DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 377TH AIR BASE WING (AFMC)

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NMED
Hazardous Waste Bureau

Mr. John Kieling
Chief, Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Bldg 1
Santa Fe, New Mexico 87505

Dear Mr. Kieling

Please find attached, "*Air Sparging and Soil-Vapor Extraction Pilot Study Letter Report*".

The letter report summarizes the Air Sparging (AS)/Soil-Vapor Extraction (SVE) Pilot Study that was performed at the Bulk Fuels Facility at Kirtland Air Force Base between June and December 2014. The report describes the pilot-study AS/SVE system and the activities conducted during operation, followed by presentation of the field and analytical results, data interpretation, and finally, conclusions gleaned from the study.

If you have any questions or concerns, please contact Mr. L. Wayne Bitner at (505) 853-3484 or at ludic.bitner@us.af.mil or Ms. Victoria Branson at (505) 846-6362 or at victoria.branson@us.af.mil.

Sincerely

ERIC H. FROEHLICH, Colonel, USAF
Commander

Attachment:
Air Sparging and Soil-Vapor Extraction Pilot Study Letter Report

cc:
NMED-EHD (Roberts, McQuillan, Agnew)
NMED-HWB (Cobrain, McDonald)
NMED-GWQB (Huddleson, Pullen, Hunter)
NMED-PSTB (Reuter)
NMED-OGC (Kendall)
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JANUARY 2016

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ERIC H. FROEHLICH, Colonel, USAF
Commander, 377th Air Base Wing

This document has been approved for public release.

KIRTLAND AIR FORCE BASE
377th Air Base Wing Public Affairs

Prepared by CB&I Federal Services LLC
2440 Louisiana Blvd. NE, Suite 300
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January 29, 2016

Subject: Air Sparging and Soil-Vapor Extraction Pilot Study Letter Report

This Letter Report has been prepared by CB&I Federal Services LLC for the U.S. Army Corps of Engineers (USACE), Albuquerque District, under Contract No. W912DY-10-D-0014, to summarize the Air Sparging (AS)/Soil-Vapor Extraction (SVE) Pilot Study that was performed at the Bulk Fuels Facility (BFF) at Kirtland Air Force Base (AFB) between June and December 2014. The pilot study was conducted in accordance the *Kirtland Air Force Base – Air Sparge and Soil Vapor Extraction Pilot Implementation Work Plan* (USACE, 2014a). The sections below describe the pilot-study AS/SVE system and the activities conducted during operation, followed by presentation of the field and analytical results, data interpretation, and finally, conclusions gleaned from the study.

1. PILOT-STUDY OBJECTIVES

The pilot-study objectives were to complete the following:

- Evaluate the use of AS to remove light non-aqueous-phase liquid (LNAPL) constituents, such as ethylene dibromide (EDB), migrating past the observed northern limit of the benzene, toluene, ethylbenzene, and xylenes (BTEX) plume source area, as a containment measure (New Mexico Environment Department, 2014).
- Evaluate the zone of influence in shallow groundwater around a single AS well installed near the existing KAFB-10617 well.

2. PILOT AS/SVE SYSTEM DESCRIPTION

Based on EDB concentrations measured during quarterly sampling events, and water-table contours (which provide estimated groundwater flow velocities), well KAFB-10617 was selected as the monitoring well for the pilot study, with a new AS/SVE well to be installed and operated upgradient of KAFB-10617. Available data showed EDB concentrations at KAFB-10617 in the range of 0.5 microgram per liter (µg/L) to 0.9 µg/L, which is 10 times greater than the U.S. Environmental Protection Agency (EPA) maximum contaminant limit of 0.05 µg/L. Water-table contours indicated groundwater movement toward the northeast at a rate of approximately 100 feet per year.

The pilot-study system included an AS component to transfer fuel hydrocarbons and EDB from the aqueous phase in the BFF groundwater into the vapor phase in the vadose zone, and an SVE component to capture/recover the vapors from the vadose zone and bring them aboveground for treatment. Figures 1 through 4 illustrate the location of the pilot study, the designs of the AS/SVE wells, the aboveground system equipment, and the connections between the wells and their respective treatment system components.

The AS/SVE pilot study was conducted south of Ridgecrest Drive and east of the Veterans Affairs Medical Center and San Pedro Avenue (Figure 1). The pilot-study system was comprised of one sparge well and one vapor-extraction well that were installed into a common borehole identified herein as KAFB-106211, one already-existing groundwater monitoring well identified as KAFB-10617, one AS compressor, one SVE blower, conveyance piping, granular-activated carbon (GAC) contact canisters, and the ancillary aboveground equipment shown on Figures 2 and 3. The aboveground AS and SVE

components were skid-mounted, and the two skids were mounted on a single trailer. Design and installation details follow.

2.1 Pilot-Study AS/SVE System Design

AS System Design

The aboveground portion of the pilot-study AS system included an air compressor, conveyance piping to carry air from the compressor to the AS well screen, and ancillary flow-control and system-monitoring gauges. A trailer-mounted 5-horsepower air compressor package sized to deliver up to 25 standard cubic feet per minute (SCFM) of clean, oil-free sparge air at an injection pressure of 28 pounds per square inch gauge at the wellhead was installed on a treatment skid. The compressor was designed to operate 24 hours per day and 7 days per week. A flow meter and a manual control valve were included to control the AS injection rate (Figure 2). The air was fed through 1-inch-diameter polyvinyl chloride (PVC) piping from the compressor to the AS wellhead.

The single sparge-well design used an aboveground air compressor to supply atmospheric air to the sparge well. Figure 4 provides a schematic representation of the AS well design and shows the completion details. The AS well was constructed of 1.25-inch-diameter, Schedule 80 PVC with a 5-foot long screen placed between 496 and 501 feet below ground surface (bgs). A 13-foot thick bentonite seal was placed in the borehole between 477 and 490 feet bgs to prevent short circuiting of sparge air between the AS and SVE well that were installed in the same borehole. The PVC riser traversed several layers of packing associated with the SVE well completion and was brought aboveground where the wellhead was connected to an air-supply line. In order to avoid potential flow of grout during installation of the AS/SVE well through permeable strata toward, and possibly interfering with, KAFB-10617, the AS/SVE well was installed at least 25 feet from KAFB-10617. If the rate of groundwater flow from the AS/SVE well toward KAFB-10617 is known, and an effect of AS on EDB concentration in the shallow groundwater is observed, then the minimum zone of influence of AS on the groundwater EDB concentration can be estimated.

One existing groundwater monitoring well (KAFB-10617) was incorporated into the pilot-study design to monitor system operation and performance. KAFB-10617 was located approximately 27 feet downgradient from KAFB-106211 and was constructed of 4-inch-diameter Schedule 80 PVC with a 25-foot long stainless steel 0.010-inch slot screen placed between 482 and 507 feet bgs. Additional KAFB-10617 completion details are provided in Appendix A.

SVE System Design:

Figure 2 provides a schematic representation of the pilot-study SVE system. The system included a single vapor-extraction well that was constructed of 3-inch-diameter, Schedule 80 PVC. A 30-foot long, Schedule 80 PVC screen was placed between 437 and 467 feet bgs so that the bottom of the screen was positioned 10 feet above the water table. Additional extraction well completion details are provided on Figure 4.

The extraction wellhead was plumbed to an SVE blower using 4-inch-diameter PVC pipe. The lengths of pipe between the wellhead and treatment system were kept short to minimize condensation potential. A dilution air valve was placed in line between the extraction wellhead and the blower in case atmospheric dilution air was required to reduce high concentrations of contaminants in the influent vapor to the GAC adsorbers, which could impact their performance and potentially lead to excessive emissions. A small amount of dilution air was used in July during system startup and initial operations, but dilution air was not required during the remainder of the study due to low influent vapor concentrations.

A skid-mounted, 5-horsepower, lobe-type positive displacement vacuum blower designed for 100 SCFM at vacuums of up to 60 inches of water column was used to extract soil vapor at a sufficient flow rate to capture the 15 to 25 SCFM of vapor that resulted from the injection of sparge air. The vacuum blower was equipped with an air/water separator for removal of any condensate or entrained water. A high-level

switch was installed on the air/water separator to shut down the SVE blower and the AS compressor if excessive liquid collected in the separator. An air cooler was installed on the exhaust side of the blower to lower the temperature of the post-blower extracted soil vapor before it went to the carbon adsorbers described below.

Two GAC adsorbers were used to remove hydrocarbons or other volatile organic compounds (VOCs) from the extracted soil vapor prior to atmospheric discharge. Each adsorber contained 2,000 pounds of virgin, coal-based GAC. The two GAC adsorbers were arranged in a lead-lag (i.e., series) configuration and were oversized with respect to contact time for 150 SCFM in order to give at least 2 weeks between carbon change-outs.

2.2 AS/SVE Pilot System Installation

KAFB-106211 was installed 27 feet upgradient from existing groundwater monitoring well KAFB-10617 (Figure 1) between June 4, 2014 and June 11, 2014, using air rotary casing hammer drilling. The AS and SVE wells were subsequently installed within the boring (Figure 4). The boring log for KAFB-106211, provided as Appendix B, showed the stratigraphy between 496 and 501 feet bgs was characterized as well-graded-gravel and sand with-gravel zones. The 5-foot long AS well screen was installed across that interval. The 30-foot long SVE well screen was placed between 437 to 467 feet bgs to extract vapor from well-graded, fine-to-coarse sand that appeared to coarsen upward. Following installation of the two well casings and completion of the AS/SVE well, a thin layer of grout was observed on the inside of the SVE well. The well was cleaned out with potable water, and a camera was lowered to inspect the casing and well screen, which were both found to be clean and undamaged. Either a small amount of grout moved through more permeable zones to enter the SVE well screen during well placement, or the bentonite seal placed just above the SVE well (399 to 432 feet bgs) was initially leaky so that grout placed above the bentonite leaked through the seal before the grout hardened to complete the seal.

Continuous split-spoon soil cores were collected from 482.0 to 500.5 feet bgs. Core collected from 482.0 to 483.5 feet bgs represented approximately 5 to 6.5 feet below the water table. The stratigraphy was characterized as well-sorted sand, grading into lean clay at the bottom. A section of this core was sent to a geotechnical laboratory to determine the vertical hydraulic conductivity of the shallow aquifer zone, which was measured at 1.88E-04 centimeters per second, i.e., a value toward the low end of the expected range for a sand unit.

The trailer-mounted system was installed within a fenced-in area near the AS/SVE well. The system was installed on a packed gravel pad, and electrical power was supplied by a new 200-amp, 230-volt single-phase service that was installed by Public Service Company of New Mexico.

2.3 AS/SVE Pilot System Operation

Following completion of KAFB-106211 and the connection of the wellheads to the treatment system, the AS/SVE system was turned on and operated from June 30, 2014 to December 18, 2014. Injection pressure and control-valve position were adjusted to give AS air flow between 15 and 25 SCFM. SVE well air flow was controlled by the well and dilution air valves at the wellhead, and was measured by a pitot tube at the wellhead. Additionally, a pressure/vacuum switch was installed at the blower inlet to shut down the system if the blower malfunctioned, and there was no vacuum at the blower inlet.

If any liquid condensate collected in the air-water separator (knock-out pot), the operators observed its presence in a separator sight glass and briefly shut down the system to manually pump the condensate into drums for appropriate disposal. Approximately 40 gallons of condensate were collected and disposed of off site during operation of the pilot system.

Soil vapor from the blower outlet was cooled to within 20 degrees Fahrenheit of ambient temperature by an air cooler. The soil vapor then passed to the two GAC adsorbers, which removed the hydrocarbons and any other VOCs. The adsorbers were piped in series, or in a “lead-lag” configuration.

During the pilot study, the SVE well extracted 100 to 240 SCFM of soil vapor under a 30- to 35-inch water vacuum. This flow rate and resulting vacuum were within the design specifications, thus indicating the well screen and filter pack were not plugged by the grout intrusion as discussed above.

2.4 AS/SVE Pilot System Monitoring

Pilot-study monitoring included collection of both operational and performance monitoring data. Operational data, including temperature, vacuum, humidity, and differential pressure, were collected at least four times per week.

Periodic groundwater, soil-vapor, and off-gas treatment effluent samples were collected and analyzed in the field, and select samples were shipped to an off-site analytical laboratory for compound-specific and hydrocarbon-class analyses. The results were used to assess system operation and make necessary operational adjustments, and to monitor system performance.

3. SAMPLING AND ANALYSES

The sampling schedule was designed to monitor the effectiveness of AS for reducing groundwater EDB concentrations. Other fuel constituent compounds were also monitored to provide a qualitative assessment of AS for their concentration reductions. SVE effectiveness has been demonstrated in the BFF vadose zone, and the evaluation during the pilot study focused more on the ability of the system to transfer vapors from the groundwater to the vadose zone, and to capture vapors from the AS operation. The assessment was based on observed aqueous- and vapor-phase concentration trends. The following sections present the sampling and analyses of groundwater for assessing AS effectiveness, followed by vapor sampling and analyses for assessing SVE performance.

Groundwater: Two baseline groundwater samples were collected before the pilot study started (June 19 and June 30, 2014). Following system startup, groundwater was sampled weekly for the first 3 weeks, biweekly for the next 8 weeks, then once every 3 weeks for the remainder of the test. A final sample was collected on January 20, 2015, i.e., 1 month after shutdown of the system. During sample collection, temperature, pH, specific conductance, dissolved oxygen, oxidation reduction potential, turbidity, and alkalinity were measured.

Groundwater samples also were sent to an off-site analytical laboratory for analysis of VOCs (EPA Method 8260B), EDB (EPA Method 8011), total petroleum hydrocarbon (TPH)-diesel range organics (DRO), and TPH-gasoline range organics (GRO) (EPA Method 8015B), iron (EPA Method 6010B), and sulfide/sulfate (EPA Method E300.0).

Prior to sampling well KAFB-10617, depth to groundwater was measured and recorded on a depth below the top-of-well–casing basis in KAFB-10617, and the nearby monitoring wells KAFB-106082 and KAFB-106038. Water-level measurements were made in KAFB-10617 when groundwater samples were collected on a weekly basis for the first 4 weeks of system operation, then on a biweekly basis for weeks 4 through 12, and finally every 3 weeks for the remainder of the pilot study.

***Vapor*:** Baseline soil-vapor samples were collected on June 21, 2014 before AS started, and then monthly for the duration of the pilot study. Vapor samples were collected from KAFB-106211 and from both the SVE wellhead and GAC exhaust using pre-evacuated Bottle-Vac™ canisters for laboratory analyses.

Vapor was also monitored four times per week using a Horiba MEXA 584L emissions analyzer at the wellhead, along the SVE conveyance pipeline, before vapor entered the condensation knock-out tank and at the inlet and outlet of the GAC adsorbers. The Horiba instrument provided analyses of total hydrocarbon (parts per million by volume [ppmv]), oxygen (O_2), carbon monoxide (CO), and carbon dioxide (CO_2) concentrations (% by volume) (Table 1).

The samples were shipped to an off-site analytical laboratory for analysis of EDB (CARB Method 422), air-phase hydrocarbons (APH) (Method MADEP APH), VOCs (EPA Method TO-15), and fixed gases (CO_2, CO, methane, nitrogen, and O_2 [EPA Method E3C]).

4. RESULTS AND DISCUSSION

The pilot-study results are presented to first describe the baseline conditions in the groundwater and vadose zone in the pilot-study area, then present operational data for the AS and SVE system components, and finally, to discuss the performance of AS for treating contaminants of concern in groundwater followed by discussion of the performance of SVE on contaminants of concern in the vadose zone.

4.1 Baseline Conditions

Groundwater: Prior to system operation, the aquifer at KAFB-10617 was characterized as slightly alkaline (pH 8.06) and highly aerobic (dissolved oxygen greater than 8.5 milligrams per liter and oxidation reduction potential higher than 209 millivolts). Soluble iron (i.e., ferrous iron) was not detected, sulfate was measured at 36.5 milligrams per liter, and sulfide concentrations were below detection. The signature established for these indicator parameters suggests the absence of biotic iron reduction and limited potential for formation of reactive iron minerals that may contribute to abiotic destruction of EDB or BTEX compounds.

The baseline EDB concentration was 0.248 µg/L. BTEX compounds were all below the analytical method detection limits (MDLs) of 0.5 µg/L, 0.5 µg/L, 0.5 µg/L, and 1.5 µg/L, respectively. Hydrocarbon fractions measured 96.2 µg/L and 343 µg/L for TPH-GRO and TPH-DRO, respectively (Table 2).

Soil Vapor: Pre-system operation soil vapor was characterized with 21.8% O_2, and CO_2 and methane below their MDLs of 0.17% (for both gases). EDB was measured at 8.5 parts per billion by volume (ppbv), benzene at 460 ppbv, toluene at 1,500 ppbv, ethylbenzene at 79 ppbv, total xylenes at 240 ppbv, and TPH at 70,180 micrograms per cubic meter (Table 3).

Soil Vapor – Groundwater Partitioning of EDB: In a two-phase (groundwater and soil vapor) system that is at equilibrium, a VOC such as EDB will apportion itself between the two phases according to Henry's Law. The Henry's Law constant for EDB predicts the equilibrium ratio of the soil-vapor concentration to the groundwater concentration at a given temperature. If the concentration in one phase is known, then the Henry's Law constant can be used to calculate the equilibrium concentration in the other phase.

EDB was detected in the baseline soil-vapor sample at 8.5 ppbv. A baseline (pre-SVE) equilibrium partitioning was evaluated to determine if EDB was being transported from groundwater to the vadose zone or vice versa. Equilibrium partitioning was determined using the dimensionless Henry's Law Constant (H) for EDB with the equation and assumptions below (Equation 1). Vapor concentrations were converted from ppmv to µg/L as described below in Equation 2.

Equation 1.) $C_a = C_g / H$

Where:
C_a = EDB concentration in groundwater, µg/L
C_g = EDB concentration in vapor, µg/L
H = dimensionless Henry's Law Constant for EDB
H for EDB = 0.0203[a] at 16 degrees Celsius (°C)
[a] H value for EDB is from *Soil Vapor Extraction and Bioventing Engineering and Design* (USACE, 2002), Table B-10.

Vapor concentration conversion from ppmv to µg/L:

Equation 2.) C_g (µg/L) = C_g (ppmv)*[(M*P) / (T*R)]

Where:
M = molar mass of EDB, 187.87 grams/mole
P = pressure, assumed to be 1 atmosphere (atm)
T = temperature in kelvin (K), assumed to be 16 °C or 289.15 K
R = gas constant, assumed to be 0.08206 (liter*atm) / (mole*K)

Based on Henry's Law partitioning, the 0.248 µg/L baseline groundwater EDB concentration measured at KAFB-10617 should have had a corresponding 0.6 ppbv EDB soil-vapor equilibrium concentration. This calculated concentration was lower than the 8.5 µg/L pre-operation soil vapor EDB concentration measured at KAFB-10617. The groundwater EDB concentration would have to be 3.3 µg/L to generate a soil-vapor concentration of 8.5 ppbv if the groundwater and soil vapor were at equilibrium. However, Henry's Law should be used with caution in this instance as concentrations in groundwater and soil vapor were not measured at the vapor-water interface (the water table) or at the same location. Soil-vapor concentrations were measured approximately 25 feet above the water table and groundwater concentrations in a 20-foot water column (15-foot well screen plus nearly 5 feet that the water table had recently risen above the top of the screen). The soil-vapor monitoring point and groundwater well are also geographically located approximately 27 feet apart at the ground surface. Additionally, vapor flow paths in the vadose zone are rarely linear and instead follow discontinuous and meandering preferential pathways driven by lithology. Natural barometric pumping has also been observed to cause seasonal and even daily changes in vapor concentrations at the BFF site. Diffusion of vapor from areas of higher concentrations to lower concentrations also occurs and can account for observed vapor concentrations in areas where no groundwater or soil contamination is found.

During the operation of the pilot system, groundwater EDB concentrations were between 0.15 and 0.35 µg/L, which would result in equilibrium soil-vapor concentrations (i.e., without active SVE) between 0.3 and 0.8 ppbv.

4.2 System Performance

Assessing system performance entailed evaluating how well the pilot-study AS/SVE system operated relative to design, and how discrete assessments of the AS component and the SVE component of the combined technology performed with regard to contaminant reductions.

System Operation: Both the AS and SVE components experienced very little downtime as shown in the operations summary in Table 4. The system operated for 4,036 hours during the 4,116-hours duration of the pilot study; it was thus 98.0% operational. The only downtimes were the result of the occasional maintenance/repair activities as listed in the table. There were no major system component malfunctions, nor was there any need for system design modifications.

AS/SVE operational data are provided in Appendix C. Because a reduction in the EDB concentration in groundwater samples from well KAFB-10617 was not observed during the first 3 months of operation, the AS injection rate was increased on October 20, 2014, from approximately 14 to 21 SCFM and was maintained at this rate through the remainder of the study (through December 18, 2014). This should have increased the zone of influence of AS on dissolved EDB in the groundwater. Furthermore, because soil-vapor-hydrocarbon concentrations were lower than the design basis of the GAC adsorbers, the SVE air-flow rate was increased to 200 to 240 SCFM to expand the SVE capture zone. Flow rates for the SVE well were calculated and are provided in Appendix D.

Air Sparging Performance: The AS component of the pilot-study system was designed to transfer EDB and other VOCs from the aqueous phase to the vapor phase as the sparge gas (i.e., injected air) moved

from the AS well screen through the shallow groundwater to the vadose zone. As such, AS effectiveness was evaluated on the basis of changes in concentrations of EDB and other VOCs in groundwater, as discussed below.

Field water-level measurements (i.e., depths to water) and groundwater-quality parameter data collected prior to sampling well KAFB-10617 are included in Table 5. Laboratory analytical results for groundwater samples collected from KAFB-10617 during the pilot study are provided in Table 2.

Figure 5 shows EDB concentrations at well KAFB-10617 through the pilot-study period. It can be seen that the EDB concentrations varied from 0.157 µg/L to 0.393 µg/L.

To evaluate whether the EDB concentrations in groundwater (Figure 5) indicated any trend during the 6-month pilot study, the Kendall-Tau test was run using EDB results that were collected during operation of the system. The trend was negative (i.e., decreasing EDB concentrations in groundwater during the pilot study), but the p-level (0.62) indicated that the trend was not statistically significant over the 6-month observation period (Table 6). A statistically significant trend would be identified by a p-level of 0.05 or less at a 95% confidence level. The observed p-level of 0.62 indicates that the apparent downward trend could be explained by chance rather than a real trend.

Other analytes of interest that were detected include the following:

- 1,2-dichloroethane was detected at concentrations ranging from 0.318 µg/L to 0.862 µg/L, but all of the results were J-qualified (i.e., estimated value, concentration was less than the 1 µg/L limit of quantitation (LOQ), but greater than laboratory MDL), thus indicating they are estimated values with a concentration that is greater than the 0.25 µg/L laboratory MDL.
- TPH-GRO and TPH-DRO were measured at concentrations ranging from 52 µg/L to 343 µg/L, respectively, and all detections were J-qualified.
- Benzene was not detected in groundwater samples collected from well KAFB-10617 during the pilot study.
- Tetrachloroethene (PCE) was detected in the baseline and second weekly groundwater samples at slightly above the 0.25 µg/L MDL, was not detected in samples collected from July through November 2014, and then were detected again in the final two groundwater samples in December 2014 and January 2015. All PCE detections were J-qualified.
- Acetone was detected at concentrations below the 10 µg/L LOQ, and it was suspected that the low detections were due to laboratory contamination.

Soil Vapor Extraction Performance: SVE performance, while considered secondary for the pilot study, was based on Horiba data, which are provided in Table 1. Total hydrocarbon readings in the influent vapor stream to the GAC canisters generally ranged from 0 to 5 ppmv with an average of 2.9 ppmv. In ambient air, the Horiba measured 3 to 5 ppmv of total hydrocarbons. EPA Method TO-15 analytical results (Table 3) confirmed that the vapor hydrocarbon concentrations at the SVE wellhead and in the GAC exhaust were well below 5 ppmv, and below the reliable quantification limit for the Horiba instrument.

For laboratory analytical data, the total VOC concentrations at the SVE wellhead and in the lag (i.e., second in the series) GAC adsorber exhaust were conservatively calculated by totaling the individual VOC vapor concentrations quantified under Method TO-15, plus the MADEP APH Method results for the TPH fractions measured. For individual TPH compounds that were not detected, 25% of the LOQ for the MADEP APH Method TPH fractions measured was applied in the total VOC calculations.

EDB was detected in the baseline soil-vapor sample (8.5 ppbv). From July to October 2014, EDB was below the detection limit (0.09 to 0.10 ppbv), but in the November and December 2014 monthly soil vapor samples, it was detected at 3.4 ppbv and 1.2 ppbv, respectively (Table 3). The three TPH fractions analyzed (C5-C8 aliphatic hydrocarbons, C9-C10 aromatic hydrocarbons, and C9-C12 aliphatic

hydrocarbons) showed similar trends of higher detections in the baseline sample, and low to non-detect from July to October 2014, but with somewhat higher concentrations in November and December 2014. EDB was consistently below the detection limit (0.09 to 0.12 ppbv) in the lag GAC adsorber exhaust.

The baseline total VOC concentration was calculated to be 30.09 ppmv at the SVE wellhead. Total VOCs at the wellhead ranged from 0.04 to 1.60 ppmv during system operation.

Other analytes detected in the wellhead soil vapor include the following (Table 3):

- APH carbon number range C5-C8 aliphatic hydrocarbons were detected in soil-vapor samples collected from the SVE wellhead at a baseline concentration of 65,000 ppbv. Following AS startup, C5-C8 aliphatic hydrocarbons had a single high detection of 2,500 ppbv, with all other concentrations during operation of the system ranging from non-detect to 680 ppbv. Using the highest concentration detected during operation, this represents a reduction of at least 96% relative to the baseline for light aliphatic compounds.
- Carbon number range C9-C12 aliphatic compounds were detected in soil-vapor samples collected from the SVE wellhead at a baseline concentration of 5,000 ppbv. Following AS startup, total C9-C10 TPH had a single high detection of 2,100 ppbv, with all other concentrations during operation of the system ranging from 100 to 900 ppbv. Using the highest concentration detected during operation, this represents a reduction of at least 58% relative to baseline for the C9-C12 aliphatic compounds.
- APH carbon number range C9-C10 aromatic compounds were detected in soil-vapor samples collected from the SVE wellhead at a baseline concentration of 180 ppbv. Following AS startup, total C9-C10 aromatic hydrocarbon concentrations had a single high detection of 190 ppbv, with all other concentrations during operation of the system ranging from 22 to 73 ppbv.
- Other VOCs were detected at concentrations above the baseline soil-vapor sample; however, these VOCs were generally detected at low concentrations (less than 10 ppbv) following system startup, and they appeared to be components of the PVC cleaner and cement used during installation of the piping from the wellhead to the treatment system (acetone, 2-butanone, and tetrahydrofuran).

The location and monitoring well to be used for the pilot study, KAFB-10617, was selected in April 2014 in response to a requirement by the New Mexico Environment Department to have the pilot study operational by June 30, 2014. The rationale for selecting this location was that it is one of the closest monitoring wells downgradient from the benzene plume. However, as discussed below, both the EDB concentrations in the groundwater and the water-table elevation at this location were changing rapidly in the spring of 2014 (as the AS-SVE well was being put in), thus making this location less favorable for the pilot study because it was not in a steady state. Additionally, the complex local stratigraphy, which is the topic of a sequence stratigraphy study performed after the AS/SVE pilot study was completed, may have resulted in a lack of stratigraphic connection between the AS well and KAFB-10617. Injecting a tracer into the AS well and monitoring KAFB-10617 for several months to verify its arrival at KAFB-10617 would have demonstrated a stratigraphic connection, but this step did not fit into the required schedule for the AS/SVE pilot study. While these considerations cannot be tied directly to the lack of a statistically-valid reduction in groundwater EDB concentrations during the study, they do indicate that other processes may have been taking place that could confound the study.

Low EDB Concentrations in Groundwater: EDB concentrations in KAFB-10617 samples, based on Quarter 1 2014 and prior samples, were expected to range between 0.5 and 0.9 µg/L (Figure 6). However, between the April 2014 sampling event and the June 19, 2014 baseline sampling event, the EDB concentration in well KAFB-10617 decreased by more than 50%, from 0.558 µg/L to 0.248 µg/L, and the concentration of EDB at well KAFB-10617 ranged from 0.157 µg/L to 0.341 µg/L during the pilot study. The rapid reduction in the EDB concentration just before the test started suggested that the groundwater

sampled at well KAFB-10617 may have been mixing with groundwater from a different location (i.e., not upgradient toward the source area) as the plume dynamics changed (as discussed below).

Water-Table Gradient Reduction: The water table has been rising in the BFF plume area since 2009 as a result of lower pumping rates at City of Albuquerque production wells to the north of the plume, with a greater rise in downgradient (northern) monitoring wells that are closer to the production wells as compared to monitoring wells toward the southern end of the BFF plume. This has flattened the water-table gradient across the plume, and has resulted in slower groundwater flow (seepage velocity). Prior to 2014, the gradient of 6 feet over the length of the plume (approximately 7,000 feet), with a horizontal hydraulic conductivity of 100 feet per day and a porosity of 0.27, would yield a seepage velocity of approximately 115 feet per year, or 57 feet in 6 months of the pilot study. The July 2014 and October 2014 shallow water-table contour maps (USACE 2014b; USACE 2015) showed that the gradient was approximately 2 feet over the length of the plume, which would result in a seepage velocity of less than 40 feet per year, or less than 20 feet in 6 months. Based on the almost-flat water table in the vicinity of the pilot study, it is conceivable that EDB was sparged from the groundwater in the vicinity of the AS/SVE well, but due to the reduced groundwater velocity and potentially flow vectors in other directions, the sparged water did not reach the monitoring well within the 6-month pilot study. This suggests that either the monitoring well was not within the radius of influence of the AS well, or that due to the lower seepage velocity and changing plume dynamics in this area, the 6-month duration of test was not long enough to observe an effect.

As discussed in the Work Plan (USACE 2014a), the AS well was expected to have a zone of influence for air stripping of up to 25 feet. Since the pilot test did not show an effect on the groundwater concentrations in the monitoring well that was 27 feet from the sparge well, the zone of influence of the sparge well was less than 27 feet. With an approximate groundwater seepage distance of less than 20 feet during the 6 months of operation, and assuming that there is a stratigraphic connection between the AS/SVE well and KAFB-10617, it seems unlikely that the sparge well zone of influence on EDB concentrations in groundwater exceeded 10 to 15 feet.

EDB Desorption Dynamics: Some fraction of the EDB in the aquifer was likely in an adsorbed state prior to sparging. The sparging only removes the dissolved fraction, thus leading to sorption disequilibrium. The system will then respond by desorbing EDB so that the sorption equilibrium is maintained. The amount of organic carbon for EDB to adsorb to is probably quite low, but sorption occurs on other surfaces such as clays as well as organic material. The EDB plume has likely been in the pilot study area for several decades, so it should be uniformly adsorbed on the aquifer solids. This adsorbed mass could act as a reservoir for EDB and buffer the groundwater concentration until a significant fraction of the adsorbed mass is removed. This would be particularly true if EDB concentrations in groundwater were decreasing rapidly, as was observed. Desorption of EDB from the aquifer solids will be a slow process because when a contaminant is adsorbed on a surface for a long period of time, the strength of the bonds increases, which slows the desorption process. This phenomenon has been observed for halogenated alkanes and alkenes (Pignatello, 2009).

5. CONCLUSIONS

The following conclusions were drawn based on the pilot-study data and discussions above.

Soil Vapor

The significant reductions in EDB and TPH fractions in soil-vapor samples during the pilot study demonstrated that the AS successfully removed contaminant vapors from the vadose zone.

Groundwater

The pilot study did not show a statistically significant decrease in EDB concentrations in groundwater monitored 27 feet downgradient of the AS well during the 6-month period. Potential reasons for this are

discussed above. The zone of influence of AS on EDB concentrations in the shallow groundwater did not appear to exceed 10 to 15 feet from the AS well.

REFERENCES

New Mexico Environment Department. 2014. Letter dated April 24, 2014, *LNAPL and Dissolved Phase EDB Aerobic Remediation Interim Measure Work Plan*.

Pignatello Joseph J. 2009. Slowly reversible sorption of aliphatic halocarbons in soils. I. Formation of residual fractions. Environmental Toxicology and Chemistry, Volume 9, Issue 9, pages 1107–1115.

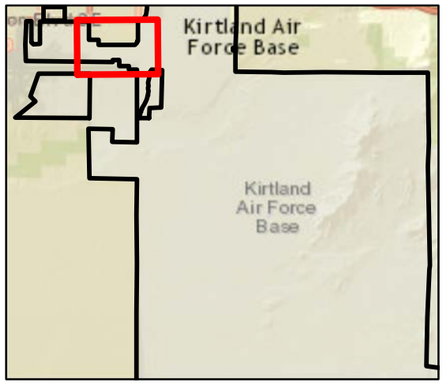
USACE, 2002. Engineering and Design Manual EM 1110-1-4001, *Soil Vapor Extraction and Bioventing*, US Army Corps of Engineers, June.

USACE. 2014a. *Kirtland Air Force Base – Air Sparge and Soil Vapor Extraction Pilot Implementation Work Plan*, Prepared by CB&I Federal Services, LLC for the USACE Albuquerque District under USACE Contract No. W912DY-10-D-0014, Delivery Order 0002, May.

USACE. 2014b. *Quarterly Pre-Remedy Monitoring and Site Investigation Report for July – September 2014*. Prepared by CB&I Federal Services LLC for the USACE Albuquerque District under USACE Contract No. W912DY-10-D-0014, Delivery Order 0002. December.

USACE. 2015. *Quarterly Pre-Remedy Monitoring and Site Investigation Report for October – December 2014*. Prepared by CB&I Federal Services LLC for the USACE Albuquerque District under USACE Contract No. W912DY-10-D-0014, Delivery Order 0002. March.

FIGURES



Groundwater Monitoring Well KAFB-10617

AS/SVE Well KAFB-106211

AS/SVE Air Sparge/Soil Vapor Extraction
KAFB Kirtland Air Force Base

Inset: City Areas

Bulk Fuels Facility

Source: ESRI DigitalGlobe

N

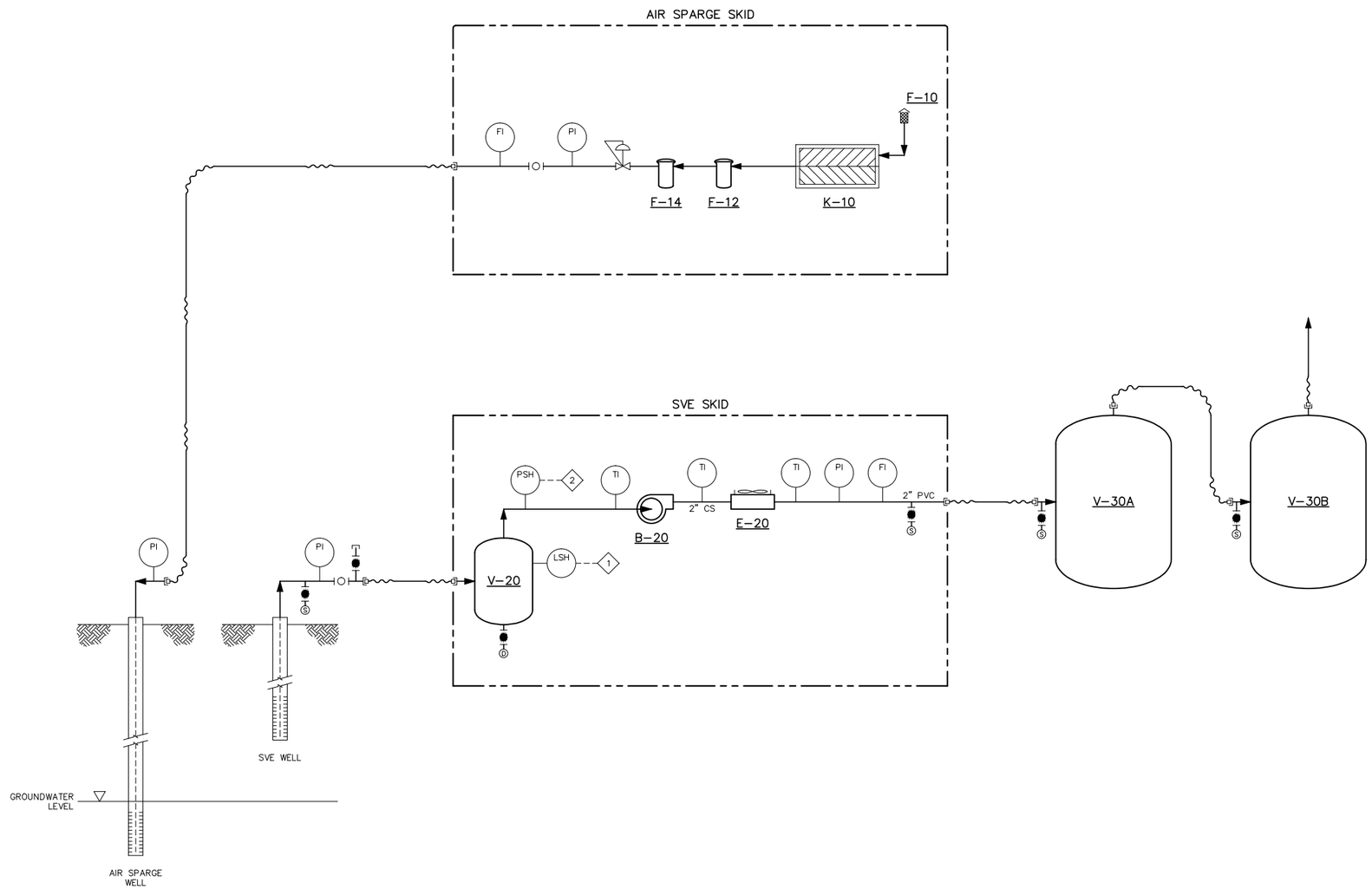
0 100 Feet

AS/SVE PILOT STUDY
BULK FUELS FACILITY
KIRTLAND AIR FORCE BASE, NEW MEXICO

FIGURE 1

AS/SVE WELL LOCATION
KIRTLAND BULK FUELS FACILITY

Generated By: EJC Date: 11/12/15 File Path:H:\KAFB_BFF\GISDocuments\Project_Maps\SVE_PneuLog_Wells\KAFB_002_sparge_Wells.mxd



NOTES:

1. ELECTRICAL SERVICES SHALL BE 230V, 200A, SINGLE PHASE.

LEGEND:

F – FLOW INDICATOR
P – PRESSURE INDICATOR
T – TEMPERATURE INDICATOR
LSH – LEVEL SWITCH HIGH
PSH – PRESSURE SWITCH HIGH (LOW VACUUM)
– SAMPLE PORT

INTERLOCKS:

1 HIGH LEVEL IN KNOCK-OUT POT SHUTS DOWN SVE BLOWER & SPARGE AIR COMPRESSOR.

2 HIGH PRESSURE (LOW VACUUM) SHUTS DOWN SPARGE AIR COMPRESSOR.

FOR REVIEW ONLY! – NOT FOR CONSTRUCTION

PRELIMINARY PROGRESS DRAWINGS ARE NOT FOR CONSTRUCTION OR FABRICATION. BILL OF MATERIALS, SHOP DRAWINGS, ETC., CREATED FROM THESE DRAWINGS MAY BE REVISED AT THE EXPENSE OF THE CONTRACTOR.

V-20	KNOCKOUT POT		
B-20	SVE VACUUM BLOWER	100 SCFM @ 40"-60" W.C. VACUUM	
E-20	AFTER-COOLER	20 F° APPROACH TO AMBIENT AIR TEMPERATURE	
F-10	AIR FILTER		
F-12	AIR FILTER		
F-14	OIL FILTER		
K-10	SPARGE AIR COMPRESSOR	25 SCFM @ 35 PSIG	
V-30A/B	CARBON ADSORBER	2,000 LB. CARBON EACH	

Revisions

Symbol	Descriptions	Date	Approved
A	ISSUED FOR REVIEW	05/02/14	

Shaw Environmental & Infrastructure, Inc.
(A CB&I Company)
312 DIRECTORS DRIVE KNOXVILLE, TENNESSEE 37923

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ALBURQUERQUE, NEW MEXICO

Designed by: SES
Drawn by: JWH
Checked by: SES
Reviewed by:
Submitted by:

KIRTLAND AIR FORCE BASE ALBUQUERQUE, NEW MEXICO

FIGURE 2
AIR SPARGE / SVE PILOT SYSTEM

Plot Scale Ratio: 1 = 1
Design File: Kirtland-Figure 3.dwg
Date: 05/02/14
Spec. No.:
Contract No.:
Drawing Code:
Sheet reference number:

File: K:\Kirtland AFB\140705\Process\Kirtland-Figure 3.dwg
XREF Files:, Border 24X36, IMAGE Files:
Plot Date/Time: May 01, 2014 – 4:34pm
Plotted By: mark.lawson

Figure 3 - Air Sparge/SVE System

GAC Adsorbers (left) and Equipment/Control Trailer

Sparge Well and SVE Well

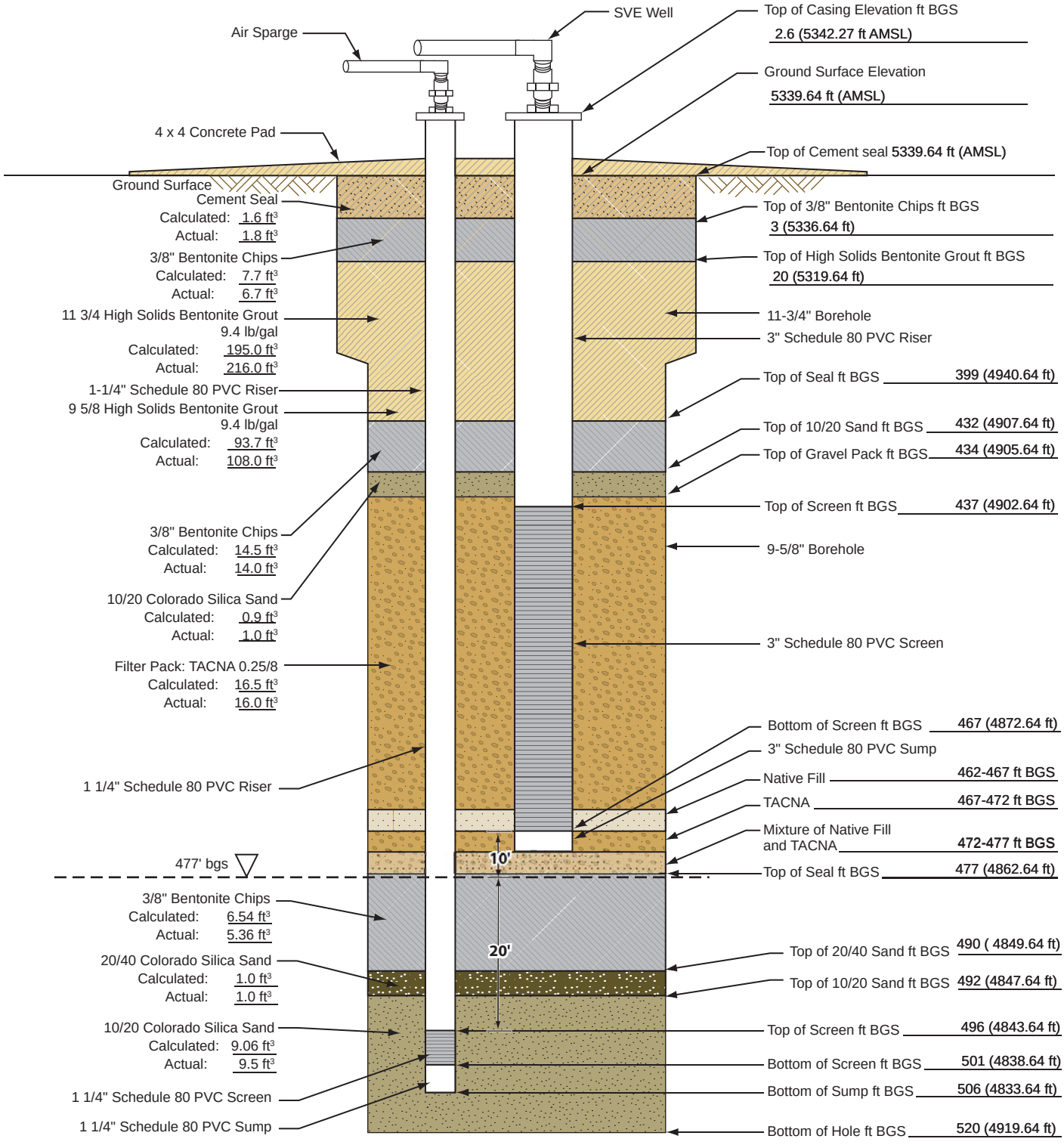
Control Panel

Compressor

AS/SVE well (left) and Monitoring Well

Figure 4
KAFB-106211 Air Sparge/SVE Well Construction

Installation Start Date/Time: 6/16/14 @ 0840
Installation End Date/Time: 6/19/14 @ 1630



Not to Scale
BGS = Below Ground Surface
Depths Subject to Change
Based on Field Observations

140705.DA010090.A1

Figure 5
EDB Concentrations in Well KAFB-10617 During the Pilot Test

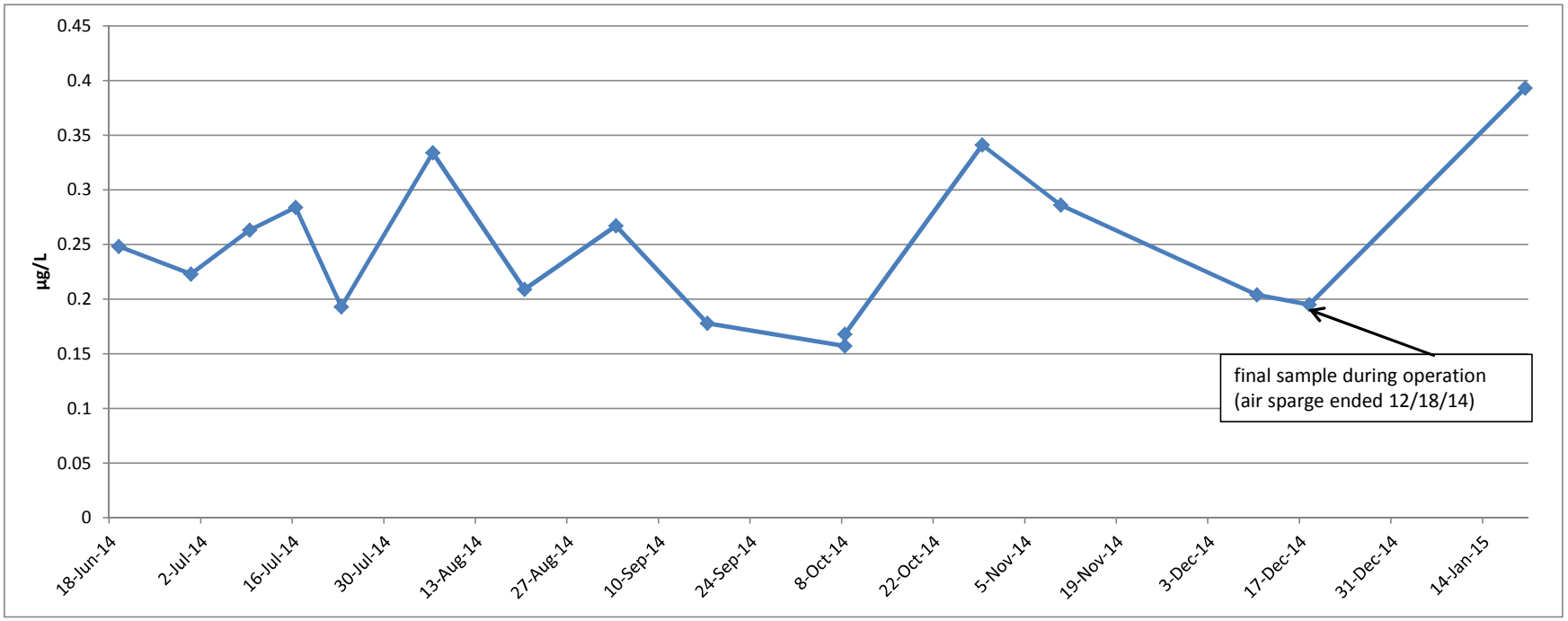
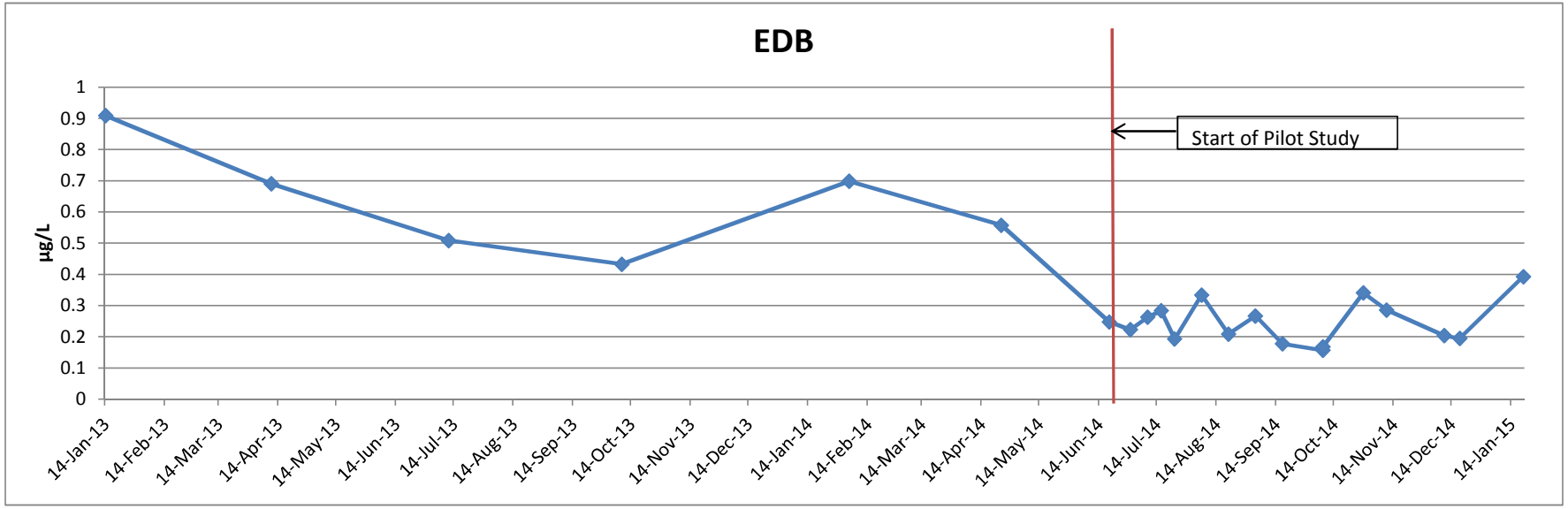


Figure 6
EDB Concentrations in Well KAFB-10617, 2013 - 2014



TABLES

Table 1. Horiba Field Readings

	SVE Well[a]				SVE Well[b]				Pre Carbon				Post 1st Carbon Bed				Post 2nd Carbon Bed (Exhaust)			
	HC[c]	CO_2	O_2	CO	HC[c]	CO_2	O_2	CO	HC[c]	CO_2	O_2	CO	HC[c]	CO_2	O_2	CO	HC[c]	CO_2	O_2	CO
Date and Time	ppm	% vol	% vol	% vol	ppm	% vol	% vol	% vol	ppm	% vol	% vol	% vol	ppm	% vol	% vol	% vol	ppm	% vol	% vol	% vol
6/30/2014 14:20	NR	NR	NR	NR	< 5	0.02%	21.11%	0.00%	< 5	0.04%	21.00%	0.00%	13	0.02%	20.74%	0.00%	< 5	0.04%	20.43%	0.00%
7/1/2014 8:07	NR	NR	NR	NR	< 5	0.02%	21.32%	0.00%	< 5	0.08%	21.32%	0.00%	6	0.02%	21.25%	0.00%	< 5	0.02%	21.07%	0.00%
7/2/2014 13:25	NR	NR	NR	NR	8	0.18%	20.28%	0.00%	5	0.16%	20.71%	0.00%	8	0.18%	20.60%	0.00%	< 5	0.16%	20.58%	0.00%
7/3/2014 9:45	NR	NR	NR	NR	7	0.18%	20.43%	0.00%	6	0.18%	22.27%	0.00%	9	0.18%	21.23%	0.00%	< 5	0.20%	20.56%	0.00%
7/7/2014 10:48	NR	NR	NR	NR	7	0.18%	20.45%	0.00%	< 5	0.18%	21.12%	0.00%	< 5	0.20%	20.88%	0.00%	< 5	0.20%	20.38%	0.00%
7/8/2014 8:27	NR	NR	NR	NR	< 5	0.20%	20.55%	0.00%	< 5	0.16%	21.82%	0.00%	< 5	0.16%	21.22%	0.00%	5	0.22%	20.37%	0.00%
7/9/2014 11:57	NR	NR	NR	NR	5	0.20%	20.41%	0.00%	< 5	0.16%	21.27%	0.00%	5	0.16%	20.88%	0.00%	5	0.18%	20.41%	0.00%
7/10/2014 11:00	NR	NR	NR	NR	8	0.20%	20.59%	0.00%	< 5	0.14%	21.06%	0.00%	< 5	0.16%	20.63%	0.00%	6	0.22%	20.95%	0.00%
7/14/2014 9:14	NR	NR	NR	NR	< 5	0.20%	20.55%	0.00%	< 5	0.18%	21.07%	0.00%	< 5	0.18%	20.91%	0.00%	< 5	0.22%	20.53%	0.00%
7/15/2014 8:33	NR	NR	NR	NR	< 5	0.18%	20.44%	0.00%	8	0.18%	20.81%	0.00%	5	0.14%	20.82%	0.00%	< 5	0.14%	20.76%	0.00%
7/16/2014 14:40	NR	NR	NR	NR	< 5	0.18%	20.57%	0.00%	< 5	0.16%	20.52%	0.00%	6	0.18%	20.38%	0.00%	< 5	0.18%	20.84%	0.00%
7/17/2014 9:50	NR	NR	NR	NR	< 5	0.20%	20.84%	0.00%	< 5	0.16%	21.52%	0.00%	< 5	0.16%	20.98%	0.00%	< 5	0.22%	20.48%	0.00%
7/21/2014 9:35	NR	NR	NR	NR	< 5	0.18%	20.37%	0.00%	< 5	0.16%	20.99%	0.00%	< 5	0.16%	20.88%	0.00%	< 5	0.20%	20.59%	0.00%
7/22/2014 8:37	NR	NR	NR	NR	6	0.20%	20.72%	0.00%	< 5	0.16%	21.10%	0.00%	5	0.22%	21.91%	0.00%	6	0.28%	21.63%	0.00%
7/23/2014 8:13	NR	NR	NR	NR	< 5	0.22%	20.54%	0.00%	< 5	0.16%	20.86%	0.00%	< 5	0.22%	21.73%	0.00%	< 5	0.24%	21.31%	0.00%
7/24/2014 10:31	NR	NR	NR	NR	8	0.18%	20.93%	0.00%	6	0.16%	21.10%	0.00%	6	0.16%	20.92%	0.00%	5	0.18%	20.36%	0.00%
7/28/2014 11:00	NR	NR	NR	NR	< 5	0.18%	20.52%	0.00%	< 5	0.20%	20.48%	0.00%	< 5	0.16%	20.96%	0.00%	< 5	0.18%	21.56%	0.00%
7/29/2014 9:47	NR	NR	NR	NR	< 5	0.18%	20.54%	0.00%	< 5	0.18%	20.83%	0.00%	< 5	0.16%	20.78%	0.00%	< 5	0.16%	20.72%	0.00%
7/30/2014 8:20	NR	NR	NR	NR	< 5	0.20%	20.58%	0.00%	< 5	0.18%	20.97%	0.00%	< 5	0.18%	20.72%	0.00%	< 5	0.30%	21.13%	0.00%
7/31/2014 10:12	NR	NR	NR	NR	< 5	0.16%	20.52%	0.00%	5	0.20%	20.73%	0.00%	< 5	0.18%	20.48%	0.00%	< 5	0.20%	20.30%	0.00%
8/4/2014 9:07	NR	NR	NR	NR	< 5	0.18%	20.42%	0.00%	< 5	0.20%	20.77%	0.00%	< 5	0.18%	20.67%	0.00%	< 5	0.22%	21.02%	0.00%
8/5/2014 8:15	NR	NR	NR	NR	< 5	0.18%	20.29%	0.00%	< 5	0.18%	21.26%	0.00%	< 5	0.18%	20.88%	0.00%	< 5	0.30%	20.74%	0.00%
8/6/2014 7:55	NR	NR	NR	NR	< 5	0.18%	20.42%	0.00%	< 5	0.16%	20.76%	0.00%	< 5	0.16%	20.47%	0.00%	< 5	0.30%	20.84%	0.00%
8/7/2014 11:50	NR	NR	NR	NR	< 5	0.18%	20.50%	0.00%	< 5	0.16%	20.60%	0.00%	< 5	0.16%	20.58%	0.00%	< 5	0.16%	20.51%	0.00%
8/11/2014 12:15	NR	NR	NR	NR	7	0.16%	19.94%	0.00%	< 5	0.12%	20.98%	0.00%	7	0.16%	20.91%	0.00%	5	0.22%	20.26%	0.00%
8/12/2014 14:57	NR	NR	NR	NR	< 5	0.16%	20.47%	0.00%	< 5	0.20%	20.35%	0.00%	< 5	0.20%	20.09%	0.00%	< 5	0.20%	20.83%	0.00%
8/13/2014 8:40	NR	NR	NR	NR	< 5	0.20%	20.55%	0.00%	< 5	0.20%	20.63%	0.00%	< 5	0.18%	20.51%	0.00%	< 5	0.20%	20.48%	0.00%
8/14/2014 10:45	NR	NR	NR	NR	7	0.18%	20.57%	0.00%	< 5	0.20%	21.14%	0.00%	< 5	0.18%	20.88%	0.00%	7	0.28%	20.72%	0.00%
8/18/2014 8:46	NR	NR	NR	NR	10	0.18%	20.30%	0.00%	< 5	0.18%	21.12%	0.00%	< 5	0.18%	20.84%	0.00%	< 5	0.24%	20.27%	0.00%
8/19/2014 9:03	< 5	0.16%	20.32%	0.00%	< 5	0.18%	20.43%	0.00%	< 5	0.18%	21.16%	0.00%	< 5	0.20%	21.14%	0.00%	< 5	0.30%	21.05%	0.00%
8/19/2014 9:30	< 5	0.20%	19.48%	0.00%	< 5	0.20%	19.56%	0.00%	< 5	0.10%	22.07%	0.00%	< 5	0.16%	20.12%	0.00%	< 5	0.26%	19.42%	0.00%
8/20/2014 12:40	6	0.18%	20.50%	0.00%	< 5	0.16%	20.44%	0.00%	< 5	0.18%	20.98%	0.00%	< 5	0.18%	20.16%	0.00%	< 5	0.22%	20.30%	0.00%
8/25/2014 8:43	< 5	0.18%	20.19%	0.00%	< 5	0.18%	20.33%	0.00%	< 5	0.20%	21.25%	0.00%	6	0.22%	21.84%	0.00%	< 5	0.26%	20.13%	0.00%
8/26/2014 9:41	< 5	0.18%	20.38%	0.00%	< 5	0.16%	20.36%	0.00%	< 5	0.18%	20.93%	0.00%	< 5	0.20%	21.03%	0.00%	< 5	0.18%	20.50%	0.00%
8/27/2014 11:10	< 5	0.16%	20.33%	0.00%	< 5	0.18%	20.32%	0.00%	< 5	0.18%	21.10%	0.00%	< 5	0.18%	20.88%	0.00%	< 5	0.20%	20.45%	0.00%
8/28/2014 9:40	< 5	0.18%	20.30%	0.00%	< 5	0.20%	20.32%	0.00%	< 5	0.16%	21.00%	0.00%	< 5	0.18%	20.79%	0.00%	< 5	0.28%	20.67%	0.00%
9/15/2014 8:20	< 5	0.16%	19.80%	0.00%	< 5	0.16%	19.44%	0.00%	< 5	0.22%	21.10%	0.00%	< 5	0.20%	21.02%	0.00%	< 5	0.28%	20.93%	0.00%
9/16/2014 10:32	< 5	0.14%	20.26%	0.00%	< 5	0.14%	20.21%	0.00%	< 5	0.12%	20.48%	0.00%	< 5	0.18%	20.65%	0.00%	< 5	0.22%	20.86%	0.00%
9/17/2014 15:50	< 5	0.16%	20.37%	0.00%	< 5	0.16%	20.40%	0.00%	< 5	0.18%	20.51%	0.00%	< 5	0.20%	20.64%	0.00%	< 5	0.24%	20.90%	0.00%
9/18/2014 14:15	< 5	0.16%	20.17%	0.00%	< 5	0.16%	20.27%	0.00%	< 5	0.20%	20.34%	0.00%	< 5	0.18%	20.54%	0.00%	< 5	0.26%	21.00%	0.00%
9/22/2014 11:30	7	0.20%	20.23%	0.00%	7	0.18%	20.18%	0.00%	< 5	0.16%	20.54%	0.00%	< 5	0.16%	20.51%	0.00%	< 5	0.22%	20.65%	0.00%
9/23/2014 13:00	< 5	0.18%	20.18%	0.00%	< 5	0.18%	20.20%	0.00%	< 5	0.18%	20.67%	0.00%	< 5	0.18%	20.64%	0.00%	< 5	0.20%	20.59%	0.00%
9/24/2014 12:01	< 5	0.20%	20.47%	0.00%	< 5	0.16%	20.24%	0.00%	< 5	0.18%	20.74%	0.00%	< 5	0.20%	20.61%	0.00%	< 5	0.24%	20.79%	0.00%

Table 1. Horiba Field Readings

	SVE Well[a]				SVE Well[b]				Pre Carbon				Post 1st Carbon Bed				Post 2nd Carbon Bed (Exhaust)			
	HC[c]	CO_2	O_2	CO	HC[c]	CO_2	O_2	CO	HC[c]	CO_2	O_2	CO	HC[c]	CO_2	O_2	CO	HC[c]	CO_2	O_2	CO
Date and Time	ppm	% vol	% vol	% vol	ppm	% vol	% vol	% vol	ppm	% vol	% vol	% vol	ppm	% vol	% vol	% vol	ppm	% vol	% vol	% vol
9/25/2014 13:00	< 5	0.20%	20.41%	0.00%	< 5	0.18%	20.47%	0.00%	< 5	0.18%	20.81%	0.00%	< 5	0.18%	20.64%	0.00%	< 5	0.22%	20.84%	0.00%
9/29/2014 8:30	< 5	0.18%	19.51%	0.00%	< 5	0.18%	19.50%	0.00%	< 5	0.18%	20.81%	0.00%	< 5	0.18%	20.77%	0.00%	< 5	0.24%	20.37%	0.00%
9/30/2014 8:50	< 5	0.18%	19.67%	0.00%	< 5	0.18%	19.54%	0.00%	< 5	0.18%	20.83%	0.00%	< 5	0.18%	20.80%	0.00%	< 5	0.22%	20.41%	0.00%
10/1/2014 10:45	< 5	0.20%	19.89%	0.00%	< 5	0.20%	19.64%	0.00%	< 5	0.20%	20.81%	0.00%	< 5	0.18%	20.76%	0.00%	< 5	0.24%	20.61%	0.00%
10/2/2014 9:00	< 5	0.18%	19.64%	0.00%	< 5	0.18%	19.49%	0.00%	< 5	0.20%	20.80%	0.00%	< 5	0.18%	20.81%	0.00%	< 5	0.22%	20.57%	0.00%
10/6/2014 9:36	5	0.18%	19.27%	0.00%	6	0.16%	19.56%	0.00%	< 5	0.14%	20.22%	0.00%	< 5	0.18%	20.52%	0.00%	< 5	0.28%	20.65%	0.00%
10/7/2014 8:50	< 5	0.18%	19.38%	0.00%	5	0.18%	19.54%	0.00%	< 5	0.16%	20.33%	0.00%	< 5	0.18%	20.61%	0.00%	< 5	0.26%	20.67%	0.00%
10/8/2014 11:05	< 5	0.20%	20.15%	0.00%	< 5	0.16%	19.94%	0.00%	< 5	0.14%	20.17%	0.00%	< 5	0.16%	20.42%	0.00%	< 5	0.18%	20.58%	0.00%
10/9/2014 10:00	< 5	0.18%	19.56%	0.00%	< 5	0.18%	19.67%	0.00%	< 5	0.16%	20.24%	0.00%	< 5	0.18%	20.56%	0.00%	< 5	0.22%	20.66%	0.00%
10/13/2014 14:20	< 5	0.18%	19.62%	0.00%	< 5	0.18%	19.72%	0.00%	< 5	0.16%	20.36%	0.00%	< 5	0.18%	20.60%	0.00%	< 5	0.20%	20.71%	0.00%
10/14/2014 9:20	< 5	0.14%	20.00%	0.00%	< 5	0.16%	19.50%	0.00%	< 5	0.18%	21.08%	0.00%	< 5	0.18%	20.89%	0.00%	< 5	0.26%	20.44%	0.00%
10/15/2014 9:30	< 5	0.18%	20.07%	0.00%	8	0.18%	19.87%	0.00%	< 5	0.16%	20.53%	0.00%	< 5	0.16%	20.88%	0.00%	< 5	0.24%	20.65%	0.00%
10/16/2014 9:35	5	0.18%	20.08%	0.00%	7	0.18%	19.78%	0.00%	< 5	0.18%	20.54%	0.00%	< 5	0.18%	20.78%	0.00%	< 5	0.24%	20.54%	0.00%
10/20/2014 12:06	< 5	0.16%	19.89%	0.00%	5	0.18%	19.87%	0.00%	< 5	0.16%	20.68%	0.00%	< 5	0.18%	20.74%	0.00%	< 5	0.22%	20.68%	0.00%
10/21/2014 13:00	< 5	0.18%	19.87%	0.00%	< 5	0.18%	19.65%	0.00%	< 5	0.18%	20.65%	0.00%	< 5	0.18%	20.95%	0.00%	< 5	0.24%	20.63%	0.00%
10/22/2014 14:30	< 5	0.16%	20.01%	0.00%	< 5	0.16%	19.85%	0.00%	< 5	0.18%	20.89%	0.00%	< 5	0.14%	20.85%	0.00%	< 5	0.24%	20.56%	0.00%
10/23/2014 12:00	5	0.18%	20.05%	0.00%	< 5	0.18%	19.92%	0.00%	< 5	0.16%	20.32%	0.00%	< 5	0.18%	20.50%	0.00%	< 5	0.22%	20.80%	0.00%
10/27/2014 13:00	< 5	0.18%	19.98%	0.00%	< 5	0.16%	19.81%	0.00%	< 5	0.18%	20.51%	0.00%	< 5	0.14%	20.66%	0.00%	< 5	0.24%	20.65%	0.00%
10/28/2014 13:30	< 5	0.16%	19.87%	0.00%	< 5	0.18%	19.90%	0.00%	< 5	0.16%	20.40%	0.00%	< 5	0.16%	20.64%	0.00%	< 5	0.24%	20.84%	0.00%
10/29/2014 14:00	< 5	0.18%	20.03%	0.00%	< 5	0.18%	19.56%	0.00%	< 5	0.18%	20.56%	0.00%	< 5	0.18%	20.53%	0.00%	< 5	0.22%	20.45%	0.00%
10/30/2014 14:00	< 5	0.18%	20.11%	0.00%	< 5	0.16%	19.66%	0.00%	< 5	0.16%	20.78%	0.00%	< 5	0.16%	20.55%	0.00%	< 5	0.24%	20.50%	0.00%
11/3/2014 12:40	< 5	0.18%	20.01%	0.00%	< 5	0.18%	19.56%	0.00%	< 5	0.16%	20.36%	0.00%	< 5	0.18%	20.72%	0.00%	< 5	0.18%	20.42%	0.00%
11/4/2014 13:00	< 5	0.16%	20.26%	0.00%	< 5	0.18%	19.58%	0.00%	< 5	0.16%	20.44%	0.00%	< 5	0.18%	20.70%	0.00%	< 5	0.20%	20.56%	0.00%
11/5/2014 14:30	< 5	0.18%	20.51%	0.00%	< 5	0.18%	19.89%	0.00%	< 5	0.16%	20.39%	0.00%	< 5	0.18%	20.81%	0.00%	< 5	0.18%	20.55%	0.00%
11/6/2014 14:00	< 5	0.18%	20.22%	0.00%	< 5	0.18%	19.55%	0.00%	< 5	0.16%	20.41%	0.00%	< 5	0.16%	20.69%	0.00%	< 5	0.18%	20.46%	0.00%
11/10/2014 11:25	< 5	0.18%	20.13%	0.00%	< 5	0.18%	19.52%	0.00%	< 5	0.16%	20.36%	0.00%	< 5	0.18%	20.70%	0.00%	< 5	0.18%	20.40%	0.00%
11/11/2014 10:15	< 5	0.16%	20.04%	0.00%	< 5	0.18%	20.04%	0.00%	< 5	0.16%	20.42%	0.00%	< 5	0.24%	20.83%	0.00%	< 5	0.22%	20.57%	0.00%
11/12/2014 11:15	< 5	0.16%	20.00%	0.00%	< 5	0.18%	19.89%	0.00%	< 5	0.16%	20.38%	0.00%	< 5	0.20%	20.86%	0.00%	< 5	0.20%	20.56%	0.00%
11/13/2014 11:15	< 5	0.16%	19.80%	0.00%	< 5	0.16%	19.90%	0.00%	< 5	0.16%	20.42%	0.00%	< 5	0.18%	20.78%	0.00%	< 5	0.18%	20.60%	0.00%
11/17/2014 12:00	< 5	0.16%	19.56%	0.00%	6	0.14%	19.76%	0.00%	< 5	0.12%	20.43%	0.00%	< 5	0.16%	20.82%	0.00%	< 5	0.20%	20.66%	0.00%
11/18/2014 15:35	< 5	0.16%	20.09%	0.00%	< 5	0.16%	20.28%	0.00%	< 5	0.14%	20.17%	0.00%	< 5	0.16%	20.47%	0.00%	< 5	0.18%	20.32%	0.00%
11/19/2014 10:30	< 5	0.16%	20.14%	0.00%	< 5	0.16%	20.31%	0.00%	< 5	0.14%	20.18%	0.00%	< 5	0.18%	20.61%	0.00%	< 5	0.18%	20.47%	0.00%
11/20/2014 11:00	< 5	0.18%	20.36%	0.00%	< 5	0.16%	19.98%	0.00%	< 5	0.14%	20.22%	0.00%	< 5	0.18%	20.48%	0.00%	< 5	0.20%	20.66%	0.00%
11/24/2014 14:43	< 5	0.16%	20.14%	0.00%	< 5	0.14%	20.01%	0.00%	< 5	0.16%	20.28%	0.00%	< 5	0.18%	20.41%	0.00%	< 5	0.18%	20.57%	0.00%
11/25/2014 9:00	< 5	0.16%	20.16%	0.00%	< 5	0.16%	19.88%	0.00%	< 5	0.14%	20.17%	0.00%	< 5	0.18%	20.77%	0.00%	< 5	0.18%	20.60%	0.00%
12/1/2014 11:00	< 5	0.16%	19.49%	0.00%	< 5	0.16%	19.59%	0.00%	< 5	0.14%	20.37%	0.00%	< 5	0.20%	20.53%	0.00%	< 5	0.24%	20.80%	0.00%
12/2/2014 16:00	< 5	0.16%	19.47%	0.00%	< 5	0.16%	19.56%	0.00%	< 5	0.16%	20.25%	0.00%	< 5	0.18%	20.57%	0.00%	< 5	0.22%	20.78%	0.00%
12/3/2014 16:00	< 5	0.16%	19.38%	0.00%	< 5	0.16%	19.50%	0.00%	< 5	0.14%	20.31%	0.00%	< 5	0.20%	20.47%	0.00%	< 5	0.22%	20.72%	0.00%
12/4/2014 11:40	< 5	0.16%	19.40%	0.00%	< 5	0.16%	19.52%	0.00%	< 5	0.16%	20.30%	0.00%	< 5	0.18%	20.50%	0.00%	< 5	0.24%	20.76%	0.00%
12/8/2014 12:00	< 5	0.18%	19.86%	0.00%	< 5	0.18%	20.02%	0.00%	< 5	0.16%	20.50%	0.00%	< 5	0.20%	20.62%	0.00%	< 5	0.20%	20.49%	0.00%
12/9/2014 8:20	< 5	0.16%	19.78%	0.00%	< 5	0.18%	19.98%	0.00%	< 5	0.16%	20.41%	0.00%	< 5	0.20%	20.64%	0.00%	< 5	0.22%	20.60%	0.00%
12/10/2014 14:40	< 5	0.14%	19.88%	0.00%	< 5	0.14%	20.07%	0.00%	< 5	0.14%	19.91%	0.00%	< 5	0.18%	20.09%	0.00%	< 5	0.18%	20.03%	0.00%
12/11/2014 12:00	< 5	0.16%	19.80%	0.00%	< 5	0.16%	20.01%	0.00%	< 5	0.16%	19.98%	0.00%	< 5	0.20%	20.13%	0.00%	< 5	0.20%	20.44%	0.00%
12/15/2014 9:10	< 5	0.14%	19.80%	0.00%	< 5	0.14%	19.52%	0.00%	< 5	0.14%	20.47%	0.00%	< 5	0.18%	20.71%	0.00%	< 5	0.14%	20.68%	0.00%

Table 1. Horiba Field Readings

	SVE Well[a]				SVE Well[b]				Pre Carbon				Post 1st Carbon Bed				Post 2nd Carbon Bed (Exhaust)			
	HC[c]	CO_2	O_2	CO	HC[c]	CO_2	O_2	CO	HC[c]	CO_2	O_2	CO	HC[c]	CO_2	O_2	CO	HC[c]	CO_2	O_2	CO
Date and Time	ppm	% vol	% vol	% vol	ppm	% vol	% vol	% vol	ppm	% vol	% vol	% vol	ppm	% vol	% vol	% vol	ppm	% vol	% vol	% vol
12/16/2014 11:30	< 5	0.16%	19.80%	0.00%	< 5	0.14%	20.02%	0.00%	< 5	0.16%	20.32%	0.00%	< 5	0.18%	20.67%	0.00%	< 5	0.16%	20.61%	0.00%
12/17/2014 11:30	< 5	0.18%	19.99%	0.00%	< 5	0.18%	20.05%	0.00%	< 5	0.16%	20.43%	0.00%	< 5	0.16%	20.74%	0.00%	< 5	0.16%	20.71%	0.00%
12/18/2014 12:15	< 5	0.18%	20.31%	0.00%	< 5	0.20%	20.07%	0.00%	< 5	0.16%	20.88%	0.00%	< 5	0.16%	20.80%	0.00%	< 5	0.18%	20.70%	0.00%

Readings for HC, CO_2, O_2, and CO were collected using a Horiba MEXA 584L emissions analyzer. PID readings were collected using a hand-held MiniRAE 2000 PID instrument.

Soil-vapor analytical results for hydrocarbons, using Method TO-15, are provided in Table 6 of the Air Sparge/SVE Monthly Report.

[a] Sample port is located on the SVE wellhead.

[b] Sample port is located on the pipeline just before vapor enters the knockout tank.

[c] Field readings using the Horiba analyzer at concentrations between 0 and 5 ppm and were reported as " < 5 ppm." Readings below 5 ppm are considered to be below the background detection capability of the instrument.

% - Percent.

< - Less than.

CO - Carbon monoxide.

CO_2 - Carbon dioxide.

HC - Total hydrocarbons.

NA - Not applicable.

O_2 - Oxygen.

PID - Photoionization detector.

ppm - Parts per million.

SVE - Soil-vapor extraction.

vol - Volume.

Table 2. Groundwater Analytical Results

	SAMPLE TYPE	Baseline GW Samples								First Weekly GW Sample				Second Weekly GW Sample				Third Weekly GW Sample				First Biweekly GW Sample				Second Biweekly GW Sample				Third Biweekly GW Sample			
	LOCATION CODE	KAFB-106017				KAFB-106017				KAFB-106017				KAFB-106017				KAFB-106017				KAFB-106017				KAFB-106017				KAFB-106017			
	SAMPLE NUMBER	GW1682				GW1683				GW1684				GW1685				GW1686				GW1687				GW1688				GW1689			
	SAMPLE DATE	19-Jun-14				30-Jun-14				9-Jul-14				16-Jul-14				23-Jul-14				6-Aug-14				20-Aug-14				3-Sep-14			
	SAMPLE PURPOSE	REG				REG				REG				REG				REG				REG				REG				REG			
	SAMPLE DEPTH	482-507 FT				482-507 FT				482-507 FT				482-507 FT				0-.14 FT				0-.15 FT				482-507 FT				0-.19 FT			
Chemical Class & Analytical Method[a]	Parameter	Result	VALQUAL	LOQ	DL	Result	VALQUAL	LOQ	DL	Result	VALQUAL	LOQ	DL	Result	VALQUAL	LOQ	DL	Result	VALQUAL	LOQ	DL	Result	VALQUAL	LOQ	DL	Result	VALQUAL	LOQ	DL	Result	VALQUAL	LOQ	DL
EDB (µg/L) Method 8011	1,2-DIBROMOETHANE	**0.248**		0.0283	0.00942	**0.223**		0.0278	0.00928	**0.263**		0.0281	0.00938	**0.284**		0.0279	0.00931	**0.193**		0.0283	0.00942	**0.334**		0.0277	0.00922	**0.209**		0.0282	0.0094	**0.267**		0.0277	0.00925
Anions (mg/L) Method E300.0	SULFATE	36.5		2.5	0.33	36.4		2.5	0.33	35.5		2.5	0.33	36.2		2.5	0.33	36.1		2.5	0.33	35.2		2.5	0.33	35.7		2.5	0.33	35.3		2.5	0.33
	SULFIDE, TOTAL	ND	U	3.51	0.702	ND	U	3.39	0.678	ND	U	4	0.8	ND	U	3.7	0.741	ND	U	3.85	0.769	ND	U	3.92	0.784	ND	U	4	0.8	ND	U	3.45	0.69
Metals (mg/L) Method 6010B	IRON	ND	U	0.1	0.03	ND	U	0.1	0.03	ND	U	0.1	0.03	ND	U	0.1	0.03	ND	U	0.1	0.03	ND	U	0.1	0.03	ND	U	0.1	0.03	ND	U	0.1	0.03
TPH (µg/L) Method 8015B	DIESEL RANGE ORGANICS	343	J	385	96.2	ND	U	370	92.6	ND	U	400	100	107	J	385	96.2	ND	U	385	96.2	143	J	400	100	ND	U	400	100	202	J	377	94.3
	GASOLINE RANGE ORGANICS	96.2	J	150	50	ND	U	150	50	ND	U	150	50	ND	U	150	50	ND	U	150	50	63.8	J	150	50	ND	U	150	50	88.2	J	150	50
VOCs (µg/L) Method 8260B	1,1,1,2-TETRACHLOROETHANE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	1,1,1-TRICHLOROETHANE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	1,1,2,2-TETRACHLOROETHANE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	1,1,2-TRICHLOROETHANE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	1,1-DICHLOROETHANE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	1,1-DICHLOROETHENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	1,1-DICHLOROPROPENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	1,2,3-TRICHLOROBENZENE	ND	U	2	0.25	ND	U	2	0.25	ND	U	2	0.25	ND	U	2	0.25	ND	U	2	0.25	ND	U	2	0.25	ND	U	2	0.25	ND	U	2	0.25
	1,2,3-TRICHLOROPROPANE	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5
	1,2,4-TRICHLOROBENZENE	ND	U	2	0.25	ND	U	2	0.25	ND	U	2	0.25	ND	U	2	0.25	ND	U	2	0.25	ND	U	2	0.25	ND	U	2	0.25	ND	U	2	0.25
	1,2,4-TRIMETHYLBENZENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	1,2-DIBROMO-3-CHLOROPROPANE	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	UJ	2	0.5	ND	U	2	0.5
	1,2-DIBROMOETHANE	**0.308**	J	1	0.25	ND	U	1	0.25	ND	U	1	0.25	**0.403**	J	1	0.25	**0.316**	J	1	0.25	**0.416**	J	1	0.25	ND	U	1	0.25	**0.251**	J	1	0.25
	1,2-DICHLOROBENZENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	1,2-DICHLOROETHANE	0.497	J	1	0.25	0.334	J	1	0.25	0.318	J	1	0.25	0.574	J	1	0.25	0.59	J	1	0.25	0.862	J	1	0.25	0.494	J	1	0.25	0.745	J	1	0.25
	1,2-DICHLOROPROPANE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	1,3,5-TRIMETHYLBENZENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	1,3-DICHLOROBENZENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	1,3-DICHLOROPROPANE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	1,4-DICHLOROBENZENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	2,2-DICHLOROPROPANE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	2-BUTANONE	ND	U	10	2.5	ND	U	10	2.5	ND	U	10	2.5	ND	U	10	2.5	ND	U	10	2.5	ND	U	10	2.5	ND	U	10	2.5	ND	U	10	2.5
	2-CHLOROTOLUENE	ND	UJ	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	2-HEXANONE	ND	U	5	1.25	ND	U	5	1.25	ND	U	5	1.25	ND	U	5	1.25	ND	U	5	1.25	ND	U	5	1.25	ND	U	5	1.25	ND	U	5	1.25
	4-CHLOROTOLUENE	ND	UJ	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	4-METHYL-2-PENTANONE	ND	U	5	1.25	ND	U	5	1.25	ND	U	5	1.25	ND	U	5	1.25	ND	U	5	1.25	ND	U	5	1.25	ND	U	5	1.25	ND	U	5	1.25
	ACETONE	5.2	J	10	2.5	ND	U	10	2.5	3.4	J	10	2.5	8.36	J+	10	2.5	ND	U	10	2.5	10.6		10	2.5	3.08	J+	10	2.5	6.23	J	10	2.5
	BENZENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	BROMOBENZENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	BROMOCHLOROMETHANE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	BROMODICHLOROMETHANE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	BROMOFORM	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	UJ	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	BROMOMETHANE	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5
	CARBON DISULFIDE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	CARBON TETRACHLORIDE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	CHLOROBENZENE	0.508	J	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	CHLOROETHANE	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5
	CHLOROFORM	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	CHLOROMETHANE	ND	UJ	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	UJ	1	0.25	ND	U	1	0.25
	CIS-1,2-DICHLOROETHENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	CIS-1,3-DICHLOROPROPENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	DIBROMOCHLOROMETHANE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	DIBROMOMETHANE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	DICHLORODIFLUOROMETHANE	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5
	ETHYLBENZENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	HEXACHLOROBUTADIENE	ND	U	2	0.25	ND	U	2	0.25	ND	U	2	0.25	ND	U	2	0.25	ND	U	2	0.25	ND	U	2	0.25	ND	U	2	0.25	ND	U	2	0.25
	ISOPROPYLBENZENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	METHYL TERT-BUTYL ETHER	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	METHYLENE CHLORIDE	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5
	NAPHTHALENE	ND	U	2	0.25	ND	U	2	0.25	ND	U	2	0.25	ND	U	2	0.25	ND	U	2	0.25	ND	UJ	2	0.25	ND	U	2	0.25	ND	U	2	0.25
	N-BUTYLBENZENE	ND	UJ	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	N-PROPYLBENZENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	P-ISOPROPYLTOLUENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	SEC-BUTYLBENZENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	STYRENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	TERT-BUTYLBENZENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	TETRACHLOROETHENE	0.313	J	1	0.25	0.262	J	1	0.25	ND	U	1	0.25	0.275	J	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	TOLUENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	TRANS-1,2-DICHLOROETHENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	TRANS-1,3-DICHLOROPROPENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	TRICHLOROETHENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	TRICHLOROFLUOROMETHANE	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5
	VINYL CHLORIDE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	XYLENES	ND	U	3	0.75	ND	U	3	0.75	ND	U	3	0.75	ND	U	3	0.75	ND	U	3	0.75	ND	U	3	0.75	ND	U	3	0.75	ND	U	3	0.75

[a]EPA analytical methods listed are for the most recent sampling event.
Shading indicates the analyte was detected.
Bold indicates analyte detected greater than regulatory standard.
µg/L - Microgram per liter.
DL - Detection limit.
EPA - Environmental Protection Agency.
FD - Field duplicate.
FT - Feet.
GW - Groundwater.
J - Estimated value,
KAFB - Kirtland Air Force Base.
LOQ - Limit of Quantitation.
MCL - Maximum contaminant level.
mg/L - Milligram per liter.
ND - Not detected.
NE - Not established.
NMAC - New Mexico Administrative Code.
NMED - New Mexico Environment Department.
REG - Regular sample.

Table 2. Groundwater Analytical Results

Chemical Class & Analytical Method[a]	Parameter	Result	VALQUAL	LOQ	DL	Result	VALQUAL	LOQ	DL	Result	VALQUAL	LOQ	DL	Result	VALQUAL	LOQ	DL	Result	VALQUAL	LOQ	DL	Result	VALQUAL	LOQ	DL	Result	VALQUAL	LOQ	DL	Result	VALQUAL	LOQ	DL
	SAMPLE TYPE	Fourth Biweekly GW Sample				First Triweekly GW Samples								Second Triweekly GW Sample				Third Triweekly GW Sample				Fourth Triweekly GW Sample				Fifth Triweekly GW Sample				Post-Decommission GW Sample			
	LOCATION CODE	KAFB-106017				KAFB-106017				KAFB-106017				KAFB-106017				KAFB-106017				KAFB-106017				KAFB-106017				KAFB-106017			
	SAMPLE NUMBER	GW1690				GW1691				GW1692				GW1693				GW1694				GW1695				GW1696				GW1697			
	SAMPLE DATE	17-Sep-14				8-Oct-14				8-Oct-14				29-Oct-14				20-Nov-14				10-Dec-14				18-Dec-14				20-Jan-15			
	SAMPLE PURPOSE	REG				REG				FD				REG				REG				REG				REG				REG			
	SAMPLE DEPTH	0-2 FT				0-2 FT				0-11 FT				0-21 FT				0-22 FT				482-507 FT				482-507 FT				482-507 FT			
EDB (µg/L) Method 8011	1,2-DIBROMOETHANE	**0.178**		0.0281	0.00937	**0.157**		0.0283	0.00943	**0.168**		0.0281	0.00937	**0.341**		0.0282	0.00941	**0.286**		0.0283	0.00944	**0.204**	J-	0.0281	0.0094	**0.195**		0.0284	0.0095	**0.393**		0.0282	0.0094
Anions (mg/L) Method E300.0	SULFATE	35.1		2.5	0.33	41.3		2.5	0.33	41.6		2.5	0.33	39.2		2.5	0.33	38.8		2.5	0.33	40.9		2.5	0.33	40.8		2.5	0.33	40.8		2.5	0.33
	SULFIDE, TOTAL	ND	U	3.77	0.755	ND	U	3.57	0.714	ND	U	3.45	0.69	ND	U	3.51	0.702	ND	U	3.92	0.784	ND	U	3.77	0.755	ND	U	3.92	0.784	ND	U	0.948	0.19
Metals (mg/L) Method 6010B	IRON	ND	U	0.1	0.03	ND	U	0.1	0.03	ND	U	0.1	0.03	ND	U	0.1	0.03	ND	U	0.1	0.03	ND	U	0.1	0.03	ND	U	0.1	0.03	ND	U	0.1	0.03
TPH (µg/L) Method 8015B	DIESEL RANGE ORGANICS	ND	U	408	102	ND	U	400	100	ND	U	408	102	213	J	408	102	136	J	400	100	128	J	400	100	155	J	392	98	116	J	392	98
	GASOLINE RANGE ORGANICS	ND	U	150	50	ND	U	150	50	ND	U	150	50	51.7	J	150	50	78.3	J	150	50	ND	U	150	50	ND	U	150	50	97.7	J	150	50
VOCs (µg/L) Method 8260B	1,1,1,2-TETRACHLOROETHANE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	1,1,1-TRICHLOROETHANE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	1,1,2,2-TETRACHLOROETHANE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	1,1,2-TRICHLOROETHANE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	1,1-DICHLOROETHANE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	1,1-DICHLOROETHENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	1,1-DICHLOROPROPENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	1,2,3-TRICHLOROBENZENE	ND	U	2	0.25	ND	UJ	2	0.25	ND	UJ	2	0.25	ND	U	2	0.25	ND	U	2	0.25	ND	U	2	0.25	ND	U	2	0.25	ND	U	2	0.25
	1,2,3-TRICHLOROPROPANE	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5
	1,2,4-TRICHLOROBENZENE	ND	U	2	0.25	ND	UJ	2	0.25	ND	UJ	2	0.25	ND	U	2	0.25	ND	U	2	0.25	ND	U	2	0.25	ND	U	2	0.25	ND	U	2	0.25
	1,2,4-TRIMETHYLBENZENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	1,2-DIBROMO-3-CHLOROPROPANE	ND	UJ	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5
	1,2-DIBROMOETHANE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	1,2-DICHLOROBENZENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	1,2-DICHLOROETHANE	0.553	J	1	0.25	0.456	J	1	0.25	0.424	J	1	0.25	0.667	J	1	0.25	0.676	J	1	0.25	0.667	J	1	0.25	0.655	J	1	0.25	0.424	J	1	0.25
	1,2-DICHLOROPROPANE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	1,3,5-TRIMETHYLBENZENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	1,3-DICHLOROBENZENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	1,3-DICHLOROPROPANE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	1,4-DICHLOROBENZENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	2,2-DICHLOROPROPANE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	2-BUTANONE	ND	U	10	2.5	ND	U	10	2.5	ND	U	10	2.5	ND	U	10	2.5	ND	U	10	2.5	ND	U	10	2.5	ND	U	10	2.5	ND	U	10	2.5
	2-CHLOROTOLUENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	2-HEXANONE	ND	U	5	1.25	ND	U	5	1.25	ND	U	5	1.25	ND	U	5	1.25	ND	U	5	1.25	ND	U	5	1.25	ND	U	5	1.25	ND	U	5	1.25
	4-CHLOROTOLUENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	4-METHYL-2-PENTANONE	ND	U	5	1.25	ND	U	5	1.25	ND	U	5	1.25	ND	U	5	1.25	ND	U	5	1.25	ND	U	5	1.25	ND	U	5	1.25	ND	U	5	1.25
	ACETONE	ND	U	10	2.5	ND	U	10	2.5	4.31	J	10	2.5	6.42	J+	10	2.5	ND	U	10	2.5	4.69	J	10	2.5	3.24	J	10	2.5	ND	U	10	2.5
	BENZENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	BROMOBENZENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	BROMOCHLOROMETHANE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	BROMODICHLOROMETHANE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	BROMOFORM	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	BROMOMETHANE	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5
	CARBON DISULFIDE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	CARBON TETRACHLORIDE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	CHLOROBENZENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	CHLOROETHANE	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5
	CHLOROFORM	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	CHLOROMETHANE	ND	U	1	0.25	0.437	J	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	CIS-1,2-DICHLOROETHENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	CIS-1,3-DICHLOROPROPENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	DIBROMOCHLOROMETHANE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	DIBROMOMETHANE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	DICHLORODIFLUOROMETHANE	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	0.676	J	2	0.5
	ETHYLBENZENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	HEXACHLOROBUTADIENE	ND	U	2	0.25	ND	U	2	0.25	ND	U	2	0.25	ND	U	2	0.25	ND	U	2	0.25	ND	U	2	0.25	ND	U	2	0.25	ND	U	2	0.25
	ISOPROPYLBENZENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	METHYL TERT-BUTYL ETHER	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	METHYLENE CHLORIDE	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5
	NAPHTHALENE	ND	U	2	0.25	ND	UJ	2	0.25	ND	UJ	2	0.25	ND	U	2	0.25	ND	U	2	0.25	ND	U	2	0.25	ND	U	2	0.25	ND	U	2	0.25
	N-BUTYLBENZENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	N-PROPYLBENZENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	P-ISOPROPYLTOLUENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	SEC-BUTYLBENZENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	STYRENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	TERT-BUTYLBENZENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	TETRACHLOROETHENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	0.292	J	1	0.25	0.446	J	1	0.25
	TOLUENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	TRANS-1,2-DICHLOROETHENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	TRANS-1,3-DICHLOROPROPENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	TRICHLOROETHENE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	TRICHLOROFLUOROMETHANE	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5	ND	U	2	0.5
	VINYL CHLORIDE	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25	ND	U	1	0.25
	XYLENES	ND	U	3	0.75	ND	U	3	0.75	ND	U	3	0.75	ND	U	3	0.75	ND	U	3	0.75	ND	U	3	0.75	ND	U	3	0.75	ND	U	3	0.75

[a]EPA analytical methods listed are for the most recent sampling event.
Shading indicates the analyte was detected.
Bold indicates analyte detected greater than regulatory standard.
µg/L - Microgram per liter.
DL - Detection limit.
EPA - Environmental Protection Agency.
FD - Field duplicate.
FT - Feet.
GW - Groundwater.
J - Estimated value,
KAFB - Kirtland Air Force Base.
LOQ - Limit of Quantitation.
MCL - Maximum contaminant level.
mg/L - Milligram per liter.
ND - Not detected.
NE - Not established.
NMAC - New Mexico Administrative Code.
NMED - New Mexico Environment Department.
REG - Regular sample.

Table 3. Soil-Vapor Analytical Results

	Sample Type	Baseline SV Sample				July Monthly SV Sample									August Monthly SV Sample									September Monthly SV Sample								
	Location Code	KAFB-106211				KAFB-106211				KAFB-106211-GAC					KAFB-106211				KAFB-106211-GAC					KAFB-106211				KAFB-106211-GAC				
	Sample Number	VA9133[a]				VA9134-R[a]				VA9145[b]					VA9135[a]				VA9146[b]					VA9136[a]				VA9147[b]				
	Sample Date	21-Jun-14				7-Aug-14				7-Aug-14					27-Aug-14				27-Aug-14					30-Sep-14				30-Sep-14				
	Sample Purpose	REG				REG				REG					REG				REG					REG				REG				
	Sample Depth	0 - 0.01 FT				0 - 0.02 FT				0 - 0.08 FT					0 - 0.03 FT				0 - 0.01 FT					0 - 0.03 FT				0 - 0.01 FT				
Chemical Class and Analytical Method[c]	Parameter	Result	VAL QUAL	LOQ	DL	Result	VAL QUAL	LOQ	DL	Result	VAL QUAL	LOQ	DL	Exhaust - Wellhead (July)	Result	VAL QUAL	LOQ	DL	Result	VAL QUAL	LOQ	DL	Exhaust - Wellhead (August)	Result	VAL QUAL	LOQ	DL	Result	VAL QUAL	LOQ	DL	Exhaust - Wellhead (September)
EDB (ppbv)	1,2-DIBROMOETHANE	8.5		0.85	0.1	ND	U	0.85	0.1	ND	U	0.8	0.09		ND	U	0.8	0.094	ND	U	0.8	0.094		ND	U	0.77	0.09	ND	U	0.87	0.1	
Fixed Gases (percent) Method E3C	CARBON DIOXIDE	ND	U	0.17	0.17	0.137		0.17	0.17	0.17		0.16	0.16	0.033	0.128		0.16	0.16	0.21		0.16	0.16	0.082	ND	U	0.15	0.15	0.148		0.17	0.17	0.148
	CARBON MONOXIDE	ND	U	0.17	0.17	ND	U	0.17	0.17	ND	U	0.16	0.16		ND	U	0.16	0.16	ND	U	0.16	0.16		ND	U	0.15	0.15	ND	U	0.17	0.17	
	METHANE	ND	U	0.17	0.17	ND	U	0.17	0.17	ND	U	0.16	0.16		ND	U	0.16	0.16	ND	U	0.16	0.16		ND	U	0.15	0.15	ND	U	0.17	0.17	
	NITROGEN	78.1		0.17	0.17	78.1		0.17	0.17	78.2		0.16	0.16	0.1	78		0.16	0.16	78		0.16	0.16	0	78		0.15	0.15	78		0.17	0.17	0
	OXYGEN	21.8		0.17	0.17	21.8		0.17	0.17	21.7		0.16	0.16	-0.1	21.9		0.16	0.16	21.8		0.16	0.16	-0.1	21.9		0.15	0.15	21.8		0.17	0.17	-0.1
TPH (µg/m^3) Method MADEP APH	C5-C8 ALIPHATIC HYDROCARBONS	65,000		1400	1400	ND	U	170	170	ND	U	250	250		200		160	160	240		160	160	40	ND	U	150	150	ND	U	170	170	
	C9-C10 AROMATIC HYDROCARBONS	180		170	170	ND	U	21	21	ND	U	32	32		ND	U	20	20	22		20	20	22	ND	U	19	19	27		22	22	27
	C9-C12 ALIPHATIC HYDROCARBONS	5,000		680	680	100		85	85	540		130	130	440	390		80	80	620		80	80	230	110		77	77	ND	U	87	87	
VOCs (ppbv) Method TO15	1,1,1-TRICHLOROETHANE	ND	U	6.2	2.1	ND	U	0.77	0.26	ND	U	1.2	0.4		ND	U	0.73	0.25	ND	U	0.73	0.25		ND	U	0.7	0.24	ND	U	0.8	0.27	
	1,1,2,2-TETRACHLOROETHANE	ND	U	5	1.5	ND	U	0.62	0.18	ND	U	0.93	0.28		ND	U	0.58	0.17	ND	U	0.58	0.17		ND	U	0.56	0.17	ND	U	0.63	0.19	
	1,1,2-TRICHLOROETHANE	ND	U	6.2	2	ND	U	0.77	0.25	ND	U	1.2	0.37		ND	U	0.73	0.23	ND	U	0.73	0.23		ND	U	0.7	0.22	ND	U	0.8	0.26	
	1,1-DICHLOROETHANE	ND	U	8.4	2.7	ND	U	1	0.33	ND	U	1.6	0.5		ND	U	0.98	0.31	ND	U	0.98	0.31		ND	U	0.95	0.3	ND	U	1.1	0.34	
	1,1-DICHLOROETHENE	ND	U	8.6	2.9	ND	U	1.1	0.36	ND	U	1.6	0.55		ND	U	1	0.34	ND	U	1	0.34		ND	U	0.97	0.33	ND	U	1.1	0.37	
	1,2,4-TRICHLOROBENZENE	ND	U	4.6	1.5	ND	U	0.57	0.18	ND	U	0.86	0.27		ND	U	0.54	0.17	ND	U	0.54	0.17		ND	U	0.52	0.16	ND	U	0.59	0.19	
	1,2,4-TRIMETHYLBENZENE	4.7	J	6.9	2.1	0.27	J	0.86	0.26	ND	U	1.3	0.39		0.71	J	0.81	0.24	0.76	J	0.81	0.24	0.05	0.54	J	0.78	0.23	0.76	J	0.89	0.27	0.22
	1,2-DIBROMOETHANE	5.5		4.4	1.4	ND	U	0.55	0.18	ND	U	0.83	0.26		ND	U	0.52	0.17	ND	U	0.52	0.17		ND	U	0.5	0.16	ND	U	0.57	0.18	
	1,2-DICHLOROBENZENE	ND	U	5.7	1.7	ND	U	0.7	0.21	ND	U	1.1	0.32		ND	U	0.66	0.2	ND	U	0.66	0.2		ND	U	0.64	0.19	ND	U	0.72	0.22	
	1,2-DICHLOROETHANE	ND	U	8.4	2.7	ND	U	1	0.33	ND	U	1.6	0.5		ND	U	0.98	0.31	ND	U	0.98	0.31		ND	U	0.95	0.3	ND	U	1.1	0.34	
	1,2-DICHLOROPROPANE	ND	U	7.4	2.4	ND	U	0.91	0.29	ND	U	1.4	0.44		ND	U	0.86	0.28	ND	U	0.86	0.28		ND	U	0.83	0.26	ND	U	0.94	0.3	
	1,3,5-TRIMETHYLBENZENE	3.6	J	6.9	2.2	ND	U	0.86	0.28	ND	U	1.3	0.41		0.26	J	0.81	0.26	0.29	J	0.81	0.26	0.03	ND	U	0.78	0.25	ND	U	0.89	0.28	
	1,3-DICHLOROBENZENE	ND	U	5.7	1.7	ND	U	0.7	0.21	ND	U	1.1	0.32		ND	U	0.66	0.2	ND	U	0.66	0.2		ND	U	0.64	0.19	ND	U	0.72	0.22	
	1,4-DICHLOROBENZENE	ND	U	5.7	1.6	ND	U	0.7	0.2	ND	U	1.1	0.3		ND	U	0.66	0.19	ND	U	0.66	0.19		ND	U	0.64	0.18	ND	U	0.72	0.2	
	2-BUTANONE	160		120	4.8	1.6	J	14	0.6	150	J	22	0.91	148.4	2.4	J	13	0.57	7.2	J	13	0.57	4.8	0.93	J	13	0.54	5.9	J	15	0.62	4.97
	2-HEXANONE	ND	U	8.3	2.7	ND	U	1	0.33	1.4	J	1.6	0.5	1.4	0.36	J	0.97	0.31	0.5	J	0.97	0.31	0.14	0.38	J	0.93	0.3	0.35	J	1.1	0.34	-0.03
	4-METHYL-2-PENTANONE	9.5		8.3	2.7	ND	U	1	0.33	ND	U	1.6	0.5		ND	U	0.97	0.31	ND	U	0.97	0.31		ND	U	0.93	0.3	ND	U	1.1	0.34	
	ACETONE	630		140	22	17	J	18	2.7	260	J	27	4.1	243	15	J	17	2.6	24		17	2.6	9	8	J	16	2.5	54		18	2.8	46
	BENZENE	460		11	3.4	3.1		1.3	0.42	ND	U	2	0.64		3.4		1.2	0.4	0.63	J	1.2	0.4	-2.77	1.9		1.2	0.38	ND	U	1.4	0.44	
	BENZENE, (CHLOROMETHYL)-	ND	U	6.6	1.4	ND	U	0.82	0.18	ND	U	1.2	0.27		ND	U	0.77	0.17	ND	U	0.77	0.17		ND	U	0.74	0.16	ND	U	0.84	0.18	
	BROMODICHLOROMETHANE	ND	U	5.1	1.5	ND	U	0.63	0.19	ND	U	0.95	0.28		ND	U	0.59	0.18	ND	U	0.59	0.18		ND	U	0.57	0.17	ND	U	0.65	0.19	
	BROMOFORM	ND	U	3.3	0.99	ND	U	0.41	0.12	ND	U	0.62	0.18		ND	U	0.38	0.12	ND	U	0.38	0.12		ND	U	0.37	0.11	ND	U	0.42	0.13	
	BROMOMETHANE	ND	U	8.8	3.3	ND	U	1.1	0.41	ND	U	1.6	0.62		ND	U	1	0.39	ND	U	1	0.39		ND	U	0.99	0.37	ND	U	1.1	0.43	
	CARBON DISULFIDE	10	J	110	3.3	ND	U	14	0.41	ND	U	20	0.61		ND	U	13	0.38	2.8	J	13	0.38	2.8	ND	U	12	0.37	ND	U	14	0.42	
	CARBON TETRACHLORIDE	ND	U	5.4	1.6	ND	U	0.67	0.2	ND	U	1	0.3		ND	U	0.63	0.19	ND	U	0.63	0.19		ND	U	0.61	0.18	ND	U	0.69	0.21	
	CHLOROBENZENE	ND	U	7.4	2.4	ND	U	0.92	0.29	ND	U	1.4	0.44		ND	U	0.86	0.28	ND	U	0.86	0.28		ND	U	0.83	0.27	ND	U	0.94	0.3	
	CHLOROETHANE	ND	U	13	4.4	ND	U	1.6	0.54	ND	U	2.4	0.82		ND	U	1.5	0.51	ND	U	1.5	0.51		ND	U	1.5	0.49	ND	U	1.6	0.56	
	CHLOROFORM	ND	U	7	2.4	ND	U	0.87	0.29	ND	U	1.3	0.44		ND	U	0.81	0.28	ND	U	0.81	0.28		ND	U	0.78	0.27	ND	U	0.89	0.3	
	CHLOROMETHANE	ND	U	16	4.9	ND	U	2	0.61	ND	U	3.1	0.92		ND	U	1.9	0.58	ND	U	1.9	0.58		ND	U	1.9	0.56	ND	U	2.1	0.63	
	CIS-1,2-DICHLOROETHENE	ND	U	8.6	2.7	ND	U	1.1	0.34	ND	U	1.6	0.51		ND	U	1	0.32	ND	U	1	0.32		ND	U	0.97	0.31	ND	U	1.1	0.35	
	CIS-1,3-DICHLOROPROPENE	ND	U	7.5	2.1	ND	U	0.93	0.26	ND	U	1.4	0.39		ND	U	0.88	0.25	ND	U	0.88	0.25		ND	U	0.84	0.24	ND	U	0.96	0.27	
	CYCLOHEXANE	690		20	5.7	ND	U	2.5	0.71	ND	U	3.7	1.1		ND	U	2.3	0.67	ND	U	2.3	0.67		ND	U	2.2	0.64	ND	U	2.5	0.73	
	DIBROMOCHLOROMETHANE	ND	U	4	1.3	ND	U	0.5	0.16	ND	U	0.75	0.24		ND	U	0.47	0.15	ND	U	0.47	0.15		ND	U	0.45	0.14	ND	U	0.51	0.16	
	DICHLORODIFLUOROMETHANE	ND	U	6.9	2.3	0.4	J	0.85	0.29	0.47	J	1.3	0.44	0.07	0.47	J	0.8	0.27	0.55	J	0.8	0.27	0.08	0.41	J	0.77	0.26	0.7	J	0.88	0.3	0.29
	ERYTHRENE	ND	U	15	6.8	ND	U	1.9	0.84	ND	U	2.9	1.3		ND	U	1.8	0.79	ND	U	1.8	0.79		ND	U	1.7	0.76	ND	U	2	0.87	
	ETHYL ACETATE	ND	U	19	6.6	ND	U	2.3	0.82	ND	U	3.5	1.2		ND	U	2.2	0.77	ND	U	2.2	0.77		ND	U	2.1	0.74	ND	U	2.4	0.85	
	ETHYLBENZENE	79		7.8	2.5	0.48	J	0.97	0.31	0.76	J	1.5	0.47	0.28	0.62	J	0.92	0.29	0.62	J	0.92	0.29	0	0.68	J	0.88	0.28	ND	U	1	0.32	
	FREON 113 (1,1,2-TRICHLORO-1,2,2-TRIFLOUROETHANE)	ND	U	4.4	1.5	ND	U	0.55	0.19	ND	U	0.83	0.28		ND	U	0.52	0.18	ND	U	0.52	0.18		ND	U	0.5	0.17	ND	U	0.57	0.19	
	HEPTANE	970		8.3	2.8	0.5	J	1	0.35	1	J	1.6	0.53	0.5	0.47	J	0.97	0.33	0.53	J	0.97	0.33	0.06	ND	U	0.93	0.32	ND	U	1.1	0.36	
	HEXACHLOROBUTADIENE	ND	U	3.2	0.89	ND	U	0.4	0.11	ND	U	0.6	0.17		ND	U	0.37	0.1	ND	U	0.37	0.1		ND	U	0.36	0.1	ND	U	0.41	0.11	
	HEXANE	430		9.7	2.9	ND	U	1.2	0.36	ND	U	1.8	0.54		ND	U	1.1	0.34	ND	U	1.1	0.34		ND	U	1.1	0.33	ND	U	1.2	0.37	
	M,P-XYLENES	190		16	4.7	1.3	J	1.9	0.58	1.1	J	2.9	0.88	-0.2	1.9		1.8	0.55	2		1.8	0.55	0.1	1.7	J	1.8	0.53	ND	U	2	0.6	
	METHYL TERT-BUTYL ETHER	ND	U	9.4	3.2	ND	U	1.2	0.4	ND	U	1.8	0.6		ND	U	1.1	0.38	ND	U	1.1	0.38		ND	U	1.1	0.36	ND	U	1.2	0.41	
	METHYLENE CHLORIDE	ND	U	9.8	3.3	ND	U	1.2	0.41	ND	U	1.8	0.62		ND	U	1.1	0.39	ND	U	1.1	0.39		ND	U	1.1	0.37	ND	U	1.3	0.43	
	NAPHTHALENE	ND	U	6.5	2.3	ND	U	0.81	0.29	ND	U	1.2	0.44		ND	U	0.76	0.27	3.9		0.76	0.27	3.9	0.32	J	0.73	0.26	0.64	J	0.83	0.3	3.9
	O-XYLENE	52		7.8	2.3	0.53	J	0.97	0.29	0.46	J	1.5	0.44	-0.07	0.99		0.92	0.27	0.96		0.92	0.27	-0.03	0.85	J	0.88	0.26	ND	U	1	0.3	
	PROPYLENE	ND	U	20	5.5	ND	U	2.5	0.69	4.2		3.7	1	4.2	0.83	J	2.3	0.65	1.1	J	2.3	0.65	0.27	ND	U	2.2	0.62	3.4		2.5	0.71	3.4
	STYRENE	ND	U	8	2.4	0.8	J	0.99	0.3	ND	U	1.5	0.45		ND	U	0.93	0.28	ND	U	0.93	0.28		ND	U	0.9	0.27	ND	U	1	0.31	
	TETRACHLOROETHENE	ND	U	5	1.4	ND	U	0.62	0.17	ND	U	0.94	0.26		ND	U	0.59	0.16	ND	U	0.59	0.16		ND	U	0.56	0.16	ND	U	0.64	0.18	
	THF	11	J	12	4.6	0.6	J	1.4	0.57	820	J	5.4	2.2	819.4	0.86	J	1.3	0.54	26		1.3	0.54	25.14	0.56	J	1.3	0.52	31		1.5	0.59	30.44
	TOLUENE	1,500		9	3.1	3.9		1.1	0.38	27		1.7	0.57	23.1	3.7		1.1	0.36	4.8		1.1	0.36	1.1	2.1		1	0.35	0.59	J	1.2	0.39	-1.51
	TRANS-1,2-DICHLOROETHENE	ND	U	8.6	3.3	ND	U	1.1	0.41	ND	U	1.6	0.61		ND	U	1	0.38	ND	U	1	0.38		ND	U	0.97	0.37	ND	U	1.1	0.42	
	TRANS-1,3-DICHLOROPROPENE	ND	U	7.5	2.4	ND	U	0.93	0.3	ND	U	1.4	0.45		ND	U	0.88	0.28	ND	U	0.88	0.28		ND	U	0.84	0.27	ND	U	0.96	0.31	
	TRICHLOROETHENE	ND	U	6.3	1.8	ND	U	0.79	0.22	ND	U	1.2	0.33		ND	U	0.74	0.21	ND	U	0.74	0.21		ND	U	0.71	0.2	ND	U	0.81	0.23	
	TRICHLOROFLUOROMETHANE	ND	U	6.1	2.1	ND	U	0.75	0.26	ND	U	1.1	0.38		0.27	J	0.71	0.24	ND	U	0.71	0.24		0.25	J	0.68	0.23	ND	U	0.77	0.26	
	VINYL ACETATE	ND	U	97	13	ND	U	12	1.6	ND	U	18	2.3		ND	U	11	1.5	ND	U	11	1.5		ND	U	11	1.4	ND	U	12	1.6	
	VINYL CHLORIDE	ND	U	13	4.5	ND	U	1.7	0.56	ND	U	2.5	0.85		ND	U	1.6	0.53	ND	U	1.6	0.53		ND	U	1.5	0.51	ND	U	1.7	0.58	
	XYLENES	240		16	4.7	1.8	J	1.9	0.58	1.6	J	2.9	0.88	-0.2	2.9		1.8	0.55	2.9		1.8	0.55	0	2.6		1.8	0.53	ND	U	2	0.6	

[a] Soil-vapor sample was collected at the SVE wellhead.
[b] Soil-vapor sample was collected at the GAC exhaust.
[c] EPA analytical methods listed are for the most recent sampling event.
[d] Parent (REG) sample result was used for calculation.
Shading indicates the analyte was detected.
µg/m^3 - Micrograms per cubic meter.
DL - Detection limit.
FD - Field duplicate.
FT - Feet.
GAC - Granulated activated carbon.
J - Estimated value, concentration is less than LOQ but greater than laboratory method detection limit (DL).
KAFB - Kirtland Air Force Base.
LOQ - Reporting limit.
ND - Not detected.
ppbv - Parts per billion by volume.
REG - Regular sample.
SV - Soil-vapor.
SVE - Soil-vapor extraction.
TPH - Total petroleum hydrocarbon.
U - Analyte was not detected. The reported numerical value is at or below the DL.
VAL QUAL - Validation qualifier.
VOC - Volatile organic compound.

Table 3. Soil-Vapor Analytical Results

			October Monthly SV Sample									November Monthly SV Sample									December Monthly SV Sample												
		Location Code	KAFB-106211				KAFB-106211-GAC					KAFB-106211				KAFB-106211-GAC					KAFB-106211				KAFB-106211-GAC				KAFB-106211-GAC				
		Sample Number	VA9137[a]				VA9148[b]					VA9138[a]				VA9149[b]					VA9139[a]				VA9150[b]				VA9151[b]				
		Sample Date	28-Oct-14				28-Oct-14					24-Nov-14				24-Nov-14					18-Dec-14				18-Dec-14				18-Dec-14				
		Sample Purpose	REG				REG					REG				REG					REG				REG				FD				
		Sample Depth	0 - 0.03 FT				0 - 0.01 FT					0 - 0.03 FT				0 - 0.01 FT					0 - 0.03 FT				0 - 0.01 FT				0 - 0.01 FT				
Chemical Class and Analytical Method[c]	Parameter		Result	VAL QUAL	LOQ	DL	Result	VAL QUAL	LOQ	DL	Exhaust - Wellhead (October)	Result	VAL QUAL	LOQ	DL	Result	VAL QUAL	LOQ	DL	Exhaust - Wellhead (November)	Result	VAL QUAL	LOQ	DL	Result	VAL QUAL	LOQ	DL	Result	VAL QUAL	LOQ	DL	Exhaust - Wellhead (December)[d]
EDB (ppbv)	1,2-DIBROMOETHANE		ND	U	0.81	0.096	ND	U	0.81	0.096		3.4		0.77	0.091	ND	U	0.78	0.092		1.2		0.77	0.091	ND	U	0.77	0.091	ND	U	1	0.12	
Fixed Gases (percent) Method E3C	CARBON DIOXIDE		0.234		0.16	0.16	ND	U	0.16	0.16		ND	U	0.15	0.15	0.162		0.16	0.16	0.162	ND	U	0.15	0.15	0.191		0.15	0.15	0.186		0.15	0.15	0.191
	CARBON MONOXIDE		ND	U	0.16	0.16	ND	U	0.16	0.16		ND	U	0.15	0.15	ND	U	0.16	0.16		ND	U	0.15	0.15	ND	U	0.15	0.15	ND	U	0.15	0.15	
	METHANE		ND	U	0.16	0.16	ND	U	0.16	0.16		ND	U	0.15	0.15	ND	U	0.16	0.16		ND	U	0.15	0.15	ND	U	0.15	0.15	ND	U	0.15	0.15	
	NITROGEN		78		0.16	0.16	78		0.16	0.16	0	77.8		0.15	0.15	77.9		0.16	0.16	0.1	78.4		0.15	0.15	78.1		0.15	0.15	78.4		0.15	0.15	-0.3
	OXYGEN		21.7		0.16	0.16	21.9		0.16	0.16	0.2	22.1		0.15	0.15	21.9		0.16	0.16	-0.2	21.5		0.15	0.15	21.7		0.15	0.15	21.4		0.15	0.15	0.2
TPH (µg/m^3) Method MADEP APH	C5-C8 ALIPHATIC HYDROCARBONS		ND	U	160	160	ND	U	160	160		680		150	150	ND	U	3500	3500		2500		150	150	ND	U	150	150	ND	U	150	150	
	C9-C10 AROMATIC HYDROCARBONS		49		20	20	34		20	20	-15	73		19	19	ND	U	430	430		190		19	19	ND	U	19	19	ND	U	19	19	
	C9-C12 ALIPHATIC HYDROCARBONS		150		81	81	310		81	81	160	900		77	77	ND	U	1700	1700		2100		77	77	170		77	77	160		77	77	-1930
VOCs (ppbv) Method TO15	1,1,1-TRICHLOROETHANE		ND	U	0.74	0.25	ND	U	0.74	0.25		ND	U	0.71	0.24	ND	U	16	5.4		ND	U	0.71	0.24	ND	U	0.71	0.24	ND	U	0.7	0.24	
	1,1,2,2-TETRACHLOROETHANE		ND	U	0.59	0.18	ND	U	0.59	0.18		ND	U	0.56	0.17	ND	U	13	3.8		ND	U	0.56	0.17	ND	U	0.56	0.17	ND	U	0.56	0.17	
	1,1,2-TRICHLOROETHANE		ND	U	0.74	0.24	ND	U	0.74	0.24		ND	U	0.71	0.23	ND	U	16	5.1		ND	U	0.71	0.23	ND	U	0.71	0.23	ND	U	0.7	0.22	
	1,1-DICHLOROETHANE		ND	U	1	0.32	ND	U	1	0.32		ND	U	0.95	0.3	ND	U	21	6.9		ND	U	0.95	0.3	ND	U	0.95	0.3	ND	U	0.95	0.3	
	1,1-DICHLOROETHENE		ND	U	1	0.35	ND	U	1	0.35		ND	U	0.97	0.33	ND	U	22	7.4		ND	U	0.97	0.33	ND	U	0.97	0.33	ND	U	0.97	0.33	
	1,2,4-TRICHLOROBENZENE		ND	U	0.55	0.17	ND	U	0.55	0.17		ND	U	0.52	0.17	ND	U	12	3.7		ND	U	0.52	0.17	ND	U	0.52	0.17	ND	U	0.52	0.16	
	1,2,4-TRIMETHYLBENZENE		1.2		0.82	0.25	1.4		0.82	0.25	0.2	2.8		0.78	0.24	ND	U	18	5.3		7.5		0.78	0.24	0.78		0.78	0.24	0.84		0.78	0.23	-6.72
	1,2-DIBROMOETHANE		ND	U	0.53	0.17	ND	U	0.53	0.17		1.1		0.5	0.16	ND	U	11	3.6		1.5		0.5	0.16	ND	U	0.5	0.16	ND	U	0.5	0.16	
	1,2-DICHLOROBENZENE		ND	U	0.67	0.2	ND	U	0.67	0.2		ND	U	0.64	0.19	ND	U	14	4.3		ND	U	0.64	0.19	ND	U	0.64	0.19	ND	U	0.64	0.19	
	1,2-DICHLOROETHANE		ND	U	1	0.32	ND	U	1	0.32		ND	U	0.95	0.3	ND	U	21	6.9		ND	U	0.95	0.3	ND	U	0.95	0.3	ND	U	0.95	0.3	
	1,2-DICHLOROPROPANE		ND	U	0.88	0.28	ND	U	0.88	0.28		ND	U	0.83	0.27	ND	U	19	6		ND	U	0.83	0.27	ND	U	0.83	0.27	ND	U	0.83	0.26	
	1,3,5-TRIMETHYLBENZENE		0.38	J	0.82	0.26	0.46	J	0.82	0.26	0.08	1.3		0.78	0.25	ND	U	18	5.6		3.6		0.78	0.25	0.32	J	0.78	0.25	0.34	J	0.78	0.25	-3.28
	1,3-DICHLOROBENZENE		ND	U	0.67	0.2	ND	U	0.67	0.2		ND	U	0.64	0.19	ND	U	14	4.3		ND	U	0.64	0.19	ND	U	0.64	0.19	ND	U	0.64	0.19	
	1,4-DICHLOROBENZENE		ND	U	0.67	0.19	ND	U	0.67	0.19		ND	U	0.64	0.18	ND	U	14	4		ND	U	0.64	0.18	ND	U	0.64	0.18	ND	U	0.64	0.18	
	2-BUTANONE		22		14	0.58	0.59	J	14	0.58	-21.41	2.1	J	13	0.55	700	J	290	12	697.9	4.7	J	13	0.55	52	J	13	0.55	79	J	13	0.54	47.3
	2-HEXANONE		0.32	J	0.99	0.32	ND	U	0.99	0.32		ND	U	0.94	0.3	ND	U	21	6.8		ND	U	0.94	0.3	0.82	J	0.94	0.3	1.3		0.93	0.3	0.82
	4-METHYL-2-PENTANONE		ND	U	0.99	0.32	ND	U	0.99	0.32		0.34	J	0.94	0.3	ND	U	21	6.8		0.64	J	0.94	0.3	ND	U	0.94	0.3	ND	U	0.93	0.3	
	ACETONE		63		17	2.6	11	J	17	2.6	-52	6.8	J	16	2.5	1800	J	360	56	1793.2	16		16	2.5	160	J	16	2.5	240	J	16	2.5	144
	BENZENE		ND	U	1.3	0.41	0.83	J	1.3	0.41	0.83	1.8		1.2	0.39	ND	U	27	8.7		5.8		1.2	0.39	ND	U	1.2	0.39	ND	U	1.2	0.38	
	BENZENE, (CHLOROMETHYL)-		ND	U	0.78	0.17	ND	U	0.78	0.17		ND	U	0.74	0.16	ND	U	17	3.7		ND	U	0.74	0.16	ND	U	0.74	0.16	ND	U	0.74	0.16	
	BROMODICHLOROMETHANE		ND	U	0.6	0.18	ND	U	0.6	0.18		ND	U	0.57	0.17	ND	U	13	3.9		ND	U	0.57	0.17	ND	U	0.57	0.17	ND	U	0.57	0.17	
	BROMOFORM		ND	U	0.39	0.12	ND	U	0.39	0.12		ND	U	0.37	0.11	ND	U	8.4	2.5		ND	U	0.37	0.11	ND	U	0.37	0.11	ND	U	0.37	0.11	
	BROMOMETHANE		ND	U	1	0.4	ND	U	1	0.4		ND	U	0.99	0.38	ND	U	22	8.5		ND	U	0.99	0.38	ND	U	0.99	0.38	ND	U	0.99	0.37	
	CARBON DISULFIDE		ND	U	13	0.39	ND	U	13	0.39		0.86	J	12	0.37	ND	U	280	8.4		ND	U	12	0.37	ND	U	12	0.37	ND	U	12	0.37	
	CARBON TETRACHLORIDE		ND	U	0.64	0.19	ND	U	0.64	0.19		ND	U	0.61	0.18	ND	U	14	4.1		ND	U	0.61	0.18	ND	U	0.61	0.18	ND	U	0.61	0.18	
	CHLOROBENZENE		ND	U	0.88	0.28	ND	U	0.88	0.28		ND	U	0.84	0.27	ND	U	19	6		ND	U	0.84	0.27	ND	U	0.84	0.27	ND	U	0.83	0.27	
	CHLOROETHANE		ND	U	1.5	0.52	ND	U	1.5	0.52		ND	U	1.5	0.5	ND	U	33	11		ND	U	1.5	0.5	ND	U	1.5	0.5	ND	U	1.5	0.49	
	CHLOROFORM		ND	U	0.83	0.28	ND	U	0.83	0.28		ND	U	0.79	0.27	ND	U	18	6		ND	U	0.79	0.27	ND	U	0.79	0.27	ND	U	0.78	0.27	
	CHLOROMETHANE		ND	U	2	0.59	ND	U	2	0.59		ND	U	1.9	0.56	ND	U	42	13		ND	U	1.9	0.56	ND	U	1.9	0.56	ND	U	1.9	0.56	
	CIS-1,2-DICHLOROETHENE		ND	U	1	0.33	ND	U	1	0.33		ND	U	0.97	0.31	ND	U	22	7		ND	U	0.97	0.31	ND	U	0.97	0.31	0.55	J	0.97	0.31	0.55
	CIS-1,3-DICHLOROPROPENE		ND	U	0.89	0.25	ND	U	0.89	0.25		ND	U	0.85	0.24	ND	U	19	5.3		ND	U	0.85	0.24	ND	U	0.85	0.24	ND	U	0.84	0.24	
	CYCLOHEXANE		ND	U	2.4	0.68	ND	U	2.4	0.68		ND	U	2.2	0.65	ND	U	50	15		5.9		2.2	0.65	ND	U	2.2	0.65	ND	U	2.2	0.64	
	DIBROMOCHLOROMETHANE		ND	U	0.48	0.15	ND	U	0.48	0.15		ND	U	0.45	0.14	ND	U	10	3.3		ND	U	0.45	0.14	ND	U	0.45	0.14	ND	U	0.45	0.14	
	DICHLORODIFLUOROMETHANE		1.1		0.82	0.28	0.56	J	0.82	0.28	-0.54	0.36	J	0.78	0.26	ND	U	18	6		0.54	J	0.78	0.26	0.91		0.78	0.26	0.92		0.77	0.26	0.37
	ERYTHRENE		ND	U	1.8	0.81	ND	U	1.8	0.81		ND	U	1.7	0.77	ND	U	39	17		ND	U	1.7	0.77	ND	U	1.7	0.77	ND	U	1.7	0.76	
	ETHYL ACETATE		ND	U	2.2	0.79	ND	U	2.2	0.79		ND	U	2.1	0.75	ND	U	48	17		4.5		2.1	0.75	ND	U	2.1	0.75	ND	U	2.1	0.74	
	ETHYLBENZENE		ND	U	0.93	0.3	0.76	J	0.93	0.3	0.76	8.8		0.89	0.28	ND	U	20	6.4		19		0.89	0.28	0.84	J	0.89	0.28	0.82	J	0.88	0.28	-18.16
	FREON 113 (1,1,2-TRICHLORO-1,2,2-TRIFLOUROETHANE)		ND	U	0.53	0.18	ND	U	0.53	0.18		ND	U	0.5	0.17	ND	U	11	3.8		ND	U	0.5	0.17	ND	U	0.5	0.17	ND	U	0.5	0.17	
	HEPTANE		ND	U	0.99	0.34	ND	U	0.99	0.34		1.6		0.94	0.32	ND	U	21	7.2		21		0.94	0.32	ND	U	0.94	0.32	ND	U	0.93	0.32	
	HEXACHLOROBUTADIENE		ND	U	0.38	0.11	ND	U	0.38	0.11		ND	U	0.36	0.1	ND	U	8.1	2.3		ND	U	0.36	0.1	ND	U	0.36	0.1	ND	U	0.36	0.1	
	HEXANE		ND	U	1.1	0.34	ND	U	1.1	0.34		ND	U	1.1	0.33	ND	U	25	7.4		3.2		1.1	0.33	ND	U	1.1	0.33	ND	U	1.1	0.33	
	M,P-XYLENES		ND	U	1.9	0.56	3		1.9	0.56	3	26		1.8	0.53	ND	U	40	12		70		1.8	0.53	3.5		1.8	0.53	3.5		1.8	0.53	-66.5
	METHYL TERT-BUTYL ETHER		ND	U	1.1	0.38	ND	U	1.1	0.38		ND	U	1.1	0.36	ND	U	24	8.2		ND	U	1.1	0.36	ND	U	1.1	0.36	ND	U	1.1	0.36	
	METHYLENE CHLORIDE		ND	U	1.2	0.4	ND	U	1.2	0.4		ND	U	1.1	0.38	ND	U	25	8.5		2.3		1.1	0.38	0.53	J	1.1	0.38	0.56	J	1.1	0.37	-1.77
	NAPHTHALENE		0.81		0.77	0.28	ND	U	0.77	0.28		ND	U	0.73	0.26	ND	U	17	6		0.28	J	0.73	0.26	ND	U	0.73	0.26	ND	U	0.73	0.26	
	O-XYLENE		ND	U	0.93	0.28	1.3		0.93	0.28	1.3	8.2		0.89	0.27	ND	U	20	6		22		0.89	0.27	1.4		0.89	0.27	1.3		0.88	0.26	-20.6
	PROPYLENE		5.7		2.4	0.66	1.3	J	2.4	0.66	-4.4	ND	U	2.2	0.63	ND	U	50	14		ND	U	2.2	0.63	2.4		2.2	0.63	3.5		2.2	0.62	2.4
	STYRENE		ND	U	0.95	0.29	ND	U	0.95	0.29		ND	U	0.9	0.27	ND	U	20	6.1		ND	U	0.9	0.27	ND	U	0.9	0.27	ND	U	0.9	0.27	
	TETRACHLOROETHENE		ND	U	0.6	0.17	ND	U	0.6	0.17		ND	U	0.57	0.16	ND	U	13	3.6		ND	U	0.57	0.16	ND	U	0.57	0.16	ND	U	0.56	0.16	
	THF		130		1.4	0.55	ND	U	1.4	0.55		ND	U	1.3	0.52	4500	J	29	12	4500	1	J	1.3	0.52	230	J	1.3	0.52	430	J	13	5.2	229
	TOLUENE		0.86	J	1.1	0.37	2.6		1.1	0.37	1.74	40		1	0.35	25		23	7.8	-15	97		1	0.35	2.6		1	0.35	2.7		1	0.35	-94.4
	TRANS-1,2-DICHLOROETHENE		ND	U	1	0.39	ND	U	1	0.39		ND	U	0.97	0.37	ND	U	22	8.3		ND	U	0.97	0.37	ND	U	0.97	0.37	ND	U	0.97	0.37	
	TRANS-1,3-DICHLOROPROPENE		ND	U	0.89	0.29	ND	U	0.89	0.29		ND	U	0.85	0.27	ND	U	19	6.1		ND	U	0.85	0.27	ND	U	0.85	0.27	ND	U	0.84	0.27	
	TRICHLOROETHENE		ND	U	0.75	0.21	ND	U	0.75	0.21		ND	U	0.72	0.2	ND	U	16	4.5		ND	U	0.72	0.2	ND	U	0.72	0.2	ND	U	0.71	0.2	
	TRICHLOROFLUOROMETHANE		ND	U	0.72	0.25	0.29	J	0.72	0.25	0.29	ND	U	0.69	0.23	ND	U	15	5.2		0.32	J	0.69	0.23	ND	U	0.69	0.23	ND	U	0.68	0.23	
	VINYL ACETATE		ND	U	12	1.5	ND	U	12	1.5		ND	U	11	1.4	ND	U	250	32		ND	U	11	1.4	ND	U	11	1.4	ND	U	11	1.4	
	VINYL CHLORIDE		ND	U	1.6	0.54	ND	U	1.6	0.54		ND	U	1.5	0.51	ND	U	34	12		ND	U	1.5	0.51	ND	U	1.5	0.51	ND	U	1.5	0.51	
	XYLENES		ND	U	1.9	0.56	4.3		1.9	0.56	4.3	34		1.8	0.53	ND	U	40	12		93		1.8	0.53	5		1.8	0.53	4.8		1.8	0.53	-88

[a] Soil-vapor sample was collected at the SVE wellhead.
[b] Soil-vapor sample was collected at the GAC exhaust.
[c] EPA analytical methods listed are for the most recent sampling event.
[d] Parent (REG) sample result was used for calculation.
Shading indicates the analyte was detected.
µg/m^3 - Micrograms per cubic meter.
DL - Detection limit.
FD - Field duplicate.
FT - Feet.
GAC - Granulated activated carbon.
J - Estimated value, concentration is less than LOQ but greater than laboratory method detection limit (DL).
KAFB - Kirtland Air Force Base.
LOQ - Reporting limit.
ND - Not detected.
ppbv - Parts per billion by volume.
REG - Regular sample.
SV - Soil-vapor.
SVE - Soil-vapor extraction.
TPH - Total petroleum hydrocarbon.
U - Analyte was not detected. The reported numerical value is at or below the DL.
VAL QUAL - Validation qualifier.
VOC - Volatile organic compound.

Table 4. Operational Data for the AS/SVE Pilot System

Date	Description
July 2014	July 25, 2014—System shutdown at 1114 and remained down until 1040 on July 26, 2014 in response to an over-voltage alarm. The over-voltage alarm was triggered by the generator supplying too little or too much power to the system.
August 2014	August 10, 2014—System shutdown at 0813 and remained down until 1150 on August 11, 2014 in response to a power loss alarm. The alarm was triggered by the generator supplying too little power to the system. August 16, 2014—System shutdown at 0139 and remained down until 0810 on August 17, 2014 in response to a power loss alarm. The alarm was triggered by the generator supplying too little power to the system. Permanent power was installed from the nearby PNM electrical line and tied into the AS/SVE system on August 29, 2014.
September 2014	The system was fully operational for the month of September.
October 2014	October 31, 2014 – System was shut down from 0954 to 1200 to replace the lead granular-activated carbon (GAC) bed. The original lag bed was reconfigured as the lead bed, and a new bed was installed as the lag bed.
November 2014	The system was fully operational for the month of November.
December 2014	The system was fully operational through December 18, which was the final operational day of the pilot test.

Notes:

- The Air Sparge and SVE wells were constructed and developed June 04 – June 26, 2014.
- Treatment system components arrived on site June 16 – June 19.
- System testing and balancing was performed June 24 – June 27, 2014.
- The system was started June 30, 2014.
- Due to delays in getting electric service from PNM, the system was run on a generator for the first two months.
- The system operated around the clock from June 30, 2014 to December18, 2014.
- There were occasional brief (less than one-hour) shutdowns for system maintenance. Longer shutdowns are listed in table.

Table 5. KAFB-10617 Field Measurements

Location Name	Sample No.	Date	Time	Gallons Removed	Depth to Groundwater (ft btoc)	Temperature (^{o}C)	pH (S.U.)	Spec Cond (µS/cm^2)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Alkalinity (mg/L as $CaCO_3$)
Baseline Groundwater Samples												
KAFB-10617	GW1682	6/19/2014	1718	51	480.52	19.27	8.06	368.0	8.58	209	0.71	NA
KAFB-10617	NA*	6/23/2014	1657	51	480.30	19.54	7.37	381.8	8.68	243	0.41	NA
KAFB-10617	GW1683	6/30/2014	1215	51	480.52	20.22	7.65	397.2	6.08	203	1.17	160
Weekly Groundwater Samples												
KAFB-10617	GW1684	7/9/2014	1053	51	480.55	19.45	7.76	380.9	9.73	169	0.75	148
KAFB-10617	GW1685	7/16/2014	1123	51	480.31	18.85	7.82	375.9	7.80	182	0.88	140
KAFB-10617	GW1686	7/23/2014	1113	51	480.63	19.08	7.72	354.7	8.47	189	0.57	105
Biweekly Groundwater Samples												
KAFB-10617	GW1687	8/6/2014	1057	51	480.14	18.86	7.66	379.3	9.40	190	0.28	136
KAFB-10617	GW1688	8/20/2014	1023	51	480.22	18.76	7.69	365.5	9.13	230	0.27	136
KAFB-10617	GW1689	9/3/2014	1104	51	480.00	19.01	7.79	357.0	6.52	175	1.52	152
KAFB-10617	GW1690	9/17/2014	1159	51	480.03	18.38	7.98	407.4	7.98	196	0.44	160
Triweekly Groundwater Samples												
KAFB-10617	GW1691	10/8/2014	1402	51	480.07	18.44	7.90	427.4	7.80	135	0.69	120
KAFB-10617	GW1693	10/29/2014	1151	51	480.13	18.49	7.79	409.2	8.96	194	0.54	136
KAFB-10617	GW1694	11/20/2014	1104	51	480.21	18.11	7.80	407.3	8.40	155	1.35	132
KAFB-10617	GW1695	12/10/2014	1123	52	479.30	17.57	7.79	381.7	8.00	191	0.47	132
KAFB-10617	GW1696	12/18/2014	1211	52	479.13	17.76	7.75	384.8	8.95	178	0.41	128
Final Groundwater Sample[a]												
KAFB-10617	GW1697	1/20/2015	1046	52	479.11	17.89	7.59	385.5	6.50	158	0.82	148

*Sample was not collected.

[a] Final groundwater sample was collected after Air Sparge/SVE system was decommissioned.

°C - Degrees Celsius.

µS/cm^2 - Microsiemens per square centimeter.

AS - Air sparge.

$CaCO_3$ - Calcium carbonate.

DO - Dissolved oxygen.

ft btoc - Feet below top of casing.

KAFB - Kirtland Air Force Base.

mg/L - Milligram per liter.

mV - Millivolt.

NA - Not applicable.

No. - Number.

NTU - Nephelometric Turbidity Unit.

ORP - Oxidation reduction potential.

S.U. - Standard unit.

SVE - Soil-Vapor Extraction.

Table 6. Kendall-Tau Test of EDB Concentrations in Well KAFB-10617 vs. Time during AS/SVE Pilot Test

Pair of Variables	Valid *N*	Tau	Z	p-value
Date vs. EDB	14	-0.099	-0.493	0.622

Date	EDB
6/19/2014	0.248
6/30/2014	0.223
7/9/2014	0.263
7/16/2014	0.284
7/23/2014	0.193
8/6/2014	0.334
8/20/2014	0.209
9/3/2014	0.267
9/17/2014	0.178
10/8/2014	0.157
10/29/2014	0.341
11/10/2014	0.286
12/10/2014	0.204
12/18/2014	0.195

APPENDICES

APPENDIX 1
Soil Boring Log KAFB-106217

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
376920.05.02.01	KAFB-10617	SHEET 1 OF 9

SOIL BORING LOG

PROJECT : ST106 TO313 LOCATION : VA Field

ELEVATION : COORDINATES :

DRILLING METHOD AND EQUIPMENT USED : ARCH 30K Pullstar Rig DRILLING CONTRACTOR : WDC Exploration & Wells / Joe Villegas

WATER LEVEL 488 7/12' START : 11/13/2008 10:50 END : 11/19/2008 1045 LOGGER : K. Mouzakis

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	NUMBER AND TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, TESTS, INSTRUMENTATION, SAMPLE ID, AND ORGANIC VAPOR READING (PID)
0		GOOD	GB		WELL GRADED SAND (SW), brownish yellow (10 YR dry to damp, no plasticity, fine sand	VOC = 0.2 ppm
10		GOOD	GB		WELL GRADED SAND (SW), strong brown (7.5 YR 5/6), dry to damp, low plasticity, trace clay	VOC = 0.3 ppm
20		GOOD	GB		WELL GRADED SAND (SW), yellowish brown (10 YR 5/6) damp, low to medium plasticity, trace clay	VOC = 0.1 ppm 1128 Making 20-40' connection 1135 Drilling to 40'
30		GOOD	GB		POORLY GRADED SAND WITH CLAY (SP-SC), strong brown (7.5 YR 5/8), damp, medium plasticity	VOC = 0.0 ppm
40		GOOD	GB		POORLY GRADED SAND (SP), yellowish brown (10 YR 5/6), damp, low to medium plasticity, trace clay	VOC = 0.0 ppm 1210 Making 40-60' connection 1220 Drilling to 60'
50		GOOD	GB		POORLY GRADED SAND (SP), yellowish brown (10 YR 5/8), damp, medium plasticity, trace gravel	VOC = 0.0 ppm

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
376920.05.02.01	KAFB-10617	SHEET 2 OF 9

SOIL BORING LOG

PROJECT : ST106 TO313 LOCATION : VA Field

ELEVATION : COORDINATES :

DRILLING METHOD AND EQUIPMENT USED : ARCH 30K Pullstar Rig DRILLING CONTRACTOR : WDC Exploration & Wells / Joe Villegas

WATER LEVEL 488 7/12' START : 11/13/2008 10:50 END : 11/19/2008 1045 LOGGER : K. Mouzakis

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	NUMBER AND TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, TESTS, INSTRUMENTATION, SAMPLE ID, AND ORGANIC VAPOR READING (PID)
60		6"6"0"	S.S.	14-24-32	SAME AS ABOVE	VOC = 0.2 ppm Sample ID: ST106-SS-10617-60 collected on 11/13/2008 at 13:30
		GOOD	GB		POORLY GRADED SAND (SP), strong brown (7.5 YR damp, medium plasticity	1335 making 60-80' connection 1345 Drilling to 80' VOC = 0.2 ppm
70		GOOD	GB		WELL GRADED SAND (SW), brownish yellow (10 YR 6/6), dry to damp, no plasticity	VOC = 0.0 ppm
80		GOOD	GB		SAME AS ABOVE	VOC = 0.0 ppm 1410 Making 80-100' connection 1420 Drilling to 100'. Hose is starting to clog.
90		GOOD	GB		POORLY GRADED SAND (SP), strong brown (7.5 YR 5/6), moist, low plasticity, trace weathered rock and clay	VOC = 0.0 ppm
100		FAIR	GB		SAME AS ABOVE	VOC = 0.0 ppm 1505 Making 100-120' connection 1515 Drilling to 120' 1545 Trip Blank labeled ST106TB10613112(1545 Hose clogged. Joe injecting water.
110		FAIR	GB		SAME AS ABOVE except strong brown (7.5 YR 5/8)	VOC = 0.0 ppm

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
376920.05.02.01	KAFB-10617	SHEET 3 OF 9

SOIL BORING LOG

PROJECT : ST106 TO313 LOCATION : VA Field

ELEVATION : COORDINATES :

DRILLING METHOD AND EQUIPMENT USED : ARCH 30K Pullstar Rig DRILLING CONTRACTOR : WDC Exploration & Wells / Joe Villegas

WATER LEVEL 488 7/12' START : 11/13/2008 10:50 END : 11/19/2008 1045 LOGGER : K. Mouzakis

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	NUMBER AND TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, TESTS, INSTRUMENTATION, SAMPLE ID, AND ORGANIC VAPOR READING (PID)
120		6"6"4"	S.S.	19-20-39	SANDY LEAN CLAY (CL), yellowish brown (10 YR 5/8) moist, medium plasticity	VOC = 0.0 ppm Sample ID: ST106-SS-10617-120 collected on 11/13/2008 at 1700
		FAIR	GB		SAME AS ABOVE	Sample ID: ST106-SS-10617-120DUP collected on 11/13/2008 at 1700 1710 Making 120-140' connection 10/14: 0720 Drilling to 140' VOC = 0.0 ppm
130					NO SAMPLE. CYCLONE CLOGGED.	0800 Cyclone clogged. 1010 Unclogged.
140		POOR	GB		SAME AS 121.5-130' SAMPLE, but wet from injected water.	VOC = 0.0 ppm 1030 Making 140-160' connection. 1040 Drilling to 160'.
150		FAIR	GB		SAME AS ABOVE	VOC = 0.0 ppm
160		FAIR	GB		SAME AS ABOVE	VOC = 0.0 ppm 1142 Making 160-180' connection 1213 Drilling to 180'
170		FAIR	GB		WELL GRADED SAND (SW), yellowish brown (10 YR 5/6), wet from injected water, coarse sand - no fines, trace gravel and twigs	VOC = 0.2 ppm

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
376920.05.02.01	KAFB-10617	SHEET 4 OF 9

SOIL BORING LOG

PROJECT : ST106 TO313 LOCATION : VA Field

ELEVATION : COORDINATES :

DRILLING METHOD AND EQUIPMENT USED : ARCH 30K Pullstar Rig DRILLING CONTRACTOR : WDC Exploration & Wells / Joe Villegas

WATER LEVEL 488 7/12' START : 11/13/2008 10:50 END : 11/19/2008 1045 LOGGER : K. Mouzakis

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	NUMBER AND TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, TESTS, INSTRUMENTATION, SAMPLE ID, AND ORGANIC VAPOR READING (PID)
180						Driller stopped injecting water 1310 Making 180-200' connection 1310 Drilling to 200' VOC = 0.0 ppm
		FAIR	GB		WELL GRADED SAND (SW), yellowish brown (10 YR wet, trace fines	
190		GOOD	GB		WELL GRADED SAND (SW), yellowish brown (10 YR 5/6), wet, trace gravel	VOC = 0.0 ppm
200		6"6"3"	SS	12-17-19	200-200.5: SAME AS ABOVE 200.5-201.5: LEAN CLAY (CL), yellowish brown (10 YI damp, medium to high plasticity	Sample ID: ST106-SS-10617-200 collected on 11/14/2008 at 1410 VOC = 0.4 ppm 1415 Tripping out Drill pipe 1430 Tripping in 9 5/8" Practice 5 foot split spoon - 2.5' recovery La
		GOOD	GB		WELL GRADED SAND (SW), yellowish brown (10 YR 5/6), moist, coarse grained, trace gravel and weathered rock	VOC = 0.0 ppm 11/15: 0940 Making 200-220' connection 0957 Drilling to 220'
210		GOOD	GB		SAME AS ABOVE but 5% gravel	VOC = 0.0 ppm
220		GOOD	GB		WELL GRADED SAND (SW), pale brown (10 YR 6/3), dry, loose	VOC = 0.0 ppm 1020 Making 220-240' connection 1030 Drilling to 240'
230		GOOD	GB		WELL GRADED GRAVEL WITH SAND (GW), light brownish grey (10 YR 6/2), damp	VOC = 0.0 ppm

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
376920.05.02.01	KAFB-10617	SHEET 5 OF 9

SOIL BORING LOG

PROJECT : ST106 TO313 LOCATION : VA Field
ELEVATION : COORDINATES :
DRILLING METHOD AND EQUIPMENT USED : ARCH 30K Pullstar Rig DRILLING CONTRACTOR : WDC Exploration & Wells / Juan
WATER LEVEL 488 7/12' START : 11/13/2008 10:50 END : 11/19/2008 1045 LOGGER : K. Mouzakis

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	NUMBER AND TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, TESTS, INSTRUMENTATION, SAMPLE ID, AND ORGANIC VAPOR READING (PID)
240		6"4"0"	S.S.	40	WELL GRADED SAND WITH GRAVEL (SW), light brownish gray (10 YR 6/2), moist, coarse sand	11/15 VOC = 0.0 ppm Sample ID: ST106-SS-10617-240 collected on 11/15/2008 at 1050
		GOOD	GB		WELL GRADED SAND (SW), light brownish gray (10 YR 6/2), dry, fine to coarse sand	VOC = 0.0 ppm 1100 Making 240-260' connection 1120 Drilling to 260'
250		GOOD	GB		WELL GRADED SAND WITH GRAVEL (SW), light brownish gray (10 YR 6/2), dry	VOC = 0.0 ppm
260		GOOD	GB		WELL GRADED SAND (SW), light yellowish brown (10 YR 6/4), dry, loose	VOC = 0.0 ppm 1130 Making 260-280' connection 1140 Drilling to 280'
270		GOOD	GB		WELL GRADED SAND (SW), light yellowish brown (10 YR 6/4), dry, loose, trace gravel	VOC = 0.0 ppm
280		GOOD	GB		WELL GRADED SAND WITH GRAVEL (SW), pinkish gray (7.5 YR 7/2), dry, loose	VOC = 0.0 ppm 1200 Making 280-300' connection 1210 Drilling to 300'
290		GOOD	GB		WELL GRADED SAND (SW), light yellowish brown (10 YR 6/4), dry, loose	VOC = 0.0 ppm

CH2MHILL

PROJECT NUMBER 376920.05.02.01

BORING NUMBER KAFB-10617

SHEET 6 OF 9

SOIL BORING LOG

PROJECT : ST106 TO313

LOCATION : Short

ELEVATION :

COORDINATES :

DRILLING METHOD AND EQUIPMENT USED : ARCH 30K Pullstar Rig

DRILLING CONTRACTOR : WDC Exploration & Wells / Juan

WATER LEVEL 488 7/12'

START : 11/13/2008 10:50 END : 11/19/2008 1045

LOGGER : K. Mouzakis

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	NUMBER AND TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, TESTS, INSTRUMENTATION, SAMPLE ID, AND ORGANIC VAPOR READING (PID)
300		6"4"0"	S.S.	8-10-15	WELL GRADED SAND WITH GRAVEL (SW), pale brown (10 YR 6/3), dry, loose, gravel up to 1"	VOC = 0.0 ppm Sample ID: ST106-SS-10617-300 collected on 11/15/2008 at 1250 Downhole VOC = 0.0 ppm 1325 Making 300-320 connection 1340 Drilling to 320' VOC = 0.0 ppm
		GOOD	GB		WELL GRADED SAND WITH GRAVEL (SW), very pal brown (10 YR 7/4), dry, loose, gravel up to 2 inch	
310		GOOD	GB		WELL GRADED GRAVEL WITH SAND (GW), light brownish gray (10 YR 6/2), dry, loose, gravel vary in si: from 1/4" to 2"	VOC = 0.0 ppm
320		GOOD	GB		WELL GRADED GRAVEL (GW), light brownish gray (10 YR 6/2), dry, loose, gravel up to 2.5"	VOC = 0.0 ppm 1410 Making 320-340' connection 1416 Drilling to 340'
330		GOOD	GB		WELL GRADED GRAVEL WITH SAND (GW), yellowish brown (10 YR 5/4), damp, loose, coarse sand	VOC = 0.0 ppm
340		GOOD	GB		WELL GRADED SAND (SW), very pale brown (10 YR 7/4), dry, loose, fine to coarse sand, trace gravel	VOC = 0.0 ppm 1445 Making 340-360' connection 1455 Drilling to 360'
350		GOOD	GB		WELL GRADED SAND WITH GRAVEL (SW), light yellowish brown (10 YR 6/4), dry, loose	VOC = 0.0 ppm

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
376920.05.02.01	KAFB-10617	SHEET 7 OF 9

SOIL BORING LOG

PROJECT : ST106 TO313 LOCATION : VA Field
ELEVATION : COORDINATES :
DRILLING METHOD AND EQUIPMENT USED : ARCH 30K Pullstar Rig DRILLING CONTRACTOR : WDC Exploration & Wells / Juan
WATER LEVEL 488 7/12' START : 11/13/2008 10:50 END : 11/19/2008 1045 LOGGER : K. Mouzakis

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	NUMBER AND TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, TESTS, INSTRUMENTATION, SAMPLE ID, AND ORGANIC VAPOR READING (PID)
360		6"2"0"	S.S.	6-10-25	WELL GRADED SAND WITH GRAVEL (SW), very pale brown (10 YR 7/3), moist, loose, gravel up to 1"	VOC = 0.0 ppm Sample ID: ST106-SS-10617-360 collected on 11/15/2008 at 1520 1530 Making 360-380' conneciton 1540 Drilling to 380' VOC = 0.0 ppm
		GOOD	GB		WELL GRADED GRAVEL WITH SAND (GW), light yel brown (10 YR 6/4), damp, loose	
370		GOOD	GB		SAME AS ABOVE	VOC = 0.0 ppm
380		GOOD	GB		WELL GRADED SAND (SW), light yellowish brown (10 YR 6/4), damp, loose, trace gravel	VOC = 0.0 ppm 1605 Making 380-400' connection 1623 Drilling to 400'
390		GOOD	GB		SAME AS ABOVE but 10% gravel	VOC = 0.0 ppm
400		GOOD	GB		WELL GRADED SAND (SW), light yellowish brown (10 YR 6/4), moist, coarse grained	VOC = 0.0 ppm 11/16 0740 Making 400-420' conneciton 0750 Drilling to 420'
410		GOOD	GB		SAME AS ABOVE trace gravel	VOC = 0.0 ppm

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
376920.05.02.01	KAFB-10617	SHEET 8 OF 9

SOIL BORING LOG

PROJECT : ST106 TO313 LOCATION : VA Field

ELEVATION : COORDINATES :

DRILLING METHOD AND EQUIPMENT USED : ARCH 30K Pullstar Rig DRILLING CONTRACTOR : WDC Exploration & Wells / Juan

WATER LEVEL 488 7/12' START : 11/13/2008 10:50 END : 11/19/2008 1045 LOGGER : K. Mouzakis

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	NUMBER AND TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, TESTS, INSTRUMENTATION, SAMPLE ID, AND ORGANIC VAPOR READING (PID)
420		6"6"3"	S.S.	6-6-30	WELL GRADED SAND (SW), very pale brown (10 YR 7/3) damp	VOC = 0.1 ppm Sample ID: ST106-SS-10617-420 collected on 11/16/2008 at 0856 Sample ID: ST106-SS-10617-420MS collected on 11/16/2008 at 0856 Sample ID: ST106-SS-10617-420SD collected on 11/16/2008 at 0856 0905 Making 420-440' conneciton 0915 Drilling to 440' VOC = 0.0 ppm
		GOOD	GB		WELL GRADED SAND WITH GRAVEL (SW), pale bro (10 YR 6/3), damp to moist	
430		GOOD	GB		SAME AS ABOVE	VOC = 0.0 ppm
440		GOOD	GB		WELL GRADED GRAVEL (GW), light yellowish brown (10 YR 6/4), damp, trace sand, varied color in rocks, sc gray and red rocks, size in gravel varies from very small to 1.5"	VOC = 0.0 ppm 0930 Making 440-460' conneciton 0943 Drilling to 460'
450		GOOD	GB		WELL GRADED SAND (SW), light yellowish brown (10 YR 6/4), moist, fine to coarse sand	VOC = 0.0 ppm
460		GOOD	GB		SAME AS ABOVE but trace clay	VOC = 0.0 ppm 1020 Making 460-480' conneciton 1030 Drilling to 480' 1100 Ear on hammer broke
470		GOOD	GB		WELL GRADED SAND (SW), very pale brown (10 YR 7/3), dry to damp, fine sand	VOC = 0.0 ppm

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
376920.05.02.01	KAFB-10617	SHEET 9 OF 9

SOIL BORING LOG

PROJECT : ST106 TO313 LOCATION : VA Field

ELEVATION : COORDINATES :

DRILLING METHOD AND EQUIPMENT USED : ARCH 30K Pullstar Rig DRILLING CONTRACTOR : WDC Exploration & Wells / Juan

WATER LEVEL 488 7/12' START : 11/13/2008 10:50 END : 11/19/2008 1045 LOGGER : K. Mouzakis

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	NUMBER AND TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, TESTS, INSTRUMENTATION, SAMPLE ID, AND ORGANIC VAPOR READING (PID)
480		6"2"0"	S.S.		WELL GRADED SAND WITH GRAVEL (SW), very pale brown (10 YR 7/3), dry, gravel up to 1.5"	VOC = 0.1 ppm Sample ID: ST106-SS-10617-480 collected on 11/16/2008 at 1150
482.5		GOOD	S.S.		482.5-484 8/12" - WELL GRADED SAND (SW), very pale brown (10 YR 7/3), moist, loose	VOC = 0.0 ppm
485		GOOD	S.S.		484 8/12" - 485 - WELL GRADED GRAVEL (GW) very pale brown (10 YR 7/3), moist	Sample ID: Core A collected on 11/17/2008 at 1114
		GOOD	GB		WELL GRADED SAND WITH GRAVEL (SW), yellowish brown (10 YR 5/4), moist	VOC = 0.0 ppm
489		GOOD	S.S.		489-491.5-WELL GRADED SAND (SW), dark yellowish brow (10 YR 4/4), saturated	VOC = 0.0 ppm Sample ID: Core B collected on 11/17/2008 at 1630
490						
491.5					491.5-493 - SAME AS ABOVE	Sample ID: Core C collected on 11/17/2008 at 1620
493		GOOD	GB		WELL GRADED GRAVEL (GW), yellowish brown (10 YR 5/4)	VOC = 0.0 ppm
494.8		GOOD	S.S.		WELL GRADED SAND (SW), yellowish brown (10 YR saturated	VOC = 0.0 ppm Sample ID: Core F collected on 11/18/2008 at 1456
497						
500		GOOD	GB		WELL GRADED GRAVEL WITH SAND (GW), yellowish brown (10 YR 5/4), wet	VOC = 0.0 ppm
510		GOOD	GB		SAME AS ABOVE	VOC = 0.0 ppm
515						End of hole at 515'

APPENDIX 2
KAFB-106211 Boring Log

Borehole ID: KAFB-106211

Client: US Army Corps of Engineers
Project Location: KAFB, Albuquerque, NM
Project Name: KAFB BFF SWMU ST-106 and SS-111
Project Number: 140705

Date Started: 6/4/2014
Date TD Reached: 6/11/2014
Date Completed: 6/11/2014

Ground Elevation AMSL (ft): 5339.6
Y Coordinate: 1475210.14
X Coordinate: 1542907.53

Hole Diameter Upper (in.): 11-3/4
Hole Diameter Lower (in.): 9-5/8
Surface Completion Type:

Groundwater Levels BGS (ft):
At Time of Drilling: 477.00
At End of Drilling: Not Recorded
After Drilling:

Drillling Contractor: National Drilling
Drilling Method: Air Rotary Casing Hammer
Logged By: Andrew Harvey

Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
0					Silty SAND (SM); brownish yellow (10YR 6/6); dry; very fine sand.		Top of Cement Seal	Hand auger to 1 ft.
							Top of Bentonite Chips	
5					Silty SAND (SM); brown (10YR 5/3); dry to moist; fine sand.	SM	3" Schedule 80 PVC Riser for SVE Well	
							1 1/4" Schedule 80 PVC Riser for AS Well	
10					Well graded SAND (SW); brown (10YR 5/3); moist; fine sand.			Water added @ 10 ft. to keep down dust.
							Bentonite Chips	
15					Same as above (10 ft.); coase sand.	SW		Water added to keep down dust.
20					Same as above (10 ft.); trace fine gravel.		Top of High Solids Bentonite Grout	
25					Well graded SAND with Silt (SW-SM); brown (10YR 5/3); fine sand.	SW-SM		
30								

KAFB_BOREHOLE_LOG - SHAW_DRILLING.GDT - 9/30/15 12:28 - N:\KAFB BFF\GINT\KAFB_PROJECT\KAFB_BFF.GPJ

Borehole ID: KAFB-106211

Client: US Army Corps of Engineers
Project Location: KAFB, Albuquerque, NM
Project Name: KAFB BFF SWMU ST-106 and SS-111
Project Number: 140705

Date Started: 6/4/2014
Date TD Reached: 6/11/2014
Date Completed: 6/11/2014

Ground Elevation AMSL (ft): 5339.6
Y Coordinate: 1475210.14
X Coordinate: 1542907.53

Hole Diameter Upper (in.): 11-3/4
Hole Diameter Lower (in.): 9-5/8
Surface Completion Type:

Groundwater Levels BGS (ft):
At Time of Drilling: 477.00
At End of Drilling: Not Recorded
After Drilling:

Drillling Contractor: National Drilling
Drilling Method: Air Rotary Casing Hammer
Logged By: Andrew Harvey

Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
30					Silty SAND (SM); brown (10YR 5/3); fine sand.			Water added during drilling.
							Bentonite Grout	
35					Same as above (30 ft.)	SM		
40					Same as above (30 ft.)			
45					Well graded SAND (SW); brown (10YR 5/3); fine to coarse sand.			
50					Same as above (45 ft.)	SW	Bentonite Grout	
55					Well graded SAND with Gravel (SW); brown (10YR 5/3); 80% coarse sand; 20% fine gravel to 20 mm.			
60								

KAFB_BOREHOLE_LOG - SHAW_DRILLING.GDT - 9/30/15 10:40 - N:\KAFB BFF\GINT\KAFB_PROJECT\KAFB_BFF.GPJ

Borehole ID: KAFB-106211

Client: US Army Corps of Engineers
Project Location: KAFB, Albuquerque, NM
Project Name: KAFB BFF SWMU ST-106 and SS-111
Project Number: 140705

Date Started: 6/4/2014
Date TD Reached: 6/11/2014
Date Completed: 6/11/2014

Ground Elevation AMSL (ft): 5339.6
Y Coordinate: 1475210.14
X Coordinate: 1542907.53

Hole Diameter Upper (in.): 11-3/4
Hole Diameter Lower (in.): 9-5/8
Surface Completion Type:

Groundwater Levels BGS (ft):
At Time of Drilling: 477.00
At End of Drilling: Not Recorded
After Drilling:

Drillling Contractor: National Drilling
Drilling Method: Air Rotary Casing Hammer
Logged By: Andrew Harvey

Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
60								
					Well graded GRAVEL with Sand (GW); brown (10YR 5/3); 60% gravel to 30 mm; 40% coarse sand.	GW		
65					Poorly graded SAND (SP); brown (10YR 5/3); fine sand; trace silt and clay.		3" Schedule 80 PVC Riser	
70					Same as above (65 ft.)		1 1/4" Schedule 80 PVC Riser	
75					Same as above (65 ft.); fine to coarse sand; trace silt.	SP	Bentonite Grout	
80					Same as above (65 ft.)			
85					Same as above (65 ft.); medium to coarse sand; trace silt.			
90								

KAFB_BOREHOLE_LOG - SHAW_DRILLING.GDT - 9/30/15 10:40 - N:\KAFB BFF\GINT\KAFB_PROJECT\KAFB_BFF.GPJ

Borehole ID: KAFB-106211

Client: US Army Corps of Engineers
Project Location: KAFB, Albuquerque, NM
Project Name: KAFB BFF SWMU ST-106 and SS-111
Project Number: 140705

Date Started: 6/4/2014
Date TD Reached: 6/11/2014
Date Completed: 6/11/2014

Ground Elevation AMSL (ft): 5339.6
Y Coordinate: 1475210.14
X Coordinate: 1542907.53

Hole Diameter Upper (in.): 11-3/4
Hole Diameter Lower (in.): 9-5/8
Surface Completion Type:

Groundwater Levels BGS (ft):
At Time of Drilling: 477.00
At End of Drilling: Not Recorded
After Drilling:

Drillling Contractor: National Drilling
Drilling Method: Air Rotary Casing Hammer
Logged By: Andrew Harvey

Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
90					Poorly graded SAND with Silt (SP-SM); brown (10YR 5/3); fine sand.	SP-SM	Bentonite Grout	
95					Poorly graded SAND (SP); brown (10YR 5/3); 90% fine sand; 10% fine gravel; trace silt.	SP		
100					Same as above (95 ft.); 90% medium to coarse sand; 10% fine gravel.			
105					Same as above (95 ft.)			
110					Same as above (95 ft.); 95% coarse sand; 5% fine gravel.			
115					Well graded GRAVEL with Sand (GW); brown (10YR 5/3); 70% gravel; 20% sand; 10% fines.	GW		
120								

Borehole ID: KAFB-106211

Client: US Army Corps of Engineers
Project Location: KAFB, Albuquerque, NM
Project Name: KAFB BFF SWMU ST-106 and SS-111
Project Number: 140705

Date Started: 6/4/2014
Date TD Reached: 6/11/2014
Date Completed: 6/11/2014

Ground Elevation AMSL (ft): 5339.6
Y Coordinate: 1475210.14
X Coordinate: 1542907.53

Hole Diameter Upper (in.): 11-3/4
Hole Diameter Lower (in.): 9-5/8
Surface Completion Type:

Groundwater Levels BGS (ft):
At Time of Drilling: 477.00
At End of Drilling: Not Recorded
After Drilling:

Drillling Contractor: National Drilling
Drilling Method: Air Rotary Casing Hammer
Logged By: Andrew Harvey

Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
120					Silty SAND (SM); fine sand; trace clay.		Bentonite Grout	
125					Same as above (120 ft.)	SM		
130					Same as above (120 ft.)			
135					Well graded GRAVEL with Sand (GW); brown (10YR 5/3); 70% fine gravel; 30% medium to coarse sand.	GW		
140					Silty SAND (SM); brown (10YR 5/3); fine sand; trace clay.			
145					Same as above (140 ft.)	SM		
150								

KAFB_BOREHOLE_LOG - SHAW_DRILLING.GDT - 9/30/15 10:40 - N:\KAFB BFF\GINT\KAFB_PROJECT\KAFB_BFF.GPJ

Borehole ID: KAFB-106211

Client: US Army Corps of Engineers
Project Location: KAFB, Albuquerque, NM
Project Name: KAFB BFF SWMU ST-106 and SS-111
Project Number: 140705

Date Started: 6/4/2014
Date TD Reached: 6/11/2014
Date Completed: 6/11/2014

Ground Elevation AMSL (ft): 5339.6
Y Coordinate: 1475210.14
X Coordinate: 1542907.53

Hole Diameter Upper (in.): 11-3/4
Hole Diameter Lower (in.): 9-5/8
Surface Completion Type:

Groundwater Levels BGS (ft):
At Time of Drilling: 477.00
At End of Drilling: Not Recorded
After Drilling:

Drillling Contractor: National Drilling
Drilling Method: Air Rotary Casing Hammer
Logged By: Andrew Harvey

Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
150					Poorly graded SAND (SP); brown (10YR 5/3); trace silt and clay.	SP	Bentonite Grout	Water added during drilling.
155					Same as above (150 ft.); 90% coarse sand; 10% fine gravel; trace silt.			
160					Same as above (150 ft.); brown to dark gray (10YR 5/3); trace fine gravel.		3" Schedule 80 PVC Riser	End of 6/4/2014. Resumed drilling on 6/5/2014.
165					Same as above (150 ft.); light brown; slightly moist; fine sand; trace silt.		1 1/4" Schedule 80 PVC Riser	
170					Same as above (150 ft.); brown (10YR 5/3); slightly moist.			
175					Same as above (150 ft.); tan to brown (10YR 5/3); slightly moist; medium to coarse sand.			
180								

KAFB_BOREHOLE_LOG - SHAW_DRILLING.GDT - 9/30/15 10:40 - N:\KAFB BFF\GINT\KAFB_PROJECT\KAFB_BFF.GPJ

Borehole ID: KAFB-106211

Client: US Army Corps of Engineers
Project Location: KAFB, Albuquerque, NM
Project Name: KAFB BFF SWMU ST-106 and SS-111
Project Number: 140705

Date Started: 6/4/2014
Date TD Reached: 6/11/2014
Date Completed: 6/11/2014

Ground Elevation AMSL (ft): 5339.6
Y Coordinate: 1475210.14
X Coordinate: 1542907.53

Hole Diameter Upper (in.): 11-3/4
Hole Diameter Lower (in.): 9-5/8
Surface Completion Type:

Groundwater Levels BGS (ft):
At Time of Drilling: 477.00
At End of Drilling: Not Recorded
After Drilling:

Drillling Contractor: National Drilling
Drilling Method: Air Rotary Casing Hammer
Logged By: Andrew Harvey

Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
180								
185					Well graded GRAVEL with Sand (GW); brown (10YR 5/3); 70% fine gravel 30% medium to coarse sand; trace silt.	GW	- Bentonite Grout	
190					Well graded SAND (SW); tanish brown to black (10YR 5/3); fine to coarse sand.	SW		Water added to reduce dust and flush cuttings.
195					Same as above (185 ft.); 95% fine to coarse sand; 5% fine gravel; trace silt.	SW		Water added.
200					Poorly graded SAND with Silt (SP-SM); brown to grayish white (10YR 5/3); fine to medium sand.	SP-SM		Water added.
205					Well graded SAND (SW); gray, tan, black (10YR 5/1); 95% fine to coarse sand; 5% fine gravel.	SW		Total depth with 11-3/4" casing @ 200 ft. bgs. Resumed drilling with 9-5/8" casing.
210					Poorly graded SAND (SP); brown (10YR 5/3); slightly moist; trace silt.	SP		

KAFB_BOREHOLE_LOG - SHAW_DRILLING.GDT - 9/30/15 10:40 - N:\KAFB BFF\GINT\KAFB_PROJECT\KAFB_BFF.GPJ

Borehole ID: KAFB-106211

Client: US Army Corps of Engineers
Project Location: KAFB, Albuquerque, NM
Project Name: KAFB BFF SWMU ST-106 and SS-111
Project Number: 140705

Date Started: 6/4/2014
Date TD Reached: 6/11/2014
Date Completed: 6/11/2014

Ground Elevation AMSL (ft): 5339.6
Y Coordinate: 1475210.14
X Coordinate: 1542907.53

Hole Diameter Upper (in.): 11-3/4
Hole Diameter Lower (in.): 9-5/8
Surface Completion Type:

Groundwater Levels BGS (ft):
At Time of Drilling: 477.00
At End of Drilling: Not Recorded
After Drilling:

Drillling Contractor: National Drilling
Drilling Method: Air Rotary Casing Hammer
Logged By: Andrew Harvey

Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
210					Well graded SAND (SW); tan to brown (10YR 5/3); slightly moist; fine to medium sand.			
215					Same as above (210 ft.); 95% sand; 5% gravel to 2 cm.			
220					Same as above (210 ft.); 95% sand; 5% gravel to 1 cm.	SW	- Bentonite Grout	
225					Same as above (210 ft.); gray, brown, tan, red (10YR 5/1); 95% fine to coarse sand; 5% fine gravel.			
230					Poorly graded SAND (SP); gray (10YR 5/1); fine sand.	SP		
235					Well graded SAND (SW); gray (10YR 5/1); 95% fine to coarse sand; 5% fine gravel.	SW		
240								

KAFB_BOREHOLE_LOG - SHAW_DRILLING.GDT - 9/30/15 10:40 - N:\KAFB BFF\GINT\KAFB_PROJECT\KAFB_BFF.GPJ

Borehole ID: KAFB-106211

Client: US Army Corps of Engineers
Project Location: KAFB, Albuquerque, NM
Project Name: KAFB BFF SWMU ST-106 and SS-111
Project Number: 140705

Date Started: 6/4/2014
Date TD Reached: 6/11/2014
Date Completed: 6/11/2014

Ground Elevation AMSL (ft): 5339.6
Y Coordinate: 1475210.14
X Coordinate: 1542907.53

Hole Diameter Upper (in.): 11-3/4
Hole Diameter Lower (in.): 9-5/8
Surface Completion Type:

Groundwater Levels BGS (ft):
At Time of Drilling: 477.00
At End of Drilling: Not Recorded
After Drilling:

Drillling Contractor: National Drilling
Drilling Method: Air Rotary Casing Hammer
Logged By: Andrew Harvey

Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
240					Well graded SAND (SW); gray (10YR 5/1); 95% fine to coarse sand; 5% fine gravel.			
245					Same as above (240 ft.)		3" Schedule 80 PVC Riser	
250					Same as above (240 ft.)			
255					Same as above (240 ft.); 98% sand; 2% gravel.	SW	1 1/4" Schedule 80 PVC Riser	
260					Same as above (240 ft.); brown (10YR 5/3); fine to medium sand; trace silt.		Bentonite Grout	
265					Same as above (240 ft.)			
270								

KAFB_BOREHOLE_LOG - SHAW_DRILLING.GDT - 9/30/15 10:40 - N:\KAFB BFF\GINT\KAFB_PROJECT\KAFB_BFF.GPJ

Borehole ID: KAFB-106211

Client: US Army Corps of Engineers
Project Location: KAFB, Albuquerque, NM
Project Name: KAFB BFF SWMU ST-106 and SS-111
Project Number: 140705

Date Started: 6/4/2014
Date TD Reached: 6/11/2014
Date Completed: 6/11/2014

Ground Elevation AMSL (ft): 5339.6
Y Coordinate: 1475210.14
X Coordinate: 1542907.53

Hole Diameter Upper (in.): 11-3/4
Hole Diameter Lower (in.): 9-5/8
Surface Completion Type:

Groundwater Levels BGS (ft):
At Time of Drilling: 477.00
At End of Drilling: Not Recorded
After Drilling:

Drillling Contractor: National Drilling
Drilling Method: Air Rotary Casing Hammer
Logged By: Andrew Harvey

Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
270					Well graded SAND (SW); gray (10YR 5/1); 95% fine to coarse sand; 5% fine gravel.	SW		
275					Same as above (270 ft.); slightly moist.			
280					Same as above (270 ft.)		Bentonite Grout	End of 6/5/2014. Resumed drilling on 6/4/2014.
285					Same as above (270 ft.); brown to reddish brown (10YR 5/3); slightly moist; fine to medium sand.			
290					Same as above (270 ft.); dry to slightly moist.			
295					Same as above (270 ft.); 95% fine to coarse sand; 5% fine gravel.			
300								

KAFB_BOREHOLE_LOG - SHAW_DRILLING.GDT - 9/30/15 10:40 - N:\KAFB BFF\GINT\KAFB_PROJECT\KAFB_BFF.GPJ

Borehole ID: KAFB-106211

Client: US Army Corps of Engineers
Project Location: KAFB, Albuquerque, NM
Project Name: KAFB BFF SWMU ST-106 and SS-111
Project Number: 140705

Date Started: 6/4/2014
Date TD Reached: 6/11/2014
Date Completed: 6/11/2014

Ground Elevation AMSL (ft): 5339.6
Y Coordinate: 1475210.14
X Coordinate: 1542907.53

Hole Diameter Upper (in.): 11-3/4
Hole Diameter Lower (in.): 9-5/8
Surface Completion Type:

Groundwater Levels BGS (ft):
At Time of Drilling: 477.00
At End of Drilling: Not Recorded
After Drilling:

Drillling Contractor: National Drilling
Drilling Method: Air Rotary Casing Hammer
Logged By: Andrew Harvey

Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
300					Well graded SAND (SW); gray (10YR 5/1); 95% fine to coarse sand; 5% fine gravel.		Bentonite Grout	
305					Well graded SAND with Gravel (SW); brown to gray (10YR 5/3); 80% medium to coarse sand; 20% fine gravel.			
310					Same as above (305 ft.); gravel to 2.5 cm.	SW		
315					Same as above (305 ft.); 60% medium to coarse sand; 40% gravel to 3 cm.			
320					Well graded GRAVEL with Sand (GW); brown to gray, red fragments (10YR); slightly moist; 75% fine to coarse gravel to 3.5 cm; 25% medium to coarse sand.	GW		
325					Well graded SAND (SW); brown (10YR 5/3); fine sand; trace gravel to 2 cm.	SW		
330								

KAFB_BOREHOLE_LOG - SHAW_DRILLING.GDT - 9/30/15 10:40 - N:\KAFB BFF\GINT\KAFB_PROJECT\KAFB_BFF.GPJ

Borehole ID: KAFB-106211

Client: US Army Corps of Engineers
Project Location: KAFB, Albuquerque, NM
Project Name: KAFB BFF SWMU ST-106 and SS-111
Project Number: 140705

Date Started: 6/4/2014
Date TD Reached: 6/11/2014
Date Completed: 6/11/2014

Ground Elevation AMSL (ft): 5339.6
Y Coordinate: 1475210.14
X Coordinate: 1542907.53

Hole Diameter Upper (in.): 11-3/4
Hole Diameter Lower (in.): 9-5/8
Surface Completion Type:

Groundwater Levels BGS (ft):
At Time of Drilling: 477.00
At End of Drilling: Not Recorded
After Drilling:

Drillling Contractor: National Drilling
Drilling Method: Air Rotary Casing Hammer
Logged By: Andrew Harvey

Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
330								
					Well graded SAND (SW); brown (10YR 5/3); fine sand; trace gravel to 2 cm.		Bentonite Grout	
335					Well graded SAND with Gravel (SW); 80% fine to coarse sand; 20% gravel.			
340					Well graded SAND (SW); brown and gray (10YR 5/3); fine to coarse sand; trace fine gravel.		3" Schedule 80 PVC Riser	
345					Same as above (340 ft.); brown (10YR 5/3); slightly moist; fine to medium sand.	SW	1 1/4" Schedule 80 PVC Riser	
350					Same as above (340 ft.); fine to medium sand; trace coarse sand.			
355					Well graded SAND with Gravel (SW); 60% medium to coarse sand; 40% fine gravel.			Added water to borehole @ 355 ft.
360								

KAFB_BOREHOLE_LOG - SHAW_DRILLING.GDT - 9/30/15 10:40 - N:\KAFB BFF\GINT\KAFB_PROJECT\KAFB_BFF.GPJ

Borehole ID: KAFB-106211

Client: US Army Corps of Engineers
Project Location: KAFB, Albuquerque, NM
Project Name: KAFB BFF SWMU ST-106 and SS-111
Project Number: 140705

Date Started: 6/4/2014
Date TD Reached: 6/11/2014
Date Completed: 6/11/2014

Ground Elevation AMSL (ft): 5339.6
Y Coordinate: 1475210.14
X Coordinate: 1542907.53

Hole Diameter Upper (in.): 11-3/4
Hole Diameter Lower (in.): 9-5/8
Surface Completion Type:

Groundwater Levels BGS (ft):
At Time of Drilling: 477.00
At End of Drilling: Not Recorded
After Drilling:

Drillling Contractor: National Drilling
Drilling Method: Air Rotary Casing Hammer
Logged By: Andrew Harvey

Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
360					Well graded GRAVEL with Sand (GW); brown (10YR 5/3); 80% fine gravel to 1.5 cm; 20% medium to coarse sand.	GW		Drill rig off @ 0925 to fix trip hammer. Resumed drilling @1530 on 6/6/2014. Water added.
365					Well graded SAND (SW); brown (10YR 5/3); 95% fine to coarse sand; 5% gravel to 2 cm.	SW		
370					Same as above (365 ft.); gray (10YR 5/1); fine to medium sand; trace clay.		Bentonite Grout	
375					Same as above (365 ft.)			
380					Same as above (365 ft.); brown to gray (10YR 5/3); dry; medium to coarse sand.			End of 6/6/2014. Resumed drilling @ 0843 on 6/9/2014. Water added.
385					Same as above (365 ft.); brown (10YR 5/3); slightly moist; fine to medium sand.			
390								

KAFB_BOREHOLE_LOG - SHAW_DRILLING.GDT - 9/30/15 10:40 - N:\KAFB BFF\GINT\KAFB_PROJECT\KAFB_BFF.GPJ

Borehole ID: KAFB-106211

Client: US Army Corps of Engineers
Project Location: KAFB, Albuquerque, NM
Project Name: KAFB BFF SWMU ST-106 and SS-111
Project Number: 140705

Date Started: 6/4/2014
Date TD Reached: 6/11/2014
Date Completed: 6/11/2014

Ground Elevation AMSL (ft): 5339.6
Y Coordinate: 1475210.14
X Coordinate: 1542907.53

Hole Diameter Upper (in.): 11-3/4
Hole Diameter Lower (in.): 9-5/8
Surface Completion Type:

Groundwater Levels BGS (ft):
At Time of Drilling: 477.00
At End of Drilling: Not Recorded
After Drilling:

Drillling Contractor: National Drilling
Drilling Method: Air Rotary Casing Hammer
Logged By: Andrew Harvey

Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
390					Well graded SAND (SW); brown (10YR 5/3); 95% fine to coarse sand; 5% gravel to 2 cm.			
395					Same as above (390 ft.)		Bentonite Grout	
400					Same as above (390 ft.); medium to coarse sand.		Top of Bentonite Seal	
405					Same as above (390 ft.)	SW		Water added.
410					Same as above (390 ft.); brown (10YR 5/3); moist; fine to medium sand.		Bentonite Seal	
415					Same as above (390 ft.)			
420								

KAFB_BOREHOLE_LOG - SHAW_DRILLING.GDT - 9/30/15 10:40 - N:\KAFB BFF\GINT\KAFB_PROJECT\KAFB_BFF.GPJ

Borehole ID: KAFB-106211

Client: US Army Corps of Engineers
Project Location: KAFB, Albuquerque, NM
Project Name: KAFB BFF SWMU ST-106 and SS-111
Project Number: 140705

Date Started: 6/4/2014
Date TD Reached: 6/11/2014
Date Completed: 6/11/2014

Ground Elevation AMSL (ft): 5339.6
Y Coordinate: 1475210.14
X Coordinate: 1542907.53

Hole Diameter Upper (in.): 11-3/4
Hole Diameter Lower (in.): 9-5/8
Surface Completion Type:

Groundwater Levels BGS (ft):
At Time of Drilling: 477.00
At End of Drilling: Not Recorded
After Drilling:

Drillling Contractor: National Drilling
Drilling Method: Air Rotary Casing Hammer
Logged By: Andrew Harvey

Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
420					Well graded SAND (SW); brown (10YR 5/3); 95% fine to coarse sand; 5% gravel to 2 cm.	SW		Water added.
425					Same as above (420 ft.); dry.		Bentonite Seal	
430					Same as above (420 ft.); dry; trace coarse sand; note increase in sand size.		Top of 10/20 Sand Top of 20/40 Sand	
435					Same as above (420 ft.); dry.		Top of 3" Schedule 80 PVC 0.010" Slot Screen	
440					Same as above (420 ft.); dry; fine to coarse sand; trace fine gravel to 1.0 cm.			@ 1150 Trip hammer not operating correctly.
445					Same as above (420 ft.)			
450								

KAFB_BOREHOLE_LOG - SHAW_DRILLING.GDT - 9/30/15 11:44 - N:\KAFB BFF\GINT\KAFB_PROJECT\KAFB_BFF.GPJ

Borehole ID: KAFB-106211

Client: US Army Corps of Engineers
Project Location: KAFB, Albuquerque, NM
Project Name: KAFB BFF SWMU ST-106 and SS-111
Project Number: 140705

Date Started: 6/4/2014
Date TD Reached: 6/11/2014
Date Completed: 6/11/2014

Ground Elevation AMSL (ft): 5339.6
Y Coordinate: 1475210.14
X Coordinate: 1542907.53

Hole Diameter Upper (in.): 11-3/4
Hole Diameter Lower (in.): 9-5/8
Surface Completion Type:

Groundwater Levels BGS (ft):
At Time of Drilling: 477.00
At End of Drilling: Not Recorded
After Drilling:

Drillling Contractor: National Drilling
Drilling Method: Air Rotary Casing Hammer
Logged By: Andrew Harvey

Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
450					Well graded SAND (SW); brown (10YR 5/3); 95% fine to coarse sand; 5% gravel to 2 cm.			
455					Same as above (450 ft.); brown (10YR 5/3); moist; fine to medium sand.			Water added.
460					Same as above (450 ft.); moist; trace fine gravel.			
465					Same as above (450 ft.); brown (10YR 5/3); moist; fine sand; trace medium sand.	SW	Native Fill Bottom of 3" Schedule 80 PVC 0.010" Slot Screen	
470					Same as above (450 ft.)		Schedule 80 PVC 5-ft Sump	
475					Same as above (450 ft.); moist; slight increase in medium sand.		Top of Seal	
480								

KAFB_BOREHOLE_LOG - SHAW_DRILLING.GDT - 9/30/15 11:44 - N:\KAFB BFF\GINT\KAFB_PROJECT\KAFB_BFF.GPJ

Borehole ID: KAFB-106211

Client: US Army Corps of Engineers
Project Location: KAFB, Albuquerque, NM
Project Name: KAFB BFF SWMU ST-106 and SS-111
Project Number: 140705

Date Started: 6/4/2014
Date TD Reached: 6/11/2014
Date Completed: 6/11/2014

Ground Elevation AMSL (ft): 5339.6
Y Coordinate: 1475210.14
X Coordinate: 1542907.53

Hole Diameter Upper (in.): 11-3/4
Hole Diameter Lower (in.): 9-5/8
Surface Completion Type:

Groundwater Levels BGS (ft):
At Time of Drilling: 477.00
At End of Drilling: Not Recorded
After Drilling:

Drillling Contractor: National Drilling
Drilling Method: Air Rotary Casing Hammer
Logged By: Andrew Harvey

Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
480					Well graded SAND (SW); brown (10YR 5/3); 95% fine to coarse sand; 5% gravel to 2 cm.	SW		Stop drilling to remove cap on casing. Prepare for split spoon sampling.
		KAFB-106211-482						
485		KAFB-106211-483.5			Lean CLAY (CL); medium to dark brown (10YR 3/3); low plasticity; trace fine sand.	CL	Bentonite Chips	
		KAFB-106211-485			Well graded SAND (SW).	SW		SPT 483.5 - 485. End of 6/9/2014. Resumed drilling on 6/10/2014. Saturated @ 486 ft. bgs.
490		KAFB-106211-488						
		KAFB-106211-490			Well graded GRAVEL (GW); saturated; brown (10YR 5/3); 70% fine to medium gravel to 4 cm; subrounded; 30% sand; trace silt.	GW	Top of 20/40 Sand; Top of 10/20 Sand	
		KAFB-106211-492						
495		KAFB-106211-493.5			Same as above (490 ft.)		Top of 1 1/4" Schedule 80 PVC 0.010" Slot Screen	SPT @ 495 - 496.5. SPT @ 497 - 498.5. SPT @ 498.5 - 500 ft. End of 6/10/2014. Resumed drilling on 6/11/2014.
		KAFB-106211-495						
		KAFB-106211-497						
500		KAFB-106211-498.5						
					Well graded SAND with Gravel (SW); 75% fine to coarse sand; 25% fine gravel; trace silt.	SW	Bottom of 1 1/4" Schedule 80 PVC 0.010" Slot Screen; Sump	
505					Well graded GRAVEL with Sand (GW); brown, tan, red (10YR 5/3); 60% fine gravel to 2 cm; 40% coarse sand.	GW	Bottom of Sump	
510								

KAFB_BOREHOLE_LOG - SHAW_DRILLING.GDT - 9/30/15 12:17 - N:\KAFB BFF\GINT\KAFB_PROJECT\KAFB_BFF.GPJ

Borehole ID: KAFB-106211

Client: US Army Corps of Engineers
Project Location: KAFB, Albuquerque, NM
Project Name: KAFB BFF SWMU ST-106 and SS-111
Project Number: 140705

Date Started: 6/4/2014
Date TD Reached: 6/11/2014
Date Completed: 6/11/2014

Ground Elevation AMSL (ft): 5339.6
Y Coordinate: 1475210.14
X Coordinate: 1542907.53

Hole Diameter Upper (in.): 11-3/4
Hole Diameter Lower (in.): 9-5/8
Surface Completion Type:

Groundwater Levels BGS (ft):
At Time of Drilling: 477.00
At End of Drilling: Not Recorded
After Drilling:

Drillling Contractor: National Drilling
Drilling Method: Air Rotary Casing Hammer
Logged By: Andrew Harvey

Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
510								
					Well graded SAND with Gravel (SW); brown, tan, red (10YR 5/3); 70% coarse sand; 30% fine gravel.	SW		
515					Same as above (510 ft.); gravel to 3 cm.			
					Well graded GRAVEL with Sand (GW); 50% medium to coarse sand; 50% fine gravel to 2 cm.	GW		
520								Total depth = 520 ft. bgs. Reached TD on 6/11/2014.
525								
530								
535								
540								

KAFB_BOREHOLE_LOG - SHAW_DRILLING.GDT - 9/30/15 10:40 - N:\KAFB BFF\GINT\KAFB_PROJECT\KAFB_BFF.GPJ

APPENDIX 3
Air Sparge and SVE System Operational Data

Appendix 3. Air Sparge and SVE System Operational Data

	Air Sparge						SVE									
							SVE Well									
	Flow Meter		Corrected Flow	Compressor Pressure	Regulator Pressure	Temperature	Well Valve % Open	Vacuum	Differential Pressure	Vacuum (Well Head)	Differential Pressure (Well Head)	Temperature	Humidity	Vacuum Gauge Pre Knockout	Differential Pressure Pre Knockout	Differential Pressure for Blower Filter
	FI-101		FI-101	PI-101	PI-102	TI-101		Sample Port						PI-201	FI-201	FI-202
Time/Date	SCFM	Correction Factor	SCFM	psi	psi	°F	%	in WC	in WC	in WC	in WC	°F	%	in WC	in WC	in WC
6/30/2014 14:20	9	1.138	10.25	105	7	104	100%	30.34	0.10	NR	NR	104.0	7.4	30	0.14	0.0
7/1/2014 8:07	9.5	1.108	10.53	105	6	86	100%	31.22	0.09	NR	NR	79.3	32.1	32	0.15	0.0
7/2/2014 13:25	9	1.108	9.97	110	6	90	100%	31.3	0.08	NR	NR	93.6	18.8	32	0.14	0.0
7/3/2014 9:45	9	1.108	9.97	115	6	90	100%	32.58	0.09	NR	NR	87.4	27.6	33	0.17	0.0
7/7/2014 10:48	8	1.135	9.08	115	7	90	100%	30.85	0.09	NR	NR	97.2	23.7	31	0.15	0.0
7/8/2014 8:27	8	1.108	8.86	100	6	88	100%	30.94	0.10	NR	NR	88.2	27.1	31	0.17	0.0
7/9/2014 11:57	8.75	1.108	9.70	100	6	93	100%	30.64	0.10	NR	NR	95.4	23.1	31	0.14	0.0
7/10/2014 11:00	8.75	1.108	9.70	107	6	90	100%	30.37	0.10	NR	NR	98.4	19.1	31	0.15	0.0
7/14/2014 9:14	10	1.108	11.08	105	6	87	100%	31.19	0.10	NR	NR	86.7	33.5	31.5	0.15	0.0
7/15/2014 8:33	11	1.108	12.19	115	6	72	100%	32.07	0.09	NR	NR	66.0	74.7	32	0.14	0.0
7/16/2014 14:40	9	1.108	9.97	105	6	90	100%	28.49	0.09	NR	NR	94.1	26.8	29	0.14	0.0
7/17/2014 9:50	9.5	1.108	10.53	110	6	86	100%	29.42	0.10	NR	NR	89.6	32.3	30	0.14	0.0
7/21/2014 9:35	11.25	1.108	12.47	105	6	92	100%	30.32	0.09	NR	NR	88.9	25.3	30	0.14	0.0
7/22/2014 8:37	11.5	1.108	12.74	110	6	110	100%	30.69	0.08	NR	NR	90.5	26.6	30.5	0.13	0.0
7/23/2014 8:13	12.0	1.108	13.30	115	6	87	100%	32.2	0.10	NR	NR	84.4	39.2	32.5	0.135	0.0
7/24/2014 10:31	11.75	1.108	13.02	110	6	94	100%	31.16	0.09	NR	NR	96.3	20.0	32	0.13	0.0
7/28/2014 11:00	12.5	1.138	14.23	115	7	93	100%	31.98	0.07	NR	NR	92.7	27.1	32	0.16	0.0
7/29/2014 9:47	12.5	1.108	13.85	115	6	86	100%	34.73	0.11	NR	NR	79.5	51.0	35	0.17	0.0
7/30/2014 8:20	11.5	1.108	12.74	105	6	82	100%	34.79	0.11	NR	NR	81.9	44.8	35.5	0.21	0.0
7/31/2014 10:12	11	1.108	12.19	115	6	86	100%	35.09	0.11	NR	NR	81.1	41.5	35.5	0.185	0.0
8/4/2014 9:07	12.5	1.108	13.85	110	6	84	100%	34.99	0.11	NR	NR	73.6	58.1	35.5	0.19	0.0
8/5/2014 8:15	13	1.108	14.41	100	6	80	100%	35	0.12	NR	NR	80.6	43.4	35.5	0.185	0.0
8/6/2014 7:55	12.75	1.108	14.13	115	6	82	100%	34.48	0.11	NR	NR	78.1	47.8	35	0.19	0.0
8/7/2014 11:50	12	1.108	13.30	110	6	88	100%	33.96	0.11	NR	NR	82.6	37.9	34.5	0.20	0.0
8/11/2014 12:15	12.5	1.108	13.85	110	6	88	100%	33.25	0.10	NR	NR	93.0	24.3	39	0.20	0.0
8/12/2014 14:57	12	1.108	13.30	110	6	94	100%	33.61	0.10	NR	NR	86.4	26.3	40	0.18	0.0
8/13/2014 8:40	12.25	1.108	13.57	110	6	88	100%	34.64	0.10	NR	NR	79.2	44.8	40	0.20	0.0
8/14/2014 10:45	13	1.108	14.41	110	6	90	100%	33.91	0.07	NR	NR	91.8	31.6	40	0.20	0.0
8/18/2014 8:46	12	1.108	13.30	110	6	90	100%	33.53	0.08	NR	NR	84.4	33.2	39.5	0.20	0.0
8/19/2014 9:03	12.5	1.108	13.85	110	6	84	100%	32.75	0.11	32.92	0.46	82.4	29.5	39	0.21	0.0
8/19/2014 9:30	12.5	1.108	13.85	110	6	84	100%	18.33	0.05	18.47	0.22	82.4	29.5	24	0.08	0.0
8/20/2014 12:40	11.25	1.108	12.47	110	6	95	100%	32.06	0.06	32.32	0.42	91.0	24.3	38.5	0.20	0.0
8/25/2014 8:43	12.75	1.108	14.13	110	6	86	100%	33.65	0.07	33.58	0.53	75.4	36.7	40	0.21	0.0
8/26/2014 9:41	12.5	1.108	13.85	105	6	84	100%	34.58	0.11	34.58	0.53	72.3	47.9	40	0.18	0.0
8/27/2014 11:10	12.75	1.108	14.13	115	6	90	100%	34.66	0.11	34.66	0.52	79.2	44.2	40	0.18	0.0
8/28/2014 9:40	12.5	1.108	13.85	105	6	86	100%	34.11	0.09	34.11	0.54	80.2	26.8	40	0.18	0.0
9/15/2014 8:20	13	1.108	14.41	110	6	80	100%	34.16	0.06	34.46	0.49	71.6	52.0	40	0.18	0.0
9/16/2014 10:32	13	1.108	14.41	100	6	87	100%	34.44	0.11	34.72	0.54	77.7	48.1	40.5	0.20	0.0
9/17/2014 15:50	13	1.108	14.41	110	6	78	100%	34.21	0.11	34.97	0.53	70.1	67.8	40	0.20	0.0
9/18/2014 14:15	13.5	1.108	14.96	110	6	89	100%	33.79	0.11	34.02	0.52	80.4	58.6	40	0.19	0.0
9/22/2014 11:30	12	1.108	13.30	110	6	90	100%	34.48	0.13	34.56	0.57	79.5	42.7	40	0.20	0.0
9/23/2014 13:00	12.25	1.108	13.57	110	6	90	100%	34.26	0.11	34.47	0.56	81.3	39.9	40	0.20	0.0
9/24/2014 12:01	12.25	1.108	13.57	110	6	87	100%	33.78	0.11	34.01	0.55	79.8	10.1	40	0.20	0.0
9/25/2014 13:00	12.5	1.108	13.85	110	6	91	100%	34.24	0.11	34.57	0.55	80.3	42.3	40	0.20	0.0
9/29/2014 8:30	13.75	1.108	15.24	105	6	83	100%	32.34	0.11	32.58	0.58	68.5	57.6	38.5	0.20	0.0
9/30/2014 8:50	13.5	1.108	14.96	110	6	85	100%	32.47	0.11	32.70	0.56	70.1	55.4	39	0.20	0.0
10/1/2014 10:45	13.5	1.108	14.96	110	6	88	100%	32.48	0.11	32.81	0.55	76.2	39.8	39.5	0.19	0.0
10/2/2014 9:00	13.5	1.108	14.96	115	6	73	100%	33.01	0.11	33.24	0.56	70.4	36.7	40	0.20	0.0
10/6/2014 9:36	14.5	1.108	16.07	105	6	77	100%	33.28	0.15	33.59	0.60	66.2	27.3	39.5	0.19	0.0
10/7/2014 8:50	14.25	1.108	15.79	110	6	74	100%	33.52	0.14	33.81	0.58	64.7	25.6	40	0.20	0.0
10/8/2014 11:05	14	1.108	15.51	110	6	84	100%	32.9	0.13	33.34	0.53	70.2	24.3	39	0.19	0.0
10/9/2014 10:00	14	1.108	15.51	110	6	84	100%	33.01	0.13	33.52	0.54	70.8	58.6	39.5	0.19	0.0
10/13/2014 14:20	14	1.108	15.51	110	6	82	100%	33.62	0.13	33.81	0.53	72.7	30.4	40	0.19	0.0
10/14/2014 9:20	16	1.108	17.73	100	6	65	100%	36.13	0.07	35.48	0.54	53.5	31.0	41	0.22	0.0
10/15/2014 9:30	14.25	1.11	15.79	115	6	78	100%	33.89	0.10	33.47	0.55	66.0	28.0	39.5	0.20	0.0
10/16/2014 9:35	14.5	1.11	16.07	110	6	80	100%	33.77	0.10	33.41	0.56	68.1	28.4	39.5	0.20	0.0
10/20/2014 12:06	19.25	1.14	21.91	10	7	78	100%	33.81	0.09	33.46	0.55	70.4	26.0	39.5	0.19	0.0
10/21/2014 13:00	19	1.14	21.63	10	7	82	100%	32.98	0.08	32.74	0.54	69.7	27.3	39.5	0.20	0.0
10/22/2014 14:30	19.25	1.14	21.91	10	7	81	100%	33.04	0.09	32.77	0.56	68.5	30.1	39.5	0.20	0.0
10/23/2014 12:00	19.25	1.14	21.91	10	7	80	100%	33.14	0.08	33.02	0.56	73.4	35.0	39.5	0.20	0.0
10/27/2014 13:00	19	1.14	21.63	10	7	76	100%	32.97	0.08	32.66	0.55	70.8	27.2	39.25	0.20	0.0
10/28/2014 13:30	19.25	1.14	21.91	10	7	75	100%	32.42	0.08	32.13	0.54	66.6	23.3	39.25	0.19	0.0
10/29/2014 14:00	19	1.14	21.63	10	7	76	100%	33.01	0.09	32.85	0.55	68.9	26.5	39.0	0.20	0.0
10/30/2014 14:00	19	1.14	21.63	10	7	80	100%	32.65	0.08	32.46	0.56	65.9	25.8	39.0	0.19	0.0
11/3/2014 12:40	18.75	1.14	21.34	10	7	78	100%	32.98	0.08	32.56	0.54	66.4	21.3	38.75	0.20	0.0

Appendix 3. Air Sparge and SVE System Operational Data

	Air Sparge						SVE									
							SVE Well									
	Flow Meter		Corrected Flow	Compressor Pressure	Regulator Pressure	Temperature	Well Valve % Open	Vacuum	Differential Pressure	Vacuum (Well Head)	Differential Pressure (Well Head)	Temperature	Humidity	Vacuum Gauge Pre Knockout	Differential Pressure Pre Knockout	Differential Pressure for Blower Filter
	FI-101		FI-101	PI-101	PI-102	TI-101		Sample Port						PI-201	FI-201	FI-202
Time/Date	SCFM	Correction Factor	SCFM	psi	psi	°F	%	in WC	in WC	in WC	in WC	°F	%	in WC	in WC	in WC
11/4/2014 13:00	18.5	1.14	21.06	10	7	79	100%	32.68	0.09	32.52	0.54	68.6	18.5	38.75	0.20	0.0
11/5/2014 14:30	18.75	1.14	21.34	10	7	76	100%	32.94	0.08	32.85	0.55	65.3	19.4	39	0.20	0.0
11/6/2014 14:00	18.75	1.14	21.34	10	7	78	100%	32.88	0.08	32.77	0.54	70.0	18.0	38.75	0.20	0.0
11/10/2014 11:25	18.5	1.14	21.06	10	7	76	100%	32.84	0.08	32.56	0.55	68.2	18.8	38.75	0.20	0.0
11/11/2014 10:15	18.75	1.14	21.34	10	7	88	100%	31.43	0.14	30.76	0.65	62.4	23.1	38.5	0.22	0.0
11/12/2014 11:15	19	1.14	21.63	10	7	74	100%	32.96	0.14	32.77	0.56	59.8	19.0	39	0.21	0.0
11/13/2014 11:15	18.75	1.14	21.34	10	7	68	100%	33.08	0.12	32.98	0.55	60.1	17.3	39.5	0.21	0.0
11/17/2014 12:00	19	1.14	21.63	10	7	56	100%	34.21	0.12	34.14	0.55	52.0	13.5	40	0.21	0.0
11/18/2014 15:35	19	1.14	21.63	10	7	65	100%	34.09	0.10	33.87	0.53	54.1	15.1	40.5	0.20	0.0
11/19/2014 10:30	19	1.14	21.63	10	7	54	100%	34.1	0.10	33.91	0.53	51.0	17.7	40.5	0.20	0.0
11/20/2014 11:00	19	1.14	21.63	10	7	52	100%	34.33	0.11	34.02	0.54	49.8	16.2	40	0.21	0.0
11/24/2014 14:43	19.25	1.14	21.91	10	7	56	100%	33.98	0.10	33.78	0.53	50.6	15.3	40	0.21	0.0
11/25/2014 9:00	19	1.14	21.63	10	7	51	100%	34.24	0.10	33.97	0.54	51.9	15.2	39.5	0.20	0.0
12/1/2014 11:00	19	1.14	21.63	10	7	68	100%	34.15	0.12	34.00	0.60	62.1	16.8	40.5	0.23	0.0
12/2/2014 16:00	19	1.14	21.63	10	7	68	100%	33.96	0.12	33.76	0.58	63.7	17.0	40.5	0.22	0.0
12/3/2014 16:00	19	1.14	21.63	10	7	68	100%	34.17	0.12	34.05	0.59	66.3	16.7	40.5	0.23	0.0
12/4/2014 11:40	19	1.14	21.63	10	7	68	100%	34.52	0.12	34.20	0.58	60.0	19.6	40.5	0.23	0.0
12/8/2014 12:00	18.75	1.14	21.34	10	7	67	100%	34.54	0.12	34.27	0.60	57.0	50.0	41.0	0.22	0.0
12/9/2014 8:20	18.75	1.14	21.34	10	7	68	100%	34.6	0.13	34.31	0.60	58.0	40.7	40.5	0.23	0.0
12/10/2014 14:40	17	1.14	19.35	10	7	73	100%	31.51	0.10	31.35	0.58	59.9	26.0	39	0.22	0.0
12/11/2014 12:00	17	1.14	19.35	10	7	70	100%	32.63	0.11	32.51	0.59	60.0	30.7	39	0.22	0.0
12/15/2014 9:10	18	1.14	20.49	10	7	48	100%	34.07	0.11	33.82	0.56	45.7	35.3	40	0.24	0.0
12/16/2014 11:30	18.5	1.14	21.06	10	7	50	100%	33.98	0.12	33.80	0.57	47.8	33.2	40	0.23	1.0
12/17/2014 11:30	18.75	1.14	21.34	10	7	54	100%	32.52	0.12	32.33	0.58	51.2	39.7	40	0.22	2.0
12/18/2014 12:15	19	1.14	21.63	10	7	56	100%	32.67	0.12	32.38	0.60	50.0	43.4	39.5	0.21	3.0

% - Percent.
°F - Degrees Fahrenheit.
inWC - Inches of water column.
lb/hr - Pounds per hour.
NA - Not applicable.
psi - Pounds per square inch.
SCFM - Standard cubic feet per minute.
SVE - Soil-vapor extraction.
THC - Total hydrocarbons.

Appendix 3. Air Sparge and SVE System Operational Data

	SVE							Hours Operational		SVE	Calculated Flows (See Flow Calcs Table)				THC	
	Dillution				Pre Carbon Vessels											
	Vacuum	Differential Pressure	Temperature	Humidity	Vacuum Post Blower	Temperature Pre HX	Temperature Post HX			Output Frequency						
	Sample Port				PI-202	TI-201	TI-202	SVE	Air Sparge		SVE Well	Dillution	Total Flow	Sparge Flow	Pre Carbon	Exhaust
Time/Date	in WC	in WC	°F	%	in WC	°F	°F	hrs	hrs	%	SCFM	SCFM	SCFM	SCFM	lb/hr	lb/hr
6/30/2014 14:20	0.11	0.01	102.0	9.0%	28.0	114	120	12.8	5.9	30%	94	31	125	10.25	0.00	0.00
7/1/2014 8:07	0.12	>0.01	76.1	39.8%	27.5	100	95	31.2	24.3	30%	91	Minimal	91	10.53	0.00	0.00
7/2/2014 13:25	0.11	>0.01	91.4	21.2%	27.5	108	110	56.9	31.8	30%	85	Minimal	85	9.97	0.01	0.00
7/3/2014 9:45	0.11	>0.01	97.4	41.3%	27.5	104	105	77.0	51.8	30%	90	Minimal	90	9.97	0.01	0.00
7/7/2014 10:48	0.13	>0.01	83.3	37.3%	28.0	104	105	174.0	148.8	30%	90	Minimal	90	9.08	0.00	0.00
7/8/2014 8:27	0.13	>0.01	81.3	32.5%	28.0	101	100	195.8	170.6	30%	97	Minimal	97	8.86	0.00	0.01
7/9/2014 11:57	0.12	>0.01	86.4	32.9%	28.0	104	110	222.8	197.6	30%	95	Minimal	95	9.70	0.00	0.01
7/10/2014 11:00	0.11	>0.01	87.1	30.4%	27.5	104	108	245.9	220.7	30%	94	Minimal	94	9.70	0.00	0.01
7/14/2014 9:14	0.11	>0.01	76.6	48.2%	27.5	100	103	338.2	313.5	30%	96	Minimal	96	11.08	0.00	0.00
7/15/2014 8:33	0.12	>0.01	64.2	84.9%	28.0	92	90	361.6	336.9	30%	92	Minimal	92	12.19	0.01	0.00
7/16/2014 14:40	0.12	>0.01	73.2	29.5%	28.0	105	114	391.8	367.1	30%	90	Minimal	90	9.97	0.00	0.00
7/17/2014 9:50	0.10	0.02	75.9	54.0%	28.0	100	102	411.0	386.3	30%	95	12	107	10.53	0.00	0.00
7/21/2014 9:35	0.11	0.02	82.8	33.9%	28.0	104	110	506.7	482.0	30%	90	12	102	12.47	0.00	0.00
7/22/2014 8:37	0.11	0.04	83.8	34.5%	27.5	104	110	529.7	505.0	30%	85	17	102	12.74	0.00	0.01
7/23/2014 8:13	0.08	0.04	77.9	52.5%	27.5	100	105	553.4	528.7	30%	96	17	112	13.30	0.00	0.00
7/24/2014 10:31	0.08	0.04	86.2	28.2%	27.5	107	115	579.6	554.9	30%	90	17	107	13.02	0.01	0.01
7/28/2014 11:00	0.08	0.04	84.2	38.0%	27.5	104	110	661.0	636.3	30%	80	17	96	14.23	0.01	0.00
7/29/2014 9:47	>0.01	>0.01	75.00	62.3%	27.5	99	105	683.1	658.4	30%	100	Minimal	100	13.85	0.00	0.00
7/30/2014 8:20	NA	NA	77.00	56.8%	27.0	99	105	705.2	680.6	30%	100	NA	100	12.74	0.00	0.00
7/31/2014 10:12	NA	NA	79.20	72.2%	27.5	103	110	730.9	706.4	30%	100	NA	100	12.19	0.01	0.00
8/4/2014 9:07	NA	NA	73.60	77.6%	27.5	98	105	825.2	800.8	30%	101	NA	101	13.85	0.00	0.00
8/5/2014 8:15	NA	NA	75.90	73.6%	27.5	98	105	848.4	824.0	30%	104	NA	104	14.41	0.00	0.00
8/6/2014 7:55	NA	NA	75.60	55.6%	27.5	98	110	872.0	847.6	30%	100	NA	100	14.13	0.00	0.00
8/7/2014 11:50	NA	NA	80.10	44.5%	27.5	104	110	899.9	875.5	30%	100	NA	100	13.30	0.01	0.00
8/11/2014 12:15	NA	NA	103.10	19.5%	27.5	102	110	978.5	954.1	30%	95	NA	95	13.85	0.00	0.01
8/12/2014 14:57	NA	NA	90.30	28.1%	27.5	111	120	1005.6	981.1	30%	95	NA	95	13.30	0.01	0.00
8/13/2014 8:40	NA	NA	78.30	49.9%	27.5	104	110	1023.4	999.0	30%	96	NA	96	13.57	0.00	0.00
8/14/2014 10:45	NA	NA	86.00	72.8%	27.5	104	115	1049.5	1025.1	30%	79	NA	79	14.41	0.00	0.01
8/18/2014 8:46	NA	NA	79.30	41.6%	27.5	100	115	1132.0	1107.5	30%	85	NA	85	13.30	0.00	0.00
8/19/2014 9:03	NA	NA	80.10	35.2%	27.5	100	110	1156.3	1131.9	30%	204	NA	204	13.85	0.01	0.00
8/19/2014 9:30	1.01	0.32	80.10	35.2%	28.0	100	110	1156.8	1132.4	30%	145	47	192	13.85	0.01	0.01
8/20/2014 12:40	NA	NA	89.20	28.4%	27.5	106	120	1183.7	1159.3	30%	194	NA	194	12.47	0.00	0.00
8/25/2014 8:43	NA	NA	81.50	33.1%	27.5	100	115	1299.8	1275.4	30%	221	NA	221	14.13	0.01	0.01
8/26/2014 9:41	NA	NA	77.20	45.3%	27.5	100	115	1324.8	1300.4	30%	222	NA	222	13.85	0.00	0.00
8/27/2014 11:10	NA	NA	88.30	37.4%	27.5	105	120	1350.2	1325.8	30%	218	NA	218	14.13	0.01	0.01
8/28/2014 9:40	NA	NA	74.50	36.3%	27.5	100	115	1372.6	1348.2	30%	222	NA	222	13.85	0.00	0.00
9/15/2014 8:20	NA	NA	74.70	53.1%	27.5	98	115	1802.9	1778.5	30%	213	NA	213	14.41	0.00	0.00
9/16/2014 10:32	NA	NA	86.50	40.8%	27.5	100	120	1828.7	1804.3	30%	223	NA	223	14.41	0.00	0.00
9/17/2014 15:50	NA	NA	78.90	69.3%	27.5	95	115	1858.0	1833.6	30%	221	NA	221	14.41	0.00	0.00
9/18/2014 14:15	NA	NA	87.70	56.4%	27.5	105	120	1880.3	1855.9	30%	216	NA	216	14.96	0.00	0.00
9/22/2014 11:30	NA	NA	86.70	39.6%	27.5	103	120	1973.7	1949.3	30%	228	NA	228	13.30	0.00	0.00
9/23/2014 13:00	NA	NA	87.80	38.4%	27.5	105	120	2001.2	1976.8	30%	226	NA	226	13.57	0.00	0.00
9/24/2014 12:01	NA	NA	81.70	40.1%	27.5	105	120	2024.2	1999.8	30%	225	NA	225	13.57	0.00	0.00
9/25/2014 13:00	NA	NA	80.90	38.7%	27.5	105	120	2049.2	2024.8	30%	224	NA	224	13.85	0.00	0.00
9/29/2014 8:30	NA	NA	71.90	56.8%	27.5	94	115	2138.7	2114.3	30%	232	NA	232	15.24	0.00	0.00
9/30/2014 8:50	NA	NA	80.10	54.7%	27.5	100	115	2163.0	2138.6	30%	228	NA	228	14.96	0.00	0.00
10/1/2014 10:45	NA	NA	80.70	41.6%	27.5	102	120	2188.8	2164.4	30%	224	NA	224	14.96	0.00	0.00
10/2/2014 9:00	NA	NA	70.60	39.7%	27.5	95	115	2211.4	2146.8	30%	229	NA	229	14.96	0.00	0.00
10/6/2014 9:36	NA	NA	72.90	23.0%	27.5	93	118	2307.7	2283.2	30%	238	NA	238	16.07	0.01	0.00
10/7/2014 8:50	NA	NA	60.70	22.2%	27.5	90	115	2330.9	2306.4	30%	234	NA	234	15.79	0.00	0.00
10/8/2014 11:05	NA	NA	78.40	21.3%	27.5	95	118	2357.2	2332.7	30%	222	NA	222	15.51	0.00	0.00
10/9/2014 10:00	NA	NA	74.60	51.7%	27.5	95	120	2380.2	2355.7	30%	223	NA	223	15.51	0.00	0.00
10/13/2014 14:20	NA	NA	79.70	30.0%	27.5	100	120	2481.0	2456.5	30%	222	NA	222	15.51	0.00	0.00
10/14/2014 9:20	NA	NA	56.10	32.2%	27.5	88	110	2499.5	2475.0	30%	228	NA	228	17.73	0.01	0.00
10/15/2014 9:30	NA	NA	70.20	27.1%	27.5	92	120	2523.7	2499.2	30%	228	NA	228	15.79	0.00	0.00
10/16/2014 9:35	NA	NA	71.30	28.0%	27.5	93	120	2547.7	2523.2	30%	229	NA	229	16.07	0.00	0.00
10/20/2014 12:06	NA	NA	76.80	29.4%	27.5	94	120	2645.7	2621.2	30%	227	NA	227	21.91	0.00	0.00
10/21/2014 13:00	NA	NA	74.20	30.0%	27.5	96	120	2670.7	2646.3	30%	225	NA	225	21.63	0.00	0.00
10/22/2014 14:30	NA	NA	76.70	17.6%	27.5	96	120	2696.2	2671.8	30%	229	NA	229	21.91	0.00	0.00
10/23/2014 12:00	NA	NA	78.80	33.4%	27.5	96	120	2718.0	2693.6	30%	229	NA	229	21.91	0.00	0.00
10/27/2014 13:00	NA	NA	76.30	19.8%	27.5	96	120	2814.9	2790.5	30%	226	NA	226	21.63	0.00	0.00
10/28/2014 13:30	NA	NA	75.40	16.6%	27.5	94	120	2839.4	2815.0	30%	226	NA	226	21.91	0.00	0.00
10/29/2014 14:00	NA	NA	69.60	15.8%	27.5	95	115	2863.9	2839.5	30%	227	NA	227	21.63	0.00	0.00
10/30/2014 14:00	NA	NA	64.50	19.5%	27.5	95	115	2887.9	2863.5	30%	231	NA	231	21.63	0.00	0.00
11/3/2014 12:40	NA	NA	59.20	15.2%	27.5	94	115	2981.6	2957.1	30%	225	NA	225	21.34	0.00	0.00

Appendix 3. Air Sparge and SVE System Operational Data

	SVE							Hours Operational		SVE	Calculated Flows (See Flow Calcs Table)				THC	
	Dillution				Pre Carbon Vessels											
	Vacuum	Differential Pressure	Temperature	Humidity	Vacuum Post Blower	Temperature Pre HX	Temperature Post HX			Output Frequency	SVE Well	Dillution	Total Flow	Sparge Flow	Pre Carbon	Exhaust
	Sample Port				PI-202	TI-201	TI-202	SVE	Air Sparge							
Time/Date	in WC	in WC	°F	%	in WC	°F	°F	hrs	hrs	%	SCFM	SCFM	SCFM	SCFM	lb/hr	lb/hr
11/4/2014 13:00	NA	NA	60.50	16.7%	27.5	93	115	3005.9	2981.4	30%	226	NA	226	21.06	0.00	0.00
11/5/2014 14:30	NA	NA	68.40	14.8%	27.5	95	115	3031.4	3006.9	30%	228	NA	228	21.34	0.00	0.00
11/6/2014 14:00	NA	NA	64.20	19.5%	27.5	94	115	3054.9	3030.4	30%	226	NA	226	21.34	0.00	0.00
11/10/2014 11:25	NA	NA	59.60	20.1%	27.5	94	115	3148.3	3123.8	30%	225	NA	225	21.06	0.00	0.00
11/11/2014 10:15	NA	NA	64.80	22.4%	27.5	90	110	3171.1	3146.6	30%	248	NA	248	21.34	0.00	0.00
11/12/2014 11:15	NA	NA	58.60	23.4%	27.5	89	110	3196.1	3171.6	30%	231	NA	231	21.63	0.00	0.00
11/13/2014 11:15	NA	NA	54.20	25.6%	27.5	90	110	3220.1	3195.6	30%	229	NA	229	21.34	0.00	0.00
11/17/2014 12:00	NA	NA	46.20	29.7%	27.5	85	110	3316.9	3292.9	30%	231	NA	231	21.63	0.00	0.00
11/18/2014 15:35	NA	NA	47.10	21.6%	27.5	87	110	3344.4	3319.9	30%	226	NA	226	21.63	0.01	0.00
11/19/2014 10:30	NA	NA	45.90	20.0%	27.5	84	105	3363.4	3338.9	30%	227	NA	227	21.63	0.00	0.00
11/20/2014 11:00	NA	NA	47.60	19.6%	27.5	82	105	3387.9	3363.4	30%	228	NA	228	21.63	0.00	0.00
11/24/2014 14:43	NA	NA	46.30	17.4%	27.5	81	100	3487.5	3463.0	30%	226	NA	226	21.91	0.00	0.00
11/25/2014 9:00	NA	NA	45.70	18.0%	27.5	78	100	3505.9	3481.4	30%	230	NA	230	21.63	0.00	0.00
12/1/2014 11:00	NA	NA	63.50	20.7%	27.5	88	110	3651.9	3627.4	30%	239	NA	239	21.63	0.00	0.00
12/2/2014 16:00	NA	NA	58.60	20.0%	27.5	90	110	3682.9	3658.4	30%	234	NA	234	21.63	0.00	0.00
12/3/2014 16:00	NA	NA	66.80	19.7%	27.5	92	110	3706.9	3682.4	30%	235	NA	235	21.63	0.00	0.00
12/4/2014 11:40	NA	NA	52.80	50.6%	27.5	90	105	3723.7	3699.2	30%	234	NA	234	21.63	0.00	0.00
12/8/2014 12:00	NA	NA	62.20	37.3%	27.5	87	105	3820.8	3796.3	30%	240	NA	240	21.34	0.00	0.00
12/9/2014 8:20	NA	NA	60.70	40.3%	27.5	85	105	3841.4	3816.9	30%	240	NA	240	21.34	0.00	0.00
12/10/2014 14:40	NA	NA	61.90	26.7%	27.5	90	110	3871.3	3846.8	30%	236	NA	236	19.35	0.00	0.00
12/11/2014 12:00	NA	NA	60.20	31.0%	27.5	90	110	3892.6	3868.1	30%	237	NA	237	19.35	0.00	0.00
12/15/2014 9:10	NA	NA	43.30	40.3%	27.5	84	100	3985.7	3961.2	30%	234	NA	234	20.49	0.00	0.00
12/16/2014 11:30	NA	NA	47.60	38.7%	27.5	86	100	4012.0	3987.5	30%	236	NA	236	21.06	0.00	0.00
12/17/2014 11:30	NA	NA	36.60	79.7%	27.5	82	100	4036.0	4011.5	30%	237	NA	237	21.34	0.00	0.00
12/18/2014 12:15	NA	NA	48.00	58.6%	27.5	84	100	4060.9	4036.4	30%	241	NA	241	21.63	0.00	0.00
							Final Hours at Shutdown	4158.9	4134.4							

% - Percent.
°F - Degrees Fahrenheit.
inWC - Inches of water column.
lb/hr - Pounds per hour.
NA - Not applicable.
psi - Pounds per square inch.
SCFM - Standard cubic feet per minute.
SVE - Soil-vapor extraction.
THC - Total hydrocarbons.

APPENDIX 4
Flow Calculations

Appendix 4. Flow Calculations

	SVE Well												Dillution											
Date and Time	Relative Humidity (%)	Temperature (°F)	Barometric Pressure (inHg)	Well Vacuum (in WC)	Well Head Absolute Pressure (inHg)	Differential Pressure (inWC)	Correction factor	Density (lbs/ft^3)	Area (ft^2)	Velocity (ft/min)	Flow Rate (ACFM)	Flow Rate (SCFM)	Relative Humidity (%)	Temperature (°F)	Barometric Pressure (inHg)	Pipe Vacuum (inWC)	Well Head Absolute Pressure (inHg)	Differential Pressure (inWC)	Correction factor	Density (lbs/ft^3)	Area (ft^2)	Velocity (ft/min)	Flow Rate (ACFM)	Flow Rate (SCFM)
6/30/2014 14:20	7.40%	104.00	30.01	30.34	22.41	0.10	0.998	0.0525	0.09	1513	134	**94**	9.0%	102.0	30.01	0.11	24.64	0.01	0.998	0.0580	0.09	455	40	**31**
7/1/2014 8:07	32.10%	79.30	30.09	31.22	22.43	0.09	0.996	0.055	0.09	1404	124	**91**	39.8%	76.1	30.09	0.12	24.72	>0.01	0.996	0.061	0.09	Minimal	Minimal	**Minimal**
7/2/2014 13:25	18.80%	93.60	30.21	31.3	22.54	0.08	0.996	0.054	0.09	1338	118	**85**	21.2%	91.4	30.21	0.11	24.84	>0.01	0.996	0.059	0.09	Minimal	Minimal	**Minimal**
7/3/2014 9:45	27.60%	87.40	30.29	32.58	22.53	0.09	0.994	0.054	0.09	1413	125	**90**	41.3%	97.4	30.29	0.11	24.92	>0.01	0.989	0.059	0.09	Minimal	Minimal	**Minimal**
7/7/2014 10:48	23.70%	97.20	30.20	30.85	22.56	0.09	0.993	0.053	0.09	1425	126	**90**	37.3%	83.30	30.20	0.13	24.83	>0.01	0.994	0.060	0.09	Minimal	Minimal	**Minimal**
7/8/2014 8:27	27.10%	88.20	31.20	30.94	23.56	0.10	0.994	0.057	0.09	1458	129	**97**	32.5%	81.30	31.20	0.13	25.83	>0.01	0.996	0.063	0.09	Minimal	Minimal	**Minimal**
7/9/2014 11:57	23.10%	95.40	30.22	30.64	22.60	0.10	0.995	0.054	0.09	1497	132	**95**	32.9%	86.40	30.22	0.12	24.85	>0.01	0.994	0.060	0.09	Minimal	Minimal	**Minimal**
7/10/2014 11:00	19.10%	98.40	30.19	30.37	22.59	0.10	0.995	0.053	0.09	1502	133	**94**	30.4%	87.10	30.19	0.11	24.82	>0.01	0.994	0.060	0.09	Minimal	Minimal	**Minimal**
7/14/2014 9:14	33.50%	86.70	30.32	31.19	22.66	0.10	0.995	0.055	0.09	1484	131	**96**	48.2%	76.60	30.32	0.11	24.95	>0.01	0.995	0.061	0.09	Minimal	Minimal	**Minimal**
7/15/2014 8:33	74.70%	66.00	30.36	32.07	22.63	0.09	0.994	0.057	0.09	1382	122	**92**	84.9%	64.20	30.36	0.12	24.99	>0.01	0.993	0.063	0.09	Minimal	Minimal	**Minimal**
7/16/2014 14:40	26.80%	94.10	30.07	28.49	22.61	0.09	0.994	0.054	0.09	1419	125	**90**	29.5%	73.20	30.07	0.12	24.70	>0.01	0.998	0.061	0.02	Minimal	Minimal	**Minimal**
7/17/2014 9:50	32.30%	89.60	30.12	29.42	22.59	0.10	0.994	0.054	0.09	1491	132	**95**	54.0%	75.90	30.12	0.10	24.75	0.02	0.994	0.061	0.02	629	15	**12**
7/21/2014 9:35	25.30%	88.90	30.25	30.32	22.65	0.09	0.995	0.054	0.09	1410	125	**90**	33.9%	82.80	30.25	0.11	24.88	0.02	0.996	0.060	0.02	631	15	**12**
7/22/2014 8:37	26.60%	90.50	30.29	30.69	22.67	0.08	0.995	0.054	0.09	1331	118	**85**	34.5%	83.80	30.29	0.11	24.92	0.04	0.995	0.060	0.02	892	21	**17**
7/23/2014 8:13	39.20%	84.40	30.37	32.2	22.64	0.10	0.993	0.055	0.09	1483	131	**96**	52.5%	77.90	30.37	0.08	25.00	0.04	0.993	0.061	0.02	887	21	**17**
7/24/2014 10:31	20.00%	96.30	30.32	31.16	22.66	0.09	0.995	0.054	0.09	1420	126	**90**	28.2%	86.20	30.32	0.08	24.95	0.04	0.995	0.060	0.02	894	21	**17**
7/28/2014 11:00	27.10%	92.70	30.41	31.98	22.69	0.07	0.994	0.054	0.09	1248	110	**80**	38.0%	84.20	30.41	0.08	25.04	0.04	0.993	0.061	0.02	891	21	**17**
7/29/2014 9:47	51.00%	79.50	30.33	34.73	22.41	0.11	0.993	0.055	0.09	1556	138	**100**	62.3%	75.00	30.33	Minimal	Minimal	>0.01	0.993	NA	0.02	Minimal	Minimal	**Minimal**
7/30/2014 8:20	44.80%	81.90	30.23	34.79	22.30	0.11	0.993	0.054	0.09	1563	138	**100**	56.8%	77.00	30.23	NA	24.87	NA	0.993	0.061	0.02	NA	NA	**NA**
7/31/2014 10:12	41.50%	81.10	30.28	35.09	22.33	0.11	0.993	0.054	0.09	1561	138	**100**	72.2%	79.20	30.28	NA	24.92	NA	0.993	0.061	0.02	NA	NA	**NA**
8/4/2014 9:07	58.10%	73.60	30.28	34.99	22.34	0.11	0.993	0.055	0.09	1550	137	**101**	77.6%	73.60	30.28	NA	24.92	NA	0.997	0.062	0.02	NA	NA	**NA**
8/5/2014 8:15	43.40%	80.60	30.28	35	22.34	0.12	0.994	0.054	0.09	1628	144	**104**	73.6%	75.90	30.28	NA	24.92	NA	0.991	0.061	0.02	NA	NA	**NA**
8/6/2014 7:55	47.80%	78.10	30.24	34.48	22.34	0.11	0.993	0.055	0.09	1556	138	**100**	55.6%	75.60	30.24	NA	24.88	NA	0.993	0.061	0.02	NA	NA	**NA**
8/7/2014 11:50	37.90%	82.60	30.22	33.96	22.36	0.11	0.994	0.054	0.09	1561	138	**100**	44.5%	80.10	30.22	NA	24.86	NA	0.994	0.061	0.02	NA	NA	**NA**
8/11/2014 12:15	24.30%	93.00	30.36	33.25	22.55	0.10	0.995	0.054	0.09	1496	132	**95**	19.5%	103.10	30.36	NA	25.00	NA	0.995	0.059	0.02	NA	NA	**NA**
8/12/2014 14:57	26.30%	86.40	30.26	33.61	22.42	0.10	0.996	0.054	0.09	1490	132	**95**	28.1%	90.30	30.26	NA	24.90	NA	0.994	0.060	0.02	NA	NA	**NA**
8/13/2014 8:40	44.80%	79.20	30.30	34.64	22.39	0.10	0.997	0.055	0.09	1481	131	**96**	49.9%	78.30	30.30	NA	24.94	NA	0.993	0.061	0.02	NA	NA	**NA**
8/14/2014 10:45	31.60%	91.80	30.26	33.91	22.40	0.07	0.995	0.054	0.09	1254	111	**79**	72.8%	86.00	30.26	NA	24.90	NA	0.988	0.060	0.02	NA	NA	**NA**
8/18/2014 8:46	33.20%	84.40	30.19	33.53	22.36	0.08	0.996	0.054	0.09	1332	118	**85**	41.6%	79.30	30.19	NA	24.83	NA	0.994	0.061	0.02	NA	NA	**NA**
8/19/2014 9:03	29.50%	82.40	30.10	32.92	22.31	0.46	0.997	0.054	0.09	3191	282	**204**	35.2%	80.10	30.10	NA	24.74	NA	0.995	0.060	0.02	NA	NA	**NA**
8/19/2014 9:30	29.50%	82.40	30.10	18.47	23.38	0.22	0.997	0.057	0.09	2156	191	**145**	35.2%	80.10	30.10	1.01	24.67	0.32	0.995	0.060	0.02	2528	59	**47**
8/20/2014 12:40	24.30%	91.00	30.09	32.32	22.35	0.42	0.995	0.053	0.09	3074	272	**194**	28.4%	89.20	30.09	NA	24.73	NA	0.994	0.059	0.02	NA	NA	**NA**
8/25/2014 8:43	36.70%	75.40	30.19	33.58	22.35	0.53	0.997	0.055	0.09	3400	301	**221**	33.1%	81.50	30.19	NA	24.83	NA	0.996	0.061	0.02	NA	NA	**NA**
8/26/2014 9:41	47.90%	72.30	30.26	34.58	22.35	0.53	0.996	0.055	0.09	3392	300	**222**	45.3%	77.20	30.26	NA	24.90	NA	0.995	0.061	0.02	NA	NA	**NA**
8/27/2014 11:10	44.20%	79.20	30.32	34.66	22.40	0.52	0.994	0.055	0.09	3381	299	**218**	37.4%	88.30	30.32	NA	24.96	NA	0.991	0.060	0.02	NA	NA	**NA**
8/28/2014 9:40	26.80%	80.20	30.25	34.11	22.37	0.54	0.997	0.055	0.09	3445	305	**222**	36.3%	74.50	30.25	NA	24.89	NA	0.996	0.061	0.02	NA	NA	**NA**
9/15/2014 8:20	52.00%	71.60	30.26	34.46	22.36	0.49	0.996	0.056	0.09	3258	288	**213**	53.1%	74.70	30.26	NA	24.90	NA	0.994	0.061	0.02	NA	NA	**NA**
9/16/2014 10:32	48.10%	77.70	30.32	34.72	22.40	0.54	0.994	0.055	0.09	3441	304	**223**	40.8%	86.50	30.32	NA	24.96	NA	0.992	0.060	0.02	NA	NA	**NA**
9/17/2014 15:50	67.80%	70.10	30.13	34.97	22.19	0.53	0.993	0.055	0.09	3402	301	**221**	69.3%	78.90	30.13	NA	24.77	NA	0.990	0.060	0.02	NA	NA	**NA**
9/18/2014 14:15	58.60%	80.40	30.01	34.02	22.14	0.52	0.991	0.054	0.09	3410	301	**216**	56.4%	87.70	30.01	NA	24.65	NA	0.990	0.059	0.02	NA	NA	**NA**
9/22/2014 11:30	42.70%	79.50	30.32	34.56	22.41	0.57	0.994	0.055	0.09	3540	313	**228**	39.6%	86.70	30.32	NA	24.96	NA	0.992	0.060	0.02	NA	NA	**NA**
9/23/2014 13:00	39.90%	81.30	30.26	34.47	22.36	0.56	0.994	0.054	0.09	3519	311	**226**	38.4%	87.80	30.26	NA	24.90	NA	0.992	0.060	0.02	NA	NA	**NA**
9/24/2014 12:01	10.10%	79.80	30.28	34.01	22.41	0.55	0.998	0.055	0.09	3471	307	**225**	40.1%	81.70	30.28	NA	24.92	NA	0.994	0.061	0.02	NA	NA	**NA**
9/25/2014 13:00	42.30%	80.30	30.25	34.57	22.34	0.55	0.994	0.054	0.09	3485	308	**224**	38.7%	80.90	30.25	NA	24.89	NA	0.994	0.061	0.02	NA	NA	**NA**
9/29/2014 8:30	57.60%	68.50	30.1	32.58	22.34	0.58	0.994	0.056	0.09	3540	313	**232**	56.8%	71.90	30.10	NA	24.74	NA	0.995	0.061	0.02	NA	NA	**NA**
9/30/2014 8:50	55.40%	70.10	30.06	32.70	22.29	0.56	0.995	0.055	0.09	3486	308	**228**	54.7%	80.10	30.06	NA	24.70	NA	0.992	0.060	0.02	NA	NA	**NA**
10/1/2014 10:45	39.80%	76.20	30.01	32.81	22.23	0.55	0.995	0.055	0.09	3479	308	**224**	41.6%	80.70	30.01	NA	24.65	NA	0.994	0.060	0.02	NA	NA	**NA**
10/2/2014 9:00	36.70%	70.40	30.22	33.24	22.41	0.56	0.997	0.056	0.09	3474	307	**229**	39.7%	70.60	30.22	NA	24.86	NA	0.997	0.062	0.02	NA	NA	**NA**
10/6/2014 9:36	27.30%	66.20	30.19	33.59	22.35	0.60	1.000	0.056	0.09	3581	317	**238**	23.0%	72.90	30.19	NA	24.83	NA	1.000	0.062	0.02	NA	NA	**NA**
10/7/2014 8:50	25.60%	64.70	30.19	33.81	22.34	0.58	1.000	0.056	0.09	3517	311	**234**	22.2%	60.70	30.19	NA	24.83	NA	1.000	0.063	0.02	NA	NA	**NA**
10/8/2014 11:05	24.30%	70.20	30.16	33.34	22.34	0.53	0.999	0.056	0.09	3381	299	**222**	21.3%	78.40	30.16	NA	24.80	NA	0.998	0.061	0.02	NA	NA	**NA**
10/9/2014 10:00	58.60%	70.80	30.05	33.52	22.22	0.54	0.994	0.055	0.09	3432	303	**223**	51.7%	74.60	30.05	NA	24.69	NA	0.995	0.061	0.02	NA	NA	**NA**
10/13/2014 14:20	30.40%	72.70	30.21	33.81	22.36	0.53	0.998	0.055	0.09	3389	300	**222**	30.0%	79.70	30.21	NA	24.85	NA	0.996	0.061	0.02	NA	NA	**NA**
10/14/2014 9:20	31.00%	53.50	30.33	35.48	22.35	0.54	1.000	0.058	0.09	3356	297	**228**	32.2%	56.10	30.33	NA	24.97	NA	1.000	0.064	0.02	NA	NA	**NA**
10/15/2014 9:30	28.00%	66.00	30.28	33.47	22.45	0.55	1.000	0.057	0.09	3420	302	**228**	27.1%	70.20	30.28	NA	24.92	NA	1.000	0.062	0.02	NA	NA	**NA**
10/16/2014 9:35	28.40%	68.10	30.21	33.41	22.39	0.56	1.000	0.056	0.09	3463	306	**229**	28.0%	71.30	30.21	NA	24.85	NA	1.000	0.062	0.02	NA	NA	**NA**
10/20/2014 12:06	26.00%	70.40	30.2	33.46	22.37	0.55	1.000	0.056	0.09	3440	304	**227**	29.4%	76.80	30.20	NA	24.84	NA	1.000	0.061	0.02	NA	NA	**NA**
10/21/2014 13:00	27.30%	69.70	30.15	32.74	22.38	0.54	1.000	0.056	0.09	3406	301	**225**	30.0%	74.20	30.15	NA	24.79	NA	1.000	0.061	0.02	NA	NA	**NA**
10/22/2014 14:30	30.10%	68.50	30.15	32.77	22.37	0.56	1.000	0.056	0.09	3465	306	**229**	17.6%	76.70	30.15	NA	24.79	NA	1.000	0.061	0.02	NA	NA	**NA**
10/23/2014 12:00	35.00%	73.40	30.3	33.02	22.50	0.56	1.000	0.056	0.09	3471	307	**229**	33.4%	78.80	30.30	NA	24.94	NA	1.000	0.061	0.02	NA	NA	**NA**

Appendix 4. Flow Calculations

	SVE Well												Dillution											
Date and Time	Relative Humidity (%)	Temperature (°F)	Barometric Pressure (inHg)	Well Vacuum (in WC)	Well Head Absolute Pressure (inHg)	Differential Pressure (inWC)	Correction factor	Density (lbs/ft^3)	Area (ft^2)	Velocity (ft/min)	Flow Rate (ACFM)	Flow Rate (SCFM)	Relative Humidity (%)	Temperature (°F)	Barometric Pressure (inHg)	Pipe Vacuum (inWC)	Well Head Absolute Pressure (inHg)	Differential Pressure (inWC)	Correction factor	Density (lbs/ft^3)	Area (ft^2)	Velocity (ft/min)	Flow Rate (ACFM)	Flow Rate (SCFM)
10/27/2014 13:00	27.20%	70.80	29.99	32.66	22.22	0.55	1.000	0.055	0.09	3453	305	**226**	19.8%	76.30	29.99	NA	24.63	NA	1.000	0.061	0.02	NA	NA	**NA**
10/28/2014 13:30	23.30%	66.60	30.2	32.13	22.47	0.54	1.000	0.057	0.09	3389	300	**226**	16.6%	75.40	30.20	NA	24.84	NA	1.000	0.061	0.02	NA	NA	**NA**
10/29/2014 14:00	26.50%	68.90	30.24	32.85	22.46	0.55	1.000	0.056	0.09	3429	303	**227**	15.8%	69.60	30.24	NA	24.88	NA	1.000	0.062	0.02	NA	NA	**NA**
10/30/2014 14:00	25.80%	65.90	30.3	32.46	22.55	0.56	1.000	0.057	0.09	3443	304	**231**	19.5%	64.50	30.30	NA	24.94	NA	1.000	0.063	0.02	NA	NA	**NA**
11/3/2014 12:40	21.30%	66.40	30.08	32.56	22.32	0.54	1.000	0.056	0.09	3400	301	**225**	15.2%	59.20	30.08	NA	24.72	NA	1.000	0.063	0.02	NA	NA	**NA**
11/4/2014 13:00	18.50%	68.60	30.27	32.52	22.51	0.54	1.000	0.056	0.09	3393	300	**226**	16.7%	60.50	30.27	NA	24.91	NA	1.000	0.063	0.02	NA	NA	**NA**
11/5/2014 14:30	19.40%	65.30	30.27	32.85	22.49	0.55	1.000	0.057	0.09	3415	302	**228**	14.8%	68.40	30.27	NA	24.91	NA	1.000	0.062	0.02	NA	NA	**NA**
11/6/2014 14:00	18.00%	70.00	30.42	32.77	22.64	0.54	1.000	0.057	0.09	3387	299	**226**	19.5%	64.20	30.42	NA	25.06	NA	1.000	0.063	0.02	NA	NA	**NA**
11/10/2014 11:25	18.80%	68.20	29.8	32.56	22.04	0.55	1.000	0.055	0.09	3459	306	**225**	20.1%	59.60	29.80	NA	24.44	NA	1.000	0.062	0.02	NA	NA	**NA**
11/11/2014 10:15	23.10%	62.40	30.03	30.76	22.40	0.65	1.000	0.057	0.09	3709	328	**248**	22.4%	64.80	30.03	NA	24.67	NA	1.000	0.062	0.02	NA	NA	**NA**
11/12/2014 11:15	19.00%	59.80	30.09	32.77	22.31	0.56	1.000	0.057	0.09	3441	304	**231**	23.4%	58.60	30.09	NA	24.73	NA	1.000	0.063	0.02	NA	NA	**NA**
11/13/2014 11:15	17.30%	60.10	30.26	32.98	22.47	0.55	1.000	0.057	0.09	3400	301	**229**	25.6%	54.20	30.26	NA	24.90	NA	1.000	0.064	0.02	NA	NA	**NA**
11/17/2014 12:00	13.50%	52.00	30.27	34.14	22.39	0.55	1.000	0.058	0.09	3379	299	**231**	29.7%	46.20	30.27	NA	24.91	NA	1.000	0.065	0.02	NA	NA	**NA**
11/18/2014 15:35	15.10%	54.10	30.26	33.87	22.40	0.53	1.000	0.058	0.09	3323	294	**226**	21.6%	47.10	30.26	NA	24.90	NA	1.000	0.065	0.02	NA	NA	**NA**
11/19/2014 10:30	17.70%	51.00	30.31	33.91	22.45	0.53	1.000	0.058	0.09	3309	293	**227**	20.0%	45.90	30.31	NA	24.95	NA	1.000	0.065	0.02	NA	NA	**NA**
11/20/2014 11:00	16.20%	49.80	30.13	34.02	22.26	0.54	1.000	0.058	0.09	3350	296	**228**	19.6%	47.60	30.13	NA	24.77	NA	1.000	0.065	0.02	NA	NA	**NA**
11/24/2014 14:43	15.30%	50.60	30.1	33.78	22.25	0.53	1.000	0.058	0.09	3323	294	**226**	17.4%	46.30	30.10	NA	24.74	NA	1.000	0.065	0.02	NA	NA	**NA**
11/25/2014 9:00	15.20%	51.90	30.44	33.97	22.57	0.54	1.000	0.058	0.09	3334	295	**230**	18.0%	45.70	30.44	NA	25.08	NA	1.000	0.066	0.02	NA	NA	**NA**
12/1/2014 11:00	16.80%	62.10	30.34	34.00	22.47	0.60	1.000	0.057	0.09	3557	314	**239**	20.7%	63.50	30.34	NA	24.98	NA	1.000	0.063	0.02	NA	NA	**NA**
12/2/2014 16:00	17.00%	63.70	30.11	33.76	22.26	0.58	1.000	0.056	0.09	3519	311	**234**	20.0%	58.60	30.11	NA	24.75	NA	1.000	0.063	0.02	NA	NA	**NA**
12/3/2014 16:00	16.70%	66.30	30.1	34.05	22.23	0.59	1.000	0.056	0.09	3561	315	**235**	19.7%	66.80	30.10	NA	24.74	NA	1.000	0.062	0.02	NA	NA	**NA**
12/4/2014 11:40	19.60%	60.00	30.04	34.20	22.16	0.58	1.000	0.056	0.09	3515	311	**234**	50.6%	52.80	30.04	NA	24.68	NA	1.000	0.064	0.02	NA	NA	**NA**
12/8/2014 12:00	50.00%	57.00	30.38	34.27	22.49	0.60	0.998	0.058	0.09	3542	313	**240**	37.3%	62.20	30.38	NA	25.02	NA	0.998	0.063	0.02	NA	NA	**NA**
12/9/2014 8:20	40.70%	58.00	30.34	34.31	22.45	0.60	0.998	0.057	0.09	3549	314	**240**	40.3%	60.70	30.34	NA	24.98	NA	0.998	0.063	0.02	NA	NA	**NA**
12/10/2014 14:40	26.00%	59.90	30.13	31.35	22.46	0.58	1.000	0.057	0.09	3491	309	**236**	26.7%	61.90	30.13	NA	24.77	NA	1.000	0.063	0.02	NA	NA	**NA**
12/11/2014 12:00	30.70%	60.00	30.2	32.51	22.44	0.59	1.000	0.057	0.09	3523	311	**237**	31.0%	60.20	30.20	NA	24.84	NA	1.000	0.063	0.02	NA	NA	**NA**
12/15/2014 9:10	35.30%	45.70	30.2	33.82	22.35	0.56	1.000	0.059	0.09	3392	300	**234**	40.3%	43.30	30.20	NA	24.84	NA	1.000	0.065	0.02	NA	NA	**NA**
12/16/2014 11:30	0.00%	0.00	30.21	0.00	24.85	0.00	1.000	0.072	0.09	0	0	**0**	0.0%	0.00	30.21	0.00	24.85	0.00	1.000	0.072	0.02	NA	NA	**NA**
12/17/2014 11:30	33.50%	86.70	30.02	0.00	24.66	0.00	1.000	0.060	0.09	0	0	**0**	48.2%	76.60	30.02	0.11	24.65	>0.01	1.000	0.061	0.02	NA	NA	**NA**
12/18/2014 12:15	74.70%	66.00	30.12	0.00	24.76	0.00	1.000	0.062	0.09	0	0	**0**	84.9%	64.20	30.12	0.12	24.75	>0.01	1.000	0.063	0.02	NA	NA	**NA**

% - Percent.
°F - Degrees Fahrenheit.
ACFM - Actual cubic feet per minute.
ft - Feet.
inHg - Inches of mercury.
inWC - Inches of water column.
lbs - Pounds.
min - Minute.
NA - Not applicable.
SCFM - Standard cubic feet per minute.
SVE - Soil-vapor extraction.