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Environmental Bureau
Oil Conservation Division

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Conoco Federal Lease
Environmental Site Assessment

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1 Executive Summary

This report describes the investigation by Mewbourne Oil Company (Mewbourne) into the area near Conoco Federal #2, a plugged and abandoned oil well formerly operated by Mark Production, which is Mewbourne's former corporate name. The owner of the surface land on which Conoco Federal #2 is located is McCasland Ranch. The Federal government has leased mineral rights for the land to Mewbourne. In 1989, McCasland Ranch drilled a water supply well about 35 feet from Conoco Federal #2. In January 1998, at the request of McCasland Ranch, New Mexico Oil Conservation Division (NMOCD) representatives examined the water supply well and reported that the well exhibited chloride concentrations that were higher than typical Ogallala groundwater. In March 1998, Mewbourne obtained water samples from the well and found that calcium and chloride concentrations did appear unusually high. The NMOCD required Mewbourne to conduct an investigation to determine if oil field operations had caused the suspected impairment of groundwater quality. On behalf of Mewbourne, R.T. Hicks Consultants, Ltd., (Hicks Consultants) investigated the area of the McCasland water supply well.

Our investigation showed:

1. The McCasland water supply well (henceforth called the McCasland windmill well) near Conoco Federal #2 draws water from the Ogallala Formation.
2. The saturated thickness of the water-bearing zone near the McCasland windmill well is only 10–15 feet, less than most Ogallala supply wells.
3. Both the McCasland windmill well and monitor well Mewbourne A draw water from a thin sand and/or gravel zone near the base of the Ogallala Formation.

4. Mewbourne files and NMOCD files show that the Conoco Federal #2 oil well was plugged and abandoned by Mark Production Company, following applicable NMOCD rules and standard industry practice.
5. The water chemistry of the McCasland windmill well near Conoco Federal #2 is not consistent with a mixture of Ogallala groundwater and oil field produced water.
6. Field tests conducted in August 1999 showed that, after four hours of pumping, the McCasland windmill well delivered water that showed 50% less dissolved solids than were observed in its adjacent water storage tank, and in 1998 samples from the McCasland windmill well.
7. The check valve between the McCasland water storage tank and the windmill well permits water leakage from the storage tank into the well casing.
8. The water storage tank at the McCasland windmill well appears to be a former oil field storage tank.
9. Although water samples taken from the McCasland windmill well during our August 1999 sampling event were obtained directly from the well casing, the well was not pumped extensively prior to the sampling. The analytical results are consistent with a mixture of unimpaired Ogallala groundwater and the 1999 sample of water stored in the adjacent tank.
10. Soil samples from the area near Conoco Federal #2 exhibit chloride concentrations below 20 mg/kg.
11. Samples taken from the newly drilled monitor well, Mewbourne A, are in compliance with the Groundwater Quality Standards for the State of New Mexico and are typical of Ogallala groundwater that has not been perturbed by surface activities.

Based on these findings, we conclude:

A. The plugged and abandoned Conoco Federal #2 oil well is not discharging oil field-produced water to the Ogallala Formation via a casing leak.

B. The soil near Conoco Federal #2 was not and is not a source of the calcium chloride observed in the McCasland windmill well.

C. Calcium chloride and possibly other residual material exist in the water storage tank adjacent to the McCasland windmill well and appear to be the source of calcium chloride observed in the water found in this well.

D. Leakage of water from the storage tank to the Ogallala Formation causes a small zone of groundwater quality degradation.

E. Adequate pumping of the windmill should restore groundwater near the area to an acceptable quality.

F. Activities of Mewbourne did not cause the observed impairment of groundwater quality at the McCasland windmill well.

G. Activities of Mewbourne up-gradient (northwest) of monitor well Mewbourne A have not caused any impairment of groundwater quality in the Ogallala Formation.

We recommend that:

I. Mewbourne should not be required to conduct additional investigation or inquiry at this site.

II. Mewbourne should be granted the authority to plug and abandon monitor well Mewbourne A.

2 Introduction

Mewbourne operates oil wells adjacent to the well commonly known as Conoco Federal #2, which was plugged and abandoned by Mewbourne in 1974. The owner of the surface land on which Conoco Federal #2 is located is McCasland Ranch. The Federal government has leased mineral rights for the land to Mewbourne. Conoco Federal #2 is in Section 30, T20S, R39E (1980 FEL 660 FSL) in Lea County, New Mexico. Plate 1 shows the location of the well relative to Hobbs, New Mexico. Plate 2 displays the oil field road network and access to the site.

In 1989, McCasland Ranch installed a windmill-driven water supply well about 35 feet from Conoco Federal #2 (referred to hereafter as the McCasland windmill well). The cover of this report shows the well site of Conoco Federal #2 and the McCasland windmill well.

On January 21, 1998, Mr. Gary Wink of the NMOCD Hobbs Office filed a report indicating that the McCasland windmill well exhibited 12,000 ppm dissolved chloride. Mewbourne conducted an investigation and responded to NMOCD on April 4, 1998. NMOCD evaluated the data submitted by Mewbourne, conducted additional field inspections, obtained published data for the area and requested that Mewbourne perform an additional investigation (letter dated June 26, 1998). On behalf of Mewbourne, Hicks Consultants prepared a response to the June 26, 1998, letter. Our August 17, 1998, investigation plan identified the work elements proposed to investigate the groundwater quality issues near the area of Conoco Federal #2 and the McCasland windmill well (the Study Area). This field investigation of the Study Area was carried out in September 1998.

In a November 4, 1998, letter to NMOCD, Hicks Consultants summarized the data available at that time, as well as the results of the field program described in the August 17, 1998, investigation plan. This submission summarizes much of the November report. In a letter dated March 9, 1999, NMOCD required additional investigation. After several telephone conversations with Mr. Wayne Price of NMOCD, Hicks Consultants outlined an investigative field campaign to address the remaining NMOCD questions regarding the Study Area. We submitted this second investigation plan on March 9, 1999; NMOCD approved the plan on April 8, 1999. Scheduling conflicts caused a delay in completing this second field investigation, which was carried out in July and August 1999. On August 11, 1999, we summarized our progress and were granted a three-week extension for submission of the final report. This report fulfills all of the requirements placed on Mewbourne by NMOCD.

3 Pre-Investigation Review of Published Data

In order to properly design the 1998 investigation, Hicks Consultants conducted a literature search to obtain information on the geology and hydrogeology in southern Lea County, near Conoco Federal #2. We obtained well logs from the office of the State Engineer for water wells within five miles of Conoco Federal #2. We examined Mewbourne files as well as information at the Hobbs office of the NMOCD for additional information regarding drilling, production and plugging of Conoco Federal #2.

Plate 3 is a topographic map presenting the locations of Conoco Federal #2 and the nearby water supply wells. Plate 4, a groundwater map of southern Lea County, shows that the McCasland windmill well is near the boundary (shown as a dashed line) between Triassic rocks and saturated Tertiary and Quaternary rocks. West of the boundary, the Tertiary Ogallala Formation, which is the principal aquifer of the area, is unsaturated (dry). Plate 4 also presents depth to water and total depths of nearby wells. As this plate shows, wells within the area mapped as Ogallala suggest a saturated thickness (difference between depth to water and total well depth) ranging from 2 feet to 125 feet, with both extremes occurring near the boundary. The 1988 driller's log of the McCasland windmill well identifies the base of the Ogallala at 88 feet. (All relevant drilling logs are included in this report as Appendix A.)

The log for the McCasland windmill well shows anhydrite ($CaSO_4$) from 70 to 88 feet below land surface. Of nine water wells within a five-mile radius of the site, well logs show that only one other well encountered anhydrite (see Appendix A). This well is located in Section 24, T20S, R38E, approximately two miles northwest of Conoco Federal #2, and is labeled in the log as McCasland Well No. 3. In this well log, the recorded anhydrite layer lies between 54 and 58 feet.

Employing water chemistry data from Nicholsen & Clebsch (1961), Hicks Consultants looked specifically at nine oil production wells and three Ogallala water supply wells near Conoco Federal #2 (Table 1). We also examined and used the water chemistry data originally prepared by NMOCD.

We investigated available records from Conoco Federal #2 for any indications of a potential source of impairment to the surrounding aquifer. The drilling log from December 1970 refers to the use of 200 sacks of regular 2% CaCl at a depth of 1,663 feet below grade. Calcium chloride is typically used at low concentrations such as this to accelerate the curing of cement grout used in setting casing. This description of the 200 sacks of 2% calcium chloride is the only written indication that such material was used at the site.

Mewbourne plugged and abandoned the well during the latter half of February 1974. Plugs were set at depths of 6,000 feet, 4,100 feet, 3,000 feet and 1,710 feet below grade, and at the surface. There is no evidence from the abandonment record to suggest that the well casing may be leaking or otherwise impairing the surrounding aquifer.

Finally, we asked several Mewbourne employees if they had any information or recollection regarding the location of the reserve pit, drilling methods, etc. While none were present when the well was drilled or plugged in the early 1970s, several suggested that the layout of the caliche pad strongly suggested the existence of a reserve pit due north of the well. They suggested that the driller may have used a "clear water drilling mud" to drill the hole. The Mewbourne employees also stated that the water storage tank used to store water pumped from the McCasland windmill well appeared to have been formerly used for oil field operations.

4 Field Investigations

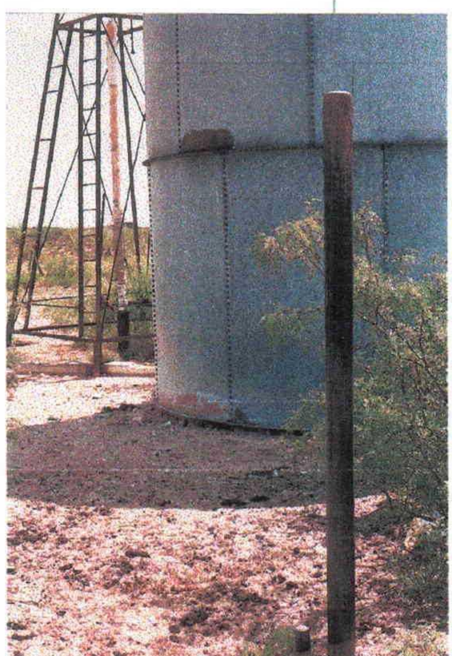
Hicks Consultants carried out two field investigations of the Study Area: a groundwater sampling in September 1998 and a monitor well drilling and sampling program in July and August 1999.

4.1 September 1998 Groundwater Sampling

On September 1, 1998, Melissa Snodgrass of Hicks Consultants examined the Study Area with Mr. Jerry Elgin of Mewbourne. Ms. Snodgrass visited the four water wells shown on Plate 3 (which include the McCasland windmill well) and collected water samples from three of them.

Assaigai Laboratories received samples from this first field program on September 2, 1998. The laboratory analyzed each sample for major cations and anions, and calculated the ion balance for all three wells. Table 2 summarizes the results from these analyses as well as previous analyses from the NMOCD. The chain of custody forms are included in this report as Appendix B; in these forms, Conoco Federal #2 is labeled Fed #2.

Figure 1: Location of McCasland windmill well relative to Conoco Federal #2, with oil well monument in foreground



MCCASLAND WINDMILL WELL: The McCasland windmill well is located 35 feet from the plugged and abandoned Conoco Federal #2 (see Figure 1). The well installation includes the water supply well, the windmill used for pumping, a water storage tank and a water trough into which the storage tank discharges. During our investigation, the water trough exhibited a thick salt crust along the water surface and feathery yellow algae along the tank surfaces. Hicks Consultants collected a water sample from the standpipe of this windmill (see Table 2 for sample results).

MEW #2 & MEW #3: The water well labeled MEW #2 on the chain of custody form is approximately two miles north of Conoco Federal #2 (also see Plate 3). Another water supply well, MEW #3, is located 1.5 miles north of Conoco Federal #2. Mr. Elgin stated that water from these two wells is used by livestock. Our field investigation showed that water troughs at both of these wells contained green algae, tadpoles and other aquatic species. The edges of the tanks contained only a thin layer of salt encrustation. Livestock were near both tanks. Because the wind during the site visit was not sufficient to cause the windmills to pump, water samples could not be collected from the wells themselves. Hicks Consultants collected a water sample from the MEW #2 water trough. No sample was taken from MEW #3.

MEW #4: The fourth water well, MEW #4, is approximately two miles northwest of Conoco Federal #2. We believe this is the well referred to in the well logs (Appendix A) as McCasland No. 3—it is within a quarter mile of the location given on the well log, and no other wells are nearby. Our investigation revealed that the water trough of this well contained some green algae; salt encrustation was considerably less than in the water trough at the McCasland windmill well, though greater than in MEW #2 and MEW #3. Site evidence suggests that livestock drink from this well. Because the windmill was not pumping during the site visit, Hicks Consultants collected a water sample from the MEW #4 water trough.

4.2 July/August 1999 Monitor Well Drilling and Soil Sampling Program

On July 29, 1999, Mr. Corky Glenn of Glenn's Water Well Service obtained water levels from the four wells shown on Plate 3. Table 3 presents the results of this survey. As Table 3 indicates, we obtained surface elevation data from the US Geologic Survey topographic map. From these data, we postulated that groundwater flowed to the southeast at Conoco Federal #2.

The March 9, 1999, investigation plan proposed one monitor well down-gradient from Conoco Federal #2 to determine the extent of water quality impairment. The presence of an extensive sand dune field south and east of Conoco Federal #2 limited access to potential drilling locations southwest (down-gradient) of Conoco Federal #2 (see Figure 2). Along the predicted southeast flow path, one feasible well location was within the original oil well pad, about 120 feet from the McCasland windmill well. The other location was more than 4,000 feet southwest, along a service road that transverses the dune field. Because we hypothesized that the source of calcium chloride may be associated with the drilling operations (e.g. a former reserve pit), drilling a potential conduit between groundwater and the potential source was not prudent. We eliminated a location on the well pad from further consideration. The second location was simply too far from the potential source area to test our hypotheses.

Figure 2: Dune field south of Conoco Federal #2 taken from McCasland windmill well, showing drill rig constructing Mewbourne A

Due to the logistical constraints of constructing a monitor well directly down-gradient, we requested a modification of our approved investigation plan (August 11, 1999). We proposed a monitor well location 100 feet south and 600 feet east of Conoco Federal #2, adjacent to a caliche service road. The NMOCD appropved the proposed modification.

Eades Well Drilling Service mobilized to the site to began drilling on August 16, 1999. A representative of McCasland Ranch was present to observe drilling activities. Drill cuttings became relatively moist (68 feet below grade), causing Eades to convert from air drilling to water drilling. Eades used about two gallons of a polymer-based drilling fluid to condition the water. Drilling stopped at 91 feet, after penetration of the Triassic Dockum Group, or "Red Beds."

As the well log shows (Appendix A), the unsaturated zone extends from ground surface to 73 feet. Light brown to reddish brown sand with minor clay and caliche characterize the unsaturated zone. The zone of saturation lies between the water table (73 feet) and the top of the "Red Beds" (Triassic Dockum Group) at 88 feet below grade. The saturated zone is dominantly sandy gravel, a typical lithology found at the base of the Ogallala Formation. We observed abundant white clay in drill cuttings from the uppermost three feet of the Dockum Group (88–91 feet below grade). At 91 feet below grade, the drilling fluid changed from clear to deep red and the cuttings showed red claystone.

After circulation of clear water from the water truck to remove cuttings, Eades completed the well with 20 feet of well screen (91–71 feet below grade) as shown in Appendix A. Eades developed the well by pumping for 35 minutes at 15–20 gpm. Produced water, which discharged to the mud pit, was completely clear and free of silt or clay after five minutes of pumping. After 13 minutes of pumping, specific conductance stabilized at 876 micro-seimens/meter (compensated for temperature). The temperature of the discharged water dropped from nearly 25 degrees C to a relatively constant 20 degrees C at the end of pumping.

We obtained groundwater samples from the development pump at the end of pumping. The McCasland Ranch representative also obtained samples. Table 2 shows the results of the analyses from Assaigai Analytical Laboratory. Appendix B contains the original laboratory reports and the chain of custody forms for this event.

The approved investigation plan also called for sampling of the McCasland windmill well and three other nearby (up-gradient) water supply wells. Because the field conductance of the newly-drilled monitor well suggested water chemistry similar to the three up-gradient wells, we elected to forego additional sampling of these three wells. We did obtain water samples from the McCasland windmill well and its associated water storage tank.

At 1:30 p.m., we switched the windmill from standby to active operation. After breaking the connection between the windmill and storage tank, we noted that water from the tank flowed back to the well casing when the windmill ceased pumping. We separated the flow pipe to permit the windmill to pump without causing additional backflow from the tank to the well casing (see Figure 3). At 4:22 p.m., we obtained a sample of the backflow discharge from the water storage tank . At or about this same time, the representative of

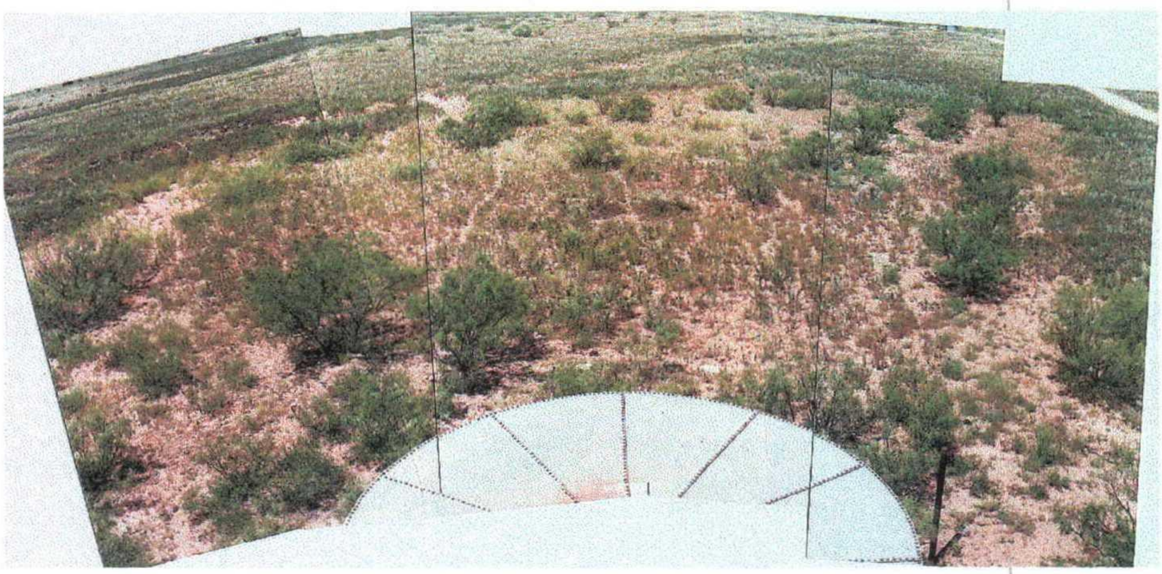
Figure 3: Photograph showing water from storage tank flowing past check valve toward windmill well

McCasland Ranch obtained a sample of the backflow and a sample from the McCasland windmill well. The windmill pumped about 20 gallons per hour during the afternoon. About 5 p.m., the windmill pumped relatively continuously, discharging about 1 gpm. We sampled the windmill discharge at 5:15 p.m. Table 2 also presents these analytical results.

To determine if past oil exploration or production activities had resulted in a spill or release of calcium chloride near Conoco Federal #2, the investigation plan required soil sampling within the suspected reserve pit and other locations where calcium chloride may have been stored/ disposed. The layout of the caliche pad relative to Conoco Federal #2 suggested that the reserve pit was north of the former oil well. Figure 4 is a photomosaic of the area north of the oil well, showing the observed changes in vegetation that suggests a former reserve pit in this location. Using a backhoe, we excavated three test holes within the suspected reserve pit and one test excavation on the caliche pad. Mewbourne employees suggested that materials might have been stored west of the well during drilling, workover or plugging operations.

Plate 5 shows the locations of the test excavations relative to Conoco Federal #2, the caliche pad and the McCasland windmill. In Test Pit #1, the backhoe encountered cured grout and one bag of hardened cement and clean, dry eolian sand. The excavation, which was about 9 feet deep, 3 feet wide and 12 feet long, encountered no evidence of drilling mud, plastic liners or salt. We did not find any material that suggested this area was used for disposal of waste. Using the backhoe, we obtained two samples from this excavation: one from the bottom of the excavation (9 feet) and one from the side of the excavation at 5 feet.

Figure 4: Photomosaic of area north of Conoco Federal #2— note rectangular shape of disturbed ground, suggesting former reserve pit



We excavated Test Pit #2 in a similar manner. The area surrounding Test Pit #2 exhibited less plant growth than the remainder of the disturbed area north of Conoco Federal #2. We hypothesized that salt disposal may have hindered plant growth. In this excavation, we encountered only clean, dry eolian sand, without any evidence of calcium chloride. We did not find any material to suggest that this area was used for disposal of waste. Using the backhoe, we obtained two samples from this excavation: one from the bottom of the excavation (9 feet) and one from the side of the excavation at 5 feet.

Along the western edge of the disturbed area, we found old wire rope and other material at the surface that suggested past disposal of exploration and production waste. However, when we excavated Test Pit #3 through this debris, we penetrated only clean, dry, eolian sand. We did not find any material that suggested this area was used for disposal of waste. Using the backhoe, we obtained two samples from this excavation: one from the bottom of the excavation (7 feet) and one from the side of the excavation at 5 feet.

On the caliche drill pad, west of Conoco Federal #2, we selected an area of limited vegetation for Test Pit #4. Here, we hypothesized that calcium chloride spills and/or disposal may have limited plant growth. Again, we encountered only clean, dry eolian sand below the caliche pad. We did not find any material to suggest that this area was used for disposal of waste. Using the backhoe, we obtained two samples from this excavation: one from the bottom of the excavation (7 feet) and one from the side of the excavation at 5 feet. Although the McCasland Ranch representative did not elect to split samples from the test excavations, he observed the entire soil sampling program.

On August 18, 1999, we mixed about 500 grams of each sample with about 500 grams of distilled water. After stirring the mixture and waiting about five minutes, we decanted the fluid and measured its specific conductance. Table 4 presents the results of this screening analysis. We submitted the four samples showing the highest conductance to the laboratory for analysis of major cations and anions. The results of the laboratory analysis are in Table 5.

For the monitor well sample, we requested analysis for volatile organic compounds—calcium, sodium, chloride, sulfate, carbonate and total dissolved solids (TDS). For samples from the McCasland windmill well, water storage tank and soil samples, we requested only the afore-mentioned cations and anions.

5 Discussion & Conclusions

5.1 Hydrogeology of the Ogallala Formation

The lithologic log of monitor well Mewbourne A demonstrates that the principal water-bearing zone in the area of Conoco Federal #2 is a coarse-grained sand and gravel unit at the base of the Ogallala Formation. This saturated, coarse-grained basal unit is typical of the Ogallala Formation. We observed no evidence of evaporites (e.g. anhydrite or gypsum), although, to the untrained eye, the white clay observed at the top of the Dockum Group (88–91 feet below land surface in Mewbourne A) resembles anhydrite. We conclude that the wells of the area tap the Ogallala Formation. We also conclude that the natural lithology of the water-bearing zone could not cause the high concentrations of calcium or chloride observed in the McCasland windmill well.

Plate 6 shows the potentiometric surface derived from August 1999 water level measurements in four windmills and in the monitor well Mewbourne A. Although the well casing elevations are not surveyed, the flat terrain permits an estimate of the well head elevation to within 2–4 feet. The relatively steep hydraulic gradient, 0.004, permits an accurate estimate of the direction of groundwater flow, despite the margin of error associated with casing elevations. We conclude that groundwater flows from the northwest to the southeast in the area near Conoco Federal #2.

5.2 Groundwater and Storage Tank Chemistry

According to analysis of samples taken during Hicks Consultants' September 1998 sampling event, the McCasland windmill well near Conoco Federal #2 exhibited a laboratory conductivity of 7,800 µmhos/cm, predominately calcium and chloride. The water from MEW #2 showed a conductivity of 1,160 µmhos/cm. Carbonate was the highest anion concentration, at 275 µg/l; the cations calcium and sodium were each approximately 100 µg/l. In MEW #4, calcium and sulfate were the dominant cations and anions, respectively. The specific conductance of MEW #4 was 3,700 µmhos/cm.

Analytical results from the August 1999 investigation of the McCasland windmill well differ from the results of the August 1998 sampling event, as well as from the results obtained by Mewbourne in its March 1998 investigation (see Table 2). Although 1999 analyses show the water to be still dominated by calcium chloride, the total dissolved solids analysis is 50% less than the results from March 1998. The concentration of other cations and anions in analyses from the 1998 investigations are also significantly higher than the result from the 1999 analysis.

However, the August 1999 laboratory analysis of the McCasland water storage tank (McCasland Tank in Table 1) is very similar to the 1998 analyses of the McCasland windmill well. The calcium, chloride, sodium and sulfate concentrations are about 25% higher in the 1999 analysis of the water storage tank than in the 1998 analyses of the windmill well. In contrast, the sulfate and magnesium concentrations of the water storage tank (1999) are essentially the same as the 1998 analyses of the windmill well.

We conclude that the 1998 samples from the McCasland windmill well were a mixture of water from the Ogallala and backflow from the well's water storage tank. We further conclude that:

- the water storage tank used at the McCasland windmill well contains calcium chloride and other residual material from its former use as an oil field tank;
- water pumped from the Ogallala Formation into the storage tank dissolves the calcium chloride and residual material that remains in the storage tank;
- the resultant calcium chloride water in the water storage tank flows into the Ogallala Formation via a leaking check valve when the windmill is not pumping;
- four hours of pumping the McCasland windmill removed some of the backflow from the storage tank and obtained some water from the Ogallala Formation; and
- the residual material in the storage tank does not contain sulfate or magnesium.

The newly drilled monitor well, Mewbourne A, exhibits chemistry similar to the up-gradient Mew #2 (see Table 2). Mewbourne A and Mew #2 are the only wells at the Study Area that are within the groundwater concentration limits established by the New Mexico Water Quality Control Commission. We conclude that Mewbourne A and Mew #2 represent the ambient water quality conditions of the Ogallala Formation and have not been perturbed by surface activities.

Hicks Consultants compared the water chemistry of the water wells at the Study Area with produced water from nine oil production wells and water from three Ogallala water supply wells in southern Lea County. The locations and ion concentrations for all these wells are displayed in Table 2. Plate 7 plots all the wells, along with the results from the 1971 sampling of Conoco Federal #1, a nearby oil well, and results from the 1998 and 1999 sampling events, on a trilinear diagram.

As Plate 7 shows, all oil field-produced waters plot very closely, with high levels of sodium and chloride and high total dissolved solids (TDS). The Ogallala water supply wells show some variation, but are generally in the center of the diamond-shaped diagram (see Figure 5), with balanced concentrations of all ions and a significantly lower TDS concentration (see Table 2). The 1998 samples from the McCasland windmill well plots apart from the oil field produced water and the Ogallala water supply wells due to the dominance of calcium (Ca) and chloride (Cl). MEW #2 and Mewbourne A plot adjacent to the Ogallala wells. MEW #4 also plots as calcium chloride water, but with a higher percentage of sodium (Na) than the McCasland windmill well. The McCasland water storage tank plots near the 1998 McCasland windmill well samples. The 1999 analysis of the McCasland windmill well plots between the Ogallala water and the McCasland water storage tank.

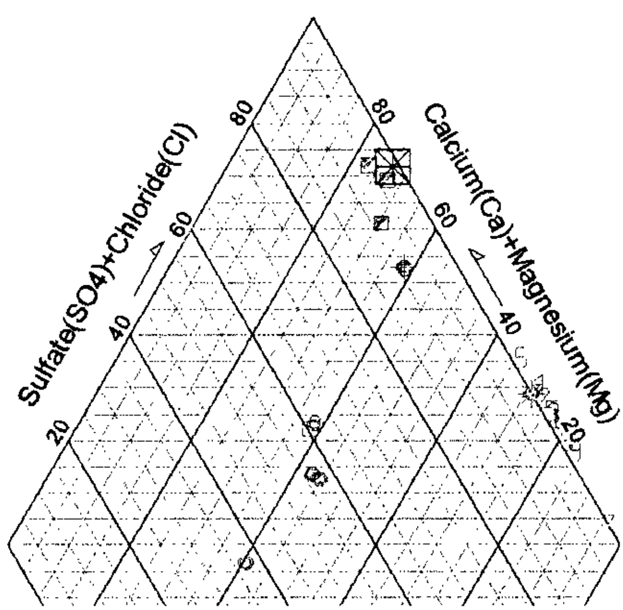


Figure 5: Detail of trilinear diagram presented in Plate 7, emphasizing hydrochemical differences

According to *Groundwater Hydrology* (D. Todd, Wiley 1980):

> *Simple mixtures of two source waters can be identified; for example, an analysis of any mixture of two waters will plot on a straight line AB on the diagram, where A and B are the positions of the analyses of the two component waters.*

Ogallala groundwater impaired by sodium chloride-rich produced water from a casing leak would plot between the Ogallala and sodium chloride groupings. As Figure 5 illustrates, the McCasland windmill well does not plot on a line between these two groupings. We conclude that the observed impairment of water quality at the McCasland windmill well is not the result of a casing leak or other release of oil field-produced water. The evidence presented in Plate 7 and Figure 5 further supports our earlier conclusion that the water from the McCasland windmill well is a mixture of Ogallala water (such as Mew #2 or Mewbourne A) and calcium chloride water created from the McCasland water storage tank. We conclude that inadequate prepresentative urging of the McCasland windmill well and backflow from the storage tank caused the 1998 well analyses to plot adjacent to the storage tank (Figure 5).

5.3 Lithology and Chemistry of the Soil Zone at Conoco Federal #2 Well Pad

Despite the observed difference between the vegetation due north of Conoco Federal #2 and the surrounding countryside (see Figure 4), there was no evidence of drilling mud and/or oil field waste. Obviously, the area north of Conoco Federal #2 was disturbed by oil field operations and minor amounts of debris (cement, wire rope, etc) placed in the pit. The chemical analyses of soil, which show chloride values below 20 mg/kg, do not suggest disposal of any material such as calcium chloride. We conclude that the area north of Conoco Federal #2 was a reserve pit. We further conclude that:

- disposal of bentonite drilling mud did not occur in the reserve pit;
- disposal of calcium chloride did not occur in the reserve pit; and
- soil near Conoco Federal #2 is not the source of the calcium chloride observed in the McCasland windmill well.

5.4 Recommendations

I. Mewbourne should not be required to conduct additional investigation or inquiry at this site.

II. Mewbourne should be granted the authority to plug and abandon monitor well Mewbourne A.

TABLES

Table 1
Ion concentrations and percentages for wells near Study Area

Concentrations in equivalents per million (ppm for TDS)

Well ID	1	2	3	4	5	6	7	8	9	Con.Fed.#1,1971
Location	22.37/22.38	21,22.37	21.37	21.37/22.38	21.37	21.38	20.37,38	21.37,38	20.38.27,28	20.39.30
Ca+2	568.9	473.1	80.49	379.98	438.88	261.47	14.97	168.4	349.3	359
Mg +2			40.95	193.75		207.8				330
Na/K +1	2261	1521.8	557.24	1988.91	1600	1343.53	434.8	847.86	2065.3	2555
HCO3 -1	6.23	2		3.2	2.39		11.64	12.19	8.13	4
SO4 -2	39.56	39.35	52.78	34.49	24.36	43.3	66.6	35.16	29.19	35
Cl -1	2904.6	2180.1	609.1	2774.7	2180.1	1748.4	338.4	1249.9	2929.9	3201
TDS	209000	149140	39440	147033	146900	93400	37000	81208	166800	
Total Cations	2829.9	1994.9	678.68	2562.64	2038.88	1812.8	449.77	1016.26	2414.6	3244
Total Anions	2950.39	2221.45	661.88	2812.39	2206.85	1791.7	416.64	1297.25	2967.22	3240
Average	2890.145	2108.175	670.28	2687.515	2122.865	1802.25	433.205	1156.755	2690.91	3242
% Ca+2	20%	24%	12%	15%	22%	14%	3%	17%	14%	11%
% Mg +2	0%	0%	6%	8%	0%	11%	0%	0%	0%	10%
% Na/K +1	80%	76%	82%	78%	78%	74%	97%	83%	86%	79%
% HCO3 -1	0%	0%	0%	0%	0%	0%	3%	1%	0%	0%
% SO4 -2	1%	2%	8%	1%	1%	2%	16%	3%	1%	1%
% Cl -1	98%	98%	92%	99%	99%	98%	81%	96%	99%	99%

Ogallala Wells

Well ID	A	B	C
Location	19.37.4.110	21.37.33.110	21.37.33.233
Ca+2	3.96	2.25	2
Mg +2		2.06	1.64
Na/K +1	3.09	4.07	4.35
HCO3 -1	5.03	3.81	4.05
SO4 -2	1.12	2.25	2.02
Cl -1	0.9	1.92	1.66
TDS	383	543	445
Total Cations	7.05	8.38	7.99
Total Anions	7.05	7.98	7.73
Average	7.05	8.18	7.86
% Ca+2	56%	27%	25%
% Mg +2	0%	25%	21%
% Na/K +1	44%	49%	54%
% HCO3 -1	71%	48%	52%
% SO4 -2	16%	28%	26%
% Cl -1	13%	24%	21%

Table 2
McCasland windmill well analytical results

Lab ID			Mew #2	Mew #4	McCasland WM	McCasland WM	McCasland WM	McCasland Tank	Mewbourne A
Date			9/1/98	9/1/98	3/31/98	9/1/98	8/17/99	8/17/99	8/17/99
Ca	µg/l		99.3	310	700	749	411	916	86.3
Fe	µg/l		0.6	0.6		19.9	1.93	0.27	nd
Mg	µg/l		18.9	52.8	90	73.9	48.4	87.4	15
K	µg/l		17	15.5	7.4	8.3	6.2	9.4	4
Si	µg/l		23.7	22		21.8			
Na	µg/l		103	275	285	373	244	447	76.5
Zn	µg/l		ND	ND		3.8			
Cl	µg/l		114	453	1771	1930	1130	2450	121
Fl	µg/l		0.9	0.6		ND	nd	nd	nd
Nitrate	µg/l		0.5	0.5	3	1	1.6	2.2	3
Nitrite	µg/l		ND	ND		ND	nd	nd	nd
Ortho. P	µg/l		ND	1.9		ND			
Sulfate	µg/l		127	775	108	112	84.3	124	74.9
HCO3	µg/l		275	172	171	117	186	55.4	198
Conductivity	µmhos/cm		1160	3700		7800	3960	7260	891
TDS					4113		2060	4270	547
BTEX									nd
Milliequivalents per liter									
	Conversion Factor								
Ca+2	0.0499		4.96	15.47	34.93	37.38	20.51	45.71	4.31
Mg +2	0.08229		1.56	4.34	7.41	6.08	3.98	7.19	1.23
Na +K	0.0435	0.02558	4.92	12.36	12.59	16.44	10.77	19.68	3.43
HCO3 -1	0.01		2.75	1.72	1.71	1.17	1.86	0.55	1.98
SO4 -2	0.02082		2.64	16.14	2.25	2.33	1.76	2.58	1.56
Cl -1	0.02821		3.22	12.78	49.96	54.45	31.88	69.11	3.41
Total Cations			11.43	32.17	54.92	59.89	35.26	72.59	8.97
Total Anions			8.61	30.63	53.92	57.95	35.49	72.25	6.95
% Ca+2			43%	48%	64%	62%	58%	63%	48%
% Mg +2			14%	14%	13%	10%	11%	10%	14%
% Na + K			43%	38%	23%	27%	31%	27%	38%
% HCO3 -1			32%	6%	3%	2%	5%	1%	28%
% SO4 -2			31%	53%	4%	4%	5%	4%	22%
% Cl -1			37%	42%	93%	94%	90%	96%	49%

Table 3
Field measurements for Mewbourne oil project

Well Name on Plate 4	Ground Elevation	Distance between ground and measuring point	Depth to Groundwater	Groundwater Elevation
McCasland Windmill	3558	1	78	3481
Mew #2	3545	1	55.5	3490.5
Mew #3	3540	1.5	57	3484.5
Mew #4	3572	1	58	3515
Mewbourne A	3553	1	72.99	3481.01

Table 4
Chemical analyses of soil at Conoco Federal #2

	Chloride	Fluoride	Sulfate	Calcium	Iron	Mg	K	Sodium
Test Pit #1, 6 feet deep	5.1	nd	23.8	2880	1390	1470	292	nd
Test Pit #2, 9 feet deep	6.2	1.9	31.1	413	2250	348	428	106
Test Pit #3, 7 feet deep	2.1	nd	9.8	257	1270	150	238	nd
Test Pit #4, 7 feet deep	15.4	nd	11.7	1530	1740	242	338	62.7

Table 5
Soil conductance at Conoco Federal #2

Sample Location	Depth	Conductivity (uS/cm)	Notes
Test Pit #1	5 ft	18.1	Submitted to Laboratory
	9 ft	6.6	
Test Pit #2	5 ft	13.5	
	9 ft	20.7	Submitted to Laboratory
Test Pit #3	5 ft	13	
	7 ft	18.2	Submitted to Laboratory
Test Pit #4	5 ft	13.4	
	7 ft	28	Submitted to Laboratory
Distilled Water	NA	3.1	

PLATES

Plate 1 Location Map

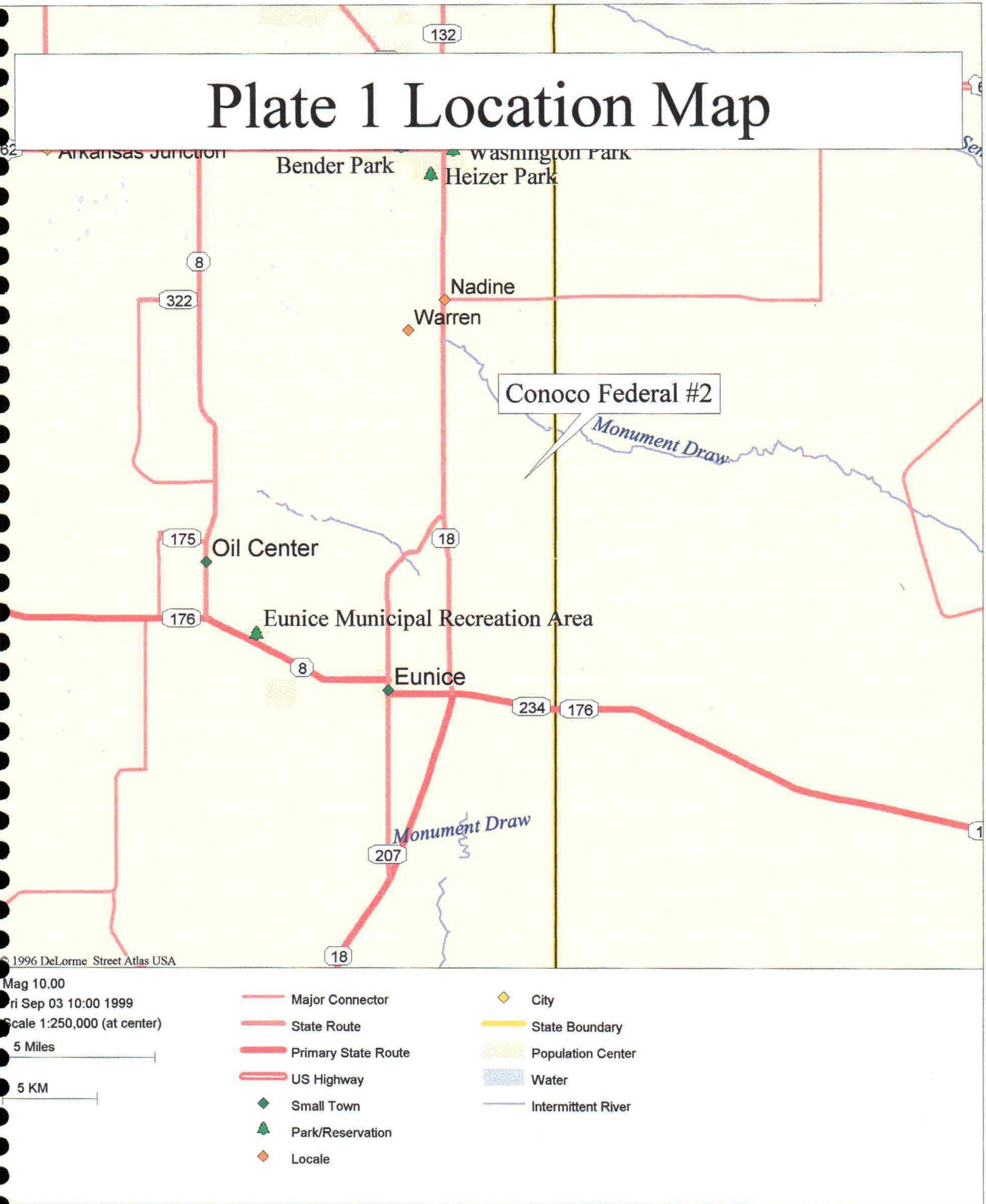
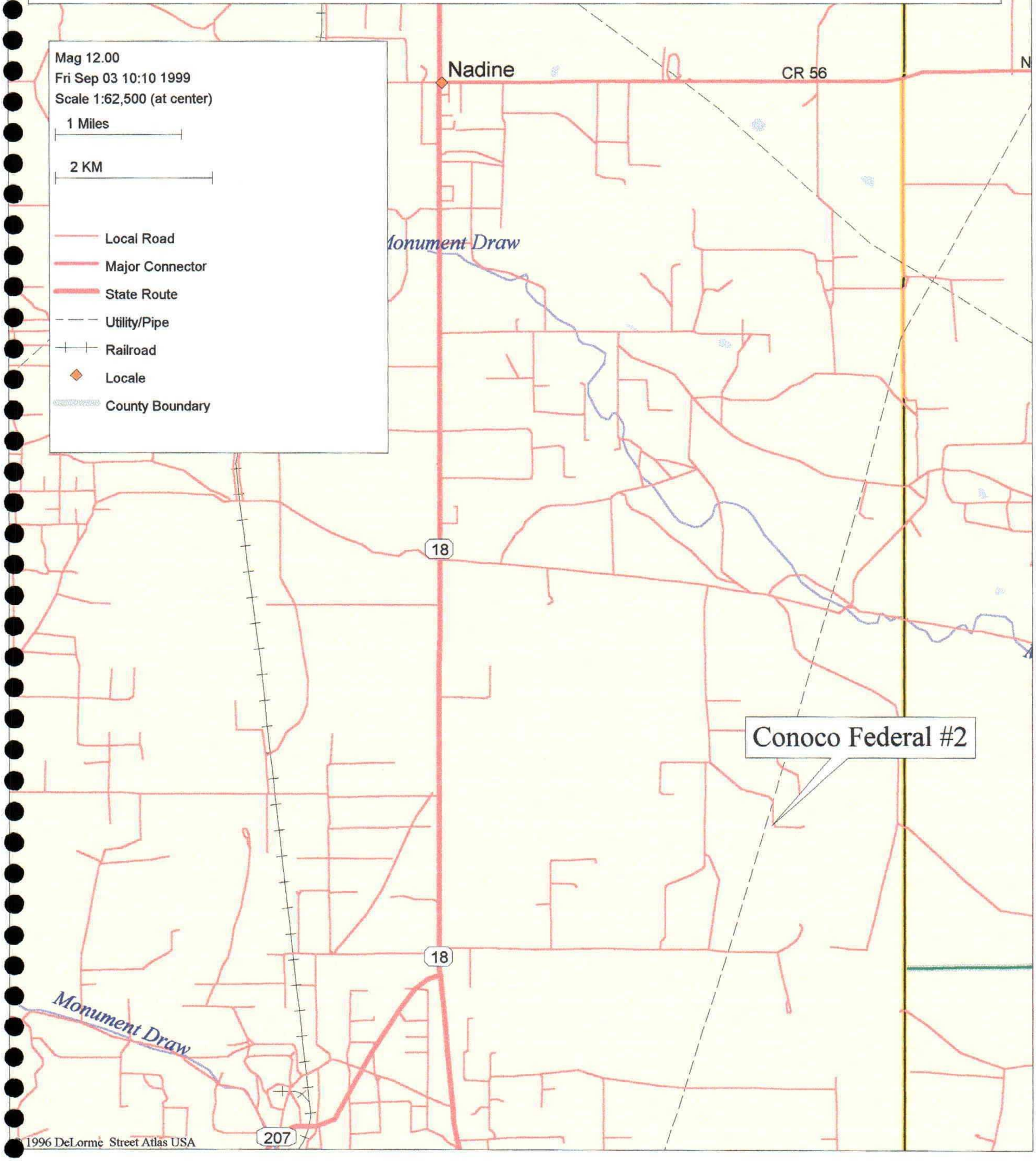
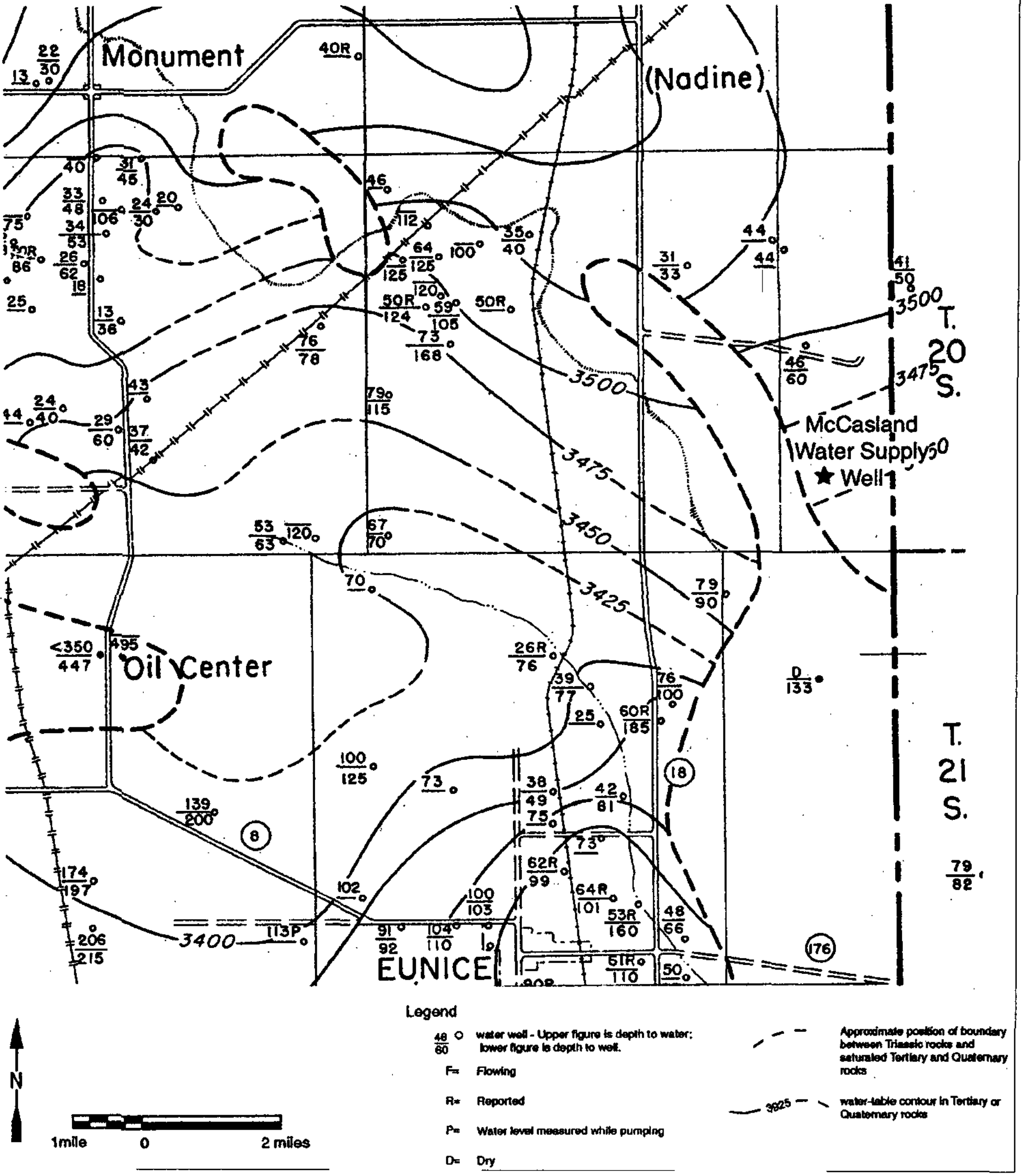


Plate 2 Access to Site

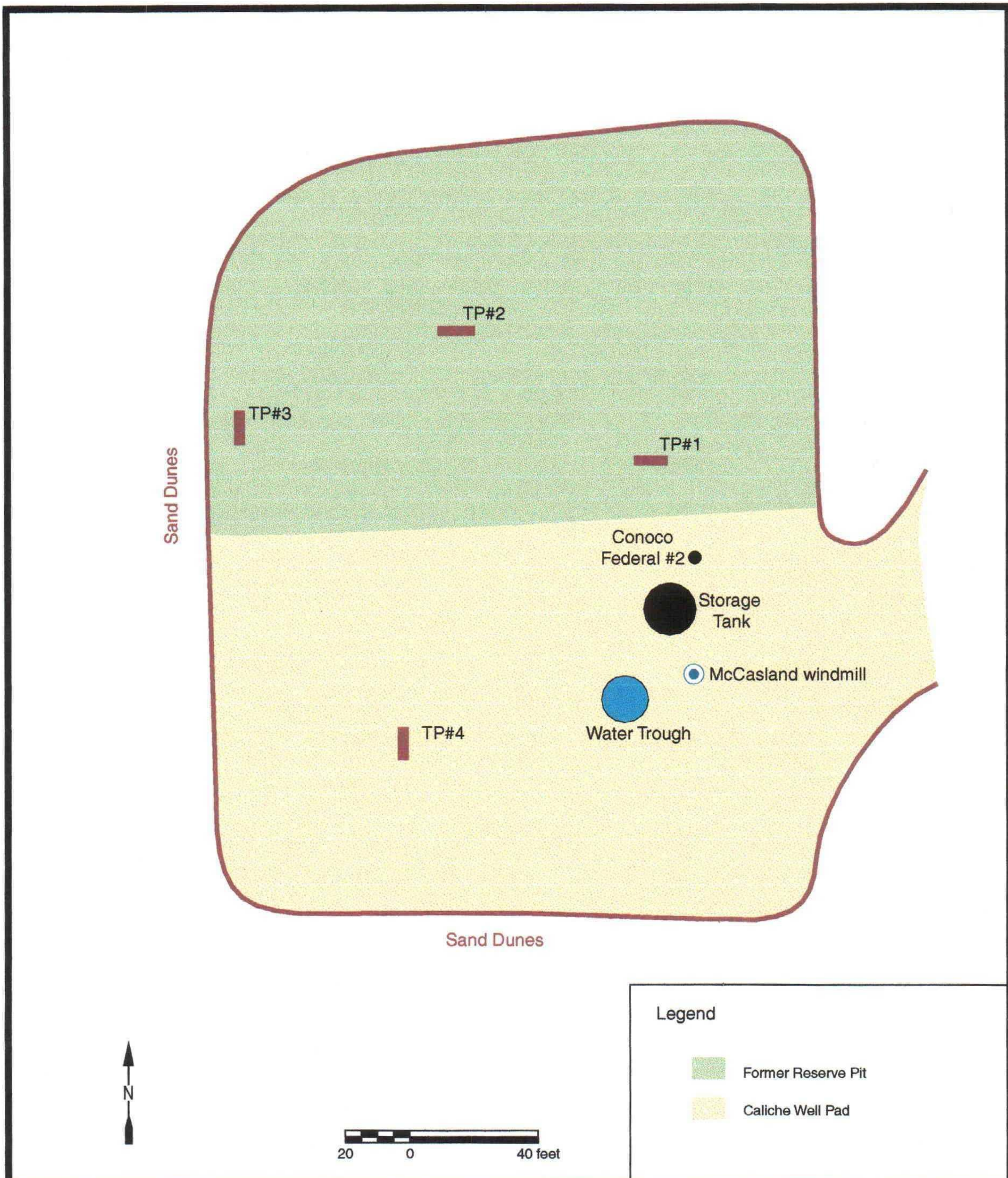


Map source: USGS Hobbs SE, Tex.- N.Mex. 7.5 minute quadrangle map

R.T. HICKS CONSULTANTS, LTD. 4665 Indian School Road NE Suite 106 Albuquerque, NM 87110 505.266.5004 Fax: 505.266.7738	Mewbourne Oil	Plate 3
	Topographic Map	August, 1999



R.T. HICKS CONSULTANTS, LTD.	Mewbourne Oil	Plate 4
4665 Indian School Road NE Suite 106 Albuquerque, NM 87110 505.266.5004 Fax: 505.266.7738	Groundwater Map of Southern Lea County	August, 1999

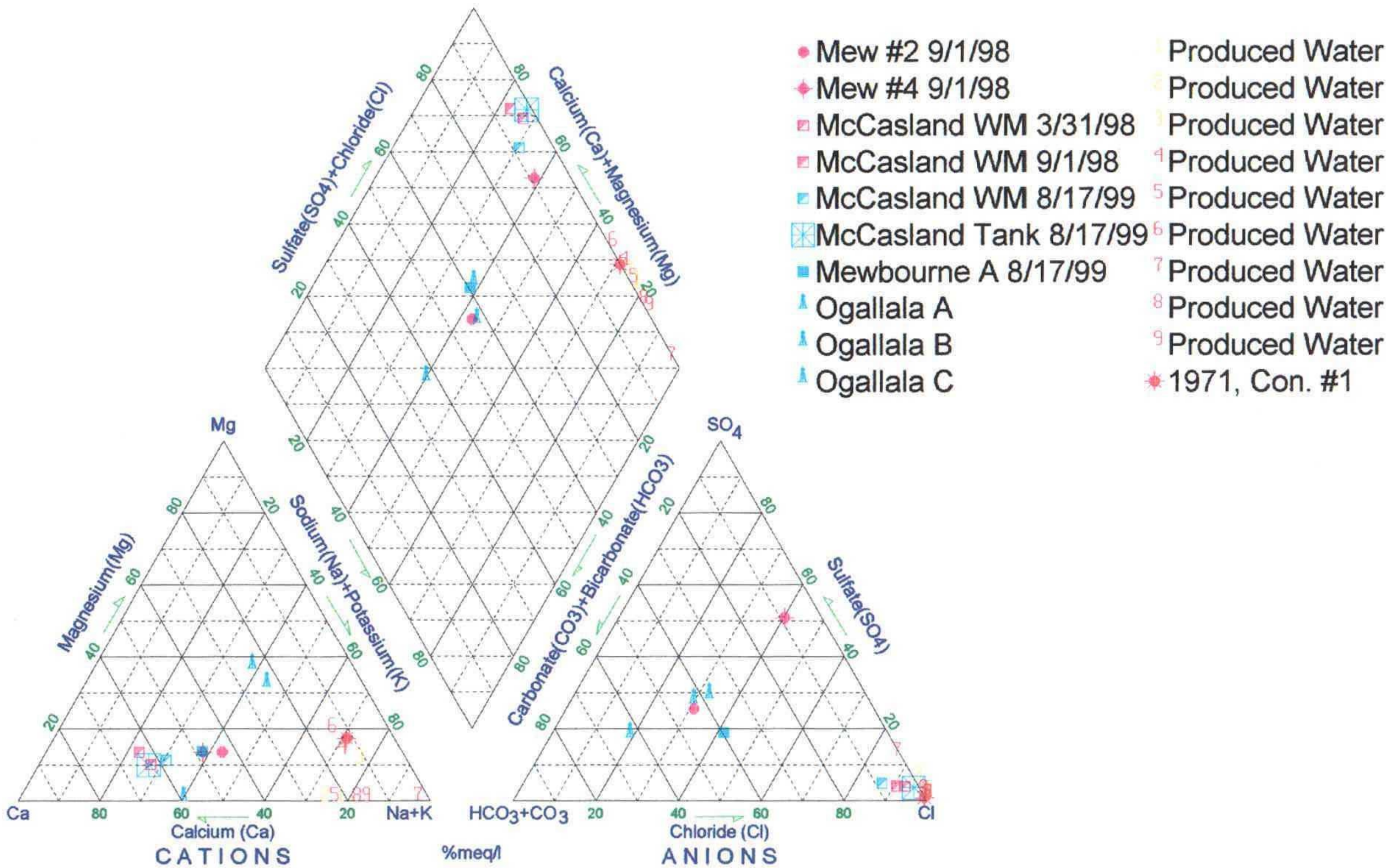


R.T. HICKS CONSULTANTS, LTD.
4665 Indian School Road NE Suite 106 Albuquerque, NM 87110
505.266.5004 Fax: 505.266.7738

Mewbourne Oil	Plate 5
Detailed Site Map Conoco Federal #2	August, 1999

Plate 7

Piper Diagram of Ogallala Water and Oil Field Brine



APPENDIX A

Well Drilling Logs

Revised June 1972

STATE ENGINEER OFFICE

WELL RECORD

Section 1. GENERAL INFORMATION

(A) Owner of well: Dallas McCasland   Owner's Well No. 2
Street or Post Office Address: P.O. Box 206
City and State: Eunice, NM 88231

Well was drilled under Permit No. L-10,044 and is located in the:

a. ____ ¼ NE ¼ NE (SW¼) ¼ SE ¼ of Section 30 Township 20S Range 39E N.M.P.M.

b. Tract No. ____ of Map No. ____ of the ____

c. Lot No. ____ of Block No. ____ of the ____
Subdivision, recorded in Lea County.

d. X= ____ feet, Y= ____ feet, N.M. Coordinate System ____ Zone in the ____ Grant.

(B) Drilling Contractor: Dallas McCasland   License No. WD 1196

Address: P.O. Box 206, Eunice, NM 88231

Drilling Began 12-16-88   Completed 12-17-88   Type tools rotary   Size of hole 7 7/8 in.

Elevation of land surface or ____ at well is ____ ft. Total depth of well 90 ft.

Completed well is [X] shallow [ ] artesian.   Depth to water upon completion of well 40 ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

Depth in Feet		Thickness in Feet	Description of Water-Bearing Formation	Estimated Yield (gallons per minute)
From	To			
58	70	12	Gray sand	5

Section 3. RECORD OF CASING

Diameter (inches)	Pounds per foot	Threads per in.	Depth in Feet		Length (feet)	Type of Shoe	Perforations	
			Top	Bottom			From	To
5" ID	2.4	PVC	0	90	?20	None	50	90

Section 4. RECORD OF MUDDING AND CEMENTING

Depth in Feet		Hole Diameter	Sacks of Mud	Cubic Feet of Cement	Method of Placement
From	To				
					None

Section 5. PLUGGING RECORD

Plugging Contractor ____
Address ____
Plugging Method ____
Date Well Plugged ____
Plugging approved by:

____
State Engineer Representative

No.	Depth in Feet		Cubic Feet of Cement
	Top	Bottom	
1			
2			
3			
4			

FOR USE OF STATE ENGINEER ONLY

Date Received January 9, 1989

Quad ____ FWL ____ FSL ____

File No. L-10,044 #2   Use EXP.   Location No. 20.39.30.430
1980' FEL & 660' FSL

(THIS IS NOW STOCK WELL NO. L-10,056)

[illegible]

Section 6. LOG OF HOLE

Depth in Feet		Thickness in Feet	Color and Type of Material Encountered
From	To		
Surface	15	15	Sand
15	25	10	Caliche
25	45	15	Broken Anhydrite
45	58	13	Hard Anhydrite with gray lime
58	70	12	Gray sand
70	88	12	Anhydrite
88	90	2	Red Bed

Section 7. REMARKS AND ADDITIONAL INFORMATION

JAN 9 8 30 AM '89

STATE ENGINEER ROSWELL, NM

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

Driller

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the appropriate district office of the State Engineer. All r s, except Section 5, s' answered as completely and accurate' ossible whe any well is drilled, repaired or deepened. this form is used as a ecord, only Section 1(a) and Section d be comp

Revised June 1972

.NGINEER OFFICE

WELL RECORD

Section 1. GENERAL INFORMATION

(A) Owner of well Dallas McCasland Owner's Well No. 3
Street or Post Office Address P.O. Box 206
City and State Eunice, NM 88231

Well was drilled under Permit No. L-10,044 and is located in the:

a. ____ ¼ ~~NW~~ SW¼ ¼ NW ¼ NW ¼ of Section 24 Township 20S Range 38E N.M.P.M.

b. Tract No. ____ of Map No. ____ of the ____

c. Lot No. ____ of Block No. ____ of the ____
Subdivision, recorded in ____ County.

d. X= ____ feet, Y= ____ feet, N.M. Coordinate System ____ Zone in the ____ Grant.

(B) Drilling Contractor Dallas McCasland License No. WD 1196

Address P.O. Box 206, Eunice, NM 88231

Drilling Began 12-28-88 Completed 12-29-88 Type tools rotary Size of hole 6¾ in.

Elevation of land surface or ____ at well is ____ ft. Total depth of well 58 ft.

Completed well is ☐ shallow ☐ artesian. Depth to water upon completion of well ____ ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

Depth in Feet		Thickness in Feet	Description of Water-Bearing Formation	Estimated Yield (gallons per minute)
From	To			
46	54	8	Gray sand	3

Section 3. RECORD OF CASING

Diameter (inches)	Pounds per foot	Threads per in.	Depth in Feet		Length (feet)	Type of Shoe	Perforations	
			Top	Bottom			From	To
4½" ID	2.0	PVC			20'	none	38	56

Section 4. RECORD OF MUDDING AND CEMENTING

Depth in Feet		Hole Diameter	Sacks of Mud	Cubic Feet of Cement	Method of Placement
From	To				
					None

Section 5. PLUGGING RECORD

Plugging Contractor ____
Address ____
Plugging Method ____
Date Well Plugged ____
Plugging approved by:

____
State Engineer Representative

No.	Depth in Feet		Cubic Feet of Cement
	Top	Bottom	
1			
2			
3			
4			

FOR USE OF STATE ENGINEER ONLY

Date Received January 9, 1989

Quad ____ FWL ____ FSL ____

File No. L-10,044 #3 Use EXP. Location No. 20.38.24.11333

(THIS IS NOW STOCK WELL NO. L-10,057)

Section 6. LOG OF HOLE

Depth in Feet		Thickness in Feet	Color and Type of Material Encountered
From	To		
0	5	5	Red clay
5	15	10	Caliche
15	46	21	Anhydrite
46	54	8	Gray sand
54	58	4	Anhydrite
58			Red bed

Section 7. REMARKS AND ADDITIONAL INFORMATION

This well was drilled 600' north from well #1.

JAN 9 8 30 AM '89

STATE ENGINEER ROSWELL NM

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

Driller

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the appropriate district office of the State Engineer. All s, except Section 5, answered as completely and accurate ossible wh well is drilled, repaired or deepened . this form is used as a ecord, only Section 1(a) and Section he comp

Form WR-23 FIELD ENGR. LOG STATE ENGINEER OFFICE

WELL RECORD

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the nearest district office of the State Engineer. All sections, except Section 5, shall be answered as completely and accurately as possible when any well is drilled, repaired or deepened. When this form is used as a plugging record, only Section 1A and Section 5 need be completed.

Section 1

	716	FEL	
	1633	FNL	

(Plat of 640 acres)

(A) Owner of well ANNA L. FOSTER

Street and Number STAR Rt. A

City HOBBS State N.M.

Well was drilled under Permit No. L-3519 and is located in the E½ ¼ NE¼ ¼ of Section 31 Twp. 19S Rge. 39E

(B) Drilling Contractor M. L. Fulling... License No. WD124

Street and Number 317 N. Fowler

City HOBBS State N.M.

Drilling was commenced 3-23 1960

Drilling was completed 3-26 1960

Elevation at top of casing in feet above sea level ______ Total depth of well 133 ft.

State whether well is shallow or artesian SHALLOW Depth to water upon completion 60

Section 2 PRINCIPAL WATER-BEARING STRATA

No.	Depth in Feet From	Depth in Feet To	Thickness in Feet	Description of Water-Bearing Formation
1	60	80	20	1st water sand
2	100	131	31	2nd water sand
3				
4				
5				

Section 3 RECORD OF CASING

Dia in.	Pounds ft.	Threads in	Depth Top	Depth Bottom	Feet	Type Shoe	Perforations From	Perforations To
16		Welded	0	133	133	No Shoe	60	133

Section 4 RECORD OF MUDDING AND CEMENTING

Depth in Feet From	Depth in Feet To	Diameter Hole in in.	Tons Clay	No. Sacks of Cement	Methods Used

Section 5 PLUGGING RECORD

Name of Plugging Contractor ______ License No. ______

Street and Number ______ City ______ State ______

Tons of Clay used ______ Tons of Roughage used ______ Type of roughage ______

Plugging method used ______ Date Plugged ______ 19__

Plugging approved by:

______ Basin Supervisor

Cement Plugs were placed as follows:

No.	Depth of Plug From	Depth of Plug To	No. of Sacks Used

FOR USE OF STATE ENGINEER ONLY

Date Received 1960 APR 11 AM 9:05 STATE ENGINEER OFFICE

File No. L-3519 Use Irr. Location No. 19.39.31.200

22342

Section 8 LOG OF WELL

Depth in Feet From	Depth in Feet To	Thickness in Feet	Color	Type of Material Encountered
0	8	8		Sub Soil
8	28	20		Cleachie
28	53	25		Sandy Clay
53	60	7		Hard Rock
60	80	20		1st water Sand
80	95	15		Sandy Clay
95	100	5		Hard Rock
100	131	31		2nd water
131	133	2		Red Bed

L S Elev 3587'
Depth to K Tr 131'
Elev of K Tr 3456'

Loc. No. 19. 39. 31. 22342
Hydro. Survey Field Check X

SOURCE OF ALTITUDE GIVEN
Interpolated from Topo. Sheet X
Determined by Inst. Leveling
Other

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described well.

M. L. Fulligim
Well Driller

Revised
June 1972

STATE ENGINEER OFFICE
WELL RECORD

Section 1. GENERAL INFORMATION

(A) Owner of well Jayson Ussery Owner's Well No. ______

Street or Post Office Address E Nadine Rd.

City and State Hobbs, New Mexico 88240

Well was drilled under Permit No. L-10,557 and is located in the :

a. ______ 1/4 ______ 1/2 N 1/2 ______ 1/4 of Section 31 Township 19S

Range 39E N.M.P.M.

b. Tract No. ______ of Map No, ______ of the ______

c. Lot No. ______ of block No. ______ of the ______

Subdivision,recorded in ______ County.

d. X= ______ feet,Y= ______ feet,N.M. Coordinate System ______

Zone inthe ______ Grant

(B) Drilling Contractor Alan G. Eades License No. WD-1044

Address 1200 E. Bender Blvd., Hobbs, New Mexico 88240

Drilling Began 5-4-96 Completed 5-4-96 Type Tools Rotary Size of hole 7 7/8 in.

Elevation of land surface or ______ at well is ______ ft. Total depth of well 135 ft.

Completed well is ☒ shallow ☐ artesian Depth to water upon completion of well 75 ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

Depth in Feet From	Depth in Feet To	Thickness in Feet	Description of Water-Bearing Formation	Estimated Yield (gallons per minute)
75	135	60	Water Sand with Sandstone Stringers	35

Section 3. RECORD OF CASING

Diameter (INCHES)	Pounds per foot	Threads per in.	Depth in Feet Top	Depth in Feet Bottom	Length (feet)	Type of Shoe	Perforations From	Perforations To
5 3/4	160psi				135		115	135

Section 4. RECORD OF MUDDING AND CEMENTING

Depth in Feet From	Depth in Feet To	Hole Diameter	Sacks of Mud	Cubic Feet of Cement	Method of Placement

Section 5. PLUGGING RECORD

Plugging Contractor ______

Address ______

Plugging Method ______

Date Well Plugged ______

Plugging approved by:

______
State Engineer Representative

No.	Depth in Feet Top	Depth in Feet Bottom	Cubic Feet of Cement
1			
2			
3			
4			

FOR USE OF STATE ENGINEER ONLY

Date Received 06/14/96

Quad ______ FWL ______ FSL ______

File No. L-10,557 Use Domestic Location No. 19.39.31.21121

Section 6. LOG OF HOLE

Depth in Feet From	Depth in Feet To	Thickness in Feet	Color and Type of Material Encountered
0	1	1	Top Soil
1	32	31	Caliche
32	34	2	Sandstone
34	73	39	Sand & Sandstone Stringers
73	75	2	Sandstone
75	135	60	Water Sand with Sandstone Stringers
			Jayson Ussery

Section 7. REMARKS AND ADDITIONAL INFORMATION

STATE ENGINEER
ROSWELL NEW MEXICO
'96 JUN 14 AM 10 58

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

Alan Eades by Andrea Kos

Driller

INSTRUCTIONS:

This form should be executed in triplicate, preferably typewritten, and submitted to the appropriate district office of the State Engineer. All sections, except Section 5, shall be answered as completely and accurately as possible when any well is drilled, repaired or deepened. When this form is used as a plugging record, only Section 1(a) and Section 5 need be completed.

APPENDIX B

Laboratory Reports and Chain of Custody Forms

T-105 P.11/11 F-548

ASSAIGAI ANALYTICAL LABORATORIES, INC.

Chain of Custody Record

Lab job no.: 9408178 Date 8/16/94

Page 1 of 1

7300 JEFFERSON, N.E.
ALBUQUERQUE, NEW MEXICO 87109
(505) 345-8964

3332 WEDGEWOOD
EL PASO, TEXAS 79925
(915) 593-6000

127 EASTGATE DRIVE, 212-C
LOS ALAMOS, NEW MEXICO 87544
(505) 662-2558

Client R.T. Hicks Consulting
Address 4665 Indian Sch NE
City / State / Zip Albuquerque NM
Project Name / Number Mewbourne
Contract / Purchase Order / Quote

Project Manager / Contact R. Hicks
Telephone No. 266-5004
Fax No. 266-7738
Samplers: (Signature) Randall H

Lab Sample Number	Field Sample Number / Location	Date	Time	Sample Type	Type / Size of Container	Preservation Temp.	Chemical	No. of Containers	Cations/Anions	TDS	BTEX + NAPH							Remarks
01A	CF2 TP4 7ft	8/16	1610	Soil	GLASS			1	*									
02A	CF2 TP3 7ft	8/16	1620	Soil	"			1	*									
03A	CF2 TP1 6ft	8/16	1300	Soil	"			1	X									AS SOON AS
4A,B,C	McCALAND WINDMILL	8/16	1415	W	Plastic			3	*	*	[illegible]							POSSIBLE
5A,B,C,D	MEWBOURNE A	8/16	1535	W	Plastic + VOAs			5	*	*	*							W/O EXTRA
6A,B,C	McCALAND W.M TANK	8/16	1422	W	Plastic			3	*	*	*							CHARGE (BUT)
07A	CF2 TP2 9'	8/16	1810	Soil	Glass			1	*									MUST BE DONE
																		BEFORE 8/31
																		RTHC 91
																		L-8 / FC 16 2R
																		8/27/99

Relinquished by:	Date / Time	Received by:	Relinquished by:	Date / Time	Received by:
Signature Randall H Printed Randall Hick Company RTHC Reason Analytical Lab	Date 8/17/94 Time 16:10	Signature [illegible] Printed [illegible] Company AAL Reason Analysis	Signature Printed Company Reason	Date Time	Signature Printed Company Reason

Method of Shipment:
Shipment No.
Special instructions:

Comments:

After analysis, samples are to be:
- ☐ Disposed of (additional fee)
- ☐ Stored (30 days max)
- ☐ Stored over 30 days (additional fee)
- ☐ Returned to customer

COURIER

FROM-ASSAIGAI LAB

SEP 02 '99 12:10 TO-RTHICKS

ASSAIGAI ANALYTICAL LABORATORIES, INC.
7300 Jefferson, NE • Albuquerque, New Mexico 87109 • (505) 345-8964 • FAX (505) 345-7259
3332 Wedgewood Dr., Suite N • El Paso, Texas 79925 • (915) 593-6000 • FAX (915) 593-7820
127 Eastgate Drive, 212-C • Los Alamos, New Mexico 87544 • (505) 662-2558

Explanation of codes

B	analyte detected in Method Blank
E	result is estimated
H	analyzed out of hold time
N	tentatively identified compound
S	subcontracted
1-9	see footnote

RT HICKS CONSULTING, LTD
attn: **MICHELLE HUNTER/RANDY HICKS**
4665 INDIAN SCH. NE 106
ALBUQUERQUE, NM 87110

Assaigai Analytical Laboratories, Inc.

Certificate of Analysis

Client: **RT HICKS CONSULTING, LTD**
Project: **9908178 MEWBOURNE**

Wm. P. Biava
William P. Biava: President of Assaigai Analytical Laboratories, Inc.

Client Sample ID **CF2 TP4 7FT** Sample Matrix **SOIL** Sample Collected 08/16/99 16:10:00

QC Group	Run Sequence	CAS #	Analyte	Result	Units	Dilution Factor	Detection Limit	Code	Run Date
9908178-01A		**EPA 300.0**							
W99178	MW.1999.984-59		Nitrate, as N	1.7	mg / Kg	2	0.2		08/20/99
W99178	MW.1999.984-59		Nitrite, as N	ND	mg / Kg	2	0.2		08/20/99
9908178-01A		**EPA 300.0**							
W99178	MW.1999.984-59		Chloride	15.4	mg / Kg	2	0.5		08/20/99
W99178	MW.1999.984-59		Fluoride	ND	mg / Kg	2	0.5		08/20/99
W99178	MW.1999.984-59		Sulfate	11.7	mg / Kg	2	0.5		08/20/99
9908178-01A		**SW846 3050A/6010A ICP**							
M99964	MW.1999.1010-63	7440-70-2	Calcium	1530	mg / Kg	1	15		08/25/99
M99964	MW.1999.1010-63	7439-89-6	Iron	1740	mg / Kg	1	15		08/25/99
M99964	MW.1999.1010-63	7439-95-4	Magnesium	242	mg / Kg	1	10		08/25/99
M99964	MW.1999.1010-63	7440-09-7	Potassium	338	mg / Kg	1	10		08/25/99
M99964	MW.1999.1010-63	7440-23-5	Sodium	62.7	mg / Kg	1	15		08/25/99

Client Sample ID **CF2 TP3 7FT** Sample Matrix **SOIL** Sample Collected 08/16/99 16:20:00

QC Group	Run Sequence	CAS #	Analyte	Result	Units	Dilution Factor	Detection Limit	Code	Run Date
9908178-02A		**EPA 300.0**							
W99178	MW.1999.984-64		Nitrate, as N	1.2	mg / Kg	2	0.2		08/20/99

QC Group	Run Sequence	CAS #	Analyte	Result	Units	Dilution Factor	Detection Limit	Code	Run Date
W99178	MW.1999.984-64		Nitrite, as N	ND	mg / Kg	2	0.2		08/20/99
9908178-02A		**EPA 300.0**							
W99178	MW.1999.984-64		Chloride	2.1	mg / Kg	2	0.5		08/20/99
W99178	MW.1999.984-64		Fluoride	ND	mg / Kg	2	0.5		08/20/99
W99178	MW.1999.984-64		Sulfate	9.8	mg / Kg	2	0.5		08/20/99
9908178-02A		**SW846 3050A/6010A ICP**							
M99964	MW.1999.1010-64	7440-70-2	Calcium	257	mg / Kg	1	15		08/25/99
M99964	MW.1999.1010-64	7439-89-6	Iron	1270	mg / Kg	1	15		08/25/99
M99964	MW.1999.1010-64	7439-95-4	Magnesium	150	mg / Kg	1	10		08/25/99
M99964	MW.1999.1010-64	7440-09-7	Potassium	238	mg / Kg	1	10		08/25/99
M99964	MW.1999.1010-64	7440-23-5	Sodium	ND	mg / Kg	1	15		08/25/99

Client Sample ID ***CF2 TP1 6FT*** Sample Matrix ***SOIL*** Sample Collected ***08/16/99 18:00:00***

QC Group	Run Sequence	CAS #	Analyte	Result	Units	Dilution Factor	Detection Limit	Code	Run Date
9908178-03A		**EPA 300.0**							
W99178	MW.1999.984-67		Nitrate, as N	3.0	mg / Kg	2	0.2		08/20/99
W99178	MW.1999.984-67		Nitrite, as N	ND	mg / Kg	2	0.2		08/20/99
9908178-03A		**EPA 300.0**							
W99178	MW.1999.984-67		Chloride	5.1	mg / Kg	2	0.5		08/20/99
W99178	MW.1999.984-67		Fluoride	ND	mg / Kg	2	0.5		08/20/99
W99178	MW.1999.984-67		Sulfate	23.8	mg / Kg	2	0.5		08/20/99
9908178-03A		**SW846 3050A/6010A ICP**							
M99964	MW.1999.1010-65	7440-70-2	Calcium	2880	mg / Kg	1	15		08/25/99
M99964	MW.1999.1010-65	7439-89-6	Iron	1390	mg / Kg	1	15		08/25/99
M99964	MW.1999.1010-65	7439-95-4	Magnesium	1470	mg / Kg	1	10		08/25/99
M99964	MW.1999.1010-65	7440-09-7	Potassium	292	mg / Kg	1	10		08/25/99
M99964	MW.1999.1010-65	7440-23-5	Sodium	ND	mg / Kg	1	15		08/25/99

Client Sample ID ***MCCASLAND WINDMILL*** Sample Matrix ***W*** Sample Collected ***08/16/99 17:15:00***

QC Group	Run Sequence	CAS #	Analyte	Result	Units	Dilution Factor	Detection Limit	Code	Run Date
9908178-04A		**EPA200.7 ICP**							
M99951	MW.1999.997-63	7440-70-2	Calcium	411	mg / L	1	0.4		08/21/99
M99951	MW.1999.997-63	7439-89-6	Iron	1.93	mg / L	1	0.05		08/21/99
M99951	MW.1999.997-63	7439-95-4	Magnesium	48.4	mg / L	1	0.1		08/21/99
M99951	MW.1999.997-63	7440-09-7	Potassium	6.2	mg / L	1	0.2		08/21/99
M99951	MW.1999.997-63	7440-23-5	Sodium	244	mg / L	1	0.2		08/21/99

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Certificate of Analysis

Client: **RT HICKS CONSULTING, LTD**

Project: **9908178 MEWBOURNE**

QC Group	Run Sequence	CAS #	Analyte	Result	Units	Dilution Factor	Detection Limit	Code	Run Date
9908178-04B		**EPA 300.0**							
W99182	MW.1999.984-17		Nitrate, as N	1.6	mg / L	1	0.1	H	08/19/99
W99182	MW.1999.984-17		Nitrite, as N	ND	mg / L	1	0.1	H	08/19/99
9908178-04B		**EPA 120.1**							
CON9943	MT.1999.2013-4		Conductivity	3,960	umhos/cm	1	1		08/25/99
9908178-04B		**EPA 300.0**							
W99182	MW.1999.998-4		Chloride	1130	mg / L	100	0.5		08/20/99
W99182	MW.1999.984-17		Fluoride	ND	mg / L	1	0.5		08/19/99
W99182	MW.1999.984-17		Sulfate	84.3	mg / L	1	0.5		08/19/99
9908178-04C		**EPA 160.1**							
TD9923	MT.1999.1995-8		Total Dissolved Solids	2,060	mg / L	1	10		08/19/99
9908178-04C		**EPA 310.1**							
ALK9936	MT.1999.2068-1		Alkalinity, Carbonate	ND	mg / L	1	2		08/27/99
ALK9936	MT.1999.2056-2		Alkalinity, Total	186	mg / L	1	2		08/27/99

Client Sample ID ***MEWBOURNE A*** Sample Matrix ***W*** Sample Collected ***08/16/99 15:35:00***

QC Group	Run Sequence	CAS #	Analyte	Result	Units	Dilution Factor	Detection Limit	Code	Run Date
9908178-05A		**EPA200.7 ICP**							
M99951	MW.1999.997-64	7440-70-2	Calcium	86.3	mg / L	1	0.4		08/21/99
M99951	MW.1999.997-64	7439-89-6	Iron	ND	mg / L	1	0.05		08/21/99
M99951	MW.1999.997-64	7439-95-4	Magnesium	15.0	mg / L	1	0.1		08/21/99
M99951	MW.1999.997-64	7440-09-7	Potassium	4.0	mg / L	1	0.2		08/21/99
M99951	MW.1999.997-64	7440-23-5	Sodium	76.5	mg / L	1	0.2		08/21/99
9908178-05B		**EPA 300.0**							
W99182	MW.1999.984-19		Nitrate, as N	3.0	mg / L	1	0.1	H	08/19/99
W99182	MW.1999.984-19		Nitrite, as N	ND	mg / L	1	0.1	H	08/19/99
9908178-05B		**EPA 120.1**							
CON9943	MT.1999.2013-5		Conductivity	891	umhos/cm	1	1		08/25/99
9908178-05B		**EPA 300.0**							
W99182	MW.1999.984-20		Chloride	121	mg / L	10	0.5		08/19/99
W99182	MW.1999.984-19		Fluoride	ND	mg / L	1	0.5		08/19/99
W99182	MW.1999.984-19		Sulfate	74.9	mg / L	1	0.5		08/19/99
9908178-05C		**EPA 160.1**							
TD9923	MT.1999.1995-9		Total Dissolved Solids	547	mg / L	1	10		08/19/99

Certificate of Analysis

Client: **RT HICKS CONSULTING, LTD**
Project: **9908178 MEWBOURNE**

QC Group	Run Sequence	CAS #	Analyte	Result	Units	Dilution Factor	Detection Limit	Code	Run Date
9908178-05C		**EPA 310.1**							
ALK9936	MT.1999.2068-2		Alkalinity, Carbonate	ND	mg / L	1	2		08/27/99
ALK9936	MT.1999.2056-3		Alkalinity, Total	198	mg / L	1	2		08/27/99
9908178-05D		**SW846 8260A Purgeable VOCs by GC/MS**							
X99266	XG.1999.711-2	71-43-2	Benzene	ND	ug / L	1	1		08/20/99
X99266	XG.1999.711-2	100-41-4	Ethylbenzene	ND	ug / L	1	1		08/20/99
X99266	XG.1999.711-2		Naphthalene	ND	ug / L	1	5		08/20/99
X99266	XG.1999.711-2	95-47-6	o-Xylene	ND	ug / L	1	1		08/20/99
X99266	XG.1999.711-2		p/m Xylenes	ND	ug / L	1	2		08/20/99
X99266	XG.1999.711-2	108-88-3	Toluene	ND	ug / L	1	1		08/20/99

Client Sample ID ***MCCASLAND WM TANK*** Sample Matrix ***W*** Sample Collected *08/16/99 14:22:00*

QC Group	Run Sequence	CAS #	Analyte	Result	Units	Dilution Factor	Detection Limit	Code	Run Date
9908178-06A		**EPA200.7 ICP**							
M99951	MW.1999.1007-30	7440-70-2	Calcium	916	mg / L	11	0.4		08/23/99
M99951	MW.1999.997-65	7439-89-6	Iron	0.27	mg / L	1	0.05		08/21/99
M99951	MW.1999.997-65	7439-95-4	Magnesium	87.4	mg / L	1	0.1		08/21/99
M99951	MW.1999.997-65	7440-09-7	Potassium	9.4	mg / L	1	0.2		08/21/99
M99951	MW.1999.997-65	7440-23-5	Sodium	447	mg / L	1	0.2		08/21/99
9908178-06B		**EPA 300.0**							
W99182	MW.1999.984-21		Nitrate, as N	2.2	mg / L	1	0.1	H	08/19/99
W99182	MW.1999.984-21		Nitrite, as N	ND	mg / L	1	0.1	H	08/19/99
9908178-06B		**EPA 120.1**							
CON9943	MT.1999.2013-6		Conductivity	7,260	umhos/cm	1	1		08/25/99
9908178-06B		**EPA 300.0**							
W99182	MW.1999.998-5		Chloride	2450	mg / L	100	0.5		08/20/99
W99182	MW.1999.984-21		Fluoride	ND	mg / L	1	0.5		08/19/99
W99182	MW.1999.984-22		Sulfate	124	mg / L	10	0.5		08/19/99
9908178-06C		**EPA 160.1**							
TD9923	MT.1999.1995-10		Total Dissolved Solids	4,270	mg / L	1	10		08/19/99
9908178-06C		**EPA 310.1**							
ALK9936	MT.1999.2068-3		Alkalinity, Carbonate	ND	mg / L	1	2		08/27/99
ALK9936	MT.1999.2056-4		Alkalinity, Total	55.4	mg / L	1	2		08/27/99

Certificate of Analysis

Client: **RT HICKS CONSULTING, LTD**
Project: **9908178 MEWBOURNE**

Client Sample ID: ***CF2 TP2 9'*** | Sample Matrix: ***SOIL*** | Sample Collected: *08/16/99 18:10:00*

QC Group	Run Sequence	CAS #	Analyte	Result	Units	Dilution Factor	Detection Limit	Code	Run Date
9908178-07A		**EPA 300.0**							
W99178	MW.1999.984-70		Nitrate, as N	1.4	mg / Kg	2	0.2		08/20/99
W99178	MW.1999.984-70		Nitrite, as N	ND	mg / Kg	2	0.2		08/20/99
9908178-07A		**EPA 300.0**							
W99178	MW.1999.984-70		Chloride	6.2	mg / Kg	2	0.5		08/20/99
W99178	MW.1999.984-70		Fluoride	1.9	mg / Kg	2	0.5		08/20/99
W99178	MW.1999.984-70		Sulfate	31.1	mg / Kg	2	0.5		08/20/99
9908178-07A		**SW846 3050A/6010A ICP**							
M99964	MW.1999.1010-66	7440-70-2	Calcium	413	mg / Kg	1	15		08/25/99
M99964	MW.1999.1010-66	7439-89-6	Iron	2250	mg / Kg	1	15		08/25/99
M99964	MW.1999.1010-66	7439-95-4	Magnesium	348	mg / Kg	1	10		08/25/99
M99964	MW.1999.1010-66	7440-09-7	Potassium	428	mg / Kg	1	10		08/25/99
M99964	MW.1999.1010-66	7440-23-5	Sodium	106	mg / Kg	1	15		08/25/99

**** Sample specific Detection Limit is determined by multiplying the sample Dilution Factor by the listed Reporting Detection Limit. ****

**** ND = Not detected: less than the sample specific Detection Limit. Results relate only to the items tested. ****

CATION-ANION BALANCE FOR 99-8178-06

CATION	mg/L	CONV. FACTOR	meq/L
Ca	916	0.0499	45.7084
Fe	0.27	0.05372	0.014504
K	9.4	0.02558	0.240452
Mg	87.4	0.08229	7.192146
Na	447	0.0435	19.4445
CATION SUM			72.6

ANION	mg/L	CONV. FACTOR	meq/L
Alk CO3 as CaCO3	0	0.02	0
Alk HCO3 as CaCO3	55.4	0.01	0.554
Cl	2450	0.02821	69.1145
SO4	124	0.02082	2.58168
NO3 as N	2.2	0.07143	0.157146
Br	0	0.01252	0
F	0.5	0.05264	0.02632
PO4 as P	0	0.0968	0
SiO3 as Si	0	0.07122	0
ANION SUM			72.43365

CATION-ANION BALANCE (%) =	0
Measured Conductivity (if available)	7260
Ion Sum Check - (0.9*EC)/100 Lo	65.34
(1.1*EC)/100 Hi	79.86
Measured TDS (if available)	4270
Calculated TDS	4070.01

CATION-ANION BALANCE FOR 99-8178-05

CATION	mg/L	CONV. FACTOR	meq/L	ANION	mg/L	CONV. FACTOR	meq/L
Ca	86.3	0.0499	4.30637	Alk CO3 as CaCO3	0	0.02	0
Fe	0.05	0.05372	0.002686	Alk HCO3 as CaCO3	198	0.01	1.98
K	4	0.02558	0.10232	Cl	121	0.02821	3.41341
Mg	15	0.08229	1.23435	SO4	74.9	0.02082	1.559418
Na	76.5	0.0435	3.32775	NO3 as N	3	0.07143	0.21429
				Br	0	0.01252	0
				F	0.5	0.05264	0.02632
				PO4 as P	0	0.0968	0
				SiO3 as Si	0	0.07122	0
CATION SUM			8.973476	ANION SUM			7.193438

CATION-ANION BALANCE (%) =	11
Measured Conductivity (if available)	891
Ion Sum Check - (0.9*EC)/100 Lo	8.019
(1.1*EC)/100 Hi	9.801
Measured TDS (if available)	547
Calculated TDS	500.05

CATION-ANION BALANCE FOR 99-8178-04

CATION	mg/L	CONV. FACTOR	meq/L	ANION	mg/L	CONV. FACTOR	meq/L
Ca	411	0.0499	20.5089	Alk CO3 as CaCO3	0	0.02	0
Fe	1.93	0.05372	0.10368	Alk HCO3 as CaCO3	186	0.01	1.86
K	6.2	0.02558	0.158596	Cl	1130	0.02821	31.8773
Mg	48.4	0.08229	3.982836	SO4	84.3	0.02082	1.755126
Na	244	0.0435	10.614	NO3 as N	1.6	0.07143	0.114288
				Br	0	0.01252	0
				F	0.5	0.05264	0.02632
				PO4 as P	0	0.0968	0
				SiO3 as Si	0	0.07122	0
CATION SUM			35.36801	ANION SUM			35.63303

CATION-ANION BALANCE (%) =	0
Measured Conductivity (if available)	3960
Ion Sum Check - (0.9*EC)/100 Lo	35.64
(1.1*EC)/100 Hi	43.56
Measured TDS (if available)	2060
Calculated TDS	2039.53

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MAY 10 1999

ENVIRONMENTAL BUREAU
OIL CONSERVATION DIVISION

CLOSURE REPORT

TEXAS - NEW MEXICO PIPE LINE COMPANY
TNM-96-S14 (STEPHEN'S PROPERTY)
SECTION 14, TOWNSHIP 21 SOUTH, RANGE 37 EAST
LEA COUNTY, NEW MEXICO

5309 Wurzbach, Suite 100
San Antonio, Texas 78238
(210) 680-3767
(210) 680-3763 FAX

CLOSURE REPORT

TEXAS - NEW MEXICO PIPE LINE COMPANY
TNM-96-S14 (STEPHEN'S PROPERTY)
SECTION 14, TOWNSHIP 21 SOUTH, RANGE 37 EAST
LEA COUNTY, NEW MEXICO

PREPARED FOR:

TEXAS - NEW MEXICO PIPE LINE COMPANY
P. O. Box 1030
Jal, New Mexico 88252

Mr. Tony Savoie

PREPARED BY:

KEI

M. Kay Hawthorne, REM

Theresa Nix
Theresa Nix
Project Manager

P. Bullinger
Pat Bullinger, P.E.

KEI Job No. 710031-1

April 29, 1999

TABLE OF CONTENTS

PURPOSE AND SCOPE

The purpose of the site closure activities was to obtain closure for the site based on New Mexico Oil Conservation Division (OCD) regulations. The scope of activities performed to achieve this objective consisted of:

- determination of OCD closure standards
- excavation of soils above OCD standard closure levels
- characterization of excavated impacted soil
- confirmation sampling in excavation
- off-site landfarming of impacted soil

PREVIOUS INVESTIGATION

The Texas - New Mexico Pipe Line Company (TNMPL) release site is located approximately 2 miles north of Eunice, Lea County, New Mexico in Section 14, Township 21 South, Range 37 East. A site plan is presented as FIG. 1.

A hydrocarbon release from a TNMPL 4 inch pipeline was identified at the site during July of 1997. The release appeared to migrate down hill into a former Chevron pit, accumulated on a portion of the pit surface, and then migrated off the former pit into adjacent pasture land. The boundaries of the former Chevron pit and the TNMPL release surface stain were clearly visible. Based on available information, it appeared the former pit was being remediated on the surface (plow and fertilizer), but no vertical delineation had been performed, to our knowledge.

KEI conducted an initial release response subsurface investigation from July 25, 1997 through August 6, 1997. The purpose of the investigation was to assess the extent of hydrocarbons across the site. The scope of work included installing 13 soil borings, collecting native soil samples, and submitting the samples for determination of total petroleum hydrocarbon (TPH) concentrations. Details of the initial release response investigation are presented in the KEI report dated December 1, 1997. A Remedial Action Plan (RAP) was submitted by KEI in a letter dated November 24, 1997.

CLOSURE ACTIVITIES

CLOSURE STANDARDS

The New Mexico OCD Guidelines for Remediation of Leaks, Spills, and Releases contains the standard criteria for remediation activities. A ranking analysis for the site was performed to determine appropriate soil remediation levels. The ranking analysis is as follows:

Depth to Ground Water	45 to 50 Feet (assumed)	20 Points
Well Head Protection	Unknown distance to Water Source Unknown distance to Private Water Source	0 Points
Surface Water Body	Unknown distance	0 Points
	Total Ranking Score	**20 Points**

Based on the total ranking score, the closure objectives for this site for concentrations of benzene, toluene, ethylbenzene, and xylene (BTEX), and TPH are summarized below.

CONSTITUENT	CLOSURE CONCENTRATIONS (mg/kg)
BENZENE	10
BTEX	50
TPH	100 + Background

SOIL EXCAVATION, CHARACTERIZATION, LANDFARMING, AND CONFIRMATION

After receiving OCD approval of the Remedial Action Plan on July 16, 1998, hydrocarbon-impacted soil was excavated and stockpiled on-site. In the former Chevron pit area, soils were excavated to the depth of the visible stain (approximately 4.5 feet) and the remainder of the pit area was turned over to Chevron for further action. As approved in the RAP, confirmation sampling was not performed in the Chevron pit because of the presence of hydrocarbon in this pit prior to the TNMPL release. The approximate dimensions and depths of the excavation and soils removed are summarized below:

MEASUREMENT	VALUE
Approximate Length	375 feet
Approximate Width	5 to 45 feet
Approximate Area	8,000 square feet
Approximate Depth	0 to 6 feet
Volume Landfarmed	1110 cubic yards
Assumed Depth to Water	45 to 50 feet

The stockpiled soils were transported to the EPL Landfarm located approximately 3 miles south of Eunice, New Mexico on July 31, 1998. Disposal documentation is included in APPENDIX C. Analytical results from composite samples of the stockpiled soils indicated the following concentration ranges:

CONSTITUENT	CONCENTRATION RANGE (mg/kg)
BENZENE	ND
BTEX	ND
TPH	56 and 88

Soil samples from the side and bottom of the initial excavation were submitted for determination of BTEX and TPH concentrations. KEI personnel collected 10 samples on August 7, 1998. Three of the sampled areas from the initial excavation exceeded the TPH cleanup standard. Additional soils were excavated in these areas and TNMPL personnel collected an additional 8 samples on August 18, 1998. Final concentration ranges of the sidewall and bottom soils are summarized below:

CONSTITUENT	CONCENTRATION RANGE (mg/kg)
BENZENE	ND to 0.885
BTEX	ND to 11.135
TPH	ND to 276

Soil analytical results are summarized in TABLE I. Although samples No. 27 and No. 29 obtained from the bottom of the excavation within the roadway slightly exceed the TPH closure standard of 100 mg/kg, excavation was halted to avoid damage to the underlying roadbed. All other samples are within closure limits. The laboratory report and chain-of-custody documentation are provided in APPENDIX A.

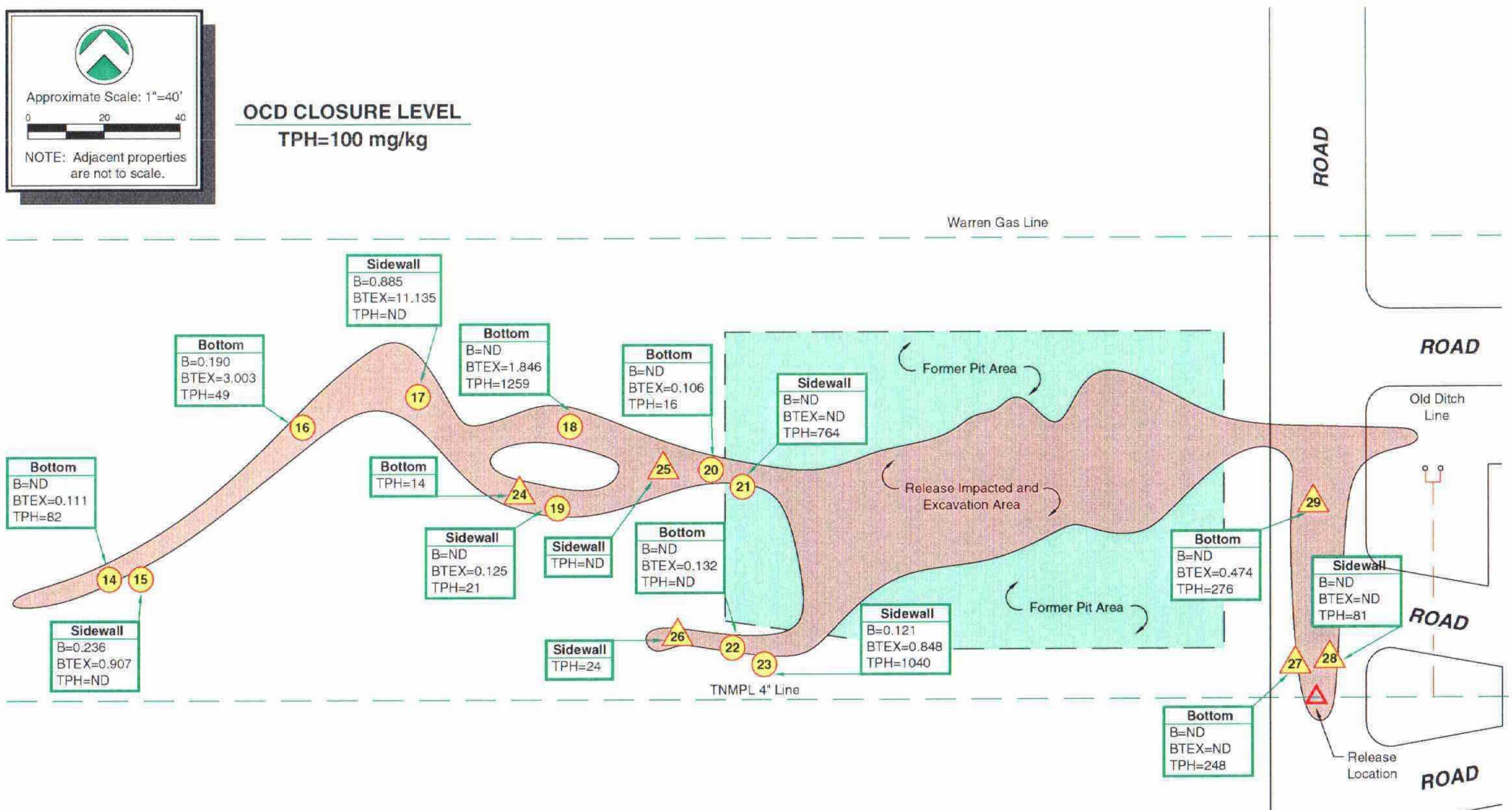
CLOSURE SUMMARY

The following can be summarized from field and laboratory data:

- previously impacted soil was excavated, stockpiled, and landfarmed off-site
- samples obtained from the excavated area indicated BTEX and TPH concentrations below closure standards, with the exception of two samples within the roadway, which had TPH concentrations of 248 and 276 mg/kg

Based on activities completed at the site and analytical results from selected soil samples, we request the site be closed under OCD regulations.

12/14/98-RM (SS-AUG98)



LEGEND

- Approximate location of impacted area.
- Approximate location of former Chevron pit.
- (20) Samples obtained by KEI on August 7, 1998.
- (25) Samples obtained by TNMPL on August 18, 1998.

B = Benzene concentration (mg/kg)

BTEX = Total Benzene, Toluene, Ethylbenzene, and Xylenes Concentration (mg/kg)

TPH = Total Petroleum Hydrocarbons Concentration (mg/kg)

ND = Indicates Constituent Concentration Below Laboratory Reporting Limit.

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SOIL SAMPLE RESULTS - AUGUST 1998

TNMPL TNM-96-S14 LEA COUNTY, NEW MEXICO

710031-1

FIG 1

TABLE I

SUMMARY OF SOIL RESULTS - BTEX AND TPH
TEXAS - NEW MEXICO PIPE LINE COMPANY
TNM-96-S14
LEA COUNTY, NEW MEXICO

SAMPLE LOCATION	SAMPLE DATE	BENZENE (mg/kg)	TOLUENE (mg/kg)	ETHYL-BENZENE (mg/kg)	XYLENES (mg/kg)	TOTAL BTEX (mg/kg)	TPH (mg/kg)
#14 Excavation Bottom	08/07/98	ND	ND	ND	0.111	0.111	82
#15 Excavation Sidewall	08/07/98	0.236	ND	0.168	0.503	0.907	ND
#16 Excavation Bottom	08/07/98	0.190	0.234	0.560	2.019	3.003	49
#17 Excavation Bottom	08/07/98	0.885	1.68	2.03	6.54	11.135	ND
#18 Excavation Bottom	08/07/98	ND	0.186	0.377	1.283	1.846	1,259
#19 Excavation Sidewall	08/07/98	ND	ND	ND	ND	0.125	21
#20 Excavation Bottom	08/07/98	ND	ND	ND	ND	0.106	16
#21 Excavation Sidewall	08/07/98	ND	ND	ND	ND	ND	764
#22 Excavation Bottom	08/07/98	ND	ND	ND	ND	0.132	ND
#23 Excavation Sidewall	08/07/98	0.121	0.224	0.118	0.385	0.848	1,040
#24 Excavation Bottom (Replaced #18)	08/18/98	---	---	---	---	---	14
#25 Excavation Sidewall (Replaced #21)	08/18/98	---	---	---	---	---	ND
#26 Excavation Sidewall (Replaced #23)	08/18/98	---	---	---	---	---	24
#27 Excavation Bottom	08/18/98	ND	ND	ND	ND	ND	248
#28 Excavation Sidewall	08/18/98	ND	ND	ND	ND	ND	81
#29 Excavation Bottom	08/18/98	ND	ND	0.108	0.366	0.474	276
#30 Stock Pile Composite	08/18/98	ND	ND	ND	ND	ND	88
#31 Stock Pile Composite	08/18/98	ND	ND	ND	ND	ND	56

NOTES:

ND - Indicates constituent was not detected above the method dection or reporting limit.
--- - Indicates constituent was not analyzed.

Method reporting/detction limits:
BTEX - 0.100 mg/kg
TPH - 10 mg/kg

Laboratory test methods:
BTEX - EPA Method SW846-8020
TPH - Modified EPA Method 81015 Diesel Range Organics

ENVIRONMENTAL LAB OF TEXAS, INC.

"Don't Treat Your Soil Like Dirt!"

KEI
ATTN: THERESA NIX
5309 WURZBACH SUITE 100
SAN ANTONIO, TEXAS 78238
FAX: 210-680-3763
FAX: 505-395-2636

Receiving Date: 08/07/98
Sample Type: SOIL
Project #:710031-1-0, Steven's
Project Location: EUNICE

Analysis Date: 08/07/98
Sampling Date: 08/07/98
Sample Condition: Intact/Iced

ELT#	FIELD CODE	BENZENE mg/kg	TOLUENE mg/kg	ETHYLBENZENE mg/kg	m,p-XYLENE mg/kg	o-XYLENE mg/kg	TPH (DRO) C10-C28 mg/kg
15066	#14 Bottom of Excavation	<0.100	<0.100	<0.100	0.111	<0.100	82
15067	#15 Side of Excavation	0.236	<0.100	0.168	0.271	0.232	<10
15068	#16 Bottom of Excavation	0.190	0.234	0.560	1.31	0.709	49
15069	#17 Bottom of Excavation	0.885	1.68	2.03	3.64	2.90	<10
15070	#18 Bottom of Excavation	<0.100	0.186	0.377	0.784	0.499	1,259
15071	#19 Side of Excavation	<0.100	<0.100	<0.100	0.125	<0.100	21
15072	#20 Bottom of Excavation	<0.100	<0.100	<0.100	0.106	<0.100	16
15073	#21 Side of Excavation	<0.100	<0.100	<0.100	<0.100	<0.100	764
15074	#22 Bottom of Excavation	<0.100	<0.100	<0.100	0.132	<0.100	<10
15075	#23 Side of Excavation	0.121	0.224	0.118	0.272	0.113	1,040
	% IA	93	95	93	92	96	101
	% EA	91	93	92	91	95	106
	BLANK	<0.001	<0.001	<0.001	<0.001	<0.001	<10

METHODS: SW 846-8020,5030, 8015m DRO

Raland K. Tuttle — 8-8-98
Raland K. Tuttle   Date

12600 West I-20 East • Odessa, Texas 79765 • (915) 563-1800 • Fax (915) 563-1713

Environmental Lab of Texas, Inc.

12600 West I-20 East Odessa, Texas 79763
(915) 563-1800 FAX (915) 563-1713

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager: Theresa Nix

Phone #: 210-680-3767

FAX #: 210-680-3763

Company Name & Address: K.e.i. Consultants

Project #: 710031-1-0

Project Name: STEVEN'S

Project Location: Eunice

Sampler Signature: [signature]

	LAB # (LAB USE ONLY)	FIELD CODE	# CONTAINERS	Volume/Amount	MATRIX: WATER	SOIL	AIR	SLUDGE	OTHER	PRESERVATIVE METHOD: HCL	HNO3	ICE	NONE	OTHER	SAMPLING: DATE	TIME	BTEX 8020/5030	TPH 8015 DRO-8015M	TCLP Metals Ag As Ba Cd Cr Pb Hg Se	Total Metals Ag As Ba Cd Cr Pb Hg Se	TCLP Volatiles	TCLP Semi Volatiles	TDS	RCI
15066	#14	Bottom of Excavation	2	4oz		/						/			8-7-98	7:45	/	/						
15067	#15	Side of Excavation	2													7:51								
15068	#16	Bottom of Excavation	2													8:10								
15069	#17	Bottom of Excavation	2													8:15								
15070	#18	Bottom of Excavation	2													8:22								
15071	#19	Side of Excavation	2													8:28								
15072	#20	Bottom of Excavation	2													8:32								
15073	#21	Side of Excavation	2													8:35								
15074	#22	Bottom of Excavation	2													8:40								
15075	#23	Side of Excavation	2	↓		↓						↓			↓	8:38	↓	↓						

Relinquished by:	Date:	Time:	Received by:
[signature]	8-7-98	12:06 pm	[signature]
Relinquished by:	Date:	Time:	Received by:
Relinquished by:	Date:	Time:	Received by Laboratory:

REMARKS:

- Please fax Results to Theresa Nix at 210-680-3767 and Tony Savoie at 505-395-2636
- BTEX: EPA method SW846-8020
- TPH: EPA Method MDRO 8015
- Rush on Results (Saturday)
- ~~[illegible]~~

ENVIRONMENTAL LAB OF TEXAS, INC.

"Don't Treat Your Soil Like Dirt!"

TEXAS NEW MEXICO PIPE LINE
ATTN: MR. TONY SAVOIE
P.O. BOX 1030
JAL, NEW MEXICO 88252
FAX: 505-395-2636

Receiving Date: 08/18/98
Sample Type: Soil
Project #: TNM 96-514
Project Name: Stephens
Project Location: 2 mi. North of Eunice

Analysis Date: 08/18/98
Sampling Date: 08/18/98
Sample Condition: Intact/Iced

ELT#	FIELD CODE	BENZENE (mg/kg)	TOLUENE (mg/kg)	ETHYLBENZENE (mg/kg)	m,p-XYLENE (mg/kg)	o-XYLENE (mg/kg)	TPH (DRO) C10-C28 (mg/kg)
15219	#24 Bottom Hole	*	*	*	*	*	14
15220	#25 Side Wall	*	*	*	*	*	<10
15221	#26 Side Wall	*	*	*	*	*	24
15222	#27 Bottom Hole	<0.100	<0.100	<0.100	<0.100	<0.100	248
15223	#28 Side Wall	<0.100	<0.100	<0.100	<0.100	<0.100	81
15224	#29 Bottom Hole	<0.100	<0.100	0.108	0.253	0.113	276
15225	#30 Stock Pile	<0.100	<0.100	<0.100	<0.100	<0.100	88
15226	#31 Stock Pile	<0.100	<0.100	<0.100	<0.100	<0.100	56
	% IA	91	98	100	98	102	103
	% EA	81	87	87	85	91	81
	BLANK	<0.001	<0.001	<0.001	<0.001	<0.001	<10

METHODS: EPA SW 846-8020,5030, 8015M DRO

Raland K. Tuttle

8-19-98
Date

Environmental Lab of Texas, Inc.

12600 West I-20 East Odessa, Texas 79763
(915) 563-1800 FAX (915) 563-1713

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager:

Phone #:

FAX #: 505-395-2636

Company Name & Address: Texas N M. Pipeline Co.

Project #: TNM 96-514

Project Name: Stephens

Project Location: 2 mi. North of Eunice

Sampler Signature: J. C. Bowie

ANALYSIS REQUEST

LAB # (LAB USE ONLY)	FIELD CODE	# CONTAINERS	Volume/Amount	MATRIX: WATER	SOIL	AIR	SLUDGE	OTHER	PRESERVATIVE METHOD: HCL	HNO3	ICE	NONE	OTHER	SAMPLING: DATE	TIME	BTEX 8020/5030	TPH 418.1	TCLP Metals Ag As Ba Cd Cr Pb Hg Se	Total Metals Ag As Ba Cd Cr Pb Hg Se	TCLP Volatiles	TCLP Semi Volatiles	TDS	RCI	TPH 8015 DRO M
15219	#24 Bottom Hole	1	4 oz		✓						✓			8/18/98	0730									✓
15220	#25 Side Wall	1	✓		✓						✓			✓	✓									✓
15221	#26 Side Wall	1	✓		✓						✓			✓	✓									✓
15222	#27 Bottom Hole	1	✓		✓						✓			✓	✓	✓								✓
15223	#28 Side Wall	1	✓		✓						✓			✓	✓	✓								✓
15224	#29 Bottom Hole	1	✓		✓						✓			✓	✓	✓								✓
15225	#30 Stock Pile	1	✓		✓						✓			✓	✓	✓								✓
15226	#31 Stock Pile	1	✓		✓						✓			✓	✓	✓								✓

Relinquished by:	Date:	Times:	Received by:
J. C. Bowie	8-18-98	11:00 MDST	J McMurrey
Relinquished by:	Date:	Times:	Received by:
Relinquished by:	Date:	Times:	Received by Laboratory:

REMARKS

QA/QC PROCEDURES

SOIL SAMPLING

Representative soil samples selected for analysis were placed in sterile glass containers equipped with a Teflon-lined lid furnished by the analytical laboratory. The container was filled to capacity with soil to limit the amount of head-space present. The container was labeled and placed on ice in an insulated cooler. The cooler was sealed for shipment to Environmental Lab of Texas, Inc. in Odessa, Texas for determination of the following constituents:

- BTEX concentrations by EPA Method SW846-8020
- TPH concentrations by EPA Method 8015 Diesel Range Organics

Proper chain-of-custody documentation was maintained throughout the sampling process.

LABORATORY PROTOCOL

The laboratory was responsible for proper QA/QC procedures. These procedures are either transmitted with the laboratory reports or are on file at the laboratory.

P. O. Box 1980
Hobbs, NM 88241-1980
District II - (505) 748-1283
811 S. First
Artesia, NM 88210
District III - (505) 334-6178
) Rio Brazos Road
ec, NM 87410
District IV - (505) 827-7131

New Mexico
Energy Minerals and Natural Resources Department
Oil Conservation Division
2040 South Pacheco Street
Santa Fe, New Mexico 87505
(505) 827-7131

Form C-1[illegible]
Originated 8/8[illegible]

Submit Orig[illegible]
Plus 1 C[illegible]
to approp[illegible]
District Off[illegible]

REQUEST FOR APPROVAL TO ACCEPT SOLID WASTE

1. RCRA Exempt: ☐ Non-Exempt: ☒ BY WAYNE PRICE 7/31/98 [initials] Verbal Approval Received: Yes ☒ No ☐	4. Generator TNM PLLC. 5. Originating Site TNM-96-S14
2. Management Facility Destination EPL	6. Transporter Merryman Const. Co.
3. Address of Facility Operator 3m. S of Hwy 176 + Hwy 18 Eunice	8. State N. M.
7. Location of Material (Street Address or ULSTR) S14 T21S R37E	Lea NM

9. Circle One:

A. All requests for approval to accept oilfield exempt wastes will be accompanied by a certification of waste from the Generator; one certificate per job.

(B.) All requests for approval to accept non-exempt wastes must be accompanied by necessary chemical analysis to PROVE the material is not-hazardous and the Generator's certification of origin. No waste classified hazardous by listing or testing will be approved.

All transporters must certify the wastes delivered are only those consigned for transport.

BRIEF DESCRIPTION OF MATERIAL:

Crude oil Affected Soil
Non Hazardous By knowledge of Process approval

RECEIVED JUL 1998 Hobbs OCD

Estimated Volume 1110 cy Known Volume (to be entered by the operator at the end of the haul) ________ cy

SIGNATURE: Ben Miller TITLE: V.P. DATE: July 31, 1998
Waste Management Facility Authorized Agent

TYPE OR PRINT NAME: Ben Miller TELEPHONE NO. 394-3481

(This space for State Use)

APPROVED BY: [signature] TITLE: Envir Engr DATE: 7/31/98

APPROVED BY: ________ TITLE: ________ DATE: ________

CERTIFICATE OF WASTE STATUS

NON-EXEMPT WASTE MATERIAL

Originating Location: Site TNM-96-514 Sec 14, T21S, R37E Lea N.M.

Source: Crude oil Pipeline SPILL

Disposal Location: 3mi South of Hwy 176 & Hwy 18 Eunice N.M.

As a condition of acceptance for disposal, I hereby certify that this waste is a non-exempt waste as defined by the Environmental Protection Agency's July 1988 Regulatory Determination. To my knowledge, this waste will either be analyzed pursuant to the provisions of 40 CFR Part 261 to verify the nature as non-hazardous or has been verified non-hazardous due to "Knowledge of Process." I further certify that to my knowledge no "hazardous or listed wastes" pursuant to the provisions of 40 CFR Part 261, Subparts C and D, has been added or mixed with the waste so as to make the resultant mixture a "hazardous waste" pursuant to the provisions of 40 CFR, Section 261.3 (b).

I, the undersigned as the agent for the Texas N.M. Pipeline Co. concur with the status of the waste from the subject site.

NAME John A. Savoie

TITLE/AGENCY Env. Rep

ADRESS P.O. Box 1030 Jal NM 88252

SIGNATURE J. A. Savoie

DATE 7-31-98

JUL 1998
RECEIVED
Hobbs
OCD