

Luke Weich Project Manager

RECEIVED

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

By OCD District 1 at 8:22 am, Jun 08, 2015

December 19, 2014

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

Re : Chevron Special Projects - NM State AN 5 (RP# 3254)

Dear Dr. Oberding,

Please find enclosed for your records, a copy of the final report documenting the assessment activities at the New Mexico State AN No. 5 (RP # 3254).

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

The assessment activities identified several locations with soil impacts 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. Should you have any questions regarding the content of the report, please do not hesitate to contact me by phone at 713-372-0292 or via e-mail at <u>luke.welch@chevron.com</u>.

Sincerely,

hell

Luke Welch Environmental Project Manager

1000 RIO Brazos Road, Aztec, NM 8/410 <u>District IV</u> 1220 Sou 1220 Sou					Sout	Servation Division Submit 1 Copy to appropriate Distriaccordance with 19.15 Fe, NM 87505				strict Office in 15.29 NMAC.		
			Rele	ease Notific	catio	n and Co	orrective A	ction	1			
					-	OPERA	FOR		🗌 Initi	al Report	\boxtimes	Final Report
		HEVRONU				Contact: Lu						
Address: 56 Facility Nat		mp Road, Lo	ovington	<u>NM 88260</u>			No.: Office: (71)		0292 Mo	bile: (832)	527-9	171
		-11N J				Facility Typ	e: Producing W	en				
Surface Ow	ner:			Mineral O)wner:				API No)		
	4					N OF REI						
Unit Letter	Section	Township	Range	Feet from the	North	/South Line	Feet from the	East/V	Vest Line	County		
J	7	18S	35E							Lea		
			Latitude	32.76148806°		Longitude	-103.45995590)°				
					TIRE	OF RELI						
Type of Rele	ase: Crude	Oil and produ	ced water		UNL	Volume of F	Release: 5.7 bbls of	oil	Volume I	Recovered: ~	65 bbl	S
Source of Re	lease: Batta						produced water our of Occurrence		Data and	Hour of Disc		
		-				7/29/11 10:2			7/29/11 1		Jovery	•
Was Immedia	ate Notice (No 🗌 Not Requ	urad	If YES, To V						
By Whom? k					meu	Mr. Leking						
Was a Water						Date and Ho If YES, Volu	ur: ame Impacting th	e Water	course.			
			Yes 🛛 N	٧o		022	1 0					8
If a Watercou N/A	urse was Im	pacted, Descr	ibe Fully.*	ç								
	ise of Probl	em and Reme	dial Action	n Taken.*								
A poly flow I	line parted o	on the weld an	id released	I fluid to the grour	nd surfa	ce. Field team	isolated the batte	ery to en	sure spill	was minimize	ed.	
Describe Are	a Affected	and Cleanup A	Action Tak	en.*					74			
Approximate for disposal.	ly 65 bbls c	of total fluid w	ere recove/	ered with a vacuur	m truck	and visually i	mpacted soils we	re excav	ated to a d	epth of two f	eet bg	s and sent off
Six discrete s of regulatory		ation samples	were colle	ected from the bas	se of the	e excavation. 7	These samples inc	licated t	he presenc	e of chloride	s at co	ncentrations
In response to activities are	o the sampli provided in	ing results, an	additional report.	l site assessment v	was con	ducted to conf	irm the extent of	soil imp	acts. Resu	lts of the add	itional	lassessment
regulations al public health should their o or the environ	Il operators or the envir operations h nment. In a	are required to ronment. The ave failed to a	o report an acceptanc adequately OCD accept	is true and compl ad/or file certain re- ee of a C-141 repo investigate and re- tance of a C-141 r	elease n ort by the emediate	otifications ar e NMOCD ma e contaminatio	d perform correc arked as "Final Ro on that pose a thre	tive acti eport" d eat to gr	ons for rel oes not rel ound wate:	eases which n ieve the oper- r, surface wat	may er ator of ter, hu	ndanger f liability man health
Signature: <	Lu	he i	Deli	L		OIL CONSERVATION DIVISION						
Printed Name	e: Luke We	lch				Approved by Environmental Specialist:						
Title: Project	Manager					Approval Dat	8:	E	Expiration	Date:		
E-mail Addre	ess: LWelch	@chevron.co	m			Conditions of Approval: Attached						

Date: 11-19-14 Phone: (713) 372-0292 * Attach Additional Sheets If Necessary



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

Subject: Site Assessment Report State AN 5 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 State AN 5, located in Lea County, New Mexico (site; Figure 1). These activities were conducted in response to a release of approximately 87.7 barrels (bbls) of produced water and oil that occurred on July 29, 2011.

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:

- 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 (91 feet below ground surface [bgs]).
- Geochemical modeling using the United States Environmental Protection Agency (USEPA) Multimedia Exposure Assessment Model (MULTIMED) Version 2.0 (USEPA 1996) indicates that a significantly larger release would be necessary to cause an exceedance of regulatory criteria in groundwater.

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

ENVIRONMENT

Date: December 2, 2014

Contact: Jonathan Olsen

Phone: 713.953.4874

Email: Jonathan.Olsen@ arcadis-us.com

Our ref: B0048609.0000



This report describes spill response activities for the July 29, 2011 release and follow-up soil assessment activities conducted on May 6, 2013.

Background Information

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

Site Location and Description

The site is located within the Chevron-operated Vacuum Unit, approximately 14 miles southwest of Lovington, New Mexico. New Mexico Highway 238 is located approximately 1 mile east 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 14 miles northeast of the site and the closest agricultural area is 8 miles southeast of the site.

The site is located northeast of the State AN 5 wellhead. The release described in the following sections occurred in the field northeast 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 September 2014, ARCADIS reviewed information obtained from the New Mexico Office of the State Engineer (NMOSE) online database (NMOSE 2011), which indicates that no water-supply wells are located within 1,000 feet of the site. The NMOSE online database identified 306 water-supply wells within a 5-mile radius of the site (NMOSE 2011). A petroleum-industry-related water-supply well, located approximately 1,400 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 4,970 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 91 feet bgs (NMOSE 2014; Attachment 3).

Initial Release Response Activities

A release of approximately 82 bbls of produced water and 5.7 bbls of oil occurred at the site on July 29, 2011 due to a poly flow line failure. Chevron personnel from the Mid-Continent Business Unit (MCBU) stopped the release and recovered approximately 65 bbls of fluids using a vacuum truck. Chevron MCBU personnel excavated visually impacted soil in the area to a depth of approximately 2 feet bgs and collected six discrete confirmation soil samples from the base of the excavated soil was not provided to ARCADIS.

Pursuant to New Mexico Oil Conservation Division (NMOCD) requirements (NMOCD 1993), David Pagano and Kim Klahsen (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 and updated C-141 forms are included as Attachment 4.

Confirmation Soil Sampling

Six discrete confirmation soil samples were collected from the base of the excavation on October 12, 2011. As reported in the laboratory analytical report (Attachment 5), soil sample containers were transported on ice, under chain of custody procedures to Cardinal Laboratories Environmental Analytical Services for the following analyses:

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



- Total petroleum hydrocarbons as gasoline range organics (TPH-GRO) and total petroleum hydrocarbons as diesel range organics (TPH-DRO) by USEPA Method 8015M
- Chloride by USEPA Method SM4500CI-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 six October 2011 confirmation soil samples 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	0	
Tota	10	

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

Note:

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).

mg/kg = milligrams per kilogram

ARCADIS

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 six discrete confirmation soil samples collected in October 2011 are provided in Table 1 and summarized below:

- Benzene and BTEX were not detected above the laboratory reporting limits (LRLs) or above the SRALs of 10 and 50 mg/kg, respectively.
- TPH-GRO was not detected above LRLs. TPH-DRO was detected in two of the six confirmation samples (AN5 SS #2 at 254 mg/kg and AN5 SS #3 at 11.54 mg/kg).
- TPH (TPH-DRO and TPH-GRO) was detected in two of the six samples (AN5 SS #2 at 254 mg/kg and AN5 SS #3 at 11.54 mg/kg). TPH was not detected above the SRAL of 1,000 mg/kg in the six discrete confirmation samples.
- Chloride was detected in all six confirmation samples, at concentrations ranging from 512 mg/kg (AN5 SS #1) to 17,000 mg/kg (AN5 SS #2). Chloride was detected above the NMAC closure criterion of 500 mg/kg in all six confirmation soil samples.

The complete laboratory analytical results with chain of custody documentation are included in Attachment 5. Chloride concentrations in all of the confirmation soil samples collected 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 October 2011, locations of pipelines and other equipment at the site, and the extent of the release as documented by Chevron MCBU personnel during the initial response activities. The site assessment activities and results are discussed below.

ARCADIS

Mr. Luke Welch December 2, 2014

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 12 soil borings (STATE AN005-1, STATE AN005-2, STATE AN005-3, STATE AN005-4, STATE AN005-5, STATE AN005-6, STATE AN005-7, STATE AN005-8, STATE AN005-9, STATE AN005-12, STATE AN005-13, and STATE AN005-15) on May 6 and 7, 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 25 feet bgs using air rotary drilling equipment.

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

Lithologic data indicate that the subsurface material primarily consists of caliche (soil carbonate) profiles including "caprock," nodular, and sandy caliche layers from approximately 0 to 25 feet bgs (Attachment 6).



Soil Assessment Sampling

Six soil samples were collected from each boring location (for a total of 72 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 25 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 STATE AN005-12, STATE AN005-13, and STATE AN005-15 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 STATE AN005-12 at 2 feet bgs, one from STATE AN005-13 at 2 feet bgs, and one from STATE AN005-15 from 10 feet bgs. A total of 57 of the 72 soil assessment samples collected were analyzed.

Soil Assessment Sample Analysis

Soil samples collected from each boring were analyzed for chloride by USEPA Method 9056.

Boring Abandonment

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

Soil Assessment Comparison Criteria

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 for 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 Pa	rameters
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 chloride for the 57 soil assessment samples are provided in Table 1 and summarized below. Laboratory analytical results with chain of custody documentation are provided in Attachment 5.



Chloride was detected in 49 of the 57 soil samples, at concentrations ranging from 32 to 3,480 mg/kg (see Table 1). Chloride concentrations were not detected above the site-specific SSL of 38,800 mg/kg.

Summary and Conclusions

A release of approximately 87.7 bbls of produced water and oil occurred at the site on July 29, 2011 due to the failure of a surface flow line. Chevron MCBU personnel stopped the release and recovered approximately 65 bbls of fluids using a vacuum truck. Visually impacted soil was excavated to a depth of approximately 2 feet bgs and six discrete confirmation soil samples were collected from the base of the excavation in October 2011. All six confirmation soil samples had chloride concentrations above regulatory criteria, which prompted an additional investigation.

In May 2013, additional soil samples were collected to assess soil impacts within the observed aerial extent of the release. Soil samples collected during the May 2013 assessment had chloride concentrations below the site-specific SSL, which was calculated using the MULTIMED model (USEPA 1996).

All 57 soil assessment samples collected in May 2013 had chloride concentrations below the site-specific SSL and only three of the 57 soil assessment samples had chloride concentrations above 1,000 mg/kg (Table 1). Due to the location of this release along the pipeline corridor, remedial activities to address the minor exceedances above 1,000 mg/kg are not recommended due to health and safety concerns. Chloride concentrations in soil samples were delineated to 250 mg/kg. Chloride impacts in soil potentially associated with the release were delineated.

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

Soil data presented in this report support a conclusion that impacted soil associated with the July 29, 2011 release at the site poses no significant threat to groundwater resources or other receptors. ARCADIS recommends that CEMC submit a request to the NMOCD that no further investigations or additional cleanup actions need to be performed at the site and that the NMOCD grant No Further Action status to the site.

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

nethan alser

Jonathan Olsen Certified Project Manager

Natura edo

Kathleen M. Abbott, PG Program Manager

Enclosures:

- Table 1 Soil Sampling Analytical Results
- Figure 1Site Location Map State AN 5Figure 2Release and Soil Boring Locations State AN 5

Attachments:

Attachment 1Site Conceptual ModelAttachment 2Photo LogAttachment 3New Mexico Office of the State Engineer – Depth to WaterAttachment 4Release Notification and Corrective Action (C-141 Form)Attachment 5Laboratory Analytical ReportsAttachment 6Boring Logs (May 2013)Attachment 7Chloride 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.

ARCADIS

- 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 Geoarcaeology 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, <u>http://nmwrrs.ose.state.nm.us/nmwrrs/waterColumn.html</u>, 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: <u>http://water.epa.gov/drink/contaminants/#List</u>, July 1.
- Western Regional Climate Center. 2014a. Hobbs, New Mexico (294026) weather station. <u>http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?nm4026</u>. Viewed on May 5.
- Western Regional Climate Center. 2014b. Artesia, New Mexico, monthly average pan evaporation. <u>http://www.wrcc.dri.edu/htmlfiles/westevap.final.html#NEW MEXICO</u>. Viewed on May 6.



Table

Table 1 Soil Sampling Analytical Results

Site Assessment Report State AN 5 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	1,0	000		
	NMAC C	Closure Criteria ^(b)								500	
M	ULTIMED Site	e-Specific SSL ^(c)								38,800	
AN5 SS #1	10/12/2011	0	<0.050	<0.050	<0.050	<0.150		<10.0	<10.0	512	
AN5 SS #2	10/12/2011	0	< 0.050	<0.050	<0.050	<0.150		<10.0	254	17,000	
AN5 SS #3	10/12/2011	0	< 0.050	<0.050	<0.050	<0.150		<10.0	11.2	14,200	
AN5 SS #4	10/12/2011	0	<0.050	<0.050	<0.050	<0.150		<10.0	<10.0	9,600	
AN5 SS #5	10/12/2011	0	<0.050	<0.050	<0.050	<0.150		<10.0	<10.0	1,580	
AN5 SS #6	10/12/2011	0	<0.050	<0.050	<0.050	<0.150		<10.0	<10.0	9,800	
	5/6/2013	2								656	5.1
	5/6/2013	5								1,940	9.2
	5/6/2013	10								1,460	10.6
STATE AN005 - 1	5/6/2013	15								192	2.6
	5/6/2013	20								96	1.7
	5/6/2013	25								96	2.8
	5/6/2013	2								384	5.5
	5/6/2013	5								32	8.3
	5/6/2013	10								32	3.2
STATE AN005 - 2	5/6/2013	15								32	6.3
	5/6/2013	20								<16	5.2
	5/6/2013	25								<16	8.6
	5/7/2013	2								96	5.6
STATE AN005 - 3	5/7/2013	5								48	4.0
	5/7/2013	10								176	5.0
	5/7/2013	15								48	5.2
	5/7/2013	20								32	5.4
	5/7/2013	25								32	4.2
	5/7/2013	2								240	6.4
	5/7/2013	5								272	6.3
	5/7/2013	10								32	6.7
STATE AN005 - 4	5/7/2013	15								32	4.3
	5/7/2013	20								32	3.0
	5/7/2013	25								32	3.3
	5/6/2013	2								32	2.3
	5/6/2013	5								<16	7.8
	5/6/2013	10								<16	11.3
STATE AN005 - 5	5/6/2013	15								32	8.3
	5/6/2013	20								<16	2.9
	5/6/2013	25								<16	2.5
	5/6/2013	2								848	4.3
	5/6/2013	5								32	6.3
	5/6/2013	10								32	6.1
STATE AN005 - 6	5/6/2013	15								32	5.2
	5/6/2013	20								32	3.3
	5/6/2013	25								<16	2.8
	5/6/2013	2								176	4.6
	5/6/2013	5								32	3.8
	5/6/2013	10								32	4.5
STATE AN005 - 7	5/6/2013	15								128	3.0
	5/6/2013	20								32	5.7

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	1,0	000		
	NMAC C	Closure Criteria ^(b)								500	
MULTIMED Site-Specific SSL (C)										38,800	
	5/6/2013	2								192	5.6
	5/6/2013	5								304	13.9
STATE AN005 - 8	5/6/2013	10								3,480	11.5
STATE ANUUS - 8	5/6/2013	15								80	4.3
	5/6/2013	20								64	3.8
	5/6/2013	25								32	3.9
	5/6/2013	2								80	3.1
	5/6/2013	5								48	5.4
STATE AN005 - 9	5/6/2013	10								64	7.2
STATE ANOUS - 9	5/6/2013	15								48	2.6
	5/6/2013	20								32	3.1
	5/6/2013	25								32	2.8
STATE AN005 - 12	5/7/2013	2								128	
STATE AN005 - 13	5/6/2013	2								32	
STATE AN005 - 15	5/7/2013	10								160	

Notes:

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

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

(b) Title 19, Chapter 15 of the NMAC concerning pits, closed-loop systems, below grade tanks and sumps, and other alternative methods, 19.15.17 NMAC, July : (c) MULTIMED exposure assessment, 2.0 Beta, United States Environmental Protection Agency, October 1996



Figures





CITY: MANCHESTER DIV/GROUP: ENVCAD DB: B.SMALL PM: TM G:ENVCAD/Emeryville/RETURN-TO/Manchester-CT/B0048601/5inal/B00486010000-B02.dwg LAYOUT: 6 SAVED: 11/15/2013 5:06 PM ACADVER: 18.1S (LMS TECH) PAGESETUP: --- PLOTSTYLETABLE: --- PLOTTED: 11/15/2013 5:32 PM BY: REYES, ALEC



Attachment 1

Site Conceptual Model



The site is located in the western edge of the Permian Basin with Lovington (the closest town) located approximately 14 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 91 feet bgs.



NOT TO SCALE SITE ASSESSMENT

A release of approximately 82 bbls of produced water and 5.7 bbls of oil occurred at the site on July 29, 2011 due to the failure of a surface flow line. Chevron personnel from the Mid-Continent Business Unit (MCBU) stopped the release and recovered approximately 65 bbls of fluids using a vacuum truck. Chevron MCBU personnel excavated visually impacted soil in the area to a depth of approximately 2 feet bgs and collected six discrete confirmation soil samples from the base of the excavation on October 12, 2011. After collecting the soil samples, the excavated area was reportedly backfilled with imported soil. 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 October 2011, locations of pipelines and other equipment at the site, and the extent of the release as documented by Chevron MCBU personnel during the initial response activities. Analyte concentrations in samples collected during the 2013 assessment were reported below site-specific criteria. Site assessment activities demonstrate that remaining soil concentrations associated with the release do not pose significant risk to groundwater resources or other receptors.



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

> Site Conceptual Model State AN 5



FIGURE



Attachment 2

Photolog

ARCADIS

State AN 5 Site Assessment Report Photolog Lea County, New Mexico



Photograph 1 – State AN 5 release area; Facing Northeast



Photograph 2 – State AN 5 release area; Facing North

ARCADIS

State AN 5 Site Assessment Report Photolog Lea County, New Mexico



Photograph 3 – State AN 5 release area; Facing Northwest



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

(R=POD has (A CLW##### in the been replaced, POD suffix indicates the POD has been replaced O=orphaned, & no longer serves a C=the file is (quarters are 1=NW 2=NE 3=SW 4=SE) water right file.) closed) (quarters are smallest to largest) (NAD83 UTM in meters) (In feet) POD Sub-QQQ **Depth Depth Water POD Number** Code basin County 64 16 4 Sec Tws Rng Х Υ Distance Well Water Column L 04975 L LE 2 2 3 07 18S 35E 640688 3625837* 247 152 105 47 R LE 640891 207 122 L 02349 L 3 1 4 07 18S 35E 3625641* 257 85 L 02349 POD2 L LE 4 1 4 07 18S 35E 641091 3625641* 302 214 85 129 L 04794 L LE 4 07 18S 35E 641200 3625540* 447 150 95 55 35E L LE 07 18S L 04906 3 640415 3625532* 629 155 87 68 L LE 107 L 04931 X 1 3 07 18S 35E 640208 3625735* 737 212 105 L LE L 04778 2 1 07 18S 35E 640575 3626545* 738 150 75 75 L LE 1 2 2 07 18S 35E 641279 834 145 85 60 L 04777 3626653* L 05172 L LE 3 3 07 18S 35E 640214 3625331* 910 161 85 76 L LE 3 06 640667 986 L 04796 4 4 18S 35E 3626847* 150 95 55 L 02350 L LE 4 1 3 08 18S 35E 641897 3625650* 999 216 105 111 Average Depth to Water: 91 feet Minimum Depth: 75 feet 105 feet Maximum Depth: Record Count: 11 **Basin/County Search:** County: Lea

UTMNAD83 Radius Search (in meters):

Easting (X): 640928.17

Northing (Y): 3625895.86

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)

Form C-141 Revised March 17, 1999

Oil Conservation Division 1220 South St. Francis Dr. Santa Fe, NM 87505 Submit 2 Copies to appropriate District Office in accordance with Rule 116 on back side of form

Release Notification and Corrective Action

	OPERATOR	Initial Report	X Final Report
Name of Company CHEVRON	Contact David Pagano/ Kim Klahsen 4	32-894-3298	
Address	Telephone No. Office: 575-396-4414 ex	t 222 Cellular:	432-894-3298
56 Texas Camp Road, Lovington NM 88260			
Facility Name: State AN 5	Facility Type: Producing Well		

	Surface Owner:	Mineral Owner	Lease No.
--	----------------	---------------	-----------

LOCATION OF RELEASE-API #

Longitude: degrees minutes seconds Lattitude: degrees minutes seconds									
Unit Letter	Section	Township	Range	Feet from the	North/South Line	Feet from the	East/West Line	County	
								□Lea	
J	7	18 S	35 E						

NATURE OF RELEASE- Chlorides= ~40,000 ppm Latitude= 32.76148806; Long. = -103.45995590

Type of Release Crude Oil and produced water	Volume of Release 5.7 Bbls	Volume Recovered~65 bbls						
	Oil and 82 Bbls produced							
	water							
Source of Release : Battery	Date and Hour of Occurrence	Date and Hour of Discovery						
Source of Release . Dattery	7/29/11 @ 10:20 a.m.	7/29/11 @ 11:00 a.m.						
Was Immediate Notice Given?	If YES, To Whom? Mr. Leking by	/ E- Mail						
x Yes 🗌 No Not Required								
By Whom? /Kim Klahsen								
Was a Watercourse Reached?	If YES, Volume Impacting the Wa	tercourse.						
Yes x No								
If a Watercourse was Impacted, Describe Fully.*								
Describe Cause of Problem and Remedial Action Taken.*								
A poly flow line parted on the weld and released fluid to the ground surface. Approximately 65 bbls of total fluid were recovered with a vacuum truck.								
The soil will be evaluated to determine the extent of remediation.								
Describe Area Affected and Cleanup Action Taken.*								
Isolated battery to ensure spill was mimimized. Clean up.								
I hereby certify that the information given above is true and complete to t	the best of my knowledge and understa	and that pursuant to NMOCD rules and						
regulations all operators are required to report and/or file certain release r	notifications and perform corrective ac	tions for releases which may endanger						
public health or the environment. The acceptance of a C-141 report by the	e NMOCD marked as "Final Report"	does not relieve the operator of liability						
should their operations have failed to adequately investigate and remedia								
or the environment. In addition, NMOCD acceptance of a C-141 report of								
federal, state, or local laws and/or regulations.	see not tene te me operator of tespon	stonity for compliance with any other						
	OIL CONSERV	VATION DIVISION						
Signature:	<u>OIL CONSER</u>	VATION DIVISION						
Signature.								
Printed Name: Kim Klahsen								
	Approved by District Supervisor:							
Title: Safety Specialist	Approval Date:	Expiration Date:						
Date: August 2, 2011 Phone: 432-4894-3298	Conditions of Approval:	Attached						

* Attach Additional Sheets If Necessary

District IV District IV 1220 Science Dr. Serte For NM 87410 1220 Science Dr. Serte For NM 87505				Sout	h St. Franc	is Dr.	Sub	Submit 1 Copy to appropriate District Office in accordance with 19.15.29 NMAC.				
1000 Rio Brazos Road, Aztec, NM 87410 1220 South St. Francis Dr. District IV 1220 South St. Francis Dr. 1220 S. St. Francis Dr., Santa Fe, NM 87505 Santa Fe, NM 87505 Release Notification and Corrective Action												
					-	OPERA	FOR		🗌 Initi	al Report	\boxtimes	Final Report
			ovington l	<u>NM 88260</u>					0292 Mo	bile: (832)	527-9	171
		-11N J				Facility Typ	e: Producing w	en				
Surface Ow	ner:			Mineral C)wner:				API No)		
Unit Letter	Section	Township	Range	Feet from the	North	/South Line	Feet from the	East/V	Vest Line	County		
J	7	18S	35E							Lea		
			Latitude	32.76148806°		Longitude	-103.45995590)°				
					TIPE	-						
Type of Rele	ase: Crude	Oil and produ	ced water		UNE	Volume of F	Release: 5.7 bbls of	oil	Volume I	Recovered: ~	65 bbl	s
Source of De	looso: Datta								Data and	Hanna CD'an		
		-						:			:overy	:
Was Immedia	ate Notice (If YES, To V	Whom?	I				
D 11/2 0 1				No [] Not Requ	nred							
								o Water	0000			
	course read		Yes 🛛 M	No			inc impacting in	e water	course.			8
	urse was Im	pacted, Descr	ibe Fully.*	ç								
	ise of Probl	em and Reme	dial Action	n Taken.*								
A poly flow I	line parted o	on the weld an	id released	fluid to the grour	nd surfa	ce. Field team	isolated the batte	ery to en	sure spill	was minimize	ed.	
Describe Are	a Affected	and Cleanup A	Action Tak	en.*					74			
	ly 65 bbls c	of total fluid w	ere recove	red with a vacuur	m truck	and visually i	mpacted soils we	re excav	ated to a d	epth of two f	eet bg	s and sent off
		ation samples	were colle	ected from the bas	se of the	e excavation. 7	These samples inc	licated t	he presenc	e of chloride	s at co	ncentrations
In response to activities are	o the sampli provided in	ing results, an	additional report.	site assessment v	was con	ducted to conf	irm the extent of	soil imp	acts. Resu	lts of the add	itional	lassessment
regulations al public health should their c or the enviror	Il operators or the envir operations h nment. In a	are required to ronment. The ave failed to a ddition, NMC	o report an acceptanc adequately OCD accept	nd/or file certain re the of a C-141 repo investigate and re	elease n ort by the emediate	otifications ar e NMOCD ma e contaminatio	d perform correc arked as "Final Ro on that pose a thre	tive acti eport" d eat to gr	ons for rel oes not rel ound wate:	eases which n ieve the oper- r, surface wat	may er ator of ter, hu	ndanger f liability man health
Signature: <	Lu	he i	Deli	L			OIL CON	SERV	<u>ATION</u>	DIVISIO	N	
Printed Name	e: Luke We	lch				Approved by	Environmental S	pecialist	•			
Title: Project	Manager					Approval Dat	a:	E	Expiration	Date:		
E-mail Addre	ess: LWelch	@chevron.co	m			Conditions of	Approval:			Attached		

Date: 11-19-14 Phone: (713) 372-0292 * Attach Additional Sheets If Necessary



Attachment 5

Laboratory Analytical Reports



October 20, 2011

DAVID PAGANO Chevron - Lovington HCR 60 Box 423 Lovington, NM 88260

RE: SOIL SAMPLES

Enclosed are the results of analyses for samples received by the laboratory on 10/14/11 15:17.

Cardinal Laboratories is accredited through Texas NELAP for:

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

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

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

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

Accreditation applies to public drinking water matrices.

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

Sincerely,

Celey D.Kune

Celey D. Keene Lab Director/Quality Manager



Analytical Results For:

		Chevron -	Lovington		
		DAVID PA	GANO		
		HCR 60 B	ox 423		
		Lovington	NM, 88260		
		Fax To:	None		
Received:	10/14/2011			Sampling Date:	10/12/2011
Reported:	10/20/2011			Sampling Type:	Soil
Project Name:	SOIL SAMPLES			Sampling Condition:	** (See Notes)
Project Number:	AN5			Sample Received By:	Celey D. Keene
Project Location:	NOT GIVEN				

Sample ID: AN 5 SS #1 (H102226-01)

BTEX 8021B	mg/kg		Analyzed By: AP						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	10/17/2011	ND	2.08	104	2.00	0.829	
Toluene*	<0.050	0.050	10/17/2011	ND	2.07	103	2.00	0.173	
Ethylbenzene*	<0.050	0.050	10/17/2011	ND	2.05	102	2.00	0.0754	
Total Xylenes*	<0.150	0.150	10/17/2011	ND	6.20	103	6.00	1.33	
Surrogate: 4-Bromofluorobenzene (PIL	99.1	% 64.4-13	4						
Chloride, SM4500Cl-B	mg/kg		Analyzed By: HM						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	512	16.0	10/17/2011	ND	432	108	400	3.64	
TPH 8015M	mg/kg		Analyzed By: AB						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	10/18/2011	ND	169	84.6	200	6.36	
DRO >C10-C28	<10.0	10.0	10/18/2011	ND	158	78.9	200	9.21	
Surrogate: 1-Chlorooctane	75.0	% 55.5-15	4						
Surrogate: 1-Chlorooctadecane	75.1	% 57.6-15	8						

Cardinal Laboratories

*=Accredited Analyte

PLEASE NOTE: Liability and Damages. Cardinal's liability and client's exclusive remedy for any claim arising, whether based in contract or tort, shall be limited to the amount paid by client for analyses. All claims, including those for negligence and any other cause whatscever shall be deemed waived unless made in writing and received by Cardinal within thirty (30) days after completion of the applicable service. In no event shall Cardinal be liable for incidental or consequential damages, including, without limitation, business interruptions, loss of use, or loss of profits incurred by client, its subsidiaries, affiliates or successors arising out of or related to the performance of the services hereunder by Cardinal, regardless of whether such claims based upon any of the above stated reasons or otherwise. Results relate only to the sample identified above. This report shall not be reproduced except in full with written approval of Cardinal toratories.

Celey D. Keine

Celey D. Keene, Lab Director/Quality Manager



Analytical Results For:

		Chevron - DAVID PA HCR 60 Bc Lovington	GANO		
		Fax To:	None		
Received:	10/14/2011			Sampling Date:	10/12/2011
Reported:	10/20/2011			Sampling Type:	Soil
Project Name:	SOIL SAMPLES			Sampling Condition:	** (See Notes)
Project Number:	AN5			Sample Received By:	Celey D. Keene
Project Location:	NOT GIVEN				

Sample ID: AN 5 SS #2 (H102226-02)

BTEX 8021B	mg/kg		Analyzed By: AP						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	10/17/2011	ND	2.08	104	2.00	0.829	
Toluene*	<0.050	0.050	10/17/2011	ND	2.07	103	2.00	0.173	
Ethylbenzene*	<0.050	0.050	10/17/2011	ND	2.05	102	2.00	0.0754	
Total Xylenes*	<0.150	0.150	10/17/2011	ND	6.20	103	6.00	1.33	
Surrogate: 4-Bromofluorobenzene (PIL	97.8	% 64.4-13	4						
Chloride, SM4500CI-B	mg/kg		Analyzed By: HM						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	17000	16.0	10/17/2011	ND	448	112	400	3.64	
TPH 8015M	mg/kg		Analyzed By: AB						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	10/18/2011	ND	169	84.6	200	6.36	
DRO >C10-C28	254	10.0	10/18/2011	ND	158	78.9	200	9.21	
Surrogate: 1-Chlorooctane	79.0	% 55.5-15	4						
Surrogate: 1-Chlorooctadecane	73.3	% 57.6-15	8						

Cardinal Laboratories

*=Accredited Analyte

PLEASE NOTE: Liability and Damages. Cardinal's liability and client's exclusive remedy for any claim arising, whether based in contract or tort, shall be limited to the amount paid by client for analyses. All claims, including those for negligence and any other cause whatscever shall be deemed waived unless made in writing and received by Cardinal within thirty (30) days after completion of the applicable service. In no event shall Cardinal be liable for incidental or consequential damages, including, without limitation, business interruptions, loss of use, or loss of profits incurred by client, its subsidiaries, affiliates or successors arising out of or related to the performance of the services hereunder by Cardinal, regardless of whether such claims based upon any of the above stated reasons or otherwise. Results relate only to the sample identified above. This report shall not be reproduced except in full with written approval of Cardinal toratories.

Celey D. Keine

Celey D. Keene, Lab Director/Quality Manager



Analytical Results For:

		Chevron - DAVID PA HCR 60 Bc Lovington	GANO		
		Fax To:	None		
Received:	10/14/2011			Sampling Date:	10/12/2011
Reported:	10/20/2011			Sampling Type:	Soil
Project Name:	SOIL SAMPLES			Sampling Condition:	** (See Notes)
Project Number:	AN5			Sample Received By:	Celey D. Keene
Project Location:	NOT GIVEN				

Sample ID: AN 5 SS #3 (H102226-03)

BTEX 8021B	mg/kg		Analyzed By: AP						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	10/17/2011	ND	2.08	104	2.00	0.829	
Toluene*	<0.050	0.050	10/17/2011	ND	2.07	103	2.00	0.173	
Ethylbenzene*	<0.050	0.050	10/17/2011	ND	2.05	102	2.00	0.0754	
Total Xylenes*	<0.150	0.150	10/17/2011	ND	6.20	103	6.00	1.33	
Surrogate: 4-Bromofluorobenzene (PIL	97.9	% 64.4-13	4						
Chloride, SM4500Cl-B	mg/kg		Analyzed By: HM						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	14200	16.0	10/17/2011	ND	448	112	400	3.64	
TPH 8015M	mg/kg		Analyzed By: AB						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	10/18/2011	ND	169	84.6	200	6.36	
DRO >C10-C28	11.2	10.0	10/18/2011	ND	158	78.9	200	9.21	
Surrogate: 1-Chlorooctane	86.2	% 55.5-15	4						
Surrogate: 1-Chlorooctadecane	89.6	% 57.6-15	8						

Cardinal Laboratories

*=Accredited Analyte

PLEASE NOTE: Liability and Damages. Cardinal's liability and client's exclusive remedy for any claim arising, whether based in contract or tort, shall be limited to the amount paid by client for analyses. All claims, including those for negligence and any other cause whatscever shall be deemed waived unless made in writing and received by Cardinal within thirty (30) days after completion of the applicable service. In no event shall Cardinal be liable for incidental or consequential damages, including, without limitation, business interruptions, loss of use, or loss of profits incurred by client, its subsidiaries, affiliates or successors arising out of or related to the performance of the services hereunder by Cardinal, regardless of whether such claims based upon any of the above stated reasons or otherwise. Results relate only to the sample identified above. This report shall not be reproduced except in full with written approval of Cardinal toratories.

Celey D. Keine

Celey D. Keene, Lab Director/Quality Manager


		Chevron - DAVID PA HCR 60 Bo Lovington	GANO		
		Fax To:	None		
Received:	10/14/2011			Sampling Date:	10/12/2011
Reported:	10/20/2011			Sampling Type:	Soil
Project Name:	SOIL SAMPLES			Sampling Condition:	** (See Notes)
Project Number:	AN5			Sample Received By:	Celey D. Keene
Project Location:	NOT GIVEN				

Sample ID: AN 5 SS #4 (H102226-04)

BTEX 8021B	mg/	kg	Analyze	d By: cms					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	10/18/2011	ND	2.06	103	2.00	2.26	
Toluene*	<0.050	0.050	10/18/2011	ND	2.03	101	2.00	3.33	
Ethylbenzene*	<0.050	0.050	10/18/2011	ND	2.02	101	2.00	4.01	
Total Xylenes*	<0.150	0.150	10/18/2011	ND	6.03	101	6.00	4.41	
Surrogate: 4-Bromofluorobenzene (PIL	102 9	64.4-13-	4						
Chloride, SM4500CI-B	mg/	kg	Analyze	d By: HM					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	9600	16.0	10/17/2011	ND	448	112	400	3.64	
TPH 8015M	mg/	'kg	Analyze	d By: AB					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	10/18/2011	ND	169	84.6	200	6.36	
DRO >C10-C28	<10.0	10.0	10/18/2011	ND	158	78.9	200	9.21	
Surrogate: 1-Chlorooctane	69.0	% 55.5-154	4						
Surrogate: 1-Chlorooctadecane	73.7	% 57.6-15	8						

Cardinal Laboratories

*=Accredited Analyte

Celey D. Keine

Celey D. Keene, Lab Director/Quality Manager



		Chevron - DAVID PA HCR 60 Bc Lovington	GANO		
		Fax To:	None		
Received:	10/14/2011			Sampling Date:	10/12/2011
Reported:	10/20/2011			Sampling Type:	Soil
Project Name:	SOIL SAMPLES			Sampling Condition:	** (See Notes)
Project Number:	AN5			Sample Received By:	Celey D. Keene
Project Location:	NOT GIVEN				

Sample ID: AN 5 SS #5 (H102226-05)

BTEX 8021B	mg/	′kg	Analyze	d By: cms					A-01	
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
Benzene*	<0.050	0.050	10/18/2011	ND	2.06	103	2.00	2.26		
Toluene*	<0.050	0.050	10/18/2011	ND	2.03	101	2.00	3.33		
Ethylbenzene*	<0.050	0.050	10/18/2011	ND	2.02	101	2.00	4.01		
Total Xylenes*	<0.150	0.150	10/18/2011	ND	6.03	101	6.00	4.41		
Surrogate: 4-Bromofluorobenzene (PIL	102 9	% 64.4-13	4							
Chloride, SM4500Cl-B	mg/	mg/kg		Analyzed By: HM					A-01	
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
Chloride	1580	16.0	10/17/2011	ND	448	112	400	3.64		
TPH 8015M	mg/	′kg	Analyze	d By: AB					A-01	
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
GRO C6-C10	<10.0	10.0	10/18/2011	ND	169	84.6	200	6.36		
DRO >C10-C28	<10.0	10.0	10/18/2011	ND	158	78.9	200	9.21		
Surrogate: 1-Chlorooctane	76.1	% 55.5-15	4							
Surrogate: 1-Chlorooctadecane	88.1	% 57.6-15	8							

Cardinal Laboratories

*=Accredited Analyte

Celey D. Keine

Celey D. Keene, Lab Director/Quality Manager



		Chevron - DAVID PAC HCR 60 Bc Lovington	GANO		
		Fax To:	None		
Received:	10/14/2011			Sampling Date:	10/12/2011
Reported:	10/20/2011			Sampling Type:	Soil
Project Name:	SOIL SAMPLES			Sampling Condition:	** (See Notes)
Project Number:	AN5			Sample Received By:	Celey D. Keene
Project Location:	NOT GIVEN				

Sample ID: AN 5 SS #6 (H102226-06)

BTEX 8021B	mg/	kg	Analyze	d By: cms					A-01
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	10/18/2011	ND	2.06	103	2.00	2.26	
Toluene*	<0.050	0.050	10/18/2011	ND	2.03	101	2.00	3.33	
Ethylbenzene*	<0.050	0.050	10/18/2011	ND	2.02	101	2.00	4.01	
Total Xylenes*	<0.150	0.150	10/18/2011	ND	6.03	101	6.00	4.41	
Surrogate: 4-Bromofluorobenzene (PIL	103 9	64.4-13	4						
Chloride, SM4500Cl-B	mg/	mg/kg A		Analyzed By: HM					A-01
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	9800	16.0	10/17/2011	ND	448	112	400	3.64	
TPH 8015M	mg/	kg	Analyze	d By: AB					A-01
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	10/18/2011	ND	172	85.9	200	4.35	
DRO >C10-C28	<10.0	10.0	10/18/2011	ND	157	78.6	200	6.92	
Surrogate: 1-Chlorooctane	77.8	% 55.5-15	4						
Surrogate: 1-Chlorooctadecane	91.6	% 57.6-15	8						

Cardinal Laboratories

*=Accredited Analyte

Celey D. Keine

Celey D. Keene, Lab Director/Quality Manager



Notes and Definitions

A-01	WATER LEAKED IN FROM ICE CHEST.
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

*=Accredited Analyte

Celey D. Keine

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: Chevron	BILL TO	ANALYSIS REQUEST
Project Manager: David Pagano	P.O. #:	
Project Manager: David Pagano Address: 56 Texas Camp Rd.	Company: Chevron	
City: Lovington State: NM Zip: 88260	Attn: Nick Moschetti	
Phone #: 505-787-9816 Fax #:	Address: 56 Texas Comp Rd.	
Project #: Project Owner:	City: Lowington	
Project Name:	State: N/M Zip: 88260	
Project Location:	Phone #: 575-396-4414 x201	
Sampler Name:	Fax #:	
FOR LAB LISE ONLY MAT Lab I.D. Sample I.D. MAT H107722 1 AN 5 2 AN 5 SS #1 / 2 AN 5 SS #2 / / 3 AN 5 SS #3 / /	RIX PRESERV SAMPLING HIX PRESERV SAMPLING HIX HIX HIX HIX HIX <td>Ch loride</td>	Ch loride
3 ANS 55 #3 VII V	3 3 10 1 12	
4 ANS SSHY VIIV		
5 ANS 55 #5 * 1 1	Z 3.50 V Y	
6 ANS SS #6 K VI VI	3:55 / /	
PLEASE NOTE: Liability and Damages. Cardinal's liability and client's exclusive remedy for any claim arising whether based analyses. All claims including those for negligence and any other cause whatsoever shall be deemed waived unless made in provide the second balance of the second	writing and received by Cardinal within 30 days after completion of the applicable	
service. In no event shall Cardinal be liable for incidental or consequential damages, including vithout limitation, business inte affiliates or successors arising out of or related to the performance of services hereunder by Cardinal, repardess of whether s Reflinguished By: Date: Received By:	uch claim is based upon any of the above stated reasons or otherwise.	
	Phone Result:	s 🗆 No 🛛 Add'l Fax #:
Time:	REMARKS:	Lad a facture in fraging chest.
Relinquished By: Date: Jol 14(11 Time: 3:17 Delivered By: (Circle One)	Condition CHECKED BY:	had water leak in fromice chest. Oli
Sampler - UPS - Bus - Other: 7.0 Ves	ntaet (Initials) Ves AMA No	
† Cardinal cannot accept verbal changes. Please fax written chang	esto 595-393-2476	Page 9 of 9



June 06, 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 05/08/13 8:00.

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/ga/lab_accred_certif.html.

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

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

Accreditation applies to public drinking water matrices.

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

Sincerely,

Celey D. Keine

Celey D. Keene Lab Director/Quality Manager



ARCADIS U.S., INC. - HOUSTON JONATHAN OLSEN 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129 Fax To: (713) 977-4620

Received:	05/08/2013	Sampling Date:	05/06/2013
Reported:	06/06/2013	Sampling Type:	Soil
Project Name:	CHEVRON BUCKEYE	Sampling Condition:	Cool & Intact
Project Number:	B0048601.0000.TAX03	Sample Received By:	Jodi Henson
Project Location:	BUCKEYE OILFIELD		

Sample ID: STATE AN005 - 9 (10') (H301088-01)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	7.18	0.100	05/09/2013	ND				3.69	
Chloride, SM4500Cl-B	mg,	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	64.0	16.0	05/09/2013	ND	432	108	400	0.00	

Sample ID: STATE AN005 - 9 (15') (H301088-02)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	2.60	0.100	05/09/2013	ND				3.69	
Chloride, SM4500Cl-B	mg	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	48.0	16.0	05/09/2013	ND	432	108	400	0.00	

Sample ID: STATE AN005 - 9 (20') (H301088-03)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	3.06	0.100	05/09/2013	ND				3.69	
Chloride, SM4500Cl-B	mg	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	32.0	16.0	05/09/2013	ND	432	108	400	0.00	

Cardinal Laboratories

*=Accredited Analyte

Celey D. Keine

Celey D. Keene, Lab Director/Quality Manager



ARCADIS U.S., INC. - HOUSTON JONATHAN OLSEN 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129 Fax To: (713) 977-4620

Received:	05/08/2013	Sampling Date:	05/06/2013
Reported:	06/06/2013	Sampling Type:	Soil
Project Name:	CHEVRON BUCKEYE	Sampling Condition:	Cool & Intact
Project Number:	B0048601.0000.TAX03	Sample Received By:	Jodi Henson
Project Location:	BUCKEYE OILFIELD		

Sample ID: STATE AN005 - 9 (25') (H301088-04)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	2.83	0.100	05/09/2013	ND				3.69	
Chloride, SM4500Cl-B	mg	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier

Sample ID: STATE AN005 - 6 (2') (H301088-05)

% Recovery True Value QC RPD Qualifier
3.69
% Recovery True Value QC RPD Qualifier
108 400 0.00
-

Sample ID: STATE AN005 - 6 (5') (H301088-06)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	6.31	0.100	05/09/2013	ND				3.69	
		()	Analyza						
Chloride, SM4500Cl-B	mg,	кд	Analyze	d By: DW					
Analyte	mg, Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier

Cardinal Laboratories

*=Accredited Analyte

Celey D. Keine

Celey D. Keene, Lab Director/Quality Manager



ARCADIS U.S., INC. - HOUSTON JONATHAN OLSEN 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129 Fax To: (713) 977-4620

Received:	05/08/2013	Sampling Date:	05/06/2013
Reported:	06/06/2013	Sampling Type:	Soil
Project Name:	CHEVRON BUCKEYE	Sampling Condition:	Cool & Intact
Project Number:	B0048601.0000.TAX03	Sample Received By:	Jodi Henson
Project Location:	BUCKEYE OILFIELD		

Sample ID: STATE AN005 - 6 (10') (H301088-07)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	6.06	0.100	05/09/2013	ND				3.69	
Chloride, SM4500Cl-B	mg,	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	32.0	16.0	05/09/2013	ND	432	108	400	0.00	

Sample ID: STATE AN005 - 6 (15') (H301088-08)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	5.17	0.100	05/09/2013	ND				3.69	
Chloride, SM4500Cl-B	mg	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier

Sample ID: STATE AN005 - 6 (20') (H301088-09)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	3.31	0.100	05/09/2013	ND				3.69	
Chloride, SM4500Cl-B	mg	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	32.0	16.0	05/09/2013	ND	432	108	400	0.00	

Cardinal Laboratories

*=Accredited Analyte

Celey D. Keine

Celey D. Keene, Lab Director/Quality Manager



ARCADIS U.S., INC. - HOUSTON JONATHAN OLSEN 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129 Fax To: (713) 977-4620

Received:	05/08/2013	Sampling Date:	05/06/2013
Reported:	06/06/2013	Sampling Type:	Soil
Project Name:	CHEVRON BUCKEYE	Sampling Condition:	Cool & Intact
Project Number:	B0048601.0000.TAX03	Sample Received By:	Jodi Henson
Project Location:	BUCKEYE OILFIELD		

Sample ID: STATE AN005 - 6 (25') (H301088-10)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	2.76	0.100	05/09/2013	ND				3.69	
Chloride, SM4500Cl-B	mg	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recoverv	True Value OC	RPD	Qualifier
		5	,			,			C

Sample ID: STATE AN005 - 1 (2') (H301088-11)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	5.07	0.100	05/09/2013	ND				3.69	
Chloride, SM4500Cl-B	mg	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier

Sample ID: STATE AN005 - 1 (5') (H301088-12)

% Moisture	%	Analyzed By: AP							
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	9.23	0.100	05/09/2013	ND				3.69	
Chloride, SM4500Cl-B	mg,	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	1940	16.0	05/09/2013	ND	432	108	400	0.00	

Cardinal Laboratories

*=Accredited Analyte

Celey D. Keine

Celey D. Keene, Lab Director/Quality Manager



ARCADIS U.S., INC. - HOUSTON JONATHAN OLSEN 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129 Fax To: (713) 977-4620

Received:	05/08/2013	Sampling Date:	05/06/2013
Reported:	06/06/2013	Sampling Type:	Soil
Project Name:	CHEVRON BUCKEYE	Sampling Condition:	Cool & Intact
Project Number:	B0048601.0000.TAX03	Sample Received By:	Jodi Henson
Project Location:	BUCKEYE OILFIELD		

Sample ID: STATE AN005 - 1 (10') (H301088-13)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	10.6	0.100	05/09/2013	ND				3.69	
Chloride, SM4500Cl-B	mg,	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	1460	16.0	05/09/2013	ND	432	108	400	0.00	

Sample ID: STATE AN005 -1 (15') (H301088-14)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	2.59	0.100	05/09/2013	ND				3.69	
Chloride, SM4500Cl-B	mg,	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	192	16.0	05/09/2013	ND	432	108	400	0.00	

Sample ID: STATE AN005 - 1 (20') (H301088-15)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	1.73	0.100	05/09/2013	ND				3.69	
Chloride, SM4500Cl-B	mg,	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	96.0	16.0	05/09/2013	ND	432	108	400	0.00	

Cardinal Laboratories

*=Accredited Analyte

Celey D. Keine

Celey D. Keene, Lab Director/Quality Manager



ARCADIS U.S., INC. - HOUSTON JONATHAN OLSEN 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129 Fax To: (713) 977-4620

Received:	05/08/2013	Sampling Date:	05/06/2013
Reported:	06/06/2013	Sampling Type:	Soil
Project Name:	CHEVRON BUCKEYE	Sampling Condition:	Cool & Intact
Project Number:	B0048601.0000.TAX03	Sample Received By:	Jodi Henson
Project Location:	BUCKEYE OILFIELD		

Sample ID: STATE AN005 - 1 (25') (H301088-16)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	2.78	0.100	05/09/2013	ND				3.69	
Chloride, SM4500Cl-B	mg,	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	96.0	16.0	05/09/2013	ND	416	104	400	0.00	

Sample ID: STATE AN005 - 5 (2') (H301088-17)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	2.27	0.100	05/09/2013	ND				3.69	
Chloride, SM4500Cl-B	mg	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
							400	0.00	

Sample ID: STATE AN005 - 5 (15') (H301088-18)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	8.26	0.100	05/09/2013	ND				3.69	
Chloride, SM4500Cl-B	mg	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	32.0	16.0	05/09/2013	ND	416	104	400	0.00	

Cardinal Laboratories

*=Accredited Analyte

Celey D. Keine

Celey D. Keene, Lab Director/Quality Manager



ARCADIS U.S., INC. - HOUSTON JONATHAN OLSEN 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129 Fax To: (713) 977-4620

Received:	05/08/2013	Sampling Date:	05/06/2013
Reported:	06/06/2013	Sampling Type:	Soil
Project Name:	CHEVRON BUCKEYE	Sampling Condition:	Cool & Intact
Project Number:	B0048601.0000.TAX03	Sample Received By:	Jodi Henson
Project Location:	BUCKEYE OILFIELD		

Sample ID: STATE AN005 - 5 (5') (H301088-19)

% Moisture	% A			d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	7.80	0.100	05/09/2013	ND				3.69	
Chloride, SM4500Cl-B	mg,	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier

Sample ID: STATE AN005 - 5 (10') (H301088-20)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	11.3	0.100	05/09/2013	ND				3.69	
Chloride, SM4500Cl-B	mg,	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	<16.0	16.0	05/09/2013	ND	416	104	400	0.00	

Sample ID: STATE AN005 - 2 (20') (H301088-21)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	5.22	0.100	05/13/2013	ND				5.31	
Chloride, SM4500Cl-B	mg,	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	<16.0	16.0	05/09/2013	ND	416	104	400	0.00	

Cardinal Laboratories

*=Accredited Analyte

Celey D. Keine

Celey D. Keene, Lab Director/Quality Manager



ARCADIS U.S., INC. - HOUSTON JONATHAN OLSEN 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129 Fax To: (713) 977-4620

Received:	05/08/2013	Sampling Date:	05/06/2013
Reported:	06/06/2013	Sampling Type:	Soil
Project Name:	CHEVRON BUCKEYE	Sampling Condition:	Cool & Intact
Project Number:	B0048601.0000.TAX03	Sample Received By:	Jodi Henson
Project Location:	BUCKEYE OILFIELD		

Sample ID: STATE AN005 - 2 (25') (H301088-22)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	8.59	0.100	05/13/2013	ND				5.31	
Chloride, SM4500Cl-B	mg,	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier

Sample ID: STATE AN005 - 7 (2') (H301088-23)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	4.64	0.100	05/13/2013	ND				5.31	
Chloride, SM4500Cl-B	mg,	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	176	16.0	05/09/2013	ND	416	104	400	0.00	

Sample ID: STATE AN005 - 7 (5') (H301088-24)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	3.83	0.100	05/13/2013	ND				5.31	
Chloride, SM4500Cl-B	mg	/ka	Analyze	d By: DW					
	ing	Ny	Analyze	а <i>ру. р</i> и					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier

Cardinal Laboratories

*=Accredited Analyte

Celey D. Keine

Celey D. Keene, Lab Director/Quality Manager



ARCADIS U.S., INC. - HOUSTON JONATHAN OLSEN 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129 Fax To: (713) 977-4620

Received:	05/08/2013	Sampling Date:	05/06/2013
Reported:	06/06/2013	Sampling Type:	Soil
Project Name:	CHEVRON BUCKEYE	Sampling Condition:	Cool & Intact
Project Number:	B0048601.0000.TAX03	Sample Received By:	Jodi Henson
Project Location:	BUCKEYE OILFIELD		

Sample ID: STATE AN005 - 7 (10') (H301088-25)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	4.48	0.100	05/13/2013	ND				5.31	
Chloride, SM4500Cl-B	mg,	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	32.0	16.0	05/09/2013	ND	416	104	400	0.00	

Sample ID: STATE AN005 - 7 (15') (H301088-26)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	3.01	0.100	05/13/2013	ND				5.31	
Chloride, SM4500Cl-B	mg	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	128	16.0	05/09/2013	ND	416	104	400	0.00	

Sample ID: STATE AN005 - 7 (20') (H301088-27)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	5.70	0.100	05/13/2013	ND				5.31	
Chloride, SM4500Cl-B	mg,	/kg	Analyze	d By: DW					
Analyte	Desult	Demonstration of Linesite	Analyzed	Method Blank	DC	0/ D	Time Makes OC	000	0
, analy co	Result	Reporting Limit	Analyzed	Method Bidrik	BS	% Recovery	True Value QC	RPD	Qualifier

Cardinal Laboratories

*=Accredited Analyte

Celey D. Keine

Celey D. Keene, Lab Director/Quality Manager



ARCADIS U.S., INC. - HOUSTON JONATHAN OLSEN 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129 Fax To: (713) 977-4620

Received:	05/08/2013	Sampling Date:	05/06/2013
Reported:	06/06/2013	Sampling Type:	Soil
Project Name:	CHEVRON BUCKEYE	Sampling Condition:	Cool & Intact
Project Number:	B0048601.0000.TAX03	Sample Received By:	Jodi Henson
Project Location:	BUCKEYE OILFIELD		

Sample ID: STATE AN005 - 7 (25') (H301088-28)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	4.76	0.100	05/13/2013	ND				5.31	
Chloride, SM4500Cl-B	mg,	/ka	Analyze	d By: DW					
			//-0						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier

Sample ID: STATE AN005 - 3 (2') (H301088-35)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	5.60	0.100	05/13/2013	ND				5.31	
Chloride, SM4500Cl-B	mg	/ka	Analyze	d By: DW					
		5							
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier

Sample ID: STATE AN005 - 3 (5') (H301088-36)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	4.04	0.100	05/13/2013	ND				5.31	
Chloride, SM4500Cl-B	mg	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recoverv	True Value OC	RPD	Qualifier
	Result	Reporting Linit	Analyzeu	Ficulou Dialik	55	70 Recovery	The value qe	N D	Quanner

Cardinal Laboratories

*=Accredited Analyte

Celey D. Keine

Celey D. Keene, Lab Director/Quality Manager



ARCADIS U.S., INC. - HOUSTON JONATHAN OLSEN 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129 Fax To: (713) 977-4620

Received:	05/08/2013	Sampling Date:	05/07/2013
Reported:	06/06/2013	Sampling Type:	Soil
Project Name:	CHEVRON BUCKEYE	Sampling Condition:	Cool & Intact
Project Number:	B0048601.0000.TAX03	Sample Received By:	Jodi Henson
Project Location:	BUCKEYE OILFIELD		

Sample ID: STATE AN005 - 3 (10') (H301088-37)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	4.95	0.100	05/13/2013	ND				5.31	
Chloride, SM4500Cl-B	mg,	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	176	16.0	05/09/2013	ND	432	108	400	0.00	

Sample ID: STATE AN005 - 3 (15') (H301088-38)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	5.19	0.100	05/13/2013	ND				5.31	
Chloride, SM4500Cl-B	mg,	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	48.0	16.0	05/09/2013	ND	432	108	400	0.00	

Sample ID: STATE AN005 - 3 (20') (H301088-39)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	5.43	0.100	05/13/2013	ND				5.31	
Chloride, SM4500Cl-B	mg	/ka	Analyze	d By: DW					
			//						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier

Cardinal Laboratories

*=Accredited Analyte

Celey D. Keine

Celey D. Keene, Lab Director/Quality Manager



ARCADIS U.S., INC. - HOUSTON JONATHAN OLSEN 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129 Fax To: (713) 977-4620

Received:	05/08/2013	Sampling Date:	05/07/2013
Reported:	06/06/2013	Sampling Type:	Soil
Project Name:	CHEVRON BUCKEYE	Sampling Condition:	Cool & Intact
Project Number:	B0048601.0000.TAX03	Sample Received By:	Jodi Henson
Project Location:	BUCKEYE OILFIELD		

Sample ID: STATE AN005 - 3 (25') (H301088-40)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	4.24	0.100	05/13/2013	ND				5.31	
Chloride, SM4500Cl-B	mg,	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	32.0	16.0	05/09/2013	ND	432	108	400	0.00	

Sample ID: STATE AN005 - 4 (2') (H301088-41)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	6.35	0.100	05/13/2013	ND				0.474	
Chloride, SM4500Cl-B	mg	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	240	16.0	05/09/2013	ND	432	108	400	0.00	

Sample ID: STATE AN005 - 4 (5') (H301088-42)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	6.28	0.100	05/13/2013	ND				0.474	
Chloride, SM4500Cl-B	mg	/ka	Analyze	d By: DW					
			Analyze						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier

Cardinal Laboratories

*=Accredited Analyte

Celey D. Keine

Celey D. Keene, Lab Director/Quality Manager



ARCADIS U.S., INC. - HOUSTON JONATHAN OLSEN 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129 Fax To: (713) 977-4620

Received:	05/08/2013	Sampling Date:	05/07/2013
Reported:	06/06/2013	Sampling Type:	Soil
Project Name:	CHEVRON BUCKEYE	Sampling Condition:	Cool & Intact
Project Number:	B0048601.0000.TAX03	Sample Received By:	Jodi Henson
Project Location:	BUCKEYE OILFIELD		

Sample ID: STATE AN005 - 4 (10') (H301088-43)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	6.70	0.100	05/13/2013	ND				0.474	
Chloride, SM4500Cl-B	mg,	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	32.0	16.0	05/09/2013	ND	432	108	400	0.00	

Sample ID: STATE AN005 - 4 (15') (H301088-44)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	4.32	0.100	05/13/2013	ND				0.474	
Chloride, SM4500Cl-B	mg,	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	32.0	16.0	05/09/2013	ND	432	108	400	0.00	

Sample ID: STATE AN005 - 4 (20') (H301088-45)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	3.02	0.100	05/13/2013	ND				0.474	
Chloride, SM4500Cl-B	mg	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier

Cardinal Laboratories

*=Accredited Analyte

Celey D. Keine

Celey D. Keene, Lab Director/Quality Manager



ARCADIS U.S., INC. - HOUSTON JONATHAN OLSEN 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129 Fax To: (713) 977-4620

Received:	05/08/2013	Sampling Date:	05/07/2013
Reported:	06/06/2013	Sampling Type:	Soil
Project Name:	CHEVRON BUCKEYE	Sampling Condition:	Cool & Intact
Project Number:	B0048601.0000.TAX03	Sample Received By:	Jodi Henson
Project Location:	BUCKEYE OILFIELD		

Sample ID: STATE AN005 - 4 (25') (H301088-46)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	3.25	0.100	05/13/2013	ND				0.474	
Chloride, SM4500Cl-B	mg,	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	32.0	16.0	05/09/2013	ND	432	108	400	0.00	

Sample ID: STATE AN005 - 12 (2') (H301088-47)

Chloride, SM4500Cl-B	mg	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	128	16.0	05/09/2013	ND	432	108	400	0.00	

Sample ID: STATE AN005 - 8 (2') (H301088-51)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	5.63	0.100	05/13/2013	ND				0.474	
Chloride, SM4500Cl-B	mg,	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier

Cardinal Laboratories

*=Accredited Analyte

Celey D. Keine

Celey D. Keene, Lab Director/Quality Manager



ARCADIS U.S., INC. - HOUSTON JONATHAN OLSEN 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129 Fax To: (713) 977-4620

Received:	05/08/2013	Sampling Date:	05/06/2013
Reported:	06/06/2013	Sampling Type:	Soil
Project Name:	CHEVRON BUCKEYE	Sampling Condition:	Cool & Intact
Project Number:	B0048601.0000.TAX03	Sample Received By:	Jodi Henson
Project Location:	BUCKEYE OILFIELD		

Sample ID: STATE AN005 - 8 (5') (H301088-52)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	13.9	0.100	05/13/2013	ND				0.474	
Chloride, SM4500Cl-B	mg,	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	304	16.0	05/09/2013	ND	432	108	400	0.00	

Sample ID: STATE AN005 - 8 (10') (H301088-53)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	11.5	0.100	05/13/2013	ND				0.474	
Chloride, SM4500Cl-B	mg	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	3480	16.0	05/09/2013	ND	432	108	400	0.00	

Sample ID: STATE AN005 - 8 (15') (H301088-54)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	4.25	0.100	05/13/2013	ND				0.474	
Chloride, SM4500Cl-B	mg	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	80.0	16.0	05/09/2013	ND	432	108	400	0.00	

Cardinal Laboratories

*=Accredited Analyte

Celey D. Keine

Celey D. Keene, Lab Director/Quality Manager



ARCADIS U.S., INC. - HOUSTON JONATHAN OLSEN 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129 Fax To: (713) 977-4620

Received:	05/08/2013	Sampling Date:	05/06/2013
Reported:	06/06/2013	Sampling Type:	Soil
Project Name:	CHEVRON BUCKEYE	Sampling Condition:	Cool & Intact
Project Number:	B0048601.0000.TAX03	Sample Received By:	Jodi Henson
Project Location:	BUCKEYE OILFIELD		

Sample ID: STATE AN005 - 8 (20') (H301088-55)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	3.82	0.100	05/13/2013	ND				0.474	
Chloride, SM4500Cl-B	mg,	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	64.0	16.0	05/09/2013	ND	432	108	400	0.00	

Sample ID: STATE AN005 - 8 (25') (H301088-56)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	3.88	0.100	05/13/2013	ND				0.474	
Chloride, SM4500Cl-B	mg	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	32.0	16.0	05/09/2013	ND	416	104	400	0.00	

Sample ID: STATE AN005 - 2 (2') (H301088-57)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	5.45	0.100	05/13/2013	ND				0.474	
		//	Analyza	d By: DW					
Chloride, SM4500Cl-B	mg,	/ Kg	Allalyze						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier

Cardinal Laboratories

*=Accredited Analyte

Celey D. Keine

Celey D. Keene, Lab Director/Quality Manager



ARCADIS U.S., INC. - HOUSTON JONATHAN OLSEN 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129 Fax To: (713) 977-4620

Received:	05/08/2013	Sampling Date:	05/06/2013
Reported:	06/06/2013	Sampling Type:	Soil
Project Name:	CHEVRON BUCKEYE	Sampling Condition:	Cool & Intact
Project Number:	B0048601.0000.TAX03	Sample Received By:	Jodi Henson
Project Location:	BUCKEYE OILFIELD		

Sample ID: STATE AN005 - 2 (5') (H301088-58)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	8.27	0.100	05/13/2013	ND				0.474	
Chloride, SM4500Cl-B	mg	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier

Sample ID: STATE AN005 - 2 (10') (H301088-59)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	3.22	0.100	05/13/2013	ND				0.474	
Chloride, SM4500Cl-B	mg	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	32.0	16.0	05/09/2013	ND	416	104	400	0.00	

Sample ID: STATE AN005 - 2 (15') (H301088-60)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	6.28	0.100	05/13/2013	ND				0.474	
Chloride, SM4500Cl-B	mg	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	32.0	16.0	05/09/2013	ND	416	104	400	0.00	

Cardinal Laboratories

*=Accredited Analyte

Celey D. Keine

Celey D. Keene, Lab Director/Quality Manager



ARCADIS U.S., INC. - HOUSTON JONATHAN OLSEN 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129 Fax To: (713) 977-4620

Received:	05/08/2013	Sampling Date:	05/06/2013
Reported:	06/06/2013	Sampling Type:	Soil
Project Name:	CHEVRON BUCKEYE	Sampling Condition:	Cool & Intact
Project Number:	B0048601.0000.TAX03	Sample Received By:	Jodi Henson
Project Location:	BUCKEYE OILFIELD		

Sample ID: STATE AN005 - 5 (20') (H301088-71)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	2.90	0.100	05/14/2013	ND				200	
Chloride, SM4500Cl-B	mg,	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	<16.0	16.0	05/09/2013	ND	416	104	400	0.00	

Sample ID: STATE AN005 - 5 (25') (H301088-72)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	2.50	0.100	05/14/2013	ND				200	
Chloride, SM4500Cl-B	mg,	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	<16.0	16.0	05/09/2013	ND	416	104	400	0.00	

Sample ID: STATE AN005 - 13 (2') (H301088-73)

Chloride, SM4500Cl-B	mg	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	32.0	16.0	05/09/2013	ND	416	104	400	0.00	

Cardinal Laboratories

*=Accredited Analyte

Celey D. Keine

Celey D. Keene, Lab Director/Quality Manager



ARCADIS U.S., INC. - HOUSTON JONATHAN OLSEN 630 PLAZA DRIVE, SUITE 600 HIGHLANDS RANCH CO, 80129 Fax To: (713) 977-4620

Received:	05/08/2013	Sampling Date:	05/06/2013
Reported:	06/06/2013	Sampling Type:	Soil
Project Name:	CHEVRON BUCKEYE	Sampling Condition:	Cool & Intact
Project Number:	B0048601.0000.TAX03	Sample Received By:	Jodi Henson
Project Location:	BUCKEYE OILFIELD		

Sample ID: STATE AN005 - 9 (2') (H301088-79)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	3.13	0.100	05/14/2013	ND				200	
Chloride, SM4500Cl-B	mg,	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	80.0	16.0	05/09/2013	ND	432	108	400	0.00	

Sample ID: STATE AN005 - 9 (5') (H301088-80)

% Moisture	%		Analyze	d By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
% Moisture	5.44	0.100	05/14/2013	ND				200	
Chloride, SM4500Cl-B	mg	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	48.0	16.0	05/09/2013	ND	432	108	400	0.00	

Sample ID: STATE AN005 - 15 (10') (H301088-87)

Chloride, SM4500Cl-B	mg	/kg	Analyze	d By: DW					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	160	16.0	05/09/2013	ND	432	108	400	0.00	

Cardinal Laboratories

*=Accredited Analyte

Celey D. Keine

Celey D. Keene, Lab Director/Quality Manager



Notes and Definitions

- ND
 Analyte NOT DETECTED at or above the reporting limit

 RPD
 Relative Percent Difference
- ** Samples not received at proper temperature of 6°C or below.
- *** Insufficient time to reach temperature.
- Chloride by SM4500Cl-B does not require samples be received at or below 6°C Samples reported on an as received basis (wet) unless otherwise noted on report

Cardinal Laboratories

*=Accredited Analyte

Celey D. Keine

Celey D. Keene, Lab Director/Quality Manager

070		BILL YO		ANALYSIS REQUEST
			.1	
Address: 2929 Brier Darth Dr. Sui	+ 300	company: Aveadis	mtens	
Huster	Zip: 77402	Attn: ALP	1. 4. 4)
1	977.4620	A 02	Inza Drive, Dul	4600
Ago "1860" sovo . TA Yo3 Projec	Christ	city:Highlands k	and 100 21	270
(barlow Buc)		State: Zip:		
Project Location: Buch zury Oil Field		Phone #:	011	
and the second have		Fax #:	int	
Samplet Matter Fydy IVanty	MATRIX	PRESERV SAMPLING		
FDH (265 USE-CHALY	S ER		e d	
Lab I.D. Sample I.D.	Contraction and the second	THER : DD/BASE: E / COOL THER : (U_{20})	ter Sterra	
128010CH	GR WA SO OIL		TIME R	
- There red los - 1	8		2610	
2 44+ ANOS (20)	25 C	1.3	1423 1	
(125/19- 200/14 miles 1	× ×	2129 4	14.50	
19.	8	× 56-13	1535	
To shate allow 5 - E (5')	× 2	61953	1 2551	
1 (3)3- 500 10 - 100 - 100	2	8-7-52	1543 1	
1		81-9-50	1 3/6	
(22)3-500 NR 1404 2	X	V 26-17	1790	and the second se
10 300		ct or fact, shall be limited to line amount 934	5) 1555	
e fer reg	a be deened waved unics react in orders as	 Inter of sea or back at replacements of the sea of s	ocinqueston el suo approatur orre da subaristacioa	
nables, A claims involving noor on region man or consequents (smages, malating villbaid injunition, business interruptions, loss of yorks approximation of second	ading withowi jingkola, tusiness interruptions by Cardinal, repardiess of whether such state	 less of use, or loss of profils inclured by drawing based upon any of the above stated read 		1
Relinquisibed By: Balls By: Balls By: Balls By: Balls By: By	Received By:	-	UII: 11 Yes 11	No Add'I Phone #: No Add'I Fax #:
Relinquished By: Dete:	Received By:	Jackwoor	REBARNO.	
Time:				
Delivered By: (Circle One)	0.69	ition CHECKER BY:		
Sampler - UPS - Bus - Other:	3 Dyes Pres	No GW		

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

150 ARDINAL

ITPerty Ferr State: TY e#: 717, 953, 4874 Fax #: 713, 977, 4620 Address: ct #: /2004/601, 8000, THE03 Project Owner: Chaular City: City: ct Name: Chaular Phale: Zip: ct Location: Pucktage Cit/Cialar Phone #: ct Location: Pucktage Cit/Cialar Phone #:	$\begin{array}{llllllllllllllllllllllllllllllllllll$	Bring Parts Dr., Shert 300 Company: Bring Parts Dr., Shert 300 Company: State: TX Zip: 77402 Attn: 3. 4874 Fax #: 713.977, 4620 Address: 11. 8000, TAX03 Project Owner: Chaver 1 Annual Parts and State: Zip Anch age 011 fire 10 Phone #: Phone #:
Address: City: State: Zip: Phone #:	2 Attn: Address: City: State: Zip: Phone #:	P.C. #. Company: Altn: Address: City: State: Zip: Phone #:
Address: City: State: Zip:	Address: City: State: Zip:	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$
Address:	Address:	Jonnythan, Olquin, Saket 300 Company: 19 Brine parte Dr., Saket 300 Company: 19 State: TX 200: 77402 Attn: 19 753, 4874 Fax #: 713, 977, 4620 Address:
	2929 Brinifacte Ver, 5241 500 Company. 845 tarn State: TX Zip: 77 402 Attn:	Provention Olympic Provention Olympic Provention Olympic Provention Olympic Provention October 200 Company: Provention Olympic Provention Olympic
It is a second to	2929 Brind Jar TC VC, SOUT SED Company.	- 9 Brind Part Dr. Sheit 380 Company:

D'

Aboratories

Page 24 of 30

L'S

HAIN-OF-CUSTODY AND ANALYSIS REQUEST	C
OF-CUSTODY AND ANALY	AIN
CUSTODY AND ANAL	
FODY AND ANAL	5
Y AND ANALYSIS REQUEST	TOD
D ANALYSIS REQUEST	Y AN
VALYSIS REQUEST	DAN
SIS REQUEST	ALY
REQUEST	SIS,
UEST	REC
	UEST

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

-	1				
	N		P.O. #		
	15		1.01 m	1 720	
Address: 2929 B.	Brincharts Dr. Suite	200	Company:	14	
	State:	Zip: 77 402	Attn:	218 <u>, F</u>	
Phone #: 713, 953, 4874		977,4620	Address:		
roject #: Benu 8601	Project #: Book 8601. 8000. TAKO3 Project Owner:	r. Chrunger	City:	d'a	
Project Name: Chau	hover Dachaya		State: Zip:		
on:	6		Phone #:	110	
Sampler Name: Aug	n Name		Fax #:		
FOR LAS USE ONLY	1.	A MATRIX	PRESERV. SAMPLING		
Lab I.D.	Sample I.D.	B)RAB OR (C)OM CONTAINERS ROUNDWATER JASTEWATER OIL IL LUDGE	THER : CID/BASE: DE / COOL ITHER : Kator	Maistura	Hold
1 Cityte	to 24/124/5-2 (20)	~	10	1627 1	
1 the the	AN105-26	10	× 54.13	1632 . 7	
22 Stockey	1405-7(21)	2	61953	1220 1	
at the De	Asim5-7/67	X	21-452	1 8221	
25	(M) 1- 50000	8	6125 2	1232 7	
DO Hat	(151) 2-16 marker	× ~	×1-25 2	1237 1	
totol La	(102) (-5 and "	X 1	E133	1243 1	
She Sh	(,52/1-301 14		EL7-5 2 -	1247.1	
Pro Pro	(27 M- 5 2 AU	X	1056-13	1002 1	×
they Or	(3) m1-420 MA	8	61-25 2	1020 1	
PLEASE NOTE: Liabity and Damages anginess. All claims including these for	barky and charapter. Caustrains tability and close's ordinative rearranging wave of an energy strength wave or and and the second paid by the closest as the second paid by the closest as the second paid by the closest as the second paid by the closest of the cooperative second paid by the closest of the closest of the closest of the closest o	dy for any dam scherp whether leased in contra hall be decrees worked unless made in writing a	is constraint at left, shall be fitning to the amount pair writing and received by Candical within 30 days after material constraint at how of the state incention for d	asi padi by the client for the ye after completion of the applicable of the chient die consciences	
ervion. He no event shall Cardoni be h Nataba ar soccessors mising out of ar i	erren. It is event shall cavind be liste to someria of someria di danayer, inductivy viluat induition. Suumar encudices, bis of some elevant of someria errenter is someria errenter of someria errenter is someria errenter by Contral, neuropartica di vietna vectorita is besed teoria of ethe above stabed teacors si difference.	ag vehicle finalision, business oficitions Carolinal, repardless of whether such ciain	I base of use, at loss of profits incurred by a is besed upon any of the above stated tea in the profit of the above stated tea		
Relinquished By:	By: Time: HBy: By: Date:	Received By:		Phone Result: U Yes Fax Result: U Yes REMARKS:	s □ No Add'i Phone#: No Add'i Fax#:
	Time:		A low of the second		
Delivered By: (Circle One) Sampler - UPS - Bus - Other	(Circle One) Bus - Other	30 Sample Condition Cool Intact Yes Yes	es (Initialis)		



потрату Name Index (RTS) 392-22476 BILL TO AMALYSIS RECOURST Interview BILL TO AMALYSIS RECOURST Interview Contramption BILL TO AMALYSIS RECOURST Interview DOI: 1000 BILL TO AMALYSIS RECOURST Interview DOI: 1000 BILL TO AMALYSIS RECOURST Interview DOI: 1000 BILL TO Contramption Interview DOI: 1000 Interview DOI: 1000 MARY STREE AMALYSIS RECOURST Interview DOI: 1000 MARY Street Table Tab	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Aboratories International Holds, NM 8220 (n1 East Martand, Holds, NM 8220 (n5) 303.238 FAX (576) 303-2478 (n0: "Alched Miss." 10: "Alched Miss." 10: "Strand Kean, Olsan." 11:		CHECKED BY:	Sample Condition Cool Intact Yes Yes No No	Circle One) Bus - Other:	Delivered By: (Circle One) Sampler - UPS - Bus - Other	
Interset BILL TO AMALYSIS BILL TO Company: State: 713, 777, 14/2 a AIth: Company: Company: Company: Company: and the colspan="2">Address: Company: Company: Company: and the colspan="2">Address: Company: Company: Company: and the colspan="2">Address: Company: Company: Compa	$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	EYES D NO	1		Setting -1 -7 - 7 - 7 - 7 - 7 - 7 - 7 - 7 - 7 -	teilinggished By:	
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	ID O F G L O F	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	T Yes I No	by Cashoal within 30 days after completion of L of least of profestimation by afters, its saturation on any of the above stated reasons or otherwise Dhome Dr.	dess e basee	mages Contralita indiffy this control sector-aver control for see for negligible and any other torse watering the is the limbe to moderate or consequential control on a play related to the protomatics of epoteets between the limb	EASE NOTE: Lisbing and Dar obyges. All chanse including the nvice. In no event shold Carden island or successors anting out	
Intervention of the second s	Intervention Interventin Interventin	Aborratorial Hobs, NN 82240 (In East Martand Hobs, NN 82240 (France State S		10 5-7	λ	AN1 005 - 3 (* On	
Internet Horbs, NM 88240 AILL TO ANALYSIS AIL TO AILL TO ANALYSIS AIL TO Company: Company: Company: AIL TO Company: AIL TO Company: AIL TO Company: Company: Cop	Chain Rest Rest <threst< th=""> Rest Rest</threst<>	$\begin{array}{c c c c c c c c c c c c c c c c c c c $		5-7-1-3		And noting 31	195	
Internet Horbs, NM 88240 AILL TO ANALYSIS AILL TO ANALYSIS AILL TO ANALYSIS AILL TO ANALYSIS State: T/P Zip: 7.74/2 AIth: 19 Brite T/P Zip: 7.74/2 Ath: Company: 19 Brite T/P Zip: 7.74/2 Ath: 19 Brite T/P Zip: 7.74/2 Ath: Company: 19 Brite T/P Zip: 7.74/2 Ath: Company: 19 Brite T/P Zip: 7.74/2 Ath: Company: Brite: 19 Brite T/P Zip: 7.74/2 Ath: Company: Brite: Zip: 10 Brite T/P Zip: 7.74/2 Ath: Company: Brite: Zip: 10 Brite T/P Zip: 7.74/2 Nate: Zip: Company: Brite: Zip: 10 Brite T/P Zip: 7.74/2 Nate: Zip: State: Zip: Brite: Zip: 10 Brite: T/P Zip: 7.74/2 Nate: Proceet: Zip: Brite: Zip: 10 Brite: All Sign Differe: Brite: All Sign Differe: Brite: All Sign Differe: Brite: All Sign Differe: Brite: All Sign Differe:<	Chain of Loop Control water Chain water	$ \begin{array}{c} \text{POPALOTICS} \\ \begin{array}{c} \text{POPALOTICS} \\ \begin{array}{c} \text{POPALOTICS} \\ \hline \text{POPALOTICS} \\ $		5-7-13		AN 805 -31		
IOI East Marland, Hobbs, NM 88240 BILL TO ANALYSIS FRIL TO ANALYSIS $PO. #: PO. #:$	HOULDIC	$\begin{array}{c} \text{Abor ration results} \\ Abor ration $		5-1-13		AN'905-3	Support State	
Of East Martand, Hobbs, NM 88240 BILL TO ANALYSIS Fill Ty Cip: 7742 ANALYSIS The Asy gert Bay Suite: Ty Zip: 7742 Attn: 19 Brive gert Bay Suite: Ty Zip: 7742 Attn: 19 Brive gert Bay Suite: Ty Zip: 7742 Attn: 19 Brive gert Bay Suite: Ty Zip: 7742 Attn: 19 Brive gert Bay Suite: Ty Zip: 7742 Attn: 19 Brive gert Bay Suite: Ty Zip: 7742 Attn: 19 Brive gert Bay Suite: Ty Zip: 7742 Attn: 19 Bay Suite: Ty Zip: 7742 Attn: 101 Bay Suite: Chrute: Chrute: State: Zip: Phone #: 101 Bay Suite: Chrute: Fox #: Phone #: 101 Brobert Constances Fox #: 11 Bay Suite: Constances Fox #: 11 Bay Suite: Constances Fox #: 11 Bay Suite: Constances Bay Suite: Constance 11 Bay Suite: Constances Bay Suite: Constance 11 Bay Suite: Constance Bay Suite: Constance 11 Bay Suite: Constance Bay Suite: Constance 12 Bay Suite: Constance Bay Suite: Constance 13 Bay Suite: Constance <	Chain of Hobis, NM 88240 GTB 333-2326 FAX (575) 393-2476 PILL TO ARCHARDS - M Company: PILL TO ARCHARDS - M State: Ty Zip: 77 Mp2 Attn: PG53. Hg 7 H Fax #: 713, 972, Hp20 Company: Company: Address: PG53. Hg 7 H Fax #: 713, 972, Hp20 Address: Zip: Company: Grad through a container Unrule and through a containers Company: Address: Zip: Grad through a container Unrule and through a containers Company: Address: Zip: Grad through a container Unrule and through a containers State: Zip: Company: Sample I.D. Grad through a containers State: Zip: State: Zip: Mathematication of the container Containers State: Zip: State: Zip: Mathematication of the container East through a container State: Zip: State: Zip: Mathematication of the container East through a container East through a container State: Zip: Mathematication of the container East through	A DOFATOTIES CHAIN-OF-CUSTO INTERS Mariand, Hobbs, NM 88240 676) 393-2326 FAX (576) 393-2476 Alcuration (155 mm) = 100 mm =		5-7-13	• • • • • • • • • • • • • • • • • • •	AN 005 - 3		
International Hobbs, NM 88240 BILL TO AMALYSIS FILL TO AMALYSIS AMALYSIS PO. #: Company: Company: <th col<="" td=""><td>HOULDER Martand, Hobbs, NM 88240 676) 393-2326 FAX (676) 393-2476 FALCHAIN-GES $ARCHAING - C(S_{2n})$ $Company:$ $ARCHAING - C(S_{2n})$ $Company:$ $ARCHAING - C(S_{2n})$ $Company:$ $ARCHAING - C(S_{2n})$ $Company:$ $BRIL TO$ $Company:$ <math>PO: starte R, Satte TO Zip: 72 V/2.2 Attn: <math>PO: starte THERE Project Owner: Chevreen <math>Chrwen CHERE Chevreen <math>Chrwen CHERE Nature $Chrwen CHERE$</math></math></math></math></math></math></math></math></math></math></math></math></math></math></math></math></math></math></math></math></math></math></math></td><td>A DO LA LO LA STATE Mariand Hobis, NM 88240 675) 393-2326 FAX (575) 393-2476 <math>ARCHAINS- US The appoint M_{12} State: D State</math></td><td>X</td><td>213</td><td></td><td>7 M- 600 NO -</td><td></td></th>	<td>HOULDER Martand, Hobbs, NM 88240 676) 393-2326 FAX (676) 393-2476 FALCHAIN-GES $ARCHAING - C(S_{2n})$ $Company:$ $ARCHAING - C(S_{2n})$ $Company:$ $ARCHAING - C(S_{2n})$ $Company:$ $ARCHAING - C(S_{2n})$ $Company:$ $BRIL TO$ $Company:$ <math>PO: starte R, Satte TO Zip: 72 V/2.2 Attn: <math>PO: starte THERE Project Owner: Chevreen <math>Chrwen CHERE Chevreen <math>Chrwen CHERE Nature $Chrwen CHERE$</math></math></math></math></math></math></math></math></math></math></math></math></math></math></math></math></math></math></math></math></math></math></math></td> <td>A DO LA LO LA STATE Mariand Hobis, NM 88240 675) 393-2326 FAX (575) 393-2476 <math>ARCHAINS- US The appoint M_{12} State: D State</math></td> <td>X</td> <td>213</td> <td></td> <td>7 M- 600 NO -</td> <td></td>	HOULDER Martand, Hobbs, NM 88240 676) 393-2326 FAX (676) 393-2476 FALCHAIN-GES $ARCHAING - C(S_{2n})$ $Company:$ $ARCHAING - C(S_{2n})$ $Company:$ $ARCHAING - C(S_{2n})$ $Company:$ $ARCHAING - C(S_{2n})$ $Company:$ $BRIL TO$ $Company:$ $PO: starte R, Satte TO Zip: 72 V/2.2 Attn: PO: starte THERE Project Owner: Chevreen Chrwen CHERE Chevreen Chrwen CHERE Nature Chrwen CHERE $	A DO LA LO LA STATE Mariand Hobis, NM 88240 675) 393-2326 FAX (575) 393-2476 $ARCHAINS- US The appoint M_{12} State: D State$	X	213		7 M- 600 NO -	
International Hobbs, NIM 88240 State: TAY	Interview Interview <thinter< td=""><td>ADORATONIA STEWATER ANTER SAMPLING CONTAINERS SAMPLING CONTAINERS SAMPLE IN CONTAINERS SAMPLE IN CONTAINERS SOIL OF HER ACIDIAASE IN CONTAINERS ACIDIAASE ACIDIAAS</td><td></td><td>1601 61-75 X</td><td>9.465.44</td><td></td><td>22</td></thinter<>	ADORATONIA STEWATER ANTER SAMPLING CONTAINERS SAMPLING CONTAINERS SAMPLE IN CONTAINERS SAMPLE IN CONTAINERS SOIL OF HER ACIDIAASE IN CONTAINERS ACIDIAASE ACIDIAAS		1601 61-75 X	9.465.44		22	
IOI East Marland, Hobbs, NM 88240 All (ADIS- us Company: Compan	Indianal Holbs, NM 88240 675) 393-2326 FAX (575) 393-2476 ARLIP/ING ub FAX (575) 393-2476 ARLIP/ING ub FAX (575) 393-2476 Polenation Fax (575) 700 Polenation Fax (576) 700 Polenation Fax	ADOLATER ADOLATION ADOLATION ALLANDS, NM 88240 575) 393-2326 FAX (576) 393-2476 ALLANDS, NM 88240 575) 393-2326 FAX (576) 393-2476 ALLANDS, NM 88240 ALLANDS, NM 8240 ALLANDS, NM 88240 ALLANDS,		61.25	nere con	1- 6,00,4H	tr.	
IOT East Marland, Hobbs, NM 88240 ANALYSIS	ADDIT Chain Chain Chain Chain 101 East Marland, Hobbs, NM 88240 575) 393-2326 FAX (575) 393-2476 FAX (575) 393-2476 11 The second seco	ADORATONICS CHAIN-OF-CUSTO		X 54-13	GF W/ SC OI SL SL	1	120106	
International Hobbs, NM 88240 FILL FO ANALYSIS FARCIPPING us ANALYSIS	ADOLOLICITO CHAIN-OF-CUSTO 101 East Marland, Hobbs, NM 88240 576) 393-2326 FAX (575) 393-2476 BILL TO 676) 393-2326 FAX (575) 393-2476 P.O. #: P.O. #: 17 Bristfart B., Suit+ 300 P.O. #: Company: 19 Bristfart B., Suit+ 300 P.O. #: Company: 19 Bristfart B., Suit+ 300 Company: P.O. #: 10 State: TP Zip: 77402 Attn: P.O. #: 10 Gover TANS Project Owner: Chargery State: Zip: 10 Grading Chargery Project Owner: Chargery State: Zip: 11 Grading Chargery Project Owner: Chargery State: Zip: 12 Grading Chargery Chargery Grading Chargery Grading Chargery 12 Grading Chargery Chargery Grading Chargery Grading Chargery 12 Grading Chargery Chargery Chargery Grading Chargery	Aboratories Aboratories Aboratories CHAIN-OF-CUSTO CHAIN-OF-CUSTO CHAIN-OF-CUSTO CHAIN-OF-CUSTO CHAIN-OF-CUSTO State: To Senathan Ofsen Aboratories P.O. #: P.O. #	7.00,999,000 Hold	THER : Alban	CONTAINERS ROUNDWATER ASTEWATER DIL L LUDGE THER :	Sample I.D.	Lab I.D.	
101 East Marland, Hobbs, NIM 88240ARCLANKS, uSBILL TOANALYSIS $ARCLANKS, uSP.O. #:P.O. #:P.O. #:P.O. #:Tornathen, OlspanState: TY Zip: 77402Company:P.O. #:P.O. #:PState: TY Zip: 77402Attn:P.O. #:P.O. #:P.O. #:PState: TY Zip: 77402Attn:P.O. #:P.O. #:P.O. #:PState: TY Zip: 77402Attn:P.O. #:P.O. #:P.O. #:PS3, 4874Fax #: 713, 977, 44/20Address:P.O. #:P.O. #:PG1, 0000-THEO3Project Owner: ChrucerCity:P.O. #:P.O. #:Poultanya OcilEizedState:Zip:P.O. #:P.O. #:Puntanya OcilEizedFax #:Phone #:P.O. #:P.O. #:$	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Aboratories Aboratories Aboratories Althores Althores Althores Althores State: Ty Zip: 7242 Althes State: Ty Zip: 7242 Ath: State: Ty Zip: 7242 Ath: State: Zip: Company: State: Zip: Chruces State: Zip: Address: State: Zip: Chruces State: Zip: Chruces		ESERV.	MATRIX	yay rung	OR LAB SSE ONLY	
IOI East Marland, Hobbs, NM 88240 FIX (575) 393-2476 BILL TO ANALYSIS APACLIPANS- u\$ ANALYSIS APACLIPANS- u\$ PO.#: BILL TO ANALYSIS ANALYSIS ANALYSIS ANALYSIS ANALYSIS ANALYSIS PO.#: State: Tyo Zip: 77402 Attn: PO.#: Company: Address: Address: Address: Address: Address: City: Address:	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Aboratories: <u>CHAIN-OF-CUSTO</u> Aboratories: <u>CHAIN-OF-CUSTO</u> Int East Marland, Hobbs, NM 88240 575) 393-2326 FAX (575) 393-2476 <i>ARCLYAINS-US</i> <i>Senathan OfSen</i> <i>ARCLYAINS-US</i> <i>Senathan OfSen</i> <i>ARCLYAINS-US</i> <i>State: Ty</i> <i>State: Ty</i> <i>State: Ty</i> <i>Company:</i> <i>State: Ty</i> <i>State: Ty</i> <i>State: Zip:</i> <i>Chylen Buck zyc</i> <i>Chylen Bu</i>			Fax #:	12 0.1	2	
IOT East Marland, Hobbs, NM 88240 For a state: 756 393-2476 BILL TO ANALYSIS ARCLANDS, VM ANALYSIS ARCLANDS, VM 88240 Colspan="2">Company: ANALYSIS ANALYSIS ANALYSIS ANALYSIS ANALYSIS ANALYSIS P.O. #: The state: T/S State: T/S Zip: $7.74p2$ Attn: Address: 953, 4874 Fax #: $713, 973, 44/20$ Address: 953, 4874 Fax #: $713, 973, 44/20$ Address: Address: 34	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	ADORATOTICS CHAIN-OF-CUSTO INTErst Marland, Hobbs, NIM 88240 576) 393-2326 FAX (575) 393-2476 <i>ARC IPADIS</i> : US <i>ARC IPADIS</i> : US <i>ARC</i>	" С К [°] I		State:	1 Buch		
101 East Marland, Hobbs, NM 88240 575) 393-2326 FAX (575) 393-2476 <i>ANALYSIS ANALYSIS ANALYSIS ANALYSIS ANALYSIS BILL TO</i> ANALYSIS <i>BILL TO</i> ANALYSIS <i>BILL TO ANALYSIS PO. #: Sens theory Olspan Company: Attn: Attn: Address: Address:</i>	CHAIN-OF-CUSTOI In East Marland, Hobbs, NM 88240 In East Marland, Hobbs, NM 88240 575) 393-2326 FAX (575) 393-2476 ARCLIPTING-ug P.O. #: In Britely arth and Closen In Britely arth and Closen State: Tyo Zip: 77402 Address: Address:	Aboratories: Aboratories CHAIN-OF-CUSTOR CHAIN-OF-CUST	dre	71	Chronger		oject #: Doo 1860	
101 East Marland, Hobbs, NM 88240 575) 393-2326 FAX (575) 393-2476 BILL TO ANALYSIS $ARLUP(M)/5 \cdot u^{4}$ P.O. #: Tenather Olspan Olspan="2">Company: 1 $ANALYSIS ANALYSIS ANALYSIS ANALYSIS Company: ANALYSIS ANALYSIS ANALYSIS ANALYSIS ANALYSIS ANALYSIS ANALYSIS Company: ANALYSIS ANALYSIS ANALYSIS $	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Aboratories CHAIN-OF-CUSTOR CHAIN-OF-C		SS:		3. 4874 Fax #: 713.	10ne #: 713, 95	
101 East Marland, Hobbs, NM 88240 575) 393-2326 FAX (575) 393-2476 ARL 19/11/5- 1/5 PRC 19/11/5- 1/5 Senather, 0/5-en P.O. #: P.O. #: P.O. #: P.O. #: P.O. #:	CHAIN-OF-CUSTOI IOT East Marland, Hobbs, NM 88240 575) 393-2326 FAX (575) 393-2476 ARC 19/11/5- 1/5 ARC 19/11/5- 1/5 P.O. #: Tori ar Apart 17 Briar Apart 10 Company:	ADORATOTICS CHAIN-OF-CUSTO INTEAST MARIAND, HODDS, NIM 88240 576) 393-2376 ARCIANS- u5 P.O. #: Tens the Offer P.O. #: Company:			77402	State: T	ty: Houston	
101 East Marland, Hobbs, NM 88240 575) 393-2326 FAX (575) 393-2476 ARC 197015- 145 576 P.O. #: 500 ANALYSIS	1 1 <td>ADORATOTIES CHAIN-OF-CUSTO Int East Marland, Hobbs, NM 88240 575) 393-2326 FAX (575) 393-2476 ARC 19/1/5- 45 P.O. #:</td> <td>18 Jul</td> <td>any:</td> <td></td> <td>R. Suit-</td> <td>292</td>	ADORATOTIES CHAIN-OF-CUSTO Int East Marland, Hobbs, NM 88240 575) 393-2326 FAX (575) 393-2476 ARC 19/1/5- 45 P.O. #:	18 Jul	any:		R. Suit-	292	
101 East Marland, Hobbs, NM 88240 575) 393-2326 FAX (575) 393-2476 ANALYSIS ANALYSIS	ADOFALOTIES <u>CHAIN-OF-CUSTOI</u> 101 East Marland, Hobbs, NM 88240 575) 393-2326 FAX (575) 393-2476 <i>ARC 19/0/K- ut</i>	Aboratories chain-of-custor of East Marland, Hobbs, NM 88240 575) 393-2326 FAX (575) 393-2476 <i>Alcurallys-ut</i>	(7)		P.O. #	5	oject Manager:	
	CHAIN-OF-CUSTO	CHAIN-OF-CUSTO	8	BILL		ARCIANS-us	ompany Name:	
	CHAIN-OF-CUSTODY AND ANALYSIS REQU	LOFIES CHAIN-OF-CUSTO	1		40	East Marland, Hobbs, NM 882 5) 393-2326 FAX (575) 393-2470	101	

$y g_7 y_1$ Fax #: 7/3.977.7.460 $r, geop. Thy g_7$ Project Owner: Charvis- multing for the start star	Bria (far te Vrog Sute:	Zip: 77402 Attn:	Altn
$\begin{array}{c} (Ur - v e^{\alpha}, Back T, Theory Project \\ (Ur - v e^{\alpha}, Back T, Tays \\ (Ur - v e^{\alpha}, Back T, Tays \\ (Ur - v e^{\alpha}, Back T, Tays \\ Start, Refer Alson \\ Start, An ecs - 4 (2) \\ Start, An ecs - $	Hongton		Address
$\begin{array}{c c} (L_{n-1} & (J_{n-1}) & Breach \mbox{Fit range} \\ (L_{n-1} & J_{n-1} & Breach \mbox{Fit range} \\ (L_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} \\ (L_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} \\ (L_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} \\ (L_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} \\ (J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} \\ (J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} \\ (J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} \\ (J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} \\ (J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} \\ (J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} \\ (J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} \\ (J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} \\ (J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} \\ (J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} \\ (J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} \\ (J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} \\ (J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} \\ (J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} \\ (J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} \\ (J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} \\ (J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} & J_{n-1} \\ (J_{n-1} & J_{n-1} &$	Project		City:
on: Buell eyr a_i (find Sample I.D. Shit. Also $a_i \leq i \leq nd$ Shit. Also $a_i \leq -1 \leq i$ Shit. Also $a_i \leq -1 \leq i \leq i$ Shit. Also $a_i = -1 \leq i \leq i$ Also $a_i = -1 \leq i \leq i \leq i$ By: (Circle One) By: (Circle One) By: Circle One)	Christian Buch		State:
$\begin{array}{c cccc} Sample I.D.\\ Sample I.D.\\ Shiph, Aple ep5-4 (2)\\ Shiph, $	on: Buellow	hd	Phone
Sample I.D. Sample I.D. Shah. All $ep5 - 4(2)$ Shah. All $ep5 - 12(2)$ Shah. All $ep5 - 12(5)$ Shah. All $eps - 12(5)$ Shah. All $eps - 12(5)$ The shall be the particular of the result of the solution	0. 14	Fax	Fax #
Sample I.D. Sample I.D. A. $AV ec5 - 4' (2')$ A. $AV ec5 - 4' (2')$ A. $AV ec5 - 4' (2')$ B. $AV ec5 - 4' (2')$ A. $AV ec5 - 4' (2')$ B. $AV ec5 - 4' (2')$ B. $AV ec5 - 12(2')$ B. $AV ec5 $	1 Land		PRESERV
$ \begin{array}{c} h_{n} & AN = 625 - 4 & (2') \\ - & AN = 625 - 4 & (2') \\ - & AN = 65 - 4 & (2') \\ - & AN = 65 - 4 & (12') \\ - & AN = 65 - 12 & (12') \\ - & AN = 65 - $		NTAINERS DUNDWATER STEWATER DGE	SE:
$ \begin{array}{c} & (AV) e_{0} S_{-} - (I - (Z)) \\ & (AV) e_{0} S_{-} - (I - (ID)) \\ & (AV) e_{0} S_{-} - (I - (ID)) \\ & (AV) e_{0} S_{-} - (I - (ID)) \\ & (AV) e_{0} S_{-} - (I - (ID)) \\ & (AV) e_{0} S_{-} - (I - (ID)) \\ & (AV) e_{0} S_{-} - (I - (ID)) \\ & (AV) e_{0} S_{-} - (I - (ID)) \\ & (AV) e_{0} S_{-} - (ID - (ID)) \\ & (AV) e_{0} S_{-$		<pre># CC GRC WAS < SOIL OIL SLU</pre>	D/BAS
$ \frac{1}{2} + 1$	AN005-4 (ACID/BAS
Priver 1			ACID/BAS
$ \begin{array}{c} \begin{array}{c} & \mathcal{C}_{1} \mathcal{C}_{2} \mathcal{C}_{1} \\ \mathcal{C}_{2} \mathcal{C}_{1} \mathcal{C}_{2} \mathcal{C}_{2} \mathcal{C}_{2} \\ \mathcal{C}_{2} \mathcal{C}_{2} \mathcal{C}_{2} \\ \mathcal{C}_{2} \mathcal{C}_{2} \mathcal{C}_{2} \\ \mathcal{C}_$	19	~	OUR CAMERA OF TRADE OF TAXABLE PARTY OF TAXABLE PARTY.
$ \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \end{array} \\ \end{array} \\ \begin{array}{c} \end{array} \\ \end{array} \\ \begin{array}{c} \end{array} \\ \end{array} \\ \begin{array}{c} \end{array} \\ \begin{array}{c} \end{array} \\ \end{array} \\ \end{array} \\ \end{array} \\ \begin{array}{c} \end{array} \\ \end{array} \\ \end{array} \\ \end{array} \\ \begin{array}{c} \end{array} \\ \begin{array}{c} \end{array} \\ \end{array} $	Malant U		ACID/BAS
	AN1005-4		ACID/BAS
1-2 r/12(5) 1-3 r/12(5) 1-4 r/12(5) 1-5 r/12(5) 1-6 r/12(5) 1-7 r/12(5) 1-7 r/12(5) 1-7 r/12(5) 1-7 r/12(5) 1-7 r/12(5) 1-7 r/12(5) 1-7 <t< td=""><td>4N 505-12</td><td></td><td>ACID/BAS</td></t<>	4N 505-12		ACID/BAS
the state of the second and the	AN 805-121		ACID/BAS
Image: An and a stable part structure work are one of the part of the stable part of the stable part of the stable part of the stable of th			ACID/BAS
to respect Cultures and using the culture version of the culture ver	50 5thr ANOR5-12(15)		ACID/BAS
Circle One)	ens exclusing those for registration and any other cause whether only shall Cardena to Natio for incluences or connerganetal darres		OTHER: ACID/BAS ICE / COC
Circle One)	of or heighed to live participations of services me	$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	OTHER : OTHER : ACID/BAS
Circle One) Time: Secented	DOBOO Timesoo	6 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
- Bus - Other: 30	Relinquished By: Time:	6 1 0 6 1 0 7	OTHER:
- Bus - Other: - Bus - Other:	Nelivered Ry: (Circle One)	6 1 0 6 1 0 7	
	Sampler - UPS - Bus - Other:	6 1 0 6 1 0 6 1 0 6 1 0 6 1 0 7	OTHER: ACIO/BAS ACIO/BAS ICE / COO ACIO/BAS </td

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

0

Laboratories

Delivered By: (Circle One) Sampler - UPS - Bus - Other:	Relinquished By: Date: Trime:		danas including trus nversi shafi Candrai	DI FASE MDTE / Tabley and Dannagen, Cantural's liability and client's world	Por Just America 2 (11)	16-3000 M	21 min and 2(4)	10 10	(152)8-3400 1941	Stat 1	1 44.4. Astro - 8(19)	- L	(12) Server a with a with		1201040	Lab I.D. Sample I.D.	ADDIA STRUCT	Sampler Name: Ryan Norry	on: Buchrowe	Project Name: Charlen Buckeye	: 600 4360 0000 . TAKA3	11×113.	lancton	Address: 2929 Brierharte Dr.,	Project Manager: Tother Phan Olym	Company Name: ARCANIS -45	(575) 393-2326 FAX (575) 393-2476
Sample Condition Cool / Intect Deves Deves	Date: Received By:	Date: 8-1-3 Received By:	e ka najdigance and bay other cubie-wathered shall be denoted water index inside in many startmann water and an Un shall be necleated in subsequential demogratic inclusing watered inclutions have and denote the subsequence of the subsequence	The exclusive country for any claim artising relative based in con-	2	X		× / 9	× 1	X 1	X	7	X X	n i	# CO GRO WAS SOIL		R	NEATDIV	4		Project Owner: Unule on		SONLL SID: JANDS	Just 30			393-2476
nuition CHECKED BV: ct. (huildab) Yes (huildab) No	Jacobar (Nonson	tade in Antary incompany of vision and the income by dealers is vehicle interview. So interpolations loss of uncourt incos of provide income of proteins. Ins vehicle interview, when vision dealers is beyond upper any of the above shaked interviews of other state.	and provide the source of all balance of the source of the	61.9.3 0	E133 1	1 61.9-32	E 4.35 a	X 2 413	K 5-13	643 ×	× 44-13	1 21-25 3			ER : D/BASE ⁻ / COOL		Fax #: foreserv sampling	Phone #:	State: Zip:	City:	Address:	Attn:	Company:	P.O. #:	BILL IO	1.9
		Phone Result: U Yes U Fax Result: U-Yes U REMARKS:		remensions and the second se	1623 1	1617 1	1614 1	1608 1	1	and a second	140 1 -	176 1	1321	128 1 1 1	T	ti ki tari ca			101		100	ell's		9,4)	2000.		
		No Add'l Fax #:	8			$= \frac{1}{2} \left(\frac{1}{2} + \frac$		normali na mandra di statuto di sua su su a su su andra su				All of the last state of the l															ANALYSIS REQUEST

Page 27 of 30

RACI

- (^{****} ARDINAL

Company Name: FALL AP (11): - 15 Solution BILL TO BILL TO ADAL 1753			A	SC Pres Pres		JPS - Bus - Other:	Sampler - UPS
any Name: HLL TO PO. 8: Hanage:: 7.3 as y han, 0 la-7, 1 Company: Harage:: All PV State:: Company: Harage:: State:: Typ: 77/92 Atm: a: 7/3, 97.3, 4 87/4 Far.#: 7/1, 7/2, 1/22 Atm: c: Location: State:: Typ: 77/92 Atm: c: Location: State:: Typ: 7/1/92 Atm: c: Location: State:: Typ: 7/1/92 Atm: c: Location: State:: Typ: 7/1/92 Atm: d: Ham:: Company: State:: Typ: d: Ham:: Sample: Company: State:: Typ: d: Ham:: Sample: Company: State:: State:: <t< th=""><th></th><th></th><th>CHECKED BY:</th><th>50 Sample Condition</th><th></th><th>By: (Circle One)</th><th>Delivered</th></t<>			CHECKED BY:	50 Sample Condition		By: (Circle One)	Delivered
any Name: Hell H (1) Diff. To Diff. To Rinanger: $\mathcal{F}_{a,b,a}$ ph.m. $\mathcal{F}_{a,b,c}$ \mathcal{F}					Time:		
any Name: HLL TO BILL TO 11Manager: $\overline{F}_{0,ny}$ then, \mathcal{O} for \mathcal{T}_{1} $\overline{\rho}_{0,0}$ $\overline{\rho}_{0,0}$ es: 2.92.9 $\overline{B}_{1,0}$ $\overline{D}_{1,0}$ $\overline{D}_{1,0}$ $\overline{D}_{1,0}$ es: $\overline{P}_{0,0}$ $\overline{P}_{0,0}$ $\overline{P}_{0,0}$ $\overline{P}_{0,0}$ $\overline{P}_{0,0}$ es: $\overline{D}_{1,0}$ $\overline{B}_{1,0}$ $\overline{P}_{0,0}$ $\overline{P}_{0,0}$ $\overline{P}_{0,0}$ $\overline{P}_{0,0}$ es: $\overline{P}_{0,0}$ $\overline{P}_{0,0}$ $\overline{P}_{0,0}$ $\overline{P}_{0,0}$ $\overline{P}_{0,0}$ $\overline{P}_{0,0}$ et Name: $\mathcal{L}_{1,0}$ $\overline{P}_{0,0}$				Received By:	Date:	d By:	Relinquished
any Name: RILL TO BILL TO 1 Manager: $7_{0,n_d}$ yhm 0 (s. $+$ -7) 2_{10} 0 (m) es: 2 (2 - 1) b_1 (s. f_0 (k. h_1 , f_{2n}), f_{2n} d_{1n} d_{1n} es: 2 (2 - 1) b_1 (s. f_0 (k. h_1 , f_{2n}), f_1 f_2 d_{1n} es: 7 (3 - 2) f_2 (k. h_1) f_2 (k. h_1) f_2 (k. h_1) f_2 (k. h_1) es: $7 (3 - 2)$ f_2 (k. h_1) f_2 (k. h_1) f_2 (k. h_1) f_2 (k. h_1) et. h_1 (k. h_2) h_1 (k. h_1) f_2 (k. h_1) f_2 (k. h_1) f_2 (k. h_1) et. h_2 (k. h_1) h_1 (k. h_2) h_2 (k. h_2) h_1 (k. h_2) h_2 (k. h_2)	TYYES I No	Fax Result: REMARKS:	endon	Repetived By:	Date:-1 G-3-1 Time:	d By:	Relinquished
any Name: HZL µ (p) 15 - u 3 Po. π : 1: Manager: $5_{n,u}$ µ _h µ _n 0 19 - 7 Po. π : Po. π : se: 2.72.7 f 10 16 1 1/2 2 10/2 Attraction Attraction se: 7.13.7 7.5.7 f 2.0 2 10/2 Attraction Attraction se: 7.13.7 7.5.7 f 2.0 2 10/2 Attraction Attraction se: 7.13.7 7.5.7 f 2.0 2 10/2 Attraction Attraction ctable: Contention: δ_{0} of k_{vers} F_{ext} for $rest for rest for re$	T YAS NO	by clast, its subsidiaries, d reasons or otherwise	stad on cancers second or order take, or lease of profiles inclusion professional of the above states	r destruet voloved unities stade in versity and reversing graditectal tanzardon, buckness interruptions, asso dri- Cardinal, lograndros af whether such claim is bared	pper cause vitalsoever shall be posequental diasnages, indiadity anne of services becauder by	ncholing those for negligence and any o that Centeral or table for incidential or to to around out of an related to the perform	analyses. All closes in service, in no event si
any Name: HZL $\mu(p)$ // ν // ν β_{0} // ν β_{0} // ν β_{0} // ν 1 Manague: $\mathcal{T}_{n,u}$ // μ $\mathcal{T}_{n'}$ // ν \mathcal{T}_{0} // \mathcal{T}_{0} \mathcal{T}_{0} \mathcal{T}_{0} se: 2 7 2 β β_{1} // β' // β' // γ' State: γ_{0} // γ' γ_{1} // γ' γ	an Dire 20 Min	t pad by the client for the	shall be limited to Bie amount	any chim arking whether based in conflact or tort.	chisive ramedy for	01	DIEASE MOTE- 1 125
any Name: $HLL TO$ BILL TO 1Manager: $5_{a,nx}$ yhon, $O [s_{i-1}]$ S_{i-1} S_{i-1} S_{i-1} 1ss: 2929 B_{i-1} B_{i-1} S_{i-1} S_{i-1} S_{i-1} 1ss: 2929 B_{i-1} B_{i-1} S_{i-1} S_{i-1} S_{i-1} S_{i-1} S_{i-1} 1ss: 2929 B_{i-1} B_{i-1} S_{i-1} S_{i-1} S_{i-1} S_{i-1} 1ss: 2929 B_{i-1} B_{i-1} S_{i-1}		3 1335 1	K 5-7-1	R.	101	-	je le
any Name: $PLL, PJ / 15^{-v/s}$ PO. #: 11 Manager: $T_{o,ne}$ yhan, $O / 5^{-v/s}$ PO. #: 11 Manager: $T_{o,ne}$ yhan, $O / 5^{-v/s}$ PO. #: 11 Manager: $T_{o,ne}$ yhan, $O / 5^{-v/s}$ Company: 11 Manager: $T_{o,ne}$ yhan, $O / 5^{-v/s}$ Company: 11 Manager: $T_{o,ne}$ yhan, $O / 5^{-v/s}$ Company: 11 Manager: $T_{o,ne}$ yhan, $O / 5^{-v/s}$ Attn: 11 Manager: $T_{o,ne}$ yhan, $O / 5^{-v/s}$ State: Zip: 12 State: To Zip: 77 / 16 Z. Attn: Address: 12 State: State: Zip: Address: Zip: 12 Clocation: $herkeyr Di / 1 C · v/s r State: Zip: 12 Clocation: herkeyr Di / 1 C · v/s r Presserv Sampluke 13 Di D. Sample I.D. Sample I.D. Presserv Sampluke Nate: 14 Di Sample State: Rawes - 1 (2 + 2 / 2 / 2 / 3) Signar - Alves - 1 (2 + 2 / 2 / 3) Signar - Alves - 1 (2 + 2 / 2 / 3) Signar - Alves - 1 (2 + 2 / 3 / 3) Signar - Alves - 1 (2 + 2 / 3 / 3) Signar - Alves - 1 (2 + 2 / 3 / 3) Signar - Alves - 1 $	\geq	3 1330	ST1	×	- 15		C
any Name: $PLL, PJ / 15 \cdot v >$ PO. #: #Managder: $T_{a,n,a} + h_{a,v}$ $15 \cdot v >$ PO. #: ss: 2929 $B_1 i a r f a r h a$ $15 \cdot v >$ Company: ss: 2929 $B_1 i a r f a r h a$ $15 \cdot v >$ Company: Company: ss: 2929 $B_1 i a r f a r h a$ $15 \cdot v >$ $21p: 77402$ Attn: at: $713.973.972.942.00$ Address: $21p: 77402$ Attn: at: $713.973.942.00$ Address: $21p: 77402.73$ Address: at: $713.973.942.00$ Address: $21p: 77402.73$ Address: at: $Dit D:$ $Bor Roy e D i fixeld Phone #: Phone #: c: Localion: Bach vy e D i fixeld Phone #: Phone #: Phone #: c: Localion: Bach vy e D i fixeld Phone #: Phone #: Phone #: Phone #: c: Localion: Bach vy e D i fixeld Phone #: Phone #:$	×		ARRANGE AND	8.		1	0
any Name: $HLL TO$ $HLL TO$ st: 2727 $Brier print Po. #: s: 2727 Brier print Po. #: Hanager: T_{anse} print State: T/p = 7/902 Company: s: 2727 Brier print State: T/p = 7/902 Attn:: s: 2727 Brie print State: T/p = 7/902 Attn:: s: 773 977 4620 Address: Address: s: Dipolet Brie print Brie print Brie print Brie print Brie print Address: ct. Chruren Brie frage Brie print Brie print$	X 1/21	2 4276 1	2 5-2-1		~ ("	1	0
any Name: $HLC pq pl 5' v 5$ BILL TO IManager: $5_{a,w,u} ph_{a,w} = 0 \frac{l_{y-1}}{l_{y-1}}$ $5_{a,w,u} ph_{a,w} = 0 \frac{l_{y-1}}{l_{y-1}}$ $PO, #:$ Iss: 2727 $B_{1:a/} p l/t_{v} l/t_{v}$ $5_{a,w,u} ph_{a,w} = 10^{2}$ $PO, #:$ Here $5^{+}a^{-}w_{v}$ State: $TX = 20^{2}$ $PO, #:$ $PO, #:$ Here $5^{+}a^{-}w_{v}$ State: $TX = 20^{2}$ $PO, #:$ $PO, #:$ Here $5^{+}a^{-}w_{v}$ State: $TX = 20^{2}$ $PO, #:$ $PO, #:$ et: $PO, #:$ State: $TX = 20^{2}$ $PO, #:$ $PO, #:$ ct: $Rev PBo/l, even, Ba, kryt Fax #: PO, W: PO, #: PO, #: ct: Rev PBo/l, even, Ba, kryt Fax #: PO, W: $	X		52	~	25	1	F
any Name: $\mathcal{HLL}_{QUIS-us}$ \mathcal{PO} . #: IManager: $Z_{n,us}$ yhan, \mathcal{O} by 1 $Z_{n,vs}$ \mathcal{PO} . #: Iss: 2929 $B_{1,isc}/p_{1}/k$ $U_{1,j}$ $S_{n+1} + 3c0$ Company: Imager: $Z_{n,us}$ yhan, \mathcal{O} by 1 $U_{1,j}$ $S_{n+1} + 3c0$ Company: Company: Imager: Z_{12} $B_{1,isc}/p_{1}/k$ $U_{1,j}$ S_{11}/k^2 Attn: Heisster T_{13} 953 $H B74$ Fax #: T_{13}/k^2 Address: cit. $B_{E0}/g_{E0}/l$ A_{out} F_{13}/k^2 Address: Z_{10}/k^2 cit. $B_{E0}/g_{E0}/l$ A_{out}/k^2 A_{out}/k^2 Address: Z_{10}/k^2 cit. $B_{E0}/g_{E0}/l^2$ B_{out}/k^2 B_{out}/k^2 B_{out}/k^2 B_{out}/k^2 B_{out}/k^2 cit. $B_{e0}/g_{E0}/l^2$ B_{out}/k^2 $B_$	X		54	*******	=	CI INT	20
any Name: PLL 10 IManager: 3_{nu} phase 0 ($p-7$) Iss: $2 (272 f)$ $3_{ss:}$: $3 (272 f)$	X	-	10		~	accession of the local division of the local	2
any Name: $HL L pp p15^{-u.5}$ BILL TO tManager: 5_{onec} yhan, O by many P.O. #: ss: 2727 $Briar p1/k$ $Dr.$, $5_{oth} + 3ee$ Company: ss: 2727 $Briar p1/k$ $Dr.$, $5_{oth} + 3ee$ Company: ss: 2727 $Briar p1/k$ $Dr.$, $5_{oth} + 3ee$ Company: ss: 2727 $Briar p1/k$ $Dr.$ State: Typ: tit: $Bp0^{1/k} Dr.$ Fax #: $713.777.952$ Attm: et: $Dp0^{1/k} Dr.$ Fax #: $713.777.952$ Attm: et: $Dp0^{1/k} Dr.$ Fax #: $713.777.952$ Attm: et: $Dp0^{1/k} Dr.$ $Brit Reyer Dr. State: Tip: et: Dr. Brit Reyer Dr. State: Tip: ior Name: Ay_{a-1} Av_{a-1} Fax #: Preserv SAMPLING aureova: Sample I.D. Gradues See: Cool Av_{a-1} Sample I.D. Soil Fax #: Preserv SAMPline Av_{a-1} Av_{a-1} $	<>		5	-	~	3 Litation	0
any Name: All Lip (1): - us I Manager: To any then, 0 for mail to the second s						State +	62
any Name: PLLADIS-us IManager: Jo na shan O lawn Sis: 2929 Briefstan State: Housstan State: TV3: 953. Housstan District Housstan District Housstan State: TV3: 953. Housstan District Housstan Distringit	×	Marine Marine		~		Gtat =	
any Name: H&L pp (15 - u 5) I Manager: Jo nu gham O (g-1) Is: 2.92.9 Brist Project Dr. State: Hourgtain State: T/2 Brist Project Owner: Location: Bucktaye Or North Dir. State: Ct. Bucktaye Ct. Sample I.D. Sample I.D. Sample I.D.		TIME	ICE /	# CO GRO WAS SOIL OIL SLUC OTH		20	H301089
any Name: $ALC \mu \rho p r + u \le D$ BILL TO t Manager: $J_{0,n,u}$ yhan, $D(q_{u-1})$ P.O. #: ss: $2.92.9$ Brief bit $D_{1,u}$, S_{n} the 300 Company: $BE 292.9$ Brief bit $D_{1,u}$, S_{n} the 300 Company: $BE 292.95.3$, 48.74 State: T_{10} Zip: $7.740.2$ Attn: a #: 71.3, 95.3, 48.74 Fax $#: 71.3, 97.7, 46.20$ Address: $ct \#: Bep 4860.1 \cdot Bore, Theorem Theorem Charles of the second state in the second state in$	Ho k		COOL	NTAINERS UNDWATE TEWATER DGE ER :	I.D.	Sample	Lab I.D.
any Name: $PLL pp (15^{-u}5)$ $PLL TO$ $tManager:$ $J_{ond} yhm, O (9^{-u}7)$ $P.O. #:$ $ss: 2929$ $Briel prik U., 5n + 300$ Company: $ss: 2929$ $Briel prik U., 5n + 300$ Company: $HoustrenState: Tp Zip: 77402Attn:HoustrenBriel project Owner: ChauserAddress:at: 713, 953, 4874Fax #: 713, 977, 4620Address:at: 713, 953, 4874Fax #: 713, 977, 4620Address:at: 713, 953, 4874Fax #: 713, 977, 4620Address:ct #: Boo 4860 [based Thyo? Project Owner: ChauserCity:ct wave 0: 1 First MState: Zip:34ct Name: Chauser Brut keytState: Zip:34ct Name: Chauser Brut keytPhone #:34ct Name: Ryan WandFax #:74ct Name: Ryan WandFax #:75$	s-a		and the second	R			FOR LAB USE OWNY
any Name: $ALL \mu \rho p r u s$ BILL TO t Manager: $\mathcal{F}_{o, nu} \mu h m, O r u s$ $P.O. \#$: $ts:: 2929$ $Brier \mu r h h, Or s state:7000t Bus s 2929Brier \mu r h h, Or s state:7000Hous s 193, 953, 4874Fax #: 713, 977, 4620Attn:u : \pi: Boo 48601 \cdot our of h h h h h h h h h h h h h h h h h h $	110,			Fax	8		Sampler Nam
any Name: $All Lip (p) f^{-u} f^{u}$ BILL TOI Manager: $\overline{J}_{0,nu}$ flux, $D f_{g+1}$ P.O. #:I: $\overline{J}_{0,nu}$ flux, $D f_{g+1}$ $D_{1.}$, \overline{J}_{n+1} P.O. #:I: $2 f^{2} f^{2} f^{n}$ $D_{1.in} f^{1} h^{n} D_{1.}$, \overline{J}_{n+1} \overline{J}_{00} State: $T \chi^{n}$ $T \chi^{n} T^{n} D^{2}$ Attn: $Hought f^{0} h^{n}$ $D_{1.}$ $\overline{J}_{1.}$ $\overline{J}_{1.}$ $h^{n} h^{n} h^{$	- Control		ne #:	Phot	Eveld	on: Buckeye	Project Locati
any Name: $All (\mu p) f^{-1} u^{5}$ PO. #:It Manager: $J_{0, ne}$ then $O [f_{2-1}]$ PO. #:It Manager: $J_{0, ne}$ then $O [f_{2-1}]$ PO. #:Its: $2 q 2 q$ $B_{1:0} (p) / h$ D_{1-} , $f_{0,1} f_{} 3 d O$ Company:Its: $2 q 2 q$ $B_{1:0} (p) / h$ D_{1-} , $f_{0,1} f_{} 3 d O$ Company:Its: $2 q 2 q$ $B_{1:0} (p) / h$ D_{1-} , $f_{0,1} f_{} 3 d O$ Company:Its: $2 q 2 q$ $B_{1:0} (p) / h$ D_{1-} , $f_{0,1} f_{} 3 d O$ Attn:Its: $2 q 2 q$ $B_{1,0} (p) / h$ $P = ax #: 713, 977, 46 Z O$ Atdress: $a #: 713, 953, 4874$ Fax #: 713, 977, 46 Z OAtdress: $a #: 718, 600 / h & 000 e, Thyo3 Project Owner: Lh = v/r = 1City:June 100 / h M = 100$	2.5				eye	: Charles Buck	Project Name:
any Name: $PLC \mu \rho r s$ IManager: $\mathcal{F}_{onc} \mu_{onc} \rho r s$ IManager: $\mathcal{F}_{onc} \mu_{onc} \rho r s$ ISS: 2929 $\mathcal{F}_{onc} \rho r s$ Imager: $\mathcal{F}_{onc} \rho r s$ Image: $\mathcal{F}_{$	<u><u><u></u></u></u>				p3 Project Owner:	048601.0000. TAM	Project #: Box
any Name: $Pl_{L,p}p_{15}$ us $Manager: \overline{J_{o,n_d,2}h_m}, O_{15}$ P_{0,n_d} $rss: 2929 Brief prh Dr., Satter 700 Company: Houghton State: T_{10} Zip: 77402. Attn:$, EP		ress:			5, 953, 4874	Phone #: 7/3
ALLADIS-US Janughan Olgan P.O. #: P.O. #: P.O. #: P.O. #:	K2 3						
ALLANS US P.O. #: P.O. #:	<i></i>	and a second secon	pany:		Suite	Brierpert	Address: 29
ALCIAIDIS-us TING	-	,	#:	P.O.	0 19-47	Jane that	Project Manag
	ANALIS		B		A.	ne: Alchaple-u	Company Nan

AIN-OF-CUSTODY AND ANALYSIS REQUEST

0

Laboratories

P.O. #: P.O. #: 21p: 77 4/6 2 Alln: 3. 97 7: 1/6 2 Alln: 9. 1/7 1/6 2 9. 1/7 1/6 2 9. 1/7 1/6 2 9. 1/7 1/6 2 9. 1/7 1/6 2 9. 1/7 1/7

NUMBER STORES

Delivered By: (Circle One) Sample Condition CHECKE Sampler - UPS - Bus - Other: 36 Cool / Mate Cool / Mate	Relinquished By:	Conte	service. In no evant shall Cardinal be fable for in opticates of successions of sing put of an referred to Relimquished By:	PLEASE NOTE: Locality and Damages. Cardenats agalyses, All dawns, scalading theea for registerice	and state	all states	110		state PS	COLUMN A STATE	SI Starter	1200	Lab I.D.	FOR LABUSE ONLY	12	Project Name: Chavron	Project #: BOOY 8601	Phone #: 713.953,4874	-		17	Company Name: AV
(Circle One) Bus - Other:	Date: Time:	Tine:	cidental or consequence of	Easily and clearly excluse and any other cause what	+- AN605-15 (20)	1 44005-15 (· AN 005-15 (101)	AN005-150	101-500 RH		- AN'005-10 (10')		Sample I.D.	1 married	22	on Buckeye	Project #: BOO 4 8 0 1, 0000, TAY & Project Owner: Che v/o 1	Fax #:		Or. Suits	Jon than Older	041416-45
Sample Condition Cool Antack	Received By:	40al Al	Regeived By: .	ansong whether ordered underso p	× × 	-	X X Z Z Z		5.	5 2 3 X		ROU	TAINERS NDWATER EWATER BE R	MATRIX	Fax #:	State	Chevian City:	71 3.977.4620 Address	Zip: 77402 Attn:	300 Company:	P.O. #:	
CHECKED BY:		REMARKS:	upon any of the above stated ressons or offer	based in constant or four, soull be briefled to the another path by the steel of the based on constant or four, sould be briefled and within a days after completion of the applicable case on writing and received by Candrali within a days after completion of the applicable we intermediate the constant of the steel incating by clears, its autocation in we wanted the steel of th	9541 61-6-9 X			OCHI RI-C-JX		XXC3-13 1352	1 61-6-5 N	CE/C DTHEI DATE TIME	OOL	PRESERV. SAMPLING	еж.	c Zip:		ess:		pany:		BILL TO
		₩ Ica	Phone Result: D Yes D No	al for the of the applicable sidteries.	X	 X	X		~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	×	Mo	fold	J- ("hia	200,10	123	45	EPA	300.	1	
			Add'l Phone #: Add'l Fax #:				X					C	1-	ad	ld	ed	13	5/	31	k	3	ANALYSIS REQUEST

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

Ba

aboratories



Attachment 6

Boring Logs (May 2013)
	e Stai ling (Well/Boring ID: STATE AN005-1
Dril	Drilling Method: Air Rotary Sampling Method: Shovel							Client: Chevron EMC Location: State AN 5
Boi Des	rehole script	e Dej tions	oth: By:	25' b R.Na	gs anny			
рертн	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description
0								
-			AR		0.0			SILTY SANDY CALICHE, Pale Yellow (2.5YR8/2), intermixed with White(5YR8/1), indurated, 80% caliche, 20% sand, silt to very fine grained, poorly sorted, dry, formation contains indurated silica cemented sandstone, Pale Brown (10YR6/3), concretion, silt to very fine grained, subangular, poorly sorted, dry.
-	-	1	AR	5	0.0	X		SANDY CALICHE, Very Pale Brown (10YR8/2), firm, dry, 60% caliche, 40% sand, fine grained, subangular to subrounded, poorly sorted, formation contains trace interbeds of indurated sandstone Light Gray (2.5YR7/2) and Pale Yellow (2.5YR8/2) caliche, silty to very fine grains, subrounded, well sorted, silica cemented, caliche is indurated, contains silt to fine grains, 70% caliche, 30% sand, dry, thinly interbedded throughout formation.
	-5 - - - - - 10 -	2	AR	5	0.0	X		
-	-	3	AR	5	0.0			Same as above, sandy caliche had slight color change.
-	-15 -	4	AR	5	0.0	X		SAND, Very Pale Brown (10YR8/3) very fine to fine grained, subrounded to subangular, poorly sorted, loose, dry calcareous, formation contains thin sandstone interbeds, Light Brown (7.5YR6/4), silt to very fine grained, subrounded, moderately sorted, silica cemented. SANDSTONE, Light Brown (7.5YR6/4), silt to very fine grained, subrounded, moderately sorted, silica cemented.
- 20 - - - - 25	-20 - - - - -25	5	AR	5	0.0	X		SAND, Pink (7.5YR7/3), fine grained,moderately sorted, loose, dry.



Dri Dri	Date Start/Finish: 05/06/2013 Drilling Company: White Drilling Drilling Method: Air Rotary							Well/Boring ID: STATE AN005-2 Client: Chevron EMC Location: State AN 5
Sar Bo	Sampling Method: Shovel Borehole Depth: 25' 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							
			AR				\bigcirc	SILTY/SANDY CALICHE, Pale Yellow (2.5YR8/2), interbedded with White(5YR8/1), indurated, 75% caliche, 25% sand, silt to very fine grained, trace fine grains in sample, subangular, poorly sorted, dry.
_	_				0.0	×	\times	SILTY/SANDY CALICHE, Very Pale Brown (10YR8/2), soft, lightly cemented, friable, slightly moist, 80% caliche, 20% sand, silt to fine grained, subrounded, moderately sorted, loose, caliche is arenaceous.
-	_	1	AR	5			$\left \right\rangle$	
-	_				0.0		$\left \right\rangle$	
5	-5 -					×	$\langle \langle \rangle \rangle$	
-		2	AR	5	0.0	R		
10 	-10 -	3	AR	5	0.0			SANDY CALICHE, Very Pale Brown (10YR8/7), soft, dry, 60% caliche, 40% sand, very fine to fine grained, subrounded, moderatley sorted, loose.
-	_					NT7		SANDSTONE, Light Yellowish Brown (2.5YR6/3), silt to fine grained, subrounded, poorly sorted, indurated, silica cementation, dry, interbedded with calcareous sand, Pink (7.5YR8/3), fine grained, subrounded, moderately sorted, dry loose, 3 inch interbeds throughout
- 15	-15 — _ _ _	4	AR	5	0.0	×		formaiton.
- 20 - - - - -	-20 - - - - - - - - 25	5	AR	5	0.0	X		Same as above, at 25 feet bgs, moderately sorted, contains sandstone Brown (7.5YR5/3), silt to very fine grains, with trace fine grains, subrounded, moderately to poorly sorted, indurated, silica cementation, thinly interbedded, formation is slightly calcareous.



Dril Dril San Bo	Date Start/Finish: 05/07/2013 Drilling Company: White Drilling Drilling Method: Air Rotary Sampling Method: Shovel Borehole Depth: 25' bgs Descriptions By: R.Nanny							Well/Boring ID: STATE AN005-3 Client: Chevron EMC Location: State AN 5	
рертн	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	
0	0								
_		1	AR AR	5	0.0	×		SILTY/SANDY CALICHE, Pale Yellow (2.5YR8/2), intermixed with White(5YR8/1), indurated, 80% caliche, 20% sand, silt to very fine grained, trace fine grains in sample, poorly sorted, subangular, dry, formation contains indurated silica cemented sandstone, Pale Brown (10YR6/3) concretions, silt to very fine grained, subangular, poorly sorted, dry.	
- 5	-5 -				0.0	×		SANDY CALICHE, Very Pale Brown (10YR8/3), slightly firm, lightly cemented, 65% caliche, 35% sand, very fine to fine grained, subangular, poorly sorted, dry. Formation contains paper thin sandstone interbeds, Light Brown (7.5YR6/4), silt to very fine grained, moderately sorted, subangular, dry, indurated, silica cementation throughout formation.	
-	-	2	AR	5	0.0				
- 10 - - -	-10 -	3	AR	5	0.0			SANDY CALICHE, Very Pale Brown (10YR8/2),soft, powdery, dry arenaceous, 60% caliche, 40% sand, very fine to fine grained, subangular to subrounded, poorly sorted, formation contains trace paper interbeds of sandstone, indurated as described above throughout.	
-	-15 — — — —	4	AR	5	0.0	×		SAND, Very Pale Brown (10YR8/3), very fine to fine grained, subangular to subrounded, poorly sorted, loose, dry, calcareous. Formation contains indurated sandstone as described above throughout.	
- 20 - - -	-20 -	5	AR	5	0.0			SAND, PINK (7.5YR7/3), fine grained, subrounded, moderately sorted, loose, dry, slightly calcareous.	
25	-25					\mathbb{R}			



Dril Dril San Boi	Date Start/Finish: 05/07/2013 Drilling Company: White Drilling Drilling Method: Air Rotary Sampling Method: Shovel Borehole Depth: 25' bgs							Well/Boring ID: STATE AN005-4 Client: Chevron EMC Location: State AN 5	
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								
-		1	AR	5	0.0	×		SILTY/SANDY CALICHE, Pale Yellow (2.5YR8/2), intermixed with White(5YR8/1), indurated, 80% caliche, 20% sand, silt to very fine grained, trace fine grains in sample, poorly sorted, subangular, dry, arenaceous, formation contains indurated silica cemented sandstone, Pale Brown (10YR6/3), concretion, silt to very fine grained, subangular, poorly sorted, dry.	
5	-5 -				0.0	×		SANDY CALICHE, Very Pale Brown (10YR8/3), slighltly firm, lightly cemented, 75% caliche, 25% sand, very fine to fine grained, subangular, poorly sorted, dry, formation contains thin sandstone, Light Brown (7.5YR6/4), silt to very fine grained, moderately sorted, subangular, dry, indurated, silica cementation throughout formation.	
-	-	2	AR	5	0.0				
-	-10 -	3	AR	5	0.0	×		SANDY CALICHE, Very Pale Brown (10YR8/3), soft, powdery, dry arenaceous, 70% caliche, 30% sand, very fine to fine grained, subangular to subrounded, poorly sorted, formation contains indurated sandstone inerbeds, throughout formation.	
-	-15	4	AR	5	0.0	×		SANDY CALICHE, Very Pale Brown (10YR8/2), soft, lightly cemented, 60% caliche, 40% sand, very fine to fine grained, subangular to subrounded, poorly sorted, dry, calcareous.	
- 20 - - - - 25	-20 - - - 	5	AR	5	0.0	X		SAND, PINK (7.5YR7/3), fine grained, moderately sorted, loose, dry, slightly calcareous.	



	Date Start/Finish: 05/06/2013 Drilling Company: White Drilling								Well/Boring ID: STATE AN005-5 Chevron
D Sa	Drilling Method: Air Rotary Sampling Method: Shovel								Client: Chevron EMC Location: State AN 5
B C	loreh Descri	ole ptio	Dep ons	oth: By:	25' b R.Na	gs inny			
DEPTH		Comple Due Mumber	oampie kun ivumber	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description
0 _	(9- -					1		
-		-	1	AR	5	0.0	×		SILTY/SANDY CALICHE, Pale Yellow (2.5YR8/2), White(5YR8/1), indurated, 75% caliche, 25% sand, silt to very fine grained, poorly sorted, dry,
_5	-5	_					×		SILTY/SANDY CALICHE, Very Pale Brown (10YR8/2), soft, lightly cemented 80% caliche, 20% sand, silt to very fine grained, subrounded, moderately sorted, loose, slightly moist.
-		-	2	AR	5	0.0			
- 1) - - -	0 -10	_	3	AR	5	0.0			SAND, Pink (7.5YR8/4), fine grained with trace medium grains in sample, sunrounded, poorly sorted, loose, calcareous. SANDSTONE, Light Yellowish Brown (2.5YR6/3), silt to very fine grained with trace fine grains in sample, subrounded, poorly sorted,
- 1!	5 -15	_	4	AR	5	0.0	×		indurated, silica cemented, dry. Formation was interbedded with thin sand, Very Pale Brown (10YR8/3), fine grained, subrounded, moderately sorted, loose throughout formation.
2) –20	_	5	AR	5	0.0	***		
	5-25	1					×		Same as above, at 25 feet, Pink (7.5YR7/3), fine grained with trace medium grains in sample, moderately to well sorted, loose, dry.



	Date Start/Finish: 05/06/2013 Drilling Company: White Drilling							Well/Boring ID: STATE AN005-6 Chevron
Dril San	ling N npling	Vetho g Met	od: ^A	hir Ro Sho	tary ovel			Client: Chevron EMC Location: State AN 5
Во	rehole	e Dei	oth:	25' b	gs			
DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description
						1		
-	-				0.0			SILTY/SANDY CALICHE (BEDROCK), Pale Yellow (2.5Y 8/2) with White(5YR8/1), indurated, 75% caliche, 25% sand, silt to very fine grained, trace fine grains in sample, subangular, poorly sorted, dry,
-	-	1	AR	5		×		
	-				0.0			SILTY/SANDY CALICHE, Very Pale Brown (10YR8/2), soft, lightly cemented, friable, powdery, 80% caliche, 20% sand, silty to very fine grained, subrounded, moderately sorted, dry, loose.
-5	-5 -					×		
-	-	2	AR	5	0.0			
- 10 - -	-10 -	3	AR	5	0.0			Same as above, at 10 feet bgs, sand increased to 35%, trace thin sandstone, Light Yellowish Brown (2.5Y6/3), silt to fine grained, subrounded poorly sorted, indurated, silica cemented interbeds continued throughout formation.
- 15	-15 -					×		SANDSTONE, Light Yellowish Brown (2.5YR6/3), silt to fine grained, subrounded, poorly sorted, indurated, silica cemented, dry, interbedded with sand, Pink (7.5YR8/3), fine grained, subrounded, moderately to well sorted, loose. thinly interbedded (3 inch) with sandstone through out formation
- - - - 20	-20 -	4	AR	5	0.0	X		SAND, Pink (7.5YR8/3), fine grained, subrounded, moderately sorted, loose, dry, formation contains very thin interbeded sandstone as described above, indurated, silica cementation.
-		5	AR	5	0.0			



Date Start/Finish: 05/06/2013 Drilling Company: White Drilling Drilling Method: Air Rotary Sampling Method: Shovel Borehole Depth: 25' bgs Descriptions By: R.Nanny	Well/Boring ID: STATE AN005-6 Client: Chevron EMC Location: State AN 5	Chevron
DEPTH ELEVATION Sample Run Number Sample/Int/Type Recovery (feet) PID Headspace (ppm) Analytical Sample Geologic Column	Stratigraphic Description	
- <u>25</u> - <u>25</u> <u>1</u> M		

ZN

RECADIS

Dril Dril San Boi	Date Start/Finish: 05/06/2013 Drilling Company: White Drilling Drilling Method: Air Rotary Sampling Method: Shovel Borehole Depth: 25' bgs Descriptions By: R.Nanny							Well/Boring ID: STATE AN005-7 Client: Chevron EMC Location: State AN 5
DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description
- - - -		1	AR	5	0.0			SILTY/SANDY CALICHE (BEDROCK), Pale Yellow (2.5Y 8/2) intermixed with White(5YR8/1), indurated, 80% caliche, 20% sand, subangular silt, to very fine grained, poorly sorted, dry formation contained indurated silica cemented sandstone Pale Brown (10YR6/3), concretions, silt to very fine grains, subangular, poorly sorted, dry
	-5 - - - - -10 -	2	AR	5	0.0			SILTY/SANDY CALICHE, Very Pale Brown (10YR8/2), indurated, dry, powdery, 75% caliche, 25% silt to very fine grains, sub-angular, poorly sorted, formation contains trace indurated silica cemented, sandstone Pale Brown (10YR6/3), thin interbedding.
- - - -	-	3	AR	5	0.0			Same as above, sand increased slightly to 30% showing trace fine grains. SAND, Very Pale Brown (7.5YR 8/2), very fine to fine grained, sub-rounded, poorly sorted, moderately calcareous, dry, loose
-		4	AR	5	0.0			
- 20 - - -	-20 -	5	AR	5	0.0			SAND, Pink (7.5YR8/3), fine grained, sub-rounded, moderately sorted, loose, dry.



Date Start/Finish: 05/06/2013 Drilling Company: White Drilling Drilling Method: Air Rotary Sampling Method: Shovel Borehole Depth: 25' bgs Descriptions By: R.Nanny	Well/Boring ID: STATE AN005-7 Client: Chevron EMC Location: State AN 5	Chevron
DEPTH ELEVATION Sample Run Number Sample/Int/Type Recovery (feet) PID Headspace (ppm) Analytical Sample Geologic Column	Stratigraphic Description	
-25-25		

ZN



	Date Start/Finish: 05/06/2013 Drilling Company: White Drilling							Well/Boring ID: STATE AN005-8 Chevron
Dri	ling N	Neth	od: A	ir Ro	tary	ıg		Client: Chevron EMC Location: State AN 5
Sar	Sampling Method: Shovel Borehole Depth: 25' bgs							
De	script	e De tions	pth: By:	R.Na	ys inny			
		nber			(mdd)	е	c	
	N	Sample Run Number	Sample/Int/Type	(feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description
Η	ELEVATION	ple Rı	iple/In	Recovery (feet)	Heads	ytical	logic C	Stratigraphic Description
DEPTH	ELE	Sam	Sam	Rec	PID	Anal	Geol	
_ 							<u></u>	
F	-				0.0			SANDY CALICHE (BEDROCK), Pale Yellow (2.5YR8/2) intermixed with White(5YR8/1), indurated, 65% caliche, 35% sand very fine to fine grained, trace medium grains in sample. sub-angular, poorly sorted, dry.
F	-	1	AR	5		\mathbb{R}		SILTY/SANDY CALICHE, Very Pale Brown (10YR8/2), soft, lightly cemented, friable argillaceous, 65% caliche, 35% sand, silt to fine grained, subrounded, moderately sorted, slightly moist
	-				0.0		\times	
5	-5 -					\mathbb{X}	$\langle \langle \rangle \rangle$	
F	_						ŏX	
F	-	2	AR	5	0.0		$O \times$	
	-						\mathbb{R}	
- 10	-10 -					\mathbb{R}	$\left \right\rangle$	
F	-						$\mathbf{\mathcal{O}}$	
F	-	3	AR	5	0.0		\bigcirc	
	-						\mathbb{Q}	
- 15	-15 -					\mathbb{R}	<u>P</u> A	SANDSTONE, Light Yellowish Brown (2.5YR6/3), silt to fine grained, subrounded, poorly sorted, indurated, silica cementation, dry
ŀ	-							
	-	4	AR	5	0.0			CALICHE SAND, Very Pale Brown (10YR8/2), very fine to fine grained, sub-rounded, moderately sorted, very lightly cemented, 50%
	-							caliche, 50% sand, dry, powdery
- 20	-20 -					\mathbb{X}		SAND, Pink (7.5YR 8/3), fine grained, subrounded, moderately sorted, loose, slightly calcareous, dry
F	-							
t	-	5	AR	5	0.0			
	-							
L_{25}	-25 -					\mathbb{H}		



Dat Dri	Date Start/Finish: 05/06/2013 Drilling Company: White Drilling							Well/Boring ID: STATE AN005-9 Chevron
Dri Sai	Drilling Method: Air Rotary Sampling Method: Shovel Borehole Depth: 25' bgs							Client: Chevron EMC Location: State AN 5
De	script	tions	By:	R.Na	anny			
DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description
	0							
-	_				0.0	×		SANDY CALICHE (BEDROCK), Pale Yellow (2.5YR8/2) intermixed with White(5YR8/1), indurated, 65% caliche, 35% sand very fine to fine grained, trace medium grains in sample. subangular, poorly sorted, dry
-	-	1	AR	5	0.0			SILTY/SANDY CALICHE, Very Pale Brown (10YR8/2), soft, lightly cemented, friable argillaceous, 65% caliche, 35% sand, silt to fine grained, subrounded, moderately sorted, slightly moist
-5	-5 -					×		
10	-10 -	2	AR	5	0.0			
_	-10 -	3	AR	5	0.0			
- 15	-15 -							SANDSTONE, Light Yellowish Brown (2.5YR6/3), silt to fine grained, subrounded, poorly sorted, indurated, silica cemented, dry
-	-	4	AR	5	0.0			SAND, Very Pale Brown (10YR 8/2), very fine to fine grained, subrounded, moderately sorted, very lightly cemented 50% caliche, 50% sand, slightly powdery, dry
- 20 -	-20 - -					×		SAND, Pink (7.5YR 8/3).
-	-	5	AR	5	0.0	\mathbb{R}		
L_25	-25	I	I		I	ן צוא	• • •	



Date Start/Finish:	05/06/2013
Drilling Company:	White Drilling

Drilling Method: Air Rotary Sampling Method: Shovel

Borehole Depth: 25' bgs Descriptions By: R.Nanny

Client: Chevron EMC Location: State AN 5

Т



DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description			
	0						<u>A 'A</u>	TOPSOIL, Sandy/Silty Clay, Dark Brown (7.5YR3/2), firm, blocky, dry, roots in sample, sand is silt to fine grained, sub-angular, poorly			
F	_				0.0			sorted, formation has trace caliche, White (10YR8/1), soft, friable, dry			
F	-					\mathbb{R}		SILTY/SAND CALICHE (BEDROCK), Pale Yellow (2.5YR8/2) with White (5Y8/1), indurated, 65% caliche, 35% sand, silt to very fine grained, trace fine grains and medium grains in sample, subangular, poorly sorted, dry			
+	-	1	AR	5							
-	-				0.0			SANDY CALICHE, Very Pale Brown (10YR 8/2), lightly cemented, dry, arenaceous, 75% caliche, 25% sand, very fine to fine grained,			
-5	-5 -							trace medium grains in sample, subangular, poorly sorted			
F	_						\pm \pm				
		2	AR	5	0.0						
- 10	-10 -						\pm \pm				
Ļ	_							CALCAREOUS SAND, Very Pale Brown (10YR 8/2), very fine to fine grained, subrounded to subangular, poorly sorted, loose, dry, fromation contains trace sandstone, Pale Yellow (2.5Y7/3), silt to fine grained, subangular, poorly sorted, indurated, silica cemented, interbedded, thin throughout formation, subgrains increased in size slightly to mostly fine grained			
F	-						<u>т:т</u> :				
F	-	3	AR	5	0.0						
+	-										
- 15	-15 -					\mathbb{R}	\pm				
F	-										
F	-	4	AR	5	0.0		•••••	SAND, Pink (7.5YR8/3), fine grained, subrounded, moderately sorted, loose, moderately calcareous, strongly interbedded with thin sandstone, Light Yellowish Brown (2.5Y6/3), silt to fine grained, subrounded, poorly sorted, indurated, silica cementation, dry			
ſ	_										
_ 20	-20 -										
-											
ļ	-										
F	-	5	AR	5	0.0						
-	-										
L_25	-25					\mathbb{H}	• • • •				



Dat Dri	e Star Iling (rt/Fin Comp	ish: bany:	05/0 Whi	6/201 te Dri	3 illing		Well/Boring ID: STATE AN005-13 Chevron				
Dri Sar Bo	lling M npling prehole script	Metho g Met e Dej	od: ^A hod: oth:	Air Ro Sho 25' ba	tary ovel gs			Client: Chevron EMC Location: State AN 5				
рертн	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description				
0												
-					0.0	×		TOPSOIL, Sandy/Silty Clay, Dark Brown (7.5YR3/2), firm, blocky, dry, roots in sample, sand is silt to fine grained, subangular, poorly sorted, formation has trace caliche, White (10YR8/1), soft, friable, dry SILTY/SAND CALICHE (BEDROCK), Pale Yellow (2.5YR8/2) with White (5YR8/1), indurated, 65% caliche, 35% sand, silt to very fine grained, trace medium grains in sample, subangular, poorly sorted, dry				
	-5 -	1	AR	5	0.0	×						
-	-	2	AR	5	0.0			SANDY CALICHE, Very Pale Brown (10YR 8/2), very soft, powdery, dry, 80% caliche, 20% sand, very fine grained, subrounded, moderately sorted, loose. Formation contains thin sandstone, Light Yellowish Brown (2.5YR6/3), silt to fine grained, subrounded, poorly sorted.				
- 10	-10 -	3	AR	5	0.0			Same as above, formation contains silica cementation throughout.				
-	-15 — — — —	4	AR	5	0.0	X						
- 20 - -	-20 -	5	AR	5	0.0			SAND, Pink (7.5YR8/3), very fine to fine grained, with trace medium grains in sample, subrounded, poorly sorted, loose, calcareous, formation contains thin sandstone interbeds.				
L_25_						\mathbb{H}						



Date Start/Finish: 05/06/2013 Drilling Company: White Drilling								Well/Boring ID: STATE AN005-15 Chevron				
Dril	lling M	Netho	od: A	Air Ro	otary	linig		Client: Chevron EMC Location: State AN 5				
Во	rehole	e Dej	pth:	25' b	gs							
De	script	lons	ву:	R.Na	anny							
Н	DEPTH ELEVATION Sample Run Number Sample/Int/Type Recovery (feet) PID Headspace (ppm) Analytical Sample Geologic Column				PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description				
DEPTH	ELE/	Samp	Samp	Reco	H DIA	Analy	Geolo					
0												
-	-				0.0	×		TOPSOIL, Sandy/Silty Clay, Dark Brown (7.5YR3/2), firm, blocky, dry, roots in sample, sand is silt to fine grained, subangular, poorly sorted, formation has trace caliche, White (10YR8/1), soft to indurated, trace nodules, dry SILTY/SAND CALICHE (BEDROCK), Pale Yellow (2.5YR8/2) intermixed with White (5YR8/1), indurated, 65% caliche, 35% sand, very fine to fine grained with trace medium grains in sample, subangular, poorly sorted, dry				
-	-	1	AR	5	0.0							
5	-5 -											
-	-	2	AR	5	0.0							
- 10 - - -	-10 -	3	AR	5	0.0			SILTY SANDY CALICHE, Very Pale Brown (10YR8/2), firmly to strongly cemented, arenaceous, 75% caliche, 25% sand, silt to very fine to fine grained, subangular, poorly sorted, dry.				
- 15 - - - - - -	-15	4	AR	5	0.0			SANDY CALICHE, Very Pale Brown (10YR8/2), very fine to fine grained, subrounded to subangular, moderately to poorly sorted, firmly cemented, 50% sand, 50% caliche, dry.				
- - - -		5	AR	5	0.0			SAND, Pink (7.5YR8/3), fine grained, subrounded, moderately sorted, loose, calcareous, dry. Same as above, at 25 feet bgs, formation contains sandstone, Pale Brown (7.5YR6/3), silt to fine grained, subrounded, moderately sorted, silica cementation, indurated, thin interbeds throughout formation.				



Attachment 7

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



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

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



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

MULTIMED Overview

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

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

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

Where:

 ψ is the pressure head (meters [m]) z is the depth (m) Kv is the saturated hydraulic conductivity (meters per year [m/year]) Krw is the relative hydraulic conductivity

The boundary condition at the water table is:

 $\psi \cdot L = 0$

Where:

L is the thickness of the unsaturated zone (m)

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

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

Where:

- θr and θs are the residual water saturation and total water saturation (dimensionless), respectively
- β , γ , α are empirical soil-specific parameters (dimensionless)

 ψ is the air pressure entry head (m)

 S_e is the effective saturation (fraction)

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

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

Where:

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

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

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

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

The mass of the chemical of interest that reaches the groundwater is expressed by the simplified steadystate 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 MUTLIMED requires the assumption that the source is continuous and constant throughout the simulation, which is not appropriate for these evaluations. Also, the transient model was selected to provide output that simulates the aquifer concentrations versus time and models a finite source.

Model Simulations and Results

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

To ascertain the maximum allowable chloride concentration for more typical chloride concentration distribution and depth to groundwater scenarios, eight MULTIMED simulations were completed. The scenarios are summarized in Table 2. The input values for the simulations were the same, except for the thickness and width of the chloride-affected soil within the soil column. The first four simulations evaluated homogeneous chloride-affected soil 20 meters wide (400 square meters $[m^2]$) and varied the chloride-affected soil 20 meters and the depth to groundwater between 20 and 30.5 meters. The remaining four simulations evaluated homogeneous chloride-affected soil thickness between 1 meter and 3 meters and the depth to groundwater soil 45 meters wide (2,000 m²) and varied the chloride affected soil thickness between 1 meters 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 1MULTIMED V2.0 Model InputsChevron HES Transfer SitesLea 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	m²	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

1 - calculated using the soil-water partitioning equation

2 - van Genutchen transport parameters are typical values for caliche-like material

cm³ - cubic centimeters

cm - centimeters

g - grams

hr - hour

L - liters

m - meters

m² - meter squared

- mg milligrams
- mL milliliters

yr - year

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 2Soil Screening Level MatrixChevron HES Transfer SitesLea County, New Mexico

	Source Length	Source Area	Source Depth	Depth to Groundwater	SSL _{gw}	Neter
Scenario	(m)	(m)	(m)	(m)	(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















