

**SQ Environmental, LLC** P.O. Box 1991 Austin, TX 78767-1991 (512) 656-9445 www.SQEnv.com

5 April 2016

Mr. Mike Bratcher New Mexico Oil Conservation Division 811 South First St. Artesia, New Mexico 88210

Via Email: <u>Mike.Bratcher@state.nm.us</u>

Re: Release Closure Report Candelario 24 #1 SWD Battery Project No. 2RP-2400 UL/E Section 24 T23S R28E API No. 30-015-26536

Dear Mr. Bratcher:

SQ Environmental (SQE) prepared this report to describe the assessment and response action activities conducted at the Candelario 24 #1 Saltwater Disposal Well (SWD) Battery site. The assessment and response actions were conducted at the Candelario 24 #1 site to resolve remaining issues associated with a release of produced fluid that occurred at the site. This work was performed on behalf of Rockcliff Operating New Mexico LLC (Rockcliff). Rockcliff has just recently acquired assets in the Loving, New Mexico area from Vanguard Operating LLC (Vanguard).

#### **Background**

A release of produced fluid from one of the flow lines to the Candelario 24 #1 SWD occurred in July 2014. The release site is located approximately three miles east of Loving, Eddy County, New Mexico, as shown on Figure 1. Vanguard operated the Candelario 24 #1 SWD at the time of the release. Notice was provided to the New Mexico Oil Conservation Division (NMOCD) by Vanguard, and an initial C-141 form was submitted. Release identification number 2RP-2400 was assigned to the incident by NMOCD. An initial soil assessment was conducted in the area of the release and chloride-affected shallow soils were identified. Total petroleum hydrocarbons were not reported in the soil assessment samples at elevated concentrations. Based on the results of the initial sampling activities, a Corrective Action Plan (CAP) dated 13 October 2014 was submitted to NMOCD.

#### Assessment and Response Actions

In accordance with the CAP, the upper 4 feet (ft) of soil within an approximately 2,251 square ft area was removed in November 2014. A 20-mil reinforced poly liner was placed in the excavation and "seated" to minimize infiltration through the soil. The excavation was backfilled with imported fill material, contoured to match the surrounding grade, and seeded with a blend of native vegetation. Documentation of the soil removal and liner installation work was submitted to the NMOCD by Vanguard in a previous report. In an e-mail dated 20 October 2014, the "dirt work" portion of the CAP was approved.



Based on the results of soil samples collected from soil borings in the area, the CAP proposed that a groundwater monitoring well be installed to evaluate whether groundwater in the vicinity of the release had been impacted. The installation of the groundwater monitoring well was approved by the NMOCD in an email dated 20 October 2014, with the clarification that the well be "situated as close to the excavation as practical, on the probable down gradient side." SQE, on behalf of Rockcliff, submitted a Well Installation Plan with details on the proposed monitoring well. The Well Installation Plan was approved by the NMOCD on 18 March 2016.

SQE mobilized to the site on 22 March 2016 to install the monitoring well. As requested by the NMOCD, the well was installed as close as possible to the former excavation area to evaluate potential chloride impacts to groundwater. The location of the monitoring well ("MW-01") is shown on Figure 2. Prior to completing the well installation, the proposed location was staked and a New Mexico One Call utility locate request was completed.

The monitoring well borehole was drilled by air rotary methods to a total depth of 40 ft below ground surface (bgs). The soil boring cuttings were continuously sampled and logged in general accordance with American Society for Testing and Materials (ASTM) Standard No. D2488-00. A boring log and well completion diagram is included as Appendix A. The uppermost saturated zone was encountered at a depth of 32 ft bgs, and the well was further drilled to a total depth of 40 ft bgs to facilitate installation of a monitoring well. After total depth was achieved, a two inch diameter schedule 40 polyvinyl chloride (PVC) well was installed in the borehole. The well was completed with 10 ft of slotted (0.01-inch) PVC screen with a PVC bottom cap. The PVC screen was installed across the vadose zone/saturated zone interface at a depth of 28 to 38 ft bgs. The well was completed with blank PVC casing to ground surface. A #20/40 silica sand filter pack was installed around the well to a depth of approximately 2 ft above the top of the screen, and a two-ft-thick bentonite seal was installed above the sand pack. The bentonite seal was hydrated and allowed to cure before continuing with the well completion. A bentonite-cement grout mixture was added to the borehole annular space from the top of the bentonite seal to ground surface. The grout was allowed to cure before installing the well surface completion. A concrete pad and locking flush mount cover surface completion were installed on the well.

Following installation, the monitoring well was developed with a submersible pump to clean the well screen and filter pack and remove fine grained material from the well casing. The well was developed until the purge water was clear and field water quality parameters (temperature, pH, conductivity, and dissolved oxygen) stabilized. Approximately ten well volumes of groundwater were removed from the well during the development activities. Following development, the depth to water in the well was gauged using an oilwater interface probe, and the well was sampled by low-flow purge methods. The groundwater sample was collected in a laboratory supplied container, placed on ice, and delivered to ALS Laboratory in Houston, Texas for analysis of chloride by EPA Method 9056A. The reported chloride concentration in the sample collected from MW-01 was 14,800 mg/L. Reported chloride concentrations are summarized on Table 2 and shown on Figure 3. The laboratory analytical report is included as Appendix B.

Based on field measurements of conductivity in purged groundwater from MW-01, two additional monitoring wells were installed to delineate chloride concentrations in shallow groundwater. MW-02 and MW-03 were installed downgradient (east-northeast) of MW-01, between the release site and the Pecos River. Boring and well completion logs for MW-02 and MW-03 are included in Appendix A. The lithology observed in the boring soil boring for MW-02 was consistent with the lithology in the MW-01 location; sand and gravel



alluvial material were observed from the surface to total depth in both borings Increased clay content was observed in the MW-03 boring, likely due to a change in lithology in the area of the Pecos River.

MW-02 and MW-03 were drilled, installed, and completed by the same methods described above for MW-01. MW-02 was installed approximately 300 ft east-northeast of MW-01, and MW-03 was installed approximately 420 ft east-northeast of MW-02. Following development, a groundwater sample was collected from each well by low-flow purge methods. The reported chloride concentration in the sample collected from MW-02 was 2,010 mg/L. The reported chloride concentration in the sample collected from MW-03 was 11,300 mg/L.

A water well is located approximately 1,100 ft south of MW-01, as shown on Figure 2. A groundwater sample was collected from the well ("WW-01") and delivered to the laboratory for analysis of chlorides. The reported chloride concentration in the water well sample was 2,060 mg/L.

A sample was also collected from an upstream location of the Pecos River during the site assessment. The Pecos River is located approximately 500 ft northeast of the release site, and flows from the northwest to the southeast in the area of the site. The reported chloride concentration in the Pecos River surface water sample was 1,170 mg/L. As part of the assessment activities, historical reports and hydrogeological data for the area were reviewed. According to U.S. Geological Survey report No. 1601, *Saline Water Resources of New Mexico*, the Pecos River alluvial deposits in Eddy County yield moderately saline water with total dissolved solids ranging from 3,000 to 10,000 parts per million (ppm). According to the report, two samples collected from the Pecos River in the area had reported chloride concentrations of 1,820 mg/L and 6,600 mg/L. Salt Lake, located across the Pecos River to the east, is used for commercial mining of naturally occurring salt deposits. The location of Salt Lake is provided on Figure 1.

Following completion of the well installation activities, the relative elevations of the top of casings on the three monitoring wells and the water well were surveyed. The wells were allowed to equilibrate overnight and the depth to water in each well was gauged using an oil-water interface probe. The water level measurements in the three monitoring wells ranged from 21.00 to 25.94 ft below top of casing. The measured depth to water and the calculated relative elevations are summarized on Table 1 and shown on Figure 2. Based on the water level elevation data collected during the site assessment activities, the shallow groundwater flow direction in the release area appears to be to the east-northeast toward the Pecos River at a gradient of approximately 0.007 ft/ft. The shallow groundwater gradient, along with an estimated hydraulic conductivity of 0.001 ft/second based on the sandy gravel lithology observed in the borings, was used to estimate the flow velocity of shallow groundwater at the site. The groundwater flow velocity was estimated to be approximately 0.58 ft/day, or 212 ft/year.

#### **Conclusions and Recommendations**

A release of produced fluid from one of the flow lines to the Candelario 24 #1 SWD occurred in July 2014. Assessment and response actions were conducted at the site in September 2014 through March 2016. Soil affected by the release has been addressed through response actions, including soil excavation and removal, and the installation of a 20-mil reinforced poly liner in the excavation to minimize infiltration through the soil.

A groundwater assessment was conducted to delineate chloride concentrations in groundwater. Based on the results of the groundwater sample collected from MW-01, shallow groundwater appears to have been



affected by the release. The approximate area of chloride affected groundwater is shown on Figure 3. Using the estimated flow velocity and a release date of July 2014, chlorides from the produced water could have traveled a maximum of approximately 350 ft in the groundwater. The reported chloride concentration in MW-02 (2.010 mg/L), which is approximately 300 ft downgradient of the release area, was similar to the reported concentration in the background sample collected from an upgradient water well (2,060 mg/L). The concentration of the chlorides reported to be present in the sample from well MW-03 (11.300 mg/L). which is 720 feet from MW-01 (and well beyond any potential impacts from the 2014 produced water release), indicates that there are other contributors (either natural or historical oil and gas operations) that have affected the shallow groundwater in the general vicinity of the 2014 produced water release. Based on the results of the assessment activities, it appears that the impacts to the groundwater are fairly limited in extent, and will dissipate with time. There are no water wells within the affected area and no other potential exposure pathways. Based on the work that has been completed (soil removal and placement of the plastic liner, and delineation of the affected groundwater), along with the lack of potential exposure to the affected groundwater, it is proposed that no additional sampling be performed, and that final closure be issued for the 2014 release. On NMOCD approval, the groundwater monitoring wells will be properly plugged and abandoned.

Please let us know if you have any questions regarding this report or need any additional information.

Sincerely, SQ Environmental, LLC

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Samuel Enis, P.G. Senior Geologist

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Susan T. Litherland, P.E. Principal

Cc: Nick Koch - Rockcliff Operating New Mexico LLC

Attachments







### TABLE 1 SUMMARY OF GROUNDWATER ELEVATIONS CANDELARIO 24 #1 LOVING, NEW MEXICO

	Date	Top of Casing Elevation (ft) <sup>1</sup>	Total Depth (ft bgs)	Screen Interval (ft bgs)	Depth to Water (ft btoc) <sup>2</sup>	Relative Groundwater Elevation
MW-01	2/13/2016	100	38	28 - 38	25.94	74.06
MW-02	2/13/2016	100.2	38	28 - 38	28.41	71.79
MW-03	2/13/2016	90.92	36	26 - 36	21.00	69.92
WW-01	2/13/2016	123.45	NM <sup>3</sup>		43.75	79.70

Notes:

1. Relative Top of Casing elevations surveyed by SQE on 3/23/2016.

2. Depth to Water measurements collected by SQE on 3/23/2016.

3. The total depth of WW-01 was greater than the length of the water level meter (100 ft).

ft - feet

bgs - Below Ground Surface.

btoc - Below Top of Casing.

All measurements are shown in feet.

#### TABLE 2 SUMMARY OF WATER SAMPLE RESULTS CANDELARIO 24 #1 LOVING, NEW MEXICO

	Sample ID	<b>MW-01</b>	<b>MW-02</b>	<b>MW-03</b>	WW-01	<b>SW-01</b>
	Lab ID	HS16031133-01	HS16031133-02	HS16031133-03	HS16031133-04	HS16031130-01
	Date	3/22/2016	3/22/2016	3/23/2016	3/23/2016	3/23/2016
	Units	mg/L	mg/L	mg/L	mg/L	ma/L
Chloride (SW9056) Chloride		14,800	2,010	11,300	2,060	1,170

NOTES:

Bold values indicate concentration reported above the laboratory reporting limit (RL).

mg/L - milligram per liter.

# APPENDIX A

# BORING LOGS AND WELL CONSTRUCTION DIAGRAMS

Γc	SQ Environmental, LLC			Borin	g/We	ll Log	Page 1 of 1	
14	2 ¦	PO Aus (512	Box 1991 tin, TX 78767-1991 2) 417-4659 or (512) 656-9445		BORING ID:	MW-01		
	PRO	IEC	TINFORMATION		DRILLIN	G INFO	RMATION	J
PROJECT: Candelario 24 #1 SWD Battery SITE LOCATION: Loving, New Mexico JOB NUMBER: 1015.007.001 PROJECT MANAGER: Susan Litherland, PE LOGGED BY: Sam Enis, PG DATE(S) DRILLED: 3/22/2016		DRILLING CO DRILLING ME TOTAL DEPT BORING DIAM TOP OF CASING GROUND ELEVA	IG COMPANY: HCI Drilling IG METHOD: Air Rotary DEPTH: 40 ft bgs S DIAMETER: 6-inch WELL DIAMETER: 2-inch CASING ELEVATION: NM N. LATITUDE W. LONG DELEVATION: NM NA NA					
compl	etion installe	d at v	vell. Located at: 32.294134, -104.046	5126.	¥ ™ ¥ S	TATIC WAT	ER LEVEL IN W	/ELL: 25.94 ft btoc
DEPTH	LITHOLOGY	USCS	DESCRIPTION		SAMPLE ID	REC. %	WELL COMPLETIO	N NOTES
		SW	0-10' Sand, reddish brown, fine grained rounded gravel (black and gray) up to 2 Dry. 10-20' Sand and gravel, medium-coars angular gravel up to 1-inch diameter. E gravel. Tan and red sand. Dry. Increased small, black, angular gravel t	d, occasional sub- 2-inch diameter. ee grained. Sub- Black and gray		100		Bentonite- cement grout from 0-16 ft bgs
20 <del>-</del> 20 <del>-</del> 25 -			20-25' Gravel, ¼ to 1-inch diameter. G brown, sub-rounded to rounded, dry, w	iray, black, and ith coarse sand.		100		Bentonite from 16-26 ft bgs
30 -			25-40' Gravel, up to 1-inch diameter. L gray, sub-rounded to rounded, dry, with	ight and dark I coarse sand.		100		20/40 Sand from: 26-38 ft bgs
35			Clay lenses encountered from 38-40'.			100		Screen 0.01" slotted from 28-38 ft bgs
40								

Γc		SQ	Environmental, LLC		Borin	g/We	Page 1 of 1	
14	シー	PO Aus	Box 1991 tin, TX 78767-1991		BORING ID:	MW-02		
	<u>x</u>	(512	2) 417-4659 or (512) 656-9445		WELL ID: M	W-02		
	PRO	JEC	Γ INFORMATION	1	DRILLIN	G INFC	RMATIO	N
PROJI SITE L JOB N PROJI LOGG	PROJECT: Candelario 24 #1 SWD Battery SITE LOCATION: Loving, New Mexico JOB NUMBER: 1015.007.001 PROJECT MANAGER: Susan Litherland, PE LOGGED BY: Sam Enis, PG DATE(S) DRILLED: 3/22/2016			DRILLING COMPANY: HCI Drilling DRILLING METHOD: Air Rotary TOTAL DEPTH: 40 ft bgs BORING DIAMETER: 6-inch WELL DIAMETER: 2-inch				
DATE	(S) DRILLEE	): 3/2	2/2016	TOP OF CASING	ELEVATION: N	N	N. LATITUC	E W. LONGITUDE
				GROUND ELEVA	TION: NM		NA	NA
REMA comple	RKS: Soil c etion installe	utting d at v	is logged at surface. Locking flush-me vell. Located at: 32.294382, -104.045	ounted surface 5235.	포 IN <b>포</b> S	IITIAL WAT	TER LEVEL IN W	/ELL: 32 ft bgs VELL: 28.41 ft btoc
DEPTH	LITHOLOGY	USCS	DESCRIPTION		SAMPLE ID	REC. %	WELL COMPLETIC	INSTALLATION NOTES
		SW	0-10' Sand with gravel, reddish brown, grained, sub-rounded gravel (black and inch diameter. Dry. Color change to dark brown from 5-10'. 10-20' Sand and gravel, medium-coars rounded gravel up to 2-inch diameter.	fine to medium d gray) up to 1- e grained. Sub- Black and gray		100		Bentonite- cement grout from 0-16 ft bgs
			gravel. Light brown and gray sand. Dr 20-25' Sand and Gravel, ¼ to 1-inch dia black, and brown, sub-rounded to round sand.	ameter. Gray, ded, dry, coarse		100		Bentonite from 16-26 ft bgs
25 +			25-40' Gravel, up to 1-inch diameter. E rounded, dry, with coarse sand. Saturated at 32'.	Dark gray, sub-		100		20/40 Sand from: 26-38 ft bgs
35								Screen 0.01" slotted from 28-38 ft bgs
40								

Γc		SQ	Environmental, LLC		B	Boring	g/We	ell Log		Page 1 of 1
17	フー	PO Aus	Box 1991 tin, TX 78767-1991		BOR	RING ID:	MW-03			
	<u> </u>	(512	2) 417-4659 or (512) 656-9445		WEL	LID: M	W-03			
	PRO.	JEC	T INFORMATION		DRILLING INFORMATION					
PROJE	ECT: Cande	lario 2	24 #1 SWD Battery	DRILLING CO	OMPAN	IY: HCI	Drilling			
SITE L	OCATION:	Lovir	ng, New Mexico 07 001	DRILLING ME	ETHOD	): Air Ro ft bas	tary			
PROJECT MANAGER: Susan Litherland, PE LOGGED BY: Sam Enis, PG			BORING DIAN	METER	R: 6-inch	W	ell diame	ΓER:	2-inch	
DATE(	DATE(S) DRILLED: 3/22/2016 TOP OF CASING ELEVATION: NM N. LATIT				N. LATITU	JDE	W. LONGITUDE			
				GROUND ELEVA	ATION: N	NM		NA		NA
REMA	RKS: Soil c	utting d at v	is logged at surface. Locking flush-mo vell_Located at: 32 294933 -104 043	ounted surface		∑ IN	ITIAL WA	TER LEVEL IN	WEL	L: 20 ft bgs
compie		uutv		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		¥ ST	ATIC WA	TER LEVEL IN	IWEL	L: 21.00 ft btoc
DEPTH	LITHOLOGY	USCS	DESCRIPTION		S	SAMPLE ID	REC. %	WELL COMPLET	ION	INSTALLATION NOTES
<sup>0</sup> T		SW	0.1E/ Sand with ground roddich brown	fina to modium					2	
			grained, sub-rounded gravel (black and	d gray) up to 1-			100			
5			inch diameter. Dry.						00 00 00	
			Color change to light brown from 5-15'.	Increased gravel	)		100			cement grout
			content.				100			from 0-14 ft bgs
10 -		6.0								
		SC								
							100		00 00 02	
15 _										
			15-20' Clayey Sand. Brown, fine graine	ed, damp.			100			Bentonite from
										14-24 lt bys
20 -			20,40' Sandy clay and sand Occasion	al gravel brown			100			
			moist.	iai gravei, brown,			100			
25										20/40 Sand
							100			from: 24-36 ft bgs
30 _										
							100			Screen 0.01"
										26-36 ft bgs
35 _										
40										
<sup>+</sup>										

# **APPENDIX B**

# LABORATORY ANALYTICAL REPORTS



10450 Stancliff Rd. Suite 210 Houston, TX 77099 T: +1 281 530 5656 F: +1 281 530 5887 www.alsglobal.com

March 29, 2016

Sam Enis SQ Environmental PO Box 1991 Austin, TX 78767

Work Order: HS16031133

Laboratory Results for: Loving NM Well Install 1072.002.003

Dear Sam,

ALS Environmental received 4 sample(s) on Mar 24, 2016 for the analysis presented in the following report.

The analytical data provided relates directly to the samples received by ALS Environmental and for only the analyses requested. Results are expressed as "as received" unless otherwise noted.

QC sample results for this data met EPA or laboratory specifications except as noted in the Case Narrative or as noted with qualifiers in the QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained by ALS Environmental. Samples will be disposed in 30 days unless storage arrangements are made.

If you have any questions regarding this report, please feel free to call me.

Sincerely,

Generated By: Jumoke.Lawal Dane J. Wacasey

# Client:SQ EnvironmentalProject:Loving NM Well Install 1072.002.003Work Order:HS16031133

#### SAMPLE SUMMARY

Lab Samp ID	Client Sample ID	Matrix	TagNo	Collection Date	Date Received	Hold
HS16031133-01	MW-01	Water		22-Mar-2016 17:00	24-Mar-2016 10:20	
HS16031133-02	MW-02	Water		22-Mar-2016 17:30	24-Mar-2016 10:20	
HS16031133-03	MW-03	Water		23-Mar-2016 08:40	24-Mar-2016 10:20	
HS16031133-04	WW-01	Water		23-Mar-2016 09:20	24-Mar-2016 10:20	

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**CASE NARRATIVE** 

Client:SQ EnvironmentalProject:Loving NM Well Install 1072.002.003Work Order:HS16031133

### WetChemistry by Method SW9056

#### Batch ID: R271422

• The test results meet requirements of the current NELAP standards, state requirements or programs where applicable.

Client:	SQ Environmental	ANALYTICAL REPORT			
Project:	Loving NM Well Install 1072.002.003	2.003 WorkOrder:HS16031133			
Sample ID:	MW-01	Lab ID:HS16031133-01			
Collection Date:	22-Mar-2016 17:00	Matrix:Water			r
ANALYSES	RESULT QUAL	REPORT LIMIT	UNITS	DILUTION FACTOR	DATE ANALYZED
ANIONS BY SW9056A	Method:SW9056				Analyst: JBA
Chloride	14,800	100	mg/L	200	25-Mar-2016 23:04

Client:	SQ Environmental	ANALYTICAL REPORT			
Project:	Loving NM Well Install 1072.002.003	3 WorkOrder:HS16031133			
Sample ID:	MW-02	Lab ID:HS16031133-02			
Collection Date:	22-Mar-2016 17:30	Matrix:Water			ſ
ANALYSES	RESULT QUAL	REPORT LIMIT	UNITS	DILUTION FACTOR	DATE ANALYZED
ANIONS BY SW9056A	Method:SW9056				Analyst: JBA
Chloride	2,010	50.0	mg/L	100	26-Mar-2016 14:26

Client:	SQ Environmental	ANALYTICAL REPORT			
Project:	Loving NM Well Install 1072.002.003	03 WorkOrder:HS16031133			
Sample ID:	MW-03	Lab ID:HS16031133-03			
Collection Date:	23-Mar-2016 08:40	Matrix:Water			ſ
ANALYSES	RESULT QUAL	REPORT LIMIT	UNITS	DILUTION FACTOR	DATE ANALYZED
ANIONS BY SW9056A	Method:SW9056				Analyst: JBA
Chloride	11,300	100	mg/L	200	26-Mar-2016 14:48

Client:	SQ Environmental	ANALYTICAL REPORT			
Project:	Loving NM Well Install 1072.002.003	2.002.003 WorkOrder:HS16031133			
Sample ID:	WW-01	Lab ID:HS16031133-04			
Collection Date:	23-Mar-2016 09:20	Matrix:Water			r
ANALYSES	RESULT QUAL	REPORT LIMIT	UNITS	DILUTION FACTOR	DATE ANALYZED
ANIONS BY SW9056A	Method:SW9056				Analyst: JBA
Chloride	2,060	50.0	mg/L	100	26-Mar-2016 15:10

DATES REPORT

Client:	SQ Environmental
Project:	Loving NM Well Install 1072.002.003
WorkOrder:	HS16031133

Sample ID	Client Sar	np ID Collection Date	TCLP Date Prep Date Analysis Date			DF
Batch ID     R271422     Test Name : ANIONS BY SW9056A     Matrix: Water						
HS16031133-	01 MW-01	22 Mar 2016 17:00			25 Mar 2016 23:04	200
HS16031133-	02 MW-02	22 Mar 2016 17:30			26 Mar 2016 14:26	100
HS16031133-	03 MW-03	23 Mar 2016 08:40			26 Mar 2016 14:48	200
HS16031133-	04 WW-01	23 Mar 2016 09:20			26 Mar 2016 15:10	100

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**QC BATCH REPORT** 

# Client:SQ EnvironmentalProject:Loving NM Well Install 1072.002.003WorkOrder:HS16031133

Batch ID:	R271422	Instr	ument:	ICS3K2		Method	d: SW905	6	
MBLK Client ID:	Sample ID:	WBLKW1-032516 Run ID	: ICS3K2	Units: _ <b>271422</b>	mg/L SeqNo: 3	Anal 3625793	ysis Date: PrepDate:	25-Mar-2016	5 <b>11:08</b> DF: <b>1</b>
Analyte		Result	PQL	SPK Val	Value	%REC	Limit	RPD Ref Value	RPD %RPD Limit Qual
Chloride		ND	0.500						
LCS Client ID:	Sample ID:	WLCSW1-032516 Run ID	: ICS3K2	Units: _271422	mg/L SeqNo: 3	Anal 3625794	ysis Date: PrepDate:	25-Mar-2016	5 <b>11:30</b> DF: <b>1</b>
Analyte		Result	PQL	SPK Val	SPK Ref Value	%REC	Limit	RPD Ref Value	RPD %RPD Limit Qual
Chloride		19.79	0.500	20	0	99.0	80 - 120		
LCSD	Sample ID:	WLCSDW1-032516		Units:	mg/L	Anal	ysis Date:	25-Mar-2016	5 11:52
Client ID:		Run ID	ICS3K2	_271422	SeqNo: 3	3625795	PrepDate:		DF: <b>1</b>
Analyte		Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD Limit Qual
Chloride		19.8	0.500	20	0	99.0	80 - 120	19.79	0.0152 20
MS	Sample ID:	HS16031138-02MS		Units:	mg/L	Anal	ysis Date:	25-Mar-2016	i 15:50
Client ID:		Run ID	ICS3K2	_271422	SeqNo: 3	3625802	PrepDate:		DF: <b>1</b>
Analyte		Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD Limit Qual
Chloride		13.36	0.500	10	3.515	98.4	80 - 120		
MS	Sample ID:	HS16031096-01MS		Units:	mg/L	Anal	ysis Date:	25-Mar-2016	i 12:35
Client ID:		Run ID	ICS3K2	_271422	SeqNo: 3	3625797	PrepDate:		DF: <b>1</b>
Analyte		Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD Limit Qual
Chloride		26.24	0.500	10	16.34	99.0	80 - 120		
MSD	Sample ID:	HS16031138-02MSD		Units:	mg/L	Anal	ysis Date:	25-Mar-2016	5 16:12
Client ID:		Run ID	ICS3K2	_271422	SeqNo: 3	3625803	PrepDate:		DF: <b>1</b>
Analyte		Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD Limit Qual
Chloride		13.38	0.500	10	3.515	98.7	80 - 120	13.36	0.172 20

# Client:SQ EnvironmentalProject:Loving NM Well Install 1072.002.003WorkOrder:HS16031133

#### **QC BATCH REPORT**

Batch ID:	R271422	Ins	strument:	ICS3K2		Metho	d: SW905	6	
MSD	Sample ID:	HS16031096-01MSD	I	Units:	mg/L	Ana	lysis Date:	25-Mar-2016	12:57
Client ID:		Run	ID: ICS3K	2_271422	SeqNo: 3	625798	PrepDate:		DF: <b>1</b>
Analyte		Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD Limit Qual
Chloride		26.27	0.500	10	16.34	99.4	80 - 120	26.24	0.149 20
The followin	g samples were anayzed	l in this batch: HS16031	133-01	HS16031133	3-02 H	HS1603113	3-03	HS16031133-0	)4

Client:	SQ Environmental
Project:	Loving NM Well Install 1072.002.003
WorkOrder:	HS16031133

Matrix Spike

Serial Dilution

Matrix Spike Duplicate Post Digestion Spike

Practical Quantitaion Limit

Sample Detection Limit

Texas Risk Reduction Program

MS MSD

PDS PQL

SD

SDL TRRP

#### QUALIFIERS, ACRONYMS, UNITS

Qualifier	Description
*	Value exceeds Regulatory Limit
а	Not accredited
В	Analyte detected in the associated Method Blank above the Reporting Limit
E	Value above quantitation range
н	Analyzed outside of Holding Time
J	Analyte detected below quantitation limit
Μ	Manually integrated, see raw data for justification
n	Not offered for accreditation
ND	Not Detected at the Reporting Limit
0	Sample amount is > 4 times amount spiked
Р	Dual Column results percent difference > 40%
R	RPD above laboratory control limit
S	Spike Recovery outside laboratory control limits
U	Analyzed but not detected above the MDL/SDL
Acronym	Description
DCS	Detectability Check Study
DUP	Method Duplicate
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MBLK	Method Blank
MDL	Method Detection Limit
MQL	Method Quantitation Limit

# CERTIFICATIONS, ACCREDITATIONS & LICENSES

Agency	Number	Expire Date
Arkansas	16-022-0	27-Mar-2017
California	2919	31-Jul-2016
Illinois	003622	09-May-2016
Kentucky	KY 2015-2016	30-Apr-2016
Louisiana	03087 2015/2016	30-Jun-2016
North Carolina	624 - 2016	31-Dec-2016
North Dakota	R-193 2015-2016	30-Apr-2016
Oklahoma	2015-047	31-Aug-2016
Texas	T104704231-15-15	30-Apr-2016

SAMPLE TRACKING

# Client:SQ EnvironmentalProject:Loving NM Well Install 1072.002.003Work Order:HS16031133

#### Lab Samp ID New Location **Client Sample ID** Action Date Person MW-01 10C HS16031133-01 Login 3/24/2016 7:25:06 PM BHH 10C HS16031133-02 MW-02 Login 3/24/2016 7:25:06 PM BHH 10C HS16031133-03 MW-03 Login 3/24/2016 7:25:06 PM BHH HS16031133-04 WW-01 Login 3/24/2016 7:25:06 PM BHH 10C

#### Page 13 of 16

						Sample Rec	eipt Checklist
Client Name:	SQ ENVI	RONMENTAL TX		Date	/Time Received:	<u>24-Mar-2016</u>	<u>i 10:20</u>
Work Order:	HS16031	133		Rece	eived by:	<u>RPG</u>	
Checklist comp	leted by:	<i>Baudelio Hernandez</i> eSignature	24-Mar-201 Date	Reviewed by:	Dane J. W eSignature	<sup>7</sup> acasey	28-Mar-2016 Date
Matrices:	<u>Wat</u>	er		Carrier name:	<u>FedEx</u>		
Shipping contai Custody seals i Custody seals i Chain of custod Chain of custod Chain of custod Samples in prop Sample contain TX1005 solids r Sufficient samp All samples rec	ner/cooler ntact on si ntact on si ly present? ly signed v ly agrees v per contair ers intact? received in le volume eived withi	in good condition? hipping container/cooler? ample bottles? when relinquished and rece with sample labels? her/bottle? hermetically sealed vials? for indicated test? n holding time?	ved?	Yes  Yes  Yes  Yes  Yes  Yes  Yes  Yes	No N	Not Present Not Present Not Present	
Temperature(s)	/Thermom	eter(s):		3.6c / 4.2c u/c			IR#4
Cooler(s)/Kit(s)	:			25268			
Date/Time sam	ple(s) sent	to storage:		03/24/2016 19:30	)		
Water - VOA via	als have ze	ero headspace?		Yes	No 📃	No VOA vials subr	nitted
Water - pH acce	eptable up	on receipt?		Yes 📃	No 📃	N/A 🔽	
pH adjusted?				Yes 🔲	No 📃	N/A 🔽	
pH adjusted by:	:						
Login Notes:	Sample la	bel time does not match C	OC, COC-17:30 La	abel-17:50. Logged p	er COC.		
Client Contacte	d:		Date Contacted:		Person Co	ntacted:	
Contacted By:	0		Regarding:				
Comments:							
Corrective Actic	on:						

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	Λ	Cincinnati, OH +1 513 733 5336 Everett, WA	Fort Co +1 970 Holland	llins, CC 490 151 I, MI	P, <b>(</b>	Chair	n of Cu	stody	For	m				HS	160	311	133		-1 <sup>2</sup>
(#	ALS)	+1 425 356 2600	+1 616	399 607	0	Ľ		<u>"</u> ]	っち				Lovi	SC	Enviro	nmenta	al j		
Enviro	nmental								55						Well Ins	all 107	2.002.0	03	
	Customer Information				Project	t Inform	ation	ct wianage	er:										
Purchase Order			Project	Name	Lovina		Installation		A							<b></b>			
Work Order			Project Nu	umber	1072.00	12 003	motunadon		B	Chiona	8 9056	- 201							
Company Name	SQ Environmental		Bill To Con	npany	SO Env	ironmant	al		2	Moistur	e								
Send Report To	Sam Enis		Invoice	e Attn	Susan I	itherland	ai I			Chloride	9056	Water							
Address	PO Box 1991		Ade	dress	PO Box	1991			E								<u>.</u>		
City/State/Zip	Austin		City/Stat	e/Zip	Austin														
Phone			P	hone	(281) 41	3-4266			<u></u>										
Fax				Fax	() 11											****			
-Mail Address	s.enis@sqenv.com		e-Mail Adr	tress															
•	Sample Description		Date	T	me	Matrix	Pres	# Bottle						(				·	
MW-0	01		3-22.16	17	00 1		Q V	1	<u> </u>	B			E	F	G	н	1	J	Hold
Mw- a	02		3.22.16	17	20	1	1	1			$ \odot$						·		
MW-	03	1	3-23-16	84	D			+-1			6	-							
@mu-	-01- WW-01		3-23-16	92	0	7	1	1			X	Ð							~
												_							
																			· · · · · · · · · · · · · · · · · · ·
npler(s) Please Pri	nt & Sign		Shipmer	nt Metho	bd	Rec	uired Turnar	ound Time:	(Check	Box)	Otr	ier			Bo	aulte D			
nquished ity:		en Enis		Receive	d by:		Std 10 WK day	•	5 WP	K Days	<b>2</b> 2V	VK Days	24	Hour				<b>.</b>	
nquisher by:	Dat	e: Time	9:	Receive	d by (Labor ຄົານ	atory): 0312	24/16 10:	20	Co	oler ID	Coo	ler Temp		ackage:	(Check	One Bo	x Below	)	
gea by (Laboratory):	Dat	e: Time	9:	Checke	d by (Labora	itory):			250	268	3	-6		vel 3 Std	QC/Row	da [	TRRF	Level 4	L .
servative Key:	1-HCI 2-HNO3 3-H	SO <sub>4</sub> 4-NaOH	5-Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub>	6-N	laHSO₄	7-Othe	r 8-4°C	9-5035		<u>na S</u> ala Salahara		careder d		ver 4 SVV her/EDD	040/CLF	,			

Note: 1. Any changes must be made in writing once samples and COC Form have been submitted to ALS Environmental. 2. Unless otherwise agreed in a formal contract, services provided by ALS Environmental are expressly limited to the terms and conditions stated on the reverse. 3. The Chain of Custody is a legal document. All information must be completed accurately.

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10450 Stancliff Rd. Suite 210 Houston, TX 77099 T: +1 281 530 5656 F: +1 281 530 5887 www.alsglobal.com

March 29, 2016

Sam Enis SQ Environmental PO Box 1991 Austin, TX 78767

Work Order: HS16031130

Laboratory Results for: Loving NM Well Install 1072.002.003

Dear Sam,

ALS Environmental received 1 sample(s) on Mar 24, 2016 for the analysis presented in the following report.

The analytical data provided relates directly to the samples received by ALS Environmental and for only the analyses requested. Results are expressed as "as received" unless otherwise noted.

QC sample results for this data met EPA or laboratory specifications except as noted in the Case Narrative or as noted with qualifiers in the QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained by ALS Environmental. Samples will be disposed in 30 days unless storage arrangements are made.

If you have any questions regarding this report, please feel free to call me.

Sincerely,

Generated By: Jumoke.Lawal Dane J. Wacasey

SAMPLE SUMMARY

# Client:SQ EnvironmentalProject:Loving NM Well Install 1072.002.003Work Order:HS16031130

#### 

Page 2 of 13

**CASE NARRATIVE** 

Client:SQ EnvironmentalProject:Loving NM Well Install 1072.002.003Work Order:HS16031130

### WetChemistry by Method SW9056

#### Batch ID: R271422

• The test results meet requirements of the current NELAP standards, state requirements or programs where applicable.

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Client:	SQ Environmental	ANALYTICAL REPORT						
Project:	Loving NM Well Install 1072.002.003		WorkOrder:HS16031130					
Sample ID:	SW-01		Lab ID:HS16031130-01					
Collection Date:	23-Mar-2016 11:45		N	latrix:Wate	r			
ANALYSES	RESULT QUAL	REPORT LIMIT	UNITS	DILUTION FACTOR	DATE ANALYZED			
ANIONS BY SW9056A	Method:SW9056				Analyst: JBA			
Chloride	1,170	20.0	mg/L	40	25-Mar-2016 22:43			

ALS Group US	SA, Corp				Date: 2	9-Mar-16	
Client: Project: WorkOrder:	SQ Environmental Loving NM Well Install 1072.002.003 DATES I HS16031130						
Sample ID	Client Samp ID	Collection Date	TCLP Date	Prep Date	Analysis Date	DF	
Batch ID R2714	422 Test Nam	e: ANIONS BY SW9056A		Matrix	: Water		
HS16031130-01	SW-01	23 Mar 2016 11:45			25 Mar 2016 22:43	40	

**QC BATCH REPORT** 

# Client:SQ EnvironmentalProject:Loving NM Well Install 1072.002.003WorkOrder:HS16031130

Batch ID:	R271422	Ins	trument:	ICS3K2		Metho	od: SW905	6	
MBLK Client ID:	Sample ID:	WBLKW1-032516 Run	ID: ICS3K2	Units: _271422	<b>mg/L</b> SeqNo:	Ana <b>3625793</b>	alysis Date: PrepDate:	25-Mar-2016	5 <b>11:08</b> DF: <b>1</b>
Analyte		Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD Limit Qual
Chloride		ND	0.500						
LCS Client ID:	Sample ID:	WLCSW1-032516 Run	ID: ICS3K2	Units: _271422	<b>mg/L</b> SeqNo:	Ana <b>3625794</b>	alysis Date: PrepDate:	25-Mar-2016	0 11:30 DF: 1
Analyte		Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD Limit Qual
Chloride		19.79	0.500	20	0	99.0	80 - 120		
LCSD Client ID: Analyte	Sample ID:	WLCSDW1-032516 Run Result	ID: ICS3K2 PQL	Units: _ <b>271422</b> SPK Val	<b>mg/L</b> SeqNo: SPK Ref Value	Ana 3625795 %REC	alysis Date: PrepDate: Control Limit	25-Mar-2016 RPD Ref Value	11:52 DF: 1 RPD %RPD Limit Qual
Chloride		19.8	0.500	20	0	99.0	80 - 120	19.79	0.0152 20
<b>MS</b> Client ID: Analyte	Sample ID:	HS16031138-02MS Run Result	ID: ICS3K2 PQL	Units: _ <b>271422</b> SPK Val	<b>mg/L</b> SeqNo: SPK Ref Value	Ana <b>3625802</b> %REC	alysis Date: PrepDate: Control Limit	25-Mar-2016 RPD Ref Value	DF: <b>1</b> DF: <b>1</b> RPD %RPD Limit Qual
Chloride		13.36	0.500	10	3.515	98.4	80 - 120		
<b>MS</b> Client ID: Analyte	Sample ID:	HS16031096-01MS Run Result	ID: ICS3K2 PQL	Units: _ <b>271422</b> SPK Val	<b>mg/L</b> SeqNo: SPK Ref Value	Ana <b>3625797</b> %REC	alysis Date: PrepDate: Control Limit	25-Mar-2016 RPD Ref Value	DF: 1 RPD %RPD Limit Qual
Chloride		26.24	0.500	10	16.34	99.0	80 - 120		
<b>MSD</b> Client ID: Analyte	Sample ID:	HS16031138-02MSD Run Result	ID: ICS3K2 PQL	Units: _ <b>271422</b> SPK Val	<b>mg/L</b> SeqNo: SPK Ref Value	Ana 3625803 %REC	alysis Date: PrepDate: Control Limit	<b>25-Mar-2016</b> RPD Ref Value	DF: 1 DF: 1 RPD %RPD Limit Qual
Chloride		13.38	0.500	10	3.515	98.7	80 - 120	13.36	0.172 20

# Client:SQ EnvironmentalProject:Loving NM Well Install 1072.002.003WorkOrder:HS16031130

#### **QC BATCH REPORT**

Batch ID:	R271422	Instr	ument:	ICS3K2		Metho	d: SW905	6	
MSD	Sample ID:	HS16031096-01MSD		Units:	mg/L	Ana	lysis Date:	25-Mar-2016	12:57
Client ID:		Run ID	: ICS3K	(2_271422	SeqNo: 3	625798	PrepDate:		DF: <b>1</b>
Analyte		Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD Limit Qual
Chloride		26.27	0.500	10	16.34	99.4	80 - 120	26.24	0.149 20
The followin	g samples were anayze	d in this batch: HS1603113	0-01						

MDL

MQL MS

MSD

PDS

PQL

SD

SDL

TRRP

WorkOrder:	HS16031130
Project:	Loving NM Well Install 1072.002.003
Client:	SQ Environmental

Method Detection Limit Method Quantitation Limit

Matrix Spike Duplicate

Post Digestion Spike

Practical Quantitaion Limit

Sample Detection Limit

Texas Risk Reduction Program

Matrix Spike

Serial Dilution

#### QUALIFIERS, ACRONYMS, UNITS

Qualifier	Description
*	Value exceeds Regulatory Limit
а	Not accredited
В	Analyte detected in the associated Method Blank above the Reporting Limit
E	Value above quantitation range
н	Analyzed outside of Holding Time
J	Analyte detected below quantitation limit
Μ	Manually integrated, see raw data for justification
n	Not offered for accreditation
ND	Not Detected at the Reporting Limit
0	Sample amount is > 4 times amount spiked
Р	Dual Column results percent difference > 40%
R	RPD above laboratory control limit
S	Spike Recovery outside laboratory control limits
U	Analyzed but not detected above the MDL/SDL
A	Description
Acronym	Description
DCS	Detectability Check Study
DUP	Method Duplicate
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MBLK	Method Blank

# CERTIFICATIONS, ACCREDITATIONS & LICENSES

Agency	Number	Expire Date
Arkansas	16-022-0	27-Mar-2017
California	2919	31-Jul-2016
Illinois	003622	09-May-2016
Kentucky	KY 2015-2016	30-Apr-2016
Louisiana	03087 2015/2016	30-Jun-2016
North Carolina	624 - 2016	31-Dec-2016
North Dakota	R-193 2015-2016	30-Apr-2016
Oklahoma	2015-047	31-Aug-2016
Texas	T104704231-15-15	30-Apr-2016

SAMPLE TRACKING

# Client:SQ EnvironmentalProject:Loving NM Well Install 1072.002.003Work Order:HS16031130

# Lab Samp ID Client Sample ID Action Date Person New Location HS16031130-01 SW-01 Login 3/24/2016 6:47:10 PM BHH 10C

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					Sample Re	ceipt Checklist
Client Name: SQ EN Work Order: HS160	VIRONMENTAL TX 31130		Date/T Receiv	Time Received: ved by:	<u>24-Mar-2010</u> <u>RPG</u>	<u>5 10:20</u>
Checklist completed by	Baudelio Hernandez eSignature	24-Mar-2016 Date	Reviewed by:	Dane J. W eSignature	acasey	28-Mar-2016 Date
Matrices: <u>W</u>	later		Carrier name:	<u>FedEx</u>		
Shipping container/cool Custody seals intact on Custody seals intact on Chain of custody presen Chain of custody signed Chain of custody agrees Samples in proper cont Sample containers intact TX1005 solids received Sufficient sample volum All samples received wit Container/Temp Blank	er in good condition? shipping container/cooler? sample bottles? nt? d when relinquished and receive s with sample labels? ainer/bottle? ct? in hermetically sealed vials? he for indicated test? thin holding time? temperature in compliance?	ed?	Yes V Yes V	No	Not Present Not Present Not Present	
Temperature(s)/Thermo	ometer(s):	3	.6c / 4.2c u/c			IR#4
Cooler(s)/Kit(s):		2	5268			
Date/Time sample(s) se Water - VOA vials have Water - pH acceptable of pH adjusted? pH adjusted by:	ent to storage: zero headspace? upon receipt?	0	3/24/2016 18:55 Yes Yes Yes	No No No	No VOA vials sub N/A 📝 N/A 📝	mitted
Login Notes:						
Client Contacted:	D	ate Contacted:		Person Co	ntacted:	
Contacted By: 0	R	egarding:				
Comments:						
Corrective Action:						

Enviro	LS) nmental	Cincinnati, OH +1 513 733 5336 Everett, WA +1 425 356 2600	Fort C +1 97( Hollan +1 616	ollins, CO 0 490 1511 Id, MI 5 399 6070	)	Chain Pag C	of Cus =or OC ID: 1	stody 390	Form		1		Loving	HS1 sq	603 Environ	<b>311</b> ; mental 11 1072.	<b>30</b> 002.003	}	
c	ustomer Information				Droio	A at Information	LS Projec	t Manage	ər:										l
Purchase Order			Project	t Namo	Fioje	ct informat	lion												
Work Order			Project N	Loving, NM Well Installation				A Chloride 9056 - Soil											
Company Name	SO Environmental		Bill To Co	mnany	1072.002.003			B Mo	isture								-		
Send Report To	Report To         Sam Enis           Address         PO Box 1991			Invoice Attn Address		SQ Environmental Susan Litherland PO Box 1991			C Ch	loride	9056 -	Water							
Address			Ac						E	D E									
City/State/Zip	Austin		City/Sta	City/State/Zip Phone		Austin (281) 413-4266				G									
Phone																			
Fax		Fax						1											
e-Mail Address	e-Mail Address s.enis@sgenv.com			dress	,														
».	Sample Description		Date	Ti	me	Matrix	Pres.	# Bottle	s A	В	C	D	E	F	G	H	1	J	Hold
mplor(s) Plegang Prig	±-A Si07		Shinme			Pom													
jec	Sontri	\$	Snipme	ent wetho	d	Requi	ired Turnaro d 10 WK days	und Time:	(Check Bo	ix) ays	D Othe	r K Days		4 Hour	_   R	esults [	ue Dat	e:	
linguished by:	Dat	te: 3.23-16	เ็นออ	Receive	d by:				Notes:										
gged by (Laboratory):	Date:     Time:     Receiver       Add by (Laboratory):     Date:     Time:     Checker       Particle     Date:     Time:     Checker				ed by (Laboratory): 「 Sinve 03124/16 10:20 ad by (Laboratory): NaHSO Z-Othor 2 180 0 5005				Cooler 252(	Cooler ID Cooler Temp. UIC 25268 3.6				OC Package: (Check One Box Below)     Level 2 Sta GC     TRRP ChkList     Level 3 Std GC/Row da     TRRP Level 4     Level 4 SW846/CLP     Other/EDD					

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