AP - 50

STAGE 1 & 2 WORKPLANS

DATE:
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October 2005

Stage I & II Abatement Plan

Zachary Hinton
EOL Junction Box

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1.0 EXECUTIVE SUMMARY

This report presents the results of the characterization activities performed by R.T. Hicks Consultants (Hicks Consultants) and Rice Operating Company (ROC) at the Zachary Hinton EOL Junction Box site. Based on field data, laboratory results, and predictive modeling, the selected remedy for the site involves placing clean fill within the excavation and placing about 3-feet of topsoil and over the site installed with a slight crown to promote surface runoff, then seeding the site with native vegetation. Using highly conservative input data, HYDRUS-1D modeling of this scenario predicts that resulting ground water chloride concentrations due to migration of residual chloride to ground water are less than 70 ppm above background concentrations (assumed as 100 ppm) after five years.

Ground water monitoring data confirm that the HYDRUS-1D predictions are conservative in that they over estimate the impact of residual chloride transport to ground water. After two years of ground water monitoring, chloride concentrations in ground water beneath the site have returned to ambient conditions (300-400 ppm).

We propose to employ MODFLOW and its contaminant transport module to predict the fate and transport of the historic impact to ground water quality evidenced by the first sample analysis. We hypothesize that the simulation modeling will show that natural dilution and dispersion has effectively mitigated any past impact to ground water quality.

This remedy is protective of ground water quality, human health, and the environment. We recommend that NMOCD close the regulatory file after completion of surface restoration and proposed modeling and forego regulation of this site under Rule 19.

2.0 DATA SUMMARY & CONCLUSIONS

2.1 DATA SUMMARY

1. In early 2002, ROC upgraded the junction box, characterized the upper vadose zone, and installed a monitoring well about 20 feet down gradient from the former box.
2. Chloride concentrations in the vadose zone exceed 1,000 ppm from 5 feet below ground surface to ground water.
3. The first ground water sample from the monitoring well exhibited a chloride concentration of 1,000 ppm.
4. Sampling of nearby supply wells demonstrates that the ambient chloride concentration in ground water is 300-400 ppm at the site.
5. Nine months of quarterly monitoring after installation of the monitoring well, chloride concentrations in samples from the monitoring well returned to the regional background concentration, 300-400 ppm.

2.2 CONCLUSIONS

1. The chemical data, the sandy lithology of the vadose zone, the lack of hydrocarbons in soil, and the water production history of the site support a conclusion that periodic small releases of produced water moved vertically from the junction box to ground water without horizontal dispersion.
2. The nature of the release and the site investigation results support a conclusion that the magnitude and extent of the release is sufficiently defined to permit design of a remedy.
3. In the past, leakage from the site caused a highly localized zone of ground water impairment.
4. Due to the nature of the release, the cross-gradient (east-west) extent of the historic impairment of ground water is probably less than 40 feet.
5. Although a single monitoring well cannot define the down gradient (north-south) extent of chloride in ground water caused by past releases, the Second Law of Thermodynamics supports a conclusion that natural dispersion and dilution will cause chloride to reach background concentrations after a relatively short down gradient transport distance.
6. Ground water data from nearby wells and data from the Zachary Hinton EOL site monitoring wells support the conclusion that 2004-2005 ground water samples from the Zachary Hinton EOL monitoring well are at background concentrations

and therefore do not now exceed the state ground water standards for chloride and TDS.

7. Other than TDS and chloride, no other constituents of concern exceed the New Mexico numerical ground water standards in the area near the site.
8. The HYDRUS-1D simulation that considers re-vegetation of the site provides an accurate representation of the current condition and agrees with site ground water data.

2.3 PROPOSED REMEDY

We recommend restoring the ground surface in the excavation using soil that will permit re-vegetation. Because the water quality at the site has returned to background conditions, we recommend plugging and abandonment of the existing monitoring well and closure of the regulatory file for this site, pending documentation of appropriate surface reclamation and presentation of the proposed saturated zone modeling experiment.

3.0 STAGE 1 ABATEMENT PLAN

ROC characterized the uppermost vadose zone during the junction box upgrade program. The results of this characterization are included in the disclosure report (Appendix A). ROC obtained samples of the deep vadose zone using an air-rotary technique and split spoon sampling. This delineation program adequately defines site conditions, and provide the data necessary to select and design an effective abatement option for the vadose zone (see Rule 19.15.1.19.E.3).

ROC characterized the saturated zone through more than three years of ground water monitoring. Hicks Consultants and ROC augmented this ground water quality database by collecting samples from nearby wells and by researching historic ground water quality data. The ground water delineation program adequately defines site conditions, and provides the data necessary to select and design an effective abatement option for the saturated zone (see Rule 19.15.1.19.E.3).

The following sections of this report present the results of the characterization programs.

3.1 CHRONOLOGY OF EVENTS

The disclosure report prepared by Rice Operating Company (ROC) in January 21, 2003 (Appendix A) summarizes the initial activities at the site. NMOCD approved the Hicks Consultants July 2, 2003 work plan for the site on August 21, 2003 (see Appendix B). Since the initial upgrade of the end-of-line box and installation of the monitoring well in 2002, ROC has overseen nearly four years of ground water sampling. Table 1 summarizes the chronology of events.

3.2 SITE LOCATION AND LAND USE

The Zachary Hinton EOL Junction Box is located about 2.5 miles southeast of the intersection of State Routes 18 and 8/176, near Eunice, New Mexico. Plate 1 shows the location of the site relative to Eunice, New Mexico. The general area of the site is employed for grazing and oil production. Plate 2 is a 2004 image showing the site, nearby oil wells and other development on this rangeland.

3.3 GEOLOGY & HYDROGEOLOGY

3.3.1 Regional & Site Hydrogeology

Plate 3 presents a geologic map of southern Lea County. This map shows the Ogallala Formation is present throughout much of the area and is underlain by the Dockum Group redbeds (the Dockum Group is mapped as T (r) cu on Plate 3). Along Monument Draw, erosion has

Table 1. *Chronology of Events at the Zachary Hinton EOL Box*

February 6, 2002	ROC upgrades EOL junction box and characterizes upper vadose zone
February 28, 2002	ROC installs monitoring well adjacent to EOL junction box
March 12, 2002	ROC notifies NMOCD of groundwater impact
April 2002 to June 2003	ROC conducts four quarters of ground water monitoring to confirm initial result and collect data in preparation for a corrective action plan
July 2, 2003	Hicks Consultants submits a corrective action workplan to NMOCD for review
August 21, 2003	NMOCD approves the workplan, which includes collection of ground water quality data from nearby supply wells and HYDRUS-1D simulation modeling
January 30, 2004	Hicks Consultants submits a Corrective Action Plan for NMOCD Review
December 3, 2004	NMOCD requests additional information
December 8, 2004	Hicks Consultants provides requested information
May 5, 2005	NMOCD orders ROC to submit an Abatement Plan pursuant to Rule 19
June 29, 2005	Hicks Consultants requests reconsideration of Abatement Plan Requirement
July 13, 2005	NMOCD re-iterates Abatement Plan Requirement

stripped the Ogallala and deposition of alluvium over the redbeds has created a separate aquifer that is hydraulically connected to the Ogallala in many locations (see Nicholsen and Clebsch, 1961).

Plate 4 displays the portion of the geologic map of southern Lea County southeast of Eunice, New Mexico (Nicholsen and Clebsch, 1961). The Ogallala Formation underlies the City of Eunice and the eastern boundary of Plate 4. Quaternary erosion and deposition removed the Ogallala and deposited alluvium within the central part of Plate 4, which effectively outlines the active channel of Monument Draw. The Zachary Hinton EOL junction box is plotted on Plate 4 and is in the middle of the alluvium within Monument Draw.

Plate 4 also shows the elevation of the top of the red-bed surface. The Dockum Group red beds are an aquiclude below the Ogallala and alluvial aquifers. In the area of the Zachary Hinton EOL junction box, the red bed elevation contours define a paleo-valley just west of and sub-parallel to Monument Draw. The elevation of the red-bed surface exerts controls on ground water flow. Where this surface is higher than the water table elevation, it obviously creates a barrier to flow. Where the red-bed surface is an expression of a paleo-valley, such as our area of interest, ground water may be directed toward the axis of this subsurface feature and the saturated thickness of the aquifer can increase as a result.

Plate 5 is the ground water map of southern Lea County (Nicholsen and Clebsch, 1961) covering the same area as Plate 4. This plate shows that the water table elevation mimics the red-bed elevation. At the Zachary Hinton EOL junction box site, ground water flows south, parallel to Monument Draw. Nicholsen and Clebsch (1961) conclude that "The bulk of the water [in the sediments along Monument Draw and under the Eunice Plain] is derived by underground flow from the Laguna Valley [Monument] area." The red-bed surface map and the water table map support this hypothesis.

Although the quality of the City of Eunice water supply wells is about 100 mg/L chloride (see Nicholson and Clebsch, 1961), a more detailed investigation of the area near the Zachary Hinton EOL site shows higher background levels. Plate 6 shows the locations of wells with past and present water quality data and Table 2 (attached) presents the results for chloride. A later section of this report discusses the local ground water chemistry.

By comparing the data from Nicholsen and Clebsch (1961) presented in Plates 4 and 5 of this report, one can estimate the saturated thickness of the alluvium in our area of interest is approximately 25-75 feet (2.6-22 meters). As shown on Plate 5, the hydraulic gradient in our area of interest is about 0.004.

Freeze and Cherry (1979) present a chart that compares hydraulic conductivity values to grain size and employing this chart for the unconsolidated sand in the uppermost saturated zone (50-60 feet below ground surface) yeilds a hydraulic conductivity value of 10^{-4} m/s. The resultant transmissivity of the unit is 1.5×10^{-3} m/s. The storativity (specific yield or porosity for this unconsolidated water table aquifer) of this sand should be about 0.25. From these data we calculate the rate of ground water flow as 0.14 m/d.

Surface water in the area is ephemeral and flows in Monument Draw occur only after large precipitation events. We found no evidence to suggest that the release from the junction box affected Monument Draw in any manner. Therefore, this document does not provide information on surface water hydrogeology.

3.4 WATER WELL INVENTORY

Appendix D presents the locations and other data of wells within the Office of the State Engineer database for the area within 1-mile of the Zachary Hinton EOL junction box site and the adjacent area. To this table we have added several wells discovered by field reconnaissance.

A later section of this report presents data to show that no existing supply wells are threatened by the release from the Zachary Hinton EOL junction box.

3.5 SUBSURFACE SOILS MONITORING PROGRAM

3.5.1 Results

The soil boring (Plate 7 and Appendix E) and backhoe excavation data (Appendix A) demonstrate that the vadose zone is sand and does not contain the caliche horizons that are common to the Ogallala Formation. This vadose zone profile is typical of the Quaternary Alluvium and is consistent with the geologic mapping presented in Plate 4.

The investigations did not detect evidence of regulated petroleum hydrocarbons in the vadose zone. Because regulated hydrocarbons were not present, further inquiry with respect to hydrocarbons is not warrented. In borehole samples, chemical data show concentrations of chloride greater than 200 ppm from 11 feet below ground surface to 50 feet below ground surface (Figure 1). The chloride concentrations greater than 1,000 ppm prompted ROC to complete a monitoring well at this site.

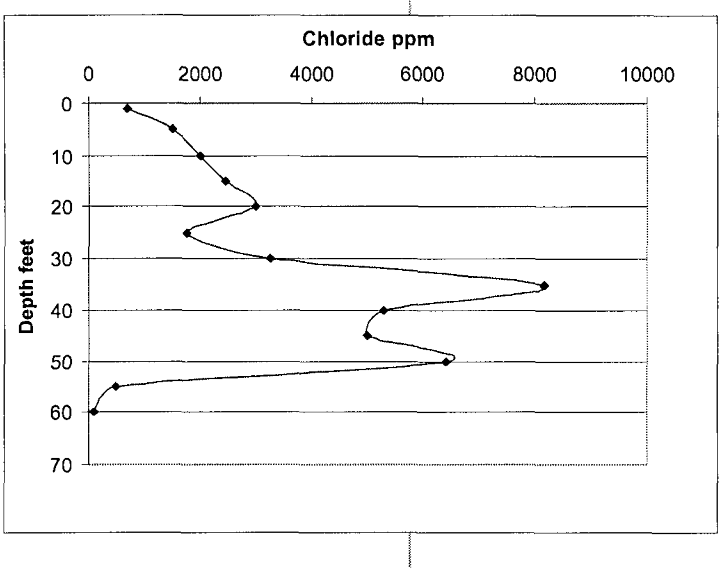


Figure 1. Borehole Chloride vs. Depth

3.5.2 Nature of the Release

Appendix C presents our conceptual model of produced water releases from junction boxes, such as the Zachary Hinton EOL site. In the absence of crude within the pores of the vadose zone at the release site, the vertical flow of produced water is less restricted. At this site, we believe that episodic releases of produced water entered the vadose zone and migrated vertically.

Chloride concentrations in excess of 1,000 ppm from below the junction box to ground water suggest that past releases from the junction box created saturated conditions in the vadose zone. Additionally, the geometry of the chloride v. depth profile of the boring may cause one to hypothesize that chloride concentration peaks at 20, 35 and 50 feet below ground surface represent three separate release events. However, without definitive grain size or moisture content analyses, these types of hypotheses are not always correct. A fine-grained horizon (such as a caliche) will have materially higher chloride concentrations than a sand horizon that immediately overlies the fine-grained horizon due to the higher moisture content.

We believe that the large difference between chloride values from 0-30 feet versus the higher values observed below 30 feet suggest that releases from the Zachary Hinton EOL junction box decreased significantly about 15-20 years ago. We base this hypothesis on measurements of chloride migration in the vadose zone of 1 to 3 feet per year at a site near Lovington, New Mexico. We also believe that the chloride concentrations from 0-30 feet suggest that some leakage continued at the site until ROC replaced the box in 2003.

3.5.3 Extent & Magnitude of Brine in the Vadose Zone

The chemical data, the sandy lithology of the vadose zone and the lack of hydrocarbons in the release allow us to conclude that produced water moved vertically from the junction box to ground water. Therefore the vertical extent of the release in the vadose zone is the entire 50-60 foot thick column. The horizontal extent of the release to the vadose zone is defined by the footprint of the former junction box. We believe that produced water moved vertically without the horizontal dispersion because the absence of fine-grained caliche horizons or clay layers in the vadose zone permits one-dimensional vertical flow. We also conclude that the chloride concentration data of the borehole adequately define the magnitude of the release to the vadose zone.

3.6 GROUND WATER QUALITY MONITORING PROGRAM

3.6.1 Results

As stated above, ROC found no hydrocarbons in soil and have not detected hydrocarbons in ground water.

Figure 2 presents ground water quality data from the monitoring well that is located within 20 feet of the former Zachary Hinton EOL junction box. Chloride concentrations were about 1,000 mg/L in early 2002, soon after replacement of the junction box. The concentration of chloride declined significantly after the first sampling event then continued to decline until June 2003. Since mid summer of 2003, chloride concentrations remained stable (less than 500 mg/L). With the exception of an anomalous analysis tied to documented laboratory errors in December 2004, TDS concentrations have followed the trend established by the chloride ion. Note that the scale of Figure 2 eliminates plotting of this anomalous data point and permits one to observe the parallel trends of chloride and TDS.

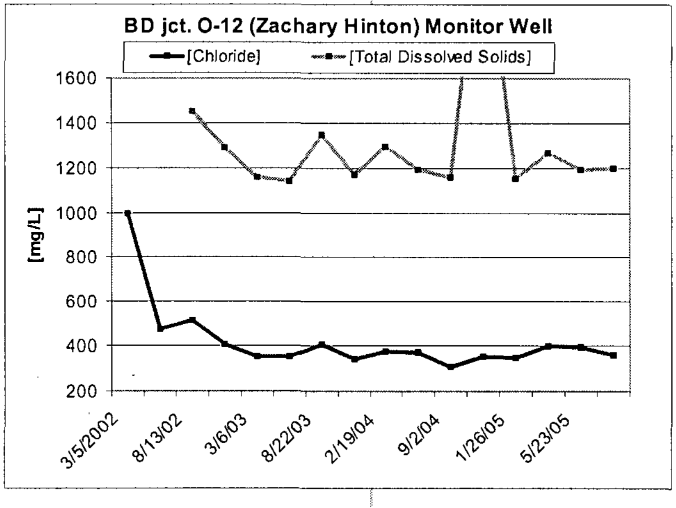


Figure 2. Chloride and TDS in site monitor well over time.

As part of our evaluation of water quality in the area, we examined the past and current ground water quality of nearby water supply wells. Plate 6 shows the locations of nearby wells that have historical water quality data and presents the chloride concentration in ground water for each of these wells.

West of Monument Draw, the data show the chloride concentration in the City of Eunice wells and the Peters West well are below Water Quality Control Commission numerical standards for ground water. Wells within or near Monument Draw, however, generally exceed the numerical standards. The difference between the water quality west of Monument Draw and the water quality within and near the Draw has been evident since the 1950s when Nicholson and Clebsch sampled the water of the area (Table 2).

Up gradient (north) from the Zachary Hinton EOL site, chloride concentration in the Active Windmill of Section 36 is 460 ppm. Like the Zachary Hinton EOL site, this well lies within Monument Draw. The chloride in this active windmill is consistent with the chloride concentrations observed in wells 22.37.1.440 and 22.37.24.133b (average of 422 and 675 ppm respectively) in the 1950s, both of which are located within Monument Draw. The Peters East well, which lies within Monument Draw and is down gradient of the Zachary Hinton EOL site, exhibits a chloride concentration of 438 ppm. As stated above the recent chloride concentrations in the Zachary Hinton EOL monitoring well are less than 400 ppm. This measurable difference in chemistry between the Zachary Hinton Site and the Peters East well could be due to the effect of higher quality ground water flowing into the Monument Draw area from the west (e.g. 200 ppm chloride in the Peters West well), or the difference may be due to normal variance associated with sampling and analysis. From these data we can conclude that 2004-2005 ground water samples from the Zachary Hinton EOL monitoring well are at background concentrations and therefore do not now exceed the state ground water standards for chloride and TDS.

3.6.2 Other Constituents of Concern

The laboratory did not detect any regulated petroleum hydrocarbons in ground water. Sulfate concentrations in ground water are below New Mexico numerical standards. The evidence allows us to conclude that only chloride and total dissolved solids exceed the numerical ground water standards.

3.6.3 Extent and Magnitude of TDS and Chloride in Ground Water

As suggested above, we conclude that the horizontal extent of the near surface release was confined to the size of the junction box itself and produced water flowed vertically through the vadose zone without material lateral dispersion to ground water. Therefore, the monitoring well, which is located about 20 feet down gradient from the former junction box, provides representative ground water chemistry data for the aquifer immediately below the release. These data show chloride concentrations of 1,000 mg/L several months after replacement of the junction box and a 6-month decline in chloride concentrations after the source of leakage ceased (i.e. replacement of the junction box).

Earlier sections of this report also provide evidence that saturated flow existed from the base of the junction box to ground water until the box was replaced in 2002. Because saturated flow continued until 2002 and the highest chloride concentrations are deep in the vadose zone, we can also conclude that the 1,000 mg/L chloride concentration of the initial ground water sample represents a reasonable estimate of the maximum chloride concentration in ground water caused by the release. A later section of this report suggests a maximum chloride concentration in ground water of less than 2,000 mg/L may have occurred in the past. Today concentrations of chloride in down gradient ground water are unlikely to be greater than 1,000 mg/L because of dispersion and dilution with transport would reduce chloride concentration.

Although we can definitively state that the water quality at the site currently meets state standards (i.e. background or existing water quality), one well cannot define the full extent of any impairment caused by the past leakage from the site. We can conclude, however, that the cross-gradient (east-west) extent of chloride concentrations exceeding background levels may be about twice the cross-gradient dimension of the junction box, or about 40 feet. We propose to test this hypothesis with the ground water modeling exercise proposed as part of the Stage 2 Abatement Plan: Saturated Zone.

A single monitoring well cannot define the down gradient (north-south) extent of chloride in ground water caused by past releases. We believe that natural dispersion and dilution will cause chloride to reach background concentrations after a relatively short down gradient transport distance. We propose to test this hypothesis with the ground water modeling proposed as part of the Stage 2 Abatement Plan: Saturated Zone.

4.0 STAGE 2 ABATEMENT PLAN: VADOSE ZONE

We used the numerical model HYDRUS-1D to simulate the transport of residual chloride from the surface through the vadose zone to ground water. We used the predicted flux of chloride to ground water from HYDRUS-1D as input into a simple ground water mixing-model to evaluate the impact on ground water quality. As Hendickx and others (2005) describe in *Modeling Study of Prodiced Water Release Scenarios*, this modeling effort requires 10 input parameters. Section 3.0 of Hendrickx and others describes the modeling approach.

4.1 DATA EMPLOYED FOR THE ZACHARY HINTON SITE

For some input parameters we employed regional data or values based upon professional judgment (see Table 3). For most of the input data to our simulations, we relied upon site data collected by Rice Operating Company. Our field inspection of the site and our evaluation of the data allow us to conclude that the site data used in our simulations reflect the conditions at the site.

Plate 7 shows the soil profile texture and thickness of the vadose zone at the site (input parameters # 1 and #2 of Table 3). We input the soil texture into HYDRUS-1D and allowed the model's library to generate the hydraulic properties. We then used these hydraulic properties in simulations of these scenarios.

Table 3. *Input parameters in HYDRUS model*

Parameter	Values	Source of Data
1. Depth to Ground Water (feet)	56	Site Data
2. Vadose Zone Texture (see Plate 7)	Attached well log	Site Data
3. Dispersion Length (cm)	100	Professional Judgment
4. Water Content θg (%)	High θg Layer 1: 10% Layer 2: 30% Layer 3: 25%	Estimated from HYDRUS simulations
5. Vadose Zone Chloride Distribution (gr/kg)	Soil boring, Plate 7	ROC data from Disclosure Report
6. Length of release perpendicular to ground water flow (feet)	20	Field measurements
7. Climate Index	Pearl, NM station (Hobbs area)	NOAA data
8. Background Ground Water Chloride (mg/L)	100	Samples from nearby wells
9. Ground Water Flux (cm/day)	0.014	Calculated from regional hydrological data
10. Aquifer Thickness (feet)	35	Nicholson & Clebsh (1961) and OSE data

Based upon our experience, we employed a dispersion length of 100 cm (input #3). The selected dispersion length is 7% of the total length of the HYDRUS-1D model (55 feet). Many researchers suggest that a dispersion length that is 7-10% of the total model length provides reasonable results for simulation experiments.

We used the soil moisture content (input # 4) presented in Table 3 from HYDRUS-1D simulations. Because we did not have site-specific soil moisture data, we assumed a "dry" soil profile then used the climate data to add moisture to the profile via precipitation over 100 years. We found that initial soil moisture in the profile changed over this 100-year period, responding to the climatic conditions. Therefore, we ran the simulations under both "wet" and "dry" conditions as determined by the 100-year simulation experiment. As Table 3 shows, we elected to employ the "wet" conditions in our simulations because leakage from the junction box over the past years has created "wet" conditions within the profile.

Plate 7 shows the measured soil chloride concentration per unit weight of soil. We converted these values to concentrations per liter of soil water (input #5) by using the equations in Hendrickx and others (2005). The length of the release (input #6) was measured in the field.

The daily climate data available from the Pearl weather station near the Hobbs Airport served as input for all climate indices required by HYDRUS-1D (input #7). We simulated 10 years after the release with average precipitation 36 cm/year.

For the input parameter #8, background ground water chloride concentration, we used 100 mg/L based upon data from the City of Eunice. We used data for the Ogallala Aquifer as described in Nicholsen and Clebsch, (1961) as input to the mixing model (input #9, ground water flux; input #10, aquifer thickness).

We also used data from the BD Zachary Hinton site monitor well to verify the predictions of the HYDRUS-1D model and the mixing model.

4.2 SETUP OF SIMULATIONS

Scenario 1: Current Conditions

The current condition scenario evaluates the potential of the chloride mass in the vadose zone to materially impair ground water quality at the site in the absence of any action by Rice Operating Company and in the absence of any natural restoration (e.g. re-establishing vegetation). As described in Hendickx and others (2005), the distribution of the mass of chloride in the vadose zone (input #5) is the most important input parameter for prediction of chloride concentrations in ground water. For this and all simulations, we assumed the chloride concentrations shown in Plate 7 existed in the profile at time zero. At time zero, we also assume that man-made leakage of produced water has ceased and the chloride concentration in the monitoring well is equal to background (100 mg/L). While the first and second assumptions are acceptable, the assumption that the chloride concentration in the monitoring well is equal to background is false. We make this last assumption as a matter of convenience to simplify our model and we explain the effect of this simplification in our discussion of the results of the simulations.

The chloride concentration of soil water $Cl^{soil\ water}$ (mg/liter) depends on the gravimetric chloride content of moist soil $Cl_g^{moist\ soil}$ (mg/kg of moist soil), the bulk density of the soil D_{soil}^{dry} (kg/m^3), and the volumetric water content of the soil $è_v$ (m^3/m^3) input #4 . To convert the chloride concentration in the soil to chloride concentration in soil water (see Hendrickx and others, 2005), we used a soil density of 1,858 kg/cubic meter and the soil moisture content in Table 3.

We entered the chloride concentration of soil water in the soil profile in HYDRUS and ran the simulation for 10 years with total precipitation and evaporation from the soil. Vegetation was assumed to not be present to enhance water transfer from soil to the atmosphere. We calibrated the results from the model with the chloride data from a monitoring well located 20 feet down gradient from the center of the spill.

Scenario 2: Reduce Infiltration

To minimize the potential for any leaching of residual chloride from the vadose zone, we assumed a surface remedy that would reduce infiltration of precipitation. To simulate such a remedy, we simply reduced the precipitation by assuming that heavy rains (that cause the majority of the infiltration) ran off after 1.5 cm fell. This simulation predicts the effect of (a) sloping the site to cause runoff of the larger precipitation events and/or (b) placement of a graded compacted layer at the surface to minimize infiltration, facilitate runoff and prevent ponding of precipitation. All other input parameters are the same as Scenario 1.

Scenario 3: Vegetation

This scenario consists of placing 30 cm of silt loam and reseeding with pasture. The transpiration is zero during the winter months but soil evaporation takes place. During the growing season, evapotranspiration is greatest. All other input parameters are the same as Scenario 1.

Scenario 4: A Silt Clay Below the Top Soil

In this scenario we placed 60 cm of a silt clay below the topsoil under the same conditions of Scenario 3. Placing the clay below the top soil minimizes infiltration into the deeper profile and provides a place for the infiltration of winter precipitation to reside until the plants take it up in the following spring and summer. All other input parameters are the same as Scenario 1.

4.3 SIMULATION RESULTS AND DISCUSSION

Figure 3 shows the response of Scenario 1 in a monitoring well located 20 feet from the center of the spill at the release site. The simulation shows chloride concentration increasing to a maximum of 1,652 ppm in year 1.7. As stated in the previous section, in this and other simulations, when man-made leakage ceased, the chloride concentrations in the vadose zone are equal to that represented in Plate 7 and Figure 1. To simplify our modeling experiment, we assumed that the chloride concentration in the monitoring well at time zero in Figure 3 is equal to background (100 mg/L). Therefore, the initial increase in chloride concentration from background (100 mg/L) to a maximum (1,652 in this simulation) is the model's response to the downward movement of the initial distribution of chloride in the profile. Because the well was installed after replacement of the junction box and cessation of periodic leakage, we cannot know the chloride concentration at the monitoring well during past man-made leakage events. We hypothesize, however, that chloride concentration in ground water would be 1,652 mg/L or more during the time that the junction box periodically released produced water. Chloride concentrations in the monitoring well might remain at or above the 1,652 mg/L during the years of periodic discharges from the former junction box, as chloride migrated from the ground surface to ground water via saturated flow. After replacement of the junction box, water additions to the soil profile cease and the soil profile would drain. During the drainage of the soil profile, chloride concentrations in the monitoring well would decrease as saturated flow ceased and slower, unsaturated flow conditions occurred in the profile.

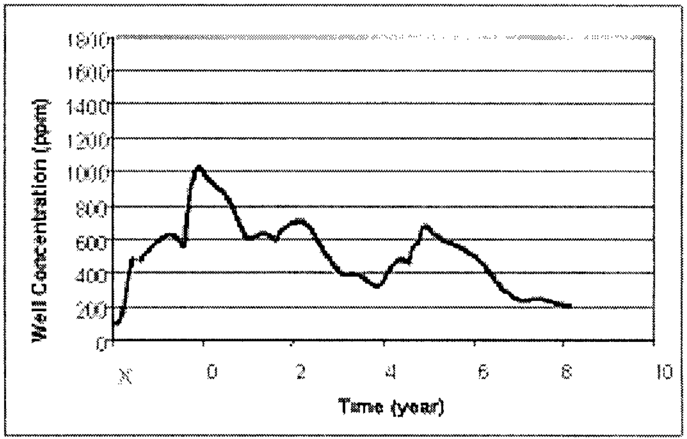


Figure 3. Chloride concentration in the monitoring well for the current conditions scenario. (Scenario 1)

Figure 4 modifies the HYDRUS-1D output to better represent the conditions described above. In this Figure, time X represents background conditions, before any leakage from the junction box. As periodic leakage occurs, chloride concentration in ground water rises and chloride is distributed throughout the unsaturated zone. We believe that the maximum chloride concentration in ground water in Figure 4 (1,652 mg/L) is approximately what we would have observed during the period of leakage from the junction box if the monitoring well had been installed. After upgrade of the junction box (here noted as approximately time zero), chloride concentrations decline as discussed above and as shown in Figure 4. About five years after upgrade of the junction box under the Current Condition Scenario, ground water chloride approaches the background concentration assumed in the model (100 mg/L).

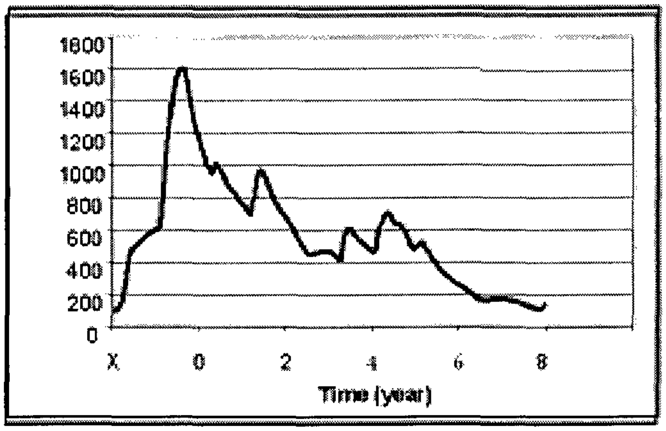


Figure 4. Modification of HYDRUS-1D simulation results to illustrate a more realistic time scale for Scenario 1.

Figure 5 shows the results of our simulations of Scenario 2 with the same modified time line as in Figure 3. Reducing infiltration of precipitation creates a maximum concentration 1,048 mg/L marked approximately as year 0 to show when junction box upgrade occured. Reducing infiltration slows the drainage of vadose zone water relative to the current condition scenario. Therefore, water and chloride enter the ground water more slowly in this scenario as compared to the no action scenario. In other words, the chloride flux (mass/time) into ground water is lower in scenario 2 than in scenario 1. The ground water flux and aquifer thickness, however, remain the same in both scenarios. The lower chloride flux into ground water results in a lower maximum concentration observed in the monitoring well. This lower flux also results in a longer time of predicted non-compliance at the monitoring well.

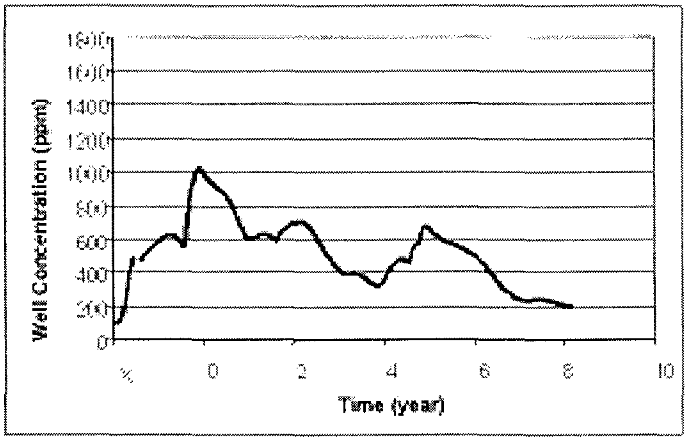


Figure 5. Modification of HYDRUS-1D simulation results to show a more realistic time scale for chloride concentration in the monitoring well for the scenario reducing the infiltration. (Scenario 2)

About six years after upgrade of the junction box, the majority of the chloride has drained from the vadose zone and concentrations in the well declines to the standard of 250 mg/L. We did not simulate the length of time necessary for ground water to reach background conditions under this scenario.

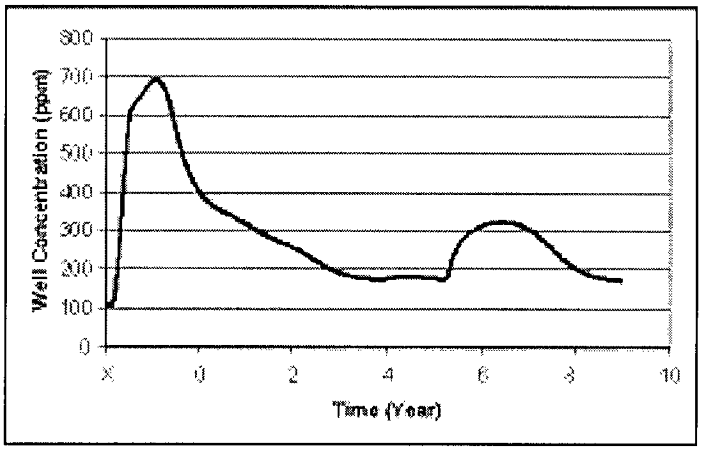


Figure 6. Modification of HYDRUS-1D simulation results to illustrate a more realistic time scale, chloride concentration in the well for the vegetation scenario. (Scenario 3)

Figure 6 shows the results of the Scenario 3, which assumes further reduction of infiltration due to evapotranspiration as a result of plant cover. The maximum chloride concentration in the well is 693 mg/L (or about 600 mg/L above the assumed background concentration of 100 mg/L) at approximately zero time on the modified scale. As discussed previously, the time of maximum chloride concentration is the time when the junction box is upgraded. The chloride concentration declines to the standard of 250 mg/L in year 2.11. However, we predict an increase in ground water chloride concentrations to 323 mg/L in year 6.5 followed by a decrease to the standard by year 7.5. This increase at year 6.5 is probably due to increased infiltration associated with the El Niño weather pattern. Because most the chloride has drained from the profile by year 6.5, we conclude that any additional increase in ground water chloride concentration (perhaps at year 14) would not exceed the ground water standard of 250 mg/L.

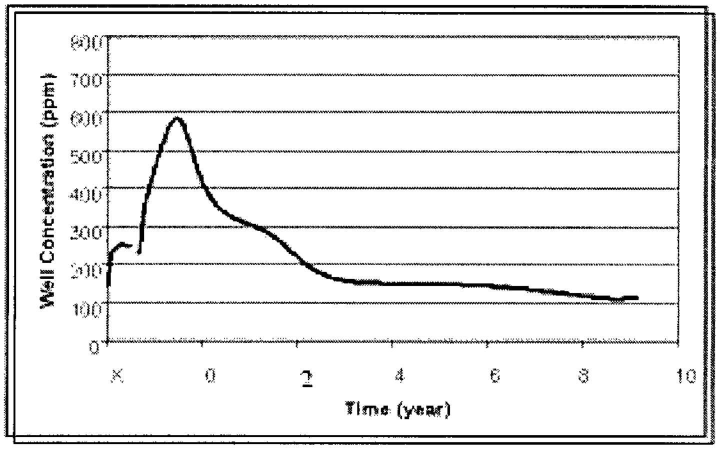


Figure 7. Modification of HYDRUS-1D simulation results showing a more realistic time scale of chloride concentration in the well for the scenario with vegetation and a silt clay layer below the topsoil. (Scenario 4).

The concentrations in the root zone in Scenario 3 are quite high as result of capillary rise that accumulates the salts at the top of the profile. Concentrations of 4,000 mg/L will prevent the grass of developing unless chloride moves deeper into the subsurface due to a soil flushing program or natural rainfall.

Figure 7 shows the result of Scenario 4 with the modified time scale. The maximum concentration in the well is 604 mg/L in year 0. It declines to 250 ppm in year 1.75. The concentrations in the root zone are about 1,300 mg/L, suitable for vegetation. By year 8, background conditions exist in the monitoring well.

Figure 2 of this report is reproduced in Plate 8 with the HYDRUS-1D simulation for Scenario 3 to permit comparison. The monitoring well data show chloride concentrations declining from 1,000 mg/L to 400 mg/L over a nine-month period. Obviously, these data do not correlate with the model predictions of Scenario 1, current conditions. Instead, the field data are more similar to the predictions of Scenario 3, where infiltration into the vadose zone is relatively low due to evapotranspiration associated with vegetation. What is most striking about the field data and the predictions of Scenario 3 is that both show a maximum chloride concentration of 600 mg/L above background at time zero. The field data and the HYDRUS-1D prediction also show relatively good agreement with respect to the time required for ground water to re-equilibrate with background water quality conditions. The simulation predicts that chloride will be less than 200 mg/L after about 2.5 years. The ground water data show that the monitoring well is at background chloride concentrations (between 350 and 400 mg/L) after about 1.5 years from cessation of saturated or "wet" conditions.

The similarity shown in Plate 10 should not be surprising if one visits the site. Vegetation does exist around the area of the suspected release (Figure 8). We believe the current flux of chloride from the vadose zone to ground water is approximately the same as that simulated in Scenario 3. We can also conclude from Figure 8 that the chloride concentration in the root zone is low enough to support vegetation. The current condition scenario, which does not provide for evapotranspiration or any reduced infiltration, obviously overestimates the impact of the chloride load to ground water quality.

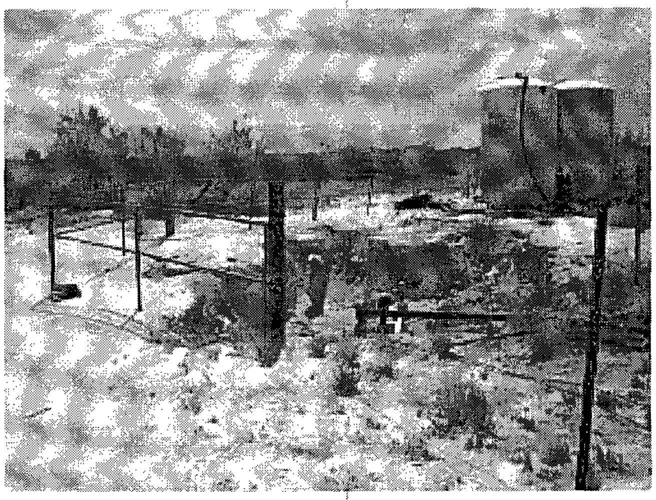


Figure 8. *Vegetation at the site.*

4.4 CONCLUSION AND RECOMMENDED ACTION: VADOSE ZONE

The HYDRUS-1D simulations for the Zachary Hinton site provide reasonably good, albeit conservative, predictions of chloride concentrations in ground water for the various scenarios. The simulation showed that about two years after the upgrade of the junction box and cessation of accidental and periodic water leakage, HYDRUS-1D predicts that chloride concentrations in the ground water monitoring well are at background correlations. The field data correlate well with early time predictions of Scenario 3, reduced flux due to vegetation. We conclude Scenario 3 predicts higher chloride concentrations than observed.

We conclude that the background chloride concentration in ground water at the Zachary Hinton EOL site is about 350-400 mg/L. We base this conclusion on historical and recent water quality analyses from the area. Natural restoration has mitigated the transient impact of past leakage from the site.

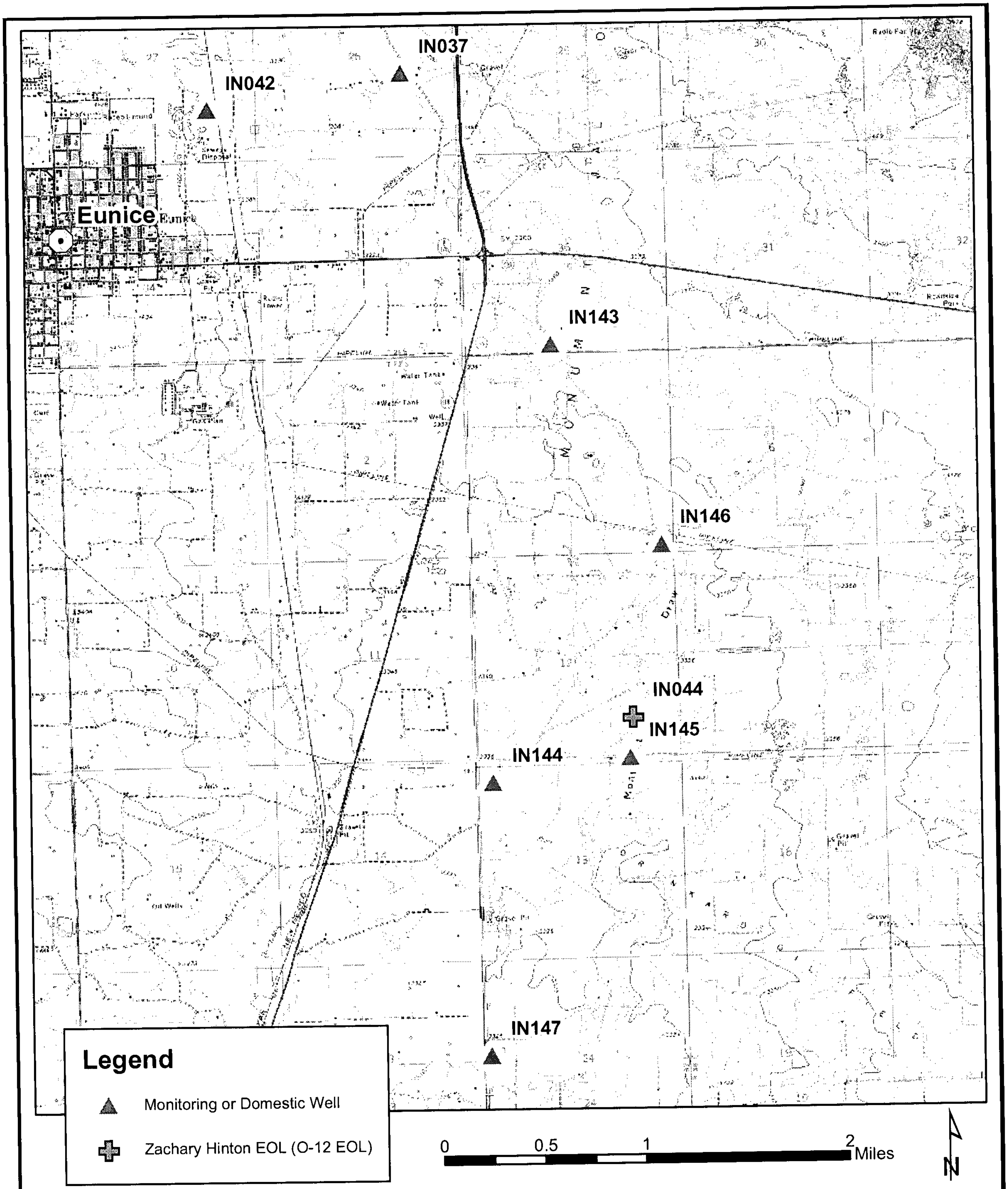
We recommend restoring the ground surface in the excavation using soil that will permit re-vegetation. Because the water quality at the site has returned to background conditions, we recommend plugging and abandonment of the existing monitoring well and closure of the regulatory file for this site, pending documentation of appropriate surface reclamation.

5.0 STAGE 2 ABATEMENT PLAN: SATURATED ZONE

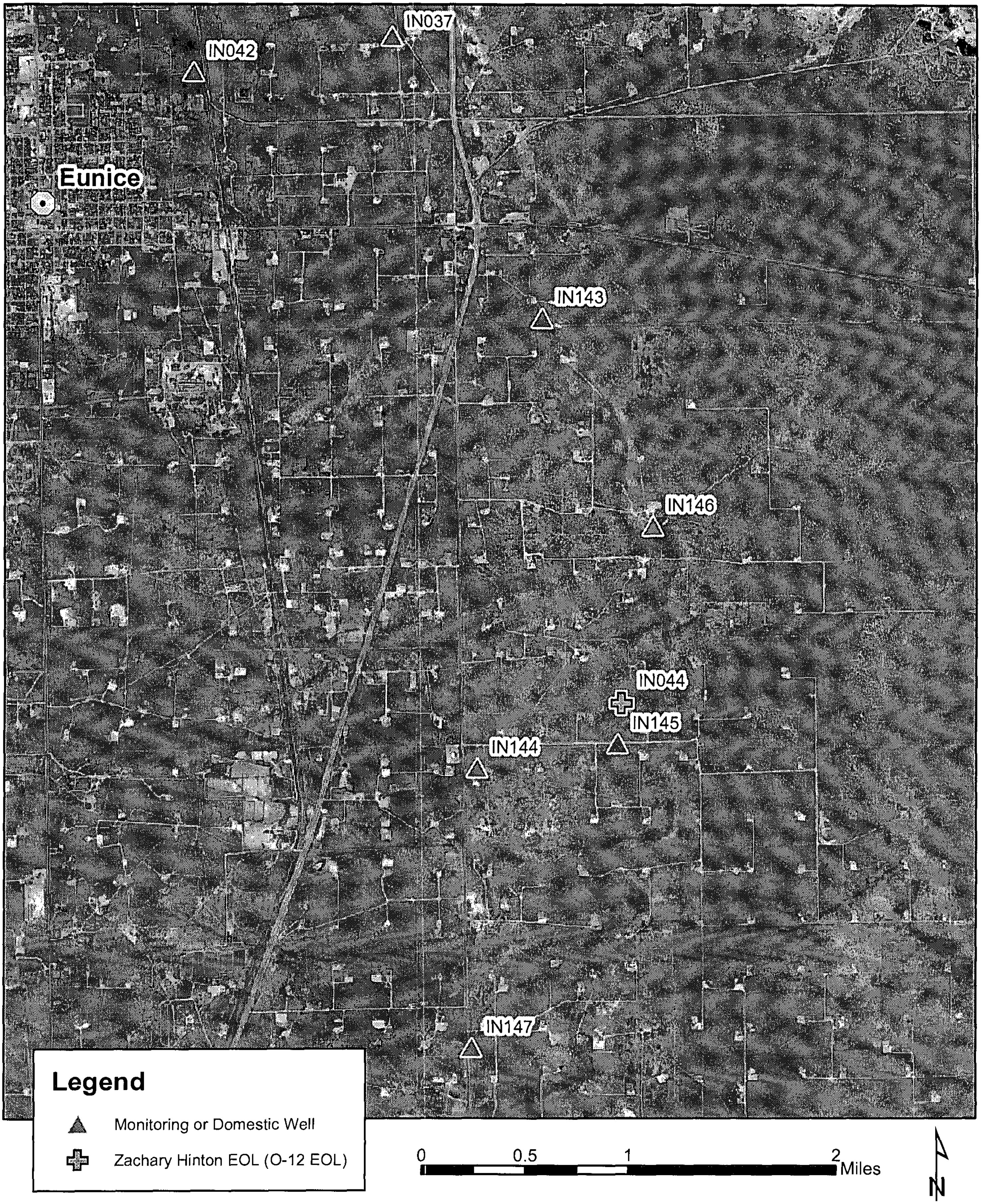
The monitoring well at the Zachary Hinton EOL Junction Box site does not exceed New Mexico ground water standards because ambient (background) concentrations are equal or greater than those currently observed. Therefore, there exists no zone of ground water impairment to define. Additional monitoring wells at the site are not warranted.

We propose to employ MODFLOW and its contaminant transport module to predict the fate and transport of the historic impact to ground water quality evidenced by the first sample analysis. We hypothesize that the simulation modeling will show that natural dilution and dispersion has effectively mitigated any past impact to ground water quality.

PLATES



R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	Location of Zachary Hinton EOL Relative to Eunice, NM	Plate 1
	ROC: CAP Zachary Hinton EOL (NMOCD #: 1R0426-36)	October 2005



R.T. Hicks Consultants, Ltd

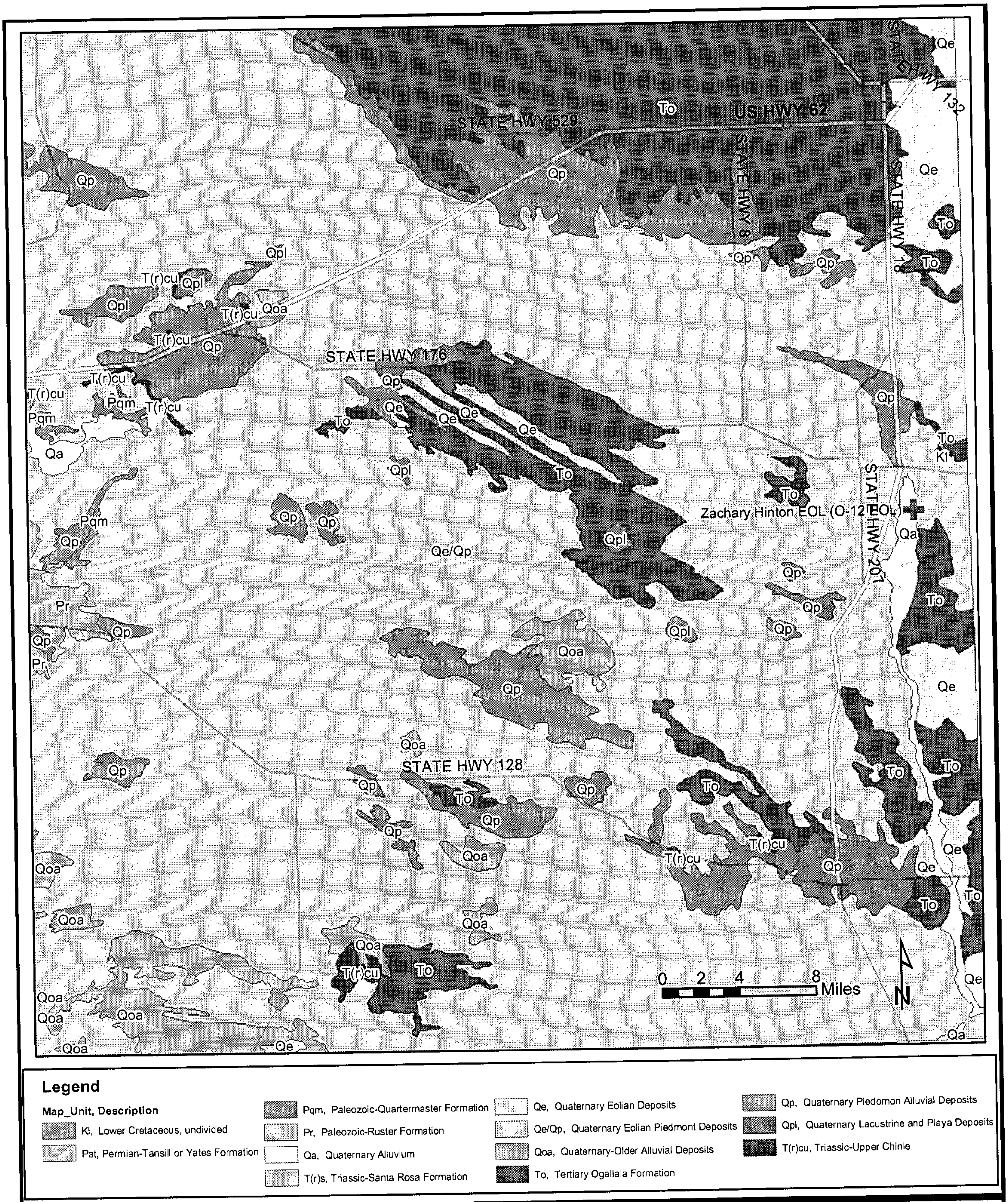
901 Rio Grande Blvd NW Suite F-142
Albuquerque, NM 87104
Ph: 505.266.5004

2004 Aerial Photograph of Site and Surrounds

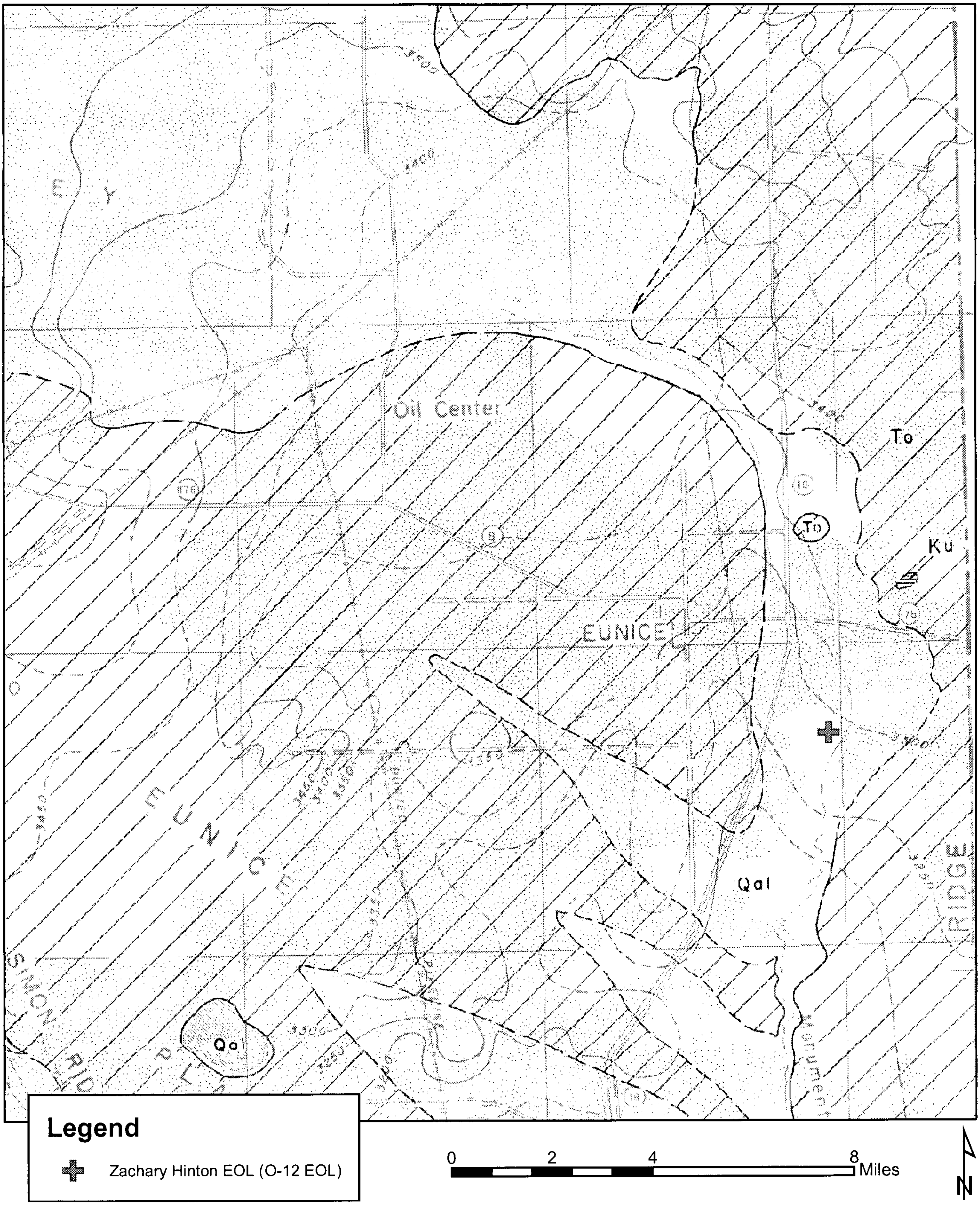
Plate 2

ROC: CAP Zachary Hinton EOL (NMOCD #: 1R0426-36)

October 2005



R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	Regional Geologic Map (USGS Open File Report OF-97-52)	Plate 3
	ROC: CAP Zachary Hinton EOL (NMOCD #: 1R0426-36)	October 2005



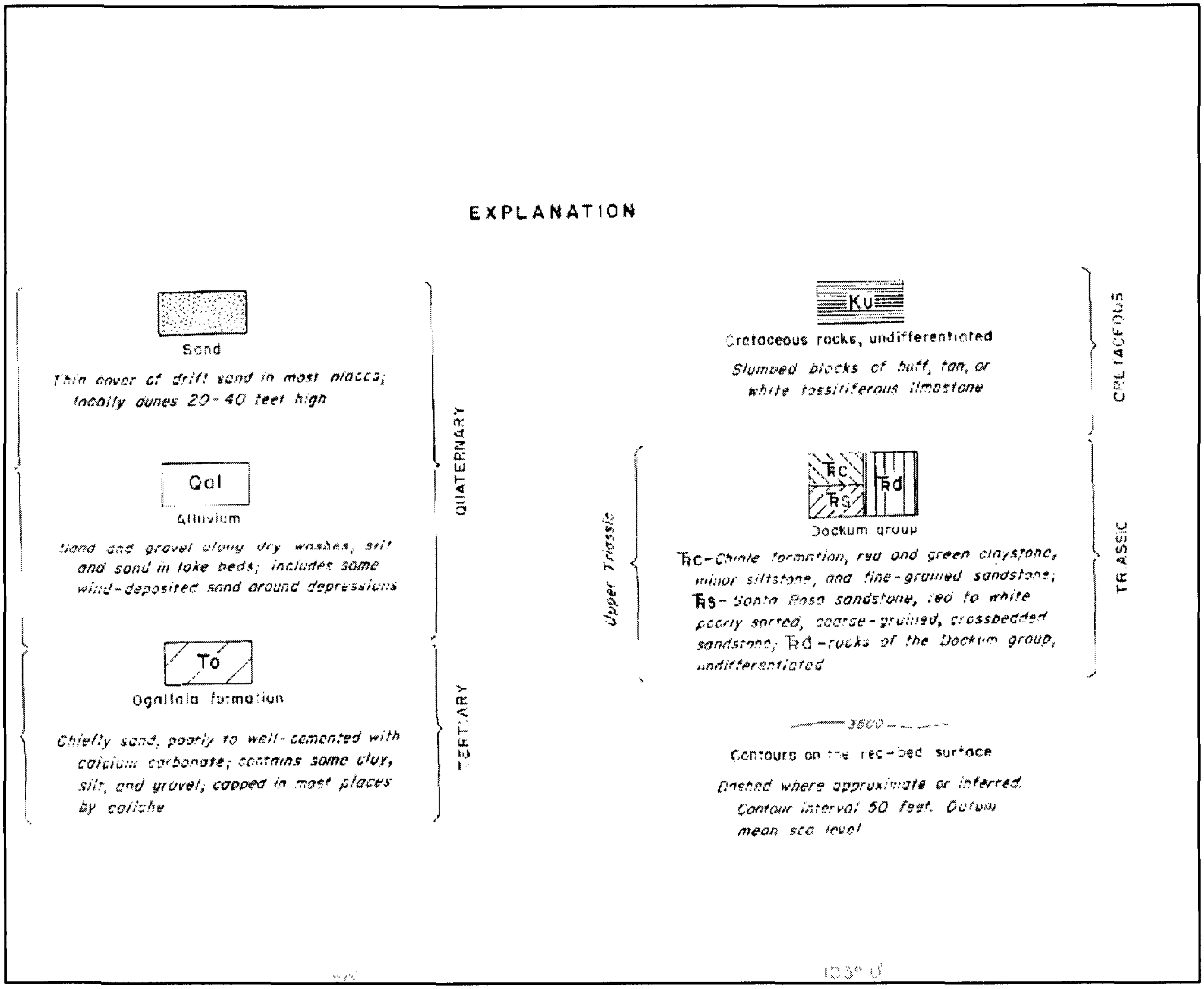
R.T. Hicks Consultants, Ltd
901 Rio Grande Blvd NW Suite F-142
Albuquerque, NM 87104
Ph: 505.266.5004

Local Geologic Map (Nicholson & Clebsch, 1961)

Plate 4

ROC: CAP Zachary Hinton EOL (NMOCD #: 1R0426-36)

October 2005



EXPLANATION

QUATERNARY

Sand

Thin cover of drift sand in most places; locally dunes 20-40 feet high

Qal

Alluvium

Sand and gravel along dry washes, silt and sand in lake beds; includes some wind-deposited sand around depressions

TERTIARY

To

Ogallala formation

Chiefly sand, poorly to well-cemented with calcium carbonate; contains some clay, silt, and gravel; capped in most places by caliche

CRETACEOUS

Ku

Cretaceous rocks, undifferentiated

Slumped blocks of buff, tan, or white fossiliferous limestone

TRIASSIC

Upper Triassic

TRc TRs TRd

Dockum group

TRc–*Chinle formation, red and green claystone, minor siltstone, and fine-grained sandstone;* TRs–*Santa Rosa sandstone, red to white poorly sorted, coarse-grained, crossbedded sandstone;* TRd–*rocks of the Dockum group, undifferentiated*

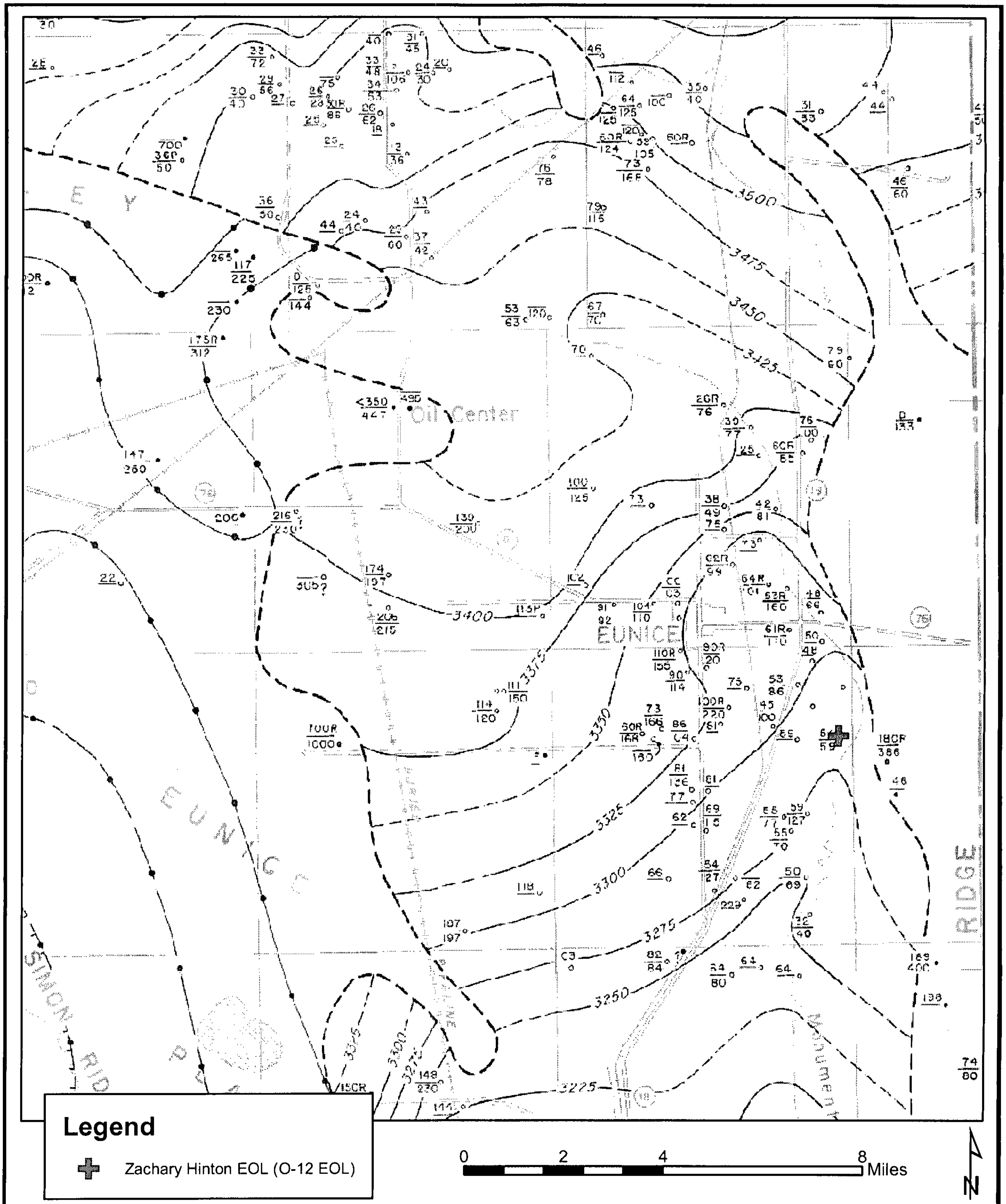
3800

Contours on the red-bed surface

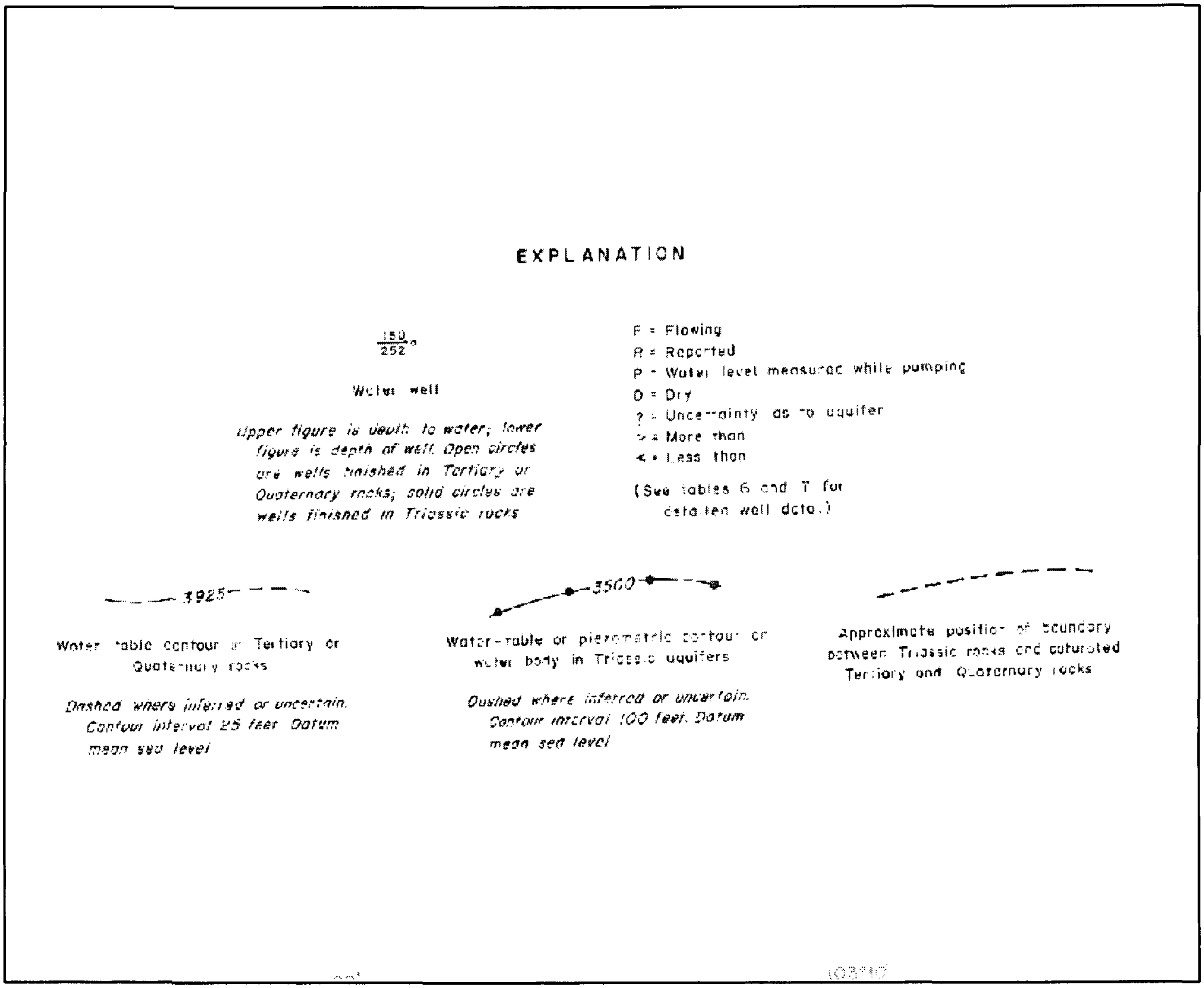
Dashed where approximate or inferred. Contour interval 50 feet. Datum mean sea level

Legend to Nicholson & Clebsch (1961) Geologic Map

R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	Supplemental Legend to Geologic Map	Plate 4 Supplemental
	ROC: CAP Zachary Hinton EOL (NMOCD #: 1R0426-36)	October 2005



R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	Local Ground Water Map (Nicholson & Clebsch, 1961)	Plate 5
	ROC: CAP Zachary Hinton EOL (NMOCD #: 1R0426-36)	October 2005



EXPLANATION

Water well

Upper figure is depth to water; lower figure is depth of well. Open circles are wells finished in Tertiary or Quaternary rocks; solid circles are wells finished in Triassic rocks

F = Flowing
R = Reported
P = Water level measured while pumping
D = Dry
? = Uncertainty as to aquifer
> = More than
< = Less than

(See tables 6 and 7 for detailed well data.)

Water-table contour in Tertiary or Quaternary rocks

Dashed where inferred or uncertain. Contour interval 25 feet. Datum mean sea level

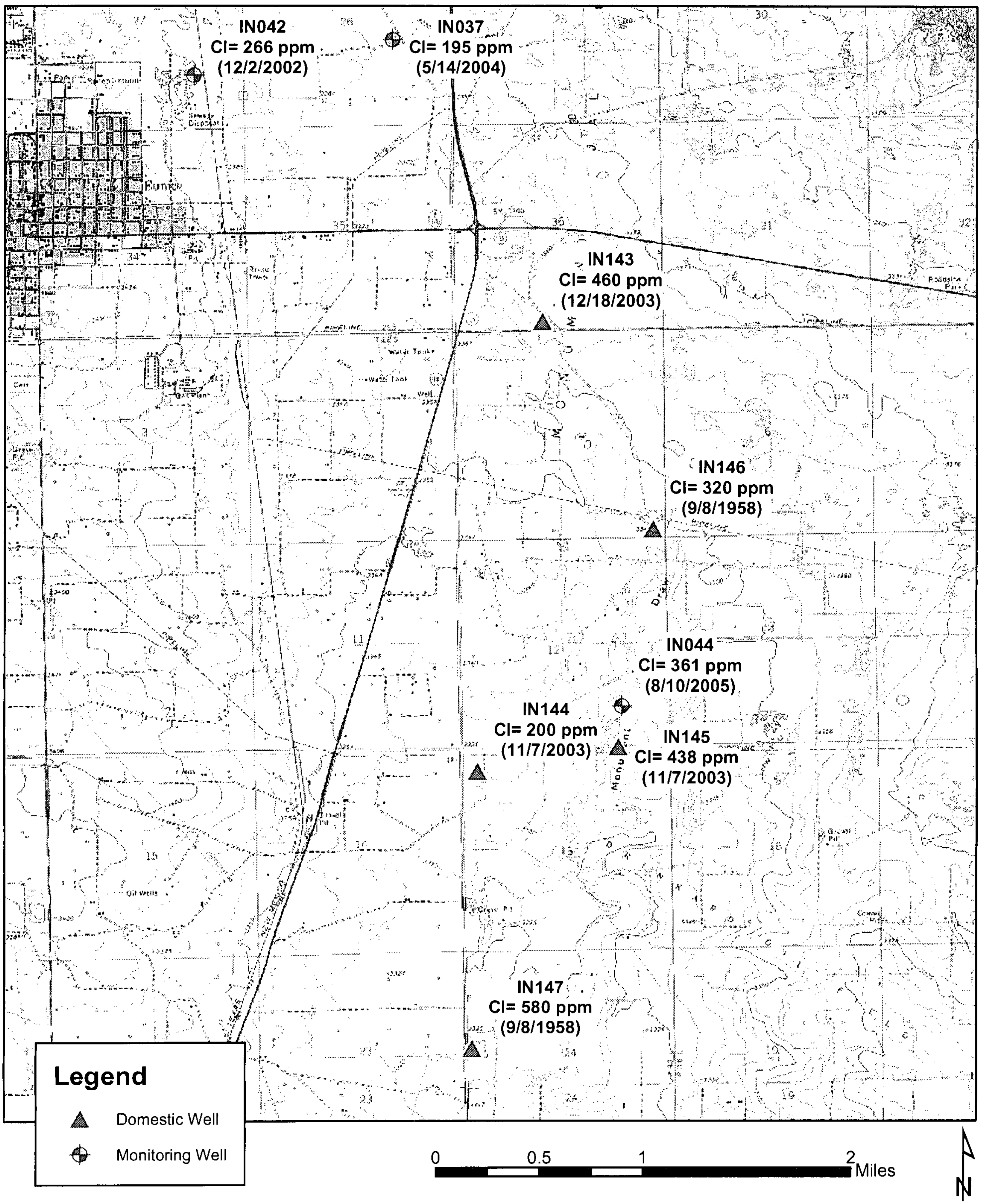
Water-table or piezometric contour on water body in Triassic aquifers

Dashed where inferred or uncertain. Contour interval 100 feet. Datum mean sea level

Approximate position of boundary between Triassic rocks and saturated Tertiary and Quaternary rocks

Legend to Nicholson & Clebsch (1961) Ground Water Map

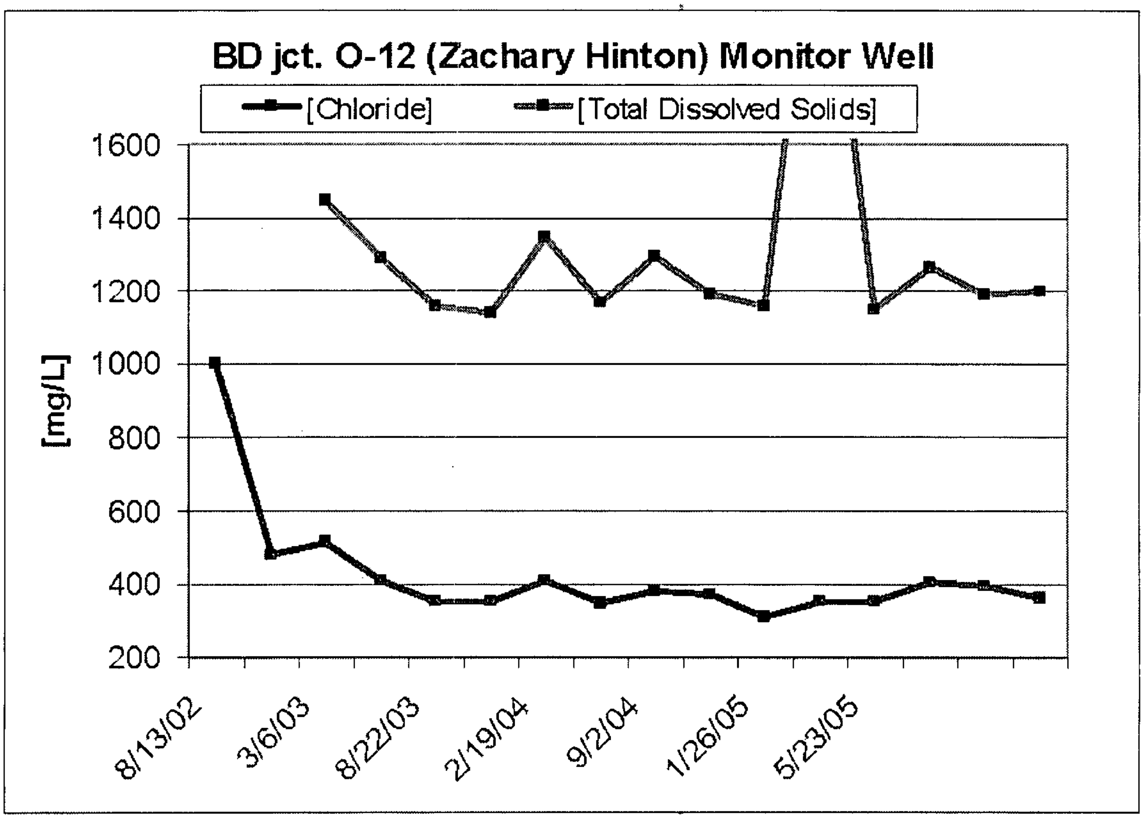
R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	Supplemental Legend to Ground Water Map	Plate 5 Supplemental
	ROC: CAP Zachary Hinton EOL (NMOCD #: 1R0426-36)	October 2005

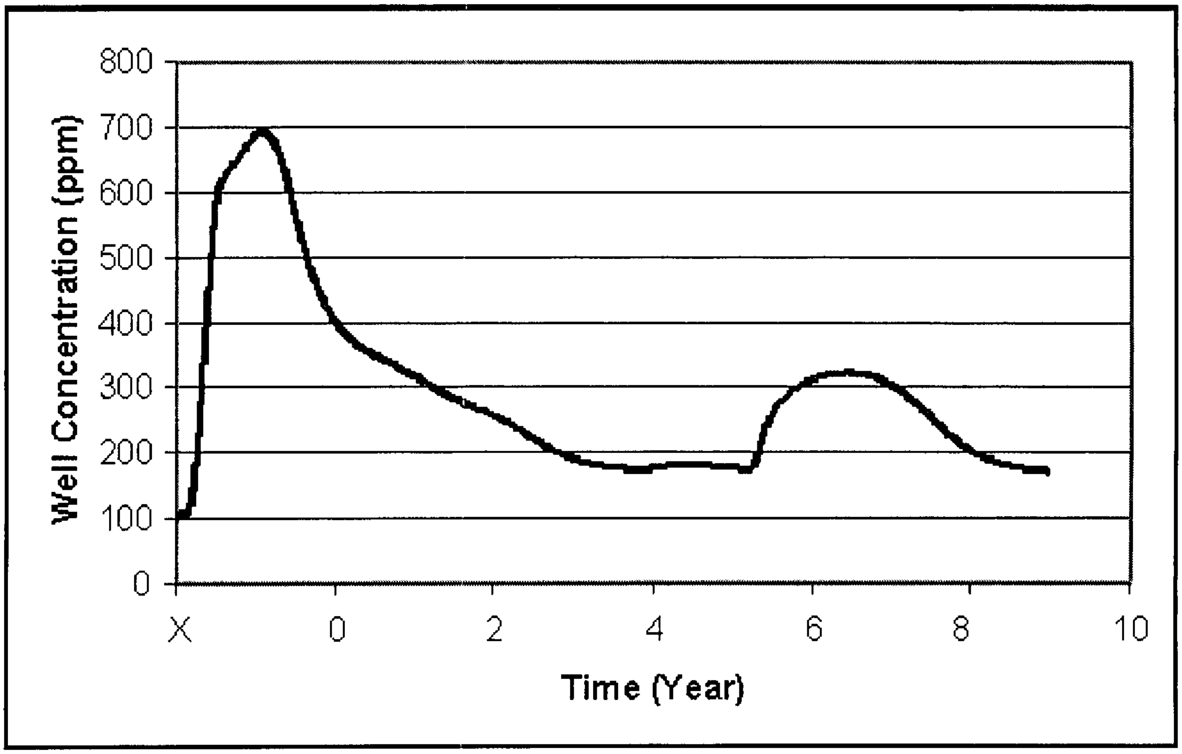


R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	Dissolved Chloride Concentration Map	Plate 6
	ROC: CAP Zachary Hinton EOL (NMOCD #: 1R0426-36)	October 2005

Depth	Lithologic Description	Measured Soil Chloride Concentration mg/kg	Bulk Density of Sample kg/cubic meter	Thickness of Column (ft)	Calculated Chloride Mass in Column (kg/m2)
ground surface					
	0-3 feet Sandy Top Soil				
	3-13 feet Caliche and Sand	1500	1858	5	4.616726087
10		2000	1858	5	6.155634783
	13-19 feet Sandy Clay	2450	1858	5	7.540652609
20	19-56 feet Various Colored Sands	3000	1856	5	9.223513043
		1750	1858	5	5.386180435
30		3270	1858	5	10.06446287
		8160	1858	5	25.11498991
40		5300	1858	5	16.31243217
		5000	1858	5	15.38908696
50		6410	1858	5	19.72880948
Aquifer 56		500	1858	5	1.538908696
60	Aquifer = Gray Sand 56-60 ft				
Total Depth of MW	Aquifer = Sandy Clay 60-63 ft	Calculated Chloride Load			121.071397

R.T. Hicks Consultants, Ltd. 901 Rio Grande NW Albuquerque, NM	RICE Operating Company	Plate 7
	Borehole Lithology Calculation of Chloride Load, Zachary Hinton EOL, Lea County	October 2005





R.T. Hicks Consultants, Ltd. 901 Rio Grande Blvd. NW, Suite F-142 Albuquerque, NM 87104 505.266.5004 Fax: 505.266.0745	Figures 2 & 6 From Text	Plate 8
	ROC Zachary Hinton EOL (O-12)	October 2005

TABLES

Table 2a: Wells Within Area of Interest

Internal Number	Site ID	Common Name	Easting (UTM NAD 83)	Northing (UTM NAD 83)	Location	System	Data From	Well Type	Well Operator	Well Owner	Land Owner
IN037	21S.373.26.J.JCT.1	Jct. J-26-1	675771.36	3591704.7	Sec 26, T21S, R37E	Hobbs BD	ROC	Monitoring Well			
IN042	21S.37E.27.I.JCT.1	Jct. I-27-1	674232.27	3591428.4	Sec 27, T21S, R37E	Hobbs BD	ROC	Monitoring Well			
IN044	22S.37E.12.O.EOL.1	Zachary Hinton EOL (O-12 EOL)	677561.08	3586541.5	Sec 12, T22S, R37E	Hobbs BD	ROC	Monitoring Well	ROC		
IN143	22S.37E.36.N.344	Windmill NE of Zach Hinton	676940.77	3589522.0	Sec 36, T22S, R37E	Domestic Well	RT Hicks	Domestic Well			
IN144	22S.37E.13.D.111	Peters Well West	676440.95	3/58/6034	Sec 13, T22S, R37E	Domestic Well	ROC	Domestic Well			
IN145	22S.37E.13.A.221	Peters Well East	677533.62	3586224.7	Sec 13, T22S, R37E	Domestic Well	ROC	Domestic Well			
IN146	22S.37E.01.P.444	22.37.1.44	677802.92	3587913.7	Sec 01, T22S, R37E	Domestic Well	Nicholson & Clebsch	Domestic Well			
IN147	22S.37E.24.E.133B	22.37.24.133B	676401.38	3583865.7	Sec 24, T22S, R37E	Domestic Well	Nicholson & Clebsch	Domestic Well			

Table 2b: Historic Organic Chemistry

Internal Number (IN)	Common Name	Date	Benzene (ppm)	Toluene (ppm)	Ethylbenzene (ppm)	Total Xylene (ppm)
IN037	Jct. J-26-1	5 /14/2004	NS	NS	NS	NS
IN037	Jct. J-26-1	5 /7 /2004	ND	ND	ND	ND
IN037	Jct. J-26-1	2 /18/2004	ND	ND	ND	ND
IN037	Jct. J-26-1	10/30/2003	ND	ND	ND	ND
IN037	Jct. J-26-1	8 /22/2003	ND	ND	ND	ND
IN037	Jct. J-26-1	6 /5 /2003	ND	ND	ND	ND
IN037	Jct. J-26-1	2 /28/2003	ND	ND	ND	ND
IN037	Jct. J-26-1	10/29/2002	ND	ND	ND	ND
IN042	Jct. I-27-1	12/2 /2002	ND	ND	ND	ND
IN044	Zachary Hinton EOL (O-12 EOL)	8 /10/2005	ND	ND	ND	ND
IN044	Zachary Hinton EOL (O-12 EOL)	5 /23/2005	ND	ND	ND	ND
IN044	Zachary Hinton EOL (O-12 EOL)	3 /22/2005	ND	ND	ND	ND
IN044	Zachary Hinton EOL (O-12 EOL)	1 /26/2005	ND	ND	ND	ND
IN044	Zachary Hinton EOL (O-12 EOL)	12/21/2004	ND	ND	ND	ND
IN044	Zachary Hinton EOL (O-12 EOL)	9 /2 /2004	ND	NS	ND	ND
IN044	Zachary Hinton EOL (O-12 EOL)	4 /17/2004	ND	ND	ND	ND
IN044	Zachary Hinton EOL (O-12 EOL)	2 /19/2004	ND	ND	ND	ND
IN044	Zachary Hinton EOL (O-12 EOL)	11/20/2003	ND	ND	ND	ND
IN044	Zachary Hinton EOL (O-12 EOL)	8 /22/2003	ND	ND	ND	ND
IN044	Zachary Hinton EOL (O-12 EOL)	6 /5 /2003	ND	ND	ND	ND
IN044	Zachary Hinton EOL (O-12 EOL)	3 /6 /2003	ND	ND	ND	ND
IN044	Zachary Hinton EOL (O-12 EOL)	10/25/2002	ND	ND	ND	ND
IN044	Zachary Hinton EOL (O-12 EOL)	8 /13/2002	ND	ND	ND	ND
IN044	Zachary Hinton EOL (O-12 EOL)	5 /15/2002	ND	ND	ND	ND
IN044	Zachary Hinton EOL (O-12 EOL)	3 /5 /2002	NS	NS	NS	NS
NMWQCC Standards (ppm)			*0.01*	*0.75*	*0.75*	*0.62*

Table 2b: Historic Organic Chemistry

Internal Number (IN)	Common Name	Date	Benzene (ppm)	Toluene (ppm)	Ethylbenzene (ppm)	Total Xylene (ppm)
IN044	Zachary Hinton EOL (O-12 EOL)	3 /5 /2002	ND	ND	ND	ND
IN064	B-20		NS	NS	NS	NS
IN065	B-30	12/22/2000	NS	NS	NS	NS
IN070	C-13		NS	NS	NS	NS
IN078	H-4		NS	NS	NS	NS
IN101	O-17-1	8 /17/2001	NS	NS	NS	NS
IN143	Windmill NE of Zach Hinton	12/18/2003	NS	NS	NS	NS
IN144	Peters Well West	11/7 /2003	ND	ND	ND	ND
IN145	Peters Well East	11/7 /2003	ND	ND	ND	ND
IN146	22.37.1.44	9 /8 /1958	NS	NS	NS	NS
IN146	22.37.1.44	10/14/1953	NS	NS	NS	NS
IN147	22.37.24.133B	9 /8 /1958	NS	NS	NS	NS
IN147	22.37.24.133B	4 /22/1955	NS	NS	NS	NS
IN147	22.37.24.133B	10/14/1953	NS	NS	NS	NS

NS: Not Sampled, ND: Non-Detect

NMWQCC Standards (ppm)	*0.01*	*0.75*	*0.75*	*0.62*

Table 2c: Historic Inorganic Chemistry - Anions and General Chemisty

Internal Number (IN)	Common Name	Date	Chloride (ppm)	Sulfate (ppm)	TDS (ppm)	Total Alkalinity (ppm)	Bicarbonate (ppm)	Carbonate (ppm)	Conductivity (microhmos)
IN037	Jct. J-26-1	5/14/2004	195	NS	736	NS	NS	NS	NS
IN037	Jct. J-26-1	5/7/2004	390	NS	1440	NS	NS	NS	NS
IN037	Jct. J-26-1	2/18/2004	478	NS	1630	NS	NS	NS	NS
IN037	Jct. J-26-1	10/30/2003	620	NS	2040	NS	NS	NS	NS
IN037	Jct. J-26-1	8/22/2003	957	NS	2620	NS	NS	NS	NS
IN037	Jct. J-26-1	6/5/2003	1460	NS	3280	NS	NS	NS	NS
IN037	Jct. J-26-1	2/28/2003	3470	NS	6870	NS	NS	NS	NS
IN037	Jct. J-26-1	10/29/2002	4520	NS	9020	NS	NS	NS	NS
IN042	Jct. I-27-1	12/2/2002	266	NS	1200	NS	NS	NS	NS
IN044	Zachary Hinton EOL (O-12 EOL)	8/10/2005	361	227	1200	180	NS	NS	NS
IN044	Zachary Hinton EOL (O-12 EOL)	5/23/2005	393	NS	1190	NS	NS	NS	NS
IN044	Zachary Hinton EOL (O-12 EOL)	3/22/2005	403	202	1270	192	NS	NS	NS
IN044	Zachary Hinton EOL (O-12 EOL)	1/26/2005	351	NS	1150	NS	NS	NS	NS
IN044	Zachary Hinton EOL (O-12 EOL)	12/21/2004	354	NS	2370	NS	NS	NS	NS
IN044	Zachary Hinton EOL (O-12 EOL)	9/2/2004	310	NS	1160	NS	NS	NS	NS
IN044	Zachary Hinton EOL (O-12 EOL)	4/17/2004	372	NS	1190	NS	NS	NS	NS
IN044	Zachary Hinton EOL (O-12 EOL)	2/19/2004	380	NS	1297	NS	NS	NS	NS
IN044	Zachary Hinton EOL (O-12 EOL)	11/20/2003	346	NS	1170	NS	NS	NS	NS
IN044	Zachary Hinton EOL (O-12 EOL)	8/22/2003	408	NS	1350	NS	NS	NS	NS
IN044	Zachary Hinton EOL (O-12 EOL)	6/5/2003	354	NS	1140	NS	NS	NS	NS
IN044	Zachary Hinton EOL (O-12 EOL)	3/6/2003	354	NS	1160	NS	NS	NS	NS
IN044	Zachary Hinton EOL (O-12 EOL)	10/25/2002	408	NS	1290	NS	NS	NS	NS
IN044	Zachary Hinton EOL (O-12 EOL)	8/13/2002	514	NS	1450	NS	NS	NS	NS
IN044	Zachary Hinton EOL (O-12 EOL)	5/15/2002	478	NS	1470	NS	NS	NS	NS
IN044	Zachary Hinton EOL (O-12 EOL)	3/5/2002	NS	NS	NS	NS	NS	NS	NS
NMWQCC Standards (ppm)			*250*	*600*	*1000*				

Table 2c: Historic Inorganic Chemistry - Anions and General Chemisty

Internal Number (IN)	Common Name	Date	Chloride (ppm)	Sulfate (ppm)	TDS (ppm)	Total Alkalinity (ppm)	Bicarbonate (ppm)	Carbonate (ppm)	Conductivity (microhmos)
IN044	Zachary Hinton EOL (O-12 EOL)	3/5/2002	1000	NS	2403	NS	NS	NS	NS
IN064	B-20		NS	NS	NS	NS	NS	NS	NS
IN065	B-30	12/22/2000	NS	NS	NS	NS	NS	NS	NS
IN070	C-13		NS	NS	NS	NS	NS	NS	NS
IN078	H-4		NS	NS	NS	NS	NS	NS	NS
IN101	O-17-1	8/17/2001	NS	NS	NS	NS	NS	NS	NS
IN143	Windmill NE of Zach Hinton	12/18/2003	460	118	1391	207	180	NS	180
IN144	Peters Well West	11/7/2003	200	62	892	221	269	NS	269
IN145	Peters Well East	11/7/2003	438	93	NS	166	202	NS	202
IN146	22.37.1.44	9/8/1958	320	448	NS	580	211	NS	211
IN146	22.37.1.44	10/14/1953	525	841	2280	994	189	NS	189
IN147	22.37.24.133B	9/8/1958	580	622	NS	1080	216	NS	216
IN147	22.37.24.133B	4/22/1955	770	598	NS	1360	216	NS	216
IN147	22.37.24.133B	10/14/1953	675	482	1960	1080	187	NS	187

NS: Not Sampled, ND: Non-Detect

NMWQCC Standards (ppm)			*250*	*600*	*1000*	

Table 2d: Inorganic Chemistry - Cations

Internal Number (IN)	Common Name	Date	Calcium (ppm)	Potassium (ppm)	Magnesium (ppm)	Sodium (ppm)	K + Na (ppm)
IN037	Jct. J-26-1	5 /14/2004	NS	NS	NS	NS	NS
IN037	Jct. J-26-1	5 /7 /2004	NS	NS	NS	NS	NS
IN037	Jct. J-26-1	2 /18/2004	NS	NS	NS	NS	NS
IN037	Jct. J-26-1	10/30/2003	NS	NS	NS	NS	NS
IN037	Jct. J-26-1	8 /22/2003	NS	NS	NS	NS	NS
IN037	Jct. J-26-1	6 /5 /2003	NS	NS	NS	NS	NS
IN037	Jct. J-26-1	2 /28/2003	NS	NS	NS	NS	NS
IN037	Jct. J-26-1	10/29/2002	NS	NS	NS	NS	NS
IN042	Jct. I-27-1	12/2 /2002	NS	NS	NS	NS	NS
IN044	Zachary Hinton EOL (O-12 EOL)	8 /10/2005	88	10.7	45.6	242	NS
IN044	Zachary Hinton EOL (O-12 EOL)	5 /23/2005	NS	NS	NS	NS	NS
IN044	Zachary Hinton EOL (O-12 EOL)	3 /22/2005	120	18.9	61.9	344	NS
IN044	Zachary Hinton EOL (O-12 EOL)	1 /26/2005	NS	NS	NS	NS	NS
IN044	Zachary Hinton EOL (O-12 EOL)	12/21/2004	NS	NS	NS	NS	NS
IN044	Zachary Hinton EOL (O-12 EOL)	9 /2 /2004	NS	NS	NS	NS	NS
IN044	Zachary Hinton EOL (O-12 EOL)	4 /17/2004	NS	NS	NS	NS	NS
IN044	Zachary Hinton EOL (O-12 EOL)	2 /19/2004	NS	NS	NS	NS	NS
IN044	Zachary Hinton EOL (O-12 EOL)	11/20/2003	NS	NS	NS	NS	NS
IN044	Zachary Hinton EOL (O-12 EOL)	8 /22/2003	NS	NS	NS	NS	NS
IN044	Zachary Hinton EOL (O-12 EOL)	6 /5 /2003	NS	NS	NS	NS	NS
IN044	Zachary Hinton EOL (O-12 EOL)	3 /6 /2003	NS	NS	NS	NS	NS
IN044	Zachary Hinton EOL (O-12 EOL)	10/25/2002	NS	NS	NS	NS	NS
IN044	Zachary Hinton EOL (O-12 EOL)	8 /13/2002	NS	NS	NS	NS	NS
IN044	Zachary Hinton EOL (O-12 EOL)	5 /15/2002	NS	NS	NS	NS	NS
IN044	Zachary Hinton EOL (O-12 EOL)	3 /5 /2002	NS	NS	NS	NS	NS
NMWQCC Standards (ppm)							

Table 2d: Inorganic Chemistry - Cations

Internal Number (IN)	*Common Name*	*Date*	*Calcium (ppm)*	*Potassium (ppm)*	*Magnesium (ppm)*	*Sodium (ppm)*	*K + Na (ppm)*
IN044	Zachary Hinton EOL (O-12 EOL)	3 /5 /2002	NS	NS	NS	NS	NS
IN064	B-20		NS	NS	NS	NS	NS
IN065	B-30	12/22/2000	NS	NS	NS	NS	NS
IN070	C-13		NS	NS	NS	NS	NS
IN078	H-4		NS	NS	NS	NS	NS
IN101	O-17-1	8 /17/2001	NS	NS	NS	NS	NS
IN143	Windmill NE of Zach Hinton	12/18/2003	101	8.56	66	176	NS
IN144	Peters Well West	11/7 /2003	65	4.49	46	96	NS
IN145	Peters Well East	11/7 /2003	102	8.51	67	154	NS
IN146	22.37.1.44	9 /8 /1958	NS	NS	NS	NS	NS
IN146	22.37.1.44	10/14/1953	222	NS	107	NS	375
IN147	22.37.24.133B	9 /8 /1958	NS	NS	NS	NS	NS
IN147	22.37.24.133B	4 /22/1955	NS	NS	NS	NS	247
IN147	22.37.24.133B	10/14/1953	218	NS	131	NS	254

NS: Not Sampled, ND: Non-Detect

NMWQCC Standards (ppm)

APPENDIX A

RICE OPERATING COMPANY
JUNCTION BOX DISCLOSURE FORM

BOX LOCATION

SWD SYSTEM	JUNCTION	UNIT	SECTION	TOWNSHIP	RANGE	COUNTY	BOX DIMENSIONS - FEET		
							Length	Width	Depth
BD	Zachary Hinton EOL	O	12	22S	37E	Lea	Box Has Not Been Built Yet		

LAND TYPE: BLM ______ STATE ______ FEE LANDOWNER Tom Kennan OTHER ______

Depth to Groundwater 56 feet NMOCD SITE ASSESSMENT RANKING SCORE: 10

Date Started 2/6/2001 Date Completed not complete OCD Witness No

Soil Excavated 0 cubic yards Excavation Length 0 Width 0 Depth 0 feet

Soil Disposed 0 cubic yards Offsite Facility n/a Location n/a

FINAL ANALYTICAL RESULTS: **Sample Date** n/a **Sample Depth** n/a

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
Vadose Zone Samples Will Be Included With Final Closure Report							

General Description of Remedial Action: Site was delineated vertically and laterally with a backhoe. Chloride impact was consistent vertically, while TPH was minimal at the location. The site was bored on 2/28/02 and chloride was found to impact groundwater. A cased monitor well was installed and the groundwater has been sampled and analyzed quarterly (see annual groundwater report for results). ROC has contracted a hydrologic consultant to assist ROC in developing a remediation plan for the vadose zone at groundwater-impacted sites with the ultimate objective being final closure.

CHLORIDE FIELD TESTS

LOCATION	DEPTH (ft)	ppm
Vertical	5	2500
	7	1400
	9	1800
	11	5200
	13	5000
	15	5400
Soil Bore	35	8160
	45	5000
	50	6410
	55	500

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

DATE 1/21/2003 PRINTED NAME Kristin Farris

SIGNATURE ______ TITLE Project Scientist

APPENDIX B

R.T. HICKS CONSULTANTS, LTD.

219 Central Avenue NW Suite 266 Albuquerque, NM 87112 505.266.5004 Fax: 505.246-1818

July 2, 2003

Mr. Wayne Price
New Mexico Oil Conservation Division
1220 South St. Francis Drive
Santa Fe, New Mexico 87505

RE: Zachary Hinton EOL Junction Box, Section 12, 22S, 37E Unit O

Dear Mr. Price

Rice Operating Company retained R.T. Hicks Consultants, Ltd. to address potential environmental concerns at the above referenced site. This submission proposes a scope of work that we believe will best mitigate any threat to human health and the environment and lead to closure of the regulatory file for this site.

Background

The Zachary Hinton EOL Junction Box is located about 2.5 miles southeast of the intersection of State Routes 18 and 8/176, near Eunice, New Mexico. Plate 1 shows the location of the site.

Rice Operating Company (ROC) prepared a disclosure report dated January 21, 2003 that summarizes activities to date. This report is part of the annual submission to NMOCD, due in April of each year. For your convenience, we have attached a copy of this ROC report and a copy of recent ground water data from the adjacent monitoring well. The soil boring and backhoe excavation data show relatively consistent concentrations of chloride from 11 feet below ground surface (5200 ppm chloride) to 50 feet below ground surface (6410 ppm chloride). The consistency of these concentrations suggests that a release from the junction box may have created saturated conditions in the vadose zone.

ROC installed a monitoring well adjacent to the junction box. Four quarters of ground water data show chloride concentrations in ground water are currently between 400 and 500 mg/L. The most recent analysis of total dissolved solids (11/6/02) from this well shows a result of 1290 mg/L. Because these values exceed the New Mexico Water Quality Commission Standards, we propose the work outlined below.

1. Evaluate Migration of Chloride Flux from the Vadose Zone to Ground Water

We propose to employ HYDRUS1D and a simple ground water mixing model to evaluate the potential of residual chloride mass in the vadose zone to materially impair ground water quality at the site. We will employ predictions of the migration of chloride ion from the vadose zone to ground water in our selection of an appropriate remedy for the land surface and underlying vadose zone. This simulation is the "no action" alternative, which predicts chloride flux to ground water in the absence of any action by ROC.

We might provide simulations of two "no action" scenarios. For both simulations, we will employ the input parameters to HYDRUS and the mixing model outlined in Table 1. In the first simulation, we will assume that vegetation is not present over the release site (no evapotranspiration) and a minimum aquifer thickness of 10 feet. This will simulate restriction of any released chloride to a portion of the underlying aquifer. If this first simulation does not return results that are consistent with the existing ground water monitoring data, we will increase the aquifer thickness in the mixing model to the maximum value allowed by data (a bout 35 feet). At other sites, we have found that chloride can be distributed throughout the thickness of the aquifer. Employing the entire thickness of the aquifer in the mixing model calculations may be appropriate for the Zachary Hinton site.

Table 1: Input Parameters for Simulation Modeling

Input Parameter	Source
Vadose Zone Thickness	Attached well log
Vadose Zone Texture	Attached well log
Dispersion Length	Professional judgment
Soil Moisture	Nearby Field Measurements
Vadose Zone Chloride Load	ROC Data from Disclosure Report
Length of release perpendicular to ground water flow	Field Measurements
Climate	Pearl, NM station (Hobbs)
Background Chloride in Ground Water	Samples from nearby wells
Ground Water Flux	Calculated from regional hydraulic data
Aquifer Thickness	Nicholson and Clebsch (1960) and SEO data

2. Collection and Evaluation of Data for Simulation Modeling

The HYDRUS1D and mixing model simulation requires input of 10 parameters. As Table 1 shows, we must collect site specific data for several of these parameters, some data are available from previous ROC work at the site, and other data are available from public sources. Our previous work with the American Petroleum Institute showed that soil moisture values did not strongly influence the ability of the model to predict chloride migration from the vadose zone to ground water. We plan to use soil moisture data from nearby sites for model input.

We propose a field program to collect important site-specific data for model input. First we will measure the depth to ground water at five nearby windmills and the adjacent monitoring well to determine the hydraulic gradient (Plate 1). We have examined these abandoned and active windmills; we can measure these water levels. To establish background chloride concentrations in ground water, we propose to sample the active windmill located in Section 13 (Plate 1) and, if possible, two additional up gradient wells in Sections 2 and 11 (identified as "Field Check Required" on Plate 1).

3. Design Remedy and Submit Report

ROC has completed the repair of the pipeline junction at the Zachary Hinton EOL. We do not anticipate additional releases of produced water at this site. Our modeling of the "no action alternative" (Task 1) may show that the residual chloride mass in the vadose zone poses a threat to ground water quality. If such a threat does exist, we will use the HYDRUS-1D model predictions to develop a remedy for the vadose zone. If necessary, we will simulate:

1. excavation, disposal and replacement of clean soil to remove the chloride mass,

2. installation of a low permeability barrier to minimize natural infiltration,

3. surface grading and seeding to eliminate any ponding of precipitation and promote evapotranspiration, thereby minimizing natural infiltration, and

4. a combination of the above potential remedies.

We will select the vadose zone remedy that offers the greatest environmental benefit while causing the least environmental damage.

We will use the ground water mixing model or a suitable alternative to assist in the design of a ground water remedy. It is possible, however, that the background chloride concentrations in ground water measured in the nearby windmills are equal to or higher than the chloride concentration in the adjacent monitoring well. Such data would strongly suggest that the Zachary Hinton EOL Junction Box has not caused any material impairment of ground water quality. If we find no evidence of impairment of water quality due to past activities at Zachary Hinton EOL Junction Box, we will not prepare a ground water remedy. If data suggest that the Zachary Hinton EOL Junction Box has contributed chloride to ground water and caused ground water impairment, we will examine the following alternatives:

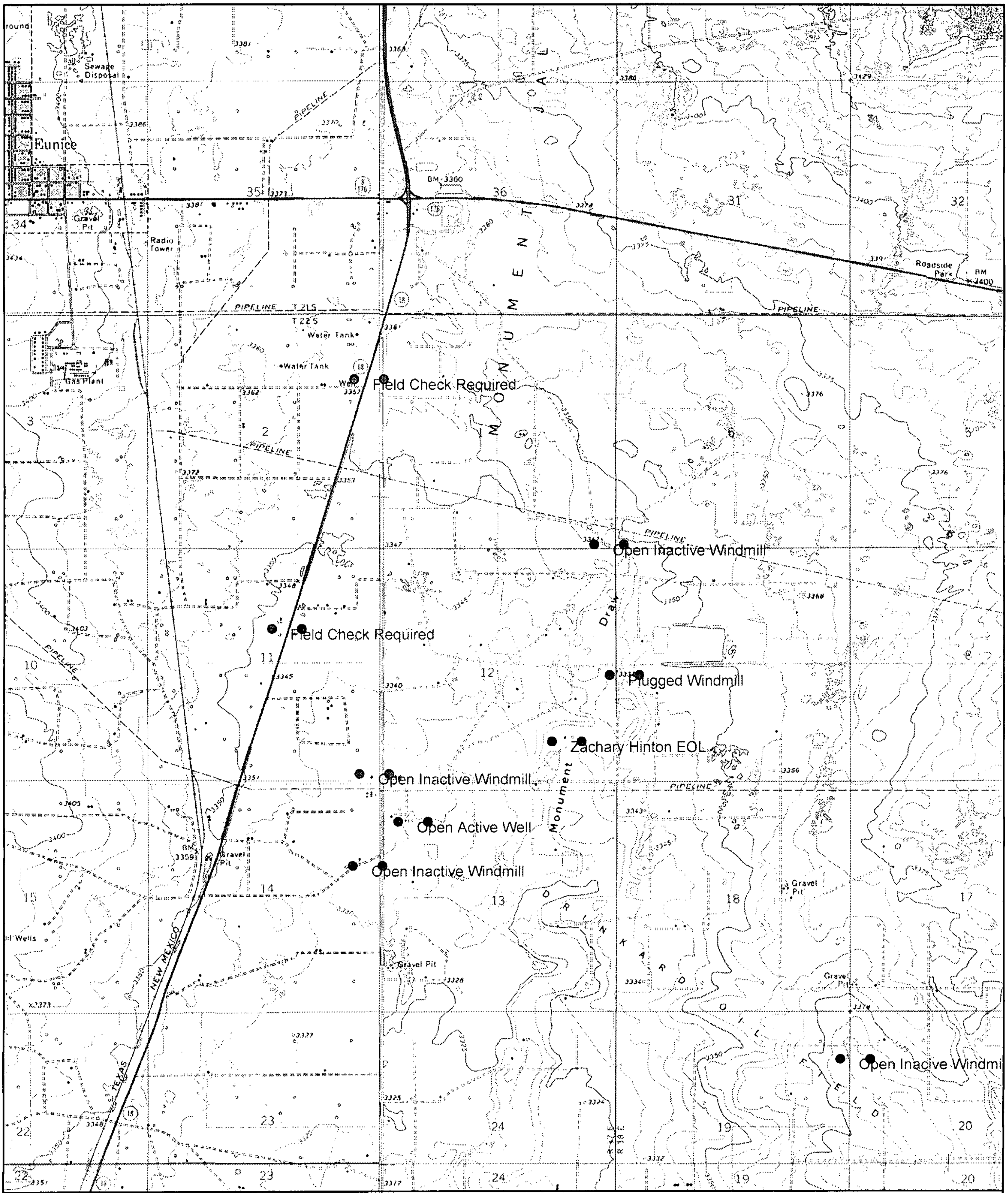
1. Natural restoration due to dilution and dispersion,
2. Pump and dispose to remove the chloride mass in the saturated zone,
3. Pump and treat to remove the chloride mass in the saturated zone,
4. Because of the location of the site, institutional controls negotiated with the landowner may provide an effective remedy. Such controls may be restriction of water use to livestock until natural restoration returns the water quality to state standards, a provision for alternative supply well design, or a provision for well head treatment to mitigate any damage to the water resource.

We plan to commence data collection for the HYDRUS1D simulations described above in mid July. Your approval to move forward with this workplan will facilitate our access to nearby windmills and speed the implementation of a surface remedy.

Sincerely,
R.T. Hicks Consultants, Ltd.

Randall T. H

Randall T. Hicks
Principal



Name: EUNICE NE
Date: 3/14/2003
Scale: 1 inch equals 2666 feet

Location: 032° 24' 36.8" N 103° 06' 56.8" W
Caption: Plate 1: Location Map

APPENDIX C

APPENDIX C

CONCEPTUAL MODEL OF SUBSURFACE PRODUCED WATER RELEASES

The System operates by gravity flow of produced water through pipelines, junction boxes, boots, tanks and disposal through injection into wells. Releases occur periodically due to gradual failures of seals, overflow of vent lines, or sudden and accidental releases. The length of time that produced water flows to the subsurface is short for sudden and accidental releases or vent overflow incidents. A failure of a seal or a small crack in a pipeline may allow a release to the subsurface for months or longer. Because of the efforts of ROC to routinely identify system failures and the ongoing upgrade program, reported releases have declined significantly since the beginning of the upgrade program.

The distribution of constituents of concern (primarily chloride, secondarily BTEX) in the surface soil and vadose zone is different for each release scenario. Releases of water volumes over long periods create saturated conditions between the release site and ground water. Where this type of release occurs, borehole data show relatively constant and 2-4 times background concentration of chloride throughout the vadose zone. Due to the natural processes of sorption and biodegradation, petroleum hydrocarbons may not impact ground water even at sites where volumes are released over long periods.

Episodic releases of small volumes of produced water will not always create saturation of the vadose zone. Where episodic releases occur in junction boxes or similar enclosures, spills of produced water and entrained crude oil infiltrate the vadose zone. After the spill ceases and the produced water drains into the vadose zone, the entrained crude oil follows similar paths as the produced water with the difference that the higher viscosity and surface tension limits the depth of infiltration. After deposition of the oil within the near surface vadose zone pore spaces, volatilization of the lighter hydrocarbons from the crude oil and the aging process in general causes the formation of an asphaltic-sand that reduces or eliminates subsequent infiltration through that same flow path.

With improved environmental management practices at the system in the 1980s and the reduction of the volumes of fluids being moved through the system in the 1990s, releases into the underlying vadose zone are reduced, but not eliminated. Any reduced-permeability asphaltic layer could result in containment and removal of small releases.

This conceptual model of produced water releases accounts for the distribution of chloride and regulated hydrocarbons observed at many System sites. Often we observe black, crude-like hydrocarbons at or near the ground surface to a depth of several inches to tens of feet. In our model, the deposition of crude in the subsurface pore spaces occurred more than 10 years ago and the aging processes have reduced the concentration of regulated hydrocarbons in this material to acceptable levels.

The depth of penetration of produced water depends primarily upon the size and frequency of releases, how quickly crude fills the pore spaces and reduces permeability, and the nature of the subsurface. At some sites, these three factors allow produced water to penetrate less than 10 feet. At other sites where produced water enters the subsurface, penetration to depths much greater than 10 feet occur due to unsaturated and saturated flow.

Because the system operates under gravity flow, the volume of produced water released is generally episodic and consists of relatively small volumes. If the total volume released is relatively small, then one may observe relatively high chloride concentrations in the unsaturated zone with no impairment of ground water quality. With improved operational and environmental practices of the 1980s and 1990s, clogged pore spaces cause saturated flow conditions to cease, and one may observe high concentrations of constituents throughout the vadose zone and no current impairment of ground water quality. Impairment of ground water quality occurs only where the mass of constituents of concern in produced water enter ground water in sufficient quantity to overwhelm natural dilution and dispersion.

In the absence of vadose zone saturation, the arid climate of New Mexico can cause sequestration of the constituents of concern in the upper vadose zone (10-20 feet below land surface) for many years. Borehole data from these types of releases show high concentrations of chloride below the release site and a relatively sharp decline in chloride concentration to background conditions with depth. If the release is not recent, natural processes can reduce the concentrations of any residual hydrocarbons and eliminate any environmental risk to ground water.

In summary, sites where chloride or other constituents of concern penetrated deep into the vadose zone probably experience long-term releases of water. Where penetration of the vadose zone is less than 20-30 feet, the release was episodic and consisted of a relatively small volume of fluid.

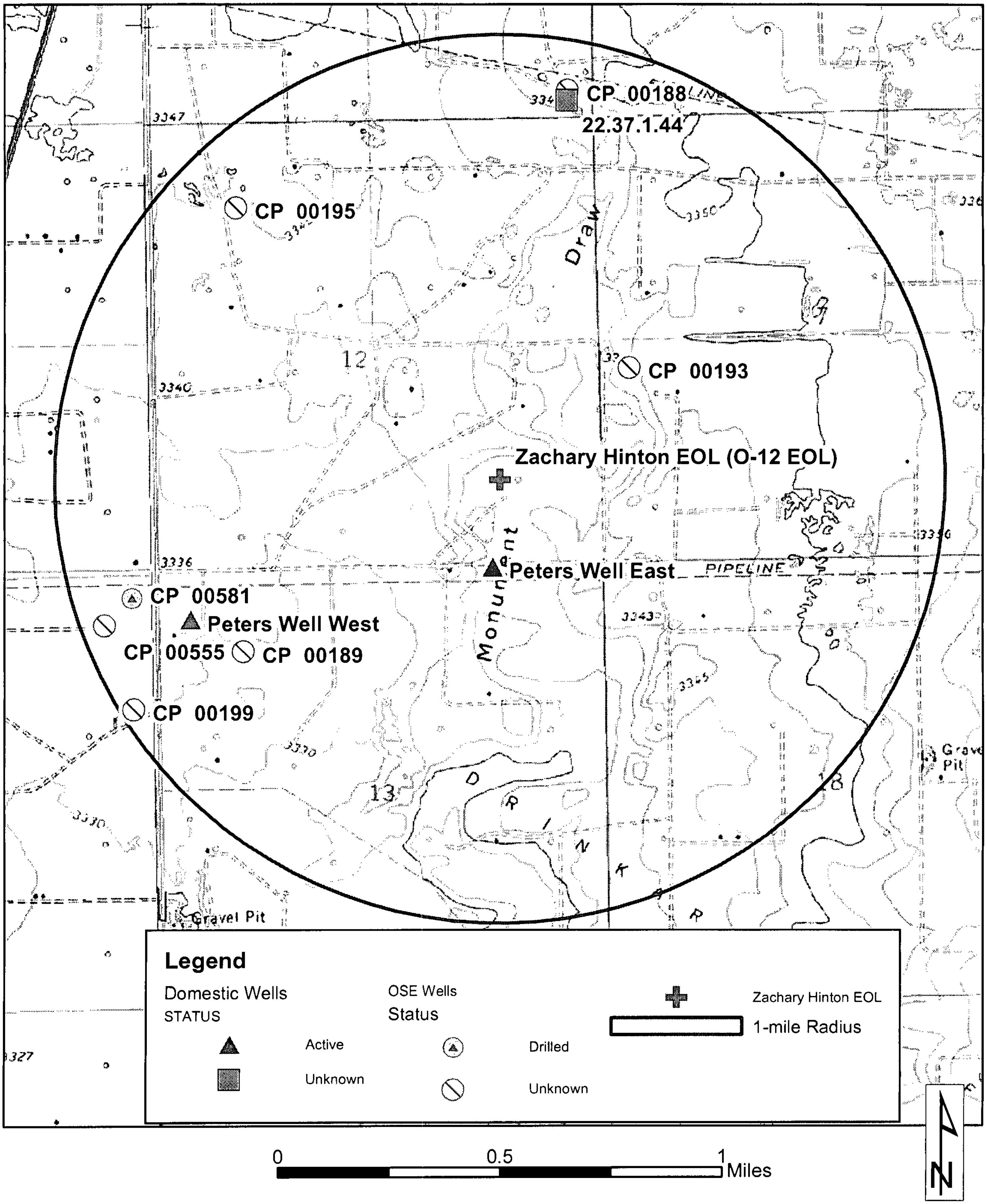
Produced water potentially released to the environment from the BD SWD System is expected to contain the following regulated constituents:

- Benzene
- Ethylbenzene
- Toluene
- Xylenes
- Naphthalenes
- Total Dissolved Solids
- Chloride
- Sulfate

Because the fate and transport of released chloride is essentially identical to that of TDS and sulfate, we can evaluate soil samples for chloride and remain confident that concentrations of chloride will indicate the presence of similar concentrations of other non-hydrocarbon constituents.

The regulated hydrocarbon constituents can behave independently of each other due to different rates of biodegradation and sorption. Field measurements of total organic vapors are very useful in providing a qualitative measure of the concentration of volatile organic constituents (e.g. benzene) in soil and we employ this field measurement to identify which samples will undergo laboratory analysis. Hundreds of laboratory analyses and field measurements of total petroleum hydrocarbons demonstrate that TPH provides little or no information regarding the environmental threat posed by produced water releases. Our inclusion of this analysis of soil in this report is one of academic interest only.

APPENDIX D



R.T. Hicks Consultants, Ltd
901 Rio Grande Blvd NW Suite F-142
Albuquerque, NM 87104
Ph: 505.266.5004

OSE wells within 1-mile of Zachary Hinton

Appendix D

ROC: CAP Zachary Hinton EOL (NMOCD #: 1R0426-36)

October 2005

Domestic Supply Wells
within 1-mile of the
Zachary Hinton EOL (O-12) Site

Domestic Supply Wells not Listed in the Office of State Engineer (OSE) Database within 1-mile of the Zachary Hinton EOL (O-12) Site.

Loc_ID	Int_NO	Site_ID	Location	LandOwner	WellOwner	Operator	System	DataFrom	STATUS	X_UTM83	Y_UTM83
Field Verified											
Peters Well East	IN145	22S.37E.13.A.221	Sec 13, T22S, R37E				Domestic Well	ROC	Active	677533.62	3586224.71
Peters Well West	IN144	22S.37E.13.D.111	Sec 13, T22S, R37E				Domestic Well	ROC	Active	676440.95	3586034
Status Unknown											
22.37.1.44	IN146	22S.37E.01.P.444	Sec 01, T22S, R37E				Domestic Well	Nicholson & Clebsch	Unknown	677802.92	3587913.67

OSE Wells listed in OSE Database within 1-mile of the Zachary Hinton EOL (O-12) Site

DB_FILE_NB	USE	WELL_NUMBE	DIVERSION	TWS	RNG	SEC	Q	Q2	Q3	EASTING	NORTHING	START_DATE	FINISH_DAT	DEPTH_WELL	DEPTH_WATE
CP 00188	DOM	CP 00188 DCL	0	22S	37E	1	4	4	4	677853	3587747			0	0
CP 00189	DOM	CP 00189 DCL	0	22S	37E	13	1	1	4	676680	3585718			0	0
CP 00193	DOM	CP 00193 DCL	0	22S	38E	7	3	1	1	678077	3586747			0	0
CP 00195	DOM	CP 00195 DCL	0	22S	37E	12	1	1	4	676652	3587325			0	0
CP 00199	DOM	CP 00199 DCL	0	22S	37E	14	2	4	2	676285	3585509			0	0
CP 00555	SAN	CP 00555 EXP	0	22S	37E	14	2	2		676179	3585812			0	0
CP 00581	SAN	CP 00581	3	22S	37E	14	2	2	2	676278	3585911	4/16/1979 0:00	4/18/1979 0:00	125	65

APPENDIX E

ENVIRONMENTAL
LAB OF

12600 West I-20 East Odessa, Texas 79765

Analytical Report

Prepared for:

Kristin Pope
Rice Operating Co.
122 W. Taylor
Hobbs, NM 88240

Project: BD- Zachary Hinton EOL
Project Number: None Given
Location: Eunice

Lab Order Number: 5H11002

Report Date: 08/22/05

Rice Operating Co. 122 W. Taylor Hobbs NM, 88240	Project: BD- Zachary Hinton EOL Project Number: None Given Project Manager: Kristin Pope	Fax: (505) 397-1471 **Reported:** 08/22/05 15:35

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
Monitor Well #1	5H11002-01	Water	08/10/05 11:24	08/11/05 07:45

Organics by GC
Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Monitor Well #1 (5H11002-01) Water									
Benzene	ND	0.00100	mg/L	1	EH51609	08/16/05	08/16/05	EPA 8021B	
Toluene	ND	0.00100	"	"	"	"	"	"	
Ethylbenzene	ND	0.00100	"	"	"	"	"	"	
Xylene (p/m)	ND	0.00100	"	"	"	"	"	"	
Xylene (o)	ND	0.00100	"	"	"	"	"	"	
Surrogate: a,a,a-Trifluorotoluene		*107 %*	*80-120*		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*101 %*	*80-120*		"	"	"	"	

General Chemistry Parameters by EPA / Standard Methods

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Monitor Well #1 (5H11002-01) Water									
Total Alkalinity	**180**	2.00	mg/L	1	EH51208	08/11/05	08/11/05	EPA 310.2M	
Chloride	**361**	5.00	"	10	EH51906	08/15/05	08/15/05	EPA 300.0	
Total Dissolved Solids	**1200**	5.00	"	1	EH51210	08/16/05	08/17/05	EPA 160.1	
Sulfate	**227**	5.00	"	10	EH51906	08/15/05	08/15/05	EPA 300.0	

Total Metals by EPA / Standard Methods

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Monitor Well #1 (5H11002-01) Water									
Calcium	**88.0**	0.100	mg/L	10	EH51103	08/11/05	08/11/05	EPA 6010B	
Magnesium	**45.6**	0.0100	"	"	"	"	"	"	
Potassium	**10.7**	0.500	"	"	"	"	"	"	
Sodium	**242**	0.500	"	50	"	"	"	"	

Organics by GC - Quality Control

Environmental Lab of Texas

Batch EH51609 - EPA 5030C (GC)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (EH51609-BLK1)				Prepared & Analyzed: 08/16/05						
Benzene	ND	0.00100	mg/L							
Toluene	ND	0.00100	"							
Ethylbenzene	ND	0.00100	"							
Xylene (p/m)	ND	0.00100	"							
Xylene (o)	ND	0.00100	"							
Surrogate: a,a,a-Trifluorotoluene	*97.9*		*ug/l*	*100*		*97.9*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*81.4*		*"*	*100*		*81.4*	*80-120*			
LCS (EH51609-BS1)				Prepared & Analyzed: 08/16/05						
Benzene	98.4		ug/l	100		98.4	80-120			
Toluene	97.0		"	100		97.0	80-120			
Ethylbenzene	106		"	100		106	80-120			
Xylene (p/m)	204		"	200		102	80-120			
Xylene (o)	104		"	100		104	80-120			
Surrogate: a,a,a-Trifluorotoluene	*104*		*"*	*100*		*104*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*95.4*		*"*	*100*		*95.4*	*80-120*			
Calibration Check (EH51609-CCV1)				Prepared: 08/16/05 Analyzed: 08/17/05						
Benzene	94.2		ug/l	100		94.2	80-120			
Toluene	94.5		"	100		94.5	80-120			
Ethylbenzene	106		"	100		106	80-120			
Xylene (p/m)	203		"	200		102	80-120			
Xylene (o)	109		"	100		109	80-120			
Surrogate: a,a,a-Trifluorotoluene	*94.9*		*"*	*100*		*94.9*	*0-200*			
Surrogate: 4-Bromofluorobenzene	*102*		*"*	*100*		*102*	*0-200*			
Matrix Spike (EH51609-MS1)	**Source: 5H11006-01**			Prepared: 08/16/05 Analyzed: 08/17/05						
Benzene	91.6		ug/l	100	ND	91.6	80-120			
Toluene	90.2		"	100	ND	90.2	80-120			
Ethylbenzene	101		"	100	ND	101	80-120			
Xylene (p/m)	191		"	200	ND	95.5	80-120			
Xylene (o)	102		"	100	ND	102	80-120			
Surrogate: a,a,a-Trifluorotoluene	*91.5*		*"*	*100*		*91.5*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*97.9*		*"*	*100*		*97.9*	*80-120*			

Organics by GC - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EH51609 - EPA 5030C (GC)										
Matrix Spike Dup (EH51609-MSD1)	**Source: 5H11006-01**			Prepared: 08/16/05 Analyzed: 08/17/05						
Benzene	95.5		ug/l	100	ND	95.5	80-120	4.17	20	
Toluene	94.5		"	100	ND	94.5	80-120	4.66	20	
Ethylbenzene	106		"	100	ND	106	80-120	4.83	20	
Xylene (p/m)	201		"	200	ND	100	80-120	4.60	20	
Xylene (o)	108		"	100	ND	108	80-120	5.71	20	
Surrogate: a,a,a-Trifluorotoluene	*82.3*		"	*100*		*82.3*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*92.9*		"	*100*		*92.9*	*80-120*			

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EH51208 - General Preparation (WetChem)										
Blank (EH51208-BLK1)				Prepared & Analyzed: 08/11/05						
Total Alkalinity	ND	2.00	mg/L							
Duplicate (EH51208-DUP1)	**Source: 5H11001-01**			Prepared & Analyzed: 08/11/05						
Total Alkalinity	0.00	2.00	mg/L		159				20	
Reference (EH51208-SRM1)				Prepared & Analyzed: 08/11/05						
Bicarbonate Alkalinity	230		mg/L	200		115	80-120			
Batch EH51210 - General Preparation (WetChem)										
Blank (EH51210-BLK1)				Prepared: 08/16/05 Analyzed: 08/17/05						
Total Dissolved Solids	ND	5.00	mg/L							
Duplicate (EH51210-DUP1)	**Source: 5H11001-01**			Prepared: 08/16/05 Analyzed: 08/17/05						
Total Dissolved Solids	628	5.00	mg/L		603			4.06	5	
Batch EH51906 - General Preparation (WetChem)										
Blank (EH51906-BLK1)				Prepared & Analyzed: 08/15/05						
Chloride	ND	0.500	mg/L							
Sulfate	ND	0.500	"							
LCS (EH51906-BS1)				Prepared & Analyzed: 08/15/05						
Chloride	8.36		mg/L	10.0		83.6	80-120			
Sulfate	9.43		"	10.0		94.3	80-120			

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EH51906 - General Preparation (WetChem)										
Calibration Check (EH51906-CCV1)				Prepared & Analyzed: 08/15/05						
Chloride	9.85		mg/L	10.0		98.5	80-120			
Sulfate	11.4		"	10.0		114	80-120			
Duplicate (EH51906-DUP1)		**Source: 5H09007-02**		Prepared & Analyzed: 08/15/05						
Sulfate	122	5.00	mg/L		122			0.00	20	
Chloride	202	5.00	"		203			0.494	20	

Total Metals by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EH51103 - 6010B/No Digestion										
Blank (EH51103-BLK1)				Prepared & Analyzed: 08/11/05						
Calcium	ND	0.0100	mg/L							
Magnesium	ND	0.00100	"							
Potassium	ND	0.0500	"							
Sodium	ND	0.0100	"							
Calibration Check (EH51103-CCV1)				Prepared & Analyzed: 08/11/05						
Calcium	1.95		mg/L	2.00		97.5	85-115			
Magnesium	2.17		"	2.00		108	85-115			
Potassium	1.90		"	2.00		95.0	85-115			
Sodium	1.84		"	2.00		92.0	85-115			
Duplicate (EH51103-DUP1)		**Source: 5H09005-01**		Prepared & Analyzed: 08/11/05						
Calcium	148	0.500	mg/L		153			3.32	20	
Magnesium	24.3	0.0100	"		24.7			1.63	20	
Potassium	5.97	0.0500	"		5.92			0.841	20	
Sodium	80.0	0.100	"		81.4			1.73	20	

Notes and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
LCS	Laboratory Control Spike
MS	Matrix Spike
Dup	Duplicate

Report Approved By: ______________________ Date: 8/22/2005

Raland K. Tuttle, Lab Manager
Celey D. Keene, Lab Director, Org. Tech Director
Peggy Allen, QA Officer

Jeanne Mc Murrey, Inorg. Tech Director
LaTasha Cornish, Chemist
Sandra Sanchez, Lab Tech.

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If you have received this material in error, please notify us immediately at 432-563-1800.

Environmental Lab of Texas

12600 West I-20 East
Odessa, Texas 79765

Phone: 432-563-1800
Fax: 432-563-1713

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager: Kristin Farris Pope
Company Name: Rice Operating
Company Address: 122 W. Taylor St.
City/State/Zip: Hobbs, NM 88240
Telephone No: (505) 393-9174
Fax No: (505) 397-1471
Sampler Signature:

Project Name: BD Zachary Hinton EOL
Project #:
Project Loc: Eunice
PO #:

5H11002

					Preservative							Matrix				Analyze For:														
																TCLP:														
																TOTAL:							X							
LAB # (lab use only)	FIELD CODE	Date Sampled	Time Sampled	No. of Containers	Ice	HNO_3	HCl (2) 40ml glass	NaOH	H_2SO_4	None (1) L HDPE	Other (Specify)	Water	Sludge	Soil	Other (specify):	TPH: 418.1 8015M 1005 1006	Cations (Ca, Mg, Na, K)	Anions (Cl, SO4, CO3, HCO3)	SAR / ESP / CEC	Metals: As Ag Ba Cd Cr Pb Hg Se	Volatiles	Semivolatiles	BTEX [✓ 8021B/5030] or BTEX 8260	RCI	N.O.R.M.	T.D.S.			RUSH TAT (Pre-Schedule	Standard TAT
-01	Monitor Well # 1	8-10-05	11:24	3	X		X			X		X					X	X					X			X				X

Special Instructions:
Please email analysis to Kristin: Kpriceswd@valornet.com

Sample Containers intact? [✓ Y] N
Temperature Upon Receipt: 2.0°c
Laboratory Comments:
Labels + seals on containers
Seal on Cooler

Relinquished by:	Date	Time	Received by:	Date	Time
	8-10-05	12:25	K. Pope	8-10-05	1230

Relinquished by:	Date	Time	Received by ELOT:	Date	Time
	8/11	7:45	Jeane McMurry	8-11-05	0745

Environmental Lab of Texas
Variance / Corrective Action Report – Sample Log-In

Client: Rice Operating

Date/Time: 08-11-05 @ 0745

Order #: 5H11002

Initials: JMM

Sample Receipt Checklist

Temperature of container/cooler?	[✓ Yes]	No	2.0 C
Shipping container/cooler in good condition?	[✓ Yes]	No	
Custody Seals intact on shipping container/cooler?	[✓ Yes]	No	Not present
Custody Seals intact on sample bottles?	[✓ Yes]	No	Not present
Chain of custody present?	[✓ Yes]	No	
Sample Instructions complete on Chain of Custody?	[✓ Yes]	No	
Chain of Custody signed when relinquished and received?	[✓ Yes]	No	
Chain of custody agrees with sample label(s)	[✓ Yes]	No	
Container labels legible and intact?	[✓ Yes]	No	
Sample Matrix and properties same as on chain of custody?	[✓ Yes]	No	
Samples in proper container/bottle?	[✓ Yes]	No	
Samples properly preserved?	[✓ Yes]	No	
Sample bottles intact?	[✓ Yes]	No	
Preservations documented on Chain of Custody?	[✓ Yes]	No	
Containers documented on Chain of Custody?	[✓ Yes]	No	
Sufficient sample amount for indicated test?	[✓ Yes]	No	
All samples received within sufficient hold time?	[✓ Yes]	No	
VOC samples have zero headspace?	[✓ Yes]	No	Not Applicable

Other observations:
H11002-01 Neutral pH. 8/11/05

Variance Documentation:

Contact Person: - Date/Time: Contacted by:

Regarding:

Corrective Action Taken:

ENVIRONMENTAL
LAB OF

12600 West I-20 East Odessa, Texas 79765

Analytical Report

Prepared for:

Kristin Pope

Rice Operating Co.

122 W. Taylor

Hobbs, NM 88240

Project: BD- Zachary Hinton EOL

Project Number: None Given

Location: Eunice

Lab Order Number: 5E24016

Report Date: 06/07/05

Rice Operating Co. 122 W. Taylor Hobbs NM, 88240	Project: BD- Zachary Hinton EOL Project Number: None Given Project Manager: Kristin Pope	Fax: (505) 397-1471 **Reported:** 06/07/05 14:11

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-1	5E24016-01	Water	05/23/05 11:37	05/24/05 15:40

Organics by GC

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-1 (5E24016-01) Water									
Benzene	ND	0.00100	mg/L	1	EE52604	05/26/05	05/26/05	EPA 8021B	
Toluene	ND	0.00100	"	"	"	"	"	"	
Ethylbenzene	ND	0.00100	"	"	"	"	"	"	
Xylene (p/m)	ND	0.00100	"	"	"	"	"	"	
Xylene (o)	ND	0.00100	"	"	"	"	"	"	
Surrogate: a,a,a-Trifluorotoluene		*100 %*	*80-120*		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*109 %*	*80-120*		"	"	"	"	

General Chemistry Parameters by EPA / Standard Methods
Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-1 (5E24016-01) Water									
Total Alkalinity	**194**	2.00	mg/L	1	EE52509	05/24/05	05/24/05	EPA 310.2M	
Chloride	**393**	5.00	"	10	EE52703	05/27/05	05/27/05	EPA 300.0	
Total Dissolved Solids	**1190**	5.00	"	1	EF50109	05/27/05	05/27/05	EPA 160.1	
Sulfate	**226**	5.00	"	10	EE52703	05/27/05	05/27/05	EPA 300.0	

Total Metals by EPA / Standard Methods

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-1 (5E24016-01) Water									
Calcium	**89.5**	0.100	mg/L	10	EE52518	05/25/05	05/25/05	EPA 6010B	
Magnesium	**50.5**	0.0100	"	"	"	"	"	"	
Potassium	**11.0**	0.500	"	"	"	"	"	"	
Sodium	**248**	0.500	"	50	"	"	"	"	

Organics by GC - Quality Control
Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EE52604 - EPA 5030C (GC)										
Blank (EE52604-BLK1)				Prepared & Analyzed: 05/26/05						
Benzene	ND	0.00100	mg/L							
Toluene	ND	0.00100	"							
Ethylbenzene	ND	0.00100	"							
Xylene (p/m)	ND	0.00100	"							
Xylene (o)	ND	0.00100	"							
Surrogate: a,a,a-Trifluorotoluene	*20.2*		*ug/l*	*20.0*		*101*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*17.1*		*"*	*20.0*		*85.5*	*80-120*			
LCS (EE52604-BS1)				Prepared & Analyzed: 05/26/05						
Benzene	93.7		ug/l	100		93.7	80-120			
Toluene	100		"	100		100	80-120			
Ethylbenzene	102		"	100		102	80-120			
Xylene (p/m)	205		"	200		102	80-120			
Xylene (o)	101		"	100		101	80-120			
Surrogate: a,a,a-Trifluorotoluene	*21.3*		*"*	*20.0*		*106*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*22.6*		*"*	*20.0*		*113*	*80-120*			
Calibration Check (EE52604-CCV1)				Prepared: 05/26/05 Analyzed: 05/27/05						
Benzene	87.9		ug/l	100		87.9	80-120			
Toluene	96.3		"	100		96.3	80-120			
Ethylbenzene	98.2		"	100		98.2	80-120			
Xylene (p/m)	197		"	200		98.5	80-120			
Xylene (o)	96.2		"	100		96.2	80-120			
Surrogate: a,a,a-Trifluorotoluene	*19.4*		*"*	*20.0*		*97.0*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*23.3*		*"*	*20.0*		*116*	*80-120*			
Matrix Spike (EE52604-MS1)	**Source: 5E23014-01**			Prepared & Analyzed: 05/26/05						
Benzene	95.4		ug/l	100	ND	95.4	80-120			
Toluene	101		"	100	ND	101	80-120			
Ethylbenzene	100		"	100	ND	100	80-120			
Xylene (p/m)	203		"	200	ND	102	80-120			
Xylene (o)	98.2		"	100	ND	98.2	80-120			
Surrogate: a,a,a-Trifluorotoluene	*19.8*		*"*	*20.0*		*99.0*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*20.3*		*"*	*20.0*		*102*	*80-120*			

Organics by GC - Quality Control

Environmental Lab of Texas

Batch EE52604 - EPA 5030C (GC)

Matrix Spike Dup (EE52604-MSD1) **Source: 5E23014-01** Prepared & Analyzed: 05/26/05

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Benzene	92.8		ug/l	100	ND	92.8	80-120	2.76	20	
Toluene	97.3		"	100	ND	97.3	80-120	3.73	20	
Ethylbenzene	98.9		"	100	ND	98.9	80-120	1.11	20	
Xylene (p/m)	202		"	200	ND	101	80-120	0.985	20	
Xylene (o)	99.1		"	100	ND	99.1	80-120	0.912	20	
Surrogate: a,a,a-Trifluorotoluene	*19.8*		*"*	*20.0*		*99.0*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*21.8*		*"*	*20.0*		*109*	*80-120*			

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Batch EE52509 - General Preparation (WetChem)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (EE52509-BLK1)				Prepared & Analyzed: 05/24/05						
Total Alkalinity	ND	2.00	mg/L							
Duplicate (EE52509-DUP1)	**Source: 5E19001-01**			Prepared & Analyzed: 05/24/05						
Total Alkalinity	215	2.00	mg/L		214			0.466	20	
Reference (EE52509-SRM1)				Prepared & Analyzed: 05/24/05						
Bicarbonate Alkalinity	230		mg/L	200		115	80-120			

Batch EE52703 - General Preparation (WetChem)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (EE52703-BLK1)				Prepared & Analyzed: 05/27/05						
Chloride	ND	0.500	mg/L							
Sulfate	ND	0.500	"							
LCS (EE52703-BS1)				Prepared & Analyzed: 05/27/05						
Chloride	10.9		mg/L	10.0		109	80-120			
Sulfate	9.99		"	10.0		99.9	80-120			
Calibration Check (EE52703-CCV1)				Prepared & Analyzed: 05/27/05						
Chloride	10.6		mg/L	10.0		106	80-120			
Sulfate	9.87		"	10.0		98.7	80-120			
Duplicate (EE52703-DUP1)	**Source: 5E24015-01**			Prepared & Analyzed: 05/27/05						
Chloride	100	2.50	mg/L		98.4			1.61	20	
Sulfate	82.3	2.50	"		82.2			0.122	20	

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EF50109 - Filtration Preparation										
Blank (EF50109-BLK1)				Prepared & Analyzed: 05/27/05						
Total Dissolved Solids	ND	5.00	mg/L							
Duplicate (EF50109-DUP1)	**Source: 5E24015-01**			Prepared & Analyzed: 05/27/05						
Total Dissolved Solids	567	5.00	mg/L		573			1.05	20	

Total Metals by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EE52518 - 6010B/No Digestion										
Blank (EE52518-BLK1)				Prepared & Analyzed: 05/25/05						
Calcium	ND	0.0100	mg/L							
Magnesium	ND	0.00100	"							
Potassium	ND	0.0500	"							
Sodium	ND	0.0100	"							
Blank (EE52518-BLK2)				Prepared & Analyzed: 05/25/05						
Calcium	ND	0.0100	mg/L							
Magnesium	ND	0.00100	"							
Potassium	ND	0.0500	"							
Sodium	ND	0.0100	"							
Calibration Check (EE52518-CCV1)				Prepared & Analyzed: 05/25/05						
Calcium	1.86		mg/L	2.00		93.0	85-115			
Magnesium	2.10		"	2.00		105	85-115			
Potassium	1.93		"	2.00		96.5	85-115			
Sodium	2.18		"	2.00		109	85-115			
Duplicate (EE52518-DUP1)	**Source: 5E19001-01**			Prepared & Analyzed: 05/25/05						
Calcium	51.6	0.500	mg/L		56.0			8.18	20	
Magnesium	26.4	0.0100	"		27.2			2.99	20	
Potassium	5.70	0.0500	"		5.69			0.176	20	
Sodium	109	0.100	"		110			0.913	20	
Duplicate (EE52518-DUP2)	**Source: 5E24016-01**			Prepared & Analyzed: 05/25/05						
Calcium	90.2	0.100	mg/L		89.5			0.779	20	
Magnesium	50.6	0.0100	"		50.5			0.198	20	
Potassium	10.7	0.500	"		11.0			2.76	20	
Sodium	244	0.500	"		248			1.63	20	

Notes and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
LCS	Laboratory Control Spike
MS	Matrix Spike
Dup	Duplicate

Report Approved By: ______________________ Date: 6/7/2005

Raland K. Tuttle, Lab Manager	Jeanne Mc Murrey, Inorg. Tech Director
Celey D. Keene, Lab Director, Org. Tech Director	James L. Hawkins, Chemist/Geologist
Peggy Allen, QA Officer	Sandra Sanchez, Lab Tech.

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Environmental Lab of Texas I, Ltd.

12600 West I-20 East
Odessa, Texas 79763

Phone: 915-563-1800
Fax: 915-563-1713

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager: Kristin Farris Pope
Company Name: Rice Operating
Company Address: 122 W Taylor St.
City/State/Zip: Hobbs, nm 88240
Telephone No: (505) 393-9174
Fax No: (505) 397-1471
Sampler Signature:

Project Name: BD - Zachary Hinton EH
Project #:
Project Loc: Eunice
PO #:

					Preservative							Matrix				Analyze For															
5E24016 LAB # (lab use only)	FIELD CODE	2005 Date Sampled	Time Sampled	No. of Containers	Ice	HNO₃	HCl	NaOH	H₂SO₄	None	Other (Specify)	Water	Sludge	Soil	Other (specify):	TPH: 418.1 8015M 1005 1006	Cations (Ca, Mg, Na, K)	Anions (Cl, SO4, CO3, HCO3)	SAR / ESP / CEC	Metals: As Ag Ba Cd Cr Pb Hg Se	Volatiles	Semivolatiles	BTEX 8021B/5030	RCI	N.O.R.M.	Total Gamma	Total Dissolved Solids			RUSH TAT (Pre-Schedule)	Standard TAT
-01	MW-1	May 23	11:37	3	X		X					X					X	X					X				X				X

Analyze For rows: TCLP: / TOTAL:

Special Instructions:
Please email analysis to Kristin enviro@leaco.net

Sample Containers Intact? ✓ N
Temperature Upon Receipt:
Laboratory Comments:
-2.0
2-VOA
1-1L

Relinquished by	Date	Time	Received by	Date	Time
	5-23-05	13:23	KP	5-23-05	B23

Relinquished by	Date	Time	Received by ELOT:	Date	Time
Kristin Pope	5-24-05	15:46	Vanita Kelly	5/24/05	15:40

Environmental Lab of Texas
Variance / Corrective Action Report – Sample Log-In

Client: Rice Operating

Date/Time: 5/24/05 3:55

Order #: 5E24016

Initials: Ck

Sample Receipt Checklist

Temperature of container/cooler?	Yes	No	-2.0 C
Shipping container/cooler in good condition?	[✓ Yes]	No	
Custody Seals intact on shipping container/cooler?	[✓ Yes]	No	Not present
Custody Seals intact on sample bottles?	[✓ Yes]	No	Not present
Chain of custody present?	[✓ Yes]	No	
Sample Instructions complete on Chain of Custody?	[✓ Yes]	No	
Chain of Custody signed when relinquished and received?	[✓ Yes]	No	
Chain of custody agrees with sample label(s)	[✓ Yes]	No	
Container labels legible and intact?	[✓ Yes]	No	
Sample Matrix and properties same as on chain of custody?	[✓ Yes]	No	
Samples in proper container/bottle?	[✓ Yes]	No	
Samples properly preserved?	[✓ Yes]	No	
Sample bottles intact?	[✓ Yes]	No	
Preservations documented on Chain of Custody?	[✓ Yes]	No	
Containers documented on Chain of Custody?	[✓ Yes]	No	
Sufficient sample amount for indicated test?	[✓ Yes]	No	
All samples received within sufficient hold time?	[✓ Yes]	No	
VOC samples have zero headspace?	[✓ Yes]	No	Not Applicable

Other observations:

Variance Documentation:

Contact Person: - Date/Time: Contacted by:

Regarding:

Corrective Action Taken:

ENVIRONMENTAL
LAB OF

12600 West I-20 East Odessa, Texas 79765

Analytical Report

Prepared for:
Kristin Pope
Rice Operating Co.
122 W. Taylor
Hobbs, NM 88240

Project: BD- Zachary Hinton EOL
Project Number: None Given
Location: Eunice/ Lea County

Lab Order Number: 5C23006

Report Date: 04/06/05

Rice Operating Co. 122 W. Taylor Hobbs NM, 88240	Project: BD- Zachary Hinton EOL Project Number: None Given Project Manager: Kristin Pope	Fax: (505) 397-1471 **Reported:** 04/06/05 14:47

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-1	5C23006-01	Water	03/22/05 13:30	03/23/05 08:00

Rice Operating Co. 122 W. Taylor Hobbs NM, 88240	Project: BD- Zachary Hinton EOL Project Number: None Given Project Manager: Kristin Pope	Fax: (505) 397-1471 **Reported:** 04/06/05 14:47

Organics by GC
Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-1 (5C23006-01) Water									
Benzene	ND	0.00100	mg/L	1	EC52804	03/24/05	03/24/05	EPA 8021B	
Toluene	ND	0.00100	"	"	"	"	"	"	
Ethylbenzene	ND	0.00100	"	"	"	"	"	"	
Xylene (p/m)	ND	0.00100	"	"	"	"	"	"	
Xylene (o)	ND	0.00100	"	"	"	"	"	"	
Surrogate: a,a,a-Trifluorotoluene		*104 %*	*80-120*		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*84.5 %*	*80-120*		"	"	"	"	

General Chemistry Parameters by EPA / Standard Methods

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-1 (5C23006-01) Water									
Total Alkalinity	**192**	2.00	mg/L	1	EC52908	03/23/05	03/23/05	EPA 310.2M	
Chloride	**403**	5.00	"	10	EC52513	03/24/05	03/24/05	EPA 300.0	
Total Dissolved Solids	**1270**	5.00	"	1	EC52507	03/24/05	03/25/05	EPA 160.1	
Sulfate	**202**	5.00	"	10	EC52513	03/24/05	03/24/05	EPA 300.0	

Total Metals by EPA / Standard Methods

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-1 (5C23006-01) Water									
Calcium	**120**	1.00	mg/L	100	EC53102	03/29/05	03/30/05	EPA 6010B	
Magnesium	**61.9**	0.0200	"	20	"	"	"	"	
Sodium	**344**	1.00	"	100	"	"	"	"	
Potassium	**18.9**	0.500	"	10	EC53109	03/29/05	03/31/05	"	

Organics by GC - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EC52804 - EPA 5030C (GC)										
Blank (EC52804-BLK1)				Prepared & Analyzed: 03/24/05						
Benzene	ND	0.00100	mg/L							
Toluene	ND	0.00100	"							
Ethylbenzene	ND	0.00100	"							
Xylene (p/m)	ND	0.00100	"							
Xylene (o)	ND	0.00100	"							
Surrogate: a,a,a-Trifluorotoluene	*19.8*		*ug/l*	*20.0*		*99.0*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*17.3*		*"*	*20.0*		*86.5*	*80-120*			
LCS (EC52804-BS1)				Prepared & Analyzed: 03/24/05						
Benzene	100		ug/l	100		100	80-120			
Toluene	98.6		"	100		98.6	80-120			
Ethylbenzene	98.5		"	100		98.5	80-120			
Xylene (p/m)	201		"	200		100	80-120			
Xylene (o)	94.1		"	100		94.1	80-120			
Surrogate: a,a,a-Trifluorotoluene	*22.2*		*"*	*20.0*		*111*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*16.5*		*"*	*20.0*		*82.5*	*80-120*			
LCS Dup (EC52804-BSD1)				Prepared & Analyzed: 03/24/05						
Benzene	101		ug/l	100		101	80-120	0.995	20	
Toluene	99.0		"	100		99.0	80-120	0.405	20	
Ethylbenzene	97.8		"	100		97.8	80-120	0.713	20	
Xylene (p/m)	199		"	200		99.5	80-120	0.501	20	
Xylene (o)	99.5		"	100		99.5	80-120	5.58	20	
Surrogate: a,a,a-Trifluorotoluene	*22.3*		*"*	*20.0*		*112*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*16.5*		*"*	*20.0*		*82.5*	*80-120*			
Calibration Check (EC52804-CCV1)				Prepared: 03/24/05 Analyzed: 03/25/05						
Benzene	98.8		ug/l	100		98.8	80-120			
Toluene	95.7		"	100		95.7	80-120			
Ethylbenzene	97.6		"	100		97.6	80-120			
Xylene (p/m)	192		"	200		96.0	80-120			
Xylene (o)	103		"	100		103	80-120			
Surrogate: a,a,a-Trifluorotoluene	*22.0*		*"*	*20.0*		*110*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*18.4*		*"*	*20.0*		*92.0*	*80-120*			

Organics by GC - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EC52804 - EPA 5030C (GC)										
Matrix Spike (EC52804-MS1)	**Source: 5C23005-01**			Prepared: 03/24/05 Analyzed: 03/28/05						
Benzene	95.1		ug/l	100	ND	95.1	80-120			
Toluene	97.2		"	100	ND	97.2	80-120			
Ethylbenzene	89.2		"	100	ND	89.2	80-120			
Xylene (p/m)	183		"	200	ND	91.5	80-120			
Xylene (o)	93.3		"	100	ND	93.3	80-120			
Surrogate: a,a,a-Trifluorotoluene	*22.0*		"	*20.0*		*110*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*20.6*		"	*20.0*		*103*	*80-120*			

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EC52507 - General Preparation (WetChem)										
Blank (EC52507-BLK1)				Prepared: 03/24/05 Analyzed: 03/25/05						
Total Dissolved Solids	ND	5.00	mg/L							
Duplicate (EC52507-DUP1)	**Source: 5C23001-01**			Prepared: 03/24/05 Analyzed: 03/25/05						
Total Dissolved Solids	1140	5.00	mg/L		1140			0.00	20	
Batch EC52513 - General Preparation (WetChem)										
Blank (EC52513-BLK1)				Prepared & Analyzed: 03/24/05						
Sulfate	ND	0.500	mg/L							
Chloride	ND	0.500	"							
Blank (EC52513-BLK2)				Prepared & Analyzed: 03/24/05						
Chloride	ND	0.500	mg/L							
Sulfate	ND	0.500	"							
LCS (EC52513-BS1)				Prepared & Analyzed: 03/24/05						
Chloride	10.4		mg/L	10.0		104	80-120			
Sulfate	9.53		"	10.0		95.3	80-120			
LCS (EC52513-BS2)				Prepared & Analyzed: 03/24/05						
Chloride	10.5		mg/L	10.0		105	80-120			
Sulfate	9.80		"	10.0		98.0	80-120			
Calibration Check (EC52513-CCV1)				Prepared & Analyzed: 03/24/05						
Chloride	10.6		mg/L	10.0		106	80-120			
Sulfate	9.93		"	10.0		99.3	80-120			

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EC52513 - General Preparation (WetChem)										
Calibration Check (EC52513-CCV2)				Prepared & Analyzed: 03/24/05						
Sulfate	9.80		mg/L	10.0		98.0	80-120			
Chloride	10.6		"	10.0		106	80-120			
Duplicate (EC52513-DUP1)	**Source: 5C23001-01**			Prepared & Analyzed: 03/24/05						
Chloride	216	5.00	mg/L		215			0.464	20	
Sulfate	216	5.00	"		215			0.464	20	
Duplicate (EC52513-DUP2)	**Source: 5C23018-07**			Prepared & Analyzed: 03/24/05						
Chloride	1540	12.5	mg/L		1530			0.651	20	
Sulfate	163	12.5	"		163			0.00	20	
Batch EC52908 - General Preparation (WetChem)										
Blank (EC52908-BLK1)				Prepared & Analyzed: 03/23/05						
Total Alkalinity	ND	2.00	mg/L							
Calibration Check (EC52908-CCV1)				Prepared & Analyzed: 03/23/05						
Carbonate Alkalinity	0.0500		mg/L	0.0500		100	80-120			
Duplicate (EC52908-DUP1)	**Source: 5C22002-01**			Prepared & Analyzed: 03/23/05						
Total Alkalinity	221	2.00	mg/L		220			0.454	20	

Total Metals by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EC53102 - 6010B/No Digestion										
Blank (EC53102-BLK1)				Prepared: 03/29/05 Analyzed: 03/30/05						
Calcium	ND	0.0100	mg/L							
Magnesium	ND	0.00100	"							
Sodium	ND	0.0100	"							
Calibration Check (EC53102-CCV1)				Prepared: 03/29/05 Analyzed: 03/30/05						
Calcium	2.25		mg/L	2.00		112	85-115			
Magnesium	1.93		"	2.00		96.5	85-115			
Sodium	2.18		"	2.00		109	85-115			
Duplicate (EC53102-DUP1)		**Source: 5C23001-01**		Prepared: 03/29/05 Analyzed: 03/30/05						
Calcium	47.7	0.100	mg/L		51.6			7.85	20	
Magnesium	62.7	0.0200	"		59.3			5.57	20	
Sodium	247	1.00	"		252			2.00	20	
Batch EC53109 - 6010B/No Digestion										
Blank (EC53109-BLK1)				Prepared: 03/29/05 Analyzed: 03/31/05						
Potassium	ND	0.0500	mg/L							
Calibration Check (EC53109-CCV1)				Prepared: 03/29/05 Analyzed: 03/31/05						
Potassium	2.02		mg/L	2.00		101	85-115			
Duplicate (EC53109-DUP1)		**Source: 5C23001-01**		Prepared: 03/29/05 Analyzed: 03/31/05						
Potassium	10.1	0.500	mg/L		10.7			5.77	20	

Notes and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
LCS	Laboratory Control Spike
MS	Matrix Spike
Dup	Duplicate

Report Approved By: ______________________ Date: 4/6/2005

Raland K. Tuttle, Lab Manager	Jeanne Mc Murrey, Inorg. Tech Director
Celey D. Keene, Lab Director, Org. Tech Director	James L. Hawkins, Chemist/Geologist
Peggy Allen, QA Officer	Sandra Sanchez, Lab Tech.

This material is intended only for the use of the individual (s) or entity to whom it is addressed, and may contain information that is privileged and confidential.

If you have received this material in error, please notify us immediately at 432-563-1800.

Environmental Lab of Texas

12600 West I-20 East
Odessa, Texas 79765

Phone: 432-563-1800
Fax: 432-563-1713

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager: Kristin Farris Pope

Company Name: Rice Operating

Company Address: 122 W. Taylor St.

City/State/Zip: Hobbs, NM 88240

Telephone No: (505) 393-9174

Fax No: (505) 397-1471

Sampler Signature:

Project Name: BD-Zachary Hinton EOL

Project #:

Project Loc: Eunice / Lea County

PO #:

5C23006

					Preservative							Matrix				Analyze For:															
																TCLP:															
																TOTAL:							X								
LAB # (lab use only)	FIELD CODE	Date Sampled 2005	Time Sampled	No. of Containers	Ice	HNO_3	HCl	NaOH	H_2SO_4	None	Other (Specify)	Water	Sludge	Soil	Other (specify):	TPH: 418.1 8015M 1005 1006	Cations (Ca, Mg, Na, K)	Anions (Cl, SO4, CO3, HCO3)	SAR / ESP / CEC	Metals: As Ag Ba Cd Cr Pb Hg Se	Volatiles	Semivolatiles	BTEX 8021B/5030 or BTEX 8260	RCI	N.O.R.M.	TOS				RUSH TAT (Pre-Schedule)	Standard TAT
-01	MW-1	3/22	13:30	3	X		X					X					X	X					X			X					X

Special Instructions: Please email analysis to Kristin enviro@leaco.net

Relinquished by:	Date	Time	Received by:	Date	Time
	3/22/05	16:03		3-22-05	16:03
Relinquished by:	Date	Time	Received by ELOT: From Drop Box	Date	Time
	3-22-0	6:[illegible]p	Jeanne McMurry	03-23-05	0800

Sample Containers Intact? [✓ Y] N

Temperature Upon Receipt: 0.5°C

Laboratory Comments:
1-L HDPE
2-40mL glass w/HCl } each set on ice w/seals on containers + cooler

Environmental Lab of Texas
Variance / Corrective Action Report – Sample Log-In

Client: Rice Operating

Date/Time: 3/23/05 10:15

Order #: 5C23006

Initials: CK

Sample Receipt Checklist

Temperature of container/cooler?	Yes	No	0.5 C
Shipping container/cooler in good condition?	[✓ Yes]	No	
Custody Seals intact on shipping container/cooler?	[✓ Yes]	No	Not present
Custody Seals intact on sample bottles?	[✓ Yes]	No	Not present
Chain of custody present?	[✓ Yes]	No	
Sample Instructions complete on Chain of Custody?	[✓ Yes]	No	
Chain of Custody signed when relinquished and received?	[✓ Yes]	No	
Chain of custody agrees with sample label(s)	[✓ Yes]	No	
Container labels legible and intact?	[✓ Yes]	No	
Sample Matrix and properties same as on chain of custody?	[✓ Yes]	No	
Samples in proper container/bottle?	[✓ Yes]	No	
Samples properly preserved?	[✓ Yes]	No	
Sample bottles intact?	[✓ Yes]	No	
Preservations documented on Chain of Custody?	[✓ Yes]	No	
Containers documented on Chain of Custody?	[✓ Yes]	No	
Sufficient sample amount for indicated test?	[✓ Yes]	No	
All samples received within sufficient hold time?	[✓ Yes]	No	
VOC samples have zero headspace?	[✓ Yes]	No	Not Applicable

Other observations:

Variance Documentation:

Contact Person: - ____________ Date/Time: ____________ Contacted by: ____________

Regarding:

Corrective Action Taken:

RICE *Operating Company*
122 West Taylor
Hobbs, NM 88240
Phone: (505) 393-9174
Fax: (505) 397-1471

TO: R. Hick

FROM: K. Farris

FAX NUMBER: (505) 266-0945

DATE: 11-11-03

COMPANY:

TOTAL NO. OF PAGE INCLUDING COVER: 5

RE: Zachary Hinton

NOTES/COMMENTS:

Here's the analyses from the Peters East + West wells. As for the windmills, Flap says he'll be pulling them in 2 wks + he will contact ROC.

If you havent recieved the domestic Well analyses from Sec. 29, let me know because I have them.

IF YOU DO NOT RECEIVE ALL PAGES INCLUDED, PLEASE CALL THE OFFICE PHONE NUMBER LISTED AT THE TOP OF THIS PAGE-THANK YOU

11-7-03 Met Flap Sims and EPI sampler
at wells near BD Zachary Hinton EOL.

Peters Sampled from well at 1:10 pm.
East Turn on pump and purged for about
Well 10 seconds and obtained samples from
faucet. Measured depth on well
50' south of Peters East (other side of road)
Depth to water = 51.52'. ft (at top of 1' casing)
Total Depth = 81.00 ft.

Peters Obtained sample from windmill tank
West at 1:33 pm. Cattle present.
Well Depth to water = 59.96 ft (at top of 2ft casing)
Total Depth = 88.28 ft

Kristin Saenz
11-6-03

CARDINAL LABORATORIES

PHONE (325) 673-7001 • 2111 BEECHWOOD • ABILENE, TX 79603
PHONE (505) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240

ANALYTICAL RESULTS FOR
RICE OPERATING CO.
ATTN: KRISTIN FARRIS
122 W. TAYLOR
HOBBS, NM 88240
FAX TO: (505) 397-1471

Receiving Date: 11/07/03
Reporting Date: 11/11/03
Project Number: 778
Project Name: ZACHARY HINTON
Project Location: BD

Sampling Date: 11/07/03
Sample Type: GROUNDWATER
Sample Condition: COOL & INTACT
Sample Received By: AH
Analyzed By: BC

LAB NUMBER	SAMPLE ID	BENZENE (mg/L)	TOLUENE (mg/L)	ETHYL BENZENE (mg/L)	TOTAL XYLENES (mg/L)
ANALYSIS DATE		11/10/03	11/10/03	11/10/03	11/11/03
H8156-1	PETERS E. WELL	<0.002	<0.002	<0.002	<0.006
H8156-2	PETERS W. WELL	<0.002	<0.002	<0.002	<0.006
Quality Control		0.090	0.091	0.090	0.265
True Value QC		0.100	0.100	0.100	0.300
% Recovery		90.1	90.8	89.8	88.5
Relative Percent Difference		0.9	1.9	1.4	0.4

METHOD: EPA SW-846 8260

Chemist

11/11/03
Date

CARDINAL LABORATORIES

PHONE (325) 673-7001 • 2111 BEECHWOOD • ABILENE, TX 79603

PHONE (505) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240

ANALYTICAL RESULTS FOR
RICE OPERATING CO.
ATTN: KRISTIN FARRIS
122 W. TAYLOR
HOBBS, NM 88240
FAX TO: (505) 397-1471

Receiving Date: 11/07/03
Reporting Date: 11/11/03
Project Number: 778
Project Name: ZACHARY HINTON
Project Location: BD

Sampling Date: 11/07/03
Sample Type: GROUNDWATER
Sample Condition: COOL & INTACT
Sample Received By: AH
Analyzed By: AH

LAB NUMBER	SAMPLE ID	Na (mg/L)	Ca (mg/L)	Mg (mg/L)	K (mg/L)	Conductivity (mS/cm)	T-Alkalinity (mgCaCO$_3$/L)
ANALYSIS DATE:		11/10/03	11/10/03	11/10/03	11/10/03	11/10/03	11/10/03
H8156-1	PETERS E. WELL	154	102	67	8.51	2325	166
H8156-2	PETERS W. WELL	98	65	46	4.49	1535	221
Quality Control		NR	56	59	5.17	1322	NR
True Value QC		NR	50	50	5.00	1413	NR
% Recovery		NR	112	118	103	93.6	NR
Relative Percent Difference		NR	0	0	1	0.7	NR
METHODS:			SM3500-Ca-D	3500-Mg E	8049	120.1	310.1

		Cl$^-$ (mg/L)	SO$_4$ (mg/L)	CO$_3$ (mg/L)	HCO$_3$ (mg/L)	pH (s.u.)	TDS (mg/L)
ANALYSIS DATE:		11/10/03	11/10/03	11/10/03	11/10/03	11/10/03	11/11/03
H8156-1	PETERS E. WELL	436	93	0	202	7.75	1464
H8156-2	PETERS W. WELL	200	62	0	269	7.81	892
Quality Control		980	53.65	NR	998	6.98	NR
True Value QC		1000	50.00	NR	1000	7.00	NR
% Recovery		98.0	107	NR	99.8	99.7	NR
Relative Percent Difference		3.1	1.5	NR	0	0	12.1
METHODS:		SM4500-Cl-B	375.4	310.1	310.1	150.1	160.1

Amy Hill
Chemist

11/11/03
Date

h8156

CARDINAL LABORATORIES, INC.
2111 Beechwood, Abilene, TX 79603 101 East Marland, Hobbs, NM 88240
(915) 673-7001 Fax (915) 673-7020 (505) 393-2326 Fax (505) 393-2476

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

Page____ of____

Company Name: RICE Operating
Project Manager: Kristin Farris
Address: 122 W Taylor
City: Hobbs State: NM Zip: 88240
Phone #: 393-9174 Fax #: 397-1471
Project #: 778 Project Owner:
Project Name: Zachary Hinton
Project Location: BD
Sampler Name: K. Farris

BILL TO
P.O. #:
Company: RICE
Attn:
Address:
City:
State: Zip:
Phone #:
Fax #:

FOR LAB USE ONLY				MATRIX						PRESERV.			SAMPLING		ANALYSIS REQUEST		
Lab I.D.	Sample I.D.	(G)RAB OR (C)OMP.	# CONTAINERS	GROUNDWATER	WASTEWATER	SOIL	CRUDE OIL	SLUDGE	OTHER :	ACID/BASE:	ICE / COOL	OTHER :	DATE	TIME	Major Anions + Cations	TDS	BTEX
H8156-1	Peters East Well	G	1	✓							✓		110903	1310	✓	✓	
	Peters East Well	G	2	✓						✓	✓			1310			✓
-2	Peters West Well	G	1	✓							✓			1333	✓	✓	
	Peters West Well	G	2	✓						✓	✓			1333			✓

Sampler Relinquished: Kristin Farris
Date: 110903
Time: 1500
Received By:

Relinquished By: Israel Juarez
Date: 11/7/03
Time: 3:00
Received By: (Lab Staff) Amy Hill

Delivered By: (Circle One)
Sampler - UPS - Bus - [✓ Other:]

Sample Condition
Cool ☒ Yes ☐ No
Intact ☐ Yes ☐ No

CHECKED BY: (Initials)

Phone Result: ☐ Yes ☐ No Add'l Phone #:
Fax Result: ☒ Yes ☐ No Add'l Fax #:
REMARKS:
Fax to RICE

† Cardinal cannot accept verbal changes. Please fax written changes to 505-393-2476.