# DRAFT
# REMEDIAL ACTION OPERATIONS REPORT
# FOURTH QUARTER 2015

**PERFORMANCE-BASED REMEDIATION**
**CONSOLIDATED UFP-QAPP**
**FAIRCHILD AIR FORCE BASE, WASHINGTON**

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# Acronyms and Abbreviations

92 ARW ..... 92nd Air Refueling Wing
% ..... percent
µg/L..... micrograms per liter
AFB..... Air Force Base
AFCEC ..... Air Force Civil Engineer Center
Bay West ..... Bay West LLC
bgs..... below ground surface
Bhate ..... Bhate Geosciences Corporation
CERCLA ..... Comprehensive Environmental Response, Compensation, and Liability Act
COC..... chemical of concern
COPC ..... chemical of potential concern
Cr..... total dissolved chromium
CRL ..... Craig Road Landfill
DCE..... dichloroethene
DRO..... diesel range organics
ERD..... enhanced reductive dechlorination
ESD ..... explanation of significant differences
FS..... feasibility study
ft ..... feet/foot
GAC..... granular activated carbon
gal..... gallons
GETS..... Groundwater Extraction and Treatment System
gpm..... gallons per minute
HRS..... hazard ranking system
lbs..... pounds
IC..... institutional control
ISCO..... in situ chemical oxidation
LUC ..... land use control
LUCIP ..... LUC Implementation Plan
LUCMP ..... LUC Management Plan
MCL..... maximum contaminant level
mg/L..... milligrams per Liter
$MnO_4$..... permanganate
MRO ..... motor oil range organics
MTCA-A..... Model Toxics Control Act Method A
mV ..... millivolts
NDA ..... Northeast Disposal Area
NOC..... Notice to Construct
O&M..... operations and maintenance
ORP ..... oxidation reduction potential
OWS ..... oil/water separator
P&T..... pump and treat
PAL..... project action limit
PDI..... pre-design investigation
RA-O..... remedial action operation
RACR..... Remedial Action Completion Report
RC..... response complete
RI ..... remedial investigation
ROD..... Record of Decision
RODA ..... ROD Amendment
RPO..... Remedial Process Optimization
SDA ..... Southwest Disposal Area
SAIC ..... Science Applications International Corporation
SQER..... small quantity emission rate
SRCAA..... Spokane Regional Clean Air Agency
SVE..... soil vapor extraction
TCE..... trichloroethene
TPH..... total petroleum hydrocarbon
TPH-D..... TPH as diesel
TPH-G..... TPH as gasoline
UCL..... upper confidence limit
UFP-QAPP..... Uniform Federal Policy – Quality Assurance Project Plan
USAF ..... United States Air Force
USEPA..... United States Environmental Protection Agency
VC..... vinyl chloride
VCP ..... Voluntary Cleanup Program
VOC..... volatile organic compound
WDOE..... Washington Department of Ecology

# 1.0 INTRODUCTION

## 1.1 Purpose and Scope

Bay West LLC (Bay West) has been retained by the Air Force Civil Engineer Center (AFCEC) under contract number FA8903-14-C-0011 to conduct remedial action operations (RA-Os) and groundwater monitoring at Fairchild Air Force Base (AFB), located near Spokane, Washington (**Figure 1-1**).

This report presents fourth quarter 2015 (October 1, 2015 through December 31, 2015) activities and results and a 2015 annual summary and evaluation for sites at Fairchild AFB with RA-O groundwater monitoring programs. These sites include LF002, WP003, FT004, ST006, and associated off-base residential wells (**Figure 1-1**). Only LF002 still has an active remediation system and this document includes results of Operations and Maintenance (O&M) activities. All these sites have been through the Comprehensive Environmental Response, Compensation, and Liability Act (CERLCA) process and are in the RA-O phase in accordance with approved Records of Decision (RODs) under U.S. Environmental Protection Agency (USEPA) and U.S Air Force (USAF) oversight. However, ST006, which is a petroleum site, is in the process of being transferred via an Explanation of Significant Differences (ESD) to the Voluntary Cleanup Program (VCP) under Washington Department of Ecology (WDOE) oversight.

## 1.2 Installation Overview

### 1.2.1 Location and Mission

Fairchild AFB encompasses approximately 4,300 acres and is located approximately 12 miles west of Spokane, Washington. Established in 1942, the base has had numerous missions ranging from a repair depot for damaged aircraft returning from World War II, a Strategic Air Command bomber wing during the Cold War, to its current primary mission as the largest air refueling wing in the USAF. Fairchild AFB is home to the 92$^{nd}$ Air Refueling Wing (92 ARW). The 92 ARW provides air refueling, coalition operations, U.S. Strategic Command strategic deterrence missions, as well as passenger and cargo airlift and aero-medical missions (Office of the Wing Historian [OWH], 2015).

### 1.2.2 Generalized Geology

Generalized geology in the base vicinity consists of three primary strata. The near-surface geology is characterized by alluvial sediments (primarily sand and gravel with some silt deposits) that generally vary from 0 to 50 feet (ft) thick. These alluvial sediments generally were deposited by receding floodwaters associated with glacial Lake Missoula. Beneath the alluvium is a thick sequence of layered basalt bedrock associated with the regional Columbia River Basalt Group. The basalt bedrock represents a series of individual flows that vary from a few ft to hundreds of ft thick. Interbedded layers of sand, silt, and clay occur between individual basalt flows; these interbeds can range from several ft to over 40 ft thick beneath the base. Massive granitic bedrock underlies basalt at depth.

The uppermost basalt at the Fairchild AFB is referred to as Basalt A. It is separated from a deeper basalt sequence (Basalt B) by a layer of low-permeability clay (Interbed A). Within the immediate vicinity of the base, Basalt A varies in thickness of about 50 to 160 ft. The top of the Basalt A unit is fractured and highly weathered in places, whereas the lower portion of Basalt A is more massive with infrequent fractures and lower permeability. Interbed A generally consists of a laterally extensive, silty clay stone that is approximately 5 to 30 ft thick. Basalt B generally is

porous and vesicular at the top and becomes progressively denser and less vesicular with depth.

#### 1.2.3 Groundwater Occurrence

The uppermost groundwater at the base typically is encountered from 3 to 30 ft below ground surface (bgs) in alluvium and/or within the fractured and weathered upper portion of Basalt A under unconfined conditions. The lower Basalt A is less porous and poorly permeable and so is not a significant pathway for groundwater flow. Groundwater flow within alluvium and Basalt A generally for the western and central portions of the base is northeasterly. However, east of the base the Basalt A is an uplifted, possibly faulted outcrop area such that more of the saturated zone is within the lower (less permeable) portion of the Basalt A. The effect of the outcrop area is to restrict and divert eastward groundwater flow and forms a flow divide approximately along the flightline. Groundwater in the western portion of the base north of the flightline flows to the north and south of the flightline flows to the southeast.

In some areas, hydraulic connection exists between alluvium and shallow basalt water-bearing zones. In other areas, the shallow alluvium and basalt bedrock water-bearing zones are separated by a low-permeability silt/clay layer.

#### 1.2.4 Demographics and Land Use

Approximately 10,000 military personnel and civilians reside or are employed at Fairchild AFB. Family housing and dormitory units house approximately 3,700 residents. The base water supply is groundwater that is piped from near the Spokane River (located approximately 9 miles to the east) and distributed throughout all on-base locations. One on-base water supply well (Well 2) provides supplemental water during the summer when demand increases for irrigation. The City of Airway Heights, located approximately 2 miles east of Fairchild AFB, is the nearest community and has a population of over 6,000 residents. The city uses groundwater as its water-supply source, which is pumped from nearby alluvial and basalt aquifers. There are less than 1,000 rural residences located within a half-mile radius of Fairchild AFB.

Current land use in the vicinity of Fairchild AFB is primarily agricultural. Agricultural use includes cattle grazing and non-irrigated cultivation of wheat and hay. Other land uses include sand and gravel mining and light industrial. Within the base boundaries, land is both developed and undeveloped.

### 1.3 RA-O Sampling and O&M Programs

RA-O sampling was conducted in 2015 on a quarterly basis at the following sites: LF002 (Craig Road Landfill [CRL]), WP003, FT004, ST006, and associated off-base residential wells. O&M activities were conducted at LF002. The first quarter sampling was completed by Bhate.

Geosciences Corporation (Bhate) under a bridge contract to maintain RA-O and O&M activities between Performance-Based Remediation contracts. The first quarter sampling event was performed in accordance with the 2014 Site-Wide Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP; Bhate, 2014a).

Bay West assumed responsibilities of the RA-O and O&M programs on April 1, 2015. The second, third, and fourth quarter sampling completed in accordance with the Consolidated UFP-QAPP; (Bay West, 2015a) and site-specific UFP-QAPPs (Bay West, 2015b; 2015c; 2015d, 2016). Sampling services for the second, third, and fourth quarters were provided by Blaine Technologies in Seattle, Washington. Analytical services were provided by Test America Laboratories located in Denver, Colorado.

Fourth quarter sample sheets are provided in **Appendix A**. Fourth quarter laboratory Reports are in **Appendix B** and data validation reports are provided in **Appendix C**. Analytical summaries for 2015 are provided in **Appendix D.1** and historical analytical summaries in **Appendix D.2**. A summary of 2015 groundwater elevation measurements is provided in **Appendix E**. GETS O&M data are provided in **Appendix F**.

# 2.0 SITE LF002 (CRAIG ROAD LANDFILL [SW-8])

## 2.1 Background

The following includes a discussion of the site setting, hydrogeology, and site environmental history.

### 2.1.1 Site Setting

LF002 is a former disposal location for Fairchild AFB consisting of a 39-acre unlined, closed, general-purpose landfill that was operated by the USAF and is approximately 0.5 miles east of Fairchild AFB (**Figure 2-1**). LF002 is now comprised of three inactive waste disposal areas:

- The Northeast Disposal Area (NDA) occupies approximately 6 acres in the northeast corner of the site and is the oldest waste disposal cell. The NDA was actively used as the main solid waste disposal area for the base from the late 1950s until the early 1960s.
- The Southwest Disposal Area (SDA) occupies 13 acres in the southwest corner of the site and was active from the late 1960s until the late 1970s. General waste types reportedly disposed of in this area included municipal and industrial wastes and construction and demolition debris; suspected disposal items are thought to include such items as solvents, dry-cleaning filters, paints, thinners, and coal ash.
- The Southeast Disposal Area (Rubble Area) occupies 20 acres in the southeast corner of the site and was operated in the late 1950s for surface disposal of construction debris from runway work performed during base conversion.

### 2.1.2 Hydrogeology

The geology at LF002 consists of approximately 15 to 70 ft of alluvial sand and gravel sediments overlying basalt bedrock (Science Applications International Corporation [SAIC], 1992). Beneath the alluvial deposits at LF002 lie two major basalt flow groups (Basalt A and Basalt B) separated by a sedimentary interbed (Interbed A) of lacustrine clay deposits. Under the landfill, the alluvium is approximately 15 to 70 ft thick. At the time of the remedial investigation (RI) in 1993, the alluvium was saturated and was hydraulically connected with the uppermost Basalt flow (Basalt A). However, since operation of the Groundwater Extraction and Treatment System (GETS; see **Section 2.1.3**), the alluvium has essentially been dewatered and wells completed in the alluvium are typically dry. The alluvial sand and gravels thicken eastward and are mined in a large quarry located east of Craig Road. The alluvium in this area remains dry until approximately 2,000 to 5,000 ft east of LF002 where a northwest trending paleo alluvial channel is encountered. Geophysical and drilling activities completed during the RI found that the channel completely scoured and dissected Basalt A and Interbed A. The channel has been filled with 250 ft of highly-permeable, unconsolidated alluvium and is underlain by the Basalt B flow. The channel cut deposits are a source of municipal water for the city of Airway Heights and three municipal water supply wells are located east of LF002 (see Question #4 in **Section 2.4**).

Basalt A is the uppermost basalt flow group and ranges from up to 90 to 140 ft thick under LF002. The uppermost 75 ft of the basalt flow (the Entablature Section) is vesicular, fractured, and weathered. Hydraulic testing completed for the RI (SAIC 1993a) and for the GETS design (SAIC 1992 and Engineering Science 1993) indicates an average hydraulic conductivity of 4.6 ft/day and a transmissivity of 350 $ft^2$/day (see **Appendix G.1** for justification of these values). Using this hydraulic conductivity data, the average groundwater gradient (0.015), and a likely value effective porosity (0.05) for basalt, the groundwater velocity is likely approximately 1.3 ft/day (see **Appendix G.3** for calculation and values used and justified).

The lower portion of the Basalt A flow (the Colonnade Section) is dense, un-weathered, and minimally fractured. The hydraulic conductivity in the Colonnade Section is very low (0.01 to 0.06 ft/day; SAIC, 1993b) and so essentially all the groundwater flow in Basalt A occurs in the Entablature Section. Basalt A has been entirely scoured away within the channel cut described in the paragraph above. For a discussion and maps of groundwater flow patterns in Basalt A please see Question #1 in **Section 2.4**.

Interbed A underlies Basalt A and is 16 to 20 ft of dense clayey deposits. Well installations and sampling indicate Interbed A hydraulically separates Basalt A and Basalt B.

### 2.1.3 Chemicals of Concern, Chemicals of Potential Concern, and Project Action Levels

The Chemical of Concern (COC) for LF002 is trichloroethene (TCE) which has a project action limit (PAL) of 5 micrograms per liter (µg/L). The PAL is based on the State of Washington's Model Toxics Control Act Method A (MTCA-A) value. Chemicals of potential concern (COPCs) include anaerobic biodegradation products of TCE including cis- and trans-1,2 dichloroethene (DCE) and vinyl chloride (VC). The PAL for VC is 0.2 µg/L (from MTCA-A). However, there are no MTCA-A standards for cis- or trans-DCE and so the PAL is from the federal maximum contaminant levels (MCLs) of 70 µg/L for cis-DCE and 100 µg/L for trans-DCE. Other COPCs for LF002 include manganese and chromium (Cr) which were mobilized following in situ chemical oxidation (ISCO) pilot studies performed in 2012 and 2013 (see **Section 2.1.4**). Manganese does not have MTCA or federal MCL health-based standards but does have a PAL from secondary MCL based on aesthetics (color, staining, odors) of 50 µg/L. The PAL for Cr (from MTCA-A) is 50 µg/L.

### 2.1.4 Environmental History

Beginning in 1984, several methods of investigation were used for contaminant source and risk identification, including record searches, interviews, and site inspections. In 1987, the USEPA scored the Fairchild AFB (four Waste Areas) using their Hazard Ranking System (HRS). As a result of the HRS scoring, Fairchild AFB, including LF002, was added to the National Priorities List in March 1989.

Between 1986 and 1991, an RI (SAIC, 1992) was completed to characterize and delineate LF002 contamination; TCE was identified as the COC with groundwater concentrations above the PAL.

The RI Report for LF002 was released to the public in April 1992. The Feasibility Study (FS) and Proposed Plan were released on August 10, 1992 and the ROD was signed in 1993.

RAOs, as listed in the ROD (USAF, 1993), are:

- To prevent consumption of groundwater exceeding federal MCLs by area residents;
- To restore contaminated groundwater in the upper aquifer to levels that are safe for drinking;
- To prevent further migration of contaminated groundwater across the site boundary and to the lower aquifer;
- To minimize the migration of contaminants from the fill material to the groundwater; and
- To prevent exposure to contaminants within subsurface soil and debris.

Components of the selected remedy, as listed in the ROD, are:

- Capping the northeast and southwest disposal areas at the landfill;
- Installing an active Soil Vapor Extraction (SVE) treatment system in each capped area;

- Extracting contaminated groundwater from the upper aquifer at the landfill boundary through utilization of a GETS and treating by air stripping and granulated activated carbon (GAC); treated groundwater will be disposed of at a location downgradient of LF002;
- Monitoring off-site water supply wells within the off-site portion of the plume and providing point-of-use treatment and/or alternative water supply if needed in the future;
- Monitoring groundwater in upper and lower aquifers; and
- Implementing institutional controls (ICs).

SVE was initially included in the ROD but was removed via an ESD in 1995 because it was not considered to be effective for treating deeper potential dense non-aqueous phase liquid-impacted fractured bedrock. However, SVE at LF002 was reconsidered by the USAF in 2008, and has been subsequently demonstrated by additional source area investigation in 2009 and pilot studies completed in 2011 and 2012 to be an effective and efficient remedy. Consequently, an ESD has been prepared and submitted to the USEPA to reinstate SVE as a remedy. The ESD also includes modifications to the GETS to include groundwater extraction from within the source area to both improve dissolved mass removal efficiency and to expose more of the Basalt A to SVE treatment. Following approval of the ESD (anticipated in mid-2016), SVE and GETS modifications will be implemented.

A summary of the completed remedial actions at LF002 is provided below:

- 1991: Limited GETS system operation begins in order to provide hydraulic containment of the on-site plume.
- 1994-1995: An air stripping unit was added to the GETS.
- 1994-1995: Engineered landfill caps consisting of composite soil, geotextile, and 30-millimeter polyvinyl chloride liner were installed over the NDA and SDA. Currently, the caps remain functional, are intact, and require minimal maintenance.
- 1995: Full-time operation of the GETS was initiated. The RA-O groundwater monitoring program was implemented for on-site and off-site monitoring wells constructed in the alluvium/Basalt-A, Basalt B, and alluvial channel aquifers.
- 2006: GETS periodically idled to allow groundwater to flood the Basalt A under the NDA and SDA, resulting in a temporary increase in mass removal.
- 2008: An Environmental Remediation Program Optimization evaluation recommended that SVE should be reconsidered as a potential remedy.
- 2009-2011: SVE pilot tests performed in the SDA and NDA verified that SVE is an effective method of TCE mass removal. Remediation wells (22 wells in the SDA and 14 in the NDA) were constructed as multi-purpose wells that could be used for SVE, ISCO, or additional monitoring wells.
- 2011-2014: Because of the success of the pilot test, continued operation of the SVE systems was recommended, and with WDOE concurrence, full-scale SVE operation began in February 2011. The USEPA concurred with continued operation of the SVE system in a correspondence dated October 19, 2012. In the Fall of 2014, SVE was suspended because of high groundwater levels during limited GETS operation (see 2012-March 2015 bullet below), and to allow for submittal of an ESD to clarify bringing remedy in compliance with CERCLA. SVE has remained off-line since that time.
- 2012-2013: ISCO pilot tests consisting of injections of sodium permanganate ($MnO_4$) were completed in the SDA and NDA. The ISCO events initially substantially oxidized

dissolved phase TCE in the treatment areas, but concentrations rebounded in the following months and years due to re-equilibrium with the sorbed phase and via back diffusion with groundwater in non-mobile porosity. Aquifer oxidation also mobilized Cr to above the PAL of 50 µg/L in some locations within the SDA and NDA.

- 2012-March 2015: Beginning in the third quarter of 2012, pumping at EW-6, EW-9, EW-10, and EW-14 (**Figure 2-1**) was suspended to mitigate potentially pumping Cr- or $MnO_4$-impacted groundwater through the GETS to the downgradient infiltration line. By the third quarter of 2013, the Cr and $MnO_4$ concentrations at EW-6 had dissipated enough to allow pumping to resume at this well. During periods of low groundwater levels (fall-winter) the remaining operating wells could not provide sufficient minimum flow (approximately 85 gallons per minute; [GPM]) for automatic operation and so GETS was operated on a manual batch mode. The manual batch mode consisted of pumping a total of 40,000 gallons per regular work day. The system was offline during evenings and non-work days.
- April 2015-December 2015: Bay West assumed responsibility of the GETS on April 1, 2015. Sampling and protocols developed in the 2015 UFP-QAPP (Bay West, 2015) allowed for limited to full pumping to resume at EW-9, EW-10, and EW-14 in July 2015.
- An ESD to re-instate SVE and to modify the GETS to allow for source area pumping was submitted in 2015 and is anticipated to be approved in 2016.

## 2.2 Groundwater Monitoring Program

This section presents a summary of fourth quarter and 2015 groundwater sampling events at LF002. The sampling was performed in accordance with the Final Consolidated Basewide UFP-QAPP (Bay West, 2015a) and the Site-Specific LF002 UFP-QAPP (Bay West, 2015b). A summary of well construction data for the wells included in the monitoring program is provided in **Table 2-1A** (extraction wells and monitoring wells) and **Table 2-1B** (remediation wells).

### 2.2.1 Fourth Quarter and 2015 Monitoring Activity Summary

Between December 11 and December 16, 2015, a total of 33 wells were sampled as part of the 2015 fourth quarter monitoring. Three additional wells were measured and reported as dry; therefore, they were not sampled. A summary of sampled locations, analysis, and quality control samples collected during the fourth quarter is provided in **Table 2-2A**. A summary of all locations monitored in 2015 is provided in **Table 2-2B**. Locations of the RA-O program wells are displayed on **Figure 2-2**.

The samples were collected using low flow purging techniques. To limit potential bias by residual $MnO_4$ that could further oxidize volatile organic compounds (VOCs) prior to laboratory analysis, ascorbic acid was used as a sequestering agent for all VOC samples where residual $MnO_4$ (as indicated by any pink or purple hue) was observed during purging. Sample summary sheets are provided in **Appendix A** and Laboratory Reports are provided in **Appendix B**.

### 2.2.2 Fourth Quarter Data Validation

Data validation reports for fourth quarter 2015 samples are provided in **Appendix C**. The results are accepted as qualified. Data validation reports for the other three quarters have been provided in the First, Second, and Third quarterly RA-O reports.

### 2.2.3 Groundwater Elevation Monitoring

Prior to purging and sampling, groundwater levels were measured at all monitoring wells and remediation wells. A summary of the fourth quarter and all 2015 groundwater level

measurements and calculated groundwater elevations is provided in **Appendix E**. Groundwater elevation maps and a discussion of groundwater flow patterns as they pertain to the environmental questions are provided in **Section 2.4**.

### 2.2.4 Fourth Quarter and 2015 Analytical Results

A summary of all validated fourth quarter and 2015 analytical results for LF002 is provided in **Appendix D.1** and historical summaries of TCE, Cr, and $MnO_4$ concentrations are provided in **Appendix D.2**. Maps of the TCE concentration distribution are provided on **Figure 2-3A** (March 2015) and **Figure 2-3B** (September, 2015). Time series graphs of TCE concentrations are provided on **Figures 2-4A** through **2-4C**. Maps of the distribution of Cr and $MnO_4$ in September 2015 are displayed on **Figure 2-5A** (for the NDA) and **Figure 2-5B** (for the SDA). Time series graphs for Cr and $MnO_4$ concentrations are provided on **Figure 2-6** and **Figure 2-7**.

Validated results from the fourth quarter sampling event demonstrated the following:

- TCE exceeded its PAL of 5 µg/L in 22 of 33 wells sampled (EW-2, EW-5, EW-6, EW-7, EW-9, EW-10, EW14, MW-63, RW-6, RW-7, RW-8, RW-9, RW-11, RW-12, RW-13, RW-14, RW-15, RW-16, NDA-8, NDA-11, NDA-12, and NDA-13). The maximum TCE concentration was 1,200 µg/L at RW-8.
- VC exceeded its PAL of 0.2 µg/L in 2 of the 33 wells sampled (RW-8 and RW-13). The maximum VC concentration was 1.8 µg/L at RW-8.
- Cr exceeded the PAL of 50 µg/L in 5 of the 18 wells sampled for this parameter (EW-10, RW-6, RW-16, RW-17, and NDA-14). The maximum Cr concentration was 470 µg/L at NDA-14.
- Manganese exceeded the PAL (USEPA secondary drinking water standard) of 50 µg/L at 6 of the 18 wells sampled for this parameter (EW-9, EW-10, RW-8, RW-11, RW-17, and NDA-14). The maximum manganese concentration was 40,000 µg/L at RW-17.

Evaluation of the 2015 sampling data in context of the UFP-QAPP environmental questions will be addressed in **Section 2.4**.

### 2.2.5 Summary Fourth Quarter and 2015 Remedial Action Activities

This section presents a summary of fourth quarter and 2015 O&M data for the GETS. Bay West assumed responsibility of the GETS on April 1, 2015. Bay West personnel were on site daily, except for weekends and some federal holidays. Normal operational activities included data recording, systems checks, treatment system flow rate monitoring, maintenance, and sampling in accordance with the UFP-QAPP (Bay West, 2015) and the O&M Plan (Bhate, 2014b).

**Appendix F** contains the following fourth quarter 2015 operational documentation:

- Weekly-Quarterly O&M Summaries;
- Operational Logs;
- Monitoring Logs;
- Combined Daily Reports;
- Landfill Cap Inspection Report; and
- Quarterly Spokane Regional Clean Air Agency (SRCAA) Letter.

Data for the other three quarters have been provided in each associated quarterly RA-O report.

### 2.2.6 Site Activities

**Table 2-3** summarizes site O&M activities for fourth quarter 2015.

### 2.2.7 Extraction Well Performance

The volume of water extracted by the wells is measured by individual flow meters installed at each well assembly. This information is transmitted back to the treatment plant, displayed, and totaled. Combined flows from the NDA and SDA are measured in the influent stream to the treatment plant.

As shown in **Table 2-4**, approximately 12.2 million gallons of groundwater were treated during fourth quarter 2015. Of this volume, the NDA contributed approximately 7.6 million gallons, or 63 percent (%); the SDA produced approximately 4.6 million gallons, or 37%. The total volume of water treated in 2015 was 43.7 million gallons.

**Table 2-5** provides a summary of GETS extraction well operational data. Since resuming automatic operations, extraction wells 2, 5, 6, 7, 9, and 12 have been pumping within their historic ranges. Pumping at EW-10 and EW-14 were less than their typical ranges because they remained on manual mode at 25 hours or less per week to prevent Cr or $MnO_4$ concentrations from exceeding the PAL in the GETS influent.

EW-3 and EW-4 normally have relatively low flow rates (0.7 to 1.6 gpm for EW-3 and 0.2 to 0.4 gpm for EW-4), but had even lower average rates in 2015 because they were off part of the time due to transducer and flow sensor malfunctions. There were no operational problems with EW-11 and the decreased flows appear to be related to low groundwater levels compounded by interference from pumping at EW-10 and EW-14.

### 2.2.8 TCE Mass Removal

**Table 2-6** provides a quarterly summary of TCE removal by the GETS. A total of 4.8 pounds (lbs) of TCE were removed by the GETS in 2015. Approximately half of the removal mass was from the NDA and half from the SDA. Mass removal improved in the second through fourth quarters over the first quarter because of the higher pumping rates and the inclusion of EW-9, EW-10, and EW-14. Additional discussion of mass removal is provided in **Section 2.4** (Question #1).

### 2.2.9 Incidental Water Treatment

Approximately 385 gallons (gal) of incidental water were treated at CRL during fourth quarter 2015. This consisted of purge water generated during drilling activities, as well as purge water generated during the purging and sampling of monitoring wells.

### 2.2.10 System Shutdown/Alarm Conditions

A system shutdown is defined as any programmable logic controller alarm or maintenance issue that results in plant down-time of one hour or more. Throughout the fourth quarter, the system was shut down for a total of approximately 425 hours. The system was shutting down due to a faulty sensor associated with a heater. The heater system was repaired in December 2015.

### 2.2.11 Site Repairs

In October, injection risers were cut from RW-8 and RW-17 and new pad locks were installed on NDA and SDA monitoring wells. In November, vegetative debris was removed from the CRL entrance gate and perimeter fence area. In December, SVE shed roof repairs were made; a tarp

was installed on the west side of structure roof to cover missing shingles that were lost during recent wind storms.

### 2.2.12 Landfill Cap Inspection

A landfill cap inspection was performed on November 10, 2015, in accordance with the O&M Plan. **Appendix F.5** contains the completed fourth quarter 2015 Landfill Cap Inspection Report; surface features of the landfill cap were generally found to be functional and intact, with the exception of small animal burrows in both the SDA and NDA which required no action. In addition, general debris/litter removal from the facility and perimeter fence was ongoing upkeep which was completed as needed throughout the fourth quarter. A faulty bushing was noted on the MV-02 turbine ventilator which required replacement.

### 2.2.13 LUC Inspection

A Land Use Control (LUC) inspection was performed for LF002 in November 2015 to evaluate LUCs established by the OU-1 ROD. Methods and results of this inspection are provided in a separate LUC Inspection Report (submittal in progress). The USAF recognizes that the LUCs originally listed in the ROD lack specificity and are not compliant with the current 2015 USAF LUC checklist. Also, the LUC Management Plan (LUCMP) completed in 2007 (USAF, 2007) was not fully implemented. USAF will complete an updated LUC Implementation Plan (LUCIP) for Fairchild AFB in 2016 which will have both on-site and off-site inspection criteria compliant with the USAF LUC checklist and the existing ROD. The LUCIP is anticipated to be finished in time to be implemented for the 2016 annual inspections. Language in the ROD for LUCs will be clarified through a ROD Amendment (ROD-A) to be submitted later in 2016.

### 2.2.14 Compliance Monitoring

GETS compliance monitoring is performed quarterly for both treated liquid phase and air phase discharges.

#### *2.2.14.1 GETS Liquid Phase Monitoring*

Water samples were collected from the CRL treatment plant on December 16, 2015 for fourth quarter 2015 compliance monitoring. Two water samples were collected, one influent and one effluent, and were analyzed for VOCs (USEPA Method 8260B). A summary of the fourth quarter and the previous 2015 quarterly sample results is included in **Table 2-7**. The sample results indicate that the GETS discharge in all four quarters of 2015 was in compliance with the TCE PAL of 5 µg/L.

#### *2.2.14.2 GETS Air Phase Monitoring*

The AS-301 treatment train was online for this quarter. The GAC units continue to operate in a series configuration with the VC-400 GAC unit as lead and the VC-401 GAC unit as lag. The lead/lag GAC units were last switched when GAC in the VC-401 unit was changed-out in September 2010. The VC-400 unit will continue to operate as lead vessel until the next GAC change-out.

Air (off-gas) samples were collected from the GAC system at the CRL treatment plant on December 21, 2015, for fourth quarter 2015 compliance monitoring. Air samples were collected from the influent to the lead GAC unit and from the effluent of the lag unit. A field duplicate was collected from the influent sample location. Each sample was analyzed for VOCs (using Method TO 14A). A summary of quarterly sample results for 2015 is included in **Table 2-8**. The fourth quarter TCE air discharge is 0.91 lbs and the annual 2015 discharge is 1.95 lbs, which is below

the 95.9 lbs per year small quantity emission rate (SQER) per conditions of LF002's Notice to Construct (NOC) #646. The fourth quarter SRCAA submittal is provided in **Appendix F.6**.

Per the LF002 O&M manual (Bhate, 2014b) carbon replacement will occur when the TCE air discharge exceeds 90% of the SQER. The SQER for TCE is 95.9 lbs per year. GAC change-out will be completed when the TCE emission first exceeds 21.5 lbs per quarter. The fourth quarter 2015 TCE emission was only 0.91 lbs. The GETS GAC is not nearing the TCE emission GAC replacement limit.

*2.2.14.3 GETS Cr and $MnO_4$ Monitoring*

In accordance with protocols established in the UFP-QAPP, pumping at EW-9, EW-10, and EW-14 resumed during the third quarter of 2015 and provided daily field monitoring for Cr and $MnO_4$ in the GETS; influent did not exceed PALs at the GETS influent tank (pre-stripper). Cr is measured using a colormetric field test kit and $MnO_4$ is measured using comparison of water color to a standardized chart. Records of the daily monitoring are provided in **Appendix F.3**. On a weekly basis (20% of the samples) the field measurement of Cr is confirmed with laboratory split sample analysis of Cr. A summary of fourth quarter weekly field Cr(6) and laboratory Cr results is provided in **Table 2-9A**. To date, there has been no exceedance of either Cr or $MnO_4$ in the GETS influent.

Per the UFP-QAPP, the laboratory split samples could be reduced to 10% (every two weeks) if the laboratory results demonstrated more than 90% confidence with the field results. Statistical comparison of the two sample sets were performed using a two sided student-T test (via UCLPro 5.0) indicated at least a 95% confidence that the field results were the same as the laboratory results. A summary of the statistical results is provided in **Table 2-9B**. To provide evaluation of Cr and $MnO_4$ inputs from the EWs, field tests for Cr(6) and $MnO_4$ were performed on samples from WE-9, EW-10, and EW-14. The results of these tests are provided in **Table 2-9C**.

## 2.3 Environmental Question Status

The following are environmental questions from Worksheet #10 of the LF002 site-specific UFP-QAPP. The text describes the current status towards addressing these questions.

***1) Is the GETS capturing the COC plume?***

Plume capture was evaluated by combining the following three different approaches:

a. Groundwater Elevation Geostatistical Modeling
b. Capture Zone Modeling
c. Downgradient TCE Concentration Responses

These approaches are described below in parts a, b, and c. A combined evaluation of capture zones in the NDA is provided in part d and for the SDA in part e. Part f provides an evaluation of potential plume loss during manual batch mode or shutdown periods.

a) <u>Groundwater Elevation Geostatistical Modeling:</u>

The groundwater potentiometric surface was geostatistically modeled by Kriging using *Surfer*® software. Kriging interpolates between data points by using a Gaussian regression process to compute a function of weighted average of known values. The Kriging method provides the best linear unbiased prediction and is widely used in spatial analysis and computer assisted groundwater elevation modeling. However, Kriging and other data interpolation approaches have difficulty in evaluating surfaces near extraction wells which exhibit logarithmic drawdown cones. To better model the groundwater elevations near

extraction wells, calculated groundwater drawdown elevations at points located 5, 50, and 100 ft north, south, east and west of the extraction wells were included in the Kriged data set. The drawdowns were calculated using a solution developed by Cooper and Jacob (1946) for both the nearest extraction well and from contributions of all other active extraction wells in each of the two disposal areas. The calculations, assumptions/justifications, parameters used and drawdown results are provided in **Appendix G**.**1**.

The modeled site-wide groundwater elevation surfaces with 10-ft contour resolution for the March 2015 and September 2015 events are provided in **Figures 2-8A** and **2-8B**. The groundwater gradient and direction of groundwater flow is directed perpendicular to the elevation contours. Overall, the groundwater gradient is directed to the east or northeast towards the incised alluvial channel located near MW116/MW115 and MW139. The natural (un-pumped) regional gradient is approximately 0.023 (MW70 to MW80 and MW94 to MW82). Seasonal fluctuations in groundwater do not appear to change the natural gradient significantly.

To better evaluate flow near the extraction wells, detailed maps were generated for the March event (**Figure 2-9A** for NDA and **Figure 2-9B** for SDA) and September (**Figure 2-9C** for NDA and **Figure 2-9D** for SDA). These maps have groundwater elevation contour resolution of 2 ft.

b) Capture Zone Modeling:

An analytical capture zone model was developed from approaches described by Todd (1980) and Grubb (1993) to approximate the groundwater divides between the extraction well, natural groundwater flow, and flow to other extraction wells. For a single extraction well, the gradient toward it is proportional to the pumping rate and inversely proportional to the radial distance to the well. The downgradient point at which the gradient towards the well is equal to the natural gradient away from the well is called the stagnation point. The flow divide laterally forms a parabolic shape with the maximum upgradient width determined by the aquifer width under natural gradient needed to supply the pumped rate. In a multiple extraction well environment, the effects on drawdown and gradient are additive and can be combined by superposition. The flow effects are primarily defined by the closest well and diminish with distance. The exact solution for the parabolic groundwater divide is relatively simple for a single well but becomes progressively more complicated with more extraction wells. However, the math can be simplified by limiting the flow divide evaluation to the following four cases: 1) the downgradient stagnation point, 2) the flow divide perpendicular to the well, 3) flow divides between pumping wells, and 4) the maximum upgradient flow width where the natural gradient returns. The equations, assumptions, and parameters used and flow divide results are provided in **Appendix G.2**. A summary of the flow divide results is provided in **Table 2-10** and are overlaid on the detailed groundwater contour maps on **Figures 2-9A** though **2-9D**.

c) Downgradient TCE Concentration Responses:

The simplest and most direct evaluation of groundwater capture is to track TCE concentration responses in downgradient monitoring wells. Monitoring wells downgradient of the NDA include: MW80, MW-78, and MW85. Monitoring wells downgradient of the SDA include MW-82, MW83, and MW-77. For all six wells, the average TCE concentrations from 2013, 2014, and 2015 were compared to the average +/- one standard deviation TCE concentration from the five previous years (2008 through 2012). These data are presented

in **Table 2-11**. The time break between pre- and post-2012 was selected because 2012 is when GETS flow was reduced (see **Section 2.1.3**).

d) Combined Capture Zone Analysis for the NDA

The March 2015 event groundwater elevations and capture zone modeling represent a time period of when the GETS was operated on a manual daily batch mode (see **Section 2.1.3**). Manual batch mode started in November 2014 and ended April 1, 2015.

In the NDA, **Figure 2-9A** demonstrates that pumping at EW-5 and EW-6 likely provided groundwater capture for the northern most portion of the disposal area including higher TCE concentration wells NDA-1, 6, 7, 8, 9, and 14 (see **Figure 2-3A**). However, the TCE plume near NDA-12 and 13 does not appear to have been within the capture zone at that time. Also, groundwater flow from most of the central and southern portion of the NDA were not within capture zones during the manual batch operation period. Part-time manual batch operation was not implemented during the fall/winter of 2015/2016 and GETS remained on full-time automatic mode.

The September 2015 event groundwater elevations and capture zone modeling represent a time period when the GETS was on full-time automatic mode (see **Section 2.1.3**). **Figure 2-9C** demonstrates that the pumping configuration in this mode of operation was successful in capturing all of the groundwater flow crossing the NDA.

Evaluation of downgradient TCE concentrations in MW-78, MW-80, and MW-85 indicates that none of the wells have exceeded the PAL in over 12 years (see **Figures 2-3A** and **2-3B** for locations). However, compared to the TCE concentration between 2008 and 2012, the TCE concentrations in MW-78 and MW-80 are above the reported 2008-2012 range (average plus one standard deviation). The apparent increase may represent some minor loss of plume capture. The potential for plume loss during manual batch mode or inoperative periods is discussed further at the end of this question.

e) Combined Capture Zone Analysis for the SDA

As in the NDA capture zone analysis, March represents the part-time manual batch mode operation and September represents the full-time automatic mode operation. In March 2015, EW-9, EW-10, and EW-14 were offline and flows from EW-11 were minimal (less than 1 gpm). Most of the groundwater extraction in the SDA was from EW-12, which is located south of the TCE plume and has had TCE concentrations less than the PAL for approximately 8 years. **Figure 2-9B** demonstrates that very little of the TCE plume in the SDA was within a capture zone during part-time manual batch mode. The plume capture situation improved significantly when pumping at EW-9 and EW-14 were initiated. Part-time pumping at EW-10 only creates a negligible capture zone which is not displayed on **Figure 2-9D**.

Evaluation of downgradient TCE concentrations in MW-77, MW-82, and MW-83 indicate that prior to 2014, none of these wells had a TCE PAL exceedance in over 8 years (see **Figure 2-3A** and **2-3B** for locations). However, in 2014 and March of 2015, MW-82 had a TCE concentration of between 6.49 and 8 µg/L. After March 2015, the TCE concentration decreased to below the PAL and was only 2.9 µg/L by December 2015. Prior to 2012, the TCE concentration had been 0.9 to 2.8 µg/L (average +/- one standard deviation). The TCE concentrations in MW-77 and MW-83 did not exceed the PAL; however, the concentrations in MW-83 appear to have increased over the reported concentrations between 2008 and 2012. The TCE concentration in MW-77 appears to have remained similar to those reported between 2008 and 2012. The TCE concentration increases in MW-82 and MW-83 and the

PAL exceedance in MW-82 suggest that some TCE plume capture loss occurred. However, as described above, the TCE concentration decreased below the PAL for the last three quarters and in December was nearly back to the 2009-2012 range.

f) Potential Plume Loss during Manual Batch Mode or Shutdown Periods

As discussed above, portions of the TCE plume appear to have been outside groundwater capture zones during part-time manual batch mode in November 2014 through March 2015. Seasonal part-time operation has been the norm since the deactivation of several extraction wells following the ISCO pilot tests. Groundwater finite element modeling performed by CH2M Hill (CH2M Hill, 2006 and CH2M Hill, 2014) predicted that the GETS could be shut down for approximately 6 months before TCE in the alluvium migrated to a point where it was beyond recapture once reactivated and TCE migration in Basalt A may require approximately 20 years of shutdown to escape GETS re-capture (CH2MHill, 2014). However, this prediction is not consistent with the observed downgradient TCE increases described in the paragraphs above. This is especially true given that since 2012, the alluvium under LF002 has not substantially re-saturated during part-time manual batch mode periods. Therefore, the primary groundwater pathway for TCE migration is through the Basalt A.

A review of the finite element model inputs found that a hydraulic conductivity of 0.2 ft/day and a groundwater velocity of 10 ft per year (0.02 ft/day) was used for the Basalt A. However, this hydraulic conductivity is not consistent with slug tests, step tests and pumping tests performed for the RI and subsequent GETs design and groundwater flow patterns. Data from these sources indicate a hydraulic conductivity of 4.6 ft/day and a groundwater velocity of 1.3 ft/day may be more representative (see **Appendix G.1** and **Appendix G.3** for justifications).

Capture zones analysis (**Table 2-10**) for the major pumping wells (EW-5, EW-2, EW-7, EW-9, and EW-14) found that the average upgradient reach (to the stagnation point) was 60 ft, which at 1.3 ft/day could be traveled in approximately 46 days (7 weeks). Therefore, a more appropriate limit to manual batch mode or shutdown period should be no more than 7 weeks.

***2) What is the current status of dissolved phase mass removal by the GETS?***

The 2015 mass removal of 4.8 lbs of TCE is a slight improvement over the 2014 removal of 3.7 lbs. The improvement is primarily due to bringing EW-9 and EW-14 back online and by maintaining full automatic pumping through the 2015 winter. A TCE mass model is in development and will be presented in a UFP-QAPP addendum anticipated to be approved in 2016. Future RA-O reports will update the mass model with TCE groundwater concentrations and mass removal amounts for the reporting year.

The total TCE mass removal by the GETS since 1995 is estimated to be 1,352 lbs. An additional 194 lbs were reportedly removed by SVE between 2010 and 2013 and 264 lbs removed by ISCO in 2012 and 2013 (CH2MHill, 2014). An additional unknown quantity of TCE removal may have also been removed by natural attenuation.

***3) Are remedial actions reducing groundwater concentrations of TCE?***

This question is intended as a placeholder question while effects of the ISCO pilot test are fully evaluated. A TCE mass model and remediation performance criteria are being developed as part of the UFP-QAPP addendum. TCE trends in the post ISCO rebound period are provided in **Table 2-12A** and will be discussed as part of Question #8.

***4) Do current COC and COPC groundwater concentrations pose risks to receptors?***

This question is addressed below in two parts: a) the COCs, COPCs and their distribution, and b) receptor pathways.

a) COC, COPCs and their distribution
The only COC identified in the ROD for LF002 was TCE. However, other COPCs include anaerobic biodegradation products of TCE (cis- and trans-DCE and VC) and ISCO residuals (Cr). As will be addressed in Questions #5 and #6, Cr is only present above the PAL in a few wells in the vicinity of the ISCO treatments (see also **Figures 2-5A** and **2-5B**) and does not appear to be migrating out of the SDA or NDA. The only TCE biodegradation product detected above PALs is VC and that is only found near the SDA source area. VC has not been detected off-site. TCE PAL exceedances also only occur within the landfills with the exception of MW-80, MW-118, and MW-141. The slight TCE PAL exceedances in MW-80 in 2014 and March 2015 are addressed in Question #1 and have subsequently been below the PAL for three quarters. TCE has been above the PAL since monitoring began in 1993 in MW-118 (located 1,975 ft east) and in MW-141 (located 2,650 northeast; see **Figures 2-3A** and **2-3B**) of the landfill. The TCE distribution in these two areas and their relationships to LF002 source areas remains unclear. An off-site investigation to better delineate these areas is planned and the access/easement agreement for new wells has been initiated. This investigation is anticipated to be performed in 2017 or 2018.

b) Receptor Pathways
The primary TCE receptor pathways identified in LF002 (OU-1) ROD were:

- Ingestion of volatiles from household use of well water;
- Inhalation of volatiles from household use of well water; and
- Dermal adsorption of chemicals from household use of well water.

The area downgradient of LF002 is mostly occupied by gravel quarry or light industrial use properties. However, there are two manufactured home residential areas, one located immediately northeast of LF002 on the east side of Craig Road and the other is about 2,150 ft northeast of LF002 near MW-141. Residents in these areas are supplied by municipal water and there are no known private wells within a mile downgradient of LF002. Therefore, there does not appear to be ingestion or inhalation exposure risks to private well receptors.

The city of Airway Heights municipal wells #1 and #4 (PS 1/4), located 4,000 ft east-southeast of LF002, have been monitored by Fairchild AFB since 1991 and TCE concentrations have remained below the PAL. However, in October 2012, the city completed another water supply well (#9) located 2,650 ft east of LF002. This well has not yet been sampled as part of the RA-O. The well log for #9 indicates that it is completed to a depth of 255 ft in the alluvial channel east of the landfill, which is the same unit that wells #1 and #4 are completed in. Sampling in other wells in the alluvial channel (MW-116, MW-115, MW-139, and municipal wells PS 1/4) has not detected TCE above the PAL to date in over 20 years of sampling. Therefore, there does not appear to be a significant risk of TCE impacts to the municipal wells. However, because these are municipal wells, monitoring will continue to verify TCE remains below the PAL.

The installation of a municipal well directly downgradient of LF002 exposes a weakness in the current off-site LUCs. As described in **Section 2.3.8**, the USAF will update the LUCIP in 2016 which will bring off-site LUC inspections in alignment with current USAF checklists. Off-site LUCs also need to be formally revised via a RODA; however, the downgradient TCE

plume is not well defined. The RODA will require further delineation of the off-site plume to allow better definition of LUC boundaries. As described previously, an off-site investigation is planned.

TCE vapor intrusion into indoor air was not evaluated as part of the RI-FS. Most, if not all of the structures present downgradient of LF002, appear to be above grade, but there has been no inventory of structures to confirm this. Also, as described above, the downgradient TCE plume is not well defined. Better plume definition will be needed to evaluate the vapor intrusion pathway. Data needed for evaluation of the vapor intrusion pathway are anticipated to be collected as part of the off-site investigation as discussed above.

***5) Are Cr concentration trends demonstrating a decrease to below the PAL and are sodium permanganate concentrations decreasing to below visible detection?***

For wells demonstrating Cr concentration above the PAL or visible $MnO_4$ in the past year of monitoring, concentration time series data were evaluated using Mann-Kendall analysis to determine if the data demonstrated a statistical significant trend (>95% confidence) or stability. All data with identified trends appeared to be linear on a semi-log plot and so rates of decrease were also evaluated using log-linear regression. A summary of the trend analysis is presented on **Table 2-12B** (Cr) and **Table 2-12C** ($MnO_4$) and trend analysis worksheets are provided in **Appendix H**.

The trend analysis results identified statistically significant decreasing Cr trends in NDA-1, 8, 12 and in RW-7, 8, 9, 11, 12, 16, and EW-10. The analysis indicated stable Cr concentrations in NDA-6 and RW-6 and no trend in NDA-14 and RW-17. The only wells with Cr remaining above the PAL (0.05 milligrams per liter [mg/L]) the last time they were sampled are NDA-1, 6, 12, 14, RW-6, 9, 16, 17 and EW-10. Trend half-lives ranged from 130 days (RW-8) to 1,000 days (RW-9).

Trend analysis results for $MnO_4$ indicate statistically significant decreasing trends in EWs 9, 10, 14, NDAs 1, 6, 8, 10 and RWs 6, 7, 8, 9, 11, 12, 13, 14, 15, 16, and 17. Only NDA-14 did not demonstrate a $MnO_4$ concentration trend. However, its concentration has always remained relatively low (0.75 to 11.3 mg/L). Trend half-lives for $Mn0_4$ range from 70 days (NDA-1) to 320 days (EW-14). As of December 2015, $MnO_4$ was visible in only EWs 9, 10, 14, NDAs 8, 10, 14 and RWs 9, 15, 16, and 17.

**6) Are Cr and residual *$MnO_4$ in* the source areas migrating**?

The potential for Cr and $MnO_4$ migration was evaluated by monitoring wells downgradient of the ISCO injection areas. These wells included EWs 5, 6, and RW-13 in the NDA and EWs 9, 10, 14, RW-18, and MW-77 in the SDA. In 2015, the Cr concentration remained below the PAL in all these wells, with the exception of EW-10, and all these wells had $MnO_4$ below visual detection, with the exception of EW-9, EW-10, and EW-14. As indicated in Question #5, the Cr concentration in EW-10 and the $MnO_4$ concentrations in EWs 9, 10, and 14 all had statistically significant decreasing trends. EWs 9, 10, and 14 are within the GETS capture zone. Therefore, the monitoring data indicate that the Cr and $Mn0_4$ plumes have not migrated beyond the landfill areas.

**7) What flow rates can be achieved at EW-5, EW-6, EW-9, EW-10, and EW-14 and what operational procedures can be implemented to prevent Cr and** $MnO_4$ **concentrations above PALs going to the infiltration discharge?**

As described in **Section 2.3.9.3**, the Cr and $MnO_4$ sampling and operational protocols established in the UFP-QAPP have been successful in allowing operation of these wells and preventing PAL exceedances of these two constituents in the GETS influent.

***8) Has the ISCO pilot test finished reacting?***

The ISCO pilot tests consisted of injecting a solution of $MnO_4$ into remediation wells in the SDA (2012 and 2013) and in the NDA (2013). Initially, $MnO_4$ concentrations were several hundred to several thousand mg/L and were present in up to nine wells in the NDA and 17 wells in the SDA (February 2013). After injections, the $MnO_4$ concentration in groundwater subsequently decreased with an exponential trend with observed half-lives of between 70 and 320 days. A summary of $MnO_4$ concentration Mann-Kendall and Log-Linear Trend analysis is provided in **Table 2-12C** and trend analysis worksheets are provided in **Appendix H**. As of September 2015, the remaining visible $MnO_4$ is present between the visible detection limit of 0.75 mg/L and 11.3 mg/L and present in one well in the NDA and 10 wells in the SDA (see **Figures 2-5A** and **2-5B**).

The samples with visually detected $MnO_4$ were stabilized with ascorbic acid to stop any post-sampling reaction. At $MnO_4$ concentration greater than 75 mg/L, TCE concentrations above the PAL were rare (2 out of a total of 48 samples; **Figure 2-10**). With decreasing $MnO_4$ concentration, the frequency of TCE above the PAL increased and at $MnO_4$ concentrations less than 3.8 mg/L, approximately 40% had TCE above the PAL and in some cases (such as RW-6) the TCE concentration was as much as 700 µg/L. The coexistence of TCE and $MnO_4$ is unstable in solution and the TCE would be expected to readily oxidize without the presence of the stabilizer. Therefore, it is likely that the $MnO_4$ and TCE exist in discrete fracture environments that are only combined during sampling. Reaction may still be occurring through slow diffusion between fracture environments. However, given the low residual $MnO_4$ concentrations, this process is likely minimal. Effectively, the ISCO reactions are considered complete.

***9) Have TCE concentrations finished rebounding from the ISCO pilot tests?***

The ISCO injections in 2012 and 2013 initially nearly completely oxidized the dissolved phase TCE in the treatment areas. Typically, the TCE concentrations decreased to below laboratory detection. However, as the TCE re-equilibrated with TCE mass in the sorbed phase and by diffusion with non-connected porosity, the TCE groundwater concentration rebounded. This resulted in a period where TCE concentrations were increasing. The end of the rebound is assumed to occur when the TCE concentrations appear to pass a rebound maximum and demonstrate a stable or decreasing trend. Mann-Kendall and log-linear trend analysis was performed on post-rebound TCE concentration data collected from on-site wells. The trend analysis starts at the apparent post-injection peak TCE concentration. In some cases, such as at EW-3, NDA-5, NDA-8, NNDA-12, NDA-13, RW-6, RW07 and RW-9, there have not yet been enough data points (less than 4) since the apparent maximum TCE rebound in those wells. **Table 2-12A** provides a summary of this analysis and analysis outputs are provided in **Appendix H**. These data demonstrate that at 14 out of 29 wells, there are still insufficient post-rebound samples to demonstrate a stable or decreasing trend. A stable trend was demonstrated at 10 wells and a decreasing or potentially decreasing trend was demonstrated at five wells. Therefore, a post-TCE rebound trend has yet to be confirmed in most of the RW and NDA wells. However, most of these wells qualitatively appear to have past the rebound peak and appear to just need a few more data points to establish decreasing trends.

**10) Are the landfill vents emitting methane or VOCs above notice of construction limits?**

**And**

**11) Is the GETS air exhaust stream meeting discharge limits?**

**And**

**12) Is the GETS air exhaust GAC nearing saturation**?

As described in **Section 2.3.9.2**, LF002 emissions remained in compliance with the NOC in 2015 and the GAC is not yet approaching saturation.

**13**) **Is the GETS treating the discharge water to below PALs?**

**And**

**14) Is the GETS working effectively?**

As discussed in **Section 2.3.7.1**, the GETS liquid effluent has remained below the PAL and below laboratory detection for all four quarters of 2015. The GETS remains effective at treating the extracted groundwater.

## 2.4 Recommendations

Based on data presented in **Section 2.0** of this 2015 Annual RA-O Report, the following are recommended:

- Implement SVE and GETS modifications once the ESD has been approved. Sampling plan revisions, performance metrics, and operational instructions will be provided by the UFP-QAPP addendum and updated LF002 O&M manual anticipated later in 2016. Continue monitoring program as modified by the two above documents until RAOs have been met.
- Implement changes to the LUC annual inspections in accordance with the LUCIP which the USAF is anticipated to complete in 2016.
- Begin quarterly sampling for VOCs (TCE) at Airway Heights municipal well #9.
- Do not operate in manual batch mode or shut down for more than 30 days to assure continued plume capture.
- Evaluate re-development and potentially lowering the pump in EW3. This will improve groundwater capture in the northeast portion of the NDA.
- Reduce laboratory split sample frequency of GETS influent Cr field measurements from 1 every 10 (10%) to 1 every 20 (5%) per the UFP-QAPP (90% confirmation between data sets has been documented).

# 3.0 SITE WP003 (WASTEWATER LAGOON [WW-1])

## 3.1 Background

### 3.1.1 Site Setting

Site WP003 (WW-1) is located south of the eastern end of the runway between the perimeter road (Rambo Road) and the north-south portion of Taxiway No. 10 (**Figure 3-1**). The site consists of two interconnected industrial lagoons that were designed to accept industrial wastewater and stormwater from the flightline and eastern portions of the base. Waste types known to have been discharged into the lagoons in the past included JP-4 fuel, oils, industrial solvents, acids, and cleaning compounds. The lagoons drain into “No Name Ditch,” which flows perennially off-base to the southeast (Bay West, 2015c).

### 3.1.2 Hydrogeology

The site geology consists of 20 to 30 ft of interlayered sand, gravel, and clay alluvium overlying up to 25 ft of clayey weathered basalt, which overlies competent basalt (Basalt A). Groundwater is encountered at between 5 and 10 ft bgs. Most groundwater flow is assumed to occur in the sand and gravel alluvium and the weathered bedrock is thought to be a clayey aquitard separating groundwater in the alluvium from the deeper fractured Basalt A. In some locations, the sandy alluvium is split by clay layers and it is unclear how or if these deposits connect to each other (Bay West, 2015c).

### 3.1.3 COCs, COPCs and PALs

The COC specified in the ROD is TCE. However, subsequent to the ROD, VC (a biodegradation product of TCE) has been present above its 0.2 µg/L PAL in a number of wells. Other TCE biodegradation products including cis- and trans-DCE are COPCs but have not been detected above the 70 µg/L and 100 µg/L PALs, respectively.

Arsenic has also been present above the PAL generally near the lagoons (MW-11, MW-12, MW-102, and MW147) since at least 2001. Arsenic may have been mobilized by redox effects from Enhanced Reductive Dechlorination (ERD) remediation efforts completed in 2001 and 2005 (see **Section 3.1.4**); arsenic was also found present in drums excavated at the site in 2005. A basewide background study determined that the arsenic background concentration is 10.7 µg/L (Shaw, 2015).

### 3.1.4 Environmental History

Field investigation activities conducted at Site WP003 (WW-1) through 1992 indicated that TCE was the primary groundwater contaminant, which had migrated at least 625 ft off-base (eastward) within the shallow alluvial aquifer. No substantial vertical migration of TCE into the lower basalt aquifer system was observed. An RI and an FS were completed in 1993. The WP003 RAOs, as listed in the OU-2 ROD (USAF, 1993), are:

1. Maintain ICs that restrict access to the site and prevent on-base usage of TCE-contaminated groundwater until cleanup levels are achieved.
2. Conduct additional source investigation activities to identify the source of groundwater TCE contamination.
3. Implement a GETS using air stripping and/or carbon adsorption.
4. Monitor off-base water supply wells in the vicinity of the site and provide point-of-use treatment or alternate water supply, if necessary.

#### 3.1.5 Remedial Action History

The following is a summary of remedial actions at WP003:

- A pump and treat (P&T) system was installed and was operational by 1996. By early 2002 TCE concentrations were below the PAL in all site wells and VC was only above the PAL in on-site wells MW-102 and WP-1. The 2003 RA-O Report concluded that the plume was being naturally attenuated and further operation of the P&T was no longer necessary. The P&T system was deactivated in 2004. However, in the fall of 2007, TCE concentrations above the PAL returned to off-site well MW-120 and have remained above the PAL ever since that time. Furthermore, sampling at off-site wells OW-2 and MW-243 in the spring of 2004 detected VC above the PAL.
- In October 2000, a cluster of 35 buried drums was removed and an estimated 750 gal of liquid waste, including sulfuric acid, heavy oils, and used hydraulic oils containing solvents such as TCE, were recovered from the drums. Additionally, approximately 225 cubic yards of TCE- and total petroleum hydrocarbon (TPH)- and arsenic-contaminated soils were removed for off-site treatment. The buried drums appear to have been a source of TCE and arsenic contamination to groundwater.
- An organic substrate was injected in 2001 and 2005 for ERD. The ERD appears to have mobilized arsenic.

The COC identified in the ROD was TCE. However, subsequent to the ROD, remedial action utilizing ERD appears to have mobilized arsenic above the PAL in the vicinity of the lagoons and appears to have resulted in accumulation of TCE daughter product VC above the PAL near MW-102 and OW-2.

A pre-design investigation is anticipated to be completed later in 2016 to evaluate remedial options to address the remaining TCE, VC, and arsenic contamination. A RODA will be submitted to document the selected remedy and to add arsenic and VC as COCs.

## 3.2 Groundwater Monitoring Program

#### 3.2.1 Summary of Fourth Quarter and 2015 Monitoring Activities

Groundwater samples were collected from eight monitoring wells at WP003 during the fourth quarter 2015 sampling event (quarterly sampling location on **Figure 3-1**). A summary of well construction data for the WP003 monitoring wells is provided in **Table 3-1**. A summary of the fourth quarter samples collected is provided in **Table 3-2A** and a summary of 2015 samples collected is provided in **Table 3-2B**. Field sampling sheets are provided in **Appendix A** and laboratory reports are provided in **Appendix B**.

#### 3.2.2 Fourth Quarter Data Validation

Data validation reports are provided in **Appendix C**. The results are accepted as qualified. A summary of all validated results is provided in **Appendix D.1**. A summary of historical TCE, VC, and arsenic concentrations at WP003 is provided in **Appendix D.2**.

#### 3.2.3 Groundwater Elevation Monitoring

Prior to purging and sampling, groundwater levels were measured. Groundwater level and elevation summaries are provided in **Appendix E**. Additionally, the summary table in **Appendix E** for WP003 contains a summary of field measurements for oxidation reduction potential (ORP), dissolved oxygen, pH, and ferrous iron concentrations that are being collected in support of a remediation pre-design investigation to be completed in 2016.

#### 3.2.4 Fourth Quarter COC Analytical Results

Validated results from the sampling event demonstrated the following:

- TCE was detected above a PAL of 5 µg/L in only MW-120 at a concentration of 9.4 µg/L. VC (a biodegradation product of TCE) was detected above the PAL of 0.2 µg/L in MW-102 at a concentration of 0.31 µg/L and in OW-2 at a concentration of 1.3 µg/L.
- Arsenic was detected above a PAL of 5 ug/L and the basewide arsenic background concentration of 10.7 µg/L (Shaw, 2015) in MW-11, MW-12, MW-102, MW-103, and WP-1 at concentrations ranging from 5 µg/L to 95 µg/L. The highest arsenic concentration was in MW-102.

Further discussion of the COC results as they pertain to the UFP-QAPP environmental questions is provided in **Section 3.3**.

#### 3.2.5 Land Use Control

A LUC inspection was performed for WP003 in November 2015 to evaluate LUCs established by the OU-2 ROD. Methods and results of this inspection are provided in a separate LUC Inspection Report (submittal in progress). The USAF recognizes that the LUCs originally listed in the OU2 ROD lack specificity and are not compliant with the current 2015 USAF LUC checklist. An ESD is currently in preparation to better define on-site LUCs at several sites at Fairchild AFB. Also, the LUCMP will be updated in 2016 which will have both on-site and off-site inspection criteria compliant with the USAF LUC checklist and the existing ROD. The LUCIP is anticipated to be finished in time to be implemented for the 2016 annual inspections.

A RODA to clarify off-site LUCs and revise the remedy will be submitted after completion of the pre-design investigation (PDI) anticipated later in 2016. Results of the PDI will be needed prior to preparation of the RODA in order to better delineate boundaries of where off-site LUCs will be required for protection of groundwater receptors and for protection of vapor intrusion receptors. In the interim, LUCs will be informally implemented per the 2016 LUCIP.

### 3.3 Environmental Question Status

The following is the current status of environmental questions listed in the site-specific UFP QAPP.

***1. Is the TCE plume migrating or is it naturally attenuating?***

The distribution of TCE concentrations in March and September 2015 are displayed in **Figure 3-2A** and **Figure 3-2B**. TCE concentrations at off-site downgradient wells MW-243 and MW-245 have been below the PAL since 2002 and 1996, respectively, and MW-256, MW-255, MW-257, and MW-258 have remained below the PAL since monitoring began at these locations in 1998. Also, sampling of residential wells RW-13 and RW-12 continue to demonstrate no detectable TCE in these wells (see **Section 6.0**).

The only well with a TCE PAL exceedance is MW-120, which is located 625 ft east of the base property boundary. Mann-Kendall and log-linear regression trend analysis of the TCE concentrations at MW-120 since December 2011 demonstrate a statistically decreasing trend with a half-life of 2,130 days (see **Table 3-3**). A time series graph of the TCE concentrations at this well is provided on **Figure 3-3A**.

The above data demonstrate that the TCE plume is naturally attenuating but at a very slow rate (half-life of 2,130 days). However, the pathway for TCE migration from the lagoon area to MW-120 is unclear. The PDI planned for later in 2016 is anticipated to help resolve TCE migration pathways. Additionally, monitored natural attenuation parameter data have been

collected on an annual basis (see **Table 3-2B** for a list of wells and parameters and **Appendix D.1** for results). These data will be compiled and evaluated as part of the PDI later in 2016.

***2. Is the VC plume migrating or is it naturally attenuating?***

The distribution of VC concentrations in March and September 2015 are displayed on **Figure 3-2A** and **Figure 3-2B**. VC has not been detected in MW-244, MW-245, MW-254, MW-255, MW-256, MW-257, or MW-258 since monitoring began in these wells in 1998. Residential wells RW-12 and RW-13 continue to demonstrate no detectable VC.

The only wells above the PAL for VC in 2016 were MW-102 and OW-2. Mann-Kendall and log-linear trend analysis demonstrate that OW-2 has a statistically significant decreasing trend and MW-102 has a probably decreasing trend (confidence of 92.4%; see **Table 3-3**). The decreases are occurring with a half-life of between 1,470 and 1,720 days. OW-2 is located approximately 450 ft east of the Fairchild AFB base-boundary. A time series graph of VC concentrations at MW-102 and OW-2 is provided on **Figure 3-3B**.

The above data demonstrate that the VC plume is likely naturally attenuating. However, the migration pathway to OW-2 is unclear. Additional data collected for the PDI later in 2016 are anticipated to help resolve VC migration pathways

***3. Are TCE or breakdown products cis-1,2 DCE, trans-DCE, or VC migrating to the Basalt A aquifer?***

Basalt A aquifer wells MW-99 and MW-257 have had no VC, cis-DCE, or trans-DCE above the PAL since monitoring began in 1991 and 1997, respectively. These data indicate that these constituents have not migrated to the Basalt A aquifer.

***4. Is the arsenic plume migrating or is it naturally attenuating?***

The distribution of arsenic concentrations in March and September 2015 are displayed in **Figure 3-2A** and **Figure 3-2B**. Arsenic appears to be a residual redox affect from past ERD efforts completed at the site (See **Section 3.1.3**). ERD includes injection of an organic substrate to induce a reducing environment. The oxidation-reduction (redox) status of groundwater can be measured via ORP. As demonstrated in **Figure 3-4**, all of the samples (10 out of 10) collected in 2015 with ORP value below -100 millivolts (mV) had arsenic concentrations above background (10.7 µg/L). Between ORP values of -100 mV and +100 mV, a third of the samples (7 out of 21) had arsenic concentrations above background and none of the samples (0 out of 7) had arsenic concentrations above background where the ORP value was above +100 mV. These data suggest that arsenic either sorbs or precipitates as it migrates out of the residual reduced groundwater halo in the former treatment area. Arsenic concentrations have not been above the PAL or background in MW-120, MW-243, MW-245, MW-255, MW-256, and MW-257 since monitoring began at these wells in 1999 or 2001.

Arsenic concentration, Mann-Kendall, and log-lineal trend analysis (see **Table 3-3** for summary) indicate there are statistically significant decreasing trends at MW-102, MW-137, and MW-241 and stable trends at MW-11 and MW-12. A time series graph of arsenic concentrations is provided in **Figure 3-3C**.

The above data demonstrate that arsenic is naturally attenuated and is not migrating. The arsenic plume above background in 2015 extended to the base boundary (MW-241) but not beyond it (MW-147 and MW-242).

5. ***What are the areas where vapor intrusion could affect future land use development?***

The TCE and VC pathway between the WP003 lagoons and MW-120/OW-2 is not well defined. Data from the PDI later in 2016 will help define areas with potential future vapor intrusion issues. There are currently no structures overlying the known TCE or VC plume.

6. ***Are downgradient residential wells at risk from WP003?***

As addressed in Questions #1, #2, and #3, the TCE, VC, and arsenic plumes appear to be naturally attenuated and are not migrating. Sampling of residential wells RW-12 and RW-13 have long demonstrated they are not impacted by the WP003. However, there is still some uncertainty in the plume pathways. Data collected from the PDI are anticipated to help resolution of these pathways.

***The following questions listed in the UFP-QAPP will be addressed by a PDI to be completed later in 2016:***

- What is the vertical and lateral distribution of TCE near or between MW-120 and MW-102?
- What is the vertical and lateral distribution of VC near or between OW-2 and MW-102?
- What is the vertical and lateral distribution of arsenic at WP003?
- Is there a continuing source of TCE or VC in the basal alluvium or weathered basalt?
- Is there a continuing source of arsenic near MW-102?
- Is the current understanding of the site lithology and hydrogeology correct?
- Is the geochemistry and microbial populations conducive to biodegradation of TCE or VC?
- Are site conditions conducive to ISCO or In Situ Chemical Reduction?
- What are the geochemical and redox controls on arsenic?

## 3.4 Recommendations

Based on the 2015 data collected, evaluated and presented above, the following are recommended actions:

- Complete the PDI as planned later in 2016. These data will address the remaining environmental questions, better define the Conceptual Site Model, and allow evaluation of additional remedies for remediation of the TCE, VC, and arsenic plumes.
- The existing monitoring program should continue as-is until evaluation of the PDI data. Changes to the sampling program, if warranted, will be presented as part of the PDI report.
- Implement the updated LUC inspection checklist in 2016 as provided in the anticipated LUCIP (in preparation).

# 4.0 SITE FT004 (FORMER FIRE TRAINING AREA [FT-1])

## 4.1 Background

### 4.1.1 Site Setting

Site FT004 is a former fire training area located in the eastern portion of the base, south of the east end of the main runway (**Figure 4-1**). From the early 1960s to 1991, the FT004 area was used for fire training exercises two to three times per month, in which JP-4 jet fuel and extinguishing foam were used in an unlined berm simulation area. After each exercise, the water, remaining fuel, and foam were drained into an oil/water separator (OWS). The OWS discharged into a low area east of the training site, which contributed to elevated concentrations of petroleum hydrocarbons in local soil and groundwater (CH2M Hill, 2012).

### 4.1.2 Hydrogeology

The shallowest water-bearing interval at the site is within alluvium and uppermost basalt at depths of 4 to 11 ft. Based on water elevation data from alluvial and shallow basalt wells, hydraulic continuity likely exists between these water-bearing units at the site. The predominant groundwater flow direction at the site is easterly. The overall lateral-flow gradient across the site is approximately 0.002. In the source area and off-Base to the east, the gradient is slightly steeper at 0.007. Groundwater underlying the site is not used as drinking water (USAF, 2013).

### 4.1.3 COCs, COPCs, and PAL

The COC identified in the ROD is benzene, which has a PAL of 5 µg/L. However, the benzene concentration has been below the PAL in all site wells since 1999. Groundwater monitoring since 2008 has detected only TPH as diesel (TPH-D) concentrations above the PAL of 500 µg/L.

### 4.1.4 Environmental History

Fuel stains and dead vegetation were observed in the effluent drainage area during 1993 RI activities; benzene was detected above PALs in soil and groundwater. The ROD for FT004 (part of OU-2) was signed in 1993 (USAF, 1993). The FT004 RAOs, as listed in the ROD, are:

1. Maintaining ICs, in the form of restrictions against on-base usage of benzene-contaminated groundwater associated with the site, until cleanup levels are achieved.
2. Implementing an in situ bioventing treatment system for benzene-contaminated soil.
3. Implementing a pilot-scale in situ air sparging system to evaluate the effectiveness of this technology for remediating benzene-contaminated groundwater, to be followed by implementation of a full-scale system if the pilot scale system is successful.
4. Monitoring off-site water supply wells in the vicinity of the site and providing point-of-use treatment arid/or alternate water supply, if necessary.

An in situ bioventing treatment system was constructed in 1997 and was fully operational until late December 2006. To expedite natural soil remediation processes, an abandoned OWS, associated piping, and surrounding impacted soils were removed in 2000 and disposed of offsite. However, the soil removal actions were not intended to address all known TPH-contaminated soil at the site, but to remove the most-contaminated soil. Confirmation samples collected from sidewalls of these excavations indicated that TPH contamination remained at levels exceeding state cleanup levels (CH2M Hill, 2012).

Approximately 3,130 tons of petroleum-impacted soil have been excavated from the site and disposed of off-site during soil removal activities in 2005 and 2008 (CH2M Hill, 2012).

Due to the observed attenuation of VOCs in shallow groundwater and soil, the groundwater monitoring program was significantly reduced in 2008 to annual sampling of five wells for TPH as gasoline (TPH-G) and TPH-D, and further reduced in 2011 to TPH-D only (CH2M Hill, 2012).

## 4.2 Groundwater Monitoring

Groundwater monitoring was performed in accordance with the UFP-QAPPs as referenced in **Section 1.3**. Well construction data for the FT004 monitoring wells are provided in **Table 4-1**.

### 4.2.1 Summary of Fourth Quarter and 2015 Monitoring Activities

Sampling at MW-3, MW-226, and MW-247 for diesel range organics (DRO) and motor oil range organics (MRO) was performed in the third quarter 2015. At the time of the fourth quarter sampling event, the UFP-QAPP had not yet been finalized in draft final version and only MW-226 was sampled quarterly. Consequently, MW-226 was the only well sampled in December 2015. The subsequent final UFP-QAPP has quarterly sampling for DRO at MW-3, MW-226, and MW-247 to provide more data to better document trends and eventual compliance with the PAL (see Questions #1 and #2 in **Section 4.3**; quarterly sampling location on **Figure 4-1**). A summary of the fourth quarter sample collected is provided in **Table 4-1A**. The sample was analyzed for TPH-D (DRO and MRO). A summary of sampled collected in 2015 is provided in **Table 4-2B**. Sample collection sheets for the fourth quarter event are provided in **Appendix A**. The laboratory report is provided in **Appendix B**.

### 4.2.2 Fourth Quarter Data Validation

The fourth quarter data validation reports are provided in **Appendix C**. The results are accepted as qualified. A summary of all 2015 validated results is provided in **Appendix D**.

### 4.2.3 Groundwater Elevation Monitoring

Prior to purging and sampling, groundwater levels were measured. Groundwater level and elevation 2015 summaries are provided in **Appendix E**.

### 4.2.4 Sample Data Results

Validated results from the fourth quarter sampling event demonstrated the following:

- Neither the DRO nor MRO concentration exceeded the PAL in MW-226.

A summary of 2015 analytical data for FT004 is provided in **Appendix D.1** and a summary of historical DRO concentrations is provided in **Appendix D.2**. Sample results and groundwater elevations are posted on **Figures 4-2A** (March) and **4-2B** (September) and a time series plot for DRO concentrations at MW-3, MW-226, and MW-247 are provided on **Figure 4-3**. Additional discussion of the DRO concentrations as they pertain to the UFP-QAPP environmental questions is provided in **Section 4.3**.

### 4.2.5 Land Use Control

A LUC inspection was performed for FT004 in November 2015 to evaluate LUCs established by the OU-2 ROD. Methods and results of this inspection are provided in a separate LUC inspection report (submittal in progress). The USAF recognizes that the LUCs originally listed in the OU2 ROD lack specificity and are not compliant with the current 2015 USAF LUC checklist. An ESD is currently in preparation to better define on-site LUCs at several sites at Fairchild AFB, including FT004. Also, the LUCIP will be updated in 2016 which will have both on-site and

off-site inspection criteria compliant with the USAF LUC checklist and the existing ROD. The LUCIP is anticipated to be finished in time to be implemented for the 2016 annual inspections.

## 4.3 Environmental Question Status

1. ***Is the TPH-D plume currently being naturally attenuated to within USAF property or is the plume migrating off-base?***

   The DRO and MRO concentrations in MW-226, which is located approximately 100 ft west (inside) of the Fairchild AFB property boundary, were below the PAL for both events it was sampled in 2015 (September and December 2015). The MRO concentrations in all the wells sampled are lower than the DRO and have been at or below the detection limit. Sampling for DRO/MRO at downgradient residential well RW-46 in September and December 2015 did not detect PAL exceedances.

   Trend analysis was performed on DRO concentrations in MW-3, MW-226, MW-227, and MW-247. A summary of the results is provided in **Table 4-3** and copies of the analysis output are provided in **Appendix H**. Although the concentrations at MW-226 appear to be decreasing, the small data set is resulting in a low trend confidence (82.1%). The analysis currently identifies the trend as stable. Additional data are needed to confirm a decreasing trend. The analysis documents statistically significant decreasing DRO trends at MW-3 and MW-247 (since 2007) and in MW-227 (since 2010).

   The above data suggest that the DRO/MRO plume is being naturally attenuated on USAF property. Additional monitoring for DRO at MW-226 will be needed to confirm that the plume at that location has a statistically significant decreasing trend.

2. ***Do TPH-D groundwater concentrations and trends support Response Complete (RC) in 8 years from the start of the period of performance?***

   Other than a minor DRO exceedance (570 µg/L vs a 500 µg/L PAL) at MW-3 in March 2015, all the wells have been below the PAL throughout 2015. As described in Question #1 and shown in **Table 4-3**, there are statistically significant decreasing DRO trends in MW-3, MW-227, and MW-247. Trend analysis identified concentration at MW-226 as stable; however, this is likely a result of the lower statistical confidence from the small data set.

   Once DRO concentrations in MW-3, MW-226, MW-227, and MW-247 all demonstrate a statistically significant decreasing trend and all monitored wells demonstrate a UCL-95% (with the previous four or more events) below the PAL, a Remedial Action Completion Report (RACR) will be prepared with USEPA and USAF concurrence to document that RC has been achieved.

   ***The following UFP-QAPP questions will be addressed after soil sampling is performed in 2016: The evaluation of these data will be provided in the 2016 Annual RA-O Report***.

   - What are current soil TPH-D and TPH-G concentrations and at what rate are concentrations decreasing via natural attenuation?
   - Is soil a continuing source of TPH-D groundwater contamination?

## 4.4 Recommendations

Based on the data presented in this section, the following is recommended:

- Quarterly groundwater sampling at MW-3, MW-226, and MW-247 should continue until all three wells demonstrate a statistically significant decreasing trend and UCL-95% values of the previous four or more events less than the PAL.
- Once these criteria have been achieved, a RACR will be prepared with USEPA and USAF concurrence to document that RC has been achieved.

# 5.0 ST006 (BULK FUEL STORAGE AREA [PS-1])

## 5.1 Background

### 5.1.1 Site Setting

Site ST006 is located at the base's main bulk fuel storage facility. The site is comprised of four aboveground storage tanks that were constructed between 1952 and 1960 to store approximately three million gallons of JP-4 fuel.

Unrelated to Installation Restoration Program activities, Fairchild AFB decommissioned Storage Tank 2406 in 2008. The tank has been removed, but all secondary containment for the former tank location and facility remains in place (Bay West, 2015d).

### 5.1.2 Hydrogeology

The shallowest water-bearing interval is within alluvium and uppermost Basalt A bedrock at depths of 2 to 10 ft. Perched groundwater is present periodically above the clay, which most likely restricts the lateral and vertical movement of groundwater and potential contaminant transport offsite. The predominant groundwater flow direction is generally to the northeast but has shown seasonal variations to the north as well. Groundwater underlying the site is not used as a drinking water source, and drinking water well installation is prohibited by on-base land use controls (Bay West, 2015d).

### 5.1.3 Environmental History

Three fuel releases have been documented at Site ST006. The first was in 1990, at the fuel transfer pipeline east of Storage Tank 2406. Approximately 4,500 gal of fuel were released and 3,000 gal were recovered. A second release was discovered when base personnel unearthed soil contaminated with approximately 2,000 gal of fuel near the transfer pipeline and Building 2404. A third release was discovered during road construction activities in 1993, near the road bed north of Storage Tank 2410. In addition to these releases, sludge removed from storage tank bottoms historically was placed in bermed areas surrounding the tanks. Field investigations at Site ST006 in 1992 and 1995 confirmed TPH contamination in soil gas, shallow soils, and groundwater (CH2M Hill, 2012). In 1995, ST-006 was included in the OU-3 ROD with Bioventing and ICs as selected remedies.

A groundwater monitoring program was initiated in 1996 and consisted of semi-annual monitoring of six wells for benzene and TPH-D. In 2002, TCE was detected in two wells, notably MW-195, where concentrations exceeded its MCL of 5 µg/L. The source of TCE has not been identified. An in situ bioventing treatment system was constructed in 1998 and was fully operational through December 2006. The bioventing system was shut down indefinitely in December 2006 based on recommendations from a Remedial Process Optimization (RPO) evaluation and concurrence from WDOE. The RPO evaluation determined that remaining site soil contamination was not within the influences of the bioventing system and that benzene and TPH-D in groundwater had achieved ROD cleanup levels (CH2M Hill, 2012).

In 2008, the groundwater monitoring program was reduced with WDOE concurrence such that MW-195, down-gradient from the tank area, is sampled twice per year for VOCs, and three wells are sampled annually for TPH-D (USAF, 2013). To support the Five-Year Review, groundwater samples were collected in March 2012 from six site wells for TPH-D analysis and from two site wells for VOC analysis, one of which was sampled again for VOCs in June 2012.

In 2015, the WDOE agreed to oversee petroleum-only sites, such as ST006, under the State of Washington's VCP. Consequently, an ESD will be submitted in 2016 to remove ST006 from OU-3.

## 5.2 Groundwater Monitoring

### 5.2.1 Summary of Fourth Quarter and 2015 Monitoring Activities

Groundwater samples were collected for TPH-D at ST006 from MW-194, MW-207, and MW-208 during the fourth quarter 2015 sampling event (sampling locations shown on **Figure 5-1**). A well construction summary for these wells is provided in **Table 5-1**. A summary of the fourth quarter samples is provided in **Table 5-1A** and a summary of the 2015 samples is provided in **Table 5-1B**. Sample sheets for the fourth quarter event are provided in **Appendix A** and laboratory reports are provided in **Appendix B**.

### 5.2.2 Fourth Quarter Data Validation

Data validation reports are provided in **Appendix C**. The results are accepted as qualified.

### 5.2.3 Groundwater Elevations

Prior to purging and sampling, groundwater levels were measured. Groundwater level and elevation summaries are provided in **Appendix E**.

### 5.2.4 Sample Data Results

A summary of all validated results is provided in **Appendix D.1** and a summary of historical analytical data is provided in **Appendix D.2**. Sample results and groundwater elevations are shown on **Figures 5-2A** (March) and **5-2B** (September). A time series graph of DRO/MRO concentrations in MW-194, MW-207, and MW-208 is displayed on **Figure 5-3**.

There were no PAL exceedances for MW-194, MW-207, or MW-208 in 2015. Additional discussion of the DRO/MRO concentrations as they pertain to the UFP-QAPP environmental questions will be addressed in **Section 5.3**.

## 5.3 Environmental Question Status

1. ***Do concentrations of DRO and MRO meet WDOE VCP confirmation criteria for compliance with the PALs (eight subsequent quarters below the PAL) or a three-year 95% Upper Confidence Limit [UCL] below the PAL)?***

   As of the submittal of the UFP-QAPP, only DRO and/or MRO at MW-194, MW-207, and MW-208 had not yet met WDOE confirmation criteria for compliance with the PAL. The 2015 data demonstrate the following progress toward PAL compliance:

   At MW-194, MW-207, and MW-208 the DRO and MRO concentrations were below the PAL in both events these wells were sampled in 2015 (third and fourth quarter). There are currently only four events since the PAL exceedance in these wells 2011. MW-194 and MW-207 have been below the PAL the last two of four events and MW-208 has been below the PAL the last three of four events. There are currently insufficient data to calculate a three-year UCL-95% or demonstrate eight consecutive quarters below the PAL.

2. ***Do concentrations of DRO and MRO demonstrate a statistically significant decreasing trend??***
   Mann-Kendall and log linear trend analysis was performed on DRO/MRO concentrations at MW-194, MW-196, MW-207 and MW-208. A summary of the trend analysis results is

provided in **Table 5-3** and trend analysis worksheets are provided in **Appendix H**. The trend data indicates that there are statistically significant decreasing DRO concentration trends at MW-196 and MW-208. The S value is negative for both MW-194 and MW-207, which suggests a decreasing trend, but with the low number of data points (4 samples), the confidence is not yet sufficient to confirm the trend. Currently the data can support stable trends in both of these wells. Additional sample data will be required to better define the trends in MW-194 and MW-207.

## 5.4 Recommendations

Based on the data presented in this section, the following action area is recommended:

- Continue quarterly sampling for DRO/MRO at MW-194, MW-207, and MW-208 until WDOE confirmation criteria have been met.
- Once the criteria have been achieved, RC will be documented by submitting a RACR (or WDOE equivalent document) with USEPA and WDOE concurrence.

# 6.0 RESIDENTIAL AND MUNICIPAL WELLS

The following is a summary of residential well sampling performed east of Fairchild AFB. Additional residential well sampling north of Fairchild AFB is being performed to evaluate the TCE plume associated with SS-39. Results of that residential well sampling will be reported with SS-39 investigation reports.

## 6.1 Residential Well Sampling Program

Table 6-1A provides a summary of wells sampled in the fourth quarter 2015 and Table 6-1B provides a summary of residential wells sampled in 2015. Locations of the monitored residential wells are displayed on **Figure 6-1**. Quarterly sampling at wells RW-15 and RW-16 and annual sampling at RW-13 for VOCs were planned per the UFP-QAPP; however, they could not be completed because the wells were dry or inoperable. Well RW-19 was planned to be sampled quarterly for TPD-D and VOCs; however, the well was inoperable. Well RW-12 was planned to be sampled for VOCs and arsenic in the third quarter; however, the arsenic was inadvertently missed. The arsenic sample was collected from RW-12 the following quarter.

There were no exceedances of PALs in these wells. Summary pages of the laboratory reports for these wells have been extracted and presented in **Appendix I**. The full laboratory reports are provided in **Appendix B**.

Data validation reports are provided in **Appendix C**. The results are accepted as qualified. A summary of all validated results is provided in **Appendix D**.

## 6.2 Recommendations

The following actions are recommended based on the data presented above:

- Propose to the Restoration Advisory Board to decrease the frequency of off-site sampling at RW-15, RW-16, and RW-17 from quarterly to annually (in March). These wells are over 3,700 ft southeast from WP003 and have not had a PAL exceedance in over 20 years of sampling. Also, RW-15 and RW-16 are inoperable or dry during the fall/winter months.
- As discussed in **Section 2.4**, sampling for VOCs should be initiated at municipal well #9 (east of LF002).

# 7.0 REFERENCES

Bay West LLC (Bay West), 2015a. Final Consolidated Uniform Federal Policy – Quality Assurance Project Plan. December.

Bay West LLC (Bay West), 2015b. Final Uniform Federal Policy – Quality Assurance Project Plan, Site LF002 (SW-8). July.

Bay West, 2015c. Final Uniform Federal Policy – Quality Assurance Project Plan, Site WP003 (WW-1). Version 01. July.

Bay West, 2015d. Draft Uniform Federal Policy – Quality Assurance Project Plan, ST006 (PS-1). September.

Bay West, 2016. Final Uniform Federal Policy – Quality Assurance Project Plan, Site Former Fire Training Area FT004 (FT-1). February.

Bhate, 2014a. Uniform Federal Policy–Quality Assurance Project Plan, Remedial Action – Operations (RA-O), Fairchild Air Force Base, Washington. March.

Bhate, 2014b. Final Operation and Maintenance Plan, Groundwater Extraction and Treatment System (GETS), Southwest Disposal Area (SDA) Soil Vapor Extraction (SVE) System, and Landfill Cap at Craig Road Landfill, Fairchild Air Force Base, Spokane, Washington. June.

CH2M Hill, 2006. Model Forecasts of Capture and Containment of Craig Road Landfill Plume, Fairchild Air Force Base, Washington, September.

CH2M Hill, 2012. Remedial Actions Operations Report Fourth Quarter and Annual 2012, Priority One and Priority Two Sites, Fairchild Airforce Base, Washington. June.

CH2M Hill, 2014. Flowline Simulations for Treatability Testing Report, April.

Cooper H.H Jr. and Jacob C.E, 1946. A generalized graphical method for evaluating formation constants and summarizing well-field history, American Geophysical Union v 27 pp 526-534.

Engineering Science, 1993. Groundwater Extraction Treatment and Infiltration Gallery System Letter Report for Craig Road Landfill, Fairchild Air Force Base, December.

Grubb, 1993. Analytical Model for Estimation of Steady-State Capture Zones of Pumping Wells in Confined and Unconfined Aquifers, GROUND WATER vol. 31, no 1 January-February.

Office of the Wing Historian, 2015. U.S. Air Force Fact Sheet-*Fairchild Air Force Base History*. http://www.fairchild.af.mil/library/factsheets/factsheet_print.asp?fsID=20643&page=1. Accessed March 2016.

SAIC, 1992. Monitoring Plan for Groundwater Mound Decay and Extraction Well Testing Program for Craig Road Landfill, Fairchild Air Force Base, Washington

SAIC, 1993a. Remedial Investigation, Craig Road Landfill, Fairchild Air Force Base, Washington.

SAIC, 1993b. ITIR Letter Report for Core Drilling, Packer Test and Borehole Geophysical Surveys, Craig Road Landfill (CRL) Fairchild Air Force Base Washington

Shaw, 2015. Background metal concentration evaluation, Fairchild Air Force Base, Washington.

Todd, D.K. 1980. Groundwater Hydrology John Wiley and Sons 535p.

United States Air Force (USAF), 1993. Record of Decision, Operable Unit No. 1 Craig Road Landfill, Fairchild Air Force Base.

# Tables

## Table 2-1A LF002 (SW-8) CRL Extraction and Monitoring Well Network—Well Construction Details

| Well | Casing Dia. (in.) | TD (ft bgs) | TOC Elev.[1] | Ground Elev[1] | Screened Formation | Area | Screened Interval | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Depth (ft bgs) | Elev (ft AMSL) |
| EW-2 | 6 | 158 | 2385.46 | 2391 | Basalt A (top-mid) | Source Area/Capture Zone | 38–108 | 2353–2283 |
| EW-3 | 6 | 155 | 2390.32 | 2395 | Basalt A (top-basal) | Source Area/Capture Zone | 45–55<br>75–145 | 2350–2340<br>2320–2250 |
| EW-4 | 6 | 156 | 2396.95 | 2404 | Basalt A (mid) | Source Area/Capture Zone | 103–133 | 2301–2271 |
| EW-5 | 4 | 156 | 2398.97 | 2403 | Basalt A (basal) | Source Area/Capture Zone | 135–155 | 2268–2248 |
| EW-6 | 6 | 152 | 2399.54 | 2403 | Basalt A (mid-basal) | Source Area/Capture Zone | 82–148 | 2321–2255 |
| EW-7 | 6 | 160 | 2388.16 | 2393 | Basalt A (mid-basal) | Source Area/Capture Zone | 87–158 | 2306–2235 |
| EW-9 | 6 | 148 | 2387.48 | 2392 | Basalt A (mid-basal) | Source Area/Capture Zone | 83–144 | 2309–2248 |
| EW-10 | 6 | 146 | 2388.83 | 2394 | Basalt A (mid-basal) | Source Area/Capture Zone | 80–141 | 2314–2253 |
| EW-11 | 4 | 120 | 2388.61 | 2394 | Basalt A (mid) | Source Area/Capture Zone | 75–120 | 2319–2274 |
| EW-12 | 6 | 143 | 2384.57 | 2389 | Basalt A (top-basal) | Source Area/Capture Zone | 34–136 | 2355–2253 |
| EW-13 | 6 | 139 | 2382.67 | 2384 | Basalt A (top-basal) | Source Area/Capture Zone | 60–130 | 2324–2254 |
| EW-14 | 6 | 155 | 2390.99 | 2404 | Basalt A (mid-basal) | Source Area/Capture Zone | 78–150 | 2326–2254 |
| MW-63 | 4 | 105 | 2403.99 | 2402 | Basalt A (mid) | Source Area/Capture Zone | 94–104 | 2308–2298 |
| MW-74 | 4 | 186 | 2402.25 | 2400 | Basalt B (top) | Source Area/Capture Zone | 173–184 | 2227–2216 |
| MW-75 | 4 | 88 | 2394.91 | 2392 | Basalt A (mid) | Source Area/Capture Zone | 76–86 | 2316–2306 |
| MW-77 | 4 | 96 | 2391.57 | 2390 | Basalt A (mid) | Containment Compliance Zone | 84–95 | 2306–2295 |
| MW-78 | 4 | 101 | 2405.07 | 2403 | Basalt A (mid) | Off-Site Contaminant Plume | 88–99 | 2315–2304 |
| MW-80 | 4 | 121 | 2419.43 | 2417 | Basalt A (mid) | Off-Site Contaminant Plume | 110–120 | 2307–2297 |
| MW-82* | 4 | 79 | 2380.28 | 2378 | Basalt A (mid) | Off-Site Contaminant Plume | 66–78 | 2312–2300 |
| MW-83* | 4 | 95 | 2343.7 | 2341 | Basalt A (basal) | Nearby Unaffected Aquifer | 79–89 | 2262–2252 |
| MW-85 | 4 | 109 | 2408.34 | 2406 | Basalt A (mid) | Containment Compliance Zone | 97–107 | 2309–2299 |
| MW-96 | 4 | 144 | 2396.27 | 2394 | Basalt A (basal) | Source Area/Capture Zone | 134–144 | 2260–2250 |
| MW-116 | 4 | 274 | 2400.51 | 2398 | Alluvium | Nearby Unaffected Aquifer | 240–252 | 2158–2146 |
| MW-118 | 4 | 114 | 2384.52 | 2382 | Basalt A (mid) | Off-Site Contaminant Plume | 98–108 | 2284–2274 |
| MW-135* | 4 | 169 | 2345.6 | 2443 | Basalt B | Nearby Unaffected Aquifer | 158–168 | 2285–2275 |
| MW-139 | 4 | 182 | 2374.33 | 2372 | Basalt B | Off-Site Contaminant Plume | 172–182 | 2200–2190 |
| MW-140 | 4 | 141 | 2396.52 | 2394 | Basalt A (basal) | Source Area/Capture Zone | 130–140 | 2264–2254 |
| MW-141 | 4 | 168 | 2407.3 | 2405 | Basalt A (basal) | Off-Site Contaminant Plume | 158–168 | 2247–2237 |
| **Water Level Measurements Only** | | | | | | | | |
| MW-17 | 2 | 24 | 2404.67 | 2404 | Alluvium | Nearby Unaffected Aquifer | 7–23 | 2397–2381 |
| MW-23 | 2 | 15 | 2387.55 | 2385 | Alluvium | Containment Compliance Zone | 8–13 | 2377–2372 |
| MW-69 | 4 | 45 | 2391.23 | 2389 | Basalt A (top) | Containment Compliance Zone | 35–45 | 2354–2344 |
| MW-70 | 4 | 28 | 2403.72 | 2401 | Basalt A (top) | Nearby Unaffected Aquifer | 18–28 | 2383–2373 |
| MW-84 | 4 | 128 | 2414.16 | 2412 | Basalt A (mid) | Nearby Unaffected Aquifer | 116–126 | 2296–2286 |
| MW-94 | 4 | 151 | 2403.6 | 2401 | Basalt A (basal) | Containment Compliance Zone | 140–150 | 2261–2251 |
| MW-95 | 4 | 147 | 2402.76 | 2400 | Basalt A (basal) | Nearby Unaffected Aquifer | 137–147 | 2263–2253 |
| MW-101 | 4 | 202 | 2406 | 2404 | Basalt B | Off-Site Contaminant Plume | 191–201 | 2213–2203 |
| MW-115 | 4 | 180 | 2399.47 | 2397 | Alluvium | Nearby Unaffected Aquifer | 166–176 | 2231–2221 |
| MW-117 | 4 | 166 | 2375.35 | 2373 | Basalt A (basal) | Nearby Unaffected Aquifer | 152–162 | 2221–2211 |
| MW-127 | 4 | 187 | 2375.3 | 2373 | Basalt A (basal) | Off-Site Contaminant Plume | 177–187 | 2196–2186 |

Notes: [1] = feet above mean sea level; elevations based on NGS NAVD (1988) TOC = top of casing
TD = total depth, bgs = below ground surface
* Ground surface at these wells was lowered due to gravel mining operations. Total depth and screened intervals shown are depths from current ground surface.

## Table 2-1B LF002 (SW-8) CRL Remediation Well Network—Well Construction Details

| Well | Casing Dia. (in.) | TD (ft bgs) | TOC Elevation | Ground Elevation | Screened Formation | Screened Interval (ft bgs) | Screened Interval Elevation |
|---|---|---|---|---|---|---|---|
| **SDA Locations** | | | | | | | |
| RW-1 | 2 | 86 | 2412.96 | 2410.2 | Basalt A (top) | 34–84 | 2376–2326 |
| RW-2 | 2 | 88 | 2408.45 | 2405.6 | Basalt A (top) | 36–86 | 2370–2320 |
| RW-3 | 2 | 91 | 2408.19 | 2405.5 | Basalt A (top) | 38–88 | 2367–2317 |
| RW-4 | 2 | 89 | 2408.72 | 2406.1 | Basalt A (top) | 38–88 | 2368–2318 |
| RW-5 | 2 | 90 | 2404.60 | 2402.0 | Basalt A (top) | 38–88 | 2364–2314 |
| RW-6 | 2 | 87 | 2403.30 | 2400.6 | Basalt A (top) | 35–85 | 2366–2316 |
| RW-7 | 2 | 87 | 2404.21 | 2401.4 | Basalt A (top) | 34–84 | 2367–2317 |
| RW-8 | 2 | 78 | 2396.74 | 2394.0 | Basalt A (top) | 45–75 | 2349–2319 |
| RW-9 | 2 | 79 | 2396.67 | 2394.0 | Basalt A (top) | 47–77 | 2347–2317 |
| RW-10 | 4 | 88 | 2406.69 | 2404.1 | Basalt A (top) | 57–87 | 2347–2317 |
| RW-11 | 4 | 93 | 2405.92 | 2403.1 | Basalt A (top) | 57–87 | 2346–2316 |
| RW-12 | 4 | 87 | 2406.36 | 2403.8 | Basalt A (top) | 57–87 | 2347–2317 |
| RW-13 | 4 | 103 | 2399.98 | 2397.5 | Basalt A (top) | 66–96 | 2332–2302 |
| RW-14 | 4 | 82 | 2401.23 | 2398.7 | Basalt A (top) | 52–82 | 2347–2317 |
| RW-15 | 4 | 84 | 2403.57 | 2401.1 | Basalt A (top) | 54–84 | 2347–2317 |
| RW-16 | 2 | 79.5 | 2395.67 | 2393.2 | Basalt A (top) | 49–79 | 2344–2314 |
| RW-17 | 2 | 78 | 2396.72 | 2394.3 | Basalt A (top) | 47–77 | 2347–2317 |
| RW-18 | 2 | 80 | 2390.67 | 2387.7 | Basalt A (top) | 47–77 | 2341–2311 |
| RW-19 | 2 | 88 | 2409.13 | 2406.1 | Basalt A (top) | 36–86 | 2370–2320 |
| VMP-09B | 2 | 67 | 2408.02 | 2408.0 | Basalt A (top) | 37–67 | 2371–2341 |
| VMP-12B | 2 | 66 | 2406.65 | 2406.7 | Basalt A (top) | 36–66 | 2371–2341 |
| VMP-28B | 2 | 75 | 2407.71 | 2407.7 | Basalt A (top) | 45–75 | 2363–2333 |
| VMP-33B | 2 | 71 | 2413.00 | 2413.0 | Basalt A (top) | 41–71 | 2372–2342 |
| **NDA Locations** | | | | | | | |
| NDA-01 | 2 | 86 | 2409.41 | 2409.7 | Basalt A (top) | 51–86 | 2359–2324 |
| NDA-02 | 2 | 43 | 2409.31 | 2409.6 | Alluvium | 23–43 | 2387–2367 |
| NDA-03 | 2 | 87 | 2407.33 | 2407.7 | Basalt A (top) | 52–87 | 2356–2321 |
| NDA-04 | 2 | 45.5 | 2407.14 | 2407.6 | Alluvium | 30–40 | 2378–2368 |
| NDA-05 | 2 | 75 | 2409.36 | 2409.7 | Basalt A (top) | 45–75 | 2365–2335 |
| NDA-06 | 2 | 80 | 2410.72 | 2411.1 | Basalt A (top) | 45–80 | 2366–2331 |
| NDA-07 | 4 | 103 | 2410.84 | 2408.4 | Basalt A (top) | 67–97 | 2341–2311 |
| NDA-08 | 4 | 112 | 2413.02 | 2410.3 | Basalt A (top) | 70–110 | 2340–2300 |
| NDA-09 | 4 | 112 | 2410.67 | 2407.9 | Basalt A (top) | 70–110 | 2338–2298 |
| NDA-10 | 4 | 122 | 2415.33 | 2412.7 | Basalt A (top) | 67–117 | 2346–2296 |
| NDA-11 | 4 | 112 | 2411.63 | 2409.3 | Basalt A (top) | 70–110 | 2339–2299 |
| NDA-12 | 4 | 112 | 2414.19 | 2411.3 | Basalt A (top) | 75–105 | 2336–2306 |
| NDA-13 | 4 | 112 | 2412.40 | 2409.6 | Basalt A (top) | 75–105 | 2335–2305 |
| NDA-14 | 4 | 92 | 2408.10 | 2405.1 | Basalt A (top) | 62–92 | 2343–2313 |

Notes:
CRL = Craig Rod Landfill, TOC = top of casing, TD = total depth of well, bgs = below ground surface
Elevations are NAVD (1988)
TOC elevations shown based on original construction. Some well heads have since been modified for injections.

## Table 2-2A Fourth Quarter 2015 LF002 Sample Summary

| Location | VOCs[1] (USEPA 8260B) | | Dissolved Cr, Mn (USEPA 6010C) | QC Notes and Field Permanganate Concentrations (parts per million) |
|---|---|---|---|---|
| | HCl | Ascorbic | | |
| EW-02 | X | | | MS/MSD |
| EW-05 | X | | X | Field Duplicate |
| EW-06 | X | | X | |
| EW-07 | X | | | |
| EW-09 | X | | X | |
| EW-10 | X | | X | |
| EW-14 | X | | X | |
| MW-63 | X | | | |
| MW-75 | X | | | Field Duplicate |
| MW-82 | X | | | |
| NDA-01 | -- | -- | -- | DRY |
| NDA-05 | -- | -- | -- | DRY |
| NDA-06 | -- | -- | -- | DRY |
| NDA-07 | X | | X | |
| NDA-08 | X | | X | |
| NDA-09 | X | | | |
| NDA-10 | X | | | |
| NDA-11 | X | | | |
| NDA-12 | X | | X | |
| NDA-13 | X | | X | |
| NDA-14 | | X | X | $MnO_4$ 3.8 mg/L |
| RW-2 | | X | | $MnO_4$ 3.8 mg/L |
| RW-5 | X | | | |
| RW-6 | X | | X | |
| RW-7 | X | | | |
| RW-8 | X | | X | |
| RW-9 | | X | | $MnO_4$ 0.75 mg/L |
| RW-10 | X | | | |
| RW-11 | X | | X | |
| RW-12 | X | | | |
| RW-13 | X | | X | |
| RW-14 | X | | X | |
| RW-15 | X | | | |
| RW-16 | X | | X | |
| RW-17 | | X | X | $MnO_4$ 7.5 mg/L |
| RW-18 | X | | X | |

*Notes:*
*[1] VOCs, specifically TCE; cis-1,2-dichloroethene (DCE); trans-DCE; and vinyl chloride (VC)*
*Cr - total dissolved chromium*
*mg/L – milligrams per liter*
*Mn - dissolved manganese*
*$MnO_4$ – permanganate*
*MS/MSD – matrix spike/matrix spike duplicate*
*USEPA - United States Environmental Protection Agency*

## Table 2-2B 2015 LF002 Sample Summary

| Location | 2014 UFP QAPP | | | | 2015 UFP QAPP | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Quarter 1 | | | | Quarter 2 | | Quarter 3 | | Quarter 4 | |
| | VOCs | Cr, Mn, As | Cl | Cr(6) | VOCs | Cr, Mn | VOCs | Cr, Mn | VOCs | Cr, Mn |
| EW-02 | X | X | | X | X | | X | | X | |
| EW-03 | X | | | | | | X | | | |
| EW-04 | | | | | | | X | | | |
| EW-05 | X | X | | X | X | X | X | X | X | X |
| EW-06 | X | X | | X | X | X | X | X | X | X |
| EW-07 | X | X | | X | X | | X | | X | |
| EW-09 | X | X | | X | X | X | X | X | X | |
| EW-10 | X | X | | X | X | X | X | X | X | X |
| EW-11 | X | X | | X | | | X | | | X |
| EW-14 | X | X | | X | X | X | X | X | X | |
| MW-63 | X | X | | X | X | | X | | X | X |
| MW-75 | X | | | | X | | X | | X | |
| MW-77 | X | X | | X | | | X | X | | |
| MW-80 | X | | | | | | | | | |
| MW-82 | X | | | | X | | X | | X | |
| MW-83 | X | | | | | | | | | |
| MW-85 | X | X | | X | | | | | | |
| MW-96 | X | | | | | | X | | | |
| MW-118 | X | | | | | | X | | | |
| MW-135 | X | | | | | | | | | |
| MW-139 | X | | | | | | X | | | |
| MW-140 | X | | | | | | | | | |
| MW-141 | X | | | | | | | | | |
| NDA-01 | X | X | X | | X | X | DRY | | Dry | |
| NDA-03 | X | X | X | | | | | | | |
| NDA-05 | X | X | X | | DRY | | DRY | | Dry | |
| NDA-06 | X | X | X | | DRY | | DRY | | Dry | |
| NDA-07 | X | X | X | | X | X | X | X | X | X |
| NDA-08 | X | X | X | | X | X | X | X | X | X |
| NDA-09 | X | X | X | | X | | X | | X | |
| NDA-10 | X | X | X | | X | | X | | X | |
| NDA-11 | X | X | X | | X | | X | | X | |
| NDA-12 | X | X | X | | X | X | X | X | X | X |
| NDA-13 | X | X | X | | X | X | X | X | X | X |
| NDA-14 | X | X | X | | X | X | X | X | X | X |
| RW-1 | X | X | X | | | | | | | |
| RW-2 | X | X | X | | X | | X | | X | |
| RW-3 | X | X | X | | | | | | | |
| RW-4 | X | X | X | | | | | | | |
| RW-5 | X | X | X | | X | | X | | X | |
| RW-6 | X | X | X | | X | X | X | X | X | X |
| RW-7 | X | X | X | | X | | X | | X | |
| RW-8 | X | X | X | | X | X | X | X | X | X |
| RW-9 | X | X | X | | X | | X | | X | |
| RW-10 | X | X | X | | X | | X | | X | |
| RW-11 | X | X | X | | X | X | X | X | X | X |
| RW-12 | X | X | X | | X | | X | | X | |
| RW-13 | X | X | X | | X | X | X | X | X | X |
| RW-14 | X | X | X | | X | X | X | X | X | X |
| RW-15 | X | X | X | | X | | X | | X | |
| RW-16 | X | X | X | | X | X | X | X | X | X |
| RW-17 | X | X | X | | X | X | X | X | X | X |
| RW-18 | X | X | X | | X | X | X | X | X | X |
| RW-19 | X | X | X | | | | | | | |
| VMP-12B | X | X | X | | | | | | | |
| VMP-28B | X | X | X | | | | | | | |

*Notes:*
*[1] VOCs, specifically TCE; cis-1,2-dichloroethene (DCE); trans-DCE; and vinyl chloride (VC), Cr - total dissolved chromium, Mn - dissolved manganese, As: dissolved arsenic*

## Table 2-3 Fourth Quarter GETS Activities

| Date | Description |
|---|---|
| 10/08/15 | Injection risers were cut from remediation wells #08 and #17. |
| 10/20/15 | CRL treatment facility shutdown due to an alarm, reason for alarm was unidentified. Approximately 8.5 hours was lost due to this alarm. |
| 10/23/15 | New pad locks were installed on CRL NDA and SDA monitoring wells. |
| 10/24/15 | CRL treatment facility shutdown due to an alarm, reason for alarm was unidentified. |
| 11/02/15 | Trench was switched from north to south. A faulty process heater thermostat has resulted in numerous CRL alarms. |
| 11/09/15 | Northwest Heating technician onsite for troubleshooting defective H-300 heater. |
| 11/10/15 | Cap inspection was completed for NDA and SDA. |
| 11/12/15 | EW-3 defective flow sensor was replaced with a new Data Industrial flow sensor. |
| 11/17/15 | CRL received a weather related power outage. Treatment facility sustained no structural damage. P-201 stripper pump was serviced. |
| 11/19/15 | Vegetative debris was removed from entrance gate and perimeter fence area. |
| 11/20/15 | P-201 process flow sensor was serviced. 301train is service ready. |
| 11/25/15 | Northwest Heating onsite for repairs to H-300 heater. H-300 gas valve was not replaced due to difficulty with burner removal. Repairs will be rescheduled for later date. |
| 11/27/15 | Train was swapped from 300 to 301. B-301 blower filters were replaced. |
| 12/7/15 | North West Heating replaced H-300 gas Valve. |
| 12/14/15 | North West Heating replaced H-300 ignition module. |
| 12/18/15 | SVE shed roof repairs were made. A tarp was installed on the Westside of structure roof to cover missing shingles that were lost during recent wind storms. |
| 12/21/15 | Fourth Quarter LTM off-gas sampling was conducted and samples shipped to Test America Laboratories. Partial flush was conducted on T-100 and T-101 surge tanks. |

**Table 2-4 Fourth Quarter GETS Average Extraction Rates and Flow Totals**

| Area | Well | Total Extracted Volume (gal) | Average Extraction Rate (gpm) | % of Total |
|---|---|---|---|---|
| NDA | EW-2 | 1,042,416 | 8.0 | 8.6% |
| | EW-3 | 36,431 | 0.3 | 0.3% |
| | EW-4 | 9,470 | 0.1 | 0.1% |
| | EW-5 | 3,982,455 | 30.4 | 32.7% |
| | EW-6 | 612,379 | 4.7 | 5.0% |
| | EW-7 | 1,927,521 | 14.7 | 15.8% |
| | TOTAL NDA | 7,610,671 | 58.1 | 62.6% |
| SDA | EW-9 | 837,359 | 6.4 | 6.9% |
| | EW-10 | 79,264 | 0.6 | 0.7% |
| | EW-11 | 15,953 | 0.1 | 0.1% |
| | EW-12 | 3,003,490 | 22.9 | 24.7% |
| | EW-13 | 0 | 0 | 0% |
| | EW-14 | 618,518 | 4.7 | 5.1% |
| | TOTAL SDA | 4,554,585 | 38.4 | 37.4% |
| | **TOTAL GETS** | **12,165,256** | **92.8** | |

*Notes:*
*gal - gallons*
*gpm – gallons per minute*

**Table 2-5 2015 GETS Extraction Well Operational Data**

| Location | Historical Pumping Range (2003-2016; GPM) | | Max Pumping Rate; GPM | 2015 Range | | Transducer Depth (ft BGS) | On/Off Settings (depth BGS) | | Pump Depth (ft-BGS)** | Well Depth (ft-BGS) |
|---|---|---|---|---|---|---|---|---|---|---|
| | Low (25th percentile) | High (75th percentile) | | Manal Batch (Average Jan through Mar) | Automatic (Average Apr through Dec) | | On | Off | | |
| EW-2 | 3.5 | 10.6 | 12 | 2.5 | 10.3 | 87 | 82 | 72 | 97 | 158 |
| EW-3 | 0.7 | 1.6 | 5 | 0.5 | 0.5 | 124 | 119 | 99 | 134 | 155 |
| EW-4 | 0.2 | 0.4 | 5 | 0 | 0.03 | 118 | 113 | 89 | 128 | 156 |
| EW-5 | 16.1 | 34.6 | 50 | 7.5 | 34.1 | 136 | 126 | 116 | 146 | 156 |
| EW-6 | 3.2 | 8.4 | 16 | 2.1 | 6.5 | 138 | 133 | 113 | 148 | 152 |
| EW-7 | 6.3 | 16.3 | 18 | 3.9 | 16.8 | 146 | 141 | 126 | 156 | 160 |
| EW-9 | 3 | 6.8 | 8 | 0 | 4.5 | 134 | 122 | 109 | 144 | 148 |
| EW-10* | 4.2 | 9.2 | 12 | 0 | 0.5 | 132 | 117 | 122 | 142 | 146 |
| EW-11 | 1.2 | 4.4 | 25 | 0.7 | 1.1 | 91 | 89 | 76 | 101 | 120 |
| EW-12 | 7 | 19.1 | 20 | 7 | 25.4 | 125 | 60 | 50 | 135 | 143 |
| EW-14* | 18.8 | 26.2 | 25 | 0 | 3.3 | 137 | 127 | 102 | 147 | 155 |

*Notes:*
*Ft-BGS= Feet below ground surface*
*GPM= gallons per minute*
*Manual Batch Mode: 20,000 gallons per week day operated during regular work hours*
*Automatic Mode: Pumps operated automatically per the PLC settings*
*25th percentile: Pumping rate is more than the 25th percentile of all average quarterly pumping rates for the well between 2003 and 2015.*
*75th percentile: Pumping rate is less than the 75th percentile of all average quarterly pumping rates for the well between 2003 and 2015.*
** EW-10 and EW-14 were only operated during regular work hours to monitor Cr and MnO4 to the GETS influent.*
*** Pump depths are assumed to be 10 ft below the transducer depth.*
*Red highlighted values are pumping rates below the historical range.*

**Table 2-6 GETS Quarterly TCE Mas Annual Extraction Rates and Flow Totals**

| Area | Quarter | Total Extracted Volume (gal) | Flow weighted average TCE conc. (ug/L)* | TCE Removal (lbs)** |
|---|---|---|---|---|
| NDA | 1st Quarter | 2,242,613 | 6.6 | 0.12 |
| | 2nd Quarter | 9,817,643 | 11.0 | 0.90 |
| | 3rd Quarter | 9,360,282 | 11.9 | 0.93 |
| | 4th Quarter | 7,610,671 | 9.7 | 0.62 |
| | TOTAL ANNUAL NDA | 29,031,209 | | 2.57 |
| SDA | 1st Quarter | 994,959 | 13.0 | 0.11 |
| | 2nd Quarter | 4,070,497 | 14.5 | 0.49 |
| | 3rd Quarter | 5,034,600 | 26.0 | 1.09 |
| | 4th Quarter | 4,554,585 | 14.2 | 0.55 |
| | TOTAL ANNUAL SDA | 14,654,641 | | 2.23 |
| **TOTAL ANNUAL GETS** | | **43,685,850** | | 4.80 |

*Flow weighted average TCE conc. by area = sum of Ci/(Qi/Qt) where Ci=TCE conc at the EW, Qi is the flow rate at the EW, Qt is the total flow rate for the area.

**TCE mass = Volume x 3.78 L/gal (conversion) x Conc. x $2.2 \times 10^{-9}$ lbs/ug (conversion)

## Table 2-7 2015 GETS Liquid Stream Compliance Sample Results

| Quarter | Plant Influent (NDA + SDA) µg/L | | Plant Effluent µg/L | |
|---|---|---|---|---|
| | TCE | cis-DCE | TCE | cis-DCE |
| 1st Quarter 2015 | 6.46 | <0.20 | <0.20 | <0.20 |
| 2nd Quarter 2015 | 18 | 1.30 | <0.16 | <0.40 |
| 3rd Quarter 2015 | 17 | 0.86 J | <0.40 | <0.40 |
| 4th Quarter 2015 | 9.4 | 0.52 J | <0.40 U | <0.40 U |

Notes:
Data Qualifiers:
J = Analyte was positively identified; the quantitation is an estimation
U = Analyte was not detected at the specified detection limit.

## Table 2-8 2015 GETS Air Stream Compliance Sample Results

| Quarter | Plant Influent (NDA + SDA) | | Plant Effluent | | |
|---|---|---|---|---|---|
| | TCE ($\mu g/m^3$) | trans-DCE ($\mu g/m^3$) | TCE ($\mu g/m^3$) | TCE lbs./qtr | trans-DCE ($\mu g/m^3$) |
| 1st Quarter 2015 | 27 | 1.8 | 7.6 | 0.06 | 14 |
| 2nd Quarter 2015 | 210 | <4 | 50 | 0.38 | <4 |
| 3rd Quarter 2015 | 210 | <4 | 72 | 0.60 | <4 |
| 4th Quarter 2015 | 210 | <4.0 | 130 | 0.91 | <4.0 |
| 2015 TOTAL | -- | -- | -- | 1.95 | -- |
| SQER for TCE | | | | 95.9 | -- |

Notes:
Data Qualifiers:
J = Analyte was positively identified; the quantitation is an estimation
U = Analyte was not detected at the specified detection limit.

## Table 2-9A LF002 Fourth Quarter GETS Weekly Cr Split Sampling

| Date Sampled | Cr(6) Field Measurement (mg/L) | Total Cr Laboratory Analytical Result (mg/L) |
|---|---|---|
| 10/7/15 | 0.01 | 0.0034 J |
| 10/14/15 | 0.02 | 0.0070 J |
| 10/21/15 | <0.01 | 0.0097 J |
| 10/28/15 | <0.01 | 0.0048 J |
| 11/4/15 | <0.01 | 0.0061 J |
| 11/11/15 | <0.01 | 0.0120 J |
| 11/18/15 | <0.01 | 0.0130 J |
| 11/24/15 | <0.01 | 0.0099 J |
| 12/2/15 | <0.01 | 0.0095 J |
| 12/9/15 | <0.01 | 0.0097 J |
| 12/16/15 | <0.01 | 0.0100 J |
| 12/23/15 | <0.01 | 0.0120 J |
| 12/30/15 | <0.01 | 0.0100 J |

*Notes:*
*Cr(6) - Chromium*

**Table 2-9B LF002 Weekly Cr and $MnO_4$ Extraction Well Monitoring**

| Date Sampled | Location | Cr(6) Field Measurement (mg/L) | $MnO_4$ Field Observation (mg/L) |
|---|---|---|---|
| 10/7/15 | EW9 | 0.03 | 0.75 |
| 10/14/15 | | **0.05** | 0.75 |
| 10/21/15 | | 0.04 | 0.75 |
| 10/29/15 | | 0.02 | 0.75 |
| 11/4/15 | | 0.01 | 0.75 |
| 11/11/15 | | 0.01 | 0.75 |
| 11/18/15 | | 0.01 | <0.75 |
| 11/25/15 | | 0.01 | <0.75 |
| 12/2/15 | | 0.01 | <0.75 |
| 12/9/15 | | 0.02 | <0.75 |
| 12/17/15 | | 0.02 | 0.75 |
| 12/22/15 | | 0.00 | 0.75 |
| 12/31/15 | | 0.00 | 0.75 |
| 10/7/15 | EW10 | **0.06** | **3.8** |
| 10/14/15 | | **0.06** | **3.8** |
| 10/21/15 | | **0.07** | **3.8** |
| 10/29/15 | | 0.04 | **3.8** |
| 11/4/15 | | 0.04 | **3.8** |
| 11/11/15 | | 0.03 | 0.75 |
| 11/18/15 | | 0.02 | **<3.8** |
| 11/25/15 | | 0.04 | **<3.8** |
| 12/2/15 | | 0.03 | **<3.8** |
| 12/9/15 | | 0.03 | **<3.8** |
| 12/17/15 | | 0.03 | **<3.8** |
| 12/22/15 | | 0.02 | **<3.8** |
| 12/31/15 | | 0.03 | **3.8** |
| 10/7/15 | EW14 | 0.01 | 0.75 |
| 10/14/15 | | 0.01 | 0.75 |
| 10/21/15 | | 0.01 | 0.75 |
| 10/29/15 | | 0.00 | Clear |
| 11/4/15 | | 0.00 | Clear |
| 11/11/15 | | 0.00 | 0.75 |
| 11/18/15 | | 0.00 | 0.75 |
| 11/25/15 | | 0.00 | <0.75 |
| 12/2/15 | | 0.00 | <0.75 |
| 12/9/15 | | 0.00 | <0.75 |
| 12/17/15 | | 0.00 | <0.75 |
| 12/22/15 | | 0.00 | <0.75 |
| 12/31/15 | | 0.00 | Clear |

*Notes:*
*mg/L – milligrams per liter*
*Cr(6) – Chromium*
*NA – Sample not collected*
*Clear – Sample was clear, so colortimeter could not be utilized.*
*MnO4 – Permanganate*

**Table 2-9C LF002 Statistical Evaluation of 2015 Field and Laboratory Cr Results**

| Parameter | Field Cr(6) data | Laboratory total Cr data |
|---|---|---|
| Number of Samples | 24 | 24 |
| Mean Value (mg/L) | 0.0083 | 0.0084 |
| Standard Deviation (mg/L0 | +/-0.0058 | +/-0.0027 |
| T-test value (95% confidence) | -0.047 | |
| T critical (equal variance) | +/- 2.013 | |
| T critical (unequal variant) | +/- 2.035 | |
| Result | T is within T critical; 95% confidence that the sample populations are the same | |

**Table 2-10 LF002 Capture Zone Model Results**

| Well | Event | Flow rate (gpm) | A (ft) | b1 (ft) | b2 (ft) | Ymax (ft) |
|---|---|---|---|---|---|---|
| EW2 | Mar | 2.5 | 14 | 20 | 21 | 40 |
| | Sept | 8.0 | 51 | 58 | (C=112) | 171 |
| EW3 | Mar | 0.5 | 3 | 6 | 6 | 8 |
| | Sept | 0.3 | 3 | (C=3) | (C=9) | 5 |
| EW4 | Mar | 0 | 0 | 0 | 0 | 0 |
| | Sept | 0.1 | <1 | <1 | <1 | <1 |
| EW5 | Mar | 7.5 | 41 | 65 | 54 | 155* |
| | Sept | 30.4 | 167 | 277 | (C=372) | 563* |
| EW6 | Mar | 2.6 | (C=48) | 19 | 61 | 34 |
| | Sept | 4.7 | (C=29) | 100 | 36 | 75 |
| EW7 | Mar | 3.9 | 20 | 40 | 26 | 62 |
| | Sept | 14.7 | 89 | (C=130) | 75 | 236 |
| EW9 | Mar | 0 | 0 | 0 | 0 | 0 |
| | Sept | 6.4 | 37 | (C=179) | (C-391) | 103 |
| EW10 | Mar | 0 | 0 | 0 | 0 | 0 |
| | Sept | 0.6 | 5 | 25 | (C=12) | 10 |
| EW11 | Mar | 0.7 | 6 | 8 | 10 | 18 |
| | Sept | 0.1 | <1 | <1 | <1 | 2 |
| EW12 | Mar | 7.0 | 55 | 85 | 85 | 169 |
| | Sept | 22.9 | 119 | (C=385)_ | 208 | 367 |
| EW14 | Mar | 0 | 0 | 0 | 0 | 0 |
| | Sept | 4.7 | 28 | 56 | (C=127) | 75 |

Notes
Calculations provided in Appendix F.2
a= downgradient stagnation point
b1= north side lateral divide (where X=0)
b2= south side lateral divide (where X=0)
ymax= flow divide far upgradient in natural flow field; 2x ymax= total flow width at natural gradient
C flow divides between pumping wells where capture zones overlap
Gpm= gallons per minute (average flow for the month)
Ft= feet
* the Y max value for EW-5 in combined with EW-6.

**Table 2-11 LF002 Downgradient TCE Concentration Capture Evaluation**

| Well | TCE Conc Range 2008-2012 (ug/L) | | Average subsequent annual TCE concentration (ug/L) | | |
|---|---|---|---|---|---|
| | Average - 1SD | Average + 1 SD | 2013 | 2014 | 2015 |
| MW-78 | 0.9 | 1.0 | **1.2** | **1.48** | * |
| MW-80 | 0.7 | 1.2 | 0.42 | **2.68** | **3.2** |
| MW-85 | 1.7 | 2.7 | 1.5 | 1.6 | 2.0 |
| | | | | | |
| MW-77 | 3.9 | 4.6 | 4.2 | 3.3 | 3.2 |
| MW-82 | 0.9 | 2.8 | **4.6** | **7.6** | **4.4** |
| MW-83 | 0.8 | 0.9 | 0.88 | **1.02** | **3.01** |
| RW-19 | 4.24* | -- | 20.3 | 4.0 | 2.95 |

SD= standard deviation
* Not sampled in 2015. The 2015 UFP-QAPP changed the annual sampling at MW-78 from the 3rd quarter to the 1st quarter. The next samples at MW-78 will be collected in the 1st quarter of 2016.

Pink background and bolded numbers are above the 2008-2012 range
Red bolded values exceed the PAL

## Table 2-12A LF002 Summary of Post Rebound TCE Concentration Trend Analysis

| | EW2 | EW3 | EW4 | EW5 | EW6 | EW7 | EW9 | EW10 | EW11 | EW14 |
|---|---|---|---|---|---|---|---|---|---|---|
| Date Start | Sep-14 | Sep-14 | Aug-13 | Aug-13 | Sep-14 | Sep-14 | Mar-14 | Jun-15 | Jun-14 | June 14 |
| Date End | Dec-15 | Sep-15 | Sep-15 | Dec-15 | Dec-15 | Dec-15 | Dec-15 | Dec-15 | Sep-15 | Dec-15 |
| # of Pts | 6 | 3 | 4 | 7 | 6 | 7 | 8 | 3 | 6 | 7 |
| Trend | No Trend | Insufficient Data | Stable | No Trend | Stable | Stable | Prob. Decreasing | Insufficient Data | Stable | Prob. Decreasing |
| Confidence | 76.5% | | 62.5% | 80.9% | 64.0% | 76.4% | 94.6% | | 81.5% | 93.2% |
| S variable | 5.0 | 3.0 | -2.0 | 7.0 | -3.0 | -6.0 | -14.0 | -3.0 | -6.0 | -11.0 |
| CV | 0.37 | 0.03 | 0.26 | 0.12 | 0.11 | 0.10 | 0.41 | 0.74 | 0.13 | 0.36 |
| Log Slope (R) | -- | -- | -- | -- | -- | -- | -1.18E-03 | -- | -- | -1.33E-03 |
| Half Life (days) | -- | -- | -- | -- | -- | -- | 590 | -- | -- | 520 |

| | NDA1 | NDA5 | NDA7 | NDA8 | NDA9 | NDA11 | NDA12 | NDA13 |
|---|---|---|---|---|---|---|---|---|
| Date Start | Sep-14 | Dec-14 | Mar-14 | Jun-15 | Dec-14 | Sep-14 | Jun-15 | Jun-15 |
| Date End | Jun-15 | Mar-15 | Dec-15 | Dec-15 | Dec-15 | Dec-15 | Dec-15 | Dec-15 |
| # of Pts | 4 | 2 | 8 | 3 | 5 | 6 | 3 | 3 |
| Trend | Stable | Insufficient Data | No Trend | Insufficient Data | Decreasing | Prob. Decreasing | Insufficient Data | Insufficient Data |
| Confidence | 62.5% | | 80.1% | | 99.2% | 93.2% | | |
| S variable | -2.00 | 1.00 | -8.00 | -1.00 | -10.00 | -9.00 | | 0.00 |
| CV | 0.68 | 0.03 | 1.38 | 1.13 | 1.30 | 0.32 | 0.64 | 0.26 |
| Log Slope (R) | -- | -- | -- | -- | -1.90E-02 | -1.42E-03 | -- | -- |
| Half Life (days) | -- | -- | -- | -- | 40 | 490 | -- | -- |

| | RW5 | RW6 | RW7 | RW8 | RW9 | RW10 | RW11 | RW12 | RW13 | RW14 | RW15 | RW17 | RW18 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date Start | Jun-14 | Jun-15 | Jun-15 | Sep-14 | Jun-15 | Jun-14 | Jun-14 | Jun-14 | Sep-14 | Sep-14 | Jun-14 | Jun-14 | Aug-13 |
| Date End | Dec-15 | Dec-15 | Dec-15 | Dec-15 | Dec-15 | Dec-15 | Dec-15 | Dec-15 | Dec-15 | Dec-15 | Dec-15 | Dec-15 | Dec-15 |
| # of Pts | 7 | 3 | 3 | 6 | 3 | 7 | 6 | 7 | 6 | 6 | 7 | 6 | 9 |
| Trend | Decreasing | Insufficient Data | Insufficient Data | No Trend | Insufficient Data | Prob. Decreasing | Stable | Stable | Stable | Stable | Stable | No Trend | Decreasing |
| Confidence | 99.9% | | | 81.5% | | 93.2% | 86.4% | 50.0% | 50.0% | 64.0% | 80.9% | 89.8% | 98.3% |
| S variable | -19.00 | -3.00 | -3.00 | 6.00 | -1.00 | -11.00 | -7.00 | -1.00 | -1.00 | -3.00 | -7.00 | | -21.00 |
| CV | 0.81 | 1.36 | 1.29 | 0.18 | 1.69 | 1.14 | 0.63 | 0.45 | 0.60 | 0.13 | 0.59 | 1.93 | 1.31 |
| Log Slope (R) | -4.74E-03 | -- | -- | -- | -- | -4.31E-03 | -- | -- | -- | -- | -- | -- | -2.59E-03 |
| Half Life (days) | 150 | -- | -- | -- | -- | 160 | -- | -- | -- | -- | -- | -- | 270 |

**Notes**
CV= Coefficient of Variance
Trend Analysis by GIS Mann Kendal Tool Kit (GIS Environmental Inc. Based on MAROS; A Decision Software System for Optimizing Monitoring Plans (Aziz and others 2003)
Criteria At least 4 data points
Decreasing: S <0; Confidence >95% (probably decreasing if confidence is <90%)
Increasing: S >0; Confidence >95% (probably increasing if confidence is <90%)
Stable: CV <1 and S<0
Log Slope by Log Linear Regression
Half Life = Ln(0.5)/R

## Table 2-12B LF002 Summary of Chromium Concentration Trend Analysis

| Well | NDA1 | NDA6 | NDA8 | NDA12 | NDA14 | EW10 |
|---|---|---|---|---|---|---|
| Date Start | 2/15/13 | 12/15/12 | 2/15/13 | 3/15/14 | 5/15/13 | 09/10/14 |
| Date End | 6/23/15 | 2/24/15 | 12/15/15 | 9/24/15 | 2/24/15 | 12/15/15 |
| Last Conc. (mg/L) | **0.200** | **0.489** | 0.003 | **0.020** | **0.470** | **0.055** |
| No data pts | 8 | 8 | 7 | 10 | 8 | 8 |
| Trend (1) | Decreasing | Stable | Decreasing | Decreasing | No Trend | Decreasing |
| Confidence (1) | 0.969 | 0.5 | 0.997 | 0.99 | 0.758 | 0.9995 |
| S value (1) | -16.00 | -1.00 | -26.00 | -16.00 | 9.00 | -20.00 |
| CV (1) | 0.66 | 0.55 | 1.00 | 0.42 | 0.52 | 0.27 |
| Exponential slope (R) (2) | -1.49E-03 | -- | -4.47E-03 | -1.73E-03 | -- | -1.68E-03 |
| Half Life (days) (3) | 470 | -- | 160 | 400 | -- | 410 |

| Well | RW6 | RW7 | RW8 | RW9 | RW11 | RW12 | RW16 | RW17 |
|---|---|---|---|---|---|---|---|---|
| Date Start | 12/15/12 | 12/15/12 | 12/15/12 | 12/15/12 | 12/15/12 | 12/15/12 | 5/15/13 | 8/15/13 |
| Date End | 12/15/15 | 3/24/15 | 12/15/15 | 3/24/15 | 12/15/15 | 3/24/15 | 12/15/15 | 12/15/15 |
| No data pts | 11 | 9 | 12 | 9 | 11 | 9 | 11 | 9 |
| Last Conc. (mg/L) | **0.086** | 0.010 | 0.001 | **0.112** | 0.046 | 0.002 | **0.110** | **0.270** |
| Trend (1) | Stable | Decreasing | Decreasing | Prob. Decreasing | Decreasing | Decreasing | Decreasing | No Trend |
| Confidence (1) | 61.9% | 98.8% | >99.9% | 94.0% | >99.9% | >99.9% | 99.4% | 58.0% |
| S value (1) | -5 | -22 | -55 | -16 | -43 | -34 | -32 | 3 |
| CV (1) | 0.65 | 1.00 | 1.24 | 0.47 | 0.91 | 1.21 | 0.35 | 0.31 |
| Exponential slope (R) (2) | -- | -2.84E-03 | -5.19E-03 | -6.90E-04 | -2.18E-03 | -4.05E-03 | -9.44E-04 | -- |
| Half Life (days) (3) | -- | 240 | 130 | 1000 | 320 | 170 | 730 | -- |

**Notes**

CV= Coefficient of Variance

1) Trend Analysis by GIS Mann Kendal Tool Kit (GIS Environmental Inc. Based on MAROS; A Decision Software System for Optimizing Monitoring Plans (Aziz and others 2003)

Criteria At least 4 data points

Decreasing: S <0; Confidence >95% (probably decreasing if confidence is <90%)

Increasing: S >0; Confidence >95% (probably increasing if confidence is <90%)

Stable: CV <1 and S<0

2) Log Slope by Log Linear Regression

Half Life = Ln(0.5)/R

## Table 2-12C LF002 Summary of $MnO_4$ Concentration Trend Analysis

| Well | EW9 | EW10 | EW14 |
|---|---|---|---|
| Date Start | 12/9/2011 | 5/26/1900 | 7/9/1900 |
| Date End | 12/15/2015 | 1/0/1900 | 1/2/1900 |
| No of Pts | 11 | 12 | 10 |
| Trend (1) | Decreasing | Decreasing | Decreasing |
| Confidence (1) | -34 | -32 | -20 |
| S value (1) | 99.6% | 98.4% | 95.5% |
| CV(1) | 2.18 | 2.13 | 1.14 |
| Log slope (R) (2) | -3.05E-03 | -2.23E-03 | -2.20E-03 |
| Half Life (days) (3) | 230 | 310 | 320 |

| Well | NDA1 | NDA6 | NDA8 | NDA10 | NDA14 |
|---|---|---|---|---|---|
| Date Start | 2/26/2013 | 2/26/2013 | 2/26/2013 | 2/26/2013 | 2/26/2013 |
| Date End | 12/15/2015 | 12/15/2015 | 12/15/2015 | 12/15/2015 | 12/15/2015 |
| No of Pts | 8 | 8 | 9 | 5 | 9 |
| Trend (1) | Decreasing | Decreasing | Decreasing | Decreasing | No Trend |
| Confidence (1) | -26 | -20 | -32 | -9 | 1 |
| S value (1) | 100.0% | 99.3% | >99.9% | 97.5% | 50.0% |
| CV(1) | 1.76 | 1.62 | 1.71 | 1.27 | 0.60 |
| Log slope (R) (2) | -1.01E-02 | -0.0088 | -0.00746 | -3.92E-03 | NA |
| Half Life (days) (3) | 70 | 80 | 90 | 180 | NA |

| Well | RW6 | RW7 | RW8 | RW9 | RW11 | RW12 | RW13 | RW14 | RW15 | RW16 | RW17 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Date Start | 12/3/2012 | 12/3/2012 | 12/3/2012 | 7/17/1901 | 12/3/2012 | 12/3/2012 | 12/3/2012 | 12/3/2012 | 12/3/2012 | 9/14/2011 | 9/14/2011 |
| Date End | 12/15/2015 | 12/15/2015 | 12/15/2015 | 12/15/2015 | 12/15/2015 | 12/15/2015 | 12/15/2015 | 12/15/2015 | 12/15/2015 | 12/15/2015 | 12/15/2015 |
| No of Pts | 8 | 9 | 8 | 10 | 7 | 6 | 8 | 8 | 10 | 14 | 9 |
| Trend (1) | Decreasing | Decreasing | Decreasing | Decreasing | Decreasing | Decreasing | Decreasing | Decreasing | Decreasing | Decreasing | Decreasing |
| Confidence (1) | -22.00 | -34.00 | -27.00 | -38.00 | -20.00 | -15.00 | -23.00 | 1.50 | 1.47 | 1.79 | 1.74 |
| S value (1) | 99.8% | >99.9% | >99.9% | >99.9% | 100.0% | 99.9% | 99.9% | 1 | 0.995 | >99.9% | 0.9955 |
| CV(1) | 1.78 | 1.80 | 1.80 | 1.56 | 1.37 | 1.73 | 0.81 | 1.50 | 1.47 | 1.79 | 1.74 |
| Log slope (R) (2) | -5.24E-03 | -4.46E-03 | -0.00822 | -0.00664 | -7.09E-03 | -0.0049 | -0.00312 | -6.80E-03 | -2.07E-03 | -0.00341 | -0.00394 |
| Half Life (days) (3) | 130 | 160 | 80 | 100 | 100 | 140 | 220 | 100 | 330 | 200 | 180 |

**Notes**

CV= Coefficient of Variance

1) Trend Analysis by GIS Mann Kendal Tool Kit (GIS Environmental Inc. Based on MAROS; A Decision Software System for Optimizing Monitoring Plans (Aziz and others 2003)

Criteria At least 4 data points

Decreasing: S <0; Confidence >95% (probably decreasing if confidence is <90%)

Increasing: S >0; Confidence >95% (probably increasing if confidence is <90%)

Stable: CV <1 and S<0

2) Log Slope by Log Linear Regression

Half Life = Ln(0.5)/R

## Table 3-1 WP003 Monitoring Well Network—Well Construction Details

| Well | Casing Diameter (inches) | Boring Depth (feet bgs) | Top of Casing Elevation [a] | Screened Formation [b] | Screened Interval (feet bgs) |
|---|---|---|---|---|---|
| EW-3 | 6 | 25 | 2405.42 | QAL | 7–17 |
| MW-11 | 2 | 20 | 2412.98 | QAL | 6–17 |
| MW-12 | 2 | 15 | 2410.76 | QAL | 8–14 |
| MW-99 | 4 | 76 | 2411.05 | Basalt A | 65–76 |
| MW-102 | 2 | 17 | 2411.48 | QAL | 6–17 |
| MW-103 | 2 | 16 | 2411.29 | QAL | 4–15 |
| MW-120 | 4 | 27 | 2403.20 | QAL | 16–27 |
| MW-147 | 2 | 23 | 2409.99 | QAL | 10–20 |
| MW-241 | 2 | 18 | 2411.85 | QAL | 8–18 |
| MW-242 | 2 | 18 | 2406.01 | QAL | 8–18 |
| MW-243 | 2 | 16 | 2403.80 | QAL | 6–16 |
| MW-244 | 2 | 67 | 2403.15 | Basalt A | 57–67 |
| MW-245 | 2 | 16 | 2398.91 | QAL | 6–16 |
| MW-255 | 2 | 13 | 2397.30 | QAL | 9–13 |
| MW-256 | 2 | 14 | 2400.00 | QAL | 9–14 |
| MW-257 | 2 | 73 | 2399.68 | Basalt A | 63–73 |
| MW-258 | 2 | 15 | 2398.97 | QAL | 9–14 |
| OW-2 | 2 | 18 | 2407.40 | QAL | 7–17 |
| WP-01 | 2 | 24 | 2408.09 | QAL | 6–11<br>16–24 |

Notes:
a. Elevations based on NGS NAVD (1988)—surveyed by CH2M HILL in November 2002
b. QAL = alluvium
c. PP = peristaltic pump

## Table 3-2A WP003 Fourth Quarter Sample Summary

| Well | VOC (USEPA Method 8260) | Arsenic (USEPA Method 6010C) | pH, ORP, DO (field) | Ferrous Iron (field) | QC Notes |
|---|---|---|---|---|---|
| WP-1 | | X | X | X | |
| OW-2 | X | | X | | Field Duplicate |
| EW-3 | | X | X | X | |
| MW-11 | | X | X | X | |
| MW-12 | | X | X | X | |
| MW-102 | X | X | X | X | |
| MW-103 | | X | X | X | |
| MW-120 | X | | X | | |

*Notes:*
*DO – dissolved oxygen*
*ORP - oxygen reduction potential*

## Table 3-2B WP003 2015 Sample Summary

| Well | 2014 UFP-QAPP | | | 2015 UFP-QAPP | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | First Quarter | | | Second Quarter | | | Third Quarter | | | 4th Quarter | | |
| | VOC (USEPA Method 8260) | Arsenic (USEPA Method 6010C) | MNA Parameters | VOC (USEPA Method 8260) | pH, ORP, DO, Fe (field) | Arsenic (USEPA Method 6010C) | VOC (USEPA Method 8260) | pH, ORP, DO, Fe (field) | Arsenic (USEPA Method 6010C) | VOC (USEPA Method 8260) | pH, ORP, DO, Fe (field) | Arsenic (USEPA Method 6010C) |
| WP-1 | | | | | X | X | | X | X | | X | X |
| OW-2 | | | | X | | | X | X | X | | X | |
| EW-3 | | | | | X | X | | X | X | | X | X |
| MW-11 | | | | | X | X | | X | X | | X | X |
| MW-12 | X | X | | | X | X | | X | X | | X | X |
| MW-99 | X | | | | | | | | | | | |
| MW-102 | X | X | X | X | X | X | X | X | X | | X | X |
| MW-103 | | | | | *(p)* | X | | X | X | | X | X |
| MW-120 | X | X | X | X | *(p)* | | X | *(p)* | | | *(p)* | |
| MW-147 | X | X | X | | | | X | X | | | | |
| MW-241 | X | X | X | | | | X | X | | | | |
| MW-243 | X | X | X | | | | | X | X | | | |
| MW-245 | X | X | X | | | | | | | | | |
| MW-255 | X | X | X | | | | | | | | | |
| MW-256 | X | X | X | | | | | | | | | |
| MW-267 | X | | | | | | | | | | | |
| MW-258 | X | | | | | | | | | | | |

X= Data collected
(p) pH, ORP, DO measured as purge parameters
MNA Parameters = Chloride, sulfate, nitrate, nitrite, methane, ethane, ethene, dissolved iron and manganese

## Table 3-3 WP003 Arsenic, TCE, and VC Concentration Trend Analysis Summary

| | Arsenic | | | | |
|---|---|---|---|---|---|
| **Well ID** | **MW-11** | **MW-12** | **MW-102** | **MW-147** | **MW-241** |
| Date Range Start | 9/1/1999 | 9/1/2003 | 9/1/2001 | 9/1/1999 | 3/1/2004 |
| Date Range End | 12/10/2015 | 12/10/2015 | 12/10/2015 | 9/23/2015 | 9/23/2015 |
| Data Points | 15 | 21 | 21 | 20 | 20 |
| Trend (1) | Stable | Stable | Decreasing | Stable | Decreasing |
| Confidence (1) | 65.1 | 57.1% | 97.7 | 89.0 | 97.3% |
| S value (1) | -9 | -5 | -67 | -39 | -36 |
| CV(1) | 0.20 | 0.50 | 0.56 | 0.63 | 0.76 |
| Log slope (R) (2) | -- | -- | -2.04E-04 | -- | -3.44E-4 |
| Half Life (days) (3) | -- | -- | 3400 | -- | 2010-- |

| | TCE | Vinyl Chloride | | | |
|---|---|---|---|---|---|
| Well ID | **MW-120** | **MW-102** | **WP-01** | **OW-2** | **MW-243** |
| Date Range Start | 12/15/11 | 11/15/2007 | 11/15/2007 | 3/15/2014 | 3/15/2004 |
| Date Range End | 12/10/2015 | 12/10/2015 | 3/13/2015 | 12/10/2015 | 9/23/2015 |
| Data Points | 16 | 40 | 37 | 25 | 35 |
| Trend (1) | Decreasing | Probably Decreasing | Decreasing | Decreasing | Decreasing |
| Confidence (1) | 99.6 | 92.4 | >99.9 | 99.5 | 98.8 |
| S value (1) | -58 | -124 | -372 | -109 | -152 |
| CV(1) | 0.22 | 0.85 | 0.98 | 1.01 | 1.34 |
| Log slope (R) (2) | -3.26E-04 | -4.04E-04 | -4.03E-04 | -4.73E-04 | -3.64-04 |
| Half Life (days) (3) | 2130 | 1720 | 1720 | 1470 | 1900 |

**Notes**

CV= Coefficient of Variance

1) Trend Analysis by GIS Mann Kendal Tool Kit (GIS Environmental Inc. Based on MAROS; A Decision Software System for Optimizing Monitoring Plans (Aziz and others 2003)

Criteria At least 4 data points

Decreasing: S <0; Confidence >95% (probably decreasing if confidence is <90%)

Increasing: S >0; Confidence >95% (probably increasing if confidence is <90%)

Stable: CV <1 and S<0

2) Log Slope by Log Linear Regression

Half Life = Ln(0.5)/R

## Table 4-1
## FT004 Monitoring Well Network—Well Construction Details

| Well | Casing Diameter (inches) | Boring Depth (feet bgs) | Top of Casing Elevation [a] | Screened Formation [b] | Screened Interval (feet bgs) |
|---|---|---|---|---|---|
| MW-1 | 2 | 15 | 2407.85 | QAL | 5–10 |
| MW-3 | 2 | 11 | 2407.08 | QAL | 4–9 |
| MW-4 | 2 | 16 | 2408.43 | QAL | 7–13 |
| MW-50 | 2 | 20 | 2404.21 | QAL | 6–16 |
| MW-100 | 4 | 53 | 2404.48 | Basalt A | 43–53 |
| MW-151 | 4 | 32 | 2404.25 | Basalt A | 20–30 |
| MW-152 | 4 | 12 | 2405.81 | QAL | 7–12 |
| MW-153 | 2 | 9 | 2406.21 | QAL | 4–9 |
| MW-154 | 4 | 31 | 2405.54 | QAL | 20–30 |
| MW-155 | 2 | 9 | 2406.16 | QAL | 4–9 |
| MW-226 | 2 | 18 | 2403.56 | QAL | 15–16 |
| MW-227 | 2 | 15 | 2402.25 | QAL | 9–14 |
| MW-246 | 2 | 15 | 2404.90 | QAL | 7–15 |
| MW-247 | 2 | 18 | 2403.14 | QAL | 5–15 |
| MW-248 | 2 | 18 | 2404.49 | QAL | 8–18 |

Notes:
a. Elevations based on NGS NAVD (1988)—surveyed by CH2M HILL in November 2002
b. QAL = alluvium
c. PP = peristaltic pump, BP = bladder pump

## Table 4-2A
## FT004 Fourth Quarter Sample Summary

| Location | TPH-D | QC Notes |
|---|---|---|
| MW-226 | X | |

*Notes:*
*TPH-D – total petroleum hydrocarbons - diesel (diesel range organics [DRO] and motor oil)*

## Table 4-2B
## FT004 2015 Sample Summary

| Location | First Quarter | Second Quarter | Third Quarter | Fourth Quarter |
|---|---|---|---|---|
| | TPH-D | TPH-D | TPH-D | TPH-D |
| MW-1 | X | | | |
| MW-3 | X | | X | |
| MW-226 | | | X | X |
| MW-227 | X | | | |
| MW-247 | | | X | |
| MW-228 | X | | | |

*Notes:*
*TPH-D – total petroleum hydrocarbons - diesel (diesel range organics [DRO] and motor oil)*

## Table 4-3
## FT004 DRO Concentration Trend Analysis Summary

| Well ID | TPH-D | | | |
|---|---|---|---|---|
| | MW-3 | MW-226 | MW-227 | MW-247 |
| Date Range Start | 3/15/2007 | 3/14/2012 | 3/15/2007 | 3/15/2007 |
| Date Range End | 9/24/2015 | 12/11/2015 | 3/13/2015 | 9/24/2015 |
| Data Points | 10 | 4 | 9 | 11 |
| Trend (1) | Decreasing | Stable | Stable | Decreasing |
| Confidence (1) | 99.7 | 83.3 | 82.1 | 98.2 |
| S value (1) | -30 | -4 | -10 | -24 |
| CV(1) | 0.85 | 0.66 | 0.52 | 0.63 |
| Log slope (R) (2) | | | | |
| Half Life (days) (3) | | | | |

**Notes**
CV= Coefficient of Variance
1) Trend Analysis by GIS Mann Kendal Tool Kit (GIS Environmental Inc. Based on MAROS; A Decision Software System for Optimizing Monitoring Plans (Aziz and others 2003)
Criteria At least 4 data points
Decreasing: S <0; Confidence >95% (probably decreasing if confidence is <90%)
Increasing: S >0; Confidence >95% (probably increasing if confidence is <90%)
Stable: CV <1 and S<0
2) Log Slope by Log Linear Regression
3) Half Life = Ln(0.5)/R

## Table 5-1 ST006 Monitoring Well Network—Well Construction Details

| Well | Casing Diameter (inches) | Boring Depth (feet bgs) | Top of Casing Elevation [a] | Screened Formation [b] | Screened Interval (feet bgs) |
|---|---|---|---|---|---|
| MW-195 | 2 | 24 | 2442.33 | QAL & Basalt A | 6–16 |
| MW-196 | 2 | 16 | 2444.49 | Basalt A | 5–15 |
| MW-208 | 4 | 17 | 2442.51 | Basalt A | 7–17 |
| MW-308 | 2 | 22 | 2443.01 | QAL & Basalt A | 7–17 |
| MW-194 | 2 | 30 | 2443.65 | Basalt A | 7–17 |
| MW-197 | 2 | 24 | 2450.36 | QAL | 11–21 |
| MW-207 | 4 | 17 | 2443.97 | QAL & Basalt A | 7–17 |

Notes:
a. Elevations based on NGS NAVD (1988)
b. QAL = alluvium
c. PP = peristaltic pump

## Table 5-2A ST006 Fourth Quarter Sample Summary

| Location | TPH-D | QC Notes |
|---|---|---|
| MW-194 | X | |
| MW-207 | X | |
| MW-208 | X | |

*Notes:*
*TPH-D – total petroleum hydrocarbons - diesel (diesel range organics [DRO] and motor oil)*

## Table 5-2B ST006 2015 Sample Summary

| Location | First Quarter | | Second Quarter | Third Quarter | Fourth Quarter |
|---|---|---|---|---|---|
| | VOCs | TPH-D | TPH-D | TPH-D | TPH-D |
| MW-194 | X | X | | X | X |
| MW-207 | | | | X | X |
| MW-208 | | | | X | X |

## Table 5-3 ST006 DRO/MRO Trend Analysis Summary

| Well ID | DRO | | | |
|---|---|---|---|---|
| | MW-196 | MW-208 | MW-194 (MRO) | MW-207 |
| Date Range Start | 3/15/1996 | 4/15/1993 | 9/3/2011 | 9/3/2011 |
| Date Range End | 2/15/2013 | 12/11/2015 | 12/11/2015 | 12/11/2015 |
| Data Points | 27 | 33 | 4 | 4 |
| Trend (1) | Decreasing | Decreasing | Stable | Stable |
| Confidence (1) | >99.9 | >99.9 | 89.6 | 83.3 |
| S value (1) | -180 | -301 | -5 | -4 |
| CV(1) | 1.17 | 1.4 | 0.91 | 0.85 |
| Log slope (R) (2) | | | | |
| Half Life (days) (3) | | | | |

**Notes**
CV= Coefficient of Variance
1) Trend Analysis by GIS Mann Kendal Tool Kit (GIS Environmental Inc. Based on MAROS; A Decision Software System for Optimizing Monitoring Plans (Aziz and others 2003)
Criteria At least 4 data points
Decreasing: S <0; Confidence >95% (probably decreasing if confidence is <90%)
Increasing: S >0; Confidence >95% (probably increasing if confidence is <90%)
Stable: CV <1 and
S<0
2) Log Slope by Log Linear Regression
3) Half Life = Ln(0.5)/R

## Table 6-1A Fourth Quarter Residential and Municipal Well Sampling Summary

| Location | VOCs[1] (USEPA 8260B) | Arsenic (USEPA Method 610C) | TPH-D | Comment |
|---|---|---|---|---|
| RW-12 | | X | | Arsenic inadvertently not included in 3rd Quarter 2015; was re-sampled in 4th Quarter 2015. |
| RW-13 | planned | | | Well not functioning per owner - well not sampled throughout 2015 Quarters |
| RW-15 | planned | | | Not Sampled Well dry per owner |
| RW-16 | *planned* | | | *Well not functioning per owner- well not sampled throughout 2015 Quarters* |
| RW-17 | X | | | |
| RW-19 | | | *planned* | *Well shutdown per owner- well not sampled throughout 2015 Quarters* |
| RW-22 | *planned* | | | *No access No owner response - well not sampled throughout 2015 Quarters* |
| RW-46 | | | X | |
| PS ¼ | X | | | |

## Table 6-1B 2015 Residential and Municipal Well Sampling Summary

| Well | Frist Quarter | | | Second Quarter | | | Third Quarter | | | Fourth Quarter | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOCs | As | TPH-D | VOCs | As | TPH-D | VOCs | As | TPH-D | VOCs | As | TPH-D |
| RW-12 | | | | | | | X | NS/ Planned | | | X | |
| RW-13 | | | | | | | NS/ Planned | | | | | |
| RW-14 | | | | | | | X | | | | | |
| RW-15 | X | | | X | | | NS/ Planned | | | NS/ Planned | | |
| RW-16 | X | | | | | | NS/ planned | | | NS/ planned | | |
| RW-17 | X | | | X | | | X | | | X | | |
| RW-19 | | | | | | | NS/ planned | | NS/ planned | | | NS/ Planned |
| RW-20 | | | | | | | X | | | | | |
| RW-21 | | | | | | | X | | | | | |
| RW-33 | | | | | | | X | | | | | |
| RW-45 | | | | | | | X | | | | | |
| RW-46 | | | | | | | X | | X | X | | X |
| PS-1/4 | X | | | X | | | X | | | X | | |

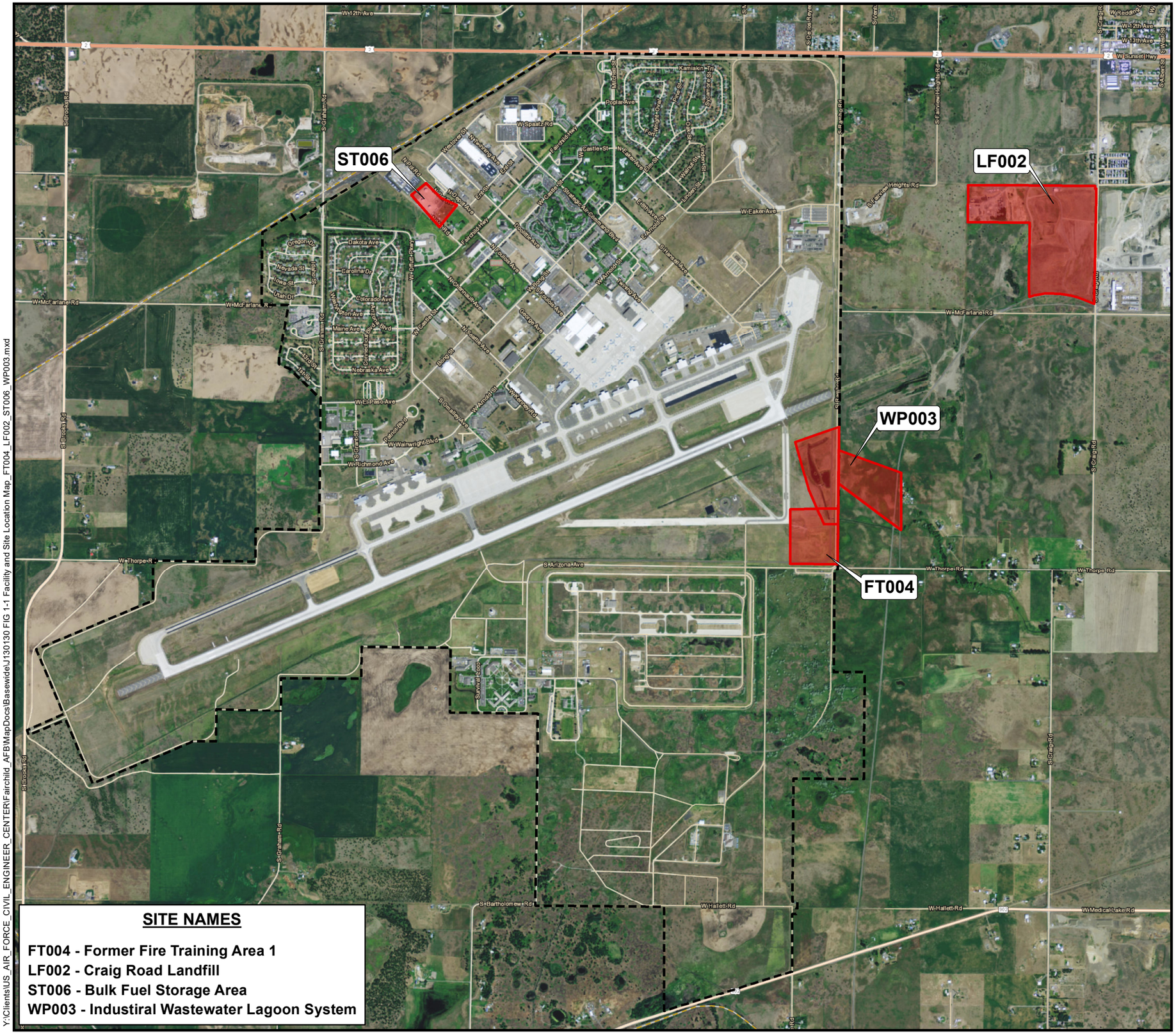
VOCs Volatile Organic Compounds
As Dissolved Arsenic
TPH-D Total Petroleum Diesel Hydrocarbons

# Figures

# Figure 1-1

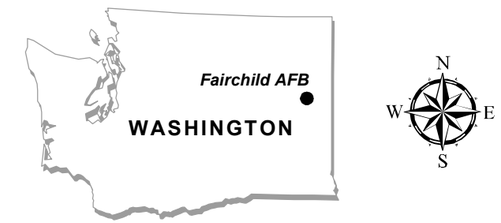
## *Facility and Site Location Map*

### Fairchild AFB, WA




**SITE NAMES**

**FT004 - Former Fire Training Area 1**
**LF002 - Craig Road Landfill**
**ST006 - Bulk Fuel Storage Area**
**WP003 - Industrial Wastewater Lagoon System**

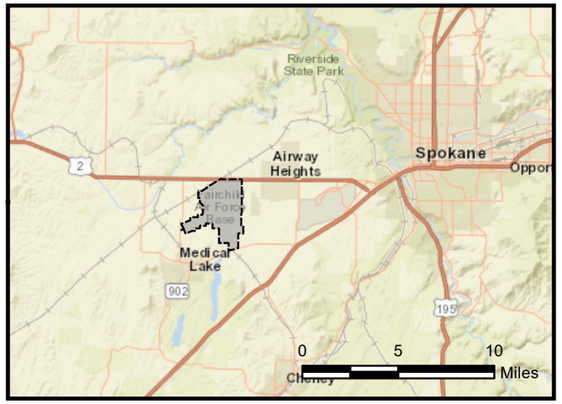



*Map Projection: NAD 1983 UTM Zone 11N, Meters*
*Basemap: ESRI World Imagery WMS*

0 2,000 4,000 Feet
0 600 1,200 Meters

Installation Boundary

FT004. LF002, ST006 and WP003 Site Boundaries

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Y:\Clients\US_AIR_FORCE_CIVIL_ENGINEER_CENTER\Fairchild_AFB\MapDocs\Basewide\J130130 FIG 1-1 Facility and Site Location Map_FT004_LF002_ST006_WP003.mxd

# Figure 2-1

## Craig Road Landfill (LF002) Site Map

### Fairchild AFB, WA

*Map Projection: NAD 1983 UTM Zone 11N, Meters*
*Basemap: ESRI World Imagery WMS*

0 250 500 Feet

0 75 150 Meters

- Extraction Well
- Monitoring Well
- Railroad
- Craig Road Landfill (LF002) Site Boundary
- Northeast Disposal Area (NDA)
- Southeast Disposal Area (Rubble Area)
- Southwest Disposal Area (SDA)

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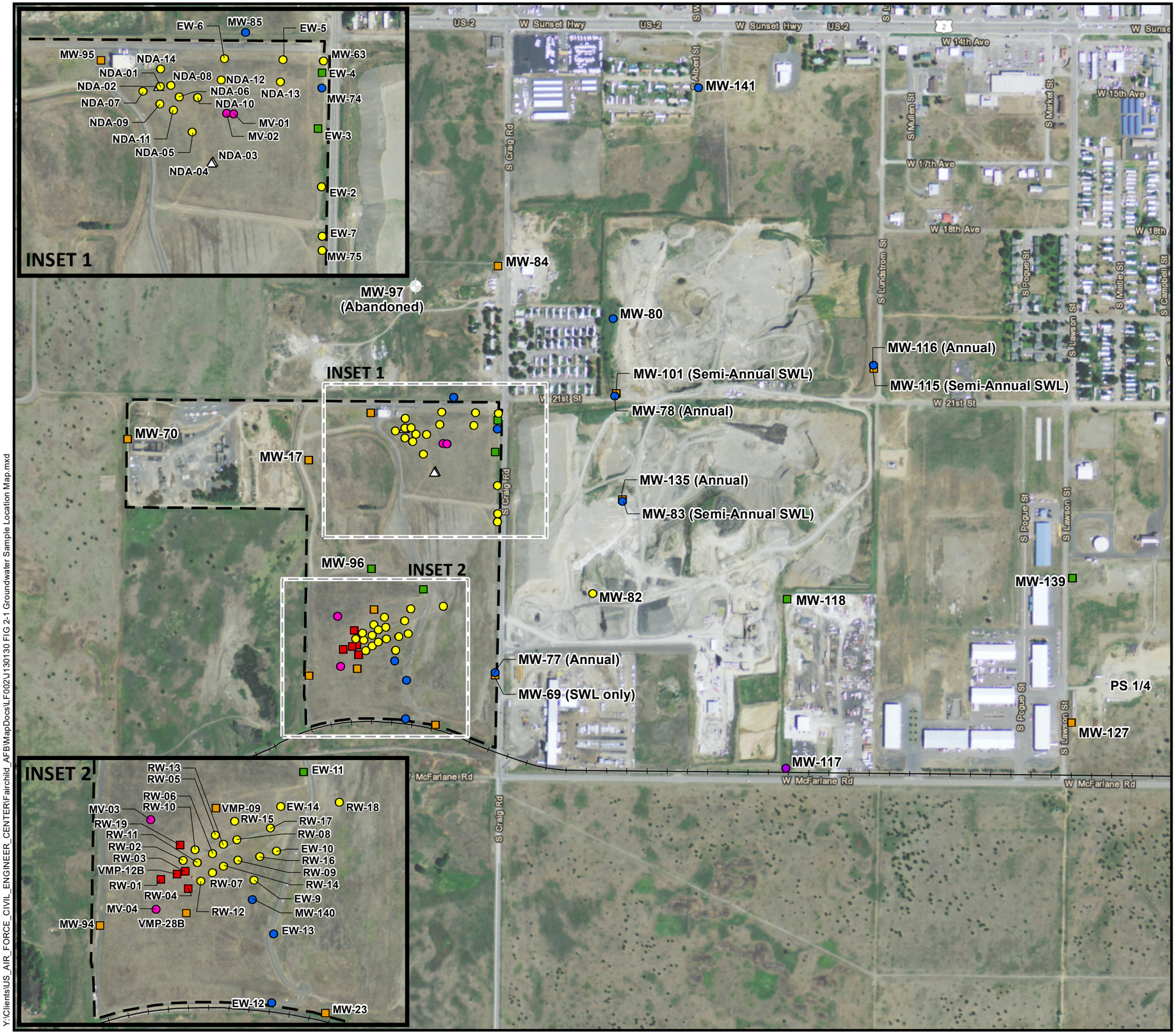
Y:\Clients\US_AIR_FORCE_CIVIL_ENGINEER_CENTER\Fairchild_AFB\MapDocs\LF002\1130130 FIG 10-2 Craig Road Landfill LF002 Site Map.mxd

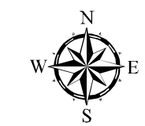



Y:\Clients\US_AIR_FORCE_CIVIL_ENGINEER_CENTER\Fairchild_AFB\MapDocs\LF002\J130130 FIG 2-1 Groundwater Sample Location Map.mxd

# Figure 2-2

## Craig Road Landfill (LF002) Groundwater Sample Location Map

### Fairchild AFB, WA




Map Projection: NAD 1983 UTM Zone 11N, Meters
Basemap: ESRI World Imagery WMS

0 625 1,250 Feet

0 175 350 Meters

- Quarterly
- Semi-Annual
- Semi-Annual SWL + Visual MN04
- Semi-Annual SWLs Only
- Annual
- Biennial
- Sampling Suspended
- Annual Air Sampling Of Methane Vents
- Railroad
- Craig Road Landfill (LF002) Site Boundary

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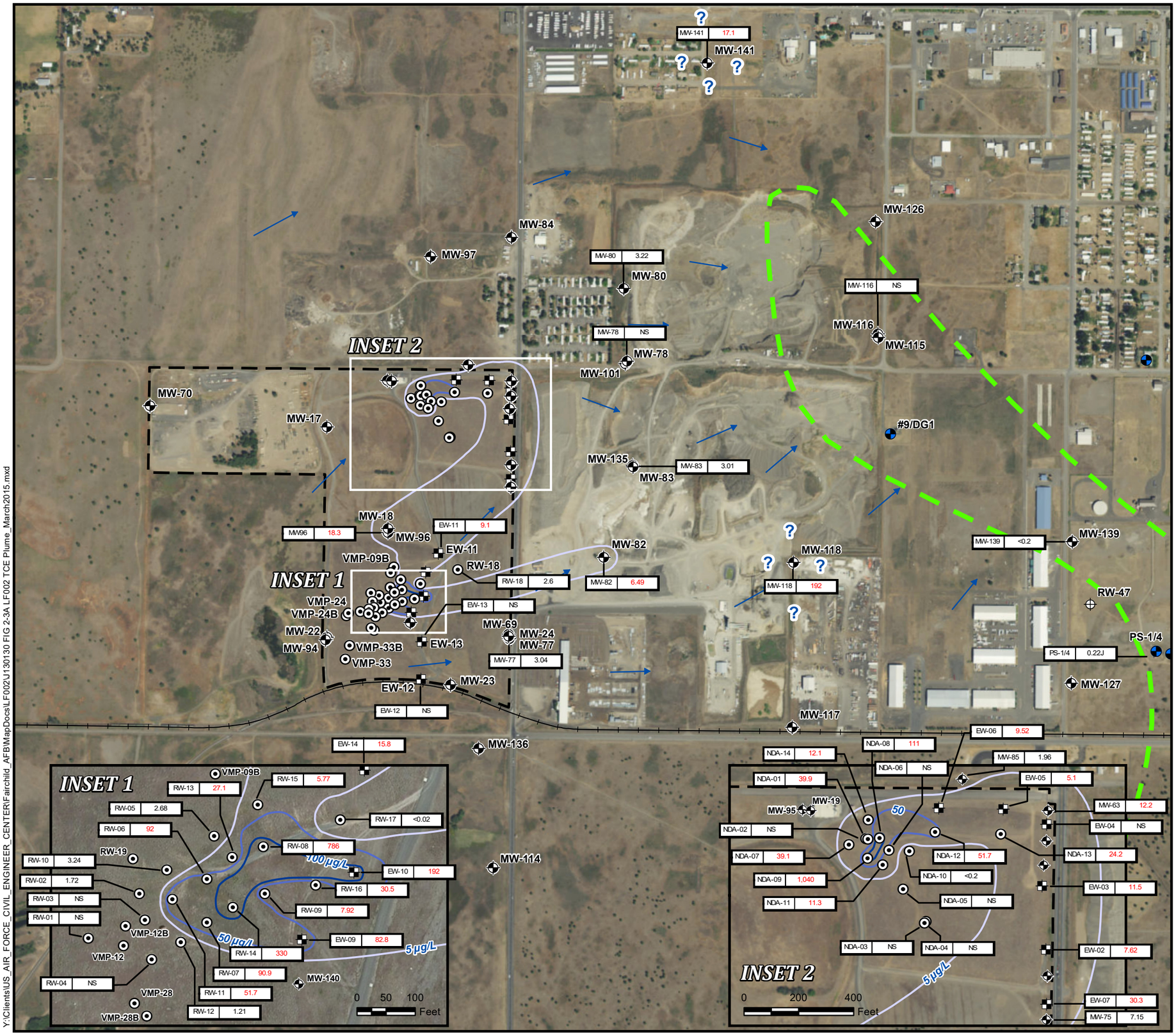


Y:\Clients\US_AIR_FORCE_CIVIL_ENGINEER_CENTER\Fairchild_AFB\MapDocs\LF002\J130130 FIG 2-3A LF002 TCE Plume_March2015.mxd

# Figure 2-3A

## *LF002 TCE Plume (March 2015)*

### Fairchild AFB, WA

*Map Projection: NAD 1983 UTM Zone 11N, Meters*
*Basemap: ESRI World Imagery WMS*

0 700 1,400 Feet
0 200 400 Meters

- Extraction Well
- Monitoring Well
- Remediation Well
- Municipal Well
- Railroad
- 5 µg/L TCE Plume Contour
- 50 µg/L TCE Plume Contour
- 100 µg/L TCE Plume Contour
- Limit of the Basalt A (September 1991 RI)
- Groundwater Flow Direction
- Craig Road Landfill (LF002) Site Boundary

| Well ID | March 2015 TCE Results |
|---|---|

**NOTES:**

1) All results shown in Micrograms per liter (µg/L)
2) Question mark symbols around MW-118 and MW-141 depict the uncertainty in the TCE plume in these locations.

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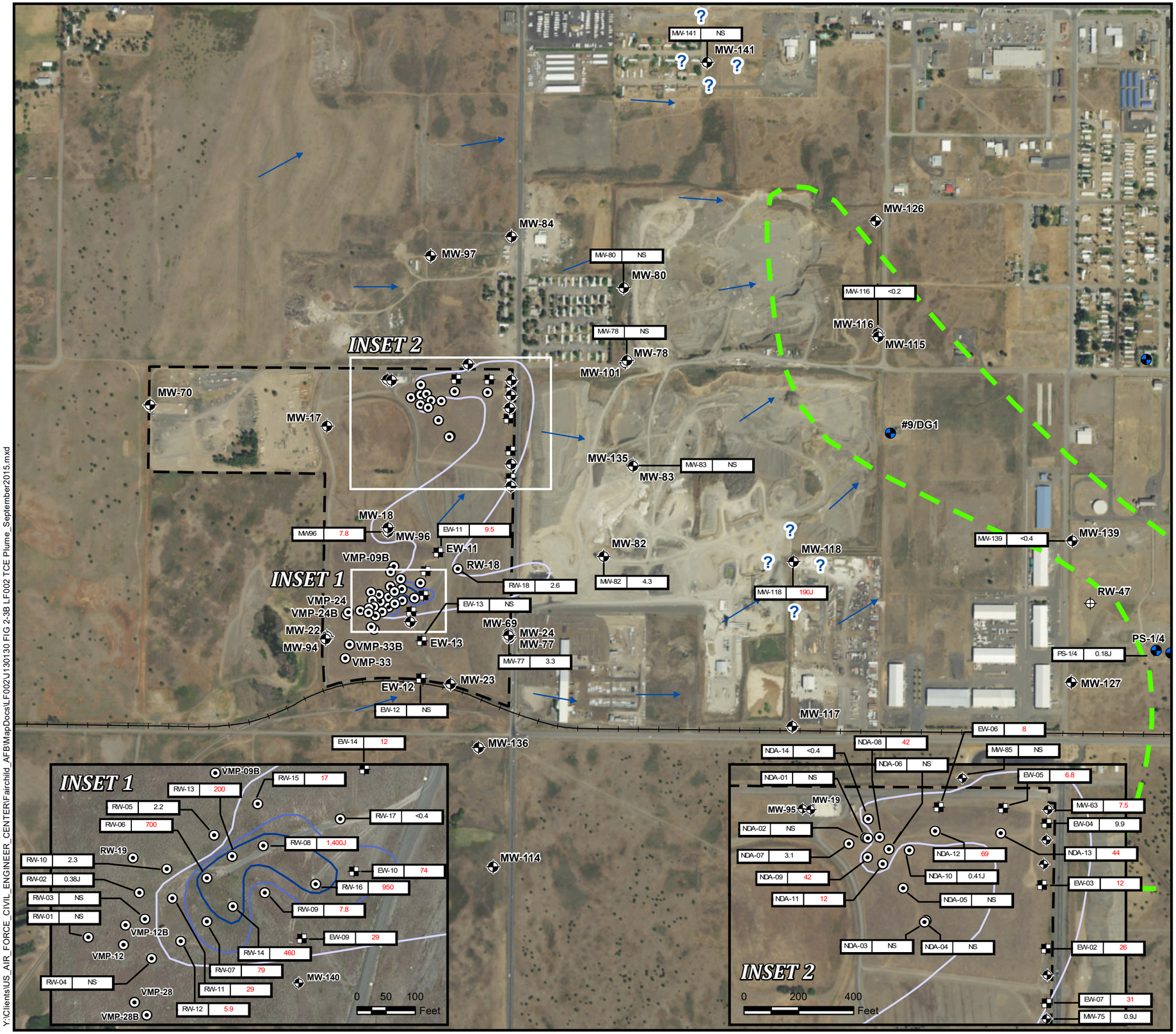
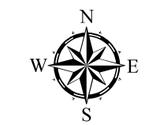



Y:\Clients\US_AIR_FORCE_CIVIL_ENGINEER_CENTER\Fairchild_AFB\MapDocs\LF002\J130130 FIG 2-3B LF002 TCE Plume_September2015.mxd

# Figure 2-3B

## *LF002 TCE Plume (September 2015)*

### Fairchild AFB, WA




*Map Projection: NAD 1983 UTM Zone 11N, Meters*
*Basemap: ESRI World Imagery WMS*

0 700 1,400 Feet
0 200 400 Meters

- Extraction Well
- Monitoring Well
- Remediation Well
- Municipal Well
- Railroad
- 5 µg/L TCE Plume Contour
- 50 µg/L TCE Plume Contour
- 100 µg/L TCE Plume Contour
- Groundwater Flow Direction
- Limit of the Basalt A (September 1991 RI)
- Craig Road Landfill (LF002) Site Boundary

| Well ID | September 2015 TCE Results |
|---|---|

**NOTES:**
1) All results shown in Micrograms per liter (µg/L)
2) Question mark symbols around MW-118 and MW-141 depict the uncertainty in the TCE plume in these locations.

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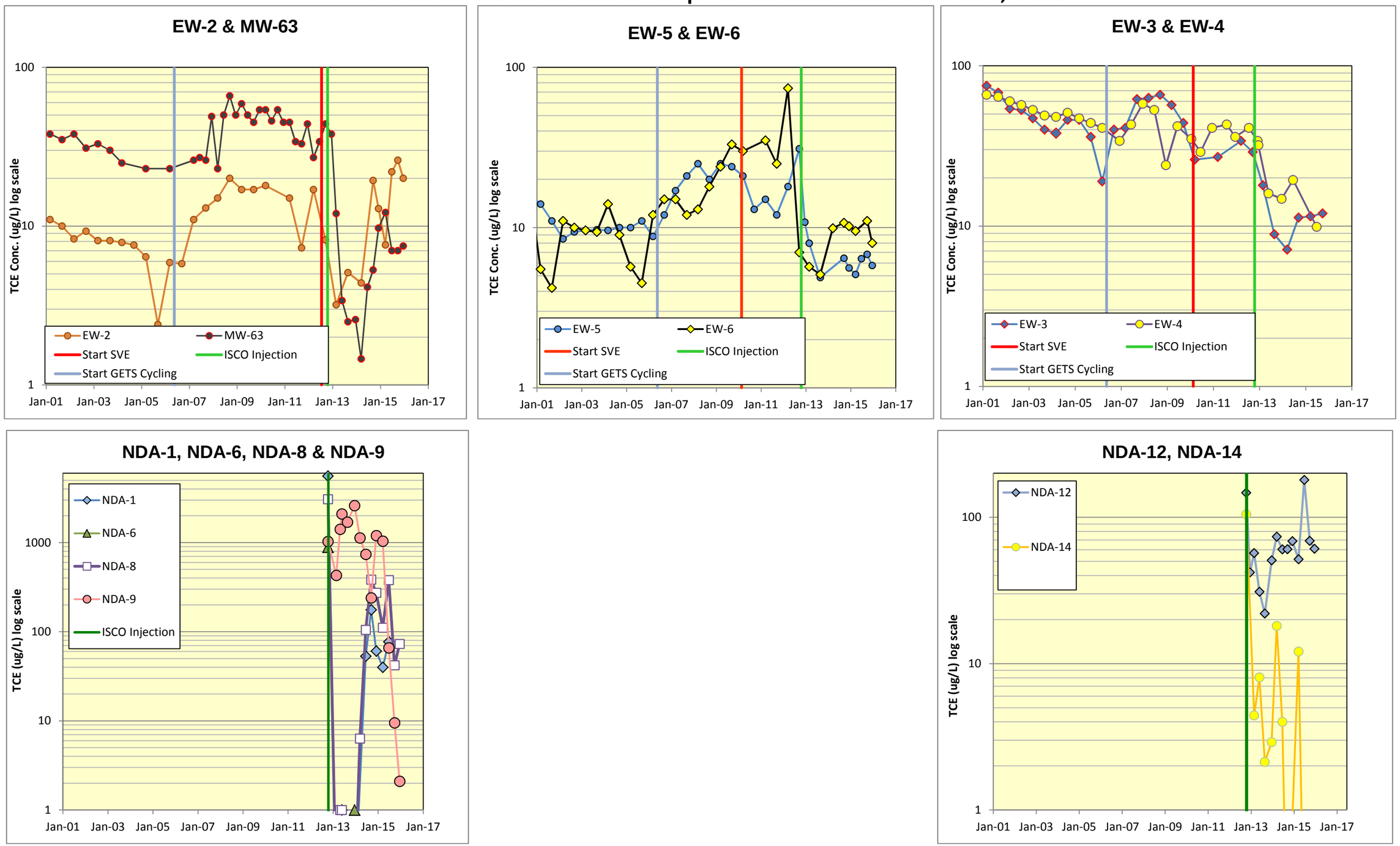
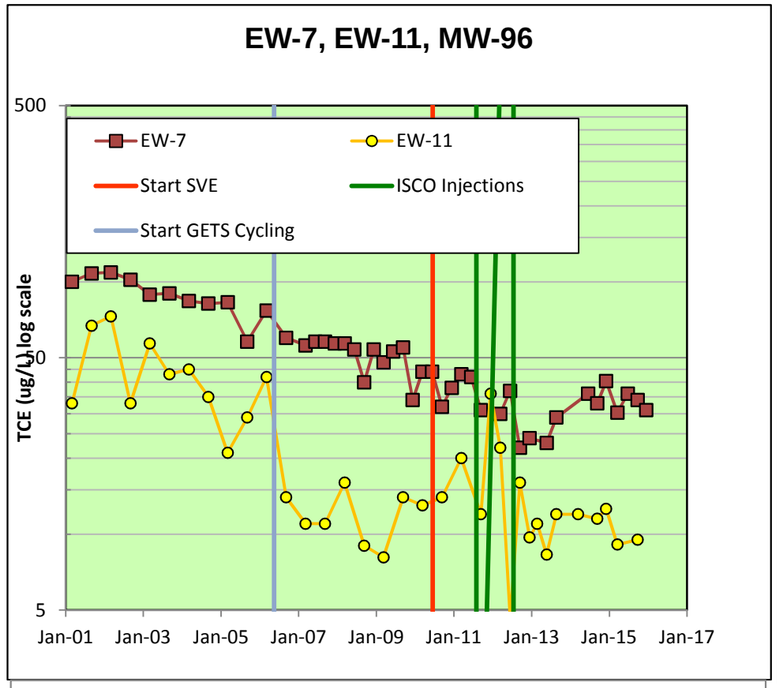
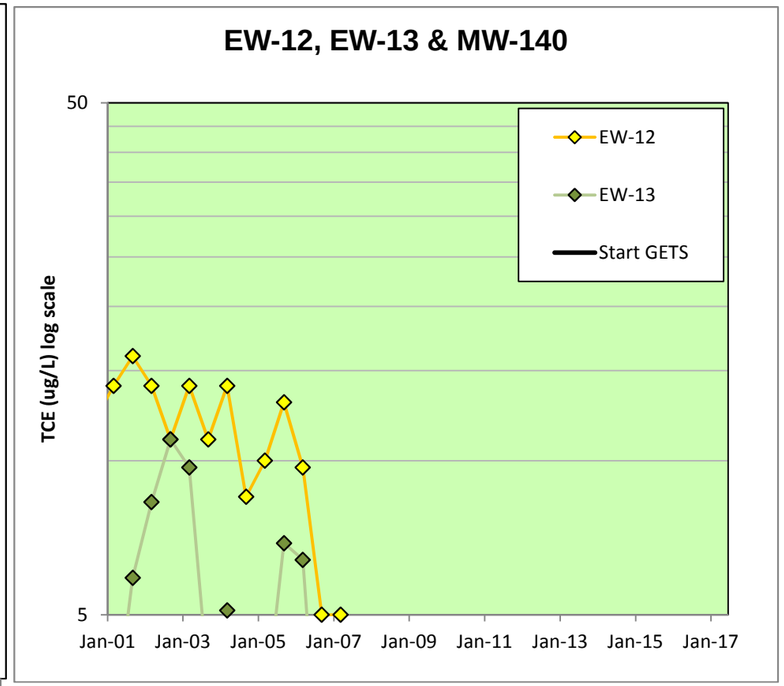
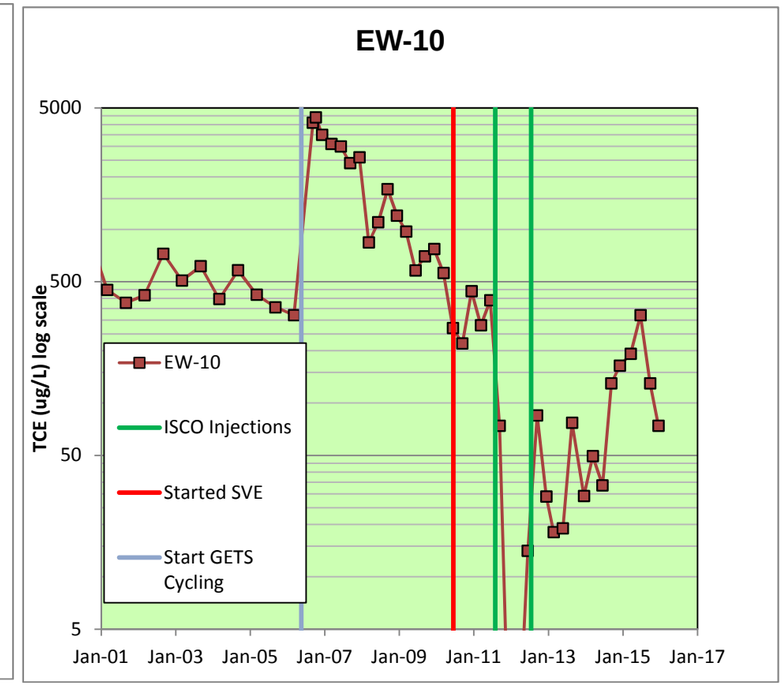
# Figure 2-4A
## Time Series TCE Concentration Graph for Selected Wells in the NDA, LF002

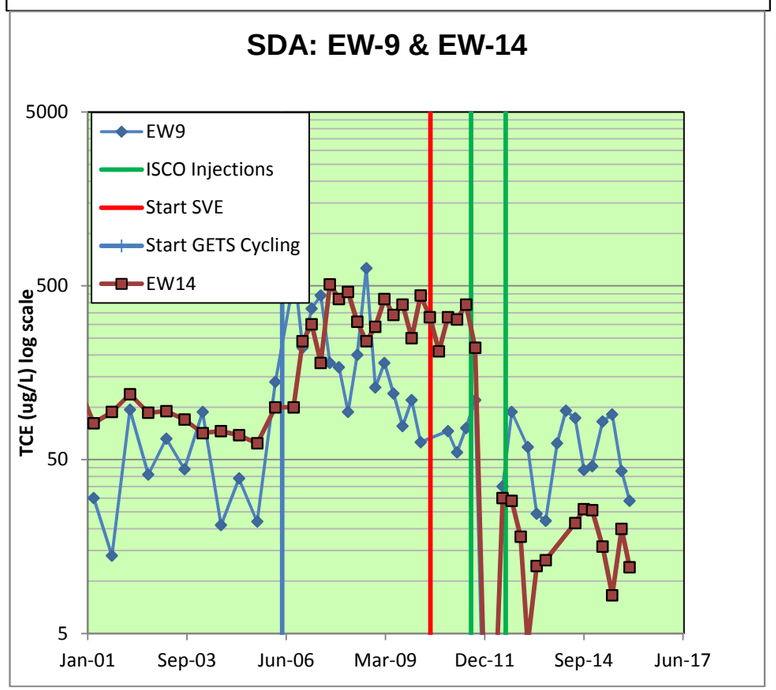


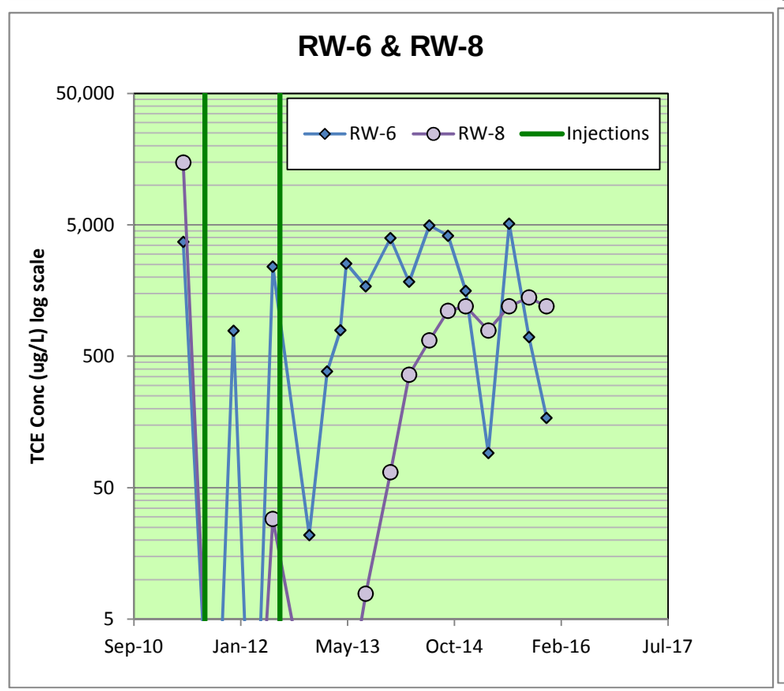
# Figure 2-4B
## Time Series TCE Concentration Graph for Selected Wells in the SDA, LF002



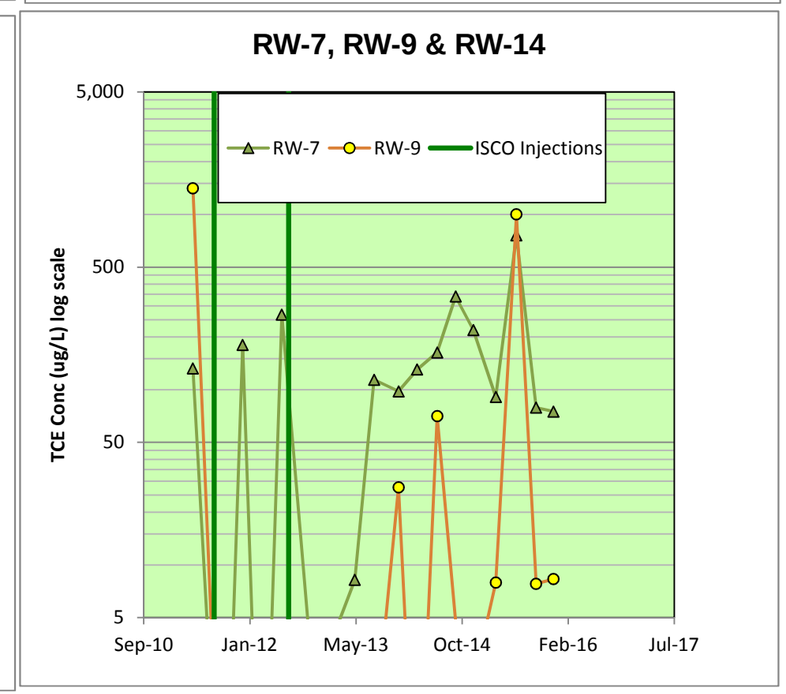
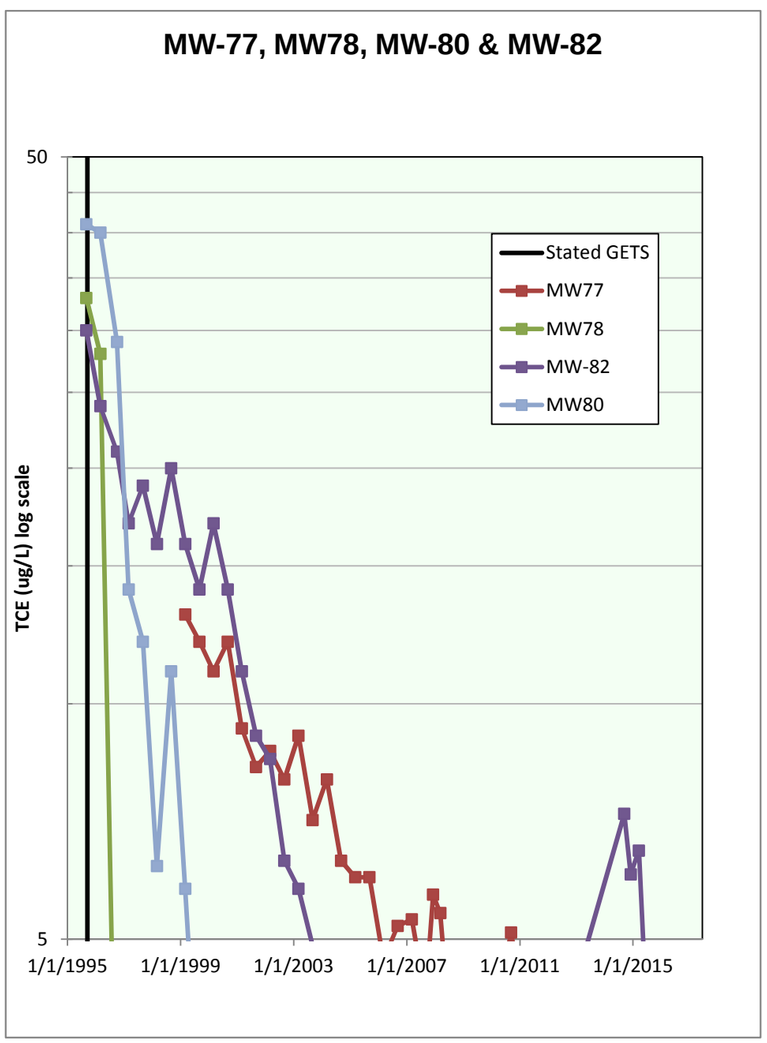
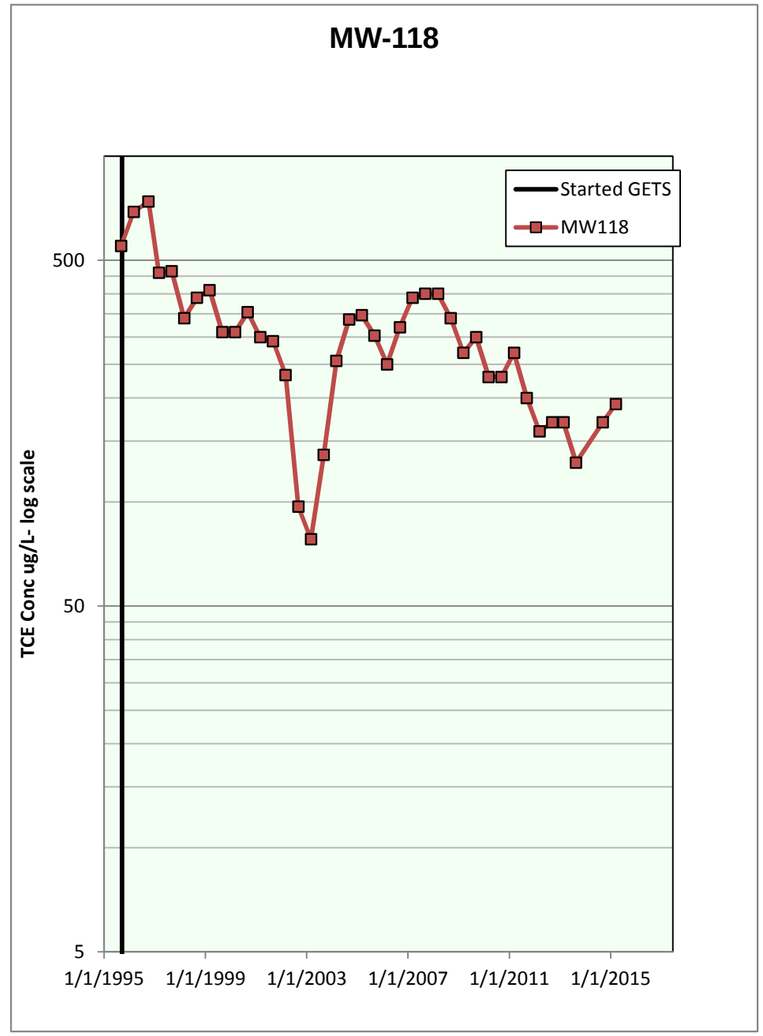
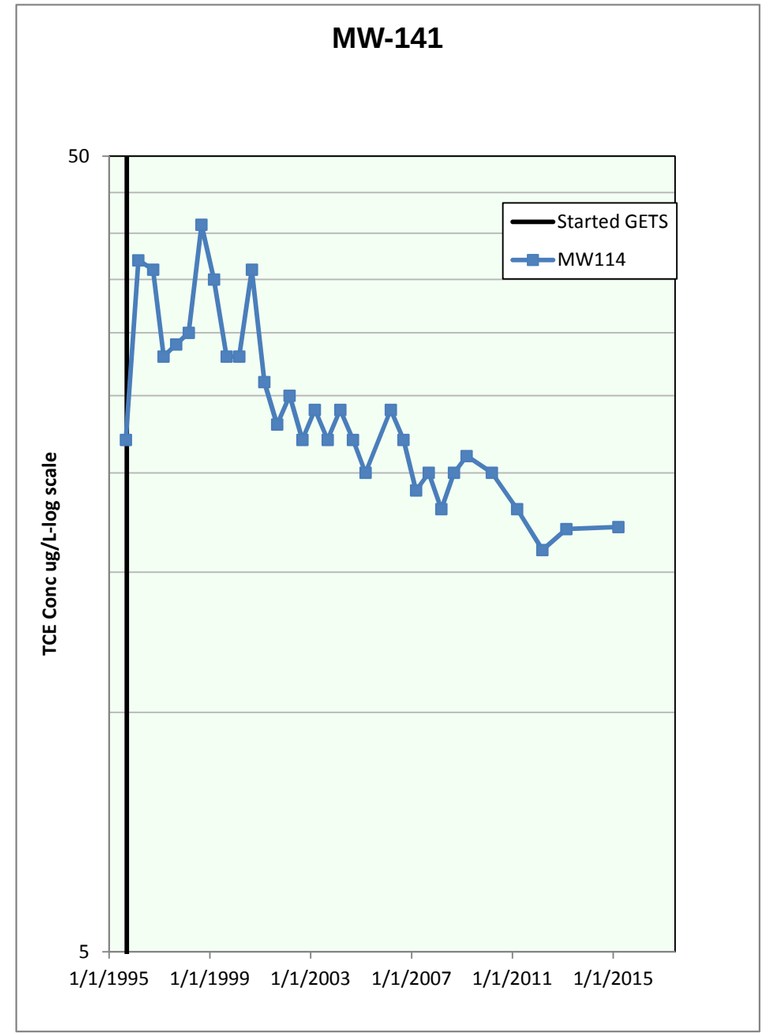
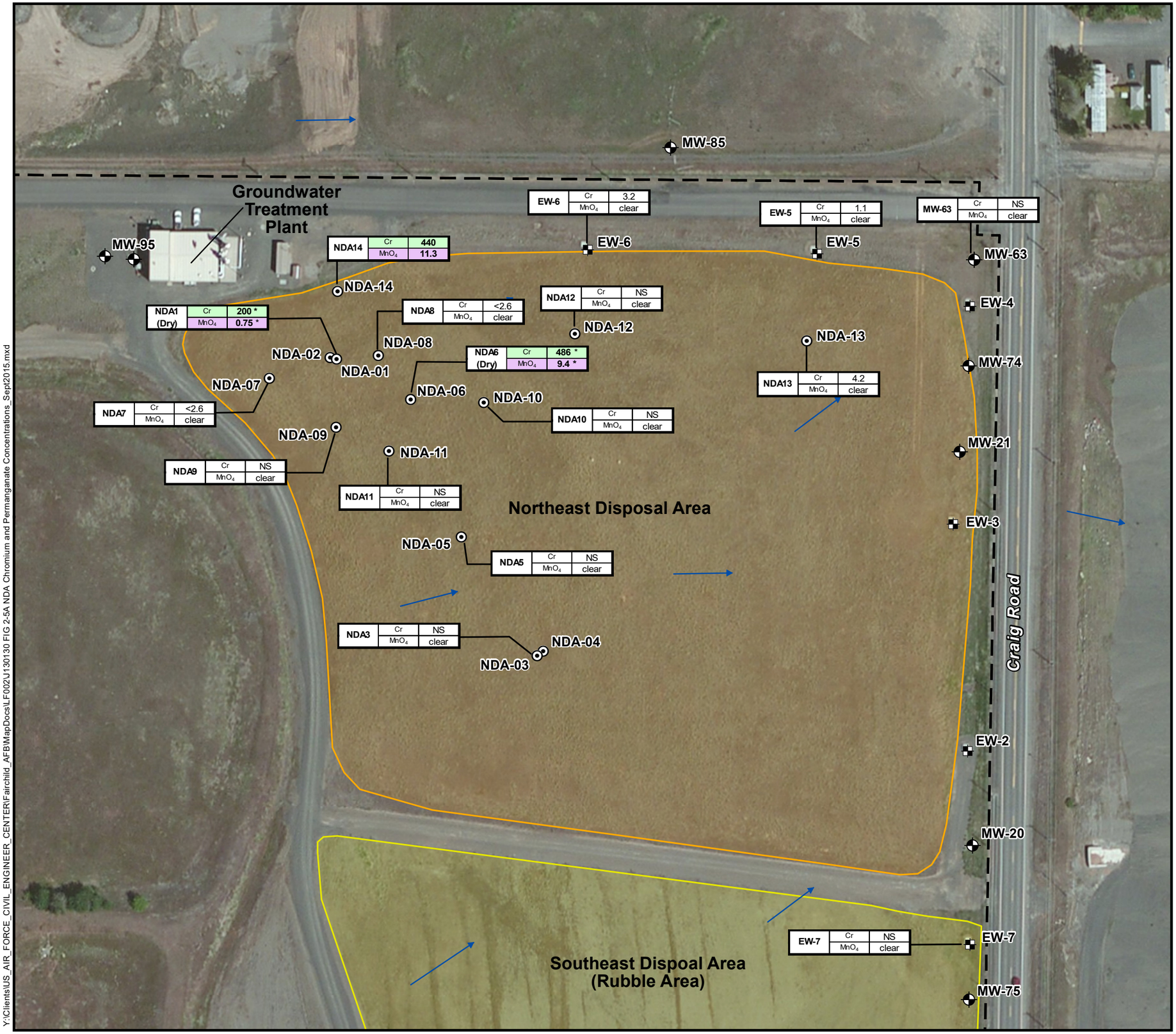



**Figure 2-4C**
**Time Series TCE Concentration Graph for Selected Wells in the Downgradient of LF002**



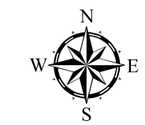






# Figure 2-5A

## *NDA Chromium and Permanganate Concentrations (September 2015)*

### Fairchild AFB, WA




*Map Projection: NAD 1983 UTM Zone 11N, Meters*
*Basemap: ESRI World Imagery WMS*

0 100 200 Feet
0 30 60 Meters

- Extraction Well
- Monitoring Well
- Remediation Well
- Railroad
- Groundwater Flow Direction
- Craig Road Landfill (LF002) Site Boundary
- Northeast Disposal Area (NDA)
- Southeast Disposal Area (Rubble Area)

| Well | Cr= Chromium Conc (ug/L) |
|---|---|
| | $MnO_4$= Permanganate Conc (mg/L) |

**NOTES:**
1) NS - Not Sampled
2) Clear - No visible permanganate
3) * - Well was dry in September 2015, posted results are from March 2015
4) ** - Well was not sampled in September 2015 per QAPP, posted results are from March 2015

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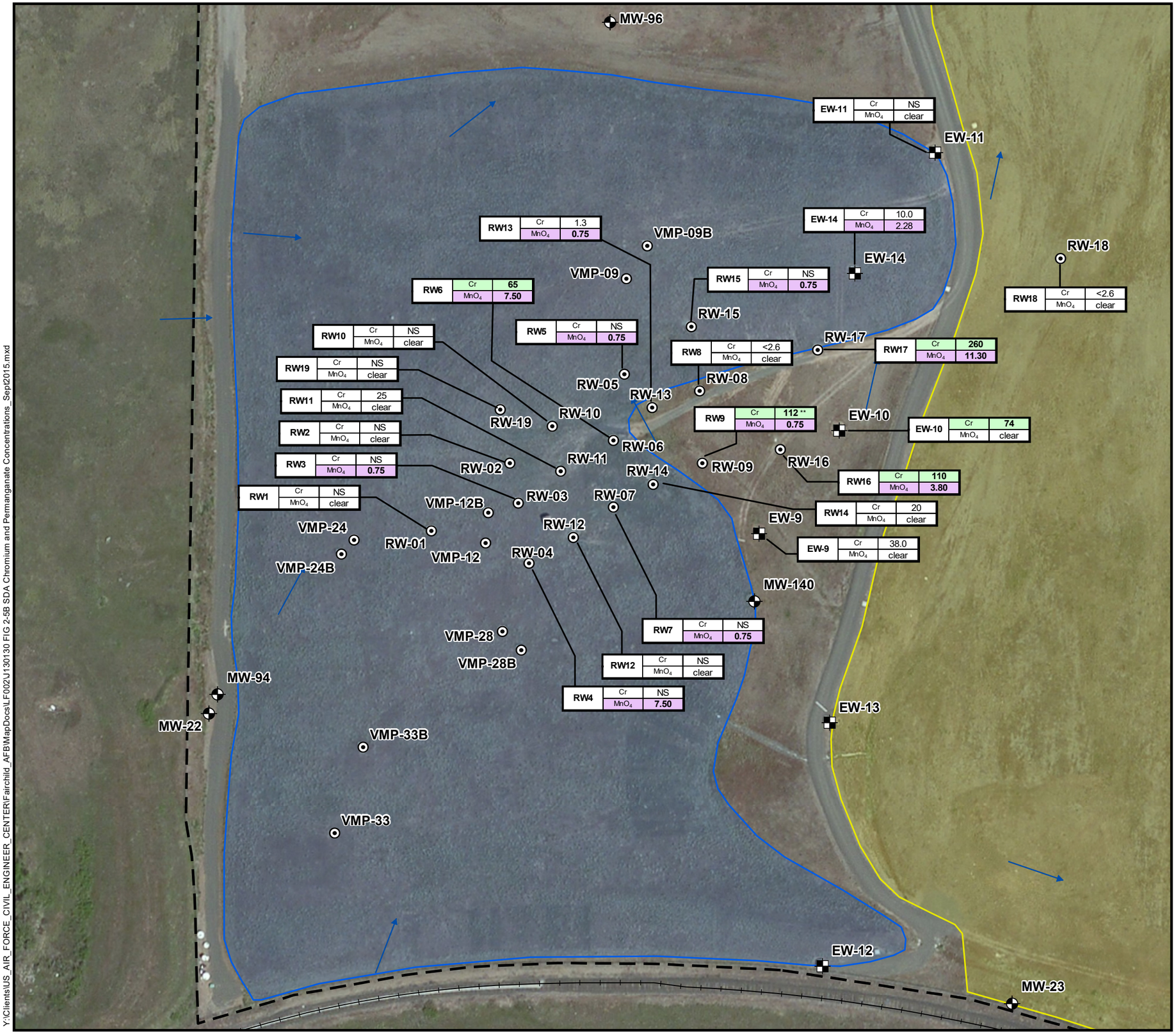
Y:\Clients\US_AIR_FORCE_CIVIL_ENGINEER_CENTER\Fairchild_AFB\MapDocs\LF002\J130130 FIG 2-5A NDA Chromium and Permanganate Concentrations_Sept2015.mxd




# Figure 2-5B

## *SDA Chromium and Permanganate Concentrations (September 2015)*

### Fairchild AFB, WA

*Map Projection: NAD 1983 UTM Zone 11N, Meters*
*Basemap: ESRI World Imagery WMS*

0 100 200 Feet
0 30 60 Meters

- Extraction Well
- Monitoring Well
- Remediation Well
- Railroad
- Groundwater Flow Direction
- Craig Road Landfill (LF002) Site Boundary
- Southwest Disposal Area (SDA)
- Southeast Disposal Area (Rubble Area)

| Well | Cr= Chromium Conc (ug/L) |
|---|---|
| | $MnO_4$= Permanganate Conc (mg/L) |

**NOTES:**
1) NS - Not Sampled
2) Clear - No visible permanganate
3) * - Well was dry in September 2015, posted results are from March 2015
4) ** - Well was not sampled in September 2015 per QAPP, posted results are from March 2015

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Y:\Clients\US_AIR_FORCE_CIVIL_ENGINEER_CENTER\Fairchild_AFB\MapDocs\LF002\J130130 FIG 2-5B SDA Chromium and Permanganate Concentrations_Sept2015.mxd

**Figure 2-6**
**LF002 Chromium Concentration Time Series Graphs**

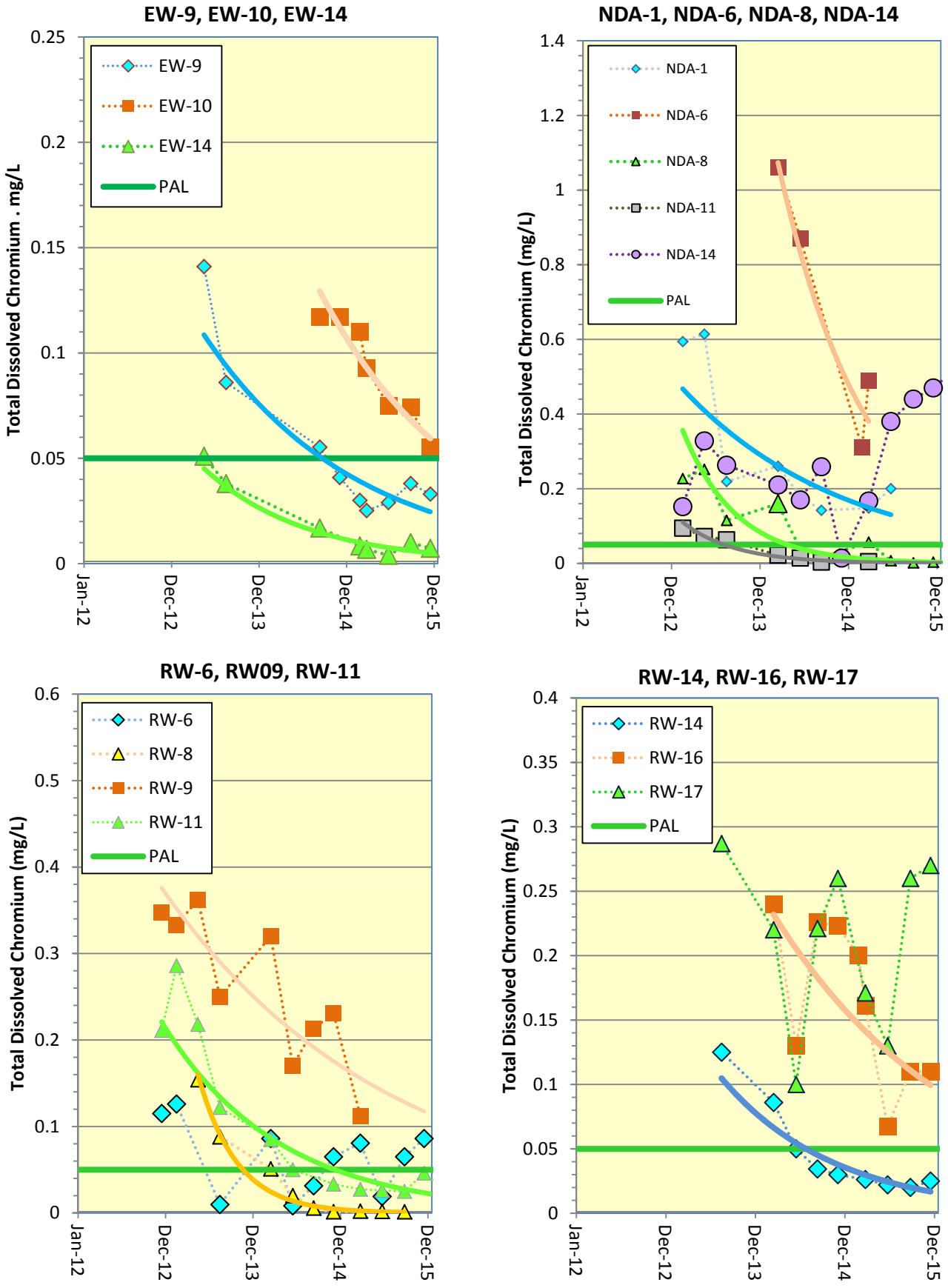
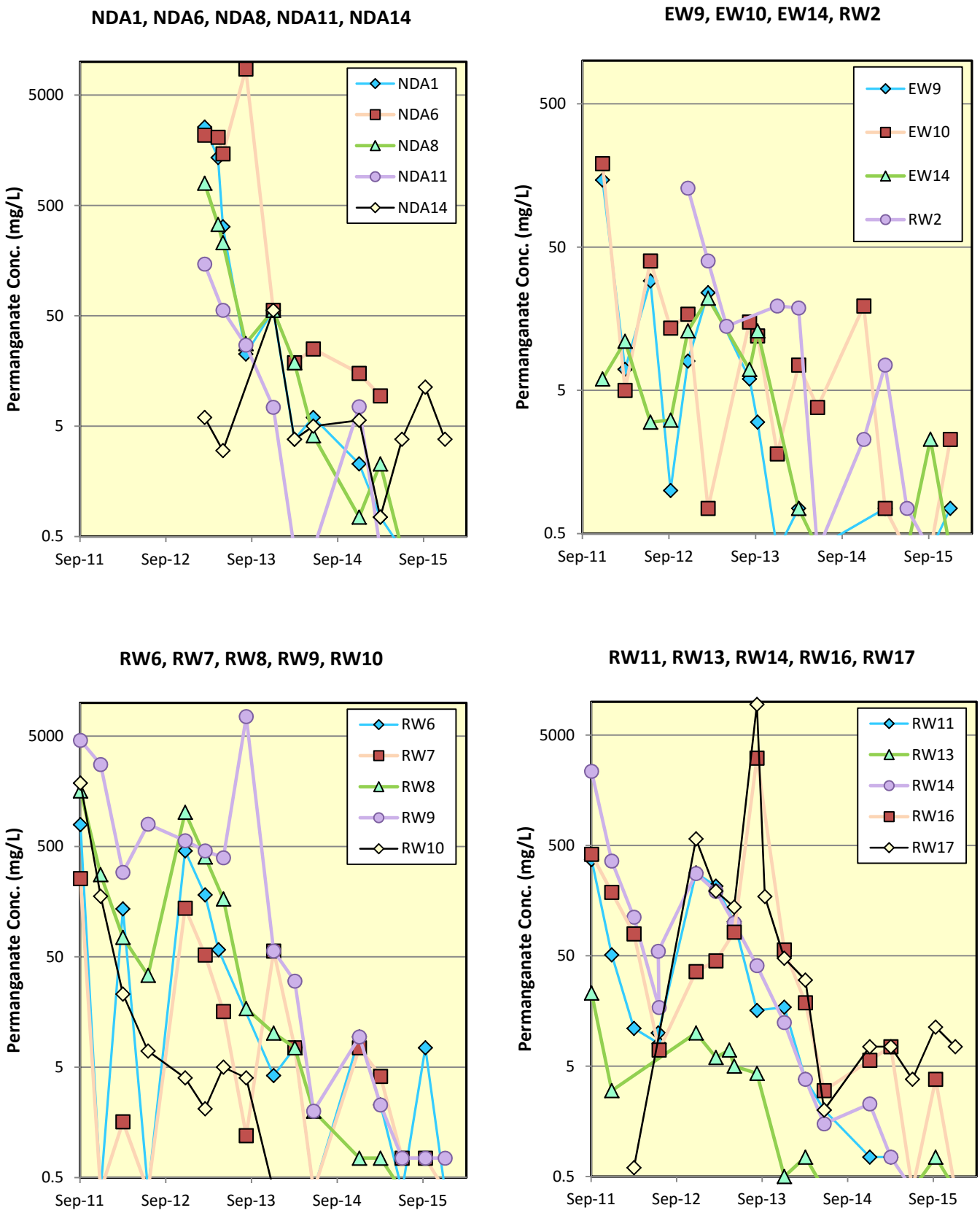
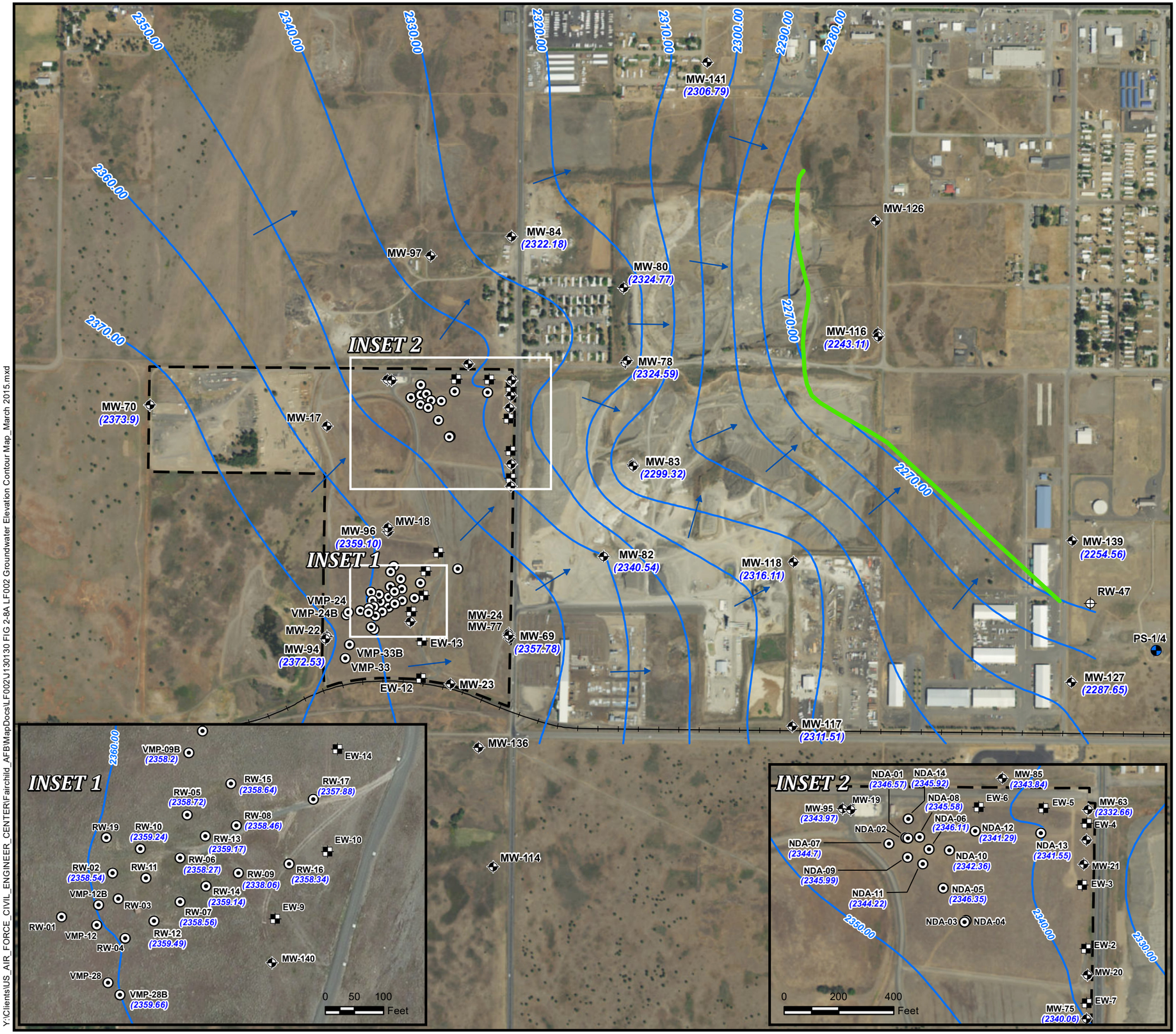


**Figure 2-7**
**$MnO_4$ Concentration Time Series Graphs**



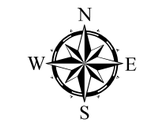



Y:\Clients\US_AIR_FORCE_CIVIL_ENGINEER_CENTER\Fairchild_AFB\MapDocs\LF002\J130130 FIG 2-8A LF002 Groundwater Elevation Contour Map_March 2015.mxd

# Figure 2-8A

## *LF002 Groundwater Elevation Contour Map - (March 2015)*

### Fairchild AFB, WA




*Map Projection: NAD 1983 UTM Zone 11N, Meters*
*Basemap: ESRI World Imagery WMS*

0 700 1,400 Feet
0 200 400 Meters

- Extraction Well
- Monitoring Well
- Remediation Well
- Residential Well
- Railroad
- Groundwater Elevation Contour Line - (ft amsl) (March 2015)
- Groundwater Flow Direction
- Basalt A Extent Line
- Craig Road Landfill (LF002) Site Boundary

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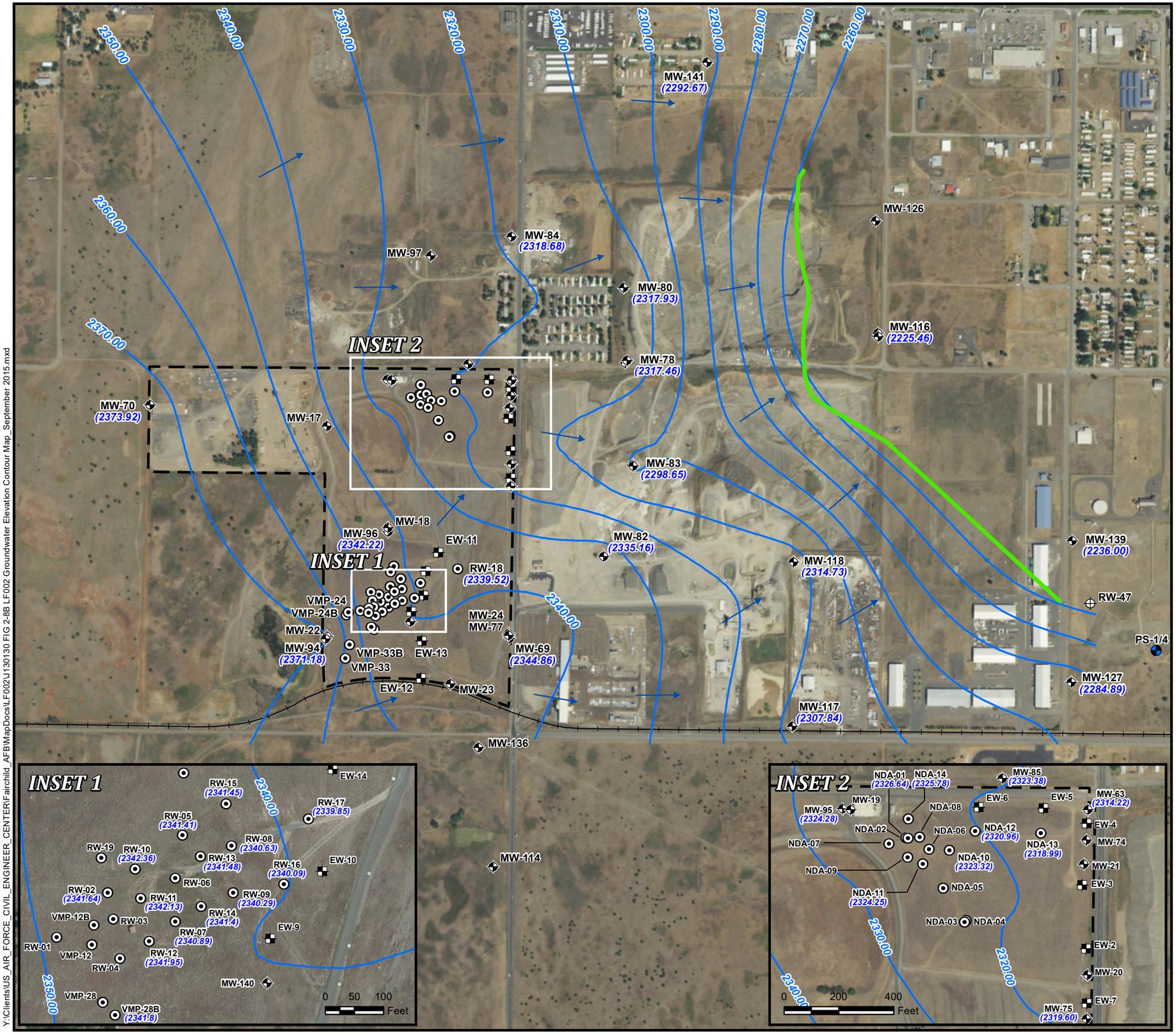
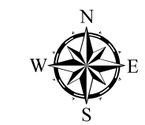



# Figure 2-8B

## *LF002 Groundwater Elevation Contour Map - (September 2015)*

### Fairchild AFB, WA




*Map Projection: NAD 1983 UTM Zone 11N, Meters*
*Basemap: ESRI World Imagery WMS*

0 700 1,400 Feet
0 200 400 Meters

- Extraction Well
- Monitoring Well
- Remediation Well
- Residential Well
- Railroad
- Groundwater Elevation Contour Line - (ft amsl) (September 2015)
- Groundwater Flow Direction
- Basalt A Extent Line
- Craig Road Landfill (LF002) Site Boundary

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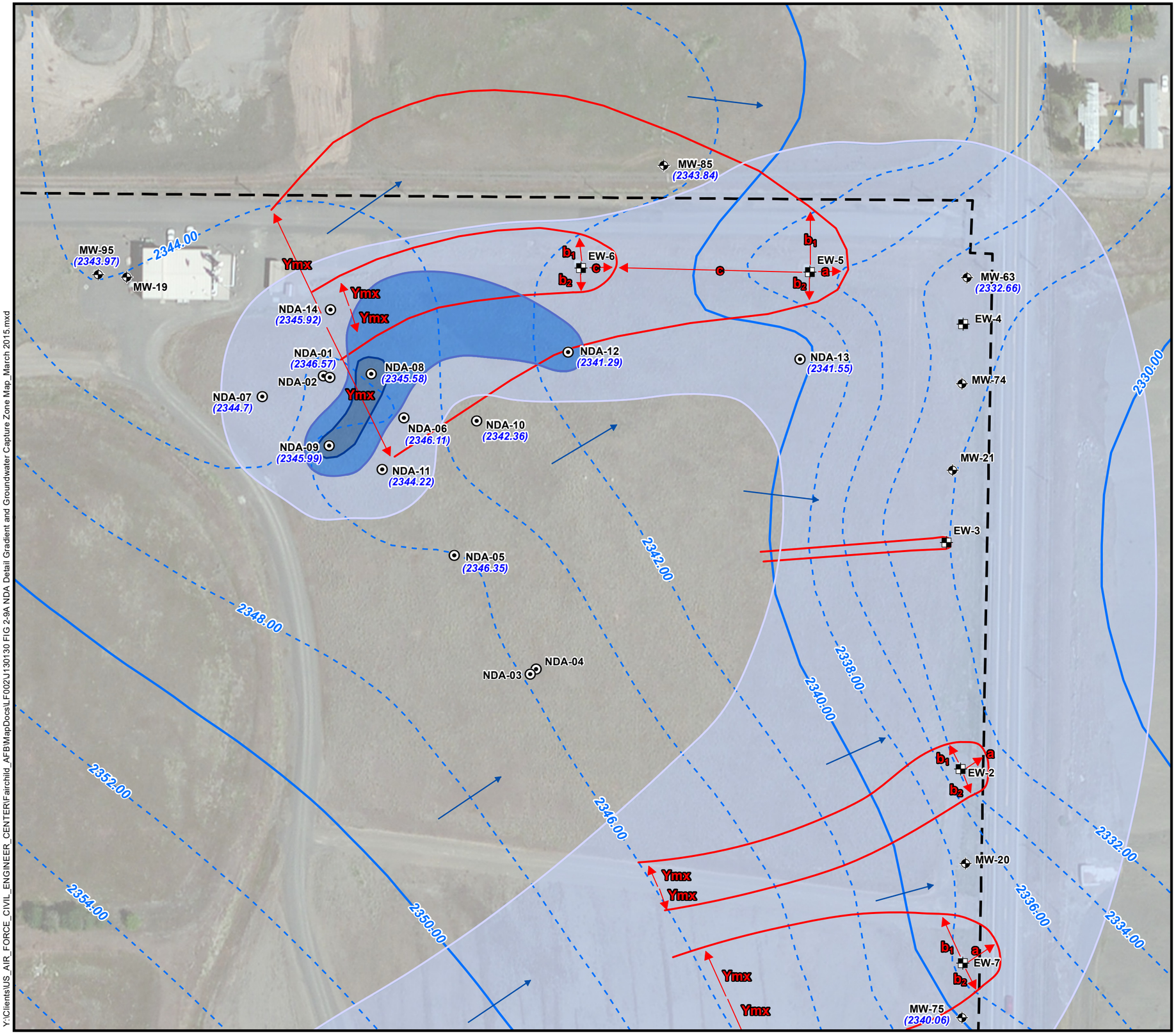
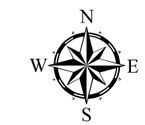



# Figure 2-9A

## *NDA Detail Gradient and Groundwater Capture Zone Map (March 2015)*

### Fairchild AFB, WA




*Map Projection: NAD 1983 UTM Zone 11N, Meters*
*Basemap: ESRI World Imagery WMS*

0 100 200 Feet
0 30 60 Meters

- Extraction Well
- Monitoring Well
- Remediation Well
- 10ft Groundwater Elevation Contour Line (ft amsl; March 2015)
- 2ft Groundwater Elevation Contour Line (ft amsl; March 2015)
- Groundwater Flow Direction
- Extraction Well Groundwater Divide
- 5 µg/L TCE Plume Contour
- 50 µg/L TCE Plume Contour
- 100 µg/L TCE Plume Contour
- Craig Road Landfill (LF002) Site Boundary

**NOTES:**

Groundwater Capture Zone Model Results (see Table 2-10 for data)

- a - Stagnation Point
- $b_1$ - North Lateral Divide (X=0)
- $b_2$ - South Lateral Divide (X=0)
- c - Pumping Well Divide
- Ymx - Max Flow Zone Width

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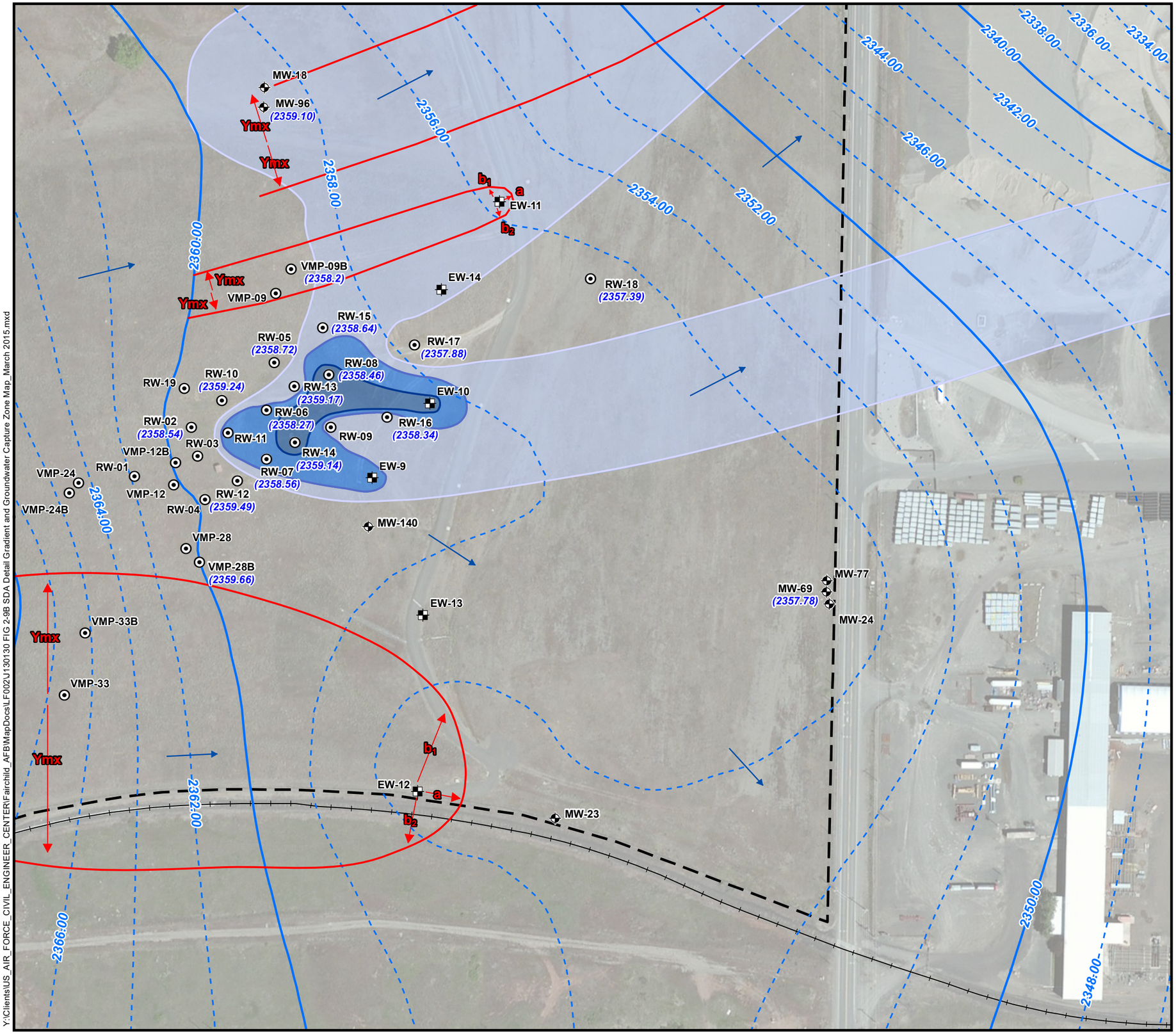
Y:\Clients\US_AIR_FORCE_CIVIL_ENGINEER_CENTER\Fairchild_AFB\MapDocs\LF002\J130130 FIG 2-9A NDA Detail Gradient and Groundwater Capture Zone Map_March 2015.mxd

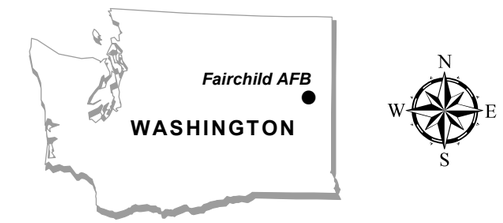



Y:\Clients\US_AIR_FORCE_CIVIL_ENGINEER_CENTER\Fairchild_AFB\MapDocs\LF002\J130130 FIG 2-9B SDA Detail Gradient and Groundwater Capture Zone Map_March 2015.mxd

# Figure 2-9B

## *SDA Detail Gradient and Groundwater Capture Zone Map (March 2015)*

### Fairchild AFB, WA




*Map Projection: NAD 1983 UTM Zone 11N, Meters*
*Basemap: ESRI World Imagery WMS*

0 150 300 Feet

0 50 100 Meters

- Extraction Well
- Monitoring Well
- Remediation Well
- 10ft Groundwater Elevation Contour Line (ft amsl; March 2015)
- 2ft Groundwater Elevation Contour Line (ft amsl; March 2015)
- Groundwater Flow Direction
- Extraction Well Groundwater Divide
- 5 µg/L TCE Plume Contour
- 50 µg/L TCE Plume Contour
- 100 µg/L TCE Plume Contour
- Craig Road Landfill (LF002) Site Boundary

**NOTES:**

Groundwater Capture Zone Model Results (see Table 2-10 for data)

- a - Stagnation Point
- $b_1$ - North Lateral Divide (X=0)
- $b_2$ - South Lateral Divide (X=0)
- c - Pumping Well Divide
- Ymx - Max Flow Zone Width

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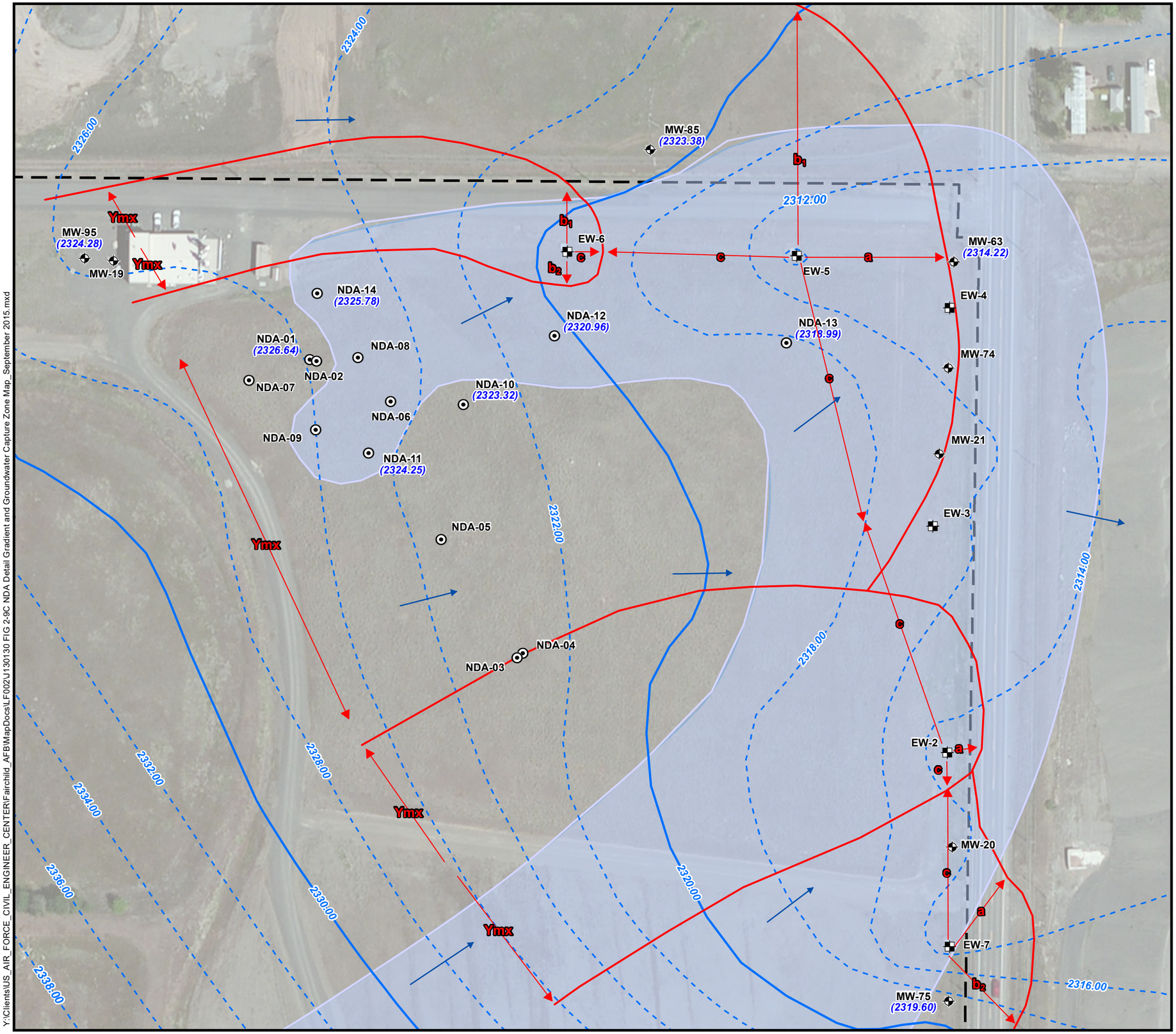
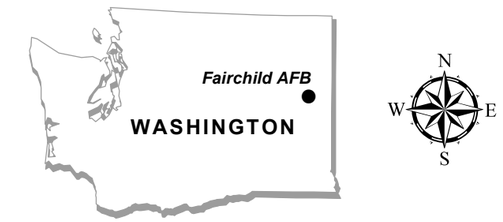



# Figure 2-9C

## *NDA Detail Gradient and Groundwater Capture Zone Map (September 2015)*

### Fairchild AFB, WA




*Map Projection: NAD 1983 UTM Zone 11N, Meters*
*Basemap: ESRI World Imagery WMS*

0 100 200 Feet
0 30 60 Meters

- Extraction Well
- Monitoring Well
- Remediation Well
- 10ft Groundwater Elevation Contour Line (ft amsl; March 2015)
- 2ft Groundwater Elevation Contour Line (ft amsl; March 2015)
- Groundwater Flow Direction
- Extraction Well Groundwater Divide
- 5 µg/L TCE Plume Contour
- 50 µg/L TCE Plume Contour
- 100 µg/L TCE Plume Contour
- Craig Road Landfill (LF002) Site Boundary

**NOTES:**

Groundwater Capture Zone Model Results (see Table 2-10 for data)

- a - Stagnation Point
- $b_1$ - North Lateral Divide (X=0)
- $b_2$ - South Lateral Divide (X=0)
- c - Pumping Well Divide
- Ymx - Max Flow Zone Width

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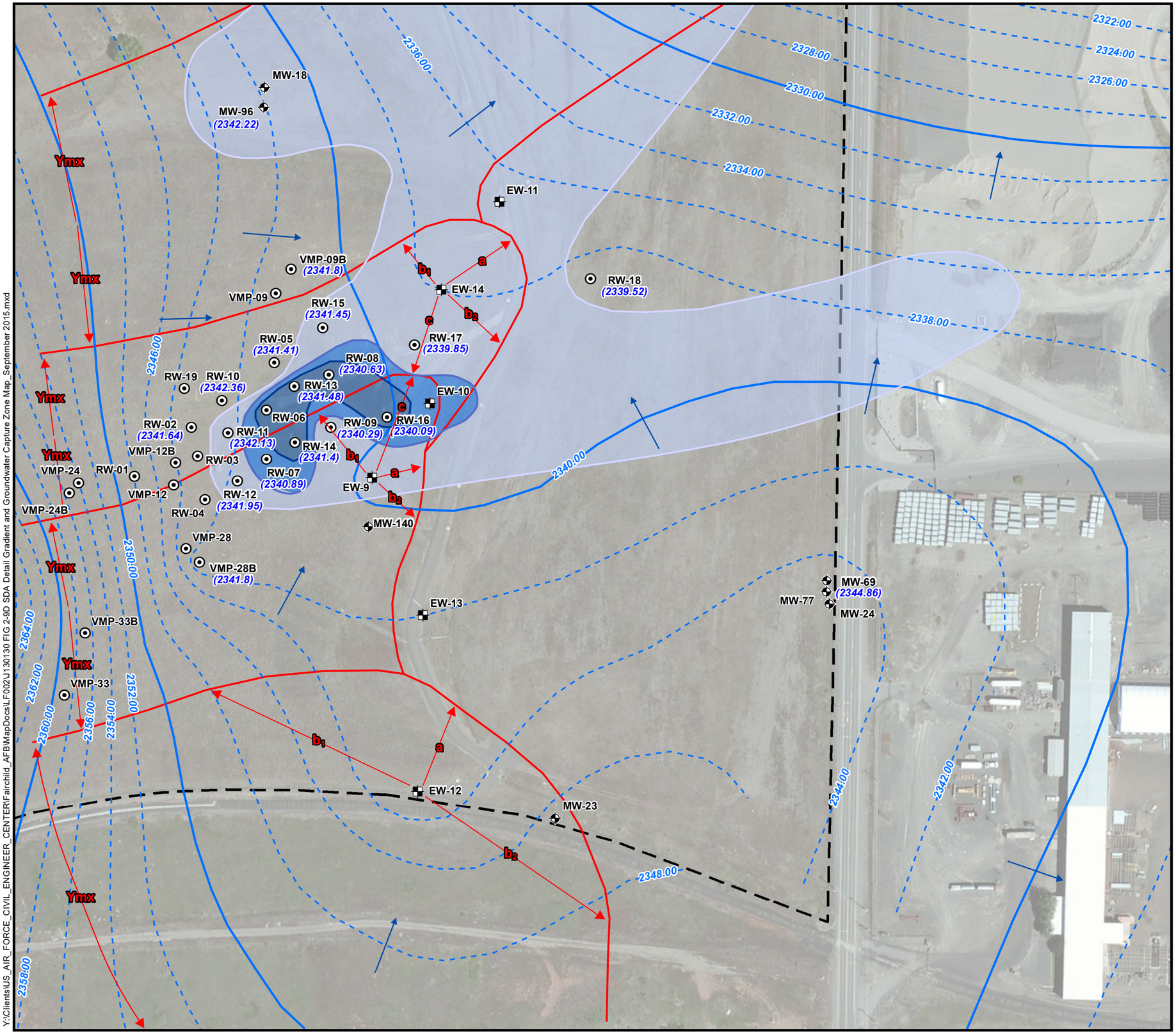
Y:\Clients\US_AIR_FORCE_CIVIL_ENGINEER_CENTER\Fairchild_AFB\MapDocs\LF002\J130130 FIG 2-9C NDA Detail Gradient and Groundwater Capture Zone Map_September 2015.mxd




Y:\Clients\US_AIR_FORCE_CIVIL_ENGINEER_CENTER\Fairchild_AFB\MapDocs\LF002\J130130 FIG 2-9D SDA Detail Gradient and Groundwater Capture Zone Map_September 2015.mxd

# Figure 2-9D

## *SDA Detail Gradient and Groundwater Capture Zone Map (September 2015)*

### Fairchild AFB, WA

*Map Projection: NAD 1983 UTM Zone 11N, Meters*
*Basemap: ESRI World Imagery WMS*

0 150 300 Feet

0 50 100 Meters

- Extraction Well
- Monitoring Well
- Remediation Well
- 10ft Groundwater Elevation Contour Line (ft amsl; March 2015)
- 2ft Groundwater Elevation Contour Line (ft amsl; March 2015)
- Groundwater Flow Direction
- Extraction Well Groundwater Divide
- 5 µg/L TCE Plume Contour
- 50 µg/L TCE Plume Contour
- 100 µg/L TCE Plume Contour
- Craig Road Landfill (LF002) Site Boundary

**NOTES:**

Groundwater Capture Zone Model Results (see Table 2-10 for data)

- a - Stagnation Point
- $b_1$ - North Lateral Divide (X=0)
- $b_2$ - South Lateral Divide (X=0)
- c - Pumping Well Divide
- Ymx - Max Flow Zone Width

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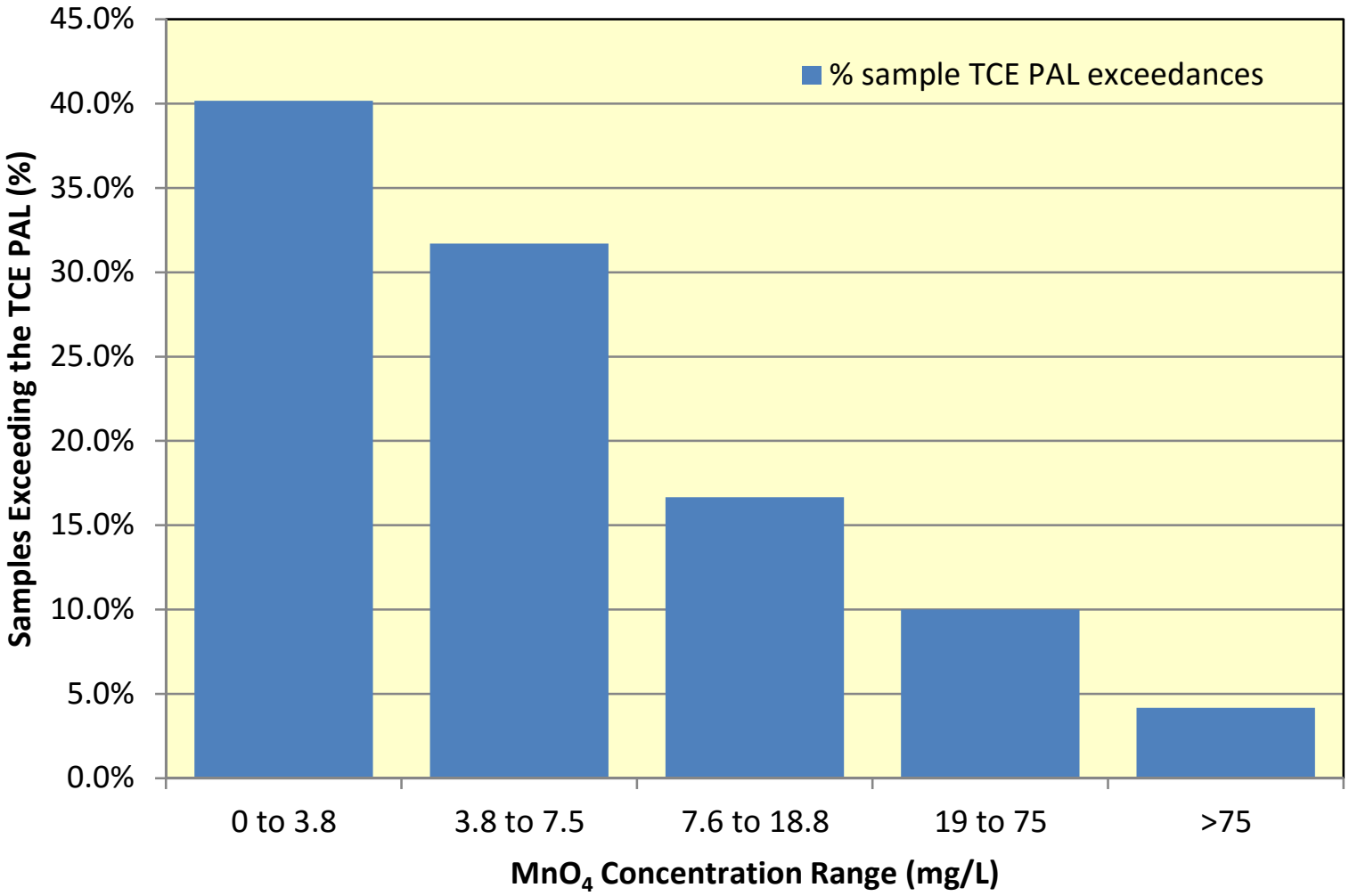
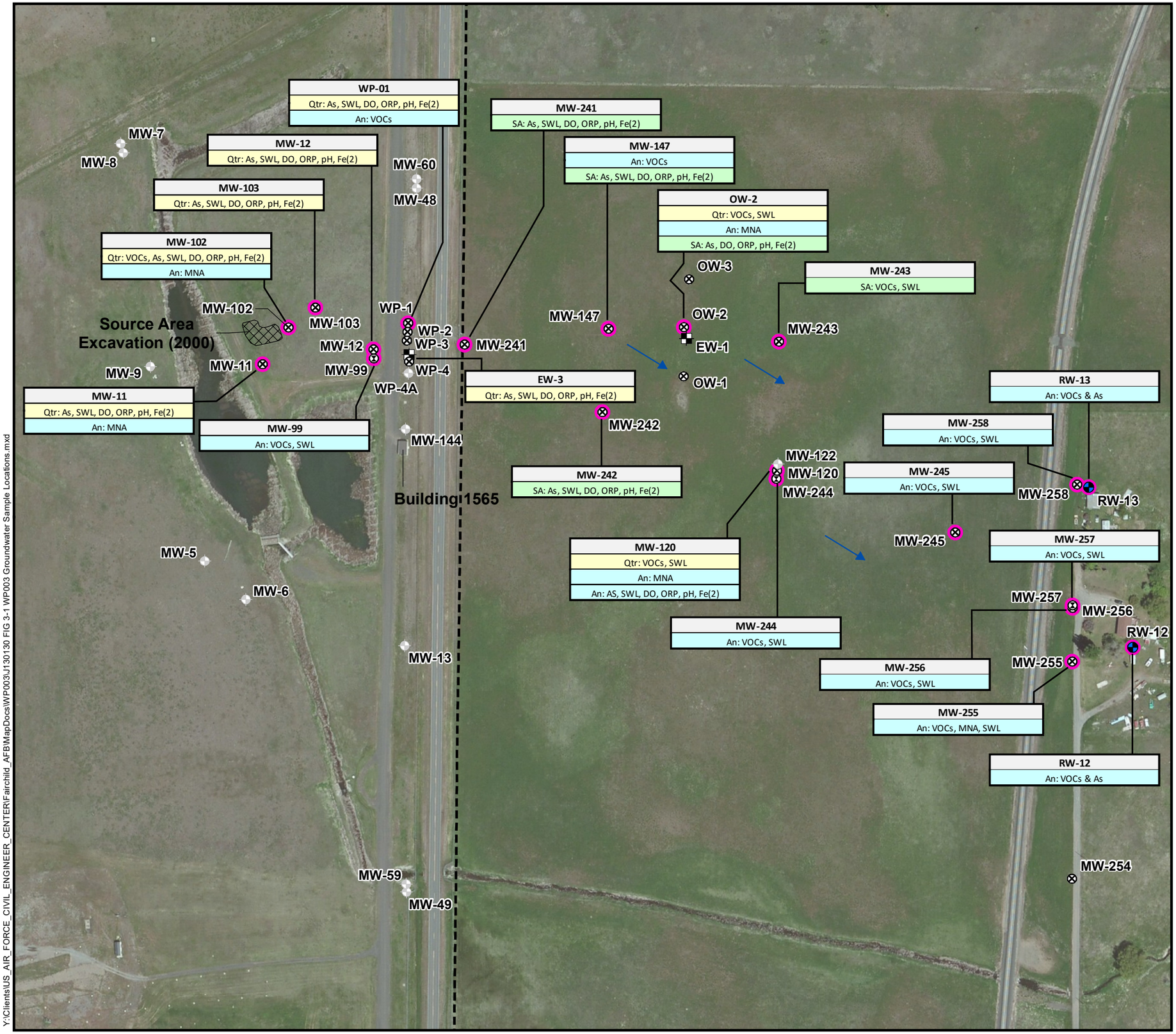
# Figure 2-10
# TCE PAL exceedances per $MnO_4$ ranges

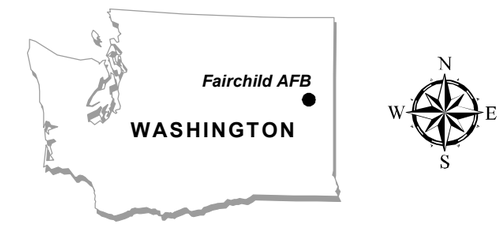





# Figure 3-1

## *WP003 (WW-1) Groundwater Sample Locations*

### Fairchild AFB, WA




*Map Projection: NAD 1983 UTM Zone 11N, Meters*
*Basemap: ESRI World Imagery WMS*

0 200 400 Feet
0 60 120 Meters

- Alluvial Aquifer Monitoring Well
- Basalt A Monitoring Well
- Extraction Well
- Monitoring Well (Abandoned)
- Residential Well
- Sampled Existing Well (Proposed)
- Groundwater Flow Direction (Approximate)
- Installation Boundary

**NOTES:**
1) Qtr - Quarterly (March, June, September, December)
2) An - Annual (March)
3) SA - Semiannual (March and September)

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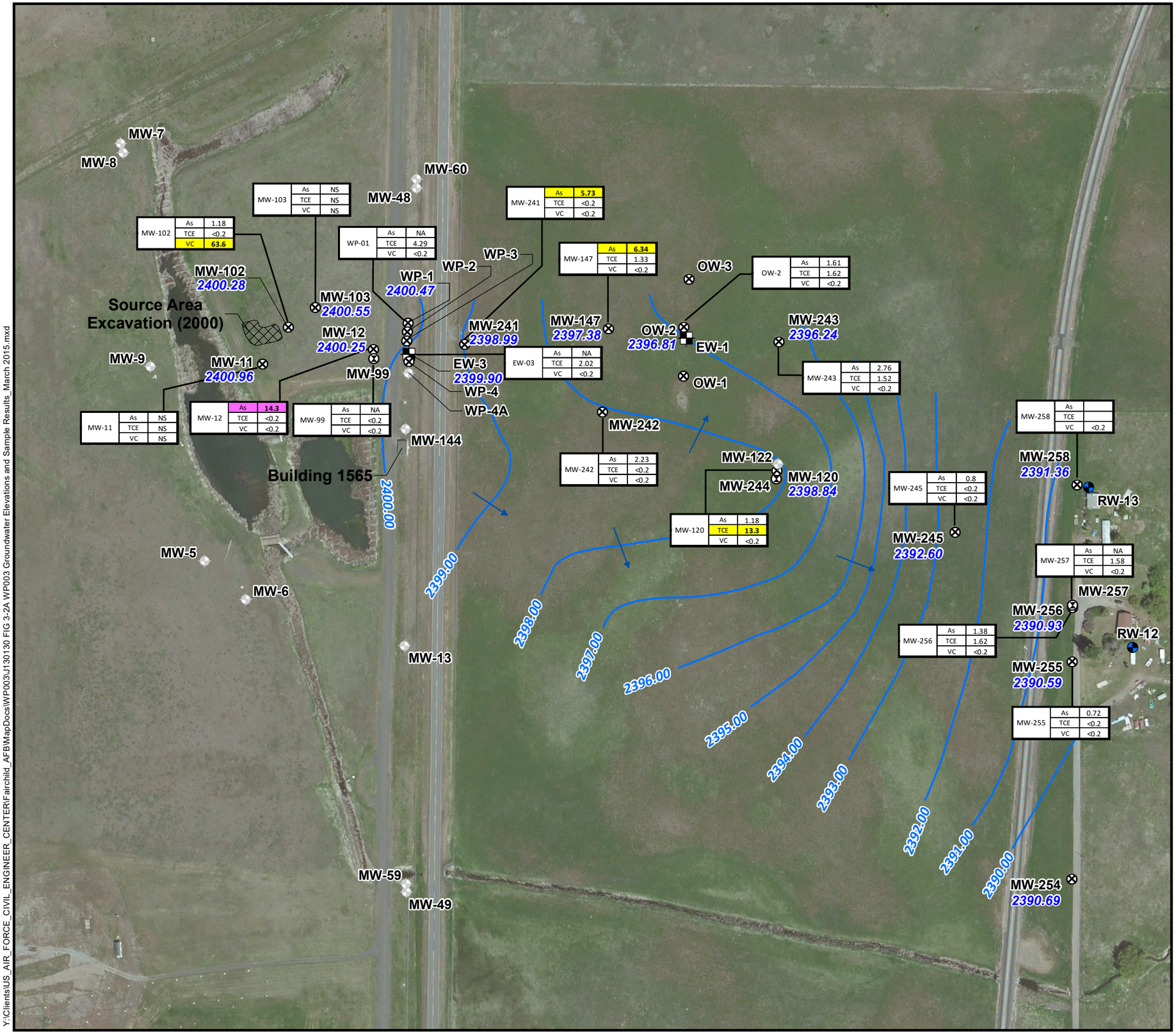
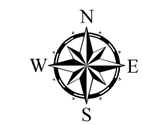
Y:\Clients\US_AIR_FORCE_CIVIL_ENGINEER_CENTER\Fairchild_AFB\MapDocs\WP003\J130130 FIG 3-1 WP003 Groundwater Sample Locations.mxd




# Figure 3-2A

## *WP003 Groundwater Elevations and Sample Results - (March 2015)*

### Fairchild AFB, WA




*Map Projection: NAD 1983 UTM Zone 11N, Meters*
*Basemap: ESRI World Imagery WMS*

0 200 400 Feet
0 60 120 Meters

- Alluvial Aquifer Monitoring Well
- Basalt A Monitoring Well
- Extraction Well
- Monitoring Well (Abandoned)
- Residential Well
- Groundwater Elevation Contour Line - (ft amsl) (March 2015)
- Groundwater Flow Direction
- Installation Boundary

| Well ID | Analyte | Result | PAL | Background |
|---|---|---|---|---|
| | As | µg/L | 5 µg/L | 10.7 µg/L |
| | TCE | µg/L | 5 µg/L | ------ |
| | VC | µg/L | 0.2 µg/L | ------ |

NOTES:

Yellow shading - Results exceed PAL
Pink shading - Results exceed background
As - Arsenic
TCE - Trichloroethylene
VC - Vinyl Chloride
NS - Not Sampled

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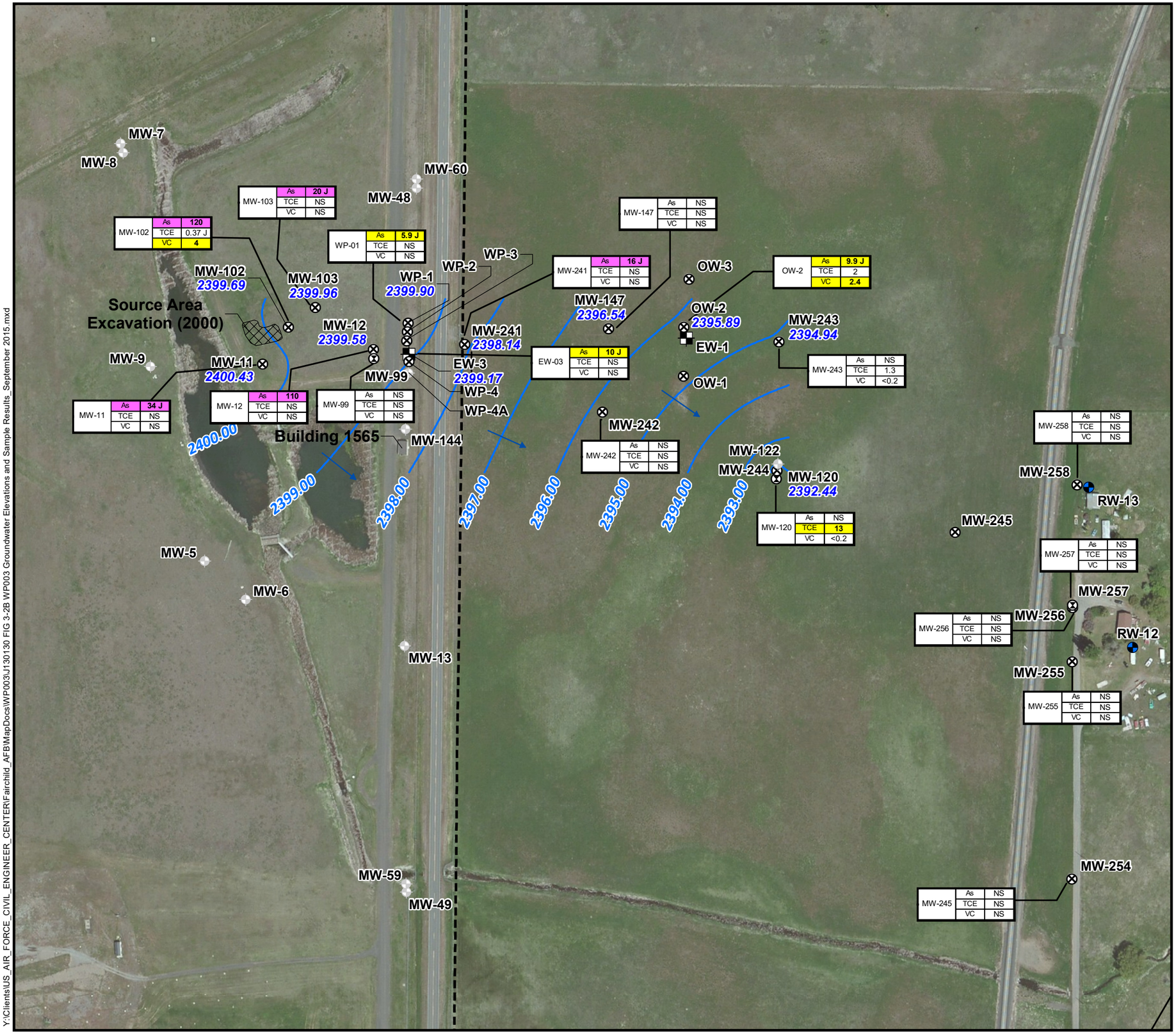
Drawn By: SG | Date Drawn/Revised: 7/21/2016 | Project No. J130130

Y:\Clients\US_AIR_FORCE_CIVIL_ENGINEER_CENTER\Fairchild_AFB\MapDocs\WP003\J130130 FIG 3-2A WP003 Groundwater Elevations and Sample Results_March 2015.mxd

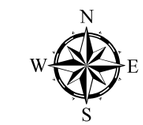



Y:\Clients\US_AIR_FORCE_CIVIL_ENGINEER_CENTER\Fairchild_AFB\MapDocs\WP003\J130130 FIG 3-2B WP003 Groundwater Elevations and Sample Results_September 2015.mxd

# Figure 3-2B

## *WP003 Groundwater Elevations and Sample Results (Sept 2015)*

### Fairchild AFB, WA




*Map Projection: NAD 1983 UTM Zone 11N, Meters*
*Basemap: ESRI World Imagery WMS*

0 200 400 Feet
0 60 120 Meters

- Alluvial Aquifer Monitoring Well
- Basalt A Monitoring Well
- Extraction Well
- Monitoring Well (Abandoned)
- Residential Well
- Groundwater Elevation Contour Line - (ft amsl) (September 2015)
- Groundwater Flow Direction
- Installation Boundary

| | Analyte | Result | PAL | Background |
|---|---|---|---|---|
| Well ID | As | µg/L | 5 µg/L | 10.7 µg/L |
| | TCE | µg/L | 5 µg/L | ------ |
| | VC | µg/L | 0.2 µg/L | ------ |

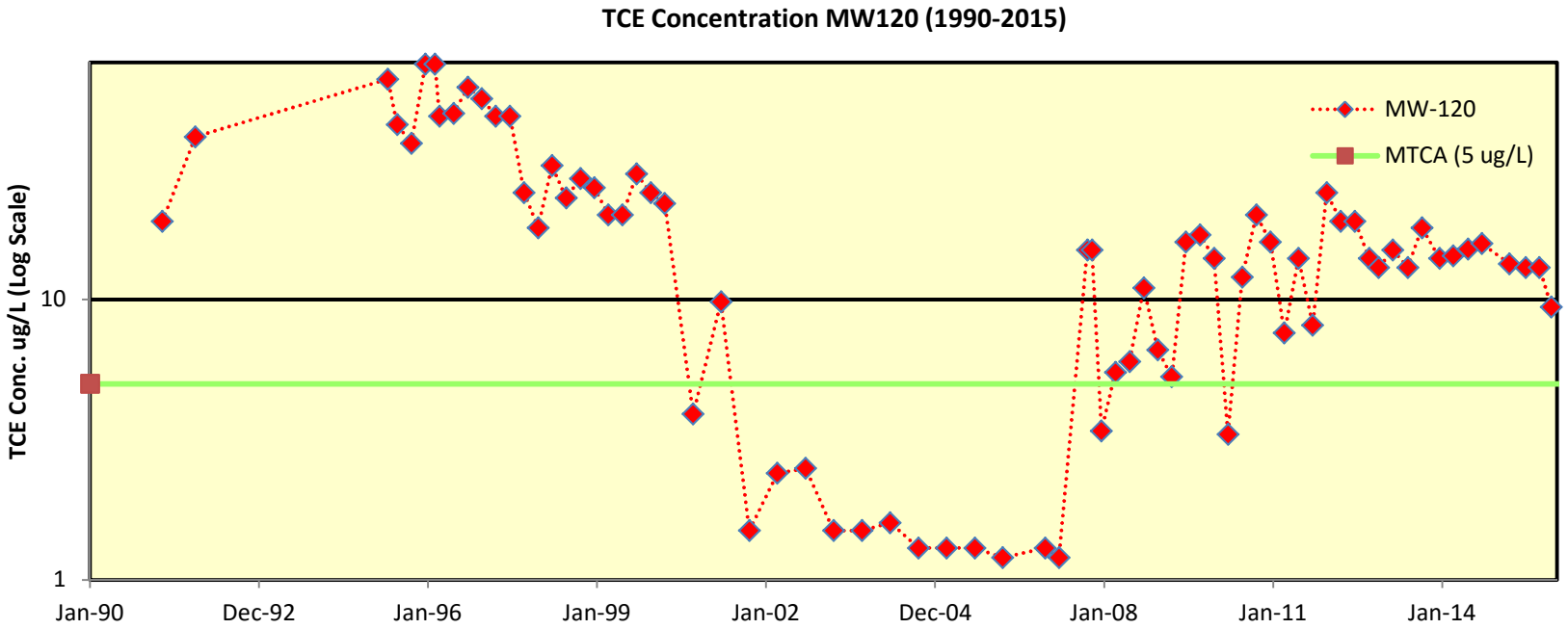
NOTES:

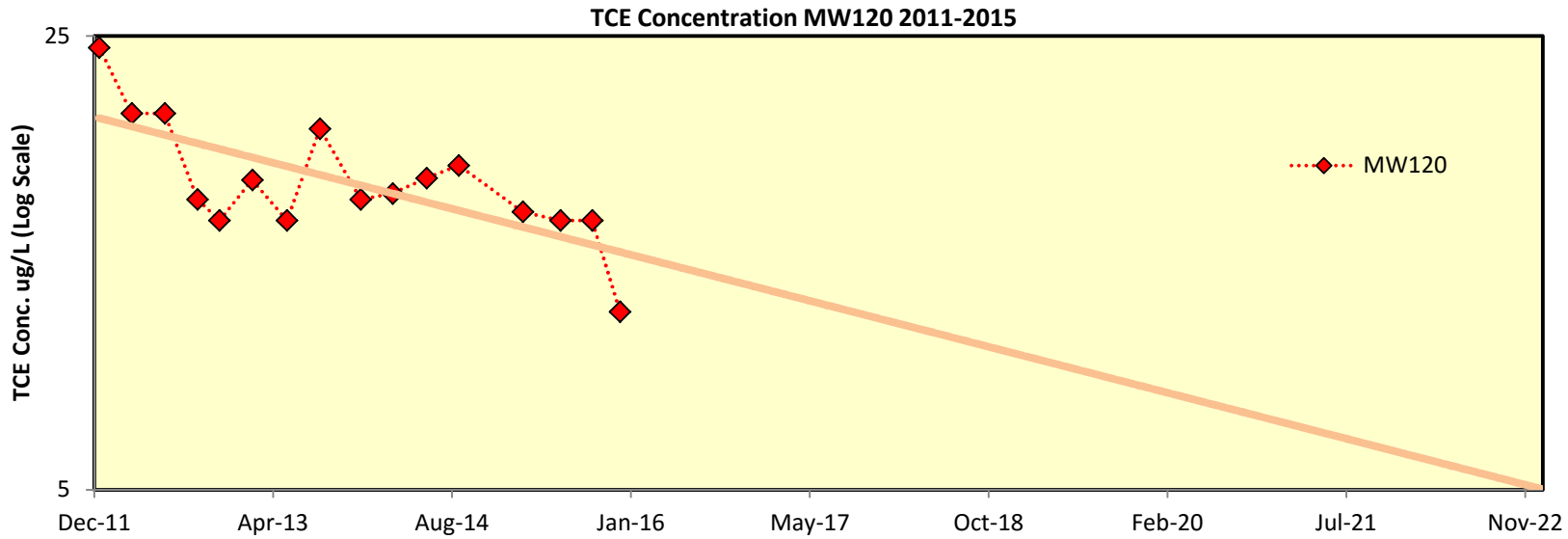
Yellow shading - Results exceed PAL
Pink shading - Results exceed background
As - Arsenic
TCE - Trichloroethylene
VC - Vinyl Chloride
NS - Not Sampled

Bay West
Customer-Focused Environmental & Industrial Solutions

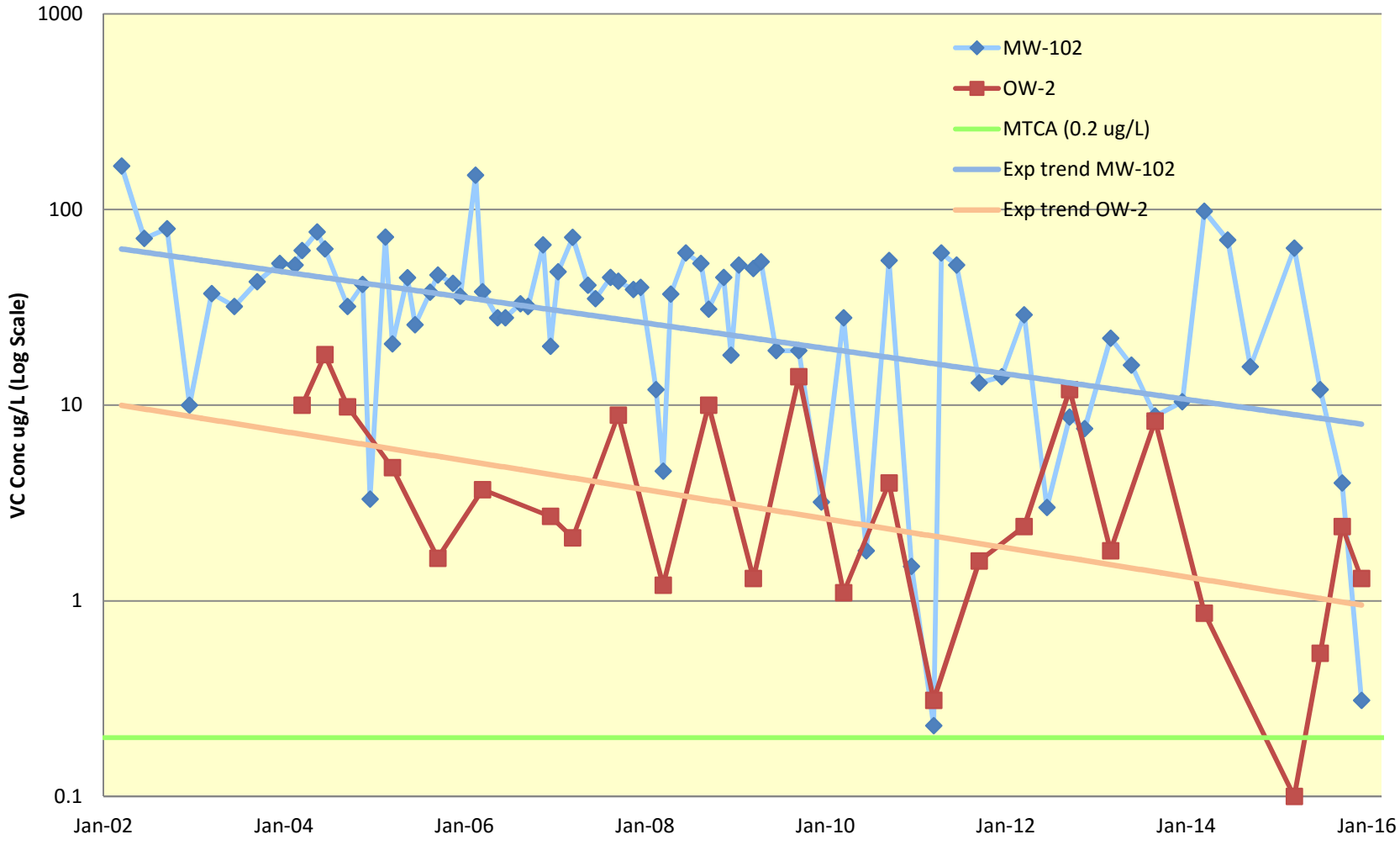
Drawn By: SG Date Drawn/Revised: 7/21/2016 Project No. J130130

# Figure 3-3A WP003 TCE Time Series Graphs

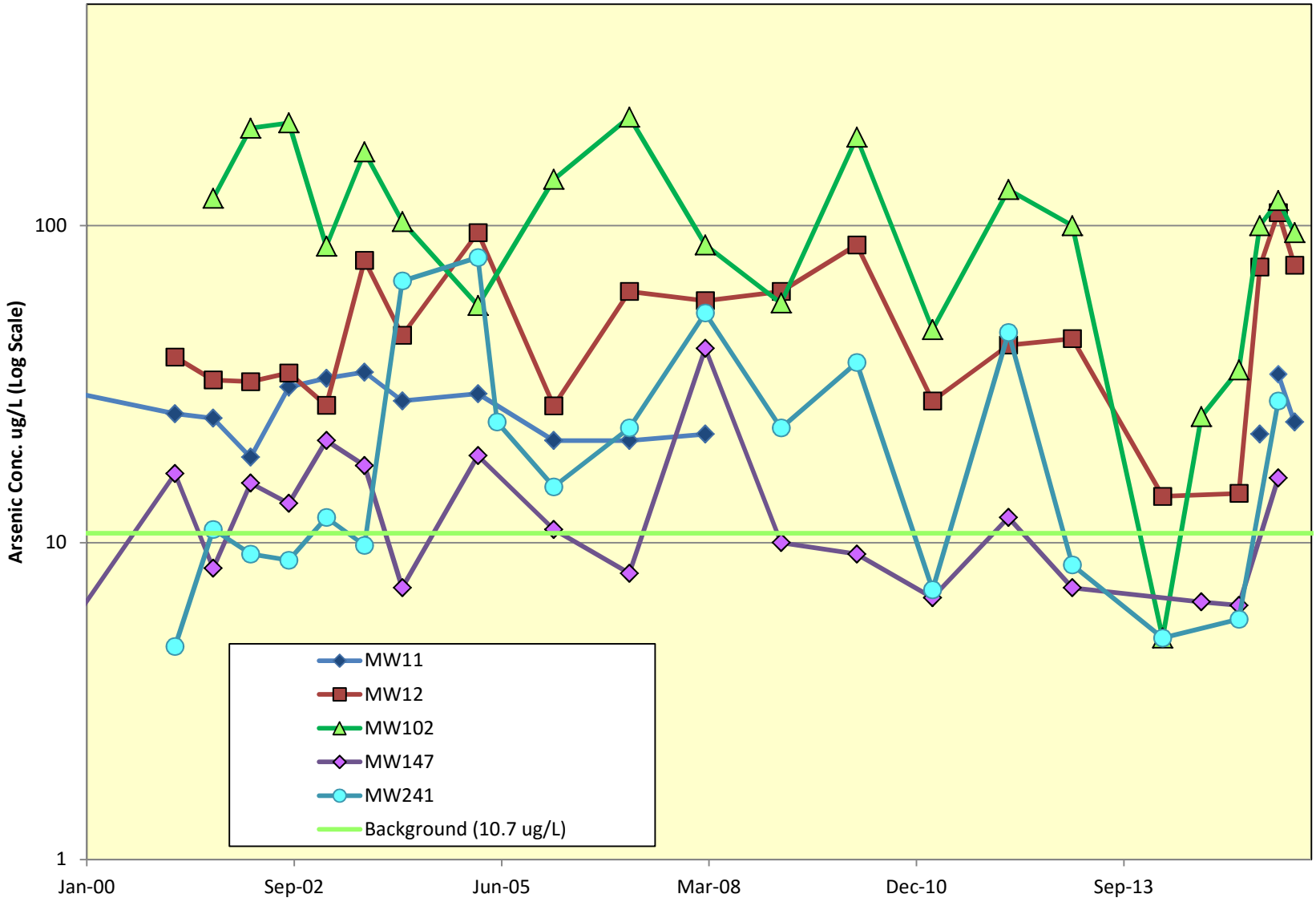


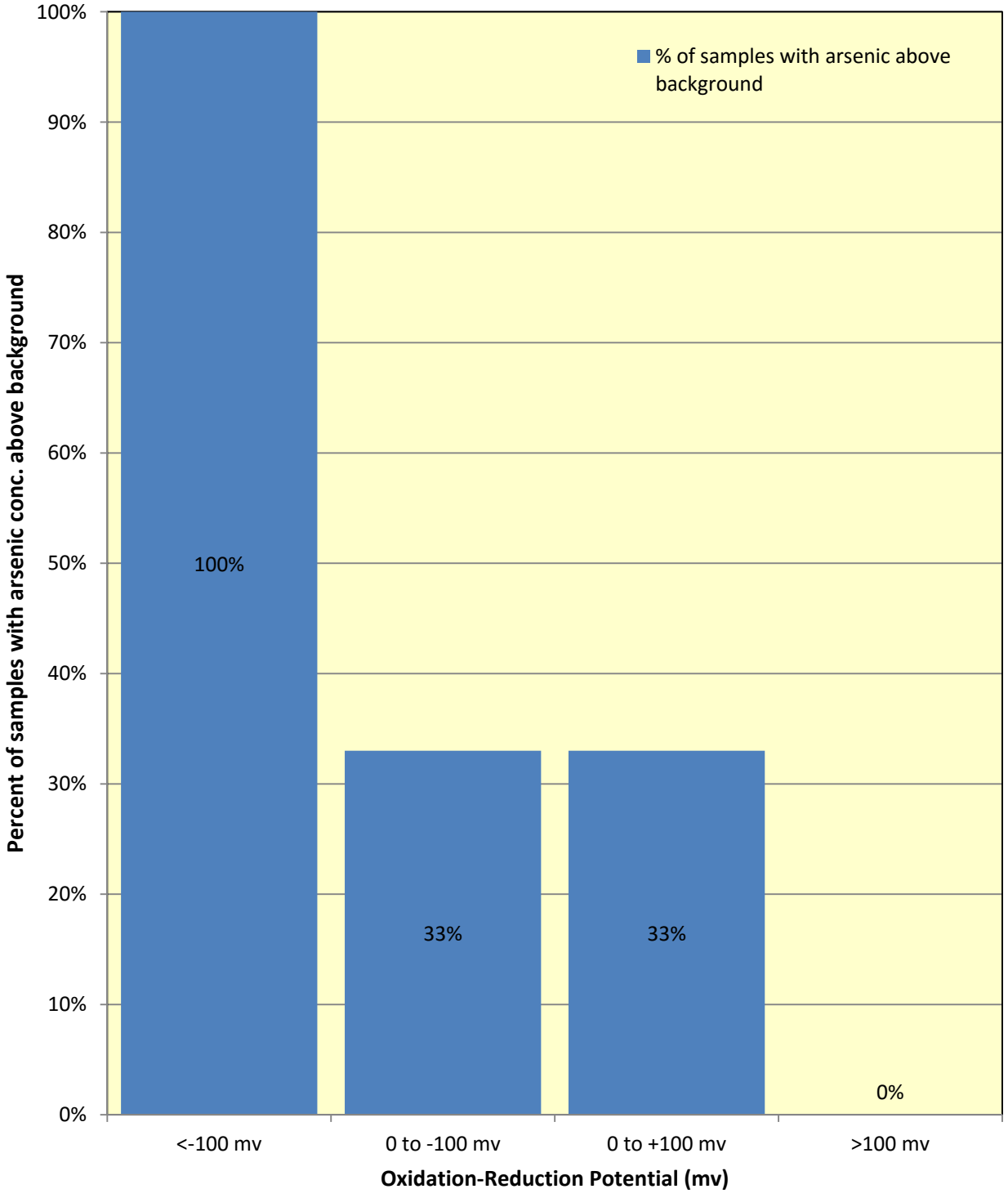
# Figure 3-3B
## WP003 VC Concentration Time Series Graphs

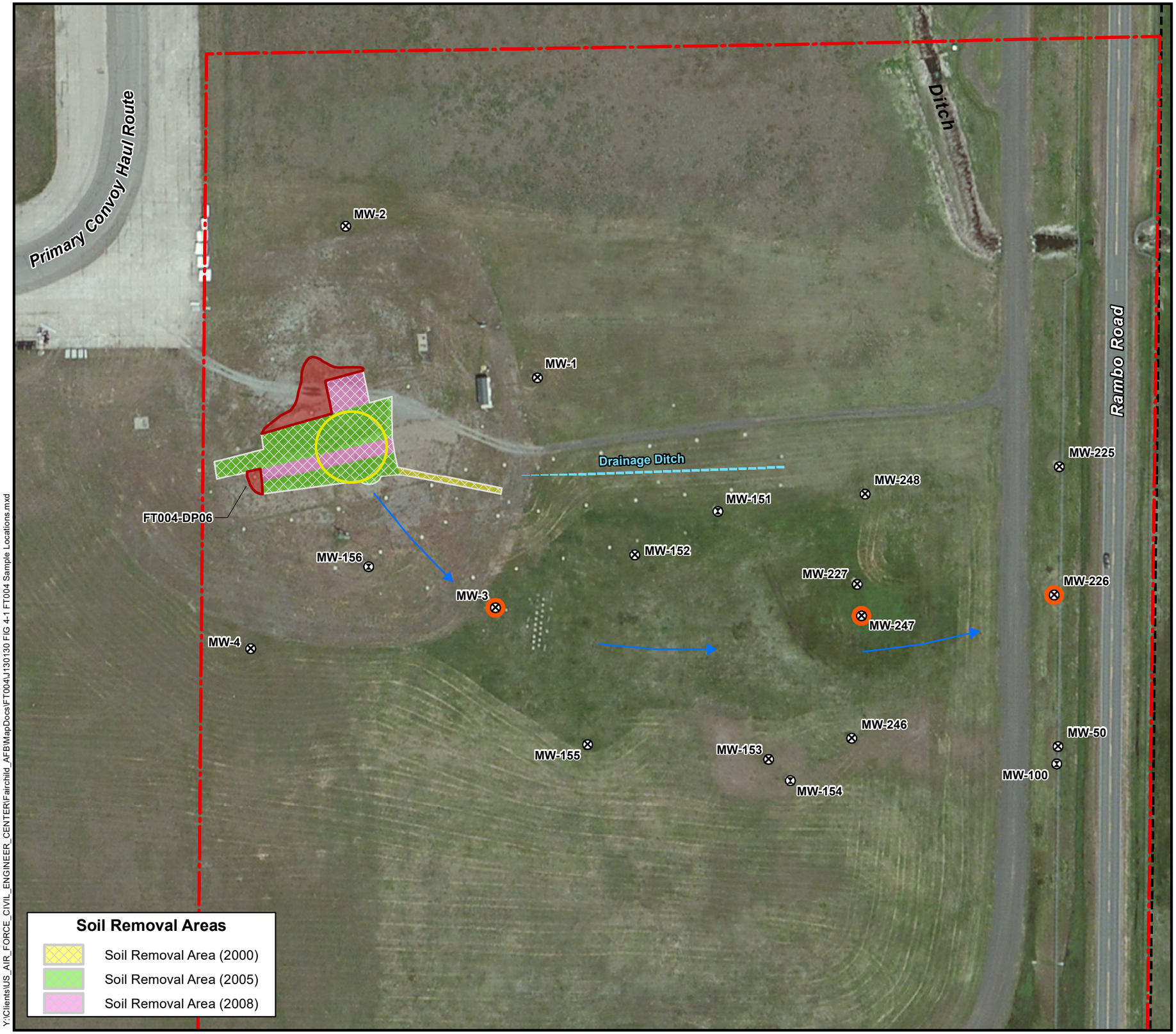


# Figure 3-3C
## Arsenic Concentration Time Series Graph



# Figure 3-4
# Percent of Samples with Arsenic Concentrations Above Background

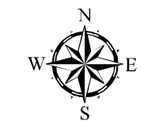





# Figure 4-1

## *Fire Training Area (FT004) Sample Locations*

### Fairchild AFB, WA




*Map Projection: NAD 1983 UTM Zone 11N, Meters*
*Basemap: ESRI World Imagery WMS*

0 100 200 Feet

0 30 60 Meters

- Alluvial Aquifer Monitoring Well
- Basalt A Monitoring Well
- Sampling Program Wells Quarterly for DRO/MRO
- Groundwater Flow Direction
- Drainage Ditch
- Former Burn Pit
- Installation Boundary
- Inferred Extent Of TPH-D or TPH-G Soil Concentrations Above The CULs
- Fire Training Area (FT004) Site Boundary

Bay West
Customer-Focused Environmental & Industrial Solutions

Drawn By: SG | Date Drawn/Revised: 4/26/2016 | Project No. J130130

Y:\Clients\US_AIR_FORCE_CIVIL_ENGINEER_CENTER\Fairchild_AFB\MapDocs\FT004\J130130 FIG 4-1 FT004 Sample Locations.mxd

Y:\Clients\US_AIR_FORCE_CIVIL_ENGINEER_CENTER\Fairchild_AFB\MapDocs\FT004\J130130 FIG 4-2A FT004 Groundwater Elevation and Sample Results Map_March 2015.mxd

# Figure 4-2A

## *FT004 Groundwater Elevation and Sample Results Map (March 2015)*

### Fairchild AFB, WA

*Map Projection: NAD 1983 UTM Zone 11N, Meters*
*Basemap: ESRI World Imagery WMS*

0 100 200 Feet

0 30 60 Meters

- Alluvial Aquifer Monitoring Well
- Basalt A Monitoring Well
- Groundwater Elevation Contour Line - (ft amsl) (Mar 2015)
- Groundwater Flow Direction
- Installation Boundary

Bay West
Customer-Focused Environmental & Industrial Solutions

Drawn By: SG | Date Drawn/Revised: 4/26/2016 | Project No. J130130

Y:\Clients\US_AIR_FORCE_CIVIL_ENGINEER_CENTER\Fairchild_AFB\MapDocs\FT004\J130130 FIG 4-2B FT004 Groundwater Elevations and Sample Results_September 2015.mxd

# Figure 4-2B

## *FT004 Groundwater Elevations and Sample Results (September 2015)*

### Fairchild AFB, WA

*Map Projection: NAD 1983 UTM Zone 11N, Meters*
*Basemap: ESRI World Imagery WMS*

0 100 200 Feet

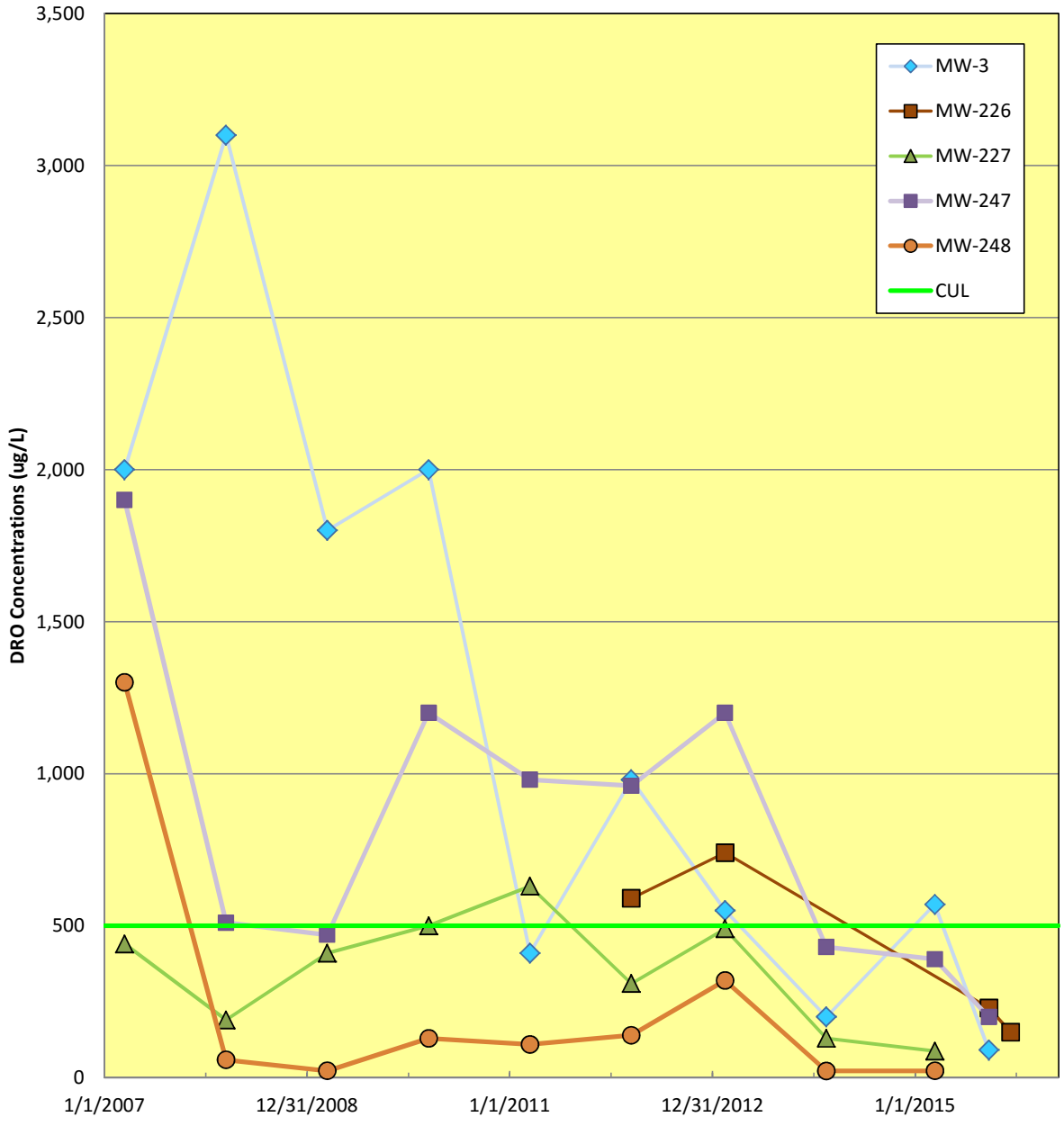
0 30 60 Meters

- Alluvial Aquifer Monitoring Well
- Basalt A Monitoring Well
- Groundwater Elevation Contour Line - (ft amsl) (September 2015)
- Groundwater Flow Direction
- Installation Boundary

Bay West
Customer-Focused Environmental & Industrial Solutions

Drawn By: SG | Date Drawn/Revised: 4/26/2016 | Project No. J130130

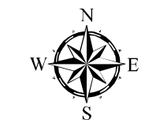
# Figure 4-3
# FT004 DRO Concentration Time Series Graph



# Figure 5-1

## *ST006 RA-O Groundwater Sample Locations*

### Fairchild AFB, WA




*Map Projection: NAD 1983 UTM Zone 11N, Meters*
*Basemap: ESRI World Imagery WMS*

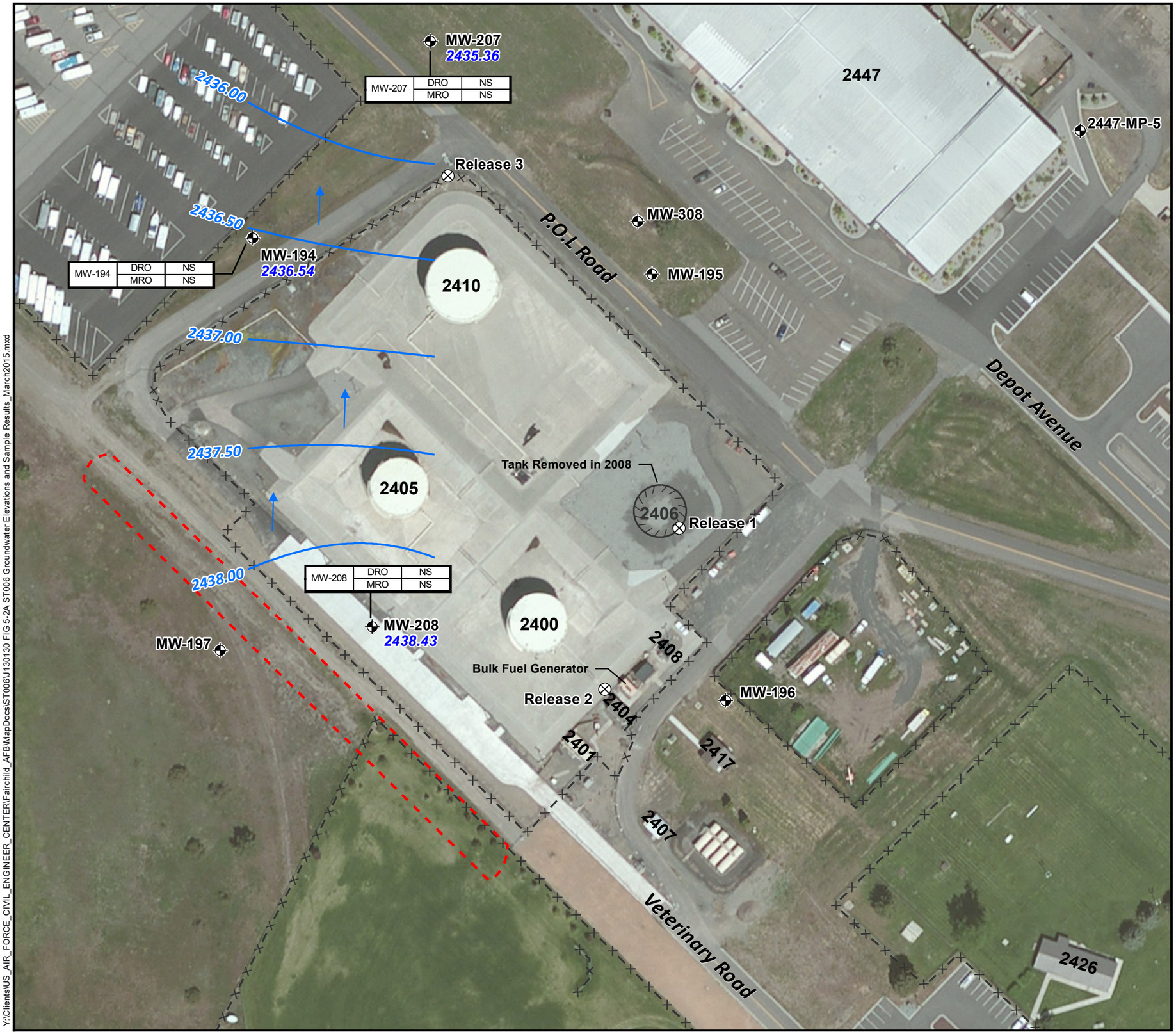
0 100 200 Feet
0 30 60 Meters

- RA-O Groundwater Monitoring Wells Quarterly for DRO/MRO
- Monitoring Well
- Approximate Location of Release
- Fence
- Approximate Area of Soil Contamination (Also Beneath the Concrete Containment Area Below Tanks)
- Former Tank Location

Bay West
Customer-Focused Environmental & Industrial Solutions

Drawn By: SG | Date Drawn/Revised: 4/26/2016 | Project No. J130130

Y:\Clients\US_AIR_FORCE_CIVIL_ENGINEER_CENTER\Fairchild_AFB\MapDocs\ST006\J130130 FIG 5-1 ST006 RA-O Groundwater Sample Locations.mxd




Y:\Clients\US_AIR_FORCE_CIVIL_ENGINEER_CENTER\Fairchild_AFB\MapDocs\ST006\J130130 FIG 5-2A ST006 Groundwater Elevations and Sample Results_March2015.mxd

# Figure 5-2A

## *ST006 Groundwater Elevations and Sample Results (March 2015)*

### Fairchild AFB, WA

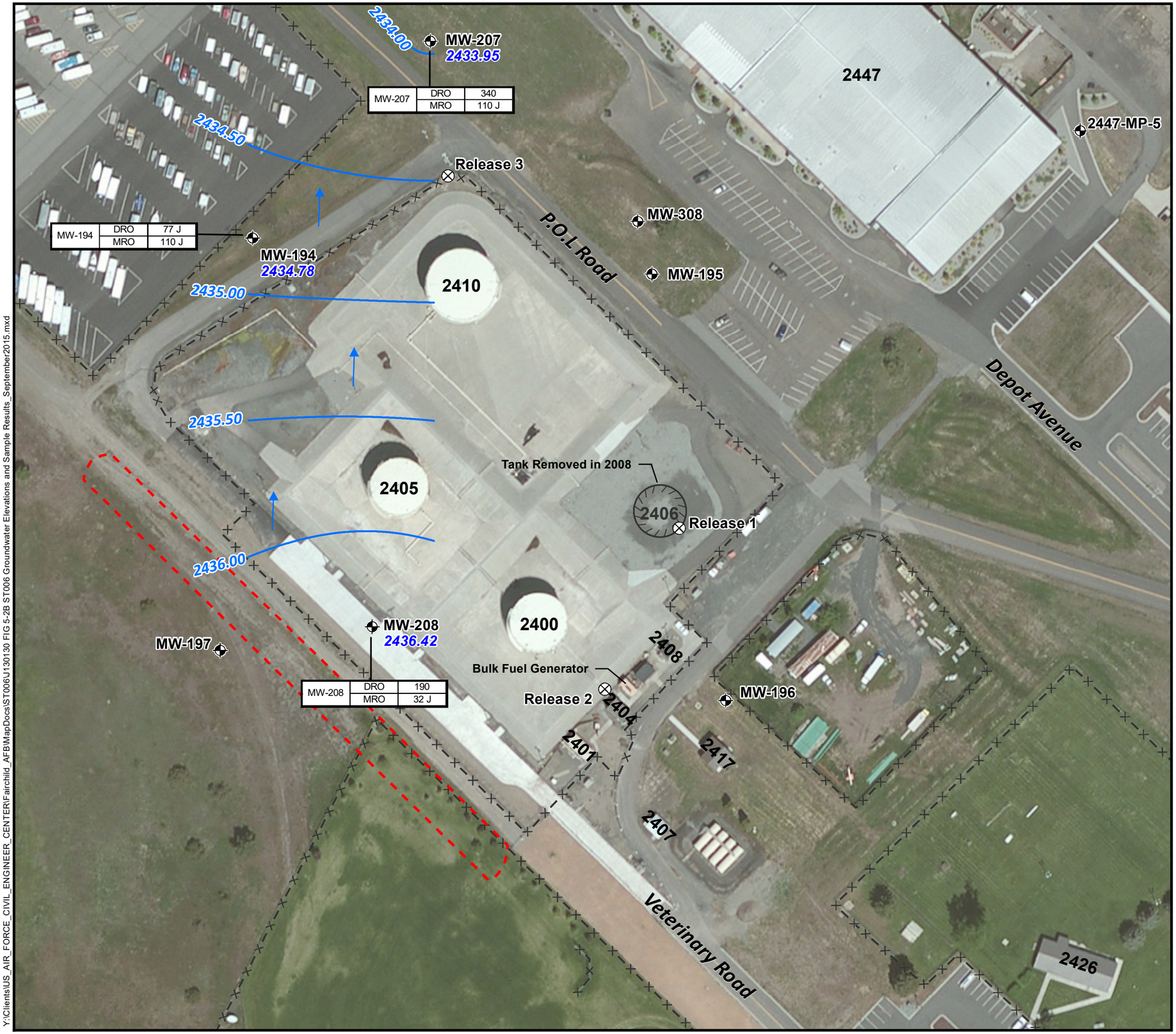
*Map Projection: NAD 1983 UTM Zone 11N, Meters*
*Basemap: ESRI World Imagery WMS*

0 100 200 Feet
0 30 60 Meters

- Monitoring Well
- Approximate Location of Release
- Fence
- Groundwater Elevation Contour Line - (ft amsl) (March 2015)
- Groundwater Flow Direction
- Approximate Area of Soil Contamination (Also Beneath the Concrete Containment Area Below Tanks)
- Former Tank Location

Bay West
Customer-Focused Environmental & Industrial Solutions

Drawn By: SG | Date Drawn/Revised: 4/26/2016 | Project No. J130130

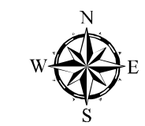



Y:\Clients\US_AIR_FORCE_CIVIL_ENGINEER_CENTER\Fairchild_AFB\MapDocs\ST006\J130130 FIG 5-2B ST006 Groundwater Elevations and Sample Results_September2015.mxd

# Figure 5-2B

## *ST006 Groundwater Elevations and Sample Results (September 2015)*

### Fairchild AFB, WA




*Map Projection: NAD 1983 UTM Zone 11N, Meters*
*Basemap: ESRI World Imagery WMS*

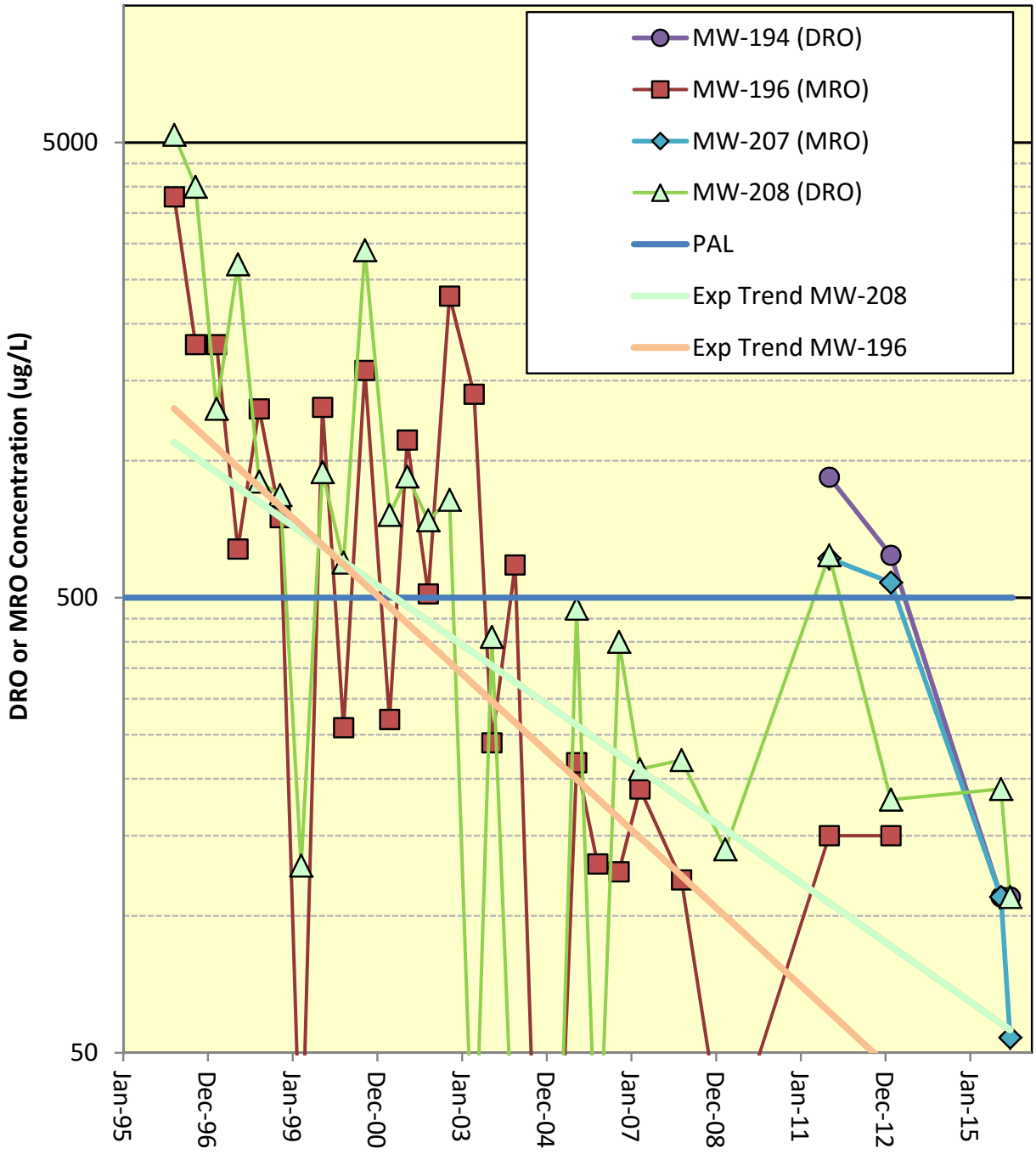
0 100 200 Feet
0 30 60 Meters

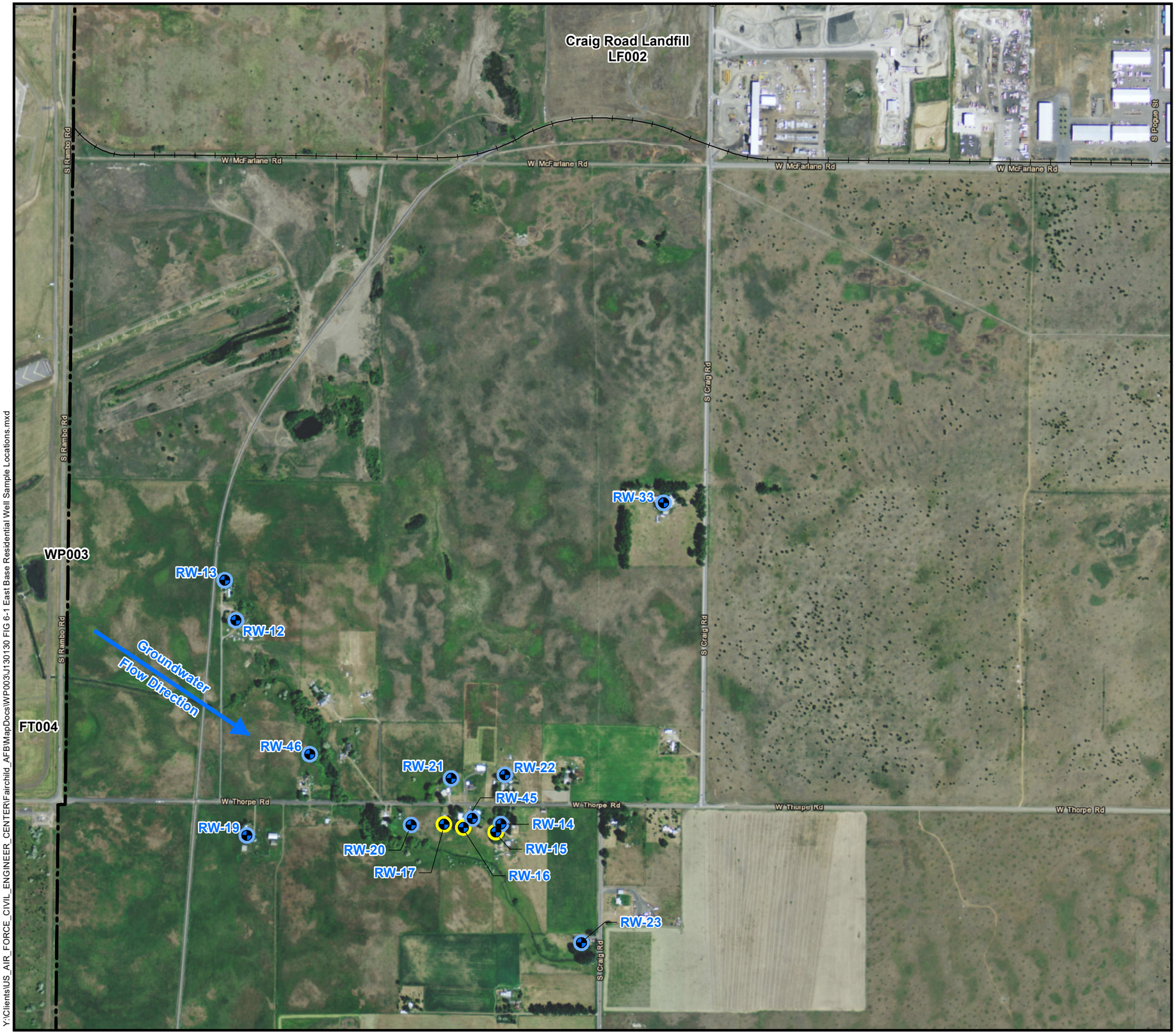
- Monitoring Well
- Approximate Location of Release
- Fence
- Groundwater Elevation Contour Line - (ft amsl) (September 2015)
- Groundwater Flow Direction
- Approximate Area of Soil Contamination (Also Beneath the Concrete Containment Area Below Tanks)
- Former Tank Location

Bay West
Customer-Focused Environmental & Industrial Solutions

Drawn By: SG | Date Drawn/Revised: 4/26/2016 | Project No. J130130

# Figure 5-3
# ST006 DRO/MRO Concentration Time Series Graph

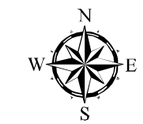





# Figure 6-1

## *East Base Residential Well Sample Locations*

### Fairchild AFB, WA




*Map Projection: NAD 1983 UTM Zone 11N, Meters*
*Basemap: ESRI World Imagery WMS*

0 800 1,600 Feet
0 250 500 Meters

- Quarterly Sampling
- Annual Sampling
- Residential Well
- Railroad
- Craig Road Landfill (LF002) Site Boundary
- Installation Boundary

Bay West
*Customer-Focused Environmental & Industrial Solutions*

Drawn By: SG | Date Drawn/Revised: 5/16/2016 | Project No. J130130

Y:\Clients\US_AIR_FORCE_CIVIL_ENGINEER_CENTER\Fairchild_AFB\MapDocs\WP003\J130130 FIG 6-1 East Base Residential Well Sample Locations.mxd

# Appendix A
# Sample Summary Forms

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151210-LB1 | Client: BayWest |
| Sampler: LB | Gauging Date: 12/11/15 |
| Well I.D.: MW-226 | Well Diameter (in.): 2 3 4 6 8 ____ |
| Total Well Depth (ft.): 17.31 | Depth to Water (ft.): 5.26 |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: PVC Grade | Flow Cell Type: YSI 556 |

Purge Method: 2" Grundfos Pump Peristaltic Pump Bladder Pump
Sampling Method: Dedicated Tubing New Tubing Other ____

Start Purge Time: 0958 Flow Rate: 200 mL/min Pump Depth: 12'

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| 1001 | 7.96 | 7.11 | 383 | 29 | 2.06 | 118.4 | 600 | 5.29 |
| 1004 | 7.94 | 7.04 | 384 | 22 | 1.95 | 93.1 | 1200 | 5.29 |
| 1007 | 7.92 | 7.01 | 390 | 20 | 1.94 | 92.5 | 1800 | 5.29 |
| 1010 | 7.93 | 7.00 | 391 | 20 | 1.93 | 91.6 | 2400 | 5.29 |
| 1013 | 7.94 | 6.98 | 392 | 19 | 1.92 | 90.8 | 3000 | 5.29 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | VOC's= 0.0 | | | Fe2+= NA | | | MNO4= NONE | |

Did well dewater? Yes No Amount actually evacuated: 3L

Sampling Time: 1014 Sampling Date: 12/11/15

Sample I.D.: FT004-MW226-15D Laboratory: TA

Analyzed for: TPH-G BTEX MTBE TPH-D Other:

Equipment Blank I.D.: @ Time Duplicate I.D.:

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151210-CB1 | Client: Bay West |
| Sampler: CP | Gauging Date: |
| Well I.D.: RW-46 | Well Diameter (in.): 2 3 4 6 8 ____ |
| Total Well Depth (ft.): | Depth to Water (ft.): |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: PVC Grade | Flow Cell Type: |

Purge Method: 2" Grundfos Pump Peristaltic Pump Bladder Pump
Sampling Method: Dedicated Tubing New Tubing Other_____

Start Purge Time:_____ Flow Rate: _____ Pump Depth:_____

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| | - No Purge | | | Sample Taken | | | — | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| 1131 | 44.7 | 6.77 | 264.0 | 27 | | 207.1 | — | |
| | VOC's= 0.0 | | | Fe2+= 0.0 | | | MNO4= 0.0 | |

Did well dewater? Yes (No) Amount actually evacuated: —

Sampling Time: 1130 Sampling Date: 12/11/15

Sample I.D.: FT004-RW46-15D Laboratory: TEA

Analyzed for: TPH-G BTEX MTBE (TPH-D) Other:

Equipment Blank I.D.: @ Time Duplicate I.D.:

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151210-LB1 | Client: BAYWEST |
| Sampler: LB | Gauging Date: 12/10/15 |
| Well I.D.: RW-19 | Well Diameter (in.) : 2 3 4 6 8 ____ |
| Total Well Depth (ft.) : | Depth to Water (ft.) : |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: PVC Grade | Flow Cell Type: |

Purge Method: 2" Grundfos Pump Peristaltic Pump Bladder Pump
Sampling Method: Dedicated Tubing New Tubing Other_____

Start Purge Time:_____ Flow Rate: _____ Pump Depth:_____

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| | — | — | WELL | SHUT | DOWN | PER | OWNER | — |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | — | — | NO | SAMPLE | TAKEN | | — | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | VOC's= | | | Fe2+= | | | MNO4= | |

| | |
|---|---|
| Did well dewater? Yes No | Amount actually evacuated: |
| Sampling Time: | Sampling Date: |
| Sample I.D.: | Laboratory: |
| Analyzed for: TPH-G BTEX MTBE TPH-D | Other: |
| Equipment Blank I.D.: @ Time | Duplicate I.D.: |

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151130-LB1 | Client: Bay West |
| Sampler: LB | Gauging Date: 12/11/15 |
| Well I.D.: MW-194 | Well Diameter (in.): 2 3 4 6 8 ____ |
| Total Well Depth (ft.): 20.07 | Depth to Water (ft.): 6.98 |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: PVC Grade | Flow Cell Type: YSI 556 |

Purge Method: 2" Grundfos Pump Peristaltic Pump Bladder Pump
Sampling Method: Dedicated Tubing New Tubing Other_____

Start Purge Time: 0823 Flow Rate: 200 mL/min Pump Depth: 15'

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| 0826 | 8.26 | 7.09 | 355 | 22 | 2.21 | 114.7 | 600 | 7.03 |
| 0829 | 8.09 | 7.06 | 352 | 19 | 1.93 | 107.9 | 1200 | 7.03 |
| 0832 | 8.10 | 7.05 | 351 | 18 | 1.91 | 106.1 | 1800 | 7.03 |
| 0835 | 8.11 | 7.04 | 350 | 17 | 1.90 | 105.2 | 2400 | 7.03 |
| 0838 | 8.12 | 7.03 | 349 | 16 | 1.89 | 104.6 | 3000 | 7.03 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | VOC's= 0.0 | | | Fe2+= NA | | | MNO4= NONE | |

Did well dewater? Yes No Amount actually evacuated: 3L

Sampling Time: 0839 Sampling Date: 12/11/15

Sample I.D.: STOOG-MW194-15D Laboratory: TA

Analyzed for: TPH-G BTEX MTBE TPH-D Other:

Equipment Blank I.D.: @ Time Duplicate I.D.:

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151130-LB1 | Client: Bay West |
| Sampler: LB | Gauging Date: 12/11/15 |
| Well I.D.: MW-207 | Well Diameter (in.): 2 3 4 6 8 ____ |
| Total Well Depth (ft.): 19.41 | Depth to Water (ft.): 8.91 |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: PVC Grade | Flow Cell Type: YSI 556 |

Purge Method: 2" Grundfos Pump Peristaltic Pump Bladder Pump
Sampling Method: Dedicated Tubing New Tubing Other ____

Start Purge Time: 0844 Flow Rate: 200 mL/min Pump Depth: 14'

| Time | Temp. (C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| 0847 | 11.39 | 7.29 | 513 | 18 | 1.74 | 130.1 | 600 | 8.91 |
| 0850 | 11.49 | 7.30 | 516 | 17 | 1.59 | 128.6 | 1200 | 8.91 |
| 0853 | 11.51 | 7.32 | 519 | 19 | 1.58 | 126.8 | 1800 | 8.91 |
| 0856 | 11.52 | 7.33 | 518 | 18 | 1.57 | 125.2 | 2400 | 8.91 |
| 0859 | 11.53 | 7.34 | 517 | 17 | 1.56 | 124.6 | 3000 | 8.91 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | VOC's= 6.0 | | | Fe2+= NP | | | MNO4= NONE | |

| | |
|---|---|
| Did well dewater? Yes No | Amount actually evacuated: 3L |
| Sampling Time: 0900 | Sampling Date: 12/11/15 |
| Sample I.D.: ST006-MW207-15D | Laboratory: TA |
| Analyzed for: TPH-G BTEX MTBE TPH-D | Other: |
| Equipment Blank I.D.: @ Time | Duplicate I.D.: |

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151210-LB1 | Client: BAYWEST |
| Sampler: LB | Gauging Date: 12/11/15 |
| Well I.D.: MW-208 | Well Diameter (in.): 2 3 (4) 6 8 ____ |
| Total Well Depth (ft.): 15.73 | Depth to Water (ft.): 5.61 |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: (PVC) Grade | Flow Cell Type: VST 556 |

Purge Method: 2" Grundfos Pump (Peristaltic) Pump Bladder Pump
Sampling Method: Dedicated (Tubing) New Tubing Other ____

Start Purge Time: 0914 Flow Rate: 200 mL/min Pump Depth: 10'

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| 0917 | 10.86 | 7.07 | 702 | 28 | 1.60 | 45.1 | 600 | 5.61 |
| 0920 | 10.83 | 7.06 | 708 | 24 | 1.55 | 37.1 | 1200 | 5.61 |
| 0923 | 10.84 | 7.05 | 710 | 22 | 1.53 | 35.4 | 1800 | 5.61 |
| 0926 | 10.85 | 7.05 | 711 | 21 | 1.52 | 34.6 | 2400 | 5.61 |
| 0929 | 10.86 | 7.04 | 712 | 21 | 1.51 | 33.6 | 3000 | 5.61 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
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| | VOC's= 00 | | | Fe2+= NA | | | MNO4= NONE | |

| | |
|---|---|
| Did well dewater? Yes (No) | Amount actually evacuated: 3L |
| Sampling Time: 0930 | Sampling Date: 12/11/15 |
| Sample I.D.: STOOG-MW208-150 | Laboratory: TA |
| Analyzed for: TPH-G BTEX MTBE (TPH-D) | Other: |
| Equipment Blank I.D.: @ Time | Duplicate I.D.: |

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151210-LB1 | Client: BAY WEST |
| Sampler: LB | Gauging Date: 12/16/15 |
| Well I.D.: RW-02 | Well Diameter (in.): (2) 3 4 6 8 ____ |
| Total Well Depth (ft.): 88.39 | Depth to Water (ft.): 72.97 |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: PVC Grade | Flow Cell Type: YSI 556 |

Purge Method: 2" Grundfos Pump Peristaltic Pump Bladder Pump
Sampling Method: Dedicated Tubing New Tubing Other_____

Start Purge Time: 0918 Flow Rate: 400 mL/MIN Pump Depth: 83'

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| 0921 | 9.63 | 7.51 | 271 | >1000 | 2.48 | 197.4 | 1200 | 73.03 |
| 0924 | 9.93 | 7.50 | 273 | >1000 | 2.43 | 194.3 | 2400 | 73.03 |
| 0927 | 10.05 | 7.49 | 274 | >1000 | 2.41 | 192.1 | 3600 | 73.03 |
| 0930 | 10.04 | 7.50 | 275 | >1000 | 2.40 | 191.4 | 4800 | 73.03 |
| 0934 | 10.05 | 7.51 | 276 | >1000 | 2.39 | 190.6 | 6000 | 73.03 |
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| | VOC's= 0.0 | | | Fe2+= NA | | | MNO4= 3.8 mg/L | |

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|---|---|
| Did well dewater? Yes (No) | Amount actually evacuated: 6L |
| Sampling Time: 0935 | Sampling Date: 12/16/15 |
| Sample I.D.: LF002-RW02-15D | Laboratory: TA |
| Analyzed for: TPH-G BTEX MTBE TPH-D | Other: VOC's (ASBC) |
| Equipment Blank I.D.: @ Time | Duplicate I.D.: |

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151210-LB1 | Client: Bay West |
| Sampler: LB | Gauging Date: 12/16/15 |
| Well I.D.: RW-05 | Well Diameter (in.): 2 3 4 6 8 ____ |
| Total Well Depth (ft.): 89.36 | Depth to Water (ft.): 69.09 |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: PVC Grade | Flow Cell Type: YSI 556 |

Purge Method: 2" Grundfos Pump Peristaltic Pump Bladder Pump
Sampling Method: Dedicated Tubing New Tubing Other ____

Start Purge Time: 1139 Flow Rate: 400 mL/MIN Pump Depth: 84'

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| 1142 | 10.90 | 7.25 | 386 | 118 | 2.41 | 133.4 | 1200 | 69.15 |
| 1145 | 11.04 | 7.23 | 387 | 105 | 2.26 | 127.3 | 2400 | 69.15 |
| 1148 | 11.05 | 7.22 | 388 | 101 | 2.23 | 126.4 | 3600 | 69.15 |
| 1151 | 11.06 | 7.21 | 389 | 100 | 2.22 | 125.1 | 4800 | 69.15 |
| 1154 | 11.07 | 7.20 | 340 | 100 | 2.21 | 124.5 | 6000 | 69.15 |
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| | | | | | | | | |
| | VOC's= 0.0 | | | Fe2+= N/A | | | MNO4= NONE | |

| | |
|---|---|
| Did well dewater? Yes No | Amount actually evacuated: 6L |
| Sampling Time: 1155 | Sampling Date: 12/16/15 |
| Sample I.D.: LF002-RW05-15D | Laboratory: TA |
| Analyzed for: TPH-G BTEX MTBE TPH-D | Other: VOC'S (HCL) |
| Equipment Blank I.D.: @ Time | Duplicate I.D.: |

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151210.LB1 | Client: BAYWEST |
| Sampler: LB | Gauging Date: 12/16/15 |
| Well I.D.: RW-06 | Well Diameter (in.): (2) 3 4 6 8 ____ |
| Total Well Depth (ft.): 86.43 | Depth to Water (ft.): 68.98 |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: (PVC) Grade | Flow Cell Type: YSI 556 |

Purge Method: 2" Grundfos Pump Peristaltic Pump (Bladder) Pump
Sampling Method: (Dedicated) Tubing New Tubing Other ____

Start Purge Time: 1028 Flow Rate: 400 mL/MIN Pump Depth: 81'

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| 1031 | 10.40 | 7.18 | 578 | >1000 | 1.77 | -72.7 | 1200 | 69.04 |
| 1034 | 10.73 | 7.17 | 575 | >1000 | 1.69 | -77.6 | 2400 | 69.04 |
| 1037 | 10.75 | 7.16 | 577 | >1000 | 1.68 | -78.1 | 3600 | 69.04 |
| 1040 | 10.76 | 7.17 | 578 | >1000 | 1.67 | -79.2 | 4800 | 69.04 |
| 1043 | 10.77 | 7.18 | 579 | >1000 | 1.66 | -80.4 | 6000 | 69.04 |
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| | | | | | | | | |
| | VOC's= 0.0 | | | Fe2+= NA | | | MNO4= NONE | |

| | |
|---|---|
| Did well dewater? Yes (No) | Amount actually evacuated: 6L |
| Sampling Time: 1044 | Sampling Date: 12/16/15 |
| Sample I.D.: LF002-RW06-ISD | Laboratory: TA |
| Analyzed for: TPH-G BTEX MTBE TPH-D | Other: VOC's (HCL) Cr/Mn |
| Equipment Blank I.D.: @ Time | Duplicate I.D.: |

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151210-LB1 | Client: Bay Water |
| Sampler: LB | Gauging Date: 12/15/15 |
| Well I.D.: RW-07 | Well Diameter (in.): 2 3 4 6 8 ____ |
| Total Well Depth (ft.): 83.22 | Depth to Water (ft.): 69.37 |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: PVC Grade | Flow Cell Type: YSI 556 |

Purge Method: 2" Grundfos Pump Peristaltic Pump Bladder Pump
Sampling Method: Dedicated Tubing New Tubing Other ____

Start Purge Time: 1050 Flow Rate: 400 mL/min Pump Depth: 78'

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| 1053 | 9.43 | 7.15 | 412 | >1000 | 1.93 | 75.3 | 1200 | 69.43 |
| 1056 | 10.17 | 7.17 | 420 | >1000 | 1.84 | 72.1 | 2400 | 69.43 |
| 1059 | 10.25 | 7.20 | 429 | >1000 | 1.82 | 70.9 | 3600 | 69.43 |
| 1102 | 10.26 | 7.20 | 428 | >1000 | 1.81 | 69.5 | 4800 | 69.43 |
| 1105 | 10.27 | 7.19 | 427 | >1000 | 1.80 | 68.2 | 6000 | 69.43 |
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| | | | | | | | | |
| | VOC's= 0.0 | | | Fe2+= NA | | | MNO4= NONE | |

| | |
|---|---|
| Did well dewater? Yes No | Amount actually evacuated: 6L |
| Sampling Time: 1106 | Sampling Date: 12/15/15 |
| Sample I.D.: LF002-RW07-15D | Laboratory: TA |
| Analyzed for: TPH-G BTEX MTBE TPH-D | Other: VOC's (HCL) |
| Equipment Blank I.D.: @ Time | Duplicate I.D.: |

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151210-LB1 | Client: BAY WEST |
| Sampler: LB | Gauging Date: 12/16/15 |
| Well I.D.: RW-08 | Well Diameter (in.): (2) 3 4 6 8 ____ |
| Total Well Depth (ft.): 77.80 | Depth to Water (ft.): 61.85 |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: PVC Grade | Flow Cell Type: YSI 556 |

Purge Method: 2" Grundfos Pump Peristaltic Pump Bladder Pump
Sampling Method: Dedicated Tubing New Tubing Other ____

Start Purge Time: 1221 Flow Rate: 400 mL/min Pump Depth: 72'

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| 1224 | 11.21 | 6.88 | 1155 | >1000 | 2.33 | 158.4 | 1200 | 61.88 |
| 1227 | 11.41 | 6.89 | 1170 | 119 | 2.14 | 152.6 | 2400 | 61.88 |
| 1230 | 11.40 | 6.91 | 1173 | 39 | 2.13 | 150.4 | 3600 | 61.88 |
| 1233 | 11.39 | 6.90 | 1174 | 38 | 2.12 | 149.6 | 4800 | 61.88 |
| 1236 | 11.38 | 6.89 | 1175 | 37 | 2.11 | 148.2 | 6000 | 61.88 |
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| | | | | | | | | |
| | VOC's= 0.0 | | | Fe2+= NA | | | MNO4= NONE | |

Did well dewater? Yes (No) Amount actually evacuated: 6L

Sampling Time: 1237 Sampling Date: 12/16/15

Sample I.D.: LF002-RW08-15D Laboratory: TA

Analyzed for: TPH-G BTEX MTBE TPH-D Other: VOC's (HCL) Cr/Mn

Equipment Blank I.D.: @ Time Duplicate I.D.:

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151210-L81 | Client: BAY WEST |
| Sampler: LB | Gauging Date: 12/15/15 |
| Well I.D.: RW-09 | Well Diameter (in.): (2) 3 4 6 8 ____ |
| Total Well Depth (ft.): 78.95 | Depth to Water (ft.): 61.79 |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: PVC Grade | Flow Cell Type: YSI 556 |

Purge Method: 2" Grundfos Pump Peristaltic Pump Bladder Pump
Sampling Method: Dedicated Tubing New Tubing Other ____

Start Purge Time: 1230 Flow Rate: 400 mL/MIN Pump Depth: 73'

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| 1233 | 10.34 | 7.10 | 919 | >1000 | 5.06 | 228.5 | 1200 | 61.81 |
| 1236 | 10.74 | 7.14 | 926 | >1000 | 4.32 | 139.9 | 2400 | 61.81 |
| 1239 | 10.78 | 7.16 | 924 | >1000 | 4.30 | 135.7 | 3600 | 61.81 |
| 1242 | 10.80 | 7.17 | 923 | >1000 | 4.29 | 134.6 | 4800 | 61.81 |
| 1245 | 10.81 | 7.18 | 922 | >1000 | 4.28 | 133.4 | 6000 | 61.81 |
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| | | | | | | | | |
| | VOC's=0.0 | | | Fe2+= NA | | | MNO4= ~~NONE~~ 0.75 mg/L | |

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|---|---|
| Did well dewater? Yes (No) | Amount actually evacuated: 6L |
| Sampling Time: 1246 | Sampling Date: 12/15/15 |
| Sample I.D.: LF002-RW09-15D | Laboratory: TA |
| Analyzed for: TPH-G BTEX MTBE TPH-D | Other: VOC's (~~TBE~~) |
| Equipment Blank I.D.: @ Time | Duplicate I.D.: |

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151210-LB1 | Client: BAYWEST |
| Sampler: LB | Gauging Date: 12/16/15 |
| Well I.D.: RW-10 | Well Diameter (in.): 2 3 (4) 6 8 ____ |
| Total Well Depth (ft.): 89.32 | Depth to Water (ft.): 70.29 |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: (PVC) Grade | Flow Cell Type: YSI 556 |

Purge Method: 2" Grundfos Pump Peristaltic Pump (Bladder) Pump
Sampling Method: (Dedicated) Tubing New Tubing Other ____

Start Purge Time: 0838 Flow Rate: 400 mL/min Pump Depth: 84'

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| 0841 | 10.19 | 7.57 | 304 | 48 | 1.78 | 87.7 | 1200 | 70.31 |
| 0844 | 10.48 | 7.53 | 302 | 35 | 1.72 | 86.3 | 2400 | 70.31 |
| 0847 | 10.51 | 7.50 | 301 | 33 | 1.70 | 80.3 | 3600 | 70.31 |
| 0850 | 10.52 | 7.49 | 300 | 32 | 1.69 | 79.2 | 4800 | 70.31 |
| 0853 | 10.53 | 7.48 | 299 | 31 | 1.68 | 78.6 | 6000 | 70.31 |
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| | | | | | | | | |
| | VOC's= 00 | | | Fe2+= NA | | | MNO4= NONE | |

| | |
|---|---|
| Did well dewater? Yes (No) | Amount actually evacuated: 6L |
| Sampling Time: 0854 | Sampling Date: 12/16/15 |
| Sample I.D.: LF002-RW10-15D | Laboratory: TA |
| Analyzed for: TPH-G BTEX MTBE TPH-D | Other: (VOC's (HCL)) |
| Equipment Blank I.D.: @ Time | Duplicate I.D.: |

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151210-LB1 | Client: BAYWEST |
| Sampler: LB | Gauging Date: 12/16/15 |
| Well I.D.: RW-11 | Well Diameter (in.): 2 3 (4) 6 8 ____ |
| Total Well Depth (ft.): 89.51 | Depth to Water (ft.): 70.05 |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: (PVC) Grade | Flow Cell Type: YSI 556 |

Purge Method: 2" Grundfos Pump Peristaltic Pump (Bladder Pump)
Sampling Method: (Dedicated Tubing) New Tubing Other ____

Start Purge Time: 0956 Flow Rate: 400 mL/min Pump Depth: 84'

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| 0959 | 9.46 | 7.43 | 290 | >1000 | 2.42 | 168.3 | 1200 | 70.05 |
| 1002 | 10.17 | 7.39 | 293 | >1000 | 1.96 | 143.5 | 2400 | 70.05 |
| 1005 | 10.19 | 7.38 | 294 | >1000 | 1.94 | 141.4 | 3600 | 70.05 |
| 1008 | 10.20 | 7.37 | 295 | >1000 | 1.93 | 140.2 | 4800 | 70.05 |
| 1011 | 10.21 | 7.36 | 296 | >1000 | 1.92 | 139.6 | 6000 | 70.05 |
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| | | | | | | | | |
| | VOC's= 60 | | | Fe2+= NA | | | MNO4= NONE | |

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|---|---|
| Did well dewater? Yes (No) | Amount actually evacuated: 6L |
| Sampling Time: 1012 | Sampling Date: 12/16/15 |
| Sample I.D.: LF002-RW11-15D | Laboratory: TA |
| Analyzed for: TPH-G. BTEX MTBE TPH-D | Other: VOC's (HCL), Cr/Mn |
| Equipment Blank I.D.: @ Time | Duplicate I.D.: |

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151210-LB1 | Client: BAYWEST |
| Sampler: LB | Gauging Date: 12/15/15 |
| Well I.D.: RW-12 | Well Diameter (in.): 2 3 (4) 6 8 ____ |
| Total Well Depth (ft.): 89.05 | Depth to Water (ft.): 70.59 |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: (PVC) Grade | Flow Cell Type: YSI 556 |

Purge Method: 2" Grundfos Pump Peristaltic Pump (Bladder Pump)
Sampling Method: (Dedicated Tubing) New Tubing Other ____

Start Purge Time: 1019 Flow Rate: 400 mL/min Pump Depth: 84'

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| 1022 | 9.33 | 7.22 | 257 | 28 | 1.54 | 53.4 | 1200 | 70.63 |
| 1025 | 9.49 | 7.21 | 260 | 21 | 1.47 | 43.9 | 2400 | 70.63 |
| 1028 | 9.52 | 7.23 | 263 | 21 | 1.45 | 42.5 | 3600 | 70.63 |
| 1031 | 9.53 | 7.24 | 264 | 20 | 1.44 | 41.6 | 4800 | 70.63 |
| 1034 | 9.54 | 7.25 | 265 | 19 | 1.43 | 40.4 | 6000 | 70.63 |
| | | | | | | | | |
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| | | | | | | | | |
| | VOC's= 0.0 | | | Fe2+= NA | | | MNO4= NONE | |

Did well dewater? Yes (No) Amount actually evacuated: 6L

Sampling Time: 1035 Sampling Date: 12/15/15

Sample I.D.: LF002-RW12-15D Laboratory: TA

Analyzed for: TPH-G BTEX MTBE TPH-D Other: VOC's (HCL)

Equipment Blank I.D.: @ Time Duplicate I.D.:

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151210-LB1 | Client: BAY WEST |
| Sampler: LB | Gauging Date: 12/16/15 |
| Well I.D.: RW-13 | Well Diameter (in.): 2 3 (4) 6 8 ____ |
| Total Well Depth (ft.): 97.96 | Depth to Water (ft.): 64.95 |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: PVC Grade | Flow Cell Type: YSI 556 |

Purge Method: 2" Grundfos Pump Peristaltic Pump Bladder Pump
Sampling Method: Dedicated Tubing New Tubing Other ____

Start Purge Time: 1106 Flow Rate: 400 mL/min Pump Depth: 92'

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| 1109 | 10.61 | 7.26 | 474 | 49 | 1.97 | 146.8 | 1200 | 64.95 |
| 1112 | 11.02 | 7.20 | 473 | 44 | 1.94 | 140.3 | 2400 | 64.95 |
| 1115 | 11.05 | 7.18 | 472 | 41 | 1.91 | 139.3 | 3600 | 64.95 |
| 1118 | 11.06 | 7.17 | 471 | 40 | 1.90 | 138.6 | 4800 | 64.95 |
| 1121 | 11.07 | 7.16 | 470 | 39 | 1.89 | 137.2 | 6000 | 64.95 |
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| | | | | | | | | |
| | | | | | | | | |
| | VOC's=0.0 | | | Fe2+= NA | | | MNO4= NONE | |

| | |
|---|---|
| Did well dewater? Yes (No) | Amount actually evacuated: 6L |
| Sampling Time: 1122 | Sampling Date: 12/16/15 |
| Sample I.D.: LF002-RW13-150 | Laboratory: TA |
| Analyzed for: TPH-G BTEX MTBE TPH-D | Other: VOC's (HCL) Cr/Mn |
| Equipment Blank I.D.: @ Time | Duplicate I.D.: |

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151210-181 | Client: BAYWEST |
| Sampler: LB | Gauging Date: 12/15/15 |
| Well I.D.: RW-14 | Well Diameter (in.): 2 3 4 6 8 ____ |
| Total Well Depth (ft.): 83.47 | Depth to Water (ft.): 65.91 |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: PVC Grade | Flow Cell Type: YSI 556 |

Purge Method: 2" Grundfos Pump Peristaltic Pump Bladder Pump
Sampling Method: Dedicated Tubing New Tubing Other ____

Start Purge Time: 1318 Flow Rate: 400 mL/min Pump Depth: 78'

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or ml) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| 1321 | 10.26 | 7.06 | 473 | 38 | 2.54 | 188.8 | 1800 | 65.91 |
| 1324 | 10.19 | 7.04 | 476 | 31 | 2.48 | 185.3 | 2400 | 65.91 |
| 1327 | 10.18 | 7.02 | 471 | 30 | 2.46 | 183.7 | 3600 | 65.91 |
| 1330 | 10.17 | 7.01 | 470 | 29 | 2.45 | 182.6 | 4800 | 65.91 |
| 1333 | 10.16 | 7.00 | 469 | 30 | 2.44 | 181.5 | 6000 | 65.91 |
| | | | | | | | | |
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| | | | | | | | | |
| | VOC's= 00 | | | Fe2+= NA | | | MNO4= NONE | |

| | |
|---|---|
| Did well dewater? Yes No | Amount actually evacuated: 6L |
| Sampling Time: 1334 | Sampling Date: 12/15/15 |
| Sample I.D.: LF002-RW14-15D | Laboratory: TA |
| Analyzed for: TPH-G BTEX MTBE TPH-D | Other: VOC's (HCL) Cr/Mn |
| Equipment Blank I.D.: @ Time | Duplicate I.D.: |

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151210-LB1 | Client: BAY WEST |
| Sampler: LB | Gauging Date: 12/16/15 |
| Well I.D.: RW-15 | Well Diameter (in.): 2 3 4 6 8 ____ |
| Total Well Depth (ft.): 85.27 | Depth to Water (ft.): 68.41 |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: PVC Grade | Flow Cell Type: YSI 556 |

Purge Method: 2" Grundfos Pump Peristaltic Pump Bladder Pump
Sampling Method: Dedicated Tubing New Tubing Other ____

Start Purge Time: 1250 Flow Rate: 400 mL/MIN Pump Depth: 80'

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| 1253 | 11.37 | 7.20 | 675 | >1000 | 2.33 | 154.4 | 1200 | 68.42 |
| 1256 | 11.66 | 7.16 | 676 | >1000 | 1.96 | 148.0 | 2400 | 68.42 |
| 1259 | 11.67 | 7.15 | 677 | >1000 | 1.95 | 145.4 | 3600 | 68.42 |
| 1302 | 11.66 | 7.14 | 678 | >1000 | 1.94 | 144.2 | 4800 | 68.42 |
| 1305 | 11.65 | 7.13 | 679 | >1000 | 1.93 | 143.6 | 6000 | 68.42 |
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| | | | | | | | | |
| | VOC's= 0.0 | | | Fe2+= NA | | | MNO4= NONE | |

| | |
|---|---|
| Did well dewater? Yes No | Amount actually evacuated: 6L |
| Sampling Time: 1306 | Sampling Date: 12/16/15 |
| Sample I.D.: LF002-RW15-15D | Laboratory: TA |
| Analyzed for: TPH-G BTEX MTBE TPH-D | Other: 8VOC's (HCL) |
| Equipment Blank I.D.: @ Time | Duplicate I.D.: |

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151210-LB1 | Client: BAYWEST |
| Sampler: LB | Gauging Date: 12/15/15 |
| Well I.D.: RW-16 | Well Diameter (in.): Ø 3 4 6 8 ____ |
| Total Well Depth (ft.): 80.49 | Depth to Water (ft.): 61.02 |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: PVC Grade | Flow Cell Type: YSI 556 |

Purge Method: 2" Grundfos Pump Peristaltic Pump Bladder Pump
Sampling Method: Dedicated Tubing New Tubing Other ____

Start Purge Time: 1130 Flow Rate: 400 mL/min Pump Depth: 75'

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| 1133 | 10.33 | 7.04 | 763 | >1000 | 1.89 | 132.0 | 1200 | 61.08 |
| 1136 | 10.69 | 7.08 | 779 | >1000 | 1.84 | 130.4 | 2400 | 61.08 |
| 1139 | 10.65 | 7.09 | 781 | >1000 | 1.81 | 129.3 | 3600 | 61.08 |
| 1142 | 10.64 | 7.10 | 782 | >1000 | 1.80 | 128.2 | 4800 | 61.08 |
| 1145 | 10.65 | 7.11 | 783 | >1000 | 1.79 | 127.6 | 6000 | 61.08 |
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| | | | | | | | | |
| | VOC's=0.0 | | | Fe2+= NA | | | MNO4= NONE | |

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|---|---|
| Did well dewater? Yes No | Amount actually evacuated: 6L |
| Sampling Time: 1146 | Sampling Date: 12/15/15 |
| Sample I.D.: LF002-RW16-150 | Laboratory: TA |
| Analyzed for: TPH-G BTEX MTBE TPH-D | Other: VOC's (HCL), Cr/Mn |
| Equipment Blank I.D.: @ Time | Duplicate I.D.: |

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 15120-LB1 | Client: BAYWEST |
| Sampler: LB | Gauging Date: 12/16/15 |
| Well I.D.: RW-17 | Well Diameter (in.): 2 3 4 6 8 ____ |
| Total Well Depth (ft.): 78.31 | Depth to Water (ft.): 64.14 |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: PVC Grade | Flow Cell Type: YSI 556 |

Purge Method: 2" Grundfos Pump Peristaltic Pump Bladder Pump
Sampling Method: Dedicated Tubing New Tubing Other ____

Start Purge Time: 1319 Flow Rate: 400 mL/MIN Pump Depth: 73'

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| 1322 | 10.61 | 7.19 | 1042 | 24 | 2.61 | 259.1 | 1200 | 64.18 |
| 1325 | 10.91 | 7.17 | 1063 | 28 | 2.62 | 243.1 | 2400 | 64.18 |
| 1328 | 10.90 | 7.18 | 1065 | 27 | 2.59 | 241.6 | 3600 | 64.18 |
| 1331 | 10.89 | 7.19 | 1067 | 27 | 2.58 | 240.4 | 4800 | 64.18 |
| 1334 | 10.90 | 7.20 | 1068 | 28 | 2.57 | 239.8 | 6000 | 64.18 |
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| | | | | | | | | |
| | VOC's= 0.0 | | | Fe2+= NA | | | MNO4= 7.5 mg/L | |

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|---|---|
| Did well dewater? Yes No | Amount actually evacuated: 6L |
| Sampling Time: 1335 | Sampling Date: 12/16/15 |
| Sample I.D.: LF002-RW17-001 | Laboratory: TA |
| Analyzed for: TPH-G BTEX MTBE TPH-D | Other: VOCs (ASBC), Cr/Mn |
| Equipment Blank I.D.: @ Time | Duplicate I.D.: |

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151210-481 | Client: Bay West |
| Sampler: LB | Gauging Date: 12/15/15 |
| Well I.D.: RW-18 | Well Diameter (in.): 2 3 4 6 8 ____ |
| Total Well Depth (ft.): 78.43 | Depth to Water (ft.): 56.54 |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: PVC Grade | Flow Cell Type: YSI 556 |

Purge Method: 2" Grundfos Pump Peristaltic Pump Bladder Pump
Sampling Method: Dedicated Tubing New Tubing Other ____

Start Purge Time: 0908 Flow Rate: 400 mL/MIN Pump Depth: 73'

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| 0911 | 9.55 | 7.43 | 1.37 | 48 | 1.33 | 25.1 | 1200 | 56.59 |
| 0914 | 10.57 | 7.42 | 1.34 | 31 | 1.32 | 23.5 | 2400 | 56.59 |
| 0917 | 10.55 | 7.41 | 1.32 | 29 | 1.31 | 21.8 | 3600 | 56.59 |
| 0920 | 10.56 | 7.40 | 1.31 | 28 | 1.30 | 20.4 | 4800 | 56.59 |
| 0923 | 10.57 | 7.39 | 1.30 | 29 | 1.29 | 19.4 | 6000 | 56.59 |
| | | | | | | | | |
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| | | | | | | | | |
| | VOC's= 0.0 | | | Fe2+= NA | | | MNO4= NONE | |

Did well dewater? Yes No Amount actually evacuated: 6L

Sampling Time: 0924 Sampling Date: 12/15/15

Sample I.D.: LF002-RW18-15D Laboratory: TA

Analyzed for: TPH-G BTEX MTBE TPH-D Other VOC's (HCL), Cr/Mn

Equipment Blank I.D.: @ Time Duplicate I.D.:

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 1512.10.281 | Client: BAYWEST |
| Sampler: LB | Gauging Date: 12/14/15 |
| Well I.D.: MDA - 01 | Well Diameter (in.): 2 3 4 6 8 ____ |
| Total Well Depth (ft.): 82.78 | Depth to Water (ft.): 81.40 |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: PVC Grade | Flow Cell Type: ____ |

Purge Method: 2" Grundfos Pump Peristaltic Pump Bladder Pump
Sampling Method: Dedicated Tubing New Tubing Other ____

Start Purge Time: ____ Flow Rate: ____ Pump Depth: ____

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| | — | — | INSUFFICIENT | WATER | TO | DO ICE | | |
| | | | | + SAMPLE | | — | | |
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| | | | | | | | | |
| | — | — | NO | SAMPLE | TAKEN | — | | |
| | | | | | | | | |
| | | | | | | | | |
| | VOC's= 6.0 | | | Fe2+= NA | | | MNO4= NA | |

| | |
|---|---|
| Did well dewater? Yes No | Amount actually evacuated: |
| Sampling Time: | Sampling Date: |
| Sample I.D.: | Laboratory: |
| Analyzed for: TPH-G BTEX MTBE TPH-D | Other: |
| Equipment Blank I.D.: @ Time | Duplicate I.D.: |

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151210-LB1 | Client: BAYWEST |
| Sampler: LB | Gauging Date: 12/14/15 |
| Well I.D.: NDA-05 | Well Diameter (in.): (2) 3 4 6 8 ____ |
| Total Well Depth (ft.): 72.05 | Depth to Water (ft.): DRY |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: PVC Grade | Flow Cell Type: |

Purge Method: 2" Grundfos Pump Peristaltic Pump Bladder Pump
Sampling Method: Dedicated Tubing New Tubing Other_____

Start Purge Time:_____ Flow Rate: _____ Pump Depth:_____

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| | — | — | WELL | IS | DRY | — | — | |
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| | — | — | NO SAMPLE | TAKEN | | — | — | |
| | | | | | | | | |
| | | | | | | | | |
| | VOC's= 0.0 | | | Fe2+= NA | | | MNO4= NA | |

| | |
|---|---|
| Did well dewater? Yes No | Amount actually evacuated: |
| Sampling Time: | Sampling Date: |
| Sample I.D.: | Laboratory: |
| Analyzed for: TPH-G BTEX MTBE TPH-D | Other: |
| Equipment Blank I.D.: @ Time | Duplicate I.D.: |

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151210-LB1 | Client: BayWest |
| Sampler: LB | Gauging Date: 12/14/15 |
| Well I.D.: NDA-06 | Well Diameter (in.): 2 3 4 6 8 ____ |
| Total Well Depth (ft.): 79.73 | Depth to Water (ft.): DRY |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: PVC Grade | Flow Cell Type: |

Purge Method: 2" Grundfos Pump Peristaltic Pump Bladder Pump
Sampling Method: Dedicated Tubing New Tubing Other_____

Start Purge Time:_____ Flow Rate: _____ Pump Depth:_____

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| | | | WELL | IS | DRY | | | |
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| | | | NO SAMPLE TAKEN | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | VOC's=00 | | | Fe2+= NA | | | MNO4= NA | |

| | |
|---|---|
| Did well dewater? Yes No | Amount actually evacuated: |
| Sampling Time: | Sampling Date: |
| Sample I.D.: | Laboratory: |
| Analyzed for: TPH-G BTEX MTBE TPH-D | Other: |
| Equipment Blank I.D.: @ Time | Duplicate I.D.: |

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151210-LB1 | Client: BAYWEST |
| Sampler: LB | Gauging Date: 12/14/15 |
| Well I.D.: NDA-07 | Well Diameter (in.): 2 3 (4) 6 8 ____ |
| Total Well Depth (ft.): 99.81 | Depth to Water (ft.): 87.75 |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: PVC Grade | Flow Cell Type: YSI 556 |

Purge Method: 2" Grundfos Pump Peristaltic Pump Bladder Pump
Sampling Method: Dedicated Tubing New Tubing Other ____

Start Purge Time: 1315 Flow Rate: 400 mL/min Pump Depth: 94'

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or ~~uS/cm~~) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| 1318 | 10.75 | 7.40 | 369 | 33 | 1.34 | 63.0 | 1200 | 87.75 |
| 1321 | 11.20 | 7.37 | 370 | 28 | 1.31 | 62.7 | 2400 | 87.75 |
| 1324 | 11.24 | 7.36 | 371 | 24 | 1.28 | 57.7 | 3600 | 87.75 |
| 1327 | 11.25 | 7.35 | 372 | 23 | 1.27 | 56.2 | 4800 | 87.75 |
| 1330 | 11.26 | 7.34 | 373 | 22 | 1.26 | 55.8 | 6000 | 87.75 |
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| | | | | | | | | |
| | VOC's= 0.0 | | | Fe2+= NA | | | MNO4= NONE | |

| | |
|---|---|
| Did well dewater? Yes (NO) | Amount actually evacuated: 6L |
| Sampling Time: 1331 | Sampling Date: 12/14/15 |
| Sample I.D.: LF002-NDA07-15D | Laboratory: TA |
| Analyzed for: TPH-G BTEX MTBE TPH-D | Other: VOCs (HCL), Cr/Mn |
| Equipment Blank I.D.: @ Time | Duplicate I.D.: |

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151210-LB1 | Client: BAYWEST |
| Sampler: LB | Gauging Date: 12/14/15 |
| Well I.D.: # NDA-08 | Well Diameter (in.): 2 3 (4) 6 8 ____ |
| Total Well Depth (ft.): 112.19 | Depth to Water (ft.): 91.05 |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: (PVC) Grade | Flow Cell Type: YSI 556 |

Purge Method: 2" Grundfos Pump Peristaltic Pump (Bladder) Pump
Sampling Method: Dedicated (Tubing) New Tubing Other ____

Start Purge Time: 1431 Flow Rate: 400 mL/MIN Pump Depth: 107'

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| 1434 | 10.52 | 7.36 | 426 | 77 | 1.48 | 83.0 | 1200 | 91.05 |
| 1437 | 11.06 | 7.34 | 430 | 38 | 1.43 | 75.1 | 2400 | 91.05 |
| 1440 | 11.13 | 7.35 | 432 | 36 | 1.41 | 66.7 | 3600 | 91.05 |
| 1443 | 11.14 | 7.36 | 433 | 35 | 1.40 | 65.2 | 4800 | 91.05 |
| 1446 | 11.15 | 7.37 | 434 | 36 | 1.39 | 64.9 | 6000 | 91.05 |
| | | | | | | | | |
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| | | | | | | | | |
| | | | | | | | | |
| | VOC's= 0.0 | | | Fe2+= NA | | | MNO4= NONE | |

| | |
|---|---|
| Did well dewater? Yes (No) | Amount actually evacuated: 6L |
| Sampling Time: 1447 | Sampling Date: 12/14/15 |
| Sample I.D.: LF002-NDA08-ISD | Laboratory: TA |
| Analyzed for: TPH-G BTEX MTBE TPH-D | Other: (VOC's (HCL), Cr/Mn) |
| Equipment Blank I.D.: @ Time | Duplicate I.D.: |

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151210-LB1 | Client: BAYWEST |
| Sampler: LB | Gauging Date: 12/14/15 |
| Well I.D.: NOA-09 | Well Diameter (in.): 2 3 (4) 6 8 ____ |
| Total Well Depth (ft.): 112.11 | Depth to Water (ft.): 86.55 |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: PVC Grade | Flow Cell Type: YSI 556 |

Purge Method: 2" Grundfos Pump Peristaltic Pump Bladder Pump
Sampling Method: Dedicated Tubing New Tubing Other ____

Start Purge Time: 1216 Flow Rate: 400 mL/min Pump Depth: 107'

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| 1219 | 11.28 | 7.36 | 442 | 118 | 1.98 | 22.6 | 1200 | 86.55 |
| 1222 | 11.26 | 7.35 | 443 | 95 | 1.81 | 21.7 | 2400 | 86.55 |
| 1225 | 11.23 | 7.34 | 444 | 36 | 1.80 | 19.4 | 3600 | 86.55 |
| 1228 | 11.22 | 7.33 | 443 | 35 | 1.79 | 18.2 | 4800 | 86.55 |
| 1231 | 11.21 | 7.32 | 442 | 36 | 1.78 | 17.6 | 6000 | 86.55 |
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| | | | | | | | | |
| | | | | | | | | |
| | VOC's= 0.0 | | | Fe2+= NA | | | MNO4= NONE | |

Did well dewater? Yes (No) Amount actually evacuated: ~~132~~ 6L

Sampling Time: 1232 Sampling Date: 12/14/15

Sample I.D.: LF002-NOA09-15D Laboratory: TA

Analyzed for: TPH-G BTEX MTBE TPH-D Other (VOC'S (HCL))

Equipment Blank I.D.: @ Time Duplicate I.D.:

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151210-181 | Client: BAYWEST |
| Sampler: LB | Gauging Date: 12/14/15 |
| Well I.D.: NDA-10 | Well Diameter (in.): 2 3 (4) 6 8 ____ |
| Total Well Depth (ft.): 119.22 | Depth to Water (ft.): 94.11 |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: PVC Grade | Flow Cell Type: YSI 556 |

Purge Method: 2" Grundfos Pump Peristaltic Pump Bladder Pump
Sampling Method: Dedicated Tubing New Tubing Other ____

Start Purge Time: 1039 Flow Rate: 400 mL/min Pump Depth: 114'

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| 1042 | 11.51 | 7.47 | 336 | 48 | 1.50 | 39.7 | 1200 | 94.11 |
| 1045 | 12.01 | 7.48 | 338 | 41 | 1.49 | 36.0 | 2400 | 94.11 |
| 1048 | 12.07 | 7.49 | 339 | 38 | 1.45 | 31.0 | 3600 | 94.11 |
| 1051 | 12.08 | 7.50 | 338 | 37 | 1.44 | 30.2 | 4800 | 94.11 |
| 1054 | 12.09 | 7.51 | 337 | 37 | 1.43 | 29.6 | 6000 | 94.11 |
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| | | | | | | | | |
| | | | | | | | | |
| | VOC's= 0.0 | | | Fe2+= NA | | | MNO4= NONE | |

| | |
|---|---|
| Did well dewater? Yes (No) | Amount actually evacuated: 6L |
| Sampling Time: 1055 | Sampling Date: 12/14/15 |
| Sample I.D.: LF002-NDA10-15D | Laboratory: TA |
| Analyzed for: TPH-G BTEX MTBE TPH-D | Other: VOC's (HCL) |
| Equipment Blank I.D.: @ Time | Duplicate I.D.: |

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151210-LB1 | Client: BAYWEST |
| Sampler: LB | Gauging Date: 12/14/15 |
| Well I.D.: NDA-11 | Well Diameter (in.): 2 3 (4) 6 8 ____ |
| Total Well Depth (ft.): 112.52 | Depth to Water (ft.): 89.52 |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: PVC Grade | Flow Cell Type: YSI 556 |

Purge Method: 2" Grundfos Pump Peristaltic Pump Bladder Pump
Sampling Method: Dedicated Tubing New Tubing Other_____

Start Purge Time: 1133 Flow Rate: 400 mL/min Pump Depth: 107'

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| 1136 | 10.91 | 7.37 | 401 | 160 | 1.82 | 80.4 | 1200 | 89.52 |
| 1139 | 11.20 | 7.40 | 403 | 36 | 1.78 | 78.4 | 2400 | 89.52 |
| 1142 | 11.22 | 7.43 | 402 | 33 | 1.76 | 76.3 | 3600 | 89.52 |
| 1145 | 11.23 | 7.44 | 403 | 32 | 1.75 | 75.4 | 4800 | 89.52 |
| 1148 | 11.24 | 7.46 | 404 | 31 | 1.74 | 74.4 | 6000 | 89.52 |
| | | | | | | | | |
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| | | | | | | | | |
| | | | | | | | | |
| | VOC's= 0.0 | | | Fe2+= NA | | | MNO4= NONE | |

| | |
|---|---|
| Did well dewater? Yes (NO) | Amount actually evacuated: 6L |
| Sampling Time: 1149 | Sampling Date: 12/14/15 |
| Sample I.D.: LF002-NDA11-15D | Laboratory: TA |
| Analyzed for: TPH-G BTEX MTBE TPH-D | Other VOC's (HCL) |
| Equipment Blank I.D.: @ Time | Duplicate I.D.: |

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151210-LBY | Client: BayWest |
| Sampler: LB | Gauging Date: 12/14/15 |
| Well I.D.: NDA-12 | Well Diameter (in.): 2 3 (4) 6 8 ____ |
| Total Well Depth (ft.): 107.29 | Depth to Water (ft.): 95.16 |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: (PVC) Grade | Flow Cell Type: YSI 556 |

Purge Method: 2" Grundfos Pump Peristaltic Pump (Bladder) Pump
Sampling Method: (Dedicated) Tubing New Tubing Other ____

Start Purge Time: 0958 Flow Rate: 400 mL/MIN Pump Depth: 102'

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| 1001 | 11.59 | 7.64 | 411 | 28 | 1.14 | 37.7 | 1200 | 95.16 |
| 1004 | 11.71 | 7.55 | 409 | 22 | 1.09 | 23.2 | 2400 | 95.16 |
| 1007 | 11.75 | 7.52 | 408 | 20 | 1.08 | 22.5 | 3600 | 95.16 |
| 1010 | 11.76 | 7.51 | 407 | 20 | 1.07 | 21.4 | 4800 | 95.16 |
| 1013 | 11.77 | 7.50 | 406 | 21 | 1.06 | 20.8 | 6000 | 95.16 |
| | | | | | | | | |
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| | VOC's= 60 | | | Fe2+= NA | | | MNO4= NONE | |

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|---|---|
| Did well dewater? Yes (No) | Amount actually evacuated: 6L |
| Sampling Time: 1014 | Sampling Date: 12/14/15 |
| Sample I.D.: LF002-NDA12-15D | Laboratory: TA |
| Analyzed for: TPH-G BTEX MTBE TPH-D | Other: VOC's (HCL), Cr/Mn |
| Equipment Blank I.D.: @ Time | Duplicate I.D.: |

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151210-LB1 | Client: BAYWEST |
| Sampler: LB | Gauging Date: 12/11/15 |
| Well I.D.: NDA-13 | Well Diameter (in.): 2 3 (4) 6 8 ____ |
| Total Well Depth (ft.): 107.91 | Depth to Water (ft.): 94.46 |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: PVC Grade | Flow Cell Type: YSI 556 |

Purge Method: 2" Grundfos Pump Peristaltic Pump Bladder Pump
Sampling Method: Dedicated Tubing New Tubing Other ____

Start Purge Time: 1204 Flow Rate: 400 mL/MIN Pump Depth: 102'

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| 1207 | 11.83 | 7.26 | 360 | 218 | 1.94 | 163.7 | 1200 | 94.46 |
| 1210 | 11.98 | 7.27 | 362 | 194 | 1.93 | 160.3 | 2400 | 94.46 |
| 1213 | 11.99 | 7.28 | 361 | 191 | 1.91 | 159.9 | 3600 | 94.46 |
| 1216 | 12.00 | 7.29 | 360 | 192 | 1.90 | 158.2 | 4800 | 94.46 |
| 1219 | 12.01 | 7.30 | 359 | 191 | 1.89 | 157.4 | 6000 | 94.46 |
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| | VOC's= 6.0 | | | Fe2+= NA | | | MNO4= NONE | |

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|---|---|
| Did well dewater? Yes (No) | Amount actually evacuated: 6L |
| Sampling Time: 1220 | Sampling Date: 12/11/15 |
| Sample I.D.: LF002-NDA13-15D | Laboratory: TA |
| Analyzed for: TPH-G BTEX MTBE TPH-D | Other: VOC's (HCL), Cr/Mn |
| Equipment Blank I.D.: @ Time | Duplicate I.D.: |

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 1512 10-LB | Client: BAYWEST |
| Sampler: LB | Gauging Date: 12/16/15 |
| Well I.D.: NDA-14 | Well Diameter (in.): 2 3 (4) 6 8 ____ |
| Total Well Depth (ft.): 94.05 | Depth to Water (ft.): 84.95 |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: PVC Grade | Flow Cell Type: YSI 556 |

Purge Method: 2" Grundfos Pump Peristaltic Pump Bladder Pump
Sampling Method: Dedicated Tubing New Tubing Other ____

Start Purge Time: 1515 Flow Rate: 400 mL/min Pump Depth: 90'

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| 1518 | 8.90 | 7.49 | 592 | >1000 | 2.37 | 160.0 | 1200 | 84.95 |
| 1521 | 9.82 | 7.44 | 598 | >1000 | 2.30 | 149.6 | 2400 | 84.95 |
| 1524 | 9.89 | 7.38 | 600 | >1000 | 2.29 | 145.2 | 3600 | 84.95 |
| 1527 | 9.90 | 7.39 | 601 | >1000 | 2.28 | 144.8 | 4800 | 84.95 |
| 1530 | 9.91 | 7.40 | 602 | >1000 | 2.26 | 143.2 | 6000 | 84.95 |
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| | VOC's= 00 | | | Fe2+= N/A | | | MNO4= 3.8 mg/L | |

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|---|---|
| Did well dewater? Yes (No) | Amount actually evacuated: 6L |
| Sampling Time: 1531 | Sampling Date: 12/16/15 |
| Sample I.D.: LF002-NDA14-15D | Laboratory: TA |
| Analyzed for: TPH-G BTEX MTBE TPH-D | Other: VOC's (As, Se), Cr/Mn |
| Equipment Blank I.D.: @ Time | Duplicate I.D.: |

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151210-LB1 | Client: BAY WEST |
| Sampler: LB | Gauging Date: 12/15/15 |
| Well I.D.: EW-02 | Well Diameter (in.): 2 3 4 6 8 ____ |
| Total Well Depth (ft.): ____ | Depth to Water (ft.): ____ |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: PVC Grade | Flow Cell Type: ____ |

Purge Method: 2" Grundfos Pump / Peristaltic Pump / Bladder Pump
Sampling Method: Dedicated Tubing / New Tubing / Other ____

Start Purge Time: 1530 Flow Rate: 500 mL/MIN Pump Depth: ____

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| 1535 | 11.63 | 7.31 | 397 | 12 | 1.92 | 116.3 | 2500 | — |
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| | VOC's= 00 | | | Fe2+= NA | | | MNO4= NONE | |

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|---|---|
| Did well dewater? Yes No | Amount actually evacuated: 2.5L |
| Sampling Time: 1536 | Sampling Date: 12/15/15 |
| Sample I.D.: LF002-EW02-15D | Laboratory: TA |
| Analyzed for: TPH-G BTEX MTBE TPH-D | Other: VOC's (HCL) MS/MSD |
| Equipment Blank I.D.: @ Time | Duplicate I.D.: |

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151210-LB1 | Client: Bay West |
| Sampler: LB | Gauging Date: 12/15/15 |
| Well I.D.: EW-05 | Well Diameter (in.): 2 3 4 6 8 ____ |
| Total Well Depth (ft.): — | Depth to Water (ft.): — |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: PVC Grade | Flow Cell Type: |

Purge Method: 2" Grundfos Pump Peristaltic Pump Bladder Pump
Sampling Method: Dedicated Tubing New Tubing Other ____

Start Purge Time: 1501 Flow Rate: 500 mL/min Pump Depth: ____

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| 1506 | 11.59 | 7.35 | 359 | 12 | 1.90 | 124.6 | 2500 | — |
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| | VOC's= 0.0 | | | Fe2+= NA | | | MNO4= NONE | |

Did well dewater? Yes No Amount actually evacuated: 2.5L

Sampling Time: 1507 Sampling Date: 12/15/15

Sample I.D.: LF002-EW05-150 Laboratory: TA

Analyzed for: TPH-G BTEX MTBE TPH-D Other: VOC's (HCL), Cr/Mn

Equipment Blank I.D.: @ Time Duplicate I.D.: LF002-EW5005-150

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151210-L81 | Client: Bay West |
| Sampler: LB | Gauging Date: 12/15/15 |
| Well I.D.: EW-06 | Well Diameter (in.): 2 3 4 6 8 ____ |
| Total Well Depth (ft.): — | Depth to Water (ft.): — |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: PVC Grade | Flow Cell Type: ____ |

Purge Method: 2" Grundfos Pump Peristaltic Pump Bladder Pump
Sampling Method: Dedicated Tubing New Tubing Other ____

Start Purge Time: 1439 Flow Rate: 500 mL/min Pump Depth: ____

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| 1444 | 10.75 | 7.43 | 372 | 12 | 2.78 | 231.7 | 2500 | — |
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| | VOC's= 60 | | | Fe2+= NA | | | MNO4= NONE | |

Did well dewater? Yes No Amount actually evacuated: 25L

Sampling Time: 1445 Sampling Date: 12/15/15

Sample I.D.: LP002-EW06-1510 Laboratory: TA

Analyzed for: TPH-G BTEX MTBE TPH-D Other: VOC's (HCL), Cr/Mn

Equipment Blank I.D.: @ Time Duplicate I.D.:

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151210-LB1 | Client: BAY WEST |
| Sampler: LB | Gauging Date: 12/15/15 |
| Well I.D.: EW 07 | Well Diameter (in.) : 2 3 4 6 8 ____ |
| Total Well Depth (ft.) : — | Depth to Water (ft.) : — |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: PVC Grade | Flow Cell Type: |

Purge Method: 2" Grundfos Pump Peristaltic Pump Bladder Pump
Sampling Method: Dedicated Tubing New Tubing Other____

Start Purge Time: 1346 Flow Rate: 500 mL/min Pump Depth: —

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| 1551 | 11.31 | 7.50 | 429 | 9 | 2.70 | 2009 | 2500 | — |
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| | VOC's= 0.0 | | | Fe2+= NA | | | MNO4= NONE | |

Did well dewater? Yes No Amount actually evacuated: 2.5L

Sampling Time: 1552 Sampling Date: 12/15/15

Sample I.D.: LF002-EW07-150 Laboratory: TA

Analyzed for: TPH-G BTEX MTBE TPH-D Other: VOC's (HCl)

Equipment Blank I.D.: @ Time Duplicate I.D.:

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151210-LB1 | Client: BAYWEST |
| Sampler: LB | Gauging Date: 12/15/15 |
| Well I.D.: EW-09 | Well Diameter (in.): 2 3 4 6 8 ____ |
| Total Well Depth (ft.): — | Depth to Water (ft.): — |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: PVC Grade | Flow Cell Type: |

Purge Method: 2" Grundfos Pump Peristaltic Pump Bladder Pump
Sampling Method: Dedicated Tubing New Tubing Other

Start Purge Time: 1349 Flow Rate: 500 mL/min Pump Depth:

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| 1354 | 11.68 | 7.18 | 398 | 14 | 2.47 | 145.2 | 2500 | — |
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| | VOC's= 00 | | | Fe2+= NA | | | MNO4= NONE | |

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|---|---|
| Did well dewater? Yes No | Amount actually evacuated: |
| Sampling Time: 1355 | Sampling Date: 12/15/15 |
| Sample I.D.: LF002-EW09-15D | Laboratory: TA |
| Analyzed for: TPH-G BTEX MTBE TPH-D | Other: VOC's (HCL), Cr/Mn |
| Equipment Blank I.D.: @ Time | Duplicate I.D.: |

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151210-LB1 | Client: BNY/WEST |
| Sampler: LB | Gauging Date: 12/15/15 |
| Well I.D.: EW-10 | Well Diameter (in.): 2 3 4 6 8 ____ |
| Total Well Depth (ft.): ——— | Depth to Water (ft.): ——— |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: PVC Grade | Flow Cell Type: ____ |

Purge Method: 2" Grundfos Pump Peristaltic Pump Bladder Pump
Sampling Method: Dedicated Tubing New Tubing Other ____

Start Purge Time: 1404 Flow Rate: 500mL/min Pump Depth: ____

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| 1409 | 11.47 | 7.19 | 357 | 11 | 2.15 | 162.1 | 2500 | ——— |
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| | VOC's= 0.0 | | | Fe2+= NA | | | MNO4= NONE | |

Did well dewater? Yes (No) Amount actually evacuated: 2500 mL

Sampling Time: 1410 Sampling Date: 12/15/15

Sample I.D.: LF002-RW10-150 Laboratory: TA

Analyzed for: TPH-G BTEX MTBE TPH-D Other: VOC's (HCL), Cr/Mn

Equipment Blank I.D.: @ Time Duplicate I.D.:

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151210-LB1 | Client: BAY WEST |
| Sampler: LB | Gauging Date: 12/15/15 |
| Well I.D.: EW-14 | Well Diameter (in.): 2 3 4 6 8 ____ |
| Total Well Depth (ft.): ——— | Depth to Water (ft.): ——— |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: PVC Grade | Flow Cell Type: |

Purge Method: 2" Grundfos Pump Peristaltic Pump Bladder Pump
Sampling Method: Dedicated Tubing New Tubing Other ____

Start Purge Time: 1422 Flow Rate: 500 mL/min Pump Depth: ———

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| 1427 | 10.88 | 7.24 | 618 | 12 | 2.48 | 148.4 | 2500 | ——— |
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| | VOC's= 60 | | | Fe2+= NA | | | MNO4= NONE | |

Did well dewater? Yes ~~No~~ Amount actually evacuated: 2.5L

Sampling Time: 1428 Sampling Date: 12/15/15

Sample I.D.: LF002-RW14-15D Laboratory: TA

Analyzed for: TPH-G BTEX MTBE TPH-D Other: VOC's (HCL), Cr/Mn

Equipment Blank I.D.: @ Time Duplicate I.D.:

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151210-LB1 | Client: BAYWEST |
| Sampler: LB | Gauging Date: 12/16/15 |
| Well I.D.: PS 1/4 | Well Diameter (in.): 2 3 4 6 8 ____ |
| Total Well Depth (ft.): — | Depth to Water (ft.): — |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: PVC Grade | Flow Cell Type: |

Purge Method: 2" Grundfos Pump Peristaltic Pump Bladder Pump
Sampling Method: Dedicated Tubing New Tubing Other

Start Purge Time: 1400 Flow Rate: 500mL/MIN Pump Depth:

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| 1405 | 12.22 | 7.46 | 383 | 6 | 2.44 | 87.6 | 2500 | — |
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| | VOC's= 0.0 | | | Fe2+= NA | | | MNO4= NONE | |

Did well dewater? Yes No Amount actually evacuated: 2.5L

Sampling Time: 1406 Sampling Date: 12/16/15

Sample I.D.: LF002-PS 1/4-15D Laboratory: TA

Analyzed for: TPH-G BTEX MTBE TPH-D Other: VOC's (HCL)

Equipment Blank I.D.: @ Time Duplicate I.D.:

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151210-LB1 | Client: BAYWEST |
| Sampler: LB | Gauging Date: 12/14/15 |
| Well I.D.: MW-63 | Well Diameter (in.): 2 3 (4) 6 8 ____ |
| Total Well Depth (ft.): —— | Depth to Water (ft.): 91.34 |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: (PVC) Grade | Flow Cell Type: YSI 556 |

Purge Method: 2" Grundfos Pump Peristaltic Pump Bladder Pump (D.D. Pump)
Sampling Method: Dedicated Tubing New Tubing Other ____

Start Purge Time: 1518 Flow Rate: 400 mL/MIN Pump Depth: NA

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| 1521 | 11.45 | 7.26 | 475 | 34 | 2.49 | 124.3 | 1200 | 91.34 |
| 1524 | 11.51 | 7.29 | 484 | 28 | 2.43 | 88.4 | 2400 | 91.34 |
| 1527 | 11.53 | 7.31 | 487 | 26 | 2.41 | 85.3 | 3600 | 91.34 |
| 1530 | 11.54 | 7.32 | 486 | 27 | 2.40 | 84.6 | 4800 | 91.34 |
| 1533 | 11.55 | 7.31 | 485 | 26 | 2.39 | 83.2 | 6000 | 91.34 |
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| | | | | | | | | |
| | VOC's=60 | | | Fe2+= NA | | | MNO4= NONE | |

Did well dewater? Yes (No) Amount actually evacuated: 6L

Sampling Time: 1534 Sampling Date: 12/14/15

Sample I.D.: LF002-MW63-15D Laboratory: TA

Analyzed for: TPH-G BTEX MTBE TPH-D Other: VOC's (HCL)

Equipment Blank I.D.: @ Time Duplicate I.D.:

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151210-LB1 | Client: Bay West |
| Sampler: LB | Gauging Date: 12/15/15 |
| Well I.D.: MW-75 | Well Diameter (in.): 2 3 (4) 6 8 ____ |
| Total Well Depth (ft.): — | Depth to Water (ft.): 77.91 |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: (PVC) Grade | Flow Cell Type: YSI 556 |

Purge Method: 2" Grundfos Pump Peristaltic Pump Bladder Pump (Other Pump)

Sampling Method: Dedicated (Tubing) New Tubing Other ____

Start Purge Time: 0829 Flow Rate: 400 mL/min Pump Depth: NA

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| 0832 | 11.56 | 7.43 | 398 | 15 | 1.54 | 136.2 | 1200 | 77.91 |
| 0835 | 11.60 | 7.45 | 400 | 13 | 1.46 | 130.0 | 2400 | 77.91 |
| 0838 | 11.61 | 7.49 | 399 | 12 | 1.45 | 129.5 | 3600 | 77.91 |
| 0841 | 11.62 | 7.50 | 398 | 13 | 1.44 | 128.6 | 4800 | 77.91 |
| 0844 | 11.63 | 7.51 | 397 | 14 | 1.43 | 127.4 | 6000 | 77.91 |
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| | | | | | | | | |
| | VOC's= 00 | | | Fe2+= NA | | | MNO4= NONE | |

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|---|---|
| Did well dewater? Yes (No) | Amount actually evacuated: GL |
| Sampling Time: 0845 | Sampling Date: 12/15/15 |
| Sample I.D.: LF002-MW75-ISD | Laboratory: TA |
| Analyzed for: TPH-G BTEX MTBE TPH-D | Other: VOC's (HCL) |
| Equipment Blank I.D.: @ Time | Duplicate I.D.: LF002-MW50/75-ISD |

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151210-LB1 | Client: BAYWEST |
| Sampler: LB | Gauging Date: 12/16/15 |
| Well I.D.: MW-82 | Well Diameter (in.): 2 3 (4) 6 8 ____ |
| Total Well Depth (ft.): ——— | Depth to Water (ft.): 46.35 |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: (PVC) Grade | Flow Cell Type: YSI 556 |

Purge Method: 2" Grundfos Pump Peristaltic Pump Bladder Pump (DED PUMP)
Sampling Method: Dedicated (Tubing) New Tubing Other ____

Start Purge Time: 1433 Flow Rate: 400 mL/min Pump Depth: NA

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| 1436 | 8.87 | 7.66 | 509 | 25 | 2.41 | 104.1 | 1200 | 46.35 |
| 1439 | 9.31 | 7.47 | 502 | 19 | 2.39 | 103.2 | 2400 | 46.35 |
| 1442 | 9.38 | 7.44 | 505 | 18 | 2.36 | 101.4 | 3600 | 46.35 |
| 1445 | 9.37 | 7.43 | 506 | 17 | 2.35 | 100.6 | 4800 | 46.35 |
| 1448 | 9.36 | 7.42 | 507 | 16 | 2.34 | 99.1 | 6000 | 46.35 |
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| | VOC's= 0.0 | | | Fe2+= NA | | | MNO4= NONE | |

| | |
|---|---|
| Did well dewater? Yes (No) | Amount actually evacuated: 6L |
| Sampling Time: 1449 | Sampling Date: 12/16/15 |
| Sample I.D.: LF002-MW82-15D | Laboratory: TA |
| Analyzed for: TPH-G BTEX MTBE TPH-D | Other: VOC's (HCL) |
| Equipment Blank I.D.: @ Time | Duplicate I.D.: |

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151130-LB1 | Client: Bay West |
| Sampler: LB | Gauging Date: 12/10/12 |
| Well I.D.: WP-01 | Well Diameter (in.): 2 3 4 6 8 ____ |
| Total Well Depth (ft.): 22.20 | Depth to Water (ft.): 7.22 |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: PVC Grade | Flow Cell Type: YSI 556 |

Purge Method: 2" Grundfos Pump Peristaltic Pump Bladder Pump
Sampling Method: Dedicated Tubing New Tubing Other ____

Start Purge Time: 1444 Flow Rate: 200 mL/min Pump Depth: 17'

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| 1447 | 10.15 | 7.26 | 209 | 24 | 1.93 | 35.9 | 600 | 7.28 |
| 1450 | 10.03 | 7.22 | 207 | 21 | 1.90 | 27.3 | 1200 | 7.28 |
| 1453 | 10.00 | 7.19 | 204 | 19 | 1.88 | 24.4 | 1800 | 7.28 |
| 1456 | 10.01 | 7.18 | 203 | 18 | 1.87 | 23.2 | 2400 | 7.28 |
| 1459 | 10.02 | 7.17 | 202 | 19 | 1.86 | 22.6 | 3000 | 7.28 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | VOC's= 0.0 | | | Fe2+= 0.4 mg/L | | | MNO4= NONE | |

| | |
|---|---|
| Did well dewater? Yes No | Amount actually evacuated: 3L |
| Sampling Time: 1500 | Sampling Date: 12/10/15 |
| Sample I.D.: WP003- WP01-15D | Laboratory: TA |
| Analyzed for: TPH-G BTEX MTBE TPH-D | Other: Ar |
| Equipment Blank I.D.: @ Time | Duplicate I.D.: |

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151130-CB1 | Client: ~~AECOM~~ Baywest |
| Sampler: AP | Gauging Date: 12/10/15 |
| Well I.D.: EW-3 | Well Diameter (in.): 2 3 4 6 8 12 |
| Total Well Depth (ft.): 21.25 | Depth to Water (ft.): 5.57 |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: PVC Grade | Flow Cell Type: YSI556 |

Purge Method: 2" Grundfos Pump Peristaltic Pump Bladder Pump
Sampling Method: Dedicated Tubing New Tubing Other

Start Purge Time: 1441 Flow Rate: 200 mL/min Pump Depth: 17.5'

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| 1444 | 9.10 | 6.38 | 233 | 222 | 7.82 | -55.5 | 600 | 5.60 |
| 1447 | 8.97 | 6.32 | 231 | 114 | 7.88 | -53.9 | 1200 | 5.60 |
| 1450 | 8.95 | 6.30 | 232 | 99 | 7.89 | -55.9 | 1800 | 5.60 |
| 1453 | 9.00 | 6.28 | 231 | 90 | 7.86 | -58.2 | 2400 | 5.60 |
| 1456 | 9.01 | 6.28 | 231 | 85 | 7.85 | -59.1 | 3000 | 5.60 |
| | | | | | | | | |
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| | | | | | | | | |
| | VOC's=0.0 | | | Fe2+= 0.0 | | | MNO4= 0.0 | |

| | |
|---|---|
| Did well dewater? Yes No | Amount actually evacuated: 3.0L |
| Sampling Time: 1457 | Sampling Date: 12/10/15 |
| Sample I.D.: WP003-EW3-150 | Laboratory: TA |
| Analyzed for: TPH-G BTEX MTBE TPH-D | Other: metals |
| Equipment Blank I.D.: @ Time | Duplicate I.D.: |

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151130-LB1 | Client: BAYWEST |
| Sampler: LB | Gauging Date: 12/10/15 |
| Well I.D.: MW-11 | Well Diameter (in.): (2) 3 4 6 8 ____ |
| Total Well Depth (ft.): 18.51 | Depth to Water (ft.): 11.78 |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: PVC Grade | Flow Cell Type: YSI 556 |

Purge Method: 2" Grundfos Pump Peristaltic Pump Bladder Pump
Sampling Method: Dedicated Tubing New Tubing Other ____

Start Purge Time: 1346 Flow Rate: 200 mL/MIN Pump Depth: 13'

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or ml) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| 1349 | 11.70 | 6.97 | 475 | 28 | 0.96 | -90.6 | 600 | 11.79 |
| 1352 | 11.79 | 6.95 | 473 | 24 | 0.91 | -96.4 | 1200 | 11.79 |
| 1355 | 11.80 | 6.94 | 472 | 23 | 0.90 | -100.1 | 1800 | 11.79 |
| 1358 | 11.81 | 6.93 | 471 | 22 | 0.89 | -101.4 | 2400 | 11.79 |
| 1401 | 11.82 | 6.92 | 470 | 21 | 0.88 | -102.3 | 3000 | 11.79 |
| | | | | | | | | |
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| | | | | | | | | |
| | VOC's= 0.0 | | | Fe2+= 0.8 mg/L | | | MNO4= NONE | |

| | |
|---|---|
| Did well dewater? Yes (No) | Amount actually evacuated: 3L |
| Sampling Time: 1402 | Sampling Date: 12/10/15 |
| Sample I.D.: WP003-MW11-15D | Laboratory: TA |
| Analyzed for: TPH-G BTEX MTBE TPH-D | Other: Ar |
| Equipment Blank I.D.: @ Time | Duplicate I.D.: |

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151130-LB1 | Client: BAY WEST |
| Sampler: LB | Gauging Date: 12/10/15 |
| Well I.D.: MW-12 | Well Diameter (in.): 2 3 4 6 8 ____ |
| Total Well Depth (ft.): 14.98 | Depth to Water (ft.): 10.47 |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: PVC Grade | Flow Cell Type: YSI 556 |

Purge Method: 2" Grundfos Pump Peristaltic Pump Bladder Pump
Sampling Method: Dedicated Tubing New Tubing Other ____

Start Purge Time: 1412 Flow Rate: 200 mL/MIN Pump Depth: 13'

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| 1415 | 10.75 | 6.87 | 623 | 44 | 1.25 | 52.7 | 600 | 10.51 |
| 1418 | 10.51 | 6.89 | 635 | 38 | 1.21 | 48.2 | 1200 | 10.51 |
| 1421 | 10.49 | 6.90 | 638 | 34 | 1.18 | 46.7 | 1800 | 10.51 |
| 1424 | 10.48 | 6.91 | 639 | 33 | 1.17 | 45.2 | 2400 | 10.51 |
| 1427 | 10.46 | 6.92 | 640 | 32 | 1.16 | 44.8 | 3000 | 10.51 |
| | | | | | | | | |
| | | | | | | | | |
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| | | | | | | | | |
| | | | | | | | | |
| | VOC's= 0.0 | | | Fe2+= 1.2 mg/L | | | MNO4= NONE | |

| | |
|---|---|
| Did well dewater? Yes No | Amount actually evacuated: 3L |
| Sampling Time: 1428 | Sampling Date: 12/10/15 |
| Sample I.D.: WP003-MW12-150 | Laboratory: TA |
| Analyzed for: TPH-G BTEX MTBE TPH-D | Other: Ar |
| Equipment Blank I.D.: @ Time | Duplicate I.D.: |

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151130-LB1 | Client: BAYWEST |
| Sampler: LB | Gauging Date: 12/10/15 |
| Well I.D.: MW-102 | Well Diameter (in.): (2) 3 4 6 8 ____ |
| Total Well Depth (ft.): 18.61 | Depth to Water (ft.): 10.59 |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: PVC Grade | Flow Cell Type: YSI 556 |

Purge Method: 2" Grundfos Pump Peristaltic Pump Bladder Pump
Sampling Method: Dedicated Tubing New Tubing Other_____

Start Purge Time: 1321 Flow Rate: 200 mL/min Pump Depth: 13'

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or ~~uS/cm~~) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| 1324 | 10.99 | 6.98 | 620 | 24 | 1.83 | 90.1 | 600 | 10.61 |
| 1327 | 11.03 | 6.96 | 621 | 21 | 1.75 | 82.6 | 1200 | 10.61 |
| 1330 | 11.02 | 6.94 | 622 | 19 | 1.72 | 80.4 | 1800 | 10.61 |
| 1333 | 11.03 | 6.93 | 623 | 18 | 1.71 | 79.6 | 2400 | 10.61 |
| 1336 | 11.04 | 6.92 | 624 | 17 | 1.70 | 78.3 | 3000 | 10.61 |
| | | | | | | | | |
| | | | | | | | | |
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| | | | | | | | | |
| | VOC's= 00 | | | Fe2+= 0.8 mg/L | | | MNO4= NONE | |

| | |
|---|---|
| Did well dewater? Yes (No) | Amount actually evacuated: 3L |
| Sampling Time: 1337 | Sampling Date: 12/10/15 |
| Sample I.D.: WP003-MW102-15D | Laboratory: TA |
| Analyzed for: TPH-G BTEX MTBE TPH-D | Other: VOC's (HCl), As |
| Equipment Blank I.D.: @ Time | Duplicate I.D.: |

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151130-LB1 | Client: BAY WEST |
| Sampler: LB | Gauging Date: 12/10/15 |
| Well I.D.: MW-103 | Well Diameter (in.): 2 3 4 6 8 ____ |
| Total Well Depth (ft.): 17.12 | Depth to Water (ft.): 10.61 |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: PVC Grade | Flow Cell Type: YSI 556 |

Purge Method: 2" Grundfos Pump Peristaltic Pump Bladder Pump
Sampling Method: Dedicated Tubing New Tubing Other_____

Start Purge Time: 1255 Flow Rate: 200 mL/MIN Pump Depth: 13'

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| 1258 | 11.33 | 6.99 | 696 | 38 | 1.84 | 101.3 | 600 | 10.65 |
| 1301 | 11.24 | 6.95 | 706 | 31 | 1.83 | 91.9 | 1200 | 10.65 |
| 1304 | 11.22 | 6.94 | 708 | 30 | 1.81 | 90.6 | 1800 | 10.65 |
| 1307 | 11.21 | 6.93 | 709 | 31 | 1.80 | 89.4 | 2400 | 10.65 |
| 1310 | 11.20 | 6.92 | 710 | 31 | 1.79 | 88.4 | 3000 | 10.65 |
| | | | | | | | | |
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| | | | | | | | | |
| | VOC's=0.0 | | | Fe2+= 0.0 mg/L | | | MNO4= NONE | |

Did well dewater? Yes No Amount actually evacuated: 3L

Sampling Time: 1311 Sampling Date: 12/10/15

Sample I.D.: WIP003-MW103-15D Laboratory: TA

Analyzed for: TPH-G BTEX MTBE TPH-D Other: Ar

Equipment Blank I.D.: @ Time Duplicate I.D.:

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151210-LB1 | Client: Bay West |
| Sampler: AP | Gauging Date: 12/11/15 |
| Well I.D.: MW-120 | Well Diameter (in.): ~~2~~ 3 (4) 6 8 ____ |
| Total Well Depth (ft.): 29.41 | Depth to Water (ft.): 10.80 |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: (PVC) Grade | Flow Cell Type: YSI 556 |

Purge Method: 2" Grundfos Pump (Peristaltic Pump) Bladder Pump

Sampling Method: Dedicated Tubing (New Tubing) Other ____

Start Purge Time: 0954 Flow Rate: 200 mL/min Pump Depth: 20'

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| 0957 | 9.46 | 6.66 | 390 | 25 | 7.56 | -25.6 | 600 | 10.91 |
| 1000 | 9.50 | 6.64 | 388 | 17 | 7.53 | -1.2 | 1200 | 10.91 |
| 1003 | 9.39 | 6.72 | 391 | 15 | 7.60 | 61.1 | 1800 | 10.91 |
| 1006 | 9.42 | 6.71 | 391 | 15 | 7.59 | 58.3 | 2400 | 10.91 |
| 1009 | 9.40 | 6.72 | 392 | 13 | 7.59 | 60.0 | 3000 | 10.91 |
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| | | | | | | | | |
| | | | | | | | | |
| | VOC's= 0.0 | | | Fe2+= 0.0 | | | MNO4= 0.0 | |

| | |
|---|---|
| Did well dewater? Yes (No) | Amount actually evacuated: 3.0L |
| Sampling Time: 1010 | Sampling Date: 12/11/15 |
| Sample I.D.: WP003-MW120-15D | Laboratory: TA |
| Analyzed for: TPH-G BTEX MTBE TPH-D | Other: VOC (HCL) |
| Equipment Blank I.D.: @ Time | Duplicate I.D.: |

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151210-LB1 | Client: Bay West |
| Sampler: CP | Gauging Date: 12/11/15 |
| Well I.D.: OW-2 | Well Diameter (in.): 2 3 4 6 8 ____ |
| Total Well Depth (ft.): 21.19 | Depth to Water (ft.): 11.61 |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: PVC Grade | Flow Cell Type: YSI 556 |

Purge Method: 2" Grundfos Pump Peristaltic Pump Bladder Pump
Sampling Method: Dedicated Tubing New Tubing Other_____

Start Purge Time: 1030 Flow Rate: 200 ml/min Pump Depth: 16.5

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| 1033 | 9.45 | 6.43 | 545 | 59 | 7.58 | -22.0 | 600 | 11.65 |
| 1036 | 9.40 | 6.43 | 548 | 45 | 7.61 | -27.2 | 1200 | 11.65 |
| 1039 | 9.57 | 6.43 | 547 | 40 | 7.45 | -29.4 | 1800 | 11.65 |
| 1042 | 9.66 | 6.43 | 547 | 37 | 7.44 | -30.5 | 2400 | 11.65 |
| 1045 | 9.71 | 6.43 | 546 | 35 | 7.39 | -29.9 | 3000 | 11.65 |
| | | | | | | | | |
| | | | | | | | | |
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| | | | | | | | | |
| | | | | | | | | |
| | VOC's= 0.0 | | | Fe2+= 0.0 | | | MNO4= 0.0 | |

| | |
|---|---|
| Did well dewater? Yes No | Amount actually evacuated: 3.0L |
| Sampling Time: 1046 | Sampling Date: 12/11/15 |
| Sample I.D.: WP003-OW2-150 | Laboratory: TA |
| Analyzed for: TPH-G BTEX MTBE TPH-D | Other: VOC (HCl) |
| Equipment Blank I.D.: @ Time | Duplicate I.D.: WP003-OW52-150 |

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151210-LB1 | Client: Bay West |
| Sampler: AP | Gauging Date: |
| Well I.D.: RW-12 | Well Diameter (in.): 2 3 4 6 8 ____ |
| Total Well Depth (ft.): | Depth to Water (ft.): |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: PVC Grade | Flow Cell Type: |

Purge Method: 2" Grundfos Pump Peristaltic Pump Bladder Pump
Sampling Method: Dedicated Tubing New Tubing Other ____

Start Purge Time: ____ Flow Rate: ____ Pump Depth: ____

| Time | Temp. (°C or F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| | - No Purge Sample Taken | | | | | | | |
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| | | | | | | | | |
| 1116 | 45.5 | 6.21 | 219.2 | 19 | | 252.1 | - | |
| | VOC's= 0.0 | | | Fe2+= 0.0 | | | MNO4= 0.0 | |

Did well dewater? Yes No Amount actually evacuated: —

Sampling Time: 1115 Sampling Date: 12/11/15

Sample I.D.: WP003-RW12-15D Laboratory: TA

Analyzed for: TPH-G BTEX MTBE TPH-D Other: metals

Equipment Blank I.D.: @ Time Duplicate I.D.:

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151210-CB1 | Client: Bay West |
| Sampler: AP | Gauging Date: 12/1/15 |
| Well I.D.: RW-15 | Well Diameter (in.): 2 3 4 6 8 ____ |
| Total Well Depth (ft.): | Depth to Water (ft.): — |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: PVC Grade | Flow Cell Type: |

Purge Method: 2" Grundfos Pump Peristaltic Pump Bladder Pump
Sampling Method: Dedicated Tubing New Tubing Other
Start Purge Time: Flow Rate: Pump Depth:

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| | — well is Dry — | | | | | | | |
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| | | | | | | | | |
| | — No Sample Taken | | | | | | | |
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| | |
|---|---|
| Did well dewater? Yes No | Amount actually evacuated: |
| Sampling Time: | Sampling Date: |
| Sample I.D.: | Laboratory: |
| Analyzed for: TPH-G BTEX MTBE TPH-D | Other: |
| Equipment Blank I.D.: @ Time | Duplicate I.D.: |

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151210-LB1 | Client: BAY WEST |
| Sampler: LB | Gauging Date: 12/10/15 |
| Well I.D.: RW-16 | Well Diameter (in.) : 2 3 4 6 8 ____ |
| Total Well Depth (ft.) : | Depth to Water (ft.) : |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: PVC Grade | Flow Cell Type: |

Purge Method: 2" Grundfos Pump Peristaltic Pump Bladder Pump
Sampling Method: Dedicated Tubing New Tubing Other_____

Start Purge Time:_____ Flow Rate: _____ Pump Depth:_____

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| | WELL NON-FUNCTIONING PER OWNER | | | | | | | |
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| | NO SAMPLE TAKEN | | | | | | | |
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| | | | | | | | | |
| | VOC's= | | | Fe2+= | | | MNO4= | |

| | |
|---|---|
| Did well dewater? Yes No | Amount actually evacuated: |
| Sampling Time: | Sampling Date: |
| Sample I.D.: | Laboratory: |
| Analyzed for: TPH-G BTEX MTBE TPH-D | Other: |
| Equipment Blank I.D.: @ Time | Duplicate I.D.: |

# LOW FLOW WELL MONITORING DATA SHEET

| | |
|---|---|
| Project #: 151210-LB1 | Client: Ray West |
| Sampler: CR | Gauging Date: / |
| Well I.D.: ~~RW-15~~ RW-17 | Well Diameter (in.): 2 3 4 6 8 ____ |
| Total Well Depth (ft.): | Depth to Water (ft.): |
| Depth to Free Product: | Thickness of Free Product (feet): |
| Referenced to: PVC Grade | Flow Cell Type: _____ |

Purge Method: 2" Grundfos Pump Peristaltic Pump Bladder Pump
Sampling Method: Dedicated Tubing New Tubing Other_____

Start Purge Time:_____ Flow Rate: _____ Pump Depth:_____

| Time | Temp. (°C or °F) | pH | Cond. (mS/cm or µS/cm) | Turbidity (NTUs) | D.O. (mg/L) | ORP (mV) | Water Removed (gals. or mL) | Depth to Water (ft.) |
|---|---|---|---|---|---|---|---|---|
| | - No Purge Sample Taken - | | | | | | | |
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| | | | | | | | | |
| 1146 | 45.4 | 7.37 | 281.5 | 346 | | 113.0 | | |
| | VOC's= 0.0 | | | Fe2+= 0.0 | | / | MNO4= 0.0 | |

Did well dewater? Yes ~~No~~ Amount actually evacuated: —

Sampling Time: 1145 Sampling Date: 12/11/15

Sample I.D.: WP003-RW15-15D Laboratory: TA

Analyzed for: TPH-G BTEX MTBE TPH-D Other: VOC(HCL)

Equipment Blank I.D.: @ Time Duplicate I.D.:

# Appendix B
# Laboratory Reports
*(Provided on CD)*

# Appendix C
# Data Validation Reports

# Laboratory Analytical Data Validation

**Site:** FAFB FT004
**Date Completed:** 01-11-2016
**Submitted by:** Nancy McDonald
**Sample Collection Date(s):** 12-11-2015
**TestAmerica Project Number(s) (LPN):** 580-55918-1
**Bay West DMS #:** 2081744

This data validation memo describes the validation of 2 aqueous sample collected December 11, 2015 and analyzed for DRO and Motor Oil by NWTPH-Dx at the TestAmerica Laboratory in Seattle, Washington, as sample delivery group (SDG) 580-55918-1. Samples included as part of this S4VM validation are listed below.

| Sample ID | Date Sampled | TestAmerica, Denver | |
|---|---|---|---|
| | | *Lab ID* | *DRO / Motor Oil* |
| FT004-MW226-15D | 12/11/2016 | 55918-4 | X |
| FT004-RW46-15D | 12/11/2016 | 53819-5 | X |

The Data Qualification Summary Table below summarizes the qualifications that were applied during validation.

| Sample ID | Date Sampled | TestAmerica, Denver | |
|---|---|---|---|
| | | *Lab ID* | *DRO / Motor Oil* |
| FT004-MW226-15D | 12/11/2016 | 55918-4 | |
| FT004-RW46-15D | 12/11/2016 | 53819-5 | |

***No data was qualified during validation.

Validation was conducted according to this hierarchy of validation guidance: DoD Quality Systems Manual for Environmental Laboratories, Version 5.0, July 2013 (DoD, 2013), and U.S. Environmental Protection Agency (USEPA) Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review (USEPA, 2014). The Site-Specific and Consolidated Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPPs) and laboratory standard operating procedures (SOPs) were consulted during the data validation.

**Data Validation Detail**

- **Data Package Completeness**

  The Level IV data package was reviewed to make certain that it contained the data required in the deliverable. This included checking the data package for the results of each analyte requested for each field sample submitted in the analytical batch, along with requested quality control (QC) documentation for the method. The data package is complete.

- **Laboratory Case Narrative/Cooler Receipt Form**

  No anomalies were noted on the chain-of-custody (CoC) or cooler receipt forms that affected data. The laboratory case narrative was accurate and complete.

- **Holding Times, Storage, and Preservation**

  Review of the sample collection and analysis dates involved comparing the CoCs, the summary forms, and the data report for holding time compliance.

  The sample was received correctly, intact, and properly preserved properly. The sample were prepared and analyzed within the holding times required by the project except for the following. Sample FT004-MW247-15C for NWTPH-Dx was originally analyzed within holding times; however, the sample was re-extracted and reanalyzed due to a low surrogate recovery. No action was warranted, because results from the initial analysis were reported.

- **Instrument Performance Check**

  The instrument met all applicable performance check requirements.

- **Initial Calibration/Initial Calibration Verification**

  Initial Calibration (ICAL) and Initial Calibration Verification (ICV) acceptance criteria were met for all analytical methods

- **Continuing Calibration Verification**

  Continuing Calibration Verification (CCV) acceptance criteria were met for all analytical methods.

- **Limit of Quantitation Check Standard**

  All acceptance criteria were met for the Limit of Quantitation (LOQ) Check Standards.

- **Interference Check Standard**

  Interference Check Standards are not applicable to NWTPH-Dx.

- **Method Blank**

  Target analytes were not detected above ½ LOQ in Method Blank.

- **Surrogate Spikes**

  Surrogates were added to the samples and QC samples as required by the analytical method. All surrogate recoveries met the required QC.

- **Matrix Spike/Matrix Spike Duplicates**

  No Matrix Spike/Matrix Spike Duplicate (MS/MSD) analyses were performed on the samples from Site FT004.

- **Laboratory Control Sample (LCS) / Laboratory Control Sample Duplicate (LCSD)**

  The LCS and LCSD recoveries for DRO and Motor oil were within the UFP-QAPP and the DoD QSM Version 5.0 acceptance criteria.

- **inductively Coupled Plasma (ICP) Serial Dilution (Dilution Test) and Post-Digestion Spikes**

  Inductively Coupled Plasma (ICP) Serial Dilutions and Post Digestion Spikes (PDS) are not applicable to NW-TPH-Dx.

- **Field Duplicates**

  No field duplicates were included with the samples in this SDG.

- **Internal Standards**

  Internal Standards (IS) are not required for NWTPH-Dx.

- **Target Analyte Identification and Quantitation**

  Target compound identification followed the specific analytical Method. Retention times were consistent with the analytical standards.

  Non-detected results were reported at the Limit of Detection (LOD) in accordance with DoD QSM Version 5.0. The laboratory also reported the LOQ and detection limit (DL) for each analyte on the sample result sheet. The laboratory reported target analytes, which were qualitatively identified at concentrations below the LOQs, with a “J” qualifier to indicate that the result is estimated as required by DoD QSM Version 5.0. The “J” qualifier was retained by the validator. In general, the LOQs reported are consistent with the LOQs listed in the UFP-QAPP. No sample dilutions were required.

**Overall Evaluation**

No analytical results were qualified during validation. All validation elements were acceptable and the data is acceptable for its intended use.

Based on the criteria presented above, it is recommended that the results reported for these analyses be accepted. LCS/LCSD and surrogate recoveries demonstrated that acceptable levels of accuracy and precision were achieved. In addition, completeness, defined to be the percentage of analytical results to be valid, was 100% for this SDG.

**Data Validation Qualifiers**

| Validation Qualifier | Definition |
|---|---|
| J | The reported positive result is considered estimated, because the result is less than the LOQ or because certain QC criteria were not met. |
| U | The analyte was not detected and is reported as less than the LOD or as defined by the client. |
| UJ | The analyte was not detected in the sample. The LOD (or LOQ) should be considered estimated and may be inaccurate or imprecise. |
| R | The result for this analyte is unusable. The analyte may or may not be present. |

**References**

U.S. Department of Defense (DoD), 2013. DoD Quality Systems Manual for Environmental Laboratories, Version 5.0, July.

U.S. Environmental Protection Agency (USEPA), 2008. USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review, June.

USEPA, 2014. USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review.

# Laboratory Analytical Data Validation

**Site:** FAFB LF002
**Date Completed:** 01-26-2016
**Submitted by:** Nancy McDonald
**Sample Collection Date(s):** 12-21-2015
**TestAmerica Project Number(s) (LPN):** 320-16568-1
**Bay West DMS #:** 2084918

This data validation memo describes the validation of three air samples collected on Fixed Gases (D1946) at the TestAmerica Laboratory in Sacramento, California, as sample delivery group (SDG) 320-16568-1. Samples included as part of this S4VM validation are listed below.

| Sample ID | Date Sampled | TestAmerica, Sacramento |
|---|---|---|
| | | *VOCs* |
| LF002 A 400 INF | 12/21/2015 | |
| LF002 A 400A | 12/21/2015 | |
| LF002 A 401 EFFL | 12/21/2015 | |

The Data Qualification Summary Table below summarizes the qualifications that were applied during validation.

| Sample ID | Date Sampled | TestAmerica, Sacramento |
|---|---|---|
| | | *VOCs* |
| LF002 A 400 INF | 09/28/2015 | |
| LF002 A 400 A | 09/28/2015 | |
| LF002 A 401 EFFL | 09/28/2015 | |

No data was qualified during validation.

Validation was conducted according to this hierarchy of validation guidance: Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.0, July 2013 (DoD, 2013), and U.S. Environmental Protection Agency (USEPA) Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review (USEPA, 2014). The Site-Specific and Consolidated Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPPs), and laboratory standard operating procedures (SOPs) were consulted during the data validation.

**Data Validation Detail**

- **Data Package Completeness**

  The Level IV data package was reviewed to make certain that it contained the data required in the deliverable. This included checking the data package for the results of each analyte requested for each field sample submitted in the analytical batch, along with requested QC documentation for the method. The data package is complete.

- **Laboratory Case Narrative/Cooler Receipt Form**

  No anomalies were noted on the chain-of-custody (CoC) or cooler receipt forms that affected data quality. The laboratory case narrative was accurate and complete and documented that TestAmerica Denver subcontracted the TO-15 analysis to TestAmerica Burlington which is also holds accreditation under DoD QSM 5.0.

- **Holding Times, Storage, and Preservation**

  Review of the sample collection and analysis dates involved comparing the CoCs, the summary forms, and the data report for holding time compliance.

  All samples were received correctly, intact and properly preserved. All samples were prepared and analyzed within the holding times required by the project.

- **Instrument Performance Check**

  The instruments met all applicable performance check requirements. The instrument performance check included verification of 4-Bromofluorobenzene (BFB) tunes for VOCs. All samples were analyzed within 12 hours of the BFB tunes.

- **Initial Calibration/Initial Calibration Verification**

  Initial Calibration (ICAL) and Initial Calibration Verification (ICV) acceptance criteria were met for all methods.

- **Continuing Calibration Verification**

  Continuing Calibration Verification (CCV) acceptance criteria were met for all methods.

- **Method Blank**

  Target analytes were not detected above half the Limit of Quantitation (LOQ) in the Method Blanks.

- **Clean Canister Certification**

  Clean canister certification was reported in this lab report including pre-shipment certification, quality control (QC), sample data, and calibrations. All QC data met acceptance criteria.

- **Surrogate Spikes**

  Surrogates were added to all VOC samples and QC samples as required by the analytical method. All surrogate recoveries met the required QC limits.

- **Matrix Spike/Matrix Spike Duplicates**

  Matrix Spike/Matrix Spike Duplicate (MS/MSD) analyses are not applicable to the samples in this SDG.

- **Laboratory Control Sample/Laboratory Control Sample Duplicate**

  All Laboratory Control Sample (LCS) and Laboratory Control Sample Duplicate (LCSD) recoveries and relative percent differences (RPDs) were within the UFP-QAPP and DoD QSM Version 5.0 acceptance criteria.

- **Field Duplicates**

  No field duplicates were collected in this SDG.

- **Internal Standards**

  In the TO-15 analysis, QC criteria were met for Internal Standards (IS) in all calibrations and all field samples.
- **Target Analyte Identification and Quantitation**

  Target compound identification followed the specific analytical Method. Retention times and Mass Spectra were consistent with the analytical standards.

  Non-detected results were reported to the Limit of Detection (LOD) in accordance with DoD QSM Version 5.0. The laboratory also reported the LOQ and detection limit (DL) for each analyte on the sample result sheet. In general, the LOQs reported are consistent with the LOQs listed in the UFP-QAPP, and sample dilutions were not required except for the following.

  **VOCs**: A decreased sample volume was analyzed due to high concentrations of Trichloroethene in all samples. The LOQs were adjusted accordingly.

**Overall Evaluation**

No results were qualified during validation. All validation elements were acceptable, and the data is acceptable for its intended use.

Based on the criteria presented above, it is recommended that the results reported for these analyses be accepted. LCS/LCSD recoveries demonstrated that acceptable levels of accuracy and precision were achieved. In addition, completeness, defined to be the percentage of analytical results to be valid, was 100 percent (%) for this SDG.

**Data Validation Qualifiers**

| Validation Qualifier | Definition |
|---|---|
| J | The reported positive result is considered estimated because the result is less than the LOQ or because certain QC criteria were not met. |
| U | The analyte was not detected and is reported as less than the LOD or as defined by the client. |
| UJ | The analyte was not detected in the sample. The LOD (or LOQ) should be considered estimated and may be inaccurate or imprecise. |
| R | The result for this analyte is unusable. The analyte may or may not be present. |

**References**

U.S. Department of Defense (DoD), 2013. DoD Quality Systems Manual for Environmental Laboratories, Version 5.0, July.

U.S. Environmental Protection Agency (USEPA), 2014. USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review.

# Laboratory Analytical Data Validation

**Site:** FAFB LF002
**Date Completed:** 01-15-2016
**Submitted by:** Nancy McDonald
**Sample Collection Date(s):** 09-26-2015
**TestAmerica Project Number(s) (LPN):** 280-77999-1
**Bay West DMS #:** 1996720

This data validation memo describes the validation of one aqueous sample collected on December 11, 2015 and analyzed for selected VOCs (8260B) and Dissolved Metals (6010C) at the TestAmerica Laboratory in Denver, Colorado, as sample delivery group (SDG) 280-77999-1. Samples included as part of this S4VM validation are listed below.

| Sample ID | Date Sampled | TestAmerica, Denver | | |
|---|---|---|---|---|
| | | *Lab ID* | *VOCs* | *Metals* |
| LF002-NDA13-15D | 09/26/2015 | 74706-1 | X | X |

*Selected for matrix spike/matrix spike duplicate (MS/MSD)

The Data Qualification Summary Table below summarizes the qualifications that were applied during validation.

| Sample ID | Date Sampled | TestAmerica, Denver | | |
|---|---|---|---|---|
| | | *Lab ID* | *VOCs* | *Metals* |
| LF002-NDA13-15D | 09/26/2015 | 74706-1 | J: cis-1,2-Dichloroethene (< LOQ, but < DL) | |
| | | | | |

Validation was conducted according to this hierarchy of validation guidance: Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.0, July 2013 (DoD, 2013), and U.S. Environmental Protection Agency (USEPA) Contract Laboratory Program National Functional Guidelines for Superfund Inorganic Methods Data Review (USEPA, 2014a) Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review (USEPA, 2014b). The Site-Specific and Consolidated Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPPs) and laboratory standard operating procedures (SOPs) were consulted during the data validation.

**Data Validation Detail**

- **Data Package Completeness**

  The Level IV data package was reviewed to make certain that it contained the data required in the deliverable. This included checking the data package for the results of each analyte requested for each field sample submitted in the analytical batch, along with requested quality control (QC) documentation for the method. The data package is complete.

- **Laboratory Case Narrative/Cooler Receipt Form**

  No anomalies were noted on the chain-of-custody (CoC) or cooler receipt forms that affected data. The laboratory case narrative was accurate and complete. The case narrative documented that the requested 6010C dissolved Chromium and Manganese analysis was subcontracted to TestAmerica Seattle in due to laboratory capacity and ICP instrument outages in order to meet the requested turn-around time.

- **Holding Times, Storage, and Preservation**

  Review of the sample collection and analysis dates involved comparing the CoCs, the summary forms, and the data report for holding time compliance.

  All samples were received correctly, intact and properly preserved.

  All samples were prepared and analyzed within the holding times required by the project.

- **Instrument Performance Check**

  The instruments met all applicable performance check requirements. The instrument performance check included verification of 4-Bromofluorobenzene (BFB) tunes for VOCs. All samples were analyzed within 12 hours of the BFB tunes.

- **Initial Calibration/Initial Calibration Verification**

  Initial Calibration (ICAL) and Initial Calibration Verification (ICV) acceptance criteria were met for all analytical methods.

- **Continuing Calibration Verification**

  Continuing Calibration Verification (CCV) acceptance criteria were met for all analytical methods.

- **Limit Of Quantification Check Standard**

  All acceptance criteria were met for the Limit of Quantification (LOQ) Check Standards.

- **Interference Check Standard**

  In the metals analysis, the Interference Check Standard met method and DoD QSM acceptance criteria.

- **Method Blank, Trip Blank**

  Target analytes were not detected above half the Limit of Quantitation (LOQ) in the Method Blanks.

- **Surrogate Spikes**

  Surrogates were added to all VOC samples and QC samples as required by the analytical method. All surrogate recoveries met the required QC limits.

- **Matrix Spike/Matrix Spike Duplicates**

  No MS/MSD analyses were performed on sample in this SDG.

- **Laboratory Control Sample/Laboratory Control Sample Duplicate**

  All Laboratory Control Sample (LCS) and Laboratory Control Sample Duplicate (LCSD) recoveries and relative percent differences (RPDs) were within the UFP-QAPP and the DoD QSM Version 5.0 acceptance criteria.

- **Inductively Coupled Plasma Serial Dilution (Dilution Test) and Post-Digestion Spikes**

  In the metals analysis, the inductively coupled plasma (ICP) Serial Dilution and Post Digestion Spike (PDS) were not performed on the sample in this SDG.

- **Field Duplicates**

  No samples were collected as field duplicates in this SDG.

- **Internal Standards**

  In the VOC analysis, all QC criteria were met for Internal Standards (IS) in all calibrations and all field samples.

- **Target Analyte Identification and Quantitation**

  In the VOC analysis, target compound identification followed the specific analytical Method. Retention times and Mass Spectra were consistent with the analytical standards. In the metals analysis, appropriate wavelengths were chosen for the metals analysis in addition to appropriate interelement correction factors.

  Non-detected results were reported at the LOD in accordance with DoD QSM Version 5.0. The laboratory also reported the LOQ and detection limit (DL) for each analyte on the sample result sheet. The laboratory reported target analytes, which were qualitatively identified at concentrations below the LOQs, with a “J” qualifier to indicate that the result is estimated as required by DoD QSM Version 5.0. The “J” qualifier was retained by the validator. In general, the LOQs reported are consistent with the LOQs listed in the UFP-QAPP.

**Overall Evaluation**

One detected cis-1,2-dichloroethene result was qualified due to a concentration < the LOQ. All validation elements were acceptable and the data is acceptable for its intended use.

Based on the criteria presented above, it is recommended that the results reported for these analyses be accepted. LCS/LCSD and surrogate recoveries demonstrated that acceptable levels of accuracy and precision were achieved. In addition, completeness, defined to be the percentage of analytical results to be valid was 100% for this SDG.

**Data Validation Qualifiers**

| Validation Qualifier | Definition |
|---|---|
| J | The reported positive result is considered estimated, because the result is less than the LOQ or because certain QC criteria were not met. |
| U | The analyte was not detected and is reported as less than the LOD or as defined by the client. |
| UJ | The analyte was not detected in the sample. The LOD (or LOQ) should be considered estimated and may be inaccurate or imprecise. |
| R | The result for this analyte is unusable. The analyte may or may not be present. |

**References**

U.S. Department of Defense (DoD), 2013. DoD Quality Systems Manual for Environmental Laboratories, Version 5.0, July.

U.S. Environmental Protection Agency (USEPA), 2014a. USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review.

USEPA, 2014b. USEPA Contract Laboratory Program National Functional Guidelines for Organic Superfund Data Review.

# Laboratory Analytical Data Validation

**Site:** FAFB LF002
**Date Completed:** 01-15-2016
**Submitted by:** Nancy McDonald
**Sample Collection Date(s):** 12-14-2015 and 12-15-2015
**TestAmerica Project Number(s) (LPN):** 280-78112-1
**Bay West DMS #:** 2081500

This data validation memo describes the validation of 29 aqueous samples, two Equipment blanks and two Trip blanks collected on September 21 and 22, 2015 and analyzed for selected VOCs (8260B) and Dissolved Metals (6010C) at the TestAmerica Laboratory in Denver, Colorado, as sample delivery group (SDG) 280-78112-1. Samples included as part of this S4VM validation are listed below.

| Sample ID | Date Sampled | TestAmerica, Denver | | | |
|---|---|---|---|---|---|
| | | *Lab ID* | *VOCs HCl preserved* | *VOCs Ascorbic Acid preserved* | *Dissolved Cr, Mn* |
| LF002-MW63-15D | 12/14/2015 | 78112-1 | X | | |
| LF002-NDA07-15D | 12/14/2015 | 78112-2 | X | | X* |
| LF002-NDA08-15D | 12/14/2015 | 78112-3 | X | | X |
| LF002-NDA09-15D | 12/14/2015 | 78112-4 | X | | |
| LF002-NDA10-15D | 12/14/2015 | 78112-5 | X | | |
| LF002-NDA11-15D | 12/14/2015 | 78112-6 | X | | |
| LF002-NDA12-15D | 12/14/2015 | 78112-7 | X | | X |
| LF002-EB1-15D | 12/14/2015 | 78112-8 | X | | X |
| LF002-MW75-15D | 12/15/2015 | 78112-9 | X | | |
| LF002-EW02-15D | 12/15/2015 | 78112-10 | X* | | |
| LF002-EW05-15D | 12/15/2015 | 78112-11 | X | | X |
| LF002-EW06-15D | 12/15/2015 | 78112-12 | X | | X |
| LF002-EW07-15D | 12/15/2015 | 78112-13 | X | | |
| LF002-EW09-15D | 12/15/2015 | 78112-14 | X | | X |
| LF002-EW10-15D | 12/15/2015 | 78112-15 | X | | X |
| LF002-EW14-15D | 12/15/2015 | 78112-16 | X | | X |
| LF002-RW07-15D | 12/15/2015 | 78112-17 | X | | |
| LF002-RW09-15D | 12/15/2015 | 78112-18 | | X | |
| LF002-RW12-15D | 12/15/2015 | 78112-19 | X | | |
| LF002-RW14-15D | 12/15/2015 | 78112-20 | X | | X |
| LF002-RW16-15D | 12/15/2015 | 78112-21 | X | | X |
| LF002-RW18-15D | 12/15/2015 | 78112-22 | X | | X |
| LF002-MW5075-15D[§] | 12/15/2015 | 78112-23 | X | | |
| LF002-EW5005-15D[£] | 12/15/2015 | 78112-24 | X | | |
| LF002-EB2-15D | 12/15/2015 | 78112-25 | X | | |
| LF002-TB1-15D | 12/15/2015 | 78112-26 | X | | |

*Selected for matrix spike/matrix spike duplicate (MS/MSD)
[§]Field duplicate of LF002-EW05-15D
[£]Field duplicate of LF002-MW75-15D

The Data Qualification Summary Table below summarizes the qualifications that were applied during validation.

| Sample ID | Date Sampled | TestAmerica, Denver | | |
|---|---|---|---|---|
| | | *Lab ID* | *VOCs* | *Dissolved Cr, Mn* |
| LF002-MW63-15D | 12/14/2015 | 78112-1 | J: cis-1,2-Dichloroethene (< LOQ, but > DL) | |
| LF002-NDA07-15D | 12/14/2015 | 78112-2 | | |
| LF002-NDA08-15D | 12/14/2015 | 78112-3 | | J: Manganese (< LOQ, but > DL) |
| LF002-NDA09-15D | 12/14/2015 | 78112-4 | J: Trichloroethene (< LOQ, but > DL) | |
| LF002-NDA10-15D | 12/14/2015 | 78112-5 | | |
| LF002-NDA11-15D | 12/14/2015 | 78112-6 | | |
| LF002-NDA12-15D | 12/14/2015 | 78112-7 | | J: Chromium (< LOQ, but > DL) |
| LF002-EB1-15D | 12/14/2015 | 78112-8 | | |
| LF002-MW75-15D | 12/15/2015 | 78112-9 | J: Trichloroethene (< LOQ, but > DL) | |
| LF002-EW02-15D | 12/15/2015 | 78112-10 | J: cis-1,2-Dichloroethene (< LOQ, but > DL) | |
| LF002-EW05-15D | 12/15/2015 | 78112-11 | J: cis-1,2-Dichloroethene (< LOQ, but > DL) | |
| LF002-EW06-15D | 12/15/2015 | 78112-12 | J: cis-1,2-Dichloroethene (< LOQ, but > DL) | |
| LF002-EW07-15D | 12/15/2015 | 78112-13 | J: Trichloroethene (high surrogate) | |
| LF002-EW09-15D | 12/15/2015 | 78112-14 | | |
| LF002-EW10-15D | 12/15/2015 | 78112-15 | | |
| LF002-EW14-15D | 12/15/2015 | 78112-16 | | J: Chromium (< LOQ, but > DL) |
| LF002-RW07-15D | 12/15/2015 | 78112-17 | | |
| LF002-RW09-15D | 12/15/2015 | 78112-18 | | |
| LF002-RW12-15D | 12/15/2015 | 78112-19 | | |
| LF002-RW14-15D | 12/15/2015 | 78112-20 | J: trans-1,2-Dichloroethene (< LOQ, but > DL) | J: Manganese (< LOQ, but > DL) |
| LF002-RW16-15D | 12/15/2015 | 78112-21 | | J: Manganese (< LOQ, but > DL) |
| LF002-RW18-15D | 12/15/2015 | 78112-22 | | J: Chromium (< LOQ, but > DL) |
| LF002-MW5075-15D | 12/15/2015 | 78112-23 | J: Trichloroethene (< LOQ, but > DL) | |
| LF002-EW5005-15D | 12/15/2015 | 78112-24 | J: cis-1,2-Dichloroethene (< LOQ, but > DL) | |
| LF002-EB2-15D | 12/15/2015 | 78112-25 | | |
| LF002-TB1-15D | 12/15/2015 | 78112-26 | | |

Validation was conducted according to this hierarchy of validation guidance: Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.0, July 2013 (DoD, 2013), and U.S. Environmental Protection Agency (USEPA) Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review (USEPA, 2014a), and USEPA Contract Laboratory Program National Functional Guidelines for Superfund Inorganic Methods Data Review (USEPA, 2014b). The Site-Specific and Consolidated Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPPs) and laboratory standard operating procedures (SOPs) were consulted during the data validation.

**Data Validation Detail**

- **Data Package Completeness**

  The Level IV data package was reviewed to make certain that it contained the data required in the deliverable. This included checking the data package for the results of each analyte requested for each field sample submitted in the analytical batch, along with requested quality control (QC) documentation for the method. The data package is complete.

- **Laboratory Case Narrative/Cooler Receipt Form**

  No anomalies were noted on the chain-of-custody (CoC) or cooler receipt forms.

  The laboratory case narrative was accurate and complete. The case narrative documented that the requested dissolved Chromium and Manganese analysis by 6010C was performed by TestAmerica Seattle due to extended turn-around times resulting from ICP instrument outage and repairs at TestAmerica Denver. In addition, VOC sample LF002-RW09-15D required addition of anti-foam prior to purging to protect the equipment. Antifoam was also added to the associated Method blank to show there was no contamination added from the use of antifoam.

- **Holding Times, Storage, and Preservation**

  Review of the sample collection and analysis dates involved comparing the CoCs, the summary forms, and the data report for holding time compliance.

  All samples were received correctly, intact and properly preserved.

  All samples were prepared and analyzed within the holding times required by the project.

- **Instrument Performance Check**

  The instruments met all applicable performance check requirements. The instrument performance check included verification of 4-Bromofluorobenzene (BFB) tunes for VOCs. All samples were analyzed within 12 hours of the BFB tunes.

- **Initial Calibration/Initial Calibration Verification**

  Initial Calibration (ICAL) and Initial Calibration Verification (ICV) acceptance criteria were met for all target VOCs and metals.

- **Continuing Calibration Verification**

  Continuing Calibration Verification (CCV) acceptance criteria were met for all target VOCs and metals.

- **Limit Of Quantification Check Standard**

  All acceptance criteria were met for the Limit of Quantification (LOQ) Check Standards.

- **Interference Check Standard**

  In the metals analysis, the Interference Check Standards met method and DoD QSM acceptance criteria.

- **Method Blanks, Equipment Blanks, Trip Blanks**

  Target analytes were not detected above half the Limit of Quantitation (LOQ) in the Method Blanks, Equipment Blanks, or Trip Blank.

- **Surrogate Spikes**

  Surrogates were added to all VOC samples and QC samples as required by the analytical method. All surrogate recoveries met the required QC limits except for the following.

| Sample ID | Surrogate | % Recovery | QC limits (%) |
|---|---|---|---|
| LF002-NDA09-15D | Toluene-d8 | 87 | 89-112 |
| LF002-NDA11-15D | Toluene-d8 | 84 | 89-112 |
| LF002-EW05-15D | Toluene-d8 | 84 | 89-112 |
| LF002-EW07-15D | 1,2-Dichloroethane-d4 | 119 | 81-118 |
| LF002-EW09-15D | Toluene-d8 | 88 | 89-112 |
| LF002-EB1-15D | Toluene-d8 | 85 | 89-112 |
| LF002-EB2-15D | 1,2-Dichloroethane-d4 | 119 | 81-118 |

  The Trichloroethene result was qualified “J” as estimated and may be biased high in sample LF002-EW07-15D. No further action was warranted for the irregular Toluene-d8 recoveries, because the surrogate does not respond to any of the requested target VOCs and the irregular surrogate recovery in sample LF002-EB2-15D was biased high and no VOCs were detected in this sample.

- **Matrix Spike/Matrix Spike Duplicates and Laboratory Duplicates**

  MS/MSD analyses were performed on samples LF002-EW02-15D for VOCs and dissolved Chromium and Manganese for sample LF002-EW02-15D. In addition, a PDS was performed on sample A LF002-EW02-15D. All recoveries were within UFP-QAPP and DoD QSM Version 5.0 acceptance criteria. In the metals analysis, the laboratory duplicate was non-detect for both the parent and duplicate samples.

- **Laboratory Control Sample/Laboratory Control Sample Duplicate**

  All Laboratory Control Sample (LCS) and Laboratory Control Sample Duplicate (LCSD) recoveries and relative percent differences (RPDs) were within the UFP-QAPP and the DoD QSM Version 5.0 acceptance criteria.

- **Inductively Coupled Plasma Serial Dilution (Dilution Test)**

  In the metals analysis, an inductively coupled plasma (ICP) Serial Dilution was performed on sample LF002-NDA07-15D and met acceptance criteria.

- **Field Duplicates**

  The following samples were collected as field duplicates in this SDG: (1) LF002-EW05-15D and LF002-RW5005-15D (VOCs and dissolved Chromium and Manganese) and (2)

LF002-MW75-15D and LF002-MW5075-15D (VOCs only). All RPDs were within the QC criterion of ≤ 50%. RPDs are not calculated when results were < LOQs in the field duplicates.

- **Internal Standards**

  In the VOC analysis, all QC criteria were met for Internal Standards (IS) in all calibrations and all field samples except for the following. The percent recovery of 49% for internal standard 1,2-TBA-d9 was slightly low and outside acceptance criteria of 50% to 200%. No action was warranted, because this internal standard does not correspond to any of the requested target compounds.

- **Target Analyte Identification and Quantitation**

  In the VOC analysis, target compound identification followed the specific analytical Method. Retention times and Mass Spectra were consistent with the analytical standards. In the metals analysis, appropriate wavelengths were chosen for the metals analysis in addition to appropriate interelement correction factors.

  Non-detected results were reported at the LOD in accordance with DoD QSM Version 5.0. The laboratory also reported the LOQ and detection limit (DL) for each analyte on the sample result sheet. The laboratory reported target analytes, which were qualitatively identified at concentrations below the LOQs, with a "J" qualifier to indicate that the result is estimated as required by DoD QSM Version 5.0. The "J" qualifier was retained by the validator. In general, the LOQs reported are consistent with the LOQs listed in the UFP-QAPP. No sample dilutions were required except for the following:

| Sample ID | Analyte | Dilution |
|---|---|---|
| LF002-NDA08-15D | Trichloroethene | 4-fold |
| LF002-NDA12-15D | Trichloroethene | 2-fold |
| LF002-RW7-15D | Trichloroethene | 4-fold |
| LF002-RW14-15D | Trichloroethene | 20-fold |
| LF002-RW16-15D | All VOCs except Trichloroethene | 5-fold |
| LF002-RW16-15D | Trichloroethene | 50-fold |

  The above LOQs were adjusted accordingly.

**Overall Evaluation**

Results were qualified during validation due to surrogate performance and detected results < the LOQ. All validation elements were acceptable and the data is acceptable for its intended use.

Based on the criteria presented above, it is recommended that the results reported for these analyses be accepted. MS/MSD, LCS/LCSD and surrogate recoveries demonstrated that acceptable levels of accuracy and precision were achieved. In addition, completeness, defined to be the percentage of analytical results to be valid was 100% for this SDG.

**Data Validation Qualifiers**

| Validation Qualifier | Definition |
|---|---|
| J | The reported positive result is considered estimated, because the result is less than the LOQ or because certain QC criteria were not met. |
| U | The analyte was not detected and is reported as less than the LOD or as defined by the client. |
| UJ | The analyte was not detected in the sample. The LOD (or LOQ) should be considered estimated and may be inaccurate or imprecise. |

**References**

U.S. Department of Defense (DoD), 2013. DoD Quality Systems Manual for Environmental Laboratories, Version 5.0, July.

U.S. Environmental Protection Agency (USEPA), 2014a. USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review.

USEPA, 2014b. USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review.

# Laboratory Analytical Data Validation

**Site:** FAFB LF002
**Date Completed:** 01-15-2016
**Submitted by:** Nancy McDonald
**Sample Collection Date(s):** 12-16-2015
**TestAmerica Project Number(s) (LPN):** 280-78170-1
**Bay West DMS #:** 2082738

This data validation memo describes the validation of 14 aqueous samples, One Equipment blank, and one Trip blank collected on December 16, 2015 and analyzed for selected VOCs (8260B) and Dissolved Metals (6010C) at the TestAmerica Laboratory in Denver, Colorado, as sample delivery group (SDG) 280-78170-1. Samples included as part of this S4VM validation are listed below.

| Sample ID | Date Sampled | TestAmerica, Denver | | | |
|---|---|---|---|---|---|
| | | *Lab ID* | *VOCs HCl preserved* | *VOCs Ascorbic Acid preserved* | *Dissolved Cr, Mn* |
| LF002-MW82-15D | 12/16/2015 | 78170-1 | X | | |
| LF002-PS1/4-15D | 12/16/2015 | 78170-2 | X | | |
| LF002-RW02-15D | 12/16/2015 | 78170-3 | | X | |
| LF002-RW05-15D | 12/16/2015 | 78170-4 | X | | |
| LF002-RW06-15D | 12/16/2015 | 78170-5 | X | | X* |
| LF002-RW08-15D | 12/16/2015 | 78170-6 | X | | X |
| LF002-RW10-15D | 12/16/2015 | 78170-7 | X | | X |
| LF002-RW11-15D | 12/16/2015 | 78170-8 | X | | X |
| LF002-RW13-15D | 12/16/2015 | 78170-9 | X | | X |
| LF002-RW15-15D | 12/16/2015 | 78170-10 | X | | |
| LF002-RW17-15D | 12/16/2015 | 78170-11 | | X | X |
| LF002-NDA14-15D | 12/16/2015 | 78170-12 | | X | X |
| LF002-EB3-15D | 12/16/2015 | 78170-13 | X | | X |
| LF002-TB2-15D | 12/16/2015 | 78170-14 | X | | |
| LF02-301INFL | 12/16/2015 | 78170-15 | X | | |
| LF02-301EFF | 12/16/2015 | 78170-16 | X | | |

*Selected for matrix spike/matrix spike duplicate (MS/MSD)
[§]Field duplicate of LF002-EW05-15D
[£]Field duplicate of LF002-MW75-15D

The Data Qualification Summary Table below summarizes the qualifications that were applied during validation.

| Sample ID | Date Sampled | TestAmerica, Denver | | |
|---|---|---|---|---|
| | | *Lab ID* | *VOCs* | *Dissolved Cr, Mn* |
| LF002-MW82-15D | 12/16/2015 | 78170-1 | | |
| LF002-PS1/4-15D | 12/16/2015 | 78170-2 | J: Trichloroethene (< LOQ, but > MDL) | |
| LF002-RW02-15D | 12/16/2015 | 78170-3 | | |
| LF002-RW05-15D | 12/16/2015 | 78170-4 | | |
| LF002-RW06-15D | 12/16/2015 | 78170-5 | | J: Dissolved Chromium<br>J: Dissolved Manganese (high RPDs in MS/MSD, < LOQ, but > MDL) |
| LF002-RW08-15D | 12/16/2015 | 78170-6 | J: trans-1,2-Dichloroethene<br>J: Vinyl chloride (< LOQ, but > MDL) | J: Dissolved Manganese (high RPD in MS/MSD) |
| LF002-RW10-15D | 12/16/2015 | 78170-7 | J: Trichloroethene (< LOQ, but > MDL) | |
| LF002-RW11-15D | 12/16/2015 | 78170-8 | | J: Dissolved Chromium<br>J: Dissolved Manganese (high RPDs in MS/MSD, < LOQ, but > MDL) |
| LF002-RW13-15D | 12/16/2015 | 78170-9 | J: trans-1,2-Dichloroethene<br>J: Vinyl chloride (< LOQ, but > MDL) | UJ: Dissolved Manganese (high RPD in MS/MSD, Equipment Blank contamination) |
| LF002-RW15-15D | 12/16/2015 | 78170-10 | J: cis-1,2-Dichloroethene (< LOQ, but > MDL) | |
| LF002-RW17-15D | 12/16/2015 | 78170-11 | J: Trichloroethene (< LOQ, but > MDL) | J: Dissolved Chromium<br>J: Dissolved Manganese (high RPD in MS/MSD |
| LF002-NDA14-15D | 12/16/2015 | 78170-12 | J: Trichloroethene (< LOQ, but > MDL) | J: Dissolved Chromium<br>J: Dissolved Manganese (high RPDs in MS/MSD) |
| LF002-EB3-15D | 12/16/2015 | 78170-13 | | J: Dissolved Manganese (< LOQ, but > MDL) |
| LF002-TB2-15D | 12/16/2015 | 78170-14 | | |
| LF02-301INFL | 12/16/2015 | 78170-15 | | |
| LF02-301EFF | 12/16/2015 | 78170-16 | | |

Validation was conducted according to this hierarchy of validation guidance: Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.0, July 2013 (DoD, 2013), and U.S. Environmental Protection Agency (USEPA) Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review (USEPA, 2014a), and USEPA Contract Laboratory Program National Functional Guidelines for Superfund Inorganic Methods Data Review (USEPA, 2014b). The Site-Specific and Consolidated Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPPs) and laboratory standard operating procedures (SOPs) were consulted during the data validation.

**Data Validation Detail**

- **Data Package Completeness**

  The Level IV data package was reviewed to make certain that it contained the data required in the deliverable. This included checking the data package for the results of each analyte requested for each field sample submitted in the analytical batch, along with requested quality control (QC) documentation for the method. The data package is complete.

- **Laboratory Case Narrative/Cooler Receipt Form**

  No anomalies were noted on the chain-of-custody (CoC) or cooler receipt forms.

  The laboratory case narrative was accurate and complete. The case narrative documented that the requested dissolved Chromium and Manganese analysis by 6010C was performed by TestAmerica Seattle due to extended turn-around times resulting from ICP instrument outage and repairs at TestAmerica Denver.

- **Holding Times, Storage, and Preservation**

  Review of the sample collection and analysis dates involved comparing the CoCs, the summary forms, and the data report for holding time compliance.

  All samples were received correctly, intact and properly preserved.

  All samples were prepared and analyzed within the holding times required by the project.

- **Instrument Performance Check**

  The instruments met all applicable performance check requirements. The instrument performance check included verification of 4-Bromofluorobenzene (BFB) tunes for VOCs. All samples were analyzed within 12 hours of the BFB tunes.

- **Initial Calibration/Initial Calibration Verification**

  Initial Calibration (ICAL) and Initial Calibration Verification (ICV) acceptance criteria were met for all target VOCs and metals.

- **Continuing Calibration Verification**

  Continuing Calibration Verification (CCV) acceptance criteria were met for all target VOCs and metals.

- **Limit Of Quantification Check Standard**

  All acceptance criteria were met for the Limit of Quantification (LOQ) Check Standards.

- **Interference Check Standard**

  In the metals analysis, the Interference Check Standards met method and DoD QSM acceptance criteria.

- **Method Blanks, Equipment Blanks, Trip Blanks**

  Target analytes were not detected above ½ the Limit of Quantitation (LOQ) in the Method Blanks, Equipment Blank, or Trip Blank. The following anomaly was observed.

  Dissolved Manganese (0.0050 mg/L) was detected in the Equipment blank at a concentrations < ½ the LOQ. The dissolved Manganese result was qualified "U" in sample LF002-RW13-15D, because the result was < 5 times the Equipment blank contamination.

- **Surrogate Spikes**

  Surrogates were added to all VOC samples and QC samples as required by the analytical method. All surrogate recoveries met the required QC limits.

- **Matrix Spike/Matrix Spike Duplicates**

  MS/MSD analyses were performed on sample LF002-RW06-15D for dissolved Chromium and Manganese. RPDs for dissolved Chromium (30%) and dissolved Manganese (29%) were high and exceeded the QC criterion of ≤ 20%. Results for dissolved Chromium and Manganese were detected in all solid samples.

- **Laboratory Control Sample/Laboratory Control Sample Duplicate**

  All Laboratory Control Sample (LCS) and Laboratory Control Sample Duplicate (LCSD) recoveries and relative percent differences (RPDs) were within the UFP-QAPP and the DoD QSM Version 5.0 acceptance criteria.

- **Inductively Coupled Plasma Serial Dilution (Dilution Test)**

  In the metals analysis, an inductively coupled plasma (ICP) Serial Dilution was performed on sample LF002-RW06-15D and met acceptance criteria.

- **Field Duplicates**

  No field duplicates were included with the samples in this SDG.

- **Internal Standards**

  In the VOC analysis, all QC criteria were met for Internal Standards (IS) in all calibrations and all field samples.

- **Target Analyte Identification and Quantitation**

  In the VOC analysis, target compound identification followed the specific analytical Method. Retention times and Mass Spectra were consistent with the analytical standards. In the metals analysis, appropriate wavelengths were chosen for the metals analysis in addition to appropriate interelement correction factors.

  Non-detected results were reported at the LOD in accordance with DoD QSM Version 5.0. The laboratory also reported the LOQ and detection limit (DL) for each analyte on the sample result sheet. The laboratory reported target analytes, which were qualitatively identified at concentrations below the LOQs, with a "J" qualifier to indicate that the result is estimated as required by DoD QSM Version 5.0. The "J" qualifier was retained by the validator. In general, the LOQs reported are consistent with the LOQs listed in the UFP-QAPP. No sample dilutions were required except for the following:

| Sample ID | Analyte | Dilution |
|---|---|---|
| LF002-RW06-15D | Trichloroethene | 5-fold |
| LF002-RW08-15D | Trichloroethene | 100-fold |
| LF002-RW13-15D | Trichloroethene | 10-fold |
| LF002-RW17-15D | Manganese | 100-fold |
| LF002-NDA14-15D | Manganese | 100-fold |

The above LOQs were adjusted accordingly.

**Overall Evaluation**

Results were qualified during validation due to MS/MSD performance, Equipment Blank contamination, and detected results < LOQ. All validation elements were acceptable and the data is acceptable for its intended use.

Based on the criteria presented above, it is recommended that the results reported for these analyses be accepted. MS/MSD, LCS/LCSD, internal standards, and surrogate recoveries demonstrated that acceptable levels of accuracy and precision were achieved. In addition, completeness, defined to be the percentage of analytical results to be valid was 100% for this SDG.

**Data Validation Qualifiers**

| Validation Qualifier | Definition |
|---|---|
| J | The reported positive result is considered estimated, because the result is less than the LOQ or because certain QC criteria were not met. |
| U | The analyte was not detected and is reported as less than the LOD or as defined by the client. |
| UJ | The analyte was not detected in the sample. The LOD (or LOQ) should be considered estimated and may be inaccurate or imprecise. |
| R | The result for this analyte is unusable. The analyte may or may not be present. |

**References**

U.S. Department of Defense (DoD), 2013. DoD Quality Systems Manual for Environmental Laboratories, Version 5.0, July.

U.S. Environmental Protection Agency (USEPA), 2014a. USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review.

USEPA, 2014b. USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review.

# Laboratory Analytical Data Validation

**Site:** FAFB ST006
**Date Completed:** 01-13-2015
**Submitted by:** Nancy McDonald
**Sample Collection Date(s):** 09-23-2015
**TestAmerica Project Number(s) (LPN):** 580-53819-1
**Bay West DMS #:** 2081917

This data validation memo describes the validation of 3 aqueous sample collected December 11, 2015 and analyzed for DRO and Motor Oil by NWTPH-Dx at the TestAmerica Laboratory in Seattle, Washington, as sample delivery group (SDG) 580-53819-1. Samples included as part of this S4VM validation are listed below.

| Sample ID | Date Sampled | TestAmerica, Denver | |
|---|---|---|---|
| | | *Lab ID* | *DRO / Motor Oil* |
| ST006-MW194-15D | 12/11/2015 | 55917-1 | X |
| ST006-MW207-15D | 12/11/2015 | 55917-2 | X |
| ST006-MW208-15D | 12/11/2015 | 55917-3 | X |

The Data Qualification Summary Table below summarizes the qualifications that were applied during validation.

| Sample ID | Date Sampled | TestAmerica, Denver | |
|---|---|---|---|
| | | *Lab ID* | *DRO / Motor Oil* |
| ST006-MW194-15D | 12/11/2015 | 55917-1 | J: DRO<br>J: Motor Oil<br>(< LOQ, but > MDL) |
| ST006-MW207-15D | 12/11/2015 | 55917-2 | J: DRO<br>J: Motor Oil<br>(< LOQ, but > MDL) |
| ST006-MW208-15D | 12/11/2015 | 55917-3 | J: Motor Oil<br>(< LOQ, but > MDL) |

Validation was conducted according to this hierarchy of validation guidance: DoD Quality Systems Manual for Environmental Laboratories, Version 5.0, July 2013 (DoD, 2013), and U.S. Environmental Protection Agency (USEPA) Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review (USEPA, 2014). The Site-Specific and Consolidated Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPPs) and laboratory standard operating procedures (SOPs) were consulted during the data validation.

**Data Validation Detail**

- **Data Package Completeness**

  The Level IV data package was reviewed to make certain that it contained the data required in the deliverable. This included checking the data package for the results of each analyte requested for each field sample submitted in the analytical batch, along with requested quality control (QC) documentation for the method. The data package is complete.

- **Laboratory Case Narrative/Cooler Receipt Form**

  No anomalies were noted on the chain-of-custody (CoC) or cooler receipt forms that affected data. The laboratory case narrative was accurate and complete and documented that sample ST006-MW194-15D contained a hydrocarbon pattern in the Diesel range; however, the elution pattern was later than the diesel fuel used as the analytical standard.

- **Holding Times, Storage, and Preservation**

  Review of the sample collection and analysis dates involved comparing the CoCs, the summary forms, and the data report for holding time compliance.

  The sample was received correctly, intact, and properly preserved properly. The sample were prepared and analyzed within the holding times required by the project.

- **Instrument Performance Check**

  The instrument met all applicable performance check requirements.

- **Initial Calibration/Initial Calibration Verification**

  Initial Calibration (ICAL) and Initial Calibration Verification (ICV) acceptance criteria were met for all analytical methods

- **Continuing Calibration Verification**

  Continuing Calibration Verification (CCV) acceptance criteria were met for all analytical methods.

- **Limit of Quantitation Check Standard**

  All acceptance criteria were met for the Limit of Quantitation (LOQ) Check Standards.

- **Interference Check Standard**

  Interference Check Standards are not applicable to NWTPH-Dx.

- **Method Blank**

  Target analytes were not detected above ½ LOQ in the Method Blank.

- **Surrogate Spikes**

  Surrogates were added to the samples and QC samples as required by the analytical method. All surrogate recoveries met the required QC limits of 50-150%.

- **Matrix Spike/Matrix Spike Duplicates**

  No Matrix Spike/Matrix Spike Duplicate (MS/MSD) analyses were performed on the samples from Site ST006.

- **Laboratory Control Sample (LCS) / Laboratory Control Sample Duplicate (LCSD)**

  The LCS and LCSD recoveries for DRO and Motor oil were within the UFP-QAPP and the DoD QSM Version 5.0 acceptance criteria.

- **inductively Coupled Plasma (ICP) Serial Dilution (Dilution Test) and Post-Digestion Spikes**

  Inductively Coupled Plasma (ICP) Serial Dilutions and Post Digestion Spikes (PDS) are not applicable to NW-TPH-Dx.

- **Field Duplicates**

  No field duplicates were included with the samples in this SDG.

- **Internal Standards**

  Internal Standards (IS) are not required for NWTPH-Dx.

- **Target Analyte Identification and Quantitation**

  Target compound identification followed the specific analytical Method. Retention times were consistent with the analytical standards.

  Non-detected results were reported at the Limit of Detection (LOD) in accordance with DoD QSM Version 5.0. The laboratory also reported the LOQ and detection limit (DL) for each analyte on the sample result sheet. The laboratory reported target analytes, which were qualitatively identified at concentrations below the LOQs, with a “J” qualifier to indicate that the result is estimated as required by DoD QSM Version 5.0. The “J” qualifier was retained by the validator. In general, the LOQs reported are consistent with the LOQs listed in the UFP-QAPP. No sample dilutions were required.

**Overall Evaluation**

Detected results in three samples were qualified, because the results were < LOQ. All validation elements were acceptable and the data is acceptable for its intended use.

Based on the criteria presented above, it is recommended that the results reported for these analyses be accepted. LCS/LCSD and surrogate recoveries demonstrated that acceptable levels of accuracy and precision were achieved. In addition, completeness, defined to be the percentage of analytical results to be valid, was 100% for this SDG.

**Data Validation Qualifiers**

| Validation Qualifier | Definition |
|---|---|
| J | The reported positive result is considered estimated, because the result is less than the LOQ or because certain QC criteria were not met. |
| U | The analyte was not detected and is reported as less than the LOD or as defined by the client. |
| UJ | The analyte was not detected in the sample. The LOD (or LOQ) should be considered estimated and may be inaccurate or imprecise. |
| R | The result for this analyte is unusable. The analyte may or may not be present. |

**References**

U.S. Department of Defense (DoD), 2013. DoD Quality Systems Manual for Environmental Laboratories, Version 5.0, July.

U.S. Environmental Protection Agency (USEPA), 2014. USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review, June.

# Laboratory Analytical Data Validation

**Site:** FAFB WP003
**Date Completed:** 11-17-2015
**Submitted by:** Nancy McDonald
**Sample Collection Date(s):** 10-09-2015
**TestAmerica Project Number(s) (LPN):** 280-75492-1
**Bay West DMS #:** 1996227

This data validation memo describes the validation of 1 aqueous sample collected October 9, 2015 and analyzed for selected DRO and Motor Oil by NWTPH-Dx at the TestAmerica Laboratory in Seattle, Washington, as sample delivery group (SDG) 280-75492-1. Samples included as part of this S4VM validation are listed below.

| Sample ID | Date Sampled | TestAmerica, Denver | |
|---|---|---|---|
| | | *Lab ID* | *DRO / Motor Oil* |
| WP003-RW46-15C | 10/09/2015 | 75492-1 | X |

The Data Qualification Summary Table below summarizes the qualifications that were applied during validation.

| Sample ID | Date Sampled | TestAmerica, Denver | |
|---|---|---|---|
| | | *Lab ID* | *DRO / Motor Oil* |
| WP003-RW46-15C | 10/09/2015 | 75492-1 | J: DRO<br>(< LOQ, but > MDL) |

Validation was conducted according to this hierarchy of validation guidance: DoD Quality Systems Manual for Environmental Laboratories, Version 5.0, July 2013 (DoD, 2013), and U.S. Environmental Protection Agency (USEPA) Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review (USEPA, 2014). The Site-Specific and Consolidated Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPPs) and laboratory standard operating procedures (SOPs) were consulted during the data validation.

**Data Validation Detail**

- **Data Package Completeness**

  The Level IV data package was reviewed to make certain that it contained the data required in the deliverable. This included checking the data package for the results of each analyte requested for each field sample submitted in the analytical batch, along with requested quality control (QC) documentation for the method. The data package is complete.

- **Laboratory Case Narrative/Cooler Receipt Form**

  No anomalies were noted on the chain-of-custody (CoC) or cooler receipt forms that affected data. The laboratory case narrative was accurate and complete.

- **Holding Times, Storage, and Preservation**

  Review of the sample collection and analysis dates involved comparing the CoCs, the summary forms, and the data report for holding time compliance.

  The sample was received correctly, intact, and properly preserved properly. The sample were prepared and analyzed within the holding times required by the project.

- **Instrument Performance Check**

  The instrument met all applicable performance check requirements.

- **Initial Calibration/Initial Calibration Verification**

  Initial Calibration (ICAL) and Initial Calibration Verification (ICV) acceptance criteria were met for all analytical methods

- **Continuing Calibration Verification**

  Continuing Calibration Verification (CCV) acceptance criteria were met for all analytical methods.

- **Limit of Quantitation Check Standard**

  All acceptance criteria were met for the Limit of Quantitation (LOQ) Check Standards.

- **Interference Check Standard**

  Interference Check Standards are not applicable to NWTPH-Dx.

- **Method Blank**

  Target analytes were not detected above ½ LOQ in the Method Blank.

- **Surrogate Spikes**

  Surrogates were added to the sample and QC samples as required by the analytical method. All surrogate recoveries met the required QC.

- **Matrix Spike/Matrix Spike Duplicates**

  No Matrix Spike/Matrix Spike Duplicate (MS/MSD) analyses were performed on the samples from Site WP003.

- **Laboratory Control Sample (LCS) / Laboratory Control Sample Duplicate (LCSD)**

  The LCS and LCSD recoveries for DRO and Motor oil were within the UFP-QAPP and the DoD QSM Version 5.0 acceptance criteria.

- **inductively Coupled Plasma (ICP) Serial Dilution (Dilution Test) and Post-Digestion Spikes**

  Inductively Coupled Plasma (ICP) Serial Dilutions and Post Digestion Spikes (PDS) are not applicable to NW-TPH-Dx.

- **Field Duplicates**

  No field duplicates were included with the samples in this SDG.

- **Internal Standards**

  Internal Standards (IS) are not required for NWTPH-Dx.

- **Target Analyte Identification and Quantitation**

  Target compound identification followed the specific analytical Method. Retention times were consistent with the analytical standards.

  Non-detected results were reported at the Limit of Detection (LOD) in accordance with DoD QSM Version 5.0. The laboratory also reported the LOQ and detection limit (DL) for each analyte on the sample result sheet. The laboratory reported target analytes, which were qualitatively identified at concentrations below the LOQs, with a “J” qualifier to indicate that the result is estimated as required by DoD QSM Version 5.0. The “J” qualifier was retained by the validator. In general, the LOQs reported are consistent with the LOQs listed in the UFP-QAPP. No sample dilutions were required.

**Overall Evaluation**

One detected DRO result was qualified, because the concentration was < LOQ. All validation elements were acceptable and the data is acceptable for its intended use.

Based on the criteria presented above, it is recommended that the results reported for these analyses be accepted. LCS/LCSD and surrogate recoveries demonstrated that acceptable levels of accuracy and precision were achieved. In addition, completeness, defined to be the percentage of analytical results to be valid, was 100% for this SDG.

**Data Validation Qualifiers**

| Validation Qualifier | Definition |
|---|---|
| J | The reported positive result is considered estimated, because the result is less than the LOQ or because certain QC criteria were not met. |
| U | The analyte was not detected and is reported as less than the LOD or as defined by the client. |
| UJ | The analyte was not detected in the sample. The LOD (or LOQ) should be considered estimated and may be inaccurate or imprecise. |
| R | The result for this analyte is unusable. The analyte may or may not be present. |

**References**

U.S. Department of Defense (DoD), 2013. DoD Quality Systems Manual for Environmental Laboratories, Version 5.0, July.

U.S. Environmental Protection Agency (USEPA), 2014. USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review, June.

# Laboratory Analytical Data Validation

**Site:** FAFB WP003
**Date Completed:** 01-14-2016
**Submitted by:** Nancy McDonald
**Sample Collection Date(s):** 12-10-2015
**TestAmerica Project Number(s) (LPN):** 280-77923-1
**Bay West DMS #:** 2082501

This data validation memo describes the validation of six aqueous samples collected December 10, 2015 and analyzed for selected volatile organic compounds (VOCs) (8260B) and Dissolved Arsenic (6020A) at the TestAmerica Laboratory in Denver, Colorado, as sample delivery group (SDG) 280-77923-1. Samples included as part of this S4VM validation are listed below.

| Sample ID | Date Sampled | TestAmerica, Denver | | |
|---|---|---|---|---|
| | | *Lab ID* | *VOCs* | *Metals* |
| WP003-EW3-15D | 12/10/2015 | 77923-1 | | X* |
| WP003-MW11-15D | 12/10/2015 | 77923-2 | | X |
| WP003-MW12-15D | 12/10/2015 | 77923-3 | | X |
| WP003-MW102-15D | 12/10/2015 | 77923-4 | X | X |
| WP003-MW103-15D | 12/10/2015 | 77923-5 | | X |
| WP003-WP01-15D | 12/10/2015 | 77923-6 | | X |

* Selected as MS/MSD

The Data Qualification Summary Table below summarizes the qualifications that were applied during validation.

| Sample ID | Date Sampled | TestAmerica, Denver | | |
|---|---|---|---|---|
| | | *Lab ID* | *VOC* | *Metals* |
| WP003-EW3-15D | 12/10/2015 | 77923-1 | | |
| WP003-MW11-15D | 12/10/2015 | 77923-2 | | |
| WP003-MW12-15D | 12/10/2015 | 77923-3 | | |
| WP003-MW102-15D | 12/10/2015 | 77923-4 | J: cis-1,2-Dichloroethene<br>J: Trichloroethene<br>J: Vinyl chloride<br>(< LOQ, but >DL) | |
| WP003-MW103-15D | 12/10/2015 | 77923-5 | | |
| WP003-WP01-15D | 12/10/2015 | 77923-6 | | |

Validation was conducted according to this hierarchy of validation guidance: DoD Quality Systems Manual for Environmental Laboratories, Version 5.0, July 2013 (DoD, 2013), and U.S. Environmental Protection Agency (USEPA) Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review (USEPA, 2014a), and Contract Laboratory Program National Functional Guidelines for Superfund Inorganic Methods Data Review (USEPA, 2014b). The Site-Specific and Consolidated Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPPs) and laboratory standard operating procedures (SOPs) were consulted during the data validation.

**Data Validation Detail**

- **Data Package Completeness**

  The Level IV data package was reviewed to make certain that it contained the data required in the deliverable. This included checking the data package for the results of each analyte requested for each field sample submitted in the analytical batch, along with requested quality control (QC) documentation for the method. The data package is complete.

- **Laboratory Case Narrative/Cooler Receipt Form**

  No anomalies were noted on the chain-of-custody (CoC) or cooler receipt forms that affected data. The laboratory case narrative was accurate and complete.

- **Holding Times, Storage, and Preservation**

  Review of the sample collection and analysis dates involved comparing the CoCs, the summary forms, and the data report for holding time compliance.

  All samples were received correctly, intact, and properly preserved properly. All samples were prepared and analyzed within the holding times required by the project.

- **Instrument Performance Check**

  The instruments met all applicable performance check requirements. The instrument performance check included verification of 4-Bromofluorobenzene (BFB) tunes for VOCs. All samples were analyzed within 12 hours of the BFB tunes.

- **Initial Calibration/Initial Calibration Verification**

  Initial Calibration (ICAL) and Initial Calibration Verification (ICV) acceptance criteria were met for all analytical methods

- **Continuing Calibration Verification**

  Continuing Calibration Verification (CCV) acceptance criteria were met for all analytical methods.

- **Limit of Quantitation Check Standard**

  All acceptance criteria were met for the Limit of Quantitation (LOQ) Check Standards.

- **Interference Check Standard**

  In the metals analysis, the Interference Check Standard met method and DoD QSM acceptance.

- **Method Blank**

  Target analytes were not detected above ½ LOQ in the Method Blank.

- **Surrogate Spikes**

  Surrogates were added to all VOC samples and QC samples as required by the analytical method. All surrogate recoveries met the required QC.

- **Matrix Spike/Matrix Spike Duplicates**

  Matrix Spike/Matrix Spike Duplicate (MS/MSD) analyses were performed on sample WP003-EW3-15D for dissolved Arsenic. All recoveries and the RPD were within DoD QSM 5.0 acceptance criteria.

- **Laboratory Control Sample (LCS) / Laboratory Control Sample Duplicate (LCSD)**

  All LCS and LCSD recoveries for VOCs and dissolved Arsenic were within the UFP-QAPP and the DoD QSM Version 5.0 acceptance criteria.

- **inductively Coupled Plasma (ICP) Serial Dilution (Dilution Test) and Post-Digestion Spikes**

  In the metals analysis, an Inductively Coupled Plasma (ICP) Serial Dilution and Post Digestion Spike (PDS) were performed on sample WP003-EW3-15D and met acceptance criteria.

- **Field Duplicates**

  No field duplicates were included with the samples in this SDG.

- **Internal Standards**

  In the VOC analysis, all QC criteria were met for Internal Standards (IS) in all calibrations and all field samples.

- **Target Analyte Identification and Quantitation**

  In the VOC analysis, target compound identification followed the specific analytical Method. Retention times and Mass Spectra were consistent with the analytical standards. In the metals analysis, appropriate wavelengths were chosen for the metals analysis in addition to appropriate interelement correction factors.

  Non-detected results were reported at the Limit of Detection (LOD) in accordance with DoD QSM Version 5.0. The laboratory also reported the LOQ and detection limit (DL) for each analyte on the sample result sheet. The laboratory reported target analytes, which were qualitatively identified at concentrations below the LOQs, with a “J” qualifier to indicate that the result is estimated as required by DoD QSM Version 5.0. The “J” qualifier was retained by the validator. In general, the LOQs reported are consistent with the LOQs listed in the UFP-QAPP. No dilutions were required.

**Overall Evaluation**

Detected VOC results were qualified, because the concentrations were < LOQ. All validation elements were acceptable and the data is acceptable for its intended use.

Based on the criteria presented above, it is recommended that the results reported for these analyses be accepted. LCS/LCSD, internal standards and surrogate recoveries demonstrated that acceptable levels of accuracy and precision were achieved. In addition, completeness, defined to be the percentage of analytical results to be valid, was 100% for this SDG.

**Data Validation Qualifiers**

| Validation Qualifier | Definition |
|---|---|
| J | The reported positive result is considered estimated, because the result is less than the LOQ or because certain QC criteria were not met. |
| U | The analyte was not detected and is reported as less than the LOD or as defined by the client. |
| UJ | The analyte was not detected in the sample. The LOD (or LOQ) should be considered estimated and may be inaccurate or imprecise. |
| R | The result for this analyte is unusable. The analyte may or may not be present. |

**References**

U.S. Department of Defense (DoD), 2013. DoD Quality Systems Manual for Environmental Laboratories, Version 5.0, July.

U.S. Environmental Protection Agency (USEPA), 2014a. USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review, June.

USEPA, 2014b. USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review.

# Laboratory Analytical Data Validation

**Site:** FAFB WP003
**Date Completed:** 01-14-2016
**Submitted by:** Nancy McDonald
**Sample Collection Date(s):** 12-11-2015
**TestAmerica Project Number(s) (LPN):** 280-78001-1
**Bay West DMS #:** 2082534

This data validation memo describes the validation of five aqueous samples collected on December 11, 2015 and analyzed for selected volatile organic compounds (VOCs) (8260B) and Dissolved Arsenic (6020A) at the TestAmerica Laboratory in Denver, Colorado, as sample delivery group (SDG) 280-78001-1. Samples included as part of this S4VM validation are listed below.

| Sample ID | Date Sampled | TestAmerica, Denver | | |
|---|---|---|---|---|
| | | *Lab ID* | *VOCs* | *Metals* |
| WP003-MW120-15D | 12/11/2015 | 78001-1 | X | |
| WP003-OW2-15D | 12/11/2015 | 78001-2 | X | |
| WP003-RW12-15D | 12/11/2015 | 78001-3 | | X |
| WP003-OW52-15D* | 12/11/2015 | 78001-4 | X | |
| WP003-RW17-15D | 12/11/2015 | 78001-5 | X | |

* Field duplicate of sample WP003-OW2-15D

The Data Qualification Summary Table below summarizes the qualifications that were applied during validation.

| Sample ID | Date Sampled | TestAmerica, Denver | | |
|---|---|---|---|---|
| | | *Lab ID* | *VOC* | *Metals* |
| WP003-MW120-15D | 12/11/2015 | 78001-1 | J: trans-1,2-Dichloroethene<br>(< LOQ, but > MDL) | |
| WP003-OW2-15D | 12/11/2015 | 78001-2 | J: trans-1,2-Dichloroethene<br>J: Vinyl chloride<br>(< LOQ, but > MDL) | |
| WP003-RW12-15D | 12/11/2015 | 78001-3 | | |
| WP003-OW52-15D | 12/11/2015 | 78001-4 | J: trans-1,2-Dichloroethene<br>J: Vinyl chloride<br>(< LOQ, but > MDL) | |
| WP003-RW17-15D | 12/11/2015 | 78001-5 | | |

Validation was conducted according to this hierarchy of validation guidance: DoD Quality Systems Manual for Environmental Laboratories, Version 5.0, July 2013 (DoD, 2013), and U.S. Environmental Protection Agency (USEPA) Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review (USEPA, 2014a), and Contract Laboratory Program National Functional Guidelines for Superfund Inorganic Methods Data Review (USEPA, 2014b). The Site-Specific and Consolidated Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPPs) and laboratory standard operating procedures (SOPs) were consulted during the data validation.

**Data Validation Detail**

- **Data Package Completeness**

  The Level IV data package was reviewed to make certain that it contained the data required in the deliverable. This included checking the data package for the results of each analyte requested for each field sample submitted in the analytical batch, along with requested quality control (QC) documentation for the method. The data package is complete.

- **Laboratory Case Narrative/Cooler Receipt Form**

  No anomalies were noted on the chain-of-custody (CoC) or cooler receipt forms that affected data. The laboratory case narrative was accurate and complete and documented that antifoam was added to samples WP003-MW120-15D, WP003-OW2-15D, WP003-OW52, and WP003-RW17-15D prior to purging to protect the equipment. Anti-foam was also added to the associated Method Blank to demonstrate that no VOC contamination was added from the anti-foam.

- **Holding Times, Storage, and Preservation**

  Review of the sample collection and analysis dates involved comparing the CoCs, the summary forms, and the data report for holding time compliance.

  All samples were received correctly, intact, and properly preserved properly. All samples were prepared and analyzed within the holding times required by the project.

- **Instrument Performance Check**

  The instruments met all applicable performance check requirements. The instrument performance check included verification of 4-Bromofluorobenzene (BFB) tunes for VOCs. All samples were analyzed within 12 hours of the BFB tunes.

- **Initial Calibration/Initial Calibration Verification**

  Initial Calibration (ICAL) and Initial Calibration Verification (ICV) acceptance criteria were met for all analytical methods

- **Continuing Calibration Verification**

  Continuing Calibration Verification (CCV) acceptance criteria were met for all analytical methods.

- **Limit of Quantitation Check Standard**

  All acceptance criteria were met for the Limit of Quantitation (LOQ) Check Standards.

- **Interference Check Standard**

  In the metals analysis, the Interference Check Standard met method and DoD QSM acceptance.

- **Method Blanks**

  Target analytes were not detected above ½ LOQ in the Method Blanks.

- **Surrogate Spikes**

  Surrogates were added to all VOC samples and QC samples as required by the analytical method. All surrogate recoveries met the required QC.

- **Matrix Spike/Matrix Spike Duplicates**

  Matrix Spike/Matrix Spike Duplicate (MS/MSD) analyses were not performed on the samples in this SDG.

- **Laboratory Control Sample (LCS) / Laboratory Control Sample Duplicate (LCSD)**

  All LCS and LCSD recoveries for VOCs and dissolved Arsenic were within the UFP-QAPP and the DoD QSM Version 5.0 acceptance criteria.

- **inductively Coupled Plasma (ICP) Serial Dilution (Dilution Test) and Post-Digestion Spikes**

  An Inductively Coupled Plasma (ICP) Serial Dilution and Post Digestion Spike (PDS) were not performed on the samples in this SDG.

- **Field Duplicates**

  Samples WP003-OW2-15D and WP003-OW52-15D were collected as field duplicates and analyzed for VOCs. All RPDs were within acceptance criteria of ≤ 50%.

- **Internal Standards**

  In the VOC and metals analysis, all QC criteria were met for Internal Standards (IS) in all calibrations and all field samples.

- **Target Analyte Identification and Quantitation**

  In the VOC analysis, target compound identification followed the specific analytical Method. Retention times and Mass Spectra were consistent with the analytical standards. In the metals analysis, appropriate wavelengths were chosen for the metals analysis in addition to appropriate interelement correction factors.

  Non-detected results were reported at the Limit of Detection (LOD) in accordance with DoD QSM Version 5.0. The laboratory also reported the LOQ and detection limit (DL) for each analyte on the sample result sheet. The laboratory reported target analytes, which were qualitatively identified at concentrations below the LOQs, with a “J” qualifier to indicate that the result is estimated as required by DoD QSM Version 5.0. The “J” qualifier was retained by the validator. In general, the LOQs reported are consistent with the LOQs listed in the UFP-QAPP. No dilutions were required.

**Overall Evaluation**

Detected VOC results were qualified, because the concentrations were < LOQ. All validation elements were acceptable and the data is acceptable for its intended use.

Based on the criteria presented above, it is recommended that the results reported for these analyses be accepted. LCS/LCSD, internal standards and surrogate recoveries demonstrated that acceptable levels of accuracy and precision were achieved. In addition, completeness, defined to be the percentage of analytical results to be valid, was 100% for this SDG.

**Data Validation Qualifiers**

| Validation Qualifier | Definition |
|---|---|
| J | The reported positive result is considered estimated, because the result is less than the LOQ or because certain QC criteria were not met. |
| U | The analyte was not detected and is reported as less than the LOD or as defined by the client. |
| UJ | The analyte was not detected in the sample. The LOD (or LOQ) should be considered estimated and may be inaccurate or imprecise. |
| R | The result for this analyte is unusable. The analyte may or may not be present. |

**References**

U.S. Department of Defense (DoD), 2013. DoD Quality Systems Manual for Environmental Laboratories, Version 5.0, July.

U.S. Environmental Protection Agency (USEPA), 2014a. USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review, June.

USEPA, 2014b. USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review.

# Appendix D
# Validated Data Analytical Summaries

D.1 – 2015 Analytical Summaries

D.2 – Historical Analytical Summaries

# Appendix D.1
# 2015 Analytical Summaries

**Summary of Validated Results**
**LF002**

| Location | Analyte | Chromium, Dissolved | Manganese, Dissolved | cis-1,2-Dichloro-ethene | trans-1,2-Dichloro-ethene | Trichloro-ethene | Vinyl chloride |
|---|---|---|---|---|---|---|---|
| | Specific Method | 6010C_DOD5 | 8260B_DOD5 | 8260B_DOD5 | 8260B_DOD5 | 8260B_DOD5 | 8260B_DOD5 |
| | Date Sampled | | | | | | |
| EW-02 | 3/18/2015 | **0.55 J** | 2.5 U | 0.20 U | 0.20 U | **7.62** | 0.20 U |
| | 6/23/2015 | NA | NA | **0.80 J** | 0.40 U | **22** | 0.20 U |
| | 9/24/2015 | NA | NA | **0.78 J** | 0.40 U | **26** | 0.20 U |
| | 12/15/2015 | NA | NA | **0.62 J** | 0.40 U | **20** | 0.20 U |
| EW-03 | 3/24/2015 | NA | NA | **2.14** | 0.20 U | **11.5** | 0.20 U |
| | 9/24/2015 | NA | NA | **1.7** | 0.40 U | **12** | 0.20 U |
| EW-04 | 9/24/2015 | NA | NA | 0.40 U | 0.40 U | **9.9** | 0.20 U |
| EW-05 | 3/24/2015 | **1.98** | 2.5 U | 0.20 U | 0.20 U | **5.1** | 0.20 U |
| | 6/23/2015 | **2.3 J** | 1.0 U | **0.22 J** | 0.40 U | **6.4** | 0.20 U |
| | 9/24/2015 | **1.1 J** | 1.0 U | **0.18 J** | 0.40 U | **6.8** | 0.20 U |
| | 12/15/2015 | 6.6 U | 3.4 U | **0.18 J** | 0.40 U | **5.8** | 0.20 U |
| EW-06 | 3/24/2015 | **6.32** | 2.5 U | **0.321 J** | 0.20 U | **9.52** | 0.20 U |
| | 6/23/2015 | **92** | 1.0 U | **0.51 J** | 0.40 U | **16** | 0.20 U |
| | 9/24/2015 | **3.2 J** | 1.0 U | **0.42 J** | 0.40 U | **11** | 0.20 U |
| | 12/15/2015 | 6.6 U | 3.4 U | **0.37 J** | 0.40 U | **8.0** | 0.20 U |
| EW-07 | 3/18/2015 | **9.07** | 2.5 U | **1.49** | 0.20 U | **30.3** | 0.20 U |
| | 6/23/2015 | NA | NA | **1.5** | 0.40 U | **36** | 0.20 U |
| | 9/24/2015 | NA | NA | **1.3** | 0.40 U | **34** | 0.20 U |
| | 12/15/2015 | NA | NA | **1.3** | 0.40 U | **31 J** | 0.20 U |
| EW-09 | 3/18/2015 | **25.2** | **7.92** | **13.7** | 0.20 U | **82.8** | 0.20 U |
| | 6/23/2015 | **29** | **47** | **14** | **0.17 J** | **91** | 0.20 U |
| | 9/24/2015 | **38** | **97** | **3.4** | 0.40 U | **43** | 0.20 U |
| | 12/15/2015 | **33** | **75** | **1.5** | 0.40 U | **29** | 0.20 U |
| EW-10 | 3/18/2015 | **92.9** | **175** | **11.6** | 0.20 U | **192** | 0.20 U |
| | 6/23/2015 | **75** | **12** | **17** | **0.75 J** | **320** | 0.40 U |
| | 9/24/2015 | **74** | **270** | **3.8** | 0.40 U | **130** | 0.20 U |
| | 12/15/2015 | **55** | **210** | **2.0** | 0.40 U | **74 D** | 0.20 U |
| EW-11 | 3/18/2015 | **0.57 J** | 2.5 U | **1.27** | 0.20 U | **9.1** | 0.20 U |
| | 9/24/2015 | NA | NA | **0.88 J** | 0.40 U | **9.5** | 0.20 U |
| EW-14 | 3/18/2015 | **6.77** | **15.4** | 0.20 U | 0.20 U | **15.8** | 0.20 U |
| | 6/23/2015 | **4.0 J** | **19** | **0.79 J** | 0.40 U | **8.2** | 0.20 U |
| | 9/24/2015 | **10 J** | **63** | **1.6** | **0.20 J** | **20** | 0.20 U |
| | 12/15/2015 | **7.3 J** | **43** | **1.1** | 0.40 U | **12** | 0.20 U |
| MW-63 | 3/17/2015 | **11.9** | 2.5 U | **0.748 J** | 0.20 U | **12.2** | 0.20 U |
| | 6/23/2015 | NA | NA | **0.30 J** | 0.40 U | **7.0** | 0.20 U |
| | 9/22/2015 | NA | NA | **0.25 J** | 0.40 U | **7.0** | 0.20 U |
| | 12/14/2015 | NA | NA | **0.22 J** | 0.40 U | **7.5** | 0.20 U |
| MW-75 | 3/16/2015 | NA | NA | 0.20 U | 0.20 U | **7.15** | 0.20 U |
| | 6/25/2015 | NA | NA | 0.40 U | 0.40 U | **1.3** | 0.20 U |
| | 9/22/2015 | NA | NA | 0.40 U | 0.40 U | **0.90 J** | 0.20 U |
| | 12/15/2015 | NA | NA | 0.40 U | 0.40 U | **0.97 J** | 0.20 U |
| MW-77 | 3/17/2015 | **0.46 J** | 2.5 U | **0.773 J** | 0.20 U | **3.04** | 0.20 U |
| | 9/22/2015 | 2.6 U | **0.34 J** | **0.87 J** | 0.40 U | **3.3** | 0.20 U |

**Summary of Validated Results**
**LF002**

| Location | Analyte | Chromium, Dissolved | Manganese, Dissolved | cis-1,2-Dichloro-ethene | trans-1,2-Dichloro-ethene | Trichloro-ethene | Vinyl chloride |
|---|---|---|---|---|---|---|---|
| MW-80 | 3/12/2015 | NA | NA | 0.02 U | 0.02 U | **3.2** | 0.20 U |
| MW-82 | 3/12/2015 | NA | NA | 0.20 U | 0.20 U | **6.49** | 0.20 U |
| | 6/24/2015 | NA | NA | 0.40 U | 0.40 U | **4.1** | 0.20 U |
| | 9/24/2015 | NA | NA | 0.40 U | 0.40 U | **4.3** | 0.20 U |
| | 12/16/2015 | NA | NA | 0.40 U | 0.40 U | **2.9** | 0.20 U |
| MW-83 | 3/12/2015 | NA | NA | 0.20 U | 0.20 U | **3.01** | 0.20 U |
| MW-85 | 3/12/2015 | NA | NA | 0.20 U | 0.20 U | **1.96** | 0.20 U |
| MW-96 | 3/16/2015 | NA | NA | 0.20 U | 0.20 U | **18.3** | 0.20 U |
| | 9/22/2015 | NA | NA | 0.40 U | 0.40 U | **7.8** | 0.20 U |
| MW-118 | 3/12/2015 | NA | NA | **4.28** | 0.20 U | **192** | 0.20 U |
| | 9/24/2015 | NA | NA | **4.5** | 0.40 U | **190 J** | 0.20 U |
| MW-135 | 3/12/2015 | NA | NA | 0.20 U | 0.20 U | 0.20 U | 0.20 U |
| MW-139 | 3/16/2015 | NA | NA | 0.20 U | 0.20 U | 0.20 U | 0.20 U |
| | 9/24/2015 | NA | NA | 0.40 U | 0.40 U | 0.40 U | 0.20 U |
| MW-140 | 3/16/2015 | NA | NA | 0.20 U | 0.20 U | **2.69** | 0.20 U |
| MW-141 | 3/12/2015 | NA | NA | **0.343** | 0.20 U | **17.1** | 0.20 U |
| RW-2 | 3/11/2015 | **3.7** | **2.67 J** | 0.20 U | 0.20 U | **1.72** | 0.20 U |
| | 6/24/2015 | NA | NA | 0.40 U | 0.40 U | 0.40 U | 0.20 U |
| | 9/21/2015 | NA | NA | 0.40 U | 0.40 U | **0.38 J** | 0.20 U |
| | 12/16/2015 | NA | NA | 0.40 U | 0.40 U | **1.2** | 0.20 U |
| RW-5 | 3/10/2015 | **3.66** | 2.5 U | 0.20 U | 0.20 U | 2.68 | 0.20 U |
| | 6/23/2015 | NA | NA | **1.3** | **0.51 J** | **12** | 0.20 U |
| | 9/21/2015 | NA | NA | **0.16 J** | 0.40 U | **2.2** | 0.20 U |
| | 12/16/2015 | NA | NA | 0.40 U | 0.40 U | **1.3** | 0.20 U |
| RW-6 | 3/11/2015 | **80.7** | **112** | 5.07 | 0.20 U | **92** | 0.20 U |
| | 6/25/2015 | **19** | **23** | **400** | **20** | **5,100** | **9.1 J** |
| | 9/21/2015 | **65** | **66** | **23** | 1.6 U | **700** | 0.80 U |
| | 12/16/2015 | **86 J** | **25 J** | **3.4** | 0.40 U | **170 D** | 0.20 U |
| RW-7 | 3/11/2015 | **9.72** | **1.71 J** | **9.88** | **0.92 J** | **90.9** | 0.20 U |
| | 6/24/2015 | NA | NA | **59** | **11** | **760** | **1.3 J** |
| | 9/21/2015 | NA | NA | **3.2** | 0.40 U | **79** | 0.20 U |
| | 12/15/2015 | NA | NA | **1.3** | 0.40 U | **75 D** | 0.20 U |
| RW-8 | 3/10/2015 | **2.09** | **73.6** | **60.8** | **8.27** | **786** | 2.0 U |
| | 6/24/2015 | **1.8 J** | **180** | **96** | **7.7** | **1,200** | **2.6 J** |
| | 9/21/2015 | 2.6 U | **160** | **140** | **17** | **1,400 J** | **3.4 J** |
| | 12/16/2015 | 6.6 U | **150 J** | **87** | **8.0 J** | **1,200 D** | **1.8 J** |
| RW-9 | 3/6/2015 | **112** | **12,400** | **0.297 J** | 0.20 U | **7.92** | 0.20 U |
| | 6/24/2015 | NA | NA | **100** | **6.2** | **1,000** | **3.4 J** |
| | 9/21/2015 | NA | NA | 0.40 U | 0.40 U | **7.8** | 0.20 U |
| | 12/15/2015 | NA | NA | 0.40 U | 0.40 U | **8.3** | 0.20 U |

**Summary of Validated Results**
**LF002**

| Location | Analyte | Chromium, Dissolved | Manganese, Dissolved | cis-1,2-Dichloro-ethene | trans-1,2-Dichloro-ethene | Trichloro-ethene | Vinyl chloride |
|---|---|---|---|---|---|---|---|
| RW-10 | 3/10/2015 | **3.26** | 2.5 U | 0.20 U | 0.20 U | **3.24** | 0.20 U |
| | 6/25/2015 | NA | NA | **2.6** | **0.32 J** | **34** | 0.20 U |
| | 9/21/2015 | NA | NA | **0.17 J** | 0.40 U | **2.3** | 0.20 U |
| | 12/16/2015 | NA | NA | 0.40 U | 0.40 U | **0.50 J** | 0.20 U |
| RW-11 | 3/10/2015 | **27.4** | 2.5 U | **1.8** | 0.20 U | **51.7** | 0.20 U |
| | 6/23/2015 | **26** | **44** | **6.3** | **0.20 J** | **110** | 0.20 U |
| | 9/21/2015 | **25** | **46** | **0.34 J** | 0.40 U | **29** | 0.20 U |
| | 12/16/2015 | **46 J** | **95 J** | 0.40 U | 0.40 U | **14** | 0.20 U |
| RW-12 | 3/11/2015 | **2.33** | 2.5 U | 0.20 U | 0.20 U | **1.21** | 0.20 U |
| | 6/24/2015 | NA | NA | 0.40 U | 0.40 U | **11** | 0.20 U |
| | 9/21/2015 | NA | NA | 0.40 U | 0.40 U | **5.9** | 0.20 U |
| | 12/15/2015 | NA | NA | 0.40 U | 0.40 U | **7.1** | 0.20 U |
| RW-13 | 3/10/2015 | **16.7** | 2.5 U | **1.46** | 0.20 U | **27.1** | 0.20 U |
| | 6/23/2015 | **6.9 J** | **2.5 J** | **23** | **2.0** | **330** | **0.82 J** |
| | 9/21/2015 | 2.6 U | **9.4 J** | **14** | **1.1** | **200** | **0.30 J** |
| | 12/16/2015 | 6.6 U | 17 UJ, EB | **9.3** | **0.95 J** | **140 D** | **0.27 J** |
| RW-14 | 3/10/2015 | **26.2** | **1.86 J** | **42.7** | **3.36 J** | **330** | 1.0 U |
| | 6/24/2015 | **22** | **1.3 J** | **62** | **4.3** | **420** | **0.97 J** |
| | 9/21/2015 | **20** | **58** | **23** | **1.4 J** | **460** | **0.48 J** |
| | 12/15/2015 | **25** | **11 J** | **11** | **0.38 J** | **360 D** | 0.40 U |
| RW-15 | 3/10/2015 | **6.99** | **13.3** | **0.786 J** | 0.20 U | **5.77** | 0.20 U |
| | 6/23/2015 | NA | NA | **9.2** | **5.7** | **26** | 0.20 U |
| | 9/21/2015 | NA | NA | **3.2** | **0.27 J** | **17** | 0.20 U |
| | 12/16/2015 | NA | NA | **0.70 J** | 0.40 U | **5.7** | 0.20 U |
| RW-16 | 3/6/2015 | **161** | **883** | **1.52** | 0.20 U | **30.5** | 0.20 U |
| | 6/24/2015 | **67** | **560** | **44** | **0.72 J** | **720** | 0.80 U |
| | 9/21/2015 | **110** | **120** | **23** | 1.6 U | **520** | 0.80 U |
| | 12/15/2015 | **110** | **16 J** | **32** | 2.0 U | **950 D** | 1.0 U |
| RW-17 | 3/6/2015 | **171** | **11,300** | 0.20 U | 0.20 U | 0.20 U | 0.20 U |
| | 6/23/2015 | **130** | **8,200** | **0.17 J** | 0.40 U | **3.3** | 0.20 U |
| | 9/21/2015 | **260** | **23,000** | 0.40 U | 0.40 U | 0.40 U | 0.20 U |
| | 12/16/2015 | **270 J** | **40,000 J** | 0.40 U | 0.40 U | **0.21 J** | 0.20 U |

**Summary of Validated Results**
**LF002**

| Location | Analyte | Chromium, Dissolved | Manganese, Dissolved | cis-1,2-Dichloro-ethene | trans-1,2-Dichloro-ethene | Trichloro-ethene | Vinyl chloride |
|---|---|---|---|---|---|---|---|
| RW-18 | 3/6/2015 | **0.85 J** | **2.11 J** | 0.20 U | 0.20 U | **2.6** | 0.20 U |
| | 6/23/2015 | **1.2 J** | **1.1 J** | 0.40 U | 0.40 U | **2.0** | 0.20 U |
| | 9/22/2015 | 2.6 U | **2.0 J** | 0.40 U | 0.40 U | **2.6** | 0.20 U |
| | 12/15/2015 | **4.9 J** | 3.4 U | 0.40 U | 0.40 U | **4.6** | 0.20 U |
| NDA-1 | 3/6/2015 | **148** | **276** | 0.20 U | 0.20 U | **39.9** | 0.20 U |
| | 6/23/2015 | **200** | **40** | **0.27 J** | 0.40 U | **77** | 0.20 U |
| NDA-5 | 3/6/2015 | 0.81 | 28.3 | 52 | 0.325 | **11.7** | **1.39** |
| | 6/24/2015 | Dry | | | | | |
| | 9/24/2015 | Dry | | | | | |
| | 12/14/2015 | Dry | | | | | |
| NDA-7 | 3/4/2015 | **0.59 J** | **4.67 J** | 0.20 U | 0.20 U | **39.1** | 0.20 U |
| | 6/24/2015 | 2.6 U | **0.92 J** | 0.40 U | 0.40 U | **0.25 J** | 0.20 U |
| | 9/22/2015 | 2.6 U | **1.4 J** | 0.40 U | 0.40 U | 1.4 | 0.20 U |
| | 12/14/2015 | 6.6 U | 3.4 U | 0.40 U | 0.40 U | 3.1 | 0.20 U |
| NDA-8 | 3/5/2015 | **56.9** | **349** | 0.20 U | 0.20 U | **111** | 0.20 U |
| | 6/23/2015 | **7.0 J** | **4.8 J** | **0.37 J** | 0.80 U | **380** | 0.40 U |
| | 9/22/2015 | 2.6 U | **4.1 J** | 0.40 U | 0.40 U | **42** | 0.20 U |
| | 12/14/2015 | 6.6 U | **1.9 J** | 0.40 U | 0.40 U | **73 D** | 0.20 U |
| NDA-9 | 3/4/2015 | **1.6** | **6.04** | 0.40 U | 0.40 U | **1,040** | 0.40 U |
| | 6/24/2015 | NA | NA | 0.40 U | 0.40 U | **66** | 0.20 U |
| | 9/22/2015 | NA | NA | 0.40 U | 0.40 U | **9.5** | 0.20 U |
| | 12/14/2015 | NA | NA | 0.40 U | 0.40 U | **2.1** | 0.20 U |
| NDA-10 | 3/4/2015 | **2.46** | **2.19 J** | 0.20 U | 0.20 U | 0.20 U | 0.20 U |
| | 6/24/2015 | NA | NA | 0.40 U | 0.40 U | 0.40 U | 0.20 U |
| | 9/22/2015 | NA | NA | 0.40 U | 0.40 U | **0.41 J** | 0.20 U |
| | 12/14/2015 | NA | NA | 0.40 U | 0.40 U | **0.32 J** | 0.20 U |
| NDA-11 | 3/4/2015 | **4.47** | **6.26** | 0.20 U | 0.20 U | **11.3** | 0.20 U |
| | 6/24/2015 | NA | NA | 0.40 U | 0.40 U | **19** | 0.20 U |
| | 9/22/2015 | NA | NA | 0.40 U | 0.40 U | **12** | 0.20 U |
| | 12/14/2015 | NA | NA | 0.40 U | 0.40 U | **9.2** | 0.20 U |

**Summary of Validated Results**
**LF002**

| Location | Analyte | Chromium, Dissolved | Manganese, Dissolved | cis-1,2-Dichloro-ethene | trans-1,2-Dichloro-ethene | Trichloro-ethene | Vinyl chloride |
|---|---|---|---|---|---|---|---|
| NDA-12 | 3/4/2015 | **33** | **1.29 J** | **1.75** | 0.20 U | **51.7** | 0.20 U |
| | 6/23/2015 | **46** | **0.61 J** | **4.9** | 0.40 U | **180** | 0.20 U |
| | 9/22/2015 | **21** | **1.2 J** | **2.1** | 0.40 U | **69** | 0.20 U |
| | 12/14/2015 | **20 J** | 3.4 U | **1.8** | 0.40 U | **61 D** | 0.20 U |
| NDA-13 | 3/4/2015 | **7.45** | 2.5 U | **0.501 J** | 0.20 U | **24.2** | 0.20 U |
| | 6/23/2015 | **9.1 J** | **1.2 J** | **0.63 J** | 0.40 U | **44** | 0.20 U |
| | 9/22/2015 | **4.2 J** | **2.5 J** | **0.74 J** | 0.40 U | **39** | 0.20 U |
| | 12/11/2015 | 6.6 U | 3.4 U | **0.81 J** | 0.40 U | **26** | 0.20 U |
| NDA-14 | 3/5/2015 | **167** | **242** | **1.51** | 0.20 U | **12.1** | 0.20 U |
| | 6/23/2015 | **380** | **11,000** | 0.40 U | 0.40 U | 0.40 U | 0.20 U |
| | 9/22/2015 | **440** | **19,000** | 0.40 U | 0.40 U | 0.40 U | 0.20 U |
| | 12/16/2015 | **470 J** | **28,000 J** | 0.40 U | 0.40 U | **0.45 J** | 0.20 U |
| PAL | | 50 | 50 | 70 | 100 | 5 | 0.20 |

Notes:
All results reported in ug/L
J = estimated value detected between LOD and LOQ
U = not detected
ug/ L= microgram per liter
D = result reported from dilution.
NA = not analyzed
NE = not established
**Yellow Shading** indicates PAL exceedance
**Bold** results indicate analyte detected above laboratory detection limit

**Summary of Validated Results**
**LF002**

| Location | Analyte | Chromium, Dissolved | Manganese, Dissolved | cis-1,2-Dichloro-ethene | trans-1,2-Dichloro-ethene | Trichloro-ethene | Vinyl chloride |
|---|---|---|---|---|---|---|---|
| | **Specific Method** | 6010C_DOD5 | 8260B_DOD5 | 8260B_DOD5 | 8260B_DOD5 | 8260B_DOD5 | 8260B_DOD5 |
| | **Date Sampled** | | | | | | |
| LF002 Influent | 6/23/2015 | NA | NA | **1.3** | 0.40 U | **18** | 0.20 U |
| | 9/24/2015 | NA | NA | **0.86 J** | 0.40 U | **17** | 0.20 U |
| | 12/16/2015 | NA | NA | **0.52 J** | 0.40 U | **9.4** | 0.20 U |
| LF002 Effuent | 6/23/2015 | NA | NA | 0.40 U | 0.40 U | 0.40 U | 0.20 U |
| | 9/24/2015 | NA | NA | 0.40 U | 0.40 U | 0.40 U | 0.20 U |
| | 12/16/2015 | NA | NA | 0.40 U | 0.40 U | 0.40 U | 0.20 U |
| PAL | | 50 | 50 | 70 | 100 | 5 | 0.20 |

Notes:
All results reported in ug/L
J = estimated value detected between LOD and LOQ
U = not detected
ug/ L= microgram per liter
NA = not analyzed
NE = not established
**Yellow Shading** indicates PAL exceedance
**Bold** results indicate analyte detected above laboratory detection limit

## Summary of Validated Results
## LF002

| Sample Name | Specific Method | Analyte | Result | Units | Q | LOD | Date Sampled |
|---|---|---|---|---|---|---|---|
| LF02INFLUENT | 6010C_DOD5 | Chromium, Dissolved | 3.4 | ug/L | J | 2.6 | 10/07/15 |
| | 6010C_DOD5 | Chromium, Dissolved | 7 | ug/L | J | 2.6 | 10/14/15 |
| | 6010C_DOD5 | Chromium, Dissolved | 9.7 | ug/L | J | 2.6 | 10/21/15 |
| | 6010C_DOD5 | Chromium, Dissolved | 4.8 | ug/L | J | 2.6 | 10/28/15 |
| | 6010C_DOD5 | Chromium, Dissolved | 6.1 | ug/L | J | 2.6 | 11/04/15 |
| | 6010C_DOD5 | Chromium, Dissolved | 12 | ug/L | J | 2.6 | 11/11/15 |
| | 6010C_DOD5 | Chromium, Dissolved | 13 | ug/L | J | 2.6 | 11/18/15 |
| | 6010C_DOD5 | Chromium, Dissolved | 9.9 | ug/L | J | 2.6 | 11/24/15 |
| | 6010C_DOD5 | Chromium, Dissolved | 9.5 | ug/L | J | 2.6 | 12/02/15 |
| | 6010C_DOD5 | Chromium, Dissolved | 9.7 | ug/L | J | 2.6 | 12/09/15 |
| | 6010C_DOD5 | Chromium, Dissolved | 10 | ug/L | J | 2.6 | 12/16/15 |
| | 6010C_DOD5 | Chromium, Dissolved | 12 | ug/L | J | 2.6 | 12/23/15 |
| | 6010C_DOD5 | Chromium, Dissolved | 10 | ug/L | J | 2.6 | 12/30/15 |

Yellow highlights indicate PAL

| Constituent | PAL (ug/L) |
|---|---|
| Chromium | 50 |
| Manganse | 50 |

Notes:

J= estimated value detected between MDL and LOQ

ug/L= microgram per liter

**Summary of Validated Results**
**WP003**

| Location | Analyte | Arsenic, Dissolved | cis-1,2-Dichloro-ethene | trans-1,2-Dichloro-ethene | Trichloro-ethene | Vinyl chloride | Chloride | Sulfate | Nitrate | Nitrite | Methane | Ethene | Iron | Manganse |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Specific Method | 6010C_DOD5 | 8260B_DOD5 | 8260B_DOD5 | 8260B_DOD5 | 8260B_DOD5 | 9056A | 9056A | 9056A | 9056A | RSK-175 | RSK-175 | 6010C_DOD5 | 6010C_DOD5 |
| | Date Sampled | | | | | | | | | | | | | |
| MW-11 | 6/26/2015 | **22 J** | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | 9/23/2015 | **34 J** | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | 12/10/2015 | **24** | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| MW-12 | 3/13/2015 | **14.3** | 0.2 U | 0.2 U | 0.2 U | 0.2 U | -- | -- | -- | -- | -- | -- | -- | -- |
| | 6/26/2015 | **74 J** | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | 9/23/2015 | **110** | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | 12/10/2015 | **75** | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| MW-99 | 3/17/2015 | **NA** | 0.2 U | 0.2 U | 0.2 U | 0.2 U | -- | -- | -- | -- | -- | -- | -- | -- |
| MW-102 | 3/13/2015 | **35.1** | **8.74** | **13.5** | 0.2 U | **63.6** | **9.97** | **1.23** | 0.1 U | 0.1 U | **3080** | **1.13** | **3790** | **2270** |
| | 6/26/2015 | **100** | **0.57 J** | **4.6** | 0.40 U | **12.0** | -- | -- | -- | -- | -- | -- | -- | -- |
| | 9/23/2015 | **120** | **2.0** | **12** | **0.37 J** | **4.0** | -- | -- | -- | -- | -- | -- | -- | -- |
| | 12/10/2015 | **92** | **0.39 J** | **1.1** | **0.53 J** | **0.31 J** | -- | -- | -- | -- | -- | -- | -- | -- |
| MW-103 | 6/26/2015 | **11 J** | NA | NA | NA | NA | -- | -- | -- | -- | -- | -- | -- | -- |
| | 9/23/2015 | **20 J** | NA | NA | NA | NA | -- | -- | -- | -- | -- | -- | -- | -- |
| | 12/10/2015 | **17** | NA | NA | NA | NA | -- | -- | -- | -- | -- | -- | -- | -- |
| MW-120 | 3/19/2015 | **1.18** | **3.5** | 0.2 U | **13.4** | 0.2 U | **12.8** | **9** | **3.47** | 0.1 U | 1.09 U | 0.29 U | 50 U | **2.5** |
| | 6/26/2015 | NA | **3.4** | **0.41 J** | **13** | 0.2 U | -- | -- | -- | -- | -- | -- | -- | -- |
| | 10/9/2015 | NA | **3.5** | **0.29 J** | **13** | 0.2 U | -- | -- | -- | -- | -- | -- | -- | -- |
| | 12/11/2015 | NA | **2.9** | **0.20 J** | **9.4** | 0.2 U | -- | -- | -- | -- | -- | -- | -- | -- |
| MW-147 | 3/19/2015 | **6.34** | 0.826 | 0.2 U | 1.33 | 0.2 U | **14** | **4.23** | **0.106** | 0.1 U | 1.09 U | 0.29 U | 50 U | **4090** |
| | 10/9/2015 | **16 J** | NA | NA | NA | NA | -- | -- | -- | -- | -- | -- | -- | -- |
| MW-241 | 3/17/2015 | **5.73** | 0.2 U | 0.2 U | 0.2 U | 0.2 U | **12.5** | **9.62** | **0.38** | 0.1 U | **430** | 0.29 U | 50 U | **405** |
| | 10/9/2015 | **28** | NA | NA | NA | NA | -- | -- | -- | -- | -- | -- | -- | -- |
| MW-242 | 3/17/2015 | **2.23** | 0.2 U | 0.2 U | 0.2 U | 0.2 U | **9.8** | **3.31** | **2.45** | 0.1 U | 1.09 U | 0.29 U | 50 U | 2.5 U |
| MW-243 | 3/19/2015 | **2.76** | **0.597** | 0.2 U | **1.52** | 0.2 U | **10** | **1.57** | **0.46** | 0.1 U | 1.09 U | 0.29 U | 50 U | **7.77** |
| | 10/9/2015 | NA | **0.62 J** | **0.22 J** | **1.3** | 0.2 U | -- | -- | -- | -- | -- | -- | -- | -- |
| MW-245 | 3/17/2015 | **0.80** | 0.2 U | 0.2 U | 0.2 U | 0.2 U | **8.95** | **4.96** | **0.532** | 0.1 U | 1.09 U | 0.29 U | 50 U | **2.99** |
| MW-255 | 3/17/2015 | **0.72** | 0.2 U | 0.2 U | 0.2 U | 0.2 U | **12.9** | **4.44** | **0.177** | 0.1 U | 1.09 U | 0.29 U | 50 U | 2.5 U |
| MW-256 | 3/17/2015 | **1.38** | <0.2 | 0.2 U | 0.2 U | 0.2 U | **16.3** | **11.7** | **10.7** | 0.1 U | 1.09 U | 0.29 U | 50 U | 2.5 U |
| MW-257 | 3/17/2015 | NA | **0.63** | 0.2 U | **1.45** | 0.2 U | -- | -- | -- | -- | -- | -- | -- | -- |
| MW-258 | 3/15/2015 | NA | 0.2 U | 0.2 U | 0.2 U | 0.2 U | -- | -- | -- | -- | -- | -- | -- | -- |
| OW-2 | 3/19/2015 | **1.61** | **1.26** | **0.70** | **1.62** | 0.2 U | -- | -- | -- | -- | -- | -- | -- | -- |
| | 6/26/2015 | NA | **1.1** | **0.67 J** | **1.3** | **0.54 J** | -- | -- | -- | -- | -- | -- | -- | -- |
| | 10/9/2015 | **9.0 J** | **1.6** | **0.84 J** | **2.0** | **2.4** | -- | -- | -- | -- | -- | -- | -- | -- |
| | 12/11/2015 | NA | **1.3** | **0.65 J** | **1.5** | **1.3 J** | -- | -- | -- | -- | -- | -- | -- | -- |
| WP-01 | 3/13/2015 | NA | **2.78** | 0.2 U | **4.29** | 0.2 U | -- | -- | -- | -- | -- | -- | -- | -- |
| | 6/26/2015 | **6.6 J** | NA | NA | NA | NA | -- | -- | -- | -- | -- | -- | -- | -- |
| | 9/23/2015 | **5.9 J** | NA | NA | NA | NA | -- | -- | -- | -- | -- | -- | -- | -- |
| | 12/10/2015 | **6.7** | NA | NA | NA | NA | -- | -- | -- | -- | -- | -- | -- | -- |
| EW-03 | 3/13/2015 | NA | **0.871** | 0.2 U | **2.02** | 0.2 U | -- | -- | -- | -- | -- | -- | -- | -- |
| | 6/26/2015 | **9.9 J** | NA | NA | NA | NA | -- | -- | -- | -- | -- | -- | -- | -- |
| | 9/23/2015 | **10 J** | NA | NA | NA | NA | -- | -- | -- | -- | -- | -- | -- | -- |
| | 12/10/2015 | **5.0** | NA | NA | NA | NA | -- | -- | -- | -- | -- | -- | -- | -- |
| PAL (ug/L) | | 5 | 70 | 100 | 5 | 0.2 | NA | NA | NA | NA | NA | NA | NA | NA |

Notes:

All results reported in ug/ L

J = estimated value detected between MDL and LOQ

U = not detected

ug/ L= microgram per liter

NA = not analyzed

NE = not established

**Yellow shading indicates PAL exceedance**

**For arsenic pale yellow shading indicates PAL exceedance but within background**

**Bold** results indicate analyte detected above laboratory detection limit

**Summary of Validated Results**
**WP003**

| Location | Analyte | Arsenic, Dissolved | Diesel Range Organics | Motor Oil | cis-1,2-Dichloro-ethene | trans-1,2-Dichloro-ethene | Trichloro-ethene | Vinyl chloride |
|---|---|---|---|---|---|---|---|---|
| | Specific Method | 6010C_DOD5 | NWTPH-Dx | NWTPH-Dx | 8260B_DOD5 | 8260B_DOD5 | 8260B_DOD5 | 8260B_DOD5 |
| | Date | | | | | | | |
| RW-12 | 10/9/2015 | NA | NA | NA | 0.40 U | 0.40 U | 0.40 U | 0.20 U |
| | 12/11/2015 | 1.0 U | NA | NA | NA | NA | NA | NA |
| RW-14 | 10/9/2015 | NA | NA | NA | 0.40 U | 0.40 U | 0.40 U | 0.20 U |
| RW-15 | 6/25/2015 | NA | NA | NA | 0.40 U | 0.40 U | **0.31 J** | 0.20 U |
| RW-17 | 6/25/2015 | NA | NA | NA | 0.50 U | 0.50 U | 0.40 U | 0.20 U |
| | 10/9/2015 | NA | NA | NA | 0.40 U | 0.40 U | 0.40 U | 0.20 U |
| | 12/11/2015 | NA | NA | NA | 0.40 U | 0.40 U | 0.40 U | 0.20 U |
| RW-20 | 10/9/2015 | NA | NA | NA | 0.40 U | 0.40 U | 0.40 U | 0.20 U |
| RW-21 | 10/9/2015 | NA | NA | NA | 0.40 U | 0.40 U | 0.40 U | 0.20 U |
| RW-33 | 10/9/2015 | NA | NA | NA | 0.40 U | 0.40 U | **0.26 J** | 0.20 U |
| RW-45 | 10/9/2015 | NA | NA | NA | 0.40 U | 0.40 U | 0.40 U | 0.20 U |
| RW-46 | 10/9/2015 | NA | **14 J** | 28 U | 0.40 U | 0.40 U | 0.40 U | 0.20 U |
| | 12/11/2015 | 92 | **20** | 29 U | NA | NA | NA | NA |
| PS-1/4 | 6/24/2015 | NA | NA | NA | 0.40 U | 0.40 U | **0.22 J** | 0.20 U |
| | 10/9/2015 | NA | NA | NA | 0.40 U | 0.40 U | **0.18 J** | 0.20 U |
| | 12/16/2015 | NA | NA | NA | 0.40 U | 0.40 U | **0.22 J** | 0.20 U |
| PAL (ug/L) | | 5 | 500 | 500 | 70 | 100 | 5 | 0.2 |

Notes:
All results reported in ug/ L
J = estimated value detected between MDL and LOQ
U = not detected
ug/ L= microgram per liter
NA = not analyzed
NE = not established
**Yellow shading** indicates PAL exceedance
**Bold** result indicate analyte detected above laboratory detection limit

Summary of Validated Resutls
GETS Air Stream

| Location | Analyte | Trichloro-ethene | Vinyl chloride | trans-1,2-Dichloro-ethene |
|---|---|---|---|---|
| | Specific Method | TO15_MOD_DOD5 | TO15_MOD_DOD5 | TO15_MOD_DOD5 |
| | Date Sampled | | | |
| LF002 A 400 INF | 6/30/2015 | **210** | 2.6 U | 4.0 U |
| | 9/28/2015 | **210** | 2.6 U | 4.0 U |
| | 12/21/2015 | **210** | 5.1 U | 4.0 U |
| LF002 A 401 EFFL | 6/30/2015 | **50** | 2.6 U | 4.0 U |
| | 9/28/2015 | **72** | 2.6 U | 4.0 U |
| | 12/21/2015 | **130** | 5.1 U | 4.0 U |
| PAL | | 2,800 | 72 | 3,100 |

Notes
All results reported in ug/m3
ug/m3 micrograms per cubic liter
U = not detected
**Bold** result indicate analyte detected above laboratory detection limit

**Summary of Validated Results**
**WP003**

| Location | Analyte | Diesel Range Organics | Motor Oil |
|---|---|---|---|
| | **Specific Method** | NWTPH-Dx | NWTPH-Dx |
| | **Date Sampled** | | |
| MW-1 | 3/15/2015 | 45 U | 100 U |
| MW-03 | 3/13/2015 | **570** | 100 U |
| | 9/23/2015 | **91 J** | **50 J** |
| MW-226 | 9/23/2015 | **23** | **96 J** |
| | 12/11/2015 | **150** | **39 J** |
| MW-227 | 3/13/2015 | **88 J** | 100 U |
| MW-246 | 9/23/2015 | **20 J** | **11 J** |
| MW-247 | 3/13/2015 | **390** | 100 U |
| | 9/23/2015 | **200** | **110** |
| MW-248 | 3/13/2015 | 46 U | 100 U |
| PAL | | 500 | 500 |

Notes:
All results reported in ug/L
J = estimated value
ug/L = microgram per liter
U = not detected
**Yellow shading** indicates PAL exceedance
**Bold** result indicate analyte detected above laboratory detection limit
D = result reported from dilution.

**Summary of Validated Results**
**ST006**

| Location | Analyte | Diesel Range Organics (ug/L) | Motor Oil (ug/L) | TCE (ug/L) |
|---|---|---|---|---|
| | **Specific Method** | NWTPH-Dx | NWTPH-Dx | 8260B |
| | **Date Sampled** | | | |
| MW-195 | 3/5/2015 | 46 U | 100 U | **0.33** |
| MW-194 | 9/23/2015 | **77 J** | **110 J** | NS |
| | 12/11/2015 | **76 J** | **110 J** | NS |
| MW-207 | 9/23/2015 | **340** | **110 J** | NS |
| | 12/11/2015 | **85 J** | **54 J** | NS |
| MW-208 | 9/23/2015 | **190** | **32 J** | NS |
| | 12/11/2015 | **110** | **16 J** | NS |
| PAL | | 500 | 500 | 5 |

Notes:
All results reported in ug/L
J = estimated value
ug/L = microgram per liter
U = not detected
**Yellow shading** indicates PAL exceedance
**Bold** result indicate analyte detected above laboratory detection limit
D = result reported from dilution.

# Appendix D.2
# Historical Analytical Summaries

## Appendix D.2 LF002 Historical TCE Concentrations

| Sample Date | May-90 | Jun-90 | Aug-90 | Feb-91 | Apr-91 | Jun-91 | Mar-95 | Apr-95 | Sep-95 | Mar-96 | Oct-96 | Mar-97 | Sep-97 | Mar-98 | Sep-98 | Mar-99 | Sep-99 | Mar-00 | Sep-00 | Mar-01 | Sep-01 | Mar-02 | Sep-02 | Mar-03 | Sep-03 | Mar-04 | Sep-04 | Mar-05 | Sep-05 | Mar-06 | Sep-06 | Oct-06 | Dec-06 | Mar-07 | Jun-07 | Sep-07 | Dec-07 | Mar-08 | Jun-08 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location ID | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| EW-2 | | | | | | | | 62 | 31 | 37 | 43 | 32 | 42 | 34 | 37 | 27 | 18 | 18 | 13 | 11 | 10 | 8.3 | 9.3 | 8.1 | 8.1 | 7.9 | 7.6 | 6.4 | 2.4 | 5.9 | 5.8 | | | 11 | | 13 | | 15 | |
| EW-3 | | | | | | | | 11 | 53 | 22 | 45 | 39 | 33 | 65 | 100 | 12 | 120 | 85 | 119 | 75 | 68 | 54 | 53 | 47 | 40 | 38 | 46 | 46 | 36 | 19 | 40 | | | 41 | | 62 | | 63 | |
| EW-4 | | | | | | | | 93 | 89 | 100 | 57 | 63 | 59 | 100 | 61 | 94 | 90 | 78 | 98 | 68 | 66 | 64 | 60 | 57 | 53 | 49 | 48 | 51 | 47 | 44 | 41 | | | 34 | | 43 | | 58 | |
| EW-5 | | | | | | | | 66 | 30 | 34 | 29 | 13 | 17 | 18 | 30 | 22 | 15 | 17 | 16 | 14 | 11 | 8.5 | 9.4 | 9.6 | 9.7 | 9.6 | 10 | 10 | 11 | 8.8 | 12 | | | 17 | | 21 | | 25 | |
| EW-6 | | | | | | | | 360 | 160 | 150 | 70 | 77 | 48 | 18 | 13 | 25 | 13 | 19 | 18 | 5.5 | 4.2 | 11 | 10 | 9.6 | 9.4 | 14 | 9 | 5.7 | 4.5 | 12 | 15 | | | 15 | | 12 | | 13 | |
| EW-7 | | | | | | | | 190 | 180 | 180 | 160 | 140 | 140 | 130 | 130 | 170 | 160 | 128 | 126 | 100 | 108 | 109 | 102 | 89 | 90 | 84 | 82 | 83 | 58 | 77 | 60 | | | 56 | 58 | 58 | 57 | 57 | 54 |
| MW-63 | | | | | | | | | | | | | | | | | | | | 38 | 35 | 38 | 31 | 33 | 30 | 25 | | 23 | | 23 | | | | 26 | 27 | 26 | 49 | 23 | 50 |
| MW-85 | 2,600 | 1,900 | 390 | 2,300 | 2,800 | 5,600 | 51 | | 63 | 26 | 21 | 12 | 12 | | 9 | 8.9 | 7.8 | 8.2 | 8.5 | 6.9 | 6.1 | 6.2 | 4.8 | 5.2 | 4.6 | 4.8 | 3.8 | 3.4 | 3.5 | 2.7 | 2.4 | | | 4 | 2.5 | 2.3 | 2.9 | 2.6 | |
| NDA1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NDA2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NDA3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NDA4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NDA5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NDA6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NDA7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NDA8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NDA9 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NDA10 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NDA11 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NDA12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NDA13 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NDA14 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| EW-9 | | | | | | | | 5,300 | 2,700 | 270 | 99 | 375 | 95 | 52 | 17 | 81 | 15 | 69 | 30 | 30 | 14 | 97 | 41 | 66 | 44 | 94 | 21 | 39 | 22 | 140 | 530 | 460 | 220 | 370 | 440 | 180 | 170 | 94 | 200 |
| EW-10 | | | | | | | | | 1,800 | 2,500 | 1,700 | 1,600 | 1,800 | 1,000 | 1,100 | 800 | 1,000 | 476 | 940 | 448 | 378 | 417 | 723 | 507 | 613 | 397 | 581 | 420 | 356 | 320 | 4,100 | 4,400 | 3,500 | 3,100 | 3,000 | 2,400 | 2,600 | 840 | 1,100 |
| EW-11 | | | | | | | | | 400 | 350 | 330 | 94 | 88 | 72 | 97 | 140 | 99 | 73 | 78 | 33 | 67 | 73 | 33 | 57 | 43 | 45 | 35 | 21 | 29 | 42 | 14 | | | 11 | | 11 | | 16 | |
| EW-12 | | | | | | | | | 1.5 | 11 | 14 | 3.4 | 4.7 | 13 | 15 | 22 | 12 | 17 | 12 | 14 | 16 | 14 | 11 | 14 | 11 | 14 | 8.5 | 10 | 13 | 9.7 | 5 | | | 5 | | 2.9 | | 4.5 | |
| EW-13 | | | | | | | | | 40 | 44 | 3 | 3.5 | 3 | 2.5 | 5 | 7.9 | 3.6 | 4.2 | 3.9 | 3 | 5.9 | 8.3 | 11 | 9.7 | 3.7 | 5.1 | 3.3 | 3.2 | 6.9 | 6.4 | 2 | | | 1.2 | | 0.4 | | 0.62 | |
| EW-14 | | | | | | | | | 2400 | 340 | 250 | 210 | 230 | 200 | 180 | 220 | 130 | 121 | 145 | 81 | 94 | 119 | 93 | 95 | 85 | 71 | 73 | 69 | 62 | 100 | 100 | | 240 | 300 | 180 | 510 | 420 | 460 | 310 |
| MW-74 | | | | | | | 0.1 | | 2.1 | 0.1 | 0.1 | 0.1 | 0.2 | 0.1 | 0.3 | 0.1 | 0.1 | 0.1 | 2.1 | | 0.31 | | 0.28 | | 0.42 | | 0.3 | 0.1 | 0.27 | | | | | | | 0.1 | | | |
| MW-75 | | | | | | | | | | | | | | | | | | | | 0.67 | | 0.9 | 0.48 | 0.42 | | | | | | | | | | 8.6 | 0.4 | 0.24 | 0.43 | 0.26 | 0.47 |
| MW-77 | | | | | | | 3 | | 2.8 | 1 | 5.3 | 6.1 | 7.8 | 8 | 12 | 13 | 12 | 11 | 12 | 9.3 | 8.3 | 8.7 | 8 | 9.1 | 7.1 | 8 | 6.3 | 6 | 6 | 4.7 | 5.2 | | | 5.3 | 4.7 | 4.3 | 5.7 | 5.4 | 4.2 |
| MW-78 | | | | | | | 4 | | 33 | 28 | 2.2 | | 0.9 | 0.7 | 0.8 | 0.9 | 0.67 | | 1.1 | 0.75 | 0.62 | 0.51 | 0.8 | 0.42 | 0.46 | 0.27 | 0.38 | 0.38 | 0.48 | 0.37 | | | | 0.91 | 1 | 0.8 | 1 | 0.7 | |
| MW-80 | | | | | | | 9.1 | | 41 | 40 | 29 | 14 | 12 | 6.2 | 11 | 5.8 | 2.9 | 3 | 2.3 | 1.6 | 1.4 | 1.5 | 1.3 | 1.2 | 0.78 | 0.68 | 0.35 | 0.34 | 0.34 | 0.26 | | | | 0.69 | | 0.69 | | 0.92 | |
| MW-82 | | | | | | | 43 | | 30 | 24 | 21 | 17 | 19 | 16 | 20 | 16 | 14 | 17 | 14 | 11 | 9.1 | 8.5 | 6.3 | 5.8 | 4.9 | 4.2 | 3.1 | 2.6 | 2.6 | 2.3 | 1.6 | | | 1.8 | 1.6 | 1.5 | 1.6 | 1.5 | |
| MW-83 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MW-85 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MW-96 | | | | 490 | 370 | 370 | 180 | | 97 | 120 | 130 | 94 | 67 | 68 | 76 | 68 | 62 | 49 | 50 | 42 | 38 | 39 | 32 | 36 | 31 | 30 | 27 | 25 | 27 | 30 | 23 | | | 22 | | 21 | | 19 | |
| MW-116 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MW-118 | | | | | | | 440 | | 550 | 690 | 740 | 460 | 465 | 340 | 390 | 410 | 310 | 310 | 354 | 300 | 292 | 233 | 97 | 78 | 137 | 256 | 337 | 347 | 303 | 250 | 320 | | | 390 | | 400 | | 400 | |
| MW-135 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MW-139 | | | | | | | | 2 | 1.4 | 1 | 1 | 0.1 | 0.1 | 0.1 | 0.7 | 0.8 | 0.52 | 0.1 | 0.1 | 1 | 0.63 | 0.76 | 0.55 | 0.6 | 0.62 | 0.53 | 0.45 | 0.38 | 0.41 | 0.32 | 0.29 | | | 0.45 | | 0.41 | | 0.38 | |
| MW-140 | | | | | | 160 | | 53 | 62 | 27 | 31 | 19 | 25 | 18 | 26 | 23 | 23 | 22 | 24 | 15 | 13 | 15 | 6.2 | 7 | 6.8 | 7.4 | 7.7 | 6.7 | 5.2 | 4.4 | 4 | | | 4.6 | | 3.6 | | 2.9 | |
| MW-141 | | | | | | 38 | | 41 | 22 | 37 | 36 | 28 | 29 | 30 | 41 | 35 | 28 | 28 | 36 | 26 | 23 | 25 | 22 | 24 | 22 | 24 | 22 | 20 | | 24 | 22 | | | 19 | | 20 | | 18 | |
| VMP-09 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| VMP-9B | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| VMP-12B | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| VMP-28B | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| VMP-33B | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RW1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RW2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RW3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RW4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RW5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RW6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RW7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RW8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RW9 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RW10 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RW11 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RW12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RW13 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RW14 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RW15 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RW16 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RW17 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RW18 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RW19 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Not sampled for TCE

0.1 Not detected (value shown is 1/2 the detection limit)

## Appendix D.2 LF002 Historical TCE Concentrations

| Sample Date | Sep-08 | Dec-08 | Mar-09 | Jun-09 | Sep-09 | Dec-09 | Jan-10 | Mar-10 | Jun-10 | Sep-10 | Dec-10 | Mar-11 | Apr-11 | Jun-11 | Jul-11 | Sep-11 | Dec-11 | Mar-12 | Jun-12 | Jul-12 | Sep-12 | Oct-12 | Nov-12 | Dec-12 | Feb-13 | Apr-13 | May-13 | Aug-13 | Dec-13 | Mar-14 | Jun-14 | Sep-14 | Dec-14 | Mar-15 | Jun-15 | Sep-15 | Dec-15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location ID | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| EW-2 | 20 | | 17 | | 17 | | | 18 | | | | 15 | | | | 7.3 | | 17 | | | 8.2 | | | | 3.2 | | | 5.1 | | 4.39 | | 19.4 | 12.9 | 7.62 | 22 | 26 | 20 |
| EW-3 | 66 | | 57 | | 44 | | | 26 | | | | 27 | | | | | | 34 | | | 29 | | | | 18 | | | 8.9 | | 7.14 | | 11.3 | | 11.5 | | 12 | |
| EW-4 | 53 | | 24 | | 42 | | | 35 | | 29 | | 41 | | | | 43 | | 36 | | | 41 | | | 34 | 32 | | | 16 | | 14.8 | | 19.4 | | | | 9.9 | |
| EW-5 | 20 | | 25 | | 24 | | | 21 | | 13 | | 15 | | | | 12 | | 18 | | | 31 | | | 10.8 | 7.99 | | | 4.88 | | | | 6.44 | 5.6 | 5.1 | 6.4 | 6.8 | 5.8 |
| EW-6 | 18 | | 24 | | 33 | | | 30 | | | | 35 | | | | 25 | | 74 | | | 7 | | | | 5.7 | | | 5.1 | | 9.91 | | 10.7 | 10.2 | 9.52 | | 11 | 8 |
| EW-7 | 40 | 54 | 48 | 53 | 55 | 34 | | 44 | 44 | 32 | 38 | 43 | | 42 | | 31 | | 30 | 37 | | 22 | | | 24 | | | 23 | 29 | | | 36 | 33 | 40.4 | 30.3 | 36 | 34 | 31 |
| MW-63 | 66 | 50 | 59 | 50 | 45 | 54 | | 54 | 46 | 54 | 45 | 45 | | 34 | | 33 | 44 | 27 | 34 | | 44 | | | 38 | 12 | | 3.4 | 2.5 | 2.58 | 1.46 | 4.13 | 5.3 | 9.72 | 12.2 | 7 | 7 | 7.5 |
| MW-85 | 2.8 | | 2.5 | | 2.4 | | | 2.2 | | 2.7 | | 1.9 | | | | 2.1 | | 1.3 | | | 1.7 | | | | 2.3 | | | 2.2 | | | | 1.37 | | | | | |
| NDA1 | | | | | | | | | | | | | | | | | | 1,150 | | | | 5,580 | | | 0.1 | | 0.1 | 0.38 | 0.1 | | 53.2 | 176 | 60.6 | 39.9 | 77 | | |
| NDA2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NDA3 | | | | | | | | | | | | | | | | | | 1 | | | | 1 | | | 1.1 | | | 1.3 | | | | 1.78 | | 1.5 | | | |
| NDA4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NDA5 | | | | | | | | | | | | | | | | | | | | | | 12.4 | | 14 | 2.2 | | 6.4 | 1.1 | 7.31 | 3.69 | 6.06 | | 11.2 | 11.7 | | | |
| NDA6 | | | | | | | | | | | | | | | | | | 994 | | | | 889 | | | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.02 | 0.2 | 0.1 | 0.1 | | | | |
| NDA7 | | | | | | | | | | | | | | | | | | | | | | 18.6 | | | 27 | | 57 | 47 | 19.3 | 22.7 | 6.82 | 0.892 | 5.62 | 39.1 | 0.25 | 1.4 | 3.1 |
| NDA8 | | | | | | | | | | | | | | | | | | | | | | 3,070 | | | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 6.32 | 105 | 384 | 273 | 111 | 380 | 42 | 73 |
| NDA9 | | | | | | | | | | | | | | | | | | | | | | 1,030 | | | 430 | 1,410 | 2,100 | 1,700 | 2,600 | 1,130 | 739 | 240 | 1,200 | 1,040 | 66 | 9.5 | 2.1 |
| NDA10 | | | | | | | | | | | | | | | | | | | | | | 24.1 | | | 0.1 | | 0.2 | 0.1 | 0.1 | 0.615 | 0.63 | 0.1 | 0.1 | 0.1 | 0.1 | 0.41 | 0.32 |
| NDA11 | | | | | | | | | | | | | | | | | | | | | | 51.3 | | | 0.1 | | 0.1 | 2.36 | 2.39 | 5.47 | 15.7 | 21.4 | 15.9 | 11.3 | 19 | 12 | 9.2 |
| NDA12 | | | | | | | | | | | | | | | | | | | | | | 147 | | 42 | 57 | | 31 | 22 | 50.8 | 73.7 | 60.4 | 60.6 | 68.8 | 51.7 | 180 | 69 | 61 |
| NDA13 | | | | | | | | | | | | | | | | | | | | | | 86 | | 17 | 0.69 | | 0.54 | 1.18 | 1.55 | | 19.7 | 24.5 | 31.9 | 24.2 | 44 | 39 | 26 |
| NDA14 | | | | | | | | | | | | | | | | | | | | | | 105 | | | 4.43 | | 8.05 | 2.13 | 2.91 | 18.1 | 4 | 0.1 | 0.85 | 12.1 | 0.1 | 0.4 | 0.45 |
| EW-9 | 630 | 130 | 180 | 120 | 78 | 110 | | 63 | | | 73 | 55 | | 76 | | 110 | 0.1 | 0.1 | 35 | | 94 | | | | 59.1 | | 24.4 | 22.2 | 62.2 | 95.5 | 86.7 | 43.6 | 45.8 | 82.8 | 91 | 43 | 29 |
| EW-10 | 1,700 | 1200 | 970 | 580 | 700 | 770 | | 560 | 270 | 220 | 440 | 280 | | 390 | | 74 | 0.1 | 0.1 | 14.1 | | 85 | | | 29 | 18.1 | | 19 | 77 | 29.2 | 49.5 | 33.6 | 130 | 164 | 192 | 320 | 130 | 74 |
| EW-11 | 9 | | 8.1 | | 14 | | | 13 | | 14 | | 20 | | | | 12 | 36 | 22 | 4.6 | | 16 | | | 9.7 | 11 | | 8.3 | 12 | | 12 | | 11.5 | 12.6 | 9.1 | | 9.5 | |
| EW-12 | 1.5 | | 2.1 | | 1.5 | | | 0.95 | | 0.6 | | 1.2 | | | | 0.68 | | 1.2 | | | 1.2 | | | | 1.1 | | | 1.1 | | 1.25 | | 1.39 | | 0.1 | | | |
| EW-13 | 1.1 | | 0.57 | | 0.48 | | | 0.65 | | 0.49 | | | | | | | | | | | | | | | | | | | | | | 1.3 | | | | | |
| EW-14 | 240 | 290 | 420 | 340 | 390 | 250 | | 440 | 330 | 210 | 330 | 320 | | 390 | | 220 | 2.6 | 1 | 30 | | 29 | | | 18 | 4.33 | | 12.2 | 13.2 | | | 21.6 | 25.9 | 25.6 | 15.8 | 8.3 | 20 | 12 |
| MW-74 | 0.1 | | | | 0.1 | | | | | 0.1 | | | | | | 0.13 | | | | | 0.1 | | | | | | | 0.02 | | | | 0.1 | | | | | |
| MW-75 | 5 | 0.73 | 1.1 | 0.56 | 0.78 | 8.2 | | 0.86 | 0.65 | 4.4 | 2.1 | 0.86 | | 0.63 | | 9.5 | 1.6 | 0.96 | 0.61 | | 8 | | | 10 | 17 | | 15 | 16 | 14.8 | 15 | 7.76 | 3.33 | 2.25 | 7.15 | 1.3 | 0.9 | 0.97 |
| MW-77 | 4.8 | 3.9 | 4.1 | | 4.2 | | | 4.1 | | 5.1 | | 3.9 | | | | 3.9 | | 4.3 | | | 4 | | | | 3.1 | | 3 | 2.4 | | 2.84 | | 3.84 | 4.51 | 3.04 | | 3.3 | |
| MW-78 | 1 | | | | | | | | | 0.86 | | | | | | 1 | | | | | 0.1 | | | | 1.2 | | | | | | | | | | | | |
| MW-80 | | | 1.2 | | | | | 1.2 | | | | 0.97 | | | | | | 0.5 | | | | | | | 0.42 | | | | | | | | | | | | |
| MW-82 | 1.9 | | | | | | | | | | | 2.2 | | | | | | 2.6 | | | | | | | 4.6 | | | | | | | 7.23 | 6.05 | 6.49 | 4.1 | 4.3 | 2.9 |
| MW-83 | | | | | | | | | | | | | | | | | | 0.77 | | | | | | | 0.88 | | | | | | | | | | | | |
| MW-85 | | | | | | | | | | | | | | | | | | 1.3 | | | 1.7 | | | | 2.3 | | | | | | | 1.37 | 1.75 | 3.01 | | | |
| MW-96 | 20 | | 20 | | 21 | | | 19 | | 17 | | 20 | | | | 16 | | 15 | | | 14 | | | | 17 | | | 13 | | 16.8 | | 16.3 | | 18.3 | | 7.8 | |
| MW-116 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0.1 | | | | | |
| MW-118 | 340 | | 270 | | 300 | | | 230 | | 230 | | 270 | | | | 200 | | 160 | | | 170 | | | | 170 | | | 130 | | | | 170 | | 192 | | 190 | |
| MW-135 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0.1 | | | |
| MW-139 | 0.33 | | 0.78 | | 0.5 | | | 0.43 | | 0.39 | | | | | | 0.27 | | 0.34 | | | 0.4 | | | | 0.38 | | | 0.38 | | | | | | 0.1 | | 0.4 | |
| MW-140 | 3 | | 2.2 | | 2.5 | | | 2.3 | | 2.2 | | 2.3 | | | | 2 | | 1.8 | | | 1.8 | | | | 2 | | | 1.9 | | 2.3 | | 2.49 | | 2.69 | | | |
| MW-141 | 20 | | 21 | | | | | 20 | | | | 18 | | | | | | 16 | | | | | | | 17 | | | | | | | | | 17.1 | | | |
| VMP-09 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| VMP-9B | | | | | | | 2.1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| VMP-12B | | | | | | | 2.5 | | | | | | | | | | | | | | | | 0.9 | | | | | | | | | | | | | | |
| VMP-28B | | | | | | | 1.1 | | | | | | | | | 15 | 16 | 8.4 | | | | | 2.2 | | | | | | | | | 1.25 | | | | | |
| VMP-33B | | | | | | | 0.43 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RW1 | | | | | | | | | | 2.34 | | | | | | | | | | | | | | | | | | 0.1 | | | | 0.948 | | 0.222 | | | |
| RW2 | | | | | | | | | | 20.3 | | | 15.1 | | | 74 | 18 | 220 | 35.1 | | | | 0.1 | | 0.1 | | 0.1 | 1.24 | 0.1 | | 0.649 | | 0.1 | 1.72 | 0.1 | 0.38 | 1.2 |
| RW3 | | | | | | | | | | 20.4 | | | 2.12 | | | 1.4 | | 3.2 | | | | | 0.25 | | | | | | 0.925 | | 1.98 | 0.432 | 1.51 | 3.18 | | | |
| RW4 | | | | | | | | | | 8.61 | | | 4.39 | | | 2.5 | | 3 | | | | | 2.1 | | | | | | | | | 2.15 | | 1.65 | | | |
| RW5 | | | | | | | | | | 5.05 | | | 380 | | | 110 | 45 | 32 | 15.2 | | | | 3.76 | | 12 | | 27.3 | 36.6 | 20.1 | 7.69 | 22 | 13.2 | 12.7 | 2.68 | 12 | 2.2 | 1.3 |
| RW6 | | | | | | | | | | 781 | | | 3,710 | | | 0.1 | 780 | 0.1 | 2410 | | | | 21.8 | | 383 | 788 | 2,540 | 1,700 | 3,960 | 1,840 | 4,950 | 4,130 | 1,570 | 92 | 5,100 | 700 | 170 |
| RW7 | | | | | | | | | | 1,650 | | | 132 | | | 0.1 | 180 | 0.1 | 268 | | | | 0.1 | | 4.23 | | 8.22 | 114 | 97.8 | 130.4 | 163 | 340 | 219 | 90.9 | 760 | 79 | 75 |
| RW8 | | | | | | | | | | 16,200 | | | 14,900 | | | 0.1 | 0.1 | 0.1 | 28.9 | | | | 0.1 | | 0.1 | | 0.1 | 7.8 | 65.5 | 362.75 | 660 | 1,110 | 1,200 | 786 | 1,200 | 1,400 | 1,200 |
| RW9 | | | | | | | | | | 1,670 | | | 1,410 | | | 0.1 | 0.1 | 0.1 | 0.1 | | | | 0.1 | | 0.1 | | 0.1 | 0.1 | 27.7 | 0.2 | 70.7 | 4.78 | 2.14 | 7.92 | 1,000 | 7.8 | 8.3 |
| RW10 | | | | | | | | | | | | | 184 | | | 0.1 | 0.1 | 0.1 | 0.1 | | | | 0.1 | | 0.55 | | 1.65 | 10 | 8 | | 17.1 | 5.02 | 10.9 | 3.24 | 34 | 2.3 | 0.5 |
| RW11 | | | | | | | | | | | | | 799 | | | 0.1 | 0.1 | 0.1 | 62.4 | | | | 0.1 | | 0.1 | | 0.25 | 122 | 12.1 | | 57.5 | | 48.2 | 51.7 | 110 | 29 | 14 |
| RW12 | | | | | | | | | | | | | 8.68 | | | 33 | 25 | 25 | | | | | 0.1 | | 0.1 | | 0.1 | 0.67 | 2.53 | | 7.05 | 9.26 | 6.34 | 1.21 | 11 | 5.9 | 7.1 |
| RW13 | | | | | | | | | | | | | 5,270 | | | 0.12 | 1.3 | 1200 | 238 | | | | 0.1 | | 0.33 | 0.1 | 0.1 | 0.1 | 409 | 37.4 | 43.4 | 309 | 139 | 27.1 | 330 | 200 | 140 |
| RW14 | | | | | | | | | | | | | 212 | | | | 0.1 | 0.1 | 10.4 | | | | 0.1 | | 0.1 | | 0.1 | 0.22 | 3.46 | 6.4 | 131 | 446 | 437 | 330 | 420 | 460 | 360 |
| RW15 | | | | | | | | | | | | | 43 | | | 0.1 | 0.11 | 4.9 | | | | | 4.27 | | 0.21 | | 32 | 15.7 | 13.2 | 8.7 | 25.4 | 13.6 | 8.83 | 5.77 | 26 | 17 | 5.7 |
| RW16 | | | | | | | | | | | | | 1,670 | | | 0.1 | 0.1 | 0.1 | 107 | | | | 2.59 | | 0.3 | | 0.25 | 22 | 3.2 | 0.2 | 34.3 | 5.02 | 3.08 | 30.5 | 720 | 520 | 950 |
| RW17 | | | | | | | | | | | | | 1,090 | | | 2,700 | 2,500 | 3,300 | 2,030 | | | | 0.1 | | 0.1 | | 0.1 | 0.1 | 14.8 | 18.3 | 21.8 | 0.1 | 0.1 | 0.1 | 3.3 | 0.2 | 0.21 |
| RW18 | | | | | | | | | | | | | | | | | | | | | | | 4.24 | | 14 | | 20 | 34 | 13.3 | | 5.3 | 3.23 | 3.48 | 2.6 | 2 | 2.6 | 4.6 |
| RW19 | | | | | | | | | | | | | | | | | | | | | | | 2.6 | | 0.1 | | 1.7 | 1.1 | 0.57 | | 0.2 | | 0.1 | 0.73 | | | |

Not sampled for TCE

0.1 Not detected (value shown is 1/2 the detection limit)

# Appendix D.2 LF002 Historical Chromium Concentrations

| Well | Dissolved Total Chromiumm Concentration (ug/L) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 12/15/12 | 02/15/13 | 05/15/13 | 08/15/13 | 03/15/14 | 06/15/14 | 09/10/14 | 12/02/14 | 02/24/15 | 03/24/15 | 06/23/15 | 09/24/15 | 12/15/15 |
| EW-2 | -- | -- | -- | -- | -- | -- | 0.88 | 0.72 | -- | 0.55 | -- | -- | -- |
| EW-5 | -- | -- | -- | -- | -- | -- | 2.65 | 2.32 | -- | 1.98 | 2.3 | 1.1 | 3.3 |
| EW-6 | -- | -- | -- | -- | -- | -- | 10.7 | 8.08 | -- | 6.32 | 2.0 | 3.2 | 3.3 |
| EW-7 | -- | -- | -- | 2.40 | -- | -- | 6.06 | 8.27 | -- | 9.07 | -- | -- | -- |
| EW-9 | 11 | **84** | **141** | **86** | -- | -- | **55.3** | 40.9 | 30.0 | 25.2 | 29.0 | 38.0 | 33.0 |
| EW-10 | **69** | 12 | 0.66 | **98.00** | -- | -- | **117** | **117** | **110** | **92.9** | **75** | **74** | **55** |
| EW-11 | -- | -- | -- | -- | -- | -- | 1.94 | 0.75 | -- | -- | -- | -- | -- |
| EW-14 | 26 | 49 | **51** | 38 | -- | -- | 16.9 | -- | 8.4 | 6.77 | 4.0 | 10.0 | 7.3 |
| MW-63 | -- | -- | -- | 4.4 | -- | -- | 19.2 | 14.3 | -- | 11.9 | -- | -- | -- |
| MW-77 | -- | -- | -- | -- | -- | -- | 0.47 | -- | 0.41 | 0.46 | -- | <2.6 | -- |
| MW-82 | -- | -- | -- | -- | -- | -- | 0.44 | -- | 0.50 | -- | <10 | -- | -- |
| MW-85 | -- | -- | -- | -- | -- | -- | <5 | -- | <5 | 0.36 | -- | -- | -- |
| NDA1 | -- | **594** | **614** | **219** | **260** | **180** | **142** | -- | -- | **148** | **200** | Dry | Dry |
| NDA3 | -- | -- | -- | 6.60 | 12 | -- | 0.94 | -- | -- | 0.34 | -- | -- | -- |
| NDA5 | -- | -- | -- | 0.66 | 3 | 5 | -- | -- | -- | 0.81 | -- | -- | -- |
| NDA6 | -- | **598** | **789** | **114** | **1,060** | **870** | -- | -- | **310** | **489** | Dry | Dry | Dry |
| NDA7 | -- | 1.8 | -- | 1.20 | 3.7 | 5 | 0.36 | -- | -- | 0.59 | 2.6 | <2.6 | <6.6 |
| NDA8 | -- | **227** | **252** | **115** | **160** | 38 | 14.6 | -- | -- | **56.9** | 7.0 | <2.6 | <6.6 |
| NDA9 | -- | 19 | -- | 4.5 | 3.7 | 5 | 2.44 | -- | -- | 1.60 | 29.0 | -- | -- |
| NDA10 | -- | 8 | -- | **96** | 6.4 | 23 | 2.1 | -- | -- | 2.46 | **75** | -- | -- |
| NDA11 | -- | **94** | **72** | **63** | 22 | 14 | 3.38 | -- | -- | 4.47 | -- | -- | -- |
| NDA12 | 16 | 23 | -- | 31 | **66** | 73 | 59.2 | -- | -- | 33 | 46 | 21 | 20 |
| NDA13 | 11 | 22 | 32 | 4.10 | 26.0 | 22 | 19.8 | -- | -- | 7.45 | 9.1 | 4.2 | 3.3 |
| NDA14 | -- | **152** | **328** | **263** | **210** | **170** | **259** | 14.2 | -- | **167** | **380** | **440** | **470** |
| RW1 | 49 | 23 | -- | 12 | 5 | -- | 0.31 | -- | -- | 0.28 | -- | -- | -- |
| RW2 | -- | -- | 22 | -- | 5.1 | 3.0 | -- | 1.57 | -- | 3.7 | -- | -- | -- |
| RW3 | -- | -- | -- | -- | 5.0 | 5.0 | 0.46 | 1.83 | -- | 1.21 | -- | -- | -- |
| RW4 | -- | -- | -- | -- | 2.9 | -- | 0.36 | -- | -- | 0.31 | -- | -- | -- |
| RW5 | 30 | 23 | 5.0 | 3.0 | 10 | 50 | 1.14 | 3.51 | -- | 3.66 | -- | -- | -- |
| RW6 | **115** | **126** | -- | 9.7 | **86** | 8.2 | 31.4 | **65** | -- | **80.7** | 19 | **65** | **86** |
| RW7 | **59** | **75** | 42 | 12 | 16 | 5.9 | 7.28 | 6.8 | -- | 9.72 | -- | -- | -- |
| RW8 | **116** | **150** | **154** | **88** | **51** | 20 | 5.64 | 1.33 | -- | 2.09 | 1.80 | <2.6 | <6.6 |
| RW9 | **347** | **333** | **362** | **47** | **320** | **170** | **213** | **231** | -- | **112** | -- | -- | -- |
| RW10 | 13 | 18 | 15 | 19 | 3.7 | 3.80 | 2.68 | 2.89 | -- | 3.26 | -- | -- | -- |
| RW11 | **211** | **286** | **218** | **122** | **85** | **50** | -- | 33.3 | -- | 27.4 | 26 | 25 | 46 |
| RW12 | **101** | 43 | 34 | 28 | 8.6 | 8.8 | 6.14 | 4.27 | -- | 2.33 | -- | -- | -- |
| RW13 | 44 | 37 | 46 | 42 | 30 | 29 | 13 | 15 | -- | 16.7 | 6.9 | 1.3 | 3.3 |
| RW14 | **117** | **142** | **159** | **125** | **86** | **50** | 34 | 30 | -- | 26.2 | 22 | 20 | 25 |
| RW15 | 21 | 21 | 6 | 2.0 | 21.0 | 4.1 | 10.8 | 9.64 | -- | 6.99 | -- | -- | -- |
| RW16 | **182** | **186** | **222** | **235** | **240** | **130** | **226** | **223** | **200** | **161** | **67** | **110** | **110** |
| RW17 | **154** | **154** | **127** | **287** | **220** | **100** | **221** | **260** | -- | **171** | **130** | **260** | **270** |
| RW18 | 8.1 | 0.81 | -- | **70** | **130** | 5.0 | 42.3 | 2.08 | -- | 0.85 | 1.20 | <2.6 | <9.8 |
| RW19 | -- | -- | -- | -- | 5.0 | 5.0 | -- | <5 | -- | 0.85 | -- | -- | -- |
| VMP-12B | -- | -- | -- | -- | 2.5 | -- | -- | -- | -- | -- | -- | -- | -- |
| VMP-28B | -- | -- | -- | -- | 4.3 | -- | 0.34 | -- | -- | -- | -- | -- | -- |

*Notes "-- ot sampled ug/l= microcram per liter Red= Above PAL (50 ug/L)*

# Appendix D.2
# LF002 Historical $MnO_4$ Concentrations

MmO4 Concentrations in mg/L; dark purple = above visual detection, light purple = at minimum visual detection of 0.75 mg/L; cl = clear

| | 9/14/2011 | 12/9/2011 | 3/13/2012 | 6/28/2012 | 6/25/2012 | 9/21/2012 | 12/3/2012 | 2/26/2013 | 4/24/2013 | 5/15/2013 | 8/20/2013 | 9/23/2013 | 12/15/2013 | 3/15/2014 | 6/3/2014 | 12/15/2014 | 3/15/2015 | 6/15/2015 | 9/22/2015 | 12/15/2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **NDA** | | | | | | | | | | | | | | | | | | | | |
| EW-5 | -- | -- | -- | -- | -- | -- | 2.7 | 0.7 | -- | -- | 5 | -- | -- | 0.75 | cl | cl | cl | cl | cl | cl |
| EW-6 | -- | -- | -- | -- | -- | -- | -- | cl | -- | -- | -- | -- | -- | cl | cl | cl | cl | cl | cl | cl |
| NDA1 | -- | -- | -- | -- | -- | -- | -- | 2,561 | 1,356 | 320 | 22.5 | -- | 56.5 | 3.8 | 6 | 2.28 | 0.75 | cl | cl | cl |
| NDA2 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | | -- | -- | -- | -- | -- | -- | 3.8 |
| NDA3 | -- | -- | -- | -- | -- | -- | -- | cl | -- | -- | -- | -- | cl | -- | -- | -- | cl | -- | -- | -- |
| NDA4 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| NDA5 | -- | -- | -- | -- | -- | -- | -- | cl | -- | -- | -- | -- | cl | cl | cl | cl | cl | cl | cl | cl |
| NDA6 | -- | -- | -- | -- | -- | -- | -- | 2,166 | 2,071 | 1,466 | 8,603 | -- | 56.5 | 18.8 | 25 | 15.05 | 9.4 | Dry | Dry | Dry |
| NDA7 | -- | -- | -- | -- | -- | -- | -- | cl | -- | | | | cl | 3.8 | cl | cl | cl | cl | cl | cl |
| NDA8 | -- | -- | -- | -- | -- | -- | -- | 794 | 336 | 230 | 28 | -- | 56.5 | 18.8 | 4.1 | 0.75 | 2.275 | cl | cl | cl |
| NDA9 | -- | -- | -- | -- | -- | -- | -- | 8 | cl | -- | -- | -- | cl | cl | cl | cl | cl | cl | cl | cl |
| NDA10 | -- | -- | -- | -- | -- | -- | -- | 1 | -- | | 15.9 | -- | cl | cl | cl | 2.28 | 2.275 | cl | cl | cl |
| NDA11 | -- | -- | -- | -- | -- | -- | -- | 147 | -- | 56 | 27.1 | -- | 7.4 | cl | cl | 7.5 | cl | cl | cl | cl |
| NDA12 | -- | -- | -- | -- | -- | -- | -- | cl | -- | -- | -- | -- | cl | 0.75 | cl | cl | cl | cl | cl | cl |
| NDA13 | -- | -- | -- | -- | -- | -- | -- | 3 | -- | 3 | | -- | cl | cl | cl | cl | cl | cl | cl | cl |
| NDA14 | -- | -- | -- | -- | -- | -- | | 6 | -- | 3 | | -- | 56.5 | 3.8 | 5 | 5.65 | 0.75 | 3.8 | 11.3 | 3.8 |
| **SDA** | | | | | | | | | | | | | | | | | | | | |
| EW-9 | | 147 | 7 | 29 | -- | 1 | 8 | 24 | -- | -- | 6 | 3 | cl | 0.75 | 0.4 | | 0.75 | cl | cl | 0.75 |
| EW-10 | | 191 | 5 | 40 | -- | 13.6 | 17 | 0.75 | -- | -- | 15 | 12 | 1.8 | 7.5 | 3.8 | 19.4 | 0.75 | cl | cl | 2.275 |
| EW-11 | cl | cl | cl | 2 | -- | cl | -- | cl | -- | -- | -- | -- | -- | cl | -- | -- | cl | -- | cl | -- |
| EW-14 | cl | 6 | 11 | 3 | -- | 3.1 | 13 | 22 | -- | -- | 7 | 13 | -- | 0.75 | 0.4 | cl | cl | cl | 2.28 | cl |
| VMP12B | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | | 0.75 | -- | cl | -- |
| VMP-28B | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.75 | | | -- | -- | cl | -- |
| RW1 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.75 | -- | | 0.75 | -- | -- | -- |
| RW2 | cl | cl | cl | cl | -- | -- | 129 | 40 | -- | 14 | -- | -- | 19.4 | 18.80 | cl | 2.28 | 7.5 | 0.75 | cl | cl |
| RW3 | cl | cl | cl | cl | cl | -- | cl | -- | -- | -- | -- | -- | -- | 7.50 | cl | cl | cl | -- | 0.75 | -- |
| RW4 | cl | cl | cl | cl | -- | -- | cl | -- | -- | -- | -- | -- | -- | -- | -- | -- | cl | -- | 7.50 | -- |
| RW5 | cl | cl | cl | cl | -- | -- | 16 | 12 | -- | 3 | 2.8 | -- | 0.75 | 7.50 | cl | 2.28 | 0.75 | 0.75 | 0.75 | cl |
| RW6 | 788 | cl | 136 | cl | -- | -- | 456 | 182 | 58 | -- | -- | -- | 4.20 | 7.50 | cl | 9.40 | 2.28 | cl | 7.5 | cl |
| RW7 | 256 | cl | 1.6 | cl | -- | -- | 138 | 52 | -- | 16 | 1.2 | -- | 56.5 | 7.50 | cl | 7.50 | 4.125 | 0.75 | 0.75 | cl |
| RW8 | 1,594 | 278 | 75 | 34 | -- | -- | 1,020 | 402 | -- | 167 | 17 | -- | 10.2 | 7.50 | 2 | 0.75 | 0.75 | cl | cl | cl |
| RW9 | 4,576 | 2765 | 291 | 796 | -- | | 564 | 456 | -- | 395 | 7,507 | -- | 56.5 | 30.10 | 2 | 9.40 | 2.275 | 0.75 | 0.75 | 0.75 |
| RW10 | 1,878 | 177 | 23 | 7 | -- | -- | 4 | 2.1 | -- | 5 | 4 | -- | cl | | cl | cl | cl | cl | cl | cl |
| RW11 | 372 | 51 | 11 | 8 | 10 | -- | 282 | 214 | -- | 102 | 16 | -- | 17.10 | 3.80 | 2 | 0.75 | 0.75 | cl | cl | cl |
| RW12 | cl | cl | cl | -- | -- | -- | 97 | 17 | -- | 11 | 4.1 | -- | 1.70 | 3.80 | cl | 0.75 | cl | cl | cl | cl |
| RW13 | 23 | 3 | cl | -- | -- | -- | 10 | 6 | 7 | 5 | 4.3 | -- | 0.50 | 0.75 | cl | cl | cl | cl | 0.75 | cl |
| RW14 | 2,345 | 361 | 112 | 17 | 55 | -- | 278 | 192 | -- | 99 | 40.7 | -- | 12.40 | 3.80 | 1.50 | 2.28 | 0.75 | cl | cl | cl |
| RW15 | 57 | 13 | 1.4 | cl | 14 | -- | 2 | 6 | -- | 1 | 1.4 | -- | cl | 0.75 | 3.00 | cl | cl | 0.75 | 0.75 | cl |
| RW16 | 416 | 188 | 79 | 7 | -- | -- | 36 | 45 | -- | 82 | 3,089 | -- | 56.5 | 18.80 | 3.00 | 5.65 | 7.5 | cl | 3.80 | cl |
| RW17 | cl | cl | 0.6 | -- | -- | -- | 573 | 193 | -- | 138 | 9,483 | 172 | 47.5 | 30.10 | 2.00 | 7.50 | 7.5 | 3.8 | 11.30 | 7.50 |
| RW18 | -- | -- | -- | cl | -- | -- | cl | -- | -- | -- | -- | -- | cl | cl | cl | cl | cl | cl | cl | cl |
| RW19 | -- | -- | -- | cl | -- | -- | cl | -- | -- | -- | -- | -- | cl | 0.75 | cl | cl | cl | cl | cl | cl |

# Appendix D.2 WP003 TCE Historical Concentrations

TCE Concentrations (ug/L)

| | MW-11 | MW-12 | MW-99 | MW-102 | MW-103 | EW-3 | WP-01 | WP-02 | WP-03 | MW-147 | MW-241 | MW-242 | EW-1 | MW-120 | MW-243 | MW-244 | OW-1 | OW-2 | OW-3 | MW-245 | MW-254 | MW-255 | MW-256 | MW-257 | MW-258 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nov-87 | | 20 | | | | | | | | | | | | | | | | | | | | | | | |
| Apr-89 | | 33 | | | | | | | | | | | | | | | | | | | | | | | |
| Jul-89 | | 180 | | | | | | | | | | | | | | | | | | | | | | | |
| Apr-91 | | 72 | | 190 | | | | | | | | | | 19 | | | | | | | | | | | |
| Nov-91 | | 14 | | 58 | | | | | | 29 | | | | 38 | | | | | | | | | | | |
| Apr-95 | | 97 | | 130 | | | | | | 7 | | | | 61 | | | | | | | | | | | |
| Jun-95 | | 115 | | 315 | | | | | | 14 | | | | 42 | | | | | | | | | | | |
| Sep-95 | | 45 | | 12 | | | | | | 16 | | | | 36 | | | | | | | | | | | |
| Dec-95 | | 3.8 | | 4.4 | | | | | | 25 | | | | 69 | | | | | | | | | | | |
| Feb-96 | | 4 | | 300 | | | | | | 31 | 1 | | | 69 | | | | | | 9 | | | | | |
| Mar-96 | 0.1 | 0.1 | 0.1 | 220 | 0.1 | 3.5 | 12 | 29 | 62 | 18 | 0.4 | 0.1 | 3.7 | 45 | 3.2 | 1.5 | | | | 3.5 | | | | | |
| Jun-96 | 0.1 | 0.1 | 0.1 | 71 | 0.1 | 1 | 47 | 44 | 5 | 14 | 1.8 | 1 | 1.2 | 46 | 3 | 1 | | | | 5.9 | | | | | |
| Sep-96 | 0.1 | 0.1 | 0.1 | 6 | 0.1 | 1.2 | 3.3 | 5.6 | 5.9 | 29 | 0.4 | 1.1 | 28 | 57 | 2.8 | 1.2 | | | | 3.8 | | | | | |
| Dec-96 | 0.1 | 0.1 | 0.1 | 190 | 0.1 | 3.1 | 11 | 4.9 | 3.6 | 16 | 1 | 2.4 | 24 | 52 | 3.3 | 1.1 | | | | 7.6 | | | | | |
| Mar-97 | 0.1 | 170 | 0.1 | 830 | 0.1 | 49 | 2.2 | 14 | 16 | 18 | 22 | 1.5 | 3.3 | 45 | 3.3 | 1.3 | | | | 2.2 | | | | | |
| Jun-97 | | 1.6 | | 170 | | 16 | 1.9 | 34 | 180 | 20 | 33 | 8.2 | 0.1 | 45 | 2.1 | 0.1 | | | | 2 | | | | | |
| Sep-97 | 0.1 | 1 | | 31 | | 1 | 110 | 364 | 14 | 8 | 2 | 4 | 3 | 24 | 2 | 1 | | | | 5 | | | | | |
| Dec-97 | | 0.6 | | 3 | | 0.7 | 44 | 18 | 2 | 19 | 0.9 | 1 | 2 | 18 | 2 | 0.8 | | | | 4 | | | | | |
| Mar-98 | | 0.4 | 0.1 | 56 | 0.1 | 0.1 | 47 | 44 | 2 | 27 | 2 | 1 | 6 | 30 | 2 | 1 | | | | 3 | 0.1 | 8 | 4 | 0.7 | 0.7 |
| Jun-98 | | 0.4 | | 1 | | 0.1 | 44 | 9 | 1 | 30 | 0.7 | 1 | 4 | 23 | 2 | | | | | 3 | 0.1 | 7 | 4 | 0.8 | 0.5 |
| Sep-98 | | 1 | | 3 | | 2 | 17 | 6 | 2 | 29 | 0.6 | 0.9 | 8 | 27 | 2 | | | | | 2 | 0.1 | 10 | 6 | 0.7 | 0.6 |
| Dec-98 | | 0.1 | | 2 | | 2 | 9 | 3 | 1 | 17 | 0.1 | 0.1 | 13 | 25 | 2 | | | | | 1 | 0.1 | 6 | 4 | 0.1 | 0.1 |
| Mar-99 | 0.1 | 1.5 | 0.1 | 362 | 0.41 | 4 | 44 | 3.3 | 1.7 | 4.4 | 2.4 | 0.97 | 7.7 | 20 | 2.3 | 0.74 | | | | 2.2 | 0.1 | 3.2 | 3.5 | 0.68 | 0.61 |
| Jun-99 | | 0.1 | | 1.3 | | 0.67 | 112 | 5.4 | 0.8 | | 0.1 | | 2.4 | 20 | | | | | | | | 3.7 | 3.3 | 0.1 | |
| Sep-99 | 0.1 | 0.1 | | 0.1 | | 1.7 | 9.5 | 2.1 | 3.8 | 22 | 0.1 | 0.1 | 12 | 28 | 1.4 | 0.63 | | | | 1.3 | 0.1 | 5.9 | 3.1 | 0.5 | 0.1 |
| Dec-99 | | 0.71 | | 4 | | 0.49 | 5.9 | 1.5 | 0.91 | | 0.1 | | 10 | 24 | | | | | | | | 3.2 | 2.6 | | |
| Mar-00 | 0.1 | 0.1 | 0.1 | 66 | 0.1 | 0.1 | 40 | 3.2 | 0.55 | 5.7 | 0.44 | 0.73 | 11 | 22 | 1.9 | 0.64 | | | | 2.2 | 0.1 | 2.8 | 3.1 | 0.72 | 0.56 |
| Jun-00 | | 0.32 | | 2 | | 0.1 | 41 | 3.3 | 0.7 | | 0.1 | | 3.5 | | | | | | | | | 2.8 | 3 | | |
| Sep-00 | | 0.88 | | 1.2 | | 0.55 | 9.5 | 1.4 | 0.64 | 9.8 | 0.1 | 0.7 | 8.3 | 3.9 | | 0.1 | | | | 1.7 | 0.1 | 3.5 | 2.6 | 1.1 | 0.1 |
| Dec-00 | | 0.72 | | 9.1 | | 0.48 | 13 | 1.6 | 0.77 | | 0.45 | | 9.8 | | 2.5 | | | | | | | 3.5 | 2.4 | | |
| Mar-01 | 0.1 | 0.31 | 0.1 | 1 | 0.1 | 0.1 | 8.8 | 38 | 2.7 | 3.9 | 0.1 | 0.49 | 4.9 | 9.8 | 3.9 | 0.44 | | | | 1.4 | 0.1 | 1.1 | 1.2 | 0.61 | 0.34 |
| Jun-01 | | 0.1 | | 0.74 | | 0.45 | 1.8 | 0.84 | 1 | | 0.1 | | 9.2 | | | | | | | | | 1.8 | 2.3 | | |
| Sep-01 | | 0.1 | | 0.45 | | 0.45 | 1.3 | 0.9 | 0.66 | 2.6 | 0.1 | 0.1 | 2.1 | 1.5 | 4.4 | | | | | 0.98 | 0.1 | 3.4 | 1.2 | 0.49 | 0.1 |
| Dec-01 | | 0.89 | | 1.3 | | 0.6 | 2.3 | 1.9 | 0.98 | | 0.49 | | 5.8 | | | | | | | | | 2.6 | 2.2 | | |
| Mar-02 | 0.1 | 0.1 | 0.1 | 2.6 | 0.1 | 0.4 | 0.54 | 1.8 | 9.2 | 3.7 | 0.32 | 0.56 | 5.2 | 2.4 | 8.5 | 0.46 | | | | 2.6 | 0.1 | 0.36 | 2.1 | 0.95 | 0.53 |
| Jun-02 | | 0.1 | | 1 | | 0.1 | 2.1 | 0.93 | 0.37 | | 0.41 | | 2.3 | | | | | | | | | 0.78 | 2.4 | | |
| Sep-02 | | 0.35 | | 0.67 | | 0.48 | 1.3 | 0.86 | 0.42 | 3 | 0.4 | 0.72 | 3.3 | 2.5 | 2.3 | | | | | 1.5 | 0.1 | 4.1 | 2.4 | 1 | 0.44 |
| Dec-02 | | 0.31 | | 2.1 | | 0.1 | 1.2 | 0.76 | 0.47 | | 0.1 | | 2.5 | | | | | | | | | 0.71 | 1.3 | | |
| Mar-03 | 0.1 | 0.14 | 0.1 | 2.2 | 0.11 | 0.22 | 1.4 | 0.71 | 0.31 | 2 | 0.78 | 0.4 | 2.4 | 1.5 | 2.1 | 0.33 | | | | 1.8 | 0.17 | 0.47 | 1.4 | 0.82 | 0.52 |
| Jun-03 | | 0.21 | | 0.55 | | 0.22 | 0.94 | 0.72 | 0.36 | 2 | 0.74 | | 1.9 | | 1.6 | | | | | | | 1.1 | 1.8 | | |
| Sep-03 | 0.1 | 0.35 | | 0.62 | | 0.5 | 0.82 | 0.79 | 0.38 | 2 | 0.42 | 0.43 | 2.5 | 1.5 | 1.3 | | | | | 0.9 | 0.23 | 3.5 | 1.8 | 0.76 | 0.33 |
| Dec-03 | | 0.26 | | 10 | | 0.36 | 1 | 0.65 | 0.46 | | 0.28 | | 2.4 | | | | | | | | | 0.63 | 1.3 | | |
| Mar-04 | 0.1 | 0.08 | 0.1 | 0.84 | 0.1 | 0.19 | 0.73 | | | 1.9 | 0.72 | 0.4 | 1.8 | 1.6 | 2.6 | 0.25 | 2.7 | 3.5 | 0.21 | 2 | 0.1 | 0.1 | 1 | 0.92 | 0.43 |
| Jun-04 | | | | 4 | | 1.9 | 0.5 | | | | | | | | 1.9 | | | 3.5 | | | | | | | |
| Sep-04 | | 0.27 | | 0.47 | | 0.32 | 0.61 | | | 1.7 | 0.27 | 0.36 | | 1.3 | 1.5 | | | 2.7 | | 0.92 | 0.19 | 2.3 | 1.3 | | 0.38 |
| Dec-04 | | | | 0.35 | | 0.21 | 0.67 | | | | | | | | 2.3 | | | | | 0.1 | 0.1 | | | | |
| Feb-05 | | | | 0.52 | | | 2.1 | | | | | | | | | | | | | | | | | | |
| Mar-05 | 0.1 | 0.15 | 0.1 | 1.4 | 0.1 | 0.34 | 1.6 | | | 1.9 | 0.09 | 0.32 | 0.1 | 1.3 | 1.8 | 0.18 | | 2.9 | | 0.9 | 0.1 | 0.14 | 0.85 | 0.82 | 0.28 |
| May-05 | | | | 6 | | | 2.3 | | | | | | | | | | | | | | | | | | |
| Jun-05 | | | | 0.61 | | | 0.43 | | | | | | | | 2.2 | | | | | | | | | | |
| Aug-05 | | | | 0.94 | | | 2.3 | | | | | | | | | | | | | | | | | | |
| Sep-05 | | 0.33 | | 1.8 | | 0.48 | 2.9 | | | 1.6 | 0.29 | 0.3 | | 1.3 | 2.2 | | | 2.6 | | 0.68 | 0.15 | 2.8 | 1.4 | | 0.4 |
| Nov-05 | | | | 0.1 | | | 2.2 | | | | | | | | | | | | | | | | | | |
| Dec-05 | | | | 1.6 | | 0.46 | 2.4 | | | | | | | | 0.23 | | | | | | | | | | |
| Jan-06 | | | | 20 | | | 1.9 | | | | | | | | | | | | | | | | | | |
| Feb-06 | | | | 0.26 | | | 1.2 | | | | | | | | | | | | | | | | | | |
| Mar-06 | 0.1 | 0.19 | 0.1 | 1.8 | 0.1 | 0.2 | 2.1 | | | 1.3 | 0.34 | 0.41 | | 1.2 | 2.2 | | | 2.1 | | 0.6 | 0.1 | 0.1 | 1.2 | 0.49 | 0.34 |

# Appendix D.2 WP003 TCE Historical Concentrations

**TCE Concentrations (ug/L)**

| | MW-11 | MW-12 | MW-99 | MW-102 | MW-103 | EW-3 | WP-01 | WP-02 | WP-03 | MW-147 | MW-241 | MW-242 | EW-1 | MW-120 | MW-243 | MW-244 | OW-1 | OW-2 | OW-3 | MW-245 | MW-254 | MW-255 | MW-256 | MW-257 | MW-258 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| May-06 | | | | 5.5 | | | 2.1 | | | | | | | | | | | | | | | | | | |
| Jun-06 | | | | 0.54 | | | 1.2 | | | | | | | | | | | | | | | | | | |
| Aug-06 | | | | 0.4 | | | 2.4 | | | | | | | | | | | | | | | | | | |
| Sep-06 | | 0.28 | | 0.2 | | 0.43 | 2.8 | | | | | | | | | | | | | | | | | | |
| Nov-06 | | | | 1 | | | 2.9 | | | | | | | | | | | | | | | | | | |
| Dec-06 | | | | 0.28 | | | 2.3 | | | 1.7 | 0.1 | 0.4 | | 1.3 | 1.8 | | | 2.3 | | 0.84 | | 0.1 | 1 | | 0.4 |
| Jan-07 | | | | 2.9 | | | 3 | | | | | | | | | | | | | | | | | | |
| Mar-07 | 0.1 | 0.18 | 0.1 | 1.8 | 0.1 | 0.57 | 3.4 | | | 1.6 | 0.27 | 0.32 | | 1.2 | 2 | 0.2 | | 2.5 | | 0.63 | 0.1 | 0.16 | 1.1 | 0.61 | 0.33 |
| May-07 | | | | 0.32 | | | 3.1 | | | | | | | | | | | | | | | | | | |
| Jun-07 | | | | 1.3 | | | 2.7 | | | | | | | | 1.4 | | | | | | | | | | |
| Aug-07 | | | | 2 | | | 2.9 | | | | | | | | | | | | | | | | | | |
| Sep-07 | | 0.38 | | 0.27 | | 0.59 | 2.8 | | | 1.2 | 0.21 | 0.32 | | **15** | 1.6 | | | 2.2 | | 0.56 | | 2.7 | 1.4 | | 0.33 |
| Oct-07 | | | | | | | | | | | | | | **15** | | | | | | | | | | | |
| Nov-07 | | | | 0.31 | | | 3.4 | | | | | | | | | | | | | | | | | | |
| Dec-07 | | | | 0.17 | | | 3.1 | | | | | | | 3.4 | 2.2 | | | | | | | | | | |
| Feb-08 | | | | 0.18 | | | 3.1 | | | | | | | | | | | | | | | | | | |
| Mar-08 | 0.1 | 0.18 | 0.1 | 2.4 | 0.1 | 0.63 | 2.6 | | | 1.5 | 0.1 | 0.26 | | **5.5** | 2.1 | 0.1 | | 2.2 | | 1.5 | 0.1 | 0.1 | 0.73 | 0.92 | 0.41 |
| Apr-08 | | | | 3.2 | | | 3 | | | | | | | | | | | | | | | | | | |
| Jun-08 | | | | 1 | | | 3.2 | | | | | | | **6** | 1.6 | | | | | | | | | | |
| Sep-08 | | 0.28 | | 0.3 | | | 2.1 | | | 1.2 | 0.16 | 0.1 | | **11** | 1.4 | | | 2.1 | | 0.48 | | 3.2 | 1.2 | | |
| Oct-08 | | | | 0.25 | | | 2.4 | | | | | | | | | | | | | | | | | | |
| Nov-08 | | | | 0.24 | | | 3 | | | | | | | | | | | | | | | | | | |
| Dec-08 | | | | 0.22 | | | 3 | | | | | | | **6.6** | 2.1 | | | | | | | | | | |
| Jan-08 | | | | 0.24 | | | 3 | | | | | | | | | | | | | | | | | | |
| Mar-09 | | 0.11 | 0.1 | 2.4 | | 0.93 | 2.6 | | | 1.4 | 0.13 | 0.22 | | **5.3** | 1.7 | | | 1.9 | | 0.39 | | 0.13 | 0.68 | 0.89 | 0.25 |
| Apr-09 | | | | 0.76 | | | 3.3 | | | | | | | | | | | | | | | | | | |
| Jun-09 | | | | 0.24 | | | 3.3 | | | | | | | **16** | 1.5 | | | | | | | | | | |
| Sep-09 | | | | 0.26 | | | 3.4 | | | | | | | **17** | 1.3 | | | 2 | | 0.4 | | 0.1 | 1.1 | | |
| Dec-09 | | | | 1.4 | | | 3.2 | | | | | | | **14** | 1.9 | | | | | | | | | | |
| Mar-10 | | 0.21 | 0.1 | 0.35 | | 0.98 | 3.3 | | | 1.4 | 0.1 | 0.2 | | **3.3** | 1.6 | | | 1.9 | | 0.48 | | 0.35 | 0.77 | 0.66 | 0.24 |
| Jun-10 | | | | 1.1 | | | 2.9 | | | | | | | **12** | 1.4 | | | | | | | | | | |
| Sep-10 | | | | 0.25 | | | 3.9 | | | 1.3 | | | | **20** | 1.6 | | | 1.8 | | 0.4 | | 4.5 | 1.1 | | |
| Dec-10 | | | | 0.5 | | | 3.2 | | | | | | | **16** | | | | | | | | | | | |
| Mar-11 | | 0.22 | 0.1 | 13 | | 1.1 | 3 | | | 0.92 | 0.38 | 0.21 | | **7.6** | 1.5 | | | 1.2 | | 0.42 | | 0.22 | 0.65 | 0.57 | 0.2 |
| Apr-11 | | | | 1.1 | | | 2.8 | | | | | | | | | | | | | | | | | | |
| Jun-11 | | | | 0.43 | | | 3.3 | | | | | | | **14** | | | | | | | | 3.3 | | | |
| Sep-11 | | | | 0.26 | | | 3.5 | | | 1.4 | | | | **8.1** | 1.1 | | | 1.5 | | 0.44 | | 4.6 | 1.2 | | |
| Dec-11 | | | | 0.18 | | | 3.7 | | | | | | | **24** | | | | | | | | | | | |
| Mar-12 | | 0.1 | 0.1 | 0.22 | | 1.1 | 3.3 | | | 1.5 | 0.27 | 0.26 | | **19** | 1.5 | | | 1.8 | | 0.76 | | 0.19 | 0.78 | 0.76 | 0.25 |
| Jun-12 | | | | 0.33 | | | 3.7 | | | | | | | **19** | | | | | | | | | | | |
| Sep-12 | | | | 0.1 | | | 3.4 | | | 1.1 | | | | **14** | 1.2 | | | 1.6 | | 0.33 | | 4.4 | 1 | | |
| Nov-12 | | | | 0.31 | | | 3.3 | | | | | | | **13** | | | | | | | | | | | |
| Feb-13 | | | | | | | | | | | | | | **15** | | | | | | 0.63 | | | | | |
| May-13 | | | | 0.23 | | | 3.4 | | | | | | | **13** | | | | | | | | | | | |
| Aug-13 | | | | 0.1 | | | 3.9 | | | 0.94 | | | | **18** | 1.1 | | | 1.5 | | 0.34 | | 3.6 | 0.92 | | |
| Dec-13 | | | | 0.1 | | | 4 | | | | | | | **14** | | | | | | | | | | | |
| Mar-14 | | | | | | | | | | 1.36 | | | | **14.3** | 0.1 | | | | | 0.1 | | 1.28 | 0.436 | 1.31 | |
| Jun-14 | | | | 0.1 | | | 3.9 | | | | | | | **15.1** | | | | | | | | | | | |
| Sep-14 | | | | | | | | | | 1.15 | | | | **15.8** | 1.26 | | | 1.39 | | 0.66 | | 2.73 | 0.1 | | |
| Mar-15 | | 0.1 | 0.1 | 0.1 | | 2.02 | 4.29 | | | 1.33 | 0.1 | 0.1 | | **13.4** | 1.52 | | | 1.62 | | 0.1 | | 0.1 | 0.1 | 1.45 | 0.1 |
| Jun-15 | | | | 0.2 | | | | | | | | | | **13** | | | | 1.3 | | | | | | | |
| Sep-15 | | | | 0.37 | | | | | | | | | | **13** | 1.3 | | | 2 | | | | | | | |
| Dec-15 | | | | 0.53 | | | | | | | | | | **9.4** | | | | 1.5 | | | | | | | |

| | |
|---|---|
| | Not sampled |
| 0.1 | Not detected (value listed is 1/2 the detection limit) |
| **6.6** | Above MCTCA (5 ug/L) |

# Appendix D.2 WP003 Historical VC Concentrations

VC Concentrations (u/L)

| | MW-11 | MW-12 | MW-99 | MW-102 | MW-103 | EW-3 | WP-01 | MW-147 | MW-241 | MW-242 | OW-2 | MW-120 | MW-243 | MW-244 | MW-245 | MW-254 | MW-255 | MW-256 | MW-257 | MW-258 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Apr-91 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | | | | | | | 0.1 | | | | | | | | |
| Apr-95 | 0.1 | 9 | 0.1 | 0.1 | 0.1 | 0.1 | | 1.2 | | | | 0.1 | | | | | | | | |
| Jun-95 | 0.1 | 23 | 0.1 | 0.1 | 0.1 | | | 3 | | | | 0.1 | | | | | | | | |
| Sep-95 | 0.1 | 19 | 0.1 | 0.1 | 0.1 | 0.1 | | 1.3 | | | | 0.1 | | | | | | | | |
| Dec-95 | 0.1 | 0.1 | 0.1 | 1.7 | 0.1 | | | 0.1 | | | | 0.1 | | | | | | | | |
| Mar-96 | 0.1 | 0.1 | 0.1 | 96 | 0.1 | 0.1 | 0.1 | 3.8 | 0.1 | 0.1 | | 0.1 | 0.1 | 0.1 | 0.1 | | | | | |
| Jun-96 | 0.1 | 0.1 | 0.1 | 40 | 0.1 | 0.1 | 7.3 | 1.6 | 0.1 | 0.1 | | 0.1 | 0.1 | 0.1 | 0.1 | | | | | |
| Sep-96 | 0.1 | 0.1 | 0.1 | 3.5 | 0.1 | 0.1 | 0.1 | 3.5 | 0.1 | 0.1 | | 0.1 | 0.1 | 0.1 | 0.1 | | | | | |
| Oct-96 | | | | | | 0.1 | | | | | | | | | | | | | | |
| Dec-96 | 0.1 | 0.1 | 0.1 | 8.5 | 0.1 | 0.1 | 0.1 | 1.2 | 0.1 | 0.1 | | 0.1 | 0.1 | 0.1 | 0.1 | | | | | |
| Mar-97 | 0.1 | 32 | 0.1 | 2.8 | 0.1 | | 0.1 | 1 | 0.1 | 0.1 | | 0.1 | 0.1 | 0.1 | 0.1 | | | | | |
| Mar-97 | | | | | | 0.1 | | | | | | | | | | | | | | |
| Jun-97 | | 0.1 | | 16 | | 1.3 | 0.1 | 0.1 | 2.2 | 0.1 | | 0.1 | 0.1 | 0.1 | 0.1 | | | | | |
| Sep-97 | | 0.1 | | 20 | | 0.1 | 7 | 0.1 | 0.1 | 0.1 | | 0.1 | 0.1 | 0.1 | 0.1 | | | | | |
| Dec-97 | | 0.1 | | 7 | | 0.1 | 2 | 0.8 | 0.1 | 0.1 | | 0.1 | 0.1 | 0.1 | 0.1 | | | | | |
| Jan-98 | | | | | | | | | | | | | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | | |
| Sep-98 | | 0.1 | | 16 | 2 | 0.1 | 0.1 | 3 | 0.1 | 0.1 | | 0.1 | 0.1 | | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Dec-98 | | 0.1 | | 7 | | 0.1 | 1 | 1 | 0.1 | 0.1 | | 0.1 | 0.1 | | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Mar-99 | 0.1 | 0.1 | 0.1 | 68 | 0.1 | 0.1 | 3.05 | 0.1 | 0.1 | 0.1 | | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Jun-99 | | 0.1 | | 8.48 | | 0.1 | 15.4 | | 0.1 | | | 0.1 | | | | | 0.1 | 0.1 | 0.1 | |
| Sep-99 | 0.1 | 0.1 | | 21.3 | | 0.1 | | | | | 0.1 | | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | |
| Dec-99 | | 0.1 | | 29.6 | | 0.1 | 0.1 | | 0.1 | | | 0.1 | | | | | 0.1 | 0.1 | | |
| Mar-00 | 0.1 | 0.1 | 0.1 | 158 | 0.1 | 0.1 | 1.05 | 0.1 | 0.1 | 0.1 | | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Jun-00 | | 0.1 | | 49.2 | | 0.1 | 0.1 | | 0.1 | | | | | | | | 0.1 | 0.1 | | |
| Sep-00 | | 0.1 | | 33.2 | | 0.1 | 1.15 | 2.22 | 0.1 | 0.1 | | 0.1 | | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Dec-00 | | 0.1 | | 85.8 | | 0.1 | 5.12 | | 0.1 | | | | | | | | 0.1 | 0.1 | | |
| Mar-01 | 0.1 | 0.1 | 0.1 | 173 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Jun-01 | | 0.1 | | 25.8 | | 0.1 | 1.71 | | 0.1 | | | | | | | | 0.1 | 0.1 | | |
| Sep-01 | | 0.1 | | 46.7 | | 0.1 | 3.04 | 0.1 | 0.1 | 0.1 | | 0.1 | 0.1 | | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Dec-01 | | 0.1 | | 3.72 | | 0.1 | 1.63 | | 0.1 | | | | | | | | 0.1 | 0.1 | | |
| Mar-02 | 0.1 | 0.1 | 0.1 | 167 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | | 0.1 | 1.09 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Jun-02 | | 0.1 | | 71.1 | | 0.1 | 12 | | 0.1 | | | | | | | | 0.1 | 0.1 | | |
| Sep-02 | | 0.1 | | 79.9 | | 0.1 | 14.6 | 4.51 | 0.1 | 0.1 | | 0.1 | 0.1 | | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Dec-02 | | 0.1 | | 10 | | 0.1 | 3.36 | | 0.1 | | | | | | | | 0.1 | 0.1 | | |
| Mar-03 | 0.1 | 0.1 | 0.1 | 37.2 | 0.1 | | 7.21 | 0.24 | 0.1 | 0.1 | | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Jun-03 | | 0.1 | | 32 | | | 3.02 | 0.39 | 0.1 | | | | 0.1 | | | | 0.1 | 0.1 | | |
| Sep-03 | | 0.1 | | 42.8 | | 0.1 | 10.9 | 1.09 | 0.1 | 0.1 | | 0.1 | 0.1 | | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Dec-03 | | 0.1 | | 53 | | 0.1 | 3.55 | | 0.1 | | | | | | | | 0.1 | 0.1 | | |
| Feb-04 | | | | 52 | | | | | | | | | | | | | | | | |
| Mar-04 | 0.53 | 0.1 | 0.1 | 61.8 | 0.1 | 0.1 | 1.02 | 0.1 | 0.1 | 0.1 | 10 | 0.1 | 0.51 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| May-04 | | | | 76.7 | | | | | | | | | | | | | | | | |
| Jun-04 | | | | 63 | | 0.71 | 0.59 | | | | 18.1 | | 0.72 | | | | | | | |
| Sep-04 | | 0.1 | | 32 | | 0.1 | 1.65 | 0.1 | 0.1 | 0.1 | 9.82 | 0.1 | 0.13 | | 0.1 | 0.1 | 0.1 | 0.1 | | 0.1 |
| Nov-04 | | | | 41.4 | | | | | | | | | | | | | | | | |
| Dec-04 | | | | 3.31 | | 0.1 | 2.38 | | | | | | 1.22 | | | | | | | |
| Feb-05 | | | | 72.4 | | | 7.42 | | | | | | | | | | | | | |
| Mar-05 | 0.34 | 0.18 | 0.1 | 20.6 | 0.1 | 0.1 | 4.44 | 0.1 | 0.1 | 0.1 | 4.79 | 0.1 | 0.35 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| May-05 | | | | 44.8 | | | 3.27 | | | | | | | | | | | | | |
| Jun-05 | | | | 25.8 | | | 0.75 | | | | | | 2.42 | | | | | | | |
| Aug-05 | | | | 37.8 | | | 8.83 | | | | | | | | | | | | | |
| Sep-05 | | 0.13 | | 46.3 | | 0.1 | 4.73 | 0.1 | 0.1 | 0.1 | 1.65 | 0.1 | 1.67 | | 0.1 | 0.1 | 0.1 | 0.1 | | 0.1 |
| Nov-05 | | | | 42 | | | 7.1 | | | | | | | | | | | | | |
| Dec-05 | | | | 36 | | 0.1 | 5.4 | | | | | | 0.24 | | | | | | | |
| Feb-06 | | | | 150 | | | 4.7 | | | | | | | | | | | | | |
| Mar-06 | 0.1 | 0.1 | 0.1 | 38 | 0.1 | 0.1 | 12 | 0.1 | 0.1 | 0.1 | 3.7 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| May-06 | | | | 28 | | | 8.6 | | | | | | | | | | | | | |
| Jun-06 | | | | 28 | | | 6.5 | | | | | | | | | | | | | |

# Appendix D.2 WP003 Historical VC Concentrations

**VC Concentrations (u/L)**

| | MW-11 | MW-12 | MW-99 | MW-102 | MW-103 | EW-3 | WP-01 | MW-147 | MW-241 | MW-242 | OW-2 | MW-120 | MW-243 | MW-244 | MW-245 | MW-254 | MW-255 | MW-256 | MW-257 | MW-258 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Aug-06 | | | | 33 | | | 2.1 | | | | | | | | | | | | | |
| Sep-06 | | 0.1 | | 32 | | 0.1 | 2.5 | | | | | | | | | | | | | |
| Nov-06 | | | | 66 | | | 2.3 | | | | | | | | | | | | | |
| Dec-06 | | | | 20 | | | 1.6 | 0.34 | 0.1 | 0.1 | 2.7 | 0.1 | 0.1 | | 0.1 | | 0.1 | 0.1 | | 0.1 |
| Jan-07 | | | | 48 | | | 3.1 | | | | | | | | | | | | | |
| Mar-07 | 0.1 | 0.1 | 0.1 | 72 | 0.1 | 0.1 | 3 | 0.1 | 0.1 | 0.1 | 2.1 | 0.1 | 0.2 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| May-07 | | | | 41 | | | 3.5 | | | | | | | | | | | | | |
| Jun-07 | | | | 35 | | | 0.68 | | | | | | 3 | | | | | | | |
| Aug-07 | | | | 45 | | | 1 | | | | | | | | | | | | | |
| Sep-07 | | 0.1 | | 43 | | 0.1 | 0.88 | 0.21 | 0.1 | 0.1 | 8.9 | 0.1 | 0.63 | | 0.1 | | 0.1 | 0.1 | | 0.1 |
| Oct-07 | | | | | | | | | | 0.1 | | | | | | | | | | |
| Nov-07 | | | | 39 | | | 0.69 | | | | | | | | | | | | | |
| Dec-07 | | | | 40 | | | 0.83 | | | | | 0.1 | 0.1 | | | | | | | |
| Feb-08 | | | | 12 | | | 0.64 | | | | | | | | | | | | | |
| Mar-08 | 0.23 | 0.1 | 0.1 | 4.6 | 0.1 | 0.1 | 1.2 | 0.1 | 0.1 | 0.1 | 1.2 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Apr-08 | | | | 37 | | | 0.52 | | | | | | | | | | | | | |
| Jun-08 | | | | 60 | | | 0.49 | | | | | 0.1 | 0.1 | | | | | | | |
| Aug-08 | | | | 53 | | | 0.4 | | | | | | | | | | | | | |
| Sep-08 | | 0.1 | | 31 | | 0.1 | 0.43 | 0.14 | 0.1 | 0.1 | 10 | 0.1 | 0.55 | | 0.1 | | 0.1 | 0.1 | | |
| Nov-08 | | | | 45 | | | 0.44 | | | | | | | | | | | | | |
| Dec-08 | | | | 18 | | | 0.4 | | | | | 0.16 | | | | | | | | |
| Jan-09 | | | | 52 | | | 0.66 | | | | | | | | | | | | | |
| Mar-09 | | 0.1 | 0.1 | 50 | | 0.1 | 0.76 | 0.1 | 0.1 | 0.1 | 1.3 | 0.1 | 0.1 | | 0.1 | | 0.1 | 0.1 | 0.1 | 0.1 |
| Apr-09 | | | | 54 | | | 0.34 | | | | | | | | | | | | | |
| Jun-09 | | | | 19 | | | 0.37 | | | | | 0.1 | 0.72 | | | | | | | |
| Sep-09 | | | | 19 | | | 0.1 | | | | 14 | 0.1 | 0.54 | | 0.1 | | 0.1 | 0.1 | | |
| Dec-09 | | | | 3.2 | | | 0.3 | | | | | 0.1 | 0.1 | | | | | | | |
| Mar-10 | | 0.1 | 0.1 | 28 | | 0.1 | 0.35 | 0.1 | 0.1 | 0.1 | 1.1 | 0.1 | 0.1 | | 0.1 | | 0.1 | 0.1 | 0.1 | 0.1 |
| Jun-10 | | | | 1.8 | | | 0.21 | | | | | 0.1 | 0.55 | | | | | | | |
| Sep-10 | | | | 55 | | | 0.1 | 0.1 | | | 4 | 0.1 | 1.7 | | 0.1 | | 0.1 | 0.1 | | |
| Dec-10 | | | | 1.5 | | | 0.13 | | | | | 0.1 | | | | | | | | |
| Mar-11 | | 0.1 | 0.1 | 0.23 | | 0.1 | 0.25 | 0.1 | 0.1 | 0.1 | 0.31 | 0.1 | 0.1 | | 0.1 | | 0.1 | 0.1 | 0.1 | 0.1 |
| Apr-11 | | | | 60 | | | 1.4 | | | | | | | | | | | | | |
| Jun-11 | | | | 52 | | | 0.38 | | | | | 0.41 | | | | | 0.1 | | | |
| Sep-11 | | | | 13 | | | 0.13 | 8.5 | | | 1.6 | 0.21 | 0.17 | | 0.1 | | 0.1 | 0.1 | | |
| Dec-11 | | | | 14 | | | 0.1 | | | | | 0.1 | | | | | | | | |
| Mar-12 | | 0.1 | 0.1 | 29 | | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 2.4 | 0.1 | 0.1 | | 0.1 | | 0.1 | 0.1 | 0.1 | 0.1 |
| Jun-12 | | | | 3 | | | 0.1 | | | | | 0.1 | | | | | | | | |
| Sep-12 | | | | 8.7 | | | 0.1 | 0.1 | | | 12 | 0.1 | 0.68 | | 0.1 | | 0.1 | 0.1 | | |
| Nov-12 | | | | 7.6 | | | 0.1 | | | | | 0.1 | | | | | | | | |
| Feb-13 | | | | 22 | | | 0.039 | | | | 1.8 | | | | | | | | | |
| May-13 | | | | 16 | | | 0.039 | 0.1 | | | | 0.039 | 0.36 | | | | | | | |
| Aug-13 | | | | 8.8 | | | 0.1 | 0.1 | | | 8.3 | 0.1 | 0.1 | | 0.1 | | 0.1 | 0.1 | | |
| Dec-13 | | | | 10.4 | | | 0.1 | | | | | 0.1 | | | | | | | | |
| Mar-14 | | 0.1 | | 98 | | | 0.1 | 0.1 | 0.1 | 0.1 | 0.865 | 0.1 | 0.1 | | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Jun-14 | | | | 69.8 | | | 0.1 | | | | | 0.1 | | | | | | | | |
| Sep-14 | | | | 15.7 | | | 0.1 | 0.1 | | | | 0.1 | 0.1 | | 0.1 | | 0.1 | 0.1 | | |
| Mar-15 | | 0.1 | 0.1 | 63.6 | | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | | 0.1 | | 0.1 | 0.1 | 0.1 | 0.1 |
| Jun-15 | | | | 12 | | | | | | | 0.54 | 0.1 | | | | | | | | |
| Sep-15 | | | | 4 | | | | | | | 2.4 | 0.15 | 0.1 | | | | | | | |
| Dec-15 | | | | 0.31 | | | | | | | 1.3 | 0.2 | | | | | | | | |

| | |
|---|---|
| | Not sampled |
| 5 | Not detected (value listed is 1/2 the detection limit) |
| **20.3** | Above MCTCA (0.2 ug/L) |

# Appendix D.2 WP003 Histrocial Arsenic Concentrations

| Well | Sep-99 | Mar-01 | Sep-01 | Mar-02 | Sep-02 | Mar-03 | Sep-03 | Mar-04 | Mar-05 | Jun-05 | Mar-06 | Mar-07 | Mar-08 | Mar-09 | Mar-10 | Mar-11 | Mar-12 | Jan-13 | Mar-14 | Sep-14 | Mar-15 | Jun-15 | Sep-15 | Dec-15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MW-11 | **30.3** | **25.5** | **24.7** | **18.6** | **31** | **33** | **34.5** | **28** | **29.5** | | **21** | **21** | **22** | | | | | | | | | **22** | **34** | **24** |
| MW-12 | | **38.5** | **32.6** | **32.2** | **34.3** | **27.1** | **77.8** | **45.1** | **95.1** | | **27** | **62** | **58** | **62** | **87** | **28** | **42** | **44** | **14** | | **14.3** | **74** | **110** | **75** |
| MW-102 | | | **122** | **203** | **211** | **86.1** | **171** | **103** | **56** | | **140** | **220** | **87** | **57** | **190** | **47** | **130** | **100** | 5 | **25** | **35.1** | **100** | **120** | **95** |
| MW-147 | 5 | **16.5** | **8.3** | **15.4** | **13.3** | **21** | **17.5** | **7.2** | **18.8** | | **11** | **8** | **41** | **10** | **9.2** | **6.7** | **12** | **7.2** | | **6.5** | **6.34** | | **16** | |
| MW-241 | | 4.7 | **11** | **9.2** | **8.8** | **12** | **9.8** | **66.9** | **79.4** | **24** | **15** | **23** | **53** | **23** | **37** | **7.1** | **46** | **8.5** | 5 | | **5.73** | | **28** | |
| MW-242 | | | | | | | | 3.3 | 2 | | 0.5 | 0.5 | 0.5 | 1.7 | 1.8 | 1.6 | 1.5 | | 5 | | 2.23 | | | |
| MW-120 | 0.5 | 0.5 | 0.5 | 1.8 | 3.7 | 6.9 | 2.2 | 1.6 | 3.7 | | 0.5 | 0.5 | 0.5 | 1.8 | 2.2 | 1.7 | 1.3 | | 5 | 1 | 1.18 | | | |
| MW-243 | | | | | | | 7.5 | 2.4 | 5.9 | | 0.5 | 0.5 | 0.5 | 2.7 | 3.5 | 2.7 | 3.5 | | 5 | 2.7 | 2.76 | | | |
| OW-2 | | | | | | | | | | | | | 4.8 | 1.6 | 1.9 | 1.6 | 1.7 | | 5 | | 1.61 | | **9** | |
| MW-245 | 0.5 | 1.8 | 0.5 | 0.5 | 1 | 0.5 | 0.5 | | | | | | | | | | 1.5 | | 5 | 0.76 | 0.8 | | | |
| MW-255 | 0.5 | 0.5 | 0.5 | 3.6 | 3 | 3.1 | 1.3 | | | | | | | | | | | | 5 | 0.78 | 0.72 | | | |
| MW-256 | 3 | 0.5 | 0.5 | 3.9 | 2.2 | 4.4 | 2.5 | 1.7 | 2.9 | | 4.8 | 0.5 | 0.5 | 1.6 | 1.9 | 1.7 | | | 5 | 1.9 | 1.38 | | | |
| MW-258 | | 0.5 | 0.5 | 3.1 | 2.6 | 0.5 | 1.7 | | | | | | | | | | | | | | | | | |

| | |
|---|---|
| | Not sampled |
| 5 | Not detected (value listed is 1/2 the detection limit) |
| **20.3** | Above background (10.7 ug/L) and above MCTCA (5 ug/L) |
| **7.2** | Above MTCA (5 ug/L) but below background (10.7 ug/L) |

# Appendix D.2
# FT002 DRO Historical Concentrations

| Location ID | MW-1 | MW-3 | MW-50 | MW-155 | MW-225 | MW-226 | MW-227 | MW-246 | MW-247 | MW-248 |
|---|---|---|---|---|---|---|---|---|---|---|
| Date Sampled | | | | | | | | | | |
| 3/15/2007 | **220** | **2,000** | | | | | **440** | | **1,900** | **1,300** |
| 3/14/2008 | **91** | **3,100** | | | | | **190** | | **510** | **59** |
| 3/14/2009 | **110** | **1,800** | | | | | **410** | *46* | **470** | *46* |
| 3/14/2010 | **110** | **2,000** | | | | | **500** | | **1,200** | **130** |
| 3/15/2011 | **77** | **410** | | | | | **630** | | **980** | **110** |
| 3/14/2012 | **120** | **980** | **260** | **99** | **150** | **590** | **310** | **120** | **960** | **140** |
| 2/15/2013 | | **550** | | | | **740** | **490** | | **1,200** | **320** |
| 2/15/2014 | *46* | **200** | | | | | **130** | | **430** | *46* |
| 3/13/2015 | *46* | **570** | | | | | **88** | | **390** | *46* |
| 9/24/2015 | | **91** | | | | **230** | | | **200** | |
| 12/11/2015 | | | | | | **150** | | | | |

Notes:
All results reported in ug/L
MTCA-CUL for DRO is 500 ug/L
*Results* = result below laboratory detection limits
**Bold** = results indicate concentration reported above laboratory detection limit
**Yellow shading** = results exceed MTCA-CUL for DRO
Gray Shading = Not Analyzed

**Appendix D.2**
**ST006 Historical Analytical Summary**

| | MW-194 | | | | | | MW-195 | | | | | | | | | | | | MW-196 | | | | | | | | | | | | MW-207 | | | | | | MW-208 | | | | | | | | | | | | MW-308 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | DRO | q | MRO /HRO | q | Jet-A | | Benzene | q | TCE | q | DRO | q | MRO/HRO | q | Jet-A | q | Benzene | q | TCE | q | TPH-D/ DRO | q | MRO/ HRO | q | Jet-A | q | Benzene | q | TPH-D/ DRO | q | MRO/ HRO | q | Jet A | q | Benzene | q | TPH-D/ DRO | q | MRO/ HRO | Q | Jet-A | q | Benzene | q | TCE | q | TPH-D/ DRO | q | MRO/ HRO | q | Jet-A | q |
| 4/15/1993 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | **7,000** | | | | | | | | | | | | | | | | | | | |
| 7/15/1993 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | **670** | | 290 | | | | | | | | | | | | | | | | | | | |
| 10/15/1993 | | | | | | | | | | | | | | | | | **6.5** | | 0.1 | u | 23 | u | | | | | | | | | | | | | **950** | | **4,000** | | | | | | | | | | | | | | | | | | | |
| 1/15/1994 | | | | | | | | | | | | | | | | | 0.1 | u | 0.1 | u | 23 | u | | | | | | | | | | | | | **160** | | **3,100** | | | | | | | | | | | | | | | | | | | |
| 3/15/1996 | | | | | | | 0.1 | u | 0.1 | | 23 | u | | | | | **260** | | 0.1 | u | **3,800** | | | | | | 0.1 | u | 23 | u | | | | | 1.9 | | **5,200** | | | | | | | | | | | | | | | | | | | |
| 9/15/1996 | | | | | | | 0.1 | u | 0.1 | | 23 | u | | | | | **12** | | 0.1 | u | **1,800** | | | | | | 0.1 | u | 23 | u | | | | | **7.7** | | **4,000** | | | | | | | | | | | | | | | | | | | |
| 3/15/1997 | | | | | | | 0.1 | u | 0.1 | | 23 | u | | | | | **88** | | 0.1 | u | **1,800** | | | | | | 0.1 | u | 23 | u | | | | | 1.9 | | **1,300** | | | | | | | | | | | | | | | | | | | |
| 9/15/1997 | | | | | | | 0.1 | u | 0.1 | | 23 | u | | | | | 4 | | 0.1 | u | **640** | | | | | | 0.1 | u | 23 | u | | | | | 4 | | **2,700** | | | | | | | | | | | | | | | | | | | |
| 3/18/1998 | | | | | | | 0.1 | u | 0.1 | | 23 | u | | | | | 0.1 | u | 0.1 | u | **1,300** | | | | | | 0.1 | u | 23 | u | | | | | 0.1 | u | **900** | | | | | | | | | | | | | | | | | | | |
| 9/15/1998 | | | | | | | | | | | | | | | | | 5 | | 0.1 | u | **750** | | | | | | | | | | | | | | 0.6 | | **840** | j | | | | | | | | | | | | | | | | | | |
| 3/15/1999 | | | | | | | 0.1 | u | 0.1 | | 23 | u | | | | | 0.61 | | 0.1 | u | 25 | u | | | | | 0.1 | u | 23 | u | | | | | 0.38 | | 129 | | | | | | | | | | | | | | | | | | | |
| 9/15/1999 | | | | | | | | | | | | | | | | | **5.3** | | 0.1 | u | **1,310** | | | | | | | | | | | | | | 0.43 | | **944** | | | | | | | | | | | | | | | | | | | |
| 3/15/2000 | | | | | | | 0.1 | u | 0.1 | u | 76 | | | | | | 0.1 | u | 0.1 | u | 259 | | | | | | 0.1 | u | 49.6 | | | | | | 0.1 | u | **597** | | | | | | | | | | | | | | | | | | | |
| 9/15/2000 | | | | | | | | | | | | | | | | | 2.6 | | 0.1 | u | **1,580** | | | | | | | | | | | | | | 0.56 | | **2,900** | | | | | | | | | | | | | | | | | | | |
| 4/15/2001 | | | | | | | 0.1 | u | 0.26 | | 47 | | | | | | 0.1 | u | 0.1 | u | 270 | | | | | | 0.1 | u | 28 | | | | | | 0.1 | u | **760** | | | | | | | | | | | | | | | | | | | |
| 9/15/2001 | | | | | | | | | | | | | | | | | 0.5 | | 0.1 | u | **1,110** | | | | | | | | | | | | | | 0.25 | | **923** | | | | | | | | | | | | | | | | | | | |
| 3/15/2002 | | | | | | | 0.1 | u | **24.6** | | 23 | | | | | | 0.3 | | 0.1 | u | **510** | | | | | | 0.1 | u | 23 | u | | | | | 0.1 | u | **740** | | | | | | | | | | | | | | | | | | | |
| 9/15/2002 | | | | | | | | | | | | | | | | | 0.39 | | 0.1 | u | **2,300** | | | | | | | | | | | | | | 0.25 | | **820** | | | | | | | | | | | | | | | | | | | |
| 4/15/2003 | | | | | | | 0.1 | u | **19** | | 23 | | | | | | 0.52 | | 0.1 | u | **1,400** | | | | | | 0.1 | u | 23 | u | | | | | 0.1 | u | 23 | u | | | | | | | | | | | | | | | | | | |
| 9/15/2003 | | | | | | | | | | | | | | | | | 0.98 | | 0.1 | u | 240 | | | | | | | | | | | | | | 0.13 | j | 410 | | | | | | | | | | | | | | | | | | | |
| 4/2/2004 | | | | | | | 0.1 | u | **8.26** | | 23 | | | | | | 0.1 | u | 0.1 | u | **590** | | | | | | 0.1 | u | 23 | u | | | | | 0.1 | u | 23 | u | | | | | 0.1 | u | 0.1 | u | 23 | u | | | | | | |
| 6/3/2004 | | | | | | | 0.1 | u | **10.37** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0.1 | u | 0.1 | u | 23 | u | | | | | | |
| 10/1/2004 | | | | | | | 0.1 | u | **8.9** | | | | | | | | 0.1 | u | 0.1 | u | 23 | u | | | | | | | | | | | | | 0.1 | u | 23 | u | | | | | 0.1 | u | 0.18 | F | 23 | u | | | | | | |
| 12/15/2004 | | | | | | | 0.1 | u | 0.1 | u | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0.1 | u | 0.1 | u | 23 | u | | | | | | |
| 4/15/2005 | | | | | | | 0.1 | u | 0.1 | u | 23 | | | | | | 0.1 | u | 0.1 | u | 23 | u | | | | | 0.1 | u | 23 | u | | | | | 0.1 | u | 23 | u | | | | | 0.1 | u | 0.1 | u | 23 | u | | | | | | |
| 6/15/2005 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9/15/2005 | | | | | | | 0.1 | u | 4.6 | | 74.6 | | | | | | 0.1 | u | 0.1 | u | 217 | | | | | | 0.1 | u | 23 | u | | | | | 0.1 | u | 473 | | | | | | 0.1 | u | 0.1 | u | 23 | u | | | | | | |
| 12/15/2005 | | | | | | | 0.1 | u | 0.1 | u | 23 | u | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0.1 | u | 0.1 | u | 23 | u | | | | | | |
| 3/15/2006 | 370 | | | | 37.5 | u | 0.075 | u | **8.7** | | 30 | j | | | 37.5 | u | 0.075 | u | 0.08 | u | 130 | j | | | 44 | u | 0.36 | j | 22 | j | | | 38 | u | 0.075 | u | 22 | j | | | 39.5 | u | 0.075 | u | 0.08 | u | 24 | j | | | 39 | u |
| 6/15/2006 | | | | | | | 0.1 | u | **11** | | 42 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0.075 | u | 0.08 | u | | | | | | | | |
| 9/15/2006 | | | | | | | 0.065 | u | **7.4** | | 90 | j | | | 125 | U | 0.065 | U | 0.05 | u | 125 | u | | | 230 | u | | | | | | | | | 0.065 | u | 400 | | | | 120 | u | 0.065 | u | 0.46 | j | 47 | j | | | 125 | u |
| 12/15/2006 | | | | | | | 0.065 | u | 0.05 | u | 36 | j | | | 125 | U | | | | | | | | | | | | | | | | | | | | | | | | | | | 0.065 | u | 0.19 | j | 60 | u | | | 120 | u |
| 3/15/2007 | | | | | | | 0.065 | u | **6.7** | | | | | | | | 0.065 | | 0.05 | u | 190 | | | | 13.5 | u | | | | | | | | | 0.065 | u | 210 | | | | 125 | u | 0.065 | u | 0.05 | u | 59 | j | | | 120 | u |
| 6/15/2007 | | | | | | | 0.1 | u | **5.1** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9/15/2007 | | | | | | | 0.065 | u | 0.1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12/15/2007 | | | | | | | 0.065 | u | 0.065 | u | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3/7/2008 | | | | | | | 0.065 | u | 0.05 | u | | | | | | | 0.065 | | 0.05 | u | 120 | | | | 125 | u | | | | | | | | | 0.065 | u | 220 | | | | 60 | u | 0.065 | | 0.05 | u | 230 | | | | 130 | j |
| 6/4/2008 | | | | | | | | | 3.8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9/16/2008 | | | | | | | 0.1 | u | 2.8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12/7/2008 | | | | | | | 0.1 | u | 0.1 | u | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3/20/2009 | | | | | | | 0.065 | u | 2.4 | | | | | | | | 0.1 | | 0.1 | u | 29 | u | | | 36 | u | | | | | | | | | 0.065 | u | 140 | | | | 160 | J | 0.065 | u | 0.05 | u | 29 | | | | 36 | |
| 6/10/2009 | | | | | | | 0.1 | u | 3.7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3/9/2010 | | | | | | | 0.1 | u | 0.13 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6/8/2010 | | | | | | | 0.1 | u | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3/16/2011 | | | | | | | 0.1 | u | 2.3 | | 37 | | 56 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6/16/2011 | | | | | | | 0.1 | u | 3.2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0.1 | u | | | | | | | | | |
| 9/3/2011 | 380 | j | **920** | j | | | 0.1 | u | 0.17 | | 110 | j | 73 | j | | | | | | | 150 | j | 130 | j | | | | | 310 | j | **610** | j | | | | | **620** | j | 110 | j | | | 0.1 | u | 0.1 | u | 110 | j | 61 | j | | | | |
| 6/25/2012 | | | | | | | 0.1 | u | 2.8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0.29 | | | | | | | | | |
| 2/15/2013 | 230 | | **620** | | | | 0.1 | u | 1.4 | | 39 | u | 77 | j | | | | | | | 150 | | 120 | j | | | | | 200 | | **540** | | | | | | 180 | | 120 | j | | | 0.1 | u | 0.46 | | 35 | | 56 | j | | | | |
| 5/23/2013 | | | | | | | 0.1 | u | 1.6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0.19 | | | | | | | | | |
| 3/14/2014 | | | | | | | 0.1 | u | 0.1 | u | 23 | u | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0.1 | u | | | | | | | | |
| 9/12/2014 | | | | | | | | | | | 23 | u | 50 | u | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3/5/2015 | | | | | | | 0.1 | | 0.33 | J | 24 | u | 50 | u | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9/23/2015 | 77 | J | 110 | J | | | | | | | | | | | | | | | | | | | | | | | | | 340 | | 110 | J | | | | | 190 | | 32 | J | | | | | | | | | | | | | | |
| 12/11/2015 | 76 | J | 110 | J | | | | | | | | | | | | | | | | | | | | | | | | | 85 | J | 54 | J | | | | | 110 | | 16 | J | | | | | | | | | | | | | | |

Notes
DRO= diesel range organics (C10-C24), in the past this has been reprot ed as THP-D
MRO= Motor Oil Range Organics (C24-C36). In the past this has been reported as Heavy Oil Range (HRO). MTCA Method A standard is for HRO (which includes Motor Oil)
q= data qualifiers; j= estimated value between LOQ and LOR; u= not detected
All results reported in ug/L
Red text indicates concentrations that exceed the PAL

# Appendix E
# Groundwater Elevation Summaries

**LF002 Groundwater Elevation Summary**

| Well | Date | MP Elv. (Ft AMSL) | SWL (ft-MP) | GW Elev. (ft AMSL) |
|---|---|---|---|---|
| MW-17 | 3/6/2015 | 2404.67 | DRY | |
| | 9/23/2015 | 2404.67 | DRY | |
| MW-23 | 3/6/2015 | 2387.55 | 15.39 | 2372.16 |
| | 9/23/2015 | 2387.55 | DRY | |
| MW-63 | 3/17/2015 | 2403.99 | 71.33 | 2332.66 |
| | 6/23/2015 | 2403.99 | 85.55 | 2318.44 |
| | 9/22/2015 | 2403.99 | 89.77 | 2314.22 |
| | 12/14/2015 | 2403.99 | 91.34 | 2312.65 |
| MW-69 | 3/6/2015 | 2391.23 | 33.45 | 2357.78 |
| | 9/23/2015 | 2391.23 | 46.37 | 2344.86 |
| MW-70 | 3/6/2015 | 2403.72 | 29.82 | 2373.90 |
| | 9/23/2015 | 2403.72 | 29.80 | 2373.92 |
| MW-74 | 3/6/2015 | 2402.25 | 142.44 | 2259.81 |
| | 9/23/2015 | 2402.25 | 142.51 | 2259.74 |
| MW-75 | 3/16/2015 | 2394.91 | 54.85 | 2340.06 |
| | 6/25/2015 | 2394.91 | 72.44 | 2322.47 |
| | 9/22/2015 | 2394.91 | 75.31 | 2319.60 |
| | 12/15/2015 | 2394.91 | 77.91 | 2317.00 |
| MW-78 | 3/12/2015 | 2405.07 | 80.48 | 2324.59 |
| | 9/23/2015 | 2405.07 | 87.61 | 2317.46 |
| MW-80 | 3/12/2015 | 2419.43 | 94.66 | 2324.77 |
| | 9/23/2015 | 2419.43 | 101.50 | 2317.93 |
| MW-82 | 3/12/2015 | 2380.28 | 39.74 | 2340.54 |
| | 6/24/2015 | 2380.28 | 42.11 | 2338.17 |
| | 9/24/2015 | 2380.28 | 45.12 | 2335.16 |
| | 12/16/2015 | 2380.28 | 46.35 | 2333.93 |
| MW-83 | 3/12/2015 | 2343.70 | 44.38 | 2299.32 |
| | 9/23/2015 | 2343.70 | 45.05 | 2298.65 |
| MW-84 | 3/6/2015 | 2414.16 | 91.98 | 2322.18 |
| | 9/23/2015 | 2414.16 | 95.48 | 2318.68 |
| MW-85 | 3/17/2015 | 2408.34 | 64.50 | 2343.84 |
| | 9/23/2015 | 2408.34 | 84.96 | 2323.38 |
| MW-94 | 3/6/2015 | 2403.60 | 31.07 | 2372.53 |
| | 9/23/2015 | 2403.60 | 32.42 | 2371.18 |
| MW-95 | 3/6/2015 | 2402.76 | 58.79 | 2343.97 |
| | 9/23/2015 | 2402.76 | 78.48 | 2324.28 |
| MW-96 | 3/16/2015 | 2396.27 | 37.17 | 2359.10 |
| | 9/21/2015 | 2396.27 | 54.05 | 2342.22 |
| MW-101 | 3/12/2015 | 2406.00 | 155.60 | 2250.40 |
| | 9/23/2015 | 2406.00 | 157.21 | 2248.79 |
| MW-115 | 3/12/2015 | 2399.47 | 166.87 | 2232.60 |
| | 9/23/2015 | 2399.47 | 172.65 | 2226.82 |
| MW-116 | 3/12/2015 | 2400.51 | 167.80 | 2232.71 |
| | 9/23/2015 | 2400.51 | 175.05 | 2225.46 |
| MW-117 | 3/6/2015 | 2375.35 | 63.84 | 2311.51 |
| | 9/23/2015 | 2375.35 | 67.51 | 2307.84 |
| MW-118 | 3/12/2015 | 2384.52 | 68.64 | 2315.88 |
| | 9/24/2015 | 2384.52 | 69.79 | 2314.73 |
| MW-127 | 3/12/2015 | 2375.30 | 87.65 | 2287.65 |
| | 9/23/2015 | 2375.30 | 90.41 | 2284.89 |
| MW-135 | 3/12/2015 | 2345.60 | 112.26 | 2233.34 |
| | 9/23/2015 | 2345.60 | 119.25 | 2226.35 |
| MW-139 | 3/16/2015 | 2374.33 | 131.10 | 2243.23 |
| | 9/24/2015 | 2374.33 | 138.33 | 2236.00 |
| MW-140 | 3/16/2015 | 2396.52 | 41.96 | 2354.56 |
| | 9/23/2015 | 2396.52 | 93.36 | 2303.16 |
| MW-141 | 3/12/2015 | 2407.30 | 100.51 | 2306.79 |
| | 9/23/2015 | 2407.30 | 114.63 | 2292.67 |

**LF002 Groundwater Elevation Summary**

| | | | | |
|---|---|---|---|---|
| RW-2 | 3/11/2015 | 2408.45 | 49.91 | 2358.54 |
| | 6/24/2015 | 2408.45 | 57.38 | 2351.07 |
| | 9/21/2015 | 2408.45 | 66.81 | 2341.64 |
| | 12/16/2015 | 2408.45 | 72.97 | 2335.48 |
| RW-5 | 3/10/2015 | 2404.60 | 45.88 | 2358.72 |
| | 6/23/2015 | 2404.60 | 53.26 | 2351.34 |
| | 9/21/2015 | 2404.60 | 63.19 | 2341.41 |
| | 12/16/2015 | 2404.60 | 69.09 | 2335.51 |
| RW-6 | 3/11/2015 | 2403.30 | 45.03 | 2358.27 |
| | 6/25/2015 | 2403.30 | 52.61 | 2350.69 |
| | 9/21/2015 | 2403.30 | 62.54 | 2340.76 |
| | 12/16/2015 | 2403.30 | 68.98 | 2334.32 |
| RW-7 | 3/11/2015 | 2404.21 | 45.65 | 2358.56 |
| | 6/24/2015 | 2404.21 | 53.30 | 2350.91 |
| | 9/21/2015 | 2404.21 | 63.32 | 2340.89 |
| | 12/15/2015 | 2404.21 | 69.37 | 2334.84 |
| RW-8 | 3/10/2015 | 2396.74 | 38.28 | 2358.46 |
| | 6/24/2015 | 2396.74 | 46.01 | 2350.73 |
| | 9/21/2015 | 2396.74 | 56.11 | 2340.63 |
| | 12/16/2015 | 2396.74 | 61.85 | 2334.89 |
| RW-9 | 3/6/2015 | 2396.67 | 58.61 | 2338.06 |
| | 6/24/2015 | 2396.67 | 46.09 | 2350.58 |
| | 9/21/2015 | 2396.67 | 56.38 | 2340.29 |
| | 12/15/2015 | 2396.67 | 61.79 | 2334.88 |
| RW-10 | 3/10/2015 | 2406.69 | 47.45 | 2359.24 |
| | 6/25/2015 | 2406.69 | 54.79 | 2351.90 |
| | 9/21/2015 | 2406.69 | 64.33 | 2342.36 |
| | 12/16/2015 | 2406.69 | 70.29 | 2336.40 |
| RW-11 | 3/10/2015 | 2405.92 | 4.31** | |
| | 6/25/2015 | 2405.92 | 54.21 | 2351.71 |
| | 9/21/2015 | 2405.92 | 63.79 | 2342.13 |
| | 12/16/2015 | 2405.92 | 70.05 | 2335.87 |
| RW-12 | 3/11/2015 | 2406.36 | 46.87 | 2359.49 |
| | 6/24/2015 | 2406.36 | 54.61 | 2351.75 |
| | 9/21/2015 | 2406.36 | 64.41 | 2341.95 |
| | 12/15/2015 | 2406.36 | 70.59 | 2335.77 |
| RW-13 | 3/10/2015 | 2399.98 | 40.81 | 2359.17 |
| | 6/23/2015 | 2399.98 | 48.43 | 2351.55 |
| | 9/21/2015 | 2399.98 | 58.50 | 2341.48 |
| | 12/16/2015 | 2399.98 | 64.95 | 2335.03 |
| RW-14 | 3/10/2015 | 2401.23 | 42.09 | 2359.14 |
| | 6/24/2015 | 2401.23 | 48.72 | 2352.51 |
| | 9/21/2015 | 2401.23 | 59.83 | 2341.40 |
| | 12/15/2015 | 2401.23 | 65.91 | 2335.32 |
| RW-15 | 3/10/2015 | 2403.57 | 44.93 | 2358.64 |
| | 6/23/2015 | 2403.57 | 52.18 | 2351.39 |
| | 9/21/2015 | 2403.57 | 62.12 | 2341.45 |
| | 12/16/2015 | 2403.57 | 68.41 | 2335.16 |
| RW-16 | 3/6/2015 | 2395.67 | 37.33 | 2358.34 |
| | 6/24/2015 | 2395.67 | 44.95 | 2350.72 |
| | 9/21/2015 | 2395.67 | 55.58 | 2340.09 |
| | 12/15/2015 | 2395.67 | 61.02 | 2334.65 |
| RW-17 | 3/6/2015 | 2396.72 | 38.84 | 2357.88 |
| | 6/23/2015 | 2396.72 | 46.75 | 2349.97 |
| | 9/21/2015 | 2396.72 | 56.87 | 2339.85 |
| | 12/16/2015 | 2396.72 | 64.14 | 2332.58 |
| RW-18 | 3/6/2015 | 2390.67 | 33.28 | 2357.39 |
| | 6/23/2015 | 2390.67 | 41.75 | 2348.92 |
| | 9/22/2015 | 2390.67 | 51.15 | 2339.52 |
| | 12/15/2015 | 2390.67 | 56.54 | 2334.13 |

**LF002 Groundwater Elevation Summary**

| | | | | |
|---|---|---|---|---|
| NDA-1 | 3/6/2015 | 2409.40 | 62.83 | 2346.57 |
| | 6/24/2015 | 2409.40 | 79.66 | 2329.74 |
| | 9/22/2015 | 2409.40 | 82.76 | 2326.64 |
| | 12/14/2015 | 2409.40 | 81.40 | 2328.00 |
| NDA-5 | 3/6/2015 | 2409.36 | 63.01 | 2346.35 |
| | 6/24/2015 | 2409.36 | DRY | |
| | 9/22/2015 | 2409.36 | DRY | |
| | 12/14/2015 | 2409.36 | DRY | |
| NDA-6 | 3/6/2015 | 2410.72 | 64.61 | 2346.11 |
| | 6/24/2015 | 2410.72 | DRY | |
| | 9/22/2015 | 2410.72 | DRY | |
| | 12/14/2015 | 2410.72 | DRY | |
| NDA-7 | 3/5/2015 | 2410.84 | 66.14 | 2344.70 |
| | 6/24/2015 | 2410.84 | 80.99 | 2329.85 |
| | 9/22/2015 | 2410.84 | 85.82 | 2325.02 |
| | 12/14/2015 | 2410.84 | 87.75 | 2323.09 |
| NDA-8 | 3/5/2015 | 2413.02 | 67.44 | 2345.58 |
| | 6/23/2015 | 2413.02 | 84.24 | 2328.78 |
| | 9/22/2015 | 2413.02 | 88.82 | 2324.20 |
| | 12/14/2015 | 2413.02 | 91.05 | 2321.97 |
| NDA-9 | 3/5/2015 | 2410.67 | 64.68 | 2345.99 |
| | 6/24/2015 | 2410.67 | 79.44 | 2331.23 |
| | 9/22/2015 | 2410.67 | 84.35 | 2326.32 |
| | 12/14/2015 | 2410.67 | 86.55 | 2324.12 |
| NDA-10 | 3/5/2015 | 2415.33 | 72.97 | 2342.36 |
| | 6/24/2015 | 2415.33 | 87.55 | 2327.78 |
| | 9/22/2015 | 2415.33 | 92.01 | 2323.32 |
| | 12/14/2015 | 2415.33 | 94.11 | 2321.22 |
| NDA-11 | 3/5/2015 | 2411.63 | 67.41 | 2344.22 |
| | 6/24/2015 | 2411.63 | 82.75 | 2328.88 |
| | 9/22/2015 | 2411.63 | 87.38 | 2324.25 |
| | 12/14/2015 | 2411.63 | 89.52 | 2322.11 |
| NDA-12 | 3/5/2015 | 2414.19 | 72.90 | 2341.29 |
| | 6/23/2015 | 2414.19 | 89.21 | 2324.98 |
| | 9/22/2015 | 2414.19 | 93.23 | 2320.96 |
| | 12/14/2015 | 2414.19 | 95.16 | 2319.03 |
| NDA-13 | 3/5/2015 | 2412.40 | 70.85 | 2341.55 |
| | 6/23/2015 | 2412.40 | 89.01 | 2323.39 |
| | 9/22/2015 | 2412.40 | 93.41 | 2318.99 |
| | 12/11/2015 | 2412.40 | 94.46 | 2317.94 |
| NDA-14 | 3/5/2015 | 2408.10 | 62.18 | 2345.92 |
| | 6/23/2015 | 2408.10 | 77.81 | 2330.29 |
| | 9/22/2015 | 2408.10 | 82.32 | 2325.78 |
| | 12/16/2015 | 2408.10 | 84.95 | 2323.15 |
| VMP-28B | 3/9/2015 | 2407.71 | 48.05 | 2359.66 |
| | 9/23/2015 | 2407.71 | 65.91 | 2341.80 |
| VMP-9B | 3/6/2015 | 2408.02 | 49.82 | 2358.20 |
| | 9/23/2015 | 2408.02 | 71.44 | 2336.58 |

MP Elev.= Measured Point Elevation
Ft. AMSL = Feet above mean sea level
SWL= static water level
GW Elev. = Groundwater Elevation
** eroneous data reported from Bhate 2014

## WP003 Groundwater Elevation and Field Parameter Summary

| Well | Date | MP Elv. (ft AMSL) | SLW (ft-bmp) | GW Elev. (ft AMSL) | ORP (mv) | DO (mg/L) | pH (su) | Fe (mg/l) |
|---|---|---|---|---|---|---|---|---|
| WP-01 | 3/13/2015 | 2408.09 | 7.62 | 2400.47 | 142 | 4.25 | 7.93 | -- |
| | 6/26/2015 | 2408.09 | 7.81 | 2400.28 | 77.1 | 1.60 | 6.18 | 0.5 |
| | 9/23/2015 | 2408.09 | 8.19 | 2399.90 | -149.6 | 0.78 | 7.41 | <0.1 |
| | 12/10/2015 | 2408.09 | 7.22 | 2400.87 | 22.6 | 1.86 | 7.17 | 0.4 |
| OW-2 | 3/19/2015 | 2407.40 | 10.59 | 2396.81 | 104.0 | 1.00 | 6.49 | -- |
| | 6/26/2016 | 2407.40 | 11.01 | 2396.39 | 217.9 | 2.39 | 5.99 | -- |
| | 10/9/2015 | 2407.40 | 11.51 | 2395.89 | 84.6 | 1.59 | 7.09 | -- |
| | 12/11/2015 | 2407.40 | 11.61 | 2395.79 | -29.9 | 7.39 | 6.43 | <0.1 |
| EW-3 | 3/13/2015 | 2405.42 | 5.52 | 2399.90 | 40.0 | 3.92 | 7.78 | NS |
| | 6/26/2015 | 2405.42 | 5.75 | 2399.67 | 104.2 | 1.01 | 6.19 | <0.1 |
| | 9/23/2015 | 2405.42 | 6.25 | 2399.17 | -96.2 | 0.81 | 7.33 | <0.1 |
| | 12/10/2015 | 2405.42 | 5.57 | 2399.85 | -59.1 | 7.85 | 6.28 | <0.1 |
| MW-11 | 3/13/2015 | 2412.98 | 12.02 | 2400.96 | *NP* | *NP* | *NP* | -- |
| | 6/26/2015 | 2412.98 | 12.18 | 2400.80 | -114.6 | 0.85 | 6.58 | 0.2 |
| | 9/23/2015 | 2412.98 | 12.55 | 2400.43 | -160.2 | 0.79 | 6.05 | 0.2 |
| | 12/10/2015 | 2412.98 | 11.78 | 2401.20 | -102.3 | 0.88 | 6.92 | 0.8 |
| MW-12 | 3/13/2015 | 2410.76 | 10.51 | 2400.25 | -128.0 | 4.40 | 6.50 | -- |
| | 6/26/2015 | 2410.76 | 10.71 | 2400.05 | -40.2 | 0.54 | 6.19 | <0.1 |
| | 9/23/2015 | 2410.76 | 11.18 | 2399.58 | -167.8 | 0.68 | 7.10 | 1.2 |
| | 12/10/2015 | 2410.76 | 10.47 | 2400.29 | 44.8 | 1.16 | 6.92 | 1.2 |
| MW-102 | 3/13/2015 | 2411.05 | 10.77 | 2400.28 | -159.0 | 3.66 | 6.53 | -- |
| | 6/26/2015 | 2411.05 | 10.99 | 2400.06 | -117.8 | 0.82 | 6.60 | 1.2 |
| | 9/23/2015 | 2411.05 | 11.36 | 2399.69 | -153.7 | 0.77 | 6.97 | 1.4 |
| | 12/10/2015 | 2411.05 | 10.59 | 2400.46 | 78.3 | 1.70 | 6.92 | 0.8 |
| MW-103 | 3/13/2015 | 2411.29 | 10.74 | 2400.55 | *NP* | *NP* | *NP* | -- |
| | 6/26/2015 | 2411.29 | 11.01 | 2400.28 | -27.4 | 0.92 | 6.64 | -- |
| | 9/23/2015 | 2411.29 | 11.33 | 2399.96 | -113.8 | 0.72 | 7.02 | 0.8 |
| | 12/10/2015 | 2411.29 | 10.61 | 2400.68 | 88.4 | 1.79 | 6.92 | <0.1 |
| MW-120 | 3/19/2015 | 2403.20 | 4.36 | 2398.84 | 190.0 | 3.00 | 6.25 | -- |
| | 6/26/2015 | 2403.20 | 10.51 | 2392.69 | 248.6 | 1.62 | 7.27 | -- |
| | 10/9/2015 | 2403.20 | 10.76 | 2392.44 | 96.3 | 1.27 | 7.32 | -- |
| | 12/11/2015 | 2403.20 | 10.80 | 2392.40 | 60.0 | 7.59 | 6.72 | -- |
| MW-147 | 3/19/2015 | 2409.99 | 12.61 | 2397.38 | -71.0 | 7.40 | 6.99 | -- |
| | 10/9/2015 | 2409.99 | 13.45 | 2396.54 | 65.4 | 1.34 | 6.95 | <0.1 |
| MW-241 | 3/17/2015 | 2411.85 | 12.86 | 2398.99 | 26.0 | 4.75 | 6.89 | -- |
| | 10/9/2015 | 2411.85 | 13.71 | 2398.14 | 51.6 | 1.81 | 7.08 | 0.2 |
| MW-243 | 3/19/2015 | 2403.80 | 7.56 | 2396.24 | 98.0 | 1.00 | 6.54 | <0.1 |
| | 10/9/2015 | 2403.80 | 8.86 | 2394.94 | 97.4 | 1.38 | 7.12 | <0.1 |

MP Elev.= Measured Point Elevation
Ft. AMSL = Feet above mean sea level
SWL= static water level
GW Elev. = Groundwater Elevation
ORP = Oxidation reduction potential
mv= millivolts
DO= dissolved oxygen
mg/L= milligrams per liter
Fe= Ferrous iron
-- Data not collected
NP Data not provided in Bhate's 2015 1st quarter report

## FT004 Groundwater Elevation Summary

| Well ID | Date | MP Elev. (ft amsl) | SWL (ft) | GW Elev. (ft amsl) |
|---|---|---|---|---|
| MW-3 | 3/13/2015 | 2407.08 | 6.02 | 2401.06 |
| | 9/23/2015 | 2407.08 | 9.31 | 2397.77 |
| MW-226 | 3/13/2015 | 2403.56 | 3.73 | 2399.83 |
| | 9/23/2015 | 2403.56 | 6.58 | 2396.98 |
| | 12/11/2015 | 2403.56 | 5.26 | 2398.30 |
| MW-247 | 3/13/2015 | 2403.14 | 3.02 | 2400.12 |
| | 9/23/2015 | 2403.14 | 5.98 | 2397.16 |

**ST006 Groundwater Elevation Summary**

| Well ID | Date | MP Elev. (ft amsl) | SWL (ft) | GW Elev. (ft amsl) |
|---|---|---|---|---|
| MW-194 | 3/5/2015 | 2443.65 | 7.11 | 2436.54 |
| | 9/23/2015 | 2443.65 | 8.87 | 2434.78 |
| | 12/11/2015 | 2443.65 | 6.98 | 2436.67 |
| MW-207 | 3/5/2015 | 2443.97 | 8.61 | 2435.36 |
| | 9/23/2015 | 2443.97 | 10.02 | 2433.95 |
| | 12/11/2015 | 2443.97 | 8.91 | 2435.06 |
| MW-208 | 3/20/2015 | 2442.51 | 4.08 | 2438.43 |
| | 9/23/2015 | 2442.51 | 6.09 | 2436.42 |
| | 12/11/2015 | 2442.51 | 5.61 | 2436.90 |

# Appendix F
# LF002 O&M Data

F.1 – Weekly-Quarterly O&M Summaries

F.2 – Operational Logs

F.3 – Monitoring Logs

F.4 – Daily Reports

F.5 – CAP Inspection

F.6 – SRCAA Letter

# Appendix F.1
# Weekly-Quarterly O&M Summaries

Bay West

# Craig Road Landfill GTP
## Monthly O&M Summary

Month October 2015

| Event | Date | | Performed By | Comments |
|---|---|---|---|---|
| | Scheduled | Performed | | |
| **AIR STRIPPER FEED PUMPS** | | | | |
| Visual inspection of couplings. | 10-21-15 | 10-21-15 | A.S | OK |
| Look for fatigue cracks, discoloration, or surface cracking. Follow manufacturer's recommendation. | 10-21-15 | 10-21-15 | | OK |
| **EMERGENCY LIGHTING** | | | | |
| Visually inspect the charging indicator light. | 10-2-15 | 10-2-15 | | OK |
| Test the emergency operation of the fixture for a minimum of 30 seconds. One or two lamps should operate at reduced illumination. | 10-2-15 | 10-2-15 | | OK 2 Lamp operational |
| **GROUNDWATER INFILTRATION TRENCH** | | | | |
| Switch main infiltration trench. | 10-1-15 | 10-1-15 | | South to North |
| **GAC** | | | | |
| Check inlet and outlet lines and clear any obstructions. | 10-14-15 | 10-14-15 | | OK |
| Check for signs of wear and tear, lining and paint integrity, and condensate accumulation. | 10-14-15 | 10-14-15 | | OK |
| **FIRE SYSTEM MAINTENANCE** | | | | |
| Visually inspect the M-1 antennae and assemblies. Check circuits for continuity. | 10-2-15 | 10-2-15 | | OK |
| Operate M-1 on backup batteries. | 10-2-15 | 10-2-15 | | OK 27.47 Volts D.C |
| Inspect fire extinguishers for adequate pressure and condition. | 10-2-15 | 10-2-15 | | OK |
| **HEALTH AND SAFETY** | | | | |
| Check and note operating condition of eyewash | 10-2-15 | 10-2-15 | | OK |
| Check and refurbish first aid kits in office and GTP. | 10-2-15 | 10-2-15 | | OK |
| **EMERGENCY OVERFLOW TANK** | | | | |
| Inspect pump in emergency overflow tank (sump). | 10-16-15 | 10-6-15 | | OK Cycled |

Bay West

# Craig Road Landfill GTP
## Weekly O&M Summary

Week Beginning 10/26-30/2015

| Event | Date Scheduled | Date Performed | Performed By | Comments |
|---|---|---|---|---|
| **SURGE TANKS** | | | | |
| Inspect flange connections for leakage and general appearance of outer tank shell. Inspect for damage. | 10-28-15 | 10-28-15 | A.S | ok |
| **AIR STRIPPING TOWER** | | | | |
| Check and record pressure drop across the tower. Record pressure in comments. | 10-29-15 | 10-29-15 | | OUT 3.1" IN 3.4" P.D 0.3" |
| **AIR STRIPPER BLOWER** | | | | |
| Check for miscellaneous vibrations or noises. | 10-30-15 | 10-30-15 | | ok |
| Check V-bolt drives for tension and excessive wear. | 10-30-15 | 10-30-15 | | ok |
| Inspect belts and motor for alignment. | 10-30-15 | 10-30-15 | | ok |
| Inspect blower bearings weekly. Grease every 2 weeks. | 10-30-15 | 10-30-15 | | ok |
| **GAC** | | | | |
| Open drain line. | 10-29-15 | 10-29-15 | | ok Dry |
| **EXTRACTION WELL VAULTS** | | | | |
| Inspect physical condition of vault exterior. | 10-26-15 | 10-26-15 | | ok |
| **EXTRACTION WELLS** | | | | |
| Open vault and inspect physical condition of piping and extraction well. | 10-26-15 | 10-26-15 | | ok |
| **AIR STRIPPER FEED PUMPS** | | | | |
| Check for visual leaks. | 10-27-15 | 10-27-15 | | ok |
| Check for miscellaneous vibrations or noises. | 10-27-15 | 10-27-15 | | ok |
| **GROUNDWATER INFILTRATION TRENCH** | | | | |
| Check manholes for surging. | 10-26-15 | 10-26-15 | | ok |
| Note trench operations (north and south) and when last changed. | 10-1-15 | 10-1-15 | ✓ | North |

Bay West

# Craig Road Landfill GTP
## Weekly O&M Summary

Week Beginning 10/19-23/2015

| Event | Date Scheduled | Date Performed | Performed By | Comments |
|---|---|---|---|---|
| **SURGE TANKS** | | | | |
| Inspect flange connections for leakage and general appearance of outer tank shell. Inspect for damage. | 10-21-15 | 10-21-15 | A.S | OK |
| **AIR STRIPPING TOWER** | | | | |
| Check and record pressure drop across the tower. Record pressure in comments. | 10-20-15 | 10-20-15 | | OUT 3.3" IN 3.7" P.D 0.4" |
| **AIR STRIPPER BLOWER** | | | | |
| Check for miscellaneous vibrations or noises. | 10-23-15 | 10-23-15 | | OK |
| Check V-bolt drives for tension and excessive wear. | 10-23-15 | 10-23-15 | | OK |
| Inspect belts and motor for alignment. | 10-23-15 | 10-23-15 | | OK |
| Inspect blower bearings weekly. Grease every 2 weeks. | 10-23-15 | 10-23-15 | | OK Greased |
| **GAC** | | | | |
| Open drain line. | 10-20-15 | 10-20-15 | | OK Dry |
| **EXTRACTION WELL VAULTS** | | | | |
| Inspect physical condition of vault exterior. | 10-19-15 | 10-19-15 | | OK |
| **EXTRACTION WELLS** | | | | |
| Open vault and inspect physical condition of piping and extraction well. | 10-19-15 | 10-19-15 | | OK |
| **AIR STRIPPER FEED PUMPS** | | | | |
| Check for visual leaks. | 10-20-15 | 10-20-15 | | OK |
| Check for miscellaneous vibrations or noises. | 10-20-15 | 10-20-15 | | OK |
| **GROUNDWATER INFILTRATION TRENCH** | | | | |
| Check manholes for surging. | 10-19-15 | 10-19-15 | | OK |
| Note trench operations (north and south) and when last changed. | 10-1-15 | 10-1-15 | | North |

Bay West

# Craig Road Landfill GTP
## Weekly O&M Summary

Week Beginning 10/12-16/2015

| Event | Date | | Performed By | Comments |
|---|---|---|---|---|
| | Scheduled | Performed | | |
| **SURGE TANKS** | | | | |
| Inspect flange connections for leakage and general appearance of outer tank shell. Inspect for damage. | 10-14-15 | 10-14-15 | A.S | OK |
| **AIR STRIPPING TOWER** | | | | |
| Check and record pressure drop across the tower. Record pressure in comments. | 10-13-15 | 10-13-15 | | OUT 2.4" IN 2.7" P.D 0.3" |
| **AIR STRIPPER BLOWER** | | | | |
| Check for miscellaneous vibrations or noises. | 10-16-15 | 10-16-15 | | OK |
| Check V-bolt drives for tension and excessive wear. | 10-16-15 | 10-16-15 | | OK |
| Inspect belts and motor for alignment. | 10-16-15 | 10-16-15 | | OK |
| Inspect blower bearings weekly. Grease every 2 weeks. | 10-16-15 | 10-16-15 | | OK |
| **GAC** | | | | |
| Open drain line. | 10-13-15 | 10-13-15 | | OK |
| **EXTRACTION WELL VAULTS** | | | | |
| Inspect physical condition of vault exterior. | 10-12-15 | 10-12-15 | | OK |
| **EXTRACTION WELLS** | | | | |
| Open vault and inspect physical condition of piping and extraction well. | 10-12-15 | 10-12-15 | | OK |
| **AIR STRIPPER FEED PUMPS** | | | | |
| Check for visual leaks. | 10-14-15 | 10-14-15 | | OK |
| Check for miscellaneous vibrations or noises. | 10-14-15 | 10-14-15 | | OK |
| **GROUNDWATER INFILTRATION TRENCH** | | | | |
| Check manholes for surging. | 10-12-15 | 10-12-15 | | OK |
| Note trench operations (north and south) and when last changed. | 10-1-15 | 10-1-15 | | North |

Bay West

# Craig Road Landfill GTP
## Weekly O&M Summary

Week Beginning 10/5-9/2015

| Event | Date | | Performed By | Comments |
|---|---|---|---|---|
| | Scheduled | Performed | | |
| **SURGE TANKS** | | | | |
| Inspect flange connections for leakage and general appearance of outer tank shell. Inspect for damage. | 10-7-15 | 10-7-15 | A.S | OK |
| **AIR STRIPPING TOWER** | | | | |
| Check and record pressure drop across the tower. Record pressure in comments. | 10-5-15 | 10-5-15 | | OUT 2.2" IN 2.5" P.D 0.3" |
| **AIR STRIPPER BLOWER** | | | | |
| Check for miscellaneous vibrations or noises. | 10-8-15 | 10-8-15 | | OK |
| Check V-bolt drives for tension and excessive wear. | 10-9-15 | 10-9-15 | | ok |
| Inspect belts and motor for alignment. | 10-9-15 | 10-9-15 | | ok |
| Inspect blower bearings weekly. Grease every 2 weeks. | 10-9-15 | 10-9-15 | | ok Greased |
| **GAC** | | | | |
| Open drain line. | 10-5-15 | 10-5-15 | | ok Dry |
| **EXTRACTION WELL VAULTS** | | | | |
| Inspect physical condition of vault exterior. | 10-5-15 | 10-5-15 | | OK |
| **EXTRACTION WELLS** | | | | |
| Open vault and inspect physical condition of piping and extraction well. | 10-5-15 | 10-5-15 | | OK |
| **AIR STRIPPER FEED PUMPS** | | | | |
| Check for visual leaks. | 10-7-15 | 10-7-15 | | OK |
| Check for miscellaneous vibrations or noises. | 10-7-15 | 10-7-15 | | OK |
| **GROUNDWATER INFILTRATION TRENCH** | | | | |
| Check manholes for surging. | 10-5-15 | 10-5-15 | | ok |
| Note trench operations (north and south) and when last changed. | 10-1-15 | 10-1-15 | ✓ | North |

Bay West

# Craig Road Landfill GTP
## Weekly O&M Summary

Week Beginning 9/28/-10/02/2015

| Event | Date | | Performed By | Comments |
|---|---|---|---|---|
| | Scheduled | Performed | | |
| **SURGE TANKS** | | | | |
| Inspect flange connections for leakage and general appearance of outer tank shell. Inspect for damage. | 10-1-15 | 10-1-15 | A.S | OK |
| **AIR STRIPPING TOWER** | | | | |
| Check and record pressure drop across the tower. Record pressure in comments. | 10-2-15 | 10-2-15 | | OUT 2.6" IN 2.9" P.D 0.3" |
| **AIR STRIPPER BLOWER** | | | | |
| Check for miscellaneous vibrations or noises. | 10-1-15 | 10-1-15 | | OK |
| Check V-bolt drives for tension and excessive wear. | 10-2-15 | 10-2-15 | | OK |
| Inspect belts and motor for alignment. | 10-2-15 | 10-2-15 | | OK |
| Inspect blower bearings weekly. Grease every 2 weeks. | 10-2-15 | 10-2-15 | | OK |
| **GAC** | | | | |
| Open drain line. | 10-1-15 | 10-1-15 | | OK Dry |
| **EXTRACTION WELL VAULTS** | | | | |
| Inspect physical condition of vault exterior. | 9-29-15 | 9-29-15 | | OK |
| **EXTRACTION WELLS** | | | | |
| Open vault and inspect physical condition of piping and extraction well. | 9-29-15 | 9-29-15 | | OK |
| **AIR STRIPPER FEED PUMPS** | | | | |
| Check for visual leaks. | 9-28-15 | 9-28-15 | | OK |
| Check for miscellaneous vibrations or noises. | 9-28-15 | 9-28-15 | | OK |
| **GROUNDWATER INFILTRATION TRENCH** | | | | |
| Check manholes for surging. | 9-28-15 | 9-28-15 | | OK |
| Note trench operations (north and south) and when last changed. | 9-1-15 | 9-1-15 | ✓ | South |

Bay West

# Craig Road Landfill GTP
## Monthly O&M Summary

Month November 2015

| Event | Date | | Performed By | Comments |
|---|---|---|---|---|
| | Scheduled | Performed | | |
| **AIR STRIPPER FEED PUMPS** | | | | |
| Visual inspection of couplings. | 11-12-15 | 11-12-15 | A.S | OK |
| Look for fatigue cracks, discoloration, or surface cracking. Follow manufacturer's recommendation. | 11-12-15 | 11-12-15 | | OK |
| **EMERGENCY LIGHTING** | | | | |
| Visually inspect the charging indicator light. | 11-2-15 | 11-2-15 | | OK |
| Test the emergency operation of the fixture for a minimum of 30 seconds. One or two lamps should operate at reduced illumination. | 11-2-15 | 11-2-15 | | OK 1 Lamp Operational |
| **GROUNDWATER INFILTRATION TRENCH** | | | | |
| Switch main infiltration trench. | 11-2-15 | 11-2-15 | | North to South |
| **GAC** | | | | |
| Check inlet and outlet lines and clear any obstructions. | 11-13-15 | 11-13-15 | | OK |
| Check for signs of wear and tear, lining and paint integrity, and condensate accumulation. | 11-13-15 | 11-13-15 | | OK |
| **FIRE SYSTEM MAINTENANCE** | | | | |
| Visually inspect the M-1 antennae and assemblies. Check circuits for continuity. | 11-2-15 | 11-2-15 | | OK |
| Operate M-1 on backup batteries. | 11-2-15 | 11-2-15 | | OK 12.47 Volts DC. |
| Inspect fire extinguishers for adequate pressure and condition. | 11-2-15 | 11-2-15 | | OK |
| **HEALTH AND SAFETY** | | | | |
| Check and note operating condition of eyewash | 11-2-15 | 11-2-15 | | OK Operational |
| Check and refurbish first aid kits in office and GTP. | 11-2-15 | 11-2-15 | | OK |
| **EMERGENCY OVERFLOW TANK** | | | | |
| Inspect pump in emergency overflow tank (sump). | 11-4-15 | 11-4-15 | | OK cycled |

Al Sandford

Bay West

# Craig Road Landfill GTP
## Weekly O&M Summary

Week Beginning 11/23-27/2015

| Event | Date: Scheduled | Date: Performed | Performed By | Comments |
|---|---|---|---|---|
| **SURGE TANKS** | | | | |
| Inspect flange connections for leakage and general appearance of outer tank shell. Inspect for damage. | 11-27-15 | 11-27-15 | A.S | OK |
| **AIR STRIPPING TOWER** | | | | |
| Check and record pressure drop across the tower. Record pressure in comments. | 11-24-15 | 11-24-15 | | OUT 3.2" IN 3.5" P.D 0.3" |
| **AIR STRIPPER BLOWER** | | | | |
| Check for miscellaneous vibrations or noises. | 11-27-15 | 11-27-15 | | ok |
| Check V-bolt drives for tension and excessive wear. | 11-27-15 | 11-27-15 | | ok |
| Inspect belts and motor for alignment. | 11-27-15 | 11-27-15 | | ok |
| Inspect blower bearings weekly. Grease every 2 weeks. | 11-27-15 | 11-27-15 | | Train swapped from 300 to 301, B-302 greased |
| **GAC** | | | | |
| Open drain line. | 11-24-15 | 11-24-15 | | ok DRY |
| **EXTRACTION WELL VAULTS** | | | | |
| Inspect physical condition of vault exterior. | 11-23-15 | 11-23-15 | | ok |
| **EXTRACTION WELLS** | | | | |
| Open vault and inspect physical condition of piping and extraction well. | 11-23-15 | 11-23-15 | | ok |
| **AIR STRIPPER FEED PUMPS** | | | | |
| Check for visual leaks. | 11-23-15 | 11-23-15 | | ok |
| Check for miscellaneous vibrations or noises. | 11-23-15 | 11-23-15 | | ok |
| **GROUNDWATER INFILTRATION TRENCH** | | | | |
| Check manholes for surging. | 11-23-15 | 11-23-15 | | ok |
| Note trench operations (north and south) and when last changed. | 11-2-15 | 11-2-15 | | South |

Al Sanford

Bay West

# Craig Road Landfill GTP
## Weekly O&M Summary

Week Beginning 11/16-20/2015

| Event | Date: Scheduled | Date: Performed | Performed By | Comments |
|---|---|---|---|---|
| **SURGE TANKS** | | | | |
| Inspect flange connections for leakage and general appearance of outer tank shell. Inspect for damage. | 11-19-15 | 11-19-15 | A.S | OK |
| **AIR STRIPPING TOWER** | | | | |
| Check and record pressure drop across the tower. Record pressure in comments. | 11-17-15 | 11-17-15 | | OUT 3.0" IN 3.3" P.D 0.3" |
| **AIR STRIPPER BLOWER** | | | | |
| Check for miscellaneous vibrations or noises. | 11-20-15 | 11-20-15 | | OK |
| Check V-bolt drives for tension and excessive wear. | 11-20-15 | 11-20-15 | | OK |
| Inspect belts and motor for alignment. | 11-20-15 | 11-20-15 | | OK |
| Inspect blower bearings weekly. Grease every 2 weeks. | 11-20-15 | 11-20-15 | | OK GREASED |
| **GAC** | | | | |
| Open drain line. | 11-17-15 | 11-17-15 | | OK DRY |
| **EXTRACTION WELL VAULTS** | | | | |
| Inspect physical condition of vault exterior. | 11-16-15 | 11-16-15 | | OK |
| **EXTRACTION WELLS** | | | | |
| Open vault and inspect physical condition of piping and extraction well. | 11-16-15 | 11-16-15 | | OK |
| **AIR STRIPPER FEED PUMPS** | | | | |
| Check for visual leaks. | 11-18-15 | 11-18-15 | | OK |
| Check for miscellaneous vibrations or noises. | 11-18-15 | 11-18-15 | | OK |
| **GROUNDWATER INFILTRATION TRENCH** | | | | |
| Check manholes for surging. | 11-16-15 | 11-16-15 | | OK |
| Note trench operations (north and south) and when last changed. | 11-2-15 | 11-2-15 | | South |

Al Sampson

Bay West

# Craig Road Landfill GTP
## Weekly O&M Summary

Week Beginning 11/9-13/2015

| Event | Date | | Performed By | Comments |
|---|---|---|---|---|
| | Scheduled | Performed | | |
| **SURGE TANKS** | | | | |
| Inspect flange connections for leakage and general appearance of outer tank shell. Inspect for damage. | 11-11-15 | 11-11-15 | A.S | OK |
| **AIR STRIPPING TOWER** | | | | |
| Check and record pressure drop across the tower. Record pressure in comments. | 11-10-15 | 11-10-15 | | OUT 3.1" IN 3.5" P.D 0.4" |
| **AIR STRIPPER BLOWER** | | | | |
| Check for miscellaneous vibrations or noises. | 11-12-15 | 11-12-15 | | OK |
| Check V-bolt drives for tension and excessive wear. | 11-12-15 | 11-12-15 | | OK |
| Inspect belts and motor for alignment. | 11-12-15 | 11-12-15 | | OK |
| Inspect blower bearings weekly. Grease every 2 weeks. | 11-12-15 | 11-12-15 | | OK |
| **GAC** | | | | |
| Open drain line. | 11-10-15 | 11-10-15 | | OK Dry |
| **EXTRACTION WELL VAULTS** | | | | |
| Inspect physical condition of vault exterior. | 11-9-15 | 11-9-15 | | OK |
| **EXTRACTION WELLS** | | | | |
| Open vault and inspect physical condition of piping and extraction well. | 11-9-15 | 11-9-15 | | OK |
| **AIR STRIPPER FEED PUMPS** | | | | |
| Check for visual leaks. | 11-10-15 | 11-10-15 | | OK |
| Check for miscellaneous vibrations or noises. | 11-10-15 | 11-10-15 | | OK |
| **GROUNDWATER INFILTRATION TRENCH** | | | | |
| Check manholes for surging. | 11-9-15 | 11-9-15 | | OK |
| Note trench operations (north and south) and when last changed. | 11-2-15 | 11-2-15 | | South |

Al Sampson

Bay West

# Craig Road Landfill GTP
## Weekly O&M Summary

Week Beginning 11/02-06/2015

| Event | Date: Scheduled | Date: Performed | Performed By | Comments |
|---|---|---|---|---|
| **SURGE TANKS** | | | | |
| Inspect flange connections for leakage and general appearance of outer tank shell. Inspect for damage. | 11-5-15 | 11-5-15 | A.S | OK ~~OUT~~ |
| **AIR STRIPPING TOWER** | | | | |
| Check and record pressure drop across the tower. Record pressure in comments. | 11-3-15 | 11-3-15 | | OUT 2.3" IN 2.6" P.D 0.3" |
| **AIR STRIPPER BLOWER** | | | | |
| Check for miscellaneous vibrations or noises. | 11-6-15 | 11-6-15 | | OK |
| Check V-bolt drives for tension and excessive wear. | 11-6-15 | 11-6-15 | | OK |
| Inspect belts and motor for alignment. | 11-6-15 | 11-6-15 | | OK |
| Inspect blower bearings weekly. Grease every 2 weeks. | 11-6-15 | 11-6-15 | | OK Greased |
| **GAC** | | | | |
| Open drain line. | 11-3-15 | 11-3-15 | | OK Dry |
| **EXTRACTION WELL VAULTS** | | | | |
| Inspect physical condition of vault exterior. | 11-2-15 | 11-2-15 | | OK |
| **EXTRACTION WELLS** | | | | |
| Open vault and inspect physical condition of piping and extraction well. | 11-2-15 | 11-2-15 | | OK |
| **AIR STRIPPER FEED PUMPS** | | | | |
| Check for visual leaks. | 11-4-15 | 11-4-15 | | OK |
| Check for miscellaneous vibrations or noises. | 11-4-15 | 11-4-15 | | OK |
| **GROUNDWATER INFILTRATION TRENCH** | | | | |
| Check manholes for surging. | 11-2-15 | 11-2-15 | | OK |
| Note trench operations (north and south) and when last changed. | 11-2-15 | 11-2-15 | ✓ | North to South |

Al Sampson

Bay West

# Craig Road Landfill GTP
## Monthly O&M Summary

Month December 2015

| Event | Date | | Performed By | Comments |
|---|---|---|---|---|
| | Scheduled | Performed | | |
| **AIR STRIPPER FEED PUMPS** | | | | |
| Visual inspection of couplings. | 12-10-15 | 12-10-15 | A.S | ok |
| Look for fatigue cracks, discoloration, or surface cracking. Follow manufacturer's recommendation. | 12-10-15 | 12-10-15 | | ok |
| **EMERGENCY LIGHTING** | | | | |
| Visually inspect the charging indicator light. | 12-1-15 | 12-1-15 | | ok |
| Test the emergency operation of the fixture for a minimum of 30 seconds. One or two lamps should operate at reduced illumination. | 12-1-15 | 12-1-15 | | ok |
| **GROUNDWATER INFILTRATION TRENCH** | | | | |
| Switch main infiltration trench. | 12-7-15 | 12-7-15 | | ok South to North |
| **GAC** | | | | |
| Check inlet and outlet lines and clear any obstructions. | 12-8-15 | 12-8-15 | | ok |
| Check for signs of wear and tear, lining and paint integrity, and condensate accumulation. | 12-9-15 | 12-9-15 | | ok |
| **FIRE SYSTEM MAINTENANCE** | | | | |
| Visually inspect the M-1 antennae and assemblies. Check circuits for continuity. | 12-1-15 | 12-1-15 | | ok |
| Operate M-1 on backup batteries. | 12-1-15 | 12-1-15 | | ok 27.47 Volts D.C |
| Inspect fire extinguishers for adequate pressure and condition. | 12-1-15 | 12-1-15 | | ok |
| **HEALTH AND SAFETY** | | | | |
| Check and note operating condition of eyewash | 12-1-15 | 12-1-15 | | ok Operational |
| Check and refurbish first aid kits in office and GTP. | 12-1-15 | 12-1-15 | | ok |
| **EMERGENCY OVERFLOW TANK** | | | | |
| Inspect pump in emergency overflow tank (sump). | 12-1-15 | 12-1-15 | | ok cycled |

Al Sanford

Bay West

# Craig Road Landfill GTP
## Weekly O&M Summary

Week Beginning 12/28/2015 - 01/01/2016

| Event | Date Scheduled | Date Performed | Performed By | Comments |
|---|---|---|---|---|
| **SURGE TANKS** | | | | |
| Inspect flange connections for leakage and general appearance of outer tank shell. Inspect for damage. | 12-28-15 | 12-28-15 | A.S | ok |
| **AIR STRIPPING TOWER** | | | | |
| Check and record pressure drop across the tower. Record pressure in comments. | 12-31-15 | 12-31-15 | | OUT 3.5" IN 3.9" P.D 0.4" |
| **AIR STRIPPER BLOWER** | | | | |
| Check for miscellaneous vibrations or noises. | 1-1-16 | 1-1-16 | | ok |
| Check V-bolt drives for tension and excessive wear. | 1-1-16 | 1-1-16 | | ok |
| Inspect belts and motor for alignment. | 1-1-16 | 1-1-16 | | ok |
| Inspect blower bearings weekly. Grease every 2 weeks. | 1-1-16 | 1-1-16 | | ok |
| **GAC** | | | | |
| Open drain line. | 12-28-15 | 12-28-15 | | ok Dry |
| **EXTRACTION WELL VAULTS** | | | | |
| Inspect physical condition of vault exterior. | 12-29-15 | 12-29-15 | | vault covers cleared of snow ok |
| **EXTRACTION WELLS** | | | | |
| Open vault and inspect physical condition of piping and extraction well. | 12-29-15 | 12-29-15 | | ok |
| **AIR STRIPPER FEED PUMPS** | | | | |
| Check for visual leaks. | 12-29-15 | 12-29-15 | | ok |
| Check for miscellaneous vibrations or noises. | 12-29-15 | 12-29-15 | | ok |
| **GROUNDWATER INFILTRATION TRENCH** | | | | |
| Check manholes for surging. | 12-30-15 | 12-30-15 | | ok |
| Note trench operations (north and south) and when last changed. | 1-1-16 | 1-1-16 | | north to South |

Bay West

# Craig Road Landfill GTP
## Weekly O&M Summary

Week Beginning 12/21-25/2015

| Event | Date: Scheduled | Date: Performed | Performed By | Comments |
|---|---|---|---|---|
| **SURGE TANKS** | | | | |
| Inspect flange connections for leakage and general appearance of outer tank shell. Inspect for damage. | 12-23-15 | 12-23-15 | A.S | |
| **AIR STRIPPING TOWER** | | | | |
| Check and record pressure drop across the tower. Record pressure in comments. | 12-22-15 | 12-22-15 | | OUT 3.0" IN 3.4" P.D 0.4" |
| **AIR STRIPPER BLOWER** | | | | |
| Check for miscellaneous vibrations or noises. | 12-23-15 | 12-23-15 | | OK |
| Check V-bolt drives for tension and excessive wear. | 12-23-15 | 12-23-15 | | OK |
| Inspect belts and motor for alignment. | 12-23-15 | 12-23-15 | | OK |
| Inspect blower bearings weekly. Grease every 2 weeks. | 12-23-15 | 12-23-15 | | OK Greased |
| **GAC** | | | | |
| Open drain line. | 12-22-15 | 12-22-15 | | OK Dry |
| **EXTRACTION WELL VAULTS** | | | | |
| Inspect physical condition of vault exterior. | 12-21-15 | 12-21-15 | | OK |
| **EXTRACTION WELLS** | | | | |
| Open vault and inspect physical condition of piping and extraction well. | 12-21-15 | 12-21-15 | | OK |
| **AIR STRIPPER FEED PUMPS** | | | | |
| Check for visual leaks. | 12-21-15 | 12-21-15 | | OK |
| Check for miscellaneous vibrations or noises. | 12-21-15 | 12-21-15 | | OK |
| **GROUNDWATER INFILTRATION TRENCH** | | | | |
| Check manholes for surging. | 12-21-15 | 12-21-15 | | OK |
| Note trench operations (north and south) and when last changed. | 12-7-15 | 12-7-15 | ✓ | North |

Bay West

# Craig Road Landfill GTP
## Weekly O&M Summary

Week Beginning 12/14-18/2015

| Event | Date | | Performed By | Comments |
|---|---|---|---|---|
| | Scheduled | Performed | | |
| **SURGE TANKS** | | | | |
| Inspect flange connections for leakage and general appearance of outer tank shell. Inspect for damage. | 12-16-15 | 12-16-15 | A.S | |
| **AIR STRIPPING TOWER** | | | | |
| Check and record pressure drop across the tower. Record pressure in comments. | 12-18-15 | 12-18-15 | | OUT 2.7" IN 3.0" P.D 0.3 |
| **AIR STRIPPER BLOWER** | | | | |
| Check for miscellaneous vibrations or noises. | 12-18-15 | 12-18-15 | | ok |
| Check V-bolt drives for tension and excessive wear. | 12-18-15 | 12-18-15 | | ok |
| Inspect belts and motor for alignment. | 12-18-15 | 12-18-15 | | ok |
| Inspect blower bearings weekly. Grease every 2 weeks. | 12-18-15 | 12-18-15 | | ok 301 train |
| **GAC** | | | | |
| Open drain line. | 12-17-15 | 12-17-15 | | ok Dry |
| **EXTRACTION WELL VAULTS** | | | | |
| Inspect physical condition of vault exterior. | 12-14-15 | 12-14-15 | | ok |
| **EXTRACTION WELLS** | | | | |
| Open vault and inspect physical condition of piping and extraction well. | 12-14-15 | 12-14-15 | | OK |
| **AIR STRIPPER FEED PUMPS** | | | | |
| Check for visual leaks. | 12-14-15 | 12-14-15 | | OK |
| Check for miscellaneous vibrations or noises. | 12-14-15 | 12-14-15 | | OK |
| **GROUNDWATER INFILTRATION TRENCH** | | | | |
| Check manholes for surging. | 12-14-15 | 12-14-15 | | OK |
| Note trench operations (north and south) and when last changed. | 12-7-15 | 12-7-15 | ✓ | North |

Bay West

# Craig Road Landfill GTP
## Weekly O&M Summary

Week Beginning 12/7-11/2015

| Event | Date | | Performed By | Comments |
|---|---|---|---|---|
| | Scheduled | Performed | | |
| **SURGE TANKS** | | | | |
| Inspect flange connections for leakage and general appearance of outer tank shell. Inspect for damage. | 12-11-15 | 12-11-15 | A.S | OK |
| **AIR STRIPPING TOWER** | | | | |
| Check and record pressure drop across the tower. Record pressure in comments. | 12-8-15 | 12-8-15 | | OUT 3.1" IN 3.5" P.D 0.4" |
| **AIR STRIPPER BLOWER** | | | | |
| Check for miscellaneous vibrations or noises. | 12-11-15 | 12-11-15 | | OK |
| Check V-bolt drives for tension and excessive wear. | 12-11-15 | 12-11-15 | | OK |
| Inspect belts and motor for alignment. | 12-11-15 | 12-11-15 | | OK |
| Inspect blower bearings weekly. Grease every 2 weeks. | 12-11-15 | 12-11-15 | | OK B-300 |
| **GAC** | | | | |
| Open drain line. | 12-8-15 | 12-8-15 | | OK Dry |
| **EXTRACTION WELL VAULTS** | | | | |
| Inspect physical condition of vault exterior. | 12-8-15 | 12-8-15 | | OK |
| **EXTRACTION WELLS** | | | | |
| Open vault and inspect physical condition of piping and extraction well. | 12-8-15 | 12-8-15 | | OK |
| **AIR STRIPPER FEED PUMPS** | | | | |
| Check for visual leaks. | 12-9-15 | 12-9-15 | | OK |
| Check for miscellaneous vibrations or noises. | 12-9-15 | 12-9-15 | | OK |
| **GROUNDWATER INFILTRATION TRENCH** | | | | |
| Check manholes for surging. | 12-7-15 | 12-7-15 | | OK |
| Note trench operations (north and south) and when last changed. | 12-7-15 | 12-7-15 | | South to North |

Al Sanford

Bay West

# Craig Road Landfill GTP
## Weekly O&M Summary

Week Beginning 11/30 - 12/4/2015

| Event | Date: Scheduled | Date: Performed | Performed By | Comments |
|---|---|---|---|---|
| **SURGE TANKS** | | | | |
| Inspect flange connections for leakage and general appearance of outer tank shell. Inspect for damage. | 12-2-15 | 12-2-15 | A.S | OK |
| **AIR STRIPPING TOWER** | | | | |
| Check and record pressure drop across the tower. Record pressure in comments. | 12-2-15 | 12-2-15 | | OUT 3.3" IN 3.7" P.D 0.4" |
| **AIR STRIPPER BLOWER** | | | | |
| Check for miscellaneous vibrations or noises. | 12-4-15 | 12-4-15 | | OK |
| Check V-bolt drives for tension and excessive wear. | 12-4-15 | 12-4-15 | | OK |
| Inspect belts and motor for alignment. | 12-4-15 | 12-4-15 | | OK |
| Inspect blower bearings weekly. Grease every 2 weeks. | 12-4-15 | 12-4-15 | | OK |
| **GAC** | | | | |
| Open drain line. | 11-30-15 | 11-30-15 | | OK Dry |
| **EXTRACTION WELL VAULTS** | | | | |
| Inspect physical condition of vault exterior. | 11-30-15 | 11-30-15 | | OK |
| **EXTRACTION WELLS** | | | | |
| Open vault and inspect physical condition of piping and extraction well. | 11-30-15 | 11-30-15 | | OK |
| **AIR STRIPPER FEED PUMPS** | | | | |
| Check for visual leaks. | 12-3-15 | 12-3-15 | | OK |
| Check for miscellaneous vibrations or noises. | 12-3-15 | 12-3-15 | | OK |
| **GROUNDWATER INFILTRATION TRENCH** | | | | |
| Check manholes for surging. | 11-30-15 | 11-30-15 | | OK |
| Note trench operations (north and south) and when last changed. | 11-2-15 | 11-2-15 | | South |

Al Sanford

Bay West

# Craig Road Landfill GTP
## Quarterly O&M Summary

4th Quarter 2015

| Event | Date | | Performed By | Comments |
|---|---|---|---|---|
| | Scheduled | Performed | | |
| **PERFORMANCE MONITORING** | | | | |
| GAC: influent, ~~intermediate,~~ and effluent | 12-21-15 | 12-21-15 | A.S | Collected by A.S and shipped to Test America, Sacramento |
| Water influent, effluent | 12-16-15 | 12-16-15 | | Collected by A.S and shipped by Blaine Tech |
| **AIR STRIPPER HEATERS** | | | | |
| Inspect vent system. | 10-22-15 | 10-22-15 | | OK |
| **AIR STRIPPER FEED PUMPS** | | | | |
| Lubricate bearing frame. | 11-17-15 | 11-17-15 | | P-201 pump greased and oil changed |
| Check shaft alignment and realign if required. | 11-17-15 | 11-17-15 | | OK |
| **AIR STRIPPER BLOWER** | | | | |
| Tighten all bolts and setscrews. Record comments. | 11-27-15 | 11-27-15 | | Bolts and screws checked, 301 trim |
| Check fan impeller for buildup and wear, and clean any foreign material. | 11-27-15 | 11-27-15 | | OK, Minor dust accumulation |
| Clean or replace filters upon visual inspection. | 11-27-15 | 11-27-15 | | OK 301 trim filters replaced. |
| **INSTRUMENTATION** | | | | |
| Clean and inspect flow meters and flow meter strainers (EW-2 through EW-7 only). | 12-16-15 | 12-16-15 | | OK |
| Clean differential pressure gauges per O&M manual. | 12-16-15 | 12-16-15 | | OK |
| **LANDFILL CAP** | | | | |
| Post-construction landfill cap inspection (separate report) | 11-10-15 | 11-10-15 | | Completed |
| **AUTODIALER** | | | | |
| Check auto dialer sequencing and response. | 10-20-15 | 10-20-15 | | OK Operational |

Al Sampson

Bay West

# Craig Road Landfill GTP
## Annual O&M Summary

Date December 2015

| Event | Date | | Performed By | Comments |
|---|---|---|---|---|
| | Scheduled | Performed | | |
| **AIR STRIPPER FEED PUMPS** | | | | |
| Lubricate motor bearings. | 11-27-15 | 11-27-15 | A.S | P-201 pump greased and oil changed, by-annual |
| Check pump capacity, pressure, and power. | 12-23-15 | 12-23-15 | | Deffered until EARLY 2016 |
| **AIR STRIPPER BLOWER** | | | | |
| Lubricate motor bearings. Follow manufacturer's recommendations. | 11-2-15 | 11-2-15 | | Blow Motors greased ~~bi-monthly~~ |
| Check motor voltage, frequency and current periodically. | 12-23-15 | 12-23-15 | | Deffered until EARLY 2016 |
| **DRUM TRANSFER PUMP** | | | | |
| Follow manufacturer's recommendations for preventative maintenance. | 11-2-15 | 11-2-15 | | Lutz drum pump in storage |
| **EMERGENCY LIGHTING** | | | | |
| Conduct a 90-minute discharge test. One or two lamps should operate at reduced illumination for at least 90 minutes. | 12-10-15 | 12-10-15 | | 1 Lamp operational |
| **SUBMERSIBLE PUMPS** | | | | |
| Check and compare power cable resistance to ground, winding resistance, and insulation resistance to manufacturer's values. | 12-23-15 | 12-23-15 | | Deffered until EARLY 2016 |
| **ALARMS** | | | | |
| Test alarms for proper function. | 11-29-15 | 11-29-15 | | OK |
| **EXTRATION WELLS** | | | | |
| Check amps, voltage, resistance to ground for well pumps (separate report attached). | 12-23-15 | 12-23-15 | | Deferred until ~~201~~ EARLY 2016 |

Al Samford

1961 37

Version 1

**Land Use Controls**
**Fairchild AFB, WA**
**Site Inspection Checklist**

Project Name: _____

Project Number: J.130130

Location: LF-02 FAFB (CRL)

**Basewide Groundwater Land Use Controls**

_____ Has soil been excavated on this project?

_____ If yes, has a dig permit been processed for this excavation?

_____ Has groundwater been exposed during this excavation?

_____ If yes, has work been stopped?

_____ Is the groundwater being used for any purpose, but not limited to, drinking, irrigation, fire control, dust control, or any other activity?

_____ Has a well been installed during this project?

_____ Has there been damage or interference, in any way, with access to and operation of groundwater monitoring wells, remedial treatment systems or sampling efforts?

**Site-Specific Land Use Controls**

Yes Do site-specific land use controls apply at this site?

NO Has a manned facility been constructed at this site? (LF-01 and LF-02)

NO Has excavation occurred that affects the integrity and function of the landfill caps, or impacts the shallow groundwater table?

NO Has a residential development been established at this site?

NO Have any wells been installed into the shallow groundwater for any use including residential, industrial, and agricultural at this site?

NO Have any wells been installed in the contaminated plume for residential, industrial, and agricultural use at this site?

**Additional Comments:**

**Inspected by:** Al Dumford 11-10-15

1961 37

Version 1

**Land Use Controls**
**Fairchild AFB, WA**
**Site Inspection Checklist**

Project Name: _____

Project Number: J.130130

Location: WP-03 FAFB

**Basewide Groundwater Land Use Controls**

_____ Has soil been excavated on this project?

_____ If yes, has a dig permit been processed for this excavation?

_____ Has groundwater been exposed during this excavation?

_____ If yes, has work been stopped?

_____ Is the groundwater being used for any purpose, but not limited to, drinking, irrigation, fire control, dust control, or any other activity?

_____ Has a well been installed during this project?

_____ Has there been damage or interference, in any way, with access to and operation of groundwater monitoring wells, remedial treatment systems or sampling efforts?

**Site-Specific Land Use Controls**

YES Do site-specific land use controls apply at this site?

NO Has a manned facility been constructed at this site? (LF-01 and LF-02)

NO Has excavation occurred that affects the integrity and function of the landfill caps, or impacts the shallow groundwater table?

NO Has a residential development been established at this site?

NO Have any wells been installed into the shallow groundwater for any use including residential, industrial, and agricultural at this site?

NO Have any wells been installed in the contaminated plume for residential, industrial, and agricultural use at this site?

**Additional Comments:**

**Inspected by:** Al Sanford 11-13-15

1961 37

Version 1

**Land Use Controls**
**Fairchild AFB, WA**
**Site Inspection Checklist**

Project Name: _____

Project Number: J.130130

Location: ET-04 F.A.F.B

**Basewide Groundwater Land Use Controls**

_____ Has soil been excavated on this project?

_____ If yes, has a dig permit been processed for this excavation?

_____ Has groundwater been exposed during this excavation?

_____ If yes, has work been stopped?

_____ Is the groundwater being used for any purpose, but not limited to, drinking, irrigation, fire control, dust control, or any other activity?

_____ Has a well been installed during this project?

_____ Has there been damage or interference, in any way, with access to and operation of groundwater monitoring wells, remedial treatment systems or sampling efforts?

**Site-Specific Land Use Controls**

YES Do site-specific land use controls apply at this site?

NO Has a manned facility been constructed at this site? (LF-01 and LF-02)

NO Has excavation occurred that affects the integrity and function of the landfill caps, or impacts the shallow groundwater table?

NO Has a residential development been established at this site?

NO Have any wells been installed into the shallow groundwater for any use including residential, industrial, and agricultural at this site?

NO Have any wells been installed in the contaminated plume for residential, industrial, and agricultural use at this site?

**Additional Comments:**

**Inspected by:** Al Sampson 11-13-15

1961 37

Version 1

**Land Use Controls**
**Fairchild AFB, WA**
**Site Inspection Checklist**

Project Name: _____

Project Number: J.130130

Location: ST-06 FAFB

**Basewide Groundwater Land Use Controls**

_____ Has soil been excavated on this project?

_____ If yes, has a dig permit been processed for this excavation?

_____ Has groundwater been exposed during this excavation?

_____ If yes, has work been stopped?

_____ Is the groundwater being used for any purpose, but not limited to, drinking, irrigation, fire control, dust control, or any other activity?

_____ Has a well been installed during this project?

_____ Has there been damage or interference, in any way, with access to and operation of groundwater monitoring wells, remedial treatment systems or sampling efforts?

**Site-Specific Land Use Controls**

YES Do site-specific land use controls apply at this site?

NO Has a manned facility been constructed at this site? (LF-01 and LF-02)

NO Has excavation occurred that affects the integrity and function of the landfill caps, or impacts the shallow groundwater table?

NO Has a residential development been established at this site?

NO Have any wells been installed into the shallow groundwater for any use including residential, industrial, and agricultural at this site?

NO Have any wells been installed in the contaminated plume for residential, industrial, and agricultural use at this site?

**Additional Comments:**

**Inspected by:** Al Sanford 11-13-15

# Appendix F.2
# Operational Logs

Bay West

# Craig Road Landfill GTP
## Extraction Well Water Levels

| OCT 2015 Date | Time | Surge Tank Level | PLC Water Levels (feet) | | | | | | | | | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | NDA Extraction Wells | | | | | | SDA Extraction Wells | | | | | | |
| | | | EW-2 | EW-3 | EW-4 | EW-5 | EW-6 | EW-7 | EW-9 | EW-10 | EW-11 | EW-12 | EW-13 | EW-14 | |
| * 10-1-15 | 12:00 | 11.2 | 11.9 | 23.9 | 18.4 | 21.1 | 21.5 | 15.2 | 19.8 | 71.6 | 30.3 | 44.2 | 58.8 | 56.8 | EW#4 online after repairs made |
| 10-2-15 | 12:00 | 11.1 | 11.9 | 6.1 | 28.3 | 21.0 | 5.7 | 13.0 | 16.8 | 71.5 | 30.1 | 44.0 | 58.6 | 56.5 | |
| 10-5-15 | 12:00 | 11.2 | 12.0 | 13.7 | 28.4 | 20.9 | 6.2 | 6.2 | 17.3 | 71.5 | 30.3 | 43.3 | 58.4 | 56.6 | EW#7 cycling |
| 10-6-15 | 13:00 | 11.2 | 12.0 | 21.6 | 28.9 | 20.9 | 22.6 | 5.6 | 11.1 | 71.2 | 29.9 | 43.1 | 58.3 | 56.1 | |
| 10-7-15 | 12:00 | 11.3 | 12.0 | 9.9 | 29.0 | 20.9 | 12.9 | 5.5 | 11.8 | 70.9 | 29.8 | 42.9 | 58.2 | 56.0 | EW#10 cycled 2 hours |
| 10-8-15 | 12:30 | 11.3 | 12.1 | 10.3 | 28.9 | 20.9 | 9.9 | 5.3 | 13.2 | 71.1 | 29.7 | 42.7 | 58.2 | 56.0 | |
| 10-9-15 | 12:00 | 11.1 | 11.9 | 22.7 | 27.9 | 20.6 | 22.7 | 5.6 | 14.3 | 70.9 | 29.5 | 42.4 | 57.9 | 55.9 | |
| 10-12-15 | 12:00 | 11.2 | 12.1 | 12.5 | 28.9 | 20.6 | 13.1 | 5.2 | 10.4 | 70.8 | 29.8 | 41.8 | 57.6 | 56.0 | |
| 10-13-15 | 12:00 | 11.2 | 23.7 | 28.9 | 20.6 | 8.0 | 5.0 | 5.2 | 10.2 | 70.7 | 29.6 | 41.6 | 57.5 | 55.8 | |
| 10-14-15 | 12:00 | 11.2 | 12.2 | 20.1 | 28.8 | 20.7 | 7.0 | 5.5 | 21.0 | 70.3 | 29.5 | 41.5 | 57.5 | 55.7 | EW#10 cycled 2.5 hours |
| 10-15-15 | 12:00 | 11.1 | 12.2 | 12.2 | 28.9 | 20.6 | 6.2 | 5.1 | 20.2 | 70.5 | 29.4 | 41.2 | 57.4 | 55.6 | |
| 10-16-15 | 12:00 | 11.2 | 12.0 | 22.5 | 28.9 | 20.4 | 8.2 | 5.6 | 17.6 | 70.3 | 29.1 | 41.1 | 57.2 | 55.4 | |
| 10-19-15 | 12:00 | 11.1 | 11.9 | 18.1 | 28.6 | 20.2 | 20.3 | 5.2 | 19.5 | 70.5 | 29.4 | 40.4 | 56.8 | 55.9 | |
| 10-20-15 | 12:00 | 11.1 | 12.2 | 23.5 | 28.5 | 20.3 | 15.0 | 5.3 | 15.5 | 70.2 | 28.9 | 40.3 | 56.9 | 55.1 | ALARM and shutdown 2200 hours |
| 10-21-15 | 12:00 | 11.2 | 12.4 | 11.7 | 25.2 | 21.9 | 22.4 | 26.6 | 21.0 | 69.8 | 28.9 | 42.9 | 57.4 | 55.1 | EW#10 cycled 2 hours / ~~ALARM~~ |
| 10-22-15 | 12:00 | 11.1 | 12.0 | 9.8 | 28.3 | 20.9 | 5.6 | 11.7 | 24.8 | 70.0 | 28.7 | 41.0 | 56.9 | 54.8 | |
| 10-23-15 | 12:00 | 11.2 | 12.0 | 20.6 | 28.6 | 20.7 | 17.5 | 5.0 | 16.2 | 70.0 | 28.6 | 40.5 | 56.7 | 54.8 | |
| 10-26-15 | 12:00 | 11.3 | 17.8 | 23.4 | 27.7 | 25.3 | 12.4 | 58.4 | 10.6 | 70.4 | 29.0 | 44.7 | 58.1 | 55.1 | ALARM 10/27 @ 12:45 plant shutdown |
| 10-27-15 | 12:00 | 11.2 | 13.2 | 7.8 | 23.5 | 22.8 | 18.7 | 39.2 | 19.3 | 70.1 | 28.8 | 42.2 | 57.3 | 54.8 | |
| 10-28-15 | 12:30 | 11.1 | 12.0 | 24.3 | 28.9 | 22.0 | 18.4 | 19.4 | 24.5 | 70.8 | 29.9 | 41.3 | 56.8 | 54.1 | |
| 10-29-15 | 12:00 | 11.2 | 12.0 | 24.3 | 28.2 | 21.5 | 11.6 | 9.0 | 22.6 | 69.2 | 28.6 | 40.7 | 56.6 | 54.6 | EW#10 cycled 2 hours |
| 10-30-15 | 12:00 | 11.0 | 11.8 | 23.5 | 24.6 | 21.0 | 8.7 | 5.2 | 18.4 | 69.6 | 28.5 | 40.3 | 56.2 | 54.3 | Process differential flow shutdown 20:50 |
| * 11-2-15 | 12:00 | 11.1 | 19.1 | 8.8 | 28.6 | 26.6 | 15.2 | 55.8 | 13.7 | 70.6 | 29.0 | 45.2 | 58.1 | 54.8 | |

Bay West

# Craig Road Landfill GTP
## Extraction Well Flow Rates

| OCT 2015 Date | Time | Flow Rates (gpm) | | | | | | | | | | | | FT-100 Flow (gpm) | FT-101 Flow (gpm) | Total Flow (gpm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | NDA Extraction Wells | | | | | | SDA Extraction Wells | | | | | | | | |
| | | EW-2 | EW-3 | EW-4 | EW-5 | EW-6 | EW-7 | EW-9 | EW-10 | EW-11 | EW-12 | EW-13 | EW-14 | | | |
| * 10-1-15 | 12:00 | 9.0 | 0 | 0 | 35.9 | 10.2 | 17.3 | 12.3 | 0 | 0 | 28.0 | 0 | 26.4 | – | 138 | 138 |
| 10-2-15 | 12:00 | 9.0 | 0 | 0 | 36.2 | 9.3 | 17.4 | 12.2 | 0 | 0 | 28.0 | 0 | 26.6 | – | 134 | 134 |
| 10-5-15 | 12:00 | 9.2 | 0 | 0 | 36.1 | 0 | 16.6 | 0 | 0 | 0 | 28.2 | 0 | 26.4 | – | 119 | 119 |
| 10-6-15 | 13:00 | 9.0 | 0 | 0 | 36.2 | 9.9 | 16.6 | 11.9 | 0 | 0 | 27.7 | 0 | 26.7 | – | 139 | 139 |
| 10-7-15 | 12:00 | 8.7 | 0 | 0 | 36.1 | 9.6 | 16.6 | 11.8 | 0 | 0 | 27.8 | 0 | 26.5 | – | 139 | 139 |
| 10-8-15 | 12:30 | 8.9 | 0 | 0 | 35.5 | 0 | 16.9 | 0 | 0 | 0 | 28.0 | 0 | 26.5 | – | 120 | 120 |
| 10-9-15 | 12:00 | 8.8 | 0 | 0 | 36.0 | 10.0 | 16.9 | 12.1 | 0 | 0 | 27.7 | 0 | 26.4 | – | 135 | 135 |
| 10-12-15 | 12:00 | 8.7 | 0 | 0 | 36.2 | 0 | 16.2 | 0 | 0 | 0 | 27.6 | 0 | 26.5 | – | 119 | 119 |
| 10-13-15 | 12:00 | 9.0 | 0 | 0 | 36.3 | 0 | 16.4 | 0 | 0 | 0 | 27.9 | 0 | 26.5 | – | 118 | 118 |
| 10-14-15 | 12:00 | 9.0 | 0 | 0 | 36.1 | 0 | 16.6 | 12.2 | 0 | 0 | 27.7 | 0 | 26.4 | – | 136 | 136 |
| 10-15-15 | 12:00 | 9.0 | 0 | 0 | 35.8 | 0 | 16.9 | 12.2 | 0 | 0 | 27.6 | 0 | 26.3 | – | 136 | 136 |
| 10-16-15 | 12:00 | 9.1 | 0 | 0 | 36.1 | 9.5 | 16.6 | 12.0 | 0 | 0 | 27.8 | 0 | 26.0 | – | 143 | 143 |
| 10-19-15 | 12:00 | 8.2 | 0 | 0 | 35.7 | 9.8 | 16.6 | 12.2 | 0 | 0 | 27.6 | 0 | 26.7 | – | 140 | 140 |
| 10-20-15 | 12:00 | 7.8 | 0 | 0 | 36.6 | 9.9 | 16.7 | 11.9 | 0 | 0 | 27.5 | 0 | 26.3 | – | 141 | 141 |
| 10-21-15 | 12:00 | 11.9 | 0 | 0 | 36.1 | 9.9 | 17.5 | 12.4 | 0 | 0 | 27.9 | 0 | 26.3 | – | 130 | 130 |
| 10-22-15 | 12:00 | 8.6 | 8.8 | 0 | 36.4 | 0 | 17.6 | 12.5 | 0 | 0 | 27.7 | 0 | 26.5 | – | 136 | 136 |
| 10-23-15 | 12:00 | 8.5 | 0 | 0 | 35.7 | 9.9 | 16.7 | 12.2 | 0 | 0 | 27.5 | 0 | 25.8 | – | 142 | 142 |
| 10-26-15 | 12:00 | 12.2 | 0 | 0 | 36.8 | 9.8 | 18.2 | 0 | 0 | 0 | 27.5 | 0 | 26.6 | – | 135 | 135 |
| 10-27-15 | 12:00 | 11.6 | 0 | 0 | 36.0 | 9.4 | 17.8 | 12.4 | 0 | 0 | 27.6 | 0 | 26.2 | – | 146 | 146 |
| 10-28-15 | 12:30 | 9.5 | 0 | 0 | 35.0 | 9.7 | 17.1 | 12.5 | 0 | 0 | 27.7 | 0 | 0 | – | 109 | 109 |
| 10-29-15 | 12:00 | 9.2 | 0 | 0 | 35.2 | 9.6 | 16.4 | 12.2 | 0 | 0 | 27.5 | 0 | 26.6 | – | 139 | 139 |
| 10-30-15 | 12:00 | 9.2 | 0 | 0 | 36.3 | 9.4 | 16.5 | 0 | 0 | 0 | 27.6 | 0 | 26.4 | – | 132 | 132 |
| * 11-2-15 | 12:00 | 11.7 | 0 | 0 | 37.0 | 9.7 | 18.4 | 0 | 0 | 0 | 27.8 | 0 | 26.3 | – | 131 | 131 |
| | | | | | | | | | | | | | | | | |

Bay West

# Craig Road Landfill GTP
## NDA Daily Flow Totals

| OCT 2015 Date | Time | NDA Extraction Well Daily Flow (gallons) | | | | | | Process Totalizers | |
|---|---|---|---|---|---|---|---|---|---|
| | | EW-2 | EW-3 | EW-4 | EW-5 | EW-6 | EW-7 | AS-300 Train | AS-301 Train |
| * 10-1-15 | 12:00 | 39061270 | 6503616 | 1470778 | 30032571 | 27519570 | 66656463 | 64541514 | 964721 |
| 10-2-15 | 12:00 | 39074999 | 6504409 | 1470778 | 30084823 | 27527182 | 66681500 | 64704223 | 964721 |
| 10-5-15 | 12:00 | 39115327 | 6506596 | 1470907 | 30240181 | 27549652 | 66754099 | 65160351 | 964721 |
| 10-6-15 | 13:00 | 39129181 | 6507337 | 1470907 | 30294661 | 27557453 | 66778609 | 65329359 | 964721 |
| 10-7-15 | 12:00 | 39141545 | 6508066 | 1470907 | 30343805 | 27564486 | 66800611 | 65481235 | 964721 |
| 10-8-15 | 12:30 | 39154540 | 6508733 | 1470907 | 30396394 | 27571926 | 66823943 | 65641591 | 964721 |
| 10-9-15 | 12:00 | 39167224 | 6509396 | 1471036 | 30447283 | 27579140 | 66846688 | 65796712 | 964721 |
| 10-12-15 | 12:00 | 39205726 | 6511616 | 1471036 | 30602587 | 27601096 | 66915703 | 66246487 | 964721 |
| 10-13-15 | 12:00 | 39218338 | 6512283 | 1471036 | 30654335 | 27608347 | 66938561 | 66403436 | 964721 |
| 10-14-15 | 12:00 | 39230844 | 6513023 | 1471036 | 30706085 | 27615565 | 66961322 | 66561338 | 964721 |
| 10-15-15 | 12:00 | 39243276 | 6513765 | 1471036 | 30757849 | 27622752 | 66984088 | 66718122 | 964721 |
| 10-16-15 | 12:00 | 39255769 | 6514434 | 1471036 | 30809561 | 27629938 | 67006851 | 66873823 | 964721 |
| 10-19-15 | 12:00 | 39293242 | 6516587 | 1471165 | 30964676 | 27651385 | 67075333 | 67313474 | 964721 |
| 10-20-15 | 12:00 | 39305381 | 6517252 | 1471165 | 31016471 | 27658453 | 67098134 | 67472933 | 964721 |
| 10-21-15 | 12:00 | 39314895 | 6517909 | 1471300 | 31054843 | 27664113 | 67115442 | 67582686 | 964721 |
| 10-22-15 | 12:00 | 39328304 | 6518648 | 1471300 | 31106640 | 27671749 | 67140265 | 67741774 | 964721 |
| 10-23-15 | 12:00 | 39340640 | 6519313 | 1471300 | 31158171 | 27679041 | 67164312 | 67899148 | 964721 |
| 10-26-15 | 12:00 | 39357807 | 6520140 | 1471490 | 31227729 | 27689575 | 67195515 | 68094026 | 964721 |
| 10-27-15 | 12:00 | 39374880 | 6520155 | 1471749 | 31279510 | 27698697 | 67221377 | 68259432 | 964721 |
| 10-28-15 | 12:30 | 39391363 | 6520173 | 1471749 | 31332183 | 27707155 | 67246765 | 68415112 | 964721 |
| 10-29-15 | 12:00 | 39404576 | 6520414 | 1471878 | 31383006 | 27715002 | 67270560 | 68575634 | 964721 |
| 10-30-15 | 12:00 | 39417506 | 6520935 | 1472007 | 31434519 | 27722745 | 67294262 | 68734456 | 964721 |
| * 11-2-15 | 12:00 | 39426814 | 6521257 | 1472216 | 31469985 | 27728845 | 67310333 | 68835057 | 964721 |
| | | | | | | | | | |
| | | | | | | | | | |

Bay West

# Craig Road Landfill GTP
## SDA Daily Flow Totals

| OCT 2015 Date | Time | NDA Extraction Wells | | | | | | FT-100 (gallons) | FT-101 (gallons) |
|---|---|---|---|---|---|---|---|---|---|
| | | EW-9 | EW-10 | EW-11 | EW-12 | EW-13 | EW-14 | | |
| * 10-1-15 | 12:00 | 19680340 | 22855582 | 20773309 | 57068168 | 3376633 | 71326364 | 11467034 | 65147449 |
| 10-2-15 | 12:00 | 19692673 | 22855582 | 20773309 | 57108842 | 3376633 | 71335473 | 11624348 | 65147499 |
| 10-5-15 | 12:00 | 19729050 | 22855582 | 20773309 | 57229636 | 3376633 | 71343434 | 12065348 | 65147499 |
| 10-6-15 | 13:00 | 19741687 | 22855582 | 20773309 | 57271941 | 3376633 | 71354219 | 12228321 | 65147499 |
| 10-7-15 | 12:00 | 19752992 | 22857284 | 20773309 | 57310067 | 3376633 | 71362917 | 12374699 | 65147499 |
| 10-8-15 | 12:30 | 19764952 | 22857284 | 20773309 | 57350840 | 3376633 | 71371910 | 12528751 | 65147499 |
| 10-9-15 | 12:00 | 19776539 | 22857284 | 20773309 | 57390266 | 3376633 | 71380659 | 12678294 | 65147499 |
| 10-12-15 | 12:00 | 19811669 | 22857284 | 20773309 | 57510580 | 3376633 | 71389005 | 13109957 | 65147499 |
| 10-13-15 | 12:00 | 19823261 | 22857284 | 20773309 | 57550573 | 3376633 | 71397652 | 13260285 | 65147499 |
| 10-14-15 | 12:00 | 19834777 | 22859200 | 20773309 | 57590538 | 3376633 | 71406201 | 13411899 | 65147499 |
| 10-15-15 | 12:00 | 19846253 | 22859200 | 20773309 | 57630517 | 3376633 | 71414767 | 13561553 | 65147499 |
| 10-16-15 | 12:00 | 19857691 | 22859200 | 20773309 | 57670458 | 3376633 | 71423558 | 13711182 | 65147499 |
| 10-19-15 | 12:00 | 19891911 | 22859200 | 20773309 | 57790283 | 3376633 | 71428144 | 14130987 | 65147499 |
| 10-20-15 | 12:00 | 19903229 | 22859200 | 20773309 | 57830211 | 3376633 | 71439567 | 14283128 | 65147499 |
| 10-21-15 | 12:00 | 19911831 | 22860930 | 20773309 | 57846206 | 3376633 | 71447067 | 14395924 | 65147499 |
| 10-22-15 | 12:00 | 19923213 | 22860930 | 20773309 | 57886178 | 3376633 | 71455429 | 14540094 | 65147499 |
| 10-23-15 | 12:00 | 19934453 | 22860930 | 20773309 | 57925928 | 3376633 | 71463876 | 14690685 | 65147499 |
| 10-26-15 | 12:00 | 19949871 | 22860930 | 20773309 | 57965598 | 3376633 | 71470849 | 14875250 | 65147499 |
| 10-27-15 | 12:00 | 19961367 | 22860930 | 20773309 | 58005468 | 3376633 | 71479319 | 15036109 | 65147499 |
| 10-28-15 | 12:30 | 19972974 | 22860930 | 20773309 | 58046096 | 3376633 | 71479498 | 15196445 | 65147499 |
| 10-29-15 | 12:00 | 19983943 | 22863560 | 20773309 | 58085254 | 3376633 | 71488058 | 15341453 | 65147499 |
| 10-30-15 | 12:00 | 19995095 | 22863560 | 20773309 | 58124972 | 3376633 | 71496559 | 15494214 | 65147499 |
| * 11-2-15 | 12:00 | 20003172 | 22863560 | 20773309 | 58136968 | 3376633 | 71503651 | 15588477 | 65147499 |
| | | | | | | | | | |
| | | | | | | | | | |

Bay West

# Craig Road Landfill GTP
## Operations Log

| Oct 2015 Date | Time | Treatment Train | | | | Pre-Stripper Temp (F) | Post-Stripper Temp (F) | Relative Humidity (%) | Pre-GAC Temp (F) | Pre-Stripper Velocity (ft/min) | Fan Speed (Hz) | Surge Tank Leak Check | | Fire System | Plant Shutdown Hours |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Active Train | Hrs of Operation | Flow (gpm) | VFD (Hz) | | | | | | | T-100 | T-101 | | |
| * 10-1-15 | 12:00 | 300 | 24 | 154 | 39.0 | 78 | 61 | 45.7 | 70 | 725 | 40.0 | ✓ | ✓ | ✓ | 0 |
| 10-2-15 | 12:00 | 300 | 24 | 103 | 33.0 | 78 | 61 | 44.8 | 80 | ~~650~~ 625 | 33.8 | ✓ | ✓ | ✓ | 0 |
| 10-5-15 | 12:00 | 300 | 72 | 156 | 39.0 | 75 | 61 | 45.1 | 80 | 710 | 39.9 | ✓ | ✓ | ✓ | 0 |
| 10-6-15 | 13:00 | 300 | 25 | 122 | 33.9 | 80 | 61 | 45.2 | 81 | 650 | 34.5 | ✓ | ✓ | ✓ | 0 |
| 10-7-15 | 12:00 | 300 | 23 | 159 | 39.0 | 70 | 61 | 44.5 | 78 | 725 | 40.0 | ✓ | ✓ | ✓ | 0 |
| 10-8-15 | 12:30 | 300 | 24.5 | 158 | 39.0 | 70 | 61 | 45.4 | 69 | 725 | 40.0 | ✓ | ✓ | ✓ | 0 |
| 10-9-15 | 12:00 | 300 | 23.5 | 104 | 33.0 | 77 | 61 | 44.6 | 70 | 625 | 33.8 | ✓ | ✓ | ✓ | 0 |
| 10-12-15 | 12:00 | 300 | 72 | 161 | 39.0 | 75 | 61 | 46.1 | 80 | 725 | 40.0 | ✓ | ✓ | ✓ | 0 |
| 10-13-15 | 12:00 | 300 | 24 | 155 | 39.0 | 76 | 61 | 44.9 | 69 | 725 | 40.0 | ✓ | ✓ | ✓ | 0 |
| 10-14-15 | 12:00 | 300 | 24 | 161 | 39.0 | 75 | 61 | 44.9 | 80 | 725 | 40.0 | ✓ | ✓ | ✓ | 0 |
| 10-15-15 | 12:00 | 300 | 24 | 127 | 34.2 | 73 | 61 | 44.6 | 70 | 650 | 34.8 | ✓ | ✓ | ✓ | 0 |
| 10-16-15 | 12:00 | 300 | 24 | 156 | 39.0 | 76 | 61 | 44.7 | 70 | 725 | 40.0 | ✓ | ✓ | ✓ | 0 |
| 10-19-15 | 12:00 | 300 | 72 | 153 | 38.6 | 60 | 61 | 44.7 | 80 | 710 | 39.4 | ✓ | ✓ | ✓ | 0 |
| 10-20-15 | 12:00 | 300 | 24 | 106 | 34.4 | 71 | 61 | 44.1 | 68 | 690 | 35.3 | ✓ | ✓ | ✓ | 8.5 |
| 10-21-15 | 12:00 | 300 | 15.5 | 158 | 39.0 | 70 | 61 | 43.9 | 71 | 750 | 40.0 | ✓ | ✓ | ✓ | 0 |
| 10-22-15 | 12:00 | 300 | 24 | 104 | 33.0 | 70 | 61 | 45.7 | 69 | 675 | 33.8 | ✓ | ✓ | ✓ | 0 |
| 10-23-15 | 12:00 | 300 | 24 | 156 | 39.0 | 63 | 61 | 44.3 | 69 | 750 | 40.0 | ✓ | ✓ | ✓ | 0 |
| 10-26-15 | 12:00 | 300 | 30 | 158 | 39.0 | 61 | 61 | 45.0 | 80 | 750 | 40.0 | ✓ | ✓ | ✓ | 42 |
| 10-27-15 | 12:00 | 300 | 24 | 163 | 39.0 | 64 | 61 | 45.2 | 70 | 750 | 40.0 | ✓ | ✓ | ✓ | 0 |
| 10-28-15 | 12:30 | 300 | 24.5 | 101 | 33.0 | 60 | 61 | 45.4 | 80 | 650 | 33.9 | ✓ | ✓ | ✓ | 0 |
| 10-29-15 | 12:00 | 300 | 23.5 | 149 | 37.7 | 65 | 61 | 45.0 | 70 | 700 | 38.5 | ✓ | ✓ | ✓ | 0 |
| 10-30-15 | 12:00 | 300 | 24 | 128 | 35.6 | 69 | 60 | 43.7 | 72 | 690 | 36.3 | ✓ | ✓ | ✓ | 0 |
| * 11-2-15 | 12:00 | 300 | 14 | 156 | 39.0 | 60 | 61 | 45.0 | 75 | 750 | 40.0 | ✓ | ✓ | ✓ | 58 |
| | | | | | | | | | | | | | | | |

Bay West

# Craig Road Landfill GTP
## Extraction Well Water Levels

| NOV 2015 Date | Time | Surge Tank Level | PLC Water Levels (feet) | | | | | | | | | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | NDA Extraction Wells | | | | | | SDA Extraction Wells | | | | | | |
| | | | EW-2 | EW-3 | EW-4 | EW-5 | EW-6 | EW-7 | EW-9 | EW-10 | EW-11 | EW-12 | EW-13 | EW-14 | |
| * 11-2-15 | 12:00 | 11.1 | 19.1 | 8.8 | 28.6 | 26.6 | 15.2 | 55.8 | 13.7 | 70.6 | 29.0 | 45.2 | 58.1 | 54.8 | Process differential shutdown 10-30 @ 21:00 |
| 11-3-15 | 12:00 | 11.1 | 14.0 | 13.3 | 28.2 | 23.7 | 20.5 | 36.9 | 10.4 | 70.0 | 28.8 | 42.6 | 57.2 | 54.5 | |
| 11-4-15 | 12:00 | 11.7 | 14.7 | 16.4 | 24.5 | 24.3 | 8.8 | 48.8 | 12.9 | 69.2 | 28.7 | 43.2 | 57.3 | 54.5 | ALARM plant shutdown @ 01:00 AM |
| 11-5-15 | 12:00 | 14.3 | 14.2 | 17.6 | 25.6 | 23.9 | 13.1 | 44.4 | 21.5 | 69.9 | 28.7 | 42.7 | 57.1 | 54.6 | ALARM plant shutdown @ 02:00 AM |
| 11-6-15 | 12:00 | 11.0 | 15.7 | 18.8 | 25.8 | 24.7 | 22.9 | 56.0 | 14.4 | 69.7 | 28.2 | 43.2 | 57.4 | 54.1 | ALARM Plant Shutdown @ 21:00 11-5 |
| 11-9-15 | 13:00 | 11.0 | 20.3 | 23.7 | 17.6 | 27.2 | 6.8 | 60.7 | 10.3 | 70.1 | 26.0 | 45.1 | 58.0 | 54.4 | ALARM Plant Shutdown @ 03:00 11-7 |
| 11-10-15 | 12:00 | 11.3 | 15.3 | 23.8 | 28.9 | 24.2 | 18.7 | 49.7 | 24.7 | 69.0 | 27.2 | 42.5 | 57.1 | 52.7 | 200 train Magnehelic zeroed |
| 11-11-15 | 12:00 | 11.3 | 13.5 | 16.9 | 25.6 | 23.1 | 12.8 | 46.9 | 14.9 | 12.8 | 22.6 | 41.5 | 56.5 | 51.6 | |
| 11-12-15 | 12:00 | 11.1 | 12.6 | 17.5 | 24.3 | 22.7 | 5.5 | 44.5 | 23.6 | 67.7 | 20.5 | 40.6 | 56.3 | 68.9 | EW#3 flow sensor replaced / EW#4 offline |
| 11-13-15 | 12:00 | 11.0 | 11.8 | 22.1 | 21.7 | 22.1 | 8.5 | 41.9 | 12.2 | 68.9 | 10.7 | 42.2 | 55.9 | 71.4 | EW #10 and #14 offline. |
| 11-16-15 | 12:00 | 11.2 | 13.1 | 24.7 | 25.1 | 22.8 | 5.3 | 49.2 | 17.8 | 68.9 | 27.7 | 40.3 | 55.9 | 53.2 | ALARM Plant shutdown @ 01:30 11-16-15 |
| 11-17-15 | 12:00 | 10.9 | 11.8 | 20.4 | 21.7 | 21.3 | 22.7 | 38.3 | 10.1 | 67.7 | 27.3 | 39.0 | 55.2 | 52.3 | |
| 11-19-15 | 11:00 | 12.0 | 15.1 | 20.4 | 24.6 | 23.9 | 24.7 | 57.0 | 10.3 | 17.8 | 27.7 | 41.2 | 56.1 | 53.2 | ALARM Plant shutdown @ 0900 hours |
| 11-20-15 | 12:00 | 11.2 | 17.2 | 19.3 | 24.6 | 25.6 | 18.7 | 62.6 | 16.1 | 69.4 | 28.0 | 42.3 | 56.7 | 54.0 | ALARM Plant shutdown @ 1800 hours 11/20 |
| 11-23-15 | 12:00 | 12.2 | 21.6 | 7.9 | 12.7 | 28.1 | 21.3 | 63.9 | 12.5 | 20.7 | 27.6 | 44.5 | 57.3 | 53.4 | ALARM Plant shutdown @ 2000 hours 11/23 |
| 11-24-15 | 12:00 | 11.6 | 19.8 | 5.6 | 27.2 | 26.4 | 5.7 | 60.8 | 17.8 | 69.3 | 27.5 | 43.4 | 56.8 | 53.3 | ALARM Plant shutdown @ 2030 hours 11/24 |
| 11-25-15 | 12:00 | 11.9 | 18.9 | 24.3 | 26.6 | 26.5 | 13.9 | 60.9 | 19.8 | 21.4 | 27.5 | 43.1 | 56.8 | 53.2 | ALARM Plant shutdown @ 1600 11/25 |
| * 11-27-15 | 12:00 | 11.3 | 22.1 | 22.6 | 28.6 | 28.7 | 24.3 | 66.0 | 14.8 | 69.8 | 27.8 | 45.1 | 57.7 | 54.0 | Train swapped from 300 to 301 @ 07:00 AM |
| 11-30-15 | 12:00 | 11.9 | 19.9 | 23.0 | 27.8 | 27.3 | 16.0 | 63.6 | 13.6 | 68.2 | 27.5 | 43.9 | 57.2 | 53.7 | ALARM Plant shutdown @ 0700 11/29 |
| * 12-1-15 | 12:00 | 11.4 | 15.1 | 22.9 | 27.6 | 24.3 | 15.1 | 52.4 | 22.9 | 13.1 | 27.3 | 41.3 | 56.2 | 53.3 | |

Al Sanfran

Bay West

# Craig Road Landfill GTP
## Extraction Well Flow Rates

| NOV 2015 Date | Time | Flow Rates (gpm) | | | | | | | | | | | | FT-100 Flow (gpm) | FT-101 Flow (gpm) | Total Flow (gpm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | NDA Extraction Wells | | | | | | SDA Extraction Wells | | | | | | | | |
| | | EW-2 | EW-3 | EW-4 | EW-5 | EW-6 | EW-7 | EW-9 | EW-10 | EW-11 | EW-12 | EW-13 | EW-14 | | | |
| * 11-2-15 | 12:00 | 11.7 | 0 | 0 | 37.0 | 9.7 | 18.4 | 0 | 0 | 0 | 27.8 | 0 | 26.3 | – | 131 | 131 |
| 11-3-15 | 12:00 | 11.3 | 0 | 0 | 36.1 | 10.0 | 17.7 | 0 | 0 | 0 | 27.8 | 0 | 26.4 | – | 136 | 136 |
| 11-4-15 | 12:00 | 11.9 | 0 | 0 | 36.2 | 9.8 | 17.8 | 12.1 | 0 | 0 | 27.4 | 0 | 26.4 | – | 144 | 144 |
| 11-5-15 | 12:00 | 11.8 | 0 | 0 | 35.5 | 9.8 | 18.5 | 0 | 0 | 0 | 27.7 | 0 | 26.8 | – | 131 | 131 |
| 11-6-15 | 12:00 | 12.1 | 0 | 0 | 35.9 | 9.7 | 18.2 | 0 | 0 | 0 | 27.7 | 0 | 26.7 | – | 130 | 130 |
| 11-9-15 | 13:00 | 12.2 | 0 | 0 | 36.2 | 9.8 | 18.6 | 0 | 0 | 0 | 27.5 | 0 | 26.4 | – | 135 | 135 |
| 11-10-15 | 12:00 | 12.5 | 0 | 0 | 36.5 | 0 | 18.1 | 12.4 | 0 | 0 | 27.5 | 0 | 26.4 | – | 131 | 131 |
| 11-11-15 | 12:00 | 12.0 | 0 | 0 | 36.4 | 0 | 18.6 | 0 | 14.9 | 0 | 27.2 | 0 | 26.0 | – | 135 | 135 |
| 11-12-15 | 12:00 | 11.9 | 0 | 0 | 35.9 | 9.6 | 18.7 | 12.5 | 0 | 0 | 27.2 | 0 | 0 | – | 100 | 100 |
| 11-13-15 | 12:00 | 10.6 | 0 | 0 | 35.8 | 9.7 | 18.0 | 12.0 | 0 | 0 | 27.8 | 0 | 0 | – | 110 | 110 |
| 11-16-15 | 12:00 | 11.9 | 0 | 0 | 36.0 | 9.9 | 18.1 | 12.2 | 0 | 0 | 27.3 | 0 | 26.1 | – | 132 | 132 |
| 11-17-15 | 12:00 | 9.1 | 7.6 | 0 | 35.8 | 10.2 | 17.5 | 0 | 0 | 0 | 27.2 | 0 | 26.1 | – | 128 | 128 |
| 11-19-15 | 11:00 | 11.7 | 0 | 0 | 36.0 | 10.6 | 18.3 | 0 | 14.9 | 0 | 27.6 | 0 | 26.3 | – | 146 | 146 |
| 11-20-15 | 12:00 | 11.9 | 0 | 0 | 35.8 | 10.0 | 18.4 | 0 | 0 | 0 | 27.6 | 0 | 26.7 | – | 134 | 134 |
| 11-23-15 | 12:00 | 11.9 | 0 | 5.0 | 36.3 | 9.6 | 18.0 | 0 | 15.0 | 0 | 27.7 | 0 | 26.6 | – | 156 | 156 |
| 11-24-15 | 12:00 | 12.1 | 0 | 0 | 36.4 | 0 | 18.4 | 0 | 0 | 0 | 27.4 | 0 | 26.6 | – | 123 | 123 |
| 11-25-15 | 12:00 | 12.0 | 0 | 0 | 36.6 | 9.3 | 18.2 | 0 | 0 | 0 | 27.2 | 0 | 26.8 | – | 135 | 135 |
| * 11-27-15 | 12:00 | 11.8 | 0 | 0 | 36.9 | 9.5 | 18.7 | 12.4 | 0 | 0 | 27.7 | 0 | 26.3 | – | 112 | 112 |
| 11-30-15 | 12:00 | 12.2 | 0 | 0 | 36.1 | 9.3 | 16.0 | 0 | 0 | 0 | 27.2 | 0 | 26.3 | – | 128 | 128 |
| * 12-1-15 | 12:00 | 11.6 | 0 | 0 | 36.0 | 9.9 | 18.1 | 12.4 | 0 | 0 | 27.3 | 0 | 26.5 | – | 140 | 140 |

Al Sampson

Bay West

# Craig Road Landfill GTP
## NDA Daily Flow Totals

| Date | Time | NDA Extraction Well Daily Flow (gallons) | | | | | | Process Totalizers | |
|---|---|---|---|---|---|---|---|---|---|
| | | EW-2 | EW-3 | EW-4 | EW-5 | EW-6 | EW-7 | AS-300 Train | AS-301 Train |
| * 11-2-15 | 12:00 | 39426814 | 6521257 | 1472216 | 31469985 | 27728945 | 67310333 | 68835057 | 964721 |
| 11-3-15 | 12:00 | 39443950 | 6521261 | 1472477 | 31522006 | 27738824 | 67336057 | 69001676 | 964721 |
| 11-4-15 | 12:00 | 39457293 | 6521581 | 1472735 | 31562555 | 27746171 | 67356152 | 69135299 | 964721 |
| 11-5-15 | 12:00 | 39471708 | 6522175 | 1472870 | 31606098 | 27754025 | 67378039 | 69271344 | 964721 |
| 11-6-15 | 12:00 | 39482075 | 6522275 | 1473015 | 31637347 | 27759974 | 67393794 | 69402578 | 964721 |
| 11-9-15 | 13:00 | 39497828 | 6522446 | 1473493 | 31684822 | 27769035 | 67417729 | 69556107 | 964721 |
| 11-10-15 | 12:00 | 39514482 | 6522950 | 1473622 | 31734722 | 27778940 | 67443148 | 69756345 | 964721 |
| 11-11-15 | 12:00 | 39531691 | 6522960 | 1473879 | 31786349 | 27788113 | 67469415 | 69962896 | 964721 |
| 11-12-15 | 12:00 | 39548895 | 6523097 | 1474006 | 31838031 | 27796736 | 67495712 | 70167762 | 964721 |
| 11-13-15 | 12:00 | 39565701 | 6523830 | 1474135 | 31889481 | 27805063 | 67521811 | 70320488 | 964721 |
| 11-16-15 | 12:00 | 39605165 | 6526006 | 1474397 | 32033737 | 27827723 | 67594635 | 70757126 | 964721 |
| 11-17-15 | 12:00 | 39620102 | 6526695 | 1474525 | 32085460 | 27835742 | 67620399 | 70921389 | 964721 |
| 11-19-15 | 11:00 | 39639266 | 6527745 | 1474806 | 32146705 | 27846432 | 67651211 | 71120847 | 964721 |
| 11-20-15 | 12:00 | 39647925 | 6528276 | 1474956 | 32172844 | 27851210 | 67664404 | 71207328 | 964721 |
| 11-23-15 | 12:00 | 39656401 | 6529036 | 1475305 | 32198417 | 27856607 | 67677333 | 71301013 | 964721 |
| 11-24-15 | 12:00 | 39666711 | 6529930 | 1475604 | 32229659 | 27863710 | 67693133 | 71408198 | 964721 |
| 11-25-15 | 12:00 | 39677268 | 6530655 | 1475882 | 32261723 | 27870623 | 67709305 | 71519480 | 964721 |
| * 11-28-15 | 12:00 | 39684094 | 6531342 | 1476094 | 32282393 | 27875357 | 67719762 | 71550629 | ~~964721~~ 1008175 |
| 11-30-15 | 12:00 | 39719134 | 6533600 | 1476795 | 32388232 | 27896808 | 67773434 | 71550629 | 1330420 |
| * 12-1-15 | 12:00 | 39736336 | 6534165 | 1477049 | 32440148 | 27907031 | 67799790 | 71550629 | 1496357 |
| | | | | | | | | | |
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Al Sanford

Bay West

# Craig Road Landfill GTP
## SDA Daily Flow Totals

| NOV 2015 Date | Time | NDA Extraction Wells | | | | | | FT-100 (gallons) | FT-101 (gallons) |
|---|---|---|---|---|---|---|---|---|---|
| | | EW-9 | EW-10 | EW-11 | EW-12 | EW-13 | EW-14 | | |
| * 11-2-15 | 12:00 | 20003172 | 22863560 | 20773309 | 58136968 | 3376633 | 71503651 | 15588477 | 65147499 |
| 11-3-15 | 12:00 | 20014801 | 22863560 | 20773309 | 58176895 | 3376633 | 71511898 | 15749660 | 65147499 |
| 11-4-15 | 12:00 | 20024061 | 22865821 | 20773309 | 58208027 | 3376633 | 71519153 | 15877796 | 65147499 |
| 11-5-15 | 12:00 | 20033909 | 22865821 | 20773309 | 58241436 | 3376633 | 71526768 | 16013286 | 65147499 |
| 11-6-15 | 12:00 | 20041035 | 22865821 | 20773309 | 58265360 | 3376633 | 71549718 | 16131921 | 65147499 |
| 11-9-15 | 12:00 | 20051780 | 22865821 | 20775478 | 58301722 | 3376633 | 71557841 | 16280581 | 65147499 |
| 11-10-15 | 12:00 | 20062687 | 22865821 | 20773676 | 58340054 | 3376633 | 71594401 | 16471246 | 65147499 |
| 11-11-15 | 12:00 | 20073626 | 22868325 | 20773871 | 58379754 | 3376633 | 71632273 | 16668623 | 65147499 |
| 11-12-15 | 12:00 | 20084315 | 22869763 | 20774469 | 58419453 | 3376633 | 71669474 | 16863614 | 65147499 |
| 11-13-15 | 12:00 | 20094952 | 22871682 | 20775919 | 58452209 | 3376633 | 71673649 | 17012549 | 65147499 |
| 11-16-15 | 12:00 | 20125201 | 22871682 | 20780142 | 58563545 | 3376633 | 71680680 | 17434183 | 65147499 |
| 11-17-15 | 12:00 | 20135886 | 22874288 | 20780142 | 58603081 | 3376633 | 71688915 | 17592611 | 65147499 |
| 11-19-15 | 11:00 | 20149051 | 22878941 | 20780142 | 58649835 | 3376633 | 71688944 | 17784347 | 65147499 |
| 11-20-15 | 12:00 | 20154628 | 22879072 | 20780142 | 58669773 | 3376633 | 71702896 | 17864675 | 65147499 |
| 11-23-15 | 12:00 | 20160321 | 22882111 | 20780233 | 58689240 | 3376633 | 71715109 | 17957154 | 65147499 |
| 11-24-15 | 12:00 | 20167243 | 22882111 | 20780781 | 58712987 | 3376633 | 71721477 | 18057364 | 65147499 |
| 11-25-15 | 12:00 | 20174290 | 22885395 | 20781312 | 58737329 | 3376633 | 71728001 | 18163351 | 65147499 |
| * 11-27-15 | 12:00 | 20178920 | 22885395 | 20781509 | 58753023 | 3376633 | 71736917 | 18234894 | 65147499 |
| 11-30-15 | 12:00 | 20201568 | 22887812 | 20784037 | 58833724 | 3376633 | 71743612 | 18553090 | 65147499 |
| * 12-1-15 | 12:00 | 20212594 | 22891071 | 20784996 | 58873244 | 3376633 | 71751345 | 18716061 | 65147499 |
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Al Sanford

Bay West

# Craig Road Landfill GTP
## Operations Log

| NOV 2015 Date | Time | Treatment Train | | | | Pre-Stripper Temp (F) | Post-Stripper Temp (F) | Relative Humidity (%) | Pre-GAC Temp (F) | Pre-Stripper Velocity (ft/min) | Fan Speed (Hz) | Surge Tank Leak Check | | Fire System | Plant Shutdown Hours |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Active Train | Hrs of Operation | Flow (gpm) | VFD (Hz) | | | | | | | T-100 | T-101 | | |
| * 11-2-15 | 12:00 | 300 | 14 | 156 | 39.0 | 60 | 61 | 45.0 | 75 | 750 | 40.0 | ✓ | ✓ | ✓ | 58 |
| 11-3-15 | 12:00 | 300 | 24 | 106 | 33.0 | 51 | 60 | 44.7 | 68 | 650 | 33.9 | ✓ | ✓ | ✓ | 6 |
| 11-4-15 | 12:00 | 300 | 18 | 158 | 39.0 | 52 | 60 | 44.0 | 79 | 725 | 39.9 | ✓ | ✓ | ✓ | 4.5 |
| 11-5-15 | 12:00 | 300 | 19.5 | 166 | 39.0 | 52 | 60 | 43.0 | 70 | 775 | 40.0 | ✓ | ✓ | ✓ | ~~14.5~~ 9.5 |
| 11-6-15 | 12:00 | 300 | 14.5 | 99 | 33.0 | 61 | 60 | 43.8 | 80 | 675 | 33.9 | ✓ | ✓ | ✓ | 51.5 |
| 11-9-15 | 13:00 | 300 | 21.5 | 128 | 35.1 | 72 | 61 | 44.7 | 80 | 650 | 36.0 | ✓ | ✓ | ✓ | 0 |
| 11-10-15 | 12:00 | 300 | 24 | 160 | 39.0 | 70 | 60 | 43.6 | 74 | 775 | 40.0 | ✓ | ✓ | ✓ | 0 |
| 11-11-15 | 12:00 | 300 | 24 | 157 | 39.0 | 62 | 60 | 43.9 | 71 | 800 | 40.0 | ✓ | ✓ | ✓ | 0 |
| 11-12-15 | 12:00 | 300 | 24 | 102 | 33.0 | 50 | 60 | 44.0 | 70 | ~~716~~ 700 | 33.8 | ✓ | ✓ | ✓ | 0 |
| 11-13-15 | 12:00 | 300 | 24 | 103 | 33.0 | 60 | 60 | 44.4 | 72 | 700 | 33.8 | ✓ | ✓ | ✓ | 5.0 |
| 11-16-15 | 12:00 | 300 | 67 | 148 | 37.9 | 76 | 60 | 44.7 | 71 | 750 | 38.8 | ✓ | ✓ | ✓ | 0 |
| 11-17-15 | 12:00 | 300 | 24 | 144 | 36.5 | 60 | 60 | 43.3 | 80 | 725 | 37.2 | ✓ | ✓ | ✓ | 13.0 |
| 11-19-15 | 11:00 | 300 | 35 | 157 | 39.0 | 71 | 60 | 43.4 | 70 | 800 | 40.0 | ✓ | ✓ | ✓ | 13.5 |
| 11-20-15 | 12:00 | 300 | 10.5 | 155 | 39.0 | 52 | 60 | 43.7 | 68 | 800 | 40.0 | ✓ | ✓ | ✓ | ~~66~~ 61 |
| 11-23-15 | 12:00 | 300 | 11 | 167 | 39.0 | 61 | 60 | 43.9 | 76 | 800 | 40.0 | ✓ | ✓ | ✓ | ~~10~~ 10 |
| 11-24-15 | 12:00 | 300 | 14 | 162 | 39.0 | 66 | 59 | 43.5 | 67 | 800 | 40.1 | ✓ | ✓ | ✓ | 10.5 |
| 11-25-15 | 12:00 | 300 | 13.5 | 158 | 39.0 | 52 | 59 | 42.1 | 69 | 790 | 40.1 | ✓ | ✓ | ✓ | 39 |
| * 11-27-15 | 12:00 | 301 * | 9 | 106 | 33.0 | 61 | 54 | 45.1 | 80 | 650 | 34.4 | ✓ | ✓ | ✓ | ~~19~~ 24 |
| 11-30-15 | 12:00 | 301 | ~~45~~ 48 | 157 | 38.0 | 61 | 56 | 44.4 | 79 | 710 | 39.4 | ✓ | ✓ | ✓ | 0 |
| * 12-1-15 | 12:00 | 301 | 24 | 155 | 38.0 | 62 | 55 | 46.1 | 76 | 710 | 39.4 | ✓ | ✓ | ✓ | 0 |
| | | | | | | | | | | | | | | | |
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Al Sampson

Bay West

# Craig Road Landfill GTP
## Operations Log

| DEC 2015 Date | Time | Treatment Train | | | | Pre-Stripper Temp (F) | Post-Stripper Temp (F) | Relative Humidity (%) | Pre-GAC Temp (F) | Pre-Stripper Velocity (ft/min) | Fan Speed (Hz) | Surge Tank Leak Check | | Fire System | Plant Shutdown Hours |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Active Train | Hrs of Operation | Flow (gpm) | VFD (Hz) | | | | | | | T-100 | T-101 | | |
| * 12-1-15 | 12:00 | 301 | 24 | 155 | 38.0 | 62 | 55 | 46.1 | 76 | 710 | 39.4 | ✓ | ✓ | ✓ | 3 |
| 12-2-15 | 12:00 | 301 | 21 | 158 | 38.0 | 65 | 54 | 45.5 | 72 | 710 | 39.4 | ✓ | ✓ | ✓ | 0 |
| 12-3-15 | 12:00 | 301 | 24 | 134 | 35.8 | 61 | 54 | 45.3 | 82 | 675 | 37.2 | ✓ | ✓ | ✓ | 0 |
| 12-4-15 | 12:00 | 301 | 24 | 136 | 35.6 | 67 | 54 | 45.3 | 81 | 675 | 36.9 | ✓ | ✓ | ✓ | 0 |
| 12-7-15 | 12:00 | 301 | 72 | 146 | 36.7 | 66 | 54 | 45.6 | 80 | 700 | 38.1 | ✓ | ✓ | ✓ | 0 |
| * 12-8-15 | 12:00 | 300 * | 24 | 153 | 38.1 | 57 | 55 | 43.4 | 80 | 750 | 39.0 | ✓ | ✓ | ✓ | 0 |
| 12-9-15 | 12:00 | 300 | 24 | 156 | 38.8 | 55 | 55 | 48.8 | 72 | 790 | 39.8 | ✓ | ✓ | ✓ | 7.5 |
| 12-10-15 | 12:00 | 300 | 16.5 | 122 | 34.4 | 73 | 56 | 43.5 | 71 | 750 | 35.3 | ✓ | ✓ | ✓ | 0 |
| 12-11-15 | 12:00 | 300 | 24 | 124 | 35.6 | 54 | 56 | 43.8 | 73 | 750 | 36.6 | ✓ | ✓ | ✓ | 0 |
| 12-14-15 | 12:00 | 300 | 72 | 157 | 38.8 | 71 | 56 | 44.4 | 76 | 800 | 39.7 | ✓ | ✓ | ✓ | 0 |
| 12-15-15 | 13:00 | 300 | 24 | 101 | 33.0 | 40 | 56 | 43.8 | 68 | 690 | 33.9 | ✓ | ✓ | ✓ | 0 |
| 12-16-15 | 13:00 | 301 * | 24 | 123 | 34.4 | 70 | 54 | 45.5 | 82 | 650 | 35.7 | ✓ | ✓ | ✓ | 2 |
| 12-17-15 | 12:00 | 301 | ~~22~~ 21 | 156 | 38.0 | 64 | 53 | 45.0 | 82 | 690 | 38.4 | ✓ | ✓ | ✓ | 0 |
| 12-18-15 | 12:00 | 301 | 24 | 110 | 33.0 | 60 | 54 | 45.6 | 73 | 625 | 34.4 | ✓ | ✓ | ✓ | 0 |
| 12-21-15 | 12:00 | 301 | 72 | 144 | 36.7 | 59 | 54 | 45.1 | 79 | 675 | 38.1 | ✓ | ✓ | ✓ | 0 |
| 12-22-15 | 12:00 | 301 | 24 | 147 | 36.5 | 53 | 54 | 45.2 | 80 | 675 | 37.6 | ✓ | ✓ | ✓ | 0 |
| 12-23-15 | 12:00 | 301 | 24 | 110 | 33.3 | 69 | 53 | 45.5 | 72 | 625 | 34.8 | ✓ | ✓ | ✓ | 0 |
| 12-24-15 | 12:00 | 301 | 48 | 105 | 33.0 | 59 | 53 | 45.3 | 79 | 625 | 34.5 | ✓ | ✓ | ✓ | 0 |
| 12-28-15 | 12:00 | 301 | 72 | 106 | 33.0 | 57 | 54 | 44.4 | 82 | 625 | 34.5 | ✓ | ✓ | ✓ | 0 |
| 12-29-15 | 12:00 | 301 | 24 | 124 | 34.7 | 61 | 54 | 45.3 | 71 | 675 | 36.0 | ✓ | ✓ | ✓ | 0 |
| 12-30-15 | 12:00 | 301 | 24 | 154 | 38.0 | 59 | 54 | 44.3 | 76 | 710 | 39.4 | ✓ | ✓ | ✓ | 0 |
| 12-31-15 | 12:00 | 301 | 24 | 104 | 33.0 | 55 | 54 | 44.4 | 79 | 625 | 34.4 | ✓ | ✓ | ✓ | 0 |
| ** 1-1-16 | 11:30 | 301 | 23.5 | 106 | 33.0 | 62 | 53 | 44.9 | 82 | 625 | 34.4 | ✓ | ✓ | ✓ | 0 |
| | | | | | | | | | | | | | | | |

Al Sanford

Bay West

# Craig Road Landfill GTP
## SDA Daily Flow Totals

| DEC 2015 Date | Time | NDA Extraction Wells | | | | | | FT-100 (gallons) | FT-101 (gallons) |
|---|---|---|---|---|---|---|---|---|---|
| | | EW-9 | EW-10 | EW-11 | EW-12 | EW-13 | EW-14 | | |
| * 12-1-15 | 12:00 | 20212594 | 22891071 | 20784996 | 58873244 | 3376633 | 71751345 | 18716061 | 65147499 |
| 12-2-15 | 12:00 | 20222695 | 22894125 | 20785678 | 58909145 | 3376633 | 71758257 | 18862985 | 65147499 |
| 12-3-15 | 12:00 | 20233381 | 22895860 | 20785678 | 58948570 | 3376633 | 71796393 | 19058008 | 65147499 |
| 12-4-15 | 12:00 | 20243796 | 22898094 | 20785678 | 58987805 | 3376633 | 71812111 | 19251521 | 65147499 |
| 12-7-15 | 12:00 | 20274724 | 22900984 | 20785678 | 59106057 | 3376633 | 71819452 | 19696637 | 65147499 |
| * 12-8-15 | 12:00 | 20284909 | 22902509 | 20785678 | 59145208 | 3376633 | 71826404 | 19848576 | 65147499 |
| 12-9-15 | 12:00 | 20295088 | 22903984 | 20785678 | 59184582 | 3376633 | 71831845 | 19998147 | 65147499 |
| 12-10-15 | 12:00 | 20302727 | 22905942 | 20785678 | 59207761 | 3376633 | 71838940 | 20107694 | 65147499 |
| 12-11-15 | 12:00 | 20313002 | 22905942 | 20785678 | 59247342 | 3376633 | 71846850 | 20262661 | 65147499 |
| 12-14-15 | 12:00 | 20342981 | 22909222 | 20785678 | 59364925 | 3376633 | 71854965 | 20693020 | 65147499 |
| 12-15-15 | 13:00 | 20353194 | 22909389 | 20785678 | 59406257 | 3376633 | 71855391 | 20837537 | 65147499 |
| 12-16-15 | 13:00 | 20362666 | 22910209 | 20785678 | 59444322 | 3376633 | 71866660 | 20983796 | 65147499 |
| 12-17-15 | 12:00 | 20321656 | 22911305 | 20785678 | 59427522 | 3376633 | 71873239 | 21114190 | 65147499 |
| 12-18-15 | 12:00 | 20381398 | 22914323 | 20785678 | 59516649 | 3376633 | 71881055 | 21263135 | 65147499 |
| 12-21-15 | 12:00 | 20410066 | 22917283 | 20785678 | 59633413 | 3376633 | 71888139 | 21677176 | 65147499 |
| 12-22-15 | 12:00 | 20419521 | 22919400 | 20785679 | 59672347 | 3376633 | 71893079 | 21817809 | 65147499 |
| 12-23-15 | 12:00 | 20428934 | 22922585 | 20785679 | 59711159 | 3376633 | 71900832 | 21963885 | 65147499 |
| 12-25-15 | 12:00 | 20447581 | 22923640 | 20785679 | 59788623 | 3376633 | 71902980 | 22229072 | 65147499 |
| 12-28-15 | 12:00 | 20475241 | 22926483 | 20785692 | 59904710 | 3376633 | 71909867 | 22632286 | 65147499 |
| 12-29-15 | 12:00 | 20484425 | 22929014 | 20786934 | 59943363 | 3376633 | 71917948 | 22778211 | 65147499 |
| 12-30-15 | 12:00 | 20493454 | 22932131 | 20788086 | 59981932 | 3376633 | 71925800 | 22923559 | 65147499 |
| 12-31-15 | 12:00 | 20502412 | 22934534 | 20789199 | 60020440 | 3376633 | 71934151 | 23068445 | 65147499 |
| XX 1-1-16 | 11:30 | 20511182 | 22934534 | 20790329 | 60058022 | 3376633 | 71938639 | 23202867 | 65147499 |
| | | | | | | | | | |
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Bay West

# Craig Road Landfill GTP
## NDA Daily Flow Totals

| Dec 2015 Date | Time | NDA Extraction Well Daily Flow (gallons) | | | | | | Process Totalizers | |
|---|---|---|---|---|---|---|---|---|---|
| | | EW-2 | EW-3 | EW-4 | EW-5 | EW-6 | EW-7 | AS-300 Train | AS-301 Train |
| * 12-1-15 | 12:00 | 39736336 | 6534195 | 1477049 | 32440148 | 27907031 | 67799790 | 71550629 | 1496357 |
| 12-2-15 | 12:00 | 39751942 | 6534200 | 1477281 | 32487207 | 27915638 | 67823580 | 71550629 | 1643101 |
| 12-3-15 | 12:00 | 39769094 | 6534405 | 1477429 | 32538808 | 27924599 | 67849883 | 71550629 | 1843122 |
| 12-4-15 | 12:00 | 39786172 | 6534923 | 1477457 | 32590122 | 27933064 | 67876041 | 71550629 | 2039295 |
| 12-7-15 | 12:00 | 39828678 | 6537050 | 1477682 | 32744399 | 27956791 | 67954595 | 71550629 | 2486415 |
| X 12-8-15 | 12:00 | 39841832 | 6537794 | 1477809 | 32795409 | 27964355 | 67980457 | 71589956 | 2602308 |
| 12-9-15 | 12:00 | 39854883 | 6538428 | 1477809 | 32846708 | 27971841 | 68006251 | 71747039 | 2602308 |
| 12-10-15 | 12:00 | 39864493 | 6538870 | 1477982 | 32883829 | 27977628 | 68024957 | 71862586 | 2602308 |
| 12-11-15 | 12:00 | 39879339 | 6538878 | 1478105 | 32935274 | 27985543 | 68050734 | 72024391 | 2602308 |
| 12-14-15 | 12:00 | 39914829 | 6539101 | 1478338 | 33088271 | 28007528 | 68127500 | 72058794 | 3006596 |
| 12-15-15 | 13:00 | 39926215 | 6539115 | 1478454 | 33142203 | 28015007 | 68154458 | 72213449 | 3006596 |
| 12-16-15 | 13:00 | 39936716 | 6539115 | 1478570 | 33191913 | 28021806 | 68179161 | 72213449 | 3155493 |
| 12-17-15 | 12:00 | 39946604 | 6539115 | 1478685 | 33238357 | 28028356 | 68202155 | 72217205 | 3284928 |
| 12-18-15 | 12:00 | 39957972 | 6539115 | 1478901 | 33289327 | 28035488 | 68227821 | 72217205 | 3438922 |
| 12-21-15 | 12:00 | 39989790 | 6539115 | 1479149 | 33441629 | 28056150 | 68303497 | 72217205 | 3863898 |
| 12-22-15 | 12:00 | 40000541 | 6539115 | 1479266 | 33492479 | 28063022 | 68328813 | 72217205 | 4009767 |
| 12-23-15 | 12:00 | 40010807 | 6539120 | 1479383 | 33543241 | 28069810 | 68354022 | 72217205 | 4160366 |
| 12-25-15 | 12:00 | 40030454 | 6539120 | 1479499 | 33644611 | 28083122 | 68404183 | 72217205 | 4437240 |
| 12-28-15 | 12:00 | 40058990 | 6539120 | 1479846 | 33796708 | 28102733 | 68478563 | 72217205 | 4852807 |
| 12-29-15 | 12:00 | 40068641 | 6539121 | 1479962 | 33847468 | 28109230 | 68503180 | 72217205 | 5000795 |
| 12-30-15 | 12:00 | 40077949 | 6539159 | 1479962 | 33898152 | 28115700 | 68527620 | 72217205 | 5149559 |
| 12-31-15 | 12:00 | 40086739 | 6539159 | 1480077 | 33948780 | 28122099 | 68552184 | 72217205 | 5297296 |
| XX 1-1-16 | 11:30 | 40095456 | 6539159 | 1480077 | 33998211 | 28128521 | 68576110 | 72217205 | 5434089 |
| | | | | | | | | | |
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Bay West

# Craig Road Landfill GTP
## Extraction Well Flow Rates

| DEC 2015 Date | Time | Flow Rates (gpm) | | | | | | | | | | | | FT-100 Flow (gpm) | FT-101 Flow (gpm) | Total Flow (gpm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | NDA Extraction Wells | | | | | | SDA Extraction Wells | | | | | | | | |
| | | EW-2 | EW-3 | EW-4 | EW-5 | EW-6 | EW-7 | EW-9 | EW-10 | EW-11 | EW-12 | EW-13 | EW-14 | | | |
| * 12-1-15 | 12:00 | 11.6 | 0 | 0 | 36.0 | 9.9 | 18.1 | 12.4 | 0 | 0 | 27.3 | 0 | 26.5 | – | 140 | 140 |
| 12-2-15 | 12:00 | 11.6 | 0 | 5.1 | 35.1 | 10.1 | 18.0 | 12.3 | 14.6 | 0 | 27.2 | 0 | 26.3 | – | 161 | 161 |
| 12-3-15 | 12:00 | 12.0 | 4.6 | 0 | 35.2 | 0 | 18.3 | 12.4 | 0 | 0 | 27.3 | 0 | 26.4 | – | 129 | 129 |
| 12-4-15 | 12:00 | 12.1 | 0 | 5.3 | 35.6 | 0 | 18.1 | 12.1 | 0 | 0 | 27.2 | 0 | 26.1 | – | 134 | 134 |
| 12-7-15 | 12:00 | 9.8 | 0 | 0 | 35.8 | 9.8 | 17.9 | 12.3 | 0 | 0 | 27.3 | 0 | 26.6 | – | 145 | 145 |
| * 12-8-15 | 12:00 | 9.5 | 0 | 0 | 35.3 | 10.1 | 18.2 | 12.2 | 0 | 0 | 27.1 | 0 | 26.5 | – | 136 | 136 |
| 12-9-15 | 12:00 | 8.6 | 0 | 0 | 35.7 | 0 | 17.9 | 0 | 0 | 0 | 27.1 | 0 | 26.9 | – | 115 | 115 |
| 12-10-15 | 12:00 | 11.7 | 0 | 0 | 35.9 | 7.9 | 18.1 | ~~15.5~~ 0 | 0 | 0 | 27.5 | 0 | 26.6 | – | 122 | 122 |
| 12-11-15 | 12:00 | 8.9 | 0 | 0 | 35.9 | 0 | 17.9 | 0 | 0 | 0 | 27.5 | 0 | 26.5 | – | 123 | 123 |
| 12-14-15 | 12:00 | 7.9 | 0 | 0 | 35.3 | 0 | 17.6 | 12.4 | 0 | 0 | 27.0 | 0 | 26.8 | – | 129 | 129 |
| 12-15-15 | 13:00 | 7.5 | 0 | 0 | 36.1 | 9.9 | 17.7 | 0 | 0 | 0 | 27.2 | 0 | 0 | – | 89 | 89 |
| 12-16-15 | 13:00 | 7.5 | 0 | 0 | 35.2 | 0 | 17.5 | 12.3 | 0 | 0 | 27.3 | 0 | 26.7 | – | 125 | 125 |
| 12-17-15 | 12:00 | 8.8 | 0 | 0 | 35.6 | 9.2 | 17.6 | 0 | 15.1 | 0 | 27.3 | 0 | 26.5 | – | 145 | 145 |
| 12-18-15 | 12:00 | 7.5 | 0 | 0 | 35.3 | 0 | 17.8 | 12.4 | 0 | 0 | 26.8 | 0 | 26.6 | – | 126 | 126 |
| 12-21-15 | 12:00 | 7.7 | 0 | 0 | 35.1 | 0 | 17.8 | 12.0 | 15.3 | 0 | 26.9 | 0 | 26.6 | – | 138 | 138 |
| 12-22-15 | 12:00 | 7.0 | 0 | 0 | 35.7 | 0 | 17.6 | 12.3 | 15.2 | 0 | 26.9 | 0 | 26.3 | – | 137 | 137 |
| 12-23-15 | 12:00 | 7.1 | 0 | 0 | 35.1 | 9.5 | 18.0 | 0 | 0 | 0 | 26.8 | 0 | 26.2 | – | 127 | 127 |
| 12-25-15 | 12:00 | 6.4 | 0 | 0 | 35.4 | 9.7 | 16.9 | 12.1 | 14.8 | 0 | 26.9 | 0 | 26.5 | – | 145 | 145 |
| 12-28-15 | 12:00 | 7.1 | 0 | 0 | 35.8 | 0 | 17.4 | 0 | 15.2 | 0 | 26.7 | 0 | 26.8 | – | 104 | 104 |
| 12-29-15 | 12:00 | 6.8 | 0 | 0 | 35.4 | 0 | 17.3 | 12.0 | 0 | 0 | 27.1 | 0 | 26.3 | – | 126 | 126 |
| 12-30-15 | 12:00 | 6.7 | 0 | 0 | 35.0 | 10.2 | 17.0 | 0 | 0 | 0 | 26.8 | 0 | 26.5 | – | 121 | 121 |
| 12-31-15 | 12:00 | 6.3 | 0 | 0 | 35.2 | 9.5 | 17.0 | 0 | 0 | 0 | 27.1 | 0 | 26.5 | – | 119 | 119 |
| X 1-1-16 | 11:30 | 6.9 | 0 | 0 | 34.9 | 10.2 | 16.7 | 12.1 | 0 | 0 | 26.8 | 0 | 26.5 | – | 131 | 131 |
| | | | | | | | | | | | | | | | | |

Al Sanford

Bay West

# Craig Road Landfill GTP
## Extraction Well Water Levels

| DEC 2015 Date | Time | Surge Tank Level | PLC Water Levels (feet) | | | | | | | | | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | NDA Extraction Wells | | | | | | SDA Extraction Wells | | | | | | |
| | | | EW-2 | EW-3 | EW-4 | EW-5 | EW-6 | EW-7 | EW-9 | EW-10 | EW-11 | EW-12 | EW-13 | EW-14 | |
| * 12-1-15 | 12:00 | 11.4 | 15.1 | 22.9 | 27.6 | 24.3 | 15.1 | 52.4 | 22.9 | 13.1 | 27.3 | 41.3 | 56.2 | 53.3 | |
| 12-2-15 | 12:00 | 12.9 | 14.8 | 7.3 | 13.4 | 24.0 | 21.5 | 55.0 | 24.7 | 15.0 | 27.1 | 41.2 | 56.0 | 53.2 | |
| 12-3-15 | 12:00 | 13.1 | 10.2 | 25.3 | 22.6 | 6.9 | ~~49.8~~ 8.0 | 49.8 | 23.8 | 67.2 | 25.5 | 39.7 | 55.2 | 51.0 | 8.0 |
| 12-4-15 | 12:00 | 11.0 | 12.4 | 20.6 | 24.7 | 22.2 | 16.2 | 48.4 | 11.9 | 65.8 | 25.0 | 39.0 | 55.0 | 50.0 | |
| 12-7-15 | 12:00 | 11.3 | 11.8 | 20.0 | 28.9 | 21.2 | 18.4 | 45.4 | 24.3 | 53.6 | 26.3 | 37.6 | 54.4 | 51.9 | Gas valve installed H-300 heater. |
| * 12-8-15 | 12:00 | 10.6 | 11.8 | 13.8 | 28.1 | 20.9 | 17.0 | 43.7 | 19.2 | 66.4 | 26.3 | 37.2 | 54.2 | 52.0 | 300 train online 07:10 12-8. |
| 12-9-15 | 12:00 | 10.5 | 12.0 | 24.0 | 28.9 | 20.5 | 19.7 | 41.0 | 22.6 | 67.0 | 26.4 | 36.6 | 54.1 | 52.1 | Alarm 11:30 PM Plant shutdown |
| 12-10-15 | 12:00 | 10.4 | 13.2 | 15.0 | 25.6 | 21.9 | 5.2 | 51.9 | 16.8 | 66.8 | 26.2 | ~~38~~ 39.8 | 54.3 | 51.7 | |
| 12-11-15 | 12:00 | 10.6 | 12.0 | 17.1 | 24.9 | 20.8 | 13.8 | 39.9 | 17.0 | 67.5 | 26.2 | 36.8 | 54.0 | 51.6 | Swapped trains end of shift 12/11 |
| 12-14-15 | 12:00 | 11.0 | 12.2 | 21.3 | 28.0 | 20.3 | 5.6 | 33.7 | 20.6 | 27.8 | 26.1 | 35.7 | 53.9 | 51.6 | Ignition Module installed H-300 heater. |
| 12-15-15 | 13:00 | ~~12.3~~ 10.4 | ~~18.1~~ 12.3 | ~~27.6~~ 18.2 | ~~20.4~~ 7.6 | ~~19.9~~ 20.5 | ~~33.7~~ 12.1 | 32.7 | 18.3 | 68.5 | 27.4 | 35.4 | 53.9 | 71.8 | Swapped trains from 300 to 301 |
| 12-16-15 | 13:00 | 11.3 | 12.2 | 39.9 | 27.3 | 20.3 | 7.3 | 32.5 | 22.6 | 67.6 | 25.8 | 35.2 | 53.8 | 51.5 | |
| 12-17-15 | 12:00 | 12.4 | 12.1 | 42.3 | 27.2 | 21.3 | 10.8 | 40.7 | 22.6 | 22.7 | 25.9 | 38.0 | 54.0 | 51.9 | offline 2 hours for heater test H-300 |
| 12-18-15 | 12:00 | 10.8 | 11.9 | 43.7 | 27.6 | 20.2 | 5.7 | 34.0 | 20.7 | 27.1 | 25.3 | 34.9 | 53.4 | 51.1 | SVE roof repairs made |
| 12-21-15 | 12:00 | 11.3 | 11.7 | 43.3 | 27.5 | 19.6 | 17.2 | 29.1 | 17.8 | 27.5 | 25.4 | 33.6 | 52.8 | 51.2 | |
| 12-22-15 | 12:00 | 11.3 | 12.0 | 43.2 | 27.5 | 19.4 | 13.7 | 27.8 | 18.6 | 27.1 | 25.8 | 33.0 | 52.9 | 51.4 | |
| 12-23-15 | 12:00 | 11.3 | 12.0 | 39.9 | 27.2 | 19.4 | 8.0 | 26.2 | 10.5 | 18.0 | 25.3 | 32.7 | 52.7 | 50.7 | |
| 12-25-15 | 12:00 | 10.4 | 12.4 | 41.0 | 28.0 | 19.8 | 8.6 | 23.7 | 16.1 | 13.3 | 26.1 | 32.5 | 52.9 | 52.4 | |
| 12-28-15 | 12:00 | 11.0 | 11.9 | 42.6 | 26.5 | 19.6 | 9.2 | 21.7 | 21.6 | 22.0 | 25.8 | 31.8 | 52.6 | 54.7 | |
| 12-29-15 | 12:00 | 11.3 | 12.0 | 22.1 | 24.6 | 19.7 | 20.4 | 20.7 | 12.8 | 66.0 | 22.6 | 31.7 | 52.5 | 50.9 | |
| 12-30-15 | 12:00 | 11.0 | 12.2 | 20.5 | 27.6 | 19.8 | 23.9 | 19.3 | 21.9 | 15.8 | 24.9 | 31.6 | 52.6 | 50.7 | |
| 12-31-15 | 12:00 | 10.8 | 12.3 | 42.0 | 25.1 | 19.9 | 21.9 | 18.0 | 17.2 | 66.2 | 24.9 | 31.5 | 52.8 | 50.8 | |
| XX 1-1-16 | 11:30 | 11.0 | 12.1 | 42.6 | 27.9 | 19.8 | 24.0 | 17.3 | 17.5 | 67.3 | 23.3 | 31.3 | 52.6 | 51.3 | |

Al Sanford

# Appendix F.3
# Monitoring Logs

# CRL Dailey $MnO_4$ Cr(6) Monitoring Log

October 2015

**Month**

| Day of the Month | Time | Sample Location (ST, SCT, FT) | Q (GPM) | Tank Level (ft) | $MnO_4$ (mg/L) | Cr(6) mg/L | Lab (X) | Collected by A.S<br>Corrective Actions or Notes |
|---|---|---|---|---|---|---|---|---|
| 10-1-15 | 11:37 | ST T-100 | 104 | 11.2 | CL | 0.01 | | 0.04-0.03=0.01 (Reagent 0.03) |
| 10-2-15 | 10:20 | ST T-100 | 118 | 11.1 | CL | 0.00 | | 0.03-0.03=0.00 (Reagent 0.03) |
| 10-5-15 | 09:10 | ST T-100 | 160 | 11.2 | CL | 0.00 | | 0.03-0.03=0.00 (Reagent 0.03) |
| 10-6-15 | 13:25 | ST T-100 | 104 | 11.2 | CL | 0.01 | | 0.04-0.03=0.01 (Reagent 0.03) |
| 10-7-15 | 07:30 | ST T-100 | 158 | 11.2 | CL | 0.01 | X | (New Reagent 0.03) 0.04-0.03=0.01 |
| 10-8-15 | 08:26 | ST T-100 | 158 | 11.2 | CL | 0.00 | | 0.03-0.03=0.00 Reagent 0.03 |
| 10-9-15 | 08:58 | ST T-100 | 146 | 11.2 | CL | 0.01 | | 0.04-0.03=0.01 Reagent 0.03 |
| 10-12-15 | 11:50 | ST T-100 | 105 | 11.1 | CL | 0.02 | | 0.05-0.03=0.02 Reagent 0.03 |
| 10-13-15 | 11:30 | ST T-100 | 147 | 11.2 | CL | 0.02 | | 0.05-0.03=0.02 Reagent 0.03 |
| 10-14-15 | 08:00 | ST T-100 | 159 | 11.2 | CL | 0.02 | X | 0.05-0.03=0.02 Reagent 0.03 |
| 10-15-15 | 10:35 | ST T-100 | 156 | 11.1 | CL | 0.01 | | 0.04-0.03=0.01 Reagent 0.03 |
| 10-16-15 | 09:11 | ST T-100 | 104 | 11.2 | CL | 0.01 | | 0.04-0.03=0.01 Reagent 0.03 |
| 10-19-15 | 10:40 | ST T-100 | 137 | 11.1 | CL | 0.00 | | 0.03-0.03=0.00 Reagent 0.03 |
| 10-20-15 | 08:37 | ST T-100 | 161 | 11.2 | CL | 0.00 | | 0.03-0.03=0.00 Reagent 0.03 |
| 10-21-15 | 08:15 | ST T-100 | 165 | ~~11.~~ 13.3 | CL | 0.00 | X | 0.03-0.03=0.00 Reagent 0.03 |
| 10-22-15 | 09:06 | ST T-100 | 107 | 11.2 | CL | 0.01 | | 0.04-0.03=0.01 Reagent 0.03 |
| 10-23-15 | 10:54 | ST T-100 | 158 | 11.2 | CL | 0.00 | | ~~0.03~~ 0.03-0.03=0.00 Reagent 0.03 New sample cell |
| 10-26-15 | 10:46 | ST T-100 | 160 | 11.2 | CL | 0.00 | | 0.03-0.03=0.00 Reagent 0.03 |
| 10-27-15 | 12:15 | ST T-100 | 158 | 11.2 | CL | 0.00 | | ~~0.0~~ Reagent 0.03 |
| 10-28-15 | 07:15 | ST T-100 | 106 | 11.1 | CL | 0.00 | X | 0.00 Reagent 0.03 |
| 10-29-15 | 09:17 | ST T-100 | 161 | 11.2 | CL | 0.00 | | Reagent 0.03 |
| 10-30-15 | 09:55 | ST T-100 | 130 | 11.2 | CL | 0.00 | | Reagent 0.03 |

Notes: Q= pumping rate at time of sample

MnO4= Permanganate concentraton by color (see WS 15 of QAPP). If sample is clear note "CL" on log.

Cr(6) = Chromium(6) concentration by field colotimeter.

Lab= Note "X" is split sample was collected.

Corrective action = Note if pumping rates were changed or suspended as a result of above results.

# CRL Weekly $MnO_4$ Cr(6) Weekly Monitoring Log

**Month** October 2015

| Day of the Month | IW5 | | | | | IW6 | | | | | IW9 | | | | | Corrective Actions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Time | Q (GPM) | $MnO_4$ (mg/L) | Cr(6) mg/L | Lab (X) | Time | Q (GPM) | $MnO_4$ (mg/L) | Cr(6) mg/L | Lab (X) | Time | Q (GPM) | $MnO_4$ (mg/L) | Cr(6) mg/L | Lab (X) | |
| 10-7-15 | | NO SAMPLE | | | | | NO | SAMPLE | | | 07:55 | 12.2 | 0.75 | 0.03 | | NO ACTION 0.06 - 0.03 = 0.03 REAGENT 0.03 |
| 10-14-15 | | NO SAMPLE | | | | | NO | SAMPLE | | | 08:20 | 12.4 | 0.75 | 0.05 | | NO ACTION REAGENT 0.03 0.08 - 0.03 = 0.05 REAGENT 0.03 |
| 10-21-15 | | NO SAMPLE | | | | | NO | SAMPLE | | | 08:44 | 11.9 | 0.75 | 0.04 | | NO ACTION 0.07 - 0.03 = 0.04 REAGENT 0.03 |
| 10-29-15 | | NO SAMPLE | | | | | NO | SAMPLE | | | 09:28 | 12.5 | 0.75 | 0.02 | | NO ACTION REAGENT 0.03 |
| | | | | | | | | | | | | | | | | |

| Day of the Month | IW10 | | | | | IW14 | | | | | Corrective Actions |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Time | Q (GPM) | $MnO_4$ (mg/L) | Cr(6) mg/L | Lab (X) | Time | Q (GPM) | $MnO_4$ (mg/L) | Cr(6) mg/L | Lab (X) | REAGENT 0.03 |
| 10-7-15 | 08:10 | 15.0 | 3.8 | 0.06 | | 08:25 | 26.6 | 0.75 | 0.01 | | EW 10 NO ACTION 0.09 - 0.03 = 0.06<br>EW 14 NO ACTION 0.04 - 0.03 = 0.01 |
| 10-14-15 | 08:37 | 15.6 | 3.8 | 0.06 | | 08:53 | 26.7 | 0.75 | 0.01 | | EW 10 NO ACTION 0.09 - 0.03 = 0.06<br>EW 14 NO ACTION 0.04 - 0.03 = 0.01 |
| 10-21-15 | 09:00 | 14.9 | 3.8 | 0.07 | | 09:15 | 26.3 | 0.75 | 0.01 | | EW 10 NO ACTION 0.10 - 0.03 = 0.07<br>EW 14 NO ACTION 0.04 - 0.03 = 0.01 |
| 10-29-15 | 09:42 | 14.9 | 3.8 | 0.04 ~~0.02~~ | | 09:52 | 26.6 | CL | 0.00 | | EW 10 NO ACTION<br>EW 14 NO ACTION REAGENT 0.03 |
| | | | | | | | | | | | |

Notes:
Q= pumping rate at time of sample
MnO4= Permanganate concentraton by color (see WS 15 of QAPP). If sample is clear note "CL" on log.
Cr(6) = Chromium(6) concentration by field colotimeter.
Lab= Note "X" is split sample was collected.
Corrective action = Note if pumping rates were changed or suspended as a result of above results.

# CRL Dailey $MnO_4$ Cr(6) Monitoring Log

**Month** November 2015

| Day of the Month | Time | Sample Location (ST, SCT, FT) | Q (GPM) | Tank Level (ft) | $MnO_4$ (mg/L) | Cr(6) mg/L | Lab (X) | Corrective Actions or Notes |
|---|---|---|---|---|---|---|---|---|
| 11-2-15 | 11:11 | ST T-100 | 160 | 11.2 | CL | 0.00 | | Reagent 0.03 |
| 11-3-15 | 09:42 | ST T-100 | 144 | 11.2 | CL | 0.00 | | Reagent 0.03 |
| 11-4-15 | 08:15 | ST T-100 | 163 | 11.2 | CL | 0.00 | X | Reagent 0.03 |
| 11-5-15 | 07:45 | ST T-100 | 161 | 11.2 | CL | 0.00 | | Reagent 0.03 |
| 11-6-15 | 09:25 | ST T-100 | 162 | 11.2 | CL | 0.00 | | Reagent 0.03 |
| 11-9-15 | 10:25 | ST T-100 | 159 | 11.3 | CL | 0.00 | | Reagent 0.03 |
| 11-10-15 | 10:35 | ST T-100 | 157 | 11.2 | CL | 0.00 | | Reagent 0.03 |
| 11-11-15 | 11:00 | ST T-100 | 164 | 11.2 | CL | 0.00 | X | Reagent 0.03 |
| 11-12-15 | 10:35 | ST T-100 | 157 | 11.2 | CL | 0.00 | | Reagent 0.03 |
| 11-13-15 | 10:09 | ST T-100 | 103 | 11.2 | CL | 0.00 | | Reagent 0.03 |
| 11-16-15 | 11:19 | ST T-100 | 100 | 11.1 | CL | 0.00 | | Reagent 0.03 |
| 11-17-15 | 10:24 | ST T-100 | 138 | 11.1 | CL | 0.00 | | Reagent 0.03 |
| 11-18-15 | 07:55 | ST T-100 | 162 | 12.2 | CL | 0.00 | X | Reagent 0.03 |
| 11-19-15 | 10:57 | ST T-100 | 162 | 12.1 | CL | 0.00 | | Reagent 0.03 |
| 11-20-15 | 10:04 | ST T-100 | 158 | 12.9 | CL | 0.00 | | Reagent 0.03 |
| 11-23-15 | 11:29 | ST T-100 | 162 | 12.3 | CL | 0.00 | | Reagent 0.03 |
| 11-24-15 | 09:00 | ST T-100 | 157 | 12.1 | CL | 0.00 | X | Reagent 0.03 |
| 11-25-15 | 11:29 | ST T-100 | 158 | 12.0 | CL | 0.00 | | Reagent 0.03 300 total |
| * 11-27-15 | 09:25 | ST T-101 * | 156 | 12.6 | CL | 0.00 | | Reagent 0.03 sample collected 301 total |
| 11-30-15 | 10:25 | ST T-101 | 154 | 12.4 | CL | 0.00 | | Reagent 0.03 301 |

Notes:
Q= pumping rate at time of sample
MnO4= Permanganate concentraton by color (see WS 15 of QAPP). If sample is clear note "CL" on log.
Cr(6) = Chromium(6) concentration by field colotimeter.
Lab= Note "X" is split sample was collected.
Corrective action = Note if pumping rates were changed or suspended as a result of above results.

# CRL Weekly $MnO_4$ Cr(6) Weekly Monitoring Log

**Month** November 2015

| Day of the Month | IW5 | | | | | IW6 | | | | | IW9 | | | | | Corrective Actions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Time | Q (GPM) | $MnO_4$ (mg/L) | Cr(6) mg/L | Lab (X) | Time | Q (GPM) | $MnO_4$ (mg/L) | Cr(6) mg/L | Lab (X) | Time | Q (GPM) | $MnO_4$ (mg/L) | Cr(6) mg/L | Lab (X) | |
| 11-4-15 | | NO SAMPLE | | | | | NO SAMPLE | | | | 10:41 | 12.1 | 0.75 | 0.01 | | NO Action Reagent 0.03 |
| 11-11-15 | | NO SAMPLE | | | | | NO SAMPLE | | | | 11:15 | 12.2 | 0.75 | 0.01 | | NO Action Reagent 0.03 |
| 11-18-15 | | NO SAMPLE | | | | | NO SAMPLE | | | | 09:54 | 12.3 | <0.75 ~~<.75~~ | 0.01 | | Reagent 0.03 |
| 11-25-15 | | NO SAMPLE | | | | | NO SAMPLE | | | | 11:43 | 12.3 | <0.75 ~~<.75~~ | 0.01 | | Reagent 0.03 |
| | | | | | | | | | | | | | | | | |

| Day of the Month | IW10 | | | | | IW14 | | | | | Corrective Actions |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Time | Q (GPM) | $MnO_4$ (mg/L) | Cr(6) mg/L | Lab (X) | Time | Q (GPM) | $MnO_4$ (mg/L) | Cr(6) mg/L | Lab (X) | |
| 11-4-15 | 10:48 | 14.8 | 3.8 | 0.04 | | 11:01 | 26.4 | CL | 0.00 ~~0.0~~ | | Reagent 0.03 EW 10 NO Action EW 14 NO Action |
| 11-11-15 | 11:24 | 15.2 | 0.75 | 0.03 | | 11:34 | 26.0 | 0.75 | 0.00 | | EW 10 NO Action EW 14 NO Action |
| 11-18-15 | 10:03 | 14.3 | <3.8 | 0.02 ~~0.05~~ | | 10:19 | 26.6 | 0.75 | 0.00 | | EW 10 NO Action EW 14 NO Action |
| 11-25-15 | 11:52 | 15.2 | <3.8 | 0.04 | | 12:01 | 26.3 | <0.75 ~~<0.75~~ | 0.00 | | EW 10 NO Action EW 14 NO Action |
| | | | | | | | | | | | |

Notes:
Q= pumping rate at time of sample
MnO4= Permanganate concentraton by color (see WS 15 of QAPP). If sample is clear note "CL" on log.
Cr(6) = Chromium(6) concentration by field colotimeter.
Lab= Note "X" is split sample was collected.
Corrective action = Note if pumping rates were changed or suspended as a result of above results.

# CRL Dailey $MnO_4$ Cr(6) Monitoring Log

**Month** December 2015

| Day of the Month | Time | Sample Location (ST, SCT, FT) | Q (GPM) | Tank Level (ft) | $MnO_4$ (mg/L) | Cr(6) mg/L | Lab (X) | Corrective Actions or Notes |
|---|---|---|---|---|---|---|---|---|
| 12-1-15 | 11:18 | ST T-101 | 108 | 11.3 | CL | 0.00 | | Reagent 0.03 301 train |
| 12-2-15 | 08:00 | ST T-101 | 166 | 15.5 | CL | 0.00 | X | Reagent 0.03 301 train |
| 12-3-15 | 09:01 | ST T-101 | 155 | ~~12~~ 11.3 | CL | 0.00 | | Reagent 0.03 301 train |
| 12-4-15 | 10:41 | ST T-101 | 153 | 10.9 | CL | 0.00 | | Reagent 0.03 301 train |
| 12-7-15 | 10:50 | ST T-101 | 140 | 11.3 | CL | 0.00 | | Reagent 0.03 301 train |
| 12-8-15 | 10:49 | ST T-100 | 158 | 10.7 | CL | 0.00 | | Sample collected from 300 train |
| 12-9-15 | 08:40 | ST T-100 | 156 | 10.8 | CL | 0.00 | X | 300 train |
| 12-10-15 | 10:24 | ST T-100 | 103 | 10.8 | CL | 0.00 | | 300 train / Reagent 0.03 |
| 12-11-15 | 10:18 | ST T-100 | 156 | 10.6 | CL | 0.00 | | 300 train / Reagent 0.03 |
| 12-14-15 | 11:19 | ST T-101 | 155 | 11.1 | CL | 0.00 | | 301 train Reagent 0.03 |
| 12-15-15 | 14:27 | ST T-101 | 140 | 11.3 | CL | 0.00 | | 301 train Reagent 0.03 |
| 12-16-15 | 12:55 | ST T-101 | 122 | 11.3 | CL | 0.00 | X | 301 train Reagent 0.03 |
| 12-17-15 | 11:20 | ST T-101 | 164 | 12.9 | CL | 0.00 | | 301 train / Reagent 0.03 |
| 12-18-15 | 12:15 | ST T-101 | 111 | 10.8 | CL | 0.00 | | 301 train / Reagent 0.03 |
| 12-21-15 | 11:46 | ST T-101 | 146 | 11.3 | CL | 0.00 | | 301 train / Reagent 0.03 |
| 12-22-15 | 11:34 | ST T-101 | 153 | 11.3 | CL | 0.00 | | 301 train / Reagent 0.03 |
| 12-23-15 | 08:00 | ST T-101 | 104 | 10.1 | CL | 0.00 | X | 301 train / Reagent 0.03 |
| 12-25-15 | 11:05 | ST T-101 | 98 | 9.1 | CL | 0.00 | | 301 train / Reagent 0.03 |
| 12-28-15 | 09:25 | ST T-101 | 118 | 11.3 | CL | 0.00 | | 301 train / Reagent 0.03 |
| 12-29-15 | 10:55 | ST T-101 | 143 | 11.3 | CL | 0.00 | | 301 train / Reagent 0.03 |
| 12-30-15 | 07:45 | ST T-101 | 100 | 9.5 | CL | 0.00 | X | 301 train / Reagent 0.03 |
| 12-31-15 | 10:31 | ST T-101 | 154 | 11.1 | CL | 0.00 | | 301 train |

Notes:

Q= pumping rate at time of sample

MnO4= Permanganate concentraton by color (see WS 15 of QAPP). If sample is clear note "CL" on log.

Cr(6) = Chromium(6) concentration by field colotimeter.

Lab= Note "X" is split sample was collected.

Corrective action = Note if pumping rates were changed or suspended as a result of above results.

# CRL Weekly $MnO_4$ Cr(6) Weekly Monitoring Log

**Month** December 2015

| Day of the Month | IW5 | | | | | IW6 | | | | | IW9 | | | | | Corrective Actions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Time | Q (GPM) | $MnO_4$ (mg/L) | Cr(6) mg/L | Lab (X) | Time | Q (GPM) | $MnO_4$ (mg/L) | Cr(6) mg/L | Lab (X) | Time | Q (GPM) | $MnO_4$ (mg/L) | Cr(6) mg/L | Lab (X) | |
| 12-2-15 | | NO SAMPLE | | | | | NO SAMPLE | | | | 11:05 | 12.4 | <.75 | .01 | | EW 9 NO Action |
| 12-9-15 | | NO SAMPLE | | | | | NO SAMPLE | | | | 11:20 | 12.2 | <.75 | .02 | | EW9 NO Action |
| 12-17-15 | | NO SAMPLE | | | | | NO SAMPLE | | | | 11:27 | 12.1 | 0.75 | 0.02 | | EW9 NO Action |
| 12-22-15 | | NO SAMPLE | | | | | NO SAMPLE | | | | 11:05 | 12.3 | 0.75 | 0.00 | | EW9 NO Action |
| 12-31-15 | | NO SAMPLE | | | | | NO SAMPLE | | | | 10:06 | 12.4 | 0.75 | 0.00 | | EW9 NO Action |

| Day of the Month | IW10 | | | | | IW14 | | | | | Corrective Actions |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Time | Q (GPM) | $MnO_4$ (mg/L) | Cr(6) mg/L | Lab (X) | Time | Q (GPM) | $MnO_4$ (mg/L) | Cr(6) mg/L | Lab (X) | |
| 12-2-15 | 11:17 | 14.9 | <3.8 | 0.03 | | 11:27 | 26.8 | <.75 | 0.00 | | EW10 NO ACTION<br>EW14 NO Action |
| 12-9-15 | 11:34<br>10 | 15.0 | <3.8 | 0.03 | | 11:42 | 26.2 | <.75 | 0.00 | | EW10 NO ACTION<br>EW14 NO Action |
| 12-17-15 | 11:36 | 15.1 | <3.8 | 0.03 | | 11:45 | 26.3 | <.75 | 0.00 | | EW10 NO Action<br>EW14 NO Action |
| 12-22-15 | 11:15 | 14.8 | <3.8 | 0.02 | | 11:25 | 26.5 | <.75 | 0.00 | | EW10 NO Action<br>EW14 NO Action |
| 12-31-15 | 10:15 | 14.9 | 3.8 | 0.03 | | 10:22 | 26.3 | CL | 0.00<br>~~CL~~ | | EW10 NO ACTION<br>EW14 NO ACTION |

Notes:
Q= pumping rate at time of sample
MnO4= Permanganate concentraton by color (see WS 15 of QAPP). If sample is clear note "CL" on log.
Cr(6) = Chromium(6) concentration by field colotimeter.
Lab= Note "X" is split sample was collected.
Corrective action = Note if pumping rates were changed or suspended as a result of above results.

# Appendix F.4
# Daily Reports

| ***Bay West*** ***ENVIRONMENTAL*** CONTRACT NUMBER FA8903-14-C-0011 | **DAILY REPORT** Version 1.0 (ATTACH ADDITIONAL SHEETS IF NECESSARY) | REPORT DATE: 09/28-10/02/2015 REVISION NO: REVISION DATE: REPORT NO: #1 October, 2015 |
|---|---|---|

| | | | |
|---|---|---|---|
| TASK ORDER NO: 005 | PROJECT NAME / LOCATION: Fairchild AFB, CRL RA-O | | |
| PROJECT NUMBER: J130130 | PROJECT DESCRIPTION: Treatment plant operations. | | |
| PROJECT MANAGER: Steve Thornton | QC REPRESENTATIVE: A. Samford | | PREPARED BY: A. Samford |
| AM WEATHER: 71 F | PM WEATHER: N/A | MAX TEMP: N/A | MIN TEMP: N/A |

**TAILGATE TOPICS:**

**SAFETY ACTIONS TAKEN TODAY/SAFETY INSPECTIONS CONDUCTED** (Include Safety Violations, Corrective Instructions Given, Corrective Actions Taken, and Results of Safety Inspections Conducted):

- Steel toe work boots, gloves and hearing protection were worn.

**EQUIPMENT ON HAND**

| Description of Equipment | Make/Model/Manufacturer | Equipment ID Number | Inspection Performed By |
|---|---|---|---|
| NA | | | |
| | | | |
| | | | |
| | | | |

**COMMENTS (acceptance status, inspection findings, etc.):**

**MATERIALS DELIVERED TO JOB SITE**

| Description of Materials Received | Make/Model/Manufacturer | Equipment Lot Number | Inspection Performed By | Number/ Volume/ Weight |
|---|---|---|---|---|
| NA | | | | |
| | | | | |
| | | | | |
| | | | | |

**COMMENTS (acceptance status, inspection findings, etc.):**

**WORK FORCE – CONTRACTOR AND SUBCONTRACTOR**

| Employee | Work Performed | Employer | Employee Number | Title/Trade | Hours |
|---|---|---|---|---|---|
| Al Samford | Treatment facility was inspected and weekly o/m was completed. SDA–SVE weekly inspection conducted. | Bay West Environmental | 00628 | Technician/Operator | 25 |
| | | | | | |
| | | | | | |

**WORK AND/OR TESTS ACCOMPLISHED OR IN PROGRESS**

Work performed at CRL:

- Treatment facility was inspected daily.
- Weekly o/m was completed, monthly o/m commenced.
- VFD upper setting is 39 HZ and lower setting is 33 HZ.
- 09/27 CRL treatment facility received a weather related shutdown. Approximately 2.5 hours of production time was lost before alarm was reset and plant was back on line.
- 09/28 Treatment facility GAC off-gas samples were collected and shipped to Test America Laboratories.
- 09/30 extraction well # 10 was cycled approximately 2.5 hours.
- 09/30 samples for Cr6 were collected from CRL influent, extraction wells #9, #10 and #14, also influent sample was transported to T.A. in Spokane Valley.
- Extraction well #14 is operational approximately 25 hours per week.
- Cr6 sampling is conducted daily from treatment influent.
- 10/01 new PVC sample port ball valve was installed in extraction well #4.
- SDA-SVE remains offline, equipment and shed will be inspected weekly. No parameters were noted and SVE remains offline.

**Planned Work / Test for Tomorrow**:

- 04/01 Continuous 24/7 treatment operations resumed at CRL. Daily operation includes inspection of treatment facilities and weekly inspection of SDA-SVE equipment and shed.

**INSPECTIONS PERFORMED**

| Task/Activity | Inspection Performed | Findings |
|---|---|---|
| Inspection of interior and exterior of treatment facility was conducted. | Visual | Negative |
| | | |
| | | |

**VISITORS AND DISCUSSION:**

None

**QUALITY CONTROL REPORT**

**QUALITY AND/OR PRODUCTION ISSUES AND RESOLUTIONS:**

- None
-

**CHANGED CONDITIONS/DELAY/CONFLICTS ENCOUNTERED** (List any conflicts with the delivery order [i.e., scope of work and/or drawings], delays to the project attributable to site and weather conditions, etc.)**:**

- None
-

**REGULATORY COMPLIANCE ISSUES:**

- None

**INSPECTION RESULTS:**

- No inspection required

**TRANSPORTATION AND DISPOSAL**

**TRANSPORTATION AND DISPOSAL ACTIVITIES/SUMMARY OF QUANTITIES:**

- None

**GENERAL COMMENTS**

**General Comments~** (rework, directives, etc.): Heavy truck traffic from Army Reserve seems to be increasing cracks in paved access road by the plant. This will continue to be monitored and base staff will be alerted.

NA

**ATTACHMENTS**

**List of Attachments:** (examples, as applicable: submittals, meeting minutes, safety meeting minutes,, COCs, weight tickets, manifests, profiles, rework item list, etc.):

NA

NOTE: Write all entries legibly in ink. Line out all unused portions or designate as "not applicable". Preparer signs first name, middle initial and last name on each completed daily inspection record. This form may be filled out electronically and signed electronically.

PREPARER'S SIGNATURE — DATE

Al Samford — 10/02/2015

| ***Bay West*** ***ENVIRONMENTAL*** CONTRACT NUMBER FA8903-14-C-0011 | **DAILY REPORT** Version 1.0 (ATTACH ADDITIONAL SHEETS IF NECESSARY) | REPORT DATE: 10/05-10/09/2015 REVISION NO: REVISION DATE: REPORT NO: #2 October, 2015 |
|---|---|---|

| | | | |
|---|---|---|---|
| TASK ORDER NO: 005 | PROJECT NAME / LOCATION: Fairchild AFB, CRL RA-O | | |
| PROJECT NUMBER: J130130 | PROJECT DESCRIPTION: Treatment plant operations. | | |
| PROJECT MANAGER: Steve Thornton | QC REPRESENTATIVE: A. Samford | | PREPARED BY: A. Samford |
| AM WEATHER: 73 F | PM WEATHER: N/A | MAX TEMP: N/A | MIN TEMP: N/A |

**TAILGATE TOPICS:**

**SAFETY ACTIONS TAKEN TODAY/SAFETY INSPECTIONS CONDUCTED** (Include Safety Violations, Corrective Instructions Given, Corrective Actions Taken, and Results of Safety Inspections Conducted):

- Steel toe work boots, gloves and hearing protection were worn.

**EQUIPMENT ON HAND**

| Description of Equipment | Make/Model/Manufacturer | Equipment ID Number | Inspection Performed By |
|---|---|---|---|
| NA | | | |
| | | | |
| | | | |
| | | | |

**COMMENTS (acceptance status, inspection findings, etc.):**

**MATERIALS DELIVERED TO JOB SITE**

| Description of Materials Received | Make/Model/Manufacturer | Equipment Lot Number | Inspection Performed By | Number/ Volume/ Weight |
|---|---|---|---|---|
| NA | | | | |
| | | | | |
| | | | | |
| | | | | |

**COMMENTS (acceptance status, inspection findings, etc.):**

**WORK FORCE – CONTRACTOR AND SUBCONTRACTOR**

| Employee | Work Performed | Employer | Employee Number | Title/Trade | Hours |
|---|---|---|---|---|---|
| Al Samford | Treatment facility was inspected and weekly o/m was completed. SDA–SVE weekly inspection conducted. | Bay West Environmental | 00628 | Technician/Operator | 25 |
| Lee Buras | Completion of 3rd quarter LTM. | Blaine Tech | NA | Technician | NA |
| | | | | | |

**WORK AND/OR TESTS ACCOMPLISHED OR IN PROGRESS**

Work performed at CRL:

- Treatment facility was inspected daily.
- Weekly o/m was completed, monthly o/m continued.
- VFD upper setting is 39 HZ and lower setting is 33 HZ.
- Blaine Tech onsite for completion of 3rd quarter LTM.
- 10/05 Extraction well #7 has started cycling.
- 10/07 extraction well # 10 was cycled approximately 2 hours.
- 10/07 samples for Cr6 were collected from CRL influent, extraction wells #9, #10 and #14, also influent sample was transported to T.A. in Spokane Valley.
- 10/08 Injection risers were cut from remediation wells #08 and #17.
- Extraction well #14 is operational approximately 25 hours per week.
- Cr6 sampling is conducted daily from treatment influent.

- SDA-SVE remains offline, equipment and shed will be inspected weekly. No parameters were noted and SVE remains offline.

**Planned Work / Test for Tomorrow**:

- 04/01 Continuous 24/7 treatment operations resumed at CRL. Daily operation includes inspection of treatment facilities and weekly inspection of SDA-SVE equipment and shed.

**INSPECTIONS PERFORMED**

| Task/Activity | Inspection Performed | Findings |
|---|---|---|
| Inspection of interior and exterior of treatment facility was conducted. | Visual | Negative |
| | | |
| | | |

**VISITORS AND DISCUSSION:**

Blain Tech's Lee Buras onsite for 3rd LTM sampling.

**QUALITY CONTROL REPORT**

**QUALITY AND/OR PRODUCTION ISSUES AND RESOLUTIONS:**

- None
-

**CHANGED CONDITIONS/DELAY/CONFLICTS ENCOUNTERED** (List any conflicts with the delivery order [i.e., scope of work and/or drawings], delays to the project attributable to site and weather conditions, etc.)**:**

- None
-

**REGULATORY COMPLIANCE ISSUES:**

- None

**INSPECTION RESULTS:**

- No inspection required

**TRANSPORTATION AND DISPOSAL**

**TRANSPORTATION AND DISPOSAL ACTIVITIES/SUMMARY OF QUANTITIES:**

- None

**GENERAL COMMENTS**

**General Comments~** (rework, directives, etc.): Heavy truck traffic from Army Reserve seems to be increasing cracks in paved access road by the plant. This will continue to be monitored and base staff will be alerted.

NA

**ATTACHMENTS**

**List of Attachments:** (examples, as applicable: submittals, meeting minutes, safety meeting minutes,, COCs, weight tickets, manifests, profiles, rework item list, etc.):

NA

NOTE: Write all entries legibly in ink. Line out all unused portions or designate as "not applicable". Preparer signs first name, middle initial and last name on each completed daily inspection record. This form may be filled out electronically and signed electronically.

| PREPARER'S SIGNATURE | DATE |
|---|---|
| Al Samford | 10/09/2015 |

| ***Bay West*** ***ENVIRONMENTAL*** CONTRACT NUMBER FA8903-14-C-0011 | **DAILY REPORT** Version 1.0 (ATTACH ADDITIONAL SHEETS IF NECESSARY) | REPORT DATE: 10/12-16/09/2015 REVISION NO: REVISION DATE: REPORT NO: #3 October, 2015 |
|---|---|---|

| | | | |
|---|---|---|---|
| TASK ORDER NO: 005 | PROJECT NAME / LOCATION: Fairchild AFB, CRL RA-O | | |
| PROJECT NUMBER: J130130 | PROJECT DESCRIPTION: Treatment plant operations. | | |
| PROJECT MANAGER: Steve Thornton | QC REPRESENTATIVE: A. Samford | | PREPARED BY: A. Samford |
| AM WEATHER: 75 F | PM WEATHER: N/A | MAX TEMP: N/A | MIN TEMP: N/A |

**TAILGATE TOPICS:**

**SAFETY ACTIONS TAKEN TODAY/SAFETY INSPECTIONS CONDUCTED** (Include Safety Violations, Corrective Instructions Given, Corrective Actions Taken, and Results of Safety Inspections Conducted):

- Steel toe work boots, gloves and hearing protection were worn.

**EQUIPMENT ON HAND**

| Description of Equipment | Make/Model/Manufacturer | Equipment ID Number | Inspection Performed By |
|---|---|---|---|
| NA | | | |
| | | | |
| | | | |
| | | | |

**COMMENTS (acceptance status, inspection findings, etc.):**

**MATERIALS DELIVERED TO JOB SITE**

| Description of Materials Received | Make/Model/Manufacturer | Equipment Lot Number | Inspection Performed By | Number/ Volume/ Weight |
|---|---|---|---|---|
| NA | | | | |
| | | | | |
| | | | | |
| | | | | |

**COMMENTS (acceptance status, inspection findings, etc.):**

**WORK FORCE – CONTRACTOR AND SUBCONTRACTOR**

| Employee | Work Performed | Employer | Employee Number | Title/Trade | Hours |
|---|---|---|---|---|---|
| Al Samford | Treatment facility was inspected and weekly o/m was completed. SDA–SVE weekly inspection conducted. | Bay West Environmental | 00628 | Technician/Operator | 25 |
| | | | | | |
| | | | | | |

**WORK AND/OR TESTS ACCOMPLISHED OR IN PROGRESS**

Work performed at CRL:

- Treatment facility was inspected daily.
- Weekly o/m was completed, monthly o/m continued.
- VFD upper setting is 39 HZ and lower setting is 33 HZ.
- 10/12 Extraction well #7 continues to cycle.
- 10/14 extraction well # 10 was cycled approximately 2 hours.
- 10/14 samples for Cr6 were collected from CRL influent, extraction wells #9, #10 and #14, also influent sample was transported to T.A. in Spokane Valley.
- 10/08 Injection risers were cut from remediation wells #05 and #09.
- Extraction well #14 is operational approximately 25 hours per week.
- Cr6 sampling is conducted daily from treatment influent.
- SDA-SVE remains offline, equipment and shed will be inspected weekly. No parameters were noted and SVE remains offline.

**Planned Work / Test for Tomorrow**:

- 04/01 Continuous 24/7 treatment operations resumed at CRL. Daily operation includes inspection of treatment facilities and weekly inspection of SDA-SVE equipment and shed.

**INSPECTIONS PERFORMED**

| Task/Activity | Inspection Performed | Findings |
|---|---|---|
| Inspection of interior and exterior of treatment facility was conducted. | Visual | Negative |
| | | |
| | | |

**VISITORS AND DISCUSSION:**

Blain Tech's Lee Buras onsite for 3rd LTM sampling.

**QUALITY CONTROL REPORT**

**QUALITY AND/OR PRODUCTION ISSUES AND RESOLUTIONS:**

- None
-

**CHANGED CONDITIONS/DELAY/CONFLICTS ENCOUNTERED** (List any conflicts with the delivery order [i.e., scope of work and/or drawings], delays to the project attributable to site and weather conditions, etc.)**:**

- None
-

**REGULATORY COMPLIANCE ISSUES:**

- None

**INSPECTION RESULTS:**

- No inspection required

**TRANSPORTATION AND DISPOSAL**

**TRANSPORTATION AND DISPOSAL ACTIVITIES/SUMMARY OF QUANTITIES:**

- None

**GENERAL COMMENTS**

**General Comments~** (rework, directives, etc.): Heavy truck traffic from Army Reserve seems to be increasing cracks in paved access road by the plant. This will continue to be monitored and base staff will be alerted.

NA

**ATTACHMENTS**

**List of Attachments:** (examples, as applicable: submittals, meeting minutes, safety meeting minutes,, COCs, weight tickets, manifests, profiles, rework item list, etc.):

NA

NOTE: Write all entries legibly in ink. Line out all unused portions or designate as "not applicable". Preparer signs first name, middle initial and last name on each completed daily inspection record. This form may be filled out electronically and signed electronically.

| PREPARER'S SIGNATURE | DATE |
|---|---|
| Al Samford | 10/16/2015 |

| ***Bay West*** ***ENVIRONMENTAL*** CONTRACT NUMBER FA8903-14-C-0011 | **DAILY REPORT** Version 1.0 (ATTACH ADDITIONAL SHEETS IF NECESSARY) | REPORT DATE: 10/19-23/09/2015 REVISION NO: REVISION DATE: REPORT NO: #4 October, 2015 |
|---|---|---|

| | | | |
|---|---|---|---|
| TASK ORDER NO: 005 | PROJECT NAME / LOCATION: Fairchild AFB, CRL RA-O | | |
| PROJECT NUMBER: J130130 | PROJECT DESCRIPTION: Treatment plant operations. | | |
| PROJECT MANAGER: Steve Thornton | QC REPRESENTATIVE: A. Samford | | PREPARED BY: A. Samford |
| AM WEATHER: 65 F | PM WEATHER: N/A | MAX TEMP: N/A | MIN TEMP: N/A |

**TAILGATE TOPICS:**

**SAFETY ACTIONS TAKEN TODAY/SAFETY INSPECTIONS CONDUCTED** (Include Safety Violations, Corrective Instructions Given, Corrective Actions Taken, and Results of Safety Inspections Conducted):

- Steel toe work boots, gloves and hearing protection were worn.

**EQUIPMENT ON HAND**

| Description of Equipment | Make/Model/Manufacturer | Equipment ID Number | Inspection Performed By |
|---|---|---|---|
| NA | | | |
| | | | |
| | | | |
| | | | |

**COMMENTS (acceptance status, inspection findings, etc.):**

**MATERIALS DELIVERED TO JOB SITE**

| Description of Materials Received | Make/Model/Manufacturer | Equipment Lot Number | Inspection Performed By | Number/ Volume/ Weight |
|---|---|---|---|---|
| NA | | | | |
| | | | | |
| | | | | |
| | | | | |

**COMMENTS (acceptance status, inspection findings, etc.):**

**WORK FORCE – CONTRACTOR AND SUBCONTRACTOR**

| Employee | Work Performed | Employer | Employee Number | Title/Trade | Hours |
|---|---|---|---|---|---|
| Al Samford | Treatment facility was inspected and weekly o/m was completed. SDA–SVE weekly inspection conducted. | Bay West Environmental | 00628 | Technician/Operator | 25 |
| | | | | | |
| | | | | | |

**WORK AND/OR TESTS ACCOMPLISHED OR IN PROGRESS**

Work performed at CRL:

- Treatment facility was inspected daily.
- Weekly o/m was completed, monthly o/m continued.
- VFD upper setting is 39 HZ and lower setting is 33 HZ.
- 10/19 extraction well #7 continues to cycle.
- 10/20 CRL treatment facility shutdown due to an alarm, reason for alarm was unidentified. Approximately 8.5 hours was lost due to this alarm.
- 10/21 extraction well # 10 was cycled approximately 2 hours.
- 10/21 samples for Cr6 were collected from CRL influent, extraction wells #9, #10 and #14, also influent sample was transported to T.A. in Spokane Valley.
- 10/23 new pad locks were installed on CRL NDA and SDA monitoring wells.
- Extraction well #14 is operational approximately 25 hours per week.
- Cr6 sampling is conducted daily from treatment influent.
- SDA-SVE remains offline, equipment and shed will be inspected weekly. No parameters were noted and SVE remains offline.

**Planned Work / Test for Tomorrow**:

- 04/01 Continuous 24/7 treatment operations resumed at CRL. Daily operation includes inspection of treatment facilities and weekly inspection of SDA-SVE equipment and shed.

**INSPECTIONS PERFORMED**

| Task/Activity | Inspection Performed | Findings |
|---|---|---|
| Inspection of interior and exterior of treatment facility was conducted. | Visual | Negative |
| | | |
| | | |

**VISITORS AND DISCUSSION:**

URS personnel onsite for F.A.F.B work.

**QUALITY CONTROL REPORT**

**QUALITY AND/OR PRODUCTION ISSUES AND RESOLUTIONS:**

- None
-

**CHANGED CONDITIONS/DELAY/CONFLICTS ENCOUNTERED** (List any conflicts with the delivery order [i.e., scope of work and/or drawings], delays to the project attributable to site and weather conditions, etc.)**:**

- None
-

**REGULATORY COMPLIANCE ISSUES:**

- None

**INSPECTION RESULTS:**

- No inspection required

**TRANSPORTATION AND DISPOSAL**

**TRANSPORTATION AND DISPOSAL ACTIVITIES/SUMMARY OF QUANTITIES:**

- None

**GENERAL COMMENTS**

**General Comments~** (rework, directives, etc.): Heavy truck traffic from Army Reserve seems to be increasing cracks in paved access road by the plant. This will continue to be monitored and base staff will be alerted.

NA

**ATTACHMENTS**

**List of Attachments:** (examples, as applicable: submittals, meeting minutes, safety meeting minutes,, COCs, weight tickets, manifests, profiles, rework item list, etc.):

NA

NOTE: Write all entries legibly in ink. Line out all unused portions or designate as "not applicable". Preparer signs first name, middle initial and last name on each completed daily inspection record. This form may be filled out electronically and signed electronically.

PREPARER'S SIGNATURE — DATE

Al Samford — 10/23/2015

| ***Bay West*** ***ENVIRONMENTAL*** CONTRACT NUMBER FA8903-14-C-0011 | **DAILY REPORT** Version 1.0 (ATTACH ADDITIONAL SHEETS IF NECESSARY) | REPORT DATE: 10/26-30/09/2015 REVISION NO: REVISION DATE: REPORT NO: #5 October, 2015 |
|---|---|---|

| | | | |
|---|---|---|---|
| TASK ORDER NO: 005 | PROJECT NAME / LOCATION: Fairchild AFB, CRL RA-O | | |
| PROJECT NUMBER: J130130 | PROJECT DESCRIPTION: Treatment plant operations. | | |
| PROJECT MANAGER: Steve Thornton | QC REPRESENTATIVE: A. Samford | | PREPARED BY: A. Samford |
| AM WEATHER: 62 F | PM WEATHER: N/A | MAX TEMP: N/A | MIN TEMP: N/A |

**TAILGATE TOPICS:**

**SAFETY ACTIONS TAKEN TODAY/SAFETY INSPECTIONS CONDUCTED** (Include Safety Violations, Corrective Instructions Given, Corrective Actions Taken, and Results of Safety Inspections Conducted):

- Steel toe work boots, gloves and hearing protection were worn.

**EQUIPMENT ON HAND**

| Description of Equipment | Make/Model/Manufacturer | Equipment ID Number | Inspection Performed By |
|---|---|---|---|
| NA | | | |
| | | | |
| | | | |
| | | | |

**COMMENTS (acceptance status, inspection findings, etc.):**

**MATERIALS DELIVERED TO JOB SITE**

| Description of Materials Received | Make/Model/Manufacturer | Equipment Lot Number | Inspection Performed By | Number/ Volume/ Weight |
|---|---|---|---|---|
| NA | | | | |
| | | | | |
| | | | | |
| | | | | |

**COMMENTS (acceptance status, inspection findings, etc.):**

**WORK FORCE – CONTRACTOR AND SUBCONTRACTOR**

| Employee | Work Performed | Employer | Employee Number | Title/Trade | Hours |
|---|---|---|---|---|---|
| Al Samford | Treatment facility was inspected and weekly o/m was completed. SDA–SVE weekly inspection conducted. | Bay West Environmental | 00628 | Technician/Operator | 25 |
| | | | | | |
| | | | | | |

**WORK AND/OR TESTS ACCOMPLISHED OR IN PROGRESS**

Work performed at CRL:

- Treatment facility was inspected daily.
- Weekly o/m was completed, monthly o/m continued.
- VFD upper setting is 39 HZ and lower setting is 33 HZ.
- 10/26 extraction well #7 continues to cycle.
- 10/24 CRL treatment facility shutdown due to an alarm, reason for alarm was unidentified.
- 10/28 extraction well # 10 was cycled approximately 2 hours.
- 10/29 samples for Cr6 were collected from CRL influent and extraction wells #9, #10 and #14. Influent sample was transported to T.A. in Spokane Valley.
- Extraction well #14 is operational approximately 25 hours per week.
- House cleaning was conducted in CRL treatment facility.
- Cr6 sampling is conducted daily from treatment influent.
- SDA-SVE remains offline, equipment and shed will be inspected weekly. No parameters were noted and SVE remains offline.

**Planned Work / Test for Tomorrow**:

- 04/01 Continuous 24/7 treatment operations resumed at CRL. Daily operation includes inspection of treatment facilities and weekly inspection of SDA-SVE equipment and shed.

**INSPECTIONS PERFORMED**

| Task/Activity | Inspection Performed | Findings |
|---|---|---|
| Inspection of interior and exterior of treatment facility was conducted. | Visual | Negative |
| | | |
| | | |

**VISITORS AND DISCUSSION:**

URS personnel onsite for F.A.F.B work.

**QUALITY CONTROL REPORT**

**QUALITY AND/OR PRODUCTION ISSUES AND RESOLUTIONS:**

- None
-

**CHANGED CONDITIONS/DELAY/CONFLICTS ENCOUNTERED** (List any conflicts with the delivery order [i.e., scope of work and/or drawings], delays to the project attributable to site and weather conditions, etc.)**:**

- None
-

**REGULATORY COMPLIANCE ISSUES:**

- None

**INSPECTION RESULTS:**

- No inspection required

**TRANSPORTATION AND DISPOSAL**

**TRANSPORTATION AND DISPOSAL ACTIVITIES/SUMMARY OF QUANTITIES:**

- None

**GENERAL COMMENTS**

**General Comments~** (rework, directives, etc.): Heavy truck traffic from Army Reserve seems to be increasing cracks in paved access road by the plant. This will continue to be monitored and base staff will be alerted.

NA

**ATTACHMENTS**

**List of Attachments:** (examples, as applicable: submittals, meeting minutes, safety meeting minutes,, COCs, weight tickets, manifests, profiles, rework item list, etc.):

NA

NOTE: Write all entries legibly in ink. Line out all unused portions or designate as "not applicable". Preparer signs first name, middle initial and last name on each completed daily inspection record. This form may be filled out electronically and signed electronically.

PREPARER'S SIGNATURE — DATE

Al Samford — 10/30/2015

| ***Bay West*** ***ENVIRONMENTAL*** CONTRACT NUMBER FA8903-14-C-0011 | **DAILY REPORT** Version 1.0 (ATTACH ADDITIONAL SHEETS IF NECESSARY) | REPORT DATE: 11/02-06/2015 REVISION NO: REVISION DATE: REPORT NO: #1 November, 2015 |
|---|---|---|

| | | | |
|---|---|---|---|
| TASK ORDER NO: 005 | PROJECT NAME / LOCATION: Fairchild AFB, CRL RA-O | | |
| PROJECT NUMBER: J130130 | PROJECT DESCRIPTION: Treatment plant operations. | | |
| PROJECT MANAGER: Steve Thornton | QC REPRESENTATIVE: A. Samford | | PREPARED BY: A. Samford |
| AM WEATHER: 60 F | PM WEATHER: N/A | MAX TEMP: N/A | MIN TEMP: N/A |

**TAILGATE TOPICS:**

**SAFETY ACTIONS TAKEN TODAY/SAFETY INSPECTIONS CONDUCTED** (Include Safety Violations, Corrective Instructions Given, Corrective Actions Taken, and Results of Safety Inspections Conducted):

- Steel toe work boots, gloves and hearing protection were worn.

**EQUIPMENT ON HAND**

| Description of Equipment | Make/Model/Manufacturer | Equipment ID Number | Inspection Performed By |
|---|---|---|---|
| NA | | | |
| | | | |
| | | | |
| | | | |

**COMMENTS (acceptance status, inspection findings, etc.):**

**MATERIALS DELIVERED TO JOB SITE**

| Description of Materials Received | Make/Model/Manufacturer | Equipment Lot Number | Inspection Performed By | Number/ Volume/ Weight |
|---|---|---|---|---|
| NA | | | | |
| | | | | |
| | | | | |
| | | | | |

**COMMENTS (acceptance status, inspection findings, etc.):**

**WORK FORCE – CONTRACTOR AND SUBCONTRACTOR**

| Employee | Work Performed | Employer | Employee Number | Title/Trade | Hours |
|---|---|---|---|---|---|
| Al Samford | Treatment facility was inspected and weekly o/m was completed. SDA–SVE weekly inspection conducted. | Bay West Environmental | 00628 | Technician/Operator | 25 |
| | | | | | |
| | | | | | |

**WORK AND/OR TESTS ACCOMPLISHED OR IN PROGRESS**

Work performed at CRL:

- Treatment facility was inspected daily.
- Weekly o/m was completed, monthly o/m continued.
- VFD upper setting is 39 HZ and lower setting is 33 HZ.
- Extraction well #7 continues to cycle.
- Faulty process heater thermostat has resulted in numerous CRL alarms.
- 11/02 trench was switched from North to South.
- 11/04 extraction well # 10 was cycled approximately 2 hours.
- 11/04 samples for Cr6 were collected from CRL influent and extraction wells #9, #10 and #14. Influent sample was transported to T.A. in Spokane Valley.
- Extraction well #14 is operational approximately 25 hours per week.
- House cleaning was conducted in CRL treatment facility.
- Cr6 sampling is conducted daily from treatment influent.
- SDA-SVE remains offline, equipment and shed will be inspected weekly. No parameters were noted and SVE remains offline.

**Planned Work / Test for Tomorrow**:

- 04/01 Continuous 24/7 treatment operations resumed at CRL. Daily operation includes inspection of treatment facilities and weekly inspection of SDA-SVE equipment and shed.

**INSPECTIONS PERFORMED**

| Task/Activity | Inspection Performed | Findings |
|---|---|---|
| Inspection of interior and exterior of treatment facility was conducted. | Visual | Negative |
| | | |
| | | |

**VISITORS AND DISCUSSION:**

11/05 Bay West personnel Steve Thornton and John Olson onsite for inspection, also Mark Haukeli with General Pump Mechanics**.**

URS personnel onsite for F.A.F.B work.

**QUALITY CONTROL REPORT**

**QUALITY AND/OR PRODUCTION ISSUES AND RESOLUTIONS:**

- None
-

**CHANGED CONDITIONS/DELAY/CONFLICTS ENCOUNTERED** (List any conflicts with the delivery order [i.e., scope of work and/or drawings], delays to the project attributable to site and weather conditions, etc.)**:**

- None
-

**REGULATORY COMPLIANCE ISSUES:**

- None

**INSPECTION RESULTS:**

- No inspection required

**TRANSPORTATION AND DISPOSAL**

**TRANSPORTATION AND DISPOSAL ACTIVITIES/SUMMARY OF QUANTITIES:**

- None

**GENERAL COMMENTS**

**General Comments~** (rework, directives, etc.): Heavy truck traffic from Army Reserve seems to be increasing cracks in paved access road by the plant. This will continue to be monitored and base staff will be alerted.

NA

**ATTACHMENTS**

**List of Attachments:** (examples, as applicable: submittals, meeting minutes, safety meeting minutes,, COCs, weight tickets, manifests, profiles, rework item list, etc.):

NA

NOTE: Write all entries legibly in ink. Line out all unused portions or designate as "not applicable". Preparer signs first name, middle initial and last name on each completed daily inspection record. This form may be filled out electronically and signed electronically.

| PREPARER'S SIGNATURE | DATE |
|---|---|
| Al Samford | 11/06/2015 |

| ***Bay West*** ***ENVIRONMENTAL*** CONTRACT NUMBER FA8903-14-C-0011 | **DAILY REPORT** Version 1.0 (ATTACH ADDITIONAL SHEETS IF NECESSARY) | REPORT DATE: 11/02-06/2015 REVISION NO: REVISION DATE: REPORT NO: #2 November, 2015 |
|---|---|---|

| | | | |
|---|---|---|---|
| TASK ORDER NO: 005 | PROJECT NAME / LOCATION: Fairchild AFB, CRL RA-O | | |
| PROJECT NUMBER: J130130 | PROJECT DESCRIPTION: Treatment plant operations. | | |
| PROJECT MANAGER: Steve Thornton | QC REPRESENTATIVE: A. Samford | | PREPARED BY: A. Samford |
| AM WEATHER: 62 F | PM WEATHER: N/A | MAX TEMP: N/A | MIN TEMP: N/A |

**TAILGATE TOPICS:**

**SAFETY ACTIONS TAKEN TODAY/SAFETY INSPECTIONS CONDUCTED** (Include Safety Violations, Corrective Instructions Given, Corrective Actions Taken, and Results of Safety Inspections Conducted):

- Steel toe work boots, gloves and hearing protection were worn.

**EQUIPMENT ON HAND**

| Description of Equipment | Make/Model/Manufacturer | Equipment ID Number | Inspection Performed By |
|---|---|---|---|
| NA | | | |
| | | | |
| | | | |
| | | | |

**COMMENTS (acceptance status, inspection findings, etc.):**

**MATERIALS DELIVERED TO JOB SITE**

| Description of Materials Received | Make/Model/Manufacturer | Equipment Lot Number | Inspection Performed By | Number/ Volume/ Weight |
|---|---|---|---|---|
| NA | | | | |
| | | | | |
| | | | | |
| | | | | |

**COMMENTS (acceptance status, inspection findings, etc.):**

**WORK FORCE – CONTRACTOR AND SUBCONTRACTOR**

| Employee | Work Performed | Employer | Employee Number | Title/Trade | Hours |
|---|---|---|---|---|---|
| Al Samford | Treatment facility was inspected and weekly o/m was completed. SDA–SVE weekly inspection conducted. | Bay West Environmental | 00628 | Technician/Operator | 25 |
| Jacob | Troubleshoot H- 300 heater malfunction. | Northwest Heating and Cooling | NA | Technician | 1.5 |
| | | | | | |

**WORK AND/OR TESTS ACCOMPLISHED OR IN PROGRESS**

Work performed at CRL:

- Treatment facility was inspected daily.
- Weekly o/m was completed, quarterly o/m continued.
- VFD upper setting is 39 HZ and lower setting is 33 HZ.
- 11/09 Northwest Heating technician onsite for troubleshooting defective H-300 heater.
- 11/10 Cap inspection was completed for NDA and SDA.
- Extraction well # 10 was cycled approximately 9.5 hours for the week.
- 11/11 samples for Cr6 were collected from CRL influent and extraction wells #9, #10 and #14. Influent sample was transported to T.A. in Spokane Valley.
- Extraction well #14 is operational approximately 25 hours per week.
- 11/12 Extraction well #3 defective flow sensor was replaced with a new Data Industrial flow sensor.
- Cr6 sampling is conducted daily from treatment influent.
- SDA-SVE remains offline, equipment and shed will be inspected weekly. No parameters were noted and SVE remains offline.

**Planned Work / Test for Tomorrow**:

- 04/01 Continuous 24/7 treatment operations resumed at CRL. Daily operation includes inspection of treatment facilities and weekly inspection of SDA-SVE equipment and shed.

**INSPECTIONS PERFORMED**

| Task/Activity | Inspection Performed | Findings |
|---|---|---|
| Inspection of interior and exterior of treatment facility was conducted. | Visual | Negative |
| | | |
| | | |

**VISITORS AND DISCUSSION:**

11/09 Northwest Heating technician onsite for troubleshooting H-300 heater problems.

**QUALITY CONTROL REPORT**

**QUALITY AND/OR PRODUCTION ISSUES AND RESOLUTIONS:**

- None
-

**CHANGED CONDITIONS/DELAY/CONFLICTS ENCOUNTERED** (List any conflicts with the delivery order [i.e., scope of work and/or drawings], delays to the project attributable to site and weather conditions, etc.)**:**

- None
-

**REGULATORY COMPLIANCE ISSUES:**

- None

**INSPECTION RESULTS:**

- No inspection required

**TRANSPORTATION AND DISPOSAL**

**TRANSPORTATION AND DISPOSAL ACTIVITIES/SUMMARY OF QUANTITIES:**

- None

**GENERAL COMMENTS**

**General Comments~** (rework, directives, etc.): Heavy truck traffic from Army Reserve seems to be increasing cracks in paved access road by the plant. This will continue to be monitored and base staff will be alerted.

NA

**ATTACHMENTS**

**List of Attachments:** (examples, as applicable: submittals, meeting minutes, safety meeting minutes,, COCs, weight tickets, manifests, profiles, rework item list, etc.):

NA

NOTE: Write all entries legibly in ink. Line out all unused portions or designate as "not applicable". Preparer signs first name, middle initial and last name on each completed daily inspection record. This form may be filled out electronically and signed electronically.

Al Samford

PREPARER'S SIGNATURE

Al Samford

11/13/2015

DATE

| ***Bay West*** ***ENVIRONMENTAL*** CONTRACT NUMBER FA8903-14-C-0011 | **DAILY REPORT** Version 1.0 (ATTACH ADDITIONAL SHEETS IF NECESSARY) | REPORT DATE: 11/16-20/2015 REVISION NO: REVISION DATE: REPORT NO: #3 November, 2015 |
|---|---|---|

| | | | |
|---|---|---|---|
| TASK ORDER NO: 005 | PROJECT NAME / LOCATION: Fairchild AFB, CRL RA-O | | |
| PROJECT NUMBER: J130130 | PROJECT DESCRIPTION: Treatment plant operations. | | |
| PROJECT MANAGER: Steve Thornton | QC REPRESENTATIVE: A. Samford | | PREPARED BY: A. Samford |
| AM WEATHER: 60 F | PM WEATHER: N/A | MAX TEMP: N/A | MIN TEMP: N/A |

**TAILGATE TOPICS:**

**SAFETY ACTIONS TAKEN TODAY/SAFETY INSPECTIONS CONDUCTED** (Include Safety Violations, Corrective Instructions Given, Corrective Actions Taken, and Results of Safety Inspections Conducted):

- Steel toe work boots, gloves and hearing protection were worn.

**EQUIPMENT ON HAND**

| Description of Equipment | Make/Model/Manufacturer | Equipment ID Number | Inspection Performed By |
|---|---|---|---|
| NA | | | |
| | | | |
| | | | |
| | | | |

**COMMENTS (acceptance status, inspection findings, etc.):**

**MATERIALS DELIVERED TO JOB SITE**

| Description of Materials Received | Make/Model/Manufacturer | Equipment Lot Number | Inspection Performed By | Number/ Volume/ Weight |
|---|---|---|---|---|
| NA | | | | |
| | | | | |
| | | | | |
| | | | | |

**COMMENTS (acceptance status, inspection findings, etc.):**

**WORK FORCE – CONTRACTOR AND SUBCONTRACTOR**

| Employee | Work Performed | Employer | Employee Number | Title/Trade | Hours |
|---|---|---|---|---|---|
| Al Samford | Treatment facility was inspected and weekly o/m was completed. SDA–SVE weekly inspection conducted. | Bay West Environmental | 00628 | Technician/Operator | 25 |
| | | | | | |
| | | | | | |

**WORK AND/OR TESTS ACCOMPLISHED OR IN PROGRESS**

Work performed at CRL:

- Treatment facility was inspected daily.
- Weekly o/m was completed. Quarterly o/m continued.
- VFD upper setting is 39 HZ and lower setting is 33 HZ.
- 11/17 CRL received a weather related power outage. Treatment facility sustained no structural damage.
- 11/17 P-201 stripper pump was serviced.
- Extraction well # 10 was cycled approximately 7 hours for the week.
- 11/18 Cr6 sampling was conducted for influent and extraction wells #9, #10 and #14. Influent sample was transported to T.A. in Spokane Valley.
- Extraction well #14 is operational approximately 25 hours per week.
- 11/19 Vegetative debris was removed from entrance gate and perimeter fence area.
- 11/20 P-201 process flow sensor was serviced. 301train is service ready.
- Cr6 sampling is conducted daily from treatment influent.
- SDA-SVE remains offline, equipment and shed will be inspected weekly. No parameters were noted and SVE remains offline.

**Planned Work / Test for Tomorrow**:

- 04/01 Continuous 24/7 treatment operations resumed at CRL. Daily operation includes inspection of treatment facilities and weekly inspection of SDA-SVE equipment and shed.

**INSPECTIONS PERFORMED**

| Task/Activity | Inspection Performed | Findings |
|---|---|---|
| Inspection of interior and exterior of treatment facility was conducted. | Visual | Negative |
| | | |
| | | |

**VISITORS AND DISCUSSION:**

**None**

**QUALITY CONTROL REPORT**

**QUALITY AND/OR PRODUCTION ISSUES AND RESOLUTIONS:**

- None
-

**CHANGED CONDITIONS/DELAY/CONFLICTS ENCOUNTERED** (List any conflicts with the delivery order [i.e., scope of work and/or drawings], delays to the project attributable to site and weather conditions, etc.)**:**

- None
-

**REGULATORY COMPLIANCE ISSUES:**

- None

**INSPECTION RESULTS:**

- No inspection required

**TRANSPORTATION AND DISPOSAL**

**TRANSPORTATION AND DISPOSAL ACTIVITIES/SUMMARY OF QUANTITIES:**

- None

**GENERAL COMMENTS**

**General Comments~** (rework, directives, etc.): Heavy truck traffic from Army Reserve seems to be increasing cracks in paved access road by the plant. This will continue to be monitored and base staff will be alerted.

NA

**ATTACHMENTS**

**List of Attachments:** (examples, as applicable: submittals, meeting minutes, safety meeting minutes,, COCs, weight tickets, manifests, profiles, rework item list, etc.):

NA

NOTE: Write all entries legibly in ink. Line out all unused portions or designate as "not applicable". Preparer signs first name, middle initial and last name on each completed daily inspection record. This form may be filled out electronically and signed electronically.

PREPARER'S SIGNATURE — DATE

Al Samford — 11/20/2015

| ***Bay West*** ***ENVIRONMENTAL*** CONTRACT NUMBER FA8903-14-C-0011 | **DAILY REPORT** Version 1.0 (ATTACH ADDITIONAL SHEETS IF NECESSARY) | REPORT DATE: 11/23-27/2015 REVISION NO: REVISION DATE: REPORT NO: #4 November, 2015 |
|---|---|---|

| | | | |
|---|---|---|---|
| TASK ORDER NO: 005 | PROJECT NAME / LOCATION: Fairchild AFB, CRL RA-O | | |
| PROJECT NUMBER: J130130 | PROJECT DESCRIPTION: Treatment plant operations. | | |
| PROJECT MANAGER: Steve Thornton | QC REPRESENTATIVE: A. Samford | | PREPARED BY: A. Samford |
| AM WEATHER: 59 F | PM WEATHER: N/A | MAX TEMP: N/A | MIN TEMP: N/A |

**TAILGATE TOPICS:**

**SAFETY ACTIONS TAKEN TODAY/SAFETY INSPECTIONS CONDUCTED** (Include Safety Violations, Corrective Instructions Given, Corrective Actions Taken, and Results of Safety Inspections Conducted):

- Steel toe work boots, gloves and hearing protection were worn.
- 11/25 Safety briefing given to Northwest Heating technician (John) whom was onsite for heater repairs. Escort was provided by A. Samford.

**EQUIPMENT ON HAND**

| Description of Equipment | Make/Model/Manufacturer | Equipment ID Number | Inspection Performed By |
|---|---|---|---|
| NA | | | |
| | | | |
| | | | |
| | | | |

**COMMENTS (acceptance status, inspection findings, etc.):**

**MATERIALS DELIVERED TO JOB SITE**

| Description of Materials Received | Make/Model/Manufacturer | Equipment Lot Number | Inspection Performed By | Number/ Volume/ Weight |
|---|---|---|---|---|
| NA | | | | |
| | | | | |
| | | | | |
| | | | | |

**COMMENTS (acceptance status, inspection findings, etc.):**

**WORK FORCE – CONTRACTOR AND SUBCONTRACTOR**

| Employee | Work Performed | Employer | Employee Number | Title/Trade | Hours |
|---|---|---|---|---|---|
| Al Samford | Treatment facility was inspected and weekly o/m was completed. SDA–SVE weekly inspection conducted. | Bay West Environmental | 00628 | Technician/Operator | 25 |
| John | Trouble shoot/ make repairs to H-300 gas valve. | Northwest Heating | NA | Technician | 1 |
| | | | | | |

**WORK AND/OR TESTS ACCOMPLISHED OR IN PROGRESS**

Work performed at CRL:

- Treatment facility was inspected daily.
- Weekly o/m was completed. Quarterly o/m continued.
- 300 train VFD upper setting is 38 HZ and lower setting is 33 HZ.
- 11/24 Cr6 sampling was conducted for influent and extraction wells #9, #10 and #14. Influent sample was transported to T.A. in Spokane Valley.
- 11/25 Staff gauge was installed at WP-036.
- 11/25 Northwest Heating onsite for repairs to H-300 heater. H-300 gas valve was not replaced due to difficulty with burner removal. Repairs will be rescheduled for later date.
- 11/27 Train was swapped from 300 to 301.
- 11/27 B-301 blower filters were replaced.
- Extraction well #14 is operational approximately 25 hours per week.
- Cr6 sampling is conducted daily from treatment influent.
- SDA-SVE remains offline, equipment and shed will be inspected weekly. No parameters were noted and SVE remains offline.

**Planned Work / Test for Tomorrow**:

- 04/01 Continuous 24/7 treatment operations resumed at CRL. Daily operation includes inspection of treatment facilities and weekly inspection of SDA-SVE equipment and shed.

**INSPECTIONS PERFORMED**

| Task/Activity | Inspection Performed | Findings |
|---|---|---|
| Inspection of interior and exterior of treatment facility was conducted. | Visual | Negative |
| | | |
| | | |

**VISITORS AND DISCUSSION:**

Northwest Heating technician (John) onsite for repairs for H-300 heater.

**QUALITY CONTROL REPORT**

**QUALITY AND/OR PRODUCTION ISSUES AND RESOLUTIONS:**

- None
-

**CHANGED CONDITIONS/DELAY/CONFLICTS ENCOUNTERED** (List any conflicts with the delivery order [i.e., scope of work and/or drawings], delays to the project attributable to site and weather conditions, etc.)**:**

- None
-

**REGULATORY COMPLIANCE ISSUES:**

- None

**INSPECTION RESULTS:**

- No inspection required

**TRANSPORTATION AND DISPOSAL**

**TRANSPORTATION AND DISPOSAL ACTIVITIES/SUMMARY OF QUANTITIES:**

- None

**GENERAL COMMENTS**

**General Comments~** (rework, directives, etc.): Heavy truck traffic from Army Reserve seems to be increasing cracks in paved access road by the plant. This will continue to be monitored and base staff will be alerted.

NA

**ATTACHMENTS**

**List of Attachments:** (examples, as applicable: submittals, meeting minutes, safety meeting minutes,, COCs, weight tickets, manifests, profiles, rework item list, etc.):

NA

NOTE: Write all entries legibly in ink. Line out all unused portions or designate as "not applicable". Preparer signs first name, middle initial and last name on each completed daily inspection record. This form may be filled out electronically and signed electronically.

Al Samford

PREPARER'S SIGNATURE — DATE

Al Samford — 11/27/2015

| ***Bay West*** ***ENVIRONMENTAL*** CONTRACT NUMBER FA8903-14-C-0011 | **DAILY REPORT** Version 1.0 (ATTACH ADDITIONAL SHEETS IF NECESSARY) | REPORT DATE: 11/30-12/04/2015 REVISION NO: REVISION DATE: REPORT NO: #1 December, 2015 |
|---|---|---|

| | | | |
|---|---|---|---|
| TASK ORDER NO: 005 | PROJECT NAME / LOCATION: Fairchild AFB, CRL RA-O | | |
| PROJECT NUMBER: J130130 | PROJECT DESCRIPTION: Treatment plant operations. | | |
| PROJECT MANAGER: Steve Thornton | QC REPRESENTATIVE: A. Samford | | PREPARED BY: A. Samford |
| AM WEATHER: 32 F | PM WEATHER: N/A | MAX TEMP: N/A | MIN TEMP: N/A |

**TAILGATE TOPICS:**

**SAFETY ACTIONS TAKEN TODAY/SAFETY INSPECTIONS CONDUCTED** (Include Safety Violations, Corrective Instructions Given, Corrective Actions Taken, and Results of Safety Inspections Conducted):

- Steel toe work boots, gloves and hearing protection were worn.
- 12/01 Safety briefing given to Northwest Heating technician (Jeremy) onsite for heater repair assessment. Escort was provided by A. Samford.

**EQUIPMENT ON HAND**

| Description of Equipment | Make/Model/Manufacturer | Equipment ID Number | Inspection Performed By |
|---|---|---|---|
| NA | | | |
| | | | |
| | | | |
| | | | |

**COMMENTS (acceptance status, inspection findings, etc.):**

**MATERIALS DELIVERED TO JOB SITE**

| Description of Materials Received | Make/Model/Manufacturer | Equipment Lot Number | Inspection Performed By | Number/ Volume/ Weight |
|---|---|---|---|---|
| NA | | | | |
| | | | | |
| | | | | |
| | | | | |

**COMMENTS (acceptance status, inspection findings, etc.):**

**WORK FORCE – CONTRACTOR AND SUBCONTRACTOR**

| Employee | Work Performed | Employer | Employee Number | Title/Trade | Hours |
|---|---|---|---|---|---|
| Al Samford | Treatment facility was inspected and weekly o/m was completed. SDA–SVE weekly inspection conducted. | Bay West Environmental | 00628 | Technician/Operator | 25 |
| Jeremy | Assess repairs required for H-300 heater. | Northwest Heating | NA | Technician | 1 |
| | | | | | |

**WORK AND/OR TESTS ACCOMPLISHED OR IN PROGRESS**

Work performed at CRL:

- Treatment facility was inspected daily.
- Weekly o/m was completed. Quarterly o/m continued.
- 301 VFD upper setting is 38 HZ and lower setting is 33 HZ.
- 12/02 Cr6 sampling was conducted for influent and extraction wells #9, #10 and #14. Influent sample was transported to T.A. in Spokane Valley.
- Extraction well #10 was operational approximately 16 hours.
- URS supplies and coolers were transported to CRL.
- Cr6 sampling is conducted daily from treatment influent.
- SDA-SVE remains offline, equipment and shed will be inspected weekly. No parameters were noted and SVE remains offline.

**Planned Work / Test for Tomorrow**:

- 04/01 Continuous 24/7 treatment operations resumed at CRL. Daily operation includes inspection of treatment facilities and weekly inspection of SDA-SVE equipment and shed.

**INSPECTIONS PERFORMED**

| Task/Activity | Inspection Performed | Findings |
|---|---|---|
| Inspection of interior and exterior of treatment facility was conducted. | Visual | Negative |
| | | |
| | | |

**VISITORS AND DISCUSSION:**

Northwest Heating technician (Jeremy) onsite for H-300 heater assesement.

**QUALITY CONTROL REPORT**

**QUALITY AND/OR PRODUCTION ISSUES AND RESOLUTIONS:**

- None
-

**CHANGED CONDITIONS/DELAY/CONFLICTS ENCOUNTERED** (List any conflicts with the delivery order [i.e., scope of work and/or drawings], delays to the project attributable to site and weather conditions, etc.)**:**

- None
-

**REGULATORY COMPLIANCE ISSUES:**

- None

**INSPECTION RESULTS:**

- No inspection required

**TRANSPORTATION AND DISPOSAL**

**TRANSPORTATION AND DISPOSAL ACTIVITIES/SUMMARY OF QUANTITIES:**

- None

**GENERAL COMMENTS**

**General Comments~** (rework, directives, etc.): Heavy truck traffic from Army Reserve seems to be increasing cracks in paved access road by the plant. This will continue to be monitored and base staff will be alerted.

NA

**ATTACHMENTS**

**List of Attachments:** (examples, as applicable: submittals, meeting minutes, safety meeting minutes,, COCs, weight tickets, manifests, profiles, rework item list, etc.):

NA

NOTE: Write all entries legibly in ink. Line out all unused portions or designate as "not applicable". Preparer signs first name, middle initial and last name on each completed daily inspection record. This form may be filled out electronically and signed electronically.

| PREPARER'S SIGNATURE | DATE |
|---|---|
| Al Samford | 12/04/2015 |

| ***Bay West*** ***ENVIRONMENTAL*** CONTRACT NUMBER FA8903-14-C-0011 | **DAILY REPORT** Version 1.0 (ATTACH ADDITIONAL SHEETS IF NECESSARY) | REPORT DATE: 12/07-11/2015 REVISION NO: REVISION DATE: REPORT NO: #2 December, 2015 |
|---|---|---|

| | | | |
|---|---|---|---|
| TASK ORDER NO: 005 | PROJECT NAME / LOCATION: Fairchild AFB, CRL RA-O | | |
| PROJECT NUMBER: J130130 | PROJECT DESCRIPTION: Treatment plant operations. | | |
| PROJECT MANAGER: Steve Thornton | QC REPRESENTATIVE: A. Samford | | PREPARED BY: A. Samford |
| AM WEATHER: 36 F | PM WEATHER: N/A | MAX TEMP: N/A | MIN TEMP: N/A |

**TAILGATE TOPICS:** Use of eye protection and wearing of steel toe boots.

**SAFETY ACTIONS TAKEN TODAY/SAFETY INSPECTIONS CONDUCTED** (Include Safety Violations, Corrective Instructions Given, Corrective Actions Taken, and Results of Safety Inspections Conducted):

- Steel toe work boots, gloves and hearing protection were worn.
- 12/07 Safety briefing given to Northwest Heating technicians (Jeremy and Ricky) onsite for gas heater repair. Escort was provided by A. Samford.

**EQUIPMENT ON HAND**

| Description of Equipment | Make/Model/Manufacturer | Equipment ID Number | Inspection Performed By |
|---|---|---|---|
| NA | | | |
| | | | |
| | | | |
| | | | |

**COMMENTS (acceptance status, inspection findings, etc.):**

**MATERIALS DELIVERED TO JOB SITE**

| Description of Materials Received | Make/Model/Manufacturer | Equipment Lot Number | Inspection Performed By | Number/ Volume/ Weight |
|---|---|---|---|---|
| NA | | | | |
| | | | | |
| | | | | |
| | | | | |

**COMMENTS (acceptance status, inspection findings, etc.):**

**WORK FORCE – CONTRACTOR AND SUBCONTRACTOR**

| Employee | Work Performed | Employer | Employee Number | Title/Trade | Hours |
|---|---|---|---|---|---|
| Al Samford | Treatment facility was inspected and weekly o/m was completed. SDA–SVE weekly inspection conducted. | Bay West Environmental | 00628 | Technician/Operator | 25 |
| Jeremy/Ricky | Perform H-300 heater repairs. | Northwest Heating | NA | Technician | 1.5 |
| | | | | | |

**WORK AND/OR TESTS ACCOMPLISHED OR IN PROGRESS**

Work performed at CRL:

- Treatment facility was inspected daily.
- Weekly o/m was completed. Quarterly o/m continued.
- 301 VFD upper setting is 38 HZ and lower setting is 33 HZ.
- North West Heating replaced H-300 gas Valve.
- 12/09 Cr6 sampling was conducted for influent and extraction wells #9, #10 and #14. Influent sample was transported to T.A. in Spokane Valley.
- Extraction well #10 was operational approximately 14.5 hours.
- Cr6 sampling is conducted daily from treatment influent.
- SDA-SVE remains offline, equipment and shed will be inspected weekly. No parameters were noted and SVE remains offline.

**Planned Work / Test for Tomorrow**:

- 04/01 Continuous 24/7 treatment operations resumed at CRL. Daily operation includes inspection of treatment facilities and weekly inspection of SDA-SVE equipment and shed.

**INSPECTIONS PERFORMED**

| Task/Activity | Inspection Performed | Findings |
|---|---|---|
| Inspection of interior and exterior of treatment facility was conducted. | Visual | Negative |
| | | |
| | | |

**VISITORS AND DISCUSSION:**

Northwest Heating technician (Jeremy and Ricky) onsite for H-300 heater repairs.

**QUALITY CONTROL REPORT**

**QUALITY AND/OR PRODUCTION ISSUES AND RESOLUTIONS:**

- None
-

**CHANGED CONDITIONS/DELAY/CONFLICTS ENCOUNTERED** (List any conflicts with the delivery order [i.e., scope of work and/or drawings], delays to the project attributable to site and weather conditions, etc.)**:**

- None
-

**REGULATORY COMPLIANCE ISSUES:**

- None

**INSPECTION RESULTS:**

- No inspection required

**TRANSPORTATION AND DISPOSAL**

**TRANSPORTATION AND DISPOSAL ACTIVITIES/SUMMARY OF QUANTITIES:**

- None

**GENERAL COMMENTS**

**General Comments~** (rework, directives, etc.): Heavy truck traffic from Army Reserve seems to be increasing cracks in paved access road by the plant. This will continue to be monitored and base staff will be alerted.

NA

**ATTACHMENTS**

**List of Attachments:** (examples, as applicable: submittals, meeting minutes, safety meeting minutes,, COCs, weight tickets, manifests, profiles, rework item list, etc.):

NA

NOTE: Write all entries legibly in ink. Line out all unused portions or designate as "not applicable". Preparer signs first name, middle initial and last name on each completed daily inspection record. This form may be filled out electronically and signed electronically.

| PREPARER'S SIGNATURE | DATE |
|---|---|
| Al Samford | 12/11/2015 |

| ***Bay West*** ***ENVIRONMENTAL*** CONTRACT NUMBER FA8903-14-C-0011 | **DAILY REPORT** Version 1.0 (ATTACH ADDITIONAL SHEETS IF NECESSARY) | REPORT DATE: 12/14-18/2015 REVISION NO: REVISION DATE: REPORT NO: #3 December, 2015 |
|---|---|---|

| | | | |
|---|---|---|---|
| TASK ORDER NO: 005 | PROJECT NAME / LOCATION: Fairchild AFB, CRL RA-O | | |
| PROJECT NUMBER: J130130 | PROJECT DESCRIPTION: Treatment plant operations. | | |
| PROJECT MANAGER: Steve Thornton | QC REPRESENTATIVE: A. Samford | | PREPARED BY: A. Samford |
| AM WEATHER: 32 F | PM WEATHER: N/A | MAX TEMP: N/A | MIN TEMP: N/A |

**TAILGATE TOPICS:** Use of eye protection and wearing of steel toe boots.

**SAFETY ACTIONS TAKEN TODAY/SAFETY INSPECTIONS CONDUCTED** (Include Safety Violations, Corrective Instructions Given, Corrective Actions Taken, and Results of Safety Inspections Conducted):

- Steel toe work boots, gloves and hearing protection were worn.
- 12/14 Safety briefing given to Northwest Heating technician (Jeremy) onsite for gas heater repair. Escort was provided by A. Samford.

**EQUIPMENT ON HAND**

| Description of Equipment | Make/Model/Manufacturer | Equipment ID Number | Inspection Performed By |
|---|---|---|---|
| NA | | | |
| | | | |
| | | | |
| | | | |

**COMMENTS (acceptance status, inspection findings, etc.):**

**MATERIALS DELIVERED TO JOB SITE**

| Description of Materials Received | Make/Model/Manufacturer | Equipment Lot Number | Inspection Performed By | Number/ Volume/ Weight |
|---|---|---|---|---|
| NA | | | | |
| | | | | |
| | | | | |
| | | | | |

**COMMENTS (acceptance status, inspection findings, etc.):**

**WORK FORCE – CONTRACTOR AND SUBCONTRACTOR**

| Employee | Work Performed | Employer | Employee Number | Title/Trade | Hours |
|---|---|---|---|---|---|
| Al Samford | Treatment facility was inspected and weekly o/m was completed. SDA–SVE weekly inspection conducted. | Bay West Environmental | 00628 | Technician/Operator | 25 |
| Jeremy | Install new ignition module for H-300 heater. | Northwest Heating | NA | Technician | 1 |
| | | | | | |

**WORK AND/OR TESTS ACCOMPLISHED OR IN PROGRESS**

Work performed at CRL:

- Treatment facility was inspected daily.
- Weekly o/m was completed.
- 301 VFD upper setting is 38 HZ and lower setting is 33 HZ.
- North West Heating replaced H-300 ignition module.
- 12/16 Cr6 sampling was conducted for influent and extraction wells #9, #10 and #14. Influent sample was transported to T.A. in Spokane Valley.
- 12/17 Stakes were placed for RW-011 and WP-036 locates.
- 12/18 SVE shed roof repairs were made. A tarp was installed on the Westside of structure roof to cover missing shingles that were lost during recent wind storms.
- Extraction well #10 was operational approximately 5 hours.
- Cr6 sampling is conducted daily from treatment influent.
- SDA-SVE remains offline, equipment and shed will be inspected weekly. No parameters were noted and SVE remains offline.

**Planned Work / Test for Tomorrow**:

- 04/01 Continuous 24/7 treatment operations resumed at CRL. Daily operation includes inspection of treatment facilities and weekly inspection of SDA-SVE equipment and shed.

**INSPECTIONS PERFORMED**

| Task/Activity | Inspection Performed | Findings |
|---|---|---|
| Inspection of interior and exterior of treatment facility was conducted. | Visual | Negative |
| | | |
| | | |

**VISITORS AND DISCUSSION:**

12/14 Northwest Heating technician (Jeremy) onsite for H-300 heater ignition module install.

**QUALITY CONTROL REPORT**

**QUALITY AND/OR PRODUCTION ISSUES AND RESOLUTIONS:**

- None
-

**CHANGED CONDITIONS/DELAY/CONFLICTS ENCOUNTERED** (List any conflicts with the delivery order [i.e., scope of work and/or drawings], delays to the project attributable to site and weather conditions, etc.)**:**

- None
-

**REGULATORY COMPLIANCE ISSUES:**

- None

**INSPECTION RESULTS:**

- No inspection required

**TRANSPORTATION AND DISPOSAL**

**TRANSPORTATION AND DISPOSAL ACTIVITIES/SUMMARY OF QUANTITIES:**

- None

**GENERAL COMMENTS**

**General Comments~** (rework, directives, etc.): Heavy truck traffic from Army Reserve seems to be increasing cracks in paved access road by the plant. This will continue to be monitored and base staff will be alerted.

NA

**ATTACHMENTS**

**List of Attachments:** (examples, as applicable: submittals, meeting minutes, safety meeting minutes,, COCs, weight tickets, manifests, profiles, rework item list, etc.):

NA

NOTE: Write all entries legibly in ink. Line out all unused portions or designate as "not applicable". Preparer signs first name, middle initial and last name on each completed daily inspection record. This form may be filled out electronically and signed electronically.

Al Samford

PREPARER'S SIGNATURE — DATE

Al Samford — 12/18/2015

| ***Bay West*** ***ENVIRONMENTAL*** CONTRACT NUMBER FA8903-14-C-0011 | **DAILY REPORT** Version 1.0 (ATTACH ADDITIONAL SHEETS IF NECESSARY) | REPORT DATE: 12/21-25/2015 REVISION NO: REVISION DATE: REPORT NO: #4 December, 2015 |
|---|---|---|

| | | | |
|---|---|---|---|
| TASK ORDER NO: 005 | PROJECT NAME / LOCATION: Fairchild AFB, CRL RA-O | | |
| PROJECT NUMBER: J130130 | PROJECT DESCRIPTION: Treatment plant operations. | | |
| PROJECT MANAGER: Steve Thornton | QC REPRESENTATIVE: A. Samford | | PREPARED BY: A. Samford |
| AM WEATHER: 30 F | PM WEATHER: N/A | MAX TEMP: N/A | MIN TEMP: N/A |

**TAILGATE TOPICS:**

**SAFETY ACTIONS TAKEN TODAY/SAFETY INSPECTIONS CONDUCTED** (Include Safety Violations, Corrective Instructions Given, Corrective Actions Taken, and Results of Safety Inspections Conducted):

- Steel toe work boots, gloves and hearing protection were worn.

**EQUIPMENT ON HAND**

| Description of Equipment | Make/Model/Manufacturer | Equipment ID Number | Inspection Performed By |
|---|---|---|---|
| NA | | | |
| | | | |
| | | | |
| | | | |

**COMMENTS (acceptance status, inspection findings, etc.):**

**MATERIALS DELIVERED TO JOB SITE**

| Description of Materials Received | Make/Model/Manufacturer | Equipment Lot Number | Inspection Performed By | Number/ Volume/ Weight |
|---|---|---|---|---|
| NA | | | | |
| | | | | |
| | | | | |
| | | | | |

**COMMENTS (acceptance status, inspection findings, etc.):**

**WORK FORCE – CONTRACTOR AND SUBCONTRACTOR**

| Employee | Work Performed | Employer | Employee Number | Title/Trade | Hours |
|---|---|---|---|---|---|
| Al Samford | Treatment facility was inspected and weekly o/m was completed. SDA–SVE weekly inspection conducted. | Bay West Environmental | 00628 | Technician/Operator | 20 |
| | | | | | |
| | | | | | |

**WORK AND/OR TESTS ACCOMPLISHED OR IN PROGRESS**

Work performed at CRL:

- Treatment facility was inspected daily.
- Weekly o/m was completed. Quarterly o/m continued.
- 301 VFD upper setting is 38 HZ and lower setting is 33 HZ.
- 12/21 4th quarter LTM off-gas sampling was conducted and samples shipped to Test America Laboratories.
- 12/23 Cr6 sampling was conducted for influent and extraction wells #9, #10 and #14. Influent sample was transported to T.A. in Spokane Valley.
- Partial flush was conducted on T-100 and T-101 surge tanks.
- Extraction well #10 was operational approximately 5 hours.
- Cr6 sampling is conducted daily from treatment influent.
- SDA-SVE remains offline, equipment and shed will be inspected weekly. No parameters were noted and SVE remains offline.

**Planned Work / Test for Tomorrow**:

- 04/01 Continuous 24/7 treatment operations resumed at CRL. Daily operation includes inspection of treatment facilities and weekly inspection of SDA-SVE equipment and shed.

**INSPECTIONS PERFORMED**

| Task/Activity | Inspection Performed | Findings |
|---|---|---|
| Inspection of interior and exterior of treatment facility was conducted. | Visual | Negative |
| | | |
| | | |

**VISITORS AND DISCUSSION:**

**QUALITY CONTROL REPORT**

**QUALITY AND/OR PRODUCTION ISSUES AND RESOLUTIONS:**

- None
-

**CHANGED CONDITIONS/DELAY/CONFLICTS ENCOUNTERED** (List any conflicts with the delivery order [i.e., scope of work and/or drawings], delays to the project attributable to site and weather conditions, etc.)**:**

- None
-

**REGULATORY COMPLIANCE ISSUES:**

- None

**INSPECTION RESULTS:**

- No inspection required

**TRANSPORTATION AND DISPOSAL**

**TRANSPORTATION AND DISPOSAL ACTIVITIES/SUMMARY OF QUANTITIES:**

- None

**GENERAL COMMENTS**

**General Comments~** (rework, directives, etc.): Heavy truck traffic from Army Reserve seems to be increasing cracks in paved access road by the plant. This will continue to be monitored and base staff will be alerted.

NA

**ATTACHMENTS**

**List of Attachments:** (examples, as applicable: submittals, meeting minutes, safety meeting minutes,, COCs, weight tickets, manifests, profiles, rework item list, etc.):

NA

NOTE: Write all entries legibly in ink. Line out all unused portions or designate as "not applicable". Preparer signs first name, middle initial and last name on each completed daily inspection record. This form may be filled out electronically and signed electronically.

| PREPARER'S SIGNATURE | DATE |
|---|---|
| Al Samford | 12/25/2015 |

# Appendix F.5
# CAP Inspection

# Craig Road Landfill Cover Inspection

**Inspection Date** November 10, 2015

**Inspector's Name and Title** AL SamFord (Print Name) Operator (Title)

| Inspection of | Condition (Check One) Adequate/ Stable | Damaged / Deteriorating | Action Required? Yes | NO | Comments / Locations |
|---|---|---|---|---|---|
| 1. Facility Access Control System | ✓ | | | ✓ | |
| A. Security Fence | ✓ | | | ✓ | |
| B. Site Access Gates | ✓ | | | ✓ | |
| C. Warning Signs | ✓ | | | ✓ | |
| D. Access Roads | ✓ | | | ✓ | |
| E. Debris, Litter, and Waste | ✓ | | | ✓ | Debris removal is ongoing. |
| | | | | | |
| 2. Runon/Runoff Control Systems | ✓ | | | ✓ | |
| A. Cap Drainage System/ Toe Drains | ✓ | | | ✓ | |
| B. Site Drainage System | ✓ | | | ✓ | |
| 1. Vegetated Swales/Channels | ✓ | | | ✓ | |
| 2. Culverts | ✓ | | | ✓ | |
| C. Others | — | | | — | |
| | | | | | |
| 3. Passive Gas Venting System | ✓ | | | ✓ | |
| A. Vent/Turbines | ✓ | | | ✓ | MV-02 turbine ventilator has a bad bushing requires replacement. |
| | | | | | |

# Craig Road Landfill Cover Inspection

| Inspection of | Condition (Check One) | | Action Required? | | Comments / Locations |
|---|---|---|---|---|---|
| | Adequate/ Stable | Damaged / Deteriorating | Yes | NO | |
| 4. Final Cover System | ✓ | | | ✓ | |
| A. Vegetative Cover | ✓ | | | ✓ | |
| B. Erosion | ✓ | | | ✓ | |
| C. Settlement | ✓ | | | ✓ | |
| D. Animal Burrowing Activity | ✓ | | | ✓ | SMALL ANIMAL burrowing in both NDA-SDA, no action required. |
| E. Other | | | | | |
| | | | | | |
| 5. GTP Building Exterior | | | | | |
| | | | | | |

6. Notes

# Appendix F.6
# SRCAA Letter

Bay West
Customer-Focused Environmental & Industrial Solutions

Bay West LLC
5 Empire Drive, St. Paul, MN 55103
651-291-0456 * FAX 651-291-0099
www.baywest.com • info@baywest.com

February 3, 2016

April Westby
Spokane Regional Clean Air Agency
3104 E. Augusta Avenue
Spokane, Washington 99207

Dear Ms. Westby:

This letter provides results for the fourth quarter 2015 air sampling event at the Craig Road Landfill (CRL) groundwater treatment plant, which occurred on December 21, 2015. This quarterly sampling complies with Condition #4 of NOC #646.

Granular activated carbon (GAC) in the former lead unit (VC-401) was changed-out and replaced with virgin GAC in September 2010. The GAC units were switched after this change-out; the VC-400 is now the lead unit, and the VC-401 unit is lag (GAC in the VC-400 unit was last changed-out with virgin carbon in September 2003).

Air (offgas) samples were collected from (1) the influent into the lead GAC unit [400INF] and (2) effluent from the lag GAC unit [400 EFFL]. Both samples were analyzed using Method TO-15. Analytical data are attached for your reference. The sample locations and Client Sample IDs are identified as follows:

| | |
|---|---|
| 1) Influent into the lead GAC unit | LF002 A 400 INF |
| 2) Effluent from lag GAC unit | LF002 A 401 EFFL |

The effluent trichloroethene (TCE) concentration was 25 ppbv (130 µg/m$^3$) in December 2015. Calculations to estimate the mass of TCE emitted during the quarter are based on assumptions outlined in the attached tables. Based on these calculations, it is estimated that approximately 0.9130 pound of TCE was discharged to the atmosphere during the quarter. Cumulative TCE emissions through fourth quarter 2015 total approximately 1.947 pound.

If you have any questions or need additional information, please contact Marc Connally at Fairchild AFB at (509) 247-8148.

Sincerely,

Steve Thornton, PMP

Bay West LLC

Cc: Marc Connally, Fairchild AFB
Al Samford, Bay West

Attachments:
1) Data Tables
2) Analytical Results

*J130130*

## Estimated TCE Emissions from Craig Road Landfill GAC System for 2015

| Month | Measured TCE Effluent Conc. (ppbv) | Measured TCE Effluent Conc. ($ug/m^3$) | Volume of Air Discharged ($m^3$) (a) | Estimated Mass of TCE Emitted (pounds) | Quarterly Total (pounds) |
|---|---|---|---|---|---|
| Jan 2015 | | | 270,118 | 0.025 | |
| Feb 2015 | **7.6** | 41.5 | 180,180 | 0.016 | |
| Mar 2015 | | | 220,568 | 0.020 | **0.061 (b)** |
| Apr 2015 | | | 1,084,996 | 0.120 | |
| May 2015 | **9.3** | 50.0 | 1,159,304 | 0.128 | |
| Jun 2015 | | | 1,114,677 | 0.123 | **0.370 (c)** |
| Jul 2015 | | | 1,338,206 | 0.212 | |
| Aug 2015 | **13** | 72.0 | 1,221,502 | 0.194 | |
| Sep 2015 | | | 1,237,322 | 0.196 | **0.6027 (d)** |
| Oct 2015 | | | 1,142,061 | 0.327 | |
| Nov 2015 | **25** | 130.0 | 812,839 | 0.233 | |
| Dec 2015 | | | 1,230,696 | 0.353 | **0.9130 (e)** |
| | | | | **2015 Total to Date:** | **1.947** |

**Notes:**

(a) Equal to the daily discharge rate reading multiplied by actual operational time during the month.

(b) The total quarterly estimated mass of TCE emitted was calculated by using the total volume of air discharged during the quarter and the detect concentration for TCE of the March 2015 effluent sample. Information provided by Bhate Inc.

(c) The total quarterly estimated mass of TCE emitted was calculated using the total volume of air discharged during the quarter and the TCE concentration of the June 2015 effluent sample.

(d) The total quarterly estimated mass of TCE emitted was calculated using the total volume of air discharged during the quarter and the TCE concentration of the September 2015 effluent sample.

(e) The total quarterly estimated mass of TCE emitted was calculated using the total volume of air discharged during the quarter and the TCE concentration of the December 2015 effluent sample.

| TCE Conversion Calculations from Craig Road Landfill GAC System for 2015 | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Month** | **TCE Eff ($ug/m^3$)** | **Volume of Air Discharged ($m^3$)** | **Estimated Mass TCE (ug) TCE ($ug/m^3$) x volume ($m^3$) = TCE (ug)** | Convert to Mass TCE (g) (*10^-6) | **Estimated Mass TCE (g)** | Convert to Mass TCE (lbs) (/453.59) | **Mass TCE (lbs)** |
| 1st Q | **41.50** | **670,866** | **27,840,939** | = / 1,000,000 | **27.8409** | = /453.59 | **0.06** |
| 2nd Q | **50.0** | **3,358,977** | **167,948,840** | = / 1,000,000 | **167.95** | = /453.59 | **0.37** |
| 3rd Q | **72.0** | **3,797,029** | **273,386,104** | = / 1,000,000 | **273.3861** | = /453.59 | **0.6027** |
| 4th Q | **130.0** | **3,185,596** | **414,127,425** | = / 1,000,000 | **414.1274** | = /453.59 | **0.9130** |
| Total | | | | | | | **1.947** |

Information for 1st quarter provided by Bhate

# Client Sample Results

Client: Bay West Inc.
Project/Site: Fairchild AFB - Bay West

TestAmerica Job ID: 320-16568-1

## Client Sample ID: LF002 A 400 INF

**Lab Sample ID: 320-16568-1**

**Date Collected: 12/21/15 08:31**
**Matrix: Air**
**Date Received: 12/22/15 10:45**
**Sample Container: Summa Canister 6L**

### Method: TO-15 MOD - Volatile Organic Compounds in Ambient Air

| Analyte | Result | Qualifier | LOQ | LOD | DL | Unit | D | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| trans-1,2-Dichloroethene | 1.0 | U | 2.0 | 1.0 | 0.50 | ppb v/v | | 01/13/16 21:36 | 1 |
| **Trichloroethene** | **38** | | 4.0 | 2.0 | 0.53 | ppb v/v | | 01/13/16 21:36 | 1 |
| Vinyl chloride | 2.0 | U | 4.0 | 2.0 | 0.60 | ppb v/v | | 01/13/16 21:36 | 1 |

| Analyte | Result | Qualifier | LOQ | LOD | DL | Unit | D | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| trans-1,2-Dichloroethene | 4.0 | U | 7.9 | 4.0 | 2.0 | ug/m3 | | 01/13/16 21:36 | 1 |
| **Trichloroethene** | **210** | | 21 | 11 | 2.8 | ug/m3 | | 01/13/16 21:36 | 1 |
| Vinyl chloride | 5.1 | U | 10 | 5.1 | 1.5 | ug/m3 | | 01/13/16 21:36 | 1 |

## Client Sample ID: LF002 A 400A

**Lab Sample ID: 320-16568-2**

**Date Collected: 12/21/15 08:36**
**Matrix: Air**
**Date Received: 12/22/15 10:45**
**Sample Container: Summa Canister 6L**

### Method: TO-15 MOD - Volatile Organic Compounds in Ambient Air

| Analyte | Result | Qualifier | LOQ | LOD | DL | Unit | D | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| trans-1,2-Dichloroethene | 1.0 | U | 2.0 | 1.0 | 0.50 | ppb v/v | | 01/13/16 22:27 | 1 |
| **Trichloroethene** | **42** | | 4.0 | 2.0 | 0.53 | ppb v/v | | 01/13/16 22:27 | 1 |
| Vinyl chloride | 2.0 | U | 4.0 | 2.0 | 0.60 | ppb v/v | | 01/13/16 22:27 | 1 |

| Analyte | Result | Qualifier | LOQ | LOD | DL | Unit | D | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| trans-1,2-Dichloroethene | 4.0 | U | 7.9 | 4.0 | 2.0 | ug/m3 | | 01/13/16 22:27 | 1 |
| **Trichloroethene** | **220** | | 21 | 11 | 2.8 | ug/m3 | | 01/13/16 22:27 | 1 |
| Vinyl chloride | 5.1 | U | 10 | 5.1 | 1.5 | ug/m3 | | 01/13/16 22:27 | 1 |

## Client Sample ID: LF002 A 401 EFFL

**Lab Sample ID: 320-16568-3**

**Date Collected: 12/21/15 08:45**
**Matrix: Air**
**Date Received: 12/22/15 10:45**
**Sample Container: Summa Canister 6L**

### Method: TO-15 MOD - Volatile Organic Compounds in Ambient Air

| Analyte | Result | Qualifier | LOQ | LOD | DL | Unit | D | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| trans-1,2-Dichloroethene | 1.0 | U | 2.0 | 1.0 | 0.50 | ppb v/v | | 01/13/16 23:17 | 1 |
| **Trichloroethene** | **25** | | 4.0 | 2.0 | 0.53 | ppb v/v | | 01/13/16 23:17 | 1 |
| Vinyl chloride | 2.0 | U | 4.0 | 2.0 | 0.60 | ppb v/v | | 01/13/16 23:17 | 1 |

| Analyte | Result | Qualifier | LOQ | LOD | DL | Unit | D | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| trans-1,2-Dichloroethene | 4.0 | U | 7.9 | 4.0 | 2.0 | ug/m3 | | 01/13/16 23:17 | 1 |
| **Trichloroethene** | **130** | | 21 | 11 | 2.8 | ug/m3 | | 01/13/16 23:17 | 1 |
| Vinyl chloride | 5.1 | U | 10 | 5.1 | 1.5 | ug/m3 | | 01/13/16 23:17 | 1 |

# Appendix G
# Calculation

G.1 – Calculated EW Drawdown

G.2 – Plume Capture Analytical Model Results

G.3 – Groundwater Velocity Calculation

# Appendix G.1
# Calculated EW Drawdown

# Appendix G.1 Modeled Pumping Well Drawdowns

(Overlay points for groundwater elevation map krieging)

Cooper-Jacob Solution

s= [2.3*Q]/(4*pi*T)*log[(2.25T*t)/r2*S] Eq(1)

Where
s= drawdown (ft)
Q= pumping rate (cfd)
T= Transmissivity (sf/d)
t= time (days)
r= radius (ft) (distance to well)
S= storativity (unitless)

For affects from other wells

$r= [X^2+Y^2]^{1/2}$ EW(2)

where
X= E-W direction off-set between well and modeled point
Y= N-S directon off-set between well and modeled point

Drawdown at a modeled point is the sum of contributions from all wells

Additionally water level change due to the natural gradient was calculated as

In * dX * cos(q) Eq(4)

Where In is the natural gradient
dX is the distance E-W from the primary pumping well
q =is the angle between the X-axis and the natural gradient

# Appendix G.1 Modeled Pumping Well Drawdowns

(Overlay points for groundwater elevation map krieging)

Parameters Used

Transmissivity was estimated from the following data sources and approaches

1) GETS initial specific capacity (data from SAIC 1992 and ES 1993)

The geometric mean of reported specific capacity of the EWs (12 wells) was 1.82 gpm/ft

Transmissity can be approximated from specific capacity by the following formula (Driscol 1986):

T= 1500*SC/7.48

Where T= transmissivity (ft2/d)

SC= specific capacity )gpm/ft)

T approx = 370 ft2/d

2) Slug tests performed in 5 wells (MW-85, MW-83, MW-82, MW-80, MW-77)

The geometric mean hydraulic conductivity was 4.8 ft/d

The average thickness of the Entabulature Section is 75 ft (SAIC 1993b)

Transmissivity is the product of hydraulic conductivity and aquifer thickness

T approx = 360 $ft^2/d$

3) Background Flow Width

The aquifer cross sectional length to support flow to a well field is calcualted by the following (Todd, 1980)

Q= T*i*L

Where Q= total well field flow (cfd), T= transmissivity (sf/d), i= natural gradient (0.023) and L = cross sectional flow length (ft)

From Figure 2-8B the approximate aquifer cross sectional length to support pumping in September 2015 was about 3,800 ft

Rearranging to T= Q/W*i

T approx = 330 $ft^2/d$

4) average of approaches = 350 $ft^2/d$

A storativity of of 0.05 based on typcuial effective porosity of basalt

An average natural gradient of 0.023 was obtained from the groundwater level change between MW-94 and MW82 and MW-70 and MW-80 in March and September 2015.

Pumping rates are as reported

# Appendix G.1 Modeled Pumping Well Drawdowns
(March 2015)

| Well Name | X Coord. | Y Coord. | Q spring | Static Elev | 2.3Q/4piT | 2.25Tt/S | | | |
|---|---|---|---|---|---|---|---|---|---|
| EW2 | 1.14 | -514.71 | 481 | 2334 | 0.251681 | 315000 | T | 350 | |
| EW3 | -14.33 | -279.58 | 96 | 2332.7 | 0.050336 | | S | 0.05 | 5.00% |
| EW4 | 0.00 | -52.91 | 0 | 2334 | 0 | | t | 20 | |
| EW5 | -146.05 | 0.00 | 1444 | 2341 | 0.755044 | | | | |
| EW6 | -363.98 | 2.57 | 404 | 2343 | 0.211412 | | | | |
| EW7 | 4.78 | -716.04 | 751 | 2341 | 0.392623 | | | | |
| | | | | | | | | | |
| EW9 | -178.80 | -431.31 | 0 | -999 | 0 | | | | |
| EW10 | -96.91 | -314.48 | 0 | -999 | 0 | | | | |
| EW11 | 0.00 | 0.00 | 142 | 2357.4 | 0.074498 | | | | |
| EW12 | -110.10 | -919.20 | 1348 | 2358.5 | 0.704707 | | | | |
| EW14 | -82.122446 | -137.035 | 0 | -999 | 0 | | | | |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NDA | | | | | | | | | | | | | | | | | IN | 0.015 | | |
| **Modeled point** | | X | Y | EW2 | EW3 | EW4 | EW5 | EW6 | EW7 | | EW2 | EW3 | EW4 | EW5 | EW6 | EW7 | IN | total S | GWE |
| EW2N | 5 ft N of EW | 1.14 | -509.71 | 5 | 231 | 457 | 531 | 629 | 206 | | 1.03 | 0.04 | 0.00 | 0.04 | -0.02 | 0.34 | | -1.43 | 2,332.57 |
| EW2S | 5 ft S of EW | 1.14 | -519.71 | 5 | 241 | 467 | 540 | 637 | 196 | | 1.03 | 0.04 | 0.00 | 0.03 | -0.02 | 0.36 | | -1.43 | 2,332.57 |
| EW2E | 5 ft E of EW | 6.14 | -514.71 | 5 | 236 | 462 | 537 | 636 | 201 | | 1.03 | 0.04 | 0.00 | 0.03 | -0.02 | 0.35 | 0.075 | -1.50 | 2,332.50 |
| EW2EE | 50 ft E of EW | 51.14 | -514.71 | 50 | 244 | 465 | 551 | 663 | 207 | | 0.53 | 0.04 | 0.00 | 0.01 | -0.03 | 0.34 | 0.75 | -1.64 | 2,332.36 |
| EW2EEE | 100 ft E of EW | 101.14 | -514.71 | 100 | 262 | 473 | 571 | 696 | 223 | | 0.38 | 0.03 | 0.00 | -0.01 | -0.04 | 0.31 | 1.5 | -2.17 | 2,331.83 |
| EW2W | 5 ft W of EW | -3.86 | -514.71 | 5 | 235 | 462 | 534 | 630 | 202 | | 1.03 | 0.04 | 0.00 | 0.03 | -0.02 | 0.35 | -0.075 | -1.36 | 2,332.64 |
| EW3N | 5 ft N of EW | -14.33 | -274.58 | 241 | 5 | 222 | 305 | 446 | 442 | | 0.19 | 0.21 | 0.00 | 0.40 | 0.04 | 0.08 | | -0.92 | 2,331.78 |
| EW3S | 5 ft S of EW | -14.33 | -284.58 | 231 | 5 | 232 | 314 | 452 | 432 | | 0.19 | 0.21 | 0.00 | 0.38 | 0.04 | 0.09 | | -0.91 | 2,331.79 |
| EW3E | 5 ft E of EW | -9.33 | -279.58 | 235 | 5 | 227 | 311 | 453 | 437 | | 0.19 | 0.21 | 0.00 | 0.39 | 0.04 | 0.09 | 0.075 | -0.98 | 2,331.72 |
| EW3W | 5 ft W of EW | -19.33 | -279.58 | 236 | 5 | 228 | 307 | 445 | 437 | | 0.19 | 0.21 | 0.00 | 0.40 | 0.04 | 0.09 | -0.075 | -0.84 | 2,331.86 |
| EW4N | 5 ft N of EW | 0.00 | -47.91 | 467 | 232 | 5 | 154 | 367 | 668 | | 0.04 | 0.04 | 0.00 | 0.85 | 0.08 | -0.06 | | -0.95 | 2,333.05 |
| EW4S | 5 ft S of EW | 0.00 | -57.91 | 457 | 222 | 5 | 157 | 369 | 658 | | 0.05 | 0.04 | 0.00 | 0.84 | 0.08 | -0.05 | | -0.94 | 2,333.06 |
| EW4E | 5 ft E of EW | 5.00 | -52.91 | 462 | 228 | 5 | 160 | 373 | 663 | | 0.04 | 0.04 | 0.00 | 0.82 | 0.07 | -0.06 | | -0.92 | 2,333.08 |
| EW4W | 5 ft W of EW | -5.00 | -52.91 | 462 | 227 | 5 | 151 | 363 | 663 | | 0.04 | 0.04 | 0.00 | 0.86 | 0.08 | -0.06 | | -0.97 | 2,333.03 |
| EW5N | 5 ft N of EW | -146.05 | 5.00 | 540 | 314 | 157 | 5 | 218 | 737 | | 0.01 | 0.03 | 0.00 | 3.10 | 0.17 | -0.09 | | -3.21 | 2,337.79 |
| EW5NN | 50 ft N of EW | -146.05 | 50.00 | 584 | 355 | 179 | 50 | 223 | 781 | | -0.01 | 0.02 | 0.00 | 1.59 | 0.17 | -0.11 | | -1.65 | 2,339.35 |
| EW5S | 5 ft S of EW | -146.05 | -5.00 | 531 | 305 | 154 | 5 | 218 | 727 | | 0.01 | 0.03 | 0.00 | 3.10 | 0.17 | -0.09 | | -3.22 | 2,337.78 |
| EW5E | 5 ft E of EW | -141.05 | 0.00 | 534 | 307 | 151 | 5 | 223 | 731 | | 0.01 | 0.03 | 0.00 | 3.10 | 0.17 | -0.09 | 0.075 | -3.29 | 2,337.71 |
| EW5W | 5 ft W of EW | -151.05 | 0.00 | 537 | 311 | 160 | 5 | 213 | 733 | | 0.01 | 0.03 | 0.00 | 3.10 | 0.18 | -0.09 | -0.075 | -3.14 | 2,337.86 |
| EW5XEW6 | mid point EW5 & EW6 | -255.01 | 1.28 | 576 | 370 | 261 | 109 | 109 | 763 | | -0.01 | 0.02 | 0.00 | 1.07 | 0.30 | -0.10 | 0 | -1.28 | 2,339.72 |
| 200NE-EW5 | 200 ft NE of EW6 | -5.05 | 141.00 | 656 | 421 | 194 | 199 | 385 | 857 | | -0.03 | 0.01 | 0.00 | 0.68 | 0.07 | -0.14 | 0 | -0.58 | 2,340.42 |
| EW6N | 5 ft N of EW | -363.98 | 7.57 | 637 | 452 | 369 | 218 | 5 | 812 | | -0.03 | 0.01 | 0.00 | 0.62 | 0.87 | -0.13 | | -1.34 | 2,341.66 |
| EW6S | 5 ft S of EW | -363.98 | -2.43 | 629 | 446 | 367 | 218 | 5 | 803 | | -0.02 | 0.01 | 0.00 | 0.62 | 0.87 | -0.12 | | -1.35 | 2,341.65 |
| EW6E | 5 ft E of EW | -358.98 | 2.57 | 630 | 445 | 363 | 213 | 5 | 805 | | -0.03 | 0.01 | 0.00 | 0.64 | 0.87 | -0.12 | 0.075 | -1.44 | 2,341.56 |
| EW6W | 5 ft W of EW | -368.98 | 2.57 | 636 | 453 | 373 | 223 | 5 | 810 | | -0.03 | 0.01 | 0.00 | 0.61 | 0.87 | -0.13 | -0.075 | -1.25 | 2,341.75 |
| EW7N | 5 ft N of EW | 4.78 | -711.04 | 196 | 432 | 658 | 727 | 803 | 5 | | 0.23 | 0.01 | 0.00 | -0.17 | -0.07 | 1.61 | | -1.62 | 2,339.38 |
| EW7S | 5 ft S of EW | 4.78 | -721.04 | 206 | 442 | 668 | 737 | 812 | 5 | | 0.22 | 0.01 | 0.00 | -0.18 | -0.07 | 1.61 | | -1.59 | 2,339.41 |
| EW7E | 5 ft E of EW | 9.78 | -716.04 | 202 | 437 | 663 | 733 | 810 | 5 | | 0.22 | 0.01 | 0.00 | -0.17 | -0.07 | 1.61 | 0.075 | -1.68 | 2,339.32 |
| EW7EE | 50 ft E of EW | 54.78 | -716.04 | 208 | 442 | 665 | 744 | 832 | 50 | | 0.22 | 0.01 | 0.00 | -0.18 | -0.07 | 0.82 | 0.75 | -1.54 | 2,339.46 |
| EW7EEE | 100 ft E of EW | 104.78 | -716.04 | 226 | 452 | 671 | 759 | 858 | 100 | | 0.20 | 0.01 | 0.00 | -0.20 | -0.08 | 0.59 | 1.5 | -2.02 | 2,338.98 |
| EW7W | 5 ft W of EW | -0.22 | -716.04 | 201 | 437 | 663 | 731 | 805 | 5 | | 0.22 | 0.01 | 0.00 | -0.17 | -0.07 | 1.61 | | -1.61 | 2,339.39 |

# Appendix G.1 Modeled Pumping Well Drawdowns
(March 2015)

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | I | 0.015 | 0.013 | |
| **SDA** | | | | | | | | | | | | | | | θ | 0.508489 | 0.007 | |
| | | | | EW9 | EW10 | EW11 | EW12 | EW14 | | EW9 | EW10 | EW11 | EW12 | EW14 | | In | total S | GWE |
| EW9N | 5 ft N of EW | -178.80 | -426.31 | 5 | 139 | 462 | 498 | 305 | | 0.00 | 0.00 | 0.01 | 0.07 | 0.00 | | 0.04 | -0.12 | -999.12 |
| EW9S | 5 ft S of EW | -178.80 | -436.31 | 5 | 122 | 472 | 488 | 315 | | 0.00 | 0.00 | 0.01 | 0.09 | 0.00 | | -0.04 | -0.06 | -999.06 |
| EW9E | 5 ft E of EW | -173.80 | -431.31 | 5 | 117 | 465 | 492 | 308 | | 0.00 | 0.00 | 0.01 | 0.08 | 0.00 | | 0.07 | -0.16 | -999.16 |
| EW9EE | 50 ft E of EW | -128.80 | -431.31 | 50 | 127 | 450 | 488 | 298 | | 0.00 | 0.00 | 0.01 | 0.09 | 0.00 | | 0.66 | -0.75 | -999.75 |
| EW9EEE | 100 ft E of EW | -78.80 | -431.31 | 100 | 154 | 438 | 489 | 294 | | 0.00 | 0.00 | 0.02 | 0.08 | 0.00 | | 1.31 | -1.41 | -1,000.41 |
| EW9W | 5 ft W of EW | -183.80 | -431.31 | 5 | 117 | 469 | 493 | 311 | | 0.00 | 0.00 | 0.01 | 0.08 | 0.00 | | -0.07 | -0.02 | -999.02 |
| EW10N | 5 ft N of EW | -96.91 | -309.48 | 147 | 147 | 324 | 610 | 173 | | 0.00 | 0.00 | 0.04 | -0.05 | 0.00 | | 0.04 | -0.02 | -999.02 |
| EW10S | 5 ft S of EW | -96.91 | -319.48 | 139 | 139 | 334 | 600 | 183 | | 0.00 | 0.00 | 0.03 | -0.04 | 0.00 | | 0.04 | -0.03 | -999.03 |
| EW10E | 5 ft E of EW | -91.91 | -314.48 | 146 | 146 | 328 | 605 | 178 | | 0.00 | 0.00 | 0.03 | -0.05 | 0.00 | | -0.06551 | 0.08 | -998.92 |
| EW10W | 5 ft W of EW | -101.91 | -314.48 | 140 | 140 | 331 | 605 | 179 | | 0.00 | 0.00 | 0.03 | -0.05 | 0.00 | | -0.06551 | 0.08 | -998.92 |
| EW11N | 5 ft N of EW | 0.00 | 5.00 | 472 | 570 | 5 | 931 | 164 | | 0.00 | 0.00 | 0.31 | -0.31 | 0.00 | | 0.04 | -0.03 | 2,357.37 |
| EW11NNN | 100 ft N of EW | 0.00 | 100.00 | | | | | | | | | | | | | | | |
| EW11S | 5 ft S of EW | 0.00 | -5.00 | 462 | 556 | 5 | 921 | 155 | | 0.00 | 0.00 | 0.31 | -0.30 | 0.00 | | -0.04 | 0.03 | 2,357.43 |
| EW11E | 5 ft E of EW | 5.00 | 0.00 | 469 | 565 | 5 | 926 | 162 | | 0.00 | 0.00 | 0.31 | -0.31 | 0.00 | | -0.06551 | 0.07 | 2,357.47 |
| EW11W | 5 ft W of EW | -5.00 | 0.00 | 465 | 561 | 5 | 925 | 157 | | 0.00 | 0.00 | 0.31 | -0.31 | 0.00 | | -0.06551 | 0.07 | 2,357.47 |
| EW12N | 5 ft N of EW | -110.10 | -914.20 | 488 | 773 | 921 | 5 | 778 | | 0.00 | 0.00 | -0.03 | 2.89 | 0.00 | | 0.04 | -2.89 | 2,355.61 |
| EW12S | 5 ft S of EW | -110.10 | -924.20 | 498 | 787 | 931 | 5 | 788 | | 0.00 | 0.00 | -0.03 | 2.89 | 0.00 | | -0.04 | -2.82 | 2,355.68 |
| EW12SS | 50 ft S of EW | -110.10 | -969.20 | 542 | 850 | 975 | 50 | 833 | | 0.00 | 0.00 | -0.04 | 1.48 | 0.00 | | -0.36514 | -1.08 | 2,357.42 |
| EW12SSS | 100 ft S of EW | -110.10 | -1,019.20 | 592 | 920 | 1025 | 100 | 883 | | 0.00 | 0.00 | -0.04 | 1.06 | 0.00 | | -0.73029 | -0.29 | 2,358.21 |
| EW12E | 5 ft E of EW | -105.10 | -919.20 | 493 | 780 | 925 | 5 | 783 | | 0.00 | 0.00 | -0.03 | 2.89 | 0.00 | | 0.07 | -2.92 | 2,355.58 |
| EW12EEE | 100 ft E of EW | -10.10 | -919.20 | 516 | 795 | 919 | 100 | 785 | | 0.00 | 0.00 | -0.03 | 1.06 | 0.00 | | 1.310221 | -2.33 | 2,356.17 |
| EW12W | 5 ft W of EW | -115.10 | -919.20 | 492 | 780 | 926 | 5 | 783 | | 0.00 | 0.00 | -0.03 | 2.89 | 0.00 | | -0.07 | -2.79 | 2,355.71 |
| EW12WW | 50 ft W of EW | -160.10 | -919.20 | 488 | 777 | 933 | 50 | 786 | | 0.00 | 0.00 | -0.03 | 1.48 | 0.00 | | -0.36514 | -1.08 | 2,357.42 |
| EW12WWW | 100 ft E f EW | -210.10 | -919.20 | 489 | 778 | 943 | 100 | 793 | | 0.00 | 0.00 | -0.03 | 1.06 | 0.00 | | -0.73029 | -0.29 | 2,358.21 |
| EW13 | @ EW13 | -210.10 | -694 | 265 | 408 | 725 | 246 | 572 | | 0.00 | 0.00 | -0.02 | 0.50 | 0.00 | | | -0.49 | 2,358.01 |
| EW14N | 5 ft N of EW | -82.1224 | -132.04 | 315 | 364 | 155 | 788 | 5 | | 0.00 | 0.00 | 0.08 | -0.21 | 0.00 | | 0.04 | 0.09 | -998.91 |
| EW14S | 5 ft S of EW | -82.1224 | -142.04 | 305 | 350 | 164 | 778 | 5 | | 0.00 | 0.00 | 0.08 | -0.20 | 0.00 | | 0.04 | 0.08 | -998.92 |
| EW14E | 5 ft E of EW | -77.1224 | -137.035 | 311 | 358 | 157 | 783 | 5 | | 0.00 | 0.00 | 0.08 | -0.20 | 0.00 | | -0.07 | 0.19 | -998.81 |
| EW14W | 5 ft W of EW | -87.1224 | -137.035 | 308 | 356 | 162 | 783 | 5 | | 0.00 | 0.00 | 0.08 | -0.20 | 0.00 | | -0.07 | 0.19 | -998.81 |

# Appendix G.1 Modeled Pumping Well Drawdowns
(September 2015)

| Well Name | X Coord. | Y Coord. | Q Fall | E | 2.3Q/4piT | 2.25Tt/S | T | 350 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| EW2 | 1.14 | -514.71 | 1540 | 2320 | 0.81 | 315000 | S | 0.05 | 5.00% | |
| EW3 | -14.33 | -279.58 | 58 | 2320 | 0.03 | | t | 20 | | |
| EW4 | 0.00 | -52.91 | 19 | 2320 | 0.01 | | | | | |
| EW5 | -146.05 | 0.00 | 5852 | 2324 | 3.06 | | | | | |
| EW6 | -363.98 | 2.57 | 905 | 2326 | 0.47 | | | | | |
| EW7 | 4.78 | -716.04 | 2830 | 2320 | 1.48 | | | | | |
| EW9 | -178.80 | -431.31 | 1232 | 2343.5 | 0.64 | | | | | |
| EW10 | -96.91 | -314.48 | 116 | 2342 | 0.06 | | | | | |
| EW11 | 0.00 | 0.00 | 19 | 2339 | 0.01 | | | | | |
| EW12 | -110.10 | -919.20 | 4409 | 2350 | 2.31 | | | | | |
| EW14 | -82.122446 | -137.035 | 905 | 2341 | 0.47 | | | | 0.017 | |

| Modeled Pt | | X | Y | EW2 | EW3 | EW4 | EW5 | EW6 | EW7 | EW2 | EW3 | EW4 | EW5 | EW6 | EW7 | IN | Total S | GWE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EW2N | 5 ft N of EW | 1.14 | -509.71 | 5 | 231 | 457 | 531 | 629 | 206 | 3.30 | 0.02 | 0.00 | 0.15 | -0.05 | 1.29 | | -4.72 | 2,315.28 |
| EW2S | 5 ft S of EW | 1.14 | -519.71 | 5 | 241 | 467 | 540 | 637 | 196 | 3.30 | 0.02 | 0.00 | 0.10 | -0.05 | 1.35 | | -4.73 | 2,315.27 |
| EW2E | 5 ft E of EW | 6.14 | -514.71 | 5 | 236 | 462 | 537 | 636 | 201 | 3.30 | 0.02 | 0.00 | 0.12 | -0.05 | 1.32 | 0.085 | -4.80 | 2,315.20 |
| **EW2EE** | 50 ft E of EW | 51.14 | -514.71 | 50 | 244 | 465 | 551 | 663 | 207 | 1.69 | 0.02 | 0.00 | 0.05 | -0.07 | 1.28 | 0.85 | -3.83 | 2,316.17 |
| **EW2EEE** | 100 ft E of EW | 101.14 | -514.71 | 100 | 262 | 473 | 571 | 696 | 223 | 1.21 | 0.02 | 0.00 | -0.05 | -0.09 | 1.19 | 1.7 | -3.98 | 2,316.02 |
| EW2W | 5 ft W of EW | -3.86 | -514.71 | 5 | 235 | 462 | 534 | 630 | 202 | 3.30 | 0.02 | 0.00 | 0.13 | -0.05 | 1.32 | -0.085 | -4.64 | 2,315.36 |
| EW3N | 5 ft N of EW | -14.33 | -274.58 | 241 | 5 | 222 | 305 | 446 | 442 | 0.59 | 0.12 | 0.01 | 1.63 | 0.09 | 0.31 | | -2.75 | 2,317.25 |
| EW3S | 5 ft S of EW | -14.33 | -284.58 | 231 | 5 | 232 | 314 | 452 | 432 | 0.62 | 0.12 | 0.01 | 1.55 | 0.09 | 0.34 | | -2.73 | 2,317.27 |
| EW3E | 5 ft E of EW | -9.33 | -279.58 | 235 | 5 | 227 | 311 | 453 | 437 | 0.61 | 0.12 | 0.01 | 1.57 | 0.09 | 0.32 | 0.085 | -2.80 | 2,317.20 |
| EW3W | 5 ft W of EW | -19.33 | -279.58 | 236 | 5 | 228 | 307 | 445 | 437 | 0.61 | 0.12 | 0.01 | 1.60 | 0.10 | 0.32 | -0.085 | -2.67 | 2,317.33 |
| EW4N | 5 ft N of EW | 0.00 | -47.91 | 467 | 232 | 5 | 154 | 367 | 668 | 0.13 | 0.02 | 0.04 | 3.44 | 0.17 | -0.22 | | -3.59 | 2,316.41 |
| EW4S | 5 ft S of EW | 0.00 | -57.91 | 457 | 222 | 5 | 157 | 369 | 658 | 0.14 | 0.02 | 0.04 | 3.38 | 0.17 | -0.20 | | -3.56 | 2,316.44 |
| EW4E | 5 ft E of EW | 5.00 | -52.91 | 462 | 228 | 5 | 160 | 373 | 663 | 0.14 | 0.02 | 0.04 | 3.34 | 0.17 | -0.21 | | -3.49 | 2,316.51 |
| EW4W | 5 ft W of EW | -5.00 | -52.91 | 462 | 227 | 5 | 151 | 363 | 663 | 0.14 | 0.02 | 0.04 | 3.50 | 0.18 | -0.21 | | -3.66 | 2,316.34 |
| EW5N | 5 ft N of EW | -146.05 | 5.00 | 540 | 314 | 157 | 5 | 218 | 737 | 0.03 | 0.02 | 0.01 | 12.55 | 0.39 | -0.35 | | -12.64 | 2,311.36 |
| **EW5NN** | 50 ft N of EW | -146.05 | 50.00 | 584 | 355 | 179 | 50 | 223 | 781 | -0.03 | 0.01 | 0.01 | 6.43 | 0.38 | -0.42 | | -6.38 | 2,317.62 |
| EW5S | 5 ft S of EW | -146.05 | -5.00 | 531 | 305 | 154 | 5 | 218 | 727 | 0.04 | 0.02 | 0.01 | 12.55 | 0.39 | -0.33 | | -12.67 | 2,311.33 |
| EW5E | 5 ft E of EW | -141.05 | 0.00 | 534 | 307 | 151 | 5 | 223 | 731 | 0.03 | 0.02 | 0.01 | 12.55 | 0.38 | -0.34 | 0.085 | -12.74 | 2,311.26 |
| EW5W | 5 ft W of EW | -151.05 | 0.00 | 537 | 311 | 160 | 5 | 213 | 733 | 0.03 | 0.02 | 0.01 | 12.55 | 0.40 | -0.34 | -0.085 | -12.58 | 2,311.42 |
| **EW5XEW6** | mid point EW5 & EW6 | -255.01 | 1.28 | 576 | 370 | 261 | 109 | 109 | 763 | -0.02 | 0.01 | 0.01 | 4.36 | 0.67 | -0.39 | 0 | -4.64 | 2,319.36 |
| **200NE-EW** | 200 ft NE of EW6 | -5.05 | 141.00 | 656 | 421 | 194 | 199 | 385 | 857 | -0.11 | 0.01 | 0.01 | 2.75 | 0.16 | -0.54 | 0 | -2.27 | 2,321.73 |
| EW6N | 5 ft N of EW | -363.98 | 7.57 | 637 | 452 | 369 | 218 | 5 | 812 | -0.09 | 0.01 | 0.00 | 2.51 | 1.94 | -0.47 | | -3.90 | 2,322.10 |
| EW6S | 5 ft S of EW | -363.98 | -2.43 | 629 | 446 | 367 | 218 | 5 | 803 | -0.08 | 0.01 | 0.00 | 2.51 | 1.94 | -0.46 | | -3.92 | 2,322.08 |
| EW6E | 5 ft E of EW | -358.98 | 2.57 | 630 | 445 | 363 | 213 | 5 | 805 | -0.08 | 0.01 | 0.00 | 2.58 | 1.94 | -0.46 | 0.085 | -4.07 | 2,321.93 |
| EW6W | 5 ft W of EW | -368.98 | 2.57 | 636 | 453 | 373 | 223 | 5 | 810 | -0.09 | 0.01 | 0.00 | 2.45 | 1.94 | -0.47 | -0.085 | -3.76 | 2,322.24 |
| EW7N | 5 ft N of EW | 4.78 | -711.04 | 196 | 432 | 658 | 727 | 803 | 5 | 0.73 | 0.01 | 0.00 | -0.69 | -0.15 | 6.07 | | -5.97 | 2,314.03 |
| EW7S | 5 ft S of EW | 4.78 | -721.04 | 206 | 442 | 668 | 737 | 812 | 5 | 0.70 | 0.01 | 0.00 | -0.72 | -0.15 | 6.07 | | -5.90 | 2,314.10 |
| EW7E | 5 ft E of EW | 9.78 | -716.04 | 202 | 437 | 663 | 733 | 810 | 5 | 0.72 | 0.01 | 0.00 | -0.71 | -0.15 | 6.07 | 0.085 | -6.01 | 2,313.99 |
| **EW7EE** | 50 ft E of EW | 54.78 | -716.04 | 208 | 442 | 665 | 744 | 832 | 50 | 0.69 | 0.01 | 0.00 | -0.75 | -0.16 | 3.11 | 0.85 | -3.75 | 2,316.25 |
| **EW7EEE** | 100 ft E of EW | 104.78 | -716.04 | 226 | 452 | 671 | 759 | 858 | 100 | 0.63 | 0.01 | 0.00 | -0.80 | -0.17 | 2.22 | 1.7 | -3.58 | 2,316.42 |
| EW7W | 5 ft W of EW | -0.22 | -716.04 | 201 | 437 | 663 | 731 | 805 | 5 | 0.72 | 0.01 | 0.00 | -0.70 | -0.15 | 6.07 | | -5.94 | 2,314.06 |

# Appendix G.1 Modeled Pumping Well Drawdowns
(September 2015)

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | 0.009 | 0.007 | |
| | | | | | | | | | | | | | | | 0.69192 | 0.006 | |
| | | | | | | | | | | | | | | | 0.50849 | 0.337 | |
| | | | | EW9 | EW10 | EW11 | EW12 | EW14 | EW9 | EW10 | EW11 | EW12 | EW14 | | | | |
| EW9N | 5 ft N of EW | -178.80 | -426.31 | 5 | 139 | 462 | 498 | 305 | 2.64 | 0.07 | 0.00 | 0.24 | 0.25 | | 0.03 | -3.24 | 2340.26 |
| EW9S | 5 ft S of EW | -178.80 | -436.31 | 5 | 164 | 472 | 488 | 315 | 2.64 | 0.06 | 0.00 | 0.28 | 0.24 | | -0.03 | -3.20 | 2340.30 |
| **EW9SSS** | | -178.80 | -531.31 | 100 | 217 | 561 | 394 | 406 | 0.97 | 0.05 | 0.00 | 0.71 | 0.13 | | 0.03 | -1.89 | 2341.61 |
| EW9E | 5 ft E of EW | -173.80 | -431.31 | 5 | 161 | 465 | 492 | 308 | 2.64 | 0.07 | 0.00 | 0.26 | 0.25 | | 0.03 | -3.25 | 2340.25 |
| **EW9EE** | 50 ft E of EW | -128.80 | -431.31 | 50 | 134 | 450 | 488 | 298 | 1.35 | 0.08 | 0.00 | 0.28 | 0.26 | | 0.35 | -2.32 | 2341.18 |
| **EW9EEE** | 100 ft E of EW | -78.80 | -431.31 | 100 | 118 | 438 | 489 | 294 | 0.97 | 0.08 | 0.00 | 0.28 | 0.27 | | 0.69 | -2.28 | 2341.22 |
| EW9W | 5 ft W of EW | -183.80 | -431.31 | 5 | 161 | 469 | 493 | 311 | 2.64 | 0.07 | 0.00 | 0.26 | 0.24 | | -0.03 | -3.17 | 2340.33 |
| | | -478.80 | -431.31 | 300 | 218 | 644 | 612 | 494 | 0.35 | 0.05 | 0.00 | -0.17 | 0.05 | | -2.08 | 1.80 | 2345.30 |
| www | | -278.80 | -431.31 | 100 | 118 | 514 | 516 | 354 | 0.97 | 0.08 | 0.00 | 0.17 | 0.19 | | -1.72 | 0.32 | 2343.82 |
| EW10N | 5 ft N of EW | -96.91 | -309.48 | 147 | 32 | 324 | 610 | 173 | 0.75 | 0.15 | 0.00 | -0.17 | 0.48 | | 0.03 | -1.25 | 2340.75 |
| EW10S | 5 ft S of EW | -96.91 | -319.48 | 139 | 24 | 334 | 600 | 183 | 0.78 | 0.17 | 0.00 | -0.13 | 0.46 | | 0.03 | -1.31 | 2340.69 |
| EW10E | 5 ft E of EW | -91.91 | -314.48 | 146 | 30 | 328 | 605 | 178 | 0.76 | 0.15 | 0.00 | -0.15 | 0.47 | | -0.03 | -1.20 | 2340.80 |
| EW10W | 5 ft W of EW | -101.91 | -314.48 | 140 | 24 | 331 | 605 | 179 | 0.78 | 0.16 | 0.00 | -0.15 | 0.47 | | -0.03 | -1.23 | 2340.77 |
| EW11N | 5 ft N of EW | 0.00 | 5.00 | 472 | 478 | 5 | 931 | 164 | 0.10 | 0.01 | 0.04 | -1.01 | 0.51 | | 0.03 | 0.33 | 2339.33 |
| EW11S | 100 ft N of EW | 0.00 | -5.00 | 462 | 465 | 5 | 921 | 155 | 0.11 | 0.01 | 0.04 | -0.99 | 0.53 | | -0.03 | 0.33 | 2339.33 |
| EW11E | 5 ft S of EW | 5.00 | 0.00 | 469 | 473 | 5 | 926 | 162 | 0.10 | 0.01 | 0.04 | -1.00 | 0.51 | | -0.03 | 0.38 | 2339.38 |
| EW11W | 5 ft E of EW | -5.00 | 0.00 | 465 | 470 | 5 | 925 | 157 | 0.11 | 0.01 | 0.04 | -1.00 | 0.52 | | -0.03 | 0.36 | 2339.36 |
| EW12N | 5 ft W of EW | -110.10 | -914.20 | 488 | 706 | 921 | 5 | 778 | 0.08 | -0.01 | 0.00 | 9.45 | -0.13 | | 0.03 | -9.41 | 2340.59 |
| EW12S | 5 ft N of EW | -110.10 | -924.20 | 498 | 720 | 931 | 5 | 788 | 0.07 | -0.01 | 0.00 | 9.45 | -0.14 | | -0.03 | -9.33 | 2340.67 |
| **EW12SS** | 5 ft S of EW | -110.10 | -969.20 | 542 | 782 | 975 | 50 | 833 | 0.02 | -0.02 | 0.00 | 4.84 | -0.16 | | -0.29 | -4.39 | 2345.61 |
| **EW12SSS** | 50 ft S of EW | -110.10 | -1,019.20 | 592 | 851 | 1025 | 100 | 883 | -0.03 | -0.02 | -0.01 | 3.45 | -0.19 | | -0.57 | -2.64 | 2347.36 |
| EW12E | 100 ft S of EW | -105.10 | -919.20 | 493 | 713 | 925 | 5 | 783 | 0.07 | -0.01 | 0.00 | 9.45 | -0.14 | | 0.03 | -9.41 | 2340.59 |
| **EW12EEE** | 5 ft E of EW | -10.10 | -919.20 | 516 | 725 | 919 | 100 | 785 | 0.05 | -0.01 | 0.00 | 3.45 | -0.14 | | 0.69 | -4.04 | 2345.96 |
| | 100 ft E of EW | 203.09 | -919.20 | 620 | 787 | 941 | 313 | 833 | -0.06 | -0.02 | 0.00 | 1.17 | -0.16 | | 2.08 | -3.01 | 2346.99 |
| | 5 ft W of EW | 603.09 | -919.20 | 922 | 1008 | 1099 | 713 | 1040 | -0.28 | -0.03 | -0.01 | -0.48 | -0.25 | | 4.85 | -3.80 | 2346.20 |
| EW12W | 50 ft W of EW | -115.10 | -919.20 | 492 | 712 | 926 | 5 | 783 | 0.07 | -0.01 | 0.00 | 9.45 | -0.14 | | -0.03 | -9.34 | 2340.66 |
| **EW12WW** | 100 ft E f EW | -160.10 | -919.20 | 488 | 710 | 933 | 50 | 786 | 0.08 | -0.01 | 0.00 | 4.84 | -0.14 | | -0.29 | -4.48 | 2345.52 |
| **EW12WWT** | @ EW13 | -210.10 | -919.20 | 489 | 711 | 943 | 100 | 793 | 0.08 | -0.01 | 0.00 | 3.45 | -0.14 | | -0.57 | -2.80 | 2347.20 |
| | 5 ft N of EW | -410.10 | -919.20 | 540 | 739 | 1007 | 300 | 848 | 0.02 | -0.01 | -0.01 | 1.25 | -0.17 | | -1.72 | 0.64 | 2350.64 |
| **EW13** | 5 ft S of EW | -210.10 | -694.20 | 265 | 408 | 725 | 246 | 572 | 0.42 | 0.02 | 0.00 | 1.65 | -0.01 | | | -2.08 | 2343.42 |
| EW14N | 5 ft E of EW | -82.1224 | -132.04 | 315 | 270 | 155 | 788 | 5 | 0.32 | 0.04 | 0.01 | -0.68 | 1.94 | | 0.03 | -1.66 | 2339.34 |
| EW14S | 5 ft W of EW | -82.1224 | -142.04 | 305 | 256 | 164 | 778 | 5 | 0.34 | 0.04 | 0.01 | -0.65 | 1.94 | | 0.03 | -1.71 | 2339.29 |
| EW14E | | -77.1224 | -137.035 | 311 | 264 | 157 | 783 | 5 | 0.33 | 0.04 | 0.01 | -0.67 | 1.94 | | -0.03 | -1.62 | 2339.38 |
| EW14W | | -87.1224 | -137.035 | 308 | 262 | 162 | 783 | 5 | 0.34 | 0.04 | 0.01 | -0.67 | 1.94 | | -0.03 | -1.63 | 2339.37 |
| | | -182.122 | -137.035 | 294 | 252 | 228 | 785 | 100 | 0.36 | 0.04 | 0.01 | -0.67 | 0.71 | | -0.57 | 0.13 | 2341.13 |
| **EW14XEW11** | | -41.06 | -68.52 | 388 | 367 | 80 | 853 | 80 | 0.21 | 0.02 | 0.02 | -0.84 | 0.80 | | 0.03 | -0.24 | 2340.76 |

# Appendix G.2
# Plume Capture Analytical Model Results

# Appendix G.2 Groundwater Flow Divided Analytical Model

## Model Development

### Basic Premise

The gradient towards a pumpin well is defined as:

$Iw = Qw/(2*p*T*r)$ *Todd (1980)* *(Eq.1)*

Where

Iw= gradient towards a pumping well (unitless)

Qw= Well pumping rate (cubic foot/day)

T= Aquifer Transmissivity ($foot^2$/day

r= radial distance from well (feet)

Set coordiante system were X is distance downgradient and Y is perpendicular to groundwater flow and north is positive and south is negative

Then r in the X direction = X

r in the Y direction = Y

The angle between the primary well (closest) and another well is:

$q = \arctan(Yi/Xi)$ *(Eq.2)*

The r for other wells located at Xi and Yi from the primary well is

$r = (Xi)^2+(Yi)^2)^{1/2}$ *(Eq.3)*

Xi = X distance between well i and the original well

Yi = Y distance between well i and the original well

### Stagnation Point (a)

Then the stagnation point is where Iw = In (natural gradient)

in this case set r in the downgradient distance becomes X and

$X=a= Qw/(2*p*T*In)$ *(Eq.4)*

a is the stagnation point

To determin the X component gradient from wells other than the primary (closest) well

We use equation 1, and substitue r for equation 3 and resolve the X compoent of the gradient by

$Iwx=Iw*Cos(\theta)$

Then the gradient contributions in the X direction from other wells is

$Iwi= \cos(q) * [Qwi/(2*p*T*(Xi)^2+(Yi)^2)^{1/2})]$ *(Eq.5)*

Where:

Iwi is the x direction gradient contribution from well i

Qwi is pumping rate at well i

The gradient contribution is the sum of equation 6 for all wells

The stagnation point occurs where Iw-In = 0

This is solved by itteration

# Appendix G.2 Groundwater Flow Divided Analytical Model

Y1 and Y2 divides

The lateral flow divide is a parobolic shape defined by:

$X = \tan[(2*p*T*In/Qw)Y]$ Todd (1980) *(Eq.6)*

As X approaches 0; $[2*\pi*T*In/Qw)Y]$ approaches $\pi/2$ and Y must approach $[Qw/4*T*In]$

Setting r in the Y direction = Y and using equaton 1 the critical gradient at the Y divide when X=0 is:

$Ic= 2*In/p$ *(Eq.7)*

This is the gradient in the Y direction necessary to capture the flow line,

The lateral gradient (Y component) contribution from other wells is

$Iwi= \sin(q) * [Qwi/(2*p*T*(Xi)^2+(Yi)^2)^{1/2})]$ *(Eq.8)*

The Y1 and Y2 divides occurs where Iw-Ic = 0

$\theta= \text{atan}\ [(Y-Yn)/X]$

$\theta= \text{atan}\ [(Y+Ys)/X]$

Note since q for wells north or south of the primary wells is not the same Y1 and Y2 may be different

This is solved by itteration

Ymax Divide

From Eq.6 when X becomes very large (approaches infinity) $[2*\pi*T*In/Qw)Y]$ approaches $2\pi$ and Y approaches $[Qw/2*T*In]$ and so:

$Ymax= Qw/2*T*In$ *(Eq.9)*

Note that 2*Ymax is the total upgradient flow width to the well and 2*Ymax *T*In = natural flow

If wells are within an overlapping capture zone Ymax can be combined

C Flow divide between pumping wells with overlaping capture zones

The divide between two pumping wells within an overlapping capture zone occures when the gradient from one is the same as the other (equal in oposite directions)

From Eq.1 this occures at

$r_1= Q_1/(Qw_1+Qw_2)*D$ *(Eq.10)*

Where

$R_1$ is the distance from well 1 to the flow divide

D is the total distance between wells

$Q_1$ is the pumping rate at well 1

$Q_2$ is the pumping rate at well 2

Parameters Used

See Appendix G.1 for selection of transmissivity value and natrual gradient value

Pumping rates are as reported

# Appendix G.2 Groundwater Capture Analytial Model (March 2015)

| Well Name | X Coord. | Y Coord. | Q gpm | Q cfd |
|---|---|---|---|---|
| EW2 | 1.14 | -514.71 | 2.52 | 485 |
| EW3 | -14.33 | -279.58 | 0.47 | 90 |
| EW4 | 0.00 | -52.91 | 0 | 0 |
| EW5 | -146.05 | 0.00 | 7.52 | 1448 |
| EW6 | -363.98 | 2.57 | 2.13 | 410 |
| EW7 | 4.78 | -716.04 | 3.86 | 743 |
| | | | | 3176 |
| EW9 | -345.48 | -314.07 | 0 | |
| EW10 | -221.63 | -243.25 | 0 | |
| EW11 | 0.00 | 0.00 | 0.74 | 142 |
| EW12 | -491.14 | -784.75 | 7.03 | 1353 |
| EW13 | -368.94 | -538.55 | 0 | |
| EW14 | -132.67 | -89.01 | 0 | |
| | | -710.21 | 24.27 | 1495 |

Mar 2015 T 350.00 i 0.023 1/2piT 0.000454728 YN @ Xo ic 0.01464225 Ys @ Xo ic 0

| X stag | Eval well | EW2 | X | 9.9 | | Xstart | 9.588838 | Y | 15 | Y start | 15.06211 | Y | 15.5 | Y start | | Ymax |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EW2 | | Dx | Dy | Angle | Cos | iw | Iw-In | Angle | sin | iw | Iw-Ic | Angle | sin | iw | Iw-Ic | **30.1** |
| | EW2 | 0 | 0.00 | | 1 | 2.228E-02 | | | 1.00 | 1.47E-02 | | | 1.00 | 1.42E-02 | | |
| | EW3 | -15.47 | 235.13 | 1.463317 | 0.11 | 1.856E-05 | | -0.07 | -1.00 | -1.85E-04 | | 0.06 | -1.00 | -1.63E-04 | | |
| | EW4 | -1.14 | 461.81 | 1.5469 | 0.02 | 0.000E+00 | | 0.00 | 1.00 | 0.00E+00 | | 0.00 | 1.00 | 0.00E+00 | | |
| | EW5 | -147.18 | 514.71 | 1.274586 | 0.29 | 3.572E-04 | | -0.29 | -0.96 | -1.21E-03 | | 0.27 | -0.96 | -1.15E-03 | | |
| | EW6 | -365.12 | 517.28 | 0.943505 | 0.59 | 1.713E-04 | | -0.63 | -0.81 | -2.43E-04 | | 0.60 | -0.82 | -2.38E-04 | | |
| | EW7 | 3.64 | -201.33 | -1.53971 | 0.03 | 5.213E-05 | | -0.02 | 1.00 | 1.56E-03 | | 0.02 | 1.00 | 1.82E-03 | | |
| | | | | | | 0.0229 | -0.0001 | | | 0.0146 | 0.0000 | | | 0.0145 | -0.0001 | |

YN @ Xo ic 0 Ys @ Xo ic 0 Ymax

| X stag | Eval well | EW3 | X | 1.90 | | Xstart | 1.78 | Y | 3.8 | Y start | 2.795031 | Y | 3.8 | Y start | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EW3 | | Dx | Dy | Angle | Cos | iw | Iw-In | Angle | sin | iw | Iw-Ic | Angle | sin | iw | Iw-Ic | **5.6** |
| | EW2 | 15.47 | -235.13 | 1.51 | 0.058 | 5.395E-05 | | -1.51 | 1.00 | 9.19E-04 | | -1.50 | 1.00 | 9.49E-04 | | |
| | EW3 | 0.00 | 0.00 | 0.00 | 1.000 | 2.154E-02 | | 0.00 | 1.00 | 1.08E-02 | | 0.00 | 1.00 | 1.08E-02 | | |
| | EW4 | 14.33 | 226.68 | -1.52 | 0.05 | 0.000E+00 | | 1.51 | -1.00 | 0.00E+00 | | 1.51 | -1.00 | 0.00E+00 | | |
| | EW5 | -131.71 | 279.58 | 1.12 | 0.43 | 9.163E-04 | | -1.13 | 0.90 | 1.94E-03 | | -1.14 | 0.91 | 1.91E-03 | | |
| | EW6 | -349.65 | 282.15 | 0.68 | 0.78 | 3.226E-04 | | -0.67 | 0.62 | 2.60E-04 | | -0.69 | 0.63 | 2.61E-04 | | |
| | EW7 | 19.11 | -436.46 | 1.53 | 0.04 | 3.047E-05 | | -1.53 | 1.00 | 7.66E-04 | | -1.53 | 1.00 | 7.79E-04 | | |
| | | | | | | 2.29E-02 | -0.0001 | | | 0.0147 | 0.0000 | | | 1.47E-02 | 0.0000 | |

| EW5 | Eval well | EW5 | X | 30.00 | | Xstart | 28.63 | Y | 47 | Y start | 44.96894 | Y | 42 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dx | Dy | Angle | Cos | iw | Iw-In | Angle | sin | iw | Iw-Ic | Angle | sin | iw | Iw-Ic | **115.4** |
| | EW2 | 147.18 | -514.71 | 1.35 | 0.222 | 9.274E-05 | | -1.31 | 0.97 | 0.0003674 | | 1.27 | -0.95 | -4.25E-04 | | |
| | EW3 | 131.71 | -279.58 | 1.22 | 0.342 | 4.703E-05 | | -1.19 | 0.93 | 0.0001078 | | 1.06 | -0.87 | -1.32E-04 | | |
| | EW4 | 146.05 | -52.91 | 0.43 | 0.91 | 0.000E+00 | | -0.60 | 0.56 | 0 | | 0.07 | -0.07 | 0.00E+00 | | |
| | EW5 | 0.00 | 0.00 | 0.00 | 1.00 | 2.195E-02 | | 0.00 | 1.00 | 0.0140088 | | 0.00 | 1.00 | 1.57E-02 | | |
| | EW6 | -217.93 | 2.57 | 0.01 | 1.00 | 7.519E-04 | | 0.20 | -0.20 | -0.0001675 | | 0.20 | -0.20 | -1.68E-04 | | |
| | EW7 | 150.82 | -716.04 | 1.40 | 0.17 | 7.741E-05 | | -1.38 | 0.98 | 0.0004261 | | 1.35 | -0.98 | -4.77E-04 | | |
| | | | | | | 2.29E-02 | -0.0001 | | | 0.0147 | 0.0001 | | | 0.0145 | -0.0002 | |

# Appendix G.2 Groundwater Capture Analytial Model (March 2015)

overlap 48.09

**EW6**

| Eval well | EW6 | X | -999.00 | | Xstart | 8.11 |
|---|---|---|---|---|---|---|
| | Dx | Dy | Angle | Cos | iw | Iw-In |
| EW2 | 365.12 | -517.28 | 0.36 | 0.935 | 1.413E-04 | |
| EW3 | 349.65 | -282.15 | 0.21 | 0.979 | 2.907E-05 | |
| EW4 | 365.12 | -55.48 | 0.04 | 1.00 | 0.000E+00 | |
| EW5 | 217.93 | -2.57 | 0.00 | -1.00 | -5.411E-04 | |
| EW6 | 0.00 | 0.00 | 0.00 | 1.00 | 1.866E-04 | |
| EW7 | 368.75 | -718.61 | 0.48 | 0.89 | 1.936E-04 | |
| | | | | | 9.56E-06 | -0.0230 |

| Y | 13.5 | Y start | 12.73292 | Y | 12.5 | Y start | | Ymax |
|---|---|---|---|---|---|---|---|---|
| Angle | sin | iw | Iw-Ic | Angle | sin | iw | Iw-Ic | **25.5** |
| -0.97 | 0.82 | 2.82E-04 | 1.9% | 0.94 | -0.81 | -2.87E-04 | | |
| -0.70 | 0.65 | 5.77E-05 | 0.4% | 0.66 | -0.61 | -5.66E-05 | | |
| -0.19 | 0.19 | 0.00E+00 | 0.0% | 0.12 | -0.12 | 0.00E+00 | | |
| -0.07 | 0.07 | 2.22E-04 | 1.5% | -0.05 | 0.05 | 1.37E-04 | | |
| 0.00 | 1.00 | 1.38E-02 | 93.7% | 0.00 | 1.00 | 1.49E-02 | | |
| -1.10 | 0.89 | 3.68E-04 | 2.5% | 1.09 | -0.89 | -3.76E-04 | | |
| | | 0.0147 | 0.0001 | | | 0.0143 | -0.0003 | |

**EW7**

| Eval well | EW7 | X | 15.00 | | Xstart | 14.69 |
|---|---|---|---|---|---|---|
| | Dx | Dy | Angle | Cos | iw | Iw-In |
| EW2 | -3.64 | 201.33 | 1.48 | 0.092 | 1.006E-04 | |
| EW3 | -19.11 | 436.46 | 1.49 | 0.078 | 7.283E-06 | |
| EW4 | -4.78 | 663.13 | 1.54 | 0.03 | 0.000E+00 | |
| EW5 | -150.82 | 716.04 | 1.34 | 0.23 | 2.021E-04 | |
| EW6 | -368.75 | 718.61 | 1.08 | 0.47 | 1.078E-04 | |
| EW7 | 0.00 | 0.00 | 0.00 | 1.00 | 2.252E-02 | |
| | | | | | 2.29E-02 | -0.0001 |
| | | | in | 0.023 | 1.464E-02 | -0.84% |

| Y | 28 | Y start | 23.07453 | Y | 20 | Y start | | Ymax |
|---|---|---|---|---|---|---|---|---|
| Angle | sin | iw | Iw-Ic | Angle | sin | iw | Iw-Ic | 46.1 |
| -1.55 | 1.00 | 1.27E-03 | | 1.55 | -1.00 | -9.96E-04 | | |
| -1.52 | 1.00 | 1.00E-04 | | 1.53 | -1.00 | -8.95E-05 | | |
| -1.56 | 1.00 | 0.00E+00 | | 1.56 | -1.00 | 0.00E+00 | | |
| -1.36 | 0.98 | 9.13E-04 | | 1.37 | -0.98 | -8.59E-04 | | |
| -1.08 | 0.88 | 2.10E-04 | | 1.11 | -0.89 | -2.02E-04 | | |
| 0.00 | 1.00 | 1.21E-02 | | 0.00 | 1.00 | 1.69E-02 | | |
| | | 0.0146 | -0.0001 | | | 0.0147 | 0.0001 | |

**EW11**

| Eval well | EW11 | X | 2.90 | | Xstart | 2.81 |
|---|---|---|---|---|---|---|
| | Dx | Dy | Angle | Cos | iw | Iw-In |
| EW11 | 0.00 | 0.00 | 0.00 | 1.000 | 2.227E-02 | |
| EW12 | -491.14 | -784.75 | -1.01 | 0.533 | 3.535E-04 | |
| EW9 | -345.48 | -314.07 | -0.73 | 0.743 | 0.000E+00 | |
| EW10 | -221.63 | -243.25 | -0.83 | 0.678 | 0.000E+00 | |
| EW14 | -368.94 | -538.55 | -0.97 | 0.568 | 0.000E+00 | |
| | | | | | 2.26E-02 | -0.0004 |

| Y | 4.5 | Y start | 4.409938 | Y | 5 | Y start | | Ymax |
|---|---|---|---|---|---|---|---|---|
| Angle | sin | iw | Iw-Ic | Angle | sin | iw | Iw-Ic | 8.8 |
| 0.00 | 1.00 | 1.43E-02 | | 0.00 | 1.00 | 1.29E-02 | | |
| 1.01 | -0.85 | -5.62E-04 | | -1.01 | 0.85 | 5.65E-04 | | |
| 0.74 | -0.68 | 0.00E+00 | | -0.73 | 0.67 | 0.00E+00 | | |
| 0.84 | -0.75 | 0.00E+00 | | -0.82 | 0.73 | 0.00E+00 | | |
| 0.97 | -0.83 | 0.00E+00 | | -0.97 | 0.82 | 0.00E+00 | | |
| | | 0.0138 | -0.0009 | | | 0.0135 | -0.0012 | |

**EW12**

| | Dx | Dy | Angle | Cos | iw | % of i |
|---|---|---|---|---|---|---|
| EW12 | | X | **27.00** | | Xstart | 27 |
| | Dx | Dy | Angle | Cos | iw | Iw-In |
| EW11 | -491.14 | -784.75 | -1.00 | 0.542 | 3.722E-05 | |
| EW12 | 0.00 | 0.00 | 0.00 | 1.000 | 2.279E-02 | |
| EW9 | 145.66 | 470.68 | -1.28 | 0.290 | 0.000E+00 | |
| EW10 | 269.51 | 541.50 | -1.11 | 0.442 | 0.000E+00 | |
| EW14 | 122.20 | 246.20 | -1.12 | 0.436 | 0.000E+00 | |
| | | | | | 2.28E-02 | -0.0002 |

| Angle | cos | iw | | Angle | cos | iw | | |
|---|---|---|---|---|---|---|---|---|
| Yn | **42.00** | Y start | 42 | Ys | **42.00** | Y start | | Ymax |
| Angle | sin | iw | Iw-Ic | Angle | sin | iw | Iw-Ic | 84.0 |
| 1.03 | -0.86 | -5.77E-05 | | -0.99 | 0.83 | 6.05E-05 | | |
| 0.00 | 1.00 | 1.46E-02 | | 0.00 | 1.00 | 1.46E-02 | | |
| 1.24 | -0.95 | 0.00E+00 | | -1.29 | 0.96 | 0.00E+00 | | |
| 1.08 | -0.88 | 0.00E+00 | | -1.14 | 0.91 | 0.00E+00 | | |
| 1.03 | -0.86 | 0.00E+00 | | -1.17 | 0.92 | 0.00E+00 | | |
| | | 0.0146 | -0.0001 | | | 0.0147 | 0.0001 | |

**EW9**

| | | X | **0.00** | | Xstart | 0 |
|---|---|---|---|---|---|---|
| | Dx | Dy | Angle | Cos | iw | Iw-In |
| EW11 | 345.48 | 314.07 | -0.74 | 0.740 | 1.023E-04 | |
| EW12 | -145.66 | -470.68 | -1.27 | 0.296 | 3.692E-04 | |
| EW9 | 0.00 | 0.00 | #DIV/0! | #DIV/0! | #DIV/0! | |
| EW10 | 123.85 | 70.82 | -0.52 | 0.868 | 0.000E+00 | |
| EW14 | -23.46 | -224.48 | -1.47 | 0.104 | 2.974E-05 | |
| | | | | | #DIV/0! | #DIV/0! |

| Yn | **0.00** | Y start | 0 | Ys | **0.00** | Y start | | Ymax |
|---|---|---|---|---|---|---|---|---|
| Angle | sin | iw | Iw-Ic | Angle | sin | iw | Iw-Ic | 0.0 |
| 0.83 | -0.74 | -1.02E-04 | | -0.74 | 0.67 | 9.30E-05 | | |
| 0.30 | -0.30 | -3.69E-04 | | -1.27 | 0.96 | 1.19E-03 | | |
| 0.00 | 1.00 | #DIV/0! | | #DIV/0! | #DIV/0! | #DIV/0! | | |
| 1.05 | -0.87 | 0.00E+00 | | -0.52 | 0.50 | 0.00E+00 | | |
| 0.10 | -0.10 | 0.00E+00 | | -1.47 | 0.99 | 0.00E+00 | | |
| | | #DIV/0! | #DIV/0! | | | #DIV/0! | #DIV/0! | |

# Appendix G.2 Groundwater Capture Analytial Model (March 2015)

EW10

| | X | 0.00 | Xstart | 0 | Yn | 0.00 | Y start | 0 | Ys | 0.00 | Y start | Ymax |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | 0.0 |

| | Dx | Dy | Angle | Cos | iw | Iw-In | Angle | cos | iw | Iw-Ic | Angle | cos | iw | Iw-Ic |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EW11 | 221.63 | 243.25 | -0.83 | 0.673 | 1.322E-04 | | 0.83 | 0.67 | 1.32E-04 | | -0.66 | 0.79 | 1.55E-04 | |
| EW12 | -269.51 | -541.50 | -1.11 | 0.446 | 4.532E-04 | | 0.43 | 0.91 | 9.23E-04 | | -0.49 | 0.88 | 8.95E-04 | |
| EW9 | -123.85 | -70.82 | -0.52 | 0.868 | 0.000E+00 | | 0.83 | 0.67 | 0.00E+00 | | -1.34 | 0.23 | 0.00E+00 | |
| EW10 | 0.00 | 0.00 | 0.00 | 1.000 | #DIV/0! | | 0.00 | 1.00 | #DIV/0! | | 0.00 | 1.00 | 0.00E+00 | |
| EW14 | -147.31 | -295.30 | -1.11 | 0.446 | 0.000E+00 | | 0.41 | 0.92 | 0.00E+00 | | -0.53 | 0.86 | 0.00E+00 | |
| | | | | | #DIV/0! | #DIV/0! | | | #DIV/0! | #DIV/0! | | | 0.0011 | -0.0136 |

EW14

| Eval well | X | 0.00 | Xstart | 0 | Yn | 0.00 | Y start | 0 | Ys | 0.00 | Y start | Ymax |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | 0.0 |

| | Dx | Dy | Angle | Cos | iw | Iw-In | Angle | cos | iw | Iw-Ic | Angle | cos | iw | Iw-Ic |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EW11 | 368.94 | 538.55 | -0.97 | 0.565 | 5.590E-05 | | 0.60 | 0.82 | 8.16E-05 | | -0.60 | 0.82 | 8.16E-05 | |
| EW12 | -122.20 | -246.20 | -1.11 | 0.445 | 9.952E-04 | | 0.46 | 0.90 | 2.01E-03 | | -0.46 | 0.90 | 2.01E-03 | |
| EW9 | 23.46 | 224.48 | -1.47 | 0.104 | 0.000E+00 | | 0.10 | 0.99 | 0.00E+00 | | -0.10 | 0.99 | 0.00E+00 | |
| EW10 | 147.31 | 295.30 | -1.11 | 0.446 | 0.000E+00 | | 0.46 | 0.89 | 0.00E+00 | | -0.46 | 0.89 | 0.00E+00 | |
| EW14 | 0.00 | 0.00 | #DIV/0! | #DIV/0! | #DIV/0! | | #DIV/0! | #DIV/0! | #DIV/0! | | 0.00 | 1.00 | #DIV/0! | |
| | | | | | #DIV/0! | #DIV/0! | | | #DIV/0! | #DIV/0! | | | #DIV/0! | #DIV/0! |

# Appendix G.2 Groundwater Capture Analytial Model (September 2015)

| Well Name | X Coord. | Y Coord. | Q gpm | Q cfd |
|---|---|---|---|---|
| EW2 | 1.14 | -514.71 | 8.00 | 1540 |
| EW3 | -14.33 | -279.58 | 0.30 | 58 |
| EW4 | 0.00 | -52.91 | 0.1 | 19 |
| EW5 | -146.05 | 0.00 | 30.4 | 5852 |
| EW6 | -363.98 | 2.57 | 4.7 | 905 |
| EW7 | 4.78 | -716.04 | 14.7 | 2830 |
| | | | | 11204 |
| Yavg | **-174.16** | **-252.94** | | |
| EW9 | -345.48 | -314.07 | 6.4 | 1232 |
| EW10 | -221.63 | -243.25 | 0.6 | 116 |
| EW11 | 0.00 | 0.00 | 0.1 | 19 |
| EW12 | -491.14 | -784.75 | 22.9 | 4409 |
| EW14 | -132.67 | -89.01 | 4.7 | 905 |

Mar 2015

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X stag X **35** Xstart 30.447 Yn **46.00** Y start 47.8261 Overlap Ys **112.08** **-999.00** Y start Iw-In Ymax

EW2

| | Dx | Dy | Angle | Cos | iw | | Angle | sin | iw | | Angle | sin | iw | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EW2 | 0 | 0.00 | | 1 | 2.001E-02 | | | 1.00 | 1.52E-02 | | | 1.00 | 7.01E-04 | | **95.7** |
| EW3 | -15.47 | 235.13 | 1.359359234 | 0.21 | 2.302E-05 | | -0.08 | -1.00 | -1.39E-04 | | -0.02 | -1.00 | -3.45E-05 | | |
| EW4 | -1.14 | 461.81 | 1.492702971 | 0.08 | 1.455E-06 | | 0.00 | 1.00 | 2.08E-05 | | 0.00 | 1.00 | 1.61E-05 | | |
| EW5 | -147.18 | 514.71 | 1.23060325 | 0.33 | 1.626E-03 | | -0.30 | -0.95 | -5.17E-03 | | -0.30 | -0.96 | -5.03E-03 | | |
| EW6 | -365.12 | 517.28 | 0.912426182 | 0.61 | 3.850E-04 | | -0.66 | -0.79 | -5.46E-04 | | -0.65 | -0.80 | -5.43E-04 | | |
| EW7 | 3.64 | -201.33 | -1.41627133 | 0.15 | 9.721E-04 | | -0.01 | 1.00 | 5.20E-03 | | 0.00 | 1.00 | 1.07E-03 | | |
| | | | | | 0.0230 | 0.0000 | | | 0.0146 | 0.0000 | | | -0.0038 | -0.0185 | |

ic 0 ic 0

**OL 3-5** **3.03** **OL 3-2** **8.57**

X stag X **1.50** Xstart 1.15 Yn **-999.00** Y start 1.80124 Ys **-999.00** Y start Ymax

EW3

| | Dx | Dy | Angle | Cos | iw | | Angle | sin | iw | | Angle | sin | iw | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EW2 | 15.47 | -235.13 | 1.51 | 0.059 | 1.763E-04 | | 1.55 | -1.00 | -9.16E-04 | | -1.56 | 1.00 | 5.67E-04 | | 3.6 |
| EW3 | 0.00 | 0.00 | 0.00 | 1.000 | 1.758E-02 | | 0.00 | 1.00 | 2.64E-05 | | 0.00 | 1.00 | 2.64E-05 | | |
| EW4 | 14.33 | 226.68 | -1.51 | 0.06 | 0.000E+00 | | 1.56 | -1.00 | -7.05E-06 | | -1.55 | 1.00 | 1.12E-05 | | |
| EW5 | -131.71 | 279.58 | 1.13 | 0.43 | 3.696E-03 | | -1.47 | 0.99 | 2.06E-03 | | 1.39 | -0.98 | -3.58E-03 | | |
| EW6 | -349.65 | 282.15 | 0.68 | 0.78 | 7.122E-04 | | -1.30 | 0.96 | 2.99E-04 | | 1.12 | -0.90 | -4.64E-04 | | |
| EW7 | 19.11 | -436.46 | 1.53 | 0.04 | 1.188E-04 | | 1.54 | -1.00 | -2.28E-03 | | -1.56 | 1.00 | 8.96E-04 | | |
| | | | | | 2.23E-02 | -0.0007 | | | -0.0008 | -0.0155 | | | -2.54E-03 | -0.0172 | |

overlap **372.08** 5+6Ymax

EW5 X **123.0** Xstart 116 Yn **200.00** Y start 182 Ys **-999.00**

| | Dx | Dy | Angle | Cos | iw | | Angle | sin | iw | | Angle | sin | iw | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EW2 | 147.18 | -514.71 | 1.52 | 0.047 | 6.378E-05 | | -1.37 | 0.98 | 0.00093995 | | 1.47 | -1.00 | -4.58E-04 | | **419.7** |
| EW3 | 131.71 | -279.58 | 1.54 | 0.031 | 2.937E-06 | | -1.30 | 0.96 | 5.1137E-05 | | 1.47 | -0.99 | -2.04E-05 | | |
| EW4 | 146.05 | -52.91 | 1.16 | 0.40 | 5.979E-05 | | -1.05 | 0.87 | 2.5619E-05 | | 1.43 | -0.99 | -8.06E-06 | | |
| EW5 | 0.00 | 0.00 | 0.00 | 1.00 | 2.163E-02 | | 0.00 | 1.00 | 0.0133052 | | 0.00 | 1.00 | 2.66E-03 | | |
| EW6 | -217.93 | 2.57 | 0.01 | 1.00 | 1.207E-03 | | 0.74 | -0.67 | -0.00093958 | | -1.36 | 0.98 | 3.94E-04 | | |
| EW7 | 150.82 | -716.04 | 1.53 | 0.04 | 6.973E-05 | | -1.41 | 0.99 | 0.00136775 | | 1.48 | -1.00 | -7.45E-04 | | |
| | | | | | 2.30E-02 | 0.0000 | | | 0.0148 | 0.0001 | | | 0.0018 | -0.0128 | |

**Overlap** **29.19**

EW6 X **-999.00** Xstart 18 Yn **41.00** Y start 28 Ys **26.00** Y start Ymax

| | Dx | Dy | Angle | Cos | iw | | Angle | sin | iw | | Angle | sin | iw | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EW2 | 365.12 | -517.28 | 0.36 | 0.935 | 4.488E-04 | | -0.99 | 0.84 | 8.79E-04 | 6.0% | 0.93 | -0.80 | -9.18E-04 | | **56.2** |
| EW3 | 349.65 | -282.15 | 0.21 | 0.979 | 1.874E-05 | | -0.75 | 0.68 | 3.76E-05 | 0.3% | 0.63 | -0.59 | -3.60E-05 | | |
| EW4 | 365.12 | -55.48 | 0.04 | 1.00 | 6.323E-06 | | -0.26 | 0.26 | 5.84E-06 | 0.0% | 0.08 | -0.08 | -1.90E-06 | | |
| EW5 | 217.93 | -2.57 | 0.00 | -1.00 | -2.187E-03 | | -0.20 | 0.20 | 2.35E-03 | 16.0% | -0.11 | 0.11 | 1.30E-03 | | |
| EW6 | 0.00 | 0.00 | 0.00 | 1.00 | 4.119E-04 | | 0.00 | 1.00 | 1.00E-02 | 68.4% | 0.00 | 1.00 | 1.58E-02 | | |
| EW7 | 368.75 | -718.61 | 0.48 | 0.89 | 7.373E-04 | | -1.12 | 0.90 | 1.37E-03 | 9.3% | 1.08 | -0.88 | -1.45E-03 | | |
| | | | | | -5.64E-04 | -0.0236 | | | 0.0147 | 0.0000 | | | 0.0147 | 0.0001 | |

overlap w **130.38**

EW7 X **61.00** Xstart 56 Yn **-999.00** Y start 88 Ys **61.00** Y start Ymax

# Appendix G.2 Groundwater Capture Analytial Model (September 2015)

| | Dx | Dy | Angle | Cos | iw | | Angle | sin | iw | | Angle | sin | iw | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EW2 | -3.64 | 201.33 | 1.26 | 0.306 | 1.012E-03 | | -1.57 | 1.00 | 5.83E-04 | | 1.56 | -1.00 | -2.67E-03 | | 175.8 |
| EW3 | -19.11 | 436.46 | 1.39 | 0.181 | 1.073E-05 | | -1.56 | 1.00 | 1.84E-05 | | 1.53 | -1.00 | -5.29E-05 | | |
| EW4 | -4.78 | 663.13 | 1.47 | 0.10 | 1.280E-06 | | -1.57 | 1.00 | 5.20E-06 | | 1.56 | -1.00 | -1.19E-05 | | |
| EW5 | -150.82 | 716.04 | 1.28 | 0.28 | 1.011E-03 | | -1.48 | 1.00 | 1.54E-03 | | 1.38 | -0.98 | -3.30E-03 | | |
| EW6 | -368.75 | 718.61 | 1.03 | 0.51 | 2.523E-04 | | -1.36 | 0.98 | 2.29E-04 | | 1.13 | -0.90 | -4.31E-04 | | |
| EW7 | 0.00 | 0.00 | 0.00 | 1.00 | 2.110E-02 | | 0.00 | 1.00 | 1.29E-03 | | 0.00 | 1.00 | 2.11E-02 | | |
| | | | | | 2.34E-02 | 0.0004 | | | 0.0037 | -0.0110 | | | 0.0146 | 0.0000 | |
| | | | in | 0.023 | 1.464E-02 | -0.84% | | | | | | | | | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EW11 | | X | <1 | | Xstart | 0 | Yn | <1 | Y start | 1 | Ys | <1 | Y start | | Ymax |
| | Dx | Dy | Angle | Cos | iw | | Angle | sin | iw | | Angle | sin | iw | | 1.2 |
| EW11 | 0.00 | 0.00 | #VALUE! | #VALUE! | #VALUE! | | #VALUE! | 1.00 | #VALUE! | | #VALUE! | 1.00 | #VALUE! | | |
| EW12 | -491.14 | -784.75 | #VALUE! | #VALUE! | #VALUE! | | #VALUE! | #VALUE! | #VALUE! | | #VALUE! | #VALUE! | #VALUE! | | |
| EW9 | -345.48 | -314.07 | #VALUE! | #VALUE! | #VALUE! | | #VALUE! | #VALUE! | #VALUE! | | #VALUE! | #VALUE! | #VALUE! | | |
| EW10 | -221.63 | -243.25 | #VALUE! | #VALUE! | #VALUE! | | #VALUE! | #VALUE! | #VALUE! | | #VALUE! | #VALUE! | #VALUE! | | |
| EW14 | -132.67 | -89.01 | #VALUE! | #VALUE! | #VALUE! | | #VALUE! | #VALUE! | #VALUE! | | #VALUE! | #VALUE! | #VALUE! | | |
| | | | | | #VALUE! | #VALUE! | | | #VALUE! | #VALUE! | | | #VALUE! | #VALUE! | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | OL 12-9 | 385.33 | | | | | | | |
| EW12 | | X | 89.00 | | Xstart | 87 | Yn | -999.00 | Y start | 137 | Ys | 150.00 | Y start | | Ymax |
| | Dx | Dy | Angle | Cos | iw | | Angle | sin | iw | | Angle | sin | iw | | 273.9 |
| EW11 | -491.14 | -784.75 | -0.93 | 0.594 | 5.263E-06 | | -0.41 | 0.40 | 6.45E-06 | | -0.91 | 0.79 | 8.51E-06 | | |
| EW12 | 0.00 | 0.00 | 0.00 | 1.000 | 2.253E-02 | | 0.00 | 1.00 | 2.01E-03 | | 0.00 | 1.00 | 1.34E-02 | | |
| EW9 | 145.66 | 470.68 | -1.45 | 0.120 | 1.412E-04 | | 1.47 | -1.00 | -3.77E-04 | | -1.34 | 0.97 | 8.55E-04 | | |
| EW10 | 269.51 | 541.50 | -1.25 | 0.316 | 2.922E-05 | | 1.40 | -0.99 | -3.32E-05 | | -1.20 | 0.93 | 6.62E-05 | | |
| EW14 | 358.47 | 695.74 | -1.20 | 0.361 | 1.992E-04 | | 1.36 | -0.98 | -2.32E-04 | | -1.17 | 0.92 | 4.12E-04 | | |
| | | | | | 2.29E-02 | -0.0001 | | | 0.0014 | -0.0133 | | | 0.0147 | 0.0001 | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | overlap 9-14 | | 179 | | Overlap 12-9 | | 391 | | |
| EW9 | | X | 26.50 | | Xstart | 24 | Yn | -999.00 | Y start | 38 | Ys | -999.00 | Y start | | Ymax |
| | Dx | Dy | Angle | Cos | iw | | Angle | sin | iw | | Angle | sin | iw | | 76.5 |
| EW11 | 345.48 | 314.07 | -0.78 | 0.713 | 1.375E-05 | | 0.26 | -0.25 | -1.62E-06 | | 1.10 | -0.89 | -1.01E-05 | | |
| EW12 | -145.66 | -470.68 | -1.22 | 0.344 | 1.374E-03 | | -0.27 | 0.27 | 9.72E-04 | | -1.47 | 1.00 | 1.35E-03 | | |
| EW9 | 0.00 | 0.00 | 0.00 | 1.000 | 2.114E-02 | | 0.00 | 1.00 | 5.61E-04 | | 0.00 | 1.00 | 5.61E-04 | | |
| EW10 | 123.85 | 70.82 | -0.63 | 0.809 | 3.543E-04 | | 0.12 | -0.11 | -5.63E-06 | | 1.44 | -0.99 | -5.58E-05 | | |
| EW14 | 212.81 | 225.06 | -0.88 | 0.638 | 1.886E-05 | | 0.17 | -0.17 | -5.67E-05 | | 1.30 | -0.96 | -4.94E-04 | | |
| | | | | | 2.29E-02 | -0.0001 | | | 0.0015 | -0.0132 | 10-9 | 12.26 | 0.0014 | -0.0133 | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EW10 | | X | 3.00 | | Xstart | 2 | Yn | 9.00 | Y start | 4 | Ys | -999.00 | Y start | | Ymax |
| | Dx | Dy | Angle | Cos | iw | | Angle | cos | iw | | Angle | cos | iw | | 7.2 |
| EW11 | 221.63 | 243.25 | -0.84 | 0.668 | 1.766E-05 | | 0.18 | 0.98 | 2.64E-05 | | -0.51 | 0.87 | 9.56E-06 | | |
| EW12 | -269.51 | -541.50 | -1.10 | 0.450 | 1.487E-03 | | -0.53 | 0.86 | 2.82E-03 | | -0.60 | 0.82 | 1.06E-03 | | |
| EW9 | -123.85 | -70.82 | -0.51 | 0.873 | 3.367E-03 | | -0.13 | 0.99 | 3.77E-03 | | 1.00 | 0.54 | 2.80E-04 | | |
| EW10 | 0.00 | 0.00 | 0.00 | 1.000 | 1.758E-02 | | 0.00 | 1.00 | 5.86E-03 | | 0.00 | 1.00 | 3.52E-04 | | |
| EW14 | 88.96 | 154.24 | -1.06 | 0.487 | 1.135E-03 | | 0.08 | 1.00 | 2.41E-03 | | -0.28 | 0.96 | 1.25E-03 | | |
| | | | | | 2.36E-02 | 0.0006 | | | 0.0149 | 0.0002 | | | 0.0029 | -0.0117 | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 9/14 over | 127.05 | | | |
| EW14 | Eval well | X | 21.00 | | Xstart | 18 | Yn | 38.00 | Y start | 28 | Ys | -999.00 | Y start | | Ymax |
| | Dx | Dy | Angle | Cos | iw | | Angle | cos | iw | | Angle | cos | iw | | 56.2 |
| EW11 | 132.67 | 89.01 | -0.67 | 0.782 | 4.731E-05 | | 1.20 | 0.36 | 2.18E-05 | | 0.14 | 0.99 | 9.30E-06 | | |
| EW12 | -358.47 | -695.74 | -1.07 | 0.479 | 1.211E-03 | | 0.45 | 0.90 | 2.21E-03 | | -0.21 | 0.98 | 1.13E-03 | | |
| EW9 | -212.81 | -225.06 | -0.77 | 0.720 | 1.244E-03 | | 0.68 | 0.78 | 1.29E-03 | | -0.17 | 0.99 | 4.44E-04 | | |
| EW10 | -88.96 | -154.24 | -0.95 | 0.580 | 1.617E-04 | | 0.43 | 0.91 | 2.26E-04 | | -0.08 | 1.00 | 4.55E-05 | | |
| EW14 | 0.00 | 0.00 | 0.00 | 1.000 | 1.960E-02 | | 0.00 | 1.00 | 1.08E-02 | | 0.00 | 1.00 | 4.12E-04 | | |
| | | | | | 2.23E-02 | -0.0007 | | | 0.0146 | -0.0001 | | | 0.0020 | -0.0126 | |

# Appendix G.3
# Groundwater Velocity Calculation

# Appendix G.3 Groundwater Velocity Calculation

V= K*In/Pe Todd (1980) Eq(1)

Where

V= groundwater velocity (ft/d)

K = Hydraulic Conductivity (ft/d)

In = natural gradient (unitless)

Pe = effective porosity (unitless)

Parameters Used

See appendix G.1 for selection of transmissivity value of 350 $ft^2/d$

K = T/aquifer thickness (75 ft see Appendix G.1)

K = 4.7 ft/d

MW-70 and MW-80 in March and September 2015.

Pe is assumed to be 0.08 which is typical of a fractured basalt

V= (4.6 ft/d)*(0.023)/(0.08)= 1.3 ft/d

Average distance to pumping stagnation point in September 2015= 60 ft (EW2,5,7,9,14)

Assume GETS can recapture the plume if it travels less than the stagnation distance

| | | | | |
|---|---|---|---|---|
| Max off time = | 60 ft/1.3 ft/d | 46.2 | days | Eq(2) |
| Safety factor (50%) | | 23 | days | |
| | | 3 | weeks | |

# Appendix H
# Concentration Trend Analysis Worksheets
(*Provided on CD*)

# Appendix I
# Residential Well Analytical Reports

# Client Sample Results

Client: Bay West Inc.
Project/Site: Fairchild AFB – LF002

TestAmerica Job ID: 280-78170-1

## Client Sample ID: LF002-PS1/4-15D

**Lab Sample ID: 280-78170-2**

**Date Collected: 12/16/15 14:06**
**Matrix: Water**
**Date Received: 12/18/15 10:55**

### Method: 8260B - Volatile Organic Compounds (GC/MS)

| Analyte | Result | Qualifier | LOQ | LOD | DL | Unit | D | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| cis-1,2-Dichloroethene | 0.40 | U | 1.0 | 0.40 | 0.15 | ug/L | | 12/29/15 12:50 | 1 |
| trans-1,2-Dichloroethene | 0.40 | U | 1.0 | 0.40 | 0.15 | ug/L | | 12/29/15 12:50 | 1 |
| **Trichloroethene** | **0.22** | **J** | 1.0 | 0.40 | 0.16 | ug/L | | 12/29/15 12:50 | 1 |
| Vinyl chloride | 0.20 | U | 1.5 | 0.20 | 0.10 | ug/L | | 12/29/15 12:50 | 1 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *1,2-Dichloroethane-d4 (Surr)* | *103* | | *81 - 118* | | *12/29/15 12:50* | *1* |
| *4-Bromofluorobenzene (Surr)* | *100* | | *85 - 114* | | *12/29/15 12:50* | *1* |
| *Dibromofluoromethane (Surr)* | *100* | | *80 - 119* | | *12/29/15 12:50* | *1* |
| *Toluene-d8 (Surr)* | *100* | | *89 - 112* | | *12/29/15 12:50* | *1* |

# Client Sample Results

Client: Bay West Inc.
Project/Site: Fairchild AFB - Bay West

TestAmerica Job ID: 280-78001-1

## Client Sample ID: WP003-RW12-15D

**Lab Sample ID: 280-78001-3**

**Date Collected: 12/11/15 11:15**

**Matrix: Water**

**Date Received: 12/12/15 08:40**

### Method: 6020A - Metals (ICP/MS) - Dissolved

| Analyte | Result | Qualifier | LOQ | LOD | DL | Unit | D | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| Arsenic, Dissolved | 1.0 | U | 5.0 | 1.0 | 0.33 | ug/L | | 12/18/15 01:04 | 1 |

# Client Sample Results

Client: Bay West Inc.
Project/Site: Fairchild AFB - Bay West

TestAmerica Job ID: 280-78001-1

## Client Sample ID: WP003-RW17-15D

**Lab Sample ID: 280-78001-5**

**Date Collected: 12/11/15 11:45**

**Matrix: Water**

**Date Received: 12/12/15 08:40**

### Method: 8260B - Volatile Organic Compounds (GC/MS)

| Analyte | Result | Qualifier | LOQ | LOD | DL | Unit | D | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| cis-1,2-Dichloroethene | 0.40 | U | 1.0 | 0.40 | 0.15 | ug/L | | 12/22/15 14:06 | 1 |
| trans-1,2-Dichloroethene | 0.40 | U | 1.0 | 0.40 | 0.15 | ug/L | | 12/22/15 14:06 | 1 |
| Trichloroethene | 0.40 | U | 1.0 | 0.40 | 0.16 | ug/L | | 12/22/15 14:06 | 1 |
| Vinyl chloride | 0.20 | U | 1.5 | 0.20 | 0.10 | ug/L | | 12/22/15 14:06 | 1 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *1,2-Dichloroethane-d4 (Surr)* | *99* | | *81 - 118* | | *12/22/15 14:06* | *1* |
| *4-Bromofluorobenzene (Surr)* | *103* | | *85 - 114* | | *12/22/15 14:06* | *1* |
| *Dibromofluoromethane (Surr)* | *99* | | *80 - 119* | | *12/22/15 14:06* | *1* |
| *Toluene-d8 (Surr)* | *98* | | *89 - 112* | | *12/22/15 14:06* | *1* |

# Client Sample Results

Client: Bay West Inc.
Project/Site: Fairchild AFB - Bay West

TestAmerica Job ID: 580-55918-1

## Client Sample ID: FT004-RW46-15D

**Lab Sample ID: 580-55918-2**

**Date Collected: 12/11/15 11:30**

**Matrix: Water**

**Date Received: 12/16/15 08:30**

### Method: NWTPH-Dx - Northwest - Semi-Volatile Petroleum Products (GC)

| Analyte | Result | Qualifier | LOQ | LOD | DL | Unit | D | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| **Diesel Range Organics (C10-C24)** | **0.020** | **J** | 0.10 | 0.029 | 0.014 | mg/L | | 12/29/15 19:13 | 1 |
| Motor Oil (>C24-C36) | 0.029 | U | 0.24 | 0.029 | 0.0093 | mg/L | | 12/29/15 19:13 | 1 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *o-Terphenyl* | *96* | | *50 - 150* | *12/23/15 12:37* | *12/29/15 19:13* | *1* |