

AP - 75

# STAGE 1 & 2 WORKPLANS

DATE:

4-17-12

**Hansen, Edward J., EMNRD**

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**From:** Laura Pena <lpena@riceswd.com>  
**Sent:** Thursday, May 03, 2012 10:07 AM  
**To:** Hansen, Edward J., EMNRD  
**Cc:** Hack Conder; Katie Jones; L Peter Galusky Jr  
**Subject:** BD J-26 (AP-75) Project Update Addendum  
**Attachments:** BD J-26 - Proposed MW-4.jpg

Mr. Hansen,

The following is an Addendum to the BD J-26 (AP-75) Project Update report submitted to the NMOCD on April 17, 2012.

Page 2, paragraph 3: *Proposed Path Forward*; red lettering will be deleted from the paragraph and blue lettering will be added to the paragraph.

"We believe, based on the analyses and results presented here, that the BD J-26 site is no longer a threat to groundwater quality. We therefore propose to ~~cease further sampling from monitor wells MW-1, MW-3 and RW-1 and to plug and abandon these wells~~ install one two inch monitor well upgradient of MW-2 (west) per NMOCD request during the May 1, 2012 meeting between ROC and NMOCD. ~~However,~~ We propose to continue ~~to~~ sampling ~~MW-2~~ on a quarterly basis ~~through 2012~~ and to submit a report to NMOCD with recommendations ~~when ROC has further delineated upgradient water conditions for the best path forward by April 1, 2013.~~ See attached plat for approximate location."

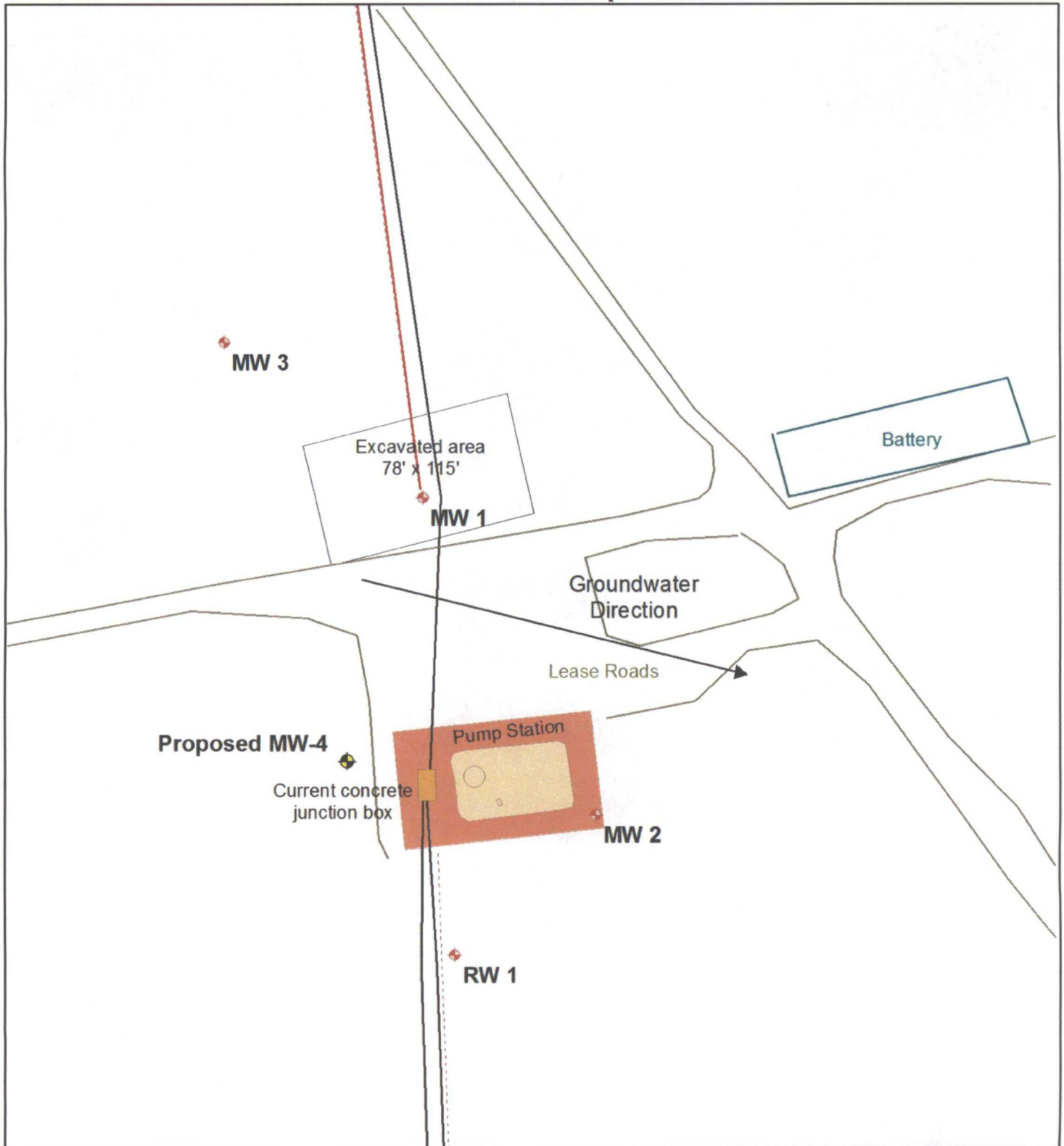
If you have any questions or require any additional information, please contact Hack Conder at (575)631-6432.

Thank you,

*Laura Peña*

Environmental Project Scientist

# Site map



***BD J-26***

**Legals: UL/J sec. 26  
T21S R37E  
NMOCD Case #: AP-75**



0 25 50 100  
Feet

Drawing date: 5-2-12  
Drafted by: L. Weinheimer

**L. Peter Galusky, Jr. Ph.D., P.G.**

**Texerra LLC**

**20055 Laredo Lane Monument, Colorado 80132**

**Tel: 719-339-6791 E-mail: lpg@texerra.com**

**April 17<sup>th</sup>, 2012**

**Mr. Edward Hansen**

New Mexico Energy, Minerals, & Natural Resources  
Oil Conservation Division, Environmental Bureau  
1220 S. St. Francis Drive  
Santa Fe, New Mexico 87505

**RECEIVED**

**APR 25 2012**

**RE: Project Update**

Rice Operating Company – BD SWD System  
**BD J-26 T21S, R37E, Sec 26, UL J**  
**NMOCD Case Number: AP-75**

Oil Conservation Division  
1220 S. St. Francis Drive  
Santa Fe, NM 87505

Sent via Certified U.S. Mail w/ Return Receipt No. 7011 0110 0001 5863 4875

Mr. Hansen,

This report is to provide an update of groundwater monitoring results for Rice Operating Company's (ROC's) BD J-26 project near Eunice, New Mexico (Figures 1 & 2) and to propose a path forward for future work.

*Groundwater Quality*

Groundwater chloride concentrations (Figure 3) in the at-source monitor well (MW-1) have dropped from their measured high values of approximately 4,500 mg/l in 2002 to less than 250 mg/l in August 2004. This is in all likelihood due to the effectiveness of soil remediation work completed in 2002 (Figures 4 & 5) and to natural attenuation (dilution) processes<sup>1</sup>. Chloride concentrations in the up-gradient monitor well (MW-3) have ranged between 119 and 172 mg/l since 2003. Chloride concentrations in a southerly well (RW-1) have similarly ranged between 136 and 200 mg/l since its installation in May of 2010. These wells are presumably indicative of the local, baseline groundwater chloride concentrations. It should further be noted that groundwater BTEX concentrations were negligible in MW-1, MW-2 and MW-3 from 2003 through 2006 after which their measurement was suspended. Thus, petroleum hydrocarbons in groundwater have been ruled out as an item of concern for this project.

In contrast, chloride concentrations in a southeasterly located monitor well (MW-2) have risen steadily from less than 250 mg/l in 2003 to 1,380 mg/l in early 2012. Although MW-2 is adjacent to an ROC SWD pump station, this facility was constructed in 2002, lined with a synthetic liner, and no spills or system upsets have been experienced at this facility. The east/southeasterly groundwater gradient (Figure 6) suggests that the source of these chlorides is not from the former junction box (near MW-1), but rather from a more westerly source. This is further supported by historical aerial photographs (Figures 7 - 13) which indicate a severely impacted area to the west/northwest of MW-2 and the ROC SWD pump station.

<sup>1</sup> BD Jct J-26 Amended Stage 2 Abatement Plan. February 26<sup>th</sup>, 2010.

*Residual Unsaturated Zone Chlorides*

The area of impact from the operation of the former junction box was excavated and protected by a double clay liner system in 2002 (Figures 4 and 5), where the composite average soil chloride concentration of backfilled soil material is approximately 500 mg/kg (Figure 15).

The MultiMed model was used to determine if residual soil (unsaturated zone) chlorides pose an on-going threat to groundwater quality. Key parameter values used in the model are given in Table 1. The time step option in the model was set to find the maximum concentration, which was estimated (calculated) to be 78 mg/l at 110 yrs. This indicates that the residual soil chlorides encompassed and capped by the double clay liner system should provide adequate protection to prevent substantial leakage of residual unsaturated zone chlorides into the groundwater.

*Proposed Path Forward*

We believe, based on the analyses and results presented here, that the BD J-26 site is no longer a threat to groundwater quality. We therefore propose to cease further sampling from monitor wells MW-1, MW-3 and RW-1 and to plug and abandon these wells. However, we propose to continue to sample MW-2 on a quarterly basis through 2012 and to submit a report to NMOCD with recommendations for the best path forward by April 1, 2013.

ROC is the service provider (agent) for the BD SWD 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 Parties, who provide all operating capital on a percentage ownership/usage basis.

We appreciate your consideration of this report. Please do not hesitate to contact either Rice Operating Company or myself if you have any questions or need additional information.

Sincerely,



L. Peter Galusky, Jr. Ph.D., P.G.  
Principal

Copy: Rice Operating Company  
Attachments: Figures and Table

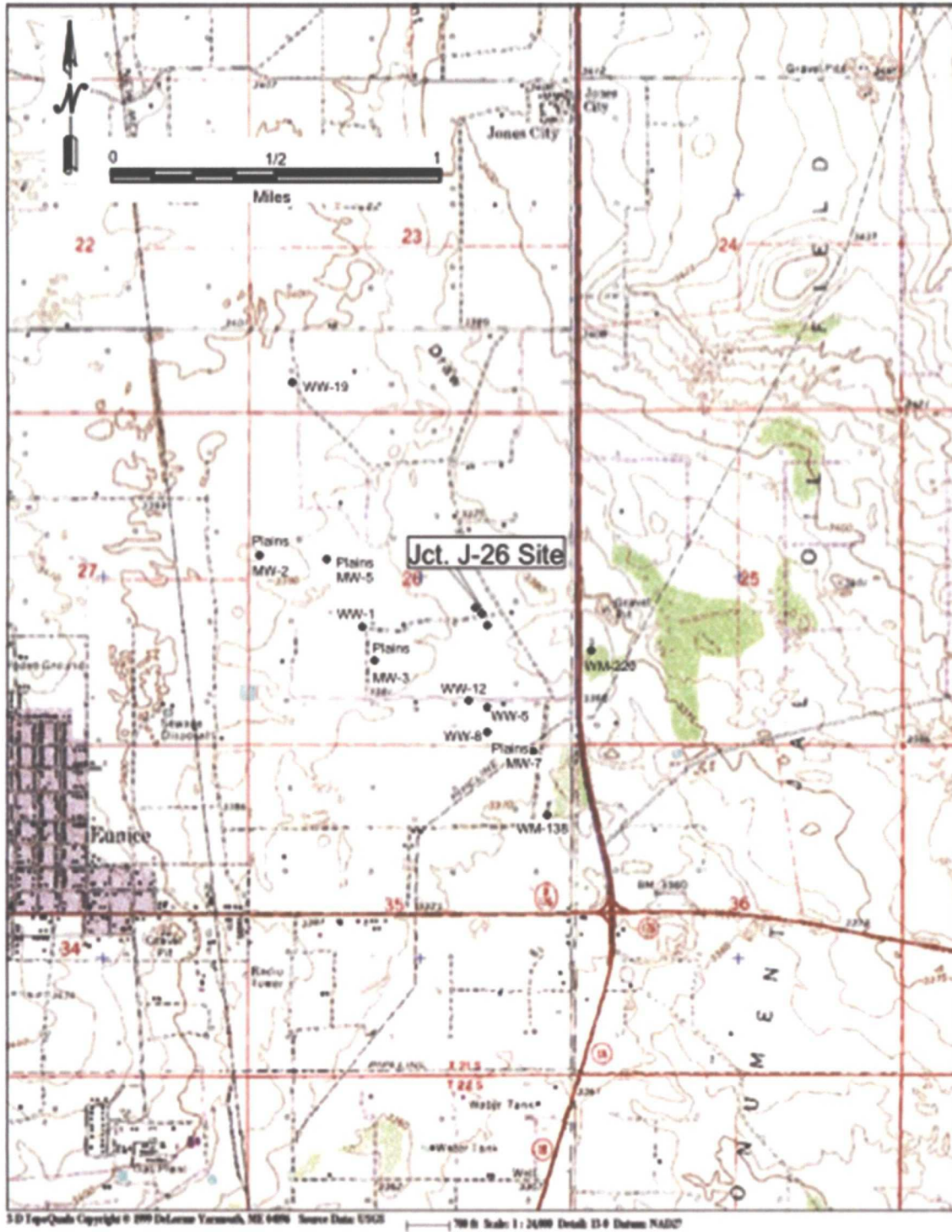
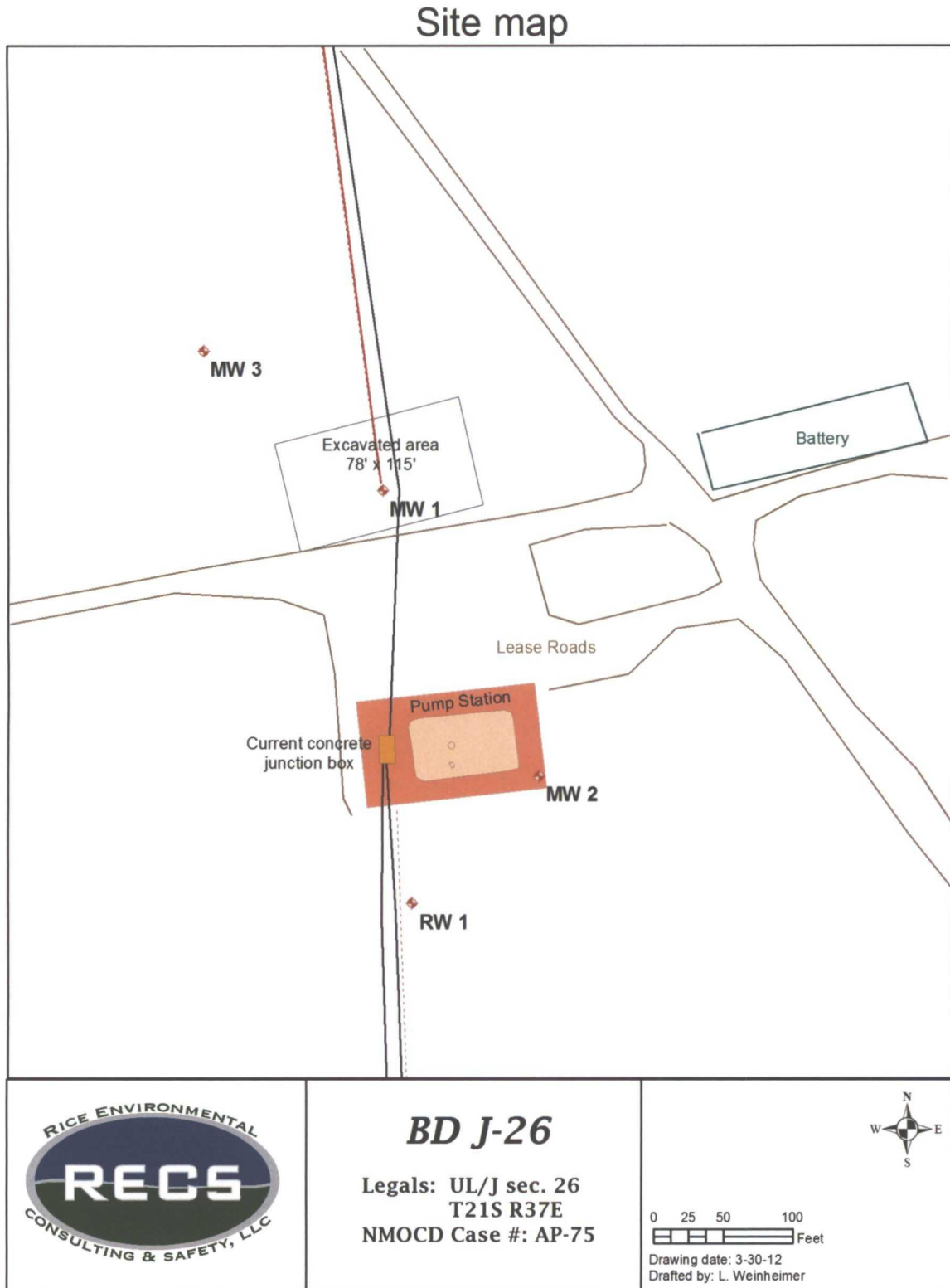


Figure 1 – BD J-26 location.





**Figure 2** – BD J-26 site layout and monitor well locations. Note that MW-1 is next to the former (since removed) junction box and within the area of contaminated soil removal.

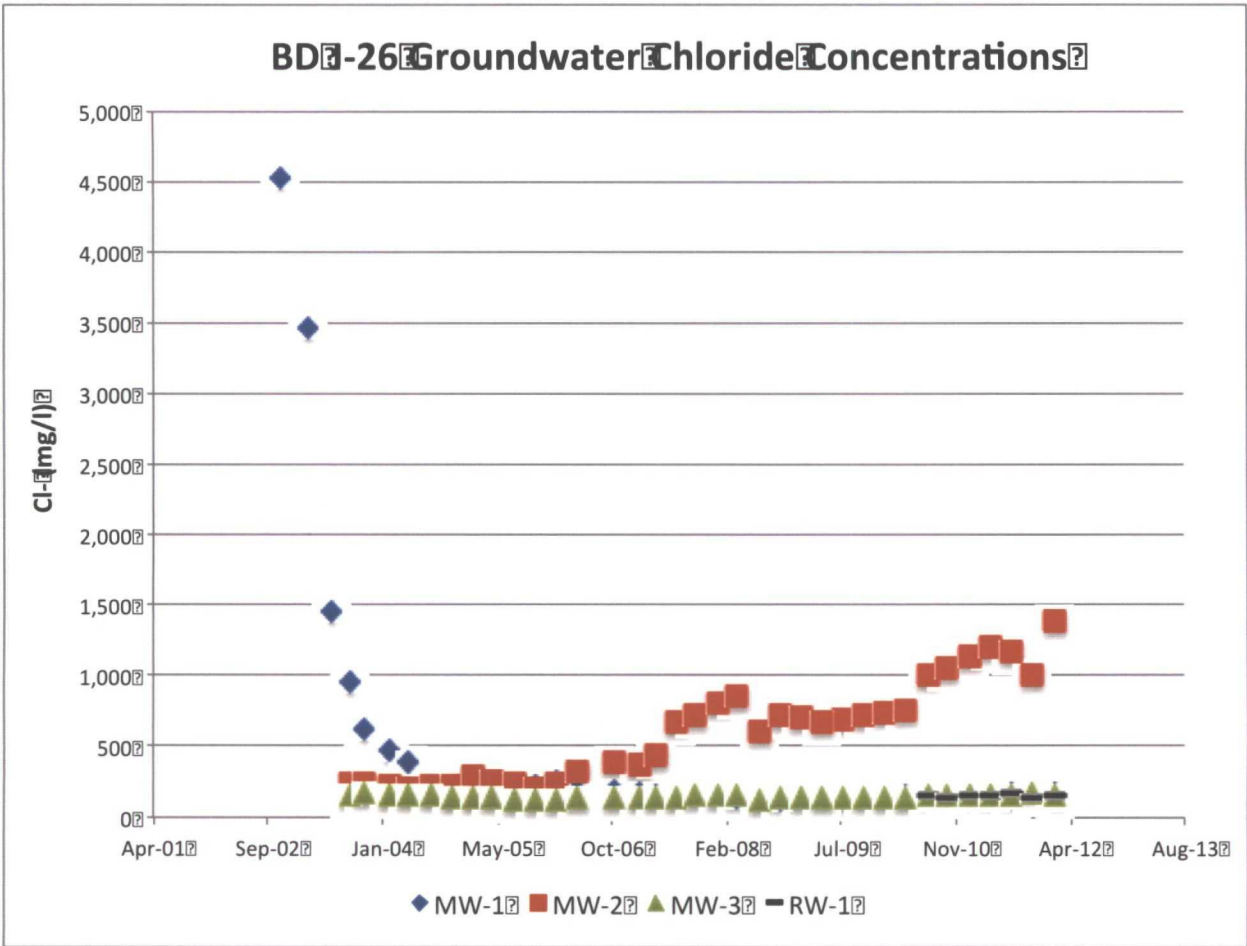
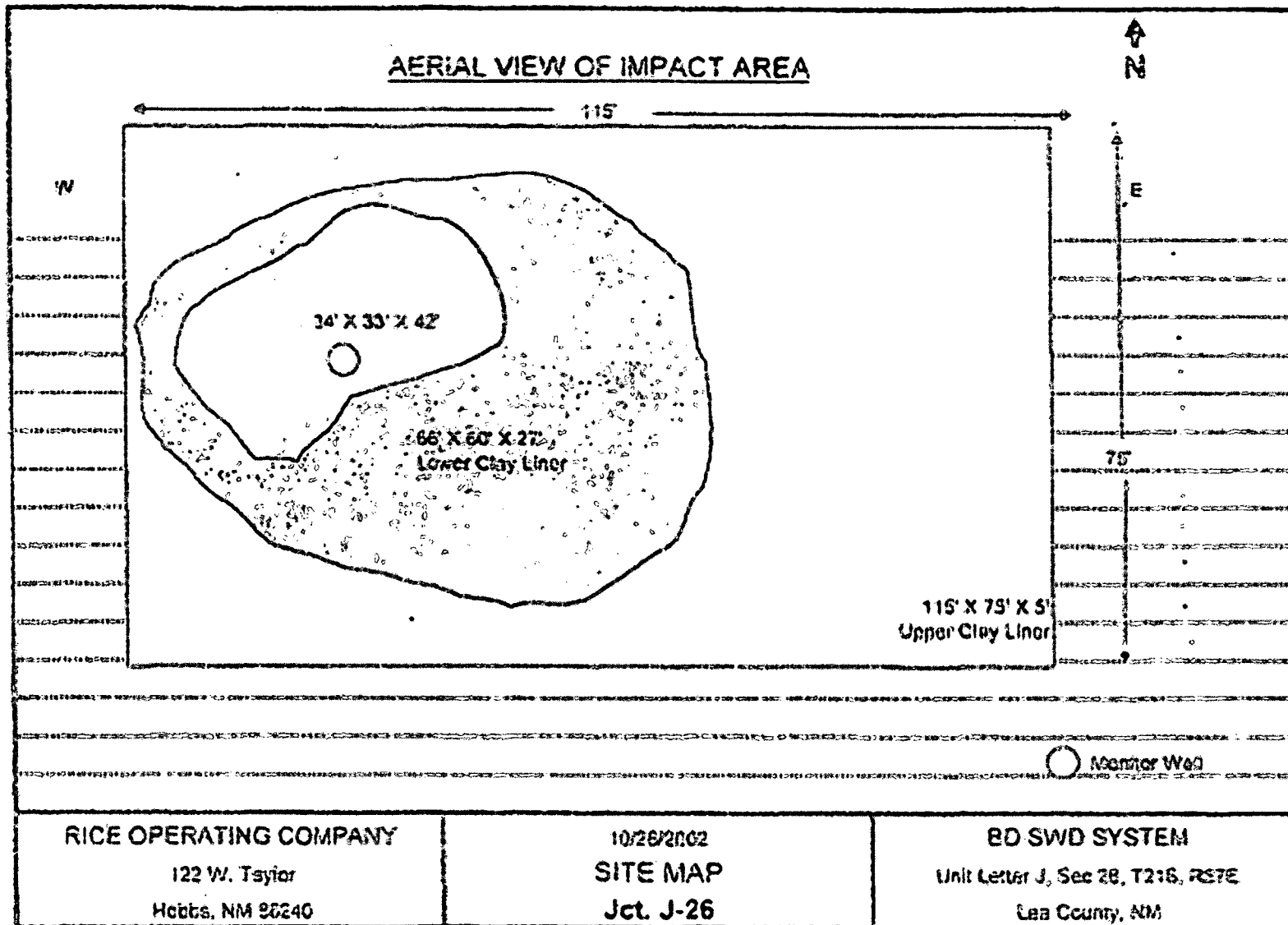
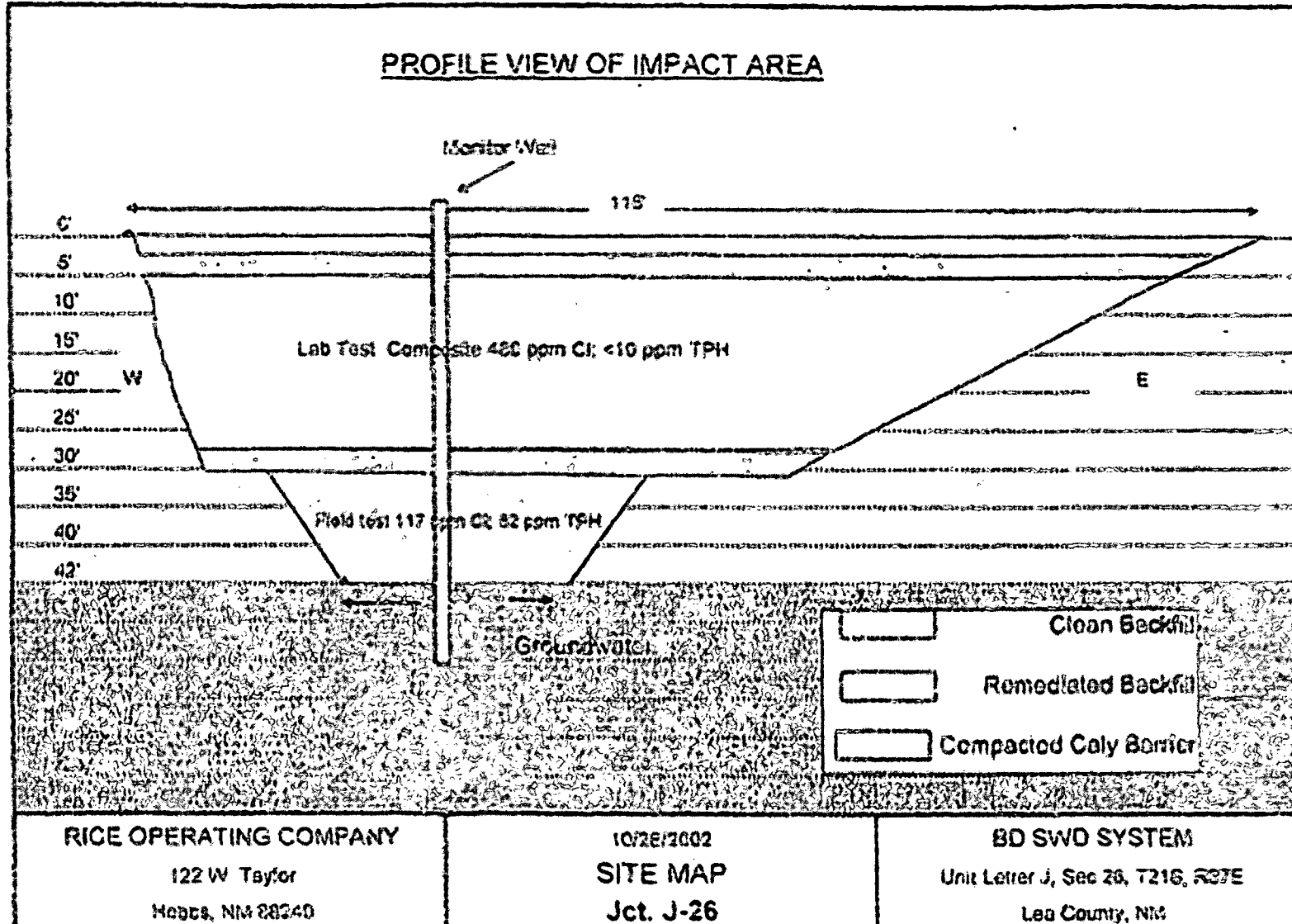


Figure 3 – BD J-26 groundwater chloride concentrations.

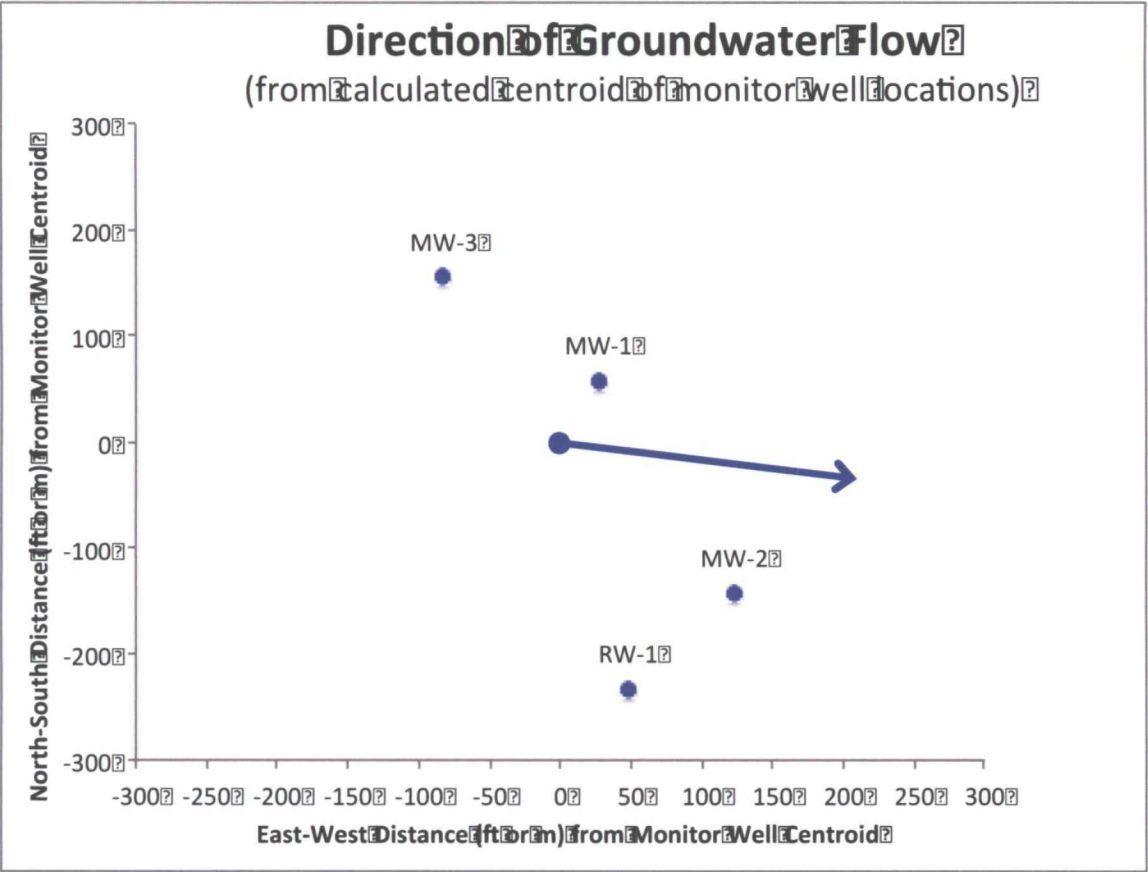




**Figure 4–** Plan view of cross sectional diagram of excavated soil at BD J-26 in 2002.



**Figure 5** – Cross sectional diagram of excavated soil and clay infiltration barriers (liners) at BD J-26 in 2002.



**Figure 6** – Calculated average annual groundwater flow directions based on 4 quarterly depth-to-groundwater measurements taken in the respective monitor wells.

1964

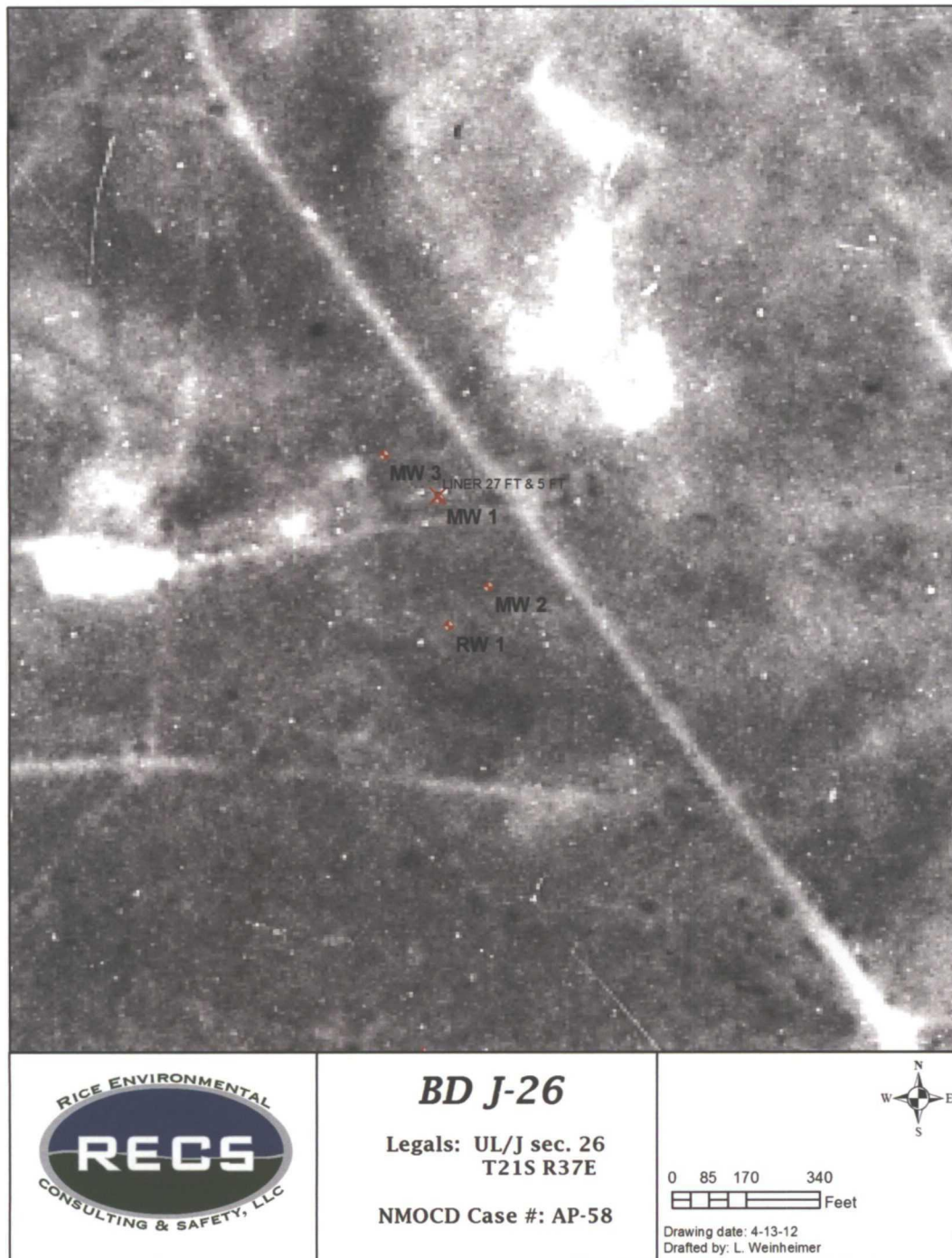


Figure 7 – BD J-26 1964 satellite photograph.

1977

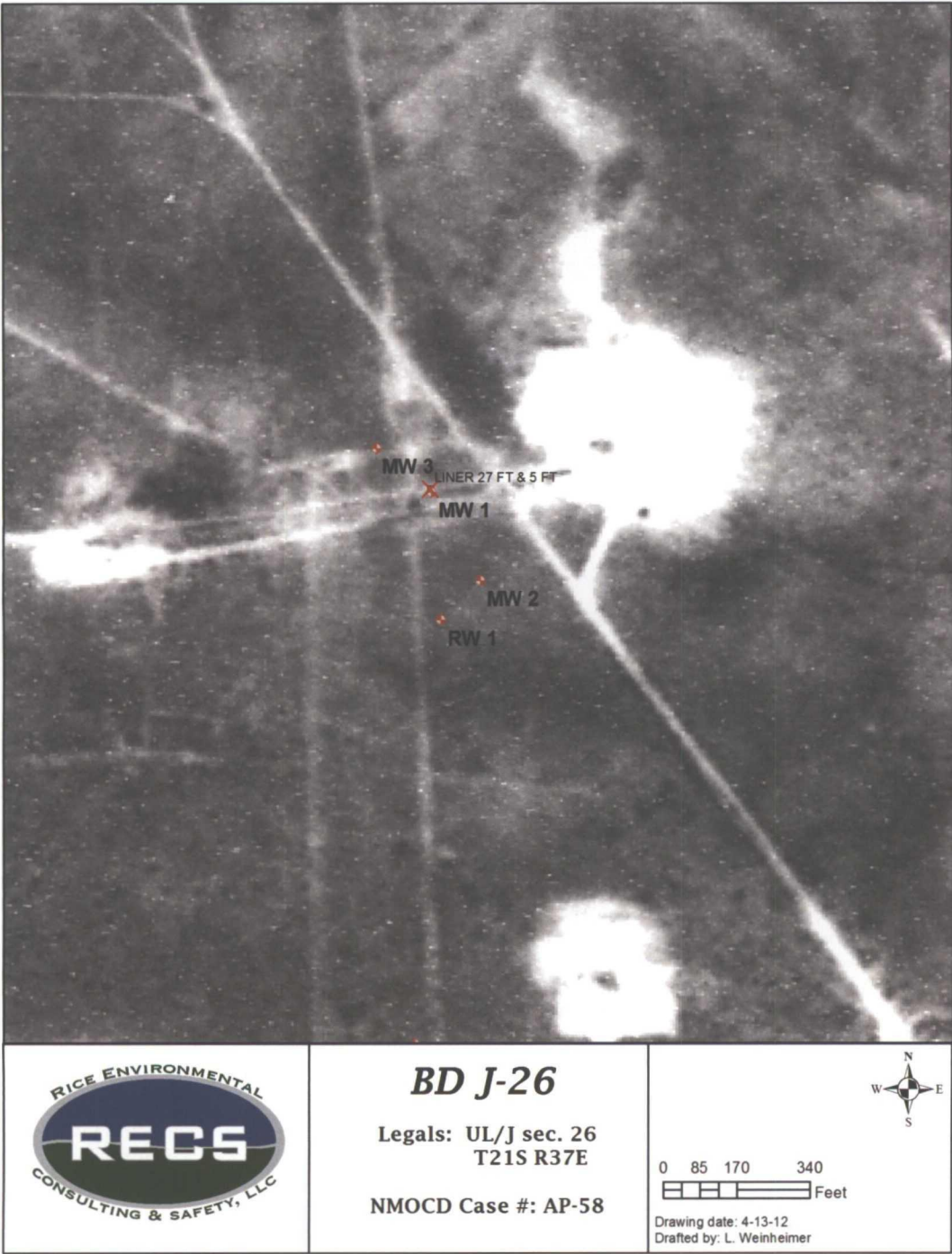


Figure 8 – BD J-26 1977 satellite photograph.



1986

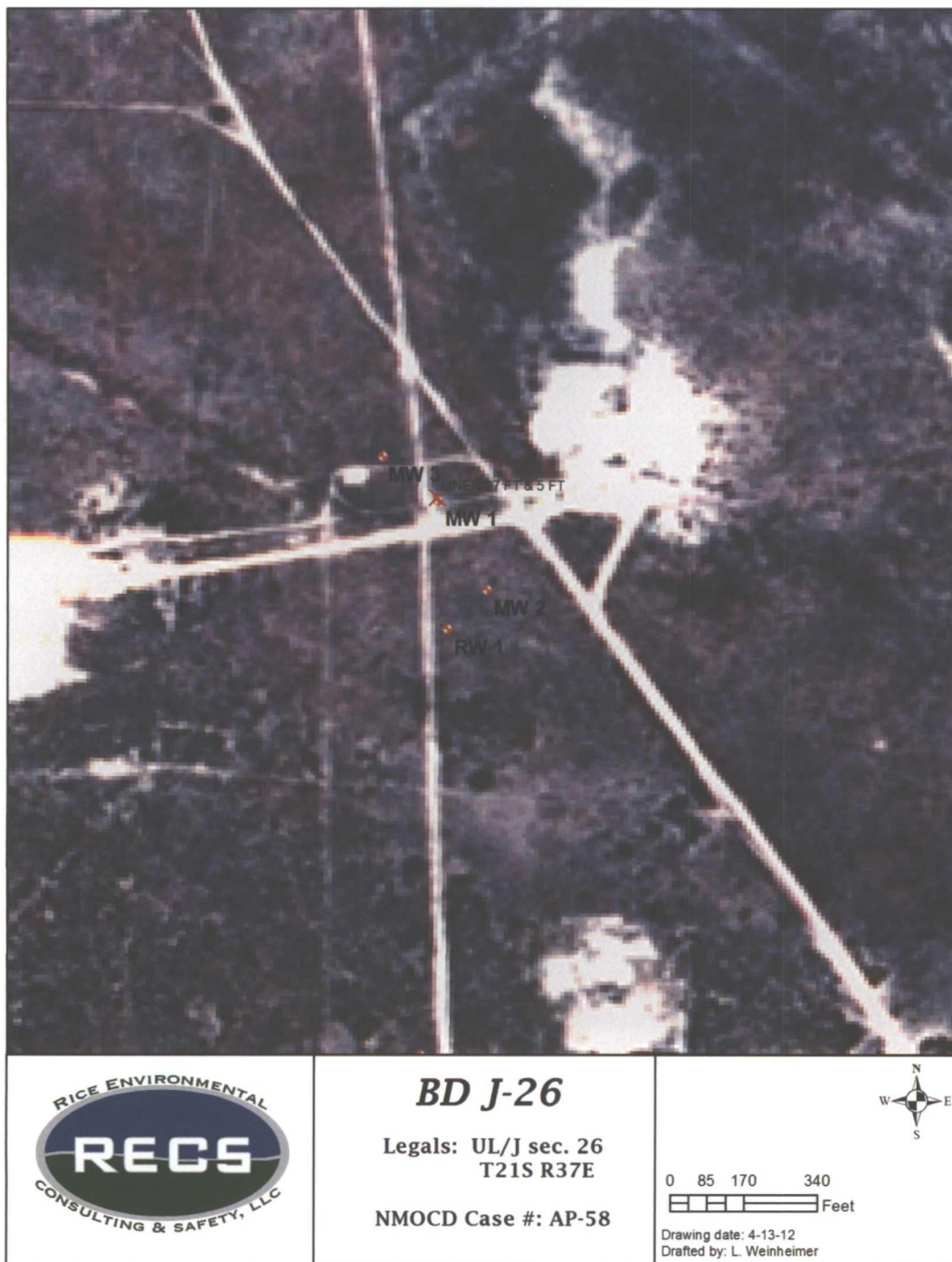


Figure 9 – BD J-26 1986 satellite photograph.



1996

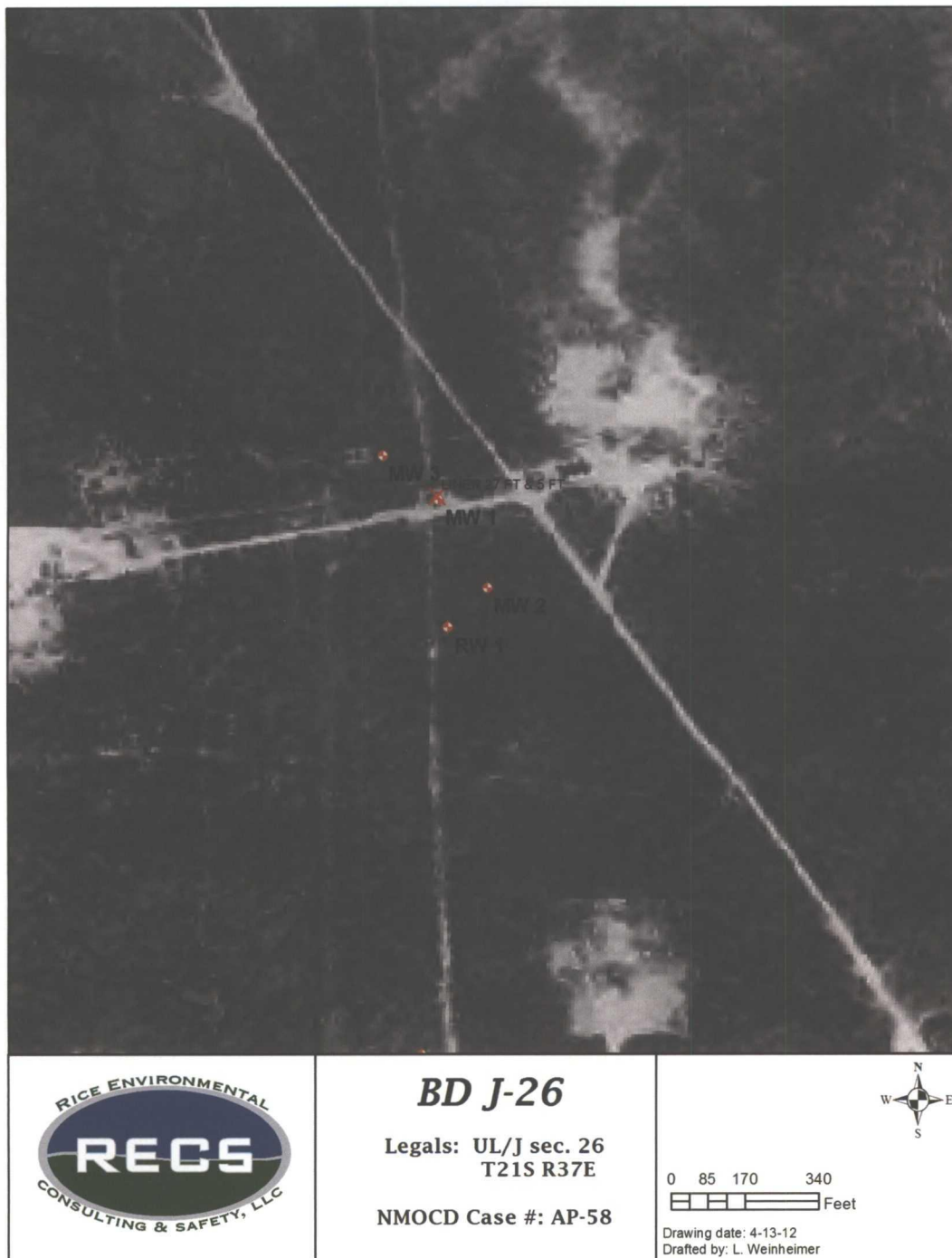


Figure 10 – BD J-26 1996 satellite photograph.

2004



Figure 11 – BD J-26 2004 satellite photograph.

2005



Figure 12 – BD J-26 2005 satellite photograph.



2009

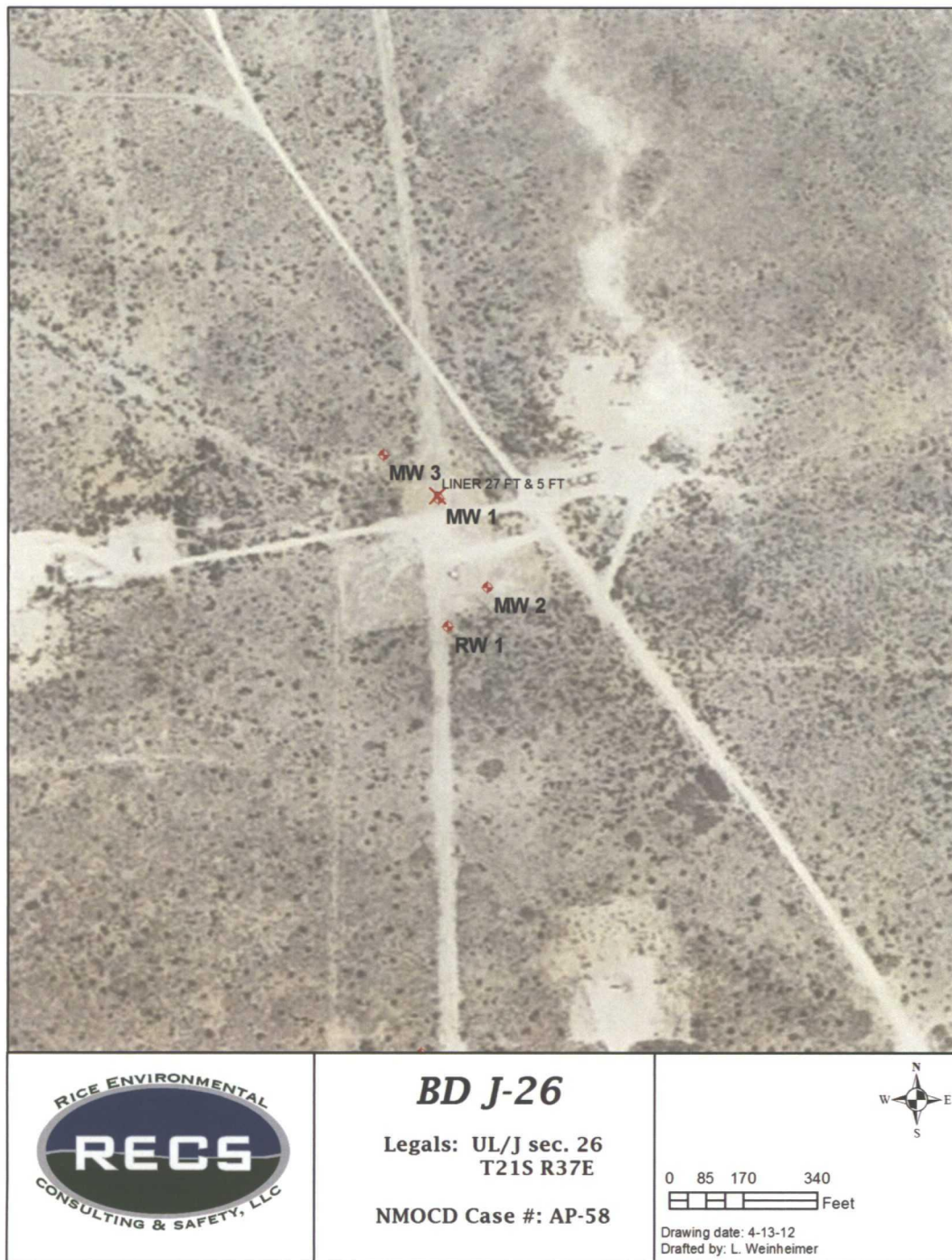


Figure 13 – BD J-26 2009 satellite photograph.

2011



Figure 14 – BD J-26 2011 satellite photograph.

RICE OPERATING COMPANY JUNCTION BOX FINAL REPORT									
BOX LOCATION									
SWD SYSTEM	JUNCTION	LINE	SECTION	TOWNSHIP	RANGE	COUNTY	BOX DIMENSIONS - FEET		
							Length	Width	Depth
ED	J-25	J	25	21S	37E	LEA			

LAND TYPE: BLM \_\_\_\_\_ STATE \_\_\_\_\_ FEE LANDOWNER DELROSE SCOTT OTHER \_\_\_\_\_

Depth to Groundwater 41' feet NMOCD SITE ASSESSMENT RANKING SCORE: 20

Date Started 04/23/2002 Date Completed 10/01/2002 OCD Witness YES

Soil Excavated 10000 cubic yards Excavation Length 115 Width 75 Depth 40 feet

Soil Disposed 480 cubic yards Offsite Facility Bandana Location Eunice, New Mexico

**FINAL ANALYTICAL RESULTS:** Sample Date 08/18/2002 Sample Depth 40'

Procure 5-point composite sample of bottom and 4-point composite sample of sidewalls. TPH, BTEX and Chloride laboratory test results completed by using an approved lab and testing procedures pursuant to NMOCD guidelines.

Sample Location	Benzene mg/kg	Toluene mg/kg	Ethyl Benzene mg/kg	Total Xylenes mg/kg	GRO mg/kg	DRO mg/kg	Chlorides mg/kg
SIDEWALLS	<0.005	<0.005	<0.005	<0.015	<10	<10	336
BOTTOM	<0.005	<0.005	<0.005	<0.015	<10	<10	304
Remediated Soil	<0.005	<0.005	<0.005	<0.015	<10	<10	480

**General Description of Remedial Action:** Vertical and lateral delineation found a large  
area impacted with TPH and chlorides. TPH impacted soil was excavated to 42' bgs and land farmed  
on-site. Chlorides were removed to 42' bgs and tested at 304 ppm. Clean backfill was placed  
in the deep excavation from 42' bgs to 27' bgs. A 12" compacted clay liner was installed at 27' bgs.  
The remediated soil was replaced in 3 lifts and packed. A second 12" compacted clay liner  
was installed at 5' bgs. The results of the compaction tests are included. The remaining  
remediated soil was placed above the clay liner and contoured to drain rain water away from the  
area above the liner. These clay liners will ensure no detrimental affect to the groundwater. A  
monitor well was installed to monitor groundwater constituents. An annual report with the  
sampling results will be sent to the NMOCD. The site will be seeded in the fall of 2002. A new  
replacement junction box has been installed north of this site.

**TPH/CHLORIDE FIELD TESTS**

LOCATION	Depth	TPH	mg/kg
SIDEWALLS	20-25'	86	342
BOTTOM	40'	11	275
Remediated Soil	comp	222	500

I HEREBY CERTIFY THAT THE INFORMATION ABOVE IS TRUE AND COMPLETE TO THE BEST OF MY KNOWLEDGE AND BELIEF.

DATE October 29, 2002 PRINTED NAME D. E. Anderson

SIGNATURE *D. E. Anderson* TITLE Project Leader - Environmental

**Figure 15-** Junction box disclosure report summarizing initial work and measured soil chloride and petroleum hydrocarbon concentrations.



<b>MultiMed</b>			
<b>Key Parameter Values</b>			
<b>Site:</b>	<b>BD J-26</b>		
<b>Date:</b>	<b>4/17/12</b>		
<b>Suggested Baseline Parameter Values:</b>			
(in the absence of a liner or subsurface infiltration barrier)			
<b>Source</b>			
<u>parameter</u>	<u>unit</u>	<u>value</u>	<u>justification/notes</u>
Source area	m <sup>2</sup>		... calculated
Source length	m	35.05	... measured
Source width	m	22.86	... measured
<b>Source infiltration rate</b>	<b>m/yr</b>	<b>0.01524</b>	<b>... equiv to 0.6 inches per year</b>
Initial concentration	mg/l	500	... from ROC junction box disclosure report
<b>Source decay coeff</b>	<b>fraction</b>	<b>2.5%</b>	<b>... assumed, and believed conservative.</b>
<b>Unsat Zone Flow</b>			
<u>parameter</u>	<u>unit</u>	<u>value</u>	<u>justification/notes</u>
			... half the distance from the chloride-
Flow layer thickness	m	6.1	affected zone to the water table.
Sat hydraulic conductivity	cm/hr	3.6	... equal to 1.5 inch/hr, assumed.
Effective porosity	fraction	0.25	... assumed.
<b>Unsat Zone Transport</b>			
<u>parameter</u>	<u>unit</u>	<u>value</u>	<u>justification/notes</u>
			... half the distance from the chloride-
Transport layer thickness	m	6.1	affected zone to the water table.
Bulk density	g/cm <sup>3</sup>	1.99	... calculated based on porosity.
<b>Saturated Zone</b>			
<u>parameter</u>	<u>unit</u>	<u>value</u>	<u>justification/notes</u>
Aquifer thickness	m	6.10	... equals 20 ft (assumed).
Mixing zone thickness	m		... let model derive value.
Effective porosity	fraction	0.3	... assumed.
Bulk density	g/cm <sup>3</sup>	1.855	... calculated based on porosity.
Sat hydraulic conductivity	m/yr	315	... representative for Ogallala aquifer.
Hydraulic gradient	m/m	0.004	... estimated from surface topography.
<b>Well Loc and Time</b>			
<u>parameter</u>	<u>unit</u>	<u>value</u>	<u>justification/notes</u>
Radial distance to well	m	1.0	... provides at-source concentration.
Time step option	hrs	Find Max Conc	... used as default.
Start time	hrs		... can vary to match output.
Stop time	hrs		... can vary to match output.

Table 1 – MultiMed key parameter values.