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REPORTS

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ENVIRONMENTAL INVESTIGATION
CHEVRON U.S.A., INC.
HELBING FEDERAL GAS WELL SITE
EDDY COUNTY, NEW MEXICO

Prepared for:

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1.0 INTRODUCTION

This report presents the findings of the environmental investigation conducted at the Chevron, U.S.A., Inc. (Chevron) Helbing Federal Gas Well (Site) located in Eddy County, New Mexico. The location of the subject Site is shown on Figure 1. The investigation was conducted to evaluate the extent and source of a condensate seep (Figure 2) which was observed in a dry arroyo located adjacent to the Site.

As shown on Figure 2, the Site is comprised of a gas well (Helbing Federal); a storage tank; and a glycol unit, separator, and a stack pac (collectively referred to herein as the Stack Pac). Located approximately 300 feet southeast of the Stack Pac is a pipeline junction box. Underground pipelines connect the equipment listed above, as shown on Figure 2. A north-south and northeast trending surface drainage is present due north of the Stack Pac. Two (2) dry arroyos, one (1) located approximately 500 feet to the northwest and the other located approximately 300 feet northeast of the Stack Pac are shown on Figure 2. The arroyos are normally dry, but surface water will flow in these arroyos during significant rainfall events. The condensate seep was originally identified

where the north-south trending surface drainage meets the northwest trending arroyo, approximately 380 feet northeast of the Site.

The environmental investigation was conducted by Roberts\Schornick and Associates (RSA) and Chevron personnel between April 12 and 13, 1993. The investigation consisted of a Site reconnaissance, an electromagnetic terrain conductivity (EM) survey, and a soil gas survey.

2.0 SITE INVESTIGATION

2.1 Site Reconnaissance

Prior to conducting the EM and soil gas surveys, a 100 foot by 100 foot field grid was established at the Site. The grid was laid out utilizing a hand transit (Lietz) and a measuring wheel. The grid was established in a north-to-south and west-to-east orientation, with the origin located 100 feet west and 100 feet south of the gas well. The grid was utilized throughout the investigation to establish accurate locations for EM and soil gas survey data points.

In addition to establishing a grid at the Site, the hand transit was utilized to measure conjugate joint orientations which were observed in sandstone and dolomite outcrops in the Site vicinity. Conjugate joint orientations are important in evaluating possible routes of groundwater and condensate migration through the subsurface.

Conjugate joint orientations measured are listed on Table 1 and are shown on Figure 2. Conjugate joint orientations were observed to trend in two (2) primary directions which ranged from approximately N18W to N44W and N35E to N48E. As shown on Figure 2, arroyos and surface water drainages appear to trend in similar orientations as the conjugate joints.

2.2 Soil Gas Survey

A soil gas survey was conducted at the Site with the RSA soil probe rig. The soil gas survey was conducted to evaluate the extent of relative hydrocarbon concentrations in soil pores (or rock fractures) at the Site. In the unsaturated zone, hydrocarbons can exist in the vapor phase in soil pores, adsorbed onto soil particles, or can exist as free hydrocarbon liquid in the soil pores. Hydrocarbons in soils in the saturated zone are typically adsorbed onto the soil particles, or may exist as free liquid in the soil pore.

The soil gas survey was conducted with an apparatus consisting of a hollow steel shaft equipped with a stainless steel sampling point (probe). The survey is performed by hydraulically pushing the probe into the ground at various depths. Once the desired depth is achieved, the probe is retracted approximately 2-inches, exposing a screen inside the probe tip. Soil gas vapors are drawn into the hollow tube through the screen with a vacuum pump, and then analyzed at the surface with an organic vapor monitor (OVM).

The OVM detector was calibrated to a known isobutylene standard prior conducting the soil gas survey and calibration was confirmed between each soil probe location. The OVM detector has a limit of detection of 0.1 relative parts per million (volume/volume) of total ionizable hydrocarbon. All soil probes and sampling equipment were decontaminated with Alconox and deionized water

between sample locations. The soil probe was advanced to depths between 0 (bedrock outcrops) and 4.0 feet below ground surface. Results of the soil gas survey are presented on Table 2. In addition, soil probe locations and maximum soil gas concentrations are shown on Figure 3.

In areas inaccessible to the soil probe rig, a head space soil gas survey was conducted. The ambient temperature headspace method (Van Zyl, 1987) consisted of collecting composite soil samples from soils at the base of the arroyo, placing the soil into a glass container (with a vacant headspace in the container), and placing aluminum foil and a cap over the container. The headspace gas in each container was tested at least 30 minutes after sample collection by using the OVM detector probe to pierce the aluminum foil and an organic vapor headspace reading was obtained. The resulting OVM headspace gas readings were in parts per million (ppm) of total ionizable hydrocarbon based on an isobutylene standard.

Soil gas headspace samples were collected within the arroyo in the locations shown on Figure 4. Soil sample depths ranged from 0.3 foot (sample S-6) to 1.4 foot (sample S-4) below ground surface. A shovel was utilized to obtain soil samples at each location. Soil samples were composited from the ground surface to bedrock or to refusal. Samples were placed into a glass container for head space analysis. Soil gas headspace readings obtained at the Site are

listed on Table 3. Soil headspace gas sample locations and values are also shown on Figures 3 and 4. Results of both the soil probe and soil headspace gas surveys are discussed in Sections 8.1 and 8.2.

2.3 EM Survey

An EM survey was conducted at the Site on April 12 and 13, 1993 in the areas shown on Figure 5. The EM survey was conducted utilizing a Geonics EM-31. The EM-31 contains a transmitter coil which is energized with an alternating current at an audio frequency, and a receiver coil which is located a short distance away. The time-varying magnetic field arising from the alternating current in the transmitter coil induces very small currents in the earth. These currents generate a secondary magnetic field which is detected by the receiver coil. The resultant data, which represents ground or terrain conductivity (in units of mmhos/m), is then plotted on a base map and contoured to evaluate areas of potential impact. Areas of high relative terrain conductivity can be related to high total dissolved solids plumes in soils and groundwater which could result from a brine release. The EM survey was conducted because brine would likely be released along with condensate during a release. The effective depth of investigation for the EM-31 is approximately 6 meters (20 feet). Values measured in the field with the EM-31 are listed on Table 4 and are shown on Figure 5. Results of the EM survey are discussed in Section 8.3.

3.0 REGIONAL TOPOGRAPHY AND PHYSIOGRAPHY

The Site is located within the Seven Rivers Embayment which is an area of moderate relief (Bjorklund, 1959). Surface elevations in the vicinity of the Facility range from approximately 4120 to 4040 feet AMSL, as shown on Figure 2. The Seven Rivers Embayment is bounded to the west by the Huapache monocline; and to the east by the Seven Rivers Hills, the Azotea Mesa, and the East and West Hess Hills. It is characterized by shallow swales and gently rounded hills.

4.0 SURFACE WATER DRAINAGE

Drainage in the Seven Rivers Embayment area consists of superimposed consequent streams which have excavated Rocky Arroyo and Last Chance Canyon; and a series of streams and arroyos generally paralleling the strike of the resistant beds of dolomite (Bjorklund, 1959). Arroyos in the vicinity of the Site drain towards the northeast through Dunnaway Draw to Rocky Arroyo. Rocky Arroyo drains towards the northeast to the Pecos River.

5.0 SOILS

Soils in the Site area comprise Ector Extremely Rocky Loam and Ector Stony Loam soils (USDA, 1971). The Ector series consists of very shallow, well drained, calcareous, and very rocky soils. At the subject Site, soils were observed to be predominantly less than approximately 4-inches thick.

6.0 REGIONAL GEOLOGY

A geologic map for the Site vicinity is presented on Figure 6. A stratigraphic column and explanation for Figure 6 is presented on Figure 7. Figure 6 shows that strata in the vicinity of the Site are comprised of the Permian-age Guadalupe Series which includes the Tansill, Yates, Seven Rivers, Queen, Grayburg, and San Andres formations. As shown on the geologic cross-sections on Figure 8 and Figure 9, strata which outcrop at the subject Site are part of the Queen formation. West to east geological cross-section A-A' (Figure 8) shows that the Helbing Federal well is located in the outcrop of the Queen formation. Geological cross section B-B' (Figure 9) also shows that the strata beneath the Site is part of the Queen formation. The Queen formation is underlain by the Grayburg formation. A regional geologic map is presented on Figure 10 with an explanation included on Figure 11. Figure 10 also shows that strata at the Site are part of the Queen formation. In addition, Figure 10 shows that an exposure of Grayburg formation strata is exposed within the arroyo located approximately 500 feet northwest of the Site. Each of the formations of the Guadalupe Series in the area of the Site is comprised of two (2) major facies: the carbonate shelf facies and the evaporate shelf facies, both of which were deposited landward of the Guadalupe reef complex.

The evaporite facies is composed primarily of gypsum, anhydrite, and other evaporite rocks interbedded with beds of siltstone and sandstone. Gypsum

typically occurs nearer the surface, and is an alteration product of anhydrite. The conversion process from anhydrite to gypsum is accompanied by an increase in volume and porosity which makes gypsum susceptible to solution by groundwater. Because of the increased porosity, areas underlain by the gypsum subfacies generally are good recharge areas (Bjorklund, 1959). The nearest evaporite facies rocks to the Site, according to Bjorklund, 1959, are present approximately 2 miles to the west of the Site and are part of the Queen formation.

The carbonate facies is composed primarily of interbedded limestone, dolomite, and sandstone, with a predominance of carbonate rocks. The rocks at the subject Site are part of the carbonate facies of the Queen formation. As shown on Figure 8, the Queen formation is comprised of dolomite interbedded with many thin sandstone and siltstone beds. The Grayburg formation, which is exposed approximately 500 feet northwest of the Site is also composed of interbedded dolomite, sandstone, and siltstone.

Alluvial sediments overlie shelf deposits along major streams and arroyos in the area. Alluvium typically consists of caliche and limestone conglomerate with some eolian material. No significant quantities of alluvium were observed in arroyos located immediately adjacent to the subject Site.

Regionally, strike of the Queen formation is towards the northeast and dip is to the southeast. Near-vertical joints observed in the Queen formation in all parts of the area have two (2) prominent trends, N40-50W and N30-40E. In many places in the shelf, jointing passes through carbonate rocks, but stops at sandstones and siltstones, the possible result of intergranular movement of the clastic grains and recementing by calcareous cement.

Conjugate joints measured in the Queen formation at the Site were found to range from N18W to N44W and N35E to N48E. Orientations of conjugate joints are listed on Table 1, and shown on Figure 2. This is consistent with published regional information.

7.0 HYDROGEOLOGY

A study by the State of New Mexico (Collins, 1987) indicates that there are three (3) separate aquifers in the vicinity of the Site. These include an alluvial aquifer, an upper Queen aquifer, and a lower Queen aquifer. The alluvial aquifer is thin and found primarily on valley or arroyo floors and alluvial fans. An alluvial aquifer is not present at the subject Site.

As shown on cross-section B-B' on Figure 9 (prepared by Collins, 1987), only the lower aquifer in the Queen formation is present in the vicinity of the Site. Figures 12, 13, and 14 present a groundwater potentiometric surface map for the region, a map showing groundwater flow directions, and a groundwater availability map, respectively. An explanation for Figure 14 is shown on Figure 15. As shown on Figures 12 and 13, the regional groundwater flow direction is towards the northeast (parallel to strike) at an approximate gradient of 0.02 feet per foot. Figure 12 shows that several of the wells within a 2.5 mile radius of the Site are completed within the Queen aquifer (wells completed in the upper Queen are not distinguished from those completed in the lower Queen aquifer). Depth to groundwater in wells within approximately 2.5 miles of the Site ranged from approximately 59 feet (2.5 miles southeast of the Site) to 472 feet (1.5 miles southeast of the Site) below ground surface, as shown on Figure 14. Depth to groundwater within the Seven Rivers Embayment is highly variable and difficult to predict. However, the regional groundwater

potentiometric surface map on Figure 12 suggests that the groundwater elevation within the Queen aquifer (lower Queen aquifer) beneath the Site is present at approximately 3750 feet AMSL. Based on a surface elevation of approximately 4100 feet, the depth to groundwater may be approximately 350 feet below ground surface at the Site.

Groundwater flows through solution joints and fractures through the carbonate facies. Interbeds of siltstone and sandstone regionally can act as aquicludes. Recharge of the lower Queen aquifer likely occurs through gypsum outcrops located west of the Site as well as through vertical surface water seepage through joints and fractures.

The quality of groundwater pumped from shelf aquifers depends largely on whether a well taps the carbonate or evaporite facies of the formation. The carbonate rocks typically yield small quantities of water satisfactory for domestic or stock use. Evaporite rocks typically yield water which is satisfactory for livestock or limited domestic use.

8.0 INVESTIGATION FINDINGS

8.1 Soil Gas Survey

8.1.1 Soil Probe Survey Results

The soil gas survey was conducted at the Site on April 12 and 13, 1993. Data was gathered for the soil gas survey with both the soil probe rig and by collecting soil gas headspace samples. Section 2.2 describes the methodologies utilized in conducting the soil probe and soil gas headspace investigations. The soil probe survey was conducted over an area which was measured into 100 foot by 100 foot grids (in order to locate soil probe stations at the Site). Approximately 55 soil probe measurements were attempted at the Site. Due to bedrock outcrops, successful soil gas measurements were made at only 46 stations. Soil gas readings can be measured when the probe is advanced deep enough to cover the probe screen (approximately 0.4 feet). Successful soil probes were advanced to depths between 0.4 and 4.0 feet at the Site. Only 17 of the soil probes were advanced to depths of 1.0 foot or greater due to the presence of shallow bedrock. Soil probe grid locations and OVM values are listed on Table 2 and shown on Figure 3. Soil probe readings were measured at levels which ranged from 0 parts per million (ppm) throughout most of the Site area, to 196.5 ppm immediately adjacent to the flow line.

8.1.2 Soil Gas Headspace Results

Soil gas head space samples were obtained along the arroyo in areas which were inaccessible to the soil probe rig. Soil gas head space samples were collected at the locations shown on Figure 4 (samples S-1 through S-20) to assess the lateral extent of impact along the arroyo. Samples were composited from sediments overlying bedrock at each location, placed into clean glass jars, sealed with aluminum foil, and capped. All soil gas head space samples were allowed to sit for at least 30 minutes prior to testing with an OVM. Soil sample composite depths ranged from 0.3 foot (sample S-6) to 1.4 foot (sample S-4) below ground surface. No sample was obtained at sample location S-12 due to the presence of a bedrock outcrop.

Soil gas headspace samples readings were found to range from 0 ppm (samples S-17 and S-18) to 719 ppm (sample S-1). Soil gas headspace readings are listed on Table 3. Sample locations and soil gas headspace values are shown on Figure 4.

8.2 Soil Gas Isopleth Maps

Soil gas values from both the soil probe survey and the headspace gas survey are plotted and contoured on Figure 3. A detail of the arroyo sample locations is presented on Figure 4. Figure 3 shows that the highest soil gas levels were measured at the base of the arroyo in the vicinity of the seep. The highest soil

gas level was measured at a level of 719 ppm in sample S-1, which was located in the drainage just east of the road (where the drainage meets the arroyo), where the seep was first observed. Based on the soil gas isopleth map (Figure 4), impacts from the seep extend approximately 280 feet along the base of the arroyo.

As shown on Figure 3, outside the arroyo the highest soil gas reading (196.5 ppm) was measured in the pipeline backfill, approximately 110 feet east of the Stack Pac. In addition, soil gas levels of 34 and 12 ppm were measured in the pipeline backfill in the vicinity of the pipeline junction box. The pipeline may be a source for impacts observed at the Site.

Measurable soil gas levels (above background) were detected approximately 250 feet north (23.3 ppm) and approximately 300 feet northeast (2.2 ppm) of the Stack Pac. Soil probes attempted in the vicinity of the Stack Pac, the Helbing Federal well, and the storage tank were either unsuccessful due to bedrock outcrops or measured no detectable soil gas levels.

Based on published data and Site observations, near-surface brine/condensate releases and/or precipitation would be expected to rapidly infiltrate (vertically) through bedrock due to the well developed system of conjugate joints in the area. Downward migration would likely continue until a less fractured or less

permeable zone was encountered (Bjorklund, 1959, suggests that sandstone and siltstone interbeds act as aquitards across many areas of the shelf including the Site area). Horizontal spreading would then likely occur when less permeable zones (sandstone/siltstone interbeds) were encountered at depth. In other words, a slow condensate release would likely migrate vertically through joints or fractures until a less-permeable material was encountered (sandstone or siltstone). Upon encountering the low-permeability material, the condensate release would then begin to migrate laterally on top of the low-permeable material. Sandstone was observed in many areas within the arroyo including the seep area, and may provide a possible pathway for lateral migration of condensate at the Site. Other potential migration pathways at the Site include the ground surface and the top of bedrock. The fact that elevated soil gas levels were not measured between the possible source of impact (the pipeline) and the seep suggests that the primary route of condensate migration may be vertically from the source through bedrock fractures, until a sandstone/siltstone unit was encountered. Upon encountering the sandstone/siltstone, the condensate would then migrate along the top of this unit until it outcrops in the arroyo. A possible migration pathway is shown on Figure 16. Further, the lower soil gas levels measured along the pipeline as compared to the seep suggests that impacts may be due to a release which is no longer occurring.

8.3 EM Survey

An EM survey was conducted at the Site with a Geonics EM 31. The EM 31 measures relative ground or terrain conductivity to a depth of approximately 6 meters (20 feet). Table 4 presents a list of readings measured. Survey stations with corresponding terrain conductivity readings are shown on Figure 5 (readings which were definitely influenced by surface interferences are shown with an "I"). As shown on Figure 5, terrain conductivity readings were found to range from approximately 2 mmhos/m along the northeast trending arroyo to 28 mmhos/m in the vicinity of the seep. The background terrain conductivity at the Site was found to range from approximately 2 mmhos/m to 10 mmhos/m.

Elevated terrain conductivities were noted in several areas of the Site as shown on Figure 5. The most notable of these areas is the area in the vicinity of the seep where terrain conductivities were measured at levels up to 28 mmhos/m. Another area is located northwest of the Stack Pac, where terrain conductivities were measured at levels up to 20 mmhos/m. However, the area northwest of the Stack Pac contains a significant amount of metal which could have influenced readings. Several elevated terrain conductivity readings were measured along the pipeline (up to 19 mmhos/m). Elevated terrain conductivities were also measured in the drainage 100 feet north of the Stack Pac (17 mmhos/m), and in the arroyo approximately 350 feet upstream of the

seep (21 mmhos/m). In addition, terrain conductivities up to approximately 15 mmhos/m were observed approximately 360 feet northwest of the Stack Pac.

In general, terrain conductivity readings in the Site vicinity were very low. A sample of the ponded water within the arroyo (in the area of the condensate seep) was obtained in order to measure its conductivity. The water sample was measured to have a conductivity of 2,050 μmhos/cm (205 mmhos/m). Based on this conductivity, the seep water sample should have a total dissolved solids level of approximately 1,435 mg/l. Conductivities in water supply wells in the vicinity of the Site have been measured at levels ranging from approximately 655 μmhos/cm to 1,300 μmhos/cm with an average of 1,046 μmhos/cm. The elevated conductivity measured in the seep water sample should show up as an anomaly as compared to background in an EM survey. Referring to Figure 5, the colored areas represent areas where the terrain conductivity may be elevated over background. These areas may be representative of areas where soil porewater contains fluids with higher conductivity as compared to adjacent areas. The higher conductivity fluids could have originated from a release at the Site.

Significant anomalies (greater than 16 mmhos/m) are located in the seep area, north and northwest of the Stack Pac, in the area of the junction box, and northeast of the junction box in the arroyo. A plausible interpretation of the EM

map would be that a release of condensate containing brine occurred at the Site which migrated vertically until a unit with a lower permeability (probably the sandstone outcropping in the arroyo) was encountered. The condensate brine release then migrated on top of the sandstone until it discharged at the seep.

Based upon the soil gas investigation and the EM survey results, the most likely release areas are either the junction box or the pipeline. In addition, the EM survey shows an anomaly due north of the Stack Pac. No evidence of contaminant migration from off-Site areas was found. In fact, the EM survey primarily detected only background terrain conductivities (10 mmhos/m or lower) north and east of the main seep area as shown on Figure 5.

9.0 FINDINGS AND CONCLUSIONS

The findings and conclusions conclusions of the environmental investigation conducted at the Helbing Federal Well Site include the following:

1. The Site is located within the Seven Rivers Embayment which is an area of moderate relief. Surface elevations in the vicinity of the Facility range from approximately 4120 to 4040 feet AMSL.

2. Arroyos in the vicinity of the Site drain towards the northeast through Dunnaway Draw to Rocky Arroyo. Rocky Arroyo drains towards the northeast to the Pecos River.

3. Soils in the Site area comprise Ector Extremely Rocky Loam and Ector Stony Loam soils.

4. The strata at the subject Site are part of the carbonate facies of the Queen formation. The Queen formation is comprised of dolomite interbedded with many thin sandstone and siltstone beds.

5. No significant quantities of alluvium were observed in arroyos located immediately adjacent to the subject Site.

6. Regionally, rocks strike to the northeast and dip towards the southeast. Conjugate joints measured at the Site were found to range from N18W to N44W, and N35E to N48E.

7. There are three (3) separate aquifers in the vicinity of the Site. These include an alluvial aquifer, an upper Queen aquifer, and a lower Queen aquifer. Only the lower aquifer in the Queen formation is present beneath the subject Site.

8. The regional groundwater flow direction is towards the northeast at an approximate gradient of 0.02 feet per foot. The depth to groundwater at the Site may be approximately 350 feet below ground surface within the lower Queen aquifer, as estimated from a published groundwater potentiometric surface map (Bjorklund, 1959).

9. Groundwater flows through solution joints and fractures through the carbonate facies. Interbeds of siltstone and sandstone regionally can act as aquitards. Recharge of the lower Queen aquifer likely occurs through gypsum outcrops located west of the Site as well as through water seepage through joints and fractures.

10. The highest soil gas levels were measured at the base of the arroyo in the vicinity of the seep. Impacts from the seep extend approximately 280 feet along the base of the arroyo.

11. Outside the arroyo, the highest soil gas reading (196.5 ppm) was measured in the pipeline backfill, approximately 110 feet east of the Stack Pac. In addition, soil gas levels of 34 and 12 ppm were measured in the pipeline backfill in the vicinity of the pipeline junction box. The pipeline may be a source for impacts observed at the Site.

12. Measurable soil gas levels (above background) were detected approximately 250 feet north (23.3 ppm) and approximately 300 feet northeast (2.2 ppm) of the Stack Pac.

13. Published data and Site observations suggest that any near-surface releases and/or precipitation would be expected to rapidly infiltrate through bedrock due to the well development system of conjugate joints in the area. Downward migration would likely continue until a less fractured or less permeable zone was encountered, such as the sandstone that outcrops in the arroyo near the seep.

14. Potential contaminant migration pathways at the Site include the ground surface, the top of bedrock, and through bedrock fractures. Soil gas data suggest that the primary route of migration may be through bedrock fractures or bedding planes.

15. Sandstone was observed in many areas within the arroyo including the seep area, and may provide a possible route for lateral migration at the Site, especially during periods of significant rainfall infiltration.

16. Several areas of the Site were measured with elevated terrain conductivities in the vicinity of the seep; along the pipeline; northwest of the Stack Pac; over a sandstone outcrop within the arroyo approximately 350 feet upstream of the seep location; within the surface drainage approximately 100 feet north of the Stack Pac; and approximately 360 feet northwest of the Stack Pac.

17. In general, terrain conductivity readings in the Site vicinity were very low. A sample of the water within the seep in the arroyo was measured to have a conductivity of 2050 μmhos/cm (205 mmhos/m). Based on this conductivity, the seep water sample should have a total dissolved solids level of approximately 1435 mg/L. The conductivity of the seep

water should show up as an anomaly as compared to background in an EM survey.

18. Significant anomalies were measured in the seep area, north and northwest of the Stack Pac, in the area of the junction box, and northeast of the junction box in the arroyo.

19. Based upon the soil gas investigation and EM survey results, the most likely release areas are either the junction box or the pipeline. In addition, an EM anomaly was observed due north of the Stack Pac.

20. No evidence of contaminant migration from off-Site areas was found.

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TABLES

TABLES

TABLE 1: CONJUGATE JOINT ORIENTATIONS, CHEVRON USA, INC., EDDY COUNTY, NEW MEXICO

LOCATION	#1 ORIENTATION	#2 ORIENTATION
200, 0	N44W	N48E
710, 10	N25W	N45E
660, 100	N22W	N43E
600, 160	N22W	N35E
360, 400	N18W	N43E
200, 570	N46W	N40E
230, 110	N27W	N43E

TABLE 2: SOIL PROBE GRID LOCATIONS AND SOIL GAS READINGS, CHEVRON, USA, INC., EDDY COUNTY, NEW MEXICO

GRID POINT	BACKGROUND OVM, PPM	PROBE DEPTH, FEET	MAXIMUM OVM READING, PPM*	CALIBRATION CHECK, PPM
0,0	---	BR	---	---
0,200	0.0	0.7	0.0	---
0,300	0.0	1.3	0.0	99.9
0,400	0.0	0.9	0.0	---
0,500	0.0	0.8	0.0	99.9
100,0	---	BR	---	---
100,230	0.0	0.6	0.0	---
100,300	0.0	0.6	0.0	99.9
100,400	0.0	0.7	0.0	99.9
100,500	---	BR	---	---
150,250	1.0	0.7	1.0	99.9
150,300	0.0	0.5	0.0	99.9
170,-10	1.0	0.9	1.0	99.9
200,0	---	BR	---	---
200,100	---	BR	0.0	---
200,200	0.0	1.4	0.0	99.9
200,250	0.7	0.5	3.0	99.9
200,300	0.0	0.7	23.3	---
200,300	0.0	0.4	5.2	---
200,350	0.7	2.0	0.0	99.9
200,400	0.0	1.7	0.0	---
200,500	0.7	1.7	0.0	99.9
247,100	1.0	0.4	1.0	99.9
250,300	0.7	0.9	0.0	99.9
250,350	1.0	0.5	1.0	99.9
300,0	2.2	0.4	2.2	---
300,100	0.0	BR	---	---
300,200	0.0	1.8	0.0	99.9
300,275	0.7	0.7	0.0	99.9
300,300	0.0	1.7	0.0	99.9
300,400	0.0	0.6	0.0	---
300,425	0.7	2.0	0.0	99.9
300,45	1.0	0.7	1.0	99.9
300,70	1.0	0.5	1.0	99.9
350,45	1.0	1.5	1.0	99.9
350,70	---	BR	---	---
400,0	2.2	0.7	0.7	---
400,100	0.0	0.5	0.0	99.9
400,200	0.0	1.6	0.0	---
400,30	1.0	3.0	196.5	99.9
400,300	0.7	1.0	2.2	99.9
400,325	0.7	0.4	0.0	---
400,70	---	BR	---	---
420,5	1.0	3.5	9.1	99.9
450,25	1.0	0.5	1.0	99.9
460,-30	1.0	1.1	1.0	99.9
500,-100	0.7	0.4	0.7	99.6
500,-60	1.0	4.0	34.0	99.9
500,-60	1.0	3.0	1.0	99.9
500,0	0.7	0.4	0.7	99.9
500,150	0.7	0.7	0.7	---
550,-90	1.0	1.9	12.0	99.9
600,-100	---	BR	---	---
600,0	0.7	0.5	0.7	---
600,100	0.7	0.9	0.7	99.9

NOTES:
OVM = ORGANIC VAPOR MONITOR
BG = BELOW GROUND
PPM = PARTS PER MILLION

TABLE 3: SOIL GAS HEADSPACE READINGS, CHEVRON USA, INC.
EDDY COUNTY, NEW MEXICO

SAMPLE NUMBER	DEPTH INTERVAL, FEET	SOIL GAS CONCENTRATION, PPM
S-1	0 - 0.7	719
S-2	0 - 0.5	399
S-3	0 - 0.5	589
S-4	0 - 1.4	335
S-5	0 - 0.4	16
S-6	0 - 0.3	35
S-7	0 - 0.7	409
S-8	0 - 0.5	385
S-9	0 - 1.0	313
S-10	0 - 0.4	154
S-11	0 - 0.7	118
S-12	BR	NS
S-13	0 - 0.6	604
S-14	0 - 0.6	374
S-15	0 - 1.0	0.7
S-16	0 - 0.4	0.7
S-17	0 - 0.7	0.0
S-18	0 - 0.5	0.0
S-19	0 - 0.5	5
S-20	0 - 0.5	12

NOTES:
BR = BEDROCK OUTCROP
NS = NO SAMPLE OBTAINED
PPM = PARTS PER MILLION

TABLE 4: EM-31 GROUND CONDUCTIVITY READINGS, CHEVRON, USA
EDDY COUNTY, NEW MEXICO

STATION NUMBER	LINE 0 PERPENDICULAR/PARALLEL MMHOS/M.	STATION NUMBER	LINE 1 PERPENDICULAR/PARALLEL MMHOS/M
1	4.8/5.1	1	10.3/9.7
2	4.4/4.4	2	6.8
3	4.5/4.5	3	5.9/6.7
4	4.3/4.4	4	6.6/6.9
5	4.9/4.9	5	7.6/7.8
6	4.9/4.9 (HORIZ: 2.9/2.9)	6	7.5/8.1
7	4.7/4.8	7	8.1/8.0
8	4.9/4.9	8	7.3/7.0
9	5.1/5.1	9	6.8/6.8
10	5.4/5.4	10	6.6/6.6
11	5.9/6.0 (PT: 200,0)	11	6.3/6.3
12	5.1/5.1	12	6.2/6.3
13	6.1/6.1	13	6.1/6.2
14	7.3/7.4	14	6.2/6.2
15	20.9/11.2 (I)	15	6.4/6.3
16	10.4/10.1	16	6.4/6.5
17	15.0/11.5	17	6.5/6.3
18	9.2/8.9	18	8.1/8.2
19	9.6/9.9	19	13.7/12.5
20	10.8/11.1 (HORIZ: 2.9/2.6)	20	12.8/11.3
21	12.7/14.3	21	11.5/26.4 (I)
22	6.9/16.7 (I)	22	ND (I)
23	10.6/12.0	23	16.1/16.4
24	11.3/12.6	24	15.2/19.6
25	9.9/12.4	25	8.4/8.2
26	11.4/12.6	26	10.2/10.2
27	12.4/13.7	27	19.7/20.3
28	14.3/15.0 (NEAR JUNCTION BOX)	28	8.2/8.5
29	17.2/18.5 (ADJ TO GAS LINE)	29	9.8/9.8
30	8.3/8.7	30	9.6/9.7
31	5.9/6.9	31	5.3/5.8
32	5.4/6.2		

NOTE:

1. ND : NO DATA.
2. (I): READING DEFINITELY INFLUENCED BY INTERFERENCES.

TABLE 4: CONTINUED

STATION NUMBER	LINE 2 PERPENDICULAR/PARALLEL MMHOS/M	STATION NUMBER	LINE 2 CONTINUED PERPENDICULAR/PARALLEL MMHOS/M
1	9.4/9.8	55	5.0/4.9
2	9.3/9.8	56	5.2/5.3
3	8.6/9.3	57	5.3/5.5
4	8.8/9.4	58	5.6/5.6
5	8.1/8.9	59	6.3/6.4
6	6.9/6.7	60	9.5/8.5
7	6.9/6.8	61	6.9/7.6
8	7.1/6.9	62	4.8/4.9
9	7.0/7.0	63	4.6/4.6
10	6.9/7.0	64	4.5/4.6
11	6.8/6.9	65	4.3/4.5
12	7.0/7.2	66	4.4/4.5 (HORIZ: 2.3/2.4)
13	7.4/7.6	67	4.4/4.3
14	8.2/8.2	68	4.3/4.3
15	8.4/8.5	69	4.2/4.3
16	8.2/8.1	70	4.2/4.2
17	8.1/8.5	71	4.1/4.2
18	6.5/6.6 (NORTH OF STACK PAC)	72	4.1/4.2
19	6.0/6.2	73	4.2/4.3
20	6.1/6.2	74	4.3/4.3
21	5.6/5.8	75	4.4/4.6
22	6.4/6.4	76	4.5/4.6
23	5.9/5.9	77	4.9/5.1
24	6.4/6.5	78	5.9/6.2
25	6.9/6.9	79	6.4/6.7
26	7.6/7.8	80	6.3/6.6
27	7.9/8.2	81	6.3/6.6
28	8.6/8.9	82	6.2/6.4
29	9.3/9.5	83	5.6/6.4
30	10.1/10.2	84	5.4/6.0
31	9.8/10.5	85	5.4/6.2
32	10.8/11.4	86	5.6/6.3
33	10.4/11.0	87	6.4/7.0
34	10.6/11.3	88	6.8/7.3
35	10.6/11.3	89	6.6/7.2
36	10.7/11.6	90	6.7/7.2
37	10.8/11.5	91	6.6/7.5
38	10.7/11.6	92	6.9/7.4
39	9.3/10.6	93	6.9/7.6
40	8.8/9.0		
41	8.2/8.4		
42	7.9/8.2		
43	7.8/8.0		
44	8.9/8.9		
45	9.5/7.1		
46	8.6/8.9		
47	7.0/7.5		
48	6.8/7.2		
49	6.5/6.6		
50	6.7/6.9		
51	8.1/8.5		
52	8.4/8.5		
53	7.7/8.0		
54	8.0/7.9		

TABLE 4: CONTINUED

STATION NUMBER	LINE 3 PERPENDICULAR/PARALLEL MMHOS/M	STATION NUMBER	LINE 3B PERPENDICULAR/PARALLEL MMHOS/M
1	18.6/17.6	1	5.5/5.7
2	12.9/13.4	2	5.3/5.4
3	10.6/10.7	3	6.1/6.3
4	12.7/12.8	4	6.5/6.4
5	8.7/9.1	5	7.4/7.3
6	7.9/8.5	6	8.2/8.3
7	6.9/7.5	7	8.7/8.9
8	6.4/6.9	8	8.1/8.1
9	5.6/6.3	9	7.5/7.6
10	5.8/6.4	10	7.8/8.1
11	5.6/6.4	11	8.3/8.4
12	4.4/5.9	12	8.7/8.9
13	4.4/6.0	13	8.9/8.9
14	5.8/5.4	14	9.5/9.4
15	8.8/9.0	15	10.1/10.2
16	11.3/11.3	16	9.8/9.7
17	13.4/13.2	17	9.8/9.9
18	16.9/16.8	18	9.7/9.7
19	13.9/12.5	19	10.7/10.8
20	12.4/12.6	20	10.0/10.0
21	11.6/11.9		
22	11.8/11.9		
23	11.9/12.0)		
24	11.2/11.6		
25	12.8/12.7		
26	12.5/12.4		
27	12.6/12.8		
28	12.1/11.8		
29	10.6/10.4		
30	10.4/10.8		
31	10.5/10.2		
32	10.8/10.7		
33	10.9/10.7		
34	12.5/12.1		
35	12.6/12.6		
36	12.9/13.1		
37	11.2/11.9		
38	11.5/12.2		
39	10.4/11.2		
40	9.9/10.6		

TABLE 4: CONTINUED

STATION NUMBER	LINE 4 PERPENDICULAR/PARALLEL MMHOS/M	STATION NUMBER	LINE 5 PERPENDICULAR/PARALLEL MMHOS/M
1	5.2/4.9	1	2.9/2.9
2	5.6/5.2	2	3.2/3.1
3	5.8/5.9	3	2.5/2.9
4	6.9/7.3	4	2.9/3.3
5	8.4/8.4	5	3.4/3.7
6	11.2/10.6	6	5.2/5.2
7	12.9/12.9 (HORIZ: 8.9/8.6)	7	9.9/9.2
8	12.3/12.7	8	12.2/12.3
9	11.9/12.1	9	13.2/13.3
10	12.5/12.7	10	14.3/13.9
11	11.2/11.1	11	13.7/13.7
12	10.9/11.0	12	13.1/13.2
13	11.2/11.1	13	13.5/12.0
14	11.7/11.8	14	9.5/9.2
15	13.7/14.0	15	7.3/7.8
16	12.8/12.7	16	6.9/7.4
17	14.2/14.4	17	7.9/8.4
18	16.7/16.6	18	7.8/8.4
19	20.1/19.9		
20	21.1/20.1		
21	22.7/22.1		
22	28.2/26.9		

TABLE 4: CONTINUED

STATION NUMBER	LINE 6 PERPENDICULAR/PARALLEL MMHOS/M	STATION NUMBER	LINE 7 PERPENDICULAR/PARALLEL MMHOS/M
1	2.5/2.5	1	8.2/8.3
2	2.4/2.4	2	8.7/8.9
3	2.6/2.5	3	9.1/9.1
4	2.9/2.8	4	8.8/9.3
5	3.4/3.2	5	10.6/10.4
6	3.2/2.9	6	11.2/11.5
7	3.0/2.9	7	11.6/12.2
8	2.7/2.8	8	9.8/10.6
9	3.2/3.4	9	8.2/9.0
10	2.8/2.8	10	9.2/9.4
11	2.8/2.7	11	9.4/9.4
12	2.4/2.4	12	11.3/11.7
13	2.4/2.4	13	11.5/12.1
14	2.3/2.3	14	12.7/12.7
15	2.3/2.4	15	11.3/11.9
16	2.3/2.4	16	12.8/13.1
17	2.4/2.4	17	12.8/13.0
18	2.7/2.6	18	13.4/13.5
19	2.5/2.4	19	14.3/14.2
20	2.6/2.6	20	12.8/12.9
21	2.4/2.5	21	10.5/10.7
22	2.4/2.5	22	9.8/10.1
23	2.1/2.4	23	10.4/10.6
24	2.1/2.3	24	10.5/10.8
25	2.1/2.2	25	11.2/9.0
26	2.1/2.1	26	10.0/10.4
27	2.2/2.4	27	9.9/10.1
28	2.1/2.2	28	9.8/10.0
29	1.9/2.1	29	9.6/9.9
30	1.9/2.1	30	9.3/9.6
		31	9.5/9.9
		32	9.4/10.0
		33	10.5/11.1
		34	11.5/11.6
		35	10.3/10.8
		36	11.6/11.9
		37	8.9/9.3
		38	9.3/9.9
		39	9.4/9.9
		40	9.7/9.9
		41	9.1/9.3
		42	8.2/8.5
		43	7.7/7.9
		44	7.9/7.9
		45	7.9/8.1
		46	7.5/7.5
		47	7.3/7.6

TABLE 4: CONTINUED

STATION NUMBER	LINE 8 PERPENDICULAR/PARALLEL MMHOS/M	STATION NUMBER	LINE 9 PERPENDICULAR/PARALLEL MMHOS/M
1	2.4/2.6	1	9.2/9.5
2	3.0/3.0	2	8.5/8.6
3	3.8/3.6	3	10.8/10.6
4	4.2/4.0	4	12.5/12.2
5	5.5/5.1	5	17.2/16.2
6	7.1/6.5	6	16.8/16.9
7	9.3/8.6	7	16.3/16.2
8	12.7/12.6	8	16.0/15.0
9	17.5/15.2	9	14.8/13.9
10	773 (I)	10	12.2/11.8
11	625 (I)	11	11.6/11.4
12	410 (I)	12	11.4/11.7
13	343 (I)	13	11.0/11.2
14	270 (I)	14	11.3/11.2
15	567/286 (I)	15	11.9/11.9
16	594/210 (I)		
17	454/178 (I)		
18	321/152 (I)		
19	182 (I)		
20	289 (I)		
21	302 (I)		
22	326 (I)		
23	216 (I)		
24	160 (I)		
25	26.1 (I)		
26	14.7/14.2		
27	12.0/11.8		
28	13.2/13.1		
29	11.2/11.3		
30	11.9/11.5		
31	12.1/12.2		
32	12.5/12.2		
33	12.4/12.2		
34	13.4/13.0		
35	10.9/10.5		
36	10.6/10.6		
37	11.7/11.5		
38	11.5/11.6		
39	11.8/11.7		
40	11.9/11.8		
41	13.7/14.1		
42	14.4/14.6		
43	13.6/13.9		
44	10.0/10.6		
45	10.2/11.2		
46	11.6/10.5		

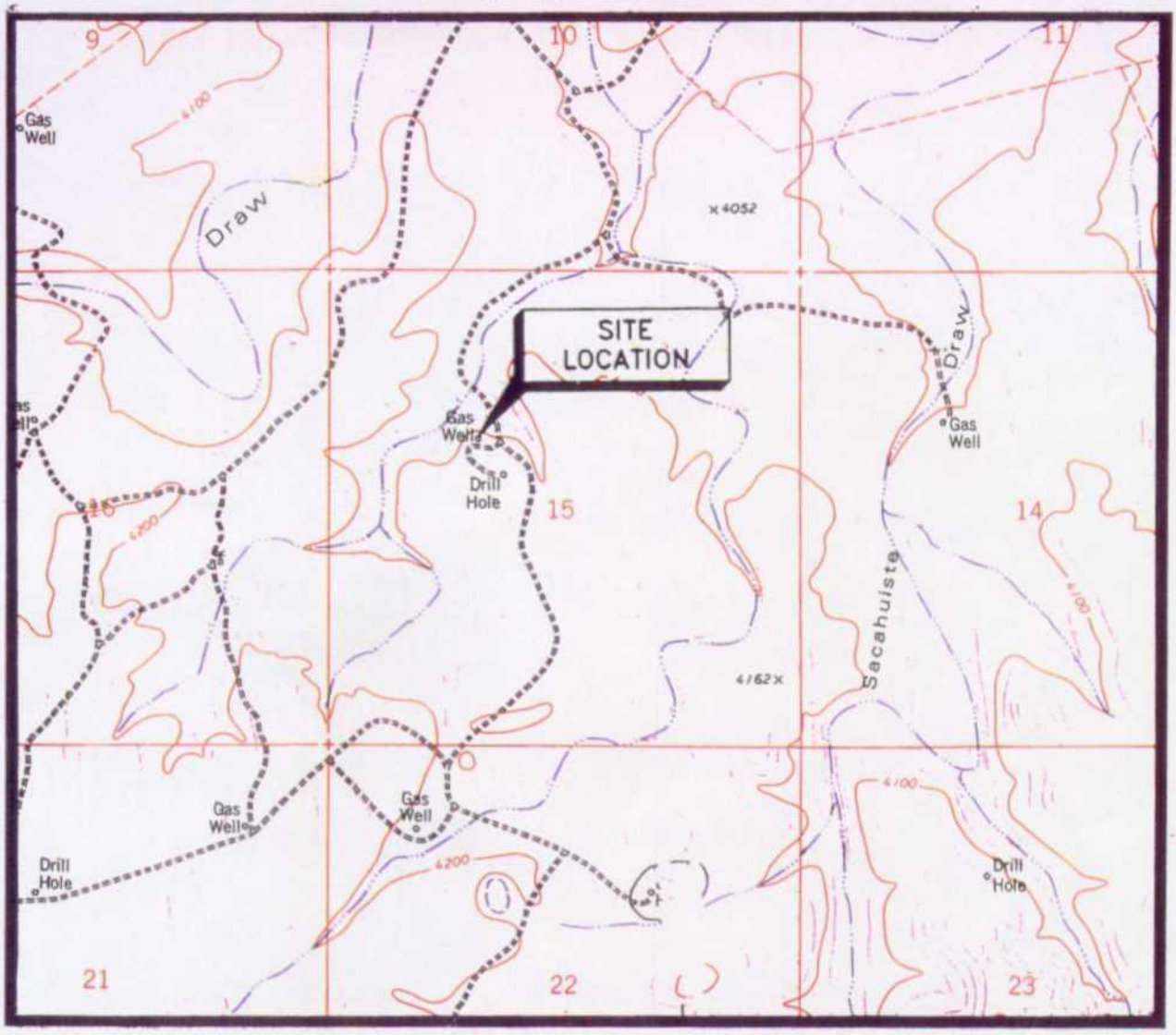
TABLE 4: CONTINUED

STATION NUMBER	LINE 10 PERPENDICULAR/PARALLEL MMHOS/M	STATION NUMBER	LINE 11 PERPENDICULAR/PARALLEL MMHOS/M
1	6.4/6.5	1	15.2/14.0
2	7.2/7.1	2	10.7/10.5
3	7.0/7.3	3	10.5/10.3
4	7.4/7.5	4	9.1/9.3
5	7.2/7.3	5	9.7/9.2
6	7.1/7.2	6	9.8/9.4
7	7.3/7.6	7	9.8/9.4
8	7.4/7.4	8	9.3/9.0
9	7.6/7.8	9	9.3/9.2
10	8.0/7.8	10	9.8/9.7
11	7.8/7.9	11	11.3/11.1
12	8.3/8.0	12	11.1/11.0
13	7.9/8.8	13	12.2/12.4
14	7.8/9.0	14	12.6/12.2
15	7.2/7.5	15	20.5/19.6
16	7.5/8.3	16	17.4/16.0
17	7.2/7.9		
18	6.8/7.0		
19	7.1/6.9		
20	7.1/7.0		
21	8.2/8.2		
22	7.5/9.5		
23	11.7/11.2		
24	11.0/10.9		
25	10.9/11.1		
26	8.4/8.5		

FIGURES

FIGURES

R 23 E



T 22 S

AFTER U.S.G.S. 7.5 MIN. TOPO. QUAD.,MARTHA CREEK, NEW MEXICO, 1978

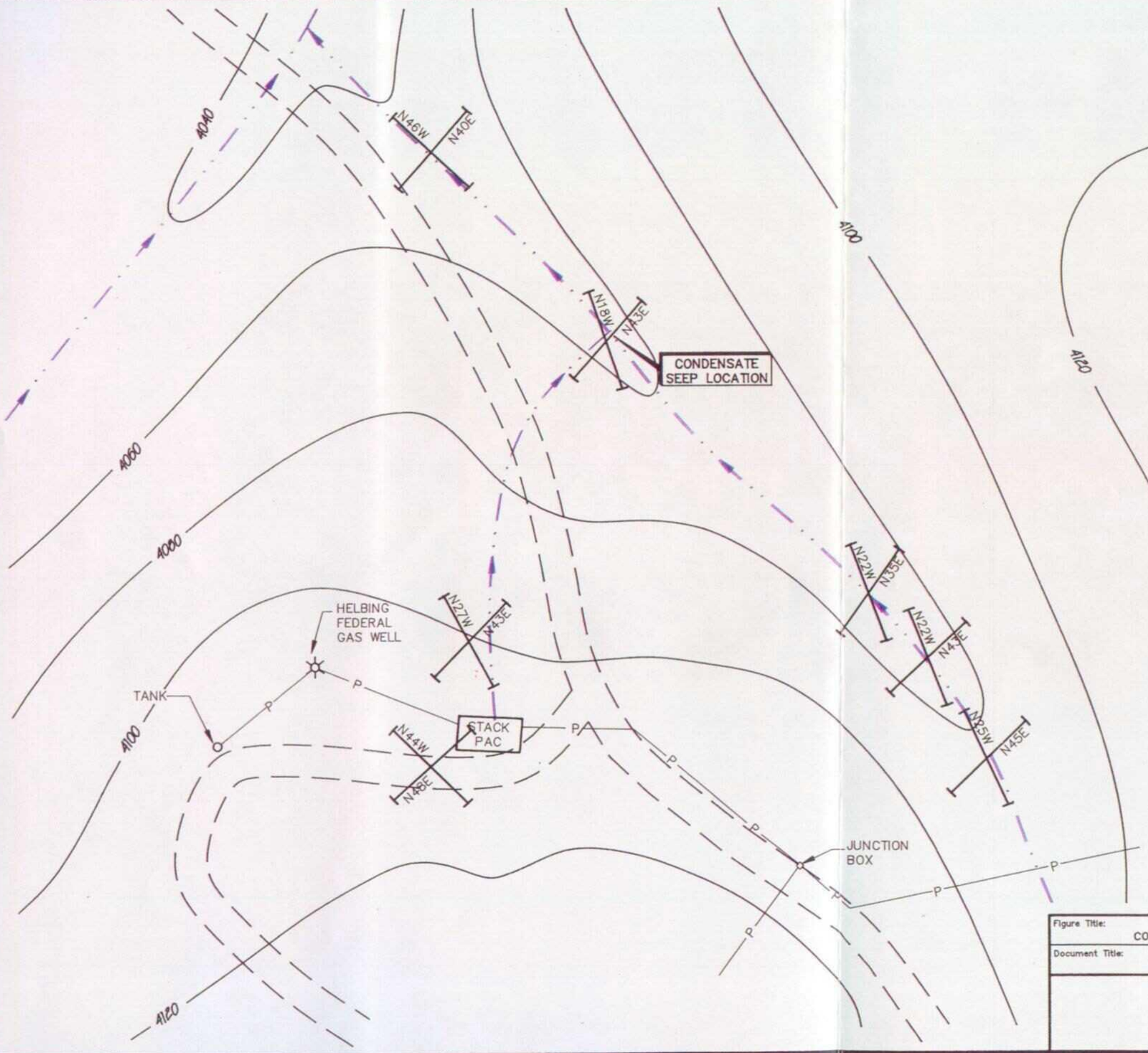
SCALE
0 1/2 1 MILE

N

Figure Title: SITE LOCATION AND TOPOGRAPHIC MAP	Client: CHEVRON, USA, INC.
Document Title: ENVIRONMENTAL INVESTIGATION REPORT	Location: HELBING FEDERAL WELL SITE EDDY COUNTY, NEW MEXICO

ROBERTS/SCHORNICK & ASSOCIATES, INC.
Environmental Consultants
3700 West Robinson, Suite 200
Norman, Oklahoma 73072
(405) 321-3895

DATE: 4/21/93	PREPARED BY: WEP
SCALE: AS SHOWN	CHECKED BY: BJS
	DRAFTED BY: BDR
PROJECT NO: 93052.01 F01	FIGURE NO.: 1



NORTH

SCALE

0 100 200 300 FEET

LEGEND

N22W N43E — CONJUGATE JOINTS SHOWING COMPASS ORIENTATIONS. ALL MEASURED JOINTS ARE NEARLY VERTICAL

— P — PIPELINE

— · · → ARROYOS AND SURFACE WATER DRAINAGES SHOWING FLOW DIRECTION

— 4060 — GROUND SURFACE ELEVATION, FEET AMSL

CONTOUR INTERVAL: 20 FEET

☼ HELBING FEDERAL GAS WELL

NOTE: THIS MAP IS NOT A PLAT OF SURVEY. ALL LOCATIONS SHOWN ARE APPROXIMATE.

Figure Title: CONJUGATE JOINT ORIENTATIONS	Client: CHEVRON, USA, INC.
Document Title: ENVIRONMENTAL INVESTIGATION REPORT	Location: HELBING FEDERAL WELL SITE EDDY COUNTY, NEW MEXICO

ROBERTS/SCHORNICK & ASSOCIATES, INC.
Environmental Consultants
3700 West Robinson, Suite 200
Norman, Oklahoma 73072
(405) 321-3695

DATE: 4/15/93	PREPARED BY: WEP
SCALE: 1"=100'	CHECKED BY: BJS
	DRAFTED BY: BDR
PROJECT NO: 93052.01 M04	FIGURE NO.: 2

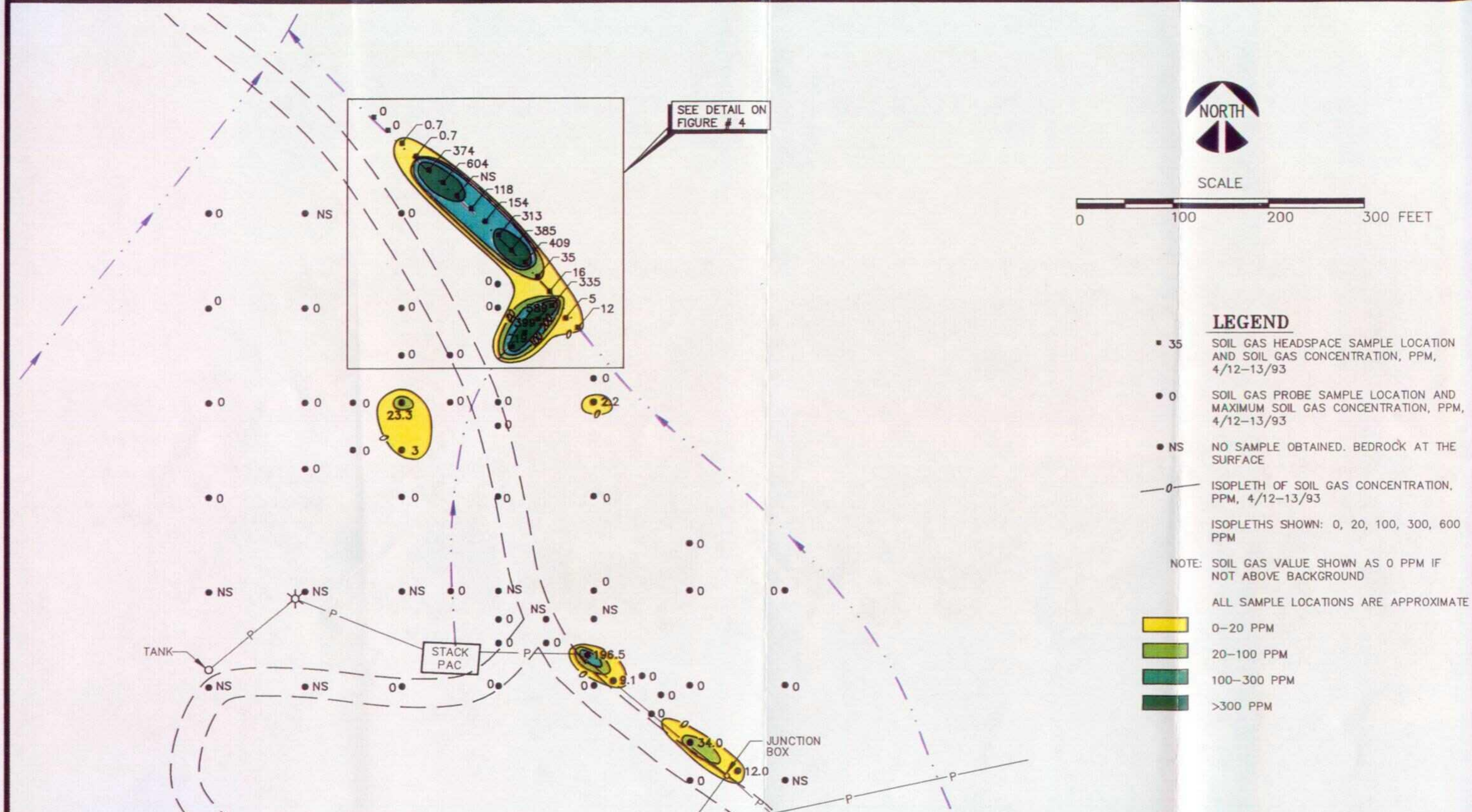
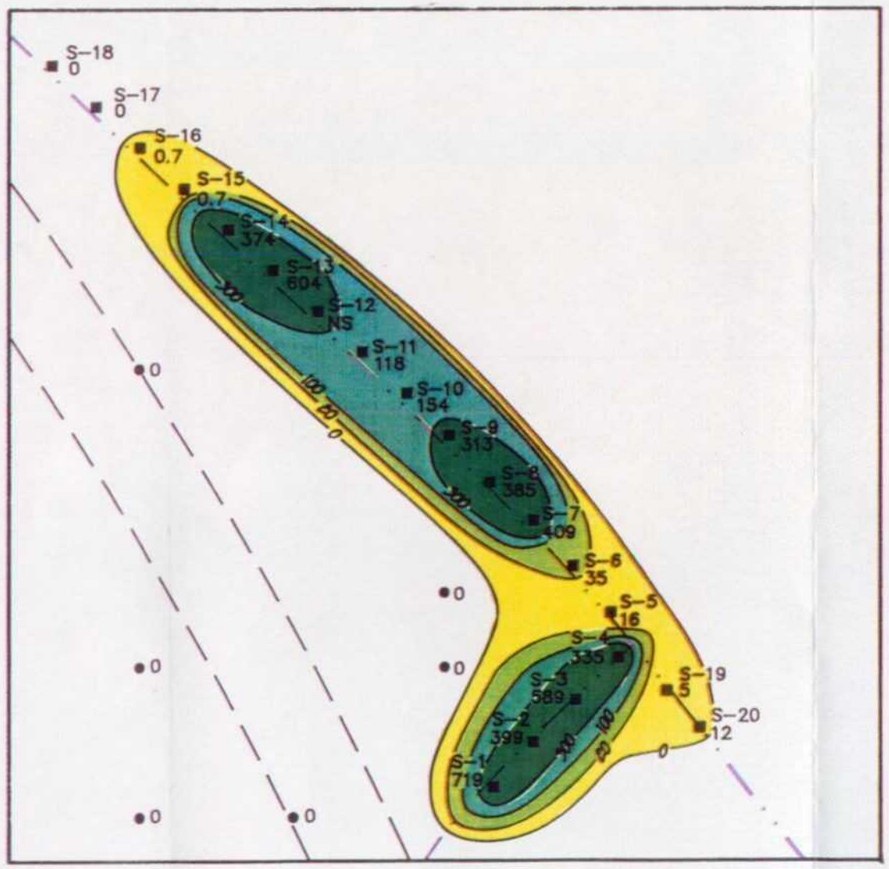


Figure Title: ISOPLETHS OF SOIL GAS CONCENTRATION PPM, 4/12–13/93	Client: CHEVRON, USA, INC.
Document Title: ENVIRONMENTAL INVESTIGATION REPORT	Location: HELBING FEDERAL WELL SITE EDDY COUNTY, NEW MEXICO
ROBERTS/SCHORNICK & ASSOCIATES, INC. Environmental Consultants 3700 West Robinson, Suite 200 Norman, Oklahoma 73072 (405) 321-3895	DATE: 1/15/93; SCALE: 1"=100'; PROJECT NO: 93052.01 M03; PREPARED BY: WEP; CHECKED BY: BJS; DRAFTED BY: BDR; FIGURE NO.: 3

DETAIL FROM FIGURE #3



NORTH

SCALE

0 50 100 FEET

LEGEND

- ■ S-6 / 35 — SOIL GAS HEADSPACE SAMPLE LOCATION AND SOIL GAS CONCENTRATION, PPM, 4/12-13/93
- ● 0 — SOIL GAS PROBE SAMPLE LOCATION AND MAXIMUM SOIL GAS CONCENTRATION, PPM, 4/12-13/93
- ● NS — NO SAMPLE OBTAINED. BEDROCK AT SURFACE
- —0— ISOPLETH OF SOIL GAS CONCENTRATION PPM, 4/12-13/93

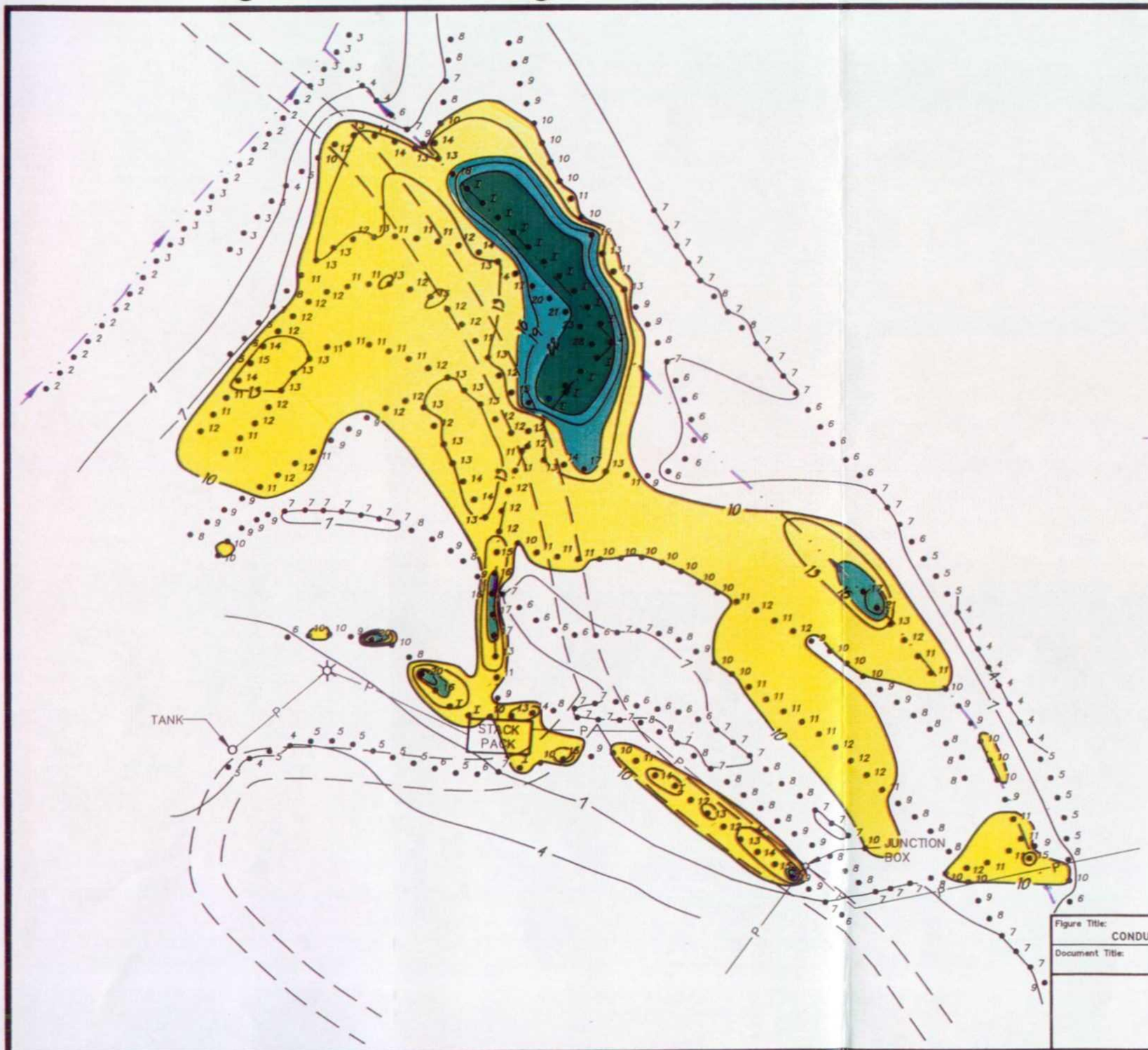
ISOPLETHS SHOWN: 0, 20, 100, 300, 600 PPM

NOTE: SOIL GAS VALUE SHOWN AS 0 PPM IF NOT ABOVE BACKGROUND

ALL SAMPLE LOCATIONS ARE APPROXIMATE

- 0-20 PPM
- 20-100 PPM
- 100-300 PPM
- >300 PPM

Figure Title: DETAIL SHOWING SOIL GAS HEADSPACE SAMPLE LOCATIONS		Client: CHEVRON, USA, INC.	
Document Title: ENVIRONMENTAL INVESTIGATION REPORT		Location: HELBING FEDERAL WELL SITE EDDY COUNTY, NEW MEXICO	
ROBERTS/SCHORNICK & ASSOCIATES, INC. Environmental Consultants 3700 West Robinson, Suite 200 Norman, Oklahoma 73072 (405) 321-3585		DATE: 4/29/93	PREPARED BY: WEP
		SCALE: 1"=50'	CHECKED BY: BJS
		PROJECT NO: 93052.01 M05	DRAFTED BY: BDR
			FIGURE NO.: 4



NORTH

SCALE

0 100 200 300 FEET

LEGEND

—— P —— PIPELINES

ARROYOS AND SURFACE WATER DRAINAGES SHOWING FLOW DIRECTION

CONTOUR INTERVAL: 20 FEET

HELBING FEDERAL GAS WELL

6 EM-31 SURVEY LINE SHOWING DATA POINTS, MMHOS/M, 4/12-13/93

ISOPLETHS SHOWN: 4, 7, 10, 13, 16, 19, 22, AND >100 MMHOS/M, 4/12-13/93

—10— ISOPLETHS OF ELECTROMAGNETIC TERRAIN CONDUCTIVITY MEASUREMENT, MMHOS/M, 4/12-13/93

NOTE: THIS MAP IS NOT A PLAT OF SURVEY. ALL LOCATIONS SHOWN ARE APPROXIMATE.

I NO READING OBTAINED DUE TO INTERFERENCE

EXPLORATION DEPTH 20 FEET

10-16 MMHOS/M

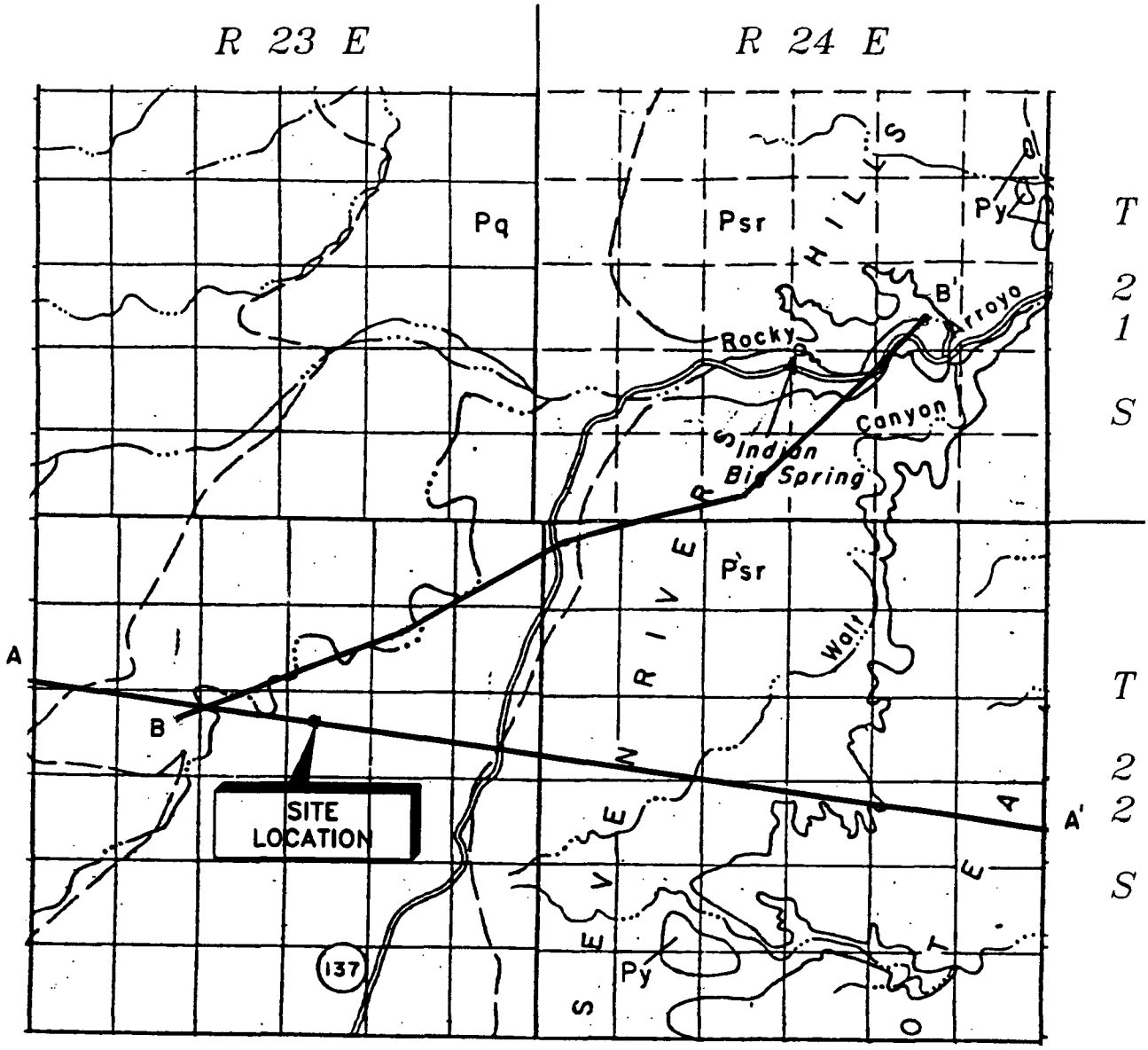
16-22 MMHOS/M

>22 MMHOS/M

Figure Title: ISOPLETHS OF TERRAIN CONDUCTIVITY, MMHOS/M, 4/12-13/93	Client: CHEVRON, USA, INC.
Document Title: ENVIRONMENTAL INVESTIGATION REPORT	Location: HELBING FEDERAL WELL SITE EDDY COUNTY, NEW MEXICO

ROBERTS/SCHORNICK & ASSOCIATES, INC.
Environmental Consultants
3700 West Robinson, Suite 200
Norman, Oklahoma 73072
(405) 321-3895

DATE: 1/15/93	PREPARED BY: WEP
SCALE: 1"=100'	CHECKED BY: BJS
	DRAFTED BY: BDR
PROJECT NO: 93052.01 M02	FIGURE NO.: 5

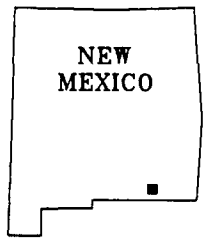


AFTER BJORKLUND AND MOTTS, 1959

A——A' LINE OF GEOLOGICAL CROSS-SECTION

CONTACT – INDEFINITE OR GRADATIONAL WHERE DASHED

SCALE
0 1 2
MILES



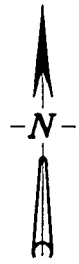


Figure Title: GEOLOGIC MAP AND LINES OF GEOLOGICAL CROSS-SECTION	Client: CHEVRON, USA, INC.
Document Title: ENVIRONMENTAL INVESTIGATION REPORT	Location: HELBING FEDERAL WELL SITE EDDY COUNTY, NEW MEXICO

ROBERTS/SCHORNICK & ASSOCIATES, INC.
Environmental Consultants
3700 West Robinson, Suite 200
Norman, Oklahoma 73072
(405) 321-3895

DATE: 4/28/93	PREPARED BY: W.E.P.
SCALE: AS SHOWN	CHECKED BY: B.J.S.
	DRAFTED BY: TAH
PROJECT NO: 9305201 F03	FIGURE NO.: 6

EXPLANATION

QUARTERNARY

OCHOA SERIES

Qal

ALLUVIUM

GRAVEL, SAND AND SILT WITH BEDS OF CALICHE AND LIMESTONE CONGLOMERATE, CONTAINS SOME EOLIAN MATERIAL. SEDIMENTS DEPOSITED MAINLY BY THE PECOS RIVER AND TRIBUTARIES. YIELDS LARGE QUANTITIES OF WATER OF SLIGHTLY SALINE TO GOOD QUALITY TO IRRIGATION WELLS.

Pr | Pr(a)

RUSTLER FORMATION

AREA Pr – VESICULAR DENSE DOLOMITE UNDERLAIN BY GYPSUM AND SILT. IN MANY PLACES DOLOMITE ASSUMES ANOMALOUS DIPS RESULTING FROM REMOVAL OF UNDERLYING EVAPORITES. YIELDS SMALL QUANTITIES OF WATER OF POOR QUALITY TO STOCK WELLS. AREA Pr(a) – RUSTLER FORMATION IS MOSTLY MANTLED BY THIN ALLUVIUM, BUT LOCALLY ALLUVIUM MAY REACH APPRECIABLE THICKNESS.

Pcs

CASTILE FORMATION

SURFACE EXPOSURES ARE GYPSUM ALTERED FROM ANHYDRITE. CONTAINS REDDISH SILT AND INSOLUBLE RESIDUE THAT MAY BE SALADO OR RUSTLER. YIELDS SMALL AMOUNTS OF WATER OF POOR QUALITY TO STOCK WELLS IN BLACK RIVER VALLEY.

SHELF FACIES

PERMIAN

GUADALUPE SERIES

Artesia Group

Pt

TANSILL FORMATION

THIN– TO MEDIUM–BEDDED DOLOMITE AND LIMESTONE WITH SEVERAL INTERBEDDED SILT BEDS IN CARBONATE FACIES. GRADES INTO GYPSUM AND RED SILTS IN BACK REEF 4 TO 6 MILES FROM REEF ESCARPMENT. YIELDS SMALL AMOUNTS OF WATER OF FAIR TO GOOD QUALITY TO WELLS AND SPRINGS IN CARBONATE FACIES.

Py

YATES FORMATION

THIN– TO MEDIUM–BEDDED DOLOMITE AND LIMESTONE INTERBEDDED WITH MANY BROWNISH SAND SILT BEDS IN CARBONATE FACIES. CARBONATE FACIES GRADES INTO GYPSUM AND SILT BEDS IN SHELF AREA 5 TO 7 MILES FROM REEF ESCARPMENT. YIELDS SMALL AMOUNTS OF WATER OF GOOD QUALITY TO DOMESTIC AND STOCK WELLS IN CARBONATE FACIES.

Psr

SEVEN RIVERS FORMATION

DOLOMITE AND LIMESTONE INTERBEDDED WITH SEVERAL SANDSTONE AND SILTSTONE BEDS IN CARBONATE FACIES. GRADES INTO GYPSUM AND SILT IN SHELF AREA 12 TO 15 MILES FROM REEF ESCARPMENT. YIELDS SMALL AMOUNTS OF WATER OF GOOD QUALITY TO DOMESTIC AND STOCK WELLS IN CARBONATE FACIES.

AFTER BJORKLUND AND MOTTS, 1959

Figure Title: REGIONAL STRATIGRAPHIC COLUMN AND EXPLANATION FOR FIGURE 6	Client: CHEVRON, USA, INC.
Document Title: ENVIRONMENTAL INVESTIGATION REPORT	Location: HELBING FEDERAL WELL SITE EDDY COUNTY, NEW MEXICO

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Environmental Consultants
3700 West Robinson, Suite 200
Norman, Oklahoma 73072
(405) 321-3895

DATE: 4/29/93	PREPARED BY: W.E.P.
SCALE: NTS	CHECKED BY: B.J.S.
	DRAFTED BY: TAH
PROJECT NO: 9305201 F02	FIGURE NO.: 7

EXPLANATION

PERMIAN

GUADALUPE

LEONARD

Pq

QUEEN FORMATION

DOLOMITE INTERBEDDED WITH MANY BROWN SAND AND SILT BEDS IN CARBONATE FACIES. GRADES INTO EVAPORITE FACIES IN SHELF AREA 15 TO 18 MILES NORTH AND NORTHWEST FROM CARLSBAD. YIELDS SMALL AMOUNTS OF WATER OF GOOD TO FAIR QUALITY WEST OF CARLSBAD.

Pg

GRAYBURG FORMATION

PRINCIPALLY DOLOMITE INTERBEDDED WITH BROWNISH FINE SAND TO SILT BEDS. CARBONATE FACIES GRADES INTO EVAPORITE FACIES IN SHELF ABOUT 20 MILES WEST FROM REEF ESCARPMENT. YIELDS SMALL AMOUNTS OF WATER OF GOOD QUALITY WEST OF CARLSBAD.

Pcs

SAN ANDRES FORMATION

WEST FROM CARLSBAD UPPER PART OF FORMATION CONSISTS OF THICK BEDDED DOLOMITE. LOWER PART CONSISTS OF MORE THINLY BEDDED DOLOMITE WITH CONSIDERABLE CHERT. SOME SANDSTONE BEDS OCCUR, PARTICULARLY NEAR THE BASE. IN THE CARLSBAD AREA THE SAN ANDRES IS EXCLUSIVELY IN THE CARBONATE FACIES. YIELDS SMALL AMOUNTS OF WATER OF GOOD QUALITY WEST OF CARLSBAD.

AFTER BJORKLUND AND MOTTS, 1959

Figure Title: REGIONAL STRATIGRAPHIC COLUMN AND EXPLANATION FOR FIGURE 6	Client: CHEVRON, USA, INC.
Document Title: ENVIRONMENTAL INVESTIGATION REPORT	Location: HELBING FEDERAL WELL SITE EDDY COUNTY, NEW MEXICO

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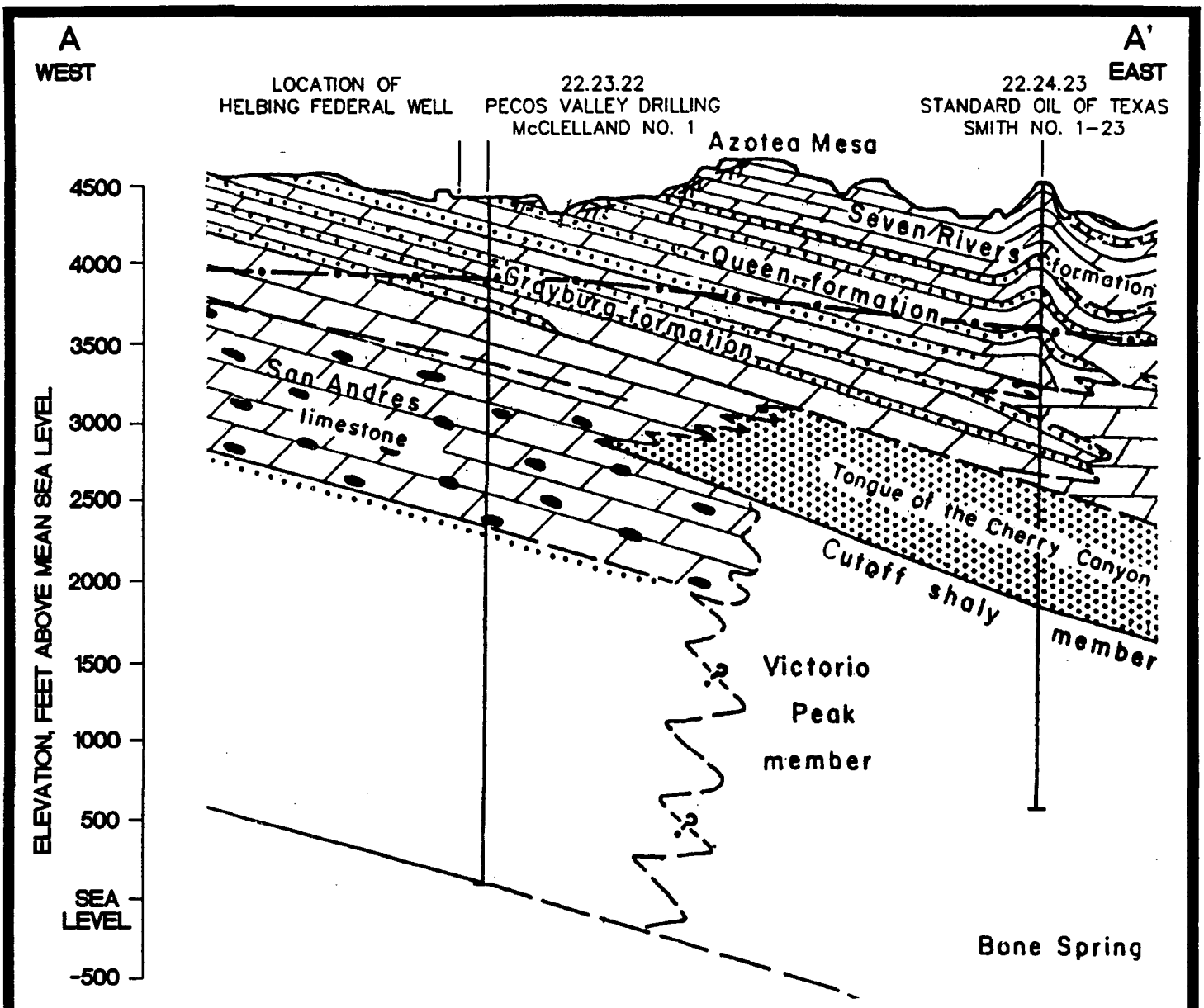
DATE: 4/29/93	PREPARED BY: W.E.P.
SCALE: NTS	CHECKED BY: B.J.S.
	DRAFTED BY: TAH
PROJECT NO: 9305201 F02	FIGURE NO.: 7



AFTER BJORKLUND AND MOTTS, 1959

LIMESTONE

DOLOMITE

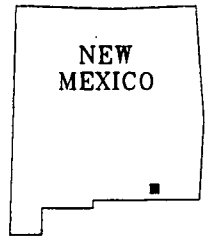
CHERT

SANDSTONE

APPROXIMATE GROUNDWATER POTENTIOMETRIC SURFACE

SCALES: VERTICAL: 1"=1000'
HORIZONTAL: 1"=10560'

VERTICAL EXAGGERATION: x 10.56



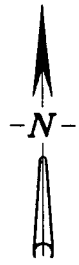


Figure Title: GEOLOGICAL CROSS-SECTION A-A'	Client: CHEVRON, USA, INC.
Document Title: ENVIRONMENTAL INVESTIGATION REPORT	Location: HELBING FEDERAL WELL SITE EDDY COUNTY, NEW MEXICO

ROBERTS/SCHORNICK & ASSOCIATES, INC.
Environmental Consultants
3700 West Robinson, Suite 200
Norman, Oklahoma 73072
(405) 321-3895

DATE: 4/28/93	PREPARED BY: W.E.P.
SCALE: AS SHOWN	CHECKED BY: B.J.S.
	DRAFTED BY: TAH
PROJECT NO: 9305201 F03	FIGURE NO.: 8

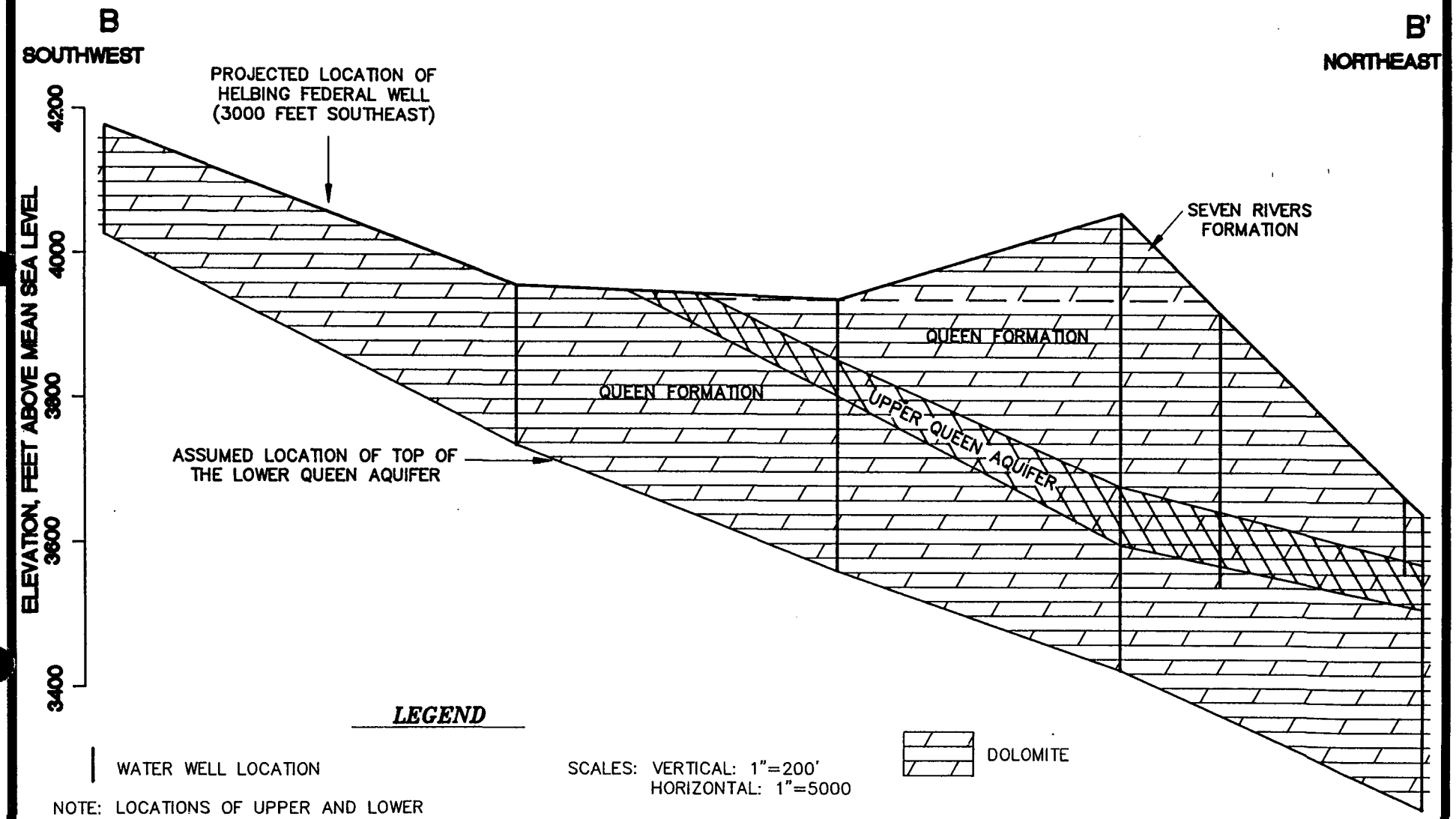


Figure Title: SOUTHWEST TO NORTHEAST GEOLOGICAL CROSS-SECTION B-B'	Document Title: ENVIRONMENTAL INVESTIGATION REPORT

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Environmental Consultants
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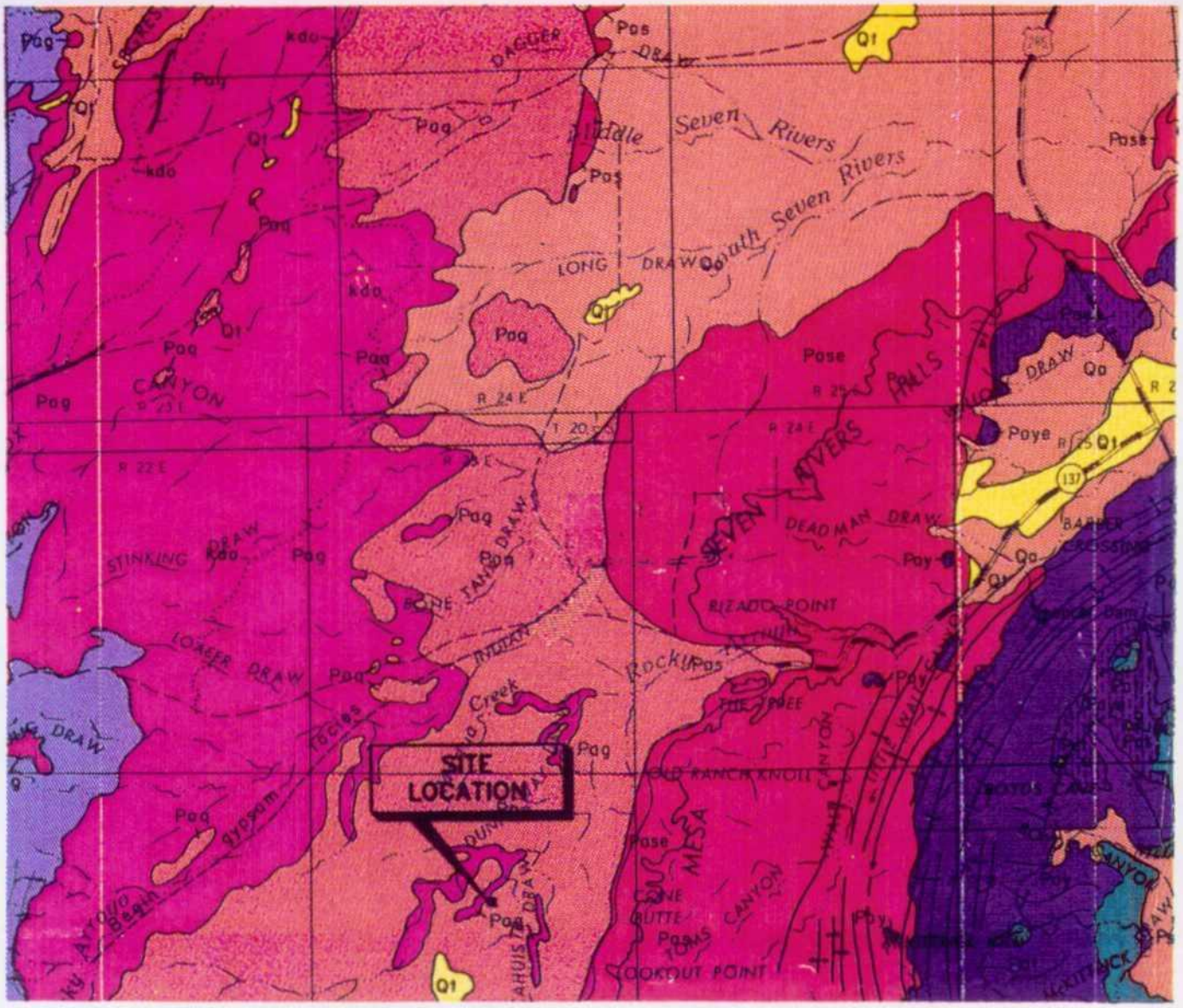
Norman, Oklahoma 73072
(405) 321-3695

Client: CHEVRON, USA, INC.		DATE: 4/29/93	PREPARED BY: W.E.P.
		SCALE: AS NOTED	CHECKED BY: B.J.S.
Location: HELBING FEDERAL WELL SITE EDDY COUNTY, NEW MEXICO			DRAFTED BY: TAH
		PROJECT NO: 9305201 M06	FIGURE NO.: 9



AFTER VINCENT C. KELLY, 1971

SCALE

0 5 10

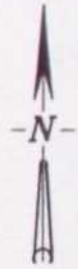


Figure Title: GUADALUPE MOUNTAINS–CARLSBAD REGIONAL GEOLOGY	Client: CHEVRON, USA, INC.
Document Title: ENVIRONMENTAL INVESTIGATION REPORT	Location: HELBING FEDERAL WELL SITE EDDY COUNTY, NEW MEXICO

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Environmental Consultants
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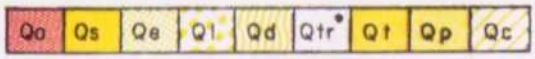
DATE: 4/28/93	PREPARED BY: W.E.P.
SCALE: AS SHOWN	CHECKED BY: B.J.S.
	DRAFTED BY: TAH
PROJECT NO: 9305201 F03	FIGURE NO.: 10

EXPLANATION



Surficial deposits

Gatuna Formation

Santa Rosa Formation

Dewey Lake Formation

Rustler Formation

Salado Formation

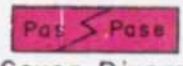
Castile Formation

Tansill Formation

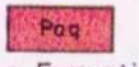
Yates Formation

Capitan Limestone

Bell Canyon Formation



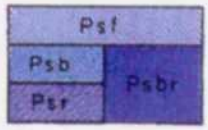
Seven Rivers Formation



Queen Formation

Goat Seep Formation

Grayburg Formation



San Andres Formation
Psf – Fourmile Draw Member
Psb – Bonney Canyon Member
Psr – Rio Bonito Member

Yeso Formation

IGNEOUS ROCKS

Dikes

AFTER VINCENT C. KELLY, 1971

Figure Title: EXPLANATION FOR FIGURE 10	Client: CHEVRON, USA, INC.
Document Title: ENVIRONMENTAL INVESTIGATION REPORT	Location: HELBING FEDERAL WELL SITE EDDY COUNTY, NEW MEXICO

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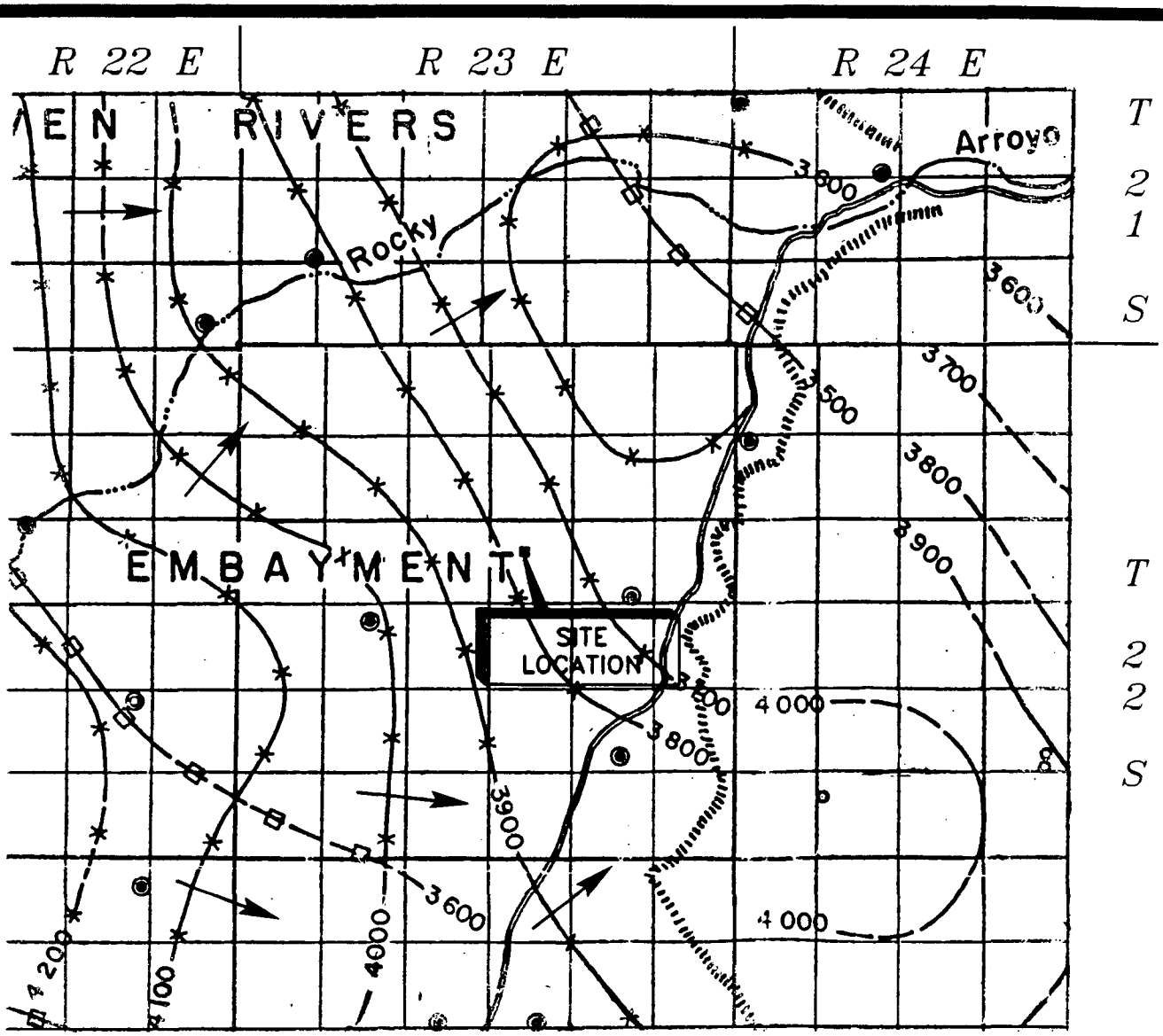
DATE: 4/29/93	PREPARED BY: W.E.P.
SCALE: NTS	CHECKED BY: B.J.S.
	DRAFTED BY: TAH
PROJECT NO: 9305201 F02	FIGURE NO.: 11



AFTER BJORKLUND AND MOTTS, 1959

- WATER WELL COMPLETED IN QUEEN–GRAYBURG FORMATION
- WATER WELL COMPLETED IN SAN ANDRES FORMATION
- WATER WELL COMPLETED IN YATES FORMATION
- GROUNDWATER POTENTIOMETRIC SURFACE , FEET AMSL, IN YATES FORMATION
- GROUNDWATER POTENTIOMETRIC SURFACE, FEET AMSL, IN SAN ANDRES FORMATION
- GROUNDWATER POTENTIOMETRIC SURFACE, FEET AMSL, IN QUEEN–GRAYBURG FORMATION
- DIRECTION OF GROUNDWATER FLOW IN QUEEN FORMATION

NOTE: DASHED WHERE APPROXIMATE

SCALE
0 1 2
MILES

NEW MEXICO

-N-

Figure Title: REGIONAL GROUNDWATER POTENTIOMETRIC SURFACE	Client: CHEVRON, USA, INC.
Document Title: ENVIRONMENTAL INVESTIGATION REPORT	Location: HELBING FEDERAL WELL SITE EDDY COUNTY, NEW MEXICO

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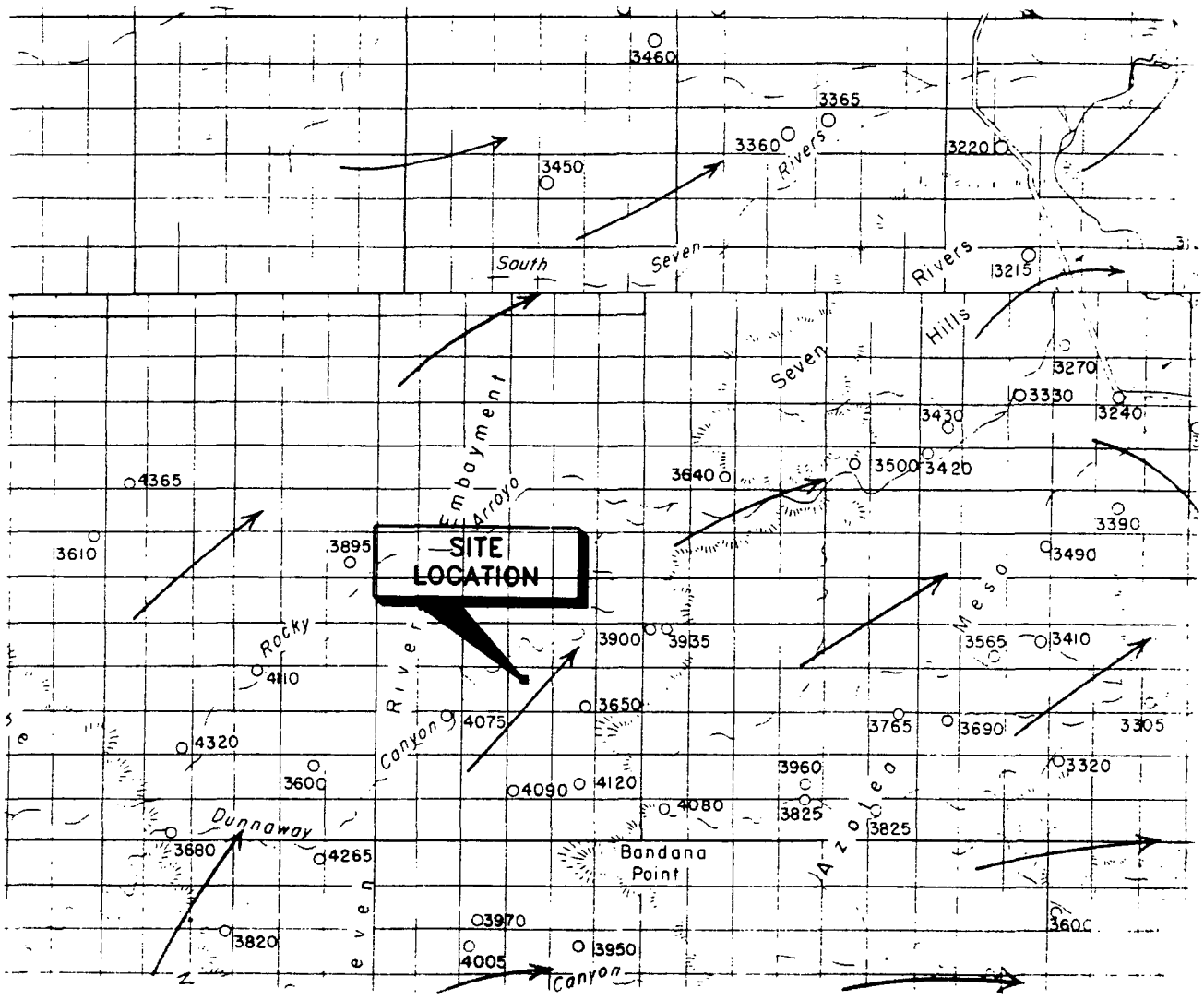
DATE: 4/28/93	PREPARED BY: W.E.P.
	CHECKED BY: B.J.S.
SCALE: AS SHOWN	DRAFTED BY: TAH
PROJECT NO: 9305201 F03	FIGURE NO.: 12



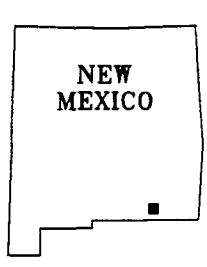
AFTER G.E. HENDRICKSON & R.S. JONES, 1952

3895 ○ WELL LOCATION AND GROUNDWATER ELEVATION, FEET AMSL

→ DIRECTION OF GROUNDWATER MOVEMENT

SCALE

0 5 10 MILES



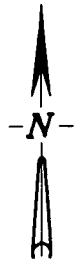


Figure Title: GENERAL DIRECTION OF MOVEMENT OF GROUNDWATER	Client: CHEVRON, USA, INC.
Document Title: ENVIRONMENTAL INVESTIGATION REPORT	Location: HELBING FEDERAL WELL SITE EDDY COUNTY, NEW MEXICO

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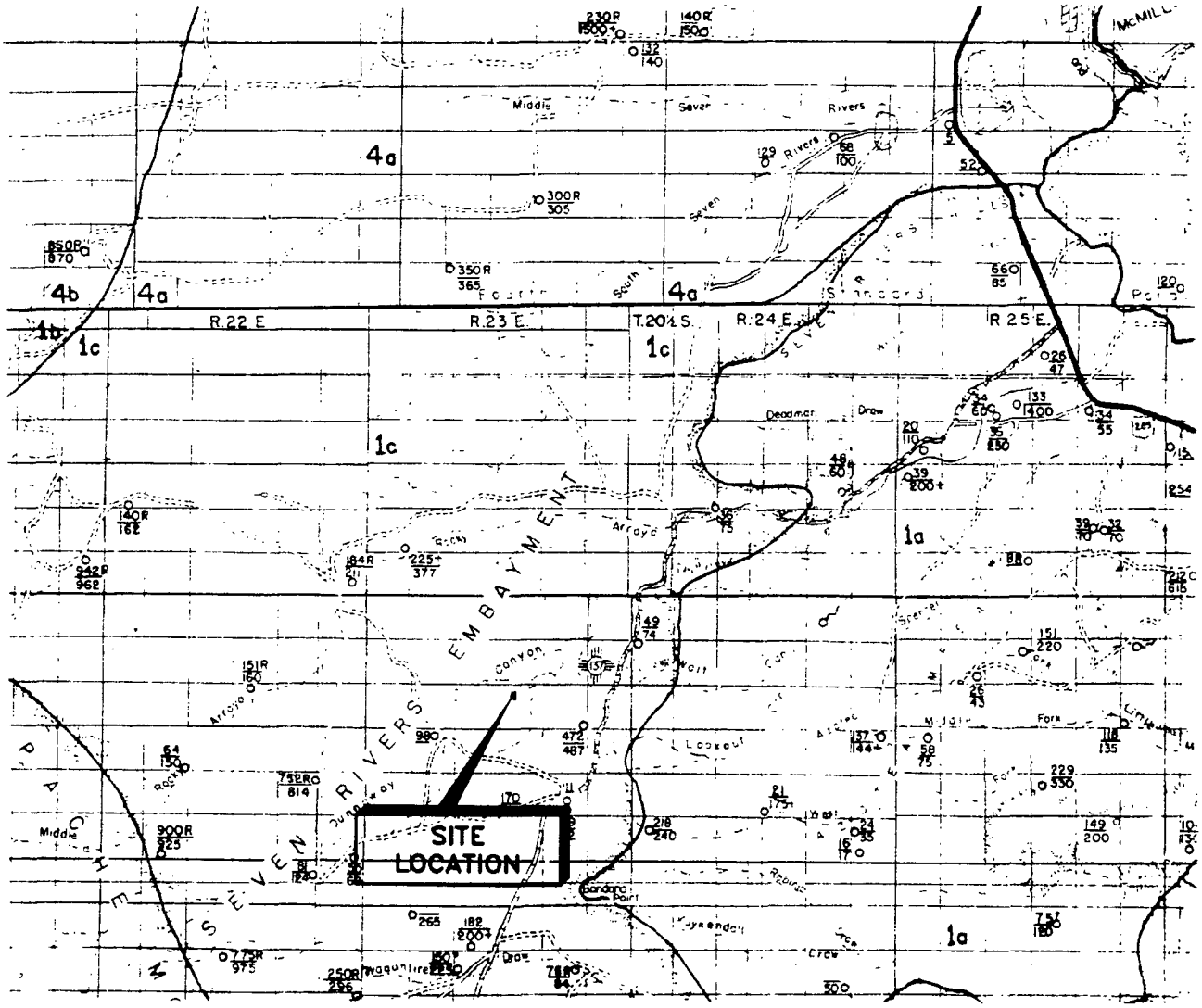
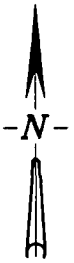
DATE: 4/28/93	PREPARED BY: W.E.P.
SCALE: AS SHOWN	CHECKED BY: B.J.S.
	DRAFTED BY: TAH
PROJECT NO: 9305201 F03	FIGURE NO.: 13



AFTER G.E. HENDRICKSON & R.S. JONES, 1952



SCALE

0 5 10 MILES

Figure Title: AVAILABILITY OF GROUNDWATER FOR EXPLANATION SEE FIGURE 15	Client: CHEVRON, USA, INC.
Document Title: ENVIRONMENTAL INVESTIGATION REPORT	Location: HELBING FEDERAL WELL SITE EDDY COUNTY, NEW MEXICO

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DATE: 4/28/93	PREPARED BY: W.E.P.
SCALE: AS SHOWN	CHECKED BY: B.J.S.
	DRAFTED BY: TAH
PROJECT NO: 9305201 F01	FIGURE NO.: 14

EXPLANATION

AVAILABILITY OF GROUND WATER BY AREAS

AREA 1. GUADALUPE MOUNTAINS:

a. Azotea Mesa: Stock and domestic supplies generally available at depths of less than 300 feet in Carlsbad limestone; perched water available locally in arroyo gravels. Irrigation supplies obtainable from Carlsbad limestone and overlying alluvium in La Huerta and Happy Valley, but shallow water in these areas is generally impotable.

b. Guadalupe Ridge and Mountains proper: Potable but generally hard water in small quantities available at depths of several hundred feet in uplands; shallow water available locally in arroyo gravels. Small springs from perched water southeast of White City on Guadalupe Ridge.

c. Seven Rivers embayment: Depths to water cannot be predicted accurately. Shallow wells can be obtained locally along arroyos, but most produce from Queen Sandstone member of Goat Seep limestone at depths as great as 900 feet. Water generally potable. Quantity generally sufficient for stock and domestic supplies.

AREA 2. ALLUVIUM SOUTH OF CARLSBAD:

a. Irrigation supplies generally obtainable. Generally impotable.

b. Stock and domestic supplies generally available at depths ranging from 100 to 225 feet.

AREA 3. BETWEEN GUADALUPE MOUNTAINS AND PECOS RIVER AND SOUTH OF LATITUDE 32°15′:

a. Stock and domestic supplies and, locally, irrigation supplies, obtainable from alluvium at depths generally less than 200 feet.

b. Stock and domestic supplies generally available in gypsum of Castile formation. Impotable over most of eastern part of area but usable for stock.

AFTER G.E. HENDRICKSON AND R.S. JONES, 1952

Figure Title: EXPLANATION FOR FIGURE 14	Client: CHEVRON, USA, INC.
Document Title: ENVIRONMENTAL INVESTIGATION REPORT	Location: HELBING FEDERAL WELL SITE EDDY COUNTY, NEW MEXICO

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DATE: 4/29/93	PREPARED BY: W.E.P.
SCALE: NTS	CHECKED BY: B.J.S.
	DRAFTED BY: TAH
PROJECT NO: 9305201 F02	FIGURE NO.: 15

EXPLANATION

AREA 4. ROSWELL BASIN:

a. Stock and domestic water available from alluvium or limestones of Chalk Bluff and San Andres formation at depths less than 50 feet on the east to 400 feet in west. Irrigation water available in eastern part.

b. Stock and domestic water available from limestone of San Andres formation at depths from 400 feet on the east to more than 800 feet on the west.

AREA 5. EAST OF PECOS RIVER:

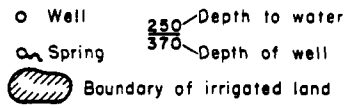
a. Stock and domestic supplies available at depths less than 200 feet in Chalk Bluff formation or Whitehorse group; locally impotable.

b. Stock water generally obtainable at depths less than 250 feet in Rustler formation; generally impotable and locally unfit for livestock.

c. Stock and domestic supplies available at depths less than 300 feet in Triassic redbeds; quality generally fair but locally impotable.

d. Potable water obtainable from sand and gravel or from underlying redbeds at a depth of about 300 feet.

EXPLANATION



AFTER G.E. HENDRICKSON AND R.S. JONES, 1952

Figure Title: EXPLANATION FOR FIGURE 14	Client: CHEVRON, USA, INC.
Document Title: ENVIRONMENTAL INVESTIGATION REPORT	Location: HELBING FEDERAL WELL SITE EDDY COUNTY, NEW MEXICO

ROBERTS/SCHORNICK & ASSOCIATES, INC.
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DATE: 4/29/93	PREPARED BY: W.E.P.
SCALE: NTS	CHECKED BY: B.J.S.
	DRAFTED BY: TAH
PROJECT NO: 9305201 F02	FIGURE NO.: 15

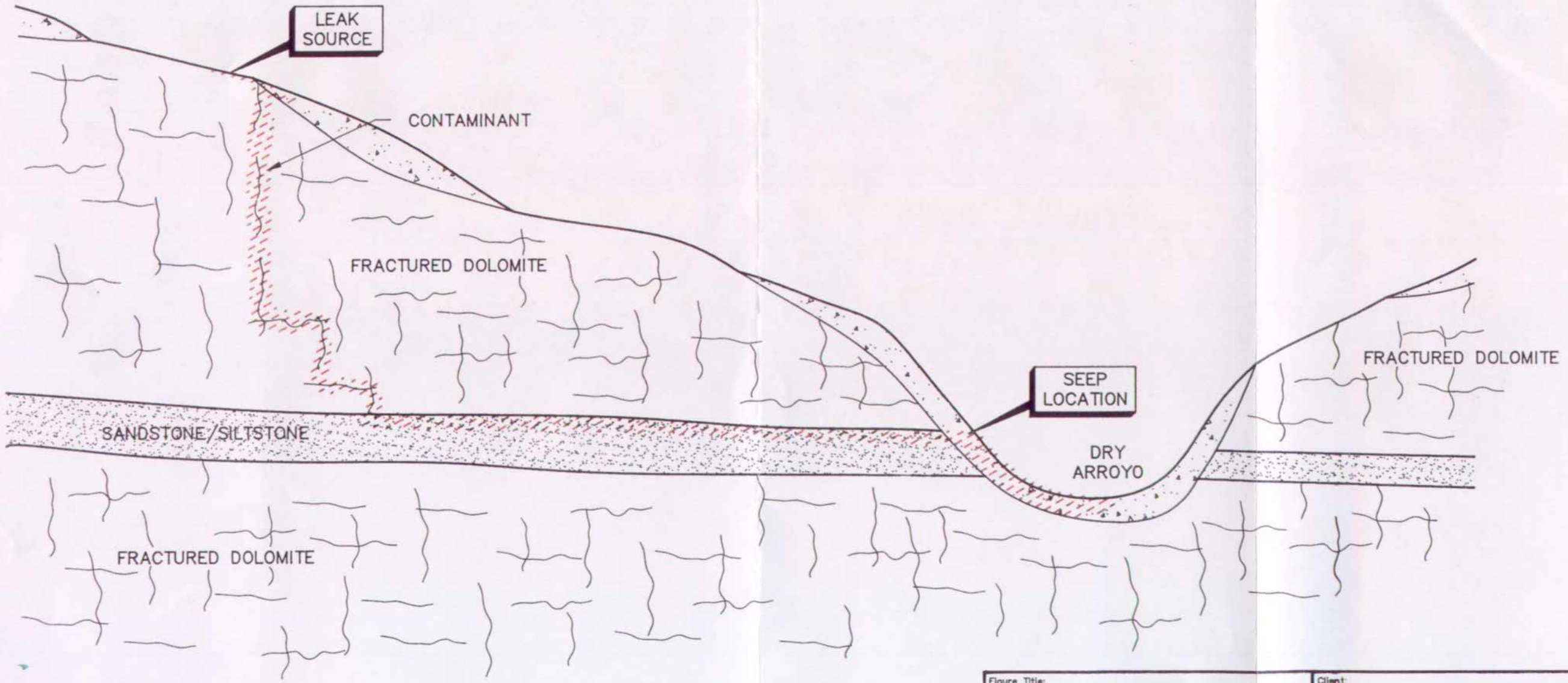

Figure Title: POSSIBLE MIGRATION PATHWAY	Client: CHEVRON, USA, INC.
Document Title: ENVIRONMENTAL INVESTIGATION REPORT	Location: HELBING FEDERAL WELL SITE EDDY COUNTY, NEW MEXICO

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Norman, Oklahoma 73072
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DATE: 5/7/93	PREPARED BY: WEP
SCALE: N.T.S.	CHECKED BY: BJS
PROJECT NO: 93052.01 M08	DRAFTED BY: RML
FIGURE NO.: 16	

ASSAIGAI
ANALYTICAL LABORATORIES, INC. • 7300 Jefferson, N.E. • Albuquerque, New Mexico 87109
3711 Admiral, Suite C • El Paso, Texas 79925

REPORT

Work Order # 93-07-051

Received: 07/08/93

Results by Sample

SAMPLE ID SAMPLE #1 FRACTION 01A TEST CODE SBTEX NAME BTEX/SW846 8020

Date & Time Collected 07/06/93 11:00:00 Category SOIL

PARAMETER	RESULT	LIMIT	D_F	DATE_ANAL
Benzene	ND	0.0010	1000	07/15/93
Toluene	ND	0.0010	1000	07/15/93
Ethylbenzene	8.9	0.0010	1000	07/15/93
P-&m-Xylene	54	0.0010	1000	07/15/93
O-Xylene	17	0.0010	1000	07/15/93

Notes and Definitions for this Report:

EXTRACTED 07/15/93
ANALYST NO
FILE ID 014
UNITS mg/Kg
BATCH_ID SGCVOA-34
PRCNT_MOIST

WQCC

Action Level

Assaigai Analytical Labs
7300 Jefferson NE
Albuquerque, NM 87109

Attn: MARLEAH M. MARTIN
Phone: (505)345-8964

CHEVRON USA INC
1216 W. LEA
P.O. BOX 670
HOBBS, NM 88240
Attn: DON GRIFFIN
Invoice Number:

Order #: 93-07-051
Date: 07/20/93 13:00
Work ID: HELBING FEDERAL NO. 1
Date Received: 07/08/93
Date Completed: 07/20/93
Client Code: CHE08M

SAMPLE IDENTIFICATION

Sample Number	Sample Description	Sample Number	Sample Description
01	SAMPLE #1		

ND = None Detected D_F = Dilution Factor NT = Not Tested
B = Analyte was present in the blank J = Estimated value
E = Estimated Value, Concentration exceeds calibration range
MULTIPLY THE LIMIT BY THE DILUTION FACTOR.

Certified By
Marleah Martin

ANALYTICAL LABORATORIES, INC. • 7300 Jefferson, N.E. • Albuquerque, New Mexico 87109
3711 Admiral, Suite C • El Paso, Texas 79925

REPORT

Work Order # 93-07-051

Received: 07/08/93

Results by Sample

SAMPLE ID SAMPLE #1 FRACTION 01B TEST CODE STRPH NAME TRPH/EPA 418.1

Date & Time Collected 07/06/93 11:00:00 Category SOIL

PARAMETER	RESULT	LIMIT	D_F	DATE_ANAL
Total Petroleum HCs	610	5.0	1.0	07/14/93

Notes and Definitions for this Report:

EXTRACTED 07/14/93
ANALYST DH
UNITS mg/Kg
BATCH_ID STRPH-096
PRCNT_MOIST

fction 100 ppm

Report to:Alpha West, Inc.
Submission #:9311000149
Project:CHEVRON USA
Date Reported:11/17/93

Client Sample #:HELBING FEDERAL GAS COM #1
Laboratory Sample ID:21907 Matrix:Soil
The sample location was EDDY COUNTY, NM.
Sample collection date was November 10, 1993.

BTEX (Method Defined With Results) Units mg/kg

Analyte	Result	Det.Limit
Benzene	<0.10	0.10
Toluene	<0.10	0.10
Ethyl Benzene	<0.1	0.1
Xylenes	<0.1	0.1

Analysis conducted using EPA method 8260.

TPH (EPA 418.1) Units mg/kg

Analyte	Result	Det.Limit
Total Petroleum Hydrocarbons	160	10

TPH (MODIFIED EPA 8015) Units mg/kg

Analyte	Result	Det.Limit
Total Petroleum Hydrocarbons	<10	10

Report To: Alpha West
Lab Number: 9311149
Page 3 of 5

Project: Chevron USA

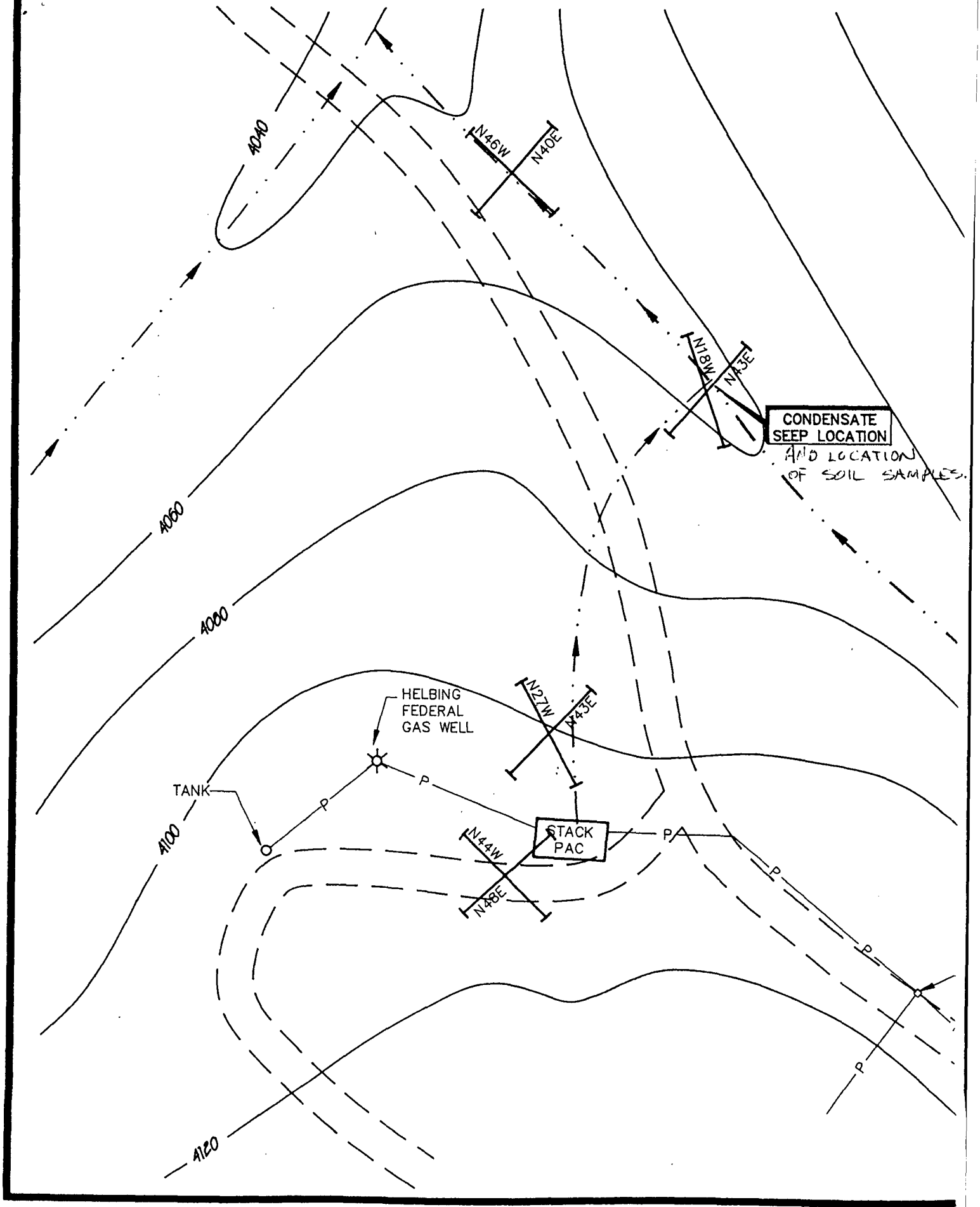
NOTE: **Sample(s) received at elevated temperature.**

RESULTS: BTEX and TPH results are reported in parts per million (ppm) in soil.

QUALITY CONTROL DATA

	Value 1	Value 2	% Var.
TPH: (418.1)	36	36	0.0
BENZENE:	17.4	18.1	3.9
CONCENTRATION UNITS:		BTEX - ppm	TPH - ppm
DETECTION LIMITS:		BTEX - 0.1	TPH - 10

ANALYST	ANALYTE	DATE EXTRACTED	DATE ANALYZED
James D. Lynch	BTEX & TPH	11/15/93	11/15/93
Tony Taylor	TPH (418.1)	11/15/93	11/16/93


4040
4060
4080
4100
4120
N46W
N40E
N18W
N43E
CONDENSATE
SEEP LOCATION
AND LOCATION
OF SOIL SAMPLES.
HELBING
FEDERAL
GAS WELL
N27W
N43E
TANK
P
STACK
PAC
N44W
N48E

STATE OF NEW MEXICO

ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT

OIL CONSERVATION DIVISION

BRUCE KING
GOVERNOR

ANITA LOCKWOOD
CABINET SECRETARY

August 12, 1994

POST OFFICE BOX 2088
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO 87504
(505) 827-5800

CERTIFIED MAIL
RETURN RECEIPT NO. P-111-334-153

Mr. D.B. McDaniel
Mid-Continent Business Unit
Chevron USA Production Co.
P.O. Box 1635
Houston, Texas 77251

RE: CHEVRON HELBING FEDERAL #1
EDDY COUNTY, NEW MEXICO

Dear Mr. McDaniel:

The New Mexico Oil Conservation Division is in the process of reviewing your June 20, 1994 correspondence regarding contamination of soils and an arroyo adjacent to Chevron's Helbing Federal #1 well site. The OCD has the following comments and requests for information regarding this correspondence:

1. The correspondence states that a site assessment conducted by Chevron determined that the source of hydrocarbons which occasionally surface in the arroyo is an adjacent Marathon Oil Company gathering system flowline and is not related to Chevron's activities at the Helbing Federal #1 well site. However, the referenced site assessment was not provided to the OCD for review. Please provide this document to the OCD Santa Fe Office with a copy provided to the OCD Artesia Office such that the OCD can review the results and conclusions of this site assessment.

2. Please provide the OCD with the locations and the laboratory analytical data sheets for the soil samples referenced in the January 6, 1994 letter to the Bureau of Land Management.

If you have any questions, please contact me at (505) 827-5885.

Sincerely,

William C. Olson
Hydrogeologist
Environmental Bureau

xc: OCD Atresia Office
J. Amos, BLM Carlsbad Resource Area
Robert Menzie, Marathon Oil Company

P 111 334 153

Receipt for Certified Mail

UNITED STATES POSTAL SERVICE

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Do not use for International Mail
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Return Receipt Showing to Whom, Date, and Addressee's Address	
TOTAL Postage & Fees	$
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PS Form **3800**, June 1991

Fold at line over top of envelope to the right of the return address

State of New Mexico
ENERGY, MINERALS and NATURAL RESOURCES DEPARTMENT
Santa Fe, New Mexico 87505

STATE OF NEW MEXICO
OIL CONSERVATION DIVISION

MEMORANDUM OF MEETING OR CONVERSATION

☑ Telephone ☐ Personal	Time approx 10:30 am	Date 7/25/94

Originating Party	Other Parties
Bob Menzie - Marathon	Bill Olson - Envir. Bureau

Subject

Helbing, Federal #1

Discussion

Approximately 2" of rain Thursday of last week
Noel Garza (Marathon Indian Basin Gas Plant Supervisor) went to site
Found pools of water in drainage along side Helbing Federal #1
Pool at junction of two drainages (one from Helbing, one comes from south) had 8" ø diameter sheen on water. No actual product visible. Sheen area inside bermed area.
Recommended Marathon sample pools of water during future events

Conclusions or Agreements

He will discuss sample with Charles Gurley & Noel Garza

Distribution

file

Signed Bill Olson

ANACHEM INC.

8 Prestige Circle, Suite 104 • Allen, Texas 75002
214/727-9003 • FAX # 214/727-9686 • 1-800-966-1186

Customer Name: Alpha West, Inc.
Date Received: November 12, 1993 at 11:21:45
Date Reported: November 17, 1993
Submission #: 9311000149
Project: CHEVRON USA

SAMPLES: The submission consisted of 1 sample with sample I.D. shown in the attached data table.

TESTS: The sample was analyzed for:
* BTEX (Method Defined With Results)
* TPH (EPA 418.1)
* TPH (MODIFIED EPA 8015)

Standards utilized in this analysis are:
418.1: n-Hexadecane, Isoctane, Chlorobenzene
8015: Toluene

Recommended maximum holding time for this analysis is:
TPH: 28 Days (Soil or Water)

RESULTS: See attached data table for results.

Distribution Of Reports:
2-Alpha West, Inc.
Attn:Clint Wallas
Ph. 915-683-5384 Fax

LAB NUMBER: 9311000149 lims

Respectfully Submitted,
Anachem,Inc.
James D Lynch
James D. Lynch, Ph.D.
Chemist

Report to: Alpha West, Inc.
Submission #:9311000149
Project:CHEVRON USA
Date Reported:11/17/93

Client Sample #:HELBING FEDERAL GAS COM #1
Laboratory Sample ID:21907 Matrix:Soil
The sample location was EDDY COUNTY, NM.
Sample collection date was November 10, 1993.

BTEX (Method Defined With Results) Units mg/kg

Analyte	Result	Det. Limit
Benzene	<0.10	0.10
Toluene	<0.10	0.10
Ethyl Benzene	<0.1	0.1
Xylenes	<0.1	0.1

Analysis conducted using EPA method 8260.

TPH (EPA 418.1) Units mg/kg

Analyte	Result	Det. Limit
Total Petroleum Hydrocarbons	160	10

TPH (MODIFIED EPA 8015) Units mg/kg

Analyte	Result	Det. Limit
Total Petroleum Hydrocarbons	<10	10

Report To: Alpha West
Lab Number: 9311149
Page 3 of 5

Project: Chevron USA

NOTE: **Sample(s) received at elevated temperature.**

RESULTS: BTEX and TPH results are reported in parts per million (ppm) in soil.

QUALITY CONTROL DATA

	Value 1	Value 2	% Var.
TPH: (418.1)	36	36	0.0
BENZENE:	17.4	18.1	3.9
CONCENTRATION UNITS:		BTEX - ppm	TPH - ppm
DETECTION LIMITS:		BTEX - 0.1	TPH - 10

ANALYST	ANALYTE	DATE EXTRACTED	DATE ANALYZED
James D. Lynch	BTEX & TPH	11/15/93	11/15/93
Tony Taylor	TPH (418.1)	11/15/93	11/16/93

ALPHA WEST, INC.

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

Client: Chevron USA	Client #
Address:	
City:	State: Zip:
Client Contact: Don Griffin	A. W. Contact: E. La Gonzales
Project Name: Helbing Federal Gas Com # 1	A.W. Job #
Project Type: Bioremediation	
Project Location: Eddy County NM	

Sample ID	Sample Type	Date & Time	Grab/Comp.	Preservative	Analysis Requested
~~Helbing Federal Gas Com # 1~~					
Helbing Federal Gas Com # 1	Soil	9:00 AM 11-10-93	Comp	Cold	TPH 418.1 8015
" " "	" "	" "	" "	" "	BTEX —

Relinquished by: (Signature)	Time: 11-11-93 Date: 4:40 p.m.	Received by: (Signature)	Time: Date:
Relinquished by: (Signature)	Time: Date:	Received by: (Signature)	Time: Date:
Relinquished by: (Signature)	Time: Date:	Received by Laboratory: (Signature) Chad Thornhill	Time: 10:30 Date: 11/12/93

Samples Taken by:	Date:	Send Results to:	Date Results Needed:	Rush Charges Authorized
		AWI - Clint Wallace	FAX	Yes____ No____

Additional Comments:

SUB 9311-149
21907

Rec'd at 21°C

684-9746

Courier-White copy, Lab-Fill out and retain yellow copy, return pink copy to Alpha West. Inc Page____of____

Assaigai Analytical Labs
7300 Jefferson NE
Albuquerque, NM 87109

Attn: MARLEAH M. MARTIN
Phone: (505)345-8964

CHEVRON USA INC
1216 W. LEA
P.O. BOX 670
HOBBS, NM 88240
Attn: DON GRIFFIN
Invoice Number:

Order #: 93-07-051
Date: 07/20/93 13:00
Work ID: HELBING FEDERAL NO. 1
Date Received: 07/08/93
Date Completed: 07/20/93
Client Code: CHE08M

SAMPLE IDENTIFICATION

Sample Number	Sample Description	Sample Number	Sample Description
01	SAMPLE #1		

ND = None Detected D_F = Dilution Factor NT = Not Tested
B = Analyte was present in the blank J = Estimated value
E = Estimated Value, Concentration exceeds calibration range
MULTIPLY THE LIMIT BY THE DILUTION FACTOR.

Certified By
Marleah Martin

Received: 07/08/93

SAMPLE ID SAMPLE #1 FRACTION 01B TEST CODE STRPH NAME TRPH/EPA 418.1
Date & Time Collected 07/06/93 11:00:00 Category SOIL

PARAMETER	RESULT	LIMIT	D_F	DATE_ANAL
Total Petroleum HCs	610	5.0	1.0	07/14/93

Notes and Definitions for this Report:

EXTRACTED 07/14/93
ANALYST DH
UNITS mg/Kg
BATCH_ID STRPH-096
PRCNT_MOIST

ACTION : 100 ppm

Received: 07/08/93

Results by Sample

SAMPLE ID SAMPLE #1 FRACTION 01A TEST CODE SBTEX NAME BTEX/SW846 8020

Date & Time Collected 07/06/93 11:00:00 Category SOIL

PARAMETER		RESULT	LIMIT	D_F	DATE_ANAL
Benzene		ND	0.0010	1000	07/15/93
Toluene		ND	0.0010	1000	07/15/93
Ethylbenzene	ppm	8.9	0.0010	1000	07/15/93
P-&m-Xylene		54	0.0010	1000	07/15/93
O-Xylene		17	0.0010	1000	07/15/93

Notes and Definitions for this Report:

EXTRACTED 07/15/93
ANALYST NO
FILE ID 014
UNITS mg/Kg
BATCH_ID SGCVOA-34
PRCNT_MOIST ___

BTEX

WQCC

Action Level

Received: 07/08/93

Results by Sample

SAMPLE ID SAMPLE #1 FRACTION 01B TEST CODE STRPH NAME TRPH/EPA 418.1
Date & Time Collected 07/06/93 11:00:00 Category SOIL

PARAMETER	RESULT	LIMIT	D_F	DATE_ANAL
Total Petroleum HCs	610	5.0	1.0	07/14/93

Notes and Definitions for this Report:

EXTRACTED 07/14/93
ANALYST DH
UNITS mg/Kg
BATCH_ID STRPH-096
PRCNT_MOIST

ACTION : 100 ppm

CHEVRON U.S.A., INC.
HELBING FEDERAL GAS WELL SITE
EDDY COUNTY, NM

BIOREMEDIATION PROCEDURE
July 5, 1993

1.) ARRIVE ON LOCATION AND PREPARE ALPHA MICROBIAL SLURRY AS FOLLOWS:

A.) TO 360 GALLONS OF BIOCATALYST ADD 360 GALLONS OF FRESH WATER.

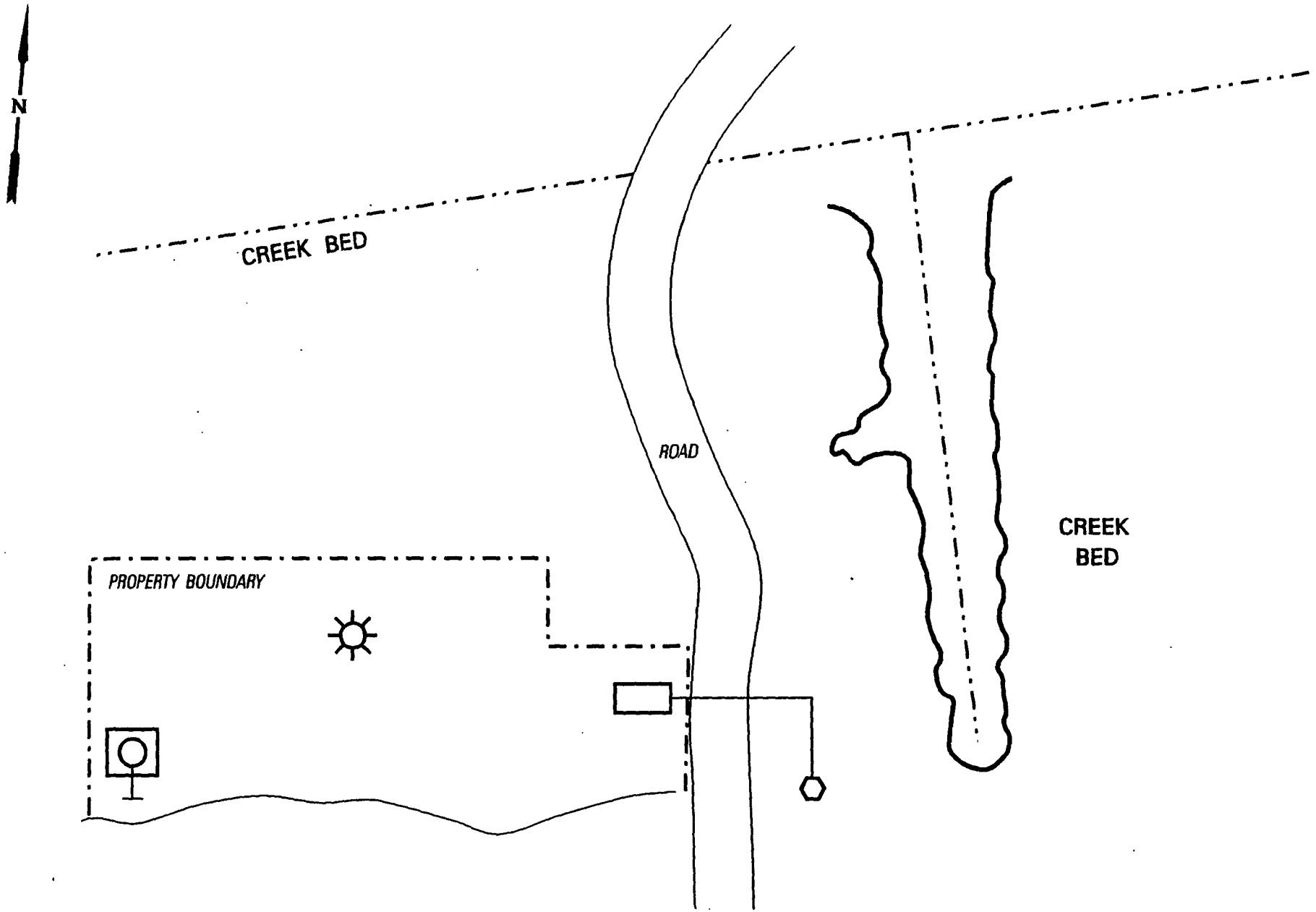
B.) ADD 5 POUNDS OF BACTERIA AND ALLOW TO HYDRATE.

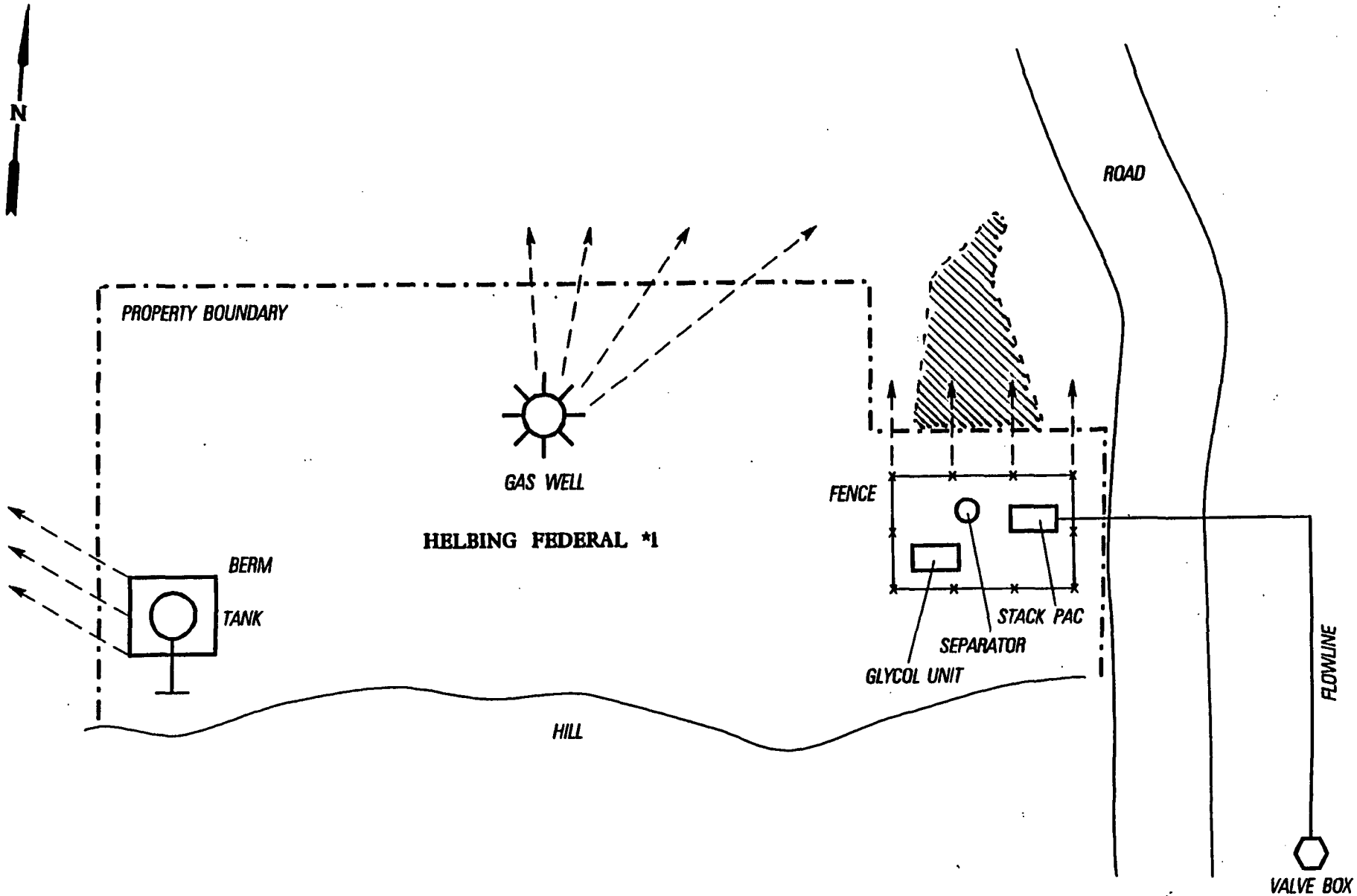
C.) IMMEDIATELY PRIOR TO SURFACE APPLICATION OF SYSTEM TO BERMED AREAS ADD 1 POUND, 3 OUNCES OF NUTRIENT.

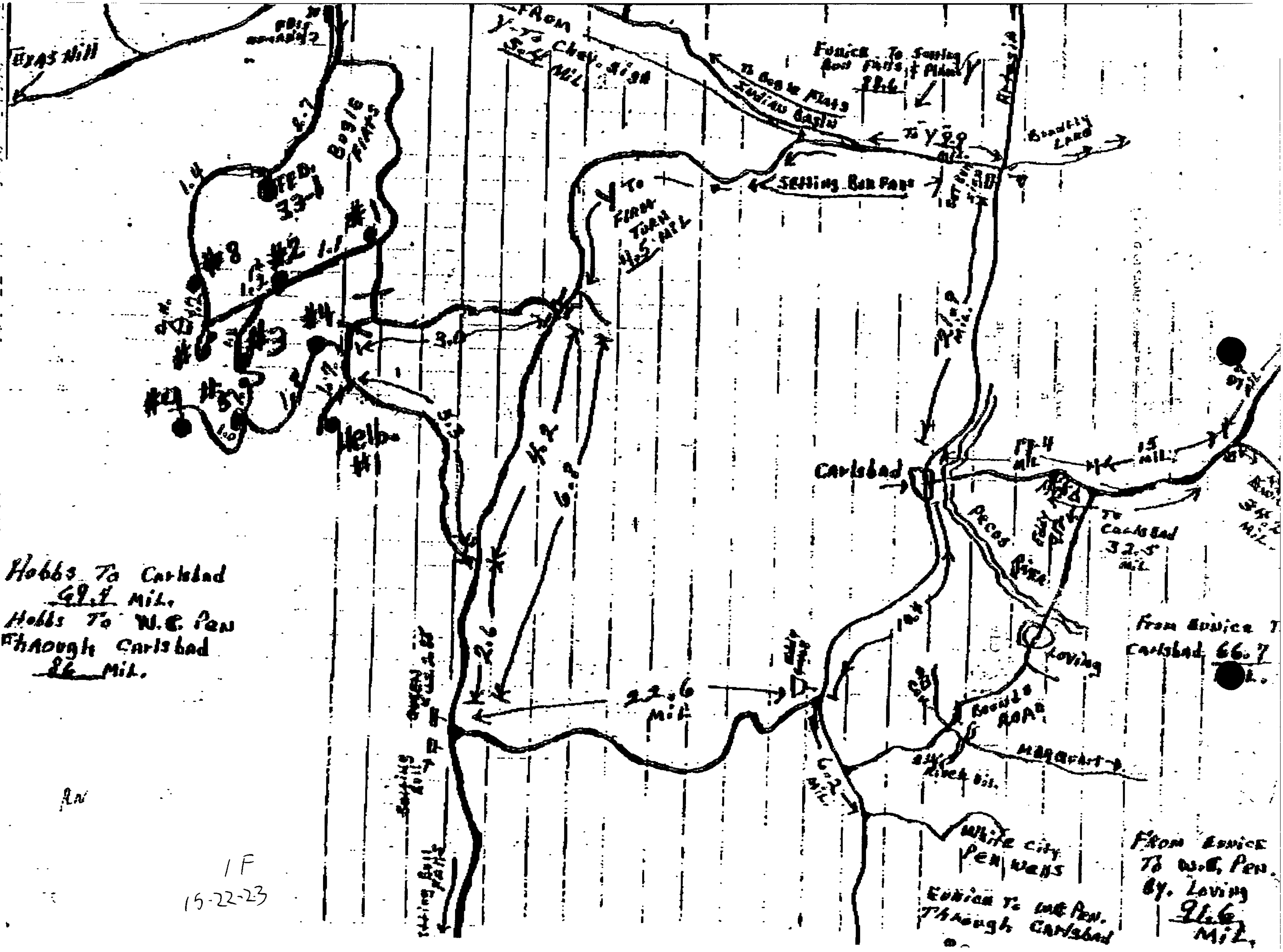
D.) APPLY SYSTEM TO AFFECTED AREAS.

2.) MAKE SECOND APPLICATION TO BERMED AREAS IDENTICALLY TO FIRST APPLICATION.

3.) APPLY MAINTENANCE TREATMENT CONSISTING OF NUTRIENTS AND BIOCATALYST IN 14 DAYS.


N
CREEK BED
ROAD
CREEK
BED
PROPERTY BOUNDARY


N
PROPERTY BOUNDARY
GAS WELL
HELBING FEDERAL *1
ROAD
FENCE
BERM
TANK
STACK PAC
SEPARATOR
GLYCOL UNIT
FLOWLINE
HILL
VALVE BOX



Hobbs To Carlsbad
69.7 Mil.
Hobbs To W.C. Pen
Through Carlsbad
86 Mil.
Carlsbad
Pecos River
Loving
From Eunice To Carlsbad 66.7
From Eunice To W.C. Pen. By Loving 91.6 Mil.
Eunice To WC Pen. Through Carlsbad
White City Pen Wells
To Carlsbad 32.5 Mil.
22.6 Mil.
Setting Bar Pass
Bradley Land
Indian Basin
To Bogle Flats
Bogle Flats
Eunice To Setting Bar Flats
To First Turn 4.5 Mil.
Heiba #1
1F
15-22-23

Chevron

Chevron

Chevron U.S.A. Production Company
P.O. Box 1635
Houston, TX 77251

D. B. McDaniel, P.E.
Manager, ESF&H
Mid-Continent Business Unit

June 20, 1994

Mr. William Olson
Environmental Bureau of OCD
P. O. Box 2088
Land Office Building
Santa Fe, NM 87504-2088

Dear Mr. Olson:

Mr. Don Griffin of Chevron's Hobbs, New Mexico Production Office recently contacted you regarding the reappearance of hydrocarbons in an arroyo adjacent to our Helbing Federal #1 well. The location of the well in the SE/NW/4 of Section 15-T22S-R23E in Eddy County is approximately 100 yards from the arroyo where the hydrocarbons are surfacing. The contaminated area is approximately 1 foot by 1 foot and appears to be contained. Water downstream was observed to be supporting aquatic life (tadpoles) with no apparent effects.

Chevron conducted and bore the entire cost of a site assessment of this area in April of 1993 at the request of the BLM. The BLM's interest was piqued when Chevron filed a Notice of Intent for an EPA general industrial stormwater permit. That site assessment clearly indicated that the most probable cause of the migrating hydrocarbons surfacing in the arroyo was from a Marathon-operated gathering system flowline paralleling the arroyo, leading from the Helbing Federal well to a junction box located nearby. There are no known, documented leaks or spills from this line; however, it was excavated and replaced immediately following the initial discovery of contamination. The results of this site assessment were shared with the BLM and Marathon.

At the BLM's request, Chevron agreed to bear the entire cost of bioremediating the surface effects of the hydrocarbons in the arroyo, until the contamination was reduced to a level that did not pose any environmental or health threats. At that time Chevron agreed to begin monitoring the arroyo for signs of reoccurrence of contamination. It was during this monitoring phase that the most recent occurrence of hydrocarbons was discovered. For your information, I have attached a letter dated January 6, 1994 to Jim Amos of the BLM outlining the results of the analyses of the samples collected from the arroyo during 1993. As you can see the analyses indicated a highly successful bioremediation effort.

Chevron plans to continue monitoring the arroyo within 24 hours of significant rainfall events. If additional contamination is discovered, a sample will be collected and analyzed for BTEX. If BTEX levels are elevated, bioremediation efforts will be resumed.

It is believed that the hydrocarbons are being moved from an area of residual saturation through the subsurface to the arroyo by percolating rain waters. Chevron's concern is that until this area of residual saturation is remediated, our efforts in the arroyo will be ongoing. Everytime a rainfall of sufficient magnitude occurs hydrocarbons will reappear in the arroyo. We are confident that Chevron's facilities are not contributing to this continuing contamination.

If you have any questions or would like to discuss this further, please feel free to contact Robin Smith in Houston at (713) 754-5046 or Don Griffin in Hobbs at (505) 397-8723.

Sincerely,

Attachment

cc: Mark Ashley
OCD
P. O. Drawer DB
Artesia, NM 88211

BLM
Carlsbad Resource Area Headquarters
P. O. Box 1778
Carlsbad, NM 88220
Attn: J. Amos

Chevron

Chevron U.S.A. Production Company
P.O. Box 1635
Houston, TX 77251

D. B. McDaniel, P.E.
Manager, ESF&H
Mid-Continent Business Unit

January 6, 1994

United States Department of the Interior
Bureau of Land Management
Carlsbad Resource Area Headquarters
P. O. Box 1778
Carlsbad, N.M. 88220

Attention: Jim Amos

SW-326/NM068032
Helbing Gas Com.
SENW, Section 15, T22S, R23E
Eddy County, New Mexico

Dear Mr. Amos:

In response to your request for Chevron to submit in writing the results of soil analyses and future monitoring plans for the referenced lease, the following is offered for your information and approval.

The first sampling event after bioremediation began occurred on July 8, 1993. Analyses yielded the following results:

BTEX (by EPA Method 8020):

Analyte

Benzene: non-detect
Toluene: non-detect
Ethyl Benzene: 8.9 ppm
P- and M-Xylene: 54 ppm
O-Xylene: 17 ppm

TPH (by EPA Method 418.1):

Analyte

Total Petroleum Hydrocarbons: 610 ppm

The most recent sampling event took place on November 10, 1993. Analyses yielded the following results:

BTEX (by EPA Method 8020):

Analyte

Benzene: non-detect
Toluene:non-detect
Ethyl Benzene:non-detect
Xylene:non-detect

TPH (by EPA Method 418.1):

Analyte

Total Petroleum Hydrocarbons:160 ppm

TPH by EPA Method 8015 (modified):

Analyte

Total Petroleum Hydrocarbons:non-detect

Two different EPA tests were performed to measure TPH in the November 10, 1993 soil samples in order to better determine the effectiveness of our bioremediation procedure. The results given by EPA Method 418.1 are believed to be inflated by the conversion of petroleum substrates to co-extracted biomass. EPA method 8015 (modified) is believed to be a better indicator of bioremediation performance. Results of both methods indicate a reduction in all analytes from the July to the November sampling. The lab reports are attached for reference.

In accordance with your input, Chevron plans to remove the trash barrels from the lease. The fence will remain as it currently exists. During the next 12 months Chevron personnel will visually monitor the arroyo for indications of new hydrocarbon contamination within 24 hours of significant rain events. Results of visual monitoring will be reported to BLM personnel on a timely basis.

We have enjoyed the good working relationship established between Chevron personnel and the personnel of BLM Resource Headquarters in Carlsbad. I'm sure you are as gratified as we are to see the progress that has been made in remediating the hydrocarbon contamination at the site.

If you have any questions or concerns, please feel free to contact Robin Smith at (713) 754-5046, or Don Griffin at our Hobbs office at (505) 397-8723.

Sincerely,

RMS:mag

Attachments

cc: N. Mouser
D. R. Griffin

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Carlsbad Resource Area Headquarters
P.O. Box 1778
Carlsbad, New Mexico 88221-1778

TAKE PRIDE IN AMERICA

3162.3 (067)
SW326/NM068032

JUN 14 1993

RECEIVED
JUN 18 199
GUSA, Mid-Continent

CERTIFIED--RETURN RECEIPT REQUESTED
P 135 586 009

Chevron U.S.A. Production Company
Attn.: D. B. McDaniel
P. O. Box 1635
Houston, TX 77251

RE: SW326/NM068032; Helbing Gas Com
SENW, Sec. 15, T22S, R23E
Eddy County, New Mexico

Dear Mr. McDaniel:

Your request of May 21, 1993 (see attached), to begin remediation on the above referenced lease is hereby approved subject to the following conditions of approval:

1. That this office be contacted prior to any work.

2. Any changes to this plan must have prior approval.

3. That any results from testing be submitted to this office.

4. Monthly monitoring will take place through the next year following completion of remediation.

If you have any questions contact Jim Amos at (505) 887-6544.

Sincerely,

Richard L. Manus
Area Manager

1 enclosure

Chevron U.S.A. Production Company
P.O. Box 1635, Houston, TX 77251

D. B. McDaniel, P.E.
Manager, ESF&H
Mid-Continent Business Unit

May 21, 1993

United States Department of the Interior
Bureau of Land Management
Carlsbad Resource Area Headquarters
P. O. Box 1778
Carlsbad, NM 88220

Attention: Jim Amos

RE: SW-326/NM068032; Helbing Gas Com.
SENW, Section 15, T22S, R23E
EDDY COUNTY, NEW MEXICO

Dear Mr. Amos:

In response to your request for Chevron to submit a plan to address the Phase II remediation procedure for the referenced lease we hereby submit the following for your approval:

1. Collect soil samples in the "seep area" in the arroyo northeast of the Helbing Federal #1, and at the location between the well and the arroyo, where elevated soil gas readings were obtained during the Phase I site evaluation. (reference Figure 3 of RSA's Environmental Investigation Report, attached).

2. Analyze the soil samples for TPH content to establish a baseline hydrocarbon contamination level.

3. Begin remediation procedures in the "seep area" of the arroyo, the location between the well and the arroyo, and the west bank of the arroyo, above where the seep emanates. Remediation will be accomplished by spraying the affected areas and possibly a more extensive soaking of the more highly contaminated areas.

4. Monitor the success of the remediation procedure by periodically collecting additional soil samples from the impacted areas at the site and analyzing them for TPH content. Once these levels reach $\leq$ 1% TPH by weight Chevron recommends that the remediation procedure be terminated.

5. Visually monitor the levels of additional hydrocarbons which may be possibly flushed to the "seep area" after significant rainfalls to determine if additional mitigation efforts are required.

6. Communicate all results of soil analysis and visual monitoring of the "seep area" to BLM personnel on a timely basis.

I trust this procedure will meet with your approval.

Chevron appreciates the cooperation the BLM has extended throughout the site assessment phase at the Helbing Federal #1 location. We look forward to working with you in the future. I'm sure the BLM will be as gratified as Chevron when the hydrocarbon contamination at the site has been removed.

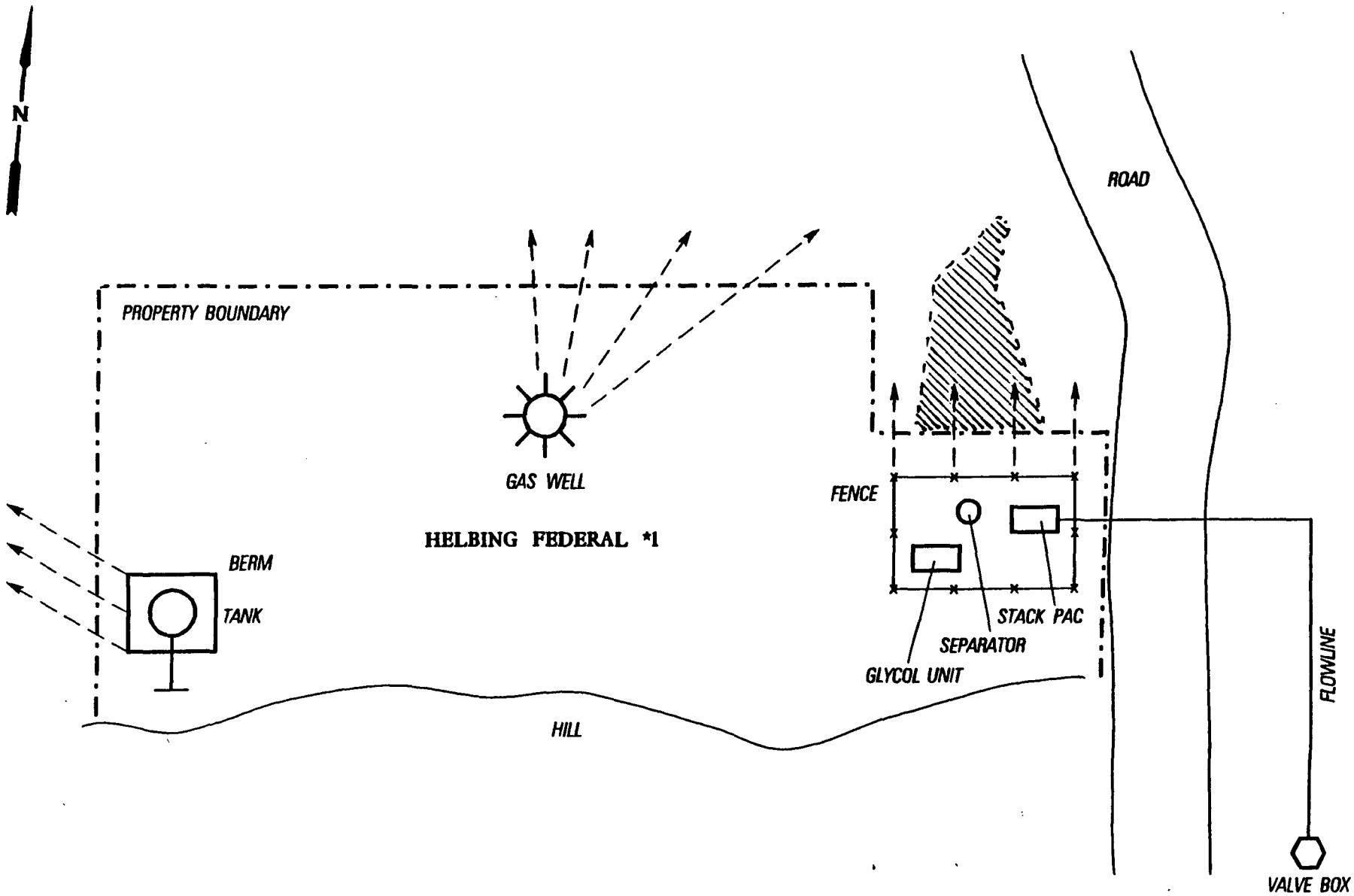
If you have any questions or concerns, please contact Robin Smith at (713) 754-5046.

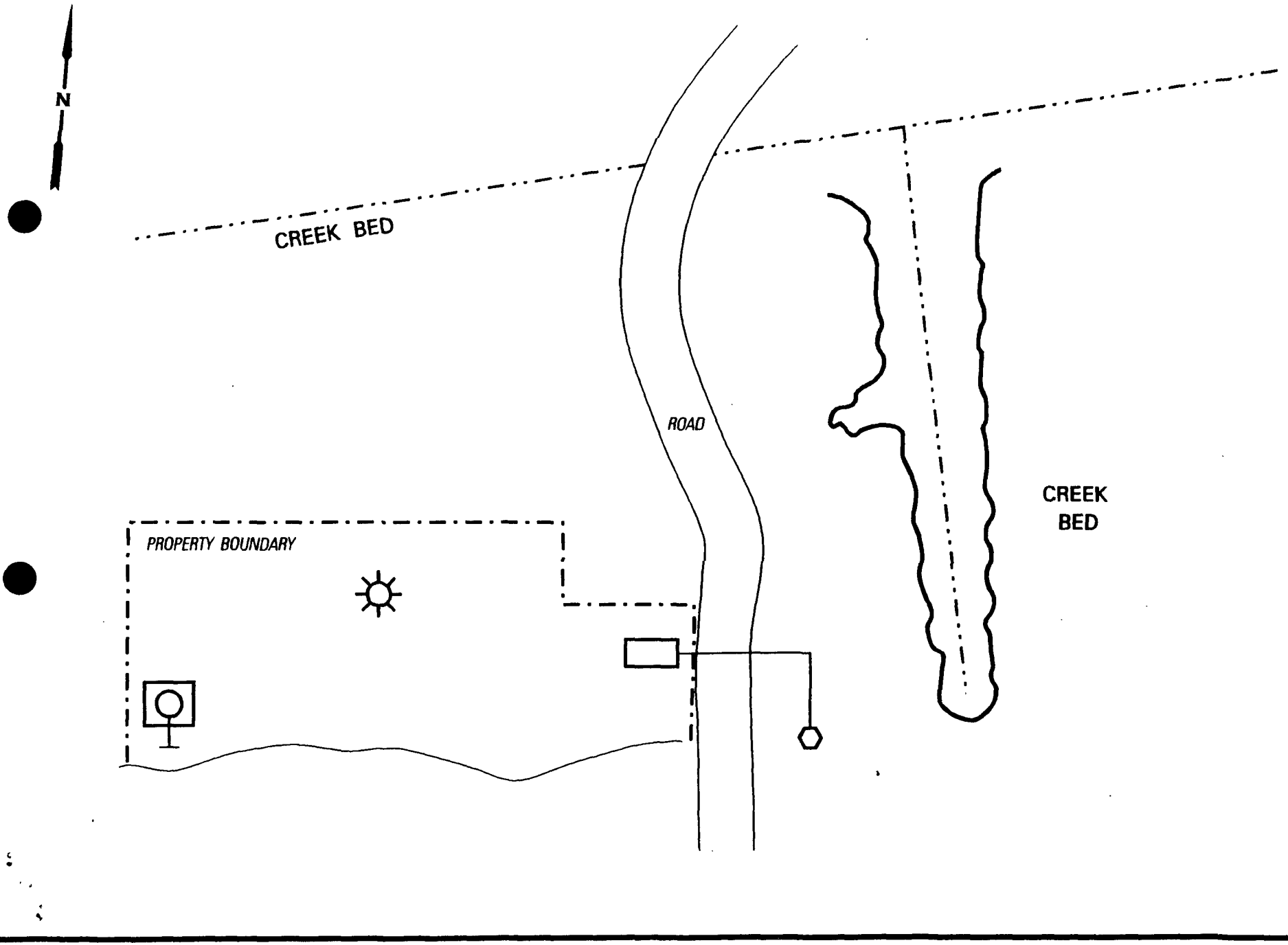
Sincerely,

RMS:mag/0521931

cc: C. R. Moxley
N. Mouser
D. R. Griffin

LOCATION OF SPILLS




N
CREEK BED
ROAD
CREEK
BED
PROPERTY BOUNDARY