vinyl Chloride	3.8	9.2	9.6	23
Acetone	38	40	89	95
cis-1,2-Dichloroethene	3.8	120	15	460
Trichloroethene	3.8	180	20	950
Tetrachloroethene	3.8	740	26	5000

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Client Sample ID: VP-3-050923

Lab ID#: 2305214-01A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3052007**	**Date of Collection: 5/9/23 11:29:00 AM**
Dil. Factor:	**2.02**	**Date of Analysis: 5/20/23 02:38 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Chloromethane	10	Not Detected	21	Not Detected
Vinyl Chloride	1.0	Not Detected	2.6	Not Detected
Freon 113	1.0	Not Detected	7.7	Not Detected
1,1-Dichloroethene	1.0	Not Detected	4.0	Not Detected
Acetone	10	50	24	120
Carbon Disulfide	4.0	Not Detected	12	Not Detected
Methylene Chloride	10	Not Detected	35	Not Detected
trans-1,2-Dichloroethene	1.0	Not Detected	4.0	Not Detected
Hexane	1.0	Not Detected	3.6	Not Detected
1,1-Dichloroethane	1.0	Not Detected	4.1	Not Detected
2-Butanone (Methyl Ethyl Ketone)	4.0	11	12	32
cis-1,2-Dichloroethene	1.0	1.2	4.0	4.7
Chloroform	1.0	Not Detected	4.9	Not Detected
1,1,1-Trichloroethane	1.0	2.5	5.5	14
Benzene	1.0	Not Detected	3.2	Not Detected
Trichloroethene	1.0	4.1	5.4	22
Toluene	2.0	Not Detected	7.6	Not Detected
1,1,2-Trichloroethane	1.0	Not Detected	5.5	Not Detected
Tetrachloroethene	1.0	100	6.8	710
Chlorobenzene	1.0	Not Detected	4.6	Not Detected
Ethyl Benzene	1.0	Not Detected	4.4	Not Detected
m,p-Xylene	2.0	Not Detected	8.8	Not Detected
o-Xylene	1.0	Not Detected	4.4	Not Detected
Styrene	1.0	Not Detected	4.3	Not Detected
Cumene	1.0	Not Detected	5.0	Not Detected
Propylbenzene	1.0	Not Detected	5.0	Not Detected
1,3,5-Trimethylbenzene	1.0	Not Detected	5.0	Not Detected
1,2,4-Trimethylbenzene	1.0	Not Detected	5.0	Not Detected
TPH ref. to Gasoline (MW=100)	100	110	410	450
Acetonitrile	10	Not Detected	17	Not Detected
Vinyl Acetate	4.0	Not Detected	14	Not Detected
Octane	4.0	Not Detected	19	Not Detected
Pentane	4.0	Not Detected	12	Not Detected
Butylbenzene	4.0	Not Detected	22	Not Detected
Decane	4.0	Not Detected	24	Not Detected
Dodecane	10	Not Detected	70	Not Detected
sec-Butylbenzene	4.0	Not Detected	22	Not Detected
p-Cymene	4.0	Not Detected	22	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits

Client Sample ID: VP-3-050923

Lab ID#: 2305214-01A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3052007**	**Date of Collection: 5/9/23 11:29:00 AM**
Dil. Factor:	**2.02**	**Date of Analysis: 5/20/23 02:38 PM**

Surrogates	%Recovery	Method Limits
Toluene-d8	101	70-130
1,2-Dichloroethane-d4	91	70-130
4-Bromofluorobenzene	99	70-130

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Client Sample ID: VP-1-050923

Lab ID#: 2305214-02A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3052008**	**Date of Collection: 5/9/23 12:52:00 PM**
Dil. Factor:	**1.99**	**Date of Analysis: 5/20/23 03:07 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Chloromethane	10	Not Detected	20	Not Detected
Vinyl Chloride	1.0	Not Detected	2.5	Not Detected
Freon 113	1.0	Not Detected	7.6	Not Detected
1,1-Dichloroethene	1.0	Not Detected	3.9	Not Detected
Acetone	10	21	24	50
Carbon Disulfide	4.0	Not Detected	12	Not Detected
Methylene Chloride	10	Not Detected	34	Not Detected
trans-1,2-Dichloroethene	1.0	Not Detected	3.9	Not Detected
Hexane	1.0	5.3	3.5	19
1,1-Dichloroethane	1.0	Not Detected	4.0	Not Detected
2-Butanone (Methyl Ethyl Ketone)	4.0	4.2	12	12
cis-1,2-Dichloroethene	1.0	Not Detected	3.9	Not Detected
Chloroform	1.0	Not Detected	4.8	Not Detected
1,1,1-Trichloroethane	1.0	Not Detected	5.4	Not Detected
Benzene	1.0	2.8	3.2	9.1
Trichloroethene	1.0	Not Detected	5.3	Not Detected
Toluene	2.0	11	7.5	40
1,1,2-Trichloroethane	1.0	Not Detected	5.4	Not Detected
Tetrachloroethene	1.0	25	6.7	170
Chlorobenzene	1.0	Not Detected	4.6	Not Detected
Ethyl Benzene	1.0	Not Detected	4.3	Not Detected
m,p-Xylene	2.0	3.4	8.6	15
o-Xylene	1.0	Not Detected	4.3	Not Detected
Styrene	1.0	Not Detected	4.2	Not Detected
Cumene	1.0	Not Detected	4.9	Not Detected
Propylbenzene	1.0	Not Detected	4.9	Not Detected
1,3,5-Trimethylbenzene	1.0	Not Detected	4.9	Not Detected
1,2,4-Trimethylbenzene	1.0	Not Detected	4.9	Not Detected
TPH ref. to Gasoline (MW=100)	100	100	410	410
Acetonitrile	10	Not Detected	17	Not Detected
Vinyl Acetate	4.0	Not Detected	14	Not Detected
Octane	4.0	Not Detected	18	Not Detected
Pentane	4.0	Not Detected	12	Not Detected
Butylbenzene	4.0	Not Detected	22	Not Detected
Decane	4.0	Not Detected	23	Not Detected
Dodecane	10	Not Detected	69	Not Detected
sec-Butylbenzene	4.0	Not Detected	22	Not Detected
p-Cymene	4.0	Not Detected	22	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits

Client Sample ID: VP-1-050923

Lab ID#: 2305214-02A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3052008**	**Date of Collection: 5/9/23 12:52:00 PM**
Dil. Factor:	**1.99**	**Date of Analysis: 5/20/23 03:07 PM**

Surrogates	%Recovery	Method Limits
Toluene-d8	105	70-130
1,2-Dichloroethane-d4	90	70-130
4-Bromofluorobenzene	96	70-130

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Client Sample ID: VP-2-050923

Lab ID#: 2305214-03A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3052010**	**Date of Collection:**	**5/9/23 2:14:00 PM**
Dil. Factor:	**7.72**	**Date of Analysis:**	**5/20/23 04:44 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Chloromethane	39	Not Detected	80	Not Detected
Vinyl Chloride	3.9	19	9.9	50
Freon 113	3.9	Not Detected	30	Not Detected
1,1-Dichloroethene	3.9	Not Detected	15	Not Detected
Acetone	39	Not Detected	92	Not Detected
Carbon Disulfide	15	Not Detected	48	Not Detected
Methylene Chloride	39	Not Detected	130	Not Detected
trans-1,2-Dichloroethene	3.9	3.8 J	15	15 J
Hexane	3.9	Not Detected	14	Not Detected
1,1-Dichloroethane	3.9	Not Detected	16	Not Detected
2-Butanone (Methyl Ethyl Ketone)	15	Not Detected	46	Not Detected
cis-1,2-Dichloroethene	3.9	120	15	500
Chloroform	3.9	Not Detected	19	Not Detected
1,1,1-Trichloroethane	3.9	Not Detected	21	Not Detected
Benzene	3.9	Not Detected	12	Not Detected
Trichloroethene	3.9	200	21	1100
Toluene	7.7	Not Detected	29	Not Detected
1,1,2-Trichloroethane	3.9	Not Detected	21	Not Detected
Tetrachloroethene	3.9	850	26	5800
Chlorobenzene	3.9	Not Detected	18	Not Detected
Ethyl Benzene	3.9	Not Detected	17	Not Detected
m,p-Xylene	7.7	Not Detected	34	Not Detected
o-Xylene	3.9	Not Detected	17	Not Detected
Styrene	3.9	Not Detected	16	Not Detected
Cumene	3.9	Not Detected	19	Not Detected
Propylbenzene	3.9	Not Detected	19	Not Detected
1,3,5-Trimethylbenzene	3.9	Not Detected	19	Not Detected
1,2,4-Trimethylbenzene	3.9	Not Detected	19	Not Detected
TPH ref. to Gasoline (MW=100)	390	Not Detected	1600	Not Detected
Acetonitrile	39	Not Detected	65	Not Detected
Vinyl Acetate	15	Not Detected	54	Not Detected
Octane	15	Not Detected	72	Not Detected
Pentane	15	Not Detected	46	Not Detected
Butylbenzene	15	Not Detected	85	Not Detected
Decane	15	Not Detected	90	Not Detected
Dodecane	39	Not Detected	270	Not Detected
sec-Butylbenzene	15	Not Detected	85	Not Detected
p-Cymene	15	Not Detected	85	Not Detected

J = Estimated value.

Container Type: 1 Liter Summa Canister

Client Sample ID: VP-2-050923

Lab ID#: 2305214-03A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3052010**	**Date of Collection: 5/9/23 2:14:00 PM**
Dil. Factor:	**7.72**	**Date of Analysis: 5/20/23 04:44 PM**

Surrogates	%Recovery	Method Limits
Toluene-d8	97	70-130
1,2-Dichloroethane-d4	99	70-130
4-Bromofluorobenzene	97	70-130

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Client Sample ID: Dup01-050923

Lab ID#: 2305214-04A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3052011**	**Date of Collection: 5/9/23 8:20:00 AM**
Dil. Factor:	**7.52**	**Date of Analysis: 5/20/23 05:10 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Chloromethane	38	Not Detected	78	Not Detected
Vinyl Chloride	3.8	9.2	9.6	23
Freon 113	3.8	Not Detected	29	Not Detected
1,1-Dichloroethene	3.8	Not Detected	15	Not Detected
Acetone	38	40	89	95
Carbon Disulfide	15	Not Detected	47	Not Detected
Methylene Chloride	38	Not Detected	130	Not Detected
trans-1,2-Dichloroethene	3.8	Not Detected	15	Not Detected
Hexane	3.8	Not Detected	13	Not Detected
1,1-Dichloroethane	3.8	Not Detected	15	Not Detected
2-Butanone (Methyl Ethyl Ketone)	15	Not Detected	44	Not Detected
cis-1,2-Dichloroethene	3.8	120	15	460
Chloroform	3.8	Not Detected	18	Not Detected
1,1,1-Trichloroethane	3.8	Not Detected	20	Not Detected
Benzene	3.8	Not Detected	12	Not Detected
Trichloroethene	3.8	180	20	950
Toluene	7.5	Not Detected	28	Not Detected
1,1,2-Trichloroethane	3.8	Not Detected	20	Not Detected
Tetrachloroethene	3.8	740	26	5000
Chlorobenzene	3.8	Not Detected	17	Not Detected
Ethyl Benzene	3.8	Not Detected	16	Not Detected
m,p-Xylene	7.5	Not Detected	33	Not Detected
o-Xylene	3.8	Not Detected	16	Not Detected
Styrene	3.8	Not Detected	16	Not Detected
Cumene	3.8	Not Detected	18	Not Detected
Propylbenzene	3.8	Not Detected	18	Not Detected
1,3,5-Trimethylbenzene	3.8	Not Detected	18	Not Detected
1,2,4-Trimethylbenzene	3.8	Not Detected	18	Not Detected
TPH ref. to Gasoline (MW=100)	380	Not Detected	1500	Not Detected
Acetonitrile	38	Not Detected	63	Not Detected
Vinyl Acetate	15	Not Detected	53	Not Detected
Octane	15	Not Detected	70	Not Detected
Pentane	15	Not Detected	44	Not Detected
Butylbenzene	15	Not Detected	82	Not Detected
Decane	15	Not Detected	88	Not Detected
Dodecane	38	Not Detected	260	Not Detected
sec-Butylbenzene	15	Not Detected	82	Not Detected
p-Cymene	15	Not Detected	82	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits

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Client Sample ID: Dup01-050923

Lab ID#: 2305214-04A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3052011**	**Date of Collection: 5/9/23 8:20:00 AM**
Dil. Factor:	**7.52**	**Date of Analysis: 5/20/23 05:10 PM**

Surrogates	%Recovery	Method Limits
Toluene-d8	96	70-130
1,2-Dichloroethane-d4	99	70-130
4-Bromofluorobenzene	96	70-130

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Client Sample ID: Lab Blank

Lab ID#: 2305214-05A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3052006a**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 5/20/23 11:47 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Chloromethane	5.0	Not Detected	10	Not Detected
Vinyl Chloride	0.50	Not Detected	1.3	Not Detected
Freon 113	0.50	Not Detected	3.8	Not Detected
1,1-Dichloroethene	0.50	Not Detected	2.0	Not Detected
Acetone	5.0	Not Detected	12	Not Detected
Carbon Disulfide	2.0	Not Detected	6.2	Not Detected
Methylene Chloride	5.0	Not Detected	17	Not Detected
trans-1,2-Dichloroethene	0.50	Not Detected	2.0	Not Detected
Hexane	0.50	Not Detected	1.8	Not Detected
1,1-Dichloroethane	0.50	Not Detected	2.0	Not Detected
2-Butanone (Methyl Ethyl Ketone)	2.0	Not Detected	5.9	Not Detected
cis-1,2-Dichloroethene	0.50	Not Detected	2.0	Not Detected
Chloroform	0.50	Not Detected	2.4	Not Detected
1,1,1-Trichloroethane	0.50	Not Detected	2.7	Not Detected
Benzene	0.50	Not Detected	1.6	Not Detected
Trichloroethene	0.50	Not Detected	2.7	Not Detected
Toluene	1.0	Not Detected	3.8	Not Detected
1,1,2-Trichloroethane	0.50	Not Detected	2.7	Not Detected
Tetrachloroethene	0.50	Not Detected	3.4	Not Detected
Chlorobenzene	0.50	Not Detected	2.3	Not Detected
Ethyl Benzene	0.50	Not Detected	2.2	Not Detected
m,p-Xylene	1.0	Not Detected	4.3	Not Detected
o-Xylene	0.50	Not Detected	2.2	Not Detected
Styrene	0.50	Not Detected	2.1	Not Detected
Cumene	0.50	Not Detected	2.4	Not Detected
Propylbenzene	0.50	Not Detected	2.4	Not Detected
1,3,5-Trimethylbenzene	0.50	Not Detected	2.4	Not Detected
1,2,4-Trimethylbenzene	0.50	Not Detected	2.4	Not Detected
TPH ref. to Gasoline (MW=100)	50	Not Detected	200	Not Detected
Acetonitrile	5.0	Not Detected	8.4	Not Detected
Vinyl Acetate	2.0	Not Detected	7.0	Not Detected
Octane	2.0	Not Detected	9.3	Not Detected
Pentane	2.0	Not Detected	5.9	Not Detected
Butylbenzene	2.0	Not Detected	11	Not Detected
Decane	2.0	Not Detected	12	Not Detected
Dodecane	5.0	Not Detected	35	Not Detected
sec-Butylbenzene	2.0	Not Detected	11	Not Detected
p-Cymene	2.0	Not Detected	11	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits

Air Toxics

Client Sample ID: Lab Blank

Lab ID#: 2305214-05A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3052006a**	**Date of Collection: NA**
Dil. Factor:	**1.00**	**Date of Analysis: 5/20/23 11:47 AM**

Surrogates	%Recovery	Method Limits
Toluene-d8	96	70-130
1,2-Dichloroethane-d4	99	70-130
4-Bromofluorobenzene	97	70-130

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Client Sample ID: CCV
Lab ID#: 2305214-06A
EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3052002**	**Date of Collection: NA**
Dil. Factor:	**1.00**	**Date of Analysis: 5/20/23 09:59 AM**

Compound	%Recovery
Chloromethane	105
Vinyl Chloride	85
Freon 113	96
1,1-Dichloroethene	89
Acetone	102
Carbon Disulfide	96
Methylene Chloride	115
trans-1,2-Dichloroethene	90
Hexane	102
1,1-Dichloroethane	98
2-Butanone (Methyl Ethyl Ketone)	95
cis-1,2-Dichloroethene	87
Chloroform	98
1,1,1-Trichloroethane	94
Benzene	101
Trichloroethene	100
Toluene	94
1,1,2-Trichloroethane	92
Tetrachloroethene	105
Chlorobenzene	95
Ethyl Benzene	94
m,p-Xylene	92
o-Xylene	92
Styrene	90
Cumene	93
Propylbenzene	93
1,3,5-Trimethylbenzene	92
1,2,4-Trimethylbenzene	91
TPH ref. to Gasoline (MW=100)	100
Acetonitrile	114
Vinyl Acetate	87
Octane	96
Pentane	112
Butylbenzene	92
Decane	99
Dodecane	99
sec-Butylbenzene	85
p-Cymene	87

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits

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Client Sample ID: CCV

Lab ID#: 2305214-06A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3052002**	**Date of Collection: NA**
Dil. Factor:	**1.00**	**Date of Analysis: 5/20/23 09:59 AM**

Surrogates	%Recovery	Method Limits
Toluene-d8	107	70-130
1,2-Dichloroethane-d4	97	70-130
4-Bromofluorobenzene	106	70-130

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Client Sample ID: LCS

Lab ID#: 2305214-07A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3052003**	**Date of Collection: NA**
Dil. Factor:	**1.00**	**Date of Analysis: 5/20/23 10:25 AM**

Compound	%Recovery	Method Limits
Chloromethane	88	70-130
Vinyl Chloride	83	70-130
Freon 113	102	70-130
1,1-Dichloroethene	92	70-130
Acetone	110	70-130
Carbon Disulfide	105	70-130
Methylene Chloride	120	70-130
trans-1,2-Dichloroethene	98	70-130
Hexane	110	70-130
1,1-Dichloroethane	107	70-130
2-Butanone (Methyl Ethyl Ketone)	101	70-130
cis-1,2-Dichloroethene	90	70-130
Chloroform	87	70-130
1,1,1-Trichloroethane	89	70-130
Benzene	82	70-130
Trichloroethene	82	70-130
Toluene	86	70-130
1,1,2-Trichloroethane	87	70-130
Tetrachloroethene	97	70-130
Chlorobenzene	93	70-130
Ethyl Benzene	91	70-130
m,p-Xylene	89	70-130
o-Xylene	91	70-130
Styrene	90	70-130
Cumene	92	70-130
Propylbenzene	93	70-130
1,3,5-Trimethylbenzene	94	70-130
1,2,4-Trimethylbenzene	92	70-130
TPH ref. to Gasoline (MW=100)	Not Spiked	
Acetonitrile	131	60-140
Vinyl Acetate	103	70-130
Octane	88	70-130
Pentane	121	70-130
Butylbenzene	97	70-130
Decane	97	60-140
Dodecane	113	60-140
sec-Butylbenzene	88	70-130
p-Cymene	90	60-140

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits

Client Sample ID: LCS
Lab ID#: 2305214-07A
EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3052003**	**Date of Collection: NA**
Dil. Factor:	**1.00**	**Date of Analysis: 5/20/23 10:25 AM**

Surrogates	%Recovery	Method Limits
Toluene-d8	93	70-130
1,2-Dichloroethane-d4	90	70-130
4-Bromofluorobenzene	107	70-130

Client Sample ID: LCSD

Lab ID#: 2305214-07AA

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	3052004	Date of Collection: NA	
Dil. Factor:	1.00	Date of Analysis: 5/20/23 10:52 AM	

Compound	%Recovery	Method Limits
Chloromethane	113	70-130
Vinyl Chloride	102	70-130
Freon 113	93	70-130
1,1-Dichloroethene	86	70-130
Acetone	102	70-130
Carbon Disulfide	97	70-130
Methylene Chloride	112	70-130
trans-1,2-Dichloroethene	87	70-130
Hexane	101	70-130
1,1-Dichloroethane	96	70-130
2-Butanone (Methyl Ethyl Ketone)	95	70-130
cis-1,2-Dichloroethene	86	70-130
Chloroform	96	70-130
1,1,1-Trichloroethane	95	70-130
Benzene	94	70-130
Trichloroethene	90	70-130
Toluene	91	70-130
1,1,2-Trichloroethane	91	70-130
Tetrachloroethene	95	70-130
Chlorobenzene	94	70-130
Ethyl Benzene	96	70-130
m,p-Xylene	93	70-130
o-Xylene	92	70-130
Styrene	92	70-130
Cumene	94	70-130
Propylbenzene	94	70-130
1,3,5-Trimethylbenzene	93	70-130
1,2,4-Trimethylbenzene	93	70-130
TPH ref. to Gasoline (MW=100)	Not Spiked	
Acetonitrile	119	60-140
Vinyl Acetate	96	70-130
Octane	94	70-130
Pentane	110	70-130
Butylbenzene	95	70-130
Decane	102	60-140
Dodecane	110	60-140
sec-Butylbenzene	87	70-130
p-Cymene	90	60-140

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits

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Client Sample ID: LCSD

Lab ID#: 2305214-07AA

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3052004**	**Date of Collection: NA**
Dil. Factor:	**1.00**	**Date of Analysis: 5/20/23 10:52 AM**

Surrogates	**%Recovery**	**Method Limits**
Toluene-d8	94	70-130
1,2-Dichloroethane-d4	98	70-130
4-Bromofluorobenzene	105	70-130

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8/17/2023
Mr. Justin Neste
CALIBRE, Environmental Technology Solutions
20926 Pugh Rd NE

Poulsbo WA 98370

Project Name: Boeing Renton
Project #:
Workorder #: 2308054

Dear Mr. Justin Neste

The following report includes the data for the above referenced project for sample(s) received on 8/1/2023 at Eurofins Air Toxics LLC.

The data and associated QC analyzed by TO-15 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Eurofins Air Toxics LLC. for your air analysis needs. Eurofins Air Toxics Inc. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Monica Tran at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Monica Tran

Monica Tran
Project Manager

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WORK ORDER #: 2308054

Work Order Summary

CLIENT:	Mr. Justin Neste CALIBRE, Environmental Technology Solutions 20926 Pugh Rd NE Poulsbo, WA 98370	**BILL TO:**	Accounts Payable CALIBRE, Environmental Technology Solutions 6354 Walker Lane, Suite 300 Metro Park
PHONE:	360-981-5606	**P.O. #**	
FAX:		**PROJECT #**	Boeing Renton
DATE RECEIVED:	08/01/2023	**CONTACT:**	Monica Tran
DATE COMPLETED:	08/17/2023		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	AMB-Blank-073123	TO-15	10.8 "Hg	9.8 psi
02A	VP-2-073123	TO-15	11 "Hg	10 psi
03A	Lab Blank	TO-15	NA	NA
04A	CCV	TO-15	NA	NA
05A	LCS	TO-15	NA	NA
05AA	LCSD	TO-15	NA	NA

CERTIFIED BY: Heidi Hayes DATE: 08/17/23

Technical Director

Certification numbers: AZ Licensure AZ0775, FL NELAP – E87680, LA NELAP – 02089, NH NELAP – 209222, NJ NELAP - CA016, NY NELAP - 11291, TX NELAP – T104704434-22-18, UT NELAP – CA009332022-14, VA NELAP - 12240, WA ELAP - C935
Name of Accreditation Body: NELAP/ORELAP (Oregon Environmental Laboratory Accreditation Program) CA300005-017
Eurofins Environment Testing Northern California, LLC certifies that the test results contained in this report meet all requirements of the 2016 TNI Standard.

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LABORATORY NARRATIVE
EPA Method TO-15
CALIBRE, Environmental Technology Solutions
Workorder# 2308054

Two 1 Liter Summa Canister samples were received on August 01, 2023. The laboratory performed analysis via EPA Method TO-15 using GC/MS in the full scan mode.

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

Dilution was performed on sample VP-2-073123 due to the presence of high level target species.

Definition of Data Qualifying Flags

Ten qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).

J - Estimated value.

E - Exceeds instrument calibration range.

S - Saturated peak.

Q - Exceeds quality control limits.

U - Compound analyzed for but not detected above the reporting limit, LOD, or MDL value. See data page for project specific U-flag definition.

UJ- Non-detected compound associated with low bias in the CCV

N - The identification is based on presumptive evidence.

M - Reported value may be biased due to apparent matrix interferences.

CN - See Case Narrative.

File extensions may have been used on the data analysis sheets and indicates as follows:

a-File was requantified

b-File was quantified by a second column and detector

r1-File was requantified for the purpose of reissue

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Summary of Detected Compounds
EPA METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: AMB-Blank-073123

Lab ID#: 2308054-01A

No Detections Were Found.

Client Sample ID: VP-2-073123

Lab ID#: 2308054-02A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
cis-1,2-Dichloroethene	2.4	78	9.6	310
Trichloroethene	2.4	130	13	700
Tetrachloroethene	2.4	660	16	4400

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Client Sample ID: AMB-Blank-073123

Lab ID#: 2308054-01A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**p081518**	**Date of Collection:**	**7/31/23 4:27:00 PM**
Dil. Factor:	**2.60**	**Date of Analysis:**	**8/15/23 10:37 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Vinyl Chloride	1.3	Not Detected	3.3	Not Detected
1,1-Dichloroethene	1.3	Not Detected	5.2	Not Detected
Methylene Chloride	13	Not Detected	45	Not Detected
cis-1,2-Dichloroethene	1.3	Not Detected	5.2	Not Detected
Benzene	1.3	Not Detected	4.2	Not Detected
Trichloroethene	1.3	Not Detected	7.0	Not Detected
Tetrachloroethene	1.3	Not Detected	8.8	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	89	70-130
1,2-Dichloroethane-d4	110	70-130
4-Bromofluorobenzene	96	70-130

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Client Sample ID: VP-2-073123

Lab ID#: 2308054-02A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**p081519**	**Date of Collection:**	**7/31/23 4:27:00 PM**
Dil. Factor:	**4.82**	**Date of Analysis:**	**8/15/23 11:07 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Vinyl Chloride	2.4	Not Detected	6.2	Not Detected
1,1-Dichloroethene	2.4	Not Detected	9.6	Not Detected
Methylene Chloride	24	Not Detected	84	Not Detected
cis-1,2-Dichloroethene	2.4	78	9.6	310
Benzene	2.4	Not Detected	7.7	Not Detected
Trichloroethene	2.4	130	13	700
Tetrachloroethene	2.4	660	16	4400

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	96	70-130
1,2-Dichloroethane-d4	100	70-130
4-Bromofluorobenzene	94	70-130

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Client Sample ID: Lab Blank

Lab ID#: 2308054-03A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**p081507d**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 8/15/23 12:21 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Vinyl Chloride	0.50	Not Detected	1.3	Not Detected
1,1-Dichloroethene	0.50	Not Detected	2.0	Not Detected
Methylene Chloride	5.0	Not Detected	17	Not Detected
cis-1,2-Dichloroethene	0.50	Not Detected	2.0	Not Detected
Benzene	0.50	Not Detected	1.6	Not Detected
Trichloroethene	0.50	Not Detected	2.7	Not Detected
Tetrachloroethene	0.50	Not Detected	3.4	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	98	70-130
1,2-Dichloroethane-d4	95	70-130
4-Bromofluorobenzene	94	70-130

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Client Sample ID: CCV

Lab ID#: 2308054-04A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**p081503**	**Date of Collection: NA**
Dil. Factor:	**1.00**	**Date of Analysis: 8/15/23 09:21 AM**

Compound	%Recovery
Vinyl Chloride	83
1,1-Dichloroethene	86
Methylene Chloride	94
cis-1,2-Dichloroethene	99
Benzene	94
Trichloroethene	101
Tetrachloroethene	109

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	84	70-130
1,2-Dichloroethane-d4	108	70-130
4-Bromofluorobenzene	118	70-130

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Client Sample ID: LCS

Lab ID#: 2308054-05A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**p081504**	**Date of Collection: NA**
Dil. Factor:	**1.00**	**Date of Analysis: 8/15/23 09:52 AM**

Compound	%Recovery	Method Limits
Vinyl Chloride	99	70-130
1,1-Dichloroethene	105	70-130
Methylene Chloride	111	70-130
cis-1,2-Dichloroethene	107	70-130
Benzene	96	70-130
Trichloroethene	99	70-130
Tetrachloroethene	104	70-130

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	99	70-130
1,2-Dichloroethane-d4	112	70-130
4-Bromofluorobenzene	111	70-130

Client Sample ID: LCSD

Lab ID#: 2308054-05AA

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**p081505**	**Date of Collection: NA**
Dil. Factor:	**1.00**	**Date of Analysis: 8/15/23 10:24 AM**

Compound	%Recovery	Method Limits
Vinyl Chloride	89	70-130
1,1-Dichloroethene	85	70-130
Methylene Chloride	89	70-130
cis-1,2-Dichloroethene	91	70-130
Benzene	93	70-130
Trichloroethene	96	70-130
Tetrachloroethene	103	70-130

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	85	70-130
1,2-Dichloroethane-d4	106	70-130
4-Bromofluorobenzene	108	70-130

Vapor Monitoring Data Sheet

Date	5/9/23	Site Location	Renton 5-09
Samplers	JN	Well ID	VP-3
		Constructed Depth	19"

Sample Train Leak Test:

Zero Time Vacuum	
1-min Vacuum	
5-min Vacuum	

Or
Shroud Test:

Gas Used	Helium
Elapsed Time	14 min
Gas Detected	59.1%

Purge Volume:

Sample Train Length (ft)	19"	48"	
Tube Diameter (in)			
Volume (L)			

Volume Reference Table:

Hose Diameter (in)	Volume (L/ft)
0.125 (1/8)	0.0024
0.25 (1/4)	0.0096
0.375 (3/8)	0.0217
0.5 (1/2)	0.0386
1 (1)	0.1543

Vapor Sample Purge Data:

	59.1%	56.3%	30.9%				
Time	1041	1047	1055				
Flow Rate (mL/min)	14/min	14/min	14/min				
PID (note ppm or ppb)	355 ppb	346 ppb	301 ppb				
Oxygen							
Carbon Dioxide							
Trace Gas Helium	0 ppm	2125 ppm	4850 ppm				

Sampling Data:

Time	1108 - 1129
Sample ID	VP-3-050923
Duplicate	NA
PID Reading	301 ppb

Analyses Performed:

VOCs (8260/TO-15)	TO-15

Sampling Device:

Summa	1L4500	Tedlar Bag	
Summa Flow Rate	~50 mL/min - Preset by lab		
Summa Start Vacuum	29.5" Hg		
Summa End Vacuum	5.5" Hg		

Sampling Notes:

CAN - 1L4500 - Flowmeter - 24000]. Assembled Shroud
COCs - PCE, TCE, cis DCE, VC
1,1-DCE, Benzene, Methylene chloride

Added helium - 59.1% inside shroud. Filled Tedlar. 0ppm helium & 355 ppb PID. Repeat 2 more times & sample. Shroud tests all below 10% concentration in shroud. Leak test passed.

Vapor Monitoring Data Sheet

Date	5/9/23
Samplers	JN

Site Location	Renton - 5-09
Well ID	VP-1
Constructed Depth	19"

Sample Train Leak Test:

Zero Time Vacuum	
1-min Vacuum	
5-min Vacuum	

Or
Shroud Test:

Gas Used	Helium
Elapsed Time	15 min
Gas Detected	90.6 %

Purge Volume:

Sample Train Length (ft)	19"	48"	
Tube Diameter (in)	1/4"	1/4"	
Volume (L)	0.015 + 0.~~0~~38 = 0.05 L		

Volume Reference Table:

Hose Diameter (in)	Volume (L/ft)
0.125 (1/8)	0.0024
0.25 (1/4)	0.0096
0.375 (3/8)	0.0217
0.5 (1/2)	0.0386
1 (1)	0.1543

Vapor Sample Purge Data:

	90.6%	82.2%	44.6%				
Time	1157	1205	1212				
Flow Rate (mL/min)	1 L/min	1 L/min	1 L/min				
PID (note ppm or ppb)	97ppb	79ppb	80ppb				
Oxygen							
Carbon Dioxide							
Trace Gas Helium	625ppm	2875ppm	2550ppm				

Sampling Data: 1232 - 1252

Time	~~1232~~ -
Sample ID	VP-1-050923
Duplicate	NA
PID Reading	80ppb

Analyses Performed:

VOCs (8260/TO-15)	TO-15

Sampling Device:

Summa	1L 3786	Tedlar Bag	
Summa Flow Rate	~50 mL/min preset by lab		
Summa Start Vacuum	30" Hg		
Summa End Vacuum	5.0 "Hg		

Sampling Notes:

Can - 1L3786
Flowmeter - 23975

Vapor Monitoring Data Sheet

Date	5/9/23	Site Location	Renton 5-09
Samplers	JN	Well ID	VP-2
		Constructed Depth	19"

Sample Train Leak Test:

Zero Time Vacuum	
1-min Vacuum	
5-min Vacuum	

Or
Shroud Test:

Gas Used	Helium
Elapsed Time	14 min
Gas Detected	89.1%

Purge Volume:

Sample Train Length (ft)	19"	48"	
Tube Diameter (in)			
Volume (L)			

Volume Reference Table:

Hose Diameter (in)	Volume (L/ft)
0.125 (1/8)	0.0024
0.25 (1/4)	0.0096
0.375 (3/8)	0.0217
0.5 (1/2)	0.0386
1 (1)	0.1543

Vapor Sample Purge Data: 89.1% 59.6% 54.1%

Time	1306	1313	1320				
Flow Rate (mL/min)	14/min	14/min	14/min				
PID (note ppm or ppb)	2069ppb	2212ppb	1912ppb				
Oxygen							
Carbon Dioxide							
Trace Gas Helium	1450ppm	2575ppm	5840ppm				

Sampling Data:

Time	1354 - 1414
Sample ID	VP-2-050923
Duplicate	Dup01-050923
PID Reading	1912ppb

Analyses Performed:

VOCs (8260/TO-15)	TO-15

Sampling Device:

Summa	1L1899 / 1L4064	Tedlar Bag	
Summa Flow Rate	~50 mL/min preset by lab		
Summa Start Vacuum	29.5 / 29.5 "Hg		
Summa End Vacuum	4.5 / 4.5 "Hg		

Sampling Notes:

Can - 1L1899 Dup can - 1L4064
Flow meter - 24926 Flowmeter - 24704

Vapor Monitoring Data Sheet

Date	7/31/23	Site Location	Renton 5-09
Samplers	JN RL	Well ID	VP-2
		Constructed Depth	19"

Sample Train Leak Test:

Zero Time Vacuum	
1-min Vacuum	
5-min Vacuum	

Or

Shroud Test:

Gas Used	Helium
Elapsed Time	10 min
Gas Detected	47% - 50%

Purge Volume:

Sample Train Length (ft)	19"	48"	
Tube Diameter (in)			
Volume (L)			

Volume Reference Table:

Hose Diameter (in)	Volume (L/ft)
0.125 (1/8)	0.0024
0.25 (1/4)	0.0096
0.375 (3/8)	0.0217
0.5 (1/2)	0.0386
1 (1)	0.1543

Vapor Sample Purge Data:

	50%	47%					
Time	1550	1600					
Flow Rate (mL/min)	14min	14min					
PID (note ppm or ppb)	58.2 ppm	48.8 ppm					
Oxygen							
Carbon Dioxide							
Trace Gas - Helium	10,400 ppm	2,850 ppm					

Sampling Data:

Time	1626
Sample ID	VP-2-073123
Duplicate	Ambient Blank @ 1627
PID Reading	40.0 ppm

Analyses Performed:

VOCs (8260/TO-15)	X

Sampling Device:

Summa	40875	Tedlar Bag	
Summa Flow Rate	14min		
Summa Start Vacuum	30 "Hg		
Summa End Vacuum	5 "Hg		

Sampling Notes:

AMB-Blank-073123 - Ambient Blank
Set up helium shroud. Purged VP-2 Initially ~3L. PID max @ 132 ppm. Purged an additional 3 liters + PID continued to drop. Final reading before helium shroud test = 49.5 ppm

Figure 1 – Vapor pin stainless steel screen at base of hole

Figure 2 – Pea gravel placed to the top of the vapor pin screen

Figure 3 –Vapor barrier installed above pea gravel

Figure 4 – Monument set with cement, compression seal cap to the side.

Sub-Slab Soil Vapor Sampling Plan

SWMU 172/174

Boeing Renton Facility

Renton, Washington

Prepared for:
The Boeing Company
EHS Remediation

Prepared by:
CALIBRE Systems, Inc.
Project No. T0014538

December 2, 2022

Table of Contents

List of Tables

List of Figures

Acronyms

1,1-DCE	1,1-dichloroethene
AO	Agreed Order
AOC	Areas of concern
CAP	Cleanup Action Plan
cis-1,2DCE	cis-1,2-dichloroethene
CLARC	Cleanup Levels and Risk Calculation
CMP	Compliance Monitoring Plan
COC	Chemical of Concern
DQOs	Data quality objectives
Ecology	Washington State Department of Ecology
EDR	Engineering Design Report
GIS	Geographic information system
ITRC	Interstate Technical and Regulatory Council
LCS	Laboratory control samples
MTCA	Model Toxics Control Act
PCE	Tetrachloroethene
PID	Photoionization detector
QAPP	Quality Assurance Project Plan
QA	Quality assurance
QC	Quality control
RPD	Relative percent difference
SDG	Sample delivery group
SOP	Standard operating procedures
SVOC	Semi volatile organic compound
SVE	Soil vapor extraction
SWMU	Solid waste management units
TCE	Trichloroethene
TO-15	Toxic organics - 15
VC	Vinyl chloride
VOC	Volatile organic compounds
$\mu g/m^3$	Microgram per cubic meter

1.0 Introduction and Purpose

Remedial actions at the Boeing Renton Facility have been implemented under the Washington State Department of Ecology (Ecology) Agreed Order (AO) No. 8191. The AO, finalized on January 2, 2013, requires implementation of the site-wide Cleanup Action Plan (CAP). The CAP provides for the following remedial actions: soil excavation, soil vapor extraction (SVE), enhanced bioremediation, institutional controls, and monitored natural attenuation for twelve separate solid waste management units (SWMUs) and areas of concern (AOCs).

The current site-wide remedial actions and groundwater monitoring program follow the CAP (Ecology 2012) and plans in the Engineering Design Report (EDR) (AMEC 2014), approved by Ecology in 2014 and the Compliance Monitoring Plan (CMP, AMEC 2014), as amended. This work plan describes new verification sampling at SWMU-172/174 related to shutdown of the SVE system at SWMU-172/174.

1.1 History/Background

SWMU-172/174 is located on the eastern side of the Renton Municipal Airport near the Cedar River. The COCs at SWMU-172/174 are:

- Soil: Tetrachloroethene (PCE), trichloroethene (TCE), vinyl chloride (VC), cis-1,2-dichloroethene (cis-1,2DCE), 1,1-dichloroethene (1,1-DCE), benzene, methylene chloride, and metals (copper, thallium, and zinc);
- Groundwater: PCE, TCE, benzene, other solvents, and solvent-related biodegradation products; one semi volatile organic compound (SVOC), and metals (arsenic, chromium, copper, and lead).

The selected remedy in the CAP includes SVE, enhanced bioremediation, monitored attenuation (MA), and institutional controls. The SVE system at SWMU-172/174 started operation in 2015 and has been operated and monitored in accordance with the EDR and CMP. Asymptotic low levels of vapor concentrations were observed at the SWMU-172/174 operating SVE wells and system influent during the November 2021 to April 2022 operating period. Rebound testing was completed during this monitoring period to evaluate whether SVE operations should be discontinued. The rebound results show marginal increases in PCE concentrations and estimated mass removal after a 35-day rest period. The slight increase in PCE mass removal was diminished back to prior asymptote levels after 16 days of operation. Based on these data and the defined shutdown criteria in the EDR and CMP (AMEC 2014a, 2014b), shutdown of the SVE system was approved by Ecology on October 17, 2022 subject to the results of this sub slab vapor verification sampling and other criteria.

As a follow-up to Boeing's request for approval to shut down the SVE system, Ecology requested additional soil vapor verification samples to evaluate the potential for indoor air exposure. This work plan presents the procedures and approach to collect that data. All of the sampling and work described in this plan is not considered or required in the CAP.

1.2 Relevant Standards

For sub-slab soil gas concentrations, no cleanup levels have been established under MTCA. The Cleanup Levels and Risk Calculation (CLARC) tables provide sub-slab soil gas screening levels under MTCA Method C. For the relevant chemicals of concern (COC), specifically PCE, TCE and VC, the CLARC tables present two sets of screening levels for evaluating the potential risk to indoor air. The MTCA C screening levels for the COCs in both groundwater and sub-slab measurements are listed in Table 1.

1.3 Purpose

The purpose of this work plan is to describe sampling procedures to collect soil vapor verification data that will be compared with relevant CLARC screening criteria. Boeing has received Ecology approval to shut down the SVE system and Ecology requested additional soil vapor verification sampling (this plan) which was not required in the CAP. This work plan presents the procedures and approach to collect that data.

1.4 Property and Building-Specific Details

The area is within a security controlled zone adjacent to the Renton Municipal Airport. Boeing operations in the area are associated with production and delivery of commercial aircraft. The 5-08/09 Buildings are used for maintenance services for equipment used in flight line operations. The building contains a satellite waste accumulation area, and the waste profile documents tetrachloroethylene waste generation

2.0 Summary of Existing Data

2.1 Existing Groundwater Data in Vicinity

SWMU 172/174 groundwater data have been collected from multiple wells over the last decade and the latest data collected in August 2022 are tabulated in Table 2. The recent Table 2 data are consistent with prior data and are below the groundwater screening levels in CLARC Method C for evaluating vapor intrusion risk (see Table 2). Monitoring wells GW152S and GW153S located next to the building are defined as the source area (i.e., source area prior to the remedial actions implemented). A summary time series of concentration data from GW152S and GW153S is included in Appendix A (all data are copied from prior reports submitted). These data include 16 sampling events over the last 5 years. The historical data from these wells show that no CVOCs have been detected above the CLARC vapor intrusion screening levels in this time period.

2.2 Existing Soil Vapor Data in Vicinity

Soil vapor data have been collected regularly at the Site since the start of SVE operations in April 2015. Asymptotic, low levels of vapor concentrations were observed at the operating SVE wells and system influent during the November 2021 to April 2022 operating period. The rebound testing completed in this time frame showed that PCE detections increased a marginal amount (from 475 $\mu g/m^3$ to 814 $\mu g/m^3$) after system restart following a 35-day rest period and decreased to 461 $\mu g/m^3$ within 16 days of operation; none of the values exceeded the sub-slab vapor screening limit for soil gas concentrations. Data from the most recent TO-15 analysis collected during rebound testing and older samples are shown in Table 3; these data show that the CLARC screening levels have not been exceeded for several years.

2.2 Ecology Data Collection Request

Following Ecology guidance for evaluating vapor intrusion (Ecology, 2022), both the prior soil vapor data and the measured groundwater concentrations are below the applicable screening levels established to evaluate the potential for vapor intrusion to create an exceedance of indoor air standards. Boeing has received Ecology approval to shut down the SVE system per the CAP requirements and Engineering Design

Report. Ecology has requested this new soil vapor verification data in the immediate area as part of the process for determining if the SVE equipment can be permanently removed from SWMU-172/174.

3.0 SAMPLING METHODOLOGY

The procedures described below present the process for installation and sampling of sub-slab soil vapor sampling points. The methods described are developed from relevant guidance documents, including EPA 2002), Interstate Technical and Regulatory Council (ITRC) Vapor Intrusion Pathway Practical Guidance (ITRC 2007), Ecology 2022.

3.1 Vapor Sampling Point Installation

Utility clearance will be conducted prior to any intrusive coring/drilling work. Utility clearance will include review of as-built building plans and marking the location of all the sub-slab utilities' approximate location. Following review of existing building and utility plans to identify existing and historic utilities, a private utility location service will be contracted to assess the potential presence of other unknown subsurface utilities in the investigation area. If any subsurface anomalies are detected during the utility survey, they will be marked. If the utility clearance indicates utilities within 5 feet, the sampling location will be relocated. After utilities have been cleared at the proposed sampling locations, the surface concrete/pavement will be cored. The initial utility drawings available for the site/area are included in Appendix C.

After coring, a small-diameter hole (1.0 to 1.25 inches in diameter) will be drilled into the underlying soil to a depth of 1 feet below the base of the slab with a roto-hammer or concrete corer. The vapor sampling point will be a commercial product such as ”Vaporpin“ or equivalent which is placed in the hole. Sand will be placed around the deeper (~ 12 inches deep) screen interval after the Vaporpin is placed. Bentonite chips will be used to fill the borehole annular space between the probe pipe and sub-slab gravel up to the base of the slab. Sufficient water will be added to hydrate the bentonite to ensure proper sealing and care will be used in placement of the bentonite to prevent post- emplacement expansion. A small monument will be placed around the probe point and will be tightly sealed to the slab with quick-setting Portland cement. The cement used will meet the Renton Airport standards for this application. Each probe will be constructed with a recessed threaded cap with a brass or stainless steel threaded fitting or compression fitting so the monument for probe completion is flush with the foundation slab to reduce the chance of a tripping hazard. Probes will be allowed to equilibrate for at least 30 minutes before samples are collected for analysis

Care will be taken during sampling to avoid the potential for ambient air break-through from the surface of the slab. Helium will be used following probe installation to assess the seal of the probe-point completion. Briefly, helium will be expressed from a pressurized tank into a shroud surrounding the head of the soil vapor probe. A mini-pump will be used to fill a Tedlar bag through the installed soil vapor probe. A portable helium detector will then be used to analyze the contents of the Tedlar bag for helium. Helium concentrations less than 10 percent will be considered acceptable (ITRC 2007).

3.1.1 Sample Analysis

Two sample analysis methods are feasible: Methods 8260 using Tedlar bags and Method TO-15 using Summa canisters. Both are approved methods and either should meet the required detection limits.

Boeing is planning to use TO-15 analysis (with sample collection using Summa canisters) because of the longer holding times approved for this sample collection method and the analytes to be reported will include the Site COCs.

3.1.2 Sample Collection

Each Summa canister and flow controller setup is to be leak tested (with a shut-in test) to verify flow controllers are functioning properly and there are no leaks in the sampling train. Using a hand pump, each sampling line is to be purged of at least 1L of soil vapor prior to sampling.

The purge volume or "dead space volume" of the sampling train is that volume of air occupying the sample collection tubing and the annular space around the tip of the vapor collection probe. The purge volume represents a volume of air that could potentially dilute a sample and must be removed before sample collection. A hand-held photoionization detector (PID) will be used to measure the VOC content of the purge air in steps. If VOCs are not detected in any of the step purge volumes, a default of three purge volumes will be removed before sampling each location. All Summa canisters will be certified clean by the laboratory to reduce the chance of contamination. A flow regulator will be placed between the probe and the Summa canister to ensure that the canister is filled over the targeted time interval.

Following purging of the vapor collection points, 1-liter Summa canisters will be field-checked for vacuum with a laboratory-supplied pressure gauge prior to use. All canisters will have initial vacuum pressures greater than -25 inches of mercury or will not be used. Each canister will be fitted with a flow restrictor calibrated for sample collection at a rate of 0.06 milliliters per minute (summa canister will be filled over an approximate 15 minute sample collection period) and connected to a length of Teflon tubing that will be attached to the soil vapor point. Following sample collection, the Summa canister will be closed and sealed. Beginning and ending times and canister vacuums will be recorded on chain- of-custody forms and sample labels.

3.2 Field Documentation

Sample documentation and control are necessary to ensure that the data are defensible and to verify that appropriate field and data review procedures are followed during all phases of the project. The field procedures for documentation, control, and transport of environmental samples are described in this Section.

Field notes will be recorded in bound field logbooks or field sampling sheets. Entries will be made with indelible ink. Field logbook entries will include factual information (free of conjecture and subjective language) and include sufficient detail such that another person (not the field sampling team) reading the logbook entries is able to understand the sampling situation based on the recorded information. Logbook pages will not be removed from the logbook. Incorrect entries will be noted by striking the incorrect entry with a single line, adding the correct entry, dating, and initialing the change. Sampling information that should be entered into the field logbook includes the following:

- Date and time of sampling.
- Weather conditions.
- Names or initials of sampling personnel.
- Sample location (including sketch and photograph)

- Canister identification number
- Initial canister vacuum
- Final canister vacuum

3.3 Meteorological Data

Local meteorological data from a public weather station will be obtained for the sampling period to record temperature, barometric pressure, wind direction and wind speed to assess diurnal or seasonal fluctuations in atmospheric conditions that may influence physical processes causing vapor intrusion and/or sampling results.

3.4 Sample Chain-of-Custody and Transport

Sample possession will be traceable from the time of sample collection until receipt of samples at the analytical laboratory. Sample chain-of-custody will be documented following the guidelines outlined below.

3.4.1 Field Custody

Samples collected will be in the custody of the field sampler(s) from the time of sample collection until the samples are transferred or shipped to the laboratory. The Project Manager will evaluate whether proper custody procedures were followed during the fieldwork by reviewing the documentation and discussing procedures with sampling personnel. It will be the responsibility of the Project Manager to decide if additional samples are necessary.

3.4.2 Sample Transfer of Custody and Transport

A chain-of-custody record will accompany samples. When transferring custody of the samples, the individual relinquishing and receiving the samples will sign, date, and note the time of transfer on the chain-of-custody record. The samples will be shipped via FedEx to Eurofins for the TO-15 analysis.

4.0 DATA MANAGEMENT AND REPORTING

Effective data management is required to provide consistent, accurate, and defensible environmental data to support subsequent project decisions/determinations based on the data. This project will collect field and laboratory data to be used for performance evaluation of remedial actions. The project plans for data management and reporting are discussed in the following sections.

4.1 Field Data

Daily field records (a combination of field logbooks and task-specific data sheets) will comprise the main documentation for field activities. As soon after collection as possible, field notes, data sheets, boring logs, and chain-of-custody forms will be scanned to create an electronic record for use in creating field summary reports. Appropriate field data will be hand-entered into the database. One hundred percent of the transferred data will be verified based on hard copy records. QA checks to identify anomalous values will also be conducted following data entry.

4.2 Laboratory Data

The contract laboratory will submit data electronically. Written documentation will also be used to clarify how field and laboratory duplicates and QA/QC samples were recorded in the data tables and to provide explanations of other issues that may arise. The data management task will include keeping accurate records of field and laboratory QA/QC samples so that project managers and technical staff who use the data will have appropriate documentation. The laboratory will assign a unique code to each batch of samples called a sample delivery group or SDG. Each analytical data set (including any extra lab documentation) will be filed based on that code.

4.3 Data Validation and Management

In order to ensure that data is of a known and acceptable quality, a data quality review will be performed independent of the laboratory and will include a review of laboratory performance criteria and sample-specific criteria. The reviewer will determine whether the project objectives have been met and whether the data are suitable for the intended purpose. The data review/validation procedure include a review of these project QC measures. The primary data quality review will consist of the following elements:

- Verification that sample numbers and analyses match the chain-of-custody request.
- Verification that sample holding times are met.
- Verification that field and laboratory blanks were performed at the proper frequency and that no analytes were present in the blanks.
- Verification that field and laboratory duplicates, matrix spikes (MS), and laboratory control samples (LCS) were run at the proper frequency and that control limits were met.
- Verification that surrogate compound analyses have been performed and that results met the criteria.
- Verification that established reporting limits have been achieved.

The data quality review will also include a review of the precision, bias, and completeness of analytical data. Precision will be assessed based on the relative percent difference (RPD) of MS/MSD and/or duplicate pairs. Calculated RPDs will be compared to the control limits and if the RPD is within these limits, the precision of the analysis will be assumed to meet the data quality objectives (DQOs) of the project. Bias will be reviewed by comparing the percent recoveries of surrogates, and LCS to the appropriate control limits. Data will be reviewed in accordance with the analytical methods, laboratory's standard operating procedures (SOPs), the project SOPs and QAPP and following industry guidance documents for data validation.

All characterization data will be entered into and managed in the Site data management system for use in conjunction with mapping tools [AutoCAD or geographic information system (GIS)] to manage, summarize, and report the sampling data generated.

4.4 Data Review and Reporting

Data validation reports will be completed following receipt of the complete laboratory data package for each analytical round. A summary data report will be prepared and submitted to Ecology.

The summary data report will include a description of the field sampling effort (e.g., procedures, sample and locations, field sample observations), descriptions and rationale for any deviations from this work plan; a discussion of any data quality issues; and tabulated field and laboratory data. Electronic data will be provided to Ecology once all analyses and data validation have been completed.

5.0 REFERENCES

AMEC, 2014a, Engineering Design Report, Boeing Renton Cleanup Action Plan Implementation, Boeing Renton Facility, Renton, Washington.

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Ecology. 2022. Guidance for Evaluating Soil Vapor Intrusion in Washington State. Washington State Department of Ecology. Publication No. 09-09-047

Interstate Technical and Regulatory Council (ITRC). 2007. Vapor Intrusion Pathway: A Practical Guideline. Washington DC.

U.S. Environmental Protection Agency (USEPA). 2002. OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance). Washington DC. EPA Document Number EPA530-D-02- 004.

TABLES

Table 1. Screening Levels to Protect Indoor Air from CLARC

Chemical	Indoor Air MTCA C Cleanup level (µg/m³)	Risk Driver for Individual Chemicals	Groundwater **Screening Level** Method C (µg/L)	Sub-Slab Soil Gas **Screening Level** Method C (µg/m³)
Tetrachloroethylene (PCE)	40	Noncancer effects	100	1,300
Trichloroethylene (TCE)	2	Noncancer effects	86	67
Vinyl chloride (VC)	2.8	Cancer	3.3	95

Notes:
µg/m³ = micrograms per cubic meter
µg/L = micrograms per liter
CLARC does not contain groundwater and sub-slab Screening Levels for cis 1,2 DCE

Table 2. August 2022 Groundwater Sampling Results Compared to Screening Levels to Protect Indoor Air

Well	PCE		TCE		VC	
	Measured PCE (µg/L)	GW SL Method C Noncancer (µg/L)	Measured TCE (µg/L)	GW SL Method C Noncancer (µg/L)	Measured VC (µg/L)	GW SL Method C Cancer (µg/L)
RGW-152S	1.05	100	0.534	8.6	0.346	3.3
RGW-153S	<0.02		0.0525		0.214	
RGW-172S	<0.02		<0.02		0.0887	
RGW-173S	<0.02		0.0496		0.175	
RGW-226S	<0.02		<0.02		0.128	
RGW-234S	<0.02		<0.02		0.17	
RGW-236S	<0.02		<0.02		<0.02	
RGW-232S	<0.02		<0.02		0.558	
RGW-235I	<0.02		0.025		0.028	

Notes:
All results and screening levels are in micro grams per liter (µg/L)
GW SL: Ground Water Screening Level - not a cleanup level
For screening level evaluation, the lowest screening level in CLARC Method C, considering both noncancer or cancer effects, is presented for comparison and the screening levels are not compliance criteria.
PCE Tetrachloroethylene
TCE Trichloroethylene
VC Vinyl chloride

Table 3. Soil Vapor Sampling Compared to Screening Levels to Protect Indoor Air

Sample port		PCE		TCE		VC	
		SG PCE (µg/m³)	S-S SG SL Method C Noncancer (µg/m³)	SG TCE (µg/m³)	S-S SG SL Method C Noncancer (µg/m³)	SG VC (µg/m³)	S-S SG SL Method C Cancer (µg/m³)
SVE-1	6/20/2019	68	1,300	7.5	67	<2.4	95
SVE-2	6/20/2019	678		52		<2.4	
SVE-3	12/2/2021	475		31		<2.4	
SVE-3	1/24/2022	746		48		<2.4	
SVE-3	1/25/2022	814		41		<2.4	
SVE-3	2/9/2022	461		24		<2.4	
SVE Inlet	9/23/2020	746		59		<2.4	
SVE Inlet	12/2/2021	265		18		<2.4	
SVE Inlet	1/24/2022	393		26		<2.4	
SVE Inlet	1/25/2022	482		27		<2.4	
SVE Inlet	2/9/2022	258		15		<2.4	

Notes

All results and screening levels are in micro grams per cubic meter (µg/m³)

S-S: Sub-slab

SG SL: Soil Gas Screening Level - not a cleanup level

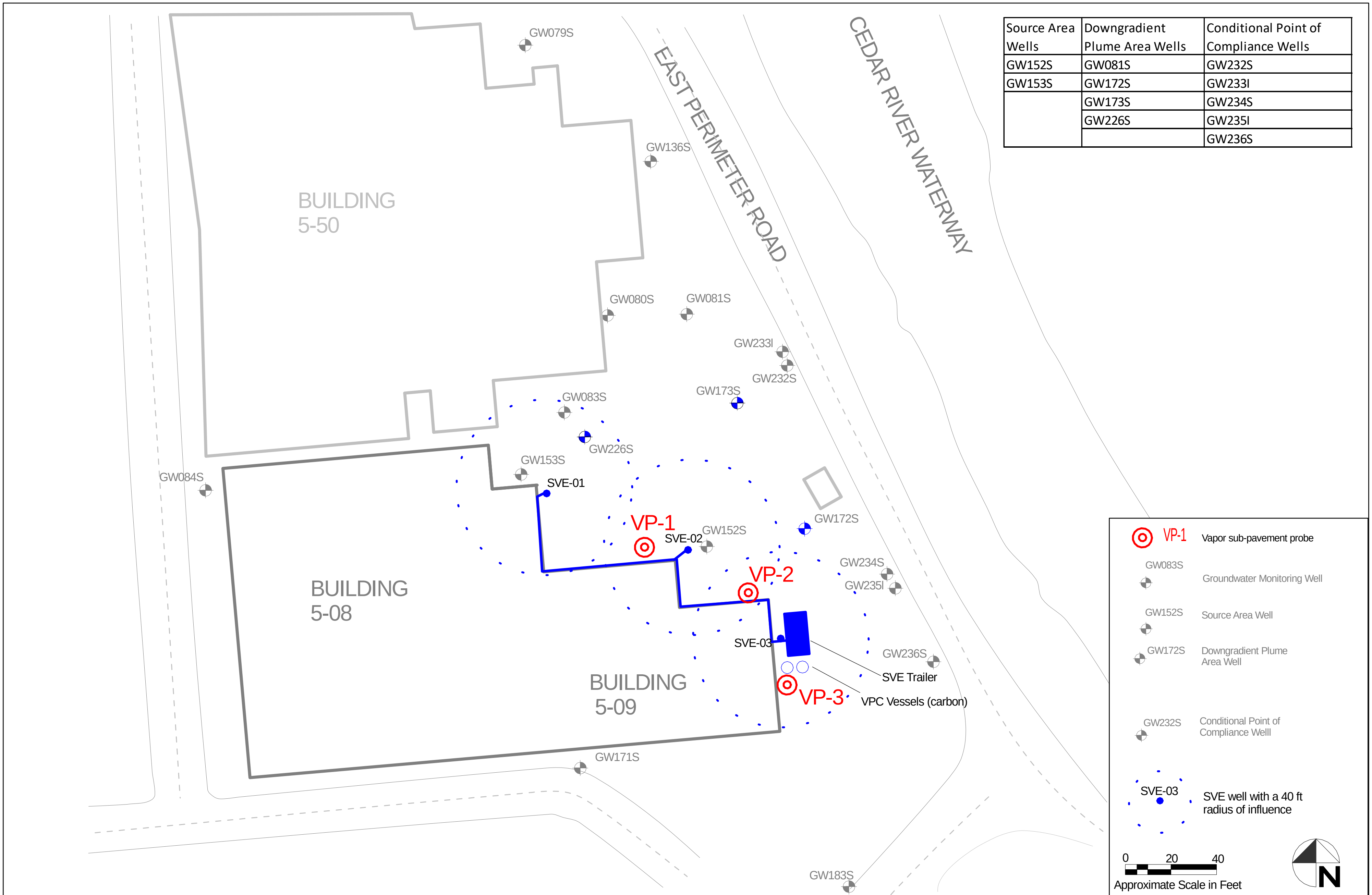
For screening level evaluation, the lowest screening level in CLARC Method C, considering both noncancer and cancer effects, is presented for comparison and the screening levels are not compliance criteria.

PCE Tetrachloroethylene

TCE Trichloroethylene

VC Vinyl chloride

FIGURES



Source Area Wells	Downgradient Plume Area Wells	Conditional Point of Compliance Wells
GW152S	GW081S	GW232S
GW153S	GW172S	GW233I
	GW173S	GW234S
	GW226S	GW235I
		GW236S

Figure 1 SWMU-172/174 Area (Bldg. 5-08/09)

Vapor Sub-Slab/Pavement Probes

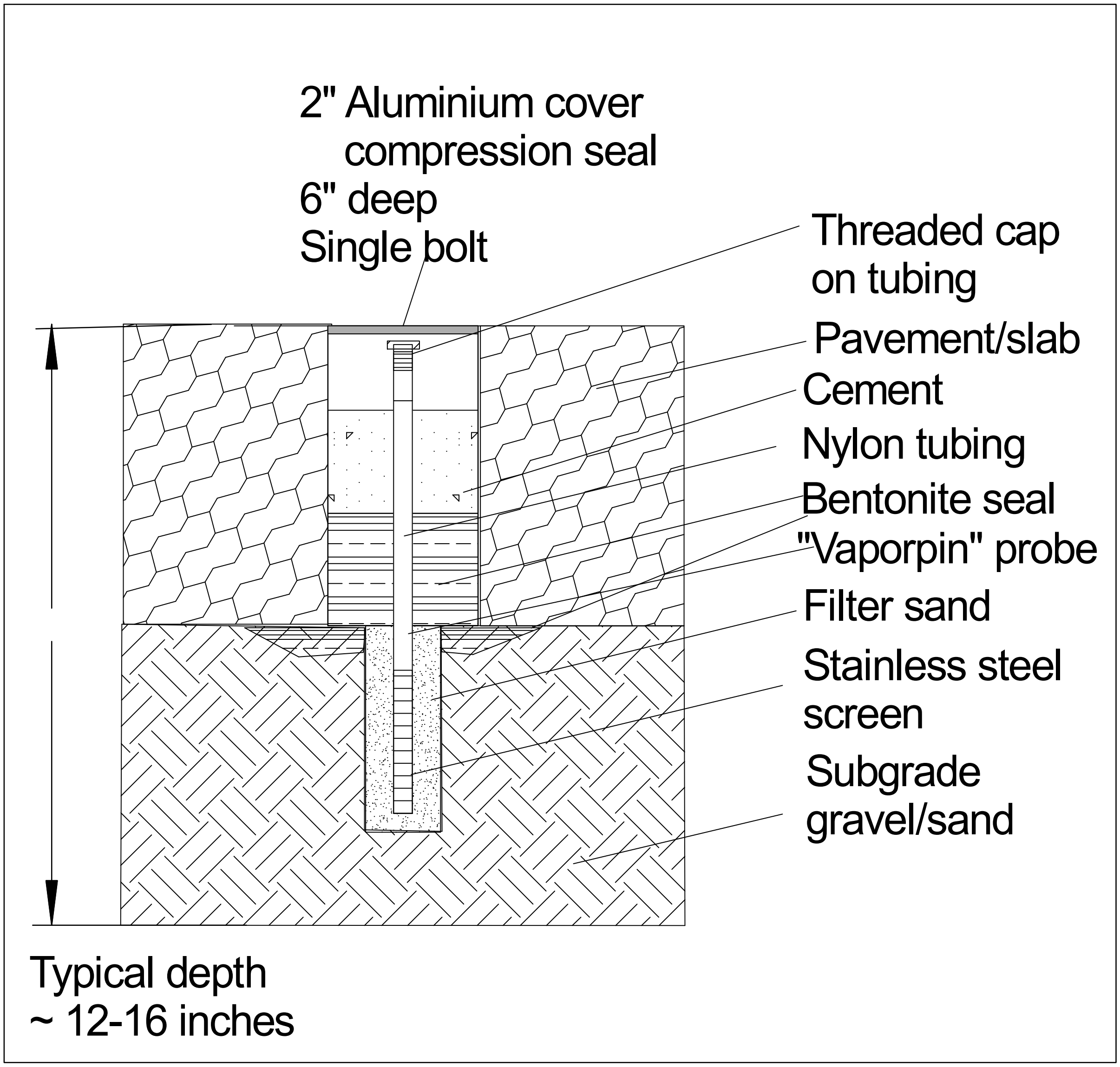


Figure 2 Soil-vapor Probe
Typical Construction Detail

Appendix A Historical Groundwater Sampling Data from the Area

TABLE D-2: SWMU-172 AND SWMU-174 GROUP HISTORICAL CONCENTRATIONS OF CONSTITUENTS OF CONCERN[1, 2]

Boeing Renton Facility, Renton, Washington

Analyte	Current Cleanup Level[4]	Well ID[3] Source Area																
		GW152S								GW153S								
		11/11/2019	3/9/2020	8/10/2020	2/15/2021	8/10/2021	2/21/2022	2/21/2022	8/24/2022	8/12/2019	11/11/2019	3/9/2020	5/11/2020	8/10/2020	2/15/2021	8/10/2021	2/21/2022	8/24/2022
Volatile Organic Compounds (µg/L)																		
cis-1,2-Dichloroethene	0.03	**0.530**	**0.892**	**1.66**	**0.144**	**1.330**	**1.57**	**1.59**	**0.877**	**0.278**	**0.204**	**0.0736**	**0.0789**	**0.0551**	**0.077**	**0.0582 J**	**0.0517**	0.100
Tetrachloroethene	0.02	**0.384**	**1.12**	**0.319**	**0.081**	**0.0872**	**1.84**	**1.71**	**1.05**	**0.0544**	**0.164**	**0.024**	0.020 U	0.020 U	0.020 U	0.020 UJ	0.0200 U	0.0200 U
Trichloroethene	0.02	**0.145**	**0.278**	**0.579**	0.020 U	**0.129**	**0.522**	**0.497**	**0.534**	**0.0326**	**0.131**	0.02 U	0.020 U	0.020 U	0.020 U	0.020 UJ	0.0200 U	0.0525
Vinyl Chloride	0.11	0.0366	**0.15**	**0.284**	0.0378	**0.506**	**0.200**	**0.219**	**0.346**	**0.153**	0.0859	**0.249**	**0.266**	**0.135**	**0.220**	**0.193 J**	**0.174**	**0.214**
Total Metals (µg/L)																		
Arsenic	1.0	**7.48**	**3.84**	**6.72**	**7.67**	**16.3**	**2.88**	**2.34**	**47.7**	**4.72**	**11.9**	**5.48**	**3.85**	**4.05**	**32.8**	**32.8**	**4.98**	**2.85**
Copper	3.5	**16.6**	**8.03**	**7.45 J**	**17.2 J**	**9.08 J**	**5.07**	**3.88**	**9.17**	1.58	**10.2**	3.09	1.73	1.68	**33.9**	**33.9**	1.45	0.641
Lead	1.0	**12.1**	**6.13**	**3.89**	**12.5 J**	**5.38 J**	**2.78 J**	**1.90 J**	**5.75**	0.351	**2.76**	0.712	0.372	0.326	**5.80**	**5.80**	0.302	0.123

Analyte	Current Cleanup Level[4]	Well ID[3] Downgradient Plume Area															
		GW172S								GW173S							
		5/6/2019	8/12/2019	5/11/2020	8/10/2020	2/15/2021	8/10/2021	2/21/2022	8/24/2022	11/11/2019	3/9/2020	5/11/2020	8/10/2020	2/15/2021	8/10/2021	2/21/2022	8/24/2022
Volatile Organic Compounds (µg/L)																	
cis-1,2-Dichloroethene	0.03	**0.0581**	0.027	**0.214**	**0.0561**	**0.108**	**0.0746**	**0.0532**	**0.0436**	**0.0378**	**0.0504**	**0.0488**	**0.0313**	**0.0505**	**0.0424 J**	0.0280	0.168
Tetrachloroethene	0.02	0.020 U	**0.0451**	**0.0625**	**0.0603**	**0.0624**	0.020 U	**0.0677**	0.0200 U	**0.0246**	**0.0224**	0.020 U	0.020 U	0.020 U	0.020 UJ	0.0200 U	0.0200 U
Trichloroethene	0.02	0.020 U	0.020 U	**0.028**	0.020 U	0.020 U	0.020 U	**0.0201**	0.0200 U	**0.0379**	**0.0305**	**0.0215**	**0.0239**	0.020 U	0.020 UJ	0.0200 U	**0.0496**
Vinyl Chloride	0.11	0.0808	0.0376	**0.369**	0.0628	**0.219**	**0.155**	**0.137**	0.0887	0.072	0.144	0.126	0.0455	**0.183**	**0.176 J**	0.0696	**0.175**
Total Metals (µg/L)																	
Arsenic	1.0	**7.71**	**10.6**	**7.03**	**10.8**	**10.8**	**7.18**	**11.2**	**4.86**	**15.6**	**11.8**	**6.72**	**7.00**	**9.94**	**11.4**	**13.8**	**6.04**
Copper	3.5	2.13	**3.86**	2.2	**6.12**	**3.89**	2.86	2.86	1.52	**4.68**	1.51	0.875	3.19	3.11	**5.96**	2.58	1.54
Lead	1.0	0.991	**1.02**	**1.07**	**2.58**	**1.98**	**1.33**	**1.37**	**1.32**	**1.36**	0.442	0.215	0.470	0.850	**1.65**	0.788	0.468

Analyte	Current Cleanup Level[4]	Well ID[3] Downgradient Plume Area								CPOC Area							
		GW226S								GW232S							
		5/6/2019	8/12/2019	5/11/2020	8/10/2020	2/15/2021	8/10/2021	2/21/2022	8/24/2022	11/11/2019	3/9/2020	5/11/2020	8/10/2020	2/15/2021	8/10/2021	2/21/2022	8/24/2022
Volatile Organic Compounds (µg/L)																	
cis-1,2-Dichloroethene	0.03	0.0223	0.0259	**0.0305**	0.0218	0.020 U	**0.0335 J**	**0.0363**	0.0255	**0.659**	**0.221**	**0.352**	**0.482**	**0.219**	**0.464 J**	**0.197**	**0.325**
Tetrachloroethene	0.02	0.020 U	0.020 U	0.020 U	**0.0279**	0.020 U	**0.0202 J**	0.0200 U	0.0200 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 UJ	0.0200 U	0.0200 U
Trichloroethene	0.02	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 UJ	0.0200 U	0.0200 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 UJ	0.0200 U	0.0200 U
Vinyl Chloride	0.11	0.0459	0.029	0.0594	0.0415	0.0519	0.0516 J	0.0414	**0.128**	**0.860**	**0.264**	**0.337**	**0.425**	**0.263**	**0.653 J**	**0.307**	**0.558**
Total Metals (µg/L)																	
Arsenic	1.0	**2.97**	**2.85**	**3.33**	**4.93**	**8.12**	**5.57**	**7.33**	**3.09**	**8.09**	**2.73**	**4.71**	**3.83**	**4.78**	**6.19**	**3.75**	**3.83**
Copper	3.5	0.500 U	0.626	0.704	1.48	**3.92**	1.48	2.40	0.500 U	**3.85**	2.22	0.539	0.627	2.09	1.79	1.09	0.500 U
Lead	1.0	0.100 U	0.100 U	0.190	0.136	0.513	0.124	0.237	0.100 U	0.378	0.354	0.100 U	0.100 U	0.318	0.262	0.234	0.122

TABLE D-2: SWMU-172 AND SWMU-174 GROUP HISTORICAL CONCENTRATIONS OF CONSTITUENTS OF CONCERN[1, 2]

Boeing Renton Facility, Renton, Washington

Analyte	Current Cleanup Level[4]	Well ID[3]															
		CPOC Area															
		GW234S								GW235I							
		5/6/2019	8/12/2019	5/11/2020	8/10/2020	2/15/2021	8/10/2021	2/21/2022	8/24/2022	11/11/2019	3/9/2020	5/11/2020	8/10/2020	2/15/2021	8/10/2021	2/21/2022	8/24/2022
Volatile Organic Compounds (µg/L)																	
cis-1,2-Dichloroethene	0.03	**0.0630**	**0.0738**	**0.092**	**0.0914**	0.020 U	**0.0892**	**0.0591**	**0.134**	**0.109**	**0.127**	**0.156**	**0.104**	**0.128**	**0.179**	**0.175**	**0.227**
Tetrachloroethene	0.02	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.0200 U	0.0200 U	0.020 U	0.020 U	0.020 U	0.020 U	**0.0292**	0.020 U	0.0200 U	0.0200 U
Trichloroethene	0.02	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.0200 U	0.0200 U	**0.0287**	**0.0336**	**0.031**	**0.0227**	0.020 U	**0.0285**	**0.0253**	**0.0250**
Vinyl Chloride	0.11	0.0235	0.0252	0.032	0.0279	0.020 U	0.0497	0.0318	**0.170**	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	**0.24**	0.0259	0.0280
Total Metals (µg/L)																	
Arsenic	1.0	**2.22**	**1.31**	**5.31**	**3.26**	**6.29**	**1.18**	**1.76**	0.974	0.237	0.251	0.289	0.288	0.200 U	0.200 U	0.200 U	0.200 U
Copper	3.5	1.93	0.869	2.43	3.21	**11.4**	2.58	2.13	2.31	0.573	0.935	1.08	1.30	0.727	0.689	0.687	0.500 U
Lead	1.0	0.843	0.280	0.671	**1.25**	**4.13**	**1.01**	0.930	0.830	0.127	0.235	0.223	0.304	0.174	0.179	0.159	0.100 U

Analyte	Current Cleanup Level[4]	Well ID[3]							
		CPOC Area							
		GW236S							
		5/6/2019	8/12/2019	5/11/2020	8/10/2020	2/15/2021	8/10/2021	2/21/2022	8/24/2022
Volatile Organic Compounds (µg/L)									
cis-1,2-Dichloroethene	0.03	0.0281	**0.0468**	**0.036**	**0.0881**	0.020 U	**0.0791**	0.0200 U	**0.0572**
Tetrachloroethene	0.02	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	**0.0206**	0.0200 U
Trichloroethene	0.02	**0.0206**	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.0200 U	0.0200 U
Vinyl Chloride	0.11	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.0223	0.0200 U	0.0200 U
Total Metals (µg/L)									
Arsenic	1.0	**2.10**	**3.70**	**2.10**	**10.1**	**2.89**	**5.49**	**1.97**	**0.995**
Copper	3.5	2.17	0.893	**4.24**	**10.8**	**9.70**	2.47	**5.27**	**1.22**
Lead	1.0	**1.90**	**1.53**	**2.61**	**10.8**	**6.31**	**1.79**	**3.32**	**0.798**

Notes
1. Data qualifiers are as follows:
   U = The analyte was not detected at the reporting limit indicated.
   J = The value is an estimate.
2. **Bolded** values exceed the cleanup levels.
3. S = shallow well; I = intermediate well.
4. Current cleanup levels obtained from Table 2 of the Cleanup Action Plan and are based on each individual SWMU or AOC.

Abbreviations
µg/L = micrograms per liter
AOC = area of concern
CPOC = conditional point of compliance
SWMU = solid waste management unit

TABLE 3: SWMU-172 AND SWMU-174 GROUP HISTORICAL CONCENTRATIONS OF CONSTITUENTS OF CONCERN[1, 2]

Boeing Renton Facility, Renton, Washington

Analyte	Current Cleanup Level[4]	Well ID[3] — Source Area — GW152S								GW153S							
		5/7/2018	8/13/2018	11/12/2018	3/4/2019	5/6/2019	8/12/2019	11/11/2019	3/9/2020	5/7/2018	8/13/2018	11/12/2018	3/4/2019	5/6/2019	8/12/2019	11/11/2019	3/9/2020
Volatile Organic Compounds (µg/L)																	
cis-1,2-Dichloroethene	0.03	**0.348**	**0.981**	**1.7**	**0.678**	**0.655**	**0.627**	**0.530**	**0.892**	**0.0649**	**0.171**	**0.238**	**0.107**	**0.108**	**0.278**	**0.204**	**0.0736**
Tetrachloroethene	0.02	**1.39**	**1.09**	**0.846**	**0.086**	**0.0594**	**0.176**	**0.384**	**1.12**	0.020 U	**0.0845**	**0.370**	0.020 U	0.020 U	**0.0544**	**0.164**	**0.024**
Trichloroethene	0.02	**0.226**	**0.833**	**0.223**	**0.152**	**0.157**	**0.203**	**0.145**	**0.278**	0.020 U	**0.241**	**0.394**	0.020 U	**0.0212**	**0.0326**	**0.131**	0.02 U
Vinyl Chloride	0.11	0.0972	**0.187 J**	**0.246**	**0.128**	**0.173**	0.0705	0.0366	**0.15**	**0.313 J**	**0.248**	**0.289**	**0.333**	**0.242**	**0.153**	0.0859	**0.249**
Total Metals (µg/L)																	
Arsenic	1.0	**2.99 J**	**75.7**	**22.6**	**7.54**	**4.49**	**23.4**	**7.48**	**3.84**	**3.51**	**5.67**	**7.84**	**4.49**	**5.97**	**4.72**	**11.9**	**5.48**
Copper	3.5	2.86	**24.1**	**4.76**	**5.12**	2.35	**21.8**	**16.6**	**8.03**	1.01	2.55	**16.2**	2.00	1.25	1.58	**10.2**	3.09
Lead	1.0	**1.52 J**	**12.7**	**2.48 J**	**3.33**	**1.26**	**14.8**	**12.1**	**6.13**	0.207	**3.06**	0.381	0.352	0.198	0.351	**2.76**	0.712
Proposed Monitoring		**Continue Monitoring**								**Continue Monitoring**							

Analyte	Current Cleanup Level[4]	Well ID[3] — Downgradient Plume Area — GW081S								GW172S							
		5/7/2018	8/13/2018	11/12/2018	3/4/2019	5/6/2019	8/12/2019	11/11/2019	3/9/2020	5/7/2018	8/13/2018	11/12/2018	3/4/2019	5/6/2019	8/12/2019	11/11/2019	3/9/2020
Volatile Organic Compounds (µg/L)																	
cis-1,2-Dichloroethene	0.03	**0.0311**	0.0243	**0.0327**	**0.0355**	0.025	0.0282	**0.0311**	**0.0357**	**0.641**	**0.129**	**0.116**	**0.111**	**0.0581**	0.027	**0.0561**	**0.305**
Tetrachloroethene	0.02	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	**0.0663**	0.020 U	0.020 U	0.020 U	**0.0376**	0.020 U	0.020 U	**0.0451**	**0.0287**	**0.976**
Trichloroethene	0.02	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	**0.0872**	**0.0370**	0.020 U	0.020 U	0.020 U	0.020 U	**0.384**
Vinyl Chloride	0.11	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	**1.41**	**1.24**	0.0742	**0.167**	0.0808	0.0376	0.0905	**0.209**
Total Metals (µg/L)																	
Arsenic	1.0	**1.63**	**2.30**	**2.20**	**2.33**	**2.49**	**2.49**	**2.69**	**1.87**	**5.52**	**8.84**	**7.24**	**6.52**	**7.71**	**10.6**	**20.5**	**32.8**
Copper	3.5	0.534	0.811	0.561	0.536	0.546	1.38	1.96	0.791	0.989	2.50 U	1.77	2.07	2.13	**3.86**	**9.25**	**27.6**
Lead	1.0	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.116	0.210	0.100 U	0.772	**1.02**	**1.13**	0.774	0.991	**1.02**	**7.44**	**15.1**
Proposed Monitoring		**Drop**								**Continue Monitoring**							

Analyte	Current Cleanup Level[4]	Well ID[3] — Downgradient Plume Area — GW173S								GW226S							
		5/7/2018	8/13/2018	11/12/2018	3/4/2019	5/6/2019	8/12/2019	11/11/2019	3/9/2020	3/5/2018	5/7/2018	8/13/2018	11/12/2018	3/4/2019	5/6/2019	8/12/2019	11/11/2019
Volatile Organic Compounds (µg/L)																	
cis-1,2-Dichloroethene	0.03	0.020 U	**0.111**	**0.0753**	**0.0756**	**0.037**	0.022	**0.0378**	**0.0504**	**0.0408**	**0.0401**	0.0262	0.020 U	**0.0387**	0.0223	0.0259	0.0235
Tetrachloroethene	0.02	**0.061**	**0.0301**	**0.218**	**0.0842**	**0.0416**	**0.0561**	**0.0246**	**0.0224**	0.020 U	0.020 U	**0.0733**	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Trichloroethene	0.02	**0.0344**	**0.0681**	**0.206**	**0.149**	**0.0742**	**0.0256**	**0.0379**	**0.0305**	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Vinyl Chloride	0.11	0.046	0.0969 J	0.0448 J	0.0312	0.0486	0.0613	0.072	0.144	0.0428	0.026	0.0409 J	0.0655	0.0432	0.0459	0.029	0.0615
Total Metals (µg/L)																	
Arsenic	1.0	**1.80**	**13.0**	**4.59**	**6.72**	**7.38**	**12.2**	**15.6**	**11.8**	**4.14**	**3.27**	**2.78**	**3.44**	**5.07**	**2.97**	**2.85**	**12.0**
Copper	3.5	3.48	**6.95**	**3.85**	**4.38**	1.11	1.39	**4.68**	1.51	2.60	1.05	1.19	2.28	**4.55**	0.500 U	0.626	**15.6**
Lead	1.0	0.314	**2.88**	0.706	0.712	0.251	0.290	**1.36**	0.442	0.297	0.129	0.141	0.422	0.413	0.100 U	0.100 U	**2.43**
Proposed Monitoring		**Continue Monitoring**								**Continue Monitoring**							

Analyte	Current Cleanup Level[4]	Well ID[3]															
		CPOC Area															
		GW232S								GW233I							
		5/7/2018	8/13/2018	11/12/2018	3/4/2019	5/6/2019	8/12/2019	11/11/2019	3/9/2020	5/7/2018	8/13/2018	11/12/2018	3/4/2019	5/6/2019	8/12/2019	11/11/2019	3/9/2020
Volatile Organic Compounds (µg/L)																	
cis-1,2-Dichloroethene	0.03	**0.367**	**0.489**	**0.426**	**0.250**	**0.319**	**0.378**	**0.659**	**0.221**	**0.0598**	**0.0587**	**0.0692**	**0.075**	**0.054**	**0.0697**	**0.0546**	**0.0552**
Tetrachloroethene	0.02	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Trichloroethene	0.02	0.020 U	0.020 U	0.020 U	0.020 U	**0.0331**	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	**0.0225**	0.020 U	0.020 U	0.020 U
Vinyl Chloride	0.11	**0.419**	**0.544 J**	**0.564**	**0.242**	**0.348**	**0.412**	**0.860**	**0.264**	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Total Metals (µg/L)																	
Arsenic	1.0	**5.36**	**6.52**	**8.01**	**5.12**	**3.96**	**6.29**	**8.09**	**2.73**	0.532	0.421	0.481	0.529	0.428	0.397	0.594	0.467
Copper	3.5	0.500 U	0.628	**13.3**	1.70	1.15	0.878	**3.85**	2.22	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.774	0.500 U
Lead	1.0	0.100 U	0.275	0.338	0.167	0.167	0.102	0.378	0.354	0.100 U	0.100 U	0.100 U	0.102	0.100 U	0.100 U	0.100 U	0.100 U
Proposed Monitoring		**Continue Monitoring**								**Drop**							

Analyte	Current Cleanup Level[4]	Well ID[3]															
		CPOC Area															
		GW234S								GW235I							
		5/7/2018	8/13/2018	11/12/2018	3/4/2019	5/6/2019	8/12/2019	11/11/2019	3/9/2020	5/7/2018	8/13/2018	11/12/2018	3/4/2019	5/6/2019	8/12/2019	11/11/2019	3/9/2020
Volatile Organic Compounds (µg/L)																	
cis-1,2-Dichloroethene	0.03	**0.0672**	**0.0758**	**0.112**	**0.0869**	**0.0630**	**0.0738**	**0.0850**	**0.0984**	**0.166**	**0.121**	**0.158**	**0.135**	**0.109**	**0.0638**	**0.109**	**0.127**
Tetrachloroethene	0.02	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Trichloroethene	0.02	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	**0.0297**	**0.0253**	**0.0305**	**0.0338**	**0.0353**	**0.0342**	0.020 U	**0.0287**	**0.0336**
Vinyl Chloride	0.11	0.020 U	0.0282 J	0.0488	0.0273	0.0235	0.0252	0.0309	0.0302	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Total Metals (µg/L)																	
Arsenic	1.0	0.820	**2.07**	**1.72**	**2.11**	**2.22**	**1.31**	**10.1**	**27.4**	0.200 U	0.200 U	0.230	0.200 U	0.403	0.292	0.237	0.251
Copper	3.5	NA	0.748	1.27	1.75	1.93	0.869	**33.2**	**32.9**	0.500 U	0.500 U	0.500 U	0.500 U	1.58	0.714	0.573	0.935
Lead	1.0	NA	0.425	0.781	0.701	0.843	0.280	**15.5**	**11.8**	0.100 U	0.100 U	0.104	0.322	0.405	0.182	0.127	0.235
Proposed Monitoring		**Continue Monitoring**								**Continue Monitoring**							

Analyte	Current Cleanup Level[4]	Well ID[3]							
		CPOC Area							
		GW236S							
		5/7/2018	8/13/2018	11/12/2018	3/4/2019	5/6/2019	8/12/2019	11/11/2019	3/9/2020
Volatile Organic Compounds (µg/L)									
cis-1,2-Dichloroethene	0.03	0.0297	**0.0427**	**0.0690**	**0.0443**	0.0281	**0.0468**	**0.108**	0.0241
Tetrachloroethene	0.02	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Trichloroethene	0.02	0.020 U	0.020 U	0.020 U	0.020 U	**0.0206**	0.020 U	0.020 U	0.020 U
Vinyl Chloride	0.11	0.020 U	0.020 U	0.0323	0.020 U	0.020 U	0.020 U	0.0437	0.020 U
Total Metals (µg/L)									
Arsenic	1.0	**1.80**	**2.69**	**3.35**	**2.81**	**2.10**	**3.70**	**36.5**	**6.29**
Copper	3.5	2.05	0.500 U	0.924	0.919	2.17	0.893	**66.9**	**21.2**
Lead	1.0	**2.49**	0.874	**1.48**	**1.94**	**1.90**	**1.53**	**117**	**18.7**
Proposed Monitoring		**Continue Monitoring**							

Notes

1. Data qualifiers are as follows:
   U = The analyte was not detected at the reporting limit indicated
   J = The value is an estimate.
2. **Bolded** values exceed the cleanup levels.
3. S = shallow well; I = intermediate well.
4. Current cleanup levels obtained from Table 2 of the Cleanup Action Plan and are based on each individual SWMU or AOC

Abbreviations

µg/L = micrograms per liter
AOC = area of concern
CPOC = conditional point of compliance
SWMU = solid waste management unit

Table copied from Wood 1st Quarter 2020 Groundwater Sampling Report

Appendix B Soil Vapor Sampling Standard Operating Procedure

Vapor Monitoring Data Sheet

Date		Site Location	
Samplers		Well ID	
		Constructed Depth	

Sample Train Leak Test:

Zero Time Vacuum	
1-min Vacuum	
5-min Vacuum	

Or
Shroud Test:

Gas Used	
Elapsed Time	
Gas Detected	

Purge Volume:

Sample Train Length (ft)			
Tube Diameter (in)			
Volume (L)			

Volume Reference Table:

Hose Diameter (in)	Volume (L/ft)
0.125 (1/8)	0.0024
0.25 (1/4)	0.0096
0.375 (3/8)	0.0217
0.5 (1/2)	0.0386
1 (1)	0.1543

Vapor Sample Purge Data:

Time							
Flow Rate (mL/min)							
PID (note ppm or ppb)							
Oxygen							
Carbon Dioxide							
Trace Gas							

Sampling Data:

Time	
Sample ID	
Duplicate	
PID Reading	

Analyses Performed:

VOCs (8260/TO-15)	

Sampling Device:

Summa		Tedlar Bag	
Summa Flow Rate			
Summa Start Vacuum			
Summa End Vacuum			

Sampling Notes:

VAPOR SAMPLING
CALIBRE STANDARD OPERATING PROCEDURES

1.0 POLICY

It is the policy of CALIBRE that any individual engaging in collection of vapor samples at job sites will abide by the procedures outlined in this document. These procedures are designed to meet or exceed guidelines set forth by the Environmental Protection Agency (EPA) for the collection of vapor samples.

2.0 PURPOSE

This Standard Operating Procedure (SOP) provides instructions that are to be followed in the collection of vapor samples (gas phase) for laboratory or field analysis of volatile organic compounds (VOCs). The purpose of this SOP is to define the use of several different air sampling techniques that can be used for soil gas monitoring, indoor air monitoring and remediation system monitoring of VOCs present as a vapor phase in air. The sampling methods discussed include sample collection with Tedlar bags, sample collection using SUMMA canisters and field testing using a Photo Ionization Detector (PID) and other vapor monitoring instruments.

3.0 INTRODUCTION

Vapor samples may be collected as part of remediation systems performance monitoring, soil gas monitoring or indoor air monitoring to provide a means of detecting volatile organic compounds (VOCs) in the specific sampling matrix. This SOP outlines the methods to be used for the collection of vapor samples using Tedlar bags and SUMMA canisters and measurement of organic vapor levels in samples using a PID.

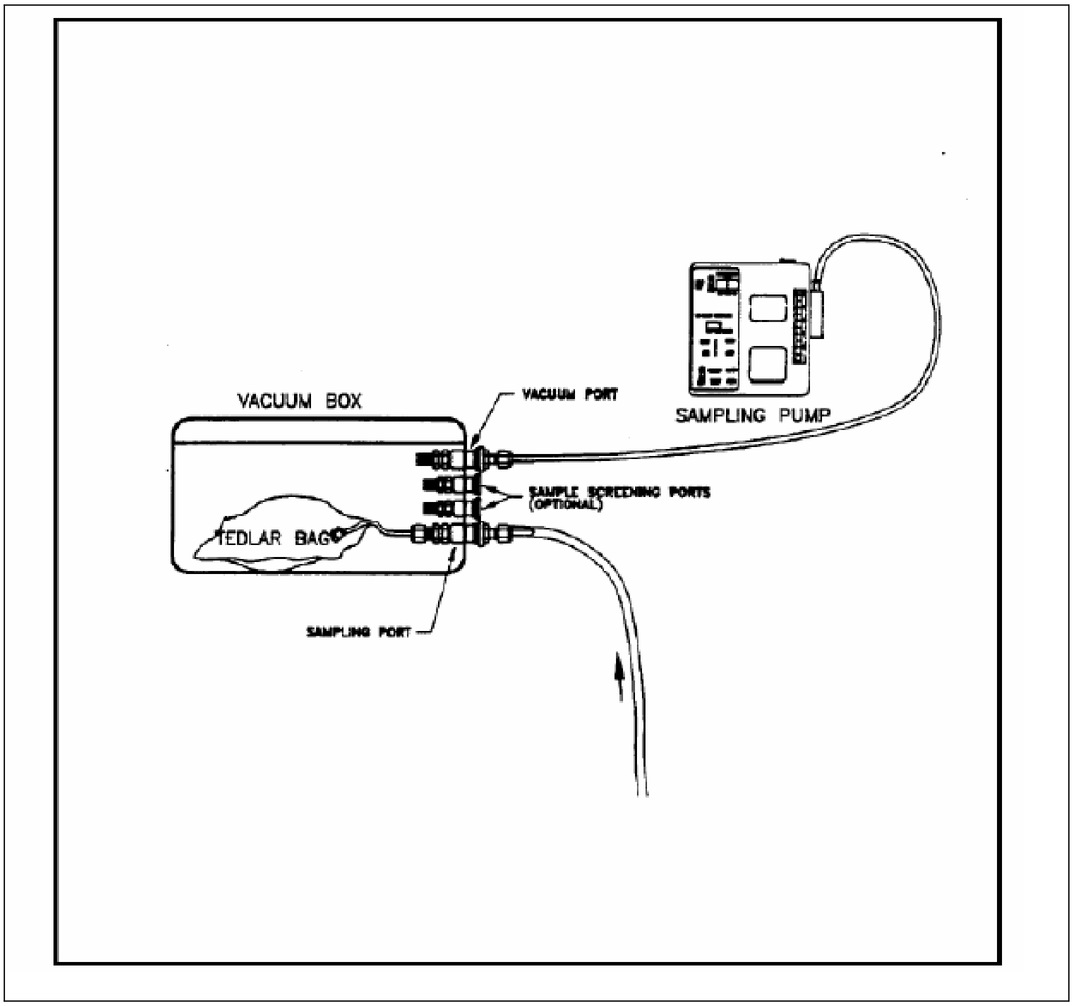
4.0 METHOD SUMMARY

The objective of the vapor sampling procedures described herein is to collect representative gas samples of the targeted media and analyze the gas for the presence of VOCs. Typically, a low volume air pump is used to pull a sample through the sampling train.

The sample may be collected in Tedlar bags using a vacuum box (see Figure 1), or directly to the Tedlar bag depending on the sampling point (lines under pressure do not need to use a vacuum box). An air pump is not required to fill a SUMMA canister; sampling is achieved by equilibration with the evacuated SUMMA canister, however a vacuum pump may still be necessary to flush the sampling train. The sample container may then be shipped to a laboratory for analysis of VOC present.

The common laboratory analytical procedures used for analysis of VOCs in gas samples are EPA methods 8260B, T015. Both of these analytical methods utilize a GC/MS analysis. Typical detection limits for the 8260B analysis are VOCs in the range of 5-100 ug/m^3. Typical detection limits for the T015 analysis are VOCs in the range of 1-10 ug/m^3. Typical detection limits for the PID analysis using a Rae Systems ppb PID are the range of 100-1,000 ug/m^3 (as total organic vapors).

Figure 1 Sampling setup using Tedlar bag in evacuated box



A PID employs the principle of photoionization to detect and quantify the concentration of organic vapors present in a gas phase sample. The analyzer will respond to most vapors that have an ionization potential (IP) less than or equal to that supplied by the ionization source used in the PID, an ultraviolet (UV) lamp. Photoionization occurs when an atom or molecule absorbs a photon of sufficient energy to release an electron and form a positive ion.

The ionization chamber exposed to the light source contains electrodes to create an electro-magnetic field in the chamber. Ions formed by the VOC adsorption of photons are driven to an electrode and the current produced is then measured and the corresponding concentration displayed on the meter, directly, in the units used for calibration, typically parts per million volume (ppmv) or parts per billion volume (ppbv). Though it can be calibrated to a particular compound, the instrument cannot distinguish between detectable compounds in a mixture of gases and, therefore, indicates an integrated response to the mixture (i.e., the measurement is for the total organic vapors present).

Field air monitoring devices include a Rae Systems ppb PID that reads in ppbv and a variety of other PID instruments that typically read in ppmv. Sampling with field instruments is typically completed with the sample first collected in a container, such as a Tedlar bag, and the PID instrument (or other) used to read the total organic vapor concentration in the sample.

5.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

5.1 Tedlar Bags

Vapor samples are generally collected in 1-liter (L) Tedlar bags. Bagged samples should be stored in the dark (i.e., in opaque containers) and protected from mechanical damage during transit to the laboratory. Further, samples should be maintained at ambient temperature by placing them in coolers, and out of direct ultra-violet (UV) light. Samples should be analyzed as soon as possible, particularly, if the stability of the compound is unknown. Under some conditions (typically considered to be high VOC concentrations), loss may occur either because of diffusion through the Tedlar bag or adsorption onto it.

A typical holding time for VOC analysis (using Tedlar bags for sampling) is no more than 48 hours. Because of this short holding-time, it is critical that the sampling event and shipping be coordinated with the laboratory prior to sample collection. In general, Tedlar bag samples collected for laboratory analysis must be collected on Monday/Tuesday and delivered by overnight courier to the laboratory (unless other specific arrangements have been made with the laboratory for the delivery date).

5.2 SUMMA Canisters

The SUMMA canisters used for vapor sampling have a 6-liter sample capacity and are certified clean by GC/MS analysis before being used in the field. An evacuated 6-liter SUMMA canister (<28 inches of mercury [Hg]) will provide a recoverable whole-gas sample of approximately 5.5 liters when allowed to fill to a vacuum of 2 inches of Hg. After sampling is completed, the samples are shipped in travel cases for off-site laboratory analysis. Most VOCs can be recovered from canisters with minimal loss up to 14 days.

5.3 Field Sampling with PID (and other instruments)

A PID instrument may be used for on-site testing of the sample collected. A PID is typically used in conjunction with sample collection in a Tedlar bag. Other field instruments that may be used (depending on the site conditions, contamination present and sampling objectives) include oxygen/lower explosive limit (O_2/LEL) meters, Flame Ionization Detectors (FIDs). Examples of other field air monitoring instruments include: combustible gas indicator (MSA CGI/0_2 Meter, Model 260), organic vapor analyzer (Foxboro OVA, Model 128, Thermo electron OVA model

580), and a variety of other instruments by various manufacturers. For any instrument used on a project, each must have the model-specific O&M manual which will specify the key details on calibration, resolution, interferences, etc.

6.0 INTERFERENCES AND POTENTIAL PROBLEMS

6.1 Factors Affecting the Sample Collected with Tedlar Bags or SUMMA Canisters

Standard laboratory analytical methods will detect VOCs at levels less than 1 part per billion volume (ppbv) in vapor phase samples. As a consequence, the potential for inadvertent sample contamination is a significant concern since many of the compounds in question are commonly used in commercial products, industries and residential settings. In order to minimize the risk of cross contamination, the following factors should be considered:

1) Proximity of the containers (bags/canisters) to source(s) of potential contamination during transportation and storage. Containers and the sampling train (tubing, pumps, or other) must be kept away from potential source(s) to the maximum extent feasible to minimize the chances of external contamination. All bags should remain in clean sealed containers until the time of use.

2) A variety of common products (many used in field sampling) will contain compounds that may be detected in the analysis. Examples include marking paint, marking pens (sharpies), fuel, adhesives, tape, and decontamination solutions from other sampling/well purging. The utmost care must be taken to minimize the potential for inadvertent contamination of the samples and sampling train.

3) Containers must be attached only to clean Teflon (or other acceptable) tubing.

4) For Tedlar bags, attach the sample label to the bag using a string or zip-tie through the eyelet on the Tedlar bag. Common adhesives found in the label may potentially permeate the bag if placed on the body of the bag.

5) Fill out labels using only a ballpoint pen; permanent markers contain volatile compounds that may contaminate the sample.

6) Due to the chemical structure of Tedlar, highly polar compounds may adhere to the inner surface of the bag. Also, low molecular weight compounds may permeate the bag.

6.2 PID Measurements

A number of factors specific to vapors associated with remediation systems and soil/indoor air vapor monitoring can affect the response of a PID. The most common problem in using a PID is rapid temperature fluctuations which may cause the PID lamp to fog; high humidity can also cause lamp fogging and decreased sensitivity. This can occur when the relative humidity of the sample collected is high such as soil vapor samples from moist/wet soils. The critical step to minimize problems associated with PID lamp fogging is to keep the PID warm (such as in the heated cab of a field vehicle) if ambient conditions are wet or cold. High and low temperature, and naturally occurring compounds, such as terpene hydrocarbons in wooded areas, can affect instrument response. Always follow instructions in the instrument manual. The manual for the specific PID used in a project must be included with equipment.

Specific considerations in the use of a PID include the following:

1) The PID is a nonspecific total organic vapor detector. It cannot be used to identify unknown substances; it can only quantify the total organic vapors (as calibrated to isobutylene response).
2) The PID must be calibrated to a specific compound (or more typically include a conversion factor for equivalent response as isobutylene).
3) The PID does not respond to certain low molecular weight hydrocarbons, such as methane and ethane, in addition, the PID does not detect a compound if the probe has a lower energy than the compound's IP. Specific compounds (e.g., carbon tetrachloride and hydrogen cyanide, have high IPs and cannot be detected with a PID.
4) Certain models of PID instruments are not designed for use in potentially flammable or combustible atmospheres.
5) The lamp window must be periodically cleaned to ensure effective ionization of the compounds by the probe (although this step has been largely eliminated with the self cleaning process implemented the Rae Systems ppb PID).
6) The PID measures concentration linearly over the calibrated range, any response outside of the calibrated range cannot be reliably quantified. The Rae Systems ppb PID requires special procedures for the zero calibration.
7) The instrument should not to be exposed to precipitation.
8) Do not use the instrument for head space analysis where liquids can inadvertently be drawn into the probe.

Transport of calibration gas cylinders by passenger and cargo aircraft must comply with International Air Transport Association (IATA) Dangerous Goods Regulations or the U.S. Code of Federal Regulations, 49 CFR Parts 100-177. A typical calibration gas included with a PID is isobutylene. It is classified as a non-flammable gas, UN #1556 and the proper shipping name is Compressed Gas. It must be shipped by cargo aircraft only.

6.3 Factors Affecting the Concentrations of Organic Compounds in Soil Gas

Concentrations of organic compounds in vapor can be affected by the physical and chemical characteristics of the soil, soil moisture, and nature of the target compound. Important factors to consider include the compounds' vapor pressure, solubility and soil partitioning (typically estimated from the organic carbon adsorption coefficient K_{oc}). Soil porosity and permeability will affect the movement of soil gas and the recharge rate of the soil gas into a well. The movement of organic vapors through fine textured soil may be very slow, thus limiting the sample volume available and the use of this technique.

The presence of a high or perched water table, or of an impermeable underlying layer (such as a clay lens or layer of buried slag) may interfere with the movement and sampling of the soil gas.

7.0 EQUIPMENT/APPARATUS

7.1 Tedlar Bag Sample Collection

The following equipment must be available and operational to perform Tedlar bag sampling:

1) Vacuum box must be clean, Teflon (or other acceptable) tubing replaced, and equipped with extra O-rings
2) Pump(s) must be charged, in good working order, and set with the appropriate flow rate of 3 liters per minute
3) Tedlar bags must be new.
4) Sample documentation (sample labels, field data sheets, logbook, chain of custody records, custody seals, etc.)
5) Small zip-ties to affix label through eyelet on bag
6) Air sampling worksheets
7) Opaque trash bags
8) PID or other field air monitoring devices
9) Cooler(s)

7.2 SUMMA Canister Sample Collection

The following equipment must be available and operational to perform sampling with SUMMA canisters:

1) 6-liter, stainless-steel SUMMA canisters;
2) Flow controllers (in the case of a prolonged time sample) with in-line particulate filters and vacuum gauges. Flow controllers are pre-calibrated to specified sample duration (e.g., 60 minutes) or flow rate (e.g., 100 milliliters per minute [mL/min]). Confirm with lab that flow controller comes with in-line particulate filter and pressure gauge;
3) ¼-inch tubing (Teflon, polyethylene, or similar);
4) Stainless steel “T” fitting (for connection to summa canisters and Teflon tubing to collect duplicate samples);
5) Portable vacuum pump (or syringe) capable of producing very low flow rates (e.g., 100-200 mL/min);
6) Helium gas canister;
7) Field helium detector;
8) Plastic sheeting;
9) Photoionization Detector (with a lamp of 11.7 eV);
10) 9/16-inch open-end wrench;
11) Chain-of-custody forms;
12) Soil-gas sample collection log; and
13) Field notebook.

7.3 Field Measurement of VOCs with PID (or other field instrument)

The following equipment must be available and operational to perform Field Testing of VOCs with a PID:

1) PID instrument, user’s manual, calibration gas and regulator, zero gas, or virgin charcoal tubing). The PID must be fully charged the night before (and include spare batteries if feasible).
2) Tedlar bags must be new.
3) Sample documentation (sample labels, field data sheets, logbook, chain of custody records, etc.).

4) Air sampling worksheets
5) Opaque trash bags
6) Any other equipment defined in section 6.1

8.0 REAGENTS

1) Calibration gases, typically isobutylene at 10 ppm for a Rae ppb PID or 100 ppm for other PIDs.
2) Materials required to zero the PID instrument (sealed virgin charcoal tubes for the Rae ppb PID or Ultra-zero grade compressed air for other PIDs).
3) Helium gas that can be used for sample shroud leak testing.

9.0 PROCEDURES

9.1 Leak Testing of the Sampling Train

Prior to sample collection from an installed vapor point, both the sample probe and the sampling train must be verified to be leak proof. If the constructed vapor sampling point allows for intrusion of vapors from other than the soil (i.e., leakage of ambient air from the ground surface), the point will not be considered a valid point for monitoring. Similarly, all connections of the sampling train must be verified to be leak proof. These two types of possible leaks (leakage to the sample collection point and sampling train) are most important when higher vacuums are required for vapor sample collection.

1) Leak testing of the vapor monitoring point: Helium will be used following probe installation to assess leakage from the ground surface to the soil vapor sampling interval. Briefly, helium (as a tracer) will be discharged from a pressurized tank into a shroud surrounding the well head of the soil vapor probe. A mini-pump will be used to sample the vadose zone/soil vapor and fill a Tedlar bag (extracting air through the installed soil vapor probe). A portable helium detector will then be used to analyze the contents of the Tedlar bag for helium. Helium concentrations less than 10 percent will be considered acceptable (ITRC 2007).
2) Leak testing of the sampling train: The set-up of the sampling train must include a leak test to verify that all connections are tight at each vapor sampling point; this is sometimes called a "shut in test". The sampling train must include valves on both ends. For each sample set-up, use a hand pump or air pump to vacuum test the sampling equipment after assembly. The leak test is to be conducted by closing the end valves of the sampling train, using a hand pump (or other device) to create a vacuum in the sampling train, and monitoring for a period of no less than 1 minute that sufficient vacuum is maintained. The volume of a typical sampling train may be very small (~ 0.1 L, based on ¼ inch diameter tubing and 10 ft length) and even very minor leaks would be apparent as decreased vacuum levels in the test. The observed leakage rate (if any) can be calculated based on the pressure change, elapsed time and volume of sampling train. The sampling train must be sufficiently tight that any minor leaks (if any) represent no more than 5% of the targeted sample collection rate (typically ~ 100-200 ml/min).

9.2 Flushing the Volume of the Sampling Train

The sampling train and subsurface probe will contain a volume of ambient air that must be flushed from the system before the sample is collected. Calculate the volume of the sampling system by summing the volume of the probe screened interval (including filter pack void space, accounting for porosity of sand pack), the volume of tubing from the probe tip to the ground surface, and the volume of above ground tubing connecting the soil probe to the sample collection device. Purge the monitoring point until at least three volumes of the full sampling system have been evacuated. Purging should be conducted at flow rates and vacuum conditions similar to those for sample collection (typically targeted at 100 to 200 ml/min).

9.3 Sample Collection with Tedlar Bag

1) Follow Section 8.1, to evacuate the volume of the sampling train. If PID/FID readings were taken prior to taking a sample, additional evacuation is not necessary.
2) Use the vacuum box and sampling train (Figure 1) to collect the sample. The sampling train must be designed to minimize the introduction or loss of contaminants due to adsorption and other factors. All parts used are either Teflon (or other acceptable) or stainless steel, and a vacuum is drawn indirectly to avoid contamination from sample pumps.
3) Place the Tedlar bag inside the vacuum box, attach it to the sampling port and open the valve. The sample probe is attached to the sampling port via Teflon (or other acceptable) tubing and a "Quick Connect" fitting.
4) Draw a vacuum around the outside of the bag, using a pump connected to the vacuum box evacuation port, via Tygon tubing and a "Quick Connect" fitting. The negative pressure inside the box causes the bag to inflate, drawing the sample into the bag.
5) Break the vacuum by removing the Tygon line from the pump. Remove the bagged sample from the box and close the valve. Record the date, time, sample location identification, and the PID instrument reading (if used) on the sample bag's label, and on the appropriate data sheet or in the site logbook(s). Bags should not be labeled directly with a marker or pen (particularly those containing volatile solvents) or should adhesive labels be affixed directly to the bags. Inks and adhesive may diffuse through the bag material and contaminate the sample. Labels should be tied to the metal eyelets provided on the bags.
6) Complete chain of custody records.

This sampling approach (Tedlar bag sampling) is straightforward and relatively easy. However, there are several things to be aware of when sampling.

1) The seals of the vacuum box must be air tight in order for the sample collection system to work.
2) Check the O-ring gasket to see if it is in place with the proper fit. O-rings that have been stretched out will not remain in place, thus requiring constant realignment.
3) Check that all the fittings associated with the vacuum joints are securely in place. The fittings can be pushed loose when inserting the valve stem into the Teflon (or other acceptable) tubing.
4) Occasionally, a corner of the Tedlar bag will stick out between the two halves of the vacuum box causing a poor seal.
5) Since the Tedlar bags will only hold a finite volume (e.g. - liter Tedlar bag), over-inflation will burst the bag.

9.4 Sample Collection with SUMMA Canister

1) Follow Section 8.1, to evacuate the volume of the sampling train. If PID/FID readings were taken prior to taking a sample, additional evacuation is not necessary.
2) Attach a certified clean, evacuated 6-L SUMMA canister via the ¼" Teflon or acceptable tubing.
3) Open the valve on the SUMMA canister. The vapor sample is drawn into the canister by pressure equilibration.
4) Record the date, time, sample location identification, and the PID instrument reading (if used) on the sample label (use ball point pen only), and on the appropriate data sheet or in the site logbook(s).
5) Complete chain of custody records.

9.5 Remediation System Sampling

The sampling procedure to be used for a remediation system depends upon the sampling point.

1) If the sampling point is under vacuum (such as a sampling port at the well head on an SVE system); follow the sample collection procedure defined in Sections 8.2 or 8.3.
2) If the sampling point is under pressure (such as the discharge side of a blower for a SVE system); use the following procedure:
   a) Attach a piece of Teflon (or other acceptable) tubing to the sampling port.
   b) Open the valve on the sampling port.
   c) Flush the tubing in the line for an appropriate number of volumes.
   d) Connect Tedlar bag (or SUMMA canister) to the Teflon (or other acceptable) tubing and fill via the line pressure.
   e) Remove sample from the tubing. Record the date, time, sample location identification, and the PID instrument reading (if used) on the sample bag's label, and on the appropriate data sheet or in the site logbook(s). Bags should not be labeled directly with a marker or pen (particularly those containing volatile solvents) nor should adhesive labels be affixed directly to the bags. Inks and adhesive may diffuse through the bag material and contaminate the sample. Labels should be tied to the metal eyelets provided on the bags.
   f) Complete chain of custody records.

9.6 Field Measurement of Organic Vapor Levels with PID

The manufacturers' manual must be consulted for the correct use and calibration of all instruments. Pumps should be calibrated prior to use in the field.

1) Collect a sample following the procedures defined in Sections 8.2 or 8.4.
2) Connect the PID probe to the sample container using a section of Teflon (or other acceptable) tubing
3) Use the PID to read the organic vapor level present in the sample.
4) Record the date, time, sample location identification, and the PID instrument reading on the appropriate data sheet or in the site logbook(s).
5) Repeat the sample collection and PID reading from the same sampling point to verify repeatability (the same Tedlar bag may be reused on this same sampling point for this repeat sampling).
6) Retest the instrument calibration after 4 hours of operation and at the end of day.

Readings may be above or below the range set on the field instrument. The range may be reset, or the response recorded as a greater than or less than the response range.

10.0 CALCULATIONS

10.1 Field Screening Instruments

Instrument readings are usually read directly from the meter. For example, PID readings are expressed in units of parts per million (ppmv) or part per billion (ppbv) depending on the PID unit. In some cases, it may be appropriate to subtract the background reading from the sample reading.

10.2 Correction Factors

A PID instrument will (typically) be calibrated to isobutylene as a calibration gas. Therefore a correction factor must be used when converting the PID response to the actual VOC concentration present in the sample. Using a PID, the instrument responds to the total organic vapors present in sample and conversion to a specific VOC concentration may be made when a specific compound present is known (based on prior sampling or other site operational knowledge). Typical PID correction factors for several for the common VOCs encountered are shown in Table 1. Appendix A includes a copy of Technical Note TN-106 from Rae Systems which presents a list of chemical compounds and their PID response correction factors (from conversion from isobutylene calibrated response to VOC concentration).

Table 1 Ionization Potential and Correction Factors for Common Compounds

Compound	Ionization Potential (eV)	Correction factor for response relative to isobutylene calibration (for 10.6 v lamp)
Acetone	9.71	1.1
Methyl ethyl ketone	9.51	0.5
Benzene	9.25	0.53
Ethylbenzene	8.77	0.52
Toluene	8.82	0.50
o-Xylene	8.56	0.59
Tetrachloroethene	9.32	0.57
Trichloroethene	9.47	0.54
Vinyl chloride	9.99	2.0
cis 1-2 dichloroethene	9.66	0.8
Isobutylene	9.24	1.0

10.3 Unit Conversions

Two common units are used to express vapor phase concentrations:

- mass per unit volume basis (e.g., ug/m^3 and ug/L); and
- volume/volume basis (ppbv, ppmv).

Field instrument readings (read directly from the meter) are typically on a volume/volume basis. Laboratory results may be presented in either units (or both).

The conversion between units is as follows:

$1\ ug/m^3 = [(273.3+T)*0.082/MW]\ ppbv$

Where T is temperature in degrees C and MW is molecular weight.

11.0 QUALITY ASSURANCE/QUALITY CONTROL

11.1 Sample Probe Contamination

Sample probe contamination is checked between each sample by drawing ambient air through the probe using a vacuum pump (e.g., Gilian pump) and checking the response of the PID. If readings are higher than background, replacement or decontamination is necessary. Sample probes may be decontaminated simply by drawing ambient air through the probe until the PID reading is at background. Contamination can also be removed by decontaminating with methanol and deionized water, then air drying. For persistent contamination, use of a portable propane torch may be needed. Using a pair of pliers to hold the probe, run the torch up and down the length of the sample probe for approximately one to two minutes. Having multiple probes per sample team will reduce lag times between sample stations while probes are decontaminated.

11.2 Sample Train Contamination

The Teflon (or other acceptable) line forming the sample train from the probe to the Tedlar bag should be changed on a daily basis. If visible contamination (soil or water) is drawn into the sampling train, it must be changed immediately. When sampling in highly contaminated areas, the sampling train should be purged with ambient air, via a vacuum pump (e.g, Gilian pump), for approximately 30 seconds between each sample. After purging, the sampling train can be checked using a PID, or other field monitoring device, to establish the cleanliness of the Teflon line.

11.3 PID Calibration and Testing

1) All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan.
2) Equipment checkout and calibration activities must occur prior to sampling/operation, they must be documented.
3) All data must be documented on field data sheets and/or within site logbooks.

11.4 Trip Blanks, Field Blanks, Duplicates, Lot Blanks

The project QA plan needs to define the appropriate level of trip blanks, field blanks, duplicates, and lot blanks to meet the sampling objectives. Typical examples that should be considered in the QA plan development include;

- A trip blank or field blank to detect any sample contamination during shipping and storage.
- A trip standard used to determine any changes in concentrations of the target compounds during the course of the sampling day (e.g., migration through the sample bag, sample degradation, or adsorption to the bag’s surface).

- A lot test sample from each lot of Tedlar bags to be used for sampling and checked for possible contamination (filled with ultra-zero grade air) and analyzed.
- A lot test of cleaned SUMMA canisters used for a GC/MS certification check. If the canister passes certification, it is re-evacuated and all canisters from that lot are available for sampling. If the chosen canister is contaminated, the entire lot of SUMMA canisters must be re-cleaned, and a single canister re-analyzed by GC/MS for certification.

12.0 DATA VALIDATION

If the same profile or pattern of VOCs found in the samples is observed in the blanks, the collection method and storage procedures must be evaluated. Depending on the levels observed, the data may be qualified as estimated or not usable (not valid).

13.0 REFERENCES

California Environmental Protection Agency, Department of Toxic Substances Control and California Regional Water Quality Control Board, Los Angeles Region, 2003, *Advisory – Active Soil Gas Investigations*, January 28, 2003.

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U.S. Environmental Protection Agency. 1984. Characterization of Hazardous Waste Sites - A Methods Manual: Volume II. Available Sampling Methods. 2nd ed. EPA-600/4-84-076.

U.S. Environmental Protection Agency. 1995. Superfund Program Representative Sampling Guidance. Volume 2: Air (Short-Term Monitoring). EPA 540-R-95/140.

14.0 APPENDICES

Appendix A – Correction Factors, Ionization Energies, and Calibration Characteristics

Correction Factors, Ionization Energies*, And Calibration Characteristics

Correction Factors and Ionization Energies

RAE Systems PIDs can be used for the detection of a wide variety of gases that exhibit different responses. In general, any compound with ionization energy (IE) lower than that of the lamp photons can be measured.* The best way to calibrate a PID to different compounds is to use a standard of the gas of interest. However, correction factors have been determined that enable the user to quantify a large number of chemicals using only a single calibration gas, typically isobutylene. In our PIDs, correction factors can be used in one of three ways:

1) Calibrate the monitor with isobutylene in the usual fashion to read in isobutylene equivalents. Manually multiply the reading by the correction factor (CF) to obtain the concentration of the gas being measured.

2) Calibrate the unit with isobutylene in the usual fashion to read in isobutylene equivalents. Call up the correction factor from the instrument memory or download it from a personal computer and then call it up. The monitor will then read directly in units of the gas of interest.

3) Calibrate the unit with isobutylene, but input an equivalent, "corrected" span gas concentration when prompted for this value. The unit will then read directly in units of the gas of interest.

* *The term "ionization energy" is more scientifically correct and replaces the old term "ionization potential." High-boiling ("heavy") compounds may not vaporize enough to give a response even when their ionization energies are below the lamp photon energy. Some inorganic compounds like H_2O_2 and NO_2 give weak response even when their ionization energies are well below the lamp photon energy.*

Example 1:

With the unit calibrated to read isobutylene equivalents, the reading is 10 ppm with a 10.6 eV lamp. The gas being measured is butyl acetate, which has a correction factor of 2.6. Multiplying 10 by 2.6 gives an adjusted butyl acetate value of 26 ppm. Similarly, if the gas being measured were trichloroethylene (CF = 0.54), the adjusted value with a 10 ppm reading would be 5.4 ppm.

Example 2:

With the unit calibrated to read isobutylene equivalents, the reading is 100 ppm with a 10.6 eV lamp. The gas measured is m-xylene (CF = 0.43). After downloading this factor, the unit should read about 43 ppm when exposed to the same gas, and thus read directly in m-xylene values.

Example 3:

The desired gas to measure is ethylene dichloride (EDC). The CF is 0.6 with an 11.7 eV lamp. During calibration with 100 ppm isobutylene, insert 0.6 times 100, or 60 at the prompt for the calibration gas concentration. The unit then reads directly in EDC values.

Conversion to mg/m^3

To convert from ppm to mg/m^3, use the following formula:

$$\text{Conc. (mg/m}^3) = \frac{[\text{Conc.(ppmv) x mol. wt. (g/mole)}]}{\text{molar gas volume (L)}}$$

For air at 25 °C (77 °F), the molar gas volume is 24.4 L/mole and the formula reduces to:

$$\text{Conc.(mg/m}^3) = \text{Conc.(ppmv) x mol. wt. (g/mole) x 0.041}$$

For example, if the instrument is calibrated with a gas standard in ppmv, such as 100 ppm isobutylene, and the user wants the display to read in mg/m^3 of hexane, whose m.w. is 86 and CF is 4.3, the overall correction factor would be 4.3 x 86 x 0.041 equals 15.2.

Correction Factors for Mixtures

The correction factor for a mixture is calculated from the sum of the mole fractions Xi of each component divided by their respective correction factors CFi:

$$CFmix = 1 / (X_1/CF_1 + X_2/CF_2 + X_3/CF_3 + ... Xi/CFi)$$

Thus, for example, a vapor phase mixture of 5% benzene and 95% n-hexane would have a CFmix of CFmix = 1 / (0.05/0.53 + 0.95/4.3) = 3.2. A reading of 100 would then correspond to 320 ppm of the total mixture, comprised of 16 ppm benzene and 304 ppm hexane.

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For a spreadsheet to compute the correction factor and TLV of a mixture see the appendix at the end of the CF table.

TLVs and Alarm Limits for Mixtures

The correction factor for mixtures can be used to set alarm limits for mixtures. To do this one first needs to calculate the exposure limit for the mixture. The Threshold Limit Value (TLV) often defines exposure limits. The TLV for the mixture is calculated in a manner similar to the CF calculation:

$$TLV\ mix = 1 / (X_1/TLV_1 + X_2/TLV_2 + X_3/TLV_3 + ...\ Xi/TLVi)$$

In the above example, the 8-h TLV for benzene is 0.5 ppm and for n-hexane 50 ppm. Therefore the TLV of the mixture is TLVmix = 1 / (0.05/0.5 + 0.95/50) = 8.4 ppm, corresponding to 8.0 ppm hexane and 0.4 ppm benzene. For an instrument calibrated on isobutylene, the reading corrsponding to the TLV is:

$$\text{Alarm Reading} = TLVmix / CFmix = 8.4 / 3.2 = 2.6 \text{ ppm}$$

A common practice is to set the lower alarm limit to half the TLV, and the higher limit to the TLV. Thus, one would set the alarms to 1.3 and 2.6 ppm, respectively.

Calibration Characteristics

a) Flow Configuration. PID response is essentially independent of gas flow rate as long as it is sufficient to satisfy the pump demand. Four main flow configurations are used for calibrating a PID:

1) **Pressurized gas cylinder (Fixed-flow regulator):** The flow rate of the regulator should match the flow demand of the instrument pump or be slightly higher.
2) **Pressurized gas cylinder (Demand-flow regulator):** A demand-flow regulator better matches pump speed differences, but results in a slight vacuum during calibration and thus slightly high readings.
3) **Collapsible gas bag:** The instrument will draw the calibration gas from the bag at its normal flow rate, as long as the bag valve is large enough. The bag should be filled with enough gas to allow at least one minute of flow (~ 0.6 L for a MiniRAE, ~0.3 L for MultiRAE).
4) **T (or open tube) method:** The T method uses a T-junction with gas flow higher than the pump draw. The gas supply is connected to one end of the T, the instrument inlet is connected to a second end of the T, and excess gas flow escapes through the third, open end of the T. To prevent ambient air mixing, a long tube should be connected to the open end, or a high excess rate should be used. Alternatively, the instrument probe can be inserted into an open tube slightly wider than the probe. Excess gas flows out around the probe.

The first two cylinder methods are the most efficient in terms of gas usage, while the bag and T methods give slightly more accurate results because they match the pump flow better.

b) Pressure. Pressures deviating from atmospheric pressure affect the readings by altering gas concentration and pump characteristics. It is best to calibrate with the instrument and calibration gas at the same pressure as each other and the sample gas. (Note that the cylinder pressure is not relevant because the regulator reduces the pressure to ambient.) If the instrument is calibrated at atmospheric pressure in one of the flow configurations described above, then 1) pressures slightly above ambient are acceptable but high pressures can damage the pump and 2) samples under vacuum may give low readings if air leaks into the sample train.

c) Temperature. Because temperature effects gas density and concentration, the temperature of the calibration gas and instrument should be as close as possible to the ambient temperature where the unit will be used. We recommend that the temperature of the calibration gas be within the instrument's temperature specification (typically 14° to 113° F or -10° to 45° C). Also, during actual measurements, the instrument should be kept at the same or higher temperature than the sample temperature to avoid condensation in the unit.

d) Matrix. The matrix gas of the calibration compound and VOC sample is significant. Some common matrix components, such as methane and water vapor can affect the VOC signal. PIDs are

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most commonly used for monitoring VOCs in air, in which case the preferred calibration gas matrix is air. For a MiniRAE, methane, methanol, and water vapor reduce the response by about 20% when their concentration is 15,000 ppm and by about 40% at 30,000 ppm. Despite earlier reports of oxygen effects, RAE PID responses with 10.6 eV lamps are independent of oxygen concentration, and calibration gases in a pure nitrogen matrix can be used. H_2 and CO_2 up to 5 volume % also have no effect.

e) Concentration. Although RAE Systems PIDs have electronically linearized output, it is best to calibrate in a concentration range close to the actual measurement range. For example, 100 ppm standard gas for anticipated vapors of 0 to 250 ppm, and 500 ppm standard for expected concentrations of 250 to 1000 ppm. The correction factors in this table were typically measured at 50 to 100 ppm and apply from the ppb range up to about 1000 ppm. Above 1000 ppm the CF may vary and it is best to calibrate with the gas of interest near the concentration of interest.

f) Filters. Filters affect flow and pressure conditions and therefore all filters to be used during sampling should also be in place during calibration. Using a water trap (hydrophobic filter) greatly reduces the chances of drawing water aerosols or dirt particles into the instrument. Regular filter replacements are recommended because dirty filters can adsorb VOCs and cause slower response time and shifts in calibration.

g) Instrument Design. High-boiling ("heavy") or very reactive compounds can be lost by reaction or adsorption onto materials in the gas sample train, such as filters, pumps and other sensors. Multi-gas meters, including EntryRAE, MultiRAE and AreaRAE have the pump and other sensors upstream of the PID and are prone to these losses. Compounds possibly affected by such losses are shown in green in the table, and may give slow response, or in extreme cases, no response at all. In many cases the multi-gas meters can still give a rough indication of the relative concentration, without giving an accurate, quantitative reading. The ppbRAE and MiniRAE series instruments have inert sample trains and therefore do not exhibit significant loss; nevertheless, response may be slow for the very heavy compounds and additional sampling time up to a minute or more should be allowed to get a stable reading.

Table Abbreviations:

CF = Correction Factor (multiply by reading to get corrected value for the compound when calibrated to isobutylene)
NR = No Response
IE = Ionization Energy (values in parentheses are not well established)
C = Confirmed Value indicated by "+" in this column; all others are preliminary or estimated values and are subject to change
ne = Not Established ACGIH 8-hr. TWA
C## = Ceiling value, given where 8-hr.TWA is not available

Disclaimer:

Actual readings may vary with age and cleanliness of lamp, relative humidity, and other factors. For accurate work, the instrument should be calibrated regularly under the operating conditions used. The factors in this table were measured in dry air at room temperature, typically at 50-100 ppm. CF values may vary above about 1000 ppm.

Updates:

The values in this table are subject to change as more or better data become available. Watch for updates of this table on the Internet at **http://www.raesystems.com**

IE data are taken from the CRC Handbook of Chemistry and Physics, 73rd Edition, D.R. Lide (Ed.), CRC Press (1993) and NIST Standard Ref. Database 19A, NIST Positive Ion Energetics, Vers. 2.0, Lias, et.al., U.S. Dept. Commerce (1993). Exposure limits (8-h TWA and Ceiling Values) are from the 2005 ACGIH Guide to Occupational Exposure Values, ACGIH, Cincinnati, OH 2005. Equations for exposure limits for mixtures of chemicals were taken from the 1997 TLVs and BEIs handbook published by the ACGIH (1997).

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Compound Name	Synonym/Abbreviation	CAS No.	Formula	9.8	C	10.6	C	11.7	C	IE (eV)	TWA
Acetaldehyde		75-07-0	C_2H_4O	NR	+	6	+	3.3	+	10.23	C25
Acetic acid	Ethanoic Acid	64-19-7	$C_2H_4O_2$	NR	+	22	+	2.6	+	10.66	10
Acetic anhydride	Ethanoic Acid Anhydride	108-24-7	$C_4H_6O_3$	NR	+	6.1	+	2.0	+	10.14	5
Acetone	2-Propanone	67-64-1	C_3H_6O	1.2	+	1.1	+	1.4	+	9.71	500
Acetone cyanohydrin	2-Hydroxyisobutyronitrile	75-86-5	C_4H_7NO					4	+	11.1	C5
Acetonitrile	Methyl cyanide, Cyanomethane	75-05-8	C_2H_3N					100		12.19	40
Acetylene	Ethyne	74-86-2	C_2H_2					2.1	+	11.40	ne
Acrolein	Propenal	107-02-8	C_3H_4O	42	+	3.9	+	1.4	+	10.10	0.1
Acrylic acid	Propenoic Acid	79-10-7	$C_3H_4O_2$			12	+	2.0	+	10.60	2
Acrylonitrile	Propenenitrile	107-13-1	C_3H_3N			NR	+	1.2	+	10.91	2
Allyl alcohol		107-18-6	C_3H_6O	4.5	+	2.4	+	1.6	+	9.67	2
Allyl chloride	3-Chloropropene	107-05-1	C_3H_5Cl			4.3		0.7		9.9	1
Ammonia		7664-41-7	H_3N	NR	+	9.7	+	5.7	+	10.16	25
Amyl acetate	mix of n-Pentyl acetate & 2-Methylbutyl acetate	628-63-7	$C_7H_{14}O_2$	11	+	2.3	+	0.95	+	<9.9	100
Amyl alcohol	1-Pentanol	75-85-4	$C_5H_{12}O$			5		1.6		10.00	ne
Aniline	Aminobenzene	62-53-3	C_7H_7N	0.50	+	0.48	+	0.47	+	7.72	2
Anisole	Methoxybenzene	100-66-3	C_7H_8O	0.89	+	0.58	+	0.56	+	8.21	ne
Arsine	Arsenic trihydride	7784-42-1	AsH_3			1.9	+			9.89	0.05
Benzaldehyde		100-52-7	C_7H_6O					1		9.49	ne
Benzenamine, N-methyl-	N-Methylphenylamine	100-61-8	C_7H_9N			0.7				7.53	
Benzene		71-43-2	C_6H_6	0.55	+	0.53	+	0.6	+	9.25	0.5
Benzonitrile	Cyanobenzene	100-47-0	C_7H_5N			1.6				9.62	ne
Benzyl alcohol	α-Hydroxytoluene, Hydroxymethylbenzene, Benzenemethanol	100-51-6	C_7H_8O	1.4	+	1.1	+	0.9	+	8.26	ne
Benzyl chloride	α-Chlorotoluene, Chloromethylbenzene	100-44-7	C_7H_7Cl	0.7	+	0.6	+	0.5	+	9.14	1
Benzyl formate	Formic acid benzyl ester	104-57-4	$C_8H_8O_2$	0.9	+	0.73	+	0.66	+		ne
Boron trifluoride		7637-07-2	BF_3	NR		NR		NR		15.5	C1
Bromine		7726-95-6	Br_2	NR	+	1.30	+	0.74	+	10.51	0.1
Bromobenzene		108-86-1	C_6H_5Br			0.6		0.5		8.98	ne
2-Bromoethyl methyl ether		6482-24-2	C_3H_7OBr			0.84	+			~10	ne
Bromoform	Tribromomethane	75-25-2	$CHBr_3$	NR	+	2.5	+	0.5	+	10.48	0.5
Bromopropane,1-	n-Propyl bromide	106-94-5	C_3H_7Br	150	+	1.5	+	0.6	+	10.18	ne
Butadiene	1,3-Butadiene, Vinyl ethylene	106-99-0	C_4H_6	0.8		0.85	+	1.1		9.07	2
Butadiene diepoxide, 1,3-	1,2,3,4-Diepoxybutane	298-18-0	$C_4H_6O_2$	25	+	3.5	+	1.2		~10	ne
Butanal	1-Butanal	123-72-8	C_4H_8O			1.8				9.84	
Butane		106-97-8	C_4H_{10}			67	+	1.2		10.53	800
Butanol, 1-	Butyl alcohol, n-Butanol	71-36-3	$C_4H_{10}O$	70	+	4.7	+	1.4	+	9.99	20
Butanol, t-	tert-Butanol, t-Butyl alcohol	75-65-0	$C_4H_{10}O$	6.9	+	2.9	+			9.90	100
Butene, 1-	1-Butylene	106-98-9	C_4H_8			0.9				9.58	ne
Butoxyethanol, 2-	Butyl Cellosolve, Ethylene glycol monobutyl ether	111-76-2	$C_6H_{14}O_2$	1.8	+	1.2	+	0.6	+	<10	25
Butoxyethanol acetate	Ethanol, 2-(2-butoxyethoxy)-, acetate	124-17-4	$C_{10}H_{20}O_4$			5.6				≤10.6	
Butoxyethoxyethanol	2-(2-Butoxyethoxy)ethanol	112-34-5	$C_8H_{18}O_3$			4.6				≤10.6	
Butyl acetate, n-		123-86-4	$C_6H_{12}O_2$			2.6	+			10	150
Butyl acrylate, n-	Butyl 2-propenoate, Acrylic acid butyl ester	141-32-2	$C_7H_{12}O_2$			1.6	+	0.6	+		10
Butylamine, n-		109-73-9	$C_4H_{11}N$	1.1	+	1.1	+	0.7	+	8.71	C5
Butyl cellosolve	see 2-Butoxyethanol	111-76-2									
Butyl hydroperoxide, t-		75-91-2	$C_4H_{10}O_2$	2.0	+	1.6	+			<10	1
Butyl mercaptan	1-Butanethiol	109-79-5	$C_4H_{10}S$	0.55	+	0.52	+			9.14	0.5
Carbon disulfide		75-15-0	CS_2	4	+	1.2	+	0.44		10.07	10
Carbon tetrachloride	Tetrachloromethane	56-23-5	CCl_4	NR	+	NR	+	1.7	+	11.47	5
Carbonyl sulfide	Carbon oxysulfide	463-58-1	COS							11.18	
Cellosolve see 2-Ethoxyethanol											
CFC-14 see Tetrafluoromethane											
CFC-113 see 1,1,2-Trichloro-1,2,2-trifluoroethane											

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Compound Name	Synonym/Abbreviation	CAS No.	Formula	9.8	C	10.6	C	11.7	C	IE (eV)	TWA
Chlorine		7782-50-5	Cl_2					1.0	+	11.48	0.5
Chlorine dioxide		10049-04-4	ClO_2	NR	+	NR	+	NR	+	10.57	0.1
Chlorobenzene	Monochlorobenzene	108-90-7	C_6H_5Cl	0.44	+	0.40	+	0.39	+	9.06	10
Chlorobenzotrifluoride, 4-	PCBTF, OXSOL 100 p-Chlorobenzotrifluoride	98-56-6	$C_7H_4ClF_3$	0.74	+	0.63	+	0.55	+	<9.6	25
Chloro-1,3-butadiene, 2-	Chloroprene	126-99-8	C_4H_5Cl			3					10
Chloro-1,1-difluoroethane, 1-	HCFC-142B, R-142B	75-68-3	$C_2H_3ClF_2$	NR		NR		NR		12.0	ne
Chlorodifluoromethane	HCFC-22, R-22	75-45-6	$CHClF_2$	NR		NR		NR		12.2	1000
Chloroethane	Ethyl chloride	75-00-3	C_2H_5Cl	NR	+	NR	+	1.1	+	10.97	100
Chloroethanol	Ethylene chlrohydrin	107-07-3	C_2H_5ClO					2.9		10.52	C1
Chloroethyl ether, 2-	bis(2-chloroethyl) ether	111-44-4	$C_4H_8Cl_2O$	8.6	+	3.0	+				5
Chloroethyl methyl ether, 2-	Methyl 2-chloroethyl ether	627-42-9	C_3H_7ClO			3					ne
Chloroform	Trichloromethane	67-66-3	$CHCl_3$	NR	+	NR	+	3.5	+	11.37	10
Chloro-2-methylpropene, 3-	Methallyl chloride, Isobutenyl chloride	563-47-3	C_4H_7Cl	1.4	+	1.2	+	0.63	+	9.76	ne
Chloropicrin		76-06-2	CCl_3NO_2	NR	+	~400	+	7	+	?	0.1
Chlorotoluene, o-	o-Chloromethylbenzene	95-49-8	C_7H_7Cl			0.5		0.6		8.83	50
Chlorotoluene, p-	p-Chloromethylbenzene	106-43-4	C_7H_7Cl					0.6		8.69	ne
Chlorotrifluoroethene	CTFE, Chlorotrifluoroethylene Genetron 1113	79-38-9	C_2ClF_3	6.7	+	3.9	+	1.2	+	9.76	5
Chlorotrimethylsilane		75-77-4	C_3H_9ClSi	NR		NR		0.82	+	10.83	ne
Cresol, m-	m-Hydroxytoluene	108-39-4	C_7H_8O	0.57	+	0.50	+	0.57	+	8.29	5
Cresol, o-	o-Hydroxytoluene	95-48-7	C_7H_8O			1.0				8.50	
Cresol, p-	p-Hydroxytoluene	106-44-5	C_7H_8O			1.4				8.35	
Crotonaldehyde	*trans*-2-Butenal	123-73-9 4170-30-3	C_4H_6O	1.5	+	1.1	+	1.0	+	9.73	2
Cumene	Isopropylbenzene	98-82-8	C_9H_{12}	0.58	+	0.54	+	0.4	+	8.73	50
Cyanogen bromide		506-68-3	$CNBr$	NR		NR		NR		11.84	ne
Cyanogen chloride		506-77-4	$CNCl$	NR		NR		NR		12.34	C0.3
Cyclohexane		110-82-7	C_6H_{12}	3.3	+	1.4	+	0.64	+	9.86	300
Cyclohexanol	Cyclohexyl alcohol	108-93-0	$C_6H_{12}O$	1.5	+	0.9	+	1.1	+	9.75	50
Cyclohexanone		108-94-1	$C_6H_{10}O$	1.0	+	0.9	+	0.7	+	9.14	25
Cyclohexene		110-83-8	C_6H_{10}			0.8	+			8.95	300
Cyclohexylamine		108-91-8	$C_6H_{13}N$			1.2				8.62	10
Cyclopentane 85% 2,2-dimethylbutane 15%		287-92-3	C_5H_{10}	NR	+	15	+	1.1		10.33	600
Cyclopropylamine	Aminocyclpropane	765-30-0	C_3H_7N	1.1	+	0.9	+	0.9	+		ne
Decamethylcyclopentasiloxane		541-02-6	$C_{10}H_{30}O_5Si_5$	0.16	+	0.13	+	0.12	+		ne
Decamethyltetrasiloxane		141-62-8	$C_{10}H_{30}O_3Si_4$	0.17	+	0.13	+	0.12	+	<10.2	ne
Decane		124-18-5	$C_{10}H_{22}$	4.0	+	1.4	+	0.35	+	9.65	ne
Diacetone alcohol	4-Methyl-4-hydroxy-2-pentanone	123-42-2	$C_6H_{12}O_2$			0.7					50
Dibromochloromethane	Chlorodibromomethane	124-48-1	$CHBr_2Cl$	NR	+	5.3	+	0.7	+	10.59	ne
Dibromo-3-chloropropane, 1,2-	DBCP	96-12-8	$C_3H_5Br_2Cl$	NR	+	1.7	+	0.43	+		0.001
Dibromoethane, 1,2-	EDB, Ethylene dibromide, Ethylene bromide	106-93-4	$C_2H_4Br_2$	NR	+	1.7	+	0.6	+	10.37	ne
Dichlorobenzene, o-	1,2-Dichlorobenzene	95-50-1	$C_6H_4Cl_2$	0.54	+	0.47	+	0.38	+	9.08	25
Dichlorodifluoromethane	CFC-12	75-71-8	CCl_2F_2			NR	+	NR	+	11.75	1000
Dichlorodimethylsilane		75-78-5	$C_2H_6Cl_2Si$	NR		NR		1.1	+	>10.7	ne
Dichloroethane, 1,2-	EDC, 1,2-DCA, Ethylene dichloride	107-06-2	$C_2H_4Cl_2$			NR	+	0.6	+	11.04	10
Dichloroethene, 1,1-	1,1-DCE, Vinylidene chloride	75-35-4	$C_2H_2Cl_2$			0.82	+	0.8	+	9.79	5
Dichloroethene, c-1,2-	*c*-1,2-DCE, *cis*-Dichloroethylene	156-59-2	$C_2H_2Cl_2$			0.8				9.66	200
Dichloroethene, t-1,2-	*t*-1,2-DCE, *trans*-Dichloroethylene	156-60-5	$C_2H_2Cl_2$			0.45	+	0.34	+	9.65	200
Dichloro-1-fluoroethane, 1,1-	R-141B	1717-00-6	$C_2H_3Cl_2F$	NR	+	NR	+	2.0	+		ne
Dichloromethane	see Methylene chloride										

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Compound Name	Synonym/Abbreviation	CAS No.	Formula	9.8	C	10.6	C	11.7	C	IE (eV)	TWA
Dichloropentafluoropropane	AK-225, mix of ~45% 3,3-dichloro-1,1,1,2,2-pentafluoropropane (HCFC-225ca) & ~55% 1,3-Dichloro-1,1,2,2,3-pentafluoropropane (HCFC-225cb)	442-56-0 507-55-1	$C_3HCl_2F_5$	NR	+	NR	+	25	+		ne
Dichloropropane, 1,2-		78-87-5	$C_3H_6Cl_2$					0.7		10.87	75
Dichloro-1-propene, 1,3-		542-75-6	$C_3H_4C_{12}$	1.3	+	0.96	+			<10	1
Dichloro-1-propene, 2,3-		78-88-6	$C_3H_4Cl_2$	1.9	+	1.3	+	0.7	+	<10	ne
Dichloro-1,1,1-trifluoroethane, 2,2-	R-123	306-83-2	$C_2HCl_2F_3$	NR	+	NR	+	10.1	+	11.5	ne
Dichloro-2,4,6-trifluoropyridine, 3,5-	DCTFP	1737-93-5	$C_5Cl_2F_3N$	1.1	+	0.9	+	0.8	+		ne
Dichlorvos *	Vapona; O,O-dimethyl O-dichlorovinyl phosphate	62-73-7	$C_4H_7Cl_2O_4P$			0.9	+			<9.4	0.1
Dicyclopentadiene	DCPD, Cyclopentadiene dimer	77-73-6	$C_{10}H_{12}$	0.57	+	0.48	+	0.43	+	8.8	5
Diesel Fuel		68334-30-5	m.w. 226			0.9	+				11
Diesel Fuel #2 (Automotive)		68334-30-5	m.w. 216	1.3		0.7	+	0.4	+		11
Diethylamine		109-89-7	$C_4H_{11}N$			1	+			8.01	5
Diethylaminopropylamine, 3-		104-78-9	$C_7H_{18}N_2$			1.3					ne
Diethylbenzene	See Dowtherm J										
Diethylmaleate		141-05-9	$C_8H_{12}O_4$			4					ne
Diethyl sulfide	see Ethyl sulfide										
Diglyme	See Methoxyethyl ether	111-96-6	$C_6H_{14}O_3$								
Diisobutyl ketone	DIBK, 2,2-dimethyl-4-heptanone	108-83-8	$C_9H_{18}O$	0.71	+	0.61	+	0.35	+	9.04	25
Diisopropylamine		108-18-9	$C_6H_{15}N$	0.84	+	0.74	+	0.5	+	7.73	5
Diketene	Ketene dimer	674-82-8	$C_4H_4O_2$	2.6	+	2.0	+	1.4	+	9.6	0.5
Dimethylacetamide, N,N-	DMA	127-19-5	C_4H_9NO	0.87	+	0.8	+	0.8	+	8.81	10
Dimethylamine		124-40-3	C_2H_7N			1.5				8.23	5
Dimethyl carbonate	Carbonic acid dimethyl ester	616-38-6	$C_3H_6O_3$	NR	+	~70	+	1.7	+	~10.5	ne
Dimethyl disulfide	DMDS	624-92-0	$C_2H_6S_2$	0.2	+	0.20	+	0.21	+	7.4	ne
Dimethyl ether	see Methyl ether										
Dimethylethylamine	DMEA	598-56-1	$C_4H_{11}N$	1.1	+	1.0	+	0.9	+	7.74	~3
Dimethylformamide, N,N-	DMF	68-12-2	C_3H_7NO	0.7	+	0.7	+	0.8	+	9.13	10
Dimethylhydrazine, 1,1-	UDMH	57-14-7	$C_2H_8N_2$			0.8	+	0.8	+	7.28	0.01
Dimethyl methylphosphonate	DMMP, methyl phosphonic acid dimethyl ester	756-79-6	$C_3H_9O_3P$	NR	+	4.3	+	0.74	+	10.0	ne
Dimethyl sulfate		77-78-1	$C_2H_6O_4S$	~23		~20	+	2.3	+		0.1
Dimethyl sulfide	see Methyl sulfide										
Dimethyl sulfoxide	DMSO, Methyl sulfoxide	67-68-5	C_2H_6OS			1.4	+			9.10	ne
Dioxane, 1,4-		123-91-1	$C_4H_8O_2$			1.3				9.19	25
Dioxolane, 1,3-	Ethylene glycol formal	646-06-0	$C_3H_6O_2$	4.0	+	2.3	+	1.6	+	9.9	20
Dowtherm A see Therminol® *											
Dowtherm J (97% Diethylbenzene) *		25340-17-4	$C_{10}H_{14}$			0.5					
DS-108F Wipe Solvent	Ethyl lactate/Isopar H/ Propoxypropanol ~7:2:1	97-64-3 64742-48-9 1569-01-3	m.w. 118	3.3	+	1.6	+	0.7	+		ne
Epichlorohydrin	ECH Chloromethyloxirane, 1-chloro2,3-epoxypropane	106-89-8	C_2H_5ClO	~200	+	8.5	+	1.4	+	10.2	0.5
Ethane		74-84-0	C_2H_6			NR	+	15	+	11.52	ne
Ethanol	Ethyl alcohol	64-17-5	C_2H_6O			10	+	3.1	+	10.47	1000
Ethanolamine *	MEA, Monoethanolamine	141-43-5	C_2H_7NO	5.6	+	1.6	+			8.96	3
Ethene	Ethylene	74-85-1	C_2H_4			9	+	4.5	+	10.51	ne
Ethoxyethanol, 2-	Ethyl cellosolve	110-80-5	$C_4H_{10}O_2$			1.3				9.6	5
Ethyl acetate		141-78-6	$C_4H_8O_2$			4.6	+	3.5		10.01	400
Ethyl acetoacetate		141-97-9	$C_6H_{10}O_3$	1.4	+	1.2	+	1.0	+	<10	ne
Ethyl acrylate		140-88-5	$C_5H_8O_2$			2.4	+	1.0	+	<10.3	5
Ethylamine		75-04-7	C_2H_7N			0.8				8.86	5

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Compound Name	Synonym/Abbreviation	CAS No.	Formula	9.8	C	10.6	C	11.7	C	IE (Ev)	TWA
Ethylbenzene		100-41-4	C_8H_{10}	0.52	+	0.52	+	0.51	+	8.77	100
Ethyl caprylate	Ethyl octanoate	106-32-1	$C_{10}H_{20}O_2$		+	0.52	+	0.51	+		
Ethylenediamine	1,2-Ethanediamine; 1,2-Diaminoethane	107-15-3	$C_2H_8N_2$	0.9	+	0.8	+	1.0	+	8.6	10
Ethylene glycol *	1,2-Ethanediol	107-21-1	$C_2H_6O_2$			16	+	6	+	10.16	C100
Ethylene glycol, Acrylate	2-hydroxyethyl Acrylate	818-61-1	$C_5H_8O_3$			8.2				≤10.6	
Ethylene glycol dimethyl ether	1,2-Dimethoxyethane, Monoglyme	110-71-4	$C_4H_{10}O_2$	1.1		0.86		0.7		9.2	ne
Ethylene glycol monobutyl ether acetate	2-Butoxyethyl acetate	112-07-2	$C_8H_{16}O_3$			1.3				≤10.6	
Ethylene glycol, monothio	mercapto-2-ethanol	60-24-2	C_2H_6OS			1.5				9.65	
Ethylene oxide	Oxirane, Epoxyethane	75-21-8	C_2H_4O			13	+	3.5	+	10.57	1
Ethyl ether	Diethyl ether	60-29-7	$C_4H_{10}O$			1.1	+	1.7		9.51	400
Ethyl 3-ethoxypropionate	EEP	763-69-9	$C_7H_{14}O_3$	1.2	+	0.75	+				ne
Ethyl formate		109-94-4	$C_3H_6O_2$					1.9		10.61	100
Ethylhexyl acrylate, 2-	Acrylic acid 2-ethylhexyl ester	103-11-7	$C_{11}H_{20}O_2$			1.1	+	0.5	+		ne
Ethylhexanol	2-Ethyl-1-hexanol	104-76-7	$C8H_{18}O$			1.9				≤10.6	
Ethylidenenorbornene	5-Ethylidene bicyclo(2,2,1)hept-2-ene	16219-75-3	C_9H_{12}	0.4	+	0.39	+	0.34	+	≤8.8	ne
Ethyl (S)-(-)-lactate see also DS-108F	Ethyl lactate, Ethyl (S)-(-)-hydroxypropionate	687-47-8 97-64-3	$C_5H_{10}O_3$	13	+	3.2	+	1.6	+	~10	ne
Ethyl mercaptan	Ethanethiol	75-08-1	C_2H_6S	0.60	+	0.56	+			9.29	0.5
Ethyl sulfide	Diethyl sulfide	352-93-2	$C_4H_{10}S$			0.5	+			8.43	ne
Formaldehyde	Formalin	50-00-0	CH_2O	NR	+	NR	+	1.6	+	10.87	C0.3
Formamide		75-12-7	CH_3NO			6.9	+	4		10.16	10
Formic acid		64-18-6	CH_2O_2	NR	+	NR	+	9	+	11.33	5
Furfural	2-Furaldehyde	98-01-1	$C_5H_4O_2$			0.92	+	0.8	+	9.21	2
Furfuryl alcohol		98-00-0	$C_5H_6O_2$			0.80	+			<9.5	10
Gasoline #1		8006-61-9	m.w. 72			0.9	+				300
Gasoline #2, 92 octane		8006-61-9	m.w. 93	1.3	+	1.0	+	0.5	+		300
Glutaraldehyde	1,5-Pentanedial, Glutaric dialdehyde	111-30-8	$C_5H_8O_2$	1.1	+	0.8	+	0.6	+		C0.05
Glycidyl methacrylate	2,3-Epoxypropyl methacrylate	106-91-2	$C_7H_{10}O_3$	2.6	+	1.2	+	0.9	+		0.5
Halothane	2-Bromo-2-chloro-1,1,1-trifluoroethane	151-67-7	$C_2HBrClF_3$					0.6		11.0	50
HCFC-22 see Chlorodifluoromethane											
HCFC-123 see 2,2-Dichloro-1,1,1-trifluoroethane											
HCFC-141B see 1,1-Dichloro-1-fluoroethane											
HCFC-142B see 1-Chloro-1,1-difluoroethane											
HCFC-134A see 1,1,1,2-Tetrafluoroethane											
HCFC-225 see Dichloropentafluoropropane											
Heptane, n-		142-82-5	C_7H_{16}	45	+	2.8	+	0.60	+	9.92	400
Heptanol, 4-	Dipropylcarbinol	589-55-9	$C_7H_{16}O$	1.8	+	1.3	+	0.5	+	9.61	ne
Hexamethyldisilazane, 1,1,1,3,3,3- *	HMDS	999-97-3	$C_6H_{19}NSi_2$			0.2	+	0.2	+	~8.6	ne
Hexamethyldisiloxane	HMDSx	107-46-0	$C_6H_{18}OSi_2$	0.33	+	0.27	+	0.25	+	9.64	ne
Hexane, n-		110-54-3	C_6H_{14}	350	+	4.3	+	0.54	+	10.13	50
Hexanol, 1-	Hexyl alcohol	111-27-3	$C_6H_{14}O$	9	+	2.5	+	0.55	+	9.89	ne
Hexene, 1-		592-41-6	C_6H_{12}			0.8				9.44	30
HFE-7100 see Methyl nonafluorobutyl ether											
Histoclear (Histo-Clear)	Limonene/corn oil reagent		m.w. ~136	0.5	+	0.4	+	0.3	+		ne
Hydrazine *		302-01-2	H_4N_2	>8	+	2.6	+	2.1	+	8.1	0.01
Hydrazoic acid	Hydrogen azide		HN_3							10.7	
Hydrogen	Synthesis gas	1333-74-0	H_2	NR	+	NR	+	NR	+	15.43	ne
Hydrogen cyanide	Hydrocyanic acid	74-90-8	HCN	NR	+	NR	+	NR	+	13.6	C4.7
Hydrogen iodide *	Hydriodic acid	10034-85-2	HI			~0.6*				10.39	
Hydrogen peroxide		7722-84-1	H_2O_2	NR	+	NR	+	NR	+	10.54	1
Hydrogen sulfide		7783-06-4	H_2S	NR	+	3.3	+	1.5	+	10.45	10
Hydroxypropyl methacrylate		27813-02-1 923-26-2	$C_7H_{12}O_3$	9.9	+	2.3	+	1.1	+		ne
Iodine *		7553-56-2	I_2	0.1	+	0.1	+	0.1	+	9.40	C0.1

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Iodomethane	Methyl iodide	74-88-4	CH_3I	0.21	+	0.22	+	0.26	+	9.54	2
Isoamyl acetate	Isopentyl acetate	123-92-2	$C_7H_{14}O_2$	10.1		2.1		1.0		<10	100
Isobutane	2-Methylpropane	75-28-5	C_4H_{10}			100	+	1.2	+	10.57	ne
Isobutanol	2-Methyl-1-propanol	78-83-1	$C_4H_{10}O$	19	+	3.8	+	1.5		10.02	50
Isobutene	Isobutylene, Methyl butene	115-11-7	C_4H_8	1.00	+	1.00	+	1.00	+	9.24	Ne
Isobutyl acrylate	Isobutyl 2-propenoate	106-63-8	$C_7H_{12}O_2$			1.5	+	0.60	+		Ne
Isoflurane	1-Chloro-2,2,2-trifluoroethyl difluoromethyl ether, forane	26675-46-7	$C_3H_2ClF_5O$	NR	+	NR	+	48	+	~11.7	Ne
Isooctane	2,2,4-Trimethylpentane	540-84-1	C8H18			1.2				9.86	ne
Isopar E Solvent	Isoparaffinic hydrocarbons	64741-66-8	m.w. 121	1.7	+	0.8	+				Ne
Isopar G Solvent	Photocopier diluent	64742-48-9	m.w. 148			0.8	+				Ne
Isopar K Solvent	Isoparaffinic hydrocarbons	64742-48-9	m.w. 156	0.9	+	0.5	+	0.27	+		Ne
Isopar L Solvent	Isoparaffinic hydrocarbons	64742-48-9	m.w. 163	0.9	+	0.5	+	0.28	+		Ne
Isopar M Solvent	Isoparaffinic hydrocarbons	64742-47-8	m.w. 191			0.7	+	0.4	+		Ne
Isopentane	2-Methylbutane	78-78-4	C_5H_{12}			8.2					Ne
Isophorone		78-59-1	$C_9H_{14}O$					3		9.07	C5
Isoprene	2-Methyl-1,3-butadiene	78-79-5	C_5H_8	0.69	+	0.63	+	0.60	+	8.85	Ne
Isopropanol	Isopropyl alcohol, 2-propanol, IPA	67-63-0	C_3H_8O	500	+	6.0	+	2.7		10.12	200
Isopropyl acetate		108-21-4	$C_5H_{10}O_2$			2.6				9.99	100
Isopropyl ether	Diisopropyl ether	108-20-3	$C_6H_{14}O$			0.8				9.20	250
Jet fuel JP-4	Jet B, Turbo B, F-40 Wide cut type aviation fuel	8008-20-6 + 64741-42-0	m.w. 115			1.0	+	0.4	+		Ne
Jet fuel JP-5	Jet 5, F-44, Kerosene type aviation fuel	8008-20-6 + 64747-77-1	m.w. 167			0.6	+	0.5	+		29
Jet fuel JP-8	Jet A-1, F-34, Kerosene type aviation fuel	8008-20-6 + 64741-77-1	m.w. 165			0.6	+	0.3	+		30
Jet fuel A-1 (JP-8)	F-34, Kerosene type aviation fuel	8008-20-6 + 64741-77-1	m.w. 145			0.67					34
Jet Fuel TS	Thermally Stable Jet Fuel, Hydrotreated kerosene fuel	8008-20-6 + 64742-47-8	m.w. 165	0.9	+	0.6	+	0.3	+		30
Limonene, D-	(R)-(+)-Limonene	5989-27-5	$C_{10}H_{16}$			0.33	+			~8.2	Ne
Kerosene C10-C16 petro.distillate – see Jet Fuels		8008-20-6									
MDI – see 4,4'-Methylenebis(phenylisocyanate)											
Maleic anhydride	2,5-Furandione	108-31-6	$C_4H_2O_3$							~10.8	0.1
Mesitylene	1,3,5-Trimethylbenzene	108-67-8	C_9H_{12}	0.36	+	0.35	+	0.3	+	8.41	25
Methallyl chloride – see 3-Chloro-2-methylpropene											
Methane	Natural gas	74-82-8	CH_4	NR	+	NR	+	NR	+	12.61	Ne
Methanol	Methyl alcohol, carbinol	67-56-1	CH_4O	NR	+	NR	+	2.5	+	10.85	200
Methoxyethanol, 2-	Methyl cellosolve, Ethylene glycol monomethyl ether	109-86-4	$C_3H_8O_2$	4.8	+	2.4	+	1.4	+	10.1	5
Methoxyethoxyethanol, 2-	2-(2-Methoxyethoxy)ethanol Diethylene glycol monomethyl ether	111-77-3	$C_7H_{16}O$	2.3	+	1.2	+	0.9	+	<10	Ne
Methoxyethyl ether, 2-	bis(2-Methoxyethyl) ether, Diethylene glycol dimethyl ether, Diglyme	111-96-6	$C_6H_{14}O_3$	0.64	+	0.54	+	0.44	+	<9.8	Ne
Methyl acetate		79-20-9	$C_3H_6O_2$	NR	+	6.6	+	1.4	+	10.27	200
Methyl acrylate	Methyl 2-propenoate, Acrylic acid methyl ester	96-33-3	$C_4H_6O_2$			3.7	+	1.2	+	(9.9)	2
Methylamine	Aminomethane	74-89-5	CH_5N			1.2				8.97	5
Methyl amyl ketone	MAK, 2-Heptanone, Methyl pentyl ketone	110-43-0	$C_7H_{14}O$	0.9	+	0.85	+	0.5	+	9.30	50
Methyl bromide	Bromomethane	74-83-9	CH_3Br	110	+	1.7	+	1.3	+	10.54	1
Methyl t-butyl ether	MTBE, *tert*-Butyl methyl ether	1634-04-4	$C_5H_{12}O$			0.9	+			9.24	40
Methyl cellosolve	see 2-Methoxyethanol										
Methyl chloride	Chloromethane	74-87-3	CH_3Cl	NR	+	NR	+	0.74	+	11.22	50
Methylcyclohexane		107-87-2	C_7H_{14}	1.6	+	0.97	+	0.53	+	9.64	400
Methylene bis(phenyl-isocyanate), 4,4'- *	MDI, Mondur M		$C_{15}H_{10}N_2O_2$	Very slow ppb level response							0.005

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Methylene chloride	Dichloromethane	75-09-2	CH_2Cl_2	NR	+	NR	+	0.89	+	11.32	25
Methyl ether	Dimethyl ether	115-10-6	C_2H_6O	4.8	+	3.1	+	2.5	+	10.03	Ne
Methyl ethyl ketone	MEK, 2-Butanone	78-93-3	C_4H_8O	0.86	+	0.9	+	1.1	+	9.51	200
Methylhydrazine	Monomethylhydrazine, Hydrazomethane	60-34-4	$C_2H_6N_2$	1.4	+	1.2	+	1.3	+	7.7	0.01
Methyl isoamyl ketone	MIAK, 5-Methyl-2-hexanone	110-12-3	$C_7H_{14}O$	0.8	+	0.76	+	0.5	+	9.28	50
Methyl isobutyl ketone	MIBK, 4-Methyl-2-pentanone	108-10-1	$C_6H_{12}O$	0.9	+	0.8	+	0.6	+	9.30	50
Methyl isocyanate	CH3NCO	624-83-9	C_2H_3NO	NR	+	4.6	+	1.5		10.67	0.02
Methyl isothiocyanate	CH3NCS	551-61-6	C_2H_3NS	0.5	+	0.45	+	0.4	+	9.25	ne
Methyl mercaptan	Methanethiol	74-93-1	CH_4S	0.65		0.54		0.66		9.44	0.5
Methyl methacrylate		80-62-6	$C_5H_8O_2$	2.7	+	1.5	+	1.2	+	9.7	100
Methyl nonafluorobutyl ether	HFE-7100DL	163702-08-7, 163702-07-6	$C_5H_3F_9O$			NR	+	~35	+		ne
Methyl-1,5-pentanediamine, 2- (coats lamp) *	Dytek-A amine, 2-Methyl pentamethylenediamine	15520-10-2	C6H16N2			~0.6	+			<9.0	ne
Methyl propyl ketone	MPK, 2-Pentanone	107-87-9	$C_5H_{12}O$			0.93	+	0.79	+	9.38	200
Methyl-2-pyrrolidinone, N-	NMP, N-Methylpyrrolidone, 1-Methyl-2-pyrrolidinone, 1-Methyl-2-pyrrolidone	872-50-4	C_5H_9NO	1.0	+	0.8	+	0.9	+	*9.17*	ne
Methyl salicylate	Methyl 2-hydroxybenzoate	119-36-8	C_8H_8O3	1.3	+	0.9	+	0.9	+	~9	ne
Methylstyrene, α-	2-Propenylbenzene	98-83-9	C_9H_{10}			0.5				8.18	50
Methyl sulfide	DMS, Dimethyl sulfide	75-18-3	C_2H_6S	0.49	+	0.44	+	0.46	+	8.69	ne
Mineral spirits	Stoddard Solvent, Varsol 1, White Spirits	8020-83-5 8052-41-3 68551-17-7	m.w. 144	1.0		0.69	+	0.38	+		100
Mineral Spirits - Viscor 120B Calibration Fluid, b.p. 156-207°C		8052-41-3	m.w. 142	1.0	+	0.7	+	0.3	+		100
Monoethanolamine - see Ethanolamine											
Mustard *	HD, Bis(2-chloroethyl) sulfide	505-60-2 39472-40-7 68157-62-0	$C_4H_8Cl_2S$			0.6					0.0005
Naphtha - see VM & P Naptha											
Naphthalene	Mothballs	91-20-3	$C_{10}H_8$	0.45	+	0.42	+	0.40	+	8.13	10
Nickel carbonyl (in CO)	Nickel tetracarbonyl	13463-39-3	C_4NiO_4			0.18				<8.8	0.001
Nicotine		54-11-5	$C_{10}H_{14}N_2$			2.0				≤10.6	
Nitric oxide		10102-43-9	NO	~6		5.2	+	2.8	+	9.26	25
Nitrobenzene		98-95-3	$C_6H_5NO_2$	2.6	+	1.9	+	1.6	+	9.81	1
Nitroethane		79-24-3	$C_2H_5NO_2$					3		10.88	100
Nitrogen dioxide		10102-44-0	NO_2	23	+	16	+	6	+	9.75	3
Nitrogen trifluoride		7783-54-2	NF_3	NR		NR		NR		13.0	10
Nitromethane		75-52-5	CH_3NO_2					4		11.02	20
Nitropropane, 2-		79-46-9	$C_3H_7NO_2$					2.6		10.71	10
Nonane		111-84-2	C_9H_{20}			1.4				9.72	200
Norpar 12	n-Paraffins, mostly C_{10}-C_{13}	64771-72-8	m.w. 161	3.2	+	1.1	+	0.28	+		ne
Norpar 13	n-Paraffins, mostly C_{13}-C_{14}	64771-72-8	m.w. 189	2.7	+	1.0	+	0.3	+		ne
Octamethylcyclotetrasiloxane		556-67-2	$C_8H_{24}O_4Si_4$	0.21	+	0.17	+	0.14	+		ne
Octamethyltrisiloxane		107-51-7	$C_8H_{24}O_2Si_3$	0.23	+	0.18	+	0.17	+	<10.0	ne
Octane, n-		111-65-9	C_8H_{18}	13	+	1.8	+			9.82	300
Octene, 1-		111-66-0	C_8H_{16}	0.9	+	0.75	+	0.4	+	9.43	75
Pentane		109-66-0	C_5H_{12}	80	+	8.4	+	0.7	+	10.35	600
Peracetic acid *	Peroxyacetic acid, Acetyl hydroperoxide	79-21-0	$C_2H_4O_3$	NR	+	NR	+	2.3	+		ne
Peracetic/Acetic acid mix *	Peroxyacetic acid, Acetyl hydroperoxide	79-21-0	$C_2H_4O_3$			50	+	2.5	+		ne
Perchloroethene	PCE, Perchloroethylene, Tetrachloroethylene	127-18-4	C_2Cl_4	0.69	+	0.57	+	0.31	+	9.32	25
PGME	Propylene glycol methyl ether, 1-Methoxy-2-propanol	107-98-2	$C_6H_{12}O_3$	2.4	+	1.5	+	1.1	+		100

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Compound Name	Synonym/Abbreviation	CAS No.	Formula	9.8	C	10.6	C	11.7	C	IE (eV)	TWA
PGMEA	Propylene glycol methyl ether acetate, 1-Methoxy-2-acetoxypropane, 1-Methoxy-2-propanol acetate	108-65-6	$C_6H_{12}O_3$	1.65	+	1.0	+	0.8	+		ne
Phenol	Hydroxybenzene	108-95-2	C_6H_6O	1.0	+	1.0	+	0.9	+	8.51	5
Phosgene	Dichlorocarbonyl	75-44-5	CCl_2O	NR	+	NR	+	8.5	+	11.2	0.1
Phosgene in Nitrogen	Dichlorocarbonyl	75-44-5	CCl_2O	NR	+	NR	+	6.8	+	11.2	0.1
Phosphine (coats lamp)		7803-51-2	PH_3	28		3.9	+	1.1	+	9.87	0.3
Photocopier Toner	Isoparaffin mix					0.5	+	0.3	+		ne
Picoline, 3-	3-Methylpyridine	108-99-6	C_6H_7N			0.9				9.04	ne
Pinene, α-		2437-95-8	$C_{10}H_{16}$			0.31	+	0.47		8.07	ne
Pinene, β-		18172-67-3	$C_{10}H_{16}$	0.38	+	0.37	+	0.37	+	~8	100
Piperylene, isomer mix	1,3-Pentadiene	504-60-9	C_5H_8	0.76	+	0.69	+	0.64	+	8.6	100
Propane		74-98-6	C_3H_8			NR	+	1.8	+	10.95	2500
Propanol, n-	Propyl alcohol	71-23-8	C_3H_8O			5		1.7		10.22	200
Propene	Propylene	115-07-1	C_3H_6	1.5	+	1.4	+	1.6	+	9.73	ne
Propionaldehyde	Propanal	123-38-6	C_3H_6O			1.9				9.95	ne
Propyl acetate, n-		109-60-4	$C_5H_{10}O_2$			3.5		2.3		10.04	200
Propylamine, n-	1-Propylamine, 1-Aminopropane	107-10-8	C_3H_9N	1.1	+	1.1	+	0.9	+	8.78	ne
Propylene carbonate *		108-32-7	$C_4H_6O_3$			62	+	1	+	10.5	ne
Propylene glycol	1,2-Propanediol	57-55-6	$C_3H_8O_2$	18		5.5	+	1.6	+	<10.2	ne
Propylene glycol propyl ether	1-Propoxy-2-propanol	1569-01-3	$C_6H_{14}O_2$	1.3	+	1.0	+	1.6	+		ne
Propylene oxide	Methyloxirane	75-56-9 16088-62-3 15448-47-2	C_3H_6O	~240		6.6	+	2.9	+	10.22	20
Propyleneimine	2-Methylaziridine	75-55-8	C_3H_7N	1.5	+	1.3	+	1.0	+	9.0	2
Propyl mercaptan, 2-	2-Propanethiol, Isopropyl mercaptan	75-33-2	C_3H_8S	0.64	+	0.66	+			9.15	ne
Pyridine		110-86-1	C_5H_5N	0.78	+	0.7	+	0.7	+	9.25	5
Pyrrolidine (coats lamp)	Azacyclohexane	123-75-1	C_4H_9N	2.1	+	1.3	+	1.6	+	~8.0	ne
RR7300 (PGME/PGMEA)	70:30 PGME:PGMEA (1-Methoxy-2-propanol:1-Methoxy-2-acetoxypropane)	107-98-2	$C_4H_{10}O_2$ / $C_6H_{12}O_3$			1.4	+	1.0	+		ne
Sarin	GB, Isopropyl methylphosphonofluoridate	107-44-8 50642-23-4	$C_4H_{10}FO_2P$			~3					
Stoddard Solvent - see Mineral Spirits		8020-83-5									
Styrene		100-42-5	C_8H_8	0.45	+	0.40	+	0.4	+	8.43	20
Sulfur dioxide		7446-09-5	SO_2	NR		NR	+	NR	+	12.32	2
Sulfur hexafluoride		2551-62-4	SF_6	NR		NR		NR		15.3	1000
Sulfuryl fluoride	Vikane	2699-79-8	SO_2F_2	NR		NR		NR		13.0	5
Tabun *	Ethyl N, N-dimethylphosphoramidocyanidate	77-81-6	$C_5H_{11}N_2O_2P$			0.8					15ppt
Tetrachloroethane, 1,1,1,2-		630-20-6	$C_2H_2Cl_4$					1.3		~11.1	ne
Tetrachloroethane, 1,1,2,2-		79-34-5	$C_2H_2Cl_4$	NR	+	NR	+	0.60	+	~11.1	1
Tetrachlorosilane		10023-04-7	$SiCl_4$	NR		NR		15	+	11.79	ne
Tetraethyl lead	TEL	78-00-2	$C_8H_{20}Pb$	0.4		0.3		0.2		~11.1	0.008
Tetraethyl orthosilicate	Ethyl silicate, TEOS	78-10-4	$C_8H_{20}O_4Si$			0.7	+	0.2	+	~9.8	10
Tetrafluoroethane, 1,1,1,2-	HFC-134A	811-97-2	$C_2H_2F_4$			NR		NR			ne
Tetrafluoroethene	TFE, Tetrafluoroethylene, Perfluoroethylene	116-14-3	C_2F_4			~15				10.12	ne
Tetrafluoromethane	CFC-14, Carbon tetrafluoride	75-73-0	CF_4			NR	+	NR	+	>15.3	ne
Tetrahydrofuran	THF	109-99-9	C_4H_8O	1.9	+	1.7	+	1.0	+	9.41	200
Tetramethyl orthosilicate	Methyl silicate, TMOS	681-84-5	$C_4H_{12}O_4Si$	10	+	1.9	+			~10	1
Therminol® D-12 *	Hydrotreated heavy naphtha	64742-48-9	m.w. 160	0.8	+	0.51	+	0.33	+		ne
Therminol® VP-1 *	Dowtherm A, 3:1 Diphenyl oxide: Biphenyl	101-84-8 92-52-4	$C_{12}H_{10}O$ $C_{12}H_{10}$			0.4	+				1
Toluene	Methylbenzene	108-88-3	C_7H_8	0.54	+	0.50	+	0.51	+	8.82	50

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Compound Name	Synonym/Abbreviation	CAS No.	Formula	9.8	C	10.6	C	11.7	C	IE (eV)	TWA
Tolylene-2,4-diisocyanate	TDI, 4-Methyl-1,3-phenylene-2,4-diisocyanate	584-84-9	$C_9H_6N_2O_2$	1.4	+	1.4	+	2.0	+		0.002
Trichlorobenzene, 1,2,4-	1,2,4-TCB	120-82-1	$C_6H_3Cl_3$	0.7	+	0.46	+			9.04	C5
Trichloroethane, 1,1,1-	1,1,1-TCA, Methyl chloroform	71-55-6	$C_2H_3Cl_3$			NR	+	1	+	11	350
Trichloroethane, 1,1,2-	1,1,2-TCA	79-00-5	$C_2H_3Cl_3$	NR	+	NR	+	0.9	+	11.0	10
Trichloroethene	TCE, Trichoroethylene	79-01-6	C_2HCl_3	0.62	+	0.54	+	0.43	+	9.47	50
Trichloromethylsilane	Methyltrichlorosilane	75-79-6	CH_3Cl_3Si	NR		NR		1.8	+	11.36	ne
Trichlorotrifluoroethane, 1,1,2-	CFC-113	76-13-1	$C_2Cl_3F_3$			NR		NR		11.99	1000
Triethylamine	TEA	121-44-8	$C_6H_{15}N$	0.95	+	0.9	+	0.65	+	7.3	1
Triethyl borate	TEB; Boric acid triethyl ester	150-46-9	$C_6H_{15}O_3B$			2.2	+	1.1	+	~10	ne
Triethyl phosphate	Ethyl phosphate	78-40-0	$C_6H_{15}O_4P$	~50	+	3.1	+	0.60	+	9.79	ne
Trifluoroethane, 1,1,2-		430-66-0	$C_2H_3F_3$					34		*12.9*	ne
Trimethylamine		75-50-3	C_3H_9N			0.9				7.82	5
Trimethylbenzene, 1,3,5- - see Mesitylene		108-67-8									25
Trimethyl borate	TMB; Boric acid trimethyl ester, Boron methoxide	121-43-7	$C_3H_9O_3B$			5.1	+	1.2	+	10.1	ne
Trimethyl phosphate	Methyl phosphate	512-56-1	$C_3H_9O_4P$			8.0	+	1.3	+	9.99	ne
Trimethyl phosphite	Methyl phosphite	121-45-9	$C_3H_9O_3P$			1.1	+		+	*8.5*	2
Turpentine	Pinenes (85%) + other diisoprenes	8006-64-2	$C_{10}H_{16}$	0.37	+	0.30	+	0.29	+	~8	20
Undecane		1120-21-4	$C_{11}H_{24}$			2				9.56	ne
Varsol – see Mineral Spirits											
Vinyl actetate		108-05-4	$C_4H_6O_2$	1.5	+	1.2	+	1.0	+	9.19	10
Vinyl bromide	Bromoethylene	593-60-2	C_2H_3Br			0.4				9.80	5
Vinyl chloride	Chloroethylene, VCM	75-01-4	C_2H_3Cl			2.0	+	0.6	+	9.99	5
Vinyl-1-cyclohexene, 4-	Butadiene dimer, 4-Ethenylcyclohexene	100-40-3	C_8H_{12}	0.6	+	0.56	+			9.83	0.1
Vinylidene chloride - see 1,1-Dichloroethene											
Vinyl-2-pyrrolidinone, 1-	NVP, N-vinylpyrrolidone, 1-ethenyl-2-pyrrolidinone	88-12-0	C_6H_9NO	1.0	+	0.8	+	0.9	+		ne
Viscor 120B - see Mineral Spirits - Viscor 120B Calibration Fluid											
V. M. & P. Naphtha	Ligroin; Solvent naphtha; Varnish maker's & painter's naptha	64742-89-8	m.w. 111 (C_8-C_9)	1.7	+	0.97	+				300
Xylene, m-	1,3-Dimethylbenzene	108-38-3	C_8H_{10}	0.50	+	0.44	+	0.40	+	8.56	100
Xylene, o-	1,2-Dimethylbenzene	95-47-6	C_8H_{10}	0.56	+	0.46	+	0.43		8.56	100
Xylene, p-	1,4-Dimethylbenzene	106-42-3	C_8H_{10}	0.48	+	0.39	+	0.38	+	8.44	100
None				1		1		1			
Undetectable				1E+6		1E+6		1E+6			

* Compounds indicated in green can be detected using a MiniRAE 2000 or ppbRAE/+ with slow response, but may be lost by adsorption on a MultiRAE or EntryRAE. Response on multi-gas meters can give an indication of relative concentrations, but may not be quantitative and for some chemicals no response is observed.

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Appendix I:
Example of Automatic Calculation of Correction Factors, TLVs and Alarm Limits for Mixtures
(Calculations performed using Excel version of this database, available on request)

Compound	CF 9.8 eV	CF 10.6 eV	CF 11.7eV	Mol. Frac	Conc ppm	TLV ppm	STEL Ppm
Benzene	0.55	0.53	0.6	0.01	1	0.5	2.5
Toluene	0.54	0.5	0.51	0.06	10	50	150
Hexane, n-	300	4.3	0.54	0.06	10	50	150
Heptane, n-	45	2.8	0.6	0.28	50	400	500
Styrene	0.45	0.4	0.42	0.06	10	20	40
Acetone	1.2	1.1	1.4	0.28	50	750	1000
Isopropanol	500	6	2.7	0.28	50	400	500
None	1	1	1	0.00	0	1	
Mixture Value:	2.1	1.5	0.89	1.00	181 ppm	56 ppm	172 ppm
TLV Alarm Setpoint when Calibrated to Isobutylene:	26 ppm	37 ppm	62 ppm				
STEL Alarm Setpoint, same Calibration	86 ppm	115 ppm	193 ppm				

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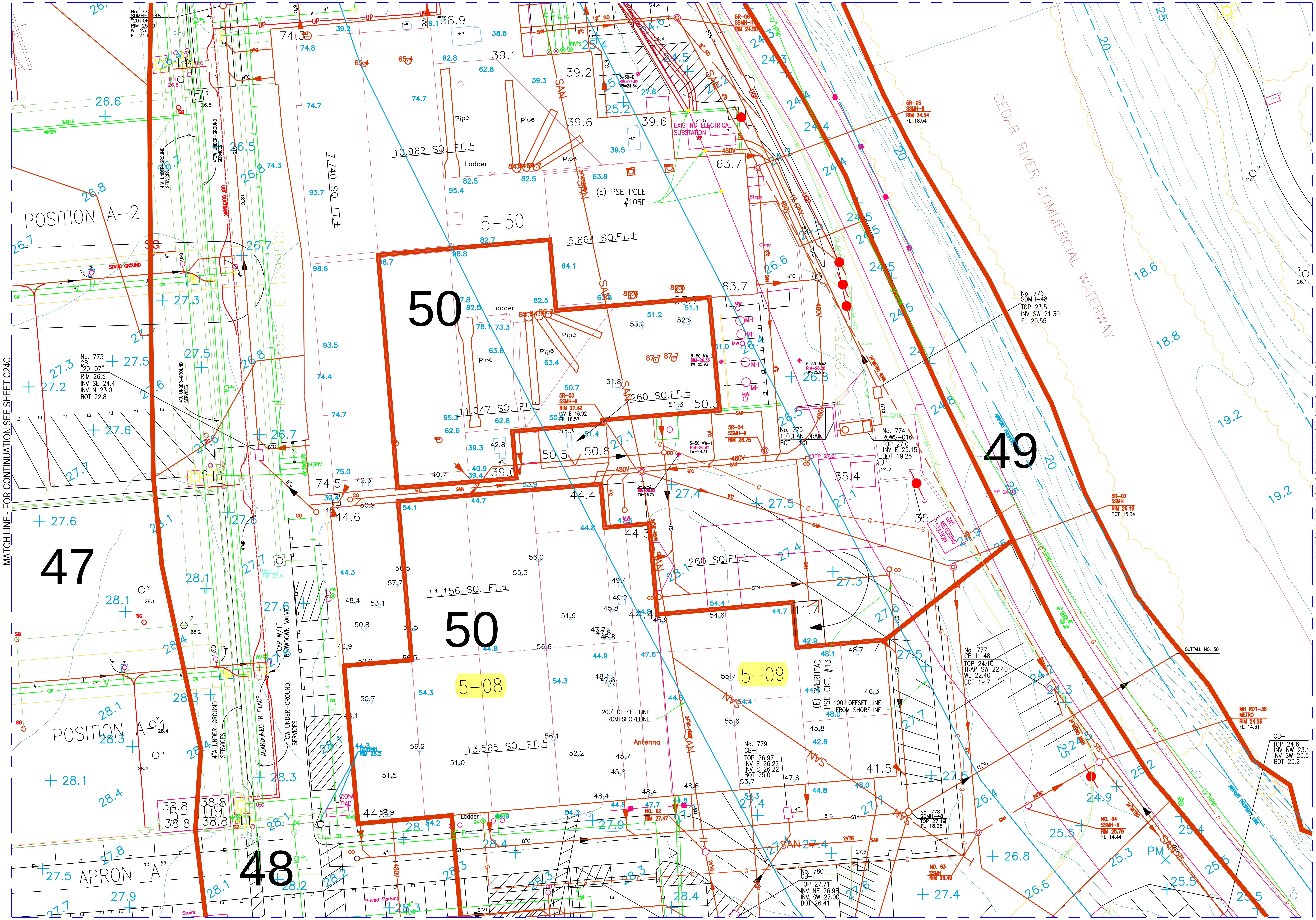
Appendix C Existing Utility Drawings in the Area

MATCH LINE - FOR CONTINUATION SEE SHEET C23D



MATCH LINE - FOR CONTINUATION SEE SHEET C25D

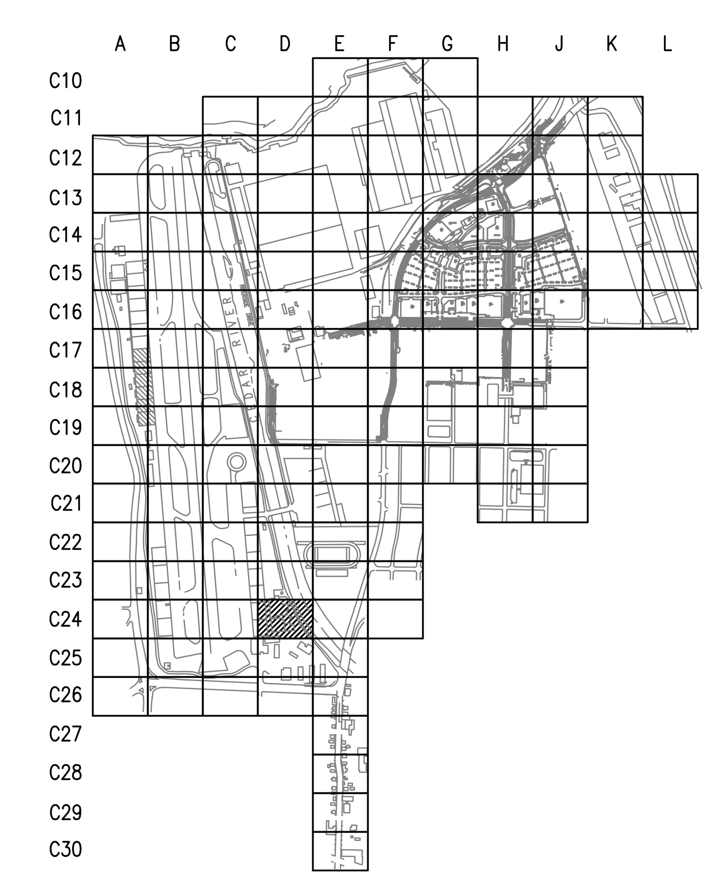
GENERAL NOTES

1. UTILITY TRENCH, SEE DETAIL B / RTN-YD-C25D 05-403-A500

CONSTRUCTION NOTES

KEY PLAN

SCALE : NONE



20' 10' 0 20' 40'

SCALE IN FEET

SYM	REVISION	BY	APPROVED	DATE
A	5-403 APRON A TRAILER ELEC (HGI#98-1353) 328449-001	HGI/SAS		06.26.98
B	UPDATED U/G UTILITY MAPS - DHA, INC	AMG	DAH	10.07.99
C	UPGRADE 20 SCALE SITE PLANS (DHA 09-1637) 9488981	ACC	DAH	04.30.10
-	INCORPORATE SHORELINE OFFSETS	WLS		03.25.15
-	RENTON AS-BUILTS W5365113-34353	KPFF	KPFF	01.15.18

SYM	REVISION	BY	APPROVED	DATE

BOEING

ACCEPTABILITY
THIS DESIGN AND/OR SPECIFICATION IS APPROVED

APPROVED BY | DEPT. | DATE

DRAWN B. RONIA | DATE 01.15.18
CHECKED
ENGINEER
CHECKED
APPROVED
APPROVED

SUBTITLE: PARTIAL SITE PLAN

TITLE: RENTON AS-BUILTS

RENTON SITE

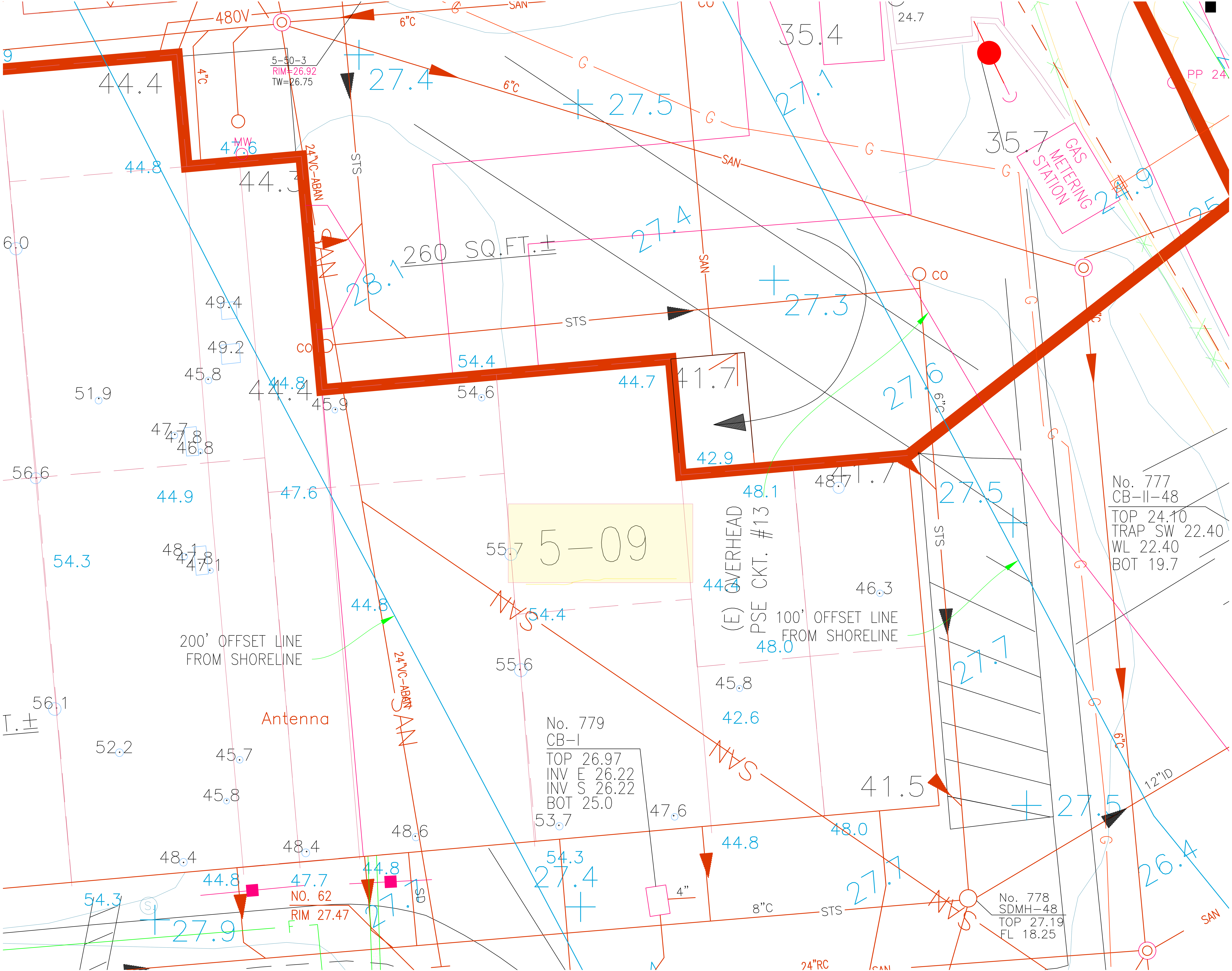
CIVIL MASTER RENTON

CURRENT REVISION W5365113-34353 | SYMBOL C | DATE 01.15.18

SHEET C24D | SEQUENCE NO.

DWG NO. RTN-YD-C24D

U:\DRAFTERS\CADUSERS\AYAZPOUR\RENTON\MASTERS\RENTON_YARDS&PARKING\SITE PLANS\20 SCALE\RTN-YD-C24D -- AYAZPOUR (US), IMAN -- LAST SAVED: April 12, 2018 -- PLOTTED: November 1, 2022



480V
5-50-3
RIM=26.92
TW=26.75
24"VC-ABAN
260 SQ.FT.±
STS
SAN
CO
GAS
METERING
STATION
PP
5-09
(E) OVERHEAD
PSE CKT. #13
100' OFFSET LINE
FROM SHORELINE
200' OFFSET LINE
FROM SHORELINE
Antenna
No. 777
CB-II-48
TOP 24.10
TRAP SW 22.40
WL 22.40
BOT 19.7
No. 779
CB-I
TOP 26.97
INV E 26.22
INV S 26.22
BOT 25.0
NO. 62
RIM 27.47
No. 778
SDMH-48
TOP 27.19
FL 18.25
12"ID
8"C
24"RC

Attachment B: Groundwater Field Data Sheets

Well Sampling Data Sheet

Date	4 / 25 / 23	Site Location	Renton
Samplers	JN	Well ID	GW-031SR
Casing Material	PVC	Constructed Depth	20' - 15' sample
Casing Diameter	2"	Condition of Well	OK

Field Measurements:

Time	0855	Depth Measured From:
Depth to Water	4.34'	

	Top of access port
	Mark on PVC casing
	Mark of protective casing
N side of case	Other

Purging Information: waterra

Pump:	x	Dedicated		Non-dedicated		Peristaltic
Bailer:		PVC		Stainless Steel		Other:
Purge Start Time		0858	Purge End Time			
Approximate Volume Purged		2.5 gal				

Water Monitoring Conditions:

Time	Vol. Purged (gal)	Temperature (°C)	Conductivity (mS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)
0858	0	12.35	0.489	1.60	6.30	94	99.6
0903	0.5	12.63	0.445	3.53	6.35	18	55.9
0908	1.0	12.76	0.437	2.03	6.15	-20	18.1
0913	1.5	12.39	0.436	1.99	6.21	-31	13.3
0918	2.0	12.33	0.435	1.73	6.25	-39	13.7
0923	2.5	12.30	0.436	1.61	6.28	-44	9.8

Sampling Data:

Time	0923	Sample ID	GW-031SR-042523
Vol. Purged (gal)		Duplicates	
Temperature (°C)		QA/QC Volumes	
Conductivity (mS/cm)			
D.O. (mg/L)			
pH			
ORP (mV)			
Turbidity (NTU)			

Sampling Device: waterra

PVC Bailer		SS Bailer		Dedicated Pump	x	Teflon Bailer	

Analyses to be Performed:

Volatile Organics	x	VOCs 8260	SVOCs by 8270C		Sulfate 375.2	x
Total Metals		RCRA 8 or	SVOCs by 8270C/SIM		RSK-175 (methane, ethane, ethene)	
Dissolved Metals		Priority Pollutants	Total Organic Carbon 415.1		Other $NO_3/NO_2/SO_4$	

Sampling Notes:

Clear, no odor or bubbles

Well Diameter	Well Volume (Gal/ft)
1 inch	0.041
2 inch	0.163
4 inch	0.653
6 inch	1.469

Or: (total depth(ft) - DTW(ft)) x Well Dia^2 x 0.0408 = 1 Well Volume

Well Sampling Data Sheet

Date	4/25/23	Site Location	Renton
Samplers	JN	Well ID	GW-244SR
Casing Material	PVC	Constructed Depth	20' - 15' sample
Casing Diameter	2"	Condition of Well	OK

Field Measurements:

Time	0940
Depth to Water	4.14

Depth Measured From:	
	Top of access port
	Mark on PVC casing
	Mark of protective casing
N side of cast	Other

Purging Information: waterra

Pump:	x	Dedicated		Non-dedicated	Peristaltic
Bailer:		PVC		Stainless Steel	Other:
Purge Start Time	0943	Purge End Time			
Approximate Volume Purged		2.5 gal			

Water Monitoring Conditions:

Time	Vol. Purged (gal)	Temperature (°C)	Conductivity (mS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)
0944	0	12.37	0.545	2.50	6.23	-32	301
0951	0.5	12.77	0.529	1.09	6.30	-53	172
0956	1.0	12.80	0.525	0.82	6.32	-59	102
1001	1.5	12.89	0.521	0.56	6.31	-65	66.3
1006	2.0	12.90	0.520	0.43	6.34	-69	63.7
1011	2.5	12.96	0.517	0.35	6.36	-72	49.9

Sampling Data:

Time	1011
Vol. Purged (gal)	
Temperature (°C)	
Conductivity (mS/cm)	
D.O. (mg/L)	
pH	
ORP (mV)	
Turbidity (NTU)	

Sample ID	GW-244SR-042523
Duplicates	
QA/QC Volumes	

Sampling Device: waterra

PVC Bailer		SS Bailer		Dedicated Pump	x	Teflon Bailer	

Analyses to be Performed:

Volatile Organics	x	VOCs 8260	SVOCs by 8270C		Sulfate 375.2	x
Total Metals		RCRA 8 or Priority Pollutants	SVOCs by 8270C/SIM		RSK-175 (methane, ethane, ethene)	
Dissolved Metals			Total Organic Carbon 415.1		Other $NO_3/NO_2/SO_4$	x

Sampling Notes:

clear w/ small brown floatis, No odor, No effervesence

Well Diameter	Well Volume (Gal/ft)
1 inch	0.041
2 inch	0.163
4 inch	0.653
6 inch	1.469

Or:(total depth(ft) - DTW(ft)) x Well Dia^2 x 0.0408 = 1 Well Volume

Well Sampling Data Sheet

Date	4 / 25 / 23	Site Location	Renton
Samplers	JN	Well ID	GW 033S
Casing Material	PVC	Constructed Depth	25' - 15' sample
Casing Diameter	2"	Condition of Well	ok

Field Measurements:

Time	1030
Depth to Water	4.24

Depth Measured From:	
	Top of access port
	Mark on PVC casing
	Mark of protective casing
N side of case	Other

Purging Information: waterra

Pump:	x	Dedicated		Non-dedicated		Peristaltic
Bailer:		PVC		Stainless Steel		Other:

Purge Start Time	1031	Purge End Time	
Approximate Volume Purged	2.0 gal		

Water Monitoring Conditions:

Time	Vol. Purged (gal)	Temperature (°C)	Conductivity (mS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)
1032	0	12.72	0.530	6.90	6.36	-25	10.5
1037	0.5	12.78	0.528	0.19	6.29	-43	7.6
1042	1.0	12.80	0.525	0.22	6.31	-53	4.7
1047	1.5	12.79	0.530	0.19	6.32	-56	4.9
1052	2.0	12.82	0.525	0.14	6.24	-56	4.3

Sampling Data:

Time	1052	Sample ID	GW-033S-042523
Vol. Purged (gal)		Duplicates	
Temperature (°C)		QA/QC Volumes	
Conductivity (mS/cm)			
D.O. (mg/L)			
pH			
ORP (mV)			
Turbidity (NTU)			

Sampling Device: waterra

PVC Bailer		SS Bailer		Dedicated Pump	X	Teflon Bailer	

Analyses to be Performed:

Volatile Organics	X	VOCs 8260	SVOCs by 8270C		Sulfate 375.2	
Total Metals		RCRA 8 or	SVOCs by 8270C/SIM		RSK-175 (methane, ethane, ethene)	
Dissolved Metals		Priority Pollutants	Total Organic Carbon 415.1		Other TPH-G	X

Sampling Notes:

clear, reducing odor, no bubbles

Well Diameter	Well Volume (Gal/ft)
1 inch	0.041
2 inch	0.163
4 inch	0.653
6 inch	1.469

Or: (total depth(ft) - DTW(ft)) x Well Dia^2 x 0.0408 = 1 Well Volume

Well Sampling Data Sheet

Date	4/ 25 / 23	Site Location	Renton
Samplers	JN	Well ID	GW-034S
Casing Material	PVC	Constructed Depth	25' - 15' sample
Casing Diameter	2"	Condition of Well	OK

Field Measurements:

Time	1114
Depth to Water	4.36

Depth Measured From:	
	Top of access port
	Mark on PVC casing
	Mark of protective casing
N side of Case	Other

Purging Information: waterra

Pump:	X	Dedicated		Non-dedicated		Peristaltic
Bailer:		PVC		Stainless Steel		Other:
Purge Start Time		1116	Purge End Time			
Approximate Volume Purged						

Water Monitoring Conditions:

Time	Vol. Purged (gal)	Temperature (°C)	Conductivity (mS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)
1118	0	13.02	0.883	3.25	6.40	-13	78.6
1123	0.5	12.75	0.988	0.97	6.56	-38	111
1128	1.0	12.71	0.955	1.09	6.51	-46	100
1133	1.5	12.65	0.913	0.97	6.49	-48	88.2
1138	2.0	12.62	0.776	0.76	6.46	-55	59.0
1143	2.5	12.59	0.693	0.62	6.46	-60	41.7

Sampling Data:

Time	1148
Vol. Purged (gal)	3.0
Temperature (°C)	12.60
Conductivity (mS/cm)	0.645
D.O. (mg/L)	0.55
pH	6.46
ORP (mV)	-63
Turbidity (NTU)	32.2

Sample ID	GW-034S-042523
Duplicates	
QA/QC Volumes	

Sampling Device: waterra

PVC Bailer		SS Bailer		Dedicated Pump	x	Teflon Bailer	

Analyses to be Performed:

Volatile Organics	X	VOCs 8260	SVOCs by 8270C		Sulfate 375.2	
Total Metals		RCRA 8 or Priority Pollutants	SVOCs by 8270C/SIM		RSK-175 (methane, ethane, ethene)	
Dissolved Metals			Total Organic Carbon 415.1		Other TPHG	x

Sampling Notes:

slight reducing odor

Well Diameter	Well Volume (Gal/ft)
1 inch	0.041
2 inch	0.163
4 inch	0.653
6 inch	1.469

Or:(total depth(ft) - DTW(ft)) x Well Dia^2 x 0.0408 = 1 Well Volume

Well Sampling Data Sheet

Date	4/25/23	Site Location	Renton
Samplers	JN	Well ID	B78-16 ~15' sample
Casing Material	Steel	Constructed Depth	25'
Casing Diameter	~10"	Condition of Well	ok

Field Measurements:

Time	
Depth to Water	

Depth Measured From:	
	Top of access port
	Mark on PVC casing
	Mark of protective casing
N side of case	Other

Purging Information: Waterra

Pump:	X	Dedicated		Non-dedicated		Peristaltic
Bailer:		PVC		Stainless Steel		Other:
Purge Start Time			Purge End Time			
Approximate Volume Purged						

Water Monitoring Conditions:

Time	Vol. Purged (gal)	Temperature (°C)	Conductivity (mS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)
1231	0	14.33	1.48	2.28	6.47	-3	47.9
1236	0.5	13.82	1.50	1.57	6.39	5	39.1
1241	1.0	13.75	1.50	1.45	6.38	6	33.6
1246	1.5	13.60	1.50	0.20	6.37	9	28.0
1251	2.0	13.62	1.49	0.00	6.34	9	23.0

Sampling Data:

Time	1256	Sample ID	B78-16-042523
Vol. Purged (gal)	2.5	Duplicates	DUP01-042523 @0800
Temperature (°C)	13.54	QA/QC Volumes	
Conductivity (mS/cm)	1.48		
D.O. (mg/L)	0.00		
pH	6.34		
ORP (mV)	9		
Turbidity (NTU)	19.5		

Sampling Device:

PVC Bailer		SS Bailer		Dedicated Pump		Teflon Bailer	

Analyses to be Performed:

Volatile Organics	X	VOCs 8260	SVOCs by 8270C		Sulfate 375.2	
Total Metals		RCRA 8 or Priority Pollutants	SVOCs by 8270C/SIM		RSK-175 (methane, ethane, ethene)	
Dissolved Metals			Total Organic Carbon 415.1 H_2SO_4 Pres.	X	Other	

Sampling Notes:

slight reducing odor.

Well Diameter	Well Volume (Gal/ft)
1 inch	0.041
2 inch	0.163
4 inch	0.653
6 inch	1.469

Or:(total depth(ft) - DTW(ft)) x Well Dia^2 x 0.0408 = 1 Well Volume

Well Sampling Data Sheet

Date	4/25/23	Site Location	Renton
Samplers	JN	Well ID	B78-11
Casing Material	PVC	Constructed Depth	10' - 8' Sample
Casing Diameter	2"	Condition of Well	ok

Field Measurements:

Time	1320	Depth Measured From:	
Depth to Water	1.94		Top of access port
			Mark on PVC casing
			Mark of protective casing
		N side of case	Other

Purging Information: waterra

Pump:	x	Dedicated		Non-dedicated		Peristaltic
Bailer:		PVC		Stainless Steel		Other:
Purge Start Time		Purge End Time				
Approximate Volume Purged						

Water Monitoring Conditions:

Time	Vol. Purged (gal)	Temperature (°C)	Conductivity (mS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)
1326	0	15.78	2.18	2.30	6.28	70	67.3
1331	0.25	15.18	1.94	2.13	6.62	45	76.1
1336	0.5	15.17	1.81	1.91	6.74	6	84.8
1341	0.75	15.12	1.79	1.73	6.68	-7	61.2
1346	1.0	14.99	1.81	1.56	6.57	-11	41.0

Sampling Data:

Time	1351	Sample ID	B78-11-042523
Vol. Purged (gal)	1.25	Duplicates	
Temperature (°C)	14.91	QA/QC Volumes	
Conductivity (mS/cm)	1.87		
D.O. (mg/L)	1.41		
pH	6.45		
ORP (mV)	-10		
Turbidity (NTU)	29.3		

Sampling Device:

PVC Bailer		SS Bailer		Dedicated Pump		Teflon Bailer	

Analyses to be Performed:

Volatile Organics	X	VOCs 8260	SVOCs by 8270C		Sulfate 375.2	x
Total Metals		RCRA 8 or	SVOCs by 8270C/SIM		RSK-175 (methane, ethane, ethene)	
Dissolved Metals		Priority Pollutants	Total Organic Carbon 415.1		Other NO_3/NO_2	x

Sampling Notes:

Clear, No odor

Well Diameter	Well Volume (Gal/ft)
1 inch	0.041
2 inch	0.163
4 inch	0.653
6 inch	1.469

Or:(total depth(ft) - DTW(ft)) x Well Dia² x 0.0408 = 1 Well Volume

Well Sampling Data Sheet

Date	10/ 26 / 23	Site Location	Renton Ave 1/2
Samplers	JN	Well ID	GW-185S-R
Casing Material	PVC	Constructed Depth	
Casing Diameter	4"	Condition of Well	ok - New

Field Measurements:

Time	1100	Depth Measured From:	
Depth to Water	4.07		Top of access port
			Mark on PVC casing
			Mark of protective casing
		N side of case	Other

Purging Information:

waterra

Pump:		Dedicated	X	Non-dedicated		Peristaltic	
Bailer:		PVC		Stainless Steel		Other:	
Purge Start Time		1104	Purge End Time				
Approximate Volume Purged							

Water Monitoring Conditions:

Time	Vol. Purged (gal)	Temperature (°C)	Conductivity (mS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)
1105	0	16.28	0.788	1.29	6.58	-117	>999
1110	0.5	17.19	0.762	0.30	6.76	-146	0.0
1115	1.0	17.44	0.761	0.13	6.85	-155	320
1120	1.5	17.57	0.764	0.04	6.88	-158	>999
1125	2.0	17.82	0.767	0.00	6.85	-159	895
1130	2.5	17.85	0.775	0.00	6.84	-162	711

Sampling Data:

Time	1135	Sample ID	GW-185S-R-102623
Vol. Purged (gal)	3.0	Duplicates	
Temperature (°C)	17.88	QA/QC Volumes	
Conductivity (mS/cm)	0.778		
D.O. (mg/L)	0.00		
pH	6.84		
ORP (mV)	-163		
Turbidity (NTU)	670		

Sampling Device:

Waterra

PVC Bailer		SS Bailer		Dedicated Pump	X	Teflon Bailer	

Analyses to be Performed:

Volatile Organics	X	VOCs 8260	SVOCs by 8270C		Sulfate 375.2	
Total Metals		RCRA 8 or	SVOCs by 8270C/SIM		RSK-175 (methane, ethane, ethene)	
Dissolved Metals		Priority Pollutants	Total Organic Carbon 415.1		Other	

Sampling Notes:

Water cloudy brown initially

No odor

Well Diameter	Well Volume (Gal/ft)
1 inch	0.041
2 inch	0.163
4 inch	0.653
6 inch	1.469

Or:(total depth(ft) - DTW(ft)) x Well Dia^2 x 0.0408 = 1 Well Volume

Well Sampling Data Sheet

Date	10/26/23	Site Location	Renton AOC-1/2
Samplers	JN	Well ID	GW-197S-R
Casing Material	PVC	Constructed Depth	
Casing Diameter	4"	Condition of Well	

Field Measurements:

Time	1150	Depth Measured From:	
Depth to Water	4.39		Top of access port
			Mark on PVC casing
			Mark of protective casing
		N side of case	Other

Purging Information:

Pump:		Dedicated	x	Non-dedicated (Waterra)		Peristaltic	
Bailer:		PVC		Stainless Steel		Other:	
Purge Start Time		Purge End Time					
Approximate Volume Purged							

Water Monitoring Conditions:

Time	Vol. Purged (gal)	Temperature (°C)	Conductivity (mS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)
1153	0	16.06	0.543	7.20	7.73	-189	669
1158	0.5	16.56	0.521	0.52	8.70	-231	166
1203	1.0	16.52	0.535	1.79	8.75	-248	787
1208	2.0	16.67	0.546	1.34	8.68	-258	>999
1213	2.5	16.57	0.549	0.0	8.56	-256	>999
1218	3.0	16.50	0.551	0.0	8.50	-256	983

Sampling Data:

Time	1223	Sample ID	GW-197S-R-102623
Vol. Purged (gal)	3.5	Duplicates	Dup01-102623
Temperature (°C)	16.43	QA/QC Volumes	
Conductivity (mS/cm)	0.552		
D.O. (mg/L)	0.0		
pH	8.47		
ORP (mV)	-256		
Turbidity (NTU)	942		

Sampling Device:

PVC Bailer		SS Bailer		Dedicated Pump	x (Waterra)	Teflon Bailer	

Analyses to be Performed:

Volatile Organics	X	VOCs 8260	SVOCs by 8270C		Sulfate 375.2	
Total Metals		RCRA 8 or Priority Pollutants	SVOCs by 8270C/SIM		RSK-175 (methane, ethane, ethene)	
Dissolved Metals			Total Organic Carbon 415.1		Other	

Sampling Notes:

cloudy brown, reducing odor.

Well Diameter	Well Volume (Gal/ft)
1 inch	0.041
2 inch	0.163
4 inch	0.653
6 inch	1.469

Or: (total depth(ft) - DTW(ft)) x Well Dia^2 x 0.0408 = 1 Well Volume

Attachment C: Groundwater Laboratory Data Package

Analytical Resources, LLC
Analytical Chemists and Consultants
Tukwila, WA

02 June 2023

Jennifer Parsons
The Boeing Company
PO Box 3703 MS 2R-96
Seattle, WA 98124

RE: Boeing Renton GW (Boeing Renton Regional GW Building 4-78/79)

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

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

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

Associated Work Order(s)	Associated SDG ID(s)
23D0603	N/A

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

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

Analytical Resources, LLC

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

Kelly Bottem, Client Services Manager

Cert# 100006-012

Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number: 23D0603	Turn-around Requested: Standard	Page: 1 of 1	
ARI Client Company: CALIBRE	Phone: 425-241-8449	Date: 4/25/23	Ice Present? Yes
Client Contact: Tom Mckeon /Justin Neste		No. of Coolers: 1	Cooler Temps: 4,6
Client Project Name: Boeing Renton			
Client Project #:	Samplers: JN		

Analytical Resources, LLC
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)

Sample ID	Date	Time	Matrix	No. Containers	VOCs	Nitrate/ Nitrite	Sulfate	TOC	TPH-G				Notes/Comments
GW-031SR-042523	4/25/23	0923	GW	5	X	X	X						VOCs = TCE cis-1,2-DCE VC Benzene
GW-244SR-042523	↓	1011	↓	5	X	X	X						
GW-033S-042523	↓	1052	↓	5	X				X				
GW-034S-042523	↓	1148	↓	5	X				X				
B78-16-042523	↓	1256	↓	4	X			X					
Dup01-042523	↓	0800	↓	3	X								
B78-11-042523	↓	1351	↓	5	X	X	X						
Trip Blank			Aq	2	X								

Comments/Special Instructions	Relinquished by:	Received by:	Relinquished by:	Received by:
cc Justin.neste@calibresys.com Tom.Mckeon@calibresys.com	(Signature) [signature]	(Signature) [signature]	(Signature)	(Signature)
	Printed Name: Justin Neste	Printed Name: Jacob Shalte	Printed Name:	Printed Name:
	Company: CALIBRE	Company: AR, LLC	Company:	Company:
	Date & Time: 4/25/23 1528	Date & Time: 04/25/23 1528	Date & Time:	Date & Time:

Limits of Liability: *ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.*

Sample Retention Policy: All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.

The Boeing Company	Project: Boeing Renton GW	
PO Box 3703 MS 2R-96	Project Number: Boeing Renton Regional GW Building 4-78/79	**Reported:**
Seattle WA, 98124	Project Manager: Jennifer Parsons	02-Jun-2023 14:21

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
GW-031SR-042523	23D0603-01	Water	25-Apr-2023 09:23	25-Apr-2023 15:28
GW-244SR-042523	23D0603-02	Water	25-Apr-2023 10:11	25-Apr-2023 15:28
GW-033S-042523	23D0603-03	Water	25-Apr-2023 10:52	25-Apr-2023 15:28
GW-034S-042523	23D0603-04	Water	25-Apr-2023 11:48	25-Apr-2023 15:28
B78-16-042523	23D0603-05	Water	25-Apr-2023 12:56	25-Apr-2023 15:28
Dup01-042523	23D0603-06	Water	25-Apr-2023 08:00	25-Apr-2023 15:28
B78-11-042523	23D0603-07	Water	25-Apr-2023 13:51	25-Apr-2023 15:28
Trip Blank	23D0603-08	Water	25-Apr-2023 08:00	25-Apr-2023 15:28

The Boeing Company	Project: Boeing Renton GW	
PO Box 3703 MS 2R-96	Project Number: Boeing Renton Regional GW Building 4-78/79	**Reported:**
Seattle WA, 98124	Project Manager: Jennifer Parsons	02-Jun-2023 14:21

Work Order Case Narrative

Gasoline by NWTPH-g (GC/MS)

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

Initial and continuing calibrations were within method requirements.

Internal standard areas were within limits.

The surrogate percent recoveries were within control limits.

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

The blank spike and blank spike duplicate (BS/LCS and BSD/LCSD) spike recoveries and relative percent difference (RPD) were within control limits.

Volatiles - EPA Method SW8260D

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

Initial and continuing calibrations were within method requirements.

Internal standard areas were within limits.

The surrogate percent recoveries were within control limits.

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

The blank spike and blank spike duplicate (BS/LCS and BSD/LCSD) spike recoveries and relative percent difference (RPD) were within control limits.

Wet Chemistry

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

Initial and continuing calibrations were within method requirements.

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

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

Analytical Resources, LLC
Analytical Chemists and Consultants

Printed: 4/26/2023 11:27:25AM

WORK ORDER

23D0603

Samples will be discarded 90 days after submission of a final report unless other instructions are received

Client: The Boeing Company **Project Manager:** Kelly Bottem

Project: Boeing Renton Regional GW Building 4-78/79 **Project Number:** Boeing Renton Regional GW Building 4-78/79

Preservation Confirmation

Container ID	Container Type	pH	
23D0603-01 A	HDPE NM, 500 mL		
23D0603-01 B	HDPE NM, 500 mL		
23D0603-01 C	VOA Vial, Clear, 40 mL, HCL		
23D0603-01 D	VOA Vial, Clear, 40 mL, HCL		
23D0603-01 E	VOA Vial, Clear, 40 mL, HCL		
23D0603-02 A	HDPE NM, 500 mL		
23D0603-02 B	HDPE NM, 500 mL		
23D0603-02 C	VOA Vial, Clear, 40 mL, HCL		
23D0603-02 D	VOA Vial, Clear, 40 mL, HCL		
23D0603-02 E	VOA Vial, Clear, 40 mL, HCL		
23D0603-03 A	VOA Vial, Clear, 40 mL, HCL		
23D0603-03 B	VOA Vial, Clear, 40 mL, HCL		
23D0603-03 C	VOA Vial, Clear, 40 mL, HCL		
23D0603-03 D	VOA Vial, Clear, 40 mL, HCL		
23D0603-03 E	VOA Vial, Clear, 40 mL, HCL		
23D0603-04 A	VOA Vial, Clear, 40 mL, HCL		
23D0603-04 B	VOA Vial, Clear, 40 mL, HCL		
23D0603-04 C	VOA Vial, Clear, 40 mL, HCL		
23D0603-04 D	VOA Vial, Clear, 40 mL, HCL		
23D0603-04 E	VOA Vial, Clear, 40 mL, HCL		
23D0603-05 A	Glass NM, Amber, 250 mL, 9N H2SO4	<2	pass
23D0603-05 B	VOA Vial, Clear, 40 mL, HCL		
23D0603-05 C	VOA Vial, Clear, 40 mL, HCL		
23D0603-05 D	VOA Vial, Clear, 40 mL, HCL		
23D0603-06 A	VOA Vial, Clear, 40 mL, HCL		
23D0603-06 B	VOA Vial, Clear, 40 mL, HCL		
23D0603-06 C	VOA Vial, Clear, 40 mL, HCL		
23D0603-07 A	HDPE NM, 500 mL		
23D0603-07 B	HDPE NM, 500 mL		
23D0603-07 C	VOA Vial, Clear, 40 mL, HCL		
23D0603-07 D	VOA Vial, Clear, 40 mL, HCL		
23D0603-07 E	VOA Vial, Clear, 40 mL, HCL		
23D0603-08 A	VOA Vial, Clear, 40 mL, HCL		
23D0603-08 B	VOA Vial, Clear, 40 mL, HCL		

Reviewed By Date

Analytical Resources, LLC
Analytical Chemists and Consultants

Printed: 4/26/2023 11:27:25AM

WORK ORDER

23D0603

Samples will be discarded 90 days after submission of a final report unless other instructions are received

Client: The Boeing Company	**Project Manager: Kelly Bottem**
Project: Boeing Renton Regional GW Building 4-78/79	**Project Number: Boeing Renton Regional GW Building 4-78/79**

PIB
Preservation Confirmed By

4/26/23
Date

Reviewed By

Date

Analytical Resources, LLC
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: Calibre

Project Name: Boeing Renton

COC No(s): NA

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

Assigned ARI Job No: 23D0603

Tracking No: NA

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of the cooler?	YES	NO
Were custody papers included with the cooler?	YES	NO
Were custody papers properly filled out (ink, signed, etc.)	YES	NO

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

Time 1528 4.6

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

Temp Gun ID#: JQC9708

Cooler Accepted by: JB Date: 04/25/23 Time: 1528

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler?		YES	NO
What kind of packing material was used? ... Bubble Wrap Wet Ice Gel Packs Baggies Foam Block Paper Other:			
Was sufficient ice used (if appropriate)?	NA	YES	NO
How were bottles sealed in plastic bags?	Individually	Grouped	Not
Did all bottles arrive in good condition (unbroken)?		YES	NO
Were all bottle labels complete and legible?		YES	NO
Did the number of containers listed on COC match with the number of containers received?		YES	NO
Did all bottle labels and tags agree with custody papers?		YES	NO
Were all bottles used correct for the requested analyses?		YES	NO
Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs) ...	NA	YES	NO
Were all VOC vials free of air bubbles?	NA	YES	NO
Was sufficient amount of sample sent in each bottle?		YES	NO
Date VOC Trip Blank was made at ARI	NA	4/24/23.	

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

Samples Logged by: PIB Date: 4/26/23 Time: 11:17 Labels checked by: RLR

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

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

Additional Notes, Discrepancies, & Resolutions:

By: Date:

Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

The Boeing Company	Project: Boeing Renton GW	
PO Box 3703 MS 2R-96	Project Number: Boeing Renton Regional GW Building 4-78/79	**Reported:**
Seattle WA, 98124	Project Manager: Jennifer Parsons	02-Jun-2023 14:21

GW-031SR-042523
23D0603-01 (Water)

Volatile Organic Compounds

Method: EPA 8260D — Sampled: 04/25/2023 09:23
Instrument: NT2 Analyst: LH — Analyzed: 04/27/2023 10:40

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap) — Extract ID: 23D0603-01 C
Preparation Batch: BLD0759 — Sample Size: 10 mL
Prepared: 04/27/2023 — Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.20	0.40	ug/L	
cis-1,2-Dichloroethene	156-59-2	1	0.20	0.20	ug/L	
Benzene	71-43-2	1	0.20	ND	ug/L	U
Trichloroethene	79-01-6	1	0.20	ND	ug/L	U
Surrogate: 1,2-Dichloroethane-d4			*80-129 %*	*109*	*%*	
Surrogate: Toluene-d8			*80-120 %*	*101*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*92.7*	*%*	

The Boeing Company	Project: Boeing Renton GW	
PO Box 3703 MS 2R-96	Project Number: Boeing Renton Regional GW Building 4-78/79	**Reported:**
Seattle WA, 98124	Project Manager: Jennifer Parsons	02-Jun-2023 14:21

GW-031SR-042523

23D0603-01 (Water)

Wet Chemistry

Method: EPA 300.0 — Sampled: 04/25/2023 09:23

Instrument: IC930 Analyst: BF — Analyzed: 04/26/2023 17:57

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: No Prep Wet Chem — Extract ID: 23D0603-01 A

Preparation Batch: BLD0749 — Sample Size: 10 mL

Prepared: 04/26/2023 — Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Nitrate-N	14797-55-8	1	0.100	0.100	ND	mg/L	U
Nitrite-N	14797-65-0	1	0.100	0.100	ND	mg/L	U
Sulfate	14808-79-8	1	0.100	0.100	ND	mg/L	U

The Boeing Company	Project: Boeing Renton GW	
PO Box 3703 MS 2R-96	Project Number: Boeing Renton Regional GW Building 4-78/79	**Reported:**
Seattle WA, 98124	Project Manager: Jennifer Parsons	02-Jun-2023 14:21

GW-244SR-042523

23D0603-02 (Water)

Volatile Organic Compounds

Method: EPA 8260D — Sampled: 04/25/2023 10:11

Instrument: NT2 Analyst: LH — Analyzed: 04/27/2023 11:42

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap) — Extract ID: 23D0603-02 E

Preparation Batch: BLD0759 — Sample Size: 10 mL

Prepared: 04/27/2023 — Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.20	0.63	ug/L	
cis-1,2-Dichloroethene	156-59-2	1	0.20	0.28	ug/L	
Benzene	71-43-2	1	0.20	ND	ug/L	U
Trichloroethene	79-01-6	1	0.20	ND	ug/L	U
Surrogate: 1,2-Dichloroethane-d4			*80-129 %*	*112*	*%*	
Surrogate: Toluene-d8			*80-120 %*	*101*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*92.0*	*%*	

Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

The Boeing Company	Project: Boeing Renton GW	
PO Box 3703 MS 2R-96	Project Number: Boeing Renton Regional GW Building 4-78/79	**Reported:**
Seattle WA, 98124	Project Manager: Jennifer Parsons	02-Jun-2023 14:21

GW-244SR-042523

23D0603-02 (Water)

Wet Chemistry

Method: EPA 300.0 — Sampled: 04/25/2023 10:11

Instrument: IC930 Analyst: BF — Analyzed: 04/26/2023 18:57

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: No Prep Wet Chem — Extract ID: 23D0603-02 A

Preparation Batch: BLD0749 — Sample Size: 10 mL

Prepared: 04/26/2023 — Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Nitrate-N	14797-55-8	1	0.100	0.100	ND	mg/L	U

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Nitrite-N	14797-65-0	1	0.100	0.100	ND	mg/L	U

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	1	0.100	0.100	0.250	mg/L	

The Boeing Company	Project: Boeing Renton GW	
PO Box 3703 MS 2R-96	Project Number: Boeing Renton Regional GW Building 4-78/79	**Reported:**
Seattle WA, 98124	Project Manager: Jennifer Parsons	02-Jun-2023 14:21

GW-033S-042523

23D0603-03 (Water)

Volatile Organic Compounds

Method: EPA 8260D — Sampled: 04/25/2023 10:52

Instrument: NT2 Analyst: LH — Analyzed: 04/27/2023 12:23

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap) — Extract ID: 23D0603-03 E

Preparation Batch: BLD0759 — Sample Size: 10 mL

Prepared: 04/27/2023 — Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.20	1.88	ug/L	
cis-1,2-Dichloroethene	156-59-2	1	0.20	0.42	ug/L	
Benzene	71-43-2	1	0.20	10.4	ug/L	
Trichloroethene	79-01-6	1	0.20	ND	ug/L	U
Surrogate: 1,2-Dichloroethane-d4			*80-129 %*	*111*	*%*	
Surrogate: Toluene-d8			*80-120 %*	*99.9*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*91.6*	*%*	

The Boeing Company	Project: Boeing Renton GW	
PO Box 3703 MS 2R-96	Project Number: Boeing Renton Regional GW Building 4-78/79	**Reported:**
Seattle WA, 98124	Project Manager: Jennifer Parsons	02-Jun-2023 14:21

GW-033S-042523

23D0603-03 (Water)

Volatile Organic Compounds

Method: NWTPHg — Sampled: 04/25/2023 10:52

Instrument: NT2 Analyst: LH — Analyzed: 04/27/2023 12:23

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap) — Extract ID: 23D0603-03 E

Preparation Batch: BLD0759 — Sample Size: 10 mL

Prepared: 04/27/2023 — Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	1	100	320	ug/L	
HC ID: GAS						
Surrogate: Toluene-d8			*80-120 %*	*99.9*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*91.6*	*%*	

The Boeing Company	Project: Boeing Renton GW	
PO Box 3703 MS 2R-96	Project Number: Boeing Renton Regional GW Building 4-78/79	**Reported:**
Seattle WA, 98124	Project Manager: Jennifer Parsons	02-Jun-2023 14:21

GW-034S-042523

23D0603-04 (Water)

Volatile Organic Compounds

Method: EPA 8260D — Sampled: 04/25/2023 11:48

Instrument: NT2 Analyst: LH — Analyzed: 04/27/2023 12:44

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap) — Extract ID: 23D0603-04 C

Preparation Batch: BLD0759 — Sample Size: 10 mL

Prepared: 04/27/2023 — Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.20	0.36	ug/L	
cis-1,2-Dichloroethene	156-59-2	1	0.20	ND	ug/L	U
Benzene	71-43-2	1	0.20	ND	ug/L	U
Trichloroethene	79-01-6	1	0.20	ND	ug/L	U
Surrogate: 1,2-Dichloroethane-d4			*80-129 %*	*111*	*%*	
Surrogate: Toluene-d8			*80-120 %*	*102*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*91.2*	*%*	

The Boeing Company	Project: Boeing Renton GW	
PO Box 3703 MS 2R-96	Project Number: Boeing Renton Regional GW Building 4-78/79	**Reported:**
Seattle WA, 98124	Project Manager: Jennifer Parsons	02-Jun-2023 14:21

GW-034S-042523

23D0603-04 (Water)

Volatile Organic Compounds

Method: NWTPHg — Sampled: 04/25/2023 11:48

Instrument: NT2 Analyst: LH — Analyzed: 04/27/2023 12:44

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap) — Extract ID: 23D0603-04 C

Preparation Batch: BLD0759 — Sample Size: 10 mL

Prepared: 04/27/2023 — Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	1	100	ND	ug/L	U
Surrogate: Toluene-d8			*80-120 %*	*102*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*91.2*	*%*	

The Boeing Company	Project: Boeing Renton GW	
PO Box 3703 MS 2R-96	Project Number: Boeing Renton Regional GW Building 4-78/79	**Reported:**
Seattle WA, 98124	Project Manager: Jennifer Parsons	02-Jun-2023 14:21

B78-16-042523

23D0603-05 (Water)

Volatile Organic Compounds

Method: EPA 8260D — Sampled: 04/25/2023 12:56

Instrument: NT2 Analyst: LH — Analyzed: 04/27/2023 17:02

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap) — Extract ID: 23D0603-05 C

Preparation Batch: BLD0759 — Sample Size: 10 mL

Prepared: 04/27/2023 — Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.20	71.4	ug/L	
cis-1,2-Dichloroethene	156-59-2	1	0.20	34.3	ug/L	
Benzene	71-43-2	1	0.20	1.89	ug/L	
Trichloroethene	79-01-6	1	0.20	2.06	ug/L	
Surrogate: 1,2-Dichloroethane-d4			*80-129 %*	*113*	*%*	
Surrogate: Toluene-d8			*80-120 %*	*98.8*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*91.7*	*%*	

Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

The Boeing Company	Project: Boeing Renton GW	
PO Box 3703 MS 2R-96	Project Number: Boeing Renton Regional GW Building 4-78/79	**Reported:**
Seattle WA, 98124	Project Manager: Jennifer Parsons	02-Jun-2023 14:21

B78-16-042523

23D0603-05 (Water)

Wet Chemistry

Method: SM 5310 B-00 — Sampled: 04/25/2023 12:56

Instrument: TOC-LCSH Analyst: RMS — Analyzed: 05/17/2023 00:15

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: No Prep Wet Chem — Extract ID: 23D0603-05 A

Preparation Batch: BLE0460 — Sample Size: 20 mL

Prepared: 05/16/2023 — Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.50	0.50	4.23	mg/L	

The Boeing Company	Project: Boeing Renton GW	
PO Box 3703 MS 2R-96	Project Number: Boeing Renton Regional GW Building 4-78/79	**Reported:**
Seattle WA, 98124	Project Manager: Jennifer Parsons	02-Jun-2023 14:21

Dup01-042523

23D0603-06 (Water)

Volatile Organic Compounds

Method: EPA 8260D — Sampled: 04/25/2023 08:00

Instrument: NT2 Analyst: LH — Analyzed: 04/27/2023 13:29

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap) — Extract ID: 23D0603-06 A

Preparation Batch: BLD0759 — Sample Size: 10 mL

Prepared: 04/27/2023 — Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.20	64.0	ug/L	
cis-1,2-Dichloroethene	156-59-2	1	0.20	31.7	ug/L	
Benzene	71-43-2	1	0.20	1.83	ug/L	
Trichloroethene	79-01-6	1	0.20	2.18	ug/L	
Surrogate: 1,2-Dichloroethane-d4			*80-129 %*	*114*	*%*	
Surrogate: Toluene-d8			*80-120 %*	*99.4*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*90.6*	*%*	

The Boeing Company	Project: Boeing Renton GW	
PO Box 3703 MS 2R-96	Project Number: Boeing Renton Regional GW Building 4-78/79	**Reported:**
Seattle WA, 98124	Project Manager: Jennifer Parsons	02-Jun-2023 14:21

B78-11-042523

23D0603-07 (Water)

Volatile Organic Compounds

Method: EPA 8260D — Sampled: 04/25/2023 13:51

Instrument: NT2 Analyst: LH — Analyzed: 04/27/2023 13:50

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap) — Extract ID: 23D0603-07 C

Preparation Batch: BLD0759 — Sample Size: 10 mL

Prepared: 04/27/2023 — Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.20	2.89	ug/L	
cis-1,2-Dichloroethene	156-59-2	1	0.20	9.38	ug/L	
Benzene	71-43-2	1	0.20	0.31	ug/L	
Trichloroethene	79-01-6	1	0.20	58.0	ug/L	
Surrogate: 1,2-Dichloroethane-d4			*80-129 %*	*109*	*%*	
Surrogate: Toluene-d8			*80-120 %*	*96.5*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*89.1*	*%*	

The Boeing Company	Project: Boeing Renton GW	
PO Box 3703 MS 2R-96	Project Number: Boeing Renton Regional GW Building 4-78/79	**Reported:**
Seattle WA, 98124	Project Manager: Jennifer Parsons	02-Jun-2023 14:21

B78-11-042523

23D0603-07 (Water)

Wet Chemistry

Method: EPA 300.0 — Sampled: 04/25/2023 13:51

Instrument: IC930 Analyst: BF — Analyzed: 04/26/2023 19:17

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: No Prep Wet Chem — Extract ID: 23D0603-07 A

Preparation Batch: BLD0749 — Sample Size: 10 mL

Prepared: 04/26/2023 — Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Nitrate-N	14797-55-8	1	0.100	0.100	ND	mg/L	U

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Nitrite-N	14797-65-0	1	0.100	0.100	ND	mg/L	U

The Boeing Company	Project: Boeing Renton GW	
PO Box 3703 MS 2R-96	Project Number: Boeing Renton Regional GW Building 4-78/79	**Reported:**
Seattle WA, 98124	Project Manager: Jennifer Parsons	02-Jun-2023 14:21

B78-11-042523

23D0603-07RE1 (Water)

Wet Chemistry

Method: EPA 300.0 — Sampled: 04/25/2023 13:51

Instrument: IC930 Analyst: BF — Analyzed: 04/26/2023 21:36

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: No Prep Wet Chem — Extract ID: 23D0603-07RE1 A

Preparation Batch: BLD0749 — Sample Size: 10 mL

Prepared: 04/26/2023 — Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	100	10.0	10.0	38.0	mg/L	D

Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

The Boeing Company	Project: Boeing Renton GW	
PO Box 3703 MS 2R-96	Project Number: Boeing Renton Regional GW Building 4-78/79	**Reported:**
Seattle WA, 98124	Project Manager: Jennifer Parsons	02-Jun-2023 14:21

Trip Blank

23D0603-08 (Water)

Volatile Organic Compounds

Method: EPA 8260D — Sampled: 04/25/2023 08:00

Instrument: NT2 Analyst: LH — Analyzed: 04/27/2023 10:20

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap) — Extract ID: 23D0603-08 A

Preparation Batch: BLD0759 — Sample Size: 10 mL

Prepared: 04/27/2023 — Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.20	ND	ug/L	U
cis-1,2-Dichloroethene	156-59-2	1	0.20	ND	ug/L	U
Benzene	71-43-2	1	0.20	ND	ug/L	U
Trichloroethene	79-01-6	1	0.20	ND	ug/L	U
Surrogate: 1,2-Dichloroethane-d4			*80-129 %*	*109*	*%*	
Surrogate: Toluene-d8			*80-120 %*	*103*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*92.9*	*%*	

Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

The Boeing Company	Project: Boeing Renton GW	
PO Box 3703 MS 2R-96	Project Number: Boeing Renton Regional GW Building 4-78/79	**Reported:**
Seattle WA, 98124	Project Manager: Jennifer Parsons	02-Jun-2023 14:21

Analysis by: Analytical Resources, LLC

Volatile Organic Compounds - Quality Control

Batch BLD0759 - NWTPHg

Instrument: NT2 Analyst: LH

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BLD0759-BLK1)				Prepared: 27-Apr-2023	Analyzed: 27-Apr-2023 08:55					
Gasoline Range Organics (Tol-Nap)	ND	100	ug/L							U
Surrogate: Toluene-d8	5.02		ug/L	*5.00*		*100*	*80-120*			
Surrogate: 4-Bromofluorobenzene	4.68		ug/L	*5.00*		*93.7*	*80-120*			
Blank (BLD0759-BLK2)				Prepared: 27-Apr-2023	Analyzed: 27-Apr-2023 08:55					
Vinyl Chloride	ND	0.20	ug/L							U
cis-1,2-Dichloroethene	ND	0.20	ug/L							U
Benzene	ND	0.20	ug/L							U
Trichloroethene	ND	0.20	ug/L							U
Surrogate: 1,2-Dichloroethane-d4	5.41		ug/L	*5.00*		*108*	*80-129*			
Surrogate: Toluene-d8	5.02		ug/L	*5.00*		*100*	*80-120*			
Surrogate: 4-Bromofluorobenzene	4.68		ug/L	*5.00*		*93.7*	*80-120*			
LCS (BLD0759-BS1)				Prepared: 27-Apr-2023	Analyzed: 27-Apr-2023 07:13					
Gasoline Range Organics (Tol-Nap)	999	100	ug/L	1000		99.9	72-128			
Surrogate: Toluene-d8	5.23		ug/L	*5.00*		*105*	*80-120*			
Surrogate: 4-Bromofluorobenzene	4.86		ug/L	*5.00*		*97.3*	*80-120*			
LCS (BLD0759-BS2)				Prepared: 27-Apr-2023	Analyzed: 27-Apr-2023 07:33					
Vinyl Chloride	11.3	0.20	ug/L	10.0		113	66-133			
cis-1,2-Dichloroethene	10.2	0.20	ug/L	10.0		102	80-121			
Benzene	10.6	0.20	ug/L	10.0		106	80-120			
Trichloroethene	9.66	0.20	ug/L	10.0		96.6	80-120			
Surrogate: 1,2-Dichloroethane-d4	5.21		ug/L	*5.00*		*104*	*80-129*			
Surrogate: Toluene-d8	5.19		ug/L	*5.00*		*104*	*80-120*			
Surrogate: 4-Bromofluorobenzene	4.77		ug/L	*5.00*		*95.5*	*80-120*			
LCS Dup (BLD0759-BSD1)				Prepared: 27-Apr-2023	Analyzed: 27-Apr-2023 07:54					
Gasoline Range Organics (Tol-Nap)	983	100	ug/L	1000		98.3	72-128	1.62	30	
Surrogate: Toluene-d8	5.25		ug/L	*5.00*		*105*	*80-120*			
Surrogate: 4-Bromofluorobenzene	4.81		ug/L	*5.00*		*96.2*	*80-120*			
LCS Dup (BLD0759-BSD2)				Prepared: 27-Apr-2023	Analyzed: 27-Apr-2023 08:14					
Vinyl Chloride	11.2	0.20	ug/L	10.0		112	66-133	0.61	30	

The Boeing Company	Project: Boeing Renton GW	
PO Box 3703 MS 2R-96	Project Number: Boeing Renton Regional GW Building 4-78/79	**Reported:**
Seattle WA, 98124	Project Manager: Jennifer Parsons	02-Jun-2023 14:21

Analysis by: Analytical Resources, LLC

Volatile Organic Compounds - Quality Control

Batch BLD0759 - EPA 8260D

Instrument: NT2 Analyst: LH

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS Dup (BLD0759-BSD2)				Prepared: 27-Apr-2023	Analyzed: 27-Apr-2023 08:14					
cis-1,2-Dichloroethene	10.1	0.20	ug/L	10.0		101	80-121	1.39	30	
Benzene	10.3	0.20	ug/L	10.0		103	80-120	2.40	30	
Trichloroethene	9.53	0.20	ug/L	10.0		95.3	80-120	1.37	30	
Surrogate: 1,2-Dichloroethane-d4	5.17		ug/L	*5.00*		*103*	*80-129*			
Surrogate: Toluene-d8	5.16		ug/L	*5.00*		*103*	*80-120*			
Surrogate: 4-Bromofluorobenzene	4.84		ug/L	*5.00*		*96.7*	*80-120*			

The Boeing Company	Project: Boeing Renton GW	
PO Box 3703 MS 2R-96	Project Number: Boeing Renton Regional GW Building 4-78/79	**Reported:**
Seattle WA, 98124	Project Manager: Jennifer Parsons	02-Jun-2023 14:21

Analysis by: Analytical Resources, LLC

Wet Chemistry - Quality Control

Batch BLD0749 - EPA 300.0

Instrument: IC930 Analyst: BF

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BLD0749-BLK1)				Prepared: 26-Apr-2023 Analyzed: 26-Apr-2023 17:17							
Nitrate-N	ND	0.100	0.100	mg/L							U
Nitrite-N	ND	0.100	0.100	mg/L							U
Sulfate	ND	0.100	0.100	mg/L							U
LCS (BLD0749-BS1)				Prepared: 26-Apr-2023 Analyzed: 26-Apr-2023 17:37							
Nitrate-N	5.11	0.100	0.100	mg/L	5.00		102	90-110			
Nitrite-N	5.17	0.100	0.100	mg/L	5.00		103	90-110			
Sulfate	5.18	0.100	0.100	mg/L	5.00		104	90-110			
Duplicate (BLD0749-DUP1)	**Source: 23D0603-01**			Prepared: 26-Apr-2023 Analyzed: 26-Apr-2023 18:17							
Nitrate-N	ND	0.100	0.100	mg/L		ND					U
Nitrite-N	ND	0.100	0.100	mg/L		ND					U
Sulfate	ND	0.100	0.100	mg/L		ND					U
Matrix Spike (BLD0749-MS1)	**Source: 23D0603-01**			Prepared: 26-Apr-2023 Analyzed: 26-Apr-2023 18:37							
Nitrate-N	1.80	0.100	0.100	mg/L	1.98	ND	90.7	75-125			
Nitrite-N	1.88	0.100	0.100	mg/L	2.03	ND	92.6	75-125			
Sulfate	1.67	0.100	0.100	mg/L	2.01	ND	82.8	75-125			

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

Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

The Boeing Company	Project: Boeing Renton GW	
PO Box 3703 MS 2R-96	Project Number: Boeing Renton Regional GW Building 4-78/79	**Reported:**
Seattle WA, 98124	Project Manager: Jennifer Parsons	02-Jun-2023 14:21

Analysis by: Analytical Resources, LLC

Wet Chemistry - Quality Control

Batch BLE0460 - SM 5310 B-00

Instrument: TOC-LCSH Analyst: RMS

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BLE0460-BLK1)					Prepared: 16-May-2023 Analyzed: 16-May-2023 18:32						
Total Organic Carbon	ND	0.50	0.50	mg/L							U
LCS (BLE0460-BS1)					Prepared: 16-May-2023 Analyzed: 16-May-2023 18:53						
Total Organic Carbon	21.18	0.50	0.50	mg/L	20.00		106	90-110			

Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

The Boeing Company	Project: Boeing Renton GW	
PO Box 3703 MS 2R-96	Project Number: Boeing Renton Regional GW Building 4-78/79	**Reported:**
Seattle WA, 98124	Project Manager: Jennifer Parsons	02-Jun-2023 14:21

Certified Analyses included in this Report

Analyte	Certifications
EPA 300.0 in Water	
Nitrate-N	DoD-ELAP,WADOE,WA-DW,NELAP
Nitrite-N	DoD-ELAP,WADOE,WA-DW,NELAP
Sulfate	DoD-ELAP,WADOE,WA-DW,NELAP
EPA 8260D in Water	
Vinyl Chloride	DoD-ELAP,ADEC,NELAP,WADOE
cis-1,2-Dichloroethene	DoD-ELAP,ADEC,NELAP,WADOE
Benzene	DoD-ELAP,ADEC,NELAP,WADOE
Trichloroethene	DoD-ELAP,ADEC,NELAP,WADOE
NWTPHg in Water	
Gasoline Range Organics (Tol-N	WADOE,DoD-ELAP
SM 5310 B-00 in Water	
Total Organic Carbon	WA-DW,WADOE,NELAP

Code	Description	Number	Expires
ADEC	Alaska Dept of Environmental Conservation	17-015	03/28/2025
DoD-ELAP	DoD-Environmental Laboratory Accreditation Program, PJLA Testing	66169	02/28/2025
NELAP	ORELAP - Oregon Laboratory Accreditation Program	WA100006-012	05/12/2023
WADOE	WA Dept of Ecology	C558	06/30/2023
WA-DW	Ecology - Drinking Water	C558	06/30/2023

The Boeing Company	Project: Boeing Renton GW	
PO Box 3703 MS 2R-96	Project Number: Boeing Renton Regional GW Building 4-78/79	**Reported:**
Seattle WA, 98124	Project Manager: Jennifer Parsons	02-Jun-2023 14:21

Notes and Definitions

*	Flagged value is not within established control limits.
D	The reported value is from a dilution
E	The analyte concentration exceeds the upper limit of the calibration range of the instrument established by the initial calibration (ICAL)
Q	Indicates a detected analyte with an initial or continuing calibration that does not meet established acceptance criteria (<20% RSD, <20% drift or minimum RRF)
U	This analyte is not detected above the reporting limit (RL) or if noted, not detected above the limit of detection (LOD).
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
[2C]	Indicates this result was quantified on the second column on a dual column analysis.

Analytical Resources, LLC
Analytical Chemists and Consultants
Tukwila, WA

30 October 2023

Tom McKeon
CALIBRE
-
-, - -

RE: Boeing Renton

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

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

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

Associated Work Order(s)	Associated SDG ID(s)
23J0709	N/A

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

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

Analytical Resources, LLC

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

Kelly Bottem

Kelly Bottem, Client Services Manager

Cert# 100006-012

4611 S. 134th Place, Suite 100 • Tukwila, WA 98168 • Ph: **(206) 695-6200** • Fax: **(206) 695-6202**

Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number: 23-50709	Turn-around Requested: 7-Day	Page: 1	of 1
ARI Client Company: CALIBRE	Phone: 425-241-8449	Date: 10/26/23	Ice Present? Y
Client Contact: Justin Neste / Tom McKeon		No. of Coolers: 1	Cooler Temps: 4.2°C
Client Project Name: Renton AOC-001/002			
Client Project #:	Samplers: J Neste		

Analytical Resources, LLC
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)

Sample ID	Date	Time	Matrix	No. Containers	VOCs								Notes/Comments
GW-185S-R-102623	10/26/23	1135	GW	3	X								
GW-197S-R-102623	10/26/23	1223	GW	3	X								
Dup01-102623	10/26/23	0800	GW	3	X								
Trip Blank					X								

Analysis Requested

Comments/Special Instructions	Relinquished by:	Received by:	Relinquished by:	Received by:
	(Signature)	(Signature)	(Signature)	(Signature)
	Printed Name: Justin Neste	Printed Name: Matthew [illegible]	Printed Name:	Printed Name:
	Company: CALIBRE	Company: ARI	Company:	Company:
	Date & Time: 10/26/23 1322	Date & Time: 10/26/23 1322	Date & Time:	Date & Time:

Limits of Liability: *ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.*

Sample Retention Policy: All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.

CALIBRE	Project:	Boeing Renton	
-	Project Number:	[none]	**Reported:**
- -, -	Project Manager:	Tom McKeon	30-Oct-2023 14:01

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
GW-185S-R-102623	23J0709-01	Water	26-Oct-2023 11:35	26-Oct-2023 13:22
GW-197S-R-102623	23J0709-02	Water	26-Oct-2023 12:23	26-Oct-2023 13:22
DUP01-102623	23J0709-03	Water	26-Oct-2023 08:00	26-Oct-2023 13:22
Trip Blank	23J0709-04	Water	26-Oct-2023 08:00	26-Oct-2023 13:22

CALIBRE	Project:	Boeing Renton	
-	Project Number:	[none]	**Reported:**
- -, -	Project Manager:	Tom McKeon	30-Oct-2023 14:01

Work Order Case Narrative

Volatiles - EPA Method SW8260D

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

Initial and continuing calibrations were within method requirements with the exception of all associated "Q" flagged analytes which are out of control low in the CCAL and acrolein is out of control high . All associated samples that contain analyte have been flagged with a "Q" qualifer.

Internal standard areas were within limits.

The surrogate percent recoveries were within control limits.

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

The blank spike and blank spike duplicate (BS/LCS and BSD/LCSD) spike recoveries and relative percent difference (RPD) were within control limits with the exception of analytes flagged on the associated forms.

Analytical Resources, LLC
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: Calibre
Project Name: Renton AOC-001/002

COC No(s): ______ NA
Delivered by: Fed-Ex UPS Courier Hand Delivered Other: ______

Assigned ARI Job No: 23J0709
Tracking No: ______ NA

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of the cooler?	YES	NO
Were custody papers included with the cooler?	YES	NO
Were custody papers properly filled out (ink, signed, etc.)	YES	NO

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

Time 1322   4.2°C

If cooler temperature is out of compliance fill out form 00070F   Temp Gun ID#: J009708

Cooler Accepted by: MD   Date: 10/26/23   Time: 1322

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler?		YES	NO
What kind of packing material was used? ... Bubble Wrap Wet Ice Gel Packs Baggies Foam Block Paper Other: ______			
Was sufficient ice used (if appropriate)?	NA	YES	NO
How were bottles sealed in plastic bags?	Individually	Grouped	Not
Did all bottles arrive in good condition (unbroken)?		YES	NO
Were all bottle labels complete and legible?		YES	NO
Did the number of containers listed on COC match with the number of containers received?		YES	NO
Did all bottle labels and tags agree with custody papers?		YES	NO
Were all bottles used correct for the requested analyses?		YES	NO
Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs) ...	NA	YES	NO
Were all VOC vials free of air bubbles?	NA	YES	NO
Was sufficient amount of sample sent in each bottle?		YES	NO
Date VOC Trip Blank was made at ARI	NA	10/26/23	

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

Samples Logged by: MD   Date: 10/26/23   Time: 1403   Labels checked by: MD

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

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

Additional Notes, Discrepancies, & Resolutions:

By: Date:

Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

CALIBRE	Project: Boeing Renton	
-	Project Number: [none]	**Reported:**
- -, -	Project Manager: Tom McKeon	30-Oct-2023 14:01

GW-185S-R-102623
23J0709-01 (Water)

Volatile Organic Compounds

Method: EPA 8260D — Sampled: 10/26/2023 11:35

Instrument: NT20 Analyst: PKC — Analyzed: 10/27/2023 14:24

Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap) — Extract ID: 23J0709-01 B

Preparation Batch: BLJ0861 — Sample Size: 10 mL

Prepared: 10/27/2023 — Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Chloromethane	74-87-3	1	0.27	0.50	ND	ug/L	U
Vinyl Chloride	75-01-4	1	0.08	0.20	0.26	ug/L	
Bromomethane	74-83-9	1	0.23	1.00	ND	ug/L	U
Chloroethane	75-00-3	1	0.05	0.20	ND	ug/L	U
Trichlorofluoromethane	75-69-4	1	0.13	0.20	ND	ug/L	U
Acrolein	107-02-8	1	2.70	5.00	ND	ug/L	U
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	1	0.11	0.20	ND	ug/L	U
Acetone	67-64-1	1	1.91	5.00	2.66	ug/L	J
1,1-Dichloroethene	75-35-4	1	0.08	0.20	ND	ug/L	U
Iodomethane	74-88-4	1	0.15	1.00	ND	ug/L	U
Methylene Chloride	75-09-2	1	0.53	1.00	ND	ug/L	U
Acrylonitrile	107-13-1	1	0.40	1.00	ND	ug/L	U
Carbon Disulfide	75-15-0	1	0.06	0.20	ND	ug/L	U
trans-1,2-Dichloroethene	156-60-5	1	0.07	0.20	ND	ug/L	U
Vinyl Acetate	108-05-4	1	0.12	0.20	ND	ug/L	U
1,1-Dichloroethane	75-34-3	1	0.04	0.20	ND	ug/L	U
2-Butanone	78-93-3	1	1.77	5.00	ND	ug/L	U
2,2-Dichloropropane	594-20-7	1	0.11	0.20	ND	ug/L	U
cis-1,2-Dichloroethene	156-59-2	1	0.08	0.20	0.65	ug/L	
Chloroform	67-66-3	1	0.05	0.20	ND	ug/L	U
Bromochloromethane	74-97-5	1	0.09	0.20	ND	ug/L	U
1,1,1-Trichloroethane	71-55-6	1	0.08	0.20	ND	ug/L	U
1,1-Dichloropropene	563-58-6	1	0.09	0.20	ND	ug/L	U
Carbon tetrachloride	56-23-5	1	0.09	0.20	ND	ug/L	U
1,2-Dichloroethane	107-06-2	1	0.08	0.20	ND	ug/L	U
Benzene	71-43-2	1	0.05	0.20	0.08	ug/L	J
Trichloroethene	79-01-6	1	0.07	0.20	ND	ug/L	U
1,2-Dichloropropane	78-87-5	1	0.07	0.20	ND	ug/L	U
Bromodichloromethane	75-27-4	1	0.09	0.20	ND	ug/L	U
Dibromomethane	74-95-3	1	0.06	0.20	ND	ug/L	U
2-Chloroethyl vinyl ether	110-75-8	1	0.55	1.00	ND	ug/L	U
4-Methyl-2-Pentanone	108-10-1	1	1.90	5.00	ND	ug/L	U

CALIBRE	Project: Boeing Renton	
-	Project Number: [none]	Reported:
- -, -	Project Manager: Tom McKeon	30-Oct-2023 14:01

GW-185S-R-102623

23J0709-01 (Water)

Volatile Organic Compounds

Method: EPA 8260D — Sampled: 10/26/2023 11:35

Instrument: NT20 Analyst: PKC — Analyzed: 10/27/2023 14:24

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
cis-1,3-Dichloropropene	10061-01-5	1	0.09	0.20	ND	ug/L	U
Toluene	108-88-3	1	0.05	0.20	0.12	ug/L	J
trans-1,3-Dichloropropene	10061-02-6	1	0.09	0.20	ND	ug/L	U
2-Hexanone	591-78-6	1	2.06	5.00	ND	ug/L	U
1,1,2-Trichloroethane	79-00-5	1	0.10	0.20	ND	ug/L	U
1,3-Dichloropropane	142-28-9	1	0.07	0.20	ND	ug/L	U
Tetrachloroethene	127-18-4	1	0.09	0.20	ND	ug/L	U
Dibromochloromethane	124-48-1	1	0.09	0.20	ND	ug/L	U
1,2-Dibromoethane	106-93-4	1	0.09	0.20	ND	ug/L	U
Chlorobenzene	108-90-7	1	0.06	0.20	ND	ug/L	U
Ethylbenzene	100-41-4	1	0.05	0.20	ND	ug/L	U
1,1,1,2-Tetrachloroethane	630-20-6	1	0.09	0.20	ND	ug/L	U
m,p-Xylene	179601-23-1	1	0.14	0.40	ND	ug/L	U
o-Xylene	95-47-6	1	0.08	0.20	ND	ug/L	U
Xylenes, total	1330-20-7	1	0.22	0.60	ND	ug/L	U
Styrene	100-42-5	1	0.09	0.20	ND	ug/L	U
Bromoform	75-25-2	1	0.15	0.20	ND	ug/L	U
1,1,2,2-Tetrachloroethane	79-34-5	1	0.03	0.20	ND	ug/L	U
1,2,3-Trichloropropane	96-18-4	1	0.16	0.50	ND	ug/L	U
trans-1,4-Dichloro 2-Butene	110-57-6	1	0.60	1.00	ND	ug/L	U
n-Propylbenzene	103-65-1	1	0.07	0.20	ND	ug/L	U
Bromobenzene	108-86-1	1	0.07	0.20	ND	ug/L	U
Isopropyl Benzene	98-82-8	1	0.07	0.20	ND	ug/L	U
2-Chlorotoluene	95-49-8	1	0.06	0.20	ND	ug/L	U
4-Chlorotoluene	106-43-4	1	0.06	0.20	ND	ug/L	U
t-Butylbenzene	98-06-6	1	0.07	0.20	ND	ug/L	U
1,3,5-Trimethylbenzene	108-67-8	1	0.07	0.20	ND	ug/L	U
1,2,4-Trimethylbenzene	95-63-6	1	0.05	0.20	ND	ug/L	U
s-Butylbenzene	135-98-8	1	0.06	0.20	ND	ug/L	U
4-Isopropyl Toluene	99-87-6	1	0.08	0.20	ND	ug/L	U
1,3-Dichlorobenzene	541-73-1	1	0.08	0.20	ND	ug/L	U
1,4-Dichlorobenzene	106-46-7	1	0.10	0.20	ND	ug/L	U
n-Butylbenzene	104-51-8	1	0.18	0.20	ND	ug/L	U
1,2-Dichlorobenzene	95-50-1	1	0.08	0.20	ND	ug/L	U
1,2-Dibromo-3-chloropropane	96-12-8	1	0.39	0.50	ND	ug/L	U
1,2,4-Trichlorobenzene	120-82-1	1	0.21	0.50	ND	ug/L	U
Hexachloro-1,3-Butadiene	87-68-3	1	1.00	2.00	ND	ug/L	U
Naphthalene	91-20-3	1	0.27	0.50	ND	ug/L	U

Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

CALIBRE	Project: Boeing Renton	
-	Project Number: [none]	**Reported:**
- -, -	Project Manager: Tom McKeon	30-Oct-2023 14:01

GW-185S-R-102623
23J0709-01 (Water)

Volatile Organic Compounds

Method: EPA 8260D — Sampled: 10/26/2023 11:35

Instrument: NT20 Analyst: PKC — Analyzed: 10/27/2023 14:24

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
1,2,3-Trichlorobenzene	87-61-6	1	0.25	0.50	ND	ug/L	U
Dichlorodifluoromethane	75-71-8	1	0.13	0.20	ND	ug/L	U
Methyl tert-butyl Ether	1634-04-4	1	0.14	0.50	ND	ug/L	U
2-Pentanone	107-87-9	1	2.34	5.00	ND	ug/L	U
Surrogate: 1,2-Dichloroethane-d4				*80-129 %*	*104*	*%*	
Surrogate: Toluene-d8				*80-120 %*	*96.7*	*%*	
Surrogate: 4-Bromofluorobenzene				*80-120 %*	*96.1*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4				*80-120 %*	*98.9*	*%*	

Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

CALIBRE	Project: Boeing Renton	
-	Project Number: [none]	**Reported:**
- -, -	Project Manager: Tom McKeon	30-Oct-2023 14:01

GW-197S-R-102623

23J0709-02 (Water)

Volatile Organic Compounds

Method: EPA 8260D — Sampled: 10/26/2023 12:23

Instrument: NT20 Analyst: LH — Analyzed: 10/26/2023 16:22

Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap) — Extract ID: 23J0709-02 A

Preparation Batch: BLJ0816 — Sample Size: 10 mL

Prepared: 10/26/2023 — Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Chloromethane	74-87-3	1	0.27	0.50	ND	ug/L	U
Vinyl Chloride	75-01-4	1	0.08	0.20	146	ug/L	E
Bromomethane	74-83-9	1	0.23	1.00	ND	ug/L	U
Chloroethane	75-00-3	1	0.05	0.20	ND	ug/L	U
Trichlorofluoromethane	75-69-4	1	0.13	0.20	ND	ug/L	U
Acrolein	107-02-8	1	2.70	5.00	ND	ug/L	U
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	1	0.11	0.20	ND	ug/L	U
Acetone	67-64-1	1	1.91	5.00	3.70	ug/L	J
1,1-Dichloroethene	75-35-4	1	0.08	0.20	1.10	ug/L	
Iodomethane	74-88-4	1	0.15	1.00	ND	ug/L	U
Methylene Chloride	75-09-2	1	0.53	1.00	ND	ug/L	U
Acrylonitrile	107-13-1	1	0.40	1.00	ND	ug/L	U
Carbon Disulfide	75-15-0	1	0.06	0.20	0.21	ug/L	
trans-1,2-Dichloroethene	156-60-5	1	0.07	0.20	1.27	ug/L	
Vinyl Acetate	108-05-4	1	0.12	0.20	ND	ug/L	U
1,1-Dichloroethane	75-34-3	1	0.04	0.20	ND	ug/L	U
2-Butanone	78-93-3	1	1.77	5.00	ND	ug/L	U
2,2-Dichloropropane	594-20-7	1	0.11	0.20	ND	ug/L	U
cis-1,2-Dichloroethene	156-59-2	1	0.08	0.20	226	ug/L	E
Chloroform	67-66-3	1	0.05	0.20	ND	ug/L	U
Bromochloromethane	74-97-5	1	0.09	0.20	ND	ug/L	U
1,1,1-Trichloroethane	71-55-6	1	0.08	0.20	ND	ug/L	U
1,1-Dichloropropene	563-58-6	1	0.09	0.20	ND	ug/L	U
Carbon tetrachloride	56-23-5	1	0.09	0.20	ND	ug/L	U
1,2-Dichloroethane	107-06-2	1	0.08	0.20	ND	ug/L	U
Benzene	71-43-2	1	0.05	0.20	0.69	ug/L	
Trichloroethene	79-01-6	1	0.07	0.20	5.07	ug/L	
1,2-Dichloropropane	78-87-5	1	0.07	0.20	ND	ug/L	U
Bromodichloromethane	75-27-4	1	0.09	0.20	ND	ug/L	U
Dibromomethane	74-95-3	1	0.06	0.20	ND	ug/L	U
2-Chloroethyl vinyl ether	110-75-8	1	0.55	1.00	ND	ug/L	U
4-Methyl-2-Pentanone	108-10-1	1	1.90	5.00	ND	ug/L	U
cis-1,3-Dichloropropene	10061-01-5	1	0.09	0.20	ND	ug/L	U
Toluene	108-88-3	1	0.05	0.20	0.17	ug/L	J
trans-1,3-Dichloropropene	10061-02-6	1	0.09	0.20	ND	ug/L	U

CALIBRE	Project: Boeing Renton	
-	Project Number: [none]	Reported:
- -, -	Project Manager: Tom McKeon	30-Oct-2023 14:01

GW-197S-R-102623

23J0709-02 (Water)

Volatile Organic Compounds

Method: EPA 8260D — Sampled: 10/26/2023 12:23

Instrument: NT20 Analyst: LH — Analyzed: 10/26/2023 16:22

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
2-Hexanone	591-78-6	1	2.06	5.00	ND	ug/L	U
1,1,2-Trichloroethane	79-00-5	1	0.10	0.20	ND	ug/L	U
1,3-Dichloropropane	142-28-9	1	0.07	0.20	ND	ug/L	U
Tetrachloroethene	127-18-4	1	0.09	0.20	0.17	ug/L	J
Dibromochloromethane	124-48-1	1	0.09	0.20	ND	ug/L	U
1,2-Dibromoethane	106-93-4	1	0.09	0.20	ND	ug/L	U
Chlorobenzene	108-90-7	1	0.06	0.20	0.14	ug/L	J
Ethylbenzene	100-41-4	1	0.05	0.20	0.08	ug/L	J
1,1,1,2-Tetrachloroethane	630-20-6	1	0.09	0.20	ND	ug/L	U
m,p-Xylene	179601-23-1	1	0.14	0.40	0.19	ug/L	J
o-Xylene	95-47-6	1	0.08	0.20	0.26	ug/L	
Xylenes, total	1330-20-7	1	0.22	0.60	0.45	ug/L	J
Styrene	100-42-5	1	0.09	0.20	ND	ug/L	U
Bromoform	75-25-2	1	0.15	0.20	ND	ug/L	U
1,1,2,2-Tetrachloroethane	79-34-5	1	0.03	0.20	ND	ug/L	U
1,2,3-Trichloropropane	96-18-4	1	0.16	0.50	ND	ug/L	U
trans-1,4-Dichloro 2-Butene	110-57-6	1	0.60	1.00	ND	ug/L	U
n-Propylbenzene	103-65-1	1	0.07	0.20	ND	ug/L	U
Bromobenzene	108-86-1	1	0.07	0.20	ND	ug/L	U
Isopropyl Benzene	98-82-8	1	0.07	0.20	0.11	ug/L	J
2-Chlorotoluene	95-49-8	1	0.06	0.20	ND	ug/L	U
4-Chlorotoluene	106-43-4	1	0.06	0.20	ND	ug/L	U
t-Butylbenzene	98-06-6	1	0.07	0.20	ND	ug/L	U
1,3,5-Trimethylbenzene	108-67-8	1	0.07	0.20	0.09	ug/L	J
1,2,4-Trimethylbenzene	95-63-6	1	0.05	0.20	0.20	ug/L	J
s-Butylbenzene	135-98-8	1	0.06	0.20	0.08	ug/L	J
4-Isopropyl Toluene	99-87-6	1	0.08	0.20	0.11	ug/L	J
1,3-Dichlorobenzene	541-73-1	1	0.08	0.20	ND	ug/L	U
1,4-Dichlorobenzene	106-46-7	1	0.10	0.20	ND	ug/L	U
n-Butylbenzene	104-51-8	1	0.18	0.20	ND	ug/L	U
1,2-Dichlorobenzene	95-50-1	1	0.08	0.20	ND	ug/L	U
1,2-Dibromo-3-chloropropane	96-12-8	1	0.39	0.50	ND	ug/L	U
1,2,4-Trichlorobenzene	120-82-1	1	0.21	0.50	ND	ug/L	U
Hexachloro-1,3-Butadiene	87-68-3	1	1.00	2.00	ND	ug/L	U
Naphthalene	91-20-3	1	0.27	0.50	0.85	ug/L	
1,2,3-Trichlorobenzene	87-61-6	1	0.25	0.50	ND	ug/L	U
Dichlorodifluoromethane	75-71-8	1	0.13	0.20	ND	ug/L	U
Methyl tert-butyl Ether	1634-04-4	1	0.14	0.50	ND	ug/L	U

Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

CALIBRE	Project: Boeing Renton	
-	Project Number: [none]	**Reported:**
- -, -	Project Manager: Tom McKeon	30-Oct-2023 14:01

GW-197S-R-102623

23J0709-02 (Water)

Volatile Organic Compounds

Method: EPA 8260D — Sampled: 10/26/2023 12:23

Instrument: NT20 Analyst: LH — Analyzed: 10/26/2023 16:22

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
2-Pentanone	107-87-9	1	2.34	5.00	ND	ug/L	U
Surrogate: 1,2-Dichloroethane-d4				*80-129 %*	*104*	*%*	
Surrogate: Toluene-d8				*80-120 %*	*99.4*	*%*	
Surrogate: 4-Bromofluorobenzene				*80-120 %*	*96.4*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4				*80-120 %*	*100*	*%*	

CALIBRE	Project: Boeing Renton	
-	Project Number: [none]	Reported:
- -, -	Project Manager: Tom McKeon	30-Oct-2023 14:01

GW-197S-R-102623

23J0709-02RE1 (Water)

Volatile Organic Compounds

Method: EPA 8260D — Sampled: 10/26/2023 12:23

Instrument: NT20 Analyst: PKC — Analyzed: 10/27/2023 14:49

Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap) — Extract ID: 23J0709-02RE1 B

Preparation Batch: BLJ0861 — Sample Size: 1 mL

Prepared: 10/27/2023 — Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Chloromethane	74-87-3	1	2.72	5.00	ND	ug/L	U
Vinyl Chloride	75-01-4	1	0.82	2.00	153	ug/L	
Bromomethane	74-83-9	1	2.31	10.0	ND	ug/L	U
Chloroethane	75-00-3	1	0.53	2.00	ND	ug/L	U
Trichlorofluoromethane	75-69-4	1	1.25	2.00	ND	ug/L	U
Acrolein	107-02-8	1	27.0	50.0	ND	ug/L	U
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	1	1.15	2.00	ND	ug/L	U
Acetone	67-64-1	1	19.1	50.0	ND	ug/L	U
1,1-Dichloroethene	75-35-4	1	0.75	2.00	1.06	ug/L	J
Iodomethane	74-88-4	1	1.48	10.0	ND	ug/L	U
Methylene Chloride	75-09-2	1	5.31	10.0	ND	ug/L	U
Acrylonitrile	107-13-1	1	3.98	10.0	ND	ug/L	U
Carbon Disulfide	75-15-0	1	0.60	2.00	0.62	ug/L	J
trans-1,2-Dichloroethene	156-60-5	1	0.69	2.00	1.06	ug/L	J
Vinyl Acetate	108-05-4	1	1.16	2.00	ND	ug/L	U
1,1-Dichloroethane	75-34-3	1	0.37	2.00	ND	ug/L	U
2-Butanone	78-93-3	1	17.7	50.0	ND	ug/L	U
2,2-Dichloropropane	594-20-7	1	1.15	2.00	ND	ug/L	U
cis-1,2-Dichloroethene	156-59-2	1	0.81	2.00	236	ug/L	
Chloroform	67-66-3	1	0.55	2.00	ND	ug/L	U
Bromochloromethane	74-97-5	1	0.87	2.00	ND	ug/L	U
1,1,1-Trichloroethane	71-55-6	1	0.77	2.00	ND	ug/L	U
1,1-Dichloropropene	563-58-6	1	0.95	2.00	ND	ug/L	U
Carbon tetrachloride	56-23-5	1	0.87	2.00	ND	ug/L	U
1,2-Dichloroethane	107-06-2	1	0.76	2.00	ND	ug/L	U
Benzene	71-43-2	1	0.53	2.00	0.82	ug/L	J
Trichloroethene	79-01-6	1	0.70	2.00	4.69	ug/L	
1,2-Dichloropropane	78-87-5	1	0.66	2.00	ND	ug/L	U
Bromodichloromethane	75-27-4	1	0.90	2.00	ND	ug/L	U
Dibromomethane	74-95-3	1	0.64	2.00	ND	ug/L	U
2-Chloroethyl vinyl ether	110-75-8	1	5.45	10.0	ND	ug/L	U
4-Methyl-2-Pentanone	108-10-1	1	19.0	50.0	ND	ug/L	U
cis-1,3-Dichloropropene	10061-01-5	1	0.89	2.00	ND	ug/L	U
Toluene	108-88-3	1	0.49	2.00	ND	ug/L	U
trans-1,3-Dichloropropene	10061-02-6	1	0.89	2.00	ND	ug/L	U

Analytical Resources, LLC
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Analytical Report

CALIBRE	Project: Boeing Renton	
-	Project Number: [none]	**Reported:**
- -, -	Project Manager: Tom McKeon	30-Oct-2023 14:01

GW-197S-R-102623
23J0709-02RE1 (Water)

Volatile Organic Compounds

Method: EPA 8260D — Sampled: 10/26/2023 12:23

Instrument: NT20 Analyst: PKC — Analyzed: 10/27/2023 14:49

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
2-Hexanone	591-78-6	1	20.6	50.0	ND	ug/L	U
1,1,2-Trichloroethane	79-00-5	1	1.04	2.00	ND	ug/L	U
1,3-Dichloropropane	142-28-9	1	0.66	2.00	ND	ug/L	U
Tetrachloroethene	127-18-4	1	0.91	2.00	ND	ug/L	U
Dibromochloromethane	124-48-1	1	0.95	2.00	ND	ug/L	U
1,2-Dibromoethane	106-93-4	1	0.86	2.00	ND	ug/L	U
Chlorobenzene	108-90-7	1	0.58	2.00	ND	ug/L	U
Ethylbenzene	100-41-4	1	0.51	2.00	ND	ug/L	U
1,1,1,2-Tetrachloroethane	630-20-6	1	0.90	2.00	ND	ug/L	U
m,p-Xylene	179601-23-1	1	1.44	4.00	ND	ug/L	U
o-Xylene	95-47-6	1	0.79	2.00	ND	ug/L	U
Xylenes, total	1330-20-7	1	2.19	6.00	ND	ug/L	U
Styrene	100-42-5	1	0.88	2.00	ND	ug/L	U
Bromoform	75-25-2	1	1.54	2.00	ND	ug/L	U
1,1,2,2-Tetrachloroethane	79-34-5	1	0.34	2.00	ND	ug/L	U
1,2,3-Trichloropropane	96-18-4	1	1.61	5.00	ND	ug/L	U
trans-1,4-Dichloro 2-Butene	110-57-6	1	6.03	10.0	ND	ug/L	U
n-Propylbenzene	103-65-1	1	0.68	2.00	ND	ug/L	U
Bromobenzene	108-86-1	1	0.66	2.00	ND	ug/L	U
Isopropyl Benzene	98-82-8	1	0.74	2.00	ND	ug/L	U
2-Chlorotoluene	95-49-8	1	0.63	2.00	ND	ug/L	U
4-Chlorotoluene	106-43-4	1	0.61	2.00	ND	ug/L	U
t-Butylbenzene	98-06-6	1	0.71	2.00	ND	ug/L	U
1,3,5-Trimethylbenzene	108-67-8	1	0.70	2.00	ND	ug/L	U
1,2,4-Trimethylbenzene	95-63-6	1	0.49	2.00	ND	ug/L	U
s-Butylbenzene	135-98-8	1	0.63	2.00	ND	ug/L	U
4-Isopropyl Toluene	99-87-6	1	0.75	2.00	ND	ug/L	U
1,3-Dichlorobenzene	541-73-1	1	0.75	2.00	ND	ug/L	U
1,4-Dichlorobenzene	106-46-7	1	1.04	2.00	ND	ug/L	U
n-Butylbenzene	104-51-8	1	1.80	2.00	ND	ug/L	U
1,2-Dichlorobenzene	95-50-1	1	0.85	2.00	ND	ug/L	U
1,2-Dibromo-3-chloropropane	96-12-8	1	3.94	5.00	ND	ug/L	U
1,2,4-Trichlorobenzene	120-82-1	1	2.08	5.00	ND	ug/L	U
Hexachloro-1,3-Butadiene	87-68-3	1	10.0	20.0	ND	ug/L	U
Naphthalene	91-20-3	1	2.74	5.00	ND	ug/L	U
1,2,3-Trichlorobenzene	87-61-6	1	2.52	5.00	ND	ug/L	U
Dichlorodifluoromethane	75-71-8	1	1.28	2.00	ND	ug/L	U
Methyl tert-butyl Ether	1634-04-4	1	1.40	5.00	ND	ug/L	U

CALIBRE	Project: Boeing Renton	
-	Project Number: [none]	**Reported:**
- -, -	Project Manager: Tom McKeon	30-Oct-2023 14:01

GW-197S-R-102623

23J0709-02RE1 (Water)

Volatile Organic Compounds

Method: EPA 8260D — Sampled: 10/26/2023 12:23

Instrument: NT20 Analyst: PKC — Analyzed: 10/27/2023 14:49

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
2-Pentanone	107-87-9	1	23.4	50.0	ND	ug/L	U
Surrogate: 1,2-Dichloroethane-d4				*80-129 %*	*109*	*%*	
Surrogate: Toluene-d8				*80-120 %*	*97.7*	*%*	
Surrogate: 4-Bromofluorobenzene				*80-120 %*	*97.2*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4				*80-120 %*	*98.3*	*%*	

Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

CALIBRE	Project: Boeing Renton	
-	Project Number: [none]	**Reported:**
- -, -	Project Manager: Tom McKeon	30-Oct-2023 14:01

DUP01-102623
23J0709-03 (Water)

Volatile Organic Compounds

Method: EPA 8260D — Sampled: 10/26/2023 08:00

Instrument: NT20 Analyst: LH — Analyzed: 10/26/2023 16:45

Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap) — Extract ID: 23J0709-03 B

Preparation Batch: BLJ0816 — Sample Size: 10 mL

Prepared: 10/26/2023 — Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Chloromethane	74-87-3	1	0.27	0.50	ND	ug/L	U
Vinyl Chloride	75-01-4	1	0.08	0.20	147	ug/L	E
Bromomethane	74-83-9	1	0.23	1.00	ND	ug/L	U
Chloroethane	75-00-3	1	0.05	0.20	ND	ug/L	U
Trichlorofluoromethane	75-69-4	1	0.13	0.20	ND	ug/L	U
Acrolein	107-02-8	1	2.70	5.00	ND	ug/L	U
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	1	0.11	0.20	ND	ug/L	U
Acetone	67-64-1	1	1.91	5.00	4.17	ug/L	J
1,1-Dichloroethene	75-35-4	1	0.08	0.20	1.11	ug/L	
Iodomethane	74-88-4	1	0.15	1.00	ND	ug/L	U
Methylene Chloride	75-09-2	1	0.53	1.00	ND	ug/L	U
Acrylonitrile	107-13-1	1	0.40	1.00	ND	ug/L	U
Carbon Disulfide	75-15-0	1	0.06	0.20	0.30	ug/L	
trans-1,2-Dichloroethene	156-60-5	1	0.07	0.20	1.30	ug/L	
Vinyl Acetate	108-05-4	1	0.12	0.20	ND	ug/L	U
1,1-Dichloroethane	75-34-3	1	0.04	0.20	ND	ug/L	U
2-Butanone	78-93-3	1	1.77	5.00	ND	ug/L	U
2,2-Dichloropropane	594-20-7	1	0.11	0.20	ND	ug/L	U
cis-1,2-Dichloroethene	156-59-2	1	0.08	0.20	220	ug/L	E
Chloroform	67-66-3	1	0.05	0.20	ND	ug/L	U
Bromochloromethane	74-97-5	1	0.09	0.20	ND	ug/L	U
1,1,1-Trichloroethane	71-55-6	1	0.08	0.20	ND	ug/L	U
1,1-Dichloropropene	563-58-6	1	0.09	0.20	ND	ug/L	U
Carbon tetrachloride	56-23-5	1	0.09	0.20	ND	ug/L	U
1,2-Dichloroethane	107-06-2	1	0.08	0.20	ND	ug/L	U
Benzene	71-43-2	1	0.05	0.20	0.68	ug/L	
Trichloroethene	79-01-6	1	0.07	0.20	4.98	ug/L	
1,2-Dichloropropane	78-87-5	1	0.07	0.20	ND	ug/L	U
Bromodichloromethane	75-27-4	1	0.09	0.20	ND	ug/L	U
Dibromomethane	74-95-3	1	0.06	0.20	ND	ug/L	U
2-Chloroethyl vinyl ether	110-75-8	1	0.55	1.00	ND	ug/L	U
4-Methyl-2-Pentanone	108-10-1	1	1.90	5.00	ND	ug/L	U
cis-1,3-Dichloropropene	10061-01-5	1	0.09	0.20	ND	ug/L	U
Toluene	108-88-3	1	0.05	0.20	0.19	ug/L	J
trans-1,3-Dichloropropene	10061-02-6	1	0.09	0.20	ND	ug/L	U

Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

CALIBRE	Project: Boeing Renton	
-	Project Number: [none]	**Reported:**
- -, -	Project Manager: Tom McKeon	30-Oct-2023 14:01

DUP01-102623

23J0709-03 (Water)

Volatile Organic Compounds

Method: EPA 8260D — Sampled: 10/26/2023 08:00

Instrument: NT20 Analyst: LH — Analyzed: 10/26/2023 16:45

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
2-Hexanone	591-78-6	1	2.06	5.00	ND	ug/L	U
1,1,2-Trichloroethane	79-00-5	1	0.10	0.20	ND	ug/L	U
1,3-Dichloropropane	142-28-9	1	0.07	0.20	ND	ug/L	U
Tetrachloroethene	127-18-4	1	0.09	0.20	0.13	ug/L	J
Dibromochloromethane	124-48-1	1	0.09	0.20	ND	ug/L	U
1,2-Dibromoethane	106-93-4	1	0.09	0.20	ND	ug/L	U
Chlorobenzene	108-90-7	1	0.06	0.20	0.12	ug/L	J
Ethylbenzene	100-41-4	1	0.05	0.20	0.08	ug/L	J
1,1,1,2-Tetrachloroethane	630-20-6	1	0.09	0.20	ND	ug/L	U
m,p-Xylene	179601-23-1	1	0.14	0.40	0.22	ug/L	J
o-Xylene	95-47-6	1	0.08	0.20	0.26	ug/L	
Xylenes, total	1330-20-7	1	0.22	0.60	0.48	ug/L	J
Styrene	100-42-5	1	0.09	0.20	ND	ug/L	U
Bromoform	75-25-2	1	0.15	0.20	ND	ug/L	U
1,1,2,2-Tetrachloroethane	79-34-5	1	0.03	0.20	ND	ug/L	U
1,2,3-Trichloropropane	96-18-4	1	0.16	0.50	0.23	ug/L	J
trans-1,4-Dichloro 2-Butene	110-57-6	1	0.60	1.00	ND	ug/L	U
n-Propylbenzene	103-65-1	1	0.07	0.20	ND	ug/L	U
Bromobenzene	108-86-1	1	0.07	0.20	ND	ug/L	U
Isopropyl Benzene	98-82-8	1	0.07	0.20	0.11	ug/L	J
2-Chlorotoluene	95-49-8	1	0.06	0.20	ND	ug/L	U
4-Chlorotoluene	106-43-4	1	0.06	0.20	ND	ug/L	U
t-Butylbenzene	98-06-6	1	0.07	0.20	ND	ug/L	U
1,3,5-Trimethylbenzene	108-67-8	1	0.07	0.20	0.09	ug/L	J
1,2,4-Trimethylbenzene	95-63-6	1	0.05	0.20	0.19	ug/L	J
s-Butylbenzene	135-98-8	1	0.06	0.20	0.08	ug/L	J
4-Isopropyl Toluene	99-87-6	1	0.08	0.20	0.11	ug/L	J
1,3-Dichlorobenzene	541-73-1	1	0.08	0.20	ND	ug/L	U
1,4-Dichlorobenzene	106-46-7	1	0.10	0.20	ND	ug/L	U
n-Butylbenzene	104-51-8	1	0.18	0.20	ND	ug/L	U
1,2-Dichlorobenzene	95-50-1	1	0.08	0.20	ND	ug/L	U
1,2-Dibromo-3-chloropropane	96-12-8	1	0.39	0.50	ND	ug/L	U
1,2,4-Trichlorobenzene	120-82-1	1	0.21	0.50	ND	ug/L	U
Hexachloro-1,3-Butadiene	87-68-3	1	1.00	2.00	ND	ug/L	U
Naphthalene	91-20-3	1	0.27	0.50	0.87	ug/L	
1,2,3-Trichlorobenzene	87-61-6	1	0.25	0.50	ND	ug/L	U
Dichlorodifluoromethane	75-71-8	1	0.13	0.20	ND	ug/L	U
Methyl tert-butyl Ether	1634-04-4	1	0.14	0.50	ND	ug/L	U

CALIBRE	Project: Boeing Renton	
-	Project Number: [none]	**Reported:**
- -, -	Project Manager: Tom McKeon	30-Oct-2023 14:01

DUP01-102623

23J0709-03 (Water)

Volatile Organic Compounds

Method: EPA 8260D — Sampled: 10/26/2023 08:00

Instrument: NT20 Analyst: LH — Analyzed: 10/26/2023 16:45

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
2-Pentanone	107-87-9	1	2.34	5.00	ND	ug/L	U
Surrogate: 1,2-Dichloroethane-d4				*80-129 %*	*103*	*%*	
Surrogate: Toluene-d8				*80-120 %*	*99.8*	*%*	
Surrogate: 4-Bromofluorobenzene				*80-120 %*	*95.2*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4				*80-120 %*	*99.2*	*%*	

Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

CALIBRE	Project: Boeing Renton	
-	Project Number: [none]	**Reported:**
- -, -	Project Manager: Tom McKeon	30-Oct-2023 14:01

DUP01-102623

23J0709-03RE1 (Water)

Volatile Organic Compounds

Method: EPA 8260D — Sampled: 10/26/2023 08:00

Instrument: NT20 Analyst: PKC — Analyzed: 10/27/2023 15:14

Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap) — Extract ID: 23J0709-03RE1 A

Preparation Batch: BLJ0861 — Sample Size: 1 mL

Prepared: 10/27/2023 — Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Chloromethane	74-87-3	1	2.72	5.00	ND	ug/L	U
Vinyl Chloride	75-01-4	1	0.82	2.00	153	ug/L	
Bromomethane	74-83-9	1	2.31	10.0	ND	ug/L	U
Chloroethane	75-00-3	1	0.53	2.00	ND	ug/L	U
Trichlorofluoromethane	75-69-4	1	1.25	2.00	ND	ug/L	U
Acrolein	107-02-8	1	27.0	50.0	ND	ug/L	U
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	1	1.15	2.00	ND	ug/L	U
Acetone	67-64-1	1	19.1	50.0	ND	ug/L	U
1,1-Dichloroethene	75-35-4	1	0.75	2.00	1.18	ug/L	J
Iodomethane	74-88-4	1	1.48	10.0	ND	ug/L	U
Methylene Chloride	75-09-2	1	5.31	10.0	ND	ug/L	U
Acrylonitrile	107-13-1	1	3.98	10.0	ND	ug/L	U
Carbon Disulfide	75-15-0	1	0.60	2.00	0.62	ug/L	J
trans-1,2-Dichloroethene	156-60-5	1	0.69	2.00	1.42	ug/L	J
Vinyl Acetate	108-05-4	1	1.16	2.00	ND	ug/L	U
1,1-Dichloroethane	75-34-3	1	0.37	2.00	ND	ug/L	U
2-Butanone	78-93-3	1	17.7	50.0	ND	ug/L	U
2,2-Dichloropropane	594-20-7	1	1.15	2.00	ND	ug/L	U
cis-1,2-Dichloroethene	156-59-2	1	0.81	2.00	240	ug/L	
Chloroform	67-66-3	1	0.55	2.00	ND	ug/L	U
Bromochloromethane	74-97-5	1	0.87	2.00	ND	ug/L	U
1,1,1-Trichloroethane	71-55-6	1	0.77	2.00	ND	ug/L	U
1,1-Dichloropropene	563-58-6	1	0.95	2.00	ND	ug/L	U
Carbon tetrachloride	56-23-5	1	0.87	2.00	ND	ug/L	U
1,2-Dichloroethane	107-06-2	1	0.76	2.00	ND	ug/L	U
Benzene	71-43-2	1	0.53	2.00	0.76	ug/L	J
Trichloroethene	79-01-6	1	0.70	2.00	4.91	ug/L	
1,2-Dichloropropane	78-87-5	1	0.66	2.00	ND	ug/L	U
Bromodichloromethane	75-27-4	1	0.90	2.00	ND	ug/L	U
Dibromomethane	74-95-3	1	0.64	2.00	ND	ug/L	U
2-Chloroethyl vinyl ether	110-75-8	1	5.45	10.0	ND	ug/L	U
4-Methyl-2-Pentanone	108-10-1	1	19.0	50.0	ND	ug/L	U
cis-1,3-Dichloropropene	10061-01-5	1	0.89	2.00	ND	ug/L	U
Toluene	108-88-3	1	0.49	2.00	ND	ug/L	U
trans-1,3-Dichloropropene	10061-02-6	1	0.89	2.00	ND	ug/L	U

CALIBRE	Project: Boeing Renton	
-	Project Number: [none]	**Reported:**
- -, -	Project Manager: Tom McKeon	30-Oct-2023 14:01

DUP01-102623
23J0709-03RE1 (Water)

Volatile Organic Compounds

Method: EPA 8260D — Sampled: 10/26/2023 08:00
Instrument: NT20 Analyst: PKC — Analyzed: 10/27/2023 15:14

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
2-Hexanone	591-78-6	1	20.6	50.0	ND	ug/L	U
1,1,2-Trichloroethane	79-00-5	1	1.04	2.00	ND	ug/L	U
1,3-Dichloropropane	142-28-9	1	0.66	2.00	ND	ug/L	U
Tetrachloroethene	127-18-4	1	0.91	2.00	ND	ug/L	U
Dibromochloromethane	124-48-1	1	0.95	2.00	ND	ug/L	U
1,2-Dibromoethane	106-93-4	1	0.86	2.00	ND	ug/L	U
Chlorobenzene	108-90-7	1	0.58	2.00	ND	ug/L	U
Ethylbenzene	100-41-4	1	0.51	2.00	ND	ug/L	U
1,1,1,2-Tetrachloroethane	630-20-6	1	0.90	2.00	ND	ug/L	U
m,p-Xylene	179601-23-1	1	1.44	4.00	ND	ug/L	U
o-Xylene	95-47-6	1	0.79	2.00	ND	ug/L	U
Xylenes, total	1330-20-7	1	2.19	6.00	ND	ug/L	U
Styrene	100-42-5	1	0.88	2.00	ND	ug/L	U
Bromoform	75-25-2	1	1.54	2.00	ND	ug/L	U
1,1,2,2-Tetrachloroethane	79-34-5	1	0.34	2.00	ND	ug/L	U
1,2,3-Trichloropropane	96-18-4	1	1.61	5.00	ND	ug/L	U
trans-1,4-Dichloro 2-Butene	110-57-6	1	6.03	10.0	ND	ug/L	U
n-Propylbenzene	103-65-1	1	0.68	2.00	ND	ug/L	U
Bromobenzene	108-86-1	1	0.66	2.00	ND	ug/L	U
Isopropyl Benzene	98-82-8	1	0.74	2.00	ND	ug/L	U
2-Chlorotoluene	95-49-8	1	0.63	2.00	ND	ug/L	U
4-Chlorotoluene	106-43-4	1	0.61	2.00	ND	ug/L	U
t-Butylbenzene	98-06-6	1	0.71	2.00	ND	ug/L	U
1,3,5-Trimethylbenzene	108-67-8	1	0.70	2.00	ND	ug/L	U
1,2,4-Trimethylbenzene	95-63-6	1	0.49	2.00	ND	ug/L	U
s-Butylbenzene	135-98-8	1	0.63	2.00	ND	ug/L	U
4-Isopropyl Toluene	99-87-6	1	0.75	2.00	ND	ug/L	U
1,3-Dichlorobenzene	541-73-1	1	0.75	2.00	ND	ug/L	U
1,4-Dichlorobenzene	106-46-7	1	1.04	2.00	ND	ug/L	U
n-Butylbenzene	104-51-8	1	1.80	2.00	ND	ug/L	U
1,2-Dichlorobenzene	95-50-1	1	0.85	2.00	ND	ug/L	U
1,2-Dibromo-3-chloropropane	96-12-8	1	3.94	5.00	ND	ug/L	U
1,2,4-Trichlorobenzene	120-82-1	1	2.08	5.00	ND	ug/L	U
Hexachloro-1,3-Butadiene	87-68-3	1	10.0	20.0	ND	ug/L	U
Naphthalene	91-20-3	1	2.74	5.00	ND	ug/L	U
1,2,3-Trichlorobenzene	87-61-6	1	2.52	5.00	ND	ug/L	U
Dichlorodifluoromethane	75-71-8	1	1.28	2.00	ND	ug/L	U
Methyl tert-butyl Ether	1634-04-4	1	1.40	5.00	ND	ug/L	U

CALIBRE	Project: Boeing Renton	
-	Project Number: [none]	**Reported:**
- -, -	Project Manager: Tom McKeon	30-Oct-2023 14:01

DUP01-102623

23J0709-03RE1 (Water)

Volatile Organic Compounds

Method: EPA 8260D — Sampled: 10/26/2023 08:00

Instrument: NT20 Analyst: PKC — Analyzed: 10/27/2023 15:14

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
2-Pentanone	107-87-9	1	23.4	50.0	ND	ug/L	U
Surrogate: 1,2-Dichloroethane-d4				*80-129 %*	*107*	*%*	
Surrogate: Toluene-d8				*80-120 %*	*98.1*	*%*	
Surrogate: 4-Bromofluorobenzene				*80-120 %*	*96.1*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4				*80-120 %*	*101*	*%*	

Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

CALIBRE	Project: Boeing Renton	
-	Project Number: [none]	**Reported:**
- -, -	Project Manager: Tom McKeon	30-Oct-2023 14:01

Trip Blank
23J0709-04 (Water)

Volatile Organic Compounds

Method: EPA 8260D — Sampled: 10/26/2023 08:00

Instrument: NT20 Analyst: PKC — Analyzed: 10/27/2023 13:38

Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap) — Extract ID: 23J0709-04 B

Preparation Batch: BLJ0861 — Sample Size: 10 mL

Prepared: 10/27/2023 — Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Chloromethane	74-87-3	1	0.27	0.50	ND	ug/L	U
Vinyl Chloride	75-01-4	1	0.08	0.20	ND	ug/L	U
Bromomethane	74-83-9	1	0.23	1.00	ND	ug/L	U
Chloroethane	75-00-3	1	0.05	0.20	ND	ug/L	U
Trichlorofluoromethane	75-69-4	1	0.13	0.20	ND	ug/L	U
Acrolein	107-02-8	1	2.70	5.00	ND	ug/L	U
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	1	0.11	0.20	ND	ug/L	U
Acetone	67-64-1	1	1.91	5.00	ND	ug/L	U
1,1-Dichloroethene	75-35-4	1	0.08	0.20	ND	ug/L	U
Iodomethane	74-88-4	1	0.15	1.00	ND	ug/L	U
Methylene Chloride	75-09-2	1	0.53	1.00	ND	ug/L	U
Acrylonitrile	107-13-1	1	0.40	1.00	ND	ug/L	U
Carbon Disulfide	75-15-0	1	0.06	0.20	ND	ug/L	U
trans-1,2-Dichloroethene	156-60-5	1	0.07	0.20	ND	ug/L	U
Vinyl Acetate	108-05-4	1	0.12	0.20	ND	ug/L	U
1,1-Dichloroethane	75-34-3	1	0.04	0.20	ND	ug/L	U
2-Butanone	78-93-3	1	1.77	5.00	ND	ug/L	U
2,2-Dichloropropane	594-20-7	1	0.11	0.20	ND	ug/L	U
cis-1,2-Dichloroethene	156-59-2	1	0.08	0.20	ND	ug/L	U
Chloroform	67-66-3	1	0.05	0.20	ND	ug/L	U
Bromochloromethane	74-97-5	1	0.09	0.20	ND	ug/L	U
1,1,1-Trichloroethane	71-55-6	1	0.08	0.20	ND	ug/L	U
1,1-Dichloropropene	563-58-6	1	0.09	0.20	ND	ug/L	U
Carbon tetrachloride	56-23-5	1	0.09	0.20	ND	ug/L	U
1,2-Dichloroethane	107-06-2	1	0.08	0.20	ND	ug/L	U
Benzene	71-43-2	1	0.05	0.20	ND	ug/L	U
Trichloroethene	79-01-6	1	0.07	0.20	ND	ug/L	U
1,2-Dichloropropane	78-87-5	1	0.07	0.20	ND	ug/L	U
Bromodichloromethane	75-27-4	1	0.09	0.20	ND	ug/L	U
Dibromomethane	74-95-3	1	0.06	0.20	ND	ug/L	U
2-Chloroethyl vinyl ether	110-75-8	1	0.55	1.00	ND	ug/L	U
4-Methyl-2-Pentanone	108-10-1	1	1.90	5.00	ND	ug/L	U
cis-1,3-Dichloropropene	10061-01-5	1	0.09	0.20	ND	ug/L	U
Toluene	108-88-3	1	0.05	0.20	ND	ug/L	U
trans-1,3-Dichloropropene	10061-02-6	1	0.09	0.20	ND	ug/L	U

Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

CALIBRE	Project: Boeing Renton	
-	Project Number: [none]	**Reported:**
- -, -	Project Manager: Tom McKeon	30-Oct-2023 14:01

Trip Blank

23J0709-04 (Water)

Volatile Organic Compounds

Method: EPA 8260D — Sampled: 10/26/2023 08:00

Instrument: NT20 Analyst: PKC — Analyzed: 10/27/2023 13:38

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
2-Hexanone	591-78-6	1	2.06	5.00	ND	ug/L	U
1,1,2-Trichloroethane	79-00-5	1	0.10	0.20	ND	ug/L	U
1,3-Dichloropropane	142-28-9	1	0.07	0.20	ND	ug/L	U
Tetrachloroethene	127-18-4	1	0.09	0.20	ND	ug/L	U
Dibromochloromethane	124-48-1	1	0.09	0.20	ND	ug/L	U
1,2-Dibromoethane	106-93-4	1	0.09	0.20	ND	ug/L	U
Chlorobenzene	108-90-7	1	0.06	0.20	ND	ug/L	U
Ethylbenzene	100-41-4	1	0.05	0.20	ND	ug/L	U
1,1,1,2-Tetrachloroethane	630-20-6	1	0.09	0.20	ND	ug/L	U
m,p-Xylene	179601-23-1	1	0.14	0.40	ND	ug/L	U
o-Xylene	95-47-6	1	0.08	0.20	ND	ug/L	U
Xylenes, total	1330-20-7	1	0.22	0.60	ND	ug/L	U
Styrene	100-42-5	1	0.09	0.20	ND	ug/L	U
Bromoform	75-25-2	1	0.15	0.20	ND	ug/L	U
1,1,2,2-Tetrachloroethane	79-34-5	1	0.03	0.20	ND	ug/L	U
1,2,3-Trichloropropane	96-18-4	1	0.16	0.50	ND	ug/L	U
trans-1,4-Dichloro 2-Butene	110-57-6	1	0.60	1.00	ND	ug/L	U
n-Propylbenzene	103-65-1	1	0.07	0.20	ND	ug/L	U
Bromobenzene	108-86-1	1	0.07	0.20	ND	ug/L	U
Isopropyl Benzene	98-82-8	1	0.07	0.20	ND	ug/L	U
2-Chlorotoluene	95-49-8	1	0.06	0.20	ND	ug/L	U
4-Chlorotoluene	106-43-4	1	0.06	0.20	ND	ug/L	U
t-Butylbenzene	98-06-6	1	0.07	0.20	ND	ug/L	U
1,3,5-Trimethylbenzene	108-67-8	1	0.07	0.20	ND	ug/L	U
1,2,4-Trimethylbenzene	95-63-6	1	0.05	0.20	ND	ug/L	U
s-Butylbenzene	135-98-8	1	0.06	0.20	ND	ug/L	U
4-Isopropyl Toluene	99-87-6	1	0.08	0.20	ND	ug/L	U
1,3-Dichlorobenzene	541-73-1	1	0.08	0.20	ND	ug/L	U
1,4-Dichlorobenzene	106-46-7	1	0.10	0.20	ND	ug/L	U
n-Butylbenzene	104-51-8	1	0.18	0.20	ND	ug/L	U
1,2-Dichlorobenzene	95-50-1	1	0.08	0.20	ND	ug/L	U
1,2-Dibromo-3-chloropropane	96-12-8	1	0.39	0.50	ND	ug/L	U
1,2,4-Trichlorobenzene	120-82-1	1	0.21	0.50	ND	ug/L	U
Hexachloro-1,3-Butadiene	87-68-3	1	1.00	2.00	ND	ug/L	U
Naphthalene	91-20-3	1	0.27	0.50	ND	ug/L	U
1,2,3-Trichlorobenzene	87-61-6	1	0.25	0.50	ND	ug/L	U
Dichlorodifluoromethane	75-71-8	1	0.13	0.20	ND	ug/L	U
Methyl tert-butyl Ether	1634-04-4	1	0.14	0.50	ND	ug/L	U

CALIBRE	Project: Boeing Renton	
-	Project Number: [none]	**Reported:**
- -, -	Project Manager: Tom McKeon	30-Oct-2023 14:01

Trip Blank

23J0709-04 (Water)

Volatile Organic Compounds

Method: EPA 8260D — Sampled: 10/26/2023 08:00

Instrument: NT20 Analyst: PKC — Analyzed: 10/27/2023 13:38

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
2-Pentanone	107-87-9	1	2.34	5.00	ND	ug/L	U
Surrogate: 1,2-Dichloroethane-d4				*80-129 %*	*100*	*%*	
Surrogate: Toluene-d8				*80-120 %*	*97.7*	*%*	
Surrogate: 4-Bromofluorobenzene				*80-120 %*	*93.3*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4				*80-120 %*	*99.0*	*%*	

Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

CALIBRE	Project: Boeing Renton	
-	Project Number: [none]	**Reported:**
- -, -	Project Manager: Tom McKeon	30-Oct-2023 14:01

Analysis by: Analytical Resources, LLC

Volatile Organic Compounds - Quality Control

Batch BLJ0816 - EPA 8260D

Instrument: NT20 Analyst: LH

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BLJ0816-BLK2)					Prepared: 26-Oct-2023 Analyzed: 26-Oct-2023 08:38						
Chloromethane	ND	0.27	0.50	ug/L							U
Vinyl Chloride	ND	0.08	0.20	ug/L							U
Bromomethane	ND	0.23	1.00	ug/L							U
Chloroethane	ND	0.05	0.20	ug/L							U
Trichlorofluoromethane	ND	0.13	0.20	ug/L							U
Acrolein	ND	2.70	5.00	ug/L							U
1,1,2-Trichloro-1,2,2-Trifluoroethane	ND	0.11	0.20	ug/L							U
Acetone	ND	1.91	5.00	ug/L							U
1,1-Dichloroethene	ND	0.08	0.20	ug/L							U
Iodomethane	ND	0.15	1.00	ug/L							U
Methylene Chloride	ND	0.53	1.00	ug/L							U
Acrylonitrile	ND	0.40	1.00	ug/L							U
Carbon Disulfide	ND	0.06	0.20	ug/L							U
trans-1,2-Dichloroethene	ND	0.07	0.20	ug/L							U
Vinyl Acetate	ND	0.12	0.20	ug/L							U
1,1-Dichloroethane	ND	0.04	0.20	ug/L							U
2-Butanone	ND	1.77	5.00	ug/L							U
2,2-Dichloropropane	ND	0.11	0.20	ug/L							U
cis-1,2-Dichloroethene	ND	0.08	0.20	ug/L							U
Chloroform	ND	0.05	0.20	ug/L							U
Bromochloromethane	ND	0.09	0.20	ug/L							U
1,1,1-Trichloroethane	ND	0.08	0.20	ug/L							U
1,1-Dichloropropene	ND	0.09	0.20	ug/L							U
Carbon tetrachloride	ND	0.09	0.20	ug/L							U
1,2-Dichloroethane	ND	0.08	0.20	ug/L							U
Benzene	ND	0.05	0.20	ug/L							U
Trichloroethene	ND	0.07	0.20	ug/L							U
1,2-Dichloropropane	ND	0.07	0.20	ug/L							U
Bromodichloromethane	ND	0.09	0.20	ug/L							U
Dibromomethane	ND	0.06	0.20	ug/L							U
2-Chloroethyl vinyl ether	ND	0.55	1.00	ug/L							U
4-Methyl-2-Pentanone	ND	1.90	5.00	ug/L							U
cis-1,3-Dichloropropene	ND	0.09	0.20	ug/L							U
Toluene	ND	0.05	0.20	ug/L							U
trans-1,3-Dichloropropene	ND	0.09	0.20	ug/L							U

CALIBRE	Project: Boeing Renton	
-	Project Number: [none]	**Reported:**
- -, -	Project Manager: Tom McKeon	30-Oct-2023 14:01

Analysis by: Analytical Resources, LLC

Volatile Organic Compounds - Quality Control

Batch BLJ0816 - EPA 8260D

Instrument: NT20 Analyst: LH

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BLJ0816-BLK2)					Prepared: 26-Oct-2023 Analyzed: 26-Oct-2023 08:38						
2-Hexanone	ND	2.06	5.00	ug/L							U
1,1,2-Trichloroethane	ND	0.10	0.20	ug/L							U
1,3-Dichloropropane	ND	0.07	0.20	ug/L							U
Tetrachloroethene	ND	0.09	0.20	ug/L							U
Dibromochloromethane	ND	0.09	0.20	ug/L							U
1,2-Dibromoethane	ND	0.09	0.20	ug/L							U
Chlorobenzene	ND	0.06	0.20	ug/L							U
Ethylbenzene	ND	0.05	0.20	ug/L							U
1,1,1,2-Tetrachloroethane	ND	0.09	0.20	ug/L							U
m,p-Xylene	ND	0.14	0.40	ug/L							U
o-Xylene	ND	0.08	0.20	ug/L							U
Xylenes, total	ND	0.22	0.60	ug/L							U
Styrene	ND	0.09	0.20	ug/L							U
Bromoform	ND	0.15	0.20	ug/L							U
1,1,2,2-Tetrachloroethane	ND	0.03	0.20	ug/L							U
1,2,3-Trichloropropane	ND	0.16	0.50	ug/L							U
trans-1,4-Dichloro 2-Butene	ND	0.60	1.00	ug/L							U
n-Propylbenzene	ND	0.07	0.20	ug/L							U
Bromobenzene	ND	0.07	0.20	ug/L							U
Isopropyl Benzene	ND	0.07	0.20	ug/L							U
2-Chlorotoluene	ND	0.06	0.20	ug/L							U
4-Chlorotoluene	ND	0.06	0.20	ug/L							U
t-Butylbenzene	ND	0.07	0.20	ug/L							U
1,3,5-Trimethylbenzene	ND	0.07	0.20	ug/L							U
1,2,4-Trimethylbenzene	ND	0.05	0.20	ug/L							U
s-Butylbenzene	ND	0.06	0.20	ug/L							U
4-Isopropyl Toluene	ND	0.08	0.20	ug/L							U
1,3-Dichlorobenzene	ND	0.08	0.20	ug/L							U
1,4-Dichlorobenzene	ND	0.10	0.20	ug/L							U
n-Butylbenzene	ND	0.18	0.20	ug/L							U
1,2-Dichlorobenzene	ND	0.08	0.20	ug/L							U
1,2-Dibromo-3-chloropropane	ND	0.39	0.50	ug/L							U
1,2,4-Trichlorobenzene	ND	0.21	0.50	ug/L							U
Hexachloro-1,3-Butadiene	ND	1.00	2.00	ug/L							U
Naphthalene	ND	0.27	0.50	ug/L							U

CALIBRE	Project: Boeing Renton	
-	Project Number: [none]	**Reported:**
- -, -	Project Manager: Tom McKeon	30-Oct-2023 14:01

Analysis by: Analytical Resources, LLC

Volatile Organic Compounds - Quality Control

Batch BLJ0816 - EPA 8260D

Instrument: NT20 Analyst: LH

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BLJ0816-BLK2)					Prepared: 26-Oct-2023 Analyzed: 26-Oct-2023 08:38						
1,2,3-Trichlorobenzene	ND	0.25	0.50	ug/L							U
Dichlorodifluoromethane	ND	0.13	0.20	ug/L							U
Methyl tert-butyl Ether	ND	0.14	0.50	ug/L							U
2-Pentanone	ND	2.34	5.00	ug/L							U
Surrogate: 1,2-Dichloroethane-d4	4.81			ug/L	*5.00*		*96.3*	*80-129*			
Surrogate: Toluene-d8	4.84			ug/L	*5.00*		*96.8*	*80-120*			
Surrogate: 4-Bromofluorobenzene	4.66			ug/L	*5.00*		*93.3*	*80-120*			
Surrogate: 1,2-Dichlorobenzene-d4	5.14			ug/L	*5.00*		*103*	*80-120*			

Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

CALIBRE	Project: Boeing Renton	
-	Project Number: [none]	**Reported:**
- -, -	Project Manager: Tom McKeon	30-Oct-2023 14:01

Analysis by: Analytical Resources, LLC

Volatile Organic Compounds - Quality Control

Batch BLJ0816 - EPA 8260D

Instrument: NT20 Analyst: LH

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS (BLJ0816-BS2)					Prepared: 26-Oct-2023	Analyzed: 26-Oct-2023 07:06					
Chloromethane	10.1	0.27	0.50	ug/L	10.0		101	60-138			
Vinyl Chloride	11.1	0.08	0.20	ug/L	10.0		111	66-133			
Bromomethane	10.7	0.23	1.00	ug/L	10.0		107	72-131			
Chloroethane	10.7	0.05	0.20	ug/L	10.0		107	60-155			
Trichlorofluoromethane	10.4	0.13	0.20	ug/L	10.0		104	62-141			
Acrolein	61.2	2.70	5.00	ug/L	50.0		122	52-190			Q
1,1,2-Trichloro-1,2,2-Trifluoroethane	11.3	0.11	0.20	ug/L	10.0		113	76-129			
Acetone	53.5	1.91	5.00	ug/L	50.0		107	58-142			
1,1-Dichloroethene	11.4	0.08	0.20	ug/L	10.0		114	69-135			
Iodomethane	10.9	0.15	1.00	ug/L	10.0		109	56-147			
Methylene Chloride	10.1	0.53	1.00	ug/L	10.0		101	65-135			
Acrylonitrile	10.4	0.40	1.00	ug/L	10.0		104	64-134			
Carbon Disulfide	10.7	0.06	0.20	ug/L	10.0		107	78-125			
trans-1,2-Dichloroethene	10.9	0.07	0.20	ug/L	10.0		109	78-128			
Vinyl Acetate	10.0	0.12	0.20	ug/L	10.0		100	55-138			
1,1-Dichloroethane	10.9	0.04	0.20	ug/L	10.0		109	76-124			
2-Butanone	53.5	1.77	5.00	ug/L	50.0		107	61-140			
2,2-Dichloropropane	11.1	0.11	0.20	ug/L	10.0		111	66-147			
cis-1,2-Dichloroethene	11.9	0.08	0.20	ug/L	10.0		119	80-121			
Chloroform	11.2	0.05	0.20	ug/L	10.0		112	80-122			
Bromochloromethane	11.1	0.09	0.20	ug/L	10.0		111	80-121			
1,1,1-Trichloroethane	11.0	0.08	0.20	ug/L	10.0		110	79-123			
1,1-Dichloropropene	11.1	0.09	0.20	ug/L	10.0		111	80-127			
Carbon tetrachloride	11.3	0.09	0.20	ug/L	10.0		113	53-137			
1,2-Dichloroethane	10.7	0.08	0.20	ug/L	10.0		107	75-123			
Benzene	11.0	0.05	0.20	ug/L	10.0		110	80-120			
Trichloroethene	11.1	0.07	0.20	ug/L	10.0		111	80-120			
1,2-Dichloropropane	10.9	0.07	0.20	ug/L	10.0		109	80-120			
Bromodichloromethane	11.1	0.09	0.20	ug/L	10.0		111	80-121			
Dibromomethane	9.68	0.06	0.20	ug/L	10.0		96.8	80-120			
2-Chloroethyl vinyl ether	10.2	0.55	1.00	ug/L	10.0		102	64-120			
4-Methyl-2-Pentanone	51.0	1.90	5.00	ug/L	50.0		102	67-133			
cis-1,3-Dichloropropene	11.2	0.09	0.20	ug/L	10.0		112	80-124			
Toluene	11.0	0.05	0.20	ug/L	10.0		110	80-120			
trans-1,3-Dichloropropene	11.1	0.09	0.20	ug/L	10.0		111	71-127			

Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

CALIBRE	Project: Boeing Renton	
-	Project Number: [none]	**Reported:**
- -, -	Project Manager: Tom McKeon	30-Oct-2023 14:01

Analysis by: Analytical Resources, LLC

Volatile Organic Compounds - Quality Control

Batch BLJ0816 - EPA 8260D

Instrument: NT20 Analyst: LH

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS (BLJ0816-BS2)					Prepared: 26-Oct-2023 Analyzed: 26-Oct-2023 07:06						
2-Hexanone	51.8	2.06	5.00	ug/L	50.0		104	69-133			
1,1,2-Trichloroethane	10.0	0.10	0.20	ug/L	10.0		100	80-121			
1,3-Dichloropropane	10.5	0.07	0.20	ug/L	10.0		105	80-120			
Tetrachloroethene	11.0	0.09	0.20	ug/L	10.0		110	80-120			
Dibromochloromethane	9.64	0.09	0.20	ug/L	10.0		96.4	65-135			
1,2-Dibromoethane	10.9	0.09	0.20	ug/L	10.0		109	80-121			
Chlorobenzene	11.1	0.06	0.20	ug/L	10.0		111	80-120			
Ethylbenzene	11.0	0.05	0.20	ug/L	10.0		110	80-120			
1,1,1,2-Tetrachloroethane	11.2	0.09	0.20	ug/L	10.0		112	80-120			
m,p-Xylene	22.8	0.14	0.40	ug/L	20.0		114	80-121			
o-Xylene	11.2	0.08	0.20	ug/L	10.0		112	80-121			
Xylenes, total	34.1	0.22	0.60	ug/L	30.0		114	76-127			
Styrene	11.4	0.09	0.20	ug/L	10.0		114	80-124			
Bromoform	9.28	0.15	0.20	ug/L	10.0		92.8	51-134			
1,1,2,2-Tetrachloroethane	10.8	0.03	0.20	ug/L	10.0		108	77-123			
1,2,3-Trichloropropane	10.4	0.16	0.50	ug/L	10.0		104	76-125			
trans-1,4-Dichloro 2-Butene	10.4	0.60	1.00	ug/L	10.0		104	55-129			
n-Propylbenzene	11.3	0.07	0.20	ug/L	10.0		113	78-130			
Bromobenzene	11.3	0.07	0.20	ug/L	10.0		113	80-120			
Isopropyl Benzene	11.6	0.07	0.20	ug/L	10.0		116	80-128			
2-Chlorotoluene	11.3	0.06	0.20	ug/L	10.0		113	78-122			
4-Chlorotoluene	11.5	0.06	0.20	ug/L	10.0		115	80-121			
t-Butylbenzene	11.3	0.07	0.20	ug/L	10.0		113	78-125			
1,3,5-Trimethylbenzene	11.6	0.07	0.20	ug/L	10.0		116	80-129			
1,2,4-Trimethylbenzene	11.6	0.05	0.20	ug/L	10.0		116	80-127			
s-Butylbenzene	11.4	0.06	0.20	ug/L	10.0		114	78-129			
4-Isopropyl Toluene	11.4	0.08	0.20	ug/L	10.0		114	79-130			
1,3-Dichlorobenzene	11.1	0.08	0.20	ug/L	10.0		111	80-120			
1,4-Dichlorobenzene	11.2	0.10	0.20	ug/L	10.0		112	80-120			
n-Butylbenzene	11.2	0.18	0.20	ug/L	10.0		112	74-129			
1,2-Dichlorobenzene	11.1	0.08	0.20	ug/L	10.0		111	80-120			
1,2-Dibromo-3-chloropropane	9.55	0.39	0.50	ug/L	10.0		95.5	62-123			
1,2,4-Trichlorobenzene	10.7	0.21	0.50	ug/L	10.0		107	64-124			
Hexachloro-1,3-Butadiene	9.63	1.00	2.00	ug/L	10.0		96.3	65-145			
Naphthalene	10.8	0.27	0.50	ug/L	10.0		108	50-134			

CALIBRE	Project: Boeing Renton	
-	Project Number: [none]	**Reported:**
- -, -	Project Manager: Tom McKeon	30-Oct-2023 14:01

Analysis by: Analytical Resources, LLC

Volatile Organic Compounds - Quality Control

Batch BLJ0816 - EPA 8260D

Instrument: NT20 Analyst: LH

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS (BLJ0816-BS2)					Prepared: 26-Oct-2023	Analyzed: 26-Oct-2023 07:06					
1,2,3-Trichlorobenzene	10.6	0.25	0.50	ug/L	10.0		106	49-133			
Dichlorodifluoromethane	11.1	0.13	0.20	ug/L	10.0		111	48-147			
Methyl tert-butyl Ether	9.91	0.14	0.50	ug/L	10.0		99.1	71-132			
2-Pentanone	52.2	2.34	5.00	ug/L	50.0		104	69-134			
Surrogate: 1,2-Dichloroethane-d4	5.04			ug/L	*5.00*		*101*	*80-129*			
Surrogate: Toluene-d8	5.06			ug/L	*5.00*		*101*	*80-120*			
Surrogate: 4-Bromofluorobenzene	5.00			ug/L	*5.00*		*99.9*	*80-120*			
Surrogate: 1,2-Dichlorobenzene-d4	4.97			ug/L	*5.00*		*99.4*	*80-120*			

CALIBRE	Project: Boeing Renton	
-	Project Number: [none]	Reported:
- -, -	Project Manager: Tom McKeon	30-Oct-2023 14:01

Analysis by: Analytical Resources, LLC

Volatile Organic Compounds - Quality Control

Batch BLJ0816 - EPA 8260D

Instrument: NT20 Analyst: LH

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS Dup (BLJ0816-BSD2)					Prepared: 26-Oct-2023 Analyzed: 26-Oct-2023 07:52						
Chloromethane	9.89	0.27	0.50	ug/L	10.0		98.9	60-138	2.53	30	
Vinyl Chloride	10.8	0.08	0.20	ug/L	10.0		108	66-133	2.06	30	
Bromomethane	10.6	0.23	1.00	ug/L	10.0		106	72-131	0.64	30	
Chloroethane	10.7	0.05	0.20	ug/L	10.0		107	60-155	0.03	30	
Trichlorofluoromethane	10.4	0.13	0.20	ug/L	10.0		104	62-141	0.63	30	
Acrolein	60.5	2.70	5.00	ug/L	50.0		121	52-190	1.28	30	Q
1,1,2-Trichloro-1,2,2-Trifluoroethane	11.2	0.11	0.20	ug/L	10.0		112	76-129	1.38	30	
Acetone	54.1	1.91	5.00	ug/L	50.0		108	58-142	1.05	30	
1,1-Dichloroethene	11.3	0.08	0.20	ug/L	10.0		113	69-135	0.93	30	
Iodomethane	10.9	0.15	1.00	ug/L	10.0		109	56-147	0.15	30	
Methylene Chloride	10.1	0.53	1.00	ug/L	10.0		101	65-135	0.46	30	
Acrylonitrile	10.3	0.40	1.00	ug/L	10.0		103	64-134	0.72	30	
Carbon Disulfide	10.5	0.06	0.20	ug/L	10.0		105	78-125	1.83	30	
trans-1,2-Dichloroethene	11.1	0.07	0.20	ug/L	10.0		111	78-128	1.82	30	
Vinyl Acetate	10.3	0.12	0.20	ug/L	10.0		103	55-138	2.54	30	
1,1-Dichloroethane	11.0	0.04	0.20	ug/L	10.0		110	76-124	0.35	30	
2-Butanone	53.5	1.77	5.00	ug/L	50.0		107	61-140	0.13	30	
2,2-Dichloropropane	10.9	0.11	0.20	ug/L	10.0		109	66-147	1.60	30	
cis-1,2-Dichloroethene	11.8	0.08	0.20	ug/L	10.0		118	80-121	0.77	30	
Chloroform	11.2	0.05	0.20	ug/L	10.0		112	80-122	0.19	30	
Bromochloromethane	11.0	0.09	0.20	ug/L	10.0		110	80-121	0.78	30	
1,1,1-Trichloroethane	10.9	0.08	0.20	ug/L	10.0		109	79-123	0.88	30	
1,1-Dichloropropene	11.0	0.09	0.20	ug/L	10.0		110	80-127	1.64	30	
Carbon tetrachloride	10.8	0.09	0.20	ug/L	10.0		108	53-137	3.78	30	
1,2-Dichloroethane	10.8	0.08	0.20	ug/L	10.0		108	75-123	0.16	30	
Benzene	10.7	0.05	0.20	ug/L	10.0		107	80-120	2.74	30	
Trichloroethene	11.0	0.07	0.20	ug/L	10.0		110	80-120	1.11	30	
1,2-Dichloropropane	10.7	0.07	0.20	ug/L	10.0		107	80-120	1.06	30	
Bromodichloromethane	10.9	0.09	0.20	ug/L	10.0		109	80-121	1.58	30	
Dibromomethane	7.72	0.06	0.20	ug/L	10.0		77.2	80-120	22.50	30	*
2-Chloroethyl vinyl ether	10.3	0.55	1.00	ug/L	10.0		103	64-120	1.16	30	
4-Methyl-2-Pentanone	51.0	1.90	5.00	ug/L	50.0		102	67-133	0.01	30	
cis-1,3-Dichloropropene	10.9	0.09	0.20	ug/L	10.0		109	80-124	2.62	30	
Toluene	10.8	0.05	0.20	ug/L	10.0		108	80-120	1.92	30	
trans-1,3-Dichloropropene	10.9	0.09	0.20	ug/L	10.0		109	71-127	1.98	30	

Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

CALIBRE	Project: Boeing Renton	
-	Project Number: [none]	**Reported:**
- -, -	Project Manager: Tom McKeon	30-Oct-2023 14:01

Analysis by: Analytical Resources, LLC

Volatile Organic Compounds - Quality Control

Batch BLJ0816 - EPA 8260D

Instrument: NT20 Analyst: LH

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS Dup (BLJ0816-BSD2)					Prepared: 26-Oct-2023	Analyzed: 26-Oct-2023 07:52					
2-Hexanone	53.0	2.06	5.00	ug/L	50.0		106	69-133	2.24	30	
1,1,2-Trichloroethane	10.1	0.10	0.20	ug/L	10.0		101	80-121	0.41	30	
1,3-Dichloropropane	10.6	0.07	0.20	ug/L	10.0		106	80-120	0.25	30	
Tetrachloroethene	11.1	0.09	0.20	ug/L	10.0		111	80-120	1.04	30	
Dibromochloromethane	9.92	0.09	0.20	ug/L	10.0		99.2	65-135	2.84	30	
1,2-Dibromoethane	10.8	0.09	0.20	ug/L	10.0		108	80-121	0.94	30	
Chlorobenzene	11.1	0.06	0.20	ug/L	10.0		111	80-120	0.27	30	
Ethylbenzene	11.1	0.05	0.20	ug/L	10.0		111	80-120	0.39	30	
1,1,1,2-Tetrachloroethane	11.3	0.09	0.20	ug/L	10.0		113	80-120	1.65	30	
m,p-Xylene	22.9	0.14	0.40	ug/L	20.0		115	80-121	0.46	30	
o-Xylene	11.3	0.08	0.20	ug/L	10.0		113	80-121	0.89	30	
Xylenes, total	34.3	0.22	0.60	ug/L	30.0		114	76-127	0.60	30	
Styrene	11.4	0.09	0.20	ug/L	10.0		114	80-124	0.58	30	
Bromoform	9.79	0.15	0.20	ug/L	10.0		97.9	51-134	5.28	30	
1,1,2,2-Tetrachloroethane	11.2	0.03	0.20	ug/L	10.0		112	77-123	3.90	30	
1,2,3-Trichloropropane	11.6	0.16	0.50	ug/L	10.0		116	76-125	11.50	30	
trans-1,4-Dichloro 2-Butene	11.2	0.60	1.00	ug/L	10.0		112	55-129	7.41	30	
n-Propylbenzene	11.8	0.07	0.20	ug/L	10.0		118	78-130	3.91	30	
Bromobenzene	11.9	0.07	0.20	ug/L	10.0		119	80-120	5.29	30	
Isopropyl Benzene	12.3	0.07	0.20	ug/L	10.0		123	80-128	5.82	30	
2-Chlorotoluene	12.0	0.06	0.20	ug/L	10.0		120	78-122	6.09	30	
4-Chlorotoluene	12.0	0.06	0.20	ug/L	10.0		120	80-121	3.63	30	
t-Butylbenzene	11.8	0.07	0.20	ug/L	10.0		118	78-125	4.26	30	
1,3,5-Trimethylbenzene	12.1	0.07	0.20	ug/L	10.0		121	80-129	4.16	30	
1,2,4-Trimethylbenzene	12.0	0.05	0.20	ug/L	10.0		120	80-127	3.67	30	
s-Butylbenzene	11.9	0.06	0.20	ug/L	10.0		119	78-129	4.84	30	
4-Isopropyl Toluene	12.0	0.08	0.20	ug/L	10.0		120	79-130	5.45	30	
1,3-Dichlorobenzene	11.7	0.08	0.20	ug/L	10.0		117	80-120	4.58	30	
1,4-Dichlorobenzene	11.7	0.10	0.20	ug/L	10.0		117	80-120	5.08	30	
n-Butylbenzene	11.7	0.18	0.20	ug/L	10.0		117	74-129	4.88	30	
1,2-Dichlorobenzene	11.6	0.08	0.20	ug/L	10.0		116	80-120	4.03	30	
1,2-Dibromo-3-chloropropane	10.2	0.39	0.50	ug/L	10.0		102	62-123	6.40	30	
1,2,4-Trichlorobenzene	11.4	0.21	0.50	ug/L	10.0		114	64-124	6.61	30	
Hexachloro-1,3-Butadiene	10.8	1.00	2.00	ug/L	10.0		108	65-145	11.10	30	
Naphthalene	11.4	0.27	0.50	ug/L	10.0		114	50-134	5.57	30	

Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

CALIBRE	Project: Boeing Renton	
-	Project Number: [none]	**Reported:**
- -, -	Project Manager: Tom McKeon	30-Oct-2023 14:01

Analysis by: Analytical Resources, LLC

Volatile Organic Compounds - Quality Control

Batch BLJ0816 - EPA 8260D

Instrument: NT20 Analyst: LH

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS Dup (BLJ0816-BSD2)					Prepared: 26-Oct-2023	Analyzed: 26-Oct-2023 07:52					
1,2,3-Trichlorobenzene	11.4	0.25	0.50	ug/L	10.0		114	49-133	6.86	30	
Dichlorodifluoromethane	11.2	0.13	0.20	ug/L	10.0		112	48-147	0.89	30	
Methyl tert-butyl Ether	10.3	0.14	0.50	ug/L	10.0		103	71-132	3.64	30	
2-Pentanone	52.4	2.34	5.00	ug/L	50.0		105	69-134	0.30	30	
Surrogate: 1,2-Dichloroethane-d4	5.10			ug/L	*5.00*		*102*	*80-129*			
Surrogate: Toluene-d8	4.98			ug/L	*5.00*		*99.7*	*80-120*			
Surrogate: 4-Bromofluorobenzene	4.89			ug/L	*5.00*		*97.8*	*80-120*			
Surrogate: 1,2-Dichlorobenzene-d4	5.13			ug/L	*5.00*		*103*	*80-120*			

Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

CALIBRE	Project: Boeing Renton	
-	Project Number: [none]	**Reported:**
- -, -	Project Manager: Tom McKeon	30-Oct-2023 14:01

Analysis by: Analytical Resources, LLC

Volatile Organic Compounds - Quality Control

Batch BLJ0816 - EPA 8260D

Volatile Organic Compounds - Quality Control

Batch BLJ0861 - EPA 8260D

Instrument: NT20 Analyst: PKC

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BLJ0861-BLK2)					Prepared: 27-Oct-2023 Analyzed: 27-Oct-2023 13:01						
Chloromethane	ND	0.27	0.50	ug/L							U
Vinyl Chloride	ND	0.08	0.20	ug/L							U
Bromomethane	ND	0.23	1.00	ug/L							U
Chloroethane	ND	0.05	0.20	ug/L							U
Trichlorofluoromethane	ND	0.13	0.20	ug/L							U
Acrolein	ND	2.70	5.00	ug/L							U
1,1,2-Trichloro-1,2,2-Trifluoroethane	ND	0.11	0.20	ug/L							U
Acetone	ND	1.91	5.00	ug/L							U
1,1-Dichloroethene	ND	0.08	0.20	ug/L							U
Iodomethane	ND	0.15	1.00	ug/L							U
Methylene Chloride	ND	0.53	1.00	ug/L							U
Acrylonitrile	ND	0.40	1.00	ug/L							U
Carbon Disulfide	ND	0.06	0.20	ug/L							U
trans-1,2-Dichloroethene	ND	0.07	0.20	ug/L							U
Vinyl Acetate	ND	0.12	0.20	ug/L							U
1,1-Dichloroethane	ND	0.04	0.20	ug/L							U
2-Butanone	ND	1.77	5.00	ug/L							U
2,2-Dichloropropane	ND	0.11	0.20	ug/L							U
cis-1,2-Dichloroethene	ND	0.08	0.20	ug/L							U
Chloroform	ND	0.05	0.20	ug/L							U
Bromochloromethane	ND	0.09	0.20	ug/L							U
1,1,1-Trichloroethane	ND	0.08	0.20	ug/L							U
1,1-Dichloropropene	ND	0.09	0.20	ug/L							U
Carbon tetrachloride	ND	0.09	0.20	ug/L							U
1,2-Dichloroethane	ND	0.08	0.20	ug/L							U
Benzene	ND	0.05	0.20	ug/L							U
Trichloroethene	ND	0.07	0.20	ug/L							U
1,2-Dichloropropane	ND	0.07	0.20	ug/L							U
Bromodichloromethane	ND	0.09	0.20	ug/L							U
Dibromomethane	ND	0.06	0.20	ug/L							U
2-Chloroethyl vinyl ether	ND	0.55	1.00	ug/L							U
4-Methyl-2-Pentanone	ND	1.90	5.00	ug/L							U

CALIBRE	Project:	Boeing Renton	
-	Project Number:	[none]	**Reported:**
- -, -	Project Manager:	Tom McKeon	30-Oct-2023 14:01

Analysis by: Analytical Resources, LLC

Volatile Organic Compounds - Quality Control

Batch BLJ0861 - EPA 8260D

Instrument: NT20 Analyst: PKC

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BLJ0861-BLK2)					Prepared: 27-Oct-2023 Analyzed: 27-Oct-2023 13:01						
cis-1,3-Dichloropropene	ND	0.09	0.20	ug/L							U
Toluene	ND	0.05	0.20	ug/L							U
trans-1,3-Dichloropropene	ND	0.09	0.20	ug/L							U
2-Hexanone	ND	2.06	5.00	ug/L							U
1,1,2-Trichloroethane	ND	0.10	0.20	ug/L							U
1,3-Dichloropropane	ND	0.07	0.20	ug/L							U
Tetrachloroethene	ND	0.09	0.20	ug/L							U
Dibromochloromethane	ND	0.09	0.20	ug/L							U
1,2-Dibromoethane	ND	0.09	0.20	ug/L							U
Chlorobenzene	ND	0.06	0.20	ug/L							U
Ethylbenzene	ND	0.05	0.20	ug/L							U
1,1,1,2-Tetrachloroethane	ND	0.09	0.20	ug/L							U
m,p-Xylene	ND	0.14	0.40	ug/L							U
o-Xylene	ND	0.08	0.20	ug/L							U
Xylenes, total	ND	0.22	0.60	ug/L							U
Styrene	ND	0.09	0.20	ug/L							U
Bromoform	ND	0.15	0.20	ug/L							U
1,1,2,2-Tetrachloroethane	ND	0.03	0.20	ug/L							U
1,2,3-Trichloropropane	ND	0.16	0.50	ug/L							U
trans-1,4-Dichloro 2-Butene	ND	0.60	1.00	ug/L							U
n-Propylbenzene	ND	0.07	0.20	ug/L							U
Bromobenzene	ND	0.07	0.20	ug/L							U
Isopropyl Benzene	ND	0.07	0.20	ug/L							U
2-Chlorotoluene	ND	0.06	0.20	ug/L							U
4-Chlorotoluene	ND	0.06	0.20	ug/L							U
t-Butylbenzene	ND	0.07	0.20	ug/L							U
1,3,5-Trimethylbenzene	ND	0.07	0.20	ug/L							U
1,2,4-Trimethylbenzene	ND	0.05	0.20	ug/L							U
s-Butylbenzene	ND	0.06	0.20	ug/L							U
4-Isopropyl Toluene	ND	0.08	0.20	ug/L							U
1,3-Dichlorobenzene	ND	0.08	0.20	ug/L							U
1,4-Dichlorobenzene	ND	0.10	0.20	ug/L							U
n-Butylbenzene	ND	0.18	0.20	ug/L							U
1,2-Dichlorobenzene	ND	0.08	0.20	ug/L							U
1,2-Dibromo-3-chloropropane	ND	0.39	0.50	ug/L							U

Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

CALIBRE	Project: Boeing Renton	
-	Project Number: [none]	**Reported:**
- -, -	Project Manager: Tom McKeon	30-Oct-2023 14:01

Analysis by: Analytical Resources, LLC

Volatile Organic Compounds - Quality Control

Batch BLJ0861 - EPA 8260D

Instrument: NT20 Analyst: PKC

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BLJ0861-BLK2)					Prepared: 27-Oct-2023 Analyzed: 27-Oct-2023 13:01						
1,2,4-Trichlorobenzene	ND	0.21	0.50	ug/L							U
Hexachloro-1,3-Butadiene	ND	1.00	2.00	ug/L							U
Naphthalene	ND	0.27	0.50	ug/L							U
1,2,3-Trichlorobenzene	ND	0.25	0.50	ug/L							U
Dichlorodifluoromethane	ND	0.13	0.20	ug/L							U
Methyl tert-butyl Ether	ND	0.14	0.50	ug/L							U
2-Pentanone	ND	2.34	5.00	ug/L							U
Surrogate: 1,2-Dichloroethane-d4	5.05			ug/L	*5.00*		*101*	*80-129*			
Surrogate: Toluene-d8	4.83			ug/L	*5.00*		*96.5*	*80-120*			
Surrogate: 4-Bromofluorobenzene	4.83			ug/L	*5.00*		*96.5*	*80-120*			
Surrogate: 1,2-Dichlorobenzene-d4	5.04			ug/L	*5.00*		*101*	*80-120*			

CALIBRE	Project: Boeing Renton	
-	Project Number: [none]	**Reported:**
- -, -	Project Manager: Tom McKeon	30-Oct-2023 14:01

Analysis by: Analytical Resources, LLC

Volatile Organic Compounds - Quality Control

Batch BLJ0861 - EPA 8260D

Instrument: NT20 Analyst: PKC

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS (BLJ0861-BS2)					Prepared: 27-Oct-2023 Analyzed: 27-Oct-2023 11:29						
Chloromethane	9.76	0.27	0.50	ug/L	10.0		97.6	60-138			
Vinyl Chloride	10.5	0.08	0.20	ug/L	10.0		105	66-133			
Bromomethane	10.3	0.23	1.00	ug/L	10.0		103	72-131			
Chloroethane	10.4	0.05	0.20	ug/L	10.0		104	60-155			
Trichlorofluoromethane	9.74	0.13	0.20	ug/L	10.0		97.4	62-141			
Acrolein	57.3	2.70	5.00	ug/L	50.0		115	52-190			
1,1,2-Trichloro-1,2,2-Trifluoroethane	10.9	0.11	0.20	ug/L	10.0		109	76-129			
Acetone	52.0	1.91	5.00	ug/L	50.0		104	58-142			
1,1-Dichloroethene	10.9	0.08	0.20	ug/L	10.0		109	69-135			
Iodomethane	10.5	0.15	1.00	ug/L	10.0		105	56-147			
Methylene Chloride	9.78	0.53	1.00	ug/L	10.0		97.8	65-135			
Acrylonitrile	9.94	0.40	1.00	ug/L	10.0		99.4	64-134			
Carbon Disulfide	10.1	0.06	0.20	ug/L	10.0		101	78-125			
trans-1,2-Dichloroethene	10.4	0.07	0.20	ug/L	10.0		104	78-128			
Vinyl Acetate	9.53	0.12	0.20	ug/L	10.0		95.3	55-138			
1,1-Dichloroethane	10.5	0.04	0.20	ug/L	10.0		105	76-124			
2-Butanone	50.7	1.77	5.00	ug/L	50.0		101	61-140			
2,2-Dichloropropane	10.6	0.11	0.20	ug/L	10.0		106	66-147			
cis-1,2-Dichloroethene	11.8	0.08	0.20	ug/L	10.0		118	80-121			
Chloroform	10.7	0.05	0.20	ug/L	10.0		107	80-122			
Bromochloromethane	10.6	0.09	0.20	ug/L	10.0		106	80-121			
1,1,1-Trichloroethane	10.3	0.08	0.20	ug/L	10.0		103	79-123			
1,1-Dichloropropene	10.6	0.09	0.20	ug/L	10.0		106	80-127			
Carbon tetrachloride	10.5	0.09	0.20	ug/L	10.0		105	53-137			
1,2-Dichloroethane	10.4	0.08	0.20	ug/L	10.0		104	75-123			
Benzene	10.3	0.05	0.20	ug/L	10.0		103	80-120			
Trichloroethene	10.6	0.07	0.20	ug/L	10.0		106	80-120			
1,2-Dichloropropane	10.3	0.07	0.20	ug/L	10.0		103	80-120			
Bromodichloromethane	10.4	0.09	0.20	ug/L	10.0		104	80-121			
Dibromomethane	7.42	0.06	0.20	ug/L	10.0		74.2	80-120			*, Q
2-Chloroethyl vinyl ether	9.65	0.55	1.00	ug/L	10.0		96.5	64-120			
4-Methyl-2-Pentanone	49.3	1.90	5.00	ug/L	50.0		98.6	67-133			
cis-1,3-Dichloropropene	10.6	0.09	0.20	ug/L	10.0		106	80-124			
Toluene	10.6	0.05	0.20	ug/L	10.0		106	80-120			
trans-1,3-Dichloropropene	10.6	0.09	0.20	ug/L	10.0		106	71-127			

CALIBRE	Project: Boeing Renton	
-	Project Number: [none]	**Reported:**
- -, -	Project Manager: Tom McKeon	30-Oct-2023 14:01

Analysis by: Analytical Resources, LLC

Volatile Organic Compounds - Quality Control

Batch BLJ0861 - EPA 8260D

Instrument: NT20 Analyst: PKC

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS (BLJ0861-BS2)					Prepared: 27-Oct-2023	Analyzed: 27-Oct-2023 11:29					
2-Hexanone	48.6	2.06	5.00	ug/L	50.0		97.2	69-133			
1,1,2-Trichloroethane	9.73	0.10	0.20	ug/L	10.0		97.3	80-121			
1,3-Dichloropropane	10.1	0.07	0.20	ug/L	10.0		101	80-120			
Tetrachloroethene	10.5	0.09	0.20	ug/L	10.0		105	80-120			
Dibromochloromethane	9.19	0.09	0.20	ug/L	10.0		91.9	65-135			
1,2-Dibromoethane	10.5	0.09	0.20	ug/L	10.0		105	80-121			
Chlorobenzene	10.5	0.06	0.20	ug/L	10.0		105	80-120			
Ethylbenzene	10.5	0.05	0.20	ug/L	10.0		105	80-120			
1,1,1,2-Tetrachloroethane	10.6	0.09	0.20	ug/L	10.0		106	80-120			
m,p-Xylene	21.7	0.14	0.40	ug/L	20.0		109	80-121			
o-Xylene	10.7	0.08	0.20	ug/L	10.0		107	80-121			
Xylenes, total	32.4	0.22	0.60	ug/L	30.0		108	76-127			
Styrene	10.7	0.09	0.20	ug/L	10.0		107	80-124			
Bromoform	8.71	0.15	0.20	ug/L	10.0		87.1	51-134			
1,1,2,2-Tetrachloroethane	10.2	0.03	0.20	ug/L	10.0		102	77-123			
1,2,3-Trichloropropane	10.2	0.16	0.50	ug/L	10.0		102	76-125			
trans-1,4-Dichloro 2-Butene	9.81	0.60	1.00	ug/L	10.0		98.1	55-129			
n-Propylbenzene	10.9	0.07	0.20	ug/L	10.0		109	78-130			
Bromobenzene	10.7	0.07	0.20	ug/L	10.0		107	80-120			
Isopropyl Benzene	11.0	0.07	0.20	ug/L	10.0		110	80-128			
2-Chlorotoluene	10.8	0.06	0.20	ug/L	10.0		108	78-122			
4-Chlorotoluene	10.9	0.06	0.20	ug/L	10.0		109	80-121			
t-Butylbenzene	10.9	0.07	0.20	ug/L	10.0		109	78-125			
1,3,5-Trimethylbenzene	11.0	0.07	0.20	ug/L	10.0		110	80-129			
1,2,4-Trimethylbenzene	11.1	0.05	0.20	ug/L	10.0		111	80-127			
s-Butylbenzene	11.1	0.06	0.20	ug/L	10.0		111	78-129			
4-Isopropyl Toluene	11.1	0.08	0.20	ug/L	10.0		111	79-130			
1,3-Dichlorobenzene	10.7	0.08	0.20	ug/L	10.0		107	80-120			
1,4-Dichlorobenzene	10.7	0.10	0.20	ug/L	10.0		107	80-120			
n-Butylbenzene	11.1	0.18	0.20	ug/L	10.0		111	74-129			
1,2-Dichlorobenzene	10.6	0.08	0.20	ug/L	10.0		106	80-120			
1,2-Dibromo-3-chloropropane	9.42	0.39	0.50	ug/L	10.0		94.2	62-123			
1,2,4-Trichlorobenzene	10.5	0.21	0.50	ug/L	10.0		105	64-124			
Hexachloro-1,3-Butadiene	9.77	1.00	2.00	ug/L	10.0		97.7	65-145			
Naphthalene	10.3	0.27	0.50	ug/L	10.0		103	50-134			

CALIBRE	Project: Boeing Renton	
-	Project Number: [none]	**Reported:**
- -, -	Project Manager: Tom McKeon	30-Oct-2023 14:01

Analysis by: Analytical Resources, LLC

Volatile Organic Compounds - Quality Control

Batch BLJ0861 - EPA 8260D

Instrument: NT20 Analyst: PKC

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS (BLJ0861-BS2)					Prepared: 27-Oct-2023	Analyzed: 27-Oct-2023 11:29					
1,2,3-Trichlorobenzene	10.5	0.25	0.50	ug/L	10.0		105	49-133			
Dichlorodifluoromethane	10.3	0.13	0.20	ug/L	10.0		103	48-147			
Methyl tert-butyl Ether	9.36	0.14	0.50	ug/L	10.0		93.6	71-132			
2-Pentanone	49.8	2.34	5.00	ug/L	50.0		99.7	69-134			
Surrogate: 1,2-Dichloroethane-d4	4.93			ug/L	*5.00*		*98.5*	*80-129*			
Surrogate: Toluene-d8	5.06			ug/L	*5.00*		*101*	*80-120*			
Surrogate: 4-Bromofluorobenzene	4.88			ug/L	*5.00*		*97.6*	*80-120*			
Surrogate: 1,2-Dichlorobenzene-d4	5.02			ug/L	*5.00*		*100*	*80-120*			

CALIBRE	Project: Boeing Renton	
-	Project Number: [none]	**Reported:**
- -, -	Project Manager: Tom McKeon	30-Oct-2023 14:01

Analysis by: Analytical Resources, LLC

Volatile Organic Compounds - Quality Control

Batch BLJ0861 - EPA 8260D

Instrument: NT20 Analyst: PKC

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS Dup (BLJ0861-BSD2)					Prepared: 27-Oct-2023	Analyzed: 27-Oct-2023 12:15					
Chloromethane	10.6	0.27	0.50	ug/L	10.0		106	60-138	7.88	30	
Vinyl Chloride	11.2	0.08	0.20	ug/L	10.0		112	66-133	6.37	30	
Bromomethane	11.1	0.23	1.00	ug/L	10.0		111	72-131	7.16	30	
Chloroethane	11.0	0.05	0.20	ug/L	10.0		110	60-155	5.81	30	
Trichlorofluoromethane	10.8	0.13	0.20	ug/L	10.0		108	62-141	10.30	30	
Acrolein	63.1	2.70	5.00	ug/L	50.0		126	52-190	9.57	30	
1,1,2-Trichloro-1,2,2-Trifluoroethane	11.7	0.11	0.20	ug/L	10.0		117	76-129	6.55	30	
Acetone	56.2	1.91	5.00	ug/L	50.0		112	58-142	7.69	30	
1,1-Dichloroethene	11.6	0.08	0.20	ug/L	10.0		116	69-135	6.04	30	
Iodomethane	11.2	0.15	1.00	ug/L	10.0		112	56-147	7.08	30	
Methylene Chloride	10.5	0.53	1.00	ug/L	10.0		105	65-135	7.58	30	
Acrylonitrile	10.9	0.40	1.00	ug/L	10.0		109	64-134	9.02	30	
Carbon Disulfide	10.9	0.06	0.20	ug/L	10.0		109	78-125	7.60	30	
trans-1,2-Dichloroethene	11.4	0.07	0.20	ug/L	10.0		114	78-128	8.41	30	
Vinyl Acetate	10.4	0.12	0.20	ug/L	10.0		104	55-138	8.63	30	
1,1-Dichloroethane	11.3	0.04	0.20	ug/L	10.0		113	76-124	6.75	30	
2-Butanone	56.8	1.77	5.00	ug/L	50.0		114	61-140	11.40	30	
2,2-Dichloropropane	11.3	0.11	0.20	ug/L	10.0		113	66-147	6.80	30	
cis-1,2-Dichloroethene	12.0	0.08	0.20	ug/L	10.0		120	80-121	2.28	30	
Chloroform	11.6	0.05	0.20	ug/L	10.0		116	80-122	7.76	30	
Bromochloromethane	11.5	0.09	0.20	ug/L	10.0		115	80-121	8.15	30	
1,1,1-Trichloroethane	11.2	0.08	0.20	ug/L	10.0		112	79-123	8.15	30	
1,1-Dichloropropene	11.5	0.09	0.20	ug/L	10.0		115	80-127	7.90	30	
Carbon tetrachloride	11.4	0.09	0.20	ug/L	10.0		114	53-137	8.18	30	
1,2-Dichloroethane	11.2	0.08	0.20	ug/L	10.0		112	75-123	7.58	30	
Benzene	11.1	0.05	0.20	ug/L	10.0		111	80-120	7.30	30	
Trichloroethene	11.5	0.07	0.20	ug/L	10.0		115	80-120	7.84	30	
1,2-Dichloropropane	10.9	0.07	0.20	ug/L	10.0		109	80-120	5.28	30	
Bromodichloromethane	11.0	0.09	0.20	ug/L	10.0		110	80-121	5.60	30	
Dibromomethane	8.14	0.06	0.20	ug/L	10.0		81.4	80-120	9.29	30	Q
2-Chloroethyl vinyl ether	10.7	0.55	1.00	ug/L	10.0		107	64-120	10.70	30	
4-Methyl-2-Pentanone	53.8	1.90	5.00	ug/L	50.0		108	67-133	8.71	30	
cis-1,3-Dichloropropene	11.4	0.09	0.20	ug/L	10.0		114	80-124	7.90	30	
Toluene	11.2	0.05	0.20	ug/L	10.0		112	80-120	6.19	30	
trans-1,3-Dichloropropene	11.3	0.09	0.20	ug/L	10.0		113	71-127	7.03	30	

Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

CALIBRE	Project: Boeing Renton	
-	Project Number: [none]	**Reported:**
- -, -	Project Manager: Tom McKeon	30-Oct-2023 14:01

Analysis by: Analytical Resources, LLC

Volatile Organic Compounds - Quality Control

Batch BLJ0861 - EPA 8260D

Instrument: NT20 Analyst: PKC

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS Dup (BLJ0861-BSD2)					Prepared: 27-Oct-2023 Analyzed: 27-Oct-2023 12:15						
2-Hexanone	55.5	2.06	5.00	ug/L	50.0		111	69-133	13.20	30	
1,1,2-Trichloroethane	10.5	0.10	0.20	ug/L	10.0		105	80-121	7.58	30	
1,3-Dichloropropane	11.2	0.07	0.20	ug/L	10.0		112	80-120	10.50	30	
Tetrachloroethene	11.5	0.09	0.20	ug/L	10.0		115	80-120	9.43	30	
Dibromochloromethane	10.0	0.09	0.20	ug/L	10.0		100	65-135	8.89	30	
1,2-Dibromoethane	11.5	0.09	0.20	ug/L	10.0		115	80-121	8.66	30	
Chlorobenzene	11.5	0.06	0.20	ug/L	10.0		115	80-120	9.40	30	
Ethylbenzene	11.5	0.05	0.20	ug/L	10.0		115	80-120	9.53	30	
1,1,1,2-Tetrachloroethane	11.7	0.09	0.20	ug/L	10.0		117	80-120	9.67	30	
m,p-Xylene	23.7	0.14	0.40	ug/L	20.0		118	80-121	8.62	30	
o-Xylene	11.8	0.08	0.20	ug/L	10.0		118	80-121	9.35	30	
Xylenes, total	35.4	0.22	0.60	ug/L	30.0		118	76-127	8.86	30	
Styrene	11.8	0.09	0.20	ug/L	10.0		118	80-124	9.88	30	
Bromoform	10.2	0.15	0.20	ug/L	10.0		102	51-134	15.50	30	
1,1,2,2-Tetrachloroethane	11.8	0.03	0.20	ug/L	10.0		118	77-123	14.50	30	
1,2,3-Trichloropropane	11.5	0.16	0.50	ug/L	10.0		115	76-125	12.00	30	
trans-1,4-Dichloro 2-Butene	11.3	0.60	1.00	ug/L	10.0		113	55-129	14.30	30	
n-Propylbenzene	12.2	0.07	0.20	ug/L	10.0		122	78-130	11.00	30	
Bromobenzene	12.0	0.07	0.20	ug/L	10.0		120	80-120	11.10	30	
Isopropyl Benzene	12.4	0.07	0.20	ug/L	10.0		124	80-128	12.10	30	
2-Chlorotoluene	12.2	0.06	0.20	ug/L	10.0		122	78-122	12.20	30	
4-Chlorotoluene	12.2	0.06	0.20	ug/L	10.0		122	80-121	11.90	30	*
t-Butylbenzene	12.2	0.07	0.20	ug/L	10.0		122	78-125	10.80	30	
1,3,5-Trimethylbenzene	12.4	0.07	0.20	ug/L	10.0		124	80-129	11.50	30	
1,2,4-Trimethylbenzene	12.3	0.05	0.20	ug/L	10.0		123	80-127	10.20	30	
s-Butylbenzene	12.3	0.06	0.20	ug/L	10.0		123	78-129	10.80	30	
4-Isopropyl Toluene	12.4	0.08	0.20	ug/L	10.0		124	79-130	11.20	30	
1,3-Dichlorobenzene	12.0	0.08	0.20	ug/L	10.0		120	80-120	11.60	30	
1,4-Dichlorobenzene	12.1	0.10	0.20	ug/L	10.0		121	80-120	12.00	30	*
n-Butylbenzene	12.2	0.18	0.20	ug/L	10.0		122	74-129	9.81	30	
1,2-Dichlorobenzene	12.0	0.08	0.20	ug/L	10.0		120	80-120	12.20	30	
1,2-Dibromo-3-chloropropane	10.9	0.39	0.50	ug/L	10.0		109	62-123	14.30	30	
1,2,4-Trichlorobenzene	11.7	0.21	0.50	ug/L	10.0		117	64-124	11.40	30	
Hexachloro-1,3-Butadiene	11.2	1.00	2.00	ug/L	10.0		112	65-145	13.30	30	
Naphthalene	12.0	0.27	0.50	ug/L	10.0		120	50-134	15.70	30	

Analytical Resources, LLC
Analytical Chemists and Consultants

Analytical Report

CALIBRE	Project:	Boeing Renton	
-	Project Number:	[none]	**Reported:**
- -, -	Project Manager:	Tom McKeon	30-Oct-2023 14:01

Analysis by: Analytical Resources, LLC

Volatile Organic Compounds - Quality Control

Batch BLJ0861 - EPA 8260D

Instrument: NT20 Analyst: PKC

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS Dup (BLJ0861-BSD2)					Prepared: 27-Oct-2023		Analyzed: 27-Oct-2023 12:15				
1,2,3-Trichlorobenzene	11.8	0.25	0.50	ug/L	10.0		118	49-133	12.00	30	
Dichlorodifluoromethane	11.3	0.13	0.20	ug/L	10.0		113	48-147	9.81	30	
Methyl tert-butyl Ether	10.6	0.14	0.50	ug/L	10.0		106	71-132	12.60	30	
2-Pentanone	54.8	2.34	5.00	ug/L	50.0		110	69-134	9.56	30	
Surrogate: 1,2-Dichloroethane-d4	5.06			ug/L	*5.00*		*101*	*80-129*			
Surrogate: Toluene-d8	5.01			ug/L	*5.00*		*100*	*80-120*			
Surrogate: 4-Bromofluorobenzene	5.03			ug/L	*5.00*		*101*	*80-120*			
Surrogate: 1,2-Dichlorobenzene-d4	5.09			ug/L	*5.00*		*102*	*80-120*			

CALIBRE	Project: Boeing Renton	
-	Project Number: [none]	**Reported:**
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Certified Analyses included in this Report

Analyte	Certifications
EPA 8260D in Water	
Chloromethane	DoD-ELAP,ADEC,NELAP,WADOE
Vinyl Chloride	DoD-ELAP,ADEC,NELAP,WADOE
Bromomethane	DoD-ELAP,ADEC,NELAP,WADOE
Chloroethane	DoD-ELAP,ADEC,NELAP,WADOE
Trichlorofluoromethane	DoD-ELAP,ADEC,NELAP,WADOE
Acrolein	DoD-ELAP,NELAP,WADOE
1,1,2-Trichloro-1,2,2-Trifluoroeth	DoD-ELAP,ADEC,NELAP,WADOE
Acetone	DoD-ELAP,ADEC,NELAP,WADOE
1,1-Dichloroethene	DoD-ELAP,ADEC,NELAP,WADOE
Iodomethane	DoD-ELAP,NELAP,WADOE
Methylene Chloride	DoD-ELAP,ADEC,NELAP,WADOE
Acrylonitrile	DoD-ELAP,NELAP,WADOE
Carbon Disulfide	DoD-ELAP,NELAP,WADOE
trans-1,2-Dichloroethene	DoD-ELAP,ADEC,NELAP,WADOE
Vinyl Acetate	DoD-ELAP,NELAP,WADOE
1,1-Dichloroethane	DoD-ELAP,ADEC,NELAP,WADOE
2-Butanone	DoD-ELAP,NELAP,WADOE
2,2-Dichloropropane	DoD-ELAP,ADEC,NELAP,WADOE
cis-1,2-Dichloroethene	DoD-ELAP,ADEC,NELAP,WADOE
Chloroform	DoD-ELAP,ADEC,NELAP,WADOE
Bromochloromethane	DoD-ELAP,ADEC,NELAP,WADOE
1,1,1-Trichloroethane	DoD-ELAP,ADEC,NELAP,WADOE
1,1-Dichloropropene	DoD-ELAP,ADEC,NELAP,WADOE
Carbon tetrachloride	DoD-ELAP,ADEC,NELAP,WADOE
1,2-Dichloroethane	DoD-ELAP,ADEC,NELAP,WADOE
Benzene	DoD-ELAP,ADEC,NELAP,WADOE
Trichloroethene	DoD-ELAP,ADEC,NELAP,WADOE
1,2-Dichloropropane	DoD-ELAP,ADEC,NELAP,WADOE
Bromodichloromethane	DoD-ELAP,ADEC,NELAP,WADOE
Dibromomethane	DoD-ELAP,ADEC,NELAP,WADOE

CALIBRE	Project: Boeing Renton	
-	Project Number: [none]	Reported:
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2-Chloroethyl vinyl ether	DoD-ELAP,ADEC,NELAP,WADOE
4-Methyl-2-Pentanone	DoD-ELAP,NELAP,WADOE
cis-1,3-Dichloropropene	DoD-ELAP,ADEC,NELAP,WADOE
Toluene	DoD-ELAP,ADEC,NELAP,WADOE
trans-1,3-Dichloropropene	DoD-ELAP,ADEC,NELAP,WADOE
2-Hexanone	DoD-ELAP,NELAP,WADOE
1,1,2-Trichloroethane	DoD-ELAP,ADEC,NELAP,WADOE
1,3-Dichloropropane	DoD-ELAP,ADEC,NELAP,WADOE
Tetrachloroethene	DoD-ELAP,ADEC,NELAP,WADOE
Dibromochloromethane	DoD-ELAP,ADEC,NELAP,WADOE
1,2-Dibromoethane	DoD-ELAP,NELAP,WADOE
Chlorobenzene	DoD-ELAP,ADEC,NELAP,WADOE
Ethylbenzene	DoD-ELAP,ADEC,NELAP,WADOE
1,1,1,2-Tetrachloroethane	DoD-ELAP,ADEC,NELAP,WADOE
m,p-Xylene	DoD-ELAP,ADEC,NELAP,WADOE
o-Xylene	DoD-ELAP,ADEC,NELAP,WADOE
Styrene	DoD-ELAP,NELAP,WADOE
Bromoform	DoD-ELAP,NELAP,WADOE
1,1,2,2-Tetrachloroethane	DoD-ELAP,ADEC,NELAP,WADOE
1,2,3-Trichloropropane	DoD-ELAP,ADEC,NELAP,WADOE
trans-1,4-Dichloro 2-Butene	DoD-ELAP,ADEC,NELAP,WADOE
n-Propylbenzene	DoD-ELAP,NELAP,WADOE
Bromobenzene	DoD-ELAP,NELAP,WADOE
Isopropyl Benzene	DoD-ELAP,NELAP,WADOE
2-Chlorotoluene	DoD-ELAP,ADEC,NELAP,WADOE
4-Chlorotoluene	DoD-ELAP,ADEC,NELAP,WADOE
t-Butylbenzene	DoD-ELAP,NELAP,WADOE
1,3,5-Trimethylbenzene	DoD-ELAP,NELAP,WADOE
1,2,4-Trimethylbenzene	DoD-ELAP,NELAP,WADOE
s-Butylbenzene	DoD-ELAP,NELAP,WADOE
4-Isopropyl Toluene	DoD-ELAP,NELAP,WADOE
1,3-Dichlorobenzene	DoD-ELAP,ADEC,NELAP,WADOE
1,4-Dichlorobenzene	DoD-ELAP,ADEC,NELAP,WADOE

n-Butylbenzene	DoD-ELAP,NELAP,WADOE
1,2-Dichlorobenzene	DoD-ELAP,ADEC,NELAP,WADOE
1,2-Dibromo-3-chloropropane	DoD-ELAP,ADEC,NELAP,WADOE
1,2,4-Trichlorobenzene	DoD-ELAP,ADEC,NELAP,WADOE
Hexachloro-1,3-Butadiene	DoD-ELAP,ADEC,NELAP,WADOE
Naphthalene	DoD-ELAP,ADEC,NELAP,WADOE
1,2,3-Trichlorobenzene	DoD-ELAP,ADEC,NELAP,WADOE
Dichlorodifluoromethane	DoD-ELAP,ADEC,NELAP,WADOE
Methyl tert-butyl Ether	DoD-ELAP,ADEC,NELAP,WADOE
2-Pentanone	WADOE

Code	Description	Number	Expires
ADEC	Alaska Dept of Environmental Conservation	17-015	03/28/2025
DoD-ELAP	DoD-Environmental Laboratory Accreditation Program, PJLA Testing	66169	02/28/2025
NELAP	ORELAP - Oregon Laboratory Accreditation Program	WA100006-012	05/12/2024

Analytical Resources, LLC
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Analytical Report

CALIBRE	Project: Boeing Renton	
-	Project Number: [none]	**Reported:**
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Notes and Definitions

*	Flagged value is not within established control limits.
E	The analyte concentration exceeds the upper limit of the calibration range of the instrument established by the initial calibration (ICAL)
J	Estimated concentration value detected below the reporting limit.
Q	Indicates a detected analyte with an initial or continuing calibration that does not meet established acceptance criteria (<20% RSD, <20% drift or minimum RRF)
U	This analyte is not detected above the reporting limit (RL) or if noted, not detected above the limit of detection (LOD).
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
[2C]	Indicates this result was quantified on the second column on a dual column analysis.