1R - 177

REPORTS

DATE:

2001

McCASLAND RANCH INITIAL SITE & GROUNDWATER INVESTIGATION
HOBBS, NEW MEXICO

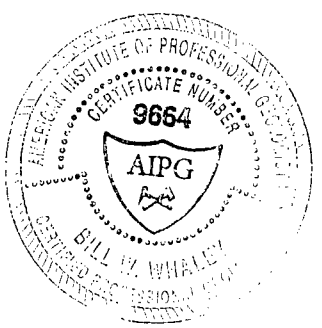
January, 2001

Prepared For:

McCasland Ranch

Prepared By:

HydroGeologic Services, Inc.
8600 Beverly Hills NE
Albuquerque, New Mexico 87122
505-856-6498



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1.0 INTRODUCTION

This report identifies the geologic field investigation which was performed for the McCasland Ranch. High levels of chloride, bromide and conductivity have been identified in the water trough and windmill well which the livestock drink from which lead to this investigation. The apparent source of the chloride contamination is from an abandoned oil/gas well which is located approximately 40 feet from the windmill well.

The site is located approximately 10 miles south of Hobbs, New Mexico to the east of State Highway 18 (mile marker 41) in Township 20 South, Range 39 East, Section 30. Open space, ranching and oil/gas operations are principle of the land in the immediate area. Vegetation is sparse in the site vicinity and consists of mesquite covered dunes (5 to 15 feet high) and yucca plants. The climate at the site area is characterized by low precipitation, a rapid rate of evaporation, and a high annual temperature and can be classified as semi-arid conditions.

2.0 FIELD INVESTIGATION

A field investigation was performed at the McCasland Ranch to help confirm the source and identify the extent of the chloride groundwater contamination. The investigation consisted of mobilizing a Speedstar 30K air/mud rotary drill rig with a 900cfm/350 psi compressor to the site. Three soil borings were advance to approximately 100 feet below surface grade each using the air rotary drilling method and converted into groundwater monitoring wells which the locations can be identified in the Site Plan (Figure 1). While the soil borings were being advanced to determine the subsurface conditions, soil samples were collected every 10 feet or change in lithology and recorded by a Certified Professional Geologist. The monitor wells were installed in a triangular formation around the plugged oil/gas well to help determine the site specific groundwater flow direction (Figure 2) and help determine the extent of the contamination.

The three soil borings were very similar in lithologies as can be viewed in Figures 4, 5, & 6. Soil boring MW-1 consisted of a silty sand layer (SM) from surface to 5 feet, a red brown clay layer (CL) from 5 feet to 14 feet, a caliche layer (SC/CL) with varying colors from 14 feet to 75 feet, a silty sand with fine gravels layer from 75 feet to 92.5 feet (water bearing zone), and a red clay layer (red bed) at 92.5 feet to total depth of 96 feet. Soil boring MW-2 consisted of a silty sand layer from surface to 6 feet, a brown clay layer from 6 feet to 17 feet, a caliche layer with varying colors from 17 feet to 80.5 feet, a sand with silt layer from 80.5 feet to 98.5 feet (water bearing), and a red clay layer from 98.5 feet to total depth of 101 feet. Soil boring MW-3 consisted of sand with silt layer from surface to 7 feet, a red-brown clay layer from 5 feet to 19 feet, a caliche layer from 19 feet to 81 feet, a sand with silt layer from 81 feet to 92 (water bearing) and a red clay layer from 92 feet to total depth.

Each soil boring was converted into a groundwater monitoring well which consisted of 4-inch Schedule 40, flush threaded PVC blank casing with 20 feet of 0.020 inch factory slotted screen. Clean 10/20 graded silica sand was installed by tremie method around the screen to approximately 2 feet above the screen overlain by a minimum 4-foot bentonite seal hydrated with potable water every two feet. A bentonite grout seal was installed by the tremie method from the bentonite seal to surface. A 6-inch diameter by 5-foot long steel protective casing with locking cap was installed surrounded by a 2' x 2' x 4" concrete pad to complete the well. Each well was developed by bailing a minimum three well volumes prior to installing temporary pumps to further develop the wells until clear of sediment.

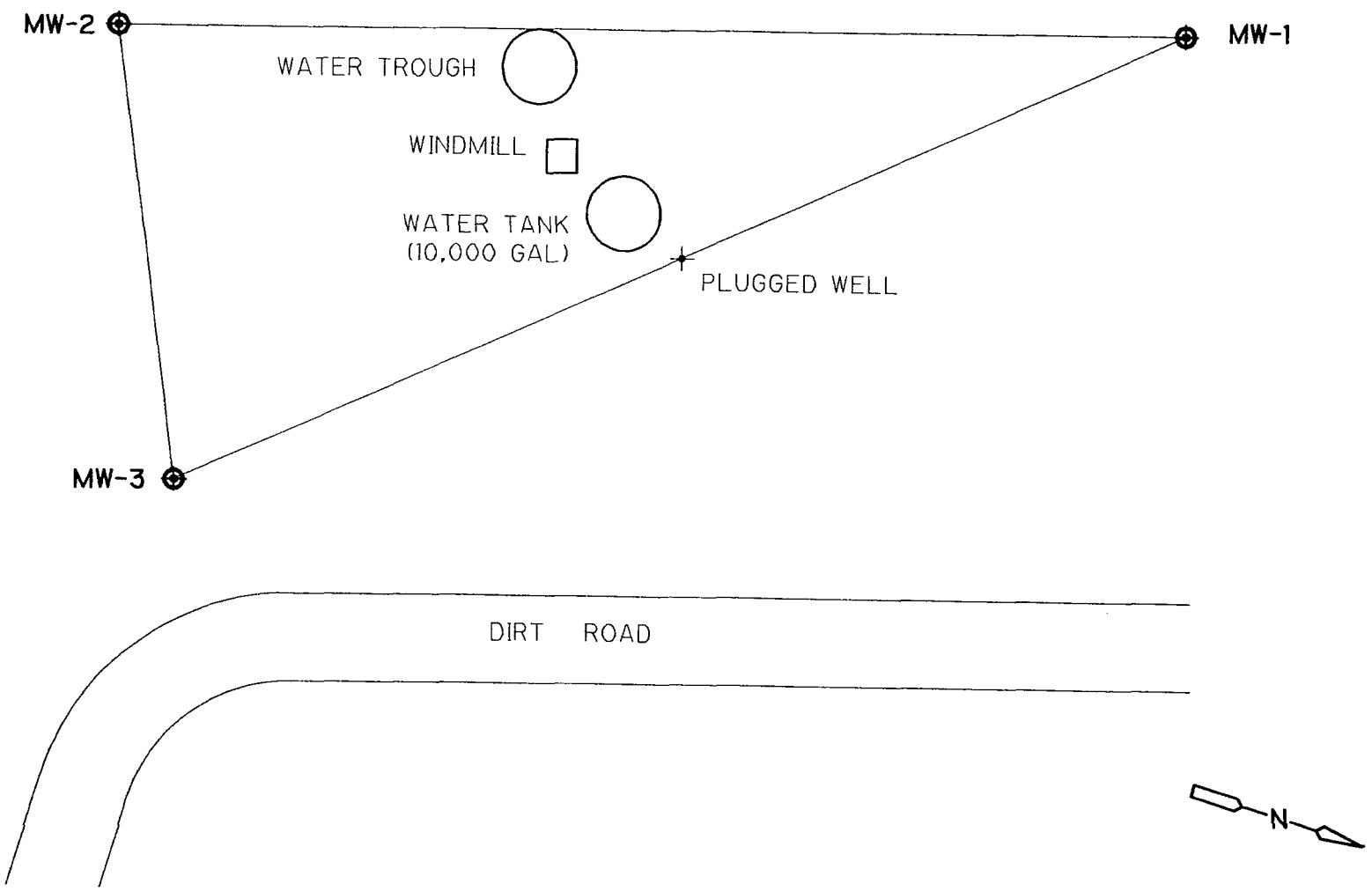
Each well was surveyed with a transit and rod to determine the top of casing (TOC) and groundwater elevations to the nearest 0.01 of a foot. Specifics of each well are as follows:

Monitor Well #	Top of Casing Elevation (FT)	Depth to Water from TOC (FT)	Groundwater Elevation (FT)
MW-1	99	78.81	20.19
MW-2	100	77.23	22.77
MW-3	98.5	81.72	16.78

Groundwater at the site appears to be flowing to the east-northeast direction with a gradient of 0.05 ft/ft. (Figure 2).

After well development, the wells were sampled for chloride concentrations , bromide, pH, and conductivity. The results are as follows:

Monitor Well #	Chloride ppm	Bromide ppm	pH	Conductivity
MW-1	100	1	7.04	796
MW-2	130	1	7.4	1109
MW-3	860	2.8	8.32	4520



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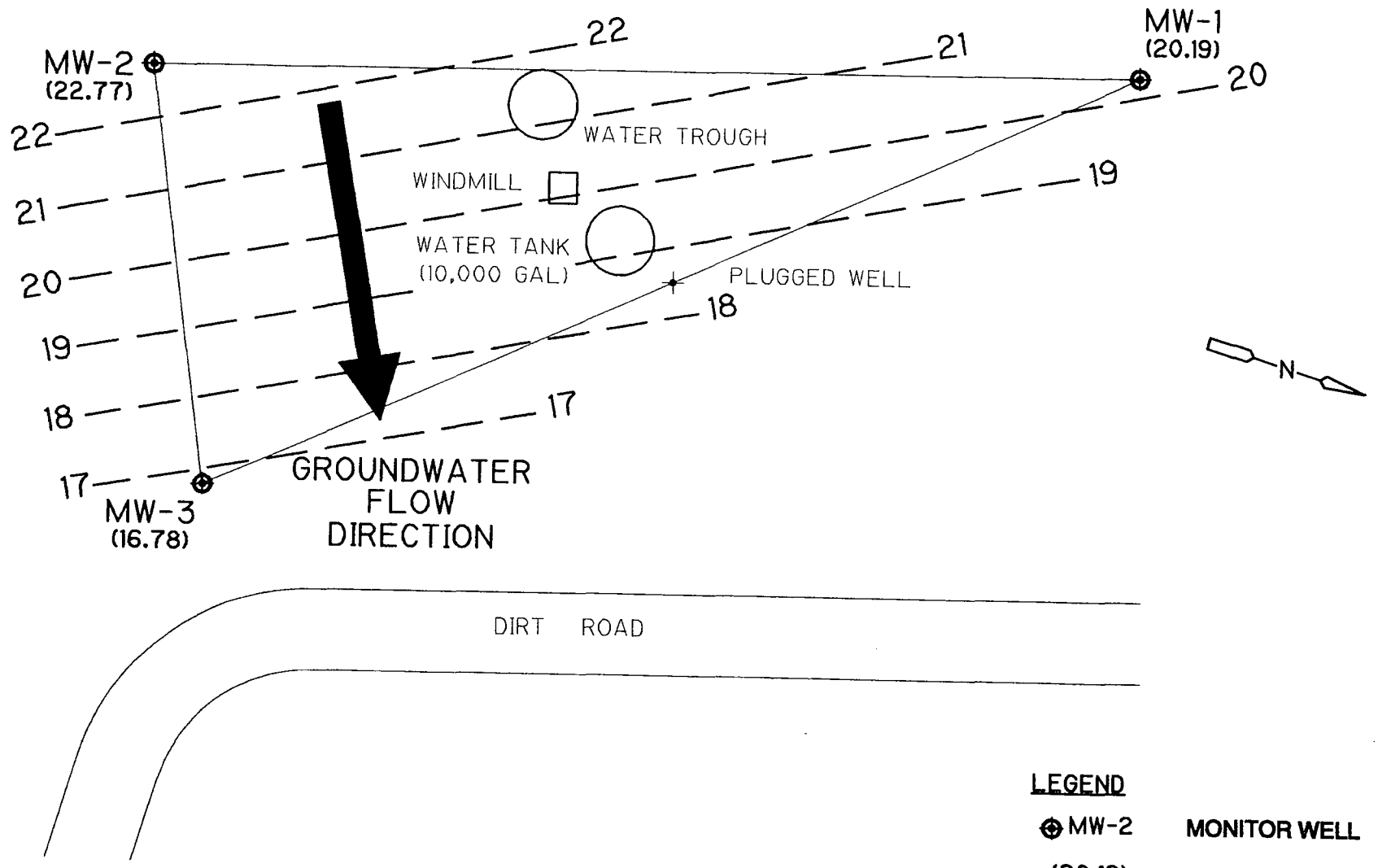
McCASLAND RANCH, HOBBS, NM
SITE PLAN

Figure 1

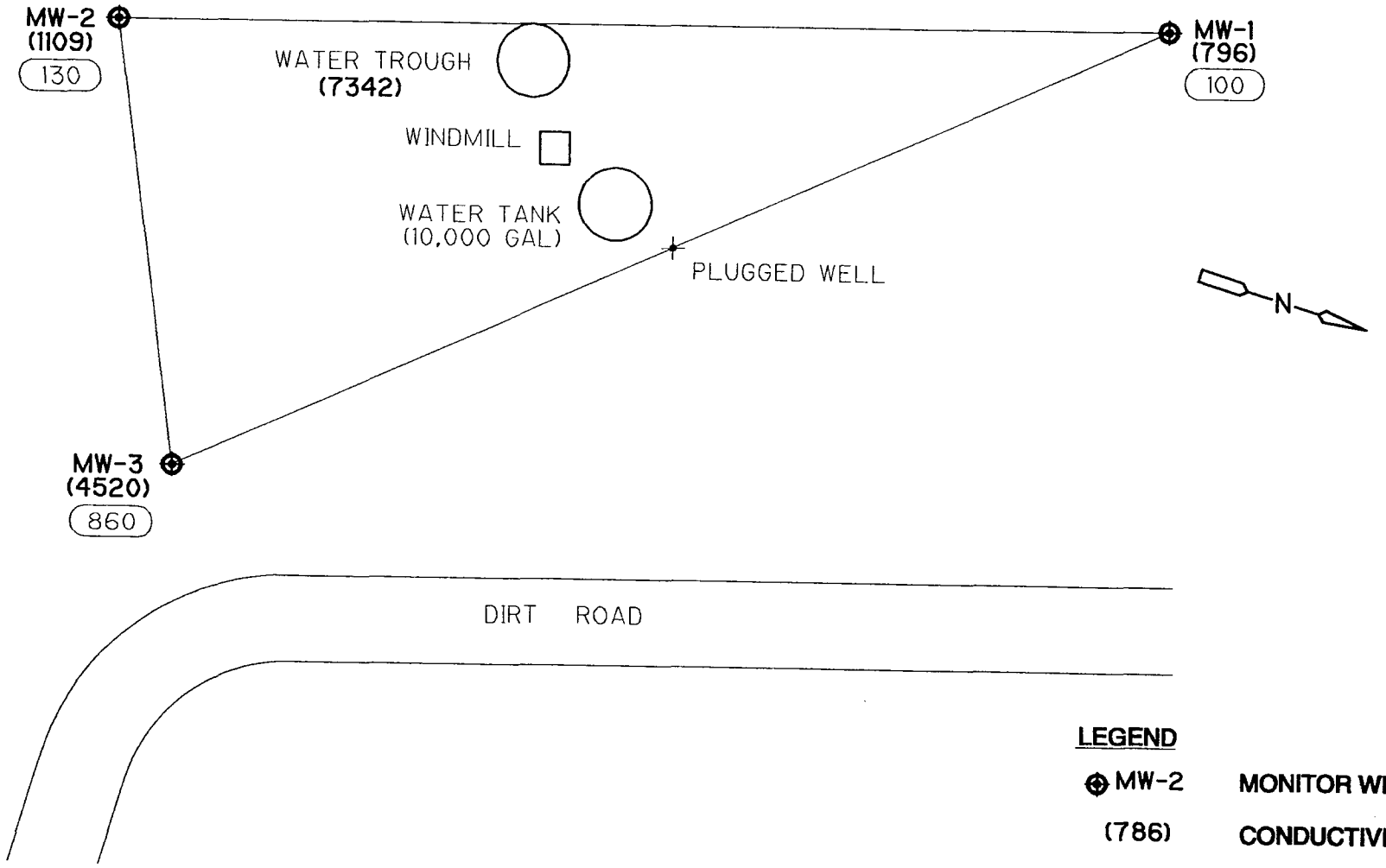


HydroGeologic Services, Inc.

HGS

McCASLAND RANCH, HOBBS, NM
GROUNDWATER FLOW DIRECTION MAP

Figure 2



LEGEND

⊕ MW-2	MONITOR WELL
(786)	CONDUCTIVITY
(100)	CHLORIDE CONCENTRATION

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HGS

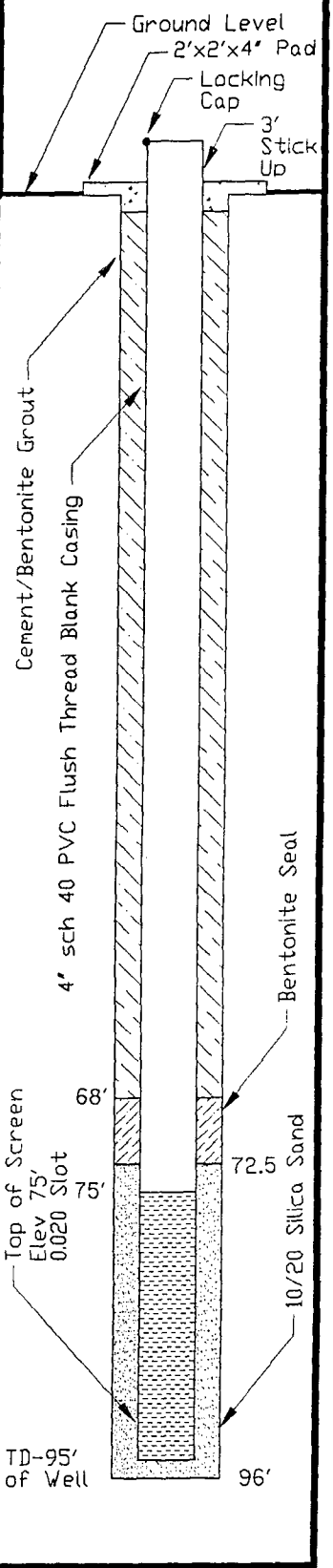
McCASLAND RANCH, HOBBS, NM
CONDUCTIVITY AND CHLORIDE CONCENTRATIONS MAP

Figure 3

SOIL BORING NO. MW-1

DEPTH, FT.	SYMBOL(USCS)	SAMPLE DESCRIPTION	SAMPLING INTERVAL IN FEET
0	SM	0'-5' Sand with silt, sli-moist, light brown, fine gravels	Continuously Sampled
10	CL	5'-14' Clay with sand, moist, red-brown to brown, sli-plastic	
20	SC/CL	14'-75' Sand with clay (Caliche), dry, tan to white, calcareous nodules	
30			
40		34' yellow-brn to yellow, gravels to 1/2"	
		36' brown	
		38' yellow brown	
		43' red brown to purple	
50		49' brown, large calcareous nodules	
		53' purple	
60		60' tan-whitepurple	
70		73' yellow-brown	
	SM	75'-92.5' Sand with silt, wet, yellow-brown, fine gravels, subangular to subrounded	
80			
90			
		92.5'-TD Clay, wet, red, sli-plastic, very fine gravels	
100		96' TD	

SOIL BORING DETAILS



HydroGeologic Services, Inc.

HGS

CLIENT: EDDIE SEAY
SITE: McCASLAND RANCH
TOTAL DEPTH = 96 FEET
DRILLER: DIAMOND BACK DRILLING

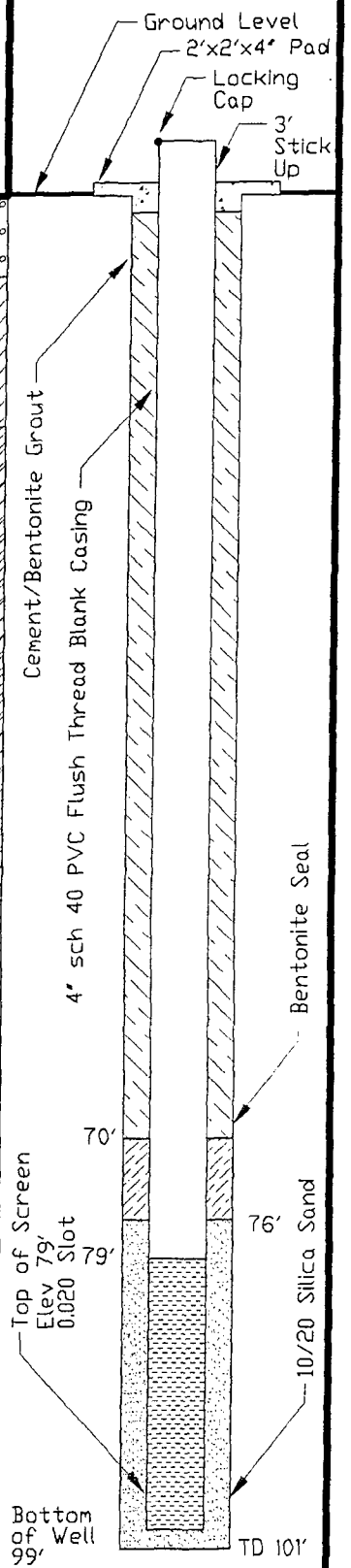
SOIL BORING NO.: MW-1
DRILLING METHOD: AR
LOGGED BY: B. WHALEY
DATE DRILLED: 1/4/01

SOIL BORING NO. MW-2

DEPTH, FT.	SYMBOL(USCS)	SAMPLE DESCRIPTION	
0	SM	0'-6'	Sand with silt, sli-moist, brown to light brown, fine gravels
10	CL	6'-17'	Clay with sand, moist, brown, sli-plastic
20	SC/CL	17'-80.5'	Sand with clay (Caliche), dry, white to tan, hard
30			
40		37'	yellow brown
50		45'	brown
		47'	red brown
60		56'	tan to white
		61'	yellow brown
70		64'	tan-white
80	SM	80.5'-98.5'	Sand with silt, wet, yellow-brown, fine gravels, subangular to subrounded
90			
100	CL	98.5'-101'	Clay with sand, wet, red, very fine gravels
		101' TD	

SAMPLING INTERVAL IN FEET: Continuously Sampled

STRATIGRAPHY



HydroGeologic Services, Inc.

HGS

CLIENT: EDDIE SEAY
SITE: McCASLAND RANCH
TOTAL DEPTH = 99 FEET
DRILLER: DIAMOND BACK DRILLING

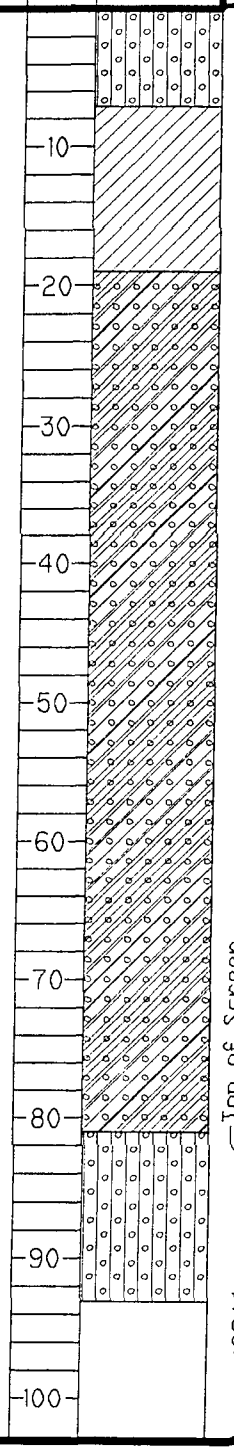
SOIL BORING NO.: MW-2
DRILLING METHOD: AR
LOGGED BY: B. WHALEY
DATE DRILLED: 1/4&5/01

SOIL BORING NO. MW-3

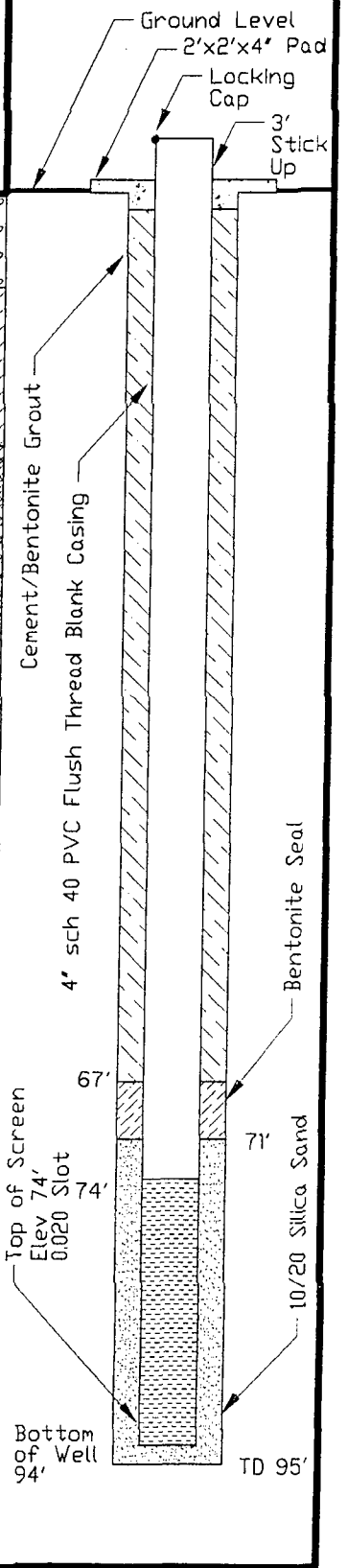
DEPTH, FT.	SYMBOL(USCS)	SAMPLE DESCRIPTION
0	SM	0'-7' Sand with silt, sli-moist, light brown, fine gravels
10	CL	5'-19' Clay with sand, moist, red-brown, sli-plastic
20	SC/CL	19'-81' Sand with clay (Caliche), dry, white to tan, very hard
30		25'-29' 1" gravels, angular
40		39' yellow brown
		44' red brown
50		48' purple
		50' yellow-brown
60		
70		68' tan-white
80	SM	81'-92' Sand with silt, wet, yellow-brown, fine gravels, subangular to subrounded
90		92'-95' Clay with sand, wet, red, sli-plastic, very fine gravels
100		95' TD

SAMPLING INTERVAL IN FEET: Continuously Sampled

STRATIGRAPHY



SOIL BORING DETAILS



HydroGeologic Services, Inc.

HGS

CLIENT: EDDIE SEAY
SITE: McCASLAND RANCH
TOTAL DEPTH = 95 FEET
DRILLER: DIAMOND BACK DRILLING

SOIL BORING NO.: MW-3
DRILLING METHOD: AR
LOGGED BY: B. WHALEY
DATE DRILLED: 1/5/01

3.0 AQUIFER TEST

A 700 minute constant rate pump test was performed to determine the hydraulic characteristics of the water bearing formation. The pump test was performed in Monitor well MW-2 while MW-1 & MW-3 were used as observation wells. Prior to the pump test a step test was performed to determine the pumping rate for the constant rate test. It was determined that a pumping rate of 1 gallon per minute (GPM) was all the aquifer could handle without pumping under. HydroGeologic Services, Inc. (HGS) performed the pump test while Rio Grande Environmental (RGE) performed the pump test model.

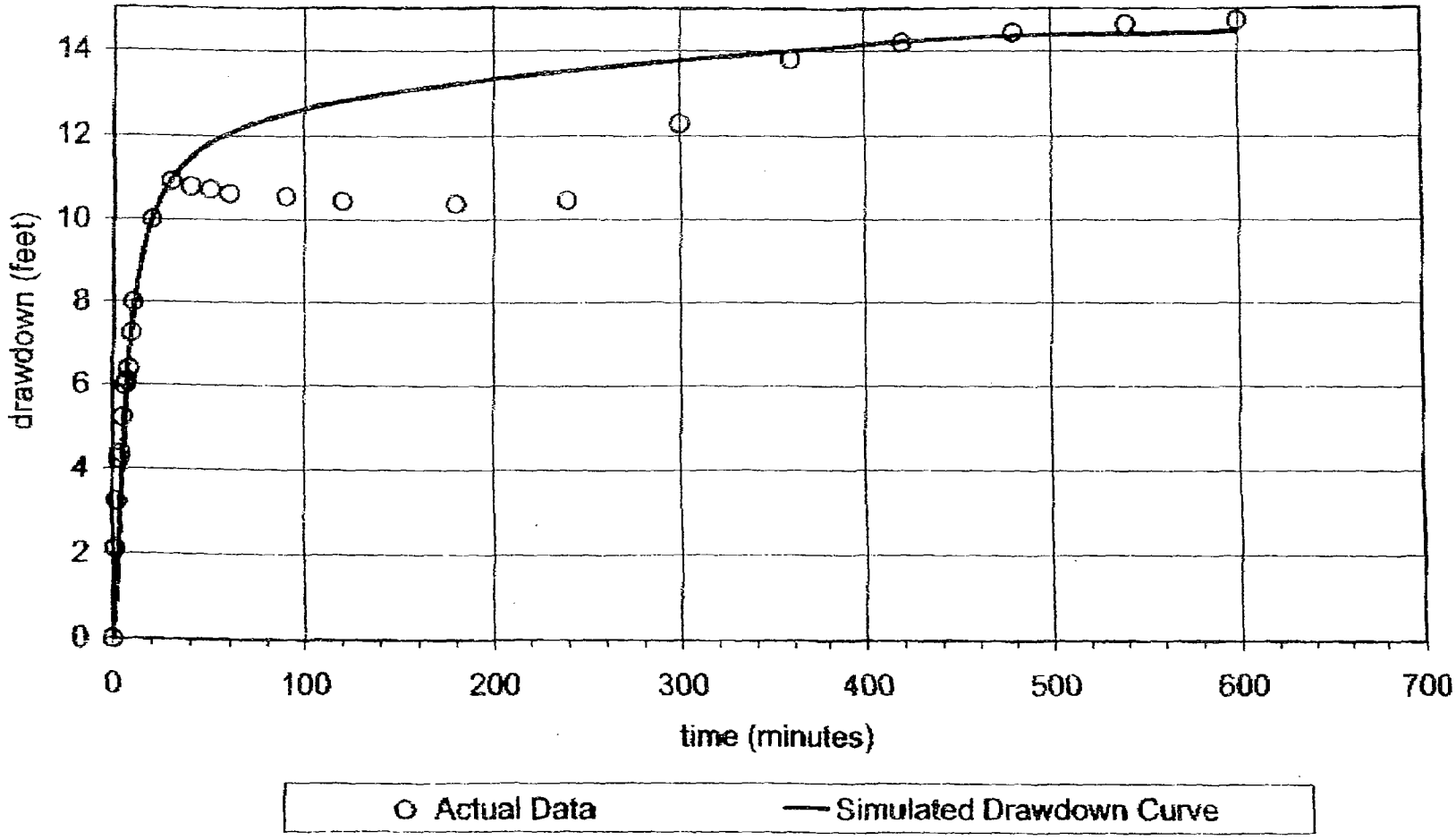
Due to the relatively high conductivity of the aquifer matrix, drawdown was not observed at either monitoring well, MW-1 and MW-3. Therefore, only the drawdown and recovery recorded at the pumping well MW-2 was analyzed. RGE utilized MODFLOW to analyze the drawdown data from MW-2. The MODFLOW model was set up an run using the graphic user interface, Groundwater Vistas. The model consists of three 15-foot thick layers and was approximately 300-feet by 300-feet. Constant head cells were positioned in the upper and lower layers of the model to simulate the relatively steep gradient across the site. The pumping well was positioned in the center of the model in the upper layer. The grid spacing was designed to reduce boundary effects within the vicinity of the pumping well. The model setup is shown in the attached figures.

Based on the model results, RGE estimated aquifer properties are as follows:

Horizontal Hydraulic Conductivity	Kx	0.87 feet/day
Vertical Hydraulic Conductivity	Kz	0.48 feet/day
Specific Yield	Sy	0.16
Storativity	S	0.0001

An iterative process was employed to achieve these estimates by comparing simulated drawdown verses the actual drawdown observed at MW-2 during pumping. The attached chart illustrates the match of the simulated and actual data. In addition, mass balance summaries from the model (steady-state and transient and simulated drawdown/head charts are included.

Hydrogeologic Pump Test Analysis Results
Drawdown @ MW-2
McCasland Ranch, New Mexico



Williamson Petroleum Consultants, Inc.

April 18, 2001

RECEIVED
APR 30 2001
Environmental Bureau
Oil Conservation Division

Hinkle, Hensley, Shanor & Martin, L.L.P.
400 Penn Plaza, Suite 700
P.O. Box 10
Roswell, New Mexico 88202

Attention Mr. Richard E. Olson

Subject: Robert A. McCasland, et al. v. Mewbourne Oil Company, et al.
Lea County Cause No. CV-00-123G
Williamson Project 0.8798

Gentlemen:

In accordance with your request I have studied the plugging record of the Mark Production Company (Mewbourne Oil Company) Conoco Federal No. 2 well in Section 30, Township 20, Range 39, Lea County, New Mexico. The Conoco Federal No. 2 is on a federal lease and comes under the jurisdiction of the Bureau of Land Management regarding drilling, production, and plugging operations.

On February 11, 1974 Mark Production Company filed a Sundry Notices and Reports on Wells Form with the United States Department of the Interior Geological Survey indicating an intention to plug the Conoco Federal No. 2 by setting cement plugs as follows:

25 sacks at 5,970 to 6,000 feet
35 sacks stub 4 ½ inch at 5,700 feet
35 sacks at 4,300 to 4,400 feet (Top of San Andres)
35 sacks at 2,900 to 3,000 (Top of the Yates)
35 sacks at 1,610 to 1,710 feet and
10 sacks at the top.

The application was amended to indicate that the hole must be filled with mud between plugs. The proposed procedure was approved by Arthur R. Brown who was the District Engineer for the United States Geological Survey (USGS) at that time in Hobbs, New Mexico. No mention was made of tagging plugs.

A similar form was filed by Mark Production Company dated July 3, 1974 stating that the plugging operations had started on February 13, 1974 and had been completed March 1, 1974. It also stated that the hole was loaded with mud between each plug as shown below:

550 WEST TEXAS AVENUE
SUITE 300
MIDLAND, TEXAS
79701-4257
915. 685. 6100
FAX 915. 685. 3909

Plug No. 1 - 25 sacks at 6,000 feet
Plug No. 2 – 35 sacks at 4,100 feet (4 ½ stub)
Plug No. 3 – 35 sacks at 3,000 feet
Plug No. 4 – 35 sacks at 1,710 feet
Plug No. 5 – 10 sacks at the surface

This procedure was also approved by Arthur R. Brown and no mention was made of tagging plugs.

In 1974 the USGS was responsible for approving plugging of wells on Federal lands. However, today the approval responsibility is with the Bureau of Land Management. Under the Bureau of Land Management 43 CFR 3160 (Federal Register/ Volume 53, No. 223 - Friday, November 18, 1988 - Effective Date: December 19, 1988) entitled "Onshore Oil and Gas Operations; Federal and Indian Oil and Gas Leases; Onshore Oil and Gas Order No. 2, Drilling Operations" under Paragraph G entitled "Drilling and Abandonment Requirements", Paragraph 6 is stated as follows "isolating medium – any cement plug which is the only isolating medium for a useable water interval or a zone containing a prospectively valuable deposit of minerals shall be tested by tagging with the drill string. Any plugs placed where the fluid level will not remain static also shall be tested by either tagging the plug with the working pipe string or pressuring to a minimum pump (surface) pressure of 1,000 psi, with no more than a 10 percent drop during a 15 minute period (case hole only)."

Since the Conoco Federal No. 2 did not contain a useable water interval or no longer contained a zone containing a prospectively valuable deposit of minerals, then there is no requirement to tag the plugs under the Bureau of Land Management Rules and Regulations. Also tagging of plugs was not required by the USGS on the approved plugging procedures for the Conoco Federal No. 2.

The New Mexico Energy Minerals and Natural Resources department has special plugging and abandonment requirements for District 1 in Hobbs, New Mexico requiring cement plugs to be tagged. However, the New Mexico Energy and Natural Resources department has no authority over the plugging of a producing well on federal lands.

On February 24, 1971 a bridge plug was set at 6,495 feet which isolated the Abo perforations and two sacks of cement were placed on top of the plug with a bailer according to the Sundry Notices and Reports on Wells form dated February 25, 1971.

The other cement plugs were set as noted above and therefore along with the cemented surface casing created barriers preventing any fluids in the wellbore from having a pathway to the shallow ground water as alleged by the plaintiffs in this case.

My work continues on this matter and additional opinions will be provided as they are developed.

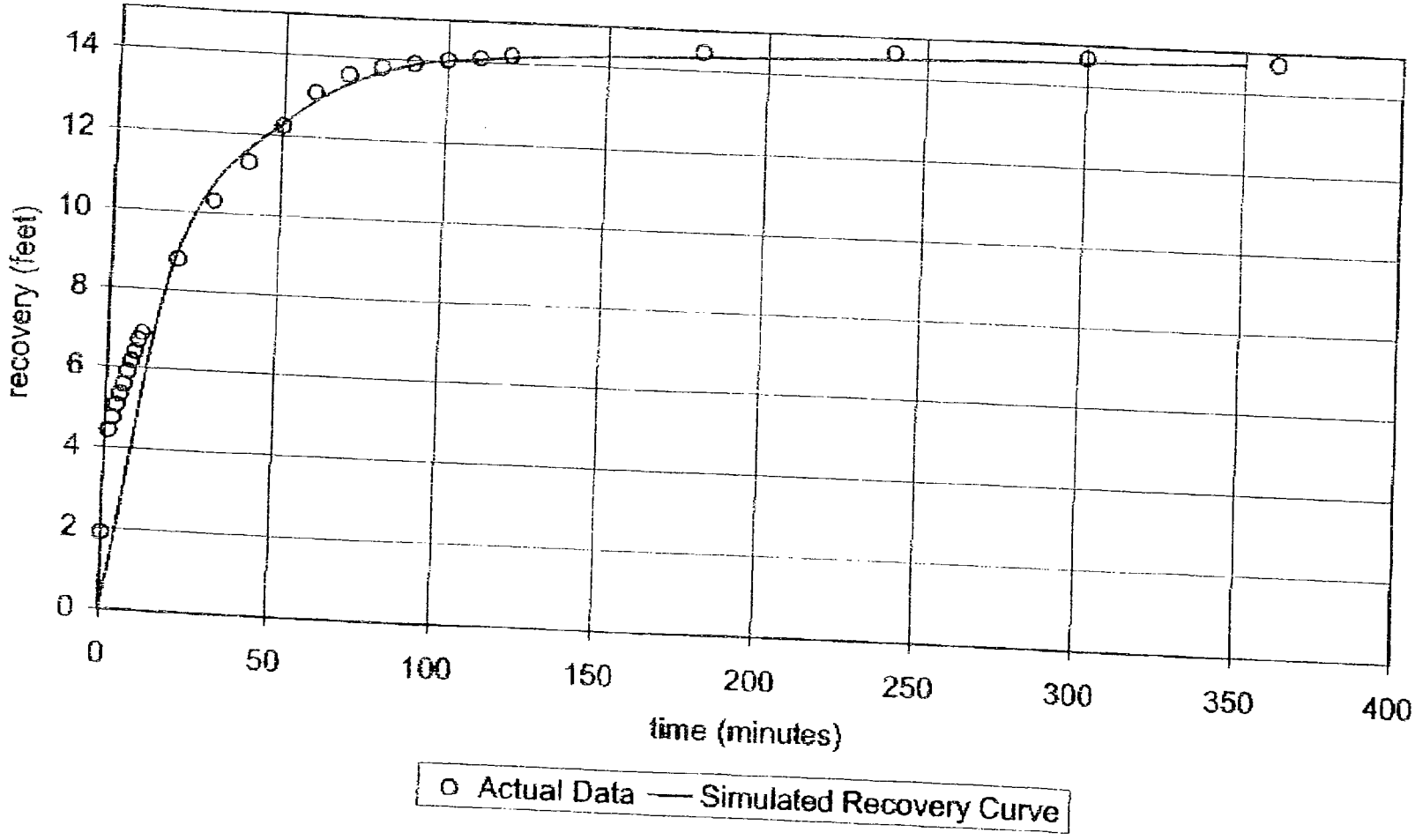
Yours very truly,

WILLIAMSON PETROLEUM CONSULTANTS, INC.

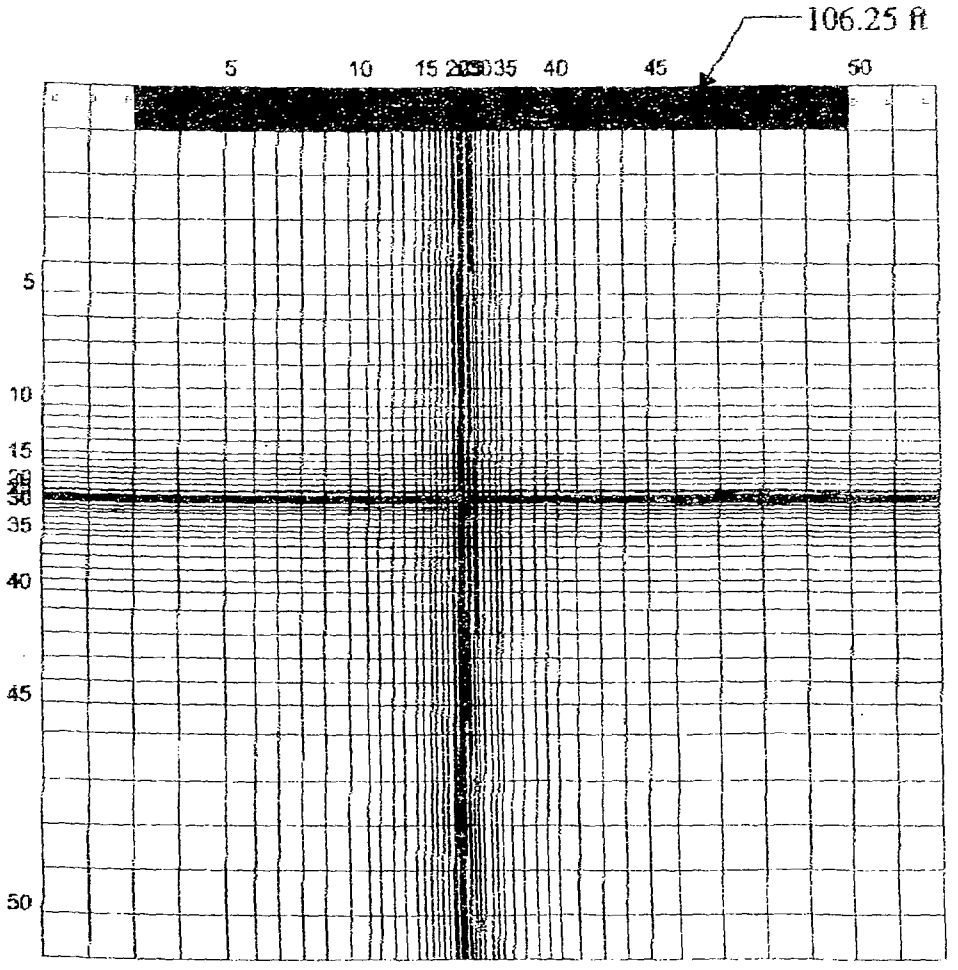
Roy C. Williamson, Jr., P.E.

RCW/thb

Hydrogeologic Pump Test Analysis Results
Recovery @ MW-2
McCasland Ranch, New Mexico



LAYER 1



Legend

Well

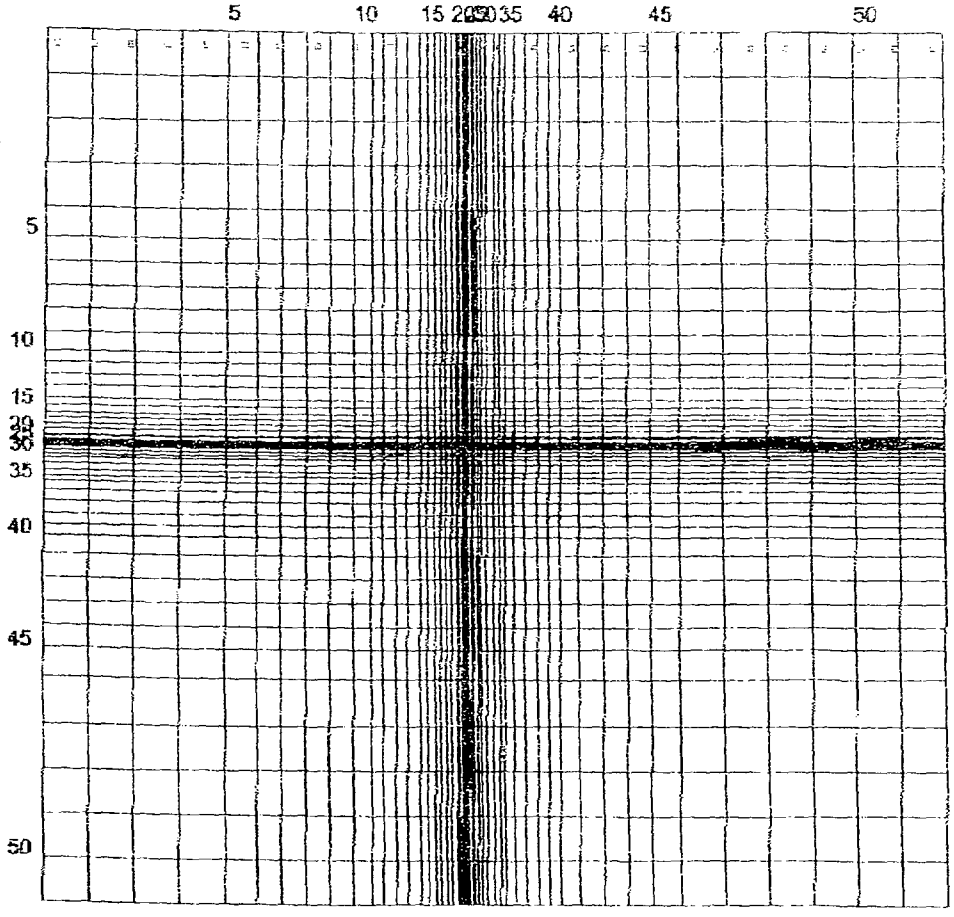
Constant Head

Well

RGE
January 2001

McCasland Ranch
Hydrogeologic Model
Grid Setup

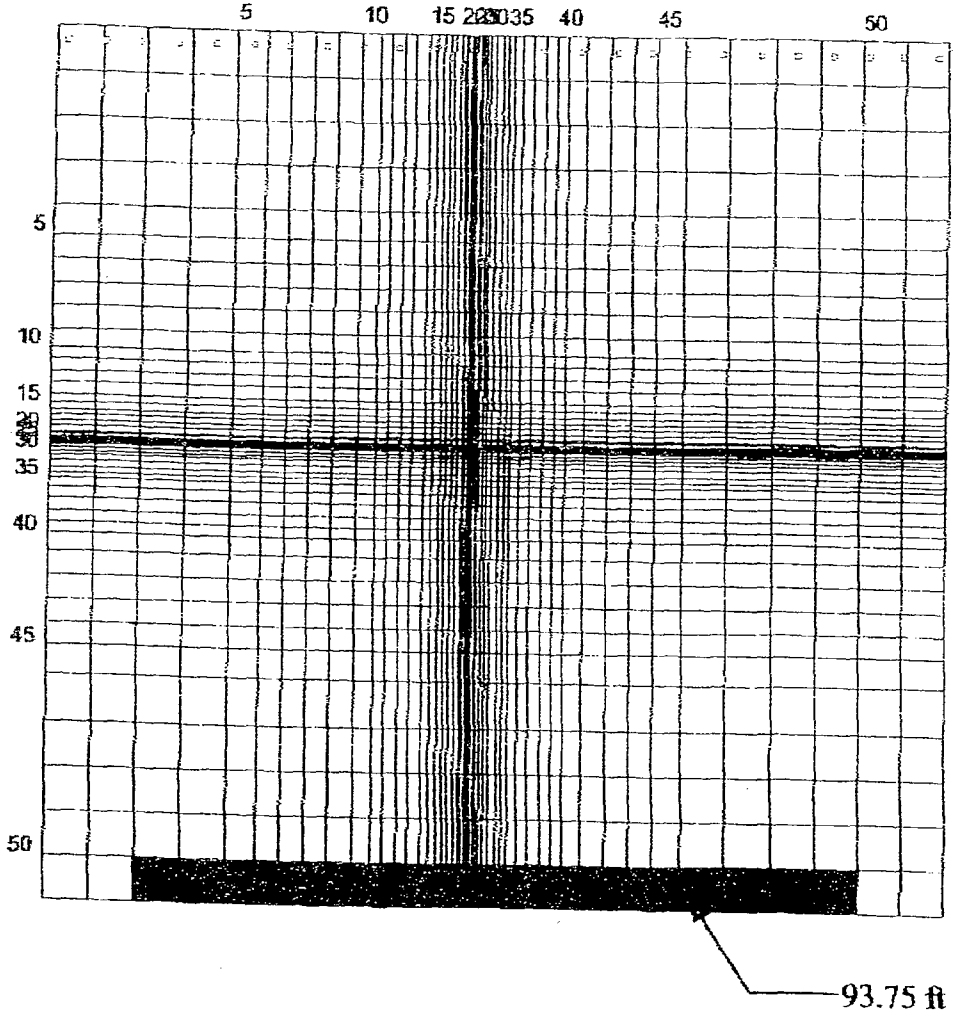
LAYER 2



RGE
January 2001

McCasland Ranch
Hydrogeologic Model
Grid Setup

LAYER 3



RGE
January 2001

McCasland Ranch
Hydrogeologic Model
Grid Setup

MASS BALANCE SUMMARY
MODFLOW MODEL
STEADY-STATE SIMULATION

Type	row	column	layer	segment	reach	flux
Recharge inflow	1	1	1	0	0	0
Recharge outflow	1	1	1	0	0	0
ET inflow	1	1	1	0	0	0
ET outflow	1	1	1	0	0	0
Qz Top inflow	1	1	1	0	0	0
Qz Top outflow	1	1	1	0	0	0
Qz Bottom inflow	1	1	1	0	0	0
Qz Bottom outflow	1	1	1	0	0	7722.883342
Storage inflow	1	1	1	0	0	0
Storage outflow	1	1	1	0	0	0
CH	1	3	1	0	0	876.105225
CH	1	4	1	0	0	451.609467
CH	1	5	1	0	0	289.386444
CH	1	6	1	0	0	227.496033
CH	1	7	1	0	0	225.047638
CH	1	8	1	0	0	223.31279
CH	1	9	1	0	0	222.054932
CH	1	10	1	0	0	165.934616
CH	1	11	1	0	0	110.393799
CH	1	12	1	0	0	110.237068
CH	1	13	1	0	0	110.103745
CH	1	14	1	0	0	109.991165
CH	1	15	1	0	0	82.431702
CH	1	16	1	0	0	54.929096
CH	1	17	1	0	0	54.91082
CH	1	18	1	0	0	54.894466
CH	1	19	1	0	0	54.87999
CH	1	20	1	0	0	41.151672
CH	1	21	1	0	0	27.430897
CH	1	22	1	0	0	21.942623
CH	1	23	1	0	0	16.456085
CH	1	24	1	0	0	10.970258
CH	1	25	1	0	0	8.227457
CH	1	26	1	0	0	10.989638
CH	1	27	1	0	0	16.453827
CH	1	28	1	0	0	21.937325
CH	1	29	1	0	0	27.420027
CH	1	30	1	0	0	27.418411
CH	1	31	1	0	0	41.124977
CH	1	32	1	0	0	54.829426
CH	1	33	1	0	0	54.82658
CH	1	34	1	0	0	54.825317
CH	1	35	1	0	0	54.825623
CH	1	36	1	0	0	82.241951
CH	1	37	1	0	0	109.67083
CH	1	38	1	0	0	109.700806
CH	1	39	1	0	0	109.744171

MASS BALANCE SUMMARY
MODFLOW MODEL
STEADY-STATE SIMULATION

Type	row	column	layer	segment	reach	flux
CH	1	40	1	0	0	109.80162
CH	1	41	1	0	0	164.838348
CH	1	42	1	0	0	220.126007
CH	1	43	1	0	0	220.875156
CH	1	44	1	0	0	221.426437
CH	1	45	1	0	0	278.218262
CH	1	46	1	0	0	421.739838
CH	1	47	1	0	0	431.575287
CH	1	48	1	0	0	452.105621
CH	1	49	1	0	0	876.655029
Total IN	1	1	1	0	0	7723.0487
Total OUT	1	1	1	0	0	7722.883342
Recharge inflow	1	1	1	0	0	0
Recharge outflow	1	1	1	0	0	0
ET inflow	1	1	1	0	0	0
ET outflow	1	1	1	0	0	0
Qz Top inflow	1	1	2	0	0	7722.883342
Qz Top outflow	1	1	2	0	0	0
Qz Bottom inflow	1	1	2	0	0	0
Qz Bottom outflow	1	1	2	0	0	7722.560049
Storage inflow	1	1	2	0	0	0
Storage outflow	1	1	2	0	0	0
Total IN	1	1	2	0	0	7722.883342
Total OUT	1	1	2	0	0	7722.560049
Recharge inflow	1	1	1	0	0	0
Recharge outflow	1	1	1	0	0	0
ET inflow	1	1	1	0	0	0
ET outflow	1	1	1	0	0	0
Qz Top inflow	1	1	3	0	0	7722.560049
Qz Top outflow	1	1	3	0	0	0
Qz Bottom inflow	1	1	3	0	0	0
Qz Bottom outflow	1	1	3	0	0	0
Storage inflow	1	1	3	0	0	0
Storage outflow	1	1	3	0	0	0
CH	51	3	3	0	0	-878.555176
CH	51	4	3	0	0	-451.991302
CH	51	5	3	0	0	-289.445984
CH	51	6	3	0	0	-227.447586
CH	51	7	3	0	0	-224.921738
CH	51	8	3	0	0	-223.115784
CH	51	9	3	0	0	-221.79248
CH	51	10	3	0	0	-165.698471
CH	51	11	3	0	0	-110.219841
CH	51	12	3	0	0	-110.05162
CH	51	13	3	0	0	-109.90802
CH	51	14	3	0	0	-109.78643
CH	51	15	3	0	0	-82.273064

MASS BALANCE SUMMARY
MODFLOW MODEL
STEADY-STATE SIMULATION

Type	row	column	layer	segment	reach	flux
CH	51	16	3	0	0	-54.821316
CH	51	17	3	0	0	-54.801666
CH	51	18	3	0	0	-54.78413
CH	51	19	3	0	0	-54.768635
CH	51	20	3	0	0	-41.067604
CH	51	21	3	0	0	-27.374641
CH	51	22	3	0	0	-21.69772
CH	51	23	3	0	0	-16.422211
CH	51	24	3	0	0	-10.947655
CH	51	25	3	0	0	-8.210497
CH	51	26	3	0	0	-10.947012
CH	51	27	3	0	0	-16.41987
CH	51	28	3	0	0	-21.892019
CH	51	29	3	0	0	-27.363358
CH	51	30	3	0	0	-27.361731
CH	51	31	3	0	0	-41.039967
CH	51	32	3	0	0	-54.716198
CH	51	33	3	0	0	-54.713642
CH	51	34	3	0	0	-54.712841
CH	51	35	3	0	0	-54.713795
CH	51	36	3	0	0	-82.075752
CH	51	37	3	0	0	-109.452827
CH	51	38	3	0	0	-109.487946
CH	51	39	3	0	0	-109.537651
CH	51	40	3	0	0	-109.602608
CH	51	41	3	0	0	-164.556
CH	51	42	3	0	0	-219.783188
CH	51	43	3	0	0	-220.374878
CH	51	44	3	0	0	-221.172775
CH	51	45	3	0	0	-277.971649
CH	51	46	3	0	0	-421.528442
CH	51	47	3	0	0	-431.592529
CH	51	48	3	0	0	-452.436089
CH	51	49	3	0	0	-878.888184
Total IN	1	1	3	0	0	7722.560049
Total OUT	1	1	3	0	0	7722.643522
Grand Total IN	0	0	0	0	0	7723.0487
Grand Total OUT	0	0	0	0	0	7722.643522
Grand Total ERROR	0	0	0	0	0	0.005248

McCasland Ranch
Hydrogeologic Pump Test

MASS BALANCE SUMMARY
MODFLOW MODEL
TRANSIENT SIMULATION

Type	row	column	layer	segment	reach	flux
Recharge inflow	1	1	1	0	0	0
Recharge outflow	1	1	1	0	0	0
ET inflow	1	1	1	0	0	0
ET outflow	1	1	1	0	0	0
Qz Top inflow	1	1	1	0	0	0
Qz Top outflow	1	1	1	0	0	0
Qz Bottom inflow	1	1	1	0	0	0
Qz Bottom outflow	1	1	1	0	0	7670.80385
Storage inflow	1	1	1	0	0	4.854854
Storage outflow	1	1	1	0	0	44.036839
CH	1	3	1	0	0	878.084351
CH	1	4	1	0	0	450.614746
CH	1	5	1	0	0	288.646484
CH	1	6	1	0	0	226.880234
CH	1	7	1	0	0	224.417969
CH	1	8	1	0	0	222.672745
CH	1	9	1	0	0	221.405502
CH	1	10	1	0	0	165.441513
CH	1	11	1	0	0	110.062271
CH	1	12	1	0	0	109.903282
CH	1	13	1	0	0	109.767677
CH	1	14	1	0	0	109.652885
CH	1	15	1	0	0	82.176605
CH	1	16	1	0	0	54.758396
CH	1	17	1	0	0	54.73962
CH	1	18	1	0	0	54.722805
CH	1	19	1	0	0	54.707882
CH	1	20	1	0	0	41.022318
CH	1	21	1	0	0	27.344636
CH	1	22	1	0	0	21.873667
CH	1	23	1	0	0	16.404182
CH	1	24	1	0	0	10.935637
CH	1	25	1	0	0	8.201483
CH	1	26	1	0	0	10.934992
CH	1	27	1	0	0	16.401833
CH	1	28	1	0	0	21.867958
CH	1	29	1	0	0	27.333244
CH	1	30	1	0	0	27.331564
CH	1	31	1	0	0	40.994579
CH	1	32	1	0	0	54.655357
CH	1	33	1	0	0	54.652321
CH	1	34	1	0	0	54.650913
CH	1	35	1	0	0	54.651119
CH	1	36	1	0	0	81.980118
CH	1	37	1	0	0	109.321762
CH	1	38	1	0	0	109.352074
CH	1	39	1	0	0	109.396057

McCasland Ranch
Hydrogeologic Pump Test

MASS BALANCE SUMMARY
MODFLOW MODEL
TRANSIENT SIMULATION

Type	row	column	layer	segment	reach	flux
CH	1	40	1	0	0	109.454437
CH	1	41	1	0	0	164.31987
CH	1	42	1	0	0	219.439667
CH	1	43	1	0	0	219.99498
CH	1	44	1	0	0	220.752579
CH	1	45	1	0	0	277.384766
CH	1	46	1	0	0	420.509338
CH	1	47	1	0	0	430.391632
CH	1	48	1	0	0	451.049683
CH	1	49	1	0	0	878.517212
Well	25	25	1	0	0	0
Total IN	1	1	1	0	0	7714.629698
Total OUT	1	1	1	0	0	7714.640689
Recharge inflow	1	1	1	0	0	0
Recharge outflow	1	1	1	0	0	0
ET inflow	1	1	1	0	0	0
ET outflow	1	1	1	0	0	0
Qz Top inflow	1	1	2	0	0	7670.60385
Qz Top outflow	1	1	2	0	0	0
Qz Bottom inflow	1	1	2	0	0	0
Qz Bottom outflow	1	1	2	0	0	7665.489799
Storage inflow	1	1	2	0	0	16.211513
Storage outflow	1	1	2	0	0	21.451806
Total IN	1	1	2	0	0	7686.815363
Total OUT	1	1	2	0	0	7686.941605
Recharge inflow	1	1	1	0	0	0
Recharge outflow	1	1	1	0	0	0
ET inflow	1	1	1	0	0	0
ET outflow	1	1	1	0	0	0
Qz Top inflow	1	1	3	0	0	7665.489799
Qz Top outflow	1	1	3	0	0	0
Qz Bottom inflow	1	1	3	0	0	0
Qz Bottom outflow	1	1	3	0	0	0
Storage inflow	1	1	3	0	0	38.800561
Storage outflow	1	1	3	0	0	0
CH	51	3	3	0	0	-878.349548
CH	51	4	3	0	0	-450.514282
CH	51	5	3	0	0	-288.491425
CH	51	6	3	0	0	-226.715851
CH	51	7	3	0	0	-224.222872
CH	51	8	3	0	0	-222.450058
CH	51	9	3	0	0	-221.158876
CH	51	10	3	0	0	-165.242188
CH	51	11	3	0	0	-109.923119
CH	51	12	3	0	0	-109.75946
CH	51	13	3	0	0	-109.619606
CH	51	14	3	0	0	-109.500969

McCasland Ranch
Hydrogeologic Pump Test

MASS BALANCE SUMMARY
MODFLOW MODEL
TRANSIENT SIMULATION

Type	row	column	layer	segment	reach	flux
CH	51	15	3	0	0	-82.060417
CH	51	16	3	0	0	-54.679989
CH	51	17	3	0	0	-54.660522
CH	51	18	3	0	0	-54.643082
CH	51	19	3	0	0	-54.62759
CH	51	20	3	0	0	-40.961769
CH	51	21	3	0	0	-27.304029
CH	51	22	3	0	0	-21.84119
CH	51	23	3	0	0	-16.379782
CH	51	24	3	0	0	-10.919352
CH	51	25	3	0	0	-5.18926
CH	51	26	3	0	0	-10.918683
CH	51	27	3	0	0	-16.377344
CH	51	28	3	0	0	-21.835262
CH	51	29	3	0	0	-27.292313
CH	51	30	3	0	0	-27.290585
CH	51	31	3	0	0	-40.93298
CH	51	32	3	0	0	-54.573059
CH	51	33	3	0	0	-54.589904
CH	51	34	3	0	0	-54.56842
CH	51	35	3	0	0	-54.568615
CH	51	36	3	0	0	-81.856415
CH	51	37	3	0	0	-109.157257
CH	51	38	3	0	0	-109.188507
CH	51	39	3	0	0	-109.233887
CH	51	40	3	0	0	-109.294106
CH	51	41	3	0	0	-164.083589
CH	51	42	3	0	0	-219.134613
CH	51	43	3	0	0	-219.704407
CH	51	44	3	0	0	-220.479691
CH	51	45	3	0	0	-277.073395
CH	51	46	3	0	0	-420.118011
CH	51	47	3	0	0	-430.122131
CH	51	48	3	0	0	-450.951385
CH	51	49	3	0	0	-878.81189
Total IN	1	1	3	0	0	7704.29036
Total OUT	1	1	3	0	0	7704.351263
Grand Total IN	0	0	0	0	0	7769.641773
Grand Total OUT	0	0	0	0	0	7769.639908
Grand Total ERROR	0	0	0	0	0	-0.00255

4.0 CONCLUSIONS/RECOMMENDATIONS

1. Based on the recently installed monitoring wells, groundwater flow direction is to the East-Northeast at a gradient of 0.05 ft/ft.

2. Chloride contamination has been identified in MW-3 at 860 ppm.

3. The source of contamination appears to be from the plugged oil/gas well. If the well was not pressure grouted correctly the chloride contamination could migrate up through the well annulus.

4. Additional wells are needed (min 3 to 5) to determine the extent of the chloride plume.

5. The initial pump test served its purpose to help define the characteristics of the aquifer. When designing a pump and treat system, more information is needed. HGS suggest performing another pump test of longer duration (min. 24 hrs) with an observation within 10-feet of the pumping well.

6. To prevent further chloride contamination of the the aquifer, HGS suggests properly abandoning the upper portion of the plugged oil/gas well. The well should be overdrilled using the Air Rotary Casing Hammer (ARCH) method with 9 5/8" drive pipe to a minimum 200 feet and backfilled with grout from the bottom up to assure the a proper seal.

E G D

ESTIMATED COST OF CLEANUP OF GROUNDWATER
McCASLAND RANCH

The McCasland Ranch is approximately 15 minutes south of Hobbs, New Mexico on state road 18. There is oil production throughout the property. The fresh water zone is less than 100 feet from the surface. Water samples taken from various windmills on the property have shown one windmill with elevated levels of inorganic compounds (anions). This particular windmill has been tested several times since March 31,1998. Due to the continued indication of contamination in this area, it has become necessary to develop a program to treat the affected groundwater.

In order to formulate a reasonable cost of cleanup of the groundwater on the McCasland Ranch, three areas must be considered. The first is the elimination of the source of the contamination. The second is the definition of the boundaries of the plume. The final is the treatment of the impacted groundwater. A breakdown of all estimated costs is attached.

The source of the contamination must be eliminated in order to provide the most efficient and cost effective cost of cleanup of the impacted groundwater. Due to the fact that the levels of contamination have not significantly diminished in the last 2 years, it is reasonable to believe that the contamination is ongoing. The impacted groundwater contains elevated levels of both chloride and bromide. This is consistent with an impact from oil field type contamination

The recently placed monitor well, approximately 175 feet up gradient (MW1) from both the windmill and plugged well, had diminished levels of both chloride (100 ppm) and bromide (1 ppm). The monitor well approximately 125 feet down gradient (MW3) from both the windmill and plugged well had elevated levels of both chloride (870 ppm) and bromide (2.8 ppm). This information indicates that the contamination has occurred somewhere between the two monitor wells.

There are three check valves between the large holding tank and bottom of the windmill. These were inspected on November 28, 2000. The windmill pump was removed and the well developed with an electric pump. The water well service operator, Mr. Jay Anthony, inspected the check valves on the windmill pump. In addition, while the pipe was disconnected from the large water holding tank, the valve was opened. No water leaked from the tank. The water level was several feet above the level of the valve. The only other source of contamination between the two monitor wells is the plugged well approximately 50 feet northeast of the windmill. The plugged well is the most likely source of contamination.

In order to formulate a cost for the elimination of the source of the contamination, Maryo Marrs Casing Pullers of Kermit, Texas was contacted. After a description of the problem, a cost for the replugging of the well was formulated. This cost is only an estimate. The costs may increase depending on what is encountered once the well is entered.

Once the source has been eliminated, it would be necessary to delineate the groundwater contamination plume. This could be accomplished with the installation of monitor wells. Because the direction and southwestern boundary of the contamination has already been established, a limited number of monitor wells should be necessary to profile the existing plume. After a discussion with Mr. Bill Whaley CPG of HydroGeologic Services, Inc., an estimate of 3 to 5 additional wells should be sufficient.

Treatment of the groundwater would be accomplished by pumping out the contaminated water and running it through the system. Some or all of the monitor wells could be utilized to extract the groundwater to be treated. After considering several technologies, a reverse osmotic (RO) system was the most cost effective for the removal of the target contaminates.

Once the system had been installed the treatment of the groundwater would occur over several years. The length of time is dependent on the size of the plume, amount of contamination encountered and the mobility of the groundwater. An estimate for the duration of the treatment is between 8 to 10 years.

Additional costs not discussed previously would be the continued sampling and chemical analysis of the water. This analysis would occur before and after treatment on a quarterly basis. Maintenance of the treatment system would occur on an annual basis.

Estimated Cost of Cleanup

Replugging Plugged Well	
Drill Rig, Pulling Unit and hands:	$20,000 to $25,000
Profile groundwater contamination	
3 to 5 monitor wells	$9,500 ea.
pumps and piping	$1,800 ea.
Installation reverse osmosis system	
150 gal/day	$ 3,900
800 gal/day	$ 4,995
3000gal/day	$11,900
Annual maintenance	$ 2,000
Quarterly sampling and analysis	
Sampler, laboratory analysis	$10,000/yr
Total cost of cleanup	Low $153,800 High $213,400

Hall Environmental
Analysis Laboratory

January 12, 2001

Greg Bybee
ECD Environmental
PO Box 9328
Albuquerque, NM 87119
TEL: (505) 768-7686
FAX (505) 768-7601

RE: McCasland Order No.: 0101044

Dear Greg Bybee:

Hall Environmental Analysis Laboratory received 3 samples on 1/9/01 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent.

Detection limits are determined by EPA methodology. No determination of compounds below these (denoted by the ND or < sign) has been made.

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

Sincerely,

Andy Freeman, Senior Project Manager
Nancy McDuffie, Assistant Laboratory Manager

Hall Environmental Analysis Laboratory

Date: 12-Jan-01

CLIENT:	ECD Environmental	Client Sample ID:	MW-1
Lab Order:	0101044	Collection Date:	1/8/01
Project:	McCasland		
Lab ID:	0101044-01	Matrix:	AQUEOUS

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ANIONS BY 300.0		E300				Analyst: SDU
Bromide	1.0	0.50		mg/L	5	1/10/01
Chloride	100	0.50		mg/L	5	1/10/01
Fluoride	ND	0.50		mg/L	5	1/10/01
Nitrate (As N)+Nitrite (As N)	1.8	0.50		mg/L	5	1/10/01
Phosphorus, Dissolved Orthophosphate (As P)	ND	2.5		mg/L	5	1/10/01
Sulfate	69	2.5		mg/L	5	1/10/01
TPH BY 418.1		E418.1				Analyst: JT
Petroleum Hydrocarbons, TR	ND	1.0		mg/L	1	1/11/01

Qualifiers:
- ND - Not Detected at the Reporting Limit
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range

Hall Environmental Analysis Laboratory

Date: *12-Jan-01*

CLIENT: ECD Environmental
Lab Order: 0101044
Project: McCasland
Lab ID: 0101044-02

Client Sample ID: MW-2
Collection Date: 1/8/01
Matrix: AQUEOUS

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ANIONS BY 300.0		E300				Analyst: **SDU**
Bromide	1.0	0.50		mg/L	5	1/10/01
Chloride	130	0.50		mg/L	5	1/10/01
Fluoride	ND	0.50		mg/L	5	1/10/01
Nitrate (As N)+Nitrite (As N)	1.1	0.50		mg/L	5	1/10/01
Phosphorus, Dissolved Orthophosphate (As P)	ND	2.5		mg/L	5	1/10/01
Sulfate	61	2.5		mg/L	5	1/10/01
TPH BY 418.1		E418.1				Analyst: **JT**
Petroleum Hydrocarbons, TR	ND	1.0		mg/L	1	1/11/01

Qualifiers:

ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
* - Value exceeds Maximum Contaminant Level
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range

Hall Environmental Analysis Laboratory

Date: *12-Jan-01*

CLIENT:	ECD Environmental	**Client Sample ID:**	MW-3
Lab Order:	0101044	**Collection Date:**	1/8/01
Project:	McCasland		
Lab ID:	0101044-03	**Matrix:**	AQUEOUS

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ANIONS BY 300.0		E300				Analyst: SDU
Bromide	2.8	0.50		mg/L	5	1/10/01
Chloride	870	10		mg/L	100	1/12/01
Fluoride	ND	0.50		mg/L	5	1/10/01
Nitrate (As N)+Nitrite (As N)	1.0	0.50		mg/L	5	1/10/01
Phosphorus, Dissolved Orthophosphate (As P)	ND	2.5		mg/L	5	1/10/01
Sulfate	95	2.5		mg/L	5	1/10/01
TPH BY 418.1		E418.1				Analyst: JT
Petroleum Hydrocarbons, TR	ND	1.0		mg/L	1	1/11/01

Qualifiers:

ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
+ - Value exceeds Maximum Contaminant Level
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range

SVL ANALYTICAL, INC.
One Government Gulch • P.O. Box 978 • Kellogg, Idaho 83837-0626 • Phone: (208)784-1258 • Fax: (208)783-0891

REPORT OF ANALYTICAL RESULTS

CLIENT : HALL ENVIRONMENTAL
SVL JOB No. : 96636
SVL SAMPLE No.: 253063

CLIENT SAMPLE ID: 0101044-01C
Sample Collected: 1/08/01
Sample Receipt : 1/11/01
Date of Report : 1/12/01
Matrix: WATER

Determination	Result	Units	Dilution	Method	Test Date	Reference
Cation Sum	8.10	meq/L	1		1/11/01	
Calcium	80.4	mg/L	1	6010B	1/11/01	2
Potassium	4.4	mg/L	1	6010B	1/11/01	2
Magnesium	12.7	mg/L	1	6010B	1/11/01	2
Sodium	67.4	mg/L	1	6010B	1/11/01	2
Silver	<0.005	mg/L	1	6010B	1/11/01	2
Arsenic	0.01	mg/L	1	6010B	1/11/01	2
Barium	0.106	mg/L	1	6010B	1/11/01	2
Cadmium	<0.002	mg/L	1	6010B	1/12/01	2
Chromium	<0.006	mg/L	1	6010B	1/12/01	2
Mercury	<0.0004	mg/L	2	7470	1/11/01	2
Lead	<0.005	mg/L	1	6010B	1/12/01	2
Selenium	0.01	mg/L	1	6010B	1/11/01	2

REFERENCES: 1) "Methods for Chemical Analysis of Water and Wastes", EPA-600/4-79-20; 2) "Test Methods for Evaluating Solid Wastes, 3rd Edition", SW 846, 1994; 3) "Standard Methods for the Examination of Water and Wastewater", 18th ED. 1992; 4) ASTM Method; 5) 40 CFR, Part 261

Reviewed By: [signature] Date 1/12/01
1/12/01 11:50

Post-it® Fax Note 7671	Date	# of pages ▶
To STEPHANIE FLORES	From RENEE A	
Co./Dept. HALL ENV.	Co. SVL ANALYTICAL	
Phone #	Phone #	
Fax # (505) 345-4107	Fax #	

SVL ANALYTICAL, INC.
One Government Gulch • P.O. Box 929 • Kellogg, Idaho 83837-0929 • Phone: (208)784-1258 • Fax: (208)783-0891

REPORT OF ANALYTICAL RESULTS

CLIENT : HALL ENVIRONMENTAL
SVL JOB No. : 96636
SVL SAMPLE No.: 253054

CLIENT SAMPLE ID: 0101044-02C
Sample Collected: 1/08/01
Sample Receipt : 1/11/01
Date of Report : 1/12/01
Matrix: WATER

Determination	Result	Units	Dilution	Method	Test Date	Reference
Cation Sum	8.53	meq/L	1		1/11/01	
Calcium	83.4	mg/L	1	6010B	1/11/01	2
Potassium	4.5	mg/L	1	6010B	1/11/01	2
Magnesium	14.2	mg/L	1	6010B	1/11/01	2
Sodium	70.8	mg/L	1	6010B	1/11/01	2
Silver	<0.005	mg/L	1	6010B	1/11/01	2
Arsenic	<0.01	mg/L	1	6010B	1/11/01	2
Barium	0.112	mg/L	1	6010B	1/11/01	2
Cadmium	<0.002	mg/L	1	6010B	1/11/01	2
Chromium	<0.006	mg/L	1	6010B	1/11/01	2
Mercury	<0.0002	mg/L	1	7470	1/11/01	2
Lead	<0.005	mg/L	1	6010B	1/11/01	2
Selenium	<0.01	mg/L	1	6010B	1/11/01	2

REFERENCES: 1) "Methods for Chemical Analysis of Water and Wastes", EPA-600/4-79-020; 2) "Test Methods for Evaluating Solid Wastes, 3rd Edition", SW 846, 1994; 3) "Standard Methods for the Examination of Water and Wastewater", 19th ED. 1995; 4) ASTM Method; 5) 40 CFR, Part 261

Reviewed By: Kristy Gray Date 1/12/01
1/12/01 11:50

SVL ANALYTICAL, INC.

One Government Gulch # P.O. Box 929 # Kellogg, Idaho 83837-0929 # Phone: (208)784-1258 # Fax: (208)783-0691

REPORT OF ANALYTICAL RESULTS

CLIENT : HALL ENVIRONMENTAL

SVL JOB No. : 96636
SVL SAMPLE No.: 253065

CLIENT SAMPLE ID: 0101044-03C
Sample Collected: 1/08/01
Sample Receipt : 1/11/01
Date of Report : 1/12/01

Matrix: WATER

Determination	Result	Units	Dilution	Method	Test Date	Reference
Cation Sum	31.6	meq/L	1		1/14/01	
Calcium	393	mg/L	1	6010B	1/11/01	2
Potassium	9.0	mg/L	1	6010B	1/11/01	2
Magnesium	67.3	mg/L	1	6010B	1/11/01	2
Sodium	143	mg/L	1	6010B	1/11/01	2
Silver	<0.005	mg/L	1	6010B	1/11/01	2
Arsenic	0.02	mg/L	1	6010B	1/11/01	2
Barium	0.532	mg/L	1	6010B	1/11/01	2
Cadmium	<0.002	mg/L	1	6010B	1/11/01	2
Chromium	<0.006	mg/L	1	6010B	1/11/01	2
Mercury	<0.0002	mg/L	1	7470	1/11/01	2
Lead	<0.005	mg/L	1	6010B	1/11/01	2
Selenium	0.02	mg/L	1	6010B	1/11/01	2

REFERENCES: 1) "Methods for Chemical Analysis of Water and Wastes", EPA-600/4-79-20; 2) "Test Methods for Evaluating Solid Wastes, 3rd Edition", SW 846, 1994; 3) "Standard Methods for the Examination of Water and Wastewater", 18th ED. 1992; 4) ASTM Method; 5) 40 CFR, Part 261

Reviewed By: Kelly Gray Date 1/12/01

1/12/01 11:50

SVL ANALYTICAL, INC.

Quality Control Report

Part I Prep Blank and Laboratory Control Sample

Client :HALL ENVIRONMENTAL SVL JOB No. :96636

Analyte	Method	Matrix	Units	Prep Blank	True—LCS—Found		LCS %R	Analysis Date
Silver	6010B	WATER	mg/L	<0.005	1.00	0.984	98.4	1/11/01
Arsenic	6010B	WATER	mg/L	<0.01	1.00	1.01	101.0	1/11/01
Barium	6010B	WATER	mg/L	<0.002	1.00	0.994	99.4	1/11/01
Calcium	6010B	WATER	mg/L	<0.04	20.0	18.9	94.5	1/11/01
Cadmium	6010B	WATER	mg/L	<0.002	1.00	1.00	100.0	1/11/01
Chromium	6010B	WATER	mg/L	<0.006	1.00	1.00	100.0	1/11/01
Potassium	6010B	WATER	mg/L	<1.0	30.0	28.0	93.3	1/11/01
Magnesium	6010B	WATER	mg/L	<0.04	20.0	18.6	93.0	1/11/01
Sodium	6010B	WATER	mg/L	<0.1	20.0	18.1	90.5	1/11/01
Lead	6010B	WATER	mg/L	<0.005	1.00	0.987	98.7	1/11/01
Selenium	6010B	WATER	mg/L	<0.01	1.00	0.97	97.0	1/11/01
Mercury	7470	WATER	mg/L	<0.0002	0.0050	0.0048	96.0	1/11/01

LEGEND:

LCS = Laboratory Control Sample LCS %R = LCS Percent Recovery N/A = Not Applicable

SVL ANALYTICAL, INC. Quality Control Report

Part II Duplicate and Spike Analysis

Client :HALL ENVIRONMENTAL SVL JOB No :96636

Test	Method	Matrix	QC SAMPLE ID Units	Result	Duplicate or MSD Found	RPD%	Matrix Spike Result	SPK ADD		%R	Test Date
Ag	6010B	WATER	1 mg/L	<0.005	<0.005	UDL	1.01	1.00		101.0	1/11/01
As	6010B	WATER	1 mg/L	0.01	0.01	0.0	1.04	1.00		103.0	1/11/01
Ba	6010B	WATER	1 mg/L	0.106	0.113	6.4	1.10	1.00		99.4	1/11/01
Ca	6010B	WATER	1 mg/L	80.4	85.0	5.6	95.9	20.0		77.5	1/11/01
Cd	6010B	WATER	1 mg/L	<0.002	<0.002	UDL	0.998	1.00		99.8	1/12/01
Cr	6010B	WATER	1 mg/L	<0.006	<0.006	UDL	1.01	1.00		101.0	1/12/01
Cu	6010B	WATER	1 mg/L	4.4	4.5	2.2	32.9	30.0		95.0	1/11/01
Mg	6010B	WATER	1 mg/L	12.7	13.4	5.4	30.8	20.0		90.5	1/11/01
Na	6010B	WATER	1 mg/L	67.4	71.0	5.2	83.0	20.0	A	78.0	1/11/01
Pb	6010B	WATER	1 mg/L	<0.005	<0.005	UDL	0.988	1.00		98.8	1/12/01
Se	6010B	WATER	1 mg/L	0.01	<0.01	200.0	1.00	1.00		99.0	1/11/01
Hg	7470	WATER	1 mg/L	<0.0004	<0.0004	UDL	0.0022	0.0020		110.0	1/11/01

LEGEND:

RPD% = ((SAM - DUP)/((SAM + DUP)/2) * 100) UDL = Both SAM & DUP not detected.

RPD% = ((SPK - MSD)/((SPK + MSD)/2) * 100) N in Duplicate/MSD column indicates MSD.

SPIKE ADD column: A = Post Digest Spike; %R = Percent Recovery N/A = Not Analyzed; E > 4S = Result more than 4X the Spike Added

QC Sample is: SVL SAM No.: 253063 Client Sample ID: 0101044-01C

CHAIN-OF-CUSTODY RECORD

HALL ENVIRONMENTAL ANALYSIS LABORATORY
4901 Hawkins NE, Suite A
Albuquerque, New Mexico 87109
Tel. 505.345.3975 Fax 505.345.4107
www.hallenvironmental.com

Client: ECO	Project Name: McCasland
Address: P.O. Box 9338 Alb NM 87119	Project #:
	Project Manager: G. Bykerk
Phone #: 268-2401	Sampler: GB
Fax #: 242-6213	Samples Cold?: ☒ Yes ☐ No

Date	Time	Matrix	Sample I.D. No.	Number/Volume	Preservative: $HgCl_2$	Preservative: HCl	HEAL No.
1/8/01		H_2O	MW-1				0101044-1
"		"	MW-2				-2
"		"	MW-3				-3

ANALYSIS REQUEST

BTEX + MTBE + TMB's (8021)	BTEX + MTBE + TPH (Gasoline Only)	TPH Method 8015B MOD (Gas/Diesel)	TPH (Method 418.1)	Volatiles Full List (8021)	EDB (Method 504.1)	EDC (Method 8021)	8310 (PNA or PAH)	RCRA 8 Metals	Cations (Na, K, Ca, Mg)	Anions ($F, Cl, NO_3, NO_2, PO_4, SO_4$)	8081 Pesticides / PCB's (8082)	8260 (VOA)	8270 (Semi-VOA)	25	Air Bubbles or Headspace (Y or N)
			X					X	X	X				X	
			X					X	X	X				X	
			X					X	X	X				X	

Date: 1/10/1	Time: 5:30	Relinquished By: (Signature)	Received By: (Signature) Jeff Kittle 1/9/01 0830
Date:	Time:	Relinquished By: (Signature)	Received By: (Signature)

Remarks: * 3day TAT if possible

FEB-12-2001(MON) 13:33 HALL ENVIRONMENTAL (FAX)505 345 4107 P.010/023

Hall Environmental Analysis Laboratory

Date: *26-Dec-00*

CLIENT:	ECD Environmental	Client Sample ID:	McCasland Windmill 1st Purge
Lab Order:	0011154	Collection Date:	11/28/00
Project:	McCasland		
Lab ID:	0011154-01	Matrix:	AQUEOUS

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ANIONS BY 300.0		**E300**				Analyst: **SDU**
Bromide	4.9	0.50		mg/L	5	12/1/00
Chloride	1500	20		mg/L	200	12/14/00
Fluoride	ND	0.50		mg/L	5	12/1/00
Nitrogen, Nitrate (As N)	1.8	0.50		mg/L	5	12/1/00
Nitrogen, Nitrite (As N)	ND	2.5		mg/L	5	12/1/00
Phosphorus, Dissolved Orthophosphate (As P)	43	2.5		mg/L	5	12/1/00
Sulfate	100	2.5		mg/L	5	12/1/00

Qualifiers:	ND - Not Detected at the Reporting Limit	S - Spike Recovery outside accepted recovery limits
	J - Analyte detected below quantitation limits	R - RPD outside accepted recovery limits
	B - Analyte detected in the associated Method Blank	E - Value above quantitation range
	* - Value exceeds Maximum Contaminant Level	

Hall Environmental Analysis Laboratory

Date: 26-Dec-00

CLIENT:	ECD Environmental	Client Sample ID:	McCasland Windmill
Lab Order:	0011154	Collection Date:	11/28/00
Project:	McCasland		
Lab ID:	0011154-02	Matrix:	AQUEOUS

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ANIONS BY 300.0		**E300**				**Analyst: SDU**
Bromide	2.9	0.10		mg/L	1	12/1/00
Chloride	1100	5.0		mg/L	50	12/14/00
Fluoride	ND	0.10		mg/L	1	12/1/00
Nitrogen, Nitrate (As N)	1.7	0.10		mg/L	1	12/1/00
Nitrogen, Nitrite (As N)	ND	0.50		mg/L	1	12/1/00
Phosphorus, Dissolved Orthophosphate (As P)	ND	0.50		mg/L	1	12/1/00
Sulfate	88	2.5		mg/L	5	12/14/00

Qualifiers:

ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
* - Value exceeds Maximum Contaminant Level
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range

Hall Environmental Analysis Laboratory

Date: *26-Dec-00*

CLIENT:	ECD Environmental	Client Sample ID:	McCasland Blank
Lab Order:	0011154	Collection Date:	11/28/00
Project:	McCasland		
Lab ID:	0011154-03	Matrix:	AQUEOUS

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ANIONS BY 300.0		E300				Analyst: SDU
Bromide	0.20	0.10		mg/L	1	12/1/00
Chloride	22	0.10		mg/L	1	12/1/00
Fluoride	0.66	0.10		mg/L	1	12/1/00
Nitrogen, Nitrate (As N)	2.0	0.10		mg/L	1	12/1/00
Nitrogen, Nitrite (As N)	ND	0.50		mg/L	1	12/1/00
Phosphorus, Dissolved Orthophosphate (As P)	ND	0.50		mg/L	1	12/1/00
Sulfate	38	0.50		mg/L	1	12/1/00

Qualifiers:	ND - Not Detected at the Reporting Limit	S - Spike Recovery outside accepted recovery limits
	J - Analyte detected below quantitation limits	R - RPD outside accepted recovery limits
	B - Analyte detected in the associated Method Blank	E - Value above quantitation range
	* - Value exceeds Maximum Contaminant Level	

SVL ANALYTICAL, INC.
One Government Gulch ■ P.O. Box 929 ■ Kellogg, Idaho 83837-0929 ■ Phone: (208)784-1258 ■ Fax: (208)783-0891

REPORT OF ANALYTICAL RESULTS

CLIENT : HALL ENVIRONMENTAL
SVL JOB No. : 96370
SVL SAMPLE No.: 250970

CLIENT SAMPLE ID: 0011154-01A
Sample Collected: 11/28/00
Sample Receipt : 12/07/00
Date of Report : 12/15/00
Matrix: WATER

Determination	Result	Units	Dilution	Method	Test Date	Reference
Calcium	692	mg/L	1	6010B	12/13/00	2
Potassium	8.9	mg/L	1	6010B	12/13/00	2
Magnesium	64.6	mg/L	1	6010B	12/13/00	2
Sodium	344	mg/L	1	6010B	12/13/00	2

REFERENCES: 1) "Methods for Chemical Analysis of Water and Wastes", EPA-600/4-79-20; 2) "Test Methods for Evaluating Solid Wastes, 3rd Edition", SW 846, 1994; 3) "Standard Methods for the Examination of Water and Wastewater", 18th ED. 1992; 4) ASTM Method; 5) 40 CFR, Part 261

Reviewed By: Barbara Johnson Date 12/15/00
12/15/00 10:19

SVL ANALYTICAL, INC.
One Government Gulch ■ P.O. Box 929 ■ Kellogg, Idaho 83837-0929 ■ Phone: (208)784-1258 ■ Fax: (208)783-0891

REPORT OF ANALYTICAL RESULTS

CLIENT : HALL ENVIRONMENTAL
SVL JOB No. : 96370
SVL SAMPLE No.: 250971

CLIENT SAMPLE ID: 0011154-02B
Sample Collected: 11/28/00
Sample Receipt : 12/07/00
Date of Report : 12/15/00
Matrix: WATER

Determination	Result	Units	Dilution	Method	Test Date	Reference
Calcium	698	mg/L	1	6010B	12/13/00	2
Potassium	8.5	mg/L	1	6010B	12/13/00	2
Magnesium	62.3	mg/L	1	6010B	12/13/00	2
Sodium	334	mg/L	1	6010B	12/13/00	2
Silver	<0.005	mg/L	1	6010B	12/13/00	2
Arsenic	0.01	mg/L	1	6010B	12/13/00	2
Barium	0.303	mg/L	1	6010B	12/13/00	2
Cadmium	<0.002	mg/L	1	6010B	12/13/00	2
Chromium	<0.006	mg/L	1	6010B	12/13/00	2
Mercury	0.0004	mg/L	2	7470	12/14/00	2
Lead	0.005	mg/L	1	6010B	12/13/00	2
Selenium	0.02	mg/L	1	6010B	12/13/00	2

REFERENCES: 1) "Methods for Chemical Analysis of Water and Wastes", EPA-600/4-79-20; 2) "Test Methods for Evaluating Solid Wastes, 3rd Edition", SW 846, 1994; 3) "Standard Methods for the Examination of Water and Wastewater", 18th ED. 1992; 4) ASTM Method; 5) 40 CFR, Part 261

Reviewed By: _____ Date 12/15/00
12/15/00 13:19

SVL ANALYTICAL, INC.

Quality Control Report

Part I Prep Blank and Laboratory Control Sample

Client :HALL ENVIRONMENTAL SVL JOB No. :96370

Analyte	Method	Matrix	Units	Prep Blank	True——LCS——Found		LCS %R	Analysis Date
Silver	6010B	WATER	mg/L	<0.005	1.00	0.991	99.1	12/13/00
Arsenic	6010B	WATER	mg/L	<0.01	1.00	0.99	99.0	12/13/00
Barium	6010B	WATER	mg/L	<0.002	1.00	0.994	99.4	12/13/00
Calcium	6010B	WATER	mg/L	<0.04	20.0	21.0	105.0	12/13/00
Cadmium	6010B	WATER	mg/L	<0.002	1.00	0.985	98.5	12/13/00
Chromium	6010B	WATER	mg/L	<0.006	1.00	0.997	99.7	12/13/00
Potassium	6010B	WATER	mg/L	<1.0	30.0	30.2	100.7	12/13/00
Magnesium	6010B	WATER	mg/L	<0.04	20.0	19.6	98.0	12/13/00
Sodium	6010B	WATER	mg/L	<0.1	20.0	20.3	101.5	12/13/00
Lead	6010B	WATER	mg/L	<0.005	1.00	0.985	98.5	12/13/00
Selenium	6010B	WATER	mg/L	0.01	1.00	0.93	93.0	12/13/00
Mercury	7470	WATER	mg/L	<0.0002	0.0050	0.0052	104.0	12/14/00

LEGEND:

LCS = Laboratory Control Sample LCS %R = LCS Percent Recovery N/A = Not Applicable

SVL ANALYTICAL, INC. Quality Control Report

Part II Duplicate and Spike Analysis

Client :HALL ENVIRONMENTAL SVL JOB No :96370

Test	Method	Matrix	QC SAMPLE ID Units	Result	Duplicate or MSD Found	RPD%	Matrix Spike Result	SPK ADD	%R	Test Date
Ag	6010B	WATER	1 mg/L	<0.005	<0.005	UDL	1.08	1.00	108.0	12/13/00
As	6010B	WATER	1 mg/L	0.01	0.01	0.0	1.07	1.00	106.0	12/13/00
Ba	6010B	WATER	1 mg/L	0.303	0.309	2.0	1.27	1.00	96.7	12/13/00
Ca	6010B	WATER	1 mg/L	698	594	0.6	694	20.0	R >4S	12/13/00
Cd	6010B	WATER	1 mg/L	<0.002	<0.002	UDL	0.954	1.00	95.4	12/13/00
Cr	6010B	WATER	1 mg/L	<0.006	<0.006	UDL	0.972	1.00	97.2	12/13/00
K	6010B	WATER	1 mg/L	8.5	8.4	1.2	41.0	30.0	108.3	12/13/00
Mg	6010B	WATER	1 mg/L	62.3	61.5	1.3	81.0	20.0	93.5	12/13/00
Na	6010B	WATER	1 mg/L	334	330	1.2	348	20.0	R >4S	12/13/00
Pb	6010B	WATER	1 mg/L	0.005	0.006	18.2	0.971	1.00	96.6	12/13/00
Se	6010B	WATER	1 mg/L	0.02	0.02	0.0	1.05	1.00	103.0	12/13/00
Hg	7470	WATER	1 mg/L	0.0004	<0.0004	200.0	0.0022	0.0020	90.0	12/14/00

LEGEND:

RPD% = (|SAM - DUP|/((SAM + DUP)/2) * 100) UDL = Both SAM & DUP not detected.

RPD% = (|SPK - MSD|/((SPK + MSD)/2) * 100) M in Duplicate/MSD column indicates MSD.

SPIKE ADD column, A = Post Digest Spike; %R = Percent Recovery N/A = Not Analyzed; R > 4S = Result more than 4X the Spike Added

QC Sample 1: SVL SAM No.: 250971 Client Sample ID: 0011154-02B

12/15/00 10:19

96370

Hall Environmental Analysis Labor
4901 Hawkins NE, Suite A
Albuquerque, New Mexico 87109
(505) 345-3975

CHAIN-OF-CUSTODY RECORD

Subcontractor:
SVL
One Government Gulch
Kellogg, ID 83837

TEL: (800) 537-7144
FAX:
Acct #:

06-Dec-00

Sample ID	Matrix	Collection Date	Bottle Type	Ag, Al, Ca, Mg [redacted]	Requested Tests: RCRA 8 Metals					
0011154-01A	Aqueous	11/28/2000	500HDPE	1						
0011154-02B	Aqueous	11/28/2000	250HDPEHNO3	1	1					

Comments: Project Name: McCasland
Please fax results by 12/21/00

	Date/Time		Date/Time
Relinquished by: Stephanie Ukhanov	12/6/00 1525	Received by: C Wilbanks	12/7/00 1:30
Relinquished by:		Received by:	

Hall Environmental Analysis Laboratory

Date: *26-Dec-00*

CLIENT: ECD Environmental
Work Order: 0011154
Project: McCasland

QC SUMMARY REPORT
Method Blank

Sample ID: MB-R304	Batch ID: R304	Test Code: E300	Units: mg/Kg	Analysis Date: 12/14/00	Prep Date:
Client ID:		Run ID: WC_001214A		SeqNo: 5814	

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Bromide	ND	0.30									
Chloride	ND	0.30									
Fluoride	ND	0.30									
Nitrate (As N) + Nitrite (As N)	ND	0									
Nitrogen, Nitrate (As N)	ND	0.30									
Nitrogen, Nitrite (As N)	ND	0.30									
Phosphorus, Dissolved Orthophosphate	ND	1.5									
Sulfate	ND	1.5									

Sample ID: mblk	Batch ID: R235	Test Code: E300	Units: mg/L	Analysis Date: 12/1/00	Prep Date:
Client ID:		Run ID: WC_001201A		SeqNo: 6018	

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Bromide	ND	0.10									
Chloride	ND	0.10									
Fluoride	ND	0.10									
Nitrogen, Nitrate (As N)	ND	0.10									
Nitrogen, Nitrite (As N)	ND	0.50									
Phosphorus, Dissolved Orthophosphate	ND	0.50									
Sulfate	ND	0.50									

Qualifiers: ND - Not Detected at the Reporting Limit; J - Analyte detected below quantitation limits; S - Spike Recovery outside accepted recovery limits; R - RPD outside accepted recovery limits; B - Analyte detected in the associated Method Blank

Hall Environmental Analysis Laboratory

Date: 26-Dec-00

CLIENT: ECD Environmental
Work Order: 0011154
Project: McCasland

QC SUMMARY REPORT
Laboratory Control Spike - generic

Sample ID: LCS-R304	Batch ID: R304	Test Code: E300	Units: mg/Kg	Analysis Date: 12/14/00	Prep Date:
Client ID:		Run ID: WC_001214A		SeqNo: 5815	

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Bromide	2.98	0.30	3	0	99.3	85	115	0			
Chloride	5.769	0.30	6	0	96.2	85	115	0			
Fluoride	0.623	0.30	0.6	0	104	85	115	0			
Nitrogen, Nitrate (As N)	3.016	0.30	3	0	101	85	115	0			
Nitrogen, Nitrite (As N)	1.165	0.30	1.2	0	97.1	85	115	0			
Phosphorus, Dissolved Orthophosphate	5.616	1.5	6	0	93.6	85	115	0			
Sulfate	11.52	1.5	12	0	96.0	85	115	0			

Sample ID: lcsd	Batch ID: R304	Test Code: E300	Units: mg/Kg	Analysis Date: 12/14/00	Prep Date:
Client ID:		Run ID: WC_001214A		SeqNo: 5819	

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Bromide	2.904	0.30	3	0	96.8	85	115	2.98	2.58	15	
Chloride	5.655	0.30	6	0	94.3	85	115	5.769	2.00	15	
Fluoride	0.609	0.30	0.6	0	102	85	115	0.623	2.27	15	
Nitrogen, Nitrate (As N)	2.95	0.30	3	0	98.3	85	115	3.016	2.21	15	
Nitrogen, Nitrite (As N)	1.14	0.30	1.2	0	95.0	85	115	1.165	2.17	15	
Phosphorus, Dissolved Orthophosphate	5.503	1.5	6	0	91.7	85	115	5.616	2.03	15	
Sulfate	11.26	1.5	12	0	93.8	85	115	11.52	2.34	15	

Sample ID: lcs	Batch ID: R335	Test Code: E300	Units: mg/L	Analysis Date: 12/1/00	Prep Date:
Client ID:		Run ID: WC_001201A		SeqNo: 6619	

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Nitrate (As N)	2.919	0.10	3	0	97.3	85	115	0			
Sulfate	11.43	0.50	12	0	95.2	85	115	0			

Qualifiers:
ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
B - Analyte detected in the associated Method Blank

CLIENT: ECD Environmental
Work Order: 0011154
Project: McCasland

QC SUMMARY REPORT
Laboratory Control Spike Duplicate

Sample ID: lcsd | Batch ID: R235 | Test Code: E300 | Units: mg/L | Analysis Date: 12/1/00 | Prep Date:
Client ID: | Run ID: WC_001201A | SeqNo: 6625

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Nitrate (As N)	2.964	0.10	3	0	98.8	85	115	0			
Sulfate	11.63	0.50	12	0	97.0	85	115	0			

Qualifiers:
ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
B - Analyte detected in the associated Method Blank

CHAIN-OF-CUSTODY RECORD

HALL ENVIRONMENTAL ANALYSIS LABORATORY
5121 69th St., Suite A-7
Lubbock, TX 79424
(806) 798-9882 • Fax (806) 798-8434

Client: ECO	Project Name: McCasland
Address: P.O. Box 9328 Alb., NM 87119	Project #:
	Project Manager:
Phone #: (505) 268-2401	Sampler: GB
Fax #: 242-6213	Samples Cold?: ☒ Yes ☐ No

Date	Time	Matrix	Sample I.D. No.	Number/Volume	Preservative	HEAL No.
11/28/00		HO	McCasland Windmill	1st Purge		0011154-1
			McCasland Windmill			-2
			McCasland Blank			-3

ANALYSIS REQUEST

BTEX + MTBE (602/8020)	BTEX + MTBE + TPH (Gasoline Only)	TPH Method 8015 MOD (Gas/Diesel)	TPH (Method 418.1)	8010/8020 Volatiles	EDB (Method 504)	EDC (Method 8010)	9310 (PNA or PAH)	RCRA 8 Metals	Cations (Na, K, Ca, Mg)	Anions (F, Cl, NO_3, NO_2, PO_4, SO_4)	8081/8082 Pesticides/PCB's	8260 (VOA)	8270 (Semi-VOA)	TPH (TNRCC-TX Method 1005)	Bc		Air Bubbles or Headspace (Y or N)
									X	X					X		
								X	X	X					X		
										X					X		

Date: 11/30/00 Time: 4:30 Relinquished By: (Signature)
Received By: (Signature) 11/30
Date: Time: Relinquished By: (Signature)
Received By: (Signature)

Remarks

PPH-10440

Hall Environmental Analysis Laboratory

Hall Environmental Analysis Laboratory
4901 Hawkins NE. Ste. A
Albuquerque, NM 87109

8/16/99

ECD Environmental
P. O Box 9328
Albuquerque, NM 87119

Dear Mr. Greg Bybee:

Enclosed are the results for the analyses that were requested. These were done according to EPA procedures or equivalent

Detection limits are determined by EPA methodology. No determination of compounds below these (denoted by the ND or < sign) has been made.

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

Sincerely:

Scott Hallenbeck
Laboratory Manager

Project: 9901105/McCausland

Hall Environmental Analysis Laboratory

Client:	ECD Environmental	**Date Collected:**	8/16/99
Project:	McCasland	**Date Received:**	8/17/99
Project Manager:	Greg Bybee	**Sample Matrix:**	Aqueous
Project Number:	-	**Date Extracted:**	NA

EPA Method - 8021

Units: PPB ug/L

HEAL LAB ID	Sample ID	MTBE	Benzene	Toluene	Ethyl-benzene	Total Xylenes	1,3,5-TMB	1,2,4-TMB	BFB % Recovery	Dilution Factor	Date Analyzed
9908063-2	Mewbourne Oil Co MW	ND	ND	ND	ND	ND	ND	ND	103	1	8/18/99
Reag. Blk.	-	ND	ND	ND	ND	ND	ND	ND	95	1	8/18/99

MRL	2.5	0.5	0.5	0.5	0.5	0.5	0.5

Hall Environmental Analysis Laboratory

Client:	BCD Environmental	**Date Collected:**	NA
Project:	McCasland	**Date Received:**	NA
Project Manager:	Greg Bybee	**Sample Matrix:**	Aqueous
Project Number:	-	**Date Extracted:**	NA

8021 QC: BS/BSD 8/16

Compound	Sample Amount (ug/L)	Spike	Recovery	% Rec	Dup	% Dup	RPD
MTBE	<2.5	40.0	44.0	110	42.6	107	3
Benzene	<0.5	20.0	20.6	103	20.8	104	1
Toluene	<0.5	20.0	20.3	103	20.2	101	1
Ethylbenzene	<0.5	20.0	20.7	104	20.3	102	2
Total Xylenes	<0.5	60.0	61.5	103	61.1	102	1
1,3,5 TMB	<0.5	20.0	20.6	104	20.4	102	2
1,2,4-TMB	<0.5	20.0	20.6	103	20.6	103	0

Hall Environmental Analysis Laboratory

Client:	ECD Environmental	Date Collected:	8/18/99
Project:	McCasland	Date Received:	8/17/99
Project Manager:	Greg Bybee	Sample Matrix:	Aqueous
Project Number:	-	Extraction Date:	8/20/99

EPA Method - 418.1

HEAL ID	Client ID	Dilution	TPH (mg/L)	Analysis Date
9908083-1	McCasland Water Well	1	ND	8/20/99
9908083-2	Mewbourne Oil Co MW	1	ND	8/20/99
Extraction Blank	-	1	ND	8/20/99

QA/QC		MRL	1.0	
Sample ID:	Sample Amount	Spike	Recovery	% Recovery
Blank Spike 8/20	<1.0	5.0	4.5	90
Sample ID:	Sample Amount	Duplicate	RPD	
Blank Duplicate 8/11	<1.0	<1.0	NA	

Hall Environmental
Analysis Laboratory

Client: EOD Environmental
Project: McCasland
Project Manager: Greg Bybee
Project Number: -

Date Collected: 8/16/99
Date Received: 8/17/99
Sample Matrix: Aqueous

Inorganic Compounds

HEAL LAB ID	Sample ID	Floride (mg/L)	Chloride (mg/L)	Bromide (mg/L)	Nitrite (mg/L)	Nitrate (mg/L)	Sulfate (mg/L)	o-Phosphate P (mg/L)
9908063-1	McCasland Water Well	0.2	720	2.4	ND	1.4	77	ND
9908063-2	Mewbourne Oil Co NW	0.3	120	1.2	ND	3.3	79	ND
Detection Limits		0.1	0.1	0.1	0.1	0.1	0.5	0.5
Method		300.0	300.0	300.0	300.0	300.0	300.0	300.0
Date Analyzed		8/17/99	8/23/99	8/17/99	8/17/99	8/17/99	8/17,23/99	8/17/99

ENERGY LABORATORIES, INC.
P.O. BOX 30916 • 1120 SOUTH 27TH STREET • BILLINGS, MT 59107-0916 • PHONE (406) 252-6325
FAX (406) 252-6069 • 1-800-735-4489 • E-MAIL: all@energylab.com

LABORATORY ANALYSIS REPORT

Hall Environmental Laboratory	Project ID:	MCCASLAND PROJ. #9908063		
Nancy McDuffie	Sample ID:	WATER WELL		
4901 Hawkins NE	Laboratory ID:	99-56021-1		
Suite A	Sample Matrix:	Water		
Albuquerque, NM 87109	Sample Date:	16-Aug-99		
	Received at lab:	20-Aug-99	Reported:	26-Aug-99

	Results	Units	Qual	Reporting Limit	Regulatory Limit	Method	Analyzed	
Calcium	308	mg/l		1		EPA 200.7	25-Aug-99 1533	RLH
Magnesium	38	mg/l		1		EPA 200.7	25-Aug-99 1533	RLH
Potassium	6	mg/l		1		EPA 200.7	25-Aug-99 1533	RLH
Sodium	188	mg/l		1		EPA 200.7	25-Aug-99 1533	RLH

ENERGY LABORATORIES, INC.
P.O. BOX 30916 • 1120 SOUTH 27TH STREET • BILLINGS, MT 59107-0916 • PHONE (406) 252-6325
FAX (406) 252-6069 • 1-800-735-4489 • E-MAIL all@energylab.com

LABORATORY ANALYSIS REPORT

Hall Environmental Laboratory	Project ID:	MCCASLAND TROJ. #9908603	
Nancy McDuffie	Sample ID:	MEWBOURNE OIL CO MW	
4901 Hawkins NE	Laboratory ID:	99-56021-2	
Suite A	Sample Matrix:	Water	
Albuquerque, NM 87109	Sample Date:	16-Aug-99	
	Received at lab:	20-Aug-99	Reported: 26-Aug-99

	Results	Units	Qual	Reporting Limit	Regulatory Limit	Method	Analyzed	
Calcium	88	mg/l		1		EPA 200.7	25-Aug-99 1535	RLH
Magnesium	16	mg/l		1		EPA 200.7	25-Aug-99 1535	RLH
Potassium	4	mg/l		1		EPA 200.7	25-Aug-99 1535	RLH
Sodium	81	mg/l		1		EPA 200.7	25-Aug-99 1535	RLH

Lab Nos. 99-56021-1

QUALITY ASSURANCE DATA PACKAGE

This report includes the results of quality assurance tests performed with the sample analyses. They are performed to determine if the methodology is in control and to monitor the laboratory's ability to produce accurate and precise results.

Constituents	Duplicate Analysis, mg/l (ppm) Original	Duplicate Analysis, mg/l (ppm) Duplicate	Spiked Analysis, % Recovery	Blank Analysis, mg/l (ppm)	Calibration Verification Sample Analysis, mg/l (ppm)	Calibration Verification Acceptance Range, mg/l (ppm)	Date Analyzed
Calcium	59	59	102	<1	51	45-55	08/25/99
Magnesium	37	37	104	<1	52	45-55	08/25/99
Potassium	13	13	104	<1	52	45-55	08/25/99
Sodium	829	824	101	<1	53	45-55	08/25/99

CHAIN-OF-CUSTODY RECORD

HALL ENVIRONMENTAL ANALYSIS LABORATORY
4901 Hawkins NE, Suite A
Albuquerque, New Mexico 87109
Tel. 505.345.3975 Fax 505.345.4107
www.hallenvironmental.com

Client: ECD Environmental

Address: P.O. Box 9328
Alb. NM
87119

Phone #: 268-2401

Fax #: 842-6213

Project Name: McCasland

Project #:

Project Manager:

Sampler: ES

Samples Cold?: ☒ Yes ☐ No

Date	Time	Matrix	Sample I.D. No.	Number/Volume	Preservative $HgCl_2$	Preservative HCl	HEAL No.
8/16/99		H_2O	McCasland water well				9908063-1
"		"	Mayboune? Dr. MW				2

ANALYSIS REQUEST

HEAL No.	BTEX + MTBE + TMB's (8021)	BTEX + MTBE + TPH (Gasoline Only)	TPH Method 8015B MOD (Gas/Diesel)	TPH (Method 418.1)	Volatiles Full List (8021)	EDB (Method 504.1)	EDC (Method 8021)	8310 (PNA or PAH)	RCRA 8 Metals	Cations (Na, K, Ca, Mg)	Anions (F, Cl, NO_3, NO_2, PO_4, SO_4)	8081 Pesticides / PCB's (8082)	8260 (VOA)	8270 (Semi-VOA)	BC		Air Bubbles or Headspace (Y or N)
9908063-1				X						X	X				X		
2	X			X						X	X				X		

Date: 8/17/99 Time: Relinquished By: (Signature) [signature] Received By: (Signature) [signature] 8/17

Date: Time: Relinquished By: (Signature) Received By: (Signature)

Remarks:

CHAIN-OF-CUSTODY RECORD

HALL ENVIRONMENTAL ANALYSIS LABORATORY
4901 Hawkins NE, Suite A
Albuquerque, New Mexico 87109
Tel. 505.345.3975 Fax 505.345.4107
www.hallenvironmental.com

H115Vfd Ex/no sub

Client:
Address: SEE RIGHT
Phone #:
Fax #:

Project Name: McCasland
Project #: 9908063
Project Manager: G. McDuff
Sampler:
Samples Cold?: ☒ Yes ☐ No

ANALYSIS REQUEST

Date	Time	Matrix	Sample I.D. No.	Number/Volume	Preservative: $HgCl_2$	Preservative: HCl	Preservative: None	HEAL No.	BTEX + MTBE + TMB's (8021)	BTEX + MTBE + TPH (Gasoline Only)	TPH Method 8015B MOD (Gas/Diesel)	TPH (Method 418.1)	Volatiles Full List (8021)	EDB (Method 504.1)	EDC (Method 8021)	8310 (PNA or PAH)	RCRA 8 Metals	Cations (Na, K, Ca, Mg)	Anions (F, Cl, NO_3, NO_2, PO_4, SO_4)	8081 Pesticides / PCB's (8082)	8260 (VOA)	8270 (Semi-VOA)			Air Bubbles or Headspace (Y or N)
8/16/99		Aq	McCasland Water Well	1 - 500ml			X	001-99-56021										X							
↓		↓	Melbourne Oil Co MW	1-1L			X	002 ↓										X							

Date: 8/19/99 Time: 2:40 Relinquished By: (Signature) [signature]
Received By: (Signature)

Date: Time: Relinquished By: (Signature)
Received By: (Signature) Krystal Simms 08/20/99 @ 1155

Remarks:

Hall Environmental
Analysis Laboratory

September 3, 1999

Hall Environmental Analysis Laboratory
4901 Hawkins NE, Ste. A
Albuquerque, NM 87109

ECD Environmental
P. O. Box 9328
Albuquerque, NM 87119

Dear Mr. Bybee:

Enclosed are the results for the analyses that were requested. These were done according to EPA procedures or equivalent.

Detection limits are determined by EPA methodology. No determination of compounds below these (denoted by the ND or < sign) has been made.

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

Sincerely,

Andy Freeman
Assistant Laboratory Manager

Project: 9908063/McCasland

Hall Environmental Analysis Laboratory

Client:	ECD Environmental	**Date Collected:**	1/25/99
Project:	McCausland	**Date Received:**	1/28/99
Project Manager:	Greg Bybee	**Sample Matrix:**	Aqueous
Project Number:	-	**Date Extracted:**	NA

EPA Method - 8021

Units: PPB(ug/L)

HEAL LAB ID	Sample ID	Benzene	Toluene	Ethyl benzene	Total Xylenes	BFB % Recovery	Dilution Factor	Date Analyzed
9901105-1	#1 Windmill	ND	ND	ND	ND	94	2	1/28/99
9901105-2	#2 Windmill	ND	ND	ND	ND	100	1	1/28/99
Reag. Blk.	-	ND	ND	ND	ND	98	1	1/28/99

MRL	0.5	0.5	0.5	0.5

Hall Environmental
Analysis Laboratory

Client:	ECD Environmental	**Date Collected:**	1/25/99
Project:	McCausland	**Date Received:**	1/28/99
Project Manager:	Greg Bybee	**Sample Matrix:**	Aqueous
Project Number:	-		

Inorganic Compounds

HEAL LAB ID	Sample ID	Floride (mg/L)	Chloride (mg/L)	Nitrite-N (mg/L)	Bromide (mg/L)	Nitrate-N (mg/L)	Sulfate (mg/L)	o-Phosphate-P (mg/L)
9901105-1	#1 Windmill	<0.5	5,000	*<0.5	12	*<0.5	110	<2.5
9812121-2	#2 Windmill	1.0	87	*ND	0.8	*3.3	110	ND
Detection Limits		0.1	0.1	0.1	0.1	0.1	0.5	0.5
Method		300.0	300.0	300.0	300.0	300.0	300.0	300.0
Date Analyzed		1/28/99	1/29/99	1/28/99	1/28/99	1/28/99	1/28/99	1/28/99

***Sample run outside of the EPA holding time of 48 hours.**

CARDINAL LABORATORIES

PHONE (915) 673-7001 • 2111 BEECHWOOD • ABILENE, TX 79603
PHONE (505) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240

ANALYTICAL RESULTS FOR
MEWBOURNE OIL CO.
ATTN: ROSS MURPHY
P.O. BOX 5270
HOBBS, NM 88241
FAX TO:

Receiving Date: 03/31/98
Reporting Date: 04/03/98
Project Number: NOT GIVEN
Project Name: NOT GIVEN
Project Location: NOT GIVEN

Sampling Date: 03/31/98
Sample Type: GROUNDWATER
Sample Condition: COOL & INTACT
Sample Received By: GP
Analyzed By: AH

LAB NUMBER	SAMPLE ID	Na (mg/L)	Ca (mg/L)	Mg (mg/L)	K (mg/L)	Conductivity (umhos/cm)	NO3 (mg/L)
ANALYSIS DATE:		4/2/98	4/1/98	4/1/98	4/1/98	4/1/98	4/1/98
H3543-1	D-K WINDMILL	285	700	90	7.4	6410	3.00
Quality Control		NR	50	50	NR	1445	5.07
True Value QC		NR	50	50	NR	1413	5.00
% Accuracy		NR	100	100	NR	102	101
Relative Percent Difference		NR	8.0	4.0	NR	0.3	0.2
METHODS:			SM3500-Ca-D	3500-Mg E	3048	120.1	353.2

LAB NUMBER	SAMPLE ID	Cl (mg/L)	SO_4 (mg/L)	CO_3 (mg/L)	HCO_3 (mg/L)	pH (s.u.)	TDS (mg/L)
ANALYSIS DATE:		4/3/98	4/1/98	4/1/98	4/1/98	4/1/98	4/2/98
H3543-1	D-K WINDMILL	1771	108	0	171	7.23	4113
Quality Control		498	100	NR	NR	6.86	NR
True Value QC		500	100	NR	NR	7.00	NR
% Accuracy		99.6	100	NR	NR	99.3	NR
Relative Percent Difference		3.4	5.0	NR	NR	0.7	9.3
METHODS:		SM4500-Cl-B	375.4	310.1	310.1	150.1	160.1

Apr 1998 Received Hobbs OCD

Gayle A. Potter, Chemist

04/03/98
Date

McCASLAND RANCH INITIAL SITE & GROUNDWATER INVESTIGATION
HOBBS, NEW MEXICO

January, 2001

Prepared For:

McCasland Ranch

Prepared By:

HydroGeologic Services, Inc.
8600 Beverly Hills NE
Albuquerque, New Mexico 87122
505-856-6498

TABLE OF CONTENTS

1.0 INTRODUCTION

This report identifies the geologic field investigation which was performed for the McCasland Ranch. High levels of chloride, bromide and conductivity have been identified in the water trough and windmill well which the livestock drink from which lead to this investigation. The apparent source of the chloride contamination is from an abandoned oil/gas well which is located approximately 40 feet from the windmill well.

The site is located approximately 10 miles south of Hobbs, New Mexico to the east of State Highway 18 (mile marker 41) in Township 20 South, Range 39 East, Section 30. Open space, ranching and oil/gas operations are principle of the land in the immediate area. Vegetation is sparse in the site vicinity and consists of mesquite covered dunes (5 to 15 feet high) and yucca plants. The climate at the site area is characterized by low precipitation, a rapid rate of evaporation, and a high annual temperature and can be classified as semi-arid conditions.

2.0 FIELD INVESTIGATION

A field investigation was performed at the McCasland Ranch to help confirm the source and identify the extent of the chloride groundwater contamination. The investigation consisted of mobilizing a Speedstar 30K air/mud rotary drill rig with a 900cfm/350 psi compressor to the site. Three soil borings were advance to approximately 100 feet below surface grade each using the air rotary drilling method and converted into groundwater monitoring wells which the locations can be identified in the Site Plan (Figure 1). While the soil borings were being advanced to determine the subsurface conditions, soil samples were collected every 10 feet or change in lithology and recorded by a Certified Professional Geologist. The monitor wells were installed in a triangular formation around the plugged oil/gas well to help determine the site specific groundwater flow direction (Figure 2) and help determine the extent of the contamination.

The three soil borings were very similar in lithologies as can be viewed in Figures 4, 5, & 6. Soil boring MW-1 consisted of a silty sand layer (SM) from surface to 5 feet, a red brown clay layer (CL) from 5 feet to 14 feet, a caliche layer (SC/CL) with varying colors from 14 feet to 75 feet, a silty sand with fine gravels layer from 75 feet to 92.5 feet (water bearing zone), and a red clay layer (red bed) at 92.5 feet to total depth of 96 feet. Soil boring MW-2 consisted of a silty sand layer from surface to 6 feet, a brown clay layer from 6 feet to 17 feet, a caliche layer with varying colors from 17 feet to 80.5 feet, a sand with silt layer from 80.5 feet to 98.5 feet (water bearing), and a red clay layer from 98.5 feet to total depth of 101 feet. Soil boring MW-3 consisted of sand with silt layer from surface to 7 feet, a red-brown clay layer from 5 feet to 19 feet, a caliche layer from 19 feet to 81 feet, a sand with silt layer from 81 feet to 92 (water bearing) and a red clay layer from 92 feet to total depth.

Each soil boring was converted into a groundwater monitoring well which consisted of 4-inch Schedule 40, flush threaded PVC blank casing with 20 feet of 0.020 inch factory slotted screen. Clean 10/20 graded silica sand was installed by tremie method around the screen to approximately 2 feet above the screen overlain by a minimum 4-foot bentonite seal hydrated with potable water every two feet. A bentonite grout seal was installed by the tremie method from the bentonite seal to surface. A 6-inch diameter by 5-foot long steel protective casing with locking cap was installed surrounded by a 2' x 2' x 4" concrete pad to complete the well. Each well was developed by bailing a minimum three well volumes prior to installing temporary pumps to further develop the wells until clear of sediment.

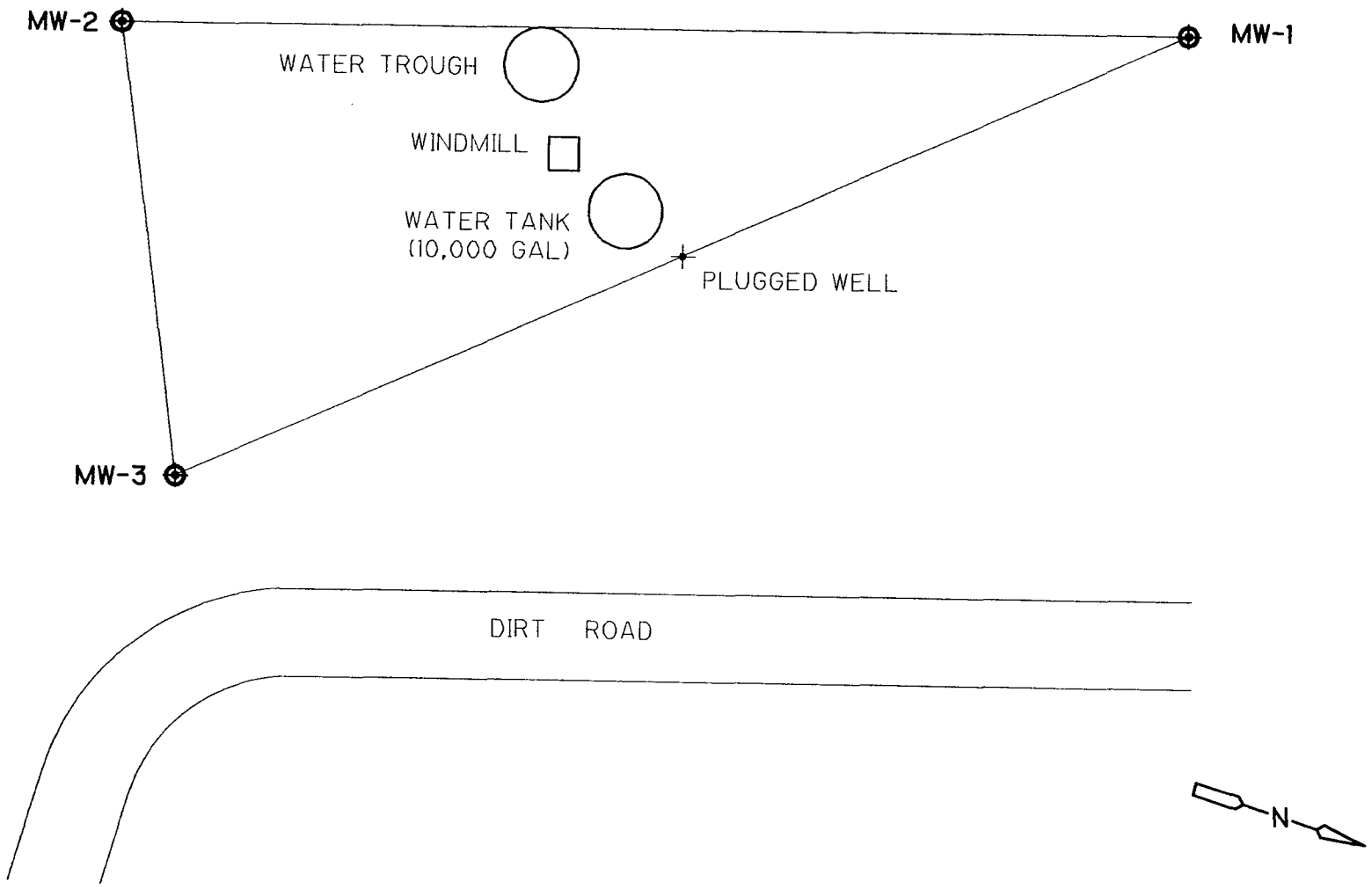
Each well was surveyed with a transit and rod to determine the top of casing (TOC) and groundwater elevations to the nearest 0.01 of a foot. Specifics of each well are as follows:

Monitor Well #	Top of Casing Elevation (FT)	Depth to Water from TOC (FT)	Groundwater Elevation (FT)
MW-1	99	78.81	20.19
MW-2	100	77.23	22.77
MW-3	98.5	81.72	16.78

Groundwater at the site appears to be flowing to the east-northeast direction with a gradient of 0.05 ft/ft. (Figure 2).

After well development, the wells were sampled for chloride concentrations , bromide, pH, and conductivity. The results are as follows:

Monitor Well #	Chloride ppm	Bromide ppm	pH	Conductivity
MW-1	100	1	7.04	796
MW-2	130	1	7.4	1109
MW-3	860	2.8	8.32	4520

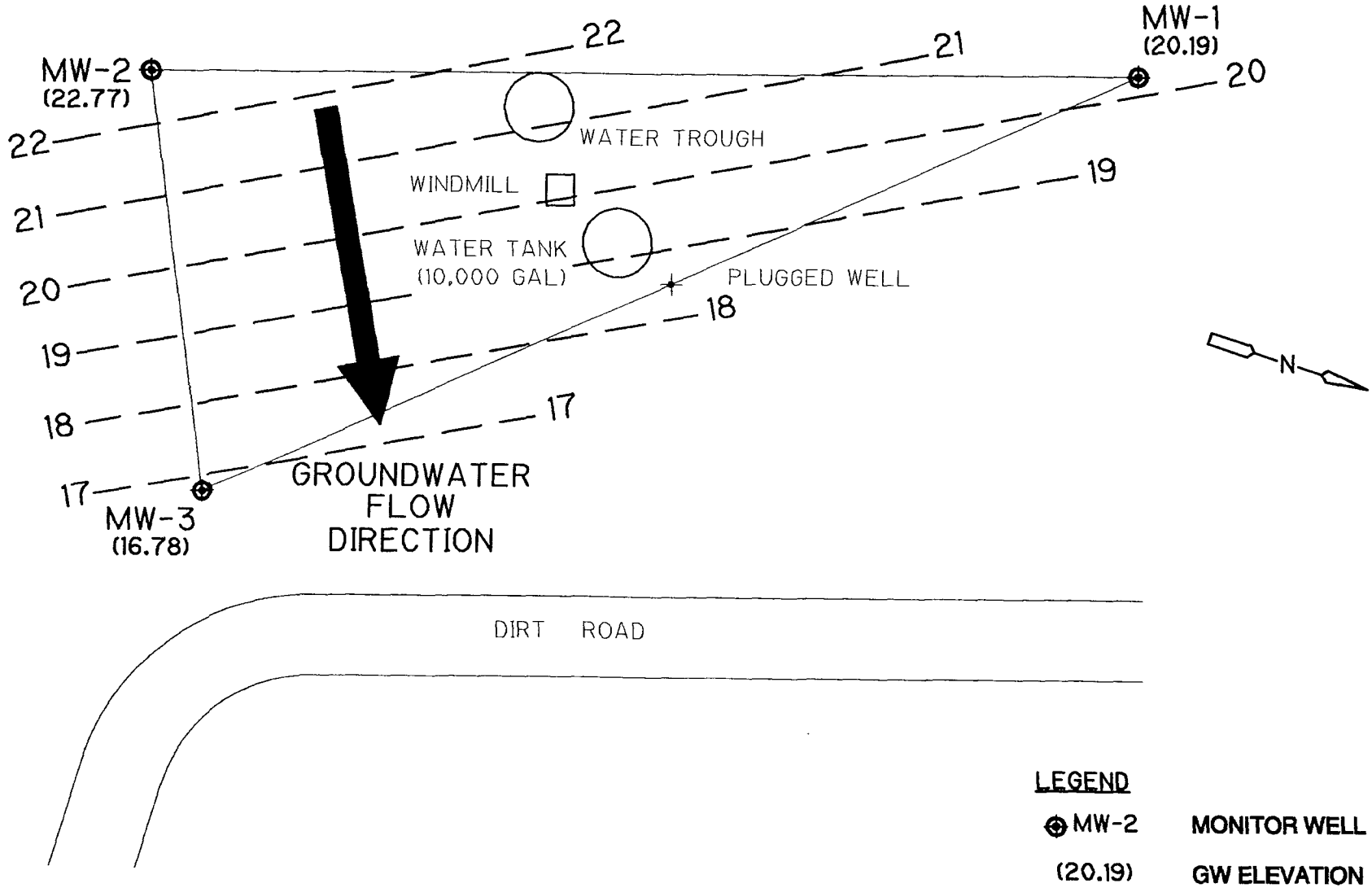


HydroGeologic Services, Inc.

HGS

McCASLAND RANCH, HOBBS, NM
SITE PLAN

Figure 1

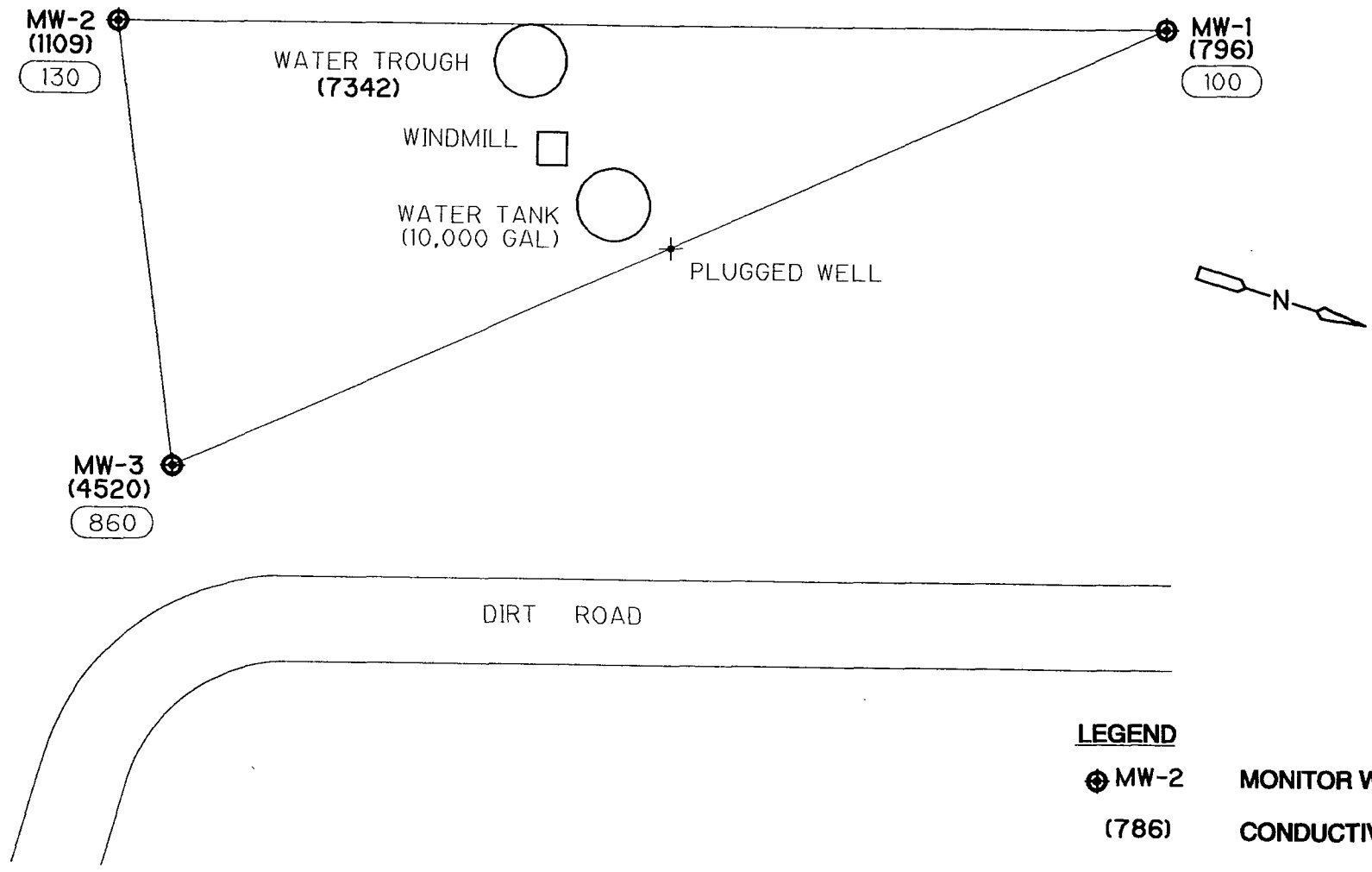


HydroGeologic Services, Inc.

HGS

McCASLAND RANCH, HOBBS, NM
GROUNDWATER FLOW DIRECTION MAP

Figure 2



LEGEND

⊕ MW-2	MONITOR WELL
(786)	CONDUCTIVITY
(100)	CHLORIDE CONCENTRATION

HydroGeologic Services, Inc.

HGS

McCASLAND RANCH, HOBBS, NM
CONDUCTIVITY AND CHLORIDE CONCENTRATIONS MAP

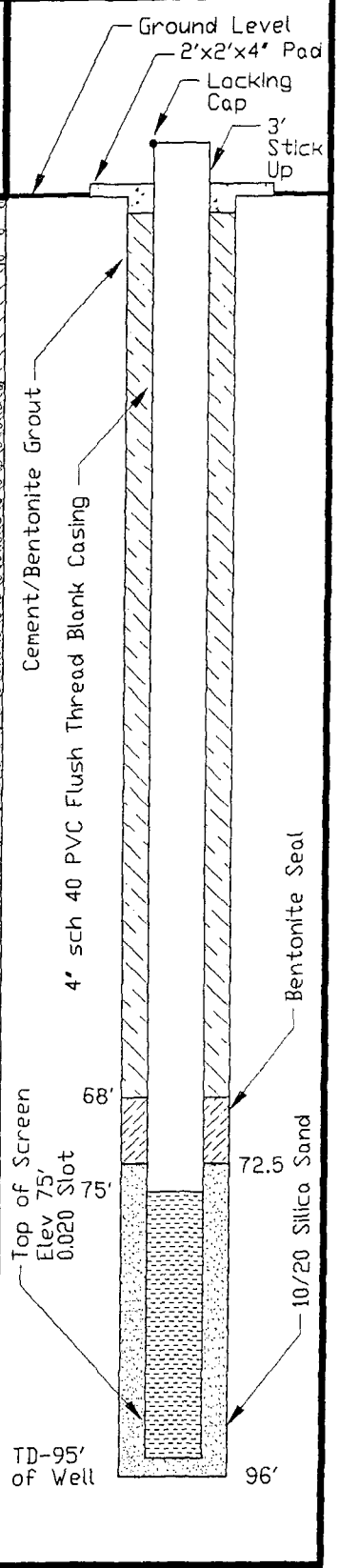
Figure 3

SOIL BORING NO. MW-1

DEPTH, FT.	SYMBOL(USCS)	SAMPLE DESCRIPTION	SAMPLING INTERVAL IN FEET
0	SM	0'-5' Sand with silt, sli-moist, light brown, fine gravels	
10	CL	5'-14' Clay with sand, moist, red-brown to brown, sli-plastic	
20		14'-75' Sand with clay (Caliche), dry, tan to white, calcareous nodules	
30			
40	SC/CL	34' yellow-brn to yellow, gravels to 1/2"	
		36' brown	
		38' yellow brown	
		43' red brown to purple	
50		49' brown, large calcareous nodules	
		53' purple	
60		60' tan-whitepurple	
70		73' yellow-brown	
80	SM	75'-92.5' Sand with silt, wet, yellow-brown, fine gravels, subangular to subrounded	
90			
100		92.5'-TD Clay, wet, red, sli-plastic, very fine gravels	
		96' TD	

Continuously Sampled

STRATIGRAPHY



HydroGeologic Services, Inc.

HGS

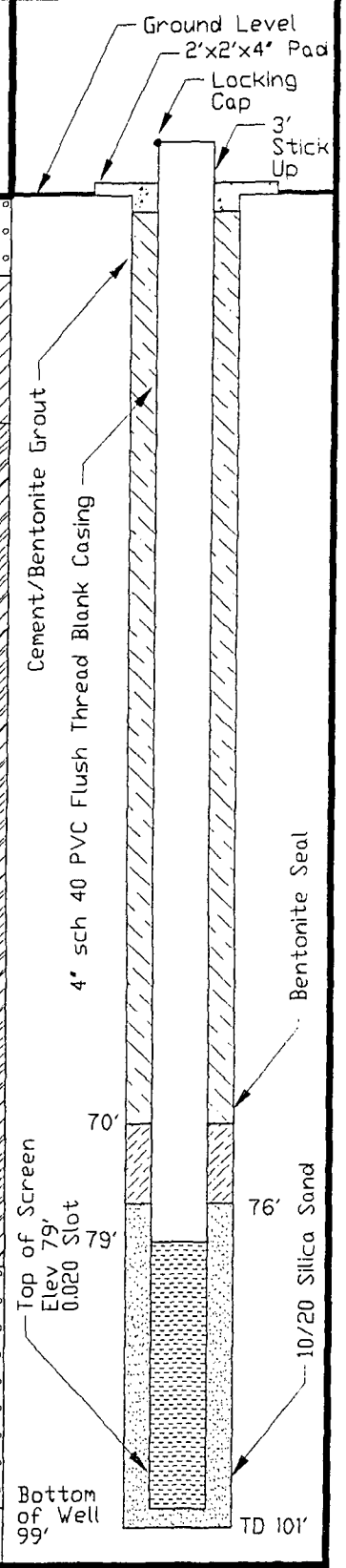
CLIENT: EDDIE SEAY
SITE: McCASLAND RANCH
TOTAL DEPTH = 96 FEET
DRILLER: DIAMOND BACK DRILLING

SOIL BORING NO.: MW-1
DRILLING METHOD: AR
LOGGED BY: B. WHALEY
DATE DRILLED: 1/4/01

SOIL BORING NO. MW-2

DEPTH, FT.	SYMBOL(USCS)	SAMPLE DESCRIPTION	SAMPLING INTERVAL IN FEET
0	SM	0'-6' Sand with silt, sli-moist, brown to light brown, fine gravels	Continuously Sampled
6	CL	6'-17' Clay with sand, moist, brown, sli-plastic	
17	SC/CL	17'-80.5' Sand with clay (Caliche), dry, white to tan, hard	
37		37' yellow brown	
45		45' brown	
47		47' red brown	
56		56' tan to white	
61		61' yellow brown	
64		64' tan-white	
80.5	SM	80.5'-98.5' Sand with silt, wet, yellow-brown, fine gravels, subangular to subrounded	
98.5	CL	98.5'-101' Clay with sand, wet, red, very fine gravels	
101		101' TD	

STRATIGRAPHY



HydroGeologic Services, Inc.

HGS

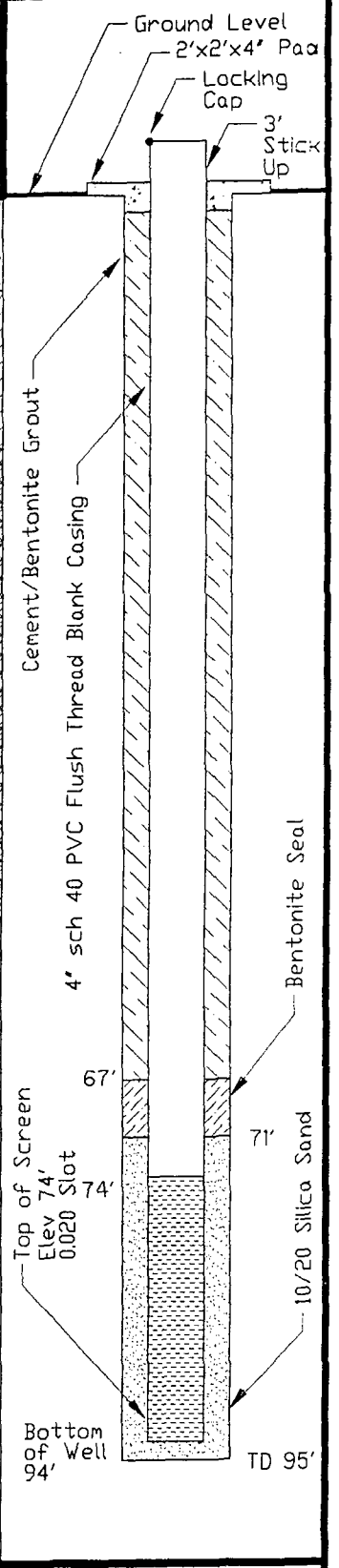
CLIENT: EDDIE SEAY
SITE: McCASLAND RANCH
TOTAL DEPTH = 99 FEET
DRILLER: DIAMOND BACK DRILLING

SOIL BORING NO.: MW-2
DRILLING METHOD: AR
LOGGED BY: B. WHALEY
DATE DRILLED: 1/4&5/01

SOIL BORING NO. MW-3

DEPTH, FT.	SYMBOL(USCS)	SAMPLE DESCRIPTION	SAMPLING INTERVAL IN FEET
0	SM	0'-7' Sand with silt, sli-moist, light brown, fine gravels	Continuously Sampled
10	CL	5'-19' Clay with sand, moist, red-brown, sli-plastic	
20	SC/CL	19'-81' Sand with clay (Caliche), dry, white to tan, very hard	
30		25'-29' 1" gravels, angular	
40		39' yellow brown	
		44' red brown	
		48' purple	
50		50' yellow-brown	
60			
70		68' tan-white	
80	SM	81'-92' Sand with silt, wet, yellow-brown, fine gravels, subangular to subrounded	
90		92'-95' Clay with sand, wet, red, sli-plastic, very fine gravels	
100		95' TD	

DEPTH, FT. / STRATIGRAPHY



HydroGeologic Services, Inc.

HGS

CLIENT: EDDIE SEAY
SITE: McCASLAND RANCH
TOTAL DEPTH = 95 FEET
DRILLER: DIAMOND BACK DRILLING

SOIL BORING NO.: MW-3
DRILLING METHOD: AR
LOGGED BY: B. WHALEY
DATE DRILLED: 1/5/01

3.0 AQUIFER TEST

A 700 minute constant rate pump test was performed to determine the hydraulic characteristics of the water bearing formation. The pump test was performed in Monitor well MW-2 while MW-1 & MW-3 were used as observation wells. Prior to the pump test a step test was performed to determine the pumping rate for the constant rate test. It was determined that a pumping rate of 1 gallon per minute (GPM) was all the aquifer could handle without pumping under. HydroGeologic Services, Inc. (HGS) performed the pump test while Rio Grande Environmental (RGE) performed the pump test model.

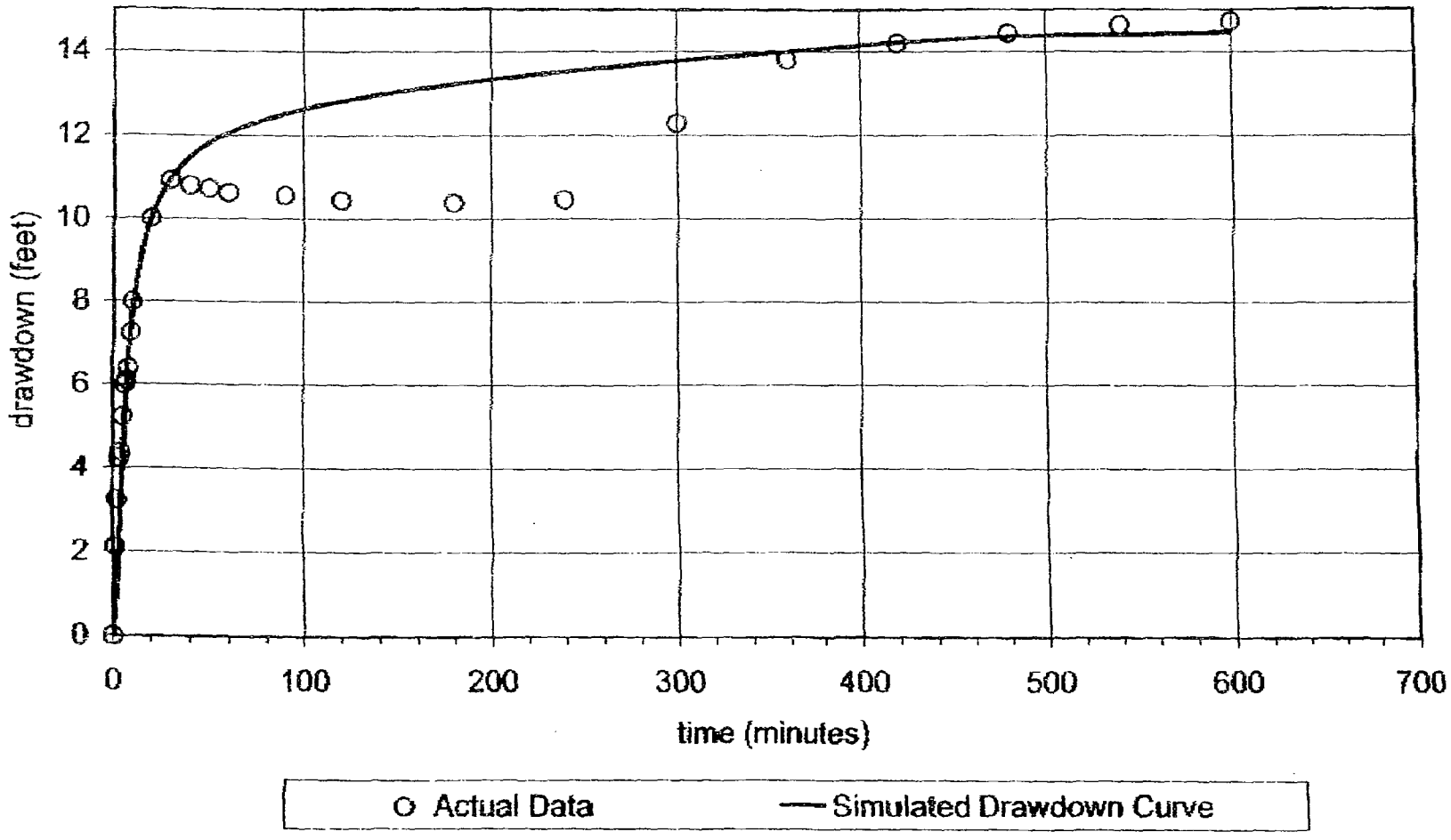
Due to the relatively high conductivity of the aquifer matrix, drawdown was not observed at either monitoring well, MW-1 and MW-3. Therefore, only the drawdown and recovery recorded at the pumping well MW-2 was analyzed. RGE utilized MODFLOW to analyze the drawdown data from MW-2. The MODFLOW model was set up an run using the graphic user interface, Groundwater Vistas. The model consists of three 15-foot thick layers and was approximately 300-feet by 300-feet. Constant head cells were positioned in the upper and lower layers of the model to simulate the relatively steep gradient across the site. The pumping well was positioned in the center of the model in the upper layer. The grid spacing was designed to reduce boundary effects within the vicinity of the pumping well. The model setup is shown in the attached figures.

Based on the model results, RGE estimated aquifer properties are as follows:

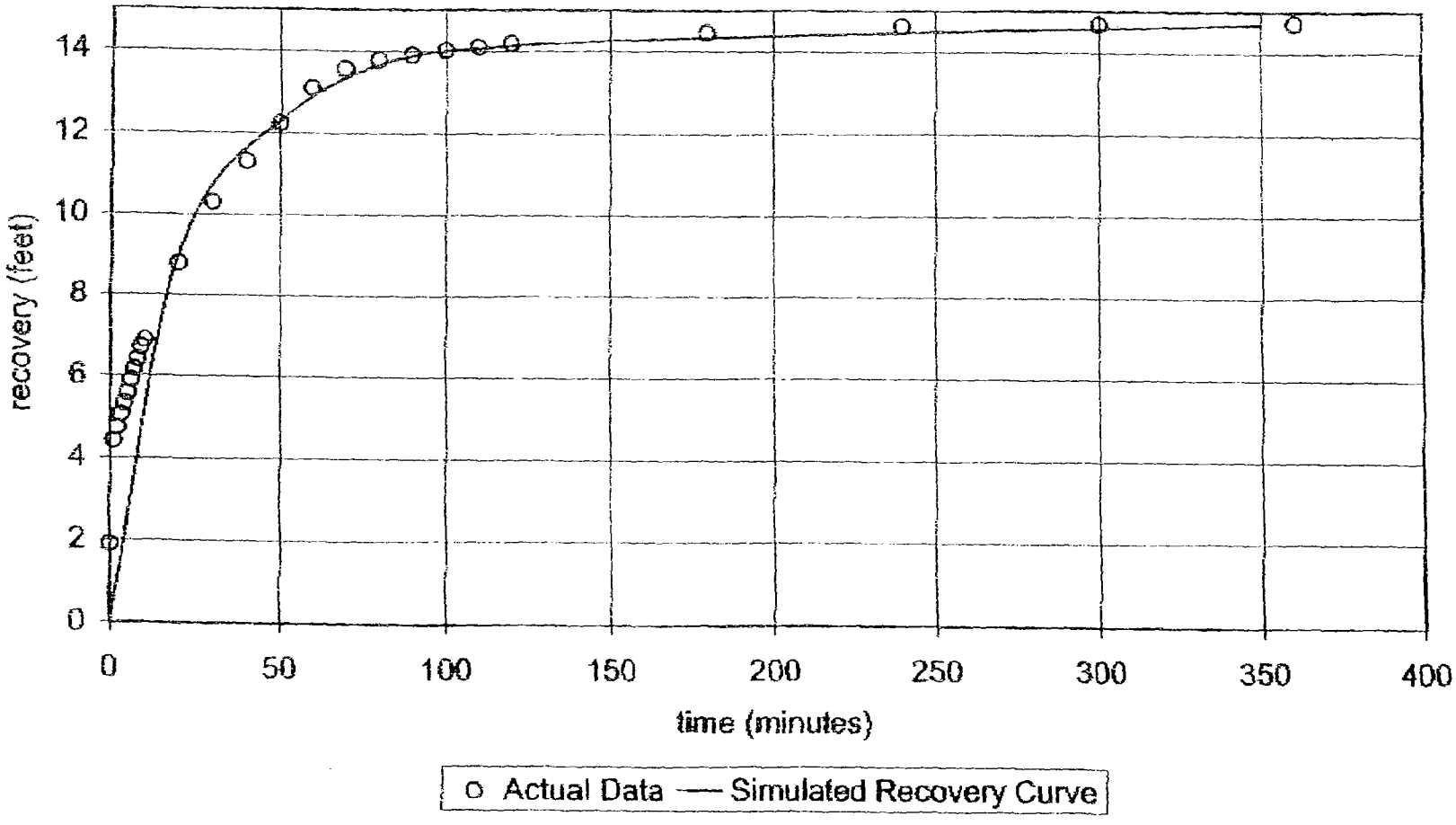
Horizontal Hydraulic Conductivity	Kx	0.87 feet/day
Vertical Hydraulic Conductivity	Kz	0.48 feet/day
Specific Yield	Sy	0.16
Storativity	S	0.0001

An iterative process was employed to achieve these estimates by comparing simulated drawdown verses the actual drawdown observed at MW-2 during pumping. The attached chart illustrates the match of the simulated and actual data. In addition, mass balance summaries from the model (steady-state and transient and simulated drawdown/head charts are included.

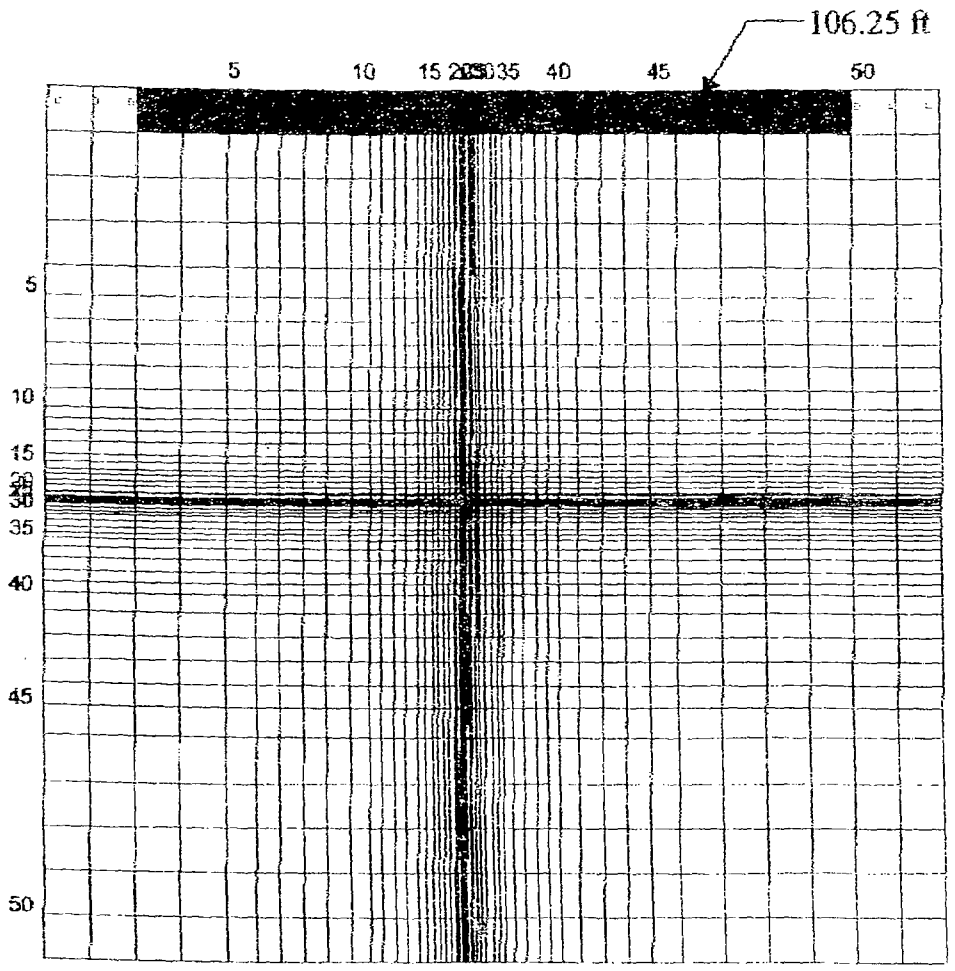
Hydrogeologic Pump Test Analysis Results
Drawdown @ MW-2
McCasland Ranch, New Mexico



Hydrogeologic Pump Test Analysis Results
Recovery @ MW-2
McCasland Ranch, New Mexico



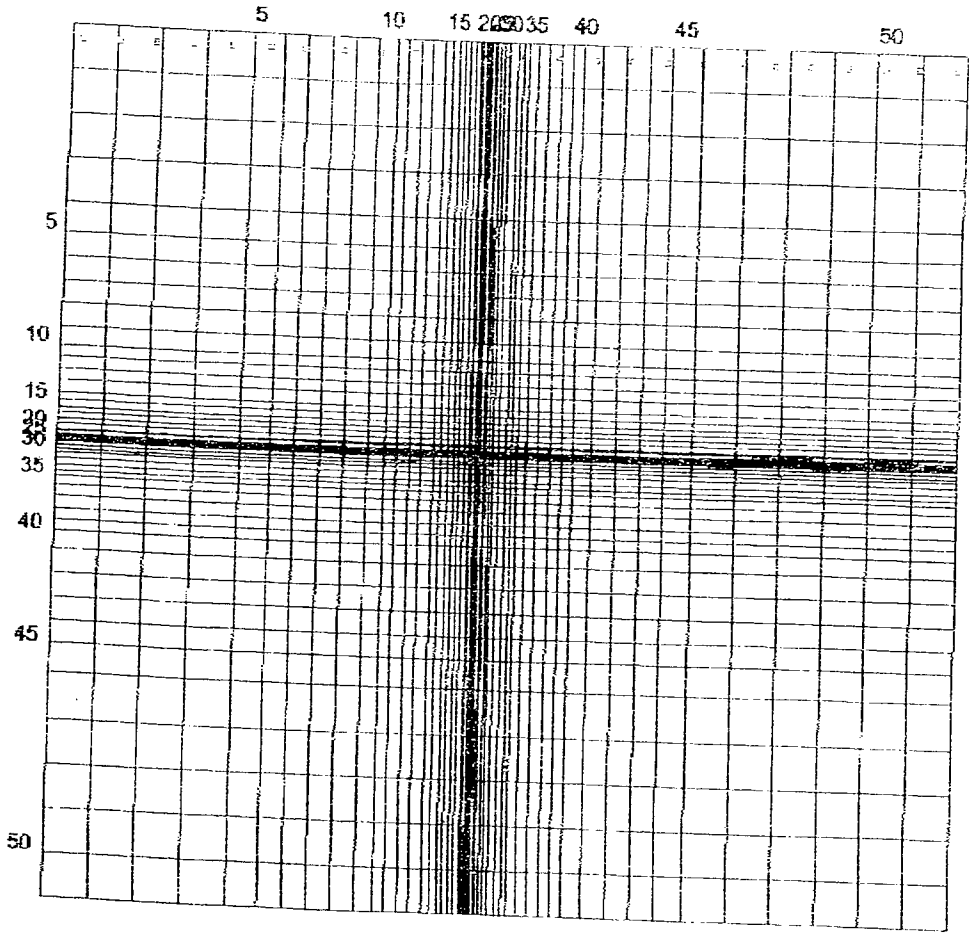
LAYER 1



RGE
January 2001

McCasland Ranch
Hydrogeologic Model
Grid Setup

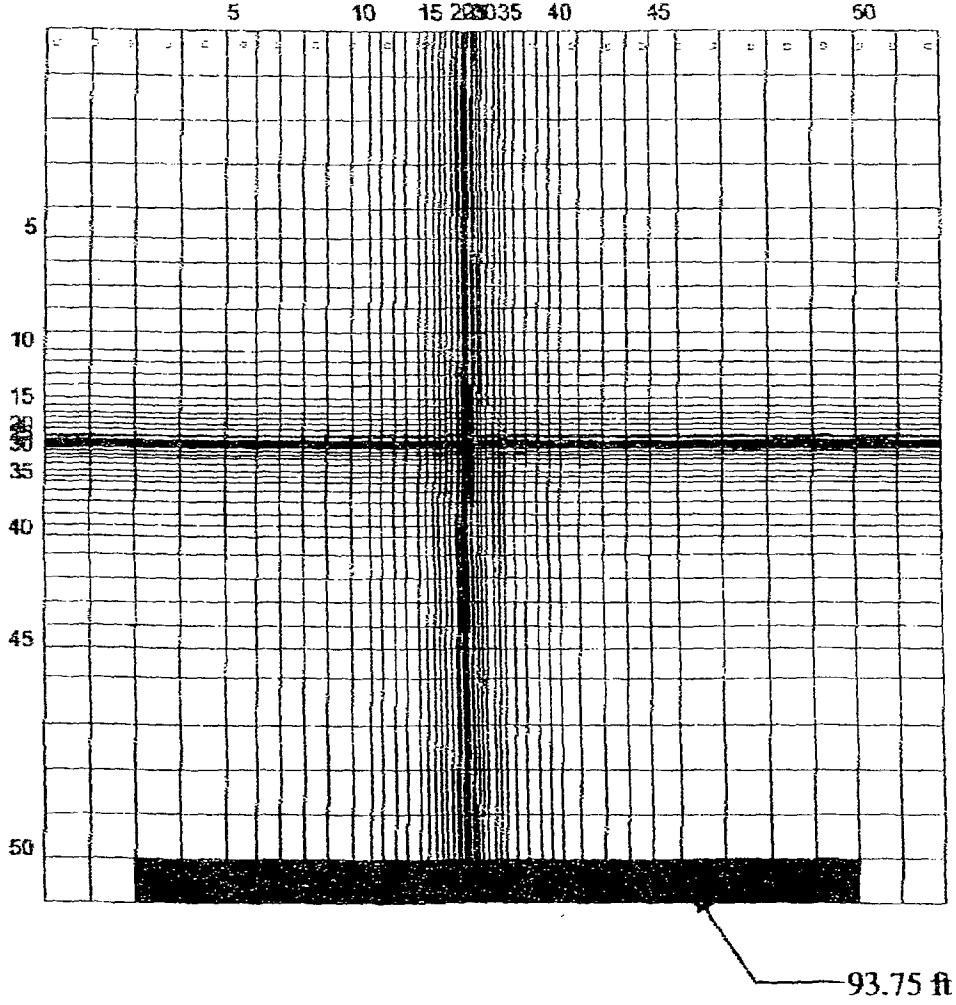
LAYER 2



RGE
January 2001

McCasland Ranch
Hydrogeologic Model
Grid Setup

LAYER 3



RGE
January 2001

McCasland Ranch
Hydrogeologic Model
Grid Setup

MASS BALANCE SUMMARY
MODFLOW MODEL
STEADY-STATE SIMULATION

Type	row	column	layer	segment	reach	flux
Recharge inflow	1	1	1	0	0	0
Recharge outflow	1	1	1	0	0	0
ET inflow	1	1	1	0	0	0
ET outflow	1	1	1	0	0	0
Qz Top inflow	1	1	1	0	0	0
Qz Top outflow	1	1	1	0	0	0
Qz Bottom inflow	1	1	1	0	0	0
Qz Bottom outflow	1	1	1	0	0	7722.883342
Storage inflow	1	1	1	0	0	0
Storage outflow	1	1	1	0	0	0
CH	1	3	1	0	0	876.105225
CH	1	4	1	0	0	451.609467
CH	1	5	1	0	0	289.386444
CH	1	6	1	0	0	227.496033
CH	1	7	1	0	0	225.047638
CH	1	8	1	0	0	223.31279
CH	1	9	1	0	0	222.054932
CH	1	10	1	0	0	165.934616
CH	1	11	1	0	0	110.393799
CH	1	12	1	0	0	110.237068
CH	1	13	1	0	0	110.103745
CH	1	14	1	0	0	109.991165
CH	1	15	1	0	0	82.431702
CH	1	16	1	0	0	54.929096
CH	1	17	1	0	0	54.91082
CH	1	18	1	0	0	54.894466
CH	1	19	1	0	0	54.87999
CH	1	20	1	0	0	41.151672
CH	1	21	1	0	0	27.430897
CH	1	22	1	0	0	21.942823
CH	1	23	1	0	0	16.456085
CH	1	24	1	0	0	10.970258
CH	1	25	1	0	0	8.227457
CH	1	26	1	0	0	10.969638
CH	1	27	1	0	0	16.453827
CH	1	28	1	0	0	21.937325
CH	1	29	1	0	0	27.420027
CH	1	30	1	0	0	27.418411
CH	1	31	1	0	0	41.124977
CH	1	32	1	0	0	54.829426
CH	1	33	1	0	0	54.82658
CH	1	34	1	0	0	54.825317
CH	1	35	1	0	0	54.825623
CH	1	36	1	0	0	82.241951
CH	1	37	1	0	0	109.67083
CH	1	38	1	0	0	109.700806
CH	1	39	1	0	0	109.744171

MASS BALANCE SUMMARY
MODFLOW MODEL
STEADY-STATE SIMULATION

Type	row	column	layer	segment	reach	flux
CH	1	40	1	0	0	109.80162
CH	1	41	1	0	0	164.838348
CH	1	42	1	0	0	220.126007
CH	1	43	1	0	0	220.875156
CH	1	44	1	0	0	221.426437
CH	1	45	1	0	0	278.218262
CH	1	46	1	0	0	421.739838
CH	1	47	1	0	0	431.575287
CH	1	48	1	0	0	452.105621
CH	1	49	1	0	0	876.655029
Total IN	1	1	1	0	0	7723.0487
Total OUT	1	1	1	0	0	7722.883342
Recharge inflow	1	1	1	0	0	0
Recharge outflow	1	1	1	0	0	0
ET inflow	1	1	1	0	0	0
ET outflow	1	1	1	0	0	0
Qz Top inflow	1	1	2	0	0	7722.883342
Qz Top outflow	1	1	2	0	0	0
Qz Bottom inflow	1	1	2	0	0	0
Qz Bottom outflow	1	1	2	0	0	7722.560049
Storage inflow	1	1	2	0	0	0
Storage outflow	1	1	2	0	0	0
Total IN	1	1	2	0	0	7722.883342
Total OUT	1	1	2	0	0	7722.560049
Recharge inflow	1	1	1	0	0	0
Recharge outflow	1	1	1	0	0	0
ET inflow	1	1	1	0	0	0
ET outflow	1	1	1	0	0	0
Qz Top inflow	1	1	3	0	0	7722.560049
Qz Top outflow	1	1	3	0	0	0
Qz Bottom inflow	1	1	3	0	0	0
Qz Bottom outflow	1	1	3	0	0	0
Storage inflow	1	1	3	0	0	0
Storage outflow	1	1	3	0	0	0
CH	51	3	3	0	0	-876.555176
CH	51	4	3	0	0	-451.991302
CH	51	5	3	0	0	-289.445984
CH	51	6	3	0	0	-227.447586
CH	51	7	3	0	0	-224.921738
CH	51	8	3	0	0	-223.115784
CH	51	9	3	0	0	-221.79248
CH	51	10	3	0	0	-165.698471
CH	51	11	3	0	0	-110.219841
CH	51	12	3	0	0	-110.05182
CH	51	13	3	0	0	-109.80802
CH	51	14	3	0	0	-109.78643
CH	51	15	3	0	0	-82.273064

MASS BALANCE SUMMARY
MODFLOW MODEL
STEADY-STATE SIMULATION

Type	row	column	layer	segment	reach	flux
CH	51	16	3	0	0	-54.821316
CH	51	17	3	0	0	-54.801686
CH	51	18	3	0	0	-54.78413
CH	51	19	3	0	0	-54.768635
CH	51	20	3	0	0	-41.067604
CH	51	21	3	0	0	-27.374641
CH	51	22	3	0	0	-21.89772
CH	51	23	3	0	0	-16.422211
CH	51	24	3	0	0	-10.947655
CH	51	25	3	0	0	-8.210497
CH	51	26	3	0	0	-10.947012
CH	51	27	3	0	0	-16.41987
CH	51	28	3	0	0	-21.892019
CH	51	29	3	0	0	-27.363358
CH	51	30	3	0	0	-27.361731
CH	51	31	3	0	0	-41.039967
CH	51	32	3	0	0	-54.716198
CH	51	33	3	0	0	-54.713642
CH	51	34	3	0	0	-54.712841
CH	51	35	3	0	0	-54.713795
CH	51	36	3	0	0	-82.075752
CH	51	37	3	0	0	-109.452827
CH	51	38	3	0	0	-109.487946
CH	51	39	3	0	0	-109.537651
CH	51	40	3	0	0	-109.602608
CH	51	41	3	0	0	-164.556
CH	51	42	3	0	0	-219.783188
CH	51	43	3	0	0	-220.374878
CH	51	44	3	0	0	-221.172775
CH	51	45	3	0	0	-277.971649
CH	51	46	3	0	0	-421.528442
CH	51	47	3	0	0	-431.592529
CH	51	48	3	0	0	-452.435089
CH	51	49	3	0	0	-878.888184
Total IN	1	1	3	0	0	7722.560049
Total OUT	1	1	3	0	0	7722.643522
Grand Total IN	0	0	0	0	0	7723.0487
Grand Total OUT	0	0	0	0	0	7722.643522
Grand Total ERROR	0	0	0	0	0	0.005248

McCasland Ranch
Hydrogeologic Pump Test

MASS BALANCE SUMMARY
MODFLOW MODEL
TRANSIENT SIMULATION

Type	row	column	layer	segment	reach	flux
Recharge inflow	1	1	1	0	0	0
Recharge outflow	1	1	1	0	0	0
ET inflow	1	1	1	0	0	0
ET outflow	1	1	1	0	0	0
Qz Top inflow	1	1	1	0	0	0
Qz Top outflow	1	1	1	0	0	0
Qz Bottom inflow	1	1	1	0	0	0
Qz Bottom outflow	1	1	1	0	0	7670.80385
Storage inflow	1	1	1	0	0	4.854854
Storage outflow	1	1	1	0	0	44.036839
CH	1	3	1	0	0	878.084351
CH	1	4	1	0	0	460.614746
CH	1	5	1	0	0	288.846484
CH	1	6	1	0	0	226.880234
CH	1	7	1	0	0	224.417969
CH	1	8	1	0	0	222.672745
CH	1	9	1	0	0	221.405502
CH	1	10	1	0	0	165.441513
CH	1	11	1	0	0	110.062271
CH	1	12	1	0	0	109.903282
CH	1	13	1	0	0	109.767677
CH	1	14	1	0	0	109.652885
CH	1	15	1	0	0	82.176605
CH	1	16	1	0	0	54.758396
CH	1	17	1	0	0	54.73962
CH	1	18	1	0	0	54.722805
CH	1	19	1	0	0	54.707882
CH	1	20	1	0	0	41.022318
CH	1	21	1	0	0	27.344536
CH	1	22	1	0	0	21.873667
CH	1	23	1	0	0	16.404182
CH	1	24	1	0	0	10.935837
CH	1	25	1	0	0	8.201483
CH	1	26	1	0	0	10.934992
CH	1	27	1	0	0	16.401833
CH	1	28	1	0	0	21.867958
CH	1	29	1	0	0	27.333244
CH	1	30	1	0	0	27.331564
CH	1	31	1	0	0	40.994579
CH	1	32	1	0	0	54.655357
CH	1	33	1	0	0	54.652321
CH	1	34	1	0	0	54.650913
CH	1	35	1	0	0	54.651119
CH	1	36	1	0	0	81.980118
CH	1	37	1	0	0	109.321762
CH	1	38	1	0	0	109.352074
CH	1	39	1	0	0	109.396057

McCasland Ranch
Hydrogeologic Pump Test

MASS BALANCE SUMMARY
MODFLOW MODEL
TRANSIENT SIMULATION

Type	row	column	layer	segment	reach	flux
CH	1	40	1	0	0	109.454437
CH	1	41	1	0	0	164.31987
CH	1	42	1	0	0	219.439667
CH	1	43	1	0	0	219.99498
CH	1	44	1	0	0	220.752579
CH	1	45	1	0	0	277.384786
CH	1	46	1	0	0	420.509338
CH	1	47	1	0	0	430.391832
CH	1	48	1	0	0	451.049683
CH	1	49	1	0	0	878.517212
Well	25	25	1	0	0	0
Total IN	1	1	1	0	0	7714.629898
Total OUT	1	1	1	0	0	7714.640689
Recharge inflow	1	1	1	0	0	0
Recharge outflow	1	1	1	0	0	0
ET inflow	1	1	1	0	0	0
ET outflow	1	1	1	0	0	0
Qz Top inflow	1	1	2	0	0	7670.60385
Qz Top outflow	1	1	2	0	0	0
Qz Bottom inflow	1	1	2	0	0	0
Qz Bottom outflow	1	1	2	0	0	7665.489799
Storage inflow	1	1	2	0	0	16.211513
Storage outflow	1	1	2	0	0	21.451806
Total IN	1	1	2	0	0	7686.815363
Total OUT	1	1	2	0	0	7686.941605
Recharge inflow	1	1	1	0	0	0
Recharge outflow	1	1	1	0	0	0
ET inflow	1	1	1	0	0	0
ET outflow	1	1	1	0	0	0
Qz Top inflow	1	1	3	0	0	7665.489799
Qz Top outflow	1	1	3	0	0	0
Qz Bottom inflow	1	1	3	0	0	0
Qz Bottom outflow	1	1	3	0	0	0
Storage inflow	1	1	3	0	0	38.800561
Storage outflow	1	1	3	0	0	0
CH	51	3	3	0	0	-878.349548
CH	51	4	3	0	0	-460.514282
CH	51	5	3	0	0	-288.491425
CH	51	6	3	0	0	-226.715851
CH	51	7	3	0	0	-224.222872
CH	51	8	3	0	0	-222.450058
CH	51	9	3	0	0	-221.158876
CH	51	10	3	0	0	-165.242188
CH	51	11	3	0	0	-109.923119
CH	51	12	3	0	0	-109.75946
CH	51	13	3	0	0	-109.619606
CH	51	14	3	0	0	-109.500989

McCasland Ranch
Hydrogeologic Pump Test

MASS BALANCE SUMMARY
MODFLOW MODEL
TRANSIENT SIMULATION

Type	row	column	layer	segment	reach	flux
CH	51	15	3	0	0	-82.060417
CH	51	16	3	0	0	-54.679989
CH	51	17	3	0	0	-54.660522
CH	51	18	3	0	0	-54.643082
CH	51	19	3	0	0	-54.62759
CH	51	20	3	0	0	-40.961769
CH	51	21	3	0	0	-27.304029
CH	51	22	3	0	0	-21.84119
CH	51	23	3	0	0	-16.379782
CH	51	24	3	0	0	-10.919352
CH	51	25	3	0	0	-8.18926
CH	51	26	3	0	0	-10.918663
CH	51	27	3	0	0	-16.377344
CH	51	28	3	0	0	-21.835262
CH	51	29	3	0	0	-27.292313
CH	51	30	3	0	0	-27.290585
CH	51	31	3	0	0	-40.93298
CH	51	32	3	0	0	-54.573059
CH	51	33	3	0	0	-54.569904
CH	51	34	3	0	0	-54.56842
CH	51	35	3	0	0	-54.568615
CH	51	36	3	0	0	-81.856415
CH	51	37	3	0	0	-109.157257
CH	51	38	3	0	0	-109.188507
CH	51	39	3	0	0	-109.233887
CH	51	40	3	0	0	-109.294106
CH	51	41	3	0	0	-164.083588
CH	51	42	3	0	0	-219.134613
CH	51	43	3	0	0	-219.704407
CH	51	44	3	0	0	-220.479691
CH	51	45	3	0	0	-277.073395
CH	51	46	3	0	0	-420.118011
CH	51	47	3	0	0	-430.122131
CH	51	48	3	0	0	-450.951385
CH	51	49	3	0	0	-878.81189
Total IN	1	1	3	0	0	7704.29036
Total OUT	1	1	3	0	0	7704.351263
Grand Total IN	0	0	0	0	0	7769.641773
Grand Total OUT	0	0	0	0	0	7769.639908
Grand Total ERROR	0	0	0	0	0	-0.00255

4.0 CONCLUSIONS/RECOMMENDATIONS

1. Based on the recently installed monitoring wells, groundwater flow direction is to the East-Northeast at a gradient of 0.05 ft/ft.

2. Chloride contamination has been identified in MW-3 at 860 ppm.

3. The source of contamination appears to be from the plugged oil/gas well. If the well was not pressure grouted correctly the chloride contamination could migrate up through the well annulus.

4. Additional wells are needed (min 3 to 5) to determine the extent of the chloride plume.

5. The initial pump test served its purpose to help define the characteristics of the aquifer. When designing a pump and treat system, more information is needed. HGS suggest performing another pump test of longer duration (min. 24 hrs) with an observation within 10-feet of the pumping well.

6. To prevent further chloride contamination of the the aquifer, HGS suggests properly abandoning the upper portion of the plugged oil/gas well. The well should be overdrilled using the Air Rotary Casing Hammer (ARCH) method with 9 5/8" drive pipe to a minimum 200 feet and backfilled with grout from the bottom up to assure the a proper seal.

ESTIMATED COST OF CLEANUP OF GROUNDWATER
McCASLAND RANCH

The McCasland Ranch is approximately 15 minutes south of Hobbs, New Mexico on state road 18. There is oil production throughout the property. The fresh water zone is less than 100 feet from the surface. Water samples taken from various windmills on the property have shown one windmill with elevated levels of inorganic compounds (anions). This particular windmill has been tested several times since March 31,1998. Due to the continued indication of contamination in this area, it has become necessary to develop a program to treat the affected groundwater.

In order to formulate a reasonable cost of cleanup of the groundwater on the McCasland Ranch, three areas must be considered. The first is the elimination of the source of the contamination. The second is the definition of the boundaries of the plume. The final is the treatment of the impacted groundwater. A breakdown of all estimated costs is attached.

The source of the contamination must be eliminated in order to provide the most efficient and cost effective cost of cleanup of the impacted groundwater. Due to the fact that the levels of contamination have not significantly diminished in the last 2 years, it is reasonable to believe that the contamination is ongoing. The impacted groundwater contains elevated levels of both chloride and bromide. This is consistent with an impact from oil field type contamination

The recently placed monitor well, approximately 175 feet up gradient (MW1) from both the windmill and plugged well, had diminished levels of both chloride (100 ppm) and bromide (1 ppm). The monitor well approximately 125 feet down gradient (MW3) from both the windmill and plugged well had elevated levels of both chloride (870 ppm) and bromide (2.8 ppm). This information indicates that the contamination has occurred somewhere between the two monitor wells.

There are three check valves between the large holding tank and bottom of the windmill. These were inspected on November 28, 2000. The windmill pump was removed and the well developed with an electric pump. The water well service operator, Mr. Jay Anthony, inspected the check valves on the windmill pump. In addition, while the pipe was disconnected from the large water holding tank, the valve was opened. No water leaked from the tank. The water level was several feet above the level of the valve. The only other source of contamination between the two monitor wells is the plugged well approximately 50 feet northeast of the windmill. The plugged well is the most likely source of contamination.

In order to formulate a cost for the elimination of the source of the contamination, Maryo Marrs Casing Pullers of Kermit, Texas was contacted. After a description of the problem, a cost for the replugging of the well was formulated. This cost is only an estimate. The costs may increase depending on what is encountered once the well is entered.

Once the source has been eliminated, it would be necessary to delineate the groundwater contamination plume. This could be accomplished with the installation of monitor wells. Because the direction and southwestern boundary of the contamination has already been established, a limited number of monitor wells should be necessary to profile the existing plume. After a discussion with Mr. Bill Whaley CPG of HydroGeologic Services, Inc., an estimate of 3 to 5 additional wells should be sufficient.

Treatment of the groundwater would be accomplished by pumping out the contaminated water and running it through the system. Some or all of the monitor wells could be utilized to extract the groundwater to be treated. After considering several technologies, a reverse osmotic (RO) system was the most cost effective for the removal of the target contaminates.

Once the system had been installed the treatment of the groundwater would occur over several years. The length of time is dependent on the size of the plume, amount of contamination encountered and the mobility of the groundwater. An estimate for the duration of the treatment is between 8 to 10 years.

Additional costs not discussed previously would be the continued sampling and chemical analysis of the water. This analysis would occur before and after treatment on a quarterly basis. Maintenance of the treatment system would occur on an annual basis.

Estimated Cost of Cleanup

Replugging Plugged Well	
Drill Rig, Pulling Unit and hands:	$20,000 to $25,000
Profile groundwater contamination	
3 to 5 monitor wells	$9,500 ea.
pumps and piping	$1,800 ea.
Installation reverse osmosis system	
150 gal/day	$ 3,900
800 gal/day	$ 4,995
3000gal/day	$11,900
Annual maintenance	$ 2,000
Quarterly sampling and analysis	
Sampler, laboratory analysis	$10,000/yr

Total cost of cleanup Low $153,800 High $213,400

Hall Environmental
Analysis Laboratory

January 12, 2001

Greg Bybee
ECD Environmental
PO Box 9328
Albuquerque, NM 87119
TEL: (505) 768-7686
FAX (505) 768-7601

RE: McCasland Order No.: 0101044

Dear Greg Bybee:

Hall Environmental Analysis Laboratory received 3 samples on 1/9/01 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent.

Detection limits are determined by EPA methodology. No determination of compounds below these (denoted by the ND or < sign) has been made.

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

Sincerely,

Andy Freeman, Senior Project Manager
Nancy McDuffie, Assistant Laboratory Manager

Hall Environmental Analysis Laboratory

Date: *12-Jan-01*

CLIENT:	ECD Environmental	**Client Sample ID:**	MW-1
Lab Order:	0101044	**Collection Date:**	1/8/01
Project:	McCasland		
Lab ID:	0101044-01	**Matrix:**	AQUEOUS

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ANIONS BY 300.0		E300				Analyst: SDU
Bromide	1.0	0.50		mg/L	5	1/10/01
Chloride	100	0.50		mg/L	5	1/10/01
Fluoride	ND	0.50		mg/L	5	1/10/01
Nitrate (As N)+Nitrite (As N)	1.8	0.50		mg/L	5	1/10/01
Phosphorus, Dissolved Orthophosphate (As P)	ND	2.5		mg/L	5	1/10/01
Sulfate	69	2.5		mg/L	5	1/10/01
TPH BY 418.1		E418.1				Analyst: JT
Petroleum Hydrocarbons, TR	ND	1.0		mg/L	1	1/11/01

Qualifiers:

ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
* - Value exceeds Maximum Contaminant Level
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range

Hall Environmental Analysis Laboratory

Date: *12-Jan-01*

CLIENT: ECD Environmental
Lab Order: 0101044
Project: McCasland
Lab ID: 0101044-02

Client Sample ID: MW-2
Collection Date: 1/8/01
Matrix: AQUEOUS

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ANIONS BY 300.0		E300				Analyst: **SDU**
Bromide	1.0	0.50		mg/L	5	1/10/01
Chloride	130	0.50		mg/L	5	1/10/01
Fluoride	ND	0.50		mg/L	5	1/10/01
Nitrate (As N)+Nitrite (As N)	1.1	0.50		mg/L	5	1/10/01
Phosphorus, Dissolved Orthophosphate (As P)	ND	2.5		mg/L	5	1/10/01
Sulfate	61	2.5		mg/L	5	1/10/01
TPH BY 418.1		E418.1				Analyst: **JT**
Petroleum Hydrocarbons, TR	ND	1.0		mg/L	1	1/11/01

Qualifiers:

ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
* - Value exceeds Maximum Contaminant Level
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range

Hall Environmental Analysis Laboratory

Date: *12-Jan-01*

CLIENT:	ECD Environmental	**Client Sample ID:**	MW-3
Lab Order:	0101044	**Collection Date:**	1/8/01
Project:	McCasland		
Lab ID:	0101044-03	**Matrix:**	AQUEOUS

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ANIONS BY 300.0		E300				Analyst: **SDU**
Bromide	2.8	0.50		mg/L	5	1/10/01
Chloride	870	10		mg/L	100	1/12/01
Fluoride	ND	0.50		mg/L	5	1/10/01
Nitrate (As N)+Nitrite (As N)	1.0	0.50		mg/L	5	1/10/01
Phosphorus, Dissolved Orthophosphate (As P)	ND	2.5		mg/L	5	1/10/01
Sulfate	95	2.5		mg/L	5	1/10/01
TPH BY 418.1		E418.1				Analyst: **JT**
Petroleum Hydrocarbons, TR	ND	1.0		mg/L	1	1/11/01

Qualifiers:

ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
* - Value exceeds Maximum Contaminant Level
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range

SVL ANALYTICAL, INC.
One Government Gulch • P.O. Box 978 • Kellogg, Idaho 83837-0626 • Phone: (208)784-1258 • Fax: (208)783-0891

REPORT OF ANALYTICAL RESULTS

CLIENT : HALL ENVIRONMENTAL
SVL JOB No. : 96636
SVL SAMPLE No.: 253063

CLIENT SAMPLE ID: 0101044-01C
Sample Collected: 1/08/01
Sample Receipt : 1/11/01
Date of Report : 1/12/01
Matrix: WATER

Determination	Result	Units	Dilution	Method	Test Date	Reference
Cation Sum	8.10	meq/L	1		1/11/01	
Calcium	80.4	mg/L	1	6010B	1/11/01	2
Potassium	4.4	mg/L	1	6010B	1/11/01	2
Magnesium	12.7	mg/L	1	6010B	1/11/01	2
Sodium	67.4	mg/L	1	6010B	1/11/01	2
Silver	<0.005	mg/L	1	6010B	1/11/01	2
Arsenic	0.01	mg/L	1	6010B	1/11/01	2
Barium	0.106	mg/L	1	6010B	1/11/01	2
Cadmium	<0.002	mg/L	1	6010B	1/12/01	2
Chromium	<0.006	mg/L	1	6010B	1/12/01	2
Mercury	<0.0004	mg/L	2	7470	1/11/01	2
Lead	<0.005	mg/L	1	6010B	1/12/01	2
Selenium	0.01	mg/L	1	6010B	1/11/01	2

REFERENCES: 1) "Methods for Chemical Analysis of Water and Wastes", EPA-600/4-79-20; 2) "Test Methods for Evaluating Solid Wastes, 3rd Edition", SW 846, 1994; 3) "Standard Methods for the Examination of Water and Wastewater", 18th ED. 1992; 4) ASTM Method; 5) 40 CFR, Part 261

Reviewed By: Date 1/12/01
1/12/01 11:50

Post-it® Fax Note 7671 | Date | # of pages ▶
To STEPHANIE FLORES | From TRECA
Co./Dept. HALL ENV. | Co. SVL ANALYTICAL
Phone # | Phone #
Fax # (505) 345-4107 | Fax #

SVL ANALYTICAL, INC.
One Government Gulch ■ P.O. Box 929 ■ Kellogg, Idaho 83837-0929 ■ Phone: (208)784-1258 ■ Fax: (208)783-6891

REPORT OF ANALYTICAL RESULTS

CLIENT : HALL ENVIRONMENTAL
SVL JOB No. : 96636
SVL SAMPLE No.: 253054

CLIENT SAMPLE ID: 0101044-02C
Sample Collected: 1/08/01
Sample Receipt : 1/11/01
Date of Report : 1/12/01
Matrix: WATER

Determination	Result	Units	Dilution	Method	Test Date	Reference
Cation Sum	8.53	meq/L	1		1/11/01	
Calcium	83.4	mg/L	1	6010B	1/11/01	2
Potassium	4.5	mg/L	1	6010B	1/11/01	2
Magnesium	14.2	mg/L	1	6010B	1/11/01	2
Sodium	70.8	mg/L	1	6010B	1/11/01	2
Silver	<0.005	mg/L	1	6010B	1/11/01	2
Arsenic	<0.01	mg/L	1	6010B	1/11/01	2
Barium	0.112	mg/L	1	6010B	1/11/01	2
Cadmium	<0.002	mg/L	1	6010B	1/11/01	2
Chromium	<0.006	mg/L	1	6010B	1/11/01	2
Mercury	<0.0002	mg/L	1	7470	1/11/01	2
Lead	<0.005	mg/L	1	6010B	1/11/01	2
Selenium	<0.01	mg/L	1	6010B	1/11/01	2

REFERENCES: 1) "Methods for Chemical Analysis of Water and Wastes", EPA-600/4-79-020; 2) "Test Methods for Evaluating Solid Wastes, 3rd Edition", SW 846, 1994; 3) "Standard Methods for the Examination of Water and Wastewater", 19th ED. 1995; 4) ASTM Method; 5) 40 CFR, Part 261

Reviewed By: Kelly Gray Date 1/12/01
1/12/01 11:50

SVL ANALYTICAL, INC.
One Government Gulch # P.O. Box 929 # Kellogg, Idaho 83837-0929 # Phone: (208)784-1258 # Fax: (208)783-3691

REPORT OF ANALYTICAL RESULTS

CLIENT : HALL ENVIRONMENTAL
SVL JOB No. : 96636
SVL SAMPLE No.: 253065

CLIENT SAMPLE ID: 0101044-03C
Sample Collected: 1/08/01
Sample Receipt : 1/11/01
Date of Report : 1/12/01
Matrix: WATER

Determination	Result	Units	Dilution	Method	Test Date	Reference
Cation Sum	31.6	meq/L	1		1/14/01	
Calcium	393	mg/L	1	6010B	1/11/01	2
Potassium	9.0	mg/L	1	6010B	1/11/01	2
Magnesium	67.3	mg/L	1	6010B	1/11/01	2
Sodium	143	mg/L	1	6010B	1/11/01	2
Silver	<0.005	mg/L	1	6010B	1/11/01	2
Arsenic	0.02	mg/L	1	6010B	1/11/01	2
Barium	0.532	mg/L	1	6010B	1/11/01	2
Cadmium	<0.002	mg/L	1	6010B	1/11/01	2
Chromium	<0.006	mg/L	1	6010B	1/11/01	2
Mercury	<0.0002	mg/L	1	7470	1/11/01	2
Lead	<0.005	mg/L	1	6010B	1/11/01	2
Selenium	0.02	mg/L	1	6010B	1/11/01	2

REFERENCES: 1) "Methods for Chemical Analysis of Water and Wastes", EPA-600/4-79-20; 2) "Test Methods for Evaluating Solid Wastes, 3rd Edition", SW 846, 1994; 3) "Standard Methods for the Examination of Water and Wastewater", 18th ED. 1992; 4) ASTM Method; 5) 40 CFR, Part 261

Reviewed By: Cindy Lacy Date 1/12/01
1/12/01 11:50

SVL ANALYTICAL, INC.

Quality Control Report

Part I Prep Blank and Laboratory Control Sample

Client :HALL ENVIRONMENTAL SVL JOS No. :96636

Analyte	Method	Matrix	Units	Prep Blank	True	LCS	Found	LCS %R	Analysis Date
Silver	6010B	WATER	mg/L	<0.005	1.00		0.984	98.4	1/11/01
Arsenic	6010B	WATER	mg/L	<0.01	1.00		1.01	101.0	1/11/01
Barium	6010B	WATER	mg/L	<0.002	1.00		0.994	99.4	1/11/01
Calcium	6010B	WATER	mg/L	<0.04	20.0		18.9	94.5	1/11/01
Cadmium	6010B	WATER	mg/L	<0.002	1.00		1.00	100.0	1/11/01
Chromium	6010B	WATER	mg/L	<0.006	1.00		1.00	100.0	1/11/01
Potassium	6010B	WATER	mg/L	<1.0	30.0		28.0	93.3	1/11/01
Magnesium	6010B	WATER	mg/L	<0.04	20.0		18.6	93.0	1/11/01
Sodium	6010B	WATER	mg/L	<0.1	20.0		18.1	90.5	1/11/01
Lead	6010B	WATER	mg/L	<0.005	1.00		0.987	98.7	1/11/01
Selenium	6010B	WATER	mg/L	<0.01	1.00		0.97	97.0	1/11/01
Mercury	7470	WATER	mg/L	<0.0002	0.0050		0.0048	96.0	1/11/01

LEGEND:

LCS = Laboratory Control Sample LCS %R = LCS Percent Recovery N/A = Not Applicable

SVL ANALYTICAL, INC. Quality Control Report

Part II Duplicate and Spike Analysis

Client :HALL ENVIRONMENTAL SVL JOB No :96636

Test	Method	Matrix	QC SAMPLE ID Units	Result	Duplicate or MSD Found	RPD%	Matrix Spike Result	SPK ADD		%R	Test Date
ag	6010B	WATER	1 mg/L	<0.005	<0.005	UDL	1.01	1.00		101.0	1/11/01
as	6010B	WATER	1 mg/L	0.01	0.01	0.0	1.04	1.00		103.0	1/11/01
ba	6010B	WATER	1 mg/L	0.105	0.113	6.4	1.10	1.00		99.4	1/11/01
ca	6010B	WATER	1 mg/L	80.4	85.0	5.6	95.9	20.0		77.5	1/11/01
cd	6010B	WATER	1 mg/L	<0.002	<0.002	UDL	0.998	1.00		99.8	1/12/01
cr	6010B	WATER	1 mg/L	<0.006	<0.006	UDL	1.01	1.00		101.0	1/12/01
k	6010B	WATER	1 mg/L	4.4	4.5	2.2	32.9	30.0		95.0	1/11/01
mg	6010B	WATER	1 mg/L	12.7	13.4	5.4	30.8	20.0		90.5	1/11/01
na	6010B	WATER	1 mg/L	67.4	71.0	5.2	83.0	20.0	A	78.0	1/11/01
pb	6010B	WATER	1 mg/L	<0.005	<0.005	UDL	0.988	1.00		98.8	1/12/01
se	6010B	WATER	1 mg/L	0.01	<0.01	200.0	1.00	1.00		99.0	1/11/01
hg	7470	WATER	1 mg/L	<0.0004	<0.0004	UDL	0.0022	0.0020		110.0	1/11/01

LEGEND:

RPD% = ((|SAM - DUP|)/((SAM + DUP)/2) * 100) UDL = Both SAM & DUP not detected.

RPD% = ((|SPK - MSD|)/((SPK + MSD)/2) * 100) A in Duplicate/MSD column indicates MSD.

SPIKE ADD column, A = Post Digest Spike; %R = Percent Recovery N/A = Not Analyzed; A > 4B = Result more than 4X the Spike Added

QC Sample Is: SVL SAM No.: 253063 Client Sample ID: 0101044-01C

CHAIN-OF-CUSTODY RECORD

HALL ENVIRONMENTAL ANALYSIS LABORATORY
4901 Hawkins NE, Suite A
Albuquerque, New Mexico 87109
Tel. 505.345.3975 Fax 505.345.4107
www.hallenvironmental.com

Client: ECO	Project Name: McCasland
Address: P.O. Box 9378 Alb NM 87119	Project #:
	Project Manager: G. Bykerk
Phone #: 268-2401	Sampler: GB
Fax #: 242-6213	Samples Cold?: ☒ Yes ☐ No

Date	Time	Matrix	Sample I.D. No.	Number/Volume	Preservative: $HgCl_2$	Preservative: HCl	HEAL No.
1/8/01		H_2O	MW-1				0101044-1
"		"	MW-2				-2
"		"	MW-3				-3

ANALYSIS REQUEST

BTEX + MTBE + TMB's (8021)	BTEX + MTBE + TPH (Gasoline Only)	TPH Method 8015B MOD (Gas/Diesel)	TPH (Method 418.1)	Volatiles Full List (8021)	EDB (Method 504.1)	EDC (Method 8021)	8310 (PNA or PAH)	RCRA 8 Metals	Cations (Na, K, Ca, Mg)	Anions (F, Cl, NO_3, NO_2, PO_4, SO_4)	8081 Pesticides / PCB's (8082)	8260 (VOA)	8270 (Semi-VOA)	25	Air Bubbles or Headspace (Y or N)
			X					X	X	X				X	
			X					X	X	X				X	
			X					X	X	X				X	

Date	Time	Relinquished By: (Signature)	Received By: (Signature)
1/9/01	5:30		Jeff Bull 1/9/01
Date:	Time:	Relinquished By: (Signature)	Received By: (Signature)

Remarks:
* 3day TAT if possible

Hall Environmental Analysis Laboratory

Date: *26-Dec-00*

CLIENT:	ECD Environmental	Client Sample ID:	McCasland Windmill 1st Purge
Lab Order:	0011154	Collection Date:	11/28/00
Project:	McCasland		
Lab ID:	0011154-01	Matrix:	AQUEOUS

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ANIONS BY 300.0		**E300**				Analyst: **SDU**
Bromide	4.0	0.50		mg/L	5	12/7/00
Chloride	1500	20		mg/L	200	12/14/00
Fluoride	ND	0.50		mg/L	5	12/7/00
Nitrogen, Nitrate (As N)	1.5	0.50		mg/L	5	12/7/00
Nitrogen, Nitrite (As N)	ND	2.5		mg/L	5	12/7/00
Phosphorus, Dissolved Orthophosphate (As P)	43	2.5		mg/L	5	12/7/00
Sulfate	100	2.5		mg/L	5	12/7/00

Qualifiers:	ND - Not Detected at the Reporting Limit	S - Spike Recovery outside accepted recovery limits
	J - Analyte detected below quantitation limits	R - RPD outside accepted recovery limits
	B - Analyte detected in the associated Method Blank	E - Value above quantitation range
	* - Value exceeds Maximum Contaminant Level	

Hall Environmental Analysis Laboratory

Date: 26-Dec-00

CLIENT:	ECD Environmental	Client Sample ID:	McCasland Windmill
Lab Order:	0011154	Collection Date:	11/28/00
Project:	McCasland		
Lab ID:	0011154-02	Matrix:	AQUEOUS

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ANIONS BY 300.0		**E300**				Analyst: SDU
Bromide	2.9	0.10		mg/L	1	12/1/00
Chloride	1100	5.0		mg/L	50	12/14/00
Fluoride	ND	0.10		mg/L	1	12/1/00
Nitrogen, Nitrate (As N)	1.7	0.10		mg/L	1	12/1/00
Nitrogen, Nitrite (As N)	ND	0.50		mg/L	1	12/1/00
Phosphorus, Dissolved Orthophosphate (As P)	ND	0.50		mg/L	1	12/1/00
Sulfate	88	2.5		mg/L	5	12/14/00

Qualifiers:

- ND - Not Detected at the Reporting Limit
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range

Hall Environmental Analysis Laboratory

Date: *26-Dec-00*

CLIENT:	ECD Environmental	Client Sample ID:	McCasland Blank
Lab Order:	0011154	Collection Date:	11/28/00
Project:	McCasland		
Lab ID:	0011154-03	Matrix:	AQUEOUS

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ANIONS BY 300.0		E300				Analyst: SDU
Bromide	0.20	0.10		mg/L	1	12/1/00
Chloride	22	0.10		mg/L	1	12/1/00
Fluoride	0.66	0.10		mg/L	1	12/1/00
Nitrogen, Nitrate (As N)	2.0	0.10		mg/L	1	12/1/00
Nitrogen, Nitrite (As N)	ND	0.50		mg/L	1	12/1/00
Phosphorus, Dissolved Orthophosphate (As P)	ND	0.50		mg/L	1	12/1/00
Sulfate	38	0.50		mg/L	1	12/1/00

Qualifiers:
- ND - Not Detected at the Reporting Limit
- J - Analyte detected below quantitation limit
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range

SVL ANALYTICAL, INC.
One Government Gulch ■ P.O. Box 929 ■ Kellogg, Idaho 83837-0929 ■ Phone: (208)784-1258 ■ Fax: (208)783-0891

REPORT OF ANALYTICAL RESULTS

CLIENT : HALL ENVIRONMENTAL
SVL JOB No. : 96370
SVL SAMPLE No.: 250970

CLIENT SAMPLE ID: 0011154-01A
Sample Collected: 11/28/00
Sample Receipt : 12/07/00
Data of Report : 12/15/00
Matrix: WATER

Determination	Result	Units	Dilution	Method	Test Date	Reference
Calcium	692	mg/L	1	6010B	12/13/00	2
Potassium	8.9	mg/L	1	6010B	12/13/00	2
Magnesium	64.6	mg/L	1	6010B	12/13/00	2
Sodium	344	mg/L	1	6010B	12/13/00	2

REFERENCES: 1) "Methods for Chemical Analysis of Water and Wastes", EPA-600/4-79-20. 2) "Test Methods for Evaluating Solid Wastes, 3rd Edition", SW 846, 1994; 3) "Standard Methods for the Examination of Water and Wastewater", 18th ED. 1992; 4) ASTM Method; 5) 40 CFR, Part 261

Reviewed By: Barbara J. Lee Date 12/15/00
12/15/00 10:19

SVL ANALYTICAL, INC.
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REPORT OF ANALYTICAL RESULTS

CLIENT : HALL ENVIRONMENTAL
SVL JOB No. : 96370
SVL SAMPLE No.: 250971

CLIENT SAMPLE ID: 0011154-02B
Sample Collected: 11/28/00
Sample Receipt : 12/07/00
Date of Report : 12/15/00
Matrix: WATER

Determination	Result	Units	Dilution	Method	Test Date	Reference
Calcium	698	mg/L	1	6010B	12/13/00	2
Potassium	8.5	mg/L	1	6010B	12/13/00	2
Magnesium	62.3	mg/L	1	6010B	12/13/00	2
Sodium	334	mg/L	1	6010B	12/13/00	2
Silver	<0.005	mg/L	1	6010B	12/13/00	2
Arsenic	0.01	mg/L	1	6010B	12/13/00	2
Barium	0.303	mg/L	1	6010B	12/13/00	2
Cadmium	<0.002	mg/L	1	6010B	12/13/00	2
Chromium	<0.006	mg/L	1	6010B	12/13/00	2
Mercury	0.0004	mg/L	2	7470	12/14/00	2
Lead	0.005	mg/L	1	6010B	12/13/00	2
Selenium	0.02	mg/L	1	6010B	12/13/00	2

REFERENCES: 1) "Methods for Chemical Analysis of Water and Wastes", EPA-600/4-79-20; 2) "Test Methods for Evaluating Solid Wastes, 3rd Edition", SW 846, 1994; 3) "Standard Methods for the Examination of Water and Wastewater", 18th ED, 1992; 4) ASTM Method; 5) 40 CFR, Part 261

Reviewed By: Brenda Johnson Date 12/15/00
12/15/00 13:19

SVL ANALYTICAL, INC.

Quality Control Report

Part I Prep Blank and Laboratory Control Sample

Client :HALL ENVIRONMENTAL

SVL JOB No. :96370

Analyte	Method	Matrix	Units	Prep Blank	True——LCS——Found		LCS %R	Analysis Date
Silver	6010B	WATER	mg/L	<0.005	1.00	0.991	99.1	12/13/00
Arsenic	6010B	WATER	mg/L	<0.01	1.00	0.99	99.0	12/13/00
Barium	6010B	WATER	mg/L	<0.002	1.00	0.994	99.4	12/13/00
Calcium	6010B	WATER	mg/L	<0.04	20.0	21.0	105.0	12/13/00
Cadmium	6010B	WATER	mg/L	<0.002	1.00	0.985	98.5	12/13/00
Chromium	6010B	WATER	mg/L	<0.006	1.00	0.997	99.7	12/13/00
Potassium	6010B	WATER	mg/L	<1.0	30.0	30.2	100.7	12/13/00
Magnesium	6010B	WATER	mg/L	<0.04	20.0	19.6	98.0	12/13/00
Sodium	6010B	WATER	mg/L	<0.1	20.0	20.3	101.5	12/13/00
Lead	6010B	WATER	mg/L	<0.005	1.00	0.985	98.5	12/13/00
Selenium	6010B	WATER	mg/L	0.01	1.00	0.93	93.0	12/13/00
Mercury	7470	WATER	mg/L	<0.0002	0.0050	0.0052	104.0	12/14/00

LEGEND:

LCS = Laboratory Control Sample LCS %R = LCS Percent Recovery N/A = Not Applicable

12/15/00 10:19

SVL ANALYTICAL, INC. Quality Control Report

Part II Duplicate and Spike Analysis

Client :HALL ENVIRONMENTAL SVL JOB No :96370

Test	Method	Matrix	QC SAMPLE ID Units	Result	Duplicate or MSD Found	RPD%	Matrix Spike Result	SPK ADD	%R	Test Date
Ag	6010B	WATER	1 mg/L	<0.005	<0.005	UDL	1.08	1.00	108.0	12/13/00
As	6010B	WATER	1 mg/L	0.01	0.01	0.0	1.07	1.00	106.0	12/13/00
Ba	6010B	WATER	1 mg/L	0.303	0.309	2.0	1.27	1.00	96.7	12/13/00
Ca	6010B	WATER	1 mg/L	698	694	0.6	694	20.0	R >4S	12/13/00
Cd	6010B	WATER	1 mg/L	<0.002	<0.002	UDL	0.954	1.00	95.4	12/13/00
Cr	6010B	WATER	1 mg/L	<0.006	<0.006	UDL	0.972	1.00	97.2	12/13/00
K	6010B	WATER	1 mg/L	8.5	8.4	1.2	41.0	30.0	108.3	12/13/00
Mg	6010B	WATER	1 mg/L	62.3	61.5	1.3	91.0	20.0	95.5	12/13/00
Na	6010B	WATER	1 mg/L	334	330	1.2	348	20.0	R >4S	12/13/00
Pb	6010B	WATER	1 mg/L	0.005	0.006	18.2	0.971	1.00	96.6	12/13/00
Se	6010B	WATER	1 mg/L	0.02	0.02	0.0	1.05	1.00	103.0	12/13/00
Hg	7470	WATER	1 mg/L	0.0004	<0.0004	200.0	0.0022	0.0020	90.0	12/14/00

LEGEND:

RPD% = ((SAM - DUP)/((SAM + DUP)/2) * 100) UDL = Both SAM & DUP not detected.

RPD% = ((SPK - MSD)/((SPK + MSD)/2) * 100) M in Duplicate/MSD column indicates MSD.

SPIKE ADD column, A = Post Digest Spike; %R = Percent Recovery; N/A = Not Analyzed; R > 4S = Result more than 4X the Spike Added

QC Sample I: SVL SAM No.: 250971 Client Sample ID: 001154-02B

12/15/00 10:19

96370

Hall Environmental Analysis Labor
4901 Hawkins NE, Suite A
Albuquerque, New Mexico 87109
(505) 345-3975

CHAIN-OF-CUSTODY RECORD

Subcontractor:
SVL
One Government Gulch
Kellogg, ID 83837

TEL: (800) 597-7144
FAX:
Acct #:

06-Dec-00

Sample ID	Matrix	Collection Date	Bottle Type	Sb, K, Ca, Mg [redacted]	RCRA 8 Metals					
0011154-01A	Aqueous	11/28/2000	500HDPE	1						
0011154-02B	Aqueous	11/28/2000	250HDPEHNO3	1	1					

Comments: Project Name: McCasland
Please fax results by: 12/21/00

	Date/Time		Date/Time
Relinquished by: Stephanie Ukhanow	12/6/00 1525	Received by: C Williams	12/7/00 1:30
Relinquished by:		Received by:	

Hall Environmental Analysis Laboratory

Date: *26-Dec-00*

CLIENT: ECD Environmental
Work Order: 0011154
Project: McCasland

QC SUMMARY REPORT
Method Blank

Sample ID: MB-R304 **Batch ID:** R304 **Test Code:** E300 **Units:** mg/Kg **Analysis Date:** 12/14/00 **Prep Date:**
Client ID: **Run ID:** WC_001214A **SeqNo:** 5814

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Bromide	ND	0.30									
Chloride	ND	0.30									
Fluoride	ND	0.30									
Nitrate (As N) + Nitrite (As N)	ND	0									
Nitrogen, Nitrate (As N)	ND	0.30									
Nitrogen, Nitrite (As N)	ND	0.30									
Phosphorus, Dissolved Orthophosphate	ND	1.5									
Sulfate	ND	1.5									

Sample ID: mblk **Batch ID:** R235 **Test Code:** E300 **Units:** mg/L **Analysis Date:** 12/1/00 **Prep Date:**
Client ID **Run ID:** WC_001201A **SeqNo:** 5618

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Bromide	ND	0.10									
Chloride	ND	0.10									
Fluoride	ND	0.10									
Nitrogen, Nitrate (As N)	ND	0.10									
Nitrogen, Nitrite (As N)	ND	0.50									
Phosphorus, Dissolved Orthophosphate	ND	0.50									
Sulfate	ND	0.50									

Qualifiers: ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
B - Analyte detected in the associated Method Blank

Hall Environmental Analysis Laboratory

Date: 26-Dec-00

CLIENT: ECD Environmental
Work Order: 0012154
Project: McClasland

QC SUMMARY REPORT
Laboratory Control Spike - generic

Sample ID: LCS-R304	Batch ID: R304	Test Code: E300	Units: mg/Kg	Analysis Date: 12/14/00	Prep Date:
Client ID:		Run ID: WC_001214A		SeqNo: 5815	

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Bromide	2.98	0.30	3	0	99.3	85	115	0			
Chloride	5.709	0.30	6	0	95.2	85	115	0			
Fluoride	0.623	0.30	0.6	0	104	85	115	0			
Nitrogen, Nitrate (As N)	3.016	0.30	3	0	101	85	115	0			
Nitrogen, Nitrite (As N)	1.165	0.30	1.2	0	97.1	85	115	0			
Phosphorus, Dissolved Orthophosphate	5.616	1.5	6	0	93.6	85	115	0			
Sulfate	11.52	1.5	12	0	96.0	85	115	0			

Sample ID: lcsd	Batch ID: R304	Test Code: E300	Units: mg/Kg	Analysis Date: 12/14/00	Prep Date:
Client ID:		Run ID: WC_001214A		SeqNo: 5819	

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Bromide	2.904	0.30	3	0	96.8	85	115	2.98	2.58	15	
Chloride	5.655	0.30	6	0	94.3	85	115	5.709	2.00	15	
Fluoride	0.609	0.30	0.6	0	102	85	115	0.623	2.27	15	
Nitrogen, Nitrate (As N)	2.95	0.30	3	0	98.3	85	115	3.016	2.21	15	
Nitrogen, Nitrite (As N)	1.14	0.30	1.2	0	95.0	85	115	1.165	2.17	15	
Phosphorus, Dissolved Orthophosphate	5.503	1.5	6	0	91.7	85	115	5.616	2.03	15	
Sulfate	11.26	1.5	12	0	93.8	85	115	11.52	2.34	15	

Sample ID: lcs	Batch ID: R335	Test Code: E300	Units: mg/L	Analysis Date: 12/1/00	Prep Date:
Client ID:		Run ID: WC_001201A		SeqNo: 6619	

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Nitrate (As N)	2.919	0.10	3	0	97.3	85	115	0			
Sulfate	11.43	0.50	12	0	95.2	85	115	0			

Qualifiers:
ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
B - Analyte detected in the associated Method Blank

CLIENT: ECD Environmental
Work Order: 0011154
Project: McCasland

QC SUMMARY REPORT
Laboratory Control Spike Duplicate

Sample ID: lcsd | Batch ID: R235 | Test Code: E300 | Units: mg/L | Analysis Date: 12/1/00 | Prep Date:
Client ID: | Run ID: WC_001201A | SeqNo: 5625

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Nitrate (As N)	2.964	0.10	3	0	98.8	85	115	0			
Sulfate	11.63	0.50	12	0	97.0	85	115	0			

Qualifiers: ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
B - Analyte detected in the associated Method Blank

CHAIN-OF-CUSTODY RECORD

HALL ENVIRONMENTAL ANALYSIS LABORATORY
5121 69th St., Suite A-7
Lubbock, TX 79424
(806) 798-9882 • Fax (806) 798-8434

Client: ECO

Project Name: McCasland

Address: P.O. Box 9828
Alb, NM 87119

Project #:

Project Manager:

Phone #: (505) 268-2401

Sampler: GB

Fax #: 242-6213

Samples Cold?: ☒ Yes ☐ No

Date	Time	Matrix	Sample I.D. No.	Number/Volume	Preservative			HEAL No.
11/28/00		H_2O	McCasland Windmill	1st Purge				0011154-1
			McCasland Windmill					-2
			McCasland Blank					-3

ANALYSIS REQUEST

BTEX + MTBE (602/8020)	BTEX + MTBE + TPH (Gasoline Only)	TPH Method 8015 MOD (Gas/Diesel)	TPH (Method 418.1)	8010/8020 Volatiles	EDB (Method 504)	EDC (Method 8010)	8310 (PNA or PAH)	RCRA 8 Metals	Cations (Na, K, Ca, Mg)	Anions (F, Cl, NO_3, NO_2, PC, SO_4)	8081/8082 Pesticides/PCB's	8260 (VOA)	8270 (Semi-VOA)	TPH (TNRCC-TX Method 1005)	Bc		Air Bubbles or Headspace (Y or N)
									X	X					X		
								X	X	X					X		
										X					X		

Date:	Time:	Relinquished By: (Signature)	Received By: (Signature)
11/30/00	4:30		11/30
Date:	Time:	Relinquished By: (Signature)	Received By: (Signature)

Remarks:

PPI-16440

FEB-12-2001 (MON) 13:38 HALL ENVIRONMENTAL (FAX)505 345 4107 P.023/023

Hall Environmental Analysis Laboratory

Hall Environmental Analysis Laboratory
4901 Hawkins NE, Ste. A
Albuquerque, NM 87109

8/16/99

ECD Environmental
P. O Box 9328
Albuquerque, NM 87119

Dear Mr. Greg Bybee:

Enclosed are the results for the analyses that were requested. These were done according to EPA procedures or equivalent.

Detection limits are determined by EPA methodology. No determination of compounds below these (denoted by the ND or < sign) has been made.

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

Sincerely:

Scott Hallenbeck
Laboratory Manager

Project: 9901105/McCausland

Hall Environmental Analysis Laboratory

Client:	ECD Environmental	**Date Collected:**	8/16/99
Project:	McCasland	**Date Received:**	8/17/99
Project Manager:	Greg Bybee	**Sample Matrix:**	Aqueous
Project Number:	-	**Date Extracted:**	NA

EPA Method - 8021

Units: PPB ug/L

HEAL LAB ID	Sample ID	MTBE	Benzene	Toluene	Ethyl-benzene	Total Xylenes	1,3,5-TMB	1,2,4-TMB	BFB % Recovery	Dilution Factor	Date Analyzed
9908363-2	Mewbourne Oil Co MW	ND	ND	ND	ND	ND	ND	ND	103	1	8/18/99
Reag. Blk.	-	ND	ND	ND	ND	ND	ND	ND	95	1	8/18/99

MRL	2.5	0.5	0.5	0.5	0.5	0.5	0.5

Hall Environmental Analysis Laboratory

Client:	BCD Environmental	**Date Collected:**	NA
Project:	McCasland	**Date Received:**	NA
Project Manager:	Greg Bybee	**Sample Matrix:**	Aqueous
Project Number:	-	**Date Extracted:**	NA

8021 QC. BS/BSD 8/18

Compound	Sample Amount (ug/L)	Spike	Recovery	% Rec	Dup	% Dup	RPD
MTBE	<2.5	40.0	44.0	110	42.6	107	3
Benzene	<0.5	20.0	20.6	103	20.8	104	1
Toluene	<0.5	20.0	20.6	103	20.2	101	1
Ethylbenzene	<0.5	20.0	20.7	104	20.3	102	2
Total Xylenes	<0.5	60.0	61.5	103	61.1	102	1
1,3,5 TMB	<0.5	20.0	20.8	104	20.4	102	2
1,2,4-TMB	<0.5	20.0	20.6	103	20.6	103	0

Hall Environmental Analysis Laboratory

Client:	ECD Environmental	Date Collected:	8/16/99
Project:	McCasland	Date Received:	8/17/99
Project Manager:	Greg Bybee	Sample Matrix:	Aqueous
Project Number:	-	Extraction Date:	8/20/99

EPA Method - 418.1

HEAL ID	Client ID	Dilution	TPH (mg/L)	Analysis Date
9908083-1	McCasland Water Well	1	ND	8/20/99
9908083-2	Mewbourne Oil Co MW	1	ND	8/20/99
Extraction Blank	-	1	ND	8/20/99

QA/QC		MRL		
Sample ID	Sample Amount	Spike	Recovery	% Recovery
Blank Spike 8/20	<1.0	5.0	4.5	90
Sample ID	Sample Amount	Duplicate	RPD	
Blank Duplicate 8/11	<1.0	<1.0	NA	

Hall Environmental
Analysis Laboratory

Client: EOD Environmental
Project: McCasland
Project Manager: Greg Bybee
Project Number: -

Date Collected: 8/16/99
Date Received: 8/17/99
Sample Matrix: Aqueous

Inorganic Compounds

HEAL LAB ID	Sample ID	Fluride (mg/L)	Chloride (mg/L)	Bromide (mg/L)	Nitrite (mg/L)	Nitrate (mg/L)	Sulfate (mg/L)	o-Phosphate P (mg/L)
9908063-1	McCasland Water Well	0.2	720	2.4	ND	1.4	77	ND
9908063-2	Mewbourne Oil Co MW	0.3	120	1.2	ND	3.3	79	ND
Detection Limits		0.1	0.1	0.1	0.1	0.1	0.5	0.5
Method		300.0	300.0	300.0	300.0	300.0	300.0	300.0
Date Analyzed		8/17/99	8/23/99	8/17/99	8/17/99	8/17/99	8/17,23/99	8/17/99

ENERGY LABORATORIES, INC.
P.O. BOX 30916 • 1120 SOUTH 27TH STREET • BILLINGS, MT 59107-0816 • PHONE (406) 252-6325
FAX (406) 252-6069 • 1-800-735-4489 • E-MAIL eli@energylab.com

LABORATORY ANALYSIS REPORT

Hall Environmental Laboratory	Project ID:	MCCASLAND PROJ. #9908063	
Nancy McDuffie	Sample ID:	WATER WELL	
4901 Hawkins NE	Laboratory ID:	99-56021-1	
Suite A	Sample Matrix:	Water	
Albuquerque, NM 87109	Sample Date:	16-Aug-99	
	Received at lab:	20-Aug-99	Reported: 26-Aug-99

	Results	Units	Qual	Reporting Limit	Regulatory Limit	Method	Analyzed	
Calcium	308	mg/l		1		EPA 200.7	25-Aug-99 1533	RLH
Magnesium	38	mg/l		1		EPA 200.7	25-Aug-99 1533	RLH
Potassium	6	mg/l		1		EPA 200.7	25-Aug-99 1533	RLH
Sodium	188	mg/l		1		EPA 200.7	25-Aug-99 1533	RLH

ENERGY LABORATORIES, INC.
P.O. BOX 30916 • 1120 SOUTH 27TH STREET • BILLINGS, MT 59107-0916 • PHONE (406) 252-6325
FAX (406) 252-6069 • 1-800-735-4489 • E-MAIL sil@energylab.com

LABORATORY ANALYSIS REPORT

Hall Environmental Laboratory	Project ID:	MCCASLAND TRGL #9908063	
Nancy McDuffie	Sample ID:	MEWBOURNE OIL CO MW	
4901 Hawkins NE	Laboratory ID:	99-56021-2	
Suite A	Sample Matrix:	Water	
Albuquerque, NM 87109	Sample Date:	16-Aug-99	
	Received at lab:	20-Aug-99	Reported: 26-Aug-99

	Results	Units	Qual	Reporting Limit	Regulatory Limit	Method	Analyzed	
Calcium	88	mg/l		1		EPA 200.7	25-Aug-99 1535	RLH
Magnesium	16	mg/l		1		EPA 200.7	25-Aug-99 1535	RLH
Potassium	4	mg/l		1		EPA 200.7	25-Aug-99 1535	RLH
Sodium	81	mg/l		1		EPA 200.7	25-Aug-99 1535	RLH

Lab Nos. 99-56021-1

QUALITY ASSURANCE DATA PACKAGE

This report includes the results of quality assurance tests performed with the sample analyses. They are performed to determine if the methodology is in control and to monitor the laboratory's ability to produce accurate and precise results.

Constituents	Duplicate Analysis ------mg/l (ppm)------ Original	Duplicate	Spiked Analysis, % Recovery	Blank Analysis, mg/l (ppm)	-----Calibration Verification----- Sample Analysis, mg/l (ppm)	Acceptance Range, mg/l (ppm)	Date Analyzed
Calcium	59	59	102	<1	51	45-55	08/25/99
Magnesium	37	37	104	<1	52	45-55	08/25/99
Potassium	13	13	104	<1	52	45-55	08/25/99
Sodium	829	824	101	<1	53	45-55	08/25/99

CHAIN-OF-CUSTODY RECORD

HALL ENVIRONMENTAL ANALYSIS LABORATORY
4901 Hawkins NE, Suite A
Albuquerque, New Mexico 87109
Tel. 505.345.3975 Fax 505.345.4107
www.hallenvironmental.com

Client: ECD Environmental
Address: P.O. Box 9328
Alb. NM
87119
Phone #: 268-2401
Fax #: 242-6213

Project Name: McCasland
Project #:
Project Manager:
Sampler: ES
Samples Cold?: ☒ Yes ☐ No

Date	Time	Matrix	Sample I.D. No.	Number/Volume	Preservative $HgCl_2$	Preservative HCl	HEAL No.
8/16/99		H_2O	McCasland water well				9908063-1
"		"	Marbourne Oil Co MW				2

ANALYSIS REQUEST

HEAL No.	BTEX + MTBE + TMB's (8021)	BTEX + MTBE + TPH (Gasoline Only)	TPH Method 8015B MOD (Gas/Diesel)	TPH (Method 418.1)	Volatiles Full List (8021)	EDB (Method 504.1)	EDC (Method 8021)	8310 (PNA or PAH)	RCRA 8 Metals	Cations (Na, K, Ca, Mg)	Anions (F, Cl, NO_3, NO_2, PO_4, SO_4)	8081 Pesticides / PCB's (8082)	8260 (VOA)	8270 (Semi-VOA)	[illegible]		Air Bubbles or Headspace (Y or N)
9908063-1				X						X	X				X		
2	X			X						X	X				X		

Date: 8/17/99 Time: Relinquished By: (Signature) [signature]
Received By: (Signature) [signature] 8/17
Date: Time: Relinquished By: (Signature)
Received By: (Signature)

Remarks:

CHAIN-OF-CUSTODY RECORD

HALL ENVIRONMENTAL ANALYSIS LABORATORY
4901 Hawkins NE, Suite A
Albuquerque, New Mexico 87109
Tel. 505.345.3975 Fax 505.345.4107
www.hallenvironmental.com

Hi15 Vad Ge/no sub

Client: SEE RIGHT

Address:

Phone #:

Fax #:

Project Name: McCasland

Project #: 9908063

Project Manager: G. McDuffie

Sampler:

Samples Cold?: ☒ Yes ☐ No

ANALYSIS REQUEST

Date	Time	Matrix	Sample I.D. No.	Number/Volume	Preservative $HgCl_2$	Preservative HCl	Preservative none	HEAL No.	BTEX + MTBE + TMB's (8021)	BTEX + MTBE + TPH (Gasoline Only)	TPH Method 8015B MOD (Gas/Diesel)	TPH (Method 418.1)	Volatiles Full List (8021)	EDB (Method 504.1)	EDC (Method 8021)	8310 (PNA or PAH)	RCRA 8 Metals	Cations (Na, K, Ca, Mg)	Anions (F, Cl, NO_3, NO_2, PO_4, SO_4)	8081 Pesticides / PCB's (8082)	8260 (VOA)	8270 (Semi-VOA)			Air Bubbles or Headspace (Y or N)
8/16/99		Aq	McCasland Water Well	1 500ml			X	001-99-5603										X							
⟂		⟂	Medowarm oil Co MW	1-500ml			X	002 ⟂										X							

Date: 8/19/99	Time: 12:40	Relinquished By: (Signature) Randy McDuffie	Received By: (Signature)
Date:	Time:	Relinquished By: (Signature)	Received By: (Signature) Krystal Simmons 08/20/99 @ 1155

Remarks:

Hall Environmental
Analysis Laboratory

September 3, 1999

Hall Environmental Analysis Laboratory
4901 Hawkins NE. Ste. A
Albuquerque, NM 87109

ECD Environmental
P. O. Box 9328
Albuquerque, NM 87119

Dear Mr. Bybee:

Enclosed are the results for the analyses that were requested. These were done according to EPA procedures or equivalent.

Detection limits are determined by EPA methodology. No determination of compounds below these (denoted by the ND or < sign) has been made.

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

Sincerely,

Andy Freeman
Assistant Laboratory Manager

Project: 9908063/McCasland

Hall Environmental Analysis Laboratory

Client:	ECD Environmental	**Date Collected:**	1/25/99
Project:	McCausland	**Date Received:**	1/28/99
Project Manager:	Greg Bybee	**Sample Matrix:**	Aqueous
Project Number:	-	**Date Extracted:**	NA

EPA Method - 8021

Units: PPB(ug/L)

HEAL LAB ID	Sample ID	Benzene	Toluene	Ethyl benzene	Total Xylenes	BFB % Recovery	Dilution Factor	Date Analyzed
9901105-1	#1 Windmill	ND	ND	ND	ND	94	2	1/28/99
9901105-2	#2 Windmill	ND	ND	ND	ND	100	1	1/28/99
Reag. Blk.	-	ND	ND	ND	ND	98	1	1/28/99

MRL	0.5	0.5	0.5	0.5	

Hall Environmental
Analysis Laboratory

Client:	ECD Environmental	**Date Collected:**	1/25/99
Project:	McCausland	**Date Received:**	1/28/99
Project Manager:	Greg Bybee	**Sample Matrix:**	Aqueous
Project Number:	-		

Inorganic Compounds

HEAL LAB ID	Sample ID	Floride (mg/L)	Chloride (mg/L)	Nitrite-N (mg/L)	Bromide (mg/L)	Nitrate-N (mg/L)	Sulfate (mg/L)	o-Phosphate-P (mg/L)
9901105-1	#1 Windmill	<0.5	5,000	*<0.5	12	*<0.5	110	<2.5
9812121-2	#2 Windmill	1.0	87	*ND	0.8	*3.3	110	ND
Detection Limits		0.1	0.1	0.1	0.1	0.1	0.5	0.5
Method		300.0	300.0	300.0	300.0	300.0	300.0	300.0
Date Analyzed		1/28/99	1/29/99	1/28/99	1/28/99	1/28/99	1/28/99	1/28/99

***Sample run outside of the EPA holding time of 48 hours.**

CARDINAL LABORATORIES

PHONE (915) 673-7001 • 2111 BEECHWOOD • ABILENE, TX 79603
PHONE (505) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240

ANALYTICAL RESULTS FOR
MEWBOURNE OIL CO.
ATTN: ROSS MURPHY
P.O. BOX 5270
HOBBS, NM 88241
FAX TO:

Receiving Date: 03/31/98
Reporting Date: 04/03/98
Project Number: NOT GIVEN
Project Name: NOT GIVEN
Project Location: NOT GIVEN

Sampling Date: 03/31/98
Sample Type: GROUNDWATER
Sample Condition: COOL & INTACT
Sample Received By: GP
Analyzed By: AH

LAB NUMBER	SAMPLE ID	Na (mg/L)	Ca (mg/L)	Mg (mg/L)	K (mg/L)	Conductivity (umhos/cm)	NO3 (mg/L)
ANALYSIS DATE:		4/2/98	4/1/98	4/1/98	4/1/98	4/1/98	4/1/98
H3543-1	D-K WINDMILL	285	700	90	7.4	6410	3.00
Quality Control		NR	60	60	NR	1445	5.07
True Value QC		NR	60	60	NR	1413	5.00
% Accuracy		NR	100	100	NR	102	101
Relative Percent Difference		NR	8.0	4.0	NR	0.3	0.2
METHODS:			SM3500-Ca-D	3500-Mg E	3048	120.1	353.2

		Cl (mg/L)	SO_4 (mg/L)	CO_3 (mg/L)	HCO_3 (mg/L)	pH (s.u.)	TDS (mg/L)
ANALYSIS DATE:		4/3/98	4/1/98	4/1/98	4/1/98	4/1/98	4/2/98
H3543-1	D-K WINDMILL	1771	108	0	171	7.23	4113
Quality Control		458	100	NR	NR	6.96	NR
True Value QC		500	100	NR	NR	7.00	NR
% Accuracy		93.6	100	NR	NR	99.3	NR
Relative Percent Difference		3.4	5.0	NR	NR	0.7	0.7
METHODS:		SM4500-Cl-B	375.4	310.1	310.1	150.1	160.1

Received Hobbs OCD APR 1998

Gayle A. Potter, Chemist

04/03/98
Date

H3543-XLS