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December 15, 2014

Dr. Tomas Oberding
Environmental Specialist
New Mexico Oil Conservation Division
1625 N. French Dr.
Hobbs, New Mexico 88240

Re : Chevron Special Projects – VGWU No. 118 (RP# 3260)

Dear Dr. Oberding,

Please find enclosed for your records, a copy of the final report documenting the assessment activities at the Vacuum Glorietta West Unit No. 118 (RP # 3260).

The report was prepared by Arcadis US, Inc. (Arcadis) on behalf of Chevron Environmental Management Company (CEMC) to document activities performed for CEMC at the above referenced site. Please note in the report, Arcadis states the depth to groundwater is less than 100 feet, however this information was obtained from NMOSE records dating back over twenty years ago. Chevron has several environmental projects in the immediate vicinity and has measured groundwater depths in the last year ranging from 120 – 140 feet below grade surface.

The assessment activities identified several locations with soil impacts in the upper two feet of soil at levels of regulatory concern. To address these issues, CEMC proposes to conduct further remedial activities where practical, given the limitations of buried and overhead lines. For more information, please see the attached report. Should you have any questions regarding the content of the report or the proposed activities, please do not hesitate to contact me by phone at 713-372-0292 or via e-mail at luke.welch@chevron.com.

Sincerely,

Luke Welch
Environmental Project Manager

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ENVIRONMENT

Mr. Luke Welch
Project Manager
Chevron Environmental Management Company
1400 Smith Street, Room 07069B
Houston, Texas 77002

Subject:
Site Assessment Report
Vacuum Glorieta West Unit #118
Lea County, New Mexico

Date:
December 2, 2014

Contact:
Jonathan Olsen

Phone:
713.953.4874

Email:
Jonathan.Olsen@arcadis-us.com

Our ref:
B0048611.0000

Dear Mr. Welch:

On behalf of Chevron Environmental Management Company (CEMC), ARCADIS U.S., Inc. (ARCADIS) prepared this Site Assessment Report (report) to document cleanup actions and soil sampling activities performed at the Vacuum Glorieta West Unit (VGWU) #118, located in Lea County, New Mexico (site; Figure 1). These activities were conducted in response to a release of approximately 10.4 barrels (bbls) of produced water and oil that occurred on April 22, 2012.

To evaluate the potential impacts related to this release, ARCADIS developed a Site Conceptual Model (SCM; Attachment 1). Based on the SCM, potential impacts to groundwater are not considered possible due to the following:

- The small volume of unrecovered material (10.4 bbls).
- Response activities included removal of liquids and impacted surface soil.
- Local conditions include low rainfall and high evapotranspiration, which minimize potential infiltration.
- The presence of a caliche layer impedes the vertical migration of liquids.
- Groundwater is encountered at significant depth (93 feet below ground surface [bgs]).
- Geochemical modeling using the United States Environmental Protection Agency (USEPA) Multimedia Exposure Assessment Model (MULTIMED) Version 2.0

(USEPA 1996) indicates that a significantly larger release would be necessary to cause an exceedance of regulatory criteria in groundwater.

This report describes spill response activities for the April 22, 2012 release and follow-up soil assessment activities conducted on May 14, 2013.

Background Information

This section summarizes the site location and description, as well as the regional setting including geology, hydrogeology, nearby drinking water wells, surface water, and climate.

Site Location and Description

The site is located within the Chevron-operated Vacuum Unit, approximately 12 miles southwest of Lovington, New Mexico. New Mexico Highway 238 is located approximately 0.4 mile west of the site.

The site is located in the western edge of the Permian Basin, a 75,000-square-mile area in west Texas and New Mexico that is populated by numerous oil and gas production wells. In New Mexico, the Permian Basin extends to Roosevelt County to the north and Chaves County to the west. Lovington (the closest town) is located approximately 12 miles northeast of the site and the closest agricultural area is 8 miles southeast of the site.

The site is located east of the VGWU #118 wellhead. The release described in the following sections occurred in the field southeast of the wellhead. A photo log of the site is included as Attachment 2.

Nearby Water Wells and Surface Water

Based on satellite imagery, no surface-water bodies were identified within 2 miles of the site (GoogleEarth 2014). In May 2013, ARCADIS field verified that no surface-water bodies are located within 1,000 feet of the site.

In October 2014, ARCADIS reviewed information obtained from the New Mexico Office of the State Engineer (NMOSE) online database (NMOSE 2011), which indicates that no water-supply wells are located within 1,000 feet of the site. The NMOSE online database identified 322 water-supply wells within a 5-mile radius of the site (NMOSE 2011). A petroleum-industry-related water-supply well, located

approximately 1,300 feet southeast (i.e., hydraulically downgradient) of the site, was identified as the closest designated-use well to the site.

Climate

Monthly average temperatures near the site vary from a minimum of 27.9 degrees Fahrenheit (°F) in January to a maximum of 93.9°F in July (Western Regional Climate Center [WRCC] Hobbs, New Mexico [294026] weather station). Total average precipitation recorded for the area of the site from the available WRCC period of record between 1912 and 2013 was approximately 15.75 inches per year (WRCC 2014a).

Due to the arid climate, the site experiences low precipitation and high evapotranspiration rates. The total average evapotranspiration from the available WRCC period of record between 1914 and 2005 was approximately 87.68 inches per year (WRCC 2014b).

Regional Geology and Hydrogeology

The site elevation is approximately 3,970 feet above mean sea level. The site is located in the Querecho Plains immediately west of the Mescalero Ridge, which demarcates the western boundary of the (Miocene to Pliocene) High Plains Ogallala Formation (Reeves 1972). A rapid drop in elevation of 200 to 250 feet occurs west of the northwest-trending Mescalero Ridge. East of the ridge, the Ogallala Formation is predominantly composed of unconsolidated alluvial fan deposits of sand and gravel near the base, overlain by interbedded sand and clay in the upper portion (Seni 1980). Repeated depositional events on the High Plains surface beginning approximately 7 million years ago, followed by aerial exposure, generated a thick sequence of caliche horizons that are competent enough to act as a cliff for the expression of Mescalero Ridge. These hard caliche deposits form the upper portion of the stratigraphic sequence. In the site area, the Ogallala Formation is underlain by red beds of the Upper Triassic-age Dockum Group. The nearest area where the Ogallala is underlain by the Cretaceous-age Trinity Group is approximately 55 miles to the northwest (Fallin 1988).

The Querecho Plain is 80 percent covered by a moderately stable dune field (Reeves 1972) that is deposited on top of Triassic Dockum red beds. The red bed surface, which is 400,000 to 500,000 years old, is relatively flat with minor erosional incisions and a 3- to 13-foot-thick near-surface caliche layer (Bachman 1980). Deposition of sand and the formation of the dune field began 60,000 years ago, with additional development beginning 9,000 years ago (Hall 2002). The surface and interior of

these dunes do not contain caliche; however, a 1-foot layer of caliche is common at the bottom of the dunes at the contact with the red bed surface. Groundwater in the area is in the Dockum Group at a depth of approximately 100 feet bgs (Summers 1972).

Water-supply wells located on the southern High Plains east of Mescalero Ridge in central Lea County and near the site, as discussed in the Nearby Water Wells and Surface Water section of this report, are completed in the High Plains Aquifer (HPA). The HPA consists primarily of the Ogallala Formation, and in localized areas, alluvial sediment of Quaternary age. Near the site, the HPA is present directly above the Triassic-age Dockum Group, which occurs at a depth of approximately 140 feet bgs (Ash 1963, Fahlquist 2003, Nativ 1988, Nicholson and Clebsch 1961, Tillery 2008). The regional groundwater flow direction is to the east-southeast (Tillery 2008).

Groundwater near the site is encountered at a depth of approximately 93 feet bgs (NMOSE 2014; Attachment 3).

Initial Release Response Activities

A release of approximately 9.61 bbls of produced water and 0.746 bbls of oil occurred at the site on April 22, 2012 due to a poly flow line failure. Chevron personnel from the Mid-Continent Business Unit (MCBU) stopped the release, excavated visually impacted soil in the area to a depth of approximately 2 feet bgs, and collected 10 discrete confirmation soil samples from the base of the excavation on July 12, 2012. Information regarding the disposal of the excavated soil was not provided to ARCADIS.

Pursuant to New Mexico Oil Conservation Division (NMOCD) requirements (NMOCD 1993), David Pagano (Chevron MCBU) submitted a Notification of Release and Correction (Form C-141) detailing the location, volume of release, and initial and planned cleanup efforts taken for the site. The original C-141 form is included as Attachment 4.

Confirmation Soil Sampling

Ten discrete confirmation soil samples were collected from the base of the excavation on July 12, 2012. As reported in the laboratory analytical report (Attachment 5), soil sample containers were transported on ice, under chain of custody procedures to Cardinal Laboratories Environmental Analytical Services for the following analyses:

- Benzene, toluene, ethylbenzene, and total xylenes (BTEX) by USEPA Method 8021B

- Total petroleum hydrocarbons as gasoline range organics (TPH-GRO) and total petroleum hydrocarbons as diesel range organics (TPH-DRO) by USEPA Method 8015M

- Chloride by USEPA Method SM4500Cl-B.

Confirmation soil sample results are presented in Table 1. The complete laboratory analytical results with chain of custody documentation are included in Attachment 5.

Data Evaluation Approach

Chevron MCBU personnel compared data from the 10 confirmation soil samples collected in July 2012 to regulatory criteria to provide context for the concentrations of analytes detected and to evaluate if additional sampling was necessary. The regulatory criteria selected are based on potential receptors near the site and consist of the following:

- NMOCD risk-based soil remediation action levels (SRALs) for benzene, total BTEX, and total petroleum hydrocarbons (TPH) for leaks, spills, and releases (NMOCD 1993). SRALs were calculated using the NMOCD criteria presented in the tables below.

Criteria	Site-Specific Result	Ranking Score
Depth to groundwater	50 to 99 feet	10
Wellhead protection area	No	0
Distance to surface-water body	>1,000 feet	0
Total Ranking Score		**10**

SRALs	Benzene (mg/kg)	Total BTEX (mg/kg)	TPH (mg/kg)
	10	50	1,000

Note:
mg/kg = milligrams per kilogram

- New Mexico Administrative Code (NMAC) closure criteria for soil beneath belowgrade tanks, drying pads associated with closed-loop systems, and pits where contents have been removed (NMAC 2009).

Criteria	Site-Specific Result	Chloride (mg/kg)
Depth below bottom of pit to groundwater	50 to 100 feet	500

Confirmation Soil Sample Results

The analytical results for BTEX, TPH-GRO, TPH-DRO, and chloride for the 10 discrete confirmation soil samples collected in July 2012 are provided in Table 1 and summarized below:

- Benzene was not detected above the laboratory reporting limits (LRLs). Toluene was detected in two of the 10 confirmation samples (VGWU #118 SS #6 at 0.221 mg/kg and VGWU #118 SS #7 at 0.841 mg/kg). Ethylbenzene was detected in three of the 10 confirmation samples, at concentrations ranging from 0.179 mg/kg (VGWU #118 SS #9) to 2.27 mg/kg (VGWU #118 SS #7). Total xylenes were detected in three of the 10 confirmation samples, at concentrations ranging from 0.384 mg/kg (VGWU #118 SS #9) to 3.32 mg/kg (VGWU #118 SS #7).Benzene and BTEX were not detected above the SRALs of 10 and 50 mg/kg, respectively.

- TPH-GRO was detected in three of the 10 confirmation samples, at concentrations ranging from 21 mg/kg (VGWU #118 SS #9) to 108 mg/kg (VGWU #118 SS #7). TPH-DRO was detected in nine of the 10 confirmation samples, at concentrations ranging from 28 mg/kg (VGWU #118 SS #10) to 6,830 mg/kg (VGWU #118 SS #7).

- TPH (TPH-DRO and TPH-GRO) was detected in nine of the 10 samples at concentrations ranging from 28 mg/kg (VGWU #118 SS #10) to 6,938 mg/kg (VGWU #118 SS #7). TPH was detected above the SRAL of 1,000 mg/kg in three of the 10 discrete confirmation samples (VGWU #118 SS #6, VGWU #118 SS #7, VGWU #118 SS #9).

- Chloride was detected in all 10 confirmation samples, at concentrations ranging from 16 mg/kg (VGWU #118 SS #1 and VGWU #118 SS #4) to 15,800 mg/kg (VGWU #118 SS #10). Chloride was detected above the NMAC closure criterion of

500 mg/kg in three of the 10 confirmation soil samples (VGWU #118 SS #8, VGWU #118 SS #9, VGWU #118 SS #10).

The complete laboratory analytical results with chain of custody documentation are included in Attachment 5. TPH concentrations in confirmation soil samples VGWU #118 SS #6, VGWU #118 SS #7, and VGWU #118 SS #9, and chloride concentrations in confirmation soil samples VGWU #118 SS #8, VGWU #118 SS #9, and VGWU #118 SS #10 were above the regulatory criteria, which prompted additional site assessment activities.

Site Assessment Activities

In May 2013, ARCADIS conducted site assessment activities to characterize the lateral and vertical extents of potential soil impacts at the site. Soil boring locations were selected based on the results of confirmation soil sampling completed at the site in July 2012, locations of pipelines and other equipment at the site, and the extent of the release as documented by Chevron MCBU personnel during the initial response activities. The site assessment activities and results are discussed below.

Pre-Field Activities

Prior to initiating field activities, ARCADIS updated the site-specific Health and Safety Plan in accordance with state and federal requirements. Prior to initiating drilling activities, underground utilities and other potential subsurface obstructions near the proposed boring locations were located and marked. A New Mexico One Call ticket was issued for the site, and a private third-party utility locator cleared all proposed boring locations for potential on- and off-site utilities that were not otherwise identified. Finally, ARCADIS staff conducted a visual inspection of the site to identify potential utility lines. Boring locations were flagged during the utility locate and coordinates were recorded using a Trimble® global positioning unit with differential capability.

Soil Sampling

To evaluate the extent of potential impacts to soil at the site, ARCADIS advanced seven soil borings (VGW U118-1, VGW U118-2, VGW U118-3, VGW U118-4, VGW U118-5, VGW U118-6, and VGW U118-7) on May 14, 2013. Soil sample locations are shown on Figure 2.

Prior to conducting drilling activities, each boring location was cleared for subsurface utilities with an air knife. The air knife could not be advanced more than 2 to 3 inches

bgs due to the presence of a thick caliche layer. Each soil boring was then advanced to a total depth of approximately 30 feet bgs using air rotary drilling equipment.

Soil was continuously logged for stratigraphic characteristics. The soil samples were field screened for the presence of volatile organic compounds using a photo ionization detector (PID) in combination with visual and olfactory screening methods for evidence of petroleum hydrocarbons. The PID used during this investigation was calibrated daily with fresh air and isobutylene gas. Field personnel recorded PID readings, soil types, and other pertinent geologic data on the boring logs (Attachment 6). No staining or elevated PID readings were observed.

Lithologic data indicate that the subsurface material primarily consists of caliche (soil carbonate) profiles including “caprock,” nodular, and sandy caliche layers from approximately 0 to 30 feet bgs (Attachment 6).

Soil Assessment Sampling

Seven soil samples were collected from each boring location (for a total of 49 soil samples) beginning at a depth of 2 feet bgs (the approximate depth of the soil excavation in the initial release response activities) and continuing at 5-foot intervals from 5 to 30 feet bgs.

The assessment soil samples were retained in clean, laboratory-supplied glass jars, labeled, placed in an ice-chilled cooler, and submitted under appropriate chain of custody protocols to TestAmerica Laboratories.

Soil samples collected from boring locations VGW U118-4, VGW U118-5, and VGW U118-6 were placed on hold pending analytical results from the other sample locations. Based on the analytical results, three soil samples were analyzed: one from boring location VGW U118-4 at 2 feet bgs, one from VGW U118-4 at 2 feet bgs, and one from VGW U118-4 at 2 feet bgs. A total of 31 of the 49 soil assessment samples collected were analyzed.

Soil Assessment Sample Analysis

Soil samples collected from each boring were analyzed for the following constituents:

- BTEX by USEPA Method 8021B
- TPH-GRO by USEPA Method 8015B
- TPH-DRO by USEPA Method 8015B
- Chloride by USEPA Method 9056

Boring Abandonment

Following sampling, the boreholes were filled with soil cuttings from the total depth to ground surface. The ground surface was restored to match the surrounding conditions.

Soil Assessment Comparison Criteria

To support site closure, ARCADIS developed a site-specific soil screening level (SSL) for chloride, by simulating unsaturated zone flow, transport, and saturated zone mixing of chloride using the MULTIMED model Version 2.0 (USEPA 1996). The NMAC chloride standard for domestic water supply of 250 milligrams per liter (NMAC 2001) was used to estimate a maximum allowable concentration of chloride in soil that would not leach to groundwater above the standard. The NMAC chloride standard is consistent with the National Secondary Drinking Water Standard for chloride, addressing taste and odor concerns (USEPA 2010).

Conservative site-specific input parameters were used in the MULTIMED (USEPA 1996) simulations compared to actual site and release conditions. Specifically:

- Modeled source lengths and areas modeled are generally significantly larger than the actual chloride-impacted soil areas.

- Chloride-impacted soil was modeled as having a uniform chloride concentration for the entire volume (i.e., area x depth) of specified soil.

- A reduction in chloride concentrations in subsurface soil due to soil chemical transformation or adsorption mechanisms was not included in the model calculations.

Based on the depth to groundwater and the aerial and vertical extents of each of the MULTIMED (USEPA 1996) simulations, with these conservative site-specific input parameters, modeled peak chloride concentrations will reach groundwater in approximately 540 to 860 years.

The Chloride MULTIMED Simulated Soil Screening Levels for the Protection of Groundwater memo is included as Attachment 7. The site-specific SSL was calculated using the input parameters presented in the table below.

Site-Specific Input Parameters	
Source length (m)	45
Source area (m^2)	2,000
Source depth (m)	0 to 1
Depth to groundwater (m)	20
Chloride SSL (mg/kg)	**38,800**

Notes:

m = meter

m^2 = square meter

Soil Assessment Sample Results

The analytical results for BTEX, TPH-GRO, TPH-DRO, and chloride for the 31 soil assessment samples are provided in Table 1 and summarized below:

- Benzene, ethylbenzene, and total xylenes were not detected above LRLs.
- Toluene was detected in 19 of the 28 soil assessment samples at concentrations ranging from 0.016 mg/kg (VGW U118-1 5 feet bgs) to 0.047 mg/kg (VGW U118-4 2 feet bgs).
- TPH-GRO was not detected above LRLs. TPH-DRO was only detected in two of the 28 soil assessment samples at 19.7 mg/kg (VGWU #118 SS #7 at 30 feet bgs) and at 102 mg/kg (VGWU #118 SS #1 at 2 feet bgs).
- Chloride was detected in 26 of the 31 soil samples at concentrations ranging from 32 to 10,000 mg/kg (see Table 1). Chloride concentrations were not detected above the site-specific SSL of 38,800 mg/kg only four (VGW U118-1 at 2 feet bgs, VGW U118-2 at 2 and 25 feet bgs, and VGW U118-7 at 2 feet bgs) of the 31 soil assessment samples had chloride concentrations above 1,000 mg/kg.

Laboratory analytical results with chain of custody documentation are provided in Attachment 5.

Summary and Conclusions

A release of approximately 10.4 bbls of produced water and oil occurred at the site on April 22, 2012 due to the failure of a surface flow line. In July 2012, Chevron MCBU personnel excavated visually impacted soil in the area to a depth of approximately 2

feet bgs and collected 10 discrete confirmation soil samples to assess soil impacts within the observed aerial extent of the release. Concentrations of chloride and/or TPH in five of the 10 confirmation soil samples were above regulatory criteria, which prompted an additional investigation. In May 2013, additional soil samples were collected to assess soil impacts within the observed aerial extent of the release. Chloride concentrations in soil samples collected during the 2013 assessment were below the site-specific SSL, which was calculated using the MULTIMED model (USEPA 1996; Attachment 6).

Potential migration of remaining petroleum hydrocarbons or chloride to groundwater is not expected due to the relatively small volume of unrecovered material, low precipitation (WRCC 2014a), high evapotranspiration rates (WRCC 2014b), and fine-grained nature of caliche layers present beneath the site. MULTIMED (USEPA 1996) model results demonstrate that the remaining soil concentrations associated with the release do not pose a significant risk to groundwater resources

Soil data presented in this report support a conclusion that impacted soil associated with the reported release at the site poses no significant threat to groundwater resources or other receptors.

However, to minimize soil exceeding the 1,000 mg/kg chloride concentration discussed during a meeting on August 20, 2014 between CEMC and the NMCOD, ARCADIS proposes that limited excavation be implemented at the site. Shallow soil (up to 4 feet bgs) with chloride concentrations above 1,000 mg/kg will be excavated to provide clean soil to establish potential vegetation at the site in the future.

ARCADIS proposes to collect soil samples (up to 4 feet bgs) to delineate the excavation area to 1,000 mg/kg of chloride. Once the proposed excavation area is defined, soil within the proposed area will be excavated to 4 feet bgs. A liner will be placed within the limits of the excavation footprint and clean fill will be used to backfill the excavation areas. Pre-excavation samples will be used as confirmation samples and no post-excavation soil samples will be collected. The proposed excavation area is presented on Figure 3.

ARCADIS recommends that, upon completion of the excavation plan, CEMC submit a request to the NMOCD that no further investigations or additional cleanup actions need to be performed at the site and that the NMOCD grant No Further Action status to the site.

If you have any questions or comments regarding the information presented in this report, please contact Jonathan Olsen at 713.953.4874 or at

Jonathan.Olsen@arcadis-us.com, or Kathleen Abbott at 925.296.7827 or at Kathleen.Abbott@arcadis-us.com.

Sincerely,

ARCADIS U.S., Inc.

Jonathan Olsen
Certified Project Manager

Kathleen M. Abbott, PG
Program Manager

Enclosures:

Table 1	Soil Sampling Analytical Results
Figure 1	Site Location Map – VGWU #118
Figure 2	Release and Soil Boring Locations – VGWU #118
Figure 3	Proposed Excavation Area – VGWU #118

Attachments:

Attachment 1	Site Conceptual Model
Attachment 2	Photo Log
Attachment 3	New Mexico Office of the State Engineer – Depth to Water
Attachment 4	Release Notification and Corrective Action (C-141 Form)
Attachment 5	Laboratory Analytical Reports
Attachment 6	Boring Logs (May 2013)
Attachment 7	Chloride Multimedia Exposure Assessment Model Simulated Soil Screening Levels for the Protection of Groundwater Memo

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ARCADIS

Table

Table 1
Soil Sampling Analytical Results

Site Assessment Report
Vacuum Glorieta West Unit #118
Lea County, New Mexico

Boring Location ID	Sample Date	Sample Depth (feet bgs)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Total Xylenes (mg/kg)	Total BTEX (mg/kg)	TPH-GRO (mg/kg)	TPH-DRO (mg/kg)	Chloride (mg/kg)	% Moisture
		SRALs [a]	**10**	---	---	---	**50**	**1,000**		---	---
		NMAC Closure Criteria [b]	---	---	---	---	---	---	---	**500**	---
		MULTIMED Site-Specific SSL [c]	---	---	---	---	---	---	---	**38,800**	---
VGWU #118 SS #1	7/12/2012	0	<0.050	<0.050	<0.050	<0.150	--	<10.0	487	16	--
VGWU #118 SS #2	7/12/2012	0	<0.050	<0.050	<0.050	<0.150	--	<10.0	44	272	--
VGWU #118 SS #3	7/12/2012	0	<0.050	<0.050	<0.050	<0.150	--	<10.0	123	144	--
VGWU #118 SS #4	7/12/2012	0	<0.050	<0.050	<0.050	<0.150	--	<10.0	295	16	--
VGWU #118 SS #5	7/12/2012	0	<0.050	<0.050	<0.050	<0.150	--	<10.0	<10.0	96	--
VGWU #118 SS #6	7/12/2012	0	<0.050	0.221	0.385	0.937	--	37	2,520	384	--
VGWU #118 SS #7	7/12/2012	0	<0.050	0.841	2.27	3.32	--	108	6,830	112	--
VGWU #118 SS #8	7/12/2012	0	<0.050	<0.050	<0.050	<0.150	--	<10.0	50	2,320	--
VGWU #118 SS #9	7/12/2012	0	<0.050	<0.050	0.179	0.384	--	21	3,050	6,240	--
VGWU #118 SS #10	7/12/2012	0	<0.050	<0.050	<0.050	<0.150	--	<10.0	28	15,800	--
VGW U118 - 01	5/14/2013	2	<0.056	0.047	<0.056	<0.169	0.047	<16.9	102	4,800	11.3
	5/14/2013	5	<0.062	0.016	<0.062	<0.186	0.016	<18.6	<18.6	192	19.2
	5/14/2013	10	<0.061	0.020	<0.061	<0.184	0.020	<18.4	<16.0	32	18.4
	5/14/2013	15	<0.061	0.022	<0.061	<0.184	0.022	<18.4	<18.4	32	18.4
	5/14/2013	20	<0.063	0.022	<0.063	<0.188	0.022	<18.8	<18.8	<16	20.2
	5/14/2013	25	<0.052	0.042	<0.052	<0.155	0.042	<15.5	<15.5	32	2.9
	5/14/2013	30	<0.062	0.023	<0.062	<0.187	0.023	<18.7	<18.7	<16	20.0
VGW U118 - 02	5/14/2013	2	<0.057	<0.057	<0.057	<0.172	<0.344	<17.2	<17.2	10,000	12.8
	5/14/2013	5	<0.054	<0.054	<0.054	<0.162	<0.324	<16.2	<16.2	368	7.3
	5/14/2013	10	<0.054	<0.054	<0.054	<0.161	<0.322	<16.1	<16.1	80	6.9
	5/14/2013	15	<0.052	0.036	<0.052	<0.156	0.036	<15.6	<15.6	112	4.1
	5/14/2013	20	<0.054	0.035	<0.054	<0.162	0.035	<16.2	<16.2	384	7.1
	5/14/2013	25	<0.054	0.039	<0.054	<0.162	0.039	<16.2	<16.2	1,090	7.3
	5/14/2013	30	<0.065	0.031	<0.065	<0.195	0.031	<19.5	<19.5	224	23.0
VGW U118 - 03	5/14/2013	2	<0.054	0.034	<0.054	<0.161	0.034	<16.1	<16.1	832	7.0
	5/14/2013	5	<0.052	0.033	<0.052	<0.157	0.033	<15.7	<15.7	96	4.4
	5/14/2013	10	<0.054	0.028	<0.054	<0.161	0.028	<16.1	<16.1	48	6.9
	5/14/2013	15	<0.054	0.031	<0.054	<0.161	0.031	<16.1	<16.1	48	6.7
	5/14/2013	20	<0.052	0.019	<0.052	<0.157	0.019	<15.7	<15.7	48	4.5
	5/14/2013	25	<0.052	0.041	<0.052	<0.156	0.041	<15.6	<15.6	32	3.6
	5/14/2013	30	<0.051	<0.051	<0.051	<0.153	<0.307	<15.3	<15.3	32	2.2
VGW U118 - 04	5/14/2013	2	--	--	--	--	--	--	--	48	--
VGW U118 - 05	5/14/2013	2	--	--	--	--	--	--	--	64	--
VGW U118 - 06	5/14/2013	2	--	--	--	--	--	--	--	128	--
VGW U118 - 07	5/14/2013	2	<0.058	0.025	<0.058	<0.175	0.025	<17.5	<17.5	7,200	14.2
	5/14/2013	5	<0.053	0.026	<0.053	<0.158	0.026	<15.8	<15.8	96	4.9
	5/14/2013	10	<0.051	<0.051	<0.051	<0.154	0.009	<15.4	<15.4	80	2.5
	5/14/2013	15	<0.051	<0.051	<0.051	<0.152	<0.304	<15.2	<15.2	80	1.4
	5/14/2013	20	<0.052	<0.052	<0.052	<0.157	<0.314	<15.7	<15.7	<16	4.4
	5/14/2013	25	<0.052	<0.052	<0.052	<0.157	<0.314	<15.7	<15.7	<16	4.4
	5/14/2013	30	<0.059	<0.059	<0.059	<0.178	<0.357	<17.8	19.7	<16	15.9

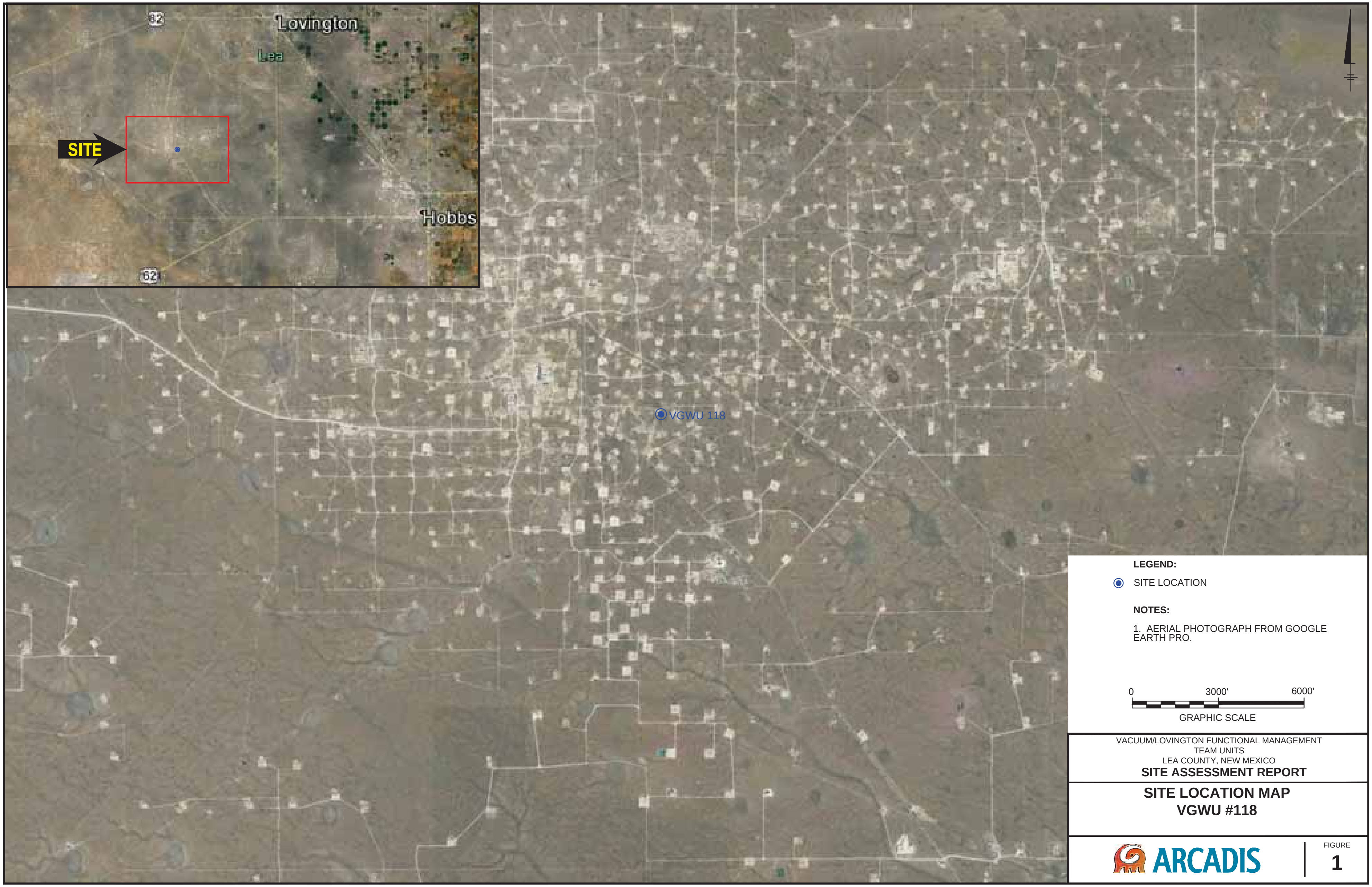
Notes:

%	Percent
mg/kg	Miligram(s) per kilogram
<	Analyte was not detected above the specified method reporting limit
--	Not Analyzed/Not Listed
bgs	Below ground surface
BTEX	Benzene, toluene, ethylbenzene, and total xylenes
MULTIMED	Multimedia Exposure Assessment Model
NMAC	New Mexico Administrative Code
TPH-GRO	Total Petroleum Hydrocarbons as Gasoline Range Organics
TPH-DRO	Total Petroleum Hydrocarbons as Diesel Range Organics
SRAL	Soil remediation action level
SSL	Soil screening level

(a) SRALs, for leaks, spills, and releases, New Mexico Oil Conservation Division, August 1993
(b) Title 19, Chapter 15 of the NMAC concerning pits, closed-loop systems, below grade tanks and sumps, and other alternative methods, 19.15.17 NMAC, July 2009
(c) MULTIMED exposure assessment, 2.0 Beta, United States Environmental Protection Agency, October 1996

ARCADIS

Figures



LEGEND:

◉ SITE LOCATION

NOTES:

1. AERIAL PHOTOGRAPH FROM GOOGLE EARTH PRO.

0 3000' 6000'

GRAPHIC SCALE

VACUUM/LOVINGTON FUNCTIONAL MANAGEMENT TEAM UNITS
LEA COUNTY, NEW MEXICO
SITE ASSESSMENT REPORT

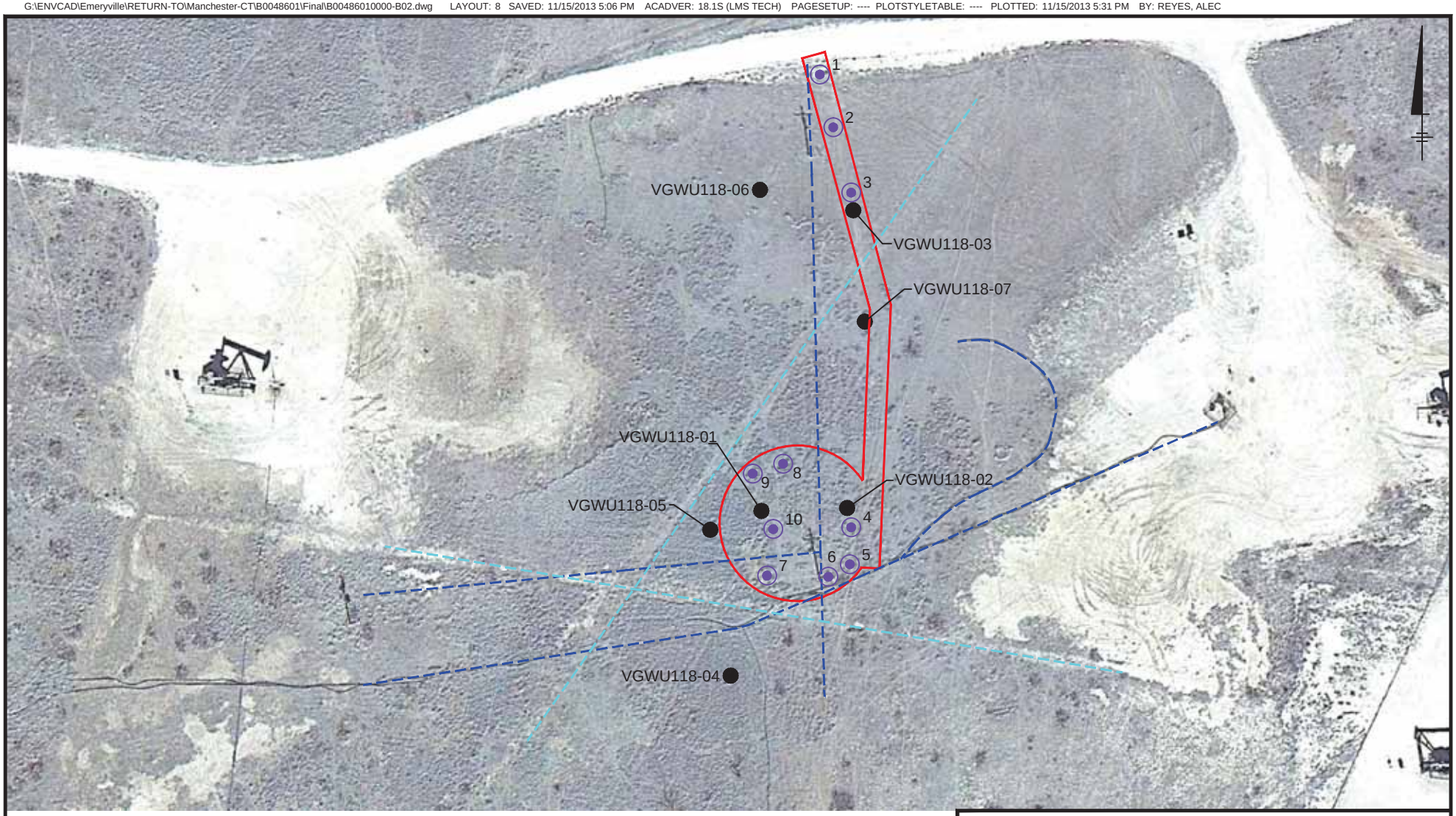
SITE LOCATION MAP
VGWU #118

ARCADIS

FIGURE
1

CITY: MANCHESTER DIV/GROUP: ENVCAD DB: B.SMALL PM: TM: LAYOUT: 1 SAVED: 4/30/2014 7:47 PM ACADVER: 18.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ---- PLOTTED: 4/30/2014 7:47 PM BY: SMALL, BRIAN
G:\ENVCAD\Manchester\ACT\B0048615\0000\00002\B0048615000-VGWU118.dwg

CITY: MANCHESTER DIV/GROUP: ENVCAD DB: B.SMALL PM: TM
G:\ENVCAD\Emeryville\RETURN-TO\Manchester-CT\B0048601\Final\B00486010000-B02.dwg LAYOUT: 8 SAVED: 11/15/2013 5:06 PM ACADVER: 18.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ---- PLOTTED: 11/15/2013 5:31 PM BY: REYES, ALEC



LEGEND:

- MAY 2013 ASSESSMENT SOIL SAMPLING LOCATION
- 1 JULY 2012 CONFIRMATION SOIL SAMPLING LOCATION
- POTENTIAL UNDERGROUND UTILITY LINE NOT DETECTED BY THIRD PARTY SURVEYOR
- ABOVE GROUND UTILITY LINE
- APPROXIMATE EXTENT OF SPILL

NOTES:

1. AERIAL PHOTOGRAPH FROM GOOGLE EARTH PRO.
2. COORDINATES FOR ALL MAY 2013 SAMPLE LOCATIONS WERE COLLECTED USING A SUB-METER TRIMBLE GPS UNIT.
3. UTILITIES WERE IDENTIFIED USING GROUND PENETRATING RADAR, RADIO FREQUENCY SURVEY OR VISUAL MEANS.

0 80' 160'

GRAPHIC SCALE

VACUUM/LOVINGTON FUNCTIONAL MANAGEMENT TEAM UNITS
LEA COUNTY, NEW MEXICO

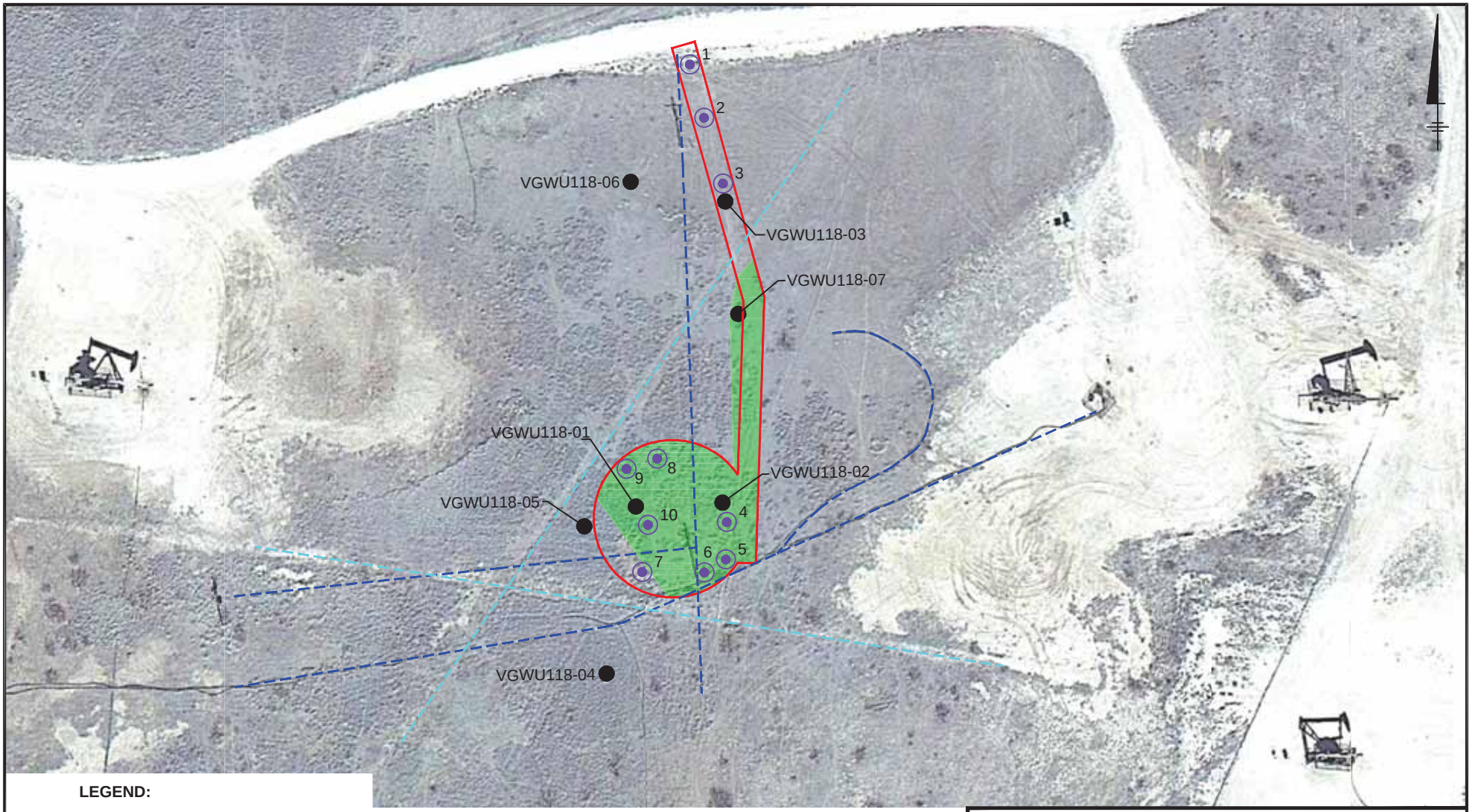
SITE ASSESSMENT REPORT

RELEASE AND SOIL BORING LOCATIONS VGWU #118

ARCADIS

FIGURE
2

CITY: MANCHESTER DIV/GROUP: ENVCAD DB: B.SMALL PM: TM
G:\ENVCAD\Manchester\ACT\B0048615\0000\00002\B00486150000-VGWU118.dwg LAYOUT: 3 SAVED: 10/9/2014 1:26 PM ACADVER: 18.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ---- PLOTTED: 10/9/2014 1:27 PM BY: SMALL, BRIAN



LEGEND:

- MAY 2013 ASSESSMENT SOIL SAMPLING LOCATION
- 1 JULY 2012 CONFIRMATION SOIL SAMPLING LOCATION
- POTENTIAL UNDERGROUND UTILITY LINE NOT DETECTED BY THIRD PARTY SURVEYOR
- ABOVE GROUND UTILITY LINE
- APPROXIMATE EXTENT OF SPILL
- PROPOSED EXCAVATION AREA

NOTES:

1. AERIAL PHOTOGRAPH FROM GOOGLE EARTH PRO.
2. COORDINATES FOR ALL MAY 2013 SAMPLE LOCATIONS WERE COLLECTED USING A SUB-METER TRIMBLE GPS UNIT.
3. UTILITIES WERE IDENTIFIED USING GROUND PENETRATING RADAR, RADIO FREQUENCY SURVEY OR VISUAL MEANS.

0 80' 160'

GRAPHIC SCALE

VACUUM/LOVINGTON FUNCTIONAL MANAGEMENT TEAM UNITS
LEA COUNTY, NEW MEXICO

SITE ASSESSMENT REPORT

PROPOSED EXCAVATION AREA VGWU #118

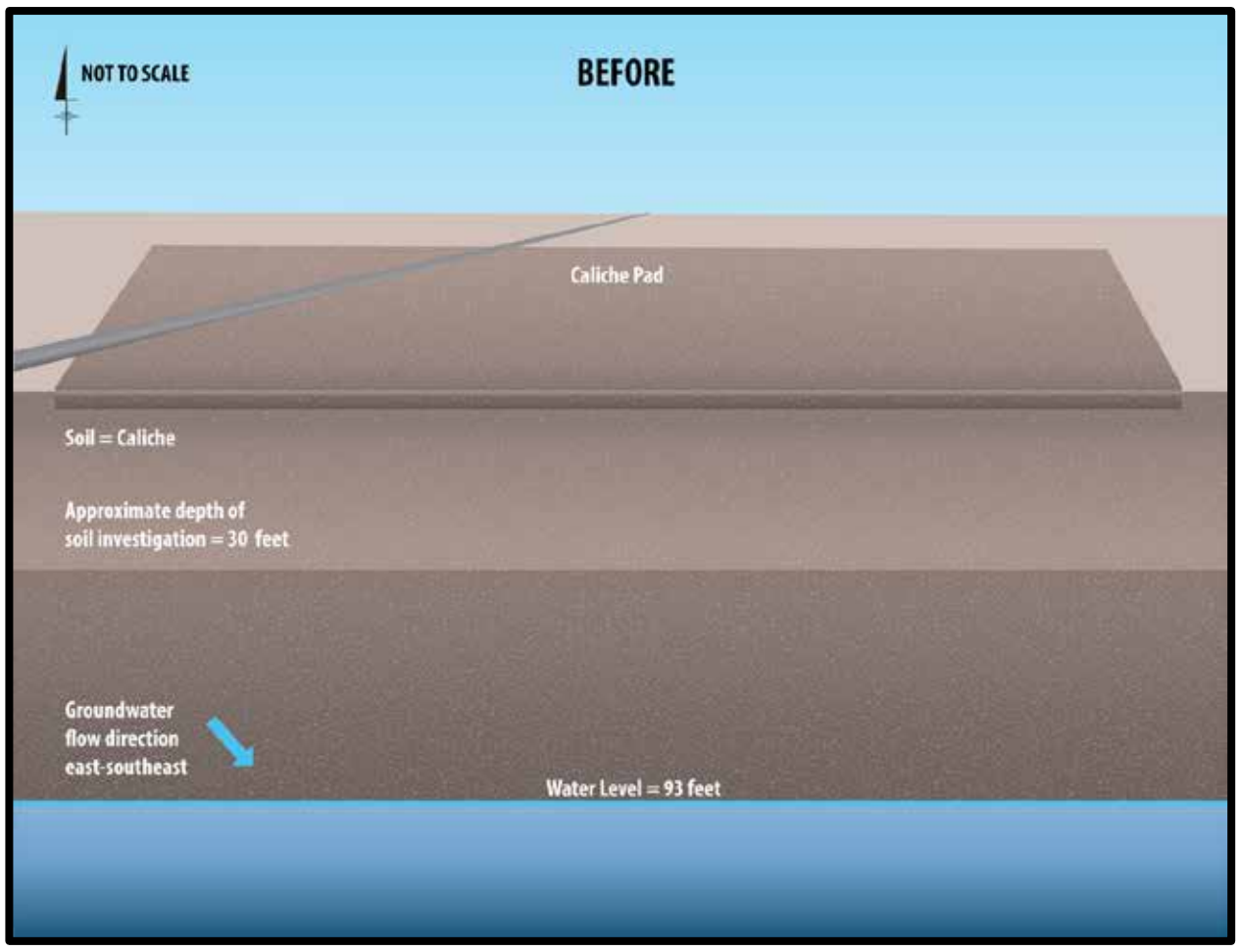
ARCADIS

FIGURE
3

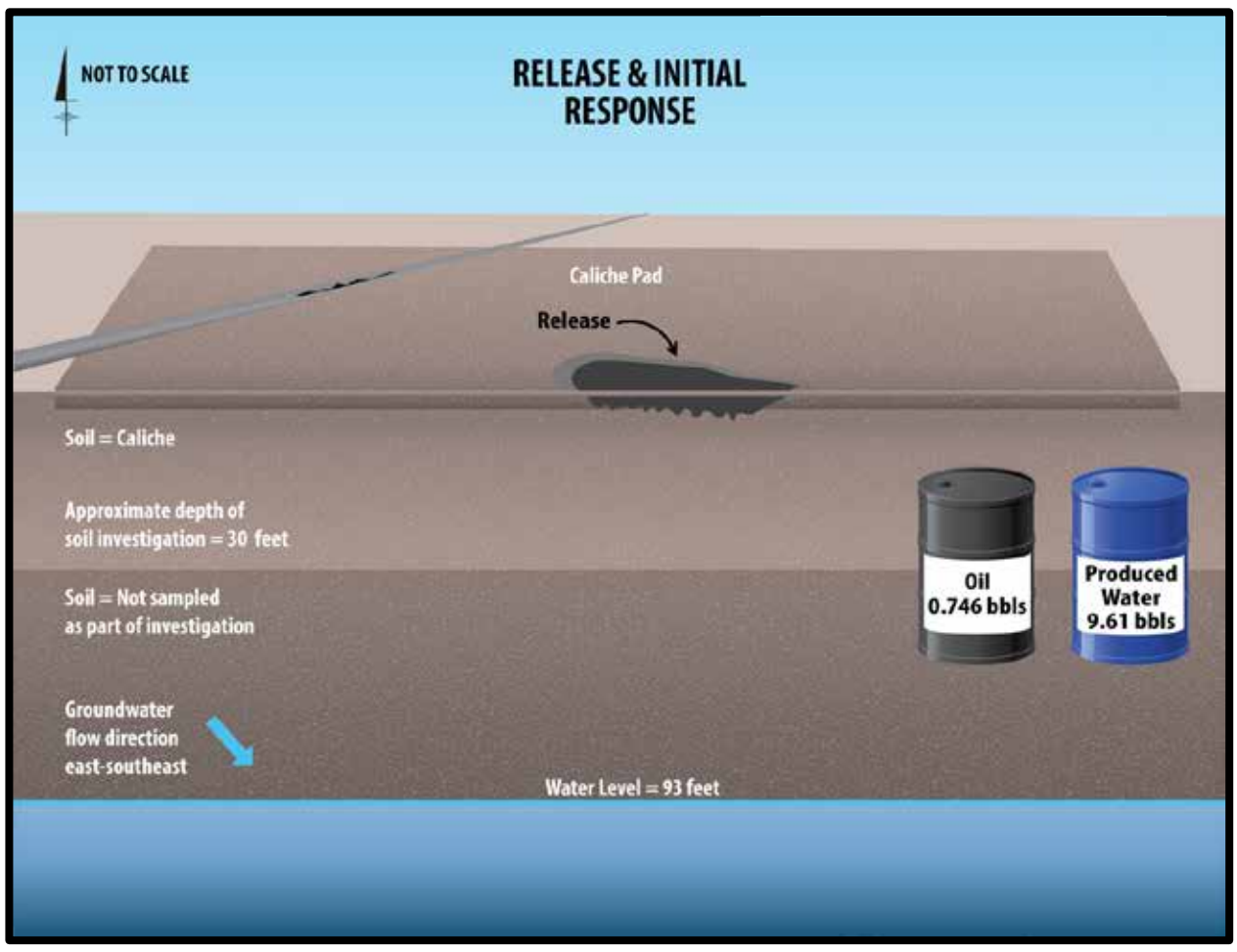
ARCADIS

Attachment 1

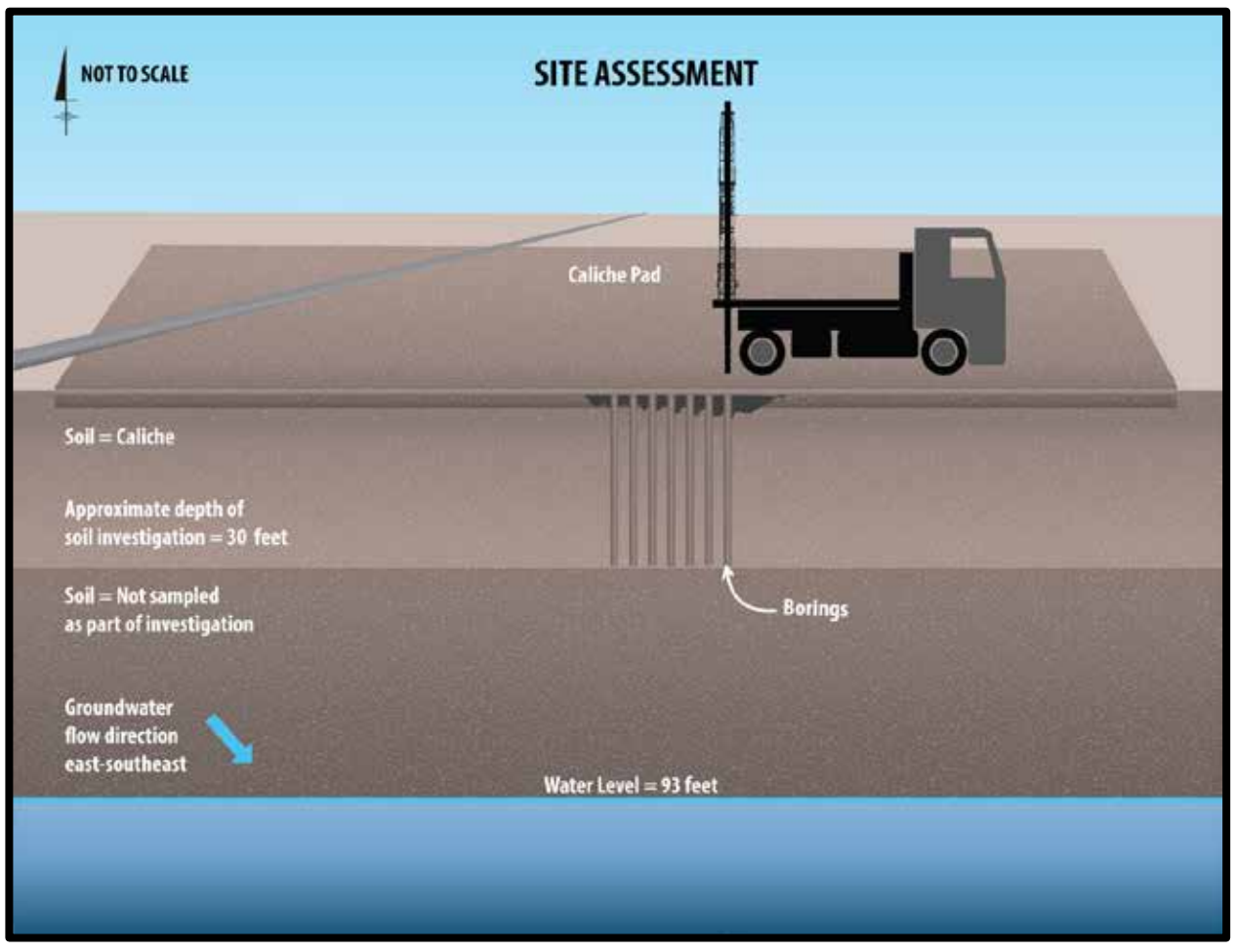
Site Conceptual Model



The site is located in the western edge of the Permian Basin with Lovington (the closest town) located approximately 12 miles northeast of the site. Due to the arid climate, the site experiences low precipitation and high evapotranspiration rates. According to information obtained from the NMOSE online database, groundwater near the site is encountered at a depth of approximately 93 feet bgs.



A release of approximately 9.61 bbls of produced water and 0.746 bbls of oil occurred at the site on April 22, 2012 due to the failure of a surface flow line. Chevron personnel from the Mid-Continent Business Unit (MCBU) stopped the release excavated visually impacted soil in the area to a depth of approximately 2 feet bgs and collected ten discrete confirmation soil samples from the base of the excavation on July 12, 2012. Analyte concentrations in one or more confirmation soil samples were above regulatory criteria, which prompted additional site assessment activities.



In May 2013, ARCADIS conducted site assessment activities to characterize the lateral and vertical extents of soil impacts at the site. Soil boring locations were selected based on the results of confirmation soil sampling completed at the site in July 2012, locations of pipelines and other equipment at the site, and the extent of the release as documented by Chevron MCBU personnel during the initial response activities. Analyte concentrations in samples collected during the 2013 assessment were reported below site-specific criteria. Site assessment activities demonstrate that remaining soil concentrations associated with the release do not pose significant risk to groundwater resources or other receptors.

VACUUM/LOVINGTON FUNCTIONAL MANAGEMENT TEAM UNITS
LEA COUNTY, NEW MEXICO
SITE ASSESSMENT REPORT

Site Conceptual Model VGWU #118

ARCADIS

FIGURE
1

ARCADIS

Attachment 2

Photolog

Photograph 1 – Vacuum Glorieta West Unit #118 release area; Facing South

Photograph 2 – Vacuum Glorieta West Unit #118 release area; Facing West

ARCADIS

Attachment 3

New Mexico Office of the State Engineer – Depth to Water

New Mexico Office of the State Engineer
Water Column/Average Depth to Water

(A CLW##### in the POD suffix indicates the POD has been replaced & no longer serves a water right file.)

(R=POD has been replaced, O=orphaned, C=the file is closed)

(quarters are 1=NW 2=NE 3=SW 4=SE)
(quarters are smallest to largest)

(NAD83 UTM in meters)

(In feet)

POD Number	POD Sub-basin	County	Q 64	Q 16	Q 4	Sec	Tws	Rng	X	Y	Distance	Depth Well	Depth Water	Water Column
L 13041 POD1	L	LE		2	2	06	18S	35E	641152	3628026	336	130		
L 13041 POD2	L	LE		2	2	06	18S	35E	641152	3628026	336	140		
L 13041 POD3	L	LE		2	2	06	18S	35E	641152	3628026	336	140		
L 13041 POD4	L	LE		2	2	06	18S	35E	641152	3628026	336	140		
L 07119 S	L	LE	1	2	1	06	18S	35E	640445	3628259*	407	233	95	138
L 05523	L	LE	3	3	2	06	18S	35E	640855	3627660*	479	147	85	62
L 10337	L	LE	4	1	1	06	18S	35E	640268	3628055*	572	190	100	90
L 07119	L	LE	1	1	1	06	18S	35E	640068	3628255*	775	233	95	138
L 02722 S5	L	LE	2	2	2	01	18S	34E	639866	3628246*	974	232		

Average Depth to Water: **93 feet**

Minimum Depth: **85 feet**

Maximum Depth: **100 feet**

Record Count: 9

UTMNAD83 Radius Search (in meters):

Easting (X): 640834.6 **Northing (Y):** 3628139.52 **Radius:** 1000

***UTM location was derived from PLSS - see Help**

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Attachment 4

Release Notification and Corrective Action (C-141 Form)

District I
1625 N. French Dr., Hobbs, NM 88240
District II
811 S. First St., Artesia, NM 88210
District III
1000 Rio Brazos Road, Aztec, NM 87410
District IV
1220 S. St. Francis Dr., Santa Fe, NM 87505

State of New Mexico
Energy Minerals and Natural Resources

Oil Conservation Division
1220 South St. Francis Dr.
Santa Fe, NM 87505

Form C-141
Revised August 8, 2011

Submit 1 Copy to appropriate District Office in accordance with 19.15.29 NMAC.

Release Notification and Corrective Action

OPERATOR

☒ Initial Report ☐ Final Report

Name of Company CHEVRON U.S.A Inc.	Contact David Pagano
Address 56 Texas Camp Road, Lovington, NM 88260	Telephone No. Office: 575-396-4414 ext 275 Cellular: 505-787-9816
Facility Name Vacuum Glorietta West Unit #118	Facility Type Production Well

Surface Owner State of New Mexico	Mineral Owner State of New Mexico	API No. 3002531129

LOCATION OF RELEASE

Unit Letter	Section	Township	Range	Feet from the	North/South Line	Feet from the	East/West Line	County
B	6	18.0S	35.0E					Lea

Latitude 32.782150° **Longitude** -103.496157°

NATURE OF RELEASE

Type of Release Produced Water Spill	Volume of Release 9.61 bbls of Produced Water and 0.746 bbls of oil	Volume Recovered 0 bbls
Source of Release Water Injection Station Pump	Date and Hour of Occurrence 04/22/12 07:00	Date and Hour of Discovery 04/22/12 07:00
Was Immediate Notice Given? ☒ Yes ☐ No ☐ Not Required	If YES, To Whom? Mr. Leking via voicemail	
By Whom? David Pagano	Date and Hour 04/223/12 11:00 AM	
Was a Watercourse Reached? ☐ Yes ☒ No	If YES, Volume Impacting the Watercourse.	

If a Watercourse was Impacted, Describe Fully.*

NA

Describe Cause of Problem and Remedial Action Taken.*

1 foot scrape on poly line caused integrity of line to give leading to spill of 9.61bbls of pw and 0.746 bbls of oil. Well shut in on discovery.

Describe Area Affected and Cleanup Action Taken.*

Spill was located in pasture

On discovery vacuum truck contacted and vacuumed up the standing fluids which were sent to disposal. Next steps are for the visually contaminated soil to be excavated up to 2 feet and sent off for disposal

I hereby certify that the information given above is true and complete to the best of my knowledge and understand that pursuant to NMOCD rules and regulations all operators are required to report and/or file certain release notifications and perform corrective actions for releases which may endanger public health or the environment. The acceptance of a C-141 report by the NMOCD marked as "Final Report" does not relieve the operator of liability should their operations have failed to adequately investigate and remediate contamination that pose a threat to ground water, surface water, human health or the environment. In addition, NMOCD acceptance of a C-141 report does not relieve the operator of responsibility for compliance with any other federal, state, or local laws and/or regulations.

Signature:	OIL CONSERVATION DIVISION	
Printed Name: David Pagano	Approved by Environmental Specialist:	
Title: Health & Environmental Specialist	Approval Date:	Expiration Date:
E-mail Address: david.pagano@chevron.com	Conditions of Approval:	Attached ☐
Date: 04/23/12 Phone: 505-787-9816		

* Attach Additional Sheets If Necessary

ARCADIS

Attachment 5

Laboratory Analytical Reports

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

July 18, 2012

DAVID PAGANO

Chevron - Lovington

HCR 60 Box 423

Lovington, NM 88260

RE: SOIL SAMPLES

Enclosed are the results of analyses for samples received by the laboratory on 07/12/12 17:07.

Cardinal Laboratories is accredited through Texas NELAP under certificate number T104704398-11-3. Accreditation applies to drinking water, non-potable water and solid and chemical materials. All accredited analytes are denoted by an asterisk (*). For a complete list of accredited analytes and matrices visit the TCEQ website at www.tceq.texas.gov/field/qa/lab_accred_certif.html.

Cardinal Laboratories is accreditated through the State of Colorado Department of Public Health and Environment for:

Method EPA 552.2	Haloacetic Acids (HAA-5)
Method EPA 524.2	Total Trihalomethanes (TTHM)
Method EPA 524.4	Regulated VOCs (V1, V2, V3)

Accreditation applies to public drinking water matrices.

This report meets NELAP requirements and is made up of a cover page, analytical results, and a copy of the original chain-of-custody. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Celey D. Keene

Celey D. Keene

Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

Chevron - Lovington
DAVID PAGANO
HCR 60 Box 423
Lovington NM, 88260
Fax To: None

Received:	07/12/2012	Sampling Date:	07/12/2012
Reported:	07/18/2012	Sampling Type:	Soil
Project Name:	SOIL SAMPLES	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: VGWU #118 SS #1 (H201602-01)

BTEX 8021B mg/kg Analyzed By: AP

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	07/17/2012	ND	1.88	93.9	2.00	2.82	
Toluene*	<0.050	0.050	07/17/2012	ND	1.89	94.5	2.00	3.09	
Ethylbenzene*	<0.050	0.050	07/17/2012	ND	1.94	97.1	2.00	4.36	
Total Xylenes*	<0.150	0.150	07/17/2012	ND	5.85	97.4	6.00	4.60	

Surrogate: 4-Bromofluorobenzene (PID *105 %* *89.4-126*

Chloride, SM4500Cl-B mg/kg Analyzed By: AP

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**16.0**	16.0	07/17/2012	ND	400	100	400	0.00	

TPH 8015M mg/kg Analyzed By: AM

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	07/17/2012	ND	166	83.1	200	6.45	
DRO >C10-C28	**487**	10.0	07/17/2012	ND	173	86.6	200	8.21	

Surrogate: 1-Chlorooctane *74.0 %* *65.2-140*

Surrogate: 1-Chlorooctadecane *99.6 %* *63.6-154*

Cardinal Laboratories *=Accredited Analyte

Celey D. Keene

Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

Chevron - Lovington
DAVID PAGANO
HCR 60 Box 423
Lovington NM, 88260
Fax To: None

Received:	07/12/2012	Sampling Date:	07/12/2012
Reported:	07/18/2012	Sampling Type:	Soil
Project Name:	SOIL SAMPLES	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: VGWU #118 SS #2 (H201602-02)

BTEX 8021B mg/kg **Analyzed By: AP**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	07/17/2012	ND	1.88	93.9	2.00	2.82	
Toluene*	<0.050	0.050	07/17/2012	ND	1.89	94.5	2.00	3.09	
Ethylbenzene*	<0.050	0.050	07/17/2012	ND	1.94	97.1	2.00	4.36	
Total Xylenes*	<0.150	0.150	07/17/2012	ND	5.85	97.4	6.00	4.60	

Surrogate: 4-Bromofluorobenzene (PID *108 %* *89.4-126*

Chloride, SM4500Cl-B mg/kg **Analyzed By: AP**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**272**	16.0	07/17/2012	ND	400	100	400	0.00	

TPH 8015M mg/kg **Analyzed By: AM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	07/17/2012	ND	166	83.1	200	6.45	
DRO >C10-C28	**43.7**	10.0	07/17/2012	ND	173	86.6	200	8.21	

Surrogate: 1-Chlorooctane *81.4 %* *65.2-140*

Surrogate: 1-Chlorooctadecane *105 %* *63.6-154*

Cardinal Laboratories *=Accredited Analyte

Celey D. Keene

Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

Chevron - Lovington
DAVID PAGANO
HCR 60 Box 423
Lovington NM, 88260
Fax To: None

Received:	07/12/2012	Sampling Date:	07/12/2012
Reported:	07/18/2012	Sampling Type:	Soil
Project Name:	SOIL SAMPLES	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: VGWU #118 SS #3 (H201602-03)

BTEX 8021B mg/kg **Analyzed By: AP**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	07/17/2012	ND	1.88	93.9	2.00	2.82	
Toluene*	<0.050	0.050	07/17/2012	ND	1.89	94.5	2.00	3.09	
Ethylbenzene*	<0.050	0.050	07/17/2012	ND	1.94	97.1	2.00	4.36	
Total Xylenes*	<0.150	0.150	07/17/2012	ND	5.85	97.4	6.00	4.60	

Surrogate: 4-Bromofluorobenzene (PID *105 %* *89.4-126*

Chloride, SM4500Cl-B mg/kg **Analyzed By: AP**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**144**	16.0	07/17/2012	ND	400	100	400	0.00	

TPH 8015M mg/kg **Analyzed By: AM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	07/17/2012	ND	166	83.1	200	6.45	
DRO >C10-C28	**123**	10.0	07/17/2012	ND	173	86.6	200	8.21	

Surrogate: 1-Chlorooctane *85.0 %* *65.2-140*

Surrogate: 1-Chlorooctadecane *112 %* *63.6-154*

Cardinal Laboratories *=Accredited Analyte

Celey D. Keene

Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

Chevron - Lovington
DAVID PAGANO
HCR 60 Box 423
Lovington NM, 88260
Fax To: None

Received:	07/12/2012	Sampling Date:	07/12/2012
Reported:	07/18/2012	Sampling Type:	Soil
Project Name:	SOIL SAMPLES	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: VGWU #118 SS #4 (H201602-04)

BTEX 8021B mg/kg **Analyzed By: AP**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	07/17/2012	ND	1.88	93.9	2.00	2.82	
Toluene*	<0.050	0.050	07/17/2012	ND	1.89	94.5	2.00	3.09	
Ethylbenzene*	<0.050	0.050	07/17/2012	ND	1.94	97.1	2.00	4.36	
Total Xylenes*	<0.150	0.150	07/17/2012	ND	5.85	97.4	6.00	4.60	

Surrogate: 4-Bromofluorobenzene (PID *104 %* *89.4-126*

Chloride, SM4500Cl-B mg/kg **Analyzed By: AP**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**16.0**	16.0	07/17/2012	ND	400	100	400	3.92	

TPH 8015M mg/kg **Analyzed By: AM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	07/17/2012	ND	166	83.1	200	6.45	
DRO >C10-C28	**295**	10.0	07/17/2012	ND	173	86.6	200	8.21	

Surrogate: 1-Chlorooctane *86.1 %* *65.2-140*

Surrogate: 1-Chlorooctadecane *110 %* *63.6-154*

Cardinal Laboratories *=Accredited Analyte

Celey D. Keene

Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

Chevron - Lovington
DAVID PAGANO
HCR 60 Box 423
Lovington NM, 88260
Fax To: None

Received:	07/12/2012	Sampling Date:	07/12/2012
Reported:	07/18/2012	Sampling Type:	Soil
Project Name:	SOIL SAMPLES	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: VGWU #118 SS #5 (H201602-05)

BTEX 8021B mg/kg **Analyzed By: AP**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	07/17/2012	ND	1.88	93.9	2.00	2.82	
Toluene*	<0.050	0.050	07/17/2012	ND	1.89	94.5	2.00	3.09	
Ethylbenzene*	<0.050	0.050	07/17/2012	ND	1.94	97.1	2.00	4.36	
Total Xylenes*	<0.150	0.150	07/17/2012	ND	5.85	97.4	6.00	4.60	

Surrogate: 4-Bromofluorobenzene (PID *104 %* *89.4-126*

Chloride, SM4500Cl-B mg/kg **Analyzed By: AP**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**96.0**	16.0	07/17/2012	ND	400	100	400	3.92	

TPH 8015M mg/kg **Analyzed By: AM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	07/17/2012	ND	166	83.1	200	6.45	
DRO >C10-C28	<10.0	10.0	07/17/2012	ND	173	86.6	200	8.21	

Surrogate: 1-Chlorooctane *82.7 %* *65.2-140*

Surrogate: 1-Chlorooctadecane *103 %* *63.6-154*

Cardinal Laboratories *=Accredited Analyte

Celey D. Keene

Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

Chevron - Lovington
DAVID PAGANO
HCR 60 Box 423
Lovington NM, 88260
Fax To: None

Received:	07/12/2012	Sampling Date:	07/12/2012
Reported:	07/18/2012	Sampling Type:	Soil
Project Name:	SOIL SAMPLES	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: VGWU #118 SS #6 (H201602-06)

BTEX 8021B mg/kg **Analyzed By: AP**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	07/18/2012	ND	1.91	95.7	2.00	0.781	
Toluene*	**0.221**	0.050	07/18/2012	ND	1.94	97.1	2.00	2.18	
Ethylbenzene*	**0.385**	0.050	07/18/2012	ND	1.98	99.0	2.00	1.91	
Total Xylenes*	**0.937**	0.150	07/18/2012	ND	5.99	99.9	6.00	2.45	

Surrogate: 4-Bromofluorobenzene (PID *117 %* *89.4-126*

Chloride, SM4500Cl-B mg/kg **Analyzed By: AP**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**384**	16.0	07/17/2012	ND	400	100	400	3.92	

TPH 8015M mg/kg **Analyzed By: AM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	**36.8**	10.0	07/17/2012	ND	166	83.1	200	6.45	
DRO >C10-C28	**2520**	10.0	07/17/2012	ND	173	86.6	200	8.21	

Surrogate: 1-Chlorooctane *91.8 %* *65.2-140*

Surrogate: 1-Chlorooctadecane *154 %* *63.6-154*

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Celey D. Keene

Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

Chevron - Lovington
DAVID PAGANO
HCR 60 Box 423
Lovington NM, 88260
Fax To: None

Received:	07/12/2012	Sampling Date:	07/12/2012
Reported:	07/18/2012	Sampling Type:	Soil
Project Name:	SOIL SAMPLES	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: VGWU #118 SS #7 (H201602-07)

BTEX 8021B mg/kg Analyzed By: AP S-04

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	07/18/2012	ND	1.91	95.7	2.00	0.781	
Toluene*	**0.841**	0.050	07/18/2012	ND	1.94	97.1	2.00	2.18	
Ethylbenzene*	**2.27**	0.050	07/18/2012	ND	1.98	99.0	2.00	1.91	
Total Xylenes*	**3.32**	0.150	07/18/2012	ND	5.99	99.9	6.00	2.45	

Surrogate: 4-Bromofluorobenzene (PID *134 %* *89.4-126*

Chloride, SM4500Cl-B mg/kg Analyzed By: AP

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**112**	16.0	07/17/2012	ND	400	100	400	3.92	

TPH 8015M mg/kg Analyzed By: AM S-04

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	**108**	10.0	07/17/2012	ND	166	83.1	200	6.45	
DRO >C10-C28	**6830**	10.0	07/17/2012	ND	173	86.6	200	8.21	

Surrogate: 1-Chlorooctane *106 %* *65.2-140*

Surrogate: 1-Chlorooctadecane *228 %* *63.6-154*

Cardinal Laboratories *=Accredited Analyte

Celey D. Keene

Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

Chevron - Lovington
DAVID PAGANO
HCR 60 Box 423
Lovington NM, 88260
Fax To: None

Received:	07/12/2012	Sampling Date:	07/12/2012
Reported:	07/18/2012	Sampling Type:	Soil
Project Name:	SOIL SAMPLES	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: VGWU #118 SS #8 (H201602-08)

BTEX 8021B mg/kg **Analyzed By: AP**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	07/18/2012	ND	1.91	95.7	2.00	0.781	
Toluene*	<0.050	0.050	07/18/2012	ND	1.94	97.1	2.00	2.18	
Ethylbenzene*	<0.050	0.050	07/18/2012	ND	1.98	99.0	2.00	1.91	
Total Xylenes*	<0.150	0.150	07/18/2012	ND	5.99	99.9	6.00	2.45	

Surrogate: 4-Bromofluorobenzene (PID *107 %* *89.4-126*

Chloride, SM4500Cl-B mg/kg **Analyzed By: AP**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**2320**	16.0	07/17/2012	ND	400	100	400	3.92	

TPH 8015M mg/kg **Analyzed By: AM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	07/17/2012	ND	166	83.1	200	6.45	
DRO >C10-C28	**49.5**	10.0	07/17/2012	ND	173	86.6	200	8.21	

Surrogate: 1-Chlorooctane *82.8 %* *65.2-140*

Surrogate: 1-Chlorooctadecane *111 %* *63.6-154*

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Celey D. Keene

Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

Chevron - Lovington
DAVID PAGANO
HCR 60 Box 423
Lovington NM, 88260
Fax To: None

Received:	07/12/2012	Sampling Date:	07/12/2012
Reported:	07/18/2012	Sampling Type:	Soil
Project Name:	SOIL SAMPLES	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: VGWU #118 SS #9 (H201602-09)

BTEX 8021B mg/kg **Analyzed By: AP**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	07/18/2012	ND	1.91	95.7	2.00	0.781	
Toluene*	<0.050	0.050	07/18/2012	ND	1.94	97.1	2.00	2.18	
Ethylbenzene*	**0.179**	0.050	07/18/2012	ND	1.98	99.0	2.00	1.91	
Total Xylenes*	**0.384**	0.150	07/18/2012	ND	5.99	99.9	6.00	2.45	

Surrogate: 4-Bromofluorobenzene (PID *115 %* *89.4-126*

Chloride, SM4500Cl-B mg/kg **Analyzed By: AP**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**6240**	16.0	07/18/2012	ND	400	100	400	3.92	

TPH 8015M mg/kg **Analyzed By: AM** **S-04**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	**20.6**	10.0	07/17/2012	ND	166	83.1	200	6.45	
DRO >C10-C28	**3050**	10.0	07/17/2012	ND	173	86.6	200	8.21	

Surrogate: 1-Chlorooctane *86.3 %* *65.2-140*

Surrogate: 1-Chlorooctadecane *163 %* *63.6-154*

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Celey D. Keene

Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

Chevron - Lovington
DAVID PAGANO
HCR 60 Box 423
Lovington NM, 88260
Fax To: None

Received:	07/12/2012	Sampling Date:	07/12/2012
Reported:	07/18/2012	Sampling Type:	Soil
Project Name:	SOIL SAMPLES	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: VGWU #118 SS #10 (H201602-10)

BTEX 8021B mg/kg **Analyzed By: AP**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	07/18/2012	ND	1.91	95.7	2.00	0.781	
Toluene*	<0.050	0.050	07/18/2012	ND	1.94	97.1	2.00	2.18	
Ethylbenzene*	<0.050	0.050	07/18/2012	ND	1.98	99.0	2.00	1.91	
Total Xylenes*	<0.150	0.150	07/18/2012	ND	5.99	99.9	6.00	2.45	

Surrogate: 4-Bromofluorobenzene (PID *105 %* *89.4-126*

Chloride, SM4500Cl-B mg/kg **Analyzed By: AP**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**15800**	16.0	07/18/2012	ND	400	100	400	3.92	

TPH 8015M mg/kg **Analyzed By: AM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	07/17/2012	ND	166	83.1	200	6.45	
DRO >C10-C28	**28.4**	10.0	07/17/2012	ND	173	86.6	200	8.21	

Surrogate: 1-Chlorooctane *77.3 %* *65.2-140*

Surrogate: 1-Chlorooctadecane *103 %* *63.6-154*

Cardinal Laboratories *=Accredited Analyte

Celey D. Keene

Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Notes and Definitions

S-04	The surrogate recovery for this sample is outside of established control limits due to a sample matrix effect.
ND	Analyte NOT DETECTED at or above the reporting limit
RPD	Relative Percent Difference
**	Samples not received at proper temperature of 6°C or below.
***	Insufficient time to reach temperature.
-	Chloride by SM4500Cl-B does not require samples be received at or below 6°C
	Samples reported on an as received basis (wet) unless otherwise noted on report

Celey D. Keene

Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

101 East Marland, Hobbs, NM 88240
(575) 393-2326 FAX (575) 393-2476

Company Name:	Chevron
Project Manager:	David Pagano
Address:	56 Texas Camp Rd.
City:	Lovington State: NM Zip: 88260
Phone #:	505-787-9816 Fax #:
Project #:	Project Owner:
Project Name:	
Project Location:	
Sampler Name:	

BILL TO

P.O. #:	
Company:	Chevron
Attn:	Nick Moschetti
Address:	56 Texas Camp Rd.
City:	Lovington
State:	NM Zip: 88260
Phone #:	575-396-4414 x201
Fax #:	

ANALYSIS REQUEST: TPH, BTEX, Chlorides

FOR LAB USE ONLY Lab I.D.	Sample I.D.	(G)RAB OR (C)OMP.	# CONTAINERS	MATRIX: GROUNDWATER	WASTEWATER	SOIL	OIL	SLUDGE	OTHER:	PRESERV: ACID/BASE:	ICE / COOL	OTHER:	SAMPLING: DATE	TIME
H201682														
1	Vblwu #118 SS#1	G					✓						7/12/12	4:00
2	Vblwu #118 SS#2													4:03
3	Vblwu #118 SS#3													4:06
4	Vblwu #118 SS#4													4:09
5	Vblwu #118 SS#5													4:12
6	Vblwu #118 SS#6													4:18
7	Vblwu #118 SS#7													4:20
8	Vblwu #118 SS#8													4:22
9	Vblwu #118 SS#9													4:25
10	Vblwu #118 SS#10													4:26

Relinquished By:	Date: 7/12/12	Received By:	
David Pagano	Time: 5:07	Nicole Henson	
Relinquished By:	Date:	Received By:	
	Time:		

Phone Result: ☐ Yes ☐ No Add'l Phone #:
Fax Result: ☐ Yes ☐ No Add'l Fax #:
REMARKS:

Delivered By: (Circle One)
Sampler - UPS - Bus - Other: 3°C

Sample Condition: Cool ☑ Yes ☐ No; Intact ☑ Yes ☐ No
CHECKED BY: (Initials)

† Cardinal cannot accept verbal changes. Please fax written changes to 505-393-2476

#26

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

June 10, 2013

JONATHAN OLSEN

ARCADIS U.S., INC. - HOUSTON

630 PLAZA DRIVE, SUITE 600

HIGHLANDS RANCH, CO 80129

RE: CHEVRON BUCKEYE

Enclosed are the results of analyses for samples received by the laboratory on 05/15/13 17:00.

Cardinal Laboratories is accredited through Texas NELAP under certificate number T104704398-11-3. Accreditation applies to drinking water, non-potable water and solid and chemical materials. All accredited analytes are denoted by an asterisk (*). For a complete list of accredited analytes and matrices visit the TCEQ website at www.tceq.texas.gov/field/qa/lab_accred_certif.html.

Cardinal Laboratories is accreditated through the State of Colorado Department of Public Health and Environment for:

Method EPA 552.2	Haloacetic Acids (HAA-5)
Method EPA 524.2	Total Trihalomethanes (TTHM)
Method EPA 524.4	Regulated VOCs (V1, V2, V3)

Accreditation applies to public drinking water matrices.

This report meets NELAP requirements and is made up of a cover page, analytical results, and a copy of the original chain-of-custody. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Celey D. Keene

Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

ARCADIS U.S., INC. - HOUSTON 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129	Project: CHEVRON BUCKEYE Project Number: B004860.0000 Project Manager: JONATHAN OLSEN Fax To: (713) 977-4620	Reported: 10-Jun-13 10:43

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
VGW U118 - 07 (10')	H301174-01	Soil	14-May-13 15:25	15-May-13 17:00
VGW U118 - 07 (15')	H301174-02	Soil	14-May-13 15:30	15-May-13 17:00
VGW U118 - 07 (20')	H301174-03	Soil	14-May-13 15:35	15-May-13 17:00
VGW U118 - 07 (25')	H301174-04	Soil	14-May-13 15:40	15-May-13 17:00
VGW U118 - 07 (30')	H301174-05	Soil	14-May-13 15:50	15-May-13 17:00
VGW U118 - 02 (2')	H301174-06	Soil	14-May-13 16:02	15-May-13 17:00
VGW U118 - 02 (5')	H301174-07	Soil	14-May-13 16:07	15-May-13 17:00
VGW U118 - 02 (10')	H301174-08	Soil	14-May-13 16:14	15-May-13 17:00
VGW U118 - 02 (15')	H301174-09	Soil	14-May-13 16:20	15-May-13 17:00
VGW U118 - 02 (20')	H301174-10	Soil	14-May-13 16:25	15-May-13 17:00
VGW U118 - 02 (25')	H301174-11	Soil	14-May-13 16:28	15-May-13 17:00
VGW U118 - 02 (30')	H301174-12	Soil	14-May-13 16:32	15-May-13 17:00
VGW U118 - 04 (2')	H301174-13	Soil	14-May-13 16:57	15-May-13 17:00
VGW U118 - 06 (2')	H301174-20	Soil	14-May-13 12:32	15-May-13 17:00
VGW U118 - 05 (2')	H301174-27	Soil	14-May-13 13:17	15-May-13 17:00
VGW U118 - 01 (2')	H301174-34	Soil	14-May-13 13:54	15-May-13 17:00
VGW U118 - 01 (5')	H301174-35	Soil	14-May-13 13:57	15-May-13 17:00
VGW U118 - 01 (10')	H301174-36	Soil	14-May-13 14:00	15-May-13 17:00
VGW U118 - 01 (15')	H301174-37	Soil	14-May-13 14:05	15-May-13 17:00
VGW U118 - 01 (20')	H301174-38	Soil	14-May-13 14:12	15-May-13 17:00
VGW U118 - 01 (25')	H301174-39	Soil	14-May-13 14:17	15-May-13 17:00
VGW U118 - 01 (30')	H301174-40	Soil	14-May-13 14:25	15-May-13 17:00
VGW U118 - 03 (2')	H301174-41	Soil	14-May-13 14:32	15-May-13 17:00
VGW U118 - 03 (5')	H301174-42	Soil	14-May-13 14:37	15-May-13 17:00
VGW U118 - 03 (10')	H301174-43	Soil	14-May-13 14:40	15-May-13 17:00
VGW U118 - 03 (15')	H301174-44	Soil	14-May-13 14:45	15-May-13 17:00
VGW U118 - 03 (20')	H301174-45	Soil	14-May-13 14:50	15-May-13 17:00

Cardinal Laboratories

*=Accredited Analyte

Celey D. Keene

Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

ARCADIS U.S., INC. - HOUSTON 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129	Project: CHEVRON BUCKEYE Project Number: B004860.0000 Project Manager: JONATHAN OLSEN Fax To: (713) 977-4620	Reported: 10-Jun-13 10:43

VGW U118 - 03 (25')	H301174-46	Soil	14-May-13 15:00	15-May-13 17:00
VGW U118 - 03 (30')	H301174-47	Soil	14-May-13 15:03	15-May-13 17:00
VGW U118 - 07 (2')	H301174-48	Soil	14-May-13 15:17	15-May-13 17:00
VGW U118 - 07 (5')	H301174-49	Soil	14-May-13 15:20	15-May-13 17:00

Cardinal Laboratories

*=Accredited Analyte

Celey D. Keene

Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

ARCADIS U.S., INC. - HOUSTON 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129	Project: CHEVRON BUCKEYE Project Number: B004860.0000 Project Manager: JONATHAN OLSEN Fax To: (713) 977-4620	Reported: 10-Jun-13 10:43

VGW U118 - 07 (10')

H301174-01 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Solids	**97.6**	0.100	%	1	3051612	DW	17-May-13	D2216	
% Moisture	**2.45**	0.100	%	1	3051612	DW	17-May-13	D2216	
Chloride	**80.0**	16.0	mg/kg	4	3051610	DW	16-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	15.4	mg/kg dry	1	3052411	CK	20-May-13	8015M	
DRO >C10-C28	ND	15.4	mg/kg dry	1	3052411	CK	20-May-13	8015M	
Surrogate: 1-Chlorooctane		*96.2 %*	*70-130*		*3052411*	CK	*20-May-13*	*8015M*	
Surrogate: o-Terphenyl		*105 %*	*70-130*		*3052411*	CK	*20-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.051	mg/kg dry	50	3051601	AP	16-May-13	8021B	
Toluene*	ND	0.051	mg/kg dry	50	3051601	AP	16-May-13	8021B	
Ethylbenzene*	ND	0.051	mg/kg dry	50	3051601	AP	16-May-13	8021B	
Total Xylenes*	ND	0.154	mg/kg dry	50	3051601	AP	16-May-13	8021B	
Total BTEX	**0.009**	0.308	mg/kg dry	50	3051601	AP	16-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		*112 %*	*89.4-126*		*3051601*	AP	*16-May-13*	*8021B*	

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Celey D. Keene, Lab Director/Quality Manager

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Analytical Results For:

ARCADIS U.S., INC. - HOUSTON 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129	Project: CHEVRON BUCKEYE Project Number: B004860.0000 Project Manager: JONATHAN OLSEN Fax To: (713) 977-4620	Reported: 10-Jun-13 10:43

VGW U118 - 07 (15')

H301174-02 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Moisture	**1.39**	0.100	%	1	3051612	DW	17-May-13	D2216	
% Solids	**98.6**	0.100	%	1	3051612	DW	17-May-13	D2216	
Chloride	**80.0**	16.0	mg/kg	4	3051610	DW	16-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	15.2	mg/kg dry	1	3052411	CK	20-May-13	8015M	
DRO >C10-C28	ND	15.2	mg/kg dry	1	3052411	CK	20-May-13	8015M	
Surrogate: 1-Chlorooctane		*94.0 %*	*70-130*		*3052411*	CK	*20-May-13*	*8015M*	
Surrogate: o-Terphenyl		*103 %*	*70-130*		*3052411*	CK	*20-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.051	mg/kg dry	50	3051601	AP	16-May-13	8021B	
Toluene*	ND	0.051	mg/kg dry	50	3051601	AP	16-May-13	8021B	
Ethylbenzene*	ND	0.051	mg/kg dry	50	3051601	AP	16-May-13	8021B	
Total Xylenes*	ND	0.152	mg/kg dry	50	3051601	AP	16-May-13	8021B	
Total BTEX	ND	0.304	mg/kg dry	50	3051601	AP	16-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		*113 %*	*89.4-126*		*3051601*	AP	*16-May-13*	*8021B*	

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Analytical Results For:

ARCADIS U.S., INC. - HOUSTON 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129	Project: CHEVRON BUCKEYE Project Number: B004860.0000 Project Manager: JONATHAN OLSEN Fax To: (713) 977-4620	Reported: 10-Jun-13 10:43

VGW U118 - 07 (20')

H301174-03 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Moisture	**4.35**	0.100	%	1	3051612	DW	17-May-13	D2216	
% Solids	**95.6**	0.100	%	1	3051612	DW	17-May-13	D2216	
Chloride	ND	16.0	mg/kg	4	3051610	DW	16-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	15.7	mg/kg dry	1	3052411	CK	20-May-13	8015M	
DRO >C10-C28	ND	15.7	mg/kg dry	1	3052411	CK	20-May-13	8015M	
Surrogate: 1-Chlorooctane		*96.2 %*	*70-130*		*3052411*	CK	*20-May-13*	*8015M*	
Surrogate: o-Terphenyl		*107 %*	*70-130*		*3052411*	CK	*20-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.052	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Toluene*	ND	0.052	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Ethylbenzene*	ND	0.052	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Total Xylenes*	ND	0.157	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Total BTEX	ND	0.314	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		*112 %*	*89.4-126*		*3051601*	AP	*17-May-13*	*8021B*	

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Analytical Results For:

ARCADIS U.S., INC. - HOUSTON 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129	Project: CHEVRON BUCKEYE Project Number: B004860.0000 Project Manager: JONATHAN OLSEN Fax To: (713) 977-4620	Reported: 10-Jun-13 10:43

VGW U118 - 07 (25')

H301174-04 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Moisture	**4.41**	0.100	%	1	3051612	DW	17-May-13	D2216	
% Solids	**95.6**	0.100	%	1	3051612	DW	17-May-13	D2216	
Chloride	ND	16.0	mg/kg	4	3051610	DW	17-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	15.7	mg/kg dry	1	3052411	CK	20-May-13	8015M	
DRO >C10-C28	ND	15.7	mg/kg dry	1	3052411	CK	20-May-13	8015M	
Surrogate: 1-Chlorooctane		*107 %*	*70-130*		*3052411*	CK	*20-May-13*	*8015M*	
Surrogate: o-Terphenyl		*99.9 %*	*70-130*		*3052411*	CK	*20-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.052	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Toluene*	ND	0.052	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Ethylbenzene*	ND	0.052	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Total Xylenes*	ND	0.157	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Total BTEX	ND	0.314	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		*111 %*	*89.4-126*		*3051601*	AP	*17-May-13*	*8021B*	

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Analytical Results For:

ARCADIS U.S., INC. - HOUSTON 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129	Project: CHEVRON BUCKEYE Project Number: B004860.0000 Project Manager: JONATHAN OLSEN Fax To: (713) 977-4620	Reported: 10-Jun-13 10:43

VGW U118 - 07 (30')

H301174-05 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Moisture	**15.9**	0.100	%	1	3051612	DW	17-May-13	D2216	
% Solids	**84.1**	0.100	%	1	3051612	DW	17-May-13	D2216	
Chloride	ND	16.0	mg/kg	4	3051610	DW	17-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	17.8	mg/kg dry	1	3052411	CK	20-May-13	8015M	
DRO >C10-C28	**19.7**	17.8	mg/kg dry	1	3052411	CK	20-May-13	8015M	
Surrogate: 1-Chlorooctane		*94.0 %*	*70-130*		*3052411*	CK	*20-May-13*	*8015M*	
Surrogate: o-Terphenyl		*103 %*	*70-130*		*3052411*	CK	*20-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.059	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Toluene*	ND	0.059	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Ethylbenzene*	ND	0.059	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Total Xylenes*	ND	0.178	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Total BTEX	ND	0.357	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		*112 %*	*89.4-126*		*3051601*	AP	*17-May-13*	*8021B*	

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Analytical Results For:

ARCADIS U.S., INC. - HOUSTON 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129	Project: CHEVRON BUCKEYE Project Number: B004860.0000 Project Manager: JONATHAN OLSEN Fax To: (713) 977-4620	Reported: 10-Jun-13 10:43

VGW U118 - 02 (2')

H301174-06 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Solids	**87.2**	0.100	%	1	3051612	DW	17-May-13	D2216	
% Moisture	**12.8**	0.100	%	1	3051612	DW	17-May-13	D2216	
Chloride	**10000**	16.0	mg/kg	4	3051610	DW	17-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	17.2	mg/kg dry	1	3052411	CK	20-May-13	8015M	
DRO >C10-C28	ND	17.2	mg/kg dry	1	3052411	CK	20-May-13	8015M	
Surrogate: 1-Chlorooctane		*89.4 %*	*70-130*		*3052411*	CK	*20-May-13*	*8015M*	
Surrogate: o-Terphenyl		*101 %*	*70-130*		*3052411*	CK	*20-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.057	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Toluene*	ND	0.057	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Ethylbenzene*	ND	0.057	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Total Xylenes*	ND	0.172	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Total BTEX	ND	0.344	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		*113 %*	*89.4-126*		*3051601*	AP	*17-May-13*	*8021B*	

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Analytical Results For:

ARCADIS U.S., INC. - HOUSTON 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129	Project: CHEVRON BUCKEYE Project Number: B004860.0000 Project Manager: JONATHAN OLSEN Fax To: (713) 977-4620	Reported: 10-Jun-13 10:43

VGW U118 - 02 (5')

H301174-07 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Moisture	**7.33**	0.100	%	1	3051612	DW	17-May-13	D2216	
% Solids	**92.7**	0.100	%	1	3051612	DW	17-May-13	D2216	
Chloride	**368**	16.0	mg/kg	4	3051701	DW	17-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	16.2	mg/kg dry	1	3052411	CK	20-May-13	8015M	
DRO >C10-C28	ND	16.2	mg/kg dry	1	3052411	CK	20-May-13	8015M	
Surrogate: 1-Chlorooctane		*96.3 %*	*70-130*		*3052411*	CK	*20-May-13*	*8015M*	
Surrogate: o-Terphenyl		*107 %*	*70-130*		*3052411*	CK	*20-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.054	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Toluene*	ND	0.054	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Ethylbenzene*	ND	0.054	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Total Xylenes*	ND	0.162	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Total BTEX	ND	0.324	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		*113 %*	*89.4-126*		*3051601*	AP	*17-May-13*	*8021B*	

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Analytical Results For:

ARCADIS U.S., INC. - HOUSTON 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129	Project: CHEVRON BUCKEYE Project Number: B004860.0000 Project Manager: JONATHAN OLSEN Fax To: (713) 977-4620	Reported: 10-Jun-13 10:43

VGW U118 - 02 (10')

H301174-08 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Moisture	**6.93**	0.100	%	1	3051612	DW	17-May-13	D2216	
% Solids	**93.1**	0.100	%	1	3051612	DW	17-May-13	D2216	
Chloride	**80.0**	16.0	mg/kg	4	3051701	DW	17-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	16.1	mg/kg dry	1	3052411	CK	20-May-13	8015M	
DRO >C10-C28	ND	16.1	mg/kg dry	1	3052411	CK	20-May-13	8015M	
Surrogate: 1-Chlorooctane		*93.7 %*	*70-130*		*3052411*	CK	*20-May-13*	*8015M*	
Surrogate: o-Terphenyl		*107 %*	*70-130*		*3052411*	CK	*20-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.054	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Toluene*	ND	0.054	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Ethylbenzene*	ND	0.054	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Total Xylenes*	ND	0.161	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Total BTEX	ND	0.322	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		*112 %*	*89.4-126*		*3051601*	AP	*17-May-13*	*8021B*	

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Analytical Results For:

ARCADIS U.S., INC. - HOUSTON 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129	Project: CHEVRON BUCKEYE Project Number: B004860.0000 Project Manager: JONATHAN OLSEN Fax To: (713) 977-4620	Reported: 10-Jun-13 10:43

VGW U118 - 02 (15')

H301174-09 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Moisture	**4.06**	0.100	%	1	3051612	DW	17-May-13	D2216	
% Solids	**95.9**	0.100	%	1	3051612	DW	17-May-13	D2216	
Chloride	**112**	16.0	mg/kg	4	3051701	DW	17-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	15.6	mg/kg dry	1	3052411	CK	20-May-13	8015M	
DRO >C10-C28	ND	15.6	mg/kg dry	1	3052411	CK	20-May-13	8015M	
Surrogate: 1-Chlorooctane		*98.8 %*	*70-130*		*3052411*	CK	*20-May-13*	*8015M*	
Surrogate: o-Terphenyl		*105 %*	*70-130*		*3052411*	CK	*20-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.052	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Toluene*	**0.036**	0.052	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Ethylbenzene*	ND	0.052	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total Xylenes*	ND	0.156	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total BTEX	**0.036**	0.313	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		*114 %*	*89.4-126*		*3052011*	AP	*21-May-13*	*8021B*	

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Analytical Results For:

ARCADIS U.S., INC. - HOUSTON 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129	Project: CHEVRON BUCKEYE Project Number: B004860.0000 Project Manager: JONATHAN OLSEN Fax To: (713) 977-4620	Reported: 10-Jun-13 10:43

VGW U118 - 02 (20')

H301174-10 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Moisture	**7.13**	0.100	%	1	3051612	DW	17-May-13	D2216	
% Solids	**92.9**	0.100	%	1	3051612	DW	17-May-13	D2216	
Chloride	**384**	16.0	mg/kg	4	3051701	DW	17-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	16.2	mg/kg dry	1	3052411	CK	20-May-13	8015M	
DRO >C10-C28	ND	16.2	mg/kg dry	1	3052411	CK	20-May-13	8015M	
Surrogate: 1-Chlorooctane		*104 %*	*70-130*		*3052411*	CK	*20-May-13*	*8015M*	
Surrogate: o-Terphenyl		*104 %*	*70-130*		*3052411*	CK	*20-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.054	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Toluene*	**0.035**	0.054	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Ethylbenzene*	ND	0.054	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total Xylenes*	ND	0.162	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total BTEX	**0.035**	0.323	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		*113 %*	*89.4-126*		*3052011*	AP	*21-May-13*	*8021B*	

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Analytical Results For:

ARCADIS U.S., INC. - HOUSTON 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129	Project: CHEVRON BUCKEYE Project Number: B004860.0000 Project Manager: JONATHAN OLSEN Fax To: (713) 977-4620	Reported: 10-Jun-13 10:43

VGW U118 - 02 (25')

H301174-11 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Moisture	**7.33**	0.100	%	1	3051612	DW	17-May-13	D2216	
% Solids	**92.7**	0.100	%	1	3051612	DW	17-May-13	D2216	
Chloride	**1090**	16.0	mg/kg	4	3051701	DW	17-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	16.2	mg/kg dry	1	3052411	CK	20-May-13	8015M	
DRO >C10-C28	ND	16.2	mg/kg dry	1	3052411	CK	20-May-13	8015M	
Surrogate: 1-Chlorooctane		*102 %*	*70-130*		*3052411*	CK	*20-May-13*	*8015M*	
Surrogate: o-Terphenyl		*103 %*	*70-130*		*3052411*	CK	*20-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.054	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Toluene*	**0.039**	0.054	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Ethylbenzene*	ND	0.054	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total Xylenes*	ND	0.162	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total BTEX	**0.039**	0.324	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		*113 %*	*89.4-126*		*3052011*	AP	*21-May-13*	*8021B*	

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Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

ARCADIS U.S., INC. - HOUSTON 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129	Project: CHEVRON BUCKEYE Project Number: B004860.0000 Project Manager: JONATHAN OLSEN Fax To: (713) 977-4620	Reported: 10-Jun-13 10:43

VGW U118 - 02 (30')

H301174-12 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Moisture	**23.0**	0.100	%	1	3051612	DW	17-May-13	D2216	
% Solids	**77.0**	0.100	%	1	3051612	DW	17-May-13	D2216	
Chloride	**224**	16.0	mg/kg	4	3051701	DW	17-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	19.5	mg/kg dry	1	3052411	CK	20-May-13	8015M	
DRO >C10-C28	ND	19.5	mg/kg dry	1	3052411	CK	20-May-13	8015M	
Surrogate: 1-Chlorooctane		*96.7 %*	*70-130*		*3052411*	CK	*20-May-13*	*8015M*	
Surrogate: o-Terphenyl		*107 %*	*70-130*		*3052411*	CK	*20-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.065	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Toluene*	**0.031**	0.065	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Ethylbenzene*	ND	0.065	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total Xylenes*	ND	0.195	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total BTEX	**0.031**	0.390	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		*114 %*	*89.4-126*		*3052011*	AP	*21-May-13*	*8021B*	

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Analytical Results For:

ARCADIS U.S., INC. - HOUSTON 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129	Project: CHEVRON BUCKEYE Project Number: B004860.0000 Project Manager: JONATHAN OLSEN Fax To: (713) 977-4620	Reported: 10-Jun-13 10:43

VGW U118 - 04 (2')

H301174-13 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
Chloride	**48.0**	16.0	mg/kg	4	3060505	DW	05-Jun-13	4500-Cl-B	

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Analytical Results For:

ARCADIS U.S., INC. - HOUSTON 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129	Project: CHEVRON BUCKEYE Project Number: B004860.0000 Project Manager: JONATHAN OLSEN Fax To: (713) 977-4620	Reported: 10-Jun-13 10:43

VGW U118 - 06 (2')

H301174-20 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
Chloride	**128**	16.0	mg/kg	4	3060505	DW	05-Jun-13	4500-Cl-B	

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Analytical Results For:

ARCADIS U.S., INC. - HOUSTON 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129	Project: CHEVRON BUCKEYE Project Number: B004860.0000 Project Manager: JONATHAN OLSEN Fax To: (713) 977-4620	Reported: 10-Jun-13 10:43

VGW U118 - 05 (2')

H301174-27 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
Chloride	**64.0**	16.0	mg/kg	4	3060505	DW	05-Jun-13	4500-Cl-B	

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Analytical Results For:

ARCADIS U.S., INC. - HOUSTON 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129	Project: CHEVRON BUCKEYE Project Number: B004860.0000 Project Manager: JONATHAN OLSEN Fax To: (713) 977-4620	Reported: 10-Jun-13 10:43

VGW U118 - 01 (2')

H301174-34 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Solids	**88.7**	0.100	%	1	3051612	DW	17-May-13	D2216	
% Moisture	**11.3**	0.100	%	1	3051612	DW	17-May-13	D2216	
Chloride	**4800**	16.0	mg/kg	4	3051701	DW	17-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	16.9	mg/kg dry	1	3052411	CK	20-May-13	8015M	
DRO >C10-C28	**102**	16.9	mg/kg dry	1	3052411	CK	20-May-13	8015M	
Surrogate: 1-Chlorooctane		*95.7 %*	*70-130*		*3052411*	CK	*20-May-13*	*8015M*	
Surrogate: o-Terphenyl		*105 %*	*70-130*		*3052411*	CK	*20-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.056	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Toluene*	**0.047**	0.056	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Ethylbenzene*	ND	0.056	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total Xylenes*	ND	0.169	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total BTEX	**0.047**	0.338	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		*113 %*	*89.4-126*		*3052011*	AP	*21-May-13*	*8021B*	

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Analytical Results For:

ARCADIS U.S., INC. - HOUSTON 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129	Project: CHEVRON BUCKEYE Project Number: B004860.0000 Project Manager: JONATHAN OLSEN Fax To: (713) 977-4620	Reported: 10-Jun-13 10:43

VGW U118 - 01 (5')

H301174-35 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Moisture	**19.2**	0.100	%	1	3051612	DW	17-May-13	D2216	
% Solids	**80.8**	0.100	%	1	3051612	DW	17-May-13	D2216	
Chloride	**192**	16.0	mg/kg	4	3051701	DW	17-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	18.6	mg/kg dry	1	3052411	CK	20-May-13	8015M	
DRO >C10-C28	ND	18.6	mg/kg dry	1	3052411	CK	20-May-13	8015M	
Surrogate: 1-Chlorooctane		*95.6 %*	*70-130*		*3052411*	CK	*20-May-13*	*8015M*	
Surrogate: o-Terphenyl		*103 %*	*70-130*		*3052411*	CK	*20-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.062	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Toluene*	**0.016**	0.062	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Ethylbenzene*	ND	0.062	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total Xylenes*	ND	0.186	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total BTEX	**0.016**	0.371	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		*112 %*	*89.4-126*		*3052011*	AP	*21-May-13*	*8021B*	

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Analytical Results For:

ARCADIS U.S., INC. - HOUSTON 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129	Project: CHEVRON BUCKEYE Project Number: B004860.0000 Project Manager: JONATHAN OLSEN Fax To: (713) 977-4620	Reported: 10-Jun-13 10:43

VGW U118 - 01 (10')

H301174-36 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Moisture	**18.4**	0.100	%	1	3051612	DW	17-May-13	D2216	
% Solids	**81.6**	0.100	%	1	3051612	DW	17-May-13	D2216	
Chloride	**32.0**	16.0	mg/kg	4	3051701	DW	17-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	18.4	mg/kg dry	1	3052411	CK	20-May-13	8015M	
DRO >C10-C28	ND	18.4	mg/kg dry	1	3052411	CK	20-May-13	8015M	
Surrogate: 1-Chlorooctane		*102 %*	*70-130*		*3052411*	CK	*20-May-13*	*8015M*	
Surrogate: o-Terphenyl		*107 %*	*70-130*		*3052411*	CK	*20-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.061	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Toluene*	**0.020**	0.061	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Ethylbenzene*	ND	0.061	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total Xylenes*	ND	0.184	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total BTEX	**0.020**	0.368	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		*112 %*	*89.4-126*		*3052011*	AP	*21-May-13*	*8021B*	

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Analytical Results For:

ARCADIS U.S., INC. - HOUSTON 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129	Project: CHEVRON BUCKEYE Project Number: B004860.0000 Project Manager: JONATHAN OLSEN Fax To: (713) 977-4620	Reported: 10-Jun-13 10:43

VGW U118 - 01 (15')

H301174-37 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Moisture	**18.4**	0.100	%	1	3051612	DW	17-May-13	D2216	
% Solids	**81.6**	0.100	%	1	3051612	DW	17-May-13	D2216	
Chloride	**32.0**	16.0	mg/kg	4	3051701	DW	17-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	18.4	mg/kg dry	1	3052411	CK	20-May-13	8015M	
DRO >C10-C28	ND	18.4	mg/kg dry	1	3052411	CK	20-May-13	8015M	
Surrogate: 1-Chlorooctane		*86.0 %*	*70-130*		*3052411*	CK	*20-May-13*	*8015M*	
Surrogate: o-Terphenyl		*94.7 %*	*70-130*		*3052411*	CK	*20-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.061	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Toluene*	**0.022**	0.061	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Ethylbenzene*	ND	0.061	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total Xylenes*	ND	0.184	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total BTEX	**0.022**	0.368	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		*113 %*	*89.4-126*		*3052011*	AP	*21-May-13*	*8021B*	

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Analytical Results For:

ARCADIS U.S., INC. - HOUSTON 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129	Project: CHEVRON BUCKEYE Project Number: B004860.0000 Project Manager: JONATHAN OLSEN Fax To: (713) 977-4620	Reported: 10-Jun-13 10:43

VGW U118 - 01 (20')

H301174-38 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Solids	**79.8**	0.100	%	1	3051612	DW	17-May-13	D2216	
% Moisture	**20.2**	0.100	%	1	3051612	DW	17-May-13	D2216	
Chloride	ND	16.0	mg/kg	4	3051701	DW	17-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	18.8	mg/kg dry	1	3052411	CK	20-May-13	8015M	
DRO >C10-C28	ND	18.8	mg/kg dry	1	3052411	CK	20-May-13	8015M	
Surrogate: 1-Chlorooctane		*97.5 %*	*70-130*		*3052411*	CK	*20-May-13*	*8015M*	
Surrogate: o-Terphenyl		*108 %*	*70-130*		*3052411*	CK	*20-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.063	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Toluene*	**0.022**	0.063	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Ethylbenzene*	ND	0.063	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total Xylenes*	ND	0.188	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total BTEX	**0.022**	0.376	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		*112 %*	*89.4-126*		*3052011*	AP	*21-May-13*	*8021B*	

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Analytical Results For:

ARCADIS U.S., INC. - HOUSTON 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129	Project: CHEVRON BUCKEYE Project Number: B004860.0000 Project Manager: JONATHAN OLSEN Fax To: (713) 977-4620	Reported: 10-Jun-13 10:43

VGW U118 - 01 (25')

H301174-39 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Solids	**97.1**	0.100	%	1	3051612	DW	17-May-13	D2216	
% Moisture	**2.93**	0.100	%	1	3051612	DW	17-May-13	D2216	
Chloride	**32.0**	16.0	mg/kg	4	3051701	DW	17-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	15.5	mg/kg dry	1	3052411	CK	20-May-13	8015M	
DRO >C10-C28	ND	15.5	mg/kg dry	1	3052411	CK	20-May-13	8015M	
Surrogate: 1-Chlorooctane		*99.8 %*	*70-130*		*3052411*	CK	*20-May-13*	*8015M*	
Surrogate: o-Terphenyl		*107 %*	*70-130*		*3052411*	CK	*20-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.052	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Toluene*	**0.042**	0.052	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Ethylbenzene*	ND	0.052	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total Xylenes*	ND	0.155	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total BTEX	**0.042**	0.309	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		*113 %*	*89.4-126*		*3052011*	AP	*21-May-13*	*8021B*	

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Analytical Results For:

ARCADIS U.S., INC. - HOUSTON 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129	Project: CHEVRON BUCKEYE Project Number: B004860.0000 Project Manager: JONATHAN OLSEN Fax To: (713) 977-4620	Reported: 10-Jun-13 10:43

VGW U118 - 01 (30')

H301174-40 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Moisture	**20.0**	0.100	%	1	3051612	DW	17-May-13	D2216	
% Solids	**80.0**	0.100	%	1	3051612	DW	17-May-13	D2216	
Chloride	ND	16.0	mg/kg	4	3051701	DW	17-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	18.7	mg/kg dry	1	3052411	CK	20-May-13	8015M	
DRO >C10-C28	ND	18.7	mg/kg dry	1	3052411	CK	20-May-13	8015M	
Surrogate: 1-Chlorooctane		*99.6 %*	*70-130*		*3052411*	CK	*20-May-13*	*8015M*	
Surrogate: o-Terphenyl		*108 %*	*70-130*		*3052411*	CK	*20-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.062	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Toluene*	**0.023**	0.062	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Ethylbenzene*	ND	0.062	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total Xylenes*	ND	0.187	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total BTEX	**0.023**	0.375	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		*113 %*	*89.4-126*		*3052011*	AP	*21-May-13*	*8021B*	

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Analytical Results For:

ARCADIS U.S., INC. - HOUSTON 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129	Project: CHEVRON BUCKEYE Project Number: B004860.0000 Project Manager: JONATHAN OLSEN Fax To: (713) 977-4620	Reported: 10-Jun-13 10:43

VGW U118 - 03 (2')

H301174-41 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Moisture	**6.98**	0.100	%	1	3051612	DW	17-May-13	D2216	
% Solids	**93.0**	0.100	%	1	3051612	DW	17-May-13	D2216	
Chloride	**832**	16.0	mg/kg	4	3051701	DW	17-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	16.1	mg/kg dry	1	3052411	CK	20-May-13	8015M	
DRO >C10-C28	ND	16.1	mg/kg dry	1	3052411	CK	20-May-13	8015M	
Surrogate: 1-Chlorooctane		*91.9 %*	*70-130*		*3052411*	CK	*20-May-13*	*8015M*	
Surrogate: o-Terphenyl		*98.8 %*	*70-130*		*3052411*	CK	*20-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.054	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Toluene*	**0.034**	0.054	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Ethylbenzene*	ND	0.054	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total Xylenes*	ND	0.161	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total BTEX	**0.034**	0.323	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		*111 %*	*89.4-126*		*3052011*	AP	*21-May-13*	*8021B*	

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CARDINAL Laboratories

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Analytical Results For:

ARCADIS U.S., INC. - HOUSTON 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129	Project: CHEVRON BUCKEYE Project Number: B004860.0000 Project Manager: JONATHAN OLSEN Fax To: (713) 977-4620	Reported: 10-Jun-13 10:43

VGW U118 - 03 (5')

H301174-42 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Moisture	**4.43**	0.100	%	1	3051613	DW	17-May-13	D2216	
% Solids	**95.6**	0.100	%	1	3051613	DW	17-May-13	D2216	
Chloride	**96.0**	16.0	mg/kg	4	3051701	DW	17-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	15.7	mg/kg dry	1	3052412	CK	21-May-13	8015M	
DRO >C10-C28	ND	15.7	mg/kg dry	1	3052412	CK	21-May-13	8015M	
Surrogate: 1-Chlorooctane		*105 %*	*70-130*		*3052412*	CK	*21-May-13*	*8015M*	
Surrogate: o-Terphenyl		*107 %*	*70-130*		*3052412*	CK	*21-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.052	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Toluene*	**0.033**	0.052	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Ethylbenzene*	ND	0.052	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total Xylenes*	ND	0.157	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total BTEX	**0.033**	0.314	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		*113 %*	*89.4-126*		*3052011*	AP	*21-May-13*	*8021B*	

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Analytical Results For:

ARCADIS U.S., INC. - HOUSTON 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129	Project: CHEVRON BUCKEYE Project Number: B004860.0000 Project Manager: JONATHAN OLSEN Fax To: (713) 977-4620	Reported: 10-Jun-13 10:43

VGW U118 - 03 (10')

H301174-43 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Moisture	**6.88**	0.100	%	1	3051613	DW	17-May-13	D2216	
% Solids	**93.1**	0.100	%	1	3051613	DW	17-May-13	D2216	
Chloride	**48.0**	16.0	mg/kg	4	3051701	DW	17-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	16.1	mg/kg dry	1	3052412	CK	21-May-13	8015M	
DRO >C10-C28	ND	16.1	mg/kg dry	1	3052412	CK	21-May-13	8015M	
Surrogate: 1-Chlorooctane		*101 %*	*70-130*		*3052412*	CK	*21-May-13*	*8015M*	
Surrogate: o-Terphenyl		*107 %*	*70-130*		*3052412*	CK	*21-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.054	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Toluene*	**0.028**	0.054	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Ethylbenzene*	ND	0.054	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total Xylenes*	ND	0.161	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total BTEX	**0.028**	0.322	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		*113 %*	*89.4-126*		*3052011*	AP	*21-May-13*	*8021B*	

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Analytical Results For:

ARCADIS U.S., INC. - HOUSTON 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129	Project: CHEVRON BUCKEYE Project Number: B004860.0000 Project Manager: JONATHAN OLSEN Fax To: (713) 977-4620	Reported: 10-Jun-13 10:43

VGW U118 - 03 (15')

H301174-44 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Moisture	**6.72**	0.100	%	1	3051613	DW	17-May-13	D2216	
% Solids	**93.3**	0.100	%	1	3051613	DW	17-May-13	D2216	
Chloride	**48.0**	16.0	mg/kg	4	3051701	DW	17-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	16.1	mg/kg dry	1	3052412	CK	21-May-13	8015M	
DRO >C10-C28	ND	16.1	mg/kg dry	1	3052412	CK	21-May-13	8015M	
Surrogate: 1-Chlorooctane		*106 %*	*70-130*		*3052412*	CK	*21-May-13*	*8015M*	
Surrogate: o-Terphenyl		*107 %*	*70-130*		*3052412*	CK	*21-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.054	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Toluene*	**0.031**	0.054	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Ethylbenzene*	ND	0.054	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total Xylenes*	ND	0.161	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total BTEX	**0.031**	0.322	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		*114 %*	*89.4-126*		*3052011*	AP	*21-May-13*	*8021B*	

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Analytical Results For:

ARCADIS U.S., INC. - HOUSTON 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129	Project: CHEVRON BUCKEYE Project Number: B004860.0000 Project Manager: JONATHAN OLSEN Fax To: (713) 977-4620	Reported: 10-Jun-13 10:43

VGW U118 - 03 (20')

H301174-45 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Moisture	**4.54**	0.100	%	1	3051613	DW	17-May-13	D2216	
% Solids	**95.5**	0.100	%	1	3051613	DW	17-May-13	D2216	
Chloride	**48.0**	16.0	mg/kg	4	3051701	DW	17-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	15.7	mg/kg dry	1	3052412	CK	21-May-13	8015M	
DRO >C10-C28	ND	15.7	mg/kg dry	1	3052412	CK	21-May-13	8015M	
Surrogate: 1-Chlorooctane		*105 %*	*70-130*		*3052412*	CK	*21-May-13*	*8015M*	
Surrogate: o-Terphenyl		*106 %*	*70-130*		*3052412*	CK	*21-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.052	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Toluene*	**0.019**	0.052	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Ethylbenzene*	ND	0.052	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total Xylenes*	ND	0.157	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total BTEX	**0.019**	0.314	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		*115 %*	*89.4-126*		*3052011*	AP	*21-May-13*	*8021B*	

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Analytical Results For:

ARCADIS U.S., INC. - HOUSTON 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129	Project: CHEVRON BUCKEYE Project Number: B004860.0000 Project Manager: JONATHAN OLSEN Fax To: (713) 977-4620	Reported: 10-Jun-13 10:43

VGW U118 - 03 (25')

H301174-46 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Solids	**96.4**	0.100	%	1	3051613	DW	17-May-13	D2216	
% Moisture	**3.57**	0.100	%	1	3051613	DW	17-May-13	D2216	
Chloride	**32.0**	16.0	mg/kg	4	3051701	DW	17-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	15.6	mg/kg dry	1	3052412	CK	21-May-13	8015M	
DRO >C10-C28	ND	15.6	mg/kg dry	1	3052412	CK	21-May-13	8015M	
Surrogate: 1-Chlorooctane		*98.8 %*	*70-130*		*3052412*	CK	*21-May-13*	*8015M*	
Surrogate: o-Terphenyl		*108 %*	*70-130*		*3052412*	CK	*21-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.052	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Toluene*	**0.041**	0.052	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Ethylbenzene*	ND	0.052	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total Xylenes*	ND	0.156	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total BTEX	**0.041**	0.311	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		*114 %*	*89.4-126*		*3052011*	AP	*21-May-13*	*8021B*	

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Analytical Results For:

ARCADIS U.S., INC. - HOUSTON 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129	Project: CHEVRON BUCKEYE Project Number: B004860.0000 Project Manager: JONATHAN OLSEN Fax To: (713) 977-4620	Reported: 10-Jun-13 10:43

VGW U118 - 03 (30')

H301174-47 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Solids	**97.8**	0.100	%	1	3051613	DW	17-May-13	D2216	
% Moisture	**2.20**	0.100	%	1	3051613	DW	17-May-13	D2216	
Chloride	**32.0**	16.0	mg/kg	4	3051701	DW	17-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	15.3	mg/kg dry	1	3052412	CK	21-May-13	8015M	
DRO >C10-C28	ND	15.3	mg/kg dry	1	3052412	CK	21-May-13	8015M	
Surrogate: 1-Chlorooctane		*94.3 %*	*70-130*		*3052412*	CK	*21-May-13*	*8015M*	
Surrogate: o-Terphenyl		*104 %*	*70-130*		*3052412*	CK	*21-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.051	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Toluene*	ND	0.051	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Ethylbenzene*	ND	0.051	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total Xylenes*	ND	0.153	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total BTEX	ND	0.307	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		*112 %*	*89.4-126*		*3052011*	AP	*21-May-13*	*8021B*	

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Analytical Results For:

ARCADIS U.S., INC. - HOUSTON 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129	Project: CHEVRON BUCKEYE Project Number: B004860.0000 Project Manager: JONATHAN OLSEN Fax To: (713) 977-4620	Reported: 10-Jun-13 10:43

VGW U118 - 07 (2')

H301174-48 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Solids	**85.8**	0.100	%	1	3051613	DW	17-May-13	D2216	
% Moisture	**14.2**	0.100	%	1	3051613	DW	17-May-13	D2216	
Chloride	**7200**	16.0	mg/kg	4	3051702	DW	17-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	17.5	mg/kg dry	1	3052412	CK	21-May-13	8015M	
DRO >C10-C28	ND	17.5	mg/kg dry	1	3052412	CK	21-May-13	8015M	
Surrogate: 1-Chlorooctane		*85.0 %*	*70-130*		*3052412*	CK	*21-May-13*	*8015M*	
Surrogate: o-Terphenyl		*92.2 %*	*70-130*		*3052412*	CK	*21-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.058	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Toluene*	**0.025**	0.058	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Ethylbenzene*	ND	0.058	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total Xylenes*	ND	0.175	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total BTEX	**0.025**	0.349	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		*113 %*	*89.4-126*		*3052011*	AP	*21-May-13*	*8021B*	

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Analytical Results For:

ARCADIS U.S., INC. - HOUSTON 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129	Project: CHEVRON BUCKEYE Project Number: B004860.0000 Project Manager: JONATHAN OLSEN Fax To: (713) 977-4620	Reported: 10-Jun-13 10:43

VGW U118 - 07 (5')

H301174-49 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Solids	**95.1**	0.100	%	1	3051613	DW	17-May-13	D2216	
% Moisture	**4.94**	0.100	%	1	3051613	DW	17-May-13	D2216	
Chloride	**96.0**	16.0	mg/kg	4	3051702	DW	17-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	15.8	mg/kg dry	1	3052412	CK	21-May-13	8015M	
DRO >C10-C28	ND	15.8	mg/kg dry	1	3052412	CK	21-May-13	8015M	
Surrogate: 1-Chlorooctane		*93.9 %*	*70-130*		*3052412*	CK	*21-May-13*	*8015M*	
Surrogate: o-Terphenyl		*102 %*	*70-130*		*3052412*	CK	*21-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.053	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Toluene*	**0.026**	0.053	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Ethylbenzene*	ND	0.053	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total Xylenes*	ND	0.158	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total BTEX	**0.026**	0.316	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		*113 %*	*89.4-126*		*3052011*	AP	*21-May-13*	*8021B*	

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Analytical Results For:

ARCADIS U.S., INC. - HOUSTON 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129	Project: CHEVRON BUCKEYE Project Number: B004860.0000 Project Manager: JONATHAN OLSEN Fax To: (713) 977-4620	Reported: 10-Jun-13 10:43

Inorganic Compounds - Quality Control

Cardinal Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 3051610 - 1:4 DI Water										
Blank (3051610-BLK1)				Prepared & Analyzed: 16-May-13						
Chloride	ND	16.0	mg/kg							
LCS (3051610-BS1)				Prepared & Analyzed: 16-May-13						
Chloride	432	16.0	mg/kg	400		108	80-120			
LCS Dup (3051610-BSD1)				Prepared & Analyzed: 16-May-13						
Chloride	432	16.0	mg/kg	400		108	80-120	0.00	20	
Duplicate (3051610-DUP1)		**Source: H301164-04**		Prepared & Analyzed: 16-May-13						
Chloride	528	16.0	mg/kg		560			5.88	20	
Matrix Spike (3051610-MS1)		**Source: H301164-04**		Prepared & Analyzed: 16-May-13						
Chloride	944	16.0	mg/kg	400	560	96.0	80-120			
Batch 3051612 - General Prep - Wet Chem										
Blank (3051612-BLK1)				Prepared: 16-May-13 Analyzed: 17-May-13						
% Moisture	ND	0.100	%							
% Solids	100	0.100	%							
Duplicate (3051612-DUP1)		**Source: H301174-01**		Prepared: 16-May-13 Analyzed: 17-May-13						
% Solids	97.8	0.100	%		97.6			0.215	20	
% Moisture	2.24	0.100	%		2.45			8.96	200	
Batch 3051613 - General Prep - Wet Chem										
Blank (3051613-BLK1)				Prepared: 16-May-13 Analyzed: 17-May-13						
% Moisture	ND	0.100	%							
% Solids	100	0.100	%							

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Analytical Results For:

ARCADIS U.S., INC. - HOUSTON 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129	Project: CHEVRON BUCKEYE Project Number: B004860.0000 Project Manager: JONATHAN OLSEN Fax To: (713) 977-4620	Reported: 10-Jun-13 10:43

Inorganic Compounds - Quality Control

Cardinal Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 3051613 - General Prep - Wet Chem										
Duplicate (3051613-DUP1)		**Source: H301174-42**		Prepared: 16-May-13 Analyzed: 17-May-13						
% Solids	95.5	0.100	%		95.6			0.0837	20	
% Moisture	4.51	0.100	%		4.43			1.79	200	
Batch 3051701 - 1:4 DI Water										
Blank (3051701-BLK1)				Prepared & Analyzed: 17-May-13						
Chloride	ND	16.0	mg/kg							
LCS (3051701-BS1)				Prepared & Analyzed: 17-May-13						
Chloride	432	16.0	mg/kg	400		108	80-120			
LCS Dup (3051701-BSD1)				Prepared & Analyzed: 17-May-13						
Chloride	432	16.0	mg/kg	400		108	80-120	0.00	20	
Duplicate (3051701-DUP1)		**Source: H301174-07**		Prepared & Analyzed: 17-May-13						
Chloride	336	16.0	mg/kg		368			9.09	20	
Matrix Spike (3051701-MS1)		**Source: H301174-07**		Prepared & Analyzed: 17-May-13						
Chloride	640	16.0	mg/kg	400	368	68.0	80-120			QM-07
Batch 3051702 - 1:4 DI Water										
Blank (3051702-BLK1)				Prepared & Analyzed: 17-May-13						
Chloride	ND	16.0	mg/kg							
LCS (3051702-BS1)				Prepared & Analyzed: 17-May-13						
Chloride	432	16.0	mg/kg	400		108	80-120			

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Analytical Results For:

ARCADIS U.S., INC. - HOUSTON 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129	Project: CHEVRON BUCKEYE Project Number: B004860.0000 Project Manager: JONATHAN OLSEN Fax To: (713) 977-4620	Reported: 10-Jun-13 10:43

Inorganic Compounds - Quality Control

Cardinal Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 3051702 - 1:4 DI Water										
LCS Dup (3051702-BSD1)				Prepared & Analyzed: 17-May-13						
Chloride	416	16.0	mg/kg	400		104	80-120	3.77	20	
Duplicate (3051702-DUP1)		**Source: H301174-48**		Prepared & Analyzed: 17-May-13						
Chloride	8400	16.0	mg/kg		7200			15.4	20	
Matrix Spike (3051702-MS1)		**Source: H301174-48**		Prepared & Analyzed: 17-May-13						
Chloride	9040	16.0	mg/kg	400	7200	460	80-120			QM-07
Batch 3060505 - 1:4 DI Water										
Blank (3060505-BLK1)				Prepared & Analyzed: 05-Jun-13						
Chloride	ND	16.0	mg/kg							
LCS (3060505-BS1)				Prepared & Analyzed: 05-Jun-13						
Chloride	432	16.0	mg/kg	400		108	80-120			
LCS Dup (3060505-BSD1)				Prepared & Analyzed: 05-Jun-13						
Chloride	432	16.0	mg/kg	400		108	80-120	0.00	20	
Duplicate (3060505-DUP1)		**Source: H301196-44**		Prepared & Analyzed: 05-Jun-13						
Chloride	592	16.0	mg/kg		528			11.4	20	
Matrix Spike (3060505-MS1)		**Source: H301196-44**		Prepared & Analyzed: 05-Jun-13						
Chloride	1020	16.0	mg/kg	400	528	124	80-120			QM-07

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Analytical Results For:

ARCADIS U.S., INC. - HOUSTON 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129	Project: CHEVRON BUCKEYE Project Number: B004860.0000 Project Manager: JONATHAN OLSEN Fax To: (713) 977-4620	Reported: 10-Jun-13 10:43

Organic Compounds - Quality Control

Cardinal Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 3052411 - General Prep										
Blank (3052411-BLK1)				Prepared & Analyzed: 20-May-13						
GRO C6-C10	ND	15.0	mg/kg wet							
DRO >C10-C28	ND	15.0	mg/kg wet							
Surrogate: 1-Chlorooctane	*116*		mg/kg	*100*		*116*	*70-130*			
Surrogate: o-Terphenyl	*63.8*		mg/kg	*50.0*		*128*	*70-130*			
LCS (3052411-BS1)				Prepared & Analyzed: 20-May-13						
GRO C6-C10	1220	15.0	mg/kg wet	1000		122	75-125			
DRO >C10-C28	1230	15.0	mg/kg wet	1000		123	75-125			
Surrogate: 1-Chlorooctane	*112*		mg/kg	*100*		*112*	*70-130*			
Surrogate: o-Terphenyl	*53.5*		mg/kg	*50.0*		*107*	*70-130*			
Matrix Spike (3052411-MS1)		**Source: H301174-41**		Prepared & Analyzed: 20-May-13						
GRO C6-C10	1180	16.1	mg/kg dry	1080	ND	110	75-125			
DRO >C10-C28	1170	16.1	mg/kg dry	1080	ND	109	75-125			
Surrogate: 1-Chlorooctane	*113*		mg/kg	*100*		*113*	*70-130*			
Surrogate: o-Terphenyl	*54.5*		mg/kg	*50.0*		*109*	*70-130*			
Matrix Spike Dup (3052411-MSD1)		**Source: H301174-41**		Prepared & Analyzed: 20-May-13						
GRO C6-C10	1130	16.1	mg/kg dry	1080	ND	105	75-125	4.65	20	
DRO >C10-C28	1250	16.1	mg/kg dry	1080	ND	116	75-125	6.22	20	
Surrogate: 1-Chlorooctane	*109*		mg/kg	*100*		*109*	*70-130*			
Surrogate: o-Terphenyl	*55.6*		mg/kg	*50.0*		*111*	*70-130*			
Batch 3052412 - General Prep										
Blank (3052412-BLK1)				Prepared: 20-May-13 Analyzed: 21-May-13						
GRO C6-C10	ND	15.0	mg/kg wet							
DRO >C10-C28	ND	15.0	mg/kg wet							
Surrogate: 1-Chlorooctane	*123*		mg/kg	*100*		*123*	*70-130*			
Surrogate: o-Terphenyl	*61.2*		mg/kg	*50.0*		*122*	*70-130*			

Cardinal Laboratories

*=Accredited Analyte

Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

ARCADIS U.S., INC. - HOUSTON 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129	Project: CHEVRON BUCKEYE Project Number: B004860.0000 Project Manager: JONATHAN OLSEN Fax To: (713) 977-4620	Reported: 10-Jun-13 10:43

Organic Compounds - Quality Control

Cardinal Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 3052412 - General Prep										
LCS (3052412-BS1)				Prepared: 20-May-13 Analyzed: 21-May-13						
GRO C6-C10	1160	15.0	mg/kg wet	1000		116	75-125			
DRO >C10-C28	1200	15.0	mg/kg wet	1000		120	75-125			
Surrogate: 1-Chlorooctane	*126*		mg/kg	*100*		*126*	*70-130*			
Surrogate: o-Terphenyl	*59.8*		mg/kg	*50.0*		*120*	*70-130*			
LCS Dup (3052412-BSD1)				Prepared: 20-May-13 Analyzed: 21-May-13						
GRO C6-C10	1200	15.0	mg/kg wet	1000		120	75-125	3.39	20	
DRO >C10-C28	1230	15.0	mg/kg wet	1000		123	75-125	2.47	20	
Surrogate: 1-Chlorooctane	*125*		mg/kg	*100*		*125*	*70-130*			
Surrogate: o-Terphenyl	*63.3*		mg/kg	*50.0*		*127*	*70-130*			
Matrix Spike (3052412-MS1)		**Source: H301174-49**		Prepared: 20-May-13 Analyzed: 21-May-13						
GRO C6-C10	1120	15.8	mg/kg dry	1050	ND	106	75-125			
DRO >C10-C28	1260	15.8	mg/kg dry	1050	ND	120	75-125			
Surrogate: 1-Chlorooctane	*128*		mg/kg	*100*		*128*	*70-130*			
Surrogate: o-Terphenyl	*57.6*		mg/kg	*50.0*		*115*	*70-130*			
Matrix Spike Dup (3052412-MSD1)		**Source: H301174-49**		Prepared: 20-May-13 Analyzed: 21-May-13						
GRO C6-C10	1200	15.8	mg/kg dry	1050	ND	114	75-125	7.27	20	
DRO >C10-C28	1300	15.8	mg/kg dry	1050	ND	124	75-125	3.28	20	
Surrogate: 1-Chlorooctane	*126*		mg/kg	*100*		*126*	*70-130*			
Surrogate: o-Terphenyl	*57.1*		mg/kg	*50.0*		*114*	*70-130*			

Cardinal Laboratories

*=Accredited Analyte

Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

ARCADIS U.S., INC. - HOUSTON 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129	Project: CHEVRON BUCKEYE Project Number: B004860.0000 Project Manager: JONATHAN OLSEN Fax To: (713) 977-4620	Reported: 10-Jun-13 10:43

Volatile Organic Compounds by EPA Method 8021 - Quality Control

Cardinal Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 3051601 - Volatiles										
Blank (3051601-BLK1)				Prepared & Analyzed: 16-May-13						
Benzene	ND	0.050	mg/kg wet							
Toluene	0.011	0.050	mg/kg wet							
Ethylbenzene	ND	0.050	mg/kg wet							
Total Xylenes	ND	0.150	mg/kg wet							
Total BTEX	0.011	0.300	mg/kg wet							
Surrogate: 4-Bromofluorobenzene (PID)	*0.0555*		mg/kg wet	*0.0500*		*111*	*89.4-126*			
LCS (3051601-BS1)				Prepared & Analyzed: 16-May-13						
Benzene	2.08	0.050	mg/kg wet	2.00		104	76.4-135			
Toluene	1.88	0.050	mg/kg wet	2.00		94.2	80.2-135			
Ethylbenzene	2.01	0.050	mg/kg wet	2.00		101	78.5-133			
Total Xylenes	5.93	0.150	mg/kg wet	6.00		98.8	80.1-135			
Surrogate: 4-Bromofluorobenzene (PID)	*0.0538*		mg/kg wet	*0.0500*		*108*	*89.4-126*			
LCS Dup (3051601-BSD1)				Prepared & Analyzed: 16-May-13						
Benzene	2.17	0.050	mg/kg wet	2.00		109	76.4-135	4.20	16.4	
Toluene	1.95	0.050	mg/kg wet	2.00		97.7	80.2-135	3.70	16.6	
Ethylbenzene	2.10	0.050	mg/kg wet	2.00		105	78.5-133	4.30	16.1	
Total Xylenes	6.15	0.150	mg/kg wet	6.00		102	80.1-135	3.69	15.8	
Surrogate: 4-Bromofluorobenzene (PID)	*0.0538*		mg/kg wet	*0.0500*		*108*	*89.4-126*			
Batch 3052011 - Volatiles										
Blank (3052011-BLK1)				Prepared: 20-May-13 Analyzed: 21-May-13						
Benzene	ND	0.050	mg/kg wet							
Toluene	0.011	0.050	mg/kg wet							
Ethylbenzene	ND	0.050	mg/kg wet							
Total Xylenes	ND	0.150	mg/kg wet							
Total BTEX	0.011	0.300	mg/kg wet							
Surrogate: 4-Bromofluorobenzene (PID)	*0.0555*		mg/kg wet	*0.0500*		*111*	*89.4-126*			

Cardinal Laboratories

*=Accredited Analyte

Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

ARCADIS U.S., INC. - HOUSTON 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129	Project: CHEVRON BUCKEYE Project Number: B004860.0000 Project Manager: JONATHAN OLSEN Fax To: (713) 977-4620	Reported: 10-Jun-13 10:43

Volatile Organic Compounds by EPA Method 8021 - Quality Control

Cardinal Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 3052011 - Volatiles										
LCS (3052011-BS1)				Prepared & Analyzed: 20-May-13						
Benzene	2.37	0.050	mg/kg wet	2.00		119	76.4-135			
Toluene	2.12	0.050	mg/kg wet	2.00		106	80.2-135			
Ethylbenzene	2.29	0.050	mg/kg wet	2.00		115	78.5-133			
Total Xylenes	6.67	0.150	mg/kg wet	6.00		111	80.1-135			
Surrogate: 4-Bromofluorobenzene (PID)	*0.0533*		mg/kg wet	*0.0500*		*107*	*89.4-126*			
LCS Dup (3052011-BSD1)				Prepared: 20-May-13 Analyzed: 21-May-13						
Benzene	2.32	0.050	mg/kg wet	2.00		116	76.4-135	2.27	16.4	
Toluene	2.10	0.050	mg/kg wet	2.00		105	80.2-135	1.17	16.6	
Ethylbenzene	2.28	0.050	mg/kg wet	2.00		114	78.5-133	0.595	16.1	
Total Xylenes	6.75	0.150	mg/kg wet	6.00		112	80.1-135	1.17	15.8	
Surrogate: 4-Bromofluorobenzene (PID)	*0.0555*		mg/kg wet	*0.0500*		*111*	*89.4-126*			

Cardinal Laboratories

*=Accredited Analyte

Celey D. Keene

Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Notes and Definitions

SUB-PBE	Analysis subcontracted to Permian Basin Environmental Lab, NELAP accreditation # T104704156-12-1.
QM-07	The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS recovery.
ND	Analyte NOT DETECTED at or above the reporting limit
RPD	Relative Percent Difference
**	Samples not received at proper temperature of 6°C or below.
***	Insufficient time to reach temperature.
-	Chloride by SM4500Cl-B does not require samples be received at or below 6°C
	Samples reported on an as received basis (wet) unless otherwise noted on report

Celey D. Keene

Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

101 East Marland, Hobbs, NM 88240
(575) 393-2326 FAX (575) 393-2476

Company Name:	ARCADIS-US	**BILL TO**	
Project Manager:	Jonathan Olson	P.O. #:	
Address:	2929 Briarpark Dr., Suit 300	Company:	
City:	Houston State: TX Zip: 77402	Attn:	
Phone #:	713.953.4874 Fax #: 713.977.4620	Address:	
Project #:	B004860.0000 Project Owner: Chevron	City:	
Project Name:	Chevron Buckeye	State: Zip:	
Project Location:	Buckeye oil field	Phone #:	
Sampler Name:		Fax #:	

FOR LAB USE ONLY Lab I.D.	Sample I.D.	(G)RAB OR (C)OMP	# CONTAINERS	MATRIX: GROUNDWATER	WASTEWATER	SOIL	OIL	SLUDGE	OTHER :	PRESERV: ACID/BASE:	ICE / COOL	OTHER :	SAMPLING DATE	SAMPLING TIME	ANALYSIS REQUEST: Chlorides 300.1	TPH 8015, BTEX 8021B, Mixture
†1301174																
1	VGWU118-07(10')	G	2			X						X	5-14-13	1525	1	1
2	VGWU118-07(15')	G	2			X						X	5-14-13	1530	1	1
3	VGWU118-07(20')	G	2			X						X	5-14-13	1535	1	1
4	VGWU118-07(25')	G	2			X						X	5-14-13	1540	1	1
5	VGWU118-07(30')	G	2			X						X	5-14-13	1550	1	1
6	VGWU118-02(2')	G	2			X						X	5-14-13	1602	1	1
7	VGWU118-02(5')	G	2			X						X	5-14-13	1607	1	1
8	VGWU118-02(10')	G	2			X						X	5-14-13	1614	1	1
9	VGWU118-02(15')	G	2			X						X	5-14-13	1620	1	1
10	VGWU118-02(20')	G	2			X						X	5-14-13	1625	1	1

Relinquished By:	Date: 5-15-13	Received By:	Phone Result:	☐ Yes	☐ No
	Time: 1700		Fax Result:	☑ Yes	☐ No
Relinquished By:	Date:	Received By:	REMARKS:		
	Time:				

Delivered By: (Circle One)	Sample Condition		CHECKED BY: (Initials)
Sampler - UPS - Bus - Other: 3° C	Cool: ☑ Yes ☐ No	Intact: ☑ Yes ☐ No	

† Cardinal cannot accept verbal changes. Please fax written changes to (575) 393-2326

#54

CARDINAL Laboratories

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

101 East Marland, Hobbs, NM 88240
(575) 393-2326 FAX (575) 393-2476

Company Name:	ARCADIS - US
Project Manager:	Jonathan Olson
Address:	2929 Briarpark Dr., Suite 300
City:	Houston State: TX Zip: 77402
Phone #:	713.953.4874 Fax #: 713.977.4620
Project #:	B004860.0000 Project Owner: Chevron
Project Name:	Chevron Buckeye
Project Location:	Buckeye Oilfield
Sampler Name:	Ryan Nanny

BILL TO

P.O. #:	
Company:	
Attn:	
Address:	
City:	
State:	Zip:
Phone #:	
Fax #:	

ANALYSIS REQUEST

FOR LAB USE ONLY Lab I.D.	Sample I.D.	(G)RAB OR (C)OMP.	# CONTAINERS	MATRIX: GROUNDWATER	WASTEWATER	SOIL	OIL	SLUDGE	OTHER:	PRESERV.: ACID/BASE:	ICE / COOL	OTHER: None	SAMPLING DATE	SAMPLING TIME	Metals: As, Ba, Cd, Cr, Pb, Se, Hg 6010B	TPH 8015 + BTEX 8021B	Hold		Cl- added 5/31/13								
H301174																										
11	VGWU118-02(25')	G	2			X						X	5-14-13	1628	1	1										
12	VGWU118-02(30')	G	2			X						X	5-14-13	1632	1	1										
13	VGWU118-04(2')	G	2			X						X	5-14-13	1657	1	1	X		X							
14	VGWU118-04(5')	G	2			X						X	5-14-13	1700	1	1	X									
15	VGWU118-04(10')	G	2			X						X	5-14-13	1705	1	1	X									
16	VGWU118-04(15')	G	2			X						X	5-14-13	1710	1	1	X									
17	VGWU118-04(20')	G	2			X						X	5-14-13	1715	1	1	X									
18	VGWU118-04(25')	G	2			X						X	5-14-13	1720	1	1	X									
19	VGWU118-04(30')	G	2			X						X	5-14-13	1728	1	1	X									

PLEASE NOTE: Liability and Damages. Cardinal's liability and client's exclusive remedy for any claim arising whether based in contract or tort, shall be limited to the amount paid by the client for the analyses. All claims including those for negligence and any other cause whatsoever shall be deemed waived unless made in writing and received by Cardinal within 30 days after completion of the applicable service. In no event shall Cardinal be liable for incidental or consequential damages, including without limitation, business interruptions, loss of use, or loss of profits incurred by client, its subsidiaries, affiliates or successors arising out of or related to the performance of services hereunder by Cardinal, regardless of whether such claim is based upon any of the above stated reasons or otherwise.

Relinquished By:	Date: 5-15-13	Received By: Jodi Henson	Phone Result: ☐ Yes ☒ No Add'l Phone #:
Relinquished By:	Time: 1700	Received By:	Fax Result: ☒ Yes ☐ No Add'l Fax #:
	Date:		REMARKS: Hold VGWU118-04 Sample 5
	Time:		

Delivered By: (Circle One) Sampler - UPS - Bus - Other: 3°C

Sample Condition: Cool ☒ Yes ☐ No; Intact ☒ Yes ☐ No

CHECKED BY: (Initials)

† Cardinal cannot accept verbal changes. Please fax written changes to (575) 393-2326

#54

CARDINAL Laboratories

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

101 East Marland, Hobbs, NM 88240
(575) 393-2326 FAX (575) 393-2476

Company Name:	ARCADIS-US	**BILL TO**	
Project Manager:	Jonathan Olson	P.O. #:	
Address:	2929 Briarpark Dr., Suit 300	Company:	
City:	Houston State: TX Zip: 77402	Attn:	
Phone #:	713.953.4874 Fax #: 713.977.4620	Address:	
Project #:	B004860.0000 Project Owner: Chevron	City:	
Project Name:	Chevron Buckeye	State: Zip:	
Project Location:	Buckeye oil field	Phone #:	
Sampler Name:		Fax #:	

FOR LAB USE ONLY Lab I.D.	Sample I.D.	(G)RAB OR (C)OMP	# CONTAINERS	MATRIX: GROUNDWATER	WASTEWATER	SOIL	OIL	SLUDGE	OTHER:	PRESERV: ACID/BASE:	ICE / COOL	OTHER:	SAMPLING: DATE	TIME	Chlorides 300.1	TPH 8015, BTEX 8021B, Moisture	Hold									
H301174																										
20	V6WU118-06(2')	G	2			X						X	5-14-13	1232	1	1	X		X							
21	V6WU118-06(5')	G	2			X						X	5-14-13	1238	1	1	X									
22	V6WU118-06(10')	G	2			X						X	5-14-13	1243	1	1	X									
23	V6WU118-06(15')	G	2			X						X	5-14-13	1248	1	1	X									
24	V6WU118-06(20')	G	2			X						X	5-14-13	1255	1	1	X									
25	V6WU118-06(25')	G	2			X						X	5-14-13	1305	1	1	X									
26	V6WU118-06(30')	G	2			X						X	5-14-13	1310	1	1	X									
27	V6WU118-05(2')	G	2			X						X	5-14-13	1317	1	1	X		X							
28	V6WU118-05(5')	G	2			X						X	5-14-13	1319	1	1	X									
29	V6WU118-05(10')	G	2			X						X	5-14-13	1320	1	1	X									

ANALYSIS REQUEST

XCl- added 5/31/13

Relinquished By:	Date: 5-15-13	Received By:	Phone Result: ☐ Yes ☐ No Add'l Phone #:
	Time: 17:00	Jodi Henson	Fax Result: ☑ Yes ☐ No Add'l Fax #:
Relinquished By:	Date:	Received By:	REMARKS: Hold V6WU118-06 & V6WU118-05 5-14-13
	Time:		

Delivered By: (Circle One) Sampler - UPS - Bus - Other: 3°C

Sample Condition: Cool ☑ Yes ☐ No; Intact ☑ Yes ☐ No

CHECKED BY: (Initials)

† Cardinal cannot accept verbal changes. Please fax written changes to (575) 393-2326

#54

CARDINAL Laboratories

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

101 East Marland, Hobbs, NM 88240
(575) 393-2326 FAX (575) 393-2476

Company Name:	ARCADIS-US
Project Manager:	Jonathan Olson
Address:	2929 Briarpark Dr., Suit 300
City:	Houston State: TX Zip: 77402
Phone #:	713.953.4874 Fax #: 713.977.4620
Project #:	B004860.0000 Project Owner: Chevron
Project Name:	Chevron Buckeye
Project Location:	Buckeye oil field
Sampler Name:	

BILL TO

P.O. #:	
Company:	
Attn:	
Address:	
City:	
State:	Zip:
Phone #:	
Fax #:	

FOR LAB USE ONLY Lab I.D.	Sample I.D.	(G)RAB OR (C)OMP.	# CONTAINERS	MATRIX: GROUNDWATER	WASTEWATER	SOIL	OIL	SLUDGE	OTHER:	PRESERV: ACID/BASE:	ICE / COOL	OTHER: None	SAMPLING DATE	SAMPLING TIME	ANALYSIS REQUEST: Chlorides, 300.1	TPH 8015, BTEX 8021B, Moisture	Hold
H301174																	
30	VGWU 118-05(15')	G	2			X						X	5-14-13	1325	1	1	X†
31	VGWU 118-05(20')	G	2			X						X	5-14-13	1328	1	1	X
32	VGWU 118-05(25')	G	2			X						X	5-14-13	1335	1	1	X
33	VGWU 118-05(30')	G	2			X						X	5-14-13	1340	1	1	X
34	VGWU 118-01(2') ON 5-14-13	G	2			X						X	5-14-13	1354	1	1	
35	VGWU 118-01(5')	G	2			X						X	5-14-13	1357	1	1	
36	VGWU 118-01(10')	G	2			X						X	5-14-13	1400	1	1	
37	VGWU 118-01(15')	G	2			X						X	5-14-13	1405	1	1	
38	VGWU 118-01(20')	G	2			X						X	5-14-13	1412	1	1	
39	VGWU 118-01(25')	G	2			X						X	5-14-13	1417	1	1	

Relinquished By:	Date: 5-15-13	Received By: Debi Henson	Phone Result: ☐ Yes ☐ No Add'l Phone #:
Relinquished By:	Time: 1700	Received By:	Fax Result: ☑ Yes ☐ No Add'l Fax #:
	Date:		REMARKS: Hold VGWU 118-05 samples
	Time:		

Delivered By: (Circle One)	Sample Condition	CHECKED BY: (Initials)
Sampler - UPS - Bus - Other: 3°C	Cool: ☑ Yes ☐ No Intact: ☑ Yes ☐ No	

† Cardinal cannot accept verbal changes. Please fax written changes to (575) 393-2326

#54

CARDINAL Laboratories

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

101 East Marland, Hobbs, NM 88240
(575) 393-2326 FAX (575) 393-2476

Company Name:	ARCADIS-US	BILL TO	
Project Manager:	Jonathan Olson	P.O. #:	
Address:	2929 Briarpark Dr., Suit 300	Company:	
City:	Houston State: TX Zip: 77402	Attn:	
Phone #:	713.953.4879 Fax #: 713.977.4620	Address:	
Project #:	B004860.0000 Project Owner: Chevron	City:	
Project Name:	Chevron Buckeye	State: Zip:	
Project Location:	Buckeye oil field	Phone #:	
Sampler Name:		Fax #:	

FOR LAB USE ONLY Lab I.D.	Sample I.D.	(G)RAB OR (C)OMP	# CONTAINERS	MATRIX: GROUNDWATER	WASTEWATER	SOIL	OIL	SLUDGE	OTHER:	PRESERV: ACID/BASE:	ICE / COOL	OTHER: Dry	SAMPLING DATE	SAMPLING TIME	Moisture 300.1	TPH 8015, BTEX 8021B, Moisture										
H301174	VGWU118-01(30')																Cl- added 5/31/13									
40	~~VGWU-01(30')~~ RW 5-14-13	G	2			X						X	5-14-13	1425	1	1										
41	~~VGWU-03(2')~~ VGWU118(2') 5-14-13	G	2			X						X	5-14-13	1432	1	1										
42	VGWU118-03(5')	G	2			X						X	5-14-13	1437	1	1										
43	VGWU118-03(10')	G	2			X						X	5-14-13	1440	1	1										
44	VGWU118-03(15')	G	2			X						X	5-14-13	1445	1	1										
45	VGWU118-03(20')	G	2			X						X	5-14-13	1450	1	1										
46	VGWU118-03(25')	G	2			X						X	5-14-13	1500	1	1										
47	VGWU118-03(30')	G	2			X						X	5-14-13	1503	1	1										
48	VGWU118-07(2')	G	2			X						X	5-14-13	1517	1	1	X									
49	VGWU112-07(5')	G	2			X						X	5-14-13	~~1530~~ 1520 RW 5-14-13	1	1										

PLEASE NOTE: Liability and Damages. Cardinal's liability and client's exclusive remedy for any claim arising whether based in contract or tort, shall be limited to the amount paid by client for analyses. All claims, including those for negligence and any other cause whatsoever, shall be deemed waived unless made in writing and received by Cardinal within 30 days after completion of the applicable service. In no event shall Cardinal be liable for incidental or consequential damages, including, without limitation, business interruptions, loss of use, or loss of profits incurred by client, its subsidiaries, affiliates or successors arising out of or related to the performance of services hereunder by Cardinal, regardless of whether such claim is based upon any of the above stated reasons or otherwise.

Relinquished By:	Date: 5-15-13	Received By:	Phone Result:	☐ Yes	☐ No Add'l Phone #:
Relinquished By:	Time: 1100	Received By:	Fax Result:	☑ Yes	☐ No Add'l Fax #:
	Date:		REMARKS:		
	Time:				
Delivered By: (Circle One)		Sample Condition: Cool ☐ Yes ☐ No; Intact ☐ Yes ☐ No	CHECKED BY: (Initials)		
Sampler - UPS - Bus - Other:	3°C				

† Cardinal cannot accept verbal changes. Please fax written changes to (575) 393-2326

#54

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Attachment 6

Boring Logs (May 2013)

Date Start/Finish: 5/14/2013
Drilling Company: White Drilling/R Dallas

Drilling Method: Air Rotary
Sampling Method: Shovel

Borehole Depth: 30' bgs
Descriptions By: R Nanny

Well/Boring ID: **VGWU118 - 01**

Client: Chevron EMC
Location: Vacuum Glorietta West Unit 118

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description
0	0		AK	2				SILTY SANDY CLAY (Topsoil), Dark Grayish Brown (10YR8/2), firm, blocky, dry, roots in sample, 50% sand, silt to very fine grained, subangular to subrounded, poorly sorted.
		1	AK	3	6.2			CALICHE, Pale Yellow (2.5YR8/4), soft, slightly moist, argillaceous, 90% caliche clay, 10% sand, silt to very fine grained, subangular to subrounded, poorly sorted.
5	-5		AR		7.1			
		2	AR	5				SANDY CALICHE, Pale Yellow (2.5YR8/3), soft, powdery, 75% caliche, 25% sand, very fine to fine grained, subangular, poorly sorted, loose, dry, trace caliche, White (2.5YR8/1), indurated, nodular, 0.3 cm to 0.5 cm.
10	-10				2.8			
		3	AR	5				
15	-15				4.0			
		4	AR	5				SANDY CALICHE, Pale Yellow (2.5YR8/2), soft, powdery, dry, 80% caliche, 20% sand, very fine to fine grained, subrounded to subangular, poorly sorted, loose, formation contains sandy siliceous caliche, Pale Yellow (7.5YR7/4), fine to very fine grained, subrounded, poorly sorted, silica cemented, nodular, traces throughout formation.
20	-20				4.7			SANDSTONE, Light Gray (10YR7/2), very fine to fine grained, subangular to subrounded, poorly sorted, weakly cemented, calcareous formation.
		5	AR	5				
25	-25				5.8			Same as above, formation sand becomes fine grained, subrounded, well sorted, contained trace indurated sandstone, Pale Yellow (2.5YR7/4), silica cemented, nodules 0.3 cm to 1 cm throughout formation.
		6	AR	5				Same as above, nodules become 5% to 10% at 30 feet bgs.
30	-30				7.4			

Remarks: ags = above ground surface; AK = air knife; amsl = above mean sea level; AR = air rotary; bgs = below ground surface; ppm = parts per million; cm = centimeter;

Date Start/Finish: 5/14/2013
Drilling Company: White Drilling/R Dallas

Drilling Method: Air Rotary
Sampling Method: Shovel

Borehole Depth: 30' bgs
Descriptions By: R Nanny

Well/Boring ID: **VGWU118 - 02**

Client: Chevron EMC
Location: Vacuum Glorietta West Unit 118

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description
0	0	1	AK	2	3.4			SILTY SANDY CLAY (Topsoil), Dark Grayish Brown (10YR4/2), soft, slightly pliable, moist, roots in sample, 50% clay and 50% sand, silt to very fine grained, subangular to subrounded, poorly sorted, trace caliche, White (5YR8/1), soft to firm, nodular, 0.2 cm to 0.3 cm.
			AK	3				CALICHE, Pale Yellow (2.5YR8/4), soft, slightly moist, argillaceous, 90% caliche clay, 10% sand, silt to very fine grained, subangular to subrounded, poorly sorted.
5	-5	2	AR		2.9			
			AR	5				SANDY CALICHE, Pale Yellow (2.5YR8/4), soft, powdery, 75% caliche, 25% sand, very fine to fine grained, subangular, poorly sorted, loose, dry. Formation contains trace caliche, White (2.5YR8/1), indurated, nodular, 0.3 cm to 0.5 cm throughout formation.
10	-10	3	AR	5	4.3			
15	-15	4	AR	5	4.8			Same as above, formation had a slight color change to Pale Yellow (2.5YR8/3), sand increased, grains turned to subrounded.
20	-20	5	AR	5	5.4			SAND, Pale Yellow (2.5YR8/2), fine grained, subrounded, moderately sorted, loose, slightly moist. Formation contains traces sandstone, Light Brown (7.5YR6/4). Sand is same as described above, indurated, nodular, silica cemented.
25	-25	6	AR	5	5.3			
30	-30				7.9			

Remarks: ags = above ground surface; AK = air knife; amsl = above mean sea level; AR = air rotary; bgs = below ground surface; ppm = parts per million; cm = centimeter;

Date Start/Finish: 5/14/2013
Drilling Company: White Drilling/R Dallas

Drilling Method: Air Rotary
Sampling Method: Shovel

Borehole Depth: 30' bgs
Descriptions By: R Nanny

Well/Boring ID: VGWU118 - 03

Client: Chevron EMC
Location: Vacuum Glorietta West Unit 118

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description
0	0	1	AK	2	2.7	☒		SILTY SANDY CLAY (Topsoil), Dark Grayish Brown (10YR4/2), firm, blocky to slightly friable, dry, roots in sample, 50% clay, 50% sand, silt to very fine grained, trace fine grains in samples, subangular to subrounded, poorly sorted, trace caliche, White (5YR8/1), soft to friable, nodular.
			AK	3				SANDY CALICHE, White (2.5YR8/1), very firm to indurated, dry, 75% caliche, 25% sand, very fine to fine grained, subangular, poorly sorted.
5	-5	2	AR		2.8	☒		CLAYEY SAND, Light Gray (2.5YR7/2), very fine to fine grained, subangular, poorly sorted, loose, 70% sand, 40% clay, calcareous clay matrix, powdery, arenaceous, trace caliche as described above, nodular, 0.1 to 0.3 cm, firm to indurated.
			AR	5				
10	-10	3	AR	5	6.2	☒		Same as above, formation had a slight color change to Light Gray (10YR7/2), loose.
15	-15	4	AR	5	6.4	☒		SANDY CALICHE, Pale Yellow (2.5YR8/2) firmly cemented, dry, 80% caliche, 20% sand, very fine to fine grained, subangular, poorly sorted, formation contains White (5YR8/1), indurated, sandy caliche nodules, rounded thoughout formation.
20	-20	5	AR	5	9.0	☒		SANDSTONE, Light Gray (10YR7/2), very fine to fine grained, subangular to subrounded, poorly sorted, weakly cemented, calcareous.
25	-25	6	AR	5	5.7	☒		Same as above, formation becomes fine grained, subrounded, well sorted. Formation contains trace indurated sandstone, Pale Yellow (2.5YR7/4), sand is same as above, silica cemented nodules.
30	-30				5.8	☒		Same as above, nodules become 10% at 30 feet bgs.

Remarks: ags = above ground surface; AK = air knife; amsl = above mean sea level; AR = air rotary; bgs = below ground surface; ppm = parts per million; cm = centimeter;

Date Start/Finish: 5/14/2013
Drilling Company: White Drilling/R Dallas

Drilling Method: Air Rotary
Sampling Method: Shovel

Borehole Depth: 30' bgs
Descriptions By: R Nanny

Well/Boring ID: VGWU118 - 04

Client: Chevron EMC
Location: Vacuum Glorietta West Unit 118

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description
0	0	1	AK	2	4.3	☒		SILTY SANDY CLAY (Topsoil), Dark Grayish Brown (10YR4/2), friable, dry, 50% clay and 50% sand, silt to fine grained, subrounded, poorly sorted, roots in sample. Formation contains trace caliche, White (5YR8/1), very fine to indurated, nodular throughout formation.
			AK	3				SANDY CALICHE, White (5YR8/1), powdery, arenaceous, dry, 80% caliche, 20% sand, very fine to fine grained, rounded, poorly sorted, formation contains trace indurated, siliceous caliche nodules, rounded throughout formation, Yellow (5YR8/3).
5	-5	2	AR	5	5.9	☒		
			AR					
10	-10	3	AR	5	6.7	☒		Same as above, formation becomes slightly softer, sand become 30%.
15	-15	4	AR	5	6.1	☒		Same as above, formation becomes soft, sand grain content becomes 40%, caliche is powdery within formation.
20	-20	5	AR	5	6.1	☒		SANDSTONE, Pale Yellow (2.5YR8/2), fine grained, subangular to subrounded, moderately to poorly sorted, calcareous, weakly cemented, friable, trace indurated, siliceous concretions, Pale Yellow (2.5YR7/4), rounded, throughout formation, formation is slightly calcareous.
25	-25	6	AR	5	5.9	☒		Same as above, formation sand becomes subrounded and well sorted, dry.
30	-30				3.6	☒		SAND at 30 feet bgs, Pale Yellow (2.5YR8/2), fine grained, subrounded, moderately to well sorted, loose, calcareous, 80% sand, 20% indurated siliceous concretions, Pale Yellow (2.5YR7/4), rounded throughout formation, dry.

Remarks: ags = above ground surface; AK = air knife; amsl = above mean sea level; AR = air rotary; bgs = below ground surface; ppm = parts per million; cm = centimeter;

Date Start/Finish: 5/14/2013
Drilling Company: White Drilling/R Dallas

Drilling Method: Air Rotary
Sampling Method: Shovel

Borehole Depth: 30' bgs
Descriptions By: R Nanny

Well/Boring ID: **VGWU118 - 05**

Client: Chevron EMC
Location: Vacuum Glorietta West Unit 118

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description
0	0	1	AK	2	4.0	☒		SILTY SANDY CLAY (Topsoil), Dark Grayish Brown (10YR4/2), firm, blocky, dry, roots in sample, 50% clay and 50% sand, silt to very fine grained, trace fine grains in sample, subangular to subrounded, poorly sorted.
			AK	3				CLAYEY SAND, Light Gray (2.5YR7/2), very fine to fine grained, subangular, poorly sorted, loose, 60% caliche, 40% sand, calcareous clay matrix, powdery, arenaceous, slight moisture, trace caliche, White (2.5YR8/1), firm to indurated, nodular, formation also contains trace siliceous caliche, Very Pale Brown (10YR7/3), indurated, rounded, nodular throughout formation.
5	-5	2	AR		3.4	☒		
			AR	5				
10	-10	3	AR	5	4.2	☒		SANDSTONE, Very Pale Brown (10YR8/2 to 10YR7/4), fine grained, subangular to subrounded, poorly sorted, indurated, calcite and silica cementation. Same as above, formation softens to friable.
15	-15	4	AR	5	5.9	☒		SANDSTONE, Light Gray (10YR7/2), very fine to fine grained, subangular to subrounded, poorly sorted, weakly cemented, calcareous, formation contains trace caliche, White (2.5YR8/1), indurated, nodular, 0.3 to 0.5 cm throughout formation.
20	-20	5	AR	5	4.1	☒		
25	-25	6	AR	5	5.0	☒		
30	-30				6.1	☒		

Remarks: ags = above ground surface; AK = air knife; amsl = above mean sea level; AR = air rotary; bgs = below ground surface; ppm = parts per million; cm = centimeter;

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Date Start/Finish: 5/14/2013
Drilling Company: White Drilling/R Dallas

Drilling Method: Air Rotary
Sampling Method: Shovel

Borehole Depth: 30' bgs
Descriptions By: R Nanny

Well/Boring ID: VGWU118 - 06

Client: Chevron EMC
Location: Vacuum Glorietta West Unit 118

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description
0	0	1	AK	2	3.9			SILTY SANDY CLAY (Topsoil), Dark Grayish Brown (10YR4/2), firm, blocky to slightly friable, dry, roots in sample, 50% clay, 50% sand, silt to very fine grained, trace fine grains in sample, subangular to subrounded, poorly sorted.
			AK	3				SANDY CALICHE, White (2.5YR8/1), very firm to indurated, dry, 75% caliche, 25% sand, very fine to fine grained, subangular, poorly sorted.
5	-5	2	AR		5.1			CLAYEY SAND, Light Gray (2.5YR7/2), very fine to fine grained, subangular, poorly sorted, loose, 60% sand, 40% caliche calcareous clay matrix, powdery arenaceous, dry trace caliche described above, nodules 0.1 cm to 0.3 cm.
			AR	5				
10	-10	3	AR	5	5.2			Same as above, firm to indurated, slight color change to Light Gray (10YR7/2), loose formation.
								SANDY CALICHE, Pale Yellow (2.5YR8/2), firmly cemented, dry, 80% caliche, 20% sand, very fine to fine grained, subangular, poorly sorted. Formation contains White (5YR8/1), indurated sandy caliche nodules, rounded.
15	-15	4	AR	5	4.1			
20	-20	5	AR	5	4.1			SANDSTONE, Light Gray (10YR7/2), vrey fine to fine grained, subangular to subrounded, poorly sorted, weakly cemented, calcareous.
25	-25	6	AR	5	6.0			Same as above, formation sand becomes fine grained, subrounded, well sorted.
30	-30				5.9			Same as above, at 30 feet bgs, White (10YR8/1), fine grained, subrounded, well sorted, dry, very calcareous.

Remarks: ags = above ground surface; AK = air knife; amsl = above mean sea level; AR = air rotary; bgs = below ground surface; ppm = parts per million; cm = centimeter;

Date Start/Finish: 5/14/2013
Drilling Company: White Drilling/R Dallas

Drilling Method: Air Rotary
Sampling Method: Shovel

Borehole Depth: 30' bgs
Descriptions By: R Nanny

Well/Boring ID: **VGWU118 - 07**

Client: Chevron EMC
Location: Vacuum Glorietta West Unit 118

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description
0	0	1	AK	2	3.4	⊠		SILTY SANDY CLAY, Light Gray (2.5YR7/2), soft, friable, slight moisture, 70% clay, 30% silt to vrey fine grained sand, subrounded, poorly sorted.
			AK	3				
5	-5	2	AR		4.6	⊠		CLAYEY SAND, Light Gray (2.5YR7/2), very fine to fine grained, subangular to subrounded, poorly sorted, loose to slightly cemented, 80% sand, 20% clay matrix, soft, powdery, dry.
			AR	5				SANDY CALICHE, Pale Yellow (2.5YR8/2), very fine to indurated, dry, trace sand, very fine to fine grained, subrounded, poorly sorted, formation contained trace concretionary caliche nodules, indurated, calcite and silica cemented, rounded, throughout formation.
10	-10	3	AR	5	6.6	⊠		
15	-15	4	AR	5	2.2	⊠		Same as above, formation has a slight color change to Pale Yellow (2.5YR8/3), sand grain content increased to 30%.
20	-20	5	AR	5	0.4	⊠		SANDSTONE, Very Pale Brown (10YR8/2), very fine to fine grained, subangular to subrounded, poorly sorted, very loosely cemented, calcareous, formation contains trace caliche, White (2.5YR8/1), indurated, nodular, rounded, 0.2 cm to 0.5 cm throughout formation.
25	-25	6	AR	5	4.0	⊠		
30	-30				5.3	⊠		Same as above, at 30 feet bgs, formation contains trace concretionary siliceous caliche nodules, 0.2 cm to 0.3 cm, rounded.

Remarks: ags = above ground surface; AK = air knife; amsl = above mean sea level; AR = air rotary; bgs = below ground surface; ppm = parts per million; cm = centimeter;

ARCADIS

Attachment 7

Chloride Multimedia Exposure Assessment Model Simulated Soil Screening Levels for the Protection of Groundwater Memo

ARCADIS U.S., Inc.
2929 Briarpark Drive
Suite 300
Houston
Texas 77042
Tel 713 953 4800
Fax 713 977 4620

MEMO

To:
Kegan Boyer, Chevron Environmental Management Company

Copies:
Chris Shepherd, ARCADIS
Kathleen Abbott, ARCADIS
David Evans, ARCADIS

From:
Jonathan Olsen

Date:
May 8, 2014

ARCADIS Project No.:
B0048615.0000

Subject:
Chloride Multimedia Exposure Assessment Model Simulated Soil Screening Levels for the Protection of Groundwater
HES Transfer Sites, Lea County, New Mexico

On behalf of Chevron Environmental Management Company, ARCADIS U.S., Inc. (ARCADIS) evaluated chloride remediation action levels for use at the Health Environmental Safety (HES) Transfer Sites near Hobbs, New Mexico. The New Mexico Oil Conservation District (NMOCD) has established soil screening levels (SSLs) for fluid management pits (also known as the "NMOCD PIT RULE" [NMAC 19.15.17]); however, no formal SSLs have been established by the NMOCD or the New Mexico Environmental Department (NMED) for surface releases of production water. The Risk Assessment Guidance for Investigation and Remediation (NMED 2012) states that SSLs should be based on risk to human health and the potential migration to groundwater with respect to the NMED-specific tap water SSL. Chloride is not considered hazardous and the NMED and the United States Environmental Protection Agency (USEPA) have not established tap water screening levels for chloride. However, the NMED has established a chloride standard for groundwater (NMAC 20.6.2.1101) of 250 milligrams per liter (mg/L). Therefore, the SSL for chloride should be based on the soil leaching to groundwater pathway.

To evaluate a chloride SSL for use at the HES Transfer Sites, ARCADIS performed simulations of unsaturated zone flow, transport, and saturated zone mixing of chloride using the Multimedia Exposure Assessment Model Version 2.0 (MULTIMED; USEPA 1996) to evaluate the potential migration of chloride in shallow soil through the unsaturated zone to the underlying groundwater. The initial simulations were intended to estimate a maximum allowable chloride soil concentration (site SSL) to evaluate HES Transfer

Sites in Lea County and eastern Eddy County, New Mexico, and to develop a baseline approach for using the model for potential future evaluations of solute migration at other HES Transfer Sites in New Mexico.

MULTIMED Overview

MULTIMED was originally designed to simulate the movement of solutes leaching from a landfill to various exposure pathways. Due to its general acceptance by the NMOCD and the USEPA and its ability to simulate unsaturated and saturated zone flow and transport, MULTIMED was selected for this evaluation. The model, as designed, simulates one-dimensional vertical transport in the unsaturated zone to the saturated zone based on user-provided input parameters considering vadose zone, saturated zone, and chemical-specific characteristic parameters.

The simulations were performed using both the unsaturated and saturated zone modules available in MULTIMED. The unsaturated zone module performs solutions of the downward flow of infiltrating water to the water table by Darcy's Law:

$$Q = -K_v \cdot K_{rw} \left(\frac{\delta\psi}{\delta z}\right)$$

Where:

ψ is the pressure head (meters [m])

z is the depth (m)

Kv is the saturated hydraulic conductivity (meters per year [m/year])

Krw is the relative hydraulic conductivity

The boundary condition at the water table is:

$$\psi \cdot L = 0$$

Where:

L is the thickness of the unsaturated zone (m)

In the unsaturated zone, it is necessary to specify the relationship between relative hydraulic conductivity, pressure head, and water saturation. This relationship is given by van Genuchten (1976):

$$S_e = \theta r + \frac{\theta s - \theta r}{[1 + (\alpha\psi^{\beta})^{\gamma}]}$$

Where:

θr and θs are the residual water saturation and total water saturation (dimensionless), respectively

β, γ, α are empirical soil-specific parameters (dimensionless)

ψ is the air pressure entry head (m)

S_e is the effective saturation (fraction)

Source area concentrations are input as leachate concentrations, therefore, the soil/water partition equation was used to convert between total soil concentration in milligrams per kilogram (mg/kg) and the leachate concentration in mg/L:

$$C_t = \frac{C_l \cdot R \cdot \theta_w}{\rho_b}$$

Where:

C_t is the concentration of the chemical of interest in soil (mg/kg)

C_l is the concentration of the chemical of interest in leachate (mg/L)

R is the retardation coefficient (dimensionless, assumed 1 for chloride)

ρ_b is the bulk density of the soil (mg/L or grams per cubic centimeter)

The mass of the chemical of interest that reaches the groundwater is expressed by the simplified steady-state equation (Salhotra et al. 1995) that couples the vadose zone to the groundwater:

$$M_L = A_w \cdot Q_f \cdot C_l$$

Where:

M_L is the chemical of interest mass that leaches from site soil (grams per year [g/year])

A_w is the width of the source area (m^2)

Q_f is the percolation rate from the facility/site (m/year)

The mixed groundwater concentration is controlled by the quasi-three-dimensional advection dispersion equations that are evaluated based on the following chemical concentration relationship within the mixing zone (Salhotra et al. 1995):

$$C(x,y,z,t) = \frac{H}{B} C_f(x,y,t) + \Delta C_p(x,y,z,t)$$

Where:

C is the dissolved concentration (mg/L, g/m^3)

x,y,z are the spatial coordinates (m)

t is elapsed time (year)

H is the source zone penetration (m), with a maximum equal to B

B is the thickness of the saturated zone (m)

MULTIMED's output concentration is a centerline concentration based on a calculated dilution attenuation factor. Thus, the output concentration is the maximum concentration of the chemical of interest in groundwater at a reasonable distance downgradient from the source area.

Model Design, Inputs, and Assumptions

The required input parameters for the MULTIMED simulations are summarized in Table 1. Input parameters include model structure, unsaturated and saturated zones, and chemical characteristics. Minimal site-specific data regarding the HES sites are available; therefore, numerous input parameters are based on published reports, default NMED values (2012), default values provided in the modeling code, and ARCADIS's experience, as indicated in Table 1. The model values are considered representative of the Lea County, New Mexico area. Due to the intended use of the SSL at multiple sites, more conservative values were generally selected for the given ranges of input parameters.

The general assumptions used in the MULTIMED model design include:

- The unsaturated and saturated zones are a single, homogeneous material.
- The applied recharge and infiltration are constant throughout the simulation.
- Initial chloride concentrations in soil below the source area and in groundwater are equal to 0.
- The model assumes no chemical transformation or adsorption of chloride to soil materials.

The simulations were performed using the transient model capabilities of MULTIMED. Steady-state simulations were not chosen because MUTLIMED requires the assumption that the source is continuous and constant throughout the simulation, which is not appropriate for these evaluations. Also, the transient model was selected to provide output that simulates the aquifer concentrations versus time and models a finite source.

Model Simulations and Results

Using the input parameters provided, soil concentrations for chloride were iteratively varied to arrive at an appropriate maximum allowable soil concentration that would be protective of groundwater for each of the scenarios. To calculate the maximum concentration that would be observed given the input concentrations and parameters, the simulation period selected was 1,980 years with 20-year time steps.

To ascertain the maximum allowable chloride concentration for more typical chloride concentration distribution and depth to groundwater scenarios, eight MULTIMED simulations were completed. The scenarios are summarized in Table 2. The input values for the simulations were the same, except for the thickness and width of the chloride-affected soil within the soil column. The first four simulations evaluated homogeneous chloride-affected soil 20 meters wide (400 square meters [m^2]) and varied the chloride-affected soil thickness between 1 meter and 3 meters and the depth to groundwater between 20 and 30.5 meters. The remaining four simulations evaluated homogeneous chloride-affected soil 45 meters wide (2,000 m^2) and varied the chloride affected soil thickness between 1 meter and 3 meters and the depth to groundwater between 20 and 30.5 meters

The predicted groundwater concentrations versus time are illustrated on Figures 1 through 8. The peak arrival times varied between 540 and 860 years. The simulations indicate the site SSLs for the protection of groundwater ranged from 8,525 to 266,100 mg/kg (Table 2) depending on the scenario and are protective of the New Mexico chloride groundwater standard of 250 mg/L.

The MULTIMED model, like any model, requires the use of simplifying assumptions regarding subsurface conditions and flow processes that result in inherent limitations and uncertainty compared to an actual flow system. In this case, uncertainty may be related to:

- The model assumes homogeneous unsaturated and saturated zones; the actual conditions at the sites likely contain numerous heterogeneities.

- The applied recharge and infiltration rates are constant. The aquifer hydraulic gradient is also assumed to be constant. These rates likely vary with time, and these variations may influence the solute migration and mixing, resulting in short-term changes in aquifer concentrations

- The model is a theoretical simulation of transport processes and is not verified or calibrated against site-specific data.

Conclusions and Recommendations

The model simulations reasonably represent conditions encountered at most of the Lea County and eastern Eddy County HES Transfer Sites. HES Transfer Sites with chloride-affected soil can be screened

against SSLs in Table 2, assuming they meet the specified conditions (source length, source depth, depth to groundwater, and soil concentration). For calculated SSLs greater than 100,000 mg/kg, a maximum allowable soil concentration of 100,000 mg/kg is recommended in accordance with the NMED risk assessment guidance (NMED 2012). For sites that meet all of these conditions, no further action is recommended. For the sites that do not meet these conditions, site-specific evaluations should be conducted.

Enclosures:

Tables

Table 1 MULTIMED V2.0 Model Inputs

Table 2 Soil Screening Level Matrix

Figures

Figure 1 MULTIMED Simulated Chloride Concentration vs. Time (Source = 20m, Chloride 0-1m, & Depth to Groundwater = 20m)

Figure 2 MULTIMED Simulated Chloride Concentration vs. Time (Source = 20m, Chloride 0-1m, & Depth to Groundwater = 30.5m)

Figure 3 MULTIMED Simulated Chloride Concentration vs. Time (Source = 20m, Chloride 0-3m, & Depth to Groundwater = 20m)

Figure 4 MULTIMED Simulated Chloride Concentration vs. Time (Source = 20m, Chloride 0-3m, & Depth to Groundwater = 30.5m)

Figure 5 MULTIMED Simulated Chloride Concentration vs. Time (Source = 45m, Chloride 0-1m, & Depth to Groundwater = 20m)

Figure 6 MULTIMED Simulated Chloride Concentration vs. Time (Source = 45m, Chloride 0-1m, & Depth to Groundwater = 30.5m)

Figure 7 MULTIMED Simulated Chloride Concentration vs. Time (Source = 45m, Chloride 0-3m, & Depth to Groundwater = 20m)

Figure 8 MULTIMED Simulated Chloride Concentration vs. Time (Source = 45m, Chloride 0-3m, & Depth to Groundwater = 30.5m)

References

New Mexico Environment Department. 2012. Risk Assessment Guidance for Investigations and Remediation, Volume I. February 2012 (updated June 2012).

Salhotra, A.M., P. Mineart, S. Sharp-Hansen, T. Allison, R. Johns, and W.B. Mills. 1995. Multimedia Exposure Assessment Model (MULTIMED 2.0) for Evaluating the Land Disposal of Wastes--Model Theory. United States Environmental Protection Agency, Athens, GA. Unpublished Report.

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Tables

Table 1
MULTIMED V2.0 Model Inputs
Chevron HES Transfer Sites
Lea County, New Mexico

Parameters		Value(s)	Units	*Notes*
Unsaturated Zone Flow Parameters:				
Depth of Unsaturated Zone		20.0	m	Local water levels (20m & 30.5m)
Hydraulic Conductivity		0.06	cm/hr	Texas (2011)
Unsaturated Zone Porosity		0.44	fraction	NMED (2012) Default
Residual Water Content		0.260	fraction	NMED (2012) Default
Unsaturated Zone Transport Parameters:				
Thickness of Layer		20 & 30.5	m	Regional water levels
Percent of Organic Matter		1.5%		NMED (2012) Default (not used)
Bulk Density		1.5	g/cm^3	NMED (2012) Default
Biological Decay Coefficient		0	1/yr	(not used)
Aquifer Parameters:				
Aquifer Porosity		0.43	fraction	NMED (2012) Default
Bulk Density		1.5	g/cm^3	NMED (2012) Default
Aquifer Thickness		12.0	m	NMED (2012) Default
Hydraulic Conductivity		542	m/yr	Texas (2011), Velocity ~ 1/2 NMED Default
Hydraulic Gradient		0.010	m/m	NMED (2012) Default
Organic Carbon Content		0.020	fraction	NMED (2012) Default (not used)
Temperature of Aquifer		15.0	°C	NMED (2012) Default (not used)
pH		6.2		(not used)
x-distance Radial Distance from Site to Receptor		12	m	equal to aquifer thickness
Source Parameters:				
Infiltration Rate		0.013	m/yr	~0.5 in/yr, Texas (2011)
Area of Waste		400 & 2000	m^2	NMED (2012) Default (~45m x45m)
Recharge Rate		0.013	m/yr	Texas (2011)
Duration of Pulse		540 to 840	yr	Varied, set equal to peak arrival time
Discharge Concentrations		0	mg/L	
Initial Soil Concentrations:				
	Depth (m)			
Chloride leachate concentration	*0*	varied	mg/L	Calculated for each scenario[1]
Chloride leachate concentration	*1 & 3*	0	mg/L	
Chloride leachate concentration	*20 & 30.5*	0	mg/L	
Additional Parameters:				
Method		Gaussian		
New Mexico Environment Department. 2012. Risk		Chloride		
Chemical Parameters:				
Normalized Distribution Coefficient		0.00	mL/g	Model Derived
Van Genuchten Parameters:				
Alpha Van Genuchten coefficient		0.38	unitless	NCSS Soil Characterization Data[2]
Beta Van Genuchten coefficient		1.2	unitless	NCSS Soil Characterization Data[2]

Notes:

°C - degrees celcius
cm - centimeters
cm^3 - cubic centimeters
g - grams
hr - hour
L - liters
m - meters
m^2 - meter squared
mg - milligrams
mL - milliliters
yr - year

1 - calculated using the soil-water partitioning equation
2 - van Genutchen transport parameters are typical values for caliche-like material

References:

NMED - New Mexico Environmental Department Risk Assessment Guidance for Site Investigations and Remediation. February 2012.
NCSS - National Cooperative Soil Survey, National Cooperative Soil Characterization Database
Texas - Texas Water Development Board 2011. Update of the Groundwater Availability Model for the Edwards-Trinity (Plateau) and Pecos Valley Aquifers of Texas. January 21, 2011

Table 2
Soil Screening Level Matrix
Chevron HES Transfer Sites
Lea County, New Mexico

Scenario	Source Length (m)	Source Area (m)	Source Depth (m)	Depth to Groundwater (m)	SSL_{gw} (mg/Kg)	Notes
1	20	400	0-1	20.0	108,000	1
2	20	400	0-1	30.5	266,100	1
3	20	400	0-3	20.0	23,750	
4	20	400	0-3	30.5	45,000	
5	45	2,000	0-1	20.0	38,800	
6	45	2,000	0-1	30.5	95,500	
7	45	2,000	0-3	20.0	8,525	
8	45	2,000	0-3	30.5	16,100	

NMED SSL Ceiling = 100,000 mg/Kg

Notes:

m - meters

mg/Kg - milligrams per Kilogram

NMED - New Mexico Environmental Department

SSL_{gw} - Site soil screening levels for the migration to groundwater pathway

SSL Ceiling - Soil Screening Level Ceiling (NMED 2012)

1 - the NMED SSL ceiling should be used

References:

New Mexico Environment Department. 2012. Risk Assessment Guidance for Investigations and Remediation, Volume I. February 2012 (updated June 2012).

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Figures

Figure 1
MULTIMED Simulated Chloride Concentration Vs Time in Groundwater
(Source = 20m, Chloride 0-1m, & Depth to Groundwater = 20m)

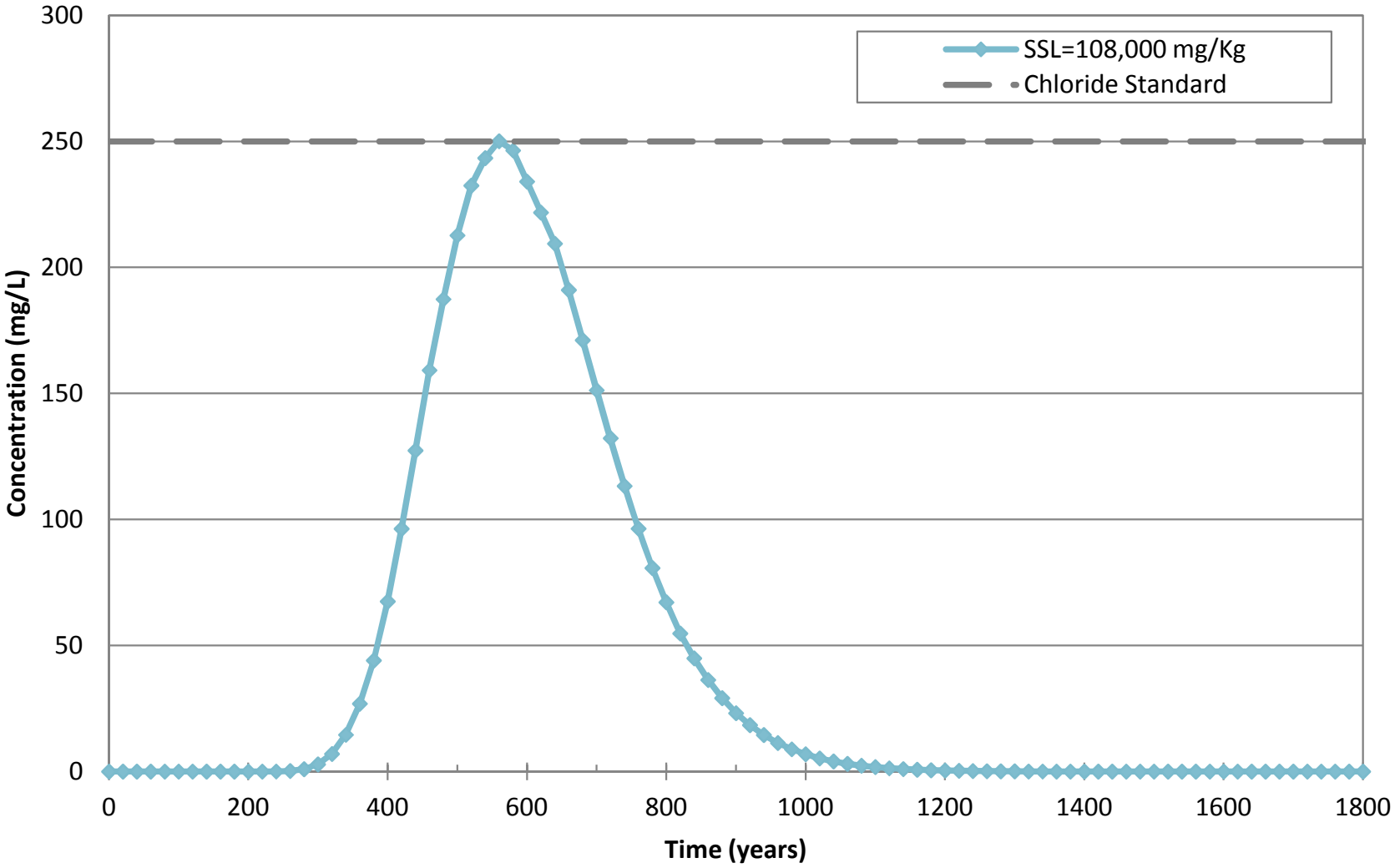

Figure 2
MULTIMED Simulated Chloride Concentration Vs Time in Groundwater
(Source = 20m, Chloride 0-1m, & Depth to Groundwater = 30.5m)

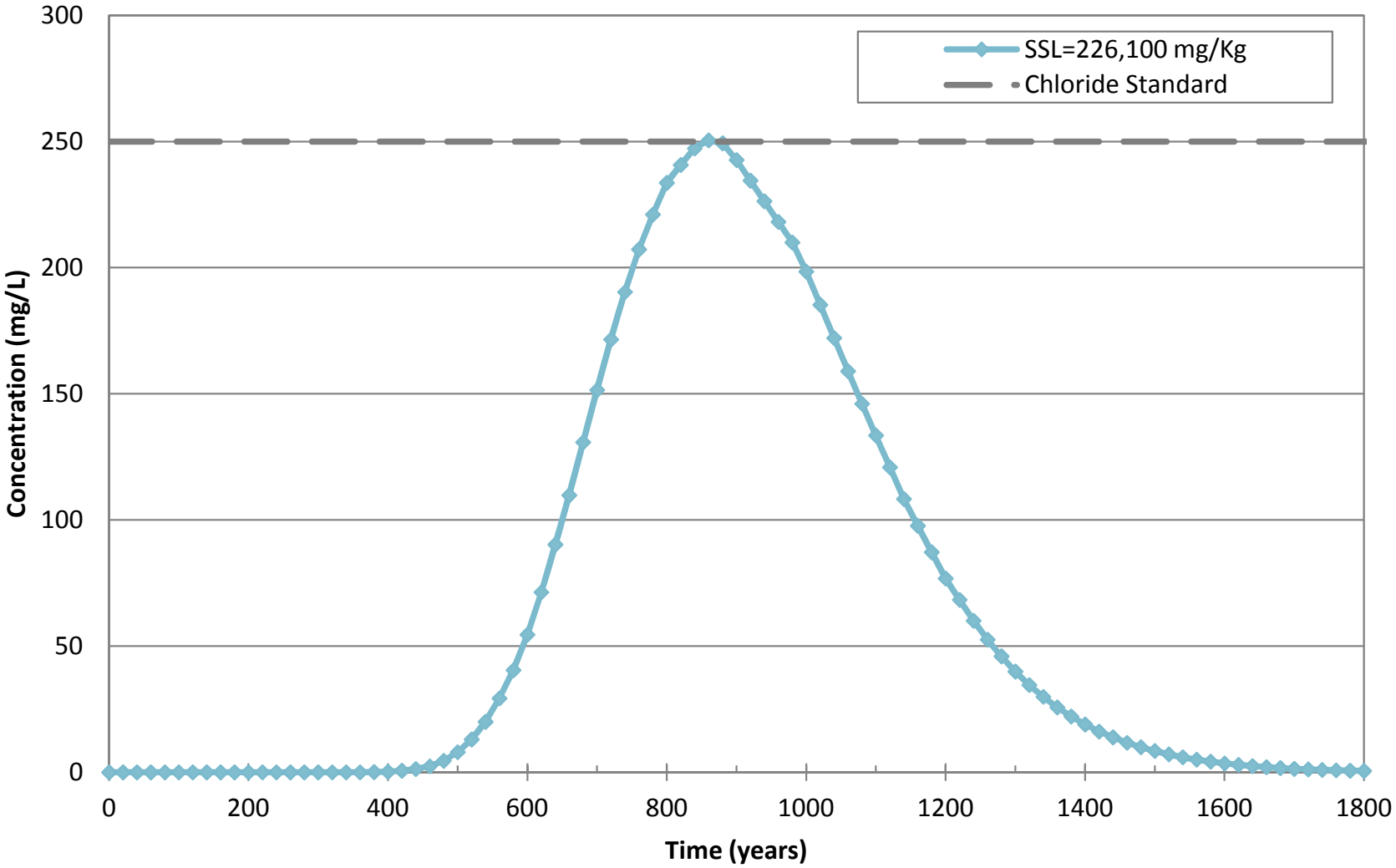

Figure 3
MULTIMED Simulated Chloride Concentration Vs Time in Groundwater
(Source = 20m, Chloride 0-3m, & Depth to Groundwater = 20m)

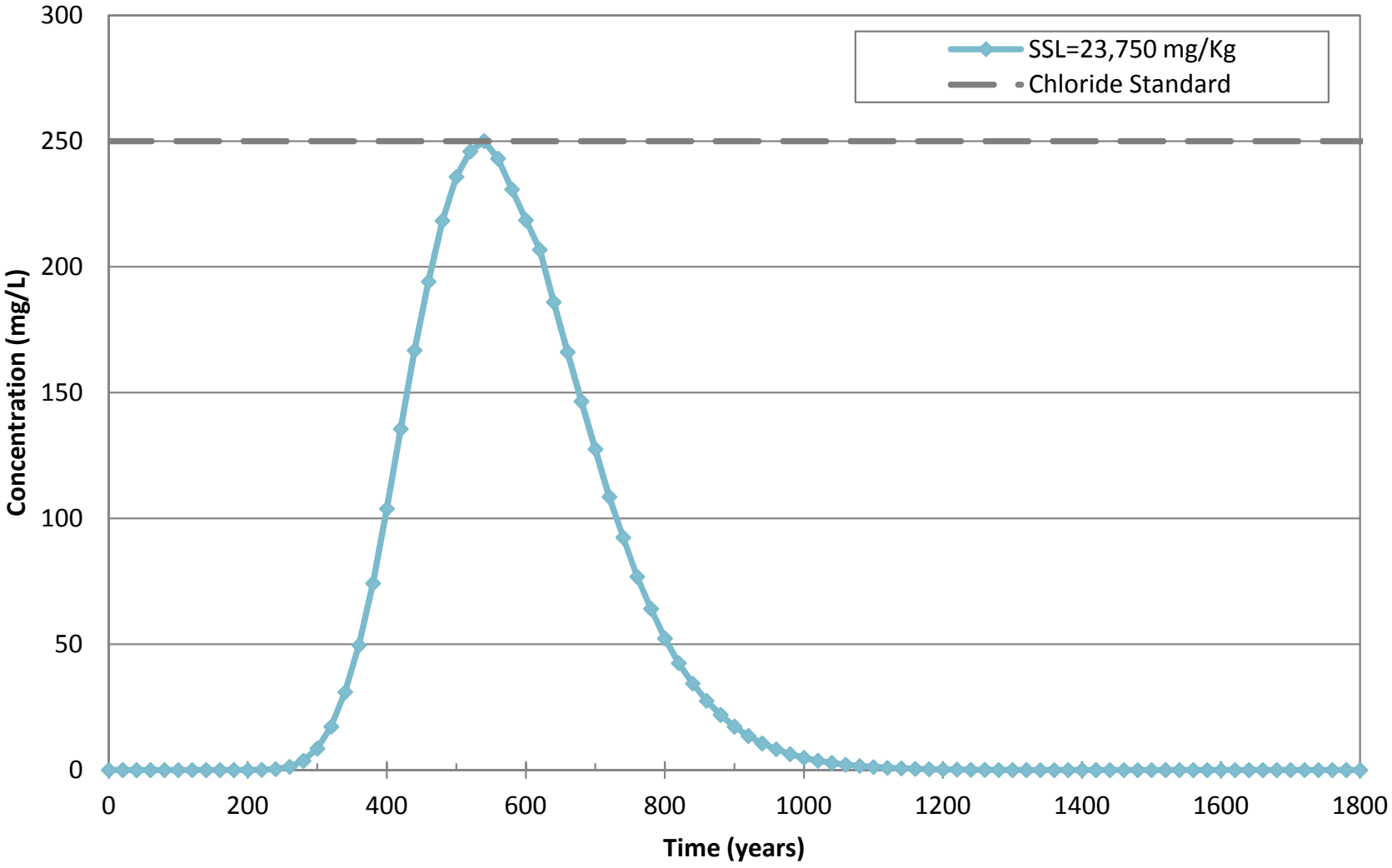

Figure 4
MULTIMED Simulated Chloride Concentration Vs Time in Groundwater
(Source = 20m, Chloride 0-3m, & Depth to Groundwater = 30.5m)

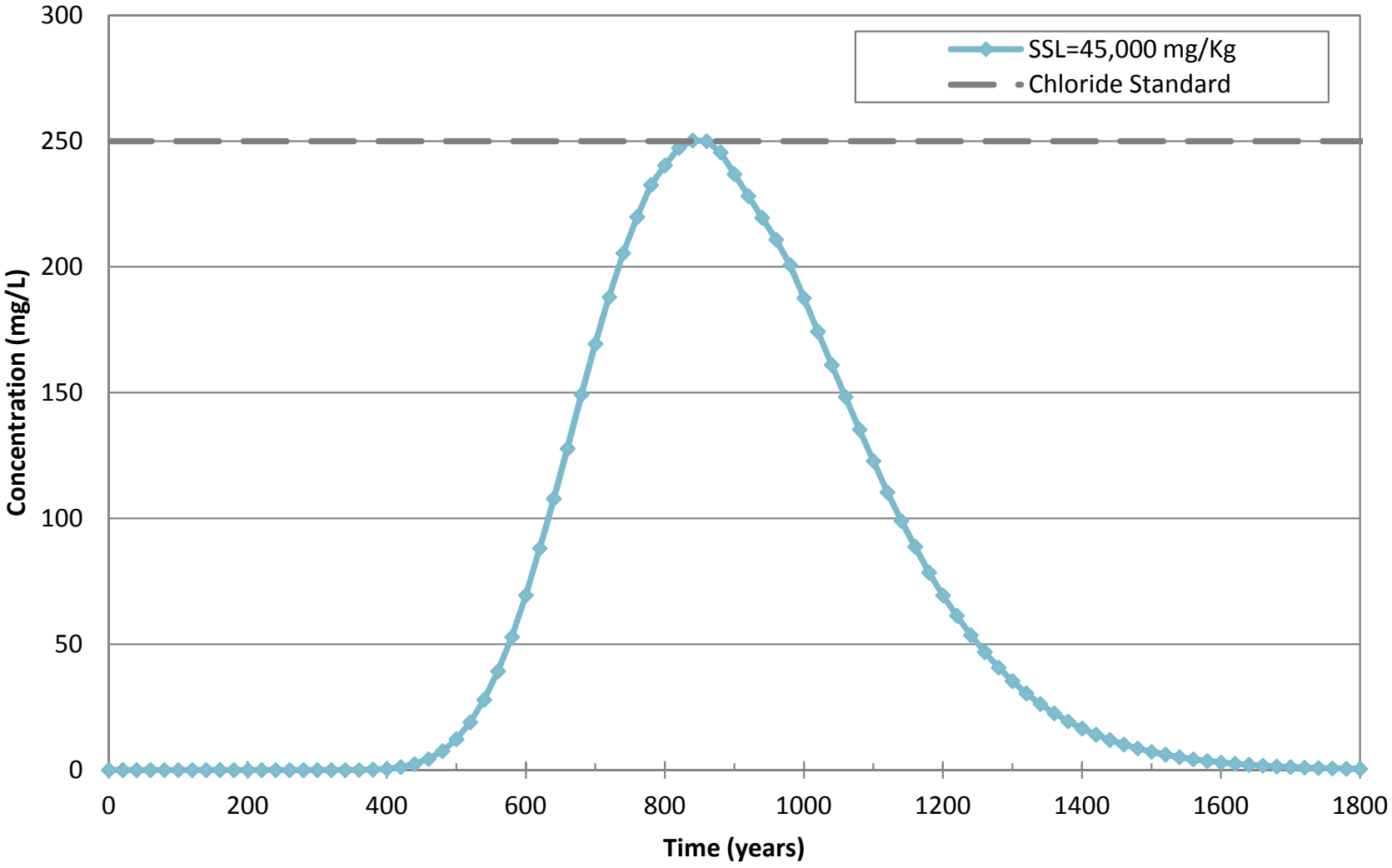

Figure 5
MULTIMED Simulated Chloride Concentration Vs Time in Groundwater
(Source = 45m, Chloride 0-1m, & Depth to Groundwater = 20m)

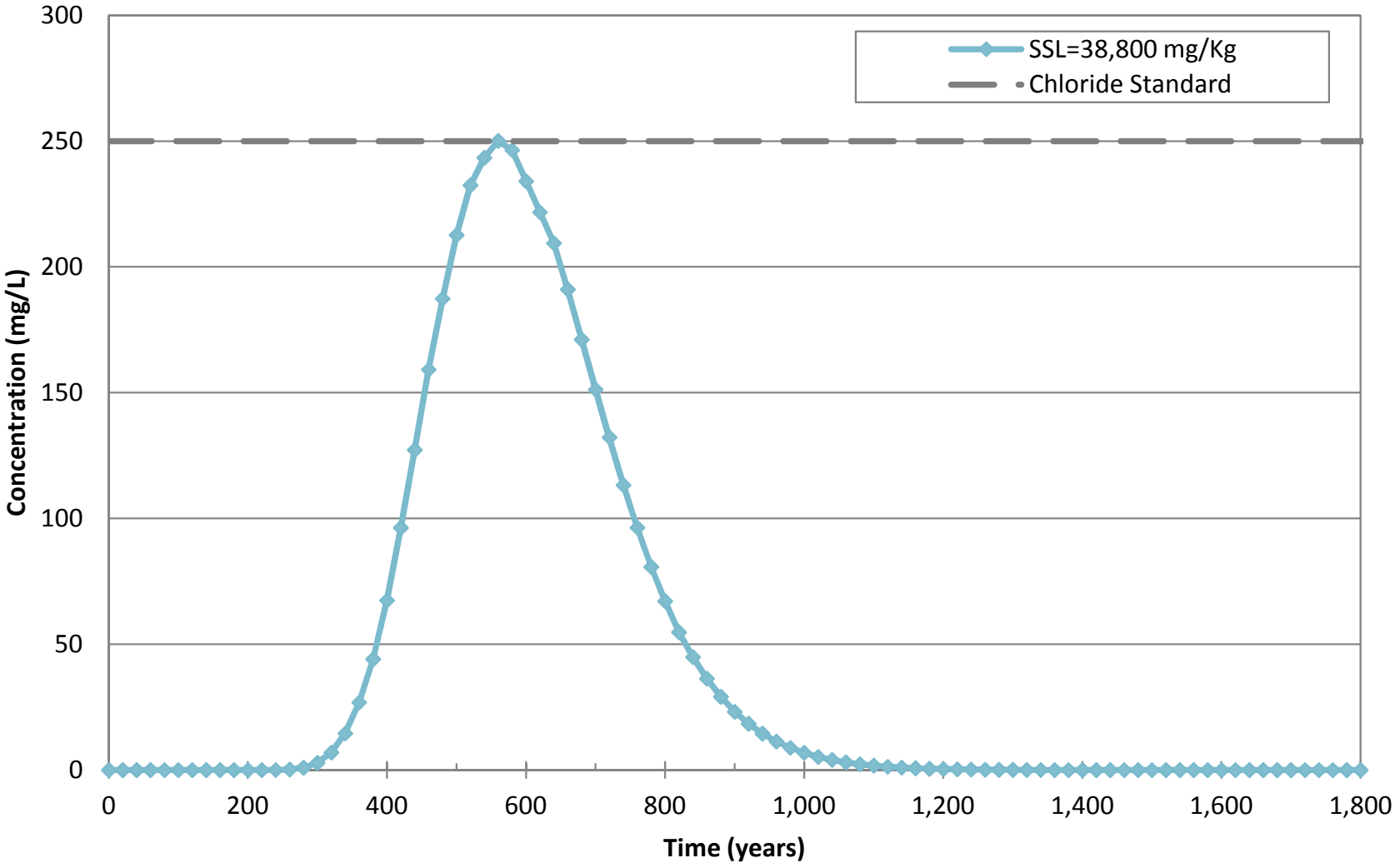

Figure 6
MULTIMED Simulated Chloride Concentration Vs Time in Groundwater
(Source = 45m, Chloride 0-1m, & Depth to Groundwater = 30.5m)

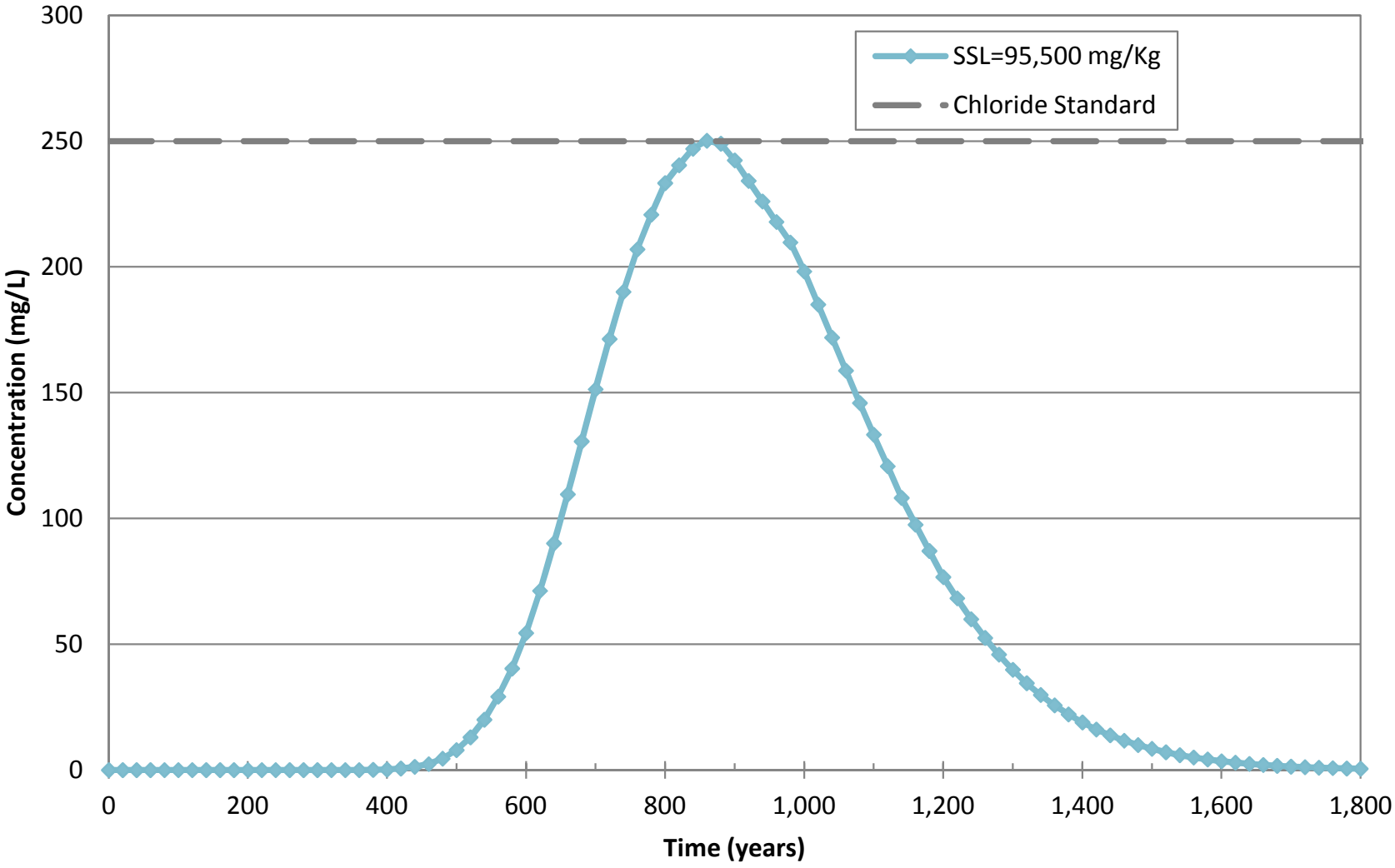

Figure 7
MULTIMED Simulated Chloride Concentration Vs Time in Groundwater
(Source = 45m, Chloride 0-3m, & Depth to Groundwater = 20m)

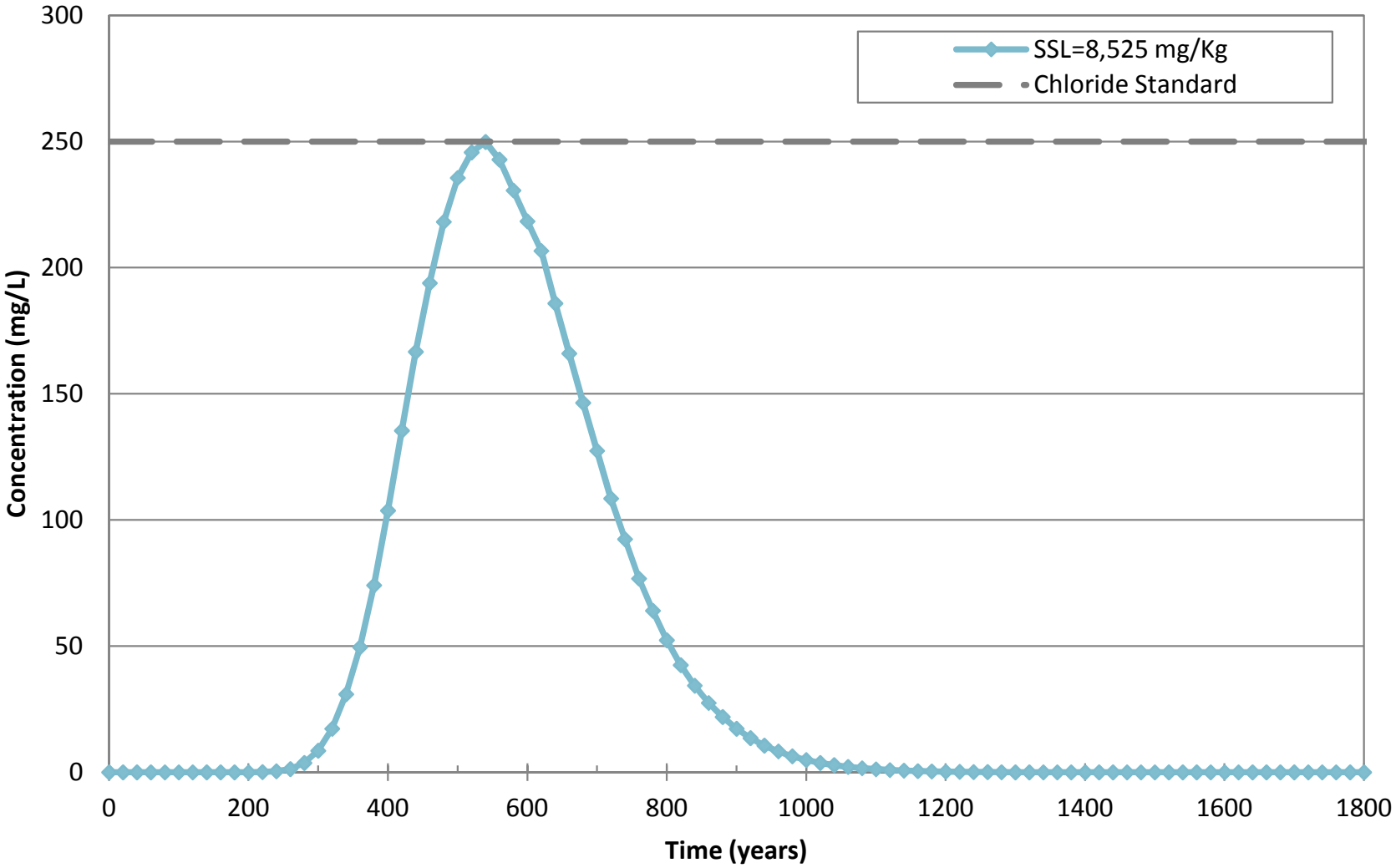

Figure 8
MULTIMED Simulated Chloride Concentration Vs Time in Groundwater
(Source = 45m, Chloride 0-3m, & Depth to Groundwater = 30.5m)