Robert Speer, P.E.
Project Manager

Chevron Environmental Management Company
4800 Fournace Place
BOB/E536C
Bellaire, TX 77401
Tel 713-432-2142
Fax 866-677-7255
RSpeer@chevron.com

February 14, 2014

Mr. Andrew Fan
Project Manager
Technical Support Branch (3LC20)
Land and Chemicals Division
United States Environmental Protection Agency, Region III
1650 Arch Street
Philadelphia, PA 19103-2029

RE: Transmittal of Semi-Annual Progress Report: July through December 2013
Former Chevron Facility 122208
5801 Riggs Road, Chillum, Maryland

Dear Mr. Fan:

Pursuant to Section VI, Paragraph E of the Administrative Order (U.S. Environmental Protection Agency [EPA] Docket Number RCRA-03-2008-0355TH), Chevron is submitting one copy of the referenced document for your review.

All data from the July through December 2013 semi-annual reporting period are provided, including trend analysis figures, groundwater potentiometric surface maps, and groundwater concentration contour maps.

If you have any questions, please feel free to contact me at 713-432-2142.

Sincerely,

Robert Speer, P.E.
Project Manager

cc: R. Montero, DDOE
A. Simkins, MDE
D. Dixon, ARCADIS

ARCADIS
Infrastructure · Water · Environment · Buildings

Imagine the result

Former Chevron Facility No. 122208

Semi-Annual Progress Report
July through December 2013

5801 Riggs Road, Chillum, Maryland

February 2014

ARCADIS

Anthony Roseamelia
Project Environmental Engineer

Denise Dixon
Project Manager

Semi-Annual Progress Report
July through December 2013

5801 Riggs Road, Chillum, Maryland

Prepared for:
Chevron Environmental Management Company

Prepared by:
ARCADIS U.S., Inc.
6723 Towpath Road
P O Box 66
Syracuse
New York 13214-0066
Tel 315 446 9120
Fax 315 449 0017

Our Ref.:
B0048950.0000.00004

Date:
February 2014

ARCADIS

Table of Contents

Appendices

1. Introduction

Pursuant to the U.S. Environmental Protection Agency (EPA) Administrative Order, Docket Number RCRA-03-2008-0355TH (AO), Chevron Environmental Management Company (Chevron) is conducting work at, and adjacent to, the former Chevron Service Station (Facility No. 122208) located at 5801 Riggs Road, Chillum, Maryland (the site). In accordance with Section VI, Paragraph E, subsection 3(c) of the AO, ARCADIS on behalf of Chevron has prepared this Semi-Annual Progress Report (Report) to describe actions taken by Chevron pursuant to the AO. The reporting period for this report is July through December 2013.

The remainder of this Report provides information on the following:

- Section 2.0 - System Overview
- Section 3.0 - Area B and C System Startup
- Section 4.0 - Discontinue Operation and Maintenance of Vapor Mitigation Systems
- Section 5.0 - Operation, Maintenance, and Monitoring
- Section 6.0 - Submittal of Deliverables
- Section 7.0 - Summary of Findings
- Section 8.0 - Permit Compliance
- Section 9.0 - Summary of Deviations from Approved Plans, Problems Encountered, and Corrective Actions Taken
- Section 10.0 - Summary of Meetings with Public and Government
- Section 11.0 - Changes in Key Personnel During the Reporting Period
- Section 12.0 - Projected Work for the Next Reporting Period
- Section 13.0 - References

2. System Overview

The piping and instrumentation diagrams for the systems (Appendix H) provide specific system information, such as equipment models and sizes, piping sizes, controls, and other technical information.

2.1 Area A Dual Phase Extraction System

Area A encompasses the former Chevron service station, the existing remediation system compound adjacent to the service station, and the shopping center parking lot near the intersection of Eastern Avenue and Riggs Road. Duplex residential homes are present southwest of Area A, and land use is generally commercial in all other directions. The Dual Phase Extraction (DPE) System consists of total fluids extraction and treatment and soil vapor extraction and treatment.

2.1.1 Total Fluids Recovery and Treatment

Pneumatic total fluids (i.e., groundwater and liquid phase hydrocarbons [LPH], if present) pumps are installed in 11 DPE wells (RW-1, RW-2, RW-3, RW-4, RW-5, MW-7, MW-17, MW-22R, GP-27R, GP-39R and PTW-B). Total fluids are pumped from the wells through buried piping to the total fluids manifold located in the remediation system trailer. The total fluids manifold leads to a coalescing-type oil/water separator. Level sensors in the oil/water separator control a centrifugal pump that intermittently transfers the water to an air stripper. LPH accumulate in the separator and are periodically skimmed off mechanically (if present). Effluent air from the air stripper is treated using two granular activated carbon (GAC) vessels in series and then discharged to the atmosphere in accordance with Maryland Department of the Environment (MDE) Air Quality General Permit to Construct for Groundwater Air Stripping, Identification No. 033-9-1160. Treated water from the air stripper is pumped through three parallel bag filters and then through two GAC vessels in series. The polished effluent flows through a buried pipe to a storm drain inlet located in Riggs Road near the intersection at Eastern Avenue, N.E. in accordance with MDE General Discharge Permit No. 2008-OGR-8514.

2.1.2 Soil Vapor Recovery and Treatment

Soil vapor extraction (SVE) is conducted at 12 wells (i.e., the 11 DPE wells plus MP-7). An individual piping leg runs from each well to a common 3-inch manifold in the remediation system trailer. The manifold leads to a moisture knockout tank and then to

the blower. The blower is a rotary lobe, positive displacement blower controlled by a variable frequency drive. Soil vapor is blown from the blower to a catalytic oxidizer for treatment. Treated air is discharged to the atmosphere in accordance with MDE Air Quality General Permit to Construct for Soil Vapor Extraction Equipment, Identification No. 033-9-1164. Water collected in the knockout tank is pumped to the oil/water separator for treatment.

2.2 Area B In-Situ Groundwater Remediation Wells

Area B is located in the alley between Oglethorpe Street and Eastern Avenue, NE, in Washington, D.C. (Oglethorpe Alley). The area surrounding Area B is residential, with brick duplexes and triplexes lining Oglethorpe Street and Eastern Avenue.

The Area B system consists of two in-situ groundwater remediation (ISGR) wells (ISGR-1 and ISGR-2) that are installed in the Oglethorpe Alley forming a transect along the alley. The objective of the ISGR wells is to remove dissolved hydrocarbon mass from groundwater in Area B by adsorption to liquid phase GAC.

For each ISGR well, water that enters the shallow aquifer inlet screen, which is placed at an appropriate depth to intersect dissolved hydrocarbons, is pumped through GAC to remove hydrocarbons to non-detect levels. The treated water is released by gravity to the deep aquifer through an outlet screen in the same well. The targeted pumping rate in each well is 1 to 2 gallons per minute (gpm), depending on the aquifer response.

The submersible pump is operated by a control panel mounted on a base with the electrical power (utility) meter. The pump is driven by a controller, which controls the speed of the pump, depending on observed system performance and operator input. The pumping rate can be varied over a range of approximately 1 to 10 gpm.

2.3 Area C Oxygen Reactive Zone

Area C is located in the alley between Oglethorpe and Nicholson Streets, NE, in Washington, D.C. (Nicholson Alley). The area surrounding Area C is residential, with brick duplexes and tri-plexes lining Nicholson and Oglethorpe Streets.

The objective of the oxygen reactive zone (ORZ) is to increase the concentration of dissolved oxygen (DO) in the subsurface of the Nicholson Alley to stimulate the growth of native microbes that use oxygen to degrade dissolved petroleum hydrocarbons. The

intent of the system is the reduction of dissolved hydrocarbons downgradient of Area C through the biotransformation of dissolved hydrocarbons by aerobic microbes.

Five oxygen injection wells (IW-1 through IW-5) are installed in the Nicholson Alley. The locations of the wells and vertical positions of the well screens correspond to the areas of highest petroleum hydrocarbon concentrations as determined from previous site investigation activities. Oxygen hoses are routed in and out of each well vault through polyvinyl chloride (PVC) inlet and outlet conduits. An oxygen emitter is installed in each injection well within the screened intervals of the wells.

Oxygen is supplied to the oxygen emitters by an oxygen cylinder housed in a permit required confined space pre-cast concrete vault installed below grade in the Nicholson Alley. The vault is located in line with, and centered between, injection wells IW-1 and IW-2 and is equipped with a floor sump, a passive ventilation system, and a continuous monitoring oxygen detector to monitor for oxygen leakage.

3. Area B and C System Startup

The pre-startup safety review for the Area B and Area C remediation systems was performed on March 28, 2013.

3.1 Area B In-situ Groundwater Remediation Wells

Following completion of action items which resulted from the pre-startup safety review, ISGR-1 and ISGR-2 were successfully started on August 28, 2013. ISGR-1 sustained operations throughout the startup process. After startup, ISGR-2 operated for several hours and shut down. After restart ISGR-2 operated for several hours and again shut down. The evaluation and troubleshooting of ISGR-2 and the system modifications planned to increase system uptime are further discussed below in Section 7.

Prior to system startup, baseline groundwater samples were collected from the screened interval of the shallow and deep piezometers for both ISGR-1 and ISGR-2 by use of HydraSleeve passive samplers. Baseline analysis results for the samples collected from the shallow and deep piezometers of ISGR-1 and ISGR-2 are included in Table C-2 in Appendix C.

Baseline samples, for analysis of volatile organic compounds and total petroleum hydrocarbons-gas range organics (TPH-GRO), were collected from MW-24A, MW-24B, MW-61A, MW-61B, GP-7A (20-25), GP-7A (30-35), and GP-7A (35-40) prior to system startup during the semi-annual groundwater monitoring event conducted in April of 2013. Also, groundwater samples, for ongoing system performance evaluation, were collected from MW-61A, MW-61B, MW-62A and MW-62B, and the influent (shallow piezometer) and effluent (deep piezometer) of the ISGR wells during the semi-annual sampling event that was conducted in September of 2013. Sample analysis results from the April and September 2013 sampling events are provided in Table C-2 in Appendix C.

The baseline sampling for volatile organic compounds and TPH-GRO was performed and analyzed per the procedures used for the semi-annual long-term monitoring program. Baseline sample analysis results will be utilized and compared to future groundwater sample analysis results to measure system performance.

3.2 Area C Oxygen Reactive Zone

Following completion of action items which resulted from the pre-startup safety review, the Area C ORZ system was successfully started on August 29, 2013. The system has maintained operation from startup through the end of the reporting period.

Prior to system startup baseline groundwater samples, for analysis of volatile organic compounds and TPH-GRO, were collected from MW-58, MW-59, MW-60, MW-26A, and MW-26B during the semi-annual groundwater monitoring event conducted in April 2013. Also, groundwater samples, for ongoing system performance evaluation, were collected from wells MW-58, MW-59, MW-60 MW-26A, and MW-26B during the semi-annual sampling event that was conducted in September of 2013. Sample analysis results from the April and September 2013 sampling events are provided in Table C-2 in Appendix C. The baseline sampling for volatile organic compounds and TPH-GRO was performed and analyzed per the procedures used for the semi-annual long-term monitoring program.

Baseline DO measurements were collected from all five injection wells (IW-1 through IW-5) and MW-58 prior to system startup on August 29, 2013. Baseline DO measurements were collected from MW-26A and MW-26B on September 30, 2013. Table G-2 in Appendix G provides a summary of the DO measurements for Area C. Baseline sample analysis results and DO measurements will be utilized and compared to future groundwater sample analysis results and measurements to evaluate system performance.

4. Discontinue Operation and Maintenance of Vapor Mitigation Systems

Based on Section 5.7 of the approved Interim Measures Work Plan for Vapor Sampling and Mitigation, if the data trend over three consecutive years suggests that continuous operation of any vapor mitigation system (VMS) installed is no longer necessary to protect human health, Chevron may petition EPA for system termination review.

Chevron submitted a letter dated November 7, 2013 to EPA to formally request a termination review and EPA approval that operation and maintenance of the three VMS units located at 746 Oglethorpe Street, 5818 Eastern Avenue, and 5824 Eastern Avenue Washington, D.C. be discontinued. In a letter dated January 9, 2014, the EPA approved Chevron's request to discontinue operation and maintenance of the three VMS units.

In response to the approval, the residence owners at 746 Oglethorpe Street and 5818 Eastern Avenue will be contacted by Chevron and informed that per the 2010 Final Remedy and as detailed in the 2010 Homeowner Report (that the resident owners previously received from the District Department of the Environment [DDOE]), they were deemed eligible to receive a VMS from the DDOE and they should not remove the VMS currently installed in their home. Following confirmation of receipt of this correspondence, the DDOE will contact the resident owners to coordinate future operation and maintenance events.

Additionally, in response to the approval, the residence owner at 5824 Eastern Avenue, who was deemed not eligible to receive a VMS from the DDOE (per the 2010 Final Remedy), will be consulted (by Chevron) to determine whether the system will be removed from the building or left in place. If the residence owner requests in writing that Chevron remove the system, Chevron will remove the system at Chevron's expense. If the residence owner requests in writing that the system be left in place (or does not respond within 3 months), Chevron will not remove the system and the residence owner will be responsible for all costs (including electricity) associated with further maintenance and operation of the system.

Notification letters, inclusive of the EPA approval date and the information discussed above, will be submitted to each resident via certified mail. For completeness, the previous VMS monitoring data from the Semi-Annual Progress Report – January through June 2013, which was submitted by Gannett Fleming, has been provided in Table D-1 of Appendix D.

5. Operation, Maintenance, and Monitoring

This section provides a summary of operation, maintenance, and monitoring (OMM) activities conducted at the site during the reporting period.

5.1 System Operation

This section provides a summary of operations for Area A, B, and C systems and includes a discussion on system uptime and downtime and other related operational points of discussion.

A description of the routine OMM requirements for Areas A, B, and C, are provided in the following sections.

5.1.1 Area A Dual Phase Extraction System

Routine OMM site visits to record measurements and collect samples are performed every other week (2/month). The reduction from weekly routine OMM visits to every other week is based on permit requirements to collect two effluent samples per month for an Area A effluent flow to the municipal storm drain of less than 500,000 gallons per month. Additional visits are made to the site each month for specific maintenance needs and to respond to system alarms as needed.

The operating hours for both the total fluids and SVE portions of the DPE system were logged regularly during the reporting period by collecting measurements from the solenoid and hour meter, respectively. For the period of July 1, 2013 through December 31, 2013, the total fluids extraction portion of the system was operating 73 percent of the time (3,220 hours on and 1,189 hours off). During the same time period, the SVE portion of the system was operating 58 percent of the time (2,548 hours on and 1,859 hours off).

Table A-1 in Appendix A contains groundwater extraction system performance data including date and time, on/off status, totalizer reading, cumulative gallons of hydrocarbons recovered, operating extraction points, maintenance information, reasons for system downtime, and types of maintenance performed during this reporting period and the previous period (January 1, 2013 through June 30, 2013). A detailed explanation of the tables is provided on the first page of Appendix A.

Table B-1 in Appendix B contains soil vapor extraction system performance data including date and time, on/off status, hour meter readings, manifold air flow readings, manifold vacuum readings, influent and effluent screening concentrations measured using a flame ionization detector (FID), cumulative gallons of hydrocarbons recovered, operating extraction points, maintenance information, reasons for system downtime, and types of maintenance performed during this reporting period and the previous period (January 1, 2013 through June 30, 2013). A detailed explanation of the tables is provided on the first page of Appendix B.

5.1.2 Area B In-situ Groundwater Remediation Wells

Routine OMM visits to Area B were conducted monthly or as needed to check system operation status, to collect carbon performance samples, and record system data.

The operating hours for both ISGR wells were logged regularly during the reporting period by collecting measurements from the hour meters during each visit. System uptime and downtime for each Area B ISGR well will be provided in future reporting after the remedies and anticipated system monitoring improvements are implemented as described in Section 7.

Table F-1 in Appendix F contains ISGR performance data for each well including date and time, on/off status, hour meter reading, total gallons pumped, system flow, influent pressure, and pump operating hours.

5.1.3 Area C Oxygen Reactive Zone

Routine OMM visits to Area C were conducted monthly or as needed to check system operation status, to collect DO measurements, and record system data. For the first quarter of operation, DO measurements were collected monthly from the specified wells to evaluate initial system operation. Going forward, DO measurements will be collected on a quarterly basis.

For the period of August 29, 2013 (system startup) through December 31, 2013, the ORZ system continuously operated.

Table G-1 in Appendix G contains ORZ performance data including date and time, on/off status, oxygen cylinder pressure, cylinder regulator pressure, well regulator pressure, and vault oxygen sensor reading.

5.2 System Maintenance

This section provides a summary of routine and non-routine maintenance activities performed for the Area A, B, and C systems.

5.2.1 Area A Dual Phase Extraction System

Routine maintenance is performed as specified or as needed, including checking the oil level of the SVE blower and air compressor, draining the air compressor, changing the bag filters, backwashing the carbons, and skimming off LPH in the oil/water separator, if present.

Provided below is a description of the non-routine maintenance activities performed at Area A.

- A third bag filter was installed in parallel with the two exiting bag filters to increase system uptime.
- An emergency stop button, which deactivates all Area A equipment, was installed on the exterior fence of the Area compound. Exterior emergency stop button can be used by emergency responders to deactivate Area A system prior to compound entry.
- The pneumatic pump from well MW-17 was pulled, due to poor performance, repaired, and put back into service.
- The internal seals of the knockout tank transfer pump failed and as a result, the pump was unable to pump the knockout tank down. The pump was removed and replaced with an identical part.
- The oil/water separator transfer pump floor mount came lose causing the motor/pump coupling to offset leading to coupling failure and pump discharge pipe breakage. A small amount of water leaked from the broken discharge piping and was contained to the Area A equipment enclosure floor and sump. The oil/water separator transfer pump floor mount was reinforced and the motor/pump coupling and broken piping were replaced with the same materials as previous.
- The liquid phase carbon for both Area A vessels was replaced with new virgin carbon.
- A storage shed was installed within the Area A fenced compound to store OMM equipment and materials.

- Leaking air tubing for well GP-27R was replaced.

5.2.2 Area B In-situ Groundwater Remediation Wells

System maintenance is performed as needed or as specified. Routine maintenance includes checking and changing cartridge filters and checking the top of the carbon for fouling and fouled carbon removal (top few inches) as needed. Non-routine maintenance activities, including pump maintenance, carbon replacement, and replacement/repair of system components, will be performed as needed.

The cartridge filters for ISGR-1 and ISGR-2 were replaced one time each since startup through the remainder of the reporting period.

5.2.3 Area C Oxygen Reactive Zone

System maintenance is performed as needed or as specified. Non-routine maintenance activities that will be performed as needed, based on system inspection and monitoring, include cleaning of the oxygen emitters, replacing the oxygen cylinder, well maintenance, removing liquids contained in the oxygen vault sump by pumping, and replacement/repair of system components.

During system startup water accumulation was observed in the equipment vault resulting from surface water infiltration. The water was pumped out to the ground and the vault hatch gasket and sealing surface were cleaned to minimize future infiltration of surface water into the equipment vault. No other maintenance was performed on the Area C system during the reporting period.

5.3 System Monitoring

This section provides a summary of monitoring activities performed for the Area A, B, and C systems.

5.3.1 Area A Dual Phase Extraction System

Routine monitoring for the DPE system includes the following activities:

- Recording groundwater and air flow rates;
- Measuring air influent and effluent concentrations using a flame ionization detector;

- Recording the manifold vacuum for the SVE system;
- Recording groundwater extraction system bag filter and air stripper differential pressure;
- Recording groundwater extraction system carbon influent pressures
- Recording the SVE hour meter
- Recording catalytic oxidizer temperatures
- Recording vacuum readings

The groundwater influent (SP-1) was sampled 6 times and the effluent (SP-3) was sampled 15 times for laboratory analysis during the reporting period (Appendix A). Effluent groundwater samples were analyzed by EPA Method 8260 for benzene, toluene, ethylbenzene, and xylenes (BTEX), methyl tert-butyl ether (MTBE), tetrachloroethene, trichloroethene, and 1,2-cis-dichloroethene. The permit limits are 100 micrograms per liter (µg/L) for total BTEX and 5 µg/L for benzene. The discharge permit requires reporting of MTBE, tetrachloroethene, trichloroethene, and 1,2-cis-dichloroethene concentrations without establishing limits.

The air stripper effluent air was sampled 6 times during the reporting period (Appendix A). Air samples were collected before treatment (SP-50) and after treatment using the vapor carbon vessels (SP-52). The samples were analyzed for BTEX using EPA Method TO-15 and for total recoverable petroleum hydrocarbons (TRPH) in the C4 to C10 range using Method TO-3. The air permit discharge limits are 20 pounds of volatile organic compounds per day and 0.02 pounds of benzene per hour.

The soil vapor extraction system influent (SP-100) and effluent (SP-200) both were sampled 6 times during the reporting period and submitted for laboratory analysis to document compliance with the air discharge permit (Appendix B). The treated effluent air sampling port (SP-200) is located in the catalytic oxidizer effluent stack before discharge to the atmosphere. Samples were analyzed for BTEX using EPA Method TO-15 and for TRPH in the C4 to C10 range using Method TO-3. The air permit discharge limits are 20 pounds of volatile organic compounds per day and 0.02 pounds of benzene per hour.

5.3.2 Area B In-situ Groundwater Remediation Wells

Routine monitoring for the ISGR wells includes the following activities:

- Recording the hour meter

- Recording total volume pumped and the system flow rate
- Recording influent pressure
- Recording the pump set point, temperature, speed, power input, power consumption, operating hours, and starts

GAC performance samples were collected monthly after system startup during the reporting period. Since startup and throughout the reporting period, analysis of samples collected from the 50% carbon sample port have been non-detect. GAC performance samples will continue to be collected on a monthly basis to determine the carbon exhaustion rate. The time between system start-up and detection of hydrocarbons at the 75% sample port will be evaluated to calculate when hydrocarbons will be detected in the 90% sample port. The carbon change out for ISGR-1 and ISGR-2 will be scheduled prior to the calculated date when the 90% sample port is expected to be impacted. Table F-2 in Appendix F provides a summary of the analysis results for the GAC performance samples collected from ISGR-1 and ISGR-2.

5.3.3 Area C Oxygen Reactive Zone

Routine monitoring for the ORZ system includes the following activities:

- Recording oxygen cylinder pressure
- Recording tank and well regulator pressure
- Recording oxygen sensor reading
- Recording well pressure

DO was measured in all injection wells (IW-1 through IW-5), MW-26A, MW-26B, and MW-58 on a monthly basis during the first quarter of system operation. Going forward, the collection of DO measurements from all injection wells (IW-1 through IW-5), MW-26A, MW-26B, and MW-58 will be reduced to quarterly. Table G-2 in Appendix G provides a summary of the DO measurements for the Area C ORZ.

Since startup and through the end of the reporting period, the oxygen cylinder usage has been tracked to evaluate system consumption and to monitor for cylinder replacement. Prior to system startup the cylinder pressure was 1,800 pounds per square inch (psi) (approximate capacity of 1,700 liters or 60 cubic feet). At the end of the reporting period, approximately half the cylinder contents had been consumed (approximately 900 psi/ 850 liters).

5.4 Site Monitoring

The EPA-approved Interim Monitoring Sampling Plan calls for monthly gauging of ten monitoring wells (GP-27R, GP-30A, GP-35A, MP-7, MW-7, MW-16, MW-18, MW-22R, MW-24A, and RW-4), semi-annual gauging of all monitoring wells, semi-annual sampling of 72 monitoring wells, and semi-annual sampling of the four soil vapor wells (VW-1, VW-2, VW-3, and VW-4). Table 1 provides a summary of the groundwater and soil vapor sampling plan.

5.4.1 Groundwater Monitoring

Monthly groundwater gauging of the ten specified monitoring wells was conducted on July 15, August 15, September 16, October 30, November 14, and December 18, 2013. The fall semi-annual groundwater gauging was conducted during the period of July 31 through August 1, 2013. The groundwater gauging data for the past year are provided in Appendix C, Table C-1. A detailed explanation of the table is provided on the first page of Appendix C. Groundwater contour maps provided as Figures 2 and 3 were created using gauging data collected during the comprehensive gauging of all wells in July/August 2013.

The fall semi-annual sampling/gauging event for the Maryland and D.C. wells was conducted during the period of September 9 through September 12, 2013. The analytical results for groundwater sampling events for the past year are provided in Appendix C, Table C-2. A detailed explanation of the table is provided on the first page of Appendix C. Groundwater iso-concentration maps were created using analytical results from the September sampling event (Figures 4 through 7).

A Mann-Kendall statistical analysis of groundwater monitoring well analytical trends is presented in Appendix I. Newer monitoring wells with less than 4 sample results were not analyzed due to insufficient data.

5.4.1.1 In-situ Groundwater Remediation Wells

Prior to startup of the Area B ISGR wells, baseline samples were collected during the semi-annual groundwater monitoring event conducted on April 9, 2013 from MW-24A, MW-24B, MW-61A, MW-61B, GP-7A (20-25), GP-7A (30-35), and GP-7A (35-40). Also, prior to system startup baseline samples were collected on August 28, 2013 from the influent (shallow piezometer) and effluent (deep piezometer) of the ISGR wells.

The analytical results for these baseline samples are provided in Appendix C, Table C-2.

To evaluate system performance, groundwater samples, for analysis of volatile organic compounds and TPH-GRO, will be collected from MW-61A, MW-61B, MW-62A and MW-62B, and the influent (shallow piezometer) and effluent (deep piezometer) of the ISGR wells during the on-going semi-annual long-term monitoring program. Analytical results for groundwater samples collected from the Area B system performance wells during the September 2013 semi-annual sampling event are provided in Appendix C, Table C-2.

Based on the baseline sampling date of the influent and effluent of the ISGR wells, additional samples were not collected from these wells during the semi-annual sampling event in September 2013. Continued sampling of these wells will continue in the spring of 2014. The influent (ISGR-1 Shallow and ISGR-2 Shallow) and effluent (ISGR-1 Deep and ISGR-2 Deep) of the ISGR wells were added to Table 1 for inclusion in the long-term monitoring program.

5.4.1.2 Oxygen Reactive Zone

Prior to startup of the Area C ORZ system, baseline samples were collected during the semi-annual groundwater monitoring event conducted on April 2, 2013 from MW-58, MW-59, MW-60, MW-26A, and MW-26B. The analytical results for these baseline samples are provided in Appendix C, Table C-2.

To evaluate system performance, groundwater samples, for analysis of volatile organic compounds and TPH-GRO, will be collected from wells MW-58, MW-59, MW-60, MW-26A, and MW-26B during the ongoing semi-annual long-term monitoring program. Analytical results for groundwater samples collected from the Area C system performance wells during the September 2013 semi-annual sampling event are provided in Appendix C, Table C-2.

5.4.2 Passive Sampling Using the HydraSleeve™

The use of HydraSleeve passive samplers was approved by DDOE and EPA for use during the September 2013 semi-annual groundwater sampling event. Groundwater samples were collected from 12 wells (MW-61A, GP-24A, GP-30A, GP-41A, MW-16, MW-20, MW-21, MW-23, MW-30R, MW-46, MW-49, and MW-6) using the HydraSleeve passive samplers.

The influent (ISGR-1 Shallow and ISGR-2 Shallow) and effluent (ISGR-1 Deep and ISGR-2 Deep) of the ISGR wells will also be sampled using the HydraSleeve passive samplers going forward in the long-term monitoring program.

5.4.3 Soil Vapor Monitoring

Semi-annual soil vapor sampling of 2 (VW-1 and VW-2) of the 4 soil vapor wells as well as an ambient sample for VW-1 was conducted on December 19, 2013. Wet weather conditions prevented sample collection (i.e., infiltration of precipitation fills soil pore spaces and inhibits soil vapor flow) from two of the soil vapor wells (VW-3 and VW-4). Analytical results for soil vapor samples collected during the December 2013 semi-annual soil vapor sampling event are provided in Appendix E, Table E-1.

6. Submittal of Deliverables

Chevron submitted the following deliverables to EPA during the reporting period:

- Semi-Annual Progress Report for January 2013 through June 2013 on July 10, 2013
- Corrective Measures Initial Assessment Report for Area B: In-Situ Groundwater Remediation Wells on November 26, 2013
- Corrective Measures Initial Assessment Report for Area C: Oxygen Reactive Zone on November 26, 2013
- Annual Vapor Mitigation System Indoor Air Sampling Report – Year 4, 2013 dated October 21, 2013

7. Summary of Findings

This section provides a summary of findings and results for the OMM activities performed during the reporting period.

7.1 Area A Dual Phase Extraction System

The groundwater extraction portion of the DPE system pumped approximately 918,586 gallons of groundwater and recovered 6.1 equivalent gallons of dissolved hydrocarbons during the reporting period. The average system flow rate over the entire period was 3.47 gpm. The total volume of groundwater pumped from this site since remediation began in 1989 is approximately 63,780,754 gallons.

The analytical results for groundwater samples collected from sample point SP-3 (treated groundwater that is discharged to the storm drain) (Table A-3 in Appendix A) indicated concentrations of benzene and BTEX in the treated groundwater were below the permit limits (5 µg/L benzene and 100 µg/L BTEX) during the reporting period.

The laboratory analytical results for monthly air stripper samples collected at sample points SP-50 (air stripper vapor carbon influent) (Appendix A, Table A-4) and SP-52 (air stripper vapor carbon effluent, to atmosphere) (Appendix A, Table A-5) indicated concentrations of benzene and TRPH in the treated vapor were well below the permit limits. The permit limits are 0.02 pounds per hour of benzene and 20 pounds per day of volatile organic compounds measured as TRPH.

The soil vapor extraction portion of the DPE system recovered 40.4 equivalent gallons of hydrocarbons in the vapor phase during the reporting period. The average air flow rate was 144.9 standard cubic feet per minute when the system was on (excluding down time).

The laboratory analytical results for monthly SVE system samples collected at sample points SP-100 (soil vapor influent) (Appendix B, Table B-2) and SP-200 (soil vapor effluent, to atmosphere) (Appendix B, Table B-3) indicated concentrations of benzene and TRPH in the treated soil vapor were well below the permit limits. The permit limits are 0.02 pounds per hour of benzene and 20 pounds per day of volatile organic compounds measured as TRPH.

Hydrocarbon Recovery Summary for Period and Cumulative Total for System

Period	Liquid-Phase Hydrocarbons (gallons)	Dissolved-Phase Hydrocarbons (eq. gallons)	Vapor-Phase Hydrocarbons (eq. gallons)	Cumulative Total Hydrocarbons (eq. gallons)
7/1/13 through 12/31/13	0.00	6.1	40.4	46.5
Cumulative Total for System	856.5	945.91	6,365.39	7,311.3

The volume of groundwater treated and the corresponding volume of hydrocarbons collected for the entire time the system has been operating on a quarter by quarter basis continued to be tracked (Figure 1).

7.2 Area B In-situ Groundwater Remediation Wells

After startup, ISGR-2 continued to shut down after a short period of operation (4-8 hours) due to a short circuiting effect (vacuum in the carbon vessel) related to the difference between the volume of water supplied to the carbon vessel by the submersible pump and the volume of water allowed to gravity drain into the deep aquifer by the internal discharge orifice. The discharge orifice installed in ISGR-2 during construction (0.17 inches) was determined to be too large when compared to the programmed output of the submersible pump (optimal design pumping rate of 1 – 2 gpm).

7.2.1 System Uptime Improvement

On September 17, 2013 the 0.17 inch orifice was replaced with an on hand 0.125 inch orifice to decrease the rate at which treated water was allowed to drain from the carbon vessel to the deep aquifer. This decrease in discharge orifice size did extend the uptime of the ISGR-2 system (24 to 48 hours), but frequent system shutdown was again observed. With the 0.125 discharge orifice installed, the system shut down was due to high pressure in the carbon vessel; therefore, the 0.125 inch orifice was not allowing enough treated water to gravity drain to the deep aquifer when compared to the volume of water supplied by the submersible pump from the shallow aquifer, resulting in increased pressure in the carbon vessel. Based on these observations,

short term and long term remedies are currently being implemented to increase system uptime.

7.2.1.1 Short Term Remedy

Increase Submersible Pump Output: With the larger on hand 0.17 inch discharge orifice installed, the submersible pump output has been incrementally (limited to approximately 0.5 gpm) increased (maximum of 4 gpm), which has resulted in increased system uptime. Increasing the submersible pump output with the larger on hand orifice has increased the pressure in the carbon vessel (equalizing the volume of water supplied by the submersible pump to the carbon vessel and the treated water allowed to gravity drain to the deeper aquifer) preventing the short circuiting/vacuum effect previously discussed.

7.2.1.2 Long Term Remedy

Intermediate Discharge Orifice: The long term remedy for increasing system uptime is the procurement of a range of discharge orifices sizes. The benefit associated with this option is that a range of orifices sizes can be fabricated out of PVC or acrylonitrile butadiene styrene (ABS) blanks and be on hand for easy installation in the event that seasonally changing water levels affect system uptime. It is anticipated that the long term remedy will be implemented in the first quarter of 2014.

In an effort to better monitor and record the Area B ISGR wells uptime, planning for installation of an auto dialer or other system operator notification devise/mechanism is currently underway and anticipated to be implemented in 2014. System optimization will be performed as required based on observed system performance and seasonal groundwater level influences. Optimization will include variability of the submersible pump output and discharge orifice size management.

7.3 Area C Oxygen Reactive Zone

A preliminary evaluation between the baseline and post startup DO measurements demonstrates that oxygen is being delivered to all five of the injection well emitters. The measurements collected also demonstrate that the emitter in each well is sufficiently forcing oxygen into solution as shown by the steady increase of DO measurements recorded during the reporting period. However, the long term effects of the Area C ORZ system on reducing the concentration of petroleum hydrocarbons in groundwater will require continued system operation and sample analysis evaluation

over a longer period of time. System optimization will be performed as required based on observed system performance. Including emitter cleaning and well maintenance as required.

8. Permit Compliance

Permits required for activities during this reporting period are described below.

8.1 Permits for Operation of the Area A System

Permit numbers 033-9-1160 Air Quality General Permit for Groundwater Air Stripping effluent and 033-9-1164 Air Quality General Permit for Soil Vapor Extraction Equipment effluent were required. Neither of these permits has an expiration date. Sampling and monitoring requirements include periodic effluent monitoring as previously described.

Permit number 2008-OGR-8514 General Discharge Permit was issued for discharge of treated groundwater at the site. This permit became effective on November 1, 2013, and expires on December 11, 2017. The permit requires weekly effluent sampling, system monitoring, and submission of a quarterly Discharge Monitoring Report.

8.2 Permits for Groundwater Monitoring and Operation of Area B and C Systems

Permit number PA10100125-R1 for Public Space Occupancy was issued on December 17, 2013 to cover traffic control requirements for sampling, gauging, and OMM of Areas B and C. A new permit is applied for and issued on a semi-annual basis and the current permit expires on June 14, 2014.

9. Summary of Deviations from Approved Plans, Problems Encountered, and Corrective Actions Taken

System optimization for the SVE portion of the Area A DPE system was not performed during the reporting period and is scheduled for completion in February 2014.

10. Summary of Meetings with Public and Government

A letter sent to Andrew Fan (Project Manager, Technical Support Branch (3LC20) Land and Chemicals Division, United State EPA, Region III) on August 12, 2013 with subject: Reduction of Analytes – Groundwater Sampling. This correspondence was submitted on behalf of Chevron to memorialize a discussion on June 25, 2013, during which ARCADIS discussed modification of the analyte list for semi-annual groundwater sampling. The AOC dated July 11, 2008 identifies chemicals of concern as benzene, toluene, ethylbenzene, xylenes, MTBE, and TPH-GRO. Chevron will continue to analyze samples for these chemicals of concern but will not continue to analyze samples for chlorinated compounds.

11. Changes in Key Personnel During the Reporting Period

As of July 1, 2013, Chevron has transitioned management of the site from Gannett Fleming to ARCADIS. The new ARCADIS project manager assigned to the site is Denise Dixon.

12. Projected Work for the Next Reporting Period

The following list identifies projected work anticipated to be performed during the next reporting period, January through June 2014:

- Routine operations and maintenance activities for the Area A, B, and C remediation systems;
- Monthly sampling of the Area A DPE system including influent and effluent sampling;
- Bi-weekly sampling of the Area A DPE system effluent to comply with water discharge permits;
- Monthly gauging of select wells near the service station to check for the presence of LPH and to document drawdown caused by the total fluids extraction system;
- Area A system optimization;
- Angle well (RW-5) transducer troubleshooting and repair as needed;
- Pull, inspect, and clean (as needed) pneumatic pumps in Area A;
- Clean oil water separator (as needed);
- Continue optimization of the Areas B remediation system to increase uptime and implementation of the long term remedy;
- In an effort to better monitor and record the Area B ISGR wells uptime, planning for installation of an auto dialer or other system operator notification devise/mechanism is currently in the planning phase and anticipated to be implemented in 2014;
- Area B monthly GAC performance sampling;
- Area B liquid phase GAC replacement (as warranted) planning;
- Area C oxygen cylinder change out;

- Area C oxygen Emitter pulling and cleaning (as needed);
- Area C passive ventilation turbine replacement on vault discharge stack;
- Area C quarterly DO measurement collection;
- Soil Drum Transportation & Disposal (left over from Area B construction effort); and
- Semi-annual groundwater sampling and gauging event in the spring of 2014.

13. References

Gannett Fleming. 2008. Interim Measures Work Plan for Vapor Sampling and Mitigation at Residences, Former Chevron Facility 122208, 5801 Riggs Road, Chillum, Maryland. Dated July 2008.

ARCADIS

Tables

ARCADIS

Chevron

TABLE 1 SUMMARY OF GROUNDWATER AND SOIL VAPOR SAMPLING PLAN
FORMER CHEVRON FACILITY NO. 122208
5801 RIGGS ROAD, CHILLUM, MARYLAND

EXISTING WELLS TO BE SAMPLED

Well Identifier	Well Location Category	Petroleum Hydrocarbon Sampling Frequency	Current Sampling Method	Groundwater Gauging Frequency[(2)]	Comment
GP-30A	Dual-Phase Extraction System	Semi-annual	Hydrasleeve	Monthly	
GP-35A	Dual-Phase Extraction System	Semi-annual	Hydrasleeve	Monthly	
MP-7	Dual-Phase Extraction System	None	None	Monthly	Gauge only
MW-5	Dual-Phase Extraction System	Semi-annual	Hydrasleeve	Semi-annual	
MW-7	Dual-Phase Extraction System	Semi-annual	From pump	Monthly	Recovery Well
MW-15	Dual-Phase Extraction System	Semi-annual	Hydrasleeve	Semi-annual	
MW-16	Dual-Phase Extraction System	Semi-annual	Hydrasleeve	Monthly	
MW-17	Dual-Phase Extraction System	Semi-annual	From pump	Semi-annual	Recovery Well
MW-18	Dual-Phase Extraction System	Semi-annual	Bailer	Monthly	
MW-23	Dual-Phase Extraction System	Semi-annual	Hydrasleeve	Semi-annual	
PTW-B	Dual-Phase Extraction System	Semi-annual	From pump	Semi-annual	Recovery Well
RW-1	Dual-Phase Extraction System	Semi-annual	From pump	Semi-annual	Recovery Well
RW-2	Dual-Phase Extraction System	Semi-annual	From pump	Semi-annual	Recovery Well
RW-3	Dual-Phase Extraction System	Semi-annual	From pump	Semi-annual	Recovery Well
RW-4	Dual-Phase Extraction System	Semi-annual	From pump	Semi-annual	Recovery Well
RW-5	Dual-Phase Extraction System	Semi-annual	From pump	Semi-annual	Angled Recovery Well
GP-27R	Dual-Phase Extraction System	Semi-annual	From pump	Semi-annual	Recovery Well
MW-22R	Dual-Phase Extraction System	Semi-annual	From pump	Semi-annual	Recovery Well
GP-39R	Dual-Phase Extraction System	Semi-annual	From pump	Semi-annual	Recovery Well
GP-2E(45-50)	Dissolved Hydrocarbons	Semi-annual	Bailer	Semi-annual	
GP-2E(55-60)	Dissolved Hydrocarbons	Semi-annual	Bailer	Semi-annual	
GP-2F(45-50)	Dissolved Hydrocarbons	Semi-annual	Bailer	Semi-annual	
GP-2F(50-55)	Dissolved Hydrocarbons	Semi-annual	Bailer	Semi-annual	
GP-7A(30-35)	Dissolved Hydrocarbons	Semi-annual	Bailer	Semi-annual	
GP-7A(35-40)	Dissolved Hydrocarbons	Semi-annual	Bailer	Semi-annual	

ARCADIS

Chevron

TABLE 1 SUMMARY OF GROUNDWATER AND SOIL VAPOR SAMPLING PLAN
FORMER CHEVRON FACILITY NO. 122208
5801 RIGGS ROAD, CHILLUM, MARYLAND

Well Identifier	Well Location Category	Petroleum Hydrocarbon Sampling Frequency	Current Sampling Method	Groundwater Gauging Frequency[(2)]	Comment
GP-24A	Dissolved Hydrocarbons	Semi-annual	HydraSleeve	Semi-annual	
GP-41A	Dissolved Hydrocarbons	Semi-annual	HydraSleeve	Semi-annual	
GP-44A	Dissolved Hydrocarbons	Semi-annual	Bailer	Semi-annual	
MW-24A	Dissolved Hydrocarbons	Semi-annual	Bailer	Monthly	
MW-24B	Dissolved Hydrocarbons	Semi-annual	Hydrasleeve	Semi-annual	
MW-25A	Dissolved Hydrocarbons	Semi-annual	Bailer	Semi-annual	
MW-25B	Dissolved Hydrocarbons	Semi-annual	Hydrasleeve	Semi-annual	
MW-26A	Dissolved Hydrocarbons	Semi-annual	Hydrasleeve	Semi-annual	
MW-26B	Dissolved Hydrocarbons	Semi-annual	Hydrasleeve	Semi-annual	
MW-27A	Dissolved Hydrocarbons	Semi-annual	Hydrasleeve	Semi-annual	
MW-27B	Dissolved Hydrocarbons	Semi-annual	Hydrasleeve	Semi-annual	
MW-33A	Dissolved Hydrocarbons	Semi-annual	Hydrasleeve	Semi-annual	Added at the request of EPA
MW-33B	Dissolved Hydrocarbons	Semi-annual	Hydrasleeve	Semi-annual	
MW-33C	Dissolved Hydrocarbons	Semi-annual	Hydrasleeve	Semi-annual	Added at the request of EPA
MW-33S	Dissolved Hydrocarbons	Semi-annual	Bailer	Semi-annual	
MW-38	Dissolved Hydrocarbons	Semi-annual	Hydrasleeve	Semi-annual	
MW-39R	Dissolved Hydrocarbons	Semi-annual	Bailer	Semi-annual	
MW-40	Dissolved Hydrocarbons	Semi-annual	Hydrasleeve	Semi-annual	
MW-43B	Dissolved Hydrocarbons	Semi-annual	Hydrasleeve	Semi-annual	
MW-44A	Dissolved Hydrocarbons	Semi-annual	Bailer	Semi-annual	
MW-44B	Dissolved Hydrocarbons	Semi-annual	Hydrasleeve	Semi-annual	
MW-45	Dissolved Hydrocarbons	Semi-annual	Hydrasleeve	Semi-annual	
MW-46	Dissolved Hydrocarbons	Semi-annual	Hydrasleeve	Semi-annual	
MW-47	Dissolved Hydrocarbons	Semi-annual	Bailer	Semi-annual	
MW-49	Dissolved Hydrocarbons	Semi-annual	Hydrasleeve	Semi-annual	
MW-50	Dissolved Hydrocarbons	Semi-annual	Bailer	Semi-annual	
GP-7A(20-25)	Sentinel	Semi-annual	Bailer	Semi-annual	

ARCADIS

Chevron

TABLE 1 SUMMARY OF GROUNDWATER AND SOIL VAPOR SAMPLING PLAN
FORMER CHEVRON FACILITY NO. 122208
5801 RIGGS ROAD, CHILLUM, MARYLAND

Well Identifier	Well Location Category	Petroleum Hydrocarbon Sampling Frequency	Current Sampling Method	Groundwater Gauging Frequency[(2)]	Comment
GP-9A(20-25)	Sentinel	Semi-annual	Bailer	Semi-annual	
GP-11A(20-25)	Sentinel	Semi-annual	Bailer	Semi-annual	
MW-6	Sentinel	Semi-annual	Hydrasleeve	Semi-annual	
MW-19	Sentinel	Semi-annual	Bailer	Semi-annual	
MW-20	Sentinel	Semi-annual	Hydrasleeve	Semi-annual	Upgradient
MW-21	Sentinel	Semi-annual	Hydrasleeve	Semi-annual	
MW-28A	Sentinel	Semi-annual	Hydrasleeve	Semi-annual	
MW-28B	Sentinel	Semi-annual	Hydrasleeve	Semi-annual	
MW-29A	Sentinel	Semi-annual	Hydrasleeve	Semi-annual	
MW-29B	Sentinel	Semi-annual	Hydrasleeve	Semi-annual	
MW-30R	Sentinel	Semi-annual	Hydrasleeve	Semi-annual	Replacement for MW-30
MW-31B	Sentinel	Semi-annual	Hydrasleeve	Semi-annual	
MW-41A	Sentinel	Semi-annual	Hydrasleeve	Semi-annual	
MW-41B	Sentinel	Semi-annual	Hydrasleeve	Semi-annual	
MW-42	Sentinel	Semi-annual	Bailer	Semi-annual	Upgradient
MW-43A	Sentinel	Semi-annual	Bailer	Semi-annual	
MW-48	Sentinel	Semi-annual	Bailer	Semi-annual	
MW-51	Sentinel	Semi-annual	Bailer	Semi-annual	
MW-53	Sentinel	Semi-annual	Hydrasleeve	Semi-annual	
MW-54	Sentinel	Semi-annual	Bailer	Semi-annual	
MW-55	Sentinel	Semi-annual	Hydrasleeve	Semi-annual	
MW-58	Oxygen Reactive Zone	Semi-annual	Hydrasleeve	Semi-annual	
MW-59	Oxygen Reactive Zone	Semi-annual	Hydrasleeve	Semi-annual	
MW-60	Oxygen Reactive Zone	Semi-annual	Hydrasleeve	Semi-annual	
MW-61A	ISGR System	Semi-annual	Hydrasleeve	Semi-annual	
MW-61B	ISGR System	Semi-annual	Hydrasleeve	Semi-annual	
MW-62A	ISGR System	Semi-annual	Hydrasleeve	Semi-annual	

ARCADIS

Chevron

TABLE 1 SUMMARY OF GROUNDWATER AND SOIL VAPOR SAMPLING PLAN
FORMER CHEVRON FACILITY NO. 122208
5801 RIGGS ROAD, CHILLUM, MARYLAND

Well Identifier	Well Location Category	Petroleum Hydrocarbon Sampling Frequency	Current Sampling Method	Groundwater Gauging Frequency[2]	Comment
MW-62B	ISGR System	Semi-annual	Hydrasleeve	Semi-annual	
ISGR-1Shallow	ISGR System	Semi-annual	Hydrasleeve	Semi-annual	Also gauged as needed for OMM
ISGR-1Deep					
ISRG-2Shallow					
ISGR-2Deep					
VW-1	Soil Vapor	Semi-annual	NA	NA	
VW-2	Soil Vapor	Semi-annual	NA	NA	
VW-3	Soil Vapor	Semi-annual	NA	NA	
VW-4	Soil Vapor	Semi-annual	NA	NA	

Footnotes:
(1) This table is adapted from the Interim Measures Sampling Plan, dated April 2006.
(2) All wells will be gauged in the spring and the fall during the Semi-annual sampling events.
(3) Sampling will be conducted in the spring and fall (low and high groundwater conditions).

Gannett Fleming

Chevron

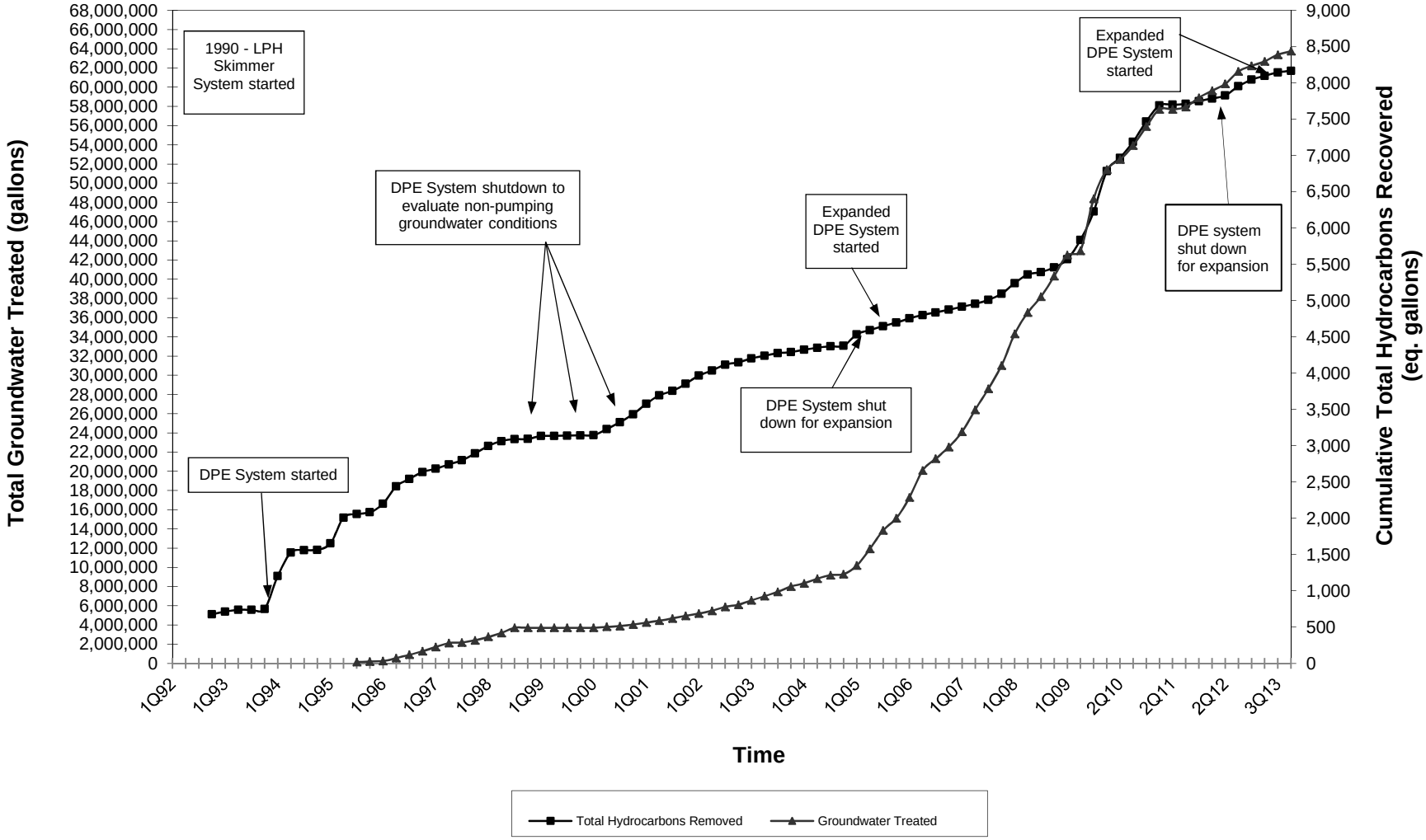
TABLE 2 STATUS OF WELLS INSTALLED AS PART OF CONSTRUCTION
FORMER CHEVRON FACILITY NO. 122208
5801 RIGGS ROAD, CHILLUM, MARYLAND

Well Identifier	Well Location Category	Petroleum Hydrocarbon Sampling Frequency	Sampling Method	Groundwater Gauging Frequency[(2)]	Comment
RW-5	Dual-Phase Extraction System	Semi-annual	From pump	Semi-annual	
RW-4	Dual-Phase Extraction System	Semi-annual	From pump	Semi-annual	
GP-27R	Dual-Phase Extraction System	Semi-annual	From pump	Semi-annual	
MW-22R	Dual-Phase Extraction System	Semi-annual	From pump	Semi-annual	
GP-39R	Dual-Phase Extraction System	Semi-annual	From pump	Semi-annual	
MW-30R	Sentinel	Semi-annual	Hydrasleeve	Semi-annual	
ISGR-1	ISGR System	Monthly	As per approved OMM Plan	None	Per approved design plan, ISGR wells are not included in long term monitoring plan. Wells will be monitored as part of OMM.
ISGR-2					
ISGR-1Shallow	ISGR System	Semi-annual	Hydrasleeve	Semi-annual	Also gauged as needed for OMM
ISGR-1Deep					
ISRG-2Shallow					
ISGR-2Deep					
MW-61A	ISGR System	Semi-annual	Hydrasleeve	Semi-annual	
MW-61B	ISGR System	Semi-annual	Hydrasleeve	Semi-annual	
MW-62A	ISGR System	Semi-annual	Hydrasleeve	Semi-annual	
MW-62B	ISGR System	Semi-annual	Hydrasleeve	Semi-annual	
MW-58	Oxygen Reactive Zone	Semi-annual	Hydrasleeve	Semi-annual	
MW-59	Oxygen Reactive Zone	Semi-annual	Hydrasleeve	Semi-annual	
MW-60	Oxygen Reactive Zone	Semi-annual	Hydrasleeve	Semi-annual	
IW-1	Oxygen Reactive Zone	None	NA	None	Per approved design plan, oxygen injection wells are not included in long term monitoring plan. Wells will be monitored as part of OMM.
IW-2					
IW-3					
IW-4					
IW-5					

ARCADIS

Figures

Figure 1
Cumulative Total Hydrocarbons Recovered and Groundwater Treated Since 1990
Semi-Annual Progress Report: July Through December 2013
Former Chevron Facility 122208, Chillum, Maryland



BASE MAP REFERENCES:

1. "GROUNDWATER POTENTIOMETRIC SURFACE MAP - REMEDIATION SYSTEM AREA - MARCH 19, 2013" BY GANNETT FLEMING, BALTIMORE MARYLAND. DATED JUNE 13, 2013.

LEGEND:

- MONITORING WELL
- DUAL-PHASE EXTRACTION RECOVERY WELL
- SOIL VAPOR EXTRACTION RECOVERY WELL
- FORMER CHEVRON FACILITY #122208 PROPERTY LINE
- PROPERTY LINE
- (136.64) GROUNDWATER ELEVATION
- 132 INFERRED GROUNDWATER CONTOUR

RIGGS ROAD (MD 212)

EASTERN AVENUE

MW-20 (138.15)
MW-21 (136.64)
MW-45 (131.41)
MW-46 (126.86)
MW-47 (125.30)
GP-44A (145.24)
MW-15 (141.56)
VP-4
RW-3
GP-35A (137.11)
MW-7
RW-1
MW-13
MW-5 (139.35)
MW-6 (137.08)
MW-4
MW-2
MW-3
GP-24A (137.30)
MW-1
RW-2
RW-4
MW-38A
(130.67) GP-41A
MP-40
GP-30A (130.73)
PTW-B
MW-12
RW-5
MW-16 (133.20)
MW-17
MW-22R
MW-30
MP-7 (130.91)
GP-27A
PTW-A
MP-20
GP-39A
MW-23 (128.02)
MW-18 (136.56)
MW-19 (134.31)

0 40' 80'
GRAPHIC SCALE

FORMER CHEVRON FACILITY #122208
CHILLUM, MARYLAND

POTENTIOMETRIC SURFACE MAP - SEPTEMBER 2013

ARCADIS

FIGURE 2

CITY: SYRACUSE NY DIV/GROUP: ENVCAD DB: E. KRAHMER LD:(Opt) PIC: M. FLEISCHNER PM: D. DIXON TM: W. KAHL TR: C. RICHARDSON LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\SYRACUSE\ACT\B0048950\000000004\DWG\48950W01.dwg LAYOUT: 3 SAVED: 1/27/2014 11:19 AM ACADVER: 18.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 1/28/2014 10:58 AM BY: KRAHMER, ERIC
XREFS: 48950X01 48950XLB IMAGES: PROJECTNAME: ----

BASE MAP REFERENCES:

1. "GROUNDWATER POTENTIOMETRIC SURFACE MAP - REMEDIATION SYSTEM AREA - MARCH 19, 2013" BY GANNETT FLEMING, BALTIMORE MARYLAND. DATED JUNE 13, 2013.

LEGEND:

- MONITORING WELL
- DUAL-PHASE EXTRACTION RECOVERY WELL
- SOIL VAPOR EXTRACTION RECOVERY WELL
- FORMER CHEVRON FACILITY #122208 PROPERTY LINE
- PROPERTY LINE
- (117.97) GROUNDWATER ELEVATION
- 108 INFERRED GROUNDWATER ELEVATION

RIGGS ROAD (MD 212)

EASTERN AVENUE

(138.15) MW-20
(145.24) GP-44A
(137.11) GP-35A
MW-15 (141.56)
(139.35) MW-5
RW-1
MW-13
(136.64) MW-21
MW-45 (131.41)
VP-4
RW-3
(137.08)
MW-6
MW-4
MW-7
RW-2
RW-4
MW-38A
(130.91) MP-40
GP-41A (130.67)
MW-46 (126.86)
(123.86) MW-48
MW-50 (117.97)
MW-51 (107.97)
PTW-B
GP-30A (130.73)
MP-7
PTW-A
GP-27A
GP-39A
MW-47 (125.30)
MW-49 (113.59)
MW-2
MW-12
RW-5
MW-3
MW-1
MW-17
MW-30
MP-20
GP-24A (137.30)
MW-16 (133.20)
MW-22R
MW-23 (128.02)
MW-18 (136.56)
MW-19 (134.31)
GP-2E(50-55)
GP-2E(45-50) (124.34)
GP-2E(55-60) (124.31)
GP-2F(50-55) (114.41)
GP-2F(45-50) (DRY)
GP-7A(20-25) (138.26)
GP-7A(35-40) (135.91)
(136.14) MW-24A
GP-9A(25-30)
GP-9A(30-35)
GP-11A(20-25) (140.10)
MW-25B (123.61)
MW-25A (123.37)
MW-30
MW-24B
GP-7A(40-45)
GP-7A(25-30)
GP-7A(30-35) (136.16)
GP-9A(20-25) (140.70)
GP-11A(25-30)
GP-11A(30-35)
GP-11A(35-40)
MW-41A (117.28)
MW-41B
MW-37
MW-62A
MW-38 (135.14)
MW-39R (129.10)
MW-39
MW-40 (122.01)
MW-27A (117.81)
MW-27B
(119.96) MW-44A
MW-44B
MW-42
(130.07) MW-26A
MW-26B
(128.98) MW-43A
MW-43B
(109.78) MW-53
MW-29B
MW-29A (107.75)
(129.46) MW-31B
MW-31A
(128.64) MW-55
MW-60
(119.47) MW-33S
MW-33A
MW-33B
MW-33C
MW-52
MW-54 (115.58)
MW-28B
MW-28A (118.00)
MW-32

0 120' 240'
GRAPHIC SCALE

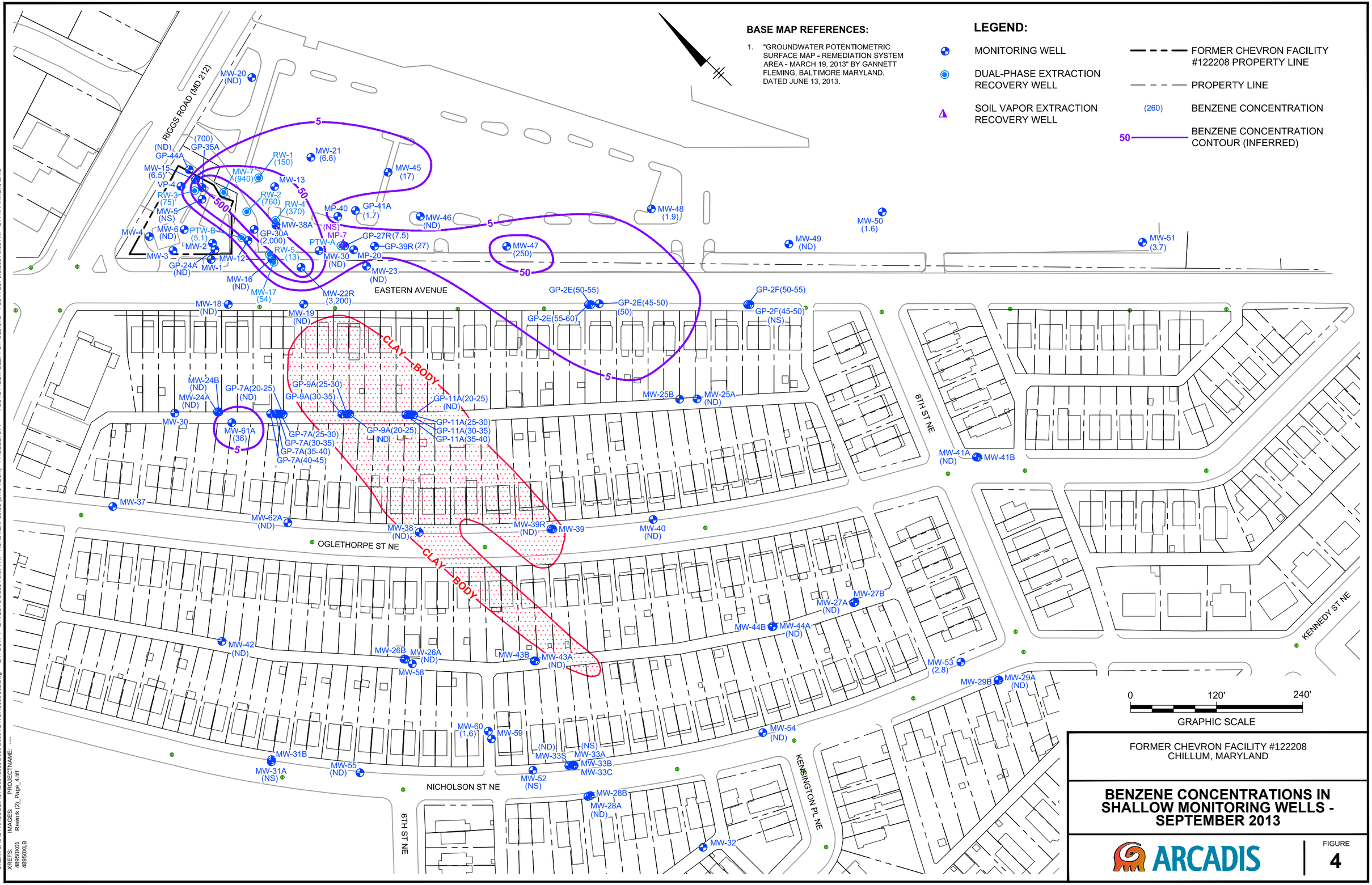
FORMER CHEVRON FACILITY #122208
CHILLUM, MARYLAND

POTENTIOMETRIC SURFACE MAP - SEPTEMBER 2013

ARCADIS

FIGURE 3

CITY: SYRACUSE NY DIV/GROUP: ENVCAD DB: E. KRAHMER LD:(Opt) PIC: M. FLEISCHNER PM: D. DIXON TM: W. KAHL TR: C. RICHARDSON LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\SYRACUSE\ACTIVE\00488950\000000004\DWG\48950W02.dwg LAYOUT: 4 SAVED: 1/28/2014 11:00 AM ACADVER: 18.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 1/28/2014 11:02 AM BY: KRAHMER, ERIC
XREFS: 48950X01 48950XLB IMAGES: PROJECTNAME: ----



FORMER CHEVRON FACILITY #122208
CHILLUM, MARYLAND

BENZENE CONCENTRATIONS IN SHALLOW MONITORING WELLS - SEPTEMBER 2013

ARCADIS

FIGURE 4

CITY: SYRACUSE NY DIV/GROUP: ENVCAD DB: E. KRAHMER LD:(Opt) PIC: M. FLEISCHNER PM: D. DIXON TM: W. KAHL TR: C. RICHARDSON
G:\ENVCAD\SYRACUSE\ACT\B004895\0000\0004\DWG\48950C01.dwg LAYOUT: 4 SAVED: 3/3/2014 9:37 AM ACADVER: 18.1S (LMS TECH) PAGESETUP: ---
XREFS: IMAGES: PROJECTNAME: ---
48950X01 Rework (2)_Page_4.tiff
48950XLB
PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 3/3/2014 9:38 AM BY: KRAHMER, ERIC

BASE MAP REFERENCES:

1. "GROUNDWATER POTENTIOMETRIC SURFACE MAP - REMEDIATION SYSTEM AREA - MARCH 19, 2013" BY GANNETT FLEMING, BALTIMORE MARYLAND. DATED JUNE 13, 2013.

LEGEND:

- MONITORING WELL
- DUAL-PHASE EXTRACTION RECOVERY WELL
- SOIL VAPOR EXTRACTION RECOVERY WELL
- FORMER CHEVRON FACILITY #122208 PROPERTY LINE
- PROPERTY LINE
- (110) MTBE CONCENTRATION
- 20 MTBE CONCENTRATION CONTOUR (INFERRED)

RIGGS ROAD (MD 212)
EASTERN AVENUE
OGLETHORPE ST NE
NICHOLSON ST NE
6TH ST NE
8TH ST NE
KENNEDY ST NE
KENSINGTON PL NE
CLAY BODY

0 120' 240'
GRAPHIC SCALE

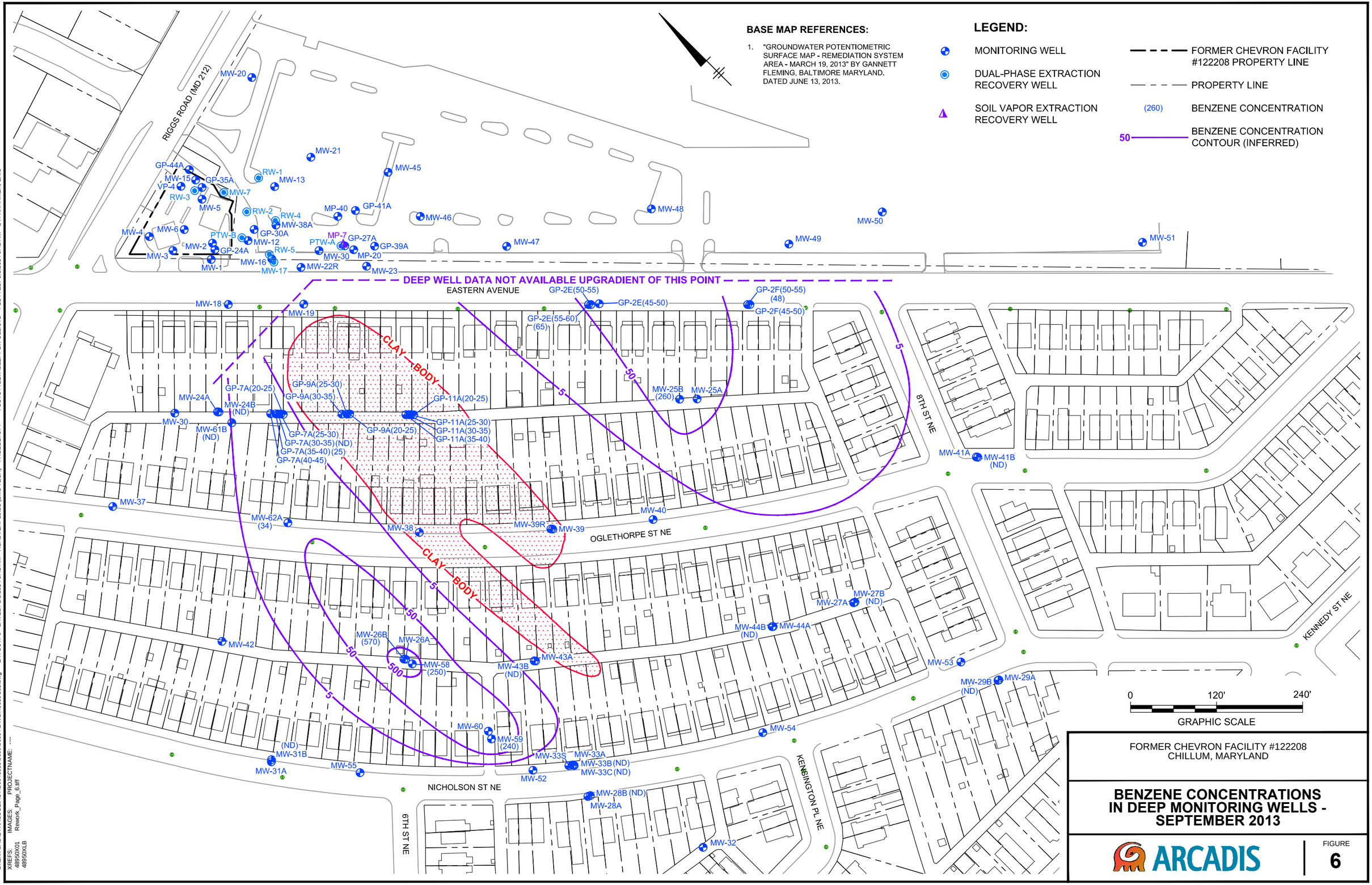
FORMER CHEVRON FACILITY #122208
CHILLUM, MARYLAND

MTBE CONCENTRATIONS IN SHALLOW MONITORING WELLS - SEPTEMBER 2013

ARCADIS

FIGURE 5

CITY: SYRACUSE NY DIV/GROUP: ENV/CAD DB: E. KRAHMER LD:(Opt) PIC: M. FLEISCHNER PM: D. DIXON TM: W. KAHL TR: C. RICHARDSON LYR:(Opt)ON=*OFF=*REF*
G:\ENVCAD\SYRACUSE\ACT\B0048950\0000\0000410\DWG\48950C02.dwg LAYOUT: 5 SAVED: 3/3/2014 9:31 AM ACADVER: 18.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 3/3/2014 9:32 AM BY: KRAHMER, ERIC
XREFS: IMAGES: PROJECTNAME: ----
48950X01 Rework (2)_Page_5.tiff
48950XLB



CITY: SYRACUSE NY DIV/GROUP: ENVCAD DB: E. KRAHMER LD:(Opt) PIC: M. FLEISCHNER PM: D. DIXON TM: W. KAHL TR: C. RICHARDSON
G:\ENVCAD\SYRACUSE\ACTIVE\B0048950\0000\0004\DWG\48950C03.dwg LAYOUT: 6 SAVED: 3/3/2014 9:42 AM ACADVER: 18.1S (LMS TECH)
XREFS: IMAGES: PROJECTNAME: ----
48950X01 Rework_Page_6.tiff
48950XLB
PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 3/3/2014 9:42 AM BY: KRAHMER, ERIC
(TECH)

BASE MAP REFERENCES:

1. "GROUNDWATER POTENTIOMETRIC SURFACE MAP - REMEDIATION SYSTEM AREA - MARCH 19, 2013" BY GANNETT FLEMING, BALTIMORE MARYLAND. DATED JUNE 13, 2013.

LEGEND:

- MONITORING WELL
- DUAL-PHASE EXTRACTION RECOVERY WELL
- SOIL VAPOR EXTRACTION RECOVERY WELL
- FORMER CHEVRON FACILITY #122208 PROPERTY LINE
- PROPERTY LINE
- (320) MTBE CONCENTRATION
- 20 MTBE CONCENTRATION CONTOUR (INFERRED)

DEEP WELL DATA NOT AVAILABLE UPGRADIENT OF THIS POINT

RIGGS ROAD (MD 212)
EASTERN AVENUE
8TH ST NE
OGLETHORPE ST NE
NICHOLSON ST NE
6TH ST NE
KENSINGTON PL NE
KENNEDY ST NE

MW-20, MW-21, MW-45, RW-1, MW-13, GP-44A, MW-15, GP-35A, VP-4, MW-7, RW-3, MW-5, RW-2, RW-4, MW-38A, MP-40, GP-41A, MW-46, MW-48, MW-50, MW-4, MW-6, PTW-B, GP-30A, MW-12, MP-7, GP-27A, MW-2, GP-24A, RW-5, PTW-A, GP-39A, MW-47, MW-49, MW-51, MW-3, MW-1, MW-16, MW-30, MP-20, MW-17, MW-22R, MW-23

MW-18, MW-19, GP-2E(50-55), GP-2E(45-50), GP-2F(50-55) (320), GP-2E(55-60) (290), GP-2F(45-50)

CLAY BODY

(ND) MW-24B, GP-7A(20-25), MW-24A, MW-61B (25), MW-30, GP-9A(30-35), GP-9A(25-30), GP-11A(20-25), GP-11A(25-30), GP-11A(30-35), GP-11A(35-40), GP-9A(20-25), GP-7A(25-30), GP-7A(30-35) (ND), GP-7A(35-40) (230), GP-7A(40-45)

MW-25B (320), MW-25A

MW-41A, MW-41B (12)

MW-37, MW-62A (66), MW-38, MW-39R, MW-39, MW-40

MW-27A, MW-27B (96), MW-44B (59), MW-44A, MW-42, MW-26B (240), MW-26A, MW-58 (110), MW-43A, MW-43B (5.4), MW-53, MW-29B (88), MW-29A

MW-60, MW-59 (220), MW-33S, MW-33A, MW-33B (ND), MW-33C (1.2), MW-54, MW-31B (1.4), MW-31A, MW-55, MW-52, MW-28B (4.3), MW-28A, MW-32

200, 20

0 120' 240'
GRAPHIC SCALE

FORMER CHEVRON FACILITY #122208
CHILLUM, MARYLAND

MTBE CONCENTRATIONS IN DEEP MONITORING WELLS - SEPTEMBER 2013

ARCADIS

FIGURE 7

Figure 8: GP-2E (45-50) Benzene Trend Analysis

Former Chevron Facility 122208

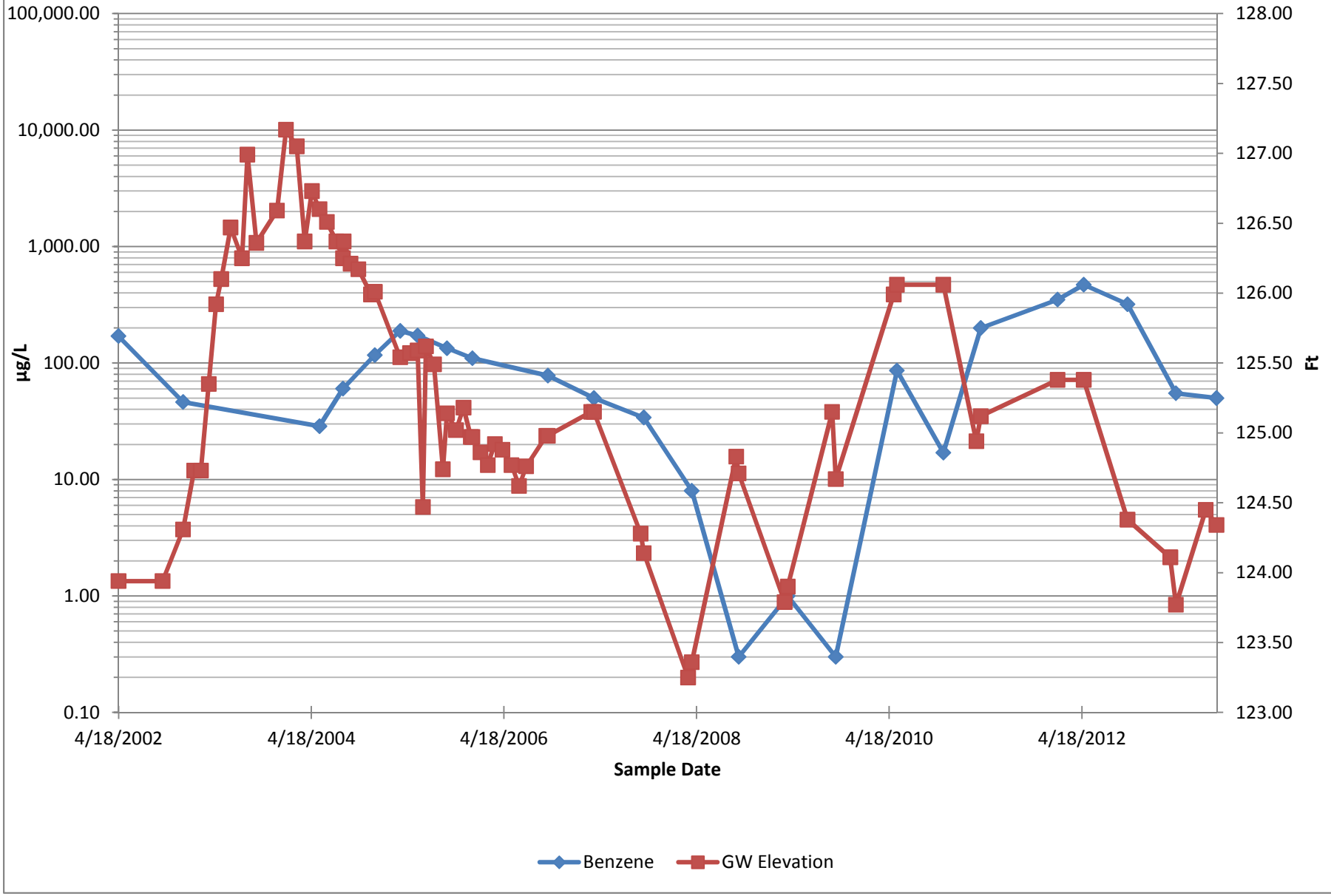


Figure 9: GP-2E (45-50) MTBE Trend Analysis

Former Chevron Facility 122208

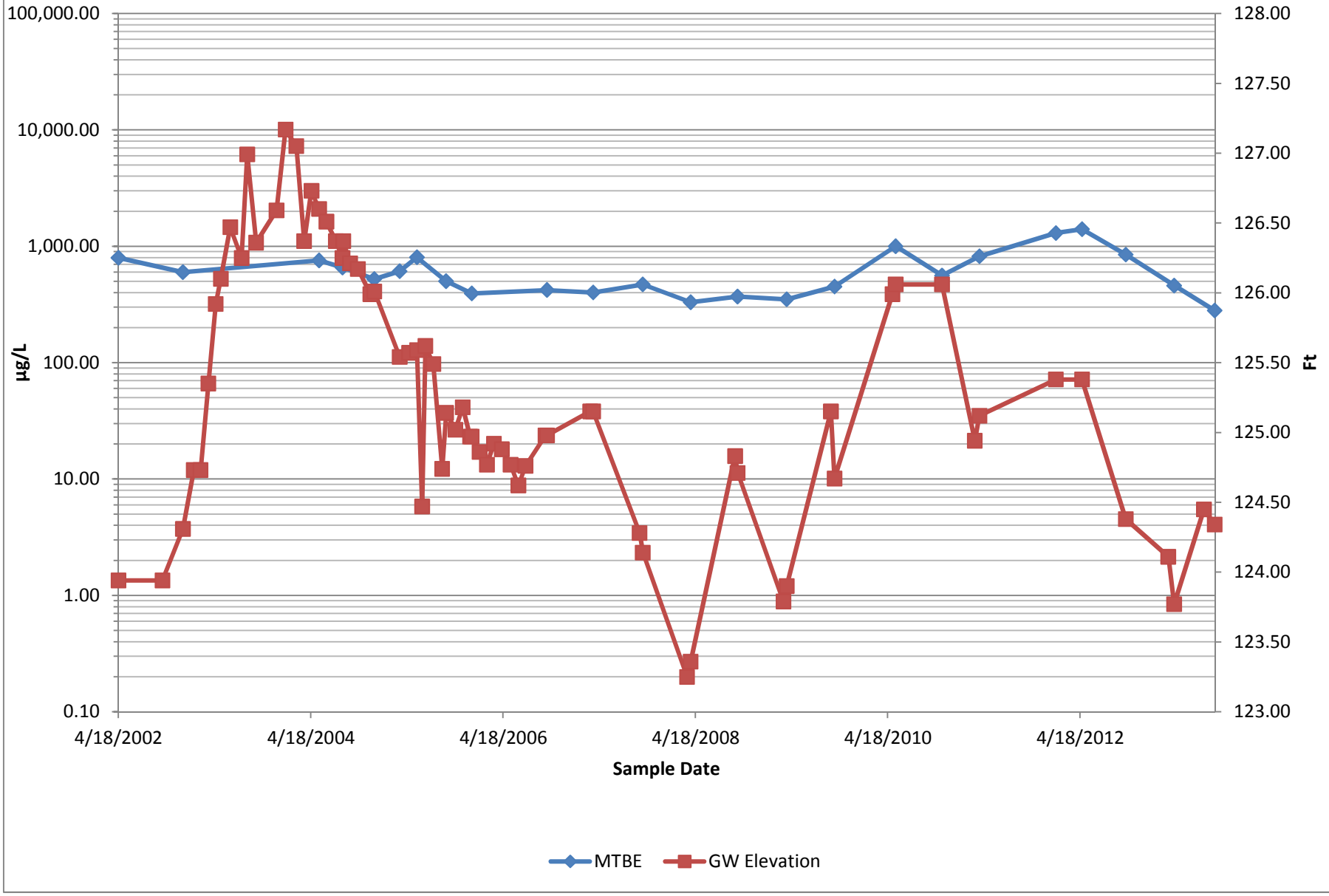


Figure 10: GP-2E (55-60) Benzene Trend Analysis

Former Chevron Facility 122208

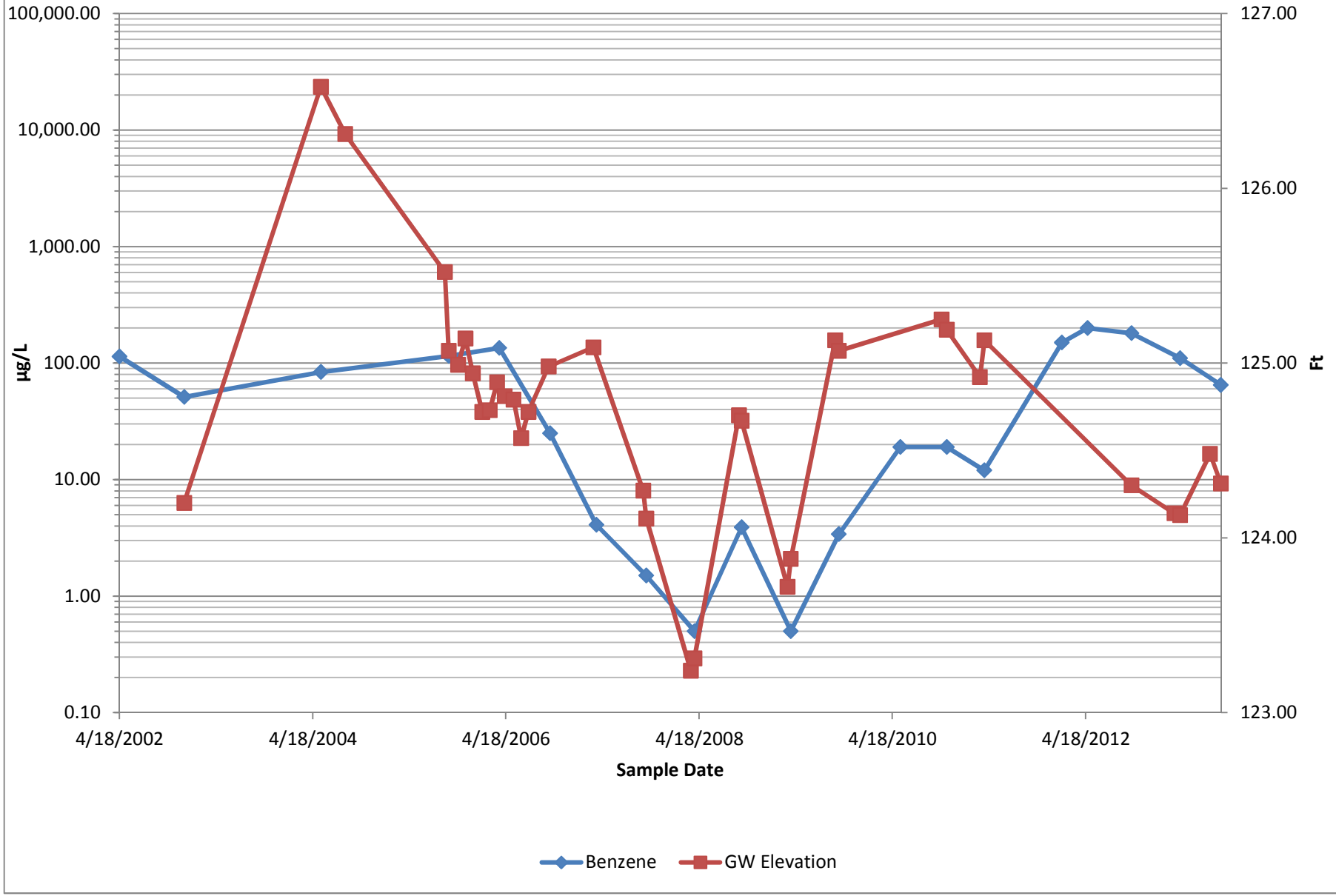


Figure 11: GP-2E (55-60) MTBE Trend Analysis

Former Chevron Facility 122208

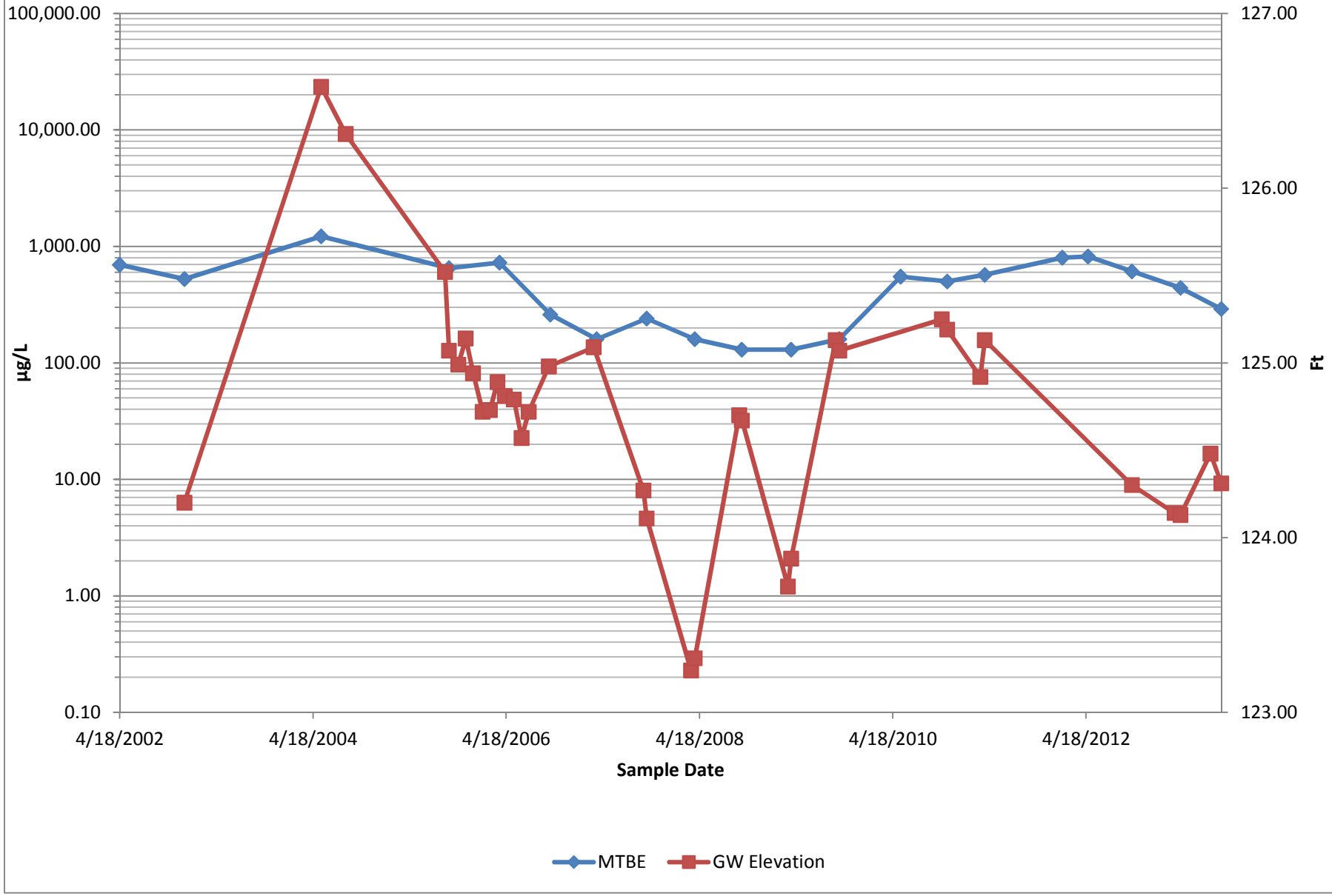


Figure 12: GP-2F (45-50) Benzene Trend Analysis

Former Chevron Facility 122208

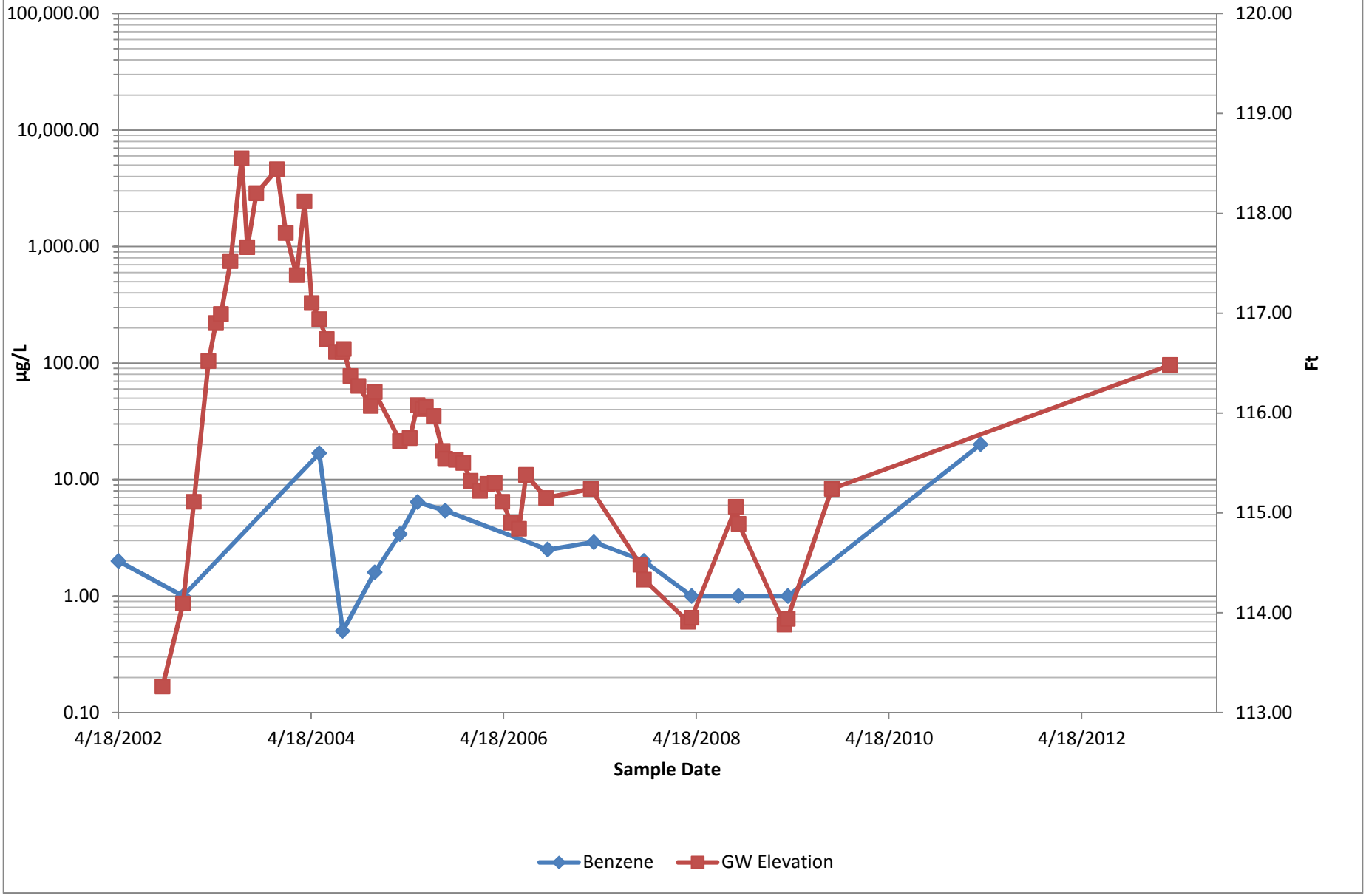


Figure 13: GP-2F (45-50) MTBE Trend Analysis

Former Chevron Facility 122208

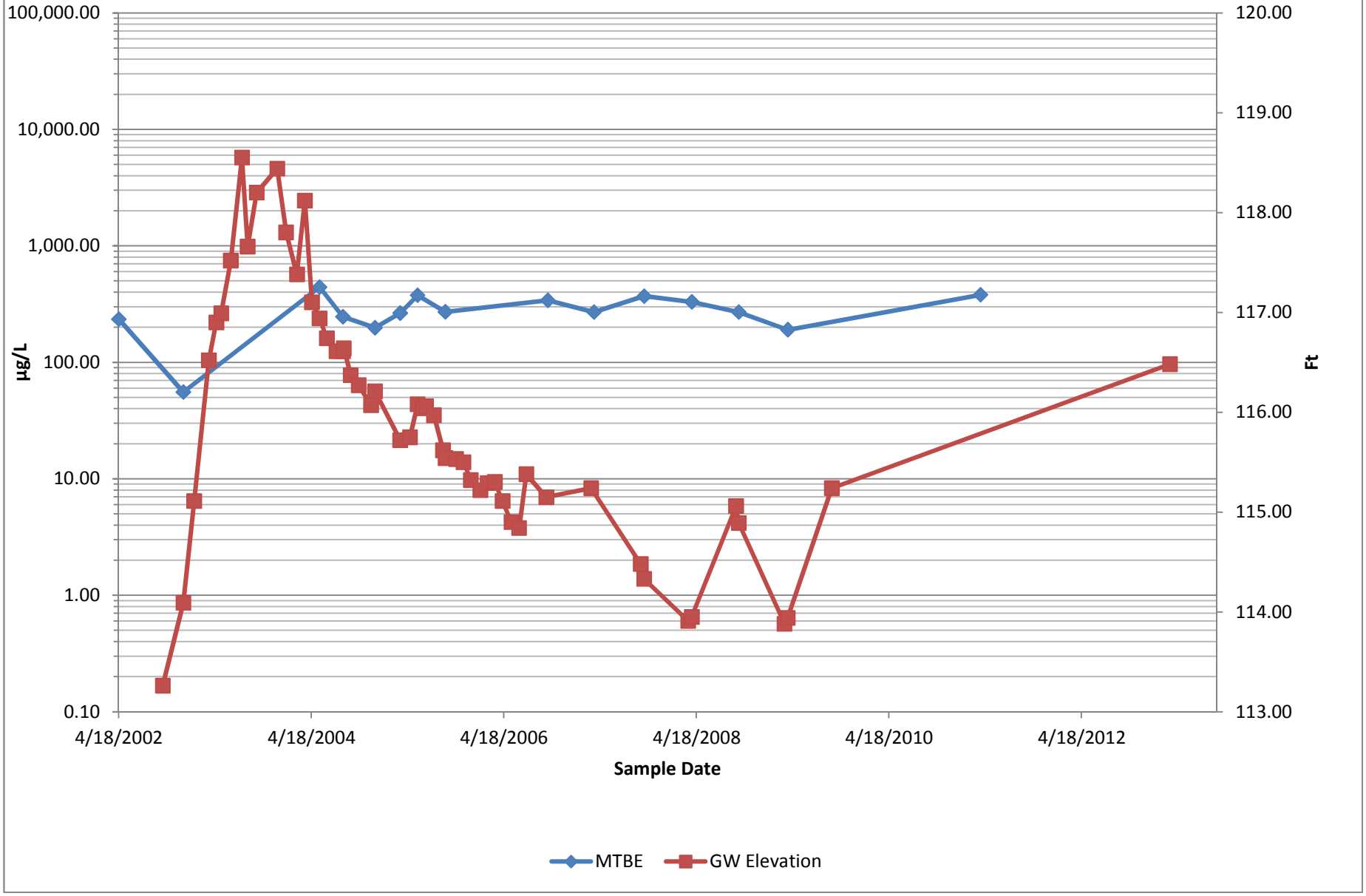


Figure 14: GP-2F (50-55) Benzene Trend Analysis

Former Chevron Facility 122208

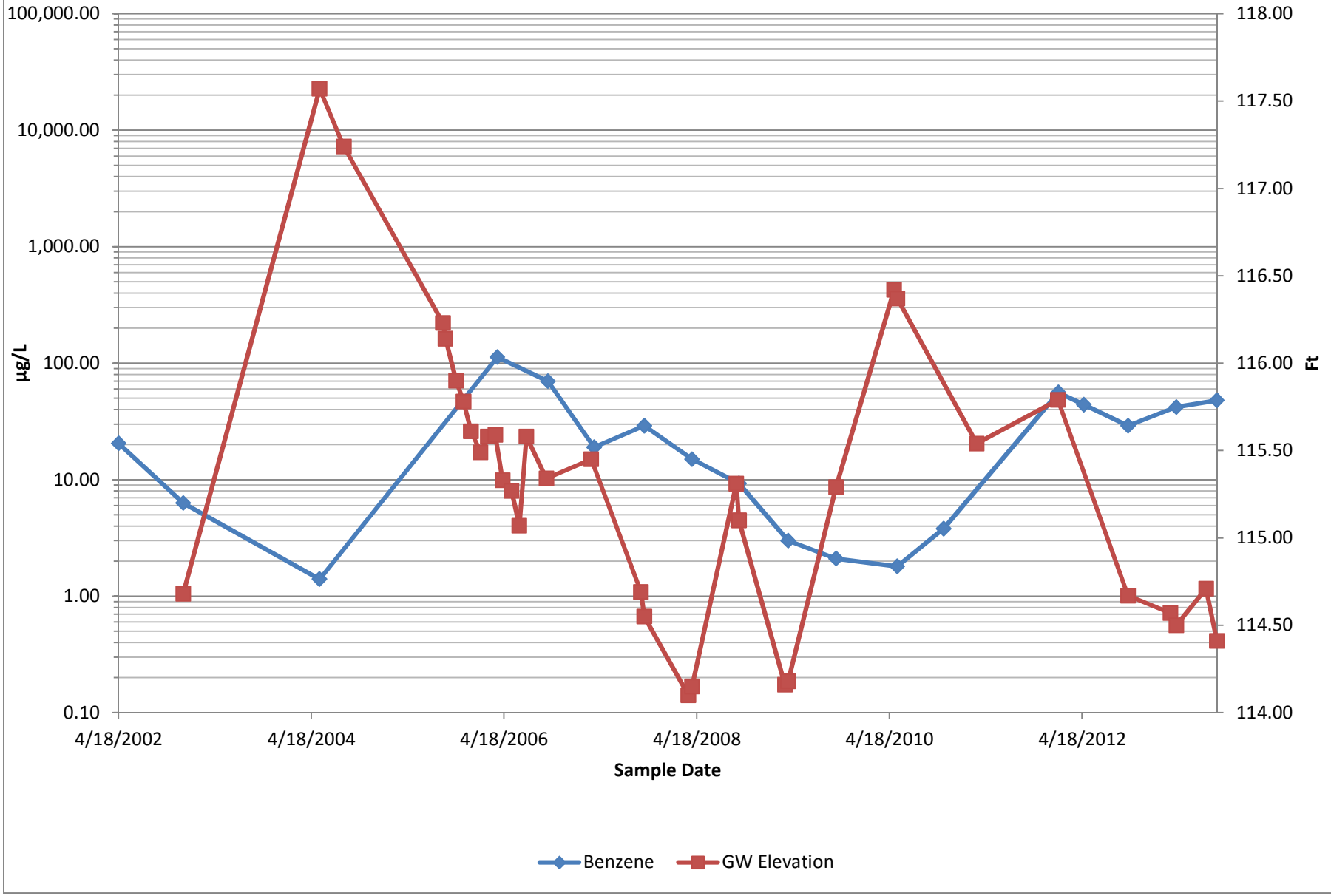


Figure 15: GP-2F (50-55) Benzene Trend Analysis

Former Chevron Facility 122208

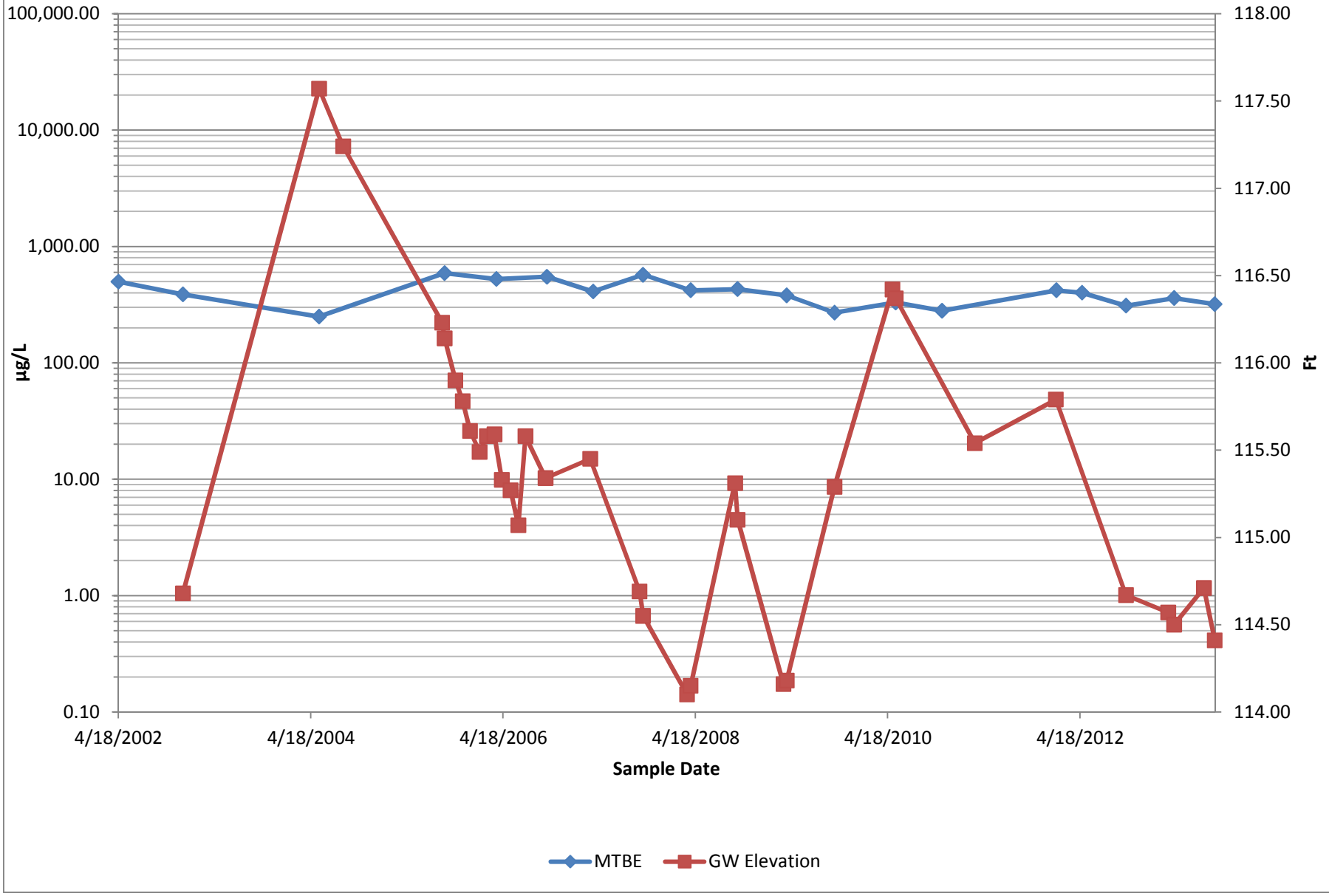


Figure 16: MW-24B Benzene Trend Analysis

Former Chevron Facility 122208

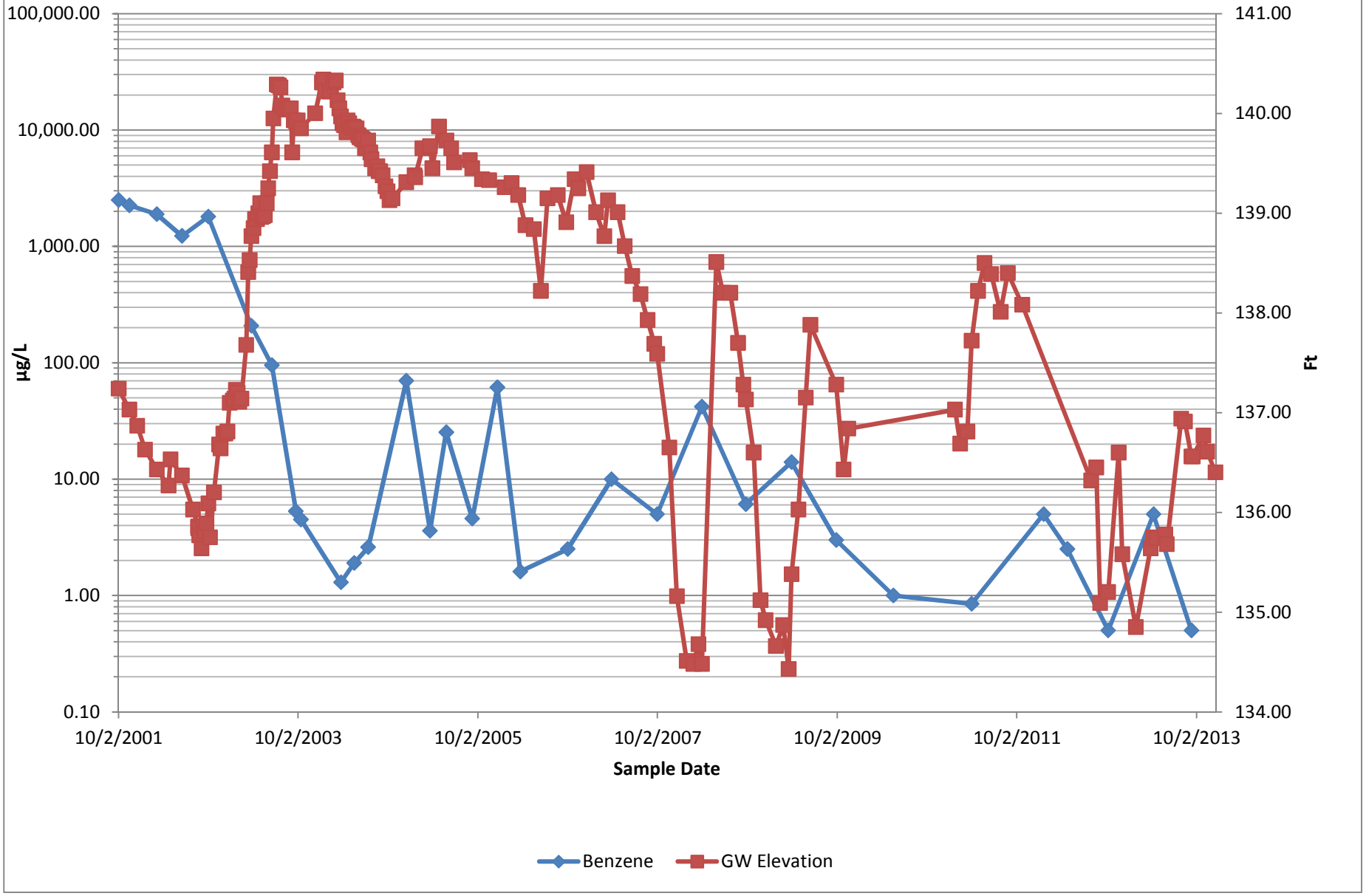


Figure 17: MW-24B MTBE Trend Analysis

Former Chevron Facility 122208

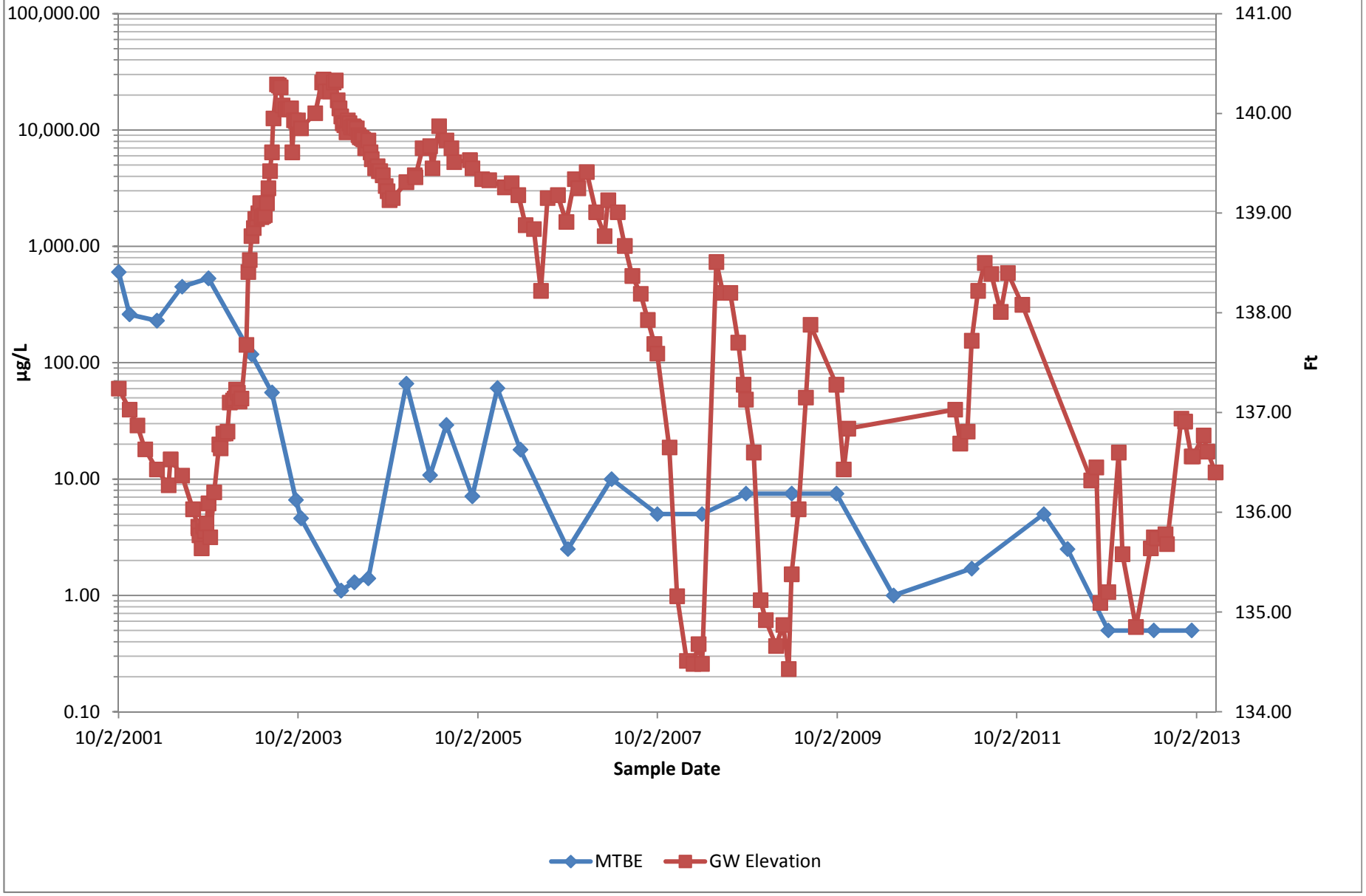


Figure 18: MW-24A Benzene Trend Analysis

Former Chevron Facility 122208

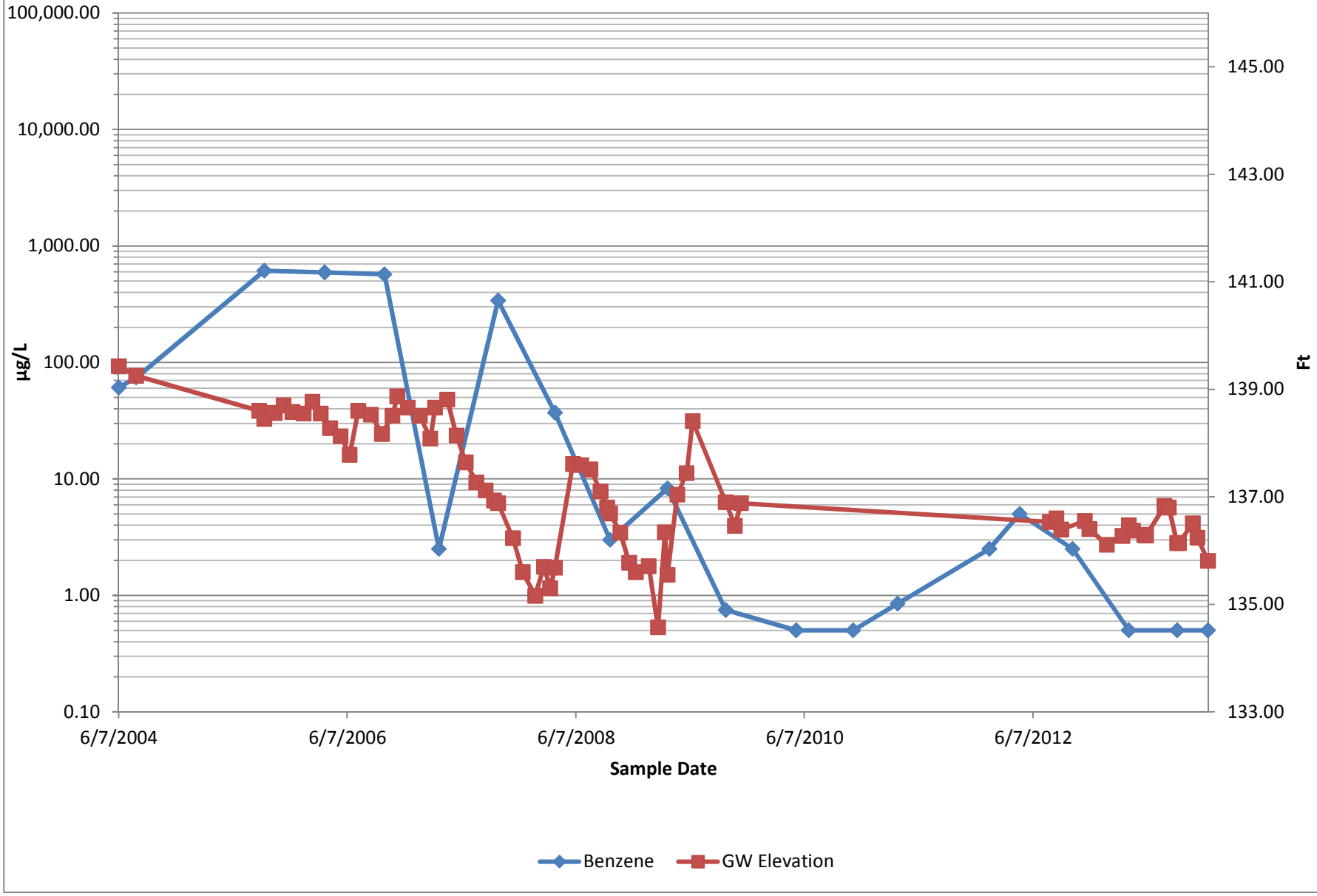


Figure 19: MW-24A MTBE Trend Analysis

Former Chevron Facility 122208

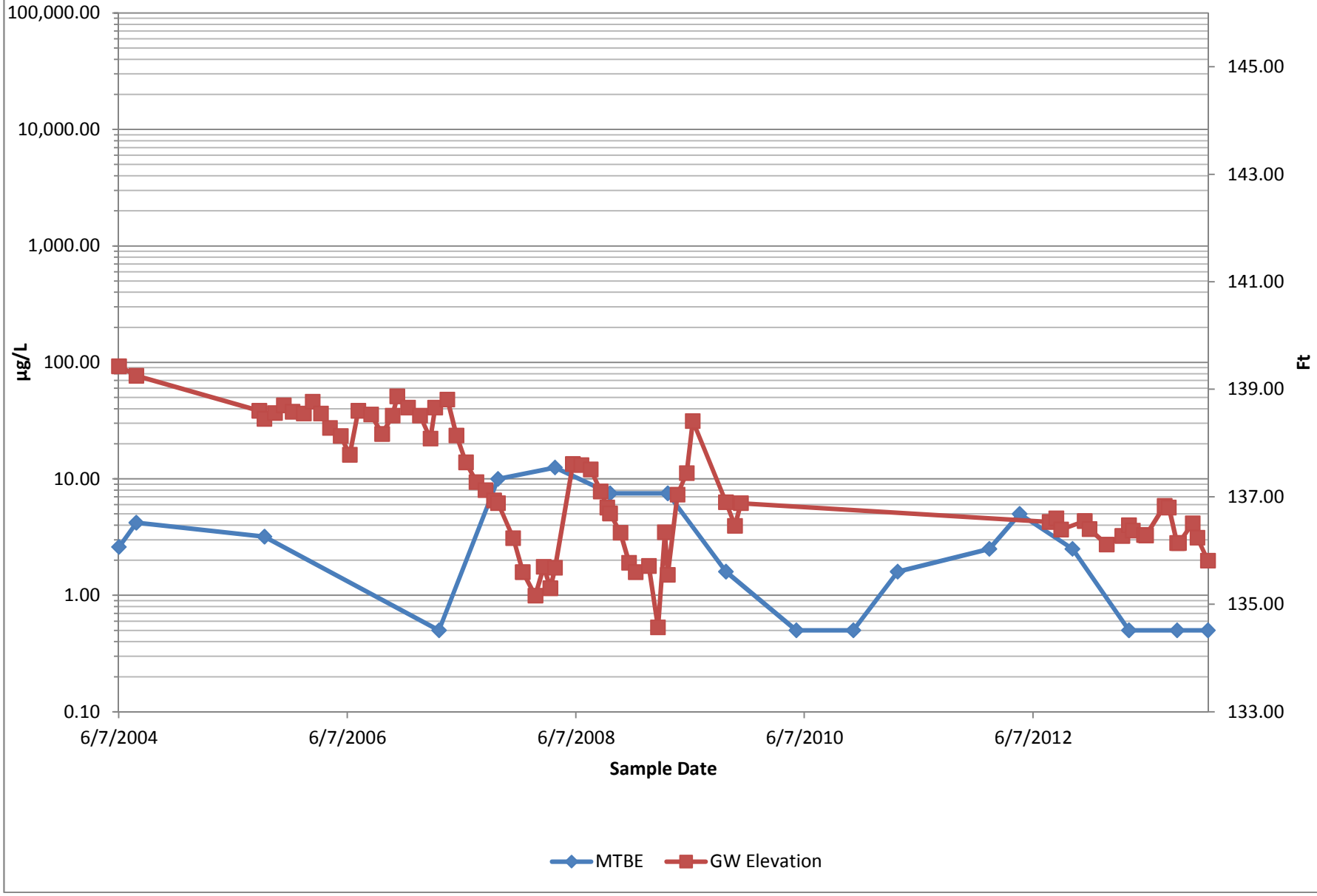


Figure 20: MW-24B Benzene Trend Analysis

Former Chevron Facility 122208

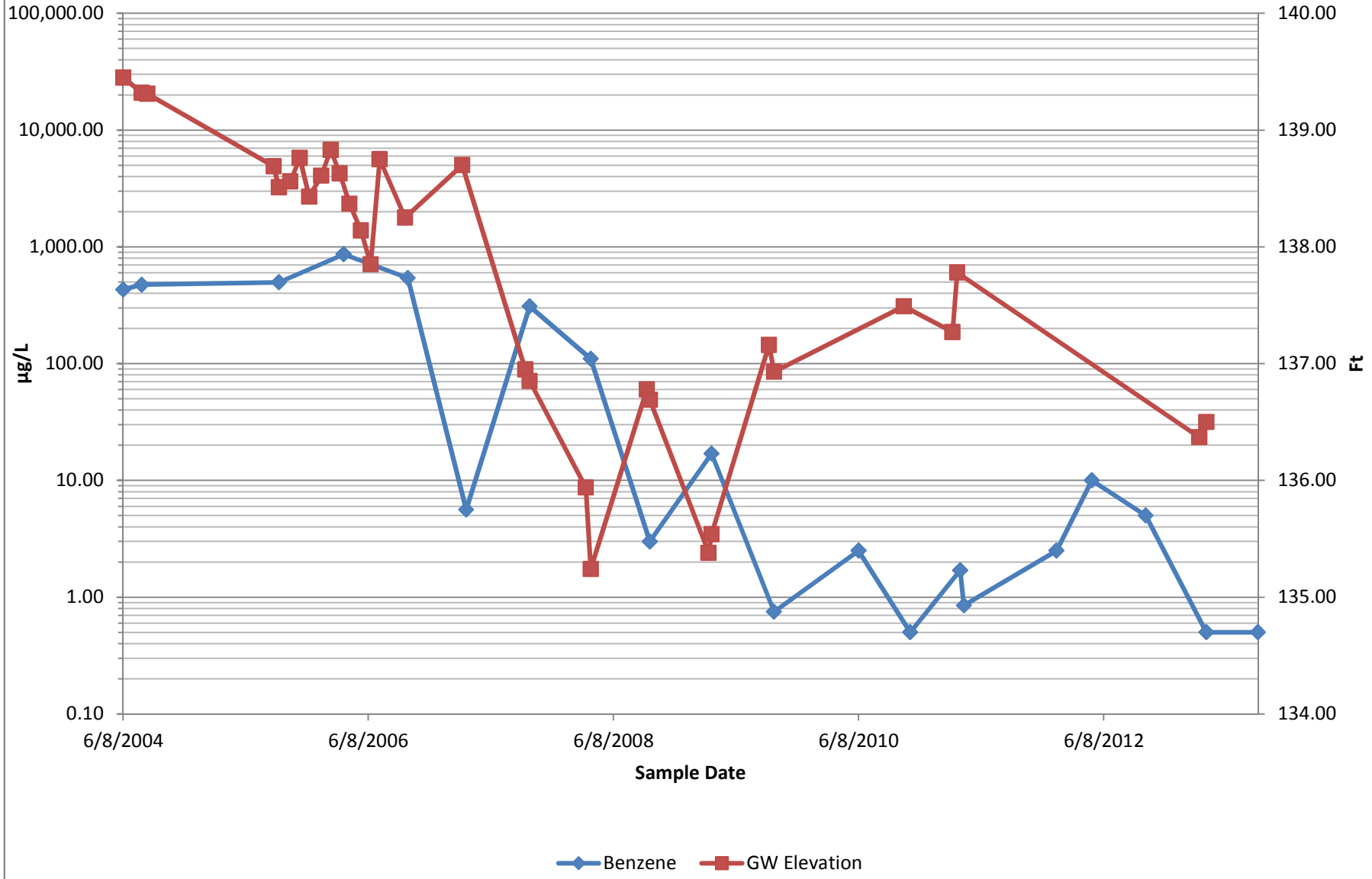


Figure 21: MW-24B MTBE Trend Analysis

Former Chevron Facility 122208

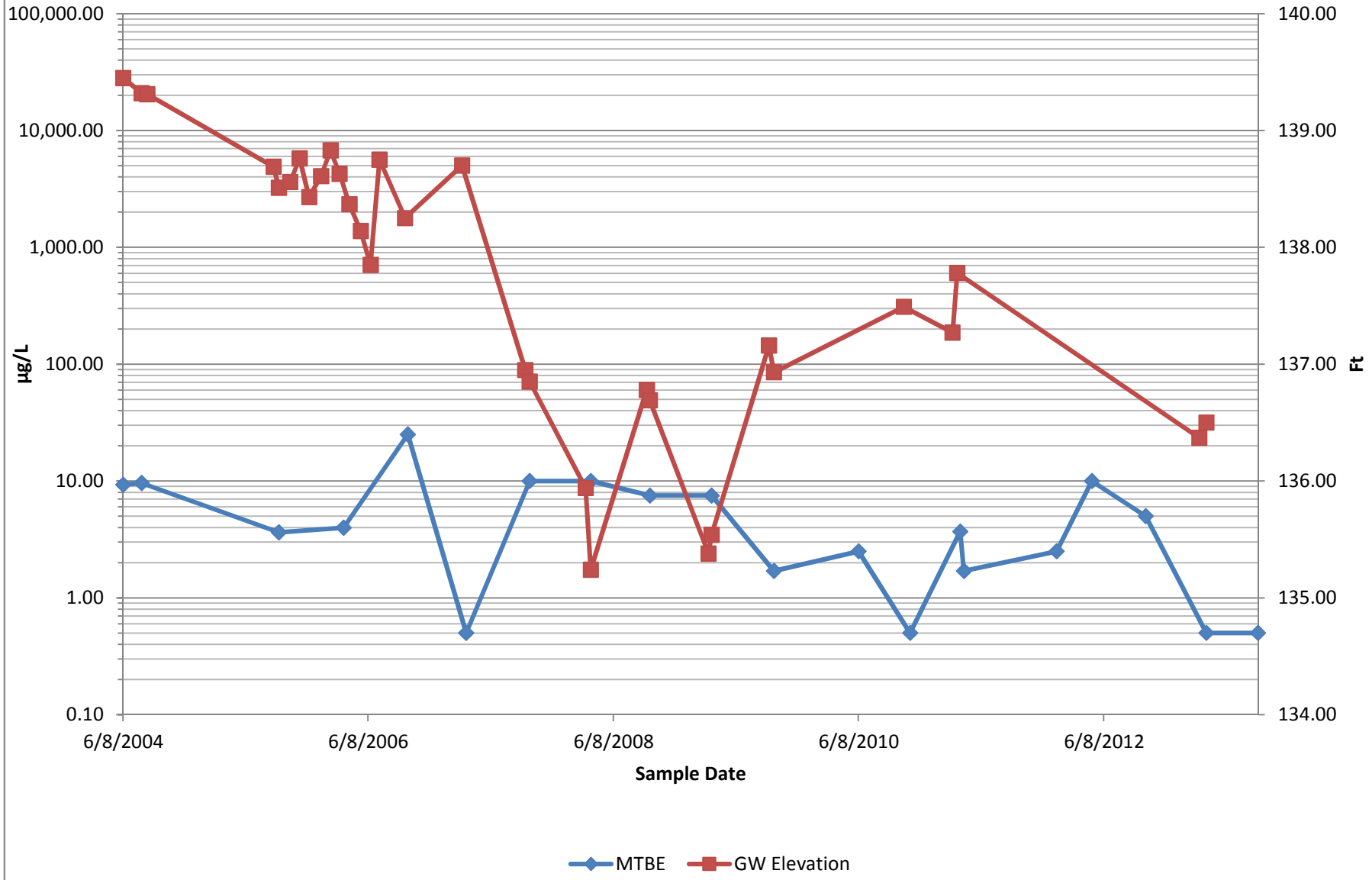


Figure 22: MW-33B Benzene Trend Analysis

Former Chevron Facility 122208

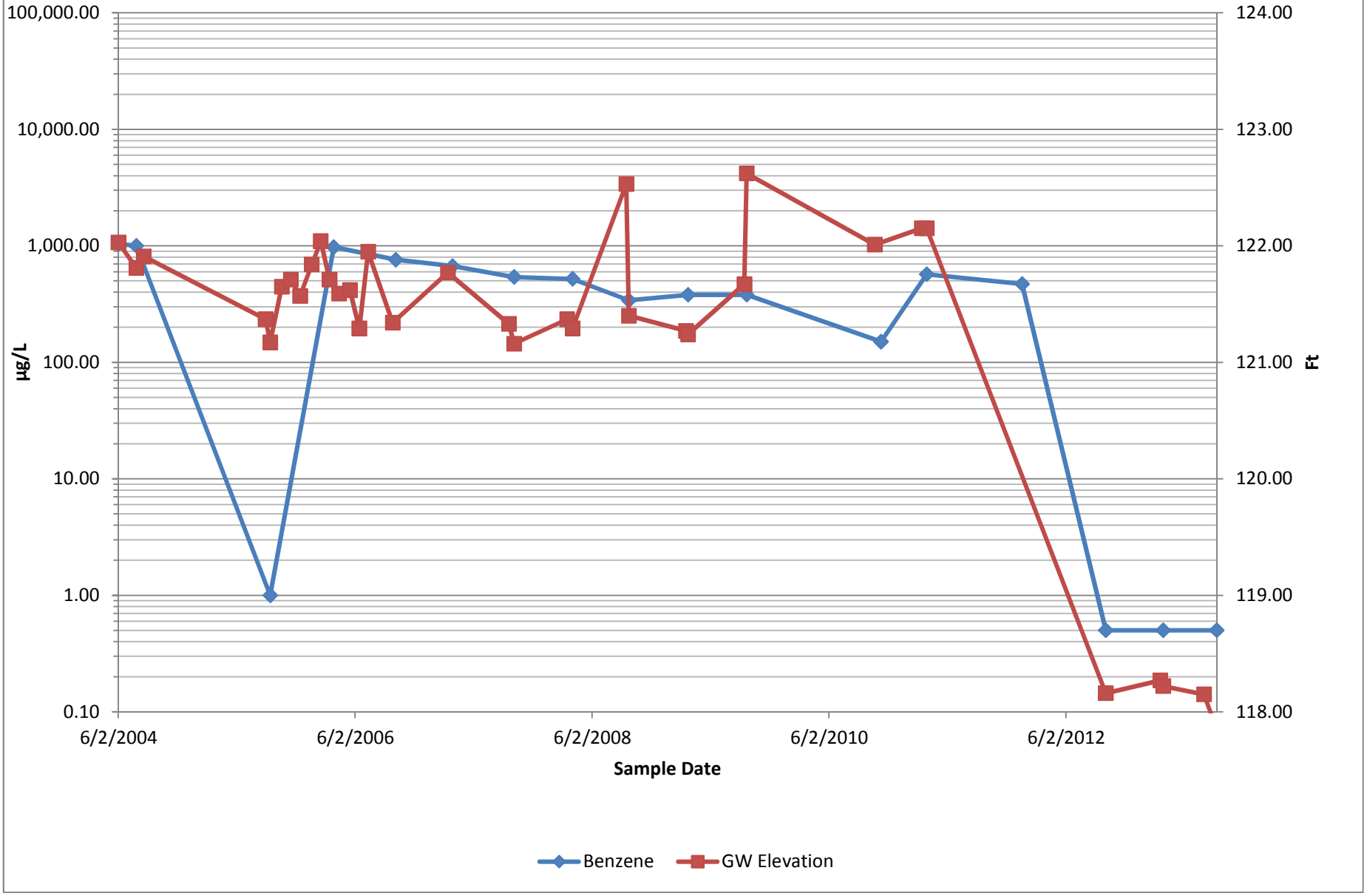


Figure 23: MW-33B MTBE Trend Analysis

Former Chevron Facility 122208

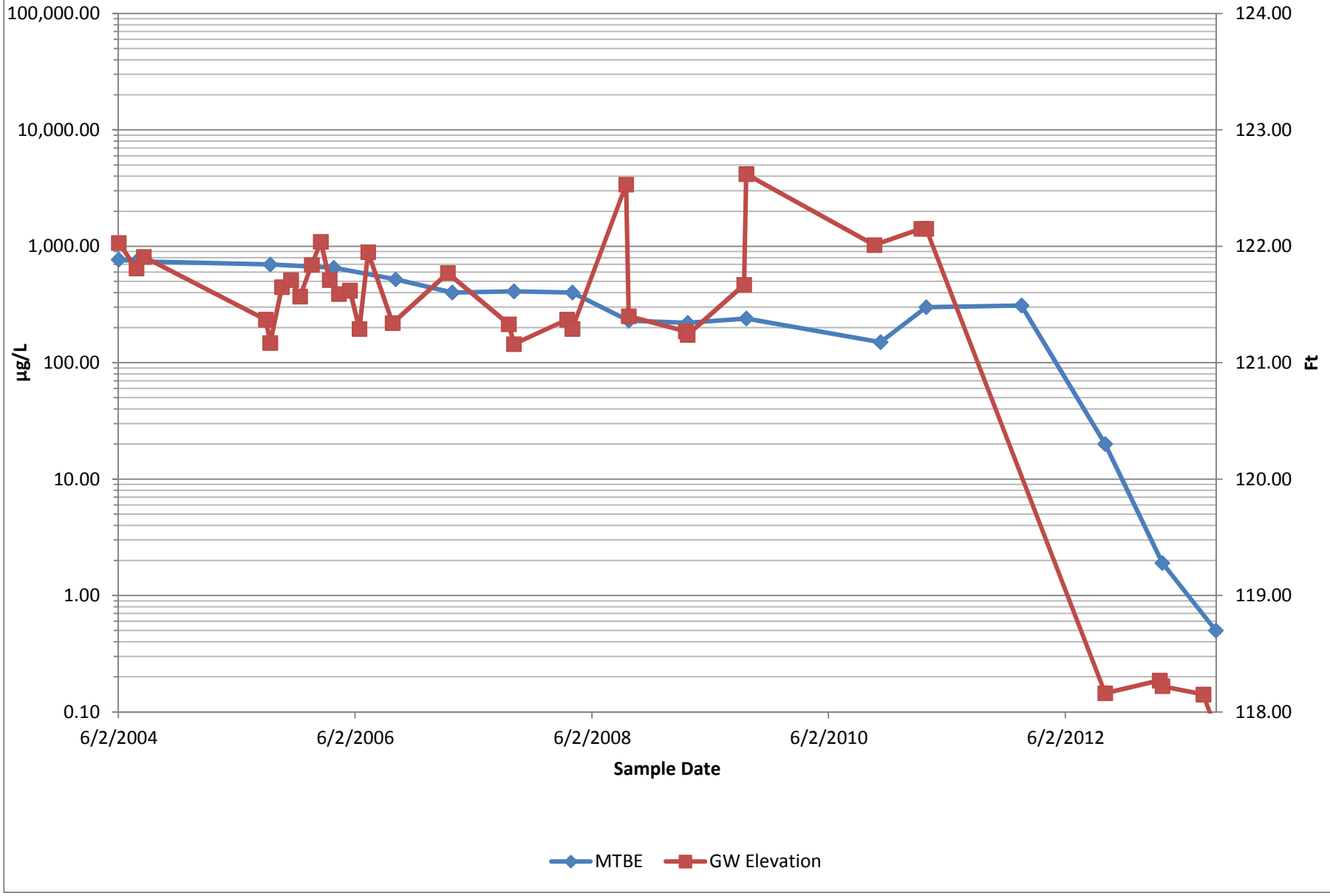


Figure 24: MW-33S Benzene Trend Analysis

Former Chevron Facility 122208

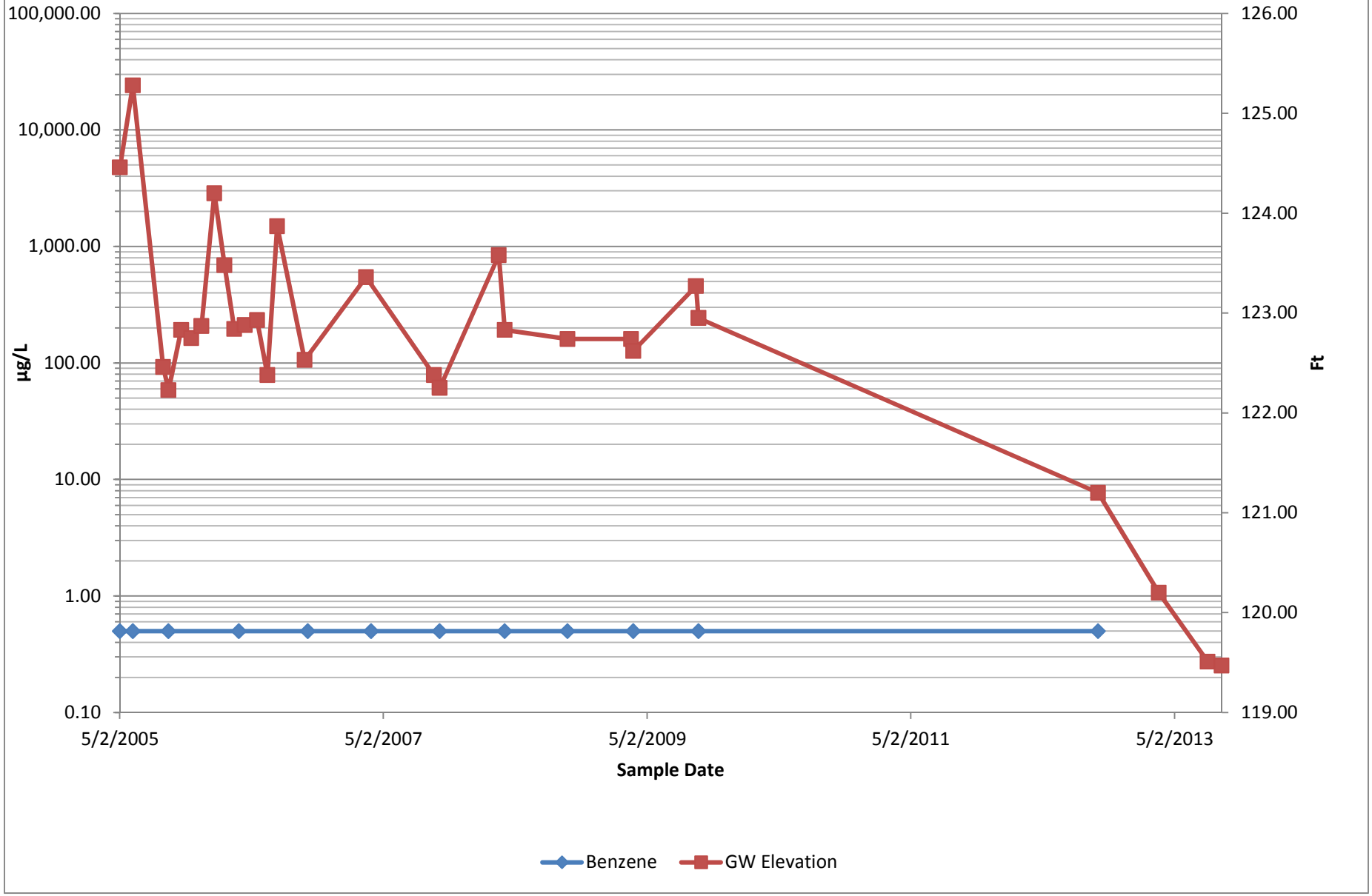
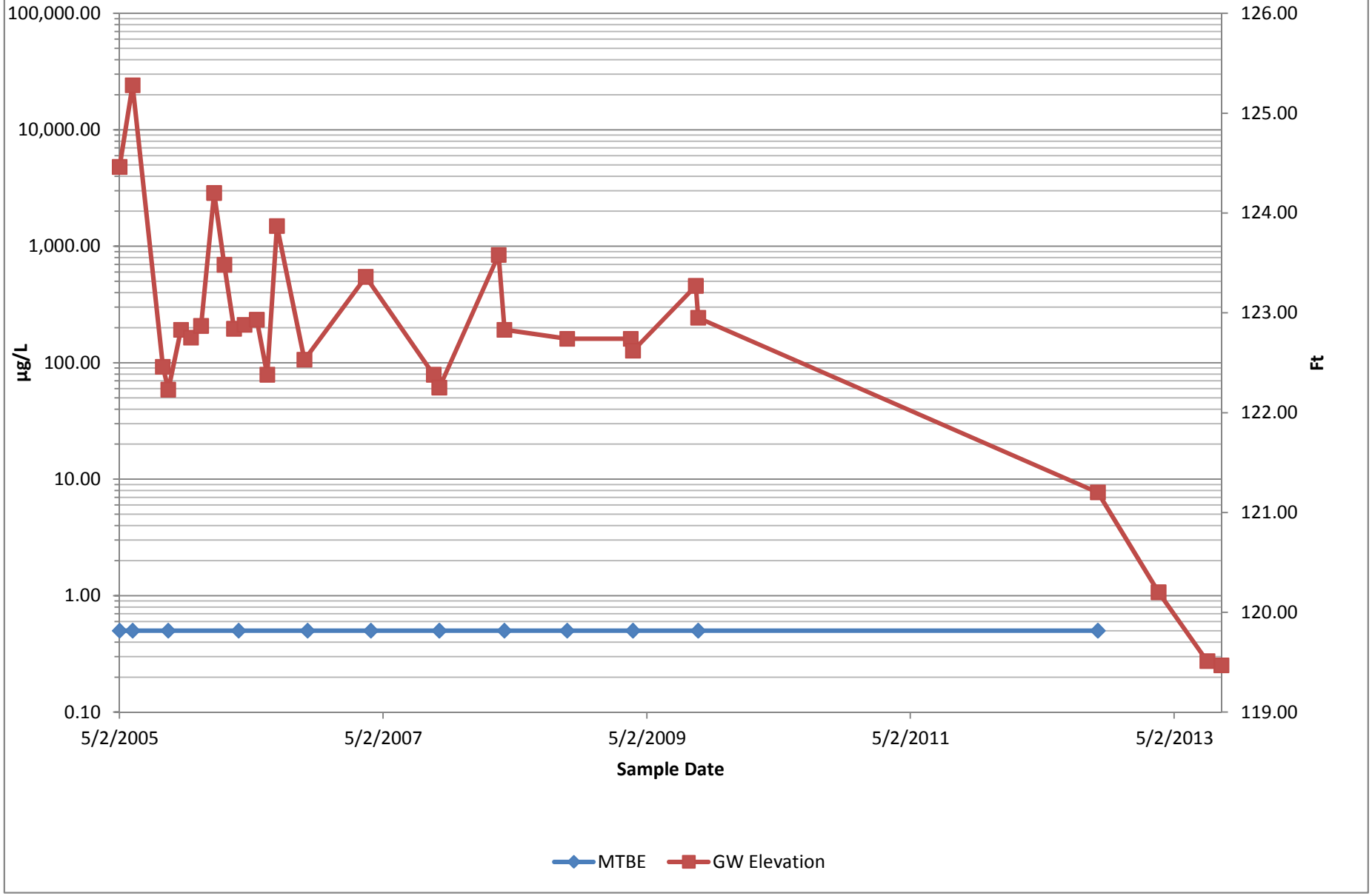


Figure 25: MW-33S MTBE Trend Analysis

Former Chevron Facility 122208



ARCADIS

Appendix A

Dual-Phase Extraction System - Groundwater Extraction Data

ARCADIS

APPENDIX A

**DUAL-PHASE EXTRACTION SYSTEM –
GROUNDWATER EXTRACTION DATA**

DESCRIPTION OF DATA TABLES

Chevron uses a central database to store remediation system data and laboratory analytical data. The tabulated data in Tables A-1, A-2, A-3, A-4, and A-5 is an exported summary of the total fluids extraction system data from the database. These data were recorded by the field technician during site visits. The analytical data for influent samples collected for laboratory analysis (Table A-2) are used to calculate the mass (and to estimate the volume) of hydrocarbons recovered in the dissolved phase. Effluent sample data are included in Table A-3 for comparison with permit limits.

The data table includes recent system data. Historical data collected are available in previous progress reports.

The following table lists the column headings in the table with a brief description of each. Please refer to the piping and instrumentation Diagram (Appendix H) for a schematic of equipment and sample ports.

Column Heading	Description
Date / Time	Date and time data were recorded.
System Status	System ON or OFF when technician recorded the data.
Influent BTEX (µg/L)	Sum of benzene, toluene, ethylbenzene, and total xylenes from influent sample port SP-1.
Effluent BTEX (µg/L)	Sum of benzene, toluene, ethylbenzene, and total xylenes from effluent sample port SP-3.
Treatment Efficiency (%)	Equation: (Influent-Effluent) / (Influent).
Totalizer Reading (gallons)	Reading on the totalizing flow meter.
Pumped Period (gallons)	Equation: (current totalizer reading) – (previous totalizer reading).
Pumped Total (gallons)	Cumulative total gallons of groundwater recovered.
Period Average (GPM)	Equation: (Gallons Pumped During Period) / (current Date-Time – previous Date-Time)
Hydrocarbons Recovered Period (gallons)[1]	Equation: [Avg. Influent BTEX (ug/L)] * e^6 * (1/0.2) * (3.785 L/gal) * (1 lb/453.6 g) * (gallons pumped) * (1 gal/6.26 lbs). NOTE: Formula assumes BTEX equals 20% of gasoline.
Hydrocarbons Recovered Cumulative (gallons)	Equation: (Hydrocarbons Recovered During Period) + (Previous Cumulative)
Operating Extraction Points	Wells in operation during the reporting period.

Notes:

(1) Assumptions: BTEX is 20% of hydrocarbon product by volume; density of hydrocarbon product is 6.26 pounds/gallon. The Average (Avg.) Influent BTEX concentration is defined as the mean of the influent concentration for the current and previous sampling events.

ARCADIS

Chevron

TABLE A-1: TOTAL FLUIDS EXTRACTION SYSTEM DATA
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MD

Date/Time	System Status	Influent BTEX (µg/L)	Effluent BTEX (µg/L)	Treatment Efficiency (%)	Totalizer Reading (gallons)	Period Pumped (gallons)	Total Pumped (gallons)	Period Average (GPM)	Hydrocarbons Recovered Period (gallons)	Hydrocarbons Recovered Cumul. (gallons)	Operating Extraction Points
7/2/12 8:46	ON	443	0	100.0	47,767,322	60,687	60,472,244	6.10	0.47	925.09	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7 RW-5
7/9/12 9:56	ON	NS	0	-	47,767,819	497	60,472,741	0.05	-	925.09	Totalizer malfunctioning (not counting). Total gallons is incorrect. RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7 RW-5
7/9/12 12:51	OFF	NS	NS	-	47,767,819	0	60,472,741	0.00	-	925.09	Off for cleaning of totalizer paddle. Total gallons is incorrect due to malfunctioning totalizer.
7/9/12 14:50	ON	NS	NS	-	47,767,819	0	60,472,741	0.00	-	925.09	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7 RW-5
7/16/12 11:21	ON	NS	0	-	47,820,897	53,078	60,525,819	5.38	-	925.09	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7 RW-5
7/16/12 12:15	OFF	NS	NS	-	47,821,181	284	60,526,103	5.26	-	925.09	Off for cleaning of view tubes on OWS and AST
7/16/12 13:19	ON	NS	0	-	47,821,181	0	60,526,103	0.00	-	925.09	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7 RW-5
7/23/12 12:50	ON	NS	NS	-	47,876,302	55,121	60,581,224	5.48	-	925.09	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7 RW-5
8/1/12 9:12	ON	NS	0	-	47,924,025	47,723	60,628,947	3.75	-	925.09	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7 RW-5
8/1/12 11:23	OFF	NS	NS	-	47,942,748	18,723	60,647,670	142.92	-	925.09	Off for cleaning of oil-water separator
8/6/12 13:16	ON	NS	0	-	47,942,748	0	60,647,670	0.00	-	925.09	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7 RW-5
8/6/12 17:10	OFF	NS	NS	-	47,943,629	881	60,648,551	3.76	-	925.09	System shut down due to malfunctioning float in AST
8/8/12 9:46	ON	NS	NS	-	47,943,629	0	60,648,551	0.00	-	925.09	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7 RW-5
8/15/12 8:42	OFF	NS	NS	-	47,995,950	52,321	60,700,872	5.22	-	925.09	Shut down due to leak in carbon vessel
8/20/12 9:21	ON	3,300	0	100.0	47,995,950	0	60,700,872	0.00	2.85	927.94	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7 RW-5
8/27/12 9:20	ON	NS	0	-	48,055,618	59,668	60,760,540	5.92	-	927.94	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7 RW-5
9/1/12 0:00	ON	NS	NS	-	48,081,292	25,674	60,786,214	3.87	-	927.94	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7 RW-5
9/4/12 8:38	ON	479	0	100.0	48,116,529	35,237	60,821,451	7.28	1.52	929.46	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7 RW-5
9/10/12 9:42	ON	NS	0	-	48,166,689	50,160	60,871,611	5.76	-	929.46	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7 RW-5
9/17/12 9:46	ON	NS	0	-	48,225,321	58,632	60,930,243	5.81	-	929.46	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7 RW-5
9/24/12 13:46	ON	NS	0	-	48,283,905	58,584	60,988,827	5.68	-	929.46	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7 RW-5
10/1/12 9:00	ON	511	0	100.0	48,337,337	53,432	61,042,259	5.46	0.73	930.19	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7 RW-5
10/8/12 9:43	ON	NS	0	-	48,392,693	55,356	61,097,615	5.47	-	930.19	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7 RW-5
10/15/12 13:00	ON	NS	3.7	-	48,457,989	65,296	61,162,911	6.35	-	930.19	Estimated

ARCADIS

Chevron

TABLE A-1: TOTAL FLUIDS EXTRACTION SYSTEM DATA
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MD

Date/Time	System Status	Influent BTEX (µg/L)	Effluent BTEX (µg/L)	Treatment Efficiency (%)	Totalizer Reading (gallons)	Period Pumped (gallons)	Total Pumped (gallons)	Period Average (GPM)	Hydrocarbons Recovered Period (gallons)	Hydrocarbons Recovered Cumul. (gallons)	Operating Extraction Points
10/23/12 9:36	ON	NS	NS	-	48,517,289	59,300	61,222,211	5.24	-	930.19	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7 RW-5
10/23/12 10:20	OFF	NS	NS	-	48,517,550	261	61,222,472	5.93	-	930.19	Shut down due to oil/water separator pump leaking, air stripper tray being broken, and carbon being spent
11/9/12 11:10	ON	NS	NS	-	48,517,550	0	61,222,472	0.00	-	930.19	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7
11/9/12 12:45	OFF	NS	NS	-	48,517,889	339	61,222,811	3.57	-	930.19	Shut down due to pressure on carbon units and bag filters being too high
11/12/12 9:50	ON	NS	NS	-	48,517,889	0	61,222,811	0.00	-	930.19	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7
11/19/12 9:04	ON	391	0	100.0	48,576,018	58,129	61,280,940	5.79	0.72	930.91	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7
11/26/12 11:48	ON	NS	0	-	48,637,017	60,999	61,341,939	5.95	-	930.91	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7 RW-5
12/3/12 10:18	ON	563	0	100.0	48,695,667	58,650	61,400,589	5.87	0.38	931.29	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7 RW-5
12/4/12 11:59	ON	NS	NS	-	48,704,839	9,172	61,409,761	5.95	-	931.29	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7 RW-5
12/10/12 9:50	ON	NS	0	-	48,758,755	53,916	61,463,677	6.33	-	931.29	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7 RW-5
12/17/12 8:04	ON	NS	0	-	48,820,437	61,682	61,525,359	6.18	-	931.29	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7 RW-5
12/27/12 9:31	ON	NS	0	-	48,907,858	87,421	61,612,780	6.03	-	931.29	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7 RW-5
12/30/12 1:00	OFF	NS	NS	-	48,930,652	22,794	61,635,574	5.98	-	931.29	Off due to compressor fault from low oil.
1/2/13 12:30	ON	1,990	0	100.0	48,930,652	0	61,635,574	0.00	2.00	933.29	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7 RW-5
1/2/13 19:50	OFF	NS	NS	-	48,932,272	1,620	61,637,194	3.68	-	933.29	Off due to unknown reason
1/7/13 10:27	ON	NS	0	-	48,932,272	0	61,637,194	0.00	-	933.29	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7 RW-5
1/11/13 12:26	OFF	NS	NS	-	48,969,288	37,016	61,674,210	6.30	-	933.29	Off due to SVE knockout tank leaking and triggering sump alarm
1/15/13 11:30	ON	NS	0	-	48,969,288	0	61,674,210	0.00	-	933.29	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7 RW-5
1/16/13 16:30	OFF	NS	NS	-	48,980,806	11,518	61,685,728	6.62	-	933.29	Off due to floor sump alarm.
1/21/13 9:48	ON	NS	0	-	48,980,806	0	61,685,728	0.00	-	933.29	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7 RW-5
1/28/13 11:47	ON	NS	NS	-	49,044,657	63,851	61,749,579	6.26	-	933.29	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7 RW-5
2/1/13 0:01	ON	NS	NS	-	49,075,121	30,464	61,780,043	6.03	-	933.29	Estimated
2/4/13 11:56	ON	382	0	100.0	49,105,471	30,350	61,810,393	6.03	1.38	934.67	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7 RW-5
2/11/13 10:12	ON	NS	0	-	49,164,164	58,693	61,869,086	5.88	-	934.67	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7 RW-5
2/18/13 11:11	ON	NS	0	-	49,223,755	59,591	61,928,677	5.88	-	934.67	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7 RW-5

ARCADIS

Chevron

TABLE A-1: TOTAL FLUIDS EXTRACTION SYSTEM DATA
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MD

Date/Time	System Status	Influent BTEX (µg/L)	Effluent BTEX (µg/L)	Treatment Efficiency (%)	Totalizer Reading (gallons)	Period Pumped (gallons)	Total Pumped (gallons)	Period Average (GPM)	Hydrocarbons Recovered Period (gallons)	Hydrocarbons Recovered Cumul. (gallons)	Operating Extraction Points
2/25/13 9:30	ON	NS	NS	-	49,283,296	59,541	61,988,218	5.97	-	934.67	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7 RW-5
2/25/13 9:31	OFF	NS	NS	-	49,283,296	0	61,988,218	0.00	-	934.67	Off for Air Stripper cleaning.
2/25/13 11:30	ON	NS	0	-	49,283,296	0	61,988,218	0.00	-	934.67	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7 RW-5
3/1/13 0:01	ON	NS	NS	-	49,313,595	30,299	62,018,517	5.98	-	934.67	Estimated
3/4/13 9:50	ON	1,530	0	100.0	49,342,927	29,332	62,047,849	5.98	1.51	936.18	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7 RW-5
3/12/13 8:21	ON	NS	0	-	49,408,712	65,785	62,113,634	5.75	-	936.18	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7 RW-5
3/18/13 10:15	ON	NS	0	-	49,457,411	48,699	62,162,333	5.56	-	936.18	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7
3/26/13 10:12	ON	NS	0	-	49,519,319	61,908	62,224,241	5.38	-	936.18	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7
4/1/13 13:41	ON	1,243	0	100.0	49,567,190	47,871	62,272,112	5.41	2.07	938.26	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7
4/8/13 10:30	ON	NS	0	-	49,619,823	52,633	62,324,745	5.32	-	938.26	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7
4/15/13 10:00	ON	NS	0	-	49,670,966	51,143	62,375,888	5.09	-	938.26	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7
4/22/13 9:00	ON	NS	0	-	49,723,236	52,270	62,428,158	5.22	-	938.26	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7
4/30/13 13:22	ON	NS	NS	-	49,782,588	59,352	62,487,510	5.04	-	938.26	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7
5/1/13 0:01	ON	NS	NS	-	49,785,630	3,042	62,490,552	4.76	-	938.26	Estimated
5/6/13 9:23	ON	144	0	100.0	49,822,579	36,949	62,527,501	4.76	1.18	939.44	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7
5/14/13 9:54	ON	NS	0	-	49,880,363	57,784	62,585,285	5.00	-	939.44	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7
5/20/13 9:00	ON	NS	0	-	49,919,170	38,807	62,624,092	4.52	-	939.44	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7
5/28/13 11:26	ON	NS	0	-	49,970,125	50,955	62,675,047	4.37	-	939.44	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7
6/1/13 0:01	ON	NS	NS	-	49,985,475	15,350	62,690,397	3.02	-	939.44	Estimated
7/1/13 7:00	ON	225.20	0.00	100.00	50,127,525	142050	62,832,447	3.26	0.38	939.81	RW1 RW2 RW3 RW-4 MW-22 PTWB GP-27R GP-39R MW-7
7/7/13 20:30	OFF	NS	NS	-	50,179,749	52224	62,884,671	5.53	-	939.81	
7/8/13 8:30	ON	NS	0.00	-	50,179,749	0	62,884,671	0.00	-	939.81	RW1 RW2 RW3 RW-4 MW-22 PTWB GP-27R GP-39R MW-7
7/15/13 7:45	ON	NS	0.00	-	50,224,405	44656	62,929,327	4.45	-	939.81	RW1 RW2 RW3 RW-4 MW-22 PTWB GP-27R GP-39R MW-7
7/20/13 15:00	OFF	NS	NS	-	50,260,915	36510	62,965,837	4.78	-	939.81	
7/23/13 9:38	ON	NS	0.00	-	50,260,915	0	62,965,837	0.00	-	939.81	Down due to blown fuse in the control panel and bad battery backup
7/29/13 7:00	ON	NS	0.00	-	50,301,088	40173	63,006,010	4.74	-	939.81	RW1 RW2 RW-4 MW-22 PTWB GP-27R GP-39R MW-7
8/5/13 7:00	ON	341.00	0.00	100.00	50,343,174	42086	63,048,096	4.18	0.41	940.22	RW1 RW2 RW-4 MW-22 GP-27R GP-39R MW-7

TABLE A-1: TOTAL FLUIDS EXTRACTION SYSTEM DATA
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MD

Date/Time	System Status	Influent BTEX (µg/L)	Effluent BTEX (µg/L)	Treatment Efficiency (%)	Totalizer Reading (gallons)	Period Pumped (gallons)	Total Pumped (gallons)	Period Average (GPM)	Hydrocarbons Recovered Period (gallons)	Hydrocarbons Recovered Cumul. (gallons)	Operating Extraction Points
8/12/13 12:30	ON	NS	0.00	-	50,382,943	39769	63,087,865	3.82	-	940.22	RW1 RW2 RW3 RW-4 MW-22 PTWB GP-27R GP-39R MW-7
8/19/13 7:40	ON	NS	0.00	-	50,460,574	77631	63,165,496	7.93	-	940.22	RW1 RW2 RW3 RW-4 MW-22 PTWB GP-27R GP-39R MW-7
8/26/13 8:00	ON	NS	NS	-	50,539,228	78654	63,244,150	7.79	-	940.22	RW1 RW2 RW3 RW-4 MW-22 PTWB GP-27R GP-39R MW-7
9/1/13 13:04	OFF	NS	NS	-	50,608,831	69603	63,313,753	7.78	-	940.22	
9/4/13 10:35	OFF	NS	0.00	-	50,608,831	0	63,313,753	0.00	-	940.22	Down due to compressor fault from low oil
9/4/13 11:50	ON	NS	NS	-	50,608,831	0	63,313,753	0.00	-	940.22	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7
9/6/13 13:05	ON	NS	NS	-	50,627,524	18693	63,332,446	6.33	-	940.22	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7
9/10/13 13:59	OFF	NS	NS	-	-	-	0	-	-	940.22	
9/12/13 12:00	ON	NS	NS	-	-	-	0	-	-	940.22	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7
9/13/13 8:15	OFF	NS	NS	-	50,672,643	45119	63,377,565	37.13	-	940.22	
9/13/13 12:00	ON	NS	NS	-	50,672,643	0	63,377,565	0.00	-	940.22	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7
9/15/13 12:00	OFF	NS	NS	-	50,674,231	1588	63,379,153	0.55	-	940.22	Down due to trailer sump high level
9/17/13 9:00	OFF	NS	NS	-	50,674,231	0	63,379,153	0.00	-	940.22	Down due to pipe repair
9/19/13 8:15	ON	NS	NS	-	50,674,231	0	63,379,153	0.00	-	940.22	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7
9/19/13 16:00	OFF	3340.00	0.00	100.00	50,674,231	0	63,379,153	0.00	4.06	944.28	Down due to pipe repair
9/30/13 7:55	ON	NS	NS	-	50,674,231	0	63,379,153	0.00	-	944.28	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7
9/30/13 8:35	OFF	NS	0.00	-	50,678,184	3953	63,383,106	98.82	-	944.28	Down due to pipe repair
10/10/13 9:45	OFF	2810.00	0.00	100.00	50,678,998	814	63,383,920	0.06	0.10	944.38	Down due to pipe repair
10/11/13 12:00	ON	NS	NS	-	-	-	-	-	-	944.38	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7
11/7/13 13:19	ON	NS	0.00	-	50,687,283	8285	63,392,205	0.21	-	944.38	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7
11/13/13 8:00	ON	NS	NS	-	50,739,349	52066	63,444,271	6.26	-	944.38	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7
11/14/13 8:25	ON	571.00	0.00	100.00	50,747,738	8389	63,452,660	5.73	0.77	945.15	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7
11/21/13 0:00	ON	NS	NS	-	50,826,588	78850	63,531,510	8.23	-	945.15	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7
11/26/13 11:00	ON	NS	0.00	-	50,892,219	65631	63,597,141	8.35	-	945.15	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7
12/2/13 9:34	OFF	NS	NS	-	50,914,780	22561	63,619,702	2.64	-	945.15	Down due to engagement of exterior emergency stop button
12/6/13 12:00	OFF	NS	NS	-	50,914,780	0	63,619,702	0.00	-	945.15	Down due to engagement of exterior emergency stop button
12/18/13 0:00	ON	798.00	0.00	100.00	50,914,780	0	63,619,702	0.00	0.76	945.91	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7
12/30/13 14:00	ON	NS	0.00	-	51,046,111	131331	63,751,033	7.25	-	945.91	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7

TABLE A-1: TOTAL FLUIDS EXTRACTION SYSTEM DATA
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MD

Date/Time	System Status	Influent BTEX (µg/L)	Effluent BTEX (µg/L)	Treatment Efficiency (%)	Totalizer Reading (gallons)	Period Pumped (gallons)	Total Pumped (gallons)	Period Average (GPM)	Hydrocarbons Recovered Period (gallons)	Hydrocarbons Recovered Cumul. (gallons)	Operating Extraction Points
1/2/14 9:34	OFF	NS	NS	-	51,075,832	29721	63,780,754	7.33	-	945.91	Down due to engagement of exterior emergency stop button
1/6/14 8:30	OFF	NS	0.00	-	51,075,832	0	63,780,754	0	-	945.91	Down due to engagement of exterior emergency stop button
1/6/14 10:00	ON	NS	NS	-	51,075,832	0	63,780,754	0	-	945.91	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7

Notes:

(1) Hydrocarbons Recovered Period (gallons) = (avg. inf. conc.) x (e-6) x (1/0.2) x (3.785 L/gal) x (1 lb/453.6 g) x (gallons pumped) x (1 gal/6.26 lbs).

(2) Formula assumes BTEX equals 20% of gasoline.

ARCADIS

Chevron

TABLE A-2: TOTAL FLUIDS EXTRACTION SYSTEM INFLUENT ANALYTICAL RESULTS
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECMEBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MD

Date/Time	Benzene (µg/L)	Toluene (µg/L)	E. Benzene (µg/L)	Xylenes (µg/L)	BTEX (µg/L)	MTBE (µg/L)
09/9/2009 0900	1,200	1,700	150	1,010	4,060	600
10/28/09 10:00	130	200	19	163	512	180
11/23/09 14:35	100	200	23	187	510	130
12/22/09 13:00	410	600	70	520	1,600	300
1/4/10 10:41	400	590	55	400	1,445	340
2/2/10 8:50	150	300	26	240	716	160
3/1/10 9:08	150	260	26	206	642	210
4/27/10 12:10	460	800	85	590	1,935	360
5/3/10 10:25	390	650	57	470	1,567	460
6/2/10 13:55	630	1,100	130	730	2,590	340
7/12/10 11:35	1,800	2,800	300	1,770	6,670	900
8/9/10 14:42	550	850	99	670	2,169	430
9/15/10 13:10	150	260	25	228	663	160
10/4/10 13:08	550	810	59	460	1,879	220
11/5/10 11:20	580	890	61	490	2,021	360
12/6/10 10:36	240	380	30	250	900	260
1/3/11 10:40	480	630	67	370	1,547	250
2/2/11 12:03	150	230	21	155	556	99
8/19/11 13:20	740	1,000	110	770	2,620	480
10/3/11 9:10	470	680	62	480	1,692	560
11/7/11 7:51	700	910	83	680	2,373	580
12/5/11 9:00	560	860	77	610	2,107	530
1/3/12 8:30	380	560	56	400	1,396	440
2/2/12 13:06	320	580	61	420	1,381	350
3/5/12 12:54	520	1,100	150	1,020	2,790	490
4/2/12 10:35	660	1,400	140	830	3,030	430
5/2/12 10:55	300	600	59	410	1,369	370
6/5/12 8:57	81	140	13	107	341	160
7/2/12 8:55	89	170	20	164	443	170
8/20/12 11:33	780	1,300	170	1,050	3,300	510
9/4/12 10:00	110	190	18	161	479	160
10/1/12 9:00	120	210	19	162	511	190
11/19/12 9:00	100	150	14	127	391	160
12/3/12 9:30	140	220	24	179	563	210
1/2/13 14:00	450	780	100	660	1,990	260
2/4/13 11:00	88	150	15	129	382	150
3/4/13 10:00	290	580	60	600	1,530	210
4/1/13 12:30	260	480	43	460	1,243	220
5/6/13 8:50	45	55	4	40	144	80
7/1/13 7:00	54	87	9	75	225	50
8/5/13 9:45	84	130	12	115	341	130
9/19/13 8:45	920	1,300	190	930	3,340	210
10/10/13 9:45	800	1,100	140	770	2,810	240
11/14/13 8:25	160	230	22	159	571	160
12/1/13 9:30	220	320	32	226	798	200

Notes:

(1) ND: Not Detected above reporting limit.

(2) <##: Parameter not detected above the reporting limit.

ARCADIS

Chevron

TABLE A-3: TOTAL FLUIDS EXTRACTION SYSTEM EFFLUENT ANALYTICAL RESULTS
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECMEBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MD

Date/Time	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Xylene (µg/L)	BTEX (µg/L)	MTBE (µg/L)
9/9/2009 0910	<1	<1	<1	<3	0	1.5
9/17/09 15:50	<1	<1	<1	<3	0	6.5
9/21/09 12:24	<1	<1	<1	<3	0	8.9
10/5/09 13:01	<1	<1	<1	<3	0	18
10/12/09 7:20	<1	<1	<1	<3	0	14
10/19/09 12:58	<1	<1	<1	<3	0	36
10/28/09 8:45	<1	<1	<1	<10	0	33
11/2/09 11:55	<1	<1	<1	<10	0	34
11/9/09 8:45	<1	<1	<1	<10	0	36
11/23/2009 14:45:00 PM	<1	<1	<1	<10	0	39
12/4/09 12:51	<1	<1	<1	<10	0	63
12/10/09 12:15	<1	<1	<1	<10	0	66
12/22/09 13:25	<1	<1	<1	<10	0	<1
12/28/09 13:00	<1	<1	<1	<10	0	<1
1/4/10 10:52	<1	<1	<1	<10	0	<1
1/12/10 12:57	<1	<1	<1	<10	0	<1
1/18/10 13:00	<1	<1	<1	<10	0	1.2
1/25/10 10:00	<1	<1	<1	<10	0	2.7
2/2/10 8:00	<1	<1	<1	<10	0	4.9
2/16/10 13:00	<1	<1	<1	<10	0	8.4
2/22/10 12:50	<1	<1	<1	<10	0	9.3
3/1/10 9:14	<1	<1	<1	<10	0	13
3/8/10 11:30	<1	<1	<1	<10	0	12
3/15/10 9:50	<1	<1	<1	<10	0	15
3/22/10 12:06	<1	<1	<1	<10	0	19
4/20/10 14:30	<1	<1	<1	<10	0	9
4/27/10 12:26	<1	<1	<1	<10	0	15
5/3/10 10:33	<1	<1	<1	<10	0	17
5/10/10 12:15	<1	<1	<1	<10	0	19
5/17/10 9:00	<1	<1	<1	<10	0	16
5/24/10 11:30	<1	<1	<1	<10	0	19
6/2/10 14:10	<1	<1	<1	<10	0	17
6/7/10 14:50	<1	<1	<1	<10	0	17
6/14/10 12:00	<1	<1	<1	<10	0	19
7/12/10 11:25	<1	<1	<1	<10	0	20
7/19/10 12:14	<1	<1	<1	<10	0	17
7/26/10 10:00	<1	<1	<1	<10	0	13
8/4/10 14:02	<1	<1	<1	<10	0	<1
8/9/10 14:49	<1	<1	<1	<10	0	<1
8/16/10 9:50	<1	<1	<1	<10	0	<1
8/23/10 8:53	<1	<1	<1	<10	0	<1
9/7/10 15:10	<1	<1	<1	<10	0	<1
9/15/10 13:17	<1	<1	<1	<10	0	<1
9/20/10 8:55	<1	<1	<1	<10	0	<1
9/27/10 15:05	<1	<1	<1	<10	0	<1
10/4/10 13:12	<1	<1	<1	<10	0	<1
10/11/10 13:50	<1	<1	<1	<10	0	<1
10/19/10 13:30	<1	<1	<1	<10	0	1.1
10/25/10 14:00	<1	<1	<1	<10	0	3.4
11/5/10 11:12	<1	<1	<1	<10	0	6.6

ARCADIS

Chevron

TABLE A-3: TOTAL FLUIDS EXTRACTION SYSTEM EFFLUENT ANALYTICAL RESULTS
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECMEBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MD

Date/Time	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Xylene (µg/L)	BTEX (µg/L)	MTBE (µg/L)
11/15/10 10:15	<1	<1	<1	<10	0	7.6
11/29/10 14:27	<1	<1	<1	<10	0	10
11/30/10 17:00	<1	<1	<1	<10	0	8.5
12/6/10 10:25	<1	<1	<1	<10	0	9.5
12/13/10 10:37	<1	<1	<1	<10	0	6.7
12/20/10 10:30	<1	<1	<1	<10	0	11
12/27/10 13:15	<1	<1	<1	<10	0	8
1/3/11 10:45	<1	<1	<1	<10	0	9.7
1/10/11 11:15	<1	<1	<1	<10	0	<1
1/19/11 10:15	<1	<1	<1	<10	0	3.9
1/25/11 12:32	<1	<1	<1	<10	0	9.5
2/2/11 12:12	<1	<1	<1	<10	0	9.7
2/7/11 10:45	<1	<1	<1	<10	0	8.8
2/21/11 9:55	<1	<1	<1	<5	0	12
2/28/11 9:00	<1	<1	<1	<5	0	12
3/21/11 12:15	<1	<1	<1	<5	0	16
8/19/11 13:42	<1	<1	<1	<10	0	<1
9/6/11 13:50	<1	<1	<1	<10	0	<1
9/19/11 9:11	<1	<1	<1	<10	0	<1
9/30/11 9:30	<1	<1	<1	<10	0	<1
10/3/11 9:03	<1	<1	<1	<10	0	<1
10/10/11 10:57	<1	<1	<1	<10	0	<1
10/17/11 10:45	<1	<1	<1	<10	0	<1
10/24/11 8:51	<1	<1	<1	<10	0	<1
11/7/11 8:03	<1	<1	<1	<10	0	<1
11/14/11 9:07	<1	<1	<1	<10	0	1.4
11/21/11 8:35	<1	<1	<1	<10	0	1.8
11/28/11 7:41	<1	<1	<1	<10	0	3.1
12/5/11 9:05	<1	<1	<1	<10	0	4.3
12/12/11 13:10	<1	<1	<1	<10	0	3.4
12/19/11 12:10	<1	<1	<1	<10	0	2.2
12/27/11 12:33	<1	<1	<1	<10	0	2.7
1/3/12 8:45	<1	<1	<1	<10	0	2.3
1/9/12 8:19	<1	<1	<1	<10	0	4.1
1/16/12 10:13	<1	<1	<1	<10	0	4.6
1/23/12 8:17	<1.0	<1.0	<1.0	<10	0	2.6
2/2/12 13:14	<1	<1	<1	<10	0	5
2/13/12 11:20	<1	<1	<1	<10	0	8.8
2/20/12 9:38	<1	<1	<1	<10	0	7.6
2/27/12 8:10	<1	<1	<1	<10	0	7.5
3/5/12 13:05	<1	<1	<1	<10	0	6.6
3/12/12 8:20	<1	<1	<1	<10	0	5.2
3/19/12 10:15	<1	<1	<1	<10	0	4.5
3/26/12 8:25	<1	<1	<1	<10	0	4.5
4/2/12 10:15	<1	<1	<1	<10	0	3.2
4/9/12 9:40	<1	<1	<1	<10	0	3.5
4/16/12 9:00	<1	<1	<1	<10	0	3.7
4/23/12 9:15	<1	<1	<1	<10	0	2.1
5/2/12/ 1045	<1	<1	<1	<10	0	2.3
5/7/12 10:30	<1	<1	<1	<10	0	2.3

ARCADIS

Chevron

TABLE A-3: TOTAL FLUIDS EXTRACTION SYSTEM EFFLUENT ANALYTICAL RESULTS
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECMEBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MD

Date/Time	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Xylene (µg/L)	BTEX (µg/L)	MTBE (µg/L)
5/14/12 10:58	<1	<1	<1	<10	0	3.2
5/23/12 9:10	<1	<1	<1	<10	0	2.1
6/5/12 9:10	<1	<1	<1	<10	0	2
6/11/12 9:49	<1	<1	<1	<10	0	2.6
6/25/12 13:50	<1	<1	<1	<10	0	3.4
7/2/12 9:10	<1	<1	<1	<10	0	3.8
7/9/12 11:14	<1	<1	<1	<10	0	2
7/16/12 11:15	<1	<1	<1	<10	0	2.3
7/23/12 13:20	<1	<1	<1	<10	0	1.6
8/1/12 10:45	<1	<1	<1	<10	0	1.5
8/6/12 14:40	<1	<1	<1	<10	0	2.9
8/20/12 11:38	<1	<1	<1	<10	0	3.4
8/27/12 8:30	<1	<1	<1	<10	0	2.3
9/4/12 10:15	<1	<1	<1	<10	0	1.3
9/10/12 10:35	<1	<1	<1	<10	0	1.1
9/17/12 10:00	<1	<1	<1	<10	0	<1
9/24/12 10:00	<1	<1	<1	<10	0	<1
10/1/12 9:10	<1	<1	<1	<10	0	<1
10/8/12 10:00	<1	<1	<1	<10	0	<1
10/15/12 13:00	1.4	2.3	<1	<10	3.7	2.8
11/19/12 9:15	<1	<1	<1	<10	0	<1
11/26/12 11:50	<1	<1	<1	<10	0	<1
12/3/12 9:45	<1	<1	<1	<10	0	<1
12/10/12 14:20	<1	<1	<1	<10	0	<1
12/17/12 8:15	<1	<1	<1	<10	0	<1
12/27/12 9:30	<1	<1	<1	<10	0	<1
1/2/13 14:15	<1	<1	<1	<10	0	<1
1/7/13 9:30	<1	<1	<1	<10	0	<1
1/15/13 13:00	<1	<1	<1	<10	0	<1
1/21/13 12:30	<1	<1	<1	<10	0	<1
2/4/13 11:15	<1	<1	<1	<10	0	<1
2/11/13 12:38	<1	<1	<1	<10	0	<1
2/18/13 11:00	<1	<1	<1	<10	0	<1
2/25/13 12:20	<1	<1	<1	<10	0	<1
3/4/13 10:15	<1	<1	<1	<10	0	<1
3/12/13 9:15	<1	<1	<1	<10	0	<1
3/18/13 12:00	<1	<1	<1	<10	0	<1
3/26/13 11:00	<1	<1	<1	<10	0	<1
4/1/13 12:45	<1	<1	<1	<10	0	<1
4/11/13 14:30	<1	<1	<1	<10	0	<1
4/15/13 11:00	<1	<1	<1	<10	0	<1
4/22/13 11:15	<1	<1	<1	<10	0	<1
5/6/13 9:05	<1	<1	<1	<10	0	<1
5/14/13 10:20	<1	<1	<1	<10	0	<1
5/20/13 9:00	<1	<1	<1	<10	0	<1
5/28/13 14:00	<1	<1	<1	<10	0	<1
7/1/13 8:05	<1	<1	<1	<10	0	<1
7/8/13 11:30	<1	<1	<1	<10	0	<1
7/15/13 7:45	<1	<1	<1	<10	0	<1
7/23/13 11:00	<1	<1	<1	<10	0	<1
7/29/13 7:00	<1	<1	<1	<10	0	<1
8/5/13 9:00	<1	<1	<1	<10	0	<1
8/12/13 12:30	<1	<1	<1	<10	0	<1

TABLE A-3: TOTAL FLUIDS EXTRACTION SYSTEM EFFLUENT ANALYTICAL RESULTS
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECMEBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MD

Date/Time	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Xylene (µg/L)	BTEX (µg/L)	MTBE (µg/L)
8/19/13 7:40	<1	<1	<1	<10	0	<1
9/19/13 9:20	<1	<1	<1	<10	0	<1
9/30/13 8:30	<1	<1	<1	<10	0	1
10/10/13 9:40	<1	<1	<1	<10	0	<1
11/14/13 8:50	<1	<1	<1	<10	0	<1
11/26/13 11:00	<1	<1	<1	<10	0	<1
12/18/13 10:00	<1	<1	<1	<10	0	<1
12/30/14:00	<1	<1	<1	<10	0	<1

Notes:

(1) ND: Not Detected above reporting limit.

(2) <##: Parameter not detected above the reporting limit.

TABLE A-4: AIR STRIPPER VAPOR CARBON INFLUENT ANALYTICAL RESULTS
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MD

Date/Time	Comp ID	Benzene (ppb)	Toluene (ppb)	E. Benzene (ppb)	Xylenes (ppb)	BTEX (ppb)	MTBE (ppb)
2/20/2012 0:00	SP-50	1.7	2.4	0.27	1.9	6.27	-
3/12/2012 0:00	SP-50	0.051	0.14	<0.017	0.11	0.301	-
4/9/2012 0:00	SP-50	2.2	2.9	0.2	1.3	6.6	-
5/23/2012 0:00	SP-50	0.024	0.19	<.0087	0.087	0.301	-
6/5/2012 0:00	SP-50	0.093	0.39	0.071	0.53	1.084	-
7/2/2012 10:15	SP-50	2	2.8	0.29	1.7	6.79	-
9/4/2012 9:15	SP-50	<0.0064	0.032	<0.0087	<0.0087	0.032	-
10/1/2012 10:45	SP-50	1.9	2.3	0.15	1.2	5.55	-
11/26/2012 12:25	SP-50	0.18	0.2	0.017	0.11	0.507	-
8/5/2013 10:55	SP-50	4.7	14	1.5	10.1	30.3	24
9/19/2013 9:40	SP-50	1300	1400	110	460	3270	390
10/10/2013 10:00	SP-50	1400	1300	120	470	3290	370
11/14/2013 9:30	SP-50	560	770	68	380	1778	470
12/19/2013 9:10	SP-50	300	330	27	150	807	250

Notes:
All values prior to 8/5/2013 are in µg/L

TABLE A-5: AIR STRIPPER VAPOR CARBON EFFLUENT ANALYTICAL RESULTS
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MD

Date	Comp ID	Benzene (ppb)	Toluene (ppb)	E. Benzene (ppb)	Xylenes (ppb)	BTEX (ppb)	MTBE (ppb)
2/20/2012 0:00	SP-52	0.52	0.61	0.05	0.38	1.56	-
3/12/2012 0:00	SP-52	0.9	1.5	0.16	1	3.56	-
4/9/2012 0:00	SP-52	0.83	1.5	0.19	1.1	3.62	-
5/23/2012 0:00	SP-52	0.86	0.89	0.074	0.4	2.224	-
6/5/2012 0:00	SP-52	1	1.4	0.15	1.3	3.85	-
7/2/2012 10:20	SP-52	0.83	1.1	0.15	0.99	3.07	-
9/4/2012 9:20	SP-52	0.72	0.88	0.06	0.33	1.99	-
10/1/2012 10:50	SP-52	0.71	1.2	0.11	0.62	2.64	-
11/26/2012 12:30	SP-52	0.91	0.54	0.045	0.25	1.745	-
7/1/2013 9:25	SP-52	130	220	<48	100	450	140
8/5/2013 11:05	SP-52	70	93	5.5	37	205.5	89
9/19/2013 9:50	SP-52	52	53	<430	<130	105	<430
10/10/2013 10:10	SP-52	180	150	50	<129	380	84
11/14/2013 9:40	SP-52	120	130	11	70	331	120
12/19/2013 9:00	SP-52	330	240	19	110	699	250

Notes:
All values prior to 7/1/2013 are in µg/L

ARCADIS

Appendix B

Dual-Phase Extraction System –
Soil Vapor Extraction Data

ARCADIS

APPENDIX B

DUAL-PHASE EXTRACTION SYSTEM – SOIL VAPOR EXTRACTION DATA

DESCRIPTION OF DATA TABLES

Overview

Chevron uses a central database to store remediation system data and laboratory analytical data. The tabulated data in Tables B-1, B-2 and B-3 is an exported summary of soil vapor extraction system data from the database. These data were recorded by the field technician during site visits. Analytical data for influent samples collected for laboratory analysis are included in Table B-2 to calculate the mass recovery rates of total petroleum hydrocarbons and benzene. Effluent sample data are included in Table B-3 for comparison with permit limits.

The data table includes recent system data. Historical data collected are available in previous progress reports.

The following table lists the column headings in the table with a brief description of each. Please refer to the piping and instrumentation Diagram (Appendix H) for a schematic of equipment and sample ports.

Column Heading	Description
Date / Time	Date and time data were recorded.
System Status	System ON or OFF when technician recorded the data.
Hour Meter (hours)	Field measurement of the hour meter.
Manifold Vacuum (in Hg)	Field measurement of vacuum in manifold.
Influent (ppmv)	Field measurement of vapor concentration prior to treatment using a photoionization detector.
Influent (cfm)	Field measurement of total vapor flow in manifold.
Effluent (ppmv)	Field measurement of vapor concentration after treatment using a photoionization detector.
Treatment Efficiency (%)	Equation: (Influent-Effluent) / (Influent).
Hydrocarbons Recovered (lbs/day) [1]	Equation: [(Influent) / (10^{-6})] * [Manifold Extraction-Flow Rate] * CV1
Hydrocarbons Recovered Period (gal)	Equation: [(Avg. Influent) x (10^{-6})] * [Avg. Manifold Extraction-Flow Rate]
Hydrocarbons Recovered Cumulative (gal)	Equation: (Avg. Influent BTEX) * (1 L / 0.26 gal) * (lb/454x10^{6} µg) * (current Total Gallons Pumped – previous Total Gallons Pumped on last sampling date) * (gal hydrocarbons / 6.48 lbs hydrocarbons) * (0.2 gal BTEX / gal hydrocarbons).
Operating Extraction Points	Wells in operation during the reporting period.

Notes:

(1) Assumptions: Hydrocarbon molecular weight is 92 grams/mole; vapor behaves like an ideal gas; Average (Avg.) Influent (ppmv) and flow rate (Manifold Extraction in the table) are averages between the current and last events. Unit conversion factors (CV) equations are:

CV1 = (92 grams/mole) * (1 mol/24.45 L) * (28.32 L/ft^3) * (1440 min/day) * (1 lb/454 grams) = 338 min*lbs/day.

CV2 = (92 grams/mole) * (1 mol/24.45 L) * (28.32 L/ft^3) * (Runtime in minutes) * (1 lb/454 grams) = 0.235 min*lbs.

ARCADIS

Chevron

TABLE B-1: SOIL VAPOR EXTRACTION SYSTEM DATA
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MD

Date/Time	System Status	Hour Meter (hours)	Manifold Vacuum (in. Hg)	Influent (ppmv)	Influent (SCFM)	Effluent (ppmv)	Treatment Efficiency	Hydrocarbons Recovered (lbs/day)	Period (gallons)	Cumul. (gallons)	Operating Extraction Points
7/2/12 8:49	ON	40,146.8	12	132	134	66.1	49.9	6.0	6.6	6,084.9	GP-27R MP-7 MW-22 MW-17 PTW-B RW-3 MW-7 RW-5 *FID Readings
7/9/12 9:55	ON	40,315.9	12	149	135	65.6	56.0	6.8	7.0	6,091.9	GP-27R MP-7 MW-22 MW-17 PTW-B RW-3 MW-7 RW-5 *FID Readings
7/9/12 12:51	OFF	40,318.9	-	-	-	-	-	-	0.1	6,092.1	Off for cleaning of totalizer paddle.
7/9/12 14:50	ON	40,318.9	-	-	-	-	-	-	-	6,092.1	GP-27R MP-7 MW-22 MW-17 PTW-B RW-3 MW-7 RW-5 *FID Readings
7/16/12 12:15	OFF	40,484.6	-	-	-	-	-	-	-	6,092.1	Off for cleaning of view tubes
7/16/12 13:19	ON	40,484.6	12	37	131	36.5	1.1	1.6	-	6,092.1	GP-27R MP-7 MW-22 MW-17 PTW-B RW-3 MW-7 RW-5 *FID Readings
7/23/12 12:48	ON	40,652.8	13	75	127	30.0	60.0	3.2	2.7	6,094.7	GP-27R MP-7 MW-22 MW-17 PTW-B RW-3 MW-7 RW-5 *FID Readings
8/1/12 9:09	ON	40,865.1	12	70	127	31.0	55.4	3.0	4.3	6,099.0	GP-27R MP-7 MW-22 MW-17 PTW-B RW-3 MW-7 RW-5 *FID Readings
8/1/12 11:23	OFF	40,867.4	-	-	-	-	-	-	0.0	6,099.1	Off for system cleaning
8/6/12 13:16	ON	40,867.9	13	40	127	30.7	22.9	1.7	-	6,099.1	GP-27R MP-7 MW-22 MW-17 PTW-B RW-3 MW-7 RW-5 *FID Readings
8/6/12 17:10	OFF	40,871.8	-	-	-	-	-	-	0.0	6,099.1	System shut down due to malfunctioning float in AST
8/8/12 9:46	ON	40,871.8	13	-	126	-	-	-	-	6,099.1	GP-27R MP-7 MW-22 MW-17 PTW-B RW-3 MW-7 RW-5 *FID Readings
8/15/12 8:42	OFF	41,038.8	-	-	-	-	-	-	-	6,099.1	Shut down due to leak in carbon vessel
8/20/12 9:21	ON	41,038.8	12	59	127	19.8	66.2	2.5	-	6,099.1	GP-27R MP-7 MW-22 MW-17 PTW-B RW-3 MW-7 RW-5 *FID Readings
8/27/12 9:21	ON	41,206.8	12	64	135	25.8	59.4	2.9	3.0	6,102.1	GP-27R MP-7 MW-22 MW-17 PTW-B RW-3 MW-7 RW-5 *FID Readings
9/4/12 8:35	ON	41,398.1	12	58	131	33.7	41.5	2.6	3.4	6,105.5	GP-27R MP-7 MW-22 MW-17 PTW-B RW-3 MW-7 RW-5 *FID Readings
9/10/12 9:42	ON	41,543.2	13	64	127	34.9	45.6	2.8	2.5	6,108.0	GP-27R MP-7 MW-22 MW-17 PTW-B RW-3 MW-7 RW-5 *FID Readings
9/17/12 9:46	ON	41,711.2	12	131	133	53.6	59.2	5.9	4.7	6,112.7	GP-27R MP-7 MW-22 MW-17 PTW-B RW-3 MW-7 RW-5 *FID Readings
9/24/12 13:13	ON	41,882.7	12	126	132	57.3	54.6	5.6	6.5	6,119.2	GP-27R MP-7 MW-22 MW-17 PTW-B RW-3 MW-7 RW-5 *FID Readings
10/1/12 9:00	ON	42,046.5	12	83	127	34.8	57.9	3.5	4.9	6,124.1	GP-27R MP-7 MW-22 MW-17 PTW-B RW-3 MW-7 RW-5 *FID Readings

ARCADIS

Chevron

TABLE B-1: SOIL VAPOR EXTRACTION SYSTEM DATA
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MD

Date/Time	System Status	Hour Meter (hours)	Manifold Vacuum (in. Hg)	Influent (ppmv)	Influent (SCFM)	Effluent (ppmv)	Treatment Efficiency	Hydrocarbons Recovered (lbs/day)	Period (gallons)	Cumul. (gallons)	Operating Extraction Points
10/8/12 9:46	ON	42,215.3	12	51	122	22.1	56.8	2.1	3.1	6,127.2	GP-27R MP-7 MW-22 MW-17 PTW-B RW-3 MW-7 RW-5 *FID Readings
10/23/12 9:35	ON	42,575.1	13	80	120	31.6	60.4	3.2	6.3	6,133.5	GP-27R MP-7 MW-22 MW-17 PTW-B RW-3 MW-7 RW-5 *FID Readings
10/23/12 10:20	OFF	42,575.8	-	-	-	-	-	-	0.0	6,133.5	Shut down due to oil/water separator pump leaking, air stripper tray being broken, and carbon being spent
11/9/12 11:45	ON	42,575.8	-	-	-	-	-	-	-	6,133.5	GP-27R MP-7 MW-22 MW-17 PTW-B RW-3 MW-7 RW-5 *FID Readings
11/9/12 12:45	OFF	42,578.5	-	-	-	-	-	-	-	6,133.5	Shut down due to pressure on carbon units and bag filters being too high
11/12/12 10:41	ON	42,578.5	13	37	125	8.1	78.3	1.6	-	6,133.5	GP-27R MP-7 MW-22 MW-17 PTW-B RW-3 MW-7 *FID Readings
11/19/12 9:08	ON	42,745.0	13	27	124	6.9	74.7	1.1	1.5	6,134.9	GP-27R MP-7 MW-22 MW-17 PTW-B RW-3 MW-7 RW-5 *FID Readings
11/26/12 0:00	ON	42,915.6	12	55	135	11.0	80.0	2.5	1.9	6,136.8	GP-27R MP-7 MW-22 MW-17 PTW-B RW-3 MW-7 RW-5 *FID Readings
12/3/12 10:17	ON	43,082.1	12	70	128	14.6	79.2	3.0	3.2	6,140.0	GP-27R MP-7 MW-22 MW-17 PTW-B RW-3 MW-7 RW-5 *FID Readings
12/4/12 12:00	ON	43,107.9	12	125	160	25.6	79.6	6.8	0.8	6,140.8	GP-27R MP-7 MW-22 MW-17 PTW-B RW-3 MW-7 RW-5 *FID Readings
12/10/12 9:53	ON	43,249.7	12	153	168	43.8	71.4	8.7	7.1	6,148.0	GP-27R MP-7 MW-22 MW-17 PTW-B RW-3 MW-7 RW-5 *FID Readings
12/17/12 8:53	ON	43,416.7	12	91	167	5.0	94.5	5.1	7.5	6,155.5	GP-27R MP-7 MW-22 MW-17 PTW-B RW-3 MW-7 RW-5 *FID Readings
12/27/12 9:29	ON	43,657.3	12	153	166	28.4	81.4	8.6	10.8	6,166.2	GP-27R MP-7 MW-22 MW-17 PTW-B RW-3 MW-7 RW-5 *FID Readings
12/30/12 1:00	OFF	43,720.9	-	-	-	-	-	-	3.5	6,169.8	Off due to compressor low
1/2/13 12:30	ON	43,720.9	12	131	176	31.5	75.9	7.8	-	6,169.8	GP-27R MP-7 MW-22 MW-17 PTW-B RW-3 MW-7 RW-5 *FID Readings
1/2/13 19:50	OFF	43,725.2	-	-	-	-	-	-	0.4	6,170.2	Off due to unknown reason
1/7/13 11:26	ON	43,725.2	12	92	177	33.8	63.4	5.5	-	6,170.2	GP-27R MP-7 MW-22 MW-17 PTW-B RW-3 MW-7 RW-5 *FID Readings
1/11/13 12:26	OFF	43,846.2	-	-	-	-	-	-	3.5	6,173.7	Off due to SVE knockout tank leaking and triggering sump alarm
1/15/13 11:44	ON	43,846.2	12	62	177	18.5	70.0	3.7	-	6,173.7	GP-27R MP-7 MW-22 MW-17 PTW-B RW-3 MW-7 RW-5 *FID Readings

ARCADIS

Chevron

TABLE B-1: SOIL VAPOR EXTRACTION SYSTEM DATA
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MD

Date/Time	System Status	Hour Meter (hours)	Manifold Vacuum (in. Hg)	Influent (ppmv)	Influent (SCFM)	Effluent (ppmv)	Treatment Efficiency	Hydrocarbons Recovered (lbs/day)	Period (gallons)	Cumul. (gallons)	Operating Extraction Points
1/16/13 16:30	OFF	43,875.7	-	-	-	-	-	-	0.7	6,174.4	Off due to high sump alarm.
1/21/13 10:00	ON	43,875.7	12	53	174	15.5	70.6	3.1	-	6,174.4	GP-27R MP-7 MW-22 MW-17 PTW-B RW-3 MW-7 RW-5 *FID Readings
1/28/13 12:15	ON	44,046.3	12	259	172	536.7	-107.5	15.1	10.1	6,184.5	GP-27R MP-7 MW-22 MW-17 PTW-B RW-3 MW-7 RW-5 *Effluent concentrations affected by weather conditions/humidity
2/4/13 12:00	ON	44,214.1	12	86	170	34.1	60.5	5.0	10.9	6,195.4	GP-27R MP-7 MW-22 MW-17 PTW-B RW-3 MW-7 RW-5 *FID Readings
2/11/13 10:30	ON	44,380.6	12	85	170	36.3	57.0	4.9	5.3	6,200.8	GP-27R MP-7 MW-22 MW-17 PTW-B RW-3 MW-7 RW-5 *FID Readings
2/18/13 11:20	ON	44,549.7	14	232	95	63.1	72.8	7.5	7.8	6,208.6	MW-22R RW-5 RW-1 MP-7 GP-39R GP-27R MW-17 MW-7 *FID Readings
2/25/13 9:30	ON	44,715.7	14	298	106	130.6	56.1	10.6	9.8	6,218.4	MW-22R RW-5 RW-1 MP-7 GP-39R GP-27R MW-17 MW-7 *FID Readings
3/4/13 9:48	ON	44,885.4	14	259	101	88.7	65.7	8.8	10.7	6,229.0	MW-22R RW-5 RW-1 MP-7 GP-39R GP-27R MW-17 MW-7 *FID Readings
3/12/13 8:24	ON	45,075.0	14	276	95	84.9	69.3	8.8	11.0	6,240.0	MW-22R RW-5 RW-1 MP-7 GP-39R GP-27R MW-17 MW-7 *FID Readings
3/18/13 12:13	ON	45,222.9	14	116	99	52.1	55.2	3.9	6.2	6,246.2	MW-22R RW-1 MP-7 GP-39R GP-27R MW-17 MW-7 *FID Readings
3/26/13 10:20	ON	45,412.9	13	167	102	68.7	58.8	5.7	6.0	6,252.2	MW-22R RW-1 MP-7 GP-39R GP-27R MW-17 MW-7 *FID Readings
4/1/13 13:30	ON	45,560.2	14	92	100	30.2	67.2	3.1	4.3	6,256.4	MW-22R RW-1 MP-7 GP-39R GP-27R MW-17 MW-7 *FID Readings
4/8/13 10:19	ON	45,725.0	14	181	98	75.1	58.5	6.0	4.9	6,261.4	MW-22R RW-1 MP-7 GP-39R GP-27R MW-17 MW-7 *FID Readings
4/15/13 10:00	ON	45,891.8	13	170	101	66.4	60.9	5.8	6.5	6,267.8	MW-22R RW-1 MP-7 GP-39R GP-27R MW-17 MW-7 *FID Readings
4/22/13 9:05	ON	46,059.8	14	134	99	44.5	66.8	4.5	5.6	6,273.4	MW-22R RW-1 MP-7 GP-39R GP-27R MW-17 MW-7 *FID Readings
4/30/13 13:23	ON	46,256.1	14	140	100	41.6	70.3	4.7	5.9	6,279.3	MW-22R RW-1 MP-7 GP-39R GP-27R MW-17 MW-7 *FID Readings
5/6/13 9:37	ON	46,369.3	14	136	99	63.6	53.2	4.5	4.2	6,283.6	MW-22R RW-1 MP-7 GP-39R GP-27R MW-17 MW-7 *FID Readings
5/14/13 9:59	ON	46,588.6	14	155	98	59.2	61.9	5.1	6.1	6,289.7	MW-22R RW-1 MP-7 GP-39R GP-27R MW-17 MW-7 *FID Readings
5/20/13 9:00	ON	46,731.4	14	195	95	74.3	62.0	6.3	5.3	6,295.0	MW-22R RW-1 MP-7 GP-39R GP-27R MW-17 MW-7 *FID Readings

ARCADIS

Chevron

TABLE B-1: SOIL VAPOR EXTRACTION SYSTEM DATA
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MD

Date/Time	System Status	Hour Meter (hours)	Manifold Vacuum (in. Hg)	Influent (ppmv)	Influent (SCFM)	Effluent (ppmv)	Treatment Efficiency	Hydrocarbons Recovered (lbs/day)	Period (gallons)	Cumul. (gallons)	Operating Extraction Points
5/27/13 12:30	OFF	46,902.9	-	-	-	-	-	-	7.1	6,302.1	Shut down due to high water level inside knockout tank
5/28/13 12:00	ON	46,902.9	14	71	104	20.1	71.8	2.5	-	6,302.1	MW-22R RW-1 MP-7 GP-39R GP-27R MW-17 MW-7 *FID Readings
5/29/13 15:30	OFF	46,930.4	-	-	-	-	-	-	0.4	6,302.5	Shut down due to high water level inside knockout tank
6/3/13 9:00	OFF	46,930.4	-	-	-	-	-	-	-	6,302.5	Shut down due to high water level inside knockout tank
7/1/13 9:15	ON	46781.60	13.50	143.40	130.24	38.30	73.29	6.32	22.50	6325.02	RW1 RW2 RW3 RW-4 MW-22 PTWB GP-27R GP-39R MW-7
7/7/13 20:30	OFF	0.00	-	-	-	-	-	-	-	6325.02	
7/8/13 7:00	OFF	0.00	-	-	-	-	-	-	-	6325.02	
7/8/13 11:30	ON	46918.50	7.00	125.00	226.84	0.00	100.00	9.59	9.00	6334.02	RW1 RW2 RW3 RW-4 MW-22 PTWB GP-27R GP-39R MW-7
7/15/13 0:00	ON	47084.40	6.00	8.70	223.40	0.80	90.80	0.66	5.20	6339.21	RW1 RW2 RW3 RW-4 MW-22 PTWB GP-27R GP-39R MW-7
7/20/13 15:00	OFF	0.00	-	-	-	-	-	-	-	6339.21	
7/22/13 7:00	OFF	0.00	-	-	-	-	-	-	-	6339.21	
7/23/13 6:30	OFF	47215.00	13.00	-	131.75	-	-	-	0.68	6339.89	Down due to blown fuse in the control panel and bad battery backup
7/23/13 9:50	ON	47215.00	-	-	-	-	-	-	-	6339.89	RW1 RW2 RW3 RW-4 MW-22 PTWB GP-27R GP-39R MW-7
7/29/13 7:00	ON	47359.00	13.00	30.90	124.64	11.70	62.14	1.30	1.26	6341.15	RW1 RW2 RW-4 MW-22 PTWB GP-27R GP-39R MW-7
8/3/13 3:00	OFF	0.00	-	-	-	-	-	-	-	6341.15	
8/5/13 7:00	OFF	47472.90	13.00	14.50	138.52	7.10	51.03	0.68	1.11	6342.26	
8/5/13 9:30	ON	47472.90	-	-	-	-	-	-	-	6342.26	RW1 RW2 RW-4 MW-22 GP-27R GP-39R MW-7
8/12/13 8:45	ON	47642.90	13.00	-	134.56	-	-	-	0.74	6343.00	RW1 RW2 RW3 RW-4 MW-22 PTWB GP-27R GP-39R MW-7
8/19/13 7:00	ON	47808.20	8.00	9.10	148.02	0.00	100.00	0.46	0.47	6343.47	RW1 RW2 RW3 RW-4 MW-22 PTWB GP-27R GP-39R MW-7
8/26/13 7:00	ON	47976.10	8.00	19.90	148.96	9.90	50.25	1.00	0.80	6344.27	RW1 RW2 RW3 RW-4 MW-22 PTWB GP-27R GP-39R MW-7
9/1/13 13:04	OFF	48125.70	-	-	-	-	-	-	-	6344.27	
9/4/13 10:30	OFF	48125.70	11.00	-	141.46	-	-	-	1.40	6345.67	Down due to compressor fault from low oil
9/4/13 12:00	ON	48125.70	11.00	-	141.46	-	-	-	-	6345.67	RW1 RW2 RW3 RW-4 MW 17 MW-22 PTWB GP-27R GP-39R MW-7
9/6/13 13:00	ON	48175.30	10.00	-	143.38	-	-	-	-	6345.67	RW1 RW2 RW3 RW-4 MW 17 MW-22 PTWB GP-27R GP-39R MW-7
9/10/13 13:59	OFF	48289.50	-	-	-	-	-	-	-	6345.67	
9/13/13 7:00	OFF	48289.50	-	-	-	-	-	-	-	6345.67	

ARCADIS

Chevron

TABLE B-1: SOIL VAPOR EXTRACTION SYSTEM DATA
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MD

Date/Time	System Status	Hour Meter (hours)	Manifold Vacuum (in. Hg)	Influent (ppmv)	Influent (SCFM)	Effluent (ppmv)	Treatment Efficiency	Hydrocarbons Recovered (lbs/day)	Hydrocarbons Recovered Period (gallons)	Hydrocarbons Recovered Cumul. (gallons)	Operating Extraction Points
9/13/13 12:45	ON	48289.50	-	-	-	-	-	-	-	6345.67	RW1 RW2 RW3 RW-4 MW 17 MW-22 PTWB GP-27R GP-39R MW-7
9/15/13 12:00	OFF	48294.80	-	-	-	-	-	-	-	6345.67	Down due to trailer sump high level
9/17/13 9:00	OFF	48294.80	-	-	0.00	-	-	-	-	6345.67	Down due to pipe repair
9/19/13 8:00	OFF	48294.80	12.00	-	128.73	-	-	-	-	6345.67	Down due to pipe repair
9/19/13 8:30	ON	48294.80	-	-	-	-	-	-	-	6345.67	RW1 RW2 RW3 RW-4 MW 17 MW-22 PTWB GP-27R GP-39R MW-7
9/19/13 16:30	OFF	48302.00	-	-	-	-	-	-	-	6345.67	Down due to pipe repair
9/30/13 7:00	OFF	48302.00	-	-	-	-	-	-	-	6345.67	Down due to pipe repair
10/10/13 7:00	OFF	48302.00	-	-	-	-	-	-	-	6345.67	Down due to pipe repair
10/10/13 8:00	ON	48302.00	12.00	48.30	129.20	11.10	77.02	2.11	6.93	6352.59	RW1 RW2 RW3 RW-4 MW 17 MW-22 PTWB GP-27R GP-39R MW-7
10/11/13 2:27	OFF	48320.10	-	-	-	-	-	-	-	6352.59	
11/7/13 7:00	OFF	48320.10	12.00	-	131.81	-	-	-	9.33	6361.92	Down due to compressor fault from low oil
11/7/13 13:25	ON	48320.10	-	-	-	-	-	-	-	6361.92	RW1 RW2 RW3 RW-4 MW 17 MW-22 PTWB GP-27R GP-39R MW-7
11/13/13 8:00	ON	48458.70	-	-	-	-	-	-	-	6361.92	RW1 RW2 RW3 RW-4 MW 17 MW-22 PTWB GP-27R GP-39R MW-7
11/14/13 8:40	ON	48481.30	12.00	-	127.43	-	-	-	-	6361.92	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7
11/21/13 8:30	ON	48649.20	13.00	10.70	124.64	3.50	67.29	0.45	0.50	6362.42	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7
11/26/13 9:40	ON	48792.60	-	-	-	-	-	-	-	6362.42	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7
12/2/13 9:34	OFF	-	-	-	-	-	-	-	-	6362.42	Down due to engagement of exterior emergency stop button
12/16/13 12:00	ON	-	-	-	-	-	-	-	-	6362.42	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7
12/18/13 8:57	ON	48839.90	12.00	22.10	128.32	9.00	59.28	0.96	2.97	6365.39	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7
12/30/13 13:13	ON	49132.20	12.00	-	127.87	-	-	-	-	6365.39	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7
1/2/14 9:34	OFF	-	-	-	-	-	-	-	-	6365.39	Down due to enaggement of exterior emergency stop button
1/6/14 8:30	OFF	49200.50	12.00	-	167.23	-	-	-	-	6365.39	Down due to enaggement of exterior emergency stop button
1/6/14 10:00	ON	49200.50	-	-	-	-	-	-	-	6365.39	RW1 RW2 RW3 RW-4 MW17 MW-22 PTWB GP-27R GP-39R MW-7

Notes:

(1) Hydrocarbons recovered are expressed as toluene (MW = 92 g/mol @ 77F).

(2) Hydrocarbons Recovered (lbs/day) = (inf. conc.) x (92 g/mol) x (mol/24.45 L) x (e-6) x (inf. flow) x (28.32 L/ft3) x (1440 min/day) x (1 lb/453.6 g).

(3) Hydrocarbons Recovered Period (gallons) = (avg. inf. conc.) x (92 g/mol) x (mol/24.45 L) x (e-6) x (avg. inf. flow) x (28.32 L/ft3) x (runtime in minutes) x (1 lb/453.6 g) x (gal/6.39 lb).

TABLE B-2: SOIL VAPOR EXTRACTION SYSTEM INFLUENT ANALYTICAL RESULTS
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MD

							Extraction Rate	
Date/Time	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Xylene (µg/L)	TPH (µg/L)	Flow (SCFM)	Benzene (lbs/hr)	TPH (lbs/day)
7/2/12 10:15	1.00	11.00	3.00	19.00	350	135	0.0005	4.26
8/27/12 8:34	0.30	1.90	0.40	2.80	180	135	0.0002	2.18
9/4/12 9:15	0.40	2.40	0.58	4.00	180	131	0.0002	2.13
10/1/12 10:45	1.80	6.40	1.30	7.20	320	127	0.0009	3.64
11/26/12 12:25	0.70	3.60	1.30	11.00	190	135	0.0004	2.30
12/3/12 9:50	0.14	0.79	0.30	2.60	230	128	0.0001	2.64
1/2/13 14:19	1.20	8.40	2.50	17.00	310	176	0.0008	4.92
2/4/13 11:35	1.00	6.00	1.70	12.00	300	170	0.0006	4.60
3/28/13 14:15	1.30	4.30	0.67	4.60	420	102	0.0005	3.85
4/1/13 13:15	13.00	43.00	6.30	45.00	420	100	0.0049	3.79
5/6/13 9:45	1.00	2.80	0.55	4.10	350	99	0.0004	3.11
7/1/13 9:15	<0.19	1.15	<0.19	2.26	147	130	0.0000	1.72
8/5/13 10:50	0.15	0.36	0.05	0.40	107	138	0.0001	1.33
9/19/13 10:35	<0.14	0.28	<0.19	<0.19	57	128	0.0001	0.66
10/10/13 10:15	<0.14	0.24	0.23	<0.19	43	129	0.0001	0.50
11/14/13 9:45	0.08	0.38	0.08	0.89	93	127	0.0000	1.06
12/19/13 9:15	0.05	0.25	<0.06	0.71	82	128	0.0000	0.95

Notes:

(1) Benzene (lbs/h) = (benzene conc.) x (e-6) x (1 lb/453.6 g) x (flow) x (28.32 L/ft3) x (60 min/hr).

(2) TPH (lbs/day) = (TPH conc.) x (e-6) x (1 lb/453.6 g) x (flow) x (28.32 L/ft3) x (1440 min/day).

(3) ug/L = (ppmv) x (MW g/mol) x (mol/24.45 L), where MW benzene = 78 and MW TPH = 92.

BTEX values after 7/1/2013 were converted from ppb

ARCADIS

Chevron

TABLE B-3: SOIL VAPOR EXTRACTION SYSTEM EFFLUENT ANALYTICAL RESULTS
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MD

							Discharge Rate	
Date/Time	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Xylene (µg/L)	TPH (µg/L)	Flow (SCFM)	Benzene (lbs/hr)	TPH (lbs/day)
7/2/12 10:20	0.51	4.50	0.95	5.60	160	135	0.0003	1.95
8/27/12 8:34	0.18	0.89	0.15	0.99	85	135	0.0001	1.03
9/4/12 9:20	0.19	1.30	0.24	1.70	97	131	0.0001	1.15
10/1/12 10:50	0.76	3.00	0.74	3.90	170	127	0.0004	1.93
11/26/12 12:30	0.14	0.43	0.13	1.00	38	135	0.0001	0.46
12/3/12 9:55	0.03	0.12	0.04	0.33	39	128	0.0000	0.45
1/2/13 14:30	0.21	1.2	0.31	2.3	82	176	0.0001	1.30
2/4/13 11:40	0.19	0.81	0.2	1.4	79	170	0.0001	1.21
3/28/13 14:20	0.27	0.76	0.12	0.88	140	102	0.0001	1.28
4/1/13 13:20	0.033	0.097	<.0043	1.2	140	100	0.0000	1.26
5/6/13 9:50	-	-	-	-	110	99	-	0.98
7/1/13 7:00	<0.06	0.25	<0.06	0.14	32	130	0.0000	0.37
8/5/13 10:40	0.02	0.04	0.01	0.05	6	139	0.0000	0.07
9/19/13 10:40	<0.14	<0.14	<0.14	<0.14	18	129	0.0001	0.21
10/10/13 10:20	<0.14	<0.14	<0.14	<0.19	15	129	0.0001	0.17
11/14/13 9:50	0.01	0.04	<0.01	0.08	18	127	0.0000	0.21
12/18/13 9:20	<0.01	0.03	<0.02	0.04	27	128	0.0000	0.31

Notes:

(1) Benzene (lbs/h) = (benzene conc.) x (e-6) x (1 lb/453.6 g) x (flow) x (28.32 L/ft3) x (60 min/hr).

(2) TPH (lbs/day) = (TPH conc.) x (e-6) x (1 lb/453.6 g) x (flow) x (28.32 L/ft3) x (1440 min/day).

(3) ug/L = (ppmv) x (MW g/mol) x (mol/24.45 L), where MW benzene = 78 and MW TPH = 92.

(4) One Tedlar bag containing the effluent air sample collected on 5/6/13 ruptured during shipment to the laboratory. As a result, no sample was available for analysis of benzene, toluene, ethylbenzene, and xylenes.

BTEX values after 7/1/2013 were converted from ppb

ARCADIS

Appendix C

Groundwater Monitoring Data

ARCADIS

APPENDIX C

GROUNDWATER MONITORING DATA

DESCRIPTION OF DATA TABLE

Overview

Chevron uses a central database to store groundwater monitoring data including laboratory analytical data. The tabulated data in Appendix C (Tables C-1 and C-2) are exported summaries of groundwater elevation data and analytical data for the past two years. Groundwater elevation data were measured using an interface probe in wells near the service station and a water level indicator at all other locations.

The following table lists the column headings in the table with a brief description of each.

Column Heading	Description
Date of Measurement	Date data were recorded.
Depth to Water (feet)	Depth to groundwater (ft)
TOC Elevation (feet)	Top of casing elevation (ft)
Water Table Elevation (feet)	Corrected water table elevation equation: (TOC) – (Depth to Water) + [(0.75)*(LPH Thickness)]
Depth to LPH (feet)	Depth to LPH (feet)
LPH Thickness (feet)	Equation: (Depth to Water-Depth to LPH)
LPH Elevation (feet)	Equation: (TOC-Depth to LPH)
Benzene (µg/L)	Laboratory reported concentration
Toluene (µg/L)	Laboratory reported concentration
Ethylbenzene (µg/L)	Laboratory reported concentration
m,p-Xylene (µg/L)	Laboratory reported concentration
o-Xylene (µg/L)	Laboratory reported concentration
Methyl-t-butyl ether (µg/L)	Laboratory reported concentration
TPH-GRO (µg/L)	Laboratory reported concentration

TABLE C-1: GROUNDWATER ELEVATION DATA
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MARYLAND

Well No.	Date of Measurement	Water (feet below casing)	PVC Casing Elevation (feet MSL)	Water Table Elevation (feet MSL)	NAPL Measurement (feet)	NAPL Thickness (feet)	NAPL Elevation (feet MSL)	Comments
GP-2E(45-50)	10/08/2012	43.79	168.17	124.38				
	03/19/2013	44.06		124.11				
	04/10/2013	44.40		123.77				
	8/1/2013	43.72		124.45				
	9/11/2013	43.83		124.34				
GP-2E(50-55)	03/19/2013	44.09	168.27	124.18				
	8/1/2013	43.79		124.48				
GP-2E(55-60)	10/08/2012	44.23	168.53	124.30				
	03/19/2013	44.39		124.14				
	04/10/2013	44.40		124.13				
	8/1/2013	44.05		124.48				
	9/11/2013	44.22		124.31				
GP-2F(45-50)	10/09/2012	-	159.59	-				Dry at 43.04ft
	03/19/2013	43.11		116.48				
	04/10/2013	-		-				DRY @ 43.21
	8/1/2013	-		-				Dry at 43.05
	9/11/2013	-		-				Dry at 43.00
GP-2F(50-55)	10/09/2012	44.92	159.59	114.67				
	03/19/2013	45.02		114.57				
	04/10/2013	45.09		114.50				
	8/1/2013	44.88		114.71				
	9/11/2013	45.18		114.41				
GP-7A(20-25)	10/05/2012	21.05	158.11	137.06				
	03/19/2013	19.81		138.30				
	04/09/2013	19.81		138.30				
	8/1/2013	18.95		139.16				
	9/10/2013	19.85		138.26				
GP-7A(25-30)	03/19/2013	20.17	158.08	137.91				
	8/1/2013	19.15		138.93				

ARCADIS

TABLE C-1: GROUNDWATER ELEVATION DATA
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MARYLAND

Chevron

Well No.	Date of Measurement	Water (feet below casing)	PVC Casing Elevation (feet MSL)	Water Table Elevation (feet MSL)	NAPL Measurement (feet)	NAPL Thickness (feet)	NAPL Elevation (feet MSL)	Comments
GP-7A(30-35)	10/05/2012	21.89	158.09	136.20				
	03/19/2013	21.74		136.35				
	04/09/2013	21.70		136.39				
	8/1/2013	21.18		136.91				
	9/10/2013	21.93		136.16				
GP-7A(35-40)	10/05/2012	22.10	158.09	135.99				
	03/19/2013	21.95		136.14				
	04/09/2013	21.91		136.18				
	8/1/2013	21.50		136.59				
	9/10/2013	22.18		135.91				
GP-7A(40-45)	03/19/2013	21.92	158.11	136.19				
	8/1/2013	21.54		136.57				
GP-9A(20-25)	10/05/2012	19.19	158.86	139.67				
	03/19/2013	17.98		140.88				
	04/09/2013	17.67		141.19				
	8/1/2013	17.20		141.66				
	9/10/2013	18.16		140.70				
GP-9A(25-30)	3/19/2013	20.76	158.81	138.05				
	8/1/2013	19.84		138.97				
GP-9A(30-35)	03/19/2013	22.89	158.76	135.87				
	8/1/2013	21.73		137.03				
GP-11A(20-25)	10/05/2012	18.21	158.28	140.07				
	03/19/2013	17.71		140.57				
	04/09/2013	17.52		140.76				
	8/1/2013	17.35		140.93				
	9/10/2013	18.18		140.10				
GP-11A(25-30)	03/19/2013	19.22	158.43	139.21				
	8/1/2013	19.92		138.51				
GP-11A(30-35)	03/19/2013	20.91	158.38	137.47				
	8/1/2013	21.59		136.79				

TABLE C-1: GROUNDWATER ELEVATION DATA
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MARYLAND

Well No.	Date of Measurement	Water (feet below casing)	PVC Casing Elevation (feet MSL)	Water Table Elevation (feet MSL)	NAPL Measurement (feet)	NAPL Thickness (feet)	NAPL Elevation (feet MSL)	Comments
GP-11A(35-40)	03/19/2013	28.84	158.38	129.54				
	8/1/2013	28.17		130.21				
GP-24A	10/01/2012	-	170.83	-				Not gauged - hydrasleeve
	03/19/2013	35.24		135.59				
	03/29/2013	35.33		135.50				
	8/1/2013	33.18		137.65				
	9/6/2013	33.53		137.30				
GP-27R	07/30/2012	44.45	166.21	121.76				Top of pump
	08/20/2012	44.95		121.26				Pumping
	09/05/2012	52.80		113.41				Pumping
	10/10/2012	-		-				Not gauged - pumping
	11/19/2012	45.10		121.11				Pumping
	12/04/2012	44.39		121.82				Pumping
	01/28/2013	48.56		117.65				Pumping
	03/19/2013	-		-				Car Parked on Top of Well
	04/13/2013	-		-				Pumping
	04/22/2013	47.64		118.57				Pumping
	05/28/2013	42.52		123.69				Pumping
	06/03/2013	49.78		116.43				Top of pump / Pumping
	7/15/2013	46.71		119.50				
	8/1/2013	49.65		116.56				
	8/15/2013	44.23		121.98				
	11/14/2013	37.73		128.48				
	12/18/2013	42.50		123.71				

TABLE C-1: GROUNDWATER ELEVATION DATA
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MARYLAND

Well No.	Date of Measurement	Water (feet below casing)	PVC Casing Elevation (feet MSL)	Water Table Elevation (feet MSL)	NAPL Measurement (feet)	NAPL Thickness (feet)	NAPL Elevation (feet MSL)	Comments
GP-30A	07/30/2012	41.13	171.78	130.65				
	08/20/2012	37.62		134.16				
	09/05/2012	40.88		130.90				
	10/11/2012	-		-				Not gauged - hydrasleeve
	11/19/2012	41.11		130.67				
	12/04/2012	41.13		130.65				
	01/28/2013	41.26		130.52				
	03/19/2013	41.15		130.63				
	03/29/2013	41.14		130.64				
	04/22/2013	41.10		130.68				
	05/28/2013	38.84		132.94				
	06/03/2013	37.77		134.01				
	8/1/2013	39.39		132.39				
	8/15/2013	38.42		133.36				
	9/6/2013	41.05		130.73				
	10/30/2013	36.50		135.28				
	11/14/2013	41.33		130.45				
	12/18/2013	41.22		130.56				
GP-35A	07/30/2012	44.07	171.96	127.89				
	08/20/2012	35.57		136.39				
	09/05/2012	43.90		128.06				
	10/10/2012	42.36		129.60				
	11/19/2012	41.73		130.23				
	12/04/2012	41.88		130.08				
	01/28/2013	42.12		129.84				
	03/19/2013	40.12		131.84				
	04/03/2013	40.81		131.15				
	04/22/2013	40.25		131.71				
	05/28/2013	38.23		133.73				
	06/03/2013	38.10		133.86				
	8/1/2013	38.23		133.73				
	8/15/2013	37.02		134.94				
	9/16/2013	34.85		137.11				
	10/30/2013	33.91		138.05				
	11/14/2013	39.22		132.74				
	12/18/2013	38.21		133.75				

ARCADIS

TABLE C-1: GROUNDWATER ELEVATION DATA
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MARYLAND

Chevron

Well No.	Date of Measurement	Water (feet below casing)	PVC Casing Elevation (feet MSL)	Water Table Elevation (feet MSL)	NAPL Measurement (feet)	NAPL Thickness (feet)	NAPL Elevation (feet MSL)	Comments
GP-39R	11/10/2012	-	171.81	-				Not gauged - pumping
	03/19/2013	51.22		120.59				Approx. Top of Pump
	04/15/2013	-		-				Pumping
	7/18/2013	51.53		120.28				
	8/1/2013	44.40		127.41				
GP-41A	10/11/2012	-	172.28	-				Not gauged - pumping
	03/19/2013	41.34		130.94				
	04/10/2013	41.80		130.48				
	8/1/2013	41.41		130.87				
	9/6/2013	41.61		130.67				
GP-44A	10/10/2012	31.36	176.20	144.84				
	03/19/2013	31.50		144.70				
	04/22/2013	31.71		144.49				
	8/1/2013	31.10		145.10				
	9/12/2013	30.96		145.24				
MP-7	07/30/2012	37.79	172.17	134.38				
	08/20/2012	37.67		134.50				
	09/05/2012	37.64		134.53				
	10/10/2012	37.90		134.27				
	11/19/2012	37.69		134.48				
	12/04/2012	37.81		134.36				
	01/28/2013	-		-				Frozen solid
	03/19/2013	37.84		134.33				
	04/22/2013	38.02		134.15				
	05/28/2013	37.85		134.32				
	06/03/2013	42.91		129.26	42.86	0.23	129.31	SVE OFF
	8/1/2013	37.50		134.67				
	8/15/2013	37.21		134.96				
	9/11/2013	41.26		130.91				
	9/16/2013	41.26		130.91				
	10/30/2013	41.15		131.02	41.07	0.08	131.10	
	11/14/2013	37.58		134.59				
	12/18/2013	38.07		134.10				

ARCADIS

TABLE C-1: GROUNDWATER ELEVATION DATA
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MARYLAND

Chevron

Well No.	Date of Measurement	Water (feet below casing)	PVC Casing Elevation (feet MSL)	Water Table Elevation (feet MSL)	NAPL Measurement (feet)	NAPL Thickness (feet)	NAPL Elevation (feet MSL)	Comments
MW-1	03/19/2013	34.52	170.46	135.94				
	8/1/2013	32.48		137.98				
MW-2	03/19/2013	-	171.41	-				DRY @ 37.10
	8/1/2013	33.05		138.36				
MW-3	03/19/2013	28.31	170.41	142.10				
	8/1/2013	30.74		139.67				
MW-4	03/19/2013	31.81	171.14	139.33				
	8/1/2013	30.92		140.22				
MW-5	10/10/2012	-	172.31	-				Dry at 33.65ft
	03/19/2013	35.55		136.76				
	04/22/2013	-		-				DRY @ 33.70
	8/1/2013	DRY		-				
	9/12/2013	32.96		139.35				
MW-6	10/11/2012	-	171.12	-				Not gauged - hydrasleeve
	03/19/2013	34.79		136.33				
	03/29/2013	34.80		136.32				
	8/1/2013	33.73		137.39				
	9/6/2013	34.04		137.08				

TABLE C-1: GROUNDWATER ELEVATION DATA
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MARYLAND

Well No.	Date of Measurement	Water (feet below casing)	PVC Casing Elevation (feet MSL)	Water Table Elevation (feet MSL)	NAPL Measurement (feet)	NAPL Thickness (feet)	NAPL Elevation (feet MSL)	Comments
MW-7	07/30/2012	43.66	177.11	133.45				Top of pump
	08/20/2012	25.52		151.59				Top of Pump
	09/05/2012	51.71		125.40				Pumping
	10/10/2012	-		-				Not gauged - pumping
	11/19/2012	56.80		120.31				Pumping
	12/04/2012	52.19		124.92				Pumping - top of pump
	01/28/2013	56.87		120.24				Pumping
	03/19/2013	51.25		125.86				Top of Pump
	04/15/2013	-		-				Pumping
	04/22/2013	52.81		124.30				Pumping
	05/28/2013	49.56		127.55				Top of pump / Pumping
	06/03/2013	53.32		123.79				Top of pump / Pumping
	7/15/2013	52.19		124.92				
	8/1/2013	52.30		124.81				
	8/15/2013	56.70		120.41				
	10/30/2013	44.40		132.71				
	11/14/2013	56.85		120.26				
	12/18/2013	52.05		125.06				
MW-12	03/19/2013	38.95	171.50	132.55				
	8/1/2013	37.88		133.62				
MW-13	03/19/2013	37.94	172.47	134.53				
	8/1/2013	35.99		136.48				
MW-15	10/10/2012	31.05	172.34	141.29				
	03/19/2013	31.22		141.12				
	03/29/2013	31.25		141.09				
	8/1/2013	30.85		141.49				
	9/12/2013	30.78		141.56				

TABLE C-1: GROUNDWATER ELEVATION DATA
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MARYLAND

Well No.	Date of Measurement	Water (feet below casing)	PVC Casing Elevation (feet MSL)	Water Table Elevation (feet MSL)	NAPL Measurement (feet)	NAPL Thickness (feet)	NAPL Elevation (feet MSL)	Comments
MW-16	07/30/2012	-	171.05	-				Dry - bottom at 40.50
	08/20/2012	38.43		132.62				
	09/05/2012	40.30		130.75				
	10/10/2012	-		-				
	11/19/2012	39.18		131.87				
	12/04/2012	39.90		131.15				
	01/28/2013	39.71		131.34				Pumping
	03/19/2013	40.26		130.79				
	04/22/2013	38.58		132.47				
	05/28/2013	36.69		134.36				
	06/03/2013	36.15		134.90				
	8/1/2013	35.02		136.03				
	8/15/2013	36.31		134.74				
	9/16/2013	37.85		133.20				
	10/30/2013	36.00		135.05				
	11/14/2013	38.27		132.78				
	12/18/2013	37.88		133.17				
MW-17	10/10/2012	-	170.67	-				Not gauged - pumping
	03/19/2013	44.14		126.53				
	04/15/2013	-		-				Pumping
	7/15/2013	32.45		138.22				Pump not running
	8/1/2013	32.83		137.84				

ARCADIS

TABLE C-1: GROUNDWATER ELEVATION DATA
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MARYLAND

Chevron

Well No.	Date of Measurement	Water (feet below casing)	PVC Casing Elevation (feet MSL)	Water Table Elevation (feet MSL)	NAPL Measurement (feet)	NAPL Thickness (feet)	NAPL Elevation (feet MSL)	Comments
MW-18	07/30/2012	32.13	168.45	136.32				
	08/20/2012	32.00		136.45				
	09/05/2012	33.36		135.09				
	10/08/2012	33.25		135.20				
	11/19/2012	31.85		136.60				
	12/04/2012	32.87		135.58				
	01/28/2013	33.60		134.85				
	03/19/2013	32.81		135.64				
	04/10/2013	32.70		135.75				
	04/22/2013	32.71		135.74				
	05/28/2013	32.67		135.78				
	06/03/2013	32.77		135.68				
	8/1/2013	31.51		136.94				
	8/15/2013	31.54		136.91				
	9/11/2013	31.89		136.56				
	9/16/2013	31.89		136.56				
	10/30/2013	31.68		136.77				
	11/14/2013	31.84		136.61				
	12/18/2013	32.05		136.40				
MW-19	10/08/2012	36.43	169.56	133.13				
	03/19/2013	36.81		132.75				
	04/10/2013	36.71		132.85				
	8/1/2013	34.52		135.04				
	9/11/2013	35.25		134.31				
MW-20	10/11/2012	-	176.27	-				Not gauged - hydrasleeve
	03/19/2013	37.93		138.34				
	03/29/2013	38.05		138.22				
	8/1/2013	38.14		138.13				
	9/6/2013	38.12		138.15				
MW-21	10/11/2012	-	173.37	-				Not gauged - hydrasleeve
	03/19/2013	36.49		136.88				
	03/29/2013	36.70		136.67				
	8/1/2013	36.65		136.72				
	9/6/2013	36.73		136.64				

TABLE C-1: GROUNDWATER ELEVATION DATA
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MARYLAND

Well No.	Date of Measurement	Water (feet below casing)	PVC Casing Elevation (feet MSL)	Water Table Elevation (feet MSL)	NAPL Measurement (feet)	NAPL Thickness (feet)	NAPL Elevation (feet MSL)	Comments
MW-22R	07/30/2012	40.57	165.08	124.51				
	08/20/2012	40.00		125.08				Top of Pump
	09/05/2012	40.05		125.03				Pumping
	10/10/2012	-		-				Not gauged - pumping
	11/19/2012	41.98		123.10				Pumping
	12/04/2012	42.20		122.88				Pumping
	01/28/2013	46.69		118.39				Pumping
	03/19/2013	-		-				Could not get past hoses and pump
	04/15/2013	-		-				Pumping
	04/22/2013	39.46		125.62				Pumping
	05/28/2013	39.35		125.73				Top of pump / Pumping
	06/03/2013	44.38		120.70				Top of pump / Pumping
	7/15/2013	42.62		122.46				
	8/1/2013	42.60		122.48				
	8/15/2013	39.85		125.23				
	10/30/2013	37.57		127.51				
	11/14/2013	42.92		122.16				
	12/18/2013	40.60		124.48				
MW-23	03/19/2013	43.41	171.31	127.90				
	04/03/2013	43.52		127.79				
	8/1/2013	43.10		128.21				
	9/6/2013	43.29		128.02				

TABLE C-1: GROUNDWATER ELEVATION DATA
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MARYLAND

Well No.	Date of Measurement	Water (feet below casing)	PVC Casing Elevation (feet MSL)	Water Table Elevation (feet MSL)	NAPL Measurement (feet)	NAPL Thickness (feet)	NAPL Elevation (feet MSL)	Comments
MW-24A	07/30/2012	20.85	157.38	136.53				
	08/20/2012	20.78		136.60				
	09/05/2012	20.99		136.39				
	10/11/2012	-		-				Not gauged - hydrasleeve
	11/19/2012	20.83		136.55				
	12/04/2012	20.98		136.40				
	01/28/2013	21.27		136.11				
	03/19/2013	21.11		136.27				
	04/09/2013	20.91		136.47				
	04/22/2013	21.01		136.37				
	05/28/2013	21.09		136.29				
	06/03/2013	21.10		136.28				
	8/1/2013	20.55		136.83				
	8/15/2013	20.58		136.80				
	9/10/2013	21.24		136.14				
	9/16/2013	21.24		136.14				
	10/30/2013	20.87		136.51				
	11/14/2013	21.14		136.24				
	12/18/2013	21.57		135.81				
MW-24B	10/11/2012	-	157.45	-				Not gauged - hydrasleeve
	03/19/2013	21.08		136.37				
	04/09/2013	20.95		136.50				
	8/1/2013	20.53		136.92				
	9/10/2013	21.23		136.22				
MW-25A	10/04/2012	26.75	149.99	123.24				
	03/19/2013	26.80		123.19				
	04/09/2013	26.78		123.21				
	8/1/2013	26.56		123.43				
	9/10/2013	26.62		123.37				

ARCADIS

TABLE C-1: GROUNDWATER ELEVATION DATA
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MARYLAND

Chevron

Well No.	Date of Measurement	Water (feet below casing)	PVC Casing Elevation (feet MSL)	Water Table Elevation (feet MSL)	NAPL Measurement (feet)	NAPL Thickness (feet)	NAPL Elevation (feet MSL)	Comments
MW-25B	10/04/2012	22.20	150.95	128.75				
	03/19/2013	27.19		123.76				
	04/09/2013	27.31		123.64				
	8/1/2013	27.64		123.31				
	9/10/2013	27.34		123.61				
MW-26A	10/11/2012	-	135.62	-				Not gauged - hydrasleeve
	03/19/2013	3.53		132.09				
	04/02/2013	4.07		131.55				
	8/1/2013	4.61		131.01				
	9/9/2013	5.55		130.07				
MW-26B	10/03/2012	9.35	135.74	126.39				
	03/19/2013	7.78		127.96				
	04/02/2013	7.12		128.62				
	8/1/2013	7.98		127.76				
	9/9/2013	7.65		128.09				
MW-27A	10/03/2012	13.55	128.92	115.37				
	03/19/2013	10.89		118.03				
	04/02/2013	10.95		117.97				
	8/1/2013	10.78		118.14				
	9/9/2013	11.11		117.81				
MW-27B	10/03/2012	11.02	128.92	117.90				
	03/19/2013	13.54		115.38				
	04/02/2013	13.54		115.38				
	8/1/2013	13.55		115.37				
	9/9/2013	13.69		115.23				
MW-28A	10/02/2012	7.67	126.13	118.46				
	03/19/2013	7.50		118.63				
	03/28/2013	7.58		118.55				
	8/1/2013	7.80		118.33				
	9/9/2013	8.13		118.00				

TABLE C-1: GROUNDWATER ELEVATION DATA
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MARYLAND

Well No.	Date of Measurement	Water (feet below casing)	PVC Casing Elevation (feet MSL)	Water Table Elevation (feet MSL)	NAPL Measurement (feet)	NAPL Thickness (feet)	NAPL Elevation (feet MSL)	Comments
MW-28B	10/02/2012	7.32	125.49	118.17				
	03/19/2013	7.32		118.17				
	03/28/2013	7.35		118.14				
	8/1/2013	7.66		117.83				
	9/9/2013	7.85		117.64				
MW-29A	10/02/2012	7.80	115.70	107.90				
	03/19/2013	7.44		108.26				
	03/28/2013	7.57		108.13				
	8/1/2013	7.59		108.11				
	9/9/2013	7.95		107.75				
MW-29B	10/02/2012	6.48	115.54	109.06				
	03/19/2013	6.51		109.03				
	03/28/2013	6.56		108.98				
	8/1/2013	9.36		106.18				
	9/9/2013	6.64		108.90				
MW-30R	10/11/2012	-	156.75	-				Not gauged - hydrasleeve
	03/19/2013	20.36		136.39				
	04/09/2013	-		-				DRY
	8/1/2013	19.93		136.82				
	9/6/2013	20.60		136.15				
MW-31A	03/19/2013	5.62	135.19	129.57				
	8/1/2013	8.85		126.34				
MW-31B	10/03/2012	5.75	135.81	130.06				
	03/19/2013	5.55		130.26				
	03/28/2013	5.72		130.09				
	8/1/2013	8.57		127.24				
	9/9/2013	6.35		129.46				
MW-32	03/19/2013	8.38	128.47	120.09				
	8/1/2013	8.76		119.71				

ARCADIS

TABLE C-1: GROUNDWATER ELEVATION DATA
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MARYLAND

Chevron

Well No.	Date of Measurement	Water (feet below casing)	PVC Casing Elevation (feet MSL)	Water Table Elevation (feet MSL)	NAPL Measurement (feet)	NAPL Thickness (feet)	NAPL Elevation (feet MSL)	Comments
MW-33A	10/02/2012	-	126.35	-				Dry at 8.83ft
	03/19/2013	8.30		118.05				
	03/28/2013	8.26		118.09				
	8/1/2013	8.42		117.93				
	9/9/2013	8.70		117.65				
MW-33B	10/02/2012	8.00	126.16	118.16				
	03/19/2013	7.89		118.27				
	03/28/2013	7.94		118.22				
	8/1/2013	8.01		118.15				
	9/9/2013	8.31		117.85				
MW-33C	10/02/2012	7.57	125.84	118.27				
	03/19/2013	7.44		118.40				
	03/28/2013	7.48		118.36				
	8/1/2013	7.69		118.15				
	9/9/2013	7.95		117.89				
MW-33S	10/02/2012	5.38	126.58	121.20				
	03/19/2013	6.38		120.20				
	03/28/2013	-		-				DRY @ 7.08
	8/1/2013	7.07		119.51				
	9/9/2013	7.11		119.47				
MW-34A	03/19/2013	9.36	107.41	98.05				
	8/1/2013	9.50		97.91				
MW-34B	03/19/2013	8.91	107.40	98.49				
	8/1/2013	8.43		98.97				
MW-37	03/19/2013	-	152.61	-				DRY @ 15.05
	8/1/2013	-		-				Dry at 15.05
MW-38	10/04/2012	11.17	146.91	135.74				
	03/19/2013	10.44		136.47				
	04/05/2013	10.36		136.55				
	8/1/2013	10.23		136.68				
	9/10/2013	11.77		135.14				

ARCADIS

TABLE C-1: GROUNDWATER ELEVATION DATA
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MARYLAND

Chevron

Well No.	Date of Measurement	Water (feet below casing)	PVC Casing Elevation (feet MSL)	Water Table Elevation (feet MSL)	NAPL Measurement (feet)	NAPL Thickness (feet)	NAPL Elevation (feet MSL)	Comments
MW-39R	10/04/2012	17.27	146.01	128.74				
	03/19/2013	16.71		129.30				
	04/05/2013	16.69		129.32				
	8/1/2013	16.28		129.73				
	9/10/2013	16.91		129.10				
MW-40	10/04/2012	23.20	145.18	121.98				
	03/19/2013	23.10		122.08				
	04/05/2013	23.03		122.15				
	8/1/2013	22.88		122.30				
	9/10/2013	23.17		122.01				
MW-41A	10/04/2012	19.73	136.96	117.23				
	03/19/2013	19.96		117.00				
	04/05/2013	19.91		117.05				
	8/1/2013	19.41		117.55				
	9/10/2013	19.68		117.28				
MW-41B	10/11/2012	-	136.82	-				Not gauged - hydrasleeve
	03/19/2013	20.25		116.57				
	04/05/2013	20.21		116.61				
	8/1/2013	19.80		117.02				
	9/10/2013	20.06		116.76				
	9/9/2013	8.85		127.97				
MW-42	10/03/2012	8.37	140.03	131.66				
	03/19/2013	7.95		132.08				
	04/02/2013	8.10		131.93				
	8/1/2013	8.21		131.82				
MW-43A	10/03/2012	4.56	133.98	129.42				
	03/19/2013	3.28		130.70				
	04/02/2013	3.61		130.37				
	8/1/2013	4.24		129.74				
	9/9/2013	5.00		128.98				

ARCADIS

TABLE C-1: GROUNDWATER ELEVATION DATA
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MARYLAND

Chevron

Well No.	Date of Measurement	Water (feet below casing)	PVC Casing Elevation (feet MSL)	Water Table Elevation (feet MSL)	NAPL Measurement (feet)	NAPL Thickness (feet)	NAPL Elevation (feet MSL)	Comments
MW-43B	10/03/2012	10.31	134.09	123.78				
	03/19/2013	9.97		124.12				
	04/02/2013	10.01		124.08				
	8/1/2013	9.99		124.10				
	9/9/2013	10.52		123.57				
MW-44A	10/03/2012	10.17	130.22	120.05				
	03/19/2013	9.85		120.37				
	04/02/2013	9.88		120.34				
	8/1/2013	9.91		120.31				
	9/9/2013	10.26		119.96				
MW-44B	10/03/2012	12.60	130.24	117.64				
	03/19/2013	12.60		117.64				
	04/02/2013	12.53		117.71				
	8/1/2013	13.78		116.46				
	9/9/2013	12.77		117.47				
MW-45	10/11/2012	-	173.89	-				Not gauged - hydrasleeve
	03/19/2013	43.07		130.82				
	03/29/2013	43.15		130.74				
	8/1/2013	42.80		131.09				
	9/12/2013	42.48		131.41				
MW-46	10/11/2012	-	174.12	-				Not gauged - hydrasleeve
	03/19/2013	47.31		126.81				
	03/29/2013	47.31		126.81				
	8/1/2013	47.05		127.07				
	9/6/2013	47.26		126.86				
MW-47	10/09/2012	46.15	171.50	125.35				
	03/19/2013	46.44		125.06				
	04/03/2013	46.42		125.08				
	8/1/2013	46.09		125.41				
	9/11/2013	46.20		125.30				

TABLE C-1: GROUNDWATER ELEVATION DATA
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MARYLAND

Well No.	Date of Measurement	Water (feet below casing)	PVC Casing Elevation (feet MSL)	Water Table Elevation (feet MSL)	NAPL Measurement (feet)	NAPL Thickness (feet)	NAPL Elevation (feet MSL)	Comments
MW-48	10/09/2012	42.05	165.96	123.91				
	03/19/2013	42.33		123.63				
	04/03/2013	42.33		123.63				
	8/1/2013	42.04		123.92				
	9/11/2013	42.10		123.86				
MW-49	10/11/2012	-	159.15	-				Not gauged - hydrasleeve
	03/19/2013	45.41		113.74				
	04/10/2013	45.46		113.69				
	8/1/2013	45.23		113.92				
	9/6/2013	45.56		113.59				
MW-50	10/09/2012	37.81	156.12	118.31				
	03/19/2013	38.13		117.99				
	04/03/2013	38.19		117.93				
	8/1/2013	38.05		118.07				
	9/11/2013	38.15		117.97				
MW-51	10/09/2012	49.97	158.12	108.15				
	03/19/2013	50.06		108.06				
	04/03/2013	50.27		107.85				
	8/1/2013	49.98		108.14				
	9/11/2013	50.15		107.97				
MW-52	03/19/2013	4.11	127.58	123.47				
	8/1/2013	5.27		122.31				
MW-53	10/02/2012	6.47	116.18	109.71				
	03/19/2013	6.17		110.01				
	03/28/2013	6.32		109.86				
	8/1/2013	6.39		109.79				
	9/9/2013	6.40		109.78				
MW-54	10/02/2012	5.64	121.76	116.12				
	03/19/2013	4.86		116.90				
	03/28/2013	5.08		116.68				
	8/1/2013	5.54		116.22				
	9/9/2013	6.18		115.58				

ARCADIS

TABLE C-1: GROUNDWATER ELEVATION DATA
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MARYLAND

Chevron

Well No.	Date of Measurement	Water (feet below casing)	PVC Casing Elevation (feet MSL)	Water Table Elevation (feet MSL)	NAPL Measurement (feet)	NAPL Thickness (feet)	NAPL Elevation (feet MSL)	Comments
MW-55	10/11/2012	-	131.49	-				Not gauged - hydrasleeve
	03/19/2013	1.97		129.52				
	04/02/2013	1.84		129.65				
	8/1/2013	1.74		129.75				
	9/9/2013	2.85		128.64				
MW-58	10/03/2012	7.29	134.97	127.68				
	03/19/2013	6.97		128.00				
	04/02/2013	7.13		127.84				
	8/1/2013	7.60		127.37				
	9/9/2013	7.91		127.06				
MW-59	10/03/2012	11.05	131.10	120.05				
	03/19/2013	10.78		120.32				
	04/02/2013	10.19		120.91				
	8/1/2013	10.91		120.19				
	9/9/2013	11.25		119.85				
MW-60	10/03/2012	8.82	131.08	122.26				
	03/19/2013	13.47		117.61				
	04/02/2013	12.12		118.96				
	8/1/2013	14.69		116.39				
	9/9/2013	13.15		117.93				
MW-61A	10/05/2012	21.41	158.49	137.08				
	03/19/2013	21.28		137.21				
	04/09/2013	21.24		137.25				
	8/1/2013	20.77		137.72				
	9/6/2013	21.60		136.89				
MW-61B	10/05/2012	23.15	157.54	134.39				
	03/19/2013	23.14		134.40				
	04/09/2013	23.15		134.39				
	8/1/2013	21.90		135.64				
	9/6/2013	23.50		134.04				

TABLE C-1: GROUNDWATER ELEVATION DATA
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MARYLAND

Well No.	Date of Measurement	Water (feet below casing)	PVC Casing Elevation (feet MSL)	Water Table Elevation (feet MSL)	NAPL Measurement (feet)	NAPL Thickness (feet)	NAPL Elevation (feet MSL)	Comments
MW-62A	10/04/2012	14.10	148.58	134.48				
	03/19/2013	11.71		136.87				
	04/05/2013	11.57		137.01				
	8/1/2013	11.38		137.20				
	9/10/2013	11.90		136.68				
MW-62B	10/04/2012	14.31	148.50	134.19				
	03/19/2013	13.71		134.79				
	04/05/2013	13.75		134.75				
	8/1/2013	13.72		134.78				
	9/10/2013	14.45		134.05				
PTW-B	10/10/2012	-	171.75	-				Not gauged - pumping
	03/19/2013	40.88		130.87				Top of Pump
	04/15/2013	-		-				Pumping
	7/15/2013	35.08		136.67				
	8/1/2013	42.18		134.23				
	8/15/2013	37.52		134.23				
RW-1	10/10/2012	-	173.36	-				Not gauged - pumping
	03/19/2013	50.95		122.41				
	04/15/2013	-		-				Pumping
	7/15/2013	50.48		122.88				
	8/1/2013	52.02		121.34				
RW-2	10/10/2012	-	172.21	-				Not gauged - pumping
	03/19/2013	50.51		121.70				
	04/15/2013	-		-				Pumping
	7/15/2013	48.82		123.39				
	8/1/2013	52.70		119.51				
RW-3	10/10/2012	-	171.62	-				Not gauged - pumping
	03/19/2013	46.55		125.07				Top of Pump
	04/15/2013	-		-				Pumping
	7/15/2013	36.90		134.72				
	8/1/2013	27.21		144.41				

TABLE C-1: GROUNDWATER ELEVATION DATA
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MARYLAND

Well No.	Date of Measurement	Water (feet below casing)	PVC Casing Elevation (feet MSL)	Water Table Elevation (feet MSL)	NAPL Measurement (feet)	NAPL Thickness (feet)	NAPL Elevation (feet MSL)	Comments
RW-4	07/30/2012	48.00	171.62	123.62				Top of pump
	08/20/2012	42.62		129.00				Top of Pump
	09/05/2012	50.30		121.32				Pumping
	10/10/2012	-		-				Not gauged - pumping
	11/19/2012	50.30		121.32				Pumping
	12/04/2012	49.00		122.62				Pumping - top of pump
	01/28/2013	42.16		129.46				Pumping
	03/19/2013	51.71		119.91				Top of Pump
	04/15/2013	-		-				Pumping
	04/22/2013	40.21		131.41				Pumping
	05/28/2013	40.29		131.33				Top of pump / Pumping
	06/03/2013	42.20		129.42				Top of pump / Pumping
	7/15/2013	44.68		126.94				
	8/1/2013	47.65		123.97				
	8/15/2013	49.60		122.02				
	9/16/2013	41.05		130.57				
	10/30/2013	36.40		135.22				
	11/14/2013	50.35		121.27				
	12/18/2013	44.90		126.72				

TABLE C-2: GROUNDWATER ANALYTICAL RESULTS
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MARYLAND

Location	Sample Date	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	m+p-Xylene (µg/L)	o-Xylene (µg/L)	Xylenes, Total (µg/L)	Methyl-t-butyl ether (µg/L)	TPH-GRO (µg/L)
GP-11A(20-25)	01/19/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
	04/25/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
	10/05/2012	<1.0	<1.0	<1.0	--	--	<10	<1.0	<100
	04/09/2013	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
	09/10/2013	<1.0	<1.0	<1.0	--	--	<10	<1.0	<100
GP-24A	05/03/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
	10/11/2012	<1.0	<1.0	<1.0	--	--	<10	<1.0	<100
	04/10/2013	<1.0	<1.0	<1.0	<5.0	<5.0	--	1.5	<100
	09/12/2013	<1.0	<1.0	<1.0	--	--	<10	<1.0	280
GP-27R	04/26/2012	63	25	4.3	17	13	--	140	450
	10/10/2012	89	30	3.8	--	--	24	150	550
	04/15/2013	24	6.8	<1.0	<5.0	<5.0	--	39	150
	09/12/2013	7.5	12	<1.0	--	--	<10	6	130
GP-2E (45-50)	01/19/2012	350	<10	<10	<50	52	--	1,300	990
	04/25/2012	470	<5.0	<5.0	<25	74	--	1,400	1,900
	10/08/2012	320	<1.0	<1.0	--	--	45	850	1,500
	04/10/2013	55 H	<2.0 H	<2.0 H	<10 H	<10 H	--	460 H	510
	09/11/2013	50	<2.0	<2.0	--	--	<20	280	380
GP-2E(55-60)	01/19/2012	150	<5.0	<5.0	<25	<25	--	800	760
	04/25/2012	200	<5.0	<5.0	<25	36	--	820	1000
	10/08/2012	180	<1.0	<1.0	--	--	28	610	910
	04/10/2013	110	<5.0	<5.0	<25	<25	--	440	790
	09/11/2013	65	<1.0	<1.0	--	--	<10	290	360
GP-2F(50-55)	01/19/2012	56	<5.0	<5.0	<25	<25	--	420	400
	04/25/2012	44	<2.0	<2.0	<10	<10	--	400	440
	10/09/2012	29	<1.0	<1.0	--	--	<10	310	300
	04/10/2013	42	<1.0	<1.0	<5.0	13	--	360 E	420
	09/11/2013	48	<1.0	<1.0	--	--	17	320	240
GP-30A	05/03/2012	12,000	14,000	750	3,400	2,200	--	18,000	63,000
	10/11/2012	16,000	27,000	2,000	--	--	12,000	13,000	120,000
	04/10/2013	16,000 H	22,000 H	1,100 H	4,900 H	2,700 H	--	14,000 H	110,000
	09/12/2013	2,000	950	150	--	--	1,100	2,500	11,000
GP-35A	05/03/2012	2,100	4,800	520	2,100	1,300	--	270	21,000
	10/10/2012	290	96	61	--	--	200	98	1,900
	04/03/2013	930	3,200	770	2,800	1,800	--	53	29,000
	09/12/2013	700	2,800	460	--	--	3,600	<20	21,000
GP-39R	10/10/2012	280	180	19	--	--	120	350	1,500
	04/15/2013	210	140	15	45	44	--	310	1,100
	9/12/2013	27	52	6.6	--	--	45	24	<100
GP-41A	05/03/2012	4.5	<1.0	<1.0	<5.0	<5.0	--	<1.0	190
	10/11/2012	<1.0	<1.0	<1.0	--	--	<10	<1.0	<100
	04/10/2013	2.2 H	<1.0 H	<1.0 H	<5.0 H	<5.0 H	--	<1.0 H	120
	09/12/2013	1.7	<1.0	<1.0	--	--	<10	<1.0	110
GP-44A	04/24/2012	<2.0	6.3	63	460	170	--	<2.0	6,500
	10/10/2012	<2.0	14	76	--	--	710	<2.0	7,400
	04/22/2013	<10	37	130	720	300	--	<10	11,000
	09/12/2013	<5.0	25	120	--	--	830	<5.0	11,000

TABLE C-2: GROUNDWATER ANALYTICAL RESULTS
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MARYLAND

Location	Sample Date	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	m+p-Xylene (µg/L)	o-Xylene (µg/L)	Xylenes, Total (µg/L)	Methyl-t-butyl ether (µg/L)	TPH-GRO (µg/L)
GP-7A(20-25)	01/19/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
	04/25/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
	10/05/2012	<1.0	<1.0	<1.0	--	--	<10	<1.0	<100
	04/09/2013	<1.0	<1.0	<1.0	<5.0	<5.0	--	1.1	<100
	09/10/2013	<1.0	<1.0	<1.0	--	--	<10	<1.0	<100
GP-7A(30-35)	01/19/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
	04/25/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
	10/05/2012	<1.0	<1.0	<1.0	--	--	<10	<1.0	<100
	04/09/2013	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
	09/10/2013	<1.0	<1.0	<1.0	--	--	<10	<1.0	<100
GP-7A(35-40)	1/19/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
	4/25/2012	4.2	<1.0	<1.0	<5.0	<5.0	--	6.3	<100
	10/5/2012	24	<1.0	3.6	--	--	<10	30	<100
	4/9/2013	38	<1.0	13	<5.0	<5.0	--	170	1,400
	9/10/2013	25	<1.0	4.0	--	--	<10	230	1,100
GP-9A(20-25)	01/19/2012	<1.0	<1.0	<1.0	--	<5.0	--	<1.0	<100
	04/25/2012	<1.0	<1.0	<1.0	--	<5.0	--	<1.0	<100
	10/05/2012	<1.0	<1.0	<1.0	<10	--	<10	<1.0	<100
	04/09/2013	<1.0	<1.0	<1.0	--	<5.0	--	<1.0	1,400
	09/10/2013	<1.0	<1.0	<1.0	<10	--	<10	2.8	1,100
MW-15	04/24/2012	5	33	12	29	19	--	<1.0	470
	10/10/2012	17	100	37	--	--	130	<1.0	1,100
	04/10/2013	<1.0 H	<1.0 H	<1.0 H	<5.0 H	<5.0 H	--	<1.0 H	<100
	09/12/2013	6.5	32	8.5	--	--	35	<1.0	320
MW-16	4/22/2013	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
	9/12/2013	<1.0	<1.0	<1.0	--	--	<10	<1.0	<100
MW-17	04/26/2012	2,800	5,900	490	2,900	1,600	--	4,100	30,000
	10/10/2012	4,000	7,500	830	--	--	5,500	4,300	45,000
	04/15/2013	190	440	62	330	200	--	650	4,700
	09/12/2013	54	260	70	--	--	880	21	4,400
MW-18	01/19/2012	<10	<10	39	350	650	--	<10	50,000
	04/25/2012	<5.0	<5.0	11	100	200	--	<5.0	23,000
	10/08/2012	<1.0	24	15	--	--	430	<1.0	190,000
	04/10/2013	5	54	120	35	89	--	<1.0	18,000
	09/11/2013	<1.0	<1.0	1.3	--	--	48	<1.0	11,000
MW-19	01/19/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
	04/25/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
	10/08/2012	<1.0	<1.0	<1.0	--	--	<10	<1.0	<100
	04/10/2013	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
	09/11/2013	<1.0	<1.0	<1.0	--	--	<10	<1.0	<100
MW-20	04/24/2012	1.7	<1.0	<1.0	<5.0	<5.0	--	<1.0	460
	10/11/2012	<1.0	<1.0	<1.0	--	--	<10	<1.0	390
	04/10/2013	<1.0 H	<1.0 H	<1.0 H	<5.0 H	<5.0 H	--	<1.0 H	410
	09/12/2013	<1.0	<1.0	<1.0	--	--	<10	<1.0	350
MW-21	04/24/2012	9.2	<1.0	4.1	5.4	<5.0	--	19	370
	10/11/2012	6.6	<1.0	<1.0	--	--	<10	<1.0	420
	04/10/2013	7.0 H	<1.0 H	<1.0 H	5.0 H	<5.0 H	--	13 H	450
	09/12/2013	6.8	<1.0	<1.0	--	--	<10	<1.0	370

TABLE C-2: GROUNDWATER ANALYTICAL RESULTS
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MARYLAND

Location	Sample Date	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	m+p-Xylene (µg/L)	o-Xylene (µg/L)	Xylenes, Total (µg/L)	Methyl-t-butyl ether (µg/L)	TPH-GRO (µg/L)
MW-22R	04/26/2012	3,900	7,800	790	3,300	1,700	--	3,600	34,000
	10/10/2012	3,100	6,200	630	--	--	3,900	2,400	32,000
	04/15/2013	2,300	3,900	390	1,600	880	--	2,200	29,000
	09/12/2013	3,200	6,100	670	--	--	4,400	3,000	26,000
MW-23	01/19/2012	59	4.8	<1.0	<5.0	5.8	--	120	130
	05/03/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	2	<100
	10/11/2012	<1.0	<1.0	<1.0	--	--	<10	1.1	<100
	04/03/2013	<1.0	<1.0	<1.0	<5.0	<5.0	--	3.6	<100
	09/12/2013	<1.0	<1.0	<1.0	--	--	<10	2.1	<100
MW-24A	01/19/2012	<5.0	<5.0	110	270	57	--	<5.0	10,000
	04/25/2012	<10	<10	92	170	<50	--	<10	11,000
	10/11/2012	<5.0	<5.0	39	--	--	130	<5.0	9,900
	04/09/2013	<1.0	2.4	60	22	27	--	<1.0	13,000
	09/10/2013	<1.0	2.1	51	--	--	25	<1.0	9,700
MW-24B	01/19/2012	<5.0	9.9	56	310	110	--	<5.0	11,000
	05/03/2012	<20	<20	59	310	<100	--	<20	11,000
	10/11/2012	<10	<10	39	--	--	160	<10	14,000
	04/09/2013	<1.0	2.1	20	23	39	--	<1.0	13,000
	09/10/2013	<1.0	1.1	9.9	--	--	27	<1.0	11,000
MW-25A	01/19/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	3.5	<100
	04/25/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	3.2	<100
	10/04/2012	<1.0	<1.0	<1.0	--	--	<10	3.4	<100
	04/09/2013	<1.0	<1.0	<1.0	<5.0	<5.0	--	2.7	<100
	09/10/2013	<1.0	<1.0	<1.0	--	--	<10	1.1	<100
MW-25B	01/19/2012	200	<2.0	<2.0	<10	19	--	390	470
	04/25/2012	120	<1.0	<1.0	<5.0	26	--	250	570
	10/04/2012	140	<1.0	<1.0	--	--	40	230	720
	04/09/2013	160	<1.0	<1.0	<5.0	33	--	250	880
	09/10/2013	260	<1.0	<1.0	--	--	66	320	1,200
MW-26A	01/18/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
	05/04/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
	10/11/2012	<1.0	<1.0	<1.0	--	--	<10	<1.0	<100
	04/02/2013	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
	09/09/2013	<1.0	<1.0	<1.0	--	--	<10	<1.0	<100
MW-26B	01/18/2012	520	<5.0	<5.0	<25	<25	--	290	880
	04/30/2012	850	<5.0	<5.0	26	37	--	510	1,700
	10/03/2012	720	<5.0	13	--	--	<50	330	1,800
	04/02/2013	710	<5.0	<5.0	<25	42	--	390	1,400
	09/09/2013	570	<5.0	<5.0	--	--	<50	240	1,500
MW-27A	05/04/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
	10/03/2012	<1.0	<1.0	<1.0	--	--	<10	100	110
	04/02/2013	<1.0	<1.0	<1.0	<5.0	<5.0	--	10	<100
	09/09/2013	<1.0	<1.0	<1.0	--	--	<10	7.4	<100
MW-27B	04/30/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	140	110
	10/03/2012	<1.0	<1.0	<1.0	--	--	<10	3.4	<100
	04/02/2013	<1.0	<1.0	<1.0	<5.0	<5.0	--	120	<100
	09/09/2013	<1.0	<1.0	<1.0	--	--	<10	96	<100
MW-28A	01/18/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
	05/08/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
	10/02/2012	<1.0	<1.0	<1.0	--	--	<10	<1.0	<100
	03/28/2013	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
	09/09/2013	<1.0	<1.0	<1.0	--	--	<10	<1.0	<100

TABLE C-2: GROUNDWATER ANALYTICAL RESULTS
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MARYLAND

Location	Sample Date	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	m+p-Xylene (µg/L)	o-Xylene (µg/L)	Xylenes, Total (µg/L)	Methyl-t-butyl ether (µg/L)	TPH-GRO (µg/L)
MW-28B	01/18/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
	05/02/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
	10/02/2012	<1.0	<1.0	<1.0	--	--	<10	2	<100
	03/28/2013	<1.0	<1.0	<1.0	<5.0	<5.0	--	2.8	<100
	09/09/2013	<1.0	<1.0	<1.0	--	--	<10	4.3	<100
MW-29A	01/18/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	5.2	<100
	05/04/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	15	<100
	10/02/2012	<1.0	<1.0	<1.0	--	--	<10	2.1	<100
	03/28/2013	<1.0	<1.0	<1.0	<5.0	<5.0	--	1	<100
	09/09/2013	<1.0	<1.0	<1.0	--	--	<10	1.4	<100
MW-29B	01/18/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	100	<100
	04/30/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	95	<100
	10/02/2012	<1.0	<1.0	<1.0	--	--	<10	84	<100
	03/28/2013	<1.0	<1.0	<1.0	<5.0	<5.0	--	85	<100
	09/09/2013	<1.0	<1.0	<1.0	--	--	<10	88	<100
MW-30R	10/11/2012	<1.0	<1.0	<1.0	--	--	<10	<1.0	<100
	9/10/2013	<1.0	<1.0	<1.0	--	--	<10	<1.0	<100
MW-31B	01/18/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	1.1	<100
	05/02/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
	10/03/2012	<1.0	<1.0	<1.0	--	--	<10	<1.0	<100
	03/28/2013	<1.0 H	<1.0 H	<1.0 H	<5.0 H	<5.0 H	--	<1.0 H	<100
	09/09/2013	<1.0	<1.0	<1.0	--	--	<10	1.4	<100
MW-33B	01/18/2012	470	<2.0	<2.0	<10	<10	--	310	820
	05/08/2012	380	<2.0	<2.0	<10	<10	--	300	1000
	10/02/2012	<1.0	<1.0	<1.0	--	--	<10	20	<100
	03/28/2013	<1.0	<1.0	<1.0	<5.0	<5.0	--	1.9	<100
	09/09/2013	<1.0	<1.0	<1.0	--	--	<10	<1.0	<100
MW-33C	01/18/2012	17	<1.0	<1.0	<5.0	<5.0	--	34	<100
	05/08/2012	3.4	<1.0	<1.0	<5.0	<5.0	--	20	<100
	10/02/2012	<1.0	<1.0	<1.0	--	--	<10	2.2	<100
	03/28/2013	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
	09/09/2013	<1.0	<1.0	<1.0	--	--	<10	1.2	<100
MW-38	01/18/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
	05/03/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
	10/04/2012	4	<1.0	<1.0	--	--	<10	6.6	<100
	04/05/2013	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
	09/10/2013	<1.0	<1.0	<1.0	--	--	<10	<1.0	<100
MW-39R	01/18/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
	04/26/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
	10/04/2012	<1.0	<1.0	<1.0	--	--	<10	<1.0	<100
	04/05/2013	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
	09/10/2013	<1.0	<1.0	<1.0	--	--	<10	<1.0	<100
MW-40	01/18/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	6	<100
	05/03/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	5.2	<100
	10/04/2012	<1.0	<1.0	<1.0	--	--	<10	21	<100
	04/05/2013	<1.0	<1.0	<1.0	<5.0	<5.0	--	16	<100
	09/10/2013	<1.0	<1.0	<1.0	--	--	<10	4.5	<100
MW-41A	01/18/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
	05/03/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
	10/04/2012	<1.0	<1.0	<1.0	--	--	<10	<1.0	<100
	04/05/2013	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
	09/10/2013	<1.0	<1.0	<1.0	--	--	<10	<1.0	<100

TABLE C-2: GROUNDWATER ANALYTICAL RESULTS
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MARYLAND

Location	Sample Date	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	m+p-Xylene (µg/L)	o-Xylene (µg/L)	Xylenes, Total (µg/L)	Methyl-t-butyl ether (µg/L)	TPH-GRO (µg/L)
MW-41B	01/18/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	15	<100
	04/26/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	13	<100
	10/11/2012	<1.0	<1.0	<1.0	--	--	<10	17	<100
	04/05/2013	<1.0	<1.0	<1.0	<5.0	<5.0	--	14	<100
	09/10/2013	<1.0	<1.0	<1.0	--	--	<10	12	<100
MW-42	01/18/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
	04/30/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
	10/03/2012	<1.0	<1.0	<1.0	--	--	<10	<1.0	<100
	04/02/2013	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
MW-43A	01/18/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
	04/30/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
	10/03/2012	<1.0	<1.0	<1.0	--	--	<10	<1.0	<100
	04/02/2013	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
	09/09/2013	<1.0	<1.0	<1.0	--	--	<10	<1.0	<100
MW-43B	01/18/2012	4.3	<1.0	<1.0	<5.0	<5.0	--	16	<100
	04/30/2012	2.9	<1.0	<1.0	<5.0	<5.0	--	12	<100
	10/03/2012	<1.0	<1.0	<1.0	--	--	<10	6.7	<100
	04/02/2013	<1.0	<1.0	<1.0	<5.0	<5.0	--	7.9	<100
	09/09/2013	<1.0	<1.0	<1.0	--	--	<10	5.4	<100
MW-44A	01/18/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	33	<100
	04/30/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	32	<100
	10/03/2012	<1.0	<1.0	<1.0	--	--	<10	30	<100
	04/02/2013	<1.0	<1.0	<1.0	<5.0	<5.0	--	21	<100
	09/09/2013	<1.0	<1.0	<1.0	--	--	<10	25	<100
MW-44B	01/18/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	89	<100
	04/30/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	87	<100
	10/03/2012	<1.0	<1.0	<1.0	--	--	<10	65	<100
	04/02/2013	<1.0	<1.0	<1.0	<5.0	<5.0	--	81	<100
	09/09/2013	<1.0	<1.0	<1.0	--	--	<10	59	<100
MW-45	04/24/2012	27	<1.0	<1.0	<5.0	23	--	<1.0	380
	10/11/2012	<1.0	<1.0	<1.0	--	--	12	<1.0	310
	04/10/2013	11 H	1.5 H	<1.0 H	15 H	25 H	--	2.0 H	570
	09/12/2013	17	2.7	<1.0	--	--	34	<1.0	640
MW-46	05/03/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	17	<100
	10/11/2012	2.3	<1.0	<1.0	--	--	<10	4.9	110
	04/10/2013	1.2 H	<1.0 H	<1.0 H	<5.0 H	<5.0 H	--	4.9 H	<100
	09/11/2013	<1.0	<1.0	<1.0	--	--	<10	4.7	<100
MW-47	04/24/2012	380	42	<5.0	42	160	--	40	2,000
	10/09/2012	430	110	4.6	--	--	260	<1.0	2,200
	04/03/2013	510	310	11	150	330	--	16	3,900
	09/11/2013	250	130	6.3	--	--	300	<1.0	1,200
MW-48	04/24/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	1.2	<100
	10/09/2012	<1.0	<1.0	<1.0	--	--	<10	<1.0	<100
	04/03/2013	<1.0	<1.0	<1.0	<5.0	<5.0	--	1.1	<100
	09/11/2013	1.9	1.1	<1.0	--	--	<10	1	<100
MW-49	05/03/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	270	320
	10/11/2012	<1.0	<1.0	<1.0	--	--	<10	200	180
	04/10/2013	<1.0 H	<1.0 H	<1.0 H	<5.0 H	<5.0 H	--	230 H	170
	09/11/2013	<1.0	<1.0	<1.0	--	--	<10	230	190

TABLE C-2: GROUNDWATER ANALYTICAL RESULTS
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MARYLAND

Location	Sample Date	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	m+p-Xylene (µg/L)	o-Xylene (µg/L)	Xylenes, Total (µg/L)	Methyl-t-butyl ether (µg/L)	TPH-GRO (µg/L)
MW-50	04/24/2012	1.9	<1.0	<1.0	<5.0	<5.0	--	83	<100
	10/09/2012	1	<1.0	<1.0	--	--	<10	110	120
	04/03/2013	2.2	<1.0	<1.0	<5.0	<5.0	--	94	<100
	09/11/2013	1.6	<1.0	<1.0	--	--	<10	110	110
MW-51	04/24/2012	5.6	<1.0	<1.0	<5.0	<5.0	--	63	110
	10/09/2012	6.1	<1.0	<1.0	--	--	<10	55	150
	04/03/2013	4.9	<1.0	<1.0	<5.0	<5.0	--	65	<100
	09/11/2013	3.7	<1.0	<1.0	--	--	<10	50	<100
MW-53	01/18/2012	5.1	<1.0	<1.0	<5.0	<5.0	--	180	130
	05/04/2012	6.5	<1.0	<1.0	<5.0	<5.0	--	140	120
	10/02/2012	4.1	<1.0	<1.0	--	--	<10	100	170
	03/28/2013	2.7	<1.0	<1.0	<5.0	<5.0	--	73	120
	09/09/2013	2.8	<1.0	<1.0	--	--	<10	110	140
MW-54	01/18/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
	04/30/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
	10/02/2012	<1.0	<1.0	<1.0	--	--	<10	3.1	<100
	03/28/2013	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
	09/10/2013	<1.0	<1.0	<1.0	--	--	<10	<1.0	<100
MW-55	01/18/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
	05/04/2012	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
	10/11/2012	<1.0	<1.0	<1.0	--	--	<10	<1.0	<100
	04/02/2013	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
	09/09/2013	<1.0	<1.0	<1.0	--	--	<10	<1.0	<100
MW-58	01/19/2012	390	<2.0	5.9	<10	18	--	220	620
	05/04/2012	240	<1.0	<1.0	8.8	19	--	190	620
	10/03/2012	380	<2.0	5.2	--	--	28	170	980
	04/02/2013	180	<2.0	<2.0	<10	13	--	140	550
	09/09/2013	250	<2.0	<2.0	--	--	21	110	600
MW-59	01/19/2012	220	<2.0	<2.0	<10	<10	--	220	630
	05/04/2012	140	<1.0	<1.0	<5.0	<5.0	--	160	440
	10/03/2012	240	<1.0	1.1	--	--	<10	210	720
	04/02/2013	260	<5.0	<5.0	<25	<25	--	250	840
	09/09/2013	240	<2.0	<2.0	--	--	<20	220	940
MW-60	10/03/2012	<1.0	<1.0	<1.0	--	--	<10	10	<100
	04/02/2013	<1.0	<1.0	<1.0	<5.0	<5.0	--	14	<100
	9/9/2013	1.6	<1.0	<1.0	--	--	<10	12	<100
MW-61A	10/05/2012	21	170	940	--	--	1,800	<10	19,000
	04/09/2013	29	280	1,400	1,800	180	--	11	20,000
	9/10/2013	38	130	900	--	--	1,200	<10	15,000
MW-61B	10/05/2012	<1.0	<1.0	<1.0	--	--	<10	33	<100
	04/09/2013	<1.0	<1.0	<1.0	<5.0	<5.0	--	16	<100
	9/10/2013	<1.0	<1.0	<1.0	--	--	<10	25	<100
MW-62A	10/04/2012	<1.0	<1.0	<1.0	--	--	<10	<1.0	<100
	04/05/2013	<1.0	<1.0	<1.0	<5.0	<5.0	--	<1.0	<100
	9/10/2013	<1.0	<1.0	<1.0	--	--	<10	<1.0	<100

TABLE C-2: GROUNDWATER ANALYTICAL RESULTS
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MARYLAND

Location	Sample Date	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	m+p-Xylene (µg/L)	o-Xylene (µg/L)	Xylenes, Total (µg/L)	Methyl-t-butyl ether (µg/L)	TPH-GRO (µg/L)
MW-62B	10/04/2012	94	1.3	210	--	--	<10	97	1,800
	04/05/2013	61	<1.0	100	<5.0	<5.0	--	77	1,200
	9/10/2013	34	<1.0	22	--	--	<10	66	800
MW-6	05/03/2012	<1.0	22	14	23	32	--	<1.0	620
	10/11/2012	<1.0	<1.0	<1.0	--	--	<10	<1.0	110
	04/10/2013	<1.0 H	<1.0 H	<1.0 H	<5.0 H	<5.0 H	--	<1.0 H	<200
	09/12/2013	<1.0	40	130	--	--	260	<1.0	8,200
MW-7	04/26/2012	3,000	4,500	600	1,100	750	--	540	20,000
	10/10/2012	390	590	58	--	--	420	99	3,600
	04/15/2013	260	550	38	380	200	--	79	3,400
	09/12/2013	940	1,300	150	--	--	880	200	7,500
PTW-B	04/26/2012	32	31	4.2	29	20	--	71	480
	10/10/2012	<1.0	4.6	1.6	--	--	39	4.7	250
	04/15/2013	<1.0	<1.0	<1.0	<5.0	<5.0	--	5.1	<100
	09/12/2013	5.1	9.6	5.1	--	--	27	11	120
RW-1	04/26/2012	400	250	37	120	110	--	180	1,900
	10/10/2012	190	140	17	--	--	82	100	1,100
	04/15/2013	260	230	31	110	79	--	140	2,300
	09/12/2013	150	150	14	--	--	140	89	1,100
RW-2	04/26/2012	600	600	72	280	230	--	520	3,900
	10/10/2012	330	220	35	--	--	200	300	2,200
	04/15/2013	340	220	38	82	110	--	260	2,600
	09/12/2013	760	1,100	170	--	--	1,100	300	7,500
RW-3	04/26/2012	190	1,400	150	870	590	--	39	5,000
	10/10/2012	84	210	15	--	--	250	77	1,200
	04/15/2013	180	240	24	100	67	--	200	490
	09/12/2013	75	590	130	--	--	1,200	29	4,700
RW-4	04/26/2012	2,200	2,500	270	1,200	690	--	2,100	23,000
	10/10/2012	2,300	3,000	380	--	--	2,300	1,600	29,000
	04/15/2013	2,900	2,700	290	1,300	760	--	2,400	25,000
	09/12/2013	370	500	72	--	--	640	150	27,000
RW-5	10/10/2012	160	1000	380	--	--	2,800	93	16,000
	9/12/2013	13	37	5.2	--	--	99	13	1,000

ARCADIS

Appendix D

Vapor Mitigation System Data

TABLE D-1. VAPOR MITIGATION SYSTEM MEASUREMENTS
SEMI-ANNUAL PROGRESS REPORT: JANUARY THROUGH JUNE 2013
FORMER CHEVRON FACILITY NO. 122208, 5801 RIGGS ROAD, CHILLUM, MD

Address	Date	Average Flow Velocity Measured Using Anemometer (ft/min)	Air Flow Rate Measured Using Anemometer (standard ft^3/min)	Air Flow Rate Measured Using Omniguard/ Magnahelic Gauge (standard ft^3/min)	Cross-Slab Differential Pressure (in. H_2O)
5818 Eastern Avenue	05/09/12	NM[1]	NM[1]	NM[1]	-0.002
5818 Eastern Avenue	06/07/13	NM[1]	NM[1]	NM[1]	-0.002
				EPA Sub-Slab Depressurization Goal	-0.016
				ASTM Sub-Slab Depressurization Goal	-0.025

Notes:

1. No VMS O&M inspections were completed since the 2012 annual VMS sampling event. Only cross-slab differential pressure measurements were collected during the 2013 annual VMS sampling event.

ARCADIS

Appendix E

Soil Vapor Monitoring

TABLE E-1 SOIL VAPOR MONITORING ANALYTICAL RESULTS
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MARYLAND

Location	Sample Date	1,1-Difluoroethane (µg/m3)	Benzene (µg/m3)	Ethylbenzene (µg/m3)	m+p-Xylene (µg/m3)	Methyl-t-butyl ether (µg/m3)	o-Xylene (µg/m3)	Toluene (µg/m3)
VW-1	01/23/2012	23	ND 3.3	ND 4.4	ND 4.4	ND 3.7	ND 4.4	ND 3.9
	05/10/2012	840	ND 3.9	ND 5.4	ND 5.4	ND 4.4	ND 5.4	13
	10/18/2012	3,700 E	ND 3.8	ND 5.1	ND 5.1	ND 4.2	ND 5.1	ND 4.4
	12/19/2013	ND 13	ND 3.8	ND 5.1	ND 5.1	ND 4.3	ND 5.1	ND 4.5
VW-1 (Ambient)	12/19/2013	ND 8.1	ND 2.4	ND 3.2	ND 3.2	ND 2.7	ND 3.2	3.6
VW-2	05/10/2012	96	25	7.9	7.6	25	ND 5.4	5.1
	10/18/2012	ND 12	ND 3.7	ND 5.0	ND 5.0	ND 4.2	ND 5.0	ND 4.4
	12/19/2013	ND 14	6.2	ND 5.5	ND 5.5	ND 4.6	ND 5.5	ND 4.8
VW-03	10/18/2012	1,200	ND 6.8	ND 9.2	14	ND 7.6	ND 9.2	ND 8.0
VW-2(AMB)	10/18/2012	--	ND 2.3	ND 3.1	ND 3.1	ND 2.6	ND 3.1	ND 2.7
VW-04(Ambient)	01/23/2012	--	ND 2.8	ND 3.8	ND 3.8	ND 3.2	ND 3.8	ND 3.3

Notes:
1) J - Estimated value
2) ND - Not detected at the minimum reported quantification limit
3) Wells VW-03 and VW-04 were not sampled during the reporting period due to the presence of water.
4) E - Exeeds instrument calibration range

ARCADIS

Appendix F

In-situ Groundwater Remediation Wells Data

TABLE F-1: IN-SITU GROUNDWATER REMEDIATION WELLS MONITORING DATA
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MD

ID	Date	On/Off Status	Hour Meter	Totalizer Reading	Flow Rate (GPM)	Influent Pressure (PSI)	Pump Set Point (%)	Pump Temp. (°C)	Pump Speed (RPM)	Power Input (W)	Power Consump. (kWh)	Sensor #1 (%)	# of Starts	Operating Hours
ISGR-1	9/30/2013 12:19	ON	813.3	-	2	8	21	41	5800	90	80	67.9	280	-
	10/30/2013 7:00	ON	1533.5	554574	0.4	8.9	21	40	5800	90	150	21.3	730	1532
	11/21/2013 11:30	OFF	2061.4	598433	0.8	3.6	28	42	6200	100	208	36.1	1175	2060
	11/21/2013 13:00	ON	-	-	1.8	9.3	45	29	7500	170	208	58.7	1179	2060
	11/26/2013 11:30	OFF	2181.5	-	1	17.5	45	31	7400	190	230	30.7	1243	2178
	12/12/2013 9:10	OFF	2310.3	-	1	0.7	60	23	0	0	266	31	1245	2308
	12/18/2013 11:35	ON	2456.2	-	1.5	14.9	60	29	7400	200	298	43.3	1251	2454
ISGR-2	9/30/2013 12:21	OFF	828.5	-	0	0.1	22	25	0	0	50	20	4342	528
	10/30/2013 7:00	OFF	1068.3	21663	0	0.1	STOP	22	0	0	76	20	4344	768
	11/21/2013 11:30	ON	1595.1	21663	0	0.1	42	31	7200	160	142	20	4348	1294
	11/21/2013 13:00	ON	2063.5	-	0	8.2	55	32	8000	210	144	20	4350	1296
	11/26/2013 12:20	ON	17159	-	0	10.9	50	33	8000	210	170	-	4350	1416
	12/12/2013 9:30	OFF	1727.8	-	0	0.7	50	22	0	0	172	20	4351	1428
	12/18/2013 9:00	OFF	1728.5	-	2.4	1.6	50	34	8000	230	172	90.9	4357	1428

TABLE F-2: CARBON PERFORMANCE ANALYTICAL RESULTS
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MD

ID	Date	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Total Xylenes (µg/L)	MTBE (µg/L)	TPH-GRO (µg/L)
ISGR-1 Influent	9/30/2013	4.2	89	210	392	<2	3,000
	10/30/2013	5.9	74	320	498	<5	9,200
	11/26/2013	8.8	20	67	126	5.9	2,300
	12/18/2013	11	19	72	122	9.9	1,800
ISGR-1 -50%	9/30/2013	<1	<1	<1	<10	<1	<100
	10/30/2013	<1	<1	<1	<10	<1	<100
	11/26/2013	<1	<1	<1	<10	<1	<100
	12/18/2013	<1	<1	<1	<10	<1	<100
ISGR-1 -75%	9/30/2013	<1	<1	<1	<10	<1	<100
	10/30/2013	<1	<1	<1	<10	<1	<100
	11/26/2013	<1	<1	<1	<10	<1	<100
	12/18/2013	<1	<1	<1	<10	<1	<100
ISGR-1 -90%	9/30/2013	<1	<1	<1	<10	<1	<100
	10/30/2013	<1	<1	<1	<10	<1	<100
	11/26/2013	<1	<1	<1	<10	<1	<100
	12/18/2013	<1	<1	<1	<10	<1	<100
ISGR-2 Influent	9/30/2013	44	5.2	30	17.2	69	480
	10/30/2013	3.9	1.1	5.8	<10	43	170
	11/26/2013	34	2.3	16	12.8	64	500
	12/19/2013	3	<1	<1	<10	6.9	<100

TABLE F-2: CARBON PERFORMANCE ANALYTICAL RESULTS
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MD

ID	Date	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Total Xylenes (µg/L)	MTBE (µg/L)	TPH-GRO (µg/L)
ISGR-2 -50%	9/30/2013	<1	<1	<1	<10	<1	<100
	10/30/2013	<1	<1	<1	<10	<1	<100
	11/26/2013	<1	<1	<1	<10	<1	<100
	12/19/2013	<1	<1	<1	<10	<1	<100
ISGR-2 -75%	9/30/2013	<1	<1	<1	<10	<1	<100
	10/30/2013	<1	<1	<1	<10	<1	<100
	11/26/2013	<1	<1	<1	<10	<1	<100
	12/19/2013	<1	<1	<1	<10	<1	<100
ISGR-2 -90%	9/30/2013	<1	<1	<1	<10	<1	<100
	10/30/2013	<1	<1	<1	<10	<1	<100
	11/26/2013	<1	<1	<1	<10	<1	<100
	12/19/2013	<1	<1	<1	<10	<1	<100

ARCADIS

Appendix G

Oxygen Reactive Zone Data

TABLE G-1: OXYGEN REACTIVE ZONE MONITORING DATA
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MD

Date	Time	Tank Pressure (PSI)	Tank Regulator Pressure (PSI)	Well Regulator Pressure (PSI)	Oxygen Sensor (%)
9/17/2013	1230	1,850	60	10	20.9
10/30/2013	1300	1,600	60	10	20.9
11/14/2013	1500	1,000	60	12	20.9
11/21/2013	1300	1,300	80	12	20.9
12/12/2013	1300	950	15	15	20.9

TABLE G-2: DISSOLVED OXYGEN MEASUREMENTS
SEMI-ANNUAL PROGRESS REPORT: JULY THROUGH DECEMBER 2013
FORMER CHEVRON FACILITY 122208, 5801 RIGGS ROAD, CHILLUM, MD

Date	9/30/2013	10/30/2013	11/27/2013
Well ID	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)
IW-1	4.02	4.92	12.69
IW-2	7.72	5.59	11.21
IW-3	5.27	5.42	11.09
IW-4	3.04	8.45	5.82
IW-5	8.92	0.27	4.19
MW-26A	1.24	0.75	0.92
MW-26B	0.92	1.09	1.21
MW-58	3.33	0.51	1.69

ARCADIS

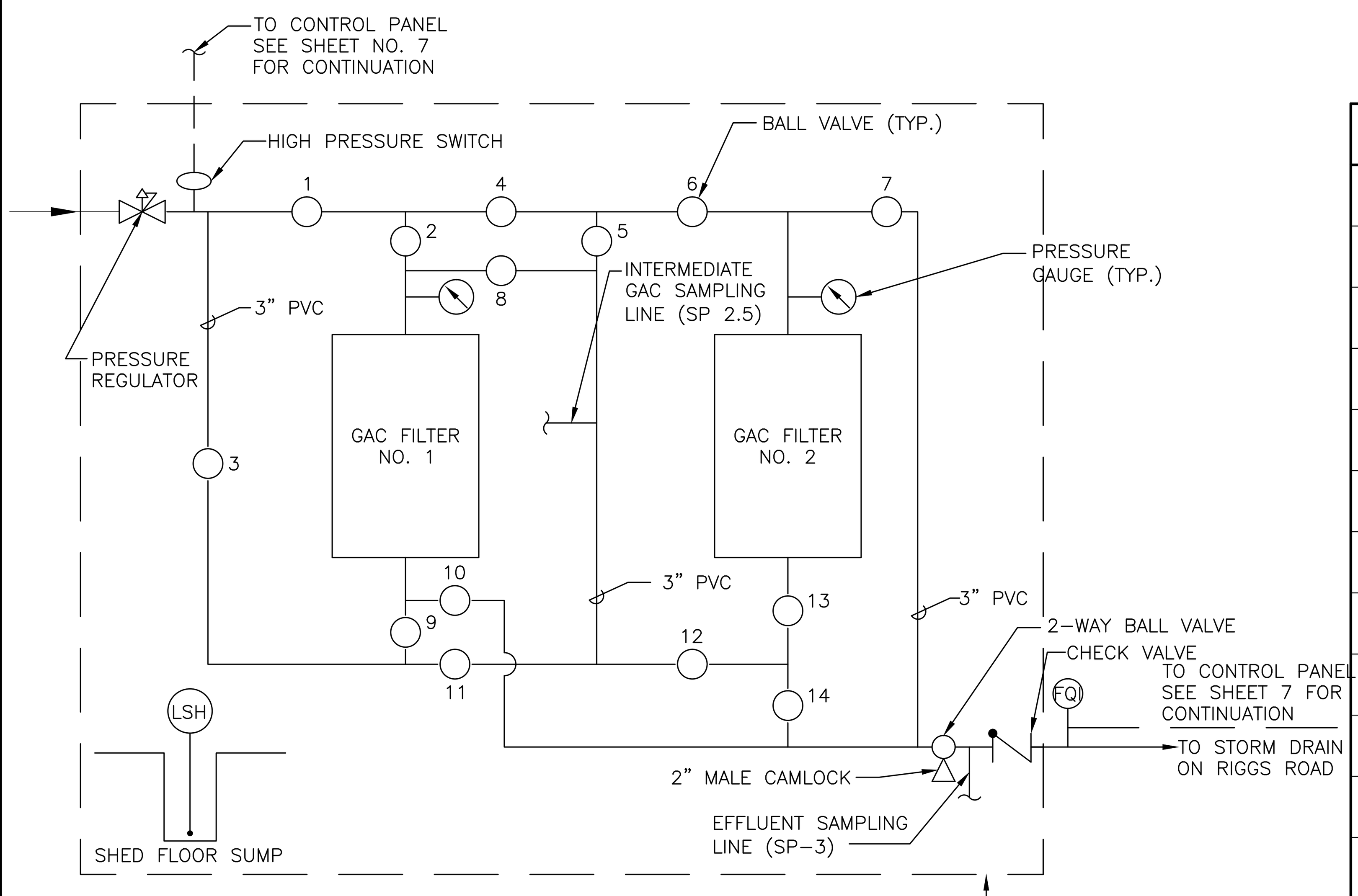
Appendix H

Area A, B, and C Piping and Instrumentation Diagrams

ARCADIS

Area A: Dual Phase Extraction System

Piping and Instrumentation Diagrams

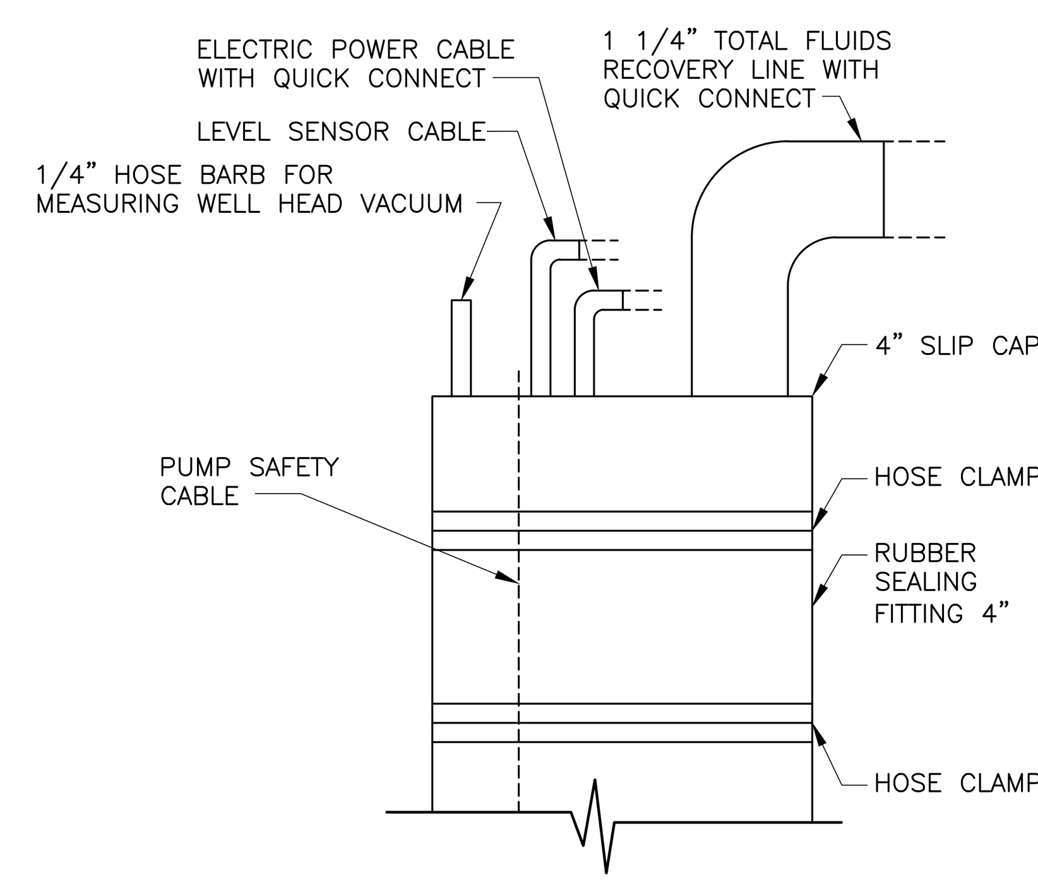


PROCESS AND INSTRUMENTATION DIAGRAM

SCALE: NOT TO SCALE

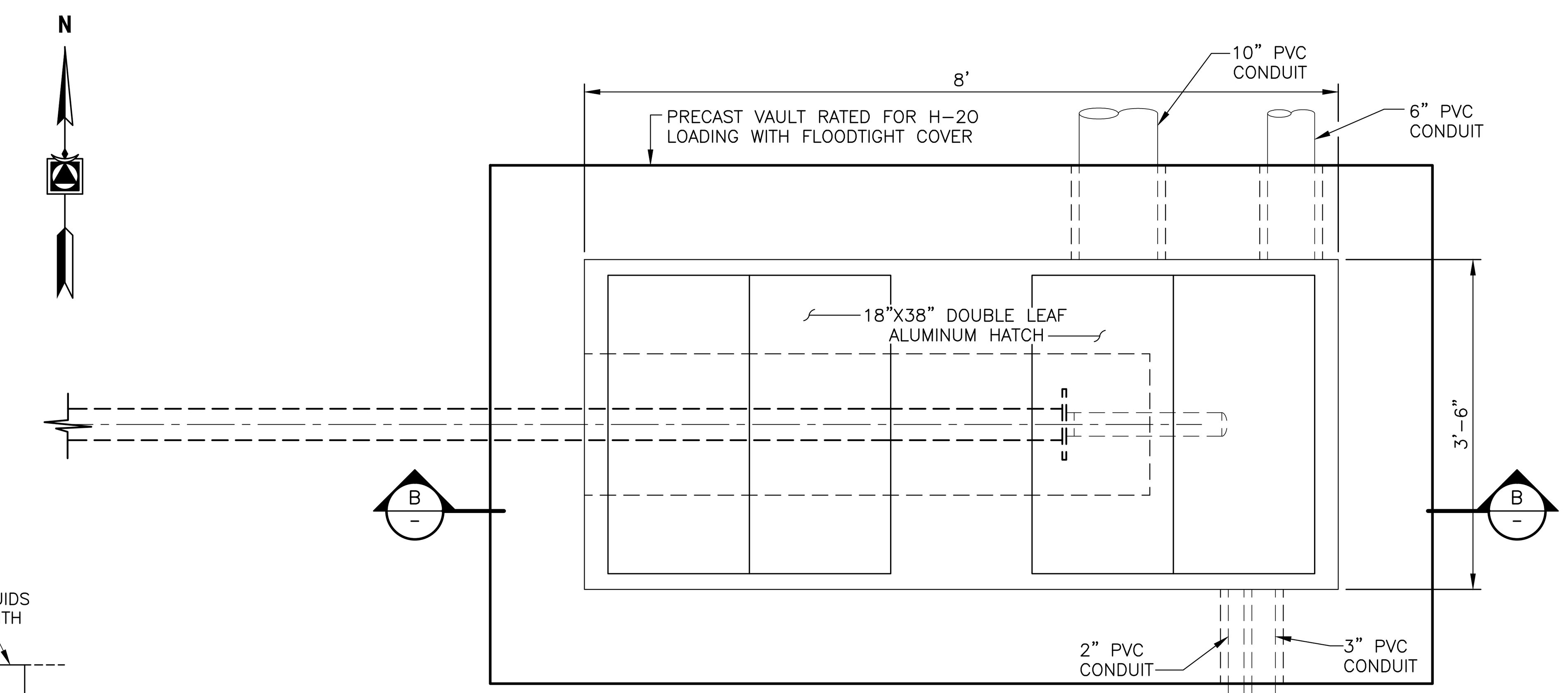
VALVE	SYSTEM OPERATING MODE: SERIES 1→2	SERIES 2→1	GAC 1	GAC 2	BW 1→2	BW 1	BW 2
1	O	O	O	O	C	C	C
2	O	C	O	C	C	C	–
3	C	C	C	C	O	O	O
4	C	O	C	O	–	–	–
5	O	C	–	C	C	C	C
6	O	O	–	O	C	–	C
7	C	C	C	C	O	C	O
8	C	O	C	–	O	O	C
9	O	C	C	–	O	O	C
10	C	O	O	C	C	C	–
11	O	C	–	–	C	C	O
12	C	O	–	C	O	O	O
13	O	O	–	O	O	C	O
14	O	C	C	O	C	O	C

O = OPEN
C = CLOSED
– = IRRELEVANT
BW = BACKWASH



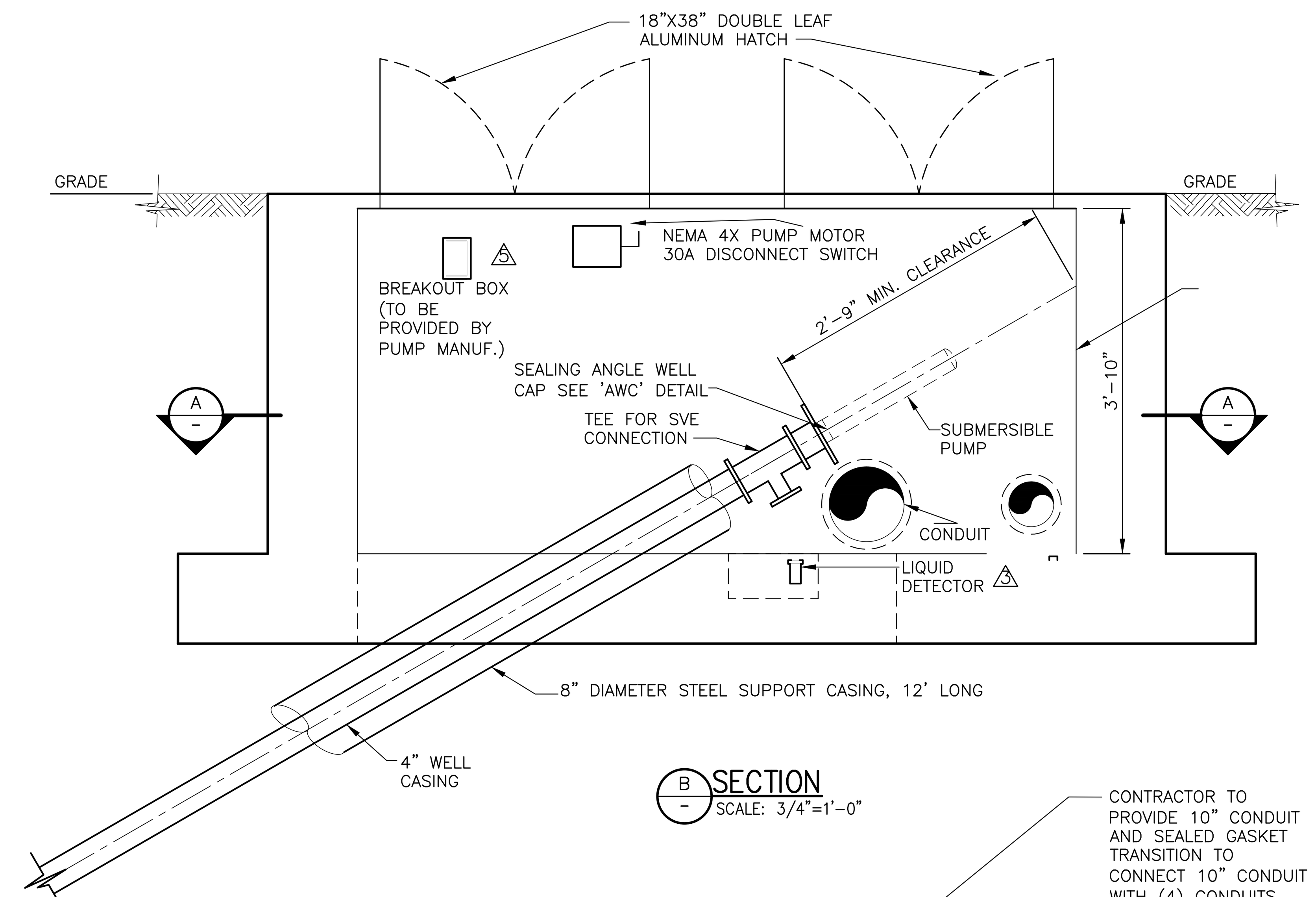
AWC SEALING ANGLE WELL CAP DETAIL

SCALE: NOT TO SCALE



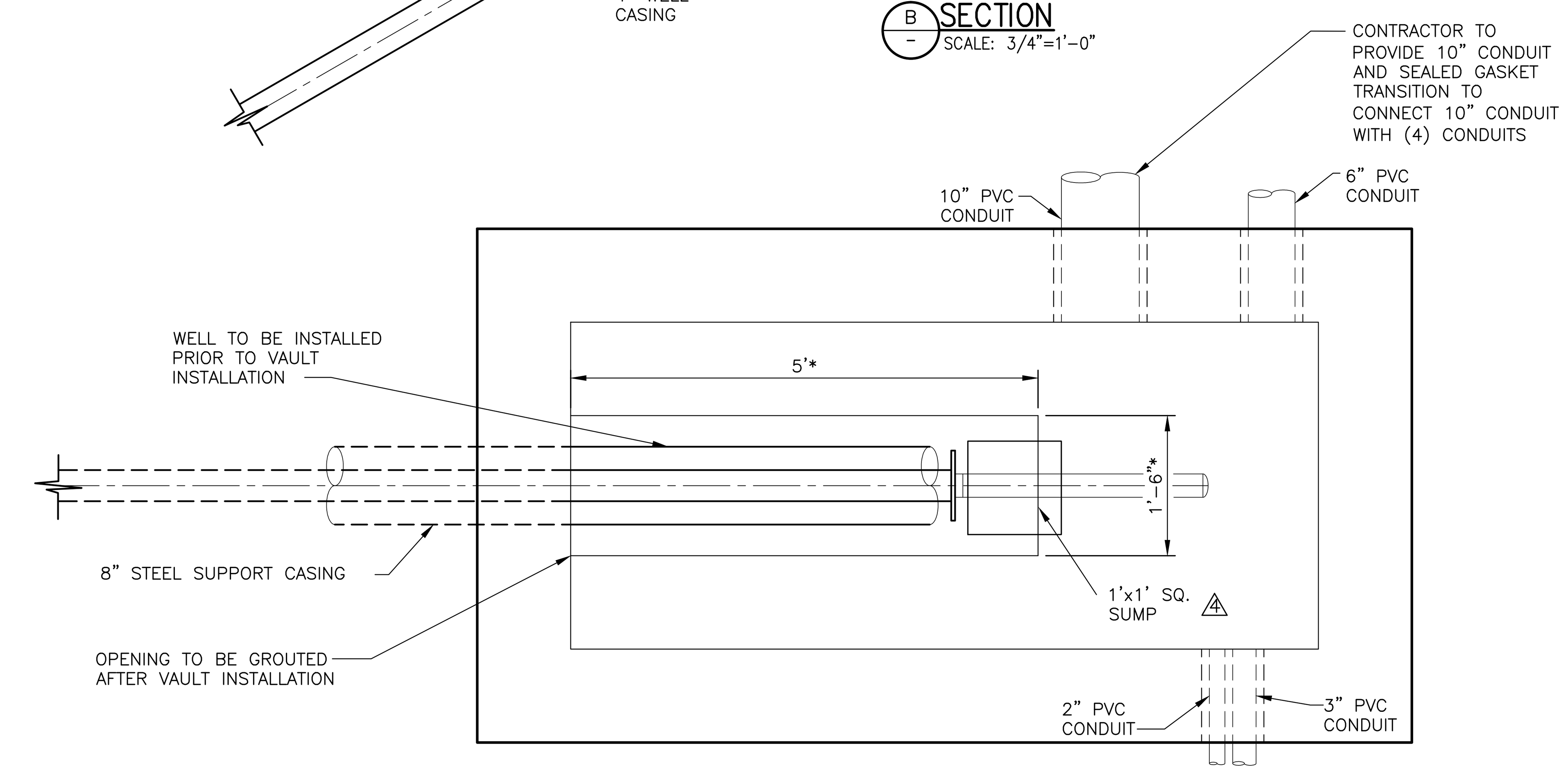
PLAN

SCALE: 3/4"=1'-0"



B SECTION

SCALE: 3/4"=1'-0"

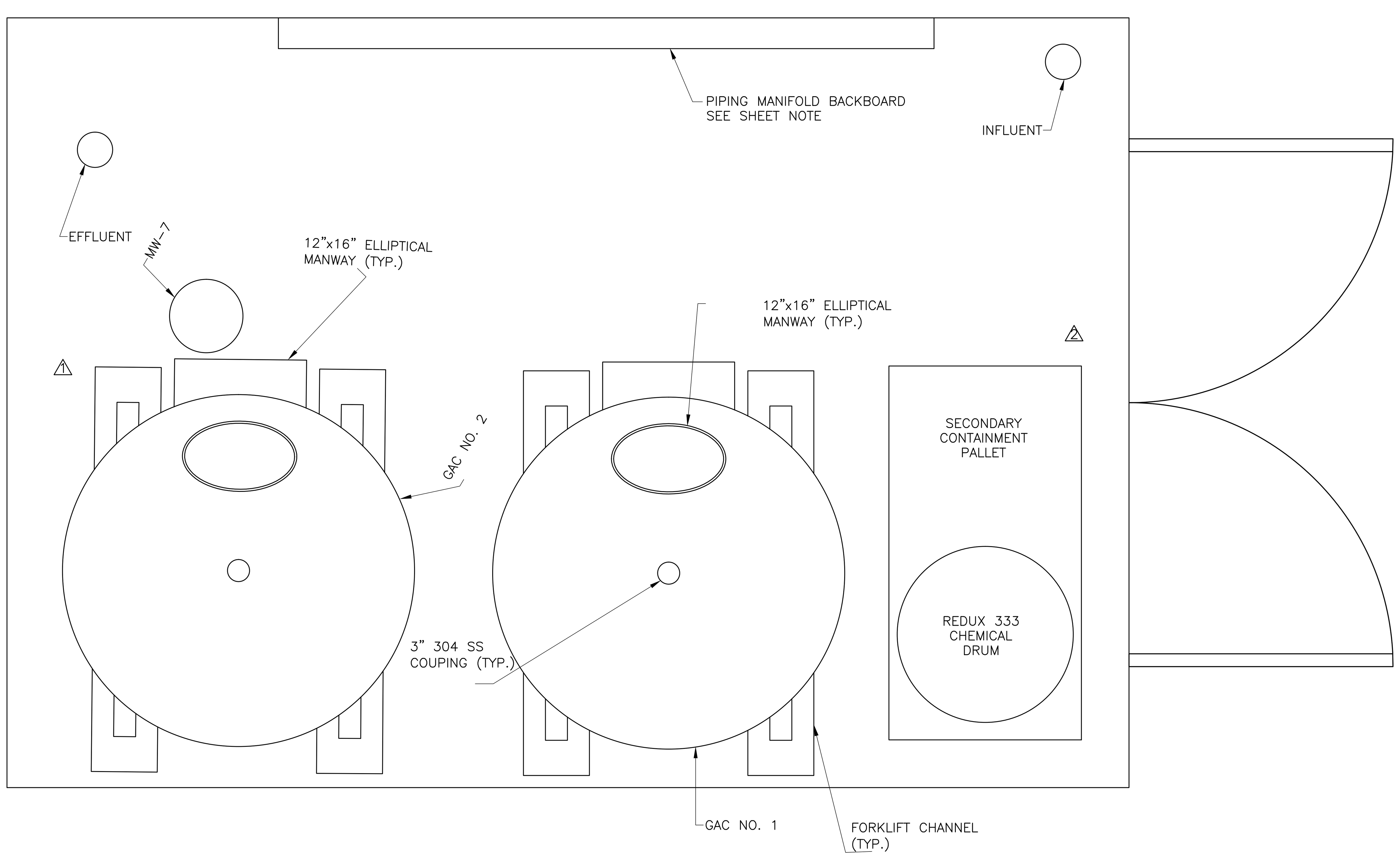


* PRECAST VAULT SHALL BE PROVIDED WITH OPENING TO ACCOMMODATE WELL CASING PER THE FOLLOWING NOTES.
1. CONTRACTOR SHALL VERIFY OPENING DIMENSIONS AND LOCATIONS PRIOR TO CASTING THE VAULT.
2. CONTRACTOR SHALL DOWEL BARS, CAST CONCRETE IN PLACE AND CLOSE OPENING WATERTIGHT WITH NON-SHRINK GROUT TO LEVEL WITH BOTTOM OF THE PRECAST VAULT, PER THE PRECAST VAULT MANUFACTURER'S RECOMMENDATIONS.
3. CONTRACTOR SHALL PROTECT WELL CASING FROM CONCRETE IN ALL CONTACT AREAS PER THE PRECAST VAULT MANUFACTURER'S RECOMMENDATIONS.

A SECTION A-A

SCALE: 3/4"=1'-0"

ANGLE WELL VAULT



GAC SHED PLAN VIEW

SCALE: 1" = 1'

SHEET NOTE:
PIPING SHALL NOT BLOCK ACCESS TO GAC MANWAYS OR RUN ACROSS THE FLOOR.

NOTE:
BEGINNING OCTOBER 2013, THIS DRAWING HAS BEEN MODIFIED BY ARCADIS U.S. TO SHOW AS-BUILT CONDITIONS.

AS-BUILT DRAWINGS

CITY: SYRACUSE-NY DIV/GROUP: 141/ENV DB: K.SARTORI PIC: PM: TM: JOHN MARRS LYR:ON=*;OFF=*REF* G:\ENVCAD\SYRACUSE\ACT\B0048971\0000\00001\DWG\CONTRACT\AREA_A\48971G04.dwg LAYOUT: 4 SAVED: 11/8/2013 11:04 AM ACADVER: 18.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ---- PLOTTED: 11/8/2013 11:05 AM BY: SARTORI, KATHERINE
XREFS: IMAGES: 122208-TB2 ANGLED WELL VAULT.JPG

SEAL

PROFESSIONAL CERTIFICATION
I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND
LICENSE NO. 33568
EXP DATE 09/12/12
ENGINEER: ROBERT W. SCRAFFORD GANNETT FLEMING, INC.

THE SEALED DRAWING IS AND SHALL REMAIN PROPERTY OF GANNETT FLEMING, INC. ANY MISUSE, REUSE, ALTERATIONS, ADDITIONS, AND/OR DELETIONS OF THESE DRAWINGS ON PROJECT EXTENSIONS OR OTHER PROJECTS SHALL BE AT THE USER'S SOLE RISK AND WITHOUT LIABILITY TO GANNETT FLEMING, INC. IN THE EVENT THAT A CONFLICT ARISES BETWEEN THE SEALED DRAWINGS AND THE ELECTRONIC FILES, THE SEALED DRAWINGS WILL GOVERN.

NO.	DESCRIPTION	DATE	BY
1	GAC NO. 2 ALIGNED PARALLEL WITH GAC NO. 1	6/11/12	ET
2	SECONDARY CONTAINMENT PALLET MOVED NEXT TO GAC NO. 1	6/11/12	ET
3	AS-BUILT LIQUID DETECTOR LOCATION	6/11/12	ET
4	AS-BUILT SUMP LOCATION	6/11/12	ET
5	AS-BUILT BREAKOUT BOX LOCATION	6/11/12	ET

REVISIONS

DESIGNED	CADD	SCALE
EL	SJM	NONE
CHECKED	APPROVED	APPROVED
RWS	RWS	X

Gannett Fleming
BALTIMORE, MARYLAND

CHEVRON PRODUCTS COMPANY
HOUSTON, TEXAS
FORMER CHEVRON FACILITY NO.122208-AREA A
CHILLUM, MARYLAND

DUAL PHASE EXTRACTION SYSTEM
GAC SYSTEM AND ANGLE WELL VAULT

JOB NO. 55588
DATE JUNE 2012
CAD FILE 122208AA GAC
SHEET NO. 4
4 OF 10

DATE:

PRIMARY ELEMENT:

FLOW

- ELECTROMAGNETIC
- CORIOLIS
- THERMAL DISPERSION
- ULTRASONIC TRANSIT–TIME OR DOPPLER
- VENTURI
- ORIFICE PLATE
- PROPELLER OR TURBINE
- VORTEX
- ROTAMETER
- FLUME
- FLOW SWITCH
- WEIR

LEVEL

- BUBBLER TUBE
- ULTRASONIC
- CAPACITANCE
- ELECTRODES (W/HOLDER)
- FLOAT
- OPTICAL

TEMPERATURE

- TEMPERATURE ELEMENT WITH WELL

ACTUATORS:

- CYLINDER
- MOTOR
- ELECTROPNEUMATIC
- ELECTROHYDRAULIC
- MANUAL (SHOWN ONLY FOR CERTAIN HAND OPERATED VALVES)
- SOLENOID
- DIAPHRAM (SPRING OPPOSED)
- DIAPHRAM (PRESSURE BALANCED)
- PRESSURE OR VACUUM RELIEF SPRING OR WEIGHT LOADED

NOTE: ON LOSS OF PRIMARY POWER (PNEUMATIC OR ELECTRICAL)

XX DENOTES ONE OF THE FOLLOWING:
FO = FAIL OPEN
FC = FAIL CLOSED
FI = FAIL TO INTERMEDIATE POSITION
BLANK = FAIL TO LAST POSITION

EQUIPMENT TAGGING:

X–NNN
- X DENOTES ONE OF THE FOLLOWING:
  M=MECHANICAL EQUIPMENT
  P=PUMP
  T=TANK
  V=VALVE
  CFD=CHEMICAL FEEDER
- NNN = LOOP NUMBER

INSTRUMENT & FUNCTION TAGGING:

XXX
NNNX
- XXX=FUNCTIONAL INSTRUMENT IDENTIFICATION LETTERS FROM INSTRUMENT IDENTIFICATION TABLE.
- X=LETTER SUFFIX TO DISTINGUISH BETWEEN INSTRUMENTS IN LOOP WITH SAME FUNCTIONAL IDENTIFICATION. (USED AS REQ'D)
- NNN=LOOP NUMBER

INPUTS & OUTPUTS INTERFACED WITH COMPUTER DATA ACQUISITION & CONTROL SYSTEM:

- ANALOG INPUT
- ANALOG OUTPUT
- DIGITAL INPUT
- DIGITAL OUTPUT
- SERIAL (INPUT/OUTPUT)

RTU X–XX
- ALPHANUMERIC CHARACTERS TO IDENTIFY CONTROL PANEL
- IF USED, NUMBER OF POINTS. (SINGLE POINT IF NOT USED)
- XX DENOTES ONE OF THE FOLLOWING:
  AO=ANALOG OUTPUT
  AI=ANALOG INPUT
  DI=DISCRETE INPUT
  DO=DISCRETE OUTPUT
  SC=SERIAL COMMUNICATIONS

EQUIPMENT POWER:

XXX
- 120VAC POWER FROM POWER PANEL CIRCUIT BREAKER, UNLESS OTHERWISE NOTED, REQUIRED TO INSTRUMENT (TYP)
- XXX DENOTES ONE OF THE FOLLOWING:
  UPS=120VAC FROM UPS VIA FUSEBLOCK
  208/3=208V, 3 PHASE FROM POWER PANEL CIRCUIT BREAKER

ANALYSIS INSTRUMENTS:

- AE XX — EXPOSED PROBE OR GAS DETECTION
- AE XX — TAPPED OR SAMPLED
- AE XX — IN–LINE

XX DENOTES ONE OF THE FOLLOWING:
CLG=CHLORINE GAS
CLR=CHLORINE RESIDUAL
PH=PH
T=TURBIDITY
FLR=FLOURIDE
SCD=STREAMING CURRENT
PM=PARTICLE MONITOR
PC=PARTICLE COUNTER
TOC=TOTAL ORGANIC CARBON

EQUIPMENT:

- CENTRIFUGAL PUMP (DRY PIT)
- CENTRIFUGAL PUMP (WET PIT)
- EJECTOR, EDUCTOR
- METERING PUMP–CHEMICAL
- CENTRIFUGAL COMPRESSOR OR BLOWER
- RECIPROCATING COMPRESSOR (PD)
- ROTARY COMPRESSOR (PD) OR BLOWER
- MOTOR
- MIXER
- VERTCAL TURBINE PUMP

XX DENOTES ONE OF THE FOLLOWING:
CS = CONSTANT SPEED
2S = TWO SPEED
VS = VARIABLE SPEED

- POSITIVE DISPLACEMENT PUMP

VALVE STATES:

- TWO–WAY VALVE, NORMALLY OPEN
- TWO–WAY VALVE, NORMALLY CLOSED
- THREE–WAY VALVE, TOTALLY–FILLED PORT BLOCKED AND PARTIALLY–FILLED PORT OPENED WHEN DEACTIVATED. PORT STATES REVERSE WHEN ACTIVATED.

EXPLANATORY NOTATIONS:

NN/XX
- FLOW STREAM No NN TO SHEET No XX
- FLOW STREAM TO OR FROM EQUIPMENT NOT SHOWN ON OTHER P&ID DRAWINGS

HAND SWITCHES

HS XX
- SELECTOR SWITCH (MAINTAINED CONTACTS)

HMS XX
- SPRING RETURN SWITCH OR PUSHBUTTONS (MOMENTARY CONTACTS)

XX DENOTES ONE OF THE FOLLOWING:
AM=AUTO/MANUAL
CAM=COMPUTER/AUTO/MANUAL
CL=COMPUTER/LOCAL
CM=COMPUTER/MANUAL
DOB=DRIVE/OFF/BYPASS
FOS=FAST/OFF/SLOW
FOR=FORWARD/OFF/REVERSE
FR=FORWARD/REVERSE
FS=FAST/SLOW
HOA=HAND/OFF/AUTO
KEY=KEYPAD
LOR=LOCAL/OFF/REMOTE
LOS=LOCKOUT/STOP
MFS=MODULATE FASTER/SLOWER
MOC=MODULATE OPEN/CLOSE
OC=OPEN/CLOSE
OO=ON/OFF
OSC=OPEN/STOP/CLOSE
SS=START/STOP
PB=PUSH BUTTON

SIGNAL CONVERTERS

X/X
- SMALL CIRCLE SIGNIFIES LOGICAL INVERSION OF SIGNAL
- X DENOTES ONE OF THE FOLLOWING:
  A=ANALOG
  B=BINIARY
  D=DIGITAL
  E=VOLTAGE
  F=FREQUENCY
  H=HYDRAULIC
  I=CURRENT
  O=ELECTROMAGNETIC, SONIC
  P=PNEUMATIC
  PF=PULSE FREQUENCY
  PD=PULSE DURATION
  R=RESISTANCE

MISCELLANEOUS:

- DIAPHRAGM SEAL
- ANNULAR DIAPHRAGM
- RUPTURE DISK (PRESSURE RELIEF)
- RUPTURE DISK (VACCUUM RELIEF)
- (REGULATED SIDE) PRESSURE REGULATOR
- VENT TO ATMOSPHERE
- AIR GAP
- TWO WAY VALVE FAIL OPEN
- TWO WAY VALVE FAIL CLOSE
- ANY VALVE, FAIL LOCKED (POSITION DOES NOT CHANGE)
- PINCH VALVE
- XP — PURGE SET X DENOTES: W=WATER A=AIR
- FLOW STRAIGHTENER
- X — EQUIPMENT CONNECTION WITH ELECTRICAL INTERLOCK
- XG — SIGHT GLASS X DENOTES: F=FLOW L=LEVEL
- PRESSURE GAUGE
- SYSTEM/EQUIPMENT GROUND
- ISOLATED GROUND
- OMNIDIRECTIONAL ANTENNA
- DIRECTIONAL ANTENNA

ABBREVIATIONS:

A or AMP	AMPERE
AC	ALTERNATING CURRENT
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AIC	AMPERE INTERRUPTING CAPACITY
AS	AMMETER SELECTOR SWITCH
ATS	AUTO TRANSFER SWITCH
AUTO	AUTOMATIC
AWG	AMERICAN WIRE GAUGE
BLDG	BUILDING
C	CONDUIT
CP	CONTROL PANEL
DIV	DIVISION
EC	ELECTRICAL CONTRACTOR
EMT	ELECTRICAL METALLIC TUBING (CONDUIT)
EF	EXHAUST FAN
EP	EXPLOSION PROOF
F/T	FEED THROUGH
FU	FUSE
FO	FIBER OPTIC
GFI	GROUND FAULT INTERRUPTER
GRD	GROUND
HP	HORSEPOWER
IG	ISOLATED GROUND
KV	KILOVOLT
KVA	KILOVOLT AMPERE
KW	KILOWATT
MTD	MOUNTED
N/A	NOT APPLICABLE
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
No	NUMBER
PNL	PANEL
PVC	POLYVINYL CHLORIDE (CONDUIT)
RECP	RECEPTACLES
RGS	RIGID GALVANIZED STEEL (CONDUIT)
RVAT	REDUCED VOLTAGE AUTOTRANSFORMER
RVSS	REDUCED VOLTAGE SOLID STATE
TVSS	TRANSIENT VOLTAGE SURGE SUPPRESSION
TYP	TYPICAL
UL	UNDERWRITER LABORATORIES
UON	UNLESS OTHERWISE NOTED
UPS	UNINTERRUPTIBLE POWER SUPPLY
V	VOLT
VS	VOLTMETER SELECTOR SWITCH
W	WIRE
WP	WEATHERPROOF
WS	WATER SUPPLY
XFMR	TRANSFORMER
1–PH	SINGLE PHASE
3–PH	THREE PHASE

VALVES & GATES:

- BALL VALVE
- BUTTERFLY VALVE
- CHECK VALVE GLOBE, GATE, PINCH OR OTHER IN–LINE VALVE
- ROTARY VALVE
- DIAPHRAM VALVE
- PLUG VALVE
- THREE WAY VALVE (ARROW IF SHOWN INDICATES FAIL OPEN PATH)
- TELESCOPING VALVE
- SLUICE GATE
- PREFABRICATED SLIDE GATE
- UNCLASSIFIED GATE (SEE SPECIFICATIONS)
- KNIFE GATE VALVE

INSTRUMENT/FUNCTION & LOCATION SYMBOLS

	FIELD (LOCAL) MOUNTED	PANEL MOUNTED		MOTOR CONTROL CENTER MOUNTED	
		ACCESSIBLE OR EXTERIOR	INACCESSIBLE OR INTERIOR	ACCESSIBLE OR EXTERIOR	INACCESSIBLE OR INTERIOR
DISCRETE INSTRUMENT	○	⊖	⊖	⊖	⊖
SHARED DISPLAY/CONTROL	□	▭	▭	▭	▭
COMPUTER FUNCTION	⬡	⬡	⬡	⬡	⬡
PROGRAMMABLE LOGIC CONTROL	◇	◇	◇	◇	◇
PILOT LIGHT	◯	◯	◯	◯	◯
HAND SWITCH MAINTAINED CONTACTS	HS	HS	HS	HS	HS
HAND SWITCH MOMENTARY CONTACTS	HMS	HMS	HMS	HMS	HMS
COMPOUND INSTRUMENTS (SHARE COMMON HOUSING)	◯◯	⊖⊖	⊖⊖	⊖⊖	⊖⊖

INSTRUMENT IDENTIFICATION TABLE ISA–S5.1–1984

LETTER	FIRST LETTER: MEASURED OR INITIATING VARIABLE	FIRST LETTER: MODIFIER	SUCCEEDING LETTERS: READOUT OR PASSIVE FUNCTION	SUCCEEDING LETTERS: OUTPUT FUNCTION	SUCCEEDING LETTERS: MODIFIER
A	ANALYSIS (2)		ALARM		
B	BURNER, COMBUSTION			CLOSE, STOP, DECREASE (1)	OFF (1)
C				CONTROL	
D		DIFFERENTIAL		OPEN, START, INCREASE (1)	
E	VOLTAGE		SENSOR (PRIMARY ELEMENT)		ENABLED (1)
F	FLOW RATE	RATIO (FRACTION)			FAIL (1)
G			GLASS, VIEWING DEVICE		
H	HAND				HIGH (OPENED)
I	CURRENT (ELECTRICAL)		INDICATE		
J	POWER	SCAN			
K	TIME, TIME SCHEDULE	TIME RATE OF CHANGE		CONTROL STATION	
L	LEVEL		LIGHT		LOW (CLOSED)
M	MOTOR, MOTION (1)	MOMENTARY		MOTOR (1)	MIDDLE OR INTERMEDIATE
N					ON OR OPERATE (1)
O			ORIFICE, RESTRICTION		OVERLOAD (1)
P	PRESSURE, VACUUM		POINT (TEST) CONNECTION	PUMP (1)	
Q	QUANTITY (2)	INTEGRATE, TOTALIZE			
R	RADIATION		RECORD		
S	SPEED, FREQUENCY	SAFETY OR SOLENOID		SWITCH	
T	TEMPERATURE			TRANSMIT	
U	MULTIVARIABLE (2)		MULTIFUNCTION (2)	MULTIFUNCTION (2)	MULTIFUNCTION (2)
V	VIBRATION, MECHANICAL ANALYSIS			VALVE, DAMPER, LOUVER	
W	WEIGHT, FORCE		WELL		
X	UNCLASSIFIED, (2)		UNCLASSIFIED (2)	UNCLASSIFIED (2)	UNCLASSIFIED (2)
Y	EVENT, STATE, PRESENCE			RELAY, COMPUTE, CONVERT	
Z	POSITION, DIMENSION			DRIVER, ACTUATOR, UNCLASSIFIED FINAL CONTROL ELEMENT	

(1) USER'S CHOICE
(2) WHEN USED, SYMBOL OR SIGNAL LINE IS INDICATED.

NOTE:
BEGINNING OCTOBER 2013, THIS DRAWING HAS BEEN MODIFIED BY ARCADIS U.S. TO SHOW AS–BUILT CONDITIONS.

AS-BUILT DRAWINGS

SEAL

DATE:

PROFESSIONAL CERTIFICATION

I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND

LICENSE NO. 33568

EXP DATE 09/12/12

ENGINEER: ROBERT W. SCRAFFORD
GANNETT FLEMING, INC.

NO.	DESCRIPTION	DATE	BY
	REVISIONS		

DESIGNED	CADD	SCALE
EL	SJM	NONE
CHECKED	APPROVED	APPROVED
RWS	RWS	X

Gannett Fleming
BALTIMORE, MARYLAND

CHEVRON PRODUCTS COMPANY
HOUSTON, TEXAS

FORMER CHEVRON FACILITY NO.122208–AREA A
CHILLUM, MARYLAND

DUAL PHASE EXTRACTION SYSTEM
INSTRUMENTATION LEGEND
ABBREVIATIONS AND GENERAL NOTES

JOB NO. 55588
DATE JUNE 2012
CAD FILE 122208AA LEG
SHEET NO. 6
6 OF 10

GRS CONTROL PANEL
EOS CONTROLER

CAT OXIDIZER RUNNING (1)
CAT OXIDIZER INLET TEMP T-1 (2)
CAT OXIDIZER OUTLET TEMP T-2 (3)
SVE BLOWER DISCHARGE FLOW SWITCH
SVE AIR FLOW (4)
KO TANK VACUUM (5)
RUN/STOP KO PUMP P-1 (HS, XA) (6)
KO TANK LEVEL HI/HI (7)
KO TANK LEVEL HI (8)
KO TANK LEVEL LO (9)
OIL/WATER SEPERATOR LEVEL HI/HI (10)
OIL/WATER SEPERATOR LEVEL HI (11)
OIL/WATER SEPERATOR LEVEL LO (12)
RUN/STOP OIL/WATER SEPERATOR PUMP P-2 (HS, XA) (13)
SVE BLOWER RPM (14)
SVE BLOWER SPEED SET POINT (15)
RUN/STOP SVE BLOWER B-1 (HS, XA) (16)
RUN/STOP AST BLOWER B-2 (HS, XA) (17)
AST BLOWER DISCHARGE FLOW SWITCH (18)
AST LEVEL HI/HI (19)
AST LEVEL HI (20)
AST LEVEL LO (21)
RUN/STOP AST PUMP P-3 (HS, XA) (22)
NOT USED (23)
3-WAY COMPRESSED AIR SOLENOID VALVE (XA) (24)
RUN/STOP COMPRESSER C-1 (HS, XA) (25)
AST EFFLUENT FLOW PULSE (26)
RUN/STOP ANGLE WELL PUMP (27)
ALARM ANGLE WELL PUMP
ALARM LIQUID DETECTOR
RUN/STOP METERING PUMP
ALARM METERING PUMP
ALARM HIGH PRESSURE SWITCH

RTU-02
CONTROL PANEL

SEE SHEET NO. 4 FOR CONTINUATION

SHEET NOTES

1. SEE SHEET NO. 4 FOR MODIFICATION WORK.
2. REMOVE CONNECTIONS FROM WELL PTW-A.
3. METERING PUMP TO BE LOCATED IN THE CARBON SHED ON/ABOVE THE CHEMICAL DRUM
3. ANGLE WELL RUN/STOP WIRED TO SOLENOID RELAY

NON-CLASSIFIED ATMOSPHERE
CLASSIFIED ATMOSPHERE (CLASS 1, DIV 2)

2" PVC
TUBING
DETAIL A

2" PVC 40 (TYP)
SVE PIPE FROM WELL
SVE PIPE FROM WELL
SVE PIPE FROM WELL
SVE PIPE FROM WELL
SVE PIPE FROM WELL
SVE PIPE FROM WELL
SVE PIPE FROM WELL
SVE PIPE FROM WELL
SVE PIPE FROM WELL
SVE PIPE FROM WELL
SVE PIPE FROM WELL
FROM ATMOSPHERE
DILUTION VALVE
TO ATMOSPHERE

GP39-A AND GP27-A
MW-22(R)
MW-7
MP-7
RW-3
RW-4
RW-1
RW-5
RW-2
MW-17
PTW-B
ST
DETAIL A
SEE SHEET NOTE 2

SILENCER
3" PVC 40
FT 003
FE 003
TI
PI 003
PIT 003
ST
LSHH 003
LSH 003
LSL 003
V1
2" GLOBE VALVE
KO TANK
VFD
SVE B-1 BLOWER TUTHILL MOD# 4009-46L3 25 HP
3" PVC 40
STARTER
1" HOSE
P-1 KO PUMP MOYNO MOD #33201 2 HP
3/4" CS
SILENCER
DRAIN
3" CS 40
1" PVC 80
2" PVC 80

LSHH 001
LSH 001
LSL 001
FSL 001
OIL/WATER SEPARATOR HYDRO QUIP MOD #AGM-2SS-60V 30 GPM
2" CS 40
P-2 OIL/WATER SEPARATOR PUMP AMT MOD #3694-97 1.5 HP
B-2 AST BLOWER NEW YORK BLOWER CO 5 HP
FSL 002
4" PVC 40
AS-1 AIR STRIPPER QED MOD #E-Z STACKER 4.4 P
2" PVC 40
SP-1

CRITICAL SAFETY DEVICE:

1. ES-1 EMERGENCY STOP BUTTON IS TIED DIRECTLY TO PANEL B AND PANEL A. WHEN ACTIVATED, EMERGENCY STOP BUTTON SHUTS DOWN ALL EQUIPMENT, BUT DOES NOT KILL POWER TO THE SYSTEM. SYSTEM OPERATORS WILL BE NOTIFIED. (CS-1)
2. FLAME ARRESTER PREVENTS UPSTREAM PROPAGATION OF FLAME FROM CATALYTIC OXIDIZER (CS-2).

CLASSIFIED ATMOSPHERE (CLASS 1, DIV 2)
NON-CLASSIFIED ATMOSPHERE
ANGLE WELL PUMP EPG MODEL TSP 2-3PT ½ HP
INSIDE ANGLE WELL VAULT RW-5
LIQUID DETECTOR
FUTURE GAC FILTER

VAPOR PHASE GAC FILTERS: TIGG MOD# N-500 400-800 CFM
4" PVC 40
VAPOR OFF GAS
ACTIVATED CARBON GAC-5
ACTIVATED CARBON GAC-4
ACTIVATED CARBON GAC-3 (SPARE)
SP-50
SP-51
SP-52
TO ATMOSPHERE

CATALITIC OXIDIZER- FALCO 300 FALMOUTH PRODUCTS
XA 006
TIT 006A
TIT 006B
PSL
TI
FLAME ARRESTER CS-2
PI
SP-200
SP-100
M

3/4" HOSE (TYP)
1" PVC BALL VALVE (TYP)
TUBING (TYP)
TO WELL RW-1
TO WELL RW-2
TO WELL RW-3
TO WELL MW-7
TO WELL MW-17
TO WELL PTW-B
TO WELL GP-27(R)
TO WELL RW-4
TO WELL MW-22
TO WELL GP-39A
TO WELL RW-5

WELL PUMPS: QED MOD# AP4T

TRAILER FLOOR SUMP
LSH

F-1C BAG FILTER
F-1B BAG FILTER
F-1A BAG FILTER
DRAIN (TYP.)
ROSEDALE PRODUCTS MODEL #L0618112P125CBPB (125 PSI)
FE 004
FQI 004
1 1/2" PVC 80

SEE SHEET NOTE 1
SEE SHEET NOTE 3
METERING PUMP LMI ROYTRONICS MODEL A 741 8178SI

LIQUID PHASE GAC FILTERS: SIEMENS MOD# LP-61P 150 PSIG MAX
GAC FILTER
1" PVC
1" GS
1" HOSE
2" PVC 80
SP-2
SP-3
INSIDE CARBON SHED
SHED FLOOR SUMP
TO STORM DRAIN IN RIGGS ROAD

INTEGRAL RELIEF VALVE
3/4" CS 40 AIR LINE
PSH 005
PSL 005
120 GAL RECEIVING TANK MAX 200 PSI
DRAIN
C-1 AIR COMPRESSOR SAYLOR BEALL MOD VT-PL-755-120 10 HP 34.4 CFM @ 175 PSI
TSH
CONTROL ROOM

NOTE:

BEGINNING OCTOBER 2013, THIS DRAWING HAS BEEN MODIFIED BY ARCADIS U.S. TO SHOW AS-BUILT CONDITIONS.

AS-BUILT DRAWINGS

SEAL

DATE:

PROFESSIONAL CERTIFICATION

I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND

LICENSE NO. 33568

EXP DATE 09/12/12

ENGINEER: ROBERT W. SCRAFFORD
GANNETT FLEMING, INC.

NO.	DESCRIPTION	DATE	BY
	REVISIONS		
1	ADDED BAG FILTER F-1C, ADDED NOTE.	10/25/13	
2	RE-ROUTED PIPE PER AS-BUILT CONDITIONS	10/29/13	
3	ADDED CHECK VALVE	10/29/13	
4	REMOVED BALL VALVE	10/29/13	
5	ADDED CS-2 AND FSL-100	11/08/13	

DESIGNED	CADD	SCALE
EL	SJM	NONE
CHECKED	APPROVED	APPROVED
RWS	RWS	X

Gannett Fleming
BALTIMORE, MARYLAND

CHEVRON PRODUCTS COMPANY
HOUSTON, TEXAS

FORMER CHEVRON FACILITY NO.122208-AREA A
CHILLUM, MARYLAND

DUAL PHASE EXTRACTION SYSTEM
PROCESS AND INSTRUMENTATION DIAGRAM

JOB NO.	SHEET NO.
55588	7
DATE	
JUNE 2012	
CAD FILE	
122208AA PID	7 OF 10

ARCADIS

Area B: In-Situ Groundwater Remediation Wells

Piping and Instrumentation Diagrams

PRIMARY ELEMENT:

FLOW

- ELECTROMAGNETIC
- CORIOLIS
- THERMAL DISPERSION
- ULTRASONIC TRANSIT–TIME OR DOPPLER
- VENTURI
- ORIFICE PLATE
- PROPELLER OR TURBINE
- VORTEX
- ROTAMETER
- FLUME
- FLOW SWITCH
- WEIR

LEVEL

- BUBBLER TUBE
- ULTRASONIC
- CAPACITANCE
- ELECTRODES (W/HOLDER)
- FLOAT
- OPTICAL

TEMPERATURE

- TEMPERATURE ELEMENT WITH WELL

ACTUATORS:

- CYLINDER
- MOTOR
- ELECTROPNEUMATIC
- ELECTROHYDRAULIC
- MANUAL (SHOWN ONLY FOR CERTAIN HAND OPERATED VALVES)
- SOLENOID
- DIAPHRAM (SPRING OPPOSED)
- DIAPHRAM (PRESSURE BALANCED)
- PRESSURE OR VACUUM RELIEF SPRING OR WEIGHT LOADED

NOTE: ON LOSS OF PRIMARY POWER (PNEUMATIC OR ELECTRICAL)

XX DENOTES ONE OF THE FOLLOWING:
FO = FAIL OPEN
FC = FAIL CLOSED
FI = FAIL TO INTERMEDIATE POSITION
BLANK = FAIL TO LAST POSITION

EQUIPMENT TAGGING:

X–NNN

X DENOTES ONE OF THE FOLLOWING:
M=MECHANICAL EQUIPMENT
P=PUMP
T=TANK
V=VALVE
CFD=CHEMICAL FEEDER

NNN = LOOP NUMBER

INSTRUMENT & FUNCTION TAGGING:

XXX=FUNCTIONAL INSTRUMENT IDENTIFICATION LETTERS FROM INSTRUMENT IDENTIFICATION TABLE.

X=LETTER SUFFIX TO DISTINGUISH BETWEEN INSTRUMENTS IN LOOP WITH SAME FUNCTIONAL IDENTIFICATION. (USED AS REQ'D)

NNN=LOOP NUMBER

EQUIPMENT:

- CENTRIFUGAL PUMP (DRY PIT)
- CENTRIFUGAL PUMP (WET PIT)
- EJECTOR, EDUCTOR
- METERING PUMP–CHEMICAL
- CENTRIFUGAL COMPRESSOR OR BLOWER
- RECIPROCATING COMPRESSOR (PD)
- ROTARY COMPRESSOR (PD) OR BLOWER
- MOTOR
- MIXER
- VERTCAL TURBINE PUMP

XX DENOTES ONE OF THE FOLLOWING:
CS = CONSTANT SPEED
2S = TWO SPEED
VS = VARIABLE SPEED

- POSITIVE DISPLACEMENT PUMP

VALVE STATES:

- TWO–WAY VALVE, NORMALLY OPEN
- TWO–WAY VALVE, NORMALLY CLOSED
- THREE–WAY VALVE, TOTALLY–FILLED PORT BLOCKED AND PARTIALLY–FILLED PORT OPENED WHEN DEACTIVATED. PORT STATES REVERSE WHEN ACTIVATED.

EXPLANATORY NOTATIONS:

- NN/XX — FLOW STREAM No NN TO SHEET No XX
- FLOW STREAM TO OR FROM EQUIPMENT NOT SHOWN ON OTHER P&ID DRAWINGS

MISCELLANEOUS:

- DIAPHRAGM SEAL
- ANNULAR DIAPHRAGM
- RUPTURE DISK (PRESSURE RELIEF)
- RUPTURE DISK (VACCUUM RELIEF)
- (REGULATED SIDE) PRESSURE REGULATOR
- VENT TO ATMOSPHERE
- AIR GAP
- TWO WAY VALVE FAIL OPEN
- TWO WAY VALVE FAIL CLOSE
- ANY VALVE, FAIL LOCKED (POSITION DOES NOT CHANGE)
- PINCH VALVE
- XP — PURGE SET, X DENOTES: W=WATER, A=AIR
- FLOW STRAIGHTENER
- EQUIPMENT CONNECTION WITH ELECTRICAL INTERLOCK
- XG — SIGHT GLASS, X DENOTES: F=FLOW, L=LEVEL
- PI — PRESSURE GAUGE
- SYSTEM/EQUIPMENT GROUND
- ISOLATED GROUND
- OMNIDIRECTIONAL ANTENNA
- DIRECTIONAL ANTENNA

VALVES & GATES:

- BALL VALVE
- BUTTERFLY VALVE
- CHECK VALVE GLOBE, GATE, PINCH OR OTHER IN–LINE VALVE
- ROTARY VALVE
- DIAPHRAM VALVE
- PLUG VALVE
- THREE WAY VALVE (ARROW IF SHOWN INDICATES FAIL OPEN PATH)
- TELESCOPING VALVE
- SLUICE GATE
- PREFABRICATED SLIDE GATE
- UNCLASSIFIED GATE (SEE SPECIFICATIONS)
- KNIFE GATE VALVE

INSTRUMENT/FUNCTION & LOCATION SYMBOLS

	FIELD (LOCAL) MOUNTED	PANEL MOUNTED: ACCESSIBLE OR EXTERIOR	PANEL MOUNTED: INACCESSIBLE OR INTERIOR	MOTOR CONTROL CENTER MOUNTED: ACCESSIBLE OR EXTERIOR	MOTOR CONTROL CENTER MOUNTED: INACCESSIBLE OR INTERIOR
DISCRETE INSTRUMENT					
SHARED DISPLAY/CONTROL					
COMPUTER FUNCTION					
PROGRAMMABLE LOGIC CONTROL					
PILOT LIGHT					
HAND SWITCH MAINTAINED CONTACTS	HS	HS	HS	HS	HS
HAND SWITCH MOMENTARY CONTACTS	HMS	HMS	HMS	HMS	HMS
COMPOUND INSTRUMENTS (SHARE COMMON HOUSING)					

INSTRUMENT IDENTIFICATION TABLE ISA–S5.1–1984

LETTER	FIRST LETTER: MEASURED OR INITIATING VARIABLE	FIRST LETTER: MODIFIER	SUCCEEDING LETTERS: READOUT OR PASSIVE FUNCTION	SUCCEEDING LETTERS: OUTPUT FUNCTION	SUCCEEDING LETTERS: MODIFIER
A	ANALYSIS (2)		ALARM		
B	BURNER, COMBUSTION			CLOSE, STOP, DECREASE (1)	OFF (1)
C				CONTROL	
D		DIFFERENTIAL		OPEN, START, INCREASE (1)	
E	VOLTAGE		SENSOR (PRIMARY ELEMENT)		ENABLED (1)
F	FLOW RATE	RATIO (FRACTION)			FAIL (1)
G			GLASS, VIEWING DEVICE		
H	HAND				HIGH (OPENED)
I	CURRENT (ELECTRICAL)		INDICATE		
J	POWER	SCAN			
K	TIME, TIME SCHEDULE	TIME RATE OF CHANGE		CONTROL STATION	
L	LEVEL		LIGHT		LOW (CLOSED)
M	MOTOR, MOTION (1)	MOMENTARY		MOTOR (1)	MIDDLE OR INTERMEDIATE
N					ON OR OPERATE (1)
O			ORIFICE, RESTRICTION		OVERLOAD (1)
P	PRESSURE, VACUUM		POINT (TEST) CONNECTION	PUMP (1)	
Q	QUANTITY (2)	INTEGRATE, TOTALIZE			
R	RADIATION		RECORD		
S	SPEED, FREQUENCY	SAFETY OR SOLENOID		SWITCH	
T	TEMPERATURE			TRANSMIT	
U	MULTIVARIABLE (2)		MULTIFUNCTION (2)	MULTIFUNCTION (2)	MULTIFUNCTION (2)
V	VIBRATION, MECHANICAL ANALYSIS			VALVE, DAMPER, LOUVER	
W	WEIGHT, FORCE		WELL		
X	UNCLASSIFIED, (2)		UNCLASSIFIED (2)	UNCLASSIFIED (2)	UNCLASSIFIED (2)
Y	EVENT, STATE, PRESENCE			RELAY, COMPUTE, CONVERT	
Z	POSITION, DIMENSION			DRIVER, ACTUATOR, UNCLASSIFIED FINAL CONTROL ELEMENT	

(1) USER'S CHOICE
(2) WHEN USED, SYMBOL OR SIGNAL LINE IS INDICATED.

INPUTS & OUTPUTS INTERFACED WITH COMPUTER DATA ACQUISITION & CONTROL SYSTEM:

- ANALOG INPUT
- ANALOG OUTPUT
- DIGITAL INPUT
- DIGITAL OUTPUT
- SERIAL (INPUT/OUTPUT)

RTU1 X–XX

ALPHANUMERIC CHARACTERS TO IDENTIFY CONTROL PANEL

IF USED, NUMBER OF POINTS. (SINGLE POINT IF NOT USED)

XX DENOTES ONE OF THE FOLLOWING:
AO=ANALOG OUTPUT
AI=ANALOG INPUT
DI=DISCRETE INPUT
DO=DISCRETE OUTPUT
SC=SERIAL COMMUNICATIONS

HAND SWITCHES

- HS XX — SELECTOR SWITCH (MAINTAINED CONTACTS)
- HMS XX — SPRING RETURN SWITCH OR PUSHBUTTONS (MOMENTARY CONTACTS)

XX DENOTES ONE OF THE FOLLOWING:
AM=AUTO/MANUAL
CAM=COMPUTER/AUTO/MANUAL
CL=COMPUTER/LOCAL
CM=COMPUTER/MANUAL
DOB=DRIVE/OFF/BYPASS
FOS=FAST/OFF/SLOW
FOR=FORWARD/OFF/REVERSE
FR=FORWARD/REVERSE
FS=FAST/SLOW
HOA=HAND/OFF/AUTO
KEY=KEYPAD
LOR=LOCAL/OFF/REMOTE
LOS=LOCKOUT/STOP
MFS=MODULATE FASTER/SLOWER
MOC=MODULATE OPEN/CLOSE
OC=OPEN/CLOSE
OO=ON/OFF
OSC=OPEN/STOP/CLOSE
SS=START/STOP
PB=PUSH BUTTON

SIGNAL CONVERTERS

X/X — SMALL CIRCLE SIGNIFIES LOGICAL INVERSION OF SIGNAL

X DENOTES ONE OF THE FOLLOWING:
A=ANALOG
B=BINARY
D=DIGITAL
E=VOLTAGE
F=FREQUENCY
H=HYDRAULIC
I=CURRENT
O=ELECTROMAGNETIC, SONIC
P=PNEUMATIC
PF=PULSE FREQUENCY
PD=PULSE DURATION
R=RESISTANCE

EQUIPMENT POWER:

XXX — 120VAC POWER FROM POWER PANEL CIRCUIT BREAKER, UNLESS OTHERWISE NOTED, REQUIRED TO INSTRUMENT (TYP)

XXX DENOTES ONE OF THE FOLLOWING:
UPS=120VAC FROM UPS VIA FUSEBLOCK
208/3=208V, 3 PHASE FROM POWER PANEL CIRCUIT BREAKER

ANALYSIS INSTRUMENTS:

- AE XX — EXPOSED PROBE OR GAS DETECTION
- AE XX — TAPPED OR SAMPLED
- AE XX — IN–LINE

XX DENOTES ONE OF THE FOLLOWING:
CLG=CHLORINE GAS
CLR=CHLORINE RESIDUAL
PH=PH
T=TURBIDITY
FLR=FLOURIDE
SCD=STREAMING CURRENT
PM=PARTICLE MONITOR
PC=PARTICLE COUNTER
TOC=TOTAL ORGANIC CARBON

ABBREVIATIONS:

A or AMP	AMPERE
AC	ALTERNATING CURRENT
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AIC	AMPERE INTERRUPTING CAPACITY
AS	AMMETER SELECTOR SWITCH
ATS	AUTO TRANSFER SWITCH
AUTO	AUTOMATIC
AWG	AMERICAN WIRE GAUGE
BLDG	BUILDING
C	CONDUIT
CP	CONTROL PANEL
DIV	DIVISION
EC	ELECTRICAL CONTRACTOR
EMT	ELECTRICAL METALLIC TUBING (CONDUIT)
EF	EXHAUST FAN
EP	EXPLOSION PROOF
F/T	FEED THROUGH
FU	FUSE
FO	FIBER OPTIC
GFI	GROUND FAULT INTERRUPTER
GRD	GROUND
HP	HORSEPOWER
IG	ISOLATED GROUND
KV	KILOVOLT
KVA	KILOVOLT AMPERE
KW	KILOWATT
MTD	MOUNTED
N/A	NOT APPLICABLE
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
No	NUMBER
PNL	PANEL
PVC	POLYVINYL CHLORIDE (CONDUIT)
RECP	RECEPTACLES
RGS	RIGID GALVANIZED STEEL (CONDUIT)
RVAT	REDUCED VOLTAGE AUTOTRANSFORMER
RVSS	REDUCED VOLTAGE SOLID STATE
TVSS	TRANSIENT VOLTAGE SURGE SUPPRESSION
TYP	TYPICAL
UL	UNDERWRITER LABORATORIES
UON	UNLESS OTHERWISE NOTED
UPS	UNINTERRUPTIBLE POWER SUPPLY
V	VOLT
VS	VOLTMETER SELECTOR SWITCH
W	WIRE
WP	WEATHERPROOF
WS	WATER SUPPLY
XFMR	TRANSFORMER
1–PH	SINGLE PHASE
3–PH	THREE PHASE

NOTE:
BEGINNING OCTOBER 2013, THIS DRAWING HAS BEEN MODIFIED BY ARCADIS U.S. TO SHOW AS–BUILT CONDITIONS.

AS-BUILT DRAWINGS

NO.	DESCRIPTION	DATE	BY
	REVISIONS		

DESIGNED	CADD	SCALE
CME	SJM	NONE
CHECKED	APPROVED	APPROVED
EL	RWS	X

Gannett Fleming
BALTIMORE, MARYLAND
AGWR

CHEVRON PRODUCTS COMPANY
ATLANTA, GEORGIA
FORMER CHEVRON FACILITY NO. 122208
CHILLUM, MARYLAND

AREA B
INSTRUMENTATION LEGEND, ABBREVIATIONS, AND GENERAL NOTES

JOB NO. 50641
DATE JUNE 2013
CAD FILE AB I–LEG
SHEET NO. 5
5 OF 12

CPC CONTROL PANEL
EOS CONTROLER
WATER LEVEL IN WELL - PRES. TRANSDUCER
LOW WATER IN WELL - LEVEL LO
PRE-FILTER PRESSURE - TRANSMITTER
WATER FLOW RATE DIFF PRESSURE TRANSMITTER
VENTURI TUBE CLEARANCE
PID CONTROL - SUBMERSIBLE PUMP
HIGH PRESSURE - GAC VESSEL
HIGH WATER IN MANHOLE - LEVEL HI
ISGR-B1
CONTROL PANEL
AI-16
DI-25
AI-17
AI-15
DO-01
DO-02
DI-26
DI-27
INSTRUMENTATION SUB-PANEL 1
PT 002
DPT 001
AMBIENT AIR
MICRO-COMPRESSOR CMP 001
MICRO-COMPRESSOR (MANHOLE VENTILATION)
CMP 002
AMBIENT AIR
PI 001
AIR BLEED
PASSIVE FLOW
SP-1 INFLUENT
10 PSIG
PSH 002
PI 002
AIR BLEED
SP-2 (50%)
SP-3 (75%)
SP-4 (90%)
MANHOLE
CLASSIFIED ATMOSPHERE (CLASS 1, DIV 2)
NON-CLASSIFIED ATMOSPHERE
ACTIVATED CARBON TYP OF TWO
CARTRIDGE FILTER INTEGRAL TO ISGR SYSTEM
CONCENTRIC WITHIN CARBON VESSEL
1/8" TYGON
LOW
HIGH
FLOW RATE VENTURI
PUMP CONTROLLER SUB PANEL 1
GRUNDFOS CU-300 CONTROLLER
LSL 001
SHALLOW PIEZOMETER
UPPER (INLET) SCREEN
PT 001
SUBMERSIBLE PUMP IN WELL GRUNDFOS 10REDI-FLO3-100 TYP OF TWO
ISGR WELL TYP OF TWO
PACKER
PASSIVE FLOW
ORIFICE FLOW RESTRICTING
LSH 001
PASSIVE FLOW
DEEP PIEZOMETER (SP-5) EFFLUENT
LOWER (OUTLET) SCREEN
LEGEND
DISCRETE INPUT
DISTRETE OUTPUT
ANALOG INPUT
ANALOG OUTPUT
PRESSURE SWITCH HIGH
LEVEL SWITCH HIGH
LEVEL SWITCH LOW
PRESSURE TRANSMITTER
PRESSURE INDICATOR
SOLENOID
COMPRESSOR FROM LEGEND PAGE

NOTE: PIPING AND INSTRUMENTATION SHOWN IS FOR ONE OF TWO ESSENTIALLY IDENTICAL SYSTEM.

NOTE:
BEGINNING OCTOBER 2013, THIS DRAWING HAS BEEN MODIFIED BY ARCADIS U.S. TO SHOW AS-BUILT CONDITIONS.

AS-BUILT DRAWINGS

NO.	DESCRIPTION	DATE	BY
REVISIONS			

DESIGNED	CADD	SCALE
SW	SJM	1"=10'
CHECKED	APPROVED	APPROVED
EL	RWS	X

Gannett Fleming
BALTIMORE, MARYLAND
AGWR

CHEVRON PRODUCTS COMPANY
ATLANTA, GEORGIA
FORMER CHEVRON FACILITY NO. 122208
CHILLUM, MARYLAND

AREA B
P&ID WITH PLC – ISGR SYSTEMS

JOB NO. 50641
DATE JUNE 2013
CAD FILE AB P&ID
SHEET NO. 6
6 OF 12

ARCADIS

Area C: Oxygen Reactive Zone

Piping and Instrumentation Diagrams

NOTE:
BEGINNING OCTOBER 2013, THIS DRAWING HAS BEEN MODIFIED BY ARCADIS U.S. TO SHOW AS-BUILT CONDITIONS.

AS-BUILT DRAWINGS

CITY: SYRACUSE-NY DIV/GROUP: 141/ENV DB: K.SARTORI PIC: PM: TM: JOHN MARRS LYR:ON=*;OFF=*REF*
G:\ENVCAD\SYRACUSE\ACT\B0048971\0000\00001\DWG\CONTRACT\AREA_C\48971G04_AC.dwg LAYOUT: 4 SAVED: 11/21/2013 9:51 AM ACADVER: 18.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ---- PLOTTED: 11/21/2013 9:51 AM BY: SARTORI, KATHERINE
XREFS: 122208-TB2 IMAGES: xx- av-6rf.JPG

SEAL

DATE:

PROFESSIONAL CERTIFICATION
I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND
LICENSE NO. 33568
EXP DATE 09/12/12
ENGINEER: ROBERT W. SCRAFFORD GANNETT FLEMING, INC.

NO.	DESCRIPTION	DATE	BY
1	ADDED NOTE	11/22/13	

REVISIONS

DESIGNED	CADD	SCALE
EL	EL	AS SHOWN
CHECKED	APPROVED	APPROVED
RWS	RWS	

Gannett Fleming
BALTIMORE, MARYLAND

CHEVRON PRODUCTS COMPANY
HOUSTON, TEXAS
FORMER CHEVRON FACILITY NO.122208-AREA C
CHILLUM, MARYLAND

AREA C
VAULT SECTIONS AND DETAILS
AND PROCESS AND INSTRUMENTATION DIAGRAM

JOB NO. 55588
DATE JUNE 2013
CAD FILE AC VAULTDET
SHEET NO. 4
4 of 7

ARCADIS

Appendix I

Mann-Kendall Statistical Analysis

Mann-Kendall Statistical Analysis
Former Chevron Facility 122208
5801 Riggs Road, Chillum, Maryland
December 2013

The Mann-Kendall statistical analysis was used to determine trends in dissolved-phase hydrocarbon concentrations at the Chillum site. These data will be used to support the site-wide groundwater remedial strategy of monitored natural attenuation (MNA).

SITE-WIDE GROUNDWATER REMEDIAL OBJECTIVE

The approved Corrective Measures Study (CMS) (Gannett Fleming, 2007) presented a site-wide groundwater remediation strategy that included MNA. One method to demonstrate that MNA is effective at decreasing hydrocarbon concentrations is the statistical evaluation of trends in the sampling results. The Mann-Kendall trend test was selected as an industry-accepted method to provide evidence as to whether dissolved-phase hydrocarbon concentrations are stable or decreasing over time.

MANN-KENDALL TREND TEST

The Mann-Kendall trend test is a non-parametric test for linear trends based upon the concept that a series of data points without a trend should fluctuate randomly around a constant mean. If an increasing trend were to exist, one would expect an earlier point to have a lower value than a later point. The converse would be true if a decreasing trend were present. A Mann-Kendall statistic S is computed by comparing each pair of data points in a data set and assigning a value of +1 or -1 if the earlier data point is less than the later data point or greater than the later one, respectively. If the two data points are equal, the pair is assigned a zero. The values assigned to the pairs are summed. If the total is positive, it implies that the majority of the differences between the points are positive, indicating a positive trend. Likewise, a negative sum indicates a decreasing trend. A value at or near zero indicates that the differences are roughly equal, implying that there is no trend. A critical value of S is determined based on the number of points in the data set and the level of significance (α) of the test. If the Mann-Kendall statistic S exceeds the critical S, then an upward trend is statistically significant. Conversely, if the Mann-Kendall S is negative and its absolute value is greater than the critical S, then there is a statistically significant downward trend. If the absolute value of S is less than the critical value of S, then the data is considered to have no trend.

The Mann-Kendall Test is robust because missing values are allowed and the data set need not conform to any particular distribution. Also, laboratory data reported as below the laboratory detection limit can be used and are reported as half the laboratory detection limit (USEPA, 1998). This approach can be used because the Mann-Kendall methodology uses only the relative magnitudes of the laboratory data rather than actual measured values (Gilbert, 1987). This test is described in detail in the unified guidance provided by the United States Environmental Protection Agency for the analysis of groundwater statistics (USEPA, 2009, p. 17:30-34).

METHODS

A Geoprobe® was used to obtain an exhaustive profile of groundwater at the site during 2001 and 2002. The Geoprobe groundwater data were used to map the centerline of dissolved-phase hydrocarbon concentrations in groundwater and subsequently install monitoring wells along the centerline of dissolved-phase hydrocarbons (Gannett Fleming, 2006).

The presence of a mappable clay body in the subsurface (as evidenced from the Geoprobe soil investigation) splits the dissolved-phase hydrocarbons in groundwater into two separate centerlines. As a result, these two centerlines are identified as the west centerline and the east centerline (Figure 1). Wells used to define the centerlines are as follows:

West Centerline	East Centerline
MW-22R	MW-22R
MW-24B	GP-39R
MW-26B	MW-47
MW-33B	GP-2E(45-50)
MW-58	MW-25B
MW-59	MW-27B
MW-60	MW-53
MW-62A	
MW-62B	

The Mann-Kendall test was performed for benzene and methyl tert butyl ether (MTBE) for each well within the centerlines. Mann-Kendall trend analysis tables for each well along the west and east centerlines are presented in Attachments A and B, respectively. The 10 most recent groundwater sampling results were used in the analysis. Values that were reported as below the laboratory detection limit were assigned a value of half of the detection limit.

RESULTS OF MANN-KENDALL ANALYSES

Tables 1 and 2 provide groundwater sampling results for individual wells along the west and east centerlines. Table 3 provides a general summary of the Mann-Kendall tests performed for both benzene and MTBE. The tests were run in a two-tailed mode at two levels of confidence, 90% (with α = 0.05 per tail) and 95% (with α = 0.025 per tail). Several trends were noted that are provided below.

Results of the analysis for the west centerline were as follows:

- No statistically significant trends were identified for benzene and MTBE concentrations in any monitoring wells for which there were sufficient data.

Results of the analysis for the east centerline were as follows:

- No statistically significant trends were identified for benzene or MTBE concentrations in MW-22R, MW-47, GP-2E(45-50), or MW-25B;

- A statistically significant decreasing trend was identified for benzene concentrations in GP-39A/GP-39R, but only at 90% confidence; statistically significant trends were identified for MTBE concentrations in GP-39A/GP-39R;

- Decreasing trends in benzene and MTBE concentrations in MW-27B and MW-53 were found to be statistically significant.

SUMMARY AND CONCLUSIONS

Dissolved-phase hydrocarbon concentrations for centerline wells were either decreasing or did not indicate a statistically significant trend. Based on this line of evidence, MNA is working to decrease dissolved-phase hydrocarbon concentrations at the site.

Based on ten sampling events conducted since 2009, benzene and MTBE concentrations along the east centerline were either decreasing or did not indicate a statistically significant trend for all wells. The concentrations in the west centerline wells did not exhibit statistically significant trends.

RECOMMENDATIONS

The following corrective measures were implemented at the site:

- Area A - an expanded DPE system, which included the addition of four vertical recovery wells and one angle recovery well;

- Area B - two In-Situ Groundwater Remediation (ISGR) Wells installed in the residential neighborhood (Oglethorpe Alley); and

- Area C - an Oxygen Reactive Zone installed in the residential neighborhood (Nicholson Alley), which includes a series of in-situ oxygen emitting probes.

As part of the corrective measures for Area A, wells MW-22R and GP-39R were over drilled and added to the expanded DPE system in Area A. MW-24B is installed near or within the radius of influence of the ISGR Well system in Area B. MW-26B is installed adjacent to and down gradient of the Oxygen Reactive Zone in Area C.

The Mann-Kendall statistical analysis will continue to be performed on an annual basis using the semi-annual groundwater monitoring data for wells along the west and east centerlines to confirm that hydrocarbon concentrations are continuing to decrease or remain stable. It is recommended that the statistical analysis methodology be reviewed in terms of parameters such as groundwater flow velocity, stratigraphy, and site history. For example, future trend tests might be more powerful if based upon 12 measurements instead of 10. It might also be useful to evaluate the stability of data sets when trends are absent. Decisions of this nature should be based on site characteristics. The next Mann-Kendall update will be submitted in January 2015.

REFERENCES

Gannett Fleming, 2006, *Site Investigation Report*, Former Chevron Facility 122208, 5801 Riggs Road, Chillum Maryland, dated January 2006.

Gannett Fleming, 2007, *Corrective Measures Study (CMS),* Former Chevron Facility 122208, 5801 Riggs Road, Chillum Maryland, dated July 2007.

Gilbert, Richard O., 1987, *Statistical Methods for Environmental Pollution Monitoring*, Van Nostrand Reinhold, NY, NY, 319 pages.

U.S. Environmental Protection Agency (USEPA), 1998, *Guidance for Data Quality Assessment*, EPA/600/R-96/084.

U.S. Environmental Protection Agency (USEPA), 2009, *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance*, EPA/530/R-09/007, March 2009.

TABLES

Table 1. Groundwater Monitoring Results - West Centerline
Mann-Kendall Statistical Analysis
Former Chevron Facility 122208
5801 Riggs Road, Chillum, Maryland

Location	Sample Date	Benzene (µg/L)	Methyl-t-butyl ether (µg/L)
MW-22R	06/08/2004	5,620	866
	08/03/2004	7,960	1,620
	09/07/2005	8,790	1,780
	03/23/2006	6,860	2,020
	10/02/2006	7,900	1,100
	03/26/2007	2,400	570
	10/01/2007	7,000	1000
	03/31/2008	4,900	710
	09/25/2008	1,100	1,100
	03/30/2009	5,900	680
	09/28/2009	4,200	420
	05/10/2010	1,300	200
	11/10/2010	950	120
	03/17/2011	1,200	110
	11/14/2011	5,500	5,700
	04/26/2012	3,900	3,600
	10/10/2012	3,100	2,400
	04/15/2013	2,300	2,200
	09/12/2013	3,200	3,000
MW-24B	06/08/2004	431	9.3
	08/02/2004	474	9.6
	09/15/2005	497	3.64
	03/27/2006	864	3.99
	10/04/2006	540	ND 50
	03/27/2007	5.6	ND 1.0
	10/02/2007	310	ND 20
	04/01/2008	110	ND 20
	09/24/2008	ND 20	ND 20
	03/27/2009	17 J	ND 20
	09/29/2009	ND 5.0	ND 5.0
	06/08/2010	ND 5.0	ND 5.0
	11/09/2010	ND 1.0	ND 1.0
	04/07/2011	ND 10	ND 10
	04/18/2011	ND 5.0	ND 5.0
	01/19/2012	ND 5.0	ND 5.0
	05/03/2012	ND 20	ND 20
	10/11/2012	ND 10	ND 10
	04/09/2013	ND 1.0	ND 1.0
	09/10/2013	ND 1.0	ND 1.0
MW-26B	06/07/2004	30.5	112
	07/30/2004	34.4	114
	09/16/2005	24.9	168
	03/28/2006	144	221
	10/05/2006	100	210
	03/28/2007	140	270
	10/04/2007	110	230
	04/02/2008	94	170
	09/23/2008	110	200
	03/25/2009	130	230
	09/22/2009	150	200
	05/11/2010	190	280
	11/09/2010	36	220
	03/03/2011	380	280
	03/30/2011	1,100	560
	01/18/2012	520	290
	04/30/2012	850	510
	10/03/2012	720	330
	04/02/2013	710	390
	09/09/2013	570	240

Table 1. Groundwater Monitoring Results - West Centerline
Mann-Kendall Statistical Analysis
Former Chevron Facility 122208
5801 Riggs Road, Chillum, Maryland

Location	Sample Date	Benzene (µg/L)	Methyl-t-butyl ether (µg/L)
MW-33B	06/02/2004	1,040	770
	07/27/2004	1000	744
	09/13/2005	ND 1	698
	03/28/2006	974	653
	10/05/2006	760	520
	03/29/2007	670	400
	10/05/2007	540	410
	04/02/2008	520	400
	09/23/2008	340	230
	03/24/2009	380	220
	09/21/2009	380	240
	05/11/2010	470	380
	11/09/2010	150	150
	03/30/2011	570	300
	01/18/2012	470	310
	05/08/2012	380	300
	10/02/2012	ND 1.0	20
	03/28/2013	ND 1.0	1.9
	09/09/2013	ND 1.0	ND 1.0
MW-58	04/21/2011	180	110
	01/19/2012	390	220
	05/04/2012	240	190
	10/03/2012	380	170
	04/02/2013	180	140
	09/09/2013	250	110
MW-59	03/02/2011	140	140
	01/19/2012	220	220
	05/04/2012	140	160
	10/03/2012	240	210
	04/02/2013	260	250
	09/09/2013	240	220
MW-60	01/19/2012	ND 1.0	16
	05/04/2012	ND 1.0	18
	10/03/2012	ND 1.0	10
	04/02/2013	ND 1.0	14
	09/09/2013	1.6	12
MW-62A	10/04/2012	ND 1.0	ND 1.0
	04/05/2013	ND 1.0	ND 1.0
	09/10/2013	ND 1.0	ND 1.0
MW-62B	10/04/2012	94	97
	04/05/2013	61	77
	09/10/2013	34	66

Notes:

1) Reporting limit shown beside not detected (ND) values.
2) Analytical results were rounded.
3) ND: Not detected above reporting limit.
4) µg/L: Microgram per liter.

Table 2. Groundwater Monitoring Results - East Centerline
Mann-Kendall Statistical Analysis
Former Chevron Facility 122208
5801 Riggs Road, Chillum, Maryland

Location	Sample Date	Benzene (µg/L)	Methyl-t-butyl ether (µg/L)
GP-2E(45-50)	08/16/2004	60.2	656
	12/15/2004	117	522
	03/21/2005	189	610
	05/26/2005	172	803
	09/14/2005	134	501
	12/20/2005	110	393
	10/02/2006	78	420
	03/26/2007	50	400
	10/01/2007	34	470
	03/31/2008	8	330
	09/25/2008	ND 2.0	370
	03/30/2009	ND 2.0	350
	09/28/2009	ND 2.0	450
	05/18/2010	86	1000
	11/10/2010	17	560
	04/01/2011	200	820
	01/19/2012	350	1,300
	04/25/2012	470	1,400
	10/08/2012	320	850
	04/10/2013	55 H	460 H
	09/11/2013	50	280
GP-39A/GP-39R	08/16/2004	476	2,060
	12/16/2004	725	2,520
	03/21/2005	7.1	3,200
	05/26/2005	905	3,550
	09/08/2005	721	2,490
	12/19/2005	995	3,360
	03/22/2006	1,570	5,960
	09/28/2006	2,500	6,500
	03/22/2007	2,600	5,800
	09/24/2007	2,300	5,200
	03/27/2008	2,100	5,400
	09/30/2008	2,100	4,800
	03/31/2009	2,200	4,900
	09/23/2009	3,100	4,600
	05/17/2010	3,100	5,500
	11/10/2010	3,400	4,200
	03/28/2011	4,100	5,100
	11/14/2011	340	680
	04/26/2012	150	400
	10/10/2012	280	350
	04/15/2013	210	310
	09/12/2013	27	24
MW-22R	06/08/2004	5,620	866
	08/03/2004	7,960	1,620
	09/07/2005	8,790	1,780
	03/23/2006	6,860	2,020
	10/02/2006	7,900	1,100
	03/26/2007	2,400	570
	10/01/2007	7,000	1000
	03/31/2008	4,900	710
	09/25/2008	1,100	1,100
	03/30/2009	5,900	680
	09/28/2009	4,200	420
	05/10/2010	1,300	200
	11/10/2010	950	120
	03/17/2011	1,200	110
	11/14/2011	5,500	5,700
	04/26/2012	3,900	3,600
	10/10/2012	3,100	2,400
	04/15/2013	2,300	2,200
	09/12/2013	3,200	3,000

Table 2. Groundwater Monitoring Results - East Centerline
Mann-Kendall Statistical Analysis
Former Chevron Facility 122208
5801 Riggs Road, Chillum, Maryland

Location	Sample Date	Benzene (µg/L)	Methyl-t-butyl ether (µg/L)
MW-25B	11/22/2004	456	502
	09/15/2005	ND 1	386
	03/24/2006	403	461
	10/04/2006	470	550
	03/27/2007	320	370
	10/03/2007	340	490
	04/01/2008	180	310
	09/24/2008	240	350
	03/27/2009	450	410
	09/22/2009	170	260
	05/18/2010	220	310
	11/09/2010	99	260
	04/01/2011	120	200
	01/19/2012	200	390
	04/25/2012	120	250
	10/04/2012	140	230
	04/09/2013	160	250
	09/10/2013	260	320
MW-27B	06/02/2004	193	534
	07/28/2004	142	507
	09/16/2005	146	417
	03/28/2006	168	451
	10/05/2006	150	370
	03/28/2007	200	530
	10/04/2007	82	310
	04/02/2008	34	240
	09/23/2008	37	240
	03/25/2009	19	240
	09/22/2009	6.5	160
	06/08/2010	ND 2.0	200
	11/09/2010	ND 1.0	170
	03/30/2011	ND 5.0	140
	04/30/2012	ND 1.0	140
	10/03/2012	ND 1.0	3.4
	04/02/2013	ND 1.0	120
	09/09/2013	ND 1.0	96
MW-47	11/19/2004	116	27.2
	09/06/2005	315	17.6
	03/22/2006	459	13.3
	09/28/2006	380	22
	03/22/2007	240	58
	09/24/2007	260	ND 1.0
	03/27/2008	360	ND 2.0
	09/29/2008	230	15
	03/31/2009	250	19
	09/23/2009	160	16
	05/17/2010	170	59
	11/05/2010	650	15
	03/28/2011	260	50
	11/15/2011	330	52
	04/24/2012	380	40
	10/09/2012	430	ND 1.0
	04/03/2013	510	16
	09/11/2013	250	ND 1.0

Table 2. Groundwater Monitoring Results - East Centerline
Mann-Kendall Statistical Analysis
Former Chevron Facility 122208
5801 Riggs Road, Chillum, Maryland

Location	Sample Date	Benzene (µg/L)	Methyl-t-butyl ether (µg/L)
MW-53	05/03/2005	ND 1.0	66.4
	06/08/2005	ND 1.0	97
	09/14/2005	ND 1.0	88.1
	03/28/2006	4	103
	10/06/2006	54	240
	03/29/2007	15	110
	10/05/2007	61	270
	04/03/2008	17	160
	09/22/2008	23	160
	03/23/2009	7.8	150
	09/21/2009	11	220
	06/08/2010	28	310
	11/09/2010	16	300
	04/07/2011	6.6	140
	01/18/2012	5.1	180
	05/04/2012	6.5	140
	10/02/2012	4.1	100
	03/28/2013	2.7	73
	09/09/2013	2.8	110

Notes:

1) Reporting limit shown beside not detected (ND) values.
2) Analytical results were rounded.
3) ND: Not detected above reporting limit.
4) µg/L: Microgram per liter.
5) H: Sample analyzed outside of holding time.

ARCADIS

Table 3. Mann-Kendall Results Summary
Mann-Kendall Statistical Analysis
Former Chevron Facility 122208
5801 Riggs Road, Chillum, Maryland

West Centerline - Benzene

Well ID	Distance from MW-22 (ft)	90% Confidence Trend Result	95% Confidence Trend Result	Date Range	Number of Data Points
MW-22R	0	No Trend	No Trend	03/30/2009-09/12/2013	10
MW-24B	232	No Trend	No Trend	09/29/2009-09/10/2013	10
MW-26B	666	No Trend	No Trend	09/22/2009-09/09/2013	10
MW-33B	944	No Trend	No Trend	03/24/2009-09/09/2013	10
MW-58	573.9875	No Trend	No Trend	04/21/2011-09/09/2013	6
MW-59	691.2099	No Trend	No Trend	03/02/2011-09/09/2013	6
MW-60	689.4315	No Trend	No Trend	01/19/2012-09/09/2013	5
MW-62A	350.6566	Insufficient Data	Insufficient Data	10/04/2012-09/10/2013	3
MW-62B	350.2294	Insufficient Data	Insufficient Data	10/04/2012-09/10/2013	3

West Centerline - MTBE

Well ID	Distance from MW-22 (ft)	90% Confidence Trend Result	95% Confidence Trend Result	Date Range	Number of Data Points
MW-22R	0	No Trend	No Trend	03/30/2009-09/12/2013	10
MW-24B	232	No Trend	No Trend	09/29/2009-09/10/2013	10
MW-26B	666	No Trend	No Trend	09/22/2009-09/09/2013	10
MW-33B	944	No Trend	No Trend	03/24/2009-09/09/2013	10
MW-58	573.9875	No Trend	No Trend	04/21/2011-09/09/2013	6
MW-59	691.2099	No Trend	No Trend	03/02/2011-09/09/2013	6
MW-60	689.4315	No Trend	No Trend	01/19/2012-09/09/2013	5
MW-62A	350.6566	Insufficient Data	Insufficient Data	10/04/2012-09/10/2013	3
MW-62B	350.2294	Insufficient Data	Insufficient Data	10/04/2012-09/10/2013	3

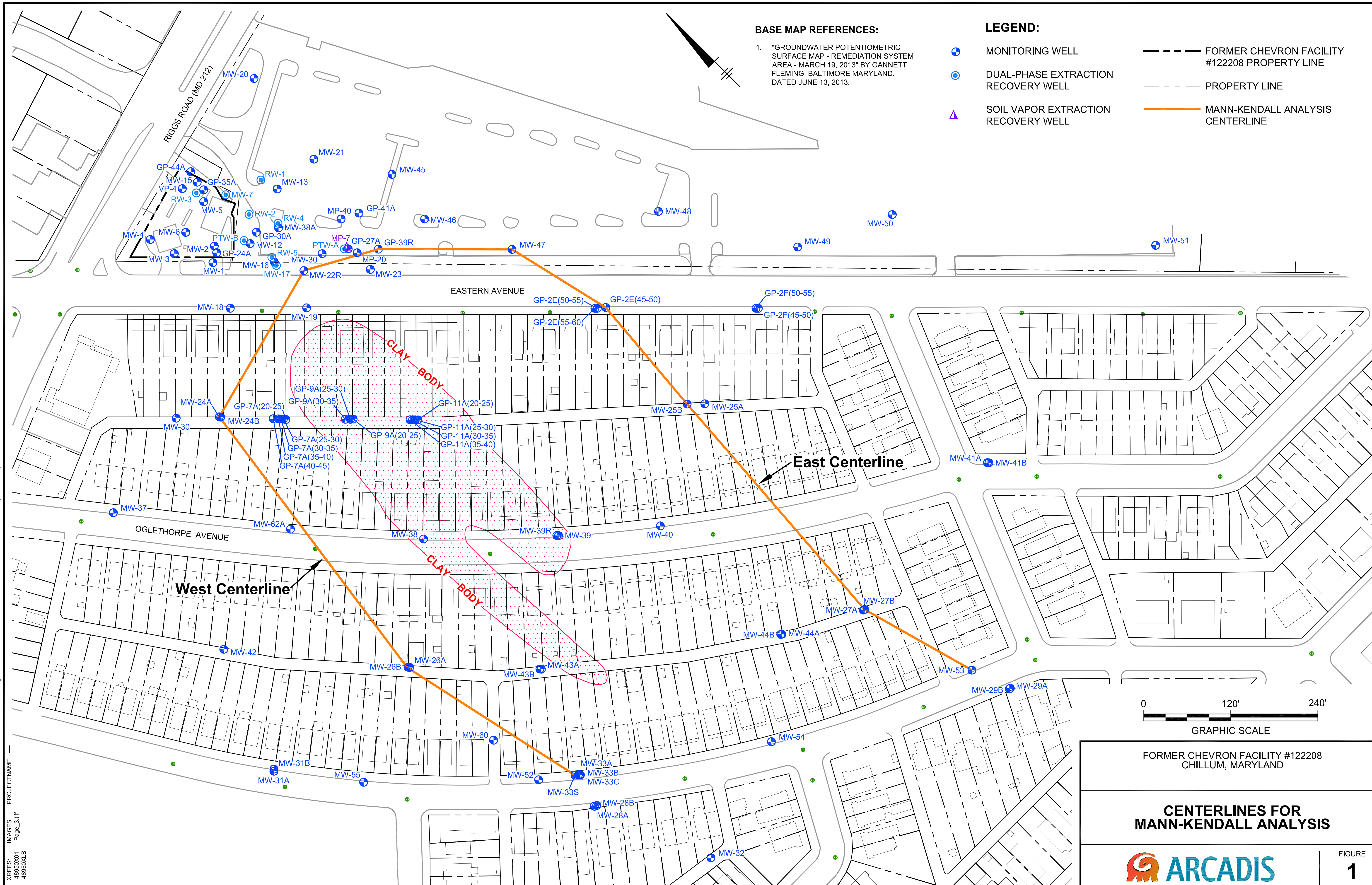
East Centerline - Benzene

Well ID	Distance from MW-22 (ft)	90% Confidence Trend Result	95% Confidence Trend Result	Date Range	Number of Data Points
MW-22R	0	No Trend	No Trend	03/30/2009-09/12/2013	10
GP-39A/GP-39R	109	Decreasing Trend	No Trend	03/31/2009-09/12/2013	10
MW-47	292	No Trend	No Trend	03/31/2009-09/11/2013	10
GP-2E (45-50)	445	No Trend	No Trend	03/30/2009-09/11/2013	10
MW-25B	618	No Trend	No Trend	03/27/2009-09/10/2013	10
MW-27B	991	Decreasing Trend	Decreasing Trend	09/23/2008-09/09/2013	10
MW-53	1163	Decreasing Trend	Decreasing Trend	03/23/2009-09/09/2013	10

East Centerline - MTBE

Well ID	Distance from MW-22 (ft)	90% Confidence Trend Result	95% Confidence Trend Result	Date Range	Number of Data Points
MW-22R	0	No Trend	No Trend	03/30/2009-09/12/2013	10
GP-39A/GP-39R	109	Decreasing Trend	Decreasing Trend	03/31/2009-09/12/2013	10
MW-47	292	No Trend	No Trend	03/31/2009-09/11/2013	10
GP-2E (45-50)	445	No Trend	No Trend	03/30/2009-09/11/2013	10
MW-25B	618	No Trend	No Trend	03/27/2009-09/10/2013	10
MW-27B	991	Decreasing Trend	Decreasing Trend	09/23/2008-09/09/2013	10
MW-53	1163	Decreasing Trend	Decreasing Trend	03/23/2009-09/09/2013	10

FIGURES


BASE MAP REFERENCES:
1. "GROUNDWATER POTENTIOMETRIC SURFACE MAP - REMEDIATION SYSTEM AREA - MARCH 19, 2013" BY GANNETT FLEMING, BALTIMORE MARYLAND. DATED JUNE 13, 2013.
LEGEND:
MONITORING WELL
DUAL-PHASE EXTRACTION RECOVERY WELL
SOIL VAPOR EXTRACTION RECOVERY WELL
FORMER CHEVRON FACILITY #122208 PROPERTY LINE
PROPERTY LINE
MANN-KENDALL ANALYSIS CENTERLINE
RIGGS ROAD (MD 212)
EASTERN AVENUE
OGLETHORPE AVENUE
CLAY BODY
CLAY BODY
East Centerline
West Centerline
0
120'
240'
GRAPHIC SCALE
FORMER CHEVRON FACILITY #122208
CHILLUM, MARYLAND
CENTERLINES FOR
MANN-KENDALL ANALYSIS
ARCADIS
FIGURE
1

ATTACHMENT A

Mann-Kendall Analysis Tables – West Centerline

WEST CENTERLINE - MW-22R - BENZENE

Mann-Kendall Statistical Method Worksheet

Site-- Chillum
Compound-- Benzene
Well-- MW-22R

	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Events
Concentration	5,900	4,200	1,300	950	1,200	5,500	3,900	3,100	2,300	3,200	10
	--	--	--	--	--	--	--	--	--	--	**Sum**
Compared to Event 1	*****	-1	-1	-1	-1	-1	-1	-1	-1	-1	-9
Compared to Event 2	*****	*****	-1	-1	-1	1	-1	-1	-1	-1	-6
Compared to Event 3	*****	*****	*****	-1	-1	1	1	1	1	1	3
Compared to Event 4	*****	*****	*****	*****	1	1	1	1	1	1	6
Compared to Event 5	*****	*****	*****	*****	*****	1	1	1	1	1	5
Compared to Event 6	*****	*****	*****	*****	*****	*****	-1	-1	-1	-1	-4
Compared to Event 7	*****	*****	*****	*****	*****	*****	*****	-1	-1	-1	-3
Compared to Event 8	*****	*****	*****	*****	*****	*****	*****	*****	-1	1	
Compared to Event 9	*****	*****	*****	*****	*****	*****	*****	*****	*****	1	1

Mann-Kendall Statistic 'S' = -7

Statistical Confidence Level

90% Confidence [a]		**95% Confidence [b]**	
I S I >	20	**I S I >**	23
Result	No Trend	**Result**	No Trend

Notes
[a] 90% confidence level assuming an alpha of 0.05 per tail.
[b] 95% confidence level assuming an alpha of 0.025 per tail.

WEST CENTERLINE - MW-22R - MTBE

Mann-Kendall Statistical Method Worksheet

Site-- Chillum
Compound-- MTBE
Well-- MW-22R

	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Events
Concentration	680	420	200	120	110	5,700	3,600	2,400	2,200	3,000	10
	--	--	--	--	--	--	--	--	--	--	**Sum**
Compared to Event 1	*****	-1	-1	-1	-1	1	1	1	1	1	1
Compared to Event 2	*****	*****	-1	-1	-1	1	1	1	1	1	2
Compared to Event 3	*****	*****	*****	-1	-1	1	1	1	1	1	3
Compared to Event 4	*****	*****	*****	*****	-1	1	1	1	1	1	4
Compared to Event 5	*****	*****	*****	*****	*****	1	1	1	1	1	5
Compared to Event 6	*****	*****	*****	*****	*****	*****	-1	-1	-1	-1	-4
Compared to Event 7	*****	*****	*****	*****	*****	*****	*****	-1	-1	-1	-3
Compared to Event 8	*****	*****	*****	*****	*****	*****	*****	*****	-1	1	
Compared to Event 9	*****	*****	*****	*****	*****	*****	*****	*****	*****	1	1

Mann-Kendall Statistic 'S' = 9

Statistical Confidence Level

90% Confidence [a]		**95% Confidence [b]**	
I S I >	20	**I S I >**	23
Result	No Trend	**Result**	No Trend

Notes
[a] 90% confidence level assuming an alpha of 0.05 per tail.
[b] 95% confidence level assuming an alpha of 0.025 per tail.

WEST CENTERLINE - MW-24B - BENZENE

Mann-Kendall Statistical Method Worksheet

Site-- Chillum
Compound-- Benzene
Well-- MW-24B

	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Events
Concentration	2.5	2.5	0.5	5	2.5	2.5	10	5	0.5	0.5	10
	--	--	--	--	--	--	--	--	--	--	**Sum**
Compared to Event 1	*****	0	-1	1	0	0	1	1	-1	-1	0
Compared to Event 2	*****	*****	-1	1	0	0	1	1	-1	-1	
Compared to Event 3	*****	*****	*****	1	1	1	1	1	0	0	5
Compared to Event 4	*****	*****	*****	*****	-1	-1	1	0	-1	-1	-3
Compared to Event 5	*****	*****	*****	*****	*****	0	1	1	-1	-1	
Compared to Event 6	*****	*****	*****	*****	*****	*****	1	1	-1	-1	
Compared to Event 7	*****	*****	*****	*****	*****	*****	*****	-1	-1	-1	-3
Compared to Event 8	*****	*****	*****	*****	*****	*****	*****	*****	-1	-1	-2
Compared to Event 9	*****	*****	*****	*****	*****	*****	*****	*****	*****	0	

Mann-Kendall Statistic 'S' = -3

Statistical Confidence Level

90% Confidence [a]		**95% Confidence [b]**	
I S I >	20	**I S I >**	23
Result	No Trend	**Result**	No Trend

Notes
[a] 90% confidence level assuming an alpha of 0.05 per tail.
[b] 95% confidence level assuming an alpha of 0.025 per tail.

WEST CENTERLINE - MW-24B - MTBE

Mann-Kendall Statistical Method Worksheet

Site-- Chillum
Compound-- MTBE
Well-- MW-24B

	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Events
Concentration	2.5	2.5	0.5	5	2.5	2.5	10	5	0.5	0.5	10
	--	--	--	--	--	--	--	--	--	--	**Sum**
Compared to Event 1	*****	0	-1	1	0	0	1	1	-1	-1	
Compared to Event 2	*****	*****	-1	1	0	0	1	1	-1	-1	
Compared to Event 3	*****	*****	*****	1	1	1	1	1	0	0	5
Compared to Event 4	*****	*****	*****	*****	-1	-1	1	0	-1	-1	-3
Compared to Event 5	*****	*****	*****	*****	*****	0	1	1	-1	-1	
Compared to Event 6	*****	*****	*****	*****	*****	*****	1	1	-1	-1	
Compared to Event 7	*****	*****	*****	*****	*****	*****	*****	-1	-1	-1	-3
Compared to Event 8	*****	*****	*****	*****	*****	*****	*****	*****	-1	-1	-2
Compared to Event 9	*****	*****	*****	*****	*****	*****	*****	*****	*****	0	

Mann-Kendall Statistic 'S' = -3

Statistical Confidence Level

90% Confidence [a]		**95% Confidence [b]**	
I S I >	20	**I S I >**	23
Result	No Trend	**Result**	No Trend

Notes
[a] 90% confidence level assuming an alpha of 0.05 per tail.
[b] 95% confidence level assuming an alpha of 0.025 per tail.

WEST CENTERLINE - MW-26B - BENZENE

Mann-Kendall Statistical Method Worksheet

Site-- Chillum
Compound-- Benzene
Well-- MW-26B

	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Events
Concentration	150	190	36	380	1,100	520	850	720	710	570	10
	--	--	--	--	--	--	--	--	--	--	**Sum**
Compared to Event 1	*****	1	-1	1	1	1	1	1	1	1	7
Compared to Event 2	*****	*****	-1	1	1	1	1	1	1	1	6
Compared to Event 3	*****	*****	*****	1	1	1	1	1	1	1	7
Compared to Event 4	*****	*****	*****	*****	1	1	1	1	1	1	6
Compared to Event 5	*****	*****	*****	*****	*****	-1	-1	-1	-1	-1	-5
Compared to Event 6	*****	*****	*****	*****	*****	*****	1	1	1	1	4
Compared to Event 7	*****	*****	*****	*****	*****	*****	*****	-1	-1	-1	-3
Compared to Event 8	*****	*****	*****	*****	*****	*****	*****	*****	-1	-1	-2
Compared to Event 9	*****	*****	*****	*****	*****	*****	*****	*****	*****	-1	-1

Mann-Kendall Statistic 'S' = 19

Statistical Confidence Level

90% Confidence [a]		**95% Confidence [b]**	
I S I >	20	**I S I >**	23
Result	No Trend	**Result**	No Trend

Notes
[a] 90% confidence level assuming an alpha of 0.05 per tail.
[b] 95% confidence level assuming an alpha of 0.025 per tail.

WEST CENTERLINE - MW-26B - MTBE

Mann-Kendall Statistical Method Worksheet

Site-- Chillum
Compound-- MTBE
Well-- MW-26B

	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Events
Concentration	200	280	220	280	560	290	510	330	390	240	10
	--	--	--	--	--	--	--	--	--	--	**Sum**
Compared to Event 1	*****	1	1	1	1	1	1	1	1	1	9
Compared to Event 2	*****	*****	-1	0	1	1	1	1	1	-1	3
Compared to Event 3	*****	*****	*****	1	1	1	1	1	1	1	7
Compared to Event 4	*****	*****	*****	*****	1	1	1	1	1	-1	4
Compared to Event 5	*****	*****	*****	*****	*****	-1	-1	-1	-1	-1	-5
Compared to Event 6	*****	*****	*****	*****	*****	*****	1	1	1	-1	2
Compared to Event 7	*****	*****	*****	*****	*****	*****	*****	-1	-1	-1	-3
Compared to Event 8	*****	*****	*****	*****	*****	*****	*****	*****	1	-1	
Compared to Event 9	*****	*****	*****	*****	*****	*****	*****	*****	*****	-1	-1

Mann-Kendall Statistic 'S' = 16

Statistical Confidence Level

90% Confidence [a]		**95% Confidence [b]**	
I S I >	20	**I S I >**	23
Result	No Trend	**Result**	No Trend

Notes
[a] 90% confidence level assuming an alpha of 0.05 per tail.
[b] 95% confidence level assuming an alpha of 0.025 per tail.

WEST CENTERLINE - MW-33B - BENZENE

Mann-Kendall Statistical Method Worksheet

Site-- Chillum
Compound-- Benzene
Well-- MW-33B

	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Events
Concentration	380	380	470	150	570	470	380	0.5	0.5	0.5	10
	--	--	--	--	--	--	--	--	--	--	**Sum**
Compared to Event 1	*****	0	1	-1	1	1	0	-1	-1	-1	-1
Compared to Event 2	*****	*****	1	-1	1	1	0	-1	-1	-1	-1
Compared to Event 3	*****	*****	*****	-1	1	0	-1	-1	-1	-1	-4
Compared to Event 4	*****	*****	*****	*****	1	1	1	-1	-1	-1	
Compared to Event 5	*****	*****	*****	*****	*****	-1	-1	-1	-1	-1	-5
Compared to Event 6	*****	*****	*****	*****	*****	*****	-1	-1	-1	-1	-4
Compared to Event 7	*****	*****	*****	*****	*****	*****	*****	-1	-1	-1	-3
Compared to Event 8	*****	*****	*****	*****	*****	*****	*****	*****	0	0	
Compared to Event 9	*****	*****	*****	*****	*****	*****	*****	*****	*****	0	

Mann-Kendall Statistic 'S' = -18

Statistical Confidence Level

90% Confidence [a]		**95% Confidence [b]**	
I S I >	20	**I S I >**	23
Result	No Trend	**Result**	No Trend

Notes
[a] 90% confidence level assuming an alpha of 0.05 per tail.
[b] 95% confidence level assuming an alpha of 0.025 per tail.

WEST CENTERLINE - MW-33B - MTBE

Mann-Kendall Statistical Method Worksheet

Site-- Chillum
Compound-- MTBE
Well-- MW-33B

	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Events
Concentration	220	240	380	150	300	310	300	20	1.9	0.5	10
	--	--	--	--	--	--	--	--	--	--	**Sum**
Compared to Event 1	*****	1	1	-1	1	1	1	-1	-1	-1	1
Compared to Event 2	*****	*****	1	-1	1	1	1	-1	-1	-1	
Compared to Event 3	*****	*****	*****	-1	-1	-1	-1	-1	-1	-1	-7
Compared to Event 4	*****	*****	*****	*****	1	1	1	-1	-1	-1	
Compared to Event 5	*****	*****	*****	*****	*****	1	0	-1	-1	-1	-2
Compared to Event 6	*****	*****	*****	*****	*****	*****	-1	-1	-1	-1	-4
Compared to Event 7	*****	*****	*****	*****	*****	*****	*****	-1	-1	-1	-3
Compared to Event 8	*****	*****	*****	*****	*****	*****	*****	*****	-1	-1	-2
Compared to Event 9	*****	*****	*****	*****	*****	*****	*****	*****	*****	-1	-1

Mann-Kendall Statistic 'S' = -18

Statistical Confidence Level

90% Confidence [a]		**95% Confidence [b]**	
I S I >	20	**I S I >**	23
Result	No Trend	**Result**	No Trend

Notes
[a] 90% confidence level assuming an alpha of 0.05 per tail.
[b] 95% confidence level assuming an alpha of 0.025 per tail.

WEST CENTERLINE - MW-58 - BENZENE

Mann-Kendall Statistical Method Worksheet

Site-- Chillum
Compound-- Benzene
Well-- MW-58

	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Events
Concentration	180	390	240	380	180	250					6
	--	--	--	--	--	--	--	--	--	--	**Sum**
Compared to Event 1	*****	1	1	1	0	1					4
Compared to Event 2	*****	*****	-1	-1	-1	-1					-4
Compared to Event 3	*****	*****	*****	1	-1	1					1
Compared to Event 4	*****	*****	*****	*****	-1	-1					-2
Compared to Event 5	*****	*****	*****	*****	*****	1					1
Compared to Event 6	*****	*****	*****	*****	*****	*****					
Compared to Event 7	*****	*****	*****	*****	*****	*****	*****				
Compared to Event 8	*****	*****	*****	*****	*****	*****	*****	*****			
Compared to Event 9	*****	*****	*****	*****	*****	*****	*****	*****	*****		

Mann-Kendall Statistic 'S' = 0

Statistical Confidence Level

90% Confidence [a]		**95% Confidence [b]**	
I S I >	10	**I S I >**	12
Result	No Trend	**Result**	No Trend

Notes
[a] 90% confidence level assuming an alpha of 0.05 per tail.
[b] 95% confidence level assuming an alpha of 0.025 per tail.

WEST CENTERLINE - MW-58 - MTBE

Mann-Kendall Statistical Method Worksheet

Site-- Chillum
Compound-- MTBE
Well-- MW-58

	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Events
Concentration	110	220	190	170	140	110					6
	--	--	--	--	--	--	--	--	--	--	**Sum**
Compared to Event 1	*****	1	1	1	1	0					4
Compared to Event 2	*****	*****	-1	-1	-1	-1					-4
Compared to Event 3	*****	*****	*****	-1	-1	-1					-3
Compared to Event 4	*****	*****	*****	*****	-1	-1					-2
Compared to Event 5	*****	*****	*****	*****	*****	-1					-1
Compared to Event 6	*****	*****	*****	*****	*****	*****					
Compared to Event 7	*****	*****	*****	*****	*****	*****	*****				
Compared to Event 8	*****	*****	*****	*****	*****	*****	*****	*****			
Compared to Event 9	*****	*****	*****	*****	*****	*****	*****	*****	*****		

Mann-Kendall Statistic 'S' = -6

Statistical Confidence Level

90% Confidence [a]		**95% Confidence [b]**	
I S I >	10	**I S I >**	12
Result	No Trend	**Result**	No Trend

Notes
[a] 90% confidence level assuming an alpha of 0.05 per tail.
[b] 95% confidence level assuming an alpha of 0.025 per tail.

WEST CENTERLINE - MW- 59 - BENZENE

Mann-Kendall Statistical Method Worksheet

Site-- Chillum
Compound-- Benzene
Well-- MW-59

	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Events
Concentration	140	220	140	240	260	240					6
	--	--	--	--	--	--	--	--	--	--	**Sum**
Compared to Event 1	*****	1	0	1	1	1					4
Compared to Event 2	*****	*****	-1	1	1	1					2
Compared to Event 3	*****	*****	*****	1	1	1					3
Compared to Event 4	*****	*****	*****	*****	1	0					1
Compared to Event 5	*****	*****	*****	*****	*****	-1					-1
Compared to Event 6	*****	*****	*****	*****	*****	*****					
Compared to Event 7	*****	*****	*****	*****	*****	*****	*****				
Compared to Event 8	*****	*****	*****	*****	*****	*****	*****	*****			
Compared to Event 9	*****	*****	*****	*****	*****	*****	*****	*****	*****		

Mann-Kendall Statistic 'S' = 9

Statistical Confidence Level

90% Confidence [a]		**95% Confidence [b]**	
I S I >	10	**I S I >**	12
Result	No Trend	**Result**	No Trend

Notes
[a] 90% confidence level assuming an alpha of 0.05 per tail.
[b] 95% confidence level assuming an alpha of 0.025 per tail.

WEST CENTERLINE - MW-59 - MTBE

Mann-Kendall Statistical Method Worksheet

Site-- Chillum
Compound-- MTBE
Well-- MW-59

	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Events
Concentration	140	220	160	210	250	220					6
	--	--	--	--	--	--	--	--	--	--	**Sum**
Compared to Event 1	*****	1	1	1	1	1					5
Compared to Event 2	*****	*****	-1	-1	1	0					-1
Compared to Event 3	*****	*****	*****	1	1	1					3
Compared to Event 4	*****	*****	*****	*****	1	1					2
Compared to Event 5	*****	*****	*****	*****	*****	-1					-1
Compared to Event 6	*****	*****	*****	*****	*****	*****					
Compared to Event 7	*****	*****	*****	*****	*****	*****	*****				
Compared to Event 8	*****	*****	*****	*****	*****	*****	*****	*****			
Compared to Event 9	*****	*****	*****	*****	*****	*****	*****	*****	*****		

Mann-Kendall Statistic 'S' = 8

Statistical Confidence Level

90% Confidence [a]		**95% Confidence [b]**	
I S I >	10	**I S I >**	12
Result	No Trend	**Result**	No Trend

Notes
[a] 90% confidence level assuming an alpha of 0.05 per tail.
[b] 95% confidence level assuming an alpha of 0.025 per tail.

WEST CENTERLINE - MW-60 - BENZENE

Mann-Kendall Statistical Method Worksheet

Site-- Chillum
Compound-- Benzene
Well-- MW-60

	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Events
Concentration	0.5	0.5	0.5	0.5	1.6						5
	--	--	--	--	--	--	--	--	--	--	**Sum**
Compared to Event 1	*****	0	0	0	1						1
Compared to Event 2	*****	*****	0	0	1						1
Compared to Event 3	*****	*****	*****	0	1						1
Compared to Event 4	*****	*****	*****	*****	1						1
Compared to Event 5	*****	*****	*****	*****	*****						
Compared to Event 6	*****	*****	*****	*****	*****	*****					
Compared to Event 7	*****	*****	*****	*****	*****	*****	*****				
Compared to Event 8	*****	*****	*****	*****	*****	*****	*****	*****			
Compared to Event 9	*****	*****	*****	*****	*****	*****	*****	*****	*****		

Mann-Kendall Statistic 'S' = 4

Statistical Confidence Level

90% Confidence [a]		**95% Confidence [b]**	
I S I >	8	**I S I >**	10
Result	No Trend	**Result**	No Trend

Notes
[a] 90% confidence level assuming an alpha of 0.05 per tail.
[b] 95% confidence level assuming an alpha of 0.025 per tail.

WEST CENTERLINE - MW-60 - MTBE

Mann-Kendall Statistical Method Worksheet

Site-- Chillum
Compound-- MTBE
Well-- MW-60

	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Events
Concentration	16	18	10	14	12						5
	--	--	--	--	--	--	--	--	--	--	**Sum**
Compared to Event 1	*****	1	-1	-1	-1						-2
Compared to Event 2	*****	*****	-1	-1	-1						-3
Compared to Event 3	*****	*****	*****	1	1						2
Compared to Event 4	*****	*****	*****	*****	-1						-1
Compared to Event 5	*****	*****	*****	*****	*****						
Compared to Event 6	*****	*****	*****	*****	*****	*****					
Compared to Event 7	*****	*****	*****	*****	*****	*****	*****				
Compared to Event 8	*****	*****	*****	*****	*****	*****	*****	*****			
Compared to Event 9	*****	*****	*****	*****	*****	*****	*****	*****	*****		

Mann-Kendall Statistic 'S' = -4

Statistical Confidence Level

90% Confidence [a]		**95% Confidence [b]**	
I S I >	8	**I S I >**	10
Result	No Trend	**Result**	No Trend

Notes
[a] 90% confidence level assuming an alpha of 0.05 per tail.
[b] 95% confidence level assuming an alpha of 0.025 per tail.

WEST CENTERLINE - MW-62A - BENZENE

Mann-Kendall Statistical Method Worksheet

Site-- Chillum
Compound-- Benzene
Well-- MW-62A

	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Events
Concentration	0.5	0.5	0.5								3
	--	--	--	--	--	--	--	--	--	--	**Sum**
Compared to Event 1	*****	0	0								
Compared to Event 2	*****	*****	0								
Compared to Event 3	*****	*****	*****								
Compared to Event 4	*****	*****	*****	*****							
Compared to Event 5	*****	*****	*****	*****	*****						
Compared to Event 6	*****	*****	*****	*****	*****	*****					
Compared to Event 7	*****	*****	*****	*****	*****	*****	*****				
Compared to Event 8	*****	*****	*****	*****	*****	*****	*****	*****			
Compared to Event 9	*****	*****	*****	*****	*****	*****	*****	*****	*****		

Mann-Kendall Statistic 'S' = 0

Statistical Confidence Level

90% Confidence [a]

I S I >

Result Insufficient Data

95% Confidence [b]

I S I >

Result Insufficient Data

Notes

[a] 90% confidence level assuming an alpha of 0.05 per tail.
[b] 95% confidence level assuming an alpha of 0.025 per tail.

WEST CENTERLINE - MW-62A - MTBE

Mann-Kendall Statistical Method Worksheet

Site-- Chillum
Compound-- MTBE
Well-- MW-62A

	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Events
Concentration	0.5	0.5	0.5								3
	--	--	--	--	--	--	--	--	--	--	**Sum**
Compared to Event 1	*****	0	0								
Compared to Event 2	*****	*****	0								
Compared to Event 3	*****	*****	*****								
Compared to Event 4	*****	*****	*****	*****							
Compared to Event 5	*****	*****	*****	*****	*****						
Compared to Event 6	*****	*****	*****	*****	*****	*****					
Compared to Event 7	*****	*****	*****	*****	*****	*****	*****				
Compared to Event 8	*****	*****	*****	*****	*****	*****	*****	*****			
Compared to Event 9	*****	*****	*****	*****	*****	*****	*****	*****	*****		

Mann-Kendall Statistic 'S' = 0

Statistical Confidence Level

90% Confidence [a]	**95% Confidence [b]**
I S I >	**I S I >**
Result Insufficient Data	**Result** Insufficient Data

Notes
[a] 90% confidence level assuming an alpha of 0.05 per tail.
[b] 95% confidence level assuming an alpha of 0.025 per tail.

WEST CENTERLINE - MW-62B - BENZENE

Mann-Kendall Statistical Method Worksheet

Site-- Chillum
Compound-- Benzene
Well-- MW-62B

	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Events
Concentration	94	61	34								3
	--	--	--	--	--	--	--	--	--	--	**Sum**
Compared to Event 1	*****	-1	-1								-2
Compared to Event 2	*****	*****	-1								-1
Compared to Event 3	*****	*****	*****								
Compared to Event 4	*****	*****	*****	*****							
Compared to Event 5	*****	*****	*****	*****	*****						
Compared to Event 6	*****	*****	*****	*****	*****	*****					
Compared to Event 7	*****	*****	*****	*****	*****	*****	*****				
Compared to Event 8	*****	*****	*****	*****	*****	*****	*****	*****			
Compared to Event 9	*****	*****	*****	*****	*****	*****	*****	*****	*****		

Mann-Kendall Statistic 'S' = -3

Statistical Confidence Level

90% Confidence [a]		**95% Confidence [b]**	
I S I >		**I S I >**	
Result	Insufficient Data	**Result**	Insufficient Data

Notes
[a] 90% confidence level assuming an alpha of 0.05 per tail.
[b] 95% confidence level assuming an alpha of 0.025 per tail.

WEST CENTERLINE - MW-62B - MTBE

Mann-Kendall Statistical Method Worksheet

Site-- Chillum
Compound-- MTBE
Well-- MW-62B

	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Events
Concentration	97	77	66								3
	--	--	--	--	--	--	--	--	--	--	**Sum**
Compared to Event 1	*****	-1	-1								-2
Compared to Event 2	*****	*****	-1								-1
Compared to Event 3	*****	*****	*****								
Compared to Event 4	*****	*****	*****	*****							
Compared to Event 5	*****	*****	*****	*****	*****						
Compared to Event 6	*****	*****	*****	*****	*****	*****					
Compared to Event 7	*****	*****	*****	*****	*****	*****	*****				
Compared to Event 8	*****	*****	*****	*****	*****	*****	*****	*****			
Compared to Event 9	*****	*****	*****	*****	*****	*****	*****	*****	*****		

Mann-Kendall Statistic 'S' = -3

Statistical Confidence Level

90% Confidence [a]		**95% Confidence [b]**	
I S I >		**I S I >**	
Result	Insufficient Data	**Result**	Insufficient Data

Notes
[a] 90% confidence level assuming an alpha of 0.05 per tail.
[b] 95% confidence level assuming an alpha of 0.025 per tail.

ATTACHMENT B

Mann-Kendall Analysis Tables – East Centerline

EAST CENTERLINE - MW-22R - BENZENE

Mann-Kendall Statistical Method Worksheet

Site-- Chillum
Compound-- Benzene
Well-- MW-22R

	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Events
Concentration	5,900	4,200	1,300	950	1,200	5,500	3,900	3,100	2,300	3,200	10
	--	--	--	--	--	--	--	--	--	--	**Sum**
Compared to Event 1	*****	-1	-1	-1	-1	-1	-1	-1	-1	-1	-9
Compared to Event 2	*****	*****	-1	-1	-1	1	-1	-1	-1	-1	-6
Compared to Event 3	*****	*****	*****	-1	-1	1	1	1	1	1	3
Compared to Event 4	*****	*****	*****	*****	1	1	1	1	1	1	6
Compared to Event 5	*****	*****	*****	*****	*****	1	1	1	1	1	5
Compared to Event 6	*****	*****	*****	*****	*****	*****	-1	-1	-1	-1	-4
Compared to Event 7	*****	*****	*****	*****	*****	*****	*****	-1	-1	-1	-3
Compared to Event 8	*****	*****	*****	*****	*****	*****	*****	*****	-1	1	
Compared to Event 9	*****	*****	*****	*****	*****	*****	*****	*****	*****	1	1

Mann-Kendall Statistic 'S' = -7

Statistical Confidence Level

90% Confidence [a]		**95% Confidence [b]**	
I S I >	20	**I S I >**	23
Result	No Trend	**Result**	No Trend

Notes
[a] 90% confidence level assuming an alpha of 0.05 per tail.
[b] 95% confidence level assuming an alpha of 0.025 per tail.

EAST CENTERLINE - MW-22R - MTBE

Mann-Kendall Statistical Method Worksheet

Site-- Chillum
Compound-- MTBE
Well-- MW-22R

	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Events
Concentration	680	420	200	120	110	5,700	3,600	2,400	2,200	3,000	10
	--	--	--	--	--	--	--	--	--	--	**Sum**
Compared to Event 1	*****	-1	-1	-1	-1	1	1	1	1	1	1
Compared to Event 2	*****	*****	-1	-1	-1	1	1	1	1	1	2
Compared to Event 3	*****	*****	*****	-1	-1	1	1	1	1	1	3
Compared to Event 4	*****	*****	*****	*****	-1	1	1	1	1	1	4
Compared to Event 5	*****	*****	*****	*****	*****	1	1	1	1	1	5
Compared to Event 6	*****	*****	*****	*****	*****	*****	-1	-1	-1	-1	-4
Compared to Event 7	*****	*****	*****	*****	*****	*****	*****	-1	-1	-1	-3
Compared to Event 8	*****	*****	*****	*****	*****	*****	*****	*****	-1	1	0
Compared to Event 9	*****	*****	*****	*****	*****	*****	*****	*****	*****	1	1

Mann-Kendall Statistic 'S' = 9

Statistical Confidence Level

90% Confidence [a]		**95% Confidence [b]**	
I S I >	20	**I S I >**	23
Result	No Trend	**Result**	No Trend

Notes
[a] 90% confidence level assuming an alpha of 0.05 per tail.
[b] 95% confidence level assuming an alpha of 0.025 per tail.

EAST CENTERLINE - GP-39R - BENZENE

Mann-Kendall Statistical Method Worksheet

Site-- Chillum
Compound-- Benzene
Well-- GP-39A/GP-39R

	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Events
Concentration	2,200	3,100	3,100	3,400	4,100	340	150	280	210	27	10
	--	--	--	--	--	--	--	--	--	--	**Sum**
Compared to Event 1	*****	1	1	1	1	-1	-1	-1	-1	-1	-1
Compared to Event 2	*****	*****	0	1	1	-1	-1	-1	-1	-1	-3
Compared to Event 3	*****	*****	*****	1	1	-1	-1	-1	-1	-1	-3
Compared to Event 4	*****	*****	*****	*****	1	-1	-1	-1	-1	-1	-4
Compared to Event 5	*****	*****	*****	*****	*****	-1	-1	-1	-1	-1	-5
Compared to Event 6	*****	*****	*****	*****	*****	*****	-1	-1	-1	-1	-4
Compared to Event 7	*****	*****	*****	*****	*****	*****	*****	1	1	-1	1
Compared to Event 8	*****	*****	*****	*****	*****	*****	*****	*****	-1	-1	-2
Compared to Event 9	*****	*****	*****	*****	*****	*****	*****	*****	*****	-1	-1

Mann-Kendall Statistic 'S' = -22

Statistical Confidence Level

90% Confidence [a]		**95% Confidence [b]**	
I S I >	20	**I S I >**	23
Result	Decreasing Trend	**Result**	No Trend

Notes
[a] 90% confidence level assuming an alpha of 0.05 per tail.
[b] 95% confidence level assuming an alpha of 0.025 per tail.

EAST CENTERLINE - GP-39R - MTBE

Mann-Kendall Statistical Method Worksheet

Site-- Chillum
Compound-- MTBE
Well-- GP-39A/GP-39R

	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Events
Concentration	4,900	4,600	5,500	4,200	5,100	680	400	350	310	24	10
	--	--	--	--	--	--	--	--	--	--	**Sum**
Compared to Event 1	*****	-1	1	-1	1	-1	-1	-1	-1	-1	-5
Compared to Event 2	*****	*****	1	-1	1	-1	-1	-1	-1	-1	-4
Compared to Event 3	*****	*****	*****	-1	-1	-1	-1	-1	-1	-1	-7
Compared to Event 4	*****	*****	*****	*****	1	-1	-1	-1	-1	-1	-4
Compared to Event 5	*****	*****	*****	*****	*****	-1	-1	-1	-1	-1	-5
Compared to Event 6	*****	*****	*****	*****	*****	*****	-1	-1	-1	-1	-4
Compared to Event 7	*****	*****	*****	*****	*****	*****	*****	-1	-1	-1	-3
Compared to Event 8	*****	*****	*****	*****	*****	*****	*****	*****	-1	-1	-2
Compared to Event 9	*****	*****	*****	*****	*****	*****	*****	*****	*****	-1	-1

Mann-Kendall Statistic 'S' = -35

Statistical Confidence Level

90% Confidence [a]		**95% Confidence [b]**	
I S I >	20	**I S I >**	23
Result	Decreasing Trend	**Result**	Decreasing Trend

Notes
[a] 90% confidence level assuming an alpha of 0.05 per tail.
[b] 95% confidence level assuming an alpha of 0.025 per tail.

EAST CENTERLINE - MW-47 - BENZENE

Mann-Kendall Statistical Method Worksheet

Site-- Chillum
Compound-- Benzene
Well-- MW-47

	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Events
Concentration	250	160	170	650	260	330	380	430	510	250	10
	--	--	--	--	--	--	--	--	--	--	**Sum**
Compared to Event 1	*****	-1	-1	1	1	1	1	1	1	0	4
Compared to Event 2	*****	*****	1	1	1	1	1	1	1	1	8
Compared to Event 3	*****	*****	*****	1	1	1	1	1	1	1	7
Compared to Event 4	*****	*****	*****	*****	-1	-1	-1	-1	-1	-1	-6
Compared to Event 5	*****	*****	*****	*****	*****	1	1	1	1	-1	3
Compared to Event 6	*****	*****	*****	*****	*****	*****	1	1	1	-1	2
Compared to Event 7	*****	*****	*****	*****	*****	*****	*****	1	1	-1	1
Compared to Event 8	*****	*****	*****	*****	*****	*****	*****	*****	1	-1	
Compared to Event 9	*****	*****	*****	*****	*****	*****	*****	*****	*****	-1	-1

Mann-Kendall Statistic 'S' = 18

Statistical Confidence Level

90% Confidence [a]		**95% Confidence [b]**	
I S I >	20	**I S I >**	23
Result	No Trend	**Result**	No Trend

Notes
[a] 90% confidence level assuming an alpha of 0.05 per tail.
[b] 95% confidence level assuming an alpha of 0.025 per tail.

EAST CENTERLINE - MW-47 - MTBE

Mann-Kendall Statistical Method Worksheet

Site-- Chillum
Compound-- MTBE
Well-- MW-47

	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Events
Concentration	19	16	59	15	50	52	40	0.5	16	0.5	10
	--	--	--	--	--	--	--	--	--	--	**Sum**
Compared to Event 1	*****	-1	1	-1	1	1	1	-1	-1	-1	-1
Compared to Event 2	*****	*****	1	-1	1	1	1	-1	0	-1	1
Compared to Event 3	*****	*****	*****	-1	-1	-1	-1	-1	-1	-1	-7
Compared to Event 4	*****	*****	*****	*****	1	1	1	-1	1	-1	2
Compared to Event 5	*****	*****	*****	*****	*****	1	-1	-1	-1	-1	-3
Compared to Event 6	*****	*****	*****	*****	*****	*****	-1	-1	-1	-1	-4
Compared to Event 7	*****	*****	*****	*****	*****	*****	*****	-1	-1	-1	-3
Compared to Event 8	*****	*****	*****	*****	*****	*****	*****	*****	1	0	1
Compared to Event 9	*****	*****	*****	*****	*****	*****	*****	*****	*****	-1	-1

Mann-Kendall Statistic 'S' = -15

Statistical Confidence Level

90% Confidence [a]		**95% Confidence [b]**	
I S I >	20	**I S I >**	23
Result	No Trend	**Result**	No Trend

Notes
[a] 90% confidence level assuming an alpha of 0.05 per tail.
[b] 95% confidence level assuming an alpha of 0.025 per tail.

EAST CENTERLINE - GP-2E(45-50) - BENZENE

Mann-Kendall Statistical Method Worksheet

Site-- Chillum
Compound-- Benzene
Well-- GP-2E(45-50)

	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Events
Concentration	1	1	86	17	200	350	470	320	55	50	10
	--	--	--	--	--	--	--	--	--	--	**Sum**
Compared to Event 1	*****	0	1	1	1	1	1	1	1	1	8
Compared to Event 2	*****	*****	1	1	1	1	1	1	1	1	8
Compared to Event 3	*****	*****	*****	-1	1	1	1	1	-1	-1	1
Compared to Event 4	*****	*****	*****	*****	1	1	1	1	1	1	6
Compared to Event 5	*****	*****	*****	*****	*****	1	1	1	-1	-1	1
Compared to Event 6	*****	*****	*****	*****	*****	*****	1	-1	-1	-1	-2
Compared to Event 7	*****	*****	*****	*****	*****	*****	*****	-1	-1	-1	-3
Compared to Event 8	*****	*****	*****	*****	*****	*****	*****	*****	-1	-1	-2
Compared to Event 9	*****	*****	*****	*****	*****	*****	*****	*****	*****	-1	-1

Mann-Kendall Statistic 'S' = 16

Statistical Confidence Level

90% Confidence [a]		**95% Confidence [b]**	
I S I >	20	**I S I >**	23
Result	No Trend	**Result**	No Trend

Notes
[a] 90% confidence level assuming an alpha of 0.05 per tail.
[b] 95% confidence level assuming an alpha of 0.025 per tail.

EAST CENTERLINE - GP-2E(45-50) - MTBE

Mann-Kendall Statistical Method Worksheet

Site-- Chillum
Compound-- MTBE
Well-- GP-2E(45-50)

	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Events
Concentration	350	450	1000	560	820	1,300	1,400	850	460	280	10
	--	--	--	--	--	--	--	--	--	--	**Sum**
Compared to Event 1	*****	1	1	1	1	1	1	1	1	-1	7
Compared to Event 2	*****	*****	1	1	1	1	1	1	1	-1	6
Compared to Event 3	*****	*****	*****	-1	-1	1	1	-1	-1	-1	-3
Compared to Event 4	*****	*****	*****	*****	1	1	1	1	-1	-1	2
Compared to Event 5	*****	*****	*****	*****	*****	1	1	1	-1	-1	1
Compared to Event 6	*****	*****	*****	*****	*****	*****	1	-1	-1	-1	-2
Compared to Event 7	*****	*****	*****	*****	*****	*****	*****	-1	-1	-1	-3
Compared to Event 8	*****	*****	*****	*****	*****	*****	*****	*****	-1	-1	-2
Compared to Event 9	*****	*****	*****	*****	*****	*****	*****	*****	*****	-1	-1

Mann-Kendall Statistic 'S' = 5

Statistical Confidence Level

90% Confidence [a]		**95% Confidence [b]**	
I S I >	20	**I S I >**	23
Result	No Trend	**Result**	No Trend

Notes
[a] 90% confidence level assuming an alpha of 0.05 per tail.
[b] 95% confidence level assuming an alpha of 0.025 per tail.

EAST CENTERLINE - MW-25B - BENZENE

Mann-Kendall Statistical Method Worksheet

Site-- Chillum
Compound-- Benzene
Well-- MW-25B

	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Events
Concentration	450	170	220	99	120	200	120	140	160	260	10
	--	--	--	--	--	--	--	--	--	--	**Sum**
Compared to Event 1	*****	-1	-1	-1	-1	-1	-1	-1	-1	-1	-9
Compared to Event 2	*****	*****	1	-1	-1	1	-1	-1	-1	1	-2
Compared to Event 3	*****	*****	*****	-1	-1	-1	-1	-1	-1	1	-5
Compared to Event 4	*****	*****	*****	*****	1	1	1	1	1	1	6
Compared to Event 5	*****	*****	*****	*****	*****	1	0	1	1	1	4
Compared to Event 6	*****	*****	*****	*****	*****	*****	-1	-1	-1	1	-2
Compared to Event 7	*****	*****	*****	*****	*****	*****	*****	1	1	1	3
Compared to Event 8	*****	*****	*****	*****	*****	*****	*****	*****	1	1	2
Compared to Event 9	*****	*****	*****	*****	*****	*****	*****	*****	*****	1	1

Mann-Kendall Statistic 'S' = -2

Statistical Confidence Level

90% Confidence [a]		**95% Confidence [b]**	
I S I >	20	**I S I >**	23
Result	No Trend	**Result**	No Trend

Notes
[a] 90% confidence level assuming an alpha of 0.05 per tail.
[b] 95% confidence level assuming an alpha of 0.025 per tail.

EAST CENTERLINE - MW-25B - MTBE

Mann-Kendall Statistical Method Worksheet

Site-- Chillum
Compound-- MTBE
Well-- MW-25B

	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Events
Concentration	410	260	310	260	200	390	250	230	250	320	10
	--	--	--	--	--	--	--	--	--	--	**Sum**
Compared to Event 1	*****	-1	-1	-1	-1	-1	-1	-1	-1	-1	-9
Compared to Event 2	*****	*****	1	0	-1	1	-1	-1	-1	1	-1
Compared to Event 3	*****	*****	*****	-1	-1	1	-1	-1	-1	1	-3
Compared to Event 4	*****	*****	*****	*****	-1	1	-1	-1	-1	1	-2
Compared to Event 5	*****	*****	*****	*****	*****	1	1	1	1	1	5
Compared to Event 6	*****	*****	*****	*****	*****	*****	-1	-1	-1	-1	-4
Compared to Event 7	*****	*****	*****	*****	*****	*****	*****	-1	0	1	
Compared to Event 8	*****	*****	*****	*****	*****	*****	*****	*****	1	1	2
Compared to Event 9	*****	*****	*****	*****	*****	*****	*****	*****	*****	1	1

Mann-Kendall Statistic 'S' = -11

Statistical Confidence Level

90% Confidence [a]		**95% Confidence [b]**	
I S I >	20	**I S I >**	23
Result	No Trend	**Result**	No Trend

Notes
[a] 90% confidence level assuming an alpha of 0.05 per tail.
[b] 95% confidence level assuming an alpha of 0.025 per tail.

EAST CENTERLINE - MW-27B - BENZENE

Mann-Kendall Statistical Method Worksheet

Site-- Chillum
Compound-- Benzene
Well-- MW-27B

	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Events
Concentration	37	19	6.5	1	0.5	2.5	0.5	0.5	0.5	0.5	10
	--	--	--	--	--	--	--	--	--	--	**Sum**
Compared to Event 1	*****	-1	-1	-1	-1	-1	-1	-1	-1	-1	-9
Compared to Event 2	*****	*****	-1	-1	-1	-1	-1	-1	-1	-1	-8
Compared to Event 3	*****	*****	*****	-1	-1	-1	-1	-1	-1	-1	-7
Compared to Event 4	*****	*****	*****	*****	-1	1	-1	-1	-1	-1	-4
Compared to Event 5	*****	*****	*****	*****	*****	1	0	0	0	0	1
Compared to Event 6	*****	*****	*****	*****	*****	*****	-1	-1	-1	-1	-4
Compared to Event 7	*****	*****	*****	*****	*****	*****	*****	0	0	0	
Compared to Event 8	*****	*****	*****	*****	*****	*****	*****	*****	0	0	
Compared to Event 9	*****	*****	*****	*****	*****	*****	*****	*****	*****	0	

Mann-Kendall Statistic 'S' = -31

Statistical Confidence Level

90% Confidence [a]		**95% Confidence [b]**	
I S I >	20	**I S I >**	23
Result	Decreasing Trend	**Result**	Decreasing Trend

Notes
[a] 90% confidence level assuming an alpha of 0.05 per tail.
[b] 95% confidence level assuming an alpha of 0.025 per tail.

EAST CENTERLINE - MW-27B - MTBE

Mann-Kendall Statistical Method Worksheet

Site-- Chillum
Compound-- MTBE
Well-- MW-27B

	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Events
Concentration	240	240	160	200	170	140	140	3.4	120	96	10
	--	--	--	--	--	--	--	--	--	--	**Sum**
Compared to Event 1	*****	0	-1	-1	-1	-1	-1	-1	-1	-1	-8
Compared to Event 2	*****	*****	-1	-1	-1	-1	-1	-1	-1	-1	-8
Compared to Event 3	*****	*****	*****	1	1	-1	-1	-1	-1	-1	-3
Compared to Event 4	*****	*****	*****	*****	-1	-1	-1	-1	-1	-1	-6
Compared to Event 5	*****	*****	*****	*****	*****	-1	-1	-1	-1	-1	-5
Compared to Event 6	*****	*****	*****	*****	*****	*****	0	-1	-1	-1	-3
Compared to Event 7	*****	*****	*****	*****	*****	*****	*****	-1	-1	-1	-3
Compared to Event 8	*****	*****	*****	*****	*****	*****	*****	*****	1	1	2
Compared to Event 9	*****	*****	*****	*****	*****	*****	*****	*****	*****	-1	-1

Mann-Kendall Statistic 'S' = -35

Statistical Confidence Level

90% Confidence [a]		**95% Confidence [b]**	
I S I >	20	**I S I >**	23
Result	Decreasing Trend	**Result**	Decreasing Trend

Notes
[a] 90% confidence level assuming an alpha of 0.05 per tail.
[b] 95% confidence level assuming an alpha of 0.025 per tail.

EAST CENTERLINE - MW-53 - BENZENE

Mann-Kendall Statistical Method Worksheet

Site-- Chillum
Compound-- Benzene
Well-- MW-53

	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Events
Concentration	7.8	11	28	16	6.6	5.1	6.5	4.1	2.7	2.8	10
	--	--	--	--	--	--	--	--	--	--	**Sum**
Compared to Event 1	*****	1	1	1	-1	-1	-1	-1	-1	-1	-3
Compared to Event 2	*****	*****	1	1	-1	-1	-1	-1	-1	-1	-4
Compared to Event 3	*****	*****	*****	-1	-1	-1	-1	-1	-1	-1	-7
Compared to Event 4	*****	*****	*****	*****	-1	-1	-1	-1	-1	-1	-6
Compared to Event 5	*****	*****	*****	*****	*****	-1	-1	-1	-1	-1	-5
Compared to Event 6	*****	*****	*****	*****	*****	*****	1	-1	-1	-1	-2
Compared to Event 7	*****	*****	*****	*****	*****	*****	*****	-1	-1	-1	-3
Compared to Event 8	*****	*****	*****	*****	*****	*****	*****	*****	-1	-1	-2
Compared to Event 9	*****	*****	*****	*****	*****	*****	*****	*****	*****	1	1

Mann-Kendall Statistic 'S' = -31

Statistical Confidence Level

90% Confidence [a]

I S I > 20

Result Decreasing Trend

95% Confidence [b]

I S I > 23

Result Decreasing Trend

Notes

[a] 90% confidence level assuming an alpha of 0.05 per tail.
[b] 95% confidence level assuming an alpha of 0.025 per tail.

EAST CENTERLINE - MW-53 - MTBE

Mann-Kendall Statistical Method Worksheet

Site-- Chillum
Compound-- MTBE
Well-- MW-53

	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Events
Concentration	150	220	310	300	140	180	140	100	73	110	10
	--	--	--	--	--	--	--	--	--	--	**Sum**
Compared to Event 1	*****	1	1	1	-1	1	-1	-1	-1	-1	-1
Compared to Event 2	*****	*****	1	1	-1	-1	-1	-1	-1	-1	-4
Compared to Event 3	*****	*****	*****	-1	-1	-1	-1	-1	-1	-1	-7
Compared to Event 4	*****	*****	*****	*****	-1	-1	-1	-1	-1	-1	-6
Compared to Event 5	*****	*****	*****	*****	*****	1	0	-1	-1	-1	-2
Compared to Event 6	*****	*****	*****	*****	*****	*****	-1	-1	-1	-1	-4
Compared to Event 7	*****	*****	*****	*****	*****	*****	*****	-1	-1	-1	-3
Compared to Event 8	*****	*****	*****	*****	*****	*****	*****	*****	-1	1	
Compared to Event 9	*****	*****	*****	*****	*****	*****	*****	*****	*****	1	1

Mann-Kendall Statistic 'S' = -26

Statistical Confidence Level

90% Confidence [a]

I S I > 20

Result Decreasing Trend

95% Confidence [b]

I S I > 23

Result Decreasing Trend

Notes

[a] 90% confidence level assuming an alpha of 0.05 per tail.

[b] 95% confidence level assuming an alpha of 0.025 per tail.