AP - 49

STAGE 1 & 2 WORKPLANS

DATE:

MAY 25, 2006

Highlander Environmental Corp.

Midland, Texas

CERTIFIED MAIL
RETURN RECIEPT NO. 7005 1160 0005 3780 2193

May 25, 2006

Mr. Wayne Price
New Mexico Energy, Minerals, & Natural Resources
Oil Conservation Division, Environmental Bureau
1220 S. St. Francis Drive
Santa Fe, New Mexico 87504

RE: **STAGE 2 ABATEMENT PLAN**
Justis Saltwater Disposal System (SWD) Site Well #H-2
Unit H, Section 2, T-26-S, R-37-E, Lea County, New Mexico
NMOCD AP-49

Mr. Price:

RICE Operating Company (ROC) has retained Highlander Environmental Corp (Highlander) to address potential environmental concerns at the above-referenced site. ROC is the service provider (operator) for the Justis SWD System (System) and has no ownership of any portion of the pipeline, well, or facility. The System is owned by a consortium of oil producers, System Partners, who provide all operating capital on a percentage ownership/usage basis.

1.0 EXECUTIVE SUMMARY

Tank replacement activities began at the Justis H-2 SWD facility in November 2001 and are complete. During the tank replacement, soil samples were taken, and indicated the necessity for additional investigation. In January 2002, Rice installed three monitor wells to evaluate groundwater in the vicinity of the H-2 injection facility. Originally, two monitor wells, MW-1 and MW-2 showed elevated chloride levels. After several quarterly sampling events, MW-2 continued to show elevated chloride levels. As a result, Rice installed two additional monitor wells in February 2004. The wells have been sampled on a quarterly basis since 2002.

The hydraulic gradient has been consistently towards the north-northwest in the vicinity of this facility. Chloride concentrations from monitor wells MW-1, MW-3, MW-4 and MW-5 have been consistently below the New Mexico Water Quality Control Commission (WQCC) standards of 250 mg/L since 2004. Only MW-2 continues to exceed the WQCC standard, with chloride concentrations ranging from 1,100 mg/L to 1,300 mg/L. No BTEX concentrations were detected at or above the reporting limits in 2005, have been detected in the last two quarterly sampling events. Additionally, no Phase-Separated Hydrocarbon (PSH) has ever been observed in any of the monitor wells.

2.0 CHRONOLOGY OF EVENTS

August 2, 2001	ROC submitted a Redwood Tank Replacement Closure Plan with the NMOCD.
November 6, 2001	ROC began tank replacement/remediation activity
December 12, 2002	ROC submitted a Redwood Tank and Emergency Pit Closure Report for the Justis SWD Facility H-2.
January 4, 2002	Monitoring Wells MW-1, MW-2 and MW-3 were installed.
January 18, 2002	NMOCD director notified of groundwater impact.
March 1, 2002	Monitor Wells (MW-1, MW-2 & MW-3) were purged and sampled.
June 10, 2002	Monitor Wells (MW-1, MW-2 & MW-3) were purged and sampled.
August 16, 2002	Monitor Wells (MW-1, MW-2 & MW-3) were purged and sampled.
November 12, 2002	Monitor Wells (MW-1, MW-2 & MW-3) were purged and sampled.
February 13, 2003	Monitor Wells (MW-1, MW-2 & MW-3) were purged and sampled.
May 20, 2003	Monitor Wells (MW-1, MW-2 & MW-3) were purged and sampled.
August 25, 2003	Work plan for additional monitor well drilling was submitted to the NMOCD.
September 23, 2003	Monitor Wells (MW-1, MW-2 & MW-3) were purged and sampled.
December 16, 2003	Monitor Wells (MW-1, MW-2 & MW-3) were purged and sampled.
February 16, 2004	Installed Monitor Wells MW-4 and MW-5.
March 11, 2004	All 5 Monitor Wells were purged and sampled.
June 28, 2004	All 5 Monitor Wells were purged and sampled.
September 23, 2004	All 5 Monitor Wells were purged and sampled.
December 21, 2004	All 5 Monitor Wells were purged and sampled.
March 21, 2005	2004 Monitor Well Report/Sampling Summary was submitted to the NMOCD.
March 23, 2005	Corrective Action Plan (CAP) submitted to the NMOCD.
March 29, 2005	All 5 Monitor Wells were purged and sampled.

May 5, 2005	Daniel Sanchez (NMOCD) requested a Rule 19, Stage I Abatement Plan for this site.
June 16, 2005	All 5 Monitor Wells were purged and sampled.
July 13, 2005	Stage I Abatement Plan submitted to the NMOCD.
September 15, 2005	All 5 Monitor Wells were purged and sampled.
December 5, 2005	All 5 Monitor Wells were purged and sampled.
February 23, 2003	Stage I Abatement Plan Approved by NMOCD.
February 27, 2006	All 5 Monitor Wells were purged and sampled.
March 15, 2006	2005 Annual Summary Report submitted to the NMOCD.

3.0 BACKGROUND & PREVIOUS WORK

On August 2, 2001, ROC submitted a Redwood Tank Replacement Closure Plan with the NMOCD. Tank replacement activities began at the Justis H-2 SWD facility on November 6, 2001 and are complete. On December 12, 2002, ROC submitted a Redwood Tank and Emergency Pit Closure Report for the Justis SWD Facility H-2.

During the tank replacement, soil samples were taken, and the sample results indicated the necessity for additional investigation. On January 4, 2002, Rice installed three monitor wells to evaluate groundwater in the vicinity of the H-2 injection facility. Originally, two monitor wells, MW-1 and MW-2 showed elevated chloride levels. After several quarterly sampling events, MW-2 continued to show elevated chloride levels. As a result, Rice installed two additional monitor wells in February 2004. The wells have been sampled on a quarterly basis since 2002.

As detailed in the most recently submitted annual summary report dated March 16, 2006, the general hydraulic gradient has been consistently towards the north-northwest in the vicinity of this facility. Chloride concentrations from monitor wells MW-1, MW-3, MW-4 and MW-5 have been consistently below the New Mexico Water Quality Control Commission (WQCC) standards of 250 mg/L since 2004. Only MW-2 continues to exceed the WQCC standard, with chloride concentrations ranging from 1,100 mg/L to 1,300 mg/L. No BTEX concentrations were detected at or above the reporting limits in 2005. Additionally, no Phase-Separated Hydrocarbon (PSH) has ever been observed in any of the monitor wells. The site is shown on Figures 1 and 2. A copy of the most current water table map is included as Figure 3.

4.0 GEOLOGY & HYDROGEOLOGY

4.1 Regional and Local Geology

This site is located in what is referred to as the South Plain physiographic subdivision of southern Lea County. This area is located south of the Eunice Plain. The topography is very irregular and without integrated drainage. Several well developed gullies head in the Eunice Plain area, but do not completely traverse the South Plain. The area is almost completely covered by a thick layer of sand. Sediments of Quaternary age are present in this area in the form of alluvial deposits, probably both of Pleistocene and Recent age and the dune sands

of Recent age. The alluvium was deposited in topographically low areas where the Ogallala formation had been stripped away. The dune sands mantle the older alluvium in most places, with some dunes locally extending to 20-40 feet high. The Quaternary alluvium is underlain by the Dockum group of Triassic age. The uppermost formation of the Dockum Group is the Chinle.

4.2 Regional and Local Hydrogeology

The Ogallala has been mostly stripped away in the area that is referred to as the South Plain and the principal aquifer is alluvium, consisting mostly of fine sand with some silt and clay. Towards the eastern end of the South Plain, approximately 20 feet of quaternary sediments are saturated and receive some recharge from the Eunice Plain. The movement of groundwater in this area is primarily to the south-southwest. The depth to water in this area is approximately 120 feet below ground surface.

4.3 Water Well Inventory

A water well inventory was performed to encompass a ½ mile radius around the facility. The inventory included a review of water well records on the New Mexico Office of the State Engineer W.A.T.E.R.S. database and United States Geologic Survey (USGS) website. Two water wells found in the online databases appear to be in the prescribed radius. A livestock well in unit 'P', Sec. 35, T25S, R37E is reported in the OSE database. The well was installed in 2001 and depth to water is reported to be 185 ft.

The other well which appears to be within the radius was found in the USGS database and is located in unit 'K', Sec. 2, T26S, R37E. Based on the record, it appears measurements began on this well in 1953 and the last recorded depth was in 1996 with a depth of 100 ft. The well depth is 119 ft. Although, USGS does not report the use of the well, a search of a database supported by New Mexico Institute of Mining and Technology (New Mexico Tech) called New Mexico Water and Infrastructure Data System (WAIDS), yielded 3 domestic well records in Section 2 with the same GPS coordinates and well completion depth as the USGS record. Sampling records also coincide. One can conclude that these records are of the same domestic well reported in unit 'K' by USGS.

Only one of the two water wells identified during the records search was located in the field. The water well located in Unit K, T26S, R37E was verified. The well records are included in Appendix A.

5.0 SUBSURFACE SOILS

The soils in the vicinity of this site are of the Kermit soils and Dune land association. The Kermit series consists of excessively drained, non-calcareous, loose sands. Typically, the surface layer is a pale-brown fine sand about 8 inches thick. The subsoil is light yellowish-brown fine sand to a depth of more than 60 inches. The monitor well lithologies at this site indicate sand with some clay stringers to a depth of approximately 135 feet.

6.0 GROUNDWATER QUALITY

6.1 Monitoring Program

The original three monitoring wells have been sampled on a quarterly basis since March 1, 2002, with the addition of monitor wells MW-4 and MW-5 in February 2004. The most recent sampling was performed on February 27, 2006, and the data was submitted to the NMOCD most recently on March 16, 2006, in the Annual Summary Report. Quarterly sampling of these wells and any additional well(s) will continue.

6.2 Hydrocarbons in Groundwater

No BTEX concentrations were detected at or above reporting limits in 2005. Additionally, no Phase-Separated Hydrocarbon (PSH) has ever been observed in any of the monitor wells.

6.3 Other Constituents of Concern

Chloride and TDS concentrations from monitor wells MW-1, MW-3, MW-4 and MW-5 were all below the New Mexico Water Quality Control Commission (WQCC) standards of 250 mg/L and 1000 mg/L, respectively, during all four quarters of 2005. Only MW-2 exceeded the WQCC standard for all four quarters.

7.0 STAGE 2 ABATEMENT PLAN

The following Stage 2 Abatement plan is proposed for the Justis H-2 SWD site:

7.1 Abatement Plan Design Criteria

Based upon the groundwater monitoring performed at this site to date, the following criteria were used in selection of an appropriate groundwater abatement system.

1. Chloride concentrations exceeding the New Mexico WQCC standards have only been observed in MW-2.
2. No BTEX concentrations were detected at or above the reporting limits in 2005.

3. No Phase-Separated Hydrocarbon (PSH) has ever been observed in any of the monitor wells.

7.2 Proposed Abatement System

A low flow pump is proposed to be installed into MW-2. The system will be capable of pumping 1-3 gallons per minute (gpm). Estimating an average 12 hour day, this system would yield approximately 2160 gallons per day at 3 gpm or approximately 788,400 gallons per year (2.42 acre-feet), if pumped only during daylight hours. As this level is below the New Mexico Office of the State Engineer's (OSE), 3 acre-feet per year requirement for water rights acquisition, no OSE permits will be required, except for possible re-injection approval.

Highlander performed a field test on water purification/remediation equipment at the Justis H-2 SWD site on December 22, 2005 and January 9, 2006. The system is designed to take impacted water, pass the water through a proprietary "catalyst", then through a sand filter, and finally through a series of reverse osmosis (RO) membranes for reduction of inorganic contaminants. This results in the creation of two water streams, a filtered water stream with a reduced total dissolved solids (TDS) content and a waste water stream, with an elevated TDS content.

The results of the testing indicated that the water from a recovery well could be passed through the system with generation of approximately 30% waste water in one pass. The filtered water was superior quality to the background concentrations, and would be suitable for re-introduction into the aquifer system. The filtered fresh water would be re-injected into the aquifer system through down gradient monitor well #5. A copy of the report detailing the results of the equipment testing is included in Appendix B. Photographs of a completed unit for this site are included in the Photographs section of this report.

In order to obtain approval for the reinjection, testing would be performed to evaluate the aquifer recharge capabilities. If approved for reinjection, the treatment system would be fitted with a total dissolved solids monitor and automated system shut-off to ensure no unacceptable water was re-introduced into the aquifer system.

8.0 QUALITY ASSURANCE/ QUALITY CONTROL

All monitor wells will continue to be sampled on a quarterly basis. The wells will be inspected for the presence of phase-separated hydrocarbons (PSH) and, if present, a sample will be collected and analyzed by gas chromatography (GC) to determine composition and origin. The wells will be properly purged and sampled with clean, dedicated, polyethylene bailers and disposable line. The groundwater samples will be submitted to a laboratory for analysis of Benzene, Toluene, Ethylbenzene, and Xylene (BTEX) by method EPA 8021B, and chloride by method 300.0.

9.0 PROPOSED SCHEDULE OF ACTIVITIES

Upon approval, the work outlined above will be implemented in a timely manner, dependent upon availability of local contractors. Quarterly sampling of the existing monitor wells will be continued and all results will be submitted in an annual summary report within the first quarter of 2007.

Respectfully submitted,
Highlander Environmental Corp.

Tim Reed

Timothy M. Reed, P.G.
Vice President

cc: ROC, Daniel Sanchez-NMOCD
enclosures: figures, photographs, water well information, remediation equipment report

FIGURES

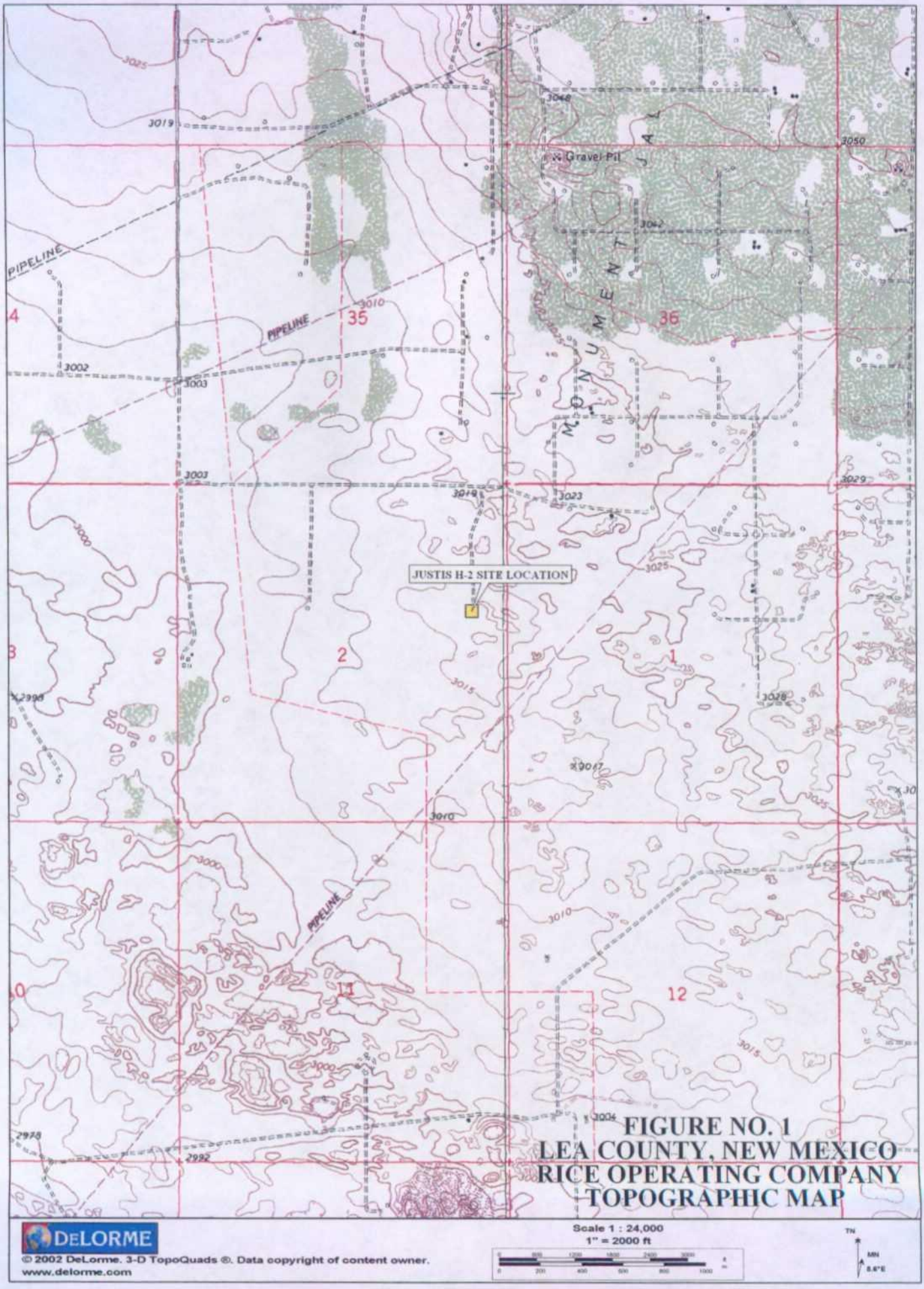


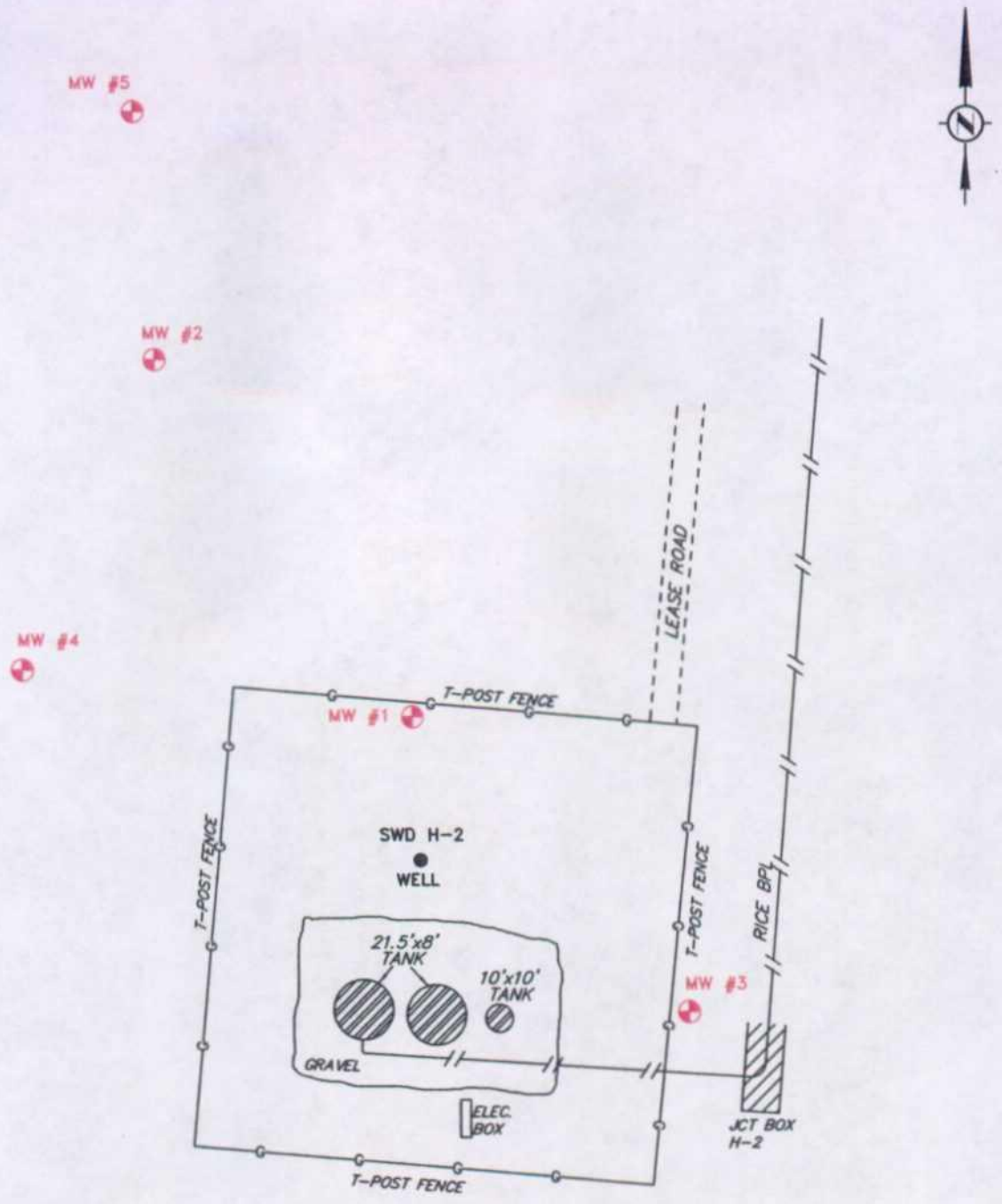
FIGURE NO. 1
LEA COUNTY, NEW MEXICO
RICE OPERATING COMPANY
TOPOGRAPHIC MAP

DeLORME

www.delorme.com

Scale 1 : 24,000
1" = 2000 ft

TN
MN
8.6°E



WELL#	ELEVATION (PVC)
MW #1	3023.45'
MW #2	3022.89'
MW #3	3019.98'
MW #4	3023.15'
MW #5	3021.06'

MONITOR WELL LOCATION

SCALE: 1"=60'

60 0 60

FIGURE NO. 2

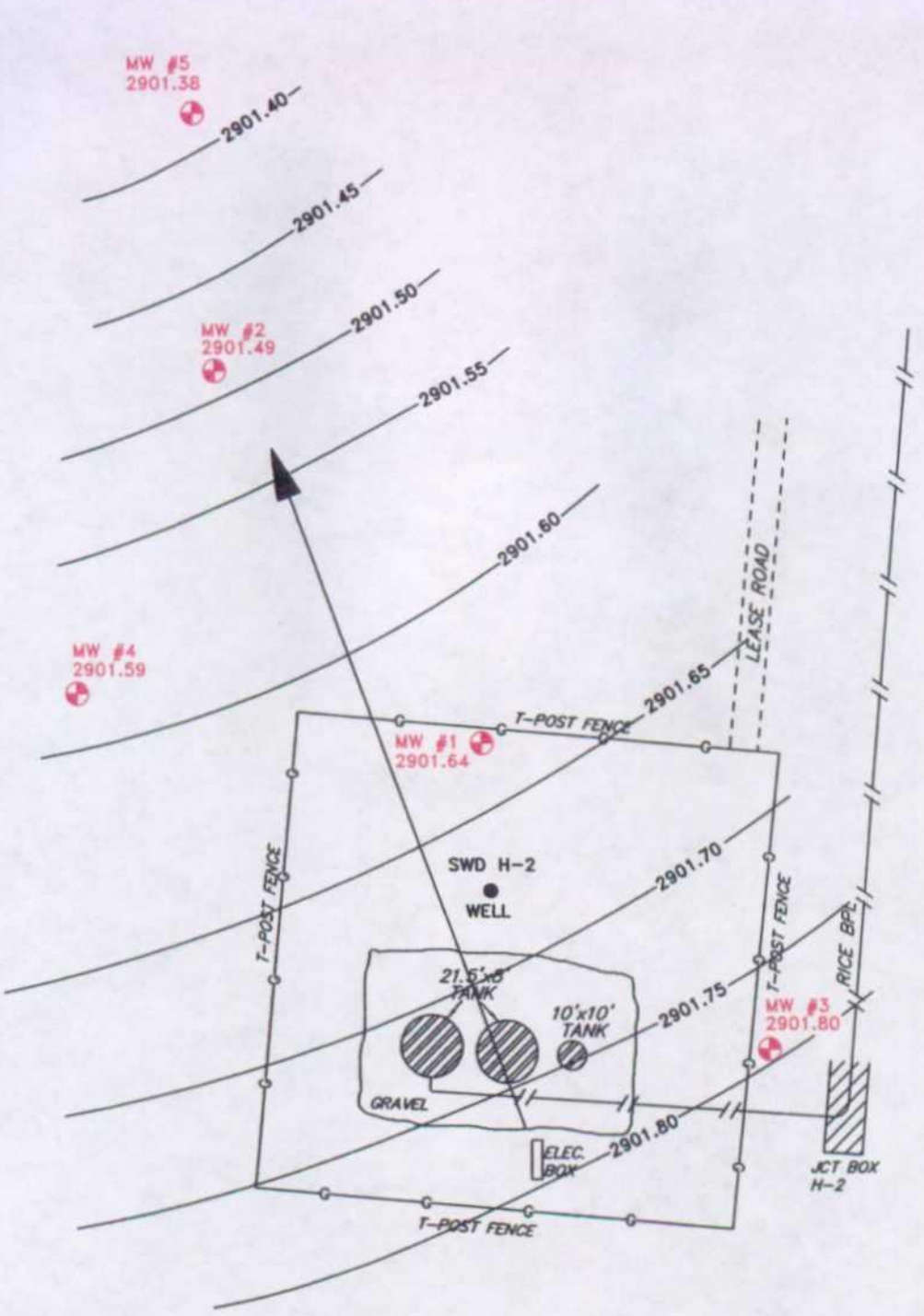
LEA COUNTY, NEW MEXICO

RICE OPERATING COMPANY

SITE MAP

HIGHLANDER ENVIRONMENTAL CORP.
MIDLAND, TEXAS

DATE: 4/30/04
DWG. BY: JJ
FILE: C:\RICE\SITE MAP



WELL#	ELEVATION (PVC)
MW #1	3023.45'
MW #2	3022.89'
MW #3	3019.98'
MW #4	3023.15'
MW #5	3021.06'

MONITOR WELL LOCATION

SCALE: 1"=60'

60 0 60

FIGURE NO. 3

LEA COUNTY, NEW MEXICO

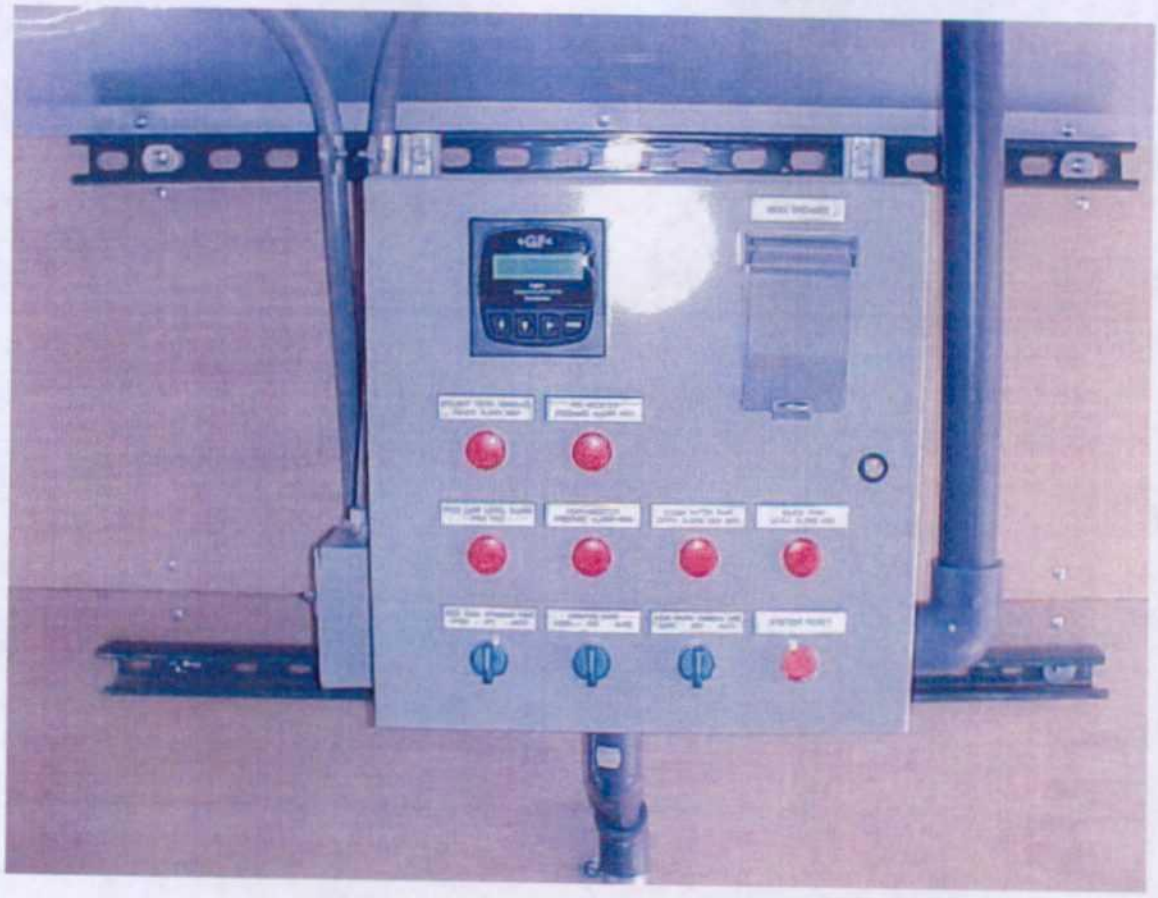
RICE OPERATING COMPANY

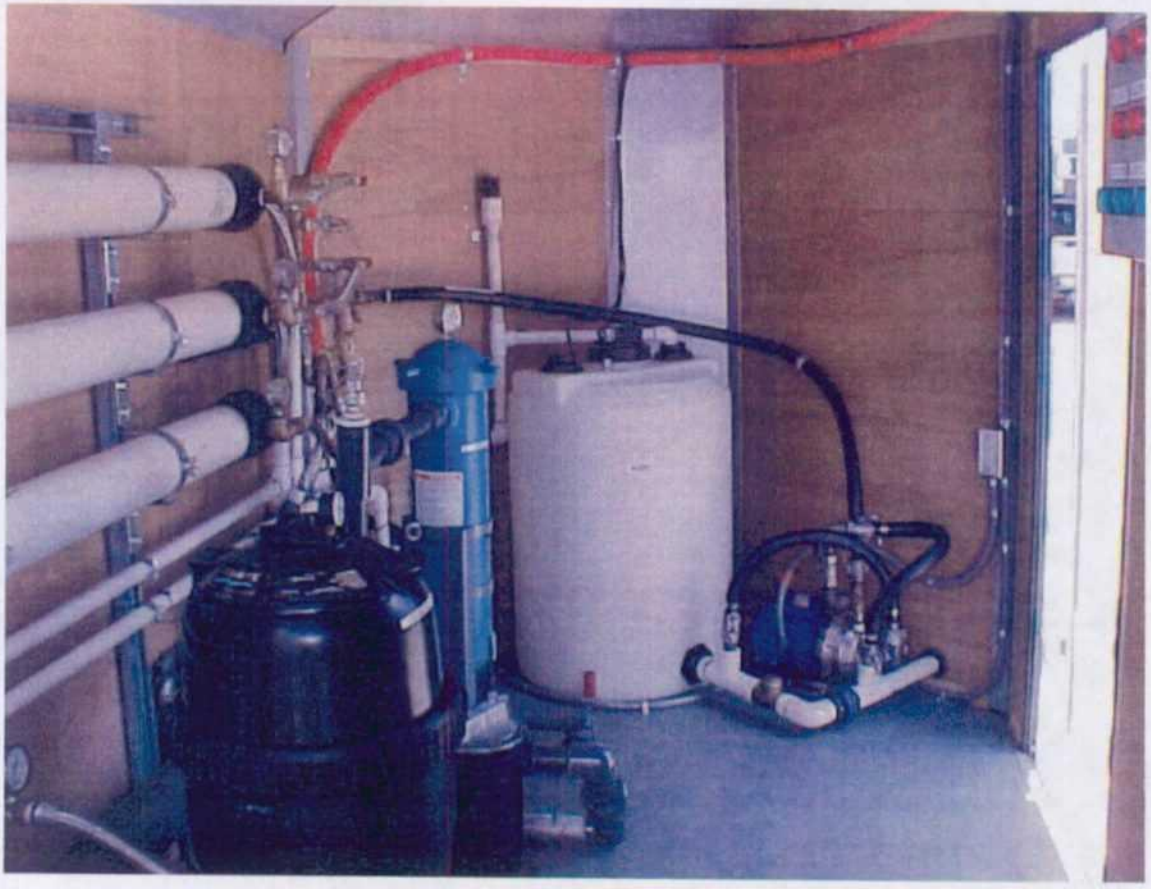
JUSTIS H-2 SWD
2/27/06 WATER TABLE MAP

HIGHLANDER ENVIRONMENTAL CORP.
MIDLAND, TEXAS

DATE: 3/6/06
DWG. BY: JJ
FILE: C:\WCE\1863\WTM 2-06

PHOTOGRAPHS





APPENDIX A

Water Well Information

Livestock Well Unit 'P', Section 35, T25S, R37E

This well could not be located.

http://iwaters.ose.state.nm.us:7001/iWATERS/

New Mexico Office of the State Engineer
Point of Diversion Summary

(quarters are 1=NW 2=NE 3=SW 4=SE)
(quarters are biggest to smallest)

POD Number	Tws	Rng	Sec	q	q	q	Zone	X	Y
CP 00909	25S	37E	35	4	4	4			

Driller License: 1184 WEST TEXAS WATER WELL SERV.
Driller Name: RODNEY D. DUTTON
Source: Shallow
Drill Start Date: 01/22/2001
Drill Finish Date: 01/24/2001
Log File Date: 02/02/2001
PCW Received Date:
Pump Type: SUBMER
Pipe Discharge Size: 1.25
Casing Size: 6
Estimated Yield:
Depth Well:
Depth Water: 185

Water Bearing Stratifications:	Top	Bottom	Description
	184	185	Shallow
Alluvium/Basin Fill			
Casing Perforations:	**Top**	**Bottom**	
	175	185	

New Mexico Office of the State Engineer
Water Right Summary

DB File Nbr: CP 00909
Primary Purpose: STK 72-12-1 LIVESTOCK WATERING
Primary Status: PMT Permit
Total Acres: 0
Total Diversion: 3
Owner: GEORGE WILLIS

Documents on File

Doc	File/Act	Status 1 2 3	Trans_Desc	From/To	Acres	Diversion
72121	01/18/2001	PMT LOG PRC	CP 00909	T	0	3

(qtr are 1=NW 2=NE 3=SW 4=SE)
(qtr are biggest to smallest X Y are in Feet UTM are in Meters)

Point of Diversion POD Number	Source	Tws	Rng	Sec	q	q	q	UTM_Zone	Easting	Northing	Latitude / Longitude
CP 00909	Shallow	25S	37E	35	4	4	4	13	676891	3550680	32 4 45.85 103 7 44.39

Domestic Well Unit 'K', Sec. 2, T26S, R37E

This well is located near the home of George Willis

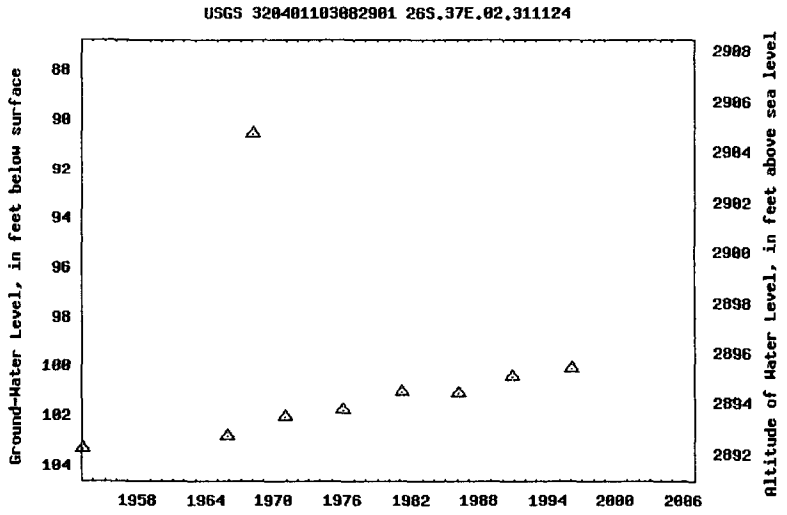
http://nwis.waterdata.usgs.gov/nm/nwis/gwlevels/?site_no=320401103082901

USGS 320401103082901 26S.37E.02.311124

[redacted]

Lea County, New Mexico
Hydrologic Unit Code 13070007
Latitude 32°04'01", Longitude 103°08'29" NAD27
Land-surface elevation 2,995.40 feet above sea level NGVD29
The depth of the well is 119 feet below land surface.
This well is completed in the ALLUVIUM,BOLSON DEPOSITS AND OTHER SURFACE DEPOSITS (110AVMB) local aquifer.

Output formats
Table of data
Tab-separated data
Graph of data
Reselect period



http://octane.nmt.edu/waterquality/

General Information About: Sample 10208

Section/ Township/Range	02 / 26 S / 37 E	Lat/Long	32.0719 / -103.1328
Elevation	2995	Depth	119
Date Collected	11/7/1984	Chlorides	105
Collector / Point of Collection	SEO / DP	Use	Domestic
Formation	OAL	TDS	0

APPENDIX B

Water Purification Equipment Report

FINDINGS OF A TEST OF THE
SURFSIDE ENVIRONMENTAL, INC.
WATER PURIFICATION/REMEDIATION EQUIPMENT
DISTRIBUTED BY
CAT-A-CLEAN CORPORATION

PREPARED FOR
RICE OPERATING COMPANY

I. Purpose

At the request of Rice Operating Company ("Rice"), Highlander Environmental Corp. ("Highlander") performed a field test on water purification/remediation equipment at the Justis H-2 SWD site operated by Rice in Lea County, New Mexico. This report is to document and report the findings of this test.

II. Background

The equipment tested was built by Surfside Environmental, Inc. and is distributed by Cat-A-Clean Corporation. The system is designed to take impacted water, pass the water through a proprietary "catalyst", then through a sand filter, and finally through a series of reverse osmosis (RO) membranes for reduction of inorganic contaminants. This results in the creation of two water streams, a filtered water stream with a reduced total dissolved solids (TDS) content and a waste water stream, with an elevated TDS content.

The Justis H-2 SWD site was selected by Rice, due to the fact that the water at this site is somewhat typical of other chloride impacted groundwater sites operated by Rice. The initial and follow-up tests were conducted utilizing water from Monitor Well #2 (Feed Water) at this location. Details and photographs of the equipment and test configuration can be found in Section V of this report.

Three tests using different scenarios were performed on December 22, 2005, and one final confirmatory test was performed on January 9, 2006. All tests were conducted by Gary Miller of Highlander. The details of the testing and groundwater quality can be found in Section VI of this report.

III. Summary of Findings

1. The catalyst does appear to improve the efficiency of the RO membranes and allows them to operate at a higher volume and lower operating pressure than would be required if the catalyst was not in use.

2. When a single RO membrane was utilized, the unit processed Feed Water (2790 mg/L TDS) from the monitor well (at the concentrations detailed in Section VI of this report) at a rate of 2.5 gpm and consistently returned at least 70% filtered water (118 to 142 mg/L TDS) and 30% waste water (5850 to 7900 mg/L TDS). When two membranes are run simultaneously or parallel, the process rate increased to 4.9 gpm while still utilizing only one charging pump.

3. The unit in the original configuration detailed in Section VI (Tests 1-3) was able to process the waste stream (6980 mg/L TDS) produced from the earlier tests, but the efficiency of the unit dropped from the rates stated above to a process rate of 1.4 gpm with a return of 60% filtered water (180 mg/L TDS) and 40% waste water (13,100 mg/L TDS).

4. The unit also was tested (Test #4) by running a fixed volume of 720 gallons of Feed Water through the unit with two RO membranes set in a parallel configuration. The waste stream from the membranes was cycled back into the feed tank and blended continuously during this test. The unit was able to produce 620 gallons of filtered water and 100 gallons of waste water in 5 hours at a process rate of 4.9 to 4.5 gpm.

5. No data was gathered that would give an indication of RO membrane life. The life expectancy of the membranes will be directly affected by the concentrations of the water being processed and therefore will vary from site to site.

6. The unit, as tested, used relatively low horsepower pumps and all of the systems use 115 volt power, which gives the unit the flexibility to be powered by smaller (4000 watt) generators. A solar/wind power conversion may also be feasible. If grid power is available, the electrical use should be minimal compared to using higher pressure equipment.

7. Surfside personnel stated that the supplier can increase the size of the RO membranes and pumps, if needed, for higher concentrations of TDS in source water and if higher flow rates are required. It should be noted that if this option is employed, additional power will be required and a higher operating cost can be expected.

IV. Feed Water

Water for the tests was taken from Monitor Well #2 (Feed Water), located at the Justis H-2 site operated by Rice. The water had a field conductivity of 3,834 uS, with a chloride level of 1,210 milligrams per Liter (mg/L) and a TDS of 2,790 mg/L.

V. Water Purification/Remediation Equipment Tested

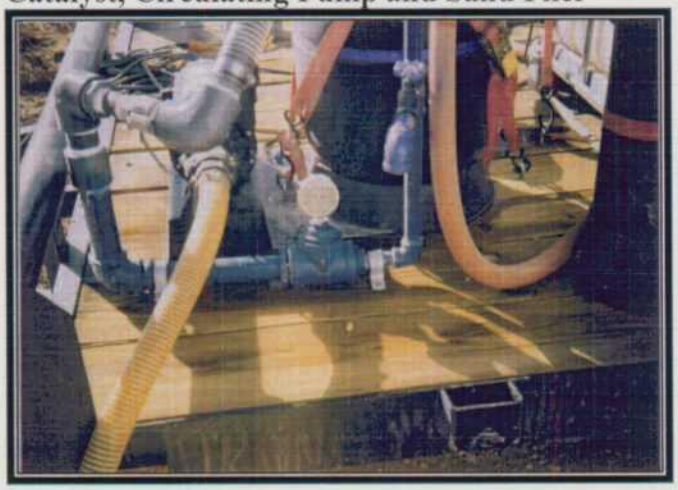
The unit tested was equipped with three RO membrane housings, each containing two membranes. A one horsepower charging pump was used to pump the water through the membranes. This pump was capable of producing over 200 psi of pressure at a 5 (+) gpm rate. The Feed Water was delivered to the charging pump utilizing a one horsepower circulating pump and sand filter. This was a typical swimming pool style pump and filter system. The charging pump took the Feed Water from the feed tank, through a catalyst, and then through a sand filter. The unit was set up with 1" quick connect hoses which allowed for changing the configuration of the unit. It was also equipped with three 300 gallon poly tanks. Pictures of the unit tested are found below.

The water was monitored in the field utilizing a YSI Incorporated, pH, salinity, conductivity and temperature meter. The conductivity readings were reported in milli-Siemens (mS) and micro-Siemens (uS).

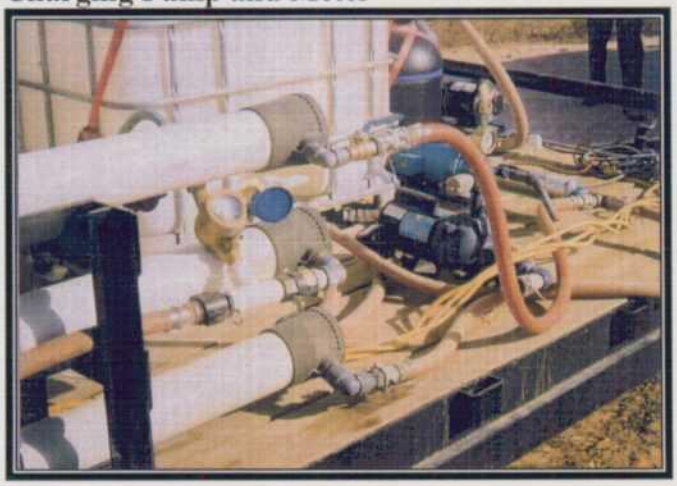
Test Trailer

RO Membranes and tanks

Catalyst, Circulating Pump and Sand Filer



Charging Pump and Meter



VI. Tests

A. TEST #1.

1. Test Scenario. For the first test, the unit was configured to pass the Feed Water through one RO membrane under 190 to 200 psi of backpressure. The waste water from this membrane was then passed through a second membrane that had no back pressure applied. The waste water from the second membrane was sent to the waste water tank. Filtered water from both membranes was then collected in the filtered water tank #1. Approximately 425 gallons of water passed through the unit in 177 minutes at a rate of 2.4 gpm. The Feed Water for this test was passed through the catalyst. Four water samples were collected during this test run. The first samples (1 and 1A) were taken after running the unit for 60 minutes and the second set of samples (2 and 2A) were taken after the unit had run for 120 minutes. The results of this sampling are listed in Table #1 below.

Flow Diagram of Test #1

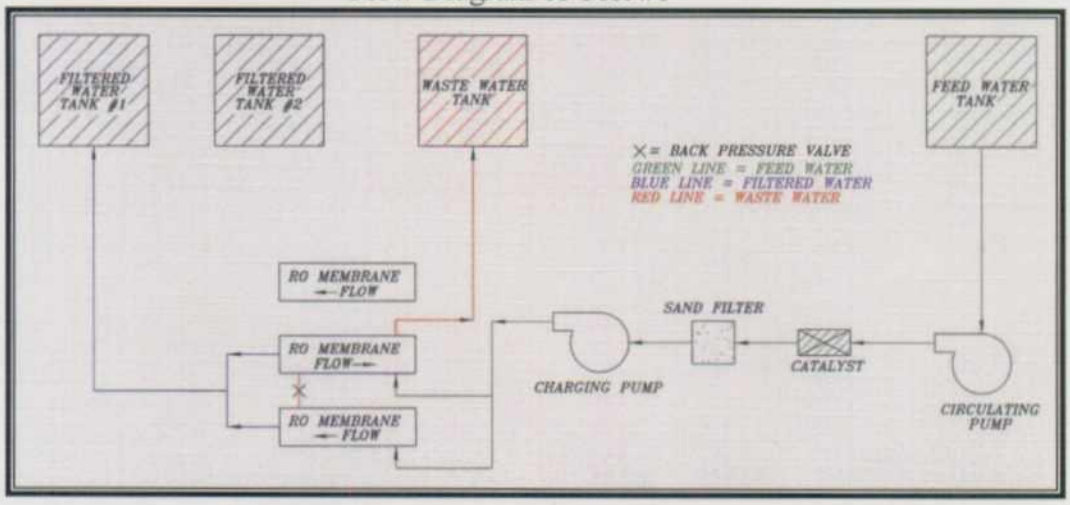


Table #1

Sample #	Minutes from start	Field Conductivity	Laboratory Chloride	Laboratory Total Dissolved Solids
1-Filtered water stream	60	167.5 uS	46.7 mg/L	142 mg/L
1A-Waste water stream	60	6.57 mS	3,260 mg/L	5,850 mg/L
2-Filtered water stream	120	262.3 uS	49.8 mg/L	118 mg/L
2A-Waste water stream	120	9.60 mS	3,670 mg/L	7,900 mg/L

2. Test Results. A stable stream of Feed Water was fed through the unit utilizing the catalyst on a single pass through the RO membranes. A constant rate of 2.4 gpm was established. The backpressure on the unit was maintained at 190 to 200 psi throughout the test and appeared to be very stable. The unit was able to produce a stream of approximately 70% filtered water and 30% waste water under these conditions.

B. TEST #2

1. Test Scenario. Test #2 was performed using the same equipment set up as Test #1 except that the Feed Water was not fed through the catalyst. In this test 150 gallons of water was fed through the unit at a rate of 2.4 gpm at the beginning of the test, ending at 2.0 gpm with a back pressure of 190 to 200 psi. Samples 3 and 3A were taken after running the unit for 60 minutes. The results of the sampling are shown in Table #2.

Flow Diagram of Test #2

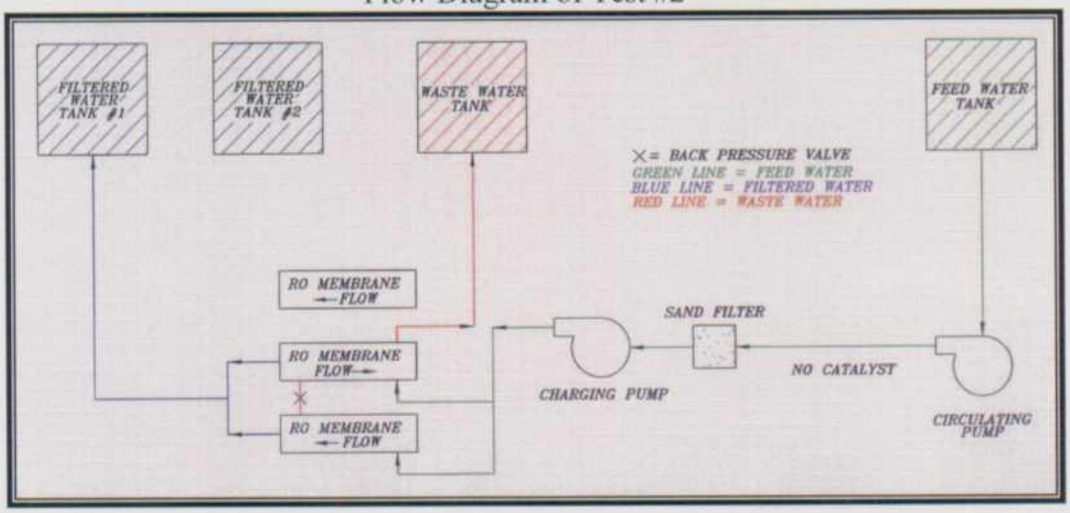


Table #2

Sample #	Minutes from start	Field Conductivity	Laboratory Chloride	Laboratory Total Dissolved Solids
3-Filtered water stream	60	158.6 uS	44.8 mg/L	58 mg/L
3A-Waste water stream	60	7.13 mS	4,330 mg/L	9,000 mg/L

2. Test Results. When the same Feed Water used in Test #1 was fed through the unit, bypassing the catalyst, the conductivity and chloride levels remained about the same as in Test #1. The TDS result from the lab on Sample #3 was somewhat suspect, given the chloride concentration and Field Conductivity reading. A more realistic number would appear to be in the 115 to 120 mg/L range.

The main difference noted during Test 2, was that the efficiency of the unit was less than that noted during Test #1 and the unit appeared to be performing less efficiently as the test progressed. The Feed Water processed by the unit for the entire Test #2 had a return of 66% filtered water and 33% waste water. There was also a problem with the pressure continuing to climb, requiring readjustment throughout the test. During the final 15 minutes of the test, it appeared that the process efficiency was dropping to approximately 60% filtered water and 40% waste water.

C. TEST #3

1. Test Scenario. Test #3 was performed using the same configuration of equipment as in Test #1, with the exception that the Feed Water for this test was the waste water stream accumulated from Tests 1 and 2. In this test, 50 gallons of waste water was fed through the unit at a rate of 1.4 gpm with a back pressure of 190 to 200 psi. Samples 4 and 4A were taken after running the unit for 35 minutes. The results of the sampling are shown in Table #3.

Flow Diagram for Test #3

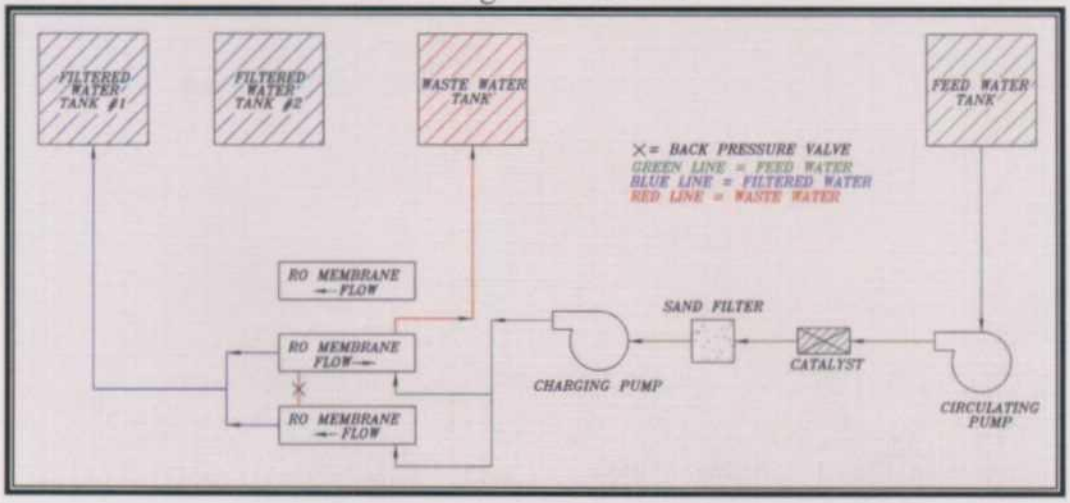


Table #3

Sample #	Minutes from start	Field Conductivity	Laboratory Chloride	Laboratory Total Dissolved Solids
Waste water (effluent) before treatment	At start	6.8 mS	3,550 mg/L	6,980 mg/L
4-Filtered water stream	35	498 uS	134 mg/L	180 mg/L
4A-Waste water stream	35	16.99 mS	6,170 mg/L	13,100 mg/L

2. Test Results. When using the waste water from the first two tests and feeding this water through the catalyst, it was found that the process rate of the unit slowed from the 2.4 gpm rate of the previous tests to 1.4 gpm. Additionally, the efficiency of the unit dropped with the processed water return being composed of 60% filtered water and 40% waste water.

D. TEST #4

1. Test Scenario. Mr. Mark Lancaster of Surfside previously stated that in order to get additional filtered water from the waste water, the process waste water could be directed back into the feed tank. This would allow the waste water to be blended with the Feed Water from the recovery well, causing an additional reduction in the percentage of waste water produced by the unit.

In this configuration, the waste water would be continuously blended with the water from the recovery well until the TDS in the blended water were so high as to render the RO membranes in the unit ineffective. At this point, the feed tank water would be taken to disposal and the cycle restarted with a fresh water tank of feed water from the recovery well.

Additionally, in order to increase the rate of flow through the unit, the membranes could be placed parallel instead of in series. This would effectively double the rate of flow while maintaining a similar reduction of TDS.

Test #4 was set up to look at both the effectiveness of running the two membranes and feeding the waste stream back through the system by returning it to the feed water tank. The main difference in this scenario and the one proposed by Mr. Lancaster is that a fixed volume of test water (the Feed Water) was used and no blending of additional well water was performed. This was done in order to see what kind of efficiency could be expected and how the unit handled the increasing TDS of the Feed Water.

Test #4 was performed using all three RO membranes. One pair was configured as in Tests 1, 2, and 3 in a series with a single membrane using back pressure and the waste being processed through a second membrane with 0 back pressure applied (Series Membranes). The filtered water stream returned from this pair of membranes was placed in filtered water tank #1.

The third membrane (Parallel Membrane) was placed parallel with the Series Membranes, however, the filtered water stream returned was placed into filtered water tank #2. The waste streams from the Parallel Membrane were combined with the waste stream from the Series Membrane. The waste water from both setups was combined and metered together. The total waste water stream was sent back to the feed water tank, blended and fed through the system again. The feed water tank contained 750 gallons of water at the beginning of the test. A total of 30 gallons of water was used to fill the membranes and filters. The waste water was returned to the feed tank and reblended throughout the entire test. This resulted in a constant increase in TDS of the Feed Water in the tank, as the ratio of filtered water to waste water changed throughout the test.

The unit ran for a total of 300 minutes for this test. The water was monitored continuously for conductivity and the levels were recorded hourly. A total of 1361 gallons of water (the combination of the waste stream and the original 750 gallons) was fed through the unit at rates ranging from 4.9 gpm at the beginning of the test to 4.53 gpm at the end of the test. The back pressure was maintained at 200 psi during the test. The sample results from this test can be found in the attached Table #4.

Flow Diagram of Test #4

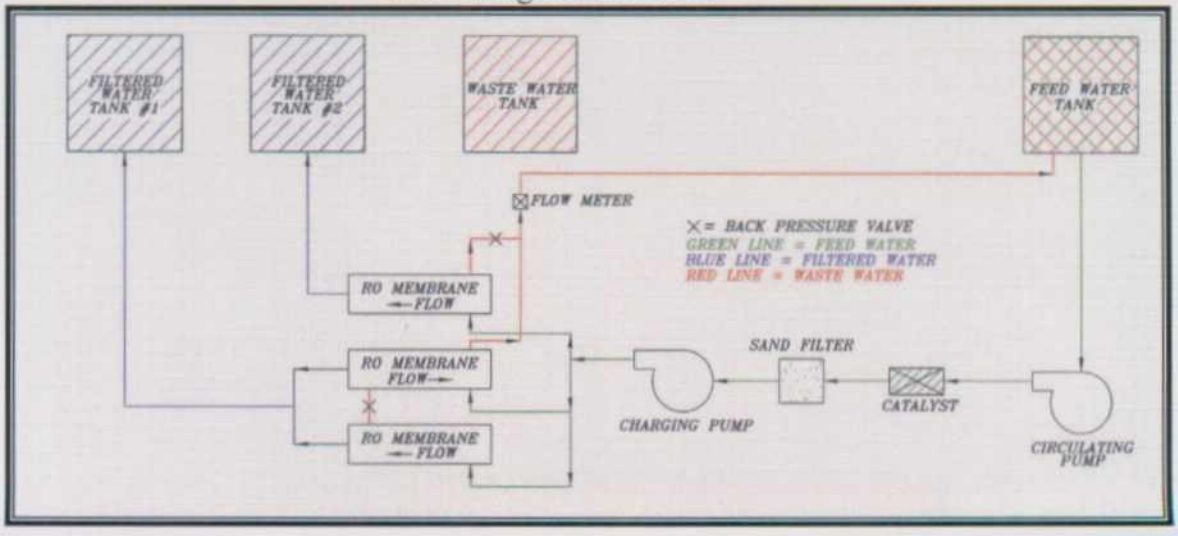


Table #4

Time	Filtered water			Feed Tank		Waste water		Notes and volume calculations
	Tank #	Volume/ gallons	Conductivity	Volume/ gallons	Conductivity	Volume/ gallons	Conductivity	
9:40				750	3834 uS			
10:00	1	15		720		40		Volumes in tanks after system flush
	2	15						
10:15	1	30	300 uS	695		71		
	2	25	42 uS					
11:00	1	75	178 uS	580	4250 uS	174	8.06 mS	160 filtered, 134 waste, 294 total fluid, 4.9 gpm
	2	85	65 uS					
11:05	1	sample #1	57.3 mg/L chloride 112 mg/L TDS	sample #3	2110 mg/L chloride 3690 mg/L TDS	sample #4	4430 mg/L chloride 8120 mg/L TDS	
	2	sample #2	40.0 mg/L chloride 48.0 mg/L TDS					
12:00	1	135	220 uS	430	5.72 mS	313	10.3 mS	209 filtered, 273 waste, 563 total fluid, 4.69 gpm
	2	155	94 uS					
1:00	1	190	288 uS	310	7.25 mS	457	11.71 mS	
	2	220	153 uS					
2:00	1	250	290 uS	200	9.17 mS	615	13.5 mS	
	2	270	202 uS					
2:15	1	Sample #5	93.4 mg/L chloride 160 mg/L TDS	Sample #7	4390 mg/L chloride 7640 mg/l TDS	Sample #8	7200 mg/l chloride 1220 mg/l TDS	
	2	Sample #6	62.6 mg/L chloride 134 mg/L TDS					
3:00	1	290	386 uS	100	12.29 mS	781	17.04 mS	
	2	330	308 uS					
3:00	1	Sample #9	146 mg/L chloride 270 mg/L TDS					

2. Test Results. During this test, it became apparent that placing the two RO membranes parallel increased the flow rate considerably. The test began with a flow rate of 4.9 gpm which was established after the first hour. This flow rate decreased to 4.53 gpm by the end of the test.

The TDS of the Feed Water in the tank at the beginning of the test was 2,790 mg/L and after running for 4 hours, the TDS in the Feed Water tank had increased to over 12,200 mg/L. It was found that as the test progressed, the backpressure on the RO membranes continued to climb, and had to be readjusted every 15 to 20 minutes, in order to maintain the initial backpressure of 200 psi.

The unit's efficiency began to drop drastically in the last hour of the test when the conductivity of the Feed Water had risen to 17.04 mS. This conductivity is comparable to the waste water sample taken during Test #3 (Sample #4A) which had a conductively of 16.99 mS and had a lab result of 6,170 mg/L chloride and 13,100 mg/L TDS. A sample of the filtered water (Sample #4) from filtered water tank #1 (which had consistently higher conductivity than tank #2 throughout the test) indicated a TDS level of 270 mg/L and a chloride level of 146 mg/L. It would appear that the unit's efficiency begins to fall dramatically when the conductivity levels get in the 17 mS range.

The unit produced a total of 620 gallons of filtered water and had 100 gallons of waste water remaining at the end of the test. Therefore, of the total water processed, the unit was able to return 86% filtered water and 14% waste water over a 5 hour period.