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RECEIVED

By JKeyes at 12:55 pm, Nov 02, 2015

December 15, 2014

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

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

Dear Dr. Oberding,

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

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

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

Sincerely,

Luke Welch
Environmental Project Manager



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

Subject:

Site Assessment Report

Vacuum Glorieta West Unit #118
Lea County, New Mexico

Dear Mr. Welch:

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

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

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

Imagine the result

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December 2, 2014

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Our ref:
B0048611.0000

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

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

Background Information

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

Site Location and Description

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

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

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

Nearby Water Wells and Surface Water

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

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

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

Climate

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

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

Regional Geology and Hydrogeology

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

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

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

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

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

Initial Release Response Activities

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

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

Confirmation Soil Sampling

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

- Benzene, toluene, ethylbenzene, and total xylenes (BTEX) by USEPA Method 8021B
- Total petroleum hydrocarbons as gasoline range organics (TPH-GRO) and total petroleum hydrocarbons as diesel range organics (TPH-DRO) by USEPA Method 8015M
- Chloride by USEPA Method SM4500Cl-B.

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

Data Evaluation Approach

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

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

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

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

Note:
mg/kg = milligrams per kilogram

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

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

Confirmation Soil Sample Results

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

- Benzene was not detected above the laboratory reporting limits (LRLs). Toluene was detected in two of the 10 confirmation samples (VGWU #118 SS #6 at 0.221 mg/kg and VGWU #118 SS #7 at 0.841 mg/kg). Ethylbenzene was detected in three of the 10 confirmation samples, at concentrations ranging from 0.179 mg/kg (VGWU #118 SS #9) to 2.27 mg/kg (VGWU #118 SS #7). Total xylenes were detected in three of the 10 confirmation samples, at concentrations ranging from 0.384 mg/kg (VGWU #118 SS #9) to 3.32 mg/kg (VGWU #118 SS #7). Benzene and BTEX were not detected above the SRALs of 10 and 50 mg/kg, respectively.
- TPH-GRO was detected in three of the 10 confirmation samples, at concentrations ranging from 21 mg/kg (VGWU #118 SS #9) to 108 mg/kg (VGWU #118 SS #7). TPH-DRO was detected in nine of the 10 confirmation samples, at concentrations ranging from 28 mg/kg (VGWU #118 SS #10) to 6,830 mg/kg (VGWU #118 SS #7).
- TPH (TPH-DRO and TPH-GRO) was detected in nine of the 10 samples at concentrations ranging from 28 mg/kg (VGWU #118 SS #10) to 6,938 mg/kg (VGWU #118 SS #7). TPH was detected above the SRAL of 1,000 mg/kg in three of the 10 discrete confirmation samples (VGWU #118 SS #6, VGWU #118 SS #7, VGWU #118 SS #9).
- Chloride was detected in all 10 confirmation samples, at concentrations ranging from 16 mg/kg (VGWU #118 SS #1 and VGWU #118 SS #4) to 15,800 mg/kg (VGWU #118 SS #10). Chloride was detected above the NMAC closure criterion of

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

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

Site Assessment Activities

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

Pre-Field Activities

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

Soil Sampling

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

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

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

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

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

Soil Assessment Sampling

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

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

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

Soil Assessment Sample Analysis

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

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

Boring Abandonment

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

Soil Assessment Comparison Criteria

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

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

- Modeled source lengths and areas modeled are generally significantly larger than the actual chloride-impacted soil areas.
- Chloride-impacted soil was modeled as having a uniform chloride concentration for the entire volume (i.e., area x depth) of specified soil.
- A reduction in chloride concentrations in subsurface soil due to soil chemical transformation or adsorption mechanisms was not included in the model calculations.

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

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

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

Notes:

m = meter

m² = square meter

Soil Assessment Sample Results

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

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

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

Summary and Conclusions

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

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

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

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

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

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

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

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

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

Sincerely,

ARCADIS U.S., Inc.



Jonathan Olsen
Certified Project Manager



Kathleen M. Abbott, PG
Program Manager

Enclosures:

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

Attachments:

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

References:

Ash, S.R. 1963. Ground-water conditions in northern Lea County, New Mexico. New Mexico Bureau of Mines and Mineral Resources, Atlas HA-62.

Bachman, George O. 1980. Regional Geology and Cenozoic History of Pecos Region, Southeastern New Mexico, US Dept. of Interior Geological Survey, Open File Report 80-1099, 120 pp.

Fahlquist, L. 2003. Ground-water quality of the southern High Plains Aquifer, Texas and New Mexico, 2001. U. S. Geological Survey Open-File Report 03-345, 69 p.

- Fallin, J.A. Tony. 1988. Hydrogeology of Lower Cretaceous Strata Under the Southern High Plains of New Mexico, New Mexico Geology, Vol. 10, No. 1, pp. 6-9, February 1988.
- Google Earth. 2014. Lovington, New Mexico, 32_46_57.76N, 103_29_26.55W, elev 3913 feet, Google Earth Imagery. February 13.
- Hall, Stephen A. 2002. Field Guide to the Geoarchaeology of the Mescalero Sands, Southeastern New Mexico, Report Submitted to the State of New Mexico Historic Preservation Division and New Mexico Bureau of Land Management, Project No. 35-00-15334.11. October 2002.
- Nativ, R. 1988. Hydrogeology and hydrochemistry of the Ogallala aquifer, Southern High Plains, Texas Panhandle and eastern New Mexico: The University of Texas at Austin, Bureau of Economic Geology Report of Investigations no. 177, 64 p.
- New Mexico Administrative Code. 2001. Title 20, Chapter 6 of the New Mexico Administrative Code for Environmental Protection, Water Quality, Ground and Surface Water Protection, 20.6.2.3103 NMAC. January.
- New Mexico Administrative Code. 2009. Title 19, Chapter 15 of the New Mexico Administrative Code concerning pits, closed-loop systems, below grade tanks and sumps, and other alternative methods, 19.15.17 NMAC. July.
- New Mexico Office of the State Engineer. 2011. Water Information, Maps and Data, Geospatial Data, OSE Well Data, http://www.ose.state.nm.us/water_info_data.html, July.
- New Mexico Office of the State Engineer. 2014. New Mexico Water Rights Reporting System, <http://nmwrrs.ose.state.nm.us/nmwrrs/waterColumn.html>, May.
- New Mexico Oil Conservation Division. 1993. Guidelines for Remediation of Leaks, Spills and Releases. August 13.
- Nicholson, A., Jr., and A. Clebsch, Jr. 1961. Geology and Ground-Water Conditions in Southern Lea County, New Mexico. ERMS 241583. Ground-Water Report 6. Socorro, NM: New Mexico Bureau of Mines and Mineral Resources.
- Reeves, C.C. Jr. 1972. Tertiary-Quaternary stratigraphy and geomorphology of West Texas and southeastern New Mexico: New Mexico Geological Society, Guidebook 23, p. 108-117.

- Seni, S.J. 1980. Sand-body geometry and depositional systems, Ogallala Formation, Texas. University of Texas, Bureau of Economic Geology, Report of Investigations No.105, 40 p.
- Summers, W.K. 1972. Geology and Regional Hydrology of the Pecos River Basin, New Mexico, New Mexico Bureau of Geology and Mineral Resources, Open File Report No. 37, 393 pp. June 1972.
- Tillery, A. 2008. Current (2004-07) conditions and changes in ground-water levels from predevelopment to 2007, Southern High Plains Aquifer, Southeast New Mexico-Lea County Underground Water Basin. U.S. Geological Survey, Scientific Investigations Map 3044.
- United States Environmental Protection Agency. 1996. Multimedia Exposure Assessment Model for exposure assessment, MULTIMED 2.0 Beta. October.
- United States Environmental Protection Agency. 2010. List of Contaminants and their Maximum Contaminant Levels, List of National Secondary Drinking Water Regulations. Online at: <http://water.epa.gov/drink/contaminants/#List>, July 1.
- Western Regional Climate Center. 2014a. Hobbs, New Mexico (294026) weather station. <http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?nm4026>. Viewed on May 5.
- Western Regional Climate Center. 2014b. Artesia, New Mexico, monthly average pan evaporation. http://www.wrcc.dri.edu/htmlfiles/westevap.final.html#NEW_MEXICO. Viewed on May 6.

Table

Table 1
Soil Sampling Analytical Results

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

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

Notes:

% Percent

mg/kg Milligram(s) per kilogram

< Analyte was not detected above the specified method reporting limit

-- Not Analyzed/Not Listed

bgs Below ground surface

BTEX Benzene, toluene, ethylbenzene, and total xylenes

MULTIMED Multimedia Exposure Assessment Model

NMAC New Mexico Administrative Code

TPH-GRO Total Petroleum Hydrocarbons as Gasoline Range Organics

TPH-DRO Total Petroleum Hydrocarbons as Diesel Range Organics

SRAL Soil remediation action level

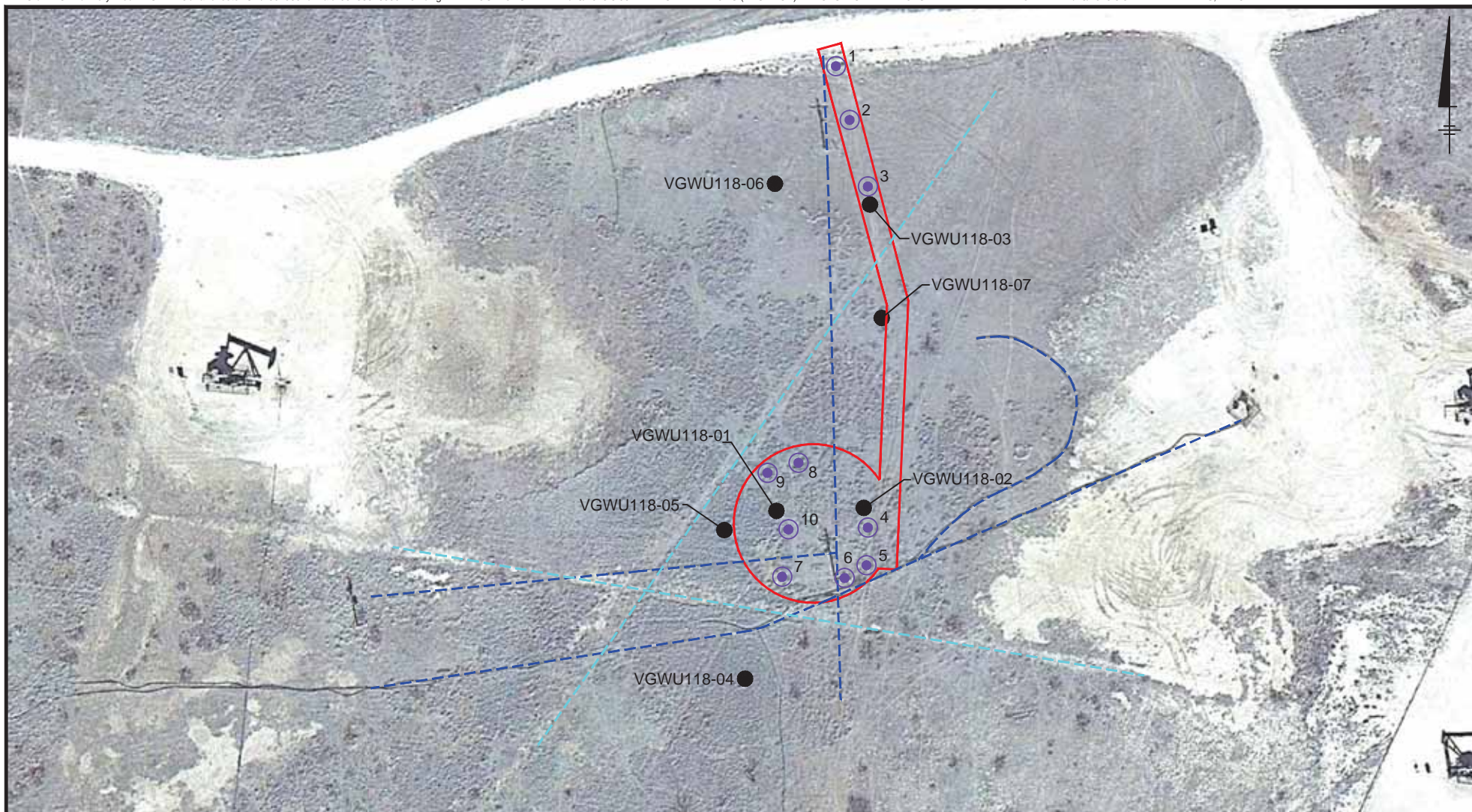
SSL Soil screening level

(a) SRALs, for leaks, spills, and releases, New Mexico Oil Conservation Division, August 1993

(b) Title 19, Chapter 15 of the NMAC concerning pits, closed-loop systems, below grade tanks and sumps, and other alternative methods, 19.15.17 NMAC, July 2009

(c) MULTIMED exposure assessment, 2.0 Beta, United States Environmental Protection Agency, October 1996

Figures

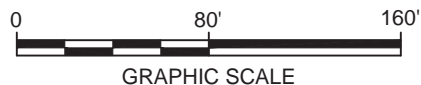


LEGEND:

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

NOTES:

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



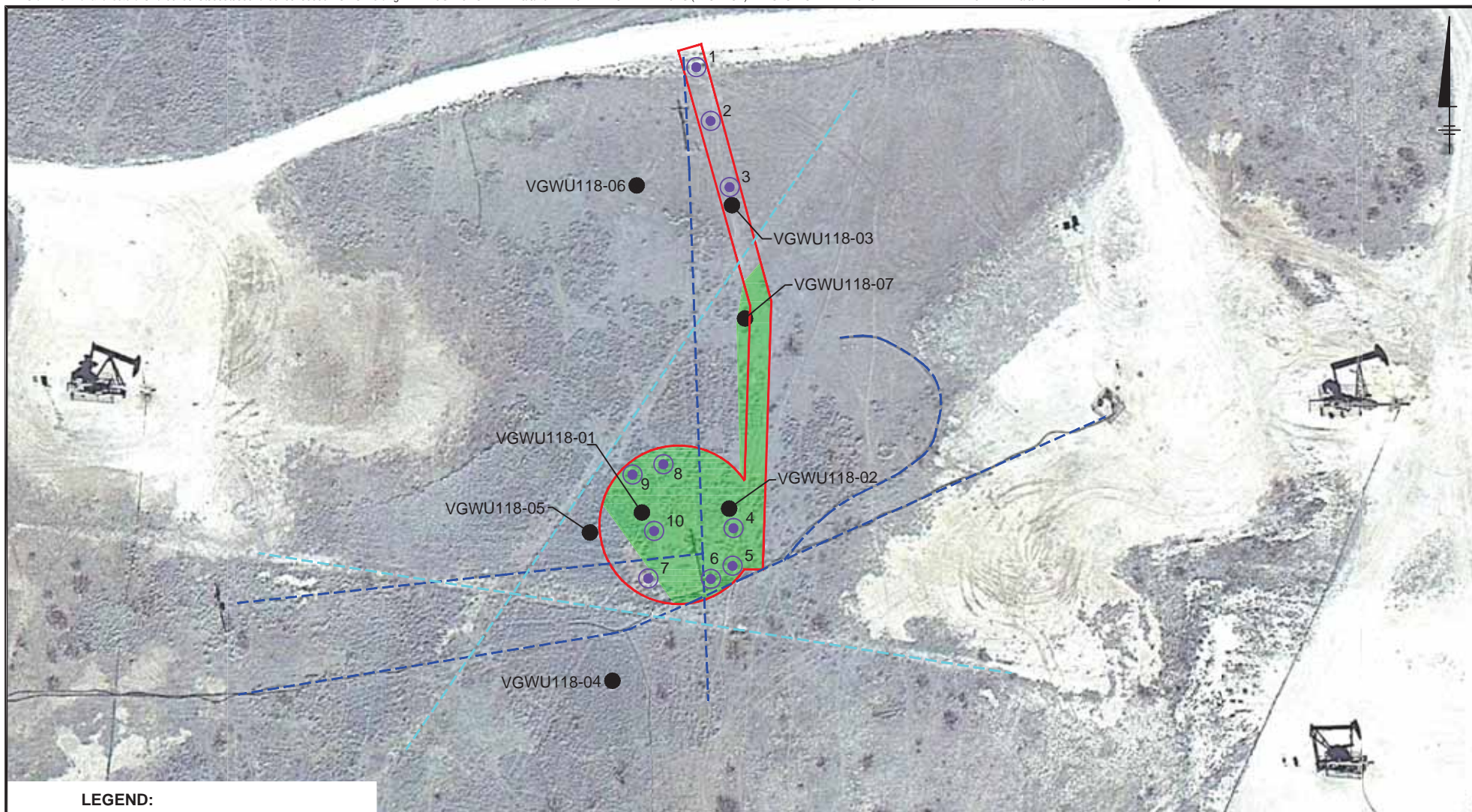
VACUUM/LOVINGTON FUNCTIONAL MANAGEMENT
 TEAM UNITS
 LEA COUNTY, NEW MEXICO
SITE ASSESSMENT REPORT

RELEASE AND SOIL BORING LOCATIONS VGWU #118



FIGURE

2

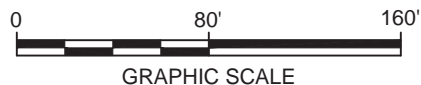


LEGEND:

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

NOTES:

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



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

**PROPOSED EXCAVATION AREA
 VGWU #118**

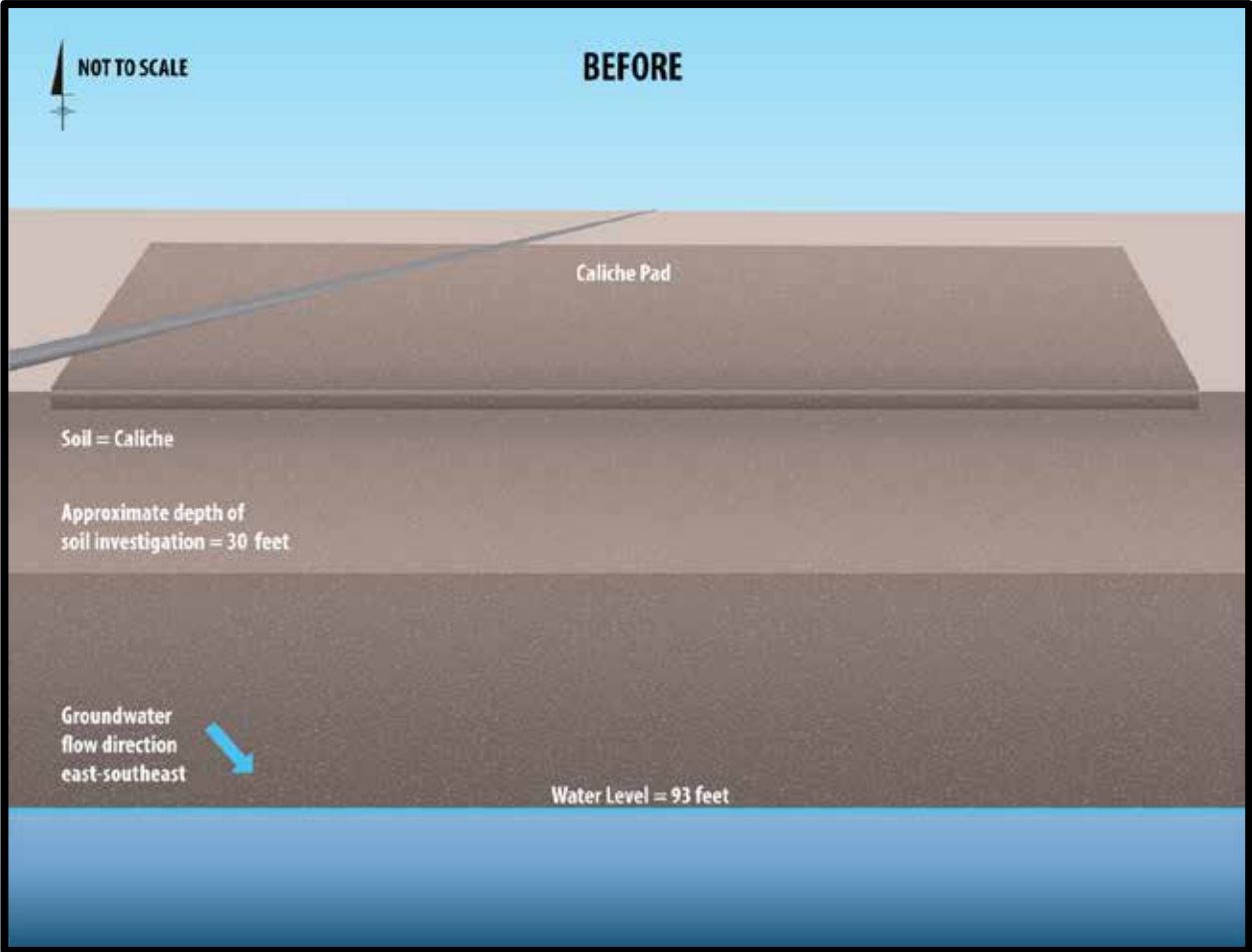


FIGURE
3

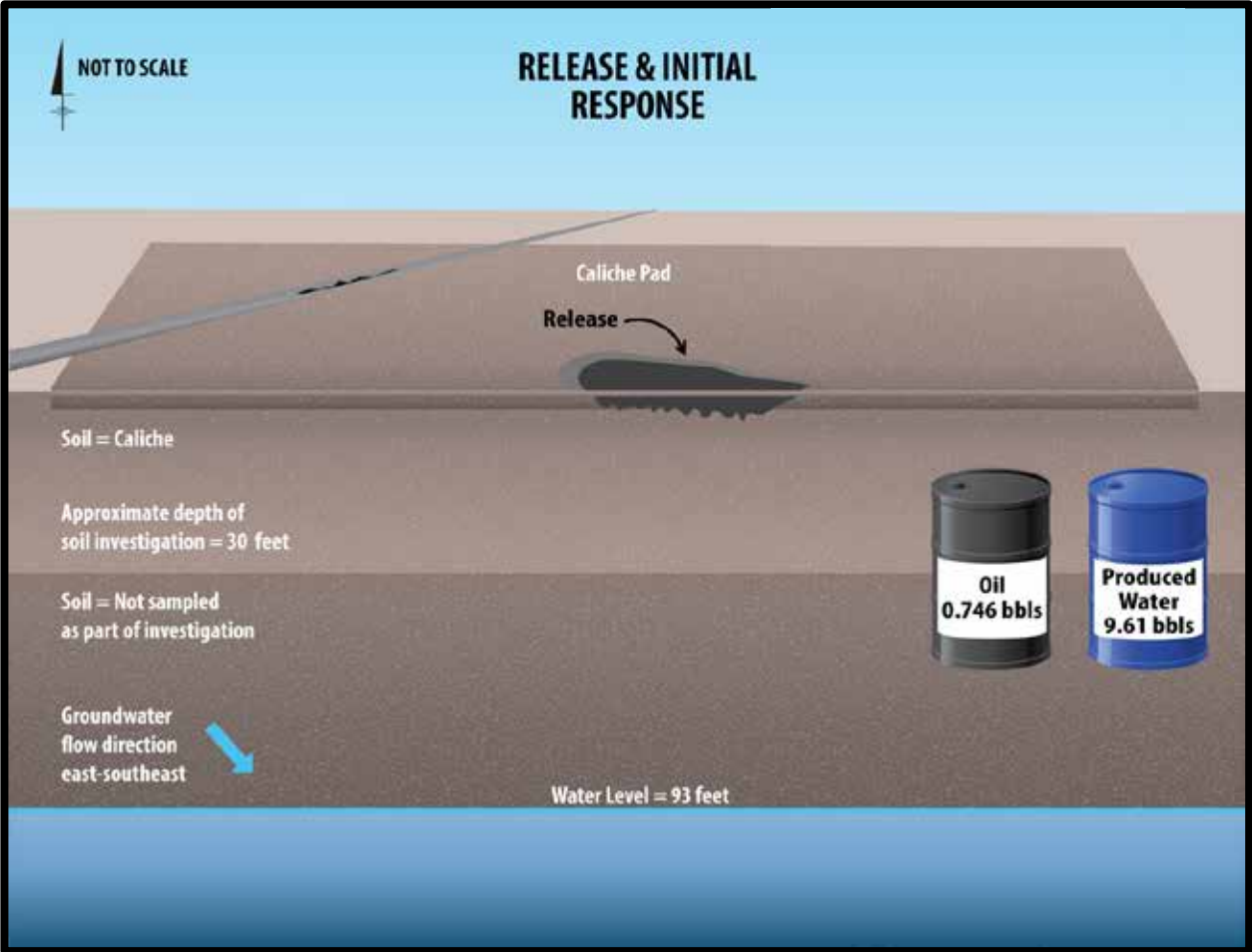


Attachment 1

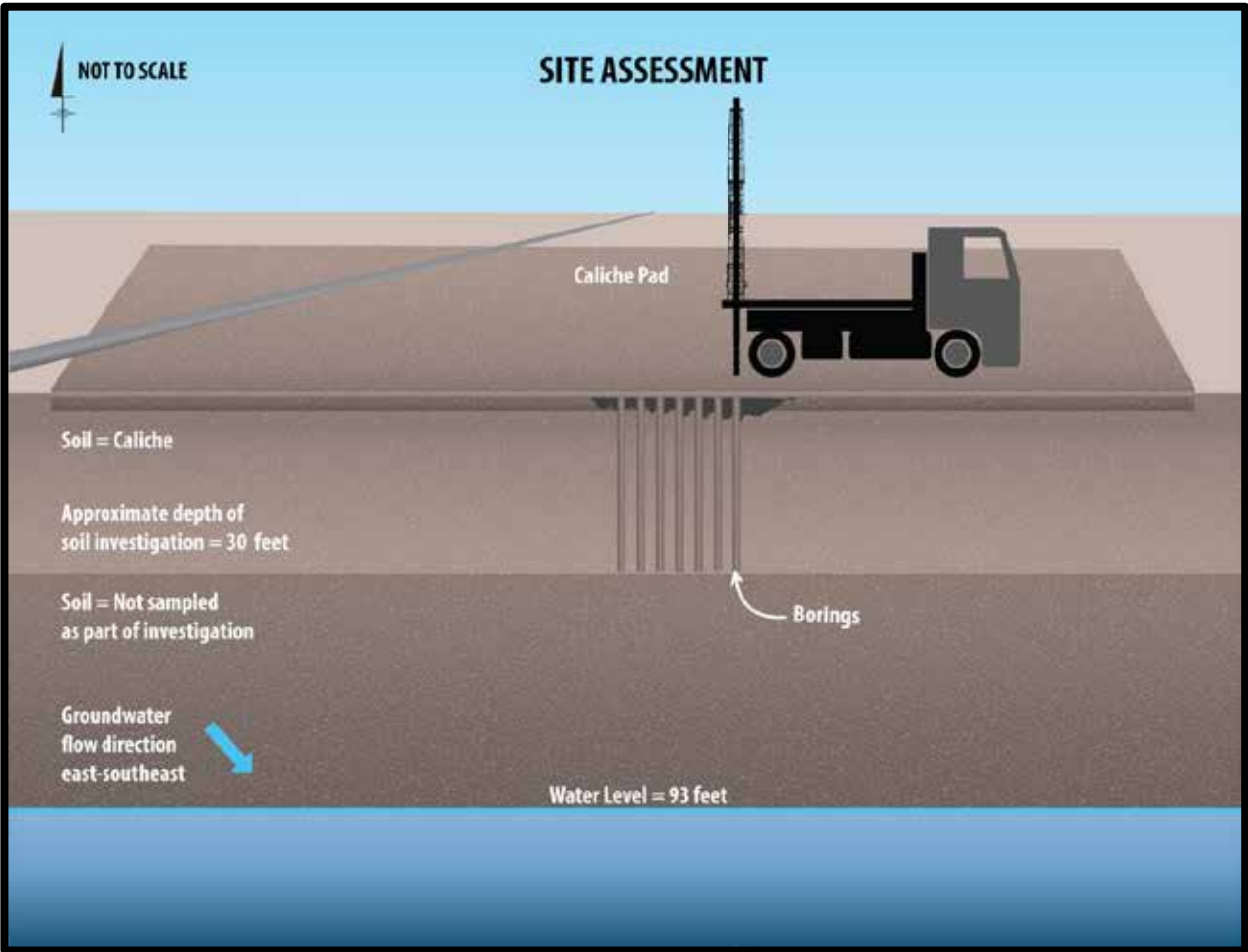
Site Conceptual Model



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



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



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



Attachment 2

Photolog



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



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



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

Average Depth to Water: **93 feet**

Minimum Depth: **85 feet**

Maximum Depth: **100 feet**

Record Count: 9

UTM NAD83 Radius Search (in meters):

Easting (X): 640834.6

Northing (Y): 3628139.52

Radius: 1000

*UTM location was derived from PLSS - see Help

The data is furnished by the NMOSE/ISC and is accepted by the recipient with the expressed understanding that the OSE/ISC make no warranties, expressed or implied, concerning the accuracy, completeness, reliability, usability, or suitability for any particular purpose of the data.



Attachment 4

Release Notification and Corrective
Action (C-141 Form)

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

State of New Mexico
Energy Minerals and Natural Resources

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

Form C-141
Revised August 8, 2011

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

Release Notification and Corrective Action

OPERATOR

☒ Initial Report ☐ Final Report

Name of Company CHEVRON U.S.A Inc.	Contact David Pagano	
Address 56 Texas Camp Road, Lovington, NM 88260	Telephone No. Office: 575-396-4414 ext 275 Cellular: 505-787-9816	
Facility Name Vacuum Glorietta West Unit #118	Facility Type Production Well	
Surface Owner State of New Mexico	Mineral Owner State of New Mexico	API No. 3002531129

LOCATION OF RELEASE

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

Latitude 32.782150° Longitude -103.496157°

NATURE OF RELEASE

Type of Release Produced Water Spill	Volume of Release 9.61 bbls of Produced Water and 0.746 bbls of oil	Volume Recovered 0 bbls
Source of Release Water Injection Station Pump	Date and Hour of Occurrence 04/22/12 07:00	Date and Hour of Discovery 04/22/12 07:00
Was Immediate Notice Given? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not Required	If YES, To Whom? Mr. Leking via voicemail	
By Whom? David Pagano	Date and Hour 04/22/12 11:00 AM	
Was a Watercourse Reached? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	If YES, Volume Impacting the Watercourse.	
If a Watercourse was Impacted, Describe Fully.* NA		
Describe Cause of Problem and Remedial Action Taken.* 1 foot scrape on poly line caused integrity of line to give leading to spill of 9.61bbls of pw and 0.746 bbls of oil. Well shut in on discovery.		
Describe Area Affected and Cleanup Action Taken.* Spill was located in pasture On discovery vacuum truck contacted and vacuumed up the standing fluids which were sent to disposal. Next steps are for the visually contaminated soil to be excavated up to 2 feet and sent off for disposal		

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

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

* Attach Additional Sheets If Necessary



Attachment 5

Laboratory Analytical Reports

July 18, 2012

DAVID PAGANO

Chevron - Lovington

HCR 60 Box 423

Lovington, NM 88260

RE: SOIL SAMPLES

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

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

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

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

Accreditation applies to public drinking water matrices.

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

Sincerely,



Celey D. Keene

Lab Director/Quality Manager

Analytical Results For:

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

 Received: 07/12/2012
 Reported: 07/18/2012
 Project Name: SOIL SAMPLES
 Project Number: NONE GIVEN
 Project Location: NOT GIVEN

 Sampling Date: 07/12/2012
 Sampling Type: Soil
 Sampling Condition: Cool & Intact
 Sample Received By: Jodi Henson

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

BTX 8021B			mg/kg		Analyzed By: AP				
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	07/17/2012	ND	1.88	93.9	2.00	2.82	
Toluene*	<0.050	0.050	07/17/2012	ND	1.89	94.5	2.00	3.09	
Ethylbenzene*	<0.050	0.050	07/17/2012	ND	1.94	97.1	2.00	4.36	
Total Xylenes*	<0.150	0.150	07/17/2012	ND	5.85	97.4	6.00	4.60	

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

Chloride, SM4500Cl-B			mg/kg		Analyzed By: AP				
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	16.0	16.0	07/17/2012	ND	400	100	400	0.00	

TPH 8015M			mg/kg		Analyzed By: AM				
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	07/17/2012	ND	166	83.1	200	6.45	
DRO >C10-C28	487	10.0	07/17/2012	ND	173	86.6	200	8.21	

Surrogate: 1-Chlorooctane 74.0 % 65.2-140

Surrogate: 1-Chlorooctadecane 99.6 % 63.6-154

Cardinal Laboratories

*=Accredited Analyte

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

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

 Received: 07/12/2012
 Reported: 07/18/2012
 Project Name: SOIL SAMPLES
 Project Number: NONE GIVEN
 Project Location: NOT GIVEN

 Sampling Date: 07/12/2012
 Sampling Type: Soil
 Sampling Condition: Cool & Intact
 Sample Received By: Jodi Henson

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

BTX 8021B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	07/17/2012	ND	1.88	93.9	2.00	2.82	
Toluene*	<0.050	0.050	07/17/2012	ND	1.89	94.5	2.00	3.09	
Ethylbenzene*	<0.050	0.050	07/17/2012	ND	1.94	97.1	2.00	4.36	
Total Xylenes*	<0.150	0.150	07/17/2012	ND	5.85	97.4	6.00	4.60	

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

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	272	16.0	07/17/2012	ND	400	100	400	0.00	

TPH 8015M		mg/kg		Analyzed By: AM					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	07/17/2012	ND	166	83.1	200	6.45	
DRO >C10-C28	43.7	10.0	07/17/2012	ND	173	86.6	200	8.21	

Surrogate: 1-Chlorooctane 81.4 % 65.2-140

Surrogate: 1-Chlorooctadecane 105 % 63.6-154

Cardinal Laboratories

*=Accredited Analyte

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

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

 Received: 07/12/2012
 Reported: 07/18/2012
 Project Name: SOIL SAMPLES
 Project Number: NONE GIVEN
 Project Location: NOT GIVEN

 Sampling Date: 07/12/2012
 Sampling Type: Soil
 Sampling Condition: Cool & Intact
 Sample Received By: Jodi Henson

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

BTX 8021B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	07/17/2012	ND	1.88	93.9	2.00	2.82	
Toluene*	<0.050	0.050	07/17/2012	ND	1.89	94.5	2.00	3.09	
Ethylbenzene*	<0.050	0.050	07/17/2012	ND	1.94	97.1	2.00	4.36	
Total Xylenes*	<0.150	0.150	07/17/2012	ND	5.85	97.4	6.00	4.60	

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

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	144	16.0	07/17/2012	ND	400	100	400	0.00	

TPH 8015M		mg/kg		Analyzed By: AM					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	07/17/2012	ND	166	83.1	200	6.45	
DRO >C10-C28	123	10.0	07/17/2012	ND	173	86.6	200	8.21	

Surrogate: 1-Chlorooctane 85.0 % 65.2-140

Surrogate: 1-Chlorooctadecane 112 % 63.6-154

Cardinal Laboratories

*=Accredited Analyte

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

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

Received: 07/12/2012
Reported: 07/18/2012
Project Name: SOIL SAMPLES
Project Number: NONE GIVEN
Project Location: NOT GIVEN

Sampling Date: 07/12/2012
Sampling Type: Soil
Sampling Condition: Cool & Intact
Sample Received By: Jodi Henson

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

BTEx 8021B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	07/17/2012	ND	1.88	93.9	2.00	2.82	
Toluene*	<0.050	0.050	07/17/2012	ND	1.89	94.5	2.00	3.09	
Ethylbenzene*	<0.050	0.050	07/17/2012	ND	1.94	97.1	2.00	4.36	
Total Xylenes*	<0.150	0.150	07/17/2012	ND	5.85	97.4	6.00	4.60	

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

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	16.0	16.0	07/17/2012	ND	400	100	400	3.92	

TPH 8015M		mg/kg		Analyzed By: AM					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	07/17/2012	ND	166	83.1	200	6.45	
DRO >C10-C28	295	10.0	07/17/2012	ND	173	86.6	200	8.21	

Surrogate: 1-Chlorooctane 86.1 % 65.2-140

Surrogate: 1-Chlorooctadecane 110 % 63.6-154

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

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

 Received: 07/12/2012
 Reported: 07/18/2012
 Project Name: SOIL SAMPLES
 Project Number: NONE GIVEN
 Project Location: NOT GIVEN

 Sampling Date: 07/12/2012
 Sampling Type: Soil
 Sampling Condition: Cool & Intact
 Sample Received By: Jodi Henson

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

BTX 8021B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	07/17/2012	ND	1.88	93.9	2.00	2.82	
Toluene*	<0.050	0.050	07/17/2012	ND	1.89	94.5	2.00	3.09	
Ethylbenzene*	<0.050	0.050	07/17/2012	ND	1.94	97.1	2.00	4.36	
Total Xylenes*	<0.150	0.150	07/17/2012	ND	5.85	97.4	6.00	4.60	

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

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
Chloride	96.0	16.0	07/17/2012	ND	400	100	400	3.92		

TPH 8015M		mg/kg		Analyzed By: AM					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	07/17/2012	ND	166	83.1	200	6.45	
DRO >C10-C28	<10.0	10.0	07/17/2012	ND	173	86.6	200	8.21	

Surrogate: 1-Chlorooctane 82.7 % 65.2-140

Surrogate: 1-Chlorooctadecane 103 % 63.6-154

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

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

 Received: 07/12/2012
 Reported: 07/18/2012
 Project Name: SOIL SAMPLES
 Project Number: NONE GIVEN
 Project Location: NOT GIVEN

 Sampling Date: 07/12/2012
 Sampling Type: Soil
 Sampling Condition: Cool & Intact
 Sample Received By: Jodi Henson

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

BTX 8021B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	07/18/2012	ND	1.91	95.7	2.00	0.781	
Toluene*	0.221	0.050	07/18/2012	ND	1.94	97.1	2.00	2.18	
Ethylbenzene*	0.385	0.050	07/18/2012	ND	1.98	99.0	2.00	1.91	
Total Xylenes*	0.937	0.150	07/18/2012	ND	5.99	99.9	6.00	2.45	

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

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	384	16.0	07/17/2012	ND	400	100	400	3.92	

TPH 8015M		mg/kg		Analyzed By: AM					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	36.8	10.0	07/17/2012	ND	166	83.1	200	6.45	
DRO >C10-C28	2520	10.0	07/17/2012	ND	173	86.6	200	8.21	

Surrogate: 1-Chlorooctane 91.8 % 65.2-140

Surrogate: 1-Chlorooctadecane 154 % 63.6-154

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

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

Received: 07/12/2012
Reported: 07/18/2012
Project Name: SOIL SAMPLES
Project Number: NONE GIVEN
Project Location: NOT GIVEN

Sampling Date: 07/12/2012
Sampling Type: Soil
Sampling Condition: Cool & Intact
Sample Received By: Jodi Henson

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

BTX 8021B		mg/kg		Analyzed By: AP				S-04	
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	07/18/2012	ND	1.91	95.7	2.00	0.781	
Toluene*	0.841	0.050	07/18/2012	ND	1.94	97.1	2.00	2.18	
Ethylbenzene*	2.27	0.050	07/18/2012	ND	1.98	99.0	2.00	1.91	
Total Xylenes*	3.32	0.150	07/18/2012	ND	5.99	99.9	6.00	2.45	

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

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
Chloride	112	16.0	07/17/2012	ND	400	100	400	3.92		

TPH 8015M		mg/kg		Analyzed By: AM				S-04	
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	108	10.0	07/17/2012	ND	166	83.1	200	6.45	
DRO >C10-C28	6830	10.0	07/17/2012	ND	173	86.6	200	8.21	

Surrogate: 1-Chlorooctane 106 % 65.2-140

Surrogate: 1-Chlorooctadecane 228 % 63.6-154

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

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

Received: 07/12/2012
Reported: 07/18/2012
Project Name: SOIL SAMPLES
Project Number: NONE GIVEN
Project Location: NOT GIVEN

Sampling Date: 07/12/2012
Sampling Type: Soil
Sampling Condition: Cool & Intact
Sample Received By: Jodi Henson

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

BTEx 8021B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	07/18/2012	ND	1.91	95.7	2.00	0.781	
Toluene*	<0.050	0.050	07/18/2012	ND	1.94	97.1	2.00	2.18	
Ethylbenzene*	<0.050	0.050	07/18/2012	ND	1.98	99.0	2.00	1.91	
Total Xylenes*	<0.150	0.150	07/18/2012	ND	5.99	99.9	6.00	2.45	

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

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	2320	16.0	07/17/2012	ND	400	100	400	3.92	

TPH 8015M		mg/kg		Analyzed By: AM					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	07/17/2012	ND	166	83.1	200	6.45	
DRO >C10-C28	49.5	10.0	07/17/2012	ND	173	86.6	200	8.21	

Surrogate: 1-Chlorooctane 82.8 % 65.2-140

Surrogate: 1-Chlorooctadecane 111 % 63.6-154

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

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

Received: 07/12/2012
Reported: 07/18/2012
Project Name: SOIL SAMPLES
Project Number: NONE GIVEN
Project Location: NOT GIVEN

Sampling Date: 07/12/2012
Sampling Type: Soil
Sampling Condition: Cool & Intact
Sample Received By: Jodi Henson

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

BTX 8021B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	07/18/2012	ND	1.91	95.7	2.00	0.781	
Toluene*	<0.050	0.050	07/18/2012	ND	1.94	97.1	2.00	2.18	
Ethylbenzene*	0.179	0.050	07/18/2012	ND	1.98	99.0	2.00	1.91	
Total Xylenes*	0.384	0.150	07/18/2012	ND	5.99	99.9	6.00	2.45	

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

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	6240	16.0	07/18/2012	ND	400	100	400	3.92	

TPH 8015M		mg/kg		Analyzed By: AM						S-04
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
GRO C6-C10	20.6	10.0	07/17/2012	ND	166	83.1	200	6.45		
DRO >C10-C28	3050	10.0	07/17/2012	ND	173	86.6	200	8.21		

Surrogate: 1-Chlorooctane 86.3 % 65.2-140

Surrogate: 1-Chlorooctadecane 163 % 63.6-154

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

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

 Received: 07/12/2012
 Reported: 07/18/2012
 Project Name: SOIL SAMPLES
 Project Number: NONE GIVEN
 Project Location: NOT GIVEN

 Sampling Date: 07/12/2012
 Sampling Type: Soil
 Sampling Condition: Cool & Intact
 Sample Received By: Jodi Henson

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

BTEx 8021B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	07/18/2012	ND	1.91	95.7	2.00	0.781	
Toluene*	<0.050	0.050	07/18/2012	ND	1.94	97.1	2.00	2.18	
Ethylbenzene*	<0.050	0.050	07/18/2012	ND	1.98	99.0	2.00	1.91	
Total Xylenes*	<0.150	0.150	07/18/2012	ND	5.99	99.9	6.00	2.45	

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

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	15800	16.0	07/18/2012	ND	400	100	400	3.92	

TPH 8015M		mg/kg		Analyzed By: AM					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	07/17/2012	ND	166	83.1	200	6.45	
DRO >C10-C28	28.4	10.0	07/17/2012	ND	173	86.6	200	8.21	

Surrogate: 1-Chlorooctane 77.3 % 65.2-140

Surrogate: 1-Chlorooctadecane 103 % 63.6-154

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Celey D. Keene, Lab Director/Quality Manager

Notes and Definitions

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

Cardinal Laboratories

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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: Livingston State: NM Zip: 88260 Phone #: 505-787-9816 Fax #: Project #: Project Name: Project Location: Sampler Name:				BILL TO P.O. #: Company: Chevron Attn: Nick Moschetti Address: 56 Texas Camp Rd. City: Livingston State: NM Zip: 88260 Phone #: 575-396-4414 x201 Fax #:				ANALYSIS REQUEST															
FOR LAB USE ONLY				MATRIX				PRESERV.		SAMPLING													
Lab I.D.		Sample I.D.		GRAB OR (C)OMP.	# CONTAINERS	GROUNDWATER WASTEWATER SOIL OIL SLUDGE OTHER:	ACID/BASE: ICE / COOL OTHER:	DATE	TIME														
H201602																							
1		V6WU #118 SS#1		G		✓		7/12/12	4:00														
2		V6WU #118 SS#2							4:03														
3		V6WU #118 SS#3							4:06														
4		V6WU #118 SS#4							4:09														
5		V6WU #118 SS#5							4:12														
6		V6WU #118 SS#6							4:18														
7		V6WU #118 SS#7							4:20														
8		V6WU #118 SS#8							4:22														
9		V6WU #118 SS#9							4:25														
10		V6WU #118 SS#10							4:26														

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Relinquished By: David Pagano Date: 7/12/12 Time: 5:07		Received By: Jodi Henson Date: 7/12/12 Time: 5:07		Phone Result: <input type="checkbox"/> Yes <input type="checkbox"/> No Fax Result: <input type="checkbox"/> Yes <input type="checkbox"/> No Add'l Phone #: Add'l Fax #:	
Relinquished By:		Received By:		REMARKS:	
Delivered By: (Circle One) Sampler - UPS - Bus - Other:		Sample Condition Cool Intact <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		CHECKED BY: (Initials)	

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

June 10, 2013

JONATHAN OLSEN

ARCADIS U.S., INC. - HOUSTON

630 PLAZA DRIVE, SUITE 600

HIGHLANDS RANCH, CO 80129

RE: CHEVRON BUCKEYE

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

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

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

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

Accreditation applies to public drinking water matrices.

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

Sincerely,



Celey D. Keene

Lab Director/Quality Manager

Analytical Results For:

ARCADIS U.S., INC. - HOUSTON
630 PLAZA DRIVE, SUITE 600
HIGHLANDS RANCH CO, 80129

Project: CHEVRON BUCKEYE
Project Number: B004860.0000
Project Manager: JONATHAN OLSEN
Fax To: (713) 977-4620

Reported:
10-Jun-13 10:43

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

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Celey D. Keene, Lab Director/Quality Manager

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

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

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

ARCADIS U.S., INC. - HOUSTON
630 PLAZA DRIVE, SUITE 600
HIGHLANDS RANCH CO, 80129

Project: CHEVRON BUCKEYE
Project Number: B004860.0000
Project Manager: JONATHAN OLSEN
Fax To: (713) 977-4620

Reported:
10-Jun-13 10:43

VGW U118 - 07 (10') H301174-01 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
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Cardinal Laboratories

Inorganic Compounds

% Solids	97.6	0.100	%	1	3051612	DW	17-May-13	D2216	
% Moisture	2.45	0.100	%	1	3051612	DW	17-May-13	D2216	
Chloride	80.0	16.0	mg/kg	4	3051610	DW	16-May-13	4500-Cl-B	

Organic Compounds

SUB-PBE

GRO C6-C10	ND	15.4	mg/kg dry	1	3052411	CK	20-May-13	8015M	
DRO >C10-C28	ND	15.4	mg/kg dry	1	3052411	CK	20-May-13	8015M	
Surrogate: 1-Chlorooctane		96.2 %	70-130		3052411	CK	20-May-13	8015M	
Surrogate: o-Terphenyl		105 %	70-130		3052411	CK	20-May-13	8015M	

Volatile Organic Compounds by EPA Method 8021

Benzene*	ND	0.051	mg/kg dry	50	3051601	AP	16-May-13	8021B	
Toluene*	ND	0.051	mg/kg dry	50	3051601	AP	16-May-13	8021B	
Ethylbenzene*	ND	0.051	mg/kg dry	50	3051601	AP	16-May-13	8021B	
Total Xylenes*	ND	0.154	mg/kg dry	50	3051601	AP	16-May-13	8021B	
Total BTEX	0.009	0.308	mg/kg dry	50	3051601	AP	16-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		112 %	89.4-126		3051601	AP	16-May-13	8021B	

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Analytical Results For:

ARCADIS U.S., INC. - HOUSTON
630 PLAZA DRIVE, SUITE 600
HIGHLANDS RANCH CO, 80129

Project: CHEVRON BUCKEYE
Project Number: B004860.0000
Project Manager: JONATHAN OLSEN
Fax To: (713) 977-4620

Reported:
10-Jun-13 10:43

VGW U118 - 07 (15')

H301174-02 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
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Cardinal Laboratories

Inorganic Compounds

% Moisture	1.39	0.100	%	1	3051612	DW	17-May-13	D2216	
% Solids	98.6	0.100	%	1	3051612	DW	17-May-13	D2216	
Chloride	80.0	16.0	mg/kg	4	3051610	DW	16-May-13	4500-Cl-B	

Organic Compounds

SUB-PBE

GRO C6-C10	ND	15.2	mg/kg dry	1	3052411	CK	20-May-13	8015M	
DRO >C10-C28	ND	15.2	mg/kg dry	1	3052411	CK	20-May-13	8015M	
Surrogate: 1-Chlorooctane		94.0 %	70-130		3052411	CK	20-May-13	8015M	
Surrogate: o-Terphenyl		103 %	70-130		3052411	CK	20-May-13	8015M	

Volatile Organic Compounds by EPA Method 8021

Benzene*	ND	0.051	mg/kg dry	50	3051601	AP	16-May-13	8021B	
Toluene*	ND	0.051	mg/kg dry	50	3051601	AP	16-May-13	8021B	
Ethylbenzene*	ND	0.051	mg/kg dry	50	3051601	AP	16-May-13	8021B	
Total Xylenes*	ND	0.152	mg/kg dry	50	3051601	AP	16-May-13	8021B	
Total BTEX	ND	0.304	mg/kg dry	50	3051601	AP	16-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		113 %	89.4-126		3051601	AP	16-May-13	8021B	

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

ARCADIS U.S., INC. - HOUSTON
630 PLAZA DRIVE, SUITE 600
HIGHLANDS RANCH CO, 80129

Project: CHEVRON BUCKEYE
Project Number: B004860.0000
Project Manager: JONATHAN OLSEN
Fax To: (713) 977-4620

Reported:
10-Jun-13 10:43

VGW U118 - 07 (20')

H301174-03 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
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Cardinal Laboratories

Inorganic Compounds

% Moisture	4.35	0.100	%	1	3051612	DW	17-May-13	D2216	
% Solids	95.6	0.100	%	1	3051612	DW	17-May-13	D2216	
Chloride	ND	16.0	mg/kg	4	3051610	DW	16-May-13	4500-Cl-B	

Organic Compounds

SUB-PBE

GRO C6-C10	ND	15.7	mg/kg dry	1	3052411	CK	20-May-13	8015M	
DRO >C10-C28	ND	15.7	mg/kg dry	1	3052411	CK	20-May-13	8015M	
Surrogate: 1-Chlorooctane		96.2 %	70-130		3052411	CK	20-May-13	8015M	
Surrogate: o-Terphenyl		107 %	70-130		3052411	CK	20-May-13	8015M	

Volatile Organic Compounds by EPA Method 8021

Benzene*	ND	0.052	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Toluene*	ND	0.052	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Ethylbenzene*	ND	0.052	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Total Xylenes*	ND	0.157	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Total BTEX	ND	0.314	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		112 %	89.4-126		3051601	AP	17-May-13	8021B	

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

ARCADIS U.S., INC. - HOUSTON
630 PLAZA DRIVE, SUITE 600
HIGHLANDS RANCH CO, 80129

Project: CHEVRON BUCKEYE
Project Number: B004860.0000
Project Manager: JONATHAN OLSEN
Fax To: (713) 977-4620

Reported:
10-Jun-13 10:43

VGW U118 - 07 (25')

H301174-04 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
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Cardinal Laboratories

Inorganic Compounds

% Moisture	4.41	0.100	%	1	3051612	DW	17-May-13	D2216	
% Solids	95.6	0.100	%	1	3051612	DW	17-May-13	D2216	
Chloride	ND	16.0	mg/kg	4	3051610	DW	17-May-13	4500-Cl-B	

Organic Compounds

SUB-PBE

GRO C6-C10	ND	15.7	mg/kg dry	1	3052411	CK	20-May-13	8015M	
DRO >C10-C28	ND	15.7	mg/kg dry	1	3052411	CK	20-May-13	8015M	
Surrogate: 1-Chlorooctane		107 %	70-130		3052411	CK	20-May-13	8015M	
Surrogate: o-Terphenyl		99.9 %	70-130		3052411	CK	20-May-13	8015M	

Volatile Organic Compounds by EPA Method 8021

Benzene*	ND	0.052	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Toluene*	ND	0.052	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Ethylbenzene*	ND	0.052	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Total Xylenes*	ND	0.157	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Total BTEX	ND	0.314	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		111 %	89.4-126		3051601	AP	17-May-13	8021B	

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Analytical Results For:

ARCADIS U.S., INC. - HOUSTON
630 PLAZA DRIVE, SUITE 600
HIGHLANDS RANCH CO, 80129

Project: CHEVRON BUCKEYE
Project Number: B004860.0000
Project Manager: JONATHAN OLSEN
Fax To: (713) 977-4620

Reported:
10-Jun-13 10:43

VGW U118 - 07 (30')

H301174-05 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
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Cardinal Laboratories

Inorganic Compounds

% Moisture	15.9	0.100	%	1	3051612	DW	17-May-13	D2216	
% Solids	84.1	0.100	%	1	3051612	DW	17-May-13	D2216	
Chloride	ND	16.0	mg/kg	4	3051610	DW	17-May-13	4500-Cl-B	

Organic Compounds

SUB-PBE

GRO C6-C10	ND	17.8	mg/kg dry	1	3052411	CK	20-May-13	8015M	
DRO >C10-C28	19.7	17.8	mg/kg dry	1	3052411	CK	20-May-13	8015M	
Surrogate: 1-Chlorooctane		94.0 %	70-130		3052411	CK	20-May-13	8015M	
Surrogate: o-Terphenyl		103 %	70-130		3052411	CK	20-May-13	8015M	

Volatile Organic Compounds by EPA Method 8021

Benzene*	ND	0.059	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Toluene*	ND	0.059	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Ethylbenzene*	ND	0.059	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Total Xylenes*	ND	0.178	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Total BTEX	ND	0.357	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		112 %	89.4-126		3051601	AP	17-May-13	8021B	

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Analytical Results For:

ARCADIS U.S., INC. - HOUSTON
630 PLAZA DRIVE, SUITE 600
HIGHLANDS RANCH CO, 80129

Project: CHEVRON BUCKEYE
Project Number: B004860.0000
Project Manager: JONATHAN OLSEN
Fax To: (713) 977-4620

Reported:
10-Jun-13 10:43

VGW U118 - 02 (2')

H301174-06 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
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Cardinal Laboratories

Inorganic Compounds

% Solids	87.2	0.100	%	1	3051612	DW	17-May-13	D2216	
% Moisture	12.8	0.100	%	1	3051612	DW	17-May-13	D2216	
Chloride	10000	16.0	mg/kg	4	3051610	DW	17-May-13	4500-Cl-B	

Organic Compounds

SUB-PBE

GRO C6-C10	ND	17.2	mg/kg dry	1	3052411	CK	20-May-13	8015M	
DRO >C10-C28	ND	17.2	mg/kg dry	1	3052411	CK	20-May-13	8015M	
Surrogate: 1-Chlorooctane		89.4 %	70-130		3052411	CK	20-May-13	8015M	
Surrogate: o-Terphenyl		101 %	70-130		3052411	CK	20-May-13	8015M	

Volatile Organic Compounds by EPA Method 8021

Benzene*	ND	0.057	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Toluene*	ND	0.057	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Ethylbenzene*	ND	0.057	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Total Xylenes*	ND	0.172	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Total BTEX	ND	0.344	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		113 %	89.4-126		3051601	AP	17-May-13	8021B	

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

ARCADIS U.S., INC. - HOUSTON
630 PLAZA DRIVE, SUITE 600
HIGHLANDS RANCH CO, 80129

Project: CHEVRON BUCKEYE
Project Number: B004860.0000
Project Manager: JONATHAN OLSEN
Fax To: (713) 977-4620

Reported:
10-Jun-13 10:43

VGW U118 - 02 (5')

H301174-07 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
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Cardinal Laboratories

Inorganic Compounds

% Moisture	7.33	0.100	%	1	3051612	DW	17-May-13	D2216	
% Solids	92.7	0.100	%	1	3051612	DW	17-May-13	D2216	
Chloride	368	16.0	mg/kg	4	3051701	DW	17-May-13	4500-Cl-B	

Organic Compounds

SUB-PBE

GRO C6-C10	ND	16.2	mg/kg dry	1	3052411	CK	20-May-13	8015M	
DRO >C10-C28	ND	16.2	mg/kg dry	1	3052411	CK	20-May-13	8015M	
Surrogate: 1-Chlorooctane		96.3 %	70-130		3052411	CK	20-May-13	8015M	
Surrogate: o-Terphenyl		107 %	70-130		3052411	CK	20-May-13	8015M	

Volatile Organic Compounds by EPA Method 8021

Benzene*	ND	0.054	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Toluene*	ND	0.054	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Ethylbenzene*	ND	0.054	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Total Xylenes*	ND	0.162	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Total BTEX	ND	0.324	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		113 %	89.4-126		3051601	AP	17-May-13	8021B	

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

ARCADIS U.S., INC. - HOUSTON
630 PLAZA DRIVE, SUITE 600
HIGHLANDS RANCH CO, 80129

Project: CHEVRON BUCKEYE
Project Number: B004860.0000
Project Manager: JONATHAN OLSEN
Fax To: (713) 977-4620

Reported:
10-Jun-13 10:43

VGW U118 - 02 (10')

H301174-08 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
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Cardinal Laboratories

Inorganic Compounds

% Moisture	6.93	0.100	%	1	3051612	DW	17-May-13	D2216	
% Solids	93.1	0.100	%	1	3051612	DW	17-May-13	D2216	
Chloride	80.0	16.0	mg/kg	4	3051701	DW	17-May-13	4500-Cl-B	

Organic Compounds

SUB-PBE

GRO C6-C10	ND	16.1	mg/kg dry	1	3052411	CK	20-May-13	8015M	
DRO >C10-C28	ND	16.1	mg/kg dry	1	3052411	CK	20-May-13	8015M	
Surrogate: 1-Chlorooctane		93.7 %	70-130		3052411	CK	20-May-13	8015M	
Surrogate: o-Terphenyl		107 %	70-130		3052411	CK	20-May-13	8015M	

Volatile Organic Compounds by EPA Method 8021

Benzene*	ND	0.054	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Toluene*	ND	0.054	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Ethylbenzene*	ND	0.054	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Total Xylenes*	ND	0.161	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Total BTEX	ND	0.322	mg/kg dry	50	3051601	AP	17-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		112 %	89.4-126		3051601	AP	17-May-13	8021B	

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

ARCADIS U.S., INC. - HOUSTON
630 PLAZA DRIVE, SUITE 600
HIGHLANDS RANCH CO, 80129

Project: CHEVRON BUCKEYE
Project Number: B004860.0000
Project Manager: JONATHAN OLSEN
Fax To: (713) 977-4620

Reported:
10-Jun-13 10:43

VGW U118 - 02 (15') H301174-09 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
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Cardinal Laboratories

Inorganic Compounds

% Moisture	4.06	0.100	%	1	3051612	DW	17-May-13	D2216	
% Solids	95.9	0.100	%	1	3051612	DW	17-May-13	D2216	
Chloride	112	16.0	mg/kg	4	3051701	DW	17-May-13	4500-Cl-B	

Organic Compounds

SUB-PBE

GRO C6-C10	ND	15.6	mg/kg dry	1	3052411	CK	20-May-13	8015M	
DRO >C10-C28	ND	15.6	mg/kg dry	1	3052411	CK	20-May-13	8015M	
Surrogate: 1-Chlorooctane		98.8 %	70-130		3052411	CK	20-May-13	8015M	
Surrogate: o-Terphenyl		105 %	70-130		3052411	CK	20-May-13	8015M	

Volatile Organic Compounds by EPA Method 8021

Benzene*	ND	0.052	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Toluene*	0.036	0.052	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Ethylbenzene*	ND	0.052	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total Xylenes*	ND	0.156	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total BTEX	0.036	0.313	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		114 %	89.4-126		3052011	AP	21-May-13	8021B	

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

ARCADIS U.S., INC. - HOUSTON
630 PLAZA DRIVE, SUITE 600
HIGHLANDS RANCH CO, 80129

Project: CHEVRON BUCKEYE
Project Number: B004860.0000
Project Manager: JONATHAN OLSEN
Fax To: (713) 977-4620

Reported:
10-Jun-13 10:43

VGW U118 - 02 (20')

H301174-10 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
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Cardinal Laboratories

Inorganic Compounds

% Moisture	7.13	0.100	%	1	3051612	DW	17-May-13	D2216	
% Solids	92.9	0.100	%	1	3051612	DW	17-May-13	D2216	
Chloride	384	16.0	mg/kg	4	3051701	DW	17-May-13	4500-Cl-B	

Organic Compounds

SUB-PBE

GRO C6-C10	ND	16.2	mg/kg dry	1	3052411	CK	20-May-13	8015M	
DRO >C10-C28	ND	16.2	mg/kg dry	1	3052411	CK	20-May-13	8015M	
Surrogate: 1-Chlorooctane		104 %	70-130		3052411	CK	20-May-13	8015M	
Surrogate: o-Terphenyl		104 %	70-130		3052411	CK	20-May-13	8015M	

Volatile Organic Compounds by EPA Method 8021

Benzene*	ND	0.054	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Toluene*	0.035	0.054	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Ethylbenzene*	ND	0.054	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total Xylenes*	ND	0.162	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total BTEX	0.035	0.323	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		113 %	89.4-126		3052011	AP	21-May-13	8021B	

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

ARCADIS U.S., INC. - HOUSTON
630 PLAZA DRIVE, SUITE 600
HIGHLANDS RANCH CO, 80129

Project: CHEVRON BUCKEYE
Project Number: B004860.0000
Project Manager: JONATHAN OLSEN
Fax To: (713) 977-4620

Reported:
10-Jun-13 10:43

VGW U118 - 02 (25')

H301174-11 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
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Cardinal Laboratories

Inorganic Compounds

% Moisture	7.33	0.100	%	1	3051612	DW	17-May-13	D2216	
% Solids	92.7	0.100	%	1	3051612	DW	17-May-13	D2216	
Chloride	1090	16.0	mg/kg	4	3051701	DW	17-May-13	4500-Cl-B	

Organic Compounds

SUB-PBE

GRO C6-C10	ND	16.2	mg/kg dry	1	3052411	CK	20-May-13	8015M	
DRO >C10-C28	ND	16.2	mg/kg dry	1	3052411	CK	20-May-13	8015M	
Surrogate: 1-Chlorooctane		102 %	70-130		3052411	CK	20-May-13	8015M	
Surrogate: o-Terphenyl		103 %	70-130		3052411	CK	20-May-13	8015M	

Volatile Organic Compounds by EPA Method 8021

Benzene*	ND	0.054	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Toluene*	0.039	0.054	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Ethylbenzene*	ND	0.054	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total Xylenes*	ND	0.162	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total BTEX	0.039	0.324	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		113 %	89.4-126		3052011	AP	21-May-13	8021B	

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

ARCADIS U.S., INC. - HOUSTON
630 PLAZA DRIVE, SUITE 600
HIGHLANDS RANCH CO, 80129

Project: CHEVRON BUCKEYE
Project Number: B004860.0000
Project Manager: JONATHAN OLSEN
Fax To: (713) 977-4620

Reported:
10-Jun-13 10:43

VGW U118 - 02 (30')

H301174-12 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
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Cardinal Laboratories

Inorganic Compounds

% Moisture	23.0	0.100	%	1	3051612	DW	17-May-13	D2216	
% Solids	77.0	0.100	%	1	3051612	DW	17-May-13	D2216	
Chloride	224	16.0	mg/kg	4	3051701	DW	17-May-13	4500-Cl-B	

Organic Compounds

SUB-PBE

GRO C6-C10	ND	19.5	mg/kg dry	1	3052411	CK	20-May-13	8015M	
DRO >C10-C28	ND	19.5	mg/kg dry	1	3052411	CK	20-May-13	8015M	
Surrogate: 1-Chlorooctane		96.7 %	70-130		3052411	CK	20-May-13	8015M	
Surrogate: o-Terphenyl		107 %	70-130		3052411	CK	20-May-13	8015M	

Volatile Organic Compounds by EPA Method 8021

Benzene*	ND	0.065	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Toluene*	0.031	0.065	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Ethylbenzene*	ND	0.065	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total Xylenes*	ND	0.195	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total BTEX	0.031	0.390	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		114 %	89.4-126		3052011	AP	21-May-13	8021B	

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:ARCADIS U.S., INC. - HOUSTON
630 PLAZA DRIVE, SUITE 600
HIGHLANDS RANCH CO, 80129Project: CHEVRON BUCKEYE
Project Number: B004860.0000
Project Manager: JONATHAN OLSEN
Fax To: (713) 977-4620Reported:
10-Jun-13 10:43**VGW U118 - 04 (2')****H301174-13 (Soil)**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
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Cardinal Laboratories**Inorganic Compounds**

Chloride	48.0	16.0	mg/kg	4	3060505	DW	05-Jun-13	4500-Cl-B	
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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:ARCADIS U.S., INC. - HOUSTON
630 PLAZA DRIVE, SUITE 600
HIGHLANDS RANCH CO, 80129Project: CHEVRON BUCKEYE
Project Number: B004860.0000
Project Manager: JONATHAN OLSEN
Fax To: (713) 977-4620Reported:
10-Jun-13 10:43**VGW U118 - 06 (2')****H301174-20 (Soil)**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
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Cardinal Laboratories**Inorganic Compounds**

Chloride	128	16.0	mg/kg	4	3060505	DW	05-Jun-13	4500-Cl-B	
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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:ARCADIS U.S., INC. - HOUSTON
630 PLAZA DRIVE, SUITE 600
HIGHLANDS RANCH CO, 80129Project: CHEVRON BUCKEYE
Project Number: B004860.0000
Project Manager: JONATHAN OLSEN
Fax To: (713) 977-4620Reported:
10-Jun-13 10:43**VGW U118 - 05 (2')****H301174-27 (Soil)**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
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Cardinal Laboratories**Inorganic Compounds**

Chloride	64.0	16.0	mg/kg	4	3060505	DW	05-Jun-13	4500-Cl-B	
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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

ARCADIS U.S., INC. - HOUSTON
630 PLAZA DRIVE, SUITE 600
HIGHLANDS RANCH CO, 80129

Project: CHEVRON BUCKEYE
Project Number: B004860.0000
Project Manager: JONATHAN OLSEN
Fax To: (713) 977-4620

Reported:
10-Jun-13 10:43

VGW U118 - 01 (2') H301174-34 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
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Cardinal Laboratories

Inorganic Compounds

% Solids	88.7	0.100	%	1	3051612	DW	17-May-13	D2216	
% Moisture	11.3	0.100	%	1	3051612	DW	17-May-13	D2216	
Chloride	4800	16.0	mg/kg	4	3051701	DW	17-May-13	4500-Cl-B	

Organic Compounds

SUB-PBE

GRO C6-C10	ND	16.9	mg/kg dry	1	3052411	CK	20-May-13	8015M	
DRO >C10-C28	102	16.9	mg/kg dry	1	3052411	CK	20-May-13	8015M	
Surrogate: 1-Chlorooctane		95.7 %	70-130		3052411	CK	20-May-13	8015M	
Surrogate: o-Terphenyl		105 %	70-130		3052411	CK	20-May-13	8015M	

Volatile Organic Compounds by EPA Method 8021

Benzene*	ND	0.056	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Toluene*	0.047	0.056	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Ethylbenzene*	ND	0.056	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total Xylenes*	ND	0.169	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total BTEX	0.047	0.338	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		113 %	89.4-126		3052011	AP	21-May-13	8021B	

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

ARCADIS U.S., INC. - HOUSTON
630 PLAZA DRIVE, SUITE 600
HIGHLANDS RANCH CO, 80129

Project: CHEVRON BUCKEYE
Project Number: B004860.0000
Project Manager: JONATHAN OLSEN
Fax To: (713) 977-4620

Reported:
10-Jun-13 10:43

VGW U118 - 01 (5')

H301174-35 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
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Cardinal Laboratories

Inorganic Compounds

% Moisture	19.2	0.100	%	1	3051612	DW	17-May-13	D2216	
% Solids	80.8	0.100	%	1	3051612	DW	17-May-13	D2216	
Chloride	192	16.0	mg/kg	4	3051701	DW	17-May-13	4500-Cl-B	

Organic Compounds

SUB-PBE

GRO C6-C10	ND	18.6	mg/kg dry	1	3052411	CK	20-May-13	8015M	
DRO >C10-C28	ND	18.6	mg/kg dry	1	3052411	CK	20-May-13	8015M	
Surrogate: 1-Chlorooctane		95.6 %	70-130		3052411	CK	20-May-13	8015M	
Surrogate: o-Terphenyl		103 %	70-130		3052411	CK	20-May-13	8015M	

Volatile Organic Compounds by EPA Method 8021

Benzene*	ND	0.062	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Toluene*	0.016	0.062	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Ethylbenzene*	ND	0.062	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total Xylenes*	ND	0.186	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total BTEX	0.016	0.371	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		112 %	89.4-126		3052011	AP	21-May-13	8021B	

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

ARCADIS U.S., INC. - HOUSTON
630 PLAZA DRIVE, SUITE 600
HIGHLANDS RANCH CO, 80129

Project: CHEVRON BUCKEYE
Project Number: B004860.0000
Project Manager: JONATHAN OLSEN
Fax To: (713) 977-4620

Reported:
10-Jun-13 10:43

VGW U118 - 01 (10')

H301174-36 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
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Cardinal Laboratories

Inorganic Compounds

% Moisture	18.4	0.100	%	1	3051612	DW	17-May-13	D2216	
% Solids	81.6	0.100	%	1	3051612	DW	17-May-13	D2216	
Chloride	32.0	16.0	mg/kg	4	3051701	DW	17-May-13	4500-Cl-B	

Organic Compounds

SUB-PBE

GRO C6-C10	ND	18.4	mg/kg dry	1	3052411	CK	20-May-13	8015M	
DRO >C10-C28	ND	18.4	mg/kg dry	1	3052411	CK	20-May-13	8015M	
Surrogate: 1-Chlorooctane		102 %	70-130		3052411	CK	20-May-13	8015M	
Surrogate: o-Terphenyl		107 %	70-130		3052411	CK	20-May-13	8015M	

Volatile Organic Compounds by EPA Method 8021

Benzene*	ND	0.061	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Toluene*	0.020	0.061	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Ethylbenzene*	ND	0.061	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total Xylenes*	ND	0.184	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total BTEX	0.020	0.368	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		112 %	89.4-126		3052011	AP	21-May-13	8021B	

Cardinal Laboratories

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

ARCADIS U.S., INC. - HOUSTON
630 PLAZA DRIVE, SUITE 600
HIGHLANDS RANCH CO, 80129

Project: CHEVRON BUCKEYE
Project Number: B004860.0000
Project Manager: JONATHAN OLSEN
Fax To: (713) 977-4620

Reported:
10-Jun-13 10:43

VGW U118 - 01 (15')

H301174-37 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
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Cardinal Laboratories

Inorganic Compounds

% Moisture	18.4	0.100	%	1	3051612	DW	17-May-13	D2216	
% Solids	81.6	0.100	%	1	3051612	DW	17-May-13	D2216	
Chloride	32.0	16.0	mg/kg	4	3051701	DW	17-May-13	4500-Cl-B	

Organic Compounds

SUB-PBE

GRO C6-C10	ND	18.4	mg/kg dry	1	3052411	CK	20-May-13	8015M	
DRO >C10-C28	ND	18.4	mg/kg dry	1	3052411	CK	20-May-13	8015M	
Surrogate: 1-Chlorooctane		86.0 %	70-130		3052411	CK	20-May-13	8015M	
Surrogate: o-Terphenyl		94.7 %	70-130		3052411	CK	20-May-13	8015M	

Volatile Organic Compounds by EPA Method 8021

Benzene*	ND	0.061	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Toluene*	0.022	0.061	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Ethylbenzene*	ND	0.061	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total Xylenes*	ND	0.184	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total BTEX	0.022	0.368	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		113 %	89.4-126		3052011	AP	21-May-13	8021B	

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

ARCADIS U.S., INC. - HOUSTON
630 PLAZA DRIVE, SUITE 600
HIGHLANDS RANCH CO, 80129

Project: CHEVRON BUCKEYE
Project Number: B004860.0000
Project Manager: JONATHAN OLSEN
Fax To: (713) 977-4620

Reported:
10-Jun-13 10:43

VGW U118 - 01 (20')

H301174-38 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
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Cardinal Laboratories

Inorganic Compounds

% Solids	79.8	0.100	%	1	3051612	DW	17-May-13	D2216	
% Moisture	20.2	0.100	%	1	3051612	DW	17-May-13	D2216	
Chloride	ND	16.0	mg/kg	4	3051701	DW	17-May-13	4500-Cl-B	

Organic Compounds

SUB-PBE

GRO C6-C10	ND	18.8	mg/kg dry	1	3052411	CK	20-May-13	8015M	
DRO >C10-C28	ND	18.8	mg/kg dry	1	3052411	CK	20-May-13	8015M	
Surrogate: 1-Chlorooctane		97.5 %	70-130		3052411	CK	20-May-13	8015M	
Surrogate: o-Terphenyl		108 %	70-130		3052411	CK	20-May-13	8015M	

Volatile Organic Compounds by EPA Method 8021

Benzene*	ND	0.063	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Toluene*	0.022	0.063	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Ethylbenzene*	ND	0.063	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total Xylenes*	ND	0.188	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total BTEX	0.022	0.376	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		112 %	89.4-126		3052011	AP	21-May-13	8021B	

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

ARCADIS U.S., INC. - HOUSTON
630 PLAZA DRIVE, SUITE 600
HIGHLANDS RANCH CO, 80129

Project: CHEVRON BUCKEYE
Project Number: B004860.0000
Project Manager: JONATHAN OLSEN
Fax To: (713) 977-4620

Reported:
10-Jun-13 10:43

VGW U118 - 01 (25')

H301174-39 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
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Cardinal Laboratories

Inorganic Compounds

% Solids	97.1	0.100	%	1	3051612	DW	17-May-13	D2216	
% Moisture	2.93	0.100	%	1	3051612	DW	17-May-13	D2216	
Chloride	32.0	16.0	mg/kg	4	3051701	DW	17-May-13	4500-Cl-B	

Organic Compounds

SUB-PBE

GRO C6-C10	ND	15.5	mg/kg dry	1	3052411	CK	20-May-13	8015M	
DRO >C10-C28	ND	15.5	mg/kg dry	1	3052411	CK	20-May-13	8015M	
Surrogate: 1-Chlorooctane		99.8 %	70-130		3052411	CK	20-May-13	8015M	
Surrogate: o-Terphenyl		107 %	70-130		3052411	CK	20-May-13	8015M	

Volatile Organic Compounds by EPA Method 8021

Benzene*	ND	0.052	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Toluene*	0.042	0.052	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Ethylbenzene*	ND	0.052	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total Xylenes*	ND	0.155	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total BTEX	0.042	0.309	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		113 %	89.4-126		3052011	AP	21-May-13	8021B	

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

ARCADIS U.S., INC. - HOUSTON
630 PLAZA DRIVE, SUITE 600
HIGHLANDS RANCH CO, 80129

Project: CHEVRON BUCKEYE
Project Number: B004860.0000
Project Manager: JONATHAN OLSEN
Fax To: (713) 977-4620

Reported:
10-Jun-13 10:43

VGW U118 - 01 (30')

H301174-40 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
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Cardinal Laboratories

Inorganic Compounds

% Moisture	20.0	0.100	%	1	3051612	DW	17-May-13	D2216	
% Solids	80.0	0.100	%	1	3051612	DW	17-May-13	D2216	
Chloride	ND	16.0	mg/kg	4	3051701	DW	17-May-13	4500-Cl-B	

Organic Compounds

SUB-PBE

GRO C6-C10	ND	18.7	mg/kg dry	1	3052411	CK	20-May-13	8015M	
DRO >C10-C28	ND	18.7	mg/kg dry	1	3052411	CK	20-May-13	8015M	
Surrogate: 1-Chlorooctane		99.6 %	70-130		3052411	CK	20-May-13	8015M	
Surrogate: o-Terphenyl		108 %	70-130		3052411	CK	20-May-13	8015M	

Volatile Organic Compounds by EPA Method 8021

Benzene*	ND	0.062	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Toluene*	0.023	0.062	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Ethylbenzene*	ND	0.062	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total Xylenes*	ND	0.187	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total BTEX	0.023	0.375	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		113 %	89.4-126		3052011	AP	21-May-13	8021B	

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

ARCADIS U.S., INC. - HOUSTON
630 PLAZA DRIVE, SUITE 600
HIGHLANDS RANCH CO, 80129

Project: CHEVRON BUCKEYE
Project Number: B004860.0000
Project Manager: JONATHAN OLSEN
Fax To: (713) 977-4620

Reported:
10-Jun-13 10:43

VGW U118 - 03 (2') H301174-41 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
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Cardinal Laboratories

Inorganic Compounds

% Moisture	6.98	0.100	%	1	3051612	DW	17-May-13	D2216	
% Solids	93.0	0.100	%	1	3051612	DW	17-May-13	D2216	
Chloride	832	16.0	mg/kg	4	3051701	DW	17-May-13	4500-Cl-B	

Organic Compounds

SUB-PBE

GRO C6-C10	ND	16.1	mg/kg dry	1	3052411	CK	20-May-13	8015M	
DRO >C10-C28	ND	16.1	mg/kg dry	1	3052411	CK	20-May-13	8015M	
Surrogate: 1-Chlorooctane		91.9 %	70-130		3052411	CK	20-May-13	8015M	
Surrogate: o-Terphenyl		98.8 %	70-130		3052411	CK	20-May-13	8015M	

Volatile Organic Compounds by EPA Method 8021

Benzene*	ND	0.054	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Toluene*	0.034	0.054	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Ethylbenzene*	ND	0.054	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total Xylenes*	ND	0.161	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total BTEX	0.034	0.323	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		111 %	89.4-126		3052011	AP	21-May-13	8021B	

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

ARCADIS U.S., INC. - HOUSTON
630 PLAZA DRIVE, SUITE 600
HIGHLANDS RANCH CO, 80129

Project: CHEVRON BUCKEYE
Project Number: B004860.0000
Project Manager: JONATHAN OLSEN
Fax To: (713) 977-4620

Reported:
10-Jun-13 10:43

VGW U118 - 03 (5') H301174-42 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
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Cardinal Laboratories

Inorganic Compounds

% Moisture	4.43	0.100	%	1	3051613	DW	17-May-13	D2216	
% Solids	95.6	0.100	%	1	3051613	DW	17-May-13	D2216	
Chloride	96.0	16.0	mg/kg	4	3051701	DW	17-May-13	4500-Cl-B	

Organic Compounds

SUB-PBE

GRO C6-C10	ND	15.7	mg/kg dry	1	3052412	CK	21-May-13	8015M	
DRO >C10-C28	ND	15.7	mg/kg dry	1	3052412	CK	21-May-13	8015M	
Surrogate: 1-Chlorooctane		105 %	70-130		3052412	CK	21-May-13	8015M	
Surrogate: o-Terphenyl		107 %	70-130		3052412	CK	21-May-13	8015M	

Volatile Organic Compounds by EPA Method 8021

Benzene*	ND	0.052	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Toluene*	0.033	0.052	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Ethylbenzene*	ND	0.052	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total Xylenes*	ND	0.157	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total BTEX	0.033	0.314	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		113 %	89.4-126		3052011	AP	21-May-13	8021B	

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

ARCADIS U.S., INC. - HOUSTON
630 PLAZA DRIVE, SUITE 600
HIGHLANDS RANCH CO, 80129

Project: CHEVRON BUCKEYE
Project Number: B004860.0000
Project Manager: JONATHAN OLSEN
Fax To: (713) 977-4620

Reported:
10-Jun-13 10:43

VGW U118 - 03 (10')

H301174-43 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
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Cardinal Laboratories

Inorganic Compounds

% Moisture	6.88	0.100	%	1	3051613	DW	17-May-13	D2216	
% Solids	93.1	0.100	%	1	3051613	DW	17-May-13	D2216	
Chloride	48.0	16.0	mg/kg	4	3051701	DW	17-May-13	4500-Cl-B	

Organic Compounds

SUB-PBE

GRO C6-C10	ND	16.1	mg/kg dry	1	3052412	CK	21-May-13	8015M	
DRO >C10-C28	ND	16.1	mg/kg dry	1	3052412	CK	21-May-13	8015M	
Surrogate: 1-Chlorooctane		101 %	70-130		3052412	CK	21-May-13	8015M	
Surrogate: o-Terphenyl		107 %	70-130		3052412	CK	21-May-13	8015M	

Volatile Organic Compounds by EPA Method 8021

Benzene*	ND	0.054	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Toluene*	0.028	0.054	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Ethylbenzene*	ND	0.054	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total Xylenes*	ND	0.161	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total BTEX	0.028	0.322	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		113 %	89.4-126		3052011	AP	21-May-13	8021B	

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

ARCADIS U.S., INC. - HOUSTON
630 PLAZA DRIVE, SUITE 600
HIGHLANDS RANCH CO, 80129

Project: CHEVRON BUCKEYE
Project Number: B004860.0000
Project Manager: JONATHAN OLSEN
Fax To: (713) 977-4620

Reported:
10-Jun-13 10:43

VGW U118 - 03 (15')

H301174-44 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
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Cardinal Laboratories

Inorganic Compounds

% Moisture	6.72	0.100	%	1	3051613	DW	17-May-13	D2216	
% Solids	93.3	0.100	%	1	3051613	DW	17-May-13	D2216	
Chloride	48.0	16.0	mg/kg	4	3051701	DW	17-May-13	4500-Cl-B	

Organic Compounds

SUB-PBE

GRO C6-C10	ND	16.1	mg/kg dry	1	3052412	CK	21-May-13	8015M	
DRO >C10-C28	ND	16.1	mg/kg dry	1	3052412	CK	21-May-13	8015M	
Surrogate: 1-Chlorooctane		106 %	70-130		3052412	CK	21-May-13	8015M	
Surrogate: o-Terphenyl		107 %	70-130		3052412	CK	21-May-13	8015M	

Volatile Organic Compounds by EPA Method 8021

Benzene*	ND	0.054	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Toluene*	0.031	0.054	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Ethylbenzene*	ND	0.054	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total Xylenes*	ND	0.161	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total BTEX	0.031	0.322	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		114 %	89.4-126		3052011	AP	21-May-13	8021B	

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

ARCADIS U.S., INC. - HOUSTON
630 PLAZA DRIVE, SUITE 600
HIGHLANDS RANCH CO, 80129

Project: CHEVRON BUCKEYE
Project Number: B004860.0000
Project Manager: JONATHAN OLSEN
Fax To: (713) 977-4620

Reported:
10-Jun-13 10:43

VGW U118 - 03 (20')

H301174-45 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
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Cardinal Laboratories

Inorganic Compounds

% Moisture	4.54	0.100	%	1	3051613	DW	17-May-13	D2216	
% Solids	95.5	0.100	%	1	3051613	DW	17-May-13	D2216	
Chloride	48.0	16.0	mg/kg	4	3051701	DW	17-May-13	4500-Cl-B	

Organic Compounds

SUB-PBE

GRO C6-C10	ND	15.7	mg/kg dry	1	3052412	CK	21-May-13	8015M	
DRO >C10-C28	ND	15.7	mg/kg dry	1	3052412	CK	21-May-13	8015M	
Surrogate: 1-Chlorooctane		105 %	70-130		3052412	CK	21-May-13	8015M	
Surrogate: o-Terphenyl		106 %	70-130		3052412	CK	21-May-13	8015M	

Volatile Organic Compounds by EPA Method 8021

Benzene*	ND	0.052	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Toluene*	0.019	0.052	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Ethylbenzene*	ND	0.052	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total Xylenes*	ND	0.157	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total BTEX	0.019	0.314	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		115 %	89.4-126		3052011	AP	21-May-13	8021B	

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

ARCADIS U.S., INC. - HOUSTON
630 PLAZA DRIVE, SUITE 600
HIGHLANDS RANCH CO, 80129

Project: CHEVRON BUCKEYE
Project Number: B004860.0000
Project Manager: JONATHAN OLSEN
Fax To: (713) 977-4620

Reported:
10-Jun-13 10:43

VGW U118 - 03 (25')

H301174-46 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
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Cardinal Laboratories

Inorganic Compounds

% Solids	96.4	0.100	%	1	3051613	DW	17-May-13	D2216	
% Moisture	3.57	0.100	%	1	3051613	DW	17-May-13	D2216	
Chloride	32.0	16.0	mg/kg	4	3051701	DW	17-May-13	4500-Cl-B	

Organic Compounds

SUB-PBE

GRO C6-C10	ND	15.6	mg/kg dry	1	3052412	CK	21-May-13	8015M	
DRO >C10-C28	ND	15.6	mg/kg dry	1	3052412	CK	21-May-13	8015M	
Surrogate: 1-Chlorooctane		98.8 %	70-130		3052412	CK	21-May-13	8015M	
Surrogate: o-Terphenyl		108 %	70-130		3052412	CK	21-May-13	8015M	

Volatile Organic Compounds by EPA Method 8021

Benzene*	ND	0.052	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Toluene*	0.041	0.052	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Ethylbenzene*	ND	0.052	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total Xylenes*	ND	0.156	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total BTEX	0.041	0.311	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		114 %	89.4-126		3052011	AP	21-May-13	8021B	

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

ARCADIS U.S., INC. - HOUSTON
630 PLAZA DRIVE, SUITE 600
HIGHLANDS RANCH CO, 80129

Project: CHEVRON BUCKEYE
Project Number: B004860.0000
Project Manager: JONATHAN OLSEN
Fax To: (713) 977-4620

Reported:
10-Jun-13 10:43

VGW U118 - 03 (30')

H301174-47 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
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Cardinal Laboratories

Inorganic Compounds

% Solids	97.8	0.100	%	1	3051613	DW	17-May-13	D2216	
% Moisture	2.20	0.100	%	1	3051613	DW	17-May-13	D2216	
Chloride	32.0	16.0	mg/kg	4	3051701	DW	17-May-13	4500-Cl-B	

Organic Compounds

SUB-PBE

GRO C6-C10	ND	15.3	mg/kg dry	1	3052412	CK	21-May-13	8015M	
DRO >C10-C28	ND	15.3	mg/kg dry	1	3052412	CK	21-May-13	8015M	
Surrogate: 1-Chlorooctane		94.3 %	70-130		3052412	CK	21-May-13	8015M	
Surrogate: o-Terphenyl		104 %	70-130		3052412	CK	21-May-13	8015M	

Volatile Organic Compounds by EPA Method 8021

Benzene*	ND	0.051	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Toluene*	ND	0.051	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Ethylbenzene*	ND	0.051	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total Xylenes*	ND	0.153	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total BTEX	ND	0.307	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		112 %	89.4-126		3052011	AP	21-May-13	8021B	

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

ARCADIS U.S., INC. - HOUSTON
630 PLAZA DRIVE, SUITE 600
HIGHLANDS RANCH CO, 80129

Project: CHEVRON BUCKEYE
Project Number: B004860.0000
Project Manager: JONATHAN OLSEN
Fax To: (713) 977-4620

Reported:
10-Jun-13 10:43

VGW U118 - 07 (2')

H301174-48 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
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Cardinal Laboratories

Inorganic Compounds

% Solids	85.8	0.100	%	1	3051613	DW	17-May-13	D2216	
% Moisture	14.2	0.100	%	1	3051613	DW	17-May-13	D2216	
Chloride	7200	16.0	mg/kg	4	3051702	DW	17-May-13	4500-Cl-B	

Organic Compounds

SUB-PBE

GRO C6-C10	ND	17.5	mg/kg dry	1	3052412	CK	21-May-13	8015M	
DRO >C10-C28	ND	17.5	mg/kg dry	1	3052412	CK	21-May-13	8015M	
Surrogate: 1-Chlorooctane		85.0 %	70-130		3052412	CK	21-May-13	8015M	
Surrogate: o-Terphenyl		92.2 %	70-130		3052412	CK	21-May-13	8015M	

Volatile Organic Compounds by EPA Method 8021

Benzene*	ND	0.058	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Toluene*	0.025	0.058	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Ethylbenzene*	ND	0.058	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total Xylenes*	ND	0.175	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total BTEX	0.025	0.349	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		113 %	89.4-126		3052011	AP	21-May-13	8021B	

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

ARCADIS U.S., INC. - HOUSTON
630 PLAZA DRIVE, SUITE 600
HIGHLANDS RANCH CO, 80129

Project: CHEVRON BUCKEYE
Project Number: B004860.0000
Project Manager: JONATHAN OLSEN
Fax To: (713) 977-4620

Reported:
10-Jun-13 10:43

VGW U118 - 07 (5')

H301174-49 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
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Cardinal Laboratories

Inorganic Compounds

% Solids	95.1	0.100	%	1	3051613	DW	17-May-13	D2216	
% Moisture	4.94	0.100	%	1	3051613	DW	17-May-13	D2216	
Chloride	96.0	16.0	mg/kg	4	3051702	DW	17-May-13	4500-Cl-B	

Organic Compounds

SUB-PBE

GRO C6-C10	ND	15.8	mg/kg dry	1	3052412	CK	21-May-13	8015M	
DRO >C10-C28	ND	15.8	mg/kg dry	1	3052412	CK	21-May-13	8015M	
Surrogate: 1-Chlorooctane		93.9 %	70-130		3052412	CK	21-May-13	8015M	
Surrogate: o-Terphenyl		102 %	70-130		3052412	CK	21-May-13	8015M	

Volatile Organic Compounds by EPA Method 8021

Benzene*	ND	0.053	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Toluene*	0.026	0.053	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Ethylbenzene*	ND	0.053	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total Xylenes*	ND	0.158	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Total BTEX	0.026	0.316	mg/kg dry	50	3052011	AP	21-May-13	8021B	
Surrogate: 4-Bromofluorobenzene (PID)		113 %	89.4-126		3052011	AP	21-May-13	8021B	

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

ARCADIS U.S., INC. - HOUSTON
630 PLAZA DRIVE, SUITE 600
HIGHLANDS RANCH CO, 80129

Project: CHEVRON BUCKEYE
Project Number: B004860.0000
Project Manager: JONATHAN OLSEN
Fax To: (713) 977-4620

Reported:
10-Jun-13 10:43

Inorganic Compounds - Quality Control

Cardinal Laboratories

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

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

ARCADIS U.S., INC. - HOUSTON
630 PLAZA DRIVE, SUITE 600
HIGHLANDS RANCH CO, 80129

Project: CHEVRON BUCKEYE
Project Number: B004860.0000
Project Manager: JONATHAN OLSEN
Fax To: (713) 977-4620

Reported:
10-Jun-13 10:43

Inorganic Compounds - Quality Control

Cardinal Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch 3051613 - General Prep - Wet Chem

Duplicate (3051613-DUP1)	Source: H301174-42			Prepared: 16-May-13 Analyzed: 17-May-13						
% Solids	95.5	0.100	%		95.6			0.0837	20	
% Moisture	4.51	0.100	%		4.43			1.79	200	

Batch 3051701 - 1:4 DI Water

Blank (3051701-BLK1)	Prepared & Analyzed: 17-May-13									
Chloride	ND	16.0	mg/kg							
LCS (3051701-BS1)	Prepared & Analyzed: 17-May-13									
Chloride	432	16.0	mg/kg	400		108	80-120			
LCS Dup (3051701-BSD1)	Prepared & Analyzed: 17-May-13									
Chloride	432	16.0	mg/kg	400		108	80-120	0.00	20	
Duplicate (3051701-DUP1)	Source: H301174-07			Prepared & Analyzed: 17-May-13						
Chloride	336	16.0	mg/kg		368			9.09	20	
Matrix Spike (3051701-MS1)	Source: H301174-07			Prepared & Analyzed: 17-May-13						
Chloride	640	16.0	mg/kg	400	368	68.0	80-120			QM-07

Batch 3051702 - 1:4 DI Water

Blank (3051702-BLK1)	Prepared & Analyzed: 17-May-13									
Chloride	ND	16.0	mg/kg							
LCS (3051702-BS1)	Prepared & Analyzed: 17-May-13									
Chloride	432	16.0	mg/kg	400		108	80-120			

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

ARCADIS U.S., INC. - HOUSTON
630 PLAZA DRIVE, SUITE 600
HIGHLANDS RANCH CO, 80129

Project: CHEVRON BUCKEYE
Project Number: B004860.0000
Project Manager: JONATHAN OLSEN
Fax To: (713) 977-4620

Reported:
10-Jun-13 10:43

Inorganic Compounds - Quality Control

Cardinal Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch 3051702 - 1:4 DI Water

LCS Dup (3051702-BSD1)				Prepared & Analyzed: 17-May-13						
Chloride	416	16.0	mg/kg	400		104	80-120	3.77	20	
Duplicate (3051702-DUP1)				Source: H301174-48 Prepared & Analyzed: 17-May-13						
Chloride	8400	16.0	mg/kg		7200			15.4	20	
Matrix Spike (3051702-MS1)				Source: H301174-48 Prepared & Analyzed: 17-May-13						
Chloride	9040	16.0	mg/kg	400	7200	460	80-120			QM-07

Batch 3060505 - 1:4 DI Water

Blank (3060505-BLK1)				Prepared & Analyzed: 05-Jun-13						
Chloride	ND	16.0	mg/kg							
LCS (3060505-BS1)				Prepared & Analyzed: 05-Jun-13						
Chloride	432	16.0	mg/kg	400		108	80-120			
LCS Dup (3060505-BSD1)				Prepared & Analyzed: 05-Jun-13						
Chloride	432	16.0	mg/kg	400		108	80-120	0.00	20	
Duplicate (3060505-DUP1)				Source: H301196-44 Prepared & Analyzed: 05-Jun-13						
Chloride	592	16.0	mg/kg		528			11.4	20	
Matrix Spike (3060505-MS1)				Source: H301196-44 Prepared & Analyzed: 05-Jun-13						
Chloride	1020	16.0	mg/kg	400	528	124	80-120			QM-07

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

ARCADIS U.S., INC. - HOUSTON
630 PLAZA DRIVE, SUITE 600
HIGHLANDS RANCH CO, 80129

Project: CHEVRON BUCKEYE
Project Number: B004860.0000
Project Manager: JONATHAN OLSEN
Fax To: (713) 977-4620

Reported:
10-Jun-13 10:43

Organic Compounds - Quality Control

Cardinal Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch 3052411 - General Prep

Blank (3052411-BLK1)

Prepared & Analyzed: 20-May-13

GRO C6-C10	ND	15.0	mg/kg wet							
DRO >C10-C28	ND	15.0	mg/kg wet							
Surrogate: 1-Chlorooctane	116		mg/kg	100		116	70-130			
Surrogate: o-Terphenyl	63.8		mg/kg	50.0		128	70-130			

LCS (3052411-BS1)

Prepared & Analyzed: 20-May-13

GRO C6-C10	1220	15.0	mg/kg wet	1000		122	75-125			
DRO >C10-C28	1230	15.0	mg/kg wet	1000		123	75-125			
Surrogate: 1-Chlorooctane	112		mg/kg	100		112	70-130			
Surrogate: o-Terphenyl	53.5		mg/kg	50.0		107	70-130			

Matrix Spike (3052411-MS1)

Source: H301174-41

Prepared & Analyzed: 20-May-13

GRO C6-C10	1180	16.1	mg/kg dry	1080	ND	110	75-125			
DRO >C10-C28	1170	16.1	mg/kg dry	1080	ND	109	75-125			
Surrogate: 1-Chlorooctane	113		mg/kg	100		113	70-130			
Surrogate: o-Terphenyl	54.5		mg/kg	50.0		109	70-130			

Matrix Spike Dup (3052411-MSD1)

Source: H301174-41

Prepared & Analyzed: 20-May-13

GRO C6-C10	1130	16.1	mg/kg dry	1080	ND	105	75-125	4.65	20	
DRO >C10-C28	1250	16.1	mg/kg dry	1080	ND	116	75-125	6.22	20	
Surrogate: 1-Chlorooctane	109		mg/kg	100		109	70-130			
Surrogate: o-Terphenyl	55.6		mg/kg	50.0		111	70-130			

Batch 3052412 - General Prep

Blank (3052412-BLK1)

Prepared: 20-May-13 Analyzed: 21-May-13

GRO C6-C10	ND	15.0	mg/kg wet							
DRO >C10-C28	ND	15.0	mg/kg wet							
Surrogate: 1-Chlorooctane	123		mg/kg	100		123	70-130			
Surrogate: o-Terphenyl	61.2		mg/kg	50.0		122	70-130			

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

ARCADIS U.S., INC. - HOUSTON
630 PLAZA DRIVE, SUITE 600
HIGHLANDS RANCH CO, 80129

Project: CHEVRON BUCKEYE
Project Number: B004860.0000
Project Manager: JONATHAN OLSEN
Fax To: (713) 977-4620

Reported:
10-Jun-13 10:43

Organic Compounds - Quality Control

Cardinal Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch 3052412 - General Prep

LCS (3052412-BS1)

Prepared: 20-May-13 Analyzed: 21-May-13

GRO C6-C10	1160	15.0	mg/kg wet	1000		116	75-125			
DRO >C10-C28	1200	15.0	mg/kg wet	1000		120	75-125			
Surrogate: 1-Chlorooctane	126		mg/kg	100		126	70-130			
Surrogate: o-Terphenyl	59.8		mg/kg	50.0		120	70-130			

LCS Dup (3052412-BS1)

Prepared: 20-May-13 Analyzed: 21-May-13

GRO C6-C10	1200	15.0	mg/kg wet	1000		120	75-125	3.39	20	
DRO >C10-C28	1230	15.0	mg/kg wet	1000		123	75-125	2.47	20	
Surrogate: 1-Chlorooctane	125		mg/kg	100		125	70-130			
Surrogate: o-Terphenyl	63.3		mg/kg	50.0		127	70-130			

Matrix Spike (3052412-MS1)

Source: H301174-49

Prepared: 20-May-13 Analyzed: 21-May-13

GRO C6-C10	1120	15.8	mg/kg dry	1050	ND	106	75-125			
DRO >C10-C28	1260	15.8	mg/kg dry	1050	ND	120	75-125			
Surrogate: 1-Chlorooctane	128		mg/kg	100		128	70-130			
Surrogate: o-Terphenyl	57.6		mg/kg	50.0		115	70-130			

Matrix Spike Dup (3052412-MS1)

Source: H301174-49

Prepared: 20-May-13 Analyzed: 21-May-13

GRO C6-C10	1200	15.8	mg/kg dry	1050	ND	114	75-125	7.27	20	
DRO >C10-C28	1300	15.8	mg/kg dry	1050	ND	124	75-125	3.28	20	
Surrogate: 1-Chlorooctane	126		mg/kg	100		126	70-130			
Surrogate: o-Terphenyl	57.1		mg/kg	50.0		114	70-130			

Cardinal Laboratories

*=Accredited Analyte

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

ARCADIS U.S., INC. - HOUSTON
630 PLAZA DRIVE, SUITE 600
HIGHLANDS RANCH CO, 80129

Project: CHEVRON BUCKEYE
Project Number: B004860.0000
Project Manager: JONATHAN OLSEN
Fax To: (713) 977-4620

Reported:
10-Jun-13 10:43

Volatile Organic Compounds by EPA Method 8021 - Quality Control

Cardinal Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
---------	--------	-----------------	-------	-------------	---------------	------	-------------	-----	-----------	-------

Batch 3051601 - Volatiles

Blank (3051601-BLK1)

Prepared & Analyzed: 16-May-13

Benzene	ND	0.050	mg/kg wet							
Toluene	0.011	0.050	mg/kg wet							
Ethylbenzene	ND	0.050	mg/kg wet							
Total Xylenes	ND	0.150	mg/kg wet							
Total BTEX	0.011	0.300	mg/kg wet							
Surrogate: 4-Bromofluorobenzene (PID)	0.0555		mg/kg wet	0.0500		111	89.4-126			

LCS (3051601-BS1)

Prepared & Analyzed: 16-May-13

Benzene	2.08	0.050	mg/kg wet	2.00		104	76.4-135			
Toluene	1.88	0.050	mg/kg wet	2.00		94.2	80.2-135			
Ethylbenzene	2.01	0.050	mg/kg wet	2.00		101	78.5-133			
Total Xylenes	5.93	0.150	mg/kg wet	6.00		98.8	80.1-135			
Surrogate: 4-Bromofluorobenzene (PID)	0.0538		mg/kg wet	0.0500		108	89.4-126			

LCS Dup (3051601-BSD1)

Prepared & Analyzed: 16-May-13

Benzene	2.17	0.050	mg/kg wet	2.00		109	76.4-135	4.20	16.4	
Toluene	1.95	0.050	mg/kg wet	2.00		97.7	80.2-135	3.70	16.6	
Ethylbenzene	2.10	0.050	mg/kg wet	2.00		105	78.5-133	4.30	16.1	
Total Xylenes	6.15	0.150	mg/kg wet	6.00		102	80.1-135	3.69	15.8	
Surrogate: 4-Bromofluorobenzene (PID)	0.0538		mg/kg wet	0.0500		108	89.4-126			

Batch 3052011 - Volatiles

Blank (3052011-BLK1)

Prepared: 20-May-13 Analyzed: 21-May-13

Benzene	ND	0.050	mg/kg wet							
Toluene	0.011	0.050	mg/kg wet							
Ethylbenzene	ND	0.050	mg/kg wet							
Total Xylenes	ND	0.150	mg/kg wet							
Total BTEX	0.011	0.300	mg/kg wet							
Surrogate: 4-Bromofluorobenzene (PID)	0.0555		mg/kg wet	0.0500		111	89.4-126			

Cardinal Laboratories

*=Accredited Analyte

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

ARCADIS U.S., INC. - HOUSTON
630 PLAZA DRIVE, SUITE 600
HIGHLANDS RANCH CO, 80129

Project: CHEVRON BUCKEYE
Project Number: B004860.0000
Project Manager: JONATHAN OLSEN
Fax To: (713) 977-4620

Reported:
10-Jun-13 10:43

Volatile Organic Compounds by EPA Method 8021 - Quality Control

Cardinal Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
---------	--------	-----------------	-------	-------------	---------------	------	-------------	-----	-----------	-------

Batch 3052011 - Volatiles

LCS (3052011-BS1)

Prepared & Analyzed: 20-May-13

Benzene	2.37	0.050	mg/kg wet	2.00		119	76.4-135			
Toluene	2.12	0.050	mg/kg wet	2.00		106	80.2-135			
Ethylbenzene	2.29	0.050	mg/kg wet	2.00		115	78.5-133			
Total Xylenes	6.67	0.150	mg/kg wet	6.00		111	80.1-135			
Surrogate: 4-Bromofluorobenzene (PID)	0.0533		mg/kg wet	0.0500		107	89.4-126			

LCS Dup (3052011-BSD1)

Prepared: 20-May-13 Analyzed: 21-May-13

Benzene	2.32	0.050	mg/kg wet	2.00		116	76.4-135	2.27	16.4	
Toluene	2.10	0.050	mg/kg wet	2.00		105	80.2-135	1.17	16.6	
Ethylbenzene	2.28	0.050	mg/kg wet	2.00		114	78.5-133	0.595	16.1	
Total Xylenes	6.75	0.150	mg/kg wet	6.00		112	80.1-135	1.17	15.8	
Surrogate: 4-Bromofluorobenzene (PID)	0.0555		mg/kg wet	0.0500		111	89.4-126			

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

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Celey D. Keene, Lab Director/Quality Manager



CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

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

Company Name: ARCADIS-15

BILL TO

ANALYSIS REQUEST

Project Manager: Jonathan Olson

P.O. #:

Address: 2929 Buhrbach Dr., Suite 300

Company:

City: Houston State: TX Zip: 77102

Attn:

Phone #: 713.953.4874 Fax #: 713.977.4620

Address:

Project #: See 4860, over Project Owner: Chuvion

City:

Project Name: Chuvion Buhrbach

State: Zip:

Project Location: Buhrbach oil field

Phone #:

Sample Name:

Fax #:

FOR LAB USE ONLY

MATRIX

PRESERV

SAMPLING

Lab I.D.

Sample I.D.

41301174

(G)RAB OR (C)OMP

CONTAINERS

GROUNDWATER

WASTEWATER

SOIL

OIL

1 V6WU118-07 (10')

6 2

DATE

TIME

1

5-14-13 1525

chlorides 300.1

2 V6WU118-07 (15')

6 2

1

5-14-13 1530

1

TPH 8015, BTEX 8021B, Mixture

3 V6WU118-07 (20')

6 2

1

5-14-13 1535

1

1

4 V6WU118-07 (25')

6 2

1

5-14-13 1540

1

1

5 V6WU118-07 (30')

6 2

1

5-14-13 1550

1

1

6 V6WU118-02 (5')

6 2

1

5-14-13 1602

1

1

7 V6WU118-02 (10')

6 2

1

5-14-13 1607

1

1

8 V6WU118-02 (15')

6 2

1

5-14-13 1614

1

1

9 V6WU118-02 (20')

6 2

1

5-14-13 1620

1

1

10 V6WU118-02 (25')

6 2

1

5-14-13 1625

1

1

Relinquished By: [Signature]

Date: 5-15-13 Time: 1:00

Received By: [Signature]

Phone Result: ☐ Yes ☐ No

Fax Result: ☐ Yes ☐ No

Remarks:

Delivered By: (Circle One)

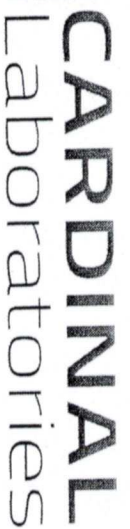
UPS ☒ Bus ☐ Other ☐

Sample Condition

Cool ☒ Intact ☒

Checked By: [Signature]

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




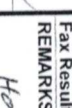


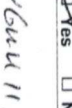
CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

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

Company Name: ACME		P.O. #:	
Project Manager: Johnathan D. Smith		Company:	
Address: 2929 Main, North Platte, NE 68901		Attn:	
City: North Platte		Address:	
State: NE Zip: 68901		City:	
Phone #: 713.993.4874 Fax #: 713.977.4620		State:	
Project #: 8804860000 Project Owner: Chewon		Zip:	
Project Name: Chewon Buchtayz		Phone #:	
Project Location: Buchtayz Oil Field		Fax #:	
Sample Name: Ryan Henry			

Lab I.D.	Sample I.D.	(G)RAB OR (C)OMP	# CONTAINERS	MATRIX							PRESERV	SAMPLING	DATE	TIME	ANALYSIS REQUEST
				GROUNDWATER	WASTEWATER	SOIL	OIL	SLUDGE	OTHER	ACID/BASE					
H301174	V6uu118-02(25')	G	2										5-14-13	1628	Moisture & Chloride = USEPA 30.1
11	V6uu118-02(25')	G	2										5-14-13	1632	TPH 8015 & BTEX 8021B
12	V6uu118-02(30')	G	2	X									5-14-13	1657	Hold
13	V6uu118-04(2')	G	2										5-14-13	1700	
14	V6uu118-04(5')	G	2										5-14-13	1705	
15	V6uu118-04(10')	G	2										5-14-13	1710	
16	V6uu118-04(15')	G	2										5-14-13	1715	
17	V6uu118-04(20')	G	2										5-14-13	1720	
18	V6uu118-04(25')	G	2										5-14-13	1728	
19	V6uu118-04(30')	G	2										5-14-13	1728	

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Relinquished By:  Date: 5-15-13 Time: 1700	Received By:  Date: 5-15-13 Time: 1700
Relinquished By:  Date: 5-15-13 Time: 1700	Received By:  Date: 5-15-13 Time: 1700

Delivered By: (Circle One) Sampler - UPS - Bus - Other:	Sample Condition Cool <input checked="" type="checkbox"/> Intact <input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	CHECKED BY: (Initials) 
REMARKS: Hold V6uu118-04 5/15/13		



CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

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

Company Name: ARCADIS-45

Project Manager: Jonathan Olson

Address: 2929 Briarclark Dr., Suit 300

City: Houston State: TX Zip: 77402

Phone #: 713.953.4874 Fax #: 713.977.4620

Project #: 80486, 000 Project Owner: Chavira

Project Name: Chavira Buick

Project Location: Buick - oil field

Sampler Name:

FOR LAB USE ONLY

Lab I.D.

Sample I.D.

(G)RAB OR (C)OMP

CONTAINERS

GROUNDWATER

WASTEWATER

SOIL

OIL

SLUDGE

OTHER :

ACID/BASE

ICE / COOL

OTHER : None

DATE

TIME

Chlorides 300.1

TPT 8019, BTEX 8021B, Moisture

Hold

XCI-added 5/31/13

X

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CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

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

Company Name: **ARCADIS-45**

Project Manager: **Jonathan Olson**

Address: **2929 Fairpark Dr., Suit 300**

City: **Houston** State: **TX** Zip: **77102**

Phone #: **713.953.4874** Fax #: **713.977.4620**

Project #: **1804860, 0000** Project Owner: **Chyron Builts**

Project Name: **Chyron Builts**

Project Location: **Builty - oil field**

Sampler Name:

FOR LAB USE ONLY

Lab I.D. Sample I.D.

Lab I.D.	Sample I.D.	(G)RAB OR (C)OMP	# CONTAINERS	MATRIX						DATE	TIME	ANALYSIS REQUEST					
				GROUNDWATER	WASTEWATER	SOIL	OIL	SLUDGE	OTHER								
H301174	UGW 118-05(15')		2									Chlorides, 300.1					
30	UGW 118-05(20')		2									TPH 8015, BTEX 8021B, Moisture					
31	UGW 118-05(25')		2									Hold					
32	UGW 118-05(30')		2														
33	UGW 118-05(35')		2														
34	UGW 118-05(40')		2														
35	UGW 118-01(15')		2														
36	UGW 118-01(10')		2														
37	UGW 118-01(15')		2														
38	UGW 118-01(20')		2														
39	UGW 118-01(25')		2														

PLEASE NOTE: I hereby certify that the above information is true and correct to the best of my knowledge and belief. I understand that any falsification of this information may result in civil and criminal penalties. I understand that any falsification of this information may result in civil and criminal penalties. I understand that any falsification of this information may result in civil and criminal penalties.

Relinquished By:

Relinquished By: *[Signature]*

Date: **5-15-13**

Time: **1:00**

Delivered By: (Circle One)

Sampler - UPS - Bus - Other:

Sample Condition
Cool ☒ Intact ☒
Yes ☒ No ☐

CHECKED BY: *[Signature]*

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

REMARKS:

Hold UGW 118-05 5-15-13

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



CARDINAL Laboratories

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

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

Company Name: ARCADIS-15

Project Manager: Jonathan Olson

Address: 2929 Bismarck Dr., Suite 300

City: Houston State: TX Zip: 77402

Phone #: 713.953.4874 Fax #: 713.977.4620

Project #: 004860, 000 Project Owner: Chevron

Project Name: Chevron Buckeye

Project Location: Buckeye oil field

Sample Name:

FOR LAB USE ONLY

BILL TO

ANALYSIS REQUEST

P.O. #:

Company:

Attn:

Address:

City:

State: Zip:

Phone #:

Fax #:

MATRIX

PRESERV

SAMPLING

Lab I.D.

Sample I.D.

H2D1174

40

41

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61

(G)RAB OR (C)OMP

CONTAINERS

GROUNDWATER

WASTEWATER

SOIL

OIL

SLUDGE

OTHER:

ACID/BASE

ICE / COOL

OTHER: None

DATE

TIME

1425

1432

1437

1440

1445

1450

1500

1503

1507

1510

1513

1517

1520

1523

1527

1530

1533

1537

1540

1543

1547

1550

1553

1557

1600

1603

1607

1610

1613

1617

1620

1623

1627

Relinquished By:

Relinquished By:

Relinquished By:

Relinquished By:

Relinquished By:

Relinquished By:

Relinquished By:

Relinquished By:

Relinquished By:

Date: 5-15-13

Time: 11:00

Date: 5-15-13

Time: 11:00

Received By:

Received By:

Received By:

Received By:

Received By:

Received By:

Received By:

Received By:

Received By:

Sample Condition

Cool ☒ Intact ☒

Yes ☒ No ☒

Yes ☒ No ☒

Yes ☒ No ☒

CHECKED BY:

CHECKED BY:

CHECKED BY:

CHECKED BY:

CHECKED BY:

CHECKED BY:

Phone Result:

Fax Result:

Phone Result:

Fax Result:

Phone Result:

Fax Result:

Phone Result:

Fax Result:

Phone Result:

Fax Result:

Yes ☐ No ☐

Yes ☐ No ☐

Yes ☐ No ☐

Yes ☐ No ☐

Yes ☐ No ☐

Yes ☐ No ☐

Yes ☐ No ☐

Yes ☐ No ☐

Yes ☐ No ☐

Yes ☐ No ☐

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Add'l Fax #:

Add'l Phone #:

Add'l Fax #:

Add'l Phone #:

Add'l Fax #:

Add'l Phone #:

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REMARKS:

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REMARKS:

Moisture 300.1

T/H 8015, BTEX 8021B, Moisture

CI-added 5/31/13



Attachment 6

Boring Logs (May 2013)

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

Well/Boring ID: VGWU118 - 01



Drilling Method: Air Rotary
Sampling Method: Shovel

Client: Chevron EMC
Location: Vacuum Glorietta West Unit 118

Borehole Depth: 30' bgs
Descriptions By: R Nanny

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description
-------	-----------	-------------------	-----------------	-----------------	---------------------	-------------------	-----------------	---------------------------

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



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

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

Well/Boring ID: VGWU118 - 02



Drilling Method: Air Rotary
Sampling Method: Shovel

Client: Chevron EMC
Location: Vacuum Goriotta West Unit 118

Borehole Depth: 30' bgs
Descriptions By: R Nanny

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description
-------	-----------	-------------------	-----------------	-----------------	---------------------	-------------------	-----------------	---------------------------

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



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

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

Well/Boring ID: VGWU118 - 03



Drilling Method: Air Rotary
Sampling Method: Shovel

Client: Chevron EMC
Location: Vacuum Glorietta West Unit 118

Borehole Depth: 30' bgs
Descriptions By: R Nanny

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description
-------	-----------	-------------------	-----------------	-----------------	---------------------	-------------------	-----------------	---------------------------

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



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

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

Well/Boring ID: VGWU118 - 04



Drilling Method: Air Rotary
Sampling Method: Shovel

Client: Chevron EMC
Location: Vacuum Glorietta West Unit 118

Borehole Depth: 30' bgs
Descriptions By: R Nanny

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



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

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

Well/Boring ID: VGWU118 - 05



Drilling Method: Air Rotary
Sampling Method: Shovel

Client: Chevron EMC
Location: Vacuum Glorietta West Unit 118

Borehole Depth: 30' bgs
Descriptions By: R Nanny

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



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

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

Well/Boring ID: VGWU118 - 06



Drilling Method: Air Rotary
Sampling Method: Shovel

Client: Chevron EMC
Location: Vacuum Glorietta West Unit 118

Borehole Depth: 30' bgs
Descriptions By: R Nanny

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



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

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

Well/Boring ID: VGWU118 - 07



Drilling Method: Air Rotary
Sampling Method: Shovel

Client: Chevron EMC
Location: Vacuum Glorietta West Unit 118

Borehole Depth: 30' bgs
Descriptions By: R Nanny

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



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



Attachment 7

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



ARCADIS U.S., Inc.
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Suite 300
Houston
Texas 77042
Tel 713 953 4800
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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)

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

K_{rw} 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:

θ_r and θ_s 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 (m²)

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/m³)

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 MULTIMED 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.



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

cm³ - cubic centimeters

g - grams

hr - hour

L - liters

m - meters

m² - 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).

Figures

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

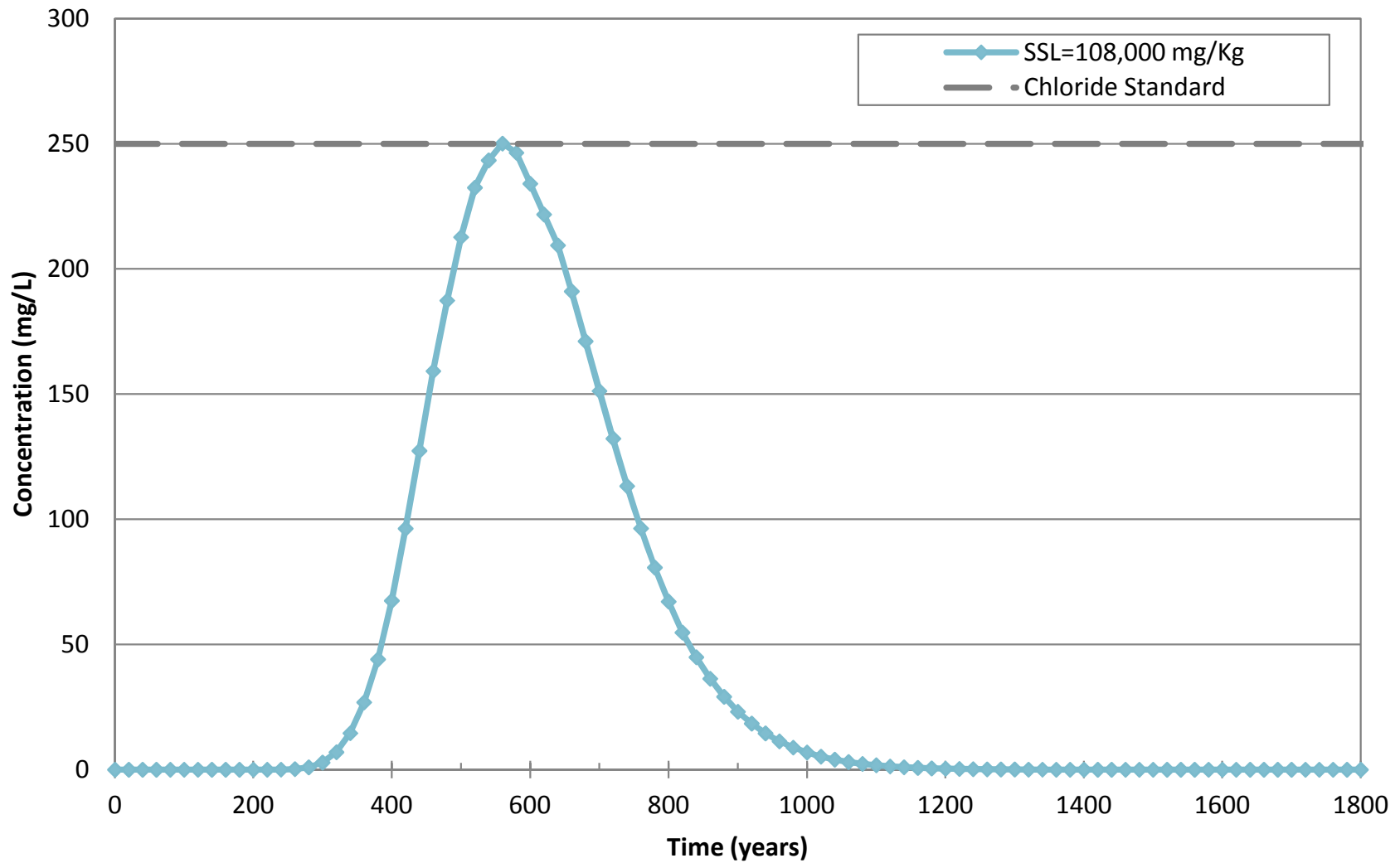


Figure 2
MULTIMED Simulated Chloride Concentration Vs Time in Groundwater
(Source = 20m, Chloride 0-1m, & Depth to Groundwater = 30.5m)

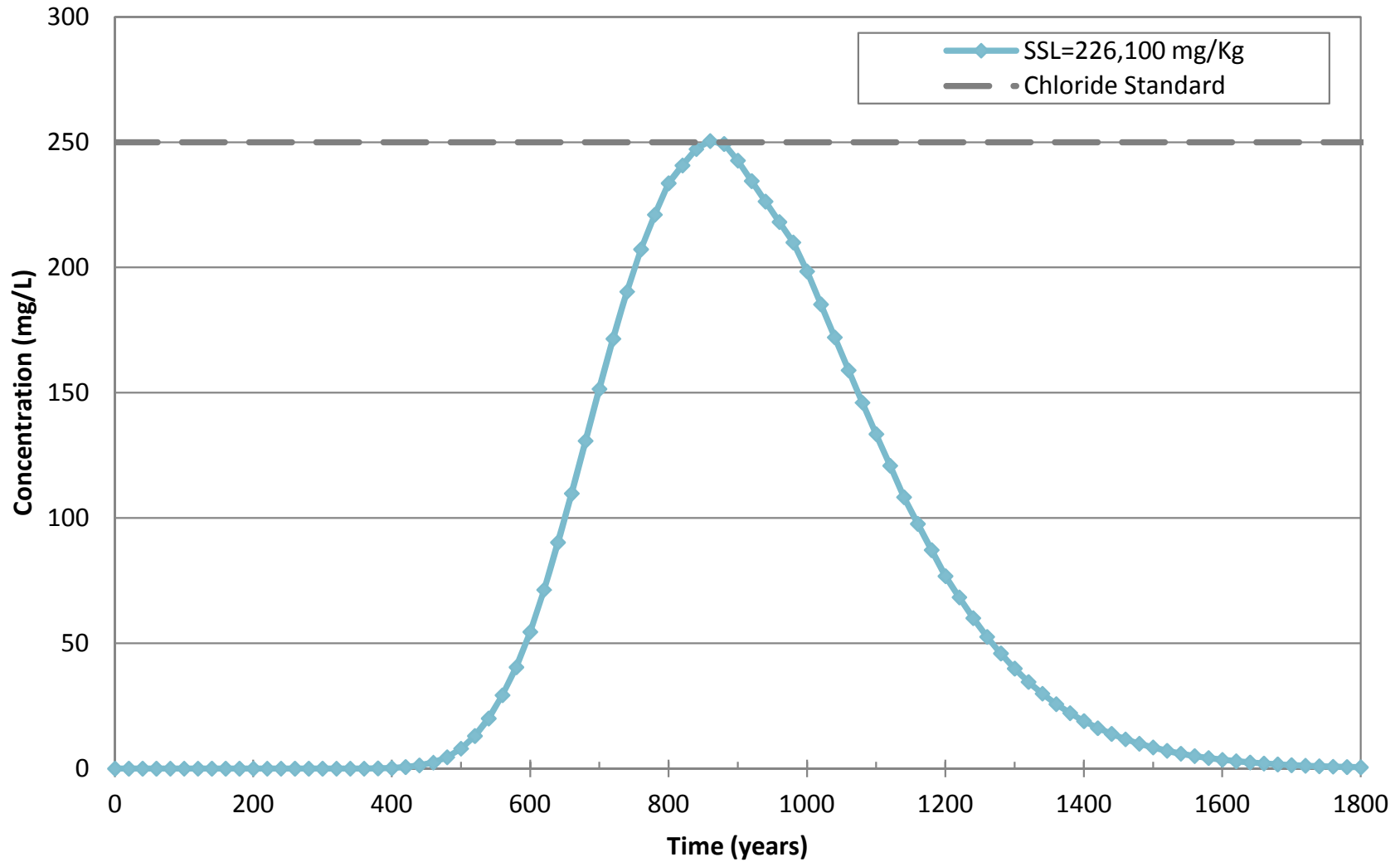


Figure 3

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

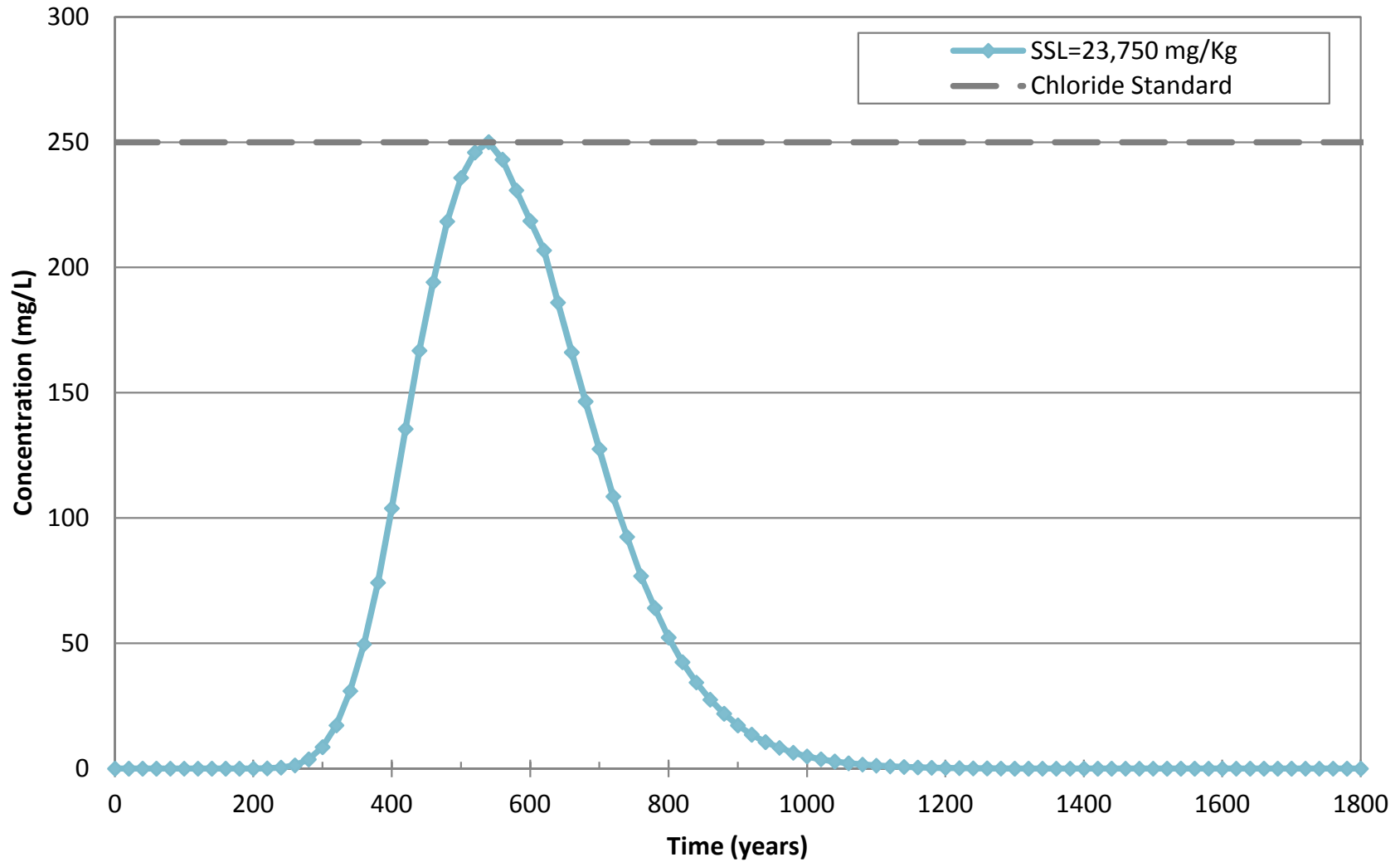


Figure 4

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

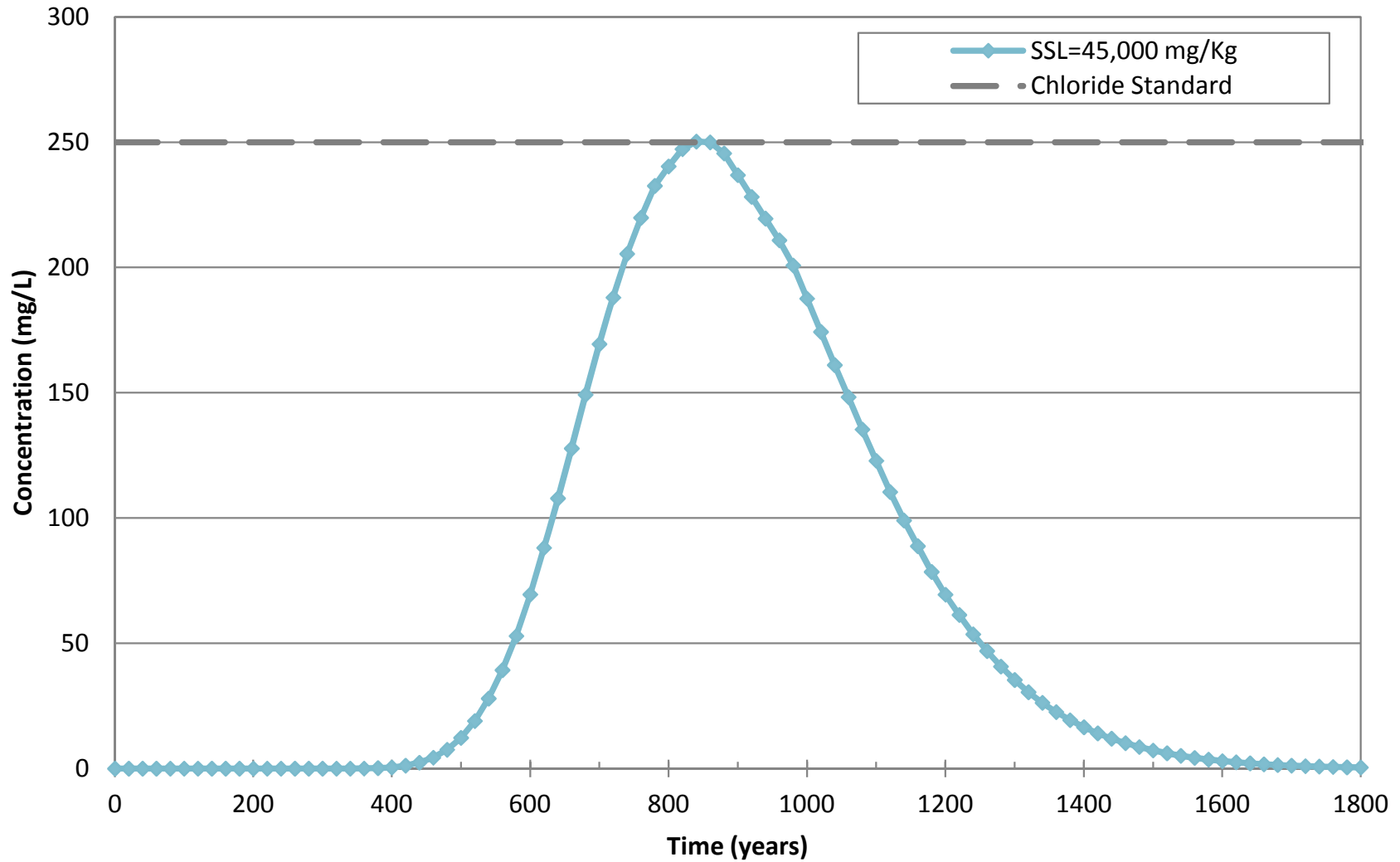


Figure 5

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

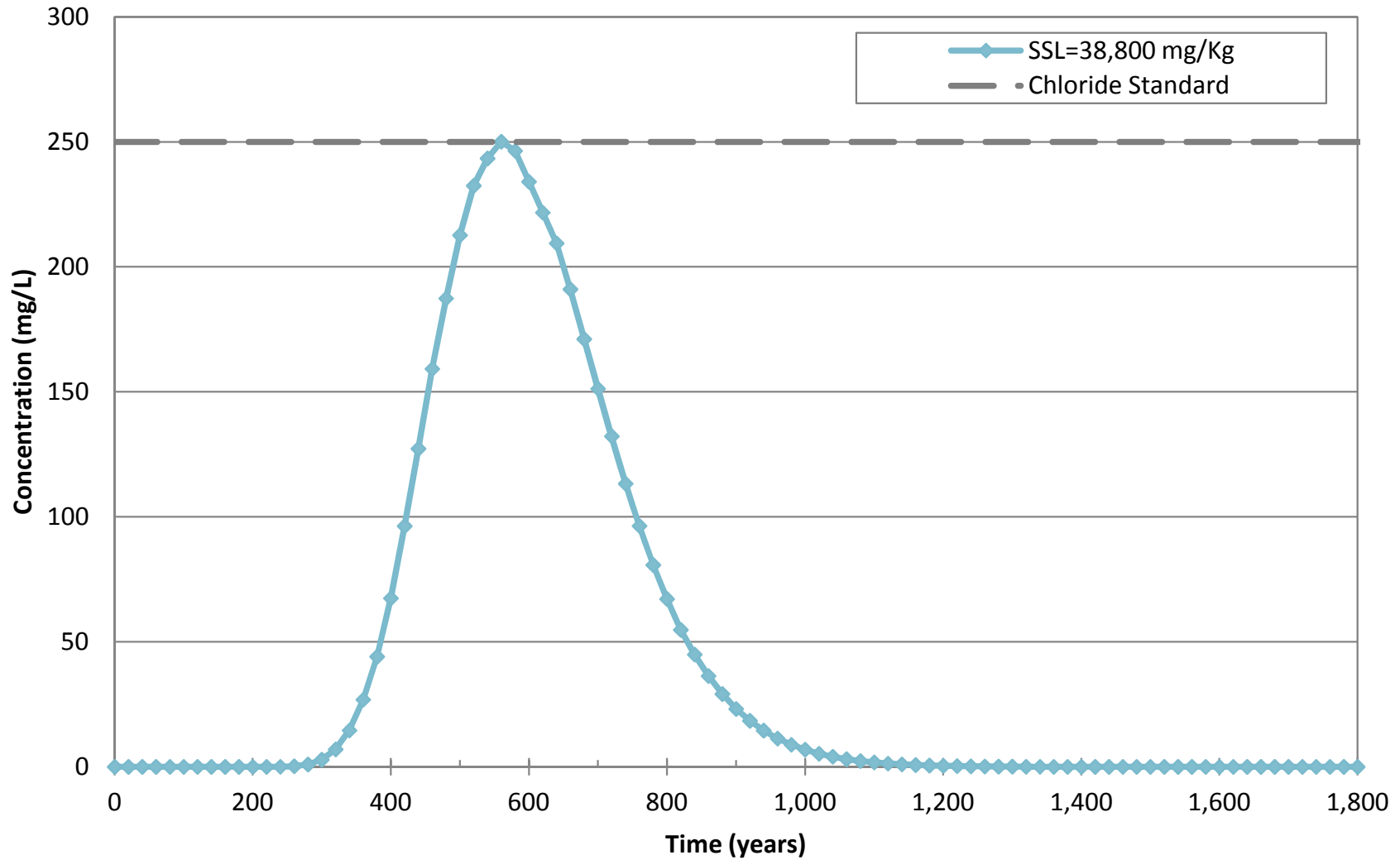


Figure 6
MULTIMED Simulated Chloride Concentration Vs Time in Groundwater
(Source = 45m, Chloride 0-1m, & Depth to Groundwater = 30.5m)

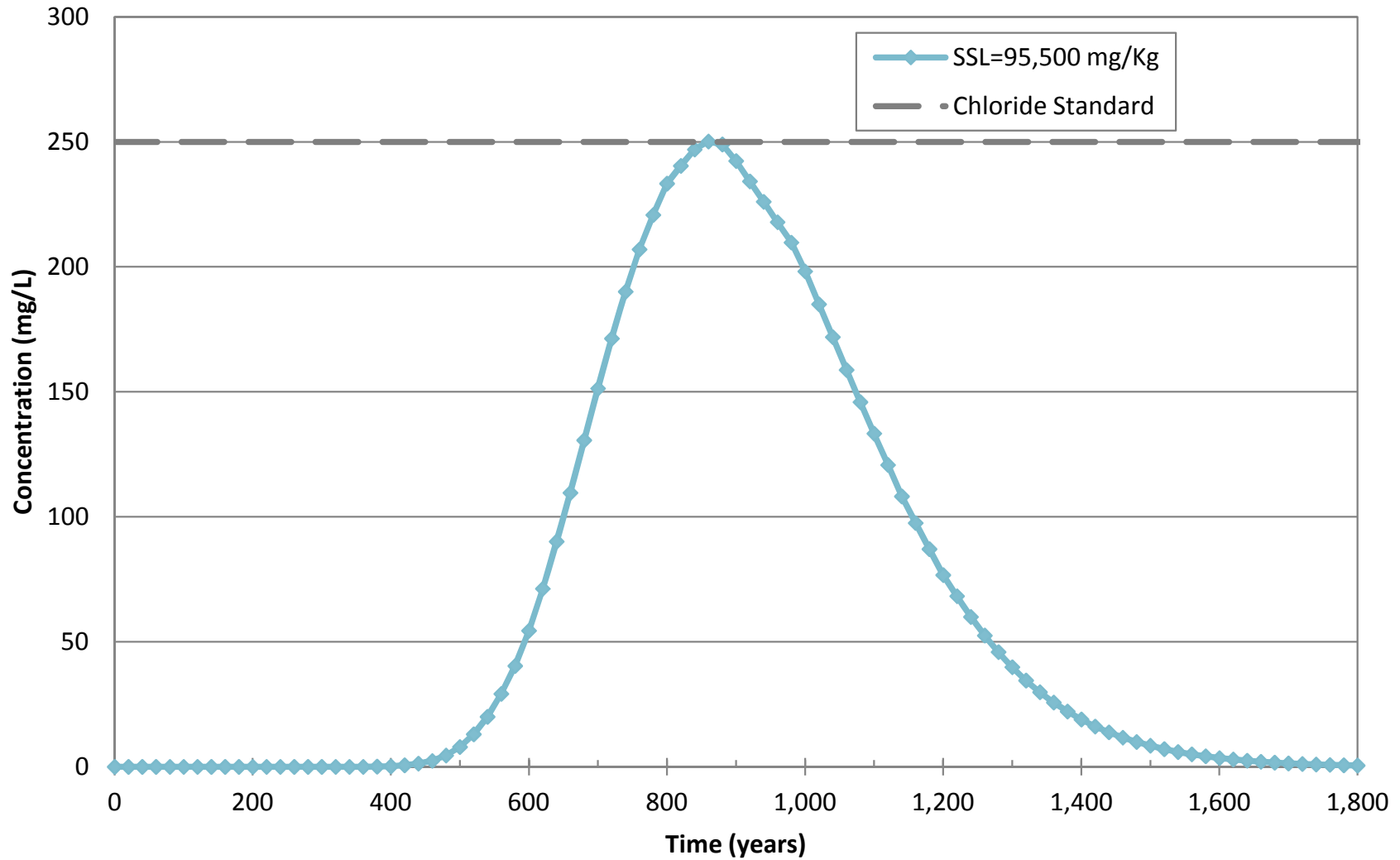


Figure 7

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

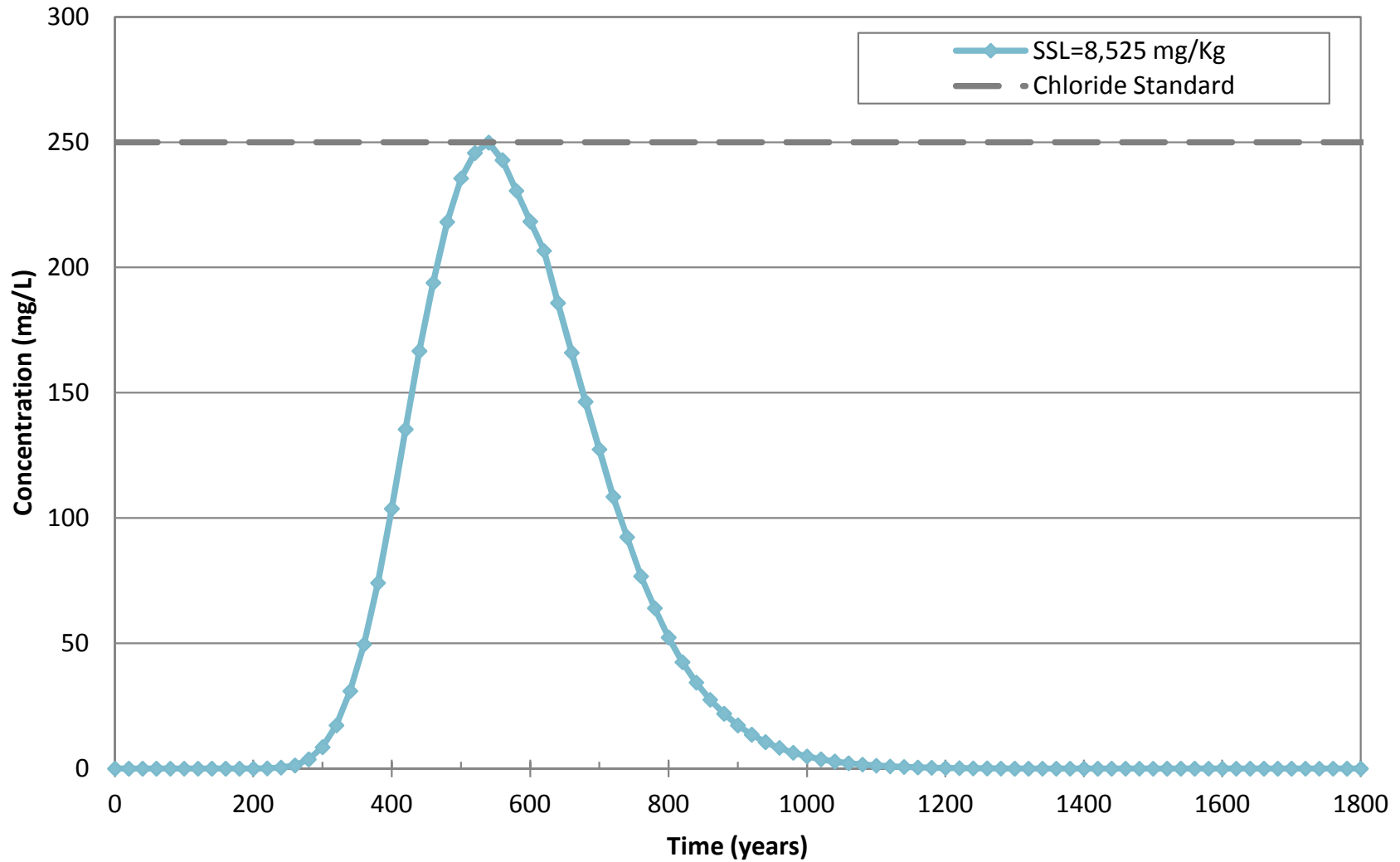


Figure 8

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

