Luke Welch
Project Manager

Upstream Business Unit
Environmental Management Company
1400 Smith Street
Room 07069B
Houston, Texas 77002
Tel 713-372-0292
Luke.Welch@chevron.com

December 5, 2014

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

Re : Chevron Special Projects – CVU 96 (RP# 3247)

Dear Mr. Oberding,

Please find enclosed for your records, a copy of the final report documenting the final closure activities at the Central Vacuum Unit No. 96 (RP #3247).

The report was prepared by Arcadis US, Inc. (Arcadis) on behalf of Chevron Environmental Management Company (CEMC) to document remedial 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 did not identify any residual impacts in soils above regulatory limits and as such, CEMC now considers project activities to be complete and respectfully requests the NMOCD to grant a no further action status. Should you have any questions regarding the content of the report, 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

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: Luke Welch
Address: 56 Texas Camp Road, Lovington, NM 88260	Telephone No.: Office: (713) 372-0292 Mobile: (832) 627-9171
Facility Name: Vacuum Central Vacuum Unit #96	Facility Type: Production Well

Surface Owner: State of New Mexico	Mineral Owner: State of New Mexico	API No. 3002534944

LOCATION OF RELEASE

Unit Letter	Section	Township	Range	Feet from the	North/South Line	Feet from the	East/West Line	County
A	6	18.0S	35.0E	649	N	980	E	Lea

Latitude 32.78246392° **Longitude** -103.497213°

NATURE OF RELEASE

Type of Release: Produced Water & Oil Spill to land	Volume of Release 21.27 bbls of Oil & 7.86 bbls of Produced Water	Volume Recovered: 20bbls mostly oil
Source of Release: Pressure Relief Valve blew out gage	Date and Hour of Occurrence: 11/5/11 1:30 AM	Date and Hour of Discovery: 11/5/11 8:30 AM
Was Immediate Notice Given? ☐ Yes ☐ No ☐ Not Required	If YES, To Whom?	
By Whom? David Pagano	Date and Hour:	
Was a Watercourse Reached? ☐ Yes ☒ No	If YES, Volume Impacting the Watercourse.	

If a Watercourse was Impacted, Describe Fully.*
N/A

Describe Cause of Problem and Remedial Action Taken.*

In the early morning of 11/5/11, stuffing box blew out due to back pressure valve being plugged with stuffing box rubbers. Spill was measured with MCA Calc Spreadsheet. At 8:15 a.m., well was shut in and cleanup efforts commenced. Calculated spill volumes were 21.27bbls oil and 7.86bbls water. Cleanup efforts initiated and 20bbls fluid mostly oil recovered.

Describe Area Affected and Cleanup Action Taken.*

Shut in well to repair back pressure valve and gauge. Spill contained, liquid was vacuumed, excavated down to 2 ft bgs, and impacted soil was disposed.

Five discrete soil confirmation samples were collected from the base of the excavation. These sampling results indicated the presence of chloride concentrations in shallow soils at levels of regulatory concern.

In response to the sampling results, an additional site assessment was conducted to confirm the extent of soil impacts. Results of the additional assessment are provided in the attached report.

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: Luke Welch	OIL CONSERVATION DIVISION	
Printed Name: Luke Welch	Approved by Environmental Specialist: Bradford Billings	
Title: Project Manager	Approval Date: 12/2/2019	Expiration Date:
E-mail Address: LWelch@chevron.com	Conditions of Approval:	Attached ☐
Date: 11-19-14 Phone: (713) 372-0292		

* Attach Additional Sheets If Necessary

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www.arcadis-us.com

ENVIRONMENT

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

Subject:
Site Assessment Report
Central Vacuum Unit #96
Lea County, New Mexico

Date:
December 2, 2014

Contact:
Jonathan Olsen

Phone:
713.953.4874

Email:
Jonathan.Olsen@arcadis-us.com

Our ref:
B0048610.0000

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 Central Vacuum Unit (CVU) #96 located in Lea County, New Mexico (site; Figure 1). These activities were conducted in response to a release of approximately 29.13 barrels (bbls) of produced water and oil that occurred at the site on November 5, 2011.

To evaluate the potential for this release to impact groundwater, 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 material released (29.13 bbls).
- Response activities included removal of liquids and impacted 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; and
- Groundwater is encountered at significant depth (93 feet below ground surface [bgs]).
- Geochemical modeling using 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 November 5, 2011 release and follow-up soil assessment activities conducted on May 8, 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 14 miles southwest of Lovington, New Mexico. New Mexico Highway 238 is located approximately 0.4 mile southwest 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 approximately 14 miles northeast of the site and the closest agricultural area is 7 miles northeast of the site.

The site is located directly northwest of the CVU #96 wellhead. The release described below occurred primarily on the well pad and northwest of the well pad. A photolog of the site is included as Attachment 2.

Nearby Water Wells and Surface Water

Based on review of satellite imagery, no surface-water bodies have been identified within 5 miles of the site (GoogleEarth 2014). In May 2013, ARCADIS field verified that there are no surface-water bodies located within 1,000 feet of the site.

In September 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 323 water-supply wells within a 5-mile radius of the site (NMOSE 2011). A petroleum-industry-related water supply well, located

approximately 1,500 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] Hobs, 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 3,980 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. The Ogallala Formation east of the ridge 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 45 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 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 (Summers 1972). Compared to the Ogallala Formation to the west of the site, the Dockum Group groundwater is not a major resource in the area, with poor potential water production rates and elevated natural dissolved solids.

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 7.86 bbls of produced water and 21.27 bbls of oil occurred at the site on November 5, 2011, due to the failure of a stuffing box. Chevron personnel from the Mid-Continent Business Unit (MCBU) stopped the release and recovered approximately 20 bbls of fluids (primarily oil) using a vacuum truck. On November 17, 2011, Chevron MCBU personnel excavated visually impacted soil in the area to a depth of approximately 2 feet bgs and collected five discrete confirmation soil samples from the base of the excavation. Information regarding the disposal of the excavated soil was not available 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) to the NMOCD, detailing the location, volume of release, and initial and planned cleanup efforts taken. The original and updated C-141 forms are included as Attachment 4.

Confirmation Soil Sampling

Five discrete confirmation soil samples were collected from the base of the excavation on November 17, 2011. 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 five confirmation soil samples collected in November 2011 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 five discrete confirmation soil samples collected in November 2011 are provided in Table 1 and summarized below:

- Of the five confirmation soil samples collected, BTEX results were below laboratory reporting limits (LRLs) with one exception: total xylenes was detected above the LRL in the soil sample collected from CVU #96 SP#1 (0.187 mg/kg). Benzene and total BTEX were not detected above the SRALs of 10 and 50 mg/kg, respectively.

- TPH-GRO was not detected above LRLs. TPH-DRO was detected in all five confirmation samples at concentrations ranging from 12.2 mg/kg (CVU #96 SP#2) to 237 mg/kg (CVU #96 SP#3).

- TPH (TPH-DRO and TPH-GRO) was detected in all five confirmation samples at concentrations ranging from 12.2 mg/kg (CVU #96 SP#2) to 237 mg/kg (CVU #96 SP#3). TPH was not detected above the SRAL of 1,000 mg/kg in the five confirmation soil samples that were collected.

- Chloride was detected in all five confirmation samples collected, at concentrations ranging from 1,150 mg/kg (CVU #96 SP#5) to 6,880 mg/kg (CVU #96 SP#3). Chloride was detected above the NMAC closure criterion of 500 mg/kg in all five confirmation soil samples.

The complete laboratory analytical results with chain of custody documentation are included in Attachment 5. Chloride concentrations in all five confirmation soil samples 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 extent of potential impacts at the site. Soil boring locations were selected based on the results of confirmation soil sampling completed at the site in November 2011, 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 potential extent of impacts to soil at the site, ARCADIS advanced six soil borings (CVU96-01, CVU96-02, CVU96-03, CVU96-04, CVU96-06, and CVU295-07) on May 8, 2013. Soil sampling 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 25 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 25 feet bgs (Attachment 6).

Soil Assessment Sampling

Six soil samples were collected from each boring location 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 25 feet bgs. A total of 36 samples were collected from the site and submitted to the lab for analysis.

The 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 Assessment Sample Analysis

Soil samples collected from each boring were analyzed for 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

ARCADIS evaluated soil assessment analytical results for benzene, total BTEX, and TPH by comparing the data with the NMOCD SRALs (NMOCD 1993), as presented in the Data Evaluation Approach section of this report.

As additional evidence in support of 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 at concentrations 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[1]**

[1] A chloride SSL of 38,800 mg/kg was calculated using MUTLTIMED (USEPA 1996)
m = meter
m^2 = square meter

Soil Assessment Sample Results

The analytical results for chloride for the 36 soil assessment samples are provided in Table 1 and summarized below. Laboratory analytical results with chain of custody documentation are provided in Attachment 5.

Chloride was detected in 26 soil assessment samples at concentrations ranging from 32 mg/kg (CVU96-02 at 2 feet bgs) to 720 mg/kg (CVU096-01 at 25 feet bgs). Chloride concentrations were not detected above the site-specific SSL of 38,800 mg/kg.

Summary and Conclusions

A release of produced water and oil occurred at the site on November 5, 2011 due to the failure of a stuffing box. Chevron MCBU personnel stopped the release and recovered approximately 20 bbls of fluids (primarily oil) using a vacuum truck. Impacted soil was excavated to a depth of approximately 2 feet bgs and five discrete confirmation soil samples were collected from the base of the excavation in November 2011. All five confirmation soil samples had chloride concentrations 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. None of the soil samples collected during the 2013 assessment exceeded the NMOCD SRALs. In addition, chloride concentrations were measured below the site-specific SSL which was calculated using the MULTIMED model (USEPA 1996).

Although not all chloride concentrations were reported below the NMAC closure criterion of 500 mg/kg (Table 1; NMAC 2009), all chloride concentrations in samples collected during the 2013 assessment were below 1,000 mg/kg and the site-specific SSL (Attachment 6). Chloride impacts in shallow soil potentially associated with the release were delineated.

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

Soil data presented in this report support a conclusion that impacted soil associated with the November 5, 2011 release at the site poses no significant threat to

groundwater resources or other receptors. ARCADIS recommends that 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 Jonathan.Olsen@arcadis-us.com, or Kathleen Abbott at 925.296.7827 or 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 – CVU #96
Figure 2	Release and Soil Boring Locations – CVU #96

Attachments:

Attachment 1	Site Conceptual Model
Attachment 2	Photolog
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
Cental Vacuum Unit 96
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**	---
CVU #96 SP#1	11/17/2011	0	<0.050	0.085	<0.050	0.187	--	<10.0	14.3	2,520	--
CVU #96 SP#2	11/17/2011	0	<0.050	<0.050	<0.050	<0.150	--	<10.0	12.2	2,440	--
CVU #96 SP#3	11/17/2011	0	<0.050	0.052	<0.050	<0.150	--	<10.0	237	6,880	--
CVU #96 SP#4	11/17/2011	0	<0.050	<0.050	<0.050	<0.150	--	<10.0	56.1	4,000	--
CVU #96 SP#5	11/17/2011	0	<0.050	<0.050	<0.050	<0.150	--	<10.0	194	1,150	--
CVU 96 - 1	5/8/2013	2	--	--	--	--	--	--	--	496	--
	5/8/2013	5	--	--	--	--	--	--	--	144	--
	5/8/2013	10	--	--	--	--	--	--	--	336	--
	5/8/2013	15	--	--	--	--	--	--	--	656	--
	5/8/2013	20	--	--	--	--	--	--	--	560	--
	5/8/2013	25	--	--	--	--	--	--	--	720	--
CVU 96 - 2	5/8/2013	2	--	--	--	--	--	--	--	32	--
	5/8/2013	5	--	--	--	--	--	--	--	<16	--
	5/8/2013	10	--	--	--	--	--	--	--	<16	--
	5/8/2013	15	--	--	--	--	--	--	--	<16	--
	5/8/2013	20	--	--	--	--	--	--	--	<16	--
	5/8/2013	25	--	--	--	--	--	--	--	<16	--
CVU 96 - 3	5/8/2013	2	--	--	--	--	--	--	--	320	--
	5/8/2013	5	--	--	--	--	--	--	--	208	--
	5/8/2013	10	--	--	--	--	--	--	--	144	--
	5/8/2013	15	--	--	--	--	--	--	--	64	--
	5/8/2013	20	--	--	--	--	--	--	--	96	--
	5/8/2013	25	--	--	--	--	--	--	--	128	--
CVU 96 - 4	5/8/2013	2	--	--	--	--	--	--	--	80	--
	5/8/2013	5	--	--	--	--	--	--	--	48	--
	5/8/2013	10	--	--	--	--	--	--	--	48	--
	5/8/2013	15	--	--	--	--	--	--	--	32	--
	5/8/2013	20	--	--	--	--	--	--	--	64	--
	5/8/2013	25	--	--	--	--	--	--	--	64	--
CVU 96 - 6	5/8/2013	2	--	--	--	--	--	--	--	80	--
	5/8/2013	5	--	--	--	--	--	--	--	48	--
	5/8/2013	10	--	--	--	--	--	--	--	272	--
	5/8/2013	15	--	--	--	--	--	--	--	352	--
	5/8/2013	20	--	--	--	--	--	--	--	304	--
	5/8/2013	25	--	--	--	--	--	--	--	304	--
CVU 96 - 7	5/8/2013	2	--	--	--	--	--	--	--	320	--
	5/8/2013	5	--	--	--	--	--	--	--	304	--
	5/8/2013	10	--	--	--	--	--	--	--	240	--
	5/8/2013	15	--	--	--	--	--	--	--	128	--
	5/8/2013	20	--	--	--	--	--	--	--	160	--
	5/8/2013	25	--	--	--	--	--	--	--	224	--

Notes:

%	Percent
mg/kg	Miligram(s) per kilogram
<	Analyte was not detected above the specified method reporting limit
--*	Information regarding the depth of these samples is not available.
--	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

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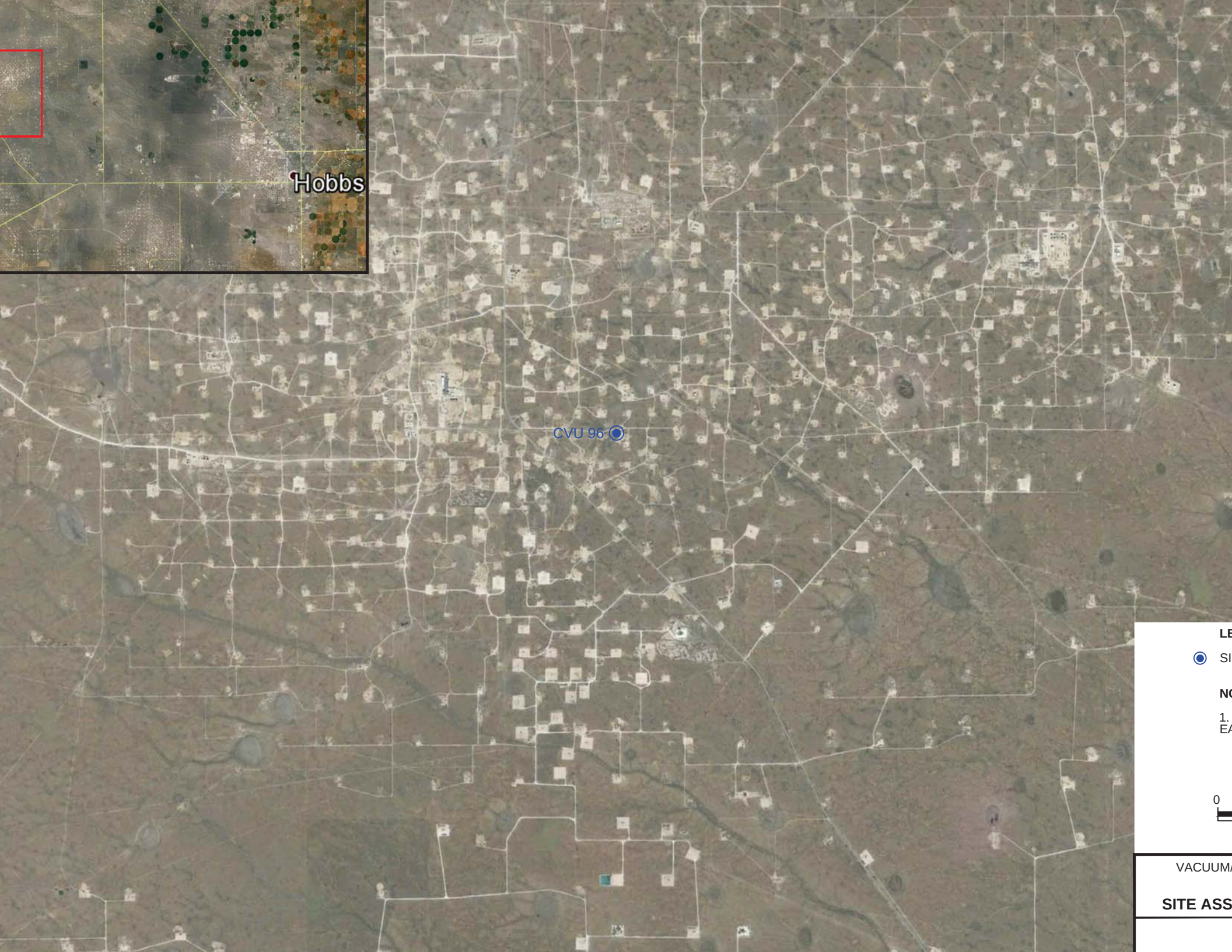
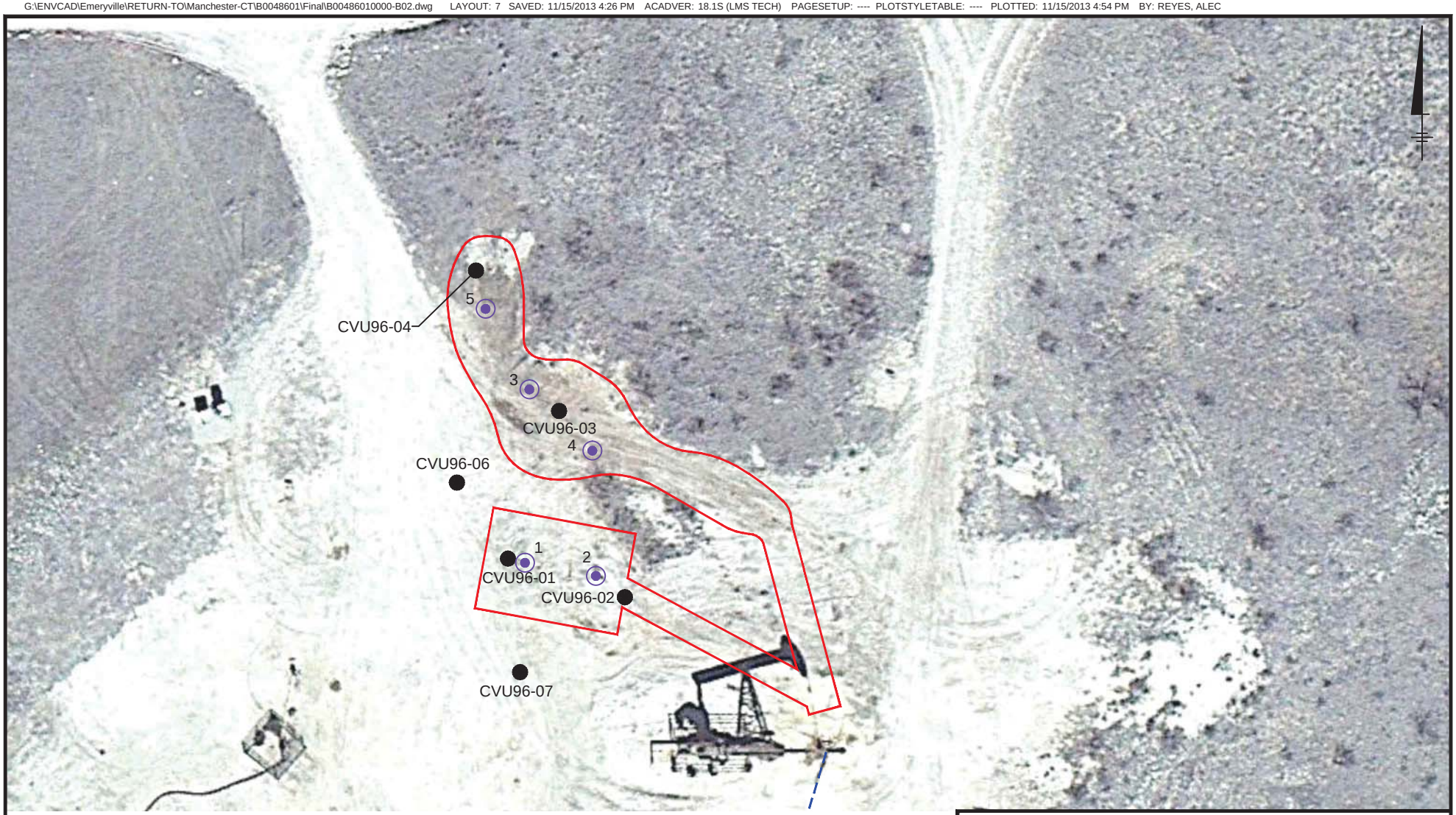
Figures


Hobbs
CVU 96
LE
SI
NO
1.
EA
0
VACUUM
SITE ASS

CITY: MANCHESTER DIV/GROUP: ENVCAD DB: B.SMALL PM: TM
G:\ENVCAD\Emeryville\RETURN-TO\Manchester-CT\B0048601\Final\B00486010000-B02.dwg LAYOUT: 7 SAVED: 11/15/2013 4:26 PM ACADVER: 18.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ---- PLOTTED: 11/15/2013 4:54 PM BY: REYES, ALEC



LEGEND:

- MAY 2013 DISCRETE SOIL SAMPLING LOCATION
- 1 NOVEMBER 2011 DISCRETE SOIL SAMPLING LOCATION
- 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 40' 80'

GRAPHIC SCALE

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

SITE ASSESSMENT AND CLOSURE REPORT

RELEASE AND SOIL BORING LOCATIONS
CVU #96

ARCADIS

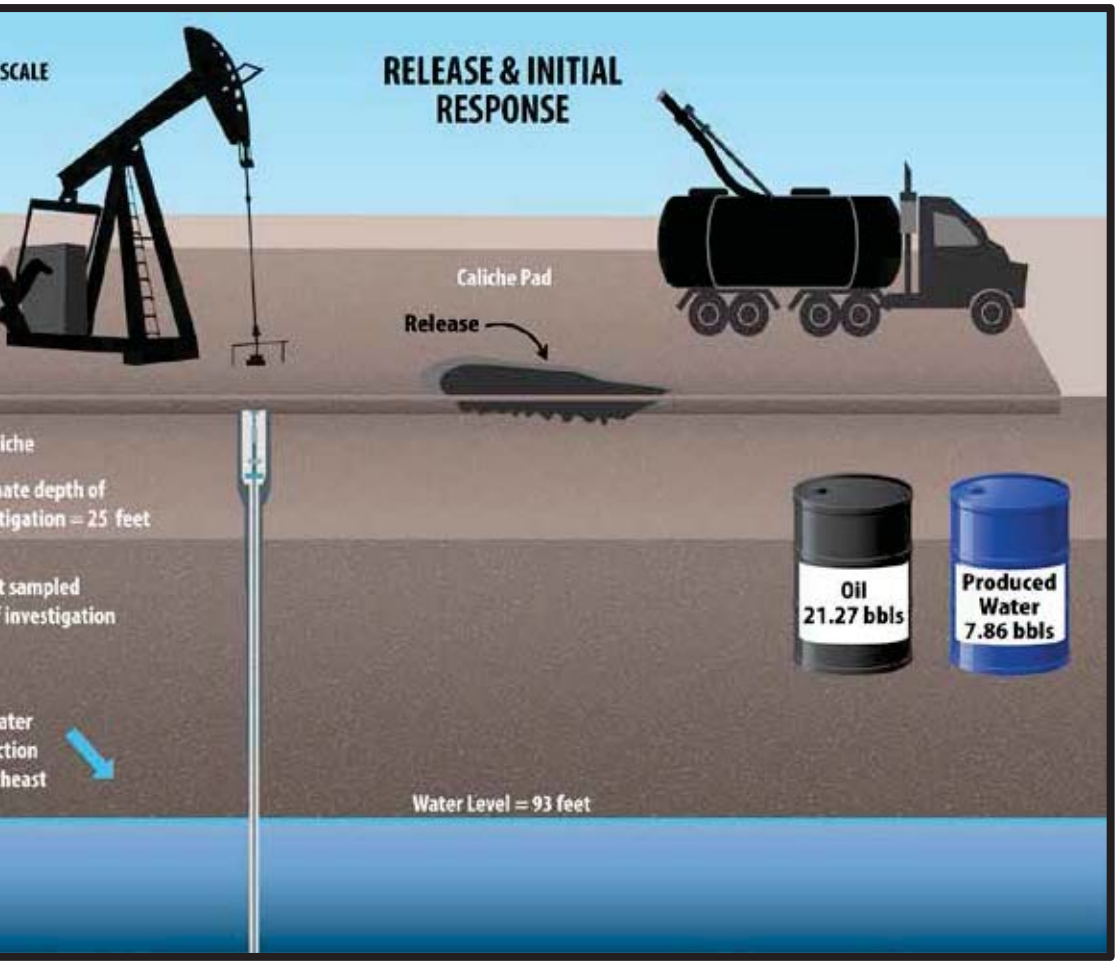
FIGURE
2

ARCADIS

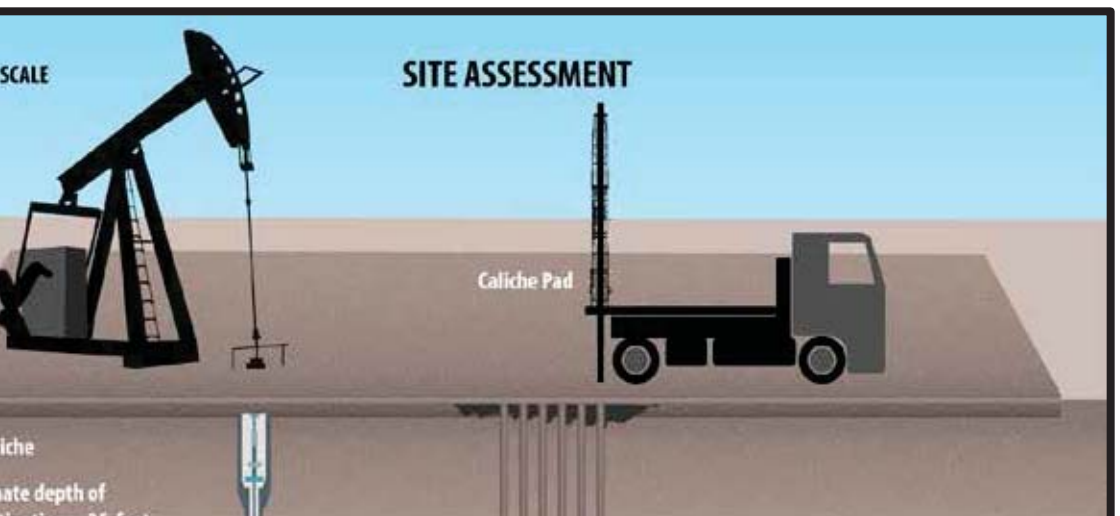
Attachment 1

Site Conceptual Model

database, groundwater near the
is encountered at a depth of
approximately 93 feet bgs.



A release of approximately 7.86 b
produced water and 21.27 bbls o
occurred at the site on Novembe
due to the failure of a stuffing box
Chevron personnel from the
MidContinent Business Unit (MC
stopped the release and recovere
approximately 20 bbls of fluids co
mostly of oil using a vacuum truc
Chevron MCBU personnel excav
visually impacted soil in the area
depth of approximately 2 feet bgs
collected five discrete confirmatio
samples from the base of the exc
Analyte concentrations in one or
confirmation soil samples were a
regulatory criteria, which prompte
additional site assessment activit



In May 2013, ARCADIS conducte
assessment activities to characte
lateral and vertical extents of soil
the site. Soil boring locations wer
based on the results of confirmat
sampling completed at the site in
2011, locations of pipelines and o
equipment at the site, and the ex
release as documented by Chevr
personnel during the initial respo
activities. Analyte concentrations
collected during the 2013 assess
reported below site-specific crite

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Attachment 2

Photolog

Photograph 1 – Central Vacuum Unit 96 release area; Facing East

Photograph 2 – Central Vacuum Unit 96 release area; Facing Southeast

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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	268	130		
L 13041 POD2	L	LE		2	2	06	18S	35E	641152	3628026	268	140		
L 13041 POD3	L	LE		2	2	06	18S	35E	641152	3628026	268	140		
L 13041 POD4	L	LE		2	2	06	18S	35E	641152	3628026	268	140		
L 07119 S	L	LE	1	2	1	06	18S	35E	640445	3628259*	493	233	95	138
L 05523	L	LE	3	3	2	06	18S	35E	640855	3627660*	528	147	85	62
L 10337	L	LE	4	1	1	06	18S	35E	640268	3628055*	677	190	100	90
L 07119	L	LE	1	1	1	06	18S	35E	640068	3628255*	868	233	95	138

Average Depth to Water: **93 feet**

Minimum Depth: **85 feet**

Maximum Depth: **100 feet**

Record Count: 8

UTMNAD83 Radius Search (in meters):

Easting (X): 640933.12 **Northing (Y):** 3628183.12 **Radius:** 1000

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

ARCADIS

Attachment 4

Release Notification and Corrective Action (C-141 Form)

District I
1625 N. French Dr., Hobbs, NM 88240
District II
1301 W. Grand Avenue, 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 March 17, 1999

Submit 2 Copies to appropriate District Office in accordance with Rule 116 on back side of form

Release Notification and Corrective Action

OPERATOR

X Initial Report Final Report

Name of Company CHEVRON	Contact David Pagano
Address 56 Texas Camp Road, Lovington NM 88260	Telephone No. Office: 575-396-4414X275 Cellular: 505-787-9816
Facility Name: Central Vacuum Unit 96	Facility Type: Active Oil Well

Surface Owner:	Mineral Owner:	Lease No.

LOCATION OF RELEASE

Closest Well is CVU No. 96 (API No. 30-025-0308) Lat: 32.78246392 / Lon: -103.497213

Unit Letter	Section	Township	Range	Feet from the	North/South Line	Feet from the	East/West Line	County
B	06	18S	35E	649	North	980	East	Lea

NATURE OF RELEASE

Type of Release Spill to land	Volume of Release 21.27bbls oil & 7.86bbls water	Volume Recovered 20bbls mostly oil
Source of Release Pressure Relief Valve blew out gage.	Date and Hour of Occurrence November 5th, 2011 @ 1:30 a.m.	Date and Hour of Discovery November 5th, 2011 @ 8:30 a.m.
Was Immediate Notice Given? ☐ Yes ☐ No ☐ Not Required	If YES, To Whom?	
By Whom?	Date and Hour	
Was a Watercourse Reached? NA ☐ Yes ☐ No	If YES, Volume Impacting the Watercourse.	

If a Watercourse was Impacted, Describe Fully.*

Describe Cause of Problem and Remedial Action Taken.*

In the early morning of 11/5/11 stuffing box blew out due to back pressure valve being plugged with stuffing box rubbers. Spill was measured with MCA Calc Spreadsheet. At 8:15a.m., well was shut in and cleanup efforts commenced. Calculated spill volumes were 21.27bbls oil & 7.86bbls water. Cleanup efforts initiated and 20bbls fluid mostly oil recovered.

Describe Area Affected and Cleanup Action Taken.*

Shut in well to repair back pressure valve and gauge. Spill contained, liquid was vacuumed up with Hydrovac, excavated down 2ft. and disposed of contaminated soil. Soil samples will be taken on 11/17/11 and results shared with OCD.

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: David Pagano	OIL CONSERVATION DIVISION	
Printed Name: David Pagano	Approved by District Supervisor:	
Title: Health & Environmental Specialist	Approval Date:	Expiration Date:
Date: 11/17/11 Phone: 505-787-9816	Conditions of Approval:	Attached ☐

* Attach Additional Sheets If Necessary

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: Luke Welch
Address: 56 Texas Camp Road, Lovington, NM 88260	Telephone No.: Office: (713) 372-0292 Mobile: (832) 627-9171
Facility Name: Vacuum Central Vacuum Unit #96	Facility Type: Production Well

Surface Owner: State of New Mexico	Mineral Owner: State of New Mexico	API No. 3002534944

LOCATION OF RELEASE

Unit Letter	Section	Township	Range	Feet from the	North/South Line	Feet from the	East/West Line	County
A	6	18.0S	35.0E	649	N	980	E	Lea

Latitude 32.78246392° **Longitude** -103.497213°

NATURE OF RELEASE

Type of Release: Produced Water & Oil Spill to land	Volume of Release 21.27 bbls of Oil & 7.86 bbls of Produced Water	Volume Recovered: 20bbls mostly oil
Source of Release: Pressure Relief Valve blew out gage	Date and Hour of Occurrence: 11/5/11 1:30 AM	Date and Hour of Discovery: 11/5/11 8:30 AM
Was Immediate Notice Given? ☐ Yes ☐ No ☐ Not Required	If YES, To Whom?	
By Whom? David Pagano	Date and Hour:	
Was a Watercourse Reached? ☐ Yes ☒ No	If YES, Volume Impacting the Watercourse.	

If a Watercourse was Impacted, Describe Fully.*
N/A

Describe Cause of Problem and Remedial Action Taken.*

In the early morning of 11/5/11, stuffing box blew out due to back pressure valve being plugged with stuffing box rubbers. Spill was measured with MCA Calc Spreadsheet. At 8:15 a.m., well was shut in and cleanup efforts commenced. Calculated spill volumes were 21.27bbls oil and 7.86bbls water. Cleanup efforts initiated and 20bbls fluid mostly oil recovered.

Describe Area Affected and Cleanup Action Taken.*

Shut in well to repair back pressure valve and gauge. Spill contained, liquid was vacuumed, excavated down to 2 ft bgs, and impacted soil was disposed.

Five discrete soil confirmation samples were collected from the base of the excavation. These sampling results indicated the presence of chloride concentrations in shallow soils at levels of regulatory concern.

In response to the sampling results, an additional site assessment was conducted to confirm the extent of soil impacts. Results of the additional assessment are provided in the attached report.

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: Luke Welch	OIL CONSERVATION DIVISION	
Printed Name: Luke Welch	Approved by Environmental Specialist:	
Title: Project Manager	Approval Date:	Expiration Date:
E-mail Address: LWelch@chevron.com	Conditions of Approval:	Attached ☐
Date: 11-19-14 Phone: (713) 372-0292		

* Attach Additional Sheets If Necessary

ARCADIS

Attachment 5

Laboratory Analytical Reports

CARDINAL Laboratories

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

November 28, 2011

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 11/18/11 12:00.

Cardinal Laboratories is accredited through Texas NELAP for:

Method SW-846 8021	Benzene, Toluene, Ethyl Benzene, and Total Xylenes
Method SW-846 8260	Benzene, Toluene, Ethyl Benzene, and Total Xylenes
Method TX 1005	Total Petroleum Hydorcarbons

Certificate number T104704398-08-TX. Accreditation applies to solid and chemical materials and non-potable water matrices.

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 (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:	11/18/2011	Sampling Date:	11/17/2011
Reported:	11/28/2011	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: CVU #96 SP #1 (H102518-01)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	11/23/2011	ND	2.09	104	2.00	0.977	
Toluene*	**0.085**	0.050	11/23/2011	ND	1.98	99.2	2.00	0.795	
Ethylbenzene*	<0.050	0.050	11/23/2011	ND	2.26	113	2.00	0.221	
Total Xylenes*	**0.187**	0.150	11/23/2011	ND	6.51	109	6.00	0.0467	

Surrogate: 4-Bromofluorobenzene (PIL *113 %* *64.4-134*

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**2520**	16.0	11/22/2011	ND	432	108	400	3.64	

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	11/20/2011	ND	217	108	200	6.01	
DRO >C10-C28	**14.3**	10.0	11/20/2011	ND	188	94.2	200	8.91	

Surrogate: 1-Chlorooctane *77.9 %* *55.5-154*

Surrogate: 1-Chlorooctadecane *98.5 %* *57.6-158*

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:	11/18/2011	Sampling Date:	11/17/2011
Reported:	11/28/2011	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: CVU #96 SP #2 (H102518-02)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	11/23/2011	ND	2.09	104	2.00	0.977	
Toluene*	<0.050	0.050	11/23/2011	ND	1.98	99.2	2.00	0.795	
Ethylbenzene*	<0.050	0.050	11/23/2011	ND	2.26	113	2.00	0.221	
Total Xylenes*	<0.150	0.150	11/23/2011	ND	6.51	109	6.00	0.0467	

Surrogate: 4-Bromofluorobenzene (PIL *112 %* *64.4-134*

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**2440**	16.0	11/22/2011	ND	432	108	400	3.64	

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	11/20/2011	ND	217	108	200	6.01	
DRO >C10-C28	**12.2**	10.0	11/20/2011	ND	188	94.2	200	8.91	

Surrogate: 1-Chlorooctane *83.9 %* *55.5-154*

Surrogate: 1-Chlorooctadecane *106 %* *57.6-158*

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:

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

Received:	11/18/2011	Sampling Date:	11/17/2011
Reported:	11/28/2011	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: CVU #96 SP #3 (H102518-03)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	11/23/2011	ND	2.09	104	2.00	0.977	
Toluene*	**0.052**	0.050	11/23/2011	ND	1.98	99.2	2.00	0.795	
Ethylbenzene*	<0.050	0.050	11/23/2011	ND	2.26	113	2.00	0.221	
Total Xylenes*	<0.150	0.150	11/23/2011	ND	6.51	109	6.00	0.0467	

Surrogate: 4-Bromofluorobenzene (PIL *115 %* *64.4-134*

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**6880**	16.0	11/22/2011	ND	432	108	400	3.64	

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	11/20/2011	ND	217	108	200	6.01	
DRO >C10-C28	**237**	10.0	11/20/2011	ND	188	94.2	200	8.91	

Surrogate: 1-Chlorooctane *81.8 %* *55.5-154*

Surrogate: 1-Chlorooctadecane *110 %* *57.6-158*

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:

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

Received:	11/18/2011	Sampling Date:	11/17/2011
Reported:	11/28/2011	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: CVU #96 SP #4 (H102518-04)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	11/23/2011	ND	2.09	104	2.00	0.977	
Toluene*	<0.050	0.050	11/23/2011	ND	1.98	99.2	2.00	0.795	
Ethylbenzene*	<0.050	0.050	11/23/2011	ND	2.26	113	2.00	0.221	
Total Xylenes*	<0.150	0.150	11/23/2011	ND	6.51	109	6.00	0.0467	

Surrogate: 4-Bromofluorobenzene (PIL *112 %* *64.4-134*

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**4000**	16.0	11/22/2011	ND	432	108	400	3.64	

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	11/20/2011	ND	217	108	200	6.01	
DRO >C10-C28	**56.1**	10.0	11/20/2011	ND	188	94.2	200	8.91	

Surrogate: 1-Chlorooctane *77.6 %* *55.5-154*

Surrogate: 1-Chlorooctadecane *99.7 %* *57.6-158*

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:

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

Received:	11/18/2011	Sampling Date:	11/17/2011
Reported:	11/28/2011	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: CVU #96 SP #5 (H102518-05)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	11/23/2011	ND	2.09	104	2.00	0.977	
Toluene*	<0.050	0.050	11/23/2011	ND	1.98	99.2	2.00	0.795	
Ethylbenzene*	<0.050	0.050	11/23/2011	ND	2.26	113	2.00	0.221	
Total Xylenes*	<0.150	0.150	11/23/2011	ND	6.51	109	6.00	0.0467	

Surrogate: 4-Bromofluorobenzene (PIL *113 %* *64.4-134*

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**1150**	16.0	11/22/2011	ND	432	108	400	3.64	

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	11/21/2011	ND	169	84.4	200	21.3	
DRO >C10-C28	**194**	10.0	11/21/2011	ND	163	81.4	200	9.53	

Surrogate: 1-Chlorooctane *68.4 %* *55.5-154*

Surrogate: 1-Chlorooctadecane *77.3 %* *57.6-158*

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Notes and Definitions

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, 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	TPH	BTEX	Chlorides
H1D2518																	
1	CV4 #96 SP #1	✓	1			✓					✓		11/17/11	17:00	✓	✓	✓
2	CV4 #96 SP #2	✓	1			✓							11/17/11	17:05	✓	✓	✓
3	CV4 #96 SP #3	✓	1			✓							11/17/11	17:06	✓	✓	✓
4	CV4 #96 SP #4	✓	1			✓							11/17/11	17:10	✓	✓	✓
5	CV4 #96 SP #5	✓	1			✓					None		11/17/11	17:15	✓	✓	✓

Relinquished By:	Date: 11/18/11 Time: 12:00	Received By:	Jodi Henson
Relinquished By:	Date: Time:	Received By:	

Phone Result: ☐ Yes ☐ No Add'l Phone #:
Fax Result: ☐ Yes ☐ No Add'l Fax #:
REMARKS: email results to dpag@chevron.com

Delivered By: (Circle One)
Sampler - UPS - Bus - Other: -10°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 14, 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 05/10/13 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

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: 14-Jun-13 11:38

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
VGW U85 - 1 (5')	H301130-01	Soil	09-May-13 14:41	10-May-13 17:00
VGW U85 - 1 (10')	H301130-02	Soil	09-May-13 14:45	10-May-13 17:00
VGW U85 - 1 (15')	H301130-03	Soil	09-May-13 14:47	10-May-13 17:00
VGW U85 - 1 (20')	H301130-04	Soil	09-May-13 14:54	10-May-13 17:00
VGW U85 - 1 (25')	H301130-05	Soil	09-May-13 14:56	10-May-13 17:00
VGW U85 - 1 (30')	H301130-06	Soil	09-May-13 14:58	10-May-13 17:00
VGW U85 - 2 (2')	H301130-07	Soil	09-May-13 15:12	10-May-13 17:00
VGW U85 - 2 (5')	H301130-08	Soil	09-May-13 15:17	10-May-13 17:00
VGW U85 - 2 (10')	H301130-09	Soil	09-May-13 15:21	10-May-13 17:00
VGW U85 - 2 (15')	H301130-10	Soil	09-May-13 15:25	10-May-13 17:00
VGW U85 - 2 (20')	H301130-11	Soil	09-May-13 15:30	10-May-13 17:00
VGW U85 - 2 (25')	H301130-12	Soil	09-May-13 15:37	10-May-13 17:00
VGW U85 - 2 (30')	H301130-13	Soil	09-May-13 15:40	10-May-13 17:00
VGW U85 - 4 (2')	H301130-14	Soil	09-May-13 15:53	10-May-13 17:00
VGW U85 - 4 (5')	H301130-15	Soil	09-May-13 15:57	10-May-13 17:00
VGW U85 - 4 (10')	H301130-16	Soil	09-May-13 16:09	10-May-13 17:00
VGW U85 - 4 15')	H301130-17	Soil	09-May-13 16:18	10-May-13 17:00
VGW U85 - 4 (20')	H301130-18	Soil	09-May-13 16:25	10-May-13 17:00
VGW U85 - 4 (25')	H301130-19	Soil	09-May-13 16:27	10-May-13 17:00
VGW U85 - 4 (30')	H301130-20	Soil	09-May-13 16:30	10-May-13 17:00
VGW U85 - 3 (2')	H301130-21	Soil	09-May-13 16:40	10-May-13 17:00
VGW U85 - 3 (5')	H301130-22	Soil	09-May-13 16:45	10-May-13 17:00
VGW U85 - 3 (10')	H301130-23	Soil	09-May-13 16:48	10-May-13 17:00
VGW U85 - 3 (15')	H301130-24	Soil	09-May-13 16:52	10-May-13 17:00
VGW U85 - 3 (20')	H301130-25	Soil	09-May-13 16:55	10-May-13 17:00
VGW U85 - 3 (25')	H301130-26	Soil	09-May-13 17:05	10-May-13 17:00
CVU 96 - 6 (20')	H301130-40	Soil	08-May-13 16:49	10-May-13 17:00

Cardinal Laboratories

*=Accredited Analyte

Celey D. Keene, Lab Director/Quality Manager

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: 14-Jun-13 11:38

CVU 96 - 6 (25')	H301130-41	Soil	08-May-13 16:50	10-May-13 17:00
VGW U85 - 5 (2')	H301130-42	Soil	09-May-13 18:24	10-May-13 17:00
VGW U85 - 5 (5')	H301130-43	Soil	09-May-13 18:26	10-May-13 17:00
VGW U85 - 5 (10')	H301130-44	Soil	09-May-13 18:30	10-May-13 17:00
VGW U85 - 5 (15')	H301130-45	Soil	09-May-13 18:32	10-May-13 17:00
VGW U85 - 5 (20')	H301130-46	Soil	09-May-13 18:34	10-May-13 17:00
VGW U85 - 5 (25')	H301130-47	Soil	09-May-13 18:37	10-May-13 17:00
VGW U85 - 5 (30')	H301130-48	Soil	09-May-13 18:40	10-May-13 17:00
VGW U85 - 1 (2')	H301130-49	Soil	09-May-13 14:38	10-May-13 17:00
CVU 96 - 6 (2')	H301130-56	Soil	08-May-13 16:43	10-May-13 17:00
CVU 96 - 6 (5')	H301130-57	Soil	08-May-13 16:46	10-May-13 17:00
CVU 96 - 6 (10')	H301130-58	Soil	08-May-13 16:47	10-May-13 17:00
CVU 96 - 6 (15')	H301130-59	Soil	08-May-13 16:48	10-May-13 17:00
CVU 96 - 2 (10')	H301130-60	Soil	08-May-13 14:47	10-May-13 17:00
CVU 96 - 2 (15')	H301130-61	Soil	08-May-13 14:50	10-May-13 17:00
CVU 96 - 2 (20')	H301130-62	Soil	08-May-13 14:54	10-May-13 17:00
CVU 96 - 2 (25')	H301130-63	Soil	08-May-13 14:57	10-May-13 17:00
CVU 96 - 3 (2')	H301130-64	Soil	08-May-13 15:17	10-May-13 17:00
CVU 96 - 3 (5')	H301130-65	Soil	08-May-13 15:22	10-May-13 17:00
CVU 96 - 3 (10')	H301130-66	Soil	08-May-13 15:25	10-May-13 17:00
CVU 96 - 3 (15')	H301130-67	Soil	08-May-13 15:28	10-May-13 17:00
CVU 96 - 3 (20')	H301130-68	Soil	08-May-13 15:31	10-May-13 17:00
CVU 96 - 3 (25')	H301130-69	Soil	08-May-13 15:34	10-May-13 17:00
CVU 96 - 1 (20')	H301130-70	Soil	08-May-13 13:47	10-May-13 17:00
CVU 96 - 1 (25')	H301130-71	Soil	08-May-13 13:50	10-May-13 17:00
CVU 96 - 4 (2')	H301130-72	Soil	08-May-13 14:05	10-May-13 17:00
CVU 96 - 4 (5')	H301130-73	Soil	08-May-13 14:08	10-May-13 17:00
CVU 96 - 4 (10')	H301130-74	Soil	08-May-13 14:13	10-May-13 17:00
CVU 96 - 4 (15')	H301130-75	Soil	08-May-13 14:16	10-May-13 17:00
CVU 96 - 4 (20')	H301130-76	Soil	08-May-13 14:20	10-May-13 17:00

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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: 14-Jun-13 11:38

CVU 96- 4 (25')	H301130-77	Soil	08-May-13 14:23	10-May-13 17:00
CVU 96 - 2 (2')	H301130-78	Soil	08-May-13 14:40	10-May-13 17:00
CVU 96 - 2 (5')	H301130-79	Soil	08-May-13 14:45	10-May-13 17:00
CVU 96 - 7 (2')	H301130-80	Soil	08-May-13 12:32	10-May-13 17:00
CVU 96 - 7 (5')	H301130-81	Soil	08-May-13 12:34	10-May-13 17:00
CVU 96 - 7 (10')	H301130-82	Soil	08-May-13 12:40	10-May-13 17:00
CVU 96 - 7 (15')	H301130-83	Soil	08-May-13 12:43	10-May-13 17:00
CVU 96 - 7 (20')	H301130-84	Soil	08-May-13 12:45	10-May-13 17:00
CVU 96 - 7 (25')	H301130-85	Soil	08-May-13 12:50	10-May-13 17:00
CVU 96 - 1 (2')	H301130-86	Soil	08-May-13 13:34	10-May-13 17:00
CVU 96 - 1 (5')	H301130-87	Soil	08-May-13 13:37	10-May-13 17:00
CVU 96 - 1 (10')	H301130-88	Soil	08-May-13 13:42	10-May-13 17:00
CVU 96 - 1 (15')	H301130-89	Soil	08-May-13 13:44	10-May-13 17:00

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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: 14-Jun-13 11:38

VGW U85 - 1 (5')

H301130-01 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Solids	**94.4**	0.100	%	1	3051504	AP	16-May-13	D2216	
% Moisture	**5.60**	0.100	%	1	3051504	AP	16-May-13	D2216	
Chloride	**368**	16.0	mg/kg	4	3051315	DW	14-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	15.9	mg/kg dry	1	3052203	CK	15-May-13	8015M	
DRO >C10-C28	ND	15.9	mg/kg dry	1	3052203	CK	15-May-13	8015M	
Surrogate: 1-Chlorooctane		*109 %*	*70-130*		*3052203*	CK	*15-May-13*	*8015M*	
Surrogate: o-Terphenyl		*117 %*	*70-130*		*3052203*	CK	*15-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.053	mg/kg dry	50	3051317	AP	15-May-13	8021B	
Toluene*	**0.016**	0.053	mg/kg dry	50	3051317	AP	15-May-13	8021B	J
Ethylbenzene*	ND	0.053	mg/kg dry	50	3051317	AP	15-May-13	8021B	
Total Xylenes*	ND	0.159	mg/kg dry	50	3051317	AP	15-May-13	8021B	
Total BTEX	**0.016**	0.318	mg/kg dry	50	3051317	AP	15-May-13	8021B	J
Surrogate: 4-Bromofluorobenzene (PID)		*109 %*	*89.4-126*		*3051317*	AP	*15-May-13*	*8021B*	

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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: 14-Jun-13 11:38

VGW U85 - 1 (10')

H301130-02 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Moisture	**6.32**	0.100	%	1	3051504	AP	16-May-13	D2216	
% Solids	**93.7**	0.100	%	1	3051504	AP	16-May-13	D2216	
Chloride	**448**	16.0	mg/kg	4	3051315	DW	14-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	16.0	mg/kg dry	1	3052203	CK	15-May-13	8015M	
DRO >C10-C28	ND	16.0	mg/kg dry	1	3052203	CK	15-May-13	8015M	
Surrogate: 1-Chlorooctane		*99.8 %*	*70-130*		*3052203*	CK	*15-May-13*	*8015M*	
Surrogate: o-Terphenyl		*106 %*	*70-130*		*3052203*	CK	*15-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.053	mg/kg dry	50	3051317	AP	15-May-13	8021B	
Toluene*	**0.020**	0.053	mg/kg dry	50	3051317	AP	15-May-13	8021B	J
Ethylbenzene*	ND	0.053	mg/kg dry	50	3051317	AP	15-May-13	8021B	
Total Xylenes*	ND	0.160	mg/kg dry	50	3051317	AP	15-May-13	8021B	
Total BTEX	**0.020**	0.320	mg/kg dry	50	3051317	AP	15-May-13	8021B	J
Surrogate: 4-Bromofluorobenzene (PID)		*109 %*	*89.4-126*		*3051317*	AP	*15-May-13*	*8021B*	

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: 14-Jun-13 11:38

VGW U85 - 1 (15')

H301130-03 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Moisture	**5.91**	0.100	%	1	3051504	AP	16-May-13	D2216	
% Solids	**94.1**	0.100	%	1	3051504	AP	16-May-13	D2216	
Chloride	**544**	16.0	mg/kg	4	3051315	DW	14-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	15.9	mg/kg dry	1	3052203	CK	15-May-13	8015M	
DRO >C10-C28	ND	15.9	mg/kg dry	1	3052203	CK	15-May-13	8015M	
Surrogate: 1-Chlorooctane		*108 %*	*70-130*		*3052203*	CK	*15-May-13*	*8015M*	
Surrogate: o-Terphenyl		*115 %*	*70-130*		*3052203*	CK	*15-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.053	mg/kg dry	50	3051317	AP	15-May-13	8021B	
Toluene*	**0.025**	0.053	mg/kg dry	50	3051317	AP	15-May-13	8021B	J
Ethylbenzene*	ND	0.053	mg/kg dry	50	3051317	AP	15-May-13	8021B	
Total Xylenes*	ND	0.159	mg/kg dry	50	3051317	AP	15-May-13	8021B	
Total BTEX	**0.025**	0.319	mg/kg dry	50	3051317	AP	15-May-13	8021B	J
Surrogate: 4-Bromofluorobenzene (PID)		*109 %*	*89.4-126*		*3051317*	AP	*15-May-13*	*8021B*	

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: 14-Jun-13 11:38

VGW U85 - 1 (20')

H301130-04 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Moisture	**2.17**	0.100	%	1	3051504	AP	16-May-13	D2216	
% Solids	**97.8**	0.100	%	1	3051504	AP	16-May-13	D2216	
Chloride	**112**	16.0	mg/kg	4	3051315	DW	14-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	15.3	mg/kg dry	1	3052203	CK	15-May-13	8015M	
DRO >C10-C28	ND	15.3	mg/kg dry	1	3052203	CK	15-May-13	8015M	
Surrogate: 1-Chlorooctane		*113 %*	*70-130*		*3052203*	CK	*15-May-13*	*8015M*	
Surrogate: o-Terphenyl		*124 %*	*70-130*		*3052203*	CK	*15-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.051	mg/kg dry	50	3051317	AP	15-May-13	8021B	
Toluene*	**0.013**	0.051	mg/kg dry	50	3051317	AP	15-May-13	8021B	J
Ethylbenzene*	ND	0.051	mg/kg dry	50	3051317	AP	15-May-13	8021B	
Total Xylenes*	ND	0.153	mg/kg dry	50	3051317	AP	15-May-13	8021B	
Total BTEX	**0.013**	0.307	mg/kg dry	50	3051317	AP	15-May-13	8021B	J
Surrogate: 4-Bromofluorobenzene (PID)		*110 %*	*89.4-126*		*3051317*	AP	*15-May-13*	*8021B*	

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Celey D. Keene

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: 14-Jun-13 11:38

VGW U85 - 1 (25')

H301130-05 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Moisture	**1.49**	0.100	%	1	3051504	AP	16-May-13	D2216	
% Solids	**98.5**	0.100	%	1	3051504	AP	16-May-13	D2216	
Chloride	**128**	16.0	mg/kg	4	3051315	DW	14-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	15.2	mg/kg dry	1	3052203	CK	15-May-13	8015M	
DRO >C10-C28	ND	15.2	mg/kg dry	1	3052203	CK	15-May-13	8015M	
Surrogate: 1-Chlorooctane		*119 %*	*70-130*		*3052203*	CK	*15-May-13*	*8015M*	
Surrogate: o-Terphenyl		*127 %*	*70-130*		*3052203*	CK	*15-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.051	mg/kg dry	50	3051317	AP	15-May-13	8021B	
Toluene*	**0.022**	0.051	mg/kg dry	50	3051317	AP	15-May-13	8021B	J
Ethylbenzene*	ND	0.051	mg/kg dry	50	3051317	AP	15-May-13	8021B	
Total Xylenes*	ND	0.152	mg/kg dry	50	3051317	AP	15-May-13	8021B	
Total BTEX	**0.022**	0.305	mg/kg dry	50	3051317	AP	15-May-13	8021B	J
Surrogate: 4-Bromofluorobenzene (PID)		*109 %*	*89.4-126*		*3051317*	AP	*15-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: 14-Jun-13 11:38

VGW U85 - 1 (30')

H301130-06 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Moisture	**6.30**	0.100	%	1	3051504	AP	16-May-13	D2216	
% Solids	**93.7**	0.100	%	1	3051504	AP	16-May-13	D2216	
Chloride	**144**	16.0	mg/kg	4	3051315	DW	14-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	16.0	mg/kg dry	1	3052203	CK	15-May-13	8015M	
DRO >C10-C28	ND	16.0	mg/kg dry	1	3052203	CK	15-May-13	8015M	
Surrogate: 1-Chlorooctane		*123 %*	*70-130*		*3052203*	CK	*15-May-13*	*8015M*	
Surrogate: o-Terphenyl		*128 %*	*70-130*		*3052203*	CK	*15-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.053	mg/kg dry	50	3051317	AP	15-May-13	8021B	
Toluene*	**0.027**	0.053	mg/kg dry	50	3051317	AP	15-May-13	8021B	J
Ethylbenzene*	ND	0.053	mg/kg dry	50	3051317	AP	15-May-13	8021B	
Total Xylenes*	ND	0.160	mg/kg dry	50	3051317	AP	15-May-13	8021B	
Total BTEX	**0.027**	0.320	mg/kg dry	50	3051317	AP	15-May-13	8021B	J
Surrogate: 4-Bromofluorobenzene (PID)		*110 %*	*89.4-126*		*3051317*	AP	*15-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: 14-Jun-13 11:38

VGW U85 - 2 (2')

H301130-07 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Moisture	**0.910**	0.100	%	1	3051504	AP	16-May-13	D2216	
% Solids	**99.1**	0.100	%	1	3051504	AP	16-May-13	D2216	
Chloride	ND	16.0	mg/kg	4	3051405	DW	14-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	15.1	mg/kg dry	1	3052203	CK	15-May-13	8015M	
DRO >C10-C28	ND	15.1	mg/kg dry	1	3052203	CK	15-May-13	8015M	
Surrogate: 1-Chlorooctane		*111 %*	*70-130*		*3052203*	CK	*15-May-13*	*8015M*	
Surrogate: o-Terphenyl		*119 %*	*70-130*		*3052203*	CK	*15-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.050	mg/kg dry	50	3051317	AP	15-May-13	8021B	
Toluene*	**0.012**	0.050	mg/kg dry	50	3051317	AP	15-May-13	8021B	J
Ethylbenzene*	ND	0.050	mg/kg dry	50	3051317	AP	15-May-13	8021B	
Total Xylenes*	ND	0.151	mg/kg dry	50	3051317	AP	15-May-13	8021B	
Total BTEX	**0.012**	0.303	mg/kg dry	50	3051317	AP	15-May-13	8021B	J
Surrogate: 4-Bromofluorobenzene (PID)		*110 %*	*89.4-126*		*3051317*	AP	*15-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: 14-Jun-13 11:38

VGW U85 - 2 (5')

H301130-08 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Moisture	**0.870**	0.100	%	1	3051504	AP	16-May-13	D2216	
% Solids	**99.1**	0.100	%	1	3051504	AP	16-May-13	D2216	
Chloride	ND	16.0	mg/kg	4	3051405	DW	14-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	15.1	mg/kg dry	1	3052203	CK	15-May-13	8015M	
DRO >C10-C28	ND	15.1	mg/kg dry	1	3052203	CK	15-May-13	8015M	
Surrogate: 1-Chlorooctane		*107 %*	*70-130*		*3052203*	CK	*15-May-13*	*8015M*	
Surrogate: o-Terphenyl		*114 %*	*70-130*		*3052203*	CK	*15-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.050	mg/kg dry	50	3051317	AP	15-May-13	8021B	
Toluene*	**0.017**	0.050	mg/kg dry	50	3051317	AP	15-May-13	8021B	J
Ethylbenzene*	ND	0.050	mg/kg dry	50	3051317	AP	15-May-13	8021B	
Total Xylenes*	ND	0.151	mg/kg dry	50	3051317	AP	15-May-13	8021B	
Total BTEX	**0.017**	0.303	mg/kg dry	50	3051317	AP	15-May-13	8021B	J
Surrogate: 4-Bromofluorobenzene (PID)		*109 %*	*89.4-126*		*3051317*	AP	*15-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: 14-Jun-13 11:38

VGW U85 - 2 (10')

H301130-09 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Moisture	**4.97**	0.100	%	1	3051504	AP	16-May-13	D2216	
% Solids	**95.0**	0.100	%	1	3051504	AP	16-May-13	D2216	
Chloride	ND	16.0	mg/kg	4	3051405	DW	14-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	15.8	mg/kg dry	1	3052203	CK	15-May-13	8015M	
DRO >C10-C28	ND	15.8	mg/kg dry	1	3052203	CK	15-May-13	8015M	
Surrogate: 1-Chlorooctane		*113 %*	*70-130*		*3052203*	CK	*15-May-13*	*8015M*	
Surrogate: o-Terphenyl		*119 %*	*70-130*		*3052203*	CK	*15-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.053	mg/kg dry	50	3051317	AP	15-May-13	8021B	
Toluene*	**0.022**	0.053	mg/kg dry	50	3051317	AP	15-May-13	8021B	J
Ethylbenzene*	ND	0.053	mg/kg dry	50	3051317	AP	15-May-13	8021B	
Total Xylenes*	ND	0.158	mg/kg dry	50	3051317	AP	15-May-13	8021B	
Total BTEX	**0.022**	0.316	mg/kg dry	50	3051317	AP	15-May-13	8021B	J
Surrogate: 4-Bromofluorobenzene (PID)		*109 %*	*89.4-126*		*3051317*	AP	*15-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: 14-Jun-13 11:38

VGW U85 - 2 (15')

H301130-10 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Moisture	**2.21**	0.100	%	1	3051504	AP	16-May-13	D2216	
% Solids	**97.8**	0.100	%	1	3051504	AP	16-May-13	D2216	
Chloride	ND	16.0	mg/kg	4	3051405	DW	14-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	15.3	mg/kg dry	1	3052203	CK	15-May-13	8015M	
DRO >C10-C28	ND	15.3	mg/kg dry	1	3052203	CK	15-May-13	8015M	
Surrogate: 1-Chlorooctane		*110 %*	*70-130*		*3052203*	CK	*15-May-13*	*8015M*	
Surrogate: o-Terphenyl		*119 %*	*70-130*		*3052203*	CK	*15-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.051	mg/kg dry	50	3051317	AP	15-May-13	8021B	
Toluene*	**0.018**	0.051	mg/kg dry	50	3051317	AP	15-May-13	8021B	J
Ethylbenzene*	ND	0.051	mg/kg dry	50	3051317	AP	15-May-13	8021B	
Total Xylenes*	ND	0.153	mg/kg dry	50	3051317	AP	15-May-13	8021B	
Total BTEX	**0.018**	0.307	mg/kg dry	50	3051317	AP	15-May-13	8021B	J
Surrogate: 4-Bromofluorobenzene (PID)		*109 %*	*89.4-126*		*3051317*	AP	*15-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: 14-Jun-13 11:38

VGW U85 - 2 (20')

H301130-11 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Moisture	**6.80**	0.100	%	1	3051504	AP	16-May-13	D2216	
% Solids	**93.2**	0.100	%	1	3051504	AP	16-May-13	D2216	
Chloride	**48.0**	16.0	mg/kg	4	3051405	DW	14-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	16.1	mg/kg dry	1	3052203	CK	15-May-13	8015M	
DRO >C10-C28	ND	16.1	mg/kg dry	1	3052203	CK	15-May-13	8015M	
Surrogate: 1-Chlorooctane		*115 %*	*70-130*		*3052203*	CK	*15-May-13*	*8015M*	
Surrogate: o-Terphenyl		*120 %*	*70-130*		*3052203*	CK	*15-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.054	mg/kg dry	50	3051317	AP	15-May-13	8021B	
Toluene*	ND	0.054	mg/kg dry	50	3051317	AP	15-May-13	8021B	
Ethylbenzene*	ND	0.054	mg/kg dry	50	3051317	AP	15-May-13	8021B	
Total Xylenes*	ND	0.161	mg/kg dry	50	3051317	AP	15-May-13	8021B	
Total BTEX	**0.009**	0.322	mg/kg dry	50	3051317	AP	15-May-13	8021B	J
Surrogate: 4-Bromofluorobenzene (PID)		*109 %*	*89.4-126*		*3051317*	AP	*15-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: 14-Jun-13 11:38

VGW U85 - 2 (25')

H301130-12 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Moisture	**2.48**	0.100	%	1	3051504	AP	16-May-13	D2216	
% Solids	**97.5**	0.100	%	1	3051504	AP	16-May-13	D2216	
Chloride	ND	16.0	mg/kg	4	3051405	DW	14-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	15.4	mg/kg dry	1	3052203	CK	15-May-13	8015M	
DRO >C10-C28	ND	15.4	mg/kg dry	1	3052203	CK	15-May-13	8015M	
Surrogate: 1-Chlorooctane		*116 %*	*70-130*		*3052203*	CK	*15-May-13*	*8015M*	
Surrogate: o-Terphenyl		*125 %*	*70-130*		*3052203*	CK	*15-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.051	mg/kg dry	50	3051317	AP	15-May-13	8021B	
Toluene*	**0.026**	0.051	mg/kg dry	50	3051317	AP	15-May-13	8021B	J
Ethylbenzene*	ND	0.051	mg/kg dry	50	3051317	AP	15-May-13	8021B	
Total Xylenes*	ND	0.154	mg/kg dry	50	3051317	AP	15-May-13	8021B	
Total BTEX	**0.026**	0.308	mg/kg dry	50	3051317	AP	15-May-13	8021B	J
Surrogate: 4-Bromofluorobenzene (PID)		*111 %*	*89.4-126*		*3051317*	AP	*15-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: 14-Jun-13 11:38

VGW U85 - 2 (30')

H301130-13 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Moisture	**20.5**	0.100	%	1	3051504	AP	16-May-13	D2216	
% Solids	**79.5**	0.100	%	1	3051504	AP	16-May-13	D2216	
Chloride	ND	16.0	mg/kg	4	3051405	DW	14-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	18.9	mg/kg dry	1	3052203	CK	15-May-13	8015M	
DRO >C10-C28	ND	18.9	mg/kg dry	1	3052203	CK	15-May-13	8015M	
Surrogate: 1-Chlorooctane		*120 %*	*70-130*		*3052203*	CK	*15-May-13*	*8015M*	
Surrogate: o-Terphenyl		*127 %*	*70-130*		*3052203*	CK	*15-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.063	mg/kg dry	50	3051317	AP	15-May-13	8021B	
Toluene*	**0.026**	0.063	mg/kg dry	50	3051317	AP	15-May-13	8021B	J
Ethylbenzene*	ND	0.063	mg/kg dry	50	3051317	AP	15-May-13	8021B	
Total Xylenes*	ND	0.189	mg/kg dry	50	3051317	AP	15-May-13	8021B	
Total BTEX	**0.026**	0.378	mg/kg dry	50	3051317	AP	15-May-13	8021B	J
Surrogate: 4-Bromofluorobenzene (PID)		*109 %*	*89.4-126*		*3051317*	AP	*15-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: 14-Jun-13 11:38

VGW U85 - 4 (2')

H301130-14 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Moisture	**8.15**	0.100	%	1	3051504	AP	16-May-13	D2216	
% Solids	**91.8**	0.100	%	1	3051504	AP	16-May-13	D2216	
Chloride	**3800**	16.0	mg/kg	4	3051405	DW	14-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	16.3	mg/kg dry	1	3052203	CK	15-May-13	8015M	
DRO >C10-C28	**461**	16.3	mg/kg dry	1	3052203	CK	15-May-13	8015M	
Surrogate: 1-Chlorooctane		*127 %*	*70-130*		*3052203*	CK	*15-May-13*	*8015M*	
Surrogate: o-Terphenyl		*129 %*	*70-130*		*3052203*	CK	*15-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.054	mg/kg dry	50	3051404	AP	15-May-13	8021B	
Toluene*	**0.017**	0.054	mg/kg dry	50	3051404	AP	15-May-13	8021B	J
Ethylbenzene*	ND	0.054	mg/kg dry	50	3051404	AP	15-May-13	8021B	
Total Xylenes*	ND	0.163	mg/kg dry	50	3051404	AP	15-May-13	8021B	
Total BTEX	**0.017**	0.327	mg/kg dry	50	3051404	AP	15-May-13	8021B	J
Surrogate: 4-Bromofluorobenzene (PID)		*111 %*	*89.4-126*		*3051404*	AP	*15-May-13*	*8021B*	

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: 14-Jun-13 11:38

VGW U85 - 4 (5')

H301130-15 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Moisture	**9.13**	0.100	%	1	3051504	AP	16-May-13	D2216	
% Solids	**90.9**	0.100	%	1	3051504	AP	16-May-13	D2216	
Chloride	**4880**	16.0	mg/kg	4	3051405	DW	14-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	16.5	mg/kg dry	1	3052203	CK	15-May-13	8015M	
DRO >C10-C28	ND	16.5	mg/kg dry	1	3052203	CK	15-May-13	8015M	
Surrogate: 1-Chlorooctane		*120 %*	*70-130*		*3052203*	CK	*15-May-13*	*8015M*	
Surrogate: o-Terphenyl		*128 %*	*70-130*		*3052203*	CK	*15-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.055	mg/kg dry	50	3051404	AP	16-May-13	8021B	
Toluene*	**0.030**	0.055	mg/kg dry	50	3051404	AP	16-May-13	8021B	J
Ethylbenzene*	ND	0.055	mg/kg dry	50	3051404	AP	16-May-13	8021B	
Total Xylenes*	ND	0.165	mg/kg dry	50	3051404	AP	16-May-13	8021B	
Total BTEX	**0.030**	0.330	mg/kg dry	50	3051404	AP	16-May-13	8021B	J
Surrogate: 4-Bromofluorobenzene (PID)		*111 %*	*89.4-126*		*3051404*	AP	*16-May-13*	*8021B*	

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: 14-Jun-13 11:38

VGW U85 - 4 (10')

H301130-16 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Solids	**98.5**	0.100	%	1	3051504	AP	16-May-13	D2216	
% Moisture	**1.54**	0.100	%	1	3051504	AP	16-May-13	D2216	
Chloride	**2000**	16.0	mg/kg	4	3051405	DW	14-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	15.2	mg/kg dry	1	3052203	CK	15-May-13	8015M	
DRO >C10-C28	ND	15.2	mg/kg dry	1	3052203	CK	15-May-13	8015M	
Surrogate: 1-Chlorooctane		*124 %*	*70-130*		*3052203*	CK	*15-May-13*	*8015M*	
Surrogate: o-Terphenyl		*128 %*	*70-130*		*3052203*	CK	*15-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.051	mg/kg dry	50	3051404	AP	16-May-13	8021B	
Toluene*	**0.016**	0.051	mg/kg dry	50	3051404	AP	16-May-13	8021B	J
Ethylbenzene*	ND	0.051	mg/kg dry	50	3051404	AP	16-May-13	8021B	
Total Xylenes*	ND	0.152	mg/kg dry	50	3051404	AP	16-May-13	8021B	
Total BTEX	**0.016**	0.305	mg/kg dry	50	3051404	AP	16-May-13	8021B	J
Surrogate: 4-Bromofluorobenzene (PID)		*112 %*	*89.4-126*		*3051404*	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: 14-Jun-13 11:38

VGW U85 - 4 15')

H301130-17 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Moisture	**1.85**	0.100	%	1	3051504	AP	16-May-13	D2216	
% Solids	**98.2**	0.100	%	1	3051504	AP	16-May-13	D2216	
Chloride	**2120**	16.0	mg/kg	4	3051405	DW	14-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	15.3	mg/kg dry	1	3052203	CK	15-May-13	8015M	
DRO >C10-C28	ND	15.3	mg/kg dry	1	3052203	CK	15-May-13	8015M	
Surrogate: 1-Chlorooctane		*118 %*	*70-130*		*3052203*	CK	*15-May-13*	*8015M*	
Surrogate: o-Terphenyl		*127 %*	*70-130*		*3052203*	CK	*15-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.051	mg/kg dry	50	3051404	AP	16-May-13	8021B	
Toluene*	**0.019**	0.051	mg/kg dry	50	3051404	AP	16-May-13	8021B	J
Ethylbenzene*	ND	0.051	mg/kg dry	50	3051404	AP	16-May-13	8021B	
Total Xylenes*	ND	0.153	mg/kg dry	50	3051404	AP	16-May-13	8021B	
Total BTEX	**0.019**	0.306	mg/kg dry	50	3051404	AP	16-May-13	8021B	J
Surrogate: 4-Bromofluorobenzene (PID)		*111 %*	*89.4-126*		*3051404*	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: 14-Jun-13 11:38

VGW U85 - 4 (20')

H301130-18 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Moisture	**5.50**	0.100	%	1	3051504	AP	16-May-13	D2216	
% Solids	**94.5**	0.100	%	1	3051504	AP	16-May-13	D2216	
Chloride	**2370**	16.0	mg/kg	4	3051405	DW	14-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	15.9	mg/kg dry	1	3052204	CK	16-May-13	8015M	
DRO >C10-C28	ND	15.9	mg/kg dry	1	3052204	CK	16-May-13	8015M	
Surrogate: 1-Chlorooctane		*114 %*	*70-130*		*3052204*	CK	*16-May-13*	*8015M*	
Surrogate: o-Terphenyl		*123 %*	*70-130*		*3052204*	CK	*16-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.053	mg/kg dry	50	3051404	AP	16-May-13	8021B	
Toluene*	**0.024**	0.053	mg/kg dry	50	3051404	AP	16-May-13	8021B	J
Ethylbenzene*	ND	0.053	mg/kg dry	50	3051404	AP	16-May-13	8021B	
Total Xylenes*	ND	0.159	mg/kg dry	50	3051404	AP	16-May-13	8021B	
Total BTEX	**0.024**	0.317	mg/kg dry	50	3051404	AP	16-May-13	8021B	J
Surrogate: 4-Bromofluorobenzene (PID)		*110 %*	*89.4-126*		*3051404*	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: 14-Jun-13 11:38

VGW U85 - 4 (25')

H301130-19 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Moisture	**6.54**	0.100	%	1	3051504	AP	16-May-13	D2216	
% Solids	**93.5**	0.100	%	1	3051504	AP	16-May-13	D2216	
Chloride	**1870**	16.0	mg/kg	4	3051405	DW	14-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	16.0	mg/kg dry	1	3052204	CK	16-May-13	8015M	
DRO >C10-C28	ND	16.0	mg/kg dry	1	3052204	CK	16-May-13	8015M	
Surrogate: 1-Chlorooctane		*126 %*	*70-130*		*3052204*	CK	*16-May-13*	*8015M*	
Surrogate: o-Terphenyl		*123 %*	*70-130*		*3052204*	CK	*16-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.053	mg/kg dry	50	3051404	AP	16-May-13	8021B	
Toluene*	**0.017**	0.053	mg/kg dry	50	3051404	AP	16-May-13	8021B	J
Ethylbenzene*	ND	0.053	mg/kg dry	50	3051404	AP	16-May-13	8021B	
Total Xylenes*	ND	0.160	mg/kg dry	50	3051404	AP	16-May-13	8021B	
Total BTEX	**0.017**	0.321	mg/kg dry	50	3051404	AP	16-May-13	8021B	J
Surrogate: 4-Bromofluorobenzene (PID)		*110 %*	*89.4-126*		*3051404*	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: 14-Jun-13 11:38

VGW U85 - 4 (30')

H301130-20 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Moisture	**21.3**	0.100	%	1	3051504	AP	16-May-13	D2216	
% Solids	**78.7**	0.100	%	1	3051504	AP	16-May-13	D2216	
Chloride	**144**	16.0	mg/kg	4	3051405	DW	14-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	19.1	mg/kg dry	1	3052204	CK	16-May-13	8015M	
DRO >C10-C28	ND	19.1	mg/kg dry	1	3052204	CK	16-May-13	8015M	
Surrogate: 1-Chlorooctane		*114 %*	*70-130*		*3052204*	CK	*16-May-13*	*8015M*	
Surrogate: o-Terphenyl		*123 %*	*70-130*		*3052204*	CK	*16-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.064	mg/kg dry	50	3051404	AP	16-May-13	8021B	
Toluene*	**0.018**	0.064	mg/kg dry	50	3051404	AP	16-May-13	8021B	J
Ethylbenzene*	ND	0.064	mg/kg dry	50	3051404	AP	16-May-13	8021B	
Total Xylenes*	ND	0.191	mg/kg dry	50	3051404	AP	16-May-13	8021B	
Total BTEX	**0.018**	0.381	mg/kg dry	50	3051404	AP	16-May-13	8021B	J
Surrogate: 4-Bromofluorobenzene (PID)		*111 %*	*89.4-126*		*3051404*	AP	*16-May-13*	*8021B*	

Cardinal Laboratories

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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: 14-Jun-13 11:38

VGW U85 - 3 (2')

H301130-21 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Moisture	**2.62**	0.100	%	1	3051505	AP	16-May-13	D2216	
% Solids	**97.4**	0.100	%	1	3051505	AP	16-May-13	D2216	
Chloride	**80.0**	16.0	mg/kg	4	3051405	DW	14-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	15.4	mg/kg dry	1	3052204	CK	16-May-13	8015M	
DRO >C10-C28	ND	15.4	mg/kg dry	1	3052204	CK	16-May-13	8015M	
Surrogate: 1-Chlorooctane		*117 %*	*70-130*		*3052204*	CK	*16-May-13*	*8015M*	
Surrogate: o-Terphenyl		*126 %*	*70-130*		*3052204*	CK	*16-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.051	mg/kg dry	50	3051404	AP	16-May-13	8021B	
Toluene*	**0.017**	0.051	mg/kg dry	50	3051404	AP	16-May-13	8021B	J
Ethylbenzene*	ND	0.051	mg/kg dry	50	3051404	AP	16-May-13	8021B	
Total Xylenes*	ND	0.154	mg/kg dry	50	3051404	AP	16-May-13	8021B	
Total BTEX	**0.017**	0.308	mg/kg dry	50	3051404	AP	16-May-13	8021B	J
Surrogate: 4-Bromofluorobenzene (PID)		*112 %*	*89.4-126*		*3051404*	AP	*16-May-13*	*8021B*	

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Celey D. Keene

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: 14-Jun-13 11:38

VGW U85 - 3 (5')

H301130-22 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Moisture	**3.96**	0.100	%	1	3051505	AP	16-May-13	D2216	
% Solids	**96.0**	0.100	%	1	3051505	AP	16-May-13	D2216	
Chloride	**272**	16.0	mg/kg	4	3051405	DW	14-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	15.6	mg/kg dry	1	3052204	CK	16-May-13	8015M	
DRO >C10-C28	ND	15.6	mg/kg dry	1	3052204	CK	16-May-13	8015M	
Surrogate: 1-Chlorooctane		*119 %*	*70-130*		*3052204*	CK	*16-May-13*	*8015M*	
Surrogate: o-Terphenyl		*128 %*	*70-130*		*3052204*	CK	*16-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.052	mg/kg dry	50	3051404	AP	16-May-13	8021B	
Toluene*	**0.019**	0.052	mg/kg dry	50	3051404	AP	16-May-13	8021B	J
Ethylbenzene*	ND	0.052	mg/kg dry	50	3051404	AP	16-May-13	8021B	
Total Xylenes*	ND	0.156	mg/kg dry	50	3051404	AP	16-May-13	8021B	
Total BTEX	**0.019**	0.312	mg/kg dry	50	3051404	AP	16-May-13	8021B	J
Surrogate: 4-Bromofluorobenzene (PID)		*110 %*	*89.4-126*		*3051404*	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: 14-Jun-13 11:38

VGW U85 - 3 (10')

H301130-23 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Moisture	**5.15**	0.100	%	1	3051505	AP	16-May-13	D2216	
% Solids	**94.8**	0.100	%	1	3051505	AP	16-May-13	D2216	
Chloride	**400**	16.0	mg/kg	4	3051405	DW	14-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	15.8	mg/kg dry	1	3052204	CK	16-May-13	8015M	
DRO >C10-C28	ND	15.8	mg/kg dry	1	3052204	CK	16-May-13	8015M	
Surrogate: 1-Chlorooctane		*96.2 %*	*70-130*		*3052204*	CK	*16-May-13*	*8015M*	
Surrogate: o-Terphenyl		*102 %*	*70-130*		*3052204*	CK	*16-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.053	mg/kg dry	50	3051404	AP	16-May-13	8021B	
Toluene*	**0.016**	0.053	mg/kg dry	50	3051404	AP	16-May-13	8021B	J
Ethylbenzene*	ND	0.053	mg/kg dry	50	3051404	AP	16-May-13	8021B	
Total Xylenes*	ND	0.158	mg/kg dry	50	3051404	AP	16-May-13	8021B	
Total BTEX	**0.016**	0.316	mg/kg dry	50	3051404	AP	16-May-13	8021B	J
Surrogate: 4-Bromofluorobenzene (PID)		*112 %*	*89.4-126*		*3051404*	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: 14-Jun-13 11:38

VGW U85 - 3 (15')

H301130-24 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Moisture	**3.05**	0.100	%	1	3051505	AP	16-May-13	D2216	
% Solids	**97.0**	0.100	%	1	3051505	AP	16-May-13	D2216	
Chloride	**240**	16.0	mg/kg	4	3051405	DW	14-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	15.5	mg/kg dry	1	3052204	CK	16-May-13	8015M	
DRO >C10-C28	ND	15.5	mg/kg dry	1	3052204	CK	16-May-13	8015M	
Surrogate: 1-Chlorooctane		*112 %*	*70-130*		*3052204*	CK	*16-May-13*	*8015M*	
Surrogate: o-Terphenyl		*117 %*	*70-130*		*3052204*	CK	*16-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.052	mg/kg dry	50	3051404	AP	16-May-13	8021B	
Toluene*	**0.034**	0.052	mg/kg dry	50	3051404	AP	16-May-13	8021B	J
Ethylbenzene*	ND	0.052	mg/kg dry	50	3051404	AP	16-May-13	8021B	
Total Xylenes*	ND	0.155	mg/kg dry	50	3051404	AP	16-May-13	8021B	
Total BTEX	**0.034**	0.309	mg/kg dry	50	3051404	AP	16-May-13	8021B	J
Surrogate: 4-Bromofluorobenzene (PID)		*112 %*	*89.4-126*		*3051404*	AP	*16-May-13*	*8021B*	

Cardinal Laboratories

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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: 14-Jun-13 11:38

VGW U85 - 3 (20')

H301130-25 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Moisture	**4.97**	0.100	%	1	3051505	AP	16-May-13	D2216	
% Solids	**95.0**	0.100	%	1	3051505	AP	16-May-13	D2216	
Chloride	**272**	16.0	mg/kg	4	3051405	DW	14-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	15.8	mg/kg dry	1	3052204	CK	16-May-13	8015M	
DRO >C10-C28	ND	15.8	mg/kg dry	1	3052204	CK	16-May-13	8015M	
Surrogate: 1-Chlorooctane		*125 %*	*70-130*		*3052204*	CK	*16-May-13*	*8015M*	
Surrogate: o-Terphenyl		*130 %*	*70-130*		*3052204*	CK	*16-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.053	mg/kg dry	50	3051404	AP	16-May-13	8021B	
Toluene*	**0.020**	0.053	mg/kg dry	50	3051404	AP	16-May-13	8021B	J
Ethylbenzene*	ND	0.053	mg/kg dry	50	3051404	AP	16-May-13	8021B	
Total Xylenes*	ND	0.158	mg/kg dry	50	3051404	AP	16-May-13	8021B	
Total BTEX	**0.020**	0.316	mg/kg dry	50	3051404	AP	16-May-13	8021B	J
Surrogate: 4-Bromofluorobenzene (PID)		*112 %*	*89.4-126*		*3051404*	AP	*16-May-13*	*8021B*	

Cardinal Laboratories

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Celey D. Keene, Lab Director/Quality Manager

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: 14-Jun-13 11:38

VGW U85 - 3 (25')

H301130-26 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Moisture	**2.94**	0.100	%	1	3051505	AP	16-May-13	D2216	
% Solids	**97.1**	0.100	%	1	3051505	AP	16-May-13	D2216	
Chloride	**192**	16.0	mg/kg	4	3051405	DW	14-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	15.5	mg/kg dry	1	3052204	CK	16-May-13	8015M	
DRO >C10-C28	ND	15.5	mg/kg dry	1	3052204	CK	16-May-13	8015M	
Surrogate: 1-Chlorooctane		*123 %*	*70-130*		*3052204*	CK	*16-May-13*	*8015M*	
Surrogate: o-Terphenyl		*123 %*	*70-130*		*3052204*	CK	*16-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.052	mg/kg dry	50	3051404	AP	16-May-13	8021B	
Toluene*	**0.015**	0.052	mg/kg dry	50	3051404	AP	16-May-13	8021B	J
Ethylbenzene*	ND	0.052	mg/kg dry	50	3051404	AP	16-May-13	8021B	
Total Xylenes*	ND	0.155	mg/kg dry	50	3051404	AP	16-May-13	8021B	
Total BTEX	**0.015**	0.309	mg/kg dry	50	3051404	AP	16-May-13	8021B	J
Surrogate: 4-Bromofluorobenzene (PID)		*111 %*	*89.4-126*		*3051404*	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: 14-Jun-13 11:38

CVU 96 - 6 (20')

H301130-40 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
Chloride	**304**	16.0	mg/kg	4	3060505	DW	05-Jun-13	4500-Cl-B	

Celey D. Keene

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: 14-Jun-13 11:38

CVU 96 - 6 (25')

H301130-41 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
Chloride	**304**	16.0	mg/kg	4	3060505	DW	05-Jun-13	4500-Cl-B	

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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: 14-Jun-13 11:38

VGW U85 - 5 (2')

H301130-42 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
Chloride	**2560**	16.0	mg/kg	4	3061104	DW	11-Jun-13	4500-Cl-B	I-02

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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: 14-Jun-13 11:38

VGW U85 - 5 (5')

H301130-43 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
Chloride	**816**	16.0	mg/kg	4	3061104	DW	11-Jun-13	4500-Cl-B	I-02

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: 14-Jun-13 11:38

VGW U85 - 5 (10')

H301130-44 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
Chloride	**96.0**	16.0	mg/kg	4	3061104	DW	11-Jun-13	4500-Cl-B	I-02

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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: 14-Jun-13 11:38

VGW U85 - 5 (15')

H301130-45 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
Chloride	**256**	16.0	mg/kg	4	3061104	DW	11-Jun-13	4500-Cl-B	I-02

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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: 14-Jun-13 11:38

VGW U85 - 5 (20')

H301130-46 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
Chloride	**64.0**	16.0	mg/kg	4	3061104	DW	11-Jun-13	4500-Cl-B	I-02

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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: 14-Jun-13 11:38

VGW U85 - 5 (25')

H301130-47 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
Chloride	**32.0**	16.0	mg/kg	4	3061104	DW	11-Jun-13	4500-Cl-B	I-02

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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: 14-Jun-13 11:38

VGW U85 - 5 (30')

H301130-48 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
Chloride	**64.0**	16.0	mg/kg	4	3061104	DW	11-Jun-13	4500-Cl-B	I-02

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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: 14-Jun-13 11:38

VGW U85 - 1 (2')

H301130-49 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
% Moisture	**4.76**	0.100	%	1	3052209	AP	22-May-13	D2216	
% Solids	**95.8**	0.100	%	1	3052209	AP	22-May-13	D2216	
Chloride	**976**	16.0	mg/kg	4	3052208	DW	22-May-13	4500-Cl-B	
Organic Compounds									**SUB-PBE**
GRO C6-C10	ND	15.7	mg/kg dry	1	3052204	CK	16-May-13	8015M	
DRO >C10-C28	ND	15.7	mg/kg dry	1	3052204	CK	16-May-13	8015M	
Surrogate: 1-Chlorooctane		*121 %*	*70-130*		*3052204*	CK	*16-May-13*	*8015M*	
Surrogate: o-Terphenyl		*124 %*	*70-130*		*3052204*	CK	*16-May-13*	*8015M*	
Volatile Organic Compounds by EPA Method 8021									
Benzene*	ND	0.052	mg/kg dry	50	3052013	AP	22-May-13	8021B	
Toluene*	**0.013**	0.052	mg/kg dry	50	3052013	AP	22-May-13	8021B	J
Ethylbenzene*	ND	0.052	mg/kg dry	50	3052013	AP	22-May-13	8021B	
Total Xylenes*	ND	0.157	mg/kg dry	50	3052013	AP	22-May-13	8021B	
Total BTEX	**0.013**	0.313	mg/kg dry	50	3052013	AP	22-May-13	8021B	J
Surrogate: 4-Bromofluorobenzene (PID)		*114 %*	*89.4-126*		*3052013*	AP	*22-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: 14-Jun-13 11:38

CVU 96 - 6 (2')

H301130-56 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
Chloride	**80.0**	16.0	mg/kg	4	3060507	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: 14-Jun-13 11:38

CVU 96 - 6 (5')

H301130-57 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
Chloride	**48.0**	16.0	mg/kg	4	3060507	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: 14-Jun-13 11:38

CVU 96 - 6 (10')

H301130-58 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
Chloride	**272**	16.0	mg/kg	4	3060507	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: 14-Jun-13 11:38

CVU 96 - 6 (15')

H301130-59 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
Chloride	**352**	16.0	mg/kg	4	3060507	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: 14-Jun-13 11:38

CVU 96 - 2 (10')

H301130-60 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
Chloride	ND	16.0	mg/kg	4	3051406	DW	14-May-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: 14-Jun-13 11:38

CVU 96 - 2 (15')

H301130-61 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
Chloride	ND	16.0	mg/kg	4	3051406	DW	14-May-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: 14-Jun-13 11:38

CVU 96 - 2 (20')

H301130-62 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
Chloride	ND	16.0	mg/kg	4	3051406	DW	14-May-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: 14-Jun-13 11:38

CVU 96 - 2 (25')

H301130-63 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
Chloride	ND	16.0	mg/kg	4	3051406	DW	14-May-13	4500-Cl-B	

Celey D. Keene

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: 14-Jun-13 11:38

CVU 96 - 3 (2')

H301130-64 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
Chloride	**320**	16.0	mg/kg	4	3051406	DW	14-May-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: 14-Jun-13 11:38

CVU 96 - 3 (5')

H301130-65 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
Chloride	**208**	16.0	mg/kg	4	3051406	DW	14-May-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: 14-Jun-13 11:38

CVU 96 - 3 (10')

H301130-66 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
Chloride	**144**	16.0	mg/kg	4	3051406	DW	14-May-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: 14-Jun-13 11:38

CVU 96 - 3 (15')

H301130-67 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
Chloride	**64.0**	16.0	mg/kg	4	3051406	DW	14-May-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: 14-Jun-13 11:38

CVU 96 - 3 (20')

H301130-68 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
Chloride	**96.0**	16.0	mg/kg	4	3051406	DW	14-May-13	4500-Cl-B	

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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: 14-Jun-13 11:38

CVU 96 - 3 (25')

H301130-69 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
Chloride	**128**	16.0	mg/kg	4	3051406	DW	14-May-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: 14-Jun-13 11:38

CVU 96 - 1 (20')

H301130-70 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
Chloride	**560**	16.0	mg/kg	4	3051406	DW	14-May-13	4500-Cl-B	

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: 14-Jun-13 11:38

CVU 96 - 1 (25')

H301130-71 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
Chloride	**720**	16.0	mg/kg	4	3051406	DW	14-May-13	4500-Cl-B	

Celey D. Keene

Celey D. Keene, Lab Director/Quality Manager

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: 14-Jun-13 11:38

CVU 96 - 4 (2')

H301130-72 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
Chloride	**80.0**	16.0	mg/kg	4	3051406	DW	14-May-13	4500-Cl-B	

Cardinal Laboratories

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Celey D. Keene

Celey D. Keene, Lab Director/Quality Manager

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: 14-Jun-13 11:38

CVU 96 - 4 (5')

H301130-73 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
Chloride	**48.0**	16.0	mg/kg	4	3051406	DW	14-May-13	4500-Cl-B	

Celey D. Keene

Celey D. Keene, Lab Director/Quality Manager

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: 14-Jun-13 11:38

CVU 96 - 4 (10')

H301130-74 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
Chloride	**48.0**	16.0	mg/kg	4	3051406	DW	14-May-13	4500-Cl-B	

Cardinal Laboratories

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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: 14-Jun-13 11:38

CVU 96 - 4 (15')

H301130-75 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
Chloride	**32.0**	16.0	mg/kg	4	3051406	DW	14-May-13	4500-Cl-B	

Celey D. Keene

Celey D. Keene, Lab Director/Quality Manager

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: 14-Jun-13 11:38

CVU 96 - 4 (20')

H301130-76 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
Chloride	**64.0**	16.0	mg/kg	4	3051406	DW	14-May-13	4500-Cl-B	

Cardinal Laboratories

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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: 14-Jun-13 11:38

CVU 96- 4 (25')

H301130-77 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
Chloride	**64.0**	16.0	mg/kg	4	3051406	DW	14-May-13	4500-Cl-B	

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: 14-Jun-13 11:38

CVU 96 - 2 (2')

H301130-78 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
Chloride	**32.0**	16.0	mg/kg	4	3051406	DW	14-May-13	4500-Cl-B	

Cardinal Laboratories

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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: 14-Jun-13 11:38

CVU 96 - 2 (5')

H301130-79 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
Chloride	ND	16.0	mg/kg	4	3051406	DW	14-May-13	4500-Cl-B	

Celey D. Keene

Celey D. Keene, Lab Director/Quality Manager

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: 14-Jun-13 11:38

CVU 96 - 7 (2')

H301130-80 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
Chloride	**320**	16.0	mg/kg	4	3060507	DW	05-Jun-13	4500-Cl-B	

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: 14-Jun-13 11:38

CVU 96 - 7 (5')

H301130-81 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
Chloride	**304**	16.0	mg/kg	4	3060507	DW	05-Jun-13	4500-Cl-B	

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: 14-Jun-13 11:38

CVU 96 - 7 (10')

H301130-82 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
Chloride	**240**	16.0	mg/kg	4	3060507	DW	05-Jun-13	4500-Cl-B	

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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: 14-Jun-13 11:38

CVU 96 - 7 (15')

H301130-83 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
Chloride	**128**	16.0	mg/kg	4	3060507	DW	05-Jun-13	4500-Cl-B	

Celey D. Keene

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: 14-Jun-13 11:38

CVU 96 - 7 (20')

H301130-84 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
Chloride	**160**	16.0	mg/kg	4	3060507	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: 14-Jun-13 11:38

CVU 96 - 7 (25')

H301130-85 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
Chloride	**224**	16.0	mg/kg	4	3060507	DW	05-Jun-13	4500-Cl-B	

Celey D. Keene

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: 14-Jun-13 11:38

CVU 96 - 1 (2')

H301130-86 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
Chloride	**496**	16.0	mg/kg	4	3051407	DW	14-May-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: 14-Jun-13 11:38

CVU 96 - 1 (5')

H301130-87 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
Chloride	**144**	16.0	mg/kg	4	3051407	DW	14-May-13	4500-Cl-B	

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: 14-Jun-13 11:38

CVU 96 - 1 (10')

H301130-88 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
Chloride	**336**	16.0	mg/kg	4	3051407	DW	14-May-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: 14-Jun-13 11:38

CVU 96 - 1 (15')

H301130-89 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories									
Inorganic Compounds									
Chloride	**656**	16.0	mg/kg	4	3051407	DW	14-May-13	4500-Cl-B	

Celey D. Keene

Celey D. Keene, Lab Director/Quality Manager

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: 14-Jun-13 11:38

Inorganic Compounds - Quality Control

Cardinal Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 3051315 - 1:4 DI Water										
Blank (3051315-BLK1)				Prepared & Analyzed: 13-May-13						
Chloride	ND	16.0	mg/kg							
LCS (3051315-BS1)				Prepared & Analyzed: 13-May-13						
Chloride	416	16.0	mg/kg	400		104	80-120			
LCS Dup (3051315-BSD1)				Prepared & Analyzed: 13-May-13						
Chloride	416	16.0	mg/kg	400		104	80-120	0.00	20	
Duplicate (3051315-DUP1)		**Source: H301122-02**		Prepared & Analyzed: 13-May-13						
Chloride	4120	16.0	mg/kg		4320			4.74	20	
Matrix Spike (3051315-MS1)		**Source: H301122-02**		Prepared & Analyzed: 13-May-13						
Chloride	4880	16.0	mg/kg	400	4320	140	80-120			QM-07
Batch 3051405 - 1:4 DI Water										
Blank (3051405-BLK1)				Prepared & Analyzed: 14-May-13						
Chloride	ND	16.0	mg/kg							
LCS (3051405-BS1)				Prepared & Analyzed: 14-May-13						
Chloride	432	16.0	mg/kg	400		108	80-120			
LCS Dup (3051405-BSD1)				Prepared & Analyzed: 14-May-13						
Chloride	432	16.0	mg/kg	400		108	80-120	0.00	20	
Duplicate (3051405-DUP1)		**Source: H301130-07**		Prepared & Analyzed: 14-May-13						
Chloride	32.0	16.0	mg/kg		0.00			200	20	QR-03

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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: 14-Jun-13 11:38

Inorganic Compounds - Quality Control

Cardinal Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 3051405 - 1:4 DI Water										
Matrix Spike (3051405-MS1)	**Source: H301130-07**			Prepared & Analyzed: 14-May-13						
Chloride	432	16.0	mg/kg	400	0.00	108	80-120			
Batch 3051406 - 1:4 DI Water										
Blank (3051406-BLK1)				Prepared & Analyzed: 14-May-13						
Chloride	ND	16.0	mg/kg							
LCS (3051406-BS1)				Prepared & Analyzed: 14-May-13						
Chloride	448	16.0	mg/kg	400		112	80-120			
LCS Dup (3051406-BSD1)				Prepared & Analyzed: 14-May-13						
Chloride	432	16.0	mg/kg	400		108	80-120	3.64	20	
Duplicate (3051406-DUP1)	**Source: H301130-60**			Prepared & Analyzed: 14-May-13						
Chloride	ND	16.0	mg/kg		0.00				20	
Matrix Spike (3051406-MS1)	**Source: H301130-60**			Prepared & Analyzed: 14-May-13						
Chloride	400	16.0	mg/kg	400	0.00	100	80-120			
Batch 3051407 - 1:4 DI Water										
Blank (3051407-BLK1)				Prepared & Analyzed: 14-May-13						
Chloride	ND	16.0	mg/kg							
LCS (3051407-BS1)				Prepared & Analyzed: 14-May-13						
Chloride	432	16.0	mg/kg	400		108	80-120			

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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: 14-Jun-13 11:38

Inorganic Compounds - Quality Control

Cardinal Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 3051407 - 1:4 DI Water										
LCS Dup (3051407-BSD1)				Prepared & Analyzed: 14-May-13						
Chloride	432	16.0	mg/kg	400		108	80-120	0.00	20	
Duplicate (3051407-DUP1)		**Source: H301130-86**		Prepared & Analyzed: 14-May-13						
Chloride	480	16.0	mg/kg		496			3.28	20	
Matrix Spike (3051407-MS1)		**Source: H301130-86**		Prepared & Analyzed: 14-May-13						
Chloride	896	16.0	mg/kg	400	496	100	80-120			
Batch 3051504 - General Prep - Wet Chem										
Blank (3051504-BLK1)				Prepared: 15-May-13 Analyzed: 16-May-13						
% Solids	100	0.100	%							
% Moisture	ND	0.100	%							
Duplicate (3051504-DUP1)		**Source: H301130-01**		Prepared: 15-May-13 Analyzed: 16-May-13						
% Moisture	6.25	0.100	%		5.60			11.0	20	
% Solids	93.8	0.100	%		94.4			0.691	20	
Batch 3051505 - General Prep - Wet Chem										
Blank (3051505-BLK1)				Prepared: 15-May-13 Analyzed: 16-May-13						
% Solids	100	0.100	%							
% Moisture	ND	0.100	%							
Duplicate (3051505-DUP1)		**Source: H301130-21**		Prepared: 15-May-13 Analyzed: 16-May-13						
% Solids	97.2	0.100	%		97.4			0.195	20	
% Moisture	2.81	0.100	%		2.62			7.00	20	

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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: 14-Jun-13 11:38

Inorganic Compounds - Quality Control

Cardinal Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 3052208 - 1:4 DI Water										
Blank (3052208-BLK1)				Prepared & Analyzed: 22-May-13						
Chloride	ND	16.0	mg/kg							
LCS (3052208-BS1)				Prepared & Analyzed: 22-May-13						
Chloride	432	16.0	mg/kg	400		108	80-120			
LCS Dup (3052208-BSD1)				Prepared & Analyzed: 22-May-13						
Chloride	416	16.0	mg/kg	400		104	80-120	3.77	20	
Duplicate (3052208-DUP1)		**Source: H301220-34**		Prepared & Analyzed: 22-May-13						
Chloride	720	16.0	mg/kg		736			2.20	20	
Matrix Spike (3052208-MS1)		**Source: H301220-34**		Prepared & Analyzed: 22-May-13						
Chloride	1060	16.0	mg/kg	400	736	80.0	80-120			
Batch 3052209 - General Prep - Wet Chem										
Blank (3052209-BLK1)				Prepared & Analyzed: 22-May-13						
% Moisture	ND	0.100	%							
% Solids	100	0.100	%							
Duplicate (3052209-DUP1)		**Source: H301130-49**		Prepared & Analyzed: 22-May-13						
% Moisture	4.23	0.100	%		4.76			11.8	20	
% Solids	95.2	0.100	%		95.8			0.555	20	
Batch 3060505 - 1:4 DI Water										
Blank (3060505-BLK1)				Prepared & Analyzed: 05-Jun-13						
Chloride	ND	16.0	mg/kg							

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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: 14-Jun-13 11:38

Inorganic Compounds - Quality Control

Cardinal Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 3060505 - 1:4 DI Water										
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
Batch 3060507 - 1:4 DI Water										
Blank (3060507-BLK1)				Prepared & Analyzed: 05-Jun-13						
Chloride	ND	16.0	mg/kg							
LCS (3060507-BS1)				Prepared & Analyzed: 05-Jun-13						
Chloride	416	16.0	mg/kg	400		104	80-120			
LCS Dup (3060507-BSD1)				Prepared & Analyzed: 05-Jun-13						
Chloride	432	16.0	mg/kg	400		108	80-120	3.77	20	
Duplicate (3060507-DUP1)	**Source: H301130-56**			Prepared & Analyzed: 05-Jun-13						
Chloride	80.0	16.0	mg/kg		80.0			0.00	20	
Matrix Spike (3060507-MS1)	**Source: H301130-56**			Prepared & Analyzed: 05-Jun-13						
Chloride	432	16.0	mg/kg	400	80.0	88.0	80-120			

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: 14-Jun-13 11:38

Inorganic Compounds - Quality Control

Cardinal Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 3061104 - 1:4 DI Water										
Blank (3061104-BLK1)				Prepared & Analyzed: 11-Jun-13						
Chloride	ND	16.0	mg/kg							
LCS (3061104-BS1)				Prepared & Analyzed: 11-Jun-13						
Chloride	416	16.0	mg/kg	400		104	80-120			
LCS Dup (3061104-BSD1)				Prepared & Analyzed: 11-Jun-13						
Chloride	416	16.0	mg/kg	400		104	80-120	0.00	20	
Duplicate (3061104-DUP1)		**Source: H301330-04**		Prepared & Analyzed: 11-Jun-13						
Chloride	ND	16.0	mg/kg		0.00				20	
Matrix Spike (3061104-MS1)		**Source: H301330-04**		Prepared & Analyzed: 11-Jun-13						
Chloride	432	16.0	mg/kg	400	0.00	108	80-120			

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Celey D. Keene, Lab Director/Quality Manager

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: 14-Jun-13 11:38

Organic Compounds - Quality Control

Cardinal Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 3052203 - General Prep										
Blank (3052203-BLK1)				Prepared & Analyzed: 15-May-13						
GRO C6-C10	ND	15.0	mg/kg wet							
DRO >C10-C28	ND	15.0	mg/kg wet							
Surrogate: 1-Chlorooctane	*83.8*		mg/kg	*100*		*83.8*	*70-130*			
Surrogate: o-Terphenyl	*40.4*		mg/kg	*50.0*		*80.8*	*70-130*			
LCS (3052203-BS1)				Prepared & Analyzed: 15-May-13						
GRO C6-C10	1060	15.0	mg/kg wet	1000		106	75-125			
DRO >C10-C28	1100	15.0	mg/kg wet	1000		110	75-125			
Surrogate: 1-Chlorooctane	*103*		mg/kg	*100*		*103*	*70-130*			
Surrogate: o-Terphenyl	*47.0*		mg/kg	*50.0*		*94.0*	*70-130*			
LCS Dup (3052203-BSD1)				Prepared & Analyzed: 15-May-13						
GRO C6-C10	1040	15.0	mg/kg wet	1000		104	75-125	1.90	20	
DRO >C10-C28	1160	15.0	mg/kg wet	1000		116	75-125	5.31	20	
Surrogate: 1-Chlorooctane	*111*		mg/kg	*100*		*111*	*70-130*			
Surrogate: o-Terphenyl	*49.4*		mg/kg	*50.0*		*98.8*	*70-130*			
Matrix Spike (3052203-MS1)		**Source: H301130-17**		Prepared & Analyzed: 15-May-13						
GRO C6-C10	1020	15.3	mg/kg dry	1020	ND	100	75-125			
DRO >C10-C28	1130	15.3	mg/kg dry	1020	ND	111	75-125			
Surrogate: 1-Chlorooctane	*117*		mg/kg	*100*		*117*	*70-130*			
Surrogate: o-Terphenyl	*56.6*		mg/kg	*50.0*		*113*	*70-130*			
Matrix Spike Dup (3052203-MSD1)		**Source: H301130-17**		Prepared & Analyzed: 15-May-13						
GRO C6-C10	1080	15.3	mg/kg dry	1020	ND	106	75-125	5.83	20	
DRO >C10-C28	1130	15.3	mg/kg dry	1020	ND	111	75-125	0.00	20	
Surrogate: 1-Chlorooctane	*122*		mg/kg	*100*		*122*	*70-130*			
Surrogate: o-Terphenyl	*59.5*		mg/kg	*50.0*		*119*	*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: 14-Jun-13 11:38

Organic Compounds - Quality Control

Cardinal Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 3052204 - General Prep										
Blank (3052204-BLK1)				Prepared: 15-May-13 Analyzed: 16-May-13						
GRO C6-C10	ND	15.0	mg/kg wet							
DRO >C10-C28	ND	15.0	mg/kg wet							
Surrogate: 1-Chlorooctane	*126*		mg/kg	*100*		*126*	*70-130*			
Surrogate: o-Terphenyl	*61.4*		mg/kg	*50.0*		*123*	*70-130*			
LCS (3052204-BS1)				Prepared: 15-May-13 Analyzed: 16-May-13						
GRO C6-C10	1150	15.0	mg/kg wet	1000		115	75-125			
DRO >C10-C28	1040	15.0	mg/kg wet	1000		104	75-125			
Surrogate: 1-Chlorooctane	*125*		mg/kg	*100*		*125*	*70-130*			
Surrogate: o-Terphenyl	*58.4*		mg/kg	*50.0*		*117*	*70-130*			
LCS Dup (3052204-BSD1)				Prepared: 15-May-13 Analyzed: 16-May-13						
GRO C6-C10	1190	15.0	mg/kg wet	1000		119	75-125	3.42	20	
DRO >C10-C28	1180	15.0	mg/kg wet	1000		118	75-125	12.6	20	
Surrogate: 1-Chlorooctane	*124*		mg/kg	*100*		*124*	*70-130*			
Surrogate: o-Terphenyl	*62.3*		mg/kg	*50.0*		*125*	*70-130*			
Matrix Spike (3052204-MS1)		**Source: H301130-49**		Prepared: 15-May-13 Analyzed: 16-May-13						
GRO C6-C10	1000	15.7	mg/kg dry	1040	ND	95.8	75-125			
DRO >C10-C28	908	15.7	mg/kg dry	1040	ND	87.0	75-125			
Surrogate: 1-Chlorooctane	*111*		mg/kg	*100*		*111*	*70-130*			
Surrogate: o-Terphenyl	*47.9*		mg/kg	*50.0*		*95.8*	*70-130*			
Matrix Spike Dup (3052204-MSD1)		**Source: H301130-49**		Prepared: 15-May-13 Analyzed: 16-May-13						
GRO C6-C10	1020	15.7	mg/kg dry	1040	ND	97.6	75-125	1.86	20	
DRO >C10-C28	955	15.7	mg/kg dry	1040	ND	91.5	75-125	5.04	20	
Surrogate: 1-Chlorooctane	*110*		mg/kg	*100*		*110*	*70-130*			
Surrogate: o-Terphenyl	*49.3*		mg/kg	*50.0*		*98.6*	*70-130*			

Cardinal Laboratories

*=Accredited Analyte

Celey D. Keene, Lab Director/Quality Manager

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: 14-Jun-13 11:38

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 3051317 - Volatiles										
Blank (3051317-BLK1)				Prepared: 13-May-13 Analyzed: 15-May-13						
Benzene	ND	0.050	mg/kg wet							
Toluene	0.011	0.050	mg/kg wet							J
Ethylbenzene	ND	0.050	mg/kg wet							
Total Xylenes	ND	0.150	mg/kg wet							
Total BTEX	0.011	0.300	mg/kg wet							J
Surrogate: 4-Bromofluorobenzene (PID)	*0.0543*		mg/kg wet	*0.0500*		*109*	*89.4-126*			
LCS (3051317-BS1)				Prepared: 13-May-13 Analyzed: 15-May-13						
Benzene	2.03	0.050	mg/kg wet	2.00		101	76.4-135			
Toluene	1.84	0.050	mg/kg wet	2.00		92.2	80.2-135			
Ethylbenzene	1.98	0.050	mg/kg wet	2.00		99.1	78.5-133			
Total Xylenes	5.91	0.150	mg/kg wet	6.00		98.5	80.1-135			
Surrogate: 4-Bromofluorobenzene (PID)	*0.0534*		mg/kg wet	*0.0500*		*107*	*89.4-126*			
LCS Dup (3051317-BSD1)				Prepared: 13-May-13 Analyzed: 15-May-13						
Benzene	2.16	0.050	mg/kg wet	2.00		108	76.4-135	6.60	16.4	
Toluene	1.96	0.050	mg/kg wet	2.00		98.1	80.2-135	6.17	16.6	
Ethylbenzene	2.09	0.050	mg/kg wet	2.00		104	78.5-133	5.16	16.1	
Total Xylenes	6.24	0.150	mg/kg wet	6.00		104	80.1-135	5.31	15.8	
Surrogate: 4-Bromofluorobenzene (PID)	*0.0529*		mg/kg wet	*0.0500*		*106*	*89.4-126*			
Batch 3051404 - Volatiles										
Blank (3051404-BLK1)				Prepared: 14-May-13 Analyzed: 15-May-13						
Benzene	ND	0.050	mg/kg wet							
Toluene	0.012	0.050	mg/kg wet							J
Ethylbenzene	ND	0.050	mg/kg wet							
Total Xylenes	ND	0.150	mg/kg wet							
Total BTEX	0.012	0.300	mg/kg wet							J
Surrogate: 4-Bromofluorobenzene (PID)	*0.0546*		mg/kg wet	*0.0500*		*109*	*89.4-126*			

Cardinal Laboratories

*=Accredited Analyte

Celey D. Keene, Lab Director/Quality Manager

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: 14-Jun-13 11:38

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 3051404 - Volatiles										
LCS (3051404-BS1)				Prepared: 14-May-13 Analyzed: 15-May-13						
Benzene	1.96	0.050	mg/kg wet	2.00		97.9	76.4-135			
Toluene	1.77	0.050	mg/kg wet	2.00		88.3	80.2-135			
Ethylbenzene	1.89	0.050	mg/kg wet	2.00		94.4	78.5-133			
Total Xylenes	5.53	0.150	mg/kg wet	6.00		92.2	80.1-135			
Surrogate: 4-Bromofluorobenzene (PID)	*0.0535*		mg/kg wet	*0.0500*		*107*	*89.4-126*			
LCS Dup (3051404-BSD1)				Prepared: 14-May-13 Analyzed: 15-May-13						
Benzene	2.11	0.050	mg/kg wet	2.00		105	76.4-135	7.34	16.4	
Toluene	1.89	0.050	mg/kg wet	2.00		94.6	80.2-135	6.90	16.6	
Ethylbenzene	2.02	0.050	mg/kg wet	2.00		101	78.5-133	6.95	16.1	
Total Xylenes	5.86	0.150	mg/kg wet	6.00		97.7	80.1-135	5.87	15.8	
Surrogate: 4-Bromofluorobenzene (PID)	*0.0538*		mg/kg wet	*0.0500*		*108*	*89.4-126*			
Batch 3052013 - Volatiles										
Blank (3052013-BLK1)				Prepared: 20-May-13 Analyzed: 22-May-13						
Benzene	ND	0.050	mg/kg wet							
Toluene	ND	0.050	mg/kg wet							
Ethylbenzene	ND	0.050	mg/kg wet							
Total Xylenes	ND	0.150	mg/kg wet							
Total BTEX	ND	0.300	mg/kg wet							
Surrogate: 4-Bromofluorobenzene (PID)	*0.0569*		mg/kg wet	*0.0500*		*114*	*89.4-126*			
LCS (3052013-BS1)				Prepared: 20-May-13 Analyzed: 22-May-13						
Benzene	2.28	0.050	mg/kg wet	2.00		114	76.4-135			
Toluene	2.05	0.050	mg/kg wet	2.00		103	80.2-135			
Ethylbenzene	2.22	0.050	mg/kg wet	2.00		111	78.5-133			
Total Xylenes	6.42	0.150	mg/kg wet	6.00		107	80.1-135			
Surrogate: 4-Bromofluorobenzene (PID)	*0.0550*		mg/kg wet	*0.0500*		*110*	*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: 14-Jun-13 11:38

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 3052013 - Volatiles										
LCS Dup (3052013-BSD1)	Prepared: 20-May-13 Analyzed: 22-May-13									
Benzene	2.37	0.050	mg/kg wet	2.00		118	76.4-135	3.54	16.4	
Toluene	2.12	0.050	mg/kg wet	2.00		106	80.2-135	3.17	16.6	
Ethylbenzene	2.28	0.050	mg/kg wet	2.00		114	78.5-133	2.97	16.1	
Total Xylenes	6.61	0.150	mg/kg wet	6.00		110	80.1-135	2.81	15.8	
Surrogate: 4-Bromofluorobenzene (PID)	*0.0552*		mg/kg wet	*0.0500*		*110*	*89.4-126*			

Cardinal Laboratories

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Celey D. Keene, Lab Director/Quality Manager

Notes and Definitions

SUB-PBE	Analysis subcontracted to Permian Basin Environmental Lab, NELAP accreditation # T104704156-12-1.
QR-03	The RPD value for the sample duplicate or MS/MSD was outside if QC acceptance limits due to matrix interference. QC batch accepted based on LCS and/or LCSD recovery and/or RPD values.
QM-07	The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS recovery.
J	Detected but below the Reporting Limit; therefore, result is an estimated concentration (CLP J-Flag).
I-02	This result was analyzed outside of the EPA recommended holding time.
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
Project Manager:	Jonathan Olsen
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: Water	SAMPLING: DATE	TIME	Moisture & Chloride (EPA 300.1)	TPH 8015 & BTEX 8021B
H301130																
1	VGW U85-1 (5')	X	2			X						X	5-9-13	1441	1	1
2	VGW U85-1 (10')	X	2			X						X	5-9-13	1445	1	1
3	VGW U85-1 (15')	X	2			X						X	5-9-13	1447	1	1
4	VGW U85-1 (20')	X	2			X						X	5-9-13	1454	1	1
5	VGW U85-1 (25')	X	2			X						X	5-9-13	1456	1	1
6	VGW U85-1 (30')	X	2			X						X	5-9-13	1458	1	1
7	VGW U85-2 (2')	X	2			X						X	5-9-13	1512	1	1
8	VGW U85-2 (5')	X	2			X						X	5-9-13	1517	1	1
9	VGW U85-2 (10')	X	2			X						X	5-9-13	1521	1	1
10	VGW U85-2 (15')	X	2			X						X	5-9-13	1525	1	1

Relinquished By:	Date: 5-10-13	Received By: Jodi Henson	
Relinquished By:	Time: 1700	Received By:	
	Date:		
	Time:		

Delivered By: (Circle One)
Sampler - UPS - Bus - Other: 2°C

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

CHECKED BY: (Initials)

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

† 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 #:	B004866.0000 Project Owner: Chevron
Project Name:	Chevron Buckeye
Project Location:	Buckeye Oilfield
Sampler Name:	Ryan Nunn

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	TIME	Methane + Chlorides + Sulfate 300.1	TPH 8015 + BTEX 8021B
H301130																
11	VGWU85-2(20')	G	2			X						X	5-9-13	1530	1	1
12	VGWU85-2(25')	G	2			X						X	5-9-13	1537	1	1
13	VGWU85-2(30')	G	2			X						X	5-9-13	1540	1	1
14	VGWU85-4(2')	G	2			X						X	5-9-13	1553	1	1
15	VGWU85-4(5')	G	2			X						X	5-9-13	1557	1	1
16	VGWU85-4(10')	G	2			X						X	5-9-13	1609	1	1
17	VGWU85-4(15')	G	2			X						X	5-9-13	1618	1	1
18	VGWU85-4(20')	G	2			X						X	5-9-13	1625	1	1
19	VGWU85-4(25')	G	2			X						X	5-9-13	1627	1	1
20	VGWU85-4(30')	G	2			X						X	5-9-13	1630	1	1

Relinquished By:	Date: 5-10-13	Received By: Jodi Hensen	Phone Result: ☐ Yes ☒ No Add'l Phone #:
	Time: 1700		Fax Result: ☐ Yes ☐ No Add'l Fax #:
Relinquished By:	Date:	Received By:	REMARKS:
	Time:		
Delivered By: (Circle One) Sampler - UPS - Bus - Other:	2°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., 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 Nunn

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:	SAMPLING: DATE	TIME	Metals: As, Ba, Cd, Cr, Pb, Se, Hg 6010.1	TPH 8015 & BTEX 8021B		Hold								
H301130																									
21	VGWU85-3(2')	6	2			X						X	4-9-13	1640	1	1									
22	VGWU85-3(5')	6	2			X						X	4-9-13	1645	1	1									
23	VGWU85-3(10')	6	2			X						X	4-9-13	1648	1	1									
24	VGWU85-3(15')	6	2			X						X	4-9-13	1652	1	1									
25	VGWU85-3(20')	6	2			X						X	4-9-13	1655	1	1									
26	VGWU85-3(25')	6	2			X						X	4-9-13	1705	1	1									
27	VGWU85-7(2')	6	2			X						X	4-9-13	1713	1	1		X							
28	VGWU85-7(5')	6	2			X						X	4-9-13	1717	1	1		X							
29	VGWU85-7(10')	6	2			X						X	4-9-13	1722	1	1		X							
30	VGWU85-7(15')	6	2			X						X	4-9-13	1726	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: 5-10-13	Received By: Jodi Henson	
Relinquished By:	Time: 1700	Received By:	
	Date:		
	Time:		

Delivered By: (Circle One)
Sampler - UPS - Bus - Other: 2°

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

CHECKED BY: (Initials)

Phone Result: ☐ Yes ☑ No Add'l Phone #:
Fax Result: ☑ Yes ☐ No Add'l Fax #:
REMARKS:
Hold VGWU85-7 samples

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

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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:	SAMPLING DATE	SAMPLING TIME	Moisture + Chlorides 300.1	TPH 8015 + BTEX 8021B	Hold									
H301130																										
31	VGWU 85-7(20')	6	2			X						X	4-9-13	1730	1	1		X								
32	VGWU 85-7(25')	6	2			X						X	4-9-13	1735	1	1		X								
33	VGWU 85-7(30')	6	2			X						X	4-9-13	1738	1	1		X								
34	VGWU 85-6(2')	6	2			X						X	4-9-13	1750	1	1		X								
35	VGWU 85-6(5')	6	2			X						X	4-9-13	1755	1	1		X								
36	VGWU 85-6(10')	6	2			X						X	4-9-13	1759	1	1		X								
37	VGWU 85-6(15')	6	2			X						X	4-9-13	1803	1	1		X								
38	VGWU 85-6(20')	6	2			X						X	4-9-13	1806	1	1		X								
39	VGWU 85-6(25')	6	2			X						X	4-9-13	1810	1	1		X								
~~40~~																										

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: 4-10-13	Received By: Jodi Henson	
Relinquished By:	Time: 1700	Received By:	
	Date:		
	Time:		

Delivered By: (Circle One)
Sampler - UPS - Bus - Other: 2°C

Sample Condition: Cool: Yes / No; Intact: Yes / No

CHECKED BY: (Initials)

Phone Result: ☐ Yes ☑ No Add'l Phone #:
Fax Result: ☐ Yes ☐ No Add'l Fax #:
REMARKS: Hold VGWU 85-7, VGWU 85-6 Samples

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

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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., Suite 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:	Ryan Harvey	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	Moisture, Chloride, TPH 8015 & BTEX 8021B			TPH 8015									
H301130																										
40	CVU 96-6 (20')	G	1			X						X	5-8-13	1649	1			X		Cl- added 5/31/13						
41	CVU 96-6 (25')	G	1			X						X	5-8-13	1650	1			X								
42	VGWU 85-5 (2')	G	2			X						X	5-9-13	1824	1	1		X			Cr added 6/10/13					
43	VGWU 85-5 (5')	G	2			X						X	5-9-13	1826	1	1		X								
44	VGWU 85-5 (10')	G	2			X						X	5-9-13	1830	1	1		X								
45	VGWU 85-5 (15')	G	2			X						X	5-9-13	1832	1	1		X								
46	VGWU 85-5 (20')	G	2			X						X	5-9-13	1834	1	1		X								
47	VGWU 85-5 (25')	G	2			X						X	5-9-13	1837	1	1		X								
48	VGWU 85-5 (30')	G	2			X						X	5-9-13	1840	1	1		X								
49	VGWU 85-1 (2')	G	2			X						X	5-9-13	1438	1	1		X								

Relinquished By:	Date: 5-10-13	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 VGWU 85-5 samples	
	Time:		Hold CVU 96-6 Samples	
Delivered By: (Circle One) Sampler - UPS - Bus - Other:	2°	Sample Condition Cool: ☑ Yes ☐ No Intact: ☐ Yes ☐ No	CHECKED BY: (Initials)	

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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: Ryan Kenny		Fax #:	

FOR LAB USE ONLY				MATRIX							PRESERV.			SAMPLING		ANALYSIS REQUEST												
Lab I.D.	Sample I.D.	(G)RAB OR (C)OMP	# CONTAINERS	GROUNDWATER	WASTEWATER	SOIL	OIL	SLUDGE	OTHER:	ACID/BASE	ICE / COOL	OTHER:	DATE	TIME	Moisture & Chlorides USEPA 300.1		TPH		Cl- added 5/31/13										
H301130																												
50	CVU96-5 (2')	G	1			X						X	5-8-13	1550	1		X		X									
51	CVU96-5 (5')	G	1			X						X	5-8-13	1555	1		X		X									
52	CVU96-5 (10')	G	1			X						X	5-8-13	1558	1		X		X									
53	CVU96-5 (15')	G	1			X						X	5-8-13	1603	1		X		X									
54	CVU96-5 (20')	G	1			X						X	5-8-13	1610	1		X		X									
55	CVU96-5 (25')	G	1			X						X	5-8-13	1617	1		X		X									
56	CVU96-6 (2')	G	1			X						X	5-8-13	1643	1		X		X									
57	CVU96-6 (5')	G	1			X						X	5-8-13	1646	1		X		X									
58	CVU96-6 (10')	G	1			X						X	5-8-13	1647	1		X		X									
59	CVU96-6 (15')	G	1			X						X	5-8-13	1648	1		X		X									

Relinquished By:	Date: 5-10-13	Received By: Jodi Henson	Phone Result: ☐ Yes ☑ No	Add'l Phone #:
	Time: 1700		Fax Result: ☐ Yes ☐ No	Add'l Fax #:
Relinquished By:	Date:	Received By:	REMARKS: Hold CVU96-5 & CVU96-6 Samples per 5-10-13	
	Time:			
Delivered By: (Circle One) Sampler - UPS - Bus - Other:		Sample Condition Cool: ☑ Yes ☐ No Intact: ☑ Yes ☐ No	CHECKED BY: (Initials)	

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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:	Ryan Kenney	Fax #:	

ANALYSIS REQUEST: Moisture + Chlorides USEPA 300.1

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	Moisture + Chlorides USEPA 300.1
H301130															
60	CVU96-2(10')	G	1			X						X	5-8-13	1447	1
61	CVU96-2(15')	G	1			X						X	5-8-13	1450	1
62	CVU96-2(20')	G	1			X						X	5-8-13	1454	1
63	CVU96-2(25')	G	1			X						X	5-8-13	1457	1
64	CVU96-3(2')	G	1			X						X	5-8-13	1517	1
65	CVU96-3(5')	G	1			X						X	5-8-13	1522	1
66	CVU96-3(10')	G	1			X						X	5-8-13	1525	1
67	CVU96-3(15')	G	1			X						X	5-8-13	1528	1
68	CVU96-3(20')	G	1			X						X	5-8-13	1531	1
69	CVU96-3(25')	G	1			X						X	5-8-13	1534	1

Relinquished By:	Date: 5-10-13 Time: 1700	Received By:	Jodi Henson
Relinquished By:	Date: Time:	Received By:	
Delivered By: (Circle One) Sampler - UPS - Bus - Other:	2° C	Sample Condition: Cool: Yes / No; Intact: Yes / No	CHECKED BY: (Initials)

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

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

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CARDINAL Laboratories

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(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:	Ryan Nanny	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: Na2S2O3	SAMPLING DATE	SAMPLING TIME	ANALYSIS REQUEST: Moisture & Chlorides (EPA 300.1)
H30113O															
70	CVU96-1(20')	G	1			X						X	5-8-13	1347	1
71	CVU96-1(25')	G	1			X						X	5-8-13	1350	1
72	CVU96-4(2')	G	1			X						X	5-8-13	1405	1
73	CVU96-4(5')	G	1			X						X	5-8-13	1408	1
74	CVU96-4(10')	G	1			X						X	5-8-13	1413	1
75	CVU96-4(15')	G	1			X						X	5-8-13	1416	1
76	CVU96-4(20')	G	1			X						X	5-8-13	1420	1
77	CVU96-4(25')	G	1			X						X	5-8-13	1423	1
78	CVU96-2(2')	G	1			X						X	5-8-13	1440	1
79	CVU96-2(5')	G	1			X						X	5-8-13	1445	1

Relinquished By:	Date: 5-10-13	Received By: Jodi Henson	Phone Result:	☐ Yes	☑ No
Relinquished By:	Time: 1700	Received By:	Fax Result:	☑ Yes	☐ No
	Date:		REMARKS:		
	Time:				

Delivered By: (Circle One)	Sample Condition	CHECKED BY: (Initials)
Sampler - UPS - Bus - Other: 2°C	Cool: ☑ Yes ☐ No Intact: ☑ Yes ☐ No	

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

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	Moisture & Chlorides used for Rec.		HOLD		Cl- added 5/31/13							
80	CVU96-7(2')	6	1			X						X	5-8-13	1232	1		X		X							
81	CVU96-7(5')	6	1			X						X	5-8-13	1234	1		X		X							
82	CVU96-7(10')	6	1			X						X	5-8-13	1240	1		X		X							
83	CVU96-7(15')	6	1			X						X	5-8-13	1243	1		X		X							
84	CVU96-7(20')	6	1			X						X	5-8-13	1245	1		X		X							
85	CVU96-7(25')	6	1			X						X	5-8-13	1250	1		X		X							
86	CVU96-1(2')	6	1			X						X	5-8-13	1334	1											
87	CVU96-1(5')	6	1			X						X	5-8-13	1337	1											
88	CVU96-1(10')	6	1			X						X	5-8-13	1342	1											
89	CVU96-1(15')	6	1			X						X	5-8-13	1344	1											

Relinquished By:	Date: 5-10-13	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 CVU96-7 Samples	
	Time:			
Delivered By: (Circle One) Sampler - UPS - Bus - Other:	Sample Condition Cool: ☑ Yes ☐ No Intact: ☑ Yes ☐ No	CHECKED BY: (Initials)		

20c

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

#54

ARCADIS

Attachment 6

Boring Logs (October 2013)

Date Start/Finish: 5/8/2013
Drilling Company: White Drilling/R Dallas

Drilling Method: Air Rotary
Sampling Method: Shovel

Borehole Depth: 25' bgs
Descriptions By: R Nanny

Well/Boring ID: **CVU96 - 01**

Client: Chevron EMC
Location: Central Vacuum Unit 96

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description
0	0	1	DP	3	15.6	☒		SANDY CALICHE, Very Pale Brown (10YR8/2), firm, arenaceous, broken up due to trucks, mostly caliche, some sand, very fine to fine grained, trace medium grains, subangular, poorly sorted, slightly moist.
5	-5	2	AR	5	9.7	☒		CALCAREOUS SANDSTONE, White (2.5YR8/1), firm, moderately cemented, part caliche and part sand, very fine to fine grained, subangular, poorly sorted, dry.
10	-10	3	AR	10	13.0	☒		CALCAREOUS SAND, White (2.5YR8/1), fine grained, subangular to subrounded, poorly sorted, loose, mostly sand, some caliche matrix, soft, powdery, slight moisture. Formation contains thin 0.3 inch to 0.5 inch calcareous sandstone, interbeds Pale Yellow (2.5YR8/2), fine grained, subangular to subrounded, poorly sorted, friable to slightly indurated, dry.
15	-15	4	AR		11.1	☒		
20	-20	5	AR	7	13.0	☒		SAND, Pale Yellow (2.5YR8/3), fine grained, subrounded, moderately sorted, loose, slight moisture.
25	-25				11.4	☒		

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; DP = Direct Push

Date Start/Finish: 5/8/2013
Drilling Company: White Drilling/R Dallas

Drilling Method: Air Rotary
Sampling Method: Shovel

Borehole Depth: 25' bgs
Descriptions By: R Nanny

Well/Boring ID: CVU96 - 02

Client: Chevron EMC
Location: Central Vacuum Unit 96

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description
0	0							SANDY CLAY (Topsoil), Yellowish Brown (10YR5/4), firm, friable, 70% clay, 30% sand, very fine to fine grained, subangular, poorly sorted, dry.
		1	DP	3	10.9	☒		SANDY CALICHE, Very Pale Brown (10YR8/2), soft arenaceous, broken up due to traffic, 70% caliche, 30% sand, very fine to fine grained, trace medium grains in sample, subangular, poorly sorted, loose, slightly moist.
5	-5		AR	5	7.9	☒		CALCAREOUS SANDSTONE, White (2.5YR8/1), firm, moderately cemented to indurated, dry, 50% caliche, 50% sand, very fine to fine grained, subangular, poorly sorted, dry.
		2	AR		3.3	☒		SAND, White (2.5YR8/1), fine grained, subangular to subrounded, poorly to moderately sorted, loose, 85% sand, 15% caliche matrix. Formation contains trace sandstone, White (2.5YR8/1), firmly cemented, friable, calcareous, thin interbeds 0.3 inch to 0.5 inch in thickness throughout formation.
10	-10							
		3	AR	10				
15	-15				8.7	☒		
		4	AR					
20	-20				7.5	☒		SAND, Pale Yellow (2.5YR8/3), fine grained, subangular to subrounded, moderately sorted, loose, slight calcareous, slight moisture, slightly calcareous.
		5	AR	7				
25	-25				7.5	☒		SAND, Pale Yellow (2.5YR7/4), fine grained, subrounded, moderately to well sorted, loose, slightly moist.

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; DP = Direct Push;

Date Start/Finish: 5/8/2013
Drilling Company: White Drilling/R Dallas

Drilling Method: Air Rotary
Sampling Method: Shovel

Borehole Depth: 25' bgs
Descriptions By: R Nanny

Well/Boring ID: CVU96 - 03

Client: Chevron EMC
Location: Central Vacuum Unit 96

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description
0	0		DP	1.5	11.9			SANDY CLAY (Topsoil), Yellowish Brown (10YR5/4), firm, friable, 70% clay, 30% sand, very fine to fine grained, subangular, poorly sorted, dry.
		1		1.5		☒		SANDY CALICHE, Very Pale Brown (10YR8/2), soft arenaceous, broken up due to traffic, 70% caliche, 30% sand, very fine to fine grained, trace medium grains in sample, subangular, poorly sorted, loose, slightly moist.
5	-5		AR		9.2	☒		CALCAREOUS SANDSTONE, White (2.5YR8/1), firm, moderately cemented to indurated, 50% caliche, 50% sand, very fine to fine grained, subangular, poorly sorted, dry.
		2	AR					
10	-10			15	6.2	☒		
		3	AR					
15	-15				10.1	☒		Very Pale Brown (2.5YR8/2), sand increasing with depth.
		4	AR					
20	-20				14.6	☒		SAND, Pale Yellow (2.5YR8/3), fine grained, subangular to subrounded, moderately sorted, loose, slightly calcareous, slightly moist.
		5	AR	6				
25	-25				14.3	☒		SAND, Pale Yellow (2.5YR7/4), fine grained, subrounded, moderately sorted, loose, slight moisture.

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; DP = Direct Push

Date Start/Finish: 5/8/2013
Drilling Company: White Drilling/R Dallas

Drilling Method: Air Rotary
Sampling Method: Shovel

Borehole Depth: 25' bgs
Descriptions By: R Nanny

Well/Boring ID: **CVU96 - 04**

Client: Chevron EMC
Location: Central Vacuum Unit 96

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description
0	0		DP	1.5	12.1	☒		SANDY CLAY (Topsoil), Yellowish Brown (10YR5/4), firm, friable, 70% clay, 30% sand, very fine to fine grained, trace medium grains, subangular, poorly sorted, dry.
		1	AR	1.5		☒		SANDY CALICHE, Very Pale Brown (10YR8/2), soft, arenaceous, broken up due to traffic, 70% caliche, 30% sand, very fine to fine grained, trace medium grains, subangular, poorly sorted, loose, slightly moist.
5	-5				15.8			
		2	AR	15	7.6	☒		CALCAREOUS SANDSTONE, White (2.5YR8/1), very fine to fine grained, subangular, poorly sorted, weakly cemented, friable, dry. 60% sand, 40% caliche matrix.
10	-10							
		3	AR		7.8	☒		Firm to slightly indurated, dry.
15	-15							
		4	AR	6	12.7	☒		SAND, Pale Yellow (2.5YR8/3), fine grained, subangular to subrounded, moderately sorted, loose, slightly calcareous, slightly moist.
20	-20							
		5	AR		9.9	☒		SAND, at 25 feet bgs, Pale Yellow (2.5YR7/4), fine grained, subrounded, moderately sorted, loose, slight moisture.
25	-25							

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; DP = Direct Push;

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Date Start/Finish: 5/8/2013
Drilling Company: White Drilling/R Dallas

Drilling Method: Air Rotary
Sampling Method: Shovel

Borehole Depth: 25' bgs
Descriptions By: R Nanny

Well/Boring ID: CVU96 - 06

Client: Chevron EMC
Location: Central Vacuum Unit 96

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description
0	0							SANDY CLAY (Topsoil), Yellowish Brown (10YR5/4), firm, friable, very fine to fine grained, subangular, poorly sorted, dry.
			DP	2	8.6	☒		SANDY CALICHE, Very Pale Brown (10YR8/2), soft, arenaceous, broken up due to trucks, very fine to fine grained, subangular, poorly sorted, loose, slightly moist.
		1	AR	5				CALCAREOUS SANDSTONE, White (2.5YR8/1), 50% caliche, 50% sand, firm, moderately cemented to indurated, very fine to fine grained, subangular, poorly sorted, dry.
5	-5				10.8	☒		
		2	AR	5				CALCAREOUS SANDSTONE, White (2.5YR8/1), 70% sand, 30% caliche, fine grained, subangular to subrounded, poorly sorted, loose, soft, powdery, mostly dry with slight moisture. Formation contains sandstone, White (2.5YR8/1), same description as formation, firmly cemented, thin interbeds, 0.3 inch to 0.5 inch thickness throughout formation.
10	-10				9.7	☒		
		3	AR	5				
15	-15				12.2	☒		Interbeds beginning, 0.3 inch to 0.5 inch thickness throughout formation.
		4	AR	5				SAND, Pale Yellow (2.5YR8/3), fine grained, subrounded, moderately sorted, loose, slightly calcareous, slight moisture. SAND, Pale Yellow (2.5YR7/4), fine grained, subrounded, moderately to well sorted, loose, slightly moist at 25 feet bgs.
20	-20				7.0	☒		
		5	AR	5				
25	-25				6.5	☒		

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; DP = Direct Push

Date Start/Finish: 5/8/2013
Drilling Company: White Drilling/R Dallas

Drilling Method: Air Rotary
Sampling Method: Shovel

Borehole Depth: 25' bgs
Descriptions By: R Nanny

Well/Boring ID: **CVU96 - 07**

Client: Chevron EMC
Location: Central Vacuum Unit 96

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description
0	0	1	DP	2	0.5	☒		SANDY CALICHE, Very Pale Brown (10YR8/2), 70% caliche, 30% sand, firm, arenaceous, broken up due to trucks, very fine to fine grained, trace medium grains, subangular, poorly sorted, dry.
5	-5	2	AR	5	0.4	☒		CALCAREOUS SANDSTONE, White (2.5YR8/1), 60% caliche, 40% sand, firm, moderately cemented with indurated zones, dry, powdery, very fine to fine grained, subangular, poorly sorted, dry.
10	-10	3	AR	5	6.7	☒		CALCAREOUS SANDSTONE, White (2.5YR8/1), fine grained, subangular to subrounded, poorly sorted, loose, soft, powdery, slight moisture. Formation contains thin 0.3 inch to 0.5 inch calcareous sandstone interbeds, Pale Yellow (2.5YR8/2), fine grained, subangular to subrounded, poorly sorted, friable to slightly indurated, dry.
15	-15	4	AR	5	8.1	☒		
20	-20	5	AR	5	7.5	☒		SAND, Pale Yellow (2.5YR8/3), fine grained with trace medium grains, subrounded, poorly sorted, loose, slight moisture.
25	-25				8.5	☒		

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; DP = Direct Push

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Attachment 7

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

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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.

United States Environmental Protection Agency. 1996. A Subtitle D Landfill Application Manual for the Multimedia Exposure Assessment Model (MULTIMED 2.0). Final Report.

Van Genuchten, M, Th., and P.J. Wierenga. 1976. Mass Transfer Studies in Sorbing Porous Media I. Analytical Solutions. Soil Science Society of America Proceedings. v 40, 473-480.

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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)

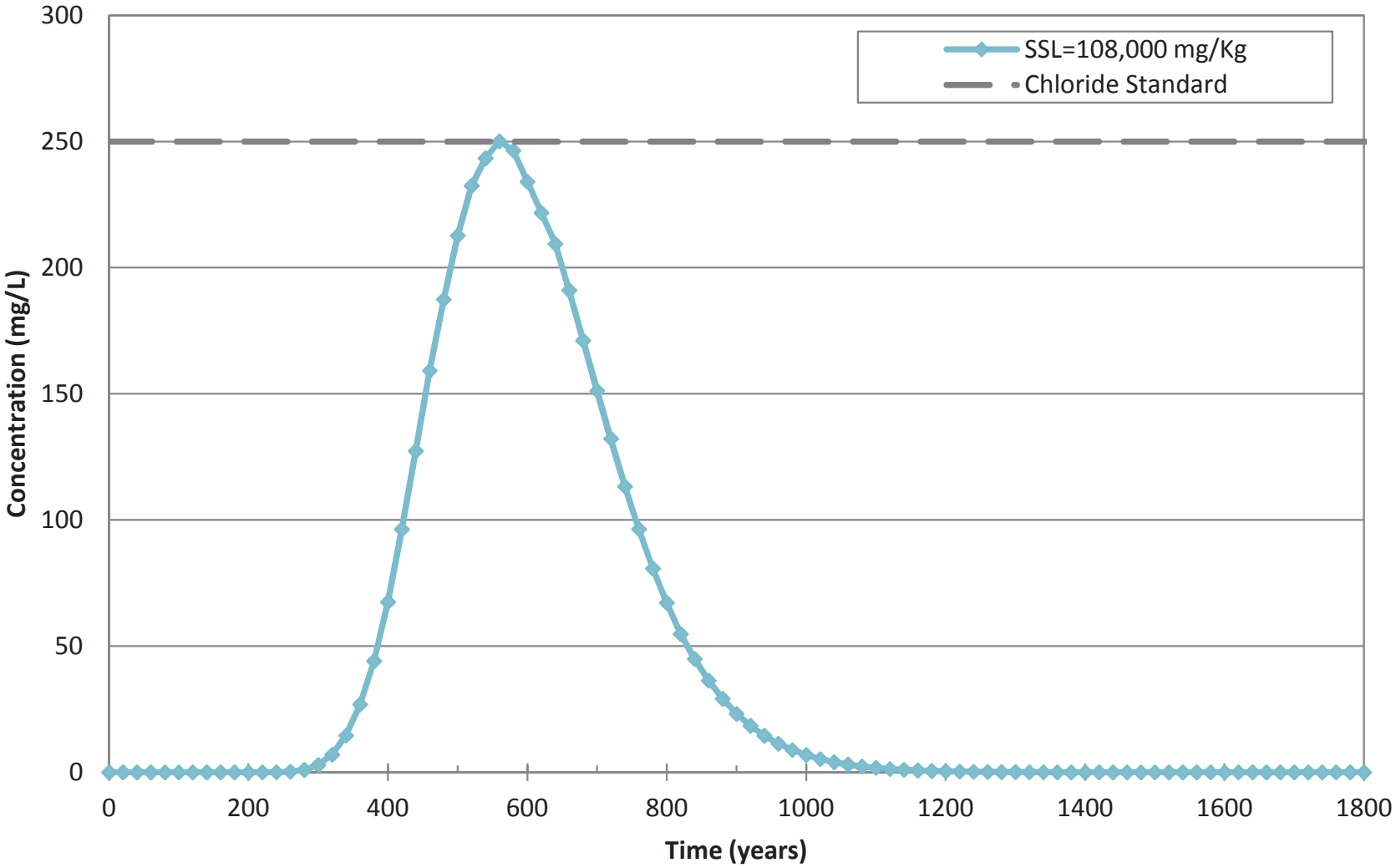

Figure 2
MULTIMED Simulated Chloride Concentration Vs Time in Groundwater
(Source = 20m, Chloride 0-1m, & Depth to Groundwater = 30.5m)

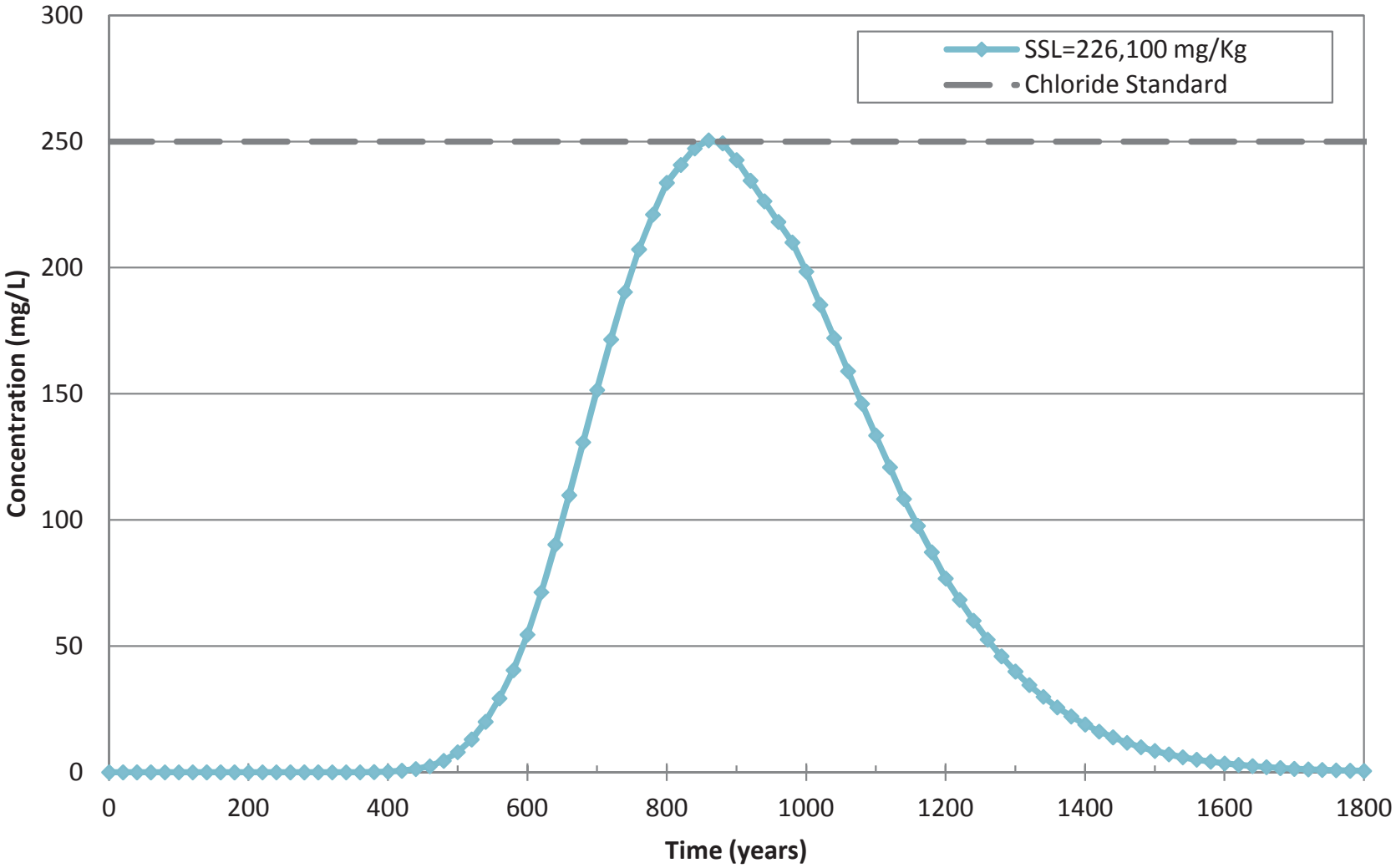

Figure 3
MULTIMED Simulated Chloride Concentration Vs Time in Groundwater
(Source = 20m, Chloride 0-3m, & Depth to Groundwater = 20m)

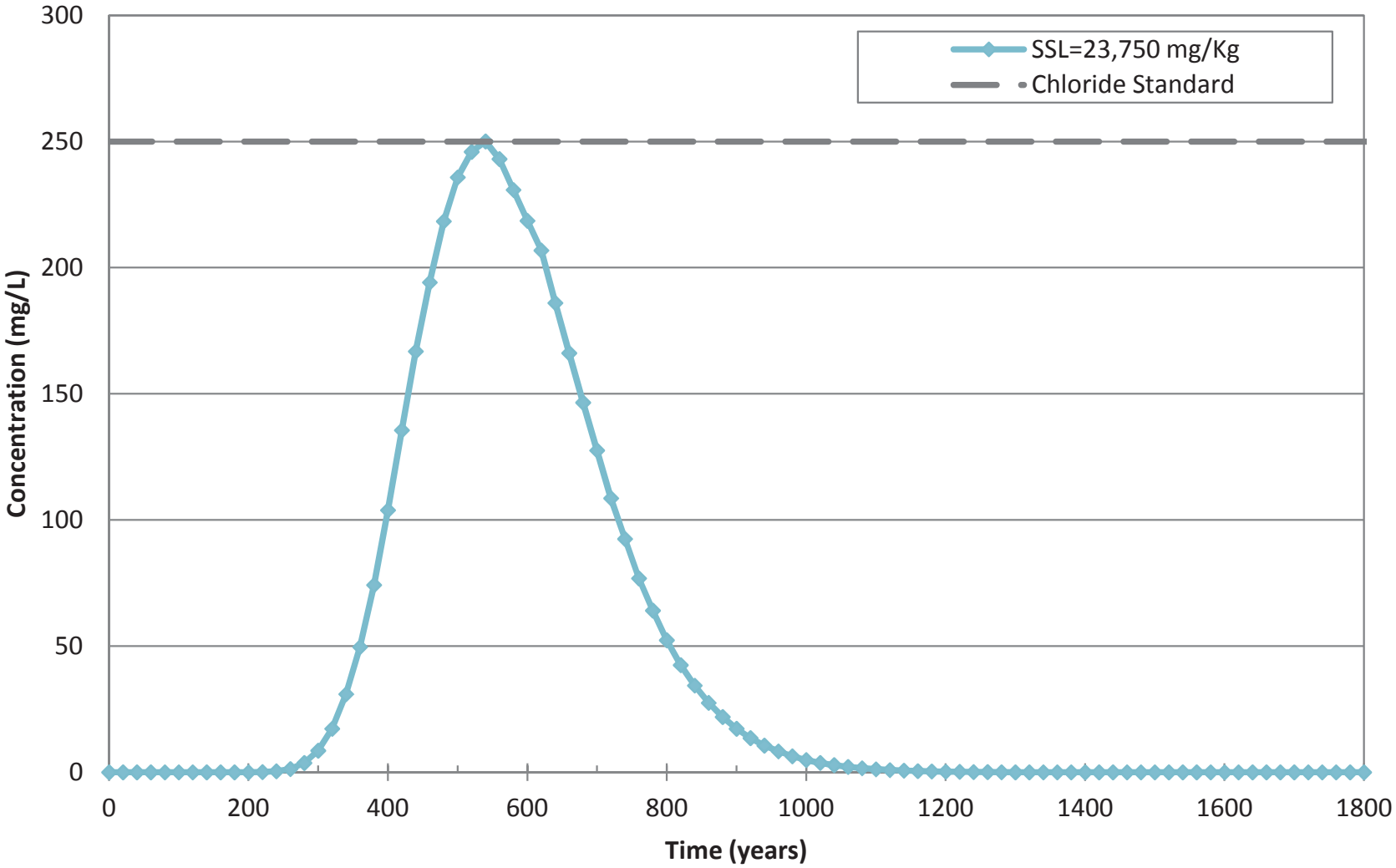

Figure 4
MULTIMED Simulated Chloride Concentration Vs Time in Groundwater
(Source = 20m, Chloride 0-3m, & Depth to Groundwater = 30.5m)

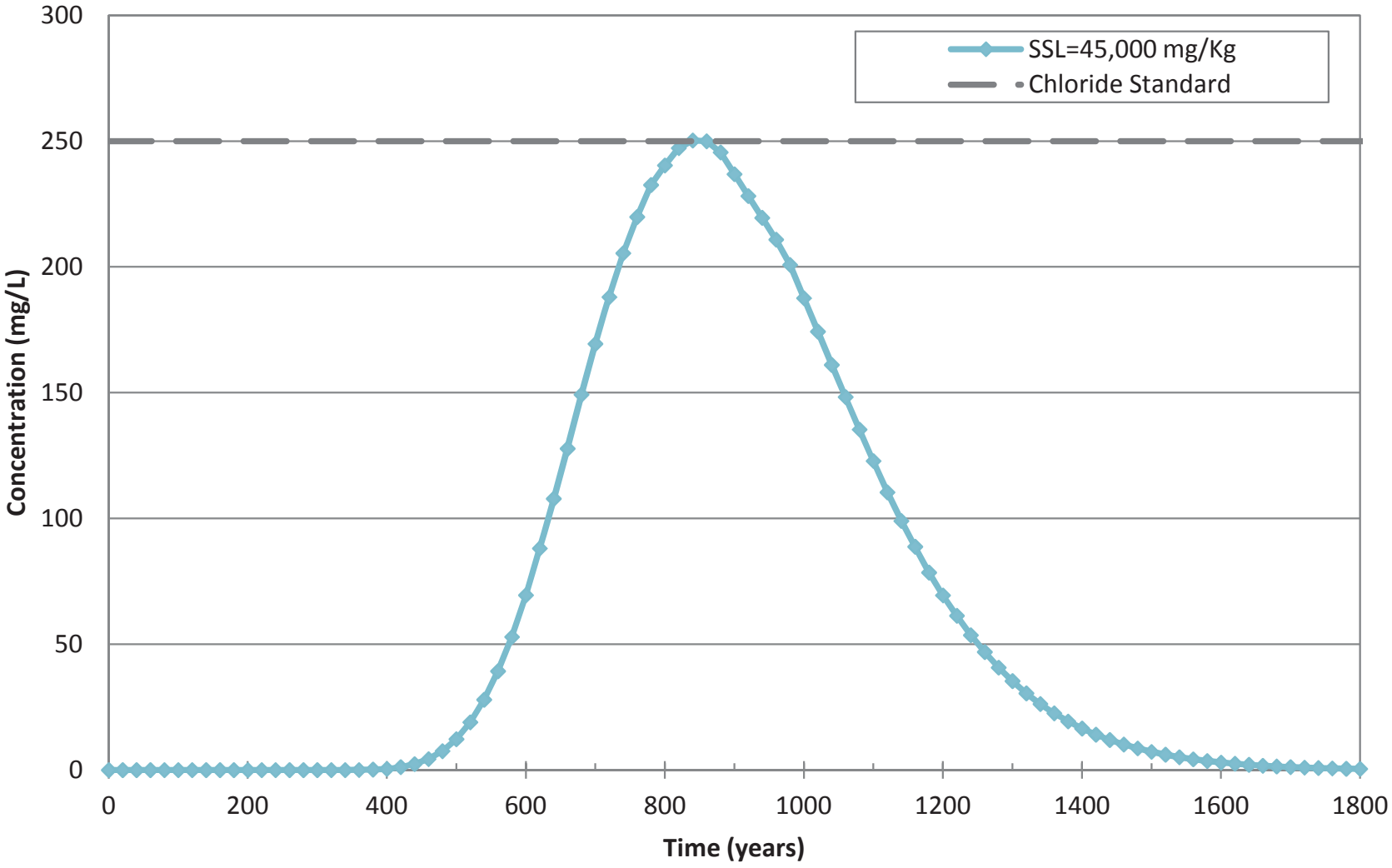

Figure 5
MULTIMED Simulated Chloride Concentration Vs Time in Groundwater
(Source = 45m, Chloride 0-1m, & Depth to Groundwater = 20m)

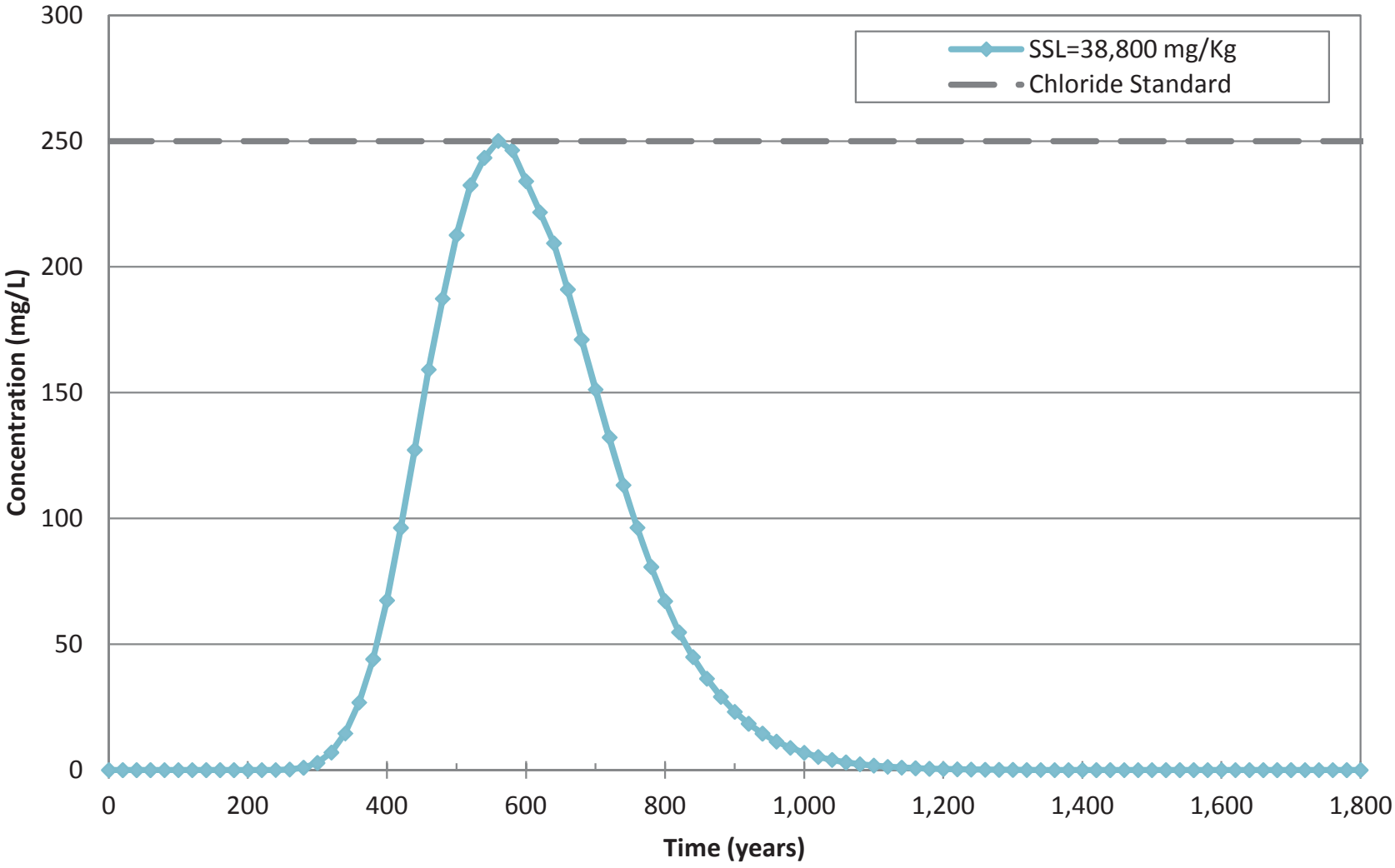

Figure 6
MULTIMED Simulated Chloride Concentration Vs Time in Groundwater
(Source = 45m, Chloride 0-1m, & Depth to Groundwater = 30.5m)

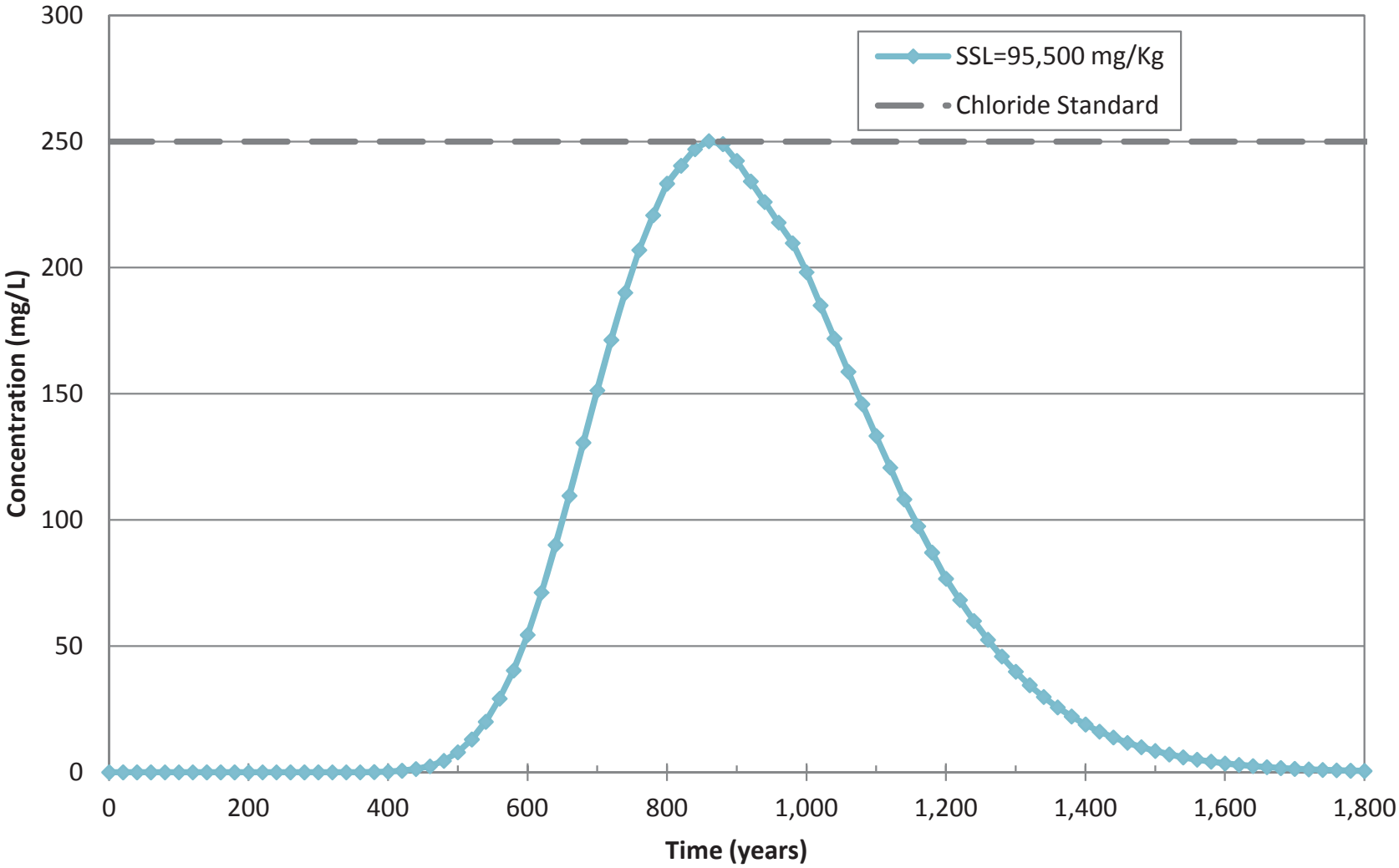

Figure 7
MULTIMED Simulated Chloride Concentration Vs Time in Groundwater
(Source = 45m, Chloride 0-3m, & Depth to Groundwater = 20m)

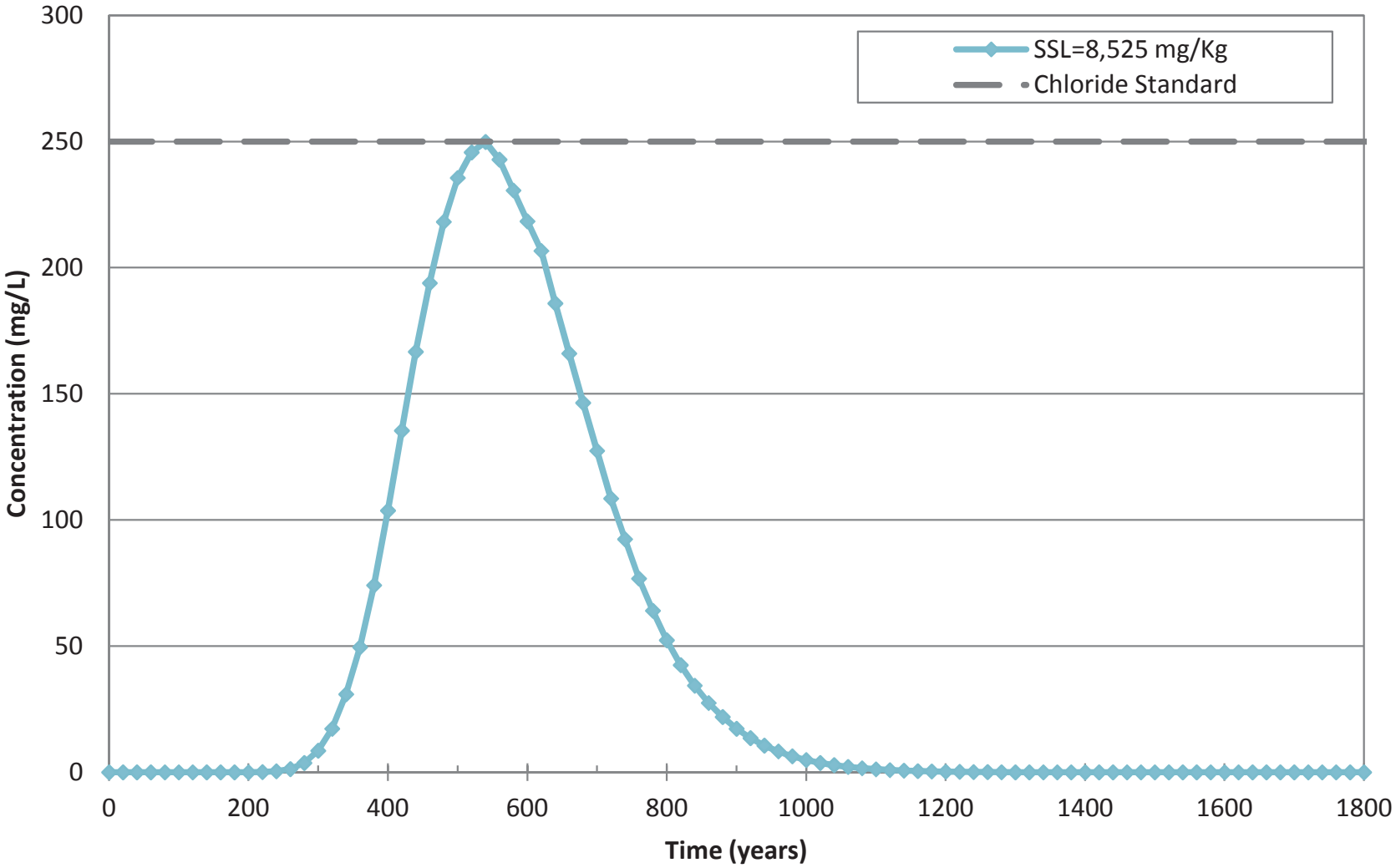

Figure 8
MULTIMED Simulated Chloride Concentration Vs Time in Groundwater
(Source = 45m, Chloride 0-3m, & Depth to Groundwater = 30.5m)