TECHNICAL MEMORANDUM

Investigation Data Summary Report
EMF Sampling Related to Data Gaps Sampling Plan
November 2012

Prepared for:
The Boeing Company
Engineering Operations and Technology
EHS Remediation

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Acronym List

AER	Air Exchange Rate
ARARs	Applicable or Relevant and Appropriate Requirements
ARI	Analytical Resources, Incorporated
AWQC	Ambient Water Quality Criteria
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CSGWPP	Comprehensive State Ground Water Protection Program
cis-1,2-DCE	cis-1,2-dichloroethene
COC	chemicals of concern
CVOC	chlorinated volatile organic compound
DGSWP	Data Gaps Sampling Work Plan
DNAPL	dense non-aqueous phase liquid
DQO	Data Quality Objective
Ecology	Washington Department of Ecology
EE/CA	Engineering Evaluation/Cost Analysis
EMF	Electronics Manufacturing Facility
EPA	Environmental Protection Agency
ERD	enhanced reductive dechlorination
FS	Feasibility Study
ft	feet
HI	Hazard Index
IDSR	Investigation Data Summary Report
J&E	Johnson and Ettinger
KCIA	King County International Airport
LDW	Lower Duwamish Waterway
L/kg	liter per kilogram
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MSL	mean sea level
MTCA	Model Toxics Control Act
MW	monitoring well
NAPL	non-aqueous phase liquids
NCP	National Contingency Plan
NGVD29	National Geodetic Vertical Datum 1929
PPE	Personal Protective Equipment
QAPP	Quality Assurance Project Plan
QA/QC	quality assurance/quality control
RA	Remedial Action
RCRA	Resource Conservation and Recovery Act
Rd	retardation coefficient
RI	Remedial Investigation
SM	Standard Methods
TCE	trichloroethene
trans-1,2-DCE	trans-1,2-dichloroethene
ug/L	micrograms per liter
VI	vapor intrusion
VOC	volatile organic compound
WAC	Washington Administrative Code

TECHNICAL MEMORANDUM
EMF Investigation Data Summary Report (IDSR)

1.0 INTRODUCTION

This report has been prepared by CALIBRE Systems, Inc. (CALIBRE) for The Boeing Company (Boeing) as a required deliverable under an Administrative Settlement Agreement and Order on Consent for Removal Action (Settlement Agreement). The Settlement Agreement was entered into by Boeing and the U.S. Environmental Protection Agency (EPA) on February 2, 2007. The primary goal of the Settlement Agreement is to complete an engineering evaluation/cost analysis (EE/CA) and subsequent EPA decision on removal action(s), based on the EE/CA. A data gaps sampling work plan (DGSWP) was approved in September 2010 and this Investigation Data Summary Report (IDSR) presents the results from DGSWP sampling activities. EPA's review and approval regarding the sufficiency of the data is required to prepare the EE/CA.

The DGSWP was developed (and sampling implemented) to address data gaps identified in the historical environmental data collected at and down-gradient of the former Electronics Manufacturing Facility (EMF) site. The EMF site is located at Boeing Field/King County International Airport (KCIA) in Seattle, Washington. The data gaps were identified based on a Data Quality Objectives (DQO) process (identifying anticipated project decisions, defining data necessary to support decisions, evaluation of existing data and definition of remaining data gaps). For the purpose of this project, the term "EMF property" is used to define the physical location of the former EMF building and immediate surrounding area (parking areas for the facility). The terms EMF site, site, and VOC plume are used to describe any areas impacted by the VOC plume from the EMF property.

Starting in 1982, investigations (and subsequent voluntary remedial actions) initially focused on the EMF property at the identified locations of hazardous material spills. In 1999, a larger volatile organic compound (VOC) plume in groundwater was identified (i.e., larger than the EMF property). Based on that data, subsequent voluntary investigations and voluntary remedial actions have been implemented in the down-gradient areas impacted by the VOC plume from the EMF property. Full-scale plume-wide voluntary remedial actions are underway (e.g., see CALIBRE 2004) and have continued throughout the recent planning phases of the Settlement Agreement. EPA has received prior notification of all voluntary remedial actions that have been implemented since the date of the Settlement Agreement (also including many remedial measures prior to the Settlement Agreement). All voluntary remedial actions completed to date are not required under the Settlement Agreement and EPA has not approved or disapproved of the actions but has required adequate time to review the proposed actions before they were implemented**.**

1.1 Background/Summary of Site Conditions

The EMF property is located on the east side of KCIA. The facility is situated between the active runways/taxiways and Perimeter Road located to the east, which forms the eastern boundary of the airport and ancillary support operations (see Figure 1). Past industrial activities at the EMF property resulted in the release of trichloroethene (TCE) to the ground and to groundwater beneath the property. The VOC plume has been transported by natural groundwater movement southwest from the EMF property, across KCIA, passing under Boeing

Plant 2 towards the Lower Duwamish Waterway (LDW) located approximately 3,600 feet southwest of the former EMF property.

The site consists of the EMF property and the portions of KCIA and Boeing Plant 2 impacted by the EMF VOC plume that is located in a west to southwest direction from the EMF property. The down-gradient boundary of the site is presumed to be the LDW. The contaminants of concern (COCs) that have been identified in the EMF VOC plume are TCE, cis-1,2-dichloroethene (cis-1,2-DCE), trans-1,2-dichloroethene (trans-1,2-DCE), and vinyl chloride. Additional background information is provided in the EMF Historical Data Summary Report (CALIBRE 2008).

The position of the historical VOC plume passes beneath KCIA and under Boeing Plant 2 before discharging to the LDW. A number of environmental investigations under the RCRA program for Plant 2 and other voluntary investigations for remedial design have been implemented throughout the area of the EMF VOC plume. The data derived from those investigations has been used to help characterize the EMF VOC plume and provide monitoring data which fulfill many of the prior data gaps identified for this project. All work, and characterization data developed has been coordinated closely with the team completing the site characterization for Plant 2.

As noted previously, initial voluntary remedial actions for the EMF site started in the 1980s and full-scale plume-wide voluntary remedial actions are underway and have continued throughout the recent planning phases under the Settlement Agreement. As a result, site conditions are dynamic (CVOC concentrations in dozens of wells have declined by over 99.9+%) and all samples at EMF wells near the LDW are below applicable ambient water quality criteria (AWQC). Based on the excellent performance of the existing voluntary remedial measures implemented to-date, Boeing is recommending that all voluntary work be fully recognized under the Settlement Agreement. The data quality objectives (DQOs) used to develop the approved DGSWP were organized (in part) around this expected outcome. Several of the key decisions from the DQO process are related to evaluation of the performance of existing ERD voluntary remedial actions, and how they could be expanded, if selected by EPA, as the preferred removal action under the EE/CA.

Based on the site status and these conditions, this IDSR focuses only on the recent data over the last 3 years. All prior data has been summarized in EMF Historical Data Summary Report (CALIBRE 2008) and DGSWP (CALIBRE 2010a).

1.2 Objectives

The October 2010 probe sampling and the February 2011 semi-annual groundwater sampling event have been implemented as part of the DGSWP to further characterize the nature and extent of the EMF VOC plume (define boundaries, identify trends) and to provide performance monitoring and optimization data necessary to address the VOC plume. Groundwater monitoring was conducted at multiple probe locations and monitoring wells over the length and width of the EMF VOC plume. The primary sampling objectives were to collect characterization data to fulfill identified data gaps (nature, extent, trends and changes) and also to optimize the present (voluntary) ERD remedial action that has been implemented. The sampling procedures and analytical methods used to collect data presented in this report are consistent with the DGSWP. This report also includes data and trends from prior sampling events. In addition, based on a request from EPA, data regarding the highest beneficial use of groundwater in the Duwamish Valley aquifer near the location of the EMF plume has been summarized.

The information in this report is organized in the following categories:

- Introduction and objectives (Section 1);
- Sampling of the DGSWP: October 2010 and February 2011 (Section 2);
- Summary of 7 Key DQO questions and data relevance (Section 3);
- Interpretation, conclusions and recommendations (Section 4); and
- References (Section 5).

Additional information presented in Appendices to this report includes:

Appendix A Data Validation Summary
Appendix B Laboratory Results Data Sheets
Appendix C Field Sampling Data Sheets
Appendix D Electronic Version of DGSWP data (Excel format on disk)
Appendix E Boeing EMF Site; Evaluation of Highest Beneficial Groundwater Use

1.3 Highest Beneficial Use of Groundwater in Duwamish Valley in Area of EMF Plume

The potential for groundwater to be used as a drinking water source is important for the evaluation of site-specific groundwater exposure pathways. A potability evaluation (CALIBRE 2012) that details the recommendation for a non-potable designation for groundwater in the vicinity of the EMF plume has been prepared and submitted to Ecology[1] for review.

[1] *The State of Washington has an EPA endorsed Comprehensive State Ground Water Protection Program (CSGWPP) and the MTCA is the primary State regulation regarding highest beneficial use of groundwater with specific criteria listed in WAC 173-340-720. The technical memorandum (CALIBRE 2012) is based on the WAC criteria.*

2.0 SAMPLING AS PART OF THE DGSWP

2.1 Locations/Wells Sampled

The DGSWP included sampling of probes and monitoring wells from October 2010 to February 2011. A total of 11 wells (PL2-443A/B/C, PL2-444A, PL2-420A/B/C, EMF-WF-32, EMF-WF-39, EMF-WF-40, and EMF-WF-41) were sampled near the Lower Duwamish Waterway (LDW). Three of these wells include the recently installed monitoring wells: EMF-WF-39, EMF-WF-40, and EMF-WF-41. These three new wells have been sampled in November 2010 and February 2011. Other existing wells near the LDW have been sampled four times over the last 2 years. One probe (EMF GP-75) was sampled over depth to define the depth interval with the highest remaining CVOC concentrations in the area of the EMF VOC plume near the LDW.

A total of 14 wells in Plant 2 have been sampled as part of the routine performance monitoring of the ERD remedial actions (voluntary). This includes wells in the 2-41 Building (EMF-IW-38), 2-40 Building (EMF-WF-31, EMF-WF-33, EMF-IW-07, and EMF-IW-40) and 2-40 parking lot (EMF-WF-36, EMF-WF-30, EMF-IW-44, PL2-440B/C, PL2-441B/C, PL2-608B/C).

Six wells near the Boeing Fire station on KCIA have been sampled as part of the routine performance monitoring of the ERD remedial actions (EMF-WF-29, EMF-WF-25, EMF-WF-26, EMF-WF-27, EMF-IW-36, and EMF-WF-38). In addition, five new probes (GP-70 to GP-74) were sampled over depth to identify any depth intervals (south of the Fire station) where a portion of the EMF plume, or plumes from other sources may be present.

Four new probes (GP-60 to GP-63) located north and south of the approximate plume boundaries (near the east side of the taxiway on KCIA) were sampled over depth to identify where portions of the EMF plume (or plumes from other sources) may be present.

A total of 13 wells on and near the EMF property have been sampled as part of the routine performance monitoring of the ERD remedial actions (EMF-NV-01, EMF-NV-02, EMF-IW-20, EMF-MW-17, EMF-MW-10, EMF-IW-27, EMF-MW-02, EMF-MW-14D, EMF-MW-04, EMF-MW-12D, EMF-MW-11S (upper and lower), EMF-MW-11D, and EMF-MW-13D). In addition, six new probes (GP-64 to GP-69) were sampled over depth to identify any depth intervals where other/expanded treatment measures on the EMF property may be appropriate. Two of the probes GP-68 and GP-69 were placed close to EMF-NV-02 specifically to evaluate the potential presence of DNAPL in that area. The other four probes, GP-64 to GP-67, were placed in areas bounding the existing ERD treatment zone to identify any areas where expanded measures may be required.

2.2 Sampling Procedures and Laboratory Analyses

The sampling procedures and laboratory analyses were completed in accordance with the procedures defined in the project QAPP.

Water samples were submitted to Analytical Resources, Inc. (ARI) of Tukwila, Washington for analysis. Selected samples (See Appendix A) were analyzed for volatile organic compounds (VOCs) using EPA method SW8260C; methane, ethane and ethene using method RSK 175; and total organic carbon (TOC) using EPA method 415.1. Copies of the laboratory data sheets and chain-of-custody records are provided in Appendix B.

Eight quality assurance/quality control (QA/QC) water samples were collected during the October probe sampling: four trip blanks, and four duplicate samples. Field duplicate samples were collected from probe locations EMF-GP64-35, EMF-GP62-40, and EMF-GP66-35, EMF GP71-40.

Eight QA/QC water samples were collected during the February 2011 round of sampling: five trip blanks, and three duplicate samples. Field duplicate samples were collected from wells EMF-WF-32, EMF-WF-30, and EMF-WF-29.

The field duplicate results are within the RPD goals presented in the QAPP.

Appendix A presents the data validation report for the laboratory samples. The review and data validation indicates that the data quality is generally suitable for the intended purpose, except specific samples as noted in the data validation (4 samples were "R" flagged in the primary analysis and several more in the diluted analysis). The data validation provided some additional data qualification flags for selected samples (included in the tables). The data validation rejected a small portion of the data collected and the rest of the data are considered usable as qualified. The complete laboratory data packages are included in Appendix B.

2.3 Field Sampling Observations

The notes and observations from field sampling are included in Appendix C. Two somewhat unusual field measurements and observations are noted (both have also been noted in most sampling events for the EMF site over the last several years): 1) The field measurement of dissolved oxygen appears to have some type of interference in many samples; and 2) a few of the sampling locations have a purple tint to the groundwater.

Instrument manuals for various DO meters indicate a potential for measurement interferences when salinity is high and when certain dissolved gases are present (hydrogen sulfide is a commonly cited example). Both of these conditions are present within the EMF VOC plume. A number of the wells sampled indicate very high electrical conductivity (EC). EC is directly related to Total Dissolved Solids (TDS, in ppm) by a standard conversion factor of 0.640 (ppm TDS/EC in umhos/cm). The higher EC readings are typically associated with the deeper sampling intervals and indicate TDS levels up to about 22,000 mg/L.

Prior testing of selected wells (CALIBRE 2010b) determined that the purple coloration is associated with bacterial growth (the cellular matter causes the coloration). A well where this condition was observed is EMF-IW-7 (at the south end of ERD treatment area 2). This well was also noted as having water that was "effervescent" in the February 2011 sampling. The effervescence is derived from dissolved gasses (e.g., methane, ethane and ethene) that are released as the pressure is reduced with sample collection (initially at 30 ft below the water table). Another well, EMF IW-38, was also noted as effervescent" in the February 2011 sampling and this well had substrate injection into it approximately 2 weeks before the sampling.

A number of the EMF wells sampled used PDBs for sample collection. ITRC guidance indicates that PDB samplers have successfully been left in place for a year with no obvious loss of bag integrity. Based on prior comments from EPA, the Boeing sampling team (primarily C. Hardy) have been instructed to inspect PDB samplers for potential losses of bag integrity during recovery. At present, no adverse effects have been noted (e.g., the collection bags are intact, and they are inspected for biofilm on the PDB surface) for sampling periods where the PDBs have been installed for longer periods (exceeding 2 years).

Another key consideration in review of the field sampling notes is the impact of tides in the LDW on depth to water observed (and calculated water levels). The tidal boundary condition at the LDW can experience tidal swings of approximately 14 ft. and the effects are observed in many monitoring wells within 1000 ft. of the waterway (and further). Some wells, when they are first opened, may exhibit a slight pressure (or vacuum) as a result of the twice daily water level changes. This is only observed if the well cap/seal is perfectly air tight and in selected wells depending upon the tidal cycle and the time lag change as the pressure is propagated through the aquifer from the tidal boundary. Vertical gradients are observed in most well clusters with the magnitude and direction of the vertical gradient changing with the twice daily tidal cycle.

2.4 Sampling Results

Table 1 shows the recent DGSWP sampling data from EMF wells near the LDW along with multiple biannual sampling events (4 events over two years for most of the wells). All wells shown in Table 1 are monitoring wells (i.e., none have been used as substrate injection wells). The data in Table 1 indicate all wells below applicable AWQC for all COCs since January 2007.

The analytical results from the one probe sample near the LDW (EMF-GP-75) indicated all COCs at levels below applicable AWQC. The data from this probe sample are presented in Table 23.

Table 2 shows the recent DGSWP sampling data along with data from multiple biannual sampling events from wells in the 2-40 and 2-41 Buildings. The wells shown in Table 2 include both substrate injection wells (the upper half of the Table) and monitoring wells (EMF-WF-31 and EMF-WF-33). The data shows all wells below applicable AWQC for all COCs except VC at well EMF-WF-33. The VC concentration in this well (EMF-WF-33) has declined from 170 ug/L in January 2007 to 5.5 ug/L as of February 2011.

Tables 3, 4, and 5 show the recent DGSWP sampling data along with data from multiple biannual sampling events from wells in the 2-40 Parking Lot area. These data are presented in three tables, each characterizing a different depth interval/water bearing zone based on the general stratigraphic zones defined for Plant 2 (A zone: 0 to 20 ft bgs, B zone: 20 – 50 ft bgs, and C zone : 50+ ft bgs). The positions of these wells are shown in Figure 5. All wells shown in Table 3 are monitoring wells. As of February 2010, all wells sampled in the zone A wells are below applicable AWQC for all COCs (all non-detect).

One well shown in Table 4 is a substrate injection well (EMF IW-44), the remaining wells (in Table 4) are monitoring wells. As of February 2011, all wells sampled in the B Zone are below applicable AWQC for all COCs except VC at the injection well EMF-IW-44. This well is the southernmost injection well in the area and has indicated a 91% decrease in VC since February 2009 (initially with VC at 1,600 ug/L and now at 140 ug/L). This well (EMF-IW-44) is in an area where ERD treatment for this portion of the EMF plume did not start until mid-2009.

All wells shown in Table 5 are monitoring wells (i.e., none are substrate injection wells). All C Zone wells sampled in this area (2-40 Parking Lot area) continue to indicate all COCs at non-detect levels.

Table 6 presents data from sampling near the Fire station area (ERD injection Area 4) where boundary wells and a number of other wells were sampled during February 2011. The wells shown in Table 6 include both substrate injection wells (the upper half of the Table) and

monitoring wells (the lower half of the Table). Most wells in this area indicate CVOCs are present solely as vinyl chloride (TCE and cis 1,2DCE at low levels or non-detect). All wells were below AWQC for all CVOCs except VC. The northern boundary monitoring well EMF-WF-25 was confirmed below AWQC with concentrations at non-detect levels. The southern boundary monitoring well EMF-WF-38 had a VC concentration of 190 ug/L (an increase from the August 2010 result of 72 ug/L), while EMF-IW-36 (closest well to the north of EMF-WF-38) had concentrations below a detection level of 0.2 ug/L for all CVOCs except trans 1,2DCE (0.2 ug/L). Monitoring well EMF-WF-29 was sampled in February 2011; in addition, two substrate injection wells (also used for monitoring) in the center of the plume were monitored in February 2011 (EMF-WF-26 and EMF-WF-27). Results for EMF-WF-29, EMF-WF-27, and EMF-WF-26 show VC above the AWQC at 7 ug/L, 270 ug/L, and 2.6 ug/L respectively. The deeper monitoring well in this area, EMF-WF-37, is at non-detect for all CVOCs. The vinyl chloride detection at EMF-WF-29 (7 ug/L) is the lowest measured in the project history, following the continued decline in VC concentrations at this well since its recorded high of 5,500 ug/L in 2003 (a 99.9% reduction). Toluene was detected in EMF-WF-26 and EMF-WF-27 at 130 ug/L and 3.5 ug/L. For all wells sampled in this area (except EMF-WF-38), the performance monitoring data indicate that dechlorination has been ongoing and is progressing through vinyl chloride to ethene.

The five probes (EMF-GP-70 through EMF-GP-74) were sampled south of the Fire station. Those results show CVOC daughter products below or near detection levels. The highest concentration of VC is at the most northern probe (EMF-GP-70) with 1.9 ug/L at 50-54 ft bgs. The locations of these probes are presented in Figures 6[2] and 7. The data from these probe samples is presented in Tables 18 to 22.

Probes sampled on the east side of KCIA (EMF-GP-60 through EMF-GP-63) showed detections of low concentrations CVOCs, including vinyl chloride above AWQC. The two northern probes (EMF-GP-60 and EMF-GP-63) each showed vinyl chloride above AWQC at several depths sampled (a maximum of 35 ug/L at EMF-GP-60 at 20-24 ft bgs). One of the southern probes, EMF-GP-62, showed vinyl chloride above the AWQC at 20-24 and 30-34 ft bgs (36 ug/L and 6.8 ug/L respectively). The down gradient probe of the southern pair (EMF-GP-61) indicated all CVOCs below AWQC over all depths. Figure 8 presents the position and concentration of total CVOCs for these probe samples, cross sections are shown in Figures 9 and 10. The analytical results are presented in Tables 8, 9, 10 and 11. The sampling from these four probes also detected two VOC compounds that have not been detected in the EMF VOC plume. The two northern probes, EMF-GP-60 and EMF-GP-63, each showed benzene at low levels (under 1 ug/L). The two southern probes, EMF-GP-61 and EMF-GP-62, each showed 1,1 DCA at low levels (0.6 to 1.1 ug/L); 1,1 DCA is not a daughter product associated with TCE dechlorination

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[2] *The approximate VOC plume boundaries shown in Figure 6 are constructed on the basic conceptual site model (CSM for the EMF plume and are based on the plume as a generally stratified layer within the aquifer. The CSM is described in detail in the EMF Historical Data Summary Report (CALIBRE 2008) and the DGSWP (CALIBRE 2010b). The plan-view depiction of the plume boundaries compresses the vertical profile to a linear boundary. Extensive vertical profile probe sampling efforts have been completed throughout the entire plume (all data are presented in prior references noted above). Based on that sampling, the EMF wells have been screened to identify and bound the EMF plume. In general the plume is present in an interval from about 10 to 40 ft bgs on the EMF property; as the plume moves down gradient it becomes more stratified and is generally found at depths of approximately 35 to 55 ft bgs. The spatial boundaries presented in Figure 6 (as well as other plan-view Figures 8, 16 and 17) are approximate and are intended to represent the highest concentration over all depths. Vertical profiles of the plume distribution have also been developed throughout the plume (several are included in this Data Report).*

(it is an ethane structure versus and ethene structure). The presence of these two compounds indicates other sources are present (other than the VOC plume identified from the EMF property).

Regardless of the source impacting these sample locations, an evaluation of the measured concentrations at these four probe sampling locations was completed to calculate a degradation half-life (in these areas) based on current conditions. As a worst case scenario, using the highest total CVOC concentration detected over the depth intervals sampled, the calculated half-lives for the each pair of probes (north and south of primary EMF plume) are between 2 and 4 months. These values are lower than the prior plume-wide half-life of 19 months (representing baseline conditions before ERD treatment, and also derived from the center of the EMF plume) indicating a much faster degradation rate in these areas (the plume fringes). This may due to faster degradation near the plume edges, the result of ERD actions in the EMF source area, or potentially other unknown factors. Figures 9 and 10 show the vertical profiles of the north and south probe pairs and clearly identify CVOCs degrading in the down gradient flow direction (the down gradient data from the southern pair show all CVOCs below AWQC at all intervals, the northern pair indicate a significant reduction along the flow path).

The historic boundary wells (EMF-MW-04, EMF-MW-12D, EMF-MW-02 and EMF-MW-14D) have been sampled multiple times between July 2008 and February 2011 (and many times, ~ 13 times, prior to 2008 starting in about 1997). All CVOC results in the last 2 years from the southern pair (EMF-MW-02 and EMF-MW-14D) have been below the detection limit. All CVOC results in the last 2 years from the deep well on the northern boundary (EMF-MW-12D) have been below the detection limit. The recent sampling (February 2011) from the shallow northern boundary well (EMF-MW-04) indicated TCE at <0.2, cis 1,2DCE at 3.9 ug/l, trans 1,2DCE at 0.2 ug/L and VC at 0.8 ug/L. These data are presented in Table 7.

Table 7 shows the recent DGSWP sampling data along with data from multiple quarterly and biannual sampling events from wells located at the former EMF Property. Based on CVOCs detected in the EMF property area wells, it is evident that dechlorination of TCE (and daughter products) is occurring. In down-gradient wells on the EMF property (EMF-MW-11S, EMF-MW-11D, EMF-MW-13D), the analytical results indicate that complete reduction of TCE to its daughter products has occurred, with low to moderate levels of cis 1,2DCE and vinyl chloride. In general, up-gradient wells have shown strong reductions in both parent and daughter products, however most wells are still above applicable AWQC. Continued source area remediation is required in this area and expanding the shallow zone ERD treatment area along with continued deep zone treatment is recommended.

Probe samples collected near EMF-NV-02, included as a suspect area for a source of DNAPL (EMF-GP-68 and EMF-GP-69), indicate low concentrations of the parent compound TCE at these two probe locations. At 38-42 ft bgs EMF-GP-68 showed the highest detection of TCE of the two probes in this area at 1.1 ug/L and EMF-GP-69 showed the highest concentration of cis 1,2DCE with 94 ug/L at 42-46 ft bgs. The results from these two probes, along with recent data from EMF-NV-02, do not indicate that DNAPL is likely present in the area. The results show concentrations of VC at 590 ug/L (38-42 ft bgs) and 110 ug/L (42-46 ft bgs) in EMF-GP-68 and EMF-GP-69, respectively. Probes sampled closer to EMF-NV-01 (EMF-GP-64, EMF-GP-65) showed the highest detections at the 25-29 ft bgs depth interval with 26.6 ug/L and 14 ug/L total CVOCs respectively. Probe EMF-GP-66, located north of EMF-NV-01 and EMF-NV-02, showed concentrations of TCE at 140 ug/L and 120 ug/L for the 25-29 and 35-39 ft bgs interval. The concentrations of cis 1,2DCE and trans 1,2DCE were collectively 116 ug/L and 548 ug/L at 25-29 and 35-39 ft bgs (predominantly as cis-1,2-DCE). VC was above the AWQC at a single

depth (35-39 ft bgs) at 3.0 ug/L. The final probe (EMF-GP-67) located south of EMF-NV-01 and EMF-NV-02 was below AWQC for VC at all depths and had a maximum CVOC concentration of 6 ug/L at 25-29 ug/L. The locations of these probes are presented as a plan view in Figure 11. Analytical data are presented in Tables 12 to 17 and presented in cross-section view in Figures 12 and 13.

Table 24 presents Bacterial Census data at wells from the 2-40 and 2-41 Buildings along with data from EMF-NV-01 and EMF-NV-02 on the EMF Property. The results are as expected based on current conditions of the EMF plume. Large bacterial numbers are seen on the EMF property where source CVOCs still exists and much smaller bacterial numbers are seen in the down-gradient areas where CVOC concentrations are low or non-detect.

The depth-to-water measurements for recent wet and dry season sampling events are shown in Tables 25 and 26. The water level elevation data are presented as contour maps in Figures 16 and 17. The water level contours are based on the zone where the EMF plume moves (generally the B zone), additional A-zone and C-zone data are included but have not been used for contouring. Many of the C-zone wells are saline and the density differences between B and C zones are important; in addition the B and C zone wells are tidally influenced throughout the Plant 2 area. Vertical gradients exist but they change continuously with tides.

2.5 Evaluation of Other Exposure Pathways

One of the data gaps identified in the DQO process was related to evaluation of several other specific exposure pathways (indoor air, storm drains, stream channels) and a determination as to whether or not those potential pathways were complete. This section presents a short summary of site data related to those pathways.

Indoor Air Pathway

At the EMF property, no structures exist above the plume. Shallow contamination is present in this area but the indoor air pathway is incomplete because no structure exists.

Near the KCIA arrivals building, a shallow monitoring well exists (EMF-MW-04) and the recent sampling data from this well indicate TCE at < 0.2 ug/L and VC at 0.8 ug/L. The recent sampling data are consistent with historical levels over that last several years. Ecology has prepared draft guidance for evaluating vapor intrusion under MTCA (Ecology 2009). The guidance is presently draft but will ultimately be incorporated into the relevant parts of MTCA for soil and groundwater cleanup standards. The methods used to set soil and groundwater cleanup standards (protective of a vapor intrusion pathway) are based on using a conservative application of the Johnson and Ettinger (J&E) Model and include a Tier 1 screening level where:

> "the investigator will often be able to determine, by focusing only on the nature and extent of volatile chemicals in the subsurface, that the contaminant source is simply too weak or too far away from buildings of interest to pose an unacceptable vapor intrusion threat"

The conservative application of the J&E Model is based on a typical residential structure (area, volume and Air Exchange Rate [AER] of 0.25 ($hours^{-1}$). A more typical AER for a commercial building is the range of 1 ($hours^{-1}$, Ecology 2009) which would reduce the exposure level (and thereby increase the screening levels for a commercial building) by a factor of 4.

Based on those conservative assumptions (i.e., not considering a typical AER for a commercial building), the draft MTCA C screening levels (as applied to indoor vapor and groundwater) for

the EMF COCs are listed below (from Ecology 2009 and based on a MTCA C risk threshold of 10^{-5} for excess cancer risks or a Hazard Index of 1 for non-cancer risks). The MTCA C values are listed because the source area of the EMF Site meets all the MTCA criteria for an industrial site (WAC 173-340-200 and 173-340-345) and is expected to remain an industrial setting for the foreseeable future (continued operation as a regional airport).

	Indoor air SL_{ia}	Groundwater Impacting indoor air SL_{gw}
VC	5.5 ug/m^3	6.8 ug/L
TCE	2.0 ug/m^3	8.4 ug/L
cis 1,2DCE	Not available	Not available
trans 1,2DCE	70 ug/m^3	290 ug/L

SL_{ia} - acceptable level for indoor air from CLARC based on MTCA C for indoor air (using parameters from WAC 173-340-750)
SL_{gw} - groundwater screening level protective of indoor air (following procedures from Ecology 2009)
Not Available -- The inhalation reference dose for cis 1,2 DCE cited within CLARC was withdrawn in April 2011 and a screening level cannot be calculated

EPA has recently updated the toxicity factors (in IRIS) for some of the CVOCs listed above and the updated toxicity factors are included in the calculations. In addition, EPA and Ecology are reviewing several calculation procedures related to these compounds and the exposure pathways. Based on these factors, the screening level values listed above are not yet approved and subject to change. In addition, as "screening values " they are not intended as cleanup levels but rather as screening thresholds below which no appreciable risk is expected. Actual cleanup levels need to consider additional factors. These screening values are intended to be conservative (based on a vapor attenuation factor for a residential structure, VAF of 0.001, and commercial/industrial exposure based on 24 hours/day, 350 days/year for 30 years as per the MTCA C assumptions).

Under a hypothetical residential-use scenario, the MTCA B screening levels (as applied to indoor vapor and groundwater) for the EMF COCs would be:

	Residential Indoor Air SL_{ia}	Groundwater impacting residential indoor air SL_{gw}
VC	0.28 ug/m^3	0.3 ug/L
TCE	0.37 ug/m^3	1.5 ug/L
cis 1,2DCE	Not available	Not available
trans 1,2DCE	32 ug/m^3	130 ug/L

Similar to the screening levels for an industrial setting, the screening level values listed above are not yet approved and subject to change. As noted above, the source area of the EMF Site meets all the MTCA criteria for an industrial site and the regional airport is expected to remain an industrial setting for the foreseeable future; residential standards in this setting are not recommended (and conflict with the intent of MTCA).

All of the recently measured values for CVOCs at EMF MW-04 (closest to the KCIA Arrivals Building) are lower than the screening levels/procedures in the draft Ecology guidance. Based on the measured site data (from EMF-MW-04) and the conservative screening levels set for protection of indoor air, no appreciable risk is present in this area.

In down-gradient plume areas where structures are present (Boeing Fire station, Boeing Plant 2), the CVOCs in shallow groundwater are non-detect or below screening levels set for protection of an indoor air pathway. Under current conditions and land use, the indoor air pathway is either not complete, or below established MTCA risk thresholds.

Storm Drains

The potential for infiltration of contaminated groundwater into the storm drainage system at the EMF property was identified as a data gap. The ground surface elevation at the EMF property is approximately 13.9 ft (NVGD29). The water table elevation in the winter is approximately 7.1 ft and in the summer is approximately 5.5 ft. Based on the site data the depth to water varies from approximately 6.8 ft bgs (high water table in winter) to approximately 8.4 ft bgs (low water table in summer/fall).

The catch basin and storm drain map provided by KCIA (see Figure 14) indicates the following:

1. On the east side of the EMF property a series of catch basins connect to a drain discharging to the south (through lift stations and ultimately discharging to outfall # 2 located approximately 1,000 ft south of Plant 2). This east side drainage system is at the distal northern end of the drain line (i.e., the highest elevation so that water can drain south to lift stations). A typical invert elevation in this area is approximately 2.5 ft bgs, well above the seasonal groundwater range.
2. On the west side of the EMF property a series of catch basins connect to a drain discharging to the north (through lift stations and ultimately discharging to outfall # 3 located in Slip 4 ft north of Plant 2). This west side drainage system is at the distal southern end of the drain line (i.e., the highest elevation so that water can drain north to lift stations). A typical invert elevation in this area is approximately 3.5 ft bgs, above the seasonal groundwater range.

SAIC/Ecology have sampled the discharge line from the NBF drainage system for VOCs related to the Georgetown Steam Plant/NBF site. The storm drain line from the western half of the EMF property connects to this drainage system. A recent updated data report (Ecology 2011) presents the data from sampling at the lift station (LS431) prior to discharge to Slip 4 in the LDW. All CVOCs (TCE, cis 1,2DCE, trans 1,2DCE and VC) are reported as less than the Method 8260C detection limit (0.2 ug/L) for all seven sampling events. Two sampling events are reported as baseflow events and five added sampling events are reported as storm events. All sampling was completed between February and June 2010.

Based on these site data, migration of CVOCs in the storm drainage system is not a complete pathway.

Stream Channels

The potential for the EMF plume migration to be impacted by stream channels in the Duwamish Valley has been evaluated in prior investigations (e.g., see Landau 1986 and PPC 2002) and the results are summarized in the EMF Historical Data Summary Report (CALIBRE 2008). Four probe sample locations were installed as part of the DGSWP to further investigate this potential effect. The 1897 map of the former natural channels within the Duwamish Valley includes

numerous depth transects/x-sections of the channel throughout the valley and includes more than 20 in the vicinity of the EMF property (see Appendix A of the EMF Historical Data Summary Report, CALIBRE 2008). All natural stream channels will have a depth above the mean sea level (MSL). The typical natural channel depths in this area were in the range of 10 feet bgs with occasional intermittent sections up to a depth of 17 feet bgs. This area of the Duwamish Valley was not filled appreciably with the Duwamish channelization (the railroad track alignment remains the same and the 1897 maps identifies orchards, a school house, and a Clay Works nearby). Areas west of the former channel are described as *"low ground, swamp, and marsh*" which were filled to create the airport.

The depth of identified CVOC concentrations in the four new probe samples was found to be variable but the highest concentrations (~ 120 ug/L CVOCs) were found at approximately 40 ft bgs (generally consistent with the EMF plume) and at an elevation of approximately -27 ft MSL. This elevation is well below the depth of the former stream channels (which must be above MSL for the stream to discharge to surface water). A comparison of the 2000 probe data collected near the center of KCIA with the 2010 probe data are presented in Figures 15 and 16. As seen in Figure 15, CVOC concentrations at the up-gradient probes (EMF-GP-63 and EMF-GP-62) show significant degradation occurring as groundwater moves to the down-gradient probes (EMF-GP-60 and EMF-GP-61). The detection of other VOCs not found in the EMF VOC plume (benzene and 1,2 DCA) indicates that other sources impact groundwater in these areas. Additional transect data (collected downstream to the LDW in 2001 to 2002) identified a well-defined Gaussian shaped plume (e.g., see transects in CALIBRE 2008). These new data do not indicate that the path of the EMF VOC plume is affected (in any significant way) by the former stream channels in the Duwamish Valley.

3.0 SUMMARY OF 7 KEY DQO QUESTIONS AND DATA RELEVANCE

Key Decision #1 – Does the impact of the VOC plume result in concentrations that cause a potential exposure risk exceeding NCP risk standards or Ambient Water Quality Criteria (AWQC) for the COCs at the discharge point?

All monitoring wells and probes near the LDW monitored between October 2010 and February 2011 were below AWQC for all CVOCs (see Table 1 and Table 23). These recent results are consistent with the multiple sampling events conducted over the last several years. The boundary wells have historically remained below AWQC representing stable boundaries of the EMF plume at the LDW. Based on the data described in this report, the present interpretation of the data is that the EMF VOC plume is at levels which do not exceed the applicable AWQC at the discharge point.

Key Decision #2 – Have all sources contributing to the plume been identified; specifically are there other sources/properties with releases that have comingled with the EMF CVOC plume?

The EMF Plume has been reasonably bounded at the EMF property (EMF-MW-4, EMF-MW-12D, EMF-MW-2 and EMF-MW-14D), at the Plant 2 parking lot (PL2-441A/B/C and PL2-608A/B/C), and the LDW (EMF-WF-443A/B/C, EMF-WF-420A/B/C). The northern boundary at the Fire station is established by EMF-WF-25; however the southern boundary (EMF-WF-38) shows an increasing VC concentration over the last 2 years. Ecology records have documented solvent spill sites south of the EMF property on the east side of KCIA. It is not known whether plumes from the other sites have comingled with the EMF plume in this area. In spite of the potential that there may be comingling occurring between the EMF Plume and other sources, the bounding at the source (EMF Property) and discharge (LDW) demonstrates that treatment of any CVOC within the Plume's path will occur prior to discharge.

Key Decision #3 – Are there areas of the EMF CVOC plume in excess of ARARs that are not being addressed by ongoing voluntary remedial actions?

On the EMF property, probe EMF-GP-66 indicates a need for an expanded treatment area near the northern boundary of the plume (Figure 9), with concentrations of TCE at or below 140 ug/L between 25 and 39 feet bgs. Historical injections at the EMF property have been targeted to address CVOCs at depths 35-45 ft bgs. Treatment at shallower depths is needed to address the high remaining concentrations in the shallow zone (e.g., cis 1,2DCE and VC found at EMF-MW-10). Expansion of the ERD injections southward at the Fire station has been implemented to treat the increased VC concentration that has recently appeared at EMF-WF-38.

Key Decision #4 – Have source control actions at the EMF property (or other properties, if applicable) been sufficient to mitigate the risks from plume migration from the source(s)?

Historical remediation measures and more recent ERD injections have produced continuing decreases in the concentrations of CVOCs in the source area (EMF Property). The future risks have not been eliminated but they have been very significantly mitigated (e.g., see data from wells EMF-NV-01, EMF-NV-02, EMF-MW-17, EMF-MW-18, EMF-MW-13D and others. All of these wells show a 99.9+% reduction in CVOCs. The existing measures have reduced, but not eliminated, the potential risk (see discussion of vapor intrusion potential in following Key

Decision # 5, and recommendation for expanded treatment at shallower depths in prior Key Decision # 3). Vapor Intrusion (VI) concerns remain in the source area (if a structure were to be built) and could arise elsewhere in the future if a changed condition caused the deep plume to expand via diffusion (from the main interval of the plume to other areas that presently do not represent VI risk).

Key Decision #5 – Are other specific exposure pathways (indoor air, storm drains, stream channels) complete?

Indoor Air

On the EMF property, no structures exist above the plume and shallow contamination is present (and remains). Near the KCIA Arrivals Building (the closest structure) all measured values of CVOCs (in the shallow zone) are lower than the screening levels proposed by Ecology for protection of indoor air (presently draft and developed using a conservative application of the J&E model) In down-gradient areas (Boeing Fire station, Boeing Plant 2) where structures are present, the CVOCs in shallow groundwater are non-detect or below MTCA screening levels for an indoor air pathway. Under current conditions and land use the indoor air pathway is either not complete or concentrations are at levels below the draft MTCA screening levels for protection of indoor air. A portion of the KCIA Arrivals Building is near the EMF plume. Therefore continued monitoring at EMF-MW-4 is needed to ensure that the shallow source area plume does not cause groundwater concentrations to exceed screening criteria indicating potential concern for vapor intrusion.

Storm drains

Existing data demonstrate no impacts to storm drains.

Stream channels

Existing data demonstrate little (if any) impacts of former stream channels on the VOC plume migration path; the historic stream channels are at an elevation above MSL and the primary EMF plume migration path is at an elevation approximately -27 ft MSL.

Key Decision #6 – If ERD is selected in the subsequent EE/CA, can the existing treatment process selected in the MTCA FS and implemented in the MTCA RA be translated to wider areas of the plume that have not yet been addressed?

The ERD remediation process is well suited for the treatment needs of the EMF Plume. It has been expanded over time to incorporate a greater extent of the existing Plume and performance has been outstanding, leading to 99% reduction in CVOCs in most areas. In relation to other existing technologies, we do not know of a more effective treatment alternative.

Key Decision #7 – Is the current voluntary remedial action mobilizing metals above AWQC?

Water quality monitoring from the ERD pilot test (RCRA 8 metals) indicated no mobilization of metals. Additional sampling for Priority Pollutant Metals confirmed no mobilization of metals. The reporting limits provided by the laboratory in recent sampling have all been below the AWQC (i.e., the non-detect values are also less than the AWQC).

4.0 INTERPRETATION, CONCLUSIONS AND RECOMMENDATIONS

The trends in the historical data along with current conditions suggest the ongoing voluntary remedial actions have been effective and the characterization data are sufficient for the EE/CA objective. The EMF plume has been bounded from the source area to the point of discharge at the LDW.

Current data from wells at the point of discharge and up-gradient Plant 2 locations show all COCs below applicable AWQC. Continued ERD injections are recommended at these locations for maintaining COC concentrations below AWQC before discharging to the LDW.

The south end of the EMF plume at the Boeing Fire station (EMF-WF-38) has shown increases in VC over the past monitoring events. This area has not been treated (by prior and ongoing remedial actions) but has been bounded by the October 2010 probe sampling. It is not clear whether this is part of the EMF plume or commingling from other sources on the east side of the KCIA. Further investigations to trace a possible different source are expected to cost more than expanding the voluntary remedial action (since ERD treatment is already underway at the Fire station area). It is recommended that expanding the remedial action at this area of the Fire station be included in future substrate injection events with a caveat that other parties may be later determined to be responsible for the VOC plume in this area.

The October 2010 probe and February 2011 monitoring data at the EMF property has shown a need for expansion of the current ERD treatment in the area, with an increased focus on the shallow zone. Historical substrate injections to promote ERD at the EMF property have addressed CVOCs at depth 40+ ft bgs. The current data show the remaining CVOCs include contamination in the groundwater above this interval.

The probe sampling on the east side of the KCIA (north end probes EMF-GP-60 and EMF-GP-63) identified CVOC concentrations above applicable AWQC at the 20 and 30 ft bgs samples at EMF-GP-60 and 20, 40 and 50 ft bgs samples at EMF-GP-63. The concentrations detected however are low enough that even without ERD treatment, natural degradation processes (the baseline reductive dechlorination rates observed in the EMF plume) should remove all CVOCs before the discharge point of the LDW.

The northern probe on the east KCIA taxiway, EMF-GP-63, had the highest total CVOC concentration of 121 ug/L (84 ug/L for cis 1,2DCE and 23 ug/L for VC) at 40 ft bgs. The distance from this probe to the point of discharge is approximately 3,300 ft following the flow path of the EMF VOC plume. At a groundwater velocity of approximately 1.2 ft per day, groundwater from this point will take 90 months to reach the point of discharge at the LDW. Using the site-specific half-life of 19 months (which represents baseline conditions before ERD treatment) along with retardation factors of 1.4 for cis 1,2DCE and 1.2 for VC (CALIBRE 2008), the measured concentrations should decrease to less than 1 ug/L for cis 1,2DCE and VC (99% and 98% reductions of the two COCs, respectively) before the exposure point. The detected results will not only undergo significant reductions through natural degradation, but will degrade much faster with ongoing ERD treatment in down-gradient areas. These data indicate that these areas will be below applicable AWQC by the time they reach the point of discharge.

All data presented in this report has been collected and reviewed in accordance with the DGSWP except as otherwise noted. The analytical data from selected samples were rejected due to headspace forming in the samples bottles. One sample location (EMF-GP-75 located

near the LDW) was placed approximately 45 ft south of the initially planned location (as presented in the DGSWP). This sampling transect is approximately 3,300 ft down gradient of the EMF source area and this specific probe (EMF-GP-75) was installed to establish the depth interval for the well which was planned in the area (EMF-WF-41). The monitoring well EMF-WF-41 was installed in the planned location identified in the DGSWP. The present monitoring well network includes a large number of wells, particularly at the LDW, and the data has been determined to be sufficient and useable in characterizing the EMF plume. The current recommendation is to move on to the next project phase which will consist of preparing the EE/CA with subsequent decision by EPA on removal action(s).

5.0 REFERENCES

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Tables

Table 1. EMF Wells Near Lower Duwamish Waterway

SiteID	SampleDate	Units	TCE		cis-1,2-DCE		trans-1,2-DCE		VC		Toluene		Notes
PL2-443A	30-Jan-09	ug/l	< 0.2	U	0.6		< 0.2	U	0.4		< 0.2	U	
	06-Aug-09	ug/l	< 0.2	U	0.5		< 0.2	U	< 0.2	U	< 0.2	U	
	11-Feb-10	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	
	09-Aug-10	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	
	02-Feb-11	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	0.2		
PL2-443B	30-Jan-09	ug/l	< 0.2	U	0.2		< 0.2	U	< 0.2	U	< 0.2	U	
	06-Aug-09	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	
	11-Feb-10	ug/l	< 0.2	U	0.2		< 0.2	U	< 0.2	U	< 0.2	U	
	09-Aug-10	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	0.2		< 0.2	U	
	02-Feb-11	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	0.2		< 0.2	U	
PL2-443C	30-Jan-09	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	
	06-Aug-09	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	
	11-Feb-10	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	
	09-Aug-10	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	
	02-Feb-11	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	
PL2-444A	11-Feb-10	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	
	09-Aug-10	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	
	07-Feb-11	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	
PL2-442A	30-Jan-09	ug/l	< 0.2	U	0.4		< 0.2	U	< 0.2	U	< 0.2	U	
	05-Aug-09	ug/l	< 0.2	U	0.3		< 0.2	U	< 0.2	U	2		
	15-Feb-10	ug/l	< 0.2	U	0.2		< 0.2	U	< 0.2	U	< 0.2	U	
	10-Aug-10	ug/l	< 0.2	U	0.3		< 0.2	U	< 0.2	U	< 0.2	U	
PL2-442B	30-Jan-09	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	
	05-Aug-09	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	0.2		0.2		
	03-Feb-10	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	
	10-Aug-10	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	0.3		< 0.2	U	
PL2-442C	30-Jan-09	ug/l	< 0.2	U	0.6		< 0.2	U	< 0.2	U	< 0.2	U	
	05-Aug-09	ug/l	< 0.2	U	0.6		< 0.2	U	< 0.2	U	< 0.2	U	
	15-Feb-10	ug/l	< 0.2	U	0.5		< 0.2	U	< 0.2	U	< 0.2	U	
	10-Aug-10	ug/l	< 0.2	U	0.6		< 0.2	U	< 0.2	U	< 0.2	U	
PL2-420A	30-Jan-09	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	0.3		< 0.2	U	
	06-Aug-09	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	0.3		< 0.2	U	
	11-Feb-10	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	0.4		< 0.2	U	
	09-Aug-10	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	0.8		< 0.2	U	
	02-Feb-11	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	0.6		< 0.2	U	
PL2-420B	30-Jan-09	ug/l	< 0.2	U	0.5		< 0.2	U	< 0.2	U	< 0.2	U	
	06-Aug-09	ug/l	< 0.2	U	0.3		< 0.2	U	0.3		< 0.2	U	
	11-Feb-10	ug/l	< 0.2	U	0.4		< 0.2	U	< 0.2	U	< 0.2	U	
	09-Aug-10	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	0.5		< 0.2	U	
	19-Aug-10	ug/l	< 0.2	U	0.4		< 0.2	U	< 0.2	U	< 0.2	U	
	02-Feb-11	ug/l	< 0.2	U	0.3		< 0.2	U	0.4		0.3		
PL2-420C	30-Jan-09	ug/l	< 0.2	U	0.9		< 0.2	U	< 0.2	U	< 0.2	U	
	06-Aug-09	ug/l	< 0.2	U	0.8		< 0.2	U	< 0.2	U	< 0.2	U	
	11-Feb-10	ug/l	< 0.2	U	0.8		< 0.2	U	< 0.2	U	< 0.2	U	
	09-Aug-10	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	
	02-Feb-11	ug/l	< 0.2	U	0.7		< 0.2	U	< 0.2	U	< 0.2	U	Chlorethane = 0.2 ug/L
EMF-WF-32	24-Jan-07	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	1				
	26-Jul-07	ug/l	< 1.0	U	< 1.0	U	< 1.0	U	< 1.0	U	< 1.0	U	
	30-Jan-08	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	0.8		< 0.2	U	
	02-Jul-08	ug/l	< 1.0	U	< 1.0	U	< 1.0	U	< 1.0	U	< 1.0	U	
	09-Feb-09	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	0.6		< 0.2	U	
	05-Aug-09	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	0.4		< 0.2	U	
	04-Feb-10	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	0.7		< 0.2	U	
	04-Feb-10	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	0.6		< 0.2	U	Duplicate
	09-Aug-10	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	0.7		< 0.2	U	
	09-Aug-10	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	0.6		< 0.2	U	Duplicate
	07-Feb-11	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	0.4		< 0.2	U	Acetone = 5.5 ug/L
	07-Feb-11	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	0.4		< 0.2	U	Duplicate, Acetone = 7.4 ug/L

Table 1. EMF Wells Near Lower Duwamish Waterway

SiteID	SampleDate	Units	TCE		cis-1,2-DCE		trans-1,2-DCE		VC		Toluene		Notes
EMF-WF-41	30-Nov-10	ug/l	< 0.2	U	31		< 0.2	U	1.1		< 0.2	U	
	07-Feb-11	ug/l	< 0.2	U	29		< 0.2	U	< 0.2	U	0.6		
EMF-WF-40	30-Nov-10	ug/l	< 0.2	U	0.2		< 0.2	U	0.3		< 0.2	U	
	07-Feb-11	ug/l	< 0.2	U	0.2		< 0.2	U	0.3		0.7		
EMF-WF-39	30-Nov-10	ug/l	0.6		3.6		0.8		0.2	U	< 0.2	U	
	07-Feb-11	ug/l	0.4		3.3		0.8		<0.2	U	<0.2	U	

Metals	SampleDate	Units	Parameter	Result		Total/Dissolved
EMF-WF-41	30-Nov-10	ug/l	Aluminum	6,250		T
	30-Nov-10	ug/l		< 250	U	D
	30-Nov-10	ug/l	Antimony	< 2	U	T
	30-Nov-10	ug/l		< 2	U	D
	30-Nov-10	ug/l	Arsenic	4		T
	30-Nov-10	ug/l		< 2	U	D
	30-Nov-10	ug/l	Barium	329		T
	30-Nov-10	ug/l		320		D
	30-Nov-10	ug/l	Beryllium	< 1	U	T
	30-Nov-10	ug/l		< 1	U	D
	30-Nov-10	ug/l	Cadmium	< 4	U	T
	30-Nov-10	ug/l		< 10	U	D
	30-Nov-10	ug/l	Calcium	430,000		T
	30-Nov-10	ug/l		452,000		D
	30-Nov-10	ug/l	Chromium	< 10	U	T
	30-Nov-10	ug/l		< 20	U	D
	30-Nov-10	ug/l	Cobalt	6		T
	30-Nov-10	ug/l		< 20	U	D
	30-Nov-10	ug/l	Copper	17		T
	30-Nov-10	ug/l		16		D
	30-Nov-10	ug/l	Iron	53,600		T
	30-Nov-10	ug/l		47,900		D
	30-Nov-10	ug/l	Lead	< 5	U	T
	30-Nov-10	ug/l		< 5	U	D
	30-Nov-10	ug/l	Magnesium	975,000		T
	30-Nov-10	ug/l		1,010,000		D
	30-Nov-10	ug/l	Manganese	4,340		T
	30-Nov-10	ug/l		4,720		D
	30-Nov-10	ug/l	Nickel	18		T
	30-Nov-10	ug/l		16		D
	30-Nov-10	ug/l	Potassium	205,000		T
	30-Nov-10	ug/l		207,000		D
	30-Nov-10	ug/l	Selenium	< 100	U	T
	30-Nov-10	ug/l		< 250	U	D
	30-Nov-10	ug/l	Silver	< 2	U	T
	30-Nov-10	ug/l		< 2	U	D
	30-Nov-10	ug/l	Sodium	8,530,000		T
	30-Nov-10	ug/l		8,680,000		D
	30-Nov-10	ug/l	Thallium	< 1	U	T
	30-Nov-10	ug/l		< 1	U	D
	30-Nov-10	ug/l	Vanadium	17		T
	30-Nov-10	ug/l		< 20	U	D
	30-Nov-10	ug/l	Zinc	< 20	U	T
	30-Nov-10	ug/l		40		D

Qualifiers:

U Non Detect

Table 2. EMF 2-40 and 2-41 Building Sampling

SiteID	SampleDate	Units	TCE		cis-1,2-DCE		trans-1,2-DCE		VC		Toluene		Notes
Injection Wells													
EMF-IW-38	01-Feb-09	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	0.4		< 0.2		2-41 Bldg
	04-Feb-10	ug/l	< 10	U	< 10	U	< 10	U	< 10	U	1,800		
	10-Aug-10	ug/l	< 4.0	U	< 4.0	U	< 4.0	U	< 4.0	U	570	J	
	07-Feb-11	ug/l	< 2.0	U	< 2.0	U	< 2.0	U	< 2.0	U	70		Substrate injections at this well two weeks prior to sampling. Styrene = 6.5 ug/L, 4-Isopropyltoluene = 17 ug/L, Acetone = 53 ug/L, 2-Butanone = 580 ug/L
EMF-IW-07	24-Jan-07	ug/l	< 1.0	U	1.4				4.7				2-40 Bldg
	25-Jul-07	ug/l	< 1.0	U	< 1.0	U	< 1.0	U	1.3		170		Purge water was purple in color with effervescence which led to sample collection in unpreserved VOA bottles. Chloroform = 9.5 ug/L, 4-Isopropyltoluene = 27 ug/L, 2-Butanone = 190 ug/L
	30-Jan-08	ug/l	< 1.0	U	2.7		< 1.0	U	4.7		970		
	02-Jul-08	ug/l	< 3.0	U	< 3.0	U	< 3.0	U	< 3.0	U	230		
	04-Feb-10	ug/l	< 10	U	< 10	U	< 10	U	< 10	U	1,600		
	07-Feb-11	ug/l	< 2.0	U	< 2.0	U	< 2.0	U	< 2.0	U	7.5		
EMF-IW-40	01-Feb-09	ug/l	< 0.2	U	0.5		< 0.2	U	11		< 0.2	U	2-40 Bldg
	07-Feb-11	ug/l	< 2.0	U	< 2.0	U	< 2.0	U	< 2.0	U	5.3		4-Isopropyltoluene = 6.5 ug/L, Chloroform = 9.1 ug/L, Acetone = 71 ug/L
Monitoring Wells													
EMF-WF-31	24-Jan-07	ug/l	< 20	U	27		27		2,400				2-40 Bldg
	24-Jan-07	ug/l	< 20	U	< 20	U			2,400				Duplicate
	25-Jul-07	ug/l	< 10	U	< 10	U	< 10	U	1,400		< 10	U	
	30-Jan-08	ug/l	< 10	U	< 10	U	< 10	U	1,100		< 10	U	
	02-Jul-08	ug/l	< 3.0	U	< 3.0	U	< 3.0	U	320		< 3.0	U	
	09-Feb-09	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	30		< 0.2	U	
	09-Feb-09	ug/l	< 0.2	U	< 0.2	U	0.3		28		< 0.2	U	Duplicate
	05-Aug-09	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	5.0		< 0.2	U	
	05-Aug-09	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	4.6		< 0.2	U	Duplicate
	04-Feb-10	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	2.2		< 0.2	U	
	10-Aug-10	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	1.3	J	< 0.2	U	
	10-Aug-10	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	1.3	J	< 0.2	U	Duplicate
	07-Feb-11	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	1		< 0.2	U	Acetone = 7.2 ug/L
EMF-WF-33	24-Jan-07	ug/l	< 5.0	U	71.8				170				2-40 Bldg
	25-Jul-07	ug/l	< 5.0	U	< 5.0	U	< 5.0	U	< 5.0	U	310		
	30-Jan-08	ug/l	< 1.0	U	4.1		1.8		110		8.2		
	02-Jul-08	ug/l	< 1.0	U	< 1.0	U	1.2		5.2		200		
	09-Feb-09	ug/l	< 0.2	U	< 0.2	U	0.2		< 0.2	U	0.4		
	05-Aug-09	ug/l	< 0.2	U	0.4		0.4		49		3.8		
	04-Feb-10	ug/l	< 0.2	U	0.2		0.5		17		1.2		
	07-Feb-11	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	5.5		< 0.2	U	PDB deployed one year before sampling

Qualifiers:

U Non Detect

J Estimated value

Table 3 A-level VOC Data2-40 Parking Lot

SiteID	SampleDate	Units	TCE		cis-1,2-DCE		trans-1,2-DCE		VC		Toluene		Notes
PL2-440A	20-Oct-94	ug/L	<1	U	<1	U	<1	U	0.05		<1	U	
	04-Aug-95	ug/L	<1	U	<1	U	<1	U	0.03		<1	U	
	24-Jul-08	ug/L	0.2		< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	
	12-Feb-10	ug/L	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	
PL2-441A	21-Jul-08	ug/L	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	
	29-Jan-09	ug/L	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	
	12-Feb-10	ug/L	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	
PL2-608A	11-Aug-08	ug/L	<0.2	U	<0.2	U	<0.2	U	<0.2	U	<0.2	U	
	29-Jan-09	ug/L	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	
	29-Jan-09	ug/L	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	Duplicate
	15-Feb-10	ug/L	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	
PL2-BF03a	12-Feb-10	ug/L	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	

Qualifiers:

U Non Detect

Table 4 B-level VOC Data2-40 Parking Lot

SiteID	SampleDate	Units	TCE		cis-1,2-DCE		trans-1,2-DCE		VC		Toluene		Notes
Injection Wells													
EMF-IW-44	01-Feb-09	ug/L	< 1.0	U	11		38		1,600		< 1.0	U	
	04-Aug-09	ug/L	< 0.2	U	0.2		33		2.3		83		For the Febr 2011 sampling, substrate injections occurred at this well two weeks prior to sampling. Sampled water had effervescence and no surface tension which led to collecting unpreserved VOA bottles. 4-Isopropyltoluene = 17 ug/L
	04-Feb-10	ug/L	1.4	J	1.2	J	20	J	180	J	30	J	
	08-Feb-11	ug/L	< 2.0	U	< 2.0	U	12		140		13		
Monitoring Wells													
EMF-WF-36	24-Jan-07	ug/L	< 5.0	U	< 5.0	U	5.6		260				
	25-Jul-07	ug/L	< 20	U	< 20	U	< 20	U	1,500		< 20	U	
	29-Jan-08	ug/L	< 3.0	U	< 3.0	U	< 3.0	U	240		< 3.0	U	
	02-Jul-08	ug/L	< 1.0	U	< 1.0	U	< 1.0	U	140		< 1.0	U	
	09-Feb-09	ug/L	< 0.2	U	< 0.2	U	< 0.2	U	14		< 0.2	U	
	4-Aug-09	ug/L	< 0.2	U	< 0.2	U	< 0.2	U	8.3		< 0.2	U	
	4-Aug-09	ug/L	< 0.2	U	< 0.2	U	< 0.2	U	8.4		< 0.2	U	Duplicate sample
	4-Feb-10	ug/L	< 0.2	U	< 0.2	U	< 0.2	U	4.6		< 0.2	U	
	11-Aug-10	ug/L	< 0.2	U	< 0.2	U	< 0.2	U	0.4		< 0.2	U	
	08-Feb-11	ug/L	< 0.2	U	< 0.2	U	< 0.2	U	0.6		< 0.2	U	Acetone = 11 ug/L
PL2-440B	1-Feb-10	ug/L	< 0.2	U	< 0.2	U	< 0.2	U	0.4		< 0.2	U	
	1-Feb-10	ug/L	< 0.2	U	< 0.2	U	< 0.2	U	0.4		< 0.2	U	Duplicate sample
	11-Aug-10	ug/L	< 0.2	U	< 0.2	U	< 0.2	U	0.6	J	< 0.2	U	
	8-Feb-11	ug/L	< 0.2	U	< 0.2	U	< 0.2	U	0.4		< 0.2	U	
PL2-441B	29-Jan-09	ug/L	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	
	4-Aug-09	ug/L	< 0.2	U	< 0.2	U	< 0.2	U	0.2		< 0.2	U	
	12-Feb-10	ug/L	< 0.2	U	< 0.2	U	< 0.2	U	0.3	U	< 0.2	U	
	11-Aug-10	ug/L	< 0.2	U	< 0.2	U	< 0.2	U	0.2	J	< 0.2	U	
	08-Feb-11	ug/L	< 0.2	U	< 0.2	U	< 0.2	U	0.2		< 0.2	U	
PL2-608B	29-Jan-09	ug/L	< 0.2	U	< 0.2	U	< 0.2	U	1.6		< 0.2	U	
	4-Aug-09	ug/L	< 0.2	U	< 0.2	U	< 0.2	U	1.1		< 0.2	U	
	15-Feb-10	ug/L	< 0.2	U	< 0.2	U	< 0.2	U	0.8		< 0.2	U	
	11-Aug-10	ug/L	< 0.2	U	< 0.2	U	< 0.2	U	0.4	J	< 0.2	U	
	08-Feb-11	ug/L	< 0.2	U	< 0.2	U	< 0.2	U	0.2	U	< 0.2	U	
EMF-WF-30	24-Jan-07	ug/L	< 10	U	18		< 10	U	120				
	25-Jul-07	ug/L	< 1.0	U	1.7		2.5		34		< 1.0	U	
	29-Jan-08	ug/L	0.2		4.2		1.4		17		< 0.2	U	
	02-Jul-08	ug/L	< 1.0	U	< 1.0	U	< 1.0	U	8.5		< 1.0	U	
	9-Feb-09	ug/L	< 0.2	U	0.6		0.8		15		2.8		
	4-Aug-09	ug/L	< 0.2	U	0.8		1.4		17		3.7		
	4-Feb-10	ug/L	< 0.2	U	0.3		0.5		3.8		0.3		
	11-Aug-10	ug/L	< 0.2	U	0.2		< 0.2	U	1.2		< 0.2	U	
	08-Feb-11	ug/L	< 0.2	U	0.2		< 0.2	U	0.7		< 0.2	U	Acetone = 5.3 ug/L
	08-Feb-11	ug/L	< 0.2	U	0.3		< 0.2	U	0.7		< 0.2	U	Duplicate Sample , Acetone = 6.3 ug/L

Qualifiers:

U Non Detect

J Estimated value

Table 5 C-level VOC Data2-40 Parking Lot

SiteID	SampleDate	Units	TCE		cis-1,2-DCE		trans-1,2-DCE		VC		Toluene		Notes
PL2-440C	12-Aug-08	ug/L	<0.2	U	<0.2	U	<0.2	U	<0.2	U	<0.2	U	
	29-Jan-09	ug/L	<0.2	U	<0.2	U	<0.2	U	<0.2	U	<0.2	U	
	12-Feb-10	ug/L	<0.2	U	<0.2	U	<0.2	U	<0.2	U	<0.2	U	
	08-Feb-11	ug/L	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	Naphthalene = 1 ug/L
PL2-441C	11-Aug-08	ug/L	<0.2	U	<0.2	U	<0.2	U	<0.2	U	<0.2	U	
	29-Jan-09	ug/L	<0.2	U	<0.2	U	<0.2	U	<0.2	U	<0.2	U	
	12-Feb-10	ug/L	<0.2	U	<0.2	U	<0.2	U	<0.2	U	<0.2	U	
	08-Feb-11	ug/L	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	Carbon Disulfide = 0.3 ug/L
PL2-608C	11-Aug-08	ug/L	<0.2	U	<0.2	U	<0.2	U	<0.2	U	<0.2	U	
	29-Jan-09	ug/L	<0.2	U	<0.2	U	<0.2	U	<0.2	U	<0.2	U	
	15-Feb-10	ug/L	<0.2	U	<0.2	U	<0.2	U	<0.2	U	<0.2	U	
	08-Feb-11	ug/L	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	

Qualifiers:

U Non Detect

Table 6 Fire Station VOC Data

SiteID	SampleDate	Units	TCE		cis-1,2-DCE		trans-1,2-DCE		VC		Toluene		Notes
Injection Wells													
EMF-WF-26	24-Jul-07	ug/L	< 3.0	U	< 3.0	U	< 3.0	U	220		< 3.0	U	
	29-Jan-08	ug/L	< 1.0	U	7.3		< 1.0	U	130		36		
	15-Apr-08	ug/L	< 3.0	U	< 3.0	U	< 3.0	U	290		75		
	01-Jul-08	ug/L	< 1.0	U	6.2		< 1.0	U	6.6		1,400		
	09-Feb-09	ug/L	0.2		6.4		0.6		16		380		
	04-Aug-09	ug/L	< 1.0	U	7.4		< 1.0	U	150		8,300		
	05-Feb-10	ug/L	< 4.0	U	< 4.0	U	< 4.0	U	< 4.0	U	790		
	11-Aug-10	ug/L	< 4.0	U	4.4		< 4.0	U	< 4.0	U	4,000		
	09-Feb-11	ug/L	< 0.2	UJ	3.8	J	0.5	J	2.6	J	130	J	Ethylbenzene = 0.3 ug/L, 4-Isopropyltoluene = 3.1 ug/L, Acetone = 8.4 ug/L
EMF-WF-27	24-Jan-07	ug/L	< 15	U	270		58		950				
	24-Jul-07	ug/L	< 10	U	170		46		1,400		< 10	U	
	29-Jan-08	ug/L	< 10	U	71		15		380		2,000		
	15-Apr-08	ug/L	< 5.0	U	< 5.0	U	9.9		640		390		
	01-Jul-08	ug/L	< 5.0	U	< 5.0	U	8.5		600		230		
	09-Feb-09	ug/L	< 0.2	U	19		14		1,000		320		
	04-Aug-09	ug/L	< 4.0	U	9.2		6.0		270		10,000		
	05-Feb-10	ug/L	< 30	UJ	< 30	UJ	< 30	UJ	320	J	3,400	J	
	11-Aug-10	ug/L	< 0.2	U	1.3		3.4		240		110		
	09-Feb-11	ug/L	< 0.2	UJ	0.3	J	2.2	J	270	J	3.5	J	Acetone = 7.8 ug/L, 4-Isopropyltoluene = 16 ug/L
EMF-IW-36	05-Feb-10	ug/L	< 10	U	< 10	U	< 10	U	< 10	U	< 10	U	
	08-Feb-11	ug/L	< 0.2	U	< 0.2	U	0.2		< 0.2	U	0.6		
Monitoring Wells													
EMF-WF-25	24-Jan-07	ug/L	< 0.2	U	< 0.2	U	< 0.2	U	1.4				
	24-Jul-07	ug/L	< 1.0	U	< 1.0	U	< 1.0	U	1.6		< 1.0	U	
	29-Jan-08	ug/L	< 0.2	U	< 0.2	U	< 0.2	U	2.7		< 0.2	U	
	01-Jul-08	ug/L	< 1.0	U	< 1.0	U	< 1.0	U	1.8		< 1.0	U	
	09-Feb-09	ug/L	< 0.2	U	< 0.2	U	< 0.2	U	2.4		< 0.2	U	
	04-Aug-09	ug/L	< 0.2	U	< 0.2	U	< 0.2	U	1.7		< 0.2	U	
	05-Feb-10	ug/L	< 0.2	U	< 0.2	U	< 0.2	U	1.7		< 0.2	U	
	11-Aug-10	ug/L	< 0.2	U	< 0.2	U	< 0.2	U	1.3		< 0.2	U	
	08-Feb-11	ug/L	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	Methylene Chloride = 1.6 ug/L
EMF-WF-29	24-Jul-07	ug/L	< 20	U	< 20	U	< 20	U	1,500		< 20	U	
	29-Jan-08	ug/L	< 10	U	< 10	U	< 10	U	1,600		< 10	U	
	01-Jul-08	ug/L	< 10	U	< 10	U	< 10	U	970		< 10	U	
	01-Jul-08	ug/L	< 10	U	< 10	U	< 10	U	1,200		< 10	U	Duplicate sample
	09-Feb-09	ug/L	< 0.2	U	0.6		< 0.2	U	770		0.2		
	04-Aug-09	ug/L	< 1.0	U	< 1.0	U	< 1.0	U	220		< 1.0	U	
	05-Feb-10	ug/L	< 0.2	U	0.2		< 0.2	U	53		< 0.2	U	
	11-Aug-10	ug/L	< 0.2	U	< 0.2	U	< 0.2	U	8.6		< 0.2	U	
	11-Aug-10	ug/L	< 0.2	U	< 0.2	U	< 0.2	U	6.5		< 0.2	U	Duplicate sample
	09-Feb-11	ug/L	< 0.2	UJ	0.2	J	< 0.2	UJ	7.0	J	< 0.2	UJ	
	09-Feb-11	ug/L	< 0.2	UJ	< 0.2	UJ	< 0.2	UJ	5.4	J	< 0.2	UJ	Duplicate sample
EMF-WF-37	26-Jul-07	ug/L	< 1.0	U	< 1.0	U	< 1.0	U	< 1.0	U	< 1.0	U	
	29-Jan-08	ug/L	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	This is a deeper well establishing the base of the EMF VOC plume
	01-Jul-08	ug/L	< 1.0	U	< 1.0	U	< 1.0	U	< 1.0	U	< 1.0	U	
	05-Feb-10	ug/L	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	0.2		
EMF-WF-38	26-Jul-07	ug/L	< 1.0	U	< 1.0	U	< 1.0	U	< 1.0	U	< 1.0	U	
	29-Jan-08	ug/L	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	
	01-Jul-08	ug/L	< 1.0	U	< 1.0	U	< 1.0	U	< 1.0	U	< 1.0	U	
	09-Feb-09	ug/L	< 0.2	U	< 0.2	U	< 0.2	U	1.5		< 0.2	U	

Table 6 Fire Station VOC Data

SiteID	SampleDate	Units	TCE		cis-1,2-DCE		trans-1,2-DCE		VC		Toluene		Notes
	04-Aug-09	ug/L	< 0.2	U	< 0.2	U	< 0.2	U	51		< 0.2	U	
	05-Feb-10	ug/L	< 0.2	U	< 0.2	U	< 0.2	U	73		< 0.2	U	
	11-Aug-10	ug/L	< 0.6	U	< 0.6	U	< 0.6	U	72		< 0.6	U	
	08-Feb-11	ug/L	< 0.2	U	0.5		< 0.2	U	190		< 0.2	U	

Qualifiers:

U Non Detect
J Estimated value
UJ Estimated detection limit

Table 7. EMF Source Area Sampling and Boundary Wells

SiteID	SampleDate	Units	TCE		cis-1,2-DCE		trans-1,2-DCE		vinyl chloride		Toluene		Notes
EMF-NV-01	03-Aug-09	ug/l	570		30		< 4.0	U	< 4.0	U	< 4.0	U	
November 2009 substrate Injection													This well used for substrate injection
	02-Feb-10	ug/l	830		650		< 4.0	U	< 4.0	U	< 4.0	U	
	19-May-10	ug/l	510		240		< 4.0	U	7		< 4.0	U	
	12-Aug-10	ug/l	590		130		< 4.0	U	9		< 4.0	U	
	10-Feb-11	ug/l	850		51		< 4.0	U	7.8		< 4.0	U	
EMF-NV-02	03-Aug-09	ug/l	4,200	J	1,100	J	87	J	240	J	< 4.0	U	
November 2009 substrate Injection													This well used for substrate injection
	02-Feb-10	ug/l	3,600		340		21		160		< 20	U	
	19-May-10	ug/l	3,100		440		< 20	U	30		< 20	U	
	12-Aug-10	ug/l	1,900	J	4,300	J	< 20	U	120	J	< 20	U	
	10-Feb-11	ug/l	3.7		190		< 3.0	U	160		< 3.0	U	
EMF-IW-20	03-Aug-09	ug/l											Not Sampled
November 2009 substrate Injection													This well used for substrate injection
	02-Feb-10	ug/l	< 0.2	UJ	14	J	4.7	J	8.9	J	0.7	J	
	19-May-10	ug/l	< 0.2	U	1.3		2.9		1.6		0.6		
	12-Aug-10	ug/l	< 0.2	U	1.1		2.7		1.3		0.7		
	09-Feb-11	ug/l	< 0.2	UJ	0.5	J	1.4	J	0.7	J	0.8	J	4-Isopropyltoluene = 0.3 ug/L, Acetone = 18 ug/L
EMF-MW-17	24-Jan-07	ug/l	58		500		110		98				
	10-Feb-09	ug/l	< 0.2	U	1.0		10		3.9		5.6		
	03-Aug-09	ug/l	< 0.2	U	0.8		3.2		1.4		2.2		
November 2009 substrate Injection													This well used for substrate injection
	01-Feb-10	ug/l	< 0.2	U	0.8		3.9		1.5		4.3		
	19-May-10	ug/l	0.5		0.7		4.3		2.6		3.4		
	12-Aug-10	ug/l	0.9		0.9		3.5		3.3		3.1		
	09-Feb-11	ug/l	4	J	2.2	J	8.5	J	11	J	3.2	J	1,1-Dichloroethene = 0.2 ug/L, Ethylbenzene = 0.5 ug/L, o-Xylene = 0.7 ug/L, 4-Isopropyltoluene = 0.8 ug/L, m,p-Xylene = 1 ug/L, Chloroethane = 2.5 ug/L, Acetone = 9.2 ug/L
EMF-MW-10	24-Jan-07	ug/l	600		2,600		110		320				
	03-Aug-09	ug/l	340		2,100		96		140		< 10	U	
	03-Aug-09	ug/l	260		2,000		71		100		< 4.0	U	Duplicate
November 2009 substrate Injection													
	02-Feb-10	ug/l	340		2,000		76		130		< 10	U	
	02-Feb-10	ug/l	320		1,800		66		110		< 10	U	Duplicate
	19-May-10	ug/l	< 10	U	3,700		62		120		< 10	U	
	12-Aug-10	ug/l	< 20	U	2,200		51		800		< 20	U	
	09-Feb-11	ug/l	0.5		830	J	21		900	J	< 0.2	U	1,1-Dichloroethene = 1.7 ug/L, Acetone = 18 ug/L
EMF-IW-27	03-Aug-09	ug/l	< 0.2	U	14		7		8.1		0.6		
November 2009 substrate Injection													This well used for substrate injection
	02-Feb-10	ug/l	< 0.2	U	15		3.6		9.8		0.3		
	19-May-10	ug/l	0.3		79		3.8		13		< 2.0	U	
	12-Aug-10	ug/l	0.3		51		3		8.5		< 0.2	U	
	09-Feb-11	ug/l	0.5	J	110	J	3.9	J	29	J	< 0.2	UJ	Acetone = 6.9 ug/L
EMF-MW-04	01-Jul-08	ug/l	< 1.0	U	< 1.0	U	< 1.0	U	< 1.0	U	< 1.0	U	Monitoring well only (no substrate injection)
Northern Boundary Shallow	03-Aug-09	ug/l											Not Sampled
	09-Feb-11	ug/l	< 0.2	U	3.9		0.2		0.8		< 0.2	U	PDB deployed in 2008, in place for 2.5 yrs
EMF-MW-12D	28-Jan-08	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	Monitoring well only (no substrate injection)
Northern Boundary Deep	01-Jul-08	ug/l	< 1.0	U	< 1.0	U	< 1.0	U	< 1.0	U	< 1.0	U	
	03-Aug-09	ug/l											Not Sampled
	09-Feb-11	ug/l	< 0.2	R	< 0.2	R	< 0.2	R	< 0.2	R	< 0.2	R	R flagged due to headspace; PDB deployed one year before sampling
EMF-MW-02	28-Jan-08	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	Monitoring well only (no substrate injection)
Southern Boundary Shallow	01-Jul-08	ug/l	< 1.0	U	< 1.0	U	< 1.0	U	< 1.0	U	< 1.0	U	
	03-Aug-09	ug/l											Not Sampled
	01-Feb-10	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	
	09-Feb-11	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	

Table 7. EMF Source Area Sampling and Boundary Wells

SiteID	SampleDate	Units	TCE		cis-1,2-DCE		trans-1,2-DCE		vinyl chloride		Toluene		Notes
EMF-MW-14D	28-Jan-08	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	Monitoring well only (no substrate injection)
Southern Boundary Deep	01-Jul-08	ug/l	< 1.0	U	< 1.0	U	< 1.0	U	< 1.0	U	< 1.0	U	
	03-Aug-09	ug/l											Not Sampled
	01-Feb-10	ug/l	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	< 0.2	U	
	09-Feb-11	ug/l	< 0.2	R	< 0.2	R	< 0.2	R	< 0.2	R	< 0.2	R	R flagged due to headspace; PDB deployed one year before sampling
EMF-MW-11S-U	03-Aug-09	ug/l	< 0.2	U	5.8		3.3		6.2		< 0.2	U	Monitoring well only (no substrate injection)
November 2009 substrate Injection													
	01-Feb-10	ug/l	< 0.2	U	2,000		130		230		< 0.2	U	
	19-May-10	ug/l	< 0.6	U	130		7		10		< 0.6	U	
	12-Aug-10	ug/l	< 0.2	U	16		1.6		6.6		< 0.2	U	
	09-Feb-11	ug/l	< 0.2	U	1,000		54		140		< 0.2	U	1,1-Dichloroethene = 3.6 ug/L, Acetone = 11 ug/L
EMF-MW-11S-L	03-Aug-09	ug/l	< 20	U	5,700		390		760		< 20	U	Monitoring well only (no substrate injection)
November 2009 substrate Injection													
	01-Feb-10	ug/l	< 20	U	2,600		180		260		< 20	U	
	19-May-10	ug/l	< 20	U	5,400		360		600		< 20	U	
	12-Aug-10	ug/l	< 20	U	2,000		200		630		< 20	U	
	09-Feb-11	ug/l	< 0.2	UJ	1,300		74		200		< 0.2	UJ	1,1-Dichloroethene = 4.5 ug/L
EMF-MW-11D	03-Aug-09	ug/l	< 4.0	U	740		320		1,000		< 4.0	U	Monitoring well only (no substrate injection)
November 2009 substrate Injection													
	01-Feb-10	ug/l	0.4		400		100		150		0.2		
	19-May-10	ug/l	< 10	U	2,800		670		1,800		< 10	U	
	12-Aug-10	ug/l	< 4.0	U	980		210		660		< 4.0	U	
	09-Feb-11	ug/l	0.7	J	1,500	J	420	J	880	J	0.2	J	1,1-Dichloroethene = 4.2 ug/L, Acetone = 7.4 ug/L
EMF-MW-13D	03-Aug-09	ug/l	< 2.0	U	14		66		260		< 2.0	U	Monitoring well only (no substrate injection)
November 2009 substrate Injection													
	01-Feb-10	ug/l	2	Q	68		65		340		< 2.0	U	
	19-May-10	ug/l	1.8		38		35		180		< 1.0	U	
	12-Aug-10	ug/l	< 1.0	U	9.7		39		120		< 1.0	U	
	09-Feb-11	ug/l	0.9	J	6.7	J	47	J	130	J	< 0.2	UJ	1,1,2-Trichloroethane = 0.9 ug/L, Acetone = 6.5 ug/L

Qualifiers:

U Non Detect

J Estimated value

UJ Estimated detection limit

Q Indicates a detected analyte with an initial or continuing calibration that does not meet established acceptance criteria (<20%RSD, <20%Drift or minimum RRF).

R Rejected/Unusable

Table 8 EMF-GP-60Taxiway on East KCIA 20-50 ft bgs, Northern Boundary

VOCs

Sample Date	Sample Location/depth	Parameter	Units	Result	Reporting Limit	Qualifier	Method
18-Oct-10	EMF-GP60-20	Trichloroethene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP60-20	cis-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP60-20	trans-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP60-20	Vinyl Chloride	ug/L	35	0.2		SW8260C
18-Oct-10	EMF-GP60-20	Benzene	ug/L	0.5	0.2		SW8260C
18-Oct-10	EMF-GP60-20	Toluene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP60-30	Trichloroethene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP60-30	cis-1,2-Dichloroethene	ug/L	18	0.2		SW8260C
18-Oct-10	EMF-GP60-30	trans-1,2-Dichloroethene	ug/L	0.6	0.2		SW8260C
18-Oct-10	EMF-GP60-30	Vinyl Chloride	ug/L	9.7	0.2		SW8260C
18-Oct-10	EMF-GP60-30	Benzene	ug/L	0.4	0.2		SW8260C
18-Oct-10	EMF-GP60-30	Toluene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP60-40	Trichloroethene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP60-40	cis-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP60-40	trans-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP60-40	Vinyl Chloride	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP60-40	Toluene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP60-50	Trichloroethene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP60-50	cis-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP60-50	trans-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP60-50	Vinyl Chloride	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP60-50	Toluene	ug/L	< 0.2	0.2	U	SW8260C

Qualifiers:

U Non Detect

Table 9 EMF-GP-63Taxiway on East KCIA 20-50 ft bgs, Northern Boundary

VOCs

Sample Date	Sample Location/depth	Parameter	Units	Result	Reporting Limit	Qualifier	Method
19-Oct-10	EMF-GP63-20	Trichloroethene	ug/L	0.4	0.2		SW8260C
19-Oct-10	EMF-GP63-20	cis-1,2-Dichloroethene	ug/L	11	0.2		SW8260C
19-Oct-10	EMF-GP63-20	trans-1,2-Dichloroethene	ug/L	0.7	0.2		SW8260C
19-Oct-10	EMF-GP63-20	Vinyl Chloride	ug/L	7.1	0.2		SW8260C
19-Oct-10	EMF-GP63-20	Toluene	ug/L	< 0.2	0.2	U	SW8260C
19-Oct-10	EMF-GP63-30	Trichloroethene	ug/L	0.3	0.2		SW8260C
19-Oct-10	EMF-GP63-30DL	cis-1,2-Dichloroethene	ug/L	62	0.6		SW8260C
19-Oct-10	EMF-GP63-30	trans-1,2-Dichloroethene	ug/L	4.9	0.2		SW8260C
19-Oct-10	EMF-GP63-30	Vinyl Chloride	ug/L	2.4	0.2		SW8260C
19-Oct-10	EMF-GP63-30	1,1-Dichloroethene	ug/L	0.2	0.2		SW8260C
19-Oct-10	EMF-GP63-30	Benzene	ug/L	0.4	0.2		SW8260C
19-Oct-10	EMF-GP63-30	Toluene	ug/L	< 0.2	0.2	U	SW8260C
19-Oct-10	EMF-GP63-40	Trichloroethene	ug/L	< 0.2	0.2	U	SW8260C
19-Oct-10	EMF-GP63-40DL	cis-1,2-Dichloroethene	ug/L	84	0.6		SW8260C
19-Oct-10	EMF-GP63-40	trans-1,2-Dichloroethene	ug/L	14	0.2		SW8260C
19-Oct-10	EMF-GP63-40	Vinyl Chloride	ug/L	23	0.2		SW8260C
19-Oct-10	EMF-GP63-40	1,1-Dichloroethene	ug/L	0.4	0.2		SW8260C
19-Oct-10	EMF-GP63-40	Toluene	ug/L	< 0.2	0.2	U	SW8260C
19-Oct-10	EMF-GP63-50	Trichloroethene	ug/L	< 0.2	0.2	U	SW8260C
19-Oct-10	EMF-GP63-50	cis-1,2-Dichloroethene	ug/L	0.7	0.2		SW8260C
19-Oct-10	EMF-GP63-50	trans-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
19-Oct-10	EMF-GP63-50	Vinyl Chloride	ug/L	9.1	0.2		SW8260C
19-Oct-10	EMF-GP63-50	Carbon Disulfide	ug/L	0.3	0.2		SW8260C
19-Oct-10	EMF-GP63-50	Toluene	ug/L	< 0.2	0.2	U	SW8260C

Qualifiers:

U Non Detect

Table 10 EMF-GP-61Taxiway on East KCIA 20-50 ft bgs, Southern Boundary

VOCs

Sample Date	Sample Location/depth	Parameter	Units	Result	Reporting Limit	Qualifier	Method
18-Oct-10	EMF-GP61-20	Trichloroethene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP61-20	cis-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP61-20	trans-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP61-20	Vinyl Chloride	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP61-20	4-Isopropyltoluene	ug/L	0.4	0.2		SW8260C
18-Oct-10	EMF-GP61-20	1,1-Dichloroethane	ug/L	0.6	0.2		SW8260C
18-Oct-10	EMF-GP61-20	Toluene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP61-30	Trichloroethene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP61-30	cis-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP61-30	trans-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP61-30	Vinyl Chloride	ug/L	0.9	0.2		SW8260C
18-Oct-10	EMF-GP61-30	Toluene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP61-40	Trichloroethene	ug/L	< 0.2	0.2	R	SW8260C
18-Oct-10	EMF-GP61-40	cis-1,2-Dichloroethene	ug/L	< 0.2	0.2	R	SW8260C
18-Oct-10	EMF-GP61-40	trans-1,2-Dichloroethene	ug/L	< 0.2	0.2	R	SW8260C
18-Oct-10	EMF-GP61-40	Vinyl Chloride	ug/L	0.2	0.2	J	SW8260C
18-Oct-10	EMF-GP61-40	Carbon Disulfide	ug/L	1	0.2	J	SW8260C
18-Oct-10	EMF-GP61-40	4-Isopropyltoluene	ug/L	2.5	0.2	J	SW8260C
18-Oct-10	EMF-GP61-40	Toluene	ug/L	0.2	0.2	J	SW8260C
18-Oct-10	EMF-GP61-50	Trichloroethene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP61-50	cis-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP61-50	trans-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP61-50	Vinyl Chloride	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP61-50	4-Isopropyltoluene	ug/L	0.3	0.2		SW8260C
18-Oct-10	EMF-GP61-50	Carbon Disulfide	ug/L	0.5	0.2		SW8260C
18-Oct-10	EMF-GP61-50	Toluene	ug/L	0.2	0.2		SW8260C

Qualifiers:

U Non Detect
R Rejected/not usable
J Estimated value

Table 11 EMF-GP-62Taxiway on East KCIA 20-50 ft bgs, Southern Boundary

VOCs

Sample Date	Sample Location/depth	Parameter	Units	Result	Reporting Limit	Qualifier	Method
18-Oct-10	EMF-GP62-20	Trichloroethene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP62-20	cis-1,2-Dichloroethene	ug/L	2.2	0.2		SW8260C
18-Oct-10	EMF-GP62-20	trans-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP62-20	Vinyl Chloride	ug/L	36	0.2		SW8260C
18-Oct-10	EMF-GP62-20	Carbon Disulfide	ug/L	0.2	0.2		SW8260C
18-Oct-10	EMF-GP62-20	1,1-Dichloroethane	ug/L	1.1	0.2		SW8260C
18-Oct-10	EMF-GP62-20	Toluene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP62-30	Trichloroethene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP62-30	cis-1,2-Dichloroethene	ug/L	0.6	0.2		SW8260C
18-Oct-10	EMF-GP62-30	trans-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP62-30	Vinyl Chloride	ug/L	6.8	0.2		SW8260C
18-Oct-10	EMF-GP62-30	Carbon Disulfide	ug/L	1.3	0.2		SW8260C
18-Oct-10	EMF-GP62-30	Toluene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP62-40	Trichloroethene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP62-40	cis-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP62-40	trans-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP62-40	Vinyl Chloride	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP62-40	Carbon Disulfide	ug/L	0.3	0.2		SW8260C
18-Oct-10	EMF-GP62-40	1,1-Dichloropropene	ug/L	0.9	0.2		SW8260C
18-Oct-10	EMF-GP62-40	Toluene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP62-40-Dup2	Trichloroethene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP62-40-Dup2	cis-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP62-40-Dup2	trans-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP62-40-Dup2	Vinyl Chloride	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP62-40-Dup2	Carbon Disulfide	ug/L	0.3	0.2		SW8260C
18-Oct-10	EMF-GP62-40-Dup2	Toluene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP62-50	Trichloroethene	ug/L	< 0.2	0.2	R	SW8260C
18-Oct-10	EMF-GP62-50	cis-1,2-Dichloroethene	ug/L	< 0.2	0.2	R	SW8260C
18-Oct-10	EMF-GP62-50	trans-1,2-Dichloroethene	ug/L	< 0.2	0.2	R	SW8260C
18-Oct-10	EMF-GP62-50	Vinyl Chloride	ug/L	< 0.2	0.2	R	SW8260C
18-Oct-10	EMF-GP62-50	Carbon Disulfide	ug/L	0.3	0.2	J	SW8260C
18-Oct-10	EMF-GP62-50	Acetone	ug/L	18	5	J	SW8260C
18-Oct-10	EMF-GP62-50	Toluene	ug/L	0.2	0.2	J	SW8260C

Qualifiers:

U Non Detect
R Reject/Unusable
J Estimated value

Table 12 EMF-GP-64EMF Property 25-45 ft bgs, Bounding Area for ERD Treatment

VOCs

Sample Date	Sample Location/depth	Parameter	Units	Result	Reporting Limit	Qualifier	Method
15-Oct-10	EMF-GP64-25	Tetrachloroethene	ug/L	0.3	0.2		SW8260C
15-Oct-10	EMF-GP64-25	Trichloroethene	ug/L	20	0.2		SW8260C
15-Oct-10	EMF-GP64-25	cis-1,2-Dichloroethene	ug/L	6.2	0.2		SW8260C
15-Oct-10	EMF-GP64-25	trans-1,2-Dichloroethene	ug/L	0.4	0.2		SW8260C
15-Oct-10	EMF-GP64-25	Vinyl Chloride	ug/L	< 0.2	0.2	U	SW8260C
15-Oct-10	EMF-GP64-25	Carbon Disulfide	ug/L	0.4	0.2		SW8260C
15-Oct-10	EMF-GP64-25	Toluene	ug/L	< 0.2	0.2	U	SW8260C
15-Oct-10	EMF-GP64-35	Trichloroethene	ug/L	3.5	0.2		SW8260C
15-Oct-10	EMF-GP64-35	cis-1,2-Dichloroethene	ug/L	1.8	0.2		SW8260C
15-Oct-10	EMF-GP64-35	trans-1,2-Dichloroethene	ug/L	0.6	0.2		SW8260C
15-Oct-10	EMF-GP64-35	Vinyl Chloride	ug/L	< 0.2	0.2	U	SW8260C
15-Oct-10	EMF-GP64-35	Carbon Disulfide	ug/L	0.3	0.2		SW8260C
15-Oct-10	EMF-GP64-35	Toluene	ug/L	< 0.2	0.2	U	SW8260C
15-Oct-10	EMF-GP64-35-Dup1	Trichloroethene	ug/L	3.7	0.2		SW8260C
15-Oct-10	EMF-GP64-35-Dup1	cis-1,2-Dichloroethene	ug/L	2	0.2		SW8260C
15-Oct-10	EMF-GP64-35-Dup1	trans-1,2-Dichloroethene	ug/L	0.7	0.2		SW8260C
15-Oct-10	EMF-GP64-35-Dup1	Vinyl Chloride	ug/L	< 0.2	0.2	U	SW8260C
15-Oct-10	EMF-GP64-35-Dup1	Carbon Disulfide	ug/L	0.3	0.2		SW8260C
15-Oct-10	EMF-GP64-35-Dup1	Toluene	ug/L	< 0.2	0.2	U	SW8260C
15-Oct-10	EMF-GP64-45	Trichloroethene	ug/L	16	0.2	J	SW8260C
15-Oct-10	EMF-GP64-45	cis-1,2-Dichloroethene	ug/L	1.6	0.2	J	SW8260C
15-Oct-10	EMF-GP64-45	trans-1,2-Dichloroethene	ug/L	< 0.2	0.2	R	SW8260C
15-Oct-10	EMF-GP64-45	Vinyl Chloride	ug/L	< 0.2	0.2	R	SW8260C
15-Oct-10	EMF-GP64-45	Carbon Disulfide	ug/L	0.2	0.2	J	SW8260C
15-Oct-10	EMF-GP64-45	2-Butanone	ug/L	6.6	5	J	SW8260C
15-Oct-10	EMF-GP64-45	Acetone	ug/L	33	5	J	SW8260C
15-Oct-10	EMF-GP64-45	Toluene	ug/L	< 0.2	0.2	R	SW8260C

Qualifiers:

U Non Detect
R Unusable
J Estimated value

Table 13 EMF-GP-66EMF Property 25-45 ft bgs, Bounding Area for ERD Treatment

VOCs

Sample Date	Sample Location/depth	Parameter	Units	Result	Reporting Limit	Qualifier	Method
19-Oct-10	EMF-GP66-25DL	Trichloroethene	ug/L	140	1		SW8260C
19-Oct-10	EMF-GP66-25DL	cis-1,2-Dichloroethene	ug/L	110	1		SW8260C
19-Oct-10	EMF-GP66-25	trans-1,2-Dichloroethene	ug/L	6.2	0.2		SW8260C
19-Oct-10	EMF-GP66-25	Vinyl Chloride	ug/L	0.6	0.2		SW8260C
19-Oct-10	EMF-GP66-25	Carbon Disulfide	ug/L	0.2	0.2		SW8260C
19-Oct-10	EMF-GP66-25	1,1-Dichloroethene	ug/L	1.8	0.2		SW8260C
19-Oct-10	EMF-GP66-25	Toluene	ug/L	< 0.2	0.2	U	SW8260C
19-Oct-10	EMF-GP66-35DL	Trichloroethene	ug/L	120	2		SW8260C
19-Oct-10	EMF-GP66-35DL	cis-1,2-Dichloroethene	ug/L	490	2		SW8260C
19-Oct-10	EMF-GP66-35DL	trans-1,2-Dichloroethene	ug/L	58	2		SW8260C
19-Oct-10	EMF-GP66-35	Vinyl Chloride	ug/L	3.0	0.2		SW8260C
19-Oct-10	EMF-GP66-35	Carbon Disulfide	ug/L	0.4	0.2		SW8260C
19-Oct-10	EMF-GP66-35	1,1-Dichloroethene	ug/L	1.6	0.2		SW8260C
19-Oct-10	EMF-GP66-35	Toluene	ug/L	< 0.2	0.2	U	SW8260C
19-Oct-10	EMF-GP66-35-DUP3	Trichloroethene	ug/L	120	4		SW8260C
19-Oct-10	EMF-GP66-35-DUP3DL	cis-1,2-Dichloroethene	ug/L	480	4		SW8260C
19-Oct-10	EMF-GP66-35-DUP3	trans-1,2-Dichloroethene	ug/L	58	0.2		SW8260C
19-Oct-10	EMF-GP66-35-DUP3	Vinyl Chloride	ug/L	3.1	0.2		SW8260C
19-Oct-10	EMF-GP66-35-DUP3	Carbon Disulfide	ug/L	0.3	0.2		SW8260C
19-Oct-10	EMF-GP66-35-DUP3	1,1-Dichloroethene	ug/L	1.6	0.2		SW8260C
19-Oct-10	EMF-GP66-35-DUP3	Toluene	ug/L	< 0.2	0.2	U	SW8260C
19-Oct-10	EMF-GP66-45	Trichloroethene	ug/L	1.5	0.2		SW8260C
19-Oct-10	EMF-GP66-45	cis-1,2-Dichloroethene	ug/L	1.6	0.2		SW8260C
19-Oct-10	EMF-GP66-45	trans-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
19-Oct-10	EMF-GP66-45	Vinyl Chloride	ug/L	< 0.2	0.2	U	SW8260C
19-Oct-10	EMF-GP66-45	Carbon Disulfide	ug/L	0.9	0.2		SW8260C
19-Oct-10	EMF-GP66-45	Toluene	ug/L	0.3	0.2		SW8260C

Qualifiers:

U Non Detect

Table 14 EMF-GP-65EMF Property 25-45 ft bgs, Bounding Area for ERD Treatment

VOCs

Sample Date	Sample Location/depth	Parameter	Units	Result	Reporting Limit	Qualifier	Method
18-Oct-10	EMF-GP65-25	Trichloroethene	ug/L	14	0.2		SW8260C
18-Oct-10	EMF-GP65-25	cis-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP65-25	trans-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP65-25	Vinyl Chloride	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP65-25	Carbon Disulfide	ug/L	1.1	0.2		SW8260C
18-Oct-10	EMF-GP65-25	Toluene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP65-35	Trichloroethene	ug/L	0.7	0.2		SW8260C
18-Oct-10	EMF-GP65-35	cis-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP65-35	trans-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP65-35	Vinyl Chloride	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP65-35	Carbon Disulfide	ug/L	0.6	0.2		SW8260C
18-Oct-10	EMF-GP65-35	Toluene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP65-45	Trichloroethene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP65-45	cis-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP65-45	trans-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP65-45	Vinyl Chloride	ug/L	< 0.2	0.2	U	SW8260C
18-Oct-10	EMF-GP65-45	Carbon Disulfide	ug/L	0.5	0.2		SW8260C
18-Oct-10	EMF-GP65-45	Toluene	ug/L	< 0.2	0.2	U	SW8260C

Qualifiers:

U Non Detect

Table 15 EMF-GP-67EMF Property 25-45 ft bgs, Bounding Area for ERD Treatment

VOCs

Sample Date	Sample Location/depth	Parameter	Units	Result	Reporting Limit	Qualifier	Method
19-Oct-10	EMF-GP67-25	Trichloroethene	ug/L	0.5	0.2		SW8260C
19-Oct-10	EMF-GP67-25	cis-1,2-Dichloroethene	ug/L	4.8	0.2		SW8260C
19-Oct-10	EMF-GP67-25	trans-1,2-Dichloroethene	ug/L	0.7	0.2		SW8260C
19-Oct-10	EMF-GP67-25	Vinyl Chloride	ug/L	< 0.2	0.2	U	SW8260C
19-Oct-10	EMF-GP67-25	Carbon Disulfide	ug/L	0.2	0.2		SW8260C
19-Oct-10	EMF-GP67-25	Toluene	ug/L	< 0.2	0.2	U	SW8260C
19-Oct-10	EMF-GP67-35	Trichloroethene	ug/L	0.3	0.2		SW8260C
19-Oct-10	EMF-GP67-35	cis-1,2-Dichloroethene	ug/L	0.3	0.2		SW8260C
19-Oct-10	EMF-GP67-35	trans-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
19-Oct-10	EMF-GP67-35	Vinyl Chloride	ug/L	< 0.2	0.2	U	SW8260C
19-Oct-10	EMF-GP67-35	Carbon Disulfide	ug/L	0.4	0.2		SW8260C
19-Oct-10	EMF-GP67-35	Toluene	ug/L	< 0.2	0.2	U	SW8260C
19-Oct-10	EMF-GP67-45	Trichloroethene	ug/L	0.5	0.2		SW8260C
19-Oct-10	EMF-GP67-45	cis-1,2-Dichloroethene	ug/L	2.5	0.2		SW8260C
19-Oct-10	EMF-GP67-45	trans-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
19-Oct-10	EMF-GP67-45	Vinyl Chloride	ug/L	< 0.2	0.2	U	SW8260C
19-Oct-10	EMF-GP67-45	Carbon Disulfide	ug/L	0.4	0.2		SW8260C
19-Oct-10	EMF-GP67-45	Chloroform	ug/L	0.4	0.2		SW8260C
19-Oct-10	EMF-GP67-45	Toluene	ug/L	0.3	0.2		SW8260C

Qualifiers:

U Non Detect

Table 16 EMF-GP-68EMF Property 38-42 ft bgs, Near NV-02

VOCs

Sample Date	Sample Location/depth	Parameter	Units	Result	Reporting Limit	Qualifier	Method
19-Oct-10	EMF-GP68-38	Trichloroethene	ug/L	1.1	0.2		SW8260C
19-Oct-10	EMF-GP68-38	cis-1,2-Dichloroethene	ug/L	27	0.2		SW8260C
19-Oct-10	EMF-GP68-38	trans-1,2-Dichloroethene	ug/L	20	0.2		SW8260C
19-Oct-10	EMF-GP68-38DL	Vinyl Chloride	ug/L	590	2		SW8260C
19-Oct-10	EMF-GP68-38	Toluene	ug/L	0.2	0.2		SW8260C
19-Oct-10	EMF-GP68-42	Trichloroethene	ug/L	0.3	0.2		SW8260C
19-Oct-10	EMF-GP68-42	cis-1,2-Dichloroethene	ug/L	5.3	0.2		SW8260C
19-Oct-10	EMF-GP68-42	trans-1,2-Dichloroethene	ug/L	6.4	0.2		SW8260C
19-Oct-10	EMF-GP68-42	Vinyl Chloride	ug/L	4.1	0.2		SW8260C
19-Oct-10	EMF-GP68-42	1,2,4-Trimethylbenzene	ug/L	0.3	0.2		SW8260C
19-Oct-10	EMF-GP68-42	Chloroethane	ug/L	0.3	0.2		SW8260C
19-Oct-10	EMF-GP68-42	Ethylbenzene	ug/L	0.3	0.2		SW8260C
19-Oct-10	EMF-GP68-42	o-Xylene	ug/L	0.4	0.2		SW8260C
19-Oct-10	EMF-GP68-42	m,p-Xylene	ug/L	1	0.4		SW8260C
19-Oct-10	EMF-GP68-42	Toluene	ug/L	0.9	0.2		SW8260C

Qualifiers:

U Non Detect

Table 17 EMF-GP-69EMF Property 38-42 ft bgs, Near NV-02

VOCs

Sample Date	Sample Location/depth	Parameter	Units	Result	Reporting Limit	Qualifier	Method
19-Oct-10	EMF-GP69-38	Trichloroethene	ug/L	0.3	0.2		SW8260C
19-Oct-10	EMF-GP69-38	cis-1,2-Dichloroethene	ug/L	0.4	0.2		SW8260C
19-Oct-10	EMF-GP69-38	trans-1,2-Dichloroethene	ug/L	0.3	0.2		SW8260C
19-Oct-10	EMF-GP69-38	Vinyl Chloride	ug/L	1.2	0.2		SW8260C
19-Oct-10	EMF-GP69-38	Toluene	ug/L	0.2	0.2		SW8260C
19-Oct-10	EMF-GP69-42	Trichloroethene	ug/L	0.4	0.2		SW8260C
19-Oct-10	EMF-GP69-42DL	cis-1,2-Dichloroethene	ug/L	94	1		SW8260C
19-Oct-10	EMF-GP69-42	trans-1,2-Dichloroethene	ug/L	32	0.2		SW8260C
19-Oct-10	EMF-GP69-42DL	Vinyl Chloride	ug/L	110	1		SW8260C
19-Oct-10	EMF-GP69-42	1,1-Dichloroethene	ug/L	0.2	0.2		SW8260C
19-Oct-10	EMF-GP69-42	Carbon Disulfide	ug/L	0.3	0.2		SW8260C
19-Oct-10	EMF-GP69-42	Toluene	ug/L	0.3	0.2		SW8260C

Qualifiers:

U Non Detect

Table 18 EMF-GP-70Geoprobe South of the Firestation 20-50 ft bgs

VOCs

Sample Date	Sample Location/depth	Parameter	Units	Result	Reporting Limit	Qualifier	Method
20-Oct-10	EMF-GP70-20	Trichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP70-20	cis-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP70-20	trans-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP70-20	Vinyl Chloride	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP70-20	Toluene	ug/L	0.2	0.2		SW8260C
20-Oct-10	EMF-GP70-30	Trichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP70-30	cis-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP70-30	trans-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP70-30	Vinyl Chloride	ug/L	0.2	0.2		SW8260C
20-Oct-10	EMF-GP70-30	Toluene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP70-40	Trichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP70-40	cis-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP70-40	trans-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP70-40	Vinyl Chloride	ug/L	0.3	0.2		SW8260C
20-Oct-10	EMF-GP70-40	Toluene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP70-50	Trichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP70-50	cis-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP70-50	trans-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP70-50	Vinyl Chloride	ug/L	1.9	0.2		SW8260C
20-Oct-10	EMF-GP70-50	Carbon Disulfide	ug/L	0.3	0.2		SW8260C
20-Oct-10	EMF-GP70-50	Toluene	ug/L	0.2	0.2		SW8260C

Qualifiers:

U Non Detect

Table 19 EMF-GP-71Geoprobe South of the Firestation 20-50 ft bgs

VOCs

Sample Date	Sample Location/depth	Parameter	Units	Result	Reporting Limit	Qualifier	Method
20-Oct-10	EMF-GP71-20	Trichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP71-20	cis-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP71-20	trans-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP71-20	Vinyl Chloride	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP71-20	Toluene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP71-30	Trichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP71-30	cis-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP71-30	trans-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP71-30	Vinyl Chloride	ug/L	0.3	0.2		SW8260C
20-Oct-10	EMF-GP71-30	Toluene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP71-40	Trichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP71-40	cis-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP71-40	trans-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP71-40	Vinyl Chloride	ug/L	1.7	0.2		SW8260C
20-Oct-10	EMF-GP71-40	Toluene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP71-40-Dup4	Trichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP71-40-Dup4	cis-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP71-40-Dup4	trans-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP71-40-Dup4	Vinyl Chloride	ug/L	1.5	0.2		SW8260C
20-Oct-10	EMF-GP71-40-Dup4	Toluene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP71-50	Trichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP71-50	cis-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP71-50	trans-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP71-50	Vinyl Chloride	ug/L	1.8	0.2		SW8260C
20-Oct-10	EMF-GP71-50	Toluene	ug/L	0.2	0.2		SW8260C

Qualifiers:

U Non Detect

Table 20 EMF-GP-72Geoprobe South of the Firestation 20-50 ft bgs

VOCs

Sample Date	Sample Location/depth	Parameter	Units	Result	Reporting Limit	Qualifier	Method
20-Oct-10	EMF-GP72-20	Trichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP72-20	cis-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP72-20	trans-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP72-20	Vinyl Chloride	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP72-20	Toluene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP72-30	Trichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP72-30	cis-1,2-Dichloroethene	ug/L	0.2	0.2		SW8260C
20-Oct-10	EMF-GP72-30	trans-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP72-30	Vinyl Chloride	ug/L	0.8	0.2		SW8260C
20-Oct-10	EMF-GP72-30	Toluene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP72-40	Trichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP72-40	cis-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP72-40	trans-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP72-40	Vinyl Chloride	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP72-40	Toluene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP72-50	Trichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP72-50	cis-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP72-50	trans-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP72-50	Vinyl Chloride	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP72-50	Carbon Disulfide	ug/L	0.3	0.2		SW8260C
20-Oct-10	EMF-GP72-50	Toluene	ug/L	< 0.2	0.2	U	SW8260C

Qualifiers:

U Non Detect

Table 21 EMF-GP-73Geoprobe South of the Firestation 20-50 ft bgs

VOCs

Sample Date	Sample Location/depth	Parameter	Units	Result	Reporting Limit	Qualifier	Method
20-Oct-10	EMF-GP73-20	Trichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP73-20	cis-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP73-20	trans-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP73-20	Vinyl Chloride	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP73-20	Toluene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP73-30	Trichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP73-30	cis-1,2-Dichloroethene	ug/L	0.2	0.2		SW8260C
20-Oct-10	EMF-GP73-30	trans-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP73-30	Vinyl Chloride	ug/L	0.4	0.2		SW8260C
20-Oct-10	EMF-GP73-30	1,2-Dichloroethane	ug/L	0.2	0.2		SW8260C
20-Oct-10	EMF-GP73-30	Toluene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP73-40	Trichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP73-40	cis-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP73-40	trans-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP73-40	Vinyl Chloride	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP73-40	Toluene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP73-50	Trichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP73-50	cis-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP73-50	trans-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP73-50	Vinyl Chloride	ug/L	0.6	0.2		SW8260C
20-Oct-10	EMF-GP73-50	Carbon Disulfide	ug/L	0.3	0.2		SW8260C
20-Oct-10	EMF-GP73-50	Toluene	ug/L	< 0.2	0.2	U	SW8260C

Qualifiers:

U Non Detect

Table 22 EMF-GP-74Geoprobe South of the Firestation 20-50 ft bgs

VOCs

Sample Date	Sample Location/depth	Parameter	Units	Result	Reporting Limit	Qualifier	Method
20-Oct-10	EMF-GP74-20	Trichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP74-20	cis-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP74-20	trans-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP74-20	Vinyl Chloride	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP74-20	Toluene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP74-30	Trichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP74-30	cis-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP74-30	trans-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP74-30	Vinyl Chloride	ug/L	0.2	0.2		SW8260C
20-Oct-10	EMF-GP74-30	1,2-Dichloroethane	ug/L	0.3	0.2		SW8260C
20-Oct-10	EMF-GP74-30	Toluene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP74-40	Trichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP74-40	cis-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP74-40	trans-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP74-40	Vinyl Chloride	ug/L	0.9	0.2		SW8260C
20-Oct-10	EMF-GP74-40	Toluene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP74-50	Trichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP74-50	cis-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP74-50	trans-1,2-Dichloroethene	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP74-50	Vinyl Chloride	ug/L	< 0.2	0.2	U	SW8260C
20-Oct-10	EMF-GP74-50	Toluene	ug/L	< 0.2	0.2	U	SW8260C

Qualifiers:

U Non Detect

Table 23 EMF-GP-752-41 Building Geoprobe 61-80 ft bgs (Duwamsih)

VOCs

Sample Date	Sample Location/depth	Parameter	Units	Result	Reporting Limit	Qualifier	Method
15-Oct-10	EMF-GP75-61	Trichloroethene	ug/L	< 0.2	0.2	U	SW8260C
15-Oct-10	EMF-GP75-61	cis-1,2-Dichloroethene	ug/L	27	0.2		SW8260C
15-Oct-10	EMF-GP75-61	trans-1,2-Dichloroethene	ug/L	0.8	0.2		SW8260C
15-Oct-10	EMF-GP75-61	Vinyl Chloride	ug/L	< 0.2	0.2	U	SW8260C
15-Oct-10	EMF-GP75-61	Carbon Disulfide	ug/L	0.5	0.2		SW8260C
15-Oct-10	EMF-GP75-61	Chloroethane	ug/L	0.8	0.2		SW8260C
15-Oct-10	EMF-GP75-61	Toluene	ug/L	< 0.2	0.2	U	SW8260C
15-Oct-10	EMF-GP75-70	Trichloroethene	ug/L	< 0.2	0.2	U	SW8260C
15-Oct-10	EMF-GP75-70	cis-1,2-Dichloroethene	ug/L	5.4	0.2		SW8260C
15-Oct-10	EMF-GP75-70	trans-1,2-Dichloroethene	ug/L	0.8	0.2		SW8260C
15-Oct-10	EMF-GP75-70	Vinyl Chloride	ug/L	< 0.2	0.2	U	SW8260C
15-Oct-10	EMF-GP75-70	Chloroethane	ug/L	0.3	0.2		SW8260C
15-Oct-10	EMF-GP75-70	Carbon Disulfide	ug/L	0.6	0.2		SW8260C
15-Oct-10	EMF-GP75-70	Toluene	ug/L	0.3	0.2		SW8260C
15-Oct-10	EMF-GP75-80	Trichloroethene	ug/L	< 0.2	0.2	U	SW8260C
15-Oct-10	EMF-GP75-80	cis-1,2-Dichloroethene	ug/L	1.2	0.2		SW8260C
15-Oct-10	EMF-GP75-80	trans-1,2-Dichloroethene	ug/L	0.3	0.2		SW8260C
15-Oct-10	EMF-GP75-80	Vinyl Chloride	ug/L	< 0.2	0.2	U	SW8260C
15-Oct-10	EMF-GP75-80	Carbon Disulfide	ug/L	0.6	0.2		SW8260C
15-Oct-10	EMF-GP75-80	Toluene	ug/L	0.3	0.2		SW8260C

Qualifiers:

U Non Detect

Table 24. DHC Bacterial Census Sampling within 2-40 and 2-41 Buildings and EMF Property

SiteID	SampleDate	Units	DHC		tceA Reductase		bvcA Reductase		VC Reductase		Notes
EMF-IW-01	18-Jan-11	cells/mL	78		<0.6	U	3.3		75.3		2-40 Bldg
EMF-IW-06	18-Jan-11	cells/mL	30		<0.8	U	<0.8	U	5		2-41 Bldg
EMF-IW-04	18-Jan-11	cells/mL	13		<1.80	U	91.2		1.9		2-41 Bldg
EMF-NV-01	03-Mar-11	cells/mL	3,480		0.1	J	161		4,730		EMF Property
EMF-NV-02	03-Mar-11	cells/mL	390,000		<0.8	U	35,000		252,000		EMF Property

Qualifiers:

U Non Detect

Table 25. Groundwater Elevation Data - August 2010

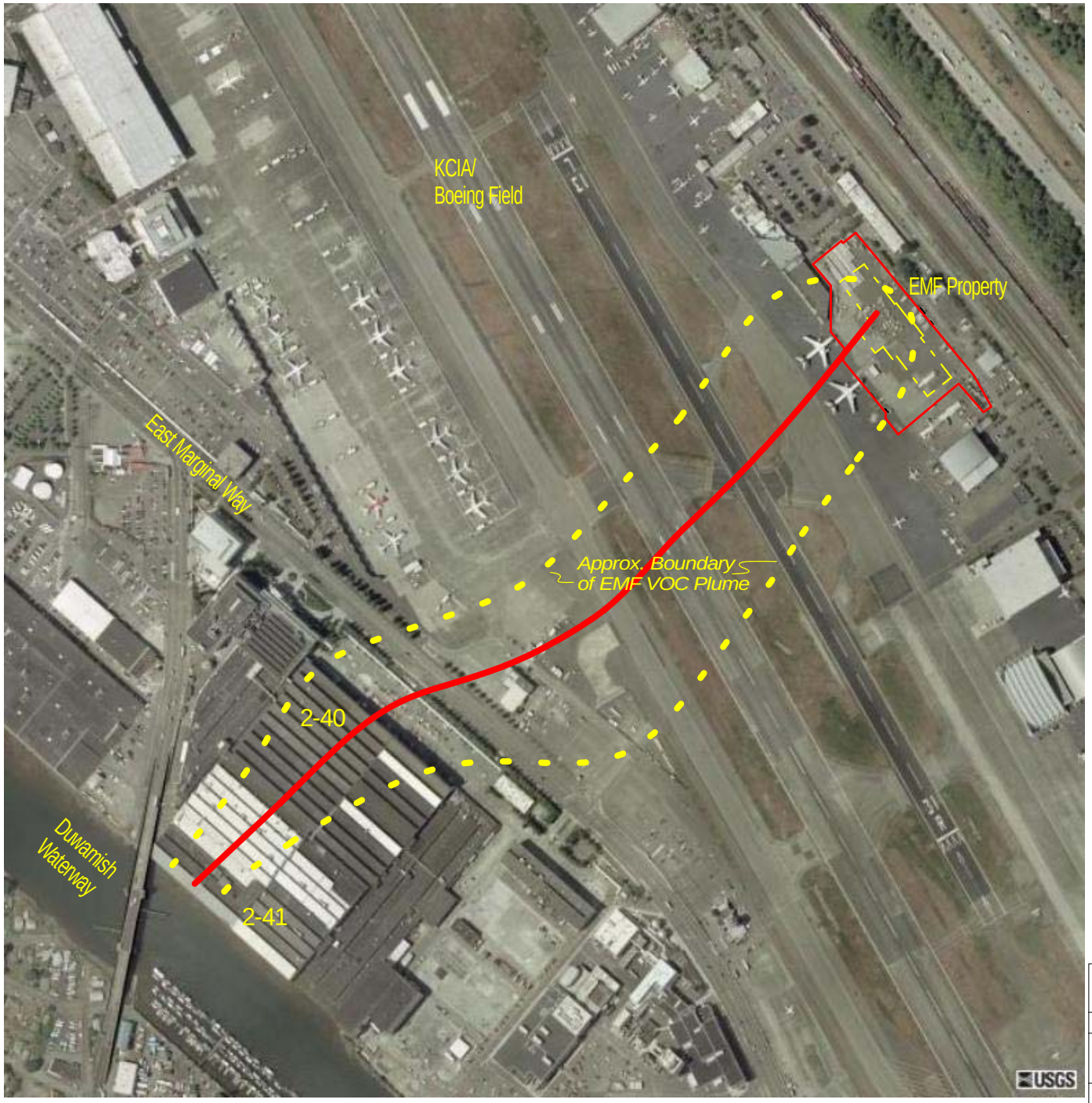
MONITOR WELL NO.	NORTHING	EASTING	RIM ELEV. OF CASE NGVD29	TOP OF PIPE ELEV. NGVD29	SCREENED INTERVAL (ft bgs)	Depth to Water (ft bgs)	Water Table Elevation (ft)	Notes
EMF Area						**Aug-10**		
EMF-NV-01	198,975.0	1,277,696.0	14.83			7.80	-7.80	Missing Survey Data
EMF-NV-02	198,889.0	1,277,646.0	14.81			8.30	-8.30	Missing Survey Data
EMF-MW-11SR**	198,775.3	1,277,500.9	13.64	13.26	12-22	7.85	5.41	
EMF-MW-11DR**	198,767.7	1,277,506.5	13.62	13.28	30-40	7.90	5.38	
EMF-MW-13DR**	198,725.0	1,277,540.2	13.77	13.32	35-45	7.92	5.40	
EMF-IW-18	198,951.6	1,277,543.9	14.40	13.88	31-41	8.36	5.52	
EMF-MW-17	198,836.2	1,277,604.1	13.88	13.62	35-45	8.25	5.37	
EMF-MW-24	198,789.1	1,277,570.2	14.23	13.92	32-42	8.05	5.87	
EMF-MW-34	198,772.6	1,277,654.5	13.82	13.52	22-37	8.09	5.43	
EMF-MW-10	198,848.2	1,277,670.8	14.34	14.06	20-25	8.52	5.54	
EMF-MW-16	198,826.1	1,277,647.7	14.01	13.75	35-45	8.19	5.56	
EMF-IW-27	198,683.7	1,277,621.5	13.38	12.98	32-42	7.63	5.35	
EMF-IW-20	198,882.0	1,277,577.6	14.18	13.79	32-42	8.36	5.43	
EMF-IW-29	198,795.8	1,277,707.3	14.18	13.69	32-42	8.47	5.22	
FireStation						**Aug-10**		
EMF-WF-29	197,721.7	1,276,058.0	13.23	12.81	35-45	9.64	3.17	
EMF-WF-25	197,671.0	1,275,799.7	14.00	13.70	35-45	10.72	2.98	
EMF-WF-26	197,524.9	1,275,969.6	13.00	12.59	37-47	9.60	2.99	
EMF-WF-27	197,443.8	1,276,059.3	12.86	12.46	35-45	9.41	3.05	
EMF-WF-38	197,245.1	1,276,265.9	13.98	13.57	37-47	10.38	3.19	
Plant 2						**Aug-10**		
EMF-WF-36	197,446.4	1,275,756.3	13.45	13.13	40-50	10.31	2.82	
EMF-WF-30	197,340.7	1,275,660.8	13.59	13.11	40-50	10.68	2.43	
PL2-440B	197,450.0	1,275,746.0	13.58	13.1	40-45	10.18	2.92	
PL2-441B	197,674.8	1,275,481.3	12.9	12.62	35-45	9.95	2.67	
PL2-608B	197,125.1	1,276,107.4	13.61	13.17	40-45	10.34	2.83	
EMF-IW-2	197,117.3	1,275,435.7	13.49	12.97	35-45	11.00	1.97	
EMF-IW-39	197,063.0	1,275,493.4	13.50	13.23	40-50	11.23	2.00	
EMF-IW-41*	197,171.0	1,275,378.5			40-50	11.33		Missing Survey Data
EMF-WF-31	197,044.3	1,275,218.7	13.28	12.96	29-39	11.32	1.64	
EMF-IW-4	196,897.1	1,275,089.6	13.24	12.65	35-45	11.55	1.10	
EMF-IW-37	196,916.7	1,275,066.2	13.21	12.98	40-50	11.72	1.26	
EMF-IW-38	196,831.8	1,275,161.0	13.32	12.97	40-50	18.87	-5.90	Tidal influence zone
PL2-444A	196,767.0	1,274,878.0	13.28	13.04	10-25	15.00	-1.96	Tidal influence zone
PL2-443A	196,826.6	1,274,807.6	13.4	12.94	8-23	12.90	0.04	Tidal influence zone
PL2-443B	196,832.6	1,274,801.0	13.43	12.99	35-45	14.25	-1.26	Tidal influence zone
PL2-443C	196,836.8	1,274,797.4	13.42	13	70-75	14.60	-1.60	Tidal influence zone
PL2-420A	196,637.1	1,274,994.0	13.41	13.18	8-18	15.27	-2.09	Tidal influence zone
PL2-420B	196,642.3	1,275,004.6	13.37	12.99	35-45	11.95	1.04	
PL2-420C	196,645.4	1,275,001.3	13.4	13.03	75-80	15.80	-2.77	Tidal influence zone
PL2-442A	196,748.6	1,275,013.2	12.91	12.52	8-18	9.64	2.88	
PL2-442B	196,749.5	1,275,014.0	12.92	12.52	35-45	9.83	2.69	
PL2-442C	196,751.7	1,275,009.7	12.95	12.43	75-80	10.08	2.35	
EMF-WF-32	196,707.4	1,274,946.9	13.28	12.88	25-35	13.60	-0.72	Tidal influence zone

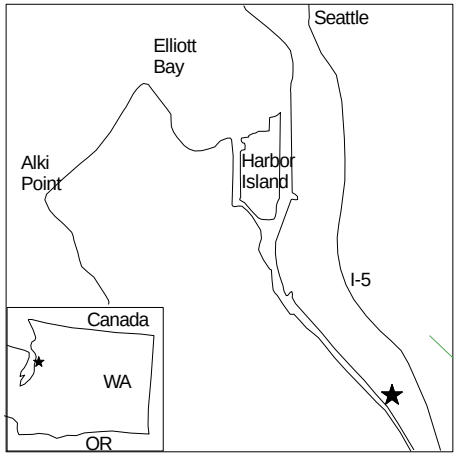
*EMF IW-41 was not originally surveyed; Northing and Easting are estimated based on other surveyed points in this area.

Table 26. Groundwater Elevation Data - February 2011

MONITOR WELL NO.	NORTHING	EASTING	RIM ELEV. OF CASE NGVD29	TOP OF PIPE ELEV. NGVD29	SCREENED INTERVAL (ft bgs)	Depth to Water (ft bgs)	Water Table Elevation (ft)	Notes
EMF Area						**Feb-11**		
EMF-NV-01	198,975.0	1,277,696.0	14.83			24.20	-24.20	Missing Survey Data
EMF-NV-02	198,889.0	1,277,646.0	14.81			6.73	-6.73	Missing Survey Data
EMF-MW-11SR**	198,775.3	1,277,500.9	13.64	13.26	12-22	6.35	6.91	
EMF-MW-11DR**	198,767.7	1,277,506.5	13.62	13.28	30-40	6.44	6.84	
EMF-MW-13DR**	198,725.0	1,277,540.2	13.77	13.32	35-45	6.52	6.80	
EMF-MW-17	198,836.2	1,277,604.1	13.88	13.62	35-45	6.93	6.69	
EMF-MW-10	198,848.2	1,277,670.8	14.34	14.06	20-25	6.98	7.08	
EMF-IW-27	198,683.7	1,277,621.5	13.38	12.98	32-42	6.15	6.83	
EMF-IW-20	198,882.0	1,277,577.6	14.18	13.79	32-42	6.84	6.95	
EMF-MW-04	199,024.0	1,277,304.5	13.98	13.74	5-15	6.18	7.56	
EMF-MW-12D	199,007.3	1,277,313.7	13.85	13.49	35-45	6.53	6.96	
EMF-MW-02	198,515.4	1,277,692.2	13.50	13.17	35-45	5.87	7.30	
EMF-MW-14D	198,510.2	1,277,695.4	13.57	13.19	40-45	6.34	6.85	
FireStation						**Feb-11**		
EMF-WF-29	197,721.7	1,276,058.0	13.23	12.81	35-45	8.82	3.99	
EMF-WF-25	197,671.0	1,275,799.7	14.00	13.70	35-45	9.85	3.85	
EMF-WF-26	197,524.9	1,275,969.6	13.00	12.59	37-47	8.85	3.74	
EMF-WF-27	197,443.8	1,276,059.3	12.86	12.46	35-45	8.70	3.76	
EMF-WF-38	197,245.1	1,276,265.9	13.98	13.57	37-47	9.40	4.17	
EMF-IW-36	197,299.7	1,276,222.2	13.68	13.32	30-45	9.14	4.18	
Plant 2						**Feb-11**		
EMF-WF-36	197,446.4	1,275,756.3	13.45	13.13	40-50	9.60	3.53	
EMF-IW-44	197,276.4	1,275,773.7	13.45	13.27	40-50	10.05	3.22	
EMF-WF-30	197,340.7	1,275,660.8	13.59	13.11	40-50	10.20	2.91	
PL2-440B	197,450.0	1,275,746.0	13.58	13.1	40-45	9.58	3.52	
PL2-440C	197,451.1	1,275,749.2	13.54	12.9	79.5-84.5	10.80	2.10	
PL2-441B	197,674.8	1,275,481.3	12.9	12.62	35-45	10.88	1.74	
PL2-441C	197,678.6	1,275,478.1	12.9	12.45	76.5-81.5	9.75	2.70	
PL2-608B	197,125.1	1,276,107.4	13.61	13.17	40-45	9.48	3.69	
PL2-608C	197,122.5	1,276,101.6	13.61	13.25	78.5-83.5	10.38	2.87	
EMF-IW-7	197,084.2	1,275,470.3	13.47	13.01	30-40	10.39	2.62	
EMF-IW-40	197,152.0	1,275,398.5	13.49	13.19	37-47	10.50	2.69	
EMF-WF-33	197,079.2	1,275,374.6	13.44	13.06	35-45	10.49	2.57	
EMF-WF-31	197,044.3	1,275,218.7	13.28	12.96	29-39	10.58	2.38	
EMF-IW-38	196,831.8	1,275,161.0	13.32	12.97	40-50	10.46	2.51	
PL2-444A	196,767.0	1,274,878.0	13.28	13.04	10-25	8.82	4.22	Tidal influence zone
PL2-443A	196,826.6	1,274,807.6	13.4	12.94	8-23	10.74	2.20	Tidal influence zone
PL2-443B	196,832.6	1,274,801.0	13.43	12.99	35-45	11.00	1.99	Tidal influence zone
PL2-443C	196,836.8	1,274,797.4	13.42	13	70-75	10.93	2.07	Tidal influence zone
PL2-420A	196,637.1	1,274,994.0	13.41	13.18	8-18	9.69	3.49	Tidal influence zone
PL2-420B	196,642.3	1,275,004.6	13.37	12.99	35-45	9.65	3.34	Tidal influence zone
PL2-420C	196,645.4	1,275,001.3	13.4	13.03	75-80	10.03	3.00	Tidal influence zone
EMF-WF-39					35-45			Not yet surveyed
EMF-WF-40					22-32	9.32		Not yet surveyed
EMF-WF-41					60-70	9.92		Not yet surveyed
EMF-WF-32	196,707.4	1,274,946.9	13.28	12.88	25-35	9.67	3.21	Tidal influence zone

Figures





APPROXIMATE
SCALE IN FEET

0 250 500 1000

BOEING® **CALIBRE Systems**

REVISION NO.: 0	DATE: 3/15/07	FILE: Fig 2-1site location.skd

Figure 1 Site Location EMF VOC Plume

DES'D: KBA	CLIENT: Boeing	PROJECT NO.: K502001
CHK'D: TJM	LOCATION: Boeing Fire Station	FIGURE: 1

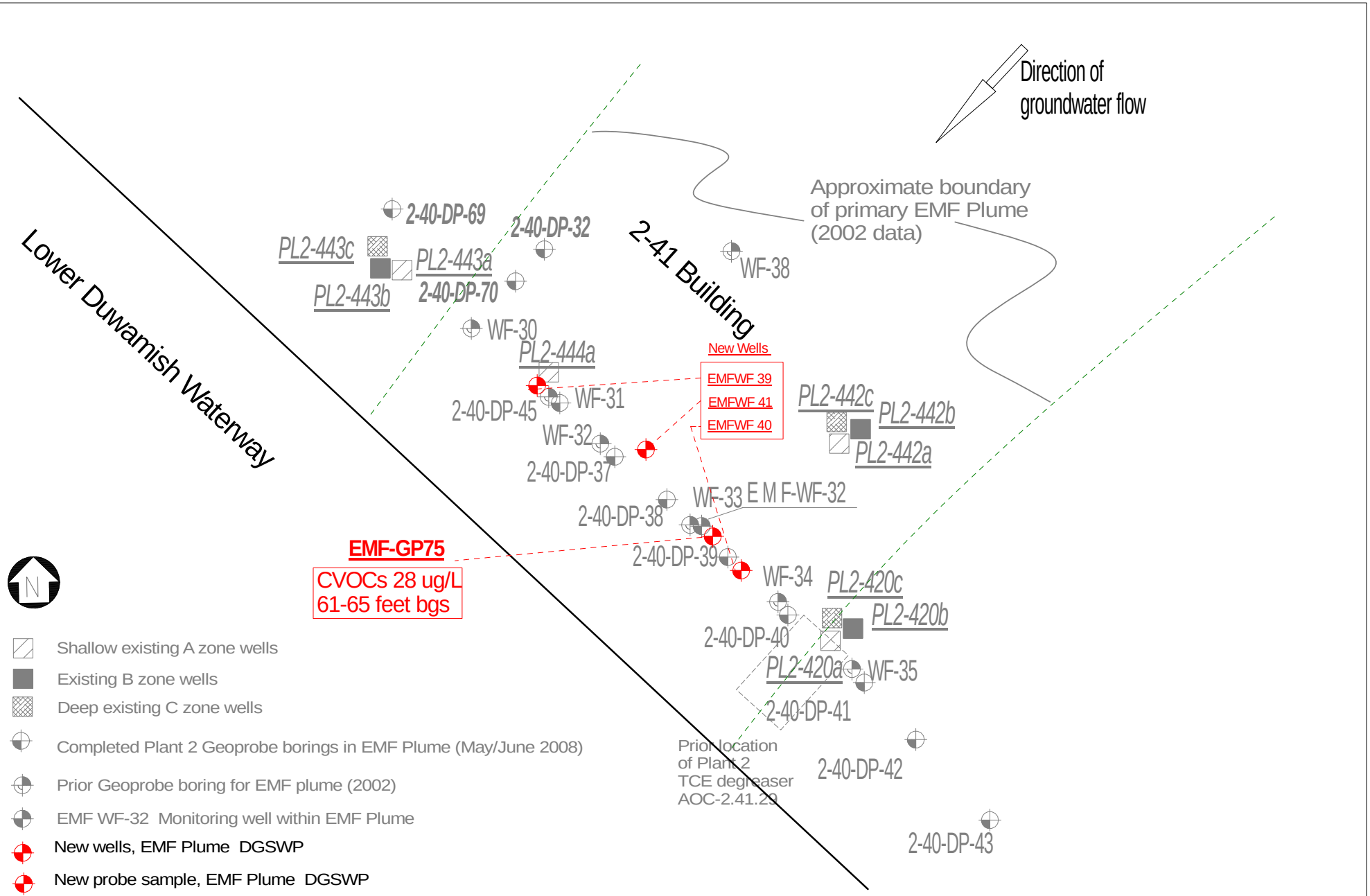
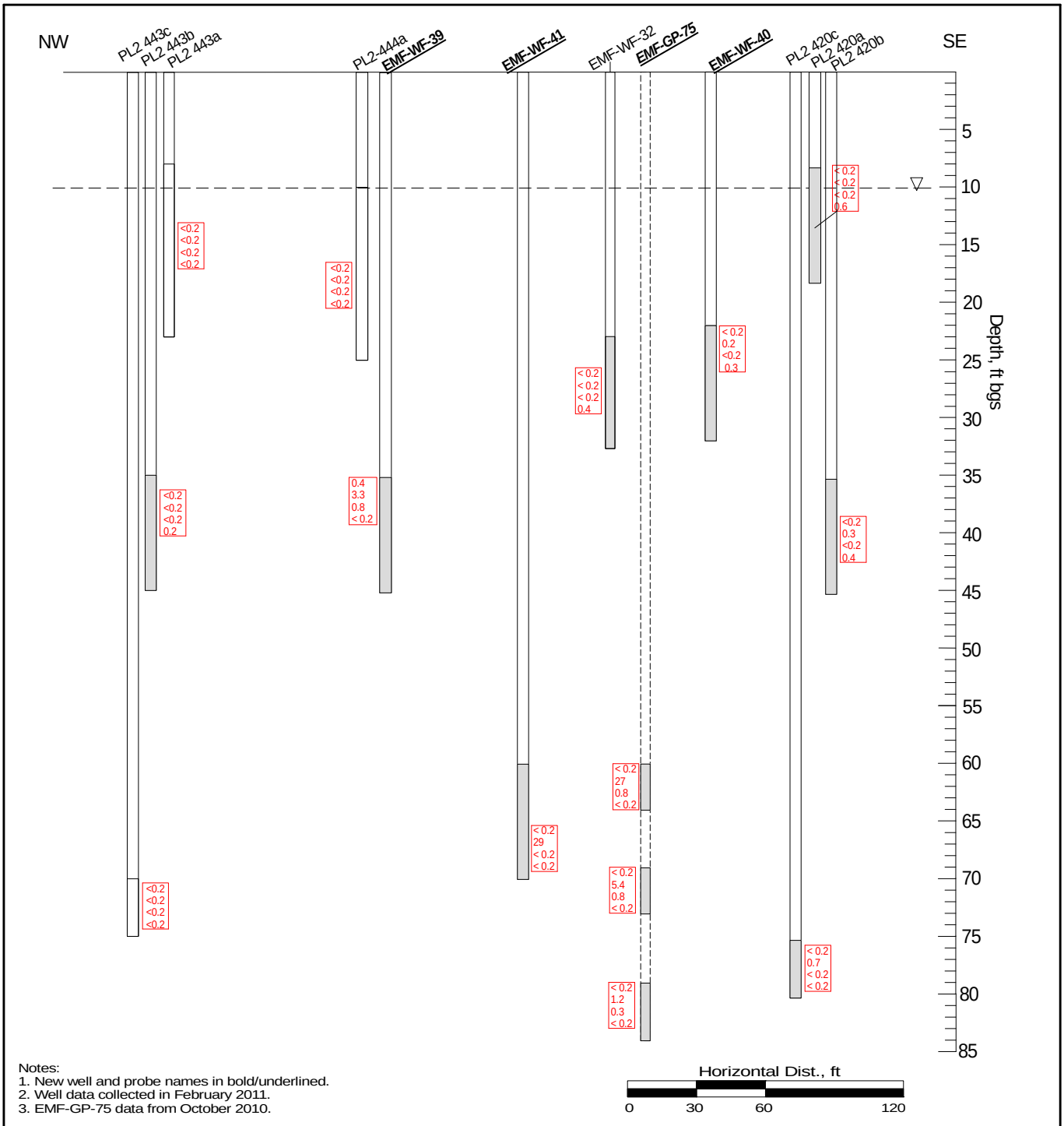


Figure 2 Total CVOCs Concentration and Depth at Probe Along Lower Duwamish Waterway, EMF Plume - October 2010



Notes:
1. New well and probe names in bold/underlined.
2. Well data collected in February 2011.
3. EMF-GP-75 data from October 2010.

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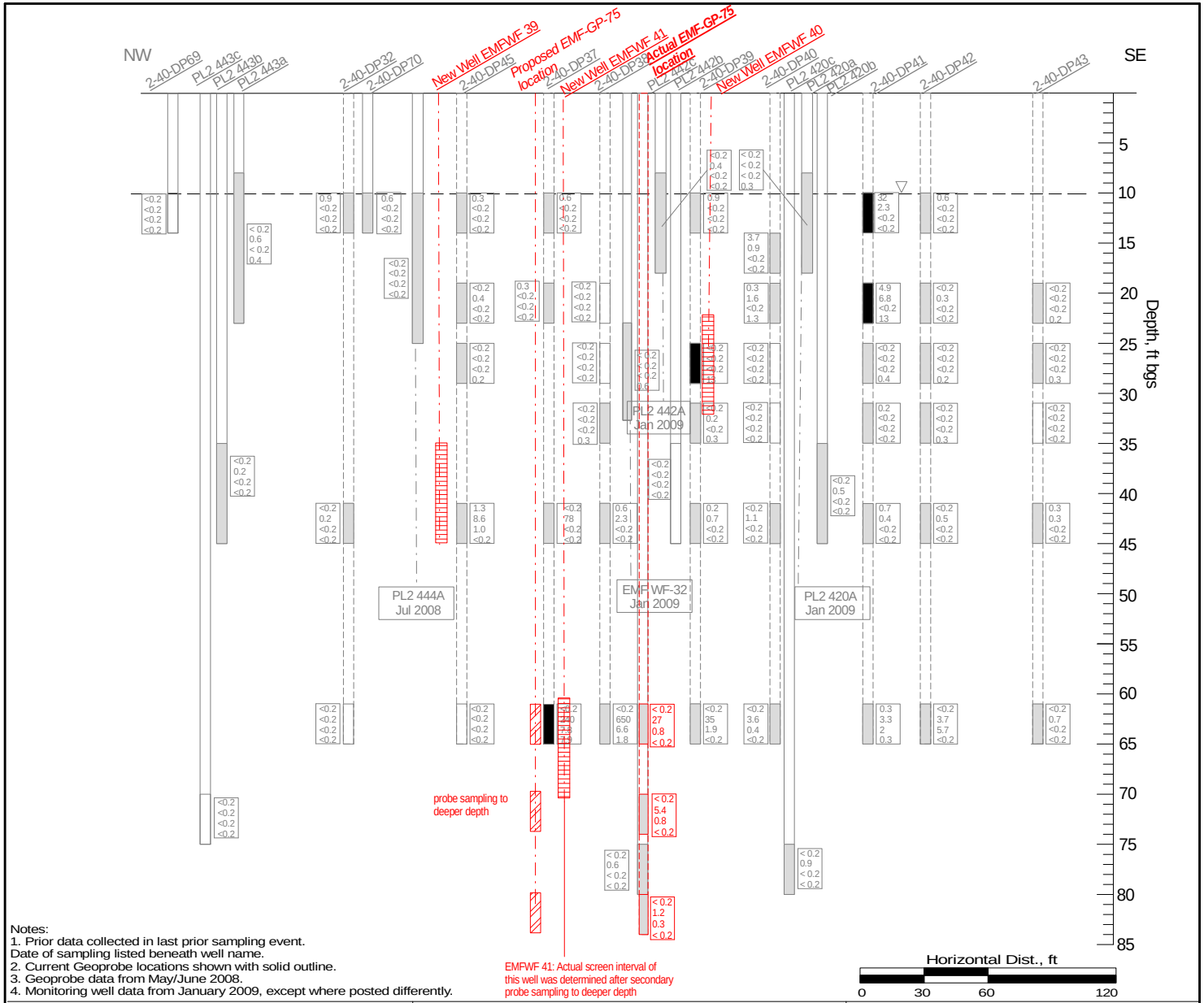
SAMPLE INTERVAL

Black areas indicate VC above AWQC/Gray areas indicate VOCs above detection limit/White areas indicate below detection level for all VOCs

DATA

<0.2	TCE (duplicate) all in ug/L
<0.2	1,2-cis-DCE (duplicate)
<0.2	1,2-trans-DCE (duplicate)
4.3	Vinyl Chloride (duplicate)

Figure 3 New Well and probe Data from EMF Plume Characterization at the Lower Duwamish Waterway - October 2010, February 2011.



Notes:
1. Prior data collected in last prior sampling event. Date of sampling listed beneath well name.
2. Current Geoprobe locations shown with solid outline.
3. Geoprobe data from May/June 2008.
4. Monitoring well data from January 2009, except where posted differently.

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LEGEND

Sample interval
ft bgs
TCE (ug/L)
12 cis DCE (ug/L)
12 trans DCE (ug/L)
Vinyl chloride (ug/L)
ft bgs
Top of water table (approx)

Indicates VOCs above revised (2003) AWQCs
Indicates VOCs detected
Indicates no VOCs detected

Figure 4 Cross section of existing monitoring wells, probe samples (May/June 2008, Jan 2009) & new wells /probes along Lower Duwamish Waterway, EMF Plume

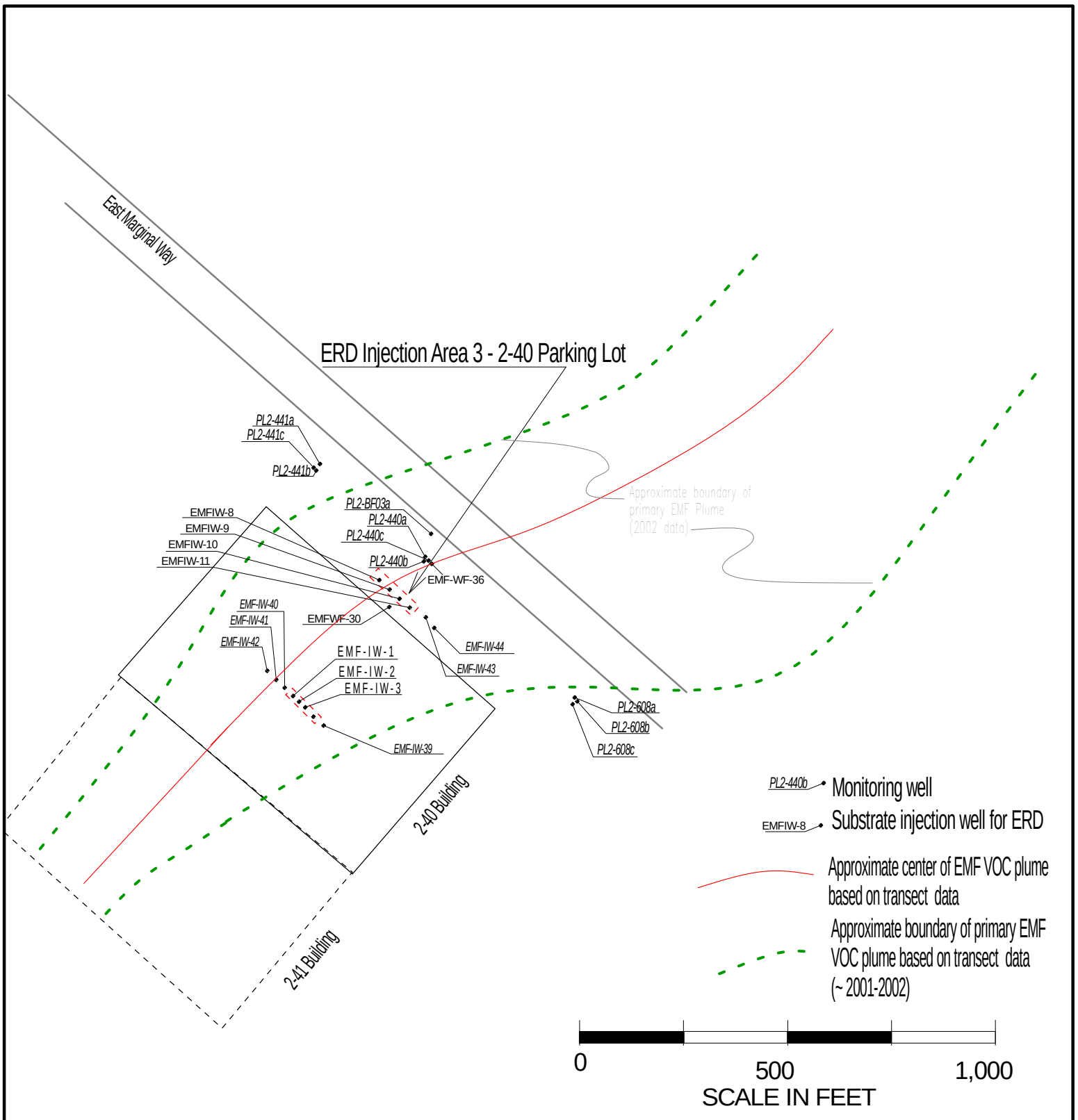

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FIGURE 5 EMF Plume Well Locations in the 2-40 Parking Lot

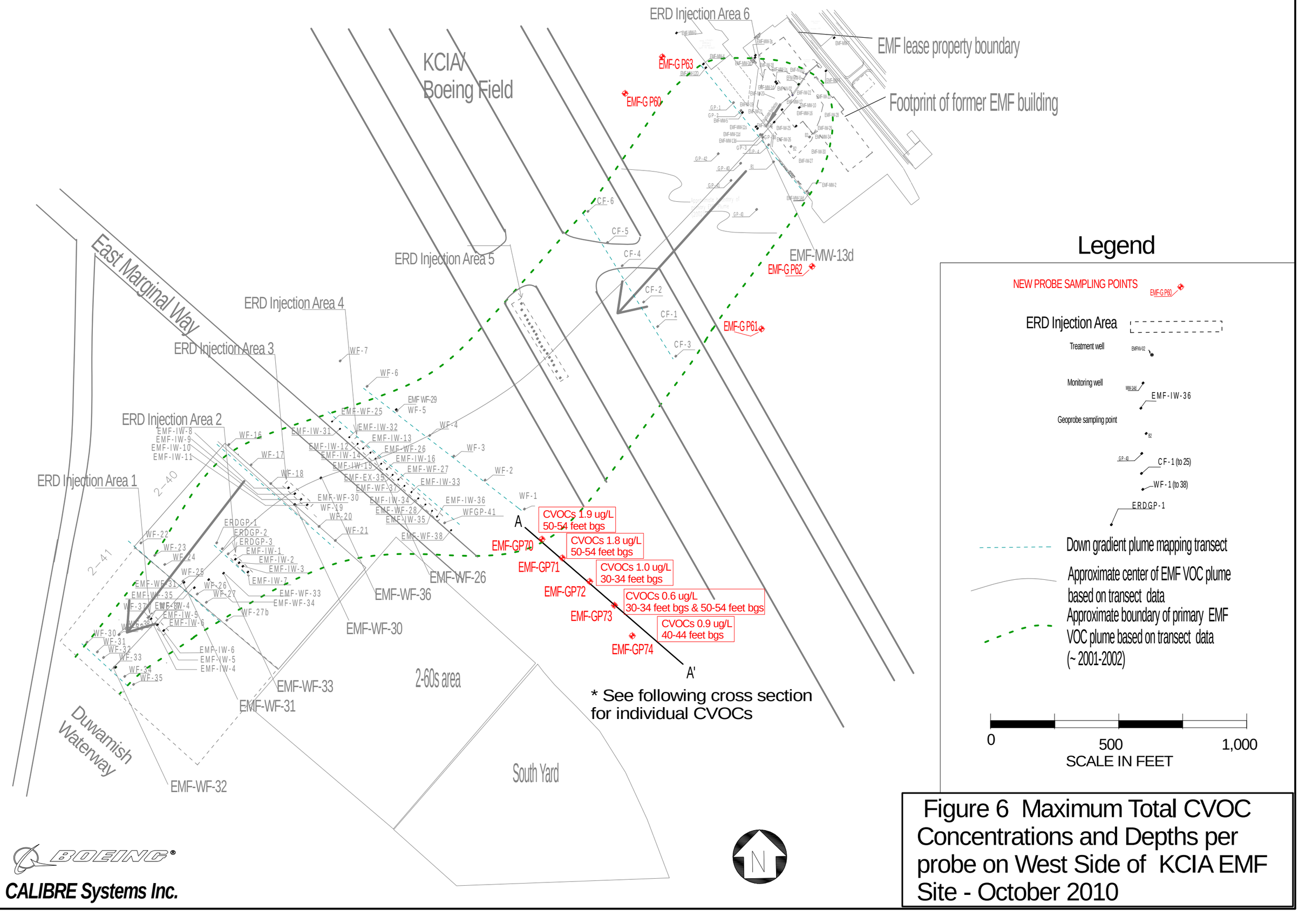

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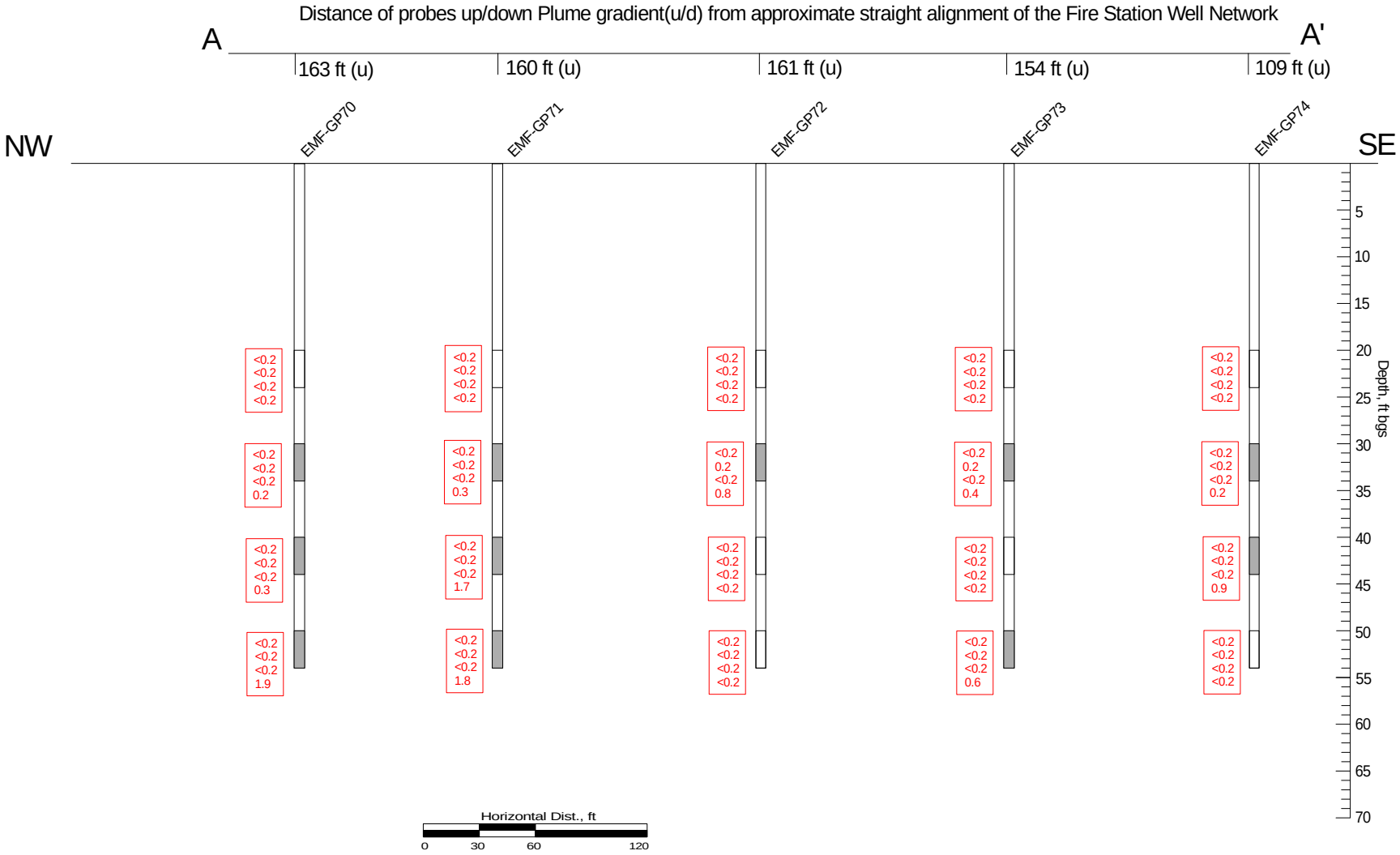
Figure 6 Maximum Total CVOC Concentrations and Depths per probe on West Side of KCIA EMF Site - October 2010



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Sample Interval

Black areas indicate VC above AWQC/Gray areas indicate VOCs above detection level/White areas indicate VOCs below detection level

LEGEND

<1 TCE (duplicate) all in ug/L
<1 1,2-cis-DCE (duplicate)
<1 1,2-trans-DCE (duplicate)
4.3 Vinyl chloride (duplicate)

Figure 7 October 2010 probe Data for EMF Plume Characterization at West KCIA, South of the Fire Station Area on North Boeing Field

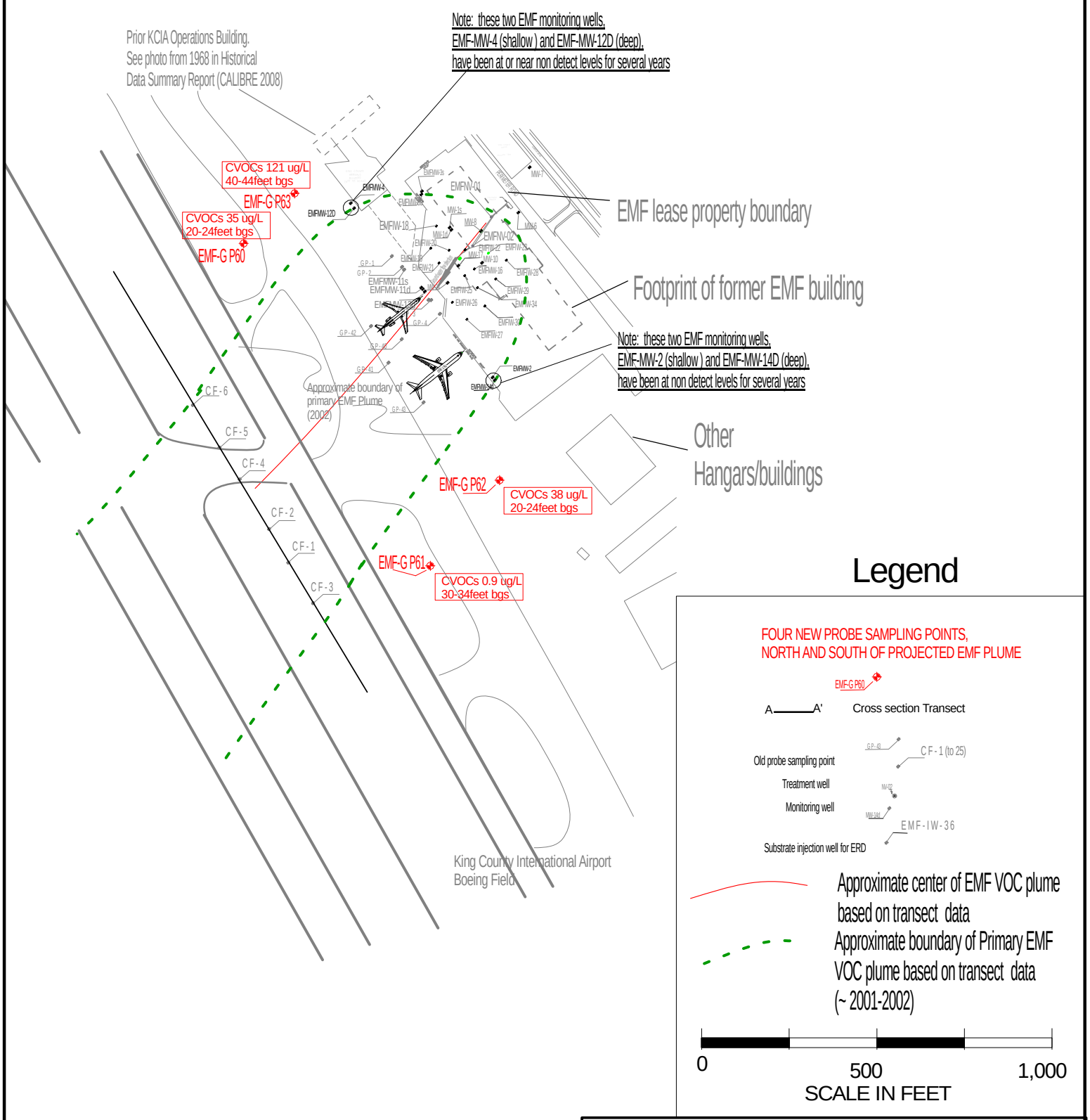

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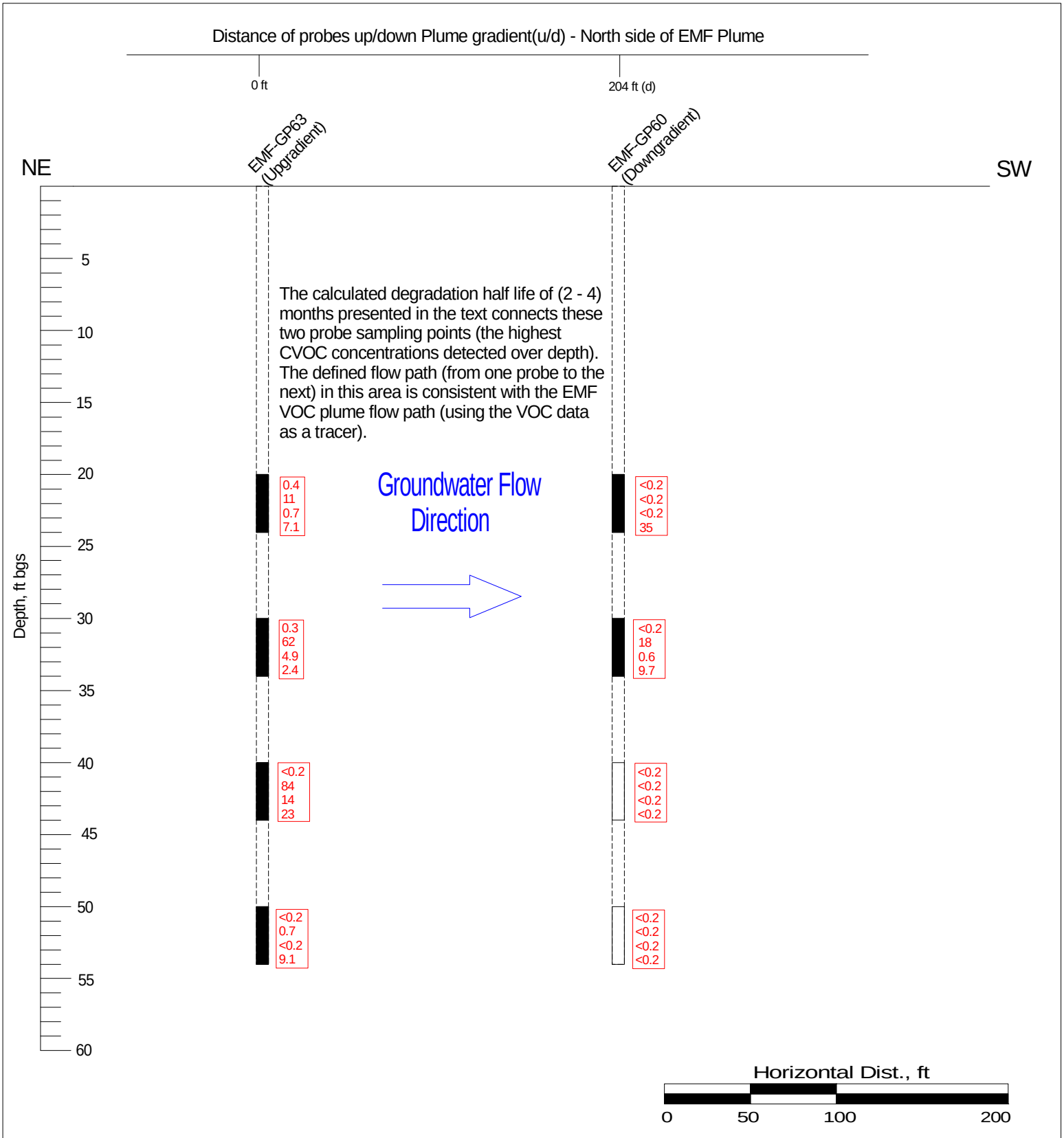
FIGURE 8 Maximum Total CVOC Concentrations and Depths per probe on the East Side of KCIA October 2010



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LEGEND

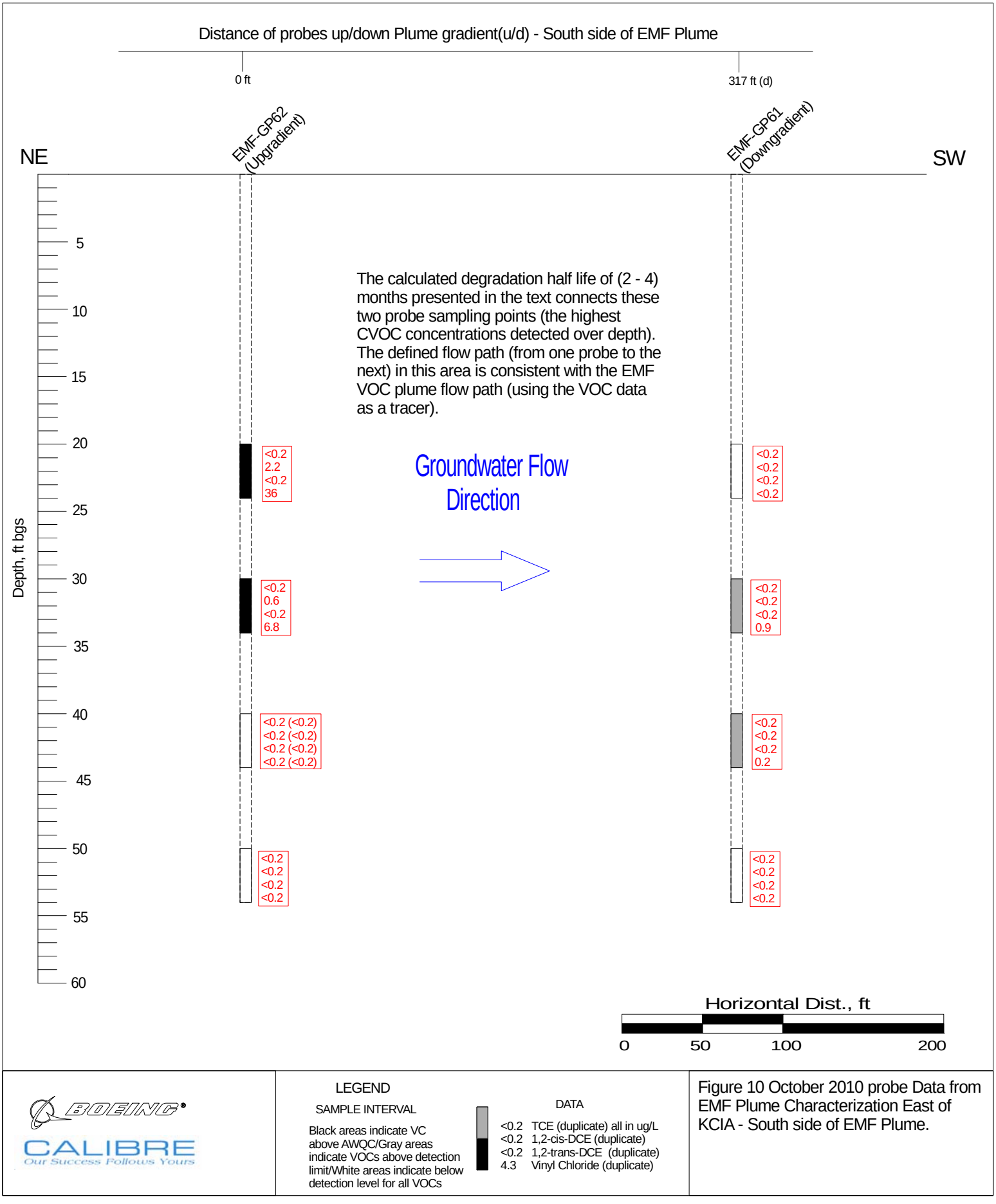
SAMPLE INTERVAL

Black areas indicate VC above AWQC/Gray areas indicate VOCs above detection limit/White areas indicate below detection level for all VOCs

DATA

<0.2 TCE (duplicate) all in ug/L
<0.2 1,2-cis-DCE (duplicate)
<0.2 1,2-trans-DCE (duplicate)
4.3 Vinyl Chloride (duplicate)

Figure 9 October 2010 probe Data from EMF Plume Characterization East of KCIA - North side of EMF Plume.



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LEGEND

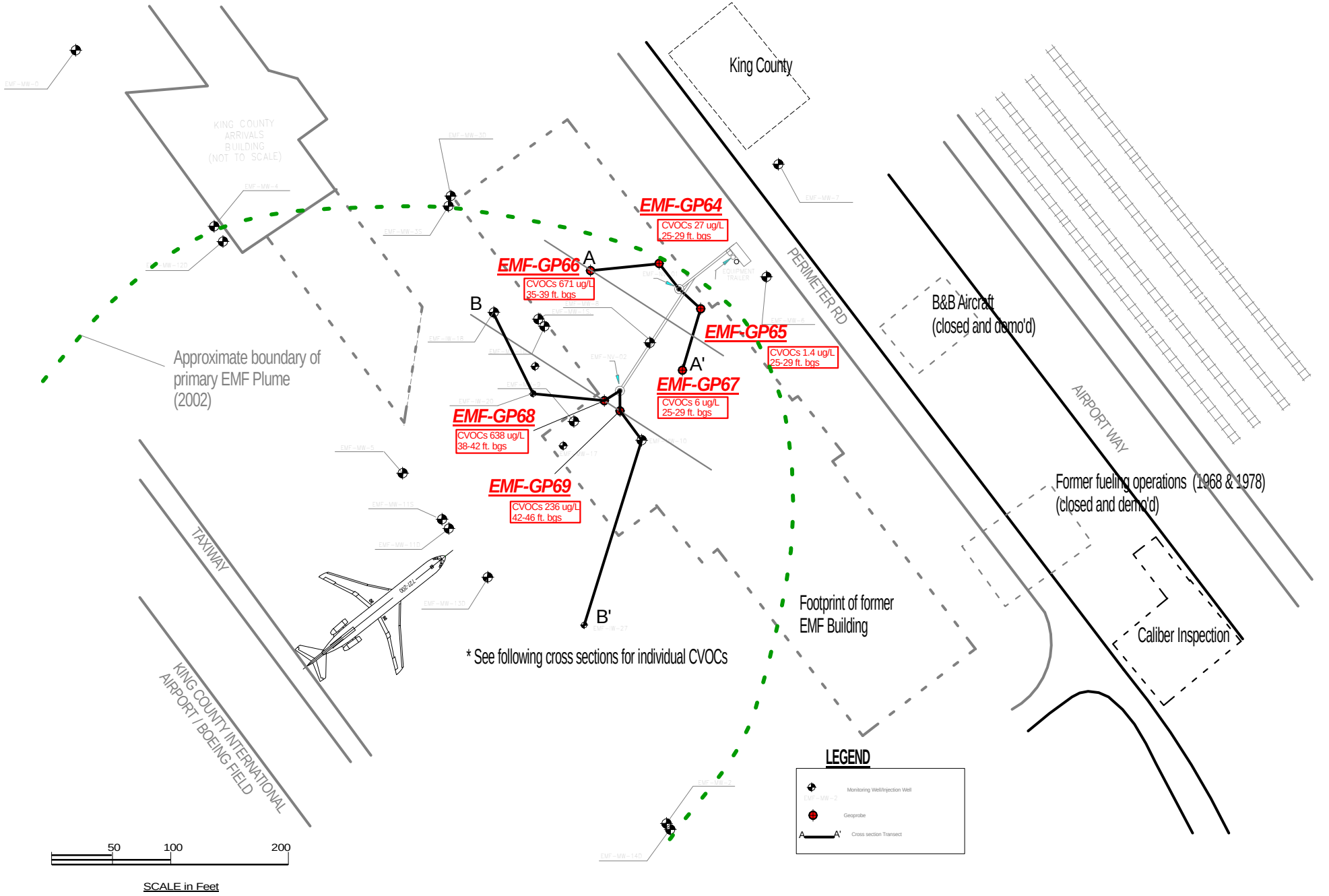
SAMPLE INTERVAL

Black areas indicate VC above AWQC/Gray areas indicate VOCs above detection limit/White areas indicate below detection level for all VOCs

DATA

<0.2 TCE (duplicate) all in ug/L
<0.2 1,2-cis-DCE (duplicate)
<0.2 1,2-trans-DCE (duplicate)
4.3 Vinyl Chloride (duplicate)

Figure 10 October 2010 probe Data from EMF Plume Characterization East of KCIA - South side of EMF Plume.



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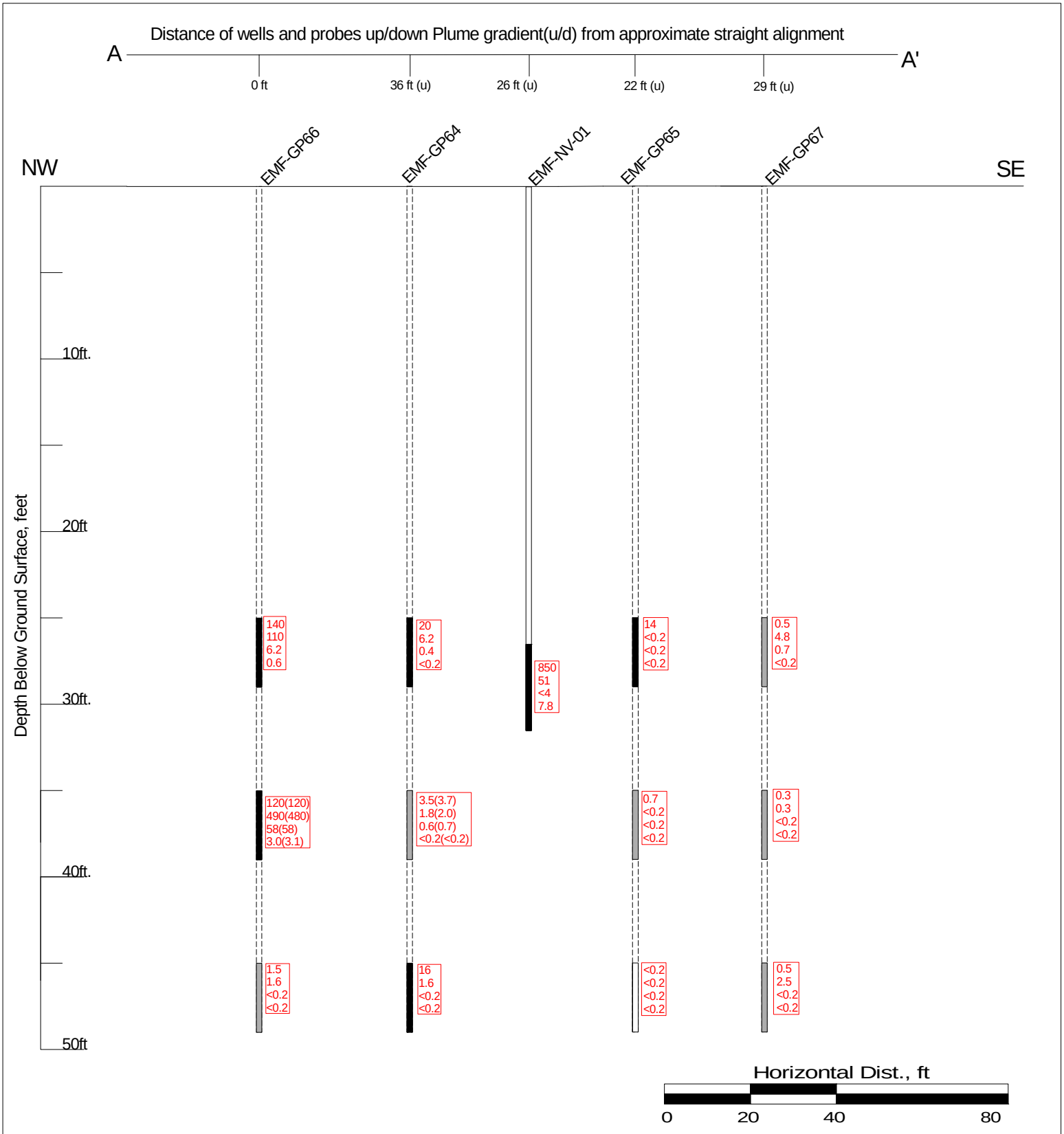
Boeing EMF Project
Seattle, Washington

Figure 11 Maximum Total CVOC Concentration and Depth per Geoprobe Near the Source Area on EMF Property - October 2010



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LEGEND

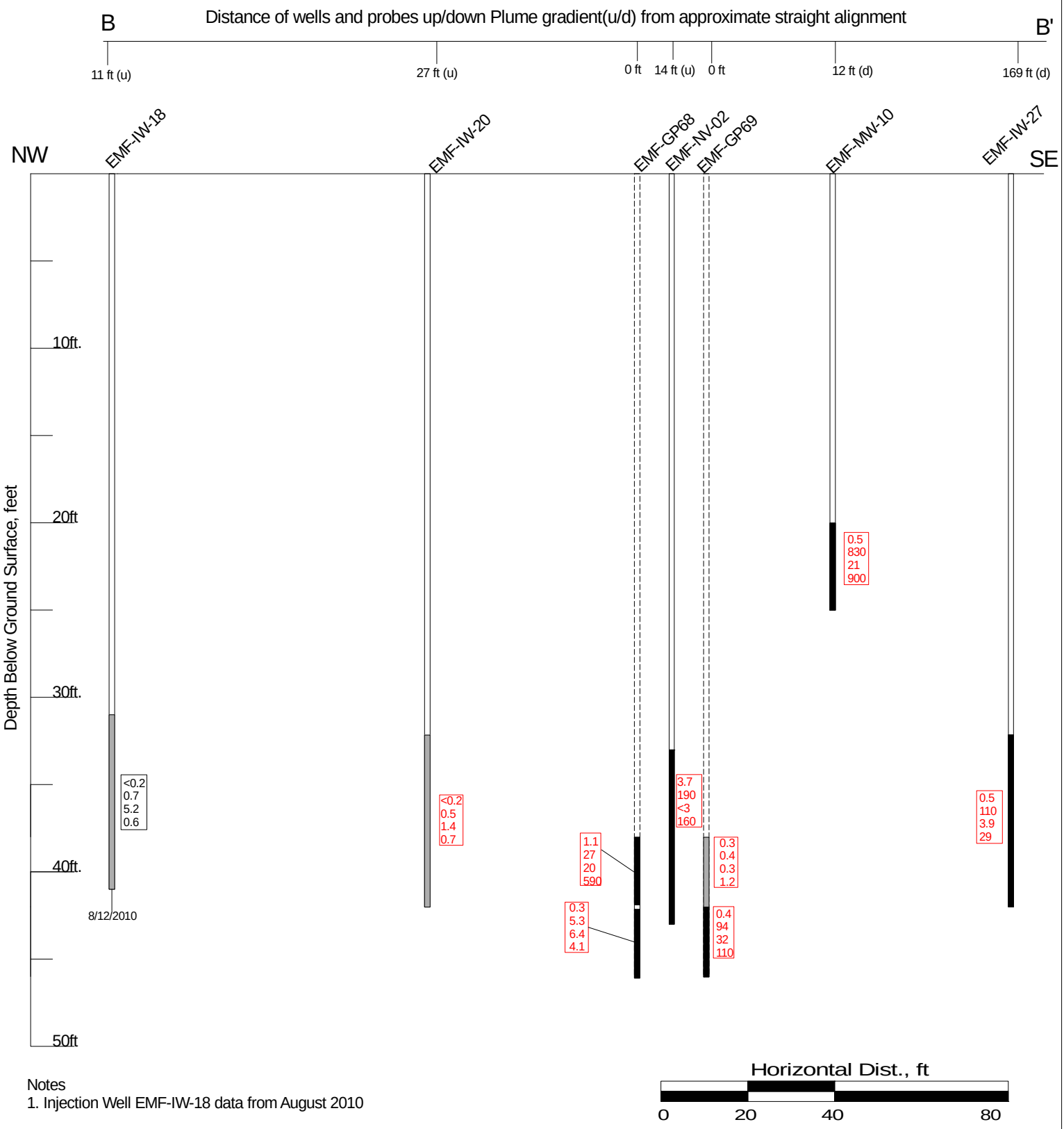
SAMPLE INTERVAL

Black areas indicate VC above AWQC/Gray areas indicate VOCs above detection limit/White areas indicate below detection level for all VOCs

DATA

<0.2 TCE (duplicate) all in ug/L
<0.2 1,2-cis-DCE (duplicate)
<0.2 1,2-trans-DCE (duplicate)
4.3 Vinyl Chloride (duplicate)

Figure 12 October 2010 and February 2011 Monitoring Well and probe Data from EMF Plume Characterization Near the Source Area on EMF Property (currently UPS). (A-A')



Notes
1. Injection Well EMF-IW-18 data from August 2010

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LEGEND

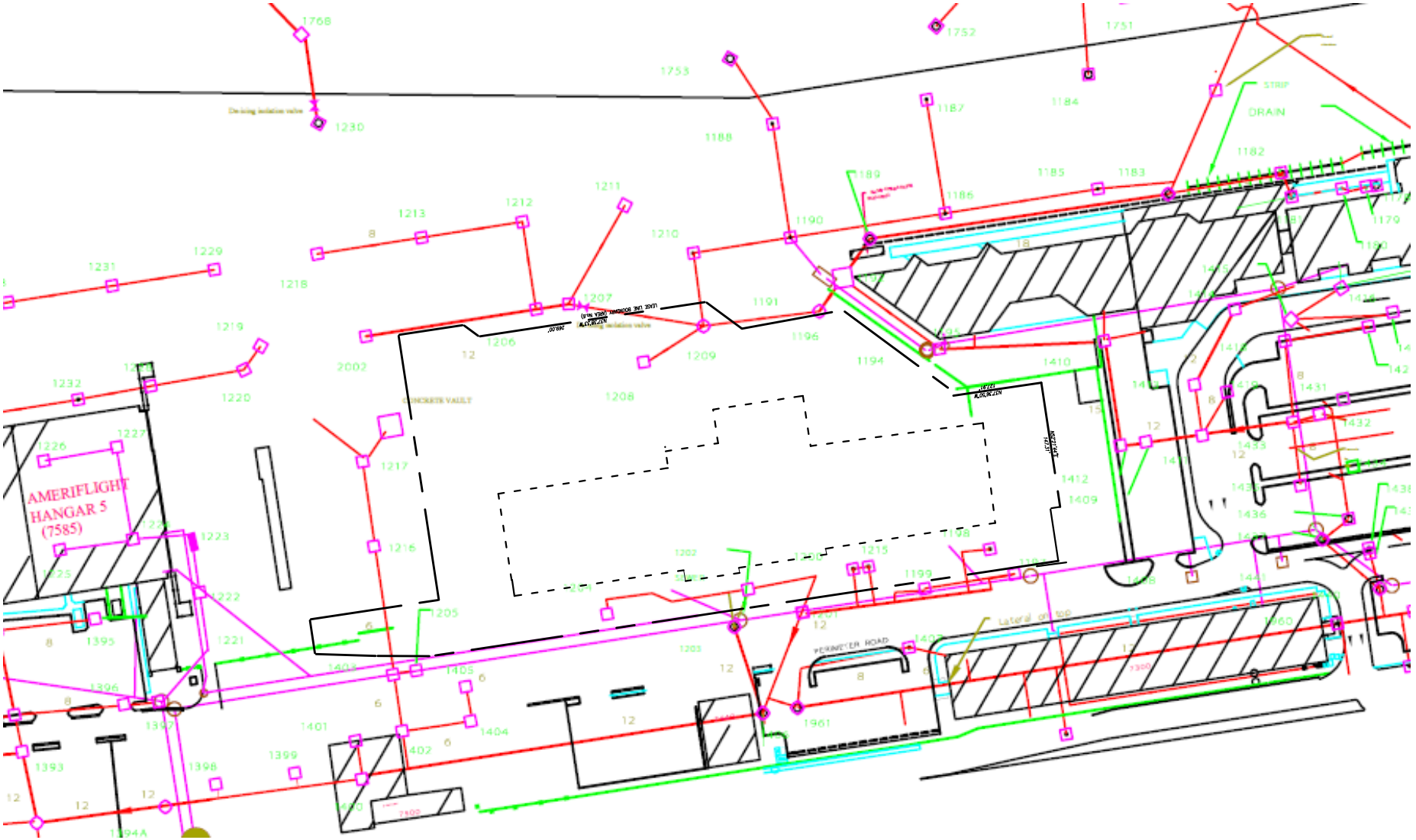
SAMPLE INTERVAL

Black areas indicate VC above AWQC/Gray areas indicate VOCs above detection limit/White areas indicate below detection level for all VOCs

CVOC DATA

<0.2	TCE	all in ug/L
<0.2	1,2-cis-DCE	
<0.2	1,2-trans-DCE	
4.3	Vinyl Chloride	

Figure 13 October 2010 and February 2011 Monitoring Well and Probe Data from EMF Plume Characterization at Areas under ERD Treatment near the EMF Source Area. (B-B')



Legend

- catchbasin
- manhole
- storm drainage
- sanitary sewer

All details taken from CAD file from KCIA titled "Stormwater Drainage System", all other details (blue & green lines) are labels/leaders, prior fencing , and other KCIA access features
Building footprints at KCIA have changed since this CAD file was prepared

Figure 14 Catch Basin and Storm Drainage Map from Former EMF Property
EMF Site

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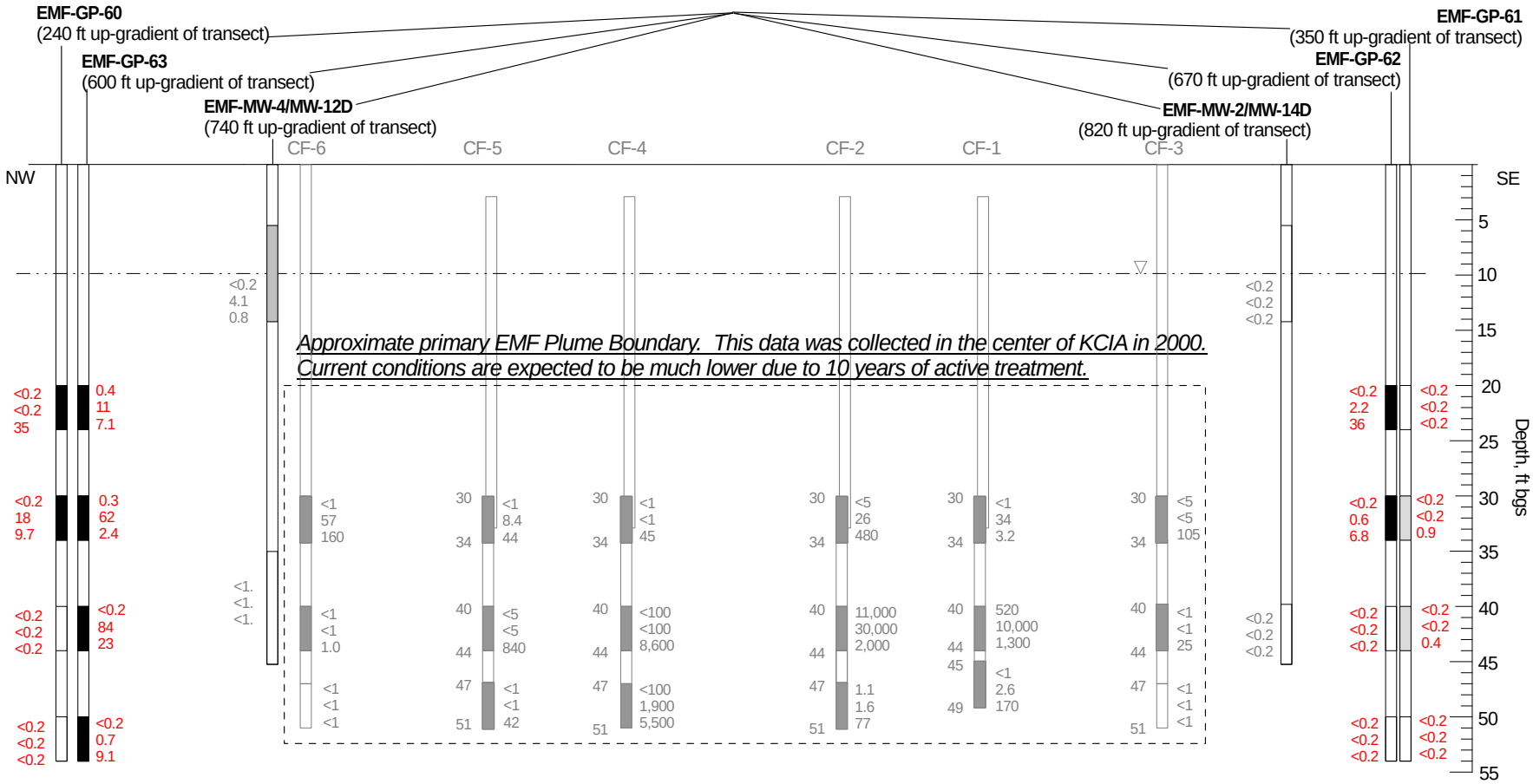
The four new probes are located up-gradient of the "CF" well transect and were sampled in October 2010. The two inside probes (EMF-GP-63 and EMF-GP-62) are approximately 350 ft up-gradient of the two outside geoprobes (EMF-GP-60 and EMF-GP-61).



Notes:

1. Data for CF-1 through CF-6 collected in November 2000 (PPC, 2002a)
2. Data for EMF-GP-60 through EMF-GP-63 collected in October 2010
3. Data for EMF-MW-2/EMF-MW-14D & EMF-MW-4/EMF-MW-12D collected between July 2008 and Febrary 2011; different dates for different wells (maximum value presented above)
4. Data from GP-60 and GP 63 also detected benzene (under 1 ug/L) which is not detected in EMF wells/source area
5. Data from GP-61 and GP 62 also detected 1,1 DCA (0.6 to 1.1 ug/L) which is not detected in EMF wells/source area

Horizontal Dist., ft: 0, 45, 90, 180

LEGEND

Sample interval
ft bgs
ft bgs
TCE (ug/L)
12DCE (ug/L)
Vinyl chloride (ug/L)
Top of water table (approx)

Indicates VOC above current AWQCs
Indicates no VOCs above AWQCs

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FIGURE 15. Results of Probe Sampling in Center of and East Side of KCIA, November 2000 and October 2010, & EMF Plume Boundary Well Sampling 2008/2011

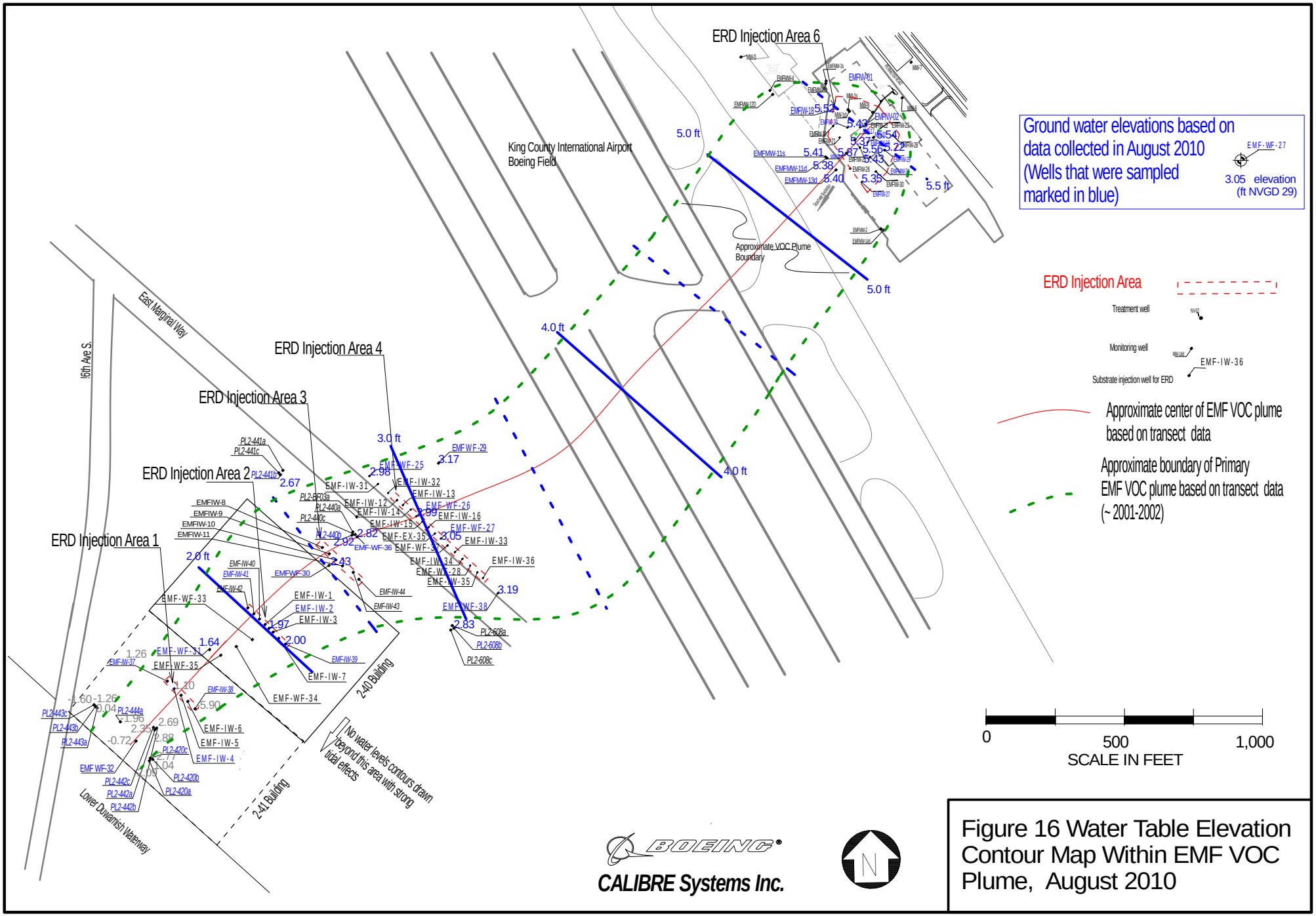

Figure 16 Water Table Elevation Contour Map Within EMF VOC Plume, August 2010

ERD Injection Area 6

ERD Injection Area 4

ERD Injection Area 3

ERD Injection Area 2

ERD Injection Area 1

King County International Airport
Boeing Field

East Marginal Way

16th Ave S.

Lower Duwamish Waterway

2-40 Building

2-41 Building

No water level contours drawn beyond this area with strong tidal effects

Approximate VOC Plume Boundary

Ground water elevations based on data collected in February 2011 (Wells that were sampled marked in blue, elevation measurements in blue, B Zone where EMF plume is present, are used for contour mapping)

EMF-WF-27
3.76 elevation (ft NVGD 29)

ERD Injection Area

Treatment well

Monitoring well

EMF-IW-36

Substrate injection well for ERD

Approximate center of EMF VOC plume based on transect data

Approximate boundary of Primary EMF VOC plume based on transect data (~ 2001-2002)

0 500 1,000
SCALE IN FEET

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N

Figure 17 Water Table Elevation Contour Map Within EMF VOC Plume, February 2011

Appendix A
Data Validation Report
October 2010 and February 2011 Sampling EMF Plume

Data Validation Report for Boeing EMF Data Gap Sampling: October 2010 Sampling

The field sampling and laboratory analysis for this project included collection of groundwater samples that were analyzed for VOCs by purge and trap gas chromatograph/mass spectrometer (GC/MS) method SW8260C in accordance with *Draft Quality Assurance Project Plan Environmental Sampling at EMF Site* (QAPP) (CALIBRE, Revision 4, September 2010). The samples were analyzed in accordance with procedures described in *Test Methods for Evaluating Solid Waste, Physical and Chemical Methods* (EPA SW-846 3rd Edition). The certified analytical laboratory is responsible for the initial data validation prior to submitting analytical results for this project. Any analytical results that do not meet the laboratory quality control (QC) acceptance criteria are identified, or the analysis repeated, validated, and, if acceptance criteria are met, reported. The laboratory is required to follow method specific QC procedures to evaluate performance and compare results with precision and accuracy criteria (from SW 846) as minimum guidelines for data validation.

An independent validation and assessment of the data was performed by CALIBRE upon receipt of laboratory data packages. The data were validated following *USEPA Contract Laboratory Program, National Functional Guidelines for Organic Methods Data Review* (June 2008). In accordance with the QAPP, ARI provided Level II data packages for validation since the range of concentrations expected are known based on prior sampling events over several years of site sampling and analyses. The data validation has been completed consistent with the data packages requested and provided. Specific QA/QC activities and results are summarized below.

The initial CALIBRE SOP in the EPA approved Work Plan is for an earlier version of *the National Functional Guidelines for Organic Methods Data Review*. The CALIBRE SOP has been updated to cite the new 2008 Guidelines and a copy of the updated CALIBRE SOP has been submitted to EPA.

Sample Delivery GroupRR86
Sampling Date 10/15/2010

Analytical Resources Inc. (ARI), located in Seattle, Washington, received seven (7) water samples and a trip blank for the analysis of Volatile Organic Compounds (VOCs) on 15 October 2010. The samples were hand delivered to ARI on the same day as sample collection under chain-of custody. Samples were analyzed in one (1) sample delivery group (SDG).

Lab Sample ID	Field Sample ID	Sample Date	SDG	Matrix	Method/Compounds
RR86A	EMF-GP75-61-65	10/15/2010	RR86	Aqueous	VOCs by 8260C
RR86B	EMF-GP75-70-74	10/15/2010	RR86	Aqueous	VOCs by 8260C
RR86C	EMF-GP75-80-84	10/15/2010	RR86	Aqueous	VOCs by 8260C
RR86D	EMF-GP64-25	10/15/2010	RR86	Aqueous	VOCs by 8260C
RR86E	EMF-GP64-35	10/15/2010	RR86	Aqueous	VOCs by 8260C
RR86F	EMF-DUP1	10/15/2010	RR86	Aqueous	VOCs by 8260C
RR86H	EMF-GP64-45	10/15/2010	RR86	Aqueous	VOCs by 8260C
RR86G	TRIP BLANK	10/15/2010	RR86	Aqueous	VOCs by 8260C

The field sampling and laboratory analysis for this project included collection of groundwater samples, same day delivery of the samples to the laboratory, and analysis for VOCs by purge and trap gas chromatograph/mass spectrometer (GC/MS) method SW8260C.

DATA VALIDATION

VOLATILE ORGANIC COMPOUNDS

Holding Times and Sample Receipt. Samples collected for VOC analysis were analyzed using EPA method 8260C, a purge and trap gas chromatograph/mass spectrometer (GC/MS) method. The samples were collected in 40 ml VOA vials pre-preserved with HCL and placed immediately in an ice chest. As it is customary for this project, all samples were delivered to the laboratory on the same day as their collection. The samples were received by the laboratory with a cooler temperature of 6.5°C. Due to same day delivery of the samples to the laboratory, there was not enough time for water samples to cool down from the ambient collection temperature to recommended temperature range of 4 ± 2 °C. All samples were received with a pH of <2.0. All samples were analyzed within method-recommended holding time for preserved VOC samples.

After the samples had aged, the analyst noted that the trip blank vial contained pea size air bubbles (2-4 mm) and sample EMF-GP64-45 contained headspace in all 3 bottles. Sample EMF-GP64-45 was decanted due to the large amount of sediment in the sample. There were no other anomalies associated with the analyses. Since the sample EMF-GP64-45 contained headspace and was decanted, all non-detect analytes have been flagged with a "R" qualifier, all detected analytes have been flagged with a "J" qualifier.

Calibration. Based on the laboratory case narrative, all samples were analyzed between 10/27/10 and 10/28/10 (within the method recommended holding time). The 10/27/10 continuing calibration (CCAL) was out of control low for methyl iodide and the 10/28/10 CCAL was out of control low for acrolein and acrylonitrile. All associated samples that contain these compounds have been flagged with a "Q" qualifier. No further corrective action was required.

Method Blanks and Trip Blanks. Method blanks were analyzed at the correct frequency per the analytical method. A trip blank was submitted for this sampling day. The date of preparation of the trip blank by the laboratory was listed on the cooler receipt form by the analyst. The laboratory analytical data form associated with the trip blank includes the sampling and the date when the trip blank was analyzed. All method and trip blank results were free of contamination. The trip blank contained 0.9 ug/L of methylene chloride. No associated data needed qualification.

Laboratory Control Samples/Matrix Spikes. Laboratory control samples (LCS) and laboratory control sample duplicates (LCSD) were analyzed. All precision and accuracy criteria were met for the LCS/LCSD. The LCS and LCSD were in control.

Surrogates. Based on the laboratory case narrative, all surrogate recoveries were in control.

DATA USABILITY

The review and evaluation of data collected in this SDG indicate that the data quality is suitable for the intended purpose (with the data quality flags noted, which includes "R" for the non-detect analytes from one sample EMF- GP64-45).

Sample Delivery Group RS06

Sampling Date 10/18/2010

Analytical Resources Inc. received 16 water samples and a trip blank for the analysis of VOCs on 18 October 2010. The samples were hand delivered to ARI on the same day as sample collection under chain-of custody. Samples were analyzed in one SDG.

Lab Sample ID	Field Sample ID	Sample Date	SDG	Matrix	Method/Compounds
RS06A	EMF-GP60-20	10/18/2010	RS06	Aqueous	VOCs by 8260C
RS06B	EMF-GP60-30	10/18/2010	RS06	Aqueous	VOCs by 8260C
RS06C	EMF-GP60-40	10/18/2010	RS06	Aqueous	VOCs by 8260C
RS06D	EMF-GP60-50	10/18/2010	RS06	Aqueous	VOCs by 8260C
RS06E	EMF-GP61-20	10/18/2010	RS06	Aqueous	VOCs by 8260C
RS06F	EMF-GP61-30	10/18/2010	RS06	Aqueous	VOCs by 8260C
RS06G	EMF-GP61-40	10/18/2010	RS06	Aqueous	VOCs by 8260C
RS06H	EMF-GP61-50	10/18/2010	RS06	Aqueous	VOCs by 8260C
RS06I	EMF-GP62-20	10/18/2010	RS06	Aqueous	VOCs by 8260C
RS06J	EMF-GP62-30	10/18/2010	RS06	Aqueous	VOCs by 8260C
RS06K	EMF-GP62-40	10/18/2010	RS06	Aqueous	VOCs by 8260C
RS06L	EMF-GP62-50	10/18/2010	RS06	Aqueous	VOCs by 8260C
RS06M	EMF-GP65-25	10/18/2010	RS06	Aqueous	VOCs by 8260C
RS06N	EMF-GP65-35	10/18/2010	RS06	Aqueous	VOCs by 8260C
RS06O	EMF-GP65-45	10/18/2010	RS06	Aqueous	VOCs by 8260C
RS06P	EMF-DUP2	10/18/2010	RS06	Aqueous	VOCs by 8260C
RS06Q	TRIP BLANK	10/18/2010	RS06	Aqueous	VOCs by 8260C

The field sampling and laboratory analysis for this project included collection of groundwater samples, same day delivery of the samples to the laboratory, and analysis for VOCs by purge and trap gas chromatograph/mass spectrometer (GC/MS) method SW8260C.

DATA VALIDATION

VOLATILE ORGANIC COMPOUNDS

Holding Times and Sample Receipt. Samples collected for VOC analysis were analyzed using EPA method 8260C, a purge and trap gas chromatograph/mass spectrometer (GC/MS) method. The samples were collected in 40 ml VOA vials pre-preserved with HCL and placed immediately in an ice chest. As it is customary for this project, all samples were delivered to the laboratory on the same day as their collection. The samples were received by the laboratory with a cooler temperature of 14.4°C. Due to same day delivery of the samples to the laboratory, there was not enough time for water samples to cool down from the ambient collection temperature to recommended temperature range of 4 ± 2 °C. All samples were received with a pH of <2.0 with the exception of two samples; EMF-GP61-40 which had a pH of 3, and sample EMF-GP62-50 which had a pH of 7. All samples were analyzed within method-recommended holding time for preserved VOC samples, except for EMF-GP61-40 and EMF-GP62-50 due to preservation.

Sample EMF-GP62-50 was decanted due to the large amount of sediment in the sample. There were no other anomalies associated with the analyses. Since the sample EMF-GP62-50 was decanted (due to sediments contained in the sample) and not preserved, all detected analytes have been flagged with a "J" qualifier and nondetects flagged with a "R" qualifier. Since the sample EMF-GP61-40 had a pH of 3, all detected analytes have been flagged with a "J" qualifier and nondetects flagged with a "R" qualifier.

Calibration. Based on the laboratory case narrative, the 10/28/10 CCAL was out of control low for acrolein and acrylonitrile and the 10/29/10 CCAL was out of control low for trans- 1, 4-Dichloro-2-butene. All associated samples that contain these compounds have been flagged with a "Q" qualifier. No further corrective action was required.

Method Blanks and Trip Blanks. Method blanks were analyzed at the correct frequency per the analytical method. All method blank results were free of contamination. A trip blank was submitted for this sampling day. The date of preparation of the trip blank by the laboratory was listed on the cooler receipt form by the analyst. The laboratory analytical data form associated with the trip blank includes the sampling and the date when the trip blank was analyzed. The trip blank contained 0.6 ug/L of methylene chloride. No associated data needed qualification.

Laboratory Control Samples/Matrix Spikes. Laboratory control samples (LCS) and laboratory control sample duplicates (LCSD) were analyzed. All precision and accuracy criteria were met for the LCS/LCSD. The LCS and LCSD were in control.

Surrogates. Based on the laboratory case narrative, all surrogate recoveries were in control.

DATA USABILITY

The review and evaluation of data collected in this SDG indicate that the data quality is suitable for the intended purpose (with the data quality flags noted).

Sample Delivery Group RS14

Sampling Date 10/19/2010

Analytical Resources Inc. received 15 water samples, one soil sample (the soil sample was for waste characterization, not site characterization), and a trip blank for the analysis of VOCs on 19 October 2010. The samples were hand delivered to ARI on the same day as sample collection under chain-of custody. Samples were analyzed in one SDG.

Lab Sample ID	Field Sample ID	Sample Date	SDG	Matrix	Method/Compounds
RS14A	EMF-GP63-20	10/19/2010	RS14	Aqueous	VOCs by 8260C
RS14B	EMF-GP63-30	10/19/2010	RS14	Aqueous	VOCs by 8260C
RS14C	EMF-GP63-40	10/19/2010	RS14	Aqueous	VOCs by 8260C
RS14D	EMF-GP63-50	10/19/2010	RS14	Aqueous	VOCs by 8260C
RS14E	EMF-GP66-25	10/19/2010	RS14	Aqueous	VOCs by 8260C
RS14F	EMF-GP66-35	10/19/2010	RS14	Aqueous	VOCs by 8260C
RS14G	EMF-GP66-45	10/19/2010	RS14	Aqueous	VOCs by 8260C
RS14H	EMF-GP67-25	10/19/2010	RS14	Aqueous	VOCs by 8260C
RS14I	EMF-GP67-35	10/19/2010	RS14	Aqueous	VOCs by 8260C
RS14J	EMF-GP67-45	10/19/2010	RS14	Aqueous	VOCs by 8260C
RS14K	EMF-GP69-38	10/19/2010	RS14	Aqueous	VOCs by 8260C
RS14L	EMF-GP68-42	10/19/2010	RS14	Aqueous	VOCs by 8260C
RS14M	EMF-GP68-38	10/19/2010	RS14	Aqueous	VOCs by 8260C
RS14N	EMF-GP68-42	10/19/2010	RS14	Aqueous	VOCs by 8260C
RS14O	EMF-DUP3	10/19/2010	RS14	Aqueous	VOCs by 8260C
RS14P	TRIP BLANK	10/19/2010	RS14	Aqueous	VOCs by 8260C
RS14Q	EMF-GP68-69	10/19/2010	RS14	Soil	VOCs by 8260C

The field sampling and laboratory analysis for this project included collection of groundwater samples, same day delivery of the samples to the lab, and analysis for VOCs by purge and trap gas chromatograph/mass spectrometer (GC/MS) method SW8260C.

DATA VALIDATION

VOLATILE ORGANIC COMPOUNDS

Holding Times and Sample Receipt. Samples collected for VOC analysis were analyzed using EPA method 8260C, a purge and trap gas chromatograph/mass spectrometer (GC/MS) method. The samples were collected in unpreserved 40 ml VOA vials and placed immediately in an ice chest. As it is customary for this project, all samples were delivered to the laboratory on the same day as their collection. The samples were received by the laboratory with a cooler temperature of 10.2°C. Due to same day delivery of the samples to the laboratory, there was not enough time for water samples to cool down from the ambient collection temperature to recommended temperature range of 4 ± 2 °C. All samples were received unpreserved. All samples were analyzed within method-recommended holding time for unpreserved VOC samples. At the time of sample delivery to the lab, the trip blank (1 of 1) and sample EMF-GP69-38 VOA bottles (1of 3) contained small bubbles (>2 mm).

Soil sample EMF-GP68-69 was not included on chain of custody. The required analysis was clarified via phone conversation on the day following sample delivery.

Calibration. Based on the laboratory case narrative, several analytes were outside of control limits. The 10/21/10 was out of control low for vinyl acetate; 2-chloroethylvinylether; 4-methyl-2-pentanone; 2-hexanone; 1,1,2,2,-tetrachloroethane; 1,2-dibromo-3-chloropropane; trans-1,4-dichloro-2-butene. The 10/22/10 CCAL at 00:30 was out of control low for trans-1,4-dichloro-2-butene; 2-chloroethylvinylether; and bromoform. The 10/22/10 CCAL at 12:04 was out of control low for vinyl acetate; trans-1,4-dichloro-2-butene; 2-chloroethylvinylether; 1,2-dibromo-3-chloropropane; and trans-1,4-dichloro-2-butene. The 10/26/10 CCAL was out of control high for methyl iodide and 4-isopropyltoluene. All associated samples that contain these compounds have been flagged with a "Q" qualifier. No further corrective actions were required.

Surrogates. Four surrogates were added to each sample per the analytical method at the required concentration. The surrogate recoveries were all within the laboratory acceptance limits.

Method Blanks and Trip Blanks. Method blanks were analyzed at the correct frequency per the analytical method. A trip blank was submitted for this sampling day. All method blanks results were free of contamination. The date of preparation of the trip blank by the laboratory was listed on the cooler receipt form by the analyst. The laboratory analytical data form associated with the trip blank includes the sampling and the date when the trip blank was analyzed. The trip blank contained 1.4 ug/L of methylene chloride. No associated data needed qualification.

Laboratory Control Samples/Matrix Spikes. Laboratory control samples (LCS) and laboratory control sample duplicates (LCSD) were analyzed. The 10/21/10 LCS was out of control low for acrylonitrile. The LCSD was in control and no further action was taken. The 00:30 10/22/10 LCS and LCSD were out of control high for acetone and out of control low for trans-1,4-dichloro-2-butene. No further action was taken. The 12:04 10/22/10 LCS was out of control low for bromoform. The LCSD is in control and no further action was taken.

Surrogates. Based on the laboratory case narrative, all surrogate recoveries were in control.

DATA USABILITY

The review and evaluation of data collected in this SDG indicate that the data quality is suitable for the intended purpose (with the data quality flags noted).

Sample Delivery Group RS46
Sampling Date 10/20/2010
Analytical Resources Inc. received 21 water samples and a trip blank for the analysis of VOCs on 20October 2010. The samples were hand delivered to ARI on the same day as sample collection under chain-of custody. Samples were analyzed in one SDG.

Lab Sample ID	Field Sample ID	Sample Date	SDG	Matrix	Method/Compounds
RS46A	EMF-GP70-20	10/20/2010	RS46	Aqueous	VOCs by 8260C
RS46B	EMF-GP70-30	10/20/2010	RS46	Aqueous	VOCs by 8260C
RS46C	EMF-GP70-40	10/20/2010	RS46	Aqueous	VOCs by 8260C
RS46D	EMF-GP70-50	10/20/2010	RS46	Aqueous	VOCs by 8260C
RS46E	EMF-GP71-20	10/20/2010	RS46	Aqueous	VOCs by 8260C
RS46F	EMF-GP71-30	10/20/2010	RS46	Aqueous	VOCs by 8260C
RS46G	EMF-GP71-40	10/20/2010	RS46	Aqueous	VOCs by 8260C
RS46H	EMF-GP71-50	10/20/2010	RS46	Aqueous	VOCs by 8260C
RS46I	EMF-GP72-20	10/20/2010	RS46	Aqueous	VOCs by 8260C
RS46J	EMF-GP72-30	10/20/2010	RS46	Aqueous	VOCs by 8260C
RS46K	EMF-GP72-40	10/20/2010	RS46	Aqueous	VOCs by 8260C
RS46L	EMF-GP72-50	10/20/2010	RS46	Aqueous	VOCs by 8260C
RS46M	EMF-GP73-20	10/20/2010	RS46	Aqueous	VOCs by 8260C
RS46N	EMF-GP73-30	10/20/2010	RS46	Aqueous	VOCs by 8260C
RS46O	EMF-GP73-40	10/20/2010	RS46	Aqueous	VOCs by 8260C
RS46P	EMF-GP73-50	10/20/2010	RS46	Aqueous	VOCs by 8260C
RS46Q	EMF-GP74-20	10/20/2010	RS46	Aqueous	VOCs by 8260C
RS46R	EMF-GP74-30	10/20/2010	RS46	Aqueous	VOCs by 8260C
RS46S	EMF-GP74-40	10/20/2010	RS46	Aqueous	VOCs by 8260C
RS46T	EMF-GP74-50	10/20/2010	RS46	Aqueous	VOCs by 8260C
RS46U	EMF-DUP4	10/20/2010	RS46	Aqueous	VOCs by 8260C
RS46V	TRIP BLANK	10/20/2010	RS46	Aqueous	VOCs by 8260C

The field sampling and laboratory analysis for this project included collection of groundwater samples that were analyzed for VOCs by purge and trap gas chromatograph/mass spectrometer (GC/MS) method SW8260C.

DATA VALIDATION

VOLATILE ORGANIC COMPOUNDS

Holding Times and Sample Receipt. Samples collected for VOC analysis were analyzed using EPA method 8260C, a purge and trap gas chromatograph/mass spectrometer (GC/MS) method. The samples were collected in unpreserved 40 ml VOA vials and placed in an ice chest. When received by the laboratory all sample temperatures were within the recommended range of 4 ± 2 °C, at 5.6°C. All samples were delivered to the laboratory on the same day as their collection. All samples were analyzed within method-recommended holding time for unpreserved VOC samples.
There were no anomalies associated with the samples and analyses.

Calibration. Based on the laboratory case narrative, all samples were analyzed on10/22/10 (within the method recommended holding time). The 10/22/10 CCAL on NT3 instrument was out of control low for 2-chloroethylvinylether; bromoform; and trans-1,4-dichloro-2-butene. All associated samples from the analytical run on NT3 that contain these compounds have been flagged with a "Q" qualifier. No further corrective action was required.

Method Blanks and Trip Blanks. Method blanks were analyzed at the correct frequency per the analytical method. All method blank results were free of contamination. A trip blank was submitted for this sampling day. The date of preparation of the trip blank by the laboratory was listed on the cooler receipt form by the analyst. The laboratory analytical data forms associated with the trip blank include dates of sampling events and dates when the trip blank was analyzed. The trip blank contained 0.7 ug/L of methylene chloride. No associated data needed qualification.

Laboratory Control Samples/Matrix Spikes. Laboratory control samples (LCS), laboratory control sample duplicates (LCSD), and Matrix Spikes were analyzed. The 10/22/10 LCS and LCSD on NT3 were out of control high for acetone and out of control low for trans-1,4-dichloro-2butene. No further action was taken. The matrix spike and matrix spike duplicate for sampleEMF-GP73-20 were out of control high for acetone, 2-butanone and 2-hexanone. No further action was required.

Surrogates. Based on the laboratory case narrative, all surrogate recoveries were in control.

DATA USABILITY

The review and evaluation of data collected in this SDG indicate that the data quality is suitable for the intended purpose (with the data quality flags noted).

Sample Delivery Group RY49
Sampling Date 11/30/2010
Analytical Resources Inc. received 3 water samples and a trip blank for the analysis of VOCs (and other analytes) on 30 November 2010. The samples were hand delivered to ARI on the same day as sample collection under chain-of custody. Samples were analyzed in one SDG.

Lab Sample ID	Field Sample ID	Sample Date	SDG	Matrix	Method/Compounds
RY49A	EMF-WF41-101130	11/30/2010	RY49	Aqueous	VOCs by 8260C, Total and dissolved metals by 6108B and 200.8; Total and dissolved low-level mercury by 7470A modified; Conductivity, salinity, and chloride by 120.1, 2520.B, and 300.0,
RY49B	EMF-WF40-101130	11/30/2010	RY49	Aqueous	VOCs by 8260C; Conductivity, salinity, and chloride by 120.1, 2520.B, and 300.0,
RY49C	EMF-WF39-101130	11/30/2010	RY49	Aqueous	VOCs by 8260C; Conductivity, salinity, and chloride by 120.1, 2520.B, and 300.0,
RY49D	TRICK BLANK	11/30/2010	RY49	Aqueous	VOCs by 8260C

The field sampling and laboratory analysis for this project included collection of groundwater samples that were analyzed for VOCs by purge and trap gas chromatograph/mass spectrometer (GC/MS) method SW8260C, total and dissolved metals with methods 6010B and 200.8, total and dissolved low-level mercury by method 7470A modified, and salinity and chloride.

DATA VALIDATION

VOLATILE ORGANIC COMPOUNDS

Holding Times and Sample Receipt. Samples collected for VOC analysis were analyzed using EPA method 8260C, a purge and trap gas chromatograph/mass spectrometer (GC/MS) method. The samples were collected in preserved 40 ml VOA vials and placed in an ice chest. When received by the laboratory all sample temperatures were within the recommended range of 4 ± 2 °C, at 5.9°C and had a pH <2. All samples were delivered to the laboratory on the same day as their collection. All samples were analyzed within method-recommended holding time for preserved VOC samples.
There were no anomalies associated with the samples and analyses.

Calibration. The 12/03/10 CCAL on NT3 instrument was in control for all analyzed VOCs.

Method Blanks and Trip Blanks. Method blanks were analyzed at the correct frequency per the analytical method. All method blank results were free of contamination. A trip blank was submitted for this sampling day. The date of preparation of the trip blank by the laboratory was listed on the cooler receipt form by the analyst. The laboratory analytical data forms associated with the trip blank include dates of sampling events and dates when the trip blank was analyzed. The trip blank was free of contamination. No associated data needed qualification.

Laboratory Control Samples/RPDs. Laboratory control samples (LCS) and laboratory control sample duplicates (LCSD) were analyzed. The 12/03/10 LCSD on NT3 were out of control high for Methyllodide. The LCS was in control and no further action was taken.

TOTAL AND DISSOLVED METALS

Holding Times and Sample Receipt. The sample collected for total and dissolved metals analysis was analyzed using EPA methods 6010b and 200.8. The sample was collected in a preserved 500 ml HDPE container and placed in an ice chest. When received by the laboratory the sample temperature was within the recommended range of 4 ± 2 °C, at 5.9°C. The sample was delivered to the laboratory on the same day as collection. Sample was digested between 12/1/2010 and 12/2/2010. The digested sample was analyzed between 12/6/2010 and 12/10/2010, within the recommended holding time.

There were no anomalies associated with the sample and analyses.

Calibration. The instrument was in control for all analyzed metals.

Method Blanks and Trip Blanks. Method blanks were analyzed at the correct frequency per the analytical method. All method blank results were free of contamination. No associated data needed qualification.

Laboratory Control Samples/Blank Spikes. Laboratory control samples (LCS) and blank spikes were analyzed. All percent recoveries were within compliance in the LCS. No further action was taken.

TOTAL AND DISSOLVED LOW-LEVEL MERCURY

Holding Times and Sample Receipt. The sample collected for total and dissolved low-level mercury analysis were analyzed using EPA method 7470A modified. The sample was collected in a preserved500 ml HDPE container and placed in an ice chest. When received by the laboratory the sample temperature was within the recommended range of 4 ± 2 °C, at 5.9°C. The sample was delivered to the laboratory on the same day as collection. Sample was digested on 12/1/2010. The digested sample was analyzed on 12/3/2010, within the recommended holding time.

Based on a clarification request, the lab indicated the modified method is used to achieve lower RLs and the calibrations are lower than the standard Hg analysis and there is no effect on the samples being digested on 12/1/10 and analyzed on 12/3/10 as the samples and associated QC are not reduced until the time of analyses (see e-mail correspondence attached).

There were no anomalies associated with the sample and analyses.

Calibration. The instrument was in control for all analyzed metals.

Method Blanks and Trip Blanks. Method blanks were analyzed at the correct frequency per the analytical method. All method blank results were free of contamination. No associated data needed qualification.

Laboratory Control Samples/Blank Spikes. Laboratory control samples (LCS) and blank spikes were analyzed. All were in control. No further action was taken.

CONDUCTIVITY, SALINITY, AND CHLORIDE

Holding Times and Sample Receipt. Conductivity, Salinity, and Chloride were analyzed using EPA methods120.1, 2520.B, and 300.0. Samples were collected in 500 ml poly containers and placed in an

ice chest. When received by the laboratory all sample temperatures were within the recommended range of 4 ± 2 °C, at 5.9°C. All samples were delivered to the laboratory on the same day as their collection. Conductivity and salinity samples were analyzed on 12/6/2010 within the method recommended holding time. Chloride samples were analyzed on 12/16/2010, within the recommended holding time.

There were no anomalies associated with the samples and analyses.

Method Blanks. The method blank was analyzed at the correct frequency per the analytical method. The method blank for chloride contained analyte. All associated samples were greater than ten times the concentration found in the method blank. The method blanks for chloride and salinity were free of contamination. No associated data needed qualification.

Laboratory Control Samples/SRM/Replicate: All percent recoveries and RPDs were in control.

DATA USABILITY

The review and evaluation of data collected in this SDG indicate that the data quality is suitable for the intended purpose (with the data quality flags noted).

-----Original Message-----
From: Kelly Bottem [mailto:kellyb@arilabs.com]
Sent: Monday, December 12, 2011 9:49 AM
To: McKeon, Tom; carl.m.bach@Boeing.com
Subject: Re: EPA comments on EMF data from Oct Nov 2010 and Febr 2011

Tom-

Re. Comments
36F The modified method is only to achieve lower RLs and the calibrations are lower than the standard Hg analysis.
There is no effect on the samples being digested on 12/1/10 and analyzed on 12/3/10 as the samples and associated QC are not reduced until the time of analyses.

37b. When asked to change sample IDs I usually correct the COC for the client but in the case of SH74 I did not. This was corrected based on feedback from Calibre and Golder.

37c please find login info which lists samples with bubble info.

38) please find revised report attached for SF10 and working on SL46.

On 12/12/2011 6:22 AM, McKeon, Tom wrote:
> Kelly pls see attached
> The following list is some I could use some help on (in the attached
> file) in red
>
> Comment #
>
> 36f
>
> 37b
>
> 37c
>
> 38
>
> Thx
>
> Tom
>
--

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"Never interrupt someone doing something you said couldn't be done" - Amelia Earhart

***Before printing, think about ENVIRONMENTAL responsibility

Data Validation Report for Boeing EMF Data Gap Sampling: February2011 Sampling

The field sampling and laboratory analysis for this project includes collection of groundwater samples and analyses for Volatile Organic Compounds (VOCs) by purge and trap gas chromatograph/mass spectrometer (GC/MS) method SW8260C. In addition, specified samples were also analyzed for dissolved gases (methane, ethane, and ethane [MEE]) using RSK 175 (modified), and total organic carbon (TOC) using EPA 415.1.All analyses were conducted in accordance with *Draft Quality Assurance Project Plan Environmental Sampling at EMF Site* (QAPP) (CALIBRE, Revision 4, September 2010). The samples were analyzed in accordance with procedures described in *Test Methods for Evaluating Solid Waste, Physical and Chemical Methods* (EPA SW-846 3rd Edition). The certified analytical laboratory is responsible for the initial data validation prior to submitting analytical results for this project. Any analytical results that do not meet the laboratory quality control (QC) acceptance criteria are identified, or the analysis repeated, validated, and, if acceptance criteria are met, reported. The laboratory is required to follow method specific QC procedures to evaluate performance and compare results with precision and accuracy criteria (from SW 846) as minimum guidelines for data validation.

An independent validation and assessment of the data was performed by CALIBRE upon receipt of laboratory data packages. The data were validated following *USEPA Contract Laboratory Program, National Functional Guidelines for Organic Methods Data Review* (June 2008). In accordance with the QAPP, ARI provided Level II data packages for validation since the range of concentrations expected are known based on prior sampling events over several years of site sampling and analyses. The data validation has been completed consistent with the data packages requested and provided. Specific QA/QC activities and results are summarized below. There were five (5) sample delivery groups associated with this sampling event and each is discussed separately below.

The initial CALIBRE SOP in the EPA approved Work Plan is for an earlier version of the *National Functional Guidelines for Organic Methods Data Review*. The CALIBRE SOP has been updated to cite the new 2008 Guidelines and a copy of the updated CALIBRE SOP has been submitted to EPA.

Sample Delivery Group SH28
Sampling Date 02/02/2011

Analytical Resources Inc. received six (6) water samples and a trip blank for the analysis on 2 February 2011. The samples were hand delivered to ARI on the same day as sample collection under COC and analyzed for VOCs by purge and trap GC/MS method SW8260C. These samples were analyzed in one (1) sample delivery group (SDG).

Lab Sample ID	Field Sample ID	Sample Date	SDG	Matrix	Method/Compounds
SH28A	PL2-420A-110202	02/02/2011	SH28	Aqueous	VOCs by 8260C
SH28B	PL2-420C-110202	02/02/2011	SH28	Aqueous	VOCs by 8260C
SH28C	PL2-420B-110202	02/02/2011	SH28	Aqueous	VOCs by 8260C
SH28D	PL2-443A-110202	02/02/2011	SH28	Aqueous	VOCs by 8260C
SH28E	PL2-443C-110202	02/02/2011	SH28	Aqueous	VOCs by 8260C
SH28F	PL2-443B-110202	02/02/2011	SH28	Aqueous	VOCs by 8260C
SH28G	TRIP BLANK	02/02/2011	SH28	Aqueous	VOCs by 8260C

DATA VALIDATION
VOLATILE ORGANIC COMPOUNDS

Holding Times and Sample Receipt. The samples were collected in 40 ml VOA vials pre-preserved with HCL and placed immediately in an ice chest. As it is customary for this project, all samples were delivered to the laboratory on the same day as their collection. The samples were received by the laboratory with a cooler temperature of 1.9°C.

All samples were received by the laboratory at a pH <2 and analyzed on 2/8/11 within method-recommended holding time for VOC samples. There were no anomalies associated with the samples upon receipt at the laboratory.

Calibration. The 2/8/11 CCAL was out of control high for 2-hexanone. All associated samples that contain this compound have been flagged with a "Q" qualifier. No further corrective actions were required.

Surrogates. All surrogate recoveries were within control limits.

Method Blanks and Trip Blanks. Method blanks were analyzed at the correct frequency per the analytical method. A trip blank was submitted with the samples for this sampling day. The date of preparation of the trip blank by the laboratory was listed on the COC. The laboratory analytical data form associated with the trip blank includes the date when the trip blank was analyzed. All method and trip blank results were free of contamination.

Laboratory Control Samples/Matrix Spikes. The LCS and LCSD were analyzed. The LCSD was out of control high for 2-hexanone. The LCS was in control and no further corrective action was required.

FIELD DUPLICATES

There was no field duplicate sample collected with this sample batch which is a deviation from the QAPP as the six samples collected (plus a trip blank) were analyzed in a separate SDG. This should have no impact on data quality; however, corrective measures will be implemented to ensure collection of duplicates as specified in the QAPP.

DATA USABILITY

The review and evaluation of data collected in this SDG indicates that the data quality is suitable for the intended purpose. No data were rejected as a result of data validation and 100% of the data are considered usable as qualified.

Sample Delivery GroupSH74
Sampling Date 02/07/2011

Analytical Resources Inc. (ARI), located in Seattle, Washington, received eleven (11)water samples and a trip blank for the analysis on 7 February 2011. The samples were hand delivered to ARI on the same day as sample collection under chain-of custody (COC) and analyzed for VOCs by purge and trap gas GC/MS method SW8260C. In addition, specified samples were also analyzed for MEE using RSK 175 (modified), and TOC using EPA 415.1.These samples were analyzed in one (1) sample delivery group (SDG).

Lab Sample ID	Field Sample ID	Sample Date	SDG	Matrix	Method/Compounds
SH74A	PL2-444A-110207*	02/07/2011	SH74	Aqueous	VOCs by 8260C
SH74B	EMF-WF39-110207	02/07/2011	SH74	Aqueous	VOCs by 8260C
SH74C	EMF-WF41-110207	02/07/2011	SH74	Aqueous	VOCs by 8260C
SH74D	EMF-WF40-110207	02/07/2011	SH74	Aqueous	VOCs by 8260C
SH74E	EMF-WF32-110207	02/07/2011	SH74	Aqueous	VOCs by 8260C, MEE by RSK175Mod, and TOC by EPA 415.1
SH74F	EMF-IW38-110207	02/07/2011	SH74	Aqueous	VOCs by 8260C and TOC by EPA 415.1
SH74G	EMF-WF31-110207	02/07/2011	SH74	Aqueous	VOCs by 8260C
SH74H	EMF-WF33-110207	02/07/2011	SH74	Aqueous	VOCs by 8260C
SH74I	EMF-IW-7-110207	02/07/2011	SH74	Aqueous	VOCs by 8260C
SH74J	EMF-DUP1-110207	02/07/2011	SH74	Aqueous	VOCs by 8260C
SH74K	EMF-IW40-110207	02/07/2011	SH74	Aqueous	VOCs by 8260C and TOC by EPA 415.1
SH74L	TRIP BLANKS	02/07/2011	SH74	Aqueous	VOCs by 8260C

*

The field sample ID on the COC form was incorrectly recorded as PL2-443A-110207; however, the laboratory correctly reported the sample number as PL2-444A-11 0207. The correct sample ID was determined based on C. Hardy (field sampler for Boeing) review of the COC (revised the following day, see Appendix C) and relayed verbally to Kelly Bottem at ARI.

DATA VALIDATION

VOLATILE ORGANIC COMPOUNDS

Holding Times and Sample Receipt. Except as noted below, the samples were collected in 40 ml VOA vials pre-preserved with HCL and placed immediately in an ice chest. As it is customary for this project, all samples were delivered to the laboratory on the same day as their collection. The samples were received by the laboratory with a cooler temperature of 5.8°C. Due to same day delivery of the samples to the laboratory, there was not enough time for water samples to cool down from the ambient collection temperature to recommended temperature range of 4 ± 2 °C.

All samples were received at the laboratory with a pH of <2.0 with the exception of samples EMF-IW-38-110207 and EMF-IW-40-110207 which both had pH of 4, and sample EMF-IW-7-110207 which had a pH of 5. These non-preserved samples were noted on the chain-of-custody (COC) form. All samples were analyzed on 2/8/11 within method-recommended holding time for VOC samples.

Upon receipt at the laboratory it was noted that some samples contained air bubbles; however, there was no record of large air bubbles or head space in these samples during analyses; therefore, no corrective action was required. As is normal laboratory procedure, the vials with no air bubbles are used for analyses, if possible (see attached e-mail correspondence). There were no other anomalies associated with the samples upon receipt at the laboratory.

Calibration. The 02/08/11 continuing calibration (CCAL) fell outside the 20% control limit low for 1,2-dibromo-3-chloropropane. All associated samples that contain this compound have been flagged with a "Q" qualifier. No further corrective action was required.

Surrogates. All surrogate recoveries were within control limits.

Method Blanks and Trip Blanks. Method blanks were analyzed at the correct frequency per the analytical method. A trip blank was submitted with the samples for this sampling day. The date of preparation of the trip blank by the laboratory was listed on the COC. The laboratory analytical data form associated with the trip blank includes the date the trip blank was analyzed. All method and trip blank results were free of contamination. No associated data needed qualification.

Laboratory Control Samples/Matrix Spikes. Laboratory control samples (LCS) and laboratory control sample duplicates (LCSD) were analyzed and the percent recovery of 1,2-dibromo-3-chloropropane fell outside the control limits low for LCS-020811. All other percent recoveries were within control limits. No corrective action was taken.

METHANE, ETHANE, AND ETHENE (MEE)

Holding Times and Sample Receipt. One sample collected for MEE was analyzed on 2/8/11 using method RSK 175 modified. The sample was collected without HCL preservative and placed in an ice chest. The samples were received by the laboratory with a cooler temperature of 5.8°C. Due to same day delivery of the samples to the laboratory, there was not enough time for water samples to cool down from the ambient collection temperature to recommended temperature range of 4 ± 2 °C. All holding times were met for this sample.

Calibration. All analytes of interest were within method acceptance criteria during initial calibration and continuing calibration(s) were in control.

Method Blanks. Method blanks were analyzed at the correct frequency per the analytical method. The method blank was free of contamination.

LCS/LCSD. The LCS and LCSD were analyzed for the sample set and were in control.

Surrogates. One surrogate was added to each sample per the analytical method at the required concentration. The surrogate recoveries were all within the laboratory acceptance limits.

TOTAL ORGANIC CARBON

Holding Times and Sample Receipt. Samples collected for TOC analysis were analyzed on 2/11/11 using EPA 415.1. The samples were collected with an H_2S0_4 preservative and placed in an ice chest. The samples were received by the laboratory with a cooler temperature of 5.8°C. Due to same day delivery of the samples to the laboratory, there was not enough time for water samples to cool down from the ambient collection temperature to recommended temperature range of 4 ± 2 °C. All holding times were met for this sample.

Calibration. All analytes of interest were within method acceptance criteria during initial calibration and continuing calibration(s) were in control.

Method Blanks and Trip Blanks. Method blanks were analyzed at the correct frequency per the analytical method. The method blank was free of contamination.

Laboratory Control Samples/Blank Spike/SRM. A standard reference material (SRM) was used to assess accuracy, and all the recoveries were within 80-120%. One MS/MSD sample, EMF-WF32-110207 was analyzed with acceptable results. All percent recoveries were within compliance in the LCS.

FIELD DUPLICATES

Field duplicate pair EMF-WF-32-110207 / EMF-DUP1-110207 was collected and submitted with this sample batch and analyzed for VOCs with this SDG. The RPDs were acceptable and all results compared. The review criteria of ±20 % for values >5x reporting limit or ±1x the reporting limit for values <5x reporting limit for water was used in the review. There are no qualification requirements for field duplicate results.

DATA USABILITY

The review and evaluation of data collected in this SDG indicates that the data quality is suitable for the intended purpose. No data were rejected as a result of data validation and 100% of the data are considered usable as qualified.

Sample Delivery Group SH90
Sampling Date 02/08/2011

Analytical Resources Inc. received thirteen (13) water samples and a trip blank for the analysis on 8 February 2011. The samples were hand delivered to ARI on the same day as sample collection under COC and analyzed for VOCs by purge and trap GC/MS method SW8260C. In addition, specified samples were also analyzed for MEE using RSK 175 (modified), and TOC using EPA 415.1. These samples were analyzed in one (1) SDG.

Lab Sample ID	Field Sample ID	Sample Date	SDG	Matrix	Method/Compounds
SH90A	EMF-WF-30-110208	02/08/2011	SH90	Aqueous	VOCs by 8260C, MEE by RSK175Mod, and TOC by EPA 415.1
SH90B	EMF-IW-44-110208	02/08/2011	SH90	Aqueous	VOCs by 8260C and TOC by EPA 415.1
SH90C	PL2-441B-110208	02/08/2011	SH90	Aqueous	VOCs by 8260C
SH90D	PL2-441C-110208	02/08/2011	SH90	Aqueous	VOCs by 8260C
SH90E	PL2-440B -110208	02/08/2011	SH90	Aqueous	VOCs by 8260C
SH90F	PL2-440C -110208	02/08/2011	SH90	Aqueous	VOCs by 8260C
SH90G	EMF-WF-36-110208	02/08/2011	SH90	Aqueous	VOCs by 8260C
SH90H	PL2-608B -110208	02/08/2011	SH90	Aqueous	VOCs by 8260C
SH90I	PL2-608C -110208	02/08/2011	SH90	Aqueous	VOCs by 8260C
SH90J	EMF-DUP2-110208	02/08/2011	SH90	Aqueous	VOCs by 8260C
SH90K	EMF-WF-38-110208	02/08/2011	SH90	Aqueous	VOCs by 8260C
SH90L	EMF-IW-36-110208	02/08/2011	SH90	Aqueous	VOCs by 8260C, MEE by RSK175Mod, and TOC by EPA 415.1
SH90M	EMF-WF-25-110208	02/08/2011	SH90	Aqueous	VOCs by 8260C
SH90N	TRIP BLANK	02/08/2011	SH90	Aqueous	VOCs by 8260C

DATA VALIDATION

VOLATILE ORGANIC COMPOUNDS

Holding Times and Sample Receipt. The samples were collected in 40 ml VOA vials pre-preserved with HCL and placed immediately in an ice chest. As it is customary for this project, all samples were delivered to the laboratory on the same day as their collection. The samples were received by the laboratory with a cooler temperature of 2.1°C.

All samples were received at the laboratory with a pH of <2.0 with the exception of sample EMF-IW-44-110208 which had a pH of 4.5 and samples EMF-440C-110208 and PL2-608C-110208 which had a pH of 7. All samples were analyzed between 2/9/11 and 2/11/11 within method-recommended holding time for VOC samples. There were no other anomalies associated with the samples upon receipt at the laboratory.

Calibration. Based on the laboratory case narrative, the 02/09/11 CCAL was out of control low for chloromethane and 1,2-dibromo-3-chloropropane.The 2/11/11 CCAL was out of control low for vinyl

acetate. All associated samples that contain these compounds have been flagged with a "Q" qualifier. No further corrective action was required.

Surrogates. All surrogate recoveries were within control limits.

Method Blanks and Trip Blanks. Method blanks were analyzed at the correct frequency per the analytical method. All method blank results were free of contamination. A trip blank was submitted with the samples for this sampling day. The date of preparation of the trip blank by the laboratory was listed on the COC. The laboratory analytical data form associated with the trip blank includes the date when the trip blank was analyzed. All method and trip blank results were free of contamination.

Laboratory Control Samples/Matrix Spikes. Laboratory control samples (LCS) and laboratory control sample duplicates (LCSD) were analyzed. All precision and accuracy criteria were met for the LCS/LCSD.

METHANE, ETHANE, AND ETHENE (MEE)

Holding Times and Sample Receipt. Samples collected for MEE were analyzed on 2/18/11 using method RSK 175 modified. The samples were collected without HCL preservative and placed in an ice chest. The samples were received by the laboratory with a cooler temperature of 2.1°C.All holding times were met for these samples.

Calibration. All analytes of interest were within method acceptance criteria during initial calibration and continuing calibration(s) were in control.

Method Blanks. Method blanks were analyzed at the correct frequency per the analytical method. The method blank was free of contamination.

LCS/LCSD. The LCS and LCSD were analyzed for the sample set and were in control.

Surrogates. One surrogate was added to each sample per the analytical method at the required concentration. The surrogate recoveries were all within the laboratory acceptance limits.

TOTAL ORGANIC CARBON

Holding Times and Sample Receipt. Samples collected for total organic carbon analysis were analyzed on 02/08/11 using EPA 415.1. The samples were collected with an H_2S0_4 preservative and placed in an ice chest. The samples were received by the laboratory with a cooler temperature of 2.1°C. All holding times were met for these samples.

Calibration. All analytes of interest were within method acceptance criteria during initial calibration and continuing calibration(s) were in control.

Method Blanks and Trip Blanks. Method blanks were analyzed at the correct frequency per the analytical method. The method blank was free of contamination.

Laboratory Control Samples/Blank Spike/SRM. A standard reference material (SRM) was used to assess accuracy, and all the recoveries were within 80-120%. All percent recoveries were within compliance in the LCS.

FIELD DUPLICATES

Field duplicate pairEMF-WF-30-110208 / EMF-DUP2-110208 was collected and submitted with this sample batch and analyzed for VOCs with this SDG. The RPDs were acceptable and all results compared.

The review criteria of ±20 % for values >5x reporting limit or ±1x the reporting limit for values <5x reporting limit for water was used in the review. There are no qualification requirements for field duplicate results.

DATA USABILITY

The review and evaluation of data collected in this SDG indicates that the data quality is suitable for the intended purpose. No data were rejected as a result of data validation and 100% of the data are considered usable as qualified.

Sample Delivery Group SI11
Sampling Date 02/09/2011

Analytical Resources Inc. received sixteen (16) water samples and a trip blank for the analysis on 9 February 2011. The samples were hand delivered to ARI on the same day as sample collection under COC and analyzed for VOCs by purge and trap GC/MS method SW8260C.In addition, specified samples were also analyzed for MEE using RSK 175 (modified), and TOC using EPA 415.1.These samples were analyzed in one (1) sample delivery group (SDG).

Lab Sample ID	Field Sample ID	Sample Date	SDG	Matrix	Method/Compounds
SI11A	EMF-WF-26-110209	02/09/2011	SI11	Aqueous	VOCs by 8260C and TOC by EPA 415.1
SI11B	EMF-WF-27-110209	02/09/2011	SI11	Aqueous	VOCs by 8260C and TOC by EPA 415.1
SI11C	EMF-WF-29-110209	02/09/2011	SI11	Aqueous	VOCs by 8260C
SI11D	EMF-MW-02-110209	02/09/2011	SI11	Aqueous	VOCs by 8260C
SI11E	EMF-MW-14D-110209	02/09/2011	SI11	Aqueous	VOCs by 8260C
SI11F	EMF-MW-04-110209	02/09/2011	SI11	Aqueous	VOCs by 8260C
SI11G	EMF-MW-12D-110209	02/09/2011	SI11	Aqueous	VOCs by 8260C
SI11H	EMF-MW-11SU-110209	02/09/2011	SI11	Aqueous	VOCs by 8260C
SI11J	EMF- MW-11D-110209	02/09/2011	SI11	Aqueous	VOCs by 8260C, MEE by RSK175Mod, and TOC by EPA 415.1
SI11K	EMF- MW-13D-110209	02/09/2011	SI11	Aqueous	VOCs by 8260C, MEE by RSK175Mod, and TOC by EPA 415.1
SI11L	EMF-IW-27-110209	02/09/2011	SI11	Aqueous	VOCs by 8260C
SI11M	EMF-IW-20-110209	02/09/2011	SI11	Aqueous	VOCs by 8260C
SI11N	EMF- MW-17-110209	02/09/2011	SI11	Aqueous	VOCs by 8260C
SI11O	EMF- MW-10-110209	02/09/2011	SI11	Aqueous	VOCs by 8260C
SI11P	EMF-DUP3-110209	02/09/2011	SI11	Aqueous	VOCs by 8260C
SI11Q	TRIP BLANK	02/09/2011	SI11	Aqueous	VOCs by 8260C

DATA VALIDATION

VOLATILE ORGANIC COMPOUNDS

Holding Times and Sample Receipt. The samples were collected in 40 ml VOA vials pre-preserved with HCL and placed immediately in an ice chest. As it is customary for this project, all samples were delivered to the laboratory on the same day as their collection. The samples were received by the laboratory with a cooler temperature of 2.2°C.

All samples were received by the laboratory at a pH <2 and analyzed between 2/15/11 and 2/16/11 within method-recommended holding time for preserved VOC samples. At the time of sample delivery to the laboratory, VOA vials (2 of 3) for sample EMF-MW-12D-110209 contained small bubbles (<2 mm). There were no other anomalies associated with the samples upon receipt at the laboratory.

Calibration. The 2/15/11 and 2/16/11 CCALs were out of control low for all associated FORM III "Q" flagged analytes. All associated samples that contain these compounds have been flagged with a "Q" qualifier. No further corrective actions were required.

Surrogates. All surrogate recoveries were within control limits.

Method Blanks and Trip Blanks. Method blanks were analyzed at the correct frequency per the analytical method. A trip blank was submitted with the samples for this sampling day. The date of preparation of the trip blank by the laboratory was listed on the COC. The laboratory analytical data form associated with the trip blank includes the date when the trip blank was analyzed. All method and trip blank results were free of contamination.

Laboratory Control Samples/Matrix Spikes. Laboratory control samples (LCS) and laboratory control sample duplicates (LCSD) were analyzed. The 2/15/11 LCS was out of control low for 2-chloroethylvinylether. No further action was taken.

Samples. At the time of analyses, several samples were noted as having air bubbles. All analytes (including nondetects) in these samples have been flagged with a "J" qualifier (Note: samples impacted include laboratory IDs: SI11A,- B, -C,-I, -J, -K,-L,-M, -N, and -P).

At the time of initial analyses, two samples were noted as having head space. In these samples, all non-detect analytes have been flagged with a "R" qualifier, all detected analytes have been flagged with a "J" qualifier (samples included laboratory IDs: SI11E, and SI11G; field sample IDs/locations EMF-MW-14D-110209 and EMF-MW-12D-110209).

The subsequent analysis also included dilution because selected analytes were outside of their calibration range. At the time of dilution, several samples were noted as having head space (they did not at the time of the initial analysis). For these samples, all non-detect analytes have been flagged with a "R" qualifier, all detected analytes have been flagged with a "J" qualifier (samples included laboratory IDs: SI11A, -B, -J, -K, -L, -M). These represent field sample locations EMF-WF-26, EMF-WF-27, EMF-MW-13D, EMF-IW-27, EMF-IW-20, EMF-MW-11D sampled in February 2011 and only the diluted samples are "R" or "J" flagged (where applicable).

METHANE, ETHANE, AND ETHENE (MEE)

Holding Times and Sample Receipt. Samples collected for MEE were analyzed on 2/18/11 using method RSK 175 modified. The samples were collected without HCL preservative and placed in an ice chest. The samples were received by the laboratory with a cooler temperature of 2.2°C. All holding times were met for these samples.

Calibration. All analytes of interest were within method acceptance criteria during initial calibration and continuing calibration(s) were in control.

Method Blanks. Method blanks were analyzed at the correct frequency per the analytical method. The method blank was free of contamination.

LCS/LCSD. The LCS and LCSD were analyzed for the sample set and were in control.

Surrogates. One surrogate was added to each sample per the analytical method at the required concentration. The surrogate recoveries were all within the laboratory acceptance limits.

TOTAL ORGANIC CARBON

Holding Times and Sample Receipt. Samples collected for total organic carbon analysis were analyzed on 02/11/11 using EPA 415.1. The samples were collected with an H_2S0_4 preservative and placed in an ice chest. The samples were received by the laboratory with a cooler temperature of 2.2°C.All holding times were met for this sample.

Calibration. All analytes of interest were within method acceptance criteria during initial calibration and continuing calibration(s) were in control.

Method Blanks and Trip Blanks. Method blanks were analyzed at the correct frequency per the analytical method. The method blank was free of contamination.

Laboratory Control Samples/Blank Spike/SRM. A standard reference material (SRM) was used to assess accuracy, and all the recoveries were within 80-120%. All percent recoveries were within compliance in the LCS.

FIELD DUPLICATES

Field duplicate pairEMF-WF-29-110209 / EMF-DUP3-110109was collected and submitted with this sample batch and analyzed for VOCs with this SDG. The RPDs were acceptable and all results compared. The review criteria of ±20 % for values >5x reporting limit or ±1x the reporting limit for values <5x reporting limit for water was used in the review. There are no qualification requirements for field duplicate results.

DATA USABILITY

The review and evaluation of data collected in this SDG indicates that the data quality is suitable for the intended purpose. No data were rejected as a result of data validation and 100% of the data are considered usable as qualified.

Sample Delivery Group SI33
Sampling Date 02/10/2011

Analytical Resources Inc. received two (2) water samples and a trip blank for the analysis on 10 February 2011. The samples were hand delivered to ARI on the same day as sample collection under COC and analyzed for VOCs by purge and trap GC/MS method SW8260C.These samples were analyzed in one (1) sample delivery group (SDG).

Lab Sample ID	Field Sample ID	Sample Date	SDG	Matrix	Method/Compounds
SI33A	EMF-NV01-110210*	02/10/2011	SI33	Aqueous	VOCs by 8260C
SI33B	EMF-NV02-110210*	02/10/2011	SI33	Aqueous	VOCs by 8260C
SI33C	TRIP BLANKS	02/10/2011	SI33	Aqueous	VOCs by 8260C

*The sample IDs on the bottles were EMF-NV-01-110210 and EMF-NV-02-110210. The IDs on the COC were reported.

DATA VALIDATION

VOLATILE ORGANIC COMPOUNDS

Holding Times and Sample Receipt. The samples were collected in40 ml VOA vials pre-preserved with HCL and placed immediately in an ice chest. As it is customary for this project, all samples were delivered to the laboratory on the same day as their collection. The samples were received by the laboratory with a cooler temperature of 3.4°C.

All samples were received by the laboratory at a pH <2 and analyzed between 2/13/11 and 2/14/11 within method-recommended holding time for VOC samples. At the time of sample delivery to the laboratory, one VOA vial (1 of 3) for sample EMF-NV01-110210 and Trip Blank vials (2 of 2) contained small bubbles (<2 mm). There were no other anomalies associated with the samples upon receipt at the laboratory.

Calibration. The 2/13/11 CCAL was out of control high for methyl iodide and out of control low for trans-1,4-dichloro-2-butene. The 2/14/11 CCAL was out of control low for all associated FORM III "Q" flagged analytes. All associated samples that contain these compounds have been flagged with a "Q" qualifier. No further corrective actions were required.

Surrogates. All surrogate recoveries were within control limits.

Method Blanks and Trip Blanks. Method blanks were analyzed at the correct frequency per the analytical method. A trip blank was submitted with the samples for this sampling day. The date of preparation of the trip blank by the laboratory was listed on the COC. The laboratory analytical data form associated with the trip blank includes the date when the trip blank was analyzed. All method and trip blank results were free of contamination.

Laboratory Control Samples/Matrix Spikes. The LCS and LCSD were analyzed. The 2/13/11 and 2/14/11 LCS and/or LCSD were out of control both low and/or high for several analytes. No further action was taken.

FIELD DUPLICATES

There was no field duplicate sample collected with this sample batch which is a deviation from the QAPP as the two samples collected (plus a trip blank) were analyzed in a separate SDG. This should have no impact on data quality; however, corrective measures will be implemented to ensure collection of duplicates as specified in the QAPP.

DATA USABILITY

The review and evaluation of data collected in this SDG indicates that the data quality is suitable for the intended purpose. No data were rejected as a result of data validation and 100% of the data are considered usable as qualified.

-----Original Message-----
From: Kelly Bottem [mailto:kellyb@arilabs.com]
Sent: Tuesday, December 13, 2011 9:30 AM
To: McKeon, Tom
Cc: Bach, Carl M
Subject: Re: re. bubbles in VOA bottles

This is correct. Tom, in all of the new EMF packages I added a comment from SW846 re.pea size bubbles having no impact on VOCs . You might consider adding that to your DV reports.
Kelly

On 12/13/2011 6:30 AM, McKeon, Tom wrote:
> Kelly
>
> For EMF SDGs SI11, SI33, SH74
>
> In the data validation report we state " As is normal laboratory
>procedure, the vials with no air bubbles are used for analyses, if possble"
>
> Please verify this is correct for noted SDGs
>
> e.g., if 2 out of 3 have bubbles(or 1 of 3) the analyst will select the
>bottle without bubbles
>
> thx
>
> Tom
>

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"Never interrupt someone doing something you said couldn't be done" -
Amelia Earhart

Appendix B
Laboratory Report Summary and Chain-of-Custody
Records for Groundwater Samples Collected October 2010 and February 2011
(On Disk)

Appendix C
Field Sample Data Sheets for Groundwater Samples
Collected February 2011 (On Disk)

Appendix D
Electronic Version of DGSWP data (Excel format on disk)