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QUARTERLY MONITORING REPORTS

August 15, 2013

RECEIVED OCD

2013 AUG 16 P 2: 24

Mr. Jim Griswold
New Mexico Oil Conservation Division
Environmental Bureau
1220 South St. Francis Drive
Santa Fe, NM 87505-4225

Re: Salty Dog Brine Station - Second Quarterly Groundwater Monitoring and O&M Report

Dear Mr. Griswold:

On behalf of PAB Services, Inc., Daniel B. Stephens & Associates, Inc. (DBS&A) is pleased to submit the enclosed groundwater monitoring and O&M report for the Salty Dog brine station located in Lea County, New Mexico. The report documents results of second quarter groundwater monitoring activities completed at the site on June 23 through 25, 2013, as well as groundwater extraction system operations and maintenance information.

Please do not hesitate to call me at (505) 353-9130 if you have any questions or require additional information.

Sincerely,

DANIEL B. STEPHENS & ASSOCIATES, INC.

Michael D. McVey
Senior Hydrogeologist

Enclosures

cc: Pieter Bergstein, PAB Services, Inc.

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Daniel B. Stephens & Associates, Inc.
6020 Academy Rd., NE, Suite 100 505-822-9400
Albuquerque, NM 87109-3315 FAX 505-822-8877

Second Quarterly Groundwater Monitoring and O&M Report

Salty Dog Brine Station

Lea County, New Mexico

Prepared for **New Mexico Energy, Minerals and Natural Resources Department**
Oil Conservation Division, Environmental Bureau

August 15, 2013

Daniel B. Stephens & Associates, Inc.

6020 Academy NE, Suite 100 • Albuquerque, New Mexico 87109

SECOND QUARTERLY GROUNDWATER MONITORING AND O&M REPORT SALTY DOG BRINE STATION LEA COUNTY, NEW MEXICO

1. INTRODUCTION

Daniel B. Stephens & Associates, Inc. (DBS&A) has prepared this groundwater monitoring and operations and maintenance (O&M) report for submission to the New Mexico Energy, Minerals and Natural Resources Department Oil Conservation Division (OCD) Environmental Bureau on behalf of PAB Services, Inc. (PAB) for the Salty Dog brine station (the site) located in Lea County, New Mexico (Figure 1). The report summarizes activities conducted at the site on June 23 through 25, 2013.

The site is comprised of a northern portion where the brine pond was located prior to closure in October 2008 and a southern portion where the brine well is located. The brine pond area and the brine well area are separated by approximately 2,500 feet, joined by a dirt road. Since the closure of the brine pond, a number of frac tanks have been stationed in the northern portion of the site to serve as storage for brine that is produced for resale. A concrete truck loading pad is located near the frac tanks. The brine well is currently not operational and attempts are being made to redrill the well and restore brine production. Six monitor wells (PMW-1, DBS-1R, and DBS-2 through DBS-5), one nested well (NW-1), and one recovery well (RW-1) are located in the former brine pond area. Nine monitor wells (MW-2 through MW-6, DBS-6 through DBS-9), one nested well (NW-2), and one recovery well (RW-2) are located in the brine well area (Figure 1).

A groundwater extraction system was installed by DBS&A at the site in early April 2012 to provide hydraulic control of the chloride groundwater plumes present beneath the former brine pond area and brine well area. The extraction system consists of two submersible pumps, conveyance lines, electrical power, and controls to extract groundwater from recovery wells RW-1 (former brine pond area) and RW-2 (brine well area), and convey the extracted groundwater to on-site frac tanks for off-site disposal.

2. SCOPE OF WORK

The scope of work for groundwater monitoring consisted of measuring fluid levels in and collecting groundwater samples from 11 monitor wells for laboratory analysis. The monitor wells included in the quarterly sampling were selected in consultation with the OCD project manager, Jim Griswold, on October 4, 2010. Groundwater samples were submitted to Hall Environmental Analysis Laboratory (HEAL) in Albuquerque, New Mexico for chloride analysis using U.S. Environmental Protection Agency (EPA) Test Method 300.0. In addition, during this monitoring and O&M event, DBS&A installed a new pump in recovery well RW-2, replaced two valves, and purchased and sent a replacement flow meter to PAB for installation.

3. MONITORING ACTIVITIES

Fluid Level Measurement

On June 23, 2013, DBS&A measured fluid levels in monitor wells DBS-1R, DBS-2 through DBS-5 and PMW-1 in the former brine pond area, and DBS-6, DBS-8, DBS-9, MW-3, and MW-5 in the brine well area using a properly decontaminated electronic water level meter (Figure 1). Table 1 provides a summary of the fluid level measurements and groundwater elevations.

The average depth to water beneath the former brine pond area during this monitoring event was 65.65 feet below ground surface (ft bgs), increasing approximately 0.41 foot since the last monitoring event in September 2012. Water levels in DBS-1R, PMW-1, DBS-2, and DBS-4 increased 1.25 feet, 1.37 feet, 0.42 foot, and 0.08 foot, respectively. Water levels in DBS-3 and DBS-5 decreased 0.27 foot and 0.38 foot, respectively.

The average depth to water beneath the brine well area was 62.78 ft bgs, decreasing 0.05 foot since September 2012. Water levels in DBS-6, DBS-8, and MW-5 decreased 0.14 foot, 0.13 foot, and 0.10 foot, respectively. The water level in MW-3 increased 0.14 foot. DBS-9, located northeast of the brine well in the playa, showed a decrease of 0.27 foot.

Potentiometric surface maps were prepared for the former brine pond and brine well areas and are included as Figures 2 and 3. The direction of groundwater flow beneath the former brine pond area remains to the southeast; the gradient decreased from 0.01 to 0.006 foot/foot (ft/ft) since the last monitoring event in September 2012. A less pronounced cone of depression was present during this monitoring event with the increase in the groundwater level.

The direction of groundwater flow beneath the brine well area remains to the southeast; the gradient remained unchanged at approximately 0.004 ft/ft (Figure 3). The pump in recovery well RW-2 went down in December 2012, and was removed for replacement. No groundwater was extracted from December through the June 2013 monitoring event. The gradient remained unchanged since the last monitoring and O&M event in September 2012 indicating that pumping at the former rate was having little to no effect on drawdown in the brine well area.

Groundwater Sampling

Groundwater samples were collected from monitor wells DBS-1R, DBS-2 through DBS-6, PMW-1, DBS-8, DBS-9, MW-3, and MW-5 on June 24 and 25, 2013. DBS&A followed corporate standard operating procedures developed from EPA guidance during collection of all groundwater samples. Prior to sampling, the well was purged of a minimum of three casing volumes using a submersible pump to ensure that a representative sample of groundwater was collected. During purging, the DBS&A field technician measured water quality parameters including temperature, specific conductance, and pH to ensure that these parameters were stabilized to within 10 percent for specific conductance, 2 degrees for temperature and +/- 0.2 pH units prior to sampling. Sample containers were then filled, labeled, and placed on ice once the stabilization criteria were met. Groundwater samples were submitted under full chain-of-custody to HEAL for chloride analysis.

4. ANALYTICAL RESULTS

Table 2 summarizes chloride analytical results for the 11 groundwater samples collected on June 24 and 25, 2013. Figures 4 and 5 show the distribution of chloride in groundwater beneath the former brine pond and brine well areas for the sampling event. The laboratory report and chain-of-custody documentation are provided in Appendix 1. Field notes recorded during groundwater monitoring activities are included in Appendix 2.

Former Brine Pond Area Wells

Groundwater samples submitted from the wells in the former brine pond area showed the following changes since the last monitoring event in September 2012. The only increase in chloride concentration was observed in DBS-1R (3,200 to 3,300 mg/L). Decreases were observed in DBS-2 (44 to 36 mg/L), DBS-3 (34 to 32 mg/L), and DBS-4 (32 to 31 mg/L). Chloride concentrations remained unchanged in DBS-5 (160 mg/L), and PMW-1 (14,000 mg/L). Two of the six wells (DBS-1R and PMW-1) sampled in the former brine pond area contain chloride concentrations in excess of the New Mexico Water Quality Control Commission (NMWQCC) standard of 250 mg/L (Table 2).

The chloride groundwater plume in the former brine pond area remains bounded by the existing monitor well network, and pumping of extraction well RW-1 continues to contain downgradient migration of the chloride groundwater plume. The chloride concentration in the downgradient well, DBS-4, remains below the standard, as do chloride concentrations in the two cross-gradient wells, DBS-2 and DBS-3 (Figure 4).

Brine Well Area Wells

Groundwater samples submitted from the wells in the brine well area showed the following changes since the last monitoring event in September 2012. The only increase in chloride concentration was observed in DBS-8 (42 to 45 mg/L). Decreases were observed in DBS-6 (390 to 340 mg/L), MW-3 (16,000 to 12,000 mg/L), and MW-5 (1,500 to 1,300 mg/L). Three of the five wells sampled in the brine well area (MW-3, MW-5, and DBS-6) contain chloride concentrations in excess of the New Mexico Water Quality Control Commission (NMWQCC) standard of 250 mg/L (Table 2).

The downgradient and northern, cross-gradient extent of the chloride groundwater plume in the brine well area remains undefined. The monitor well located closest to the extraction well (MW-3), the farthest downgradient well (MW-5), and the northern-most cross-gradient well (DBS-6) all continue to contain chloride concentrations in excess of the NMWQCC standard (Figure 5).

The chloride concentration in monitor well DBS-9 decreased from 320 to 200 mg/L since the last monitoring event in September 2012, and no longer exceeds the NMWQCC standard. DBS-9 was installed in the playa located northeast of the brine well to determine if documented releases that entered the playa in 2002 and 2005 impacted groundwater (Figure 5).

5. GROUNDWATER EXTRACTION SYSTEM O&M

Groundwater extraction from recovery well RW-1 at the former brine pond area was started on April 7, 2012. The flow rate for RW-1 was initially set at the design specification of 0.5 gallons per minute (gpm). Groundwater extraction from recovery well RW-2 at the brine well area was started on April 6, 2012. The flow rate for RW-2 was initially set at 1.3 gpm. After DBS&A set the flow rates, the PAB facility manager, Mr. Terry Wallace, adjusted the flow rates upward to facilitate daily disposal of the extracted groundwater.

Former Brine Pond Area

The groundwater extraction system at RW-1 has been in operation for approximately 441 days as of June 25, 2013. In July 2012, the system was down for a period of three days due to an electrical problem at the control box. Mr. Wallace contacted an electrician and the necessary repairs were made to restart the pump.

Extracted volumes of groundwater were recorded by the DBS&A field technician during the monitoring event and are provided in Table 3. To date, 2,599,392 gallons have been pumped from recovery well RW-1.

Pumping of recovery well RW-1 at the current flow rate of approximately 4.1 gallons per minute (gpm) has resulted in continued containment of the chloride groundwater plume in the former brine pond area. Monitor wells DBS-1R and PMW-1, the two wells in closest proximity to the extraction well, are the only wells that contain chloride concentrations in excess of the NMWQCC standard. Pumping at the current rate is effectively controlling downgradient migration of the chloride groundwater plume, and although the chloride concentrations in the wells remain elevated, they are expected to decrease through time with continued pumping.

Brine Well Area

The groundwater extraction system at RW-2 has been in operation for approximately 252 days. The pump in RW-2 went down on approximately December 14, 2012 ceasing groundwater extraction in the brine well area. As of the above date when the pump went down, 1,406,748 gallons have been pumped from recovery well RW-2 (Table 3).

Pumping of recovery well RW-2 at a flow rate of approximately 3.9 gpm (when the pump went down) has had little to no effect on drawdown in the brine well area. The chloride plume remains undefined downgradient and cross-gradient to the north of the extraction well. Monitor well MW-3, the well in closest proximity to the extraction well, showed a decrease in chloride concentration from 16,000 to 12,000 mg/L since the last monitoring event. This is the lowest concentration detected in MW-3 since June 2008. Monitor well MW-5, the farthest downgradient well, showed a decrease in chloride concentration from 1,500 to 1,300 mg/L. This is the lowest concentration detected in MW-5 since April 2009. Monitor well DBS-6, the northern-most cross-gradient well, showed a decrease in chloride concentration from 390 to 340 mg/L. This is the lowest concentration detected in DBS-6 since the well was installed in April 2009. The reduction in concentrations noted above in the three wells may indicate a reduction in the total chloride contaminant mass in the brine well area. This will be further evaluated during future monitoring events as groundwater extraction at RW-2 is reinstated with the installation of the new pump.

System Maintenance

During a routine site visit on December 14, 2013, Mr. Wallace noted that the groundwater extraction system at recovery well RW-2 was not operating. Efforts by Mr. Wallace to restart the pump were unsuccessful. After a troubleshooting phone discussion with the DBS&A engineer, Mr. Wallace and PAB staff removed the pump and shipped it DBS&A for inspection. DBS&A then shipped the pump to an authorized manufacturer's representative for inspection and determination of the cause of failure. A determination was made that the pump failed due to a faulty motor shaft seal, and a new replacement pump, covered under the manufacturer's warranty, was sent to DBS&A. DBS&A coordinated with Mr. Wallace to install the replacement pump during the June 2013 monitoring event.

DBS&A field staff arrived on-site the week of June 23, 2013 to perform quarterly groundwater monitoring, system O&M, and installation of the replacement pump in recovery well RW-2. A new Grundfos pump (serial number P1-1211) was installed in RW-2 and set at the same depth as the original pump. In addition, two new 3/4-inch stainless steel ball valves were installed on each extraction system to replace bronze gate valves that had stopped functioning properly. During start-up and testing, DBS&A field staff discovered that the totalizing flow meter installed at RW-2's wellhead was leaking. DBS&A recommended to Mr. Wallace that RW-2 not be operated until the damaged flow meter could be replaced. A new Badger flow meter (serial number 13445491) was purchased by DBS&A and shipped to Mr. Wallace for installation.

DBS&A did not identify any other maintenance issues requiring attention during this groundwater monitoring event. No other visible damage to any of the aboveground extraction system components was noted at either the RW-1 or RW-2 wellheads. RW-1 was running and no leaks were observed at the wellhead, along the conveyance lines, or at the tie-in to the frac tank. RW-2 will be put back in service once PAB has installed the replacement flow meter.

Future Extraction System Operation

Flow will be maintained at the current rate at RW-1 in the former brine pond area. Minor increases will be made to the flow rate at RW-2 in the brine well area in the near term, if possible, while maintaining a volume of extracted groundwater that can be disposed of on a daily basis by PAB. Once the brine well is brought back online, full-scale operation of the extraction system will begin with reinjection of the extracted groundwater into the brine well. At that time, the flow rate for RW-2 will be increased to meet the design specification of 15 gpm.

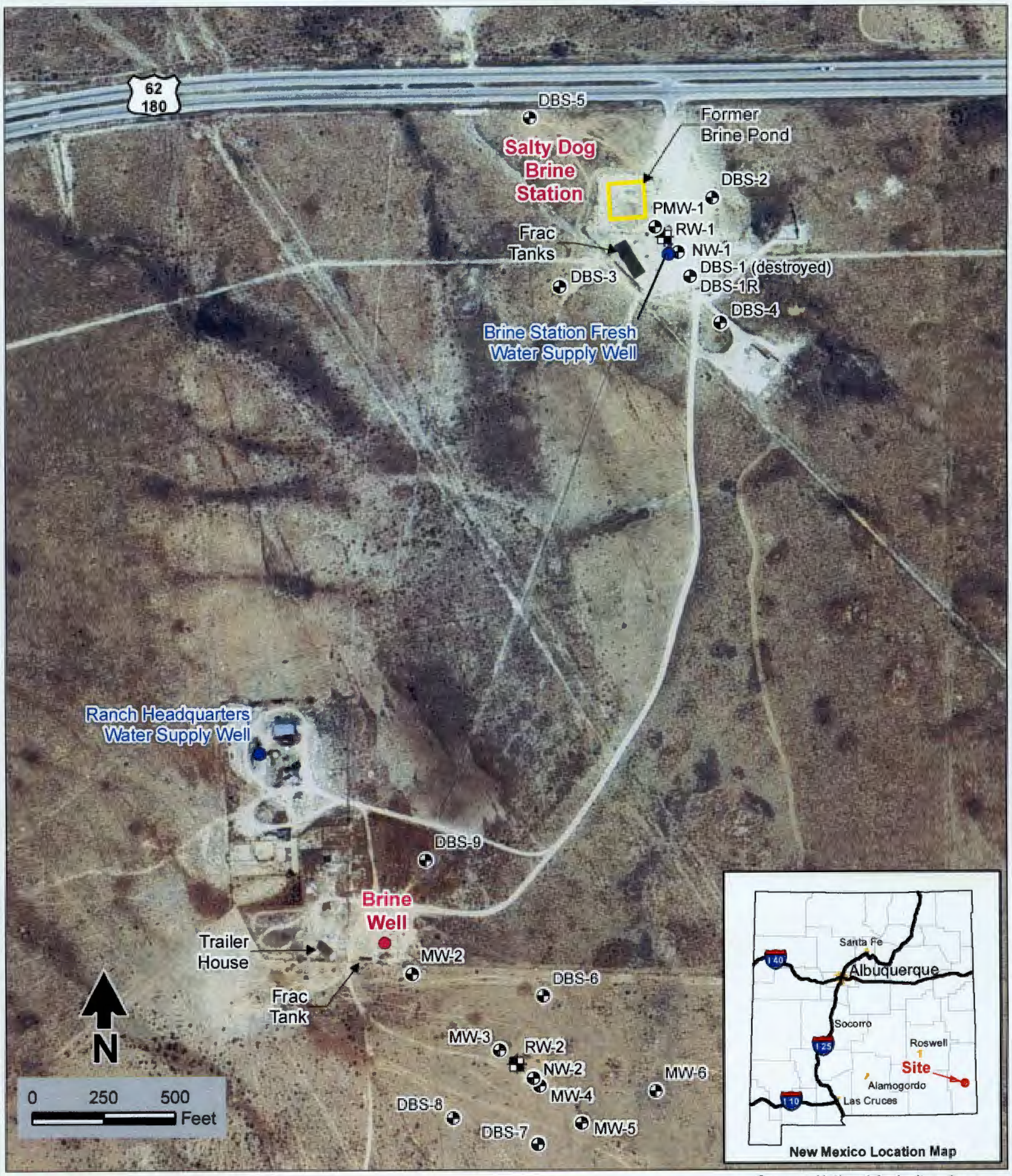
6. RECOMMENDATIONS

Based on the groundwater monitoring results, DBS&A recommends the following:

- Continue quarterly groundwater sampling to assess the performance of the groundwater extraction systems in the former brine pond area and brine well area by the collection of groundwater samples for laboratory analysis from the on-site monitor wells.
- Maintain the current flow rate of approximately 4.1 gpm from extraction well RW-1 and reevaluate during the next monitoring event based on chloride concentrations in DBS-1R and PMW-1.
- If possible, increase the flow rate from extraction well RW-2 while still maintaining a volume of extracted groundwater that can be disposed of on a daily basis by PAB.
- Once the brine well is brought back online, increase the flow rate from extraction well

RW-2 to meet the design specification of 15 gpm with reinjection of the extracted groundwater from RW-1 and RW-2 into the brine well.

Figures



Explanation

- Water supply well
- Monitor well
- Recovery well
- Well destroyed

Source: National Agriculture Imagery Program (NAIP), dated May 13, 2009

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SALTY DOG BRINE STATION

Site Location Map

Daniel B. Stephens & Associates, Inc.

5/31/2012

JN ES08.0118.01

Figure 1

Explanation

Note: * Well not used for contouring.

Source: National Agriculture Imagery Program (NAIP), dated May 13, 2009

DBS-2 Well designation
3753.47 Groundwater elevation, ft msl
● Groundwater elevation (ft msl)
Potentiometric surface elevation contour (ft msl)
Groundwater flow direction (dashed where inferred)

SALTY DOG BRINE STATION

Former Brine Pond Area
Potentiometric Surface Elevations
June 23, 2013

Daniel B. Stephens & Associates, Inc.
7/15/2013 JN ES08.0118.01

Figure 2

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Explanation

MW-5 Well designation

3747.21 Groundwater elevation, ft msl

● Groundwater elevation (ft msl)

Potentiometric surface elevation contour (ft msl)

Source: National Agriculture Imagery Program (NAIP), dated May 13, 2009

SALTY DOG BRINE STATION

Playa Lake and Brine Well Area Potentiometric Surface Elevations June 23, 2013

Daniel B. Stephens & Associates, Inc.
7/15/2013 JN ES08.0118.01

Figure 3

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Explanation

DBS-5 Well designation
160 Chloride concentration (mg/L)

Monitor well location

BOLD indicates concentration equal to or greater than the NMWQCC standard.
NS = Not sampled

Source: National Agriculture Imagery Program (NAIP), dated May 13, 2009

SALTY DOG BRINE STATION
Former Brine Pond Area
Chloride Concentrations in Groundwater
June 24 and 25, 2013

Daniel B. Stephens & Associates, Inc.
8/14/2013 JN ES08.0118.01

Figure 4

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Explanation

MW-5	Well designation
1,300	Chloride concentration (mg/L)
⊕	Monitor well location

BOLD indicates concentration equal to or greater than the NMWQCC standard.
NS = Not sampled

Source: National Agriculture Imagery Program (NAIP), dated May 13, 2009

SALTY DOG BRINE STATION

Playa Lake and Brine Well Area Chloride Concentrations in Groundwater June 24, 2013

Daniel B. Stephens & Associates, Inc.
8/14/2013
JN ES08.0118.01

Figure 5

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Tables

Table 1. Summary of Historical Fluid Level Measurements
Salty Dog Brine Station, Lea County, New Mexico

Monitor Well	Screen Interval (ft bgs)	Top of Casing Elevation [a] (ft msl)	Date Measured	Depth to Water (ft btoc)	Groundwater Elevation (ft msl)
DBS-1	56.0-76.0	3817.09	04/08/09	62.38	3754.71
			05/11/11	64.70	3752.39
			10/04/11	Well destroyed	
DBS-1R	58.0-78.0	3817.00 [b]	04/30/12	63.60	3753.40
			09/10/12	65.65	3751.35
			06/23/13	64.40	3752.60
DBS-2	58.0-78.0	3820.50	04/08/09	65.45	3755.05
			05/11/11	66.80	3753.70
			10/04/11	65.87	3754.63
			02/08/12	65.96	3754.54
			04/30/12	66.26	3754.24
			09/10/12	67.45	3753.05
			06/23/13	67.03	3753.47
DBS-3	56.0-76.72	3816.66	04/08/09	60.67	3755.99
			05/11/11	61.25	3755.41
			10/04/11	61.25	3755.41
			02/08/12	61.11	3755.55
			04/30/12	61.41	3755.25
			09/10/12	61.81	3754.85
			06/23/13	62.08	3754.58
DBS-4	56.0-76.0	3820.37	04/08/09	66.27	3754.10
			05/11/11	67.23	3753.14
			10/04/11	66.67	3753.70
			02/08/12	66.76	3753.61
			04/30/12	67.02	3753.35
			09/10/12	67.78	3752.59
			06/23/13	67.70	3752.67
DBS-5	56.9-76.9	3820.66	04/08/09	62.99	3757.67
			05/11/11	63.45	3757.21

[a] Top of casing elevations surveyed by Pettigrew & Assoc. on May 28, 2009.
[b] Top of casing elevation surveyed by Pettigrew & Assoc. on June 13, 2012.

ft bgs = Feet below ground surface
ft btoc = Feet below top of casing
ft msl = Feet above mean sea level
NA = Not available

Table 1. Summary of Historical Fluid Level Measurements
Salty Dog Brine Station, Lea County, New Mexico

Monitor Well	Screen Interval (ft bgs)	Top of Casing Elevation [a] (ft msl)	Date Measured	Depth to Water (ft btoc)	Groundwater Elevation (ft msl)
DBS-5 (cont.)	56.9-76.9	3820.66	10/04/11	63.41	3757.25
			02/08/12	63.46	3757.20
			04/30/12	63.70	3756.96
			09/10/12	63.92	3756.74
			06/23/13	64.30	3756.36
DBS-6	56.7-76.7	3812.65	04/07/09	62.75	3749.90
			05/11/11	63.11	3749.54
			10/04/11	63.16	3749.49
			02/08/12	63.20	3749.45
			04/30/12	63.43	3749.22
			09/10/12	63.60	3749.05
			06/23/13	63.74	3748.91
DBS-7	55.1-75.1	3810.21	04/07/09	61.74	3748.47
DBS-8	55.2-75.2	3810.70	04/07/09	61.20	3749.50
			05/11/11	61.67	3749.03
			10/04/11	61.71	3748.99
			02/08/12	61.77	3748.93
			04/30/12	62.00	3748.70
			09/10/12	62.15	3748.55
			06/23/13	62.28	3748.42
DBS-9	48.0-68.0	3806.26	04/08/09	53.93	3752.33
			05/11/11	54.39	3751.87
			10/04/11	54.59	3751.67
			02/08/12	54.53	3751.73
			04/30/12	54.68	3751.58
			09/10/12	54.77	3751.49
			06/23/13	55.04	3751.22
NW-1s	52.95-72.95	3817.33	04/08/09	62.35	3754.98
NW-1m	99.31-119.31	3817.35	04/08/09	62.25	3755.10

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NA = Not available

Table 1. Summary of Historical Fluid Level Measurements
Salty Dog Brine Station, Lea County, New Mexico
Page 3 of 4

Monitor Well	Screen Interval (ft bgs)	Top of Casing Elevation [a] (ft msl)	Date Measured	Depth to Water (ft btoc)	Groundwater Elevation (ft msl)
NW-1d	149.45-169.45	3817.35	04/08/09	62.04	3755.31
NW-2s	53.35-73.35	3812.50	04/08/09	63.08	3749.42
NW-2m	93.72-113.72	3812.45	04/08/09	63.27	3749.18
NW-2d	126.87-146.87	3812.46	04/08/09	66.41	3746.05
PMW-1	63-78	3821.17	06/23/08	67.51	3753.66
			04/08/09	65.97	3755.20
			05/11/11	68.70	3752.47
			10/04/11	66.95	3754.22
			02/08/12	66.69	3754.48
			04/30/12	67.27	3753.90
			09/10/12	69.77	3751.40
			06/23/13	68.40	3752.77
MW-1	120-140	NA	06/23/08	59.90	NA
MW-2	127-147	3812.68	06/23/08	61.42	3751.26
			04/07/09	61.65	3751.03
MW-3	NA	3812.05	06/23/08	62.06	3749.99
			04/07/09	62.02	3750.03
			05/11/11	62.91	3749.14
			10/04/11	62.91	3749.14
			02/08/12	62.95	3749.10
			04/30/12	63.39	3748.66
			09/10/12	63.50	3748.55
			06/23/13	63.36	3748.69
MW-4	111-131	3811.33	06/23/08	62.12	3749.21
			04/07/09	62.51	3748.82
MW-5	112-132	3808.96	06/23/08	60.60	3748.36
			04/07/09	60.79	3748.17
			05/11/11	61.17	3747.79
			10/04/11	61.72	3747.24

[a] Top of casing elevations surveyed by Pettigrew & Assoc. on May 28, 2009.
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Table 1. Summary of Historical Fluid Level Measurements
Salty Dog Brine Station, Lea County, New Mexico

Monitor Well	Screen Interval (ft bgs)	Top of Casing Elevation [a] (ft msl)	Date Measured	Depth to Water (ft btoc)	Groundwater Elevation (ft msl)
MW-5 (cont.)	112-132	3808.96	02/08/12	61.23	3747.73
			04/30/12	61.50	3747.46
			09/10/12	61.65	3747.31
			06/23/13	61.75	3747.21
MW-6	NA	3810.17	06/23/08	62.17	3748.00
			04/07/09	62.41	3747.76

[a] Top of casing elevations surveyed by Pettigrew & Assoc. on May 28, 2009.
[b] Top of casing elevation surveyed by Pettigrew & Assoc. on June 13, 2012.

ft bgs = Feet below ground surface
ft btoc = Feet below top of casing
ft msl = Feet above mean sea level
NA = Not available

Table 2. Summary of Chloride Groundwater Analytical Data
Salty Dog Brine Station, Lea County, New Mexico

Monitor Well	Date	Chloride Concentration (mg/L) [a]
New Mexico Water Quality Control Commission Standard		*250*
DBS-1	04/08/09	**320**
	05/12/11	**940**
	10/04/11	Well destroyed
DBS-1R	05/01/12	**3,000**
	09/11/12	**3,200**
	06/25/13	**3,300**
DBS-2	04/08/09	14
	05/12/11	25
	10/05/11	18
	02/09/12	22
	05/01/12	24
	09/11/12	44
	06/25/13	36
DBS-3	04/08/09	36
	05/12/11	35
	10/05/11	34
	02/09/12	34
	05/01/12	33
	09/11/12	34
	06/24/13	32
DBS-4	04/08/09	38
	05/12/11	33
	10/05/11	32
	02/09/12	32
	05/01/12	31
	09/11/12	32
	06/25/13	31
DBS-5	04/08/09	65
	05/12/11	140
	10/05/11	140
	02/09/12	140

Bold indicates concentrations that exceed the applicable standard.
[a] All samples analyzed in accordance to EPA method 300.0, unless otherwise noted.
[b] Samples analyzed in accordance to Standard Method 4500-Cl B.
mg/L = Milligrams per liter

Table 2. Summary of Chloride Groundwater Analytical Data
Salty Dog Brine Station, Lea County, New Mexico
Page 2 of 4

Monitor Well	Date	Chloride Concentration (mg/L) [a]
New Mexico Water Quality Control Commission Standard		*250*
DBS-5 (cont.)	04/30/12	150
	09/11/12	160
	06/24/13	160
DBS-6	04/07/09	**380**
	05/12/11	**410**
	10/05/11	**400**
	02/09/12	**380**
	04/30/12	**400**
	09/11/12	**390**
	06/24/13	**340**
DBS-7	04/07/08	**570**
DBS-8	04/07/09	58
	05/12/11	36
	10/05/11	140
	02/09/12	41
	04/30/12	41
	09/10/12	42
	06/24/13	45
DBS-9	04/08/09	210
	05/12/11	**600**
	10/05/11	**440**
	02/09/12	**290**
	04/30/12	**330**
	09/11/12	**320**
	06/24/13	200
NW-1s	04/08/09	**630**
NW-1m	04/08/09	57
NW-1d	04/08/09	38
NW-2s	04/08/09	**410**
NW-2m	04/08/09	**570**
NW-2d	04/08/09	**4,700**

Bold indicates concentrations that exceed the applicable standard.
[a] All samples analyzed in accordance to EPA method 300.0, unless otherwise noted.
[b] Samples analyzed in accordance to Standard Method 4500-Cl B.
mg/L = Milligrams per liter

**Table 2. Summary of Chloride Groundwater Analytical Data
Salty Dog Brine Station, Lea County, New Mexico
Page 3 of 4**

Monitor Well	Date	Chloride Concentration (mg/L) [a]
New Mexico Water Quality Control Commission Standard		*250*
PMW-1	02/27/08	**9,500** [b]
	05/30/08	**8,600** [b]
	06/23/08	**12,700**
	04/08/09	**11,000**
	05/12/11	**13,000**
	10/05/11	**12,000**
	02/09/12	**12,000**
	05/01/12	**12,000**
	09/11/12	**14,000**
	06/25/13	**14,000**
MW-1	05/30/08	75 [b]
	06/23/08	243
MW-2	02/27/08	120 [b]
	05/30/08	80 [b]
	06/23/08	**1,480**
	04/07/09	**1,200**
MW-3	02/27/08	**348** [b]
	05/30/08	**360** [b]
	06/23/08	**1,090**
	04/07/09	**17,000**
	05/12/11	**16,000**
	10/05/11	**14,000**
	02/09/12	**15,000**
	04/30/12	**14,000**
	09/10/12	**16,000**
	06/24/13	**12,000**
MW-4	02/27/08	**476** [b]
	05/30/08	**512** [b]
	06/23/08	**5,730**
	04/07/09	**6,600**
MW-5	02/27/08	**1,280** [b]

Bold indicates concentrations that exceed the applicable standard.

[a] All samples analyzed in accordance to EPA method 300.0, unless otherwise noted.

[b] Samples analyzed in accordance to Standard Method 4500-Cl B.

mg/L = Milligrams per liter

Table 2. Summary of Chloride Groundwater Analytical Data Salty Dog Brine Station, Lea County, New Mexico

Monitor Well	Date	Chloride Concentration (mg/L) [a]
New Mexico Water Quality Control Commission Standard		*250*
MW-5 (cont.)	05/30/08	**1,220** [b]
	06/23/08	**1,260**
	04/07/09	**1,300**
	05/12/11	**1,500**
	10/05/11	**1,500**
	02/09/12	**1,500**
	04/30/12	**1,400**
	09/10/12	**1,500**
	06/24/13	**1,300**
MW-6	02/27/08	32 [b]
	05/30/08	36 [b]
	06/23/08	31.4
	04/07/09	25
Ranch Headquarters Supply Well	06/23/08	35.4
Brine Station Fresh Water Supply Well	02/27/08	**630** [b]
	05/30/08	**590** [b]
	06/23/08	**650**

Bold indicates concentrations that exceed the applicable standard.

[a] All samples analyzed in accordance with EPA method 300.0, unless otherwise noted.

[b] Samples analyzed in accordance with Standard Method 4500-Cl B.

mg/L = Milligrams per liter

Table 3. Summary of Cumulative Extracted Groundwater Volumes
Salty Dog Brine Station, Lea County, New Mexico
Page 1 of 1

Recovery Well	Date	Days of Operation	Average Flow Rate (gpm)	Extracted Volume (gal)
RW-1	04/07/12	Groundwater extraction started		
	05/01/12	24	2.1	73,740
	09/11/12	154	2.9	636,237
	06/25/13	441	4.1	2,599,392
RW-2	04/06/12	Groundwater extraction started		
	05/01/12	25	2.5	91,450
	09/11/12	158	4.3	963,789
	12/14/12 [a]	252	3.9	1,406,748

[a] Pump went down on 12/14/12 due to a blown inner shaft motor seal.

gpm = gallons per minute
gal = gallons

Appendices

Appendix 1

Laboratory Report

HALL ENVIRONMENTAL ANALYSIS LABORATORY

Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: www.hallenvironmental.com

July 05, 2013

Mike McVey
Daniel B. Stephens & Assoc.
6020 Academy NE Suite 100
Albuquerque, NM 87109
TEL: (505) 822-9400
FAX (505) 822-8877

RE: Salty Dog OrderNo.: 1306B07

Dear Mike McVey:

Hall Environmental Analysis Laboratory received 11 sample(s) on 6/26/2013 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent. To access our accredited tests please go to www.hallenvironmental.com or the state specific web sites. In order to properly interpret your results it is imperative that you review this report in its entirety. See the sample checklist and/or the Chain of Custody for information regarding the sample receipt temperature and preservation. Data qualifiers or a narrative will be provided if the sample analysis or analytical quality control parameters require a flag. When necessary, data qualifers are provided on both the sample analysis report and the QC summary report, both sections should be reviewed. All samples are reported, as received, unless otherwise indicated. Lab measurement of analytes considered field parameters that require analysis within 15 minutes of sampling such as pH and residual chlorine are qualified as being analyzed outside of the recommended holding time.

Please don't hesitate to contact HEAL for any additional information or clarifications.

ADHS Cert #AZ0682 -- NMED-DWB Cert #NM9425 -- NMED-Micro Cert #NM0190

Sincerely,

Andy

Andy Freeman
Laboratory Manager
4901 Hawkins NE
Albuquerque, NM 87109

Analytical Report
Lab Order: **1306B07**
Date Reported: **7/5/2013**

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Daniel B. Stephens & Assoc. **Lab Order:** 1306B07
Project: Salty Dog

Lab ID: 1306B07-001 **Collection Date:** 6/24/2013 9:31:00 AM
Client Sample ID: MW-5 **Matrix:** AQUEOUS

Analyses	Result	RL	Qual	Units	DF	Date Analyzed	Batch ID
EPA METHOD 300.0: ANIONS							Analyst: **JRR**
Chloride	1300	50	*	mg/L	100	6/27/2013 2:49:14 PM	R1162(

Lab ID: 1306B07-002 **Collection Date:** 6/24/2013 10:33:00 AM
Client Sample ID: MW-3 **Matrix:** AQUEOUS

Analyses	Result	RL	Qual	Units	DF	Date Analyzed	Batch ID
EPA METHOD 300.0: ANIONS							Analyst: **JRR**
Chloride	12000	500	*	mg/L	1E	7/1/2013 10:07:11 PM	R1169

Lab ID: 1306B07-003 **Collection Date:** 6/24/2013 11:08:00 AM
Client Sample ID: DBS-8 **Matrix:** AQUEOUS

Analyses	Result	RL	Qual	Units	DF	Date Analyzed	Batch ID
EPA METHOD 300.0: ANIONS							Analyst: **JRR**
Chloride	45	5.0		mg/L	10	6/27/2013 3:26:26 PM	R1162(

Lab ID: 1306B07-004 **Collection Date:** 6/24/2013 11:40:00 AM
Client Sample ID: DBS-6 **Matrix:** AQUEOUS

Analyses	Result	RL	Qual	Units	DF	Date Analyzed	Batch ID
EPA METHOD 300.0: ANIONS							Analyst: **JRR**
Chloride	340	50	*	mg/L	100	6/27/2013 4:03:40 PM	R1162(

Lab ID: 1306B07-005 **Collection Date:** 6/24/2013 1:30:00 PM
Client Sample ID: DBS-9 **Matrix:** AQUEOUS

Analyses	Result	RL	Qual	Units	DF	Date Analyzed	Batch ID
EPA METHOD 300.0: ANIONS							Analyst: **JRR**
Chloride	200	50		mg/L	100	6/27/2013 4:28:29 PM	R1162(

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
O	RSD is greater than RSDlimit	P	Sample pH greater than 2 for VOA and TOC only.
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Daniel B. Stephens & Assoc. **Lab Order:** 1306B07
Project: Salty Dog

Lab ID: 1306B07-006 **Collection Date:** 6/24/2013 2:45:00 PM
Client Sample ID: DBS-5 **Matrix:** AQUEOUS

Analyses	Result	RL	Qual	Units	DF	Date Analyzed	Batch ID
EPA METHOD 300.0: ANIONS						Analyst: **JRR**	
Chloride	160	5.0		mg/L	10	6/27/2013 5:05:42 PM	R11629

Lab ID: 1306B07-007 **Collection Date:** 6/24/2013 6:50:00 PM
Client Sample ID: DBS-3 **Matrix:** AQUEOUS

Analyses	Result	RL	Qual	Units	DF	Date Analyzed	Batch ID
EPA METHOD 300.0: ANIONS						Analyst: **JRR**	
Chloride	32	5.0		mg/L	10	6/27/2013 5:30:32 PM	R11629

Lab ID: 1306B07-008 **Collection Date:** 6/25/2013 10:40:00 AM
Client Sample ID: DBS-2 **Matrix:** AQUEOUS

Analyses	Result	RL	Qual	Units	DF	Date Analyzed	Batch ID
EPA METHOD 300.0: ANIONS						Analyst: **JRR**	
Chloride	36	5.0		mg/L	10	6/27/2013 5:55:21 PM	R11629

Lab ID: 1306B07-009 **Collection Date:** 6/25/2013 11:08:00 AM
Client Sample ID: DBS-4 **Matrix:** AQUEOUS

Analyses	Result	RL	Qual	Units	DF	Date Analyzed	Batch ID
EPA METHOD 300.0: ANIONS						Analyst: **JRR**	
Chloride	31	5.0		mg/L	10	6/27/2013 6:20:11 PM	R11629

Lab ID: 1306B07-010 **Collection Date:** 6/25/2013 11:44:00 AM
Client Sample ID: DBS-1R **Matrix:** AQUEOUS

Analyses	Result	RL	Qual	Units	DF	Date Analyzed	Batch ID
EPA METHOD 300.0: ANIONS						Analyst: **JRR**	
Chloride	3300	100	*	mg/L	200	7/1/2013 10:19:35 PM	R11694

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
O	RSD is greater than RSDlimit	P	Sample pH greater than 2 for VOA and TOC only.
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Daniel B. Stephens & Assoc. **Lab Order:** 1306B07
Project: Salty Dog

Lab ID: 1306B07-011 **Collection Date:** 6/25/2013 3:00:00 PM
Client Sample ID: PMW-1 **Matrix:** AQUEOUS

Analyses	Result	RL	Qual	Units	DF	Date Analyzed	Batch ID
EPA METHOD 300.0: ANIONS							Analyst: **JRR**
Chloride	14000	1000	*	mg/L	2E	7/1/2013 10:32:00 PM	R1169‹

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
O	RSD is greater than RSDlimit	P	Sample pH greater than 2 for VOA and TOC only.
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1306B07**

05-Jul-13

Client: Daniel B. Stephens & Assoc.

Project: Salty Dog

Sample ID **MB** SampType: **MBLK** TestCode: **EPA Method 300.0: Anions**
Client ID: **PBW** Batch ID: **R11629** RunNo: **11629**
Prep Date: Analysis Date: **6/27/2013** SeqNo: **329847** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	ND	0.50								

Sample ID **LCS** SampType: **LCS** TestCode: **EPA Method 300.0: Anions**
Client ID: **LCSW** Batch ID: **R11629** RunNo: **11629**
Prep Date: Analysis Date: **6/27/2013** SeqNo: **329848** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	4.8	0.50	5.000	0	96.0	90	110			

Sample ID **MB** SampType: **MBLK** TestCode: **EPA Method 300.0: Anions**
Client ID: **PBW** Batch ID: **R11629** RunNo: **11629**
Prep Date: Analysis Date: **6/27/2013** SeqNo: **329910** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	ND	0.50								

Sample ID **LCS** SampType: **LCS** TestCode: **EPA Method 300.0: Anions**
Client ID: **LCSW** Batch ID: **R11629** RunNo: **11629**
Prep Date: Analysis Date: **6/27/2013** SeqNo: **329911** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	4.5	0.50	5.000	0	90.9	90	110			

Sample ID **MB** SampType: **MBLK** TestCode: **EPA Method 300.0: Anions**
Client ID: **PBW** Batch ID: **R11694** RunNo: **11694**
Prep Date: Analysis Date: **7/1/2013** SeqNo: **331965** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	ND	0.50								

Sample ID **LCS** SampType: **LCS** TestCode: **EPA Method 300.0: Anions**
Client ID: **LCSW** Batch ID: **R11694** RunNo: **11694**
Prep Date: Analysis Date: **7/1/2013** SeqNo: **331966** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	4.6	0.50	5.000	0	91.5	90	110			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
O	RSD is greater than RSDlimit	P	Sample pH greater than 2 for VOA and TOC only.
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit

HALL ENVIRONMENTAL ANALYSIS LABORATORY

Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: www.hallenvironmental.com

Sample Log-In Check List

Client Name: DBS   Work Order Number: 1306B07   RcptNo: 1

Received by/date: MG 06/26/13

Logged By: Michelle Garcia 6/26/2013 10:25:00 AM Michelle Garcia

Completed By: Michelle Garcia 6/26/2013 12:42:09 PM Michelle Garcia

Reviewed By: [signature] 06/26/13

Chain of Custody

1. Custody seals intact on sample bottles? Yes ☐ No ☐ Not Present ☑
2. Is Chain of Custody complete? Yes ☑ No ☐ Not Present ☐
3. How was the sample delivered? Client

Log In

4. Was an attempt made to cool the samples? Yes ☑ No ☐ NA ☐
5. Were all samples received at a temperature of >0° C to 6.0°C Yes ☑ No ☐ NA ☐
6. Sample(s) in proper container(s)? Yes ☑ No ☐
7. Sufficient sample volume for indicated test(s)? Yes ☑ No ☐
8. Are samples (except VOA and ONG) properly preserved? Yes ☑ No ☐
9. Was preservative added to bottles? Yes ☐ No ☑ NA ☐
10. VOA vials have zero headspace? Yes ☐ No ☐ No VOA Vials ☑
11. Were any sample containers received broken? Yes ☐ No ☑
12. Does paperwork match bottle labels? Yes ☑ No ☐
    (Note discrepancies on chain of custody)
13. Are matrices correctly identified on Chain of Custody? Yes ☑ No ☐
14. Is it clear what analyses were requested? Yes ☑ No ☐
15. Were all holding times able to be met? Yes ☑ No ☐
    (If no, notify customer for authorization.)

# of preserved bottles checked for pH: ____
(<2 or >12 unless noted)
Adjusted? ____
Checked by: ____

Special Handling (if applicable)

16. Was client notified of all discrepancies with this order? Yes ☐ No ☐ NA ☑

Person Notified: ____ Date: ____
By Whom: ____ Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person
Regarding: ____
Client Instructions: ____

17. Additional remarks:

18. **Cooler Information**

Cooler No	Temp °C	Condition	Seal Intact	Seal No	Seal Date	Signed By
1	2.5	Good	Not Present			

Chain-of-Custody Record

Client: DBS+A

Mailing Address:

Phone #: 505-822-9400

email or Fax#: MMcVey@DBStephens.com

QA/QC Package:

☐ Standard ☐ Level 4 (Full Validation)

Accreditation

☐ NELAP ☐ Other ______

☐ EDD (Type) ______

Turn-Around Time:

☑ Standard ☐ Rush ______

Project Name: Salty Dog

Project #: ES08.0118

Project Manager: M. McVey

Sampler: M. Yauck

On Ice: ☒ Yes ☐ No

Sample Temperature: 2.5

HALL ENVIRONMENTAL ANALYSIS LABORATORY

www.hallenvironmental.com

4901 Hawkins NE - Albuquerque, NM 87109

Tel. 505-345-3975 Fax 505-345-4107

Date	Time	Matrix	Sample Request ID	Container Type and #	Preservative Type	HEAL No. 1306B[illegible]
6/24/13	0931	water	MW-5	125 ml Poly	None	-001
	1033		MW-3			-002
	1108		DBS-8			-003
	1140		DBS-6			-004
	1330		DBS 9			-005
	1445		DBS 5			-006
	1850		DBS-3			-007
6/25/13	1040		DBS-2			-008
	1108		DBS-4			-009
	1144		DBS-1R			-010
	1500		PMW-1			-011

Analysis Request

Sample Request ID	BTEX + MTBE + TMB's (8021)	BTEX + MTBE + TPH (Gas only)	TPH 8015B (GRO / DRO / MRO)	TPH (Method 418.1)	EDB (Method 504.1)	PAH's (8310 or 8270 SIMS)	RCRA 8 Metals	Anions (F,Cl,NO_3,NO_2,PO_4,SO_4)	8081 Pesticides / 8082 PCB's	8260B (VOA)	8270 (Semi-VOA)	Cl-				Air Bubbles (Y or N)
MW-5												✓				
MW-3												✓				
DBS-8												✓				
DBS-6												✓				
DBS 9												✓				
DBS 5												✓				
DBS-3												✓				
DBS-2												✓				
DBS-4												✓				
DBS-1R												✓				
PMW-1												✓				

Date:	Time:	Relinquished by:	Received by:	Date	Time
6/26/13	1025	M. Yauck	[signature]	06/26/13	10:25
Date:	Time:	Relinquished by:	Received by:	Date	Time

Remarks:

If necessary, samples submitted to Hall Environmental may be subcontracted to other accredited laboratories. This serves as notice of this possibility. Any sub-contracted data will be clearly notated on the analytical report.

Appendix 2

Field Notes

9/11/12 ML

1320 PMW-1 78.40-69.77=863•.5=4.32gal

	T°c	pH	SpC uS/cm
Initial	22.3	7.01	31841
2.16gal	20.7	6.96	30416
Final	20.6	6.98	31281

1345 Collect sample

1410 Check water meters

North: 636237

South: 963789

1430 Offsite

1930 Arrive in Albuquerque

6/23/13 ML

1700 On site

1710 Begin gauging wells

Well	DTW	TD
PMW-1	68.40	78.40
DBS-1R	64.40	74.44
DBS-2	67.03	76.30
DBS-3	62.08	76.30
DBS-4	67.70	79.50
DBS-5	64.30	77.26
DBS-6	63.74	76.81
DBS-8	62.28	72.70
DBS-9	55.04	69.50
MW-3	63.36	147.00
MW-5	61.75	129.00

1830 Off site

6/23/13

6/24/13 KW

0700 M. Wood on site

0710 Calibrate YSI Pro

	Reading	T°C
pH 7	7.01	24.9
4	4.00	24.5
10	10.01	24.1
SpC 1413	1414	23.3
DO %	87.2	662.6 mmHg
mg/L	7.52	

0748 @ MW-5

129.00 - 61.75 = 67.25 • .5 = 33.63 gal/scr

Vol (gal)	T°C	pH	SpC µS/cm	Comments
0803 Initial	19.5	6.77	2317	clear 2gpm
10	19.5	6.76	4557	clear
20	19.5	6.71	4567	"
30	19.5	6.75	4410	"
40	19.5	6.77	4414	"

0815 Blown fuse on pump controller

0915 Resume pumping w/ new fuse

0931 Collect MW-5

1000 @ MW-3

147.00 - 63.36 = 83.64 • .5 = 41.82

1010 Begin pumping @ 2gpm

6/24/13 KW

MW-3

Vol (gal)	T°C	pH	SpC µS/cm	comments
Initial	19.6	7.04	4280	clear
10	19.3	6.92	4299	"
20	19.3	6.47	26326	"
30	19.3	6.43	32090	"
40	19.3	6.43	34134	"
45	19.3	6.43	34100	"

1033 Collect MW-3

1035 South water meter: 140674.8 gal

1050 @ DBS-8

72.70 - 62.29 = 10.42 • 0.5 = 5.21 gal

Vol (gal)	T°C	pH	SpC µS/cm	comments
Initial	19.9	7.27	810	milky brn
5	19.8	7.00	760	clear
10	19.8	6.99	746	"
15	19.8	6.99	745	"

1108 Collect DBS-8

1120 @ DBS-6

76.81 - 63.74 = 13.07 • 0.5 = 6.54 gal

Vol (gal)	T°C	pH	SpC µS/cm	comments
Initial	20.0	6.76	1897	milky brown
5	19.8	6.68	1835	clear
10	19.6	6.63	1856	"
15	19.9	6.65	1851	"

1140 collect DBS-6

6/24/13 MW

1300 @ DBS-9

69.50 - 55.04 = 14.46 · 0.5 = 7.23 gal

Vol (gal)	T°C	pH	SpC uS/cm	Comments
Initial	19.1	7.02	1820	milky brown
5	18.8	6.88	1603	clear
10	18.7	6.90	1482	"
15	18.8	6.92	1437	clear
20	18.7	6.92	1451	"

1330 Collect DBS-9

1400 @ DBS-5

77.26 - 64.30 = 12.96 · 0.5 = 6.48 gal (sw)

Vol (gal)	T°C	pH	SpC uS/cm	Comments
Initial	20.1	6.89	1282	milky brn
5	19.9	6.72	1274	milky white
10	20.1	6.69	1203	"
15	—	—	—	—
20	—	—	—	—

1424 Pump controller overheated, allow to cool for 10 min

1434 Resume pumping

1438 Well dry

1445 Collect DBS-5

1505 @ DBS-3

76.30 - 62.08 = 14.22 · 0.5 = 7.21 gal

MW

6/24/13 MW

DBS-3

Vol (gal)	T°C	pH	SpC uS/cm	Comments
Initial	20.6	7.06	670	milky brown
5	20.1	7.41	565	milk wht
10	20.1	7.35	580	"
12	20.1	7.38	574	"

1510 Pump has stopped

1530 Water appears to have gotten into pump casing. Plan is to let pump dry out & check voltage of control line

1830 Resume pumping

1850 Collect DBS-3

1900 Off site

MW 6/24/13

6/25/13 MW

0700 Track down parts for pump

0930 M. Wauck + S. Brady on site

0935 Calibrate YSI Pro

	Reading	T°C
pH 4	4.01	25.2
7	7.00	25.0
10	—	—
SpC 1413	1413	25.0
DO %	—	
mg/L	—	

1020 @ DBS-2

76.30 - 67.03 = 9.27 · 0.5 = 4.64 gal

Vol (gal)	T°C	pH	SpC	Comments
Initial	19.8	7.07	599	milky brn
2	19.4	6.93	603	milky wht
4	19.4	6.96	616	"
6	19.4	6.87	615	clear

1040 Collect DBS-2

1050 @ DBS-4

79.50 - 67.70 = 11.80 · 0.5 = 5.9 gal

Vol (gal)	T°C	pH	SpC	Comments
Initial	19.8	7.40	552	milky brn
3	19.6	7.18	556	milk wht
6	19.5	7.08	554	clear
9	19.5	7.07	554	clear

6/25/13 MW

1108 Collect DBS-4

1120 @ DBS-1R

74.44 - 64.40 = 10.04 · 0.5 = 5.02 gal

Vol (gal)	T°C	pH	SpC	comments
Initial	19.9	7.02	7629	milky wht
3	19.6	6.86	8391	"
6	19.6	6.75	9571	clear
9	19.5	6.76	9711	

1144 Collect DBS-1R

1200 Assist S. Brady w/ pump installation

1437 @ PMW-1

78.40 - 68.40 = 10.00 · 0.5 = 5.00 gal

Vol (gal)	pH	T°C	SpC	comments
Initial	6.73	19.5	35010	clear
3	6.70	19.4	36096	"
6	6.70	19.4	40826	"
9	6.73	19.4	42400	"

1500 collect PMW-1

1600 W. Meter 2599392

Note: pump on leaking from meter (south AW-2). TOLD TERRY THAT METER NEEDS TO BE REPLACED AND NOT OPERATE WELL. TERRY SAID HIS GUYS WILL

58

6/25/13 ~~REPLACE~~ INSTALL METER. TOLD HIM DBS&A WILL PURCHASE & SHIP NEW METER TO HIM.
— SBRADY

PUMP SET AT ORIGINAL DEPTH. APPEARED TO BE OPERATING SMOOTHLY.
— SBRADY

6/25/13

September 27, 2012

Mr. Jim Griswold
New Mexico Oil Conservation Division
Environmental Bureau
1220 South St. Francis Drive
Santa Fe, NM 87505-4225

Re: Salty Dog Brine Station - First Quarterly Groundwater Monitoring and O&M Report

Dear Mr. Griswold:

On behalf of PAB Services, Inc., Daniel B. Stephens & Associates, Inc. (DBS&A) is pleased to submit the enclosed groundwater monitoring and O&M report for the Salty Dog brine station located in Lea County, New Mexico. The report documents results of the first quarter groundwater monitoring activities completed at the site on September 10 and 11, 2012, as well as groundwater extraction system operations and maintenance information.

Please do not hesitate to call me at (505) 353-9130 if you have any questions or require additional information.

Sincerely,

DANIEL B. STEPHENS & ASSOCIATES, INC.

Michael D. McVey
Senior Hydrogeologist

Enclosures

cc: Pieter Bergstein, PAB Services, Inc.

Daniel B. Stephens & Associates, Inc.
6020 Academy Rd., NE, Suite 100 505-822-9400
Albuquerque, NM 87109-3315 FAX 505-822-8877

First Quarterly Groundwater Monitoring and O&M Report
Salty Dog Brine Station
Lea County, New Mexico

Prepared for **New Mexico Energy, Minerals and Natural Resources Department**
Oil Conservation Division, Environmental Bureau

September 27, 2012

Daniel B. Stephens & Associates, Inc.

6020 Academy NE, Suite 100 • Albuquerque, New Mexico 87109

FIRST QUARTERLY GROUNDWATER MONITORING AND O&M REPORT SALTY DOG BRINE STATION LEA COUNTY, NEW MEXICO

1. INTRODUCTION

Daniel B. Stephens & Associates, Inc. (DBS&A) has prepared this groundwater monitoring and operations and maintenance (O&M) report for submission to the New Mexico Energy, Minerals and Natural Resources Department Oil Conservation Division (OCD) Environmental Bureau on behalf of PAB Services, Inc. (PAB) for the Salty Dog brine station (the site) located in Lea County, New Mexico (Figure 1). The report summarizes activities conducted at the site on September 10 and 11, 2012.

The site is comprised of a northern portion where the brine pond was located prior to closure in October 2008 and a southern portion where the brine well is located. The brine pond area and the brine well area are separated by approximately 2,500 feet, joined by a dirt road. Since the closure of the brine pond, a number of frac tanks have been stationed in the northern portion of the site to serve as storage for brine that is produced for resale. A concrete truck loading pad is located near the frac tanks. The brine well is currently not operational and attempts are being made to redrill the well and restore brine production. Six monitor wells (PMW-1, DBS-1R, and DBS-2 through DBS-5), one nested well (NW-1), and one recovery well (RW-1) are located in the former brine pond area. Nine monitor wells (MW-2 through MW-6, DBS-6 through DBS-9), one nested well (NW-2), and one recovery well (RW-2) are located in the brine well area (Figure 1).

A groundwater extraction system was installed by DBS&A at the site in early April 2012 to provide hydraulic control of the chloride groundwater plumes present beneath the former brine pond area and brine well area. The extraction system consists of two submersible pumps, conveyance lines, electrical power, and controls to extract groundwater from recovery wells RW-1 (former brine pond area) and RW-2 (brine well area), and convey the extracted groundwater to on-site frac tanks for off-site disposal.

2. SCOPE OF WORK

The scope of work for groundwater monitoring consisted of measuring fluid levels in and collecting groundwater samples from 11 monitor wells for laboratory analysis. The monitor wells included in the quarterly sampling were selected in consultation with the OCD project manager, Jim Griswold, on October 4, 2010. Groundwater samples were submitted to Hall Environmental Analysis Laboratory (HEAL) in Albuquerque, New Mexico for chloride analysis using U.S. Environmental Protection Agency (EPA) Test Method 300.0.

3. MONITORING ACTIVITIES

Fluid Level Measurement

On September 10, 2012, DBS&A measured fluid levels in monitor wells DBS-1R, DBS-2 through DBS-5 and PMW-1 in the former brine pond area, and DBS-6, DBS-8, DBS-9, MW-3, and MW-5 in the brine well area using a properly decontaminated electronic water level meter (Figure 1). Table 1 provides a summary of the fluid level measurements and groundwater elevations.

The average depth to water beneath the former brine pond area during this monitoring event was 66.06 feet below ground surface (ft bgs), decreasing approximately 1.18 feet since the last monitoring event in April 2012. Water levels in DBS-1R and PMW-1, the wells closest to extraction well RW-1, decreased 2.05 feet and 2.50 feet, respectively. Water levels in DBS-2, DBS-3, DBS-4, and DBS-5 decreased 1.19 feet, 0.40 foot, 0.76 foot, and 0.22 foot, respectively. The greater drawdown observed in monitor wells DBS-1R, PMW-1, and DBS-2 is the result of groundwater pumping occurring at extraction well RW-1. These three wells, compared to the other wells in the former brine pond area, are located in the closest proximity to the extraction well.

The average depth to water beneath the brine well area was 62.73 ft bgs, decreasing 0.15 foot since April 2012. Water levels in DBS-6, DBS-8, MW-3, and MW-5 decreased 0.17 foot, 0.15 foot, 0.11 foot, and 0.15 foot, respectively. The water level in DBS-9, located northeast of the brine well in the playa, decreased 0.09 foot. Only minor drawdown is evident in the brine well area from pumping of extraction well RW-2 at the current flow rate.

Potentiometric surface maps were prepared for the former brine pond and brine well areas and are included as Figures 2 and 3. The gradient increased an order of magnitude beneath the former brine pond area from 0.005 to 0.01 foot/foot (ft/ft) since the last monitoring event in April 2012, and a cone of depression is apparent during this monitoring event with continued pumping from extraction well RW-1 (Figure 2). The direction of groundwater flow beneath the brine well area remains to the south-southeast with continued pumping from extraction well RW-2. The gradient remained unchanged at approximately 0.004 ft/ft (Figure 3) indicating that pumping at the current rate is having little to no effect on drawdown in the brine well area.

Groundwater Sampling

Groundwater samples were collected from monitor wells DBS-1R, DBS-2 through DBS-6, PMW-1, DBS-8, DBS-9, MW-3, and MW-5 on September 10 and 11, 2012. DBS&A followed corporate standard operating procedures developed from EPA guidance during collection of all groundwater samples. Prior to sampling, the well was purged of a minimum of three casing volumes using a submersible pump to ensure that a representative sample of groundwater was collected. During purging, the DBS&A field technician measured water quality parameters including temperature, specific conductance, and pH to ensure that these parameters were stabilized to within 10 percent for specific conductance, 2 degrees for temperature and +/- 0.2 pH units prior to sampling. Sample containers were then filled, labeled, and placed on ice once the stabilization criteria were met. Groundwater samples were submitted under full chain-of-custody to HEAL for chloride analysis.

4. ANALYTICAL RESULTS

Table 2 summarizes chloride analytical results for the 11 groundwater samples collected on September 10 and 11, 2012. Figures 4 and 5 show the distribution of chloride in groundwater beneath the former brine pond and brine well areas for the sampling event. The laboratory report and chain-of-custody documentation are provided in Appendix 1. Field notes recorded during groundwater monitoring activities are included in Appendix 2.

Former Brine Pond Area Wells

During this monitoring event, groundwater samples submitted from all of the wells in the former brine pond area showed increases in chloride concentrations. Increases were: DBS-1R (3,000 to 3,200 mg/L), DBS-2 (24 to 44 mg/L), DBS-3 (33 to 34 mg/L), DBS-4 (31 to 32 mg/L), DBS-5 (150 to 160 mg/L), and PMW-1 (12,000 to 14,000 mg/L). Currently, only two of the six wells sampled in the former brine pond area contain chloride concentrations in excess of the New Mexico Water Quality Control Commission (NMWQCC) standard of 250 mg/L (Table 2).

The chloride groundwater plume in the former brine pond area remains bounded by the existing monitor well network. Monitor wells PMW-1 and DBS-1R, located downgradient of the former brine pond, continue to show chloride concentrations in excess of the NMWQCC standard (Figure 4). The chloride concentration in the farthest downgradient well, DBS-4, remains below the standard.

Brine Well Area Wells

During this monitoring event, groundwater samples submitted from three of the wells in the brine well area showed increases in chloride concentrations. Increases were: DBS-8 (41 to 42 mg/L), MW-3 (14,000 to 16,000 mg/L), and MW-5 (1,400 to 1,500 mg/L). Two of the wells showed decreases in chloride concentrations. Decreases were: DBS-6 (400 to 390 mg/L) and DBS-9 (330 to 320 mg/L). Currently, four of the five wells sampled in the brine well area (MW-3, MW-5, DBS-6, and DBS-9) contain chloride concentrations in excess of the New Mexico Water Quality Control Commission (NMWQCC) standard of 250 mg/L (Table 2).

The downgradient and northern, cross-gradient extent of the chloride groundwater plume in the brine well area remains undefined. The monitor well located closest to the extraction well (MW-3), the farthest downgradient well (MW-5), and the northern-most cross-gradient well (DBS-6) all continue to contain chloride concentrations in excess of the NMWQCC standard (Figure 5).

The chloride concentration in monitor well DBS-9 decreased slightly during this monitoring event to 320 mg/L, but still continues to exceed the NMWQCC standard. DBS-9 was installed in the playa located northeast of the brine well to determine if documented releases that entered the playa in 2002 and 2005 impacted groundwater (Figure 5).

5. GROUNDWATER EXTRACTION SYSTEM O&M

Groundwater extraction from recovery well RW-1 at the former brine pond area was started on April 7, 2012. The flow rate for RW-1 was initially set at the design specification of 0.5 gallons per minute (gpm). Groundwater extraction from recovery well RW-2 at the brine well area was started on April 6, 2012. The flow rate for RW-2 was initially set at 1.3 gpm. After DBS&A set the flow rates, the PAB facility manager adjusted the flow rates upward to facilitate daily disposal of the extracted groundwater.

Former Brine Pond Area

The groundwater extraction system at RW-1 has been in operation for approximately 153 days. During July 2012, the system was down for a period of three days due to an electrical problem at the control box. The facility manager for PAB contacted an electrician and the necessary repairs were made to restart the pump.

Extracted volumes of groundwater were recorded by the DBS&A field technician during the monitoring event and are provided in Table 3. To date, 636,237 gallons have been pumped from recovery well RW-1.

Pumping of recovery well RW-1 at the current flow rate of approximately 2.9 gallons per minute (gpm) has resulted in a cone of depression being produced in the former brine pond area. The cone of depression is evident in the most recent potentiometric surface map (Figure 2). Monitor wells DBS-1R and PMW-1, both located within the cone of depression, are the only wells that contain chloride concentrations in excess of the NMWQCC standard. Pumping at the current rate is effectively controlling downgradient migration of the chloride plume, and although the chloride concentrations in the wells remain elevated, they are expected to decrease through time with continued pumping.

Brine Well Area

The groundwater extraction system at RW-2 has been in operation for approximately 157 days. The system has been operating without interruption since it was started. To date, 963,789 gallons have been pumped from recovery well RW-2 (Table 3).

Pumping of recovery well RW-2 at the current flow rate of approximately 4.3 gallons per minute (gpm) has had little to no effect on drawdown in the brine well area. The chloride plume remains undefined downgradient and cross-gradient to the north of the extraction well. Monitor well MW-3, the well in closest proximity to the extraction well, showed an increase in chloride concentration since the last monitoring event which may indicate some limited hydraulic control of the plume; however, the farthest downgradient well, MW-5 remains elevated and, in fact, showed an increase in chloride concentration since the last monitoring event indicating that the downgradient portion of the plume is not being captured by pumping at the current rate.

System Maintenance

During July 2012, the PAB facility manager noted that the extraction system at RW-1 in the former brine pond area was not operating. An electrician was contacted by PAB to troubleshoot the problem and repairs were made to the control box. The pump was restarted after being down for three days. Since the repairs were made, the system has been operating without interruption.

DBS&A did not identify any maintenance issues requiring attention during this groundwater monitoring event. No visible damage to any of the aboveground extraction system components was noted at either the RW-1 or RW-2 wellheads. Both pumps were running and no leaks were observed at either wellhead, along either of the conveyance lines, or at the tie-ins to the frac tanks.

Future Extraction System Operation

Flow will be maintained at the current rate at RW-1 in the former brine pond area. Minor increases will be made to the flow rate at RW-2 in the brine well area in the near term, if possible, while maintaining a volume of extracted groundwater that can be disposed of on a daily basis by PAB. Once the brine well is brought back online, full-scale operation of the extraction system will begin with reinjection of the extracted groundwater into the brine well. At that time, the flow rate for RW-2 will be increased to meet the design specification of 15 gpm.

6. RECOMMENDATIONS

Based on the groundwater monitoring results, DBS&A recommends the following:

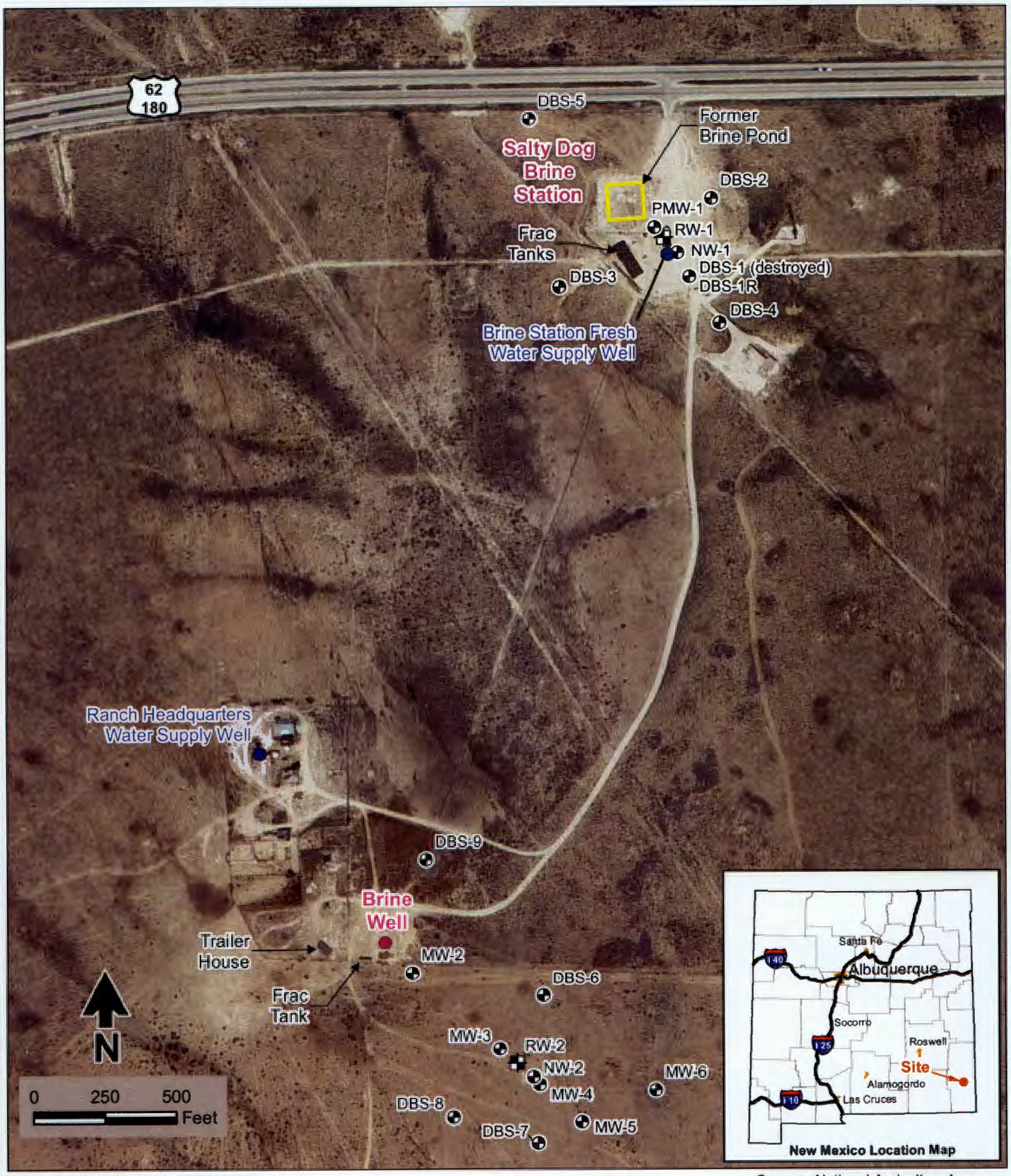
- Continue quarterly groundwater sampling to assess the groundwater extraction system performance by the collection of groundwater samples for laboratory analysis from the on-site monitor wells.

- Maintain the current flow rate of approximately 2.9 gpm from extraction well RW-1 and reevaluate during the next monitoring event based on chloride concentrations in DBS-1R and PMW-1.

- If possible, increase the flow rate from extraction well RW-2 while still maintaining a volume of extracted groundwater that can be disposed of on a daily basis by PAB.

- Once the brine well is brought back online, increase the flow rate from extraction well RW-2 to meet the design specification of 15 gpm with reinjection of the extracted groundwater from RW-1 and RW-2 into the brine well.

Figures



Explanation

- Water supply well
- Monitor well
- Recovery well
- Well destroyed

Source: National Agriculture Imagery Program (NAIP), dated May 13, 2009

SALTY DOG BRINE STATION
Site Location Map

Daniel B. Stephens & Associates, Inc.
5/31/2012
JN ES08.0118.01

Figure 1

Path: S:\Projects\ES08.0118.01_Salty_Dog_Inc\GIS\MXDs\Site_location_map.mxd

Explanation

DBS-2 Well designation
3753.05 Groundwater elevation, ft msl
● Groundwater elevation (ft msl)
Potentiometric surface elevation contour (ft msl)
Groundwater flow direction (dashed where inferred)

Note: * Well not used for contouring.

Source: National Agriculture Imagery Program (NAIP), dated May 13, 2009

S:\Projects\ES08.0118.01_Salty_Dog_Inc\GIS\MXDs\Fluid_levels\GWE_20120910_brine_station.mxd

SALTY DOG BRINE STATION
Former Brine Pond Area
Potentiometric Surface Elevations
September 10, 2012

Daniel B. Stephens & Associates, Inc.
9/25/2012
JN ES08.0118.01

Figure 2

Explanation

MW-5 Well designation

3747.31 Groundwater elevation, ft msl

● Groundwater elevation (ft msl)

Potentiometric surface elevation contour (ft msl)

Source: National Agriculture Imagery Program (NAIP), dated May 13, 2009

SALTY DOG BRINE STATION

Playa Lake and Brine Well Area Potentiometric Surface Elevations September 10, 2012

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Daniel B. Stephens & Associates, Inc.
9/25/2012 JN ES08.0118.01

Figure 3

Explanation

DBS-5	Well designation
160	Chloride concentration (mg/L)
⊕	Monitor well location

BOLD indicates concentration equal to or greater than the NMWQCC standard.
NS = Not sampled

Source: National Agriculture Imagery Program (NAIP), dated May 13, 2009

SALTY DOG BRINE STATION

Former Brine Pond Area
Chloride Concentrations in Groundwater
September 11, 2012

Daniel B. Stephens & Associates, Inc.
9/25/2012
JN ES08.0118.01

Figure 4

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Explanation

MW-5 Well designation

1,500 Chloride concentration (mg/L)

⊕ Monitor well location

BOLD indicates concentration equal to or greater than the NMWQCC standard.

NS = Not sampled

Source: National Agriculture Imagery Program (NAIP), dated May 13, 2009

SALTY DOG BRINE STATION

Playa Lake and Brine Well Area
Chloride Concentrations in Groundwater
September 10 and 11, 2012

Daniel B. Stephens & Associates, Inc.
9/25/2012 JN ES08.0118.01

Figure 5

S:\Projects\ES08.0118.01_Salty_Dog_Inc\GIS\MXDs\Analytical_results\cl_gw_20120911_brine_well.mxd

Tables

Table 1. Summary of Historical Fluid Level Measurements
Salty Dog Brine Station, Lea County, New Mexico

Monitor Well	Screen Interval (ft bgs)	Top of Casing Elevation [a] (ft msl)	Date Measured	Depth to Water (ft btoc)	Groundwater Elevation (ft msl)
DBS-1	56.0-76.0	3817.09	04/08/09	62.38	3754.71
			05/11/11	64.70	3752.39
			10/04/11	Well destroyed	
DBS-1R	58.0-78.0	3817.00 b	04/30/12	63.60	3753.40
			09/10/12	65.65	3751.35
DBS-2	58.0-78.0	3820.50	04/08/09	65.45	3755.05
			05/11/11	66.80	3753.70
			10/04/11	65.87	3754.63
			02/08/12	65.96	3754.54
			04/30/12	66.26	3754.24
			09/10/12	67.45	3753.05
DBS-3	56.0-76.72	3816.66	04/08/09	60.67	3755.99
			05/11/11	61.25	3755.41
			10/04/11	61.25	3755.41
			02/08/12	61.11	3755.55
			04/30/12	61.41	3755.25
			09/10/12	61.81	3754.85
DBS-4	56.0-76.0	3820.37	04/08/09	66.27	3754.10
			05/11/11	67.23	3753.14
			10/04/11	66.67	3753.70
			02/08/12	66.76	3753.61
			04/30/12	67.02	3753.35
			09/10/12	67.78	3752.59
DBS-5	56.9-76.9	3820.66	04/08/09	62.99	3757.67
			05/11/11	63.45	3757.21
			10/04/11	63.41	3757.25
			02/08/12	63.46	3757.20
			04/30/12	63.70	3756.96
			09/10/12	63.92	3756.74

[a] Top of casing elevations surveyed by Pettigrew & Assoc. on May 28, 2009.
[b] Top of casing elevation surveyed by Pettigrew & Assoc. on June 13, 2012.

ft bgs = Feet below ground surface
ft msl = Feet above mean sea level
ft btoc = Feet below top of casing
NA = Not available

Table 1. Summary of Historical Fluid Level Measurements
Salty Dog Brine Station, Lea County, New Mexico

Monitor Well	Screen Interval (ft bgs)	Top of Casing Elevation [a] (ft msl)	Date Measured	Depth to Water (ft btoc)	Groundwater Elevation (ft msl)
DBS-6	56.7-76.7	3812.65	04/07/09	62.75	3749.90
			05/11/11	63.11	3749.54
			10/04/11	63.16	3749.49
			02/08/12	63.20	3749.45
			04/30/12	63.43	3749.22
			09/10/12	63.60	3749.05
DBS-7	55.1-75.1	3810.21	04/07/09	61.74	3748.47
DBS-8	55.2-75.2	3810.70	04/07/09	61.20	3749.50
			05/11/11	61.67	3749.03
			10/04/11	61.71	3748.99
			02/08/12	61.77	3748.93
			04/30/12	62.00	3748.70
			09/10/12	62.15	3748.55
DBS-9	48.0-68.0	3806.26	04/08/09	53.93	3752.33
			05/11/11	54.39	3751.87
			10/04/11	54.59	3751.67
			02/08/12	54.53	3751.73
			04/30/12	54.68	3751.58
			09/10/12	54.77	3751.49
NW-1s	52.95-72.95	3817.33	04/08/09	62.35	3754.98
NW-1m	99.31-119.31	3817.35	04/08/09	62.25	3755.10
NW-1d	149.45-169.45	3817.35	04/08/09	62.04	3755.31
NW-2s	53.35-73.35	3812.50	04/08/09	63.08	3749.42
NW-2m	93.72-113.72	3812.45	04/08/09	63.27	3749.18
NW-2d	126.87-146.87	3812.46	04/08/09	66.41	3746.05
PMW-1	63-78	3821.17	06/23/08	67.51	3753.66
			04/08/09	65.97	3755.20
			05/11/11	68.70	3752.47
			10/04/11	66.95	3754.22

[a] Top of casing elevations surveyed by Pettigrew & Assoc. on May 28, 2009.
[b] Top of casing elevation surveyed by Pettigrew & Assoc. on June 13, 2012.

ft bgs = Feet below ground surface
ft btoc = Feet below top of casing
ft msl = Feet above mean sea level
NA = Not available

Table 1. Summary of Historical Fluid Level Measurements
Salty Dog Brine Station, Lea County, New Mexico

Monitor Well	Screen Interval (ft bgs)	Top of Casing Elevation [a] (ft msl)	Date Measured	Depth to Water (ft btoc)	Groundwater Elevation (ft msl)
PMW-1 (cont.)	63-78	3821.17	02/08/12	66.69	3754.48
			04/30/12	67.27	3753.90
			09/10/12	69.77	3751.40
MW-1	120-140	NA	06/23/08	59.90	NA
MW-2	127-147	3812.68	06/23/08	61.42	3751.26
			04/07/09	61.65	3751.03
MW-3	NA	3812.05	06/23/08	62.06	3749.99
			04/07/09	62.02	3750.03
			05/11/11	62.91	3749.14
			10/04/11	62.91	3749.14
			02/08/12	62.95	3749.10
			04/30/12	63.39	3748.66
			09/10/12	63.50	3748.55
MW-4	111-131	3811.33	06/23/08	62.12	3749.21
			04/07/09	62.51	3748.82
MW-5	112-132	3808.96	06/23/08	60.60	3748.36
			04/07/09	60.79	3748.17
			05/11/11	61.17	3747.79
			10/04/11	61.72	3747.24
			02/08/12	61.23	3747.73
			04/30/12	61.50	3747.46
			09/10/12	61.65	3747.31
MW-6	NA	3810.17	06/23/08	62.17	3748.00
			04/07/09	62.41	3747.76

[a] Top of casing elevations surveyed by Pettigrew & Assoc. on May 28, 2009.
[b] Top of casing elevation surveyed by Pettigrew & Assoc. on June 13, 2012.

ft bgs = Feet below ground surface
ft msl = Feet above mean sea level
ft btoc = Feet below top of casing
NA = Not available

Table 2. Summary of Chloride Groundwater Analytical Data
Salty Dog Brine Station, Lea County, New Mexico
Page 1 of 4

Monitor Well	Date	Chloride Concentration (mg/L) [a]
New Mexico Water Quality Control Commission Standard		*250*
DBS-1	04/08/09	**320**
	05/12/11	**940**
	10/04/11	Well destroyed
DBS-1R	05/01/12	**3,000**
	09/11/12	**3,200**
DBS-2	04/08/09	14
	05/12/11	25
	10/05/11	18
	02/09/12	22
	05/01/12	24
	09/11/12	44
DBS-3	04/08/09	36
	05/12/11	35
	10/05/11	34
	02/09/12	34
	05/01/12	33
	09/11/12	34
DBS-4	04/08/09	38
	05/12/11	33
	10/05/11	32
	02/09/12	32
	05/01/12	31
	09/11/12	32
DBS-5	04/08/09	65
	05/12/11	140
	10/05/11	140
	02/09/12	140
	04/30/12	150
	09/11/12	160
DBS-6	04/07/09	**380**
	05/12/11	**410**

Bold indicates concentrations that exceed the applicable standard.

[a] All samples analyzed in accordance to EPA method 300.0, unless otherwise noted.

[b] Samples analyzed in accordance to Standard Method 4500-Cl B.

mg/L = Milligrams per liter

Table 2. Summary of Chloride Groundwater Analytical Data
Salty Dog Brine Station, Lea County, New Mexico
Page 2 of 4

Monitor Well	Date	Chloride Concentration (mg/L) [a]
New Mexico Water Quality Control Commission Standard		*250*
DBS-6 (cont.)	10/05/11	**400**
	02/09/12	**380**
	04/30/12	**400**
	09/11/12	**390**
DBS-7	04/07/08	**570**
DBS-8	04/07/09	58
	05/12/11	36
	10/05/11	140
	02/09/12	41
	04/30/12	41
	09/10/12	42
DBS-9	04/08/09	210
	05/12/11	**600**
	10/05/11	**440**
	02/09/12	**290**
	04/30/12	**330**
	09/11/12	**320**
NW-1s	04/08/09	**630**
NW-1m	04/08/09	57
NW-1d	04/08/09	38
NW-2s	04/08/09	**410**
NW-2m	04/08/09	**570**
NW-2d	04/08/09	**4,700**
PMW-1	02/27/08	**9,500** [b]
	05/30/08	**8,600** [b]
	06/23/08	**12,700**
	04/08/09	**11,000**
	05/12/11	**13,000**
	10/05/11	**12,000**
	02/09/12	**12,000**
	05/01/12	**12,000**

Bold indicates concentrations that exceed the applicable standard.

[a] All samples analyzed in accordance to EPA method 300.0, unless otherwise noted.

[b] Samples analyzed in accordance to Standard Method 4500-Cl B.

mg/L = Milligrams per liter

Table 2. Summary of Chloride Groundwater Analytical Data
Salty Dog Brine Station, Lea County, New Mexico

Monitor Well	Date	Chloride Concentration (mg/L) [a]
New Mexico Water Quality Control Commission Standard		*250*
PMW-1 (cont.)	09/11/12	**14,000**
MW-1	05/30/08	75 [b]
	06/23/08	243
MW-2	02/27/08	120 [b]
	05/30/08	80 [b]
	06/23/08	**1,480**
	04/07/09	**1,200**
MW-3	02/27/08	**348** [b]
	05/30/08	**360** [b]
	06/23/08	**1,090**
	04/07/09	**17,000**
	05/12/11	**16,000**
	10/05/11	**14,000**
	02/09/12	**15,000**
	04/30/12	**14,000**
	09/10/12	**16,000**
MW-4	02/27/08	**476** [b]
	05/30/08	**512** [b]
	06/23/08	**5,730**
	04/07/09	**6,600**
MW-5	02/27/08	**1,280** [b]
	05/30/08	**1,220** [b]
	06/23/08	**1,260**
	04/07/09	**1,300**
	05/12/11	**1,500**
	10/05/11	**1,500**
	02/09/12	**1,500**
	04/30/12	**1,400**
	09/10/12	**1,500**
MW-6	02/27/08	32 [b]
	05/30/08	36 [b]

Bold indicates concentrations that exceed the applicable standard.

[a] All samples analyzed in accordance to EPA method 300.0, unless otherwise noted.

[b] Samples analyzed in accordance to Standard Method 4500-Cl B.

mg/L = Milligrams per liter

Table 2. Summary of Chloride Groundwater Analytical Data
Salty Dog Brine Station, Lea County, New Mexico

Monitor Well	Date	Chloride Concentration (mg/L) [a]
New Mexico Water Quality Control Commission Standard		*250*
MW-6 (cont.)	06/23/08	31.4
	04/07/09	25
Ranch Headquarters Supply Well	06/23/08	35.4
Brine Station Fresh Water Supply Well	02/27/08	**630** [b]
	05/30/08	**590** [b]
	06/23/08	**650**

Bold indicates concentrations that exceed the applicable standard.

[a] All samples analyzed in accordance with EPA method 300.0, unless otherwise noted.

[b] Samples analyzed in accordance with Standard Method 4500-Cl B.

mg/L = Milligrams per liter

Table 3. Summary of Extracted Groundwater Volumes
Salty Dog Brine Station, Lea County, New Mexico
Page 1 of 1

Recovery Well	Date	Days of Operation	Average Flow Rate (gpm)	Extracted Volume (gal)
RW-1	05/01/12	23	2.2	73,740
	09/11/12	153	2.9	636,237
RW-2	05/01/12	24	2.6	91,450
	09/11/12	157	4.3	963,789

gpm = gallons per minute
gal = gallons

Appendices

Appendix 1

Laboratory Report

HALL ENVIRONMENTAL ANALYSIS LABORATORY

Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: www.hallenvironmental.com

September 18, 2012

Mike McVey
Daniel B. Stephens & Assoc.
6020 Academy NE Suite 100
Albuquerque, NM 87109
TEL: (505) 822-9400
FAX (505) 822-8877

RE: Salty Dog　　　　OrderNo.: 1209467

Dear Mike McVey:

Hall Environmental Analysis Laboratory received 11 sample(s) on 9/12/2012 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent. To access our accredited tests please go to www.hallenvironmental.com or the state specific web sites. See the sample checklist and/or the Chain of Custody for information regarding the sample receipt temperature and preservation. Data qualifiers or a narrative will be provided if the sample analysis or analytical quality control parameters require a flag. All samples are reported as received unless otherwise indicated. Lab measurement of analytes considered field parameters that require analysis within 15 minutes of sampling such as pH and residual chlorine are qualified as being analyzed outside of the recommended holding time.

Please don't hesitate to contact HEAL for any additional information or clarifications.

Sincerely,

Andy Freeman
Laboratory Manager
4901 Hawkins NE
Albuquerque, NM 87109

Analytical Report
Lab Order: **1209467**
Date Reported: **9/18/2012**

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Daniel B. Stephens & Assoc. **Lab Order:** 1209467
Project: Salty Dog

Lab ID: 1209467-001 **Collection Date:** 9/10/2012 2:45:00 PM
Client Sample ID: MW-5 **Matrix:** AQUEOUS

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: **JRR**
Chloride	1500	50		mg/L	100	9/13/2012 7:49:47 PM

Lab ID: 1209467-002 **Collection Date:** 9/10/2012 3:47:00 PM
Client Sample ID: MW-3 **Matrix:** AQUEOUS

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: **JRR**
Chloride	16000	500		mg/L	1000	9/15/2012 1:40:58 AM

Lab ID: 1209467-003 **Collection Date:** 9/10/2012 6:36:00 PM
Client Sample ID: DBS-8 **Matrix:** AQUEOUS

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: **JRR**
Chloride	42	10		mg/L	20	9/12/2012 7:16:57 PM

Lab ID: 1209467-004 **Collection Date:** 9/11/2012 8:08:00 AM
Client Sample ID: DBS-6 **Matrix:** AQUEOUS

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: **JRR**
Chloride	390	25		mg/L	50	9/13/2012 8:39:25 PM

Lab ID: 1209467-005 **Collection Date:** 9/11/2012 8:50:00 AM
Client Sample ID: DBS-9 **Matrix:** AQUEOUS

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: **JRR**
Chloride	320	10		mg/L	20	9/12/2012 8:06:37 PM

Lab ID: 1209467-006 **Collection Date:** 9/11/2012 9:28:00 AM
Client Sample ID: DBS-4 **Matrix:** AQUEOUS

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: **JRR**
Chloride	32	10		mg/L	20	9/12/2012 8:31:27 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
P	Sample pH greater than 2	R	RPD outside accepted recovery limits
RL	Reporting Detection Limit	S	Spike Recovery outside accepted recovery limits

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Daniel B. Stephens & Assoc. **Lab Order:** 1209467
Project: Salty Dog

Lab ID: 1209467-007 **Collection Date:** 9/11/2012 10:05:00 AM
Client Sample ID: DBS-2 **Matrix:** AQUEOUS

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: **JRR**
Chloride	44	10		mg/L	20	9/12/2012 9:21:06 PM

Lab ID: 1209467-008 **Collection Date:** 9/11/2012 10:45:00 AM
Client Sample ID: DBS-5 **Matrix:** AQUEOUS

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: **JRR**
Chloride	160	10		mg/L	20	9/12/2012 9:45:56 PM

Lab ID: 1209467-009 **Collection Date:** 9/11/2012 12:20:00 PM
Client Sample ID: DBS-3 **Matrix:** AQUEOUS

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: **JRR**
Chloride	34	10		mg/L	20	9/12/2012 10:10:45 PM

Lab ID: 1209467-010 **Collection Date:** 9/11/2012 12:55:00 PM
Client Sample ID: DBS-1R **Matrix:** AQUEOUS

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: **JRR**
Chloride	3200	250		mg/L	500	9/13/2012 8:51:49 PM

Lab ID: 1209467-011 **Collection Date:** 9/11/2012 1:45:00 PM
Client Sample ID: PMW-1 **Matrix:** AQUEOUS

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: **JRR**
Chloride	14000	500		mg/L	1000	9/15/2012 1:53:22 AM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
P	Sample pH greater than 2	R	RPD outside accepted recovery limits
RL	Reporting Detection Limit	S	Spike Recovery outside accepted recovery limits

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: 1209467

18-Sep-12

Client: Daniel B. Stephens & Assoc.

Project: Salty Dog

Sample ID **MB**	SampType: **MBLK**			TestCode: **EPA Method 300.0: Anions**					
Client ID: **PBW**	Batch ID: **R5484**			RunNo: **5484**					
Prep Date:	Analysis Date: **9/12/2012**			SeqNo: **156741**	Units: **mg/L**				

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	ND	0.50								

Sample ID **LCS**	SampType: **LCS**			TestCode: **EPA Method 300.0: Anions**					
Client ID: **LCSW**	Batch ID: **R5484**			RunNo: **5484**					
Prep Date:	Analysis Date: **9/12/2012**			SeqNo: **156742**	Units: **mg/L**				

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	4.7	0.50	5.000	0	93.8	90	110			

Sample ID **MB**	SampType: **MBLK**			TestCode: **EPA Method 300.0: Anions**					
Client ID: **PBW**	Batch ID: **R5528**			RunNo: **5528**					
Prep Date:	Analysis Date: **9/13/2012**			SeqNo: **158122**	Units: **mg/L**				

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	ND	0.50								

Sample ID **LCS**	SampType: **LCS**			TestCode: **EPA Method 300.0: Anions**					
Client ID: **LCSW**	Batch ID: **R5528**			RunNo: **5528**					
Prep Date:	Analysis Date: **9/13/2012**			SeqNo: **158123**	Units: **mg/L**				

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	4.7	0.50	5.000	0	93.6	90	110			

Sample ID **MB**	SampType: **MBLK**			TestCode: **EPA Method 300.0: Anions**					
Client ID: **PBW**	Batch ID: **R5556**			RunNo: **5556**					
Prep Date:	Analysis Date: **9/14/2012**			SeqNo: **158889**	Units: **mg/L**				

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	ND	0.50								

Sample ID **LCS**	SampType: **LCS**			TestCode: **EPA Method 300.0: Anions**					
Client ID: **LCSW**	Batch ID: **R5556**			RunNo: **5556**					
Prep Date:	Analysis Date: **9/14/2012**			SeqNo: **158890**	Units: **mg/L**				

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	4.8	0.50	5.000	0	96.6	90	110			

Sample ID **MB**	SampType: **MBLK**			TestCode: **EPA Method 300.0: Anions**					
Client ID: **PBW**	Batch ID: **R5556**			RunNo: **5556**					
Prep Date:	Analysis Date: **9/15/2012**			SeqNo: **158961**	Units: **mg/L**				

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	ND	0.50								

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
P	Sample pH greater than 2	R	RPD outside accepted recovery limits

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: 1209467
18-Sep-12

Client: Daniel B. Stephens & Assoc.
Project: Salty Dog

Sample ID **LCS** SampType: **LCS** TestCode: **EPA Method 300.0: Anions**
Client ID: **LCSW** Batch ID: **R5556** RunNo: **5556**
Prep Date: Analysis Date: **9/15/2012** SeqNo: **158962** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	4.9	0.50	5.000	0	97.5	90	110			

Qualifiers:

- * Value exceeds Maximum Contaminant Level.
- E Value above quantitation range
- J Analyte detected below quantitation limits
- P Sample pH greater than 2
- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- R RPD outside accepted recovery limits

HALL ENVIRONMENTAL ANALYSIS LABORATORY

Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: www.hallenvironmental.com

Sample Log-In Check List

Client Name: DBS

Work Order Number: 1209467

Received by/date: 09/12/12

Logged By: Lindsay Mangin 9/12/2012 8:10:00 AM

Completed By: Lindsay Mangin 9/12/2012 12:54:12 PM

Reviewed By: 09/12/12

Chain of Custody

1. Were seals intact? Yes [ ] No [ ] Not Present [✓]
2. Is Chain of Custody complete? Yes [✓] No [ ] Not Present [ ]
3. How was the sample delivered? Client

Log In

4. Coolers are present? (see 19. for cooler specific information) Yes [✓] No [ ] NA [ ]
5. Was an attempt made to cool the samples? Yes [✓] No [ ] NA [ ]
6. Were all samples received at a temperature of >0° C to 6.0°C Yes [ ] No [✓] NA [ ]
   Approved by client.
7. Sample(s) in proper container(s)? Yes [✓] No [ ]
8. Sufficient sample volume for indicated test(s)? Yes [✓] No [ ]
9. Are samples (except VOA and ONG) properly preserved? Yes [✓] No [ ]
10. Was preservative added to bottles? Yes [ ] No [✓] NA [ ]
11. VOA vials have zero headspace? Yes [ ] No [ ] No VOA Vials [✓]
12. Were any sample containers received broken? Yes [ ] No [✓]
13. Does paperwork match bottle labels? Yes [✓] No [ ]
   (Note discrepancies on chain of custody)
14. Are matrices correctly identified on Chain of Custody? Yes [✓] No [ ]
15. Is it clear what analyses were requested? Yes [✓] No [ ]
16. Were all holding times able to be met? Yes [✓] No [ ]
   (If no, notify customer for authorization.)

# of preserved bottles checked for pH:

(<2 or >12 unless noted)

Adjusted?

Checked by:

Special Handling (if applicable)

17. Was client notified of all discrepancies with this order? Yes [ ] No [ ] NA [✓]

Person Notified: Date:

By Whom: Via: [ ] eMail [ ] Phone [ ] Fax [ ] In Person

Regarding:

Client Instructions:

18. Additional remarks:

19. Cooler Information

Cooler No	Temp °C	Condition	Seal Intact	Seal No	Seal Date	Signed By
1	10.1	Good	Not Present			

Chain-of-Custody Record

Client: Daniel B. Stephens & Associates

Mailing Address: 6020 Academy NE Suite 100
Albuquerque NM 87109

Phone #: 505-822-9400

email or Fax#: MMcvey@DBStephens.com

QA/QC Package:

☐ Standard ☐ Level 4 (Full Validation)

☐ Other ______

☑ EDD (Type) Excel

Turn-Around Time:

☑ Standard ☐ Rush ______

Project Name:

Salty Dog

Project #:

ES08.0118.03

Project Manager:

Mike McVey

Sampler: Micah Nauck

On Ice: ☒ Yes ☐ No

Sample Temperature: [illegible]

HALL ENVIRONMENTAL ANALYSIS LABORATORY

www.hallenvironmental.com

4901 Hawkins NE - Albuquerque, NM 87109

Tel. 505-345-3975 Fax 505-345-4107

Analysis Request

Date	Time	Matrix	Sample Request ID	Container Type and #	Preservative Type	HEAL No. 1209467	BTEX + MTBE + TMB's (8021)	BTEX + MTBE + TPH (Gas only)	TPH 8015B (GRO / DRO / MRO)	TPH (Method 418.1)	EDB (Method 504.1)	PAH (8310 or 8270SIMS)	RCRA 8 Metals	Anions (F,Cl,NO_3,NO_2,PO_4,SO_4)	8081 Pesticides / 8082 PCB's	8260B (VOA)	8270 (Semi-VOA)	Chloride				Air Bubbles (Y or N)
9/10/12	1445 ~~1335~~	Water	MW-5	125 mL	None	-001												X				
	1547		MW-3			-002												X				
	1836		DBS ~~MW~~-8			-003												X				
9/11/12	0808		DBS ~~MW~~-6			-004												X				
	0850		DBS ~~MW~~-9			-005												X				
	0928		DBS-4			-006												X				
	1005 ~~0950~~		DBS-2			-007												X				
	1045		DBS-5			-008												X				
	1220		DBS-3			-009												X				
	1255		DBS-1R			-010												X				
	1345		PMW-1			-011												X				

Date:	Time:	Relinquished by:	Received by:	Date	Time
9/12/12	0810	[signature]	[signature]	09/12/12	0810
Date:	Time:	Relinquished by:	Received by:	Date	Time

Remarks:

If necessary, samples submitted to Hall Environmental may be subcontracted to other accredited laboratories. This serves as notice of this possibility. Any sub-contracted data will be clearly notated on the analytical report.

Appendix 2

Field Notes

9/10/12 MW

0600 Depart for Salty Dog

1130 Onsite

1135 Begin guaging wells

Well ID	DTW	TD
DBS-1R	65.65	74.44
DBS-2	67.45	76.30
DBS-3	61.81	76.30
DBS-4	67.78	79.50
DBS-5	63.92	77.26
DBS-6	63.60	76.81
DBS-8	62.15	72.70
DBS-9	54.77	69.50
PMW-1	69.77	78.40
MW-3	63.50	147.00
MW-5	61.65	129.00

1300 Complete guaging wells

1305 Calibrate YSI Pro

pH	4	7	10	SpC 1000
	4.09 23.6°	7.05 23.8	10.03 23.7	1003 26.0°

1335 MW-5 129.00 - 61.65 = 67.35 · .5 = 33.67 gal

	Temp °C	pH	SpC µS/cm
Initial	22.0	6.67	2178
16 gal	21.1	6.94	4444
Final	20.5	6.93	4358

1445 Collect sample

MW

9/10/12 MW

1530 MW-3 147.00 - 63.50 = 83.50 · .5 = 41.75 gal

	T°C	pH	SpC µS/cm
Initial	21.7	7.15	5524
20.5 gal	20.1	6.54	31815
Final	20.0	6.59	35511

1547 Collect sample

1605 MW-8 72.70 - 62.15 = 10.55 · .5 = 5.28 gal

	T°C	pH	SpC µS/cm
Initial	22.3	7.38	858
2.6 gal	21.5	7.27	752
Final	21.2	7.25	732

1836 Collect sample

1840 Offsite

9/10/12 MW

9/11/12 MV

0725 Onsite

0735 Calibrate YSI Pro

pH 4		7		10		SpC 1000	
4.10	22.0°	7.01	22.1°	10.00	21.6°	1000	22.0°

0745 MW-6 76.81-63.60=7.21·.5=3.60 gal

	T°C	pH	SpC us/cm
Initial	20.5	7.25	1947
1.8 gal	20.0	6.99	1667
Final	19.9	6.88	1712

0808 Collect sample

0825 MW-9 69.50-54.77=14.73·.5=7.36 gal

	T°C	pH	SpC us/cm
Initial	19.8	7.08	2371
3.5 gal	19.3	7.12	1799
Final	19.7	7.07	1624

0850 Collect sample

0905 DBS-4 79.50-67.78=11.72·.5=5.86 gal

	T°C	pH	SpC us/cm
Initial	20.9	7.55	559
2.9 gal	20.7	7.52	524
Final	20.9	7.45	529

0928 Collect sample

9/11/12

9/11/12 MV

0950 DBS-2 76.30-67.45·.5=4.4 gal

	T°C	pH	SpC us/cm
Initial	22.6	7.47	598
2.2 gal	20.4	7.36	620
Final	20.6	7.30	565

1005 collect sample

1025 DBS-5 77.26-63.92=13.34·.5=6.67 gal

	T°C	pH	SpC us/cm
Initial	23.5	7.15	1213
3.35	21.0	7.23	1224
Final	20.7	7.23	1225

1045 Collect sample

1150 DBS-3 76.30-61.81=14.49·.5=7.25 gal

	T°C	pH	SpC us/cm
Initial	23.7	7.60	582
3.6 gal	20.7	7.44	528
Final	20.4	7.49	565

1220 collect sample

1235 DBS-1R 74.44-65.65=8.79·.5=4.39 gal

	T°C	pH	SpC us/cm
Initial	22.8	7.49	2939
2.2	20.4	7.20	7218
Final	20.3	7.03	2245

1255 Collect sample

9/11/12

9/11/12 [initials]

1320	PMW-1	78.40 - 69.77 = 8.63 · .5 = 4.32 gal	
	T°C	pH	SpC uS/cm
Initial	22.3	7.01	31841
2.16 gal	20.7	6.96	30416
Final	20.6	6.98	31281

1345 Collect sample

1410 Check water meters

North: 636237

South: 963789

1430 Offsite

1930 Arrive in Albuquerque

October 14, 2011

RECEIVED OCD

2011 OCT 17 P 12:22

Mr. Jim Griswold
New Mexico Oil Conservation Division
Environmental Bureau
1220 South St. Francis Drive
Santa Fe, NM 87505-4225

Re: Salty Dog Brine Station - Second Quarterly Groundwater Monitoring Report

Dear Mr. Griswold:

On behalf of PAB Services, Inc., Daniel B. Stephens & Associates, Inc. (DBS&A) is pleased to submit the enclosed groundwater monitoring report for the Salty Dog brine station located in Lea County, New Mexico. The report documents second quarter groundwater monitoring activities completed at the site on October 4 and 5, 2011.

Please don't hesitate to call me at (505) 353-9130 if you have any questions or require additional information.

Sincerely,

DANIEL B. STEPHENS & ASSOCIATES, INC.

Michael D. McVey
Senior Hydrogeologist

Enclosures

cc: Pieter Bergstein, PAB Services, Inc.

S:\Projects\ES08.0118.01_Salty_Dog_Inc\ES08.0118.02_Salty Dog Remediation\Docs\2nd Qtrly GW Mon\Griswold_102111.doc

GROUNDWATER MONITORING REPORT
SALTY DOG BRINE STATION
LEA COUNTY, NEW MEXICO

1. INTRODUCTION

Daniel B. Stephens & Associates, Inc. (DBS&A) has prepared this second quarterly groundwater monitoring report for submission to the New Mexico Energy, Minerals and Natural Resources Department Oil Conservation Division (OCD) Environmental Bureau on behalf of PAB Services, Inc. (PAB) for the Salty Dog brine station located in Lea County, New Mexico (Figure 1). This report summarizes groundwater monitoring activities conducted at the site on October 4 and 5, 2011.

The Salty Dog brine station site is comprised of a northern portion where the former brine pond was located and a southern portion where the brine well is located (Figure 1). The former brine pond area and the brine well area are separated by approximately 2,500 feet, joined by a dirt road. Five monitor wells, one nested well, and one recovery well are located in the former brine pond area. Nine monitor wells, one nested well, and one recovery well are located in the brine well area.

Since the brine pond was closed in October 2008, a number of frac tanks have been stationed in the northern portion of the site to serve as storage for brine that is produced for resale. A concrete truck loading pad is located near the frac tanks. The brine well is currently not operational and attempts are being made to redrill the well and restore brine production at the site.

2. SCOPE OF WORK

The scope of work for quarterly groundwater monitoring consisted of measuring fluid levels in and collecting groundwater samples from eleven monitor wells for laboratory analysis. The eleven monitor wells included in the quarterly sampling were selected in consultation with the OCD project manager, Jim Griswold, on October 4, 2010. Groundwater samples were submitted to

Hall Environmental Analysis Laboratory (HEAL) in Albuquerque, New Mexico for chloride analysis using U.S. Environmental Protection Agency (EPA) Test Method 300.0.

3. MONITORING ACTIVITIES

On October 4, 2011, DBS&A measured fluid levels in monitor wells DBS-2 through DBS-5 and PMW-1 in the former brine pond area, and DBS-6, DBS-8, DBS-9, MW-3, and MW-5 in the brine well area using a properly decontaminated electronic water level meter. Fluid levels were not measured in monitor well DBS-1 because the well has been destroyed. Table 1 provides a summary of the fluid level measurements. The average depth to water beneath the former brine pond area during this monitoring event was 64.83 feet below ground surface (ft bgs), increasing approximately 0.53 foot since the last monitoring event in May 2011. Increases ranged from 0.04 foot in DBS-5 to 1.75 feet in PMW-1. The average depth to water beneath the brine well area was 62.38 ft bgs, decreasing 0.16 foot since May 2011. Decreases ranged from 0.04 foot in DBS-8 to 0.55 foot in MW-5.

Potentiometric surface maps were prepared for the former brine pond and brine well areas and are included as Figures 2 and 3. Groundwater beneath both areas flows to the southeast at an average gradient of approximately 0.004 foot per foot (ft/ft) (Figures 2 and 3). The gradient beneath the former brine pond area has decreased from 0.008 to 0.004 ft/ft since the last monitoring event in May 2011, and is being less influenced with reduced pumping of the brine station fresh water supply well (Figure 1).

Groundwater samples were collected from monitor wells DBS-2 through DBS-5, PMW-1, DBS-6, DBS-8, DBS-9, MW-3, and MW-5 on October 5, 2011. A sample was not collected from DBS-1 because the well has been destroyed. DBS&A followed corporate standard operating procedures developed from EPA guidance during collection of all groundwater samples. Prior to sampling, the well was purged of a minimum of three casing volumes using a submersible pump to ensure that a representative sample of groundwater was collected. During purging, the DBS&A field technician measured water quality parameters including temperature, specific conductance, and pH to ensure that these parameters were stabilized to within 10 percent for specific conductance, 2 degrees for temperature and +/- 0.2 pH units prior to sampling. Sample containers were then filled, labeled, and placed on ice once the stabilization criteria were met. Groundwater samples were submitted under full chain-of-custody to HEAL for chloride analysis.

4. ANALYTICAL RESULTS

Table 2 summarizes chloride analytical results for the ten groundwater samples collected on October 5, 2011. Figures 4 and 5 show the distribution of chloride in groundwater beneath the former brine pond and brine well areas for the sampling event. Complete laboratory reports and chain-of-custody documentation are provided in Appendix 1. Field notes recorded during groundwater monitoring activities are included in Appendix 2.

Since the last monitoring event in May 2011, only monitor well DBS-8 showed an increase in chloride concentration from 36 to 140 mg/L. Monitor wells DBS-2 (25 to 18 mg/L), DBS-3 (35 to 34 mg/L), DBS-4 (33 to 32 mg/L), DBS-6 (410 to 400 mg/L), DBS-9 (600 to 440 mg/L), PMW-1 (13,000 to 12,000 mg/L), and MW-3 (16,000 to 14,000 mg/L) showed decreases in chloride concentrations. Monitor wells DBS-5 (140 mg/L) and MW-5 (1,500 mg/L) showed no change in chloride concentration. Currently, five of the ten wells sampled contain concentrations of chloride in excess of the NMWQCC standard of 250 mg/L (Table 2). Monitor well DBS-1 contained chloride concentrations in excess of the standard during the April 2009 and May 2011 sampling events prior to being destroyed sometime between the May 2011 and October 2011 sampling events.

The extent of the chloride groundwater plume in the former brine pond area remains bounded by the existing monitor well network. Monitor well PMW-1 (12,000 mg/L), located downgradient of the former brine pond, continues to show a chloride concentration in excess of the NMWQCC standard (Figure 4). The chloride concentration in the farthest downgradient well, DBS-4, remains below the standard.

The downgradient and cross-gradient extents of the chloride groundwater plume in the brine well area remains undefined. The farthest downgradient well, MW-5, and the northern-most cross-gradient well, DBS-6, contained chloride concentrations in excess of the NMWQCC standard (Figure 5). The chloride concentration in the upgradient monitor well, DBS-9, decreased from 600 to 440 mg/L since the last monitoring event in May 2011, but still exceeds the NMWQCC standard. DBS-9 was installed in a playa lake north of the brine well to determine potential impacts from documented releases that entered the playa in 2002 and 2005 (Figure 5).

5. RECOMMENDATIONS

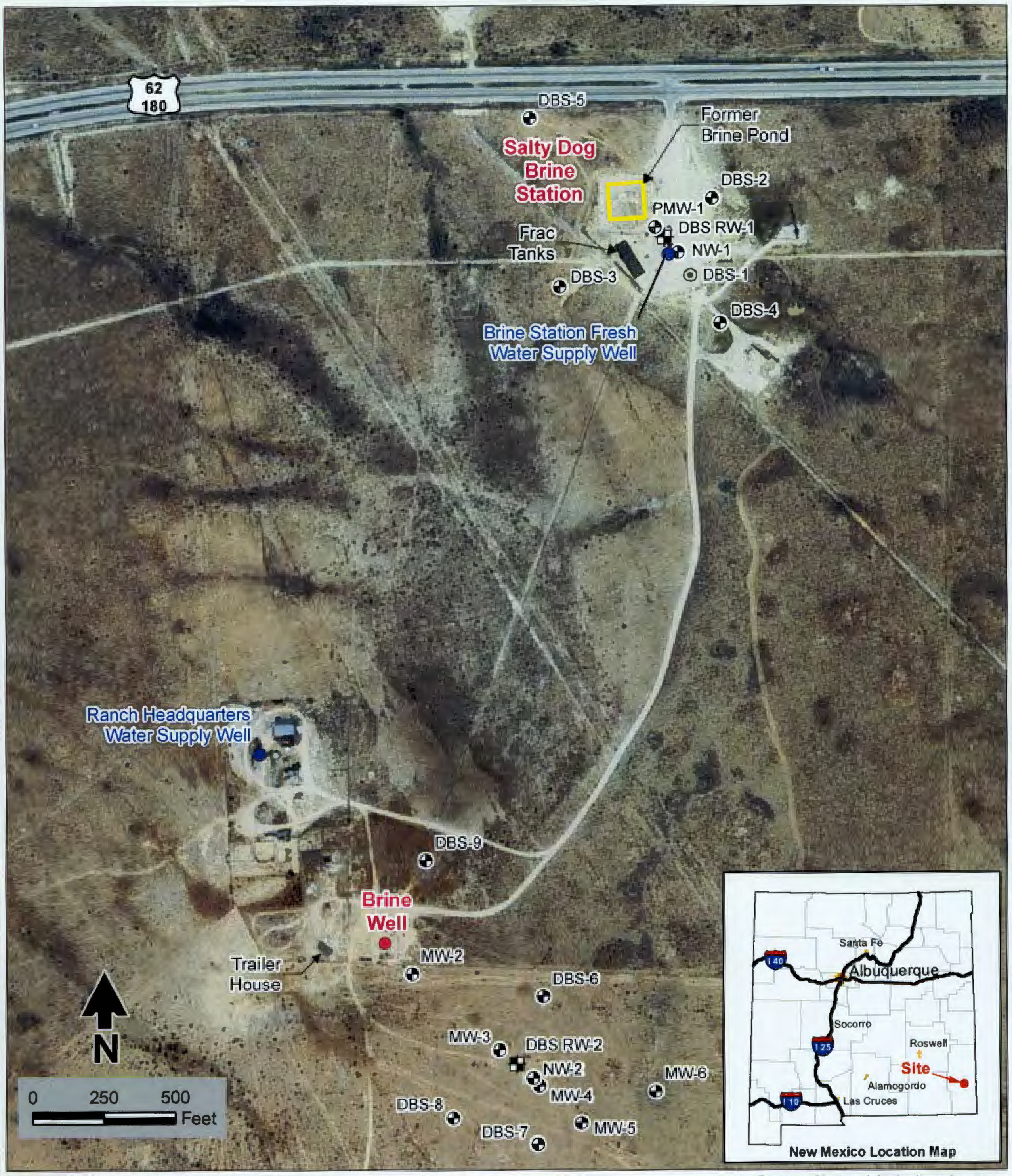
Based on the current groundwater monitoring results and trends in chloride concentrations, DBS&A recommends the following:

- Continue quarterly groundwater sampling to monitor chloride contaminant concentration trends in site wells.

- Redrill and install a replacement monitor well for DBS-1, which was destroyed (likely by truck traffic from brine filling operations) sometime between the last sampling event in May 2011 and this sampling event in October 2011.

- Begin active remediation of the chloride groundwater plumes at the former brine pond and brine well areas to control plume migration and reduce chloride concentrations in groundwater to less than the 250 mg/L NMWQCC standard.

Figures



Explanation

- Water supply well
- Monitor well
- Recovery well
- Well destroyed

Source: National Agriculture Imagery Program (NAIP), dated May 13, 2009

SALTY DOG BRINE STATION

Site Location Map

Daniel B. Stephens & Associates, Inc.

10/13/2011

JN ES08.0118.01

Figure 1

Path: S:\Projects\ES08.0118.01_Salty_Dog_Inc\GIS\MXDs\Site_location_map.mxd

Explanation

DBS-2	Well designation
3754.63	Groundwater elevation, ft msl

- ● Groundwater elevation (ft msl)
- ⦿ Well destroyed
- — Potentiometric surface elevation contour (ft msl)

Source: National Agriculture Imagery Program (NAIP), dated May 13, 2009

SALTY DOG BRINE STATION

Former Brine Pond Area
Potentiometric Surface Elevations
October 4, 2011

Daniel B. Stephens & Associates, Inc.
10/12/2011 JN ES08.0118.01

Figure 2

Path: S:\Projects\ES08.0118.01_Salty_Dog_Inc\GIS\MXDs\Fluid_levels\GWE_20111004_brine_station.mxd

Explanation

MW-5 Well designation
3747.24 Groundwater elevation, ft msl

Groundwater elevation (ft msl)

Potentiometric surface elevation contour (ft msl)

Source: National Agriculture Imagery Program (NAIP), dated May 13, 2009

SALTY DOG BRINE STATION

Playa Lake and Brine Well Area Potentiometric Surface Elevations October 4, 2011

Daniel B. Stephens & Associates, Inc.
10/12/2011 JN ES08.0118.01

Figure 3

Path: S:\Projects\ES08.0118.01_Salty_Dog_Inc\GIS\MXDs\Fluid_levels\GWE_20111004_brine_well.mxd

Explanation

DBS-5	Well designation
140	Chloride concentration (mg/L)
●	Monitor well location
◉	Well destroyed

BOLD indicates concentration equal to or greater than the NMWQCC standard.
NS = Not sampled

Source: National Agriculture Imagery Program (NAIP), dated May 13, 2009

SALTY DOG BRINE STATION

Former Brine Pond Area
Chloride Concentrations in Groundwater
October 5, 2011

Daniel B. Stephens & Associates, Inc.
10/12/2011 JN ES08.0118.01

Figure 4

Path: S:\Projects\ES08.0118.01_Salty_Dog_Inc\GIS\MXDs\Analytical_results\cl_gw_20111105_brine_station.mxd

Explanation

MW-5 Well designation

1,500 Chloride concentration (mg/L)

Monitor well location

BOLD indicates concentration equal to or greater than the NMWQCC standard.

NS = Not sampled

Source: National Agriculture Imagery Program (NAIP), dated May 13, 2009

SALTY DOG BRINE STATION

Playa Lake and Brine Well Area
Chloride Concentrations in Groundwater
October 5, 2011

Daniel B. Stephens & Associates, Inc.
10/12/2011 JN ES08.0118.01

Figure 5

Path: S:\Projects\ES08.0118.01_Salty_Dog_Inc\GIS\MXDs\Analytical_results\cl_gw_20111005_brine_well.mxd

Tables

Table 1. Summary of Historical Fluid Level Measurements
Salty Dog Brine Station, Lea County, New Mexico
Page 1 of 2

Monitor Well	Screen Interval (ft bgs)	Top of Casing Elevation[a] (ft msl)	Date Measured	Depth to Water (ft btoc)	Groundwater Elevation (ft msl)
DBS-1	56.0-76.0	3817.09	04/08/09	62.38	3754.71
			05/11/11	64.70	3752.39
			10/04/11	Well destroyed	
DBS-2	58.0-78.0	3820.50	04/08/09	65.45	3755.05
			05/11/11	66.80	3753.70
			10/04/11	65.87	3754.63
DBS-3	56.0-76.72	3816.66	04/08/09	60.67	3755.99
			05/11/11	61.25	3755.41
			10/04/11	61.25	3755.41
DBS-4	56.0-76.0	3820.37	04/08/09	66.27	3754.10
			05/11/11	67.23	3753.14
			10/04/11	66.67	3753.70
DBS-5	56.9-76.9	3820.66	04/08/09	62.99	3757.67
			05/11/11	63.45	3757.21
			10/04/11	63.41	3757.25
DBS-6	56.7-76.7	3812.65	04/07/09	62.75	3749.90
			05/11/11	63.11	3749.54
			10/04/11	63.16	3749.49
DBS-7	55.1-75.1	3810.21	04/07/09	61.74	3748.47
DBS-8	55.2-75.2	3810.70	04/07/09	61.20	3749.50
			05/11/11	61.67	3749.03
			10/04/11	61.71	3748.99
DBS-9	48.0-68.0	3806.26	04/08/09	53.93	3752.33
			05/11/11	54.39	3751.87
			10/04/11	54.59	3751.67
NW-1 (s)	52.95-72.95	3817.33	04/08/09	62.35	3754.98
NW-1 (m)	99.31-119.31	3817.35	04/08/09	62.25	3755.10
NW-1 (d)	149.45-169.45	3817.35	04/08/09	62.04	3755.31
NW-2 (s)	53.35-73.35	3812.50	04/08/09	63.08	3749.42

[a] Top of casing elevations surveyed by Pettigrew & Assoc. on May 28, 2009.

ft bgs	= Feet below ground surface	ft btoc	= Feet below top of casing
ft msl	= Feet above mean sea level	NA	= Not available

Table 1. Summary of Historical Fluid Level Measurements
Salty Dog Brine Station, Lea County, New Mexico
Page 2 of 2

Monitor Well	Screen Interval (ft bgs)	Top of Casing Elevation[a] (ft msl)	Date Measured	Depth to Water (ft btoc)	Groundwater Elevation (ft msl)
NW-2 (m)	93.72-113.72	3812.45	04/08/09	63.27	3749.18
NW-2 (d)	126.87-146.87	3812.46	04/08/09	66.41	3746.05
PMW-1	63-78	3821.17	06/23/08	67.51	3753.66
			04/08/09	65.97	3755.20
			05/11/11	68.70	3752.47
			10/04/11	66.95	3754.22
MW-1	120-140	NA	06/23/08	59.90	NA
MW-2	127-147	3812.68	06/23/08	61.42	3751.26
			04/07/09	61.65	3751.03
MW-3	NA	3812.05	06/23/08	62.06	3749.99
			04/07/09	62.02	3750.03
			05/11/11	62.91	3749.14
			10/04/11	62.91	3749.14
MW-4	111-131	3811.33	06/23/08	62.12	3749.21
			04/07/09	62.51	3748.82
MW-5	112-132	3808.96	06/23/08	60.60	3748.36
			04/07/09	60.79	3748.17
			05/11/11	61.17	3747.79
			10/04/11	61.72	3747.24
MW-6	NA	3810.17	06/23/08	62.17	3748.00
			04/07/09	62.41	3747.76

[a] Top of casing elevations surveyed by Pettigrew & Assoc. on May 28, 2009.

ft bgs = Feet below ground surface
ft btoc = Feet below top of casing
ft msl = Feet above mean sea level
NA = Not available

Table 2. Summary of Chloride Groundwater Analytical Data
Salty Dog Brine Station, Lea County, New Mexico

Monitor Well	Date	Chloride Concentration (mg/L) [a]
New Mexico Water Quality Control Commission Standard		*250*
DBS-1	04/08/09	**320**
	05/12/11	**940**
DBS-2	04/08/09	14
	05/12/11	25
	10/05/11	18
DBS-3	04/08/09	36
	05/12/11	35
	10/05/11	34
DBS-4	04/08/09	38
	05/12/11	33
	10/05/11	32
DBS-5	04/08/09	65
	05/12/11	140
	10/05/11	140
DBS-6	04/07/09	**380**
	05/12/11	**410**
	10/05/11	**400**
DBS-7	04/07/08	**570**
DBS-8	04/07/09	58
	05/12/11	36
	10/05/11	140
DBS-9	04/08/09	210
	05/12/11	**600**
	10/05/11	**440**
NW-1s	04/08/09	**630**
NW-1m	04/08/09	57
NW-1d	04/08/09	38
NW-2s	04/08/09	**410**
NW-2m	04/08/09	**570**
NW-2d	04/08/09	**4,700**
PMW-1	02/27/08	**9,500** [b]

Bold indicates concentrations that exceed the applicable standard.

[a] All samples analyzed in accordance to EPA method 300.0, unless otherwise noted.

[b] Samples analyzed in accordance to Standard Method 4500-Cl B.

mg/L = Milligrams per liter

Table 2. Summary of Chloride Groundwater Analytical Data
Salty Dog Brine Station, Lea County, New Mexico

Monitor Well	Date	Chloride Concentration (mg/L) [a]
New Mexico Water Quality Control Commission Standard		*250*
PMW-1 (cont.)	05/30/08	**8,600** [b]
	06/23/08	**12,700**
	04/08/09	**11,000**
	05/12/11	**13,000**
	10/05/11	**12,000**
MW-1	05/30/08	75 [b]
	06/23/08	243
MW-2	02/27/08	120 [b]
	05/30/08	80 [b]
	06/23/08	**1,480**
	04/07/09	**1,200**
MW-3	02/27/08	**348** [b]
	05/30/08	**360** [b]
	06/23/08	**1,090**
	04/07/09	**17,000**
	05/12/11	**16,000**
	10/05/11	**14,000**
MW-4	02/27/08	**476** [b]
	05/30/08	**512** [b]
	06/23/08	**5,730**
	04/07/09	**6,600**
MW-5	02/27/08	**1,280** [b]
	05/30/08	**1,220** [b]
	06/23/08	**1,260**
	04/07/09	**1,300**
	05/12/11	**1,500**
	10/05/11	**1,500**
MW-6	02/27/08	32 [b]
	05/30/08	36 [b]
	06/23/08	31.4
	04/07/09	25

Bold indicates concentrations that exceed the applicable standard.

[a] All samples analyzed in accordance to EPA method 300.0, unless otherwise noted.

[b] Samples analyzed in accordance to Standard Method 4500-Cl B.

mg/L = Milligrams per liter

Table 2. Summary of Chloride Groundwater Analytical Data
Salty Dog Brine Station, Lea County, New Mexico
Page 3 of 3

Monitor Well	Date	Chloride Concentration (mg/L) [a]
New Mexico Water Quality Control Commission Standard		*250*
Ranch Headquarters Supply Well	06/23/08	35.4
Brine Station Fresh Water Supply Well	02/27/08	**630** [b]
	05/30/08	**590** [b]
	06/23/08	**650**

Bold indicates concentrations that exceed the applicable standard.

[a] All samples analyzed in accordance with EPA method 300.0, unless otherwise noted.

[b] Samples analyzed in accordance with Standard Method 4500-Cl B.

mg/L = Milligrams per liter

Appendices

Appendix 1

Laboratory Reports

HALL ENVIRONMENTAL ANALYSIS LABORATORY

COVER LETTER

Wednesday, October 12, 2011

Mike McVey
Daniel B. Stephens & Assoc.
6020 Academy NE Suite 100
Albuquerque, NM 87109

TEL: (505) 822-9400
FAX (505) 822-8877

RE: Salty Dog

Order No.: 1110357

Dear Mike McVey:

Hall Environmental Analysis Laboratory, Inc. received 10 sample(s) on 10/6/2011 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent. Below is a list of our accreditations. To access our accredited tests please go to www.hallenvironmental.com or the state specific web sites. See the sample checklist and/or the Chain of Custody for information regarding the sample receipt temperature and preservation. Data qualifiers or a narrative will be provided if the sample analysis or analytical quality control parameters require a flag. All samples are reported as received unless otherwise indicated.

Please do not hesitate to contact HEAL for any additional information or clarifications.

Sincerely,

Andy Freeman, Laboratory Manager

NM Lab # NM9425 NM0901
AZ license # AZ0682

Hall Environmental Analysis Laboratory, Inc.

Date: *12-Oct-11*

CLIENT: Daniel B. Stephens & Assoc. **Lab Order:** 1110357
Project: Salty Dog

Lab ID: 1110357-01 **Collection Date:** 10/5/2011 10:05:00 AM
Client Sample ID: PMW1 **Matrix:** AQUEOUS

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: **SRM**
Chloride	12000	500		mg/L	1000	10/11/2011 4:16:07 AM

Lab ID: 1110357-02 **Collection Date:** 10/5/2011 10:55:00 AM
Client Sample ID: DBS5 **Matrix:** AQUEOUS

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: **SRM**
Chloride	140	10		mg/L	20	10/7/2011 7:05:22 AM

Lab ID: 1110357-03 **Collection Date:** 10/5/2011 11:28:00 AM
Client Sample ID: DBS2 **Matrix:** AQUEOUS

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: **SRM**
Chloride	18	0.50		mg/L	1	10/7/2011 8:15:02 AM

Lab ID: 1110357-04 **Collection Date:** 10/5/2011 12:11:00 PM
Client Sample ID: DBS4 **Matrix:** AQUEOUS

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: **SRM**
Chloride	32	10		mg/L	20	10/7/2011 9:07:15 AM

Lab ID: 1110357-05 **Collection Date:** 10/5/2011 12:50:00 PM
Client Sample ID: DBS3 **Matrix:** AQUEOUS

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: **SRM**
Chloride	34	10		mg/L	20	10/7/2011 9:42:04 AM

Lab ID: 1110357-06 **Collection Date:** 10/5/2011 1:29:00 PM
Client Sample ID: DBS9 **Matrix:** AQUEOUS

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: **SRM**
Chloride	440	25		mg/L	50	10/11/2011 6:00:37 AM

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
E	Estimated value	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	MCL	Maximum Contaminant Level
NC	Non-Chlorinated	ND	Not Detected at the Reporting Limit
PQL	Practical Quantitation Limit	S	Spike recovery outside accepted recovery limits

Hall Environmental Analysis Laboratory, Inc.

Date: *12-Oct-11*

CLIENT:	Daniel B. Stephens & Assoc.	**Lab Order:**	1110357
Project:	Salty Dog		

Lab ID:	1110357-07	**Collection Date:**	10/5/2011 3:42:00 PM
Client Sample ID:	MW3	**Matrix:**	AQUEOUS

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: **SRM**
Chloride	14000	2500		mg/L	5000	10/11/2011 5:08:23 AM

Lab ID:	1110357-08	**Collection Date:**	10/5/2011 5:37:00 PM
Client Sample ID:	DBS6	**Matrix:**	AQUEOUS

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: **SRM**
Chloride	400	25		mg/L	50	10/11/2011 5:25:47 AM

Lab ID:	1110357-09	**Collection Date:**	10/5/2011 6:23:00 PM
Client Sample ID:	MW5	**Matrix:**	AQUEOUS

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: **SRM**
Chloride	1500	100		mg/L	200	10/11/2011 5:43:12 AM

Lab ID:	1110357-10	**Collection Date:**	10/5/2011 6:54:00 PM
Client Sample ID:	DBS8	**Matrix:**	AQUEOUS

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: **SRM**
Chloride	140	10		mg/L	20	10/7/2011 1:11:02 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
E	Estimated value	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	MCL	Maximum Contaminant Level
NC	Non-Chlorinated	ND	Not Detected at the Reporting Limit
PQL	Practical Quantitation Limit	S	Spike recovery outside accepted recovery limits

QA/QC SUMMARY REPORT

Client: Daniel B. Stephens & Assoc.
Project: Salty Dog
Work Order: 1110357

Analyte	Result	Units	PQL	SPK Va	SPK ref	%Rec	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Method: EPA Method 300.0: Anions											
Sample ID: MB		*MBLK*				Batch ID:	**R48269**	Analysis Date:	10/6/2011 11:21:14 AM		
Chloride	ND	mg/L	0.50								
Sample ID: MB		*MBLK*				Batch ID:	**R48269**	Analysis Date:	10/7/2011 5:03:29 AM		
Chloride	ND	mg/L	0.50								
Sample ID: MB		*MBLK*				Batch ID:	**R48312**	Analysis Date:	10/10/2011 11:43:50 AM		
Chloride	ND	mg/L	0.50								
Sample ID: LCS		*LCS*				Batch ID:	**R48269**	Analysis Date:	10/6/2011 11:38:39 AM		
Chloride	4.999	mg/L	0.50	5	0	100	90	110			
Sample ID: LCS		*LCS*				Batch ID:	**R48269**	Analysis Date:	10/7/2011 5:20:54 AM		
Chloride	5.026	mg/L	0.50	5	0	101	90	110			
Sample ID: LCS		*LCS*				Batch ID:	**R48312**	Analysis Date:	10/10/2011 12:01:14 PM		
Chloride	4.982	mg/L	0.50	5	0	99.6	90	110			

Qualifiers:

E	Estimated value	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	NC	Non-Chlorinated
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits

Hall Environmental Analysis Laboratory, Inc.

Sample Receipt Checklist

Client Name DBS

Date Received: 10/6/2011

Work Order Number 1110357

Received by: AMG

Sample ID labels checked by: ________ Initials

Checklist completed by: ________ Signature 10/6/11 Date

Matrix:

Carrier name: Client drop-off

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐		
Custody seals intact on shipping container/cooler?	Yes ☐	No ☐	Not Present ☐	Not Shipped ☑	
Custody seals intact on sample bottles?	Yes ☐	No ☐	N/A ☑		
Chain of custody present?	Yes ☑	No ☐			
Chain of custody signed when relinquished and received?	Yes ☑	No ☐			
Chain of custody agrees with sample labels?	Yes ☑	No ☐			
Samples in proper container/bottle?	Yes ☑	No ☐			
Sample containers intact?	Yes ☑	No ☐			
Sufficient sample volume for indicated test?	Yes ☑	No ☐			
All samples received within holding time?	Yes ☑	No ☐			Number of preserved bottles checked for pH:
Water - VOA vials have zero headspace?	No VOA vials submitted ☑	Yes ☐	No ☐		
Water - Preservation labels on bottle and cap match?	Yes ☐	No ☐	N/A ☑		________
Water - pH acceptable upon receipt?	Yes ☐	No ☐	N/A ☑		*<2 >12 unless noted below.*
Container/Temp Blank temperature?	**2.3°**	*<6° C Acceptable* If given sufficient time to cool.			

COMMENTS:

Client contacted ________ Date contacted: ________ Person contacted ________

Contacted by: ________ Regarding: ________

Comments: ________

Corrective Action ________

Chain-of-Custody Record

Client: DBS+A

Mailing Address: 6020 Academy
Albuquerque NM 87109

Phone #: ~~505 228 0~~ 822-9400

email or Fax#: MMcVey@DBStephens.com

QA/QC Package:
☑ Standard ☐ Level 4 (Full Validation)

Accreditation
☑ NELAP ☐ Other ______

☑ EDD (Type) Excel

Turn-Around Time:
☑ Standard ☐ Rush ______

Project Name: Salty Dog

Project #: ES08.0118

Project Manager: Mike McVey

Sampler: M Nauck

On Ice: Yes No

Sample Temperature: 2.3

HALL ENVIRONMENTAL ANALYSIS LABORATORY

www.hallenvironmental.com

4901 Hawkins NE - Albuquerque, NM 87109

Tel. 505-345-3975 Fax 505-345-4107

Date	Time	Matrix	Sample Request ID	Container Type and #	Preservative Type	HEAL No.	BTEX + MTBE + TMB's (8021)	BTEX + MTBE + TPH (Gas only)	TPH Method 8015B (Gas/Diesel)	TPH (Method 418.1)	EDB (Method 504.1)	8310 (PNA or PAH)	RCRA 8 Metals	Anions (F,Cl,NO_3,NO_2,PO_4,SO_4)	8081 Pesticides / 8082 PCB's	8260B (VOA)	8270 (Semi-VOA)	Cl-				Air Bubbles (Y or N)
10/5	1005	Water	PMW1	Poly	None	1110357-1												✓				
	1055		DBS5			2												✓				
	1128		DBS2			3												✓				
	1211		DBS4			4												✓				
	1250		DBS3			5												✓				
	1329		DBS9			6												✓				
	1542		MW3			7												✓				
	1737		DBS6			8												✓				
	1823		MW5			9												✓				
	1854		DBS8			10												✓				

Date:	Time:	Relinquished by:	Received by:	Date	Time
10/6/11	1230	[signature]	[signature]	10/6/11	1230
Date:	Time:	Relinquished by:	Received by:	Date	Time

Remarks:

If necessary, samples submitted to Hall Environmental may be subcontracted to other accredited laboratories. This serves as notice of this possibility. Any sub-contracted data will be clearly notated on the analytical report.

Appendix 2

Field Notes

10/~~4~~/11

MV

1300 Onsite at SaltyDog Brine Station
Gauge Wells to be sampled for Cl⁻

Well	DTW	TD	~~SO~~ MV
PMW-1	66.95	79.46	~~2.6~~ MV
DBS2	65.87	78.21	
DBS 5	63.41	78.16	
DBS 3	61.25	78.17	
DBS4	66.67	80.06	
DBS1	~~Appears Pd[illegible]~~	destroyed MV 10/10/11	
DBS9	54.59	70.77	
DBS6	63.16	77.71	
DBS8	61.71	74.65	
MW3	62.91	147.04	
~~DBS5~~ MW5	61.72	130.10	

1610 Contact M. McVey about DBS-1. Send photos to email

1630 M. McVey calls w/ J. Bunch saying DBS4's vault seems to have been moved.

1640 Attempt to move vault by hand. Vault is loose, but too heavy to move by hand.

1645 M. Mauck offsite

M. Mauck 10/4/11

10/~~4~~5/11

MV

0730 Onsite at PMW-1. Begin setting up for sampling

0745 Calibrate YSI 63 S/N 08E 1014 19

pH	T°C	SpC (µS/cm)
7.01	22.6	NA
9.92	22.6	
4.07	22.6	

0800 Offsite for supplies

0907 Resume set up on PMW-1

0940 Begin pumping

0949 Water to surface PMW-1 6.12 gal 3cv

Time	Vol (gal)	pH	T°C	SpC µS/cm	Comments
0950	0.0	6.67	22.0	30.0	Turb very milky
0953	3.0	6.78	19.8	176.1	slightly milk
0956	5.0	6.76	19.4	58.7	clear
0959	6.0	6.78	18.8	58.9	clear
1002	7.0	6.79	19.4	60.1	clear

1005 Collect sample PMW-1

1015 Set up on DBS-5 7.23 gal (3cv)

Time	Vol (gal)	pH	T°C	SpC µS/cm	Comments
1033	0.0	7.34	28.0	2010	slightly milky
1036	3.1	7.00	24.5	1619	"
1039	5.0	6.99	23.5	1345	"
1042	6.3	6.99	23.4	~~2.0~~ 1380	clear
1045	7.2	7.00	22.8	~~2.0~~ 1376	clear
1048	9.0	7.02	23.6	~~NA~~ 1399	clear

30
10/5/11 MV

1055 Collect sample + FD at DBS5

1108 Set up on DBS2 6.03 gal 3CV

Time	Vol(gal)	pH	T°C	SpC $\frac{uS}{cm}$	Comments
1115	1.3	7.36	20.8	226.8	milky Brown
1118	3.0	7.46	20.1	435.4	"
1121	4.3	7.31	19.9	433.0	milky white
1124	5.9	7.31	19.9	428.3	"
1127	7.5	7.35	19.9	434.6	"

1128 Collect Sample at DBS2

1140 Set up on DBS4 6.54 gal (3CV)

Time	Vol(gal)	pH	T°C	SpC $\frac{uS}{cm}$	Comments
1155	0.0	7.60	22.6	252.0	milky Brown
1158	1.8	7.57	20.5	344.4	"
1201	3.7	7.44	20.6	487.0	clear
1204	5.8	7.44	20.5	241.8	clear
1207	8.0	7.42	20.3	231.0	Clear
1210	9.3	7.41	20.4	233.6	

1211 Collect Sample DBS4

1220 Setup at DBS3 8.28 gal (3CV)

Time	Vol(gal)	pH	T°C	SpC $\frac{uS}{cm}$	Comments
1236	0.0	7.47	22.0	263.0	milky brown
1239	3.0	7.39	20.8	272.9	milky white
1242	4.0	7.37	20.5	579.0	clear
1245	7.9	7.31	20.5	540.6	clear
1248	9.1	7.34	20.4	536.5	clear

31
10/5/11 MV

1250 Collect sample DBS3

1301 Set up on DBS9 7.92 gal (3CV)

Time	Vol(gal)	pH	T°C	SpC $\frac{uS}{cm}$	Comments
1315	0.0	7.02	22.0	3130	milky Brown
1318	2.5	7.01	19.7	2422	milky white
1321	~~5.~~ 4.5 MV	7.01	19.8	2151	"
1324	7.0	6.98	19.6	2064	clear
1327	~~8.~~ 9.3 MV	7.00	19.5	2107	clear

1350 Offsite for lunch

1440 Set up on ~~NW~~ MV MW3 41.37 gal (cv3)

Time	Vol (gal)	pH	T°C	SpC($\frac{uS}{cm}$)	comments
1506	0.0	6.92	24.1	8.64 mS	clear
1509	3.8	6.83	20.7	8.01 mS	clear
1512	7.1	6.83	20.2	7.76 mS	"
1515	10.0	6.73	20.0	10.12 mS	"
1518	14.3	6.41	19.8	25.42 mS	"
1521	17.8	6.43	19.7	28.61 mS	"
1524	21.4	6.45	19.5	28.95 mS	"
1527	25.0	6.44	19.6	20.06 mS	"
1530	29.0	6.47	19.4	30.25 mS	"
1533	33.3	6.42	19.7	30.93 mS	"
1536	36.5	6.43	19.7	31.51 mS	"
1539	~~42.0~~ 40.0 MV	6.46	19.4	31.09	"
1541	42.8	6.45	19.4	31.57	

1542 Collect MW3 sample

32
10/5/11
MN

1557 Set up on MW5 33.45 gal (3cv)

Time	Vol(gal)	pH	T °C	SpC uS/cm	Comments
1630	Pump does not seem to be pumping				
1655	Set up on DBS6				
1705	Replace pump motor				
~~1726~~					

Time	Vol	pH	T°C	SpC	Comments
1726	0.0	6.92	22.5	1274	Milky Brown
1729	3.0	7.14	19.9	1519	clear
1732	5.5	6.96	19.5	1591	Clear
1735	7.5	6.94	19.5	1597	clear

1737 Collect sample DBS6
1740 Set up on MW5 33.45 gal (3cv)

Time	Vol(gal)	pH	T °C	SpC uS/cm	Comments
1757	0.0	7.20	20.5	2573	Clear
1800	~~3.1~~ 4.1 MN	6.97	19.7	2928	clear
1803	8.3	6.91	19.3	3738	clear
1806	12.5	6.86	19.3	3826	clear
1809	17.0	6.87	19.3	3964	"
1812	21.5	6.86	19.4	3944	"
1815	25.5	6.86	19.3	3945	"
1818	29.8	6.86	19.3	3954	"
1821	34.3	6.97	19.1	3923	"

1823 Collect sample MW5
1831 Set up on DBS8 6.33 gal (3cv)

33
10/5/11
MN

Time	Vol(gal)	pH	T °C	SpC uS/cm	Comments
1841	0.0	7.38	21.0	824	Milky Brown
1844	2.3	7.26	19.7	783	Milky white
1847	4.3	7.17	19.5	755	clear
1850	6.4	7.17	19.4	730	"
1853	8.4	7.16	19.6	736	"

1854 Collect sample DBS8
1910 Offsite

MN 10/5/11

November 9, 2016

Dr. Tomas Oberding
New Mexico Oil Conservation Division
Environmental Bureau
1220 South St. Francis Drive
Santa Fe, New Mexico 87505-4225

Re: Third Quarter 2016 Groundwater Monitoring and O&M Report, Salty Dog Brine Station

Dear Dr. Oberding:

On behalf of PAB Services, Inc., Daniel B. Stephens & Associates, Inc. (DBS&A) is pleased to submit the enclosed groundwater monitoring and operation and maintenance (O&M) report for the Salty Dog brine station located in Lea County, New Mexico. The report documents results of third quarter 2016 groundwater monitoring activities completed at the site on September 13 and 14, 2016, as well as groundwater extraction system O&M information.

Please note that we recommend reducing the monitoring and reporting frequency from quarterly to semiannually. We are seeking your approval for this reduction and will continue quarterly monitoring and reporting until we receive that approval. The Settlement Agreement & Stipulated Revised Final Oder NM-OCD 2008-2A allows Salty Dog to request that the monitoring schedule be reduced. This is stipulated on page 15 under subsection f.vi of item 15. We respectively request the reduction on behalf of Salty Dog for the reasons described in the report.

Please do not hesitate to call us at (505) 822-9400 if you have any questions or require additional information.

Sincerely,

DANIEL B. STEPHENS & ASSOCIATES, INC.

John Ayarbe, P.G.
Senior Hydrogeologist

Michael D. McVey, P.G.
Senior Hydrogeologist

JA/MDM/rpf
Enclosure
cc: Pieter Bergstein, PAB Services, Inc.
Jim Sayre, Salty Dog, Inc.

Third Quarter 2016
Groundwater Monitoring and
O&M Report

Salty Dog Brine Station

Lea County, New Mexico

Prepared for **New Mexico Energy, Minerals and Natural Resources Department Oil Conservation Division**

November 9, 2016

Daniel B. Stephens & Associates, Inc.

6020 Academy NE, Suite 100 • Albuquerque, New Mexico 87109

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Appendix

Third Quarter 2016 Groundwater Monitoring and O&M Report
Salty Dog Brine Station, Lea County, New Mexico

1. Introduction

Daniel B. Stephens & Associates, Inc. (DBS&A) has prepared this groundwater monitoring and operations and maintenance (O&M) report for submission to the New Mexico Energy, Minerals and Natural Resources Department Oil Conservation Division (OCD) Environmental Bureau on behalf of PAB Services, Inc. (PAB) for the Salty Dog brine station (the site) located in Lea County, New Mexico (Figure 1). The report summarizes activities conducted at the site on September 13 and 14, 2016.

The site consists of a northern portion, where the brine pond was located prior to closure in October 2008, and a southern portion, where the brine well is located. The brine pond area and the brine well area are separated by approximately 2,500 feet, joined by a dirt road (Figure 1). Injection water for the brine well comes from two fresh water supply wells (FWS-1 and FWS-2) and remedial pumping at recovery wells in both the former brine pond area (RW-1) and brine well area (RW-2). Groundwater extraction at RW-1 is limited due to pumping from FWS-1. However, pumping at FWS-1 provides hydraulic containment and removal of chloride-impacted groundwater in the former brine pond area.

Brine that is produced for sale is stored at a tank battery on the southern boundary of the former brine pond area. The tank battery consists of six 750-barrel aboveground storage tanks (ASTs) surrounded by a berm. A concrete truck loading pad with two brine filling stations is located north of the tank battery. An operations shed is located adjacent to the loading pad to the west.

Six monitor wells (PMW-1, DBS-1R, and DBS-2 through DBS-5), one nested well (NW-1), one fresh water supply well (FWS-1), and one recovery well (RW-1) are located in the former brine pond area. Nine monitor wells (MW-2 through MW-6, DBS-6 through DBS-9), one nested well (NW-2), one fresh water supply well (FWS-2), and one recovery well (RW-2) are located in the brine well area (Figure 1).

DBS&A installed groundwater extraction systems at the site in early April 2012 to provide hydraulic containment and removal of chloride-impacted groundwater in the former brine pond and brine well areas. The extraction systems consist of submersible pumps, conveyance lines, electrical power, and controls to extract impacted groundwater from the recovery wells. Extracted groundwater is conveyed to the on-site ASTs for reinjection at the brine well.

2. Scope of Work

The scope of work for groundwater monitoring consisted of (1) measuring fluid levels in and collecting groundwater samples from 11 monitor wells, and (2) performing maintenance on the groundwater extraction systems, as necessary. Groundwater samples were submitted to Hall Environmental Analysis Laboratory (HEAL) in Albuquerque, New Mexico for chloride analysis using U.S. Environmental Protection Agency (EPA) method 300.0. The monitor wells included in the quarterly sampling were selected in consultation with Jim Griswold on October 4, 2010; Mr. Griswold was the OCD Project Manager for the site at that time. The selected monitor wells are shown in Figures 2 through 5.

3. Monitoring Activities

3.1 Fluid Level Measurement

On September 13, 2016, DBS&A measured water levels in monitor wells DBS-1R, DBS-2 through DBS-5, and PMW-1 in the former brine pond area (Figure 2) and DBS-6, DBS-8, DBS-9, MW-3, and MW-5 in the brine well area (Figure 3) using a properly decontaminated electronic water level meter. Table 1 reports water level measurements and groundwater elevations.

During this monitoring event, the average depths to water beneath the former brine pond area and brine well area were 68.3 feet below ground surface (bgs) and 63.2 feet bgs, respectively. On average, water levels in the former brine pond area declined by approximately 0.9 foot since the last monitoring event in June 2016, while water levels in the brine well area declined by 0.4 foot.

Figures 2 and 3 present potentiometric surface maps for the former brine pond area and the brine well area, respectively. The direction of groundwater flow beneath the former brine pond area remains to the southeast at a gradient of approximately 0.006 foot per foot (ft/ft) (Figure 2)—increasing slightly since the previous monitoring event. A broad cone of depression was observed in the vicinity of the fresh water supply well (FWS-1) due to increased fresh water production when depth to water level measurements were recorded. The direction of groundwater flow beneath the brine well area remains to the southeast at a gradient of approximately 0.004 ft/ft (Figure 3)—decreasing slightly relative to the previous monitoring event.

3.2 Groundwater Sampling

On September 14, 2016, groundwater samples were collected from monitor wells DBS-1R, DBS-2 through DBS-6, DBS-8, DBS-9, MW-3, MW-5, and PMW-1 following standard sampling procedures developed from EPA guidance. Before sampling, each well was purged of a minimum of three casing volumes using a submersible pump so that a representative groundwater sample was collected. While purging, DBS&A measured water quality field parameters consisting of temperature, specific conductance, and pH. Samples were collected once three casing volumes were purged. Sample containers were then filled, labeled, and placed in an ice-filled cooler. Groundwater samples were submitted under chain of custody to HEAL for chloride analysis.

Samples of the brine well injection water and the produced brine were also collected to meet requirements under discharge permit BW-8. Analytical results of these samples will be reported in the 2016 Annual Class III Well Report.

4. Analytical Results

Table 2 summarizes chloride analytical results for the 11 groundwater samples. Figures 4 and 5 show the distribution of chloride in groundwater beneath the former brine pond area and the brine well area, respectively. The laboratory report and chain of custody documentation are provided in Appendix A. Field notes recorded during groundwater monitoring activities are provided in Appendix B.

4.1 Former Brine Pond Area Wells

Since the last monitoring event in June 2016, minor to no changes in chloride concentrations were observed at monitor wells DBS-2 through DBS-5 (Table 2). DBS-1R and PMW-1 continue to exhibit chloride concentrations above the New Mexico Water Quality Control Commission (NMWQCC) standard of 250 milligrams per liter (mg/L) (Figure 4). The chloride concentration at DBS-1R showed a slight decrease from 570 mg/L to 360 mg/L, while the concentration at PMW-1 increased slightly, from 8,500 mg/L to 9,300 mg/L.

The chloride plume in the former brine pond area remains bounded by the existing monitor well network (Figure 4). Pumping from PAB's fresh water supply well FSW-1 provides hydraulic containment of the chloride plume. The chloride concentration at downgradient monitor well DBS-4 remains below the NMWQCC standard, as do chloride concentrations at the two cross-gradient monitor wells, DBS-2 and DBS-3.

4.2 Brine Well Area Wells

Since the last monitoring event in June 2016, minor changes in chloride concentrations were observed at most of the monitor wells in the brine well area (Table 2). Monitor wells MW-3 (the well closest to extraction well RW-2), MW-5 (the farthest downgradient well), and DBS-6 (the northernmost cross-gradient well) continue to exhibit chloride concentrations above the NMWQCC standard (Figure 5). The chloride concentration at MW-3 decreased from 9,400 mg/L to 9,100 mg/L. The chloride concentration at MW-5 increased from 970 mg/L to 1,000 mg/L. The chloride concentration at DBS-6 decreased from 300 mg/L to 290 mg/L.

During previous monitoring events, monitor well DBS-9 (an upgradient monitor well) has exhibited chloride concentrations above the NMWQCC standard; however, during this reporting period, the chloride concentration at DBS-9 was 190 mg/L, below the NMWQCC standard

(Table 2). DBS-9 was installed in the playa located northeast of the brine well to help characterize groundwater impacts from documented releases in 2002 and 2005.

5. Groundwater Extraction System O&M

Remedial groundwater extraction in the former brine pond and brine well areas began in April 2012 by pumping from recovery wells RW-1 and RW-2. Extracted groundwater volumes at RW-1 and RW-2 are reported in Table 3.

Production from the fresh water supply well (FWS-1) also supports hydraulic containment and removal of chloride-impacted groundwater in the former brine pond area.

5.1 Former Brine Pond Area

Other than some brief shutdowns to address a few maintenance issues, the groundwater extraction system at RW-1 operated continually until approximately March 2015 (Table 3). Pumping from the nearby fresh water supply well (FWS-1) is inhibiting the effectiveness of RW-1 as an extraction well by lowering groundwater levels at this well. PAB attempted to set the pump at RW-1 to a deeper depth in the well so that pumping from RW-1 could continue, but the pump is already set near the bottom of the well. Although pumping from RW-1 has ceased, pumping at FWS-1 provides containment of the chloride plume in the former brine pond area. The average pumping rate at FWS-1 during the third quarter 2016 was approximately 5 gallons per minute (gpm).

Monitor wells DBS-1R and PMW-1 are the only wells that exhibit chloride concentrations above the NMWQCC standard. Pumping of the fresh water supply well is preventing the downgradient migration of the chloride groundwater plume; although the chloride concentrations in wells DBS-1R and PMW-1 remain elevated, they have decreased from historical highs (Table 2) and are expected to continue to decrease through time with continued pumping at the fresh water supply well. The chloride concentration at downgradient monitor well DBS-4 is well below the NMWQCC standard.

5.2 Brine Well Area

The groundwater extraction system at RW-2 has been operated continually since April 6, 2012 with the exception of addressing a few maintenance issues. A total of 18,453,822 gallons of chloride-impacted groundwater have been pumped from RW-2 (Table 3). Historically, pumping of recovery well RW-2 at flow rates of 2.5 to 4.3 gpm produced little drawdown in the brine well area. However, after increasing the average pumping rate to 66 gpm after the second quarter 2015 monitoring event (Table 3), a cone of depression became evident, thereby improving hydraulic containment and removal of the chloride plume.

The average pumping rate at RW-2 during this reporting period was approximately 6 gpm. A cone of depression was not observed during this monitoring event (Figure 3), although RW-2 was pumping at the time water level measurements were recorded.

The chloride plume remains undefined downgradient and cross-gradient to the north of the recovery well (RW-2). Since April 2009, chloride concentrations in the northernmost cross-gradient well (DBS-6) have fluctuated between 290 and 410 mg/L. Since February 2008, chloride concentrations in the downgradient well (MW-5) have fluctuated between 970 and 1,500 mg/L. The chloride concentration in monitor well MW-3, the well closest to the extraction well (RW-2), decreased by almost half between September and December 2015, but has been showing a slight rebound since that time (Table 2).

5.3 Facility and System Maintenance

On June 13, 2016 the pump at RW-2 was damaged during a lightning storm. Operations manager Jim Sayre promptly replaced the pump on June 15, 2016. The pump at FWS-2, upgradient from RW-2 (Figure 1), was also damaged and subsequently replaced.

5.4 Future Extraction System Operation

Pumping of the fresh water supply well (FWS-1) has lowered groundwater levels at RW-1, precluding groundwater extraction at this well. Pumping of FWS-1 provides hydraulic containment and removal of the chloride plume. Future monitoring data will be used to evaluate the effectiveness of FWS-1 in providing hydraulic containment and removal of chloride-impacted groundwater in the former brine pond area.

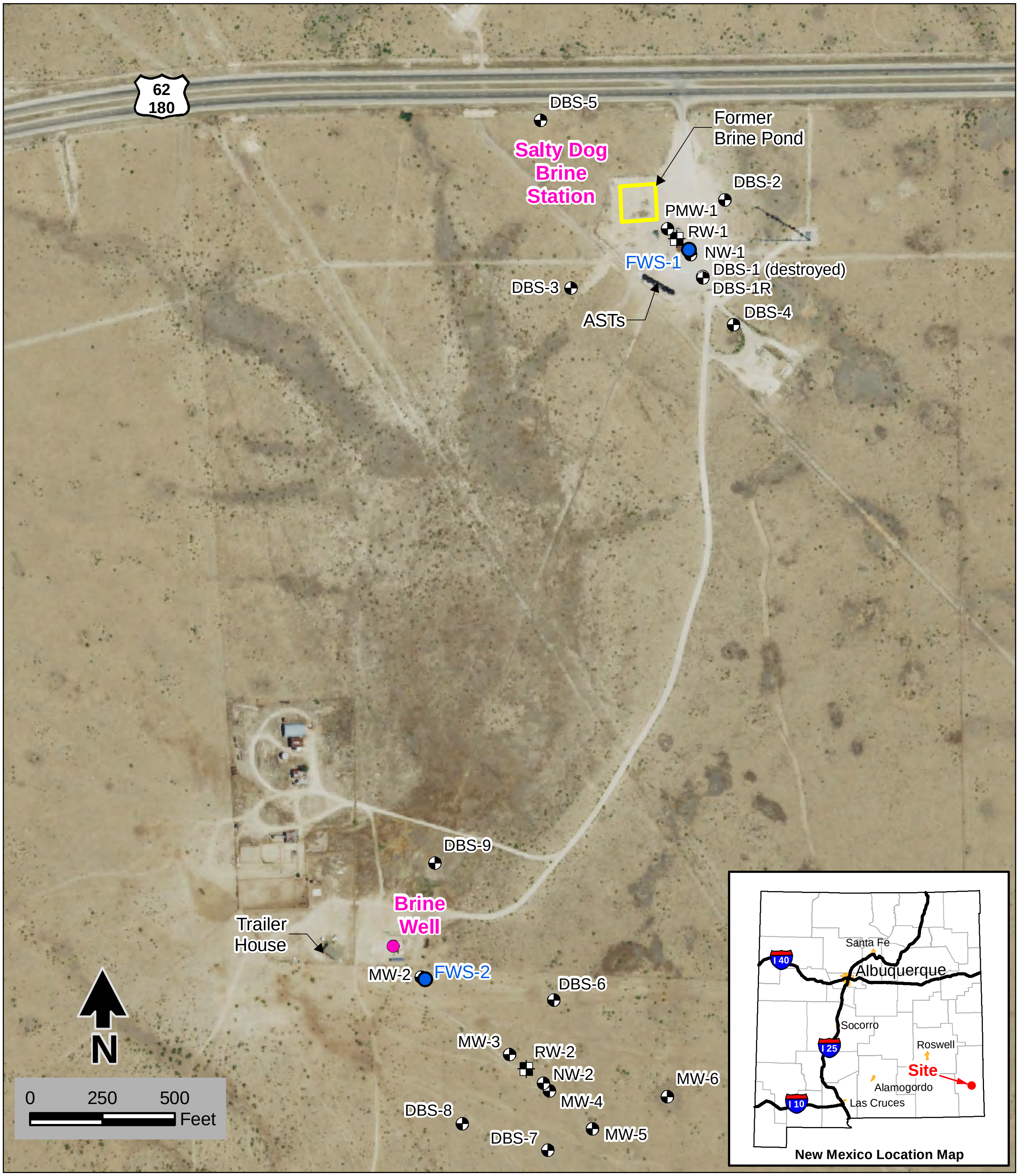
Pumping of extraction well RW-2 will continue. Increased pumping at RW-2 since the second quarter of 2015 provides improved hydraulic containment and removal of the chloride plume in the brine well area. Future monitoring data will be used to evaluate the effectiveness of RW-2 in providing hydraulic containment and removal of chloride-impacted groundwater in the former brine well area.

6. Recommendations

Based on the current groundwater monitoring results and site O&M activities, DBS&A has the following recommendations:

- Continue groundwater extraction at FWS-1 and RW-2 to provide hydraulic containment of the chloride plumes in the former brine pond area and brine well area, respectively.
- Reduce the monitoring and reporting frequency from quarterly to semiannually. Groundwater extraction from FWS-1 and RW-2 has shown continued containment of the chloride plume in both the former brine pond and brine well areas. Although chloride concentrations at monitor wells immediately adjacent to FWS-1 and RW-2 are elevated, chloride concentrations at the downgradient and cross-gradient monitor wells generally meet the NMWQCC standard and remain stable. Implementation of this recommendation requires OCD approval.

Figures



Note: AST = Aboveground storage tank

Source: National Agriculture Imagery Program (NAIP), May 10, 2014

Explanation

- Fresh water supply well
- Monitor well
- Recovery well
- Well destroyed

SALTY DOG BRINE STATION

Site Location Map

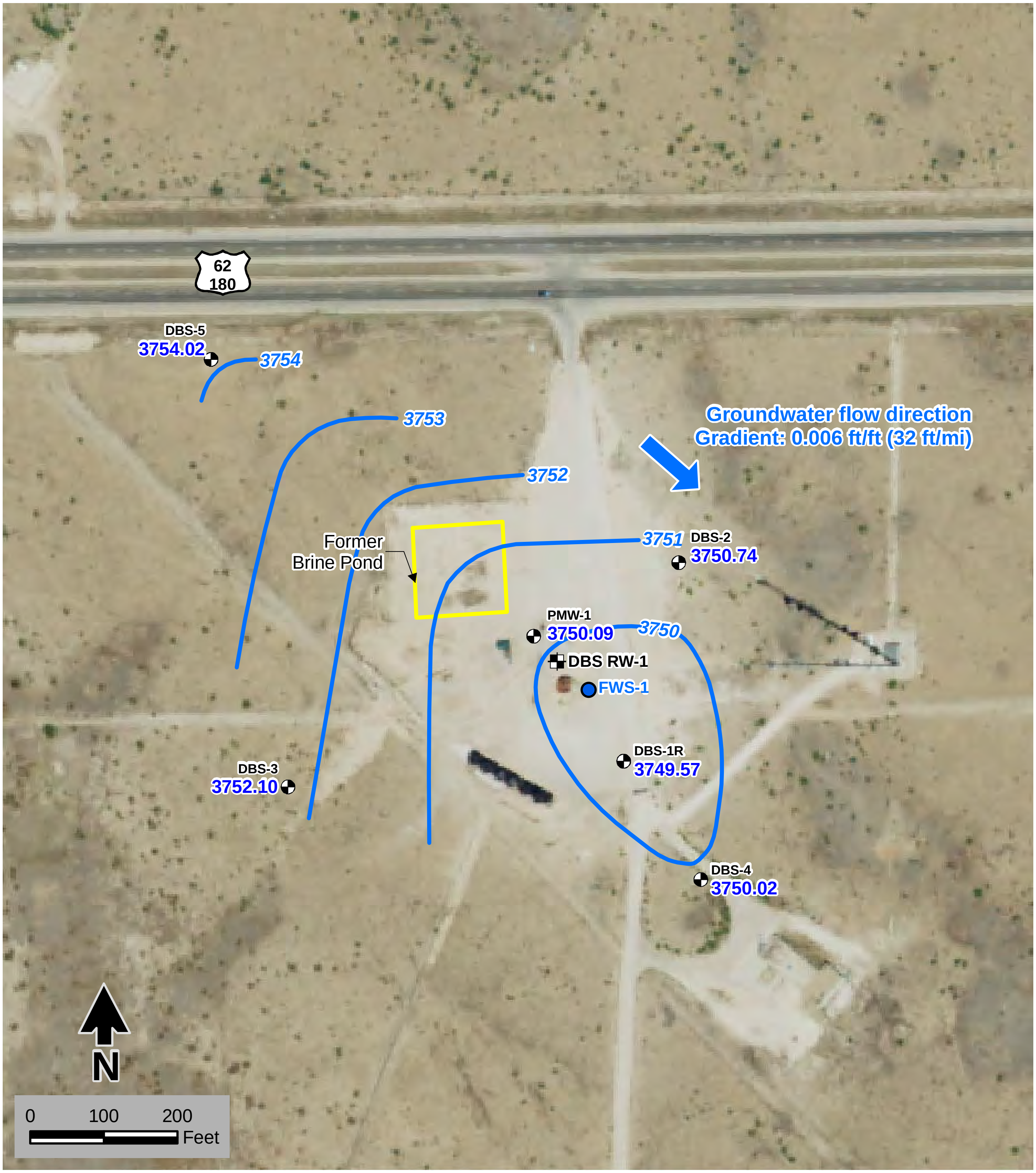
Daniel B. Stephens & Associates, Inc.

10/26/2016

JN ES08.0118.06

Figure 1

S:\PROJECTS\ES08.0118.01_SALTY_DOG_INC\GIS\MXDS\REPORT\2016_3Q\FIG01_SITE_LOCATION_MAP.MXD



Source: National Agriculture Imagery Program (NAIP), May 10, 2014

Explanation

DBS-3 Well designation

3752.10 Groundwater elevation, ft msl

- Monitor well
- Recovery well
- Fresh water supply well

Potentiometric surface elevation contour (ft msl), dashed where inferred

Groundwater flow direction

SALTY DOG BRINE STATION

Former Brine Pond Area

Potentiometric Surface Elevations

September 2016

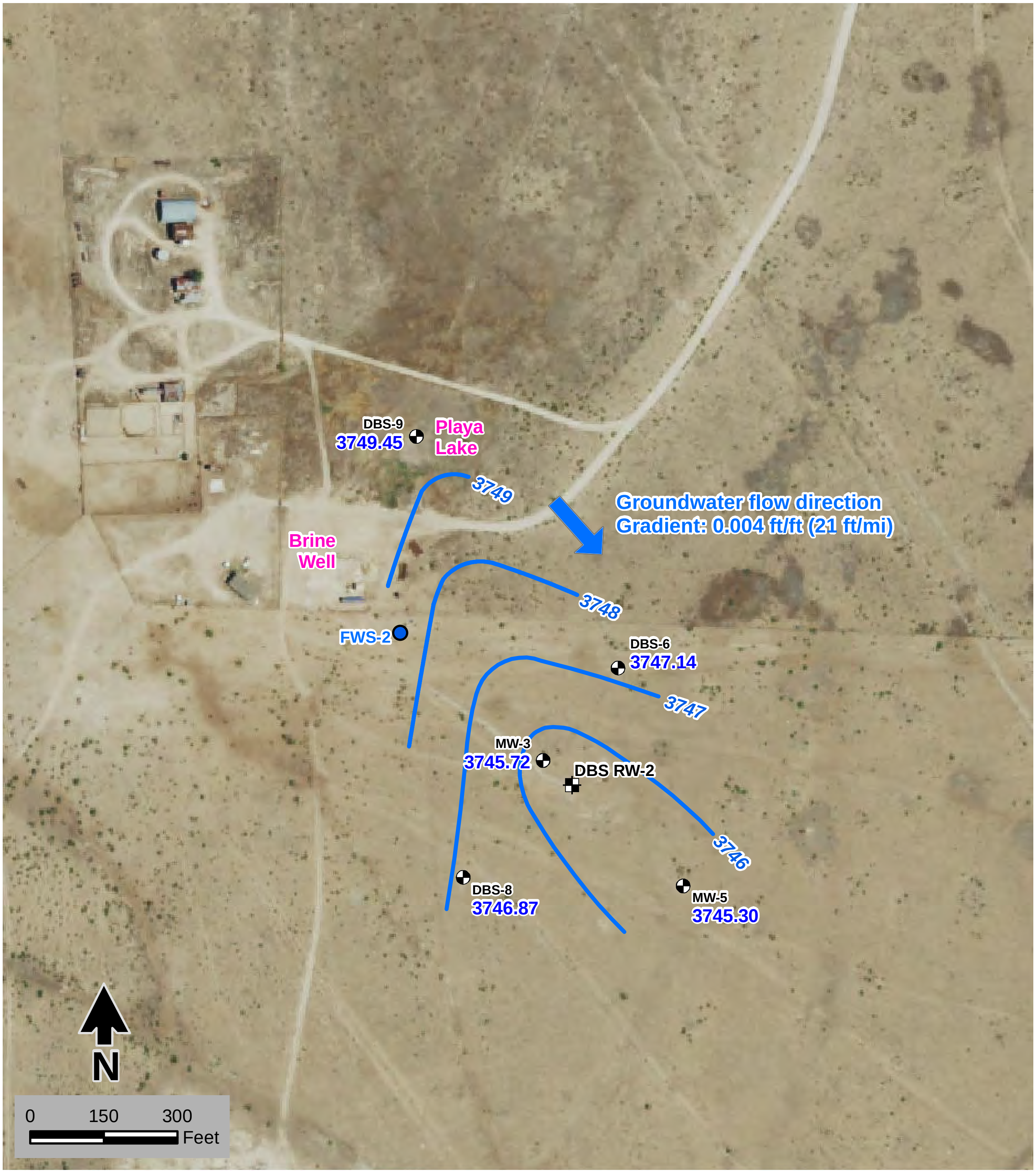
Daniel B. Stephens & Associates, Inc.

11/7/2016

JN ES08.0118.06

Figure 2

S:\PROJECTS\ES08.0118.01_SALTY_DOG_INC\GIS\MXDS\REPORT\2016_3Q\FIG02_GWE_201609_BRINE_STATION.MXD



Source: National Agriculture Imagery Program (NAIP), May 10, 2014

Explanation

MW-5 Well designation

3745.49 Groundwater elevation, ft msl

Monitor well

Recovery well

Fresh water supply well

Potentiometric surface elevation contour (ft msl), dashed where inferred

Groundwater flow direction

SALTY DOG BRINE STATION

Playa Lake and Brine Well Area Potentiometric Surface Elevations September 2016

Daniel B. Stephens & Associates, Inc.

11/7/2016

JN ES08.0118.06

Figure 3

S:\PROJECTS\ES08.0118.01_SALTY_DOG_INC\GIS\MXDS\REPORT\2016_3Q\FIG03_GWE_201609_BRINE_WELL.MXD

Source: National Agriculture Imagery Program (NAIP), May 10, 2014

Explanation

DBS-5 Well designation
170 Chloride concentration (mg/L)

Monitor well

Recovery well

Red indicates concentration equal to or greater than the NMWQCC standard.

SALTY DOG BRINE STATION

Former Brine Pond Area
Chloride Concentrations in Groundwater
September 2016

Daniel B. Stephens & Associates, Inc.
10/27/2016 JN ES08.0118.06

Figure 4

S:\PROJECTS\ES08.0118.01_SALTY_DOG_INC\GIS\MXDS\REPORT\2016_3Q\FIG04_CL_GW_201609_BRINE_STATION.MXD

Source: National Agriculture Imagery Program (NAIP), May 10, 2014

Explanation

DBS-8 Well designation
34 Chloride concentration (mg/L)
Monitor well
Recovery well

Red indicates concentration equal to or greater than the NMWQCC standard.

SALTY DOG BRINE STATION

Playa Lake and Brine Well Area Chloride Concentrations in Groundwater September 2016

Daniel B. Stephens & Associates, Inc.
10/24/2016 JN ES08.0118.06

Figure 5

S:\PROJECTS\ES08.0118.01_SALTY_DOG_INC\GIS\MXDS\REPORT\2016_3Q\FIG05_CL_GW_201609_BRINE_WELL.MXD

Tables

Table 1. Historical Fluid Level Measurements
Salty Dog Brine Station, Lea County, New Mexico

Monitor Well	Screen Interval (ft bgs)	Top of Casing Elevation [a] (ft msl)	Date Measured	Depth to Water (ft btoc)	Groundwater Elevation (ft msl)
DBS-1	56.0–76.0	3,817.09	4/08/2009	62.38	3,754.71
			5/11/2011	64.70	3,752.39
			10/04/2011	Well destroyed	
DBS-1R	58.0–78.0	3,817.00 [b]	4/30/2012	63.60	3,753.40
			9/10/2012	65.65	3,751.35
			6/23/2013	64.40	3,752.60
			1/09/2014	67.23	3,749.77
			4/07/2014	66.36	3,750.64
			3/20/2015	67.17	3,749.83
			7/01/2015	67.92	3,749.08
			9/29/2015	67.07	3,749.93
			12/16/2015	67.54	3,749.46
			3/22/2016	66.61	3,750.39
			6/08/2016	66.23	3,750.77
			9/13/2016	67.43	3,749.57
DBS-2	58.0–78.0	3,820.50	4/08/2009	65.45	3,755.05
			5/11/2011	66.80	3,753.70
			10/04/2011	65.87	3,754.63
			2/08/2012	65.96	3,754.54
			4/30/2012	66.26	3,754.24
			9/10/2012	67.45	3,753.05
			6/23/2013	67.03	3,753.47
			1/09/2014	69.08	3,751.42
			4/07/2014	68.67	3,751.83
			3/20/2015	69.32	3,751.18
			6/30/2015	69.29	3,751.21
			9/29/2015	69.41	3,751.09
			12/16/2015	69.71	3,750.79
			3/22/2016	69.13	3,751.37
			6/08/2016	68.91	3,751.59
			9/13/2016	69.76	3,750.74

[a] Top of casing elevations surveyed by Pettigrew & Assoc. on May 28, 2009.
[b] Top of casing elevation surveyed by Pettigrew & Assoc. on June 13, 2012.

ft bgs = Feet below ground surface
ft msl = Feet above mean sea level
ft btoc = Feet below top of casing
NA = Not available

Table 1. Historical Fluid Level Measurements
Salty Dog Brine Station, Lea County, New Mexico

Monitor Well	Screen Interval (ft bgs)	Top of Casing Elevation [a] (ft msl)	Date Measured	Depth to Water (ft btoc)	Groundwater Elevation (ft msl)
DBS-3	56.0–76.72	3,816.66	4/08/2009	60.67	3,755.99
			5/11/2011	61.25	3,755.41
			10/04/2011	61.25	3,755.41
			2/08/2012	61.11	3,755.55
			4/30/2012	61.41	3,755.25
			9/10/2012	61.81	3,754.85
			6/23/2013	62.08	3,754.58
			1/09/2014	63.30	3,753.36
			4/07/2014	63.43	3,753.23
			3/20/2015	63.93	3,752.73
			6/30/2015	63.99	3,752.67
			9/29/2015	64.17	3,752.49
			12/16/2015	64.41	3,752.25
			3/22/2016	63.88	3,752.78
			6/08/2016	63.92	3,752.74
			9/13/2016	64.56	3,752.10
DBS-4	56.0–76.0	3,820.37	4/08/2009	66.27	3,754.10
			5/11/2011	67.23	3,753.14
			10/04/2011	66.67	3,753.70
			2/08/2012	66.76	3,753.61
			4/30/2012	67.02	3,753.35
			9/10/2012	67.78	3,752.59
			6/23/2013	67.70	3,752.67
			1/09/2014	69.37	3,751.00
			4/07/2014	69.23	3,751.14
			3/20/2015	69.81	3,750.56
			6/30/2015	69.85	3,750.52
			9/29/2015	70.00	3,750.37
			12/16/2015	70.25	3,750.12
			3/22/2016	69.74	3,750.63
			6/08/2016	69.62	3,750.75
			9/13/2016	70.35	3,750.02

[a] Top of casing elevations surveyed by Pettigrew & Assoc. on May 28, 2009.
[b] Top of casing elevation surveyed by Pettigrew & Assoc. on June 13, 2012.

ft bgs = Feet below ground surface
ft msl = Feet above mean sea level
ft btoc = Feet below top of casing
NA = Not available

Table 1. Historical Fluid Level Measurements
Salty Dog Brine Station, Lea County, New Mexico

Monitor Well	Screen Interval (ft bgs)	Top of Casing Elevation [a] (ft msl)	Date Measured	Depth to Water (ft btoc)	Groundwater Elevation (ft msl)
DBS-5	56.9–76.9	3,820.66	4/08/2009	62.99	3,757.67
			5/11/2011	63.45	3,757.21
			10/04/2011	63.41	3,757.25
			2/08/2012	63.46	3,757.20
			4/30/2012	63.70	3,756.96
			9/10/2012	63.92	3,756.74
			6/23/2013	64.30	3,756.36
			1/09/2014	65.28	3,755.38
			4/07/2014	65.48	3,755.18
			3/20/2015	65.9	3,754.76
			7/01/2015	66.18	3,754.48
			9/29/2015	66.25	3,754.41
			12/16/2015	66.47	3,754.19
			3/22/2016	66.08	3,754.58
			6/08/2016	66.16	3,754.50
			9/13/2016	66.64	3,754.02
DBS-6	56.7–76.7	3,812.65	4/07/2009	62.75	3,749.90
			5/11/2011	63.11	3,749.54
			10/04/2011	63.16	3,749.49
			2/08/2012	63.20	3,749.45
			4/30/2012	63.43	3,749.22
			9/10/2012	63.60	3,749.05
			6/23/2013	63.74	3,748.91
			1/09/2014	64.00	3,748.65
			4/07/2014	64.22	3,748.43
			3/19/2015	64.78	3,747.87
			7/01/2015	64.81	3,747.84
			9/29/2015	65.48	3,747.17
			12/16/2015	65.26	3,747.39
			3/22/2016	65.38	3,747.27

[a] Top of casing elevations surveyed by Pettigrew & Assoc. on May 28, 2009.
[b] Top of casing elevation surveyed by Pettigrew & Assoc. on June 13, 2012.
ft bgs = Feet below ground surface — ft btoc = Feet below top of casing
ft msl = Feet above mean sea level — NA = Not available

Table 1. Historical Fluid Level Measurements
Salty Dog Brine Station, Lea County, New Mexico

Monitor Well	Screen Interval (ft bgs)	Top of Casing Elevation [a] (ft msl)	Date Measured	Depth to Water (ft btoc)	Groundwater Elevation (ft msl)
DBS-6 (cont.)	56.7–76.7	3,812.65	6/08/2016	65.37	3,747.28
			9/13/2016	65.51	3,747.14
DBS-7	55.1–75.1	3,810.21	4/07/2009	61.74	3,748.47
DBS-8	55.2–75.2	3,810.70	4/07/2009	61.20	3,749.50
			5/11/2011	61.67	3,749.03
			10/04/2011	61.71	3,748.99
			2/08/2012	61.77	3,748.93
			4/30/2012	62.00	3,748.70
			9/10/2012	62.15	3,748.55
			6/23/2013	62.28	3,748.42
			1/09/2014	62.47	3,748.23
			4/07/2014	62.67	3,748.03
			3/19/2015	63.19	3,747.51
			6/30/2015	63.25	3,747.45
			9/29/2015	63.82	3,746.88
			12/16/2015	63.58	3,747.12
			3/22/2016	63.76	3,746.94
			6/08/2016	63.72	3,746.98
			9/13/2016	63.83	3,746.87
DBS-9	48.0–68.0	3,806.26	4/08/2009	53.93	3,752.33
			5/11/2011	54.39	3,751.87
			10/04/2011	54.59	3,751.67
			2/08/2012	54.53	3,751.73
			4/30/2012	54.68	3,751.58
			9/10/2012	54.77	3,751.49
			6/23/2013	55.04	3,751.22
			1/09/2014	55.27	3,750.99
			4/07/2014	55.56	3,750.70
			3/19/2015	55.95	3,750.31
			7/01/2015	56.14	3,750.12
			9/29/2015	56.49	3,749.77

[a] Top of casing elevations surveyed by Pettigrew & Assoc. on May 28, 2009.
[b] Top of casing elevation surveyed by Pettigrew & Assoc. on June 13, 2012.

ft bgs = Feet below ground surface
ft msl = Feet above mean sea level
ft btoc = Feet below top of casing
NA = Not available

Table 1. Historical Fluid Level Measurements
Salty Dog Brine Station, Lea County, New Mexico

Monitor Well	Screen Interval (ft bgs)	Top of Casing Elevation [a] (ft msl)	Date Measured	Depth to Water (ft btoc)	Groundwater Elevation (ft msl)
DBS-9 (cont.)	48.0–68.0	3,806.26	12/16/2015	56.52	3,749.74
			3/22/2016	56.51	3,749.75
			6/08/2016	56.64	3,749.62
			9/13/2016	56.81	3,749.45
NW-1s	52.95–72.95	3,817.33	4/08/2009	62.35	3,754.98
NW-1m	99.31–119.31	3,817.35	4/08/2009	62.25	3,755.10
NW-1d	149.45–169.45	3,817.35	4/08/2009	62.04	3,755.31
NW-2s	53.35–73.35	3,812.50	4/08/2009	63.08	3,749.42
NW-2m	93.72–113.72	3,812.45	4/08/2009	63.27	3,749.18
NW-2d	126.87–146.87	3,812.46	4/08/2009	66.41	3,746.05
PMW-1	63–78	3,821.17	6/23/2008	67.51	3,753.66
			4/08/2009	65.97	3,755.20
			5/11/2011	68.70	3,752.47
			10/04/2011	66.95	3,754.22
			2/08/2012	66.69	3,754.48
			4/30/2012	67.27	3,753.90
			9/10/2012	69.77	3,751.40
			6/23/2013	68.40	3,752.77
			1/09/2014	71.24	3,749.93
			4/07/2014	69.97	3,751.20
			3/20/2015	70.78	3,750.39
			7/01/2015	71.41	3,749.76
			9/29/2015	70.76	3,750.41
			12/16/2015	71.03	3,750.14
			3/22/2016	70.30	3,750.87
			6/08/2016	69.65	3,751.52
			9/13/2016	71.08	3,750.09
MW-1	120–140	NA	6/23/2008	59.90	NA
MW-2	127–147	3,812.68	6/23/2008	61.42	3,751.26
			4/07/2009	61.65	3,751.03

[a] Top of casing elevations surveyed by Pettigrew & Assoc. on May 28, 2009.
[b] Top of casing elevation surveyed by Pettigrew & Assoc. on June 13, 2012.
ft bgs = Feet below ground surface
ft msl = Feet above mean sea level
ft btoc = Feet below top of casing
NA = Not available

Table 1. Historical Fluid Level Measurements
Salty Dog Brine Station, Lea County, New Mexico

Monitor Well	Screen Interval (ft bgs)	Top of Casing Elevation [a] (ft msl)	Date Measured	Depth to Water (ft btoc)	Groundwater Elevation (ft msl)
MW-3	NA	3,812.05	6/23/2008	62.06	3,749.99
			4/07/2009	62.02	3,750.03
			5/11/2011	62.91	3,749.14
			10/04/2011	62.91	3,749.14
			2/08/2012	62.95	3,749.10
			4/30/2012	63.39	3,748.66
			9/10/2012	63.50	3,748.55
			6/23/2013	63.36	3,748.69
			1/09/2014	63.55	3,748.50
			4/07/2014	63.88	3,748.17
			3/19/2015	64.27	3,747.78
			7/01/2015	64.34	3,747.71
			9/29/2015	67.94	3,744.11
			12/16/2015	64.75	3,747.30
			3/22/2016	64.84	3,747.21
			6/08/2016	64.89	3,747.16
			9/13/2016	66.33	3,745.72
MW-4	111–131	3,811.33	6/23/2008	62.12	3,749.21
			4/07/2009	62.51	3,748.82
MW-5	112–132	3,808.96	6/23/2008	60.60	3,748.36
			4/07/2009	60.79	3,748.17
			5/11/2011	61.17	3,747.79
			10/04/2011	61.72	3,747.24
			2/08/2012	61.23	3,747.73
			4/30/2012	61.50	3,747.46
			9/10/2012	61.65	3,747.31
			6/23/2013	61.75	3,747.21
			1/09/2014	61.90	3,747.06
			4/07/2014	62.18	3,746.78
			3/19/2015	62.96	3,746.00
			6/30/2015	62.71	3,746.25

[a] Top of casing elevations surveyed by Pettigrew & Assoc. on May 28, 2009.
[b] Top of casing elevation surveyed by Pettigrew & Assoc. on June 13, 2012.

ft bgs = Feet below ground surface
ft msl = Feet above mean sea level
ft btoc = Feet below top of casing
NA = Not available

Table 1. Historical Fluid Level Measurements
Salty Dog Brine Station, Lea County, New Mexico

Monitor Well	Screen Interval (ft bgs)	Top of Casing Elevation [a] (ft msl)	Date Measured	Depth to Water (ft btoc)	Groundwater Elevation (ft msl)
MW-5 (cont.)	112–132	3,808.96	9/29/2015	63.92	3,745.04
			12/16/2015	63.02	3,745.94
			3/22/2016	63.14	3,745.82
			6/08/2016	63.47	3,745.49
			9/13/2016	63.66	3,745.30
MW-6	NA	3,810.17	6/23/2008	62.17	3,748.00
			4/07/2009	62.41	3,747.76

[a] Top of casing elevations surveyed by Pettigrew & Assoc. on May 28, 2009.
[b] Top of casing elevation surveyed by Pettigrew & Assoc. on June 13, 2012.

ft bgs = Feet below ground surface
ft msl = Feet above mean sea level
ft btoc = Feet below top of casing
NA = Not available

Table 2. Chloride Groundwater Analytical Data
Salty Dog Brine Station, Lea County, New Mexico

Monitor Well	Date	Chloride Concentration (mg/L) [a]
	NMWQCC Standard	*250*
DBS-1	4/08/2009	**320**
	5/12/2011	**940**
	10/04/2011	Well destroyed
DBS-1R	5/01/2012	**3,000**
	9/11/2012	**3,200**
	6/25/2013	**3,300**
	1/10/2014	**1,000**
	4/08/2014	**1,700**
	3/20/2015	**1,200**
	7/01/2015	**860**
	9/30/2015	**670**
	12/17/2015	**760**
	3/23/2016	**560**
	6/09/2016	**570**
	09/14/2016	**360**
DBS-2	4/08/2009	14
	5/12/2011	25
	10/05/2011	18
	2/09/2012	22
	5/01/2012	24
	9/11/2012	44
	6/25/2013	36
	1/10/2014	45
	4/08/2014	22
	3/20/2015	29
	6/30/2015	28
	9/30/2015	40
	12/17/2015	35
	3/23/2016	46
	6/09/2016	41
	9/14/2016	41

Bold indicates that value exceeds the applicable standard.
[a] All samples analyzed using EPA method 300.0, unless otherwise noted.
[b] Samples analyzed using Standard Method 4500-Cl B.
mg/L = Milligrams per liter

Table 2. Chloride Groundwater Analytical Data
Salty Dog Brine Station, Lea County, New Mexico
Page 2 of 7

Monitor Well	Date	Chloride Concentration (mg/L) [a]
	NMWQCC Standard	*250*
DBS-3	4/08/2009	36
	5/12/2011	35
	10/05/2011	34
	2/09/2012	34
	5/01/2012	33
	9/11/2012	34
	6/24/2013	32
	1/10/2014	34
	4/08/2014	32
	3/20/2015	35
	6/30/2015	35
	9/30/2015	34
	12/17/2015	34
	3/23/2016	36
	6/09/2016	35
	9/14/2016	37
DBS-4	4/08/2009	38
	5/12/2011	33
	10/05/2011	32
	2/09/2012	32
	5/01/2012	31
	9/11/2012	32
	6/25/2013	31
	1/10/2014	32
	4/08/2014	30
	3/20/2015	33
	6/30/2015	31
	9/30/2015	33
	12/17/2015	35
	3/23/2016	38

Bold indicates that value exceeds the applicable standard.
[a] All samples analyzed using EPA method 300.0, unless otherwise noted.
[b] Samples analyzed using Standard Method 4500-Cl B.
mg/L = Milligrams per liter

Table 2. Chloride Groundwater Analytical Data
Salty Dog Brine Station, Lea County, New Mexico

Monitor Well	Date	Chloride Concentration (mg/L) [a]
	NMWQCC Standard	*250*
DBS-4 (cont.)	6/09/2016	35
	9/14/2016	37
DBS-5	4/08/2009	65
	5/12/2011	140
	10/05/2011	140
	2/09/2012	140
	4/30/2012	150
	9/11/2012	160
	6/24/2013	160
	1/10/2014	180
	4/08/2014	160
	3/20/2015	140
	7/01/2015	140
	9/30/2015	150
	12/17/2015	160
	3/23/2016	150
	6/09/2016	150
	9/14/2016	170
DBS-6	4/07/2009	**380**
	5/12/2011	**410**
	10/05/2011	**400**
	2/09/2012	**380**
	4/30/2012	**400**
	9/11/2012	**390**
	6/24/2013	**340**
	1/10/2014	**390**
	4/07/2014	**400**
	3/19/2015	**370**
	7/01/2015	**360**
	9/30/2015	**370**
	12/17/2015	**380**

Bold indicates that value exceeds the applicable standard.
[a] All samples analyzed using EPA method 300.0, unless otherwise noted.
[b] Samples analyzed using Standard Method 4500-Cl B.
mg/L = Milligrams per liter

Table 2. Chloride Groundwater Analytical Data
Salty Dog Brine Station, Lea County, New Mexico

Monitor Well	Date	Chloride Concentration (mg/L) [a]
	NMWQCC Standard	*250*
DBS-6 (cont.)	3/23/2016	**310**
	6/09/2016	**300**
	9/14/2016	**290**
DBS-7	4/07/2008	**570**
DBS-8	4/07/2009	58
	5/12/2011	36
	10/05/2011	140
	2/09/2012	41
	4/30/2012	41
	9/10/2012	42
	6/24/2013	45
	1/09/2014	38
	4/07/2014	36
	3/19/2015	36
	7/01/2015	34
	9/30/2015	35
	12/17/2015	33
	3/23/2016	35
	6/09/2016	34
	9/14/2016	34
DBS-9	4/08/2009	210
	5/12/2011	**600**
	10/05/2011	**440**
	2/09/2012	**290**
	4/30/2012	**330**
	9/11/2012	**320**
	6/24/2013	200
	1/10/2014	170
	4/07/2014	220
	3/19/2015	**260**
	7/01/2015	210

Bold indicates that value exceeds the applicable standard.
[a] All samples analyzed using EPA method 300.0, unless otherwise noted.
[b] Samples analyzed using Standard Method 4500-Cl B.
mg/L = Milligrams per liter

Table 2. Chloride Groundwater Analytical Data
Salty Dog Brine Station, Lea County, New Mexico

Monitor Well	Date	Chloride Concentration (mg/L) [a]
	NMWQCC Standard	*250*
DBS-9 (cont.)	9/30/2015	**260**
	12/17/2015	230
	3/23/2016	200
	6/09/2016	190
	9/14/2016	190
NW-1s	4/08/2009	**630**
NW-1m	4/08/2009	57
NW-1d	4/08/2009	38
NW-2s	4/08/2009	**410**
NW-2m	4/08/2009	**570**
NW-2d	4/08/2009	**4,700**
PMW-1	2/27/2008	**9,500** [b]
	5/30/2008	**8,600** [b]
	6/23/2008	**12,700**
	4/08/2009	**11,000**
	5/12/2011	**13,000**
	10/05/2011	**12,000**
	2/09/2012	**12,000**
	5/01/2012	**12,000**
	9/11/2012	**14,000**
	6/25/2013	**14,000**
	1/10/2014	**11,000**
	4/08/2014	**12,000**
	3/20/2015	**8,500**
	7/01/2015	**8,600**
	9/30/2015	**9,700**
	12/17/2015	**9,800**
	3/23/2016	**8,200**
	6/09/2016	**8,500**
	9/14/2016	**9,300**

Bold indicates that value exceeds the applicable standard.
[a] All samples analyzed using EPA method 300.0, unless otherwise noted.
[b] Samples analyzed using Standard Method 4500-Cl B.
mg/L = Milligrams per liter

Table 2. Chloride Groundwater Analytical Data
Salty Dog Brine Station, Lea County, New Mexico

Monitor Well	Date	Chloride Concentration (mg/L) [a]
	NMWQCC Standard	*250*
MW-1	5/30/2008	75 [b]
	6/23/2008	243
MW-2	2/27/2008	120 [b]
	5/30/2008	80 [b]
	6/23/2008	**1,480**
	4/07/2009	**1,200**
MW-3	2/27/2008	**348** [b]
	5/30/2008	**360** [b]
	6/23/2008	**1,090**
	4/07/2009	**17,000**
	5/12/2011	**16,000**
	10/05/2011	**14,000**
	2/09/2012	**15,000**
	4/30/2012	**14,000**
	9/10/2012	**16,000**
	6/24/2013	**12,000**
	1/10/2014	**10,000**
	4/07/2014	**12,000**
	3/19/2015	**9,700**
	7/01/2015	**10,000**
	9/30/2015	**9,600**
	12/17/2015	**5,100**
	3/23/2016	**8,200**
	6/09/2016	**9,400**
	9/14/2016	**9,100**
MW-4	2/27/2008	**476** [b]
	5/30/2008	**512** [b]
	6/23/2008	**5,730**
	4/07/2009	**6,600**
MW-5	2/27/2008	**1,280** [b]
	5/30/2008	**1,220** [b]

Bold indicates that value exceeds the applicable standard.
[a] All samples analyzed using EPA method 300.0, unless otherwise noted.
[b] Samples analyzed using Standard Method 4500-Cl B.
mg/L = Milligrams per liter

Table 2. Chloride Groundwater Analytical Data
Salty Dog Brine Station, Lea County, New Mexico

Monitor Well	Date	Chloride Concentration (mg/L) [a]
	NMWQCC Standard	*250*
MW-5 (cont.)	6/23/2008	**1,260**
	4/07/2009	**1,300**
	5/12/2011	**1,500**
	10/05/2011	**1,500**
	2/09/2012	**1,500**
	4/30/2012	**1,400**
	9/10/2012	**1,500**
	6/24/2013	**1,300**
	1/10/2014	**1,300**
	4/07/2014	**1,300**
	3/19/2015	**1,200**
	7/01/2015	**1,200**
	9/30/2015	**1,000**
	12/17/2015	**1,000**
	3/23/2016	**980**
	6/09/2016	**970**
	9/14/2016	**1,000**
MW-6	2/27/2008	32 [b]
	5/30/2008	36 [b]
	6/23/2008	31.4
	4/07/2009	25
Ranch Headquarters Supply Well	6/23/2008	35.4
Brine Station Fresh Water Supply Well	2/27/2008	**630** [b]
	5/30/2008	**590** [b]
	6/23/2008	**650**

Bold indicates that value exceeds the applicable standard.
[a] All samples analyzed using EPA method 300.0, unless otherwise noted.
[b] Samples analyzed using Standard Method 4500-Cl B.
mg/L = Milligrams per liter

Table 3. Cumulative Extracted Groundwater Volumes
Salty Dog Brine Station, Lea County, New Mexico

Recovery Well	Date	Days of Operation	Average Flow Rate (gpm)	Extracted Volume (gallons)
RW-1	4/07/2012	Groundwater extraction started		
	5/01/2012	24	2.1	73,740
	9/11/2012	154	2.9	636,237
	6/25/2013	441	4.1	2,599,392
	11/15/2013 [a]	585	3.6	3,060,181
	3/20/2015	1,075	2.4	3,668,511
	6/30/2015 [b]	1,167	—	3,668,511
	9/30/2015	1,259	—	3,668,511
FWS-1	12/17/2015	—	—	1,232,787
	3/22/2016	359	12.8	3,011,469
	6/08/2016	437	33.9	6,818,179
	9/13/2016	534	5.4	7,578,404
RW-2	4/06/2012	Groundwater extraction started		
	5/01/2012	25	2.5	91,450
	9/11/2012	158	4.3	963,789
	12/14/2012 [c]	252	3.9	1,406,748
	6/25/2013 [d]	—	—	—
	9/21/2013 [e]	335	2.9	1,407,005
	9/30/2015 [f]	1,074	68 [f]	7,313,515
	12/17/2015	1,152	44	12,266,210
	3/22/2016	1,248	32	16,657,635
	6/08/2016	1,326	9.0	17,661,576
	9/13/2016	1,423	5.7	18,453,822

[a] Pump went down in RW-1 on approximately November 15, 2013.
[b] Meter appears to not be functioning correctly, but the pumping well is functioning.
[c] Pump in RW-2 went down on December 14, 2012 due to a blown inner shaft motor seal.
[d] New pump installed in RW-2 and started on June 25, 2013.
[e] Meter and pump were removed from RW-2 on approximately September 21, 2013 by facility manager to install a new, larger-capacity pump.
[f] Meter reinstalled and pumping increased after the June 30 and July 1, 2015 monitoring event; flowrate assumes 60 days of operation (August 1 through September 30, 2015) based on personal communication with Jim Sayre (PAB).
gpm = Gallons per minute

Appendix A

Laboratory Analytical Report

HALL
ENVIRONMENTAL
ANALYSIS
LABORATORY

Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: www.hallenvironmental.com

October 12, 2016

John Ayarbe
Daniel B. Stephens & Assoc.
6020 Academy NE Suite 100
Albuquerque, NM 87109
TEL: (505) 822-9400
FAX (505) 822-8877

RE: Salty Dog OrderNo.: 1609828

Dear John Ayarbe:

Hall Environmental Analysis Laboratory received 13 sample(s) on 9/15/2016 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent. To access our accredited tests please go to www.hallenvironmental.com or the state specific web sites. In order to properly interpret your results it is imperative that you review this report in its entirety. See the sample checklist and/or the Chain of Custody for information regarding the sample receipt temperature and preservation. Data qualifiers or a narrative will be provided if the sample analysis or analytical quality control parameters require a flag. When necessary, data qualifers are provided on both the sample analysis report and the QC summary report, both sections should be reviewed. All samples are reported, as received, unless otherwise indicated. Lab measurement of analytes considered field parameters that require analysis within 15 minutes of sampling such as pH and residual chlorine are qualified as being analyzed outside of the recommended holding time.

Please don't hesitate to contact HEAL for any additional information or clarifications.

ADHS Cert #AZ0682 -- NMED-DWB Cert #NM9425 -- NMED-Micro Cert #NM0190

Sincerely,

Andy Freeman
Laboratory Manager
4901 Hawkins NE
Albuquerque, NM 87109

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Daniel B. Stephens & Assoc. **Client Sample ID:** DBS-1R
Project: Salty Dog **Collection Date:** 9/14/2016 3:30:00 PM
Lab ID: 1609828-001 **Matrix:** AQUEOUS **Received Date:** 9/15/2016 10:30:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 300.0: ANIONS						Analyst: **LGT**	
Chloride	360	50	*	mg/L	100	9/20/2016 8:45:19 PM	R37349

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:				
	*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
	D	Sample Diluted Due to Matrix	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
	ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
	R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
	S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Daniel B. Stephens & Assoc.
Project: Salty Dog
Lab ID: 1609828-002
Matrix: AQUEOUS

Client Sample ID: DBS-2
Collection Date: 9/14/2016 2:00:00 PM
Received Date: 9/15/2016 10:30:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 300.0: ANIONS							Analyst: **LGT**
Chloride	41	5.0		mg/L	10	9/20/2016 8:57:44 PM	R37349

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Daniel B. Stephens & Assoc.
Project: Salty Dog
Lab ID: 1609828-003
Matrix: AQUEOUS
Client Sample ID: DBS-3
Collection Date: 9/14/2016 3:05:00 PM
Received Date: 9/15/2016 10:30:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 300.0: ANIONS							Analyst: **LGT**
Chloride	37	5.0		mg/L	10	9/20/2016 9:22:33 PM	R37349

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Daniel B. Stephens & Assoc. **Client Sample ID:** DBS-4
Project: Salty Dog **Collection Date:** 9/14/2016 12:30:00 PM
Lab ID: 1609828-004 **Matrix:** AQUEOUS **Received Date:** 9/15/2016 10:30:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 300.0: ANIONS							Analyst: **LGT**
Chloride	37	5.0		mg/L	10	9/20/2016 9:47:23 PM	R37349

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:				
*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Daniel B. Stephens & Assoc.
Project: Salty Dog
Lab ID: 1609828-005
Matrix: AQUEOUS

Client Sample ID: DBS-5
Collection Date: 9/14/2016 2:30:00 PM
Received Date: 9/15/2016 10:30:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 300.0: ANIONS							Analyst: **LGT**
Chloride	170	5.0		mg/L	10	9/20/2016 10:37:02 PM	R37349

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:				
	*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
	D	Sample Diluted Due to Matrix	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
	ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
	R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
	S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

Date Reported: **10/12/2016**

CLIENT: Daniel B. Stephens & Assoc.
Client Sample ID: DBS-6
Project: Salty Dog
Collection Date: 9/14/2016 11:45:00 AM
Lab ID: 1609828-006
Matrix: AQUEOUS
Received Date: 9/15/2016 10:30:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 300.0: ANIONS						Analyst: **LGT**	
Chloride	290	50	*	mg/L	100	9/20/2016 11:14:17 PM	R37349

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Daniel B. Stephens & Assoc.
Project: Salty Dog
Lab ID: 1609828-007
Matrix: AQUEOUS

Client Sample ID: DBS-8
Collection Date: 9/14/2016 9:05:00 AM
Received Date: 9/15/2016 10:30:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 300.0: ANIONS							Analyst: **LGT**
Chloride	34	5.0		mg/L	10	9/20/2016 11:26:42 PM	R37349

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:				
*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Daniel B. Stephens & Assoc.
Client Sample ID: DBS-9
Project: Salty Dog
Collection Date: 9/14/2016 8:25:00 AM
Lab ID: 1609828-008
Matrix: AQUEOUS
Received Date: 9/15/2016 10:30:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 300.0: ANIONS						Analyst: **LGT**	
Chloride	190	50		mg/L	100	9/21/2016 12:03:56 AM	R37349

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:				
*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Daniel B. Stephens & Assoc.
Project: Salty Dog
Lab ID: 1609828-009
Matrix: AQUEOUS

Client Sample ID: MW-3
Collection Date: 9/14/2016 11:10:00 AM
Received Date: 9/15/2016 10:30:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 300.0: ANIONS							Analyst: **LGT**
Chloride	9100	500	*	mg/L	1E	9/21/2016 12:28:45 AM	R37349

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Daniel B. Stephens & Assoc.
Project: Salty Dog
Lab ID: 1609828-010
Matrix: AQUEOUS
Client Sample ID: MW-5
Collection Date: 9/14/2016 10:10:00 AM
Received Date: 9/15/2016 10:30:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 300.0: ANIONS							Analyst: **LGT**
Chloride	1000	50	*	mg/L	100	9/21/2016 1:18:24 AM	R37349

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Daniel B. Stephens & Assoc. **Client Sample ID:** PMW-1
Project: Salty Dog **Collection Date:** 9/14/2016 4:05:00 PM
Lab ID: 1609828-011 **Matrix:** AQUEOUS **Received Date:** 9/15/2016 10:30:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 300.0: ANIONS						Analyst: **LGT**	
Chloride	9300	500	*	mg/L	1E	9/21/2016 1:43:14 AM	R37349

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:				
*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Daniel B. Stephens & Assoc.
Project: Salty Dog
Lab ID: 1609828-012 **Matrix:** AQUEOUS

Client Sample ID: Injection
Collection Date: 9/14/2016 3:45:00 PM
Received Date: 9/15/2016 10:30:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
SPECIFIC GRAVITY							Analyst: **LGT**
Specific Gravity	0.9915	0			1	9/21/2016 3:49:00 PM	R37370
EPA METHOD 300.0: ANIONS							Analyst: **LGT**
Chloride	240	50		mg/L	100	9/21/2016 2:08:04 AM	R37349
SM2540C MOD: TOTAL DISSOLVED SOLIDS							Analyst: **KS**
Total Dissolved Solids	725	20.0	*	mg/L	1	9/23/2016 1:36:00 PM	27634
SM4500-H+B: PH							Analyst: **JRR**
pH	8.11	1.68	H	pH units	1	9/19/2016 9:35:15 PM	R37296

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Daniel B. Stephens & Assoc.
Project: Salty Dog
Lab ID: 1609828-013
Matrix: AQUEOUS
Client Sample ID: Brine
Collection Date: 9/14/2016 4:07:00 PM
Received Date: 9/15/2016 10:30:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
SPECIFIC GRAVITY							Analyst: **LGT**
Specific Gravity	1.148	0			1	9/21/2016 3:49:00 PM	R37370
EPA METHOD 300.0: ANIONS							Analyst: **LGT**
Chloride	160000	5000	*	mg/L	1E	9/21/2016 2:20:29 AM	R37349
SM2540C MOD: TOTAL DISSOLVED SOLIDS							Analyst: **KS**
Total Dissolved Solids	241000	2000	*D	mg/L	1	9/23/2016 1:36:00 PM	27634
SM4500-H+B: PH							Analyst: **JRR**
pH	7.32	1.68	H	pH units	1	9/19/2016 9:39:11 PM	R37296
EPA METHOD 200.7: METALS							Analyst: **ELS**
Sodium	140	2.0		mg/L	1	9/30/2016 8:22:30 PM	27612

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

WO#: **1609828**

Hall Environmental Analysis Laboratory, Inc.

12-Oct-16

Client: Daniel B. Stephens & Assoc.

Project: Salty Dog

Sample ID	MB-27612	SampType:	MBLK	TestCode:	EPA Method 200.7: Metals				
Client ID:	PBW	Batch ID:	27612	RunNo:	37369				
Prep Date:	9/20/2016	Analysis Date:	9/21/2016	SeqNo:	1160993	Units:	mg/L		

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Sodium	ND	1.0								

Sample ID	LCS-27612	SampType:	LCS	TestCode:	EPA Method 200.7: Metals		
Client ID:	LCSW	Batch ID:	27612	RunNo:	37369		
Prep Date:	9/20/2016	Analysis Date:	9/21/2016	SeqNo:	1160994	Units:	mg/L

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Sodium	49	1.0	50.00	0	98.1	85	115			

Sample ID	LLLCS-27612	SampType:	LCSLL	TestCode:	EPA Method 200.7: Metals		
Client ID:	BatchQC	Batch ID:	27612	RunNo:	37369		
Prep Date:	9/20/2016	Analysis Date:	9/21/2016	SeqNo:	1161051	Units:	mg/L

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Sodium	ND	1.0	0.5000	0	105	50	150			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1609828**
12-Oct-16

Client: Daniel B. Stephens & Assoc.
Project: Salty Dog

Sample ID **MB**	SampType: **MBLK**	TestCode: **EPA Method 300.0: Anions**
Client ID: **PBW**	Batch ID: **R37349**	RunNo: **37349**
Prep Date:	Analysis Date: **9/20/2016**	SeqNo: **1160322** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	ND	0.50								

Sample ID **LCS**	SampType: **LCS**	TestCode: **EPA Method 300.0: Anions**
Client ID: **LCSW**	Batch ID: **R37349**	RunNo: **37349**
Prep Date:	Analysis Date: **9/20/2016**	SeqNo: **1160323** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	4.8	0.50	5.000	0	95.4	90	110			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

WO#: **1609828**

Hall Environmental Analysis Laboratory, Inc.

12-Oct-16

Client: Daniel B. Stephens & Assoc.

Project: Salty Dog

Sample ID **1609828-012ADUP**		SampType: **DUP**			TestCode: **Specific Gravity**					
Client ID: **Injection**		Batch ID: **R37370**			RunNo: **37370**					
Prep Date:		Analysis Date: **9/21/2016**			SeqNo: **1161076**		Units:			
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Specific Gravity	0.9934	0						0.191	20	

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1609828**

12-Oct-16

Client: Daniel B. Stephens & Assoc.

Project: Salty Dog

Sample ID **MB-27634** SampType: **MBLK** TestCode: **SM2540C MOD: Total Dissolved Solids**

Client ID: **PBW** Batch ID: **27634** RunNo: **37439**

Prep Date: **9/21/2016** Analysis Date: **9/23/2016** SeqNo: **1163956** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Dissolved Solids	ND	20.0								

Sample ID **LCS-27634** SampType: **LCS** TestCode: **SM2540C MOD: Total Dissolved Solids**

Client ID: **LCSW** Batch ID: **27634** RunNo: **37439**

Prep Date: **9/21/2016** Analysis Date: **9/23/2016** SeqNo: **1163957** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Dissolved Solids	1030	20.0	1000	0	103	80	120			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

HALL ENVIRONMENTAL ANALYSIS LABORATORY

Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: www.hallenvironmental.com

Sample Log-In Check List

Client Name: DBS Work Order Number: 1609828 RcptNo: 1

Received by/date: AF 09/15/16

Logged By: **Lindsay Mangin** 9/15/2016 10:30:00 AM

Completed By: **Lindsay Mangin** 9/15/2016 2:01:34 PM

Reviewed By: IO 9/16/16

Chain of Custody

1. Custody seals intact on sample bottles? Yes ☐ No ☐ Not Present ☑
2. Is Chain of Custody complete? Yes ☑ No ☐ Not Present ☐
3. How was the sample delivered? Client

Log In

4. Was an attempt made to cool the samples? Yes ☑ No ☐ NA ☐
5. Were all samples received at a temperature of >0° C to 6.0°C Yes ☐ No ☑ NA ☐
   Approved by client.
6. Sample(s) in proper container(s)? Yes ☑ No ☐
7. Sufficient sample volume for indicated test(s)? Yes ☑ No ☐
8. Are samples (except VOA and ONG) properly preserved? Yes ☑ No ☐
9. Was preservative added to bottles? Yes ☐ No ☑ NA ☐
10. VOA vials have zero headspace? Yes ☐ No ☐ No VOA Vials ☑
11. Were any sample containers received broken? Yes ☐ No ☑
12. Does paperwork match bottle labels? Yes ☑ No ☐
    (Note discrepancies on chain of custody)
13. Are matrices correctly identified on Chain of Custody? Yes ☑ No ☐
14. Is it clear what analyses were requested? Yes ☑ No ☐
15. Were all holding times able to be met? Yes ☑ No ☐
    (If no, notify customer for authorization.)

# of preserved bottles checked for pH: 1
(<2 or >12 unless noted)
Adjusted? No
Checked by: JC

Special Handling (if applicable)

16. Was client notified of all discrepancies with this order? Yes ☐ No ☐ NA ☑

Person Notified: Date
By Whom: Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person
Regarding:
Client Instructions:

17. Additional remarks:

18. Cooler Information

Cooler No	Temp °C	Condition	Seal Intact	Seal No	Seal Date	Signed By
1	8.7	Good	Not Present			

Chain-of-Custody Record

Client: DBS&A

Mailing Address: 6020 Academy RD NE #100
Albuquerque NM 87109

Phone #: 505-822-9400

email or Fax#: JAYARBE@DBStephens.com

QA/QC Package:
☒ Standard ☐ Level 4 (Full Validation)

Accreditation
☐ NELAP ☐ Other ____

☐ EDD (Type) ____

Turn-Around Time:
☒ Standard ☐ Rush ____

Project Name: SALTY DOG

Project #: ES08.0118.06

Project Manager: J. AYARBE

Sampler: M. Zbrozek

On Ice: ☒ Yes ☐ No

Sample Temperature: 8.7°C

HALL ENVIRONMENTAL ANALYSIS LABORATORY

www.hallenvironmental.com

4901 Hawkins NE - Albuquerque, NM 87109

Tel. 505-345-3975 Fax 505-345-4107

Date	Time	Matrix	Sample Request ID	Container Type and #	Preservative Type	HEAL No. 1609828	BTEX + MTBE + TMB's (8021)	BTEX + MTBE + TPH (Gas only)	TPH 8015B (GRO / DRO / MRO)	TPH (Method 418.1)	EDB (Method 504.1)	PAH's (8310 or 8270 SIMS)	RCRA 8 Metals	Anions (F,Cl,NO_3,NO_2,PO_4,SO_4)	8081 Pesticides / 8082 PCB's	8260B (VOA)	8270 (Semi-VOA)	Chloride	pH, TDS, Spec Grav	Na		Air Bubbles (Y or N)
.16	1530	GW	DBS-1R	1 poly	none	-001												/				
	1400		DBS-2			-002												/				
	1505		DBS-3			-003												/				
	1230		DBS-4			-004												/				
	1430		DBS-5			-005												/				
	1145		DBS-6			-006												/				
	0905		DBS-8			-007												/				
	0825		DBS-9			-008												/				
	1110		MW-3			-009												/				
	1010		MW-5			-010												/				
	1605		PMW-1			-011												/				
	1545		INJECTION	2 poly	2 none	-012												/	/			
	1607		BRINE	3 poly	2 none 1 HNO_3	-013												/	/	/		

Date:	Time:	Relinquished by:	Received by:	Date	Time
/16	1032	[signature]	[signature]	9/15/16	10:30
Date:	Time:	Relinquished by:	Received by:	Date	Time

Remarks:

If necessary, samples submitted to Hall Environmental may be subcontracted to other accredited laboratories. This serves as notice of this possibility. Any sub-contracted data will be clearly notated on the analytical report.

Appendix B

Field Notes

3/23

9.13.16 M. Zbrozek

1440 M. Zbrozek onsite for quarterly
Ground water monitoring
1450 Drive around site for reconn
Weather warm sunny clear ~87°
rig observed over RW-2 - Tires flat
does not appear to be in service.
See photos.
1515 Begin Guaging Wells.
Depth recorded on field sheet
1545 RW-2 Totalizer - Pump On
405876.6 bbl sound
1610 MW-2 Totalizer
0.2 bbl
1730 M. Zbrozek offsite - returning
9.14.16 for sampling

MZ
9.13.2016

M. Zbrozek 9.14.16

0735 M. Zbrozek onsite for ground water
Monitoring
0745 Set up at DBS-9
Calibrate YSI

pH	4.0	24.02°c		
	10	24.40°c		
	7	24.32°c		
Spc	1413	24.06°c		
	1510			
ORP	220 / 200.7	23.95°c		
DO%	767.1 mmHg		78.3 DO%	100.9 DO%

0805 Begin Sampling @ DBS-9
Sample @ 0825
0845 Set up at DBS-8
Sample @ 0905
0920 Setup at MW-5
sample @ 1010
1025 Setup at MW-3
Sample @ 1110
1043 RW-2 Totalizer pump off
405930.3 bbl no sound
1128 SETUP @ DBS-6
sample @ 1145
1205 SETUP @ DBS-4
sample @ 1230

3/?

9.14.16 M. Zbrozek

1241 Setup AT DBS-2
Sample @ 1400
Pump will not pump to top of casing consistently - Trouble shoot often attributed to pump housing unable to repair. used poly Bailer
1420 Attempted pump, still does not pump to top of casing use of Bailer for remaining wells.
- Pump is working
DBS-5 sampled at 1430
1445 SETup and DBS-3
Sample @ 1505
1515 Setup at DBS-1R
sample @ 1530
1541 Sample at Injection
@ 1545
FWS-1 Totalizer
80438.8 bbl
Pump on ~ 3156 BPD
1550 SETUP AT PMW1
Sample @ 1605
1607 SAMPLE at Brine Tanks
Na, pH, TDS, Spec grav, Cl @ 1607
1610 Jim Sarp onsite, Jim mentioned that the totalizers near RW-2 -

M. Zbrozek 9.14.16

1610 - May not be recording properly and that we may want to check his sale numbers to verify pumping output which has increased due to recent growth in oil drilling.
1645 M Zbrozek offsite
All samples preserved on Ice for transport to Hall Environmental

9.14.16

Daniel B. Stephens & Associates, Inc.

GROUNDWATER ELEVATION DATA SHEET

Project Name: Salty Dog
Sampler: M. Zbrozek
Project #: ES08.0118.06
Sample Date: 09/13/16
Project Manager: John Ayarbe
Sheet # 1 of 1

Well ID	Depth to NAPL	Depth to Water	Total Depth	Comments: (well dia., sampled, condition)
DBS-1R	–	67.43	74.39	
DBS-2	–	69.76	75.38	
DBS-3	–	64.56	74.73	
DBS-4	–	70.35	78.83	
DBS-5	–	66.64	75.84	
DBS-6	–	65.51	76.03	
DBS-7	–	64.34	75.77	WL only
DBS-8	–	63.83	69.92	
DBS-9	–	56.81	67.59	
MW-3	–	66.33	147.05	
MW-4	–	66.31	147.49	WL only
MW-5	–	63.66	128.79	
MW-6	–	65.11	119.15	WL only
PMW-1		71.08	77.82	
NW-1				WL only

Comments:

S:\Projects\ES08.0118.06_Salty_Dog_2016\Field Forms\SD GW Elevation.docx

Daniel B. Stephens & Associates, Inc.

GROUNDWATER MONITORING DATA SHEET

Project Name: Salty Dog
Sampler: M. Zbrozek
Project #: ES08.0118.06
Sample Date: 09/14/2016
Project Manager: John Ayarbe
Sample Time: 1530

Well #: DBS-1R

Well Diameter: 2" (inches)
Height of Water Column: 6.96 (feet)
Depth to NAPL: --- (feet btoc)
Casing Volume: 1.11 (gal)
Depth to Water: 67.43 (feet btoc)
Purge Volume: 3.33 (gal)
Total Depth of Well: 74.39 (feet)
Purge Method: ~~Grab~~ pump

Note:
One casing volume (SCH 40 PVC): 2.0" ID casing = 0.16 gal/ft; 4.0" = 0.65 gal/ft; 6.0" = 1.47 gal/ft

Groundwater Parameters:

Casing Volume	pH	Temp (°F)	Conductivity (µS/cm)	ORP (mv)	D.O. (mg/L)	Turbidity (NTU)
Initial	7.67	21.73	1356	102.2	11.38	Hazy clear
1	7.51	19.75	1375	106.6	10.67	
1.5	7.40	19.57	1403	112.5	10.44	
2	7.18	19.50	1457	123.9	10.30	Hazy Tan clear
2.5	6.95	19.44	1500	133.1	10.23	
3	6.69	19.42	1567	145.3	10.12	Hazy clear
3.5						
4						
4.5						
5						

Sample Description:

Physical Observations:

Analytical Method(s): ~~Sodium~~, Chloride, ~~TDS~~, ~~Spec Gravity~~, ~~pH~~

Daniel B. Stephens & Associates, Inc.

GROUNDWATER MONITORING DATA SHEET

Project Name: Salty Dog

Sampler: M. Zbrozek

Project #: ES08.0118.06

Sample Date: 09/14/2016

Project Manager: John Ayarbe

Sample Time: 1400

Well #: DBS-2

Well Diameter: 2" (inches)

Height of Water Column: 5.62 (feet)

Depth to NAPL: --- (feet btoc)

Casing Volume: 0.89 (gal)

Depth to Water: 69.76 (feet btoc)

Purge Volume: 2.70 (gal)

Total Depth of Well: 75.38 (feet)

Purge Method: ~~Grab~~ pump Fail used Bailer

Note:
One casing volume (SCH 40 PVC): 2.0" ID casing = 0.16 gal/ft; 4.0" = 0.65 gal/ft; 6.0" = 1.47 gal/ft

Groundwater Parameters:

Casing Volume	pH	Temp (°F)	Conductivity (µS/cm)	ORP (mv)	D.O. (mg/L)	Turbidity (NTU)
Initial	7.62	25.12	532	111.4	8.28	Hazy Tan Clear
1	7.35	2219	530	132.4	8.32	
1.5						
2	7.60	2161	554	107.9	8.03	
2.5						
3						
3.5						
4						
4.5						
5						

Sample Description:

Physical Observations: Pump not functioning used Pole Bailer

Analytical Method(s): ~~Sodium~~, Chloride, ~~TDS~~, Spec ~~Gravity~~, pH

T:\Admin\Field Forms\Att 1.5-1_GROUNDWATER MONITORING DATA SHEET_rev1.pdf

Daniel B. Stephens & Associates, Inc.

GROUNDWATER MONITORING DATA SHEET

Project Name: Salty Dog
Sampler: M. Zbrozek
Project #: ES08.0118.06
Sample Date: 09/14/2016
Project Manager: John Ayarbe
Sample Time: 1505

Well #: DBS-3

Well Diameter: 2" (inches) Height of Water Column: 10.17 (feet)
Depth to NAPL: --- (feet btoc) Casing Volume: 1.62 (gal)
Depth to Water: 64.56 (feet btoc) Purge Volume: 4.88 (gal)
Total Depth of Well: 74.73 (feet) Purge Method: pump

Note:
One casing volume (SCH 40 PVC): 2.0" ID casing = 0.16 gal/ft; 4.0" = 0.65 gal/ft; 6.0" = 1.47 gal/ft

Groundwater Parameters:

Casing Volume	pH	Temp (°F)	Conductivity (µS/cm)	ORP (mv)	D.O. (mg/L)	Turbidity (NTU)
Initial	7.73	20.00	522	112.7	11.08	Hazy Turbid Brown
1	7.61	19.91	521	116.2	10.60	Hazy clear
1.5	7.30	19.72	520	130.4	10.03	
2	7.09	19.71	520	141.1	9.99	
2.5	6.83	19.67	519	152.0	9.96	
3	6.75	19.66	519	156.3	9.95	
3.5						
4						
4.5						
5						

Sample Description:

Physical Observations:

Analytical Method(s): ~~Sodium~~, Chloride, ~~TDS~~, ~~Spec Gravity~~, ~~pH~~

Daniel B. Stephens & Associates, Inc.

GROUNDWATER MONITORING DATA SHEET

Project Name: Salty Dog
Sampler: M. Zbrozek

Project #: ES08.0118.06
Sample Date: 09/14/2016

Project Manager: John Ayarbe
Sample Time: 1230

Well #: DBS-4

Well Diameter: 2" (inches)
Height of Water Column: 8.48 (feet)

Depth to NAPL: --- (feet btoc)
Casing Volume: 1.36 (gal)

Depth to Water: 70.35 (feet btoc)
Purge Volume: 4.07 (gal)

Total Depth of Well: 78.83 (feet)
Purge Method: pump

Note:
One casing volume (SCH 40 PVC): 2.0" ID casing = 0.16 gal/ft; 4.0" = 0.65 gal/ft; 6.0" = 1.47 gal/ft

Groundwater Parameters:

Casing Volume	pH	Temp (°F)	Conductivity (µS/cm)	ORP (mv)	D.O. (mg/L)	Turbidity (NTU)
Initial	7.71	23.32	482	128.7	8.67	Hazy Brown Turbid
1	7.58	20.87	505	123.9	9.42	
1.5	7.41	20.47	505	126.6	9.52	Hazy Brown
2	7.41	20.38	504	127.4	9.51	
2.5	7.37	20.01	505	129.8	9.64	
3	~~7~~ 7.34	19.98	504	131.7	9.58	Hazy Clear
3.5						
4						
4.5						
5						

Sample Description: 1 Poly

Physical Observations:

Analytical Method(s): ~~Sodium~~, Chloride, ~~TDS~~, ~~Spec Gravity~~, ~~pH~~

Daniel B. Stephens & Associates, Inc.

GROUNDWATER MONITORING DATA SHEET

Project Name: Salty Dog
Sampler: M. Zbrozek
Project #: ES08.0118.06
Sample Date: 09/14/2016
Project Manager: John Ayarbe
Sample Time: 1830

Well #: DBS-5

Well Diameter: 2" (inches)
Height of Water Column: 9.2 (feet)
Depth to NAPL: --- (feet btoc)
Casing Volume: 1.47 (gal)
Depth to Water: 66.64 (feet btoc)
Purge Volume: 4.42 (gal)
Total Depth of Well: 75.84 (feet)
Purge Method: (Pump

Note:
One casing volume (SCH 40 PVC): 2.0" ID casing = 0.16 gal/ft; 4.0" = 0.65 gal/ft; 6.0" = 1.47 gal/ft

Groundwater Parameters:

Casing Volume	pH	Temp (°F)	Conductivity (µS/cm)	ORP (mv)	D.O. (mg/L)	Turbidity (NTU)
Initial	7.20	20.31	1148	120.3	9.32	
1	7.15	20.10	1143	121.5	9.07	
1.5	7.07	20.04	1140	124.4	8.86	
2	6.77	20.03	1131	133.3	8.63	
2.5	6.57	20.03	1128	141.0	8.55	
3	6.39	19.99	1123	147.5	8.49	
3.5						
4						
4.5						
5						

Sample Description:

Physical Observations:

Analytical Method(s): Sodium, Chloride, TDS, Spec Gravity, pH

Daniel B. Stephens & Associates, Inc.

GROUNDWATER MONITORING DATA SHEET

Project Name: Salty Dog
Sampler: M. Zbrozek
Project #: ES08.0118.06
Sample Date: 09/14/2016
Project Manager: John Ayarbe
Sample Time: 1145

Well #: DBS-6

Well Diameter: 2” (inches) Height of Water Column: 10.52 (feet)
Depth to NAPL: --- (feet btoc) Casing Volume: 1.68 (gal)
Depth to Water: 65.51 (feet btoc) Purge Volume: 5.05 (gal)
Total Depth of Well: 76.03 (feet) Purge Method: Pump

Note:
One casing volume (SCH 40 PVC): 2.0" ID casing = 0.16 gal/ft; 4.0" = 0.65 gal/ft; 6.0" = 1.47 gal/ft

Groundwater Parameters:

Casing Volume	pH	Temp (°F)	Conductivity (µS/cm)	ORP (mv)	D.O. (mg/L)	Turbidity (NTU)
Initial	7.22	23.58	1544	91.3	8.06	Tan Hazy Mod Turbid
1	7.06	20.07	1471	107.5	8.02	
1.5	7.00	19.81	1467	111.5	8.20	Hazy Tan
2	6.95	19.64	1455	114.1	8.21	
2.5	6.92	19.62	1445	115.0	8.11	
3	6.91	19.64	1439	114.7	8.04	
3.5						
4						
4.5						
5						

Sample Description:

Physical Observations:

Analytical Method(s): Sodium, Chloride, TDS, Spec Gravity, pH

Daniel B. Stephens & Associates, Inc.

GROUNDWATER MONITORING DATA SHEET

Project Name: Salty Dog
Sampler: M. Zbrozek
Project #: ES08.0118.06
Sample Date: 09/14/2016
Project Manager: John Ayarbe
Sample Time: 0905

Well #: DBS-8

Well Diameter: 2" (inches)
Height of Water Column: 6.09 (feet)
Depth to NAPL: --- (feet btoc)
Casing Volume: 0.97 (gal)
Depth to Water: 63.83 (feet btoc)
Purge Volume: 2.92 (gal)
Total Depth of Well: 69.92 (feet)
Purge Method: Pump

Note:
One casing volume (SCH 40 PVC): 2.0" ID casing = 0.16 gal/ft; 4.0" = 0.65 gal/ft; 6.0" = 1.47 gal/ft

Groundwater Parameters:

Casing Volume	pH	Temp (°F)	Conductivity (µS/cm)	ORP (mv)	D.O. (mg/L)	Turbidity (NTU)
Initial	7.23	20.03	614	149.2	8.34	Hazy clear
1	7.05	20.11	618	129.8	8.30	
1.5	7.02	20.12	620	129.0	8.40	
2	6.99	19.91	619	128.8	8.40	
2.5	6.97	19.85	613	128.8	8.29	
3	6.97	19.83	611	128.8	8.25	
3.5						
4						
4.5						
5						

Sample Description:

Physical Observations:

Analytical Method(s): Sodium, Chloride, TDS, Spec Gravity, pH

Daniel B. Stephens & Associates, Inc.

GROUNDWATER MONITORING DATA SHEET

Project Name: Salty Dog
Sampler: M. Zbrozek
Project #: ES08.0118.06
Sample Date: 09/14/2016
Project Manager: John Ayarbe
Sample Time: 0825

Well #: DBS-9

Well Diameter: 2" (inches)
Height of Water Column: 10.78 (feet)
Depth to NAPL: --- (feet btoc)
Casing Volume: 1.72 (gal)
Depth to Water: 56.81 (feet btoc)
Purge Volume: 5.17 (gal)
Total Depth of Well: 67.59 (feet)
Purge Method: Pump

Note:
One casing volume (SCH 40 PVC): 2.0" ID casing = 0.16 gal/ft; 4.0" = 0.65 gal/ft; 6.0" = 1.47 gal/ft

Groundwater Parameters:

Casing Volume	pH	Temp (°F)	Conductivity (μS/cm)	ORP (mv)	D.O. (mg/L)	Turbidity (NTU)
Initial	6.94	19.83	1584	141.7	104.5%	Slight Tan Hazy
1	6.92	18.91	1217	128.7	9.36 mg/L	Hazy clear
1.5	6.91	18.84	1148	129.8	9.28	
2	6.89	18.80	1150	129.6	9.29	
2.5	6.87	18.78	1119	129.6	9.29	
3	6.81	19.09	1195	132.0	9.31	
3.5	6.83	19.14	1105	130.5	9.31	
4						
4.5						
5						

Sample Description:

Physical Observations:

Analytical Method(s): Sodium, Chloride, TDS, Spec Gravity, pH

Daniel B. Stephens & Associates, Inc.

GROUNDWATER MONITORING DATA SHEET

Project Name: Salty Dog
Sampler: M. Zbrozek
Project #: ES08.0118.06
Sample Date: 09/14/2016
Project Manager: John Ayarbe
Sample Time: 1110

Well #: MW-3

Well Diameter: 2" (inches) Height of Water Column: 80.72 (feet)
Depth to NAPL: --- (feet btoc) Casing Volume: 12.91 (gal)
Depth to Water: 66.33 (feet btoc) Purge Volume: 38.74 (gal)
Total Depth of Well: 147.05 (feet) Purge Method: Pump

Note:
One casing volume (SCH 40 PVC): 2.0" ID casing = 0.16 gal/ft; 4.0" = 0.65 gal/ft; 6.0" = 1.47 gal/ft

Groundwater Parameters:

Casing Volume	pH	Temp (°F)	Conductivity (µS/cm)	ORP (mv)	D.O. (mg/L)	Turbidity (NTU)
Initial	6.97	20.17	81	130.9	5.03	clear
1	6.89	19.61	11582	124.3	5.64	clear
1.5	6.73	19.54	12999	129.8	~~6.~~ 4.96	
2	6.53	19.49	15932	126.9	4.34	
2.5	6.51	19.76	19076	121.0	4.28	clear
3	6.53	19.56	20552	117.7	4.24	
3.5	6.54	19.56	21237	117.6	4.21	clear
4	6.55	19.56	21039	117.1	4.19	
4.5						
5						

Sample Description:

Physical Observations:

Analytical Method(s): ~~Sodium~~, Chloride, ~~TDS~~, ~~Spec Gravity~~, ~~pH~~

Daniel B. Stephens & Associates, Inc.

GROUNDWATER MONITORING DATA SHEET

Project Name: Salty Dog

Sampler: M. Zbrozek

Project #: ES08.0118.06

Sample Date: 09/14/2016

Project Manager: John Ayarbe

Sample Time: 1010

Well #: MW-5

Well Diameter: 2" (inches)

Height of Water Column: 65.13 (feet)

Depth to NAPL: --- (feet btoc)

Casing Volume: 10.42 (gal)

Depth to Water: 63.66 (feet btoc)

Purge Volume: 31.26 (gal)

Total Depth of Well: 128.79 (feet)

Purge Method: Pump

Note:
One casing volume (SCH 40 PVC): 2.0" ID casing = 0.16 gal/ft; 4.0" = 0.65 gal/ft; 6.0" = 1.47 gal/ft

Groundwater Parameters:

Casing Volume	pH	Temp (°F)	Conductivity (μS/cm)	ORP (mv)	D.O. (mg/L)	Turbidity (NTU)
Initial	6.52	20.09	159	161.1	10.93	Clear
1	6.43	19.55	3188	132.9	4.54	
1.5	6.51	19.66	3106	130.3	4.59	
2	6.52	19.67	3070	130.0	4.60	
2.5	6.54	19.71	3021	129.1	4.61	Clear
3	6.54	1968	2995	128.5	4.64	Clear
3.5						
4						
4.5						
5						

Sample Description: 1 poly

Physical Observations: Clear.

Analytical Method(s): Sodium, Chloride, TDS, Spec Gravity, pH

Daniel B. Stephens & Associates, Inc.

GROUNDWATER MONITORING DATA SHEET

Project Name: Salty Dog
Sampler: M. Zbrozek
Project #: ES08.0118.06
Sample Date: 09/14/2016
Project Manager: John Ayarbe
Sample Time: 1605

Well #: PMW-1

Well Diameter: 2" (inches)
Height of Water Column: 6.74 (feet)
Depth to NAPL: --- (feet btoc)
Casing Volume: 1.07 (gal)
Depth to Water: 71.08 (feet btoc)
Purge Volume: 3.32 (gal)
Total Depth of Well: 77.82 (feet)
Purge Method: Pump

Note:
One casing volume (SCH 40 PVC): 2.0" ID casing = 0.16 gal/ft; 4.0" = 0.65 gal/ft; 6.0" = 1.47 gal/ft

Groundwater Parameters:

Casing Volume	pH	Temp (°F)	Conductivity (µS/cm)	ORP (mv)	D.O. (mg/L)	Turbidity (NTU)
Initial	7.13	21.17	35 477	114.7	9.56	Milky White
1	7.16	20.26	23120	102.8	9.19	Hazy
1.5	7.13	20.23	22420	103.3	9.15	Hazy clear
2	7.10	20.10	22067	103.7	9.16	
2.5	7.09	20.06	22064	104.3	9.13	
3	7.09	20.04	21877	104.9	9.10	Hazy clear
3.5						
4						
4.5						
5						

Sample Description:

Physical Observations:

Analytical Method(s): Sodium, Chloride, TDS, Spec Gravity, pH

Chain-of-Custody Record

Client: DBS&A

Mailing Address: 6020 Academy RD NE #100
Albuquerque NM 87109

Phone #: 505-822-9400

email or Fax#: JAYARBE@DBStephens.com

QA/QC Package:
☒ Standard ☐ Level 4 (Full Validation)

Accreditation
☐ NELAP ☐ Other ____________

☐ EDD (Type) ____________

Turn-Around Time:
☒ Standard ☐ **Rush**____________

Project Name: SALTY DOG

Project #: ES08.0118.06

Project Manager: J. AYARBE

Sampler: M. Zbrozek

On Ice: ☒ Yes ☐ No

Sample Temperature: 3.7°C

HALL ENVIRONMENTAL ANALYSIS LABORATORY

www.hallenvironmental.com

4901 Hawkins NE - Albuquerque, NM 87109

Tel. 505-345-3975 Fax 505-345-4107

Analysis Request

Date	Time	Matrix	Sample Request ID	Container Type and #	Preservative Type	HEAL No.	BTEX + MTBE + TMB's (8021)	BTEX + MTBE + TPH (Gas only)	TPH 8015B (GRO / DRO / MRO)	TPH (Method 418.1)	EDB (Method 504.1)	PAH's (8310 or 8270 SIMS)	RCRA 8 Metals	Anions (F,Cl,NO_3,NO_2,PO_4,SO_4)	8081 Pesticides / 8082 PCB's	8260B (VOA)	8270 (Semi-VOA)	Chloride	pH, TDS, Spec Grav	Na		Air Bubbles (Y or N)
7.14.16	1530	GW	DBS-1R	1 poly	none													/				
	1400		DBS-2															/				
	1505		DBS-3															/				
	1230		DBS-4															/				
	1430		DBS-5															/				
	1145		DBS-6															/				
	0905		DBS-8															/				
	0825		DBS-9															/				
	1110		MW-3															/				
	1010		MW-5															/				
	1605		PMW-1															/				
	1545 1607		INJECTION BRINE	2 poly 3 poly	2 none 2 none 1 HNO3													/	/	/		

Date:	Time:	Relinquished by:	Received by:	Date	Time
7/15/16	1032	[signature]	[signature]	9/1?	10??
Date:	Time:	Relinquished by:	Received by:	Date	Time

Remarks:

June 22, 2012

Mr. Jim Griswold
New Mexico Oil Conservation Division
Environmental Bureau
1220 South St. Francis Drive
Santa Fe, NM 87505-4225

Re: Salty Dog Brine Station - Fourth Quarterly Groundwater Monitoring Report

Dear Mr. Griswold:

On behalf of PAB Services, Inc., Daniel B. Stephens & Associates, Inc. (DBS&A) is pleased to submit the enclosed groundwater monitoring report for the Salty Dog brine station located in Lea County, New Mexico. The report documents fourth quarter groundwater monitoring activities completed at the site on April 30 and May 1, 2012.

Please do not hesitate to call me at (505) 353-9130 if you have any questions or require additional information.

Sincerely,

DANIEL B. STEPHENS & ASSOCIATES, INC.

Michael D. McVey
Senior Hydrogeologist

Enclosures

cc: Pieter Bergstein, PAB Services, Inc.

Daniel B. Stephens & Associates, Inc.
6020 Academy Rd., NE, Suite 100 505-822-9400
Albuquerque, NM 87109-3315 FAX 505-822-8877

Fourth Quarterly Groundwater Monitoring Report
Salty Dog Brine Station
Lea County, New Mexico

Prepared for **New Mexico Energy, Minerals and Natural Resources Department**
Oil Conservation Division, Environmental Bureau

June 22, 2012

Daniel B. Stephens & Associates, Inc.

6020 Academy NE, Suite 100 • Albuquerque, New Mexico 87109

QUARTERLY GROUNDWATER MONITORING REPORT
SALTY DOG BRINE STATION
LEA COUNTY, NEW MEXICO

1. INTRODUCTION

Daniel B. Stephens & Associates, Inc. (DBS&A) has prepared this fourth quarterly groundwater monitoring report for submission to the New Mexico Energy, Minerals and Natural Resources Department Oil Conservation Division (OCD) Environmental Bureau on behalf of PAB Services, Inc. (PAB) for the Salty Dog brine station (Site) located in Lea County, New Mexico (Figure 1). This report summarizes groundwater monitoring activities conducted at the Site on April 30 and May 1, 2012.

The Site is comprised of a northern portion where the brine pond was located prior to closure in October 2008, and a southern portion where the brine well is located. The brine pond area and the brine well area are separated by approximately 2,500 feet, joined by a dirt road. Since the closure of the brine pond, a number of frac tanks have been stationed in the northern portion of the Site to serve as storage for brine that is produced for resale. A concrete truck loading pad is located near the frac tanks. The brine well is currently not operational and attempts are being made to redrill the well and restore brine production at the Site. Six monitor wells (PMW-1, DBS-1R, and DBS-2 through DBS-5), one nested well (NW-1), and one recovery well (RW-1) are located in the former brine pond area. Nine monitor wells (MW-2 through MW-6, DBS-6 through DBS-9), one nested well (NW-2), and one recovery well (RW-2) are located in the brine well area (Figure 1).

A groundwater extraction system was installed by DBS&A at the Site in early April 2012 to provide hydraulic control of the chloride groundwater plumes present beneath the former brine pond area and brine well area. The extraction system consists of two submersible pumps, conveyance lines, electrical power, and controls to extract groundwater from recovery wells RW-1 (former brine pond area) and RW-2 (brine well area), and convey the extracted groundwater to on-site frac tanks for off-site disposal. At the time of the fourth quarterly groundwater monitoring event, the extraction system had been operating for a period of approximately three weeks.

2. SCOPE OF WORK

The scope of work for quarterly groundwater monitoring consisted of measuring fluid levels in and collecting groundwater samples from 11 monitor wells for laboratory analysis. The monitor wells included in the quarterly sampling were selected in consultation with the OCD project manager, Jim Griswold, on October 4, 2010. Groundwater samples were submitted to Hall Environmental Analysis Laboratory (HEAL) in Albuquerque, New Mexico for chloride analysis using U.S. Environmental Protection Agency (EPA) Test Method 300.0.

3. MONITORING ACTIVITIES

On April 30, 2012, DBS&A measured fluid levels in existing monitor wells DBS-2 through DBS-5 and PMW-1 in the former brine pond area, and DBS-6, DBS-8, DBS-9, MW-3, and MW-5 in the brine well area using a properly decontaminated electronic water level meter (Figure 1). In addition, fluid levels were measured in the newly installed monitor well, DBS-1R, which replaced former well DBS-1. DBS-1 was destroyed by a backhoe sometime between the May 2011 and October 2011 sampling events during grading activities at the Site. DBS-1R was installed approximately five feet south of DBS-1 by DBS&A and Peterson Drilling and Testing, Inc. during the installation of the groundwater extraction system in April 2012. Table 1 provides a summary of the fluid level measurements.

The average depth to water beneath the former brine pond area during this monitoring event was 64.88 feet below ground surface (ft bgs), decreasing approximately 0.08 foot since the last monitoring event in February 2012. Water levels in wells DBS-2, DBS-3, DBS-4, and DBS-5 decreased from 0.24 to 0.30 foot; the water level in PMW-1 decreased 0.58 foot. The average depth to water beneath the brine well area was 62.58 ft bgs, decreasing 0.29 foot since February 2012. Water levels in wells DBS-6, DBS-8, and MW-5 decreased from 0.23 to 0.27 foot; the water level in well MW-3 decreased 0.44 foot. The water level in DBS-9, located northeast of the brine well in the playa, decreased 0.15 foot. The greater drawdown observed in monitor wells PMW-1 and MW-3 is the result of groundwater pumping occurring at extraction wells RW-1 and RW-2. PMW-1 and MW-3, compared to the other Site monitor wells, are located in the closest proximity to the extraction wells. At the time of gauging, the extraction system had been operating for a period of approximately three weeks.

Potentiometric surface maps were prepared for the former brine pond and brine well areas and are included as Figures 2 and 3. Groundwater beneath the former brine pond area continues to flow to the southeast. The gradient increased slightly from 0.004 to 0.005 foot/foot (ft/ft) with implementation of groundwater pumping from extraction well RW-1 (Figure 2). The direction of groundwater flow beneath the brine well area changed slightly, with implementation of groundwater pumping from extraction well RW-2, from southeast to south-southeast. The gradient remained unchanged at approximately 0.004 ft/ft (Figure 3).

Groundwater samples were collected from monitor wells DBS-1R, DBS-2 through DBS-6, PMW-1, DBS-8, DBS-9, MW-3, and MW-5 on April 30 and May 1, 2012. DBS&A followed corporate standard operating procedures developed from EPA guidance during collection of all groundwater samples. Prior to sampling, the well was purged of a minimum of three casing volumes using a submersible pump to ensure that a representative sample of groundwater was collected. During purging, the DBS&A field technician measured water quality parameters including temperature, specific conductance, and pH to ensure that these parameters were stabilized to within 10 percent for specific conductance, 2 degrees for temperature and +/- 0.2 pH units prior to sampling. Sample containers were then filled, labeled, and placed on ice once the stabilization criteria were met. Groundwater samples were submitted under full chain-of-custody to HEAL for chloride analysis.

4. ANALYTICAL RESULTS

Table 2 summarizes chloride analytical results for the 11 groundwater samples collected on April 30 and May 1, 2012. Figures 4 and 5 show the distribution of chloride in groundwater beneath the former brine pond and brine well areas for the sampling event. Complete laboratory reports and chain-of-custody documentation are provided in Appendix 1. Field notes recorded during groundwater monitoring activities are included in Appendix 2.

DBS-1R was sampled for the first time during this monitoring event. Analytical results from the groundwater sample submitted from the well showed a chloride concentration of 3,000 mg/L. DBS-1R was installed approximately five feet south of the former well DBS-1. DBS-1 showed a chloride concentration of 940 mg/L the last time it was sampled on May 12, 2011 before it was destroyed.

During this monitoring event, groundwater samples submitted from wells DBS-2 (22 to 24 mg/L), DBS-5 (140 to 150 mg/L), DBS-6 (380 to 400 mg/L), and DBS-9 (290 to 330 mg/L) showed increases in chloride concentrations. Monitor wells DBS-3 (34 to 33 mg/L), DBS-4 (32 to 31 mg/L), MW-3 (15,000 to 14,000 mg/L), and MW-5 (1,500 to 1,400 mg/L) showed decreases in chloride concentrations. Monitor wells DBS-8 (41 mg/L) and PMW-1 (12,000 mg/L) showed no change in chloride concentrations. Currently, six of the 11 wells sampled contain chloride concentrations in excess of the New Mexico Water Quality Control Commission (NMWQCC) standard of 250 mg/L (Table 2).

The chloride groundwater plume in the former brine pond area remains bounded by the existing monitor well network. Monitor well PMW-1 (12,000 mg/L), located downgradient of the former brine pond, continues to show a chloride concentration in excess of the NMWQCC standard (Figure 4). The chloride concentration in the farthest downgradient well, DBS-4, remains below the standard.

The downgradient and northern, cross-gradient extent of the chloride groundwater plume in the brine well area remains undefined. The farthest downgradient well, MW-5, and the northern-most cross-gradient well, DBS-6, continue to contain chloride concentrations in excess of the NMWQCC standard (Figure 5).

The chloride concentration in monitor well DBS-9, which was showing a decreasing trend during previous monitoring events (600 mg/L in May 2011 to 440 mg/L in October 2011 to 290 mg/L in February 2012), increased slightly during this monitoring event to 330 mg/L and still exceeds the NMWQCC standard. DBS-9 was installed in the playa located northeast of the brine well to determine if documented releases that entered the playa in 2002 and 2005 impacted groundwater (Figure 5).

5. GROUNDWATER EXTRACTION SYSTEM OPERATION

Groundwater extraction from recovery well RW-2 at the brine well area was started on April 6, 2012. Groundwater extraction from recovery well RW-1 at the former brine pond area was started on April 7, 2012. The flow rate for RW-1 was initially set at the design specification of 0.5 gallons per minute (gpm). The flow rate for RW-2 was initially set at 1.25 gpm. Approximately one week after DBS&A set the flow rates, PAB staff adjusted the flow rates upward to facilitate daily disposal of the extracted groundwater. At the time of groundwater monitoring, approximately three weeks after system startup, extracted volumes of groundwater were recorded by the DBS&A field technician. The extracted volumes are provided in Table 3.

Since the extraction system had only been operating for a period of approximately three weeks prior to this groundwater monitoring event, little effect on chloride concentrations in Site monitor wells was noted. Assessments of system performance regarding hydraulic plume capture will be provided in future quarterly monitoring reports.

Flow will be maintained at the current rate, with minor increases or decreases, to maintain a volume of extracted groundwater that can be disposed of on a daily basis by PAB. Once the brine well is brought back online, full-scale operation of the extraction system will begin with reinjection of the extracted groundwater into the brine well. At that time, the flow rate for RW-2 will be increased to meet the design specification of 15 gpm.

6. RECOMMENDATIONS

Based on the current groundwater monitoring results and trends in chloride concentrations, and the installation of the groundwater extraction system in early April 2012, DBS&A recommends the following:

- Continue quarterly groundwater sampling to assess the groundwater extraction system performance by the collection of groundwater samples for laboratory analysis from the on-site monitor wells. Chloride concentrations measured in each well will be used to verify plume capture.

- Adjust the flow rate from the RW-2 recovery well upward to 15 gpm to meet the design specification once the brine well is brought back online and reinjection of the extracted groundwater into the brine well can be implemented.

Figures

Source: National Agriculture Imagery Program (NAIP), dated May 13, 2009

Explanation

- Water supply well
- Monitor well
- Recovery well
- Well destroyed

Path: S:\Projects\ES08.0118.01_Salty_Dog_Inc\GIS\MXDs\Site_location_map.mxd

SALTY DOG BRINE STATION

Site Location Map

Daniel B. Stephens & Associates, Inc.

5/31/2012 JN ES08.0118.01

Figure 1

Explanation

DBS-2 Well designation
3754.24 Groundwater elevation, ft msl

● Groundwater elevation (ft msl)

—— Potentiometric surface elevation contour (ft msl)

Note: * Well not used for contouring.

Source: National Agriculture Imagery Program (NAIP), dated May 13, 2009

SALTY DOG BRINE STATION

Former Brine Pond Area
Potentiometric Surface Elevations
April 30, 2012

Daniel B. Stephens & Associates, Inc.
10/13/2011 JN ES08.0118.01

Figure 2

Path: S:\Projects\ES08.0118.01_Salty_Dog_Inc\GIS\MXDs\Fluid_levels\GWE_20120430_brine_station.mxd

Explanation

MW-5 Well designation

3747.46 Groundwater elevation, ft msl

● Groundwater elevation (ft msl)

—— Potentiometric surface elevation contour (ft msl)

Source: National Agriculture Imagery Program (NAIP), dated May 13, 2009

SALTY DOG BRINE STATION

Playa Lake and Brine Well Area Potentiometric Surface Elevations April 30, 2012

Path: S:\Projects\ES08.0118.01_Salty_Dog_Inc\GIS\MXDs\Fluid_levels\GWE_20120430_brine_well.mxd

Daniel B. Stephens & Associates, Inc.
10/12/2011 JN ES08.0118.01

Figure 3

Explanation

DBS-5 Well designation

150 Chloride concentration (mg/L)

Monitor well location

Source: National Agriculture Imagery Program (NAIP), dated May 13, 2009

BOLD indicates concentration equal to or greater than the NMWQCC standard.

NS = Not sampled

SALTY DOG BRINE STATION

Former Brine Pond Area

Chloride Concentrations in Groundwater

April 30, 2012 and May 1, 2012

Daniel B. Stephens & Associates, Inc.

02/22/2012 JN ES08.0118.01

Figure 4

Path: S:\Projects\ES08.0118.01_Salty_Dog_Inc\GIS\MXDs\Analytical_results\cl_gw_20120430_brine_station.mxd

Explanation

MW-5 Well designation

1,400 Chloride concentration (mg/L)

Monitor well location

BOLD indicates concentration equal to or greater than the NMWQCC standard.

NS = Not sampled

Source: National Agriculture Imagery Program (NAIP), dated May 13, 2009

SALTY DOG BRINE STATION

Playa Lake and Brine Well Area
Chloride Concentrations in Groundwater
April 30, 2012

Daniel B. Stephens & Associates, Inc.
02/22/2012 JN ES08.0118.01

Figure 5

Path: S:\Projects\ES08.0118.01_Salty_Dog_Inc\GIS\MXDs\Analytical_results\cl_gw_20120430_brine_well.mxd

Tables

Table 1. Summary of Historical Fluid Level Measurements
Salty Dog Brine Station, Lea County, New Mexico

Monitor Well	Screen Interval (ft bgs)	Top of Casing Elevation [a] (ft msl)	Date Measured	Depth to Water (ft btoc)	Groundwater Elevation (ft msl)
DBS-1	56.0-76.0	3817.09	04/08/09	62.38	3754.71
			05/11/11	64.70	3752.39
			10/04/11	Well destroyed	
DBS-1R	58.0-78.0	3816.00 [b]	04/30/12	63.60	3752.40
DBS-2	58.0-78.0	3820.50	04/08/09	65.45	3755.05
			05/11/11	66.80	3753.70
			10/04/11	65.87	3754.63
			02/08/12	65.96	3754.54
			04/30/12	66.26	3754.24
DBS-3	56.0-76.72	3816.66	04/08/09	60.67	3755.99
			05/11/11	61.25	3755.41
			10/04/11	61.25	3755.41
			02/08/12	61.11	3755.55
			04/30/12	61.41	3755.25
DBS-4	56.0-76.0	3820.37	04/08/09	66.27	3754.10
			05/11/11	67.23	3753.14
			10/04/11	66.67	3753.70
			02/08/12	66.76	3753.61
			04/30/12	67.02	3753.35
DBS-5	56.9-76.9	3820.66	04/08/09	62.99	3757.67
			05/11/11	63.45	3757.21
			10/04/11	63.41	3757.25
			02/08/12	63.46	3757.20
			04/30/12	63.70	3756.96
DBS-6	56.7-76.7	3812.65	04/07/09	62.75	3749.90
			05/11/11	63.11	3749.54
			10/04/11	63.16	3749.49
			02/08/12	63.20	3749.45

[a] Top of casing elevations surveyed by Pettigrew & Assoc. on May 28, 2009.
[b] Top of casing elevation surveyed by Pettigrew & Assoc. on June 13, 2012.

ft bgs = Feet below ground surface
ft msl = Feet above mean sea level
ft btoc = Feet below top of casing
NA = Not available

Table 1. Summary of Historical Fluid Level Measurements
Salty Dog Brine Station, Lea County, New Mexico

Monitor Well	Screen Interval (ft bgs)	Top of Casing Elevation [a] (ft msl)	Date Measured	Depth to Water (ft btoc)	Groundwater Elevation (ft msl)
DBS-6 (cont.)	56.7-76.7	3812.65	04/30/12	63.43	3749.22
DBS-7	55.1-75.1	3810.21	04/07/09	61.74	3748.47
DBS-8	55.2-75.2	3810.70	04/07/09	61.20	3749.50
			05/11/11	61.67	3749.03
			10/04/11	61.71	3748.99
			02/08/12	61.77	3748.93
			04/30/12	62.00	3748.70
DBS-9	48.0-68.0	3806.26	04/08/09	53.93	3752.33
			05/11/11	54.39	3751.87
			10/04/11	54.59	3751.67
			02/08/12	54.53	3751.73
			04/30/12	54.68	3751.58
NW-1 (s)	52.95-72.95	3817.33	04/08/09	62.35	3754.98
NW-1 (m)	99.31-119.31	3817.35	04/08/09	62.25	3755.10
NW-1 (d)	149.45-169.45	3817.35	04/08/09	62.04	3755.31
NW-2 (s)	53.35-73.35	3812.50	04/08/09	63.08	3749.42
NW-2 (m)	93.72-113.72	3812.45	04/08/09	63.27	3749.18
NW-2 (d)	126.87-146.87	3812.46	04/08/09	66.41	3746.05
PMW-1	63-78	3821.17	06/23/08	67.51	3753.66
			04/08/09	65.97	3755.20
			05/11/11	68.70	3752.47
			10/04/11	66.95	3754.22
			02/08/12	66.69	3754.48
			04/30/12	67.27	3753.90
MW-1	120-140	NA	06/23/08	59.90	NA
MW-2	127-147	3812.68	06/23/08	61.42	3751.26
			04/07/09	61.65	3751.03
MW-3	NA	3812.05	06/23/08	62.06	3749.99

[a] Top of casing elevations surveyed by Pettigrew & Assoc. on May 28, 2009.
[b] Top of casing elevation surveyed by Pettigrew & Assoc. on June 13, 2012.

ft bgs = Feet below ground surface
ft msl = Feet above mean sea level
ft btoc = Feet below top of casing
NA = Not available

Table 1. Summary of Historical Fluid Level Measurements
Salty Dog Brine Station, Lea County, New Mexico

Monitor Well	Screen Interval (ft bgs)	Top of Casing Elevation [a] (ft msl)	Date Measured	Depth to Water (ft btoc)	Groundwater Elevation (ft msl)
MW-3 (cont.)	NA	3812.05	04/07/09	62.02	3750.03
			05/11/11	62.91	3749.14
			10/04/11	62.91	3749.14
			02/08/12	62.95	3749.10
			04/30/12	63.39	3748.66
MW-4	111-131	3811.33	06/23/08	62.12	3749.21
			04/07/09	62.51	3748.82
MW-5	112-132	3808.96	06/23/08	60.60	3748.36
			04/07/09	60.79	3748.17
			05/11/11	61.17	3747.79
			10/04/11	61.72	3747.24
			02/08/12	61.23	3747.73
			04/30/12	61.50	3747.46
MW-6	NA	3810.17	06/23/08	62.17	3748.00
			04/07/09	62.41	3747.76

[a] Top of casing elevations surveyed by Pettigrew & Assoc. on May 28, 2009.
[b] Top of casing elevation surveyed by Pettigrew & Assoc. on June 13, 2012.

ft bgs = Feet below ground surface
ft msl = Feet above mean sea level
ft btoc = Feet below top of casing
NA = Not available

Table 2. Summary of Chloride Groundwater Analytical Data
Salty Dog Brine Station, Lea County, New Mexico
Page 1 of 3

Monitor Well	Date	Chloride Concentration (mg/L) [a]
New Mexico Water Quality Control Commission Standard		*250*
DBS-1	04/08/09	**320**
	05/12/11	**940**
	10/04/11	Well destroyed
DBS-1R	05/01/12	**3,000**
DBS-2	04/08/09	14
	05/12/11	25
	10/05/11	18
	02/09/12	22
	05/01/12	24
DBS-3	04/08/09	36
	05/12/11	35
	10/05/11	34
	02/09/12	34
	05/01/12	33
DBS-4	04/08/09	38
	05/12/11	33
	10/05/11	32
	02/09/12	32
	05/01/12	31
DBS-5	04/08/09	65
	05/12/11	140
	10/05/11	140
	02/09/12	140
	04/30/12	150
DBS-6	04/07/09	**380**
	05/12/11	**410**
	10/05/11	**400**
	02/09/12	**380**
	04/30/12	**400**
DBS-7	04/07/08	**570**
DBS-8	04/07/09	58

Bold indicates concentrations that exceed the applicable standard.

[a] All samples analyzed in accordance to EPA method 300.0, unless otherwise noted.

[b] Samples analyzed in accordance to Standard Method 4500-Cl B.

mg/L = Milligrams per liter

Table 2. Summary of Chloride Groundwater Analytical Data
Salty Dog Brine Station, Lea County, New Mexico

Monitor Well	Date	Chloride Concentration (mg/L) [a]
New Mexico Water Quality Control Commission Standard		*250*
DBS-8 (cont.)	05/12/11	36
	10/05/11	140
	02/09/12	41
	04/30/12	41
DBS-9	04/08/09	210
	05/12/11	**600**
	10/05/11	**440**
	02/09/12	**290**
	04/30/12	**330**
NW-1s	04/08/09	**630**
NW-1m	04/08/09	57
NW-1d	04/08/09	38
NW-2s	04/08/09	**410**
NW-2m	04/08/09	**570**
NW-2d	04/08/09	**4,700**
PMW-1	02/27/08	**9,500** [b]
	05/30/08	**8,600** [b]
	06/23/08	**12,700**
	04/08/09	**11,000**
	05/12/11	**13,000**
	10/05/11	**12,000**
	02/09/12	**12,000**
	05/01/12	**12,000**
MW-1	05/30/08	75 [b]
	06/23/08	243
MW-2	02/27/08	120 [b]
	05/30/08	80 [b]
	06/23/08	**1,480**
	04/07/09	**1,200**
MW-3	02/27/08	**348** [b]
	05/30/08	**360** [b]

Bold indicates concentrations that exceed the applicable standard.
[a] All samples analyzed in accordance to EPA method 300.0, unless otherwise noted.
[b] Samples analyzed in accordance to Standard Method 4500-Cl B.
mg/L = Milligrams per liter

Table 2. Summary of Chloride Groundwater Analytical Data
Salty Dog Brine Station, Lea County, New Mexico
Page 3 of 3

Monitor Well	Date	Chloride Concentration (mg/L) [a]
New Mexico Water Quality Control Commission Standard		*250*
MW-3 (cont.)	06/23/08	**1,090**
	04/07/09	**17,000**
	05/12/11	**16,000**
	10/05/11	**14,000**
	02/09/12	**15,000**
	04/30/12	**14,000**
MW-4	02/27/08	**476** [b]
	05/30/08	**512** [b]
	06/23/08	**5,730**
	04/07/09	**6,600**
MW-5	02/27/08	**1,280** [b]
	05/30/08	**1,220** [b]
	06/23/08	**1,260**
	04/07/09	**1,300**
	05/12/11	**1,500**
	10/05/11	**1,500**
	02/09/12	**1,500**
	04/30/12	**1,400**
MW-6	02/27/08	32 [b]
	05/30/08	36 [b]
	06/23/08	31.4
	04/07/09	25
Ranch Headquarters Supply Well	06/23/08	35.4
Brine Station Fresh Water Supply Well	02/27/08	**630** [b]
	05/30/08	**590** [b]
	06/23/08	**650**

Bold indicates concentrations that exceed the applicable standard.
[a] All samples analyzed in accordance with EPA method 300.0, unless otherwise noted.
[b] Samples analyzed in accordance with Standard Method 4500-Cl B.
mg/L = Milligrams per liter

Table 3. Summary of Extracted Groundwater Volumes
Salty Dog Brine Station, Lea County, New Mexico
Page 1 of 1

Recovery Well	Date	Ave. Flow Rate (gpm)	Extracted Volumes (gal)
RW-1	05/01/12	2.5	73,740
RW-2	05/01/12	3.5	91,450

gpm = gallons per minute
gal = gallons

Appendices

Appendix 1

Laboratory Reports

HALL ENVIRONMENTAL ANALYSIS LABORATORY

Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: www.hallenvironmental.com

May 08, 2012

Mike McVey
Daniel B. Stephens & Assoc.
6020 Academy NE Suite 100
Albuquerque, NM 87109
TEL: (505) 822-9400
FAX (505) 822-8877

RE: Salty Dog   OrderNo.: 1205141

Dear Mike McVey:

Hall Environmental Analysis Laboratory received 11 sample(s) on 5/2/2012 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent. To access our accredited tests please go to www.hallenvironmental.com or the state specific web sites. See the sample checklist and/or the Chain of Custody for information regarding the sample receipt temperature and preservation. Data qualifiers or a narrative will be provided if the sample analysis or analytical quality control parameters require a flag. All samples are reported as received unless otherwise indicated.

Please don't hesitate to contact HEAL for any additional information or clarifications.

Sincerely,

Andy

Andy Freeman
Laboratory Manager
4901 Hawkins NE
Albuquerque, NM 87109

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Daniel B. Stephens & Assoc. **Lab Order:** 1205141
Project: Salty Dog

Lab ID: 1205141-001 **Collection Date:** 4/30/2012 1:00:00 PM
Client Sample ID: DBS-8 **Matrix:** AQUEOUS

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: **BRM**
Chloride	41	10		mg/L	20	5/3/2012 2:58:04 PM

Lab ID: 1205141-002 **Collection Date:** 4/30/2012 2:00:00 PM
Client Sample ID: MW-5 **Matrix:** AQUEOUS

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: **BRM**
Chloride	1,400	100		mg/L	200	5/3/2012 3:09:18 PM

Lab ID: 1205141-003 **Collection Date:** 4/30/2012 3:15:00 PM
Client Sample ID: MW-3 **Matrix:** AQUEOUS

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: **BRM**
Chloride	14,000	1,000		mg/L	2000	5/3/2012 3:20:32 PM

Lab ID: 1205141-004 **Collection Date:** 4/30/2012 3:59:00 PM
Client Sample ID: DBS-6 **Matrix:** AQUEOUS

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: **BRM**
Chloride	400	25		mg/L	50	5/3/2012 3:31:45 PM

Lab ID: 1205141-005 **Collection Date:** 4/30/2012 5:22:00 PM
Client Sample ID: DBS-9 **Matrix:** AQUEOUS

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: **BRM**
Chloride	330	25		mg/L	50	5/3/2012 3:42:59 PM

Lab ID: 1205141-006 **Collection Date:** 4/30/2012 6:08:00 PM
Client Sample ID: DBS-5 **Matrix:** AQUEOUS

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: **BRM**
Chloride	150	10		mg/L	20	5/3/2012 3:54:13 PM

Qualifiers:

*/X	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	Spike Recovery outside accepted recovery limits		

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Daniel B. Stephens & Assoc. **Lab Order:** 1205141
Project: Salty Dog

Lab ID: 1205141-007 **Collection Date:** 5/1/2012 8:16:00 AM
Client Sample ID: DBS-3 **Matrix:** AQUEOUS

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: **BRM**
Chloride	33	10		mg/L	20	5/3/2012 4:05:27 PM

Lab ID: 1205141-008 **Collection Date:** 5/1/2012 8:58:00 AM
Client Sample ID: DBS-4 **Matrix:** AQUEOUS

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: **BRM**
Chloride	31	10		mg/L	20	5/3/2012 4:16:41 PM

Lab ID: 1205141-009 **Collection Date:** 5/1/2012 9:41:00 AM
Client Sample ID: DBS-2 **Matrix:** AQUEOUS

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: **BRM**
Chloride	24	10		mg/L	20	5/7/2012 3:32:58 PM

Lab ID: 1205141-010 **Collection Date:** 5/1/2012 10:27:00 AM
Client Sample ID: DBS-1R **Matrix:** AQUEOUS

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: **BRM**
Chloride	3,000	100		mg/L	200	5/7/2012 3:45:23 PM

Lab ID: 1205141-011 **Collection Date:** 5/1/2012 11:04:00 AM
Client Sample ID: PMW-1 **Matrix:** AQUEOUS

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: **BRM**
Chloride	12,000	500		mg/L	1000	5/3/2012 5:12:50 PM

Qualifiers:

*/X	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	Spike Recovery outside accepted recovery limits		

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1205141**

08-May-12

Client: Daniel B. Stephens & Assoc.

Project: Salty Dog

Sample ID **MB**	SampType: **MBLK**	TestCode: **EPA Method 300.0: Anions**								
Client ID: **PBW**	Batch ID: **R2571**	RunNo: **2571**								
Prep Date:	Analysis Date: **5/3/2012**	SeqNo: **71672**	Units: **mg/L**							

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	ND	0.50								

Sample ID **LCS**	SampType: **LCS**	TestCode: **EPA Method 300.0: Anions**	
Client ID: **LCSW**	Batch ID: **R2571**	RunNo: **2571**	
Prep Date:	Analysis Date: **5/3/2012**	SeqNo: **71673**	Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	4.7	0.50	5.000	0	94.9	90	110			

Sample ID **MB**	SampType: **MBLK**	TestCode: **EPA Method 300.0: Anions**	
Client ID: **PBW**	Batch ID: **R2623**	RunNo: **2623**	
Prep Date:	Analysis Date: **5/7/2012**	SeqNo: **72905**	Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	ND	0.50								

Sample ID **LCS**	SampType: **LCS**	TestCode: **EPA Method 300.0: Anions**	
Client ID: **LCSW**	Batch ID: **R2623**	RunNo: **2623**	
Prep Date:	Analysis Date: **5/7/2012**	SeqNo: **72906**	Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	4.6	0.50	5.000	0	92.0	90	110			

Qualifiers:

*/X	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit

HALL ENVIRONMENTAL ANALYSIS LABORATORY

Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: www.hallenvironmental.com

Sample Log-In Check List

Client Name: DBS

Work Order Number: 1205141

Received by/date: AF 05/02/12

Logged By: Lindsay Mangin 5/2/2012 12:45:00 PM

Completed By: Lindsay Mangin 5/2/2012 5:20:38 PM

Reviewed By: IO 05/03/12

Chain of Custody

1. Were seals intact? Yes No Not Present ✔
2. Is Chain of Custody complete? Yes ✔ No Not Present
3. How was the sample delivered? Client

Log In

4. Coolers are present? (see 19. for cooler specific information) Yes ✔ No NA
5. Was an attempt made to cool the samples? Yes ✔ No NA
6. Were all samples received at a temperature of >0° C to 6.0°C Yes ✔ No NA
7. Sample(s) in proper container(s)? Yes ✔ No
8. Sufficient sample volume for indicated test(s)? Yes ✔ No
9. Are samples (except VOA and ONG) properly preserved? Yes ✔ No
10. Was preservative added to bottles? Yes No ✔ NA
11. VOA vials have zero headspace? Yes No No VOA Vials ✔
12. Were any sample containers received broken? Yes No ✔
13. Does paperwork match bottle labels? Yes ✔ No
    (Note discrepancies on chain of custody)
14. Are matrices correctly identified on Chain of Custody? Yes ✔ No
15. Is it clear what analyses were requested? Yes ✔ No
16. Were all holding times able to be met? Yes ✔ No
    (If no, notify customer for authorization.)

# of preserved bottles checked for pH: (<2 or >12 unless noted)

Adjusted?

Checked by:

Special Handling (if applicable)

17. Was client notified of all discrepancies with this order? Yes No NA ✔

Person Notified: Date

By Whom: Via: eMail Phone Fax In Person

Regarding:

Client Instructions:

18. Additional remarks:

19. Cooler Information

Cooler No	Temp °C	Condition	Seal Intact	Seal No	Seal Date	Signed By
1	3.4	Good	Not Present			

Chain-of-Custody Record

Client: DBS+A

Mailing Address: 6020 Academy NE
Albuquerque NM 87110

Phone #: 505-822-9400

email or Fax#: MMcvey@DBStephens.com

QA/QC Package:
☑ Standard ☐ Level 4 (Full Validation)

Accreditation
☑ NELAP ☐ Other

☑ EDD (Type)

Turn-Around Time:
☑ Standard ☐ Rush

Project Name: Salty Dog

Project #: ES08.0118.01

Project Manager: Mike McVey

Sampler: M. Nauck

On Ice: ☑ Yes ☐ No

Sample Temperature: 3.4°C

HALL ENVIRONMENTAL ANALYSIS LABORATORY

www.hallenvironmental.com

4901 Hawkins NE - Albuquerque, NM 87109

Tel. 505-345-3975 Fax 505-345-4107

Analysis Request

Date	Time	Matrix	Sample Request ID	Container Type and #	Preservative Type	HEAL No. 1205141	BTEX + MTBE + TMB's (8021)	BTEX + MTBE + TPH (Gas only)	TPH Method 8015B (Gas/Diesel)	TPH (Method 418.1)	EDB (Method 504.1)	8310 (PNA or PAH)	RCRA 8 Metals	Anions (F,Cl,NO_3,NO_2,PO_4,SO_4)	8081 Pesticides / 8082 PCB's	8260B (VOA)	8270 (Semi-VOA)	300.0 Chloride				Air Bubbles (Y or N)
4/20/12	1300	Water	DBS-8	None	500ml Poly	-001												✓				
	1400		MW-5			-002												✓				
	1515		MW-3			-003												✓				
	1559		DBS-6			-004												✓				
	1722		DBS-9			-005												✓				
	1808		DBS-5			-006												✓				
5/1/12	0816		DBS-3			-007												✓				
	0858		DBS-4			-008												✓				
	0941		DBS-2			-009												✓				
	1027		DBS-1R			-010												✓				
	1104		PMW-1			-011												✓				

MW

Date:	Time:	Relinquished by:	Received by:	Date	Time
~~4/30~~ 5/1/12	1830	M. Nauck	[signature]	5/2/12	0900
5/2/12	12:45	[signature]	[signature]	5/2/12	12:45

Remarks:

If necessary, samples submitted to Hall Environmental may be subcontracted to other accredited laboratories. This serves as notice of this possibility. Any sub-contracted data will be clearly notated on the analytical report.

Appendix 2

Field Notes

4/30/12 MW

0520 Load up at warehouse
1100 Onsite at Salty Dog
Begin guaging wells
~~PMW~~

Well	DTW	TD
PMW-1	67.27	78.71
DBS-1R	63.60	74.58
DBS-2	66.26	76.51
DBS-3	61.41	76.80
DBS-4	67.02	79.72
DBS-5	63.70	77.51
DBS-6	63.43	77.00
DBS-8	62.00	72.95
DBS-9	54.68	69.90
MW-3	63.39	147.05
MW-5	61.50	129.12

1220 ~~DBS~~ Calibrate YSI
pH 7: 7.00 @ 24.5°C SpC uS/cm 1000 992 @ 23.8
10: 10.05 @ 24.6°C

4/30/12 MW

1245 DBS-8 (72.95 - 62.00 = 10.95 · 0.5 = 5.475 gal (3cv))

Time	Vol (gal)	pH	T°C	SpC uS/cm	Comments
1251	Initial	7.51	25.1	717	Turbid
1252	1.5	7.56	21.8	693	Turbid
1254	3.0	7.68	21.2	682	milky
1256	4.5	7.67	21.0	673	milky
1258	Final	7.67	21.1	670	milky

1300 collect sample

1315 MW-5 (129.12 - 61.50 = 67.62 · 0.50 = 33.81 gal 3cv)

Time	Vol (gal)	pH	T°C	SpC uS/cm	Comments
~~Initial~~ 1332	Initial	7.34	23.4	920	clear
1343	11	7.76	21.3	3744	clear
1348	22	7.65	20.4	3669	clear
1352	33	7.51	20.1	3632	clear
~~Final~~ 1359	Final	7.50	19.9	3596	clear

1400 Collect sample

1410 MW-3 (147.05 - 63.39 = 83.66 · 0.5 = 41.83 gal 3cv)

Time	Vol	pH	T°C	SpC uS/cm	Comments
1440	Initial	7.22	22.2	6650	clear
1452	14	6.98	20.7	2428	clear
1501	28	7.09	20.2	2775	clear
1510	42	7.37	20.2	2927	clear
1512	Final	7.42	19.9	2916	

1515 collect sample

4/30/12 MW

1527 DBS-6 (77.00-63.43=13.57•0.5=6.79gal 3cv)

Time	Vol (gal)	pH	T°C	SpC us/cm	Comments
1548	Initial	7.24	23.4	1632	Turbid
1550	2	7.45	21.3	1491	Milky
1553	4	7.42	20.8	1480	Clear
1556	6	7.46	20.4	1490	Clear
1558	Final	7.38	20.8	1505	Clear

1559 Collect sample

1650 DBS-9 (69.90-54.68=15.22•0.5=7.61gal 3cv)

Time	Vol (gal)	pH	T°C	SpC us/cm	Comments
1708	Initial	7.24	22.4	2372	Turbid
1712	2	7.61	20.4	1722	Turbid
1716	4	7.70	19.8	1760	Clear
1719	6	7.71	19.5	1550	Clear
1721	Final	7.62	19.5	1548	clear

1722 Collect sample

1742 DBS-5 (77.51-63.70=13.81•0.5=6.91gal 3cv)

Time	Vol (gal)	pH	T°C	SpC us/cm	Comments
1759	Initial	7.26	23.1	1065	Turbid
1801	2	7.40	20.8	1021	Milky
1804	4	7.45	20.6	1007	Clear
1806	6	7.51	20.1	1007	clear
1807	Final	7.48	20.7	1005	Clear

1808 Collect sample

5/1/12 MW

0730 Onsite at Salty Dog.

Calibrate YSI63

pH 7 7.00 T°C 18.4 SpC us/cm (1000) 999

10 10.05 18.0

0742 DBS-3 (76.80-61.41=15.39•0.5=7.70gal (3cv))

Time	Vol (gal)	pH	T°C	SpC us/cm	Comments
0807	Initial	7.43	19.4	467	Turbid
0809	2.3	7.45	18.9	486	Milky
0811	4.6	7.46	18.8	473	Milky
0813	6.9	7.51	19.1	469	clear
0815	Final	7.43	19.0	469	Clear

0816 Collect sample

0830 DBS-4 (79.72-67.02=12.70•0.5=6.35gal (3cv))

Time	Vol (gal)	pH	T°C	SpC us/cm	Comments
0847	Initial	7.63	22.5	462.8	Turbid
0852	2	7.65	20.8	455	Milky
0853	4	7.63	20.1	457	clear
0856	6	7.67	19.4	457	Clear
0857	Final	7.63	19.6	450	Clear

0858 Collect sample

5/1/12 MW

0913 DBS-2 (76.51-66.26=10.25•0.5=5.13 gal (3cv))

Time	Vol(gal)	pH	T°C	SpC us/cm	Comments
0930	Initial	7.63	21.4	450	Turbid
0933	1.5	7.67	20.1	443	Clear
0936	3.0	7.60	19.9	442	Clear
0939	4.5	7.61	19.9	440	Clear
0940	Final	7.61	20.5	456	Clear

0941 Collect sample

0957 DBS-1R (74.58-63.60=10.98•0.5=5.49 gal (3cv))

Time	Vol(gal)	pH	T°C	SpC us/cm	Comments
1019	Initial	7.14	23.0	8800	Turbid
1021	1.5	7.38	19.9	6230	Milky
1023	3.0	7.42	19.5	5930	Clear
1025	4.5	7.44	19.2	6440	Clear
1026	Final	7.41	19.0	6820	Clear

1027 Collect Sample

1041 PMW-1 (78.71-67.27=11.44•0.5=5.72 gal 3cv)

Time	Vol(gal)	pH	T°C	SpC us/cm	Comments
1056	Initial	7.05	24.8	2730	Milky
1058	1.5	7.30	21.5	2352	Clear
1100	3.0	7.32	20.7	2357	Clear
1101	4.5	7.33	20.4	2428	Clear
1103	Final	7.30	20.6	2448	Clear

1104 Collect sample

5/1/12 MW

1116 North end flow meter reading 73740

1124 South end flow meter reading 91450

1200 Offsite

MW 5/1/12

June 1, 2012

RECEIVED OCD

2012 JUN -4 P 1:32

Mr. Jim Griswold
New Mexico Oil Conservation Division
Environmental Bureau
1220 South St. Francis Drive
Santa Fe, NM 87505-4225

Re: Groundwater Extraction System Installation Report
Salty Dog Brine Station, Lea County, New Mexico

Dear Mr. Griswold:

On behalf of PAB Services, Inc., Daniel B. Stephens & Associates, Inc. (DBS&A) is pleased to submit the enclosed report documenting the installation of a groundwater extraction system and replacement monitor well at the Salty Dog brine station from April 4 to 7, 2012.

Please do not hesitate to call me at (505) 353-9130 if you have any questions or require additional information.

Sincerely,

DANIEL B. STEPHENS & ASSOCIATES, INC.

Michael D. McVey
Senior Hydrogeologist

Enclosures

cc: Pieter Bergstein, PAB Services, Inc.

Daniel B. Stephens & Associates, Inc.
6020 Academy Rd., NE, Suite 100 505-822-9400
Albuquerque, NM 87109-3315 FAX 505-822-8877

Groundwater Extraction System

Installation Report

Salty Dog Brine Station

Lea County, New Mexico

Prepared for **New Mexico Energy, Minerals and Natural Resources Department Oil Conservation Division, Environmental Bureau**

June 1, 2012

Daniel B. Stephens & Associates, Inc.

6020 Academy NE, Suite 100 • Albuquerque, New Mexico 87109

Table of Contents

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List of Appendices

1. Introduction

On behalf of PAB Services, Inc. (PAB), Daniel B. Stephens & Associates, Inc. (DBS&A) has prepared this groundwater extraction system installation report for submission to the New Mexico Energy, Minerals and Natural Resources Department Oil Conservation Division (OCD). The Salty Dog brine station (Site) is located in Lea County in southeastern New Mexico, approximately 12 miles west of Hobbs on the south side of the Hobbs/Carlsbad Highway (US-180 W/US-62 W) (Figure 1).

The Site is comprised of a northern portion where the brine pond was located prior to closure in October 2008, and a southern portion where the brine well is located. The brine pond area and the brine well area are separated by approximately 2,500 feet, joined by a dirt road. Since the closure of the brine pond, a number of frac tanks have been stationed in the northern portion of the Site to serve as storage for brine that is produced for resale. A concrete truck loading pad is located near the frac tanks. The brine well is currently not operational and attempts are being made to redrill the well and restore brine production at the Site. Six monitor wells (PMW-1, DBS-1R and DBS-2 through DBS-5), one nested well (NW-1), and one recovery well (RW-1) are located in the brine pond area. Nine monitor wells (MW-2 through MW-6, DBS-6 through DBS-9), one nested well (NW-2), and one recovery well (RW-2) are located in the brine well area (Figure 1).

This report summarizes the installation of a groundwater extraction system to hydraulically control chloride groundwater plumes in the northern brine pond area and the southern brine well area. A summary of the extraction system installation and system operation are provided in Sections 2 and 3. A brief discussion of the installation of replacement monitor well DBS-1R is provided in Section 4. Section 5 presents the conclusions. The field activities were completed at the Site from April 4 through 7, 2012.

2. Extraction System Installation

On April 4, 2012, DBS&A personnel arrived on-site to install a groundwater extraction system for the hydraulic control of chloride-contaminated groundwater plumes at the brine pond area and the brine well area. The extraction system consists of two submersible pumps, conveyance lines, electrical power, and controls to extract groundwater from recovery wells RW-1 and RW-2, and convey the extracted groundwater to on-site frac tanks for off-site disposal.

Submersible pumps were installed in recovery wells RW-1 (brine pond area) and RW-2 (brine well area) to initially extract 0.5 gallon per minute (gpm) and 1.5 gpm, respectively. DBS&A subcontracted with Peterson Drilling and Testing, Inc. (Peterson) of Amarillo, Texas to complete the installation of the pumps. A Grundfos submersible pump, model number 5S03-9, rated to 6 gpm, was installed in RW-1 at a depth of 82 feet below ground surface (ft bgs) with 1-inch Schedule 40 (SCH 40) polyvinyl chloride (PVC) drop pipe. A Grundfos submersible pump, model number 16S05-5, rated to 18 gpm, was installed in RW-2 at a depth of 100 ft bgs with 1-inch SCH 40 PVC drop pipe. Manufacturer's cut sheets are provided for each pump in Appendix A.

Electrical power was provided from two separate distribution panels located near each recovery well. Electrical installation was completed by Triple S Electric under contract with the facility owner. Completions were the same at each well head and included a concrete surface pad, locking steel shroud, plumbing connections, totalizing flow meter, and pressure gauge. Four bollards were installed at each well head for protection. Conveyance lines, consisting of 1.5-inch high density polyethylene (HDPE), were placed in excavated trenches at approximately 8 inches bgs and buried. The conveyance lines carry the extracted groundwater from each recovery well to frac tanks located nearby for off-site disposal. Approximately 100 feet of HDPE pipe was installed from the RW-1 well head to a frac tank located at the brine pond area. Approximately 800 feet of HDPE pipe was installed from the RW-2 well head to a frac tank located at the brine well area. Piping and instrumentation diagrams (P&IDs) of each well installation are presented in Figures 2 and 3, with lengths and material details provided. Photographic documentation of the extraction system installation is provided in Appendix B. Field notes recorded during the installation are provided in Appendix C.

3. System Operation

The pumping rate for each recovery well can be increased or decreased by electronically adjusting the line pressure set point on the control panel located at each well head or manually throttling a gate valve in each conveyance line. A 240 volt power disconnect is mounted next to the control panel for each pump. The pump control for each well is provided by a Grundfos CU 301 control unit. The CU 301 provides pump controls by maintaining a constant line pressure registered by a pressure transducer. The CU 301 can be set for line pressures ranging from 40 pounds per square inch (psi) to 100 psi. Both controllers were set initially to 40 psi line pressure. With the line pressure set to 40 psi, the valve nearest the point of discharge from each well was opened, adjusted, and a timed reading was taken from the totalizing flow meter. This was done with both systems until the flow rate was found to be acceptable and the system had stabilized. Initially, RW-1 was set to produce 0.5 gpm and RW-2 was set to produce 1.5 gpm. Each frac tank includes a float valve that will shut off flow should a tank reach its full capacity. A frac tank storage volume of 20,000 gallons allows 7 to 28 days of storage between pumping and off-site disposal events, based on recovery rates of 1.5 to 0.5 gpm, respectively. However, PAB plans to dispose of the extracted groundwater on a daily basis. Manufacturer's information for operation and maintenance of the pumps is provided in Appendix D.

4. Monitor Well Replacement

On April 4, 2012, DBS&A and Peterson installed monitor well DBS-1R to replace monitor well DBS-1 which was destroyed by a backhoe during site grading in 2011. Installed five feet south of DBS-1, the DBS-1R boring was advanced to approximately 20 feet below the water table and completed as a 2-inch-diameter groundwater monitor well. The well consists of 20 feet of 2-inch-diameter, 0.020-inch slot, flush-threaded, machine-cut, SCH 40 PVC well screen with blank SCH 40 PVC to the surface. The screen was placed so that approximately five feet would be above the water table and 15 feet below. The filter pack consisted of 8/16 silica sand, placed by a tremie pipe, extending from the bottom of the boring to approximately 3 feet above the well screen. A 3-foot-thick bentonite pellet seal (hydrated) was then placed above the sand pack, and the annular space above the bentonite seal was filled with cement/bentonite grout to the surface. The well was completed with a locking cap within an eight-inch-diameter, flush-mount, traffic-grade well vault with a 3-foot by 3-foot by 6-inch-thick concrete pad to mitigate potential disturbance to the well completion. The concrete pad was also painted orange to increase visibility to on-site traffic (Photograph 11).

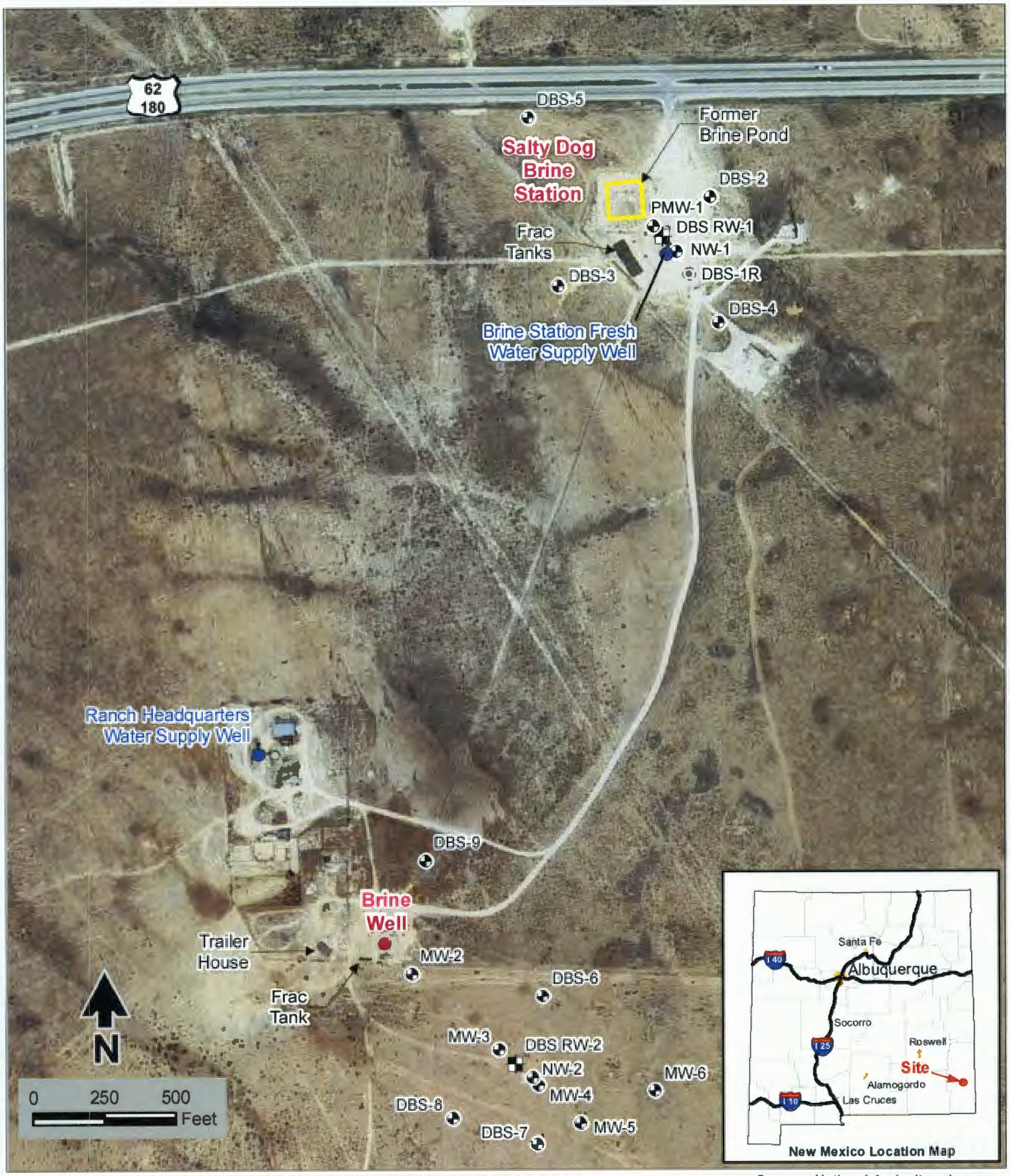
DBS&A was able to locate monitor well DBS-1 so that the well could be properly plugged and abandoned. It was determined that the top six inches of the well had been sheared off and the well casing was partially filled with dirt. The well casing was cut off three feet below ground surface and filled with cement/bentonite grout. The concrete well pad was broken up and the concrete and steel well vault were disposed of.

5. Conclusion

A groundwater extraction system was installed at the Site from April 4 to 7, 2012 to provide hydraulic control of the chloride-contaminated groundwater plumes at the former brine pond and brine well areas. The completed installation included the placement of submersible pumps in recovery wells RW-1 and RW-2 with plumbing to frac tanks for off-site disposal. The pumps were sized to meet the design pumping rates for hydraulic plume control specified in the 2009 remedial design report of 0.5 gpm for RW-1 and 15 gpm for RW-2. Currently, the flow rate for RW-1 is set at the design specification of 0.5 gpm. The flow rate for RW-2 was set below the design specification of 15 gpm to facilitate daily off-site disposal of the extracted groundwater. Once the brine well is brought back online, full-scale operation of the extraction system can begin with reinjection of the extracted groundwater into the brine well. At that time, the flow rate for RW-2 will be increased to meet the design specification of 15 gpm.

Quarterly groundwater monitoring will continue at the Site to assess system performance by the collection of groundwater samples for laboratory analysis from the on-site monitor wells. Chloride concentrations measured in each well will be used to determine contaminant plume control. In addition, extracted groundwater volumes will be provided in each quarterly report. System maintenance will be performed by PAB during routine weekly site visits, in addition to maintenance performed by DBS&A during quarterly groundwater monitoring.

Figures



Explanation

- Water supply well
- Monitor well
- Recovery well
- Well destroyed

Source: National Agriculture Imagery Program (NAIP), dated May 13, 2009

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SALTY DOG BRINE STATION
Site Location Map

Daniel B. Stephens & Associates, Inc.
5/31/2012 JN ES08.0118.01

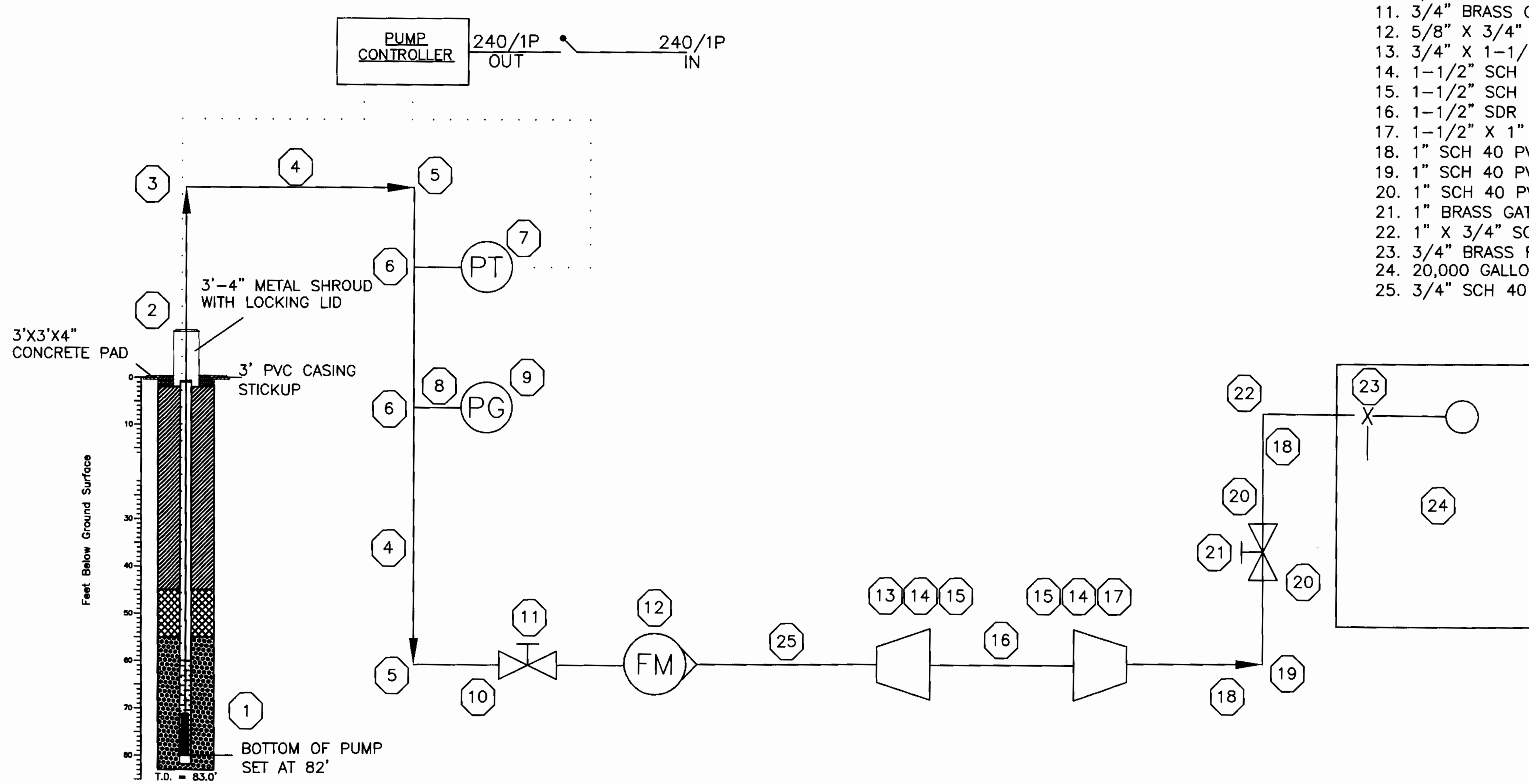
Figure 1

GENERAL NOTES:

1. SYSTEM INSTALLED APRIL 4 THROUGH 7, 2012

KEYED NOTES:

1. GRUNDFOS PUMP MODEL: 16S05-5 HP:1/2
2. 1" SCH 40 PVC PIPE, NPT ENDS
3. 1" SCH 40 PVC 90 ELBOW MNPTX SOCKET
4. 1' SCH 40 PVC PIPE, SPIGOT ENDS
5. 1" SCH 40 PVC 90 ELBOW, SOCKET ENDS
6. 1" X 1/2'" X 1" REDUCING TEE SOCKETxFNPTxSOCKET
7. GRUNDFOS PRESSURE TRANSDUCERS & PUMP CONTROLLER MODEL: CU301
8. 1/2" X 1/4" NPT REDUCING BUSHING,BRASS
9. BADGER METER ANALOG PRESSURE GAUGE
10. 3/4" SCH 40 PVC MNPT ADAPTER
11. 3/4" BRASS GATE VALVE
12. 5/8" X 3/4" BADGER TOTALIZING FLOWMETER
13. 3/4" X 1-1/2" SCH 40 PVC ADAPTER
14. 1-1/2" SCH 40 PVC PIPE
15. 1-1/2" SCH 40 DRESSER COUPLING
16. 1-1/2" SDR 13 HDPE PIPE
17. 1-1/2" X 1" SCH 40 PVC REDUCING BUSHING
18. 1" SCH 40 PVC PIPE
19. 1" SCH 40 PVC 90 ELBOW
20. 1" SCH 40 PVC MNPT ADAPTER
21. 1" BRASS GATE VALVE
22. 1" X 3/4" SCH 40 PVC 90 ELBOW FNPT ADAPTER
23. 3/4" BRASS FLOAT VALVE W/INTEGRAL BULKHEAD FITTING
24. 20,000 GALLON FRAC TANK
25. 3/4" SCH 40 PVC PIPE



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RW-1 Piping and Instrumentation Diagram

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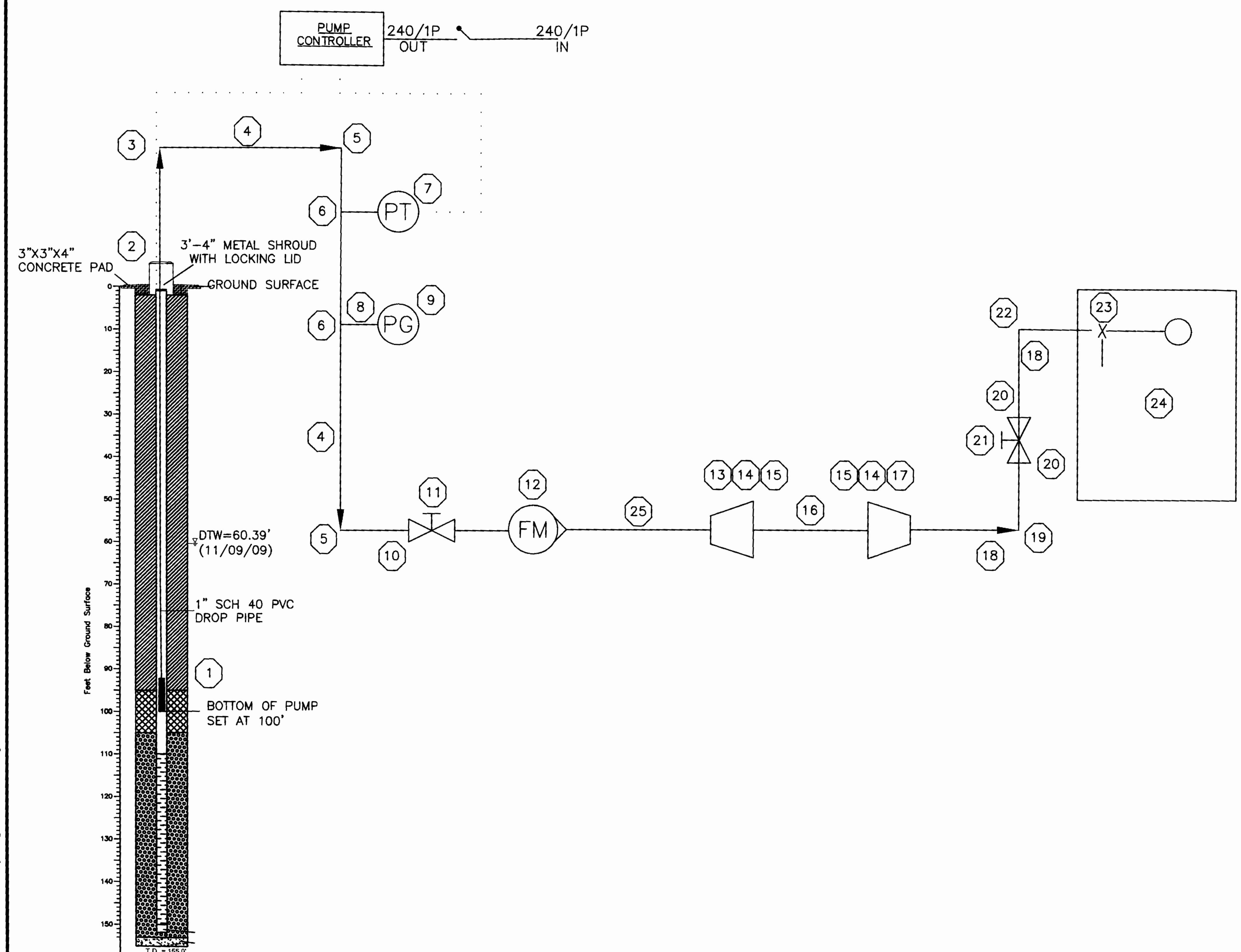
5-31-12
JN ES08.0118

Figure 2



GENERAL NOTES:

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23. 3/4" BRASS FLOAT VALVE W/INTEGRAL BULKHEAD FITTING
24. 20,000 GALLON FRAC TANK
25. 3/4" SCH 40 PVC PIPE

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RW-2 Piping and Instrumentation Diagram

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5-31-12 JN ES08.0118

Figure 3

Appendices

Appendix A

Manufacturer's Cut Sheets

SQ/SQE SUBMERSIBLE PUMPS

3-Inch SQ/SQE Submersible Well Pumps
3-Inch and Larger Wells

SQ/SQE pumps are suitable for both continuous and intermittent operation for a variety of applications:

- Domestic water supply
- Small waterworks
- Irrigation
- Tank applications

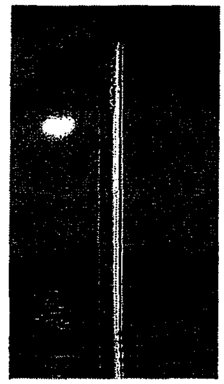
SQ, SQE pumps offer the following features:

- Dry-Run protection
- High efficiency pump and motor
- Protection against up-thrust
- Soft-start
- Over-voltage and under-voltage protection
- Overload protection
- Over-temperature protection
- High starting torque

Additionally, the SQE pumps offer:

- Constant pressure control
- Variable speed
- Electronic control and communication

The SQ and SQE pump models incorporate an innovative motor design. With the use of permanent-magnet technology within the motor, the SQ/SQE pumps deliver unmatched performance. By combining permanent-magnet motors and Grundfos's own micro frequency converter, we are now able to control and communicate with the pump in ways never before possible. A few of the features that come out of this combination are Constant Pressure Control, Soft-Start, and integrated Dry-Run protection. These are just a few of the many features that the SQ/SQE pumps can offer.



The SQ pump models operate at a constant speed much like today's conventional pumps. The difference between it and traditional pumps is you get all the benefits of an electronically controlled permanent-magnet motor that cannot be accomplished with a conventional induction motor. The SQ pumps are available for single phase power. They use a simple 2-wire design making installation easy.

The SQE uses the Grundfos "Smart Motor". Like the SQ model, we still use the high efficiency permanent magnet motor, but we give this motor the ability to communicate. The "Smart Motor" communicates via the CU301 status box through the power leads. It is not necessary to run any additional wires down the well. By being able to communicate with the pump you can have Constant Pressure Control and the ability to change the pump performance while the pump is installed in the well. Like the SQ motor, this is also a 2-wire motor designed for single-phase operation.

TYPE KEYS

SP Example 10 S 05 - 9

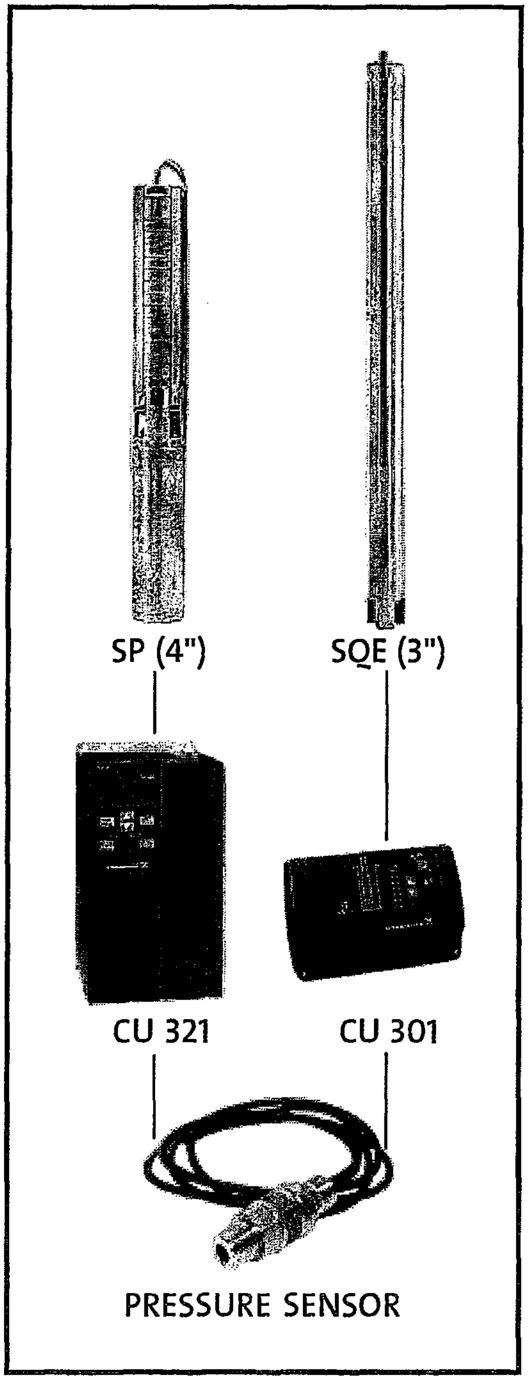
- 10: Rated gallons per minute
- S: Material of construction
- 05: Horsepower
- 9: Number of pump stages

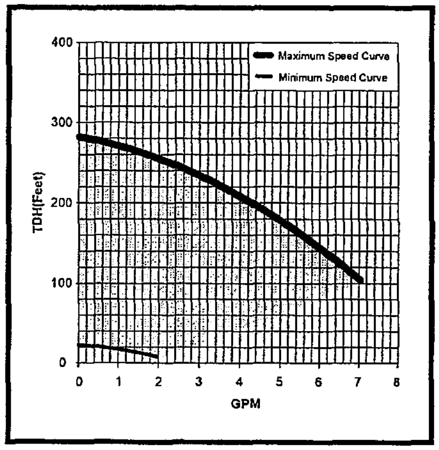
SQ/SQE Example 10 SQ E 05 - 160

- 10: Rated gallons per minute
- SQ: Basic version (without communication)
- E: Electronic communication
- 05: Horsepower
- 160: Total Dynamic Head in (ft) at rated flow

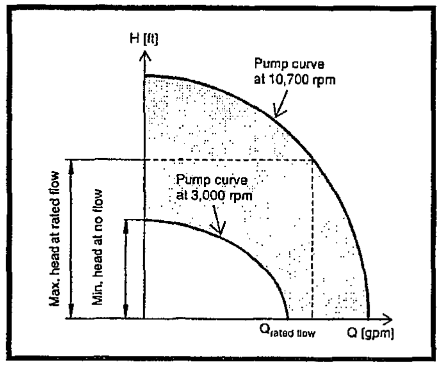
Performance Curves and Technical Data

For 3-Inch & larger well applications

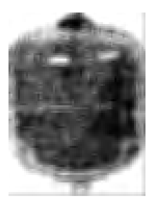




Performance Curves



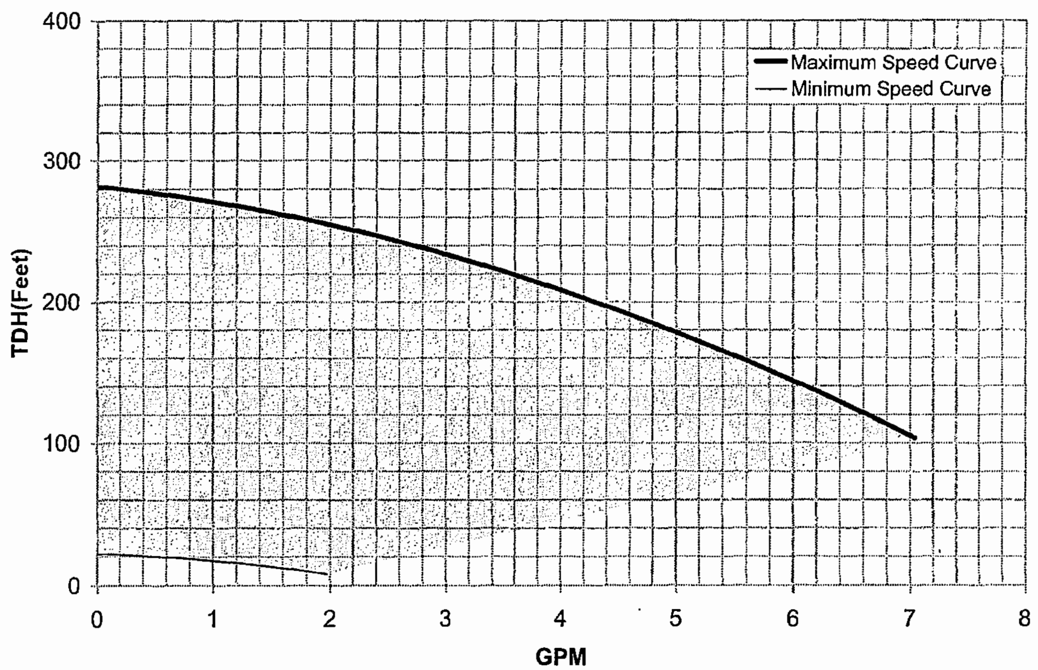
System Sizing Guide



WATER TANK

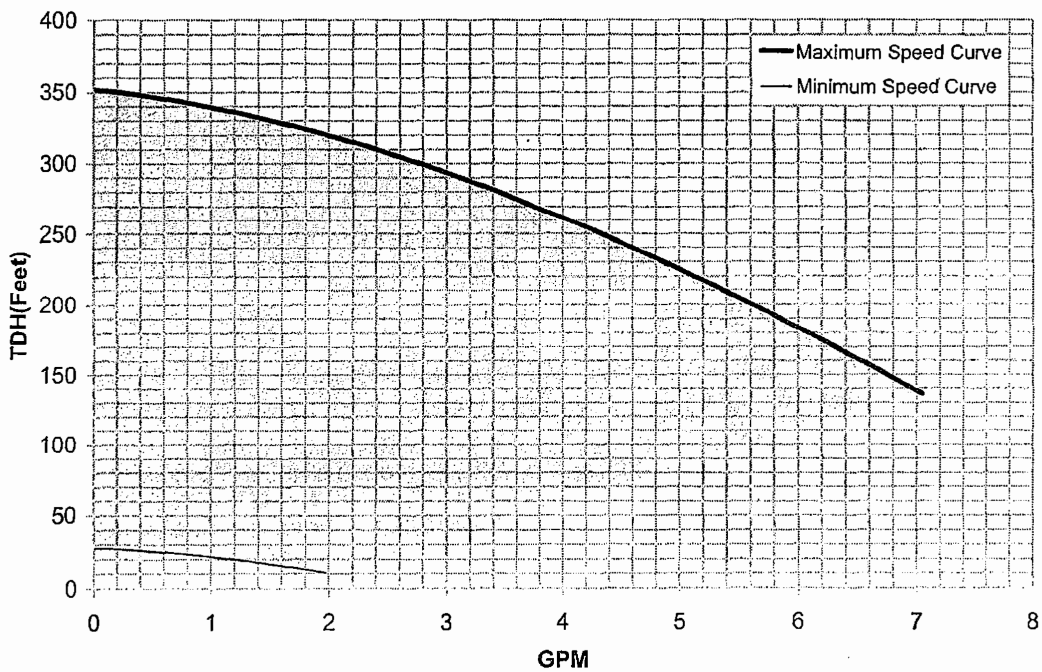
2 gallon tank min. for SQE
4 gallon tank min. for CU 321

5 GPM • MODEL 5SQE05-180



OUTLET SIZE: 1" NPT **NOMINAL DIA. 3"**

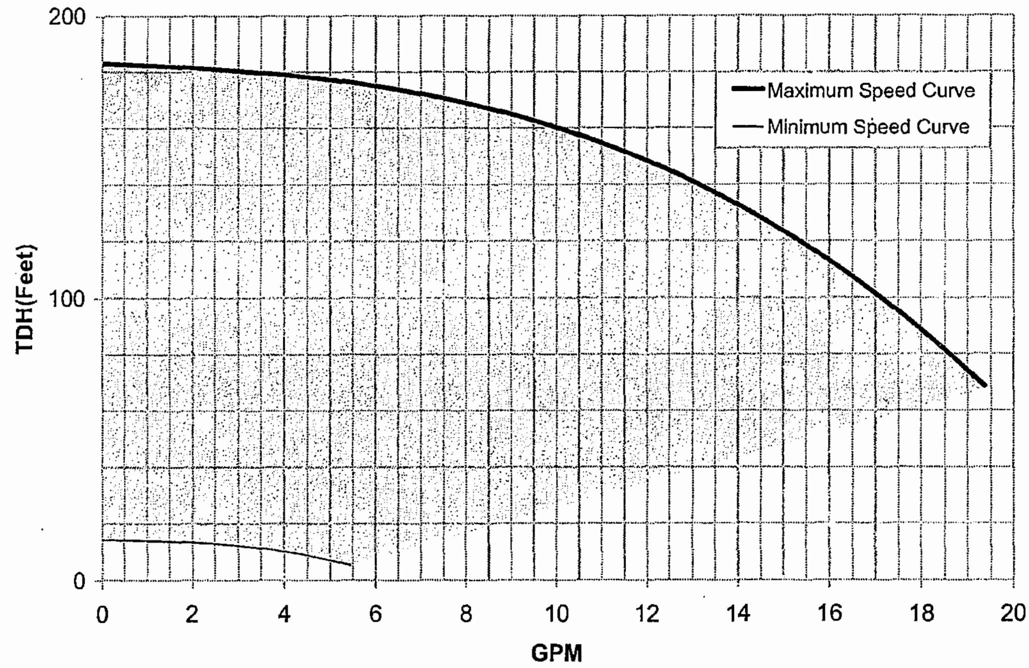
5 GPM • MODEL 5SQE07-230



OUTLET SIZE: 1" NPT **NOMINAL DIA. 3"**

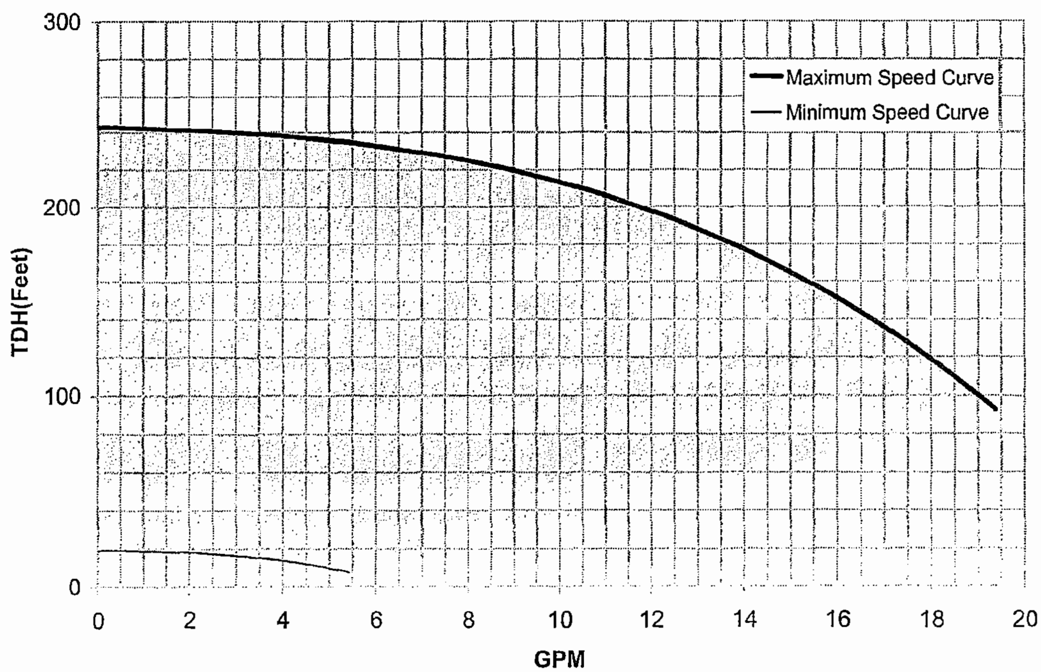
SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

15 GPM • MODEL 15SQE05-110



OUTLET SIZE: 1 1/4" NPT **NOMINAL DIA. 3"**

15 GPM • MODEL 15SQE07-150



OUTLET SIZE: 1 1/4" NPT **NOMINAL DIA. 3"**

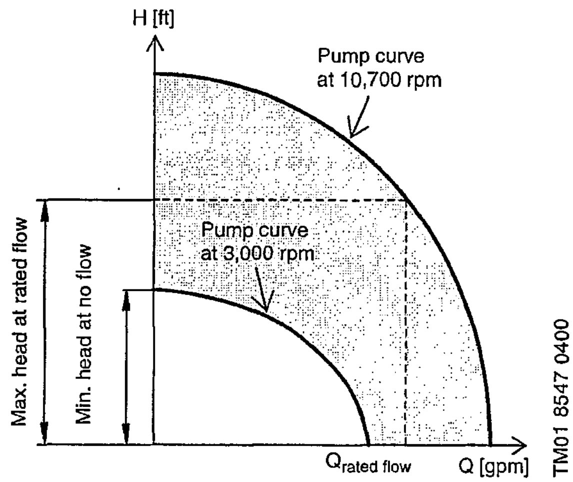
SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

Step 1
Calculate minimum head requirements at no flow conditions:

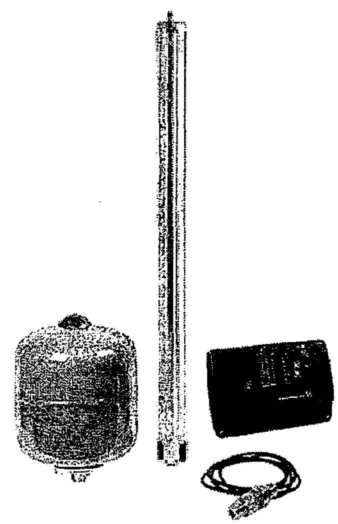
Hmax (required) = dynamic head + system pressure (in feet) + above grade elevation + friction loss.

Step 2
Select pump from chart as follows:
- Choose model family based on the desired flow rate. i.e. 15SQE for a flow rate of 15gpm
- Select the first model with a value in Column 2 greater than the Hmax calculated in Step 1
- For example: the choice for a 22gpm model with an Hmax of 140' would be the 22SQE-160. Double check your selection in the performance curves found in the previous pages of this book.

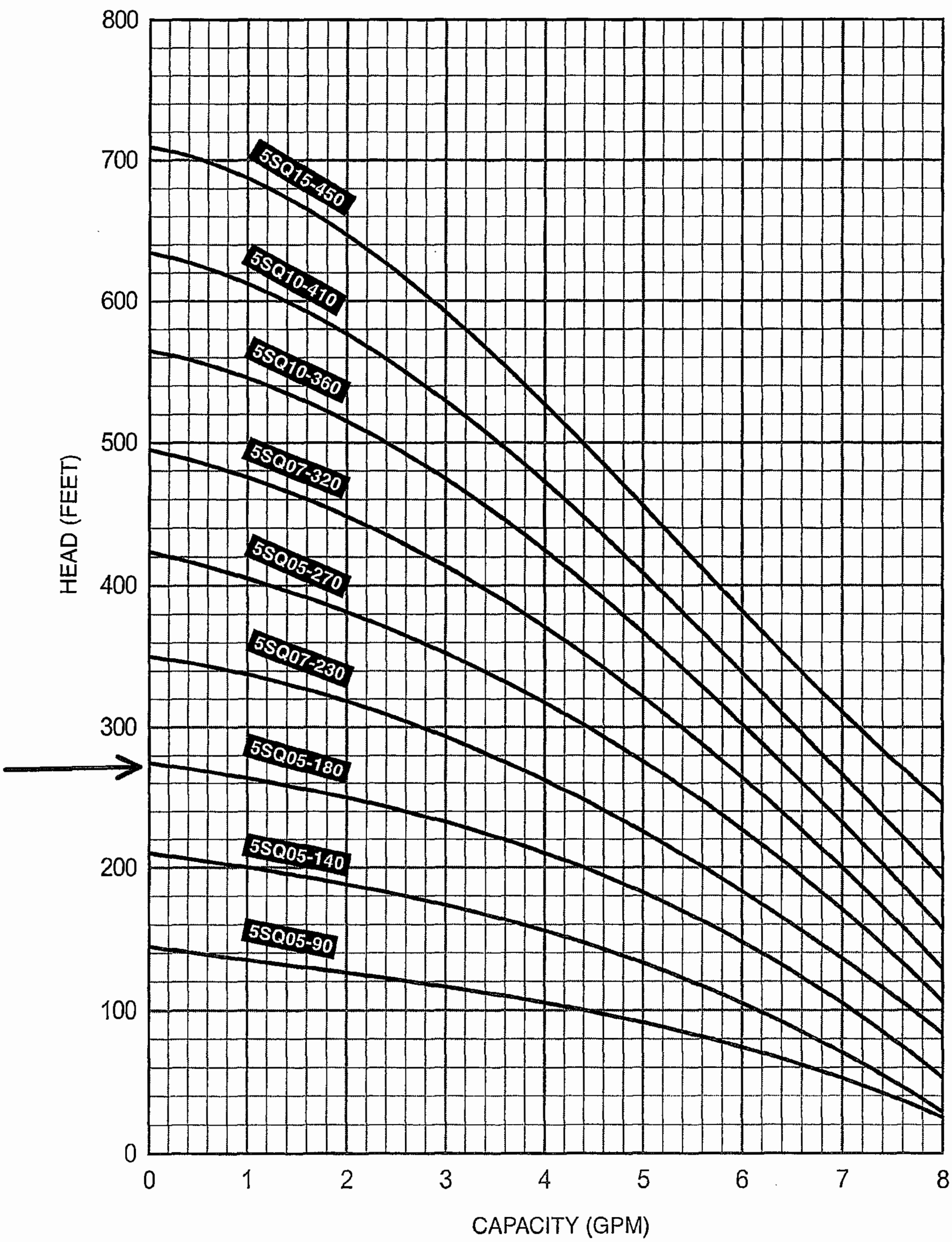
	Col. 1	Col. 2
System Sizing Matrix		
Pump Type Model B	Shutoff Head (0 GPM) @ 3000 RPM Min. Speed	Head @ Rated GPM @ 10700 RPM Max. Speed
	TDH(Feet)	TDH(Feet)
5SQE-90	11	86
5SQE-140	17	131
5SQE-180	22	177
5SQE-230	28	222
5SQE-270	34	270
5SQE-320	39	315
5SQE-360	45	360
5SQE-410	51	405
5SQE-450	56	450
10SQE-110	12	105
10SQE-160	17	164
10SQE-200	23	215
10SQE-240	29	267
10SQE-290	34	328
10SQE-330	40	390
15SQE-70	10	75
15SQE-110	14	123
15SQE-150	19	164
15SQE-180	24	205
15SQE-220	29	246
15SQE-250	33	287
15SQE-290	38	328
22SQE-40	5	36
22SQE-80	9	77
22SQE-120	14	117
22SQE-160	18	159
22SQE-190	23	200
22SQE-220	27	240
30SQE-40	5	33
30SQE-90	11	82
30SQE-130	16	126



Note: All calculated head requirements must lie between the selected pump models minimum and maximum speed curves.



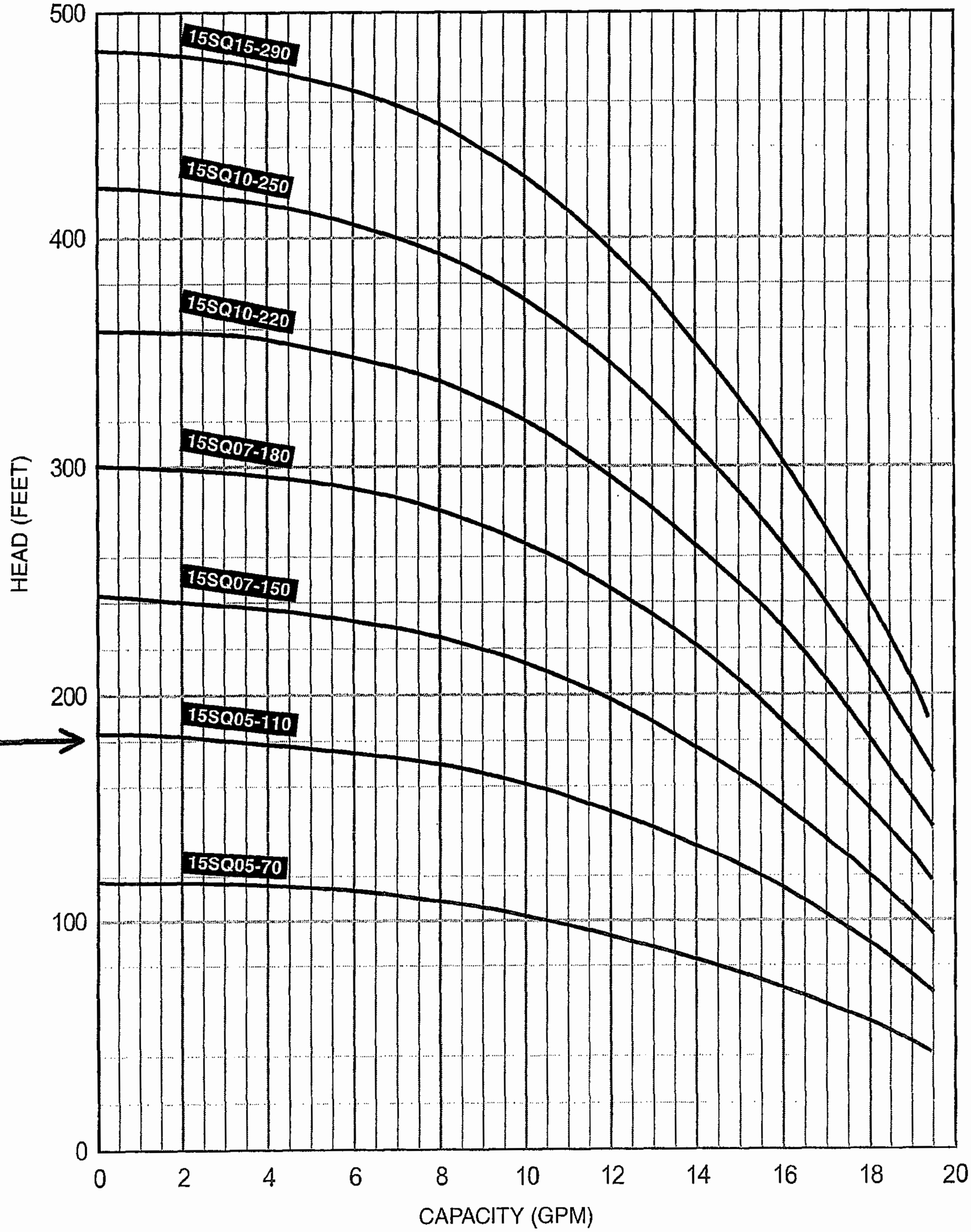
OUTLET SIZE: 1" NPT **NOMINAL DIA. 3"**



SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE. PERFORMANCE CONFORMS TO ISO 9906 ANNEX A

PERFORMANCE CURVES 15 GPM MODELS 15 SQ

OUTLET SIZE: 1 1/4" NPT **NOMINAL DIA. 3"**



SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE. PERFORMANCE CONFORMS TO ISO 9906. (E) ANNEX A

Dimensions and Weights

MODEL	FIG.	HP	MOTOR SIZE	DISCHARGE SIZE	DIMENSIONS IN INCHES A	B	C	D	E	APPROX. SHIP WT.
5SQ/SQE05-90	A	1/2	3"	1" NPT	30.4	19.8	10.6	2.6	2.9	12
5SQ/SQE05-140	A	1/2	3"	1" NPT	30.4	19.8	10.6	2.6	2.9	12
5SQ/SQE05-180	A	1/2	3"	1" NPT	31.5	19.8	11.6	2.6	2.9	12
5SQ/SQE07-230	A	3/4	3"	1" NPT	33.6	19.8	13.7	2.6	2.9	13
5SQ/SQE07-270	A	3/4	3"	1" NPT	33.6	19.8	13.7	2.6	2.9	13
5SQ/SQE07-320	A	3/4	3"	1" NPT	34.6	19.8	14.8	2.6	2.9	13
5SQ/SQE10-360	A	1	3"	1" NPT	38.2	21.3	16.9	2.6	2.9	16
5SQ/SQE10-410	A	1	3"	1" NPT	38.2	21.3	16.9	2.6	2.9	16
5SQ/SQE15-450	A	1 1/2	3"	1" NPT	39.3	21.3	18.0	2.6	2.9	16
10SQ/SQE05-110	A	1/2	3"	1 1/4" NPT	30.4	19.8	10.6	2.6	2.9	12
10SQ/SQE05-160	A	1/2	3"	1 1/4" NPT	30.4	19.8	10.6	2.6	2.9	12
10SQ/SQE07-200	A	3/4	3"	1 1/4" NPT	31.5	19.8	11.6	2.6	2.9	13
10SQ/SQE07-240	A	3/4	3"	1 1/4" NPT	33.6	19.8	13.7	2.6	2.9	13
10SQ/SQE10-290	A	1	3"	1 1/4" NPT	35.0	21.3	13.7	2.6	2.9	16
10SQ/SQE15-330	A	1 1/2	3"	1 1/4" NPT	36.14	21.3	14.8	2.6	2.9	16
15SQ/SQE05-70	A	1/2	3"	1 1/4" NPT	30.4	19.8	10.6	2.6	2.9	12
15SQ/SQE05-110	A	1/2	3"	1 1/4" NPT	30.4	19.8	10.6	2.6	2.9	12
15SQ/SQE07-150	A	3/4	3"	1 1/4" NPT	31.5	19.8	11.6	2.6	2.9	13
15SQ/SQE07-180	A	3/4	3"	1 1/4" NPT	33.6	19.8	13.7	2.6	2.9	13
15SQ/SQE10-220	A	1	3"	1 1/4" NPT	35.0	21.3	13.7	2.6	2.9	16
15SQ/SQE10-250	A	1	3"	1 1/4" NPT	36.1	21.3	14.8	2.6	2.9	16
15SQ/SQE15-290	A	1 1/2	3"	1 1/4" NPT	38.2	21.3	16.9	2.6	2.9	16
22SQ/SQE05-40	A	1/2	3"	1 1/2" NPT	30.4	19.8	10.6	2.6	2.9	12
22SQ/SQE05-80	A	1/2	3"	1 1/2" NPT	30.4	19.8	10.6	2.6	2.9	12
22SQ/SQE07-120	A	3/4	3"	1 1/2" NPT	31.5	19.8	11.6	2.6	2.9	13
22SQ/SQE07-160	A	3/4	3"	1 1/2" NPT	33.6	19.8	13.7	2.6	2.9	13
22SQ/SQE10-190	A	1	3"	1 1/2" NPT	38.2	21.3	16.9	2.6	2.9	16
22SQ/SQE15-220	A	1 1/2	3"	1 1/2" NPT	38.2	21.3	16.9	2.6	2.9	16
30SQ/SQE05-40	A	1/2	3"	1 1/2" NPT	30.4	19.8	10.6	2.6	2.9	12
30SQ/SQE07-90	A	3/4	3"	1 1/2" NPT	30.4	19.8	10.6	2.6	2.9	13
30SQ/SQE10-130	A	1	3"	1 1/2" NPT	35.0	21.3	13.7	2.6	2.9	13

DISCHARGE SIZES
1" NPT 5SQ/SQE
1 1/4" NPT 10-15SQ/SQE
1 1/2" NPT 22-30 SQ/SQE

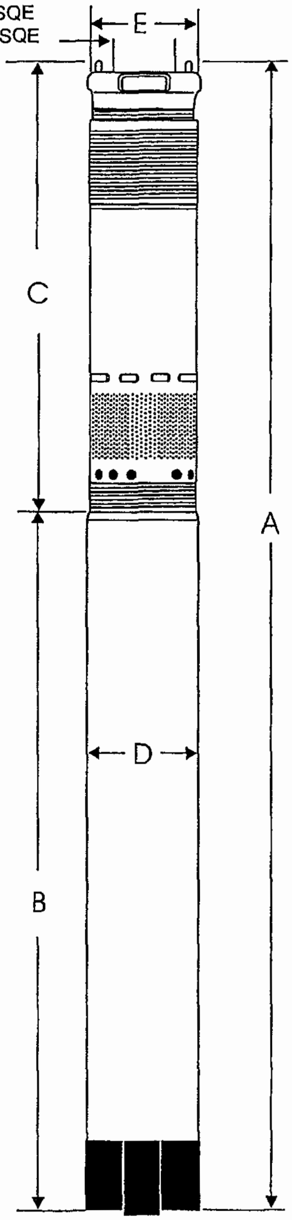


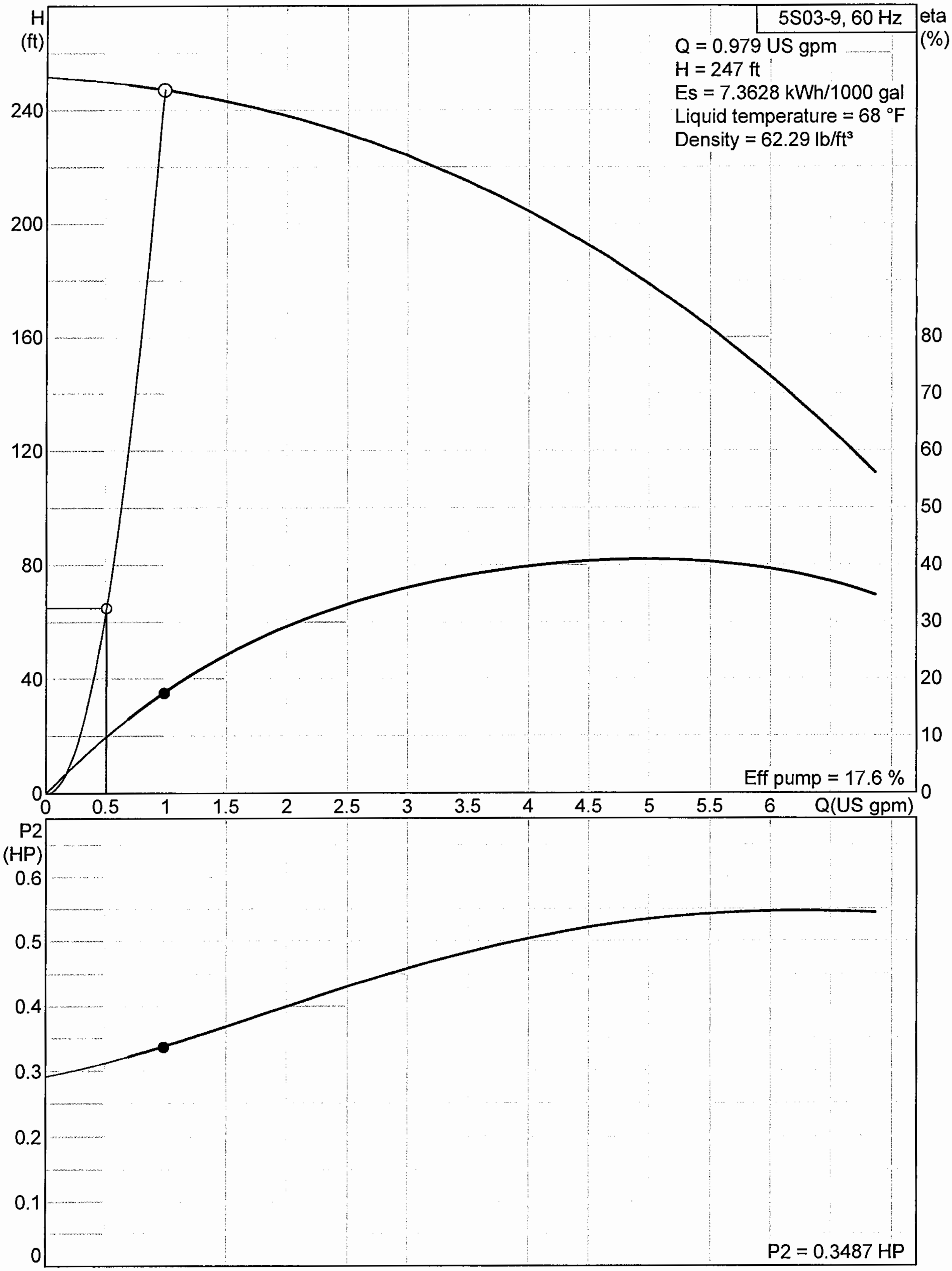
Fig. A

MATERIALS OF CONSTRUCTION

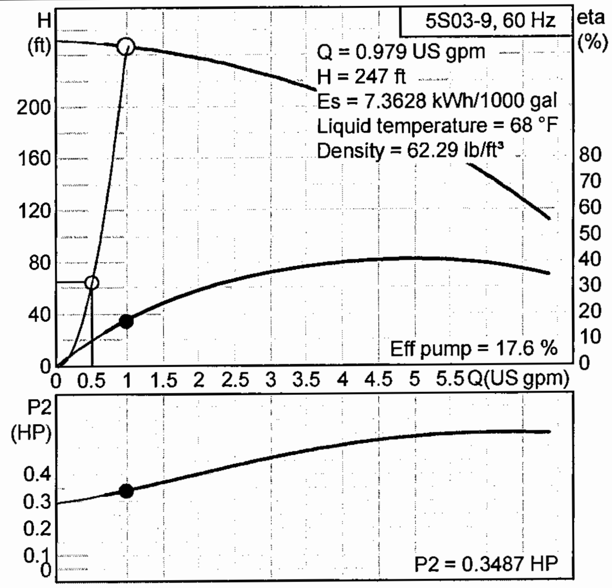
COMPONENT	SPLINED SHAFT
Valve Casing	Polyamide
Discharge Chamber	304 Stainless Steel
Valve Guide	Polyamide
Valve Spring	316LN Stainless Steel
Valve Cone	Polyamide
Valve Seat	NBR Rubber
O-ring	NBR Rubber
Lock Ring	310 Stainless Steel
Top Bearing	NBR Rubber
Top Chamber	Polyamide
Guide Vanes	Polyamide
Impeller	Polyamide w/tungsten carbide bearings
Bottom Chamber	Polyamide
Neck Ring	TPU/PBT
Bearing	Aluminum Oxide
Suction Interconnector	Polyamide
Ring	304 Stainless Steel
Pump Sleeve	304 Stainless Steel
Cone for Pressure Equalization	Polyamide
Spacer	Polyamide
Sand Trap	316 Stainless Steel
Shaft w/Coupling	304 Stainless Steel
Cable Guard	304 Stainless Steel

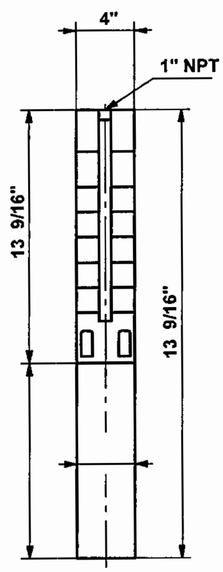
NOTES: Specifications subject to change without notice.

08010009 5S03-9 60 Hz

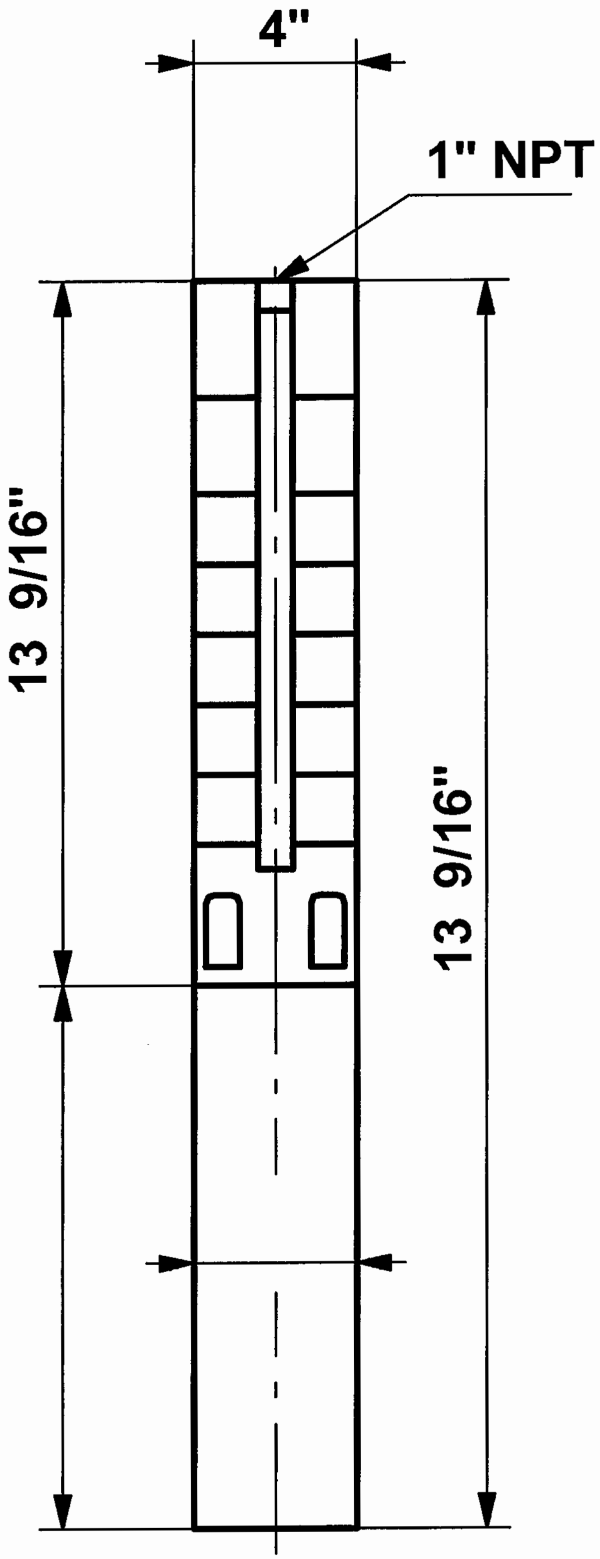


Description	Value
Product name:	5S03-9
Product Number:	08010009
EAN number:	5700390263102
Technical:	
Speed for pump data	3450 rpm
Actual calculated flow:	0.98 US gpm
Flow range	0.748 .. 7 US gpm
Max flow:	7 US gpm
Resulting head of the pump:	247 ft
Stages:	9
Model:	B
Valve:	Y
Materials:	
Pump:	Stainless steel DIN W.-Nr. 1.4301 AISI 304
Impeller:	Stainless steel DIN W.-Nr. 1.4301 AISI 304
Installation:	
Pump outlet:	1" NPT
Motor diameter:	4 inch
Liquid:	
Maximum liquid temperature:	104 °F
Liquid temp:	68 °F
Density:	998.2 kg/m³
Electrical data:	
Applic. motor:	GRUNDFOS
Power (P2) required by pump	0.496 HP
Main frequency:	60 Hz
Start. method:	DOL
Others:	
Sales region:	Namreg



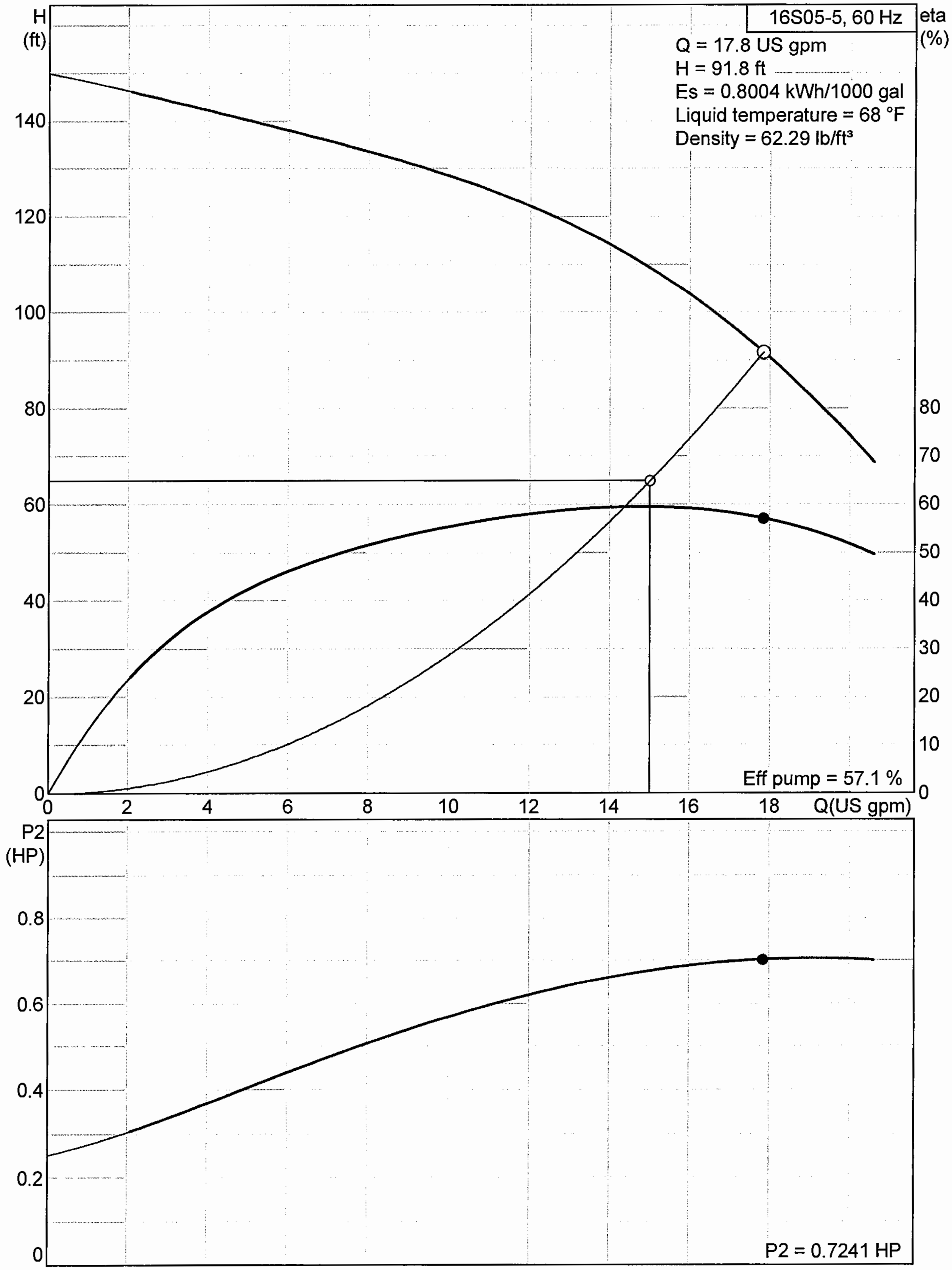


08010009 5S03-9 60 Hz

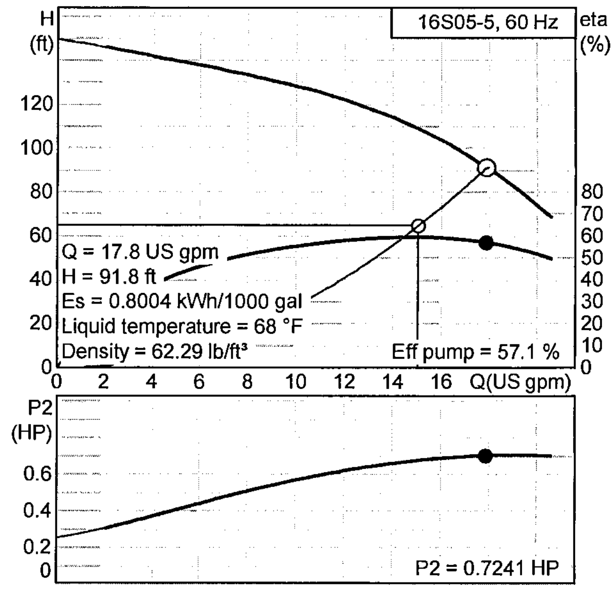


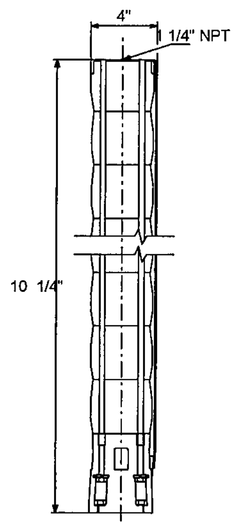
Note! All units are in [mm] unless others are stated.
Disclaimer: This simplified dimensional drawing does not show all details.

10010005 16S05-5 60 Hz

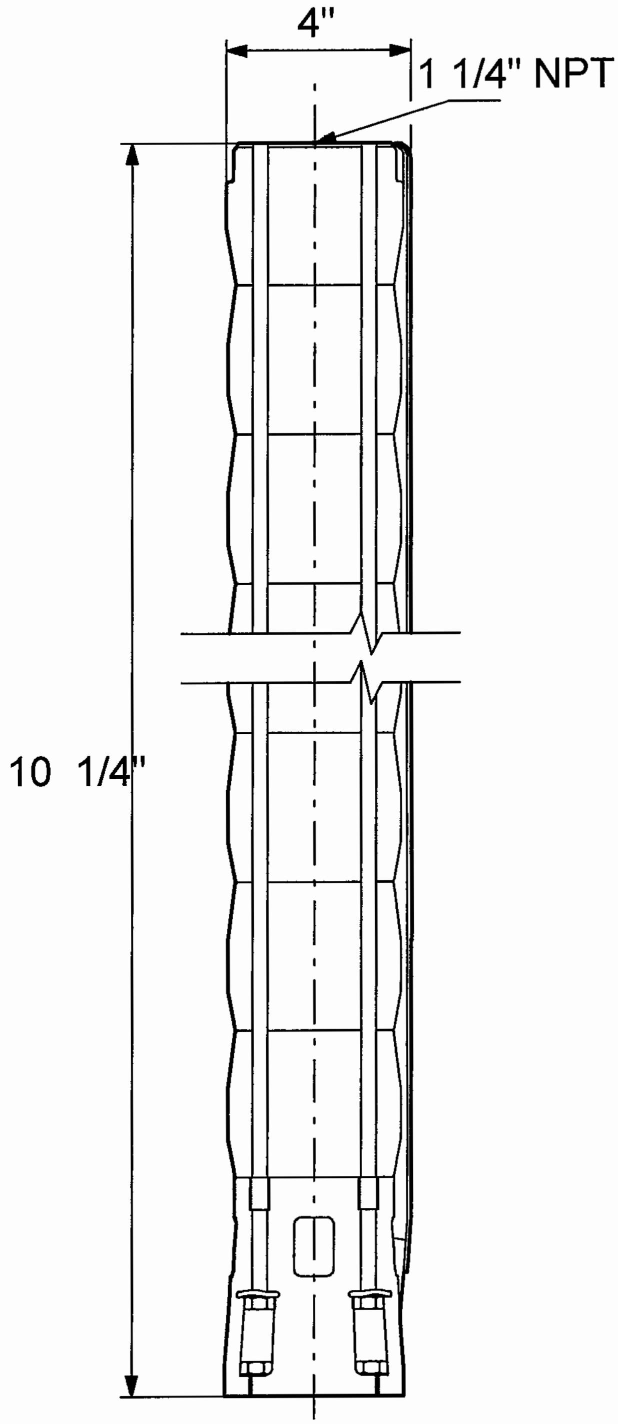


Description	Value
Product name:	16S05-5
Product Number:	10010005
EAN number:	5700390303396
Technical:	
Speed for pump data	3450 rpm
Actual calculated flow:	17.8 US gpm
Flow range	2.07 .. 20 US gpm
Max flow:	20 US gpm
Resulting head of the pump:	91.8 ft
Stages:	5
Model:	B
Valve:	Y
Materials:	
Pump:	Stainless steel DIN W.-Nr. 1.4301 AISI 304
Impeller:	Stainless steel DIN W.-Nr. 1.4301 AISI 304
Installation:	
Pump outlet:	1 1/4" NPT
Motor diameter:	4 inch
Liquid:	
Maximum liquid temperature:	104 °F
Liquid temp:	68 °F
Density:	998.2 kg/m³
Electrical data:	
Applic. motor:	GRUNDFOS
Power (P2) required by pump	0.738 HP
Main frequency:	60 Hz
Start. method:	DOL
Others:	
Sales region:	Namreg





10010005 16S05-5 60 Hz



Note! All units are in [mm] unless others are stated.
Disclaimer: This simplified dimensional drawing does not show all details.

Appendix B

Photographic Documentation

1. Trenching for conveyance piping installation for RW-2

2. Installation of conveyance piping from RW-2

SALTY DOG BRINE STATION
Photographs

3. Installation of conveyance piping and pump at RW-2

4. Making drop pipe connection during installation of pump in RW-2

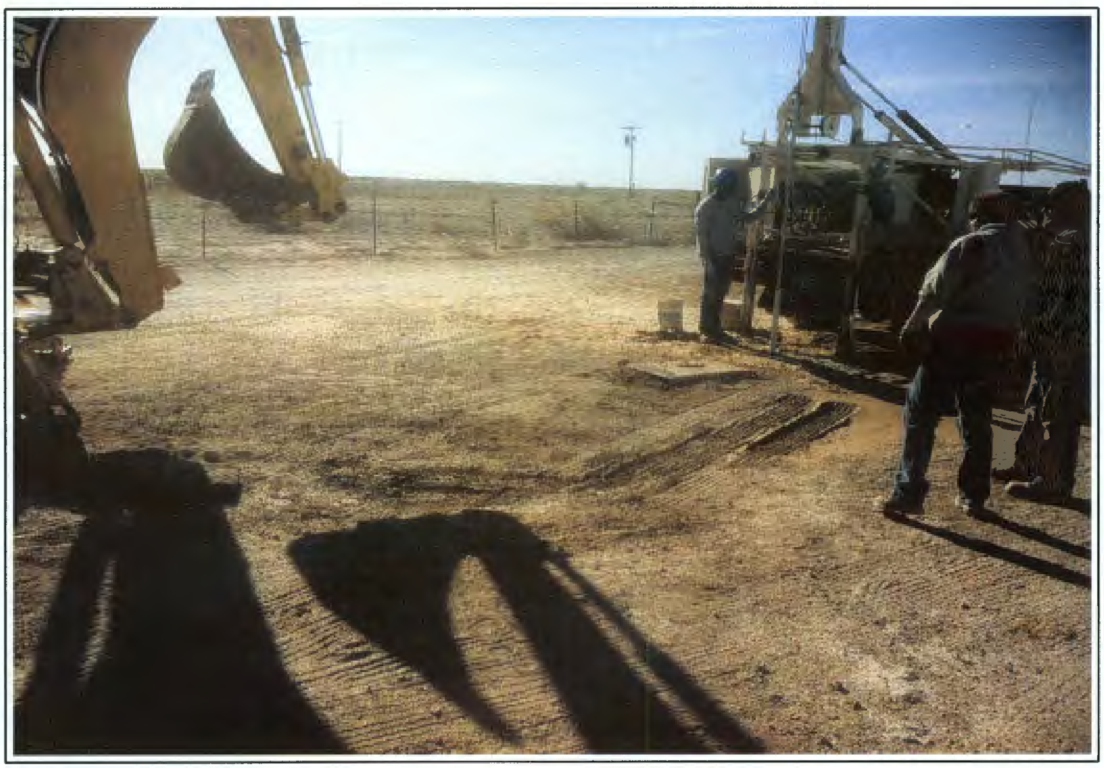
5. Grundfos submersible pump and drop pipe connection

6. Grundfos CU 301 pump controller

7. Termination of conveyance piping into frac tank for RW-2

8. Completed installation for RW-1

9. Completed installation for RW-2



10. Developing DBS-1R

11. DBS-1R surface completion

Appendix C

Field Notes

CHGAM 08/04/12

1100 DRILLING CREW ONSITE
SEAN MARKED OUT THE AREA
TO BE TRENCHED.

1115 BEGAN TRENCHING @ RW-2
WELL SITE.

— MIKE MCVEY IS ONSITE TO
OVERSEE WELL DRILLING.

1123 ELECTRIC CREW @ RW-2
SITE. PREPARING THE SITE
WHERE PUMP PANEL BOX WILL
BE INSTALLED.

1128 STANDARD COMPANY INSTALLING
DISCHARGE TANK (FRAC TANK).

1143 PUMP DISCHARGE TANK INSTALLED

4/4/12 SBRADY

0800 ONSITE WAITING FOR TERRY AND OTHER CONTRACTORS TO SHOW UP.

0830 CELESTINE ONSITE

0900 TERRY ONSITE. DISCUSSING OPTIONS FOR PUMP CONTROLS/ /POWER, DISCHARGE FOR CONVEYANCE LINE & OTHER ISSUES. TERRY APPROVED TIPPING ~~FRA~~ FRACK TANK ABOVE RUNK WHEEL FOR DISCHARGE POINT.

1000 STEVE (TRIPLE S ELECTRIC) ONSITE TO DISCUSS ELECTRIC INSTALL. TYLER (BACKHOE OPERATOR) ONSITE.

1030 WALKED ~~BOTH~~ WELL SITES. TERRY SAYS FRACK TANK

SBRADY 4/4/12

FOR ~~SOUTHERN~~ (RW-2) ~~SITE~~ WELL SITE WILL BE HERE THIS AFTERNOON. FOR SOUTHERN SITE (RW-2) TERRY SAID BEST OPTION FOR POWER IS TO DISCONNECT EXISTING 1" WELL AND RECONNECT ~~FOR~~ NEW WELL PUMP. DISCONNECT WILL BE AT POWER DROP. PANEL BOX WILL BE ATTACHED AT BALLARD FOR PUMP CONTROLS.

1045 MCVEY ONSITE. HAVE MARK TRENCH LINE FOR NORTHERN WELL (RW-1) PLAN ON 2' UNDER TRACTOR TRAILER EXIST PATH. PLAN ON INSTALL DISCONNECT ~~@~~ @ POWERDROP

1115 CELESTINE IS OFF OBSERVING TRENCHING

4/4/2012 SERADY

1200 DROPPING POLY PIPE ~~IN~~ IN TRENCH. PETERSON IS ~~SETT~~ SETTING ~~NORTHERN~~ SOUTHERN (RW-2).

1300 PUMP SET IN ~~NORTHERN~~ SOUTHERN WELL (RW-2)

1320 DONE RUNNING OUT PIPE. CELESTINE IS GOING NORTH TO OBSERVE TRENCHING. PETERSON HEADING NORTH NOW TO SET NEXT PUMP AND BEGIN DRILLING NEW MONITORING WELL.

1415 MCVEY INFORMED ME THAT I HAD PETERSON SET THE WRONG PUMP IN SOUTHERN WELL (RW-2) TAGGED NORTERN WELL (RW-1)

DTW: 67.50' DTB: ~~NA~~ 85.30'

SERADY 4/4/12

1415 TRENCH AT NORTHERN (RW-1) WELL FINISHED. STEVE SAID THERE MIGHT BE AN ISSUE WITH POWER DROP AT NORTHERN (RW-1) WELL. UTILITY POLE MAY BE OWNED BY PROVIDER AND THEY MIGHT NOT BE ABLE TO TAKE POWER OFF OF IT. DURING TRENCHING A 2" CONDUIT WAS CAUGHT & PULLED MAYBE A HOT LINE. TERRY HAD SAID THERE WERE NO HOT LINE CROSSING TRENCH PATH. CALLED ELECTRICIAN TO COME AND INSPECT DAMAGES.

1500 ONSITE AT SOUTHERN WELL (RW-2) TO PULL PUMP AND INSTALL CORRECT ONE. ELECTRICIAN ONSITE

4/4/12 SBRADY SBRADY 4/4/12

CALLED TERRY REGARDING BROKE 2" CONDUIT. HE'S ON HIS WAY OUT.

1500 STEVE & TERRY ONSITE. 2" CONDUIT WAS HOT, AND THEY ARE NOW DETERMINING WERE IT WENT & HOW ~~TO~~ FIX IT.

CONTINUED

1538 DTW :63.50' TOC DTB: 155.10' TOC

~~SETTING BOTTOM OF PUMP @ 100' FROM BOTTOM.~~

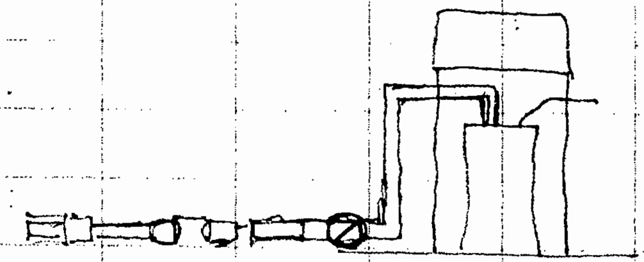
RW-2 BOTTOM OF PUMP SET @ 100'

1600 CELESTINE OFF SITE

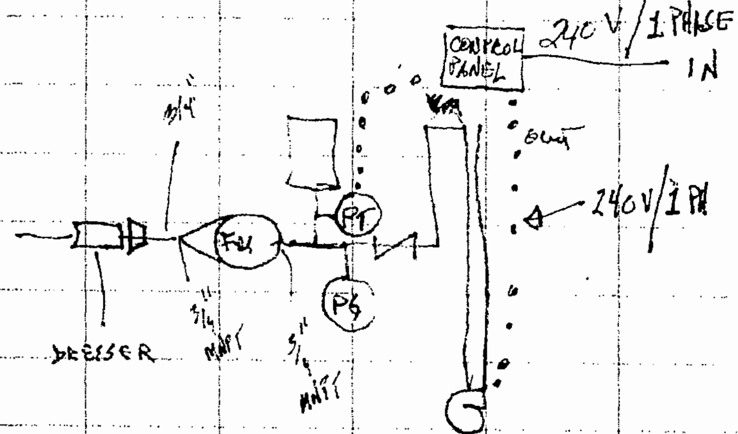
1609 SETTING RW-2 FINAL STICK GOING IN, TRIMMED LENGTH OF PUMP OF CASING IN ORDER TO SET PUMP AT 100' FROM TOP OF CASING

4/5/12 SBRADY 4/5/2011

0745 PETERSON DRILLING & McVEY ONSITE.
GETTING READY TO SET RW-1
WITH PUMP



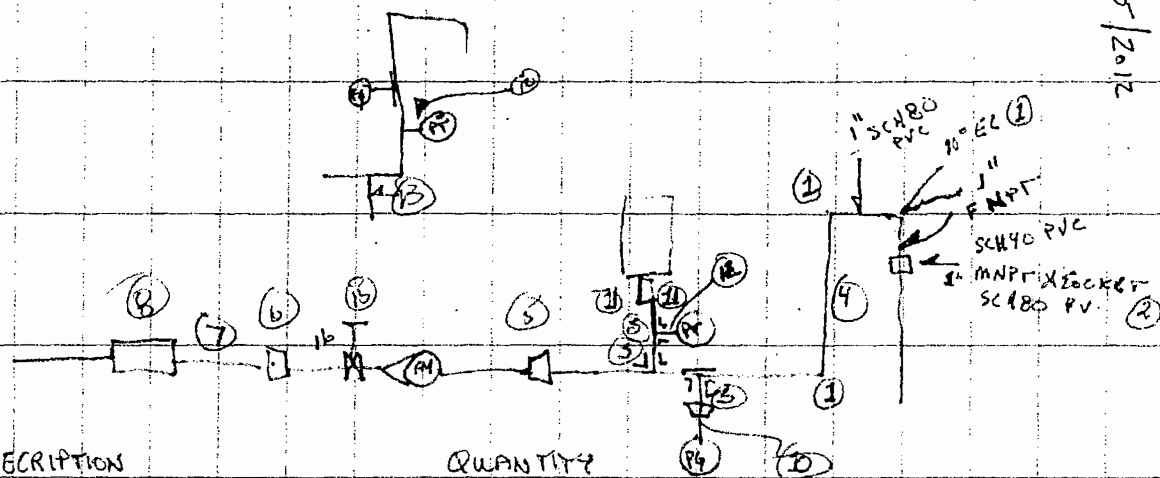
0830 BOTTOM OF PUMP SET @ 82' BELOW
TOP OF CASING. COLESTINO ONSITE.
CALLED STEVE - HE WILL BE
ONSITE SHORTLY. PETERSON
IS BAILING WELL.



1. DRILLING RIG
2. SERVICE RIG
3. PUMP RIG
4. BACK HOE
5. 2 DBSA FIELD VEHICLES

0900 PETERSON IS DONE W/ DECOMMISSIONING
OLD MONITOR WELL.

4/5/2012



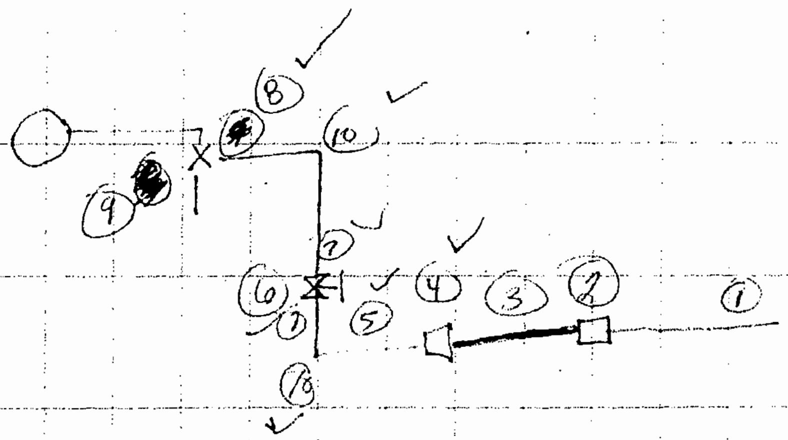
ID	DECRIPTION	QUANTITY
(1)	ELBOW 90° SCH 80 PVC 1"	(3)
(2)	MNPT x SOCKET SCH 80 PVC 1"	1
(3)	1" SCH80 PVC TEE	3

ID	DESCRIPTION	QUANTITY
(15)	3/4" BRASS GATE VALVE	(1)

(4)	1" SCH80 PVC PIPE	
~~(5)~~	~~1" SCH80 1" x 3/4" FNPT SCH80 PVC ADAPTER~~	~~1~~
(6)	3/4" MALE NPT X 1-1/2" SCH80 PVC ADAPTER	1
(7)	1-1/2" SCH80 PVC PIPE	
~~(8)~~	~~1-1/2" DRESSER COUPLING~~	7
(9)	1-1/2" SDR 13 HDPE PIPE	
(10)	1"-~~[illegible]~~ x 1/4" FNPT ADAPTER	1
(11)	3/4" SCH 80 PVC 90° EL	2
(12)	1" x 1/2" FNPT ADAPTER SCH80 PVC	1
(13)	1" x 3/4" SCH80 PVC ADAPTER	1
(14)	3/4" SCH80 PVC PIPE	

4/5/20

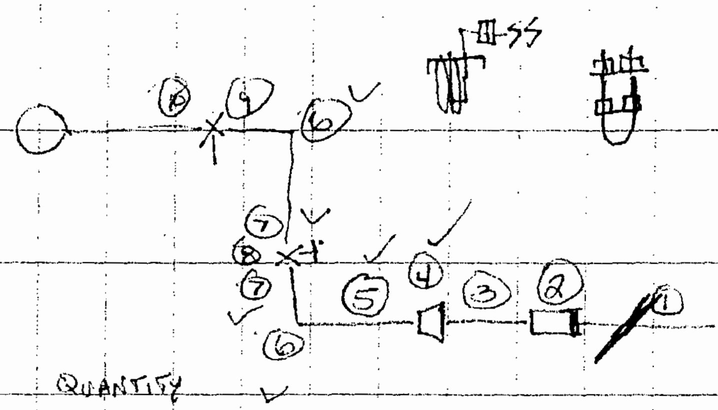
4/5/2012



ID	DESCRIPTION	QUANTITY
1	1-1/2" POLY PIPE	
2	1-1/2" DRESSER COUPLING	1
3	1-1/2" SCH80 PVC PIPE	2'
4	1-1/2" X 1" SCH80 PVC ADAPTER	1
5	1" SCH80 PVC PIPE	?
6	1" BRASS GATE VALVE	1
7	1" x 1" MNPT SCH80 PVC ADAPTER	1
8	3/4" FNPT x 1" SCH80 PVC ADAPTER	1
9	3/4" BRASS FLOAT VALVE w/ BULKHEAD FITTING	1
10	1" 90° SCH80 PVC ELBOW	2

4/5/2012

4/5/2012

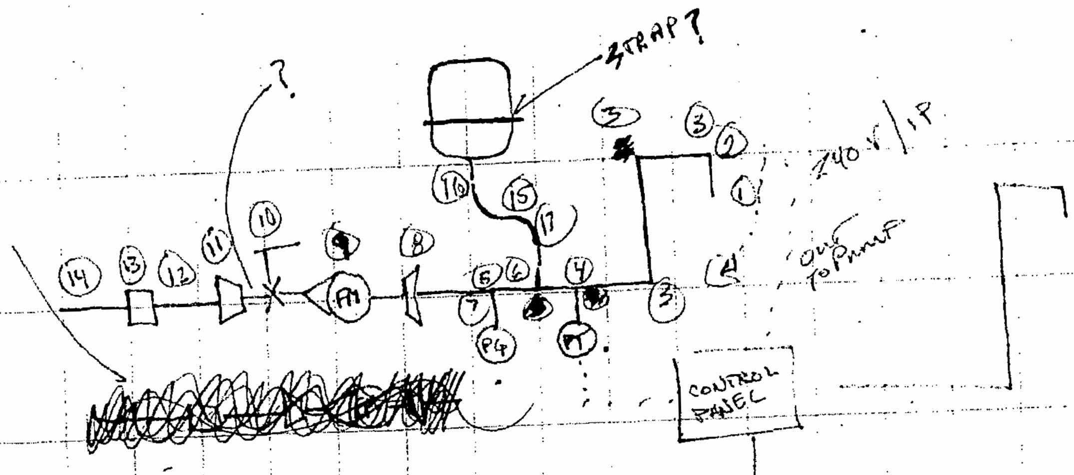


ID	DESCRIPTION	QUANTITY
1	1-½" POLY PIPE	
2	1-½" DRESSER COUPLING	1
3	1-½" SCH80 PVC PIPE	2'
4	1-½" x ¾" SCH80 PVC ADAPTER	1
5	¾" SCH80 PVC PIPE	10'
6	¾" SCH80 PVC 90° ELBOW	2
~~7~~	~~¾" MNPT ADAPTER~~	~~2~~
8	¾" BRASS GATE VALVE	1
9	¾" FNPT ADAPTER	1
~~10~~	~~¾" BRASS FLOAT VALVE~~	~~1~~

COUPLING

4/5/2012

1/5/2012



O/F

240V/1P

ID	DESCRIPTION	QUANTITY
1	1" ADAPTER MNPT SCH80 PVC	1 — 2 ✓
2	1" SCH80 PVC PIPE	?
3	1" 90° EL SCH80 PVC	3 — 6 ✓
4	1"x½" TEE SCH80 PVC	1 — 2 ✓
5	1" x ¾" FMNPT SCH80 PVC ADAPTER	1 — 2 ✓
6	1"x¾" SCH80 PVC TEE	1 — 2 ✓
7	1"x1" SCH80 PVC ~~TEE~~	1 — 2 NA
8	1"x¾" FNPT SCH80 PVC ~~TEE~~ ADAPTER	1 — 2 ✓
9	FLOW METER	1 — 2 NA
10	¾" BRASS GATE VALVE	1 — 2 NA
11	1-½" X ¾" MNPT ADAPTER ✓ ✓	1 — 2
12	1-½" SCH80 PVC PIPE	?
13	DRESSER COUPLING	1 — 2
14	~~1-½" POLY PIPE~~	NA
15	¾" SCH80 PVC PIPE	? ✓
16	¾" FNPT SCH80 PVC ADAPTER	1
17	¾" 90° ELBOW SCH80 PVC	2 — 4 ✓

ITEM	QUANTITY
1. SPRAY PAINT	2 CANS
2. CABLES/CHAINS	FEET
3. CHAIN SNAPS CARABINERS	2
4. ~~DRILL FOR BULKHEAD~~	1 CELESTINE
5. U-ANCHOR 2"	6 ✓
6. PRIMER	1 ✓
7. GLUE	1 ✓
8. PIPE CUTTER	1

$\boxed{\text{HAGEN}}$ HOWARD PHILIPS

4/5/2012

4/5/2012

1330 JERRY ONSITE

1420 BRADY & CELESTINE OFF SITE TO RUN PARTS.

1635 DBS&A ONSITE FROM RUNNING PARTS. ALL CONTRACTOR OFFSITE WORKING ON ASSEMBLING WELLHEAD PIPING.

1800 SHUTTING DOWN FOR THE DAY.

4/6/2012

0800 ELECTRICIAN ONSITE AT BRINE WELL FOR WIRING RW-2.

~~0835~~ 0845 DBS&A OFFSITE TO GET PVC PARTS.

1105 DBS&A ONSITE. AT RW-2 COMPLETING PIPING AT WELLHEAD

1215 AT RW-1 INSTALLING PIPING AT WELLHEAD.

1240 ELECTRICIAN HAS FINISHED WIRING RW-2. PUMP FUNCTIONS PROPERLY.

1250 ELECTRICIAN AT RW-1 WORK ON POWER SUPPLY.

1430 ELECTRICIAN HAS FINISH WITH WIRING RW-1. PUMP FUNCTIONS PROPERLY.

4/6/2012 SBRADY ~~SBRADY~~ 4/6/2012

1700 FINISHED WITH PIPING AT RW-1

FLOW IS SET AT ½ gpm.

WELL/PRESSURE CONTROLLER IS SET

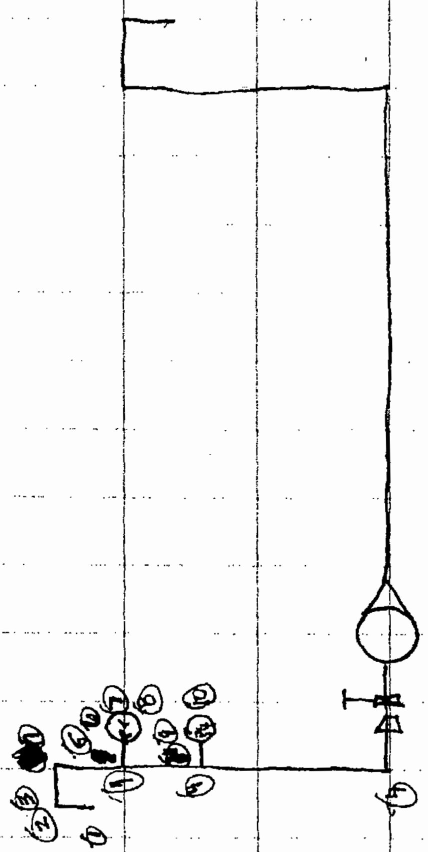
AT 40 PSI. ANALOG PRESSURE

GAUGE IS FLUCUATING AND

HASN'T STABILIZED AT GIVE

FLOW RATE.

ITEM	DESCRIPTION
1	1" SOCK X 3/4" MNPT 90° EL
2	3/4" SCH 40 PVC PIPE
3	3/4" SCH 40 PVC 90° EL
4	3/4" SCH 40 PVC TEE
5	3/4" x 1" FNPT SCH 40 PVC ADAPTER
6	
7	
8	
9	
10	
11	



4/7/2012 SBRADY SBRADY 4/7/2012

0730 RW-1 PRESSURE HAS STABILIZED OVERNIGHT. HEADING DOWN RW-2 TO FINISH OUTLET SIDE OF TRANSMISSION LINE.

0930 OFFSITE FOR LADDER & DRILL BIT (BUSTED MINE).

1045 ONSITE W/SUPPLIES. THE WIND IS BLOWING LIKE A MADMAN.

1100 DRILLING TANK PENETRATION AT ABOUT 10'-12' UP THE SIDE OF THE FRAK TANK.

1210 BREAKING FOR LUNCH

1245 FINISHING UP W/ PIPING

1330 HEADING TO WELL TO START PUMPING.

1345 PUMP SET AT $2\frac{1}{2}$ gpm PRESSURE IS FLUCTUATING.

1415 ADJUST FLOAT ARM ON VALVE TO CLOSE AT ABOUT $1\text{-}\frac{1}{2}$' BELOW DISCHARGE OF VALVE

1500 CALLED MIKE TO INFORM THAT I WAS HEADING HOME. FLOW RATE IS TOO HIGH RETURNING TO SITE TO ADJUST FLOW.

1530 FLOW SET $1\frac{1}{4}$ gpm. NOW HEADING OFFSITE.

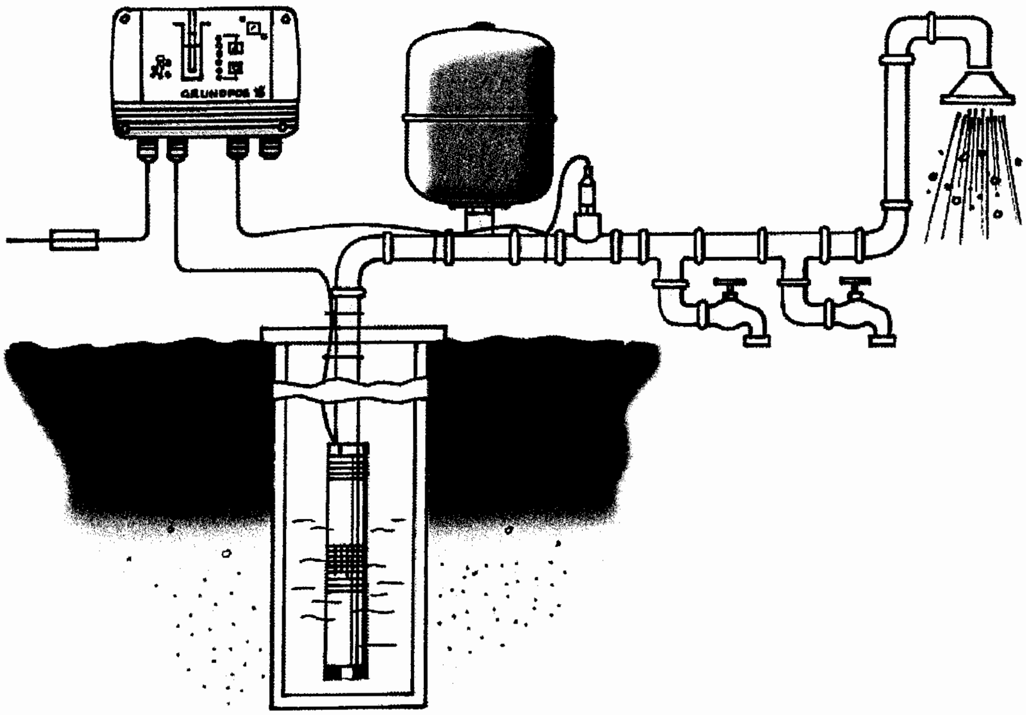
Appendix D

Manufacturer's Operations and Maintenance Information

GRUNDFOS **INSTRUCTIONS**

CU 301

(US) Installation and operating instructions



BE › THINK › INNOVATE ›

LIMITED WARRANTY

Products manufactured by GRUNDFOS PUMPS CORPORATION (Grundfos) are warranted to the original user only to be free of defects in material and workmanship for a period of 24 months from date of installation, but not more than 30 months from date of manufacture. Grundfos' liability under this warranty shall be limited to repairing or replacing at Grundfos' option, without charge, F.O.B. Grundfos' factory or authorized service station, any product of Grundfos' manufacture. Grundfos will not be liable for any costs of removal, installation, transportation, or any other charges which may arise in connection with a warranty claim. Products which are sold but not manufactured by Grundfos are subject to the warranty provided by the manufacturer of said products and not by Grundfos' warranty. Grundfos will not be liable for damage or wear to products caused by abnormal operating conditions, accident, abuse, misuse, unauthorized alteration or repair, or if the product was not installed in accordance with Grundfos' printed installation and operating instructions.

To obtain service under this warranty, the defective product must be returned to the distributor or dealer of Grundfos' products from which it was purchased together with proof of purchase and installation date, failure date, and supporting installation data. Unless otherwise provided, the distributor or dealer will contact Grundfos or an authorized service station for instructions. Any defective product to be returned to Grundfos or a service station must be sent freight prepaid; documentation supporting the warranty claim and/or a Return Material Authorization must be included if so instructed.

GRUNDFOS WILL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES, LOSSES, OR EXPENSES ARISING FROM INSTALLATION, USE, OR ANY OTHER CAUSES. THERE ARE NO EXPRESS OR IMPLIED WARRANTIES, INCLUDING MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, WHICH EXTEND BEYOND THOSE WARRANTIES DESCRIBED OR REFERRED TO ABOVE.

Some jurisdictions do not allow the exclusion or limitation of incidental or consequential damages and some jurisdictions do not allow limit actions on how long implied warranties may last. Therefore, the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights and you may also have other rights which vary from jurisdiction to jurisdiction.

CU 301

US

CONTENTS

⚠ Prior to installation, read these installation and operating instructions. Installation and operation must comply with local regulations and accepted codes of good practice.

1. Constant-pressure control

The control unit CU 301 is for use only with Grundfos SQE pumps incorporating electronic power factor correction (PFC).

1.1 Description

The system maintains a constant pressure within the maximum pump performance in spite of a varying water consumption.

The CU 301 is designed for wall mounting only.

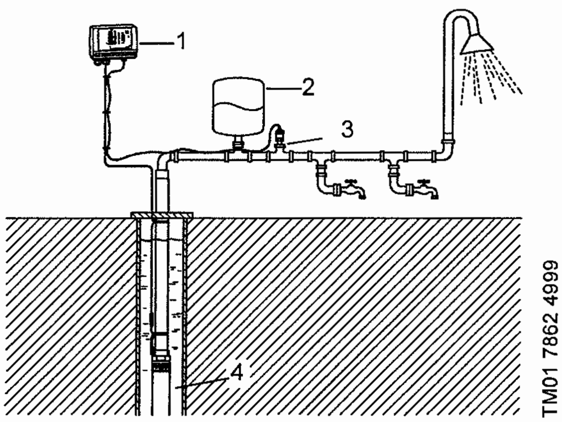


Fig. 1 Example of a system with constant-pressure control

Pos.	Description
1	CU 301
2	Diaphragm tank (2 gal.)
3	Pressure sensor
4	SQE pump

1.2 Function

The pressure is registered by means of the pressure sensor, which transmits a 4-20 mA signal to the CU 301. The CU 301 adjusts the pump performance accordingly to maintain constant pressure by changing the pump speed.

Mains borne signalling

The communication between the CU 301 and the pump is via the power supply cable.

This communication principle is mains borne signalling (or power line communication). Using this principle means that no additional cables to the pump are required.

The communication of data is effected via a high-frequency signal transmitted to the power supply cable and led into the electronics unit by means of signal coils incorporated in the motor and the CU 301 respectively.

In situations where multiple CU 301 pump power cables are run parallel in wiring trays or conduit and less than 10-12 inches apart, the possibility for undesired communication between units exists. When this occurs, intermittent or continuous "No contact" is typically seen. Other unexpected errors may also be seen.

Refer to section *5.3.10* for further instructions.

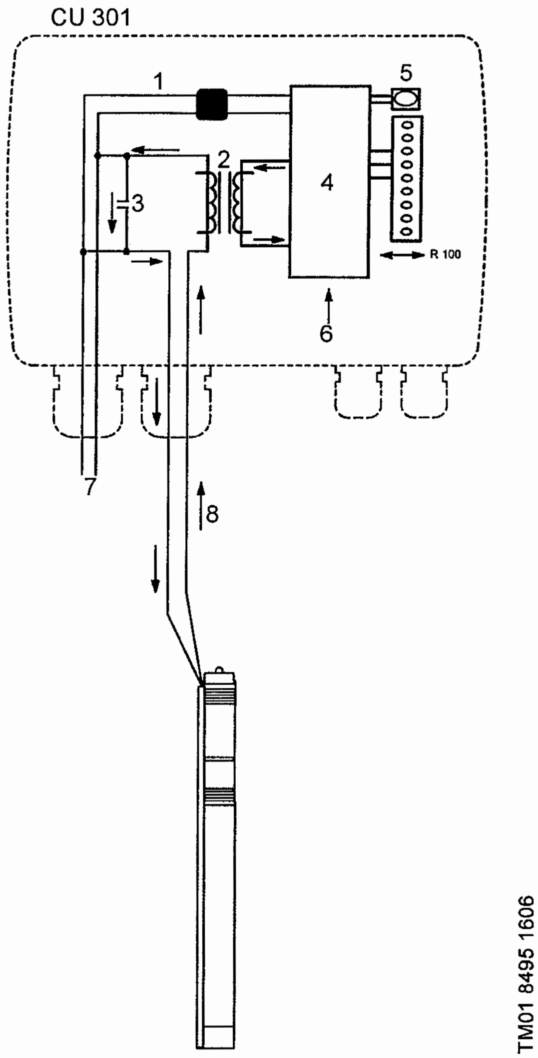


Fig. 2 Principle of mains borne signalling

Pos.	Description
1	Supply to the electronics
2	Signal coils
3	Capacitor
4	Electronics for the control of the communication
5	On/Off button
6	Sensor signal
7	Mains supply
8	Communication signals

US

US

When does the pump start?

The pump starts as a consequence of

- a high flow or
- a low pressure or
- a combination of both.

To ensure that the pump is started when water is consumed, a flow detection is required. The flow is detected via pressure changes in the system. When water is consumed, the pressure will drop accordingly depending on the size of the diaphragm tank and the water flow:

- at a low flow, the pressure will drop slowly.
- at a high flow, the pressure will drop quickly.

See fig. 3.

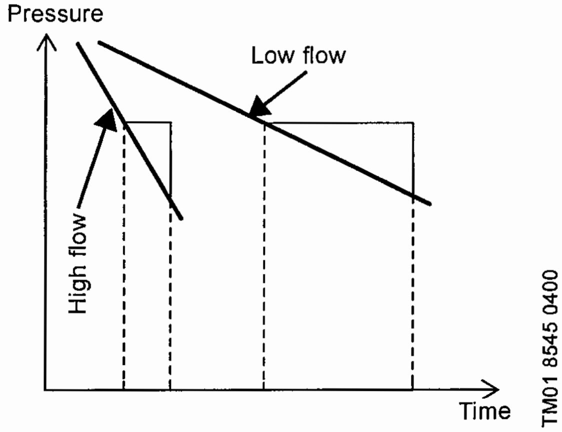


Fig. 3 Pressure changes in relation to flow

Note: When the pressure is dropping 1.4 psi/s or faster, the pump will start immediately.

With a diaphragm tank of 2 gal., the pump will start at a flow rate of approx. 0.8 gpm.

Note: If a larger tank is used, the flow must be higher before the pump starts.

Consumption up to 0.8 gpm

The pump will start when the pressure has dropped to 7 psi below the pressure setting.

The pump will run until the pressure is 7 psi above the pressure setting.

Flow detection

During pump operation, i.e. when water is consumed, the CU 301 will adjust the pump speed to maintain a constant pressure. In order to stop the pump when no water is consumed, the CU 301 performs flow detection every 10 seconds.

The pump speed is reduced and pressure is read. A pressure drop indicates that water is being consumed and the pump speed is resumed, see fig. 4.

If the pump speed can be reduced without any pressure drop being registered, this indicates that no water is consumed. The diaphragm tank will be filled with water and the pump will be stopped.

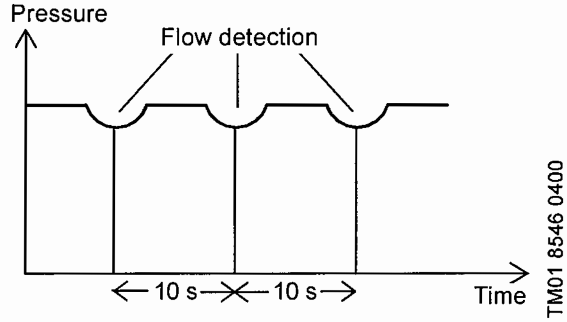


Fig. 4 Flow detection every 10 seconds during operation

System limits

Even though the CU 301 is controlling the pressure within ±3 psi, bigger pressure variations may occur in the system. If the consumption is suddenly changed, e.g. if a tap is opened, the water must start flowing before the pressure can be made constant again. Such dynamic variations depend on the pipework, but, typically, they will lie between 7 and 14 psi.

If the desired consumption is higher than the quantity the pump is able to deliver at the desired pressure, the pressure follows the pump curve as illustrated in the far right of fig. 5.

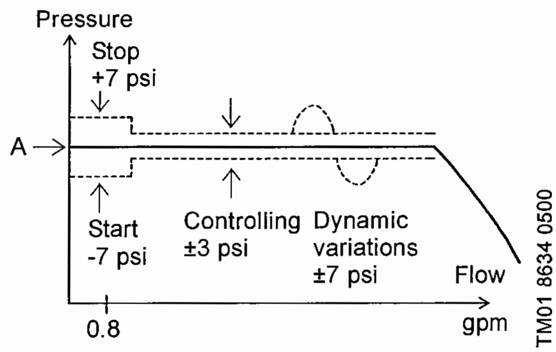


Fig. 5 Possible pressure variations during constant-pressure operation

A = Pressure setting

1.3 System sizing

To ensure the correct function of the system, it is important that the pump is of the right type.

During operation, the CU 301 controls the pump speed within the range from 3,000 rpm to 10,700 rpm, see fig. 6.

It is recommended to follow the guidelines below.

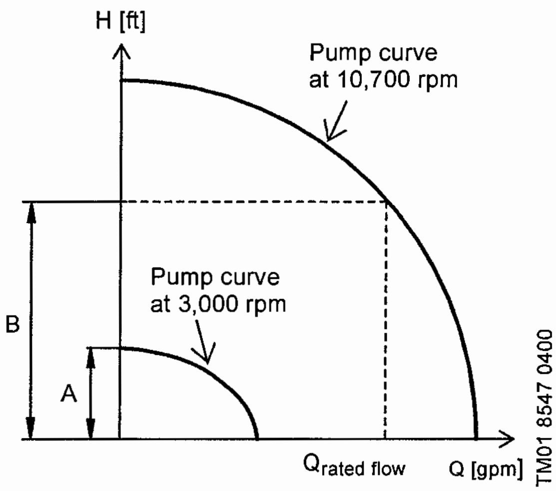


Fig. 6 Pump curves at 3,000 rpm and 10,700 rpm

A: Minimum head at no flow.

B: Maximum head at rated flow.

The following must be fulfilled:

- Minimum head at no flow < static head + system pressure.
  Comment: If this is not fulfilled, the pressure may exceed the pressure set on the CU 301.
- Maximum head at rated flow > dynamic head + system pressure.
  Comment: If this is not fulfilled, the pressure may fall below the pressure set on the CU 301.

Maximum head at rated flow and minimum head at no flow can be found in the following sections.

1.4 SQE and SQE-NE

US

Pump type	Min. head at 0 gpm, 3,000 rpm [feet]	Max. head at rated flow, 10,700 rpm [feet]
5 SQE-90	12	104
5 SQE-140	18	161
5 SQE-180	24	218
5 SQE-230	31	275
5 SQE-270	37	332
5 SQE-320	43	389
5 SQE-360	49	446
5 SQE-410	55	503
5 SQE-450	61	560
10 SQE-110	12	102
10 SQE-160	17	158
10 SQE-200	23	214
10 SQE-240	29	270
10 SQE-290	34	326
10 SQE-330	40	382
15 SQE-70	10	80
15 SQE-110	4	121
15 SQE-150	19	161
15 SQE-180	24	202
15 SQE-220	29	242
15 SQE-250	33	283
15 SQE-290	38	323
22 SQE-40	5	35
22 SQE-80	9	75
22 SQE-120	14	115
22 SQE-160	18	155
22 SQE-190	23	195
22 SQE-220	27	235
30 SQE-40	5	31
30 SQE-90	11	78
30 SQE-130	16	125
10 SQE-100 NE	10	96
10 SQE-140 NE	15	134
10 SQE-180 NE	20	173
10 SQE-220 NE	25	212
10 SQE-260 NE	30	251
10 SQE-300 NE	34	290
10 SQE-340 NE	39	329
22 SQE-40 NE	35	290
22 SQE-80 NE	39	322
22 SQE-110 NE	42	353
22 SQE-140 NE	46	385
22 SQE-180 NE	50	417
22 SQE-210 NE	54	448

US

1.5 Positioning the pressure sensor

Pressure losses often cause inconvenience to the user. The CU 301 keeps the pressure constant in the place where the pressure sensor is positioned, see fig. 7.

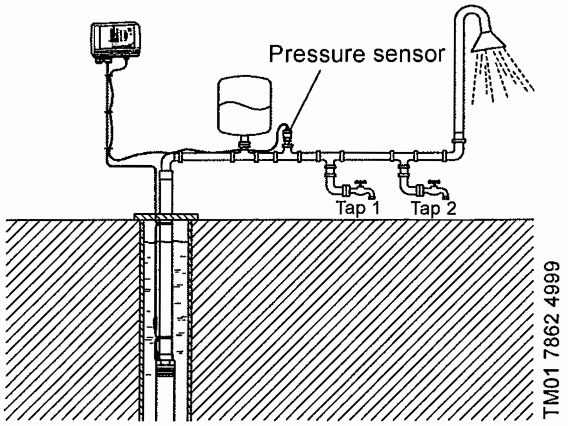


Fig. 7 Pressure sensor position

In fig. 7, tap 1 is placed close to the pressure sensor. Therefore, the pressure will be kept nearly constant at tap 1, as the friction loss is small. At the shower and tap 2, the friction loss is greater. This, of course, depends on the piping.

Therefore, it is recommended that the pressure sensor be positioned as close to the places of consumption as possible.

1.6 Precharge pressure setting

The CU 301 is designed to work with a 2 gal. diaphragm tank.

The precharge pressure of the diaphragm tank must be set to 70% of the pressure setting in order to use the tank to the limit of its capacity. This is of course especially important when the tank volume is limited to 2 gal.

Use the values in the following table.

Prechange pressure is measured with 0 psi in the pipeline:

Setting [psi]	Precharge pressure [psi]
40	28
50	35
60	42
70	49
80	56
90	63
100	70

Note: If the precharge pressure is higher than the pressure setting, the system will have difficulty controling the pressure.

If the user wants to adjust the pressure without changing the precharge pressure of the diaphragm tank, the precharge pressure must be equal to the lowest pressure setting used. This means that the control will work but that the pressure fluctuations might increase.

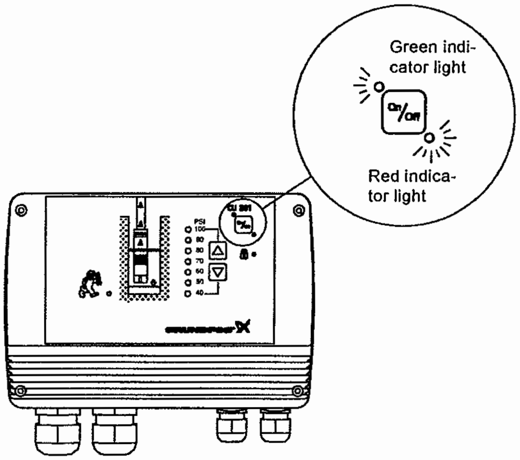
1.7 Pressure relief valve

In order to provide protection against the possibility of an overpressurization, a pressure relieve valve should be installed down stream of the well head. The setpoint of the pressure relief valve should be at least 30 psi above the pressure setting, see section *2.3*.

If a relief valve is installed, it is recommended that its discharge be plumbed into an appropriate drainage point.

2. Operating functions

2.1 On/Off button



TM02 4169 1606

Fig. 8 On/Off button

The green and red indicator lights in the On/Off button indicate pump operating condition as follows:

Indication	Description
Green indicator light permanently on	The system is operational.
Green indicator light off	The system is not operational.
Red indicator light permanently on	Pump has been stopped by means of the On/Off button.*
Red indicator light flashing	The CU 301 is communicating with the R100.

* If the On/Off button has been used to stop the pump, this button must also be used for restarting.

Any alarm indication can be reset by pressing the On/Off button.

If the On/Off button is pressed for more than 5 seconds, the pump is started, irrespective of any active fault/alarm indications and sensor signals.

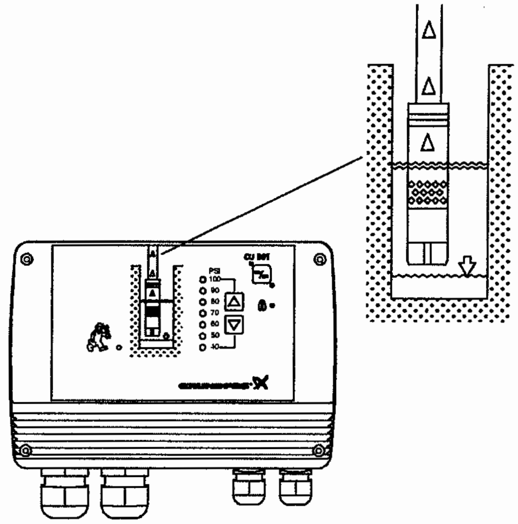
When the On/Off button is released, the pump will stop, if the alarm still exists.

IMPORTANT

Setting this button to the OFF position DOES NOT remove power from the pump. Before servicing the pump, remove power at the service breaker.

2.2 Indication of pump operation

On the graphical illustration on the CU 301 front, the riser pipe shows running light when the pump is operating. When the pump is not operating, none of the indicator lights are on, see fig. 9.



TM02 4170 1606

Fig. 9 Indication of pump operation

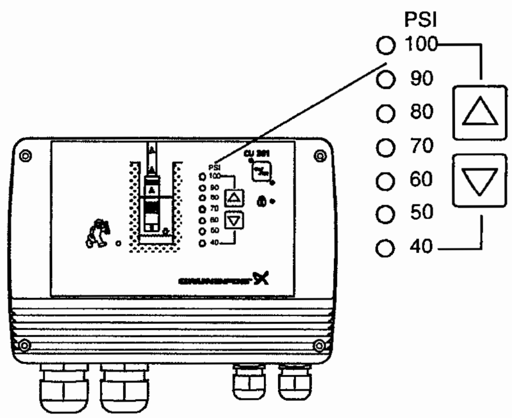
The indication of pump operation can be changed by means of the R100.

Possible settings:

- "Running light" during pump operation (factory setting).
- "Constant light" during pump operation.

2.3 Pressure setting

The two arrow buttons on the CU 301 front are used for the pressure setting, see fig. 10.



TM02 4171 1606

Fig. 10 Pressure setting and indication

US

Indication of pressure setting

The system pressure set is indicated by a yellow indicator light, which is permanently on.

Setting range: 40-100 psi.

Arrow-up button

When this button is pressed, the system pressure setting is increased in steps of 10 psi.

Arrow-down button

When this button is pressed, the system pressure setting is decreased in steps of 10 psi.

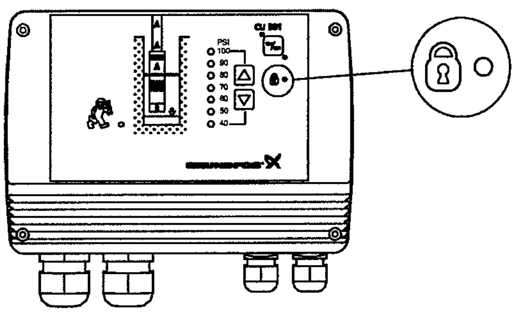
2.4 Button locking

The buttons on the CU 301 can be locked/unlocked by pressing the two arrow buttons simultaneously for 5 seconds or via the R100 remote control.

Note: When the arrow buttons are used for locking, take care not to inadvertently change the pressure setting.

Use the following procedure:

1. Set the pressure one step up.
2. Press the arrow-down button as the first one when pressing the two buttons.



TM02 4172 1606

Fig. 11 Button lock indication

When the buttons are locked, the indicator light is permanently on, see fig. 11.

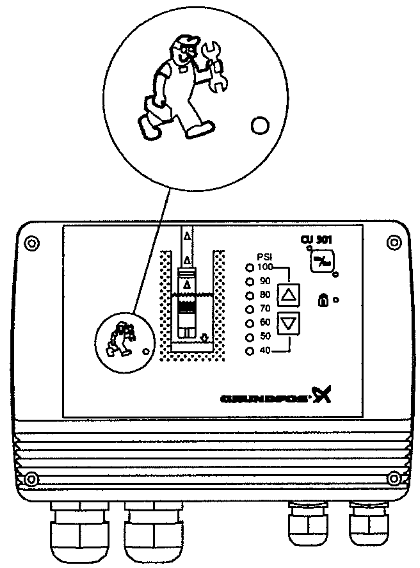
For further information, see section *5.3.8 Buttons on the CU 301*.

3. Alarm functions

The CU 301 continuously receives operating data from the pump. The alarm functions indicated on the CU 301 front are described in the following sections.

3.1 Service alarm

If one or more factory-set alarm values are exceeded, the indicator light for service alarm is permanently on, see fig. 12.



TM02 4173 1606

Fig. 12 Service alarm indicator

Possible alarms:

- Sensor defective
- Overload
- Overtemperature
- Speed reduction
- Voltage alarm
- No contact to pump.

The possible alarms and how to identify them and make the relevant corrections are described in section *7.1 Service*.

3.2 Dry-running protection

The purpose of the dry-running protection is to protect the pump in case of insufficient water flow.

The dry-running protection makes the conventional dry-running protection unnecessary.

No additional cables to the motor are required. The dry-running settings shown in section *8. Technical data*, are built into the pump and automatically transmitted to the CU 301. These settings can be changed via the R100.

When air enters the pump together with water, the pump power decreases, and pressure drops, causing the motor to increase speed. If the power consumption falls below the dry run setting for an accumulated time of 5 seconds, and the motor speed is within 1,000 rpm of the maximum speed setting as defined in the section *5.3.6*, the CU 301 stops the pump and declares a dry-running alarm.

When the motor is stopped, the dry-running indicator light is permanently on, see fig. 13, pos. A.

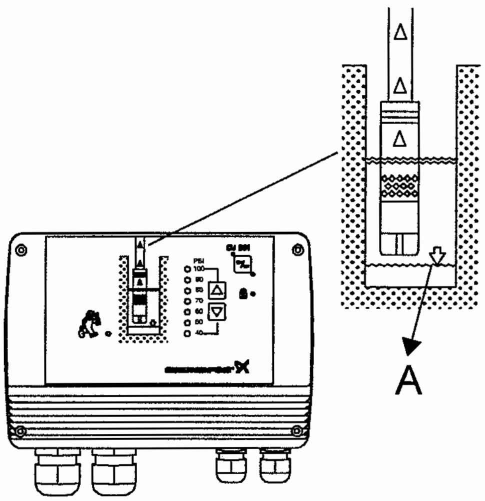


Fig. 13 Dry-running indicator light

Possible cause	Remedy
The pump performance is too high compared to the well yield.	Replace the pump with a smaller one.
	Reduce pump performance using the R100, display *5.3.6 Maximum speed*.
Well screen is blocked.	Well service is required.

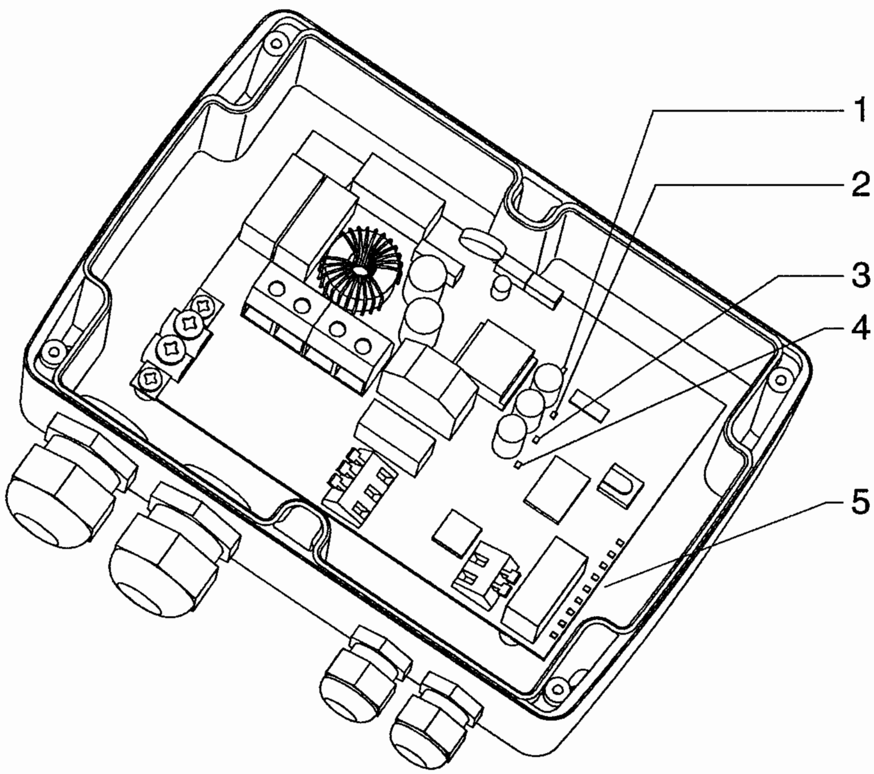
Restarting

After 5 minutes (factory setting) or the period set by means of the R100, display *5.3.4 Automatic restart*, the motor will restart automatically.

US

US

4. Position of LEDs



TM01 8537 1606

Fig. 14 Position of the LEDs inside the CU 301

Pos.	Indication	Description
1	+24 V overload	Permanent red light when the internal 24 VDC supply is overloaded.
2	+24 V	Permanent green light when the internal 24 VDC supply is OK.
3	+10 V	Permanent green light when the internal 10 VDC supply is OK.
4	+5 V	Permanent green light when the internal 5 VDC supply is OK.
	9 indicator lights:	
	Control indicator	Flashing green light when the pump control is working correctly.
	Min. speed	Permanent yellow light when the pump is running at minimum speed, 3,000 rpm.
	Max. speed	Permanent yellow light when the pump is running at maximum speed, 10,700 rpm.
	Sensor defective *)	Permanent red light when the sensor signal is out of signal range.
5	Overload *)	Permanent red light when the motor load exceeds the stop limit, see section *8. Technical data.*
	Overtemperature *)	Permanent red light when the motor temperature exceeds the stop limit, see section *8. Technical data.*
	Speed reduction *)	Permanent red light when the pump speed is reduced, see section *8. Technical data.*
	Voltage alarm *)	Permanent red light when the supply voltage is out of range, see section *8. Technical data.*
	No contact to pump *)	Permanent red light when communication between the CU 301 and the pump is impossible.

*) Press the On/Off button to reset the alarm indication.

5. CU 301 with R100

The R100 remote control can be used as a supplement for the installer and as an excellent troubleshooting tool. Grundfos highly recommends the use of one for diagnosing problems and accessing system information unavailable through other means. The R100 provides wireless communication with the CU 301.

US

Note: It is not necessary to use the R100 to operate the system. The R100 offers additional features.

The R100 communicates via infrared light. During communication, there must be visual contact between the CU 301 and the R100. The best visual contact between the two units is obtained by pointing the R100 at the lower arrow button or by removing the front cover and pointing the R100 at the right side of the CU 301, see fig. 15.

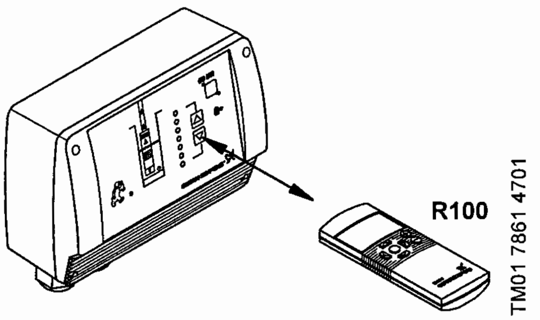


Fig. 15 IR communication between the CU 301 and the R100

The R100 offers possibilities of altering factory settings and reviewing operating status of the pump.

When the communication between the R100 and CU 301 has been established, the red indicator light in the On/Off button will flash.

For general use of the R100, see the operating instructions included with it.

The menu structure for the R100 and CU 301 is divided into four parallel menus, each including a number of displays.

0. **GENERAL**, see operating instructions for the R100.
1. **OPERATION**
2. **STATUS**
3. **INSTALLATION**

Menu overview, see fig. 16, page 14.

Note: The number stated at each individual display in fig. 16 refers to the section in which the display is described.

US

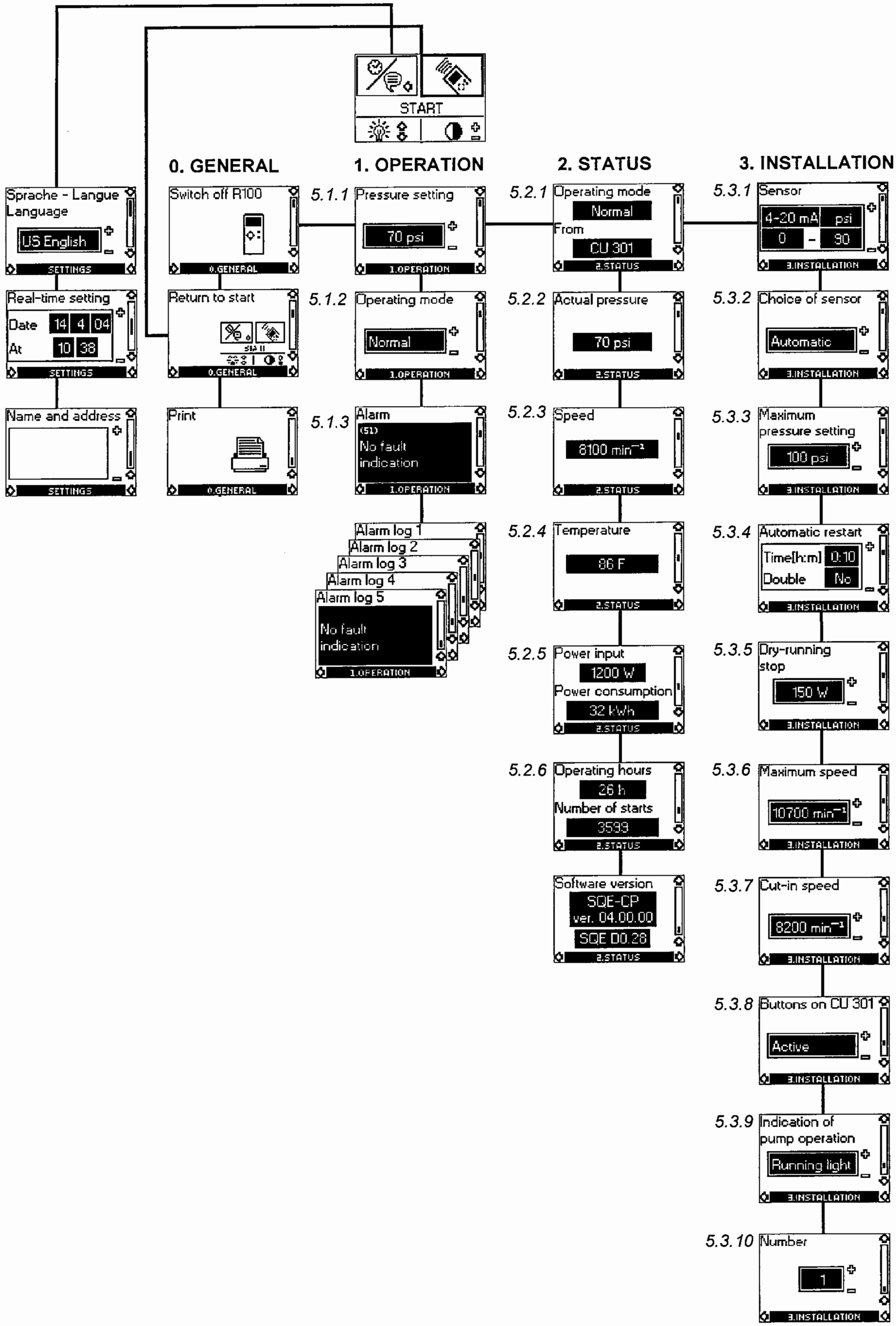


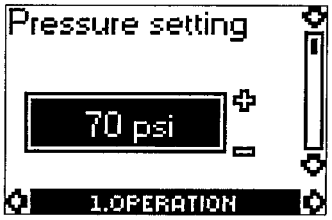
Fig. 16 Menu overview

5.1 Menu OPERATION

The OPERATION menu for the CU 301 offers the possibility of setting and reading operating parameters.

Factory settings are marked in **bold**-faced type under each individual display.

5.1.1 Pressure setting



TM CU301_1_01 US

Set the required pressure.

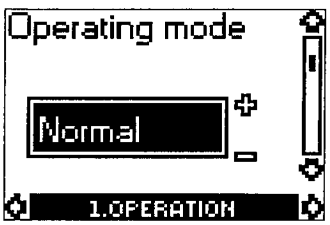
Setting range

- *40-100 psi* (10 psi intervals), ***50 psi.***

Relation to other displays

The setting in display *5.1.1 Pressure setting* is overridden by the "Max." and "Min." settings in the displays *5.1.2 Operating mode* and *5.3.3 Maximum pressure setting.*

5.1.2 Operating mode



TM CU301_1_02 US

Select one of the following operating modes:

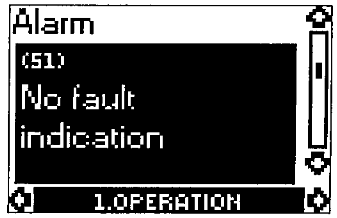
- *Max.*
  Pump operation is set to maximum speed, irrespective of the pressure setting. The maximum speed is set in display *5.3.6 Maximum speed* (factory setting: 10,700 min^{-1}).
- *Normal*
  Normal operating mode, i.e. pump operation is based on the pressure set in display *5.1.1 Pressure setting.*
- *Min.*
  Pump operation is set to minimum speed, 3,000 min^{-1}, irrespective of the pressure setting.
- ***Stop***
  The pump is stopped.

If the On/Off button has been used to stop the pump, this button must also be used for restarting.

Relation to other displays

The "Max." and "Min." settings override the pressure setting in display *5.1.1 Pressure setting.*

5.1.3 Alarm



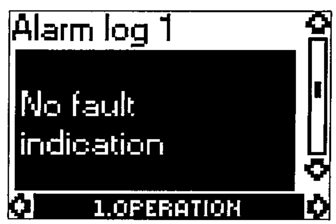
TM CU301_1_03 US

This display shows the current alarm status.

Possible alarms are described in the following table:

Alarm indication	Description
No fault indication	No alarms are registered by the CU 301.
No contact to pump	No communication between the CU 301 and the pump.*
Overvoltage	The supply voltage exceeds the limit value.
Undervoltage	The supply voltage is below the limit value.
Dry running	The dry-running protection of the pump has been activated.
Overtemperature	The motor temperature exceeds the limit value.
Overload	The current consumption of the motor exceeds the limit value.
Sensor defective	The sensor signal has fallen outside the measuring range set. The sensor signal of a 4-20 mA or 2-10 V sensor is below 2 mA or 1 V respectively.

* The pump will attempt to operate in on/off mode starting at 7 psi below pressure setting and stopping at 7 psi above pressure setting. The system must be reset every 250 stops.



TM CU301_1_04 US

The R100 can retrieve the last five alarms that the CU 301 experienced. They are displayed in order of occurrence with "Alarm log 1" being the most recent.

5.2 Menu STATUS

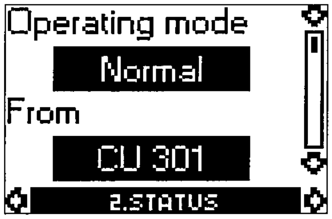
US

The STATUS menu for the CU 301 provides operating data about pump/motor and sensor. It is not possible to change or set values in this menu.

When [OK] is pressed continuously in this display, the displayed value is being updated.

The measuring accuracy is stated in section *8. Technical data.*

5.2.1 Operating mode



TM CU301_2_01 US

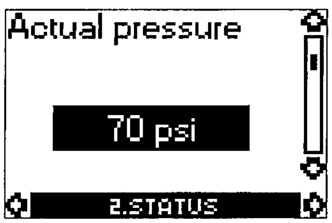
Possible operating modes:

- *Max.*
  Pump operation has been set to maximum speed, i.e. 10,700 min^{-1}.
- *Normal*
  Normal operating mode, i.e. pump operation is based on the pressure set in display *5.1.1 Pressure setting.*
- *Min.*
  Pump operation has been set to minimum speed, 3,000 min^{-1}.
- *Stop*
  The pump has stopped.

The operating mode was selected from one of the following:

- *CU 301* (On/Off button on the CU 301)
- *R100*
- *Sensor* (signals received via the sensor input).

5.2.2 Actual pressure



TM CU301_2_02 US

The actual system pressure measured by the pressure sensor.

Tolerance: ±1%.

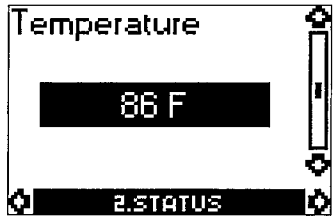
5.2.3 Speed

TM CU301_2_03 US

The actual speed stated in min^{-1} (rpm).

Tolerance: ±1%.

5.2.4 Temperature



TM CU301_2_04 US

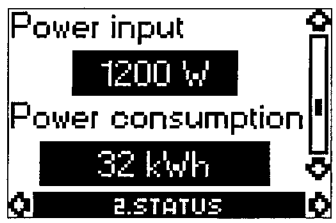
The actual temperature of the motor electronics stated in "C" or "F", based on language selected in "settings".

Tolerance: ±5%.

Relation to other displays

To select "F", choose the language "US English" in the settings menu.

5.2.5 Power input and power consumption



TM CU301_2_05 US

Power input

The actual motor power from the electricity supply. The power input is displayed in W (watt).

Note: This value is used for the calculation of minimum power limit (dry-running stop).

Power consumption

The accumulated motor power consumption in kWh.

The value of power consumption is accumulated from the pump's birth and it cannot be reset.

The value

- is stored in the motor electronics, and it is kept even if the CU 301 is replaced.
- is updated in the software every 2 minutes of continuous operation. The displayed value is updated every two hours.

Tolerance: ±5%.

5.2.6 Operating hours and number of starts

TM CU301_2_06 US

Operating hours

The number of operating hours is accumulated from the pump's birth and it cannot be reset.

The value

- is stored in the motor electronics, and it is kept even if the CU 301 is replaced.
- is updated in the software every 2 minutes of continuous operation. The displayed value is updated every two hours.

Number of starts

The number of starts is accumulated from the pump's birth and it cannot be reset.

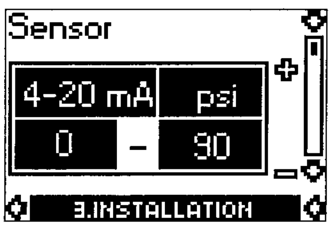
The value is stored in the motor electronics, and it is kept even if the CU 301 is replaced.

5.3 Menu INSTALLATION

The INSTALLATION menu for the CU 301 offers the possibility of configuring the CU 301, pump/motor and sensor.

Factory settings are marked in **bold**-faced type under each individual display.

5.3.1 Sensor



TM CU301_3_01 US

Make the following settings according to sensor type:

- Sensor output signal: "–" (not active), *0-20 mA*, ***4-20 mA***, *0-10 V*, *2-10 V*.
- Setting range unit: *bar*, ***psi***.

Setting range, psi:

- Minimum value: ***0***.
- Maximum value: *40-120* (*40, 50, 60, 70 ...* ***120***).

Setting range, bar:

- Minimum value: ***0***.
- Maximum value: *2-6* (*2, 2.5, 3, 3.5 ...* ***6.0***).

Note: The pressure sensor used must measure the pressure in the actual measuring unit.

Relation to other displays

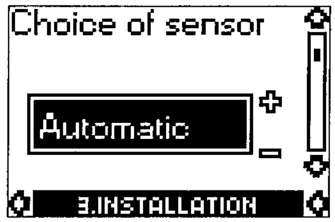
The measuring unit appearing in display *5.2.2 Actual pressure* will be identical to the measuring unit in the front cover.

Exception: If "Manual" is selected in display *5.3.2 Choice of sensor*, the sensor can be set, irrespective of the front cover.

If changes are made in display *5.3.1 Sensor*, the setting in display *5.3.2 Choice of sensor* is changed to "Manual".

If the original setting is resumed, it is necessary to change the setting in display *5.3.2 Choice of sensor* from "Manual" to "Automatic".

5.3.2 Choice of sensor



TM CU301_3_02 US

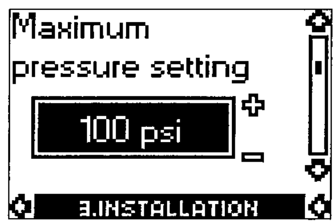
The following settings are available:

- ***Automatic***
- *Manual*.

Relation to other displays

If, for some reason, the setting in this display has changed to "Manual" and this is changed to "Automatic", the setting of the displays *5.3.1 Sensor* and *5.3.3 Maximum pressure setting* will change to the factory setting.

5.3.3 Maximum pressure setting



TM CU301_3_03 US

The setting of this display overrules the possibility of using the arrow button on the CU 301 front to increase the pressure to a setting above the "Maximum pressure setting".

The following settings are available:

- *40-100 psi* (10 psi intervals).

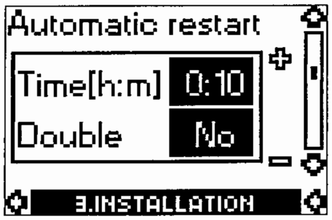
Relation to other displays

The setting of this display overrules the possibility of using the display *5.1.1 Pressure setting* to increase the pressure to a setting above the "Maximum pressure setting".

If the setting is changed from 100 psi, the setting in display *5.3.2 Choice of sensor* changes from "Automatic" to "Manual".

US

5.3.4 Automatic restart



TM CU301_3_04 US

Set the automatic restart time from stop, caused by an alarm, to restart attempt.

The following settings are available:

Time

- ***0:05***
- "–" (not active)
- *1, 2, ... 30* m (1 min. intervals)
  30, 45, 1 h, ... *2* h (15 min. intervals)
  2 h *30* m, *3* h, ... *4* h (30 min. intervals).

Double

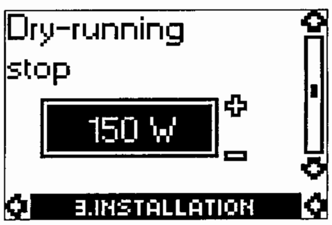
- *Yes*
- ***No***.

When "Yes" is selected, the restart time set will be doubled automatically for every 10 motor stops caused by an alarm. The time is doubled up to a stop time of 4 hours.

After 10 hours of operation without an alarm, the restart time is automatically set to:

- the time set in the "Time" field or
- ***5*** min. (factory setting) if no setting was made in the "Time" field.

5.3.5 Dry-running stop



TM CU301_3_05 US

The dry-running stop value is factory-set.

The factory setting depends on the power rating of the motor.

The following settings are default:

- Motor type 0.5 hp, dry-running stop = ***300 W***.
  Note: For 10 SQE 160 and 10 SQE 160 N pumps, the value is 550 W.
- Motor type 0.75 hp, dry-running stop = ***680 W***.
- Motor type 1.0 hp, dry-running stop = ***800 W***.
- Motor type 1.5 hp, dry-running stop = ***900 W***.

When the dry-running protection is to be active, the minimum value of the pump power input must be set in this display.

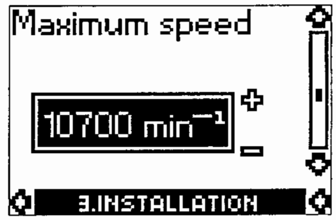
Setting range: *0-2500 W* (10 W intervals).

Relation to other displays

The actual pump power input can be read in display *5.2.5 Power input and power consumption*.

If the maximum pump speed has been reduced in display *5.3.6 Maximum speed*, the dry-running stop value must be changed.

5.3.6 Maximum speed



TM CU301_3_06 US

Set the maximum speed.

Setting range: *3,000-**10,700 min^{-1}*** (100 min^{-1} intervals).

Dry-running stop at reduced maximum pump speed

If the maximum pump speed has been reduced, the dry-running stop value in display *5.3.5 Dry-running stop* must be changed.

Calculating the minimum power limit

Note: The calculated value is used in display *5.3.5 Dry-running stop*.

Note: If the pump is worn, a renewed calculation of the minimum power limit may be required.

Step	Action
1	Start the pump against closed discharge valve.
2	Read the power input (P_1) in display *5.2.5 Power input and power consumption*.
3	Calculate the minimum power limit as follows: Power limit [W] = $P_1 \cdot 0.9$.

5.3.7 Cut-in speed

TM CU301_3_07US

In the case of an oversized pump or drastically changing water levels, this function may cause an excess pressure, at start-up, in relation to the desired discharge pressure. The cut-in speed can therefore be lowered to compensate.

Setting range: *3,000-10,700 min^{-1}* (***8,200 min^{-1}***) (100 min^{-1} intervals).

Relation to other displays

The maximum speed setting can be read in display *5.3.6 Maximum speed.*

The maximum pump speed setting overrules the cut-in speed setting.

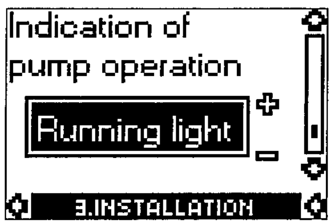
5.3.8 Buttons on the CU 301

TM CU301_3_08 US

The buttons on the CU 301 can be set to:

- ***Active***
- *Not active.*

5.3.9 Indication of pump operation



TM CU301_3_09 US

The following settings are available:

- ***Running light***
- *Constant light.*

5.3.10 Number

TM CU301_3_10 US

Allocate a number to the CU 301 and the pump connected. The CU 301 and the pump must have the same number.

The CU 301 control unit communicates with the SQE pumps via the pump power cable to turn the pumps on and off, set motor speed and monitor pump status.

The technique used for performing this communication impresses a high frequency data signal on the pump power cable that is picked off by internal pump electronics and then decoded into command instructions. This is the reason for assigning unique numbers to each CU 301 in a multiple unit installation.

The unique number serves as a communication address between each CU 301 control unit/motor pair.

In situations where multiple CU 301 pump power cables are run parallel in wiring trays or conduit and less than 10-12 inches apart, the possibility for undesired communication between units exists. When this occurs, intermittent or continuous "No contact" is typically seen. Other unexpected errors may also be seen.

There are two approaches available to eliminating the possibility of this occurring:

- Physical separation of cables:
  Maintain a minimum distance of 10-12 inches between pump power cables, and never place more than one cable in a conduit.
- Use shielded cable:
  The use of shielded cable prevents cross communication between parallel cables and allows sharing of conduit and cable trays. Tie the cable shield to earth only at the CU 301 control unit.

Suitable cables:

Manf.	Part#	Gage
Anixter	2A-1403S	14
Anixter	2A-1203S	12
Anixter	2A-1003S	10
Anixter (1-800-321-1486)		

In addition, Grundfos recommends applying power to only one CU 301 unit/motor at a time while programming the CU 301 number with the R100. This will prevent the possibility of two pumps hearing the same number assignment command.

US

6. Print

The actual data in the R100 can be printed on a Hewlett-Packard printer type HP82240B.

Navigate the R100 to the print menu and point the R100 at the IR sensor of the printer and press [OK]. The following information will be printed:

```
              R100
          Status report

Product type:  CU 301

Software version:
SQE-CP ver. 03.00.00
SQE D0.30

            Settings

General:              Value
Pressure setting      60 psi
Operating mode        Normal
Max. pres. set.       (psi)
                      100
Auto. rest. time      0:01
Auto. rest. db.       No
Dry-run stop          150 W
Max. speed(speed)     10.700
Buttons on CU 301     Active
Operat. indicat.      Run.
Number                1


Sensor
Type          4-20 mA
Unit          psi
Choice        Manual

                 Min.    Max.
Range            0       120


          Actual values

                  Value
Operating mode    Stop
From              CU 301
Act. pressure     64 psi
Temperature       74 F
Speed             0 min-1
Power input       20 W
Power consump.    10 kWh
Operat. hours     18 h
Num. of starts    397


Alarm
No fault
indication



Date    : 15.5.02
At      : 13:24
```

TM03 4040 1406

7. Troubleshooting

Before starting any work on the CU 301, make sure that the electricity supply has been switched off and that it cannot be accidentally switched on.

7.1 Service

The CU 301 continuously receives operating data from the pump. In case of an alarm, the service indicator light is permanently on, see fig. 17.

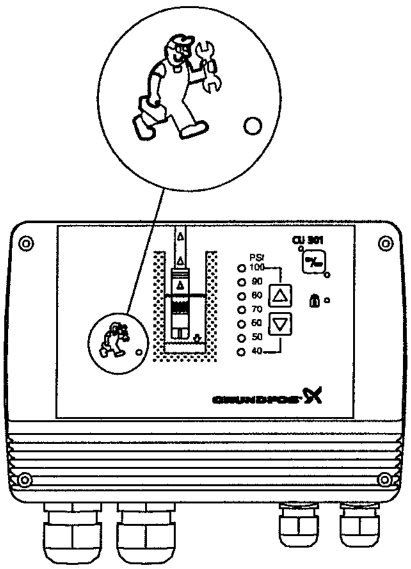


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Fig. 17 Service alarm indicator

The service indicator light will be permanently on if one of the following alarm situations occurs:

- Sensor defective
- Overload
- Overtemperature
- Speed reduction
- Voltage alarm
- No contact to pump.

To identify the cause of the service alarm, it is necessary to remove the front cover from the CU 301 or use the R100. Fit the front cover as shown in fig. 18 to avoid disconnecting the multi-core cable.

A number of LEDs are mounted on the supply board inside the CU 301, see section *4. Position of LEDs*.

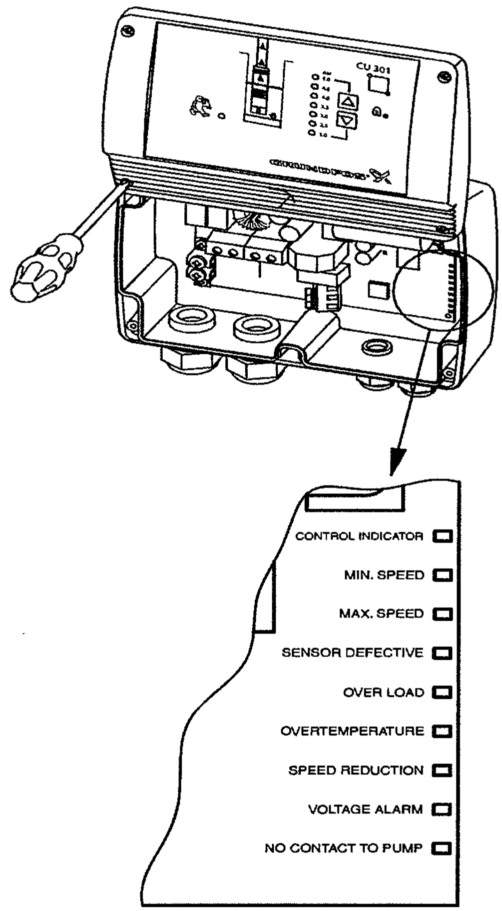

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Fig. 18 LEDs and alarm texts on the supply board

US

US

Fault	Possible cause	Remedy
1. No light in the front cover.	a) The ribbon cable connection is loose or defective.	• Is the control indicator LED flashing? If not, the CU 301 is defective. • Check that the ribbon cable connection is secure.
2. The pump does not start. The green indicator light in the On/Off button is on. No alarm is indicated.	a) The CU 301, the pressure sensor or the pump is defective.	Check • that the control indicator LED is flashing. If not, the CU 301 is defective. • that the system pressure is 7 psi below the pressure setting. If so, the pump is supposed to start. Open a tap to be sure. If the pump starts, the system is probably OK. The system pressure can be read on the pressure gauge. • Refer to fault 13 to troubleshoot the pressure sensor. If the pump has not started yet, proceed as follows: • Press the On/Off button for 5 seconds. If the pump starts, the CU 301 or the sensor may be defective. **Note:** The pressure is not controlled and may rise to a high level.
3. The pressure is not constant.	a) The pump is not of the correct type or the precharge pressure of the diaphragm tank is incorrect.	Check • that the LED for Max. speed or Min. speed is on. If so, this indicates that the pump has reached a limit. See section *1.3 System sizing*. Replace the pump, if necessary. • the precharge pressure of the diaphragm tank. **Note: Remember to stop and drain the system before the pressure is checked.** • Make sure the diaphragm tank is the 2 gal. size. • whether the sensor is positioned far away from the tap. If so, the pressure variations may be caused by friction losses, see section *1.5 Positioning the pressure sensor.*
	b) No contact between SQE pump and CU 301 control unit.	Check that the LED for "No contact to pump" is on. If so, go to fault no. 14.
4. The pump is running continuously.	a) The pump cannot deliver the set pressure. The CU 301 or the sensor is defective.	• Try to lower the pressure setting, see section *1.3 System sizing.* Note that the pump may run for about 15 to 20 seconds before it stops. • Check that the control indicator LED is flashing. • Check that the pipe end of the sensor is not blocked. If so, remove the blockage. • Try to stop the pump by means of the On/Off button. If this is not possible, the CU 301 is defective. Replace the CU 301. • Refer to fault 13 to troubleshoot the pressure sensor.

(continued on the following page)

5. The CU 301 indicates "No contact to pump".	a)	The motor is not an MSE 3.	If the pump has already worked satisfactorily with a CU 301 or a CU 300, the motor can be expected to be an MSE 3. There is no technical way of determining the motor type. The only way is to read the nameplate engraved in the motor sleeve.
	b)	The pump cable is longer than 650 feet.	Reduce the length of the pump cable.
	c)	Cable breakage.	Switch off the mains supply to the CU 301. Connect motor leads directly to the mains supply. Switch on the mains supply again. The pump is now connected direct to the mains supply without interference from the CU 301. Does the motor start? **Yes:** The cable is OK. Go to point d). **No:** Switch off the mains supply again. Remove cable and cable plug from the motor and ohm out cable including plug. Is the cable OK? **Yes:** The motor is defective. Replace the motor. **No:** Replace the cable.
	d)	Cross communication with adjacent CU 301.	If another CU 301 is installed: • Insure each unit has a unique number assigned. See section *5.3.10 Number.* • If pump cables run parallel to each other, physically separate them by 12-14 inches or rewire using shielded cable.
	e)	The CU 301 communication part is defective.	Are the three CU 301 supply board LEDs in pos. 2, 3 and 4 on and is the control indicator LED flashing? See section *4. Position of LEDs.* **Yes:** • The mains supply is OK. • Assign the system a new number. If this does not work, the CU 301 or the motor communication part is defective. Replace the CU 301 and give the new system a number between 1 and 64 in order to obtain correspondence between the numbering of the SQE pump and the CU 301. **Note:** Two systems on the same mains supply must not have the same number! Is the LED "No contact to pump" of the new CU 301 also on? **Yes:** The CU 301 is OK. Go to point f). **No:** The CU 301 which was removed is defective.
	f)	The MSE 3 motor communication part is defective.	As a consequence of the above-mentioned checks, replace the MSE 3 motor.
6. Even AFTER replacement, the CU 301 indicates "No contact to pump".	a)	Numbering of SQE pump and CU 301 is different.	If an SQE/CU 301 system has been given a number, this number is stored in both the SQE and CU 301. A new CU 301 or SQE may not have a number corresponding to the number stored in the previous unit. Therefore, "No contact to pump" is indicated even if there is no fault. Give a new system the number between 1 and 64 in order to obtain correspondence between the numbering of the SQE pump and the CU 301. **Note:** Two systems on the same mains supply must not have the same number!

(continued on the following page)

US

7. The CU 301 indicates "Overvoltage" or "Undervoltage".	a) The supply voltage is unstable or outside the voltage range specified for the installed motor type.	Check - possibly over a period of time - that the supply voltage is according to the values below. • Motor type 0.5 hp = 198-315 V • Motor type 0.75 hp = 198-315 V • Motor type 1.0 hp = 207-315 V • Motor type 1.5 hp = 207-315 V. Voltage range for 100-115 V motors: • Motor type 0.5 hp = 90-180 V. **Note:** As the voltage is detected at the motor, allow for the voltage drop in the pump cable.
8. The CU 301 indicates "Dry running".	If the power consumption is lower than the dry-running stop setting and the motor speed is within 1,000 rpm of programmed maximum speed, for an accumulated period of 5 seconds, the pump will be stopped.	
	a) The pump performance is too high for the well yield.	Replace the pump with a smaller pump or reduce the pump performance, by lowering maximum speed, or reducing set pressure.
	b) The well screen is blocked.	Check the well capacity and restore water supply to the well.
	c) The dry-running stop setting is incorrect.	Check and correct the setting, see section *5.3.5 Dry-running stop.*
9. The CU 301 indicates "Speed reduction" and "Undervoltage".	Speed reduction is activated so as to maintain a reduced performance. When the supply voltage falls so low that it can no longer supply the necessary current to maintain 3,000 min^{-1}, the pump will be stopped.	
	a) The supply voltage is unstable or lower than the voltage range specified for the installed motor type.	Restore correct supply voltage.
	b) The pump is not of the correct type.	Install correct pump type.
	c) The voltage drop in the pump cable is too great.	Replace the pump cable with lower gauge wires.
10. The CU 301 indicates "Speed reduction" and "Overload".	Speed reduction is activated so as to maintain a reduced performance.	
	a) The pump is worn or blocked.	The pump must be serviced.
	b) The pump is too large for the installed motor.	Replace pump or motor.
11. The CU 301 indicates "Overtemperature".	The temperature sensor in the motor is sensing a temperature above the values stated in *8. Technical data*, factory settings.	
	a) Insufficient cooling of the motor.	Restore correct cooling of the motor. The flow velocity past the motor should be at least 0.5 ft/s.
12. The CU 301 indicates "Overload".	a) The pump is worn or blocked.	The pump must be serviced.
	b) The pump is too large for the installed motor.	Replace pump or motor.

(continued on the following page)

13. The CU 301 indicates "Sensor defective".	a) The pressure sensor is defective.	Check that the sensor is wired correctly. Check that the R100 setting of the sensor is correct, see section *5.3.1.* If the sensor type is 4-20 mA, measure the DC voltage across the sensor input terminals. If the DC voltage measured at the sensor input terminals is not between 2 and 10 V the sensor or wiring is defective. Refer to section *9.*, page 28, for additional troubleshooting assistance. Replace defective parts. Are the LED "Sensor defective" and the LED, pos. 1, on? See section *4. Position of LEDs.* **Yes:** The total load of 24 VDC from terminal 5 is above 100 mA. Disconnect the sensor in order to determine if it is defective. Replace defective sensor. **No:** The load is OK, but the CU 301 sensor input may be defective.
14. The pump is operating on/off.	a) No communication.	Check that the LED "No contact to pump" is on. If so, the control unit CU 301 starts and stops the pump, based on the sensor signal only. The CU 301 has to be reset every 250 stops. Refer to fault no. 5 for remedy.
15. Excess pressure, for a short moment, at start of consumption.	a) Cut-in speed is too high.	Reduce the cut-in speed, see section *5.3.7 Cut-in speed.*

8. Technical data

Supply voltage

1 x 100-240 V –10%/+6%, 50/60 Hz, PE.

Power consumption

5 W.

Back-up fuse

Maximum 16 A.

Current consumption

Maximum 130 mA.

Mains borne signalling

Frequency shift keying (FSK).

(132.45 kHz ±0.6 kHz).

Enclosure class

IP 55.

Maximum length between CU 301 and pump

650 feet.

Ambient temperature

- During operation: –22 to +113°F (–30 to +45°C) (must not be exposed to direct sunlight).
- During storage: –22 to +140°F (–30 to +60°C).

Weight

4.5 lb.

Relative air humidity

Maximum 95%.

Materials

The CU 301 box is made of black PPO.

EMC (electromagnetic compatibility)

According to EN 55014 and EN 55014-2.

Dimensional sketch

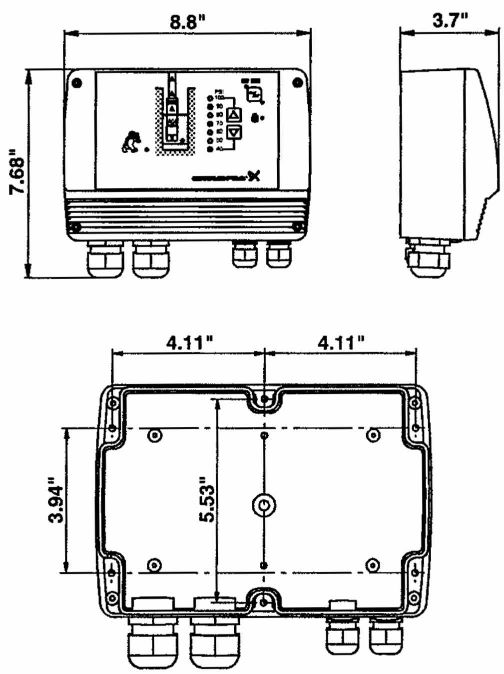

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Fig. 19 Dimensional sketch

Input for external sensor

- Voltage signal:
  0-10 VDC/2-10 VDC, R_i = 11 kΩ.
  Tolerance: ±3% at maximum voltage signal.
  #22 ga. Screened cable is recommended.
  Maximum cable length: 1640 ft (500 m).
- Current signal:
  DC 0-20 mA/4-20 mA, R_i = 500 Ω.
  Tolerance: ±3% at maximum current signal.
  #22 ga. Screened cable is recommended.
  Maximum cable length: 1640 ft (500 m).

Factory settings

	200-240 V motors				100-115 V motors
Alarm	**SQ/SQE/ SQE-NE 0.5 hp**	**SQ/SQE/ SQE-NE 0.75 hp**	**SQ/SQE/ SQE-NE 1.0 hp**	**SQ/SQE/ SQE-NE 1.5 hp**	**All models**
Sensor defective	4-20 mA (the value is stored in the CU 301)				
Overload	5.2 A	8.4 A	11.2 A	12 A	11 A
Overtemperature	Stop limit: 167°F (75°C)	Stop limit: 180°F (82°C)	Stop limit: 198°F (92°C)	Stop limit: 203°F (95°C)	Stop limit: 185°F (85°C)
	Restart: 145°F (63°C)	Restart: 162°F (72°C)	Restart: 180°F (82°C)	Restart: 185°F (85°C)	Restart: 167°F (75°C)
Speed reduction	In connection with undervoltage or overload				
Overvoltage *)	315 VAC	315 VAC	315 VAC	315 VAC	180 VAC
Undervoltage	Speed reduction when the supply voltage is below:				
	198 V	198 V	207 V	207 V	90 V
	Stop limit: 150 V	Stop limit: 150 V	Stop limit: 150 V	Stop limit: 150 V	Stop limit: 75 V
Dry running	300 W/550 W**	680 W	800 W	900 W	300 W/550 W**

*) 200-240 V motors: Operation is guaranteed up to 280 VAC.
100-115 V motors: Operation is guaranteed up to 150 VAC.
In order to avoid unnecessary stops, the overvoltage stop limit is as stated.

**) The 550 W dry-running limit only applies to 10 SQE 160 and 10 SQE 160 N pumps.

Accuracy of R100 readings

Operation

Display	**Accuracy**
5.2.2 Actual pressure	±1.4 psi
5.2.3 Speed	±1%
5.2.4 Temperature	±5%
5.2.5 Power input and power consumption	±5%

Sensor

The sensor signal accuracy depends on the sensor type. See the sensor specifications in question.

8.1 Electrical connection

The electrical connection should be carried out by an authorized electrician.

Never make any connections on the CU 301 terminal block unless the electricity supply has been switched off. The CU 301 must be connected in accordance with the local rules and regulations.

IMPORTANT

The On/Off button on the CU 301 must not be used as a safety switch when installing and servicing the pump.

Mains disconnector must be provided by the installer.

"Raintight or wet location hubs that comply with the requirements in the standard for Fittings for Conduit and Outlet Boxes, UL514B, are to be used. Suitable devices for CU 301 are rated with enclosure type 3, 3R, 3S, 4, 4X, 6 or 6P".

The supply voltage and frequency are marked on the nameplate. Make sure that the CU 301 is suitable for the electricity supply on which it will be used.

If the CU 301 is connected to an electric installation where a Ground Fault Circuit Interrupter (GFCI) is used as an additional protection, this device **must** trip out when earth fault currents with DC content (pulsating DC) occur.

The CU 301 has two terminal blocks:

- Terminals 1 to 4.
- Terminals 5 to 7.

Furthermore, the CU 301 is equipped with two screw terminals for the protective earth leads (PE).

Always use copper conductors approved for 60/75°C (140/167°F).

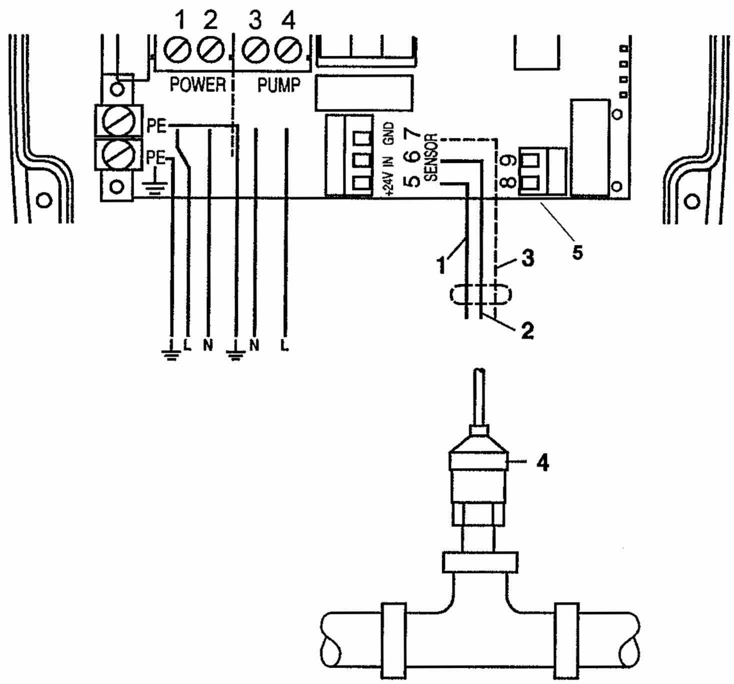

Fig. 20 Electrical connection of the CU 301

Legend

Pos.	Description
1	Standard pressure sensor +24 VDC, brown lead, terminal 5
2	Standard pressure sensor Input signal, black lead, terminal 6
3	Standard pressure sensor Braid, terminal 7
4	Standard pressure sensor
5	Connections for operating relay

8.1.1 Mains supply

POWER, terminals 1, 2 and PE

Connect terminals 1 and 2 to the phase and neutral leads of the mains supply. Each terminal can be connected to any of the two leads. Torque: 15 lbf-in.

Connect the PE terminal to the green/yellow earth lead. Torque: 9.0 - 15.3 lbf-in. Each PE terminal must be connected to an earth lead of its own.

Maximum wire size of the leads to be connected is 10 AWG.

Circuit breaker: Maximum 16 A.

Note: The leads of the mains supply must not be connected to terminals 3 and 4 (PUMP).

8.1.2 Pump supply

PUMP, terminals 3, 4 and PE

Connect terminals 3 and 4 to the phase and neutral leads of the pump. Each terminal can be connected to any of the two leads. Torque: 15 lbf-in.

Connect the PE terminal to the green/yellow earth lead. Torque: 9.0 - 15.3 lbf-in. Each PE terminal must be connected to an earth lead of its own.

Maximum wire size of the leads to be connected is 10 AWG.

In situations where multiple CU 301 pump power cables are run parallel in wiring trays or conduit and less than 10-12 inches apart, the possibility for undesired communication between units exists. When this occurs, intermittent or continuous "No contact" is typically seen. Other unexpected errors may also be seen.
Refer to section *5.3.10 Number* for further instructions.

8.1.3 Pressure sensor

SENSOR, terminals 5, 6 and 7

Terminals 5, 6 and 7 (SENSOR) are used for the pressure sensor.

Sensor signals

The sensor to be connected must provide signals within one of the following ranges:

- 0-10 V
- 2-10 V
- 0-20 mA
- 4-20 mA - factory default.

Changeover between current and voltage signals is carried out by means of the R100.

Important!

The total load of terminal 5 (+24 VDC) must not exceed 100 mA.

RELAY, terminals 8 and 9

Terminals 8 and 9 (RELAY) are used for the connection of an external signal transmitter (sound or light).

The operating relay is a normally open contact when the pump is not running, and closes while the pump is running.

Relay specifications

Maximum load: 230 VAC, 0.5 A.

9. Pressure sensor voltage chart

Voltage to pressure chart for CU 301 pressure sensors. Measure the DC voltage between "SENSOR IN" and "SENSOR GND". Voltages lower than 2 or higher than 10 indicate an incorrectly wired or a faulty sensor.

US

DC voltage	psi	DC voltage	psi	DC voltage	psi
1.9	0.0	4.5	40.5	7.1	81.0
2.0	0.7	4.6	41.2	7.2	81.7
2.0	1.5	4.6	42.0	7.2	82.5
2.1	2.2	4.7	42.7	7.2	83.2
2.1	3.0	4.7	43.5	7.3	84.0
2.2	3.7	4.8	44.2	7.3	84.7
2.2	4.5	4.8	45.0	7.4	85.5
2.3	5.2	4.8	45.7	7.4	86.2
2.3	6.0	4.9	46.5	7.5	87.0
2.4	6.7	4.9	47.2	7.5	87.7
2.4	7.5	5.0	48.0	7.6	88.5
2.4	8.2	5.0	48.7	7.6	89.2
2.5	9.0	5.1	49.5	7.7	90.0
2.5	9.7	5.1	50.2	7.7	90.7
2.6	10.5	5.2	51.0	7.8	91.5
2.6	11.3	5.2	51.7	7.8	92.2
2.7	12.0	5.3	52.5	7.9	93.0
2.7	12.8	5.3	53.2	7.9	93.7
2.8	13.5	5.4	54.0	8.0	94.5
2.8	14.3	5.4	54.7	8.0	95.2
2.9	15.0	5.5	55.5	8.1	96.0
2.9	15.7	5.5	56.2	8.1	96.7
3.0	16.5	5.6	57.0	8.2	97.5
3.0	17.2	5.6	57.7	8.2	98.2
3.1	18.0	5.7	58.5	8.3	99.0
3.1	18.7	5.7	59.2	8.3	99.7
3.2	19.5	5.8	60.0	8.4	100.5
3.2	20.2	5.8	60.7	8.4	101.3
3.3	21.0	5.9	61.5	8.4	102.0
3.3	21.7	5.9	62.2	8.5	102.8
3.4	22.5	6.0	63.0	8.5	103.5
3.4	23.2	6.0	63.7	8.6	104.3
3.5	24.0	6.0	64.5	8.6	105.0
3.5	24.7	6.1	65.2	8.7	105.8
3.6	25.5	6.1	66.0	8.7	106.5
3.6	26.2	6.2	66.7	8.8	107.3
3.6	27.0	6.2	67.5	8.8	108.0
3.7	27.7	6.3	68.2	8.9	108.8
3.7	28.5	6.3	69.0	8.9	109.5
3.8	29.2	6.4	69.7	9.0	110.3
3.8	30.0	6.4	70.5	9.0	111.0
3.9	30.7	6.5	71.2	9.1	111.8
3.9	31.5	6.5	72.0	9.1	112.5
4.0	32.2	6.6	72.7	9.2	113.3
4.0	33.0	6.6	73.5	9.2	114.0
4.1	33.7	6.7	74.2	9.3	114.8
4.1	34.5	6.7	75.0	9.3	115.5
4.2	35.2	6.8	75.7	9.4	116.3
4.2	36.0	6.8	76.5	9.4	117.0
4.3	36.7	6.9	77.2	9.5	117.8
4.3	37.5	6.9	78.0	9.5	118.5
4.4	38.2	7.0	78.7	9.6	119.3
4.4	39.0	7.0	79.5	9.6	120.0
4.5	39.7	7.1	80.2		

10. Disposal

This product or parts of it must be disposed of in an environmentally sound way:

1. Use the public or private waste collection service.
2. If this is not possible, contact the nearest Grundfos company or service workshop.

US

Subject to alterations.

U.S.A.

GRUNDFOS Pumps Corporation
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Phone: +1-913-227-3400
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S.A. de C.V.
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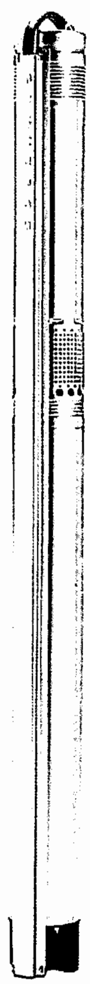
Telefax: +52-81-8144 4010

Addresses revised 22.09.2005

GRUNDFOS **INSTRUCTIONS**

SQ, SQE

(US) Installation and operating instructions



BE > THINK > INNOVATE >

GRUNDFOS

LIMITED WARRANTY

Products manufactured by GRUNDFOS PUMPS CORPORATION (Grundfos) are warranted to the original user only to be free of defects in material and workmanship for a period of 24 months from date of installation, but not more than 30 months from date of manufacture. Grundfos' liability under this warranty shall be limited to repairing or replacing at Grundfos' option, without charge, F.O.B. Grundfos' factory or authorized service station, any product of Grundfos' manufacture. Grundfos will not be liable for any costs of removal, installation, transportation, or any other charges which may arise in connection with a warranty claim. Products which are sold but not manufactured by Grundfos are subject to the warranty provided by the manufacturer of said products and not by Grundfos' warranty. Grundfos will not be liable for damage or wear to products caused by abnormal operating conditions, accident, abuse, misuse, unauthorized alteration or repair, or if the product was not installed in accordance with Grundfos' printed installation and operating instructions.

To obtain service under this warranty, the defective product must be returned to the distributor or dealer of Grundfos' products from which it was purchased together with proof of purchase and installation date, failure date, and supporting installation data. Unless otherwise provided, the distributor or dealer will contact Grundfos or an authorized service station for instructions. Any defective product to be returned to Grundfos or a service station must be sent freight prepaid; documentation supporting the warranty claim and/or a Return Material Authorization must be included if so instructed.

GRUNDFOS WILL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES, LOSSES, OR EXPENSES ARISING FROM INSTALLATION, USE, OR ANY OTHER CAUSES. THERE ARE NO EXPRESS OR IMPLIED WARRANTIES, INCLUDING MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, WHICH EXTEND BEYOND THOSE WARRANTIES DESCRIBED OR REFERRED TO ABOVE.

Some jurisdictions do not allow the exclusion or limitation of incidental or consequential damages and some jurisdictions do not allow limit actions on how long implied warranties may last. Therefore, the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights and you may also have other rights which vary from jurisdiction to jurisdiction.

SQ, SQE

Installation and operating instructions	Page 4	US

US

CONTENTS

⚠ Before beginning installation procedures, these installation and operating instructions should be studied carefully. The installation and operation should also be in accordance with local regulations and accepted codes of good practice.

1. General description

The SQ/SQE is a 3 inch diameter submersible pump mainly designed for the pumping of raw water in domestic water supply. This manual is designed to assist in the proper set-up, installation and operation of these pumps.

1.1 Applications

Typical applications are:

- residential housing
- small waterworks
- pressure boosting
- irrigation systems
- liquid transfer in tanks.

2. Preinstallation

2.1 Well preparation

If the pump is to be installed in a new well, the well should be fully developed and bailed or blown free of cuttings and sand.

The construction of the Grundfos SQ/SQE submersibles makes them resistant to abrasion; however, no pump made of any material can forever withstand the destructive wear that occurs when constantly pumping sandy water.

If this pump is used to replace an oil-filled submersible or oil-lubricated line-shaft turbine in an existing well, the well must be blown or bailed clear of oil.

2.2 Make sure you have the right pump

Determine the maximum depth of the well and the drawdown level at the maximum pump capacity. Pump selection and setting depth should be made based on this data.

2.3 Pumped liquid requirements

Submersible well pumps are designed for pumping clear, cold water; free of air or gases. Decreased pump performance and life expectancy can occur if the water is not clear, cold or contains air or gases.

The water temperature should not exceed 104°F.

A check should be made to ensure that the installation depth of the pump will always be at least three feet below the maximum drawdown level of the well. The bottom of the motor should never be installed lower than the top of the well screen or within five feet of the well bottom.

2.4 Motor cooling requirements

To ensure proper motor cooling, refer to the table below for minimum flow requirements:

Flow velocity past the motor	Maximum liquid temperature
0.0 f/s (free convection)	86°F (30°C)
Min. 0.5 f/s	104°F (40°C)

If the pump is to be installed horizontally, e.g. in a tank, and there is a risk that the pump might be covered by mud, it must be installed in a flow sleeve.

2.5 Liquid temperatures/cooling

Figure 1 shows an SQ/SQE pump installed in a well.

With the pump operating, figure 1 illustrates the following:

- Well diameter
- Pump diameter
- Temperature of pumped liquid
- Flow past the motor to the pump suction strainer.

Note: The well diameter must be at least 3 inches. If there is a risk that the motor will be covered with sediment, it is recommended the pump be placed in a flow sleeve. The motor should always be installed above the well screen.

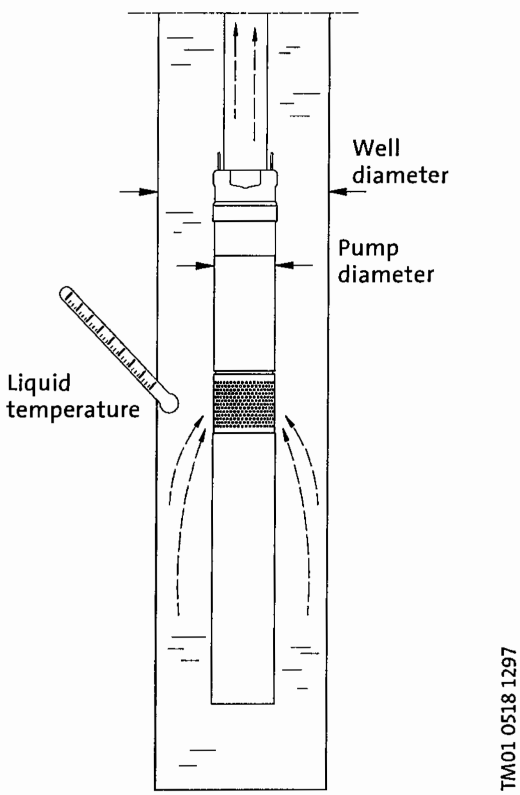


Fig. 1 Pump installed in well

2.6 Motor preparation

Grundfos MS 3 and MSE 3 submersible motors have water-lubricated slide bearings. No additional lubrication is required.

The submersible motors are factory-filled with a special Grundfos motor liquid, type SML 2, which will protect the motor liquid down to 4°F (–20°C) and prevent the growth of bacteria. The level of motor liquid is important for the operating life of the bearings and consequently the life of the motor.

2.7 Refilling of motor liquid

If for any reason the motor liquid has been drained or lost, the motor must be refilled with Grundfos motor liquid SML 2.

To refill the motor, proceed as follows:

1. Remove the cable guard and separate the pump end from the motor.
2. Place the motor in vertical position with an inclination of approximately 10°.
3. Remove the filling plug using a screwdriver or a similar tool.
4. Inject motor liquid into the motor with a filling syringe or similar tool, see fig. 2.
5. To allow possible air to escape, move the motor from side to side and turn the shaft.
6. Replace the filling plug and make sure it is tight.
7. Assemble pump end and motor.
8. Fit the cable guard.

The pump is now ready for installation.

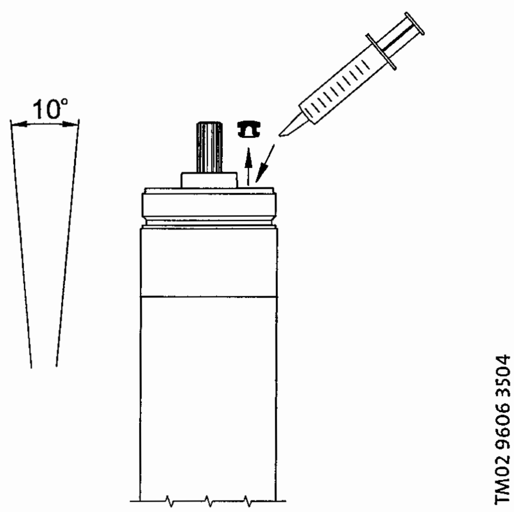


Fig. 2 Injecting motor liquid

3. Installation positions

3.1 Positional requirements

The pump is suitable for vertical as well as horizontal installation, however, the pump shaft must never fall below the horizontal plane, see fig. 3.

If the pump is to be installed horizontally, e.g. in a tank, and there is a risk that the pump might be covered by mud, it must be installed in a flow sleeve.

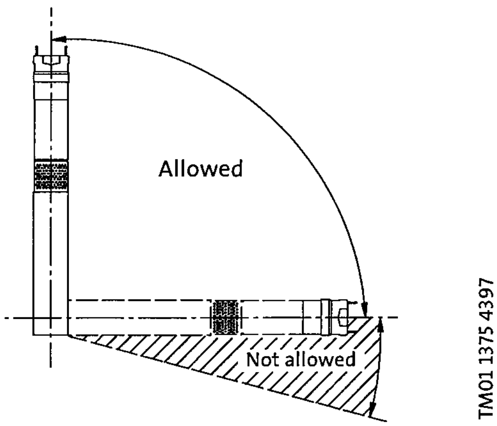


Fig. 3 Pump position

4. Electrical connection

4.1 General

The electrical connection should be carried out by an authorized electrician in accordance with local regulations.

⚠ Before starting work on the pump, make sure that the electricity supply has been switched off and that it cannot be accidentally switched on.

The pump must be grounded.

The pump must be connected to an external mains switch.

The supply voltage, rated maximum current and power factor (PF) appear on the motor nameplate.

The required voltage for Grundfos submersible MS 3/MSE 3 motors, measured at the motor terminals, is –10%/+6% of the nominal voltage during continuous operation (including variation in the supply voltage and losses in cables).

If the pump is connected to an installation where a Ground Fault circuit breaker (GFI) is used as additional protection, this circuit breaker must trip out when ground fault currents with DC content (pulsating DC) occur.

Note: The pump must never be connected to a capacitor or to another type of control box than CU 300 or CU 301.

Note: The pump must never be connected to an external frequency converter.

Supply voltage:

1 x 90-120 V or 1 x 200-240 V –10%/+6%, 50/60 Hz.

The current consumption can only be measured accurately by means of a true RMS instrument. If other instruments are used, the value measured will differ from the actual value.

The SQE pumps can be connected to a CU 300 or CU 301 control box.

4.2 Motor protection

The motor has built-in automatic thermal overload protection and requires no additional motor protection.

4.3 Connection of motor

The motor can be connected directly to the main circuit breaker.

Start/stop of the pump will typically be done via a pressure switch, see fig. 4.

Note: The pressure switch must be rated for the maximum amps of the specific pump.

⚠ Reduced risk of electric shock during operation of this pump requires the provision of acceptable grounding. If the means of connection to the supply connected box is other than grounded metal conduit, ground the pump back to the service by connecting a copper conductor, at least the size of the circuit supplying the pump.

Single-phase 2-wire wiring diagram for Grundfos motors

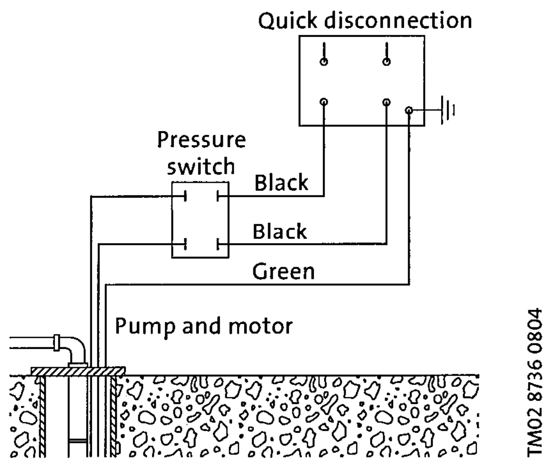


Fig. 4 Wiring diagram

Note: The pump must never be connected to a capacitor or to another type of control box than CU 300 or CU 301.

5. Cable sizing

Single-phase 60 Hz maximum cable length motor service to entrance:

Motor rating		Copper wire size								
Volts	hp	14	12	10	8	6	4	2	0	00
115	0.5	65	100	160	260	410	660	1050	1680	
230	0.5	300	480	760	1210	1930	3060	4870		
230	0.75	190	300	470	750	1190	1890	3010	4800	
230	1.0	140	220	350	560	890	1420	2260	3600	4540
230	1.5	130	210	330	520	830	1320	2110	3360	4230

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6. Splicing the cable

Splice the drop cable with the motor cable. If the splice is carefully made, it will be as efficient as any other portion of the cable and will be completely watertight.

There are a number of cable splicing kits available today - epoxy-filled, rubber-sealed, etc. Many perform well if the manufacturer's directions are followed carefully. If one of these kits is not used, we recommend the following method for splicing the motor cable to the drop cable:

1. Examine the motor cable and the drop cable carefully for damage.
2. Cut the motor leads off in a staggered manner.
3. Cut the ends of the drop cable so that the ends match up with the motor leads.
   Be sure to match the colors.
4. Strip back and strip off one inch of insulation from each lead, making sure to scrape the wire bare to obtain a good connection.
   Be careful not to damage the copper conductor when stripping off the insulation.
5. Insert a properly sized Sta-Kon™-type connector on each pair of leads, again making sure that colors are matched.
   Using Sta-Kon™ crimping pliers, indent the lugs. Be sure to squeeze down hard on the pliers, particularly when using large cable.
6. Form a piece of electrical putty tightly around each Sta-Kon™. The putty should overlap on the insulation of the wire.
7. Use a good quality tape such as #33 Scotch Waterproof or Plymouth Rubber Company Slipknot Grey. **Wrap each wire and joint tightly for a distance of about 2½ inches on each side of the joint.**
   Make a minimum of four passes over each joint and overlap each pass approximately one inch to ensure a completely watertight seal.

Note: Do not lower or lift the pump using the motor cable.

7. Fitting the cable plug to the motor

The cable plug supplied with the motor is factory-greased. Check that the plug is greased correctly, see fig. 5.

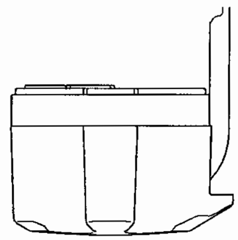

Fig. 5 Greasing of plug

To fit the cable plug, proceed as follows:

1. Check that the cable is of the correct type, cross-section and length.
2. Check that the mains on the location has correct connection to ground.
3. Check that the motor socket is clean and dry.
4. Press the cable plug onto the motor socket.
   The plug will only fit one way, see fig. 6.
5. Fit and tighten the four screws, see fig. 6.
   When the plug has been fitted, there must not be a clearance between the motor and the cable plug.

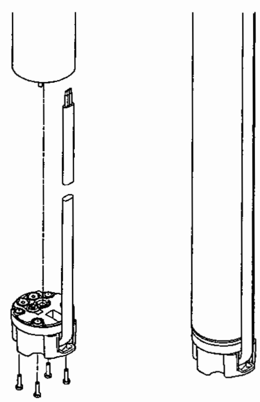

Fig. 6 Fitting the cable plug

8. Fitting the cable guard

To fit the cable guard, proceed as follows:

1. Make sure that the motor lead lies flat in the cable guard.
2. Place the cable guard in the groove in the cable plug. The two flaps must engage with the upper edge of the pump sleeve, see fig. 7.

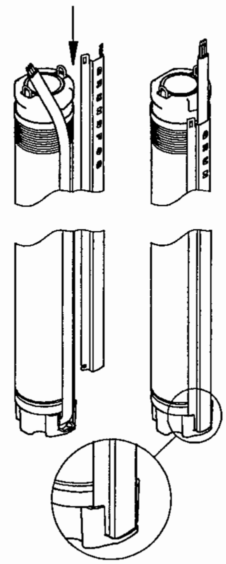

Fig. 7 Placing the cable guard

3. Fasten the cable guard to the pump suction strainer with the two self-tapping screws supplied, see fig. 8.

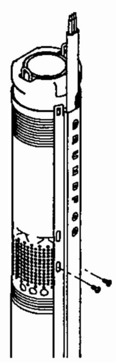

Fig. 8 Fitting the cable guard to the pump suction strainer

9. Piping

- The pump should only be gripped by the two flats at the top of the pump, see fig. 9.
- The pump can be installed vertically or horizontally. During operation, the pump must always be completely submerged in water.
- When plastic pipe is used, a stainless steel safety wire is recommended for lowering and lifting the pump. Fasten the wire to the eyelet on the pump, see fig. 10.
- The threaded joints must be well cut and fit together tightly to ensure that they do not work loose.

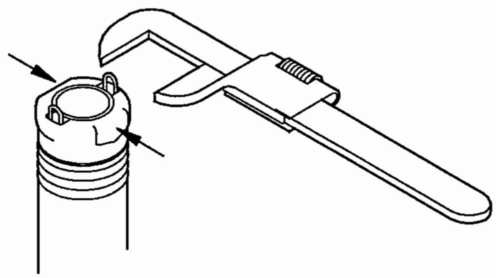

Fig. 9 Gripping the pump

10. Installing the pump

10.1 Installation depth

The dynamic water level should always be above the pump, see fig. 10.

A = Dynamic water level

B = Static water level

C = Minimum 3 inch well diameter

D = Drawdown

E = Installation depth below static water level. Maximum 500 feet.

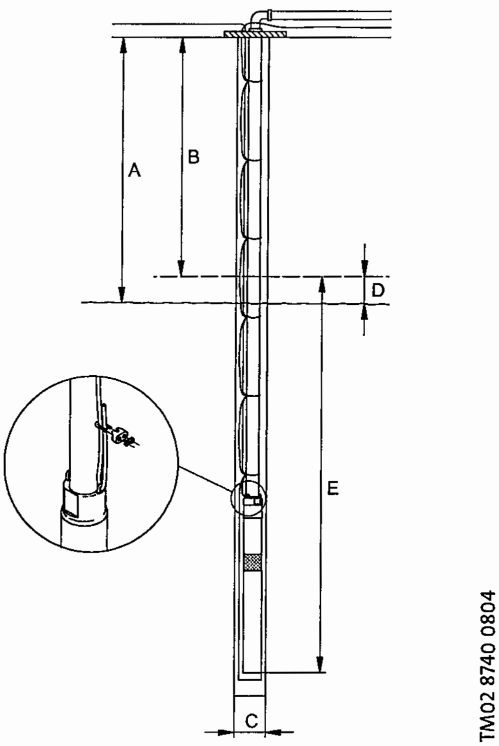

Fig. 10 Installation depth

Procedure:

To install the pump, proceed as follows:

1. Attach the enclosed data plate sticker at the well head.
2. Check the well for proper clearance. The well must be at least 3 inches in diameter. It is a good idea to check the well for clearance using a plumb ring (2.95 ø x 10 in.).
3. Attach the first section of riser pipe to the pump.
4. Lower the pump into the well. Make sure the motor cable is not damaged when the pump is lifted or lowered into the well, especially in 3 inch wells. **Note:** Do not lower or lift the pump using the motor cable.
5. When the pump has been installed to the required depth, the installation should be finished by means of a well seal.
   Note that the dynamic water level should always be above the pump.
6. Loosen the safety wire so that it becomes unloaded and lock it to the well seal using a cable clamp.
7. Complete the electrical connections.

US

Note: The pump must never be connected to a capacitor or to another type of control box than CU 300 or CU 301.

Installation depths:

Maximum installation depth:
500 feet below the static water level.

Minimum installation depth:
1.75 feet below the dynamic water level.

Vertical installation:

During start-up and operation, the pump must always be completely submerged in water.

Horizontal installation:

The pump must be installed at least 1.75 feet below the dynamic water level.

If there is a risk that the pump might be covered by mud, the pump must always be placed in a flow sleeve.

Note: Do not lower or lift the pump using the motor cable.

11. Generator operation

It is safe to operate the SQ/SQE with a generator.

The generator must be sized 50% above the P1 (input power) values of the pump. See the following table.

Motor [hp]	Min. generator size [W]	Recommended generator output [W]
0.5	1200	1500
0.75	1900	2500
1.0	2600	3200
1.5	2800	3500

US

12. Starting the pump for the first time

When the pump has been connected correctly, the pump should be started with the discharge valve closed approximately one third.

Due to the soft start feature, the pump takes approximately 2 seconds to develop full pressure.

12.1 Motor cooling and other considerations

- Make sure the well is capable of yielding a minimum quantity of water corresponding to the pump capacity.
- Do not start the pump until it is completely submerged in the liquid.
- As the valve is being opened, the drawdown should be checked to ensure that the pump always remains submerged.
- To ensure the necessary cooling of the motor, the pump should never be set so low that it gives no water.
  If the flow rate suddenly falls, the reason might be that the pump is pumping more water than the well can yield. The pump must immediately be stopped and the fault corrected.

12.2 Impurities in the water

If there are impurities in the water, the valve should be opened gradually as the water becomes clearer. The pump should not be stopped until the water is clean, otherwise the pump parts and the check valve may become clogged.

When the water is clean, the valve should be fully opened.

12.3 Minimum flow rate

To ensure the necessary cooling of the motor, the pump flow rate should never be set to a value lower than 0.2 gpm.
If the flow rate suddenly falls, the reason might be that the pump is pumping more water than the well can yield. The pump must immediately be stopped and the fault corrected.

Note: The pump's dry-running protection is effective only within the recommended duty range of the pump.

Note: Do not let the pump run against a closed discharge valve for more than 5 minutes. When the discharge valve is closed, there is no cooling flow and there is a risk of overheating in motor and pump.

12.4 Built-in protection

The motor incorporates an electronic unit which protects the motor in various situations.

- In case of overload, the built-in overload protection will stop the pump for 5 minutes. After that period, the pump will attempt to restart.
- If the pump has been stopped as a result of dry running, it will start automatically after 5 minutes.
- If the pump is restarted and the well has not recovered, the pump will stop after 30 seconds.

12.5 Resetting the pump

Switch off the electricity supply for 1 minute.

The motor is protected against the following conditions:

- dry running
- voltage surges (up to 6000 V)
  In areas with high lightning intensity, external lightning protection is required.
- overvoltage
- undervoltage
- overload
- overtemperature.

12.6 MS 3 motors

Note: All MS 3 motors are factory-set to detect dry-running conditions.

Check that the combination of pump and motor corresponds to the data on page 39.

12.7 MSE 3 motors

Note: All MSE 3 motors are factory-set to detect dry-running conditions. However, if the maximum pump speed setting is changed, the dry running stop value must also be changed. Please refer to either the CU 301 or CU 300 I&O for instructions on this procedure.

12.8 Maintenance and service

The pumps are normally maintenance-free.

Deposits and wear may occur. For that purpose, service kits and service tools are available from Grundfos.
The Grundfos Service Manual is available on request.

The pumps can be serviced at a Grundfos service center.

13. Assembly of pump and motor

To assemble pump end and motor, proceed as follows:

1. Place the motor horizontally in a vice and tighten it, see fig. 12.
2. Pull the pump shaft out to the position shown in fig. 11.

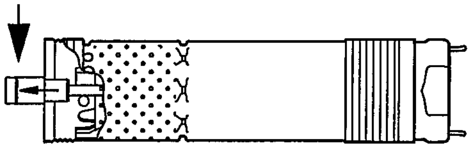

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Fig. 11 Pump shaft position

3. Grease the motor shaft end with the grease supplied with the motor.
4. Screw the pump end on the motor (55 Nm).
   Note: The pump shaft must engage with the motor shaft.
   A spanner may be used on the clamping faces of the pump end, see fig. 12.
5. Fit the cable guard as described in section *8*.

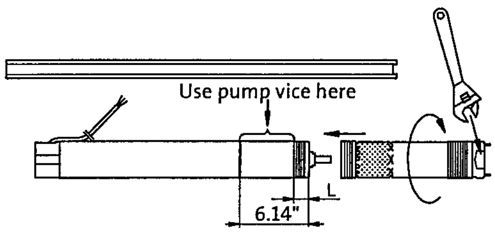

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Fig. 12 Pump in vice

0.5 hp: L = 4.7".
0.75 hp: L = 4.0".
1.0 hp: L = 2.6".
1.5 hp: L = 2.6".

When pump end and motor have been assembled correctly, there must be no clearance between pump end and motor.

To disassemble, reverse procedure.

US

14. Troubleshooting

Fault	Cause	Remedy
1. The pump does not run.	a) The fuses are blown.	Replace the blown fuses. If the new fuses blow too, check the electrical installation and the drop cable.
	b) The GFI circuit breaker has tripped.	Reset the circuit breaker.
	c) No electricity supply.	Contact the electricity provider.
	d) The motor protection has cut off the electricity supply due to overload.	Check for motor/pump blockage.
	e) The drop cable is defective.	Repair or replace the pump/cable.
	f) Overvoltage has occurred.	Check the electricity supply.
2. The pump runs but gives no water.	a) The discharge valve is closed.	Open the valve.
	b) No water or too low water level in well.	Increase the installation depth of the pump, throttle the pump or replace it with a smaller capacity model.
	c) The check valve is stuck in its closed position.	Pull the pump and clean or replace the valve.
	d) The suction strainer is closed.	Pull the pump and clean the strainer.
	e) The pump is defective.	Repair or replace the pump.
3. The pump runs at reduced capacity.	a) The drawdown is larger than anticipated.	Increase the installation depth of the pump, throttle the pump or replace it with a smaller capacity model.
	b) The valves in the discharge pipe are partly closed/blocked.	Check and clean or replace the valves as necessary.
	c) The discharge pipe is partly choked by impurities (iron bacteria).	Clean or replace the discharge pipe.
	d) The check valve of the pump is blocked.	Pull the pump and clean or replace the valve.
	e) The pump and the riser pipe are partly choked by impurities (iron bacteria).	Pull the pump. Check and clean or replace the pump, if necessary. Clean the pipes.
	f) The pump is defective.	Repair or replace the pump.
	g) Hole in discharge pipe.	Check and repair the piping.
	h) The riser pipe is defective.	Replace the riser pipe.
	i) Undervoltage has occurred.	Check the electricity supply.
4. Frequent starts and stops.	a) The differential of the pressure switch between the start and stop pressures is too small.	Increase the differential. However, the stop pressure must not exceed the operating pressure of the pressure tank and the start pressure should be high enough to ensure sufficient water supply.
	b) The water level electrodes or level switches in the reservoir have not been installed correctly.	Adjust the intervals of the electrodes/level switches to ensure suitable time between the cutting-in and cutting-out of the pump. See installation and operating instructions for the automatic devices used. If the intervals between start/stop cannot be changed via the automatics, the pump capacity may be reduced by throttling the discharge valve.
	c) The check valve is leaking or stuck half-open.	Pull the pump and clean or replace the check valve.
	d) The supply voltage is unstable.	Check the electricity supply.
	e) The motor temperature is too high.	Check the water temperature.

14.1 Instruments not allowed

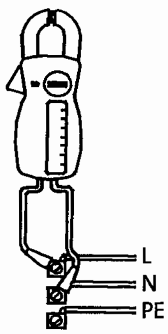
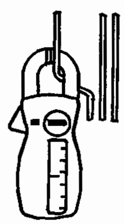
Note: The use of the following instruments is not allowed during troubleshooting.

TM01 2072 1098

Fig. 13 Instruments not allowed

Note: When measuring, use RMS instruments.

15. Checking of motor and cable

1. Supply voltage  TM00 1371 5092	Measure the voltage L1 (RMS) between phase and L2. Connect the voltmeter to the terminals at the connections.	The voltage should, when the motor is loaded, be within the range specified in section *4. Electrical connection*. Large variations in supply voltage indicate poor electricity supply, and the pump should be stopped until the problem has been corrected.
2. Current consumption  TM00 1372 5082	Measure the current (RMS) while the pump is operating at a constant discharge head (if possible, at the capacity where the motor is most heavily loaded). For maximum current, see motor nameplate.	If the current exceeds the full-load current, there are the following possible faults: • Poor connection in the leads, possibly in the cable joint. • Too low supply voltage, see item 1.

16. Environment

During handling, operation, storage and transport, all environment regulations dealing with the handling of hazardous materials must be observed.

When the pump is taken out of operation, it must be ensured that no hazardous material is left in the pump and in the riser pipe, which can be injurious to persons and the environment.

17. Disposal

Disposal of this product or parts of it must be carried out according to the following guidelines:

1. Use the local public or private waste collection service.
2. If such waste collection service does not exist or cannot handle the materials used in the product, please deliver the product or any hazardous materials from it to your nearest Grundfos company or service center.

18. Technical data

US

Supply voltage

1 x 90-120 V –10%/+6%, 50/60 Hz, PE.
1 x 200-240 V –10%/+6%, 50/60 Hz, PE.

Operation via generator

Recommended generator output must be equal to P1 [kW] + 50% and minimum P1 + 10%.

Starting current

The motor starting current is equal to the highest value stated on the motor nameplate.

Starting

Soft starting.

Run-up time

Maximum 2 seconds.

Motor protection

The motor is protected against dry running, overvoltage, undervoltage, overload and overtemperature.

Power factor

PF = 1.

Service factor

0.5 hp: 1.85 at 115 V/230 V.
0.75 hp: 2.05 at 230 V.
1.0 hp: 2.25 at 230 V.
1.5 hp: 1.65 at 230 V.

Motor cable

3 Wire, 14 AWG XLPE.
Length: 5 feet.

Motor liquid

Type SML 2.

pH values

5 to 9.

Liquid temperature

The temperature of the pumped liquid must not exceed 104°F.

Note: If liquids with a viscosity higher than that of water are to be pumped, please contact Grundfos.

Discharge port

5 SQ/SQE: 1" NPT.
10-15 SQ/SQE: 1¼" NPT.
22-30 SQ/SQE: 1½" NPT.

Storage conditions

Minimum ambient temperature: 4°F.
Maximum ambient temperature: 140°F.

Freeze protection

Note: The motor must not be stored without being filled with motor liquid.

If the pump has to be stored after use, it must be stored on a frost-free location or it must be ensured that the motor liquid is frost-proof.

Operating conditions

Minimum ambient liquid temperature: 32°F.
Maximum ambient liquid temperature: 104°F.

Motor dimensions (MS 3 and MSE 3)

0.5 hp: 20.9" length x 2.68" diameter.
0.75 hp: 20.9" length x 2.68" diameter.
1.0 hp: 22.3" length x 2.68" diameter.
1.5 hp: 22.3" length x 2.68" diameter.

Motor weights (MS 3 and MSE 3)

0.5 hp: 6.0 lbs.
0.75 hp: 7.1 lbs.
1.0 hp: 8.2 lbs.
1.5 hp: 8.2 lbs.

Pump end dimensions

Pump diameter: 2.68".
Pump diameter, incl. cable guard: 2.91".

Pump end dimensions (min. and max.)

5 SQ/SQE: 10.6" to 18.0".
10 SQ/SQE: 10.6" to 14.8".
15 SQ/SQE: 10.6" to 16.9".
22 SQ/SQE: 10.6" to 16.9".
30 SQ/SQE: 10.6" to 13.7".

Pump end weights (min. and max.)

All SQ/SQE models: 2.2 lbs to 3.5 lbs.

Well diameter

Minimum 3".

Installation depth

Maximum 500 feet below static water level.

Subject to alterations.

Pump models

Pump type	Power P_2 [hp]	Voltage [V]	Flow range [gpm]	Min. well dia.	Disch.
5SQ/SQE-90	0.5	230/115	1.5-7.5	3"	1" NPT
5SQ/SQE-140	0.5	230/115	1.5-7.5	3"	1" NPT
5SQ/SQE-180	0.5	230/115	1.5-7.5	3"	1" NPT
5SQ/SQE-230	0.75	230	1.5-7.5	3"	1" NPT
5SQ/SQE-270	0.75	230	1.5-7.5	3"	1" NPT
5SQ/SQE-320	0.75	230	1.5-7.5	3"	1" NPT
5SQ/SQE-360	1.0	230	1.5-7.5	3"	1" NPT
5SQ/SQE-410	1.0	230	1.5-7.5	3"	1" NPT
5SQ/SQE-450	1.5	230	1.5-7.5	3"	1" NPT
10SQ/SQE-110	0.5	230/115	3-15	3"	1¼" NPT
10SQ/SQE-160	0.5	230/115	3-15	3"	1¼" NPT
10SQ/SQE-200	0.75	230	3-15	3"	1¼" NPT
10SQ/SQE-240	0.75	230	3-15	3"	1¼" NPT
10SQ/SQE-290	1.0	230	3-15	3"	1¼" NPT
10SQ/SQE-330	1.5	230	3-15	3"	1¼" NPT
15SQ/SQE-70	0.5	230/115	4-20	3"	1¼" NPT
15SQ/SQE-110	0.5	230/115	4-20	3"	1¼" NPT
15SQ/SQE-150	0.75	230	4-20	3"	1¼" NPT
15SQ/SQE-180	0.75	230	4-20	3"	1¼" NPT
15SQ/SQE-220	1.0	230	4-20	3"	1¼" NPT
15SQ/SQE-250	1.0	230	4-20	3"	1¼" NPT
15SQ/SQE-290	1.5	230	4-20	3"	1¼" NPT
22SQ/SQE-40	0.5	230/115	7-33	3"	1½" NPT
22SQ/SQE-80	0.5	230/115	7-33	3"	1½" NPT
22SQ/SQE-120	0.75	230	7-33	3"	1½" NPT
22SQ/SQE-160	1.0	230	7-33	3"	1½" NPT
22SQ/SQE-190	1.0	230	7-33	3"	1½" NPT
22SQ/SQE-220	1.5	230	7-33	3"	1½" NPT
30SQ/SQE-40	0.5	230/115	8-42	3"	1½" NPT
30SQ/SQE-90	0.75	230	8-42	3"	1½" NPT
30SQ/SQE-130	1.0	230	8-42	3"	1½" NPT

Accessories

Product	Part number
CU 300	96422776
CU 301	96436754
Flow sleeve	96037505
Grease	96037562
Flow switch	96022967
Pressure transmitter	96026030

U.S.A.

GRUNDFOS Pumps Corporation
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Olathe, Kansas 66061
Phone: +1-913-227-3400
Telefax: +1-913-227-3500

Canada

GRUNDFOS Canada Inc.
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Boulevard TLC No. 15
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Mexico
Phone: +52-81-8144 4000
Telefax: +52-81-8144 4010

Addresses revised 18.04.2002

February 24, 2012

Mr. Jim Griswold
New Mexico Oil Conservation Division
Environmental Bureau
1220 South St. Francis Drive
Santa Fe, NM 87505-4225

Re: Salty Dog Brine Station - Third Quarterly Groundwater Monitoring Report

Dear Mr. Griswold:

On behalf of PAB Services, Inc., Daniel B. Stephens & Associates, Inc. (DBS&A) is pleased to submit the enclosed groundwater monitoring report for the Salty Dog brine station located in Lea County, New Mexico. The report documents third quarter groundwater monitoring activities completed at the site on February 8 and 9, 2012.

Please do not hesitate to call me at (505) 353-9130 if you have any questions or require additional information.

Sincerely,

DANIEL B. STEPHENS & ASSOCIATES, INC.

Michael D. McVey
Senior Hydrogeologist

Enclosures

cc: Pieter Bergstein, PAB Services, Inc.

Quarterly Groundwater Monitoring Report
Salty Dog Brine Station
Lea County, New Mexico

Prepared for **New Mexico Energy, Minerals and Natural Resources Department**
Oil Conservation Division, Environmental Bureau

February 24, 2012

Daniel B. Stephens & Associates, Inc.

6020 Academy NE, Suite 100 • Albuquerque, New Mexico 87109

QUARTERLY GROUNDWATER MONITORING REPORT SALTY DOG BRINE STATION LEA COUNTY, NEW MEXICO

1. INTRODUCTION

Daniel B. Stephens & Associates, Inc. (DBS&A) has prepared this third quarterly groundwater monitoring report for submission to the New Mexico Energy, Minerals and Natural Resources Department Oil Conservation Division (OCD) Environmental Bureau on behalf of PAB Services, Inc. (PAB) for the Salty Dog brine station located in Lea County, New Mexico (Figure 1). This report summarizes groundwater monitoring activities conducted at the site on February 8 and 9, 2012.

The Salty Dog brine station site is comprised of a northern portion where the former brine pond was located and a southern portion where the brine well is located (Figure 1). The former brine pond area and the brine well area are separated by approximately 2,500 feet, joined by a dirt road. Five monitor wells, one nested well, and one recovery well are located in the former brine pond area. Nine monitor wells, one nested well, and one recovery well are located in the brine well area.

Since the brine pond was closed in October 2008, a number of frac tanks have been stationed in the northern portion of the site to serve as storage for brine that is produced for resale. A concrete truck loading pad is located near the frac tanks. The brine well is currently not operational and attempts are being made to redrill the well and restore brine production at the site.

2. SCOPE OF WORK

The scope of work for quarterly groundwater monitoring consisted of measuring fluid levels in and collecting groundwater samples from ten monitor wells for laboratory analysis. The ten monitor wells included in the quarterly sampling were selected in consultation with the OCD project manager, Jim Griswold, on October 4, 2010. Groundwater samples were submitted to Hall Environmental Analysis Laboratory (HEAL) in Albuquerque, New Mexico for chloride analysis using U.S. Environmental Protection Agency (EPA) Test Method 300.0.

3. MONITORING ACTIVITIES

On February 8, 2012, DBS&A measured fluid levels in monitor wells DBS-2 through DBS-5 and PMW-1 in the former brine pond area, and DBS-6, DBS-8, DBS-9, MW-3, and MW-5 in the brine well area using a properly decontaminated electronic water level meter. Fluid levels were not measured in monitor well DBS-1 because the well has been destroyed. Table 1 provides a summary of the fluid level measurements. The average depth to water beneath the former brine pond area during this monitoring event was 64.80 feet below ground surface (ft bgs), increasing approximately 0.03 foot since the last monitoring event in October 2011. Water levels in wells DBS-2, -4, and -5 decreased from 0.05 to 0.09 foot, while water levels in wells DBS-3 and PMW-1 increased from 0.14 to 0.26 foot. The average depth to water beneath the brine well area was 62.29 ft bgs, increasing 0.09 foot since October 2011. Water levels in wells DBS-6, -8, and MW-3 decreased from 0.04 to 0.06 foot, while water levels in well MW-5 increased 0.49 foot.

Potentiometric surface maps were prepared for the former brine pond and brine well areas and are included as Figures 2 and 3. Groundwater beneath both areas continues to flow to the southeast at an average gradient of approximately 0.004 foot per foot (ft/ft).

Groundwater samples were collected from monitor wells DBS-2 through DBS-6, PMW-1, DBS-8, DBS-9, MW-3, and MW-5 on February 9, 2012. A sample was not collected from DBS-1 because the well has been destroyed. DBS&A followed corporate standard operating procedures developed from EPA guidance during collection of all groundwater samples. Prior to sampling, the well was purged of a minimum of three casing volumes using a submersible pump to ensure that a representative sample of groundwater was collected. During purging, the DBS&A field technician measured water quality parameters including temperature, specific conductance, and pH to ensure that these parameters were stabilized to within 10 percent for specific conductance, 2 degrees for temperature and +/- 0.2 pH units prior to sampling. Sample containers were then filled, labeled, and placed on ice once the stabilization criteria were met. Groundwater samples were submitted under full chain-of-custody to HEAL for chloride analysis.

4. ANALYTICAL RESULTS

Table 2 summarizes chloride analytical results for the ten groundwater samples collected on February 9, 2012. Figures 4 and 5 show the distribution of chloride in groundwater beneath the former brine pond and brine well areas for the sampling event. Complete laboratory reports and chain-of-custody documentation are provided in Appendix 1. Field notes recorded during groundwater monitoring activities are included in Appendix 2.

Since the last monitoring event in October 2011, monitor wells DBS-2 and MW-3 showed increases in chloride concentration from 18 to 22 mg/L and 14,000 to 15,000 mg/L, respectively. Monitor wells DBS-6 (400 to 380 mg/L), DBS-8 (140 to 41 mg/L), and DBS-9 (440 to 290 mg/L) showed decreases in chloride concentrations. Monitor wells DBS-3 (34 mg/L), DBS-4 (32 mg/L), DBS-5 (140 mg/L), PMW-1 (12,000 mg/L), and MW-5 (1,500 mg/L) showed no change in chloride concentration. Currently, five of the ten wells sampled contain concentrations of chloride in excess of the NMWQCC standard of 250 mg/L (Table 2). Monitor well DBS-1 contained chloride concentrations in excess of the standard during the April 2009 and May 2011 sampling events prior to being destroyed sometime between the May 2011 and October 2011 sampling events.

The chloride groundwater plume in the former brine pond area remains bounded by the existing monitor well network. Monitor well PMW-1 (12,000 mg/L), located downgradient of the former brine pond, continues to show a chloride concentration in excess of the NMWQCC standard (Figure 4). The chloride concentration in the farthest downgradient well, DBS-4, remains below the standard.

The downgradient and northern, cross-gradient extent of the chloride groundwater plume in the brine well area remains undefined. The farthest downgradient well, MW-5, and the northern-most cross-gradient well, DBS-6, continue to contain chloride concentrations in excess of the NMWQCC standard (Figure 5).

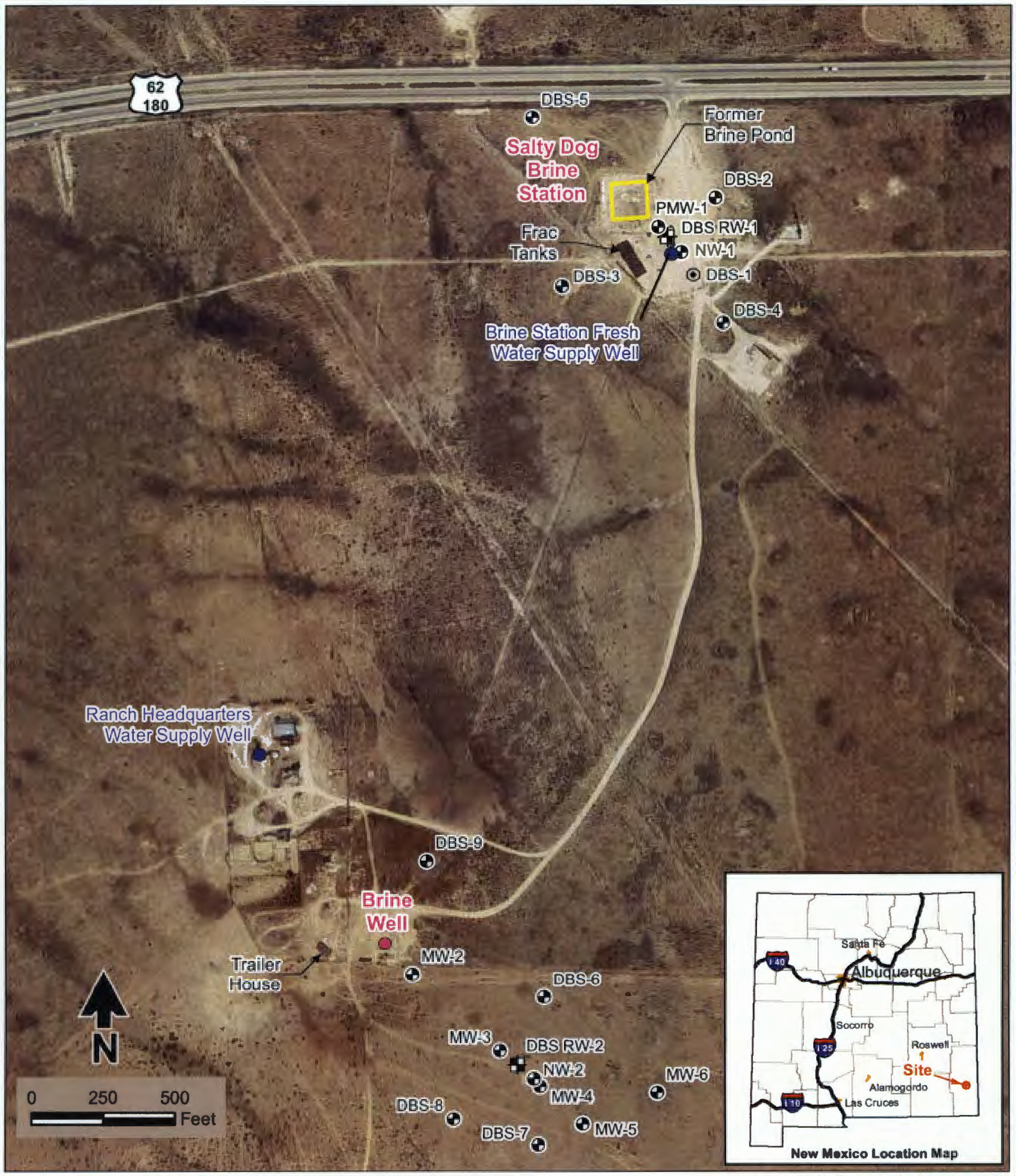
The chloride concentration in monitor well DBS-9 continues to show a decreasing trend (600 mg/L in May 2011 to 440 mg/L in October 2011 to 290 mg/L in February 2012), but still exceeds the NMWQCC standard. DBS-9 was installed in the playa located north of the brine well to determine if documented releases that entered the playa in 2002 and 2005 impacted groundwater (Figure 5).

5. RECOMMENDATIONS

Based on the current groundwater monitoring results and trends in chloride concentrations, DBS&A recommends the following:

- Continue quarterly groundwater sampling to monitor chloride contaminant concentration trends in site wells.
- Redrill and install a replacement monitor well for DBS-1, which was destroyed by a backhoe sometime between May and October 2011.
- Begin active remediation of the chloride groundwater plumes at the former brine pond and brine well areas to control plume migration and reduce chloride concentrations in groundwater to less than the 250 mg/L NMWQCC standard.

Figures



Source: National Agriculture Imagery Program (NAIP), dated May 13, 2009

Explanation

- Water supply well
- Monitor well
- Recovery well
- Well destroyed

Path: S:\Projects\ES08.0118.01_Salty_Dog_Inc\GIS\MXDs\Site_location_map.mxd

Daniel B. Stephens & Associates, Inc.
10/13/2011
JN ES08.0118.01

SALTY DOG BRINE STATION
Site Location Map

Figure 1

Path: S:\Projects\ES08.0118.01_Salty_Dog_Inc\GIS\MXDs\Fluid_levels\GWE_20120208_brine_station.mxd

Explanation

DBS-2 Well designation

3754.54 Groundwater elevation, ft msl

● Groundwater elevation (ft msl)

— Potentiometric surface elevation contour (ft msl)

Source: National Agriculture Imagery Program (NAIP), dated May 13, 2009

SALTY DOG BRINE STATION

Former Brine Pond Area
Potentiometric Surface Elevations
February 8, 2012

Daniel B. Stephens & Associates, Inc.
10/13/2011 JN ES08.0118.01

Figure 2

Path: S:\Projects\ES08.0118.01_Salty_Dog_Inc\GIS\MXDs\Fluid_levels\GWE_20120208_brine_well.mxd

Explanation

MW-5 Well designation

3747.73 Groundwater elevation, ft msl

● Groundwater elevation (ft msl)

— Potentiometric surface elevation contour (ft msl)

Source: National Agriculture Imagery Program (NAIP), dated May 13, 2009

SALTY DOG BRINE STATION

Playa Lake and Brine Well Area
Potentiometric Surface Elevations
February 8, 2012

Daniel B. Stephens & Associates, Inc.
10/12/2011 JN ES08.0118.01

Figure 3

Explanation

DBS-5	Well designation
140	Chloride concentration (mg/L)
⊕	Monitor well location

BOLD indicates concentration equal to or greater than the NMWQCC standard.
NS = Not sampled

Source: National Agriculture Imagery Program (NAIP), dated May 13, 2009

SALTY DOG BRINE STATION

Former Brine Pond Area
Chloride Concentrations in Groundwater
February 9, 2012

Daniel B. Stephens & Associates, Inc.
02/22/2012
JN ES08.0118.01

Figure 4

Path: S:\Projects\ES08.0118.01_Salty_Dog_Inc\GIS\MXDs\Analytical_results\cl_gw_20120209_brine_station.mxd

Explanation

MW-5 Well designation
1,500 Chloride concentration (mg/L)

Monitor well location

BOLD indicates concentration equal to or greater than the NMWQCC standard.
NS = Not sampled

Source: National Agriculture Imagery Program (NAIP), dated May 13, 2009

SALTY DOG BRINE STATION

Playa Lake and Brine Well Area
Chloride Concentrations in Groundwater
February 9, 2012

Daniel B. Stephens & Associates, Inc.
02/22/2012 JN ES08.0118.01

Figure 5

Path: S:\Projects\ES08.0118.01_Salty_Dog_Inc\GIS\MXDs\Analytical_results\cl_gw_20120209_brine_well.mxd

Tables

Table 1. Summary of Historical Fluid Level Measurements
Salty Dog Brine Station, Lea County, New Mexico

Monitor Well	Screen Interval (ft bgs)	Top of Casing Elevation[a] (ft msl)	Date Measured	Depth to Water (ft btoc)	Groundwater Elevation (ft msl)
DBS-1	56.0-76.0	3817.09	04/08/09	62.38	3754.71
			05/11/11	64.70	3752.39
			10/04/11	Well destroyed	
DBS-2	58.0-78.0	3820.50	04/08/09	65.45	3755.05
			05/11/11	66.80	3753.70
			10/04/11	65.87	3754.63
			02/08/12	65.96	3754.54
DBS-3	56.0-76.72	3816.66	04/08/09	60.67	3755.99
			05/11/11	61.25	3755.41
			10/04/11	61.25	3755.41
			02/08/12	61.11	3755.55
DBS-4	56.0-76.0	3820.37	04/08/09	66.27	3754.10
			05/11/11	67.23	3753.14
			10/04/11	66.67	3753.70
			02/08/12	66.76	3753.61
DBS-5	56.9-76.9	3820.66	04/08/09	62.99	3757.67
			05/11/11	63.45	3757.21
			10/04/11	63.41	3757.25
			02/08/12	63.46	3757.20
DBS-6	56.7-76.7	3812.65	04/07/09	62.75	3749.90
			05/11/11	63.11	3749.54
			10/04/11	63.16	3749.49
			02/08/12	63.20	3749.45
DBS-7	55.1-75.1	3810.21	04/07/09	61.74	3748.47
DBS-8	55.2-75.2	3810.70	04/07/09	61.20	3749.50
			05/11/11	61.67	3749.03
			10/04/11	61.71	3748.99
			02/08/12	61.77	3748.93
DBS-9	48.0-68.0	3806.26	04/08/09	53.93	3752.33

[a] Top of casing elevations surveyed by Pettigrew & Assoc. on May 28, 2009.

ft bgs = Feet below ground surface
ft btoc = Feet below top of casing
ft msl = Feet above mean sea level
NA = Not available

Table 1. Summary of Historical Fluid Level Measurements
Salty Dog Brine Station, Lea County, New Mexico

Monitor Well	Screen Interval (ft bgs)	Top of Casing Elevation[a] (ft msl)	Date Measured	Depth to Water (ft btoc)	Groundwater Elevation (ft msl)
DBS-9 (cont.)	48.0-68.0	3806.26	05/11/11	54.39	3751.87
			10/04/11	54.59	3751.67
			02/08/12	54.53	3751.73
NW-1 (s)	52.95-72.95	3817.33	04/08/09	62.35	3754.98
NW-1 (m)	99.31-119.31	3817.35	04/08/09	62.25	3755.10
NW-1 (d)	149.45-169.45	3817.35	04/08/09	62.04	3755.31
NW-2 (s)	53.35-73.35	3812.50	04/08/09	63.08	3749.42
NW-2 (m)	93.72-113.72	3812.45	04/08/09	63.27	3749.18
NW-2 (d)	126.87-146.87	3812.46	04/08/09	66.41	3746.05
PMW-1	63-78	3821.17	06/23/08	67.51	3753.66
			04/08/09	65.97	3755.20
			05/11/11	68.70	3752.47
			10/04/11	66.95	3754.22
			02/08/12	66.69	3754.48
MW-1	120-140	NA	06/23/08	59.90	NA
MW-2	127-147	3812.68	06/23/08	61.42	3751.26
			04/07/09	61.65	3751.03
MW-3	NA	3812.05	06/23/08	62.06	3749.99
			04/07/09	62.02	3750.03
			05/11/11	62.91	3749.14
			10/04/11	62.91	3749.14
			02/08/12	62.95	3749.10
MW-4	111-131	3811.33	06/23/08	62.12	3749.21
			04/07/09	62.51	3748.82
MW-5	112-132	3808.96	06/23/08	60.60	3748.36
			04/07/09	60.79	3748.17
			05/11/11	61.17	3747.79
			10/04/11	61.72	3747.24
			02/08/12	61.23	3747.73

[a] Top of casing elevations surveyed by Pettigrew & Assoc. on May 28, 2009.

ft bgs = Feet below ground surface
ft msl = Feet above mean sea level
ft btoc = Feet below top of casing
NA = Not available

Table 1. Summary of Historical Fluid Level Measurements
Salty Dog Brine Station, Lea County, New Mexico

Monitor Well	Screen Interval (ft bgs)	Top of Casing Elevation[a] (ft msl)	Date Measured	Depth to Water (ft btoc)	Groundwater Elevation (ft msl)
MW-6	NA	3810.17	06/23/08	62.17	3748.00
			04/07/09	62.41	3747.76

[a] Top of casing elevations surveyed by Pettigrew & Assoc. on May 28, 2009.

ft bgs = Feet below ground surface
ft msl = Feet above mean sea level
ft btoc = Feet below top of casing
NA = Not available

Table 2. Summary of Chloride Groundwater Analytical Data
Salty Dog Brine Station, Lea County, New Mexico

Monitor Well	Date	Chloride Concentration (mg/L) [a]
New Mexico Water Quality Control Commission Standard		*250*
DBS-1	04/08/09	**320**
	05/12/11	**940**
	10/04/11	Well destroyed
DBS-2	04/08/09	14
	05/12/11	25
	10/05/11	18
	02/09/12	22
DBS-3	04/08/09	36
	05/12/11	35
	10/05/11	34
	02/09/12	34
DBS-4	04/08/09	38
	05/12/11	33
	10/05/11	32
	02/09/12	32
DBS-5	04/08/09	65
	05/12/11	140
	10/05/11	140
	02/09/12	140
DBS-6	04/07/09	**380**
	05/12/11	**410**
	10/05/11	**400**
	02/09/12	**380**
DBS-7	04/07/08	**570**
DBS-8	04/07/09	58
	05/12/11	36
	10/05/11	140
	02/09/12	41
DBS-9	04/08/09	210
	05/12/11	**600**
	10/05/11	**440**

Bold indicates concentrations that exceed the applicable standard.

[a] All samples analyzed in accordance to EPA method 300.0, unless otherwise noted.

[b] Samples analyzed in accordance to Standard Method 4500-Cl B.

mg/L = Milligrams per liter

Table 2. Summary of Chloride Groundwater Analytical Data
Salty Dog Brine Station, Lea County, New Mexico

Monitor Well	Date	Chloride Concentration (mg/L) [a]
New Mexico Water Quality Control Commission Standard		*250*
DBS-9 (cont.)	02/09/12	**290**
NW-1s	04/08/09	**630**
NW-1m	04/08/09	57
NW-1d	04/08/09	38
NW-2s	04/08/09	**410**
NW-2m	04/08/09	**570**
NW-2d	04/08/09	**4,700**
PMW-1	02/27/08	**9,500** [b]
	05/30/08	**8,600** [b]
	06/23/08	**12,700**
	04/08/09	**11,000**
	05/12/11	**13,000**
	10/05/11	**12,000**
	02/09/12	**12,000**
MW-1	05/30/08	75 [b]
	06/23/08	243
MW-2	02/27/08	120 [b]
	05/30/08	80 [b]
	06/23/08	**1,480**
	04/07/09	**1,200**
MW-3	02/27/08	**348** [b]
	05/30/08	**360** [b]
	06/23/08	**1,090**
	04/07/09	**17,000**
	05/12/11	**16,000**
	10/05/11	**14,000**
	02/09/12	**15,000**
MW-4	02/27/08	**476** [b]
	05/30/08	**512** [b]
	06/23/08	**5,730**
	04/07/09	**6,600**

Bold indicates concentrations that exceed the applicable standard.
[a] All samples analyzed in accordance to EPA method 300.0, unless otherwise noted.
[b] Samples analyzed in accordance to Standard Method 4500-Cl B.
mg/L = Milligrams per liter

Table 2. Summary of Chloride Groundwater Analytical Data
Salty Dog Brine Station, Lea County, New Mexico

Monitor Well	Date	Chloride Concentration (mg/L) [a]
New Mexico Water Quality Control Commission Standard		*250*
MW-5	02/27/08	**1,280** [b]
	05/30/08	**1,220** [b]
	06/23/08	**1,260**
	04/07/09	**1,300**
	05/12/11	**1,500**
	10/05/11	**1,500**
	02/09/12	**1,500**
MW-6	02/27/08	32 [b]
	05/30/08	36 [b]
	06/23/08	31.4
	04/07/09	25
Ranch Headquarters Supply Well	06/23/08	35.4
Brine Station Fresh Water Supply Well	02/27/08	**630** [b]
	05/30/08	**590** [b]
	06/23/08	**650**

Bold indicates concentrations that exceed the applicable standard.

[a] All samples analyzed in accordance with EPA method 300.0, unless otherwise noted.

[b] Samples analyzed in accordance with Standard Method 4500-Cl B.

mg/L = Milligrams per liter

Appendices

Appendix 1

Laboratory Reports

HALL ENVIRONMENTAL ANALYSIS LABORATORY

Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: www.hallenvironmental.com

February 20, 2012

Mike McVey
Daniel B. Stephens & Assoc.
6020 Academy NE Suite 100
Albuquerque, NM 87109
TEL: (505) 822-9400
FAX (505) 822-8877

RE: Ground H2O Sampling Salty Dog, Hobbs OrderNo.: 1202375

Dear Mike McVey:

Hall Environmental Analysis Laboratory received 10 sample(s) on 2/10/2012 for the analyses presented in the following report.

There were no problems with the analytical events associated with this report unless noted in the Case Narrative. Analytical results designated with a "J" qualifier are estimated and represent a detection above the Method Detection Limit (MDL) and less than the Reporting Limit (PQL). These analytes are not reviewed nor narrated as to whether they are laboratory artifacts.

Quality control data is within laboratory defined or method specified acceptance limits except if noted.

If you have any questions regarding these tests results, please feel free to call.

Sincerely,

Andy Freeman
Laboratory Manager
4901 Hawkins NE
Albuquerque, NM 87109

Analytical Report
Lab Order: **1202375**
Date Reported: **2/20/2012**

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Daniel B. Stephens & Assoc.
Project: Ground H2O Sampling Salty Dog, Hobbs
Lab Order: 1202375

Lab ID: 1202375-001 **Collection Date:** 2/9/2012 8:35:00 AM
Client Sample ID: DBS-4 **Matrix:** AQUEOUS

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: **BRM**
Chloride	32	2.5		mg/L	5	2/13/2012 8:33:52 PM

Lab ID: 1202375-002 **Collection Date:** 2/9/2012 9:17:00 AM
Client Sample ID: DBS-2 **Matrix:** AQUEOUS

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: **BRM**
Chloride	22	2.5		mg/L	5	2/13/2012 9:11:08 PM

Lab ID: 1202375-003 **Collection Date:** 2/9/2012 9:58:00 AM
Client Sample ID: PMW-1 **Matrix:** AQUEOUS

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: **BRM**
Chloride	12,000	500		mg/L	1000	2/14/2012 6:49:46 PM

Lab ID: 1202375-004 **Collection Date:** 2/9/2012 10:38:00 AM
Client Sample ID: DBS-3 **Matrix:** AQUEOUS

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: **BRM**
Chloride	34	2.5		mg/L	5	2/17/2012 6:31:55 PM

Lab ID: 1202375-005 **Collection Date:** 2/9/2012 11:12:00 AM
Client Sample ID: DBS-5 **Matrix:** AQUEOUS

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: **BRM**
Chloride	140	10		mg/L	20	2/13/2012 9:48:21 PM

Lab ID: 1202375-006 **Collection Date:** 2/9/2012 12:02:00 PM
Client Sample ID: DBS-9 **Matrix:** AQUEOUS

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: **BRM**
Chloride	290	25		mg/L	50	2/13/2012 10:00:46 PM

Qualifiers:				
	*/X	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
	J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
	R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
	S	Spike Recovery outside accepted recovery limits		

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Daniel B. Stephens & Assoc. **Lab Order:** 1202375
Project: Ground H2O Sampling Salty Dog, Hobbs

Lab ID: 1202375-007 **Collection Date:** 2/9/2012 12:35:00 PM
Client Sample ID: DBS-8 **Matrix:** AQUEOUS

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: **BRM**
Chloride	41	2.5		mg/L	5	2/13/2012 10:13:10 PM

Lab ID: 1202375-008 **Collection Date:** 2/9/2012 1:38:00 PM
Client Sample ID: DBS-6 **Matrix:** AQUEOUS

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: **BRM**
Chloride	380	25		mg/L	50	2/13/2012 10:25:35 PM

Lab ID: 1202375-009 **Collection Date:** 2/9/2012 2:55:00 PM
Client Sample ID: MW-3 **Matrix:** AQUEOUS

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: **BRM**
Chloride	15,000	500		mg/L	1000	2/14/2012 7:01:00 PM

Lab ID: 1202375-010 **Collection Date:** 2/9/2012 3:55:00 PM
Client Sample ID: MW-5 **Matrix:** AQUEOUS

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: **BRM**
Chloride	1,500	50		mg/L	100	2/13/2012 11:15:16 PM

Qualifiers:

*/X	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	Spike Recovery outside accepted recovery limits		

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: 1202375

20-Feb-12

Client: Daniel B. Stephens & Assoc.

Project: Ground H2O Sampling Salty Dog, Hobbs

Sample ID **MB** SampType: **MBLK** TestCode: **EPA Method 300.0: Anions**
Client ID: **PBW** Batch ID: **R918** RunNo: **918**
Prep Date: Analysis Date: **2/13/2012** SeqNo: **26532** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	ND	0.50								

Sample ID **LCS** SampType: **LCS** TestCode: **EPA Method 300.0: Anions**
Client ID: **LCSW** Batch ID: **R918** RunNo: **918**
Prep Date: Analysis Date: **2/13/2012** SeqNo: **26533** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	4.7	0.50	5.000	0	94.9	90	110			

Sample ID **1202390-006AMS** SampType: **MS** TestCode: **EPA Method 300.0: Anions**
Client ID: **BatchQC** Batch ID: **R918** RunNo: **918**
Prep Date: Analysis Date: **2/13/2012** SeqNo: **26538** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	6.5	0.50	5.000	1.856	92.4	78	107			

Sample ID **1202390-006AMSD** SampType: **MSD** TestCode: **EPA Method 300.0: Anions**
Client ID: **BatchQC** Batch ID: **R918** RunNo: **918**
Prep Date: Analysis Date: **2/13/2012** SeqNo: **26539** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	6.4	0.50	5.000	1.856	91.7	78	107	0.495	20	

Sample ID **MB** SampType: **MBLK** TestCode: **EPA Method 300.0: Anions**
Client ID: **PBW** Batch ID: **R918** RunNo: **918**
Prep Date: Analysis Date: **2/13/2012** SeqNo: **26581** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	ND	0.50								

Sample ID **LCS** SampType: **LCS** TestCode: **EPA Method 300.0: Anions**
Client ID: **LCSW** Batch ID: **R918** RunNo: **918**
Prep Date: Analysis Date: **2/13/2012** SeqNo: **26582** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	4.7	0.50	5.000	0	94.1	90	110			

Sample ID **1202395-003AMS** SampType: **MS** TestCode: **EPA Method 300.0: Anions**
Client ID: **BatchQC** Batch ID: **R918** RunNo: **918**
Prep Date: Analysis Date: **2/14/2012** SeqNo: **26598** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	19	0.50	5.000	14.05	100	78	107			

Qualifiers:

*/X	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: 1202375

20-Feb-12

Client: Daniel B. Stephens & Assoc.
Project: Ground H2O Sampling Salty Dog, Hobbs

Sample ID **1202395-003AMSD** SampType: **MSD** TestCode: **EPA Method 300.0: Anions**
Client ID: **BatchQC** Batch ID: **R918** RunNo: **918**
Prep Date: Analysis Date: **2/14/2012** SeqNo: **26599** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	19	0.50	5.000	14.05	102	78	107	0.422	20	

Sample ID **MB** SampType: **MBLK** TestCode: **EPA Method 300.0: Anions**
Client ID: **PBW** Batch ID: **R952** RunNo: **952**
Prep Date: Analysis Date: **2/14/2012** SeqNo: **27530** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	ND	0.50								

Sample ID **LCS** SampType: **LCS** TestCode: **EPA Method 300.0: Anions**
Client ID: **LCSW** Batch ID: **R952** RunNo: **952**
Prep Date: Analysis Date: **2/14/2012** SeqNo: **27542** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	4.7	0.50	5.000	0	94.3	90	110			

Sample ID **MB** SampType: **MBLK** TestCode: **EPA Method 300.0: Anions**
Client ID: **PBW** Batch ID: **R952** RunNo: **952**
Prep Date: Analysis Date: **2/15/2012** SeqNo: **27606** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	ND	0.50								

Sample ID **LCS** SampType: **LCS** TestCode: **EPA Method 300.0: Anions**
Client ID: **LCSW** Batch ID: **R952** RunNo: **952**
Prep Date: Analysis Date: **2/15/2012** SeqNo: **27607** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	4.7	0.50	5.000	0	93.4	90	110			

Sample ID **1202449-003AMS** SampType: **MS** TestCode: **EPA Method 300.0: Anions**
Client ID: **BatchQC** Batch ID: **R952** RunNo: **952**
Prep Date: Analysis Date: **2/15/2012** SeqNo: **27628** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	14	0.50	5.000	9.227	104	78	107			

Sample ID **1202449-003AMSD** SampType: **MSD** TestCode: **EPA Method 300.0: Anions**
Client ID: **BatchQC** Batch ID: **R952** RunNo: **952**
Prep Date: Analysis Date: **2/15/2012** SeqNo: **27629** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	15	0.50	5.000	9.227	107	78	107	1.12	20	S

Qualifiers:

*/X	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1202375**

20-Feb-12

Client: Daniel B. Stephens & Assoc.

Project: Ground H2O Sampling Salty Dog, Hobbs

Sample ID **MB** SampType: **MBLK** TestCode: **EPA Method 300.0: Anions**
Client ID: **PBW** Batch ID: **R1019** RunNo: **1019**
Prep Date: Analysis Date: **2/17/2012** SeqNo: **29413** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	ND	0.50								

Sample ID **LCS** SampType: **LCS** TestCode: **EPA Method 300.0: Anions**
Client ID: **LCSW** Batch ID: **R1019** RunNo: **1019**
Prep Date: Analysis Date: **2/17/2012** SeqNo: **29414** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	5.0	0.50	5.000	0	100	90	110			

Sample ID **1202629-001AMS** SampType: **MS** TestCode: **EPA Method 300.0: Anions**
Client ID: **BatchQC** Batch ID: **R1019** RunNo: **1019**
Prep Date: Analysis Date: **2/17/2012** SeqNo: **29416** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	11	0.50	5.000	6.004	97.4	78	107			

Sample ID **1202629-001AMSD** SampType: **MSD** TestCode: **EPA Method 300.0: Anions**
Client ID: **BatchQC** Batch ID: **R1019** RunNo: **1019**
Prep Date: Analysis Date: **2/17/2012** SeqNo: **29417** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	11	0.50	5.000	6.004	96.8	78	107	0.275	20	

Qualifiers:

*/X	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit

HALL ENVIRONMENTAL ANALYSIS LABORATORY

Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: www.hallenvironmental.com

Sample Log-In Check List

Client Name: DBS

Work Order Number: 1202375

Received by/date: MG 2/10/12

Logged By: Michelle Garcia 2/10/2012 1:23:00 PM Michelle Garcia

Completed By: Michelle Garcia 2/10/2012 1:32:43 PM Michelle Garcia

Reviewed By: IO 2/10/12

Chain of Custody

1. Were seals intact? Yes ☐ No ☐ Not Present ☑
2. Is Chain of Custody complete? Yes ☑ No ☐ Not Present ☐
3. How was the sample delivered? Client

Log In

4. Coolers are present? (see 19. for cooler specific information) Yes ☑ No ☐ NA ☐
5. Was an attempt made to cool the samples? Yes ☑ No ☐ NA ☐
6. Were all samples received at a temperature of >0° C to 6.0°C Yes ☑ No ☐ NA ☐
7. Sample(s) in proper container(s)? Yes ☑ No ☐
8. Sufficient sample volume for indicated test(s)? Yes ☑ No ☐
9. Are samples (except VOA and ONG) properly preserved? Yes ☑ No ☐
10. Was preservative added to bottles? Yes ☐ No ☑ NA ☐
11. VOA vials have zero headspace? Yes ☐ No ☐ No VOA Vials ☑
12. Were any sample containers received broken? Yes ☐ No ☑
13. Does paperwork match bottle labels? Yes ☑ No ☐
(Note discrepancies on chain of custody)
14. Are matrices correctly identified on Chain of Custody? Yes ☑ No ☐
15. Is it clear what analyses were requested? Yes ☑ No ☐
16. Were all holding times able to be met? Yes ☑ No ☐
(If no, notify customer for authorization.)

# of preserved bottles checked for pH: ______
(<2 or >12 unless noted)
Adjusted? ______
Checked by: ______

Special Handling (if applicable)

17. Was client notified of all discrepancies with this order? Yes ☐ No ☐ NA ☑

Person Notified: ______ Date: ______
By Whom: ______ Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person
Regarding: ______
Client Instructions: ______

18. Additional remarks:

19. Cooler Information

Cooler No	Temp °C	Condition	Seal Intact	Seal No	Seal Date	Signed By
1	2.2	Good	Not Present			

Chain-of-Custody Record

Client: DBS&A

Mailing Address: 6020 ACADEMY NE SUITE 100, ABQ, NM 87109

Phone #: 505-822-9400

email or Fax#:

QA/QC Package:

☐ Standard ☐ Level 4 (Full Validation)

Accreditation

☐ NELAP ☐ Other ______

☐ EDD (Type) ______

Turn-Around Time:

☑ Standard ☐ Rush ______

Project Name: GROUNDH2O SAMPLING SALTY DOG, HOBBS

Project #: ES08.0118.01

Project Manager: MIKE McVEY

Sampler: CELESTINE NGAM

On Ice: ☒ Yes ☐ No

Sample Temperature: 2.9

HALL ENVIRONMENTAL ANALYSIS LABORATORY

www.hallenvironmental.com

4901 Hawkins NE - Albuquerque, NM 87109

Tel. 505-345-3975 Fax 505-345-4107

Analysis Request

Date	Time	Matrix	Sample Request ID	Container Type and #	Preservative Type	HEAL No. 1202375	BTEX + MTBE + TMB's (8021)	BTEX + MTBE + TPH (Gas only)	TPH Method 8015B (Gas/Diesel)	TPH (Method 418.1)	EDB (Method 504.1)	8310 (PNA or PAH)	RCRA 8 Metals	Anions (F,Cl,NO_3,NO_2,PO_4,SO_4)	8081 Pesticides / 8082 PCB's	8260B (VOA)	8270 (Semi-VOA)	EPA 300, CHLORIDE				Air Bubbles (Y or N)
02/09/12	0835	GW	DBS-4	250ml HDPE, 1	ICE	1												X				
	0917		DBS-2			2												X				
	0958		PMW-1			3												X				
	1038		DBS-3			4												X				
	1112		DBS-5			5												X				
	1202		DBS-9			6												X				
	1235		DBS-8			7												X				
	1328		DBS-6			8												X				
	1455		MW-3			9												X				
	1555		MW-5			10												X				

C. NGAM 02/10/12

Date:	Time:	Relinquished by:	Received by:	Date	Time
02/10/12	1323	CELESTINE NGAM	Michael Garcia	2/10/12	1323
Date:	Time:	Relinquished by:	Received by:	Date	Time

Remarks:

If necessary, samples submitted to Hall Environmental may be subcontracted to other accredited laboratories. This serves as notice of this possibility. Any sub-contracted data will be clearly notated on the analytical report.

Appendix 2

Field Notes

02/08/12 C. NGAM

1300 ONSITE @ SALTY DOG

1400 MET LARRY SQUIRES. HE WANTS A COPY OF GW SAMPLING RESULT.

WELL ID	DTW	TD
DBS-4	66.76	80.32
DBS-2	65.96	79.15
PMW-1	66.69	79.47
DBS-3	61.11	78.37
DBS-5	63.46	78.47
DBS-9	54.53	70.97
DBS-8	61.77	76.97
MW-5	61.23	130.02
MW-3	62.95	147.27
DBS-6	63.20	78.02

1455 ~~0835~~ CALIBRATE YSI PRO

- pH 7.00 / 7.07 @ 10.4°C
- pH 10.0 / 10.18 @ 10.8°C

* CONDUCTIVITY PROBE FAILING TO CALIBRATE. RESTORED DEFAULT CALIBRATION (FACTORY) BUT STILL WOULD NOT CALIBRATE. PROBE HAS FUNCTIONALITY PROBLEM

1538 OFFSITE

C. NGAM 02/09/12

0750 ONSITE @ DBS-4

3CV = [(80.32 − 66.76) x 0.5]
= 6.8 GAL. SET PUMP @ 73' BTOC

VOL(GAL)	pH	T°C	COMMENTS
~~Initial~~ 0	7.41	15.3	TURBID - CONDUCTIVITY PROBE FAILED
~~Final~~ 2.0	7.50	17.10	SLIGHTLY TURBID
4.0	7.54	17.30	"
[illegible]	7.57	17.60	CLOUDY.

0835 COLLECTED SAMPLE

0850 DBS-2

3CV = [(79.15 − 65.96) x 0.5] GAL
= 6.6 GAL PUMP @ 72' BTOC

TIME	VOL(GAL)	pH	T°C	COMMENTS
0910	INITIAL	7.60	16.8	TURBID
0912	2	7.48	17.5	CLOUDY
0914	4	7.46	17.7	CLOUDY
0916	7	7.45	17.8	CLOUDY

0917 COLLECTED CL SAMPLE.

0940 PMW-1

3CV = [(79.47 − 66.69) x 0.5]
= 6.4 GAL, PUMP @ 75' BTOC

TIME	VOL(GAL)	pH	T°C	COMMENTS
0948	~~Initial~~ INITIAL	7.12	16.8	CLOUDY

02/09/12 C. NGAM

PMW-1 CONT.

TIME	VOL(GAL)	T°C	pH	COMMENTS
0949	2.0	18.0	6.98	CLOUDY
0952	4.0	18.2	6.96	CLEAR
0957	7.0	18.6	6.95	CLEAR

0958 COLLECTED CL⁻ SAMPLE

1020 DBS-3

3CV = [(78.37 − 61.11) X 0.5]
= 8.63 GAL PUMP @ 70' BTOC

TIME	VOL(GAL)	T°C	pH	COMMENTS
1030	INITIAL	18.7	7.68	TURBID
1032	3.0	19.0	7.53	CLOUDY
1034	6.0	18.9	7.52	CLOUDY
1036	9.0	19.0	7.50	CLEAR

1038 COLLECTED CL⁻ SAMPLE

1100 DBS-5

3CV = [(78.47 − 63.46) X 0.5]
= 7.51 GAL, PUMP @ 70' BTC

TIME	VOL(GAL)	T°C	pH	COMMENTS
1104	INITIAL	18.7	7.15	TURBID
1105	2.0	19.0	7.15	CLOUDY
1106	4.0	19.1	7.12	CLEAR
1108	6.0	19.1	7.10	CLEAR
1110	8.0	19.0	7.11	〃

C. NGAM 02/09/12

DBS-5 CONT.

1112 COLLECTED CL⁻ SAMPLE

1140 DBS-9

3CV = [(70.97 − 54.53) X 0.5]
= 8.22 GAL, PUMP @ 60' BTOC

TIME	VOL(GAL)	T°C	pH	COMMENTS
1154	INITIAL	18.0	7.37	TURBID
1155	3.0	17.9	7.30	TURBID
1156	6.0	17.9	7.32	CLOUDY
1158	9.0	17.8	7.30	CLOUDY

1202 COLLECTED SAMPLE

1225 DBS-8

3CV = [(76.97 − 61.77) X 0.5)]
= 7.6 GAL

TIME	VOL(GAL)	T°C	pH	COMMENTS
1230	INITIAL	18.6	7.37	TURBID
1232	2.0	19.0	7.34	TURBID
1233	4.0	19.1	7.31	TURBID
1234	6.0	19.2	7.30	CLOUDY
1235	8.0	19.2	7.30	CLOUDY

C. NGAM
02/09/2012

02/09/12 C. NGAM

1315 DBS-6
3CV = [(78.02 - 63.20) x 0.5]
= 7.41 GAL, PUMP @ 70' BTOC

TIME	VOL(GAL)	pH	T°C	COMMENTS
1320	INITIAL	7.29	18.4	TURBID
1321	2.0	7.15	18.9	CLOUDY
1322	4.0	7.06	19.0	CLOUDY
1323	6.0	7.05	19.1	CLEAR
1324	8.0	7.04	19.1	CLEAR
1325	10.0	7.04	19.1	CLEAR

1328 COLLECTED CL⁻ SAMPLE.

1355 MW-3
3CV = [(147.27 - 62.95) x 0.5]
= 42.16 GAL, PUMP @ 115' BTOC

TIME	VOL(GAL)	pH	T°C	COMMENTS
1415	INITIAL	7.17	17.1	CLEAR
1423	10	6.64	18.7	CLEAR
1432	20	6.65	18.7	CLEAR W/ FOAM
1442	30	6.65	18.6	"
1453	43	6.66	18.7	"

1455 COLLECTED CL⁻ SAMPLE

C. NGAM
02/09/12

C. NGAM 02/09/12

1510 MW-5
3CV = [(130.02 - 61.23) x 0.5]
= 34.40 GAL, PUMP @ 115' BTOC

TIME	VOL(GAL)	pH	T°C	COMMENTS
1518	INITIAL	7.23	18.7	CLEAR
1528	10	7.05	19.2	"
1537	20	7.03	19.1	"
1547	30	7.01	19.2	"
1553	35	7.01	19.0	"

1555 COLLECTED CL⁻ SAMPLE

NOTE: CONDUCTIVITY WAS EXCLUDED FROM THE ABOVE H_2O PARAMETERS BECAUSE CONDUCTIVITY PROBE IS NON FUNCTIONAL.
- TRIED CALIBRATING PROBE BUT NO SUCCESS. PROBE WAS READING CONDUCTIVITY OF MAGNITUDE ~~10^5~~ 10^5 IN DI H_2O.
- PUMP WAS DECONTAMINATED BETWEEN WELLS.

1640 CLEANED SITE. CHECK SAMPLES
1645 OFFSITE

C. NGAM
02/09/12

RECEIVED

2008 MAR 6 PM 1 59

CARDINAL LABORATORIES

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

ANALYTICAL RESULTS FOR
SALTY DOG
ATTN: JIM SAYRE
P.O. BOX 513
HOBBS, NM 88241
FAX TO: (575) 393-8353

Receiving Date: 02/27/08
Reporting Date: 02/27/08
Project Number: NOT GIVEN
Project Name: NOT GIVEN
Project Location: NOT GIVEN

Analysis Date: 02/27/08
Sampling Date: 02/27/08
Sample Type: GROUNDWATER
Sample Condition: INTACT
Sample Received By: ML
Analyzed By: HM

LAB NO.	SAMPLE ID	Cl^- (mg/L)
H14335-1	WATER WELL	630
H14335-2	PIT WELL	9,500
H14335-3	MW-2	120
H14335-4	MW-3	348
H14335-5	MW-4	476
H14335-6	MW-5	1280
H14335-7	MW-6	32
Quality Control		490
True Value QC		500
% Recovery		98
Relative Percent Difference		2.0

METHOD: Standard Methods	4500-Cl^-B

Hope C. Moreno
Chemist

02-27-08
Date

H14335 SALTY DOG

ZIA TRANS
PO Box 513
Hobbs N.M.
88242

ROSWELL NM 882
PM
04 MAR
2008

Oil Conservation Div
Attn Glen Von Gotten
1220 South St. Francis
Santa Fe New Mexico
87505

87505+4225-99 C011

NM 74-0

CARDINAL LABORATORIES

PHONE (325) 673-7001 • 2111 BEECHWOOD • ABILENE, TX 79603

PHONE (505) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240

RECEIVED 2007 NOV 2 PM 12 39

ANALYTICAL RESULTS FOR
SALTY DOG INC. NM - 74
ATTN: JIM SAYRE
P.O. BOX 513
HOBBS, NM 88241
FAX TO: (575) 393-8353

Receiving Date: 10/26/07
Reporting Date: 10/26/07
Project Owner: NOT GIVEN
Project Name: NOT GIVEN
Project Location: NOT GIVEN

Analysis Date: 10/26/07
Sampling Date: 10/26/07
Sample Type: GROUNDWATER
Sample Condition: COOL & INTACT
Sample Received By: SB
Analyzed By: AB

LAB NUMBER	SAMPLE ID	Cl^- (mg/L)
H13587-1	PIT MONITOR WELL	9,897
H13587-2	FRESH WATER WELL	730
H13587-3	MONITOR WELL #1	104
H13587-4	MONITOR WELL #2	108
H13587-5	MONITOR WELL #3	356
H13587-6	MONITOR WELL #4	1,100
H13587-7	MONITOR WELL #5	100
H13587-8	MONITOR WELL #6	28
	Quality Control	500
	True Value QC	500
	% Recovery	100
	Relative Percent Difference	< 0.1
	METHOD: Standard Methods	4500-ClB

Chemist

10/26/07
Date

H13587 SALTY DOG

CARDINAL LABORATORIES
101 East Marland, Hobbs, NM 88240 2111 Beechwood, Abilene, TX 79603
(505) 393-2326 FAX (505) 393-2476 (325) 673-7001 FAX (325)673-7020

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

Company Name: SALTY DOG INC
Project Manager: JIM SAYRE
Address: PO Box 513
City: Hobbs State: NM Zip: 88240
Phone #: 393-8352 Fax #:
Project #: Project Owner:
Project Name:
Project Location:
Sampler Name: JIM SAYRE

BILL TO
P.O. #:
Company: SALTY Dog
Attn: TERRY WALLACE
Address: PO Box 513
City: Hobbs
State: NM Zip: 88240
Phone #: 393-8352
Fax #: 393-8353

ANALYSIS REQUEST

FOR LAB USE ONLY

Lab I.D.	Sample I.D.	(G)RAB OR (C)OMP.	# CONTAINERS	MATRIX: GROUNDWATER	WASTEWATER	SOIL	OIL	SLUDGE	OTHER:	PRESERV.: ACID/BASE:	ICE / COOL	OTHER:	SAMPLING: DATE	TIME	Cl
H13887-1	Pit Monitor Well			✓									10-26	9:30	X
2	Fresh Water Well			✓									10-26	9:30	
3	Monitor Well #1			✓									10-26	9:30	
4	Monitor Well #2			✓									10-26	9:30	
5	Monitor Well #3			✓									10-26	9:30	
6	Monitor Well #4			✓									10-26	9:30	
7	Monitor Well #5			✓									10-26	9:30	
8	Monitor Well #6			✓									10-26	9:30	

Relinquished By: J D Sayre Date: 10-26 Time: 10-45 Received By:

Relinquished By: Date: Time: Received By: Sue Barnes 10/26/07 10:45

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

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

CHECKED BY: (Initials) SB

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

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