Quarterly report, fourth quarter 2019

RCRA Corrective Action Program
Boeing Renton Facility
Project # 0088880100.2019 The Boeing Company

Prepared for:

The Boeing Company
Seattle, Washington

February 17, 2020

Quarterly report, fourth quarter 2019

RCRA Corrective Action Program
Boeing Renton Facility
Project # 0088880100.2019 The Boeing Company

Prepared for:

The Boeing Company
Seattle, Washington

Prepared by:

Wood Environment & Infrastructure Solutions, Inc.
600 University Street, Suite 600
Seattle, Washington 98101
USA
T: 206-342-1760

February 17, 2020

This report was prepared by the staff of Wood Environment & Infrastructure Solutions, 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.

Wood Environment & Infrastructure Solutions, Inc.

02/17/2020

John Long, L.G. L. Hg.
Licensed Geologist/Hydrogeologist #1354
Expiration Date: May 23, 2022

Copyright and non-disclosure notice

Third-party disclaimer

Table of contents

List of figures

List of tables

List of appendices

1.0 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 at the Boeing Renton Facility (the Facility) during the fourth quarter 2019. 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, 2014). The groundwater monitoring program is detailed in the Addendum to the Compliance Monitoring Plan (Wood, 2019), which contains changes to the revised Compliance Monitoring Plan (Amec Foster Wheeler, 2016a) that superseded the original plan presented in Appendix D of the EDR (AMEC, 2014).

Groundwater monitoring and final cleanup action implementation 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, soil vapor extraction [SVE] and monitored attenuation [MA]);
- Building 4-78/79 SWMU/AOC Group: (bioremediation, SVE, MNA, and MA);
- Former Fuel Farm AOC Group: (MNA);
- AOC-001 and AOC-002: (bioremediation and MA);
- AOC-003: (bioremediation and MA);
- AOC-004: (bioremediation and MA);
- AOC-060: (bioremediation and MA);
- AOC-090: (bioremediation and MA);
- Building 4-70: (bioremediation and MA);
- Lot 20/Former Building 10-71 Parcel: (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). It should be noted that monitoring for the Building 10-71 area and Building 4-70 area is included in this monitoring report to maintain continuity with the monitoring program that has been conducted for these areas for several years and as approved by the Washington State Department of Ecology (Ecology); these two areas are not addressed explicitly in the Compliance Monitoring Plan but are being addressed per Ecology's December 30, 2015, email to Boeing with comments on the revised Compliance Monitoring Plan. Monitoring for Apron A is also included, as semiannual monitoring began in this area starting in the fourth quarter 2016, as reported in the Apron A Investigation Results report (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 are discussed for each SWMU and AOC in this report. Discussions of the protection of

groundwater for drinking water beneficial uses compare concentrations of COCs to both the current site specific cleanup levels (CULs) specified in the CAP (which were based primarily on drinking water and protection of surface water beneficial uses) and to proposed updated CULs from the CALIBRE Systems, Inc. (CALIBRE) December 17, 2019, technical memorandum (CALIBRE, 2019a). Analytical data for groundwater presented in the tables are compared to the AOC/SWMU specific CULs specified in the CAP for the respective points of compliance.

This quarterly report:

- Describes work completed during the reporting quarter;
- 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 quarter, 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 quarter;
- Describes and discusses trends in monitoring data;
- Assesses remediation at each area; and
- Assesses attainment of the current CULs at the CPOCs.

This report presents this information for the fourth quarter 2019, the period from October through December 2019.

1.1 Quarterly progress reporting

In accordance with the requirements of the Order, corrective action activities were conducted at the Facility, as described in this report. As approved by Ecology in their letter dated November 18, 2015, progress reporting is conducted on a quarterly basis in conjunction with monitoring, operations, and maintenance activities conducted under the CAP.

1.1.1 Work completed in the fourth quarter 2019

The following work was completed during the fourth quarter 2019, the period from October through December 2019:

- On October 11, 2019, Boeing removed the pumps from the monitoring wells in AOC-001 and AOC-002, and labeled, bagged, and placed them in storage for potential re-use.
- Groundwater monitoring for the fourth quarter 2019 was completed during November 2019.
- On behalf of Boeing, Wood submitted the third quarter 2019 report to Ecology on November 15, 2019.
- On November 20, 2019, CALIBRE collected groundwater samples from Building 4-78/79 monitoring wells (GW031S and GW244S) and injection wells (B78-11, B78-13, B78-17, B78-18, B78-19, B78-20, and B78-21) as part of the nitrate/sulfate application for cleanup of benzene.
- On November 25, 2019, Holocene Drilling decommissioned (abandoned) monitoring wells GW049S, GW185S, GW186S, GW187S, GW190S, GW191D, GW192S, GW194S, GW195S, GW196D, GW197S,

GW245S, and GW246S) in AOC-001 and AOC-002 in accordance with Ecology well abandonment regulations in Washington Administrative Code 173-160-990, as described in the memo submitted to Ecology on December 21, 2017 (Amec Foster Wheeler, 2017). The source area well, GW193S, was not abandoned. The abandonment of wells was required to accommodate the redevelopment of the northern aircraft apron area (Apron R) surrounding AOC-001 and AOC-002.

- On December 17, 2019, Boeing submitted a technical memorandum to Ecology evaluating the CULs for groundwater applicable to the Boeing Renton Facility (CALIBRE, 2019a). This technical memorandum was prepared based on prior discussions with the Ecology site manager regarding changed conditions (elimination of certain COCs which were no longer present, and the promulgation of revised Ecology standards for protection of surface water). The current CULs specified in the CAP were calculated for the various SWMUs and AOCs in the Feasibility Study Work Plan (Geomatrix, 2004). These CULs were developed using the criteria applicable at that time and the consideration of initial concentrations of all compounds detected in source areas. Ecology has made several clarifications and changes to the Model Toxics Control Act (MTCA) since the draft CAP was prepared that are relevant to Facility CULs. Additionally, remedial actions have been implemented that have changed conditions at the Facility in relevant ways. The re-evaluation of CULs was completed to update criteria based on current standards, evaluate only those constituents that now remain in groundwater, and provide standardized CULs for each chemical that would apply to all areas of the Facility.

  The important factors that changed are as follows:

  - Remedial actions have been implemented Facility-wide and the current data demonstrate that the prior list of COCs has been reduced in many AOCs (i.e., many of the chemicals on the initial COC list for each AOC are no longer present in groundwater);
  - The U.S. Environmental Protection Agency has established revised toxicity criteria for TCE, PCE, and arsenic to account for recent scientific studies, and new state and federal standards have been set for arsenic;
  - Ecology and the U.S. Environmental Protection Agency published new/revised standards, which are now the promulgated criteria set for protection of surface water, considering fish consumption and ingestion of potable water;
  - The scientific knowledge regarding degradation rates for vinyl chloride (VC) under a variety of conditions has grown, specifically for naturally reducing conditions such as are present at the Facility, where definitive data have been collected demonstrating degradation and attenuation of VC; and
  - Ecology has recognized that arsenic is a naturally occurring compound in groundwater and CULs are to be based on background concentrations.

  The December 17, 2019, technical memorandum proposed revised CULs based on MTCA criteria for potable water that are demonstrated to be protective of other exposure pathways and promulgated criteria. These proposed revised CULs are referenced herein as *proposed* CULs, while the CULs specified in the CAP are referenced as *current* CULs.

1.1.2 Deviations from required tasks

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

1.1.3 Deviations from CAP

There were no deviations from the CAP during this activity period, and there are no planned deviations from the CAP expected for the next activity period.

1.1.4 Schedule revisions

There were no significant revisions to the schedule for this reporting period and no revisions are expected for the next activity period.

1.1.5 Work projected for the next quarter

The following work is projected for the first quarter 2020:

- Reporting will be completed in accordance with the Order, CAP, EDR, and any changes approved by Ecology.
- Performance monitoring is scheduled for mid-March to support the benzene cleanup at Building 4-78/79. Nitrate and sulfate injections may be performed as needed, depending on performance monitoring results.
- Nitrate and sulfate injections may be performed for the Building 4-78/79 area, depending on performance monitoring results.
- Soil with total petroleum hydrocarbons (TPH) exceeding current CULs within unsaturated and smear zones is planned for excavation on the east side of Building 4-79. Groundwater elevations are currently being monitored to determine if water levels will be low enough to allow for sufficient excavations to occur in the second or third quarter 2020.

2.0 Groundwater sampling methodology

Groundwater was sampled and analyzed as described in Appendix A. These procedures are in accordance with the methods specified in the revised Compliance Monitoring Plan (Amec Foster Wheeler, 2016a). Table A-1 summarizes the current groundwater monitoring program and constituents of concern (COCs) specified in the CAP and revised in the Addendum to the Compliance Monitoring Plan (Wood, 2019) 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 include Building 4-70, Lot 20/Former Building 10-71, and Apron A, which were not included in the CAP. Any changes or exceptions to the sampling or analytical methods cited in Appendix A during the quarter are 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 quarter, 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 compact disc. The data validation memoranda are included in Appendix C.

3.0 Corrective action activities completed during quarter

This section describes the corrective action activities conducted at the Facility during the fourth quarter 2019. Operation of the SVE system at SWMU-172/174 continued during the fourth quarter, as discussed

in Section 3.2.1.2. Quarterly compliance monitoring was conducted in accordance with the Addendum to the Compliance Monitoring Plan (Wood, 2019).

3.1 SWMU-168

SWMU-168 is monitored semiannually during the first and third quarters; therefore, no monitoring was conducted for this area during the fourth quarter 2019.

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, SVE, and MA. Figure 1 shows the layout of the groundwater monitoring wells and the remediation system for these SWMUs.

3.2.1 Cleanup action activities

3.2.1.1 Installation/construction activities

No installation/construction activities were conducted for these SWMUs during the fourth quarter.

3.2.1.2 Soil vapor extraction and bioremediation operations

The SVE system at SWMU-172 and SWMU-174 operated normally during the fourth quarter. Details for system operations are included in the SVE operations and monitoring report prepared by CALIBRE and included as Appendix D.

3.2.2 Compliance monitoring plan deviations

No deviations from the Compliance Monitoring Plan occurred for this area during the fourth quarter.

3.2.3 Water levels

Groundwater elevations for the SWMU-172 and SWMU-174 area measured during the fourth quarter 2019 are summarized in Table 1 and shown on Figure 1. The contoured water level elevation data for November 2019 show that groundwater generally flows northeast from SWMU-172 and SWMU-174 toward the Cedar River Waterway, with an approximate hydraulic gradient of 0.011.

3.2.4 Groundwater monitoring results

Groundwater in this area is monitored following the schedules presented in Tables A-1 and A-2 in Appendix A. Results for primary geochemical indicators are presented in Table 2; results for the SWMU-172 and SWMU-174 area COCs are presented in Table 3.

3.2.4.1 Monitored attenuation/geochemical indicators

The geochemical indicator results are presented in Table 2. Total organic carbon (TOC) concentrations ranged from 1.22 milligrams per liter (mg/L) to 29.56 mg/L for all SWMU-172 and SWMU-174 monitoring wells. The pH measurements for all SWMU-172 and SWMU-174 monitoring wells are near neutral. The other natural attenuation parameter results indicate that geochemical conditions were generally uniform; the oxidation/reduction potential (ORP) results during this event appear biased high.

3.2.4.2 COC results for source and downgradient plume areas

Table 3 lists fourth quarter 2019 analytical results for the SWMU-172 and SWMU-174 COCs. Figures 2 and 3 show historical trend plots for tetrachloroethene (PCE), trichloroethene (TCE), VC, and

cis 1,2 dicholoethene (cis-1,2-DCE) in source area wells GW152S and GW153S, and in downgradient plume area wells GW172S and GW173S. Flow generally moves from the vicinity of source area well GW152S to downgradient plume area well GW172S, and from source area well GW153S to downgradient plume area well GW173S. PCE and TCE are the chlorinated solvents that were used at the Facility, and cis-1,2-DCE and VC are breakdown products resulting from biodegradation processes.

As shown in Table 3, cis-1,2-DCE, TCE, PCE, and VC concentrations exceeded the *current* CPOC CULs in the groundwater from both source area and downgradient plume area wells. The detected values for all organic COCs are below 1 microgram per liter (µg/L) for the source area and downgradient plume area wells. As shown in Figures 2 and 3, the concentrations of COCs in groundwater from source area wells GW152S and GW153S and downgradient plume area wells GW172S and GW173S generally remained stable with some fluctuation during the fourth quarter. All cis-1,2-DCE, TCE, and PCE concentrations in groundwater from the source area and downgradient plume area wells meet the MTCA criteria for potable water supply (and the *proposed* CULs); VC remains above the potable water criteria in GW226S at 0.615 µg/L.

Arsenic was detected above the *current* CUL in the groundwater from all source area and downgradient plume area wells. As shown in Figure 4, the arsenic concentrations in the groundwater increased in source area well GW153S and decreased in source area well GW152S and both downgradient plume area wells during the fourth quarter sampling event. Copper and lead were detected above their *current* CULs in the groundwater from both source area wells and in all downgradient plume area wells except GW081S.

3.2.4.3 COC results for conditional point of compliance area

Results from the CPOC area wells are presented in Table 3 and trend charts for cis-1,2-DCE, TCE, and VC for all CPOC area wells are presented in Figure 5. As shown in Table 3, cis-1,2-DCE was detected above the *current* CUL in the groundwater from all CPOC area wells at concentrations ranging from 0.0546 to 0.659 micrograms per liter (µg/L); TCE was detected above the *current* CUL in the groundwater from GW235I; and VC was detected above the *current* CUL in the groundwater from GW232S and GW236S. PCE was not detected in the groundwater from the CPOC wells and is not shown in Figure 5. As shown on Figure 5, concentrations of cis-1,2-DCE have exceeded the *current* CUL in the groundwater from CPOC wells since compliance monitoring began, but are generally stable, except for an increase in the cis-1,2-DCE concentration in groundwater from GW232S during the fourth quarter. The concentrations of both TCE and VC generally appear to be stable, except for an increase in the VC concentration in groundwater from GW232S.

Arsenic was detected above the *current* CUL in the groundwater from all CPOC area wells except for GW233I and GW235I, copper was detected above the *current* CUL in the groundwater from all CPOC area wells except for GW233I and GW235I, and lead was detected above the *current* CUL in the groundwater from CPOC wells GW234S and GW236S (Table 3). Figure 6 shows arsenic, copper, and lead concentration trends since the beginning of compliance monitoring in groundwater from the CPOC area wells. As shown in Figure 6, arsenic, copper and lead concentrations in the groundwater from GW236S increased in the fourth quarter of 2019. However, despite this isolated increase in concentration during the fourth quarter of 2019, there are no apparent long-term increasing or decreasing trends in the groundwater from CPOC area wells. The groundwater field data field data sheet noted that there was high turbidity in the sample collected from this well (GW236S). Therefore, the elevated metals concentrations in the groundwater from this well are likely due to the suspended solids present in the groundwater sample due to turbidity and not reflective of the groundwater quality.

While select COC concentrations exceed the *current* CUL in the groundwater from select CPOC wells, all of these COC concentrations were below the applicable MTCA criteria for potable water supply in the groundwater from all CPOC area wells with two exceptions: arsenic at lead at GW234S and GW236S.

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 during the fourth quarter 2019. The cleanup remedy for this SMWU/AOC group is bioremediation, SVE, MNA, and MA. Figure 7 shows the location of groundwater monitoring wells, bioremediation wells, and SVE wells for this area.

3.3.1 Cleanup action activities

3.3.1.1 Installation/construction activities

No installation/construction activities were conducted for these SWMUs during the fourth quarter.

3.3.1.2 Soil vapor extraction and bioremediation operations

As previously reported during 2018 monitoring events, the SVE system at Building 4-78/79 SWMU/AOC Group was shut down during the first quarter of 2018, during which rebound testing was implemented. Soil samples were collected during the second quarter 2018 to assess the attainment of current soil CULs, and results were reported in the second quarter monitoring report (Wood, 2018). These CULs were attained with one exception: the sample from 4.5 feet below ground surface at well PP13 had a concentration of total petroleum hydrocarbons as gasoline (TPH-G) of 147 milligrams per kilogram (mg/kg), and the field duplicate was 131 mg/kg, above the current CUL of 30 mg/kg.

A revised work plan (CALIBRE, 2019b) for excavating the soils near PP13 and GW013S was submitted to Ecology on May 8, 2019, in response to a request from Ecology. The investigation described in the work plan was conducted on June 13 and 14, 2019, and the results were submitted to Ecology in November 2019 (CALIBRE 2019c). Groundwater elevations were monitored during the fourth quarter to determine the best time for soil removal activities. As documented in an email to Ecology dated October 22, 2019, the soil excavation work had not been completed because groundwater levels were not low enough before the start of the rainy season to schedule the work. TPH-G concentrations in groundwater continue to be closely monitored.

No new nitrate/sulfate injections have been completed since March 2019. Trend charts for cis-1,2-DCE and benzene in the injection wells are presented in Figure 8, and charts for TCE and VC in the injection wells are presented in Figure 9.

3.3.2 Compliance monitoring plan deviations

No deviations from the compliance monitoring plan occurred for this area during the fourth quarter.

3.3.3 Water levels

Table 4 presents the groundwater elevations measured during the fourth quarter 2019 groundwater monitoring event at the Building 4-78/79 SWMU/AOC group. As shown in Figure 7, the observed direction of groundwater flow from the source area during November 2019 is generally to the southwest, with a hydraulic gradient of 0.003.

3.3.4 Groundwater monitoring results

Results for primary geochemical indicators are presented in Table 5; results for the COCs for Building 4-78/79 SWMU/AOC Group are presented in Table 6. Groundwater at this area is monitored following the schedule presented in Tables A-1 and A-2 in Appendix A.

3.3.4.1 Natural attenuation/geochemical indicators

The geochemical indicator results are presented in Table 5. In general, source area, downgradient, and CPOC area wells had low levels of dissolved oxygen and biased high ORP readings. Despite the biased ORP readings, it is likely that reducing conditions are present over the area that are generally favorable for reductive dechlorination of chlorinated volatile organic compounds. The pH in all monitoring wells was above 6.0 standard units during the fourth quarter monitoring period. Results for the other primary geochemical indicators were fairly consistent throughout this area. TOC concentrations in source area wells ranged from 7.21 to 126.60 mg/L.

3.3.4.2 COC results for source and downgradient plume areas

Table 6 lists fourth quarter 2019 analytical results for the Building 4-78/79 SWMU/AOC Group COCs. The CULs established in the CAP for the CPOC are also presented on Table 6. Figures 10 and 11 are trend charts showing historical trends for COCs for four groundwater monitoring wells that have a history of frequent detections. Trend charts have not been prepared for groundwater monitoring wells or COCs that do not have a history of frequent detections.

As shown in Table 6, benzene, cis-1,2-DCE, and VC were detected in groundwater from several source area wells at concentrations above the *current* CPOC CULs. In source area wells GW039S and GW243I, all COCs were below *current* CULs. TCE was not detected in the groundwater from source area wells. TPH-G was detected in the groundwater from source area well GW031S, at a concentration of 1,540 µg/L (the field duplicate concentration was 1560 µg/L). TPH-G was also detected in the groundwater from source area well GW033S at a concentration of 247 µg/L, below the *current* CPOC CUL. All COCs were non-detect in the groundwater from the downgradient plume area wells.

Figure 10 shows trends for selected COCs for source area wells GW031S and GW033S, and Figure 11 shows trends for selected COCs for source area well GW034S and downgradient plume area well GW209S. COC concentrations in the groundwater from GW031S and GW033S are generally consistent with historical results and trends. The groundwater from GW033S historically had the highest concentrations of cis-1,2-DCE and VC prior to the Duct Bank dewatering project.

COC concentrations in groundwater from source area well GW034S and downgradient plume area well GW209S (Figure 11) remain stable with concentrations below detection, except for the VC concentration in the groundwater from source area well GW034S during the fourth quarter. No new nitrate/sulfate injections have been completed since March 2019.

Concentrations of COCs in the groundwater from select source area wells remain above the MTCA criteria for potable water supply (specifically benzene, VC, and TPH-G). Active treatment is ongoing. Concentrations of COCs for all analytes in all the groundwater from the downgradient plume area wells are below the applicable MTCA criteria for potable water.

3.3.4.3 COC results for conditional point of compliance area

Groundwater monitoring results from the fourth quarter for the CPOC area are summarized in Table 6. Trends for CPOC wells GW143S, GW237S, and GW240D are shown in Figures 12 through 14. Benzene was not detected in groundwater from the CPOC area wells, except GW237S, where it was still below the

current CUL at a concentrations 0.66 µg/L (Table 6). As shown in Figure 12, benzene has been sporadically detected in the groundwater from CPOC area well GW237S but has not been detected above the *current* CUL in the groundwater from any of the other CPOC wells. The benzene concentration in the groundwater from CPOC well GW237S was below the *current* CUL during the fourth quarter. For the CPOC area wells, all COCs were below the *proposed* CULs and the MTCA criteria for potable water supply, except for VC at a concentration of 0.34 µg/L in the groundwater from CPOC well GW237S.

3.4 Former Fuel Farm AOC group

The Former Fuel Farm AOC group is monitored semiannually in May and November. The final remedy for the Former Fuel Farm is MNA.

3.4.1 Cleanup action activities

No installation/construction activities were conducted for this cleanup action area during the fourth quarter.

3.4.2 Compliance monitoring plan deviations

No deviations from the compliance monitoring plan occurred for this area during the fourth quarter.

3.4.3 Water levels

Groundwater elevations for the Former Fuel Farm AOC Group measured during the fourth quarter 2019 are summarized in Table 7 and shown on Figure 15. Groundwater elevation contours are not shown on Figure 15 due to anomalous measurements.

3.4.4 Groundwater monitoring results

Results for primary geochemical indicators are presented in Table 8; results for COCs for the Former Fuel Farm AOC Group are presented in Table 9. Groundwater in this area is monitored following the schedule presented in Tables A-1 and A-2 in Appendix A.

3.4.4.1 Monitored natural attenuation indicators

The geochemical indicator results are presented in Table 8. Results in Table 8 indicate that geochemical conditions are generally consistent throughout the Former Fuel Farm AOC Group. The pH in CPOC area wells GW212S, GW224S, and GW258S were below 6.0 standard units; low pH may interfere with biological degradation of site COCs. The other geochemical indicators indicate that conditions are generally conducive to natural attenuation of the COCs for the Former Fuel Farm AOC Group.

3.4.4.2 COC results for source area

Table 9 lists fourth quarter 2019 analytical results for the Former Fuel Farm AOC Group COCs. The CULs established in the CAP are also presented on Table 9. As shown in Table 9, TPH in the diesel and Jet A ranges was not detected above the reporting limit in the groundwater from the single source area well (GW255S).

3.4.4.3 COC results for conditional point of compliance area

CPOC area monitoring results are presented in Table 9. Figure 16 shows trend data for CPOC area wells GW211S, GW221S, and GW224S. Figure 16 shows that the fourth quarter results for these wells are consistent with the historical monitoring results since late 2013.

Samples were analyzed for TPH in the diesel and Jet A ranges both with and without a silica gel cleanup which can be performed on samples to remove polar organic compounds. The results after silica gel cleanup are therefore considered to be more accurate. As shown in Table 9, concentrations of TPH as diesel and Jet A were both lower after silica gel cleanup had been performed (except in the case of the groundwater from GW211S). Generally, detections above the *current* CULs decreased to below the *current* CULs after silica gel cleanup. We propose to continue to analyze samples GW211S, GW221S and GW224S with the silica gel procedure during future sampling events.

3.5 AOC-001 and AOC-002

Apron R near AOC-001 and AOC-002 is under reconstruction, therefore, no monitoring was conducted for this area during the fourth quarter 2019. For more details see Section 1.1.1.

3.6 AOC-003

This section describes corrective action activities conducted at AOC-003 for the fourth quarter 2019. The cleanup remedy for this AOC is bioremediation and MA. Figure 17 shows the location of groundwater monitoring and bioremediation wells at AOC-003, as well as the groundwater elevations measured during this monitoring event.

3.6.1 Cleanup action activities

No installation/construction activities were conducted for this cleanup action area during the fourth quarter.

3.6.2 Compliance monitoring plan deviations

Groundwater samples were collected from the CPOC area wells during the fourth quarter. Following the schedule presented in Table A-1, source and downgradient area wells are sampled semiannually in the first and third quarters.

3.6.3 Water levels

Table 10 presents the groundwater elevations measured during the fourth quarter 2019 monitoring event at AOC-003 and AOC-092. Figure 17 shows the groundwater elevations from this event. Groundwater flow directions cannot be determined from the available groundwater elevation data.

3.6.4 Groundwater monitoring results

Groundwater at AOC-003 is monitored following the schedule presented in Tables A-1 and A-2 in Appendix A. Results for geochemical indicators are presented in Table 11; results for the AOC-003 COCs are presented in Table 12.

3.6.4.1 Monitored attenuation//geochemical indicators

The geochemical indicator results are presented in Table 11. Results in Table 11 indicate that geochemical conditions are generally consistent throughout this AOC and are generally conducive to biodegradation of the COCs for this AOC.

3.6.4.2 COC results for source and downgradient plume areas

Source area and downgradient plume area wells are monitored semiannually in the first and third quarters; therefore, no monitoring for source area or downgradient plume wells was conducted in the fourth quarter.

3.6.4.3 COC results for conditional point of compliance area

Groundwater from the two CPOC area wells had no detections of PCE, TCE or cis-1,2-DCE above their respective *current* CULs. VC was detected at concentrations above the *current* CUL in the groundwater from both CPOC wells (GW247S and GW248I), at concentrations of 0.504 and 0.620 µg/L, respectively.

VC concentrations exceed the *proposed* CUL in the groundwater from CPOC wells, as detailed above, and remain above the applicable MTCA criteria for potable water supply in both CPOC wells.

3.7 AOC-004

AOC-004 is monitored semiannually during the first and third quarters; therefore, no monitoring was conducted for this area during the fourth quarter 2019.

3.8 AOC-060

AOC-060 is monitored semiannually during the first and third quarters; therefore, no monitoring was conducted for this area during the fourth quarter 2019.

3.9 AOC-090

AOC-090 is monitored semiannually during the first and third quarters; therefore, no monitoring was conducted for this area during the fourth quarter 2019.

3.10 Building 4-70 area

The Building 4-70 Area is monitored semiannually during the first and third quarters; therefore, no monitoring was conducted for this area during the fourth quarter 2019.

3.11 Lot 20/Former Building 10-71 Parcel

This section describes corrective action activities conducted for this area during the fourth quarter 2019. Figure 18 shows the locations of the groundwater monitoring wells and the bioremediation injection system at the Lot 20/Former Building 10-71 Parcel, as well as the groundwater elevations measured during the fourth quarter. The Lot 20/Former Building 10-71 Parcel was not included in the EDR but was later added to the Compliance Monitoring Plan (Amec Foster Wheeler, 2016a) and has been regularly monitored in conjunction with the Facility corrective action areas. The cleanup remedy for the Lot 20/Former Building 10-71 Parcel is bioremediation and MA. This area is monitored semiannually in the second and fourth quarters, in accordance with Table A-1 in Appendix A.

3.11.1 Cleanup action activities

No construction or operations work was conducted for the Lot 20/Former Building 10-71 Parcel during the fourth quarter.

3.11.2 Water levels

The groundwater elevations measured during the fourth quarter at the Lot 20/Former Building 10-71 Parcel are presented in Table 13 and on Figure 18. Groundwater contours are not shown on Figure 18 because the three monitoring wells measured are arranged nearly in a straight line and do not provide enough water level data to prepare contours. Based on the fourth quarter water level measurements, the apparent groundwater flow appears to be generally to the northwest.

3.11.3 Groundwater monitoring results

Results for primary geochemical indicators for groundwater from the Lot 20/Former Building 10-71 Parcel monitoring wells are presented in Table 14; results for COCs for the Lot 20/Former Building 10-71 Parcel monitoring wells are presented in Table 15. Groundwater in this area is monitored following the schedule presented in Tables A-1 in Appendix A.

3.11.3.1 Monitored attenuation/geochemical indicators

The geochemical indicator results are presented in Table 14. The pH in groundwater from the three monitoring wells (10-71-MW1, 10-71-MW2, and 10-71-MW4) of the Lot 20/Former Building 10-71 Parcel were above or equal to 6 standard units. All remaining parameters in the groundwater from these monitoring wells appear uniform. Results in Table 14 indicate that geochemical conditions are generally consistent throughout this AOC and are generally conducive to biodegradation of the COCs for this AOC.

3.11.3.2 COC results

Fourth quarter analytical results for the Lot 20/Former Building 10-71 Parcel COCs are presented in Table 15. The concentrations of all of the COCs—cis-1,2-DCE, toluene, TCE, and VC—in the groundwater from Lot 20/Former Building 10-71 Parcel monitoring wells were below detection, and the detection limits are lower than the applicable MTCA criteria for potable water supply.

3.12 Apron A area

This section describes corrective action activities conducted at the Apron A area during the fourth quarter 2019. The cleanup remedy proposed for the Apron A area is bioremediation and MA. Figure 19 shows the locations of the groundwater monitoring wells in the Apron A area.

3.12.1 Cleanup action activities

No construction or operations work was conducted in the Apron A area during the fourth quarter.

3.12.2 Water levels

The depth to groundwater measured during the fourth quarter at Apron A are presented in Table 16 and on Figure 19. Groundwater elevations are not available because the top of casing elevations were never surveyed. Groundwater flow directions cannot be determined from the available depth to groundwater data.

3.12.3 Groundwater monitoring results

Results for primary geochemical indicators for groundwater from groundwater monitoring wells GW262S and GW264S are presented in Table 17; results for COCs from these wells are presented in Table 18. Groundwater in this area is monitored following the schedule presented in Tables A-1 and A-2 in Appendix A.

3.12.3.1 Monitored attenuation/geochemical indicators

Geochemical parameters are presented in Table 17. TOC concentrations in the monitoring wells were slightly elevated during the fourth quarter 2019 monitoring event. The other primary geochemical indicators show that reducing conditions were present and that conditions were conducive to biological degradation of the chlorinated volatile organic compounds.

3.12.3.2 COC results

Fourth quarter analytical results for the Apron A COCs (cis-1,2-DCE and VC) are presented in Table 18. Cis-1,2-DCE was not detected in the groundwater from GW262S or GW264S. VC was not detected in the groundwater from monitoring well GW262S, but was detected in the groundwater from monitoring well GW264S at a concentration of 0.38 µg/L, which is above the applicable MTCA criteria for potable water supply.

4.0 References

AMEC Environment & Infrastructure, Inc. (AMEC), 2012, Draft Cleanup Action Plan, Boeing Renton Facility, Renton, Washington: Prepared for The Boeing Company, September.

AMEC, 2014, Draft Engineering Design Report, Boeing Renton Cleanup Plan Implementation, Boeing Renton Facility, Renton, Washington: Prepared for The Boeing Company, July.

Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler), 2016a, Compliance Monitoring Plan, Boeing Renton Facility, Renton, Washington: Prepared for The Boeing Company, February.

Amec Foster Wheeler, 2016b, Apron A Investigation Results, Renton Municipal Airport – Boeing Apron A Renton, Washington, June.

Amec Foster Wheeler, 2016c, Quality Assurance Project Plan, Boeing Renton Facility, Renton, Washington: Prepared for The Boeing Company, February.

Amec Foster Wheeler, 2017, Apron R Well Abandonment and Replacement technical memorandum, Boeing Renton Corrective Action Program, Renton, Washington, December.

CALIBRE Systems, Inc. (CALIBRE), 2019a, Cleanup Levels in Groundwater at the Boeing Renton Plant, December 17.

CALIBRE, 2019b, Plan for Evaluation of Soils around Probe PP13 at Building 4-78/4-79 SWMU/AOC Group; Boeing Renton Site, April 29.

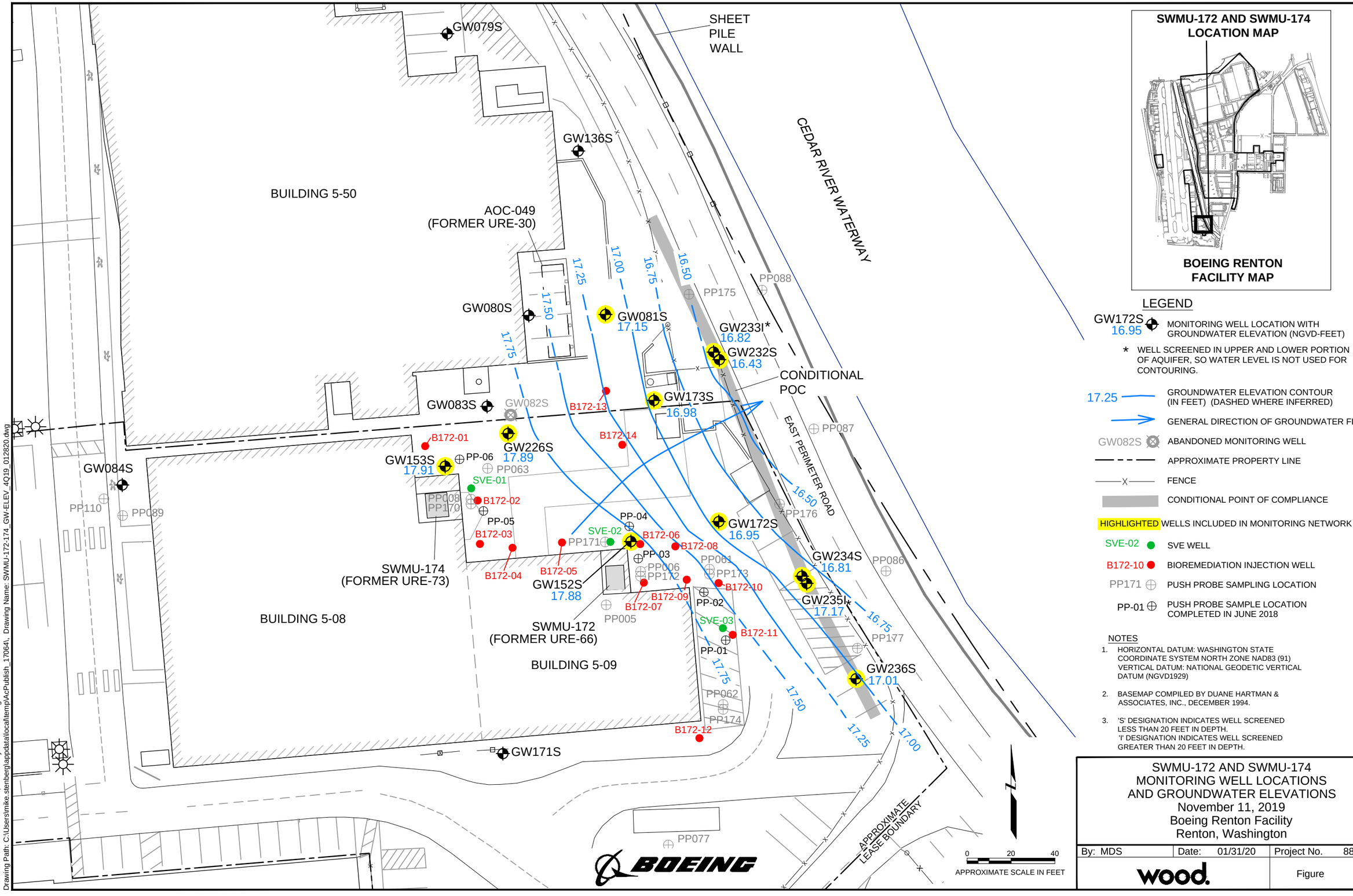
CALIBRE, 2019c, Soils Probes at Building 4-78/4-79 SWMU/AOC Group; Boeing Renton Site, November 21.

Geomatrix, 2004, Final Feasibility Study Work Plan, Boeing Renton Plant, Renton, Washington: Prepared for The Boeing Company, April.

Wood Environment & Infrastructure Solutions, Inc. (Wood), 2018, Quarterly report, second quarter 2018, RCRA Corrective Action Program, Boeing Renton Facility.

Wood, 2019, Addendum to the Compliance Monitoring Plan, Boeing Renton Facility, Renton, Washington: Prepared for the Boeing Company, April.

Figures



SWMU-172 AND SWMU-174 LOCATION MAP

BOEING RENTON FACILITY MAP

LEGEND

GW172S 16.95 — 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.

17.25 — GROUNDWATER ELEVATION CONTOUR (IN FEET) (DASHED WHERE INFERRED)

GENERAL DIRECTION OF GROUNDWATER FLOW

GW082S — ABANDONED MONITORING WELL

APPROXIMATE PROPERTY LINE

FENCE

CONDITIONAL POINT OF COMPLIANCE

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

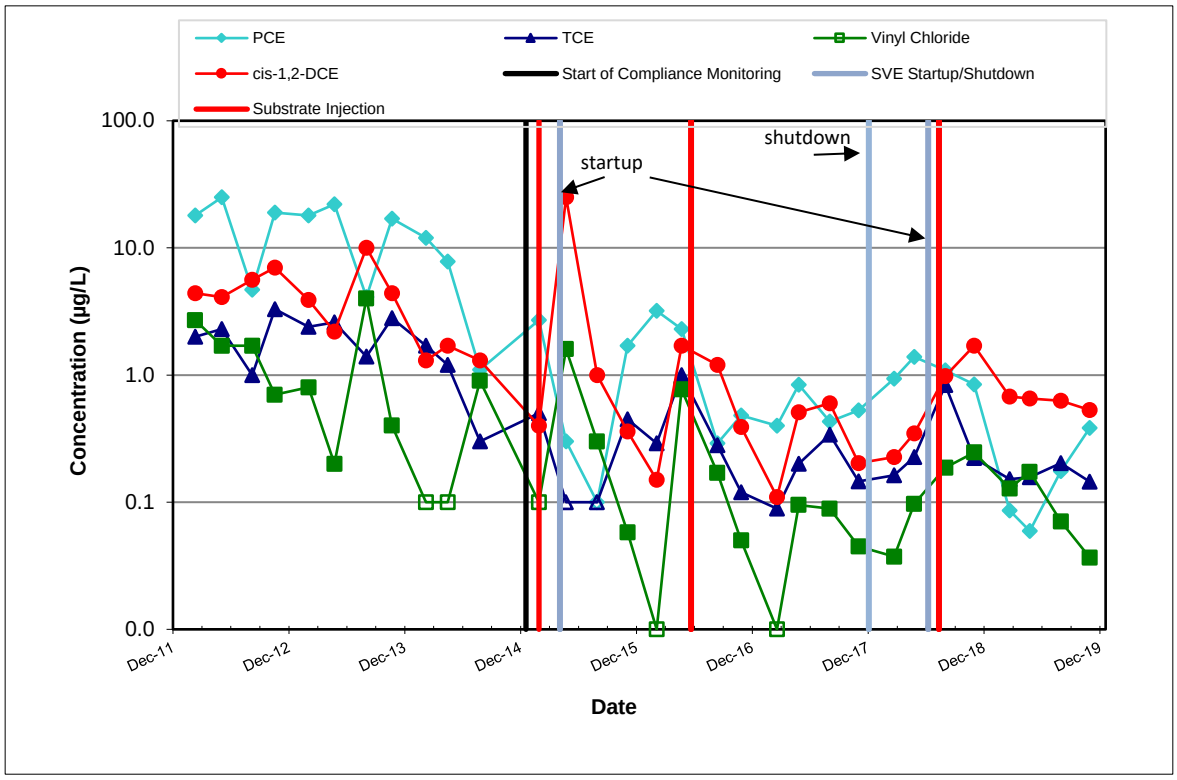
NOTES

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.

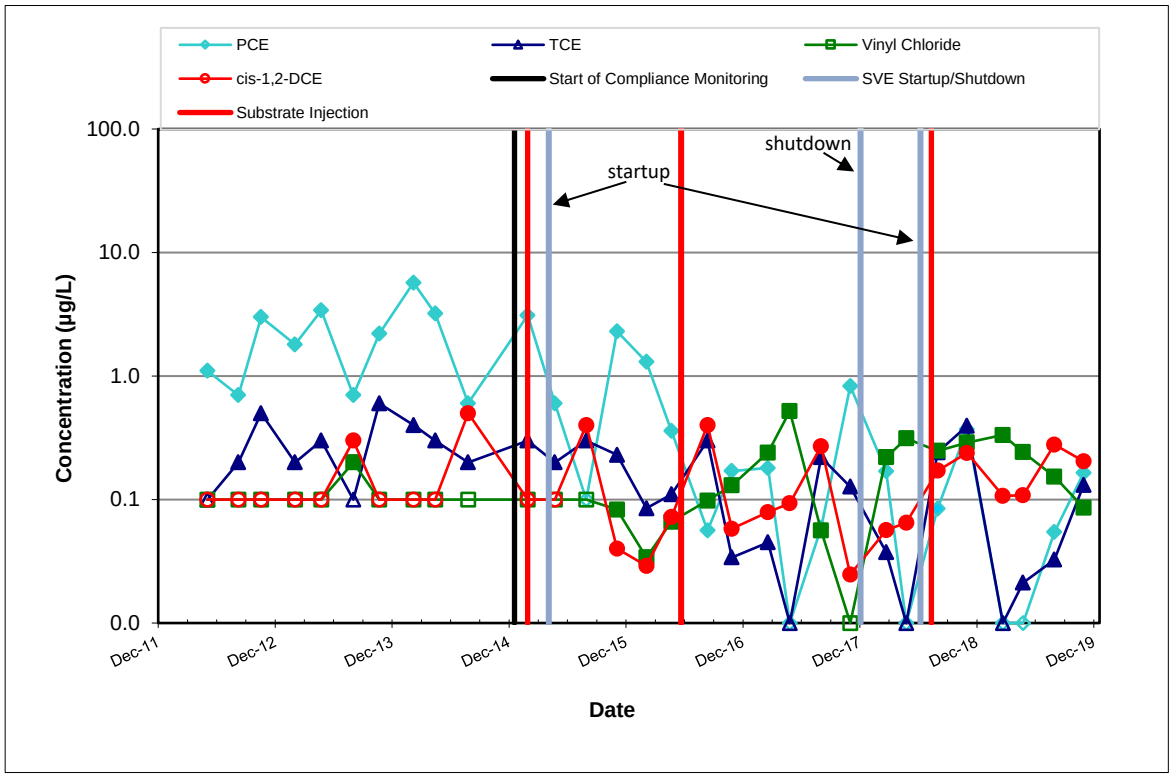
SWMU-172 AND SWMU-174 MONITORING WELL LOCATIONS AND GROUNDWATER ELEVATIONS November 11, 2019 Boeing Renton Facility Renton, Washington

By: MDS	Date: 01/31/20	Project No. 8888
wood.		Figure 1

Plot Date: 01/31/20 - 10:22am, Plotted by: mike.stenberg
Drawing Path: C:\Users\mike.stenberg\appdata\local\temp\AcPublish_17064\, Drawing Name: SWMU-172-174_GW-ELEV_4Q19_012820.dwg



SOURCE AREA WELL GW152S

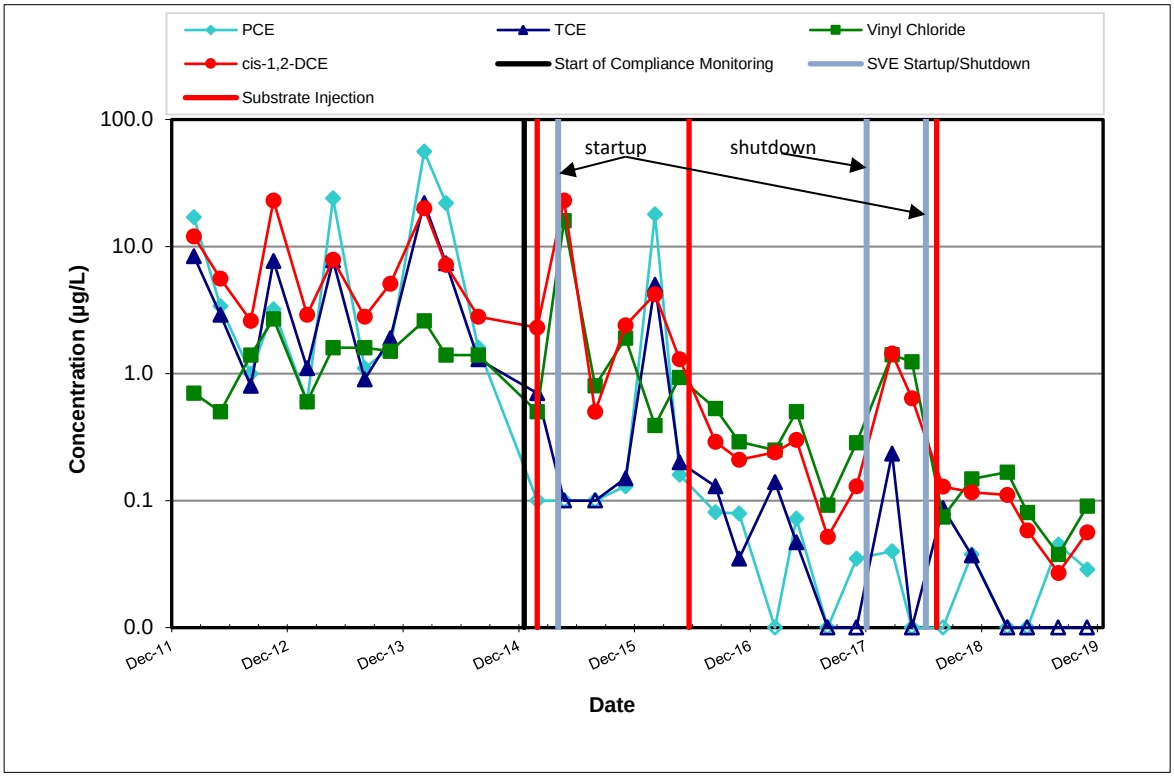


SOURCE AREA WELL GW153S

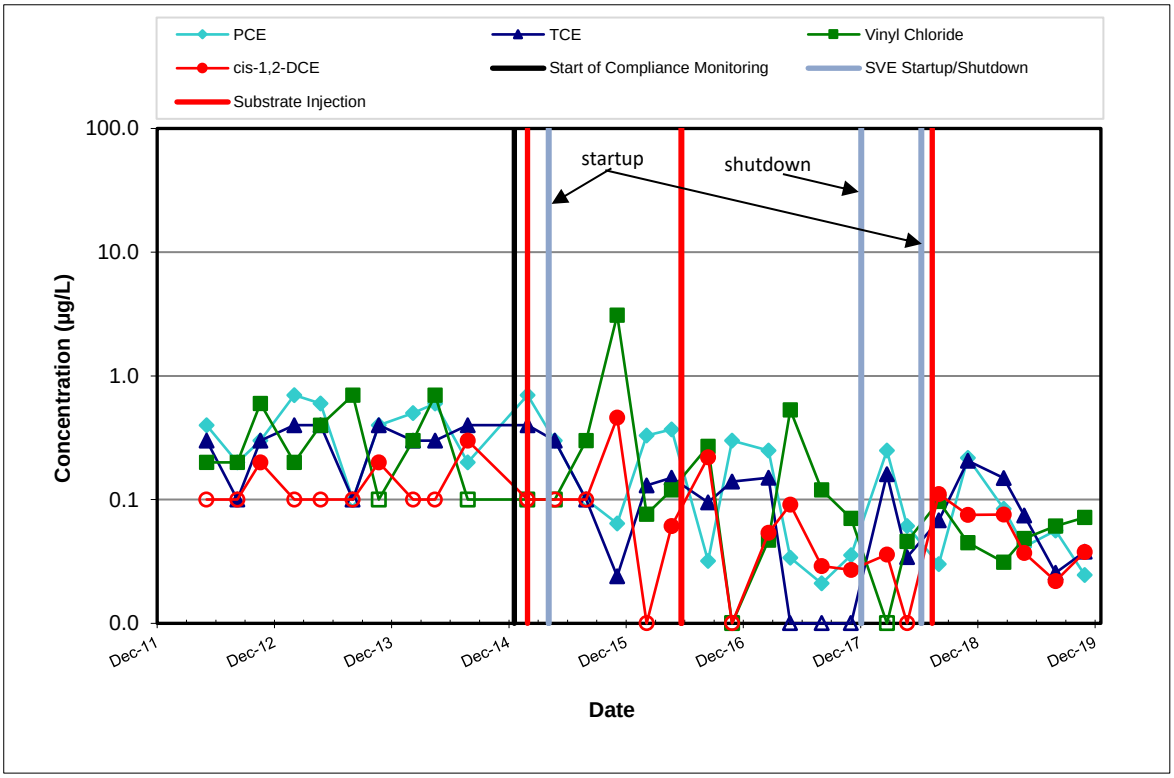
Note: non-detected values shown at one-half the reporting limit and graphed with an open symbol.

wood.	SWMU-172 AND SWMU-174 TREND PLOTS FOR SOURCE AREA WELLS GW152S AND GW153S Boeing Renton Facility Renton, Washington	Project No. 8888 Figure 2

P:\8888 - Boeing Renton\03 Order Reporting Files\Quarterly Reports\2019\4Q2019\Figures\OLD data\Figures 2 to 6_ SWMU_172-174 Trend Plots.xlsx



DOWNGRADIENT PLUME AREA WELL GW172S

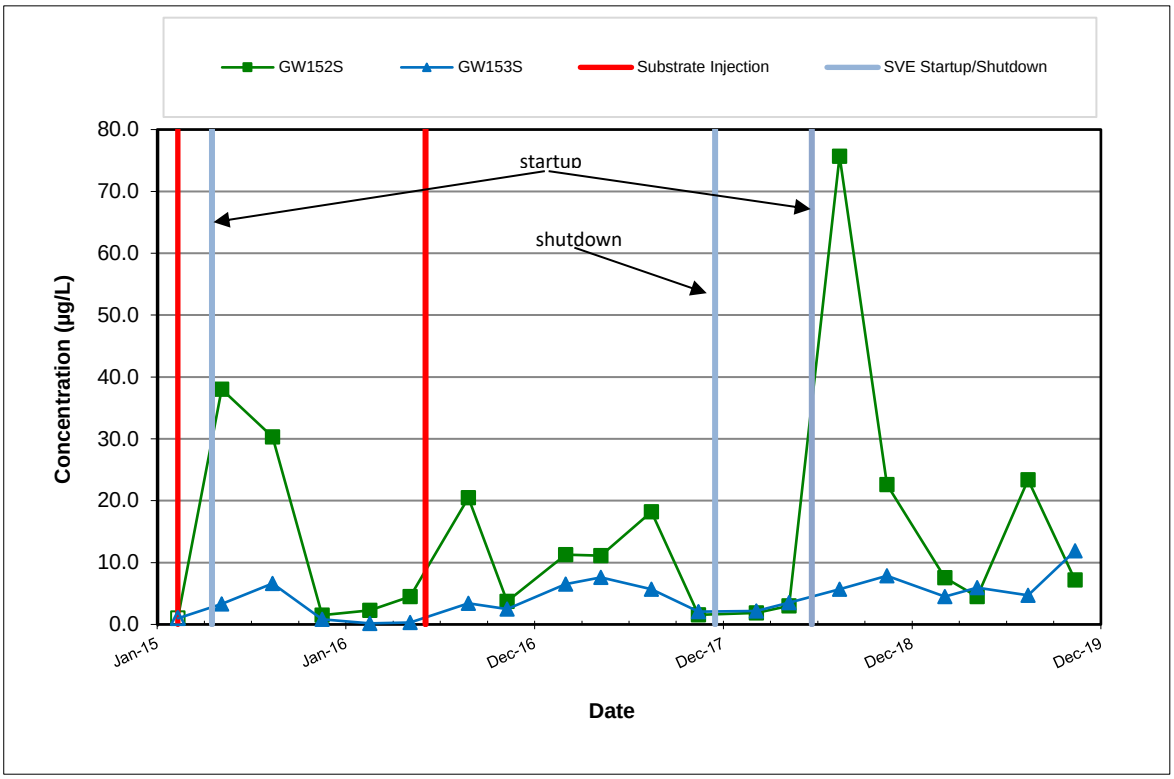


DOWNGRADIENT PLUME AREA WELL GW173S

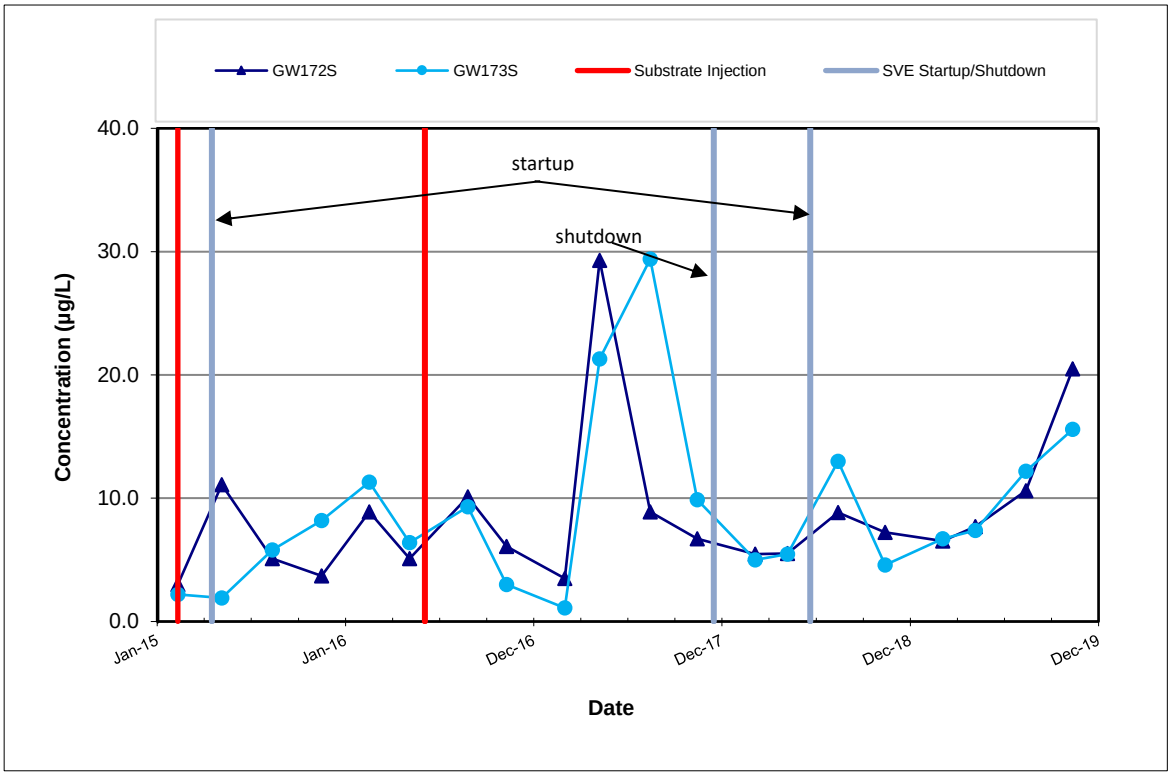
Note: non-detected values shown at one-half the reporting limit and graphed with an open symbol.

wood.	SWMU-172 AND SWMU-174 TREND PLOTS FOR DOWNGRADIENT PLUME AREA WELLS GW172S AND GW173S Boeing Renton Facility Renton, Washington	Project No. 8888 Figure 3

P:\8888 - Boeing Renton\03 Order Reporting Files\Quarterly Reports\2019\4Q2019\Figures\OLD data\Figures 2 to 6_ SWMU_172-174 Trend Plots.xlsx



TOTAL ARSENIC IN SOURCE AREA WELLS

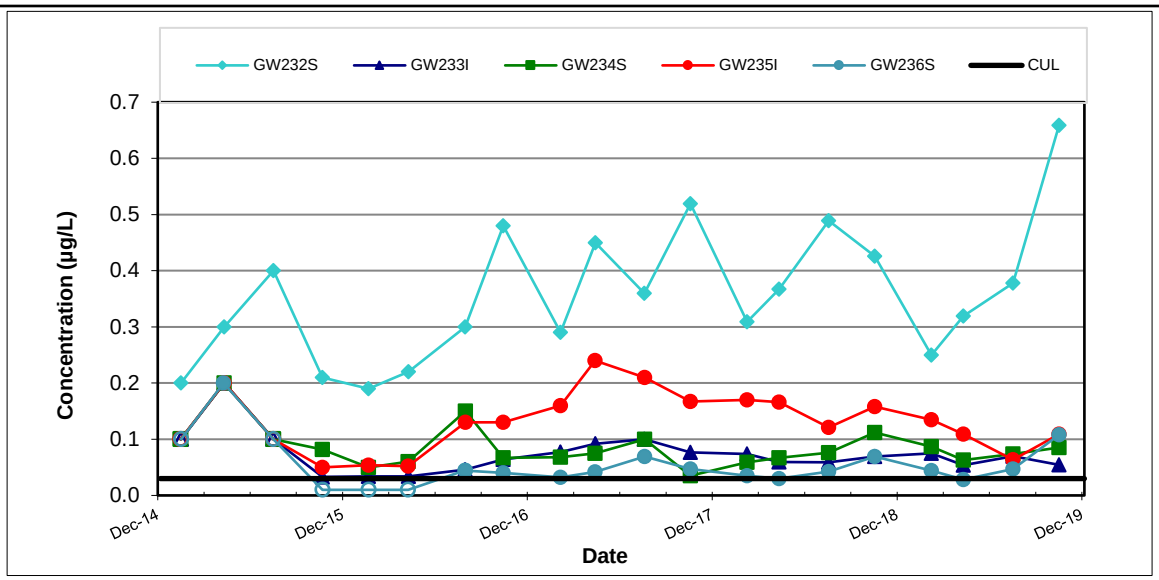


TOTAL ARSENIC IN DOWNGRADIENT PLUME AREA WELLS

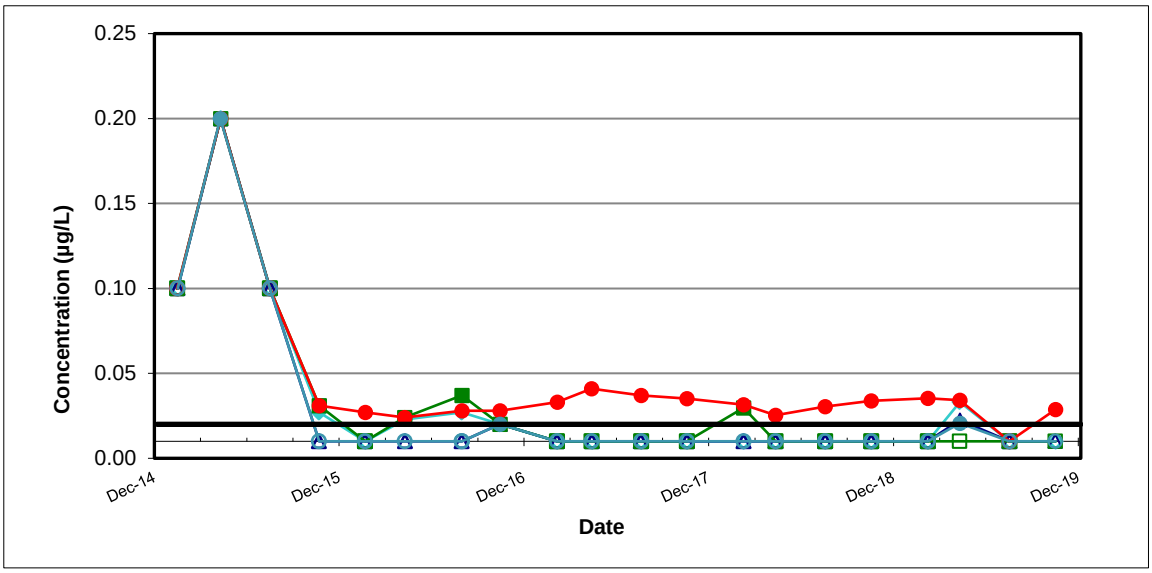
Note: non-detected values shown at one-half the reporting limit and graphed with an open symbol.

wood.	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. 8888 Figure 4

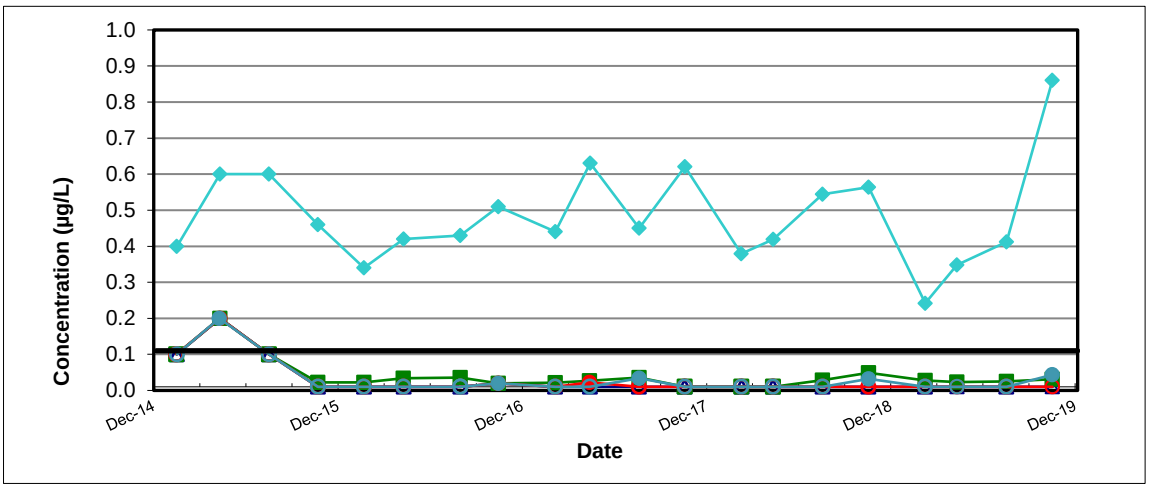
P:\8888 - Boeing Renton\03 Order Reporting Files\Quarterly Reports\2019\4Q2019\Figures\OLD data\Figures 2 to 6_ SWMU_172-174 Trend Plots.xlsx



cis-1,2-Dichloroethene



Trichloroethene

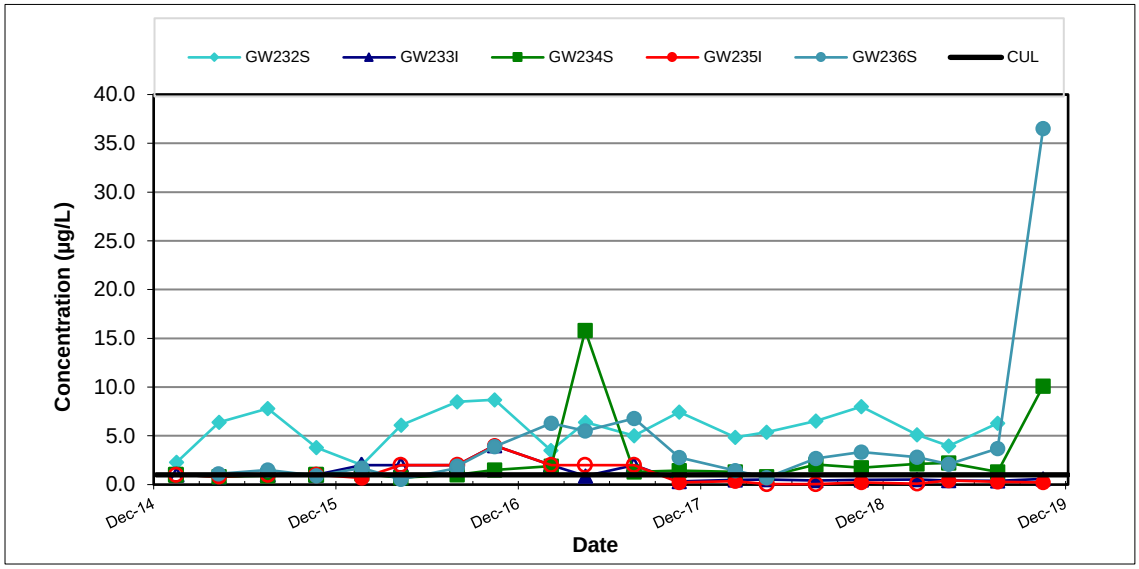


Vinyl Chloride

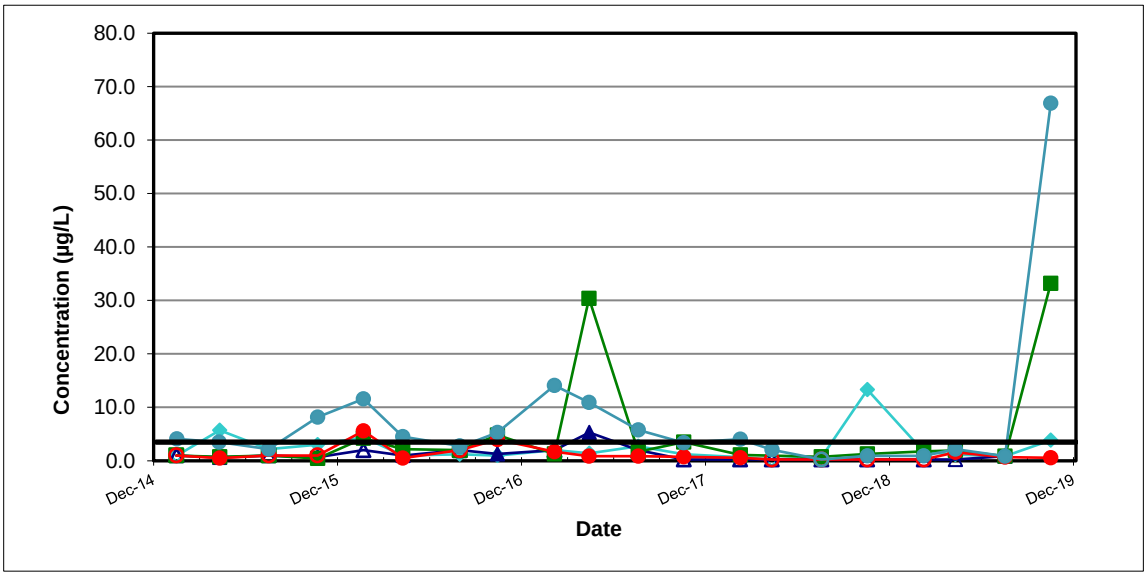
Note: non-detected values shown at one-half the reporting limit and graphed with an open symbol.

wood.	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. 8888 Figure 5

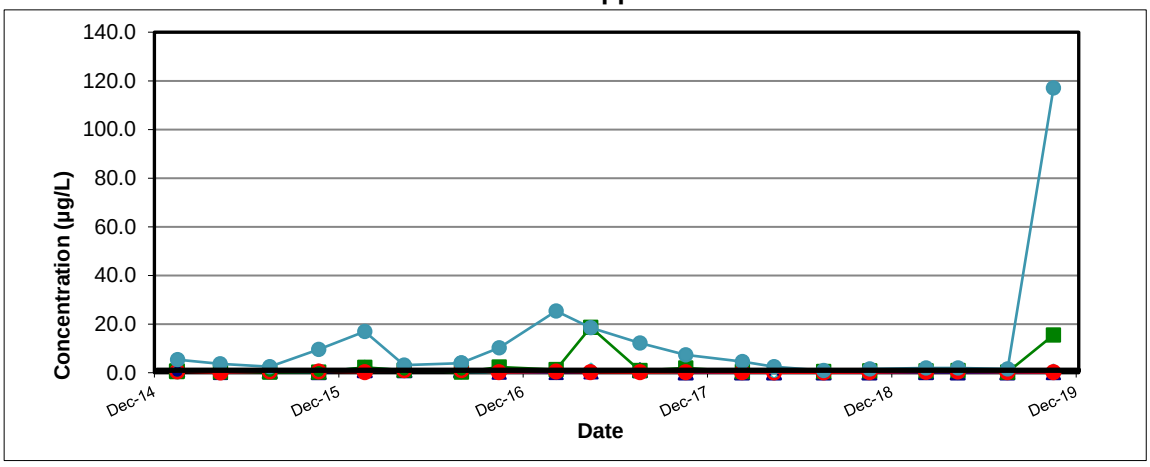
P:\8888 - Boeing Renton\03 Order Reporting Files\Quarterly Reports\2019\4Q2019\Figures\OLD data\Figures 2 to 6_ SWMU_172-174 Trend Plots.xlsx



Arsenic



Copper



Lead

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

wood.	SWMU-172 AND SWMU-174 TREND PLOTS FOR ARSENIC, COPPER AND LEAD IN CPOC AREA WELLS Boeing Renton Facility Renton, Washington	Project No. 8888 Figure 6

P:\8888 - Boeing Renton\03 Order Reporting Files\Quarterly Reports\2019\4Q2019\Figures\OLD data\Figures 2 to 6_ SWMU_172-174 Trend Plots.xlsx

CEDAR RIVER TRAIL PARK

NISHIWAKI LANE

APPROXIMATE PROPERTY LINE

CONDITIONAL POC

CEDAR RIVER WATERWAY

BUILDING 4-45

BUILDING 4-79

BUILDING 4-78

BUILDING 4-77

SWMU-181

DISPENSER ISLAND (REMOVED)

AOC-013 (URE-17)

AOC-014 (URE-18)

AOC-015 (URE-24)

AOC-026 (URE-54)

AOC-037 (URE-25)

AOC-054 (URE-23)

14.10

14.20

GW132S

GW133S

GW237S 14.05

GW238I 14.05*

GW209S 14.07

GW210S 14.24

GW031S 14.18

GW244S 14.17

GW022S

GW023S

GW024D

GW026I

GW027D

GW042D

GW041S

GW243I 14.14*

GW039S 14.19

GW040S

GW239I 14.09

GW240D 14.34*

GW143S 14.11

GW242I 14.09*

GW241S 14.09

GW032D

GW151D

GW033S 14.15

GW034S 14.14

GW037S

GW038S 14.11

GW035S

GW036S

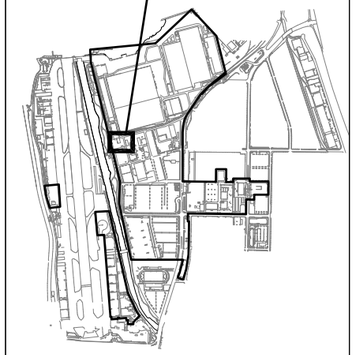
GW030S

PP083 PP084 PP085 PP086 PP087 PP088 PP089 PP178 PP179 PP180 PP181 PP182 PP183 PP185 PP186 PP187 PP188 PP189 PP201

SVE-01 SVE-02 SVE-03 SVE-04 SVE-05 SVE-06 SVE-07 SVE-08 SVE-09 SVE-10 SVE-11 SVE-12 SVE-13 SVE-14 SVE-15

B78-01 B78-02 B78-03 B78-04 B78-05 B78-06 B78-07 B78-08 B78-09 B78-10 B78-11 B78-12 B78-13 B78-14 B78-15 B78-16 B78-17 B78-18 B78-19 B78-20 B78-21

4-78/79 SWMU/AOC GROUP LOCATION MAP



BOEING RENTON FACILITY MAP

LEGEND

GW033S 14.15 — 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.

GW042D — EXTRACTION WELL

14.10 — GROUNDWATER ELEVATION CONTOUR (IN FEET) (DASHED WHERE INFERRED)

GENERAL DIRECTION OF GROUNDWATER FLOW

GW032D — ABANDONED MONITORING WELL

SVE-15 — HORIZONTAL SVE WELL

B78-12 — BIOREMEDIATION INJECTION WELL

EXTRACTION WELL CONVERTED TO INJECTION WELL

PP083 — PUSH-PROBE SAMPLE LOCATION

FENCE

APPROXIMATE FUEL AND NON-CHLORINATED VOC SOURCE AREAS

REMOVED UST (WESTON, 2001)

CONDITIONAL POINT OF COMPLIANCE

HIGHLIGHTED WELLS INCLUDED IN MONITORING NETWORK

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.

0 25 50

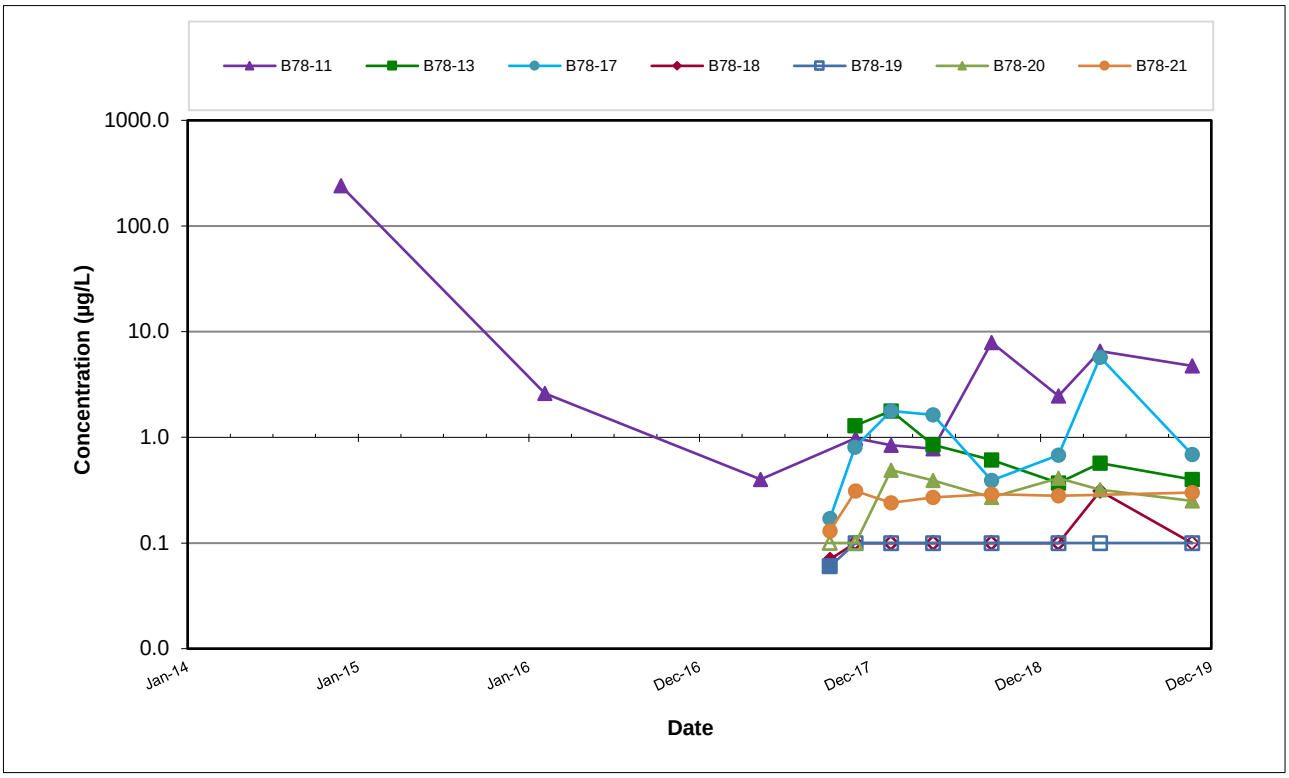
APPROXIMATE SCALE IN FEET

BUILDING 4-78/79 SWMU/AOC GROUP MONITORING WELL LOCATIONS AND GROUNDWATER ELEVATIONS NOVEMBER 12, 2019

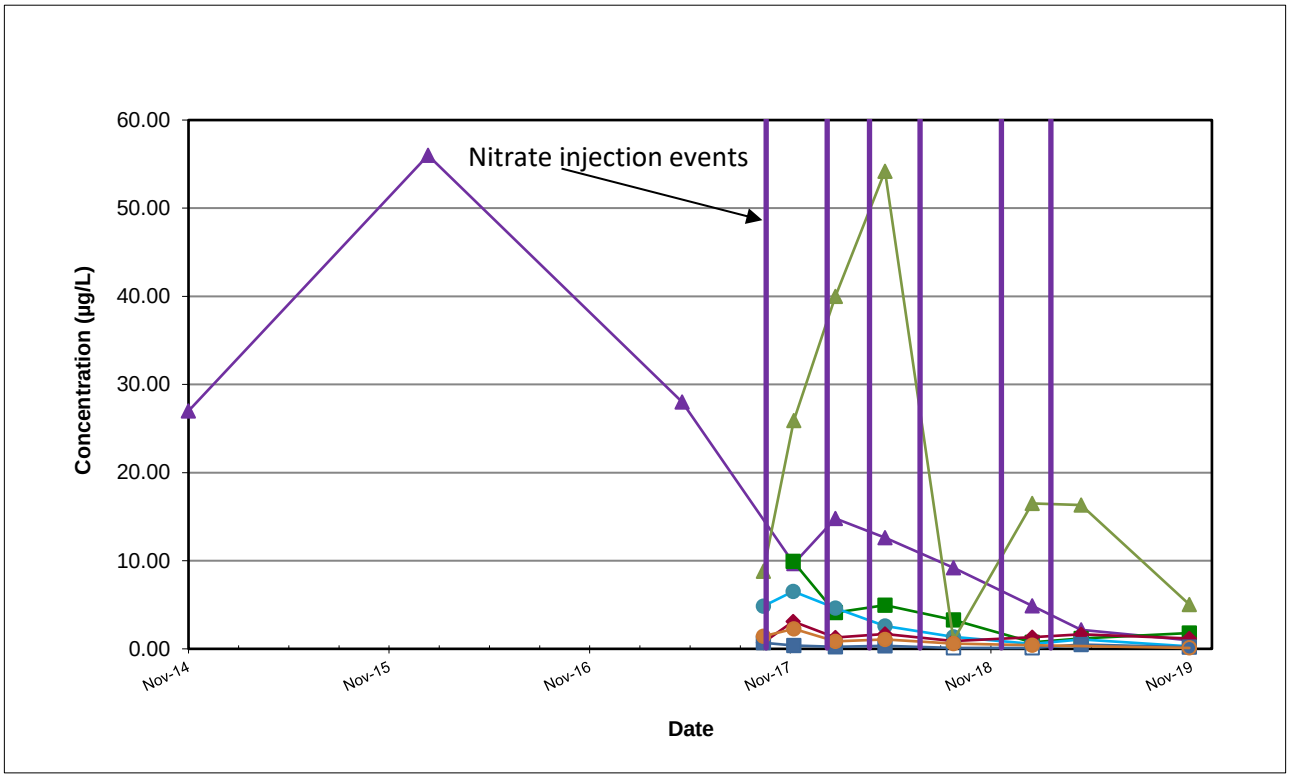
Boeing Renton Facility
Renton, Washington

By: MDS	Date: 02/11/20	Project No. 8888
wood.		Figure 7

Plot Date: 02/11/20 - 2:54pm, Plotted by: adam.stenberg
Drawing Path: S:\8888_2006\101_4q19_GW-MR\Fig 7 Boeing Q4 2019\, Drawing Name: Figure7_Building 4-78-79_GW-ELEV_4Q19_012820.dwg



cis-1,2-Dichloroethene

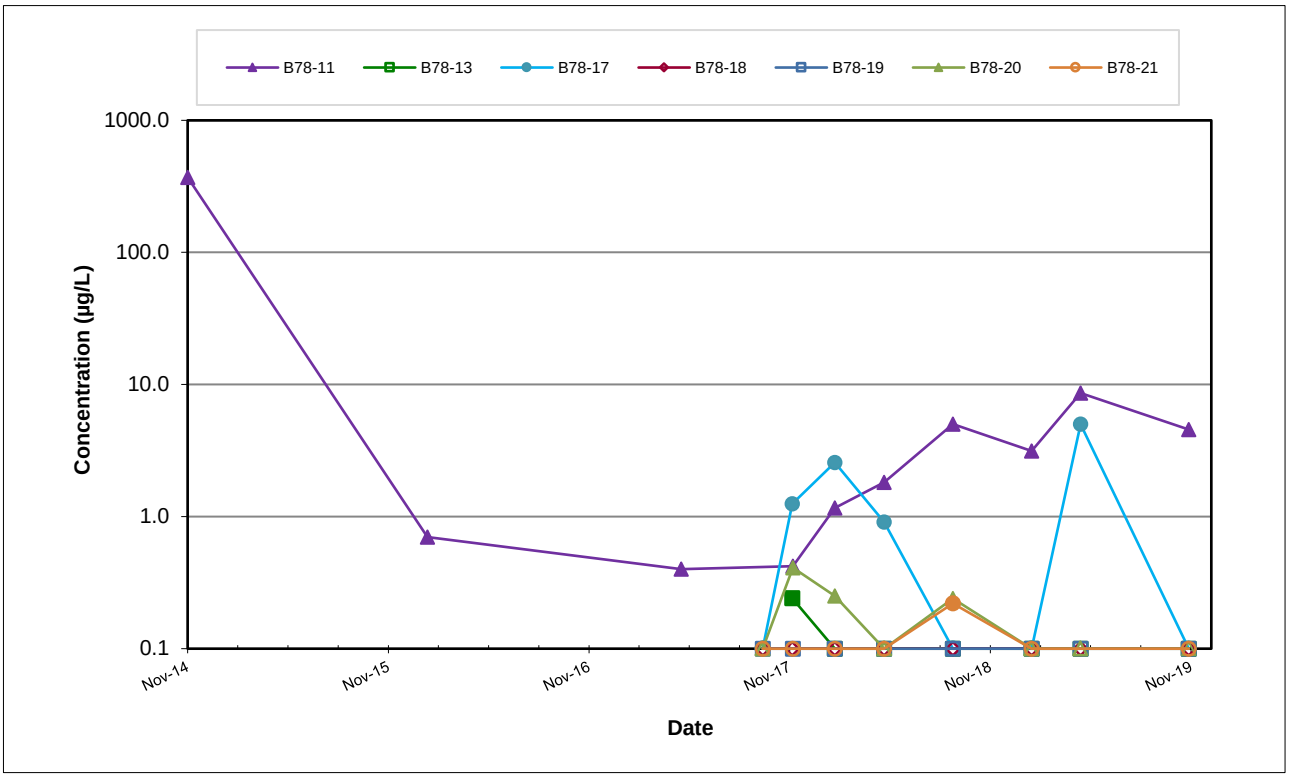


Benzene

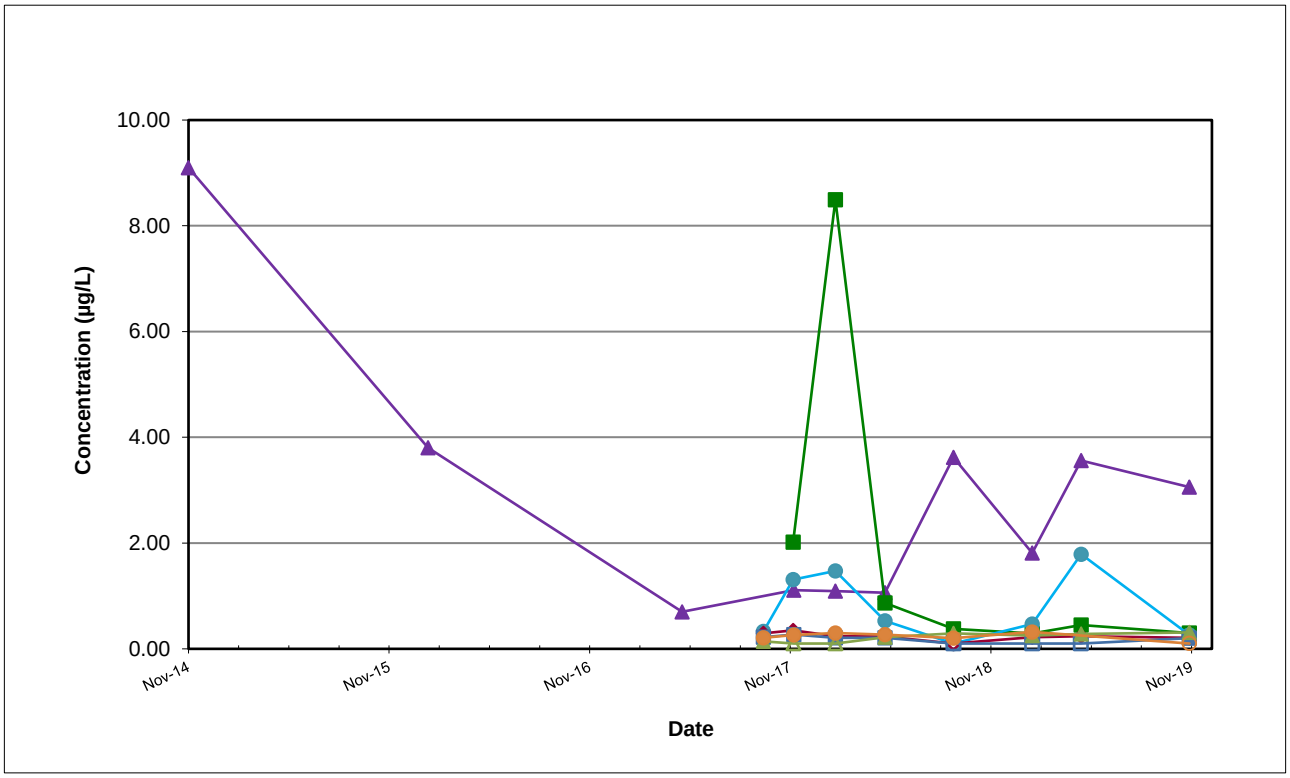
Note: non-detected values shown at one-half the reporting limit and graphed with an open symbol.

wood.	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. 8888 Figure 8

P:\8888 - Boeing Renton\03 Order Reporting Files\Quarterly Reports\2019\4Q2019\Figures\OLD data\Figures 8 to 14_ Bldg 4-78-79 Trend Plots.xlsx



Trichloroethene

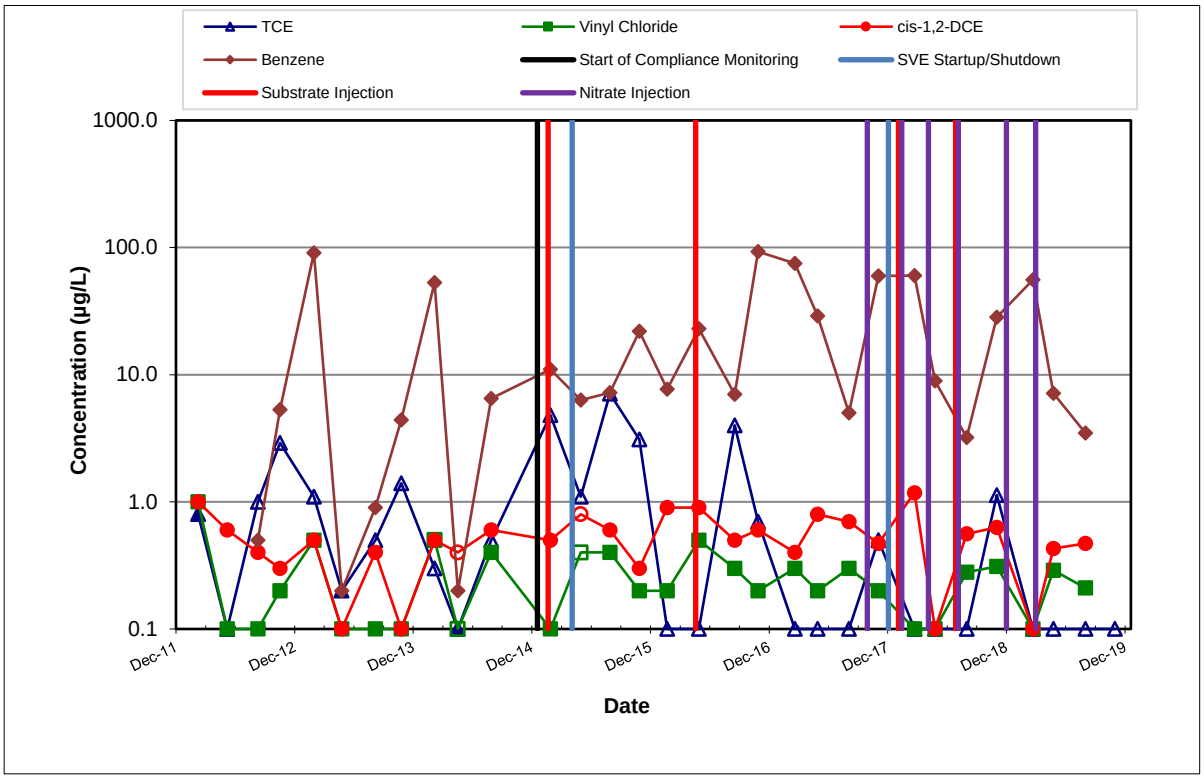


Vinyl Chloride

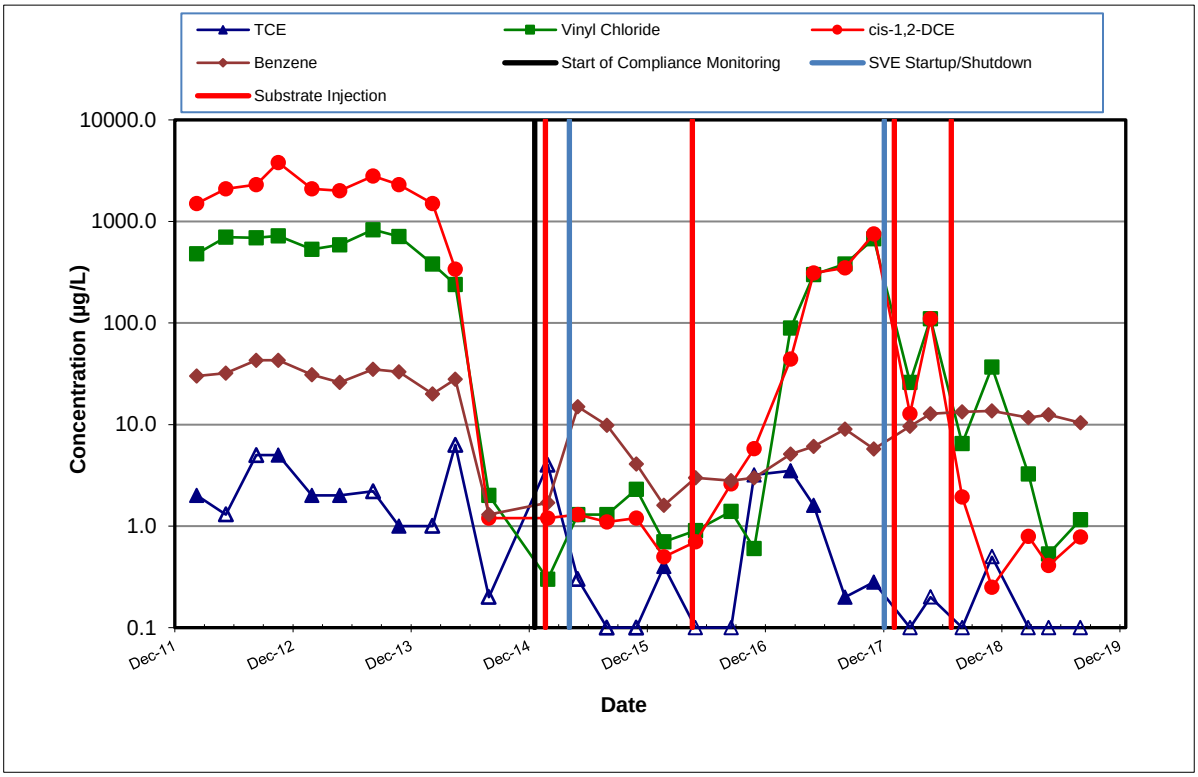
Note: non-detected values shown at one-half the reporting limit and graphed with an open symbol.

wood.	BUILDING 4-78/79 SWMU/AOC GROUP TREND PLOTS FOR TRICHLOROETHENE AND VINYL CHLORIDE IN INJECTION WELLS Boeing Renton Facility Renton, Washington	Project No. 8888 Figure 9

P:\8888 - Boeing Renton\03 Order Reporting Files\Quarterly Reports\2019\4Q2019\Figures\OLD data\Figures 8 to 14_ Bldg 4-78-79 Trend Plots.xlsx



SOURCE AREA WELL GW031S

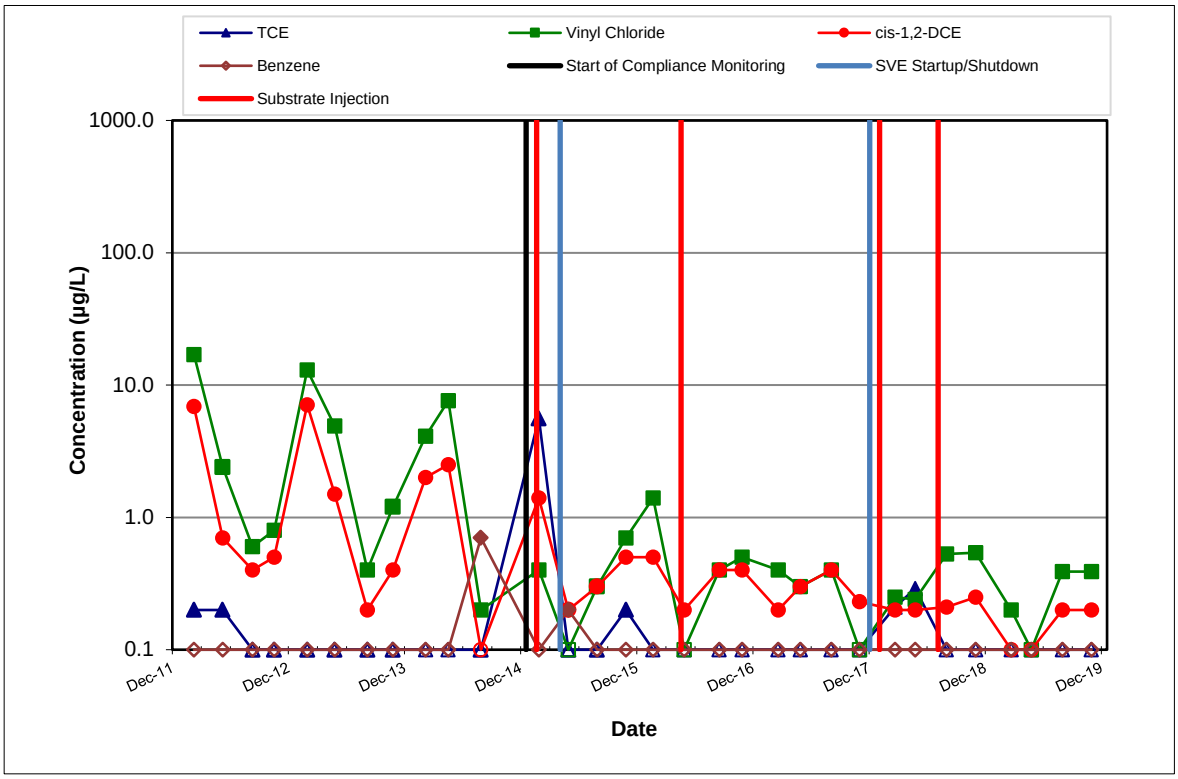


SOURCE AREA WELL GW033S

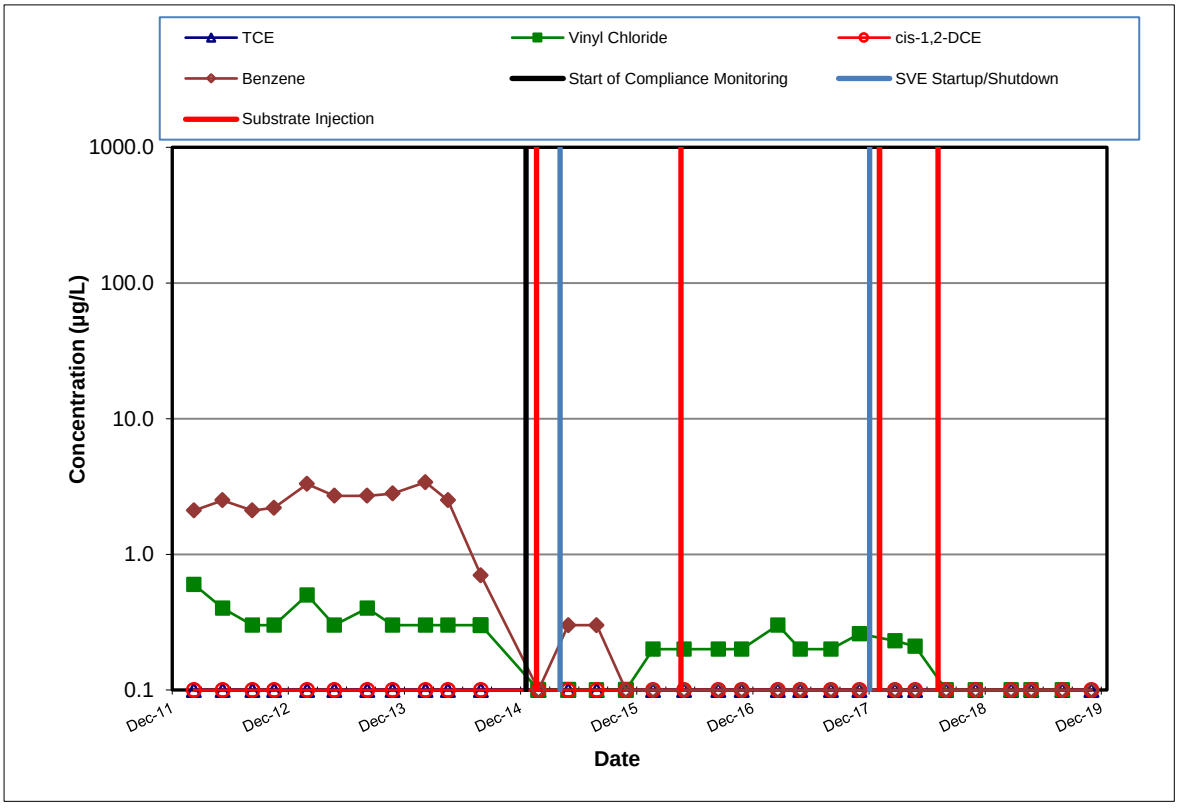
Note: non-detected values shown at one-half the reporting limit and graphed with an open symbol.

wood.	BUILDING 4-78/79 SWMU/AOC GROUP TREND PLOTS FOR SOURCE AREA WELLS GW031S AND GW033S Boeing Renton Facility Renton, Washington	Project No. 8888 Figure 10

P:\8888 - Boeing Renton\03 Order Reporting Files\Quarterly Reports\2019\4Q2019\Figures\OLD data\Figures 8 to 14_ Bldg 4-78-79 Trend Plots.xlsx



SOURCE AREA WELL GW034S

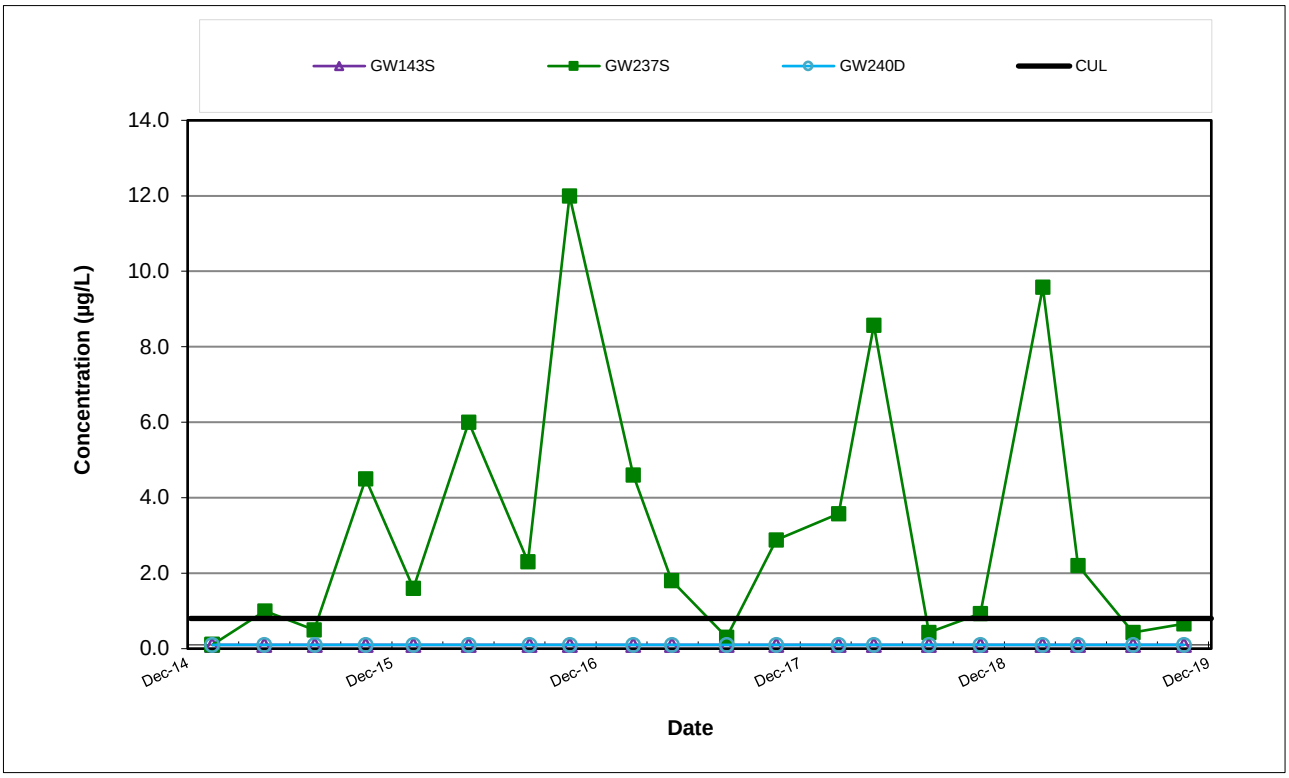


DOWNGRADIENT PLUME AREA WELL GW209S

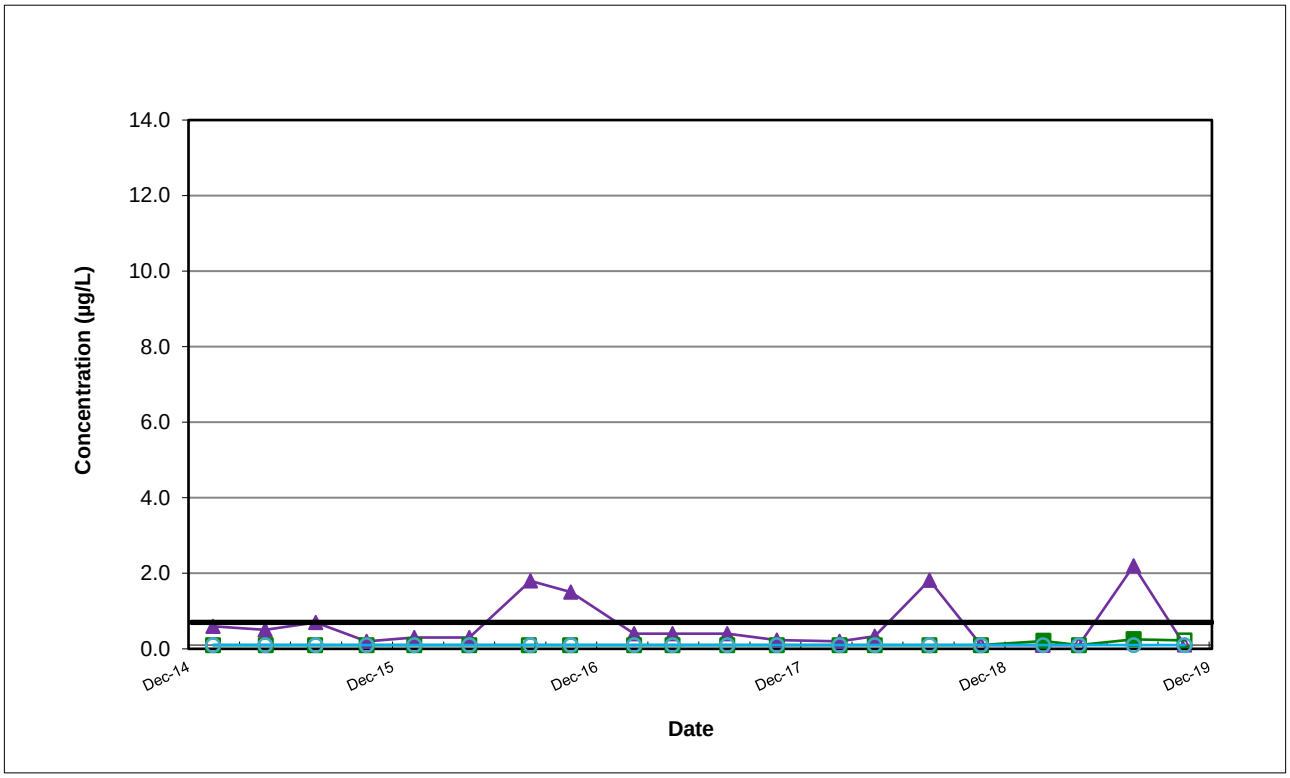
Note: non-detected values shown at one-half the reporting limit and graphed with an open symbol.

wood.	BLDG 4-78/79 SWMU/AOC GROUP TREND PLOTS FOR SOURCE AREA WELL GW034S AND DOWNGRADIENT PLUME AREA WELL GW209S Boeing Renton Facility	Project No. 8888 Figure 11

P:\8888 - Boeing Renton\03 Order Reporting Files\Quarterly Reports\2019\4Q2019\Figures\OLD data\Figures 8 to 14_ Bldg 4-78-79 Trend Plots.xlsx



Benzene

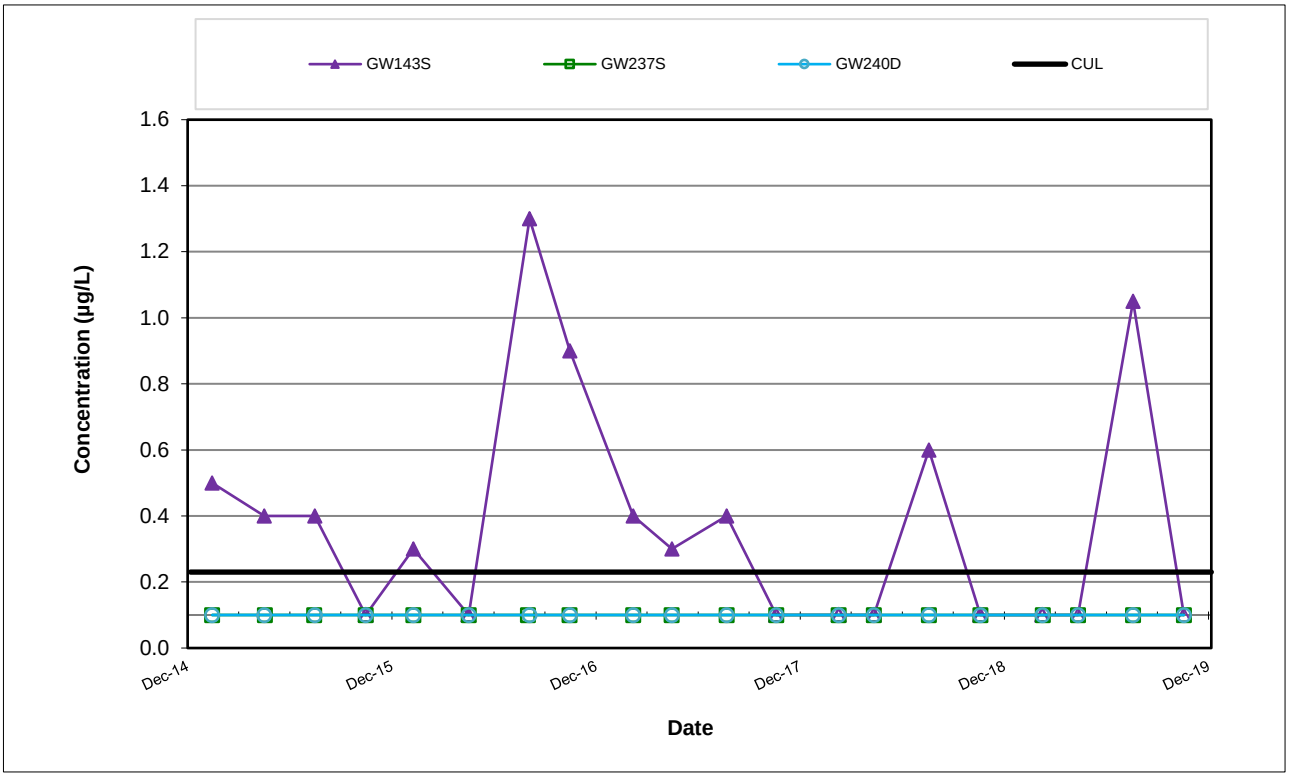


cis-1,2-Dichloroethene

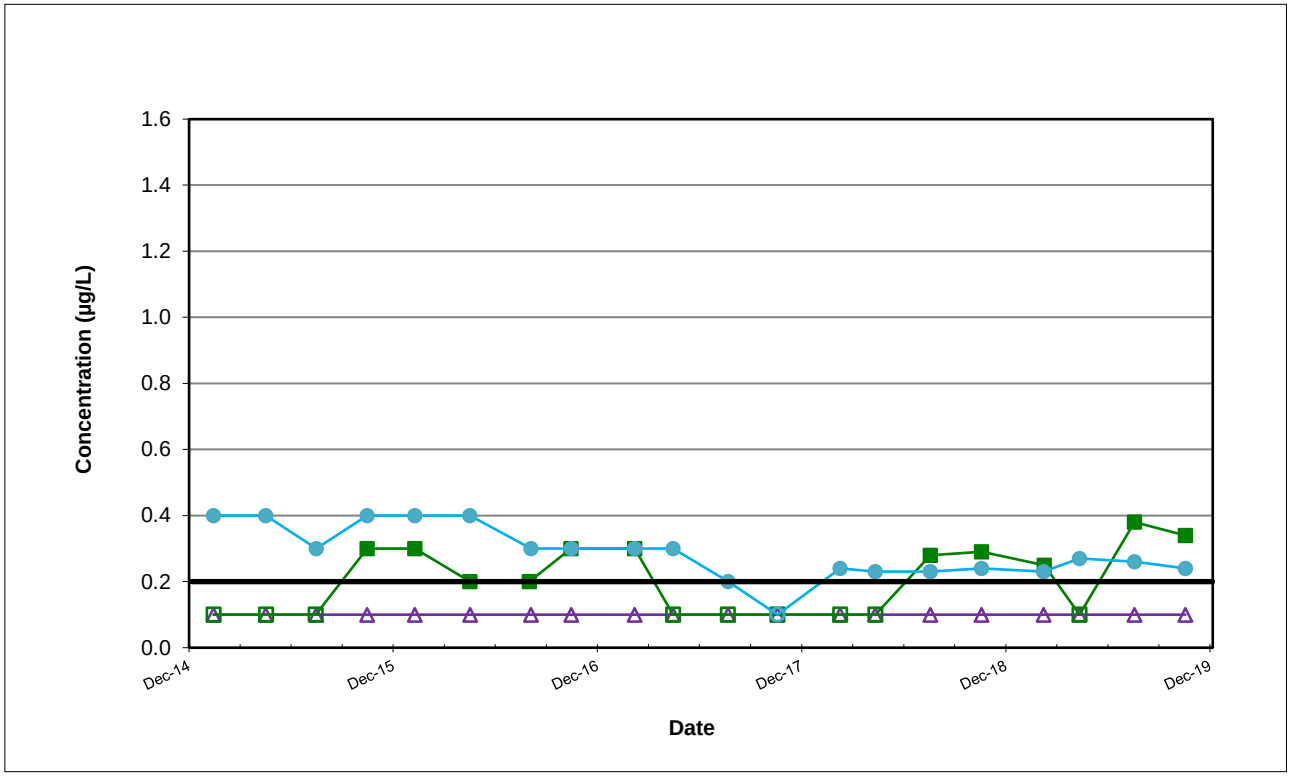
Note: non-detected values shown at one-half the reporting limit and graphed with an open symbol.

wood.	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. 8888 Figure 12

P:\8888 - Boeing Renton\03 Order Reporting Files\Quarterly Reports\2019\4Q2019\Figures\OLD data\Figures 8 to 14_ Bldg 4-78-79 Trend Plots.xlsx



Trichloroethene

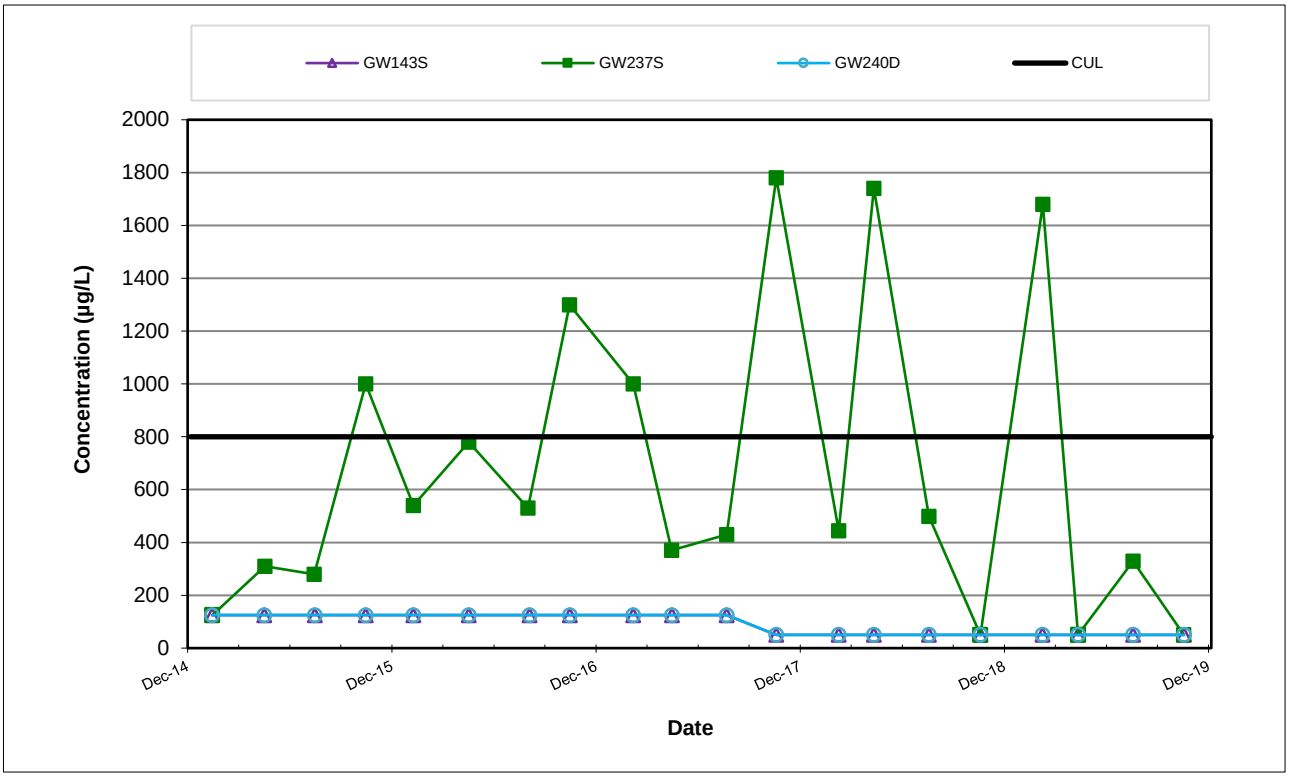


Vinyl Chloride

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

wood.	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. 8888 Figure 13

P:\8888 - Boeing Renton\03 Order Reporting Files\Quarterly Reports\2019\4Q2019\Figures\OLD data\Figures 8 to 14_ Bldg 4-78-79 Trend Plots.xlsx

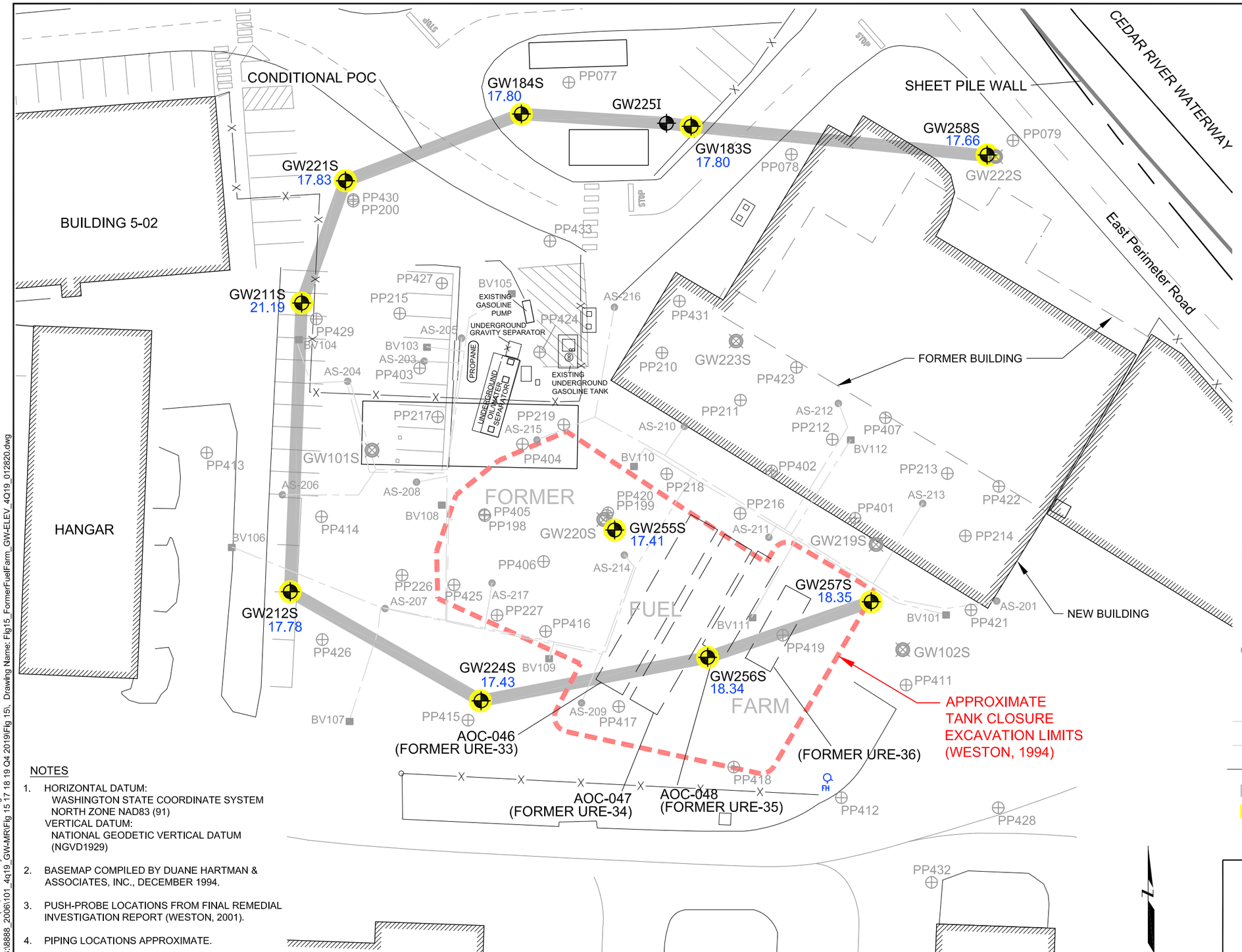


TPH as Gasoline

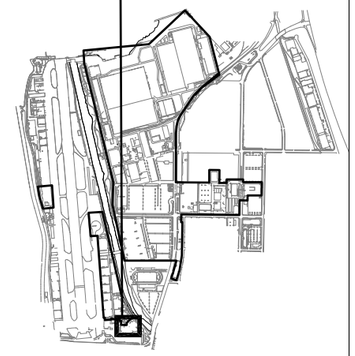
Note: non-detected values shown at one-half the reporting limit and graphed with an open symbol.

wood.	BUILDING 4-78/79 SWMU/AOC GROUP TREND PLOTS FOR TPH AS GASOLINE IN CPOC AREA WELLS Boeing Renton Facility Renton, Washington	Project No. 8888 Figure 14

P:\8888 - Boeing Renton\03 Order Reporting Files\Quarterly Reports\2019\4Q2019\Figures\OLD data\Figures 8 to 14_ Bldg 4-78-79 Trend Plots.xlsx



FORMER FUEL FARM AOC GROUP LOCATION MAP



BOEING RENTON FACILITY MAP

LEGEND

- GW184S 17.80 — MONITORING WELL LOCATION WITH GROUNDWATER ELEVATION (NGVD-FEET)
- * WELL SCREENED IN LOWER PORTION OF AQUIFER, SO WATER LEVEL IS NOT USED FOR CONTOURING.
- PP042 — PUSH PROBE LOCATION
- GW222S — ABANDONED 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
- 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.

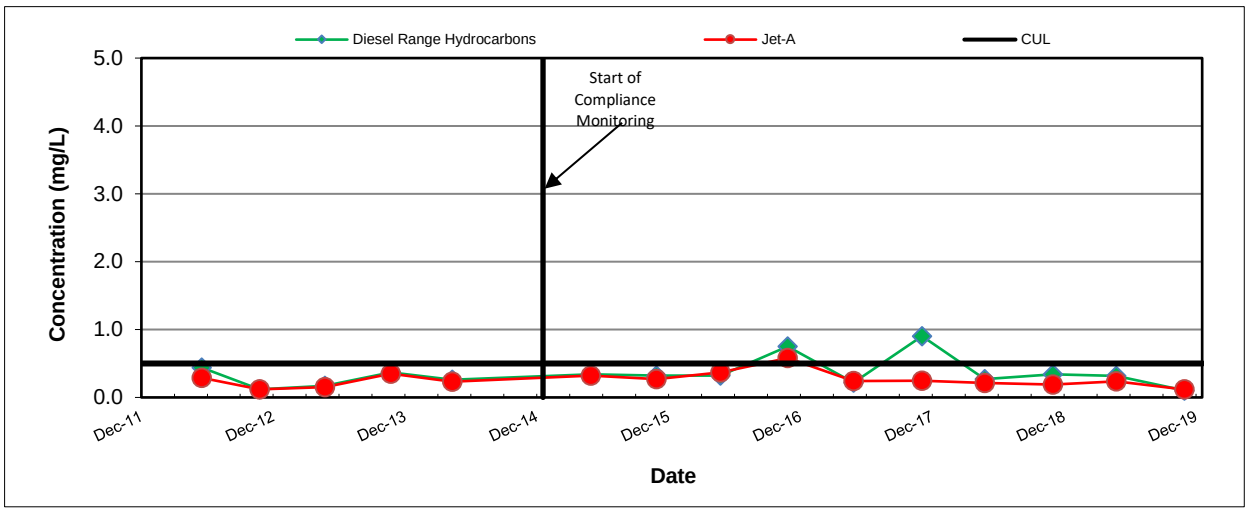
0 20 40
APPROXIMATE SCALE IN FEET

FORMER FUEL FARM AOC GROUP MONITORING WELL LOCATIONS AND GROUNDWATER ELEVATIONS

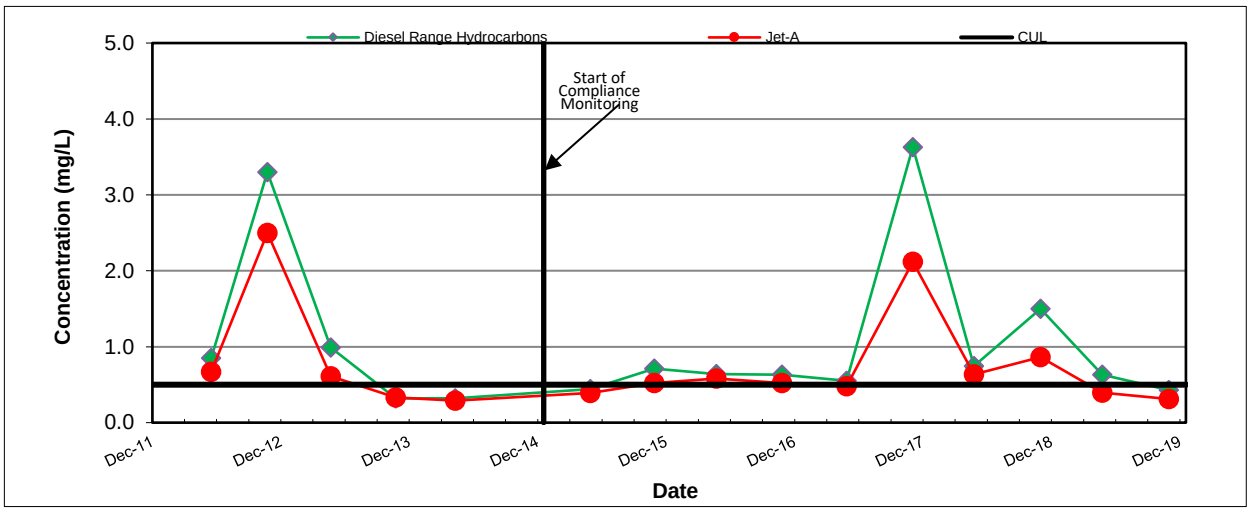
November 11, 2019
Boeing Renton Facility
Renton, Washington

By: MDS	Date: 02/11/20	Project No. 8888
wood.		Figure 15

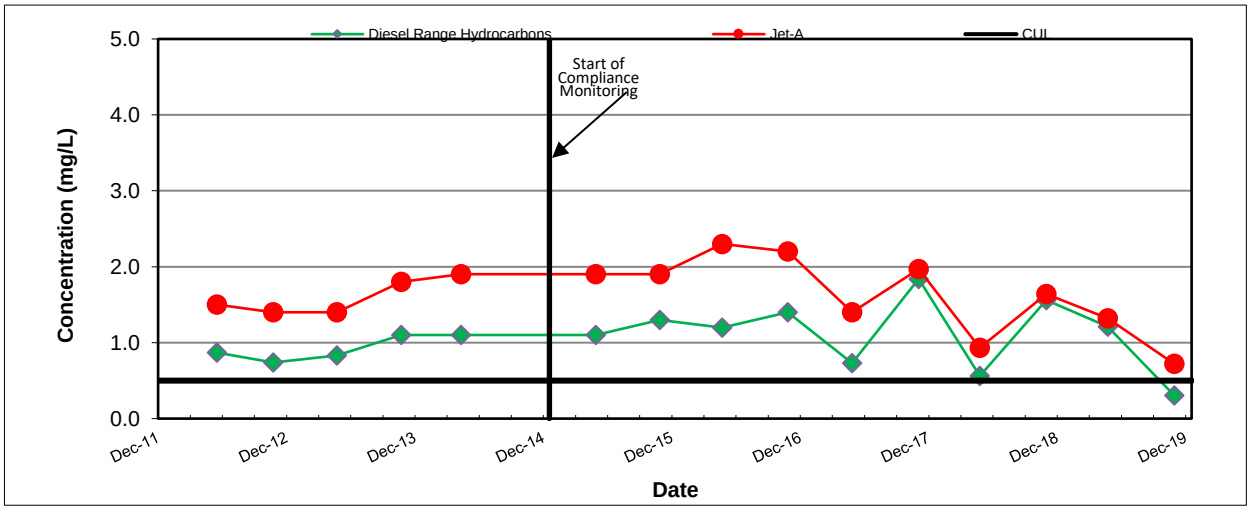
Plot Date: 02/11/20 - 2:38pm, Plotted by: adam.stenberg
Drawing Path: S:\8888_2006\101_4q19_GW-MR\Fig 15 17 18 19 Q4 2019\Fig 15\, Drawing Name: Fig15_FormerFuelFarm_GW-ELEV_4Q19_012820.dwg



CPOC WELL GW211S



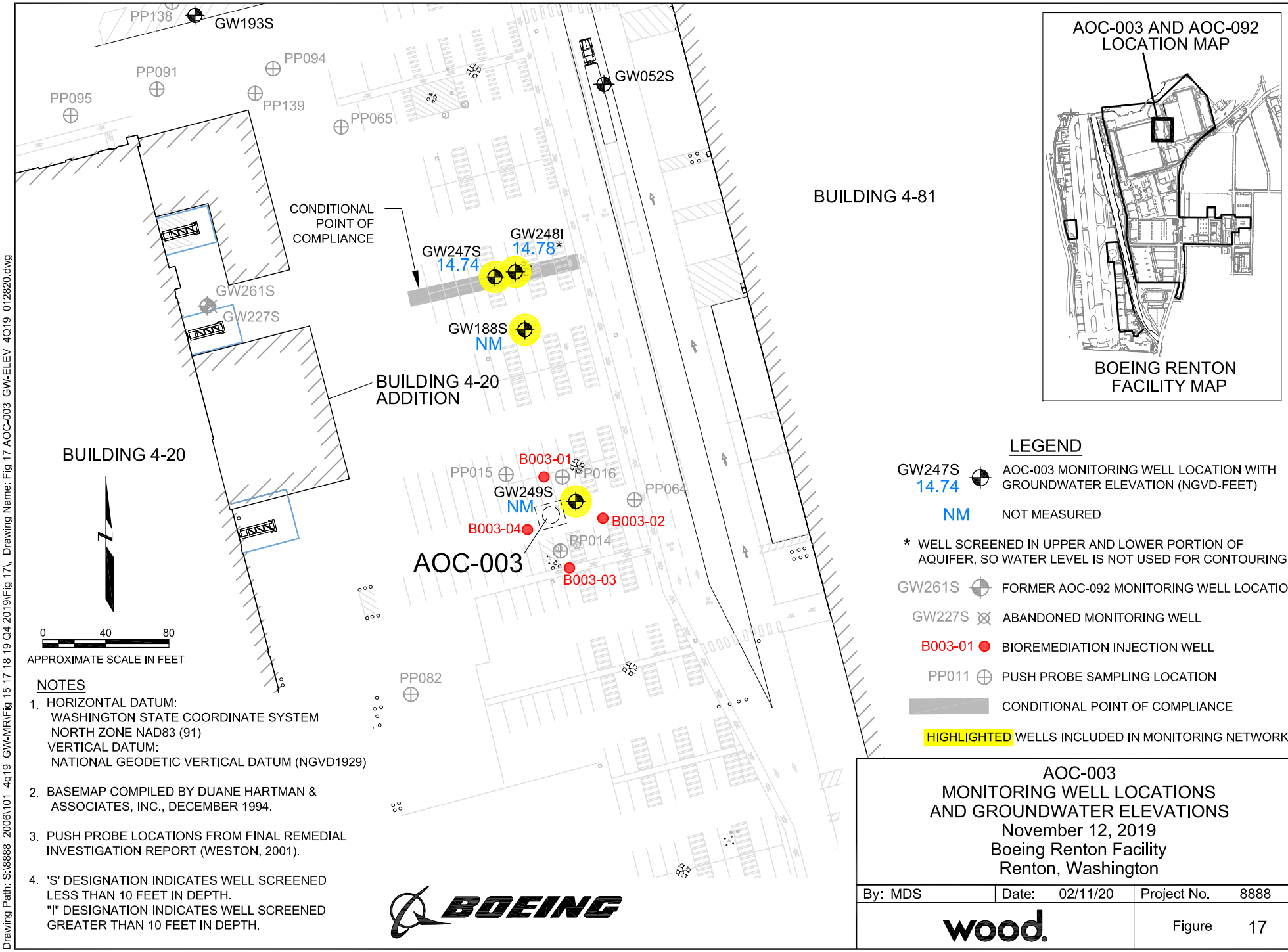
CPOC WELL GW221S



CPOC WELL GW224S

wood.	FORMER FUEL FARM AOC GROUP TREND PLOTS FOR CPOC AREA WELLS GW211S, GW221S, AND GW224S Boeing Renton Facility Renton, Washington	Project No. 8888 Figure 16

P:\8888 - Boeing Renton\03 Order Reporting Files\Quarterly Reports\2019\4Q2019\Figures\Figure 16_FFF CPOC trend plot.xls



AOC-003 AND AOC-092
LOCATION MAP

BOEING RENTON
FACILITY MAP

LEGEND

GW247S 14.74	AOC-003 MONITORING WELL LOCATION WITH GROUNDWATER ELEVATION (NGVD-FEET)
NM	NOT MEASURED
*	WELL SCREENED IN UPPER AND LOWER PORTION OF AQUIFER, SO WATER LEVEL IS NOT USED FOR CONTOURING.
GW261S	FORMER AOC-092 MONITORING WELL LOCATION
GW227S	ABANDONED MONITORING WELL
B003-01	BIOREMEDIATION INJECTION WELL
PP011	PUSH PROBE SAMPLING LOCATION
	CONDITIONAL POINT OF COMPLIANCE
HIGHLIGHTED	WELLS INCLUDED IN MONITORING NETWORK

NOTES

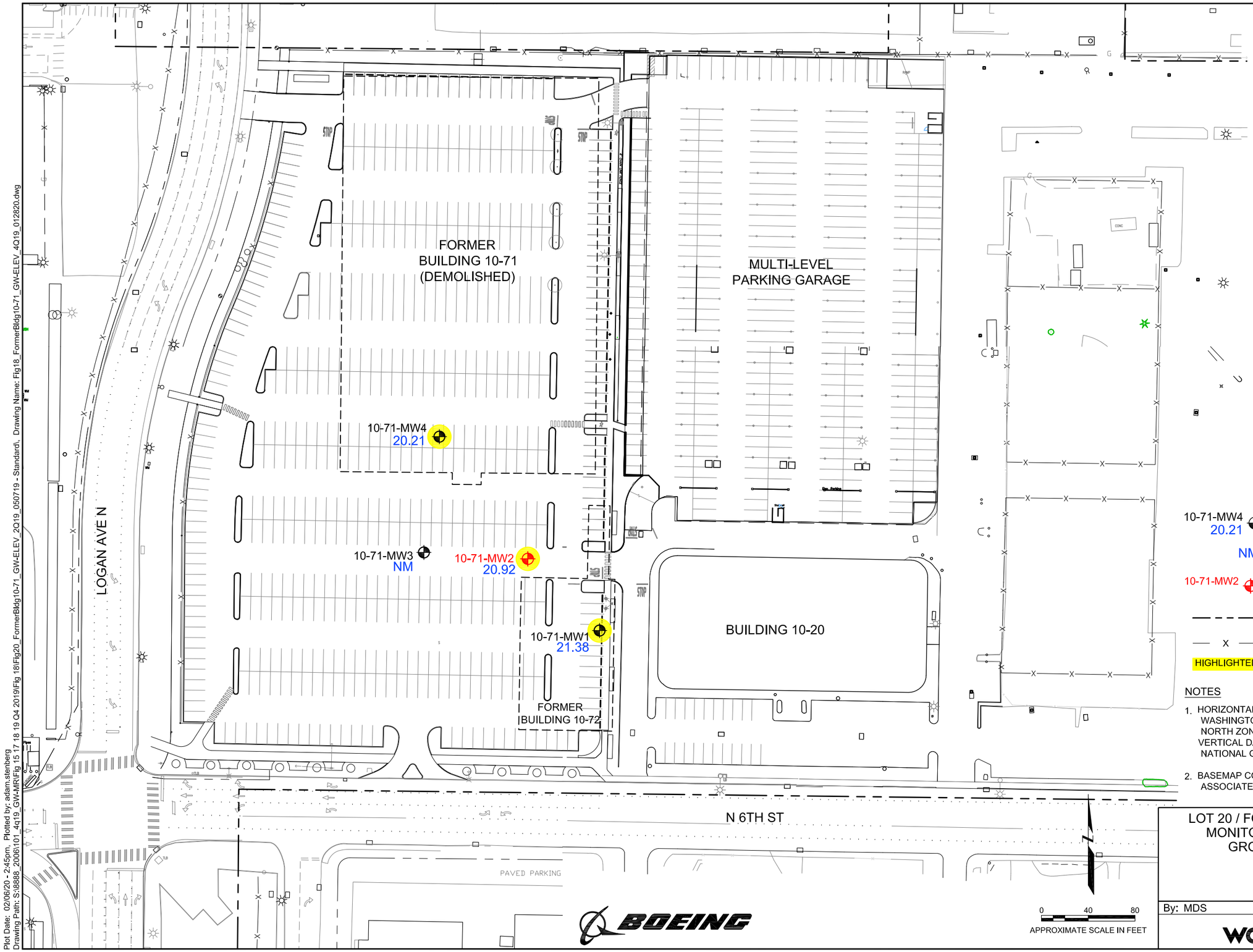
1. HORIZONTAL DATUM:
   WASHINGTON STATE COORDINATE SYSTEM
   NORTH ZONE NAD83 (91)
   VERTICAL DATUM:
   NATIONAL GEODETIC VERTICAL DATUM (NGVD1929)
2. BASEMAP COMPILED BY DUANE HARTMAN & ASSOCIATES, INC., DECEMBER 1994.
3. PUSH PROBE LOCATIONS FROM FINAL REMEDIAL INVESTIGATION REPORT (WESTON, 2001).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

BOEING

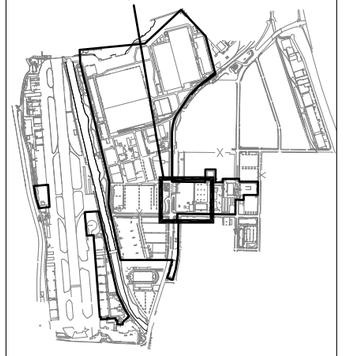
AOC-003
MONITORING WELL LOCATIONS AND GROUNDWATER ELEVATIONS
November 12, 2019
Boeing Renton Facility
Renton, Washington

By: MDS	Date: 02/11/20	Project No. 8888
wood.		Figure 17

Plot Date: 02/11/20 - 2:26pm, Plotted by: adam.stenberg
Drawing Path: S:\8888_2006\101_4q19_GW-MR\Fig 15 17 18 19 Q4 2019\Fig 17\, Drawing Name: Fig 17 AOC-003_GW-ELEV_4Q19_012820.dwg



FORMER BUILDING 10-71
LOCATION MAP



BOEING RENTON
FACILITY MAP

LEGEND

10-71-MW4 20.21	MONITORING WELL LOCATION GROUNDWATER ELEVATION (NGVD-FT)
NM	NOT MEASURED
10-71-MW2	ELECTRON DONOR INJECTION WELL AND MONITORING WELL LOCATION
— — — —	APPROXIMATE PROPERTY LINE
— X —	FENCE
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.

LOT 20 / FORMER BUILDING 10-71 PARCEL MONITORING WELL LOCATIONS AND GROUNDWATER ELEVATIONS

November 11, 2019
Boeing Renton Facility
Renton, Washington

By: MDS	Date: 02/06/20	Project No. 8888
wood.		Figure 18

Plot Date: 02/06/20 - 2:45pm, Plotted by: adam.stenberg
Drawing Path: S:\8888_2006\101_4q19_GW-MR\Fig 15 17 18 19 Q4 2019\Fig 18\Fig20_FormerBldg10-71_GW-ELEV_2Q19_050719 - Standard\, Drawing Name: Fig18_FormerBldg10-71_GW-ELEV_4Q19_012820.dwg

Plot Date: 02/03/20 - 2:06pm, Plotted by: mike.stenberg
Drawing Path: C:\Users\mike.stenberg\appdata\local\temp\AcPublish_15648\, Drawing Name: Fig19_APRON A_GW-ELEV_4Q19_012820.dwg

CEDAR RIVER WATERWAY

EAST PERIMETER ROAD

B-4
B-3
B-6
SHED
SHED
SHED
SHED
SHED
CB
B-10
B-12
B-2
B-9
B-8
B-7
CB
B-17
B-1
B-16
BUILDING
B-13
B-15
B-14
GW265S
GW263S
NM
GW264S
6.04' DTW
GW262S
5.33' DTW

APPROXIMATE AREA
OF TRENCH INJECTION

APRON A
LOCATION MAP

BOEING RENTON
FACILITY MAP

LEGEND

GW264S 6.04' DTW	MONITORING WELL LOCATION WITH DEPTH TO WATER (BGS IN FEET)
NM	NOT MEASURED
B-1	SOIL SAMPLE LOCATION
	APPROXIMATE PROPERTY LINE
x	FENCE

HIGHLIGHTED WELLS INCLUDED IN MONITORING NETWORK

N

0 20 40
APPROXIMATE SCALE IN FEET

APRON A
MONITORING WELL LOCATIONS AND DEPTH TO GROUNDWATER
November 11, 2019
Boeing Renton Facility
Renton, Washington

By: MDS	Date: 02/03/20	Project No. 16096
wood.		Figure 19

Tables

TABLE 1: SWMU-172 and SWMU-174 GROUP GROUNDWATER ELEVATION DATA
NOVEMBER 11, 2019
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]
GW081S	5 to 20[3]	25.91	8.76	17.15
GW152S	5 to 20[3]	26.98	9.10	17.88
GW153S	5 to 20[3]	27.47	9.56	17.91
GW172S	8 to 18[3]	26.44	9.49	16.95
GW173S	8 to 18[3]	26.51	9.53	16.98
GW226S	5 to 20[3]	26.86	8.97	17.89
GW232S	4 to 14	24.45	8.02	16.43
GW233I	15 to 25	24.35	7.53	16.82
GW234S	3 to 13	24.95	8.14	16.81
GW235I	15 to 25	24.90	7.73	17.17
GW236S	5 to 15	24.36	7.35	17.01

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

Abbreviations
bgs = below ground surface
TOC = top of casing

TABLE 2: SWMU-172 AND SWMU-174 GROUP CONCENTRATIONS OF PRIMARY GEOCHEMICAL INDICATORS [1]
NOVEMBER 11, 2019
Boeing Renton Facility, Renton, Washington

	Well ID[2]											
	Source Area			Downgradient Plume Area				CPOC Area				
	GW152S	GW152S (field dup.)	GW153S	GW081S	GW172S	GW173S	GW226S	GW232S	GW233I	GW234S	GW235I	GW236S
Specific Conductivity (µS/cm)	150.2	145.4	121.1	167.7	227.8	356.8	283.8	503.0	215.7	240.3	152.6	345.3
Dissolved Oxygen (mg/L)	1.06	0.95	4.40	2.25	1.73	0.80	0.65	6.93	1.85	0.91	1.18	1.36
Oxidation/Reduction Potential (mV)	92.9	91.9	94.5	87.8	89.1	56.9	80.2	70.5	64.3	77.0	84.5	6.5
pH (standard units)	6.28	6.28	6.35	6.36	6.35	6.69	6.52	6.20	6.40	6.47	6.27	6.45
Temperature (degrees C)	13.20	13.10	14.30	13.20	16.20	11.80	13.20	14.80	10.40	14.90	15.90	15.60
Total Organic Carbon (mg/L)	29.56	18.21	10.59	4.84	6.90	6.08	28.86	7.89	4.69	27.54	1.22	6.60

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
CPOC = conditional point of compliance
degrees C = degrees Celsius
field dup. = field duplicate
mg/L = milligrams per liter
mV = millivolts

TABLE 3: SWMU-172 AND SWMU-174 GROUP CONCENTRATIONS OF CONSTITUENTS OF CONCERN[1, 2]
NOVEMBER 11, 2019
Boeing Renton Facility, Renton, Washington

	Current Cleanup Levels[4]	Well ID[3]											
		Source Area			Downgradient Plume Area				CPOC Area				
		GW152S	GW152S (field dup.)	GW153S	GW081S	GW172S	GW173S	GW226S	GW232S	GW233I	GW234S	GW235I	GW236S
Volatile Organic Compounds (µg/L)													
cis-1,2-Dichloroethene	0.03	**0.530**	**0.545**	**0.204**	**0.0311**	**0.0561**	**0.0378**	**0.235**	**0.659**	**0.0546**	**0.0850**	**0.109**	**0.108**
Tetrachloroethene	0.02	**0.384**	**0.372**	**0.164**	**0.0663**	**0.0287**	**0.0246**	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02U
Trichloroethene	0.02	**0.145**	**0.142**	**0.131**	0.02 U	0.02 U	**0.0379**	0.02 U	0.02 U	0.02 U	0.02 U	**0.0287**	0.02 U
Vinyl Chloride	0.11	0.0366	0.0522	0.0859	0.02 U	0.0905	0.0720	**0.615**	**0.860**	0.02 U	0.0309	0.02 U	**0.0437**
Total Metals (µg/L)													
Arsenic	1.0	**7.18**	**16.4**	**11.9**	**2.69**	**20.5**	**15.6**	**12.0**	**8.09**	0.594	**10.1**	0.237	**36.5**
Copper	3.5	**16.6**	**33.4**	**10.2**	1.96	**9.25**	**4.68**	**15.6**	**3.85**	0.774	**33.2**	0.573	**66.9**
Lead	1.0	**12.1**	**26.6**	**2.76**	0.21	**7.44**	**1.36**	**2.43**	0.378	0.100 U	**15.5**	0.127	**117**

Notes

1. Data qualifiers are as follows:
   J = The result is an estimate.
   U = The analyte was not detected at the reporting limit indicated.
2. **Bolded** values exceed the current 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
CPOC = conditional point of compliance
field dup. = field duplicate

TABLE 4: BUILDING 4-78/79 SWMU/AOC GROUP
GROUNDWATER ELEVATION DATA
NOVEMBER 12, 2019
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	5 to 25	19.44	5.26	14.18
GW033S	5 to 25	19.49	5.34	14.15
GW034S	5 to 25	19.65	5.51	14.14
GW038S	5 to 25	19.68	5.57	14.11
GW039S	3.5 to 13.5	19.30	5.11	14.19
GW143S	10 to 15	19.81	5.70	14.11
GW209S	3.5 to 13.3	19.37	5.30	14.07
GW210S	3.5 to 13.3	19.19	4.95	14.24
GW237S	5 to 15	18.85	4.80	14.05
GW238I	5 to 20	18.94	4.89	14.05
GW239I	15 to 20	19.69	5.60	14.09
GW240D	22 to 27	19.81	5.47	14.34
GW241S	4 to 14	20.28	6.19	14.09
GW242I	15 to 20	20.44	6.35	14.09
GW243I	5 to 20	19.49	5.35	14.14
GW244S	5 to 15	19.53	5.36	14.17

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

Abbreviations
bgs = below ground surface
TOC = top of casing

TABLE 5: BUILDING 4-78/79 SWMU/AOC GROUP CONCENTRATIONS OF PRIMARY GEOCHEMICAL INDICATORS [1]
NOVEMBER 12, 2019
Boeing Renton Facility, Renton, Washington

	Well ID[2]									
	Source Area							Downgradient Plume Area		
	GW031S	GW031S (field dup.)	GW033S	GW034S	GW039S	GW243I	GW244S	GW038S	GW209S	GW210S
Specific Conductivity (µS/cm)	359.1	NA	341.8	259.7	199.4	357.0	383.0	267.9	328.0	274.4
Dissolved Oxygen (mg/L)	0.95		0.61	0.35	0.42	0.21	1.22	0.55	0.26	0.28
Oxidation/Reduction Potential (mV)	114.1		111.7	92.4	2.0	-3.3	112.2	87.5	7.0	103.3
pH (standard units)	6.26		6.30	6.45	6.30	6.30	6.24	6.36	6.48	6.65
Temperature (degrees C)	13.1		13.7	13.8	16.9	15.6	12.0	12.9	15.3	11.8
Total Organic Carbon (mg/L)	15.38	15.01	17.51	8.00	7.21	10.84	14.90	19.72	9.27	126.60

	Well ID[2]						
	CPOC Area						
	GW143S	GW237S	GW238I	GW239I	GW240D	GW241S	GW242I
Specific Conductivity (µS/cm)	306.3	207.0	400.4	294.7	327.3	295.2	290.6
Dissolved Oxygen (mg/L)	0.23	0.42	1.00	0.25	0.20	0.20	0.19
Oxidation/Reduction Potential (mV)	-6.4	12.4	23.8	11.6	3.6	-12.1	-3.4
pH (standard units)	6.41	6.46	6.28	6.38	6.53	6.44	6.43
Temperature (degrees C)	15.00	14.60	15.10	13.10	13.30	15.10	14.30
Total Organic Carbon (mg/L)	9.93	5.06	9.24	10.07	7.31	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; I = intermediate well; D = deep well.

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
NA = not analyzed

TABLE 6: BUILDING 4-78/79 SWMU/AOC GROUP
CONCENTRATIONS OF CONSTITUENTS OF CONCERN [1, 2]
NOVEMBER 12, 2019
Boeing Renton Facility, Renton, Washington

	Current Site Specific Cleanup Level[4]	Well ID[3]						
		Source Area						
		GW031S	GW031S (field dup.)	GW033S	GW034S	GW039S	GW243I	GW244S
Volatile Organic Compounds (µg/L)								
Benzene	0.80	**4.77**	**4.75**	**11.5**	0.20 U	0.20 U	0.20 U	**0.87**
cis-1,2-Dichloroethene	0.70	0.40	0.39	**2.78**	0.20 U	0.20 U	0.20 U	0.20 U
Trichloroethene	0.23	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Vinyl Chloride	0.20	**0.25**	**0.27**	**13**	**0.39**	0.20 U	0.20 U	**0.35**
Total Petroleum Hydrocarbons (µg/L)								
TPH-G (C7-C12)	800	**1,540**	**1,560**	347	100 U	100 U	100 U	100 U

	Current Site Specific Cleanup Level[4]	Well ID[3]		
		Downgradient Plume Area		
		GW038S	GW209S	GW210S
Volatile Organic Compounds (µg/L)				
Benzene	0.80	0.20 U	0.20 U	0.20 U
cis -1,2-Dichloroethene	0.70	0.20 U	0.20 U	0.20 U
Trichloroethene	0.23	0.20 U	0.20 U	0.20 U
Vinyl Chloride	0.20	0.20 U	0.20 U	0.20 U
Total Petroleum Hydrocarbons (µg/L)				
TPH-G (C7-C12)	800	100 U	100 U	100 U

	Current Site Specific Cleanup Level[4]	Well ID[3]						
		CPOC Area						
		GW143S	GW237S	GW238I	GW239I	GW240D	GW241S	GW242I
Volatile Organic Compounds (µg/L)								
Benzene	0.80	0.20 U	0.66	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
cis -1,2-Dichloroethene	0.70	0.20 U	0.22	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Trichloroethene	0.23	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Vinyl Chloride	0.20	0.20 U	**0.34**	0.20 U	0.20 U	**0.24**	0.20 U	0.20 U
Total Petroleum Hydrocarbons (µg/L)								
TPH-G (C7-C12)	800	100 U	100 U	100 U	100 U	100 U	100 U	100 U

Notes
1. Data qualifiers are as follows:
   U = The result is an estimate.
   U = The analyte was not detected at the reporting limit indicated.
2. **Bolded** values exceed the current 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
CPOC = conditional point of compliance
field dup. = field duplicate
TPH-G = total petroleum hydrocarbons as gasoline

TABLE 7: FORMER FUEL FARM GROUNDWATER ELEVATION DATA
NOVEMBER 11, 2019
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]
GW183S	5.5 to 15	26.58	8.78	17.80
GW184S	5.6 to 15	27.14	9.34	17.80
GW211S	4.8 to 14.7	27.77	6.58	21.19
GW212S	4.9 to 14.8	28.06	10.28	17.78
GW221S	5 to 15	27.93	10.10	17.83
GW224S	5 to 15	27.98	10.55	17.43
GW255S	6 to 16	27.49	10.08	17.41
GW256S	7 to 16	27.22	8.88	18.34
GW257S	8 to 16	27.87	9.52	18.35
GW258S	9 to 16	25.51	7.85	17.66

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

Abbreviations
bgs = below ground surface
TOC = top of casing

TABLE 8: FORMER FUEL FARM CONCENTRATIONS OF PRIMARY GEOCHEMICAL INDICATORS [1]
NOVEMBER 11, 2019
Boeing Renton Facility, Renton, Washington

	Well ID[2]											
	Source Area	CPOC Area										
	GW255S	GW183S	GW184S	GW211S	GW212S	GW221S	GW224S	GW224S (field dup.)	GW255S	GW256S	GW257S	GW258S
Specific Conductivity (µS/cm)	192.2	141.7	155.8	238.0	236.8	226.1	258.7	257.2	192.2	150.6	157.1	285.0
Dissolved Oxygen (mg/L)	0.77	0.61	2.33	0.21	0.60	0.82	0.91	0.78	0.77	0.60	0.84	0.85
Oxidation/Reduction Potential (mV)	-18.0	17.0	17.9	-39.6	20.1	7.0	-22.9	-22.6	-18.0	4.3	41.1	18.6
pH (standard units)	6.19	6.33	6.49	6.53	5.77	6.25	5.96	5.94	6.19	6.21	6.08	5.98
Temperature (degrees C)	14.5	14.2	14.4	12.2	14.5	14.3	14.7	14.7	14.5	16.3	16.1	13.3

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

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

TABLE 9: FORMER FUEL FARM CONCENTRATIONS OF CONSTITUENTS OF CONCERN [1, 2, 3]
NOVEMBER 11, 2019
Boeing Renton Facility, Renton, Washington

	Current Cleanup Levels[5]	Well ID[4]														
		Source Area	CPOC Area													
		GW255S	GW183S	GW184S	GW211S		GW212S	GW221S		GW224S		GW224S (field dup.)		GW256S	GW257S	GW258S
Total Petroleum Hydrocarbons (mg/L)																
TPH-D (C12-C24)	0.5	0.100 U	0.100 U	0.100 U	0.120	*0.102*	0.100 U	**1.65**	*0.427*	**1.51**	*0.303*	**1.46**	*0.370*	0.100 U	0.100 U	0.100 U
Jet A	0.5	0.100 U	0.100 U	0.100 U	0.100 U	*0.117*	0.100 U	**1.09**	*0.309*	**1.93**	***0.720***	**1.80**	***0.923***	0.100 U	0.100 U	0.100 U

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

Abbreviations
CPOC = conditional point of compliance
field dup. = field duplicate
mg/L = milligrams per liter

TABLE 10: AOC-003 GROUNDWATER ELEVATION DATA
NOVEMBER 12, 2019
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]	3.5 to 13.5	18.78	NM	NM
GW247S	4 to 14	18.91	4.17	14.74
GW248I	10 to 20	18.78	4.00	14.78
GW249S[3]	4 to 14	18.85	NM	NM

Notes
1. S = shallow well; I = intermediate well.
2. Elevations in feet relative to National Geodetic Vertical Datum of 1929.
3. Depth to water measurement not collected at GW188S and GW249S during the fourth quarter 2019.

Abbreviations
bgs = below ground surface
NM = not measured
TOC = top of casing

TABLE 11: AOC-003 CONCENTRATIONS
OF PRIMARY GEOCHEMICAL INDICATORS [1]
NOVEMBER 12, 2019
Boeing Renton Facility, Renton, Washington

	Well ID[2]	
	CPOC Area	
	GW247S	GW248I
Specific Conductivity (µS/cm)	367.3	434.2
Dissolved Oxygen (mg/L)	0.19	0.67
Oxidation/Reduction Potential (mV)	18.9	83.1
pH (standard units)	6.39	6.36
Temperature (degrees C)	14.70	11.60
Total Organic Carbon (mg/L)	10.48	13.32

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
CPOC = conditional point of compliance
degrees C = degrees Celsius
mg/L = milligrams per liter
mV = millivolts

TABLE 12: AOC-003 CONCENTRATIONS OF CONSTITUENTS OF CONCERN [1, 2]
NOVEMBER 12, 2019
Boeing Renton Facility, Renton, Washington

		Current Site Specific Cleanup Level[4]	Well ID[3]	
			CPOC Area	
			GW247S	GW248I
Volatile Organic Compounds (µg/L)				
cis-1,2-Dichloroethene		0.78	0.0635	0.02 U
Tetrachloroethene		0.02	0.02 U	0.02 U
Trichloroethene		0.16	0.148	0.0514
Vinyl Chloride		0.24	**0.504**	**0.620**

Notes
1. Data qualifiers are as follows:
U = The analyte was not detected at the reporting limit indicated.
2. **Bolded** values exceed the current 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
CPOC = conditional point of compliance

TABLE 13: LOT 20/FORMER BUILDING 10-71 PARCEL
GROUNDWATER ELEVATION DATA[1]
NOVEMBER 11, 2019
Boeing Renton Facility, Renton, Washington

Well ID	Screen Interval Depth (feet bgs)	TOC Elevation (feet)[2]	Depth to Groundwater (feet below TOC)	Groundwater Elevation (feet)[2]
10-71-MW-1	7 to 17	30.07	8.69	21.38
10-71-MW-2	7 to 17	29.88	8.96	20.92
10-71-MW-4	6 to 16	28.97	8.76	20.21

Notes
1. Water levels not measured in monitoring well 10-71-MW-3 so it is not included in this table.
2. Elevations in feet relative to National Geodetic Vertical Datum of 1929.

Abbreviations
bgs = below ground surface
TOC = top of casing

TABLE 14: LOT 20/FORMER BUILDING 10-71 PARCEL CONCENTRATIONS
OF PRIMARY GEOCHEMICAL INDICATORS [1]
NOVEMBER 11, 2019
Boeing Renton Facility, Renton, Washington

	Well ID		
	10-71-MW1	10-71-MW2	10-71-MW4
Specific Conductivity (µS/cm)	191.0	166.0	259.7
Dissolved Oxygen (mg/L)	0.36	1.52	0.37
Oxidation/Reduction Potential (mV)	-7.8	25.4	-35.9
pH (standard units)	6.00	6.23	6.21
Temperature (degrees C)	15.00	14.00	16.10

Notes
1. Primary geochemical indicators are measured in the field.

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

TABLE 15: LOT 20/FORMER BUILDING 10-71 PARCEL
CONCENTRATIONS OF CONSTITUENTS OF CONCERN [1, 2]
NOVEMBER 11, 2019
Boeing Renton Facility, Renton, Washington

	Well ID		
	10-71-MW1	**10-71-MW2**	**10-71-MW4**
Volatile Organic Compounds (µg/L)			
cis- 1,2-Dichloroethene	0.20 U	0.20 U	0.20 U
Toluene	0.20 U	0.20 U	0.20 U
Trichloroethene	0.20 U	0.20 U	0.20 U
Vinyl Chloride	0.20 U	0.20 U	0.20 U

Notes
1. Data qualifiers are as follows:
   U = The analyte was not detected at the reporting limit indicated.
2. No current cleanup standards were established for the Building 10-71 Parcel.

Abbreviations
µg/L = micrograms per liter
na = not established

TABLE 16: APRON A GROUNDWATER ELEVATION DATA
NOVEMBER 11, 2019
Boeing Renton Facility, Renton, Washington

Well ID	Screen Interval Depth (feet bgs)	TOC Elevation (feet)[1]	Depth to Groundwater (feet below TOC)	Groundwater Elevation (feet)[1]
GW262S	8 to 18	NA	5.33	NA
GW263S	8 to 18	NA	NM	NA
GW264S	8 to 18	NA	6.04	NA

Notes
1. Elevations in feet relative to National Geodetic Vertical Datum of 1929.

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

TABLE 17: APRON A CONCENTRATIONS OF PRIMARY GEOCHEMICAL INDICATORS [1]
NOVEMBER 11, 2019
Boeing Renton Facility, Renton, Washington

	Well ID[2]		
	Source Area Wells		
	GW262S	GW262S (field dup.)	GW264S
Specific Conductivity (µS/cm)	390.6	392.7	683.0
Dissolved Oxygen (mg/L)	0.67	0.60	0.61
Oxidation/Reduction Potential (mV)	-34.7	-38.1	-51.8
pH (standard units)	6.35	6.36	6.28
Temperature (degrees C)	15.20	15.90	16.10
Total Organic Carbon (mg/L)	31.15	31.60	37.98

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.

Abbreviations
µS/cm = microsiemens per centimeter
degrees C = degrees Celsius
field dup. = field duplicate
mg/L = milligrams per liter
mV = millivolts

TABLE 18: APRON A CONCENTRATIONS
OF CONSTITUENTS OF CONCERN[1]
NOVEMBER 11, 2019
Boeing Renton Facility, Renton, Washington

	Well ID[2]		
	GW262S	GW262S (field dup.)	GW264S
Volatile Organic Compounds (µg/L)			
cis- 1,2-Dichloroethene	0.20 U	0.20 U	0.20 U
Vinyl Chloride	0.20 U	0.20 U	0.38

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 A

TABLE A-1: GROUNDWATER COMPLIANCE MONITORING SCHEDULE

Boeing Renton Facility, Renton, Washington

Cleanup Action Area	Monitoring Frequency[1]		Groundwater Monitoring Wells[2]				Additional Water Level Monitoring Wells[3]	Constituents of Concern[4]	Analyses[5]
	Quarterly	Semiannual	Cross-Gradient Wells	Source Area Wells	Downgradient Plume Wells	CPOC Wells			
SWMU-168		X (1,3)	NA	GW228S[7]	NA	GW229S, GW230I, and GW231S		VC	SW8260C SIM
SWMU-172/SWMU-174	X		NA	GW152S and GW153S	GW081S, GW172S, GW173S, and GW226S	GW232S, GW233I, GW234S, GW235I, and GW236S		*cis* -1,2-DCE, PCE, TCE, VC	SW8260C SIM[6]
								Arsenic, copper, and lead	EPA 6020A
Building 4-78/79 SWMU/AOC Group	X		NA	GW031S, GW033S, GW034S, GW039S, GW243I, and GW244S	GW038S, GW209S, and GW210S	GW143S, GW237S, GW238I, GW239I, GW240D, GW241S, and GW242I		VC, TCE, *cis* -1,2-DCE, benzene	SW8260C[6]
								TPH-gasoline	NWTPH-Gx
Former Fuel Farm SWMU/AOC Group		X (2,4)	NA	GW255S, GW256S, and GW257S	NA	GW183S, GW184S, GW211S, GW212S, GW221S, GW224S, and GW258S		TPH-jet fuel, TPH-diesel	NWTPH-Dx
AOC-001/AOC-002[9]	X (CPOC wells)	X (1,3) (all other wells)	NA	GW193S[9]	GW190S[8,9], GW191D[8,9], GW192S[8,9], and GW246S[8,9]	GW185S[8,9], GW195S[8,9], GW196D[8,9], GW197S[8,9], and GW245S[8,9]		Benzene	SW8260C[6]
								TCE, *cis* -1,2-DCE, 1,1-dichloroethene, VC	SW8260C SIM[6]
AOC-003	X (CPOC wells)	X (1,3) (all other wells)	NA	GW249S	GW188S	GW247S and GW248I		PCE, TCE	SW8260C SIM[6]
								cis -1,2-DCE, VC	
AOC-004		X (1,3)	NA	GW250S	NA	GW174S		Lead	EPA 6020A
AOC-060		X (1,3)	GW012S and GW014S	GW009S	GW147S	GW149S, GW150S, GW252S, GW253I, and GW254S	GW010S and GW011D	VC	SW8260C SIM[6]
								TCE, *cis* -1,2-DCE	
AOC-090		X (1,3)	NA	GW189S	GW175I and GW176S	GW163I, GW165I, GW177I, GW178S, GW179I, GW180S, GW207S, and GW208S		1,1,2-Trichloroethane, acetone, benzene, toluene, carbon tetrachloride, chloroform, *cis* -1,2-DCE, *trans* -1,2-DCE, methylene chloride	SW8260C[6]
								1,1-Dichloroethene, 1,1,2,2-tetrachloroethane, VC, PCE, TCE	SW8260C SIM[6]
								TPH-gasoline	NWPTH-Gx
								TPH-diesel, TPH-motor oil	NWTPH-Dx
Building 4-70 Area		X (1,3)	NA	NA	NA	GW259S and GW260S		TCE, *cis* -1,2-DCE, VC	SW8260C[6]
Lot 20/Former Building 10-71		X (2,4)	NA	10-71-MW1, 10-71-MW2, and 10-71-MW4	NA	NA		Toluene, cis-1,2-DCE, TCE, VC	SW8260C[6]
Apron A		X (2,4)	NA	GW262S and GW264S	NA	NA		*cis* -1,2-DCE and VC	SW8260C[6]

Notes:

1. The EDR presents the groundwater monitoring frequency for each SWMU/AOC. For sites with semiannual monitoring frequency, specific quarters when monitoring will be conducted is indicated by 1 for quarter 1, 2 for quarter 2, etc.
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. 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.
7. GW228S will not be monitored on a semiannual basis - only the CPOC wells will be monitored on a semiannual basis for SWMU-168.
8. Monitoring wells were abandoned on 11/25/2019 prior to Apron R construction and will be replaced upon completion of construction.
9. Groundwater monitoring and sampling will be suspended until completion of construction.

Abbreviations:

AOC = area of concern
cis -1,2-DCE = *cis* -1,2 dichloroethene
COCs = constituents of concern
CPOC = conditional point of compliance
Cr = chromium
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
VOCs = volatile organic compounds

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

Boeing Renton Facility, Renton, Washington

Cleanup Action Area	Groundwater Monitoring Wells				Primary Geochemical Parameters[2]		
						Monitoring Frequency[3]	
	Cross-Gradient Wells	Source Area Wells	Downgradient Plume Wells	CPOC Wells	Indicators	Quarterly	Semiannual
SWMU-168	NA	GW228S[4]	NA	GW229S, GW230I, and GW231S	Dissolved oxygen, pH, ORP, temperature, specific conductance		X (1,3)
SWMU-172/SWMU-174	NA	GW152S and GW153S	GW081S, GW172S, GW173S, and GW226S	GW232S, GW233I, GW234S, GW235I, and GW236S	Dissolved oxygen, pH, ORP, temperature, specific conductance, TOC	X	
Building 4-78/79 SWMU/AOC Group	NA	GW031S, GW033S, GW034S, GW039S, GW243I, and GW244S	GW038S, GW209S, and GW210S	GW143S, GW237S, GW238I, GW239I, GW240D, GW241S, and GW242I	Dissolved oxygen, pH, ORP, temperature, specific conductance in all wells, TOC in all wells except GW241S and GW242I	X	
Former Fuel Farm SWMU/AOC Group	NA	GW255S, GW256S, and GW257S	NA	GW183S, GW184S, GW211S, GW212S, GW221S, GW224S, and GW258S	Dissolved oxygen, pH, ORP, temperature, specific conductance		X (2,4)
AOC-001/AOC-002[7]	NA	GW193S[7]	GW190S[6,7], GW191D[6,7], GW192S[6,7], and GW246S[6,7]	GW185S[6,7], GW195S[6,7], GW196D[6,7], GW197S[6,7], and GW245S[6,7]	Dissolved oxygen, pH, ORP, temperature, specific conductance, TOC	X (CPOC wells)	X (1,3) (all other wells)
AOC-003	NA	GW249S	GW188S	GW247S and GW248I	Dissolved oxygen, pH, ORP, temperature, specific conductance, TOC	X (CPOC wells)	X (1,3) (all other wells)
AOC-004	NA	GW250S	NA	GW174S	Dissolved oxygen, pH, ORP, temperature, specific conductance		X (1,3)
AOC-060	GW012S and GW014S	GW009S	GW147S	GW149S, GW150S, GW252S, GW253I, and GW254S	Dissolved oxygen, pH, ORP, temperature, specific conductance, TOC		X (1,3)
AOC-090	NA	GW189S	GW175I and GW176S	GW163I, GW165I, GW177I, GW178S, GW179I, GW180S, GW207S, and GW208S	Dissolved oxygen, pH, ORP, temperature, specific conductance, TOC [5]		X (1,3)
Building 4-70 Area	NA	NA	NA	GW259S and GW260S	Dissolved oxygen, pH, ORP, temperature, specific conductance, TOC		X (1,3)
Lot 20/Former Building 10-71	NA	10-71-MW1, 10-71-MW2, and 10-71-MW4	NA	NA	Dissolved oxygen, pH, ORP, temperature, specific conductance		X (2,4)
Apron A	NA	GW262S and GW264S	NA	NA	Dissolved oxygen, pH, ORP, temperature, specific conductance, TOC		X (2,4)

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.
3. The EDR presents the groundwater monitoring frequency for each SWMU/AOC. For sites with semiannual monitoring frequency, specific quarters when monitoring will be conducted is indicated by 1 for quarter 1, 2 for quarter 2, etc.
4. Primary geochemical parameters will not be collected at GW228S - only at CPOC wells that are sampled semiannually.
5. TOC will only be analyzed in the groundwater from the source area well (GW189S).
6. Monitoring wells were abandoned on 11/25/2019 prior to Apron R construction and will be replaced upon completion of construction.
7. Groundwater monitoring and sampling will be suspended until completion of construction.

Abbreviations:

AOC = area of concern
COCs = constituents of concern
CPOC = conditional point of compliance
EDR = Engineering Design Report
NA = not applicable
ORP = oxidation reduction potential
SWMU = solid waste management unit
TOC = total organic carbon

Appendix B

Groundwater Low-Flow Sample Collection Form

Project Name: Boeing Renton | Project Number: 0025217.099.099

Event: Nov-19 | Date/Time: 11/ 11 /2019@ 1047

Sample Number: RGW081S- 191111 | Weather: SC

Landau Representative: DSB

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES) Damaged (NO) Describe: Flush Mount

DTW Before Purging (ft) 8.76 Time: 1019 Flow through cell vol. GW Meter No.(s 4

Begin Purge: Date/Time: 11/ 11 /201 1021 End Purge: Date/Time: 11/ 11 /2019 @ 1040 Gallons Purged: 0.25

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ■ Other SITE TREATMENT SYSTEM

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
Purge Goals: Stablization of Parameters for three consecutive readings within the following limits	**+/- 3%**	**+/- 3%**	**+/- 10%**	**+/- 0.1 units**	**+/- 10 mV**	**+/- 10%**	**< 0.3 ft**	**>/= 1 flow through cell**	
1024	13.8	163.0	1.74	6.54	78.9		8.71		
1027	13.6	166.6	1.72	6.43	83.4		8.72		
1030	13.5	167.2	1.79	6.38	86.0		8.72		
1033	13.4	166.9	1.94	6.37	86.8				
1036	13.2	167.0	2.17	6.36	92.6				
1039	13.2	167.7	2.25	6.36	87.8				

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ■ Pump/Pump Type BLADDER

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ■ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ■ Dedicated

(By Numerical Order) ☐ Other

Sample Description (color, turbidity, odor, sheen, etc.): TAN HIGH TURBIDITY NONS

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1	13.4	167.8	2.23	6.36	87.9				
2	13.4	167.8	2.24	6.36	87.9				
3	13.4	167.8	2.22	6.36	88.0				
4	13.4	167.9	2.19	6.36	88.0				
Average:	13.4	167.8	2.22	6.36	88.0	#DIV/0!			

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)
3	(8260-SIM) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX) WA ☐ OR ☐
	(8270D) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease) WA ☐ OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)
1	(COD) (TOC5310C) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)
1	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)
	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic
	VOC (Boeing short list)
	Methane Ethane Ethene Acetylene
	others

Duplicate Sample No(s):

Comments:

Signature: DSB Date: 11/11/2019

Groundwater Low-Flow Sample Collection Form

Project Name: Boeing Renton | Project Number: 0025217.099.099

Event: Nov-19 | Date/Time: 11/ 11 /2019@ 1227

Sample Number: RGW152S- 191111 | Weather: CLEAR

Landau Representative: DSB

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES) Damaged (NO) Describe: Flush Mount

DTW Before Purging (ft) 9.1 Time: 1203 Flow through cell vol. GW Meter No.(s 4

Begin Purge: Date/Time: 11/ 11 /201 1204 End Purge: Date/Time: 11/ 11 /2019 @ 1224 Gallons Purged: 0.25

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ■ Other SITE TREATMENT SYSTEM

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
Purge Goals: Stablization of Parameters for three consecutive readings within the following limits	**+/- 3%**	**+/- 3%**	**+/- 10%**	**+/- 0.1 units**	**+/- 10 mV**	**+/- 10%**	**< 0.3 ft**	**>/= 1 flow through cell**	
1207	14.7	194.9	1.77	6.19	106.5		9.11		
1210	14.2	195.1	1.40	6.24	100.0		9.11		
1213	13.8	180.6	1.28	6.27	97.0		9.11		
1216	13.4	161.3	1.05	6.30	93.4				
1219	13.2	154.1	0.98	6.29	92.6				
1222	13.2	150.2	1.06	6.28	92.9				

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ■ Pump/Pump Type BLADDER

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ■ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ■ Dedicated

(By Numerical Order) ☐ Other

Sample Description (color, turbidity, odor, sheen, etc.): GREY HIGH TURBIDITY NONS

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1	13.1	149.2	1.05	6.28	93.1				
2	13.1	146.9	0.98	6.28	91.7				
3	13.1	145.0	0.94	6.28	91.6				
4	13.1	143.2	0.91	6.28	91.6				
Average:	13.1	146.1	0.97	6.28	92.0	#DIV/0!			

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)
3	(8260-SIM) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX) WA ☐ OR ☐
	(8270D) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease) WA ☐ OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)
1	(COD) (TOC5310C) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)
1	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)
	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic
	VOC (Boeing short list)
	Methane Ethane Ethene Acetylene
	others

Duplicate Sample No(s): Duplicate Location (DUP1)

Comments:

Signature: DSB Date: 11/11/2019

Groundwater Low-Flow Sample Collection Form

Project Name: Boeing Renton | Project Number: 0025217.099.099

Event: Nov-19 | Date/Time: 11/ 11 /2019@ 1207

Sample Number: RGW153S- 191111 | Weather: SC

Landau Representative: DSB

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES) Damaged (NO) Describe: Flush Mount

DTW Before Purging (ft) 9.56 Time: 1138 Flow through cell vol. GW Meter No.(s 4

Begin Purge: Date/Time: 11/ 11 /201 1139 End Purge: Date/Time: 11/ 11 /2019 @ 1153 Gallons Purged: 0.25

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ■ Other SITE TREATMENT SYSTEM

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
	Purge Goals: Stablization of Parameters for three consecutive readings within the following limits							>/= 1 flow through cell	
	+/- 3%	+/- 3%	+/- 10%	+/- 0.1 units	+/- 10 mV	+/- 10%	< 0.3 ft		
1142	14.7	153.5	4.16	6.52	84.9		9.54		
1145	14.5	152.4	4.51	6.40	90.7		9.54		
1148	14.4	152.0	4.43	6.38	92.8		9.54		
1151	14.3	152.1	4.40	6.35	94.5				

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ■ Pump/Pump Type BLADDER

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ■ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ■ Dedicated

(By Numerical Order) ☐ Other

Sample Description (color, turbidity, odor, sheen, etc.): TAN MODERATE TURBIDITY NONS

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1	14.2	152.0	4.35	6.35	94.7				
2	14.2	152.0	4.31	6.35	94.7				
3	14.2	152.0	4.29	6.34	94.8				
4	14.2	152.0	4.30	6.34	94.8				
Average:	14.2	152.0	4.31	6.35	94.8	#DIV/0!			

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)
3	(8260-SIM) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX) WA ☐ OR ☐
	(8270D) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease) WA ☐ OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)
1	(COD) (TOC5310C) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)
1	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)
	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic
	VOC (Boeing short list)
	Methane Ethane Ethene Acetylene
	others

Duplicate Sample No(s):

Comments:

Signature: DSB Date: 11/11/2019

Groundwater Low-Flow Sample Collection Form

Project Name: Boeing Renton | Project Number: 0025217.099.099

Event: Nov-19 | Date/Time: 11/ 11 /2019@ 1307

Sample Number: RGW172S- 191111 | Weather: CLEAR

Landau Representative: DSB

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES) Damaged (NO) Describe: Flush Mount

DTW Before Purging (ft) 9.49 Time: 1241 Flow through cell vol. GW Meter No.(s 4

Begin Purge: Date/Time: 11/ 11 /201 1242 End Purge: Date/Time: 11/ 11 /2019 @ 1259 Gallons Purged: 0.25

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ■ Other SITE TREATMENT SYSTEM

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
Purge Goals: Stablization of Parameters for three consecutive readings within the following limits	**+/- 3%**	**+/- 3%**	**+/- 10%**	**+/- 0.1 units**	**+/- 10 mV**	**+/- 10%**	**< 0.3 ft**	**>/= 1 flow through cell**	
1245	16.2	223.0	1.24	6.37	94.8		9.51		
1248	16.8	223.1	1.42	6.35	93.0		9.52		
1251	16.9	224.4	1.72	6.34	91.6		9.52		
1254	16.0	226.2	1.72	6.34	90.7				
1257	16.2	227.8	1.73	6.35	89.1				

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ■ Pump/Pump Type BLADDER

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ■ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ■ Dedicated

(By Numerical Order) ☐ Other

Sample Description (color, turbidity, odor, sheen, etc.): TAN MODERATE TURBIDITY NONS

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1	16.2	228.8	1.75	6.35	88.8				
2	16.3	229.8	1.75	6.35	88.6				
3	16.3	230.7	1.75	6.35	88.4				
4	16.3	231.6	1.75	6.35	88.3				
Average:	16.3	230.2	1.75	6.35	88.5	#DIV/0!			

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)		
3	(8260-SIM) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX)	WA ☐	OR ☐
	(8270D) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease)	WA ☐	OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)		
1	(COD) (TOC5310C) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)		
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)		
1	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)		
	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic		
	VOC (Boeing short list)		
	Methane Ethane Ethene Acetylene		
	others		

Duplicate Sample No(s):

Comments:

Signature: DSB Date: 11/11/2019

Groundwater Low-Flow Sample Collection Form

Project Name: Boeing Renton | Project Number: 0025217.099.099

Event: Nov-19 | Date/Time: 11/ 11 /2019@ 1007

Sample Number: RGW173S- 191111 | Weather: OC

Landau Representative: DSB

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES) Damaged (NO) Describe: Flush Mount

DTW Before Purging (ft) 9.53 Time: 940 Flow through cell vol. GW Meter No.(s 4

Begin Purge: Date/Time: 11/ 11 /201 941 End Purge: Date/Time: 11/ 11 /2019 @ 1000 Gallons Purged: 0.25

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ■ Other SITE TREATMENT SYSTEM

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
	Purge Goals: Stablization of Parameters for three consecutive readings within the following limits							>/= 1 flow	
	+/- 3%	+/- 3%	+/- 10%	+/- 0.1 units	+/- 10 mV	+/- 10%	< 0.3 ft	through cell	
944	15.2	395.3	0.09	6.61	71.1		9.54		
947	14.2	388.4	0.12	6.63	66.8		9.54		
950	13.5	380.8	0.19	6.64	64.0		9.54		
953	12.6	371.9	0.36	6.67	60.9				
956	12.0	362.7	0.57	6.68	58.7				
959	11.8	356.8	0.80	6.69	56.9				

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ■ Pump/Pump Type BLADDER

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ■ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ■ Dedicated

(By Numerical Order) ☐ Other

Sample Description (color, turbidity, odor, sheen, etc.): TAN HIGH TURBIDITY NONS

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1	11.8	355.6	0.84	6.69	56.6				
2	11.7	355.3	0.86	6.70	56.5				
3	11.7	354.9	0.89	6.70	56.4				
4	11.7	354.9	0.91	6.70	56.2				
Average:	11.7	355.2	0.88	6.70	56.4	#DIV/0!			

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)		
3	(8260-SIM) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX)	WA ☐	OR ☐
	(8270D) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease)	WA ☐	OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)		
1	(COD) (TOC5310C) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)		
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)		
1	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)		
1	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic		
	VOC (Boeing short list)		
	Methane Ethane Ethene Acetylene		
	others		

Duplicate Sample No(s):

Comments: MSMSD Location

Signature: DSB Date: 11/11/2019

Groundwater Low-Flow Sample Collection Form

Project Name: Boeing Renton | Project Number: 0025217.099.099

Event: Nov-19 | Date/Time: 11/ 11 /2019@ 1117

Sample Number: RGW226S- 191111 | Weather: SC

Landau Representative: DSB

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES) Damaged (NO) Describe: Flush Mount

DTW Before Purging (ft) 8.97 Time: 1050 Flow through cell vol. GW Meter No.(s 4

Begin Purge: Date/Time: 11/ 11 /201 1052 End Purge: Date/Time: 11/ 11 /2019 @ 1113 Gallons Purged: 0.25

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ■ Other SITE TREATMENT SYSTEM

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
Purge Goals: Stablization of Parameters for three consecutive readings within the following limits	**+/- 3%**	**+/- 3%**	**+/- 10%**	**+/- 0.1 units**	**+/- 10 mV**	**+/- 10%**	**< 0.3 ft**	**>/= 1 flow through cell**	
1055	15.0	170.6	3.26	6.51	87.5		8.84		
1058	14.7	170.4	2.59	6.46	87.0		8.86		
1101	14.0	182.4	2.47	6.42	88.5		8.87		
1104	13.7	224.0	1.75	6.32	93.9				
1107	13.3	275.8	0.90	6.42	87.4				
1110	13.2	283.8	0.65	6.52	80.2				

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ■ Pump/Pump Type BLADDER

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ■ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ■ Dedicated

(By Numerical Order) ☐ Other

Sample Description (color, turbidity, odor, sheen, etc.): TAN MODERATE TURBIDITY NONS

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1	13.2	283.9	0.64	6.53	79.3				
2	13.2	284.2	0.63	6.54	78.8				
3	13.2	284.4	0.61	6.55	78.2				
4	13.2	284.5	0.60	6.56	77.6				
Average:	13.2	284.3	0.62	6.55	78.5	#DIV/0!			

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)
3	(8260-SIM) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX) WA ☐ OR ☐
	(8270D) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease) WA ☐ OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)
1	(COD) (TOC5310C) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)
1	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)
	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic
	VOC (Boeing short list)
	Methane Ethane Ethene Acetylene
	others

Duplicate Sample No(s):

Comments:

Signature: DSB Date: 11/11/2019

Groundwater Low-Flow Sample Collection Form

Project Name: Boeing Renton | Project Number: 0025217.099.099

Event: Nov-19 | Date/Time: 11/ 11 /2019@ 847

Sample Number: RGW232S- 191111 | Weather: FOG

Landau Representative: DSB

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES) Damaged (NO) Describe: Flush Mount

DTW Before Purging (ft): 8.02 Time: 825 Flow through cell vol. GW Meter No.(s 4

Begin Purge: Date/Time: 11/ 11 /201 827 End Purge: Date/Time: 11/ 11 /2019 @ 841 Gallons Purged: 0.25

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ■ Other SITE TREATMENT SYSTEM

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
	Purge Goals: Stablization of Parameters for three consecutive readings within the following limits							**>/= 1 flow through cell**	
	+/- 3%	**+/- 3%**	**+/- 10%**	**+/- 0.1 units**	**+/- 10 mV**	**+/- 10%**	**< 0.3 ft**		
830	15.8	516.0	4.76	6.53	59.7		8.54		
833	15.3	508.0	6.77	6.27	69.5		8.53		
836	15.1	505.0	6.89	6.23	70.6		8.53		
839	14.8	503.0	6.93	6.20	70.5		8.52		

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ■ Pump/Pump Type BLADDER

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ■ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ■ Dedicated

(By Numerical Order) ☐ Other

Sample Description (color, turbidity, odor, sheen, etc.): CLEAR COLORLESS NONS

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1	14.7	502.0	6.95	6.20	70.5				
2	14.7	502.0	6.93	6.20	70.6				
3	14.7	502.0	6.91	6.20	70.5				
4	14.6	501.0	6.93	6.19	70.5				
Average:	14.7	501.8	6.93	6.20	70.5	#DIV/0!			

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)		
3	(8260-SIM) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX)	WA ☐	OR ☐
	(8270D) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease)	WA ☐	OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)		
1	(COD) (TOC5310C) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)		
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)		
1	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)		
1	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic		
	VOC (Boeing short list)		
	Methane Ethane Ethene Acetylene		
	others		

Duplicate Sample No(s):

Comments:

Signature: DSB Date: 11/11/2019

Groundwater Low-Flow Sample Collection Form

Project Name: Boeing Renton | Project Number: 0025217.099.099

Event: Nov-19 | Date/Time: 11/ 11 /2019@ 917

Sample Number: RGW233I- 191111 | Weather: FOG

Landau Representative: DSB

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES) Damaged (NO) Describe: Flush Mount

DTW Before Purging (ft) 7.53 Time: 850 Flow through cell vol. GW Meter No.(s 4

Begin Purge: Date/Time: 11/ 11 /201 854 End Purge: Date/Time: 11/ 11 /2019 @ 913 Gallons Purged: 0.25

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ■ Other SITE TREATMENT SYSTEM

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
	Purge Goals: Stablization of Parameters for three consecutive readings within the following limits							**>/= 1 flow through cell**	
	+/- 3%	**+/- 3%**	**+/- 10%**	**+/- 0.1 units**	**+/- 10 mV**	**+/- 10%**	**< 0.3 ft**		
857	13.9	208.0	0.29	6.59	62.9		7.52		
900	13.1	204.6	0.53	6.54	64.0		7.52		
903	11.9	212.8	1.10	6.46	65.3		7.52		
906	11.3	220.5	1.47	6.42	66.1				
909	10.7	219.8	1.72	6.41	65.3				
912	10.4	215.7	1.85	6.40	64.3				

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ■ Pump/Pump Type BLADDER

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ■ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ■ Dedicated

(By Numerical Order) ☐ Other

Sample Description (color, turbidity, odor, sheen, etc.): CLEAR COLOLRESS NONS

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1	10.3	215.3	1.86	6.39	64.5				
2	10.3	214.8	1.87	6.39	64.7				
3	10.3	213.5	1.88	6.39	64.1				
4	10.2	212.7	1.90	6.40	63.7				
Average:	10.3	214.1	1.88	6.39	64.3	#DIV/0!			

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)		
3	(8260-SIM) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX)	WA ☐	OR ☐
	(8270D) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease)	WA ☐	OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)		
1	(COD) (TOC5310C) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)		
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)		
1	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)		
	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic		
	VOC (Boeing short list)		
	Methane Ethane Ethene Acetylene		
	others		

Duplicate Sample No(s):

Comments:

Signature: DSB Date: 11/11/2019

Groundwater Low-Flow Sample Collection Form

Project Name: Boeing Renton | Project Number: 0025217.099.099

Event: Nov-19 | Date/Time: 11/ 11 /2019@ 1347

Sample Number: RGW234S- 191111 | Weather: CLEAR

Landau Representative: DSB

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES) Damaged (NO) Describe: Flush Mount

DTW Before Purging (ft) 8.14 Time: 1318 Flow through cell vol. GW Meter No.(s 4

Begin Purge: Date/Time: 11/ 11 /201 1320 End Purge: Date/Time: 11/ 11 /2019 @ 1339 Gallons Purged: 0.25

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ■ Other SITE TREATMENT SYSTEM

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
Purge Goals: Stablization of Parameters for three consecutive readings within the following limits	**+/- 3%**	**+/- 3%**	**+/- 10%**	**+/- 0.1 units**	**+/- 10 mV**	**+/- 10%**	**< 0.3 ft**	**>/= 1 flow through cell**	
1323	15.7	261.2	0.38	6.39	90.3		8.16		
1326	15.4	256.7	0.37	6.41	87.0		8.17		
1329	15.1	252.3	0.49	6.43	83.9		8.17		
1332	14.8	247.4	0.69	6.45	31.1				
1335	14.8	243.8	0.93	6.46	78.8				
1338	14.9	240.3	0.91	6.47	77.0				

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ■ Pump/Pump Type BLADDER

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ■ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ■ Dedicated

(By Numerical Order) ☐ Other

Sample Description (color, turbidity, odor, sheen, etc.): tan HIGH TURBIDITY NONS

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1	15.0	240.4	0.91	6.46	77.3				
2	15.0	240.2	0.91	6.46	77.5				
3	15.0	239.4	0.92	6.46	77.7				
4	15.0	237.8	0.93	6.46	77.6				
Average:	15.0	239.5	0.92	6.46	77.5	#DIV/0!			

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)
3	(8260-SIM) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX) WA ☐ OR ☐
	(8270D) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease) WA ☐ OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)
1	(COD) (TOC5310C) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)
1	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)
	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic
	VOC (Boeing short list)
	Methane Ethane Ethene Acetylene
	others

Duplicate Sample No(s):

Comments:

Signature: DSB Date: 11/11/2019

Groundwater Low-Flow Sample Collection Form

Project Name: Boeing Renton | Project Number: 0025217.099.099

Event: Nov-19 | Date/Time: 11/ 11 /2019@ 1407

Sample Number: RGW235I- 191111 | Weather: CLEAR

Landau Representative: DSB

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES) Damaged (NO) Describe: Flush Mount

DTW Before Purging (ft) 7.73 Time: 1336 Flow through cell vol. GW Meter No.(s 4

Begin Purge: Date/Time: 11/ 11 /201 1342 End Purge: Date/Time: 11/ 11 /2019 @ 1402 Gallons Purged: 0.25

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ■ Other SITE TREATMENT SYSTEM

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
Purge Goals: Stablization of Parameters for three consecutive readings within the following limits	**+/- 3%**	**+/- 3%**	**+/- 10%**	**+/- 0.1 units**	**+/- 10 mV**	**+/- 10%**	**< 0.3 ft**	**>/= 1 flow through cell**	
1345	15.1	150.7	0.27	6.37	83.8		7.71		
1348	15.3	149.9	0.42	6.27	84.9		7.72		
1351	15.5	150.6	0.61	6.25	85.2		7.72		
1354	15.7	151.7	1.05	6.26	85.0				
1357	15.9	152.9	1.12	6.27	85.0				
1400	15.9	152.6	1.18	6.27	84.5				

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ■ Pump/Pump Type BLADDER

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ■ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ■ Dedicated

(By Numerical Order) ☐ Other

Sample Description (color, turbidity, odor, sheen, etc.): CLEAR COLORLESS NONS

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1	15.9	152.7	1.18	6.27	84.5				
2	15.9	152.9	1.16	6.28	84.4				
3	16.0	152.9	1.15	6.28	84.5				
4	16.0	153.0	1.15	6.28	84.4				
Average:	16.0	152.9	1.16	6.28	84.5	#DIV/0!			

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)		
3	(8260-SIM) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX)	WA ☐	OR ☐
	(8270D) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease)	WA ☐	OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)		
1	(COD) (TOC5310C) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)		
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)		
1	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)		
	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic		
	VOC (Boeing short list)		
	Methane Ethane Ethene Acetylene		
	others		

Duplicate Sample No(s):

Comments:

Signature: DSB Date: 11/11/2019

Groundwater Low-Flow Sample Collection Form

Project Name: Boeing Renton | Project Number: 0025217.099.099

Event: Nov-19 | Date/Time: 11/ 11 /2019@ 1427

Sample Number: RGW236S- 191111 | Weather: CLEAR

Landau Representative: DSB

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES) Damaged (NO) Describe: Flush Mount

DTW Before Purging (ft) 7.35 Time: 1406 Flow through cell vol. GW Meter No.(s 4

Begin Purge: Date/Time: 11/ 11 /201 1407 End Purge: Date/Time: 11/ 11 /2019 @ 1426 Gallons Purged: 0.25

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ■ Other SITE TREATMENT SYSTEM

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
	Purge Goals: Stablization of Parameters for three consecutive readings within the following limits							>/= 1 flow	
	+/- 3%	+/- 3%	+/- 10%	+/- 0.1 units	+/- 10 mV	+/- 10%	< 0.3 ft	through cell	
1410	15.5	321.8	4.20	6.37	90.4		7.43		
1413	15.6	333.2	2.56	6.42	86.0		7.37		
1416	15.6	339.3	2.02	6.44	84.4		7.37		
1419	15.7	343.2	1.70	6.44	82.9				
1422	15.7	344.5	1.52	6.45	81.9				
1425	15.6	345.3	1.36	6.45	81.2				

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ■ Pump/Pump Type BLADDER

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ■ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ■ Dedicated

(By Numerical Order) ☐ Other

Sample Description (color, turbidity, odor, sheen, etc.): ORANGE HIGH TURBIDITY NONS

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1	15.6	345.6	1.33	6.46	80.9				
2	15.6	345.7	1.27	6.46	80.7				
3	15.6	345.9	1.23	6.46	80.4				
4	15.6	346.0	1.20	6.46	80.1				
Average:	15.6	345.8	1.26	6.46	80.5	#DIV/0!			

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)
3	(8260-SIM) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX) WA ☐ OR ☐
	(8270D) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease) WA ☐ OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)
1	(COD) (TOC5310C) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)
1	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)
1	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic
	VOC (Boeing short list)
	Methane Ethane Ethene Acetylene
	others

Duplicate Sample No(s):

Comments:

Signature: DSB Date: 11/11/2019

Groundwater Low-Flow Sample Collection Form

Project Name: Boeing Renton | Project Number: 0025217.099.099

Event: Nov-19 | Date/Time: 11/ 12 /2019@ 1045

Sample Number: RGW031S- 191112 | Weather: RAINY, COLD

Landau Representative: BXM

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES) Damaged (NO) Describe: Flush Mount

DTW Before Purging (ft) 5.26 Time: 1018 Flow through cell vol. GW Meter No.(s HERON-3

Begin Purge: Date/Time: 11/ 12 /2019 @ 1022 End Purge: Date/Time: 11/ 12 /2019 @ 1044 Gallons Purged: < 1

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ■ Other SITE TREATMENT SYSTEM

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
	Purge Goals: Stablization of Parameters for three consecutive readings within the following limits							>/= 1 flow	
	+/- 3%	+/- 3%	+/- 10%	+/- 0.1 units	+/- 10 mV	+/- 10%	< 0.3 ft	through cell	
1025	15.2	366.2	0.37	6.31	112.5		5.27		
1028	14.0	360.2	0.58	6.27	113.9		5.26		
1031	13.7	356.7	0.75	6.26	114.5		5.26		
1034	13.5	356.6	0.95	6.25	114.4				
1037	13.2	357.7	1.04	6.25	114.7				
1040	13.1	359.1	0.95	6.26	114.1				

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ■ Pump/Pump Type BLADDER

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ■ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ■ Dedicated

(By Numerical Order) ☐ Other

Sample Description (color, turbidity, odor, sheen, etc.): CLEAR, COLORLESS, NO SHEEN, NO ODOR, DARK FINES

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1	13.1	359.4	1.00	6.26	113.8				
2	13.1	359.9	1.02	6.27	113.6				
3	13.1	360.0	1.05	6.28	113.6				
4	13.1	360.7	1.09	6.28	113.6				
Average:	13.1	360.0	1.04	6.27	113.7	#DIV/0!			

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)		
5	(8260) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX)	WA ☐	OR ☐
	(8270) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease)	WA ☐	OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)		
1	(COD) (TOC) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)		
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)		
	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)		
	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic		
	VOC (Boeing short list)		
	Methane Ethane Ethene Acetylene		
	others		

Duplicate Sample No(s): Duplicate Location (DUP2)

Comments:

Signature: BXM Date: 11.12.19

Groundwater Low-Flow Sample Collection Form

Project Name: Boeing Renton | Project Number: 0025217.099.099

Event: Nov-19 | Date/Time: 11/ 12 /2019@ 1230

Sample Number: RGW033S- 191112 | Weather: OVERCAST, COOL

Landau Representative: BXM

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES) Damaged (NO) Describe: Flush Mount

DTW Before Purging (ft) 5.34 Time: 1202 Flow through cell vol. GW Meter No.(s HERON-3

Begin Purge: Date/Time: 11/ 12 /2019 @ 1204 End Purge: Date/Time: 11/ 12 /2019 @ 1227 Gallons Purged: < 1

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ■ Other SITE TREATMENT SYSTEM

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
	Purge Goals: Stablization of Parameters for three consecutive readings within the following limits							>/= 1 flow through cell	
	+/- 3%	+/- 3%	+/- 10%	+/- 0.1 units	+/- 10 mV	+/- 10%	< 0.3 ft		
1207	15.7	379.5	0.18	6.32	120.5		5.37		
1210	14.7	362.5	0.31	6.30	118.2		5.38		
1213	14.5	358.0	0.32	6.29	117.5		5.39		
1216	14.3	349.3	0.40	6.30	115.1				
1219	14.2	347.0	0.46	6.30	114.1				
1222	13.9	343.1	0.56	6.29	112.6				
1225	13.7	341.8	0.61	6.30	111.7				

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ■ Pump/Pump Type BLADDER

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ■ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ■ Dedicated

(By Numerical Order) ☐ Other

Sample Description (color, turbidity, odor, sheen, etc.): CLEAR, COLORLESS, NO SHEEN, NO ODOR, SOME DARK FINES

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1	13.7	341.5	0.63	6.3	111.5				
2	13.7	341.2	0.64	6.3	111.4				
3	13.7	341.0	0.65	6.3	111.3				
4	13.7	340.9	0.65	6.3	111.2				
Average:	13.7	341.2	0.64	6.3	111.4	#DIV/0!			

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)	
5	(8260) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX)	WA ☐ OR ☐
	(8270) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease)	WA ☐ OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)	
1	(COD) (TOC) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)	
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)	
	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)	
	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic	
	VOC (Boeing short list)	
	Methane Ethane Ethene Acetylene	
	others	

Duplicate Sample No(s):

Comments:

Signature: BXM Date: 11.12.19

Groundwater Low-Flow Sample Collection Form

Project Name: Boeing Renton | Project Number: 0025217.099.099

Event: Nov-19 | Date/Time: 11/ 12 /2019@ 1320

Sample Number: RGW034S- 191112 | Weather: OVERCAST, COOL

Landau Representative: BXM

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES) Damaged (NO) Describe: Flush Mount

DTW Before Purging (ft) 5.51 Time: 1253 Flow through cell vol. GW Meter No.(s HERON-3

Begin Purge: Date/Time: 11/ 12 /2019 @ 1255 End Purge: Date/Time: 11/ 12 /2019 @ 1318 Gallons Purged: < 1

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ■ Other SITE TREATMENT SYSTEM

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
	Purge Goals: Stablization of Parameters for three consecutive readings within the following limits							**>/= 1 flow through cell**	
	+/- 3%	**+/- 3%**	**+/- 10%**	**+/- 0.1 units**	**+/- 10 mV**	**+/- 10%**	**< 0.3 ft**		
1258	16.1	268.3	0.11	6.48	102.6		5.50		
1301	15.7	269.0	0.18	6.46	100.8		5.50		
1304	15.0	266.9	0.22	6.45	98.1		5.51		
1307	14.7	265.4	0.24	6.45	96.8				
1310	14.2	262.6	0.28	6.45	94.8				
1313	14.1	261.3	0.35	6.45	93.8				
1316	13.8	259.7	0.35	6.45	92.4				

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ■ Pump/Pump Type BLADDER

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ■ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ■ Dedicated

(By Numerical Order) ☐ Other

Sample Description (color, turbidity, odor, sheen, etc.): CLEAR, COLORLESS, NO SHEEN, NO ODOR

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1	13.8	259.4	0.35	6.45	92.1				
2	13.7	259.2	0.35	6.45	92.0				
3	13.7	259.1	0.35	6.45	91.9				
4	13.6	258.8	0.36	6.45	91.6				
Average:	13.7	259.1	0.35	6.45	91.9	#DIV/0!			

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)	
5	(8260) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX)	WA ☐ OR ☐
	(8270) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease)	WA ☐ OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)	
1	(COD) (TOC) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)	
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)	
	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)	
	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic	
	VOC (Boeing short list)	
	Methane Ethane Ethene Acetylene	
	others	

Duplicate Sample No(s):

Comments:

Signature: BXM Date: 11.12.19

Groundwater Low-Flow Sample Collection Form

Project Name: Boeing Renton | Project Number: 0025217.099.099

Event: Nov-19 | Date/Time: 11/ 12 /2019@ 1405

Sample Number: RGW038S- 191112 | Weather: OVERCAST, COLD

Landau Representative: BXM

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES) Damaged (NO) Describe: Flush Mount

DTW Before Purging (ft) 5.57 Time: 1332 Flow through cell vol. GW Meter No.(s HERON-3

Begin Purge: Date/Time: 11/ 12 /2019 @ 1338 End Purge: Date/Time: 11/ 12 /2019 @ 1401 Gallons Purged: < 1

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ■ Other SITE TREATMENT SYSTEM

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
	Purge Goals: Stablization of Parameters for three consecutive readings within the following limits							>/= 1 flow through cell	
	+/- 3%	+/- 3%	+/- 10%	+/- 0.1 units	+/- 10 mV	+/- 10%	< 0.3 ft		
1341	15.4	278.2	0.23	6.40	93.9		5.58		
1344	14.9	279.4	0.28	6.36	93.4		5.59		
1347	14.4	277.2	0.35	6.35	92.4		5.60		
1350	13.9	274.5	0.40	6.35	91.2				
1353	13.3	271.0	0.49	6.36	89.5				
1356	13.1	269.6	0.52	6.36	88.6				
1359	12.9	267.9	0.55	6.36	87.5				

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ■ Pump/Pump Type BLADDER

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ■ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ■ Dedicated

(By Numerical Order) ☐ Other

Sample Description (color, turbidity, odor, sheen, etc.): GRAY TINT, CLOUDY, DARK FINES, NO SHEEN, NO ODOR

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1	12.9	267.7	0.56	6.36	87.3				
2	12.9	267.5	0.56	6.36	87.4				
3	12.8	267.4	0.58	6.37	87.2				
4	12.8	267.4	0.57	6.37	87.0				
Average:	12.9	267.5	0.57	6.37	87.2	#DIV/0!			

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)		
5	(8260) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX)	WA ☐	OR ☐
	(8270) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease)	WA ☐	OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)		
1	(COD) (TOC) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)		
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)		
	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)		
	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic		
	VOC (Boeing short list)		
	Methane Ethane Ethene Acetylene		
	others		

Duplicate Sample No(s):

Comments:

Signature: BXM Date: 11.12.19

Groundwater Low-Flow Sample Collection Form

Project Name: Boeing Renton | Project Number: 0025217.099.099

Event: Nov-19 | Date/Time: 11/ 12 /2019@ 1301

Sample Number: RGW039S- 191112 | Weather: CLOUDY 40S

Landau Representative: SRB

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES) Damaged (NO) Describe: Flush Mount

DTW Before Purging (ft) 5.11 Time: 1245 Flow through cell vol. GW Meter No.(s HERON1

Begin Purge: Date/Time: 11/ 12 /201 1300 End Purge: Date/Time: 11/ 12 /2019 @ 1322 Gallons Purged: 0.5

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ■ Other SITE TREATMENT SYSTEM

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
	Purge Goals: Stablization of Parameters for three consecutive readings within the following limits							>/= 1 flow through cell	
	+/- 3%	+/- 3%	+/- 10%	+/- 0.1 units	+/- 10 mV	+/- 10%	< 0.3 ft		
1303	16.7	201.0	0.86	6.21	12.3	LOW	5.13		
1306	17.0	200.6	0.61	6.25	9.1		5.14		
1309	16.9	199.6	0.51	6.27	6.8		5.14		
1312	16.9	199.5	0.49	6.29	4.0				
1315	16.8	198.8	0.42	6.29	2.7				
1318	16.8	198.7	0.42	6.29	2.3				
1321	16.9	199.4	0.42	6.30	2.0				

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ■ Pump/Pump Type DED BLADDER

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ■ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ■ Dedicated

(By Numerical Order) ☐ Other

Sample Description (color, turbidity, odor, sheen, etc.): SLIGHTLY YELLOW WITH ORANGE PARTICULATES NO/NS

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1	16.8	199.4	0.46	6.30	1.9				
2	16.8	199.4	0.44	6.30	1.9				
3	16.9	199.4	0.42	6.30	2.0				
4	16.9	199.2	0.42	6.30	1.9				
Average:	16.9	199.4	0.44	6.30	1.9	#DIV/0!			

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)	
5	(8260) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX)	WA ☐ OR ☐
	(8270) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease)	WA ☐ OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)	
1	(COD) (TOC) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)	
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)	
	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)	
	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic	
	VOC (Boeing short list)	
	Methane Ethane Ethene Acetylene	
	others	

Duplicate Sample No(s):

Comments:

Signature: SRB Date: 11.12.19

Groundwater Low-Flow Sample Collection Form

Project Name: Boeing Renton | Project Number: 0025217.099.099

Event: Nov-19 | Date/Time: 11/ 12 /2019@ 1141

Sample Number: RGW143S- 191112 | Weather: CLOUDY 40S

Landau Representative: SRB

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES) Damaged (NO) Describe: Flush Mount

DTW Before Purging (ft) 5.7 Time: 1110 Flow through cell vol. GW Meter No.(s HERON1

Begin Purge: Date/Time: 11/ 12 /201 1111 End Purge: Date/Time: 11/ 12 /2019 @ 1125 Gallons Purged: 0.5

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ■ Other SITE TREATMENT SYSTEM

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
Purge Goals: Stablization of Parameters for three consecutive readings within the following limits	**+/- 3%**	**+/- 3%**	**+/- 10%**	**+/- 0.1 units**	**+/- 10 mV**	**+/- 10%**	**< 0.3 ft**	**>/= 1 flow through cell**	
1114	14.9	296.3	0.19	6.37	6.4	MED	5.75		
1117	14.9	303.9	0.21	6.40	-0.7		5.73		
1120	14.9	304.7	0.22	6.40	-3.5		5.73		
1123	15.0	306.3	0.23	6.41	-6.4				

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ■ Pump/Pump Type DED BLADDER

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ■ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ■ Dedicated

(By Numerical Order) ☐ Other

Sample Description (color, turbidity, odor, sheen, etc.): SLGIHTLY YELLOW AND TURBID WITH RED PARTICULATES NO/NS

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1	15.0	306.6	0.23	6.41	-6.8				
2	15.0	306.7	0.23	6.41	-7.2				
3	15.0	307.0	0.22	6.41	-7.6				
4	15.1	307.0	0.22	6.41	-8.0				
Average:	15.0	306.8	0.23	6.41	-7.4	#DIV/0!			

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)		
5	(8260) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX)	WA ☐	OR ☐
	(8270) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease)	WA ☐	OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)		
1	(COD) (TOC) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)		
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)		
	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)		
	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic		
	VOC (Boeing short list)		
	Methane Ethane Ethene Acetylene		
	others		

Duplicate Sample No(s):

Comments: SHEEN IN BUCKET

Signature: SRB Date: 11.12.19

Groundwater Low-Flow Sample Collection Form

Project Name: Boeing Renton | Project Number: 0025217.099.099

Event: Nov-19 | Date/Time: 11/ 12 /2019@ 1021

Sample Number: RGW209S- 191112 | Weather: CLOUDY 40S

Landau Representative: SRB

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES) Damaged (NO) Describe: Flush Mount

DTW Before Purging (ft) 5.3 Time: 945 Flow through cell vol. GW Meter No.(s HERON1

Begin Purge: Date/Time: 11/ 12 /201 950 End Purge: Date/Time: 11/ 12 /2019 @ 1000 Gallons Purged: 0.5

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ■ Other SITE TREATMENT SYSTEM

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
Purge Goals: Stablization of Parameters for three consecutive readings within the following limits	**+/- 3%**	**+/- 3%**	**+/- 10%**	**+/- 0.1 units**	**+/- 10 mV**	**+/- 10%**	**< 0.3 ft**	**>/= 1 flow through cell**	
953	15.1	330.7	0.24	6.48	17.2	LOW	5.30		
956	15.2	329.8	0.26	6.48	15.3		5.30		
959	15.3	328.0	0.26	6.48	7.0		5.30		

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ■ Pump/Pump Type DED BLADDER

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ■ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ■ Dedicated

(By Numerical Order) ☐ Other

Sample Description (color, turbidity, odor, sheen, etc.): CLEAR COLORLESS NO/NS

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1	15.3	327.8	0.28	6.47	6.4				
2	15.3	327.9	0.27	6.47	5.9				
3	15.3	327.7	0.27	6.48	5.4				
4	15.3	328.3	0.27	6.48	5.2				
Average:	15.3	327.9	0.27	6.48	5.7	#DIV/0!			

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)		
5	(8260) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX)	WA ☐	OR ☐
	(8270) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease)	WA ☐	OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)		
1	(COD) (TOC) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)		
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)		
	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)		
	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic		
	VOC (Boeing short list)		
	Methane Ethane Ethene Acetylene		
	others		

Duplicate Sample No(s):

Comments:

Signature: SRB Date: 11.12.19

Groundwater Low-Flow Sample Collection Form

Project Name: Boeing Renton | Project Number: 0025217.099.099

Event: Nov-19 | Date/Time: 11/ 12 /2019@ 1135

Sample Number: RGW210S- 191112 | Weather: OVERCAST, COLD

Landau Representative: BXM

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES) Damaged (NO) Describe: Flush Mount

DTW Before Purging (ft) 4.95 Time: 1110 Flow through cell vol. GW Meter No.(s HERON-3

Begin Purge: Date/Time: 11/ 12 /2019 @ 1112 End Purge: Date/Time: 11/ 12 /2019 @ 1134 Gallons Purged: < 1

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ■ Other SITE TREATMENT SYSTEM

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
	Purge Goals: Stablization of Parameters for three consecutive readings within the following limits							>/= 1 flow through cell	
	+/- 3%	+/- 3%	+/- 10%	+/- 0.1 units	+/- 10 mV	+/- 10%	< 0.3 ft		
1115	14.6	278.7	2.11	6.50	111.3		5.02		
1118	13.9	276.8	0.21	6.48	112.2		5.02		
1121	12.6	282.4	0.16	6.48	112.9		5.02		
1124	11.8	296.5	0.18	6.59	110.3				
1127	11.8	295.5	0.20	6.65	107.1				
1130	11.7	287.4	0.27	6.68	103.6				
1133	11.8	274.4	0.28	6.65	103.3				

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ■ Pump/Pump Type BLADDER

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ■ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ■ Dedicated

(By Numerical Order) ☐ Other

Sample Description (color, turbidity, odor, sheen, etc.): BROWN, CLOUDY, LOTS OF BROWN SOLIDS, NO SHEEN, NO ODOR

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1	11.8	272.6	0.28	6.65	103.4				
2	11.8	269.3	0.30	6.64	103.9				
3	11.8	268.7	0.29	6.64	103.7				
4	11.8	268.0	0.30	6.63	103.7				
Average:	11.8	269.7	0.29	6.64	103.7	#DIV/0!			

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)	
5	(8260) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX)	WA ☐ OR ☐
	(8270) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease)	WA ☐ OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)	
1	(COD) (TOC) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)	
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)	
	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)	
	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic	
	VOC (Boeing short list)	
	Methane Ethane Ethene Acetylene	
	others	

Duplicate Sample No(s):

Comments:

Signature: BXM Date: 11.12.19

Groundwater Low-Flow Sample Collection Form

Project Name: Boeing Renton | Project Number: 0025217.099.099

Event: Nov-19 | Date/Time: 11/ 12 /2019@ 1001

Sample Number: RGW237S- 191112 | Weather: CLOUDY 40S

Landau Representative: SRB

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES) Damaged (NO) Describe: Flush Mount

DTW Before Purging (ft) 4.8 Time: 922 Flow through cell vol. GW Meter No.(s HERON1

Begin Purge: Date/Time: 11/ 12 /201 930 End Purge: Date/Time: 11/ 12 /2019 @ 947 Gallons Purged: 0.5

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ■ Other SITE TREATMENT SYSTEM

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
Purge Goals: Stablization of Parameters for three consecutive readings within the following limits	**+/- 3%**	**+/- 3%**	**+/- 10%**	**+/- 0.1 units**	**+/- 10 mV**	**+/- 10%**	**< 0.3 ft**	**>/= 1 flow through cell**	
933	14.5	210.3	0.53	6.50	14.1	LOW	4.80		
936	14.5	209.5	0.51	6.50	14.0		4.80		
939	14.6	206.5	0.44	6.47	12.8		4.80		
942	14.6	206.8	0.42	6.47	12.5				
945	14.6	207.0	0.42	6.46	12.4				

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ■ Pump/Pump Type DED BLADDER

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ■ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ■ Dedicated

(By Numerical Order) ☐ Other

Sample Description (color, turbidity, odor, sheen, etc.): SLIGHTLY YELLOW CLEAR WITH MINOR PARTICULATES SLIGHT ODOR NO SHEEN

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1	14.6	207.2	0.41	6.46	12.2				
2	14.6	207.4	0.41	6.46	12.1				
3	14.6	207.7	0.40	6.46	12.0				
4	14.6	207.3	0.40	6.46	12.0				
Average:	14.6	207.4	0.41	6.46	12.1	#DIV/0!			

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)		
5	(8260) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX)	WA ☐	OR ☐
	(8270) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease)	WA ☐	OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)		
1	(COD) (TOC) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)		
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)		
	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)		
	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic		
	VOC (Boeing short list)		
	Methane Ethane Ethene Acetylene		
	others		

Duplicate Sample No(s):

Comments:

Signature: SRB Date: 11.12.19

Groundwater Low-Flow Sample Collection Form

Project Name: Boeing Renton | Project Number: 0025217.099.099

Event: Nov-19 | Date/Time: 11/ 12 /2019@ 936

Sample Number: RGW238I- 191112 | Weather: CLOUDY 40S

Landau Representative: SRB

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES) Damaged (NO) Describe: Flush Mount

DTW Before Purging (ft) 4.89 Time: 903 Flow through cell vol. GW Meter No.(s HERON1

Begin Purge: Date/Time: 11/ 12 /201 904 End Purge: Date/Time: 11/ 12 /2019 @ 927 Gallons Purged: 0.5

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ■ Other SITE TREATMENT SYSTEM

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
	Purge Goals: Stablization of Parameters for three consecutive readings within the following limits							>/= 1 flow through cell	
	+/- 3%	+/- 3%	+/- 10%	+/- 0.1 units	+/- 10 mV	+/- 10%	< 0.3 ft		
907	16.2	377.7	2.21	6.16	35.5	LOW	4.91		
910	14.8	413.6	1.90	6.23	35.7		4.91		
913	14.9	413.5	1.86	6.22	35.8		4.91		
916	15.0	402.3	1.17	6.26	26.9				
919	15.0	401.4	1.15	6.26	26.1				
922	15.2	400.4	1.03	6.28	24.3				
925	15.1	400.4	1.00	6.28	23.8				

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ■ Pump/Pump Type DED BLADDER

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ■ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ■ Dedicated

(By Numerical Order) ☐ Other

Sample Description (color, turbidity, odor, sheen, etc.): SLIGHTLY YELLOW AND TURBID SULFURIC ODOR NO SHEEN

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1	15.1	400.5	0.97	6.28	23.1				
2	15.1	399.5	0.95	6.29	22.8				
3	15.1	399.8	0.92	6.29	22.5				
4	15.2	399.9	0.90	6.29	22.1				
Average:	15.1	399.9	0.94	6.29	22.6	#DIV/0!			

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)	
5	(8260) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX)	WA ☐ OR ☐
	(8270) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease)	WA ☐ OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)	
1	(COD) (TOC) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)	
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)	
	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)	
	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic	
	VOC (Boeing short list)	
	Methane Ethane Ethene Acetylene	
	others	

Duplicate Sample No(s):

Comments:

Signature: SRB Date: 11.12.19

Groundwater Low-Flow Sample Collection Form

Project Name: Boeing Renton | Project Number: 0025217.099.099

Event: Nov-19 | Date/Time: 11/ 12 /2019@ 1056

Sample Number: RGW239I- 191112 | Weather: CLOUDY 40S

Landau Representative: SRB

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES) Damaged (NO) Describe: Flush Mount

DTW Before Purging (ft) 5.6 Time: 1015 Flow through cell vol. GW Meter No.(s HERON1

Begin Purge: Date/Time: 11/ 12 /201 1025 End Purge: Date/Time: 11/ 12 /2019 @ 1036 Gallons Purged: 0.5

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ■ Other SITE TREATMENT SYSTEM

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
Purge Goals: Stablization of Parameters for three consecutive readings within the following limits	**+/- 3%**	**+/- 3%**	**+/- 10%**	**+/- 0.1 units**	**+/- 10 mV**	**+/- 10%**	**< 0.3 ft**	**>/= 1 flow through cell**	
1028	13.0	293.2	0.25	6.33	18.8	MED-LOW	5.63		
1031	13.1	294.6	0.26	6.37	12.5		5.63		
1034	13.1	294.7	0.25	6.38	11.6		5.63		

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ■ Pump/Pump Type DED BLADDER

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ■ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ■ Dedicated

(By Numerical Order) ☐ Other

Sample Description (color, turbidity, odor, sheen, etc.): CLEAR COLORLESS NONS

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1	13.1	294.6	0.27	6.38	10.9				
2	13.1	294.6	0.26	6.39	10.3				
3	13.1	294.6	0.26	6.39	9.8				
4	13.1	294.7	0.26	6.39	9.3				
Average:	13.1	294.6	0.26	6.39	10.1	#DIV/0!			

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)		
5	(8260) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX)	WA ☐	OR ☐
	(8270) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease)	WA ☐	OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)		
1	(COD) (TOC) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)		
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)		
	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)		
	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic		
	VOC (Boeing short list)		
	Methane Ethane Ethene Acetylene		
	others		

Duplicate Sample No(s):

Comments: MSMSD Location

Signature: SRB Date: 11.12.19

Groundwater Low-Flow Sample Collection Form

Project Name: Boeing Renton | Project Number: 0025217.099.099

Event: Nov-19 | Date/Time: 11/ 12 /2019@ 1121

Sample Number: RGW240D-191112 | Weather: CLOUDY 40S

Landau Representative: SRB

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES) Damaged (NO) Describe: Flush Mount

DTW Before Purging (ft) 5.47 Time: 1045 Flow through cell vol. GW Meter No.(s HERON1

Begin Purge: Date/Time: 11/ 12 /201 1050 End Purge: Date/Time: 11/ 12 /2019 @ 1100 Gallons Purged: 0.5

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ■ Other SITE TREATMENT SYSTEM

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
	Purge Goals: Stablization of Parameters for three consecutive readings within the following limits							>/= 1 flow	
	+/- 3%	+/- 3%	+/- 10%	+/- 0.1 units	+/- 10 mV	+/- 10%	< 0.3 ft	through cell	
1053	13.3	328.8	0.20	6.53	8.3	MED-LOW	6.10		
1056	13.3	328.8	0.21	6.53	6.2		6.05		
1059	13.3	327.3	0.20	6.53	3.6		6.05		

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ■ Pump/Pump Type DED BLADDER

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ■ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ■ Dedicated

(By Numerical Order) ☐ Other

Sample Description (color, turbidity, odor, sheen, etc.): WHITE AND VERY TURBID NO/NS

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1	13.3	327.0	0.20	6.53	2.8				
2	13.2	326.6	0.20	6.53	2.2				
3	13.2	326.4	0.20	6.53	1.4				
4	13.2	326.3	0.20	6.53	1.0				
Average:	13.2	326.6	0.20	6.53	1.9	#DIV/0!			

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)	
5	(8260) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX)	WA ☐ OR ☐
	(8270) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease)	WA ☐ OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)	
1	(COD) (TOC) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)	
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)	
	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)	
	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic	
	VOC (Boeing short list)	
	Methane Ethane Ethene Acetylene	
	others	

Duplicate Sample No(s):

Comments: LARGE DRAWDOWN

Signature: SRB Date: 11.12.19

Groundwater Low-Flow Sample Collection Form

Project Name: Boeing Renton | Project Number: 0025217.099.099

Event: Nov-19 | Date/Time: 11/ 12 /2019@ 1231

Sample Number: RGW-241S 191112 | Weather: CLOUDY 40S

Landau Representative: SRB

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES) Damaged (NO) Describe: Flush Mount

DTW Before Purging (ft) 6.19 Time: 1159 Flow through cell vol. GW Meter No.(s HERON1

Begin Purge: Date/Time: 11/ 12 /201 1200 End Purge: Date/Time: 11/ 12 /2019 @ 1210 Gallons Purged: 0.5

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ☐ Other SITE TREATMENT SYSTEM

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
Purge Goals: Stablization of Parameters for three consecutive readings within the following limits	**+/- 3%**	**+/- 3%**	**+/- 10%**	**+/- 0.1 units**	**+/- 10 mV**	**+/- 10%**	**< 0.3 ft**	**>/= 1 flow through cell**	
1203	15.1	295.1	0.19	6.43	-6.8	LOW	6.23		
1206	15.0	295.4	0.18	6.43	-8.4		6.23		
1209	15.1	295.2	0.20	6.44	-12.1		6.23		

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ☐ Pump/Pump Type DED BLADDER

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ☐ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ☐ Dedicated

(By Numerical Order) ☐ Other

Sample Description (color, turbidity, odor, sheen, etc.): SLIGHTLY GRAY AND CLOUDY NO/NS

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1	15.1	295.3	0.20	6.43	-12.4				
2	15.1	295.0	0.19	6.43	-12.7				
3	15.2	295.2	0.20	6.43	-13.1				
4	15.2	295.4	0.19	6.43	-13.5				
Average:	15.2	295.2	0.20	6.43	-12.9	#DIV/0!			

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)		
5	(8260) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX)	WA ☐	OR ☐
	(8270) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease)	WA ☐	OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)		
1	(COD) (TOC) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)		
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)		
	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)		
	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic		
	VOC (Boeing short list)		
	Methane Ethane Ethene Acetylene		
	others		

Duplicate Sample No(s):

Comments:

Signature: SRB Date: 11.12.19

Groundwater Low-Flow Sample Collection Form

Project Name: Boeing Renton | Project Number: 0025217.099.099

Event: Nov-19 | Date/Time: 11/ 12 /2019@ 1201

Sample Number: RGW-242I- 191112 | Weather: CLOUDY 40S

Landau Representative: SRB

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES) Damaged (NO) Describe: Flush Mount

DTW Before Purging (ft) 6.35 Time: 1130 Flow through cell vol. GW Meter No.(s HERON1

Begin Purge: Date/Time: 11/ 12 /201 1131 End Purge: Date/Time: 11/ 12 /2019 @ 1141 Gallons Purged: 0.5

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ■ Other SITE TREATMENT SYSTEM

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
Purge Goals: Stablization of Parameters for three consecutive readings within the following limits	**+/- 3%**	**+/- 3%**	**+/- 10%**	**+/- 0.1 units**	**+/- 10 mV**	**+/- 10%**	**< 0.3 ft**	**>/= 1 flow through cell**	
1134	13.9	292.6	0.18	6.43	5.9	LOW	6.35		
1137	14.3	291.0	0.19	6.44	-1.6		6.35		
1140	14.3	290.6	0.19	6.43	-3.4		6.35		

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ■ Pump/Pump Type DED BLADDER

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ■ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ■ Dedicated

(By Numerical Order) ☐ Other

Sample Description (color, turbidity, odor, sheen, etc.): SLIGHTLY GRAY AND SLIGHTY TURBID NO/NS

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1	14.3	290.5	0.20	6.43	-3.8				
2	14.3	290.5	0.20	6.43	-4.2				
3	14.3	290.4	0.20	6.44	-4.5				
4	14.3	290.4	0.20	6.43	-4.8				
Average:	14.3	290.5	0.20	6.43	-4.3	#DIV/0!			

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)		
5	(8260) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX)	WA ☐	OR ☐
	(8270) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease)	WA ☐	OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)		
1	(COD) (TOC) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)		
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)		
	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)		
	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic		
	VOC (Boeing short list)		
	Methane Ethane Ethene Acetylene		
	others		

Duplicate Sample No(s):

Comments:

Signature: SRB Date: 11.12.19

Groundwater Low-Flow Sample Collection Form

Project Name: Boeing Renton | Project Number: 0025217.099.099

Event: Nov-19 | Date/Time: 11/ 12 /2019@ 1301

Sample Number: RGW-243I- 191112 | Weather: CLOUDY 40S

Landau Representative: SRB

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES) Damaged (NO) Describe: Flush Mount

DTW Before Purging (ft) 5.35 Time: 1226 Flow through cell vol. GW Meter No.(s HERON1

Begin Purge: Date/Time: 11/ 12 /201 1230 End Purge: Date/Time: 11/ 12 /2019 @ 1245 Gallons Purged: 0.5

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ■ Other SITE TREATMENT SYSTEM

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
Purge Goals: Stablization of Parameters for three consecutive readings within the following limits	**+/- 3%**	**+/- 3%**	**+/- 10%**	**+/- 0.1 units**	**+/- 10 mV**	**+/- 10%**	**< 0.3 ft**	**>/= 1 flow through cell**	
1233	15.5	372.1	0.24	6.34	19.0	LOW	5.37		
1236	15.5	364.7	0.19	6.32	12.6		5.37		
1239	15.3	358.4	0.19	6.31	8.2		5.37		
1242	15.6	357.0	0.21	6.30	-3.3				

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ■ Pump/Pump Type DED BLADDER

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ■ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ■ Dedicated

(By Numerical Order) ☐ Other

Sample Description (color, turbidity, odor, sheen, etc.): SLIGHTLY GRAY AND CLOUDY NO/NS

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1	15.7	357.0	0.22	6.30	-3.7				
2	15.7	357.0	0.22	6.30	-4.0				
3	15.7	357.0	0.21	6.30	-4.3				
4	15.7	357.3	0.22	6.30	-4.6				
Average:	15.7	357.1	0.22	6.30	-4.2	#DIV/0!			

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)		
5	(8260) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX)	WA ☐	OR ☐
	(8270) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease)	WA ☐	OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)		
1	(COD) (TOC) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)		
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)		
	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)		
	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic		
	VOC (Boeing short list)		
	Methane Ethane Ethene Acetylene		
	others		

Duplicate Sample No(s):

Comments:

Signature: SRB Date: 11.12.19

Groundwater Low-Flow Sample Collection Form

Project Name: Boeing Renton | Project Number: 0025217.099.099

Event: Nov-19 | Date/Time: 11/ 12 /2019@ 1005

Sample Number: RGW-244S 191112 | Weather: CLOUDY, RAINY

Landau Representative: BXM

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES) Damaged (NO) Describe: Flush Mount

DTW Before Purging (ft) 5.36 Time: 937 Flow through cell vol. GW Meter No.(s HERON-3

Begin Purge: Date/Time: 11/ 11 /2019 @ 940 End Purge: Date/Time: 11/ 11 /2019 @1003 Gallons Purged: < 1

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ■ Other SITE TREATMENT SYSTEM

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
	Purge Goals: Stablization of Parameters for three consecutive readings within the following limits							>/= 1 flow through cell	
	+/- 3%	+/- 3%	+/- 10%	+/- 0.1 units	+/- 10 mV	+/- 10%	< 0.3 ft		
943	13.6	440.2	0.56	6.32	117.5		5.38		
946	13.3	432.6	0.40	6.31	116.2		5.37		
949	12.8	417.1	0.48	6.28	114.8		5.37		
952	12.3	405.4	0.98	6.26	113.6				
955	12.2	395.2	1.04	6.25	113.1				
958	12.1	386.6	1.15	6.25	112.6				
1001	12.0	383.0	1.22	6.24	112.2				

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ■ Pump/Pump Type BLADDER

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ■ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ■ Dedicated

(By Numerical Order) ☐ Other

Sample Description (color, turbidity, odor, sheen, etc.): CLEAR, COLORLESS, NO SHEEN, NO ODOER

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1	12.0	382.5	1.26	6.24	112.2				
2	12.0	382.3	1.28	6.24	112.1				
3	12.0	381.6	1.25	6.24	112.1				
4	12.0	381.2	1.27	6.24	112.0				
Average:	12.0	381.9	1.27	6.24	112.1	#DIV/0!			

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)	
5	(8260) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX)	WA ☐ OR ☐
	(8270) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease)	WA ☐ OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)	
1	(COD) (TOC) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)	
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)	
	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)	
	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic	
	VOC (Boeing short list)	
	Methane Ethane Ethene Acetylene	
	others	

Duplicate Sample No(s):

Comments:

Signature: BXM Date: 11.12.19

Groundwater Low-Flow Sample Collection Form

Project Name: Boeing Renton | Project Number: 0025217.099.099

Event: Nov-19 | Date/Time: 11/ 11 /2019@ 1351

Sample Number: RGW183S- 191111 | Weather: PC 50S

Landau Representative: SRB

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES) Damaged (NO) Describe: Flush Mount

DTW Before Purging (ft) 8.78 Time: 1320 Flow through cell vol. GW Meter No.(s HERON1

Begin Purge: Date/Time: 11/ 11 /201 1321 End Purge: Date/Time: 11/ 11 /2019 @ 1345 Gallons Purged: 0.5

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ■ Other SITE TREATMENT SYSTEM

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
Purge Goals: Stablization of Parameters for three consecutive readings within the following limits	**+/- 3%**	**+/- 3%**	**+/- 10%**	**+/- 0.1 units**	**+/- 10 mV**	**+/- 10%**	**< 0.3 ft**	**>/= 1 flow through cell**	
1324	13.6	149.9	4.91	6.28	28.9	LOW	8.78		
1327	13.7	148.9	4.06	6.28	24.9		8.78		
1330	13.7	147.7	3.66	6.28	23.9		8.78		
1333	13.9	144.4	1.49	6.31	19.7				
1336	14.1	142.6	0.78	6.30	19.6				
1339	14.2	142.2	0.64	6.33	18.0				
1342	14.2	141.7	0.61	6.33	17.0				

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ■ Pump/Pump Type DED BLADDER

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ■ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ■ Dedicated

(By Numerical Order) ☐ Other

Sample Description (color, turbidity, odor, sheen, etc.): SLIGHTLY GRAY AND TURBID NO/NS

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1	14.4	142.0	0.57	6.32	17.0				
2	14.4	141.8	0.59	6.34	16.2				
3	14.4	141.9	0.58	6.34	15.7				
4	14.4	142.0	0.56	6.34	15.7				
Average:	14.4	141.9	0.58	6.34	16.2	#DIV/0!			

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)		
	(8260) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX)	WA ☐	OR ☐
2	(8270) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease)	WA ☐	OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)		
	(COD) (TOC) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)		
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)		
	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)		
	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic		
	VOC (Boeing short list)		
	Methane Ethane Ethene Acetylene		
	others		

Duplicate Sample No(s):

Comments:

Signature: SRB Date: 11/11/2019

Groundwater Low-Flow Sample Collection Form

Project Name: Boeing Renton | Project Number: 0025217.099.099

Event: Nov-19 | Date/Time: 11/ 11 /2019@ 1405

Sample Number: RGW184S- 191111 | Weather: SUNNY, COOL

Landau Representative: BXM

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES) Damaged (NO) Describe: Flush Mount

DTW Before Purging (ft) 9.34 Time: 1338 Flow through cell vol. GW Meter No.(s HERON-3

Begin Purge: Date/Time: 11/ 11 /2019 @ 1340 End Purge: Date/Time: 11/ 11 /2019 @ 1402 Gallons Purged: < 1

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ■ Other SITE TREATMENT SYSTEM

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
	Purge Goals: Stablization of Parameters for three consecutive readings within the following limits							>/= 1 flow through cell	
	+/- 3%	+/- 3%	+/- 10%	+/- 0.1 units	+/- 10 mV	+/- 10%	< 0.3 ft		
1343	14.9	141.3	2.99	6.52	23.6		9.34		
1346	14.7	141.7	3.01	6.51	20.8		9.33		
1349	14.7	147.9	2.88	6.5	21.6		9.33		
1352	14.6	152.6	2.80	6.5	20.8				
1355	14.5	155.3	2.45	6.5	19.4				
1358	14.4	155.8	2.50	6.5	18.5				
1401	14.4	155.8	2.33	6.49	17.9				

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ■ Pump/Pump Type BLADDER

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ■ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ■ Dedicated

(By Numerical Order) ☐ Other

Sample Description (color, turbidity, odor, sheen, etc.): CLEAR, COLORLESS, NO SHEEN, NO ODOR

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1	14.4	155.8	2.35	6.49	17.9				
2	14.4	155.8	2.32	6.49	17.9				
3	14.3	155.8	2.36	6.49	17.8				
4	14.3	155.8	2.43	6.49	17.8				
Average:	14.4	155.8	2.37	6.49	17.9	#DIV/0!			

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)		
	(8260) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX)	WA ☐	OR ☐
2	(8270) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease)	WA ☐	OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)		
	(COD) (TOC) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)		
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)		
	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)		
	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic		
	VOC (Boeing short list)		
	Methane Ethane Ethene Acetylene		
	others		

Duplicate Sample No(s):

Comments:

Signature: BXM Date: 11.11.19

Groundwater Low-Flow Sample Collection Form

Project Name: Boeing Renton | Project Number: 0025217.099.099

Event: Nov-19 | Date/Time: 11/11 /2019@ 1045

Sample Number: RGW211S- 191111 | Weather: PARTLY SUNNY, COOL

Landau Representative: BXM

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES) Damaged (NO) Describe: Flush Mount

DTW Before Purging (ft) 6.58 Time: 1014 Flow through cell vol. GW Meter No.(s HERON -3

Begin Purge: Date/Time: 11/ 11 /2019 @ 1021 End Purge: Date/Time: 11/ 11 /2019 @ 1044 Gallons Purged: < 1

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ■ Other SITE TREATMENT SYSTEM

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
Purge Goals: Stablization of Parameters for three consecutive readings within the following limits	**+/- 3%**	**+/- 3%**	**+/- 10%**	**+/- 0.1 units**	**+/- 10 mV**	**+/- 10%**	**< 0.3 ft**	**>/= 1 flow through cell**	
1024	13.3	276.5	0.33	6.54	-3.8		8.23		
1027	13.0	272.8	0.30	6.55	-13.4		8.36		
1030	12.5	257.8	0.26	6.56	-25.1		8.42		
1033	12.4	254.1	0.29	6.55	-29.9		8.30		
1036	12.2	250.7	0.25	6.55	-33.0		8.30		
1039	12.2	243.5	0.22	6.53	-37.2		8.27		
1042	12.2	238.0	0.21	6.53	-39.6		8.27		

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ■ Pump/Pump Type BLADDER

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ■ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ■ Dedicated

(By Numerical Order) ☐ Other

Sample Description (color, turbidity, odor, sheen, etc.): BROWN, SLIGHTLY CLOUDY, DARK SOLIDS, NO ODOR, NO SHEEN

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1	12.2	236.6	0.20	6.52	-40.3				
2	12.2	236.0	0.21	6.52	-40.4				
3	12.2	235.8	0.21	6.52	-40.7				
4	12.2	235.3	0.20	6.52	-40.7				
Average:	12.2	235.9	0.21	6.52	-40.5	#DIV/0!			

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)	
	(8260) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX)	WA ☐ OR ☐
2	(8270) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease)	WA ☐ OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)	
	(COD) (TOC) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)	
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)	
	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)	
	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic	
	VOC (Boeing short list)	
	Methane Ethane Ethene Acetylene	
	others	

Duplicate Sample No(s):

Comments:

Signature: BXM Date: 11.11.19

Groundwater Low-Flow Sample Collection Form

Project Name: Boeing Renton | Project Number: 0025217.099.099

Event: Nov-19 | Date/Time: 11/ 11/2019@ 1135

Sample Number: RGW212S- 191111 | Weather: PARTLY CLOUDY, COOL

Landau Representative: BXM

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES) Damaged (NO) Describe: Flush Mount

DTW Before Purging (ft) 10.28 Time: 1106 Flow through cell vol. GW Meter No.(s HERON-3

Begin Purge: Date/Time: 11/ 11 /2019 @ 1109 End Purge: Date/Time: 11/ 11 /2019 @ 1132 Gallons Purged: <1

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ■ Other SITE TREATMENT SYSTEM

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
	Purge Goals: Stablization of Parameters for three consecutive readings within the following limits							>/= 1 flow	
	+/- 3%	+/- 3%	+/- 10%	+/- 0.1 units	+/- 10 mV	+/- 10%	< 0.3 ft	through cell	
1112	14.1	230.2	0.68	5.77	24.9		10.40		
1115	14.2	233.4	0.60	5.77	24.2		10.41		
1118	14.4	235.6	0.59	5.77	22.2		10.43		
1121	14.5	236.8	0.60	5.77	20.1				

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ■ Pump/Pump Type BLADDER

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ■ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ■ Dedicated

(By Numerical Order) ☐ Other

Sample Description (color, turbidity, odor, sheen, etc.): SLIGHTLY BROWN, SLIGHTLY CLOUDY, NO ODOR, NO SHEEN

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1	14.6	236.6	0.56	5.76	19.7				
2	14.6	235.5	0.54	5.76	19.4				
3	14.6	236.5	0.52	5.76	19.3				
4	14.6	236.6	0.52	5.76	19.2				
Average:	14.6	236.3	0.54	5.76	19.4	#DIV/0!			

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)		
	(8260) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX)	WA ☐	OR ☐
2	(8270) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease)	WA ☐	OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)		
	(COD) (TOC) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)		
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)		
	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)		
	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic		
	VOC (Boeing short list)		
	Methane Ethane Ethene Acetylene		
	others		

Duplicate Sample No(s):

Comments:

Signature: BXM Date: 11.11.19

Groundwater Low-Flow Sample Collection Form

Project Name: Boeing Renton | Project Number: 0025217.099.099

Event: Nov-19 | Date/Time: 11/ 11 /2019@ 1315

Sample Number: RGW221S- 191111 | Weather: SUNNY, COOL

Landau Representative: BXM

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES) Damaged (NO) Describe: Flush Mount

DTW Before Purging (ft) 10.1 Time: 1245 Flow through cell vol. GW Meter No.(s HERON-3

Begin Purge: Date/Time: 11/ 11 /2019 @ 1250 End Purge: Date/Time: 11/ 11 /2019 @ 1313 Gallons Purged: < 1

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ■ Other SITE TREATMENT SYSTEM

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
Purge Goals: Stablization of Parameters for three consecutive readings within the following limits	**+/- 3%**	**+/- 3%**	**+/- 10%**	**+/- 0.1 units**	**+/- 10 mV**	**+/- 10%**	**< 0.3 ft**	**>/= 1 flow through cell**	
1253	14.2	196.5	1.72	6.14	27.0		10.1		
1256	14.5	205.3	1.55	6.18	19.6		10.1		
1259	14.7	216.4	1.29	6.22	15.1		10.1		
1302	14.6	223.6	1.03	6.23	12.4				
1305	14.6	227.3	0.94	6.25	10.4				
1308	14.6	228.1	0.90	6.25	8.8				
1311	14.3	226.1	0.82	6.25	7.0				

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ■ Pump/Pump Type BLADDER

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ■ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ■ Dedicated

(By Numerical Order) ☐ Other

Sample Description (color, turbidity, odor, sheen, etc.): CLEAR, COLORLESS, NO SHEEN, NO ODOR

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1	14.4	226.0	0.79	6.25	6.6				
2	14.3	225.3	0.77	6.25	6.6				
3	14.3	225.2	0.76	6.25	6.4				
4	14.2	224.7	0.75	6.25	6.4				
Average:	14.3	225.3	0.77	6.25	6.5	#DIV/0!			

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)	
	(8260) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX)	WA ☐ OR ☐
2	(8270) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease)	WA ☐ OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)	
	(COD) (TOC) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)	
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)	
	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)	
	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic	
	VOC (Boeing short list)	
	Methane Ethane Ethene Acetylene	
	others	

Duplicate Sample No(s):

Comments:

Signature: BXM Date: 11.11.19

Groundwater Low-Flow Sample Collection Form

Project Name: Boeing Renton | Project Number: 0025217.099.099

Event: Nov-19 | Date/Time: 11/ 11 /2019@ 1000

Sample Number: DUP3- 191111 | Weather: PC 50S

Landau Representative: SRB

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES) Damaged (NO) Describe: Flush Mount

DTW Before Purging (ft) _____ Time: _____ Flow through cell vol. GW Meter No.(s HERON1

Begin Purge: Date/Time: 11/ 11 /2019 @ End Purge: Date/Time: 11/ 11 /2019 @ Gallons Purged: 0.5

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ■ Other SITE TREATMENT SYSTEM

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
	Purge Goals: Stablization of Parameters for three consecutive readings within the following limits							**>/= 1 flow through cell**	
	+/- 3%	**+/- 3%**	**+/- 10%**	**+/- 0.1 units**	**+/- 10 mV**	**+/- 10%**	**< 0.3 ft**		

DUPLICATE TO RGW224S

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ☐ Pump/Pump Type DED BLADDER

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ☐ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ☐ Dedicated

(By Numerical Order) ☐ Other _____

Sample Description (color, turbidity, odor, sheen, etc.): CLEAR COLORLESS NO/NS

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1	14.6	257.9	0.80	5.94	-22.5				
2	14.7	257.6	0.82	5.93	-22.2				
3	14.7	257.0	0.77	5.95	-22.8				
4	14.6	256.4	0.74	5.95	-23.0				
Average:	14.7	257.2	0.78	5.94	-22.6	#DIV/0!			

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)		
	(8260) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX)	WA ☐	OR ☐
2	(8270) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease)	WA ☐	OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)		
	(COD) (TOC) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)		
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)		
	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)		
	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic		
	VOC (Boeing short list)		
	Methane Ethane Ethene Acetylene		
	others		

Duplicate Sample No(s): Duplicate to RGW224S

Comments: _____

Signature: SRB Date: 11/11/2019

Groundwater Low-Flow Sample Collection Form

Project Name: Boeing Renton | Project Number: 0025217.099.099

Event: Nov-19 | Date/Time: 11/ 11 /2019@ 1046

Sample Number: RGW224S- 191111 | Weather: PC 50S

Landau Representative: SRB

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES) Damaged (NO) Describe: Flush Mount

DTW Before Purging (ft) 10.55 Time: 1018 Flow through cell vol. GW Meter No.(s HERON1

Begin Purge: Date/Time: 11/ 11 /201 1019 End Purge: Date/Time: 11/ 11 /2019 @ 1041 Gallons Purged: 0.5

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ■ Other SITE TREATMENT SYSTEM

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
	Purge Goals: Stablization of Parameters for three consecutive readings within the following limits							>/= 1 flow through cell	
	+/- 3%	+/- 3%	+/- 10%	+/- 0.1 units	+/- 10 mV	+/- 10%	< 0.3 ft		
1022	15.4	263.1	1.59	6.01	-17.6	LOW	10.67		
1025	15.4	264.2	1.64	6.00	-18.9		10.67		
1028	15.1	265.6	1.33	6.01	-22.9		10.67		
1031	15.1	263.4	1.08	5.98	-22.9				
1034	14.9	261.4	1.01	5.98	-23.6				
1037	14.7	259.7	0.91	5.96	-23.1				
1040	14.7	258.7	0.91	5.96	-22.9				

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ■ Pump/Pump Type DED BLADDER

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ■ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ■ Dedicated

(By Numerical Order) ☐ Other

Sample Description (color, turbidity, odor, sheen, etc.): CLEAR COLORLESS NO/NS

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1	14.7	258.5	0.84	5.95	-22.8				
2	14.7	257.7	0.79	5.95	-22.6				
3	14.7	257.1	0.79	5.94	-22.6				
4	14.7	257.0	0.75	5.94	-22.6				
Average:	14.7	257.6	0.79	5.95	-22.7	#DIV/0!			

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)		
	(8260) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX)	WA ☐	OR ☐
2	(8270) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease)	WA ☐	OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)		
	(COD) (TOC) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)		
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)		
	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)		
	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic		
	VOC (Boeing short list)		
	Methane Ethane Ethene Acetylene		
	others		

Duplicate Sample No(s): Duplicate Location (DUP3)

Comments:

Signature: SRB Date: 11/11/2019

Groundwater Low-Flow Sample Collection Form

Project Name: Boeing Renton | Project Number: 0025217.099.099

Event: Nov-19 | Date/Time: 11/ 11 /2019@ 1121

Sample Number: RGW255S- 191111 | Weather: PC 50S

Landau Representative: SRB

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES) Damaged (NO) Describe: Flush Mount

DTW Before Purging (ft) 10.03 Time: 1037 Flow through cell vol. GW Meter No.(s HERON1

Begin Purge: Date/Time: 11/ 11 /201 1048 End Purge: Date/Time: 11/ 11 /2019 @ 1110 Gallons Purged: 0.5

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ☐ Other SITE TREATMENT SYSTEM

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
Purge Goals: Stablization of Parameters for three consecutive readings within the following limits	**+/- 3%**	**+/- 3%**	**+/- 10%**	**+/- 0.1 units**	**+/- 10 mV**	**+/- 10%**	**< 0.3 ft**	**>/= 1 flow through cell**	
1051	15.7	233.2	0.60	6.23	-16.2	LOW	10.07		
1054	15.7	229.8	0.57	6.25	-17.5		10.05		
1057	15.5	220.3	0.57	6.24	-19.3		10.05		
1100	15.0	203.4	0.68	6.23	-19.2				
1103	15.0	202.4	0.62	6.22	-18.0				
1106	14.7	195.7	0.72	6.21	-18.0				
1109	14.5	192.2	0.77	6.19	-18.0				

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ☐ Pump/Pump Type DED BLADDER

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ☐ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ☐ Dedicated

(By Numerical Order) ☐ Other

Sample Description (color, turbidity, odor, sheen, etc.): CLEAR COLORLESS SLIGHTY PETROLEUM ODOR NO SHEEN

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1	14.5	191.4	0.73	6.19	-17.7				
2	14.6	191.1	0.76	6.18	-17.3				
3	14.6	191.0	0.74	6.19	-17.7				
4	14.5	191.1	0.73	6.19	-17.8				
Average:	14.6	191.2	0.74	6.19	-17.6	#DIV/0!			

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)		
	(8260) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX)	WA ☐	OR ☐
2	(8270) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease)	WA ☐	OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)		
	(COD) (TOC) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)		
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)		
	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)		
	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic		
	VOC (Boeing short list)		
	Methane Ethane Ethene Acetylene		
	others		

Duplicate Sample No(s):

Comments:

Signature: SRB Date: 11/11/2019

Groundwater Low-Flow Sample Collection Form

Project Name: Boeing Renton | Project Number: 0025217.099.099

Event: Nov-19 | Date/Time: 11/ 11 /2019@ 1215

Sample Number: RGW256S- 191111 | Weather: PARTLY CLOUDY, COOL

Landau Representative: BXM

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES) Damaged (NO) Describe: Flush Mount

DTW Before Purging (ft) 8.88 Time: 1148 Flow through cell vol. GW Meter No.(s HERON-3

Begin Purge: Date/Time: 11/ 11 /2019 @ 1150 End Purge: Date/Time: 11/ 11 /2019 @ 1213 Gallons Purged: < 1

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ■ Other SITE TREATMENT SYSTEM

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
	Purge Goals: Stablization of Parameters for three consecutive readings within the following limits							>/= 1 flow through cell	
	+/- 3%	+/- 3%	+/- 10%	+/- 0.1 units	+/- 10 mV	+/- 10%	< 0.3 ft		
1153	15.9	144.4	0.71	6.18	19.2		8.93		
1156	16.2	146.9	0.66	6.18	12.7		8.93		
1159	16.3	148.4	0.61	6.20	9.1		8.94		
1202	16.3	149.9	0.55	6.20	6.1		8.93		
1205	16.3	150.6	0.60	6.21	4.3				

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ■ Pump/Pump Type BLADDER

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ■ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ■ Dedicated

(By Numerical Order) ☐ Other

Sample Description (color, turbidity, odor, sheen, etc.): CLEAR, COLORLESS, NO ODOR, NO SHEEN

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1	16.3	150.8	0.56	6.21	3.9				
2	16.3	151.0	0.57	6.22	3.6				
3	16.2	151.1	0.59	6.22	3.4				
4	16.3	151.3	0.59	6.22	3.4				
Average:	16.3	151.1	0.58	6.22	3.6	#DIV/0!			

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)		
	(8260) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX)	WA ☐	OR ☐
2	(8270) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease)	WA ☐	OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)		
	(COD) (TOC) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)		
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)		
	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)		
	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic		
	VOC (Boeing short list)		
	Methane Ethane Ethene Acetylene		
	others		

Duplicate Sample No(s):

Comments:

Signature: BXM Date: 11.11.19

Groundwater Low-Flow Sample Collection Form

Project Name: Boeing Renton | Project Number: 0025217.099.099

Event: Nov-19 | Date/Time: 11/ 11 /2019@ 1146

Sample Number: RGW257S- 191111 | Weather: PC 50S

Landau Representative: SRB

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES) Damaged (NO) Describe: Flush Mount

DTW Before Purging (ft) 9.52 Time: 1110 Flow through cell vol. GW Meter No.(s HERON1

Begin Purge: Date/Time: 11/ 11 /201 1116 End Purge: Date/Time: 11/ 11 /2019 @ 1136 Gallons Purged: 0.5

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ■ Other SITE TREATMENT SYSTEM

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
Purge Goals: Stablization of Parameters for three consecutive readings within the following limits	**+/- 3%**	**+/- 3%**	**+/- 10%**	**+/- 0.1 units**	**+/- 10 mV**	**+/- 10%**	**< 0.3 ft**	**>/= 1 flow through cell**	
1119	15.6	155.6	1.41	6.07	35.8	LOW	9.52		
1122	15.7	156.0	1.31	6.08	39.0		9.52		
1125	15.9	158.0	0.98	6.09	37.1		9.52		
1128	16.3	158.0	0.84	6.08	39.5				
1131	16.2	157.6	0.90	6.10	38.6				
1134	16.1	157.1	0.84	6.08	41.1				

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ■ Pump/Pump Type DED BLADDER

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ■ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ■ Dedicated

(By Numerical Order) ☐ Other

Sample Description (color, turbidity, odor, sheen, etc.): CLEAR COLORLESS NO/NS

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1	16.2	157.0	0.83	6.08	41.4	LOW			
2	16.2	156.9	0.76	6.02	44.6				
3	16.1	156.8	0.79	6.04	43.2				
4	16.1	156.6	0.76	6.05	42.9				
Average:	16.2	156.8	0.79	6.05	43.0	#DIV/0!			

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)		
	(8260) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX)	WA ☐	OR ☐
2	(8270) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease)	WA ☐	OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)		
	(COD) (TOC) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)		
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)		
	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)		
	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic		
	VOC (Boeing short list)		
	Methane Ethane Ethene Acetylene		
	others		

Duplicate Sample No(s):

Comments:

Signature: SRB Date: 11/11/2019

Groundwater Low-Flow Sample Collection Form

Project Name: Boeing Renton | Project Number: 0025217.099.099

Event: Nov-19 | Date/Time: 11/ 11 /2019@ 1316

Sample Number: RGW258S- 191111 | Weather: PC 50S

Landau Representative: SRB

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES) Damaged (NO) Describe: Flush Mount

DTW Before Purging (ft) 7.85 Time: Flow through cell vol. GW Meter No.(s HERON1

Begin Purge: Date/Time: 11/ 11 /201 1245 End Purge: Date/Time: 11/ 11 /2019 @ 1307 Gallons Purged: 0.5

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ■ Other SITE TREATMENT SYSTEM

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
	Purge Goals: Stablization of Parameters for three consecutive readings within the following limits							>/= 1 flow through cell	
	+/- 3%	+/- 3%	+/- 10%	+/- 0.1 units	+/- 10 mV	+/- 10%	< 0.3 ft		
1248	13.7	262.4	5.61	5.81	66.1	LOW	7.87		
1251	13.6	266.9	5.11	5.83	60.0		7.87		
1254	13.5	273.2	4.72	5.86	54.3		7.87		
1257	13.5	273.5	4.20	5.87	50.1				
1300	13.6	277.1	3.83	5.89	46.0				
1303	13.4	283.0	1.21	5.94	28.1				
1306	13.3	285.0	0.85	5.98	18.6				

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ■ Pump/Pump Type DED BLADDER

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ■ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ■ Dedicated

(By Numerical Order) ☐ Other

Sample Description (color, turbidity, odor, sheen, etc.): SLIGHTLY GRAY AND TURBID NO/NS

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1	13.2	285.1	0.82	5.99	17.3				
2	13.2	285.0	0.76	5.98	16.4				
3	13.2	285.2	0.74	5.99	14.5				
4	13.2	285.5	0.78	6.00	12.9				
Average:	13.2	285.2	0.78	5.99	15.3	#DIV/0!			

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)		
	(8260) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX)	WA ☐	OR ☐
2	(8270) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease)	WA ☐	OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)		
	(COD) (TOC) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)		
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)		
	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)		
	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic		
	VOC (Boeing short list)		
	Methane Ethane Ethene Acetylene		
	others		

Duplicate Sample No(s):

Comments: MSMSD Location

Signature: SRB Date: 11/11/2019

Groundwater Low-Flow Sample Collection Form

Project Name: Boeing Renton | Project Number: 0025217.099.099

Event: Nov-19 | Date/Time: 11/ 12 /2019@ 1501

Sample Number: RGW247S- 191112 | Weather: CLOUDY 40S

Landau Representative: SRB

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES) Damaged (NO) Describe: Flush Mount

DTW Before Purging (ft) 4.17 Time: 1430 Flow through cell vol. GW Meter No.(s HERON1

Begin Purge: Date/Time: 11/ 12 /201 1431 End Purge: Date/Time: 11/ 12 /2019 @ 1455 Gallons Purged: 0.5

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ■ Other SITE TREATMENT SYSTEM

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
	Purge Goals: Stablization of Parameters for three consecutive readings within the following limits							>/= 1 flow through cell	
	+/- 3%	+/- 3%	+/- 10%	+/- 0.1 units	+/- 10 mV	+/- 10%	< 0.3 ft		
1434	15.3	382.1	0.25	6.38	47.4	LOW	4.49		
1437	15.2	375.7	0.31	6.39	42.3		4.39		
1440	14.8	370.0	0.32	6.39	37.7		4.32		
1443	14.6	368.7	0.24	6.39	34.4		4.32		
1446	14.6	367.1	0.20	6.39	29.4		4.32		
1449	14.6	366.5	0.19	6.39	21.9				
1452	14.7	367.3	0.19	6.39	18.9				

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ■ Pump/Pump Type DED BLADDER

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ■ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ■ Dedicated

(By Numerical Order) ☐ Other

Sample Description (color, turbidity, odor, sheen, etc.): SLIGHTLY GRAY CLEAR NO/NS

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1	14.7	367.3	0.19	6.39	18.2				
2	14.7	368.0	0.19	6.39	17.8				
3	14.8	367.8	0.19	6.39	17.1				
4	14.8	368.0	0.19	6.38	16.0				
Average:	14.8	367.8	0.19	6.39	17.3	#DIV/0!			

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)		
3	(8260) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX)	WA ☐	OR ☐
	(8270D) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease)	WA ☐	OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)		
1	(COD) (TOC) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)		
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)		
	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)		
	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic		
	VOC (Boeing short list)		
	Methane Ethane Ethene Acetylene		
	others		

Duplicate Sample No(s):

Comments:

Signature: SRB Date: 11.12.19

Groundwater Low-Flow Sample Collection Form

Project Name: Boeing Renton | Project Number: 0025217.099.099

Event: Nov-19 | Date/Time: 11/ 12 /2019@ 1500

Sample Number: RGW248I- 191112 | Weather: CLOUDY, COOL

Landau Representative: BXM

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES) Damaged (NO) Describe: Flush Mount

DTW Before Purging (ft) 4.00 Time: 1432 Flow through cell vol. GW Meter No.(s HERON-3

Begin Purge: Date/Time: 11/ 12 /2019 @ 1434 End Purge: Date/Time: 11/ 12 /2019 @ 1457 Gallons Purged: < 1

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ■ Other SITE TREATMENT SYSTEM

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
	Purge Goals: Stablization of Parameters for three consecutive readings within the following limits							>/= 1 flow through cell	
	+/- 3%	+/- 3%	+/- 10%	+/- 0.1 units	+/- 10 mV	+/- 10%	< 0.3 ft		
1437	13.5	424.4	0.23	6.36	93.6		3.99		
1440	13.1	435.7	0.29	6.36	90.8		3.95		
1443	12.7	437.6	0.36	6.36	88.1		3.95		
1446	12.3	438.0	0.44	6.36	86.3				
1449	12.0	437.5	0.53	6.36	85.3				
1452	11.8	436.5	0.58	6.36	84.4				
1455	11.6	434.2	0.67	6.36	83.1				

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ■ Pump/Pump Type BLADDER

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ■ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ■ Dedicated

(By Numerical Order) ☐ Other

Sample Description (color, turbidity, odor, sheen, etc.): COLORLESS, SLIGHTLY CLOUDY, LIGHT FINES, NO SHEEN, NO ODOR

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1	11.6	434.0	0.67	6.37	83.0				
2	11.6	433.6	0.67	6.36	82.7				
3	11.6	433.6	0.68	6.37	82.5				
4	11.6	432.9	0.69	6.37	82.4				
Average:	11.6	433.5	0.68	6.37	82.7	#DIV/0!			

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)		
3	(8260) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX)	WA ☐	OR ☐
	(8270D) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease)	WA ☐	OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)		
1	(COD) (TOC) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)		
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)		
	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)		
	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic		
	VOC (Boeing short list)		
	Methane Ethane Ethene Acetylene		
	others		

Duplicate Sample No(s):

Comments:

Signature: BXM Date: 11.12.19

Groundwater Low-Flow Sample Collection Form

Project Name: Boeing Renton | Project Number: 0025217.099.099

Event: Nov-19 | Date/Time: 11/ 11 /2019@ 1511

Sample Number: 10-71-MW[191111 | Weather: PC 50S

Landau Representative: SRB

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES) Damaged (NO) Describe: Flush Mount

DTW Before Purging (ft) 8.69 Time: 1437 Flow through cell vol. GW Meter No.(s HERON1

Begin Purge: Date/Time: 11/ 11 /201[illegible] 1440 End Purge: Date/Time: 11/ 11 /2019 @ 1503 Gallons Purged: 0.5

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ■ Other SITE TREATMENT SYSTEM

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
	Purge Goals: Stablization of Parameters for three consecutive readings within the following limits							>/= 1 flow through cell	
	+/- 3%	+/- 3%	+/- 10%	+/- 0.1 units	+/- 10 mV	+/- 10%	< 0.3 ft		
1443	14.7	167.1	5.34	5.62	66.8	LOW	8.69		
1446	15.2	190.9	1.04	5.77	23.0		8.69		
1449	15.3	191.7	0.46	5.86	10.6		8.69		
1452	15.3	192.1	0.40	5.93	2.7				
1455	15.3	191.5	0.39	5.99	-4.2				
1458	15.1	191.4	0.36	6.00	-7.0				
1501	15.0	191.0	0.36	6.00	-7.8				

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ■ Pump/Pump Type DED BLADDER

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ■ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ■ Dedicated

(By Numerical Order) ☐ Other

Sample Description (color, turbidity, odor, sheen, etc.): CLEAR COLORLESS NO/NS

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1	15.0	190.9	0.37	5.99	-8.0				
2	14.9	190.8	0.38	5.99	-8.1				
3	14.9	190.7	0.36	5.98	-7.8				
4	14.9	190.7	0.36	5.97	-7.6				
Average:	14.9	190.8	0.37	5.98	-7.9	#DIV/0!			

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)	
3	(8260) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX)	WA ☐ OR ☐
	(8270D) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease)	WA ☐ OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)	
1	(COD) (TOC) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)	
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)	
	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)	
	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic	
	VOC (Boeing short list)	
	Methane Ethane Ethene Acetylene	
	others	

Duplicate Sample No(s):

Comments:

Signature: SRB Date: 11/11/2019

Groundwater Low-Flow Sample Collection Form

Project Name: Boeing Renton | Project Number: 0025217.099.099

Event: Nov-19 | Date/Time: 11/ 11 /2019@ 1500

Sample Number: 10-71-MW: 191111 | Weather: PARTLY CLOUDY, COOL

Landau Representative: BXM

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES) Damaged (NO) Describe: Flush Mount

DTW Before Purging (ft) 8.96 Time: 1432 Flow through cell vol. GW Meter No.(s HERON-3

Begin Purge: Date/Time: 11/ 11 /2019 @ 1434 End Purge: Date/Time: 11/ 11 /2019 @ 1457 Gallons Purged: < 1

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ■ Other SITE TREATMENT SYSTEM

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
	Purge Goals: Stablization of Parameters for three consecutive readings within the following limits							>/= 1 flow through cell	
	+/- 3%	+/- 3%	+/- 10%	+/- 0.1 units	+/- 10 mV	+/- 10%	< 0.3 ft		
1437	14.9	168.6	1.82	6.24	38.8		8.96		
1440	14.8	171.7	1.87	6.23	35.4		8.95		
1443	14.4	175.6	1.54	6.25	29.9		8.95		
1446	14.3	174.9	1.46	6.26	27.8				
1449	14.2	170.8	1.56	6.26	26.2				
1452	14.0	166.5	1.65	6.24	26.1				
1455	14.0	166.0	1.52	6.23	25.4				

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ■ Pump/Pump Type BLADDER

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ■ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ■ Dedicated

(By Numerical Order) ☐ Other

Sample Description (color, turbidity, odor, sheen, etc.): CLEAR, COLORLESS, ORANGE SOLIDS, NO SHEEN, NO ODOR

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1	14.0	166.1	1.51	6.23	25.4				
2	14.0	166.5	1.50	6.23	25.3				
3	14.0	166.7	1.51	6.23	25.2				
4	14.0	166.8	1.50	6.23	25.1				
Average:	14.0	166.5	1.51	6.23	25.3	#DIV/0!			

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)		
3	(8260) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX)	WA ☐	OR ☐
	(8270D) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease)	WA ☐	OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)		
1	(COD) (TOC) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)		
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)		
	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)		
	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic		
	VOC (Boeing short list)		
	Methane Ethane Ethene Acetylene		
	others		

Duplicate Sample No(s):

Comments:

Signature: BXM Date: 11.11.19

Groundwater Low-Flow Sample Collection Form

Project Name: Boeing Renton | Project Number: 0025217.099.099

Event: Nov-19 | Date/Time: 11/ 11 /2019@ 1540

Sample Number: 10-71-MW4 191111 | Weather: PC 50S

Landau Representative: SRB

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES) Damaged (NO) Describe: Flush Mount

DTW Before Purging (ft) 8.76 Time: 1504 Flow through cell vol. GW Meter No.(s HERON1

Begin Purge: Date/Time: 11/ 11 /201 1510 End Purge: Date/Time: 11/ 11 /2019 @ 1533 Gallons Purged: 0.5

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ■ Other SITE TREATMENT SYSTEM

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
	Purge Goals: Stablization of Parameters for three consecutive readings within the following limits							>/= 1 flow	
	+/- 3%	+/- 3%	+/- 10%	+/- 0.1 units	+/- 10 mV	+/- 10%	< 0.3 ft	through cell	
1513	15.2	224.4	2.87	6.01	17.0	LOW	8.76		
1516	15.8	282.1	1.12	6.17	-10.4		8.76		
1519	16.0	284.4	0.48	6.24	-34.3		8.76		
1522	16.0	272.3	0.43	6.24	-36.1				
1525	16.1	267.3	0.38	6.24	-36.6				
1528	16.1	263.2	0.35	6.22	-36.4				
1531	16.1	259.7	0.37	6.21	-35.9				

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ■ Pump/Pump Type DED BLADDER

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ■ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ■ Dedicated

(By Numerical Order) ☐ Other

Sample Description (color, turbidity, odor, sheen, etc.): SLIGHLTY GRAY AND TURBID NO/NS

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1	16.0	259.2	0.35	6.21	-36.4				
2	16.0	258.6	0.33	6.21	-36.7				
3	16.0	257.9	0.33	6.21	-36.2				
4	16.0	256.1	0.33	6.20	-36.2				
Average:	16.0	258.0	0.34	6.21	-36.4	#DIV/0!			

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)		
3	(8260) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX)	WA ☐	OR ☐
	(8270D) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease)	WA ☐	OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)		
	(COD) (TOC) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)		
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)		
	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)		
	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic		
	VOC (Boeing short list)		
	Methane Ethane Ethene Acetylene		
	others		

Duplicate Sample No(s):

Comments:

Signature: SRB Date: 11/11/2019

Groundwater Low-Flow Sample Collection Form

Project Name: Boeing Renton | Project Number: 0025217.099.099

Event: Nov-19 | Date/Time: 11/ 11 /2019@ 905

Sample Number: RGW262S- 191111 | Weather: CLOUDY, COOL

Landau Representative: BXM

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES) Damaged (NO) Describe: Flush Mount

DTW Before Purging (ft) 5.33 Time: 834 Flow through cell vol. GW Meter No.(s HERON -1

Begin Purge: Date/Time: 11/ 11 /2019 @ 837 End Purge: Date/Time: 11/ 11 /2019 @ 900 Gallons Purged: < 1

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ■ Other SITE TREATMENT SYSTEM

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
	Purge Goals: Stablization of Parameters for three consecutive readings within the following limits							>/= 1 flow through cell	
	+/- 3%	+/- 3%	+/- 10%	+/- 0.1 units	+/- 10 mV	+/- 10%	< 0.3 ft		
840	15.4	455.2	2.36	6.18	-9.3		6.81		PERI ON LOWEST
843	14.7	439.1	2.11	6.26	-14.7		7.21		FLOW
846	14.8	424.4	1.59	6.27	-17.0		7.80		
849	14.4	408.5	1.41	6.32	-22.6		8.09		
852	15.9	410.1	1.09	6.33	-27.0		8.89		
855	15.0	391.7	0.81	6.35	-30.6		9.27		
858	15.2	390.6	0.67	6.35	-34.7		9.59		

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ■ Pump/Pump Type PERI #7

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ■ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ■ Dedicated

(By Numerical Order) ☐ Other

Sample Description (color, turbidity, odor, sheen, etc.): SLIGHT YELLOW COLOR, CLEAR, SOME SOLIDS, NO ODOR, NO SHEEN

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1	15.4	387.5	0.63	6.35	-35.6				
2	15.9	392.8	0.60	6.35	-37.0				
3	15.9	394.6	0.59	6.36	-38.1				
4	15.9	392.9	0.57	6.36	-39.2				
Average:	15.8	392.0	0.60	6.36	-37.5	#DIV/0!			

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)		
7	(8260) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX)	WA ☐	OR ☐
2	(8270D) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease)	WA ☐	OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)		
	(COD) (TOC) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)		
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)		
	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)		
	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic		
	VOC (Boeing short list)		
	Methane Ethane Ethene Acetylene		
	others		

Duplicate Sample No(s): Duplicate Location (DUP5)

Comments:

Signature: BXM Date: 11.11.2019

Groundwater Low-Flow Sample Collection Form

Project Name: Boeing Renton | Project Number: 0025217.099.099

Event: Nov-19 | Date/Time: 11/11 /2019@ 800

Sample Number: RGW262S- 191111 | Weather: CLOUDY, COOL

Landau Representative: BXM

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES) Damaged (NO) Describe: Flush Mount

DTW Before Purging (ft) 5.33 Time: 834 Flow through cell vol. GW Meter No.(s HERON -1

Begin Purge: Date/Time: 11/ 11 /2019 @ 837 End Purge: Date/Time: 11/ 11 /2019 @ 900 Gallons Purged: < 1

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ■ Other SITE TREATMENT SYSTEM

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
	Purge Goals: Stablization of Parameters for three consecutive readings within the following limits							**>/= 1 flow through cell**	
	+/- 3%	**+/- 3%**	**+/- 10%**	**+/- 0.1 units**	**+/- 10 mV**	**+/- 10%**	**< 0.3 ft**		

Duplicate to RGW262S

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ■ Pump/Pump Type PERI #7

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ■ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ■ Dedicated

(By Numerical Order) ☐ Other

Sample Description (color, turbidity, odor, sheen, etc.): SLIGHT YELLOW COLOR, CLEAR, SOME SOLIDS, NO ODOR, NO SHEEN

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1	15.8	389.4	0.61	6.35	-36.5				
2	15.9	394.7	0.58	6.35	-37.6				
3	15.9	393.6	0.59	6.36	-38.6				
4	15.9	392.9	0.60	6.36	-39.6				
Average:	15.9	392.7	0.60	6.36	-38.1	#DIV/0!			

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)		
7	(8260) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX)	WA ☐	OR ☐
2	(8270D) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease)	WA ☐	OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)		
	(COD) (TOC) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)		
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)		
	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)		
	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic		
	VOC (Boeing short list)		
	Methane Ethane Ethene Acetylene		
	others		

Duplicate Sample No(s): Duplicate to RGW262S

Comments:

Signature: BXM Date: 11.11.19

Groundwater Low-Flow Sample Collection Form

Project Name: Boeing Renton | Project Number: 0025217.099.099

Event: Nov-19 | Date/Time: 11/ 11 /2019@ 940

Sample Number: RGW264S- 191111 | Weather: OVERCAST, COOL

Landau Representative: BXM

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES) Damaged (NO) Describe: Flush Mount

DTW Before Purging (ft) 6.04 Time: 909 Flow through cell vol. GW Meter No.(s HERON-1

Begin Purge: Date/Time: 11/ 11 /2019 @ 915 End Purge: Date/Time: 11/ 11 /2019 @ 938 Gallons Purged: < 1

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ■ Other SITE TREATMENT SYSTEM

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
	Purge Goals: Stablization of Parameters for three consecutive readings within the following limits							>/= 1 flow through cell	
	+/- 3%	+/- 3%	+/- 10%	+/- 0.1 units	+/- 10 mV	+/- 10%	< 0.3 ft		
918	16.9	676	0.36	6.26	-8.2		6.89		
921	16.1	680	0.37	6.29	-20.5		7.00		
924	15.4	668	0.46	6.29	-30.3		7.05		
927	15.5	672	0.55	6.29	-38.5		7.12		
930	15.5	672	0.60	6.29	-43.9		7.15		
933	15.8	675	0.60	6.29	-48.8		7.16		
936	16.1	683	0.61	6.28	-51.8				

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ■ Pump/Pump Type PERI #7

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ■ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ■ Dedicated

(By Numerical Order) ☐ Other

Sample Description (color, turbidity, odor, sheen, etc.): SLIGHTLY YELLOW, CLEAR, NO ODOR, NO SHEEN

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1	16.1	682	0.59	6.28	-52.2				
2	16.4	683	0.59	6.28	-52.5				
3	16.6	684	0.58	6.28	-53.0				
4	16.8	687	0.58	6.27	-53.3				
Average:	16.5	684	0.59	6.28	-52.8	#DIV/0!			

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)		
7	(8260) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX)	WA ☐	OR ☐
2	(8270D) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease)	WA ☐	OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)		
	(COD) (TOC) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)		
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)		
	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)		
	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic		
	VOC (Boeing short list)		
	Methane Ethane Ethene Acetylene		
	others		

Duplicate Sample No(s):

Comments:

Signature: BXM Date: 11.11.19

Appendix C

Memo

To:	John Long, Project Manager	Project:	0088880100.2019
From:	Crystal Thimsen	c:	Project File
Tel:	(206) 342-1760		
Fax:	(206) 342-1761		
Date:	December 11, 2019		

Subject: Summary Data Quality Review
November 2019 Boeing Renton Groundwater Sampling
SWMU-172/174
ARI Group Number: 19K0160

This memo presents the summary data quality review of 11 primary groundwater samples, one groundwater field duplicate, and one trip blank sample collected on November 11, 2019. 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) (cis-1,2-dichloroethene, tetrachloroethene, trichloroethene, and vinyl chloride) by U.S. Environmental Protection Agency (EPA) Method 8260C with selected ion monitoring (SIM);
- Total organic carbon (TOC) by Standard Method (SM) 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
RGW232S-191111	19K0160-01	all
RGW233I-191111	19K0160-02	all
RGW173S-191111	19K0160-03	all
RGW081S-191111	19K0160-04	all
RGW226S-191111	19K0160-05	all
RGW153S-191111	19K0160-06	all
RGWDUP1-191111	19K0160-07	all
RGW152S-191111	19K0160-08	all
RGW172S-191111	19K0160-09	all
RGW234S-191111	19K0160-10	all
RGW235I-191111	19K0160-11	all

Sample ID	Laboratory Sample ID	Requested Analyses
RGW236S-191111	19K0160-12	all
Trip Blank	19K0160-13	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, 2014a and b).

ARI received the samples on November 12, 2019. The temperatures of the coolers were recorded upon receipt and were below the maximum acceptable temperature of 6 degrees Celsius.

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 except as noted:

   The MS/MSD sample for vinyl chloride in data package 19K0160 slightly exceeded the upper spike recovery percentage of 120% at 142% and $135% in the two samples analyzed. This indicates a slight positive bias in the vinyl chloride analytical results for this data package. The data is not qualified for use.
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 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, except for vinyl chloride. Vinyl chloride results were previously qualified due the MS/MSD recoveries; therefore, only the vinyl chloride result for sample RGWDUP1-191111 is qualified as estimated and qualified with a "J" due to the field duplicate RPD.

Sample ID/ Field Duplicate ID	Analyte	Primary Result (ng/L)	Duplicate Result (ng/L)	Reporting Limit (ng/L)	RPD (%)
RGW152S-191111/ RGWDUP1-191111	vinyl chloride	36.6	52.2	20	35
	cis-1,2-dichloroethene	530	545	20	3
	trichloroethene	145	142	20	2
	tetrachloroethene	384	372	20	3

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 total 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

   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 total lead results for samples RGW152S-191111 and RGWDUP1-191111 are qualified as estimated and flagged with a "J."

Sample ID/ Field Duplicate ID	Analyte	Primary Result	Duplicate Result	Reporting Limit	RPD (%)
RGW152S-191111/ RGWDUP1-191111	TOC	29.56 mg/L	18.21 mg/L	0.50 mg/L	46
	total arsenic	7.48 µg/L	16.4 µg/L	0.200 µg/L	75
	total copper	16.6 µg/L	33.4 µg/L	0.500 µg/L	NC
	total lead	12.1 µg/L	26.6 µg/L	0.100 µg/L	75

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

Commented [MK1]: Added lead qualifiers to final table; correct?

Commented [MK2]: This column was not updated from 2Q.

Commented [MK3]: Data package says RL is 0.400 for GW152S and 1.00 for DUP1; 0.200 is from 2Q; what should it be now?

Commented [MK4]: Data package says RL is 1.00 for GW152S and 2.50 for DUP1; 0.500 is from 2Q; what should it be now?

Commented [MK5]: Data package says RL is 0.200 for GW152S and 0.500 for DUP1; 0.100 is from 2Q; what should it be now?

7. Reporting Limits and Laboratory Flags – Acceptable

Overall assessment of data

The table below summarizes the data assessment. The completeness of work order number 19K0160 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	Qualified Result	Units	Qualifier Reason
RGW232S-191111	none			
RGW233I-191111	none			
RGW173S-191111	none			
RGW081S-191111	none			
RGW226S-191111	none			
RGW153S-191111	none			
RGWDUP1-191111	vinyl chloride lead	52.2 J 26.6 J	ng/L µg/L	MS/MSD recovery ????
RGW152S-191111	lead	12.1 J	µg/L	????
RGW172S-191111	none			
RGW234S-191111	none			
RGW235I-191111	none			
RGW236S-191111	none			
Trip Blank	none			

Abbreviations
µg/L = micrograms per liter
J = the analyte is qualified as estimated
RPD = relative percent difference

Commented [MK6]: Not sure what reason is for this qualifier

Commented [MK7]: Not sure what reason is for this qualifier

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), 2014a, U.S. EPA National Functional Guidelines for Superfund Organic Methods Data Review: EPA 540-R-014-002, August.

EPA, 2014b, U.S. EPA National Functional Guidelines for Inorganic Superfund Data Review: EPA 540-R-013-001, August.

Memo

To: John Long, Project Manager
From: Crystal Thimsen
Tel: (206) 342-1760
Fax: (206) 342-1761

Date: December 16, 2019

Project: 0088880100.2019
c: Project File

Subject: Summary Data Quality Review
November 2019 Boeing Renton Groundwater Sampling
Building 4-78/79 SWMU/AOC Group
ARI Work Order Number: 19K0178

This memo presents the summary data quality review of 16 primary groundwater samples, one field duplicate groundwater sample, and two trip blank samples collected on November 12, 2019. 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 8260C;
- Total petroleum hydrocarbons as gasoline (TPH-G) by Ecology Method NWTPH-G; and
- Total organic carbon (TOC) by Standard Method (SM) 5310B-00.

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

Sample ID	Laboratory Sample ID	Requested Analyses
RGWDUP2-191112	19K0178-01	all
RGW238I-191112	19K0178-02	all
RGW237S-191112	19K0178-03	all
RGW209S-191112	19K0178-04	all
RGW244S-191112	19K0178-05	all
RGW239I-191112	19K0178-06	all
RGW031S-191112	19K0178-07	all
RGW240D-191112	19K0178-08	all
RGW143S-191112	19K0178-09	all
RGW242I-191112	19K0178-10	VOCs and TPH-G
RGW210S-191112	19K0178-11	all
RGW241S-191112	19K0178-12	VOCs and TPH-G
RGW033S-191112	19K0178-13	all

Sample ID	Laboratory Sample ID	Requested Analyses
RGW243I-191112	19K0178-14	all
RGW039S-191112	19K0178-15	all
RGW034S-191112	19K0178-16	all
RGW038S-191112	19K0178-17	all
Trip Blank	19K0178-18	VOCs and 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.

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, 2014a and b).

ARI received the samples on November 13, 2019. The temperatures of the coolers were recorded upon receipt and were below the maximum acceptable temperature of 6 degrees Celsius.

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
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 (%)
RGW031S-191112/ RGWDUP2-191112	vinyl chloride	0.25	0.27	0.20	NC
	cis-1,2-dichloroethene	0.40	0.39	0.20	NC
	benzene	4.77	4.75	0.20	<1
	TPH-G	1,540	1,560	100	1

Abbreviations
µg/L = micrograms per liter
NC = not calculated
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/LCSD – 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 RPDs are acceptable.

Sample ID/ Field Duplicate ID	Analyte	Primary Result (mg/L)	Duplicate Result (mg /L)	Reporting Limit (mg /L)	RPD (%)
RGW031S-190507/ RGWDUP2-190507	TOC	15.38	15.01	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 number 19K0178 is 100 percent. Evaluation of the usefulness of these data is based on EPA guidance documents identified 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
RGWDUP2-190507	none
RGW241S-190507	none
RGW242I-190507	none
RGW240D-190507	none
RGW239I-190507	none
RGW238I-190507	none
RGW210S-190507	none
RGW031S-190507	none
RGW143S-190507	none
RGW237S-190507	none
RGW244S-190507	none
RGW209S-190507	none
RGW034S-190507	none
Trip Blank	none
RGW039S-190508	none
RGW243I-190508	none
RGW033S-190508	none
RGW038S-190508	none
Trip Blank	

Abbreviations
µg/L = micrograms per liter
J = The value is an estimate

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), 2014a, U.S. EPA National Functional Guidelines for Superfund Organic Methods Data Review: EPA 540-R-014-002, August.

EPA, 2014b, U.S. EPA National Functional Guidelines for Inorganic Superfund Data Review: EPA 540-R-013-001, August.

Memo

To: John Long, Project Manager
From: Crystal Thimsen
Tel: (206) 342-1760
Fax: (206) 342-1761

Date: December 16, 2019

Project: 0088880100.2019
c: Project File

Subject: Summary Data Quality Review
November 2019 Boeing Renton Groundwater Sampling
Former Fuel Farm AOC Group
ARI Work Order Number: 19K0167

This memo presents the summary data quality review of 10 primary groundwater samples and one field duplicate collected on November 11, 2019. 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, both with and without silica-gel acid cleanup procedure to determine if concentrations are affected by natural organic material.

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

Sample ID	Laboratory Sample ID	Requested Analyses
RGWDUP3-191111	19K0167-01 and 02	all
RGW224S-191111	19K0167-03 and 04	all
RGW255S-191111	19K0167-05 and 06	all
RGW211S-191111	19K0167-07 and 08	all
RGW212S-191111	19K0167-09 and 10	all
RGW257S-191111	19K0167-11 and 12	all
RGW256S-191111	19K0167-13 and 14	all
RGW258S-191111	19K0167-15 and 16	all
RGW221S-191111	19K0167-17 and 18	all
RGW183S-191111	19K0167-19 and 20	all
RGW184S-191111	19K0167-21 and 22	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, 2014).

ARI received the samples on November 12, 2019. The temperatures of the coolers were recorded upon receipt and were less than the maximum acceptable temperature of 6 degrees Celsius.

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
2. Blanks – Acceptable
3. Surrogates – Acceptable
4. LCS – 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 5 percent, or one for every 20 samples. Primary and duplicate results are summarized in the table below. The field duplicate relative percent difference (RPD) is within the project-specific control limit of 30 percent for concentrations greater than five times the reporting limit.

Sample ID/ Field Duplicate ID	Analyte	Primary Result (mg/L)	Duplicate Result (mg/L)	Reporting Limit (mg/L)	RPD (%)
RGW224S-191111/ RGWDUP3-191111	TPH-D C12-C24	1.51	1.46	0.100	3
		0.303	0.370		NC
	TPH Jet A C10-C18	1.93	1.80	0.100	7
		0.720	0.923		25

Abbreviations
mg/L = milligrams per liter
RPD = relative percent difference
TPH = total petroleum hydrocarbons
TPH-D = total petroleum hydrocarbons as diesel

7. Reporting Limits and Laboratory Flags – Acceptable

Overall assessment of data

The table below summarizes the data review. The completeness of ARI work order number 19K0167 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
RGWDUP3-191111	none
RGW224S-191111	none
RGW255S-191111	none
RGW211S-191111	none
RGW212S-191111	none
RGW257S-191111	none
RGW256S-191111	none
RGW258S-191111	none
RGW221S-191111	none
RGW183S-191111	none
RGW184S-191111	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), 2014, U.S. EPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review: EPA 540-R-014-002, August.

Memo

To:	John Long, Project Manager	Project:	0088880100.2019
From:	Crystal Thimsen	c:	Project File
Tel:	(206) 342-1760		
Fax:	(206) 342-1761		
Date:	December 16, 2019		

Subject: Summary Data Quality Review
November 2019 Boeing Renton Groundwater Sampling
AOC-003
ARI Work Order Number: 19K0184

This memo presents the summary data quality review of two primary groundwater samples and one trip blank sample collected on November 12, 2019. The samples were submitted to Analytical Resources, Inc. (ARI), located in Tukwila, Washington, a laboratory accredited by the Washington State Department of Ecology (Ecology).

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 8260C with selected ion monitoring (SIM); and
- Total organic carbon (TOC) by Standard Method (SM) 5310C.

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

Sample ID	Laboratory Sample ID	Requested Analyses
RGW247S-191112	19K0184-01	all
RGW248I-191112	19K0184-02	all
Trip Blank	19K0184-03	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, 2014a and b).

ARI received the samples on November 13, 2019. The temperature of the cooler was recorded upon receipt and was below the maximum acceptable temperature of 6 degrees Celsius. A sample time was not

listed on the COC for sample RGW248I-191112; however, a time was indicated on the sample jar labels. The laboratory logged the sample time as the time indicated on the sample jar labels.

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
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 project specific MS/MSD analyses. Sample precision is evaluated based on LCS and LCSD recoveries. The MS/MSD project frequency requirement of one MS/MSD for every 20 samples was achieved with extra volume submitted at other sites included in this sampling event.
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 19K0184 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.

Sample ID	Qualified Analyte
RGW247S-191112	none
RGW248I-191112	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), 2014a, U.S. EPA National Functional Guidelines for Superfund Organic Methods Data Review: EPA 540-R-014-002, August.

EPA, 2014b, U.S. EPA National Functional Guidelines for Inorganic Superfund Data Review: EPA 540-R-013-001, August.

\\sea2-fs1\Archive\8888.000 Boeing Renton\247\App C Memos\4. AOC-001-002 and -003 DV Memo CD.docx

Memo

To:	John Long, Project Manager	Project:	0088880100.2019
From:	Crystal Thimsen	c:	Project File
Tel:	(206) 342-1760		
Fax:	(206) 342-1761		
Date:	December 16, 2019		

Subject: Summary Data Quality Review
November 2019 Boeing Renton Groundwater Sampling
Building 10-71 Parcel
ARI Work Order Number: 19K0162

This memo presents the summary data quality review of three primary groundwater samples and one trip blank sample collected on November 11, 2019. 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) (vinyl chloride, cis-1,2-dichloroethene, trichloroethene, and toluene) by U.S. Environmental Protection Agency (EPA) Method 8260C.

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

Sample ID	Laboratory Sample ID	Requested Analyses
10-71-MW2-191111	19K0162-01	VOCs
10-71-MW1-191111	19K0162-02	VOCs
10-71-MW4-191111	19K0162-03	VOCs
Trip Blank	19K0162-04	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 EPA guidelines (EPA, 2014).

ARI received the samples on November 12, 2019. 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 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 project specific MS/MSD analyses. Sample precision is evaluated based on LCS and LCSD recoveries. The MS/MSD project frequency requirement of one MS/MSD for every 20 samples was achieved with extra volume submitted 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 work order number 19K0162 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 are not qualified and meet the project's data quality objectives.

Sample ID	Qualified Analyte
10-71-MW2-191111	none
10-71-MW1-191111	none
10-71-MW4-191111	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), 2014, U.S. EPA National Functional Guidelines for Superfund Organic Methods Data Review: EPA 540-R-014-002, August.

Memo

To:	John Long, Project Manager	Project:	0088880100.2019
From:	Crystal Thimsen	c:	Project File
Tel:	(206) 342-1760		
Fax:	(206) 342-1761		
Date:	December 11, 2019		

Subject: Summary Data Quality Review
November 2019 Boeing Renton Groundwater Sampling
Apron A
ARI Work Order Number: 19K0161

This memo presents the summary data quality review of two primary groundwater samples, one groundwater field duplicate, and one trip blank sample collected on November 11, 2019. 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) (vinyl chloride and cis-1,2-dichloroethene) by U.S. Environmental Protection Agency (EPA) Method 8260C; and
- Total organic carbon (TOC) by Standard Method (SM) 5310B.

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

Sample ID	Laboratory Sample ID	Requested Analyses
RGWDUP5-191111	19K0161-01	all
RGW262S-191111	19K0161-02	all
RGW264S-191111	19K0161-03	all
Trip Blank	19K0161-04	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, 2014a and b).

ARI received the samples on November 12, 2019. The temperature of the coolers were recorded upon receipt and was below the maximum acceptable temperature of 6 degrees Celsius. The laboratory logged the samples with the time on the chain-of-custody and proceeded with analysis.

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 project specific MS/MSD analyses. Sample precision is evaluated based on LCS and LCSD recoveries. The MS/MSD project frequency requirement of one MS/MSD for every 20 samples was achieved with extra volume submitted at other sites included in this sampling event.
6. Field Duplicates – Acceptable

   One field duplicate, RGWDUP5-191111, was submitted with sample RGW262S-191111. Primary and duplicate samples were analyzed 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 were below detection; therefore, the field duplicate relative percent difference (RPD) is not calculated for samples in this work order.
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 project specific MS/MSD analyses. Sample precision is evaluated based on LCS and LCSD recoveries. The MS/MSD project frequency requirement of one MS/MSD for every 20 samples was achieved with extra volume submitted at other sites included in this sampling event.
5. Laboratory Duplicates – Acceptable
6. Field Duplicates – Acceptable

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

Sample ID/ Field Duplicate ID	Analyte	Primary Result (mg/L)	Duplicate Result (mg/L)	Reporting Limit (mg/L)	RPD (%)
RGW262S-191111/ RGWDUP5-191111	TOC	31.15	31.60	5.00	1

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 number 19K0161 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
RGWDUP5-191111	none
RGW262S-191111	none
RGW264S-191111	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), 2014a, U.S. EPA National Functional Guidelines for Superfund Organic Methods Data Review: EPA 540-R-014-002, August.

EPA, 2014b, U.S. EPA National Functional Guidelines for Inorganic Superfund Data Review: EPA 540-R-013-001, August.

Appendix D

APPENDIX D

Summary of Remedial Actions at the Boeing Renton Facility October - December 2019

Boeing Renton Site
Renton, Washington

Prepared for:
The Boeing Company
EHS Remediation

Prepared by:
CALIBRE Systems, Inc.
Project No. T0014323

February 14, 2020

Table of Contents

List of Tables

List of Figures

Acronyms

AOC	Area of Concern
^{o}Bx	degrees brix
bgs	below ground surface
Building 4-78/79	Building 4-78/4-79 SWMU/AOC Group
CALIBRE	CALIBRE Systems, Inc.
cfm	cubic feet per minute
DAP	Diammonium Phosphate
DCA	Dichloroethane
DCE	Dichloroethene
EDR	Engineering Design Report
ERD	Enhanced Reductive Dechlorination
ft	feet
lbs	pounds
mg/L	milligrams per liter
MgSO4	Magnesium Sulfate
NA	not analyzed
NaNO3	Sodium Nitrate
ND	non-detect
PCE	Tetrachloroethene
PID	Photoionization detector
ppbv	parts per billion by volume
SVE	Soil Vapor Extraction
SWMU	Solid Waste Management Unit
TCA	Trichloroethane
TCE	Trichloroethene
Tech Memo	Technical Memorandum
Total Chlorinated	Sum of PCE, TCE, cis-1,2-DCE, trans-1,2-DCE, 1,1,1-TCA, and 1,1-DCA
TPH-G	Total Petroleum Hydrocarbons-Gasoline
ug/L	micorgrams per liter
VC	Vinyl Chloride
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 in the fourth quarter of 2019 (between October 1 and December 31, 2019). The ongoing remedial actions include:

1. Operation of one 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 AOCs located throughout the Renton Facility, and;
3. Anaerobic biodegradation of benzene by nitrate/sulfate injections at the 4-78/79 Building.

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 4-78/79 Building (CALIBRE 2017).

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 locations of SWMU-172/174 and Building 4-78/79 within the Facility are shown on Figure 1-1. The locations of the other AOCs and SWMUs where groundwater treatment is ongoing are also included 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 in the fourth quarter of 2019. This includes operation and monitoring activities for 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
Lot 20/Former Building 10-71
AOC-060
AOC-090
Building 4-70, and
Apron A

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 – Conclusions and Recommendations
Section 5 – References
Attachment A – Field Data Sheets

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 both systems had shown low-level VOC concentrations removed at asymptotically low levels. Rebound stabilization tests were conducted in early 2018 followed by collection of soil confirmation samples from both areas in June 2018. Ecology approved the recommended shutdown of the Building 4-78/79 SVE system on November 1, 2018 after review and evaluation of the soil confirmation results for that area (CALIBRE 2018a). Operational modifications have continued at the SWMU-172/174 SVE system to optimize VOC removal for that area. The following sections summarize the operating conditions, operational changes, and performance monitoring/evaluation for the SWMU-172/174 SVE system performed in October to December 2019.

2.1 SWMU-172/174 SVE System

The SWMU-172/174 SVE system consists of three vapor extraction wells and a SVE equipment trailer as shown in Figure 2-1. The SVE system is equipped with two vapor-phase GAC vessels, each filled with 1,800 pounds of virgin carbon. The GAC vapor treatment system is configured to run in a lead-lag configuration with vapor from the outlet of the lead vessel passing through the lag vessel. The system historically included two smaller vessels each containing 200 pounds of zeolite impregnated with permanganate for vinyl chloride treatment. As described below, the lag permanganate drum became plugged during the beginning of the fourth quarter 2019 and was taken offline. The lead permanganate drum is still operating within the treatment system. Permanganate treatment was originally included in the design to treat potential vinyl chloride that would not be captured in GAC. Permanganate treatment is not providing any benefit and may be discontinued in the future because vinyl chloride is not present in any of the inlet air streams (Table 2-1).

Routine maintenance including oil changes, drive-belt tensioning and inspection, inspection of the air filter, and inspection of the moisture separator was completed per the Operations Manual (CALIBRE, 2014). System monitoring includes regular monitoring of total organic vapor concentrations with a calibrated PID.

2.1.1 TO-15 Laboratory Analysis of Vapor Samples

No samples for TO-15 analysis were collected during this operating period. Table 2-1 summarizes the TO-15 detections for the SWMU-172/174 SVE system for 15 TO-15 sampling events[1] that have been implemented since system startup.

2.1.2 Summary of Operations and Operational Changes

The soil confirmation samples collected in the second quarter of 2018 identified a location between SVE-2 and SVE-3 which still showed elevated PCE levels in soil. During the third quarter of 2018, the SVE system was adjusted to alter the flushing pattern through this area by using SVE-3 as an inlet vent well with continued extraction through SVE-2 and SVE-1. Vapor concentrations, measured with a PID, showed some increase for approximately two weeks during that reporting period. Subsequent measurements during the fourth quarter 2018 reporting period showed vapor concentrations reducing to previous low level detections. Therefore, on December 5, 2018 the SVE system was adjusted to alter the flushing pattern around SVE-2 and SVE-3 by using SVE-1 as an inlet vent well with continued extraction from SVE-2 and re-opening SVE-3 to extraction.

At the end of the second quarter 2019 PID readings showed reduced VOC levels at SVE-2 while SVE-1 remained near 0 ppbv. System operational modifications were completed that day (following the collection of samples for TO-15 analysis) to adjust SVE-1 as an inlet vent well with extraction at SVE-2 and SVE-3. The system has continued to operate in this manner during the fourth quarter 2019. Table 2-2 shows the PID readings for the wells in the SWMU 172/174 SVE system. Table 2-3 shows an operational summary for the system.

A brief summary of key changes/events associated with operation of the SWMU 172/174 SVE system is presented below; specific details are only included for weeks when system changes and modifications were implemented. More details on weekly operations are summarized in Table 2-2 and the operational logs included in Appendix A.

- On October 2, 2019 the hose between the 2nd carbon vessel and 2nd permanganate drum had a crack near the camlock fitting entering the permanganate drum. The system was turned off to repair the hose.
- On October 3, 2019 the repaired hose was installed and limited effluent flow was observed from the permanganate drum indicating this drum had become plugged. The drum was removed from the treatment system and sampled later in October 2019 for waste characterization. The first permanganate drums is still operating between the two carbon vessels.
- On November 20, 2019 the system showed a high vacuum and low flow rate. After inspection of the system, it was observed that the wire cage within the moisture separator had become

[1] Multiple changes to SVE system operations have been implemented over the period where data are shown. Changes to extraction flow rates by SVE wells are used to maximize the VOC mass removal and the corresponding SVE influent concentration is highly dependent on the flow rate from selected wells.

dislodged allowing the float ball to swirl within the chamber and eventually get sucked into the discharge outlet of the separator blocking flow and causing vacuum to increase. The wire cage and float ball were reinstalled on November 20 and 22. Blower oil was changed at this time.

- On December 23, 2019 the system was turned off for the holiday break period and restarted on December 31, 2019.

2.1.3 Mass Removal Estimate

Between April 17, 2015 and December 31, 2019 the SWMU-172/174 SVE system has recovered an estimated 19.4 pounds of VOCs (primarily PCE), as shown in Table 2-3. Approximately 1.1 pounds of VOCs were removed during the current reporting period (fourth quarter 2019) based on the PID measurements collected. The cumulative VOC mass removal for the SWMU-172/174 SVE system is shown in Figure 2-2.

2.2 Recommended Next Steps for the SVE Systems

Modifying the SVE system flow at the SWMU-172/174 area at the end of the second quarter 2019 showed increases in VOC mass removal from the system influent. Subsequent monitoring during fourth quarter 2019 showed variable vapor concentrations from SVE-3. Some rebound was observed at this well when the system was shutdown (with the moisture separator/float ball malfunction) and then again following the shutdown period for the holiday break. However, the subsequent site visits and monitoring showed these elevated levels declined within two weeks. During the first few weeks of the first quarter 2020, concentrations have reduced back to low levels at the system (see Table 2-2 and 2-3). In addition, as noted in prior quarterly monitoring reports, the location of this site is adjacent to a paint booth for final assembly of aircraft and parts. Previous monitoring events have shown variability in PID measurements especially when paint odor is present in the area. Boeing has temporarily suspended painting operations in the area and therefore, at least temporarily, upcoming monitoring events should be without potential interference from painting operations. To take advantage of this, modifications for the system will be made to alternate flows between wells as has been done in the past (i.e. SVE-3 is extracting and will be changed to an inlet vent and vice versa for SVE-1). If no significant changes are observed in PID measurements following these modifications the system will be shut down for a rebound test (~ 2 weeks to a month) in order to monitor rebounding at the site. Summa can samples for TO-15 analysis will be collected for the system restart following the planned rebound period.

Additional modifications to the operation of this system should be considered to continue increased mass removal in the area between SVE-2 and SVE-3. These modifications may include opening SVE-1 and SVE-3 as an inlet vent or SVE-1 and SVE-2 as an inlet vent, to focus vapor removal in that area. It may also be beneficial to operate the SVE system in a pulsed mode in order to allow vapor concentrations to rebound followed by running the system for a period of time.

3.0 Ongoing Groundwater Treatment

Groundwater treatment is being implemented at several AOCs/SWMUs at the Renton Facility. The primary remedy being implemented is enhanced reductive dechlorination (ERD) of chlorinated solvents in targeted areas. The ERD treatment involves substrate injection using sucrose as a carbon source to stimulate biological degradation of the chlorinated solvents starting in late 2014.

Beginning in late 2017, anaerobic biodegradation of benzene using nitrate and sulfate injections was implemented for a small area at the 4-78/79 Building. As a result of any soil excavations being postponed until drier months, additional nitrate/sulfate samples in groundwater were collected for the benzene treatment area in November 2019 and results are presented in Table 3-1. The November 2019 monitoring results show six of the seven injection wells and both of the monitoring wells with benzene concentrations reduced from May 2019 monitoring (and also reduced from baseline sampling prior to when treatment started in October 2017). Benzene concentrations at these wells range from non-detect to 5.0 ug/L with concentration reductions at approximately 43 to 95 percent of the baseline results. These performance monitoring data indicate biodegradation of benzene is occurring. Benzene increased slightly from baseline concentrations at injection well B78-18 (1.18 ug/L in Nov 2019 and 0.72 ug/L in Oct 2017). The monitoring results also show low concentrations of nitrate with 0.129 mg/L in one injection well and all others were non-detect. Sulfate detections ranged from 0.160 mg/L to 5.65 mg/L.

Based on the positive results, Boeing submitted a recommendation for additional nitrate/sulfate injections in the area (the last nitrate/sulfate injection was March 2019 which was the sixth event). These injections were completed in early first quarter 2020 (seventh event) and performance monitoring data is planned to be collected approximately 30 days after the injection event. This will include the same list of wells sampled in the previous performance monitoring events and the results will be discussed in the first quarter 2020 monitoring report. Additional nitrate/sulfate injections would be completed following evaluation of those monitoring results.

Site wide groundwater sampling was conducted as part of the quarterly monitoring program during this reporting period and the results are discussed in the main text of the quarterly report. Table 3-2 presents a summary of those groundwater monitoring results, by area, related to groundwater treatment/ERD implementation, with recommendations for additional substrate injections at selected areas.

4.0 Conclusions and Recommendations

SVE operations were modified at the SWMU-172/174 area at the end of the second quarter 2019 to increase flushing between extraction wells SVE-2 and SVE-3, based on the elevated PCE detections observed during the soil confirmation sampling event in the second quarter of 2018. It is recommended that SVE operations be continued for this area, with additional modifications to include opening of SVE-1 and SVE-2 as inlet vents or SVE-1 and SVE-3 as inlet vents to allow focused vapor removal at SVE-2 and SVE-3. If alternating flows from the SVE wells does not show significant changes in vapor measurements the

system will be shut down to monitor for any VOC rebound in soil vapor. Samples for TO-15 analysis will be collected following a planned shutdown period.

Groundwater monitoring will continue in accordance with the EDR and approved updates to the monitoring, with supplemental VOC and TOC sampling at selected wells. Performance monitoring data related to benzene treatment at the Building 4-78/79 area collected in the fourth quarter 2019 show a majority of the wells in this treatment area are at benzene concentrations below baseline results, with many wells at 90% reduction from baseline (see Table 3-2). Additional nitrate/sulfate injections were completed in the first quarter 2020. Substrate injections for ERD treatment are recommended at selected wells at the 4-78/79 Building area around well GW033S which has shown an increase in CVOCs from August 2019.

5.0 References

AMEC 2014. Draft Engineering Design Report Boeing Renton Cleanup Action Plan Implementation. Prepared by AMEC Environment & Infrastructure, Inc. for The Boeing Company. July 2014.

CALIBRE 2014. Operations and Maintenance Plan for the Renton Cleanup Action Soil Vapor Extraction Systems. Prepared by CALIBRE Systems, Inc. for The Boeing Company, EHS Remediation. July 2014.

CALIBRE 2017. Bioremediation of Benzene in Groundwater; Building 4-78/79 Area, Boeing Renton Facility Rev. 1. Prepared by CALIBRE Systems, Inc. for The Boeing Company, EHS Remediation. September 2017.

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.

CALIBRE 2018b. Plan for Evaluation of Soils around Probe PP13 at Building 4-78/4-79 SWMU/AOC Group; Boeing Renton Site. Prepared by CALIBRE Systems, Inc. for The Boeing Company, EHS Remediation. November 2018.

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.

USACE 2002. Engineering and Design - Soil Vapor Extraction and Bioventing. Prepared by US Army Corps of Engineers. EM 1110-1-4001. June 2002.

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 TO-15 Analytical Results - SWMU-172/174 SVE System Project History

SVE System Inlet

Date	PCE	TCE	cis-1,2-DCE	trans-1,2-DCE	Vinyl Chloride	1,1,1-TCA	1,1-DCA	Acetone	Toluene	m,p-Xylene	Chloroform	o-Xylene	Pentane	Hexane	Total Chlorinated	Total VOCs
4/17/2015	1,500	130	120	ND	ND	13	ND	ND	ND	ND	ND	ND	ND	ND	1,763	1,763
10/13/2015	400	31	13	ND	ND	3.3	ND	ND	ND	ND	ND	ND	ND	ND	447	447
3/8/2016	82	5.4	3.1	ND	ND	ND	ND	ND	1.1	2.2	ND	ND	ND	ND	91	94
6/30/2016	230	18	10	ND	ND	1.8	ND	11	ND	ND	2.4	ND	ND	ND	260	273
9/12/2016	230	16	8.3	ND	ND	1.9	ND	ND	ND	ND	1.2	ND	ND	ND	256	257
12/14/2016	100	6.2	3.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	110	110
5/30/2017 - 30 min	520	220	17	ND	ND	13	2.7	ND	ND	ND	ND	ND	ND	ND	773	773
5/30/2017 - 100 min	530	200	17	ND	ND	14	ND	ND	ND	ND	ND	ND	ND	ND	761	761
5/30/2017 - 225 min	510	130	16	ND	ND	12	ND	ND	ND	ND	ND	ND	ND	ND	668	668
8/16/2017	180	16	7.8	ND	ND	1.7	ND	ND	ND	ND	ND	ND	ND	ND	206	206
12/8/2017 - Rebound Start	99	7.6	3.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	110	110
5/22/2018	430	43	13	ND	ND	12	ND	ND	ND	ND	ND	ND	ND	ND	498	498
6/7/2018	160	13	5.4	ND	ND	1.8	ND	ND	ND	ND	ND	ND	ND	ND	180	180
6/20/2018	170	14	5.7	ND	ND	1.8	ND	ND	ND	ND	ND	ND	ND	ND	192	192
8/30/2018	110	8.6	3.7	NA	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	122	122
2/13/2019	32	2.2	1.6	NA	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	36	36
6/20/2019	74	6.2	3.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	84	84

SVE-1

Date	PCE	TCE	cis-1,2-DCE	trans-1,2-DCE	Vinyl Chloride	1,1,1-TCA	1,1-DCA	Acetone	Toluene	m,p-Xylene	Chloroform	o-Xylene	Pentane	Hexane	Total Chlorinated	Total VOCs
6/20/2019	10	1.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	11	11

SVE-2

Date	PCE	TCE	cis-1,2-DCE	trans-1,2-DCE	Vinyl Chloride	1,1,1-TCA	1,1-DCA	Acetone	Toluene	m,p-Xylene	Chloroform	o-Xylene	Pentane	Hexane	Total Chlorinated	Total VOCs
8/30/2018	180	14	6.1	NA	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	200	200
2/13/2019	48	3.3	2.8	NA	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	54	54
6/20/2019	100	9.6	5.1	ND	ND	1.4	ND	ND	1.4	ND	ND	ND	ND	ND	116	118

SVE-3

Date	PCE	TCE	cis-1,2-DCE	trans-1,2-DCE	Vinyl Chloride	1,1,1-TCA	1,1-DCA	Acetone	Toluene	m,p-Xylene	Chloroform	o-Xylene	Pentane	Hexane	Total Chlorinated	Total VOCs
5/30/2017 - 30 min	540	51	18	ND	ND	14	2.6	ND	2.2	ND	ND	ND	ND	ND	626	628
5/30/2017 - 100 min	200	16	6.5	ND	ND	5.5	ND	ND	ND	ND	ND	ND	ND	ND	228	228
8/16/2017	350	30	15	ND	ND	3.5	ND	ND	ND	ND	1.3	ND	ND	ND	399	400
12/8/2017 - Rebound Start	170	13	5.8	ND	ND	1.7	ND	ND	ND	ND	ND	ND	ND	ND	191	191
1/19/2018 - 35-Day 60 Minute Sample	310	30	13	ND	ND	6.9	1.3	ND	ND	ND	1.1	ND	ND	ND	361	362
1/19/2018 - 35-Day 180 Minute Sample	310	28	12	ND	ND	7.9	1.1	ND	ND	ND	1.1	ND	ND	ND	359	360
3/6/2018 - 80-Day 60 Min Sample	440	41	15	ND	ND	14	2.2	ND	ND	ND	ND	ND	ND	ND	512	512
3/6/2018 - 80-Day 180 Min Sample	410	33	13	ND	ND	13	1.6	ND	ND	ND	ND	ND	ND	ND	471	471
5/22/2018	790	66	22	ND	ND	22	ND	ND	ND	ND	ND	ND	ND	ND	900	900
6/7/2018	280	23	9.6	ND	ND	3	ND	ND	ND	ND	ND	ND	ND	ND	316	316
6/20/2018	310	24	11	ND	ND	3.4	ND	ND	ND	ND	ND	ND	ND	ND	348	348

Table 2-1 TO-15 Analytical Results - SWMU-172/174 SVE System Project History

VPC Outlet

Date	PCE	TCE	cis-1,2-DCE	trans-1,2-DCE	Vinyl Chloride	1,1,1-TCA	1,1-DCA	Acetone	Toluene	m,p-Xylene	Chloroform	o-Xylene	Pentane	Hexane	Total Chlorinated	Total VOCs
4/17/2015	5.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.1	5.1
10/13/2015	ND	ND	ND	ND	ND	ND	ND	11	ND	ND	ND	ND	ND	ND	ND	11
3/8/2016	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/30/2016	ND	ND	ND	ND	ND	ND	ND	ND	15	1.6	ND	1.2	6.2	1.2	ND	25
9/12/2016	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
12/14/2016	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8/16/2017	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Notes:

All results are in parts per billion by volume (ppbv).

ND = non-detect

NA = not analyzed

DCE = Dichloroethene

PCE = tetrachloroethene

TCE = trichloroethene

Total Chlorinated = the sum of PCE, TCE, cis-1,2-DCE, trans-1,2-DCE, 1,1,1-TCA, and 1,1-DCA.

Shaded cells are results from 1st Quarter 2019.

Table 2-2 PID Monitoring - SWMU-172/174 SVE System

Date	Days in Operation Since Startup [1]	SVE-01	SVE-02	SVE-03	VPC Inlet	VPC Mid	VPC Outlet	Notes
10/2/2019	1,466	Vent					0	Hose between 2nd GAC vessel and 2nd KMNO4 drum has crack near camlock. Turned system off to repair hose.
10/3/2019	1,467	Vent					0	Onsite to install repaired hose. Took 2nd KMNO4 drum offline as it is plugged.
10/10/2019	1,474	Vent			0		0	Onsite to move KMNO4 drum out of work area, will sample it next week.
10/24/2019	1,488	Vent					0	System down, pulley belts have torn. System off for ~ 2 days. Ordered replacement belts and collected waste characterization sample from KMNO4 drum for VOCs and SVOCs.
10/29/2019	1,493	Vent	86	402	401		0	Installed replacement belts and turned system on. HR meter not working; ordered replacement. Readings after 1 hour of operating.
11/20/2019	1,515	Vent		4,832	2,050		0	High vac/low flow; float ball inside moisture separator was getting sucked into discharge outlet blocking flow and causing vacuum to increase. Zip tied cap to wire mesh inside moisture separator. Changed blower oil.
11/22/2019	1,517	Vent	2	175	104		0	System turned off during visit to install float ball inside wire cage within moisture separator. Restart system. ~ 3 gal condensate drained from moisture separator.
12/12/2019	1,537	Vent			570		0	~ 3 gal condensate drained from moisture separator.
12/23/2019	1,548	Vent			110		0	Shut system down after readings for Boeing Christmas break. ~ 3 gal condensate drained from moisture separator.
12/31/2019	1,556	Vent	0	5,839	4,862		0	System restart after Boeing Christmas break.
1/9/2020	1,565	Vent	204	960	1,082		0	~ 1.5 gal condensate drained from moisture separator.
1/17/2020	1,573	Vent			51		0	~ 7.5 gal condensate drained from moisture separator.

Notes:

[1] Days in operation since system startup on April 17, 2015.

Operational change was made on 6/20/19. Due to reduced concentrations observed at SVE-1 and the influent, SVE-01 was opened as a vent well to promote focused flow towards SVE-02 and SVE-03.

Blank cells - Not all wells were measured with the PID during each sampling event.

Table 2-3 VOC Mass Removal Estimate - SWMU 172/174 SVE System

Date	PID Reading (ppbv)	Corrected Value (PCE) (ppbv)[1]	System Flow (cfm)	Cumulative Runtime Hours	VOCs removed in Operating Period Between Monitoring Events (lbs)[2]	Cumulative VOC Mass Removed Since Start of SVE Operations in April, 2015 (lbs)
9/26/2019	163	94	85	28,248	0.058	18.35
10/2/2019[3]	163	94	70	28,382	0.021	18.37
10/3/2019	System Down	0	0	28,382	0.000	18.37
10/10/2019	0	0	105	28,550	0.000	18.37
10/24/2019	System Down	0	0	28,833	0.000	18.37
10/29/2019	401	231	86	28,953	0.058	18.43
11/20/2019	2,050	1,180	35	29,481	0.530	18.96
11/22/2019	104	60	105	29,529	0.007	18.96
12/12/2019	570	328	105	30,009	0.402	19.36
12/23/2019	110	63	105	30,273	0.043	19.41
12/31/2019	System Down	0	0	30,273	0.000	19.41
1/9/2020	1,082	623	105	30,489	0.343	19.75
1/17/2020	51	29	105	30,681	0.014	19.76

Notes:

PID = photoionization detector

ppbv = parts per billion by volume

cfm = cubic feet per minute

lbs = pounds

[1] A correction factor of 0.57 has been applied to the PID vapor measurement for VOCs based on the mixture of analytes detected in the TO-15 analysis at the influent sample point from 6/20/19. This number is much higher than the TO-15 results.

[2] These are based soley on the PID measurements collected this quarter; the prior TO-15 analyses indicates much lower mass.
TO-15 analysis results showed Tetrachloroethene made up 88% of the total VOCs removed at the influent on 6/20/19.

[3] Previous weeks influent PID reading used to calculate mass removal if that reading was not collected during the site visit.

Table 3-1 - Baseline and Performance Monitoring Groundwater Data; 4-78/79 Benzene Treatment Area

Sample ID	Date	Sample Depth (ft bgs)	TCE (ug/L)		cis-1,2-DCE (ug/L)		VC (ug/L)		Benzene (ug/L)		Nitrate (mg-N/L)		Nitrite (mg-N/L)		Sulfate (mg/L)	
B78-11-8-113017	11/30/2017	8	0.42		0.98		1.11		9.66		<0.100	U	<0.100	U	1.94	
B78-11-021418	2/14/2018	8	1.16		0.84		1.09		14.8		<0.100	U	<0.100	U	9.22	D
B78-11-051518	5/15/2018	8	1.86		0.78		1.06		12.6		<0.100	U	<0.100	U	34.1	D
B78-11-180917	9/17/2018	8	5.01		7.90		3.62		9.20		<0.100	U	<0.100	U	23.4	D
B78-11-020719	2/7/2019	8	3.13		2.47		1.81		4.88		<0.100	U	<0.100	U	25.0	D
B78-11-050719	5/7/2019	8	8.60		6.55		3.56		2.15		<0.100	U	<0.100	U	47.0	D
B78-11-112019	11/20/2019	8	4.56		4.75		3.06		0.97		<0.100	U	<0.100	U	5.65	D
B78-13-15-112917	11/29/2017	15	0.24		1.29		2.02		9.92		0.135		<0.100	U	0.652	
B78-13-021418	2/14/2018	15	<0.2	U	1.78		8.49		4.11		<0.100	U	<0.100	U	1.31	
B78-13-051518	5/15/2018	15	<0.2	U	0.85		0.87		4.94		0.182		<0.100	U	4.32	D
B78-13-180917	9/17/2018	15	<0.2	U	0.61		0.38		3.29		<0.100	U	<0.100	U	0.812	
B78-13-020719	2/7/2019	15	<0.2	U	0.37		0.29		0.74		<0.100	U	<0.100	U	0.189	
B78-13-050719	5/7/2019	15	<0.2	U	0.57		0.45		1.16		<0.100	U	<0.100	U	<0.100	U
B78-13-112019	11/20/2019	15	<0.2	U	0.40		0.30	M	1.81		<0.100	U	<0.100	U	0.354	
B78-17-9-100617	10/6/2017	9	<0.2	U	0.17	J	0.33		4.84		-		-		-	
B78-17-15-112917	11/29/2017	15	1.25		0.81		1.31		6.52		<0.100	U	<0.100	U	17.1	D
B78-17-021418	2/14/2018	15	2.57		1.78		1.47		4.61		<0.100	U	<0.100	U	7.35	D
B78-17-051518	5/15/2018	15	0.91		1.63		0.53		2.60		<0.100	U	<0.100	U	8.66	D
B78-17-180917	9/17/2018	15	<0.2	U	0.39		<0.2	U	1.37		<0.100	U	<0.100	U	9.63	D
B78-17-020719	2/7/2019	15	<0.2	U	0.68		0.47		0.56		0.101		<0.100	U	2.32	
B78-17-050719	5/7/2019	15	5.00		5.72		1.79		1.07		0.101		<0.100	U	4.92	D
B78-17-112019	11/20/2019	15	<0.2	U	0.69		0.26	M	0.28		<0.100	U	<0.100	U	1.32	
B78-18-8-100617	10/6/2017	8	<0.2	U	0.07	J	0.29		0.72		-		-		-	
B78-18-15-112917	11/29/2017	15	<0.2	U	<0.2	U	0.35	M	3.10		<0.100	U	<0.100	U	0.343	
DUP-01-112917	11/29/2017	15	<0.2	U	<0.2	U	0.36		2.96		<0.100	U	<0.100	U	1.68	
B78-18-021418	2/14/2018	15	<0.2	U	<0.2	U	0.24		1.28		<0.100	U	<0.100	U	1.47	
B78-18-051518	5/15/2018	15	<0.2	U	<0.2	U	0.23		1.68		<0.100	U	<0.100	U	27.6	D
B78-18-180917	9/17/2018	15	<0.2	U	<0.2	U	<0.2	U	0.89		<0.100	U	<0.100	U	7.28	D
B78-18-020719	2/7/2019	15	<0.2	U	<0.2	U	0.22		1.32		<0.100	U	<0.100	U	2.41	D
B78-18-050719	5/7/2019	15	<0.2	U	0.31		0.24		1.66		<0.100	U	<0.100	U	2.44	D
B78-18-112019	11/20/2019	15	<0.2	U	<0.2	U	0.21	M	1.18		<0.100	U	<0.100	U	2.64	D
B78-19-9-100617	10/6/2017	9	<0.2	U	0.06	J	0.22		0.69		-		-		-	
B78-19-15-112917	11/29/2017	15	<0.2	U	<0.2	U	0.27	M	0.36		<0.100	U	<0.100	U	0.255	
B78-19-021418	2/14/2018	15	<0.2	U	<0.2	U	0.21		0.23		<0.100	U	<0.100	U	1.22	
B78-19-051518	5/15/2018	15	<0.2	U	<0.2	U	0.21		0.34		<0.100	U	<0.100	U	22.4	D
B78-19-180917	9/17/2018	15	<0.2	U	<0.2	U	<0.2	U	<0.2	U	<0.100	U	<0.100	U	1.91	
B78-19-020719	2/7/2019	15	<0.2	U	<0.2	U	<0.2	U	<0.2	U	<0.100	U	<0.100	U	2.16	
B78-19-050719	5/7/2019	15	<0.2	U	<0.2	U	<0.2	U	0.50		<0.100	U	<0.100	U	14.2	D
B78-19-112019	11/20/2019	15	<0.2	U	<0.2	U	0.2	M	0.21		<0.100	U	<0.100	U	0.454	
B78-20-8-100617	10/6/2017	8	<0.2	U	<0.2	U	0.14	J	8.81		-		-		-	
B78-20-15-113017	11/30/2017	15	0.41		<0.2	U	<0.2	U	25.9		2.93	D	<0.100	U	53.9	D
B78-20-021418	2/14/2018	15	0.25		0.49	M	<0.2	U	40.0		<0.100	U	<0.100	U	21.1	D
B78-20-051518	5/15/2018	15	<0.2	U	0.39		0.22		54.2		<0.100	U	<0.100	U	15.5	D
B78-20-180917	9/17/2018	15	0.24		0.27		0.29		0.98		<0.100	U	<0.100	U	2.39	
B78-20-020719	2/7/2019	15	<0.2	U	0.41	M	0.25		16.5		<0.100	U	<0.100	U	1.89	
B78-20-050719	5/7/2019	15	<0.2	U	0.32		0.28		16.3		<0.100	U	<0.100	U	4.93	D
B78-20-112019	11/20/2019	15	<0.2	U	0.25		0.31	M	5.0		0.129		<0.100	U	2.47	

Table 3-1 - Baseline and Performance Monitoring Groundwater Data; 4-78/79 Benzene Treatment Area

Sample ID	Date	Sample Depth (ft bgs)	TCE (ug/L)		cis-1,2-DCE (ug/L)		VC (ug/L)		Benzene (ug/L)		Nitrate (mg-N/L)		Nitrite (mg-N/L)		Sulfate (mg/L)	
B78-21-8-100617	10/6/2017	8	<0.2	U	0.13	J	0.21		1.42		-		-		-	
Dup01-100617	10/6/2017	15	<0.2	U	0.15	J	0.20	J	2.01		-		-		-	
B78-21-15-112917	11/29/2017	15	<0.2	U	0.31	M	0.26		2.27		0.101		<0.100	U	4.43	D
B78-21-021418	2/14/2018	15	<0.2	U	0.24		0.30		0.86		<0.100	U	<0.100	U	1.60	
B78-21-051518	5/15/2018	15	<0.2	U	0.27		0.27		1.08		<0.100	U	<0.100	U	4.59	D
B78-21-180917	9/17/2018	15	0.22		0.29		<0.2	U	0.59		<0.100	U	<0.100	U	3.62	D
B78-21-020719	2/7/2019	15	<0.2	U	0.28		0.32		0.43		0.170		0.161		3.78	D
B78-21-050719	5/7/2019	15	<0.2	U	0.42		<0.2	U	0.80		<0.100	U	<0.100	U	5.73	D
B78-21-112019	11/20/2019	15	<0.2	U	0.30		<0.2	U	<0.2	U	<0.100	U	<0.100	U	5.92	D
GW-244S-13-112917	11/29/2017	13	3.48		8.06		5.68		7.97		<0.100	U	<0.100	U	0.753	
GW-244S-021418	2/14/2018	13	1.01		1.25		1.22		5.34		<0.100	U	<0.100	U	1.25	
GW-244S	3/6/2018	13	1.26		2.00		1.56		6.86		-		-		-	
GW-244S-051518	5/15/2018	13	<0.2	U	0.30		0.41		3.89		<0.100	U	<0.100	U	<0.100	U
GW-244S-180917	9/17/2018	13	<0.2	U	0.25		0.38		3.74		<0.100	U	<0.100	U	0.113	
GW-244S	*11/13/2018*	*13*	*<0.2*	*U*	*0.26*		*0.55*		*2.95*		-		-		-	
GW-244S-020719	2/7/2019	13	<0.2	U	0.26		0.47		1.14		0.101		<0.100	U	0.337	
GW-244S	*3/4/2019*	*13*	*0.22*		*0.82*		*0.86*		*1.73*		-		-		-	
GW-244S-050719	5/7/2019	13	<0.2	U	1.22		1.18		1.13		<0.100	U	<0.100	U	1.45	
GW-244S	*5/7/2019*	*13*	*<0.2*	*U*	*2.03*		*1.45*		*1.47*		-		-		-	
GW-244S	*8/13/2019*	*13*	*<0.2*	*U*	*0.37*		*0.71*		*1.77*		-		-		-	
GW-244S	*11/11/2019*	*13*	*<0.2*	*U*	*<0.2*	*U*	*0.35*		*0.87*		-		-		-	
GW-244S-112019	11/20/2019	13	<0.2	U	<0.2	U	0.50	M	0.41		<0.100	U	<0.100	U	0.160	
GW-031S-23-113017	11/30/2017	23	<0.2	U	<0.2	U	<0.2	U	17.6		<0.100	U	<0.100	U	2.54	D
GW-031S-021418	2/14/2018	23	<0.2	U	0.45	M	0.49		21.9		<0.100	U	<0.100	U	3.67	D
DUP-01-021418	2/14/2018	23	<0.2	U	0.46		0.42		21.4		-		-		-	
GW-031S	3/6/2018	23	<0.2	U	1.18		<0.2	U	60.3		-		-		-	
GW-031S-051518	5/15/2018	23	0.36		0.40		0.21		2.68		<0.100	U	<0.100	U	2.95	D
Dup-01-051518	5/15/2018	23	0.32		0.34		0.20		2.64		<0.100	U	<0.100	U	2.87	D
GW-031S-180917	9/17/2018	23	<0.2	U	<0.2	U	0.28		<0.2	U	<0.100	U	<0.100	U	0.499	
Dup-01-180917	9/17/2018	23	<0.2	U	0.21		0.30		<0.2	U	<0.100	U	<0.100	U	0.441	
GW-031S	*11/13/2018*	*23*	*<0.2*	*U*	*0.63*		*0.31*		*28.3*		-		-		-	
Dup-01	*11/13/2018*	*23*	*<0.2*	*U*	*0.58*		*0.30*		*23.8*		-		-		-	
GW-031S-020719	2/7/2019	23	<0.2	U	0.51	M	<0.2	U	21.6		<0.100	U	<0.100	U	0.170	
Dup-01-020719	2/7/2019	23	<0.2	U	0.57	M	0.24		22.7		<0.100	U	<0.100	U	0.202	
GW-031S	*3/4/2019*	*23*	*<0.2*	*U*	*<0.2*	*U*	*<0.2*	*U*	*55.9*		-		-		-	
Dup-01	*3/4/2019*	*23*	*<0.2*	*U*	*<0.2*	*U*	*<0.2*	*U*	*58.6*		-		-		-	
GW-031S-050719	5/7/2019	23	<0.2	U	0.22		0.30		1.90		<0.100	U	<0.100	U	1.86	
Dup-01-050719	5/7/2019	23	<0.2	U	0.27		<0.2	U	2.16		<0.100	U	<0.100	U	0.689	
GW-031S	*5/7/2019*	*23*	*<0.2*	*U*	*0.43*		*0.29*		*7.13*		-		-		-	
Dup-01	*5/7/2019*	*23*	*<0.2*	*U*	*0.38*		*0.27*		*6.69*		-		-		-	
GW-031S	*8/13/2019*	*23*	*<0.2*	*U*	*0.47*		*0.21*		*3.47*		-		-		-	
Dup-01	*8/13/2019*	*23*	*<0.2*	*U*	*0.48*		*0.22*		*4.37*		-		-		-	
GW-031S	*11/11/2019*	*23*	*<0.2*	*U*	*0.40*		*0.25*		*4.77*		-		-		-	
Dup-01	*11/11/2019*	*23*	*<0.2*	*U*	*0.39*		*0.27*		*4.75*		-		-		-	
GW-031S-112019	11/20/2019	23	<0.2	U	<0.2	U	<0.2	U	1.90		<0.100	U	<0.100	U	1.26	
Dup-01-112019	11/20/2019	23	<0.2	U	<0.2	U	0.27	M	2.31		<0.100	U	<0.100	U	1.16	

Notes:

U = non-detect

D = dilution

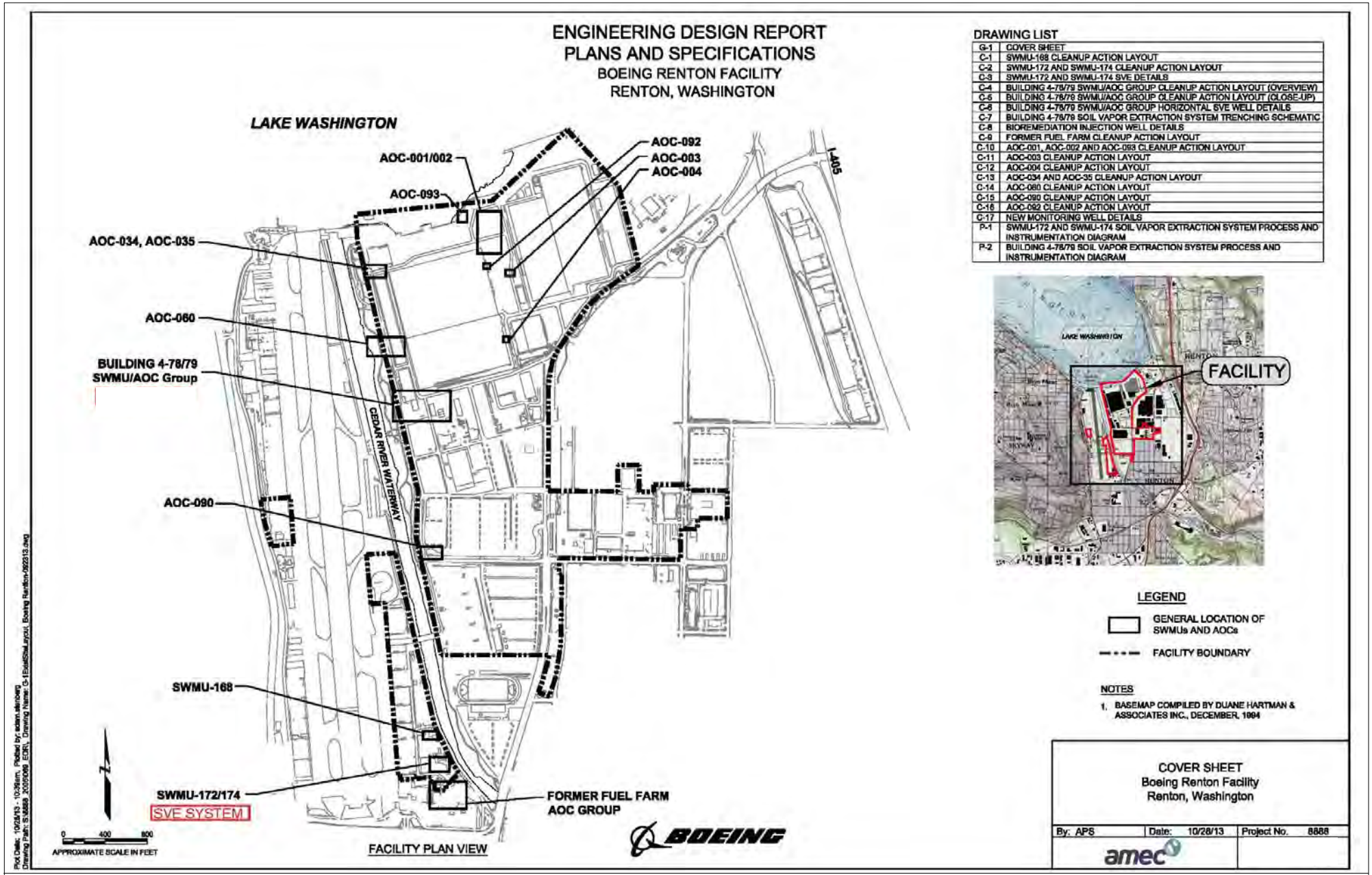
M = Estimated value for a GC/MS analyte detected and confirmed by an analyst but with low spectral match parameters.

Samples in italics collected as part of the Renton quarterly groundwater monitoring program.

Table 3-2 Groundwater Monitoring Results Summary November 2019 and Recommended ERD Treatment

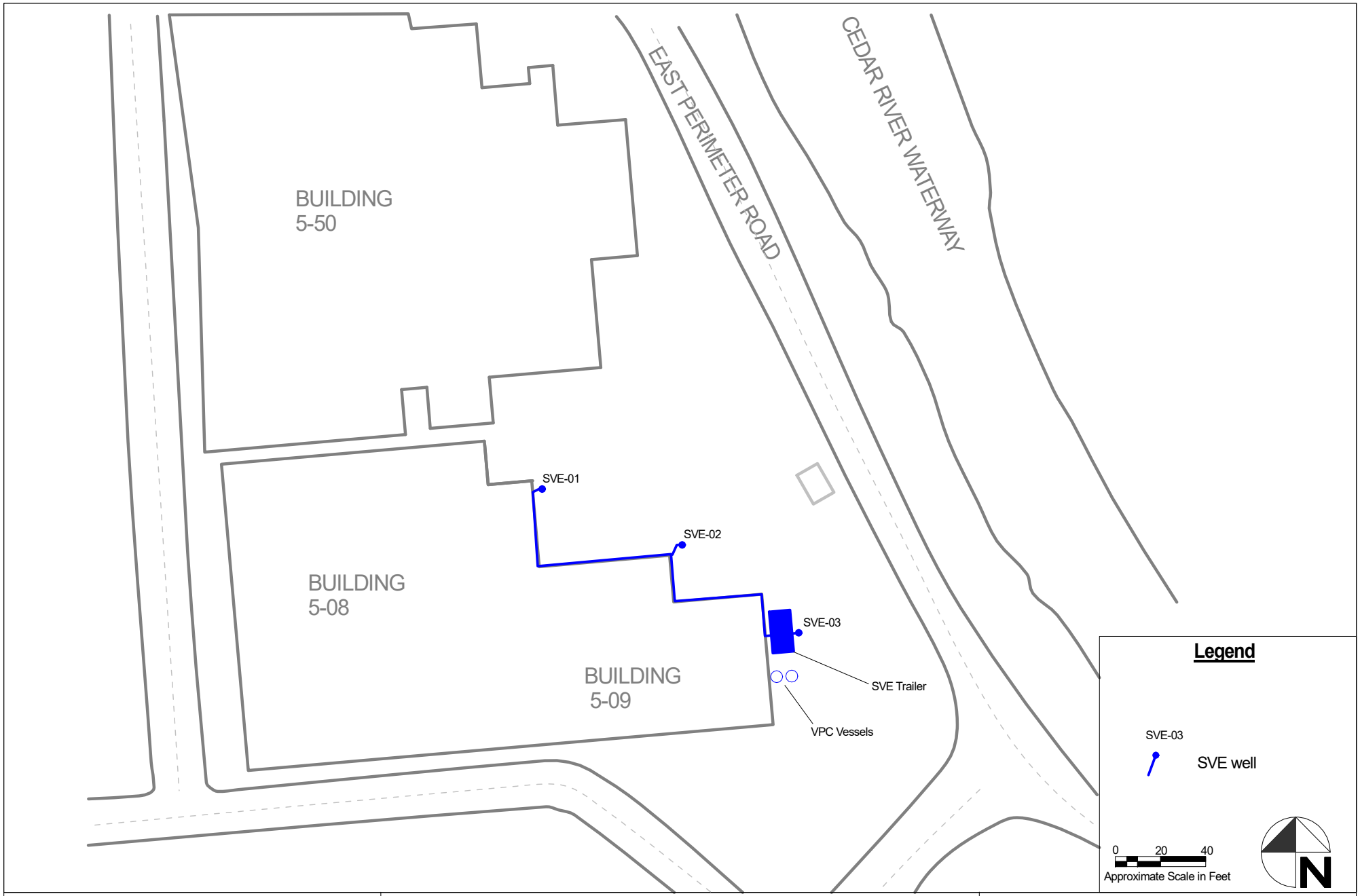
GW Treatment Area	Source and down gradient MWs	CPOC wells	Treatment IWs	ERD Treatment Recommendation
SWMU-172/174	PCE and TCE at or less than 0.38 ug/L; cisDCE less than 0.55 ug/L and VC less than 0.61 ug/L.	All detections are at 0.86 ug/L or less.	*Prior data Mar 2018, North and South IWS showed total CVOCs range from 0.03 ug/L to 6.90 ug/L. TOC near background.*	**Detections are very low and less than 1 ug/L throughout the site. Will consider additional injections if beneficial.**
Building 4-78/4-79 SWMU/AOC Group	TCE is ND; cisDCE and VC are less than 1.0 ug/L at all but GW033S with cisDCE at 2.78 ug/L and VC at 13 ug/L. One central well (GW033S) continues to show total CVOCs remain reduced from Nov 2017 results of 1,430 ug/L but have increased from prior quarter. Recent data show 46 ug/L in Nov 2018, 4.1 ug/L in Mar 2019, 0.94 ug/L in May 2019, 1.94 ug/L in Aug 2019, and 15.8 ug/L in Nov 2019. Substrate was applied to this area after Mar 2019 sampling. Benzene remained steady at source well GW031S (59 ug/L in Mar 2019 to 7.1 ug/L in May 2019 to 4.37 ug/L in Aug 2019 to 4.77 ug/L). Nitrate/sulfate injections were recommended in December 2019 and completed in January 2020.	Majority of detections are ND; northern well GW237S with cisDCE detection at 0.22 ug/L and VC at 0.34 ug/L, central well GW240D with VC at 0.24 ug/L. Northern well GW237S showed Benzene at 0.66 ug/L.	*Prior data May 2017, 4 of 5 wells with low detections where sum of CVOCs are less than 3 ug/L*	**CVOC detections have increased at source well GW033S. Recommend substrate injection in selected IWs/areas around GW033S. Additional benzene, nitrate, sulfate samples collected in November 2019. Nitrate/sulfate injections recommended for the area around GW-031S and completed in January 2020.**
AOC-001/002	*Prior data Aug 2019: Source MW: TCE is 0.04 ug/L, cisDCE is 0.99 ug/L and VC is 0.12 ug/L. Down gradient wells less than 3.71 ug/L total CVOCs.*	*Prior data Aug 2019: All detections below 0.30 ug/L.*	*Prior data Mar 2018, detections at or below 0.30 ug/L.*	**Consider injection at infiltration galleries at source (IPRA and IPRB) when area is accessible.**
AOC-003	*Prior data Aug 2019: All detections are less than 0.40 ug/L.*	All detections are less than 0.62 ug/L.	*Prior data May 2017 one of four IWs sampled – VC detection less than 0.30 ug/L*	**Substrate injection to be considered in conjunction with AOC-001/002.**
Lot 20 / former 10-71	All wells are ND.	-	-	**No action at this time.**
AOC-60	*Prior data Aug 2019: MW's with detections less than 0.37 ug/L; treatment MWs with total CVOCs less than 5.8 ug/L.*	*Prior data Aug 2019: Detections less than 0.15 ug/L.*	-	**Detections are very low throughout the site. Will consider additional injections if beneficial.**
AOC – 90	*Prior data Aug 2019: Treatment MW at source with total CVOCs at 8.9 ug/L total CVOCs (primarily cisDCE) and down from 27 ug/L in Aug 2018; down gradient wells less than 0.57 ug/L total CVOCs.*	*Prior data Aug 2019: Detections less than 0.40 ug/L.*	-	**Detections are very low throughout the site. Will consider additional injections if beneficial.**
Apron A	Two of three wells ND; GW264S with VC at 0.38 ug/L.	-	-	**Detections are very low throughout the site. Will consider additional injections if beneficial.**
Building 4-70	-	*Prior data Aug 2019: VC is non-detect; TCE and cisDCE detections less than 0.71 ug/L.*	-	**No action at this time.**

FIGURES



CALIBRE Systems, Inc.

Figure 1-1 Site Location/ AOC Outlines



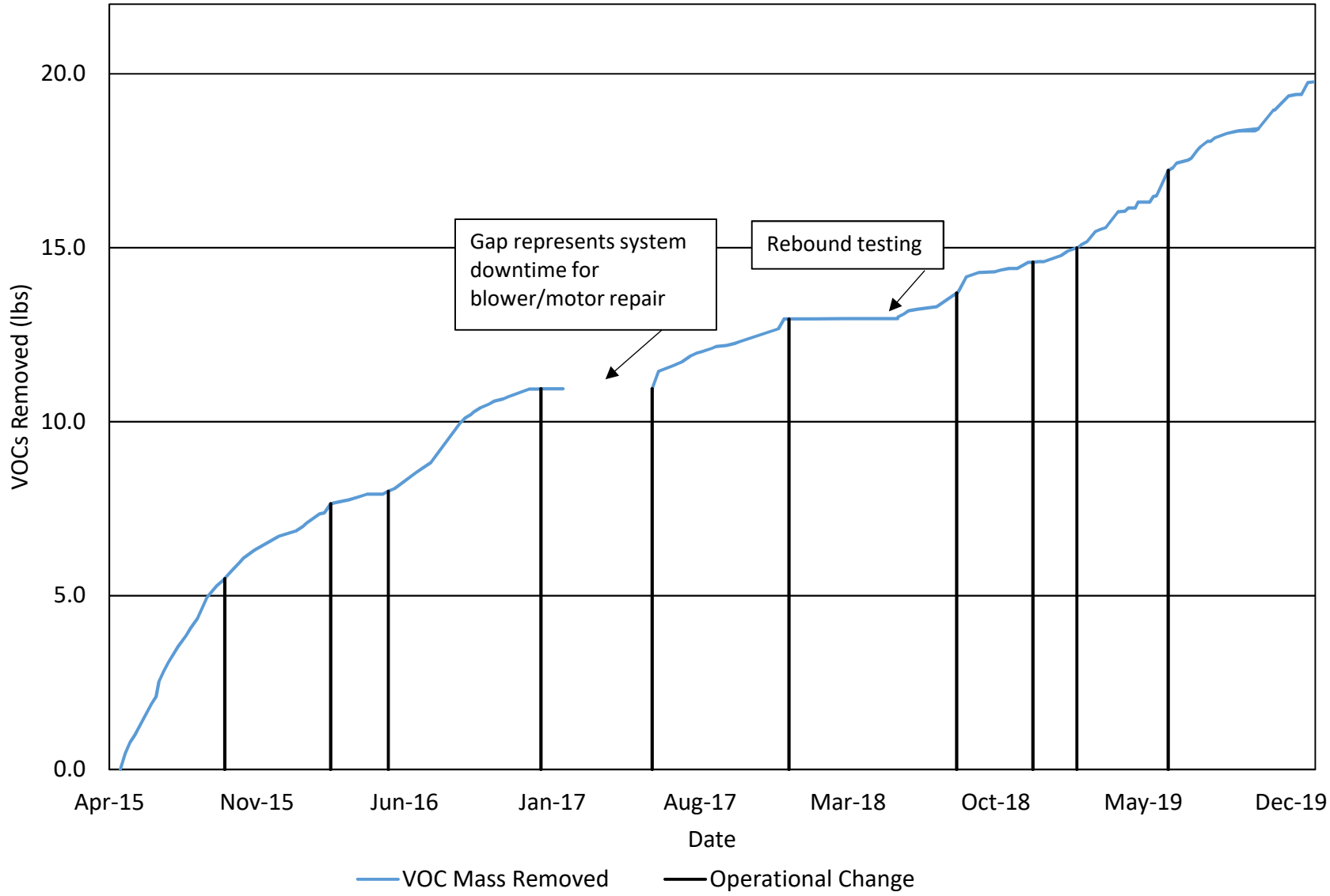
BOEING®

CALIBRE Systems Inc.

Boeing Renton
Spring 2017 SVE Quarterly Summary Report

Figure 2-1 SWMU-172/174 Area
SVE System Layout

Figure 2-2 Cumulative VOC Mass Removed - SWMU-172/174 SVE System



*SWMU 172/174 SVE system did not run Winter 2017 due to equipment failure.

Attachment A: Field Log Forms

Renton Cleanup Action SVE System – SWMU 172/174
Field Operations Log Form

Inspection Date: 10/2/19 Date of last inspection: 9/26/19

Periodic systems check:

1) Check flowrate, vacuum, pressure, moisture separator, water storage drums

2) Check each SVE well, VPC inlet, and VPC outlet with PID.

Operational Parameters - Monitoring interval is variable.		
Inspection Time: 0810		Motor Hours: 13,572.7
Blower	**Current Value**	**Other Notes**
Vacuum gauge	32" H_2O	Hose between 2nd GAC vessel & 2nd Permanganate vessel has crack at camlock connection. No flow through 2nd permanganate vessel. Turned system off to repair hose.
Pressure gauge	75" H_2O	
System flow rate	70 SCFM	
Blower Temperature	146°F	
Temp.at lag VPC discharge		
Other notes: check oil level, drive belts, TEFC motor fan, any unusual noise/vibration		

PID Model: PPB RAE 3000	Details: 0 ppb / 10.00 ppm
Calibration time/ date:	PID check after monitoring:

Sampling Point	Time	PID Reading (1)	PID Reading (2)	Vacuum	Flow Rate (gauge)	Differential Pressure	Flow Rate Calculated[1]
SVE-01							
SVE-02							
SVE-03							
VPC Inlet							
VPC Midpoint							
VPC Outlet							
Other vapor point _____							

1. Flow rate calculated from the equation $Flow\ Rate\ (cfm) = 12.24 \times \sqrt{differential\ pressure}$.

Questions? Call Justin Neste @ (360) 981-5606

At the Completion of a monitoring event scan monitoring forms and email to Justin Neste: Justin.Neste@calibresys.com

Signature _____ Printed Name _____ Signature _____ Date

Renton Cleanup Action SVE System – SWMU 172/174
Field Operations Log Form

Inspection Date: 10/3/19 Date of last inspection: 10/2/19

Periodic systems check:

1) Check flowrate, vacuum, pressure, moisture separator, water storage drums
2) Check each SVE well, VPC inlet, and VPC outlet with PID.

Operational Parameters - Monitoring interval is variable.		
Inspection Time: 1030		Motor Hours: 13,572.7
Blower	**Current Value**	**Other Notes**
Vacuum gauge	38"H2O	Repaired hose & took 2nd permanganate drum offline (plugged) Restart System
Pressure gauge	10"H2O	
System flow rate	105 scfm	
Blower Temperature	95°F	
Temp.at lag VPC discharge		
Other notes: check oil level, drive belts, TEFC motor fan, any unusual noise/vibration		

PID Model:	Details:
Calibration time/ date:	PID check after monitoring:

Sampling Point	Time	PID Reading (1)	PID Reading (2)	Vacuum	Flow Rate (gauge)	Differential Pressure	Flow Rate Calculated[1]
SVE-01							
SVE-02							
SVE-03							
VPC Inlet							
VPC Midpoint							
VPC Outlet							
Other vapor point ______							

1. Flow rate calculated from the equation $Flow\ Rate\ (cfm) = 12.24 \times \sqrt{differential\ pressure}$.

Questions? Call Justin Neste @ (360) 981-5606
At the Completion of a monitoring event scan monitoring forms and email to Justin Neste: Justin.Neste@calibresys.com

Signature ______________ Printed Name ______________ Signature ______ Date

Renton Cleanup Action SVE System – SWMU 172/174
Field Operations Log Form

Inspection Date: 10/10/19 Date of last inspection: 10/3/19

Periodic systems check:
1) Check flowrate, vacuum, pressure, moisture separator, water storage drums
2) Check each SVE well, VPC inlet, and VPC outlet with PID.

Operational Parameters - Monitoring interval is variable.		
Inspection Time: 1015		Motor Hours: 13740.7
Blower	**Current Value**	**Other Notes**
Vacuum gauge	35" H20	Onsite to move Permanganate drum out of work area. Will sample drum next week
Pressure gauge	10" H20	
System flow rate	105 SCFM	
Blower Temperature	94°F	
Temp.at lag VPC discharge		
Other notes: check oil level, drive belts, TEFC motor fan, any unusual noise/vibration		

PID Model: PPBRAE3000	Details: 0 ppb / 10.00 ppm
Calibration time/ date: 10/10/19 1015	PID check after monitoring:

Sampling Point	Time	PID Reading (1)	PID Reading (2)	Vacuum	Flow Rate (gauge)	Differential Pressure	Flow Rate Calculated[1]
SVE-01							
SVE-02							
SVE-03							
VPC Inlet		0 ppb	0 ppb				
VPC Midpoint							
VPC Outlet		0 ppb	0 ppb				
Other vapor point _____							

1. Flow rate calculated from the equation $Flow\ Rate\ (cfm) = 12.24 \times \sqrt{differential\ pressure}$.

Questions? Call Justin Neste @ (360) 981-5606
At the Completion of a monitoring event scan monitoring forms and email to Justin Neste: Justin.Neste@calibresys.com

Signature Justin Neste (Printed Name) (Signature) 10/10/19 (Date)

Renton Cleanup Action SVE System – SWMU 172/174
Field Operations Log Form

Inspection Date: 10/24/19 Date of last inspection: 10/10/19

Periodic systems check:

1) Check flowrate, vacuum, pressure, moisture separator, water storage drums

2) Check each SVE well, VPC inlet, and VPC outlet with PID.

Operational Parameters - Monitoring interval is variable.		
Inspection Time: 0910		Motor Hours: 14024.1
Blower	**Current Value**	**Other Notes**
Vacuum gauge		System down. Pulley belts have torn. (~2 days, 52 hrs off) Ordered replacement belts. Sampled permanganate drum for VOCs & SVOCs. Delivered to ARI Sample ID - 5-09-WC1-102419
Pressure gauge		
System flow rate		
Blower Temperature		
Temp.at lag VPC discharge		
Other notes: check oil level, drive belts, TEFC motor fan, any unusual noise/vibration		

PID Model:	Details:
Calibration time/ date:	PID check after monitoring:

Sampling Point	Time	PID Reading (1)	PID Reading (2)	Vacuum	Flow Rate (gauge)	Differential Pressure	Flow Rate Calculated[1]
SVE-01							
SVE-02							
SVE-03							
VPC Inlet							
VPC Midpoint							
VPC Outlet							
Other vapor point _____							

1. Flow rate calculated from the equation $Flow\ Rate\ (cfm) = 12.24 \times \sqrt{differential\ pressure}$.

Questions? Call Justin Neste @ (360) 981-5606

At the Completion of a monitoring event scan monitoring forms and email to Justin Neste: Justin.Neste@calibresys.com

Signature Justin Neste (Printed Name) _____ (Signature) 10/24/19 (Date)

Renton Cleanup Action SVE System – SWMU 172/174
Field Operations Log Form

Inspection Date: 10/29/19 Date of last inspection: 10/24/19

Periodic systems check:
1) Check flowrate, vacuum, pressure, moisture separator, water storage drums
2) Check each SVE well, VPC inlet, and VPC outlet with PID.

Operational Parameters - Monitoring interval is variable.

Inspection Time: 0830 Motor Hours: HR meter not working

Blower	Current Value
Vacuum gauge	35"H20
Pressure gauge	8"H20
System flow rate	86 SCFM
Blower Temperature	68°F
Temp.at lag VPC discharge	

Other Notes

Picked up replacement belts. Ordered replacement HR meter
Installed belts & Turned system on.
After 1hr operation
Out - 0/0 PPb
In - 339/401 PPb
SVE2 - 86/80 PPb
SVE3 - 402/400 PPb
SVE1 - Vent

Other notes: check oil level, drive belts, TEFC motor fan, any unusual noise/vibration

PID Model: PPBRAE 3000 Details: 0 PPb / 10.01 PPm

Calibration time/ date: 10/29/19 0830 PID check after monitoring:

Sampling Point	Time	PID Reading (1)	PID Reading (2)	Vacuum	Flow Rate (gauge)	Differential Pressure	Flow Rate Calculated[1]
SVE-01		Vent					
SVE-02	0845	66 PPb	52 PPb				
SVE-03	0850	475 PPb	475 PPb				
VPC Inlet	0840	432 PPb	441 PPb				
VPC Midpoint							
VPC Outlet	0835	0 PPb	0 PPb				
Other vapor point _____							

1. Flow rate calculated from the equation $Flow\ Rate\ (cfm) = 12.24 \times \sqrt{differential\ pressure}$.

Questions? Call Justin Neste @ (360) 981-5606
At the Completion of a monitoring event scan monitoring forms and email to Justin Neste: Justin.Neste@calibresys.com

Signature Justin Neste (Printed Name) (Signature) 10/29/19 (Date)

Renton Cleanup Action SVE System – SWMU 172/174
Field Operations Log Form

Inspection Date: 11/20/19 Date of last inspection: 10/29/19

Periodic systems check:
1) Check flowrate, vacuum, pressure, moisture separator, water storage drums
2) Check each SVE well, VPC inlet, and VPC outlet with PID.

Operational Parameters - Monitoring interval is variable.

Inspection Time: 1330 Motor Hours: Install New HR Meter

Blower	Current Value	Other Notes
Vacuum gauge	85" H2O / 20" H2O	After fixing moisture seperator: High Vac + Low Flow
Pressure gauge	0" H2O / 10" H2O	wire mesh inside moisture seperator - back disconnected from cap + float ball was getting sucked into discharge/ outlet of moisture seperator, blocking flow + causing vacuum to increase. Zipped cap back on + restarted
System flow rate	355 scfm / 105 scfm	
Blower Temperature	147°F	Changed oil.
Temp.at lag VPC discharge		

Other notes: check oil level, drive belts, TEFC motor fan, any unusual noise/vibration

PID Model: RAE 3000 PPB Details: 0.0 ppb / 10.01 ppm

Calibration time/ date: 11/20/19 1330 PID check after monitoring:

Sampling Point	Time	PID Reading (1)	PID Reading (2)	Vacuum	Flow Rate (gauge)	Differential Pressure	Flow Rate Calculated[1]
SVE-01		Vent					
SVE-02							
SVE-03	1350	4,832 ppb					
VPC Inlet	1345	1,679 ppb	2,050 ppb				
VPC Midpoint							
VPC Outlet	1338	0 ppb	0 ppb				
Other vapor point _____							

1. Flow rate calculated from the equation $Flow\ Rate\ (cfm) = 12.24 \times \sqrt{differential\ pressure}$.

Questions? Call Justin Neste @ (360) 981-5606
At the Completion of a monitoring event scan monitoring forms and email to Justin Neste: Justin.Neste@calibresys.com

Signature Justin Neste (Printed Name) (Signature) 11/20/19 (Date)

Renton Cleanup Action SVE System – SWMU 172/174
Field Operations Log Form

Inspection Date: 11/22/19 Date of last inspection: 11/20/19

Periodic systems check:

1) Check flowrate, vacuum, pressure, moisture separator, water storage drums

2) Check each SVE well, VPC inlet, and VPC outlet with PID.

Operational Parameters - Monitoring interval is variable.		
Inspection Time: 1200		Motor Hours:
Blower	**Current Value**	**Other Notes**
Vacuum gauge	42" H20	System turned off to place float ball back inside wire cage within moisture separator
Pressure gauge	10" H20	Restart @ 1240
System flow rate	105 SCFM	~3 gal condensate drained from separator tank
Blower Temperature	93°F	
Temp.at lag VPC discharge		
Other notes: check oil level, drive belts, TEFC motor fan, any unusual noise/vibration		

PID Model: PPB RAE 3000	Details: 0 ppm / 10 ppm
Calibration time/ date: 11/22/19 1200	PID check after monitoring:

Sampling Point	Time	PID Reading (1)	PID Reading (2)	Vacuum	Flow Rate (gauge)	Differential Pressure	Flow Rate Calculated[1]
SVE-01		vent					
SVE-02		2 ppb	0 ppb				
SVE-03		175 ppb	172 ppb				
VPC Inlet		92 ppb	104 ppb				
VPC Midpoint							
VPC Outlet		0 ppb	0 ppb				
Other vapor point _____							

1. Flow rate calculated from the equation $Flow\ Rate\ (cfm) = 12.24 \times \sqrt{differential\ pressure}$.

Questions? Call Justin Neste @ (360) 981-5606

At the Completion of a monitoring event scan monitoring forms and email to Justin Neste: Justin.Neste@calibresys.com

Signature _____ Printed Name _____ Signature _____ Date

Renton Cleanup Action SVE System – SWMU 172/174
Field Operations Log Form

Inspection Date: 12/12/19 Date of last inspection: 11/22/19

Periodic systems check:
1) Check flowrate, vacuum, pressure, moisture separator, water storage drums
2) Check each SVE well, VPC inlet, and VPC outlet with PID.

Operational Parameters - Monitoring interval is variable.		
Inspection Time: 1300		Motor Hours:
Blower	**Current Value**	**Other Notes**
Vacuum gauge	39" H_2O	~ 3 gal drained from seperator
Pressure gauge	10" H_2O	
System flow rate	105 SCFM	
Blower Temperature	88 °F	
Temp.at lag VPC discharge		
Other notes: check oil level, drive belts, TEFC motor fan, any unusual noise/vibration		

PID Model:	Details:
Calibration time/ date:	PID check after monitoring:

Sampling Point	Time	PID Reading (1)	PID Reading (2)	Vacuum	Flow Rate (gauge)	Differential Pressure	Flow Rate Calculated[1]
SVE-01							
SVE-02							
SVE-03							
VPC Inlet		570 ppb					
VPC Midpoint							
VPC Outlet		0 ppb					
Other vapor point _____							

1. Flow rate calculated from the equation $Flow\ Rate\ (cfm) = 12.24 \times \sqrt{differential\ pressure}$.

Questions? Call Justin Neste @ (360) 981-5606
At the Completion of a monitoring event scan monitoring forms and email to Justin Neste: Justin.Neste@calibresys.com

Signature _____ Printed Name _____ Signature _____ Date

Renton Cleanup Action SVE System – SWMU 172/174
Field Operations Log Form

Inspection Date: 12/23/19 Date of last inspection: 12/12/19

Periodic systems check:
1) Check flowrate, vacuum, pressure, moisture separator, water storage drums
2) Check each SVE well, VPC inlet, and VPC outlet with PID.

Operational Parameters - Monitoring interval is variable.		
Inspection Time: 1700		Motor Hours:
Blower	**Current Value**	**Other Notes**
Vacuum gauge		~ 3 gallon drained from seperator tank System shut down after readings for Boeing xmas Break.
Pressure gauge		
System flow rate		
Blower Temperature		
Temp.at lag VPC discharge		
Other notes: check oil level, drive belts, TEFC motor fan, any unusual noise/vibration		

PID Model:	Details:
Calibration time/ date:	PID check after monitoring:

Sampling Point	Time	PID Reading (1)	PID Reading (2)	Vacuum	Flow Rate (gauge)	Differential Pressure	Flow Rate Calculated[1]
SVE-01							
SVE-02							
SVE-03							
VPC Inlet		110 ppb	94 ppb				
VPC Midpoint							
VPC Outlet							
Other vapor point _____							

1. Flow rate calculated from the equation $Flow\ Rate\ (cfm) = 12.24 \times \sqrt{differential\ pressure}$.

Questions? Call Justin Neste @ (360) 981-5606
At the Completion of a monitoring event scan monitoring forms and email to Justin Neste: Justin.Neste@calibresys.com

Signature _____ Printed Name _____ Signature _____ Date

Renton Cleanup Action SVE System – SWMU 172/174
Field Operations Log Form

Inspection Date: 12/31/2019 Date of last inspection: 12/23/19

Periodic systems check:

1) Check flowrate, vacuum, pressure, moisture separator, water storage drums

2) Check each SVE well, VPC inlet, and VPC outlet with PID.

Operational Parameters - Monitoring interval is variable.		
Inspection Time: 11:15		Motor Hours: Replacement Hr meter not working
Blower	**Current Value**	**Other Notes**
Vacuum gauge	42" H2O	System Restart after Boeing Xmas Break
Pressure gauge	10" H2O	
System flow rate	105 SCFM	
Blower Temperature	85°F	
Temp.at lag VPC discharge		
Other notes: check oil level, drive belts, TEFC motor fan, any unusual noise/vibration		

PID Model: PPB RAE 3000			Details: 0.01 ppb / 10.01 ppm				
Calibration time/ date: 12/31 1115			PID check after monitoring:				
Sampling Point	**Time**	**PID Reading (1)**	**PID Reading (2)**	**Vacuum**	**Flow Rate (gauge)**	**Differential Pressure**	**Flow Rate Calculated[1]**
SVE-01		Vent					
SVE-02		0 ppb	0 ppb				
SVE-03		5,519 ppb	5,839 ppb				
VPC Inlet	5min	4,800 ppb	4,719 ppb	35min	4,862	4,686 ppb	
VPC Midpoint							
VPC Outlet							
Other vapor point _____							

1. Flow rate calculated from the equation $Flow\ Rate\ (cfm) = 12.24 \times \sqrt{differential\ pressure}$.

Questions? Call Justin Neste @ (360) 981-5606

At the Completion of a monitoring event scan monitoring forms and email to Justin Neste: Justin.Neste@calibresys.com

Signature _____ Printed Name _____ Signature _____ Date