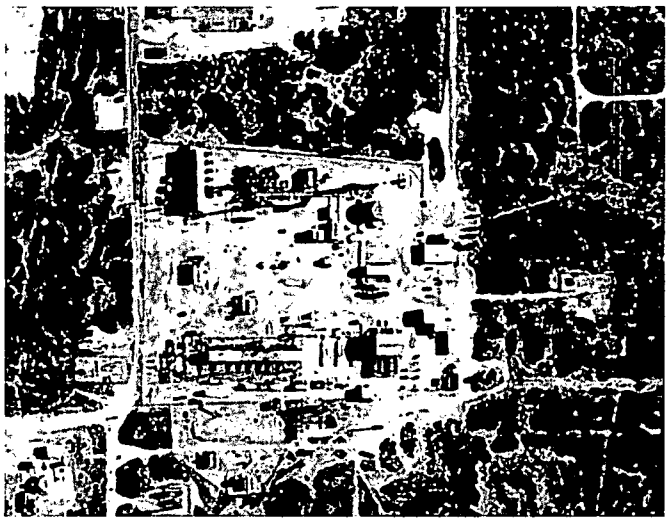
GW - __020__

H2S CONTINGENCY PLAN

FRONTIER field services, llc
southern ute indian tribe

C-108 Application for Approval to Drill and Operate a New Well For The Injection of Acid Gas Frontier Field Services, LLC Maljamar Natural Gas Processing Plant

(Unit O, Section 21, Township 17 S, Range 32 E)



May 16, 2011

Prepared For:

Frontier Field Services, LLC
4200 E. Skelly Dr., #700
Tulsa, OK 74135

Submitted To:

New Mexico Oil Conservation Division
1220 South St. Francis Drive
Santa Fe, NM 87505

Prepared By:

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GEOLEX INCORPORATED

STATE OF NEW MEXICO
ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT

Oil Conservation Division
1220 South St. Francis Dr.
Santa Fe, New Mexico 87505

FORM C-108
Revised June 10, 2003

Case 14664

APPLICATION FOR AUTHORIZATION TO INJECT

I. PURPOSE: _____ Secondary Recovery _____ Pressure Maintenance __X__ Disposal _____ Storage
Application qualifies for administrative approval? _____ Yes __X__ No

II. OPERATOR: **Frontier Field Services, LLC.**
ADDRESS: **4200 Skelly Dr., #700, Tulsa, OK 74135**
CONTACT PARTY: **Alberto A. Gutierrez, R.G.- GEOLEX, INC.** PHONE: **(505)-842-8000**

III. WELL DATA: Complete the data required on the reverse side of this form for each well proposed for injection. Additional sheets may be attached if necessary. **A CROSS REFERENCE TO THE APPLICABLE SECTIONS OR APPENDICES IN THE ATTACHED C108 APPLICATION FOR EACH ROMAN NUMERAL BELOW IS SPECIFIED BY SECTION AND/OR APPENDIX NUMBERS.**

IV. Is this an expansion of an existing project? _____ Yes __X__ No
If yes, give the Division order number authorizing the project: **N/A**

V. Attach a map that identifies all wells and leases within two miles of any proposed injection well with a one-half mile radius circle drawn around each proposed injection well. This circle identifies the well's area of review. **SECTIONS. 5 and 6; APPENDICES B, C and D.**

VI. Attach a tabulation of data on all wells of public record within the area of review which penetrate the proposed injection zone. Such data shall include a description of each well's type, construction, date drilled, location, depth, record of completion, and a schematic of any plugged well illustrating all plugging detail.
SECTIONS 4 and 5; APPENDICES A, B and C.

VII. Attach data on the proposed operation, including:

1. Proposed average and maximum daily rate and volume of fluids to be injected; **SECTIONS 1, 2, and 3**
2. Whether the system is open or closed; **SECTIONS 1, 2, 4 and 7**
3. Proposed average and maximum injection pressure; **SECTIONS 1 and 3**
4. Sources and an appropriate analysis of injection fluid and compatibility with the receiving formation if other than reinjected produced water; and, **SECTION 4 and APPENDIX A**
5. If injection is for disposal purposes into a zone not productive of oil or gas at or within one mile of the proposed well, attach a chemical analysis of the disposal zone formation water (may be measured or inferred from existing literature, studies, nearby wells, etc.). **SECTIONS 3 and 4; APPENDIX A**

*VIII. Attach appropriate geologic data on the injection zone including appropriate lithologic detail, geologic name, thickness, and depth. Give the geologic name, and depth to bottom of all underground sources of drinking water (aquifers containing waters with total dissolved solids concentrations of 10,000 mg/l or less) overlying the proposed injection zone as well as any such sources known to be immediately underlying the injection interval. **SECTION 4 and APPENDIX A**

IX. Describe the proposed stimulation program, if any. **N/A**

*X. Attach appropriate logging and test data on the well. (If well logs have been filed with the Division, they need not be resubmitted). **WELL IS NOT YET DRILLED**

*XI. Attach a chemical analysis of fresh water from two or more fresh water wells (if available and producing) within one mile of any injection or disposal well showing location of wells and dates samples were taken. **SECTION 4 and APPENDIX A.**

XII. Applicants for disposal wells must make an affirmative statement that they have examined available geologic and engineering data and find no evidence of open faults or any other hydrologic connection between the disposal zone and any underground sources of drinking water. **SECTION 7**

XIII. Applicants must complete the "Proof of Notice" section on the reverse side of this form. **APPENDIX D**

XIV. Certification: I hereby certify that the information submitted with this application is true and correct to the best of my knowledge and belief.

NAME: Alberto A. Gutierrez, C.P.G. TITLE: President, Geolex, Inc.®; Consultant to Frontier Field Services LLC

SIGNATURE: _____ DATE: 5/16/11

E-MAIL ADDRESS: aag@geolex.com

* If the information required under Sections VI, VIII, X, and XI above has been previously submitted, it need not be resubmitted. Please show the date and circumstances of the earlier submittal: **SEE ATTACHED APPLICATION**

DISTRIBUTION: Original and one copy to Santa Fe with one copy to the appropriate District Office

III. WELL DATA

A. The following well data must be submitted for each injection well covered by this application. The data must be both in tabular and schematic form and shall include:

(1) Lease name; Well No.; Location by Section, Township and Range; and footage location within the section. **Section 21, T17S, R32 E, 130' FSL, 1813' FEL - SECTIONS 1, 3 and 4.**

(2) Each casing string used with its size, setting depth, sacks of cement used, hole size, top of cement, and how such top was determined. **SEE SECTION 3 FOR PROPOSED WELL DESIGN. FINAL DESIGN WILL BE SUBMITTED WHEN PROPOSED WELL IS DRILLED AND COMPLETED.**

(3) A description of the tubing to be used including its size, lining material, and setting depth. **SECTION 3 AND FIGURE 4 FOR PROPOSED WELL DESIGN**

(4) The name, model, and setting depth of the packer used or a description of any other seal system or assembly used. **SECTION 3**

Division District Offices have supplies of Well Data Sheets which may be used or which may be used as models for this purpose. Applicants for several identical wells may submit a "typical data sheet" rather than submitting the data for each well.

B. The following must be submitted for each injection well covered by this application. All items must be addressed for the initial well. Responses for additional wells need be shown only when different. Information shown on schematics need not be repeated.

(1) The name of the injection formation and, if applicable, the field or pool name. **SECTIONS 1 and 4**

(2) The injection interval and whether it is perforated or open-hole. **SECTION 3**

(3) State if the well was drilled for injection or, if not, the original purpose of the well. **N/A- WELL IS NOT YET DRILLED**

(4) Give the depths of any other perforated intervals and detail on the sacks of cement or bridge plugs used to seal off such perforations. **N/A**

(5) Give the depth to and the name of the next higher and next lower oil or gas zone in the area of the well, if any. **SECTIONS 4 and 5; APPENDICES A, B and C**

XIV. PROOF OF NOTICE

All applicants must furnish proof that a copy of the application has been furnished, by certified or registered mail, to the owner of the surface of the land on which the well is to be located and to each leasehold operator within one-half mile of the well location. **SECTION 5; APPENDICES C and D. WE WILL NOTIFY OPERATORS AND LEASEHOLD OWNERS AND SURFACE OWNERS WITHIN THE AREA OF REVIEW PURSUANT TO NMOCD REGULATIONS AND WE WILL SUBMIT AFFIDAVITS OF PUBLICATION OF NOTICE AND CERTIFIED MAIL RETURN RECEIPTS AT HEARING.**

Where an application is subject to administrative approval, a proof of publication must be submitted. Such proof shall consist of a copy of the legal advertisement which was published in the county in which the well is located. The contents of such advertisement must include: **SEE APPENDICES C and D FOR DRAFT OF PUBLIC NOTICE – AFFIDAVIT OF PUBLICATION OF NOTICE FROM NEWSPAPER WILL BE SUBMITTED AT HEARING.**

(1) The name, address, phone number, and contact party for the applicant;

(2) The intended purpose of the injection well; with the exact location of single wells or the Section, Township, and Range location of multiple wells;

(3) The formation name and depth with expected maximum injection rates and pressures; and,

(4) A notation that interested parties must file objections or requests for hearing with the Oil Conservation Division, 1220 South St. Francis Dr., Santa Fe, New Mexico 87505, within 15 days.

NO ACTION WILL BE TAKEN ON THE APPLICATION UNTIL PROPER PROOF OF NOTICE HAS BEEN SUBMITTED.

NOTICE: Surface owners or offset operators must file any objections or requests for hearing of administrative applications within 15 days from the date this application was mailed to them.

TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY 1

2.0 INTRODUCTION AND ORGANIZATION OF THIS C-108 APPLICATION 4

3.0 PROPOSED CONSTRUCTION AND OPERATION OF MALJAMAR AGI #1 WELL 5

3.1 CALCULATED MAXIMUM INJECTION PRESSURE 5

3.2 WELL DESIGN 7

4.0 REGIONAL AND LOCAL GEOLOGY AND HYDROGEOLOGY 10

4.1 GENERAL GEOLOGIC SETTING 10

4.2 BEDROCK GEOLOGY 10

4.3 LITHOLOGIC AND RESERVOIR CHARACTERISTICS OF THE WOLFCAMP 11

4.4 SEISMIC INTERPRETATION 11

4.5 CALCULATED AREAS OF FLUID INJECTION 12

4.6 GROUNDWATER HYDROLOGY IN THE VICINITY OF THE PROPOSED INJECTION WELL 13

5.0 OIL AND GAS WELLS IN THE MALJAMAR AGI #1 AREA OF REVIEW AND VICINITY 14

5.1 STATUS OF WOLFCAMP-PENETRATING WELLS WITHIN ONE MILE OF FRONTIER GAS PLANT 14

5.2 CEMENTING, COMPLETION AND PLUGGING 16

6.0 IDENTIFICATION AND REQUIRED NOTIFICATION OF OPERATORS SUBSURFACE LESSEES AND SURFACE OWNERS WITHIN THE AREA OF REVIEW 18

7.0 AFFIRMATIVE STATEMENT OF LACK OF HYDRAULIC CONNECTION BETWEEN PROPOSED INJECTION ZONE AND KNOWN SOURCES OF DRINKING WATER 19

LIST OF FIGURES

Figure 1: Location of Frontier Field Services, LLC Gas Plant

Figure 2: Location of Proposed Maljamar #1 AGI Well

Figure 3: Schematic of Frontier Field Services, LLC Gas Plant Acid Gas Injection System Components

Figure 4: Maljamar AGI #1 Well Design

Figure 5: Generalized stratigraphy for the Permian Basin

Figure 6: Structural Features of the Permian Basin

Figure 7: Schematic Wolfcamp Depositional Environments

Figure 8: Deep Wells (>9,000 Feet) Within One Mile of Field Services, LLC Gas Plant

Figure 9: Structure on Top of Wolfcamp from 3-D Seismic Interpretation

Figure 10: Enhanced Vertical Seismic Section

Figure 11: Areal Extent of Lower Wolfcamp Proposed Primary Injection Zone

Figure 12: Cross-Section Showing Extent of Primary Proposed Injection Zone (Lower Wolfcamp)

Figure 13: Areal Extent of Secondary Injection Target (Lower Leonard Zone 1)

Figure 14: Areal Extent of Secondary Injection Target (Lower Leonard Zone 2)

Figure 15: Summary of Areal Extent of Potential AGI Reservoirs

Figure 16: Calculated Area of Injection at 2.0 MMSCFD

LIST OF APPENDICES

Appendix A: Wolfcamp Formation Fluid Analyses and Injection Fluid Analyses

Appendix B: Table and Map of Water Wells within One Mile Area of Review

Appendix C: Active Oil and Gas Well Data; Plugged Oil and Gas Well Data; CD copy of NMOCD Files for Wells Penetrating the Wolfcamp

Appendix D: Identification of Operators, Surface Owners, Lessees, and other Interested Parties for Notices; Copies of Notice Letters and Certified Mail Receipts, and Copies of Draft Public Notices for Hearing

1.0 EXECUTIVE SUMMARY

On behalf of Frontier Field Services, LLC (Frontier), Geolex®, Inc. (Geolex) has prepared and is hereby submitting a complete C-108 application for approval to drill, complete and operate a combined acid gas injection and CO_2 sequestration well (Maljamar AGI #1) adjacent to the Frontier Gas Plant which is located on approximately 19 acres in Section 21, T17S, R32E near Maljamar in Lea County, New Mexico (Figure 1). The well will be drilled vertically at 130 feet from the south line and 1,813 feet from the east line of Section 21 (Figure 2).

The Maljamar AGI #1 is anticipated to have a total depth of approximately 10,000 feet in the lower Leonard and Wolfcamp series along the northern margin of the Delaware Basin (Permian). The primary proposed injection zone will be within a porous debris and algal mound carbonate facies in the Wolfcamp with secondary potential targets in the lower Leonard. All of these zones are between 9,300 and 10,000 feet. Analysis of the reservoir characteristics of these units confirms that they act as excellent closed-system reservoirs that should easily accommodate the future needs of Frontier for disposal of acid gas and sequestration of CO_2 from the plant. Frontier needs to safely inject up to 2.0 million standard cubic feet (MMSCF) per day of treated acid gas (TAG) for 30 years. Geologic studies conducted for the selection of this location demonstrate that the proposed injection zone is readily capable of accepting and containing the proposed acid gas and CO_2 injection volumes well within NMOCD's recommended maximum injection pressures.

In preparing this C-108 application, Geolex conducted a detailed examination of all of the elements required to be evaluated in order to prepare and obtain approval for this application for injection. The elements of this evaluation include:

- Identification and characterization of all hydrocarbon-producing zones of wells that surround and are present on the plant site;
- The depths of perforated pay intervals in those wells relative to the depth of the target injection zones (lower Leonard and Wolfcamp);
- The past and current uses of the proposed intervals;
- Total feet of net porosity in the Wolfcamp;
- The stratigraphic and structural setting of the targeted zones relative to any nearby active or plugged wells, and other wells penetrating the intervals;
- The identification of and sample notification letter that will be sent to all surface owners within a one mile radius of the proposed injection well;
- The identification of all wells within a two mile radius and of all operators within a one mile radius of the proposed injection well;
- Identification and characterization of all plugged wells within a one mile radius of the proposed injection well;
- The details of the proposed injection operation, including general well design and average and maximum daily rates of injection and injection pressures;
- Sources of injection fluid and compatibility with the formation fluid of the injection zone;
- Location and identification of any fresh water bearing zones in the area; the depth and quality of available groundwater in the vicinity of the proposed well, including a determination that there are no structures which could possibly communicate the disposal zone with any known sources of drinking water;
- The preliminary revision of the existing Rule 11 plan for the facility to accommodate the proposed changes in operation and the new AGI facility (to be submitted in final form before commencing injection of acid gas).

Based upon this detailed evaluation, as summarized in this application, Frontier has determined that the proposed injection well is a safe and environmentally-sound project for the disposal of acid gas. Furthermore, the project provides additional environmental benefit by permanently sequestering a significant volume of CO_2 which would otherwise continue to be released to the atmosphere and the flaring of H_2S which currently takes place at the Plant. At the expected ratio of 12% H_2S and 88% CO_2, injecting 2.0 MMSCFD will sequester 10.7 tons of H_2S and 101.2 tons of CO_2 per day.

Our research has identified one primary and two secondary AGI targets in the algal-mound and slope-debris facies of the lower Leonard and Wolfcamp intervals, a series of thick (up to 200 feet) porous deposits formed along the former shelf break of the Delaware Basin isolated within tight mudstones and micrites, located approximately 9,000 to 10,000 feet below the plant.

Our geological evaluation shows that the most promising zone is the lower Wolfcamp Reservoir. This unit lies between approximately 9,800 to 10,000 feet, has an area of 190 acres, and an estimated net capacity of 24.2 million barrels of TAG. Additional potential reservoirs lie in the lower Leonard, above the Wolfcamp, and include:

- The lower Leonard Reservoir #1, lying at depths of approximately 9,300 to 9,400 feet, with an extent of 64 acres, a net porosity of 33 feet, and an estimated capacity of 9 million barrels of TAG, and
- The lower Leonard Reservoir #2, at depths from 9,450 to 9,550 feet, with an area of 53 acres, 17 feet of net porosity, and a estimated capacity of 3.8 million barrels of TAG.

Although the Wolfcamp reservoir is our primary target, we will log and, if promising, perforate and test the lower Leonard zones to determine their feasibility for TAG injection.

These reservoirs are effectively sealed laterally and above and below by the much less permeable adjacent facies. These less permeable rocks consist of finer-grained deeper water sediments from the transgressive units that were deposited during and after the deposition of the porous algal mound/detrital faces.

At the anticipated reservoir conditions (130°F and 3400 psi), each million standard cubic feet of TAG will be compressed to 425 barrels (2,387 cubic feet).

As an example of the injectibility of these reservoirs, we have researched the injection capacity of two salt water injection (SWD) wells completed in the lower Wolfcamp located south of the Frontier plant:

- COG Operating LLC Federal BI 001, 0.9 miles south in Section 28 (injected 3,900 BBL/Day in 2010),
- COG Operating LLC Maljamar SWD 29 001, 1.2 miles south in Section 29 (injected 2,500 BBL/Day in 2010)

The performance of these wells clearly demonstrates the capacity of similar, though not connected, units in this formation. Based on these data, we have concluded that the Leonard and Wolfcamp mounds provide ample porosity, permeability and volume to serve Frontier's injection needs.

Although 201 wells are listed within one mile of the proposed AGI, only 12 wells, of which six are active and six plugged, penetrate into or through the Wolfcamp. NMOCD files show that all of the twelve wells have been completed and/or plugged in a manner that will effectively isolate the Wolfcamp interval.

None of the six active wells produce from the Wolfcamp. The nearest well active in the Wolfcamp is the Federal B1 001 salt water injection well, approximately one mile south of the plant. Two other active wells have been plugged back to shallower zones (ie, San Andres), again isolating the Wolfcamp. The remaining two active producing wells are producing from the Devonian (13,600 feet) and the McKee (14,800 feet). Therefore, the proposed AGI activities into the confined lower Wolfcamp algal mound will not cause any impacts to existing production and/or plugged wells.

In addition to providing a safe and adequate reservoir for H_2S and CO_2, the geologic environment is ideal to demonstrate the required capture and sequestration of CO_2 to obtain future credits or offsets.

Active oil and gas leases in the one-mile area are held by ConocoPhillips Company and COG Operating LLC. With the exception of plant property owned by Frontier and Mid-America, all of the adjacent lands within one mile are federal lands administrated by the Bureau of Land Management and some minor amount of state land. All surface owners and operators within a one-mile radius of the proposed injection well will be notified at least 20 days prior to the NMOCD hearing pursuant to the requirements of NMOCD.

There is no permanent body of surface water within several miles of the plant. A search of the New Mexico State Engineer's files shows that only one water well (owned by Reliant Processing, approximately 0.1 miles southwest of the Gas Plant) lies within one mile of the proposed AGI. This well has a total depth of 158 feet. Available information shows that groundwater occurs at a depth of approximately 70 to 85 feet, and is hosted by the sandstones in the underlying Triassic Dockum Group. The planned well design will completely isolate the fresh water-bearing zones through the Rustler (source of the deepest groundwater) by surface casing that will be cemented to the surface. The proposed injection zone is a closed system, and there are no open faults, fractures, or other structures that could potentially serve as a pathway between the proposed injection zone and any sources of fresh water.

2.0 INTRODUCTION AND ORGANIZATION OF THIS C-108 APPLICATION

The completed NMOCD Form C-108 is included before the Table of Contents of this document and references appropriate sections where data required to be submitted are included herein.

This application organizes and details all of the information required by NMOCD to evaluate and approve the submitted Form C-108 – Application for Authorization to Inject. This information is presented in the following categories:

- A detailed description of the location, construction and operation of the proposed injection well (Section 3.0)
- A summary of the regional and local geology, the hydrogeology, and the location of drinking water wells within the area of review (Section 4.0)
- The identification, location, status, production zones, and other relevant information on oil and gas wells within the area of review (Section 5.0)
- The identification and required notification for operators and surface land owners that are located within the area of review (Section 6.0)
- An affirmative statement, based on the analysis of geological conditions at the site, that there is no hydraulic connection between the proposed injection zone and any known sources of drinking water (Section 7.0), and

In addition, this application includes the following supporting information:

- Appendix A: Wolfcamp Formation Fluid Analysis and Analyses of Frontier Maljamar Gas Plant TAG.
- Appendix B: Table and Map of Water Wells within One Mile Area of Review and Groundwater Analyses
- Appendix C: Maps and spreadsheets showing all active, temporarily abandoned, abandoned and plugged oil and gas wells included within two mile, and one mile areas and associated plugging reports, and a CD with complete NMOCD file on each plugged and active well penetrating the Wolfcamp within one mile of the proposed AGI.
- Appendix D: Maps and spreadsheets identifying operators, lessees, surf ace owners and other interested parties for notices, copies of notice letters and certified mail receipts, and copies of the public notices for the hearing.

It is anticipated that this application shall be the subject of a NMOCD hearing on June 23, 2011.

3.0 PROPOSED CONSTRUCTION AND OPERATION OF MALJAMAR AGI #1 WELL

The proposed injection well will be drilled adjacent to the Frontier Plant Site in Unit O, 130 feet from the south line and 1813 feet from the east line of Section 21, T17S, and R32E at. Figure 2 shows the proposed location of the new well. Frontier will apply for an operator number and file the required bond for the proposed Maljamar AGI #1 upon approval of this C-108 and prior to commencement of drilling.

3.1 CALCULATED MAXIMUM INJECTION PRESSURE

The well will be designed and constructed such that it will serve as the injection conduit for a stream of treated acid gas. The treated acid gas stream (TAG) will be of approximately the following composition:

- 88% CO_2
- 12% H_2S
- Trace Components of $C_1 - C_7$

The total volume of TAG to be injected under this scenario will be approximately 425 barrels per day for each million cubic feet at reservoir conditions. Pressure reduction valves will be incorporated to assure that maximum surface injection pressure allowed by NMOCD will not be exceeded.

The calculated maximum allowable injection pressure would be approximately 2,973 psi (depending on specific gravity of final TAG stream). We have used the following method approved by NMOCD to calculate the preliminary proposed maximum injection pressure. The final maximum permitted surface injection pressure should be based on the final specific gravity of the injection stream according to the following formula:

$IP_{max} = PG\ (D_{top})$ where: IP_{max}= maximum surface injection pressure (psi)
PG = pressure gradient of mixed injection fluid (psi/foot)
D_{top} = depth at top of perforated interval of injection zone (feet)

and $PG = 0.2 + 0.433\ (1.04 - SG_{tag})$ where:

SG_{tag} = specific gravity of treated acid gas (pressure and temperature dependent; calculated as the average density in the tubing, using surface conditions of 100°F and 1,500 psi, and bottom hole conditions of 100°F and 3,400 psi; see Table 1 for details)

For the maximum requested injection volume (2 MMSCF/Day) it is assumed that:

$SG_{tag} = 0.78$
$D_{top} = 9{,}500$ feet

Therefore:

$$PG = 0.2 + 0.433\ (1.04 - 0.78) = 0.313$$

$$IP_{max} = PG(D_{top}) = 0.313 \times 9{,}500 = 2{,}973 \text{ psi}$$

Based on the performance of the existing injection well, it is anticipated that the average injection pressure would not exceed 2,973 psi. Based on the above calculations, Frontier is requesting approval of a maximum injection pressure to be 2,973 psi at the surface.

Table 1: Pressure and Volume Calculations for TAG, Proposed Frontier Maljamar AGI #1

PROPOSED INJECTION STREAM CHARACTERISTICS

TAG	H_2S	CO_2	H_2S	CO_2	TAG
Gas vol MMSCFD	conc. mol %	conc. mol %	inject rate lb/day	inject rate lb/day	inject rate lb/day
2	12.00	88.00	22781	215734	238516

CONDITIONS AT WELL HEAD

Well Head Conditions		TAG							
Temp F	Pressure psi	Gas vol MMSCFD	Comp CO_2:H_2S	Inject Rate lb/day	Density[1] kg/m^3	SG[2]	density lb/gal	volume ft^3	volume bbl
100	1500	2	88:12	238516	663.70	0.66	5.54	5754	1025

CONDITIONS AT BOTTOM OF WELL

Injection Zone Conditions					TAG				
Temp F	Pressure[3] psi	$Depth_{top}$ ft	$Depth_{bottom}$ ft	Ave. Thick. ft	Density[1] kg/m^3	SG[2]	density lb/gal	volume ft^3	volume bbl
100	3400	9500	9750	250	896.03	0.90	7.48	4262	759

CONDITIONS IN RESERVOIR AT EQUILIBRIUM

Injection Reservoir Conditions					TAG				
Temp[5] F	Pressure[3] psi	Ave. Por. %	Swr	Porosity[6] ft	Density[1] kg/m^3	SG[2]	density lb/gal	volume ft^3	volume bbl
130	3400	12	0.45	16.5	799.90	0.80	6.68	4774	850

CONSTANTS

	SCF/mol	
Molar volume at STD	0.7915	
	g/mol	lb/mol
Molar weight of H_2S	34.0809	0.0751
Molar weight of CO_2	44.0096	0.0970
Molar weight of H_2O	18.015	0.0397

[1] Density calculated using AQUAlibrium software

[2] Specific gravity calculated assuming a constant density for water

[3] PP is extrapolated using successful Drill Stem Tests at nearby wells

[4] Thickness is the ave. total thickness of coarse sand units in the reservoir zone

[5] Reservoir temp. is extrapolated from bottomhole temp. measured at nearby wells

[6] Porosity is estimated using geophysical logs from nearby wells

CALCULATION OF MAXIMUM INJECTION PRESSURE LIMITATION

SG_{TAG}	0.78
$PG = 0.2 + 0.433\ (1.04\text{-}SG_{TAG})$	0.313 psi/ft
$IP_{max} = PG * Depth$	2970 psi

Where: SG_{TAG} is specific gravity of TAG; PG is calculated pressure gradient; and IP_{max} is calculated maximum injection pressure.

CALCULATION OF 30 YEAR AREA OF INJECTION

Cubic Feet/day (5.6146 ft^3/bbl)	4774 ft^3/day
Cubic Feet/30 years	52312423 ft^3/30 years
Area = V/Net Porosity (ft)	3170450 ft^2/30 years
Area = V/Net Porosity (ft) (43560 ft^2/ac	72.8 acres/30 years
Radius =	1005 ft
	0.19 miles

Calculations presented in Table 1 (incorporating the compressibility of the TAG at reservoir conditions) show that, given a more detailed calculation of well pressure,. Over 30 years, a daily injection volume of 2 MMSCF/Day of TAG will occupy approximately 52.3 million cubic feet in the reservoir. As discussed in Section 4.3, a calculated gross net porosity of 30 feet in the reservoir is reduced to an effective net porosity of 16.5 feet after correcting for a residual water content of 45%. Based on a net porosity of 16.5 feet, we calculate that the 30-year injection volume will occupy approximately 72.8 acres of the reservoir, with a radius of 0.19 miles.

3.2 WELL DESIGN

While the injected fluid will be dehydrated, the line that will convey the TAG to the well from the compression facilities will be a 3 inch steel line (304 or 316) to provide added corrosion protection. The final design for the compression facilities and associated piping and layout of H_2S alarms and other safety equipment will be submitted for NMOCD review prior to commencement of injection operations as part of a revised Rule 11 plan. The schematic of the new AGI facilities and tie-in to the existing Frontier Plant are shown in Figure 3, and the preliminary design for the injection well is shown on Figure 4.

The proposed well (Maljamar AGI #1) will be a vertical well, spudded on property leased by the Frontier Field Services LLC. This design will allow Frontier to access the primary injection zone and potentially two other zones from this location. The well will be drilled vertically to a final total depth of approximately 10,000 feet.

The well will have each string of the telescoping casing cemented to the surface and will include a subsurface safety valve (SSV) on the production tubing to assure that fluid cannot flow back out of the well in the event of a failure of the injection equipment. In addition, the annular space between the projection tubing and the well bore will be filled with an inert fluid such as diesel fuel as a further safety measure which is consistent with injection well designs which have been previously approved by NMOCD for acid gas injection.

Design and materials considerations include: placement of SSV and the packer, double casing through freshwater resources and shallow production zones (Dockum and Rustler Group (groundwater), Artesia Group and San Andres-Grayburg (oil and gas production)), characterization of the zone of injection, and a total depth (TD) ensuring identification of the reservoirs. Three casing strings are proposed (Figure 4):

1. Surface casing to approximately 550 feet, beneath the Triassic "Redbeds", to protect the fresh water.
2. Intermediate casing to approximately 4,200 feet, to isolate the Permian salt units (Salado/Castile) and the productive units in the Artesia Group (Yates and Queen) and the San Andres/Grayburg.
3. Production casing extending down to the final total depth (TVD 10,000 feet). Following logging and analysis, the injection intervals will be determined, and the final depth of the long string, perforation zones and packer location will be selected.

A suitable drilling rig will be chosen for the job that will include a 5,000 psi blowout preventer (minimum) and choke manifold for any unforeseen pressures encountered. The borehole for the surface casing will be drilled with a 17 ½ inch bit to a depth of approximately 550 feet, and 13 $^{3}/_{8}$ inch, 48.0 ppf, H40, STC casing will be installed and cemented to the surface with approximately 600 sacks of cement (or amount adequate to circulate the cement to the surface). The intermediate hole will be drilled with a 12 ¼ inch bit to a depth of approximately 4,200 feet. There an 8 $^{5}/_{8}$ inch, 24.0 ppf, J55, STC surface casing string will be run and cemented to surface with approximately 1,500 sacks of cement. Visual inspections of cement returns to the surface will be noted in both the conductor and surface pipe casing jobs. Casing and cement integrity will be demonstrated by pressure-testing after each cement job.

After verifying the intermediate casing, the well will be drilled to the projected TD of 10,000 feet using a 7 $^{7}/_{8}$ inch bit.

The proposed open hole logging suite for the TD run consists of a Dual Induction, Density-Neutron-Gamma Ray Porosity and Fracture Matrix Identification (FMI) log in the lower Leonard and the Wolfcamp and a portion of the caprock and basal seal formations, with rotary sidewall cores in the Wolfcamp. A conventional core will be collected from the Wolfcamp zone to evaluate the permeability of this caprock. Additional sidewall cores may also be obtained from the Wolfcamp to allow more detailed reservoir analysis.

After the logs have been evaluated, the production casing consisting of approximately 10,000 feet of 5½ inch, 15.5 ppf, L80 casing grade will be run and cemented with an approximate total of 1500 sacks of cement. A 30 foot section of Corrosion Resistant Alloy (CRA) material will be inserted into the string at the packer setting depth to provide a corrosion resistant seat for the packer later in the job. The cementing of the long string will be accomplished in two stages. The first stage will seal the annular space from total depth (approximately 10,000 feet) to a level well above the CRA joint. This stage will employ acid-resistant cement (CORROSACEM™ or equivalent). For the second stage, a DV Tool previously inserted in the casing (at approximately 5000) feet will be used to pump the remaining cement to the surface.

Once the cement has set up, the tubing adaptor for the wellhead will be welded on the wellhead and the rig will be released. A casing integrity (pressure test) will be performed to test the casing just prior to releasing the rig. Following successful testing and the release of the drilling rig, a workover rig will be used and a cement bond log will be run to ascertain the quality of the cement bond of the production casing. It is important that a good bond be established around the injection interval as well as below the CRA joint to assure that acid gas mixed with formation water do not travel up the outside of the casing and negatively impact the integrity of the casing job.

Once the integrity of the cement job has been determined, the selected injection intervals will be perforated with approximately four shots per foot. At this location a total of 500 feet of target areas may be perforated. A temporary string of removable packer and tubing will be run, and injection tests (step tests) will be performed to determine the final injection pressures and volumes. Once the reservoirs have been tested, the final tubing string including a permanent packer, approximately 9300 feet of 2 $^{7}/_{8}$ inch, 6.5 ppf, L80 ULTRA FX premium thread tubing, and an SSV will be run into the well. A ¼ inch inconel steel line will connect the SSV to a hydraulic panel at the surface.

The National Association of Corrosion Engineers (NACE) issues guidelines for metals exposed to various corrosive gases like the ones in this well. For a H_2S/CO_2 stream of acid gas that is de-watered at the surface through successive stages of compression, downhole components such as the SSV and packer need to be constructed of Inconel 925. The CRA joint will be constructed of a similar alloy from a manufacturer such as Sumitomo. A product like SM2550 (with 50% nickel content) will likely be used. The gates, bonnets and valve stems within the Christmas tree will be nickel coated as well.

The rest of the Christmas tree will be made of standard carbon steel components and outfitted with annular pressure gauges that report operating pressure conditions in real time to a gas control center located remotely from the wellhead. In the case of abnormal pressures or any other situation requiring immediate action, the acid gas injection process can be stopped at the compressor and the wellhead shut-in using a hydraulically operated wing valve on the Christmas tree. The SSV provides a redundant safety feature to shut in the well in case the wing valve does not close properly.

After the AGI well is drilled and tested to assure that it will be able to accept the volume of injection fluid (without using acid gas), it will be completed with the approved injection equipment for the acid gas stream. The Rule 11 Plan will be finalized when the compression facility design and well connection design is complete and will be submitted for NMOCD review and approval prior to commencement of TAG injection into the Frontier AGI well. A Rule 11 Plan for the current facility at Maljamar was submitted on May 10, 2011.

4.0 REGIONAL AND LOCAL GEOLOGY AND HYDROGEOLOGY

4.1 GENERAL GEOLOGIC SETTING

The Frontier Gas Plant is located in the southern half of Section 21, T 17 S, R 32 E, in Lea County, New Mexico, approximately 3 miles southeast of Maljamar (Figure 1). The Plant is located within a physiographic area which has been referred to as the Querecho Plains by various authors including Nicholson & Clebsch (1961). This area is almost entirely covered at the surface by Holocene reddish brown dune sand underlain by a hard caliche surface or calcareous silts which may be found in buried valleys or internally drained Quaternary playas. These dune sands are locally stabilized with shin oak, mesquite and some burr-grass. There are no surface bodies of water or groundwater discharge sites within one mile of the Plant; and where drainages exist in interdunal areas, they are ephemeral, discontinuous, dry washes. A prominent outcrop of the Pliocene Ogallala Formation (Mescalero Ridge) trends to the northwest-southeast, immediately east of Maljamar. Beneath the Holocene and Quaternary deposits lies the underlying Triassic redbeds of the Dockum Group. The Triassic units are in turn underlain by the Rustler Formation and followed by the Ochoa series of evaporites including the Castile and the Salado Formations. Beneath these formations is the Permian sequence of the Delaware Basin described generally below.

4.2 BEDROCK GEOLOGY

Figure 5 is a generalized stratigraphic column showing the Permian Formations that underlie the Plant site. The Plant is located on the northern margin of the Delaware Basin province of the Permian Basin, where Permian rocks generally dip to the south as they transition from a sequence of shelf and shelf-edge carbonates and sandstones to basinal-equivalent shale, sandstones, and limestones to the west. Shallow production in the area is from the Yates, Seven Rivers, Queen, and San Andres Formations. Deeper production has been found in the Permian Paddock, and Yeso/Abo, the Pennsylvanian Cisco, Strawn and Morrow, and other targets in the Devonian and McKee (Ordovician). Please see Appendices A and B for additional information on oil and gas wells within the area of review.

The anticipated depths to formation tops at the proposed well site are:

Formation	**Depth (feet)**
San Andres	3,880
Glorieta	5,380
Tubbs	6,900
Abo (lower Leonard)	7,580
Wolfcamp	9,550
Pennsylvanian	10,000 (Est. TD at Pennsylvanian top)
Cisco	10,400
Strawn	11,400
Morrow	11,990
Mississippian	12,450
Devonian	13,500

4.3 LITHOLOGIC AND RESERVOIR CHARACTERISTICS OF THE WOLFCAMP

As seen in Figure 6, the area now underlain by the Plant was near to the shelf-basin topographic break in Wolfcamp time (290-270 million years old). Changes in eustatic and tectonic fluctuations in sea levels lead to the formation of numerous algal mound and associated detrital carbonate deposits along the inflection between the shallower shelf and the deeper basin. Higher sea levels favored the formation of algal mounds in this area, while lower sea levels caused the formation of debris fans between and below the mounds. This system has lead to the deposition of similar "reef" and fan bodies throughout the Permian system, in the Abo, San Andres and Capitan formations (Figure 7).

The algal mounds and debris fans are tabular bodies, typically elongated along the paleoshoreline, with thickness up to several hundred feet, and lateral extents of hundreds of feet to several miles. Within these units, porosity can be as high as 20%. In the surrounding muddier carbonate lagoon facies, permeability and porosity are much reduced. This geometry creates discrete reservoirs within surrounding seal rocks. These types of reservoirs have produced hydrocarbons, such as in the Abo Empire field, but also have formed barren reservoirs with good potential for AGI development. Other similar, yet isolated and distinct, Wolfcamp mound and fan facies are the three zones completed by COG Operating LLC for two salt water disposal (SWD) wells approximately one mile south of the Frontier Plant (Figure 8).

4.4 SEISMIC INTERPRETATION

Due to the discontinuous nature of the Wolfcamp mounds, we have evaluated 3-D seismic data from a two square-mile area surrounding the Plant to specifically identify and characterize their thickness and lateral extent. Our analyses have allowed us to identify three potential AGI reservoirs (lower Wolfcamp #3, lower Leonard #1, and lower Leonard #2) in the vicinity of the Frontier plant, and to provide quantitative estimates of reservoir extent and volume.

To calibrate the seismic velocities with known log data, three synthetic seismic logs were generated from acoustic logs from wells in the study area (Figure 9). This figure also summarizes a seismic structure interpretation of top of the Wolfcamp. The structure map clearly shows the shelf-basin geometry in this area, and was used as a basic tool in further evaluation of the facies, lithologies and relative porosity of the target units. Seismic analyses, integrated with log data, shows that the Wolfcamp zone has the largest lateral extent and the greatest volume. The lower Leonard units may also have some potential as secondary targets.

Figure 10 is an enhanced seismic cross-section, from the location shown in Figure 9. In this figure, the blue end of the color scale corresponds to high seismic amplitude (denser rocks), while the red end represents low amplitude (more porous units). The three target reservoirs (lower Leonard #1, lower Leonard #2, and lower Wolfcamp #3) are identified by the numbered arrows. Discontinuous low-amplitude events with underlying high-amplitude events, seen along a given horizon, are a good indication of localized porosity. In contrast, persistent low-amplitude events (black arrow in Figure 10) are more consistent with shale beds.

Figures 11 and 12 show the respective time slices and seismic cross-sections for the lower Wolfcamp unit. This unit is the most laterally extensive unit, and has excellent potential for AGI development. Although it trends towards the existing Wolfcamp producing wells to the northeast of the plant (see Figure 8), the seismic data show that there is a clear porosity barrier that isolates this zone.

Figure 13 is a time slice showing the geometry of the lower Leonard #1 (arrow 1 in Figure 10) reservoir in plan view. This map clearly shows the distribution and geometry of the porous facies in this unit, and just importantly shows that the unit is clearly bounded and sealed by much less porous surrounding rocks.

Figure 14 is a time slice showing the distribution of the porosity in the lower Leonard #2 zone (arrow 2 in Figure 10). This map shows that although the lower Leonard #2 unit is smaller and thinner than the lower Leonard #1 it still has useful volume, and is well-isolated by less porous surrounding rocks.

Figure 15 superimposes the areal extents of the three AGI-potential zones, and incorporates the estimated acreage, net porosity, and available capacity of each of the zones. These calculations can be summarized as:

- the primary injection target of lower Wolfcamp Reservoir, at 9,800 to 10,000 feet, has area of 190 acres, and an estimated capacity of 24.2 million barrels of TAG,
- the secondary injection target of the lower Leonard Reservoir #1, lying at depths of approximately 9,300 to 9,400 feet, has an extent of 64 acres, a net porosity of 33 feet, and an estimated capacity of 9 million barrels of TAG,
- the secondary injection target of the lower Leonard Reservoir #2, at depths from 9,450 to 9,550 feet, has an area of 53 acres, 17 feet of net porosity, and a estimated capacity of 3.8 million barrels of TAG.

After analysis of the geophysical logging of the proposed Maljamar AGI #1 well, specific zones will be selected for completion as AGI reservoirs. The seismic evaluation has given us confidence that:

- Effective AGI reservoirs exist in the area of the Frontier gas plant,
- The reservoirs are effectively isolated from any known or potential production in the area, and
- Specific drilling programs, locations and completion targets can be selected in a safe, cost-effective and effective manner.

4.5 CALCULATED AREAS OF FLUID INJECTION

Based on the geology described in Section 4.4, anticipated range of injection volumes, and the injection pressures and temperatures in the reservoir (see Section 3.1 and Table 1) we have calculated the range of injection areas for the anticipated ranges of injection volume, over an estimated 30-year life of the AGI well. These calculations are shown in Table 2, and shown in Figure 156.

As calculated in Section 3.1, each standard million cubic feet (MMSCF) of TAG at the surface will be compressed to approximately 425 barrels of supercritical fluid at reservoir pressures and temperature. Hence, a 30-year lifetime of injection will result in 4.6 million barrels in the reservoir per MMSCFD of TAG. As shown in the Table below, the Wolfcamp zone alone is capable of holding up to 5 times the anticipated injection rate for 30 years.

As shown in Figure 16, the proposed maximum injection rate of 2.0 MMSCFD will generate a "footprint" with an area of approximately 73 acres after considering the effect of irreducible water. This footprint will not impact any of the nearby wells.

Table 2: Calculated Volumes and Areas of TAG in Wolfcamp Reservoir						
Daily TAG Injection Volume (MMSCF)	Daily Volume of TAG in Reservoir (BBLS/D)	Total TAG Volume in Reservoir after 30 Years (BBLS)	Calculated Reservoir Volume in Wolfcamp (BBLS)	Percentage of Reservoir Occupied	Calculated Radii of Affected Area of Reservoir (Miles)	Affected Area of Reservoir (Acres)
2.0	850	9.3 Million	24 Million	38.8%	0.19	72.8

4.5 FORMATION FLUID CHEMISTRY

Formation fluid chemistry for the Wolfcamp is available from two nearby wells: Baish A 012 (API # 3002520568) located in Sec. 21, T17S, R32E, approximately 1 mile southwest of the Frontier gas plant, and Baish B 001 (API# 3002500637) located in Sec. 22, T17S, R32E, approximately 1.25 miles northeast of the Frontier gas plant. The reference information for the formation fluids is included in Appendix A.

Parameter	BAISH A 012	BAISH B 001
Mg^{++}	972	680
Na^{+}	52,298	34,704
$CO_3^{=}$	Nd	Nd
$HCO_3^{=}$	1,220	481
$SO_4^{=}$	4,400	3,900
Cl^{-}	50,000	33,000
Fe (free)	11	14
pH	7.6	7.4
$CaCO_3$	1.4	0.9

Analyses show that the formation waters are sodium/chloride brines.

4.6 GROUNDWATER HYDROLOGY IN THE VICINITY OF THE PROPOSED INJECTION WELL

In the area of the Frontier Gas Plant, the surficial deposits are relatively thin layers of aeolian sands and both active and stabilized dunes. These materials are described in the *Soil Survey-Lea County, New Mexico* (United States Department of Agriculture, 1974) as the Kermit Dune Lands and the Maljamar Fine Sands. Under these sandy deposits lie the "redbeds" of the Triassic Dockum Group, in which ground water locally occurs in sandier beds of the mudrocks characterizing the Dockum. Local depth to groundwater in the Dockum is reported to be approximately 70 feet. The only significant aquifer in the area is the Pliocene Ogallala Formation, which crops out in the Mescalero Ridge, a prominent landform seen near Maljamar, approximately 3 miles northeast of the Plant (Nicholson and Clebsh, 1961).

As seen in Figure B-1, one water well is reported within one mile of the Plant, with a total depth of 158 feet. The results of a search of the New Mexico State Engineer's files for registered water wells in this area are included in Appendix B. Also included are the available groundwater analyses for water wells in this area. The nearest well listed is in Section 3, T17S, R32E, approximately 3 miles north of the plant. This well is completed in the Ogallala Formation, and has a Total Dissolved Solids of approximately 500 mg/L (Nicholson and Clebsh, 1961).

5.0 OIL AND GAS WELLS IN THE MALJAMAR AGI #1 AREA OF REVIEW AND VICINITY

Appendix C contains a complete list based on NMOCD records of all active, temporarily abandoned, abandoned and plugged oil and gas wells within two miles (Figure C1, Table C1) and those within the one-mile radius area of review (Figure B2) of the proposed AGI disposal well.

There are 565 recorded wells within two miles of the Plant, of which 351 are active and 214 are listed as plugged and abandoned. Within one mile of the plant, there are 201 wells, of which 139 are active and 62 are plugged and abandoned. These wells are shown in Figure C2.

A review of the available NMOCD data regarding the wells within one mile of the proposed AGI well shows that of the 201 total wells, only 12 intersect and/or penetrate the proposed injection zone in the Wolfcamp. Of the total 201 wells, 148 (74%) are less than 6,000 feet deep. These wells are or were targeted into the San Andres/Grayburg, Glorieta and Paddock zones. An additional 41 wells are drilled between 6,000 feet and 8,933 feet, targeting the Yeso and/or Abo formations. All of these wells' total depths are well above the Wolfcamp, which lies from 9,100 to 9,300 feet in this area.

5.1 STATUS OF WOLFCAMP-PENETRATING WELLS WITHIN ONE MILE OF FRONTIER GAS PLANT

As shown in the Table 3 below, and in the accompanying Figure C3 in Appendix C, there are a total of 12 wells penetrating the Wolfcamp "deep wells" in the one mile area of review. Information on the wells in the one mile area of review (see Table 2 below) includes their total depth, production or injection interval and current status. A review of the available data on these wells indicates that they are cased and cemented throughout the Wolfcamp interval, effectively sealing that formation and preventing any migration of injected fluids to deeper or shallower units. A copy of the NMOCD files for these 12 wells is included on the CD in Appendix C.

Table 3: Summary of Wells Penetrating Wolfcamp within One Mile of Frontier Gas Plant

API #	OPERATOR	SPUD DATE	PLUG DATE	TOTAL DEPTH	WELL NAME	WELL TYPE	STATUS	Producing/Target/ Injection Zone	Miles From Plant
3002500751	CONOCOPHILLIPS COMPANY	9/20/1948	9/17/2004	10,005	QUEEN B 036 (Baish B 36)	Oil	Plugged	Wolfcamp (Dry Hole)	0.37
3002521951	PAN AMERICAN PETROLEUM CORP	12/20/1966	1/2/1900	13,735	BAISH B FEDERAL 002	Oil	Plugged	Wolfcamp (Dry Hole)	0.40
3002500622	CONOCO INC	11/12/1958	1/2/1900	13,670	BAISH A 008	Oil	Plugged	Cisco/Abo (plugged back)	0.57
3002535252	COG OPERATING LLC	11/17/2000	na	15,026	MC FEDERAL 006	Gas	Active	Devonian	0.68
3002500745	CONOCOPHILLIPS COMPANY	8/8/1961	na	9,680	MCA UNIT 382	Oil	Active	San Andres (plugged back)	0.70
3002500614	CONOCO INC	11/1/1993	3/3/1993	12,778	MCA UNIT 355	Injection	Plugged	Abo/Grayburg (plugged back)	0.73
3002500634	CONOCO INC	4/26/1951	1/2/1900	13,573	BAISH B 005	Oil	Plugged	Devonian	0.81
3002527068	COG OPERATING LLC	10/14/1980	na	12,992	FEDERAL BI 001	Salt Water Disposal	Active	Wolfcamp (plugged back)	0.86
3002508053	CONOCO INC	10/28/1959	9/5/1996	13,965	MCA UNIT 303	Injection	Plugged	Grayburg (plugged back)	0.92
3002520647	COG OPERATING LLC	10/25/1964	na	9,958	MC FEDERAL 007	Oil	Active	Paddock (plugged back)	0.94
3002534647	COG OPERATING LLC	6/16/1999	na	14,912	MC FEDERAL COM 001	Gas	Active	McKee	0.99
3002520568	CONOCOPHILLIPS COMPANY	11/22/1963	na	13,717	BAISH A 012	Oil	Active	Abo (plugged back)	0.99

5.2 CEMENTING, COMPLETION AND PLUGGING

The details of the completion and/or plugging design and construction of these 12 wells are summarized in the diagrams included in Appendix C. Also included are the complete NMOCD files for these wells, in electronic form, in the accompanying CD entitled "NMOCD Files for Wolfcamp-Penetrating Wells within One Mile of the Frontier Gas Plant". Table 4 below summarizes the casing and cementing information for the plugged deep wells.

Table 4: Casing and Cement Details for Plugged Deep Wells within One Mile of Frontier Gas Plant

API #	3002500614	3002500622	3002500634	3002500751	3002508053	3002521951
Well Name	MCA UNIT 355	BAISH A 008	BAISH B 005	QUEEN B 036 (Baish B 036)	MCA UNIT 303 *	BAISH B FEDERAL 002
Distance From Plant (miles)	0.73	0.57	0.81	0.37	0.92	0.40
Status	P&A	P&A	P&A	P&A	P&A	P&A
Total Depth (feet)	12,778	13,670	13,939	10,747	13,965	13,735
Conductor Depth (feet)	178	428	100	825	444	390
Intermediate Casing Depth (feet)	4,181	5,052	2,700	4,198	4,740	4,660
Long StringCasing Depth (feet)	11,813	13,642	13,562	10,745	Dry, not cased	10,301
Conductor TOC (feet)	Surface (NMOCD Files)	Surface (NMOCD Files)	Surface (NMOCD Files)	Surface (NMOCD Files)	Surface (NMOCD Files)	Surface (NMOCD Files)
Intermediate Casing TOC (feet)	Surface (NMOCD Files)	Surface (Calculated)	Surface (NMOCD Files)	3391 feet (NMOCD Files)	Surface (NMOCD Files)	Surface (NMOCD Files)
Long String Casing TOC (feet)	4,860 feet (NMOCD Files)	5,300 feet (Calculated)	3,000 feet (NMOCD Files)	5,890 feet (NMOCD Files)	Dry Hole, not cased	6,300 feet (Calculated)
Producing/Target/ Zone	Grayburg	Cisco/Abo	Devonian	San Andres	Wolfcamp (Dry Hole)	Grayburg
Top Wolfcamp (Depth)	**9,200**	**9,118**	**9,090**	**9,320**	**9,079**	**9,105**

In the cases of Baish A 008 and Baish B Federal 002, documentation was missing for the tops of cement (TOC) of either the intermediate or long string. In these cases, the TOC was calculated using the annular volumes provided in the Halliburton "Red Book" and the amounts (sacks) of cement provided in the NMOCD files. The length of the annulus filled with the cement was calculated using a very conservative cement yield of 1.0 cubic feet per sack. This indicates that all of the plugged wells' "long string" is effectively isolated from the lower Leonard and Wolfcamp injection zones. Similarly, Table 5 below summarizes the casing and cementing for the six active deep wells within one mile of the Plant. Only well MCA Unit 383 lacked details on the long string top of cement, and a calculated TOC of 7,700 feet was developed using the method described above. This also indicates that all of the active wells' "long string" is effectively isolated from the lower Leonard and Wolfcamp injection zones.

Table 5: Casing and Cement Details for Active Deep Wells within One Mile of Frontier Gas Plant						
API #	3002500745	3002520568	3002520647	3002527068	3002534647	3002535252
WellName	MCA UNIT 382	BAISH A 012	MC FEDERAL 007	FEDERAL BI0 01	MC FEDERAL COM 001	MC FEDERAL 006
Distance From Plant (miles)	0.70	0.99	0.94	0.86	0.99	0.68
Status	Active	Active	Active	Active (SWD)	Active	Active
Total Depth (feet)	9,680	13,717	9,958	12,992	14,912	15,026
Conductor Depth (feet)	360	863	821	723	525	748
Intermediate Casing Depth (feet)	4,576	4,570	4,600	4,500	4,657	4,600
Long StringCasing Depth (feet)	9,108	10,825	9,955	12,967	14,909	13,605
Conductor TOC (feet)	Surface (NMOCD Files)	Surface (NMOCD Files)	Surface (NMOCD Files)	Surface (NMOCD Files)	Surface (NMOCD Files)	Surface (NMOCD Files)
Intermediate Casing TOC (feet)	Surface (NMOCD Files)	Surface (NMOCD Files)	Surface (NMOCD Files)	Surface (NMOCD Files)	Surface (NMOCD Files)	Surface (NMOCD Files)
Long String Casing TOC (feet)	7700 feet (Calculated)	3000 feet (NMOCD Files)	2200 feet (NMOCD Files)	1345 feet (NMOCD Files)	705 feet (NMOCD Files)	Surface (NMOCD Files)
Producing/Injection Zone	Grayburg-San Andres	Paddock	Paddock	Wolfcamp	McKee	Devonian
Top Wolfcamp (Depth)	**9,230**	**9,170**	**9,046**	**9,320**	**9,050**	**9,100**

To determine the validity of the calculations for TOC based on annular volumes, number of cement sacks, and a yield of 1.0 cubic feet of cement per sack, the same calculations were applied to the wells where known TOC's were available. A complete set of calculations for the long-string TOCs are included as Table C2 in Appendix C.

The results of this evaluation are shown in Table 6 below. Calculated versus measured TOC's are very similar, with only well Queen B 036 showing a measured TOC (5,890 feet) significantly deeper that the estimated TOC of 4,101 feet.

Table 6: Calculated vs Measures Cement Tops, Deep Wells within One Mile of Frontier Gas Plant				
Well Name	Reported TOC	Calculated TOC	Depth to Top Wolfcamp	Total Depth
MCA UNIT 355	4,860	4,489	9,200	12,778
BAISH A 008	not reported	5,300	9,118	13,670
BAISH B 005	4,480	5,167	9,090	13,939
QUEEN B 036 (Baish B 036)	5,890	4,101	9,320	10,747
MCA UNIT 303	not completed	not completed	9,079	13,965
BAISH B FEDERAL 002	not reported	6,300	9,105	13,735
MCA UNIT 382	not reported	7,700	9,298	9,680
BAISH A 012	3,000	2,710	9,048	13,717
MC FEDERAL 007	2,200	2,000	9,046	9,958
FEDERAL BI 001	1,345	3,400	9,320	12,992
MC FEDERAL COM 001	705	Surface	9,051	14,912
MC FEDERAL 006	Surface	Surface	9,099	15,026

6.0 IDENTIFICATION AND REQUIRED NOTIFICATION OF OPERATORS SUBSURFACE LESSEES AND SURFACE OWNERS WITHIN THE AREA OF REVIEW

Geolex contracted with MBF Land Services in Roswell, New Mexico to research land records in Lea County to obtain a listing of all operators, oil, gas and mineral lessees, and surface owners within a one mile radius of the proposed AGI well. Appendix D includes the data from that search.

Table D-1 lists operators within this one-mile radius, and Table D-2 lists the names and addresses of surface owners within the same one mile area of review. As shown in Table D-1, production in the area of review is controlled by two operators as currently listed by the NMOCD internet database. Appendix D also includes Table D-3 which lists the names and addresses surface lessees of record in the area of review, Table D-4 listing businesses included in the area of review, as extracted from the Lea County land records, and Figure D-1 is a map showing the same data.

All of these operators, oil, gas and mineral lessees and surface owners within the one-mile area of review will be provided notice and an opportunity to review this application at least 20 days prior to the OCD Hearing, according to the requirements of Section XIV of the C-108 and NMOCD's current policy on applications for acid gas injection wells. A draft form of this notice to interested parties is included in Appendix D. The proposed public notice that will be published in the Lovington Daily Leader at least 20 days prior to NMOCD Hearing is also included in Appendix D.

7.0 AFFIRMATIVE STATEMENT OF LACK OF HYDRAULIC CONNECTION BETWEEN PROPOSED INJECTION ZONE AND KNOWN SOURCES OF DRINKING WATER

As part of the work performed to support this application, a detailed investigation of the structure, stratigraphy and hydrogeology of the area surrounding the proposed Maljamar AGI #1 injection well has been performed. The investigation included the analysis of available geologic data and hydrogeologic data from wells and literature identified in Sections 3, 4 and 5 above including related appendices. Based on this investigation and analysis of these date, it is clear that there are no open fractures, faults or other structures which could potentially result in the communication of proposed injection zone with any known sources of drinking water in the vicinity as described above in Sections 4 and 5 of this application. The proposed injection zone is a closed system

FIGURES

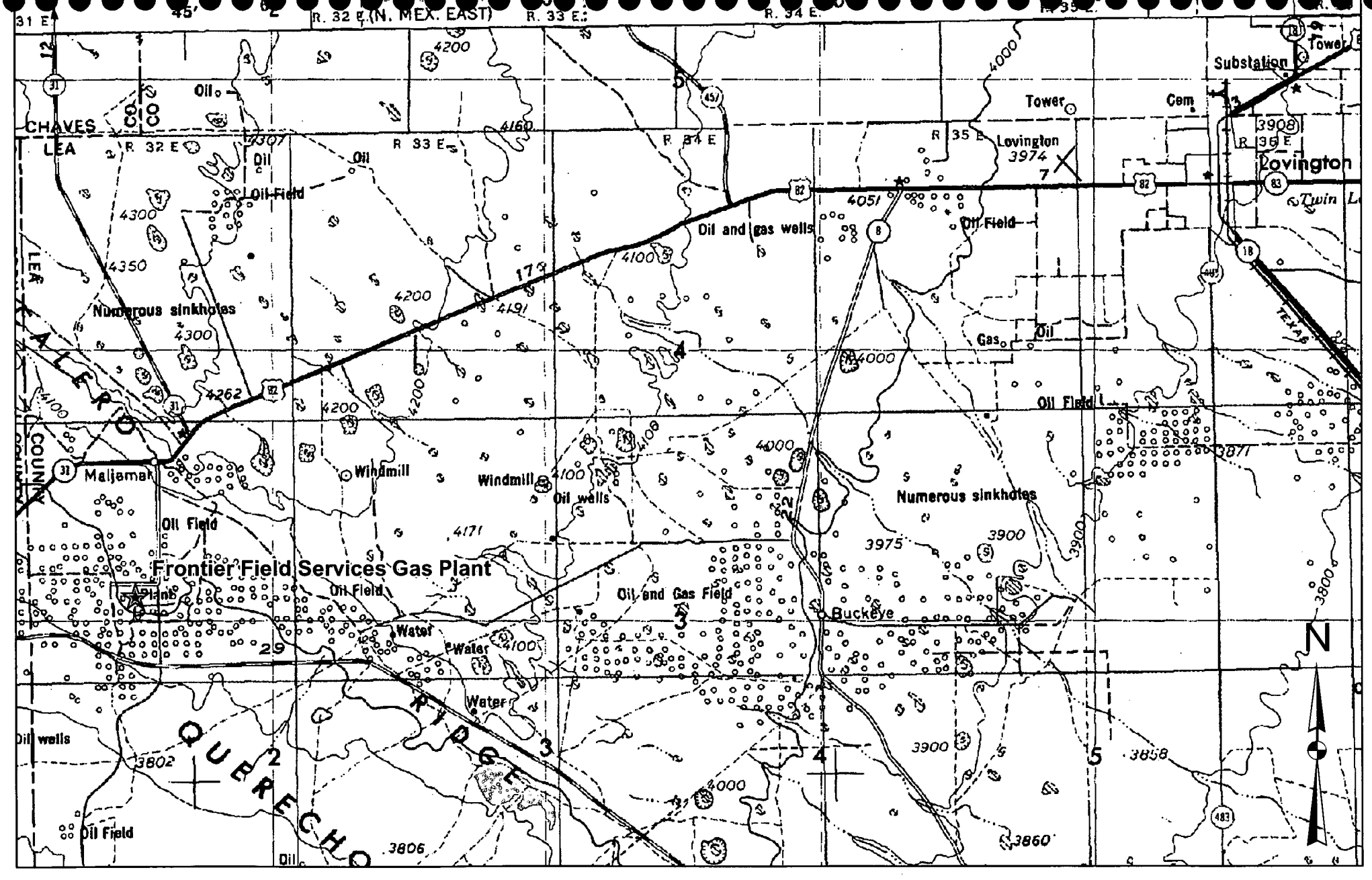

Figure 1: Location of Frontier Field Services, LLC Gas Plant

GEOLEX INCORPORATED

FRONTIER field services, llc southern ute indian tribe

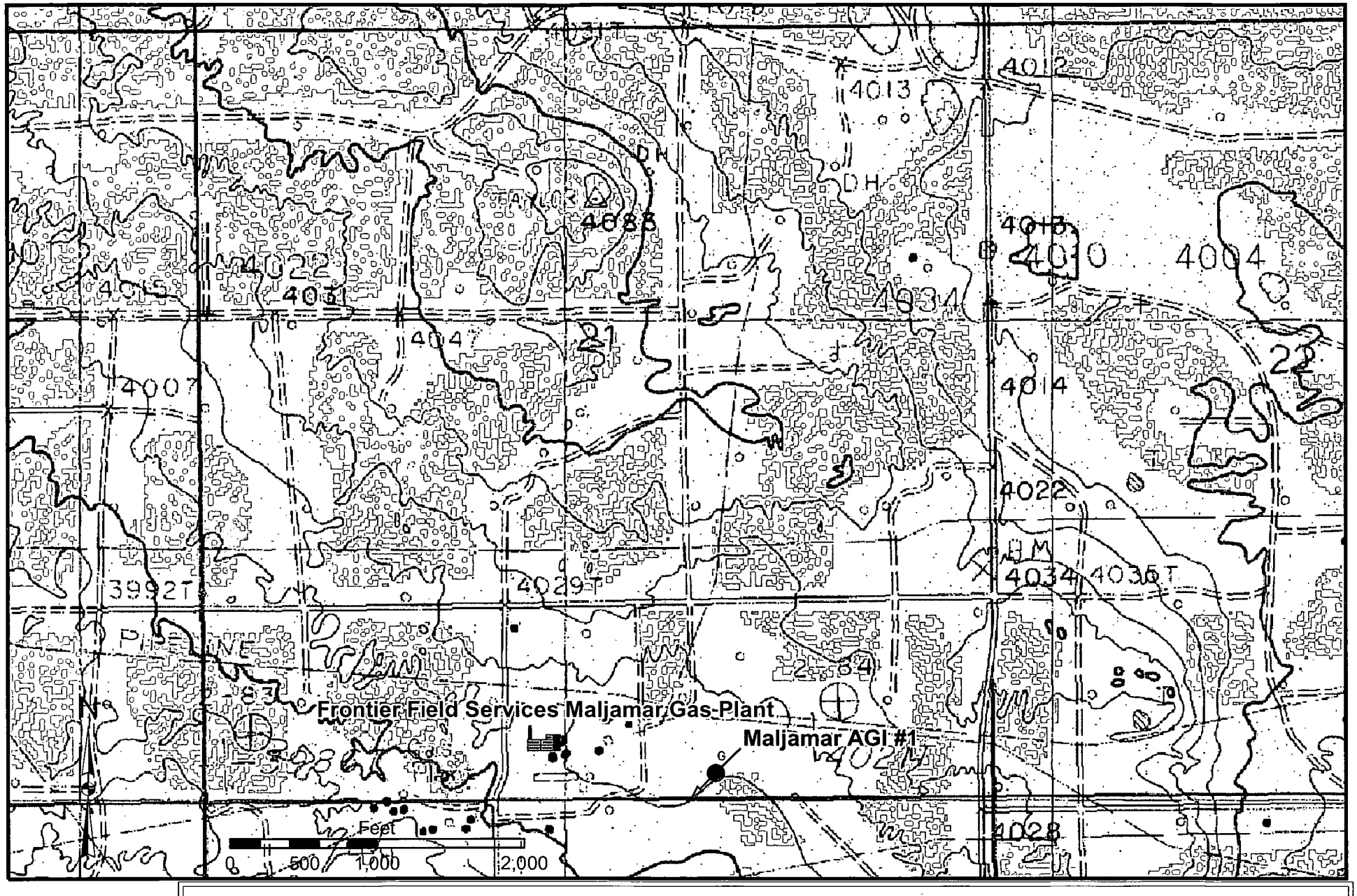

Figure 2: Location of Proposed Maljamar AGI #1
(Unit O, Section 21, T17S, R32E, 130 Feet FSL, 1813 Feet FEL, Lea Co., New Mexico))

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field services, llc
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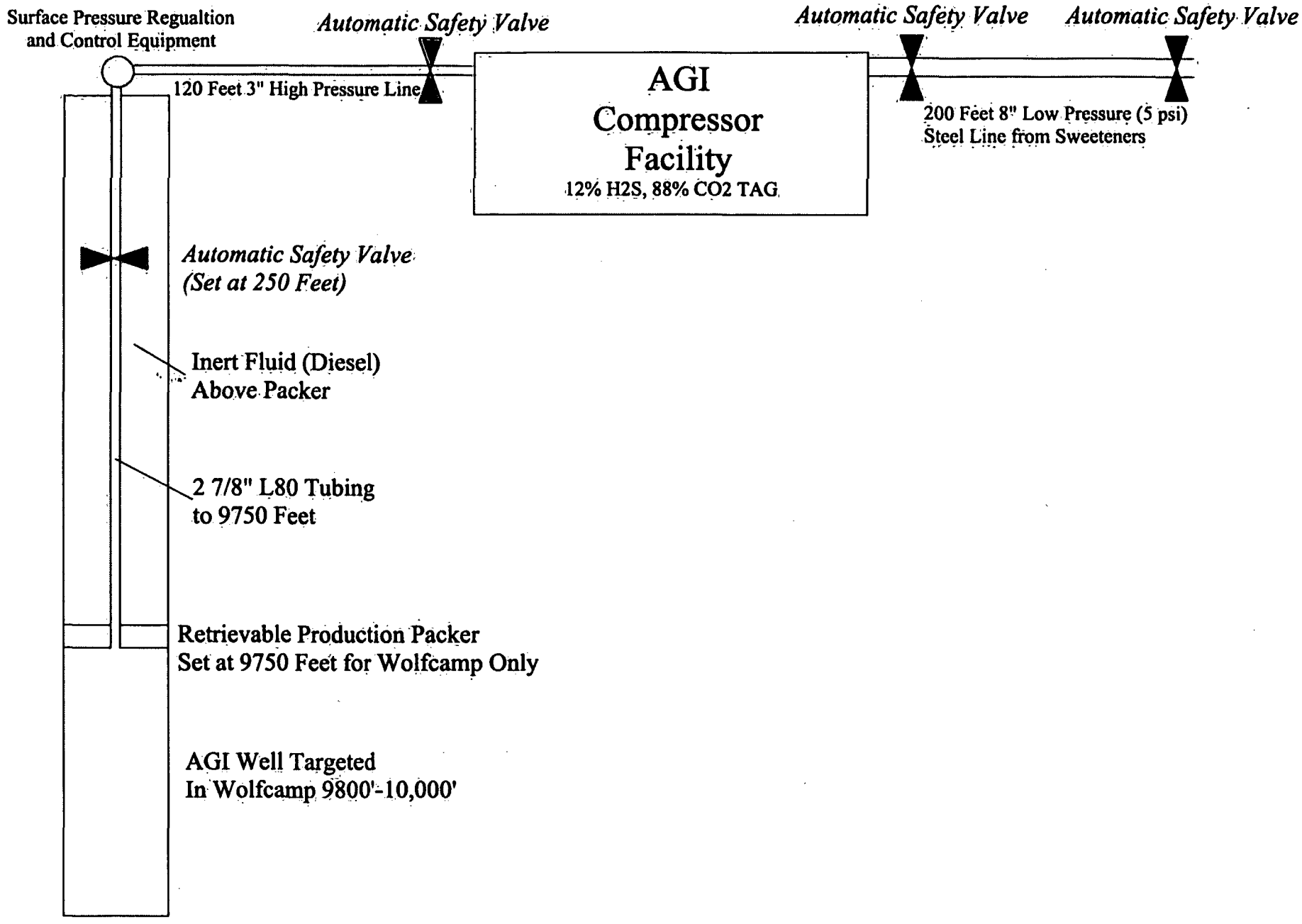

Figure 3: Schematic of Frontier Field Services, LLC Maljamar Gas Plant Acid Gas Injection System Components (Targeted Wolfcamp Completion)

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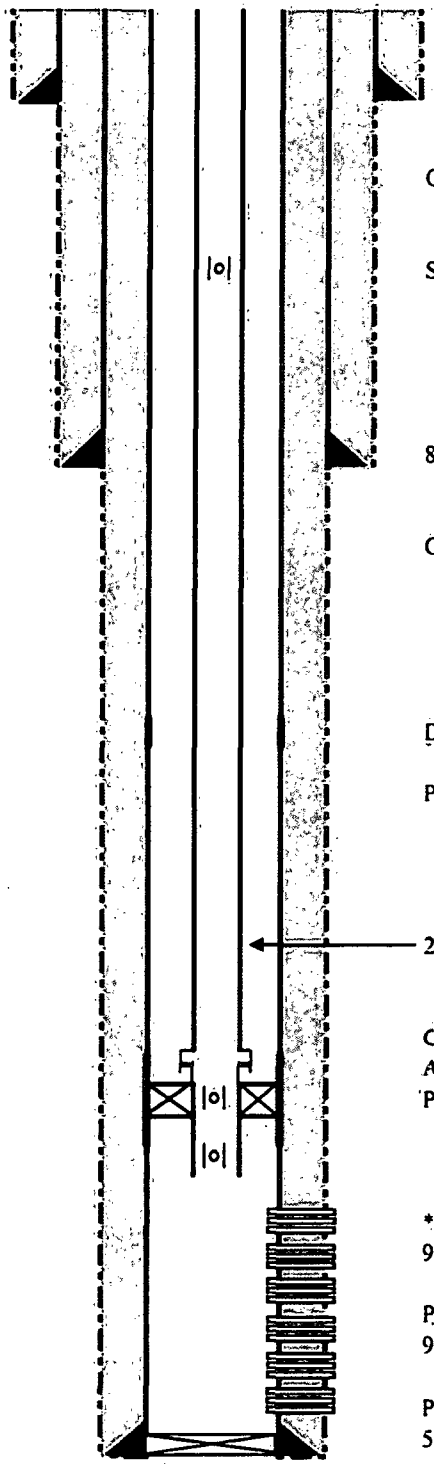
FIGURE 4: MALJAMAR AGI #1 WELL DESIGN

FRONTIER

Location: 130' FSL & 1831' FEL
STR S22-T17S-R32E
County, St.: LEA COUNTY, NEW MEXICO



OH = 17 1/2""

13 3/8" at 5500'

OH = 12 1/4"

SSSV at ~250'

8 5/8" at 4,200'

OH = 7 7/8"

DV Tool at ~5000'

Primary TOC @ ~8,500'

2 7/8" to 9,300'

Corrosion Resistant Alloy (CRA) Joint

Packer at ~9,300'

*Possible Secondary Targets
9,300-9,550'

Primary Target
9,800' - 10,000'

PBTD @ 10,000'
5 1/2" at 10,000'

TD: 10,000'

CONDUCTOR CASING
13 3/8", 48.00#/ft, H40, STC at ~550'

SURFACE CASING:
8 5/8", 24.0 #/ft, J55, STC at ~4,200'

PRODUCTION CASING:
5 1/2", 15.5 #/ft, L80, STC at ~10,000'

ANNULAR FLUID:
Diesel Fuel from top of packer to surface

TUBING:
Subsurface Safety Valve at ~250 ft

2 7/8", 6.5#/ft, L80, Premium thread at ~9,300'

PACKER:
Permanent Production Packer
Adj. Choke (if needed, placed in nipple below packer)
Check valve (if needed, placed in nipple below packer)

PERFORATIONS:

Primary Target	Secondary Target*
Lower Wolfcamp	Lower Leonard #1
9,800' - 10,000'	9,300' - 9,400'
	Lower Leonard #2
	9,450' - 9,550'

* Depending on logging and coring results

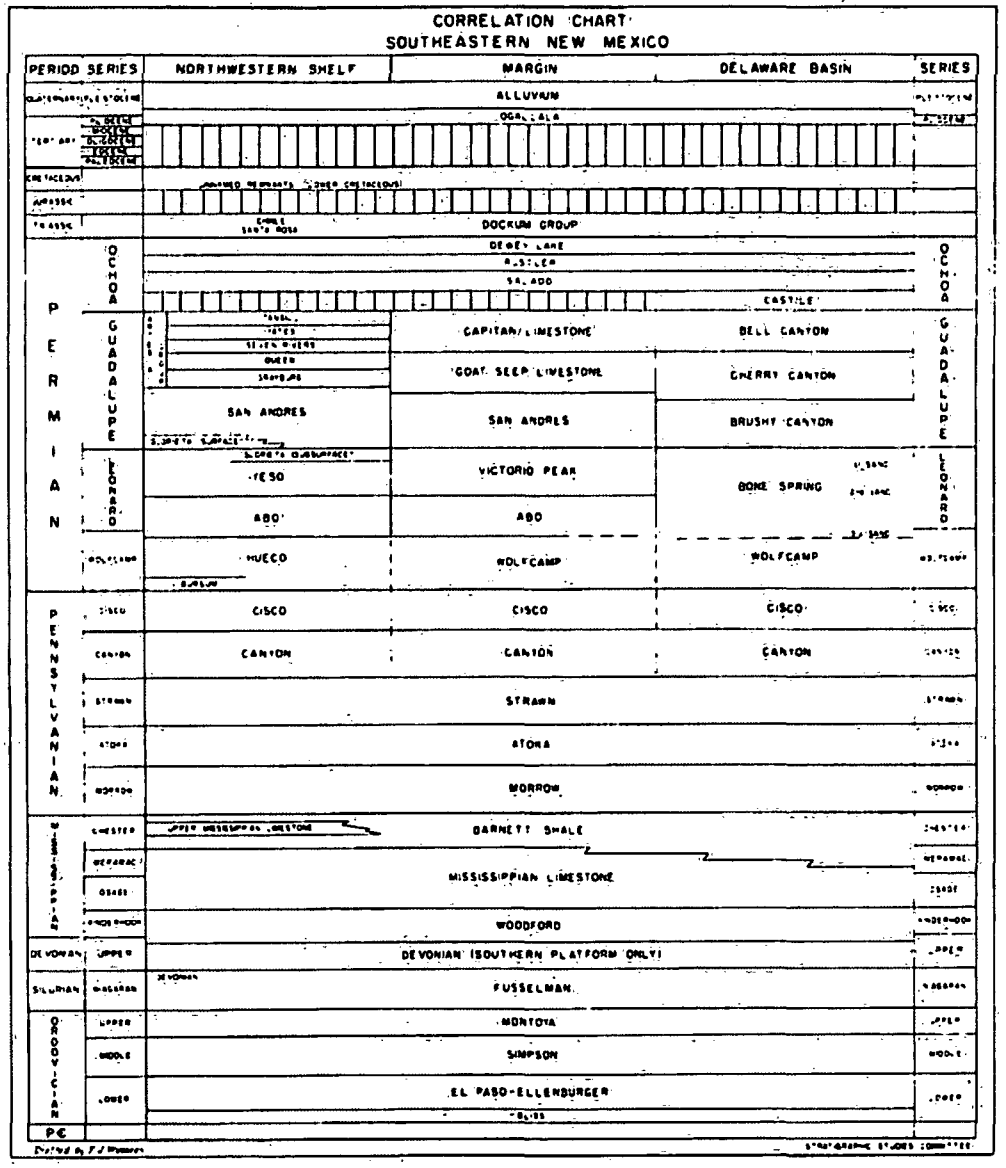


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Figure 5: Generalized Stratigraphy for Permian Basin

FRONTIER

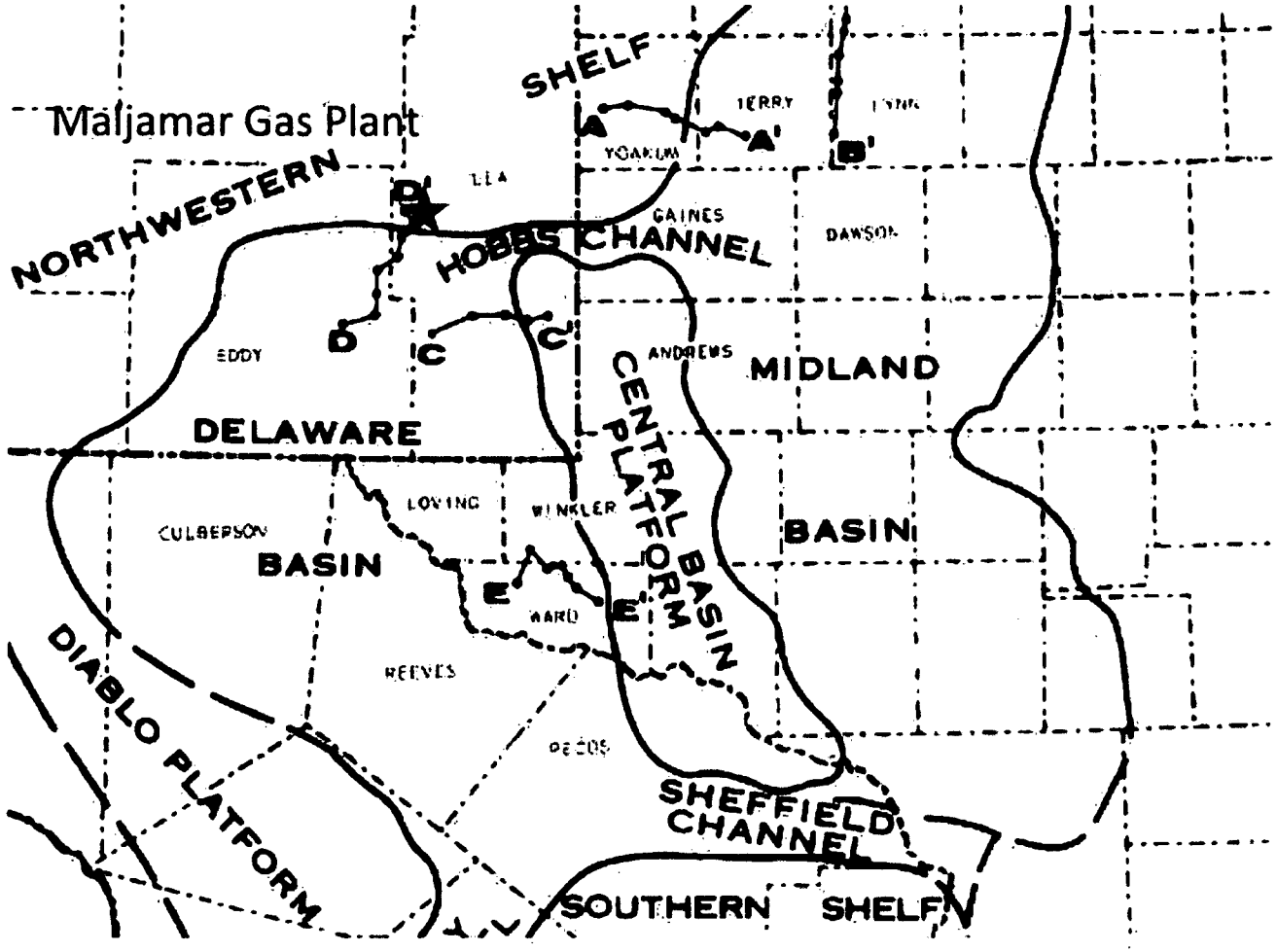

Figure 6: Structural Features of the Permian Basin

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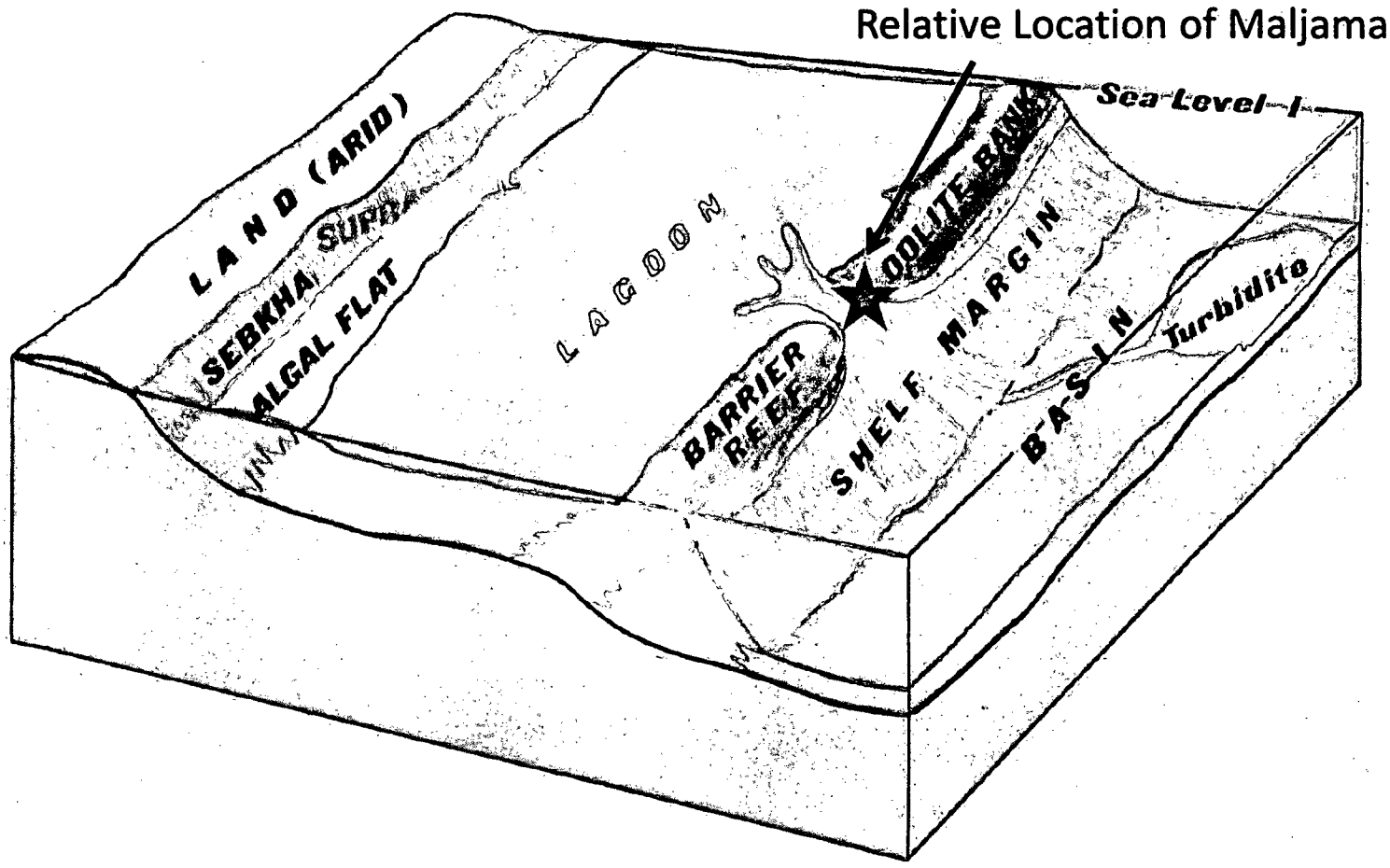

Figure 7: Location of Study Area Relative to Schematic Wolfcamp Depositional Environments

Note: Isolated detrital carbonated and reef mounds in general stratigraphic intervals of lower Leonard and Wolfcamp have limited areal extent and are confined by fine-grained deeper basin sediments.

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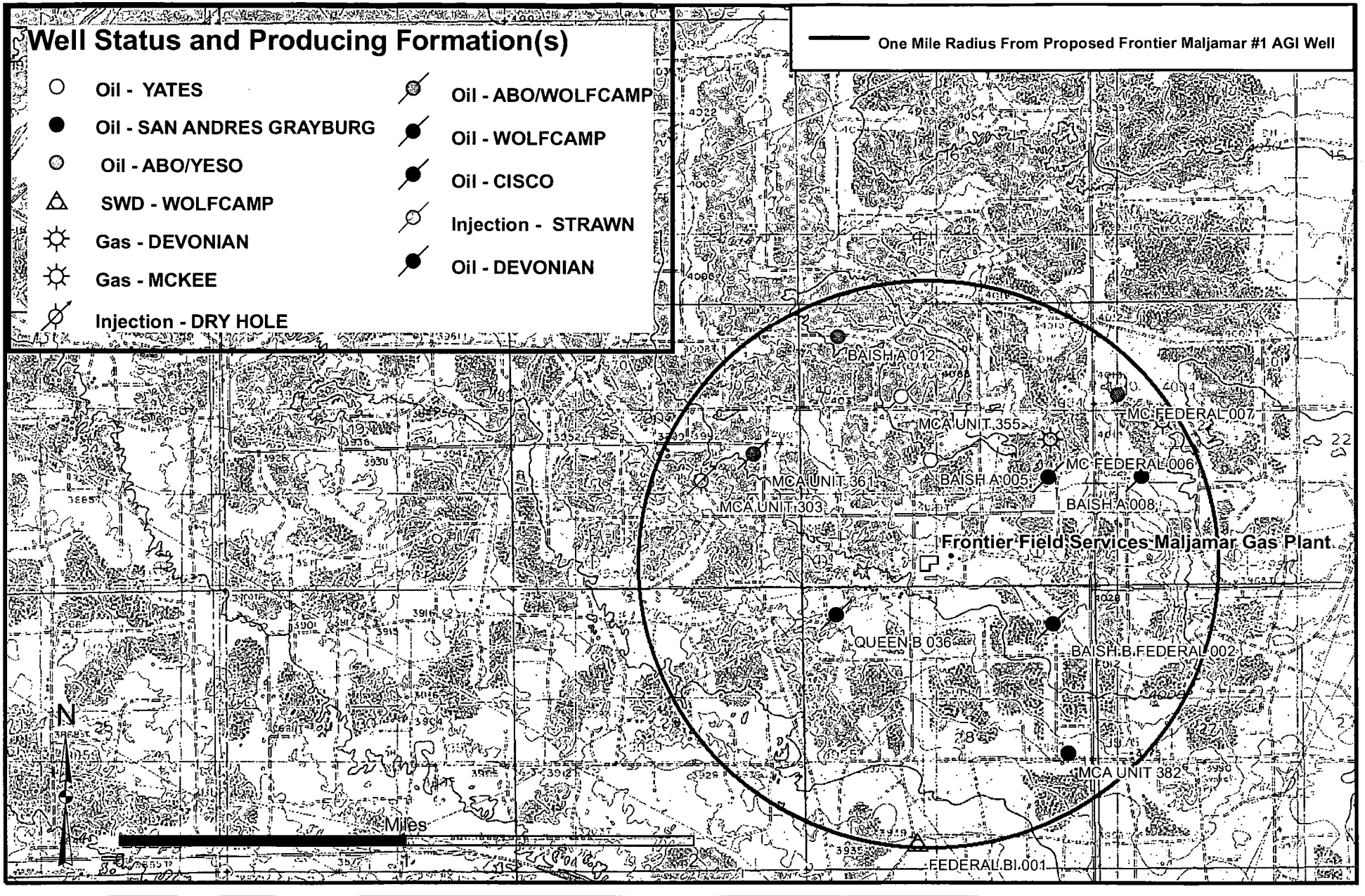

Figure 8: Deep Wells (>9,000 feet) Within Area of Review Around Frontier Field Services, LLC Maljamar Gas Plant

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FRONTIER field services, llc southern ute indian tribe

FIGURE 9: STRUCTURE ON TOP OF WOLFCAMP FROM 3-D SEISMIC INTERPRETION

Elevation on top of Wolfcamp (C. I. = 20 ft).

The location of the Maljamar Plant is indicated by the red outline.

Location of control wells where synthetic seismic profiles were constructed are indicated with black arrows.

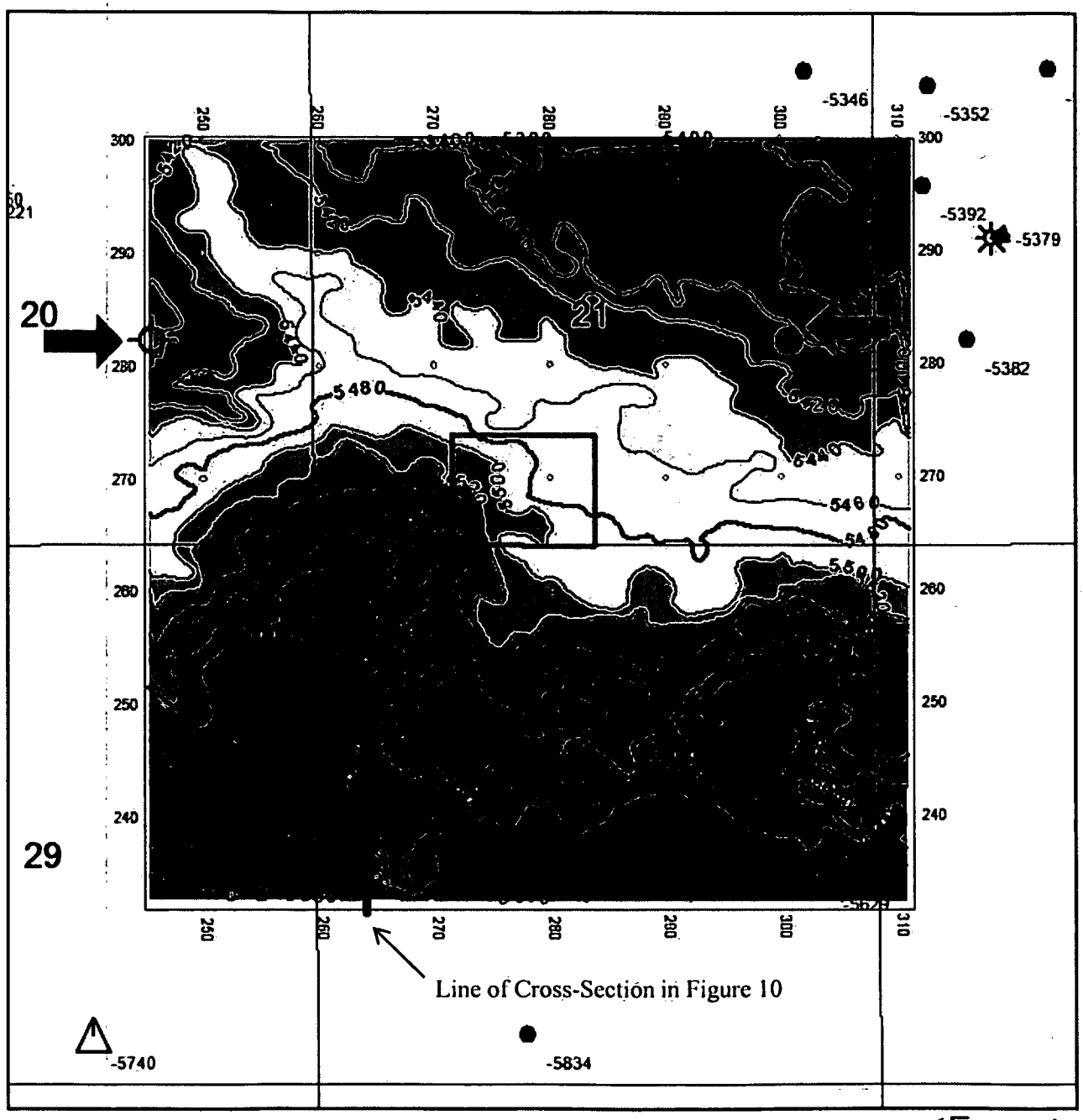

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FIGURE 10:
ENHANCED VERTICAL SEISMIC SECTION

Expanded scale, color-enhanced vertical section showing the locations of the three zones of interest (red and green arrows).

Yellow and red correspond to lower-amplitude events that, if sporadically developed along a given horizon, more likely indicate porosity development, as opposed to low-amplitude, persistent events (e.g., black arrow) which indicate shale beds.

Additionally, the presence of a strong, localized peak event directly beneath the low amplitude (porosity) events, as we particularly see under #1 and #3 (yellow dashed lines) shows strong density contrast between beds, which may also indicate development of significant porosity above.

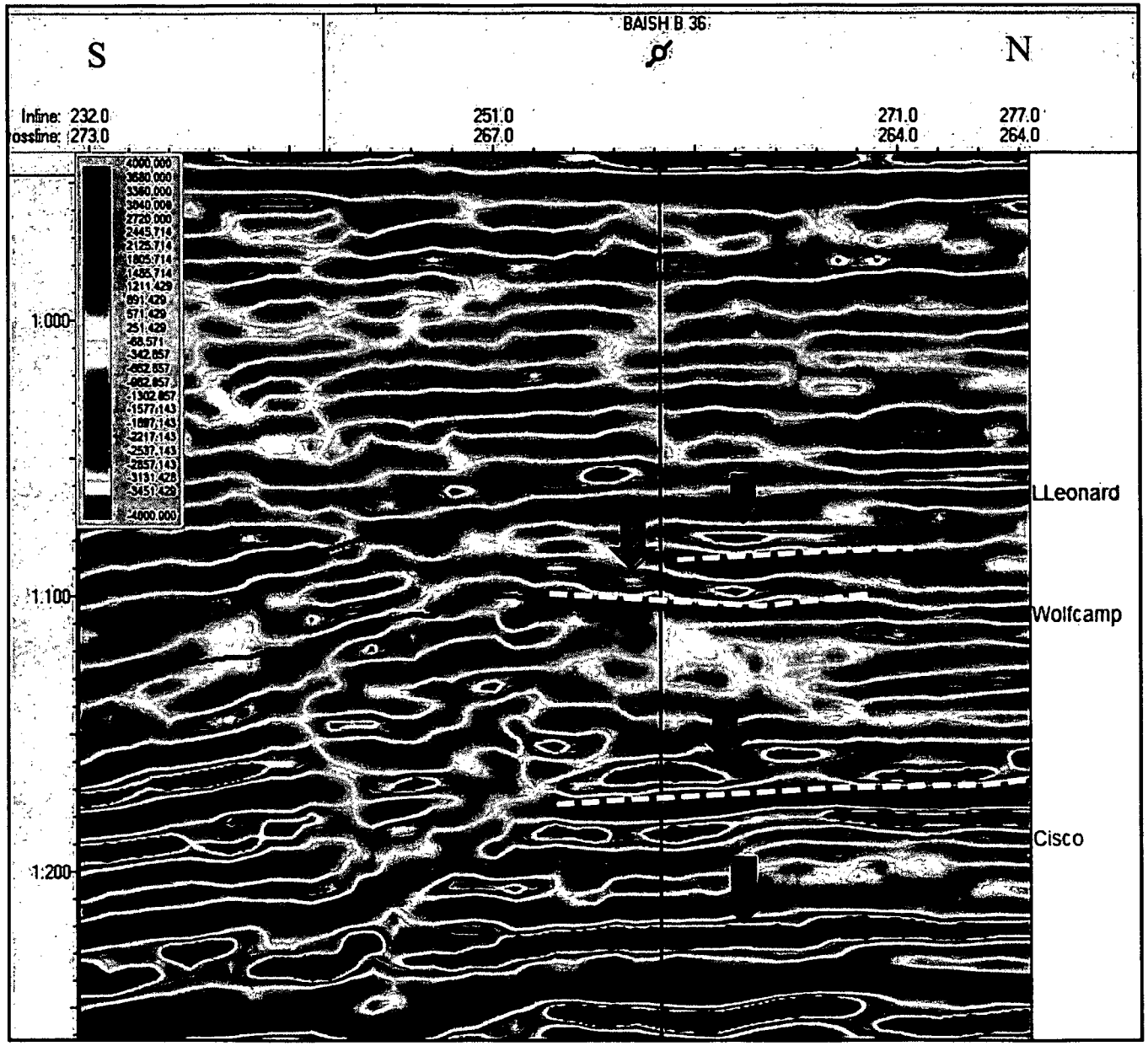

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FIGURE 11: AREAL EXTENT OF LOWER WOLFCAMP (Proposed Primary Injection Zone)

Amplitude map along the lower Wolfcamp porosity zone horizon, approximately 410 feet below the top of the Wolfcamp. The black dashed outline shows a coherent porosity trend that is underlain by a sharply contrasted, high amplitude event, and it covers 189 acres. The limits of this map represent the limits of Zone 3, except for that portion that goes off-survey to the east.

This zone is not laterally connected to the wells to the south that inject saltwater into the Wolfcamp.

The geometry of this zone suggests a possible debris apron fed by a narrow channel on its northeast boundary.

A vertical seismic section, whose trace is shown in black, is presented in the next slide.

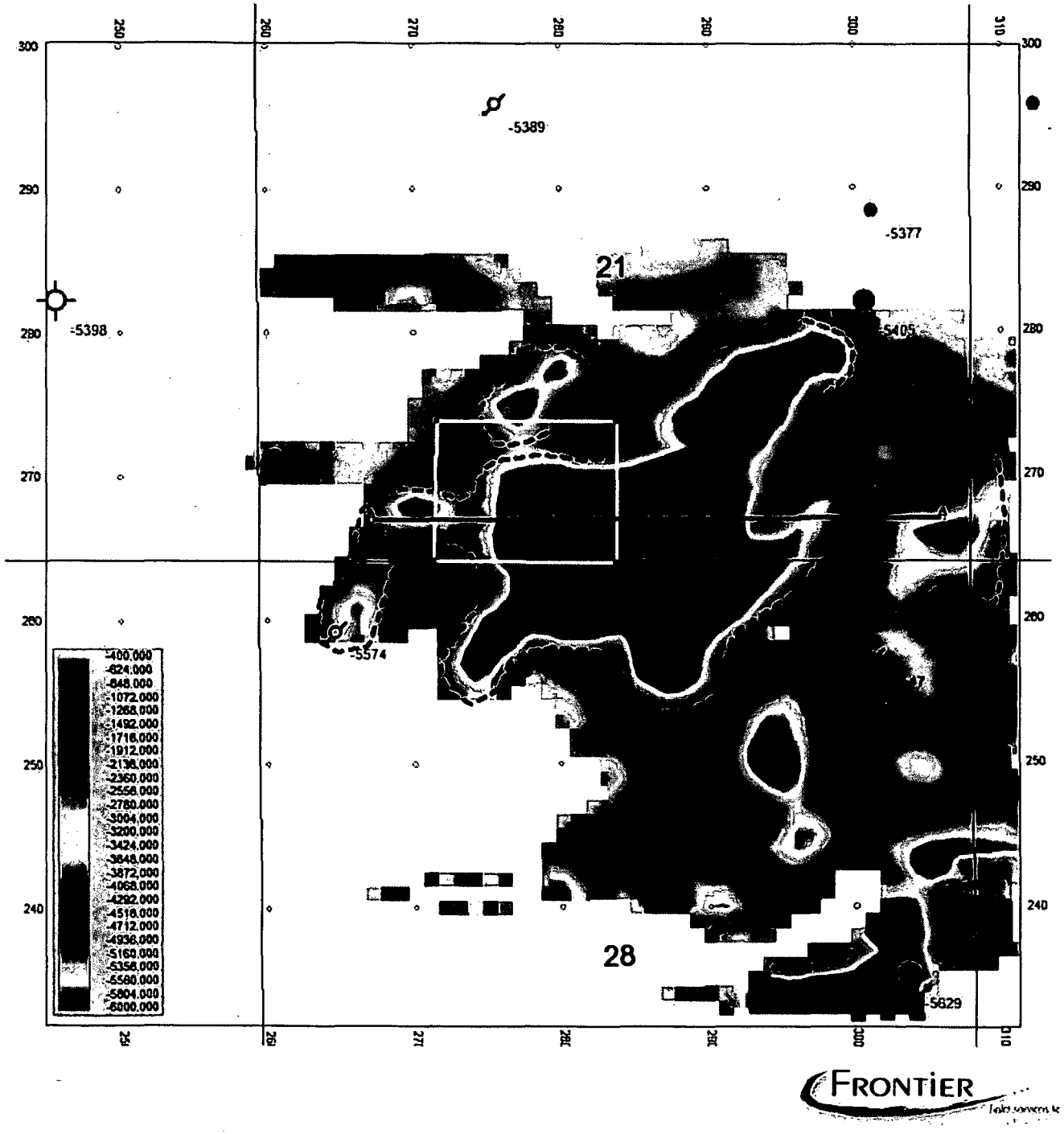

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FIGURE 12: CROSS-SECTION SHOWING EXTENT OF PROPOSED PRIMARY INJECTION ZONE (LOWER WOLFCAMP)

Vertical seismic section across the plant area (yellow bar), showing the lower Wolfcamp porosity zone (dashed black line).

Within this zone are pockets of higher porosity, noted where there is a sharper amplitude contrast between the zone and the underlying peak reflector (e.g., at red arrows). The warmer colors are thought to denote higher porosity.

The time thickness of this anomaly suggests an average porosity thickness of approximately 30 feet, with a maximum of 50 feet.

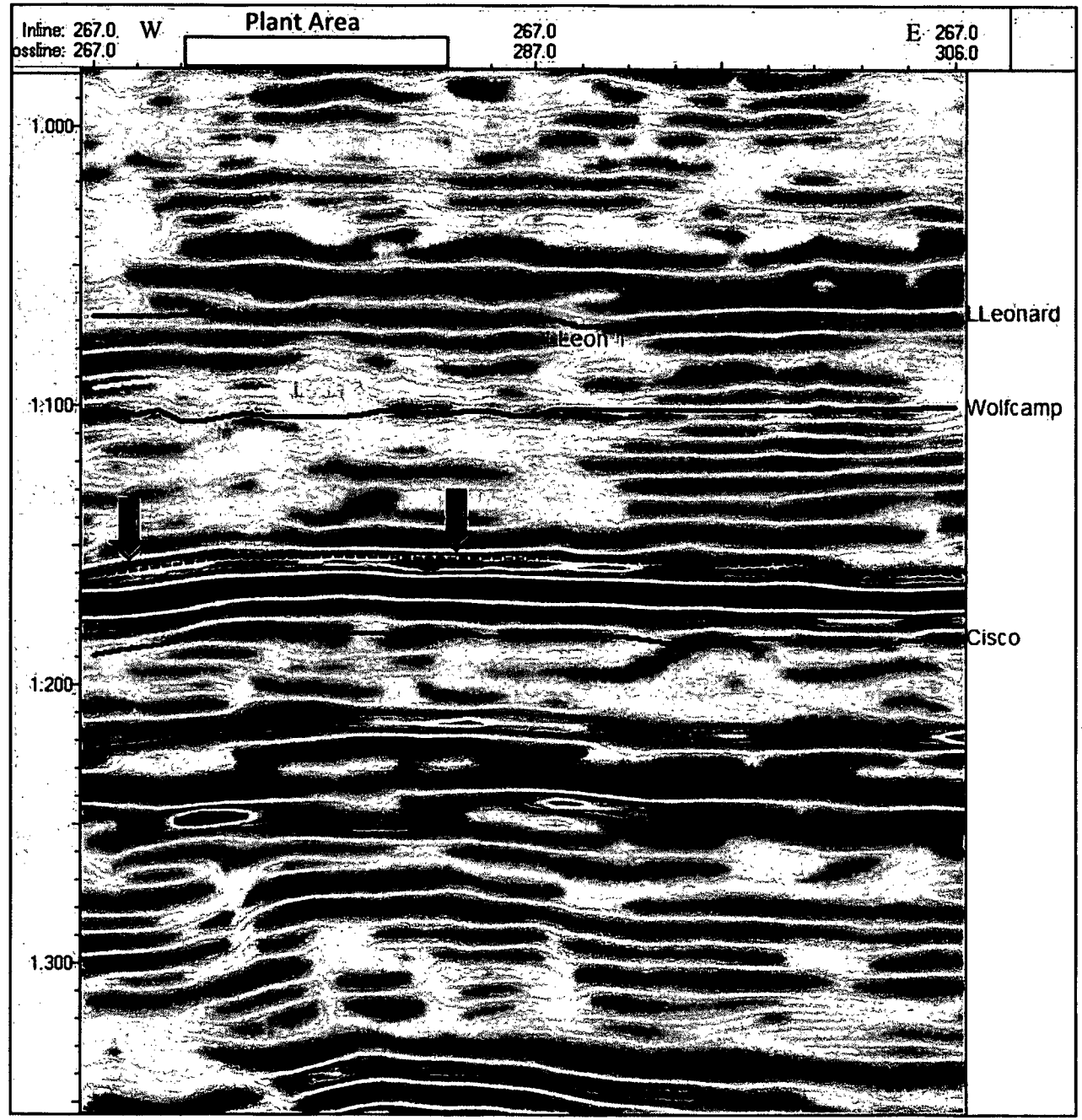

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FIGURE 13: AREAL EXTENT OF SECONDARY INJECTION TARGET (LOWER LEONARD ZONE 1)

Amplitude map along the upper Lower Leonard porosity zone horizon, approximately 225 feet above the top of the Wolfcamp. The white outline shows the plant site. The black dashed outline shows a coherent porosity trend that is underlain by a sharply contrasted, high amplitude event, and it covers 64 acres.

The limits of this map represent the limits of Zone 1. The geometry of this zone suggests a possible debris apron or a lowstand carbonate mound.

A vertical seismic section, whose trace is shown in black, is presented in the next slide.

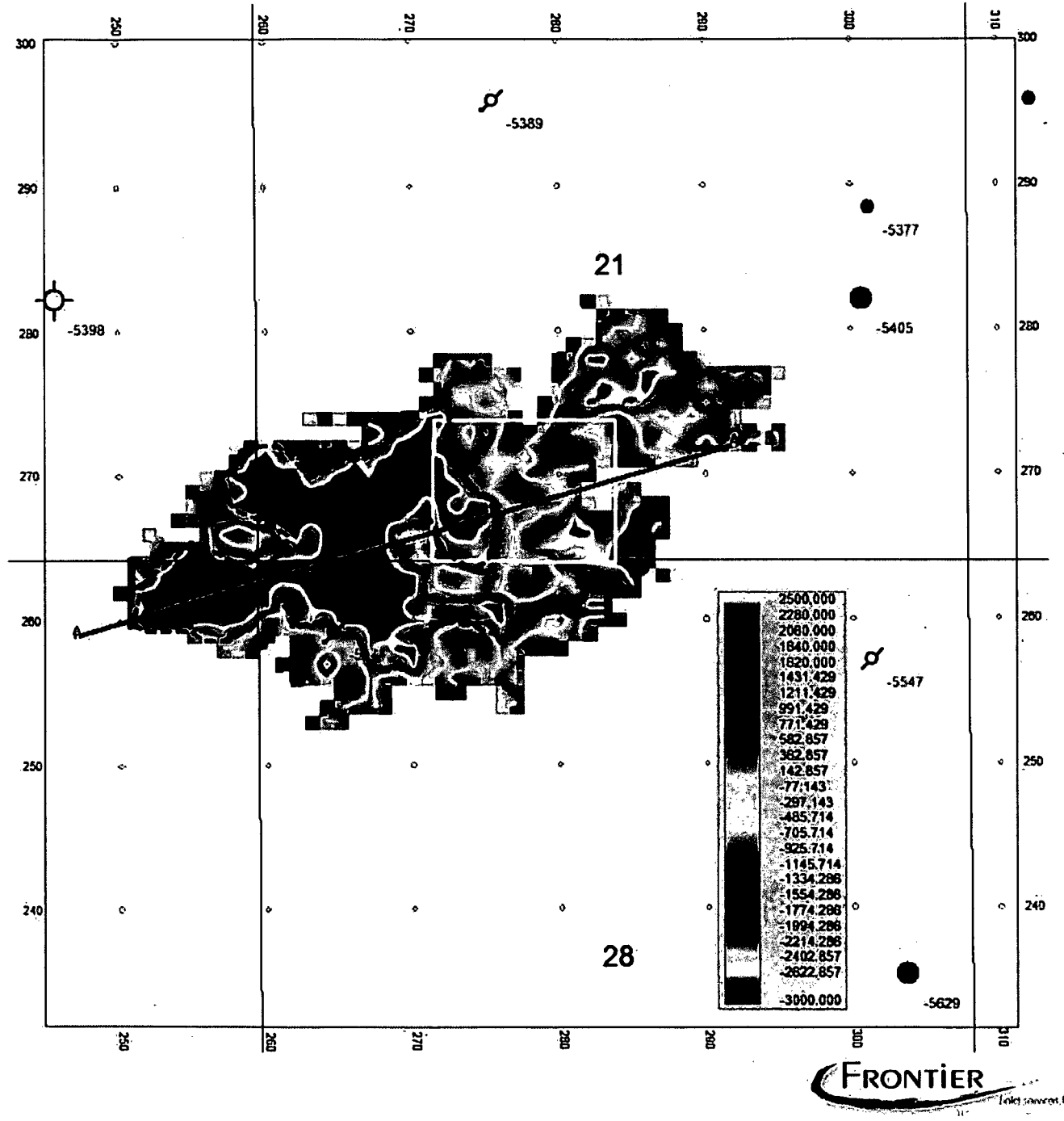

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FIGURE 14: AREAL EXTENT OF SECONDARY INJECTION TARGET (LOWER LEONARD ZONE 2)

Amplitude map along the lower Lower Leonard porosity zone horizon, approximately 85 feet above the top of the Wolfcamp.

The white outline shows the plant site. The black dashed outline shows a coherent porosity trend that is underlain by a sharply contrasted, high amplitude event, and it covers 53 acres.

The limits of this map represent the limits of the contiguous portion of Zone 2. The geometry of this zone suggests a composite channelized debris flow. The porosity zone is cut off to the south by the fault that transects the Lower Leonard section.

A vertical seismic section, whose trace is shown in black, is presented in the next slide.

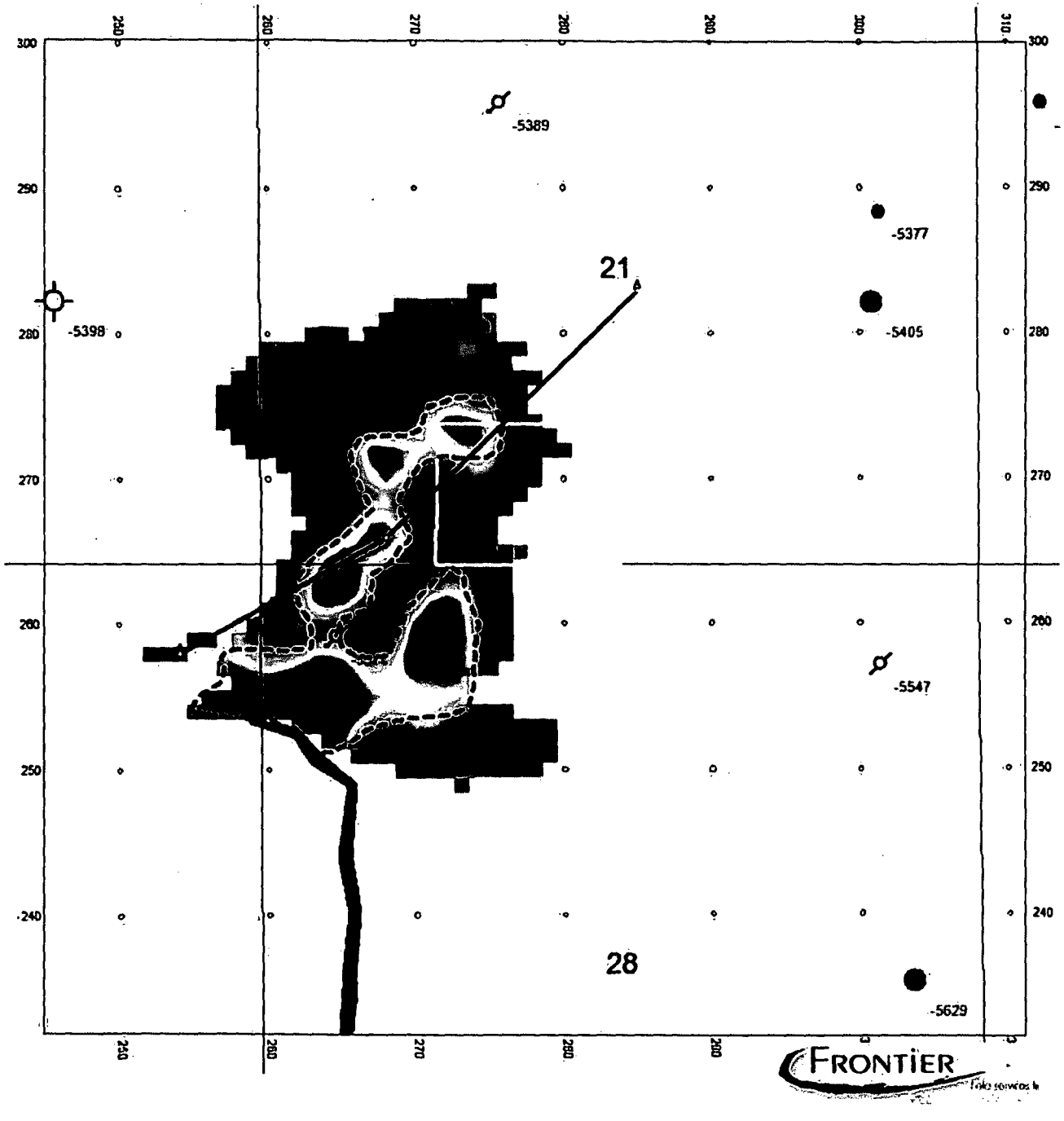

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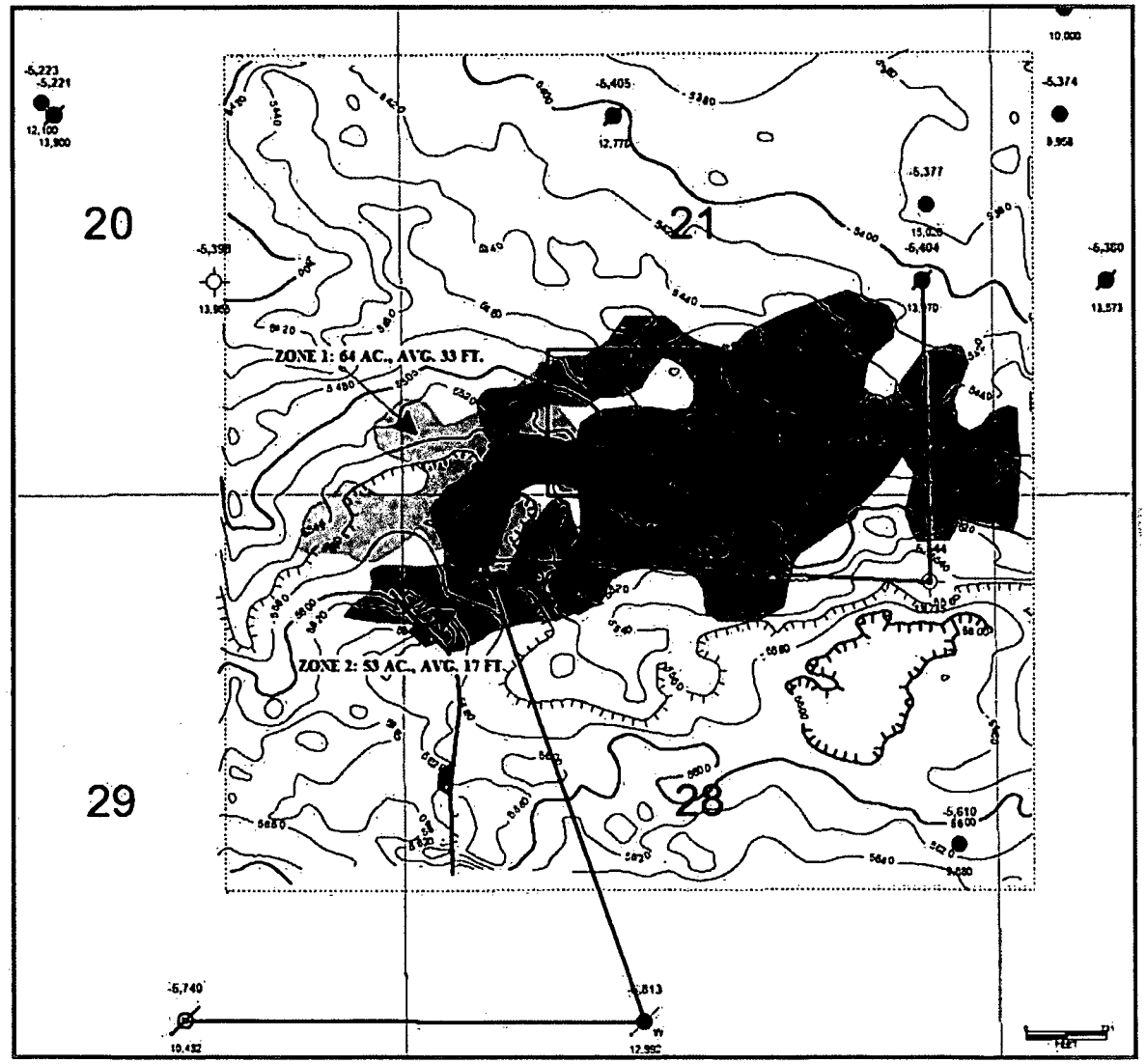
FIGURE 15: SUMMARY OF AREAL EXTENTS OF POTENTIAL AGI RESERVOIRS

Calculated properties are superimposed on the seismic depth map, top of Wolfcamp.

Lower Leonard Zone 1: 64 Acres, average net porosity 33 feet. Capacity 9 million barrels of TAG

Lower Leonard Zone 2: 53 Acres, average net porosity 17 feet. Capacity 3.8 million barrels of TAG

Lower Wolfcamp: 189 Acres, average net porosity 30 feet. Capacity 24.2 million barrels of TAG



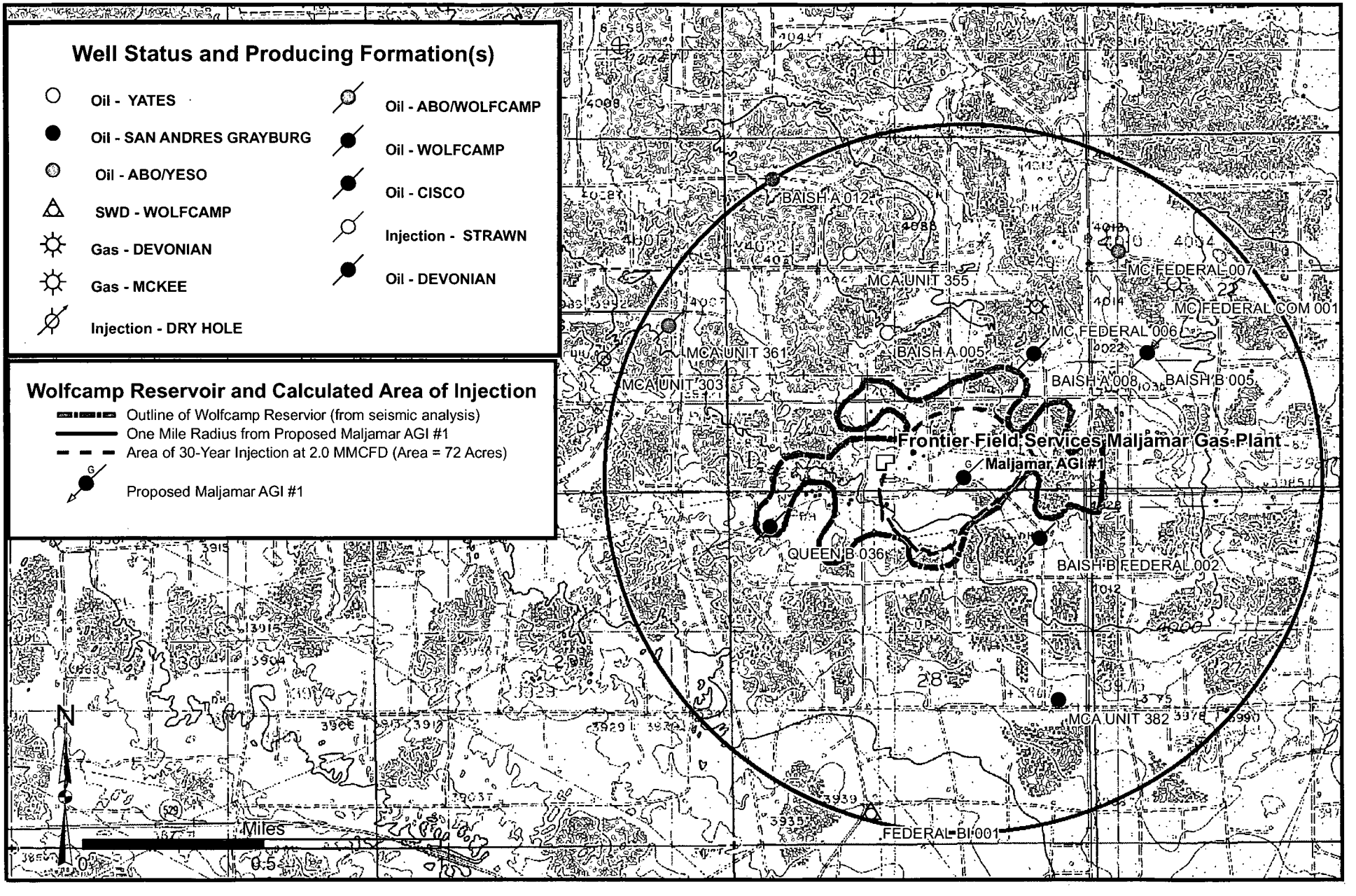


Figure 16: Calculated Area of Injection for 30 Years at 2.0 MMSCFD

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APPENDIX A

A-1 Wolfcamp Formation Fluid Analyses and Analyses of Frontier Maljamar Gas Plant TAG

Table A-1. Wolfcamp Formation Fluid Analyses

	Wolfcamp Formation	
Parameter	Baish A - 5/1/81 mg/L	Baish B - 5/1/81 mg/L
Ca^{2+}	972	680
Mg^{2+}	2360	2000
Na^{+} (calc.)	57,298	34,704
CO_3^{2-}	0	0
HCO_3^{2-}	1220	481
SO_4^{2-}	4400	3900
Cl^{-}	50,000	33,000
H_2S	strong	strong
Iron (free)	11	14
pH	7.6	7.4
SG		
O_2 (free)		
$CaCO_3$ S.I.	1.4	0.9
$CaSO_4$ S.I.	neg	neg

Data from SWD C-108 application for API # 30-025-00751, NMOCD files

LOCATION ______________ FIELD [illegible] [illegible] WATER ANALYSIS

(Ca^{++})	mg/L	meq/L	mg/L	meq/L	mg/L	meq/L
(Mg^{++})	972		1080		1507	124
(Na^{+}) Calc.	2360		2000		1723	86
(Na^{+}) Calc.	52298		34704		20655	898
$(CO_3^{=})$	0		0		0	
$(HCO_3^{=})$	1220		481		915	15
$(SO_4^{=})$	4100		3900		1050	21.8
(Cl^{-})	[illegible]		33000		38,000	1071
H_2S	STRONG		STR		1190	69.3
IRON (Free)	11		14		3.8	
PH @ °F	7.6		7.4		6.25	
Sp. Gr. @ °F					1.04	
O_2 (Free)	5				9.3	
$CaCO_3$ S.I.	1.4		.7		-1.6	
$CaSO_4$ S.I.	Neg		neg		-1.9	
BY.... DATED	Champion 5-1-81		Champion 5-1-81		CRD	10-19 81
	Batch A		Batch B		MCA	Btry 2

WOLFCAMP WATER SAMPLE - ZONE TO BE DISPOSED INTO

MCA UNIT (G-SA) WATER TO BE INJECTED

G:\10-014\WellData\PluggedWells\Full 30025007510000.tif

MANLEY GAS TESTING, INC.
P.O. DRAWER 193 ODESSA, TEXAS 79760
OFFICE(432)367-3024 FAX(432)367-1166 E-MAIL: MANLEYGAST@AOL.COM

CHARGE..... 150 - 0
REC. NO. 14
TEST NUMBER.. 9693

DATE SAMPLED..... 01-24-11
DATE RUN..... 02-02-11
EFFEC. DATE..... 02-01-11

STATION NO. ... 06311001

PRODUCER ..... FRONTIER FIELD SERVICES

SAMPLE NAME.... ACID GAS FLARE TYPE: SPOT

RECEIVED FROM.. FRONTIER FIELD SERVICES LLC - MALJAMAR

FLOWING PRESSURE ..... 14.1 PSIA FLOWING TEMPERATURE ..... 87 F

SAMPLED BY: BM CYLINDER NO. ... 037

FRACTIONAL ANALYSIS
CALCULATED @ 14.650 PSIA AND 60F

	MOL%	GPM (REAL)	
HYDROGEN SULFIDE...	11.500		
NITROGEN.....	0.573		
CARBON DIOXIDE.....	85.850		
METHANE.....	1.602		
ETHANE.....	0.296	0.079	H2S PPMV = 115000
PROPANE.....	0.105	0.029	
ISO-BUTANE.....	0.007	0.002	
NOR-BUTANE.....	0.026	0.008	
ISO-PENTANE.....	0.005	0.002	'Z' FACTOR (DRY) = 0.9940
NOR-PENTANE.....	0.007	0.003	'Z' FACTOR (WET) = 0.9936
HEXANES +.....	0.029	0.013	
TOTALS	100.000	0.136	CALC. MOL. WT. = 42.30

..CALCULATED SPECIFIC GRAVITIES..

REAL, DRY 1.4690

REAL, WET 1.4549

..CALCULATED GROSS HEATING VALUES..

BTU/CF - REAL, DRY 27

BTU/CF - REAL, WET 27

DISTRIBUTION AND REMARKS:

ENTERED

ANALYZED BY: JT
** R **

APPROVED:

APPENDIX B

Table and Map of Water Wells within One Mile Area of Review and Groundwater Analyses

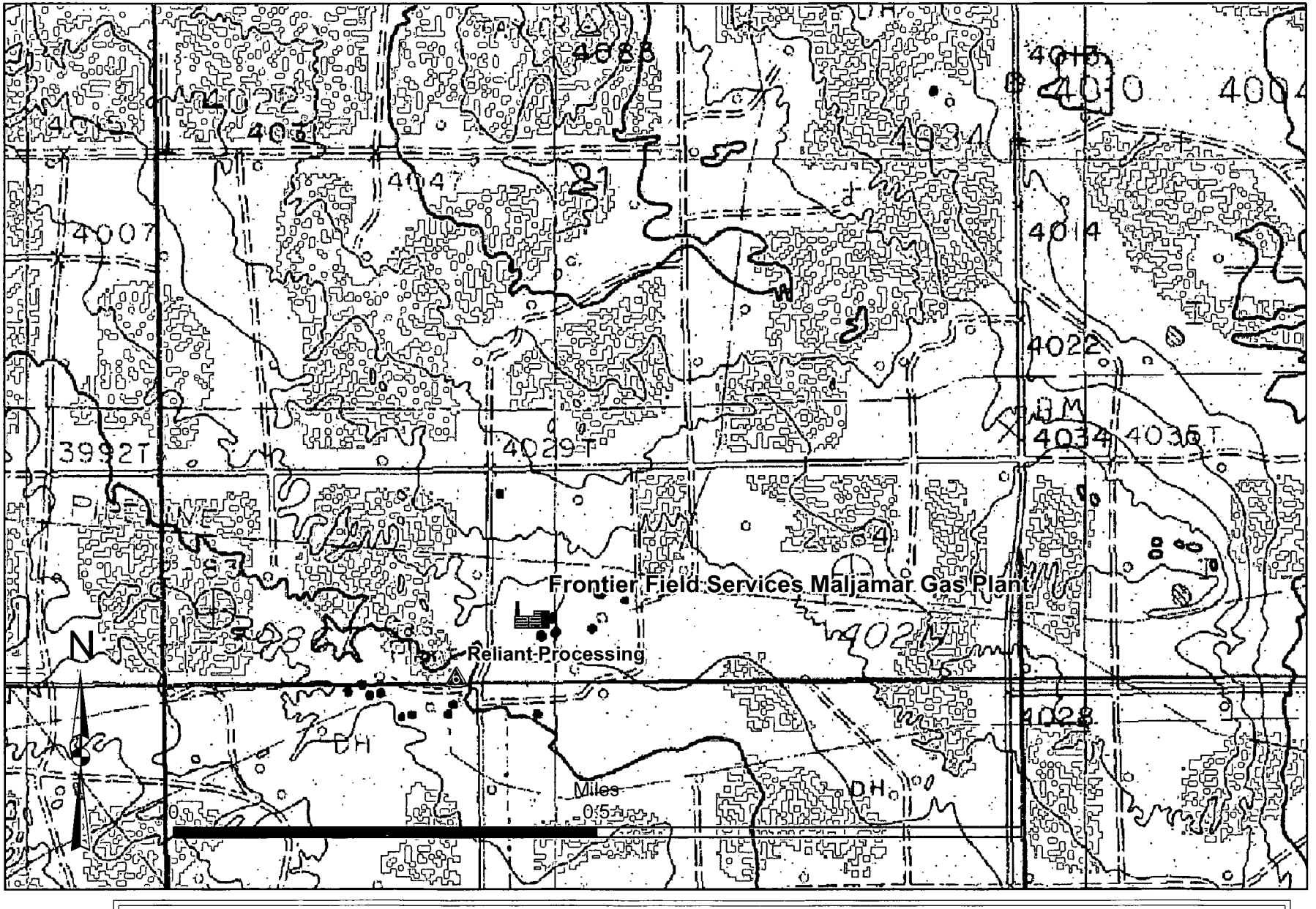

Figure B-1: Location of Known Water Wells Within One Mile of Frontier Field Services, LLC Gas Plant

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Table B-1. Water Wells Within a One Mile Radius of Proposed AGI Well.

WR File Nbr (POD Number)	Subbasin	Use	Diversion	Owner	County	Source	Depth (feet)	q16	q4	Sec	Tws	Rng	X*	Y*	Distance (miles)
RA 10175		SAN	3	RELIANT PROCESSING FLO CO2	LEA	Shallow	158	2	1	28	17S	32E	614814	3631005	0.1162

***UTM location was derived from PLSS - see Help**

New Mexico Office of the State Engineer
Point of Diversion Summary

POD Number	Q64	Q16	Q4	Sec	Tws	Rng	X	Y
RA 10175		2	1	28	17S	32E	614814	3631005*

(quarters are 1=NW 2=NE 3=SW 4=SE)
(quarters are smallest to largest)
(NAD83 UTM in meters)

Driller License: EADES, ALAN G.
Driller Name: EADES, ALAN

Drill Start Date:	02/04/2002	**Drill Finish Date:**	02/04/2002	**Plug Date:**	
Log File Date:	03/06/2002	**PCW Rcv Date:**		**Source:**	Shallow
Pump Type:		**Pipe Discharge Size:**		**Estimated Yield:**	
Casing Size:	5.75	**Depth Well:**	158 feet	**Depth Water:**	

Water Bearing Stratifications:	Top	Bottom	Description
	87	89	Shallow Alluvium/Basin Fill
	89	116	Shallow Alluvium/Basin Fill
	116	124	Shallow Alluvium/Basin Fill

Casing Perforations:	Top	Bottom
	118	158

Meter Number:	5380	**Meter Make:**	SENSUS
Meter Serial Number:	560656282	**Meter Multiplier:**	10.0000
Number of Dials:	6	**Meter Type:**	Diversion
Unit of Measure:	Gallons	**Return Flow Percent:**	
Usage Multiplier:		**Reading Frequency:**	Annual

Meter Readings (in Acre-Feet)

Read Date	Year	Mtr Reading	Flag	Rdr	Comment	Mtr Amount
03/20/2002	2002	0	A	RPT		0
05/06/2002	2002	170	A	RPT		0.005
02/13/2003	2002	2410	A	PRT		0.069
02/01/2005	2004	3420	A	ch		0.031

**YTD Meter Amounts:	Year	Amount
	2002	0.074
	2004	0.031

***UTM location was derived from PLSS - see Help**

GROUND-WATER REPORT 6

Geology and Ground-Water Conditions in Southern Lea County, New Mexico

by ALEXANDER NICHOLSON, Jr.
and ALFRED CLEBSCH, JR.

UNITED STATES GEOLOGICAL SURVEY

Prepared in cooperation with the
New Mexico Institute of Mining and Technology,
State Bureau of Mines and Mineral Resources Division
and the New Mexico State Engineer

1961

STATE BUREAU OF MINES AND MINERAL RESOURCES
NEW MEXICO INSTITUTE OF MINING & TECHNOLOGY
CAMPUS STATION SOCORRO, NEW MEXICO

TABLE 8. CHEMICAL ANALYSES OF WATER FROM WELLS IN SOUTHERN LEA COUNTY, N. MEX.

(Analyses by U.S. Geological Survey except as noted; chemical constituents in parts per million and equivalents per million [underscored].)

Sample	Location number*	Date of collection	Geologic source†	Depth‡ (ft)	Silica (SiO_2)	Calcium (Ca)	Magnesium (Mg)	Sodium plus potassium (Na+K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (sum)	Hardness as $CaCO_3$ Calcium	Hardness as $CaCO_3$ Magnesium	Percent sodium	Specific conductance (micromhos at 25°C)	pH
1	17.32.5.140	7-21-54	To	—	—	—	—	34	194	0	25	17	—	—	—	136		35	419	—
						2.72		1.46	3.18		.52	.48								
2	17.33.18.322	7-19-54	To	220	—	—	—	27	177	0	40	23	—	—	—	160		27	442	—
						3.20		1.18	2.90		.83	.65								
3	19.32.8.200	12- 9-58	Tr	—	19	10	13	131	306	0	74	21	1.2	6.4	426	80	78	682	8.0	
						.50	1.10	5.71	5.02		1.54	.59	.06	.10						
4	19.34.9.114	12- 9-58	Tr(?)	33	41	430	65	675	189	0	1,680	560	.3	139	3,680	1,340	52	4,660	7.1	
						21.46	5.34	29.33	3.10		34.98	15.79	.02	2.24						
5	19.36.35.125	4- 9-38	To	45	—	—	—	—	—	—	212	31	—	—	—	—	—	562	—	
											4.41	.87								
6	19.36.32.110	11-20-29	To	32	—	84	—	158	261	0	225	79	—	6.8	668	222	—	—	—	
						4.44		6.86	4.28		4.68	2.23		.11						
7	19.37.4.110	9-19-29	To	29	—	68	—	71	307	0	54	32	—	—	383	198	—	—	—	
						3.96		3.09	5.03		1.12	.90								
8	19.37.29.344a	7-15-54	Qal	30±	—	—	—	52	296	0	62	91	—	—	—	322	26	865	—	
						6.44		2.27	4.85		1.29	2.57								
9	do.	9- 9-58	Qal	30±	—	—	—	—	215	0	54	73	—	—	—	252	—	678	7.6	
						5.04			3.52		1.12	2.06								
10	20.36.15.421	3-30-54	Qal	50	—	—	—	—	304	0	1,840	1,080	—	—	—	—	—	6,780	—	
									4.98		38.30	30.46								
11	20.36.15.421	9- 9-58	Qal	50	—	—	—	—	292	0	2,250	1,240	—	—	—	1,720	—	7,500	7.4	
						34.40			4.79		46.84	34.97								
12	20.37.4.111	4- 2-54	Qal	40	—	—	—	—	423	0	67	450	—	—	—	—	—	2,180	—	
									6.93		1.39	12.69								
13	20.37.4.111	4-22-55	Qal	40	—	—	—	—	438	0	78	425	—	—	—	670	—	2,090	7.2	
						13.40			7.18		1.62	11.99								
14	20.37.4.111	9- 9-58	Qal	40	—	—	—	—	318	0	108	425	—	—	—	460	—	1,670	7.3	
						9.20			5.21		2.25	9.16								
15	20.37.4.221	4-22-55	Qal	45	—	—	—	—	269	0	90	51	—	—	—	278	—	758	8.1	
						5.56			4.41		1.87	1.44								
16	20.37.4.221	9- 9-58	Qal	45	—	—	—	—	255	0	87	47	—	—	—	246	—	708	8.0	
						4.92			4.18		1.69	1.33								
17	20.38.19.320	4- 2-54	Qal	115	—	—	—	—	227	0	—	39	—	—	—	—	—	627	—	
									3.72			1.10								
18	20.38.19.320	9- 9-58	Qal	115	—	—	—	—	104	0	23	49	—	—	—	68	—	376	8.1	
						1.36			1.70		.48	1.38								
19	21.33.2.231	9- 4-58	Tr	1,150	—	—	—	—	336	0	95	20	—	—	—	22	—	778	8.0	
						.44			5.51		1.98	.56								
20	21.33.2.422	6-28-54	To	120	—	—	—	—	116	0	17	1,020	—	—	—	—	—	3,370	—	
									1.90		.35	28.77								
21	21.33.2.422	4-22-55	To	120	—	—	—	2.5	115	0	20	1,170	—	13	—	1,770	0.3	3,750	7.5	
						35.40		.11	1.88		.42	33.00		.21						
22	21.33.2.422	9- 4-58	To	120	—	—	—	—	109	0	43	1,640	—	—	—	2,400	—	5,070	7.1	
						48.00			1.79		.90	46.25								
23	21.33.2.442b	4-22-55	To	—	—	—	—	—	345	0	15	12	—	—	—	304	—	600	7.4	
						6.08			5.65		.31	.34								
24	21.33.2.442b	9- 4-58	To	—	—	—	—	—	354	0	18	7.0	—	—	—	306	—	629	7.5	
						6.12			5.80		.37	.20								
25	21.35.27.321a	12- 8-58	To	—	—	—	—	—	301	0	170	44	—	—	—	204	—	995	8.0	
						4.08			4.93		3.54	1.24								
26	21.36.9.222	7-27-54	Tr	447	—	17	7.8	280	434	0	216	65	4.4	0.1	803	74	89	1,290	—	
						.85	.64	12.18	7.11		4.50	1.83	.23	.00						
27	21.36.9.222	9- 8-58	Tr	447	—	—	—	—	425	0	213	64	—	—	—	73	—	1,270	8.1	
						1.46			6.97		4.43	1.80								
28§	21.37.33.110	7-18-42	To	130	73	45	25	96	182	25	108	68	3.5	10	543	216	—	799	—	
						2.25	2.06	4.07	2.98	.83	2.25	1.92	.18	.16						
29	21.37.33.111	9- 9-58	To	110‡	—	—	—	—	240	0	108	61	—	—	—	186	—	785	7.7	
						3.72			3.93		2.25	1.72								
30§	21.37.33.210	8- 1-42	Tr	350	16	50	31	563	360	0	855	208	1.8	.5	1,900	252	—	2,850	—	

APPENDIX C

Active Oil and Gas Well Data

Permanently Plugged Oil and Gas Well Data

CD copy of NMOCD Files for Wells Penetrating the Wolfcamp

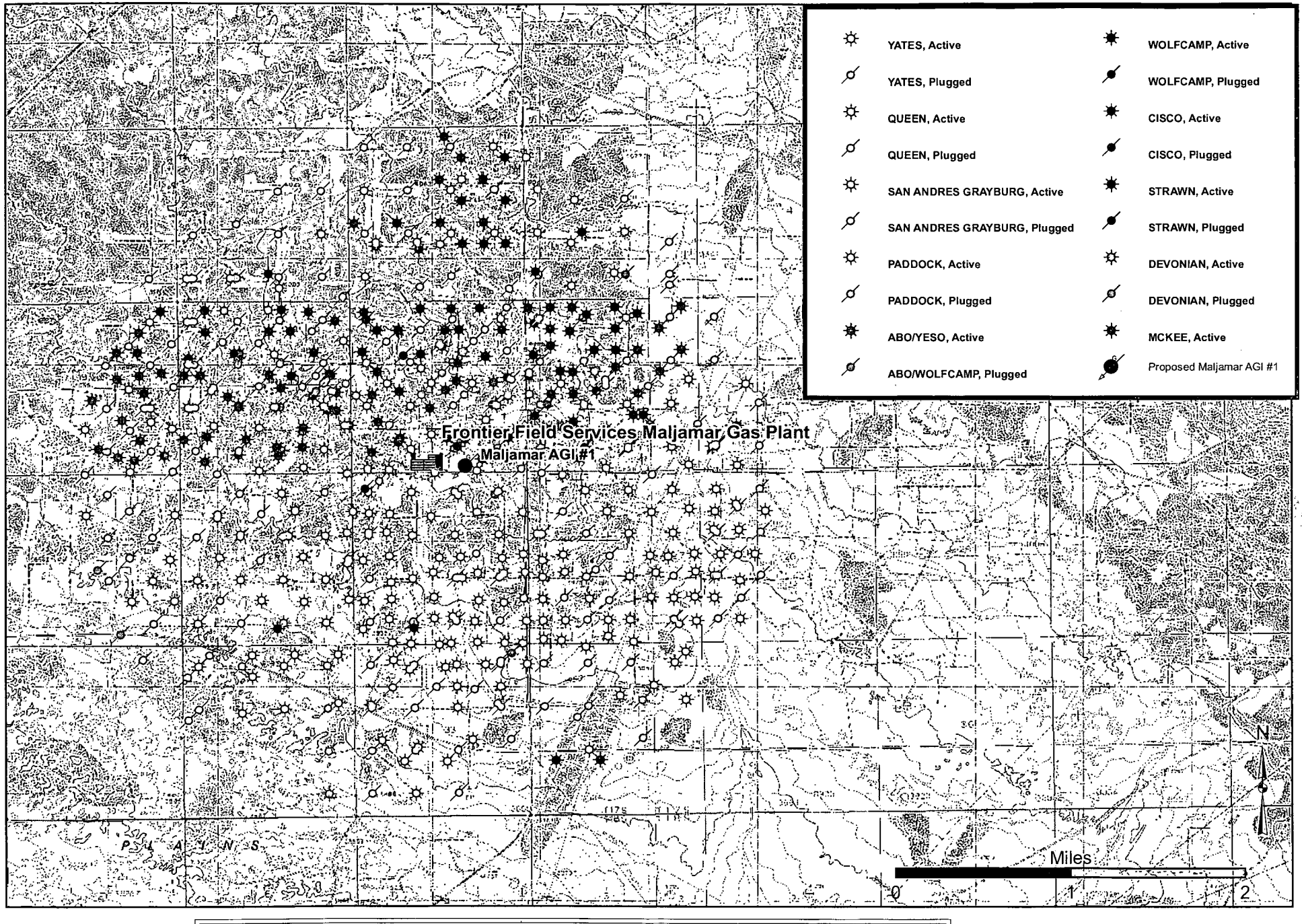


Figure C-1: Wells Within Two Miles of Proposed Maljamar AGI #1 Well

GEOLEX
INCORPORATED

FRONTIER
field services, llc
southern ute indian tribe

Table C-1: Wells Within Two Miles of Frontier Field Services, LLC Proposed AGI Well

API	OPERATOR	PLUG_DATE	RANGE	SDIV_UL	SECTION	SPUD_DATE	TOWNSHIP	TVD_DEPTH	WELL_NAME	WELL_TYPE	COMPL_STATUS	LATITUDE	LONGITUDE	UTMN	UTME	MilesFromTarget
3002512769	CONOCOPHILLIPS COMPANY		32E	B	28		17.0S	4119	MCA UNIT 116	O	Active	32.81262208	-103.7712399	3631182.996	615031.334	0.06
3002500734	CONOCOPHILLIPS COMPANY		32E	C	28		17.0S	4086	MCA UNIT 115	O	Active	32.81102022	-103.7735838	3631002.854	614813.954	0.12
3002500737	CONOCO INC	1/2/1900	32E	B	28	1/2/1900	17.0S	3834	MCA UNIT 117	O	Plugged	32.81100927	-103.7693407	3631006.257	615211.222	0.17
3002530337	CONOCOPHILLIPS COMPANY		32E	B	28		17.0S	4110	MCA UNIT 380	I	Active	32.81071703	-103.7689936	3630974.235	615244.095	0.20
3002500609	CONOCOPHILLIPS COMPANY		32E	N	21		17.0S	4082	MCA UNIT 092	O	Active	32.81464839	-103.7735891	3631405.094	614808.791	0.20
3002523569	CONOCOPHILLIPS COMPANY		32E	F	28		17.0S	4110	MCA UNIT 260	O	Active	32.80895393	-103.7717156	3630775.801	614991.523	0.22
3002520522	CONOCOPHILLIPS COMPANY		32E	N	21		17.0S	4100	MCA UNIT 234	O	Active	32.81290857	-103.7757288	3631209.883	614610.707	0.22
3002500617	CONTINENTAL OIL	1/2/1900	32E	O	21	1/2/1900	17.0S	4080	MCA UNIT 091	O	Plugged	32.81463744	-103.7693487	3631408.494	615205.79	0.23
3002523433	CONOCOPHILLIPS COMPANY		32E	N	21	1/19/1970	17.0S	4250	MCA UNIT 251	O	Active	32.81585251	-103.7715631	3631540.794	614996.913	0.26
3002539108	COG OPERATING LLC		32E	N	21	10/9/2009	17.0S	7197	MC FEDERAL 037	O	Active	32.81522882	-103.7748329	3631468.095	614691.601	0.27
3002500750	KEWANEE OIL CO	1/2/1900	32E	D	28	1/2/1900	17.0S	2494	BAISH B 033	O	Plugged	32.81193563	-103.776823	3631100.83	614509.515	0.28
3002534973	COG OPERATING LLC		32E	N	21	9/24/2000	17.0S	6908	MC FEDERAL 005	O	Active	32.81555822	-103.7746698	3631504.791	614706.447	0.29
3002524196	CONOCOPHILLIPS COMPANY		32E	A	28		17.0S	4200	MCA UNIT 318	O	Active	32.81274888	-103.7671033	3631201.563	615418.445	0.29
3002520496	CONOCOPHILLIPS COMPANY		32E	F	28		17.0S	4182	MCA UNIT 235	O	Active	32.80919794	-103.775722	3630798.503	614616.108	0.29
3002524267	CONOCOPHILLIPS COMPANY		32E	O	21	10/14/1972	17.0S	4200	MCA UNIT 328	O	Active	32.81543176	-103.7682712	3631497.733	615305.639	0.32
3002539168	COG OPERATING LLC		32E	P	21	7/25/2009	17.0S	7120	J C FEDERAL 030	O	Active	32.81372321	-103.7665665	3631310.171	615467.441	0.34
3002500736	CONOCOPHILLIPS COMPANY		32E	F	28		17.0S	4128	MCA UNIT 152	I	Active	32.80739205	-103.7735763	3630600.617	614819.322	0.34
3002539059	COG OPERATING LLC		32E	O	21	5/25/2009	17.0S	7017	J C FEDERAL 025	O	Active	32.81581657	-103.768272	3631540.395	615305.067	0.34
3002523731	CONOCOPHILLIPS COMPANY		32E	A	28	3/18/1971	17.0S	4190	MCA UNIT 274	O	Active	32.80925814	-103.7670979	3630814.56	615423.464	0.35
3002500608	CONOCOPHILLIPS COMPANY		32E	M	21		17.0S	4104	MCA UNIT 093	O	Active	32.81301037	-103.7779039	3631218.813	614406.941	0.35
3002500733	CONOCOPHILLIPS COMPANY		32E	D	28	9/8/1939	17.0S	4071	MCA UNIT 114	O	Active	32.81103136	-103.7779004	3630999.41	614409.805	0.35
3002539163	COG OPERATING LLC		32E	M	21	2/14/2009	17.0S	7015	MC FEDERAL 036	O	Active	32.81439736	-103.7774972	3631373.025	614443.238	0.36
3002500739	CONOCOPHILLIPS COMPANY		32E	G	28		17.0S	3806	MCA UNIT 151	O	Active	32.8073811	-103.7693351	3630604.017	615216.428	0.36
3002500751	CONOCOPHILLIPS COMPANY	9/17/2004	32E	D	28	9/20/1948	17.0S	10005	QUEEN B 036	O	Plugged	32.81132361	-103.7782476	3631031.435	614376.924	0.37
3002539001	COG OPERATING LLC		32E	O	21	7/9/2009	17.0S	7138	MC FEDERAL 033	O	Active	32.81600712	-103.7675529	3631562.305	615372.142	0.37
3002500615	CONOCO INC	9/27/1995	32E	K	21	7/7/1949	17.0S	4085	MCA UNIT 068	I	Plugged	32.81667398	-103.7756625	3631627.416	614612.079	0.38
3002537900	CONOCOPHILLIPS COMPANY		32E	E	28	9/25/2006	17.0S	4488	MCA UNIT 395	O	Active	32.80767334	-103.7760622	3630629.106	614586.213	0.38
3002537931	CONOCOPHILLIPS COMPANY		32E	D	28	10/16/2006	17.0S	4445	MCA UNIT 394	O	Active	32.80928587	-103.7778478	3630805.949	614416.967	0.39
3002521951	PAN AMERICAN PETROLEUM CORP	2/15/1968	32E	A	28	12/20/1966	17.0S	13735	BAISH B FEDERAL 002	O	Plugged	32.81072403	-103.7653507	3630978.988	615585.149	0.40
3002539000	COG OPERATING LLC		32E	K	21	8/4/2009	17.0S	7042	MC FEDERAL 032	O	Active	32.81805174	-103.7716973	3631784.471	614981.516	0.41
3002500738	CONOCOPHILLIPS COMPANY		32E	A	28		17.0S	4145	MCA UNIT 118	O	Active	32.81099803	-103.7650241	3631009.723	615615.371	0.41
3002500611	CONOCOPHILLIPS COMPANY		32E	K	21		17.0S	4136	MCA UNIT 069	O	Active	32.81827655	-103.7735946	3631807.333	614803.609	0.44
3002538703	COG OPERATING LLC		32E	L	21		17.0S	7027	MC FEDERAL 020	O	Active	32.81696558	-103.7768306	3631658.479	614502.351	0.44
3002500616	CONOCO INC	4/3/2001	32E	P	21		17.0S	4124	MCA UNIT 090	I	Plugged	32.8146262	-103.7650314	3631411.961	615609.989	0.44
3002500604	CONOCO INC	1/12/1999	32E	J	21		17.0S	4129	MCA UNIT 070	I	Plugged	32.81826561	-103.7693569	3631810.731	615200.339	0.45
3002537939	CONOCOPHILLIPS COMPANY		32E	E	28	10/28/2006	17.0S	4460	MCA UNIT 397	O	Active	32.80765056	-103.7778935	3630624.597	614414.784	0.46
3002521489	CONOCOPHILLIPS COMPANY		32E	J	28		17.0S	4120	MCA UNIT 177	O	Active	32.80545123	-103.7709345	3630388.316	615069.168	0.46
3002512804	CONOCOPHILLIPS COMPANY		32E	D	28		17.0S	4050	MCA UNIT 113	O	Active	32.8126309	-103.7799801	3631174.497	614213.05	0.47
3002523482	CONOCOPHILLIPS COMPANY		32E	D	28		17.0S	4080	MCA UNIT 252	O	Active	32.80941354	-103.7794013	3630818.423	614271.356	0.47
3002500735	CONOCO INC	1/2/1900	32E	E	28	1/2/1900	17.0S	3815	MCA UNIT 153	O	Plugged	32.80740319	-103.777893	3630597.172	614415.147	0.47
3002539002	COG OPERATING LLC		32E	I	21	9/13/2009	17.0S	7033	MC FEDERAL 034	O	Active	32.81702034	-103.7661161	3631676.208	615505.341	0.48
3002539356	CONOCOPHILLIPS COMPANY		32E	J	28	7/2/2009	17.0S	4170	MCA UNIT 487	O	Active	32.80552826	-103.7688417	3630399.136	615265.016	0.49
3002500619	CONOCOPHILLIPS COMPANY		32E	K	21	3/5/1964	17.0S	3717	BAISH A 005	O	Active	32.81918079	-103.7725166	3631908.755	614903.363	0.49
3002523744	CONOCOPHILLIPS COMPANY		32E	E	28	6/9/1971	17.0S	4150	MCA UNIT 284	O	Active	32.80565248	-103.7758128	3630405.329	614612.158	0.50
3002523740	CONOCO INC	6/28/2000	32E	G	28	4/11/1971	17.0S	4175	MCA UNIT 280	O	Plugged	32.80576783	-103.767256	3630427.426	615413.174	0.51
3002500740	CONOCOPHILLIPS COMPANY		32E	H	28		17.0S	4103	MCA UNIT 150	I	Active	32.80736986	-103.7650185	3630607.483	615620.594	0.52
3002539060	COG OPERATING LLC		32E	P	21	2/24/2009	17.0S	7010	J C FEDERAL 026	O	Active	32.81553039	-103.7639541	3631513.385	615709.673	0.52
3002538387	COG OPERATING LLC		32E	J	21	7/3/2007	17.0S	7015	MC FEDERAL 011	O	Active	32.81958687	-103.7701121	3631956.393	615127.936	0.53
3002538998	COG OPERATING LLC		32E	K	21		17.0S	7025	MC FEDERAL 029	O	Active	32.81946124	-103.7746757	3631937.503	614700.879	0.53
3002500620	CONOCO INC	1/2/1900	32E	J	21	1/2/1900	17.0S	2325	BAISH A 006	O	Plugged	32.81916988	-103.7682796	3631912.16	615300.023	0.53
3002539354	CONOCOPHILLIPS COMPANY		32E	K	28	7/7/2009	17.0S	4142	MCA UNIT 484	O	Active	32.8042434	-103.7715326	3630253.756	615014.724	0.54
3002512796	CONOCO INC	9/4/1997	32E	M	22		17.0S	4128	MCA UNIT 089	O	Plugged	32.81287485	-103.7627052	3631220.34	615830.04	0.54
3002500610	CONOCOPHILLIPS COMPANY		32E	L	21		17.0S	4125	MCA UNIT 067	I	Active	32.81828769	-103.7779119	3631803.887	614399.428	0.55
3002512763	CONOCOPHILLIPS COMPANY		32E	F	21	10/12/1971	17.0S	4124	MCA UNIT 044	O	Active	32.82015913	-103.7715206	3632018.304	614995.343	0.56
3002537879	CONOCOPHILLIPS COMPANY		32E	H	29	9/6/2006	17.0S	4450	MCA UNIT 393	O	Active	32.80765065	-103.780055	3630622.27	614212.409	0.56
3002500622	CONOCO INC	3/7/1986	32E	I	21	11/12/1958	17.0S	13670	BAISH A 008	O	Plugged	32.81825566	-103.7655302	3631813.805	615558.592	0.57
3002523807	CONOCOPHILLIPS COMPANY		32E	I	20	6/27/1971	17.0S	4120	MCA UNIT 287	O	Active	32.8166853	-103.7801499	3631623.814	614191.966	0.57
3002524186	CONOCOPHILLIPS COMPANY		32E	D	27		17.0S	4200	MCA UNIT 317	O	Active	32.80924656	-103.7626178	3630818.176	615842.93	0.58
3002500742	CONOCOPHILLIPS COMPANY		32E	K	28		17.0S	4100	MCA UNIT 176	O	Active	32.80375398	-103.7735689	3630197.283	614824.693	0.58
3002539292	COG OPERATING LLC		32E	L	21	5/19/2010	17.0S	7035	MC FEDERAL 038	O	Active	32.81919343	-103.7774063	3631904.851	614445.598	0.58
3002500612	CONOCOPHILLIPS COMPANY		32E	I	21	3/4/1942	17.0S	4131	MCA UNIT 071	O	Active	32.81825437	-103.7650396	3631814.199	615604.522	0.59
3002538833	COG OPERATING LLC		32E	G	21	8/4/2009	17.0S	7035	MC FEDERAL 026	O	Active	32.82030478	-103.7690344	3632037.16	615227.897	0.59
3002524258	CONOCOPHILLIPS COMPANY		32E	P	21	10/6/1972	17.0S	4250	MCA UNIT 326	O	Active	32.81622887	-103.7630399	3631591.825	615794.353	0.59
3002500743	CONOCO INC	10/2/1987	32E	J	28	5/17/1941	17.0S	3295	MCA UNIT 178	I	Plugged	32.80374293	-103.7693294	3630200.669	615221.656	0.59
3002500752	CONOCO INC	8/14/1996	32E	A	29		17.0S	4078	MCA UNIT 112	O	Plugged	32.8110376	-103.782217	3630995.438	614005.663	0.60
3002537976	CONOCOPHILLIPS COMPANY		32E	L	28	11/9/2006	17.0S	4450	MCA UNIT 396	O	Active	32.80531428	-103.7784969	3630364.928	614361.281	0.60
3002508031	CONOCOPHILLIPS COMPANY		32E	E	21		17.0S	4102	MCA UNIT 046	O	Active	32.82016892	-103.7758378	3632014.701	614591.181	0.60
3002524226	CONOCOPHILLIPS COMPANY		32E	J	28		17.0S	4220	MCA UNIT 301	I	Active	32.80374124	-103.7686754	3630201.195	615282.893	0.61
3002529854	CONOCOPHILLIPS COMPANY		32E	G	21	3/16/1987	17.0S	4300	MCA UNIT 368	O	Active	32.82013641	-103.7674772	3632020.192	615373.89	0.61

3002539353	CONOCOPHILLIPS COMPANY		32E	I	28	5/28/2009	17.0S	4208	MCA UNIT 483	O	Active	32.80414954	-103.767139	3630248.138	615426.22	0.62
3002500613	CONOCO INC	1/2/1900	32E	G	21	1/2/1900	17.0S	2510	BAISH A 004	O	Plugged	32.82099506	-103.7704424	3632112.156	615095.199	0.62
3002508063	CONOCOPHILLIPS COMPANY		32E	P	20		17.0S	4098	MCA UNIT 094	I	Active	32.81466574	-103.7822237	3631397.672	614000.402	0.62
3002539355	CONOCOPHILLIPS COMPANY		32E	I	28	6/27/2009	17.0S	4206	MCA UNIT 486	O	Active	32.80538	-103.7646884	3630387.234	615654.078	0.63
3002539403	CONOCOPHILLIPS COMPANY		32E	K	28	7/26/2009	17.0S	4124	MCA UNIT 485	O	Active	32.80342971	-103.7756938	3630159.026	614626.153	0.63
3002534933	COG OPERATING LLC		32E	L	21	2/17/2000	17.0S	5982	MC FEDERAL 004	O	Active	32.8191975	-103.7789926	3631903.586	614297.092	0.64
3002534773	COG OPERATING LLC		32E	F	21	1/26/2000	17.0S	5952	MC FEDERAL 003	O	Active	32.82141201	-103.7725201	3632156.121	614900.162	0.64
3002539169	COG OPERATING LLC		32E	M	22	7/8/2009	17.0S	7121	J C FEDERAL 031	O	Active	32.81415038	-103.7612036	3631363.401	615968.965	0.64
3002512794	CONOCO INC	9/19/2001	32E	L	28		17.0S	4055	MCA UNIT 174	O	Plugged	32.80544727	-103.7799655	3630378.084	614223.607	0.65
3002500726	CONOCO INC	8/6/1996	32E	D	27	5/19/1940	17.0S	4150	MCA UNIT 119	I	Plugged	32.81247564	-103.7607098	3631178.269	616017.371	0.66
3002539263	COG OPERATING LLC		32E	I	20	4/7/2009	17.0S	7010	GC FEDERAL 025	O	Active	32.81794991	-103.7809694	3631763.133	614113.63	0.66
3002500741	CONOCOPHILLIPS COMPANY	2/28/2005	32E	I	28	8/28/1940	17.0S	4125	MCA UNIT 175	I	Plugged	32.80376523	-103.7778855	3630193.85	614420.511	0.67
3002538997	COG OPERATING LLC		32E	I	21	5/12/2009	17.0S	7013	MC FEDERAL 028	O	Active	32.81902113	-103.763962	3631900.387	615704.408	0.67
3002538038	CONOCOPHILLIPS COMPANY		32E	L	28	10/8/2006	17.0S	4550	MCA UNIT 407	O	Active	32.80511482	-103.7800138	3630341.174	614219.51	0.67
3002500753	CONOCOPHILLIPS COMPANY		32E	H	29		17.0S	3810	MCA UNIT 154	I	Active	32.80740945	-103.7822096	3630593.203	614010.989	0.68
3002500621	CONTINENTAL OIL	1/2/1900	32E		21	1/2/1900	17.0S	2390	BAISH A 007	O	Plugged	32.81915856	-103.7639623	3631915.623	615704.202	0.68
3002500618	CONOCOPHILLIPS COMPANY		32E	H	21	11/21/1966	17.0S	2386	BAISH A 003	O	Active	32.82100948	-103.7768367	3632106.809	614496.591	0.68
3002535252	COG OPERATING LLC		32E	H	21	11/17/2000	17.0S	15026	MC FEDERAL 006	G	Active	32.82018666	-103.765371	3632028.065	615570.995	0.68
3002500628	CONOCOPHILLIPS COMPANY		32E	M	22		17.0S	4145	MCA UNIT 088	O	Active	32.8146168	-103.7607141	3631415.649	616014.186	0.68
3002500605	CONOCOPHILLIPS COMPANY	11/28/2006	32E		21	8/30/1945	17.0S	4181	MCA UNIT 045	I	Plugged	32.8219092	-103.7736002	3632210.069	614798.412	0.68
3002523790	CONOCOPHILLIPS COMPANY		32E	K	28		17.0S	4180	MCA UNIT 296	O	Active	32.80215435	-103.771489	3630022.197	615021.497	0.68
3002538717	COG OPERATING LLC		32E	E	21	7/18/2008	17.0S	7027	MC FEDERAL 024	O	Active	32.82114691	-103.7768369	3632122.045	614496.396	0.69
3002500603	CONOCOPHILLIPS COMPANY		32E	G	21	9/18/1964	17.0S	4119	MCA UNIT 043	O	Active	32.8218997	-103.7693652	3632213.624	615194.871	0.69
3002500745	CONOCOPHILLIPS COMPANY		32E	I	28	8/8/1961	17.0S	9680	MCA UNIT 382	O	Active	32.80411529	-103.7645523	3630247.168	615668.459	0.70
3002512792	CONOCOPHILLIPS COMPANY		32E	E	27		17.0S	4180	MCA UNIT 149	O	Active	32.80565963	-103.7626123	3630420.509	615848.099	0.70
3002500744	CONOCO INC	1/2/1900	32E		28	1/2/1900	17.0S	3925	MCA UNIT 179	O	Plugged	32.80373169	-103.7650128	3630204.135	615625.839	0.70
3002530491	CONOCOPHILLIPS COMPANY		32E	E	27		17.0S	4200	MCA UNIT 384	O	Active	32.80740805	-103.7611892	3630615.912	615979.072	0.71
3002523706	CONOCOPHILLIPS COMPANY		32E	P	20		17.0S	4130	MCA UNIT 269	O	Active	32.8131959	-103.7842984	3631232.48	613808.044	0.72
3002538830	COG OPERATING LLC		32E	L	22	9/18/2008	17.0S	7007	J C FEDERAL 018	O	Active	32.81733892	-103.761309	3631716.791	615954.955	0.72
3002523705	CONOCOPHILLIPS COMPANY		32E	K	28		17.0S	4155	MCA UNIT 268	O	Active	32.80201404	-103.7756418	3630002.131	614632.839	0.73
3002523660	CONOCO INC	9/14/1995	32E	E	21	12/30/1970	17.0S	4145	MCA UNIT 262	I	Plugged	32.82017825	-103.7799916	3632011.239	614202.316	0.73
3002500614	CONOCO INC	3/3/1993	32E		21	11/1/1953	17.0S	12778	MCA UNIT 355	I	Plugged	32.82246041	-103.7742551	3632270.47	614736.397	0.73
3002508062	CONOCOPHILLIPS COMPANY		32E	I	20		17.0S	4072	MCA UNIT 066	O	Active	32.81829388	-103.7822292	3631799.908	613995.253	0.73
3002500722	CONTINENTAL OIL	1/2/1900	32E	E	27	1/2/1900	17.0S	Not Reported	MCA UNIT 148	O	Plugged	32.80736049	-103.7607019	3630611.174	616024.758	0.73
3002539265	COG OPERATING LLC		32E	O	20	4/14/2009	17.0S	7114	GC FEDERAL 029	O	Active	32.81490005	-103.7844154	3631421.288	613794.917	0.75
3002538996	COG OPERATING LLC		32E	H	21	11/3/2009	17.0S	7012	MC FEDERAL 027	O	Active	32.8205683	-103.7639655	3632071.914	615702.074	0.75
3002512797	CONOCO INC	8/30/1995	32E	H	21		17.0S	4106	MCA UNIT 041	O	Plugged	32.82037506	-103.7635889	3632050.902	615737.58	0.75
3002527065	CONOCO INC	8/26/1988	32E	P	20	1/14/1981	17.0S	4150	MCA UNIT 362	O	Plugged	32.81956349	-103.7814854	3631941.469	614063.262	0.76
3002524352	CONOCOPHILLIPS COMPANY		32E	P	28		17.0S	4175	MCA UNIT 333	O	Active	32.80185432	-103.7670863	3629993.731	615434.122	0.76
3002500606	CONOCOPHILLIPS COMPANY		32E	E	21		17.0S	4097	MCA UNIT 047	O	Active	32.82191895	-103.7779174	3632206.469	614394.258	0.76
3002535988	COG OPERATING LLC		32E	L	22	9/16/2003	17.0S	5946	J C FEDERAL 003	O	Active	32.81915384	-103.7618036	3631917.465	615906.295	0.77
3002520216	CONTINENTAL OIL	1/2/1900	32E	G	21	1/2/1900	17.0S	2398	BAISH A 009	O	Plugged	32.82280434	-103.7682879	3632315.094	615294.55	0.77
3002538776	COG OPERATING LLC		32E	G	21	4/28/2008	17.0S	7039	MC FEDERAL 017	O	Active	32.82322143	-103.7704475	3632358.982	615091.85	0.77
3002529956	CONOCOPHILLIPS COMPANY		32E	P	20		17.0S	4300	MCA UNIT 372	O	Active	32.81621936	-103.784352	3631567.625	613799.171	0.77
3002539262	COG OPERATING LLC		32E	I	20	5/14/2009	17.0S	7045	GC FEDERAL 024	O	Active	32.81650794	-103.784287	3631599.689	613804.888	0.78
3002523938	CONOCOPHILLIPS COMPANY		32E	D	27		17.0S	4200	MCA UNIT 299	O	Active	32.81231817	-103.758633	3631163.092	616212.01	0.78
3002538978	CONOCOPHILLIPS COMPANY		32E	L	27	11/23/2008	17.0S	4320	MCA UNIT 409	O	Active	32.80413758	-103.76243	3630251.963	615867.143	0.78
3002500630	CONOCO INC	4/15/2000	32E	L	22		17.0S	4102	MCA UNIT 072	I	Plugged	32.81824495	-103.7607223	3631817.885	616008.702	0.78
3002530347	CONOCOPHILLIPS COMPANY	3/7/2007	32E	G	21	5/20/1988	17.0S	4220	MCA UNIT 379	O	Plugged	32.82340056	-103.7706605	3632378.61	615071.68	0.78
3002538551	COG OPERATING LLC		32E	H	21	11/17/2007	17.0S	7125	MC FEDERAL 013	O	Active	32.822357	-103.7661283	3632267.857	615497.292	0.79
3002529102	CONOCOPHILLIPS COMPANY		32E	B	29		17.0S	4440	MCA UNIT 365Y	O	Active	32.80955428	-103.7852225	3630827.749	613726.168	0.79
3002528988	CONOCO INC	12/26/1984	32E	B	29	10/15/1984	17.0S	1009	MCA UNIT 365	O	Plugged	32.80949931	-103.7852224	3630821.655	613726.247	0.79
3002539402	CONOCOPHILLIPS COMPANY		32E	M	28	7/21/2009	17.0S	4153	MCA UNIT 481	O	Active	32.80192493	-103.7783722	3629989.295	614377.298	0.79
3002523920	CONOCO INC	7/3/1997	32E	D	27		17.0S	4200	MCA UNIT 292	O	Plugged	32.80923973	-103.7586282	3630821.798	616216.467	0.80
3002539351	CONOCOPHILLIPS COMPANY		32E	O	28	6/9/2009	17.0S	4200	MCA UNIT 478	O	Active	32.80039514	-103.7714497	3629827.201	615027.442	0.81
3002523487	CONOCOPHILLIPS COMPANY		32E	O	28		17.0S	4100	MCA UNIT 254	O	Active	32.8005279	-103.7696513	3629843.877	615195.664	0.81
3002538973	CONOCOPHILLIPS COMPANY		32E	L	27	11/30/2008	17.0S	4285	MCA UNIT 400	O	Active	32.80516534	-103.7606985	3630367.807	616027.929	0.81
3002500634	CONOCO INC	1/2/1900	32E	E	22	1/2/1900	17.0S	13573	BAISH B 005	O	Plugged	32.81824384	-103.7600681	3631818.48	616069.947	0.81
3002527066	CONOCO INC	1/27/1988	32E	H	20	5/22/1981	17.0S	4250	MCA UNIT 363	O	Plugged	32.82041518	-103.7820002	3632035.338	614013.981	0.82
3002526606	CONOCO INC	8/31/1988	32E	H	20	1/16/1980	17.0S	4150	MCA UNIT 358	I	Plugged	32.82022007	-103.7822321	3632013.457	613992.521	0.82
3002527076	CONOCO INC	8/29/1988	32E	H	20	10/25/1980	17.0S	4150	MCA UNIT 359	O	Plugged	32.82086586	-103.7814645	3632085.882	614063.553	0.82
3002527067	CONOCO INC	11/22/1988	32E	H	20	6/16/1981	17.0S	4325	MCA UNIT 364	O	Plugged	32.82051137	-103.7819185	3632046.091	614021.506	0.82
3002527064	CONOCO INC	1/2/1900	32E	I	20	1/2/1900	17.0S	8933	MCA UNIT 361	O	Plugged	32.8195832	-103.7829866	3631942.035	613922.703	0.82
3002500762	CONOCOPHILLIPS COMPANY		32E	I	29		17.0S	4250	MCA UNIT 173	O	Active	32.80377379	-103.7822021	3630190.136	614016.333	0.82
3002538739	COG OPERATING LLC		32E	E	21		17.0S	7000	MC FEDERAL 016	O	Active	32.82282694	-103.7783441	3632306.674	614353.15	0.83
3002500748	CONOCO INC	4/9/2001	32E	N	28		17.0S	4025	MCA UNIT 209	I	Plugged	32.80012581	-103.7735614	3629795.046	614830.061	0.83
3002524183	CONOCOPHILLIPS COMPANY		32E	M	22		17.0S	4200	MCA UNIT 316	O	Active	32.81635861	-103.7586412	3631611.037	616205.982	0.83
3002529959	CONOCOPHILLIPS COMPANY	3/6/2007	32E	E	21	9/17/1987	17.0S	4350	MCA UNIT 373	O	Plugged	32.82370099	-103.7758924	3632406.233	614581.534	0.83
3002538714	COG OPERATING LLC		32E	H	20	3/16/2008	17.0S	7027	BC FEDERAL 033	O	Active	32.82101706	-103.7816446	3632102.451	614046.501	0.83
3002524235	CONOCOPHILLIPS COMPANY		32E	L	28		17.0S	4170	MCA UNIT 324	O	Active	32.80202524	-103.7799584	3629998.702	614228.649	0.83
3002539352	CONOCOPHILLIPS COMPANY		32E	N	28	7/14/2009	17.0S	4150	MCA UNIT 479	O	Active	32.80036826	-103.7758837	3629819.406	614612.301	0.84

3002500747	CONTINENTAL OIL	1/2/1900	32E	O	28	1/2/1900	17.0S	4000	MCA UNIT 208	O	Plugged	32.80011476	-103.7693236	3629798.431	615226.881	0.84
3002538988	CONOCOPHILLIPS COMPANY		32E	P	28	11/16/2008	17.0S	4322	MCA UNIT 421	O	Active	32.8016141	-103.764568	3629969.85	615670.229	0.84
3002524461	CONOCOPHILLIPS COMPANY	1/3/2003	32E	G	21	7/7/1973	17.0S	4175	MCA UNIT 340	O	Plugged	32.82364045	-103.7672923	3632408.879	615386.668	0.84
3002524213	CONOCOPHILLIPS COMPANY		32E	G	29		17.0S	4125	MCA UNIT 319	O	Active	32.80566479	-103.784446	3630397.369	613803.825	0.85
3002500767	CONOCOPHILLIPS COMPANY		32E	B	29		17.0S	4020	MCA UNIT 111	I	Active	32.8110389	-103.7865335	3630990.935	613601.536	0.85
3002500635	CONOCO INC	8/8/1996	32E	E	22	3/30/1956	17.0S	2351	MCA UNIT 040	O	Plugged	32.82097645	-103.7618078	3632119.529	615903.534	0.85
3002527068	COG OPERATING LLC		32E	N	28	10/14/1980	17.0S	12992	FEDERAL BI 001	S	Active	32.79963105	-103.7735603	3629740.194	614830.8	0.86
3002508065	CONOCOPHILLIPS COMPANY		32E	O	20		17.0S	4055	MCA UNIT 095	O	Active	32.81466704	-103.786541	3631393.169	613596.217	0.86
3002500601	CONOCO INC	9/12/1995	32E	C	21	3/30/1930	17.0S	4169	MCA UNIT 027	O	Plugged	32.82462787	-103.7725251	3632512.65	614895.554	0.87
3002538979	CONOCOPHILLIPS COMPANY		32E	O	28	12/10/2008	17.0S	4304	MCA UNIT 410	O	Active	32.80010993	-103.7674596	3629799.928	615401.422	0.87
3002524076	CONOCOPHILLIPS COMPANY		32E	G	29		17.0S	4100	MCA UNIT 308	O	Active	32.80741056	-103.7858721	3630589.383	613668.078	0.87
3002520149	CONTINENTAL OIL	1/2/1900	32E	B	21	1/2/1900	17.0S	2436	BAISH A 011	I	Plugged	32.82462322	-103.7704507	3632514.392	615089.742	0.87
3002500602	CONOCO INC	9/6/1995	32E	H	21	9/24/1934	17.0S	4093	MCA UNIT 042	I	Plugged	32.82279468	-103.7639706	3632318.742	615698.71	0.87
3002500728	CONOCOPHILLIPS COMPANY		32E	L	27		17.0S	4170	MCA UNIT 180	I	Active	32.80372233	-103.7606962	3630207.826	616030.02	0.87
3002539270	COG OPERATING LLC		32E	O	20	9/22/2009	17.0S	7136	GC FEDERAL 032	O	Active	32.81418612	-103.7868183	3631339.552	613570.868	0.87
3002538509	COG OPERATING LLC		32E	C	21	10/17/2007	17.0S	7012	MC FEDERAL 012	O	Active	32.82463277	-103.7746837	3632510.848	614693.483	0.88
3002539170	COG OPERATING LLC		32E	N	22	2/7/2009	17.0S	7315	J C FEDERAL 032	O	Active	32.81370335	-103.7569834	3631318.478	616364.644	0.88
3002527063	CONOCO INC	8/30/1988	32E	H	20	11/27/1980	17.0S	4150	MCA UNIT 360	O	Plugged	32.82084963	-103.7830147	3632082.411	613918.455	0.88
3002524233	CONOCOPHILLIPS COMPANY		32E	L	27		17.0S	4175	MCA UNIT 321	O	Active	32.80198023	-103.7626064	3630012.59	615853.425	0.88
3002538715	COG OPERATING LLC		32E	B	21	5/29/2009	17.0S	6920	MC FEDERAL 022	O	Active	32.82461937	-103.7687173	3632515.854	615252.009	0.88
3002500749	CONOCO INC	1/2/1900	32E	M	28	1/2/1900	17.0S	3980	MCA UNIT 210	O	Plugged	32.80013705	-103.777878	3629791.613	614425.862	0.89
3002524127	CONOCOPHILLIPS COMPANY		32E	E	27		17.0S	4250	MCA UNIT 314	O	Active	32.80561157	-103.7586226	3630419.559	616221.714	0.90
3002523509	CONOCO INC	9/29/2000	32E	L	20	5/11/1970	17.0S	4145	MCA UNIT 256	I	Plugged	32.81997118	-103.7843576	3631983.572	613793.863	0.90
3002508054	CONOCOPHILLIPS COMPANY	4/10/2006	32E	H	20	5/11/1937	17.0S	4069	MCA UNIT 048	I	Plugged	32.8219242	-103.7822347	3632202.386	613990.101	0.90
3002500768	CONOCO INC	5/30/1989	32E	G	29	5/30/1989	17.0S	3566	MCA UNIT BATTERY 2 155	O	Plugged	32.80741075	-103.7865261	3630588.701	613606.846	0.90
3002539164	COG OPERATING LLC		32E	K	22	7/23/2009	17.0S	7119	J C FEDERAL 023	O	Active	32.81678263	-103.757481	3631659.323	616314.045	0.90
3002538815	COG OPERATING LLC		32E	D	21	6/26/2009	17.0S	7020	MC FEDERAL 021	O	Active	32.82463764	-103.7768424	3632509.047	614491.402	0.91
3002500720	CONOCOPHILLIPS COMPANY		32E	C	27		17.0S	4119	MCA UNIT 120	O	Active	32.81098121	-103.7563909	3631017.333	616423.665	0.91
3002500746	CONOCOPHILLIPS COMPANY	10/6/2004	32E	P	28		17.0S	4125	MCA UNIT 207	I	Plugged	32.80010352	-103.765007	3629801.896	615631.08	0.92
3002508053	CONOCO INC	9/5/1996	32E	J	20	3/13/1959	17.0S	13965	MCA UNIT 303	I	Plugged	32.81829503	-103.7860559	3631795.915	613637.013	0.92
3002500626	CONOCO INC	4/20/2001	32E	N	22		17.0S	4124	MCA UNIT 087	I	Plugged	32.81460936	-103.7563968	3631419.571	616418.38	0.92
3002520304	CONTINENTAL OIL	1/2/1900	32E	A	21	1/2/1900	17.0S	2410	BAISH A 010	I	Plugged	32.8246136	-103.7661334	3632518.035	615493.894	0.93
3002523715	CONOCOPHILLIPS COMPANY		32E	A	20	2/23/1971	17.0S	4163	MCA UNIT 271	O	Active	32.82380662	-103.7801608	3632413.324	614181.834	0.94
3002512707	CONOCOPHILLIPS COMPANY	4/5/2006	32E	B	21	3/15/1965	17.0S	4117	MCA UNIT 028	I	Plugged	32.82552786	-103.7693735	3632615.861	615189.41	0.94
3002500623	CONOCO INC	1/2/1900	32E	E	22	1/2/1900	17.0S	4110	BAISH A 002	O	Plugged	32.82188174	-103.7607306	3632221.078	616003.198	0.94
3002525849	CONOCOPHILLIPS COMPANY		32E	M	28		17.0S	4170	MCA UNIT 357	O	Active	32.79956163	-103.7785635	3629727.076	614362.413	0.94
3002520647	COG OPERATING LLC		32E	E	22	10/25/1964	17.0S	9958	MC FEDERAL 007	O	Active	32.82243252	-103.761386	3632281.423	615941.128	0.94
3002508064	CONOCO INC	12/15/1998	32E	L	20		17.0S	4045	MCA UNIT 065	I	Plugged	32.81829518	-103.7865464	3631795.404	613591.094	0.95
3002524376	CONOCOPHILLIPS COMPANY		32E	L	22		17.0S	4150	MCA UNIT 338	O	Active	32.81998676	-103.7586493	3632013.272	616200.5	0.95
3002538856	CONOCOPHILLIPS COMPANY		32E	C	33	9/22/2008	17.0S	4345	MCA UNIT 411	O	Active	32.79828495	-103.7738332	3629590.66	614806.977	0.96
3002538972	CONOCOPHILLIPS COMPANY		32E	K	27	12/5/2008	17.0S	4348	MCA UNIT 399	O	Active	32.80413087	-103.7585058	3630255.526	616234.578	0.96
3002539166	COG OPERATING LLC		32E	N	22	8/31/2009	17.0S	7123	J C FEDERAL 028	O	Active	32.81551578	-103.7560391	3631520.458	616450.686	0.96
3002538980	CONOCOPHILLIPS COMPANY		32E	B	33	10/4/2008	17.0S	4360	MCA UNIT 412	O	Active	32.79827463	-103.7698755	3629593.819	615177.577	0.96
3002512785	CONOCOPHILLIPS COMPANY		32E	B	33		17.0S	4000	MCA UNIT 222	O	Active	32.79816765	-103.7710197	3629580.713	615070.575	0.96
3002538986	CONOCOPHILLIPS COMPANY		32E	M	27	12/15/2008	17.0S	4380	MCA UNIT 418	O	Active	32.80188076	-103.7606933	3630003.659	616032.684	0.96
3002500719	CONOCOPHILLIPS COMPANY	9/17/2004	32E	F	27	12/17/1939	17.0S	4150	QUEEN B 006	O	Plugged	32.80735305	-103.7563853	3630615.094	616428.92	0.96
3002523559	CONOCOPHILLIPS COMPANY		32E	N	28		17.0S	4135	MCA UNIT 261	O	Active	32.79838587	-103.7756343	3629599.895	614638.198	0.97
3002538716	COG OPERATING LLC		32E	A	21	9/6/2008	17.0S	6999	MC FEDERAL 023	O	Active	32.82460986	-103.7644654	3632519.445	615650.039	0.97
3002539480	COG OPERATING LLC		32E	K	22	11/5/2009	17.0S	7027	J C FEDERAL 049	O	Active	32.81914643	-103.7574863	3631921.386	616310.469	0.97
3002512755	CONOCOPHILLIPS COMPANY		32E	N	20		17.0S	4048	MCA UNIT 096	O	Active	32.81292233	-103.7887591	3631197.356	613390.776	0.98
3002524349	CONOCOPHILLIPS COMPANY		32E	O	28		17.0S	4225	MCA UNIT 332	O	Active	32.79836401	-103.7672443	3629606.597	615423.838	0.98
3002534932	COG OPERATING LLC		32E	H	20	2/21/2000	17.0S	7028	BC FEDERAL 003	O	Active	32.82283139	-103.7831519	3632301.975	613903.082	0.98
3002508362	BUFFALO OIL CO	1/2/1900	32E	J	20	1/2/1900	17.0S	5359	MITCHELL B 023	O	Plugged	32.81829538	-103.7872431	3631794.678	613525.872	0.98
3002523733	CONOCOPHILLIPS COMPANY	9/30/2004	32E	B	29	3/27/1971	17.0S	4083	MCA UNIT 277	O	Plugged	32.80929414	-103.7886066	3630795.273	613409.663	0.99
3002534647	COG OPERATING LLC		32E	E	22	6/16/1999	17.0S	14912	MC FEDERAL COM 001	G	Active	32.82106769	-103.7587401	3632133.013	616190.593	0.99
3002500607	CONOCOPHILLIPS COMPANY	11/30/2006	32E	D	21	9/19/1938	17.0S	4175	MCA UNIT 026	I	Plugged	32.8255471	-103.7779231	3632608.707	614389.073	0.99
3002520568	CONOCOPHILLIPS COMPANY		32E	A	21	11/22/1963	17.0S	13717	BAISH A 012	O	Active	32.8255471	-103.7779231	3632608.707	614389.073	0.99
3002538832	COG OPERATING LLC		32E	C	21	9/10/2009	17.0S	7027	MC FEDERAL 025	O	Active	32.82644195	-103.7725279	3632713.77	614892.955	0.99
3002538829	COG OPERATING LLC		32E	G	20	11/18/2008	17.0S	6900	BC FEDERAL 032	O	Active	32.82088024	-103.7854711	3632083.159	613688.466	0.99
3002538987	CONOCOPHILLIPS COMPANY		32E	M	27	12/23/2008	17.0S	4375	MCA UNIT 419	O	Active	32.80009705	-103.7623746	3629804.061	615877.573	1.00
3002538738	COG OPERATING LLC		32E	B	21	9/3/2008	17.0S	7015	MC FEDERAL 014	O	Active	32.82643512	-103.7694737	3632716.337	615178.859	1.00
3002500631	CONOCOPHILLIPS COMPANY		32E	K	22		17.0S	4112	MCA UNIT 073	O	Active	32.81823752	-103.756405	3631821.808	616412.88	1.00
3002500766	CONOCOPHILLIPS COMPANY		32E	O	29		17.0S	4000	MCA UNIT 172	O	Active	32.80189409	-103.7844383	3629979.331	613809.351	1.01
3002500763	CONOCOPHILLIPS COMPANY		32E	P	29		17.0S	4013	MCA UNIT 211	I	Active	32.80014563	-103.7821946	3629787.901	614021.668	1.01
3002523687	CONOCOPHILLIPS COMPANY		32E	K	20		17.0S	4110	MCA UNIT 266	O	Active	32.81655044	-103.7886827	3631599.676	613393.32	1.02
3002500764	CONOCOPHILLIPS COMPANY		32E	J	29		17.0S	3950	MCA UNIT 171	I	Active	32.80377971	-103.7865187	3630186.146	613612.159	1.02
3002522661	CONOCOPHILLIPS COMPANY		32E	A	21	7/20/1968	17.0S	4100	MCA UNIT 245	O	Active	32.82551705	-103.7645329	3632619.949	615642.544	1.02
3002512795	CONOCOPHILLIPS COMPANY		32E	N	22		17.0S	4100	MCA UNIT 086	O	Active	32.81286042	-103.7543257	3631227.953	616614.561	1.03
3002538835	COG OPERATING LLC		32E	D	21	2/14/2010	17.0S	7055	MC FEDERAL 015	O	Active	32.82617972	-103.7781203	3632678.63	614369.803	1.03
3002538728	COG OPERATING LLC		32E	A	21	4/16/2008	17.0S	6965	MC FEDERAL 018	O	Active	32.82642878	-103.7666282	3632718.74	615445.227	1.04
3002538831	COG OPERATING LLC		32E	F	22	3/5/2010	17.0S	7046	J C FEDERAL 017	O	Active	32.82096944	-103.7574905	3632123.495	616307.699	1.04

3002524128	CONOCO INC	12/9/1998	32E		27		17.0S		MCA UNIT 315	O	Plugged	32.80197341	-103.7586169	3630016.212	616226.983		1.04
3002538989	CONOCOPHILLIPS COMPANY		32E	A	33	11/10/2008	17.0S		4385 MCA UNIT 420	O	Active	32.79826079	-103.7645624	3629598.084	615675.097		1.05
3002523846	CONOCOPHILLIPS COMPANY		32E	C	27	8/4/1971	17.0S		4185 MCA UNIT 282	O	Active	32.80923224	-103.7543116	3630825.721	616620.621		1.05
3002538262	COG OPERATING LLC		32E	E	22	3/1/2007	17.0S		7011 MC FEDERAL 010	O	Active	32.82319932	-103.7596543	3632368.337	616102.238		1.05
3002500730	CONOCOPHILLIPS COMPANY		32E	O	27		17.0S		4205 MCA UNIT 183	O	Active	32.80923213	-103.7542431	3630825.784	616627.034		1.05
3002500729	CONOCOPHILLIPS COMPANY		32E	M	27		17.0S		4155 MCA UNIT 206	O	Active	32.80009417	-103.7606904	3629805.588	616035.277		1.06
3002538746	COG OPERATING LLC		32E	A	20	6/13/2009	17.0S		7033 BC FEDERAL 028	O	Active	32.82546966	-103.7809974	3632596.797	614101.393		1.06
3002539322	CONOCOPHILLIPS COMPANY		32E	C	33	6/15/2009	17.0S		4338 MCA UNIT 491	O	Active	32.79691514	-103.7755506	3629436.93	614647.924		1.06
3002524274	CONOCOPHILLIPS COMPANY		32E	O	22	11/14/1972	17.0S		4200 MCA UNIT 327	O	Active	32.8161586	-103.7542558	3631593.692	616616.796		1.07
3002512756	CONOCO INC	1/2/1900	32E	F	29	1/2/1900	17.0S		3992 MCA UNIT 156	O	Plugged	32.80543189	-103.7887341	3630366.94	613402.631		1.08
3002500724	CONOCOPHILLIPS COMPANY		32E	K	27		17.0S		4094 MCA UNIT 181	O	Active	32.80371484	-103.7563796	3630211.741	616434.198		1.08
3002539264	COG OPERATING LLC		32E	N	20	3/2/2009	17.0S		7103 GC FEDERAL 027	O	Active	32.81557512	-103.7900385	3631490.092	613267.631		1.08
3002500799	CONOCO INC	1/2/1900	32E	C	33	1/2/1900	17.0S	Not Reported	MCA UNIT 221	O	Plugged	32.79649763	-103.7735554	3629392.807	614835.287		1.08
3002508056	CONOCO INC	8/17/1996	32E	G	20	4/24/1939	17.0S		4038 MCA UNIT 049	O	Plugged	32.82192484	-103.786552	3632197.809	613585.95		1.08
3002500800	CONOCOPHILLIPS COMPANY		32E	B	33		17.0S		4135 MCA UNIT 223	I	Active	32.79648658	-103.7693166	3629396.192	615232.217		1.09
3002520231	CONOCO INC	7/25/1996	32E	A	20	5/19/1970	17.0S		5445 MCA UNIT 258	O	Plugged	32.82464548	-103.7833183	3632502.919	613885.19		1.09
3002539321	CONOCOPHILLIPS COMPANY		32E	B	33	6/21/2009	17.0S		4300 MCA UNIT 490	O	Active	32.79628341	-103.7704606	3629372.421	615125.356		1.09
3002512748	CONOCO INC	1/2/1900	32E	A	21	1/2/1900	17.0S		4140 MCA UNIT 029	O	Plugged	32.82642284	-103.7639789	3632720.978	615693.229		1.09
3002530363	CONOCOPHILLIPS COMPANY		32E	D	22	1/14/1989	17.0S		10000 BAISH A 014	O	Active	32.82509845	-103.7612612	3632577.125	615949.347		1.09
3002500758	CONOCO INC	4/24/2000	32E	C	29	7/16/1940	17.0S		4073 MCA UNIT 110	O	Plugged	32.81104017	-103.7907527	3630986.55	613206.52		1.09
3002512782	CONOCOPHILLIPS COMPANY		32E	D	34		17.0S		4139 MCA UNIT 225	O	Active	32.79821493	-103.762764	3629594.968	615843.553		1.10
3002539417	COG OPERATING LLC		32E	G	20	10/4/2009	17.0S		7010 BC FEDERAL 043	O	Active	32.82101794	-103.7876299	3632096.105	613486.199		1.10
3002539088	COG OPERATING LLC		32E	K	22	3/16/2009	17.0S		7008 J C FEDERAL 021	O	Active	32.81934856	-103.7551712	3631946.346	616526.933		1.10
3002535142	CONOCOPHILLIPS COMPANY	11/11/2009	32E	K	27	9/17/2000	17.0S		4499 MCA UNIT 387	O	Plugged	32.80430971	-103.7554812	3630278.683	616517.54		1.10
3002508055	CONOCOPHILLIPS COMPANY	1/3/2003	32E	A	20	7/8/1938	17.0S		4129 MITCHELL A 004	G	Plugged	32.82555233	-103.7822404	3632604.621	613984.932		1.10
3002539266	COG OPERATING LLC		32E	N	20	9/26/2009	17.0S		7123 GC FEDERAL 031	O	Active	32.81429727	-103.7908216	3631347.581	613195.939		1.11
3002508067	CONOCO INC	3/25/1988	32E	N	20	8/23/1945	17.0S		4027 MCA UNIT 097	O	Plugged	32.81466831	-103.7907568	3631388.787	613201.535		1.11
3002523984	CONOCOPHILLIPS COMPANY		32E	C	33		17.0S		4175 MCA UNIT 300	O	Active	32.79611394	-103.7739798	3629349.807	614796.04		1.11
3002512749	MALJAMAR OIL & GAS	1/2/1900	32E	A	33	1/2/1900	17.0S		515 PEARSALL LM 001	O	Plugged	32.79759876	-103.7636621	3629525.672	615760.256		1.11
3002500578	CONOCO INC	1/2/1900	32E	N	16	1/2/1900	17.0S	Not Reported	MCA UNIT 012	I	Plugged	32.82825602	-103.7725294	3632914.89	614890.479		1.11
3002512772	CONOCOPHILLIPS COMPANY	2/18/2005	32E	K	20	10/1/1948	17.0S		4039 MCA UNIT 064	O	Plugged	32.82004116	-103.7887042	3631986.659	613386.872		1.12
3002500815	CONOCO INC	11/9/1993	32E	A	33		17.0S		MCA UNIT 383	O	Plugged	32.79737956	-103.7639233	3629501.084	615736.082		1.12
3002539432	CONOCOPHILLIPS COMPANY		32E	A	33	8/1/2009	17.0S		4334 MCA UNIT 489	O	Active	32.79647919	-103.766472	3629398.476	615498.591		1.12
3002538740	COG OPERATING LLC		32E	D	22		17.0S		6952 MC FEDERAL 019	O	Active	32.82460111	-103.7596575	3632523.747	616100.114		1.12
3002500798	CONOCOPHILLIPS COMPANY	4/18/2007	32E	D	33		17.0S		4283 MCA UNIT 220	I	Plugged	32.79650888	-103.7778713	3629389.376	614431.138		1.13
3002500632	CONOCOPHILLIPS COMPANY	4/30/2003	32E	F	22	9/28/1944	17.0S		4075 MCA UNIT 039	I	Plugged	32.82187471	-103.7564133	3632225.046	616407.359		1.13
3002531100	CONOCOPHILLIPS COMPANY		32E	F	29		17.0S		4350 MCA UNIT 386	I	Active	32.80757418	-103.7906991	3630602.344	613215.933		1.13
3002500801	CONOCO INC	12/11/1999	32E	A	33		17.0S		MCA UNIT 224	O	Plugged	32.7967502	-103.7650012	3629430.129	615635.964		1.13
3002500624	CONTINENTAL OIL	1/2/1900	32E	D	22	1/2/1900	17.0S	Not Reported	MCA UNIT 030	O	Plugged	32.82550989	-103.7607389	3632623.314	615997.704		1.13
3002500760	CONOCO INC	6/29/1990	32E	F	29	8/13/1940	17.0S		4070 MCA UNIT 157	I	Plugged	32.80741203	-103.7907479	3630584.314	613211.57		1.14
3002512793	CONOCOPHILLIPS COMPANY	10/12/2004	32E	L	27		17.0S		4070 MCA UNIT 182	O	Plugged	32.80545618	-103.7540884	3630407.325	616646.451		1.14
3002538984	CONOCOPHILLIPS COMPANY		32E	N	27	9/2/2008	17.0S		4465 MCA UNIT 416	O	Active	32.80009042	-103.7584994	3629807.579	616240.436		1.14
3002528161	ENDURANCE RESOURCES LLC		32E	A	32		17.0S		4200 HOVER STATE 006	O	Active	32.79742302	-103.7811099	3629487.224	614126.712		1.14
3002538985	CONOCOPHILLIPS COMPANY		32E	M	27	12/29/2008	17.0S		4466 MCA UNIT 417	O	Active	32.79852746	-103.7606879	3629631.894	616037.546		1.14
3002538713	COG OPERATING LLC		32E	G	20	3/17/2010	17.0S		7025 BC FEDERAL 031	O	Active	32.822722	-103.7871093	3632285.589	613532.766		1.14
3002534772	COG OPERATING LLC		32E	F	22	1/7/2000	17.0S		5950 J C FEDERAL 002	O	Active	32.8209659	-103.7553318	3632125.48	616509.787		1.15
3002500797	MALJAMAR OIL & GAS	1/2/1900	32E	A	33	1/2/1900	17.0S		4339 PEARSALL PERMIT 003	O	Plugged	32.79647534	-103.7650007	3629399.657	615636.367		1.15
3002535989	COG OPERATING LLC		32E	D	22	12/27/2002	17.0S		6918 MC FEDERAL 008	O	Active	32.82641867	-103.7618203	3632722.882	615895.295		1.15
3002500715	CONOCOPHILLIPS COMPANY		32E	B	27		17.0S		4100 MCA UNIT 121	I	Active	32.81097389	-103.75217	3631021.178	616818.85		1.16
3002530116	CONOCO INC	10/3/1995	32E	J	22	11/17/1987	17.0S		4250 MCA UNIT 378	O	Plugged	32.81978131	-103.7542932	3631995.292	616608.562		1.16
3002538983	CONOCOPHILLIPS COMPANY		32E	N	27	1/9/2009	17.0S		4412 MCA UNIT 415	O	Active	32.80187284	-103.7561314	3630007.797	616459.84		1.16
3002500599	CONOCO INC	1/2/1900	32E	P	17	1/2/1900	17.0S		4147 MCA UNIT 014	O	Plugged	32.82747599	-103.7802156	3632820.079	614172.008		1.16
3002530731	CONOCOPHILLIPS COMPANY	3/23/2007	32E	O	22		17.0S		4420 MCA UNIT 385	O	Plugged	32.81446462	-103.7521768	3631408.18	616813.646		1.16
3002500640	CONTINENTAL OIL	1/2/1900	32E	O	22	1/2/1900	17.0S	Not Reported	MCA UNIT 085	O	Plugged	32.81460205	-103.7521769	3631423.416	616813.457		1.17
3002538539	COG OPERATING LLC		32E	B	20	10/1/2007	17.0S		7015 BC FEDERAL 015	O	Active	32.82464581	-103.7854769	3632500.631	613683.125		1.17
3002508066	CONOCO INC	4/27/2000	32E	K	20	9/13/1941	17.0S		4027 MCA UNIT 063	O	Plugged	32.81829645	-103.7907621	3631791.022	613196.437		1.17
3002512780	CONOCO INC	1/2/1900	32E	F	22	1/2/1900	17.0S	Not Reported	MCA UNIT 038	O	Plugged	32.82029086	-103.7543327	3632051.741	616604.198		1.17
3002500765	CONOCOPHILLIPS COMPANY		32E	O	29		17.0S		4070 MCA UNIT 212	O	Active	32.80015156	-103.7865112	3629783.913	613617.477		1.18
3002500567	CONOCOPHILLIPS COMPANY	3/9/2007	32E	O	16	8/4/1938	17.0S		4109 MCA UNIT 011	O	Plugged	32.82915602	-103.7693808	3633018.098	615184.043		1.19
3002538836	COG OPERATING LLC		32E	C	22	11/1/2008	17.0S		6961 J C FEDERAL 016	O	Active	32.82440559	-103.7577437	3632504.174	616279.519		1.19
3002538727	COG OPERATING LLC		32E	A	20	4/12/2008	17.0S		7035 BC FEDERAL 027	O	Active	32.82626721	-103.7836479	3632682.361	613852.267		1.19
3002523797	CONOCOPHILLIPS COMPANY		32E	K	29		17.0S		4150 MCA UNIT 294	O	Active	32.80203728	-103.7886644	3629990.665	613413.468		1.19
3002512747	CONOCO INC	1/2/1900	32E	P	16	1/2/1900	17.0S	Not Reported	MCA UNIT 010	O	Plugged	32.82801644	-103.7637203	3632897.94	615715.369		1.20
3002500717	CONOCOPHILLIPS COMPANY		32E	G	27		17.0S		3853 MCA UNIT 146	O	Active	32.80734573	-103.7521628	3630618.941	616824.272		1.20
3002500809	CONOCO INC	1/2/1900	32E	G	33	1/2/1900	17.0S	Not Reported	MCA UNIT 230	O	Plugged	32.79460916	-103.7713896	3629185.791	615040.522		1.20
3002524513	CONOCOPHILLIPS COMPANY		32E	M	27		17.0S		4425 MCA UNIT 346	O	Active	32.79842824	-103.7589219	3629622.833	616203.038		1.21
3002539433	CONOCOPHILLIPS COMPANY		32E	G	33	8/9/2009	17.0S		4373 MCA UNIT 492	O	Active	32.79464501	-103.7693135	3629192.026	615234.883		1.21
3002538860	CONOCOPHILLIPS COMPANY		32E	D	34	8/22/2008	17.0S		4531 MCA UNIT 406	O	Active	32.79647155	-103.7623196	3629402.172	615887.427		1.21
3002537656	COG OPERATING LLC		32E	F	22	1/27/2006	17.0S		10200 J C FEDERAL 004	O	Active	32.82277998	-103.755336	3632326.598	616507.025		1.22
3002523778	CONOCO INC	6/1/1993	32E	D	29	5/15/1971	17.0S		4080 MCA UNIT 288	O	Plugged	32.81267629	-103.7929949	3631165.543	612994.527		1.22
3002529955	CONOCO INC	9/29/1995	32E	F	33		17.0S		MCA UNIT 371	O	Plugged	32.7945929	-103.7756773	3629179.333	614639.04		1.22

3002500789	ENDURANCE RESOURCES LLC		32E	A	32	11/13/1940	17.0S	3955	HOVER STATE 001	O	Active	32.79651747	-103.7821872	3629385.666	614026.993	1.23
3002539519	COG OPERATING LLC		32E	O	29	11/9/2009	17.0S	10482	MALJAMAR SWD 29 001	S	Active	32.7996851	-103.7870988	3629731.566	613563.05	1.23
3002500579	CONOCOPHILLIPS COMPANY		32E	M	16	2/21/1969	17.0S	4150	MCA UNIT 013	O	Active	32.82917525	-103.7779281	3633010.945	614383.953	1.23
3002500627	CONOCOPHILLIPS COMPANY		32E	J	22		17.0S	4112	MCA UNIT 074	I	Active	32.81823019	-103.7521816	3631825.655	616808.268	1.23
3002500727	CONOCO INC	12/18/1998	32E	N	27		17.0S		MCA UNIT 205	I	Plugged	32.80008668	-103.7563738	3629809.503	616439.472	1.23
3002500754	CONOCOPHILLIPS COMPANY		32E	K	29		17.0S	3964	MCA UNIT 170	O	Active	32.80378556	-103.7907432	3630182.264	613216.608	1.23
3002523798	CONTINENTAL OIL	3/17/1988	32E	O	29	7/5/1971	17.0S	4080	MCA UNIT 290	O	Plugged	32.80929552	-103.7929905	3630790.732	612999.218	1.24
3002539165	COG OPERATING LLC		32E	J	22	11/9/2009	17.0S	7148	J C FEDERAL 024	O	Active	32.81732219	-103.7516244	3631725.603	616861.62	1.24
3002529853	CONOCOPHILLIPS COMPANY		32E	E	29		17.0S	4150	MCA UNIT 369	O	Active	32.80902066	-103.7929901	3630760.259	612999.604	1.24
3002529852	CONOCOPHILLIPS COMPANY	11/14/2006	32E	G	33		17.0S	4396	MCA UNIT 370	O	Plugged	32.7943795	-103.7676194	3629164.437	615393.863	1.25
3002500637	CONOCO INC	1/2/1900	32E	C	22	1/2/1900	17.0S	13657	BAISH B 001	O	Plugged	32.82550463	-103.7575009	3632626.29	616300.815	1.25
3002539261	COG OPERATING LLC		32E	K	20	3/23/2009	17.0S	7020	GC FEDERAL 020	O	Active	32.81920382	-103.7918428	3631890.463	613094.117	1.25
3002538744	COG OPERATING LLC		32E	B	20	9/9/2009	17.0S	7024	BC FEDERAL 025	O	Active	32.82464608	-103.7876356	3632498.341	613481.051	1.26
3002508061	CONOCOPHILLIPS COMPANY	9/16/2004	32E	B	20	6/15/1944	17.0S	4080	MCA UNIT 024	I	Plugged	32.82555298	-103.7865577	3632600.045	613580.798	1.26
3002508050	CONOCOPHILLIPS COMPANY	12/5/2006	32E	F	20	10/25/1960	17.0S	5500	MCA UNIT 257	O	Plugged	32.82367047	-103.7886932	3632389.043	613383.29	1.26
3002500731	CONTINENTAL OIL	1/2/1900	32E	O	27	1/2/1900	17.0S	Not Reported	QUEEN B 001	O	Plugged	32.80170179	-103.7541984	3629990.963	616641.056	1.26
3002500817	CONOCOPHILLIPS COMPANY	12/21/2006	32E	D	34		17.0S	4270	MCA UNIT 226		Plugged	32.796466	-103.7606848	3629403.349	616040.515	1.26
3002538995	COG OPERATING LLC		32E	G	22	3/3/2010	17.0S	7042	J C FEDERAL 019	O	Active	32.82137488	-103.7532649	3632173.103	616702.741	1.26
3002523738	CONOCOPHILLIPS COMPANY		32E	H	33		17.0S	4230	MCA UNIT 275	O	Active	32.79459253	-103.7649975	3629190.919	615639.104	1.27
3002534914	ENDURANCE RESOURCES LLC		32E	B	32	3/20/2000	17.0S	4202	HOVER STATE 008	O	Active	32.79742897	-103.7854258	3629483.234	613722.574	1.28
3002523686	CONOCOPHILLIPS COMPANY		32E	L	20		17.0S	4100	MCA UNIT 265	O	Active	32.81674701	-103.7932324	3631616.598	612967.14	1.28
3002508057	CONOCO INC	5/3/2000	32E	F	20	8/30/1941	17.0S	4081	MCA UNIT 050	I	Plugged	32.82192542	-103.7907675	3632193.35	613191.329	1.29
3002524058	CONOCO INC	9/11/2001	32E	A	27		17.0S		MCA UNIT 307	O	Plugged	32.81223697	-103.7498507	3631163.778	617034.336	1.29
3002523707	CONOCOPHILLIPS COMPANY		32E	F	29		17.0S	4130	MCA UNIT 270	O	Active	32.80566732	-103.7928221	3630388.664	613019.577	1.29
3002500718	CONOCOPHILLIPS COMPANY		32E	J	27		17.0S	4180	MCA UNIT 184	I	Active	32.80370756	-103.7521554	3630215.594	616829.725	1.29
3002500625	CONOCO INC	9/8/1995	32E	C	22		17.0S	4157	BAISH B 002	G	Plugged	32.82550286	-103.7564216	3632627.282	616401.849	1.29
3002539415	COG OPERATING LLC		32E	B	20	12/11/2009	17.0S	7050	BC FEDERAL 041	O	Active	32.82645999	-103.7863628	3632700.812	613597.887	1.30
3002539272	COG OPERATING LLC		32E	M	20	8/28/2009	17.0S	7016	GC FEDERAL 030	O	Active	32.81376232	-103.7941896	3631284.671	612881.304	1.30
3002524369	CONOCOPHILLIPS COMPANY		32E	H	27		17.0S	4125	MCA UNIT 335	O	Active	32.80908721	-103.7499262	3630814.488	617031.397	1.30
3002539472	COG OPERATING LLC		32E	M	20	11/16/2009	17.0S	7123	GC FEDERAL 041	O	Active	32.81586492	-103.7939474	3631518.039	612901.32	1.30
3002533584	CONOCOPHILLIPS COMPANY		32E	F	20	10/5/1996	17.0S	13900	ELVIS 001	O	Active	32.82247514	-103.7907683	3632254.295	613190.557	1.31
3002539089	COG OPERATING LLC		32E	J	22	6/25/2009	17.0S	7025	J C FEDERAL 022	O	Active	32.81913536	-103.7511034	3631927.201	616908.019	1.31
3002538366	COG OPERATING LLC		32E	F	20	6/15/2007	17.0S	6985	BC FEDERAL 014	O	Active	32.82283244	-103.790638	3632294.048	613202.301	1.31
3002524236	CONOCOPHILLIPS COMPANY		32E	I	22		17.0S	4175	MCA UNIT 325	O	Active	32.81648095	-103.7499389	3631634.201	617020.515	1.32
3002536156	CONOCO INC	1/2/1900	32E	P	17	1/2/1900	17.0S	Not Reported	MCA UNIT 246	O	Plugged	32.82918046	-103.7822461	3633006.857	613979.764	1.32
3002538982	CONOCOPHILLIPS COMPANY		32E	O	27	1/4/2009	17.0S	4510	MCA UNIT 414	O	Active	32.80008299	-103.7542736	3629811.408	616636.129	1.32
3002537964	COG OPERATING LLC		32E	C	22	10/13/2006	17.0S	7100	J C FEDERAL 005	O	Active	32.8257909	-103.7560788	3632659.594	616433.562	1.32
3002500804	MARBOB ENERGY CORP	1/2/1900	32E	L	33	1/2/1900	17.0S	Not Reported	PEARSALL A 003	O	Plugged	32.79286945	-103.773549	3628990.568	614840.551	1.33
3002500807	CONOCO INC	6/16/2000	32E	L	33		17.0S		MCA UNIT 232	I	Plugged	32.79284196	-103.773549	3628987.52	614840.586	1.33
3002538859	CONOCOPHILLIPS COMPANY		32E	C	34	8/13/2008	17.0S	4566	MCA UNIT 405	O	Active	32.79783308	-103.7565151	3629559.496	616429.179	1.33
3002500803	CONOCOPHILLIPS COMPANY		32E	G	33	6/15/1954	17.0S	4280	MCA UNIT 231	O	Active	32.7928584	-103.7693105	3628993.953	615237.469	1.33
3002500633	CONOCO INC	5/15/2002	32E	G	22		17.0S		MCA UNIT 037	O	Plugged	32.82186793	-103.7521862	3632228.958	616803.076	1.34
3002533949	CONOCOPHILLIPS COMPANY		32E	F	20	5/22/1997	17.0S	12100	ELVIS 004	O	Active	32.82280503	-103.7911416	3632290.47	613155.193	1.34
3002538730	COG OPERATING LLC		32E	K	16	5/17/2008	17.0S	7025	EDWARD STATE 004	O	Active	32.83147203	-103.7725993	3633271.365	614879.794	1.34
3002534713	COG OPERATING LLC		32E	B	20	12/17/1999	17.0S	5773	BC FEDERAL 002	O	Active	32.82646015	-103.7876384	3632699.459	613478.482	1.35
3002500558	CONOCO INC	2/5/1992	32E	M	15		17.0S	4003	MCA UNIT BATTERY 2 009	O	Plugged	32.82913803	-103.7607449	3633025.551	615992.425	1.35
3002500808	CONOCOPHILLIPS COMPANY		32E	E	33		17.0S	4165	MCA UNIT 233	O	Active	32.79315556	-103.7778654	3629017.61	614435.986	1.35
3002523672	CONTINENTAL OIL	1/2/1900	32E	D	20	1/2/1900	17.0S	Not Reported	MCA UNIT 263	O	Plugged	32.81998485	-103.7932372	3631975.562	612962.592	1.35
3002508069	CONOCO INC	11/22/1999	32E	M	20		17.0S		MCA UNIT 098	O	Plugged	32.81466961	-103.795074	3631384.316	612797.36	1.35
3002524275	CONOCOPHILLIPS COMPANY		32E	J	27		17.0S	4215	MCA UNIT 329	O	Active	32.80544943	-103.7500824	3630411.003	617021.54	1.35
3002521226	CONOCOPHILLIPS COMPANY		32E	M	15	6/24/1965	17.0S	9950	HUDSON 001	O	Active	32.82944091	-103.7610724	3633058.771	615961.376	1.35
3002529967	CONOCOPHILLIPS COMPANY		32E	L	20		17.0S	4203	MCA UNIT 374	O	Active	32.81974029	-103.7934789	3631948.19	612940.276	1.36
3002500814	KEWANEE OIL CO	1/2/1900	32E	H	33	1/2/1900	17.0S	Not Reported	PEARSALL AX 007	O	Plugged	32.79313942	-103.7653416	3629029.44	615608.763	1.36
3002500790	ENDURANCE RESOURCES LLC		32E	B	32		17.0S	4022	HOVER STATE 002	I	Active	32.7965234	-103.7865031	3629381.679	613622.851	1.36
3002500757	CONOCO INC	12/29/1999	32E	N	29	10/13/1941	17.0S	4034	MCA UNIT 213	I	Plugged	32.80015741	-103.7907385	3629780.027	613221.648	1.37
3002500805	CONOCO INC	1/2/1900	32E	E	33	1/2/1900	17.0S	Not Reported	PEARSALL A 001	O	Plugged	32.7928807	-103.7778649	3628987.137	614436.385	1.37
3002530679	COG OPERATING LLC		32E	J	16	7/21/1993	17.0S	6060	LEAKER CC STATE 009	O	Active	32.83187952	-103.7704637	3633318.867	615079.165	1.37
3002524499	CONOCOPHILLIPS COMPANY	3/27/2007	32E	J	22	8/29/1973	17.0S	4150	MCA UNIT 345	O	Plugged	32.81969709	-103.7501066	3631990.582	617000.598	1.38
3002500576	COG OPERATING LLC		32E	K	16		17.0S	4350	EDWARD STATE 002	O	Active	32.83207709	-103.7727637	3633338.268	614863.627	1.38
3002500761	CONOCO INC	9/6/1997	32E	E	29	10/8/1940	17.0S	3779	MCA UNIT 158	O	Plugged	32.80741333	-103.7950645	3630579.844	612807.418	1.38
3002524583	CONOCOPHILLIPS COMPANY		32E	N	27		17.0S	4350	MCA UNIT 353	O	Active	32.79874996	-103.7542952	3629663.595	616635.847	1.38
3002538838	COG OPERATING LLC		32E	J	16	11/15/2008	17.0S	7004	LEAKER CC STATE 015	O	Active	32.83187472	-103.7683047	3633320.688	615281.257	1.38
3002500802	KEWANEE OIL CO	1/2/1900	32E	H	33	1/2/1900	17.0S	Not Reported	PEARSALL A FEDERAL 007	O	Plugged	32.79284716	-103.7649946	3628997.418	615641.635	1.39
3002538697	COG OPERATING LLC		32E	B	22	7/7/2008	17.0S	7035	J C FEDERAL 013	O	Active	32.82459073	-103.753269	3632529.633	616698.152	1.39
3002523767	CONOCO INC	2/18/1998	32E	K	29		17.0S		MCA UNIT 293	O	Plugged	32.80204313	-103.7928175	3629986.867	613024.595	1.39
3002527929	LYNX PETROLEUM CONSULTANTS INC		32E	N	15	1/14/1983	17.0S	4212	LYNX FEDERAL 003	O	Active	32.82822574	-103.7575053	3632927.968	616296.856	1.40
3002531092	ENDURANCE RESOURCES LLC		32E	H	32		17.0S	4245	HOVER STATE 007	O	Active	32.79332759	-103.7811026	3629033.184	614132.628	1.40
3002500590	CONOCOPHILLIPS COMPANY		32E	O	17		17.0S	3514	MITCHELL B 010	O	Active	32.82827408	-103.7865628	3632901.72	613576.856	1.40
3002500716	CONOCOPHILLIPS COMPANY		32E	A	27		17.0S	4120	MCA UNIT 122	O	Active	32.81096631	-103.7478534	3631025.116	617222.997	1.41
3002500577	COG OPERATING LLC		32E	L	16	9/28/1994	17.0S	4168	EDWARD STATE 003	G	Active	32.83208634	-103.7768527	3633334.855	614480.879	1.41
3002500818	CONOCOPHILLIPS COMPANY	3/1/2005	32E	C	34	6/15/1941	17.0S	4171	MCA UNIT 227	O	Plugged	32.79645852	-103.7563689	3629407.263	616444.661	1.41

3002508068	CONOCO INC	9/15/1995	32E	L	20		17.0S		MCA UNIT 062	I	Plugged	32.81829775	-103.7950794	3631786.551	612792.27		1.41
3002500639	CONOCOPHILLIPS COMPANY		32E	P	22		17.0S		4129 MCA UNIT 084	I	Active	32.81459447	-103.7478596	3631427.355	617217.652		1.42
3002539320	CONOCOPHILLIPS COMPANY		32E	I	27	5/21/2009	17.0S		4390 MCA UNIT 474	O	Active	32.80403296	-103.74954	3630254.563	617074.182		1.42
3002500723	CONOCOPHILLIPS COMPANY		32E	O	27		17.0S		4132 MCA UNIT 204	O	Active	32.8000794	-103.752148	3629813.357	616835.165		1.42
3002538261	COG OPERATING LLC		32E	G	22	8/31/2007	17.0S		7020 J C FEDERAL 009	O	Active	32.82277327	-103.751108	3632330.523	616902.823		1.42
3002508049	CONTINENTAL OIL	1/2/1900	32E	C	20	1/2/1900	17.0S	Not Reported	MCA UNIT 255	O	Plugged	32.82380843	-103.7922748	3632400.501	613047.842		1.43
3002500584	PHILLIPS PETROLEUM CO	1/2/1900	32E	K	16	1/2/1900	17.0S	Not Reported	MALJAMAR 002	O	Plugged	32.83279365	-103.7736152	3633416.786	614783.003		1.43
3002508060	CONOCOPHILLIPS COMPANY	2/5/2003	32E	C	20	4/8/1944	17.0S		4052 MCA UNIT 023	O	Plugged	32.82555356	-103.7907728	3632595.586	613186.23		1.43
3002500569	COG OPERATING LLC		32E	J	16	2/12/1959	17.0S		4318 LEAKER CC STATE 003	O	Active	32.83278416	-103.7693853	3633420.337	615178.937		1.43
3002526720	COG OPERATING LLC		32E	C	32		17.0S		4275 WALLINGFORD 002	O	Active	32.79743478	-103.7896603	3629479.333	613326.059		1.44
3002538619	COG OPERATING LLC		32E	I	16	2/26/2008	17.0S		7025 LEAKER CC STATE 010	O	Active	32.83186506	-103.7639867	3633324.337	615685.441		1.44
3002500714	CONOCOPHILLIPS COMPANY		32E	H	27		17.0S		3798 MCA UNIT 145	I	Active	32.80733815	-103.7478462	3630622.878	617228.435		1.44
3002508048	CONOCOPHILLIPS COMPANY		32E	L	20		17.0S		5442 MITCHELL B 015	O	Active	32.81829794	-103.7957335	3631785.874	612731.035		1.45
3002538745	COG OPERATING LLC		32E	E	20	8/25/2008	17.0S		7000 BC FEDERAL 026	O	Active	32.82101891	-103.7944947	3632088.862	612843.566		1.45
3002500793	KERSEY , COMPANY	1/2/1900	32E	H	32	1/2/1900	17.0S	Not Reported	HOVER FRITSCHI STATE 005	O	Plugged	32.79288931	-103.7821808	3628983.43	614032.223		1.45
3002500592	CONOCO INC	1/2/1900	32E	O	17	1/2/1900	17.0S	Not Reported	MITCHELL B 009	O	Plugged	32.82918111	-103.7865641	3633002.279	613575.58		1.45
3002539349	CONOCOPHILLIPS COMPANY		32E	I	27	4/3/2009	17.0S		4405 MCA UNIT 475	O	Active	32.80535016	-103.7483327	3630401.935	617185.494		1.45
3002500732	CONOCOPHILLIPS COMPANY		32E	J	27	8/17/1954	17.0S		4266 MCA UNIT 185	O	Active	32.8019587	-103.7500753	3630024.002	617026.78		1.45
3002500755	CONOCOPHILLIPS COMPANY		32E	L	29		17.0S		3935 MCA UNIT 169	I	Active	32.80379154	-103.7950598	3630178.313	612812.434		1.46
3002512711	CONOCOPHILLIPS COMPANY		32E	I	22		17.0S		4055 MCA UNIT 075	O	Active	32.81822261	-103.7478643	3631829.594	617212.447		1.47
3002500575	CONTINENTAL OIL	1/2/1900	32E	L	16	1/2/1900	17.0S	Not Reported	GULF STATE E 001	O	Plugged	32.8328034	-103.7779332	3633413.184	614378.824		1.47
3002539479	COG OPERATING LLC		32E	B	22	11/30/2009	17.0S		7036 J C FEDERAL 040	O	Active	32.82640481	-103.7532712	3632730.754	616695.573		1.47
3002512764	CONOCOPHILLIPS COMPANY	3/16/2007	32E	P	19	1/7/1947	17.0S		3986 MCA UNIT 099	O	Plugged	32.81292506	-103.7973119	3631188.517	612590.05		1.47
3002538699	COG OPERATING LLC		32E	H	22	8/7/2008	17.0S		7017 J C FEDERAL 015	O	Active	32.82095577	-103.7489471	3632131.413	617107.493		1.47
3002523741	CONOCOPHILLIPS COMPANY		32E	D	29		17.0S		4025 MCA UNIT 281	O	Active	32.80929672	-103.7971436	3630786.433	612610.383		1.48
3002500636	CONOCOPHILLIPS COMPANY		32E	B	22	9/30/1959	17.0S		4033 BAISH B 003	O	Active	32.82549608	-103.7521908	3632631.198	616797.896		1.48
3002500820	CONOCO INC	10/2/2000	32E	E	34		17.0S		4440 MCA UNIT BATTERY 2 229	I	Plugged	32.79283784	-103.7606787	3629001.111	616045.799		1.48
3002500571	COG OPERATING LLC		32E	I	16		17.0S		4224 LEAKER CC STATE 005	O	Active	32.83277452	-103.7650673	3633423.984	615583.117		1.48
3002538834	COG OPERATING LLC		32E	K	16	9/12/2008	17.0S		7012 EDWARD STATE 006	O	Active	32.83370314	-103.774696	3633516.445	614680.67		1.50
3002524462	CONOCOPHILLIPS COMPANY		32E	P	22	7/17/1973	17.0S		4150 MCA UNIT 341	O	Active	32.81305228	-103.7461896	3631258.229	617376.025		1.50
3002508058	CONOCOPHILLIPS COMPANY	9/20/2004	32E	E	20	1/2/1942	17.0S		3990 MCA UNIT 051	O	Plugged	32.82192602	-103.7950847	3632188.801	612787.188		1.50
3002523673	CONOCOPHILLIPS COMPANY		32E	I	19		17.0S		4060 MCA UNIT 264	O	Active	32.81655321	-103.7973172	3631590.753	612584.978		1.50
3002533854	CONOCOPHILLIPS COMPANY		32E	O	17	3/8/1997	17.0S		14000 ELVIS 002	O	Active	32.82948359	-103.7876309	3633034.668	613475.338		1.50
3002524515	CONOCOPHILLIPS COMPANY		32E	A	27		17.0S		4175 MCA UNIT 347	O	Active	32.80935547	-103.7462151	3630848.344	617378.499		1.51
3002538981	CONOCOPHILLIPS COMPANY		32E	B	34	1/14/2009	17.0S		4620 MCA UNIT 413	O	Active	32.79823728	-103.7518162	3629609.492	616868.643		1.51
3002500721	CONOCO INC	7/31/1996	32E	I	27		17.0S		4250 MCA UNIT 186	O	Plugged	32.80370014	-103.7478388	3630219.549	617233.904		1.52
3002538735	COG OPERATING LLC		32E	I	16	8/19/2008	17.0S		7020 LEAKER CC STATE 014	O	Active	32.83368398	-103.7661479	3633523.632	615480.794		1.53
3002500794	MACK ENERGY CORP	8/22/2002	32E	C	32	3/30/1968	17.0S		4041 WALLINGFORD 001	O	Plugged	32.79652925	-103.7907348	3629377.789	613226.594		1.53
3002527292	COG OPERATING LLC		32E	C	32		17.0S		4700 WALLINGFORD 003	O	Active	32.79562069	-103.7896546	3629278.216	613328.895		1.53
3002536503	COG OPERATING LLC		32E	J	33	12/27/2003	17.0S		6025 PEARSALL A 002	O	Active	32.79012736	-103.7678182	3628692.798	615380.739		1.53
3002534733	COG OPERATING LLC		32E	C	20	10/18/1999	17.0S		5900 BC FEDERAL 001	O	Active	32.82646079	-103.7920988	3632694.749	613060.957		1.53
3002536364	COG OPERATING LLC		32E	L	33	10/9/2003	17.0S		5100 PEARSALL AX 008	O	Active	32.7901479	-103.7767811	3628685.333	614541.378		1.54
3002508052	CONOCOPHILLIPS COMPANY	12/15/2006	32E	E	20	8/3/1961	17.0S		5350 MCA UNIT 253	O	Plugged	32.8219261	-103.7957389	3632188.112	612725.947		1.54
3002538731	COG OPERATING LLC		32E	B	22	12/6/2008	17.0S		6999 J C FEDERAL 010	O	Active	32.8258517	-103.7511119	3632671.818	616898.424		1.54
3002538621	COG OPERATING LLC		32E	L	16	2/10/2008	17.0S		7040 EDWARD STATE 005	O	Active	32.83371286	-103.7790139	3633512.844	614276.505		1.55
3002536194	COG OPERATING LLC		32E	D	20	5/11/2003	17.0S		6598 BC FEDERAL 008	O	Active	32.82464698	-103.7940094	3632491.614	612884.406		1.55
3002500598	CONOCOPHILLIPS COMPANY		32E	I	17		17.0S		4240 MCA UNIT 008	O	Active	32.83280859	-103.7822512	3633409.093	613974.65		1.55
3002538814	COG OPERATING LLC		32E	E	20	2/2/2010	17.0S		7041 BC FEDERAL 029	O	Active	32.82244833	-103.7956742	3632246.079	612731.344		1.55
3002536362	COG OPERATING LLC		32E	K	33	12/26/2003	17.0S		5125 PEARSALL AX 006	O	Active	32.78953508	-103.7732488	3628621.222	614872.95		1.55
3002500629	CONOCOPHILLIPS COMPANY	3/28/2007	32E	H	22		17.0S		4184 MCA UNIT 036	I	Plugged	32.82186106	-103.7478689	3632232.976	617207.238		1.56
3002512798	CONOCOPHILLIPS COMPANY		32E	I	30		17.0S		3995 MCA UNIT 168	O	Active	32.8055408	-103.7976781	3630369.457	612565.076		1.56
3002512771	CONOCOPHILLIPS COMPANY	9/21/2004	32E	L	20		17.0S		4024 MCA UNIT 061	I	Plugged	32.82004371	-103.7971588	3631977.903	612595.403		1.56
3002500559	LYNX PETROLEUM CONSULTANTS INC		32E	L	15		17.0S		4150 LYNX FEDERAL 007	O	Active	32.83276628	-103.7608147	3633427.731	615981.174		1.57
3002500792	ENDURANCE RESOURCES LLC		32E	G	32		17.0S		4156 HOVER STATE 004	O	Active	32.79289523	-103.7864967	3628979.442	613628.065		1.57
3002538977	CONOCOPHILLIPS COMPANY		32E	P	27	1/19/2009	17.0S		4476 MCA UNIT 408	O	Active	32.80185857	-103.747835	3630015.382	617236.678		1.57
3002500756	CONOCO INC	10/6/1997	32E	M	29		17.0S		MCA UNIT 214	O	Plugged	32.80016339	-103.7950551	3629776.077	612817.458		1.57
3002500759	CONOCOPHILLIPS COMPANY		32E	D	29	8/4/1940	17.0S		3965 MCA UNIT 109	I	Active	32.80016339	-103.7950551	3629776.077	612817.458		1.57
3002521840	CONTINENTAL OIL	1/2/1900	32E	K	33	1/2/1900	17.0S	Not Reported	PEARSALL AX 004	I	Plugged	32.78923341	-103.7735425	3628587.458	614845.834		1.58
3002500819	CONOCOPHILLIPS COMPANY	1/9/2007	32E	B	34		17.0S		4203 MCA UNIT 228	I	Plugged	32.79645124	-103.7521391	3629411.122	616840.744		1.58
3002536546	MACK ENERGY CORP	6/21/2005	32E	I	33	6/23/2004	17.0S		5200 PEARSALL A 003	O	Plugged	32.79011873	-103.7640745	3628695.931	615731.33		1.58
3002500806	BARNEY COCKBURN	1/2/1900	32E	J	33	1/2/1900	17.0S	Not Reported	PEARSALL A 011	O	Plugged	32.7892237	-103.7693043	3628590.991	615242.738		1.58
3002524370	CONOCO INC	1/2/1900	32E	L	23	1/2/1900	17.0S	Not Reported	MCA UNIT 336	O	Plugged	32.81647268	-103.7452946	3631638.436	617455.316		1.58
3002524375	CONOCOPHILLIPS COMPANY		32E	H	27		17.0S		4280 MCA UNIT 337	O	Active	32.80558909	-103.7457661	3630431.272	617425.49		1.59
3002538696	COG OPERATING LLC		32E	A	22	1/24/2009	17.0S		7000 J C FEDERAL 012	O	Active	32.82458391	-103.7489517	3632533.653	617102.301		1.59
3002528372	LYNX PETROLEUM CONSULTANTS INC		32E	K	15	9/3/1983	17.0S		4031 LYNX FEDERAL 004	O	Active	32.83185388	-103.7575097	3633330.208	616291.714		1.60
3002508041	CONOCOPHILLIPS COMPANY	4/20/2006	32E	P	19		17.0S		3840 MCA UNIT 100	I	Plugged	32.81467469	-103.7993913	3631380.28	612393.171		1.60
3002500586	CONOCO INC	1/2/1900	32E	N	17	1/2/1900	17.0S	Not Reported	MCA UNIT 015	I	Plugged	32.82918169	-103.7907774	3632997.822	613181.197		1.61
3002524109	CONOCOPHILLIPS COMPANY		32E	H	22		17.0S		4250 MCA UNIT 312	O	Active	32.82025031	-103.7461171	3632056.34	617373.347		1.61
3002500823	SOUTHERN UNION PRODUCTION CO	1/2/1900	32E	F	34	1/2/1900	17.0S	Not Reported	PEARSALL B 002	O	Plugged	32.79283035	-103.7563628	3629005.025	616449.962		1.61
3002527861	LYNX PETROLEUM CONSULTANTS INC		32E	O	15		17.0S		4200 LYNX FEDERAL 001	O	Active	32.82926335	-103.753278	3633047.667	616691.197		1.61
3002500595	W J RUTLEDGE JR	1/2/1900	32E	L	33	1/2/1900	17.0S		860 PPEARSALL A 001	O	Plugged	32.7892433	-103.7778584	3628583.877	614441.653		1.61

3002500811	CONOCO INC	1/2/1900	32E	I	33	1/2/1900	17.0S	3496	PEARSALL AX 001	O	Plugged	32.7892433	-103.7778584	3628583.877	614441.653	1.61
3002500784	CONOCO INC	5/8/2000	32E	H	30		17.0S		MCA UNIT 159	I	Plugged	32.80741838	-103.7993811	3630575.807	612403.262	1.63
3002523824	CONOCOPHILLIPS COMPANY		32E	I	30		17.0S	4160	MCA UNIT 295	O	Active	32.80204929	-103.7972976	3629982.77	612605.105	1.63
3002536601	MACK ENERGY CORP	1/6/2006	32E	E	34	3/21/2004	17.0S	5360	LEOPARD FEDERAL 001	O	Plugged	32.7919252	-103.7574402	3628903.487	616350.25	1.63
3002526835	MACK ENERGY CORP	6/6/1997	32E	D	32	6/13/1980	17.0S	4250	HOVER 001	O	Plugged	32.7974408	-103.7939729	3629475.387	612922.231	1.63
3002539319	CONOCOPHILLIPS COMPANY		32E	L	26	4/9/2009	17.0S	4412	MCA UNIT 463	O	Active	32.80403987	-103.7456485	3630259.644	617438.538	1.63
3002538994	COG OPERATING LLC		32E	I	19		17.0S	7021	GC FEDERAL 011	O	Active	32.81712095	-103.7993949	3631651.486	612389.754	1.63
3002500725	CONOCO INC	1/2/1900	32E	P	27	1/2/1900	17.0S	Not Reported	MCA UNIT 203	I	Plugged	32.80007198	-103.7478314	3629817.312	617239.36	1.63
3002500589	CONOCOPHILLIPS COMPANY		32E	N	17		17.0S	5397	MITCHELL B 011	O	Active	32.82918179	-103.7914316	3632997.133	613119.961	1.63
3002508059	CONOCO INC	1/2/1900	32E	D	20	1/2/1900	17.0S	Not Reported	MCA UNIT 022	I	Plugged	32.82555416	-103.7950901	3632591.037	612782.096	1.63
3002536502	COG OPERATING LLC		32E	J	33	3/8/2004	17.0S	5360	PEARSALL A 001	O	Active	32.7883191	-103.7703818	3628489.528	615143	1.64
3002538698	COG OPERATING LLC		32E	H	22		17.0S	6817	J C FEDERAL 014	O	Active	32.82276635	-103.7467908	3632334.54	617306.971	1.64
3002536361	COG OPERATING LLC		32E	K	33	8/15/2003	17.0S	5110	PEARSALL AX 005	O	Active	32.78832887	-103.7746199	3628486.005	614746.101	1.64
3002525418	TIPTON OIL, GAS ACQUISITIONS, INC.	4/7/2006	32E	O	15		17.0S		HUDSON FEDERAL 001	O	Plugged	32.82912422	-103.7521982	3633033.435	616792.454	1.64
3002500649	CONOCOPHILLIPS COMPANY		32E	M	23		17.0S	4153	MCA UNIT 083	O	Active	32.81458733	-103.7438694	3631430.996	617591.224	1.65
3002508035	CONOCOPHILLIPS COMPANY		32E	I	19	4/9/1946	17.0S	3725	MCA UNIT 060	O	Active	32.81830285	-103.7993967	3631782.518	612388.097	1.65
3002538742	COG OPERATING LLC		32E	H	19	10/3/2008	17.0S	6944	BC FEDERAL 023	O	Active	32.82124055	-103.7983217	3632109.355	612485.031	1.66
3002500705	CONOCOPHILLIPS COMPANY		32E	D	26		17.0S	4050	MCA UNIT 123	I	Active	32.81095859	-103.7435368	3631029.055	617627.144	1.66
3002539306	CONOCOPHILLIPS COMPANY		32E	E	26	3/27/2009	17.0S	4407	MCA UNIT 453	O	Active	32.80911732	-103.7436967	3630824.74	617614.599	1.66
3002500593	CONOCO INC	10/25/1989	32E	J	17	10/25/1989	17.0S	4200	MITCHELL B 008	O	Plugged	32.83280923	-103.7865691	3633404.514	613570.493	1.66
3002535715	J W INC	2/4/1997	32E	O	30		17.0S	99	BRINE STATION 529	M	Plugged	32.81011704	-103.8004933	3630873.817	612295.736	1.66
3002508051	CONOCOPHILLIPS COMPANY		32E	D	20		17.0S	5370	MCA UNIT 331	I	Active	32.82555424	-103.7957442	3632590.348	612720.867	1.66
3002500643	WILLIAMS & COCKBURN	1/2/1900	32E	M	23	1/2/1900	17.0S	Not Reported	MILLER 003	O	Plugged	32.81458674	-103.7435424	3631431.294	617621.839	1.66
3002500645	KEWANEE OIL CO	1/2/1900	32E	M	23	1/2/1900	17.0S	Not Reported	MILLER A FEDERAL 007	O	Plugged	32.81472417	-103.7435425	3631446.53	617621.648	1.67
3002524218	CONOCOPHILLIPS COMPANY		32E	E	26	8/14/1972	17.0S	4250	MCA UNIT 322	O	Active	32.80760588	-103.7438571	3630656.991	617601.572	1.67
3002524298	CONOCOPHILLIPS COMPANY	11/20/2006	32E	P	27	11/26/1972	17.0S	4400	MCA UNIT 302	I	Plugged	32.79965883	-103.74734	3629772.052	617285.915	1.67
3002531055	COG OPERATING LLC		32E	G	34		17.0S	4758	PEARSALL BX 005	O	Active	32.79373193	-103.7532118	3629108.454	616743.852	1.67
3002539111	COG OPERATING LLC		32E	P	19	7/24/2009	17.0S	7037	GC FEDERAL 015	O	Active	32.81558395	-103.800472	3631479.938	612290.853	1.67
3002523825	CONOCOPHILLIPS COMPANY	4/21/2006	32E	H	19	7/13/1971	17.0S	4085	MCA UNIT 298	I	Plugged	32.82367174	-103.7973277	3632379.953	612575.014	1.68
3002524527	CONOCOPHILLIPS COMPANY		32E	I	27		17.0S	4400	MCA UNIT 348	O	Active	32.80195113	-103.7457587	3630027.948	617430.967	1.68
3002500581	CONOCO INC	1/2/1900	32E	G	16	1/2/1900	17.0S	3760	STATE O 001	G	Plugged	32.83642168	-103.7736203	3633819.012	614777.857	1.68
3002500638	CONOCO INC	1/2/1900	32E	A	22	1/2/1900	17.0S	Not Reported	BAISH B 004	O	Plugged	32.82548921	-103.7478735	3632635.217	617202.041	1.68
3002500795	MACK ENERGY CORP	7/27/2004	32E	L	32	1/21/1942	17.0S	3490	PEARSALL QUEEN SAND UNIT 001	I	Plugged	32.7892532	-103.7821744	3628580.313	614037.464	1.68
3002500570	COG OPERATING LLC		32E	G	16		17.0S	4293	LEAKER CC STATE 004	O	Active	32.8364146	-103.7693896	3633822.831	615173.846	1.68
3002508032	CONOCO INC	7/23/1996	32E	I	19	3/8/1971	17.0S	5288	MCA UNIT 259	O	Plugged	32.81830419	-103.8000508	3631781.971	612326.862	1.69
3002525107	V-F PETROLEUM INC		32E	K	15	8/23/1975	17.0S	11700	HUDSON FEDERAL 001	O	Active	32.83275914	-103.7564313	3633431.76	616391.473	1.69
3002500711	CONTINENTAL OIL	1/2/1900	32E	E	26	1/2/1900	17.0S	Not Reported	MCA UNIT 144	M	Plugged	32.80733043	-103.7435296	3630626.817	617632.598	1.69
3002500775	CONOCOPHILLIPS COMPANY		32E	I	30		17.0S	3912	MCA UNIT 167	O	Active	32.80379894	-103.7993763	3630174.536	612408.268	1.69
3002538842	COG OPERATING LLC		32E	I	19	6/22/2008	17.0S	6815	GC FEDERAL 008	O	Active	32.8195603	-103.8000527	3631921.23	612325.103	1.71
3002500580	CONOCOPHILLIPS COMPANY		32E	E	16		17.0S	4040	MCA UNIT 005	O	Active	32.83642881	-103.7779383	3633815.119	614373.697	1.71
3002523732	CONOCOPHILLIPS COMPANY		32E	P	19		17.0S	4030	MCA UNIT 276	O	Active	32.81293361	-103.8014656	3631185.048	612201.166	1.72
3002500791	MACK ENERGY CORP	6/16/1997	32E	D	32		17.0S		HOVER 003	O	Plugged	32.79653523	-103.7950507	3629373.839	612822.453	1.72
3002500796	COG OPERATING LLC		32E	J	32		17.0S	3618	PEARSALL QUEEN SAND UNIT 002	O	Active	32.79653523	-103.7950507	3629373.839	612822.453	1.72
3002512558	CONOCOPHILLIPS COMPANY	8/11/1960	32E	H	16	9/16/1959	17.0S	4147	STATE B 007	O	Plugged	32.83640728	-103.7650716	3633826.736	615578.007	1.72
3002500574	MACK ENERGY CORP	11/19/2002	32E	H	16	9/16/1959	17.0S	933	LEAKER CC 007	O	Plugged	32.83640716	-103.7650062	3633826.794	615584.128	1.72
3002527443	SANDRIDGE EXPLORATION AND PRODUCTION, LLC		32E	F	32		17.0S	4200	LEA LL STATE 001	O	Active	32.79257126	-103.7907295	3628938.985	613232.107	1.73
3002523789	CONOCOPHILLIPS COMPANY	3/14/2007	32E	B	30	5/29/1971	17.0S	4025	MCA UNIT 289	O	Plugged	32.8096631	-103.8016241	3630822.289	612190.437	1.73
3002508037	CONOCO INC	9/14/2001	32E	H	19		17.0S		MCA UNIT 052	I	Plugged	32.82192911	-103.799402	3632184.545	612383.034	1.73
3002538855	CONOCOPHILLIPS COMPANY		32E	L	26	8/5/2008	17.0S	4477	MCA UNIT 402	O	Active	32.80547761	-103.7431956	3630421.771	617666.312	1.74
3002523730	CONOCOPHILLIPS COMPANY		32E	L	26		17.0S	4260	MCA UNIT 273	I	Active	32.80369243	-103.7438492	3630223.125	617607.467	1.74
3002523739	CONOCO INC	9/20/1995	32E	P	19	4/10/1971	17.0S	4050	MCA UNIT 279	O	Plugged	32.81642433	-103.8014708	3631572.048	612196.291	1.74
3002539315	CONOCOPHILLIPS COMPANY		32E	M	26	4/15/2009	17.0S	4550	MCA UNIT 458	O	Active	32.79993069	-103.7456401	3629804.079	617444.729	1.75
3002500566	COG OPERATING LLC		32E	G	16		17.0S	4202	LEAKER CC STATE 002	G	Active	32.83731982	-103.7683112	3633924.367	615273.611	1.75
3002500704	CONOCO INC	10/26/1989	32E	L	26	8/16/1940	17.0S	4073	MCA UNIT BATTERY 4-187	I	Plugged	32.80369172	-103.7435222	3630223.41	617638.085	1.75
3002500822	COG OPERATING LLC		32E	H	34		17.0S	3552	PEARSALL BX 002	O	Active	32.79456465	-103.7498951	3629204.442	617053.342	1.76
3002538695	COG OPERATING LLC		32E	A	22	4/29/2008	17.0S	7023	J C FEDERAL 011	O	Active	32.8263945	-103.7467953	3632736.781	617301.78	1.77
3002538992	COG OPERATING LLC		32E	H	19	3/30/2009	17.0S	6918	BC FEDERAL 036	O	Active	32.8210235	-103.80048	3632082.996	612283.261	1.77
3002538589	COG OPERATING LLC		32E	H	16	12/5/2007	17.0S	7020	LEAKER CC STATE 001	O	Active	32.83731615	-103.7661522	3633926.318	615475.689	1.77
3002500821	COG OPERATING LLC		32E	A	34		17.0S	4316	PEARSALL BX 001	O	Active	32.79644381	-103.7478232	3629415.074	617244.891	1.77
3002529427	CONOCOPHILLIPS COMPANY		32E	D	26		17.0S	4250	MCA UNIT 366	O	Active	32.80969903	-103.7416213	3630891.543	617808.143	1.77
3002536511	MACK ENERGY CORP	6/16/2005	32E	G	34	1/13/2004	17.0S	6020	PEARSALL BX 007	O	Plugged	32.79331599	-103.7510529	3629064.725	616946.56	1.78
3002524545	CONOCOPHILLIPS COMPANY		32E	M	23		17.0S	4250	MCA UNIT 349	O	Active	32.81297508	-103.7414634	3631254.928	617818.602	1.78
3002523930	CONOCO INC	3/4/1998	32E	G	30		17.0S		MCA UNIT 278	O	Plugged	32.80567762	-103.8016188	3630380.437	612195.941	1.78
3002500597	CONOCO INC	1/25/1990	32E	H	17	1/25/1990	17.0S	3660	MCA UNIT 006	I	Plugged	32.83643299	-103.7822563	3633810.916	613969.542	1.78
3002538975	CONOCOPHILLIPS COMPANY		32E	M	26	2/27/2009	17.0S	4523	MCA UNIT 404	O	Active	32.80185085	-103.7438422	3630018.961	617610.547	1.78
3002530696	COG OPERATING LLC		32E	A	34	6/28/1990	17.0S	4712	PEARSALL BX 004	O	Active	32.79734896	-103.7467463	3629516.621	617344.541	1.79
3002524463	CONOCO INC	1/2/1900	32E	D	26	1/2/1900	17.0S	Not Reported	MCA UNIT 342	O	Plugged	32.80940189	-103.7414572	3630858.783	617823.899	1.79
3002500650	CONOCO INC	1/2/1900	32E	E	23	1/2/1900	17.0S	Not Reported	MCA UNIT 035	O	Plugged	32.82185429	-103.7435517	3632237.022	617611.39	1.79
3002500585	CONOCO INC	1/2/1900	32E	M	17	1/2/1900	17.0S	Not Reported	MCA UNIT 016	I	Plugged	32.82918229	-103.7950954	3632993.272	612777.014	1.79
3002539113	COG OPERATING LLC		32E	O	19		17.0S	7050	GC FEDERAL 018	O	Active	32.81418656	-103.8026286	3631322.725	612090.711	1.79
3002500564	LYNX PETROLEUM CONSULTANTS INC	8/29/1985	32E	P	15		17.0S	4150	FEDERAL C 001	I	Plugged	32.82821032	-103.7478782	3632936.896	617198.027	1.79

3002537891	MARBOB ENERGY CORP		32E	L	34	9/12/2006	17.0S	9600	MOE FEDERAL 007	O	Active	32.78829442	-103.759592	3628498.588	616153.468	1.79
3002500781	CONOCO INC	4/9/2001	32E	P	30		17.0S		MCA UNIT 215	I	Plugged	32.80017078	-103.7993717	3629772.299	612413.266	1.79
3002538993	COG OPERATING LLC		32E	J	19	12/1/2008	17.0S	6805	GC FEDERAL 010	O	Active	32.8173054	-103.8022243	3631668.93	612124.644	1.79
3002523743	CONOCOPHILLIPS COMPANY		32E	I	19	4/24/1971	17.0S	4075	MCA UNIT 283	O	Active	32.81991505	-103.8014759	3631959.048	612191.425	1.80
3002527857	LYNX PETROLEUM CONSULTANTS INC		32E	E	15	9/23/1982	17.0S	4167	LYNX FEDERAL 002	G	Active	32.8364006	-103.7607537	3633830.727	615982.157	1.80
3002524271	CONOCOPHILLIPS COMPANY		32E	M	23		17.0S	4200	MCA UNIT 330	O	Active	32.81632836	-103.7414677	3631626.694	617813.773	1.80
3002527291	MACK ENERGY CORP	4/17/1995	32E	D	32		17.0S	4168	HOVER 002	O	Plugged	32.79562966	-103.7961284	3629272.292	612722.681	1.80
3002539314	CONOCOPHILLIPS COMPANY		32E	F	26	5/15/2009	17.0S	4454	MCA UNIT 457	O	Active	32.80753263	-103.741339	3630651.674	617837.432	1.81
3002500596	CONOCOPHILLIPS COMPANY		32E	M	17		17.0S	5405	MCA UNIT 267	O	Active	32.82918237	-103.7957496	3632992.583	612715.778	1.82
3002524725	COG OPERATING LLC		32E	A	34		17.0S	4475	PEARSALL BX 003	O	Active	32.78919402	-103.7563566	3628601.881	616455.282	1.82
3002538164	COG OPERATING LLC		32E	A	19	6/1/2007	17.0S	6720	BC FEDERAL 013	O	Active	32.82646288	-103.7983294	3632688.332	612477.727	1.82
3002500813	COG OPERATING LLC		32E	N	33		17.0S	3698	PEARSALL AX 003	O	Active	32.78560523	-103.773536	3628185.22	614851.106	1.83
3002535652	COG OPERATING LLC		32E	H	19	9/16/2001	17.0S	7562	BC FEDERAL 006	O	Active	32.82298896	-103.8006464	3632300.724	612265.211	1.83
3002500560	A H HOVER	1/2/1900	32E	P	15	1/2/1900	17.0S	Not Reported	WILLIAMS 001	O	Plugged	32.82911735	-103.7478802	3633037.454	617196.648	1.83
3002528679	LYNX PETROLEUM CONSULTANTS INC		32E	F	15	4/18/1984	17.0S	4250	LYNX FEDERAL 005	O	Active	32.83548843	-103.7570888	3633733.626	616326.371	1.83
3002500810	KEWANEE OIL CO	1/2/1900	32E	O	33	1/2/1900	17.0S	Not Reported	PEARSALL A 016	O	Plugged	32.78559552	-103.7692983	3628188.753	615247.979	1.83
3002500561	LYNX PETROLEUM CONSULTANTS INC		32E	J	15	11/12/1961	17.0S	4202	LYNX FEDERAL 008	O	Active	32.83275236	-103.7522062	3633435.67	616786.955	1.83
3002524546	CONOCO INC	10/6/1995	32E	L	26	10/13/1973	17.0S	4350	MCA UNIT 350	I	Plugged	32.80543263	-103.7414492	3630418.729	617829.886	1.84
3002508030	CONOCOPHILLIPS COMPANY		32E	A	19		17.0S	4030	MCA UNIT 021	O	Active	32.82555726	-103.7994074	3632586.781	612377.959	1.85
3002500769	CONOCOPHILLIPS COMPANY	2/22/2005	32E	B	30		17.0S	4010	MCA UNIT 107	I	Plugged	32.81105532	-103.8037025	3630974.436	611994.101	1.85
3002524009	CONOCOPHILLIPS COMPANY		32E	I	30		17.0S	4175	MCA UNIT 304	O	Active	32.80205785	-103.8014507	3629979.304	612216.229	1.85
3002520280	CONOCO INC	1/2/1900	32E	K	17	1/2/1900	17.0S	Not Reported	MITCHELL B 019	O	Plugged	32.83371685	-103.7907847	3633500.616	613174.759	1.85
3002500707	CONOCO INC	4/5/2001	32E	M	26		17.0S		MCA UNIT 202	I	Plugged	32.80006356	-103.7435148	3629821.172	617643.557	1.85
3002508043	CONOCO INC	9/26/1995	32E	O	19	11/12/1941	17.0S	3695	MCA UNIT 101	O	Plugged	32.81468348	-103.8037086	3631376.672	611988.978	1.85
3002500812	CONOCO INC	1/2/1900	32E	M	33	1/2/1900	17.0S	Not Reported	PEARSALL AX 002	O	Plugged	32.78561513	-103.7778519	3628181.64	614446.909	1.85
3002538741	COG OPERATING LLC		32E	A	19	8/17/2009	17.0S	7040	BC FEDERAL 022	O	Active	32.82465164	-103.8004854	3632485.232	612278.19	1.87
3002500770	CONOCOPHILLIPS COMPANY	12/22/2003	32E	G	30		17.0S		MCA UNIT 160	I	Plugged	32.80742716	-103.8036977	3630572.199	611999.102	1.87
3002535813	COG OPERATING LLC		32E	G	19	1/26/2004	17.0S	6620	BC FEDERAL 007	O	Active	32.82075142	-103.8026382	3632050.541	612081.568	1.88
3002500594	CONOCO INC	1/2/1900	32E	G	17	1/2/1900	17.0S	Not Reported	MITCHELL B 003	O	Plugged	32.83643419	-103.7865742	3633806.399	613565.4	1.88
3002527776	CHEVRON U S A INC	1/2/1900	32E	E	32	1/2/1900	17.0S	Not Reported	LEA LL STATE 002	O	Plugged	32.79290707	-103.7950459	3628971.602	612827.485	1.88
3002539318	CONOCOPHILLIPS COMPANY		32E	K	26	3/16/2009	17.0S	4480	MCA UNIT 462	O	Active	32.80327472	-103.7413304	3630179.618	617843.857	1.88
3002524095	CONTINENTAL OIL	1/2/1900	32E	H	19	1/2/1900	17.0S	Not Reported	MCA UNIT 309	O	Plugged	32.82353977	-103.8014813	3632360.904	612186.363	1.89
3002508042	CONOCOPHILLIPS COMPANY	9/22/2004	32E	J	19	5/25/1942	17.0S	3995	MCA UNIT 059	I	Plugged	32.81831163	-103.803714	3631778.908	611983.921	1.89
3002500653	CONOCO INC	11/30/1999	32E	D	23		17.0S		MCA UNIT 031	I	Plugged	32.82548244	-103.7435562	3632639.263	617606.187	1.89
3002539110	COG OPERATING LLC		32E	O	19	6/9/2009	17.0S	7025	GC FEDERAL 014	O	Active	32.81489122	-103.8045004	3631398.865	611914.59	1.90
3002538362	MARBOB ENERGY CORP		32E	K	34	11/3/2007	17.0S	9663	MOE FEDERAL 005	O	Active	32.78828448	-103.7552761	3628502.233	616557.654	1.91
3002500706	CONOCO INC	8/2/1996	32E	C	26	4/18/1940	17.0S	4028	SEARS A 002	O	Plugged	32.81095077	-103.7392202	3631032.999	618031.291	1.91
3002530115	CONOCOPHILLIPS COMPANY		32E	K	23		17.0S	4255	MCA UNIT 377	O	Active	32.81983101	-103.7404747	3632016.133	617902.109	1.91
3002500644	CONOCOPHILLIPS COMPANY	9/8/2004	32E	N	23		17.0S	4065	MCA UNIT 082	I	Plugged	32.81457892	-103.7392251	3631435.239	618026.035	1.91
3002521710	COG OPERATING LLC		32E	P	32		17.0S	4182	PEARSALL QUEEN SAND UNIT 003	O	Active	32.78562502	-103.7821678	3628178.076	614042.712	1.92
3002500710	CONOCOPHILLIPS COMPANY	4/27/2006	32E	N	26		17.0S		MCA UNIT 201	O	Plugged	32.80180393	-103.7411965	3630016.705	617858.335	1.93
3002539324	CONOCOPHILLIPS COMPANY		32E	K	26	3/21/2009	17.0S	4480	MCA UNIT 465	O	Active	32.80547024	-103.7397816	3630424.758	617985.973	1.93
3002500583	CONOCO INC	1/2/1900	32E	C	16	1/2/1900	17.0S	Not Reported	MCA UNIT 004	O	Plugged	32.84004982	-103.7736255	3634221.25	614772.701	1.93
3002500776	CONOCO INC	1/2/1900	32E	J	30	1/2/1900	17.0S	Not Reported	MCA UNIT 166	I	Plugged	32.80380772	-103.8036929	3630170.929	612004.092	1.93
3002500572	MACK ENERGY CORP	5/27/1998	32E	B	16		17.0S	4196	LEAKER CC 006	I	Plugged	32.84004274	-103.7693939	3634225.071	615168.758	1.93
3002539468	COG OPERATING LLC		32E	G	19	11/27/2009	17.0S	6920	BC FEDERAL 050	O	Active	32.82301077	-103.8026416	3632301.025	612078.412	1.94
3002500712	CONOCO INC	5/26/1999	32E	I	26	6/18/1941	17.0S	4075	MCA UNIT 143	I	Plugged	32.80732261	-103.739213	3630630.761	618036.762	1.94
3002500816	ANDERSON PLANK AR	1/2/1900	32E	J	34	1/2/1900	17.0S	Not Reported	VIRGINIA SHAW 002	O	Plugged	32.79008891	-103.7510456	3628706.955	616951.468	1.94
3002538974	CONOCOPHILLIPS COMPANY		32E	F	26	3/6/2009	17.0S	4417	MCA UNIT 401	O	Active	32.80910829	-103.738713	3630829.294	618081.214	1.95
3002530438	COG OPERATING LLC	10/4/2006	32E	A	31		17.0S	4200	BROWN FEDERAL 003	O	Plugged	32.79713578	-103.8004464	3629434.677	612316.454	1.95
3002500646	CONOCO INC	8/13/1996	32E	K	23	4/16/1941	17.0S	4150	MCA UNIT 077	O	Plugged	32.81820707	-103.7392297	3631837.48	618020.807	1.95
3002500565	MACK ENERGY CORP	6/29/2005	32E	I	15		17.0S	4105	LYNX C FEDERAL 002	O	Plugged	32.83183846	-103.7478862	3633339.132	617192.511	1.95
3002529272	LYNX PETROLEUM CONSULTANTS INC		32E	D	15	7/6/1985	17.0S	4150	LYNX FEDERAL 006	O	Active	32.8391232	-103.7618364	3634131.388	615877.282	1.95
3002536521	COG OPERATING LLC		32E	H	34	2/6/2004	17.0S	5312	PEARSALL BX 009	O	Active	32.79330849	-103.746737	3629068.674	617350.72	1.96
3002500582	CONOCO INC	1/25/1990	32E	D	16	1/25/1990	17.0S	3985	MCA UNIT 003	O	Plugged	32.84005695	-103.7779435	3634217.357	614368.558	1.96
3002500591	CONOCO INC	10/25/1989	32E	L	17	10/25/1989	17.0S	4336	MITCHELL B 007	O	Plugged	32.83281041	-103.7951012	3633395.506	612771.884	1.96
3002508038	CONOCOPHILLIPS COMPANY	12/7/2006	32E	G	19	5/30/1942	17.0S	3987	MCA UNIT 053	O	Plugged	32.82193469	-103.8037193	3632180.58	611978.878	1.97
3002539316	CONOCOPHILLIPS COMPANY		32E	N	26	4/21/2009	17.0S	4602	MCA UNIT 459	O	Active	32.80005885	-103.7413238	3629823.09	617848.719	1.97
3002500573	COG OPERATING LLC		32E	A	16		17.0S	4080	LEAKER CC STATE 008	O	Active	32.84003541	-103.7650759	3634228.974	615572.902	1.97
3002537023	FOREST OIL CORPORATION	4/13/2005	32E	E	32	3/25/2005	17.0S	5000	LEA LL STATE 004	O	Plugged	32.7920015	-103.7961237	3628870.055	612727.7	1.97
3002512762	CONOCOPHILLIPS COMPANY	3/21/2006	32E	C	30		17.0S	3975	MCA UNIT 106	I	Plugged	32.81273639	-103.8059011	3631158.484	611786.157	1.97
3002520425	FOREST OIL CORP	1/2/1900	32E	J	30	1/2/1900	17.0S	Not Reported	CARPER 001	O	Plugged	32.80471693	-103.8047733	3630270.586	611901.794	1.97
3002524057	CONOCOPHILLIPS COMPANY		32E	B	30		17.0S	4020	MCA UNIT 306	O	Active	32.80931414	-103.8057768	3630779.202	611802.08	1.97
3002500563	CHEVRON U S A INC	1/2/1900	32E	G	15	1/2/1900	17.0S	Not Reported	MALJAMAR GRAYBURG UNIT 076	O	Plugged	32.83548155	-103.7522123	3633738.244	616782.81	1.98
3002508023	CONOCO INC	1/2/1900	32E	P	18	1/2/1900	17.0S	Not Reported	MITCHELL B 012	I	Plugged	32.8291854	-103.7994133	3632989.016	612372.837	1.98
3002535814	COG OPERATING LLC		32E	J	19	1/28/2002	17.0S	7085	GC FEDERAL 001	O	Active	32.81898784	-103.8051083	3631852.401	611852.545	1.98
3002520588	HARVEY E YATES CO	1/2/1900	32E	O	30	1/2/1900	17.0S	10128	SOUTH MALJAMAR DEEP 001	O	Plugged	32.79927035	-103.802608	3629669.036	612111.367	1.99
3002523745	CONOCOPHILLIPS COMPANY		32E	J	19		17.0S	4060	MCA UNIT 285	O	Active	32.81657045	-103.8057883	3631583.673	611791.915	1.99
3002538620	COG OPERATING LLC		32E	B	16	4/2/2008	17.0S	7015	LEAKER CC STATE 011	O	Active	32.84095077	-103.7699837	3634325.099	615112.385	1.99
3002500709	CONOCOPHILLIPS COMPANY	1/13/2004	32E	K	26		17.0S		MCA UNIT 188	O	Plugged	32.8036824	-103.7392056	3630227.187	618042.267	1.99

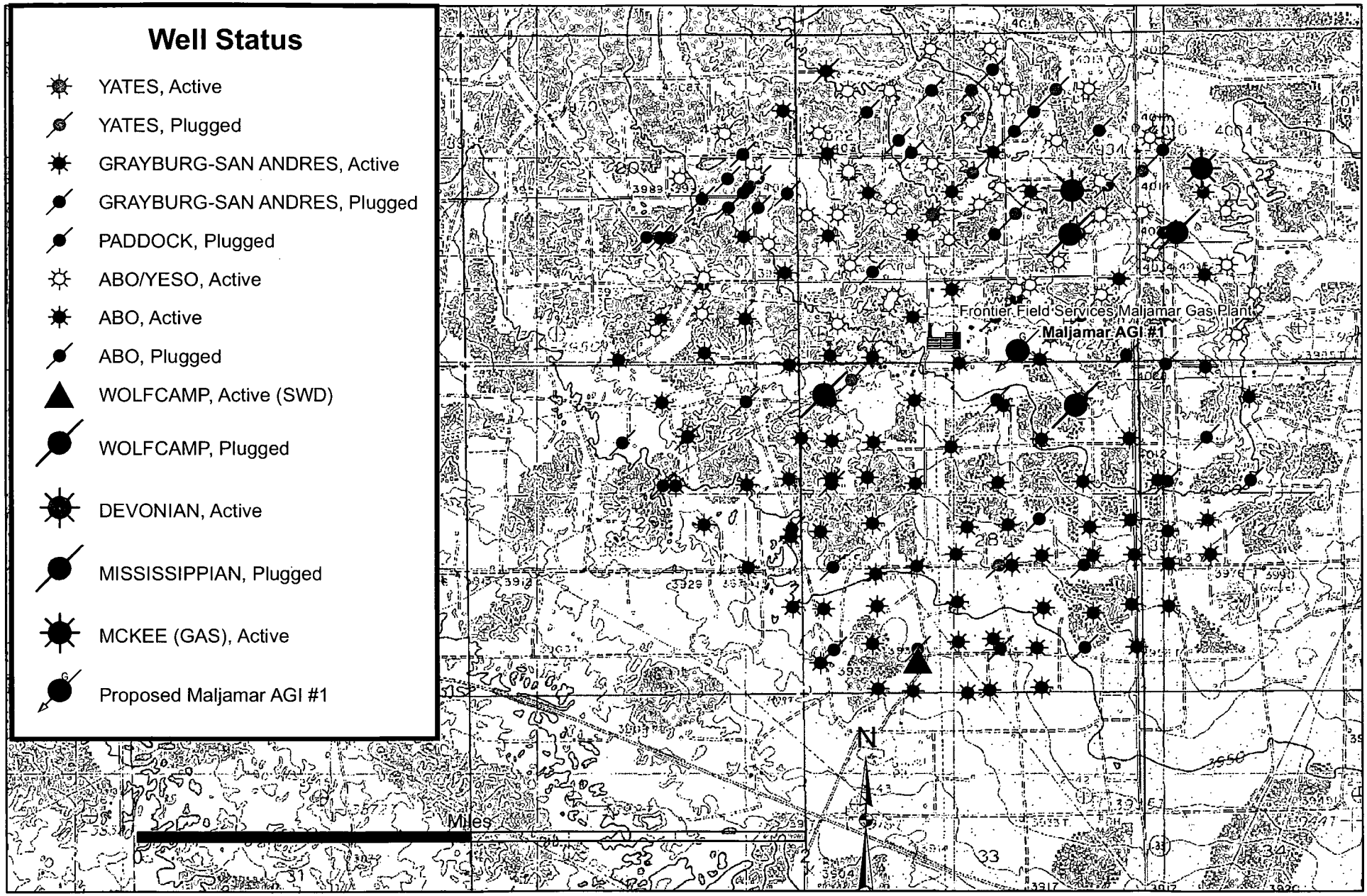


Figure C-2: Location and Status of Wells within One Mile of Proposed Maljamar AGI #1 Well

GEOLEX® INCORPORATED

FRONTIER field services, llc southern ute indian tribe

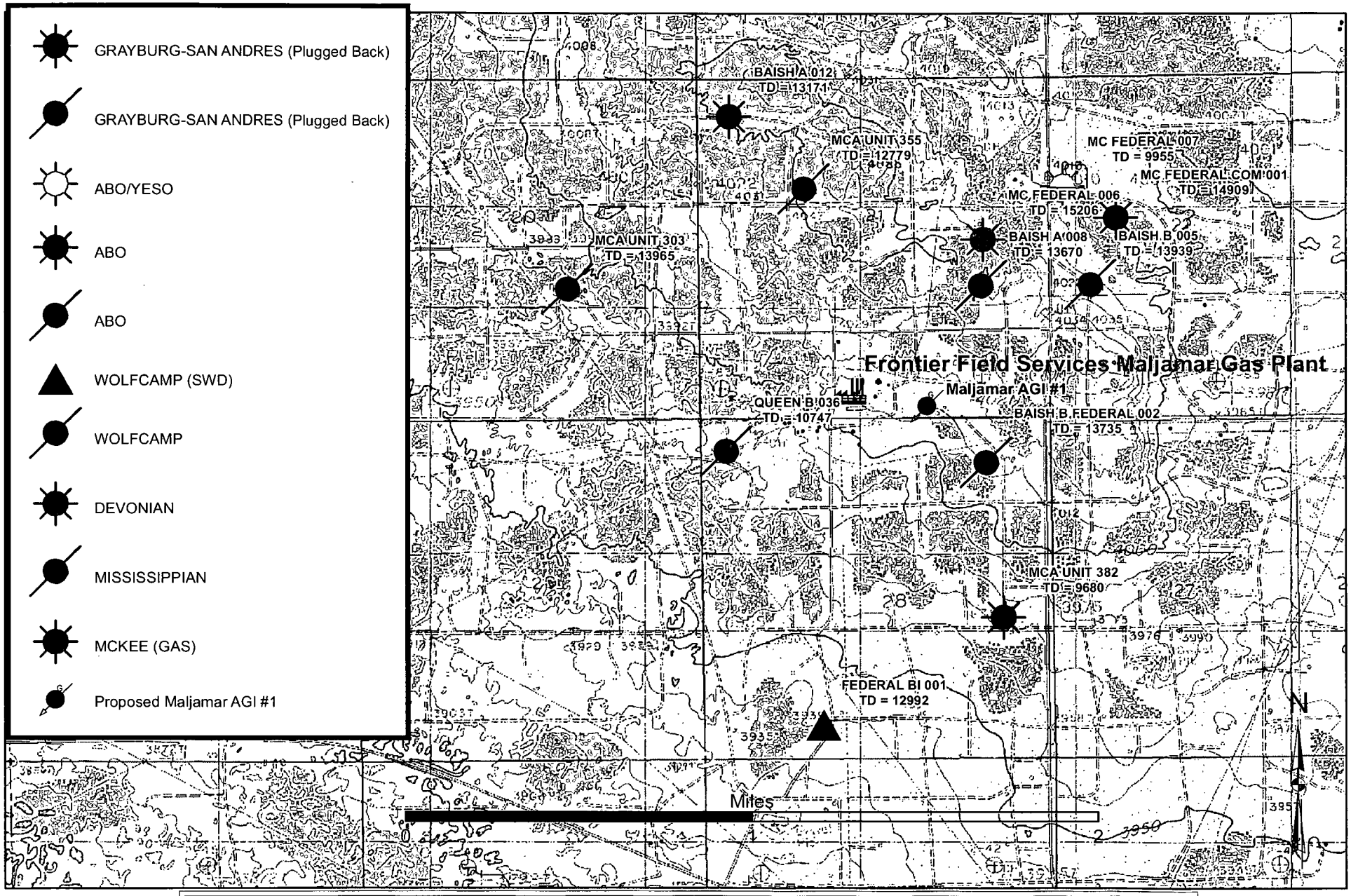
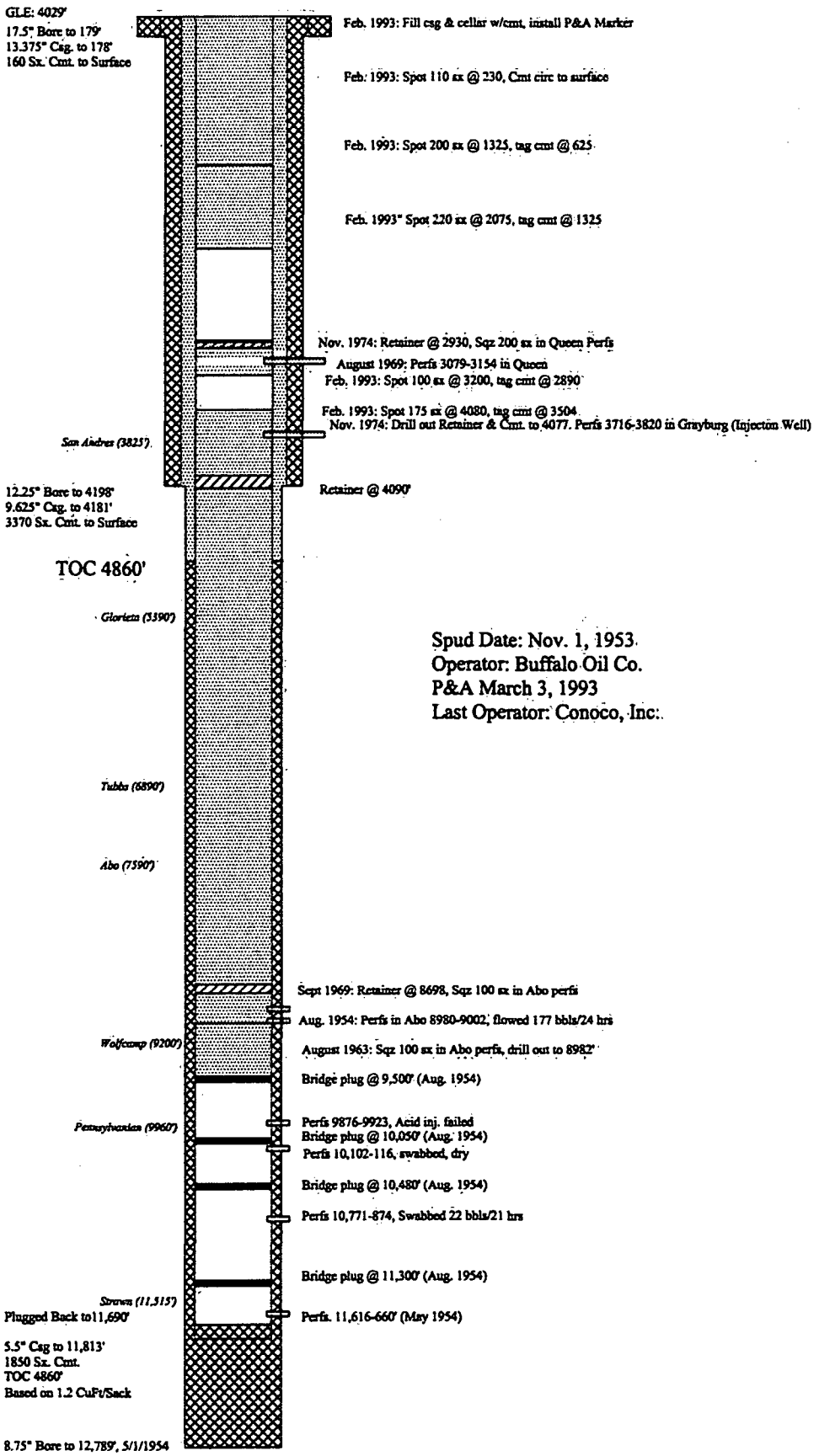


Figure C3: Location and Status of Deep (>9000') Wells within One Mile of Proposed Maljamar AGI #1 Well

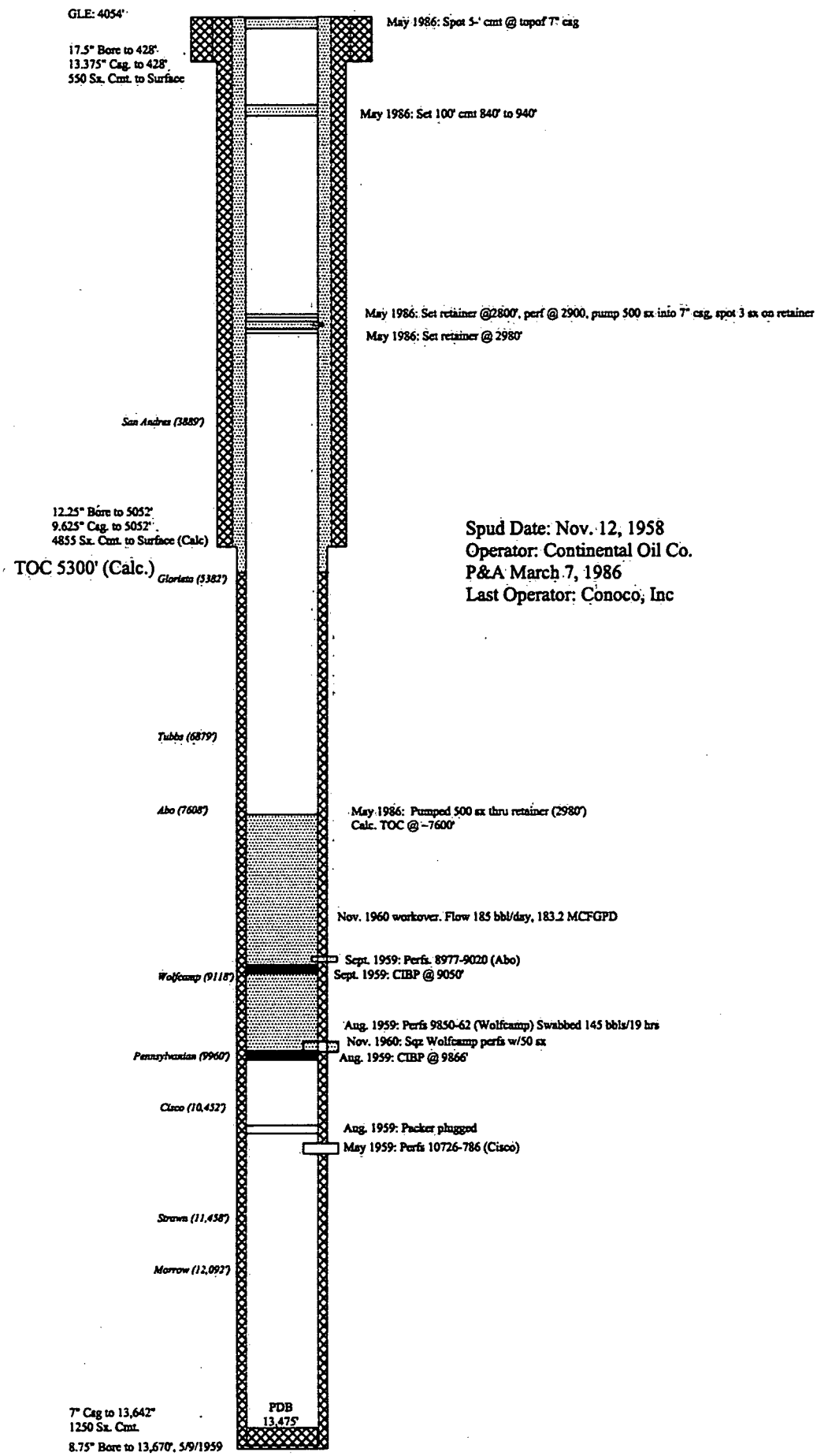
GEOLEX® INCORPORATED

FRONTIER field services, llc southern ute indian tribe

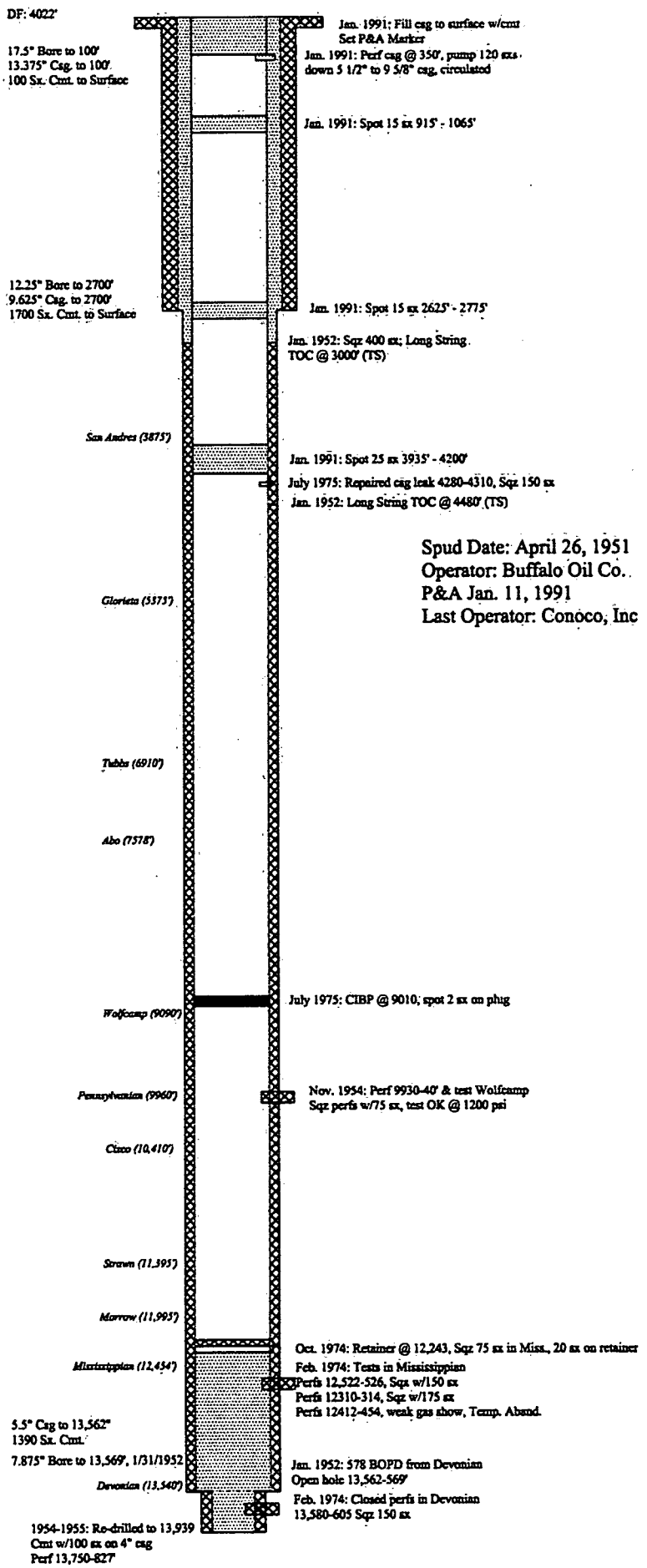
MCA Unit 355
API # 3002500614
1780' FNL 1780' FWL, Sec. 21, T17S R32E.



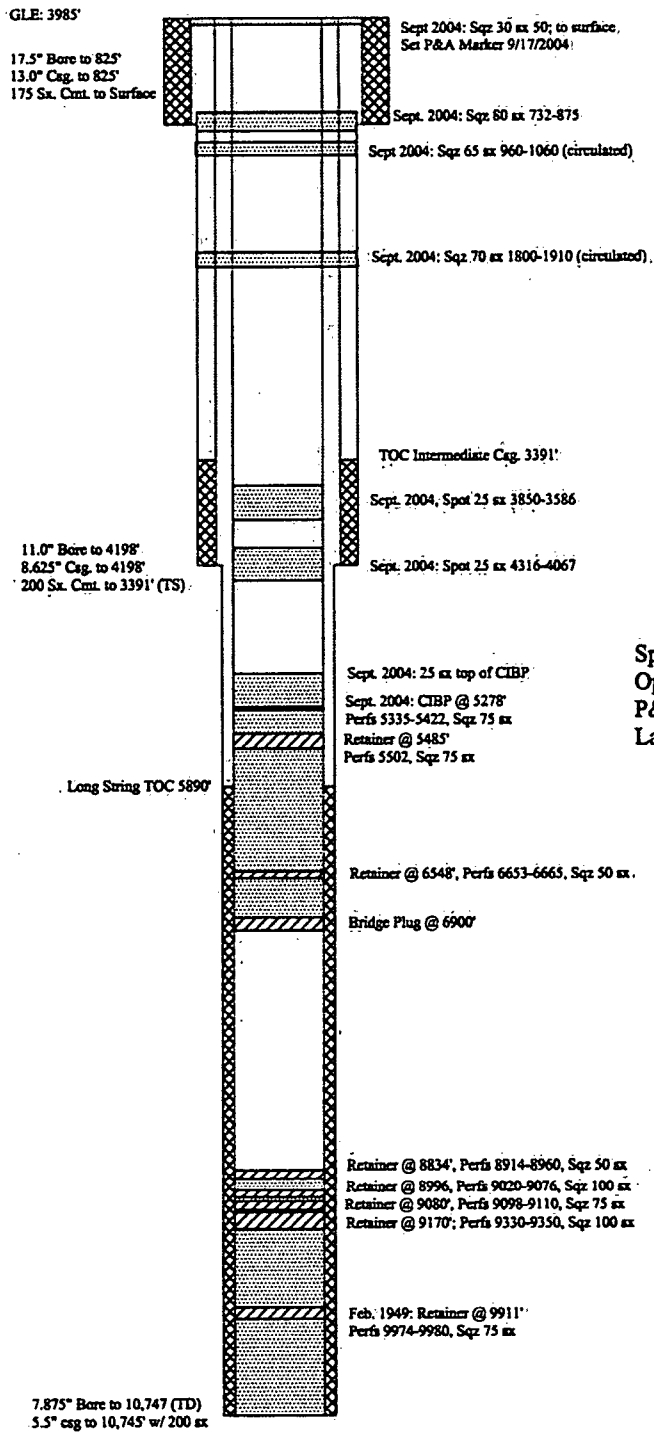
BAISH A 008
API # 3002500622
1980' FSL 810' FEL, Sec. 21, T17S R32E



BAISH B 005
API # 3002500634
1980' FSL 860' FWL, Sec. 22, T17S R32E

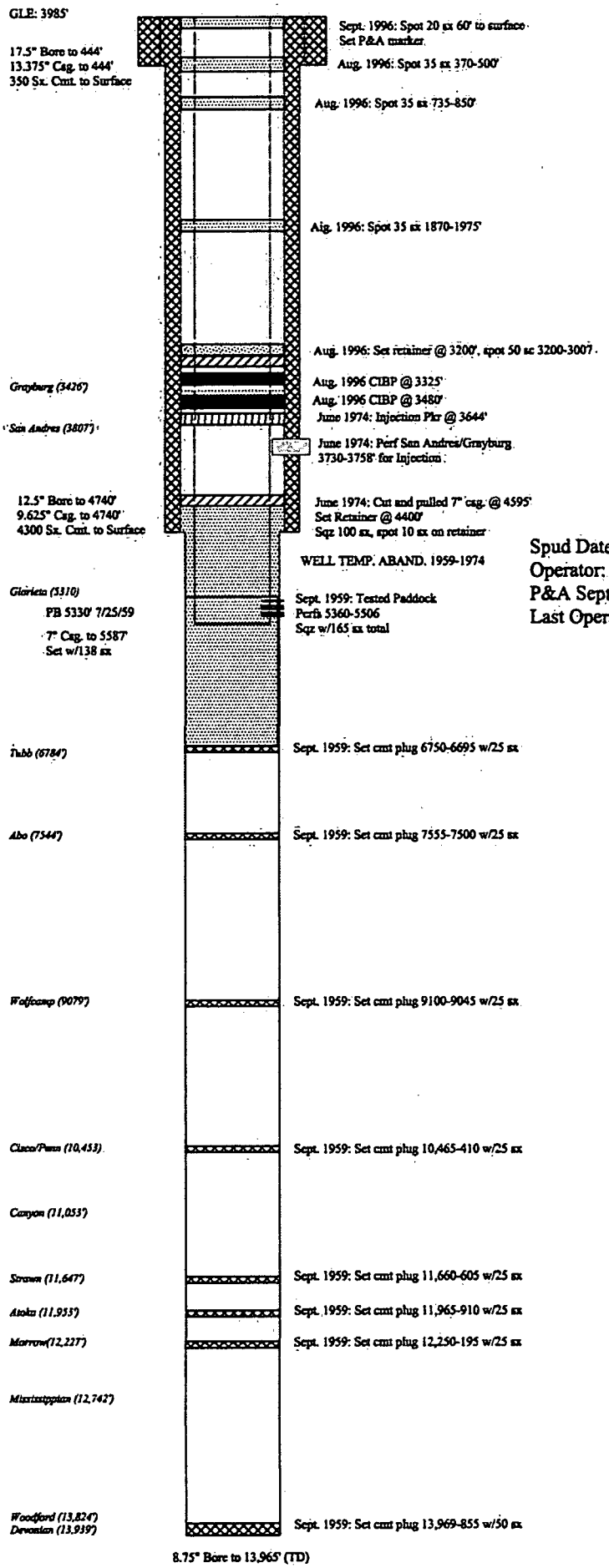


QUEEN B 036
API # 3002500751
554' FNL 554' FWL, Sec. 28, T17S R32E



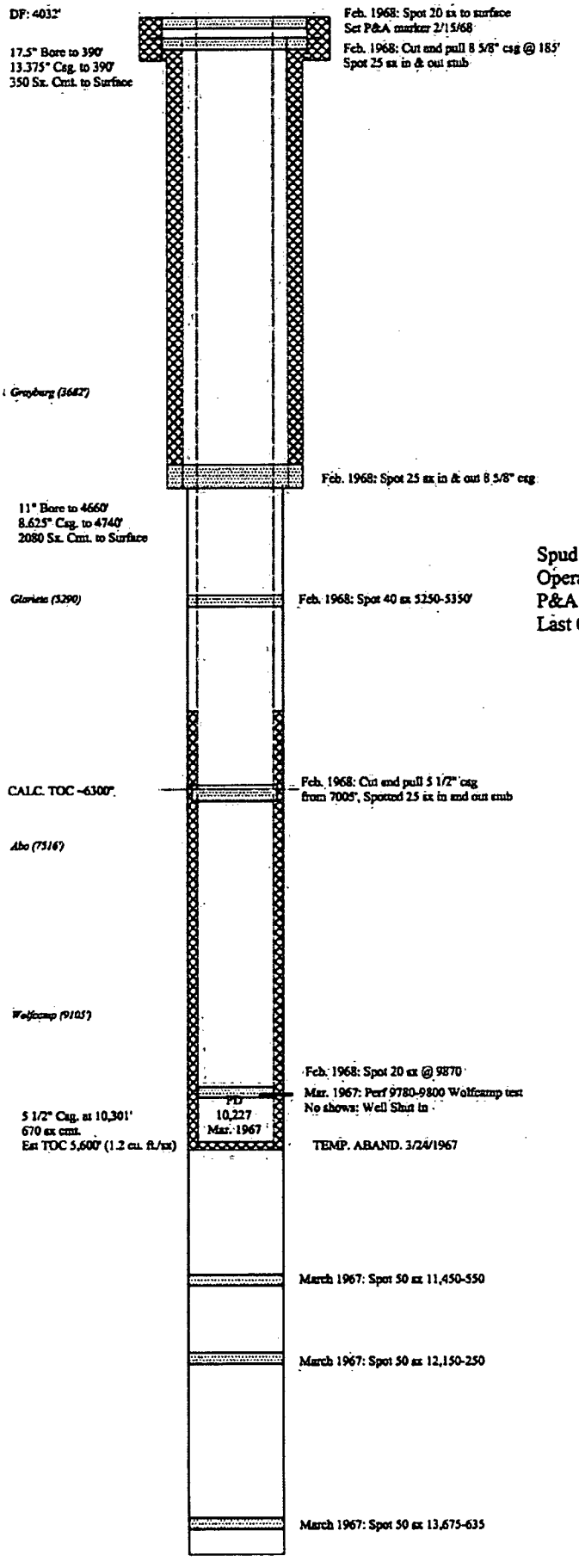
Spud Date: Sept. 20, 1948
Operator: Kewanee Oil Co.
P&A Sept. 17, 2004
Last Operator: ConocoPhillips Co.

MCA UNIT 303
API # 3002508053
1980' FSL 1830' FEL, Sec. 20, T17S R32E



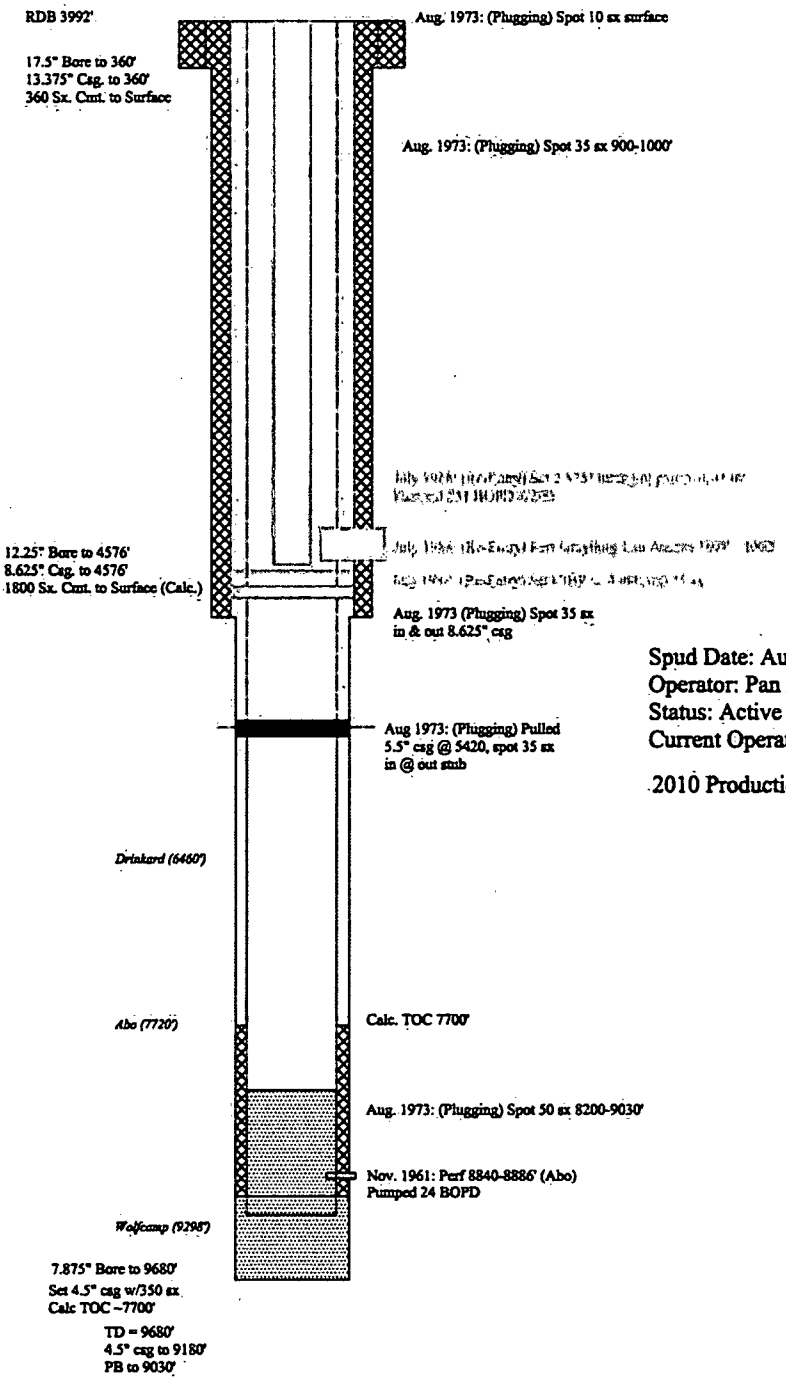
Spud Date: March 13, 1959
Operator: Continental Oil Co.
P&A Sept. 5, 1996
Last Operator: Conoco, Inc.

BAISH B FEDERAL 002
API # 3002521951
760' FNL 760' FEL, Sec. 28, T17S R32E



Spud Date: Dec. 20, 1966
Operator: Pan American Corp.
P&A Feb. 15, 1968
Last Operator: Pan American Corp.

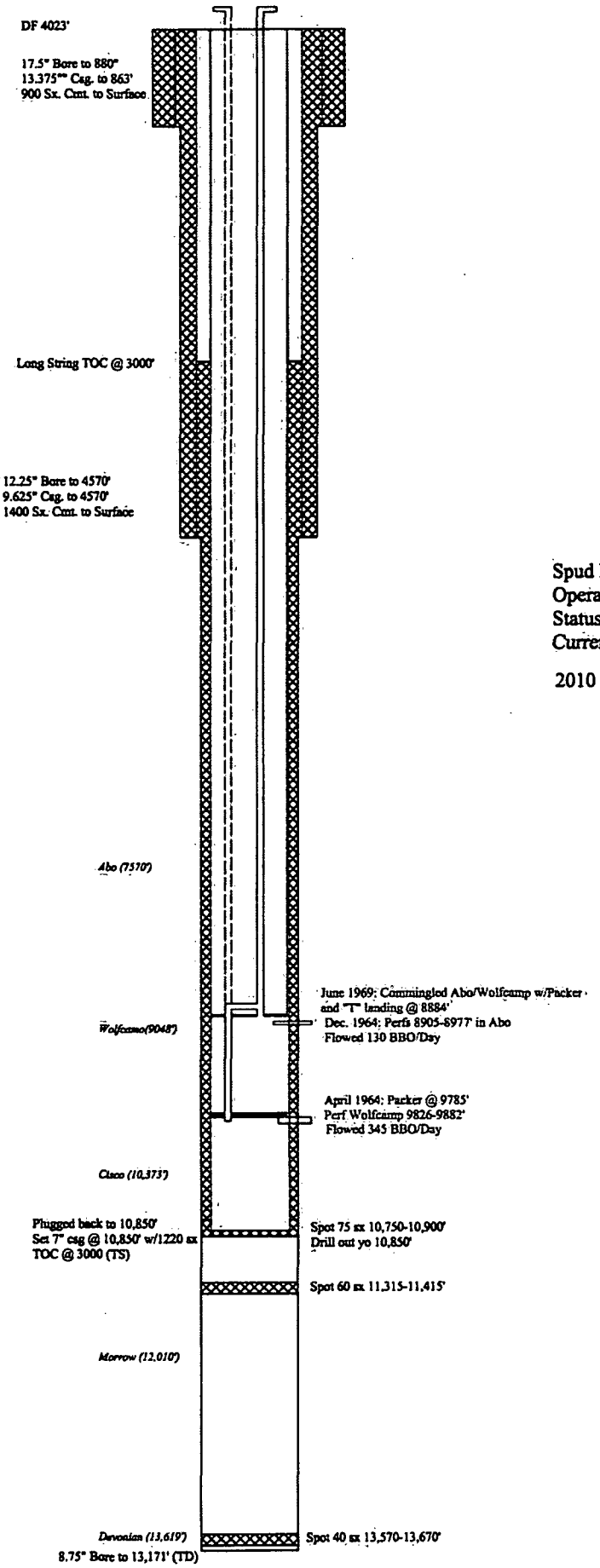
MCA UNIT 382
API # 3002500745
2120' FSL 519' FEL, Sec. 28, T17S R32E



Spud Date: Aug. 8, 1961
Operator: Pan American Petroleum Corp.
Status: Active
Current Operator: ConocoPhillips Co.

2010 Production: 1582 MMCFG, 1791 BBO

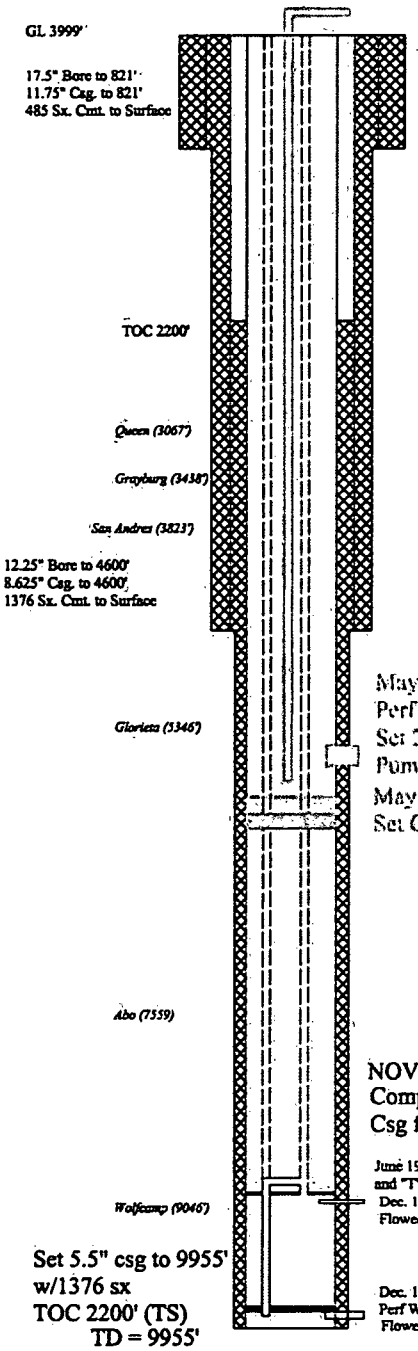
BAISH A 012
API # 3002520568
660' FNL 660' FEL, Sec. 21, T17S R32E



Spud Date: Nov. 22, 1963
Operator: Continental Oil Co.
Status: Active
Current Operator: COG Operating LLC

2010 Production: 4195 MMCFG, 1965 BBO

MC Federal 007 (Formerly BAISH A 013)
API # 3002520647
1780' FNL 460 FWL, Sec. 22, T17S R32E



Spud Date: Oct. 25, 1964
Operator: Continental Oil Co.
Status: Active
Current Operator: COG Operating LLC

2010 Production: 14865 MMCFG, 4443 BBO

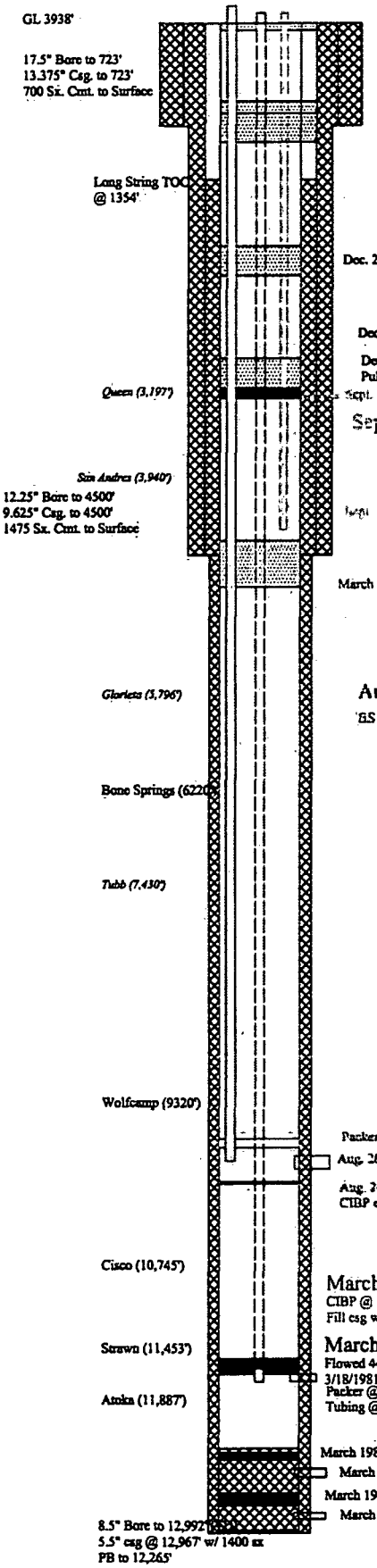
May 2002: Re-Entry
Perf Paddock 5448-5610'
Set 2.875" Tubing & pump to 5615'
Pumped 80 BBO/Day
May 2002: Re-Entry
Set CIBP @ 5950' w/35' cmt cap

NOV. 1992: WELL SHUT IN
Completion equip. removed, packer set @ ~8900'
Csg filled w/ packer fluid

June 1969: Commingled Abo/Wolfcamp w/Packer and "T" landing @ 8902'
Dec. 1964: Perfs 8918-8951' in Abo
Flowed 330 BBO/Day

Dec. 1964: Packer @ 9666'
Perf Wolfcamp 9797-9873'
Flowed 200 BBO/Day

Federal BI 001
API # 3002527068
480' FSL 1980 FWL, Sec. 28, T17S R32E



Dec. 2003: Sqz 25 sx 60' to Surface

Dec. 2003: Sqz 40 sx 673-773'

Dec. 2003: Pumped 25 sx 775-1023'

Dec. 2003: Spot 25 sx 1919-2173

Dec. 2003: Spot 25 sx 2882-3136'

Dec. 2003: P&A Well
Pulled tubing, set CIBP @ 3116'

Sept. 1993: Perf 3195-3223 (Queen)

Sept 1993: Re-Completed in Queen

Spud Date: Oct. 15, 1980
Operator: Amaco Production Co.
Status: Active/SWD
Current Operator: COG Operating LLC

2010 Injection: 1,424,890 BBLS (Avg. 3,904 BBLS/Day)

Sept. 1993: Squeeze w/ 4200 sx

March 1993: Spot 50 sx 4450' - 4850' (Temp Aband.)

August 2008: Well Re-Entered and Recompleted as SWD, injection Zone in the Wolfcamp

Packer @ 9600'

Aug. 2008: perf 9670-9875'

Aug. 2008: Clean out and test well
CIBP set @ 9975'

March 1993: Temp. Aband.
CIBP @ 11,590, 35' cmt on top'
Fill csg w/packer fluid

March 1981: Completed w/Perfs 11,636-648' (Strawn)
Flowed 446 BBO/Day
3/18/1981
Packer @ 11,588'
Tubing @ 11,620

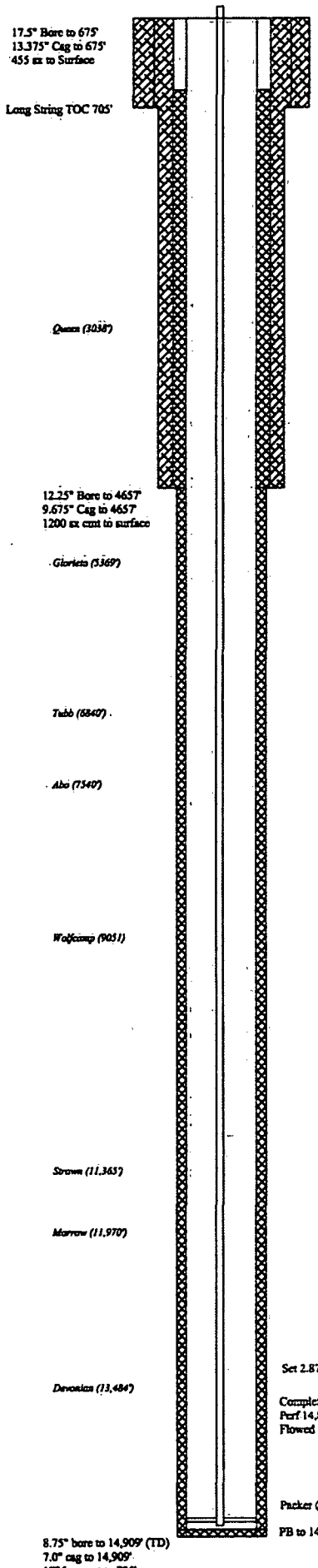
March 1981: CIBP @ 12,300' w/35' cmt top

March 1981: Perf 12,516-540' (Morrow) -no prod.

March 1981: CIBP @ 12,650'

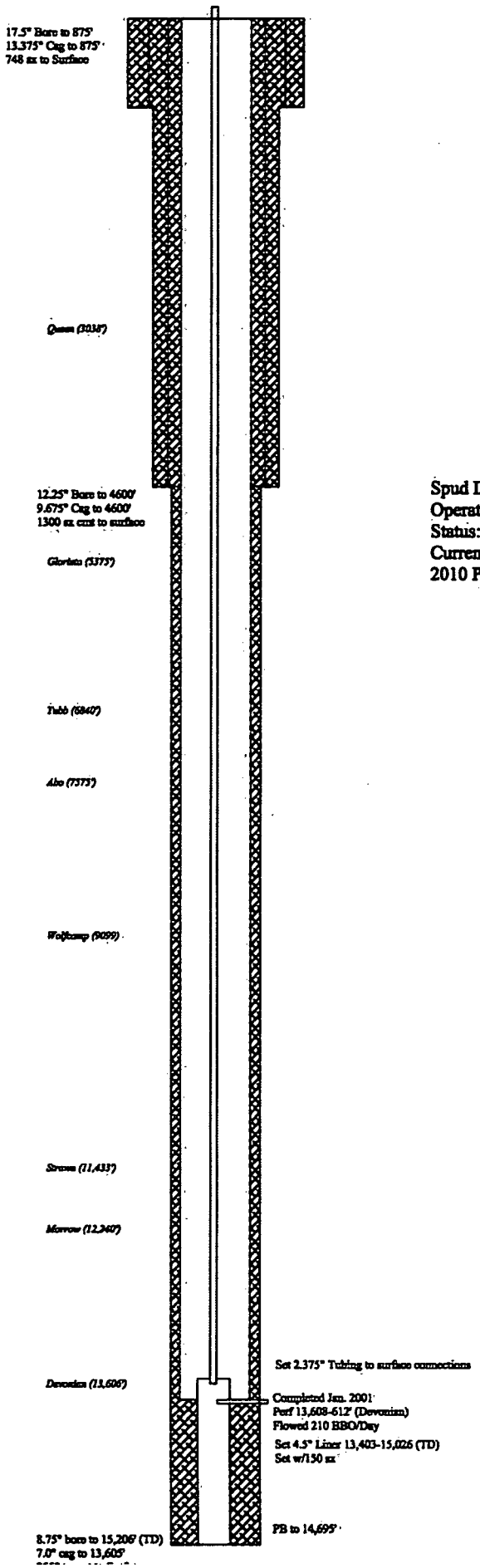
March 1981: Perf 12,668-702' (Morrow) -no prod

MC Federal 001
API # 3002534647
225' FNL, 1094' FWL, Sec. 22, T17S, R32E



Spud Date: June 19, 1999
Operator: Mack Energy Corp.
Status: Active
Current Operator: COG Operating LLC
2010 Production: 41,589 MMCFG, 596 BBO

MC Federal 006
API # 3002535252
2600 FNL,760' FEL, Sec. 21, T17S, R32E



Spud Date: Nov. 17, 2000
Operator: Mack Energy Corp.
Status: Active
Current Operator: COG Operating LLC
2010 Production: 3480 BBO

CD PLACEHOLDER

APPENDIX D

Identification of Operators, Surface Owners, Lessees, and other Interested Parties for Notices; Copies of Notice Letters and Certified Mail Receipts; Copy of Draft Public Notice for Hearing

TABLE D-1

OPERATORS WITHIN ONE MILE RADIUS OF PROPOSED MALJAMAR AGI #1

Conoco Phillips Company
3401 E. 30th Street
Farmington, NM 87402

Endurance Resources, LLC
15455 Dallas Parkway
Suite 600
Addison, TX 75234

TABLE D-2

SURFACE OWNERS ON WITHIN ONE MILE RADIUS OF PROPOSED MALJAMAR AGI #1

Section 15, Southwest Quarter (SW/4), 17 South, Range 32 East

Department of the Interior
Bureau of Land Management
301 Dinosaur Trail
Santa Fe, NM 87508

Surface Lessee:

LaDoyce & Olane Caswell
1702 Gillham
Brownfield, TX 79316

Section 16, South Half (S/2), 17 South, Range 32 East

Department of the Interior
Bureau of Land Management
301 Dinosaur Trail
Santa Fe, NM 87508

Surface Lessee:

LaDoyce & Olane Caswell
1702 Gillham
Brownfield, TX 79316

Section 17, South Half (S/2), 17 South, Range 32 East

Department of the Interior
Bureau of Land Management
301 Dinosaur Trail
Santa Fe, NM 87508

Surface Lessee:

LaDoyce & Olane Caswell
1702 Gillham
Brownfield, TX 79316

Section 20, ALL, 17 South, Range 32 East

Department of the Interior
Bureau of Land Management
301 Dinosaur Trail
Santa Fe, NM 87508

Surface Lessee:

LaDoyce & Olane Caswell
1702 Gillham
Brownfield, TX 79316

Section 21, North Half Northwest Quarter Northwest Quarter Southeast Quarter, (N/2 NW/4 NW/4 SE/4)

Mid America Pipeline Company LLC
Tax Department
P. O. Box 4018
Houston, TX 77210

Section 21, 19.08 acre tract in South part of Section 21 & North part of Section 28

Frontier Field Services LLC
1900 Dalrock Rd.
Rowlett, TX 75088

Section 21, ALL less & except the above 2 tracts

Department of the Interior
Bureau of Land Management
301 Dinosaur Trail
Santa Fe, NM 87508

Surface Lessee:

LaDoyce & Olane Caswell
1702 Gillham
Brownfield, TX 79316

Section 22, ALL, 17 South, Range 32 East

Department of the Interior
Bureau of Land Management
301 Dinosaur Trail
Santa Fe, NM 87508

Surface Lessee:

LaDoyce & Olane Caswell
1702 Gillham
Brownfield, TX 79316

Section 27, ALL, 17 South, Range 32 East

Department of the Interior
Bureau of Land Management
301 Dinosaur Trail
Santa Fe, NM 87508

Surface Lessee:

LaDoyce & Olane Caswell
1702 Gillham
Brownfield, TX 79316

Section 28, ALL, 17 South, Range 32 East

Department of the Interior
Bureau of Land Management
301 Dinosaur Trail
Santa Fe, NM 87508

Surface Lessee:

LaDoyce & Olane Caswell
1702 Gillham
Brownfield, TX 79316

Section 29, ALL, 17 South, Range 32 East

Department of the Interior
Bureau of Land Management
301 Dinosaur Trail
Santa Fe, NM 87508

Surface Lessee:

LaDoyce & Olane Caswell
1702 Gillham
Brownfield, TX 79316

Section 32, North Half (N/2), 17 South, Range 32 East

State of New Mexico
Commissioner of Public Land
310 Old Santa Fe Trail
Santa Fe, NM 87501-2708

Surface Lessee:

Williams & Son Cattle Company
P. O. Box 30
Maljamar, NM 88264

Section 33, North Half (N/2), 17 South, Range 32 East

Department of the Interior
Bureau of Land Management
301 Dinosaur Trail
Santa Fe, NM 87508

Surface Lessee:

LaDoyce & Olane Caswell
1702 Gillham
Brownfield, TX 79316

Section 34, North Half (N/2), 17 South, Range 32 East

Department of the Interior
Bureau of Land Management
301 Dinosaur Trail
Santa Fe, NM 87508

Surface Lessee:

LaDoyce & Olane Caswell
1702 Gillham
Brownfield, TX 79316

TABLE D-3

LEASE HOLDERS WITHIN ONE MILE RADIUS OF PROPOSED MALJAMAR AGI #1

V-F Petroleum Inc.
P. O. Box 1889
Midland, TX 79702

Section 15, Southwest Quarter (SW/4), 17 South, Range 32 East

Conoco Phillips Company
3401 E. 30th Street
Farmington, NM 87402

Section 15, Southwest Quarter (SW/4), 17 South, Range 32 East
Section 16, South Half (S/2), 17 South, Range 32 East
Section 17, Southeast Quarter (SE/4), 17 South, Range 32 East
Section 20, (ALL), 17 South, Range 32 East
Section 21, (ALL), 17 South, Range 32 East
Section 22, West Half (W/2), 17 South, Range 32 East
Section 27, ALL, 17 South, Range 32 East
Section 28, ALL, 17 South, Range 32 East
Section 29, ALL, 17 South, Range 32 East
Section 32, North Half (N/2), 17 South, Range 32 East
Section 33, North Half (N/2), 17 South, Range 32 East
Section 34, North Half (N/2), 17 South, Range 32 East

Cimerax Energy Company of Colorado
600 N. Marienfeld
Suite 600
Midland, TX 79701

Section 16, South Half (S/2), 17 South, Range 32 East;

COG Operating, LLC
550 W. Texas
Suite 1300
Midland, TX 79701

Section 16, South Half (S/2), 17 South, Range 32 East
Section 17, Southeast Quarter (SE/4), 17 South, Range 32 East
Section 20, (ALL), 17 South, Range 32 East
Section 21, (ALL), 17 South, Range 32 East
Section 22, West Half (W/2), 17 South, Range 32 East
Section 28, ALL, 17 South, Range 32 East
Section 29, ALL, 17 South, Range 32 East
Section 32, North Half (N/2), 17 South, Range 32 East
Section 33, North Half (N/2), 17 South, Range 32 East
Section 34, North Half (N/2), 17 South, Range 32 East

Endurance Resources, LLC
15455 Dallas Parkway
Suite 600
Addison, TX 75234

Section 32, North Half (N/2), 17 South, Range 32 East

Lynx Petroleum Consultants, Inc.
P. O. Box 1708
Hobbs, NM 88241

Section 15, Southwest Quarter (SW/4), 17 South, Range 32 East

TABLE D-3

LEASE HOLDERS WITHIN ONE MILE RADIUS OF PROPOSED MALJAMAR AGI #1

V-F Petroleum Inc.
P. O. Box 1889
Midland, TX 79702

Section 15, Southwest Quarter (SW/4), 17 South, Range 32 East

Conoco Phillips Company
3401 E. 30th Street
Farmington, NM 87402

Section 15, Southwest Quarter (SW/4), 17 South, Range 32 East
Section 16, South Half (S/2), 17 South, Range 32 East
Section 17, Southeast Quarter (SE/4), 17 South, Range 32 East
Section 20, (ALL), 17 South, Range 32 East
Section 21, (ALL), 17 South, Range 32 East
Section 22, West Half (W/2), 17 South, Range 32 East
Section 27, ALL, 17 South, Range 32 East
Section 28, ALL, 17 South, Range 32 East
Section 29, ALL, 17 South, Range 32 East
Section 32, North Half (N/2), 17 South, Range 32 East
Section 33, North Half (N/2), 17 South, Range 32 East
Section 34, North Half (N/2), 17 South, Range 32 East

Cimerax Energy Company of Colorado
600 N. Marienfeld
Suite 600
Midland, TX 79701

Section 16, South Half (S/2), 17 South, Range 32 East;

COG Operating, LLC
550 W. Texas
Suite 1300
Midland, TX 79701

Section 16, South Half (S/2), 17 South, Range 32 East
Section 17, Southeast Quarter (SE/4), 17 South, Range 32 East
Section 20, (ALL), 17 South, Range 32 East
Section 21, (ALL), 17 South, Range 32 East
Section 22, West Half (W/2), 17 South, Range 32 East
Section 28, ALL, 17 South, Range 32 East
Section 29, ALL, 17 South, Range 32 East
Section 32, North Half (N/2), 17 South, Range 32 East
Section 33, North Half (N/2), 17 South, Range 32 East
Section 34, North Half (N/2), 17 South, Range 32 East

Endurance Resources, LLC
15455 Dallas Parkway
Suite 600
Addison, TX 75234

Section 32, North Half (N/2), 17 South, Range 32 East

Lynx Petroleum Consultants, Inc.
P. O. Box 1708
Hobbs, NM 88241

Section 15, Southwest Quarter (SW/4), 17 South, Range 32 East

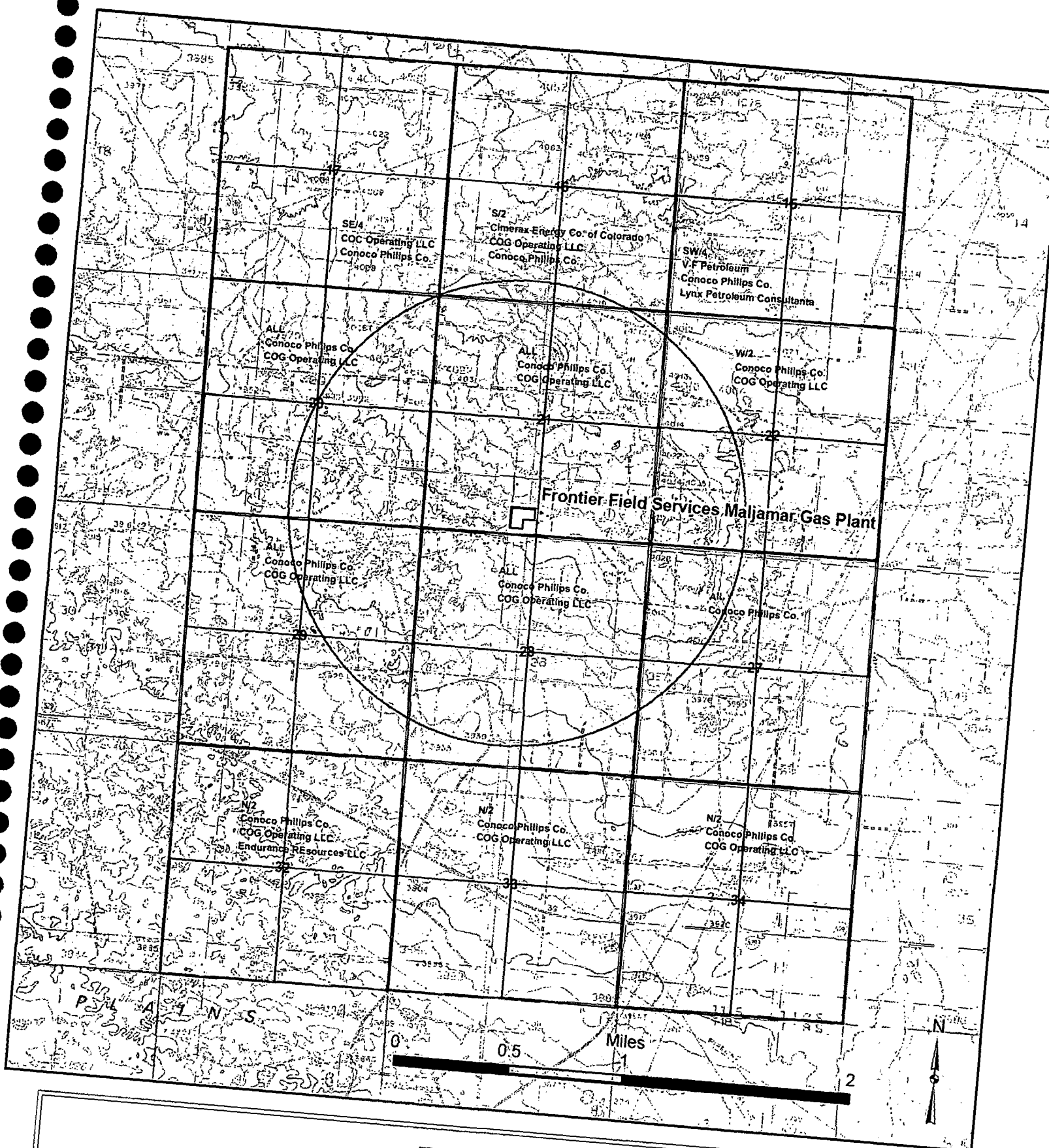


Figure D-1:
Lease owners within one mile of Proposed Maljamar AGI #1 Well

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CORPORATED

FRONTIER
field services, llc
southern ute indian tribe

TABLE D-4

BUSINESSES WITHIN ONE MILE RADIUS OF PROPOSED MALJAMAR AGI #1

Gas Processing Plant
Frontier Field Services, LLC
1900 Dalrock
Rowlett, TX 75088

Compressor Station (unmanned)
Mid America Pipeline Company, LLC
Tax Department
P.O. Box 4018
Houston, TX 77210

Conoco Philips Warehouse (unmanned)
Conoco Phillips Company
3401 E 30th Street
Farmington, NM 87402

May 15, 2011

Generic Notified Party
Mailing Address
City, State Zip Code

VIA CERTIFIED MAIL
RETURN RECEIPT REQUESTED

RE: Frontier Field Services, LLC Proposed Maljamar AGI #1

This letter is to advise you that Frontier Field Services, LLC ("Frontier") filed the enclosed application on May 15, 2011 with the New Mexico Oil Conservation Division ("NMOCD" or "the Division") seeking authorization to drill an Acid Gas Injection (AGI) well at the Frontier Gas Processing Plant near Maljamar, New Mexico. The proposed well will be located 130 feet from the South line and 1813 feet from the East line of Section 21, Township 17 South, Range 32 East, in Lea County. Frontier plans to inject up to 2MMCFD of acid gas from the Plant at a maximum pressure of 2973 psi into this well into the lower Wolfcamp Formation and possibly into the lower Leonard Formation, approximately 9300 to 10000 feet below the surface. The proposed well will serve as the disposal well for acid gas currently being flared at the Frontier Processing Plant.

This application has been set for hearing before a Division Examiner at 8am on June 23, 2011 in Porter Hall at the NMOCD's Santa Fe office located at 1220 South Saint Francis Drive, Santa Fe, New Mexico 87505. You are not required to attend this hearing, but as an owner of an interest that may be affected by Frontier's application, you may appear and present testimony. Failure to appear at that time and become a party of record will preclude you from challenging the application at a later date.

A party appearing at the hearing is required by the Division's rules to file a Pre-Hearing Statement with the NMOCD's Santa Fe office no later than one week prior to the hearing date. This statement must be served on counsel for Frontier and on all other parties and should include: your name and the name of your attorney, if any; a concise statement of the case; the names of all witnesses you will call to testify at the hearing; the approximate time you will need to present your case; and an identification of any procedural matters that need to be resolved prior to the hearing.

If you have any questions concerning this application, you may contact Mr. Alberto Gutierrez at (505) 842-8000 at Geolex, Inc. 500 Marquette Avenue NW, Suite 1350, Albuquerque, New Mexico 87102.

Sincerely,
Geolex, Inc.

Alberto A. Gutiérrez, C.P.G.
President
Consultant to Frontier Field Services LLC

Enclosure
AAG/lh
C:\ Projects\10-014\Reports\C-108\Notices\Final Frontier Notice Letter.docx

FRONTIER FIELD SERVIVICES, LLC
DRAFT PUBLIC NOTICE FOR HEARING

Case No. : Application of Frontier Field Services, LLC for authority to inject, Lea County, New Mexico. Frontier Field Services, LLC requests an order authorizing it to inject acid gas and carbon dioxide (CO_2) from the Maljamar Processing Plant into its proposed Maljamar AGI#1 well. The well will be located in Section 21, Township 17 South, Range 32 East, NMPM, in Lea County, New Mexico. Frontier Field Services seeks approval to drill and complete a well for injection of acid gas and CO_2 into the lower Leonard and Wolfcamp formations in injection intervals approximately from 9300 feet to 10000 feet, and approval of a maximum injection pressure of 2973 psi and a maximum daily injection rate of 2MMCFD. The proposed Maljamar AGI #1 will be located eight approximately three miles south of the town of Maljamar, New Mexico.

Chavez, Carl J, EMNRD

From: Chavez, Carl J, EMNRD
Sent: Tuesday, May 10, 2011 7:38 AM
To: 'aag@geolex.com'; VonGonten, Glenn, EMNRD
Cc: 'Prentiss, John'; 'Franzen, Matthew'; 'Julie W. Gutierrez'; Hill, Larry, EMNRD; Dade, Randy, EMNRD
Subject: RE: Submission of Frontier Field Services LLC Maljamar Gas Plant H2S Contingency Plan (GW-020)

Alberto:

Good morning.

The OCD is in receipt of the Maljamar Gas Plant H2S Contingency Plan and will notify Frontier if there are any questions.

The H2S Contingency Plan that Frontier submitted appears to meet the intent of the OCD regulations. OCD reserves the right to request modifications and/or changes as needed at a later date.

The OCD is currently awaiting the receipt of the Empire ABO Gas Plant H2S Contingency Plan (Eddy County).

Please contact me if you have questions. Thank you.

Note: Please be advised that OCD approval of this plan does not relieve Frontier Field Service, LLC of responsibility should their operations fail to adequately investigate and remediate contamination that pose a threat to ground water, surface water, human health or the environment. In addition, OCD approval does not relieve Frontier Field Service, LLC of responsibility for compliance with any other federal, state, or local laws and/or regulations.

Carl J. Chavez, CHMM
New Mexico Energy, Minerals & Natural Resources Dept.
Oil Conservation Division, Environmental Bureau
1220 South St. Francis Dr., Santa Fe, New Mexico 87505
Office: (505) 476-3490
Fax: (505) 476-3462
E-mail: CarlJ.Chavez@state.nm.us
Website: http://www.emnrd.state.nm.us/ocd/index.htm
"Why not Prevent Pollution; Minimize Waste; Reduce the Cost of Operations; & Move Forward with the Rest of the Nation?" To see how, go to "Pollution Prevention & Waste Minimization" at:
http://www.emnrd.state.nm.us/ocd/environmental.htm#environmental)

File: OCD Online (GW-020) "H2S Contingency Plan"

From: Alberto A. Gutierrez, RG [mailto:aag@geolex.com]
Sent: Monday, May 09, 2011 6:45 PM
To: VonGonten, Glenn, EMNRD; Chavez, Carl J, EMNRD
Cc: 'Prentiss, John'; 'Franzen, Matthew'; 'Julie W. Gutierrez'
Subject: Submission of Frontier Maljamar Rule 11 Plan

Glenn and Carl,

Enclosed you will find the revised H_2S contingency plan (consistent with Rule 11 requirements) for the Frontier Maljamar Gas Plant. The attached pdf includes the cover letter and the complete electronic copy of the plan and all figures and appendices. Two hard copies of the plan will be sent via registered mail to Daniel Sanchez tomorrow as well. This plan submission completes the requirement pursuant to Daniel's letter to Frontier dated March 1, 2011.

As we discussed in our meeting last month, we will shortly be submitting an AGI application (C-108) for a proposed AGI well at this facility. The enclosed H_2S contingency plan will remain unchanged until the AGI application is approved after review and hearing on the C-108. At that time the final design for the surface facilities associated with the well can be completed and a revised H_2S contingency plan which includes the well and surface compression facility will be submitted for review and approval prior to beginning operation. This is not anticipated for approximately one year after the AGI is approved and the well can be drilled and tested.

Please call me if you have any questions or wish to discuss this plan during your review. Thanks
Regards,
Alberto

Alberto A. Gutiérrez, RG
Geolex, Inc®
500 Marquette Avenue, NW Suite 1350
Albuquerque, NM 87102
505-842-8000 Ext. 105
505-842-7380 Fax

FRONTIER
field services, llc
southern ute indian tribe

RECEIVED
MAY 04 2011

May 10, 2011

Mr. Daniel Sanchez
Enforcement and Compliance Manager
NM Oil Conservation Division
1220 South St. Francis Drive
Santa Fe, NM 87505

VIA EMAIL and FIRST CLASS MAIL
RETURN RECEIPT REQUESTED

RE: SUBMITTAL OF FRONTIER FIELD SERVICES, LLC MALJAMAR GAS PLANT H_2S CONTINGENCY PLAN PURSUANT TO §19.15.11 et seq. NMAC

Dear Mr. Sanchez:

Pursuant to your letter of March 1, 2011 regarding the requirements under current OCD rules pertaining to H_2S under §19.15.11 et seq. NMAC we submitted our existing Rule 118 plan on March 17th and at that time informed you that we were already in the process of having Geolex, Inc.* revise our plan to be consistent with Rule 11 and our intent to submit it prior to your August 2011 deadline.

As mentioned in our letter of March 17, 2011 and in keeping with Frontier's commitment to safety and to operating in compliance with all applicable state, federal and local regulations, attached you will find the plan revised to conform to all requirements of NMOCD's Rule 11 (§19.15.11 et seq. NMAC). I trust that this submission brings Frontier Field Services, LLC up to date with all of NMOCD's rules relative to H_2S contingency planning.

If you have any questions or require additional information, please contact me at 575-706-6983 or Ms. Julie W. Gutiérrez at 505-842-8000.

Sincerely,
Frontier Field Services, LLC.

John Prentiss
Area Manager

Enclosure

cc: Carl Chavez, NMOCD Environmental Bureau
OCD District Office Hobbs
Richard Goodyear, NMED-AQB w/o enclosure

H_2S Contingency Plan

Frontier Maljamar Gas Processing Plant
1001 Conoco Road
PO Box 7
Maljamar, NM 88264
(575-676-3528)

May 10, 2011

TABLE OF CONTENTS

Page

I. Introduction
[API RP-55 7.1] 1

II. Scope
[API RP-55 7.2] 1

III. Plan Availability
[API RP-55 7.3] 1

IV. Emergency Procedures 2
[NMAC 19.15.11.9.B(2)(a)][API RP-55 7.4 a.]
A. Responsibilities and Duties of Personnel During an Emergency
B. Immediate Action Plan
C. Telephone Numbers and Communication Methods
D. Location of Residents, Roads, and Medical Facilities
E. Evacuation Routes, Emergency Evacuation Areas, and Road Block Locations
F. Monitoring Equipment, Alarm Systems, Safety Equipment, and Supplies

V. Characteristics of Hydrogen Sulfide (H_2S), Sulfur Dioxide (SO_2), and Carbon Dioxide (CO_2) [NMAC 19.15.11.9.B(2)(b)][API RP-55 7.4 b.] 13
A. Characteristics of Hydrogen Sulfide (H_2S)
B. Sulfur Dioxide (SO_2)
C. Carbon Dioxide (CO_2)
D. Radii of Exposure

VI. Facility Description, Maps, and Drawings
[AC [19.15.11.9.B(2)(c)][API RP-55 7.4 c.] 16
A. Maljamar Processing Plant Description of Operations
B. Map of Plant

VII. Training and Drills
[NMAC 19.15.11.9.B(2)(d)][API RP-55 7.4 d.] 17
A. Responsibilities and Duties of Essential Personnel
B. On-site or Classroom Drills
C. Notification and Training of Residents on Protective Measures in Emergency Situations
D. Training and Attendance Documentation
E. Briefing of Public Officials on Evacuation and Shelter in Place Plans

VIII. Coordination with State Emergency Plans
[NMAC 19.15.11.9.B(2)(e)] 18
A. Oil Conservation Division
B. New Mexico State Police

IX. Plan Activation
[NMAC 19.15.11.9.C][API RP-55 7.4 d.]..... 18
A. Activation Levels
B. Events that Could Lead to a Release

X. Submission of H_2S Contingency Plans
[NMAC 19.15.11.9.D]..... 19
A. Submission
B. Retention
C. Inventory

APPENDICES

Appendix A – Facility Maps and Drawings
Map A-1: Facility Map
Map A-2: Alarm and Monitor Locations
Map A-3: Safety and Fire Equipment Locations

Appendix B – Response Flow Diagrams

Appendix C – ROE Calculations
Map C-1: Facility ROE

Appendix D – Emergency Assembly Areas and Evacuation Routes
Map D-1: Evacuation Route and Emergency Assembly Area Locations

Appendix E – Distribution List

Location of Facility

1) **Frontier Field Services, LLC, Maljamar Gas Processing Plant**
The physical location of the Plant is in Section 21, Township 17S, Range 32E, Lea County, NM. The plant is approximately three miles south of the town of Maljamar, NM, in a very isolated area. Driving Directions to the plant are as follows: (1) At the Junction of Highway 82 and County Road 126 go south 2.6 miles and turn right onto Conoco Road and take first paved road south to the office. (2) At the Junction of Highway 529 and County Road 126 go north 1.9 miles and turn left onto Conoco Road and take first paved road south to the office.

The mailing address of the plant is:
1001 Conoco Road
P.O. Box 7
Maljamar, NM 88264

2) **The Maljamar Gas Plant Measurement Office on the Plant site (See Map A-1)** will serve as the Communication Center during the response to an H_2S release. If this location must be evacuated, the secondary staging area located at the intersection to Conoco Road and CR 126A (See Map A-1) will be used to direct activities, utilizing cell phones and company radios.

I. Introduction

[API RP-55 7.1]

The Frontier Field Services Maljamar Processing Plant is a natural gas processing plant which process field gas containing hydrogen sulfide (H_2S) and handles and/or generates sulfur dioxide (SO_2). This H_2S contingency plan was created to document procedures that are to be followed in the event of an H_2S release that occurs at the plant. This plan complies with the ***New Mexico Oil Conservation Division (OCD) Rule 11(§ 19.15.11 et. seq. NMAC)***. The plan and operation of the Maljamar Plant also conform to standards set forth in ***API RP-55 "Recommended Practices for Oil and Gas Producing and Gas Processing Plant Operations Involving Hydrogen Sulfide"***. The Maljamar Plant does not have any storage tanks in which hydrogen sulfide or other gas or gas products are stored, and thus, API regulations and OCD regulations (specifically 19.15.11.12.E NMAC) relative to those types of storage are not applicable for this plant.

II. Scope

[API RP-55 7.2]

This contingency plan is specific to the Frontier Maljamar Gas Processing Plant. It contains procedures to provide an organized response to an unplanned release from the plant and documents procedures that would be followed to alert and protect any members of the public, residents in surrounding areas and/or contractors working on or around the plant in the event of an unplanned release. This H_2S Contingency Plan has been prepared to minimize the hazard resulting from an H_2S release. It will be used to inform company personnel, local emergency responders and the public of actions to be taken before, during and after an H_2S release. All operations shall be performed with safety as the primary goal. The primary concern of Frontier Field Services Maljamar Gas Plant, during an H_2S release, is to protect Company employees, contractors and the public; the secondary concern is to minimize the damage and other adverse effects of the emergency. Any part of the operation that might compromise the safety of individuals will cease until the operation can be re-evaluated and the proper engineering controls to assure safety are implemented. No individual should place the protection of the Plant property above his or her own personal safety.

It must be kept in mind that in a serious situation involving a Hydrogen Sulfide (H_2S) release, not only Frontier Field Services personnel are involved, but local Fire Departments, Law Enforcement, County and even State of New Mexico agencies may be interested parties. Cooperation will expedite all decisions. In any emergency situation involving a H_2S release, delegation of duties will be made to appropriate employees and groups. These duties will be reviewed on an annual basis to ensure complete understanding which will facilitate a well-coordinated response by all involved personnel to the emergency situation.

III. Plan Availability

[API RP-55 7.3]

This contingency plan shall be available to all personnel responsible for implementing any portion of the plan (see Appendix E for distribution list). Copies of the plan will be distributed to the following agencies: OCD; New Mexico Department of Public Safety (DPS), Local Emergency Planning Committee (LEPC); Maljamar, Lovington, Artesia, Hobbs and Loco Hills, Fire Departments; New Mexico State Police Lea County District Office; Hobbs, Lovington and Carlsbad Sheriff's Offices. The Plan will be available at the following Frontier Field Services, LLC locations: Maljamar Processing Plant, Maljamar, NM; Frontier Field Services Main Office, 4200 Skelly Drive, Suite 700, Tulsa, OK 74135.

IV. Emergency Procedures
[NMAC 19.15.11.9.B(2)(a)] [API RP-55 7.4 a] [29 CFR 1910.1200]

A. Responsibilities and Duties of Personnel during an Emergency

Plant evacuation for all visitors and Plant personnel that are not operators begins with the 10 ppm H_2S intermittent alarm and/or flashing yellow beacon. The Plant operators will make a determination of the level of the incident as detailed below and will respond immediately, if required, by donning 30-minute Self Contained Breathing Apparatus (SCBA). They will determine if any personnel are in distress and will assist any distressed personnel to evacuate to a designated Emergency Assembly Area. Emergency services (911) will be contacted if there are injuries or as otherwise deemed necessary. At the sound of the alarm and/or upon observation of the flashing beacons, all other personnel in the Plant are to stop work, check the prevailing wind direction and immediately proceed along designated evacuation routes and/or upwind to the pre-designated Emergency Assembly Area(s) that are described in Appendix D.

Roll call shall be conducted at the Emergency Assembly Area to assure all personnel have evacuated safely. This facility requires that all visitors check in before entering the Plant, and thus the check-in sheet will be used at the Emergency Assembly Areas to make a full accounting of all personnel and visitors.

The Plant Manager or designee will serve as the Incident Commander (IC) and head of the Incident Command Team. The IC will bear the overall responsibility to see that objectives of the Plan are met and to insure the safety of the public and all personnel involved in the response. The IC will monitor all activities being carried out. Members of the Maljamar Plant Incident Response Team will keep him informed of conditions throughout the release emergency. The IC's role is to ensure control of the emergency incident. He will notify or delegate responsibility for notification of all Frontier or contract personnel and any civil authorities needed to respond to the incident. The IC will assign any additional personnel to support roles as needed. Upon notification or discovery of an H_2S release, the following steps will be initiated by the Frontier IC or designee:

1. Assume the role of Incident Commander (IC) and gather as much information as possible regarding the release of H_2S.
2. Alert other emergency response personnel of the potential hazard.
3. Arrange for support personnel to be sent to the location of the release.
4. Proceed to the site to assess emergency response actions needed
5. Set up an on-site command station
6. Implement the H_2S Incident Response Plan as necessary
7. Remain on site as IC until relieved or the incident is under control.

The following is a description of key personnel responsibilities during an Incident Response. Depending on the specific circumstances surrounding the release, a single individual may serve multiple roles for key personnel outlined below.

Incident Commander (IC).

a. Obtain initial incident briefing from on scene or prior IC, if available
b. Ensure the safety of all personnel involved in the response.
c. Assess the incident situation and develop appropriate strategies. Conduct site investigations as needed. Establish response priorities.
d. Conduct initial and ongoing briefings with IC staff..
e. Activate elements of the Incident Command System as required.
f. Ensure planning response meetings are conducted.
g. Keep Frontier Field Services line and senior management informed of response situation.
h. Manage all incident operations.
i. Ensure a Frontier Field Services media representative has approved all information releases prior to release or issue.

1. **Operations Section Chief.**
   a. Obtain briefing from IC.
   b. Ensure the safety of all personnel under Operations Section Chief supervision.
   c. Brief and assign operations personnel in accordance with Incident Response needs.
   d. Supervise operations; ensure personnel have the equipment, materials supplies and support needed to respond in a safe, efficient and effective manner.
   e. Determine Operations Section needs and request additional resources as necessary.
   f. Report information about special activities, events and occurrences to the IC.
   g. Ensure site security.

2. **Safety Officer**
   a. Obtain briefing from IC.
   b. Exercise emergency authority to stop and prevent unsafe acts.
   c. Apply for manpower, equipment and services necessary to ensure safe operations at all sites.
   d. Ensure hazard communications systems, including Material Safety Data Sheets (MSDS's), are in place at all involved field locations.
   e. Identify hazardous situations associated with the incident.
   f. Ensure all regulatory requirements as related to safety are satisfied.
   g. Ensure that employees and contractors entering the clean-up sites are properly briefed as to the dangers and precautions to be observed at the site. Ensure only those involved in the response are involved in the clean-up of hazardous materials; otherwise, review their training and qualifications.
   h. Determine the types of air monitoring equipment (direct reading, personal monitoring, etc.) necessary to support response operations.
   i. Participate in response planning meetings.
   j. Lead Incident Investigation Teams for any incident occurring during or after the emergency. Document and review findings with all team members

3. **Logistics Section Chief**
   a. Obtain briefing from the IC.
   b. Identify and provide logistics support for planned and expected operations.
   c. Coordinate and process requests for additional resources.
   e. Assist Officers and Section Chiefs from other functions in resources procurement.
   f. Advise on current service and support capabilities.

5. **Information Officer**
   a. Obtain briefing from IC.
   b. Establish a single incident information center whenever possible.
   c. Identify and communicate public, community, and media concerns to the IC.
   d. Respond to special requests for information.

6. **Planning Section Chief**
   a. Obtain briefing from IC.
   b. Reassign initial response and incident personnel into incident positions as needed.
   c. Assemble information on alternative strategies.
   d. Identify need for use of specialized resources.
   e. Advise IC staff of any significant changes in incident status.
   f. Distribute IC's orders and prepare plans for implementation.

7. **Other Employees**
   All employees on duty should be on standby awaiting instructions from the IC. They may be called on to provide support contacting vendors for supplies, contacting local support groups for assistance to the general public, provide onsite logistical support to the responders, blocking roads, assist with evacuations, etc.

No employee or contractor will be asked to provide incident scene support that they are not comfortable in their ability to perform or have not been specifically trained to perform.

B. Immediate Action Plan

1. The following outlines the Immediate Action Plan that is illustrated by the response flow diagrams included in Appendix B. The Immediate Action Plan is divided into three levels which are activated in response to increased severity of an unanticipated release of H_2S at the Plant. The following procedures are to be used when responding to an H_2S release. In the event of activation of an H2S alarm, the Plant Operator will assess the situation pursuant to Paragraph IV. A above and determine the appropriate level of response consistent with Immediate Action Plan. Additional or long-term response actions will be determined on a case-by-case basis, if needed, once the Incident Command Center (ICC) and System (ICS) are established following the immediate response.

Level	Alarms	Actions
I	Continuous audible alarm sounded and flashing blue lights activated for H_2S at 10 ppm or greater.	**1.** The audible signal for a Plant emergency and evacuation is a continuous siren alarm and a flashing red beacon. An H_2S alarm is activated and a blue light flashes when 10 ppm or greater are detected. The audible alarm and flashing blue lights are redundant systems which function independently of one another so that should one system fail, the other would remain active. These systems incorporate back-up battery capabilities as recommended in API RP 55 which insure their operation in the event of a power failure. A computer in the control room and in the Plant Operator's office establishes which H_2S monitor has activated the alarm and/or flashing blue beacon. At the initial sound of the intermittent alarm or the flashing blue beacon, assigned operator will assess the location of the alarm and make an initial determination of the cause of the alarm. The operator will attempt to rule out potential false alarms based on sensor malfunction or other conditions and if a release is detected, he will make a determination of prevailing wind and estimated magnitude of the release. If the cause of the release is a minor problem such as a packing or seal leak, the operator will take the necessary steps to correct the situation and eliminate the source of the release. If necessary, the operator will make a call to the supervisor on call for back-up. Once the operator has back-up they will put on a 30 minute self-contained breathing apparatus (SCBA). (There is one operator at the plant at all times, and at least 13 SCBA devices are located where they are accessible to the operator.) All other personnel in the Plant complex shall immediately evacuate the Plant and go to the closest Emergency Assembly Area (see Appendix D, Map D-1). The operators, using a buddy system will first help any persons in distress evacuate to the Emergency Assembly Area. If deemed necessary by the Plant Manager (IC) or Plant Supervisor, local emergency response service providers will be contacted by Plant personnel designated by the IC or Plant Supervisor. **2.** All entities within the 500 ppm radius of exposure (ROE) will be notified (by telephone) of a release if the audible alarm is activated at 10 ppm H_2S or greater. Notification will be done by personnel designated by the IC or his designee. The nature of the release and status of containment will be conveyed. Businesses will be advised to report the incident to employees working near the Plant and to alert any third party contractors or service companies working in the Plant vicinity or imminently scheduled to work in the vicinity of the release. All individuals will be instructed to leave the area and not to enter/re-enter area until further notice. There are no known residences within the 500 or 100 ppm ROE. The only businesses within the 100 ppm ROE are an unmanned compressor station owned by Mid America Pipeline Company and an unmanned Conoco Phillips Field Warehouse. In the event of an H_2S release, the Conoco Philips Field Warehouse will be contacted by Frontier personnel, and if individuals are present they will be advised either to evacuate to an Emergency Assembly Area or to shelter in place, as deemed appropriate by the IC. Frontier personnel will also make a visual inspection of the ROE area to insure that no individuals are seen inside the ROE, and if any are observed, they will be advised to immediately evacuate to the designated Emergency Assembly area, described above. **3.** Wearing the SCBAs, the operator(s) will attempt to fix the cause of the release. The H_2S levels at the Emergency Assembly Area will be monitored with a hand held or personal monitor. If H_2S levels in the Emergency Assembly Areas exceed 10 ppm H_2S, everyone will evacuate to an alternate Emergency Assembly Area, as designated by the IC (See Appendix D, Map D-1). **4.** The IC will set up secondary re-entry team(s) with 30 minute SCBAs to re-enter and resolve the situation. Re-entry will occur in 15 minute shifts at the direction of the IC until the problem is resolved or the emergency shutdown (ESD) is activated. If release is resolved and monitored levels in the Plant are less than 10 ppm H_2S, personnel may re-enter the Plant. The OCD shall be notified within four hours of any release that activates the Plan. If the release is not resolved and H_2S levels continue to increase, Level II Response is indicated.

Levels	Alarms	Actions
II	Continuous audible alarm sounded and flashing blue lights activated and H_2S greater than 20 ppm measured with handheld device	**1.** The continuous audible alarm and blue flashing lights indicate the detection of H_2S greater than or equal to 10 ppm and the operator(s) have been unable to stop the release of H_2S or level measured with handheld device exceeds 20 ppm. The audible alarm and flashing lights are redundant systems which function independently of one another so that should one system fail, the other would remain active. These systems incorporate back-up battery capabilities as recommended in API RP 55 which insure their operation in the event of a power failure. A control panel in the Process Control Room establishes which H_2S monitor has activated the alarm and or flashing blue beacon. If Level II Response is activated, operators will immediately put on 30 minute SCBAs, and all other personnel in the Plant complex will put on emergency escape packs (located throughout the plant) and evacuate using the evacuation routes to the Emergency Assembly Area specified by the IC or his designee (see Appendix D Map D-1). The operators, upon suit up with the SCBAs, will first help any persons in distress evacuate to the Emergency Assembly Area. See Section IV. F. (see Page12) for a listing of respirator equipment available at the Plant. If deemed necessary, local emergency response service providers will be contacted by the IC or his designee. **2.** All other entities within the 100 ppm ROE will be contacted by phone and notified of release and asked to evacuate. The nature of the release and status of containment will be conveyed. Depending on release status and prevailing wind conditions, some entities within the 100 ppm ROE may be asked to shelter in place rather than evacuate. Those entities will be instructed to close any windows and shut off any air conditioning/heating until further notice. In addition, they will be instructed to contact other employees/residents not currently present and instruct them not to enter/reenter the area until further instruction. **3.** The LEPC and law enforcement will be contacted by phone and notified of the release and status of containment. The IC will assign responsibility for notification to appropriate personnel. There are no known residences within the 100 ppm ROE. The only businesses are an unmanned compressor station owned by Mid America Pipeline Company and an unmanned Conoco Phillips Field Warehouse. In the event of an H_2S release, the Conoco Philips Field Warehouse will be contacted by Frontier personnel, and if personnel are present, they will be advised either to evacuate to an Emergency Assembly Area or to shelter in place, as deemed appropriate by the IC. Frontier personnel will also make a visual inspection of the ROE area to insure that no individuals are seen inside the ROE, and if any are observed, they will be advised to immediately evacuate to the designated Emergency Assembly Area as described above. **4.** Operator(s) with 30 minute SCBAs will assess the release and attempt to resolve it. If after 15 minutes on scene there is no resolution, the operator(s) will notify the Plant Manager to determine if the emergency shutdown (ESD) should be activated. **5.** If monitored H_2S levels at the Emergency Assembly Area exceed 10 ppm, everyone will evacuate to an alternate Emergency Assembly Area, as designated by the IC. **a)** Re-entry will occur in full SCBA and in 15 minute shifts at the direction of the IC until IC determines problem has been resolved or emergency shut downs (ESDs) are activated. **b)** If release is resolved and monitored levels of H_2S in the Plant are less than 10 ppm, personnel may return to Plant. The OCD shall be notified within four hours of any release that activates the Plan. All entities previously notified will be informed that the release has been resolved and advised of the current monitored H_2S levels at the Plant. **c)** No resolution requires activation of Level III Response with notifications and reporting as per Plan. If the release is not resolved and/or H_2S levels continue to increase, Level III Response is indicated. **5.** Initiate and maintain a Chronological Record of Events log.

Level	Alarms	Actions
III	Continuous audible alarm sounded and flashing blue lights activated for catastrophic release; red lights for fire or explosion ESD alarm is a continuous audible alarm with flashing red lights	**1.** Level III Response indicated in the event of a catastrophic release; fire; explosion; a continuous release of maximum volume for 24 hours; or NMAC 19.15.11: mandatory activation of indication of 100 ppm in any defined public area; 500 ppm at any public road; or 100 ppm at a distance greater than 3000 feet from the site or the release. If H_2S is at 20 ppm or greater and repair efforts at Level II have been unsuccessful, then a Level III response may be implemented at the discretion of the IC. Emergency Shutdown (ESD) procedures will immediately be implemented if a Level III Response is initiated. **2.** Road blocks will be set up at Conoco Rd and CR 126. (See Appendix D, Map D-1). **3.** All personnel shall have evacuated to a designated Emergency Assembly Area. Evacuation of all entities within the 100 ppm ROE will have been confirmed. Full H_2S Plan with all notifications and public agency involvement will be implemented. Notifications to all entities within the 100 ppm ROE will include the nature of the release and status of containment. Notifications will include but are not limited to the following: **a)** All businesses within the 100 ppm ROE will be instructed to immediately alert all company personnel, third party contractors and/or services companies working in the area, and those imminently scheduled to work in the area, of the release and evacuation status of the Plant. They will be instructed to immediately leave and/or not enter/reenter the area within the roadblocks until further instruction. **b)** All other entities within the 100 ppm ROE will be instructed to immediately shelter in place, if appropriate, based on the source of the release and the wind direction. Those entities will be instructed to close any windows and shut off any air conditioning/heating until further notice. In addition, they will be instructed to contact other employees/residents not currently present and instruct them to not enter/reenter the area until further instruction. **c)** The IC will make the decision based on, but not limited to, H_2S concentration and wind direction, whether a safe evacuation can be implemented, and recommend an evacuation route. There are no known residences within the 100 ppm ROE. The only businesses within the 100 ppm ROE are an unmanned compressor station owned by Mid America Pipeline Company and an unmanned Conoco Phillips Field Warehouse. In the event of an H_2S release, the Conoco Philips Field Warehouse will be contacted by Frontier personnel, and if personnel are there, they will be advised either to evacuate to an Emergency Assembly Area or to shelter in place, as deemed appropriate by the IC. Frontier personnel will also make a visual inspection of the 500 ppm ROE area to insure that no individuals are seen inside the ROE, and if any are observed, they will be advised to immediately evacuate to the designated Emergency Assembly area, described above. **4.** If escaping vapors have ignited, the vapors should be allowed to continue to burn unless the fire endangers personnel, other property, or other equipment. **5.** When applicable, maintain communication with the Plant Manager, or his designee, to keep him up-to-date of the situation and the action taken prior to his arrival at the location. **6.** Initiate and maintain a Chronological Record of Events log. **7.** Within one hour after the activation of the H_2S Plan, begin agency notifications by calling OCD and National Response Center (NRC). **8.** Establish media staging area adjacent to the Emergency Assembly Area and direct all media to it. **9.** Once resolved and monitored levels in the Plant and at Emergency Assembly Area are less than 10 ppm, roadblocks will be removed, and all entities within the 100 ppm ROE will be allowed to return. All entities previously notified will be informed that the release has been resolved and advised of the current monitored H_2S levels. **10.** Monitoring will continue after problems are abated, at the direction of the Plant Manager **11.** Agency reports to be submitted as required.

C. Telephone Numbers and Communication Methods

1. Emergency Services

AGENCY	TELEPHONE #
Lovington Fire Department	(575) 369-2359
Maljamar Fire Department	(575) 676-4100
Artesia Fire Department	(575) 746-5050
Hobbs Fire Department	(575) 397-9308
Loco Hills Fire Department	(575) 677-2349
Ambulance Services Hobbs	(575)397-9308
Artesia	(575) 746-5050
Carlsbad	(575) 885-2111
Lovington	(575) 396-2359
Hospitals	
Artesia General	(575) 748-3333
Carlsbad Medical Center	(575) 887-4100
Lovington-Nor Lea	(575) 396-6611
Hobbs- Lea Regional	(575) 392-6581
Lubbock University Medical Center (UMC) Level I Trauma Center	(806)775-8200
State Police (HMER) Eddy County	(575) 885-3137
Poison Control (Albuquerque)	(800) 222-1222
Helicopter Services	
Lifeguard (Albuquerque)	1-888-866-7256
Southwest Medivac (Hobbs)	1-800-971-4348
AeroCare (Lubbock)	1-800-823-1991
Air Med (El Paso)	(915) 772-9292

2. Government Agencies

AGENCY	TELEPHONE #
Oil Conservation Division, Santa Fe, NM (OCD) Oil Conservation District Office (Artesia) Air Quality Bureau, Santa Fe, NM	(505) 476-3440 (575) 748-1283 (505) 827-1494
US BLM (Carlsbad District Office)	(575) 887-6544
Local Emergency Planning Committee (LEPC)	(575) 887-9511
National Response Center (NRC)	1-800-424-8802

3. Operators and Contractors

COMPANY	SERVICE	CONTACT	PHONE
B&H Construction	Construction/Maint.	Mike Wright	505-887-9755
Cooper Cameron Valves	Valve Repair	Dean Bohannon	432-362-1151
Cubix Corp.	Emissions Testing	Marc McDaniel	512-243-0202
Desert X-Ray	X-Ray Services	Elic Brymer	432-363-0669
E. D. Walton Const.	Construction Services	Wade Lancaster	800-657-9190
Environmental Plus	Spill Remediation	Gabino Rosa	505-394-3481
Ferguson Const.	Construction Services	Mark Wieser	505-396-3689
Fite Fire & Safety	Safety Services	Tim Nolen	432-689-6492
Gandy Corp.	Oilfield Service	Larry Gandy	505-396-4948
Hanover Compression	Compression Service	Vicki Egan	281-447-8787

Hughes Services	Vacuum Service	Donnie Mathews	505-677-3113
Industrial Insulation	Insulation Service	Scott Fulton	432-332-8203
Kenemore Welding	Welding Service	George Kenemore	505-676-2332
Mark's Crane & Rigging	Crane Services	David Landreth	432-337-1538
Mobile Labs	Laboratory Service	Jenny Linley	432-337-4744
Permian Valve Repair	Valve Repair	Raymond Tucker	432-381-1313
Plant Maint. Services	Chemical Cleaning	Dale Carter	432-580-5900
BJ-Coiltec	Nitrogen Services	Stephen Baugh	432-683-1887
Smith & Son's	Construction Service	Randy Smith	505-397-1852
Southwest Safety	Safety Services	Scott Magness	505-392-8080
TWS, Inc.	Crane, Man Lift Service	Randy Gandy	505-398-3811

4. Public

N/A There are no residences within the 100 ppm ROE. The plant is located in a very isolated area.

5. Frontier Internal Call List

NAME	TITLE	Office #	Cell #	Home #
	Maljamar Plant Control Room	(575) 676-2400		
	24 Hour Emergency Number	(800) 503-5545		
Mike Hicks	President	(918) 388-8417	(918) 699-5738	
John Prentiss	Plant Manager/Incident Commander	(575) 676-3528	(575) 706-6983	(575) 885-1265
Joe Ysusi	Manager, Compliance Safety Officer	(575) 676-3505	(575) 706-9670	(575) 746-2213
Steve Maker	Operations Section Chief	(575) 676-3502	(575) 361-3108	(575) 396-3771
Rudy Lizardo	Maintenance Foreman, Planning Section Chief	(575) 676-3504	(575) 361-0135	(575) 396-3771
Jerry Wright	Measurement Foreman, Information Officer	(575) 676-3506	(575) 361-0154	(575) 396-5556
Joe Calderon	Field Foreman, Logistics Section Chief	(575) 676-3506	(575) 361-0148	(575) 885-3504

6. Frontier Field Services, LLC will use 2-way radios and telephones to communicate internally. Telephone will be used for external communication. Land lines and high speed internet access are available at the plant office.

D. Location of Nearby Residences, Roads, and Medical Facilities

1. There are no residences are located within the ROE of the Plant.

2. The following roads are located within the ROE:
   a) Various lease roads.
   b) Conoco Phillips Field Warehouse service roads
   c) Mid America Pipeline Compressor Station service roads

3. The following facilities are located within the ROE of the Plant:
   a) Mid America Pipeline Compressor Station
   b) Conoco Philips Field Warehouse
   The Mid America Compressor Station is an unmanned facility. The Conoco Philips Field Warehouse has no employees who regularly work at that facility. In the event of an H2S release, Conoco Philips will be contacted by Frontier personnel identified by the IC or his designee. If personnel are there, they will be advised to evacuate or shelter in place as deemed appropriate the IC.

4. There are no medical facilities located within the ROE.

5. In addition to notifying the facilities listed above, Frontier personnel will make a visual inspection of the ROE area to insure that no individuals are seen inside the ROE, and if any are observed, they will be advised to immediately evacuate to the designated Emergency Evacuation Area, described above.

E. Evacuation Routes, Emergency Assembly Areas, and Road Block Locations

1. The Maljamar Gas Plant Measurement office will serve as the Communication Center during the response to an H_2S release. If this location must be evacuated, the secondary staging area located at the intersection to Conoco Road and CR 126A will be used to direct activities, utilizing cell phones and company radios. Personnel not directly involved in the response will be instructed to refrain from using company mobile phones, hand held radios and telephones during a response.

2. Evacuation Routes and Emergency Assembly Areas are depicted on Map D-1 in Appendix D.

3. Pre-planned road block locations are designated near the Emergency Evacuation areas on County Road 126 and Conoco Road and are depicted on Map D-1 in Appendix D. Each location will have pre-positioned, portable road barriers with lights. The locations will have flashing lights and warning signs. The IC will designate a representative to staff each of the roadblocks. If deemed necessary by the IC, the State or Local Police will be asked to assist with maintaining the roadblocks.

F. Monitoring Equipment, Alarm Systems, Safety Equipment, and Supplies Available

1. EMERGENCY SHUTDOWN SYSTEM (ESD): There are 12 ESD manual stations located at various points in the facility. See Maps A-2 and A-3 in Appendix A. The Plant ESD can be activated at any time by any employee or at the direction of the IC. If a Level III Response is initiated, then ESD will immediately be activated.
When any one of the 12 manual stations is activated, the system will be shutdown and the natural gas inlets and outlets will be blocked. The operators are also able to auto close the one (1) main block valve on the incoming gas line to the Plant. Activating these should allow the plant to avoid a Level III response. The IC can send trained personnel to designated off-site manual block valves. There are also various methods to shut down gas flow at the various wellheads and incoming gathering lines. These can and would be evaluated on a case by case basis. Designated employees will have remote access to the plant controls including ESD capabilities.

2. PLANT ALARMS, VISIBLE BEACONS & WIND INDICATORS: Colored beacons, horns, and wind direction indicators are located in various locations throughout the Plant and are depicted in Appendix A on Map A-2.

Wind direction indicators are installed throughout the plant. At least one wind direction indicator can be seen at any location within the Plant complex, as well as from any point on the perimeter of the plant. There are 5 windsocks located at the Plant.

3. GAS DETECTION EQUIPMENT: The Plant uses Otis Notis Stand Alone fixed H_2S Sensors. These sensors are part of a fixed point monitoring system used to detect the presence of hydrogen sulfide in ambient air. The blue flashing beacon is activated at H_2S concentrations of 10 ppm or greater. The horn is also activated with a continuous alarm at H_2S concentrations of 10 ppm or greater. The fixed hydrogen sulfide monitors are strategically located throughout the Plant to detect an uncontrolled released of hydrogen sulfide. The Plant operators are able to monitor the H_2S levels of all the Plant sensors on the control monitor located in the control room. In addition, select employees can access this information remotely. These sensors are located on the plot plan in Appendix A, Maps A-2 and A-3. These sensors all have to be acknowledged and will not clear themselves. This requires immediate action for any occurrence or malfunction. The Plant sensors have battery backup systems and are calibrated monthly. Audible alarm systems are also calibrated monthly.

Handheld gas detection monitors are available to plant personnel to check specific areas and equipment prior to initiating maintenance or working on equipment. There are 4 handheld monitors and

each individual is assigned a personal H_2S monitor. The handheld gas detection devices are RKI GSX-2900 4-way monitors. The detectors have sensors for oxygen, LEL (lower explosive limit hydrocarbon atmospheres), hydrogen sulfide, and carbon monoxide. They indicate the presence of H_2S with a beeping sound at 10 ppm. The beeps change in tone as H_2S increases to 20 ppm. The personal monitors are set to alarm (beep) at 10 ppm with the beeps becoming closer together as the H_2S concentration increases to 20 ppm. Both the handheld and personal monitors have digital readouts of H_2S ppm concentration.

The compressor building has two methane sensors; one sends a call out at the 30% lower explosive limit (LEL); the second shuts the compressors down at 50% LEL. The methane sensors are visual and audible alarms. The compressor building also is equipped with fire eyes that will also shut the units down. The four product pumps also have LEL sensors.

4. RESPIRATORS: The facility has 13 Drager 30-minute self-contained breathing apparatus (SCBA) respirators and 6 Scott 5-minute escape packs strategically located throughout the Plant. There are also 2 emergency packs with supplied air lines distributed throughout the plant. The respirator locations are identified in Appendix A on Map A-2. All Plant personnel are certified to use the self-contained breathing apparatus (SCBAs) respirators and emergency packs.

5. FIRE FIGHTING EQUIPMENT: The Plant personnel are trained only for insipient stage fire fighting. The fire extinguishers located in the Plant process areas, compressor buildings, process buildings, and company vehicles are typically an Ansul 30# ABC dry chemical fire extinguisher. See Appendix A, Map A-3 for location. The Plant does not have a fire water system, only a utility water system that is not designed for fire fighting.

- 6. TRAFFIC CONTROL KIT: The Plant has a Traffic Control Kit located in the office which contains the necessary equipment to initiate and maintain traffic control.

7. FIRST AID EQUIPMENT LOCATIONS:
   a) First Aid Kits are located at the following locations:
   - Control Room
   - Office

   b) Eye Wash stations are located at the following locations:
   - Lab
   - Office
   - Engine Buildings, Maintenance Shop, Welding Shop

8. PERSONAL H_2S MONITORS: All Frontier personnel assigned to the Plant and associated field personnel are issued and required to use personal H_2S monitors while on duty.

10. SIGNS and MARKERS: The Plant has warning, caution and notice signs indicating the presence of "H_2S/Poisonous Gas" and high pressure gas at the entrance to the Plant. Emergency response phone numbers are posted at the entrance to the Plant. Signs are located at the Plant gate entrance indicating that all visitors are to sign in.

V. Characteristics of Hydrogen Sulfide (H_2S), Sulfur Dioxide (SO_2) and Carbon Dioxide (CO_2) [NMAC 19.15.11.9.B(2)(b)] [API RP-55 7.4 b.]

A. Hydrogen Sulfide (H_2S): Hydrogen Sulfide (H_2S): The proposed inlet gas streams into the Plant will contain a maximum of 1,800 ppm (or 0.18 mole percent) of hydrogen sulfide based on data generated from the sampling of the inlet gas at least daily. Hydrogen sulfide is a colorless, toxic and flammable gas, and has the odor of rotten eggs. Hydrogen sulfide gas is heavier than air. Hydrogen sulfide presents a significant health hazard by paralyzing the respiratory system resulting in serious injury or death.

Hydrogen Sulfide Properties and Characteristics	
CAS No.	7783-06-4
Molecular Formula	H_2S
Molecular Weight	34.082 g/mol
Ceiling Concentration	20 ppm (OSHA)
Ceiling Peak Concentration	50 ppm (OSHA)
Threshold Limit Value (TLV)	15 ppm (ACGIH)
Time Weighted Average (TWA)	10 ppm (NIOSH)
Short Term Exposure Level (STEL)	15 ppm (ACGIH)
Immediately Dangerous to Life or Health (IDLH)	100 ppm
Specific Gravity Relative to Air (Air=1.0)	1.189
Boiling Point	-76.5F
Freezing Point	-121.8F
Vapor Pressure	396 psia
Autoignition Temperature	518F
Lower Flammability Limit	4.3%
Upper Flammability Limit	46.0%
Stability	Stable
pH in water	3
Corrosivity	Reacts with metals, plastics, tissues and nerves

Physical Effects of Hydrogen Sulfide		
Concentration		
ppm	%	Physical Effects
1	0.00010	Can be smelled (rotten egg odor)
10	0.0010	Obvious & unpleasant odor; Permissible exposure level; safe for 8 hour exposure
20	0.0020	Acceptable ceiling concentration
50	0.0050	Loss of sense of smell in 15 minutes
100	0.0100	Immediately dangerous to life and health(IDLH) loss of sense of smell in 3-15 minutes; stinging in eyes & throat; Altered breathing
200	0.0200	Kills smell rapidly; stinging in eyes & throat
500	0.0500	Dizziness; Unconscious after short exposure; Need artificial respiration
700	0.0700	Unconscious quickly; death will result if not rescued promptly
1000	0.1000	Instant unconsciousness; followed by death within minutes

B. Sulfur Dioxide (SO_2): Sulfur dioxide is produced as a by-product of H_2S combustion at the flare. The flare unit receives the residual hydrogen sulfide and carbon dioxide stream that is routed from the amine unit. It is colorless, transparent, and is non-flammable, with a pungent odor associated with burning sulfur. Sulfur dioxide is heavier than air, but will be picked up by a breeze and carried downwind at elevated temperatures. Sulfur dioxide can be extremely irritating to the eyes and mucous membranes of the upper respiratory tract.

Sulfur Dioxide Properties & Characteristics	
CAS No.	7446-09-5
Molecular Formula	SO_2
Molecular Weight	64.07 g/mol
Permissible Exposure Limit (PEL)	5 ppm(OSHA)
Time Weighted Average (TWA)	2 ppm(ACGIH)
Short Term Exposure Level (STEL)	5 ppm(ACGIH)
Immediately Dangerous to Life and Health (IDLH)	100 ppm
Specific Gravity Relative to Air (Air = 1.0)	2.26
Boiling Point	14°F
Freezing Point	-103.9°F
Vapor Pressure	49.1 psia
Autoignition Temperature	N/A
Lower Flammability Limit	N/A
Upper Flammability Limit	N/A
Stability	Stable
Corrosivity	Could form an acid rain in aqueous solutions

Physical Effects of Sulfur Dioxide	
Concentration	**Effect**
1 ppm	Pungent odor, may cause respiratory changes
2 ppm	Permissible exposure limit; Safe for an 8 hour exposure
3-5 ppm	Pungent odor; normally a person can detect sulfur dioxide in this range
5 ppm	Short Term Exposure Limit (STEL); Safe for 15 minutes of exposure
12 ppm	Throat irritation, coughing, chest constriction, eyes tear and burn
100 ppm	Immediately Dangerous To Life & Health (IDLH)
150 ppm	So irritating that it can only be endured for a few minutes
500 ppm	Causes a sense of suffocation, even with first breath
1,000 ppm	Death may result unless rescued promptly.

C. **Carbon Dioxide (CO_2)**: The proposed inlet streams into the Plant will contain a maximum of 11,105 ppm (or 1.1105 mole percent) of carbon dioxide based on data generated from the sampling of the inlet gas at least daily. Carbon dioxide gas is colorless, odorless and non-flammable and is heavier than air.

Carbon Dioxide Properties & Characteristics	
CAS No.	124-38-9
Molecular Formula	CO_2
Molecular Weight	44.010 g/mol
Time Weighted Average (TWA)	5,000 ppm
Short Term Exposure Level (STEL)	30,000 ppm
Immediately Dangerous to Life and Health (IDLH)	40,000 ppm
Specific Gravity Relative to Air (Air = 1.0)	1.5197
Boiling Point	-109.12°F
Freezing Point	-69.81°F
Vapor Pressure	830 psia
Autoignition Temperature	N/A
Lower Flammability Limit	N/A
Upper Flammability Limit	N/A
Stability	Stable
pH in Saturated Solution	3.7
Corrosivity	dry gas is relatively inert & not corrosive; can be corrosive to mild steels in aqueous solutions

Physical Effects of Carbon Dioxide	
Concentration	**Effect**
1.0 %	Breathing rate increases slightly
2.0 %	Breathing rate increases to 50% above normal level. Prolonged exposure can cause headache, tiredness
3.0 %	Breathing rate increases to twice normal rate and becomes labored. Weak narcotic effect. Impaired hearing, headache, increased blood pressure and pulse rate
4 – 5 %	Breathing increases to approximately four times normal rate, symptoms of intoxication become evident, and slight choking may be felt
5 – 10 %	Characteristic sharp odor noticeable. Very labored breathing, headache, visual impairment, and ringing in the ears. Judgment may be impaired, followed within minutes by loss of consciousness
10 – 100 %	Unconsciousness occurs more rapidly above 10% level. Prolonged exposure to high concentrations may eventually result in death from asphyxiation

D. Radii of Exposure [NMAC 19.15.11.7.K]

The basis for worst case scenario calculations is as follows:

- The hydrogen sulfide content of the inlet natural gas stream into the Frontier Maljamar Gas Plant is variable, ranging up to 1800 parts per million (ppm) or 0.18 mole percent as determined from average daily inlet gas analyses.

- The plant has a maximum daily (24 hour) processing volume of 60 MMSCF.

- The worst case scenario ROE also assumes an uncontrolled instantaneous release of the entire 24-hour throughput from the inlet contactor at the facility. Because the Plant is a throughput process plant, it is impossible that the entire 24-hour throughput volume of the Plant could be released instantaneously as is assumed in the worst case scenario calculations of the ROE. However, to comply with NMAC 19.15.11, that assumption is the worst case scenario in the formulas and calculations are provided here and in Appendix C.

It should further be noted that the reason this rate, used as worst case, could not ever be released over a 24-hour period is the Plant's emergency shutdown (ESD) systems would be activated. The ESD would prevent the flow of gas into the Plant in the event of an emergency. Appendix C contains the ROE calculation and a map (C-1) showing the ROE around the Plant.

The formulas for calculating the 100 ppm and the 500 ppm radii of exposure are as follows:

100 ppm ROE Calculation (as per 19 NMAC 15.11.7.K.1):

$$X=[(1.589)(\text{hydrogen sulfide concentration})(Q)]^{(0.6258)}$$

500 ppm Radius of Exposure Calculation (as per 19 NMAC 15.11.7.K.2):

$$X=[(0.4546)(\text{hydrogen sulfide concentration})(Q)]^{(0.6258)}$$

Where:
X = radius of exposure in feet
"hydrogen sulfide concentration" = the decimal equivalent of the mole or volume fraction of hydrogen sulfide in the gaseous mixture
Q = Escape rate expressed in cubic feet per day (corrected for standard conditions of 14.73 psi absolute and 60 degrees Fahrenheit)

Amine Unit (Facility)	
500-ppm ROE	**862 feet**
100-ppm ROE	**1887 feet**

Both the 500 ppm and the 100 ppm radii of exposure for the facility are shown on Map C-1 of Appendix C. This ROE pattern is designed to include the 100 and 500 ppm radii for a potential worst case failure.

VI. Facility Description, Maps, and Drawings [NMAC 19.15.11.9.B(2)(c)] [API RP-55 7.4 c.]

A. Maljamar Processing Plant Description of Operations: The primary function of the plant is to remove H_2S and CO_2 from sour field gas so that the gas can meet pipeline specifications. The plant has been designated a primary Standard Industrial Classification (SIC) Code of 1311. The operation of the Frontier Maljamar Gas Plant is intended to process up to 60 MMSCFD of gas. The facility is authorized to

operate continuously (8760 hr/yr) at design maximum capacity processing rates with a cap of five tons per day of sulfur emissions. The gas is treated to remove acid gas components, dehydrated to remove water and processed to remove heavy (liquid) hydrocarbons from the gas stream. Several plant systems are involved in performing these functions.

The amine unit is designed to remove acid gas components (carbon dioxide, hydrogen sulfide and mercaptans) from the natural gas stream. These components are removed from the natural gas because they are corrosive, hazardous to health, and reduce the heating value of the natural gas stream. In addition, the carbon dioxide can freeze in the cryogenic unit forming dry ice and forcing the shutdown of the facility. This process is known as the gas sweetening process. The acid gas removed by the amine unit is routed to the flare for incineration.

Molecular sieve dehydration is used upstream of the cryogenic processes to achieve a -150°F dew point. The process uses two molecular sieve vessels with one vessel in service absorbing moisture from the gas stream and the other vessel in the regeneration mode. The cryogenic unit is designed to liquefy natural gas components from the sweet, dehydrated inlet gas by removing work (heat) from the gas by means of the turbo expander. The cryogenic unit recovers natural gas liquids (NGL) by cooling the gas stream to extremely cold temperatures (-150°F) and condensing components such as ethane, propane, butanes and heavier hydrocarbons. Once the sweet, dry gas (essentially 100 % methane) exits the cryogenic unit, it needs to be recompressed to approximately 600 - 700 psi before the gas is sent to the main transportation pipeline. This is accomplished with one 2500 horsepower electric drive compressor and two combined 2300 horsepower gas driven compressors.

B. Map of Plant

See Appendix A, Map A-1

VII. Training and Drills
[NMAC 19.15.11.9.B(2)(d)] [API RP-55 7.4 d]

A. Responsibilities and Duties of Essential Personnel

Please See Section IV. Emergency Procedures (Page 2) for a detailed listing of responsibilities of essential personnel during a response. Personnel responsible for implementing this plan shall be trained on their duties and responsibilities related to this plan during the annual on-site or table top training exercises. All Plant personnel, visitors, and contractors must attend a Plant overview orientation prior to obtaining permission to enter the Plant. A refresher course on this training is required annually for all persons. This training also complies with the requirements of the Frontier Field Services, LLC Corporate Safety Program.

B. On-site or Classroom Drills

Frontier Field Services, LLC may use table top exercises as well as hands-on emergency response training methods. Training and drills in emergency response procedures help ensure personnel are adequately prepared to handle most emergency situations. Frontier personnel will be trained on the H_2S Incident Response Plan and procedures annually. Everyone's role and responsibilities will be covered. The need for emergency preparedness will be emphasized through the use of drills and other exercises that simulate an emergency in which personnel perform or demonstrate their roles in the emergency. These drills can be either "table-top" discussions or realistic drills in which equipment will be deployed and contractors will participate. Frontier Field Services, LLC shall conduct a table top exercise annually at a minimum.

C. Notification and Training of Others on Protective Measures in Emergency Situations

At the time of submission of this plan there are no residences within the 100 ppm ROE. However, in the event of a release, Frontier personnel will make a visual inspection of the ROE area to insure that no individuals are seen inside the ROE, and if any are observed, they will be advised to immediately

evacuate to the designated Emergency Evacuation Area. Businesses located within the 100 ppm ROE include an unmanned Mid America Pipeline Company Compressor Station and a Conoco Phillips Field Warehouse. The Conoco Phillips Warehouse has no employees who regularly work at that facility. Conoco Philips personnel will, however, be invited to participate in and/or observe annual drills where they will be briefed on notification, evacuation and shelter in place plans such as shutting off any air conditioning/heating units until they are notified that it is safe. The Conoco Philips Field Warehouse will be contacted by Frontier personnel in the event of a release.

D. Training and Attendance Documentation

All training and drills will be documented. Documentation of the training, drills and reviews will be on file at the Frontier Field Services office at the Maljamar Plant Documentation shall include sign in sheets, synopsis of the training conducted, and an after action review of the training.

E. Briefing of Public Officials on Evacuation and Shelter in Place Plans

Local law enforcement, first responders, and fire personnel will also be invited to participate and/or observe annual drills, as well as being briefed on notification, evacuation, and shelter in place plans.

VIII. Coordination with State Emergency Plans

[NMAC 19.15.11.9.B(2)(e)]

A. Oil Conservation Division (OCD)

OCD will be notified with an automatic email to the District II office advising of the activation of the H_2S Contingency Plan if any of the alarms are activated at 10 ppm H_2S or greater. In the event of a power failure, a phone call will be made within four hours. All subsequent paperwork will be filed in a timely fashion.

B. New Mexico State Police/ New Mexico Hazardous Materials Emergency Response Plan

The New Mexico State Police are responsible for overall scene management and coordination of all resources. A designated Emergency Response Officer (ERO) will establish the National Interagency Incident Management System (NIIMS) Incident Command System (ICS) as the Incident Commander (IC) and be responsible for management of all response resources on scene. Off-scene coordination of response resources will be handled through designated Headquarters Emergency Response Officers. Law enforcement-related activities will be coordinated by State Police.

IX. Plan Activation

[NMAC 19.15.11.9.C] [API RP-55 7.4 d]

A. Activation Levels

Level I– Continuous audible alarm sounded and/or flashing blue beacons activated for H_2S greater than or equal to 10 ppm

Level II – Continuous audible alarm sounded and/or flashing blue beacons activated for H_2S greater than or equal to 10 ppm and H2S release unable to be resolved or level of H2S in excess of 20 ppm measured with handheld detection devices.

Level III–Catastrophic release; fire; explosion; a continuous release of maximum volume for 24 hours; or NMAC 19.15.11: mandatory activation of indication of 100 ppm in any defined public area; 500 ppm at any public road; or 100 ppm at a distance greater than 3000 feet from the site or the release.

B. Events that Could Lead to a Release of H_2S

- Inlet and plant piping failure
- Amine still failure
- Flange/gasket leaks on inlet and plant piping
- Valve packing
- Failure of flare to ignite

X. Submission of H_2S Contingency Plans [NMAC 19.15.11.9.D]

A. Submission

1. Frontier Field Services, LLC has submitted this H_2S Contingency Plan to the OCD.

B. Retention

1. Frontier Field Services, LLC shall maintain a copy of the contingency plan at the Maljamar Gas Plant and at Frontier Field Services Headquarters office in Tulsa Oklahoma. The plan shall be will be submitted to the OCD and will be readily accessible for review by the OCD at the facility upon request.

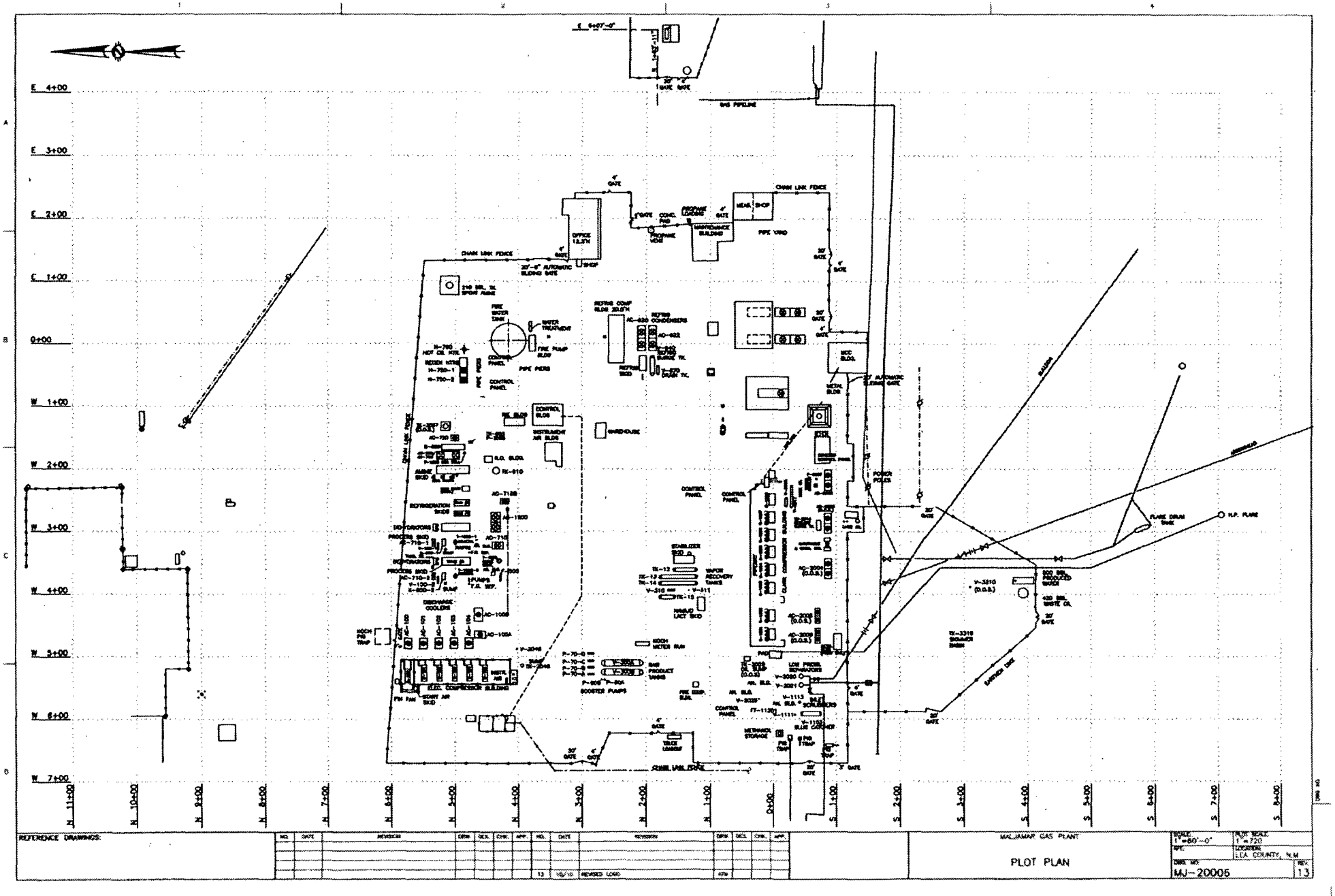
C. Inventory

1. Frontier Energy Company will file an annual inventory of wells, facilities and operations for which plans are on file with the OCD, to the Local Emergency Planning Committee (LEPC) and the State Emergency Response Commission as per NMAC 19.15.11.
2. The inventory shall include the name, address, telephone number, and point of contact for all operations in which plans are on file.

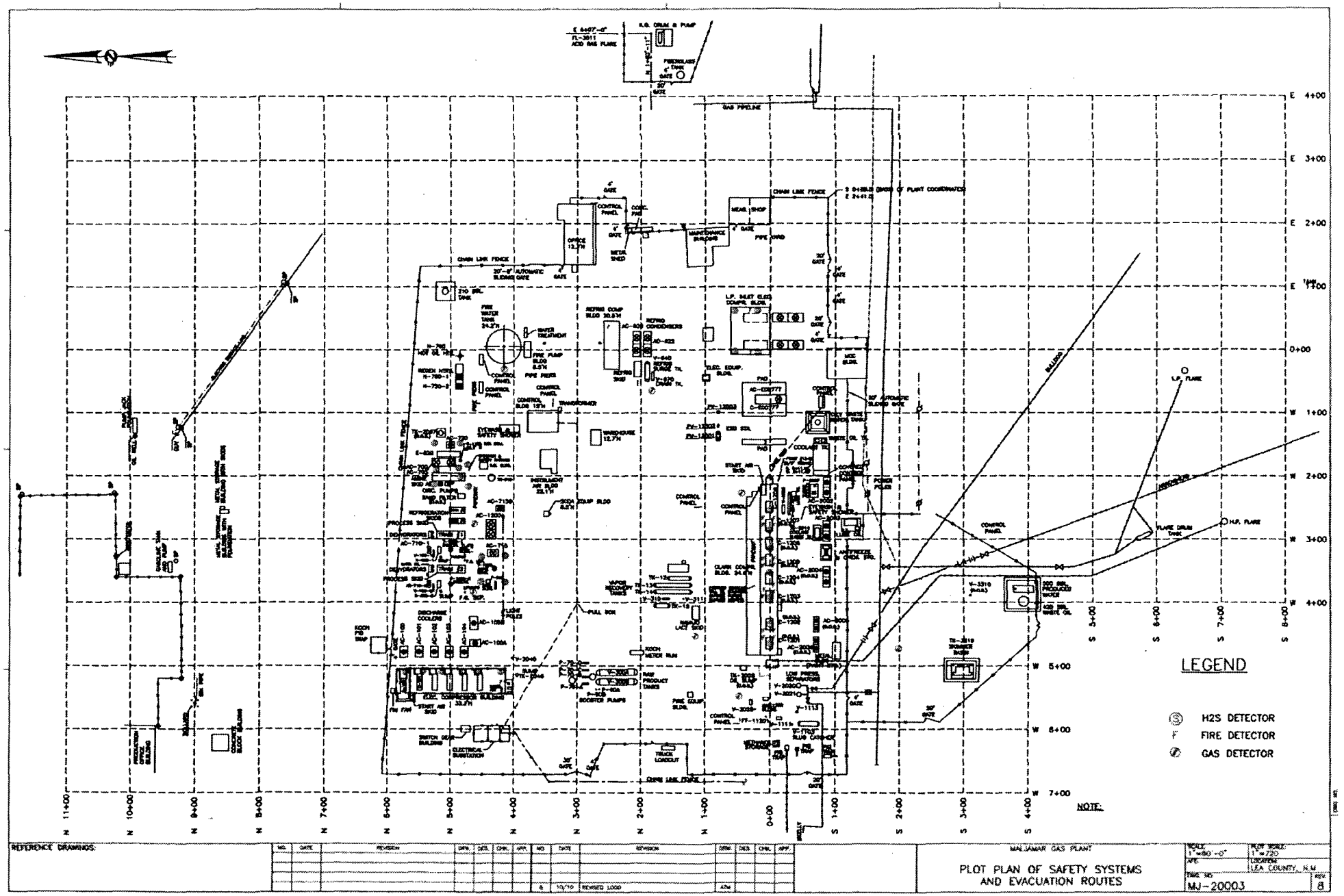
APPENDICES

Appendix A – Facility Maps and Drawings

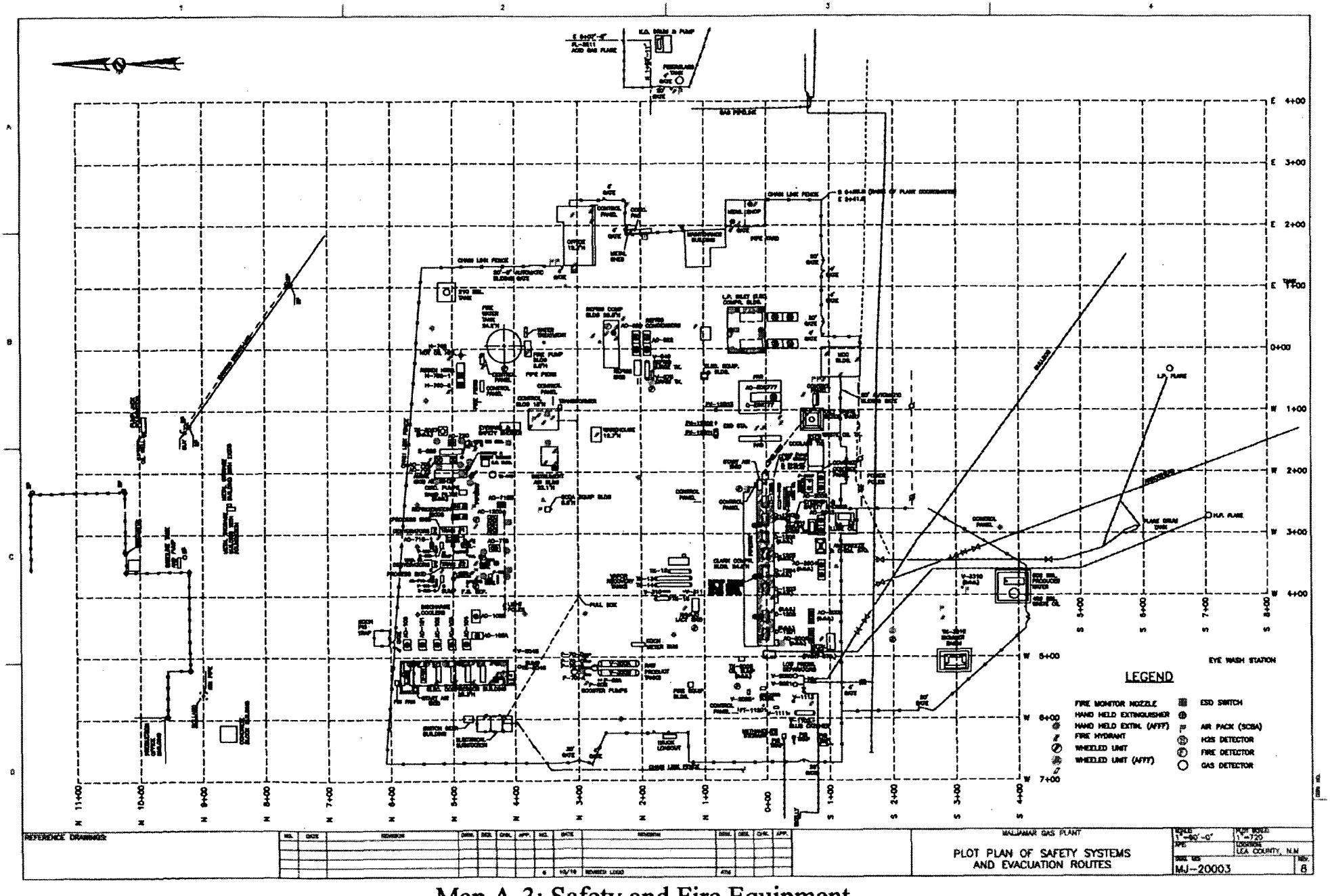
Map A-1:	Facility Map
Map A-2:	Alarm and Monitor Locations
Map A-3:	Safety and Fire Equipment Locations



Map A-1: Facility Map



Map A-2: Alarms and Monitors



Map A-3: Safety and Fire Equipment

Appendix B – Response Flow Diagrams

LEVEL I RESPONSE

CALL 911 for death or injury for emergency assistance

H_2S detected at levels greater than or equal to 10 ppm: Continuous audible alarm and flashing blue lights

- Evacuate all personnel to appropriate Emergency Assembly Area
- Notify Frontier Management
- Assign operators to suit up in SCBA
- Notify all entities in the 500 ppm ROE
- Operators wearing SCBA will attempt to locate and repair leak
- Rotate Operators in 15 minute shifts
- If H_2S levels exceed 10 ppm in Emergency Assembly Area relocate to an Alternate Emergency Assembly area

- If H_2S levels exceed 20 ppm proceed to Level II response

Once resolved and monitored levels in Plant are less than 10 ppm H_2S: return to plant and continue to monitor

LEVEL II RESPONSE

CALL 911 for death or injury for emergency assistance

H_2S detected greater than or equal to 20 ppm or Level I release not resolved: continuous audible alarm and flashing blue lights

- Operators put on SCBA
- Others put on Emergency Respirators
- Evacuate all personnel from plant to designated Emergency Assembly Area
- Assign operators to suit up in SCBA
- Notify entities in the 100 ppm ROE to shelter in place or evacuate depending on weather and release conditions (IC determines this) if perimeter alarms are activated
- Operators wearing SCBA attempt to locate and repair leak
- Rotate Operators in 15 minute shifts
- Re-entry will occur for 45 minutes or until the IC determines the ESD must be activated
- Notify LEPC
- If H_2S levels exceed 10 ppm in Emergency Assembly Area relocate to an alternate Emergency Assembly Area

Once resolved and monitored levels in Plant are less than 10 ppm H_2S: return to plant and continue to monitor

- If H_2S levels exceed 20 ppm and repair efforts are unsuccessful, worst case scenario and/or catastrophic release have occurred then implement Level 3 response

LEVEL III RESPONSE

CALL 911 for death or injury for emergency assistance

H_2S detected greater than 20 ppm:
continuous audible alarm and flashing blue lights
repair efforts are unsuccessful, worst case scenario and/or catastrophic release have occurred

- Set up road blocks on Conoco Rd and CR 126
- Confirm all personnel have evacuated the 500 ppm ROE
- Instruct all personnel in the 100 ppm ROE to evacuate to Emergency Asembly Area or shelter in place as determined by the IC
- If vapors have ignited, continue to let burn unless fires endanger personnel
- Initiate a chronological record of events
- Within one hour of activation of the plan notify NMOCD and the NRC
- Establish a Media staging area
- Submit agency reports as required

Once resolved and monitored levels in Plant are less than 10 ppm H_2S:
return to Plant
continue to monitor

Appendix C – ROE Calculations

ROE Calculations Worksheet
Map C-1: Facility ROE

The radius of exposure is calculated using the following equations:
100 ppm ROE calculation (as per 19 NMAC 15.11.7.K.1)
$X_{100ppm} = [(1.589)(Conc_{H2S})(Q)]^{(0.6258)}$
500 ppm ROE calculation (as per 19 NMAC 15.11.7.K.2)
$X_{500ppm} = [(0.4546)(Conc_{H2S})(Q)]^{(0.6258)}$
Where:
X = radius of exposure (ft)
$Conc_{H2S}$ = the decimal equivalent of the mole or volume fraction of H_2S in the gas
Q = daily plant throughput corrected to standard conditions (SCFD)

Plant parameters				
Q =	60	MMSCFD =	60000000	SCFD
$Conc_{H2S}$ =	1800	ppm =	0.18	% = 0.0018 fraction
ROE calculation:				
X_{100ppm} =	[(1.589)*(0.0018)*(60000000)]^(0.6258)			
X_{100ppm} =	1887	ft =	0.36	miles
X_{500ppm} =	[(0.4546)*(0.0018)*(60000000)]^(0.6258)			
X_{500ppm} =	862	ft =	0.16	miles

Appendix C ROE Calculations for Maljamar Gas Plant

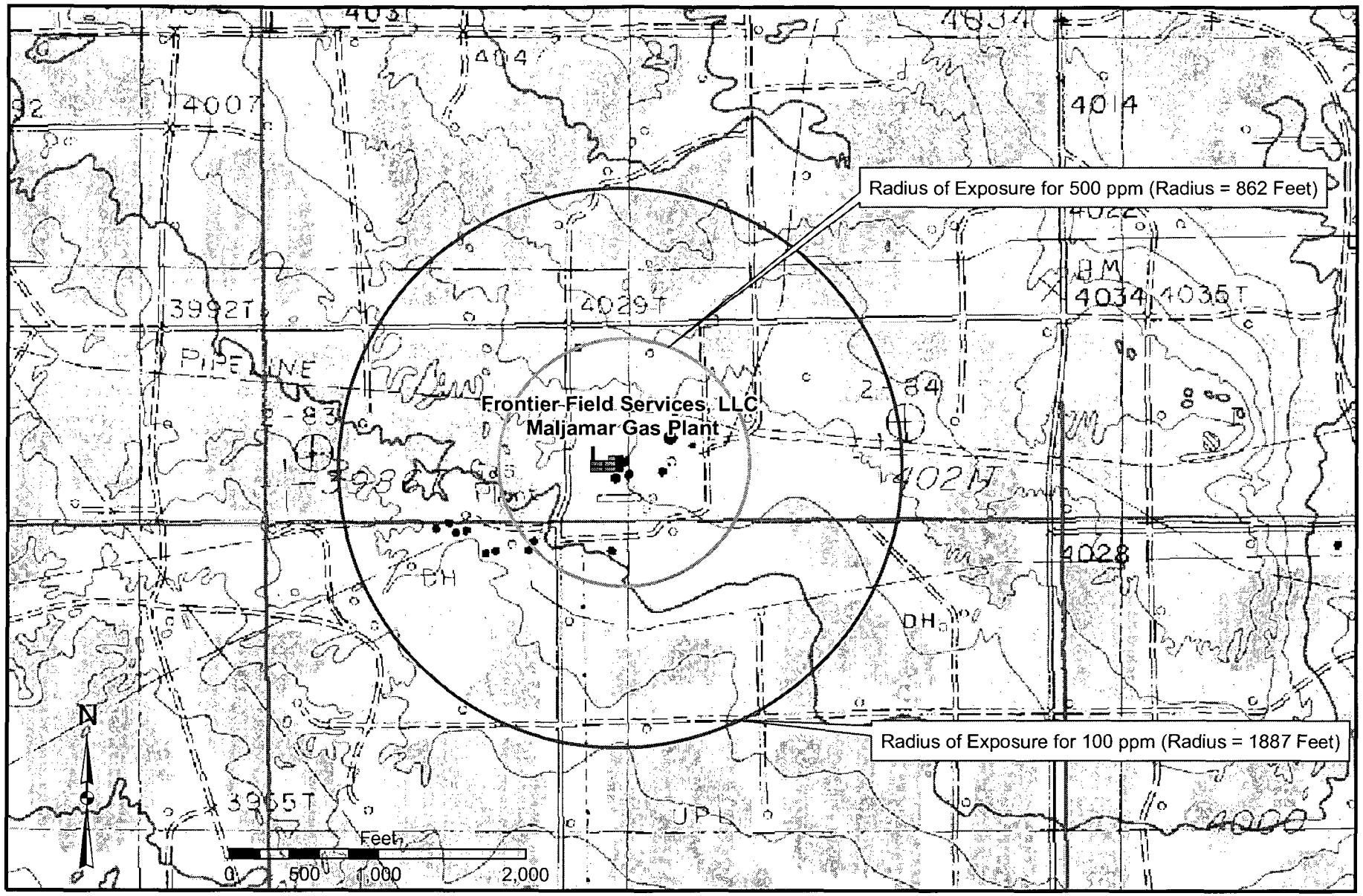


Figure C-1: Radii of Exposure for 100 ppm and 500 ppm

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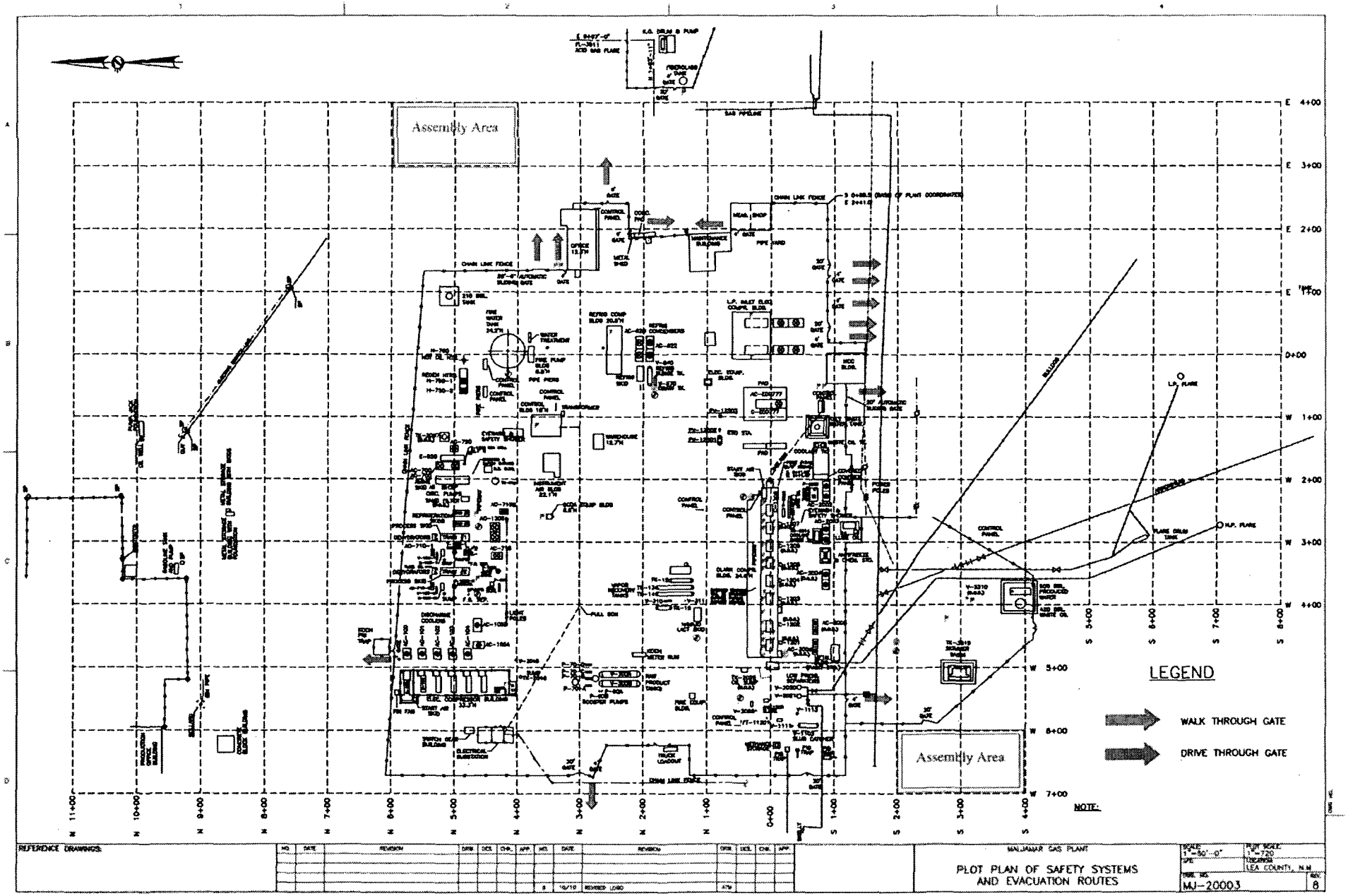
field services, llc

Appendix D – Emergency Assembly Areas and Evacuation Routes

Map D-1: Evacuation Route and Emergency Assembly Area Locations



Map D-1: Evacuation Routes and Emergency Assembly Area Locations

Appendix E – Distribution List

APPENDIX E – H_2S Contingency Plan Distribution List

New Mexico Oil Conservation Division
1625 N. French Drive
Hobbs, NM 88240

New Mexico Department of Public Safety
5100 Jack Gomez Blvd.
Hobbs, NM 88240

Lea Co. Local Emergency Planning Committee
100 North Main
Lovington, NM 88260

Artesia Fire Department
309 North 7th Street
Artesia, NM 88210-1913

Hobbs Fire Department
301 E White Street
Hobbs, NM 88240

Lea County Sheriff's Department
215 E. Central
Lovington, NM 88260

Maljamar Gas Plant
1001 Conoco Rd.
Maljamar, NM 88264

Frontier Field Services LLC Main Office
4200 Skelly Drive, Suite 700
Tulsa, OK 74135

Conoco Phillips Lovington Office for Conoco Phillips Field Warehouse
29 Vacuum Complex Lane
Lovington, NM 88260

Mid America Pipeline Company LLC for Mid America Compressor Station
P.O. Box 4018
Houston, TX 77210

Chavez, Carl J, EMNRD

From: Alberto A. Gutierrez, RG [aag@geolex.com]
Sent: Thursday, March 24, 2011 10:09 PM
To: Chavez, Carl J, EMNRD
Cc: Sanchez, Daniel J., EMNRD; VonGonten, Glenn, EMNRD; Hill, Larry, EMNRD; Dade, Randy, EMNRD; 'Prentiss, John'; 'Franzen, Matthew'
Subject: RE: Frontier Maljamar Gas Plant Lea County (GW-020) Frontier Letter w/ Attached Rule 118 H2S CP for OCD Records

Mr. Chavez:

Thanks for your email regarding Frontier's Rule 118 plan for the Maljamar Plant and you are correct, you will have the updated H2S CP pursuant to Rule 11 for that plant well before your August 11, 2011 deadline.

In reply to your inquiry regarding the Empire Abo Gas Plant (GW-022), Frontier is in receipt of your letter also and you will receive an updated plan for that facility as well before the August 11, 2011 deadline. I will be in touch with you shortly regarding the anticipated submittal date for both plans.

Call me if you have questions.

Regards
Alberto

Alberto A. Gutiérrez, RG
Geolex, Inc®
500 Marquette Avenue, NW Suite 1350
Albuquerque, NM 87102
505-842-8000 Ext. 105
505-842-7380 Fax

FRONTIER
field services, llc
southern ute indian tribe

March 17, 2011
Mr. Daniel Sanchez
Acting Division Director
NM Oil Conservation Division
1220 South St. Francis Drive
Santa Fe, NM 87505

FIRST CLASS MAIL
RETURN RECEIPT REQUESTED

RE: FRONTIER FIELD SERVICES, LLC MALJAMAR GAS PLANT H_2S CONTINGENCY PLAN STATUS – YOUR LETTER OF MARCH 1, 2011

Dear Mr. Sanchez:

We are in receipt of your letter of March 1, 2011 regarding the requirements under current OCD rules regarding flaring/venting pursuant to §19.15.7.37 et seq. NMAC and rules pertaining to H_2S under §19.15.11 et seq. NMAC. Our consultant, Alberto Gutiérrez (Geolex, Inc.®) spoke with Carl Chavez of your office on March 10, 2011, to clarify the applicability of above referenced OCD rules to our facility and I am writing this letter to confirm our understanding based on that conversation and the status of our plant.

Frontier's Maljamar plant operates under NMED Title V Air Quality Permit Operating Permit P123R1 and NSR Air Quality Permit 0319-M7-R3 which allow for the flaring of up to 5 tons of sulfur per day with a maximum throughput of 60MMCFD. We also operate under OCD discharge plan GW-020. We understand that while we operate in compliance with these permits which explicitly allow flaring as described above we are not subject to the requirements of §19.15.7.37 et seq. NMAC and the OCD Form C-129 process.

In response to the second point in the letter relative to OCD rules pertaining to H_2S under §19.15.11 et seq. NMAC, as Mr. Gutierrez explained to Mr. Chavez, Frontier does have a H_2S Contingency Plan in place which was submitted to NMOCD back in 2004-2005 pursuant to the old requirements under Rule 118. A copy of that plan is attached, since according to your records you were not able to locate the plan. Mr. Chavez mentioned that this may have resulted from that plan not having been in your files when you had the files scanned for electronic files in 2009. Pursuant to Mr. Chavez' request, this copy is being provided as an information copy only for confirmation that Frontier has been in compliance with the former Rule 118 requirements to have a H_2S Contingency Plan in place.

In keeping with Frontier's commitment to safety and to operating in compliance with all applicable state, federal and local regulations, we are well underway in the process of upgrading our current H_2S Contingency Plan to comply with the requirements of Rule 11. As Mr. Gutiérrez informed Mr. Chavez, Geolex was retained in January to prepare an upgraded H_2S Contingency Plan pursuant to current Rule 11 requirements (§19.15.11 et seq. NMAC). We anticipate submitting this plan to the OCD Environmental Bureau by June, well in advance of the August 11, 2011 deadline required by your letter. I trust that this letter clarifies Frontier Field Services, LLC status with respect to the rules addressed in your letter. If you have any questions or require additional information, please contact me at 575.706.6983 or Mr. Alberto A. Gutiérrez at 505-842-8000.

Sincerely,
Frontier Field Services, LLC.

John Prentiss
Area Manager

Enclosure

cc: Carl Chavez, NMOCD Environmental Bureau w/o Enclosure
Richard Goodyear, NMED-AQB w/o Enclosure
OCD District Office Hobbs w/o Enclosure
Alberto A. Gutiérrez, Geolex w/o Enclosure

INCIDENT RESPONSE PLAN FOR A HYDROGEN SULFIDE RELEASE

Frontier
Field Services, LLC

Maljamar Plant
Maljamar, NM

Date
August 28, 2003

Revised 8/12/2004

H_2S INCIDENT RESPONSE PLAN
Table of Contents

TAB A **PAGE #**

A. INTRODUCTION AND PURPOSE 3

B. FRONTIER'S KEY CONTACT INFORMATION 4

C. COORDINATION WITH STATE EMERGENCY PLAN 5

TAB B

EMERGENCY PROCEDURES 6

A. DISCOVERY AND IMPLEMENTATION OF EMERGENCY ACTION PLAN 6

B. INITIAL RESPONSE 7

C. ACTIVATION OF HYDROGEN SULFIDE RESPONSE PLAN 7

D. EVACUATION OF PUBLIC AREAS 7

E. TRAINING AND DRILLS 8

TAB C

ROLES AND RESPONSIBILITIES OF EMERGENCY RESPONSE PERSONNEL....9, 10

TAB D

EMERGENCY PHONE CONTACTS.....11

TAB E

CONTRACTOR SUPPORT LIST.....15

APPENDICES .....

A. Map of Frontier Field Services System Showing Location of Maljamar Plant.
B. Plot Plan of the Maljamar Plant.
C. Maljamar Plant ROE Calculation.
D. Hydrogen Sulfide and Sulfur Dioxide physical properties and physiological effects.

A. INTRODUCTION AND PURPOSE

Introduction

It is important that all personnel thoroughly understand that the first and foremost goal in reacting to an emergency is to protect the employees, as well as the public's safety; and secondly, to minimize the damage and other adverse effects of the emergency. It must be kept in mind that in a serious situation involving a Hydrogen Sulfide (H_2S) release, not only Frontier Field Services personnel are involved, but local Fire Departments, Law Enforcement, County and even State of New Mexico agencies may be interested parties. Cooperation will expedite all decisions.

In any emergency situation involving a H2S release, delegation of duties will be made to appropriate employees and groups. These duties will be reviewed on an annual basis to ensure complete understanding which will facilitate a well-coordinated response by personnel to the emergency situation.

The Maljamar Gas Plant Measurement office will serve as the Communication Center during the response to an H2S release. If this location must be evacuated, the secondary staging area located at the intersection to Conoco Road and CR 126A will be used to direct activities, utilizing cell phones and company radios. Personnel not directly involved in the response should refrain from using Company Mobile phones, hand held radios and telephones unless absolutely necessary.

Purpose

This H_2S Incident Response Plan has been prepared to minimize the hazard resulting from an H_2S release. It shall be used to inform company personnel, local emergency responders and the public within an area of exposure to potentially hazardous volume of H_2S of actions to be taken before, during and after an H_2S release.

The primary concern of Frontier Field Services – Maljamar Gas Plant, during an H_2S release, is to protect Company employees, contractors and the public. No individual should place the protection of the Plant Property above his or her own personal safety.

The Incident Command Team will be headed by the Maljamar Plant Manager (Incident Commander) of the Maljamar Plant, or the designated alternate (in the absence of the Plant Manager). He will act as the head of the Incident Command Team and will bear the overall responsibility to see that objectives of the Plan are met. The Plant Manager or Alternate will monitor all activities being carried out. Members of the Maljamar Incident Response Team will keep him informed of conditions throughout the Release emergency.

The Frontier Field Services Maljamar Gas Processing Plant consists of a 60 Million cubic feet per day cryogenic gas processing plant for treating H_2S.

The plant is "manned" 24 hours per day.

Sources of potentially hazardous volumes of H_2S gas in the Maljamar Plant include:

- The low pressure inlet area to the Maljamar Plant.
- The amine treater (removes H_2S from the inlet gas stream) inside the Maljamar Plant.

Leaks from these sources could create an H_2S exposure area. The size of the release, location and concentration will determine if these areas are hazardous. The calculations of the exposure potential and size of the leak is based on a "worst case" scenario. These calculations are based on escape rates as allowed by New Mexico Hydrogen Sulfide standard for existing and new operations. The H_2S concentrations were determined by using stain tubes and sample analysis. The Radius of Exposure calculations were done using the Pasquill-Gifford equation.

The calculated Radius of Exposures is located in Appendix C.

REMEMBER

"Remember that the time it takes to complete a job is never so urgent that you cannot spend the time it takes to do the job safely."

B. CONTACT INFORMATION

Maljamar Plant Address: 1001 Conoco Road
P.O. Box 7
Maljamar, NM 88264

Office Telephone Number: 505-676-3501
Plant Control Room: 505-676-3509
Office Fax Number: 505-676-2401
24 hour emergency number: 800-503-5545

Key Contact: **John Prentiss, Plant Manager**
Office: 505-676-3528
Cell: 505-361-0053

Or: **Retha Scott, Manager, Compliance**
Office: 505-676-3505
Cell: 505-361-0128

C. COORDINATION WITH STATE EMERGENCY PLANS

Under certain conditions as provided for in the New Mexico Hazardous Materials Emergency Response Plan (HMER), the New Mexico State Police responding to the emergency may elect to assume the position of Incident Commander (IC) or they may establish a unified command of which Frontier Field Services IC may be a key member. Under the Unified Command scenario, Frontier's IC will cooperate with any emergency responders on site, such as the New Mexico State Police, local fire department, Sheriff's Office, NMOCD or other public emergency response agencies to manage a safe response to the emergency situation.

The IC's role is to ensure control of the emergency incident. He will notify or delegate notification to all Frontier or contract personnel and any civil authorities needed to respond to the incident. The IC will assign any additional personnel to support roles as needed. Upon notification or discovery of an H_2S release, the following steps should be initiated by the Frontier IC or designee:

1. Assume the role of Incident Commander (IC) and gather as much information as possible regarding the release of H_2S.
2. Alert other emergency response personnel of the potential hazard.
3. Arrange for support personnel to be sent to the location of the release.
4. Proceed to the site to assess emergency response actions needed.
5. Set up an on-site command station.
6. Implement the H_2S Incident Response Plan as necessary.
7. Remain on site as IC until relieved or the incident is under control.

As part of our Risk Management Plan for the Frontier Field Services Maljamar Plant we will conduct annual reviews of our RMP and invite the local Sheriff's Department, Fire Departments from Lovington and Maljamar, EMT Services, Emergency Planners from Lea and Eddy counties and State Police to discuss contingency plans.

See additional roles and responsibilities of the Incident Commander in TAB 3 Roles and Responsibilities of Emergency Response Personnel.

EMERGENCY PROCEDURES

A. Discovery and Implementation of Immediate Action Plan

Upon discovery or notification of a potentially hazardous release of H_2S, Frontier Field Services employees should immediately activate the following H_2S Incident Response Plan:

a. Alert and account for facility personnel
1. Move away and upwind from the source of the release.
2. Don personal protective breathing equipment.
3. Alert other personnel in the area of the potential hazard.
4. Assist any personnel in distress.
5. Proceed to the designated emergency assembly area.
6. Account for personnel on site.

b. Take immediate measures to control the presence of or potential H_2S release and eliminate potential ignition sources. Emergency shut down procedures should be initiated as necessary to correct or control the release. When the required action cannot be accomplished in time to prevent exposing operating personnel or the public to hazardous concentrations of H_2S take the following steps, as needed for site specific conditions.

c. Alert the public (directly or through appropriate government agencies) that they may be exposed to atmospheres exceeding 30 ppm of H_2S.

d. Initiate evacuation operations.

e. Contact the on-call supervisor on the call list. Notify the supervisor of the circumstances and whether immediate assistance is needed. The supervisor should notify (or arrange notification of) other supervisors, Plant Manager and other appropriate personnel (including public officials) on the call list.

f. Make recommendations to public officials regarding blocking unauthorized access to the release area and assist as needed.

g. Make recommendations to public officials regarding the evacuation of the public and assist as needed.

h. Notify, as required, the state, local officials and the National Response Center to comply with release reporting requirements.

i. Monitor the atmosphere in the area of the release (after following abatement measures) to determine when it is safe for re-entry.

B. Initial Response

1. The Frontier Field Services employee (First Responder) at the release site or upon notification of an emergency situation shall immediately proceed to the location and assess the situation and then notify the Incident Commander (IC) or designee of the potential hazard.

a. Provide the IC with as much data possible concerning the location, the extent of the emergency and the need for additional assistance.

b. Warn others in the area of the situation and evacuate if necessary.

c. Remain at the site, at a safe distance upwind of the release and available for communication. Wait for assistance to arrive before attempting to enter the potentially hazardous area.

d. Provide rescue and first aid assistance as needed.

2. Upon notification of an emergency the IC or designee shall:

a. Notify other key Emergency Response personnel and alert them to the situation.

b. The IC will proceed to the site and assess the situation.

c. The IC will determine if the H_2S Incident Response Plan should be initiated.

d. In the absence of the IC or designee the Frontier Field Services employee at the site will determine if the Plan should be activated and will remain at the scene until relieved by another Frontier Field Services employee or the Civil Authorities.

C. Activation of the H_2S Incident Response Plan

The H_2S Incident Response Plan will be activated when the release creates a concentration of hydrogen sulfide of more than:

- 100 ppm in any public area.
- 500 ppm at any public road.
- Or 100 ppm ROE is greater than 3000 feet from the site of the release.

It is the responsibility of the Frontier Field Services Incident Commander (IC) to ensure control of the emergency response plan and if necessary to coordinate these efforts with any state or local emergency plans.

D. Evacuation of Public Areas

When an H_2S release requires the evacuation of the public from areas which contain or could contain potentially hazardous concentrations of H_2S the information regarding the calculated radius of exposures (ROE) contained in Appendix C will be utilized. This information will assist in determining the areas of concern at a specific release site. ROE's have been calculated for the Maljamar Gas Plant site. Information contained in this plan will be reviewed periodically to ensure accuracy and determine ROE's limits. We will review the plan with State and local emergency responders as part of our annual Incident Response, Right to know training.

E. Training and Drills

Training and drills in emergency response procedures help ensure personnel are adequately prepared to handle most emergency situations. Frontier Field Services personnel will be trained on the H_2S Incident Response Plan and procedures annually. Everyone's role and responsibilities will be covered. The need for emergency preparedness will be emphasized through the use of drills and other exercises that simulate an emergency in which personnel perform or demonstrate their roles in the emergency. These drills can be either "table-top" or discussions or realistic drills in which equipment will be deployed and contractors participate. Public officials can be informed and participate in these drills.

Review and critiques of the drills or exercises will be conducted afterward to identify any potential improvement in the plan.

Documentation of the training, drills and reviews will be on file at the Frontier Field Services office at the Maljamar Plant.

ROLES AND RESPONSIBILITIES OF EMERGENCY RESPONSE PERSONNEL

Following is a description of key personnel responsibilities for Incident Response.

a. **Incident Commander**.

1. Obtain initial incident briefing from on scene or prior Incident Commander, if available.
2. Assess incident situation and develop appropriate strategies. Conduct site investigations as needed. Establish response priorities.
3. Conduct initial and ongoing briefings with IC staff.
4. Activate elements of the Incident Command System as required.
5. Ensure planning meetings are conducted.
6. Keep Frontier Field Services Line and Senior Management informed of response situation.
7. Manage all Incident operations.
8. Ensure a Frontier Field Services media representative has approved all information releases prior to release or issue.
9. Ensure the safety of all personnel involved in the response.

b. **Operations Section Chief**.

1. Obtain briefing from Incident Commander.
2. Brief and assign operations personnel in accordance with Incident Response needs.
3. Supervise operations; ensure personnel have the equipment, materials supplies and support needed to respond in a safe, efficient and effective manner.
4. Determine Operations Section needs and request additional resources as necessary.
5. Report information about special activities, events and occurrences to the IC.
6. Ensure the safety of all personnel under Operations Section Chief supervision.
7. Ensure site security.

c. **Safety Officer**.

1. Obtain briefing from Incident Commander.
2. Apply for manpower, equipment and services necessary to ensure safe operations at all sites.
3. Ensure hazard communications systems, including MSDS's, are in place at all involved field locations.
4. Identify hazardous situations associated with the incident.
5. Ensure all regulatory requirements as related to safety are satisfied.
6. Ensure that employees and contractors entering the clean-up sites are properly briefed as to the dangers and precautions to be observed at the site. Ensure only those

involved in the response are involved in the clean-up of hazardous materials; otherwise, review their training and qualifications.

7. Determine the types of air monitoring equipment (direct reading, personal monitoring, etc.) necessary to support response operations.

8. Participate in planning meetings.

9. Exercise emergency authority to stop and prevent unsafe acts.

10. Lead Incident Investigation Teams for any Incident occurring during or after the emergency. Document and review findings with all team members.

d. **Logistics Section Chief.**

1. Obtain briefing from the Incident Commander.
2. Identify and provide Logistics support for planned and expected operations.
3. Coordinate and process requests for additional resources.
4. Assist Officers and Section Chiefs from other functions in resources procurement.
5. Advise on current service and support capabilities.

e. **Information Officer.**

1. Obtain briefing from Incident Commander.
2. Establish a single incident information center whenever possible.
3. Identify and communicate public, community, and media concerns to the Incident Commander.
4. Respond to special requests for information.

f. **Planning Section Chief.**

1. Obtain briefing from Incident Commander.
2. Reassign initial response and incident personnel into incident positions as needed.
3. Assemble information on alternative strategies.
4. Identify need for use of specialized resources.
5. Advise Incident Command Staff of any significant changes in incident status.
6. Distribute Incident Commander's orders and prepare plans for implementation.

g. **Other Employees.**

All employees on duty should be on stand by awaiting instructions from the Incident Commander. They may be called on to provide support contacting vendors for supplies, contacting local support groups for assistance to the general public, provide on site logistical support to the responders, blocking roads, assist with evacuations, etc.

No employee or contractor will be asked to provide incident scene support that they are not comfortable in their ability to perform or have not been specifically trained to perform.

Frontier
Field Services, LLC

Maljamar Gas Plant
H_2S Incident Response Plan
EMERGENCY PHONE NUMBERS

24 Hour Number: 800-503-5545
Maljamar Plant Control Room: 505-676-3509

John Prentiss Plant Manager, Incident Commander	Office...505-676-3528 Cell.....505-361-0053 Home....505-885-1265
Retha Scott Manager, Compliance, Safety Officer	Office....505-676-3505 Cell.....505-361-0128 Home.....505-392-1457
Steve Maker Operations, Operations Section Chief	Office.....505-676-3502 Cell.....505-361-3108 Home.....505-396-0308
Rudy Lizardo Maintenance Foreman, Planning Section Chief	Office.....505-676-3504 Cell.....505-361-0135 Home.....505-396-3771
Jerry Wright Measurement Foreman, Information Officer 0154	Office.....505-676-3512 Cell.....505-361- Home.....505-396-5556
Joe Calderon Field Foreman, Logistics Section Chief 0148	Office.....505-676-3506 Cell.....505-361- Home.....505-885-3504

Revised 8/12/2004

Frontier
Field Services, LLC

TULSA HEADQUARTERS PHONE NUMBERS

Dave Presley, President	Office.....918-492-4450 x302 Cell.....918-637-2419
Jim Lind, Vice President	Office.....918-492-4450 x306 Cell.....918-605-1255
Mike Hicks, Director of Operations	Office.....918-492-4450 x317 Cell.....918-688-5738
Brad Campbell, Manager, Engineering	Office.....918-492-4450 x308 Cell.....918-760-0029

Frontier
Field Services, LLC

Maljamar Gas Plant

H_2S Incident Response Plan

EMERGENCY PHONE NUMBERS

EMERGENCIES – DIAL 911

LAW ENFORCEMENT:	
Hobbs Sheriff's Office	**505-393-2515**
Lovington Sheriff's Office	**505-396-3611**
Carlsbad Sheriff's Office	**505-887-7551**
New Mexico State Police – Lea County	**505-392-5588**
New Mexico State Police – Eddy County	**505-885-3137**
FIRE DEPARTMENTS:	
Lovington	**505-396-2359**
Maljamar	**505-676-4100**
Artesia	**505-746-2701**
Hobbs	**505-397-9308**
Loco Hills	**505-677-2181**
AMBULANCE SERVICE:	
Artesia	**505-746-2701**
Hobbs	**505-397-7561**
Lovington	**505-396-2359**
Carlsbad	**505-885-2111**
Aero Care – Lubbock	**800-627-2376**
HOSPITALS:	
Hobbs – Lea Regional	**505-392-6581**
Lovington – Nor-Lea	**505-396-6611**
Carlsbad – Guadalupe	**505-887-4100**
Lubbock – Methodist	**806-793-4366**
Lubbock – St. Mary's	**806-796-6850**
POISON CONTROL CENTER:	
Albuquerque	**800-432-6866**

Frontier
Field Services, LLC

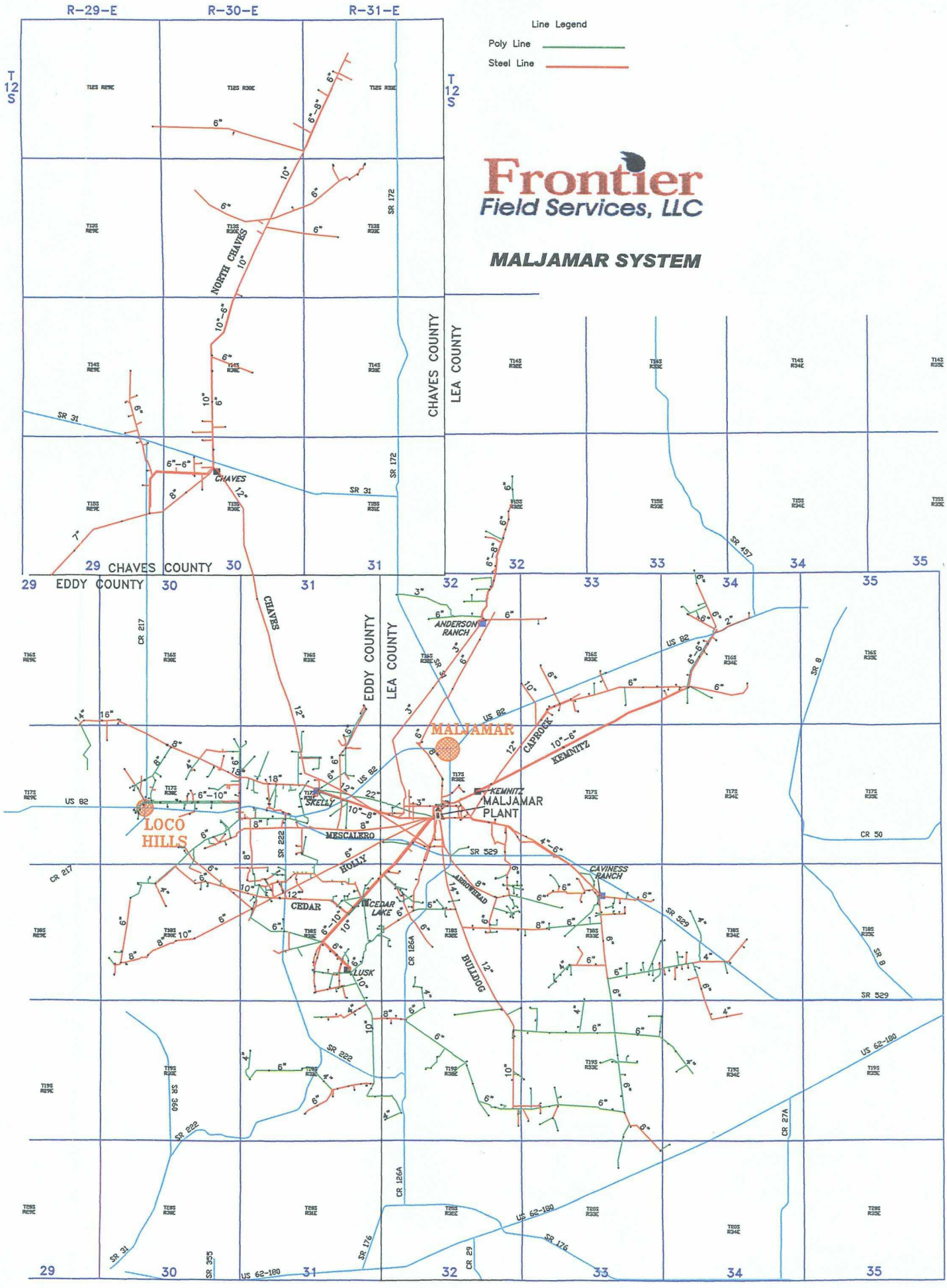
Maljamar Gas Plant
H_2S Incident Response Plan
GOVERNMENT AGENCIES

New Mexico Oil Conservation Division	**505-393-6161**
Bureau of Land Management	**505-393-3612**
Air Quality Bureau, Santa Fe, NM	**505-827-1494**

Frontier
Field Services, LLC

Maljamar Gas Plant
H_2S Incident Response Plan
CONTRACTOR SUPPORT

COMPANY	SERVICE	CONTACT	PHONE
B&H Construction	Construction/Maint.	Mike Wright	505-887-9755
Cooper Cameron Valves	Valve Repair	Dean Bohannon	915-362-1151
Cubix Corp.	Emissions Testing	Marc McDaniel	512-243-0202
Desert X-Ray	X-Ray Services	Elic Brymer	915-363-0669
E. D. Walton Const.	Construction Services	Wade Lancaster	800-657-9190
Environmental Plus	Spill Remediation	Gabino Rosa	505-394-3481
Ferguson Const.	Construction Services	Mark Wieser	505-396-3689
Fite Fire & Safety	Safety Services	Tim Nolen	915-689-6492
Gandy Corp.	Oilfield Service	Larry Gandy	505-396-4948
Hanover Compression	Compression Service	Vicki Egan	281-447-8787
Hughes Services	Vacuum Service	Donnie Mathews	505-677-3113
Industrial Insulation	Insulation Service	Scott Fulton	915-332-8203
Kenemore Welding	Welding Service	George Kenemore	505-676-2332
Mark's Crane & Rigging	Crane Services	David Landreth	915-337-1538
Mobile Labs	Laboratory Service	Jenny Linley	915-337-4744
Permian Valve Repair	Valve Repair	Raymond Tucker	915-381-1313
Plant Maint. Services	Chemical Cleaning	Dale Carter	432-580-5900
BJ-Coiltec	Nitrogen Services	Stephen Baugh	915-683-1887
Smith & Son's	Construction Service	Randy Smith	505-397-1852
Southwest Safety	Safety Services	Scott Magness	505-392-8080
TWS, Inc.	Crane, Man Lift Service	Randy Gandy	505-398-3811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R-31-E
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Line Legend
Poly Line
Steel Line
Frontier
Field Services, LLC
MALJAMAR SYSTEM
CHAVES COUNTY
LEA COUNTY
EDDY COUNTY
NORTH CHAVES
CHAVES
ANDERSON RANCH
MALJAMAR
KEMNITZ
MALJAMAR PLANT
CAPROCK
LOCO HILLS
SKELLY
MESCALERO
HOLLY
CEDAR
CEDAR LAKE
LUSK
AGAVE HEAD
CAVINESS RANCH
BULLDOG
US 82
SR 31
SR 172
SR 457
SR 529
SR 222
SR 360
SR 8
SR 176
US 62-180
CR 217
CR 126A
CR 27A
CR 29
CR 50
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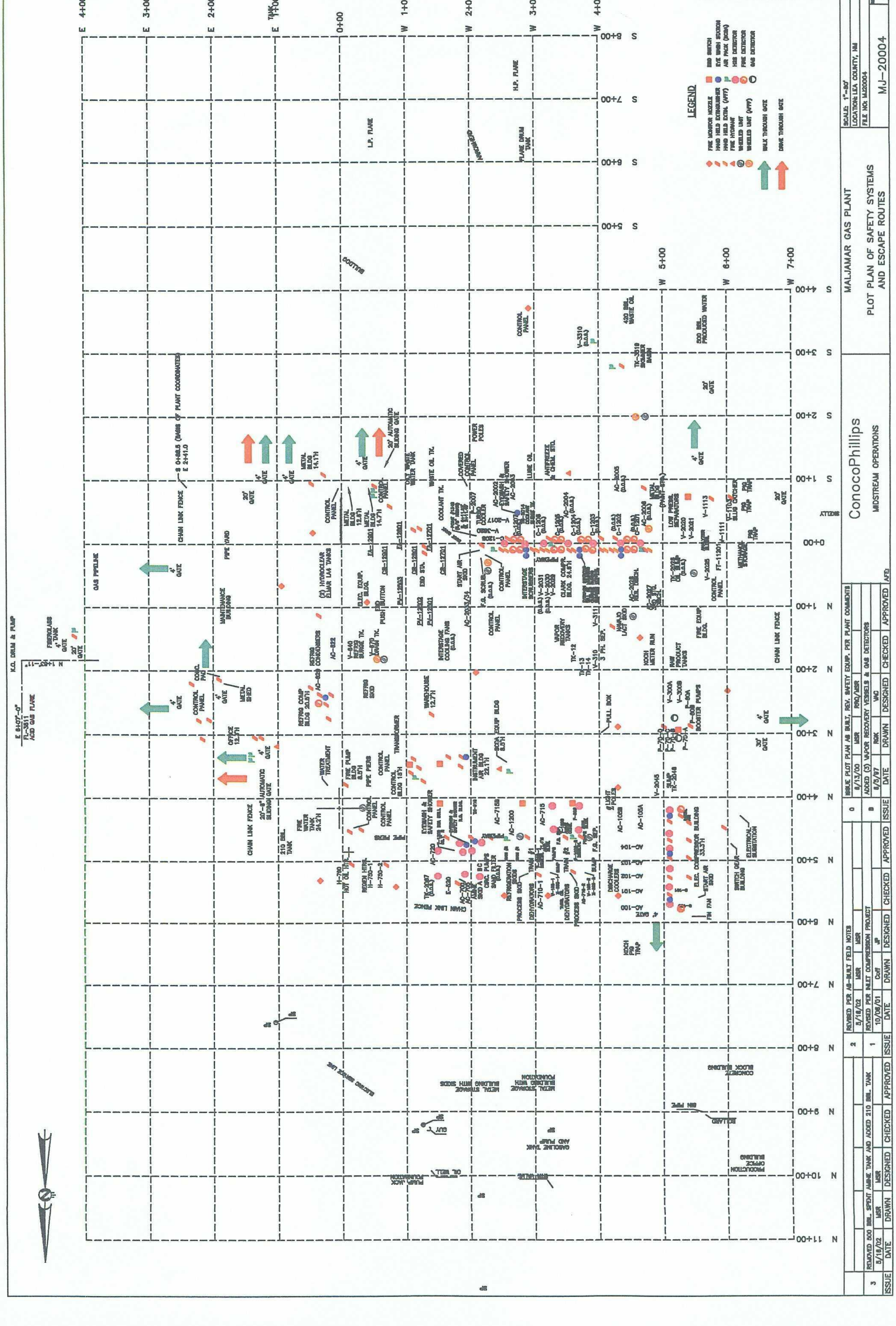
APPENDIX B


MALJAMAR GAS PLANT
PLOT PLAN OF SAFETY SYSTEMS
AND ESCAPE ROUTES
ConocoPhillips
MIDSTREAM OPERATIONS
MJ-20004
LOCATION: LEA COUNTY, NM
LEGEND
WALK THROUGH GATE
DRIVE THROUGH GATE

Frontier Field Services
Maljamar, NM System
Maljamar Plant Calculation

OCD Rule 118

Pasquill-Gifford Equation for Calculating Radius of Exposure (ROE) of Hydrogen Sulfide (H2S)

Enter H2S in PPM	12000	*enter Data in green shaded areas*	
Enter Gas flow in mcf/day	26000		
Constant for 500 ppm ROE	0.4546	constant	
Constant for 300 ppm ROE	0.77	constant	
Constant for 100 ppm ROE	1.589	constant	
Mult factor for 500 ppm ROE	141835.2	formula	
Mult factor for 300 ppm ROE	240240	formula	
Mult factor for 100 ppm ROE	495768	formula	
Flow Rate of Pure H2S in Gas Stream (Actual Volume Fraction)	312	mcf/day	
H2S Concentration Volume Fraction	0.012	decimal equivalent	
H2S Concentration Volume Fraction in percent %	1.20%	percent	
500 ppm radius of exposure (public road)	**1675**	feet	*ANSWER*
300 ppm radius of exposure	**2329**	feet	*ANSWER*
100 ppm radius of exposure (public area)	**3665**	feet	*ANSWER*

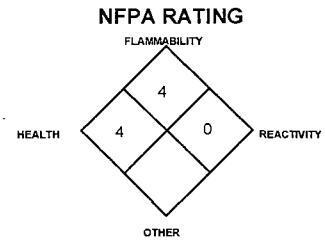
Conversions:

To convert H2S in percent to parts per million (ppm) Put H2S in % in blue shaded area; read answer to the right in the yellow shaded area in ppm	Input H2S in % below 1.2	ppm 12000	*ANSWER*
To convert H2S from parts per million (ppm) to perecent Put H2S in ppm in blue shaded area; read answer to the right in the yellow shaded area in percent	Input H2S in ppm below 12000	% 1.2000%	*ANSWER*
To convert gas flow in cubic feet per day to mcf per day put cubic feet per day in blue shaded area; read answer to the right in the yellow shaded area in MCF	Input cubic feet per day below 26000000	mcf/day 26000	*ANSWER*
To convert gas flow from MCF per day to cubic feet per day put MCF per day in blue shaded area, read answer to the right in the yellow shaded area in Cubic feet per day	Input MCF day below 26000	Cubic feet per day 26000000	*ANSWER*

Airgas

MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards



PART I *What is the material and what do I need to know in an emergency?*

1. PRODUCT IDENTIFICATION

CHEMICAL NAME; CLASS:	**HYDROGEN SULFIDE - H_2S**
	Document Number: 001029
PRODUCT USE:	For general analytical/synthetic chemical uses.
SUPPLIER/MANUFACTURER'S NAME:	AIRGAS INC.
ADDRESS:	259 N. Radnor-Chester Road Suite 100 Radnor, PA 19087-5283
BUSINESS PHONE:	1-610-687-5253
EMERGENCY PHONE:	1-800-949-7937 International: 423-479-0293
DATE OF PREPARATION:	May 20, 1996
REVISION DATE:	February 3, 2001

2. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	mole %	EXPOSURE LIMITS IN AIR					
			ACGIH		OSHA			
			TLV ppm	STEL ppm	PEL ppm	STEL ppm	IDLH ppm	OTHER
Hydrogen Sulfide	7783-06-4	> 99.0%	10	15	20 C 10 (Vacated 1989 PEL)	50 ppm (10 minute maximum peak) 15 (Vacated 1989 PEL)	100	NIOSH REL: 10 ppm C (10 minutes) DFG-MAK: 10 ppm
Maximum Impurities		< 1.0%	None of the trace impurities in this mixture contribute significantly to the hazards associated with the product. All hazard information pertinent to this product has been provided in this Material Safety Data Sheet, per the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200) and State equivalent standards.					

NE = Not Established C = Ceiling Limit See Section 16 for Definitions of Terms Used

NOTE: All WHMIS required information is included. It is located in appropriate sections based on the ANSI Z400.1-1993 format.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: *Hydrogen Sulfide is a toxic, flammable gas and has a distinct "rotten-egg" smell.* Hydrogen Sulfide is a colorless liquid which rapidly turns into a gas at standard atmospheric temperatures and pressures. Inhalation of high concentrations of this gas can result in unconsciousness, coma, and death. Contact with rapidly expanding gases, or contact with the liquid, may cause frostbite. Both the liquid and gas pose a serious fire hazard when accidentally released. The gas is heavier than air and may spread long distances. Distant ignition and flashback are possible. Flame or high temperature impinging on a localized area of the cylinder of Hydrogen Sulfide can cause the cylinder to rupture without activating the cylinder's relief devices. Provide adequate fire protection during emergency response situations.

SYMPTOMS OF OVEREXPOSURE BY ROUTE OF EXPOSURE: The most significant route of overexposure for Hydrogen Sulfide is by inhalation. The following paragraphs describe symptoms of exposure by route of exposure.

INHALATION: Inhalation of high concentrations of Hydrogen Sulfide can cause dizziness, headache, and nausea. Exposure to higher concentrations can result in respiratory arrest, coma, or unconsciousness. Exposure for more than 30 minutes at concentrations of greater than 600 ppm have been fatal. Continuous inhalation of low concentrations may cause olfactory fatigue, so that the odor is no longer an effective warning of the presence of Hydrogen Sulfide. A summary of exposure concentrations and observed effects are as follows:

CONCENTRATION	EXPOSURE SYMPTOM
0.3-30 ppm:	Odor is obvious and unpleasant.
50 ppm:	Eye irritation. Dryness and irritation of nose, throat.
Slightly higher than 50 ppm:	Irritation of the respiratory system.
100-150 ppm:	Temporary loss of smell.
200-250 ppm:	Headache, vomiting nausea. Prolonged exposure may lead to lung damage. Exposures of 4-8 hours can be fatal.
300-500:	Swifter onset of symptoms. Death occurs in 1-4 hours.
500 ppm:	Headache, excitement, staggering, stomach after brief exposure. Death occurs from 0.5 - 1 hour.
> 600 ppm:	Rapid onset of unconsciousness, coma, death.
> 1000 ppm:	Immediate respiratory arrest.

Severe exposures which do not result in death may cause long-term symptoms such as memory loss, paralysis of facial muscles, or nerve tissue damage.

HAZARDOUS MATERIAL INFORMATION SYSTEM

HEALTH	(BLUE)	4
FLAMMABILITY	(RED)	4
REACTIVITY	(YELLOW)	0
PROTECTIVE EQUIPMENT		D

EYES	RESPIRATORY	HANDS	BODY
	See Section 8		See Section 8

For routine industrial applications

See Section 16 for Definition of Ratings

SKIN and EYE CONTACT: The gas may be irritating to the skin. Inflammation and irritation of the eyes can occur at very low airborne concentration (less than 10 ppm). Exposure over several hours may result in "gas eyes" or "sore eyes" with symptoms of scratchiness, irritation, tearing and burning. Above 50 ppm, there is an intense tearing, blurring of vision, and pain when looking at light. Exposed individuals may see rings around bright lights. Most symptoms disappear when exposure ceases. However, in serious cases, the eyes can be permanently damaged.

OTHER POTENTIAL HEALTH EFFECTS: Contact with liquid or rapidly expanding gases (which are released under high pressure) may cause frostbite. Symptoms of frostbite include change in skin color to white or grayish-yellow. The pain after such contact can quickly subside.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in **Lay Terms**. Overexposure to Hydrogen Sulfide may cause the following health effects:

ACUTE: Hydrogen Sulfide is irritating to the skin and eyes. Inhalation of high concentrations of Hydrogen Sulfide can cause dizziness, headache, and nausea. Exposure to higher concentrations can result in respiratory arrest, coma, or unconsciousness, and death. Contact with liquid or rapidly expanding gases may cause frostbite.

CHRONIC: Severe exposures which do not result in death may cause long-term symptoms such as memory loss, paralysis of facial muscles, or nerve tissue damage. Chronic overexposure may cause permanent eye damage.

TARGET ORGANS: Respiratory system, skin, eyes, central nervous system.

PART II *What should I do if a hazardous situation occurs?*

4. FIRST-AID MEASURES

RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO HYDROGEN SULFIDE WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. At a minimum, Self-Contained Breathing Apparatus and gloves should be worn. Under some response circumstances, Fire-Retardant Personal Protective equipment may be necessary. Adequate fire protection must be provided during rescue situations.

Remove victim(s) to fresh air as quickly as possible. Trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation, if necessary. Only trained personnel should administer supplemental oxygen.

In case of frostbite, place the frostbitten part in warm water. DO NOT USE HOT WATER. If warm water is not available, or is impractical to use, wrap the affected parts gently in blankets. Alternatively, if the fingers or hands are frostbitten, place the affected area in the armpit. Encourage victim to gently exercise the affected part while being warmed. Seek immediate medical attention.

SKIN EXPOSURE: If liquid is spilled on skin, or if irritation of the skin develops after exposure to liquid or gas, immediately begin decontamination with running water. Minimum flushing is for 15 minutes. Remove exposed or contaminated clothing, taking care not to contaminate eyes. Victim must seek immediate medical attention.

EYE EXPOSURE: If liquid is splashed into eyes, or if irritation of the eye develops after exposure to liquid or gas, open victim's eyes while under gentle running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 15 minutes.

Victim(s) must be taken for medical attention. Rescuers should be taken for medical attention, if necessary. Take copy of label and MSDS to physician or other health professional with victim(s).

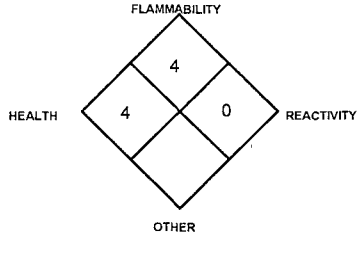
5. FIRE-FIGHTING MEASURES

FLASH POINT: Not applicable. Hydrogen Sulfide is a flammable gas.
AUTOIGNITION TEMPERATURE: 260°C (500°F)
FLAMMABLE LIMITS (in air by volume, %):

Lower (LEL): 4.0%
Upper (UEL): 44.0%

FIRE EXTINGUISHING MATERIALS: Extinguish Hydrogen Sulfide fires by shutting-off the source of the gas. Use water spray to cool fire-exposed containers, structures, and equipment. Other appropriate extinguishing media are dry chemical, foam, and carbon dioxide.

NFPA RATING



See Section 16 for Definition of Ratings

UNUSUAL FIRE AND EXPLOSION HAZARDS: Hydrogen Sulfide is a flammable, toxic gas and presents an extreme hazard to firefighters. The products of thermal decomposition of this material include water and sulfur dioxide. This gas is heavier than air; it can travel a long distance to a source of ignition and flash back.

DANGER! Fires impinging (direct flame) on the outside surface of unprotected pressure storage vessels of Hydrogen Sulfide can be very dangerous. Direct flame exposure on the cylinder wall can cause cylinder failure. For massive fires in large areas, use unmanned hose.

Explosion Sensitivity to Mechanical Impact: Not sensitive.
Explosion Sensitivity to Static Discharge: Static discharge may cause Hydrogen Sulfide to ignite explosively.

SPECIAL FIRE-FIGHTING PROCEDURES: Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. The best fire-fighting technique may be simply to let the burning gas escape from the pressurized cylinder, tank car, or pipeline. Stop the leak before extinguishing fire. If the fire is extinguished before the leak is sealed, the leaking gas could explosively re-ignite without warning and cause extensive damage, injury, or fatality. In this case, increase ventilation (in enclosed areas) to prevent flammable mixture formation. If water is not available for cooling or protection of vessel exposures, evacuate the area. Refer to the North American Emergency Response Guidebook (Guide #117) for additional information.

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a release, clear the affected area, protect people, and respond with trained personnel. Adequate fire protection must be provided.

Minimum Personal Protective Equipment should be **Level B: fire-retardant protective clothing, mechanical resistant gloves and Self-Contained Breathing Apparatus.** Use only non-sparking tools and equipment. Locate and seal the source of the leaking gas. Protect personnel attempting the shut-off with water-spray. Allow the gas to dissipate. Monitor the surrounding area for levels of combustible gas, Hydrogen Sulfide, and oxygen. Combustible gas concentration must be below 10% of the LEL (LEL = 4.0%) prior to entry. A colorimetric tube is available for Hydrogen Sulfide. If a colorimetric tube is used to indicate the concentration of Hydrogen Sulfide, the reading obtained should be lower than the limits indicated in Section 2 (Composition and Information on Ingredients). The atmosphere must have at least 19.5 percent oxygen before personnel can be allowed in the area without Self-Contained Breathing Apparatus (SCBA).

Attempt to close the main source valve prior to entering the area. If this does not stop the release (or if it is not possible to reach the valve), allow the gas to release in place or remove it to a safe area and allow the gas to be released there.

THIS IS AN EXTREMELY FLAMMABLE, TOXIC GAS. Protection of all personnel and the area must be maintained.

PART II *What should I do if a hazardous situation occurs?*

7. HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting Hydrogen Sulfide IN YOU. Do not eat or drink while handling chemicals. Be aware of any signs of effects of exposure indicated in Section 3 (Hazard Identification); exposures to fatal concentrations of Hydrogen Sulfide could occur rapidly. Working alone with Hydrogen Sulfide should be avoided when possible. All work operations should be monitored in such a way that emergency personnel can be immediately contacted in the event of a release.

STORAGE AND HANDLING PRACTICES: Cylinders should be stored in dry, well-ventilated areas away from sources of heat. Compressed gases can present significant safety hazards. Store containers away from heavily trafficked areas and emergency exits. Post "No Smoking or Open Flames" signs in storage or use areas. Store Hydrogen Sulfide cylinders away from incompatible materials, such as strong oxidizers, metals, and metal oxides.

SPECIAL PRECAUTIONS FOR HANDLING GAS CYLINDERS: Protect cylinders against physical damage. Store in cool, dry, well-ventilated area, away from sources of heat, ignition and direct sunlight. Do not allow area where cylinders are stored to exceed 52°C (125°F). Use a check valve or trap in the discharge line to prevent hazardous backflow. Post "No Smoking or Open Flame" signs in storage and use areas. Cylinders should be stored upright and be firmly secured to prevent falling or being knocked over. Cylinders can be stored in the open, but in such cases, should be protected against extremes of weather and from the dampness of the ground to prevent rusting. Never tamper with pressure relief devices in valves and cylinders. Electrical equipment should be non-sparking or explosion proof. The following rules are applicable to situations in which cylinders are being used:

Before Use: Move cylinders with a suitable hand truck. Do not drag, slide, or roll cylinders. Do not drop cylinders or permit them to strike each other. Secure cylinders firmly. Leave the valve protection cap, if provided, in-place until cylinder is ready for use.
During Use: Use designated CGA fittings and other support equipment. Do not use adapters. Do not heat cylinder by any means to increase the discharge rate of the product from the cylinder. Use check valve or trap in discharge line to prevent hazardous backflow into the cylinder. Do not use oils or grease on gas-handling fittings or equipment.
After Use: Close main cylinder valve. Replace valve protection cap, if provided. Mark empty cylinders "EMPTY".

NOTE: Use only DOT or ASME code containers. Earth-ground and bond all lines and equipment associated with Hydrogen Sulfide. Close valve after each use and when empty. Cylinders must not be recharged except by or with the consent of owner. For additional information refer to the Compressed Gas Association Pamphlet P-1, *Safe Handling of Compressed Gases in Containers.* Additionally, refer to CGA Bulletin SB-2 "*Oxygen Deficient Atmospheres*" and CGA Pamphlet G-12, "*Hydrogen Sulfide*".

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain application equipment is locked and tagged-out safely. Purge gas handling equipment with inert gas (e.g. nitrogen) before attempting repairs.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation. Local exhaust ventilation is preferred, because it prevents Hydrogen Sulfide dispersion into the work place by eliminating it at its source. If appropriate, install automatic monitoring equipment to detect the level of Hydrogen Sulfide, the presence of potentially explosive air-gas mixtures, and oxygen. Eye wash stations/safety showers should be near areas where Hydrogen Sulfide is used or stored.

RESPIRATORY PROTECTION: Maintain Hydrogen Sulfide levels below the exposure limits provided in Section 2 (Composition and Information on Ingredients) and oxygen levels above 19.5% in the workplace. Use supplied air respiratory protection during emergency response to a release of Hydrogen Sulfide. If respiratory protection is required, follow the requirements of the Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), or equivalent State standards. The following NIOSH respiratory protection recommendations for Hydrogen Sulfide are provided for additional information.

CONCENTRATION of HYDROGEN SULFIDE	**RESPIRATORY EQUIPMENT**
Up to 100 ppm:	Powered air-purifying respirator with cartridge(s) to protect against Hydrogen Sulfide, gas mask with canister to protect against Hydrogen Sulfide, Supplied Air Respirator (SAR), or full-facepiece Self-Contained Breathing Apparatus (SCBA).
Emergency or Planned Entry into Unknown Concentration or IDLH Conditions:	Positive pressure, full-facepiece SCBA or positive pressure, full-facepiece SAR with an auxiliary positive pressure SCBA.
Escape:	Gas mask with canister to protect against Hydrogen Sulfide or escape-type SCBA

The IDLH concentration for Hydrogen Sulfide is 100 ppm.

EYE PROTECTION: Splash goggles or safety glasses, for protection from rapidly expanding gases and splashes of Liquid Hydrogen Sulfide. Additionally, face-shields should be worn if there is a potential for contact with liquid Hydrogen Sulfide.

HAND PROTECTION: Wear mechanical resistant gloves when handling cylinders of Hydrogen Sulfide. Wear chemical resistant gloves when using this gas. Butyl rubber, chlorinated polyethylene, neoprene nitrile, and polyvinyl rubber are recommended.

BODY PROTECTION: Use body protection appropriate for task. Coveralls may be appropriate if splashes from the liquefied gas are anticipated. Transfer of large quantities under pressure may require protective equipment appropriate to protect employees from splashes of liquefied product, as well as fire retardant items.

9. PHYSICAL and CHEMICAL PROPERTIES

VAPOR DENSITY: 1.406 kg/m^3 (0.0878 lb/ft^3)
SPECIFIC GRAVITY (air = 1): 1.188
SOLUBILITY IN WATER: Soluble.
EVAPORATION RATE (nBuAc = 1): Not applicable.
ODOR THRESHOLD: 0.13-100 ppm.
COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable.
pH: Not applicable.
FREEZING POINT: -85.5°C (-122.0°F)
BOILING POINT @ 1 atm: -60.3°C (-76.6°F)
EXPANSION RATIO: Not applicable
VAPOR PRESSURE (psia): 266.7
SPECIFIC VOLUME (ft^3/lb): 11.2

APPEARANCE AND COLOR: Colorless gas. The liquid is also colorless. The odor for both the liquid and gas is similar to that of "rotten eggs".

HOW TO DETECT THIS SUBSTANCE (warning properties): Continuous inhalation of low concentrations may cause olfactory fatigue, so that there are no distinct warning properties. In terms of leak detection, fittings and joints can be painted with a soap solution to detect leaks, which will be indicated by a bubble formation. Wet lead acetate paper can be used for leak detection. The paper turns black in the presence of Hydrogen Sulfide. Cadmium Chloride solutions can also be used. The solution will turn yellow upon contact with Hydrogen Sulfide.

10. STABILITY and REACTIVITY

STABILITY: Stable.

DECOMPOSITION PRODUCTS: Water, sulfur dioxide.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Hydrogen Sulfide is not compatible with the following materials: oxidizing agents, organic peroxides, alkaline materials, metals (e.g., copper, lead), and metal oxides. Hydrogen Sulfide is corrosive to most metals, because it reacts with these substances to form metal sulfides.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Contact with incompatible materials and exposure to heat, sparks and other sources of ignition Avoid exposing cylinders to extremely high temperatures, which could cause the cylinders to rupture.

PART III *How can I prevent hazardous situations from occurring?*

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: The following information is for Hydrogen Sulfide.

LCLo (inhalation, human) = 600 ppm/30 minutes
LDLo (inhalation, man) = 5.7 mg/kg; central nervous system, pulmonary effects
LCLo (inhalation, human) = 800 ppm/5 minutes
LC_{50} (inhalation, rat) = 444 ppm
TCLo (inhalation, rat) = 20 ppm (female, 6-22 days post), reproductive effects
LC_{50} (inhalation, mouse) = 634 ppm/1 hour
LCLo (inhalation, mammal) = 800 ppm/5 minutes

SUSPECTED CANCER AGENT: Hydrogen Sulfide is not found on the following lists: FEDERAL OSHA Z LIST, NTP, IARC, CAL/OSHA, and therefore is neither considered to be nor suspected to be a cancer-causing agent by these agencies.

IRRITANCY OF PRODUCT: Hydrogen Sulfide is severely irritating to the eyes, and may be mildly to severely irritating to the skin.

SENSITIZATION TO THE PRODUCT: Hydrogen Sulfide is not known to cause sensitization in humans with prolonged or repeated contact.

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of Hydrogen Sulfide and its components on the human reproductive system.

Mutagenicity: No mutagenicity effects for humans have been described for Hydrogen Sulfide.
Embryotoxicity: No embryotoxic effects for humans have been described for Hydrogen Sulfide.
Teratogenicity: No teratogenic effects for humans have been described for Hydrogen Sulfide.
Reproductive Toxicity: No reproductive toxicity effects for humans have been described for Hydrogen Sulfide. Animal reproductive data are available for Hydrogen Sulfide; these data were obtained during clinical studies on specific animal tissues exposed to this compound.

A mutagen is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generation lines. An embryotoxin is a chemical which causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A teratogen is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance which interferes in any way with the reproductive process.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Conditions relating to the target organs may be aggravated by overexposures to Hydrogen Sulfide. See Section 3 (Hazard Identification) for information on these conditions.

RECOMMENDATIONS TO PHYSICIANS: Administer oxygen, if necessary. Treat symptoms and eliminate exposure. Be observant for initial signs of pulmonary edema.

BIOLOGICAL EXPOSURE INDICES (BEIs): Currently, Biological Exposure Indices (BEIs) are not applicable for Hydrogen Sulfide.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: This gas will be dissipated rapidly in well-ventilated areas. Additional environmental data are available for Hydrogen Sulfide as follows:

HYDROGEN SULFIDE: Water Solubility = 1 g/242 mL at 20°C

EFFECT OF MATERIAL ON PLANTS or ANIMALS: Any adverse effect on animals would be related to oxygen-deficient environments, respiratory system damage, and central nervous system effects. See Section 11 (Toxicological Information) for additional information on the effects on animals. Additional information on the effects of Hydrogen Sulfide on plants are available as follows:

Continuous fumigation of plants with 300 or 3000 ppb Hydrogen Sulfide caused leaf lesions, defoliation, and reduced growth with severity of injury correlated to dose. At higher (3.25 and 5.03 ppm) Hydrogen Sulfide, significant reductions in leaf CO2 and water vapor exchanges occurred, and stomatal openings were depressed. When Hydrogen Sulfide gas was applied to 29 species of green plants for 5 hours, young, rapidly elongating tissues were more sensitive to injury than older tissues. Symptoms included scorching of young shoots and leaves, basal and marginal scorching of older leaves. Mature leaves were unaffected. Seeds exposed to Hydrogen Sulfide gas showed delay in germination.

EFFECT OF CHEMICAL ON AQUATIC LIFE: Hydrogen Sulfide is soluble in water and is toxic to terrestrial life. Therefore, all work practices should be aimed at eliminating contamination of aquatic environments with Hydrogen Sulfide. Additional information on effects of Hydrogen Sulfide on aquatic life are as follows on the next page:

12. ECOLOGICAL INFORMATION (Continued)

EFFECT OF CHEMICAL ON AQUATIC LIFE:

TLm (Asellussp) = 0.111 mg/L/96 hour
TLm (Cranfgonyx sp) =1.07 mg/L/96 hour
TLm (Gammarrus) = 0.84 mg/L/96 hour
LC_{50} (fly inhalation) = 380 mg/m^3/960 minutes
LC_{50} (fly inhalation) = 1500 mg/m^3/7 minutes
TLm (Lepomis macrochirus, bluegill sunfish) = 0.0478 mg/L/96 hour
TLm (Lepomis macrochirus, bluegill sunfish) = 0.0448 mg/L/96 hour at 21-22 °C
TLm (Pimephlaes promelas, fathead minnow) = 0.0071-0.55 mg/L/96 hour
TLm (Salvenilis foninalis, brook trout) = 0.0160-0.515 mg/L/96 hour at 6-12.5 °C
LC_{50} (goldfish, *Carassius auratus*) = 51-95 mg/L, flow-through test, varied oxygen, 96 hours
LC_{50} (white suckers, *Catastonius commersonii*) = 0.018-0.034 mg/L, 24-120 hours, flow-through test
LC_{50} (northern pike, *Esox lucius*) = 0.026-0.159 mg/L, 96-24 hours, flow-through test
LC_{50} (walleye, *Stizostedion vitreum*) = 0.007-0.020 mg/L, 72-96 hours, flow-through test
LC_{50} (bluegill, *Lepomis macrochirus*) = 0.0090-0.032 mg/L, 96 hours, temperatures 8-22°C

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Product removed from the cylinder must be disposed of in accordance with appropriate Federal, State, and local regulations. Return cylinders with residual product to Airgas. Do not dispose locally.

14. TRANSPORTATION INFORMATION

THIS MATERIAL IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME: Hydrogen sulfide, liquefied
HAZARD CLASS NUMBER and DESCRIPTION: 2.3 (Poison Gas)
UN IDENTIFICATION NUMBER: UN 1053
PACKING GROUP: Not Applicable
DOT LABEL(S) REQUIRED: Poison Gas, Flammable Gas
NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2000): 117
SPECIAL PROVISION: Hydrogen Sulfide is poisonous by inhalation. Shipments must be properly described as inhalation hazards. ZONE B.
MARINE POLLUTANT: Hydrogen Sulfide is not classified by the DOT as a Marine Pollutant (as defined by 49 CFR 172.101, Appendix B).

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: THIS MATERIAL IS CONSIDERED AS DANGEROUS GOODS. Use the above information for the preparation of Canadian Shipments. Note: There is an alternative shipping name spelling for Canadian shipments: Hydrogen Sulphide.

15. REGULATORY INFORMATION

U.S. SARA REPORTING REQUIREMENTS: Hydrogen Sulfide is subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act, as follows:

CHEMICAL NAME	SARA 302 (40 CFR 355, Appendix A)	SARA 304 (40 CFR Table 302.4)	SARA 313 (40 CFR 372.65)
Hydrogen Sulfide	YES	YES	YES

U.S. SARA THRESHOLD PLANNING QUANTITY: Hydrogen Sulfide = 500 lb.

U.S. CERCLA REPORTABLE QUANTITY (RQ): Hydrogen Sulfide CERCLA RQ = 100 lb; Hydrogen Sulfide EHS (Extremely Hazardous Substance) RQ = 100 lb; Hydrogen Sulfide RCRA Code = U135.

CANADIAN DSL/NDSL INVENTORY STATUS: Hydrogen Sulfide is on the DSL Inventory.

U.S. TSCA INVENTORY STATUS: Hydrogen Sulfide is listed on the TSCA Inventory.

OTHER U.S. FEDERAL REGULATIONS: Hydrogen Sulfide is subject to the reporting requirements of Section 112(r) of the Clean Air Act. The Threshold Quantity for this gas is 10,000 lb. Compliance with the OSHA Process Safety Standard (29 CFR 1910.119) may be applicable to operations involving the use of Hydrogen Sulfide. Under this regulation Hydrogen Sulfide is listed in Appendix A. The Threshold Quantity of Hydrogen Sulfide under this regulation is 1500 lb.

15. REGULATORY INFORMATION (Continued)

U.S. STATE REGULATORY INFORMATION: Hydrogen Sulfide is covered under specific State regulations, as denoted below:

Alaska - Designated Toxic and Hazardous Substances: Hydrogen Sulfide.
California - Permissible Exposure Limits for Chemical Contaminants: Hydrogen Sulfide.
Florida - Substance List: Hydrogen Sulfide.
Illinois - Toxic Substance List: Hydrogen Sulfide.
Kansas - Section 302/313 List: Hydrogen Sulfide.
Massachusetts - Substance List: Hydrogen Sulfide.
Michigan - Critical Materials Register: Hydrogen Sulfide.
Minnesota - List of Hazardous Substances: Hydrogen Sulfide.
Missouri - Employer Information/Toxic Substance List: Hydrogen Sulfide.
New Jersey - Right to Know Hazardous Substance List: Hydrogen Sulfide.
North Dakota - List of Hazardous Chemicals, Reportable Quantities: Hydrogen Sulfide.
Pennsylvania - Hazardous Substance List: Hydrogen Sulfide.
Rhode Island - Hazardous Substance List: Hydrogen Sulfide.
Texas - Hazardous Substance List: Hydrogen Sulfide.
West Virginia - Hazardous Substance List: Hydrogen Sulfide.
Wisconsin - Toxic and Hazardous Substances: Hydrogen Sulfide.

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): Hydrogen Sulfide is not on the California Proposition 65 lists.

LABELING:

DANGER: POISONOUS, FLAMMABLE LIQUID AND GAS UNDER PRESSURE.
MAY BE FATAL IF INHALED.
CAN FORM EXPLOSIVE MIXTURES WITH AIR.
MAY CAUSE RESPIRATORY TRACT AND CENTRAL NERVOUS SYSTEM DAMAGE.
CAN CAUSE EYE IRRITATION.
GAS DEADENS SENSE OF SMELL.
SYMPTOMS MAY BE DELAYED.

ODOR: ROTTEN EGGS.

Do not breath gas.
Do not depend on odor to detect presence of gas.
Store and use with adequate ventilation, and use in closed systems.
Keep away from heat, flames, and sparks.
Avoid contact with eyes.
Cylinder temperature should not exceed 52°C (125°F).
Close valve after each use and when empty.
Use in accordance with the Material Safety Data Sheet.

POISON

CALL A PHYSICIAN

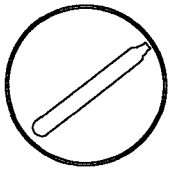
FIRST AID: **IF INHALED**, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician, even if no symptoms are present. Keep under medical observation. Symptoms may be delayed.

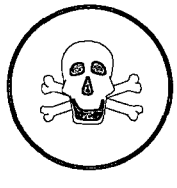
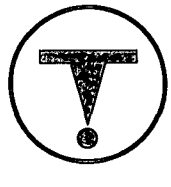
IN CASE OF CONTACT, immediately flush eyes or skin with water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician.

DO NOT REMOVE THIS PRODUCT LABEL.

CANADIAN WHMIS SYMBOLS:

Class A: Compressed Gas
Class B1: Flammable Gas
Class D1A: Toxic Material/Immediate and Serious Effects
Class D2B: Other Toxic Effects



16. OTHER INFORMATION

PREPARED BY: **Airgas - SAFECOR**

The information contained herein is based on data considered accurate. However, no warranty is expressed or implied regarding the accuracy of these data or the results to be obtained from the use thereof. AIRGAS, Inc. assumes no responsibility for injury to the vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, AIRGAS, Inc. assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in his use of the material.

DEFINITIONS OF TERMS

A large number of abbreviations and acronyms appear on a MSDS. Some of these which are commonly used include the following:

CAS #: This is the Chemical Abstract Service Number which uniquely identifies each constituent. It is used for computer-related searching.

EXPOSURE LIMITS IN AIR:
ACGIH - American Conference of Governmental Industrial Hygienists, a professional association which establishes exposure limits. **TLV** - Threshold Limit Value - an airborne concentration of a substance which represents conditions under which it is generally believed that nearly all workers may be repeatedly exposed without adverse effect. The duration must be considered, including the 8-hour Time Weighted Average **(TWA)**, the 15-minute Short Term Exposure Limit, and the instantaneous Ceiling Level **(C)**. Skin absorption effects must also be considered.
OSHA - U.S. Occupational Safety and Health Administration. **PEL** - Permissible Exposure Limit - This exposure value means exactly the same as a TLV, except that it is enforceable by OSHA. The OSHA Permissible Exposure Limits are based in the 1989 PELs and the June, 1993 Air Contaminants Rule (Federal Register: 58: 35338-35351 and 58: 40191). Both the current PELs and the vacated PELs are indicated. The phrase, "Vacated 1989 PEL," is placed next to the PEL which was vacated by Court Order.
IDLH - Immediately Dangerous to Life and Health - This level represents a concentration from which one can escape within 30-minutes without suffering escape-preventing or permanent injury. **The DFG - MAK** is the Republic of Germany's Maximum Exposure Level, similar to the U.S. PEL. **NIOSH** is the National Institute of Occupational Safety and Health, which is the research arm of the U.S. **O**ccupational **S**afety and **H**ealth **A**dministration (**OSHA**). NIOSH issues exposure guidelines called **R**ecommended **E**xposure **L**evels (**RELs**). When no exposure guidelines are established, an entry of **NE** is made for reference.

HAZARD RATINGS:
HAZARDOUS MATERIALS IDENTIFICATION SYSTEM: Health Hazard: **0** (minimal acute or chronic exposure hazard); **1** (slight acute or chronic exposure hazard); **2** (moderate acute or significant chronic exposure hazard); **3** (severe acute exposure hazard; onetime overexposure can result in permanent injury and may be fatal); **4** (extreme acute exposure hazard; onetime overexposure can be fatal). Flammability Hazard: **0** (minimal hazard); **1** (materials that require substantial pre-heating before burning); **2** (combustible liquid or solids; liquids with a flash point of 38-93°C [100-200°F]); **3** (Class IB and IC flammable liquids with flash points below 38°C [100°F]); **4** (Class IA flammable liquids with flash points below 23°C [73°F] and boiling points below 38°C [100°F]. Reactivity Hazard: **0** (normally stable); 1 (material that can become unstable at elevated temperatures or which can react slightly with water); **2** (materials that are unstable but do not detonate or which can react violently with water); **3** (materials that can detonate when initiated or which can react explosively with water); **4** (materials that can detonate at normal temperatures or pressures).
NATIONAL FIRE PROTECTION ASSOCIATION: Health Hazard: **0** (material that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials); **1** (materials that on exposure under fire conditions could cause irritation or minor residual injury); **2** (materials that on intense or continued exposure under fire conditions could cause temporary incapacitation or possible residual injury); **3** (materials that can on short exposure could cause serious temporary or residual injury); **4** (materials that under very short exposure causes death or major residual injury).

NATIONAL FIRE PROTECTION ASSOCIATION (Continued): Flammability Hazard and Reactivity Hazard: Refer to definitions for "Hazardous Materials Identification System".

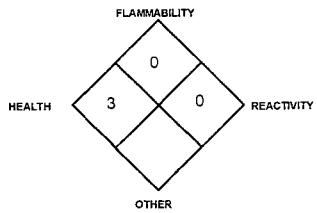
FLAMMABILITY LIMITS IN AIR:
Much of the information related to fire and explosion is derived from the National Fire Protection Association (**NFPA**). Flash Point - Minimum temperature at which a liquid gives off sufficient vapors to form an ignitable mixture with air. Autoignition Temperature: The minimum temperature required to initiate combustion in air with no other source of ignition. LEL - the lowest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source. UEL - the highest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source.

TOXICOLOGICAL INFORMATION:
Possible health hazards as derived from human data, animal studies, or from the results of studies with similar compounds are presented. Definitions of some terms used in this section are: **LD_{50}** - Lethal Dose (solids & liquids) which kills 50% of the exposed animals; **LC_{50}** - Lethal Concentration (gases) which kills 50% of the exposed animals; **ppm** concentration expressed in parts of material per million parts of air or water; **mg/m^3** concentration expressed in weight of substance per volume of air; **mg/kg** quantity of material, by weight, administered to a test subject, based on their body weight in kg. Data from several sources are used to evaluate the cancer-causing potential of the material. The sources are: **IARC** - the International Agency for Research on Cancer; **NTP** - the National Toxicology Program, **RTECS** - the Registry of Toxic Effects of Chemical Substances, **OSHA** and **CAL/OSHA**. IARC and NTP rate chemicals on a scale of decreasing potential to cause human cancer with rankings from 1 to 4. Subrankings (2A, 2B, etc.) are also used. Other measures of toxicity include **TDLo**, the lowest dose to cause a symptom and **TCLo** the lowest concentration to cause a symptom; **TDo**, **LDLo**, and **LDo**, or **TC**, **TCo**, **LCLo**, and **LCo**, the lowest dose (or concentration) to cause lethal or toxic effects. **BEI** - Biological Exposure Indices, represent the levels of determinants which are most likely to be observed in specimens collected from a healthy worker who has been exposed to chemicals to the same extent as a worker with inhalation exposure to the TLV. Ecological Information: EC is the effect concentration in water.

REGULATORY INFORMATION:
This section explains the impact of various laws and regulations on the material. **EPA** is the U.S. Environmental Protection Agency. **WHMIS** is the Canadian Workplace Hazardous Materials Information System. **DOT** and **TC** are the U.S. Department of Transportation and the Transport Canada, respectively. Superfund Amendments and Reauthorization Act **(SARA)**; the Canadian Domestic/Non-Domestic Substances List **(DSL/NDSL)**; the U.S. Toxic Substance Control Act **(TSCA)**; Marine Pollutant status according to the **DOT**; the Comprehensive Environmental Response, Compensation, and Liability Act **(CERCLA or Superfund)**; and various state regulations.

Airgas

NFPA RATING



MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards

PART I *What is the material and what do I need to know in an emergency?*

1. PRODUCT IDENTIFICATION

CHEMICAL NAME; CLASS:	**SULFUR DIOXIDE - SO_2**
	Document Number: 001047
PRODUCT USE:	For general analytical/synthetic chemical uses.
SUPPLIER/MANUFACTURER'S NAME:	AIRGAS INC.
ADDRESS:	259 N. Radnor-Chester Road Suite 100 Radnor, PA 19087-5283
BUSINESS PHONE:	1-610-687-5253
EMERGENCY PHONE:	CHEMTREC: 1-800-424-9300 International: 703-527-3887 (Call Collect)
DATE OF PREPARATION:	May 20, 1996
SECOND REVISION:	January 23, 1998

2. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	mole %	EXPOSURE LIMITS IN AIR					
			ACGIH		OSHA			
			TLV ppm	STEL ppm	PEL ppm	STEL ppm	IDLH ppm	OTHER
Sulfur Dioxide	7446-09-5	> 99.98 %	2, A4 (Not Classifiable as Human Carcinogen)	5	5 2 (Vacated 1989 PEL)	5 (Vacated 1989 PEL)	100	NIOSH REL: 2 ppm TWA; 5 ppm STEL DFG-MAK: 2 ppm TWA
Maximum Impurities		< 0.02%	None of the trace impurities in this mixture contribute significantly to the hazards associated with the product. All hazard information pertinent to this product has been provided in this Material Safety Data Sheet, per the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200) and State equivalent standards.					

NE = Not Established C = Ceiling Limit See Section 16 for Definitions of Terms Used

NOTE: All WHMIS required information is included. It is located in appropriate sections based on the ANSI Z400.1-1993 format.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: Sulfur Dioxide is a colorless, non-flammable, toxic gas with a distinct odor similar to burning sulfur. Sulfur Dioxide is shipped as a liquid which rapidly turns into a gas at standard atmospheric temperatures and pressures. Sulfur Dioxide is irritating to the respiratory system and to contaminated skin and eyes. Exposure to high concentrations of this gas may be fatal. Contact with rapidly expanding gases, or contact with the liquid, may cause frostbite. The gas reacts with water or moisture to generate sulfurous acid, which can also be corrosive to contaminated tissue.

SYMPTOMS OF OVEREXPOSURE BY ROUTE OF EXPOSURE: The most significant route of overexposure for Sulfur Dioxide is by inhalation. The following paragraphs describe symptoms of exposure by route of exposure.

INHALATION: Exposure to Sulfur Dioxide gas in low concentrations produces an irritating effect on the mucous membranes of the eyes, nose, throat, and lungs due to the formation of sulfurous acid when it comes into contact with moist tissues or moist air. Acute exposure through inhalation may result in dryness and irritation of the nose and throat, choking, coughing, and bronchospasm. Severe overexposure may cause death through systemic acidosis, pulmonary edema, or from respiratory arrest. High concentrations of Sulfur Dioxide gas may cause an oxygen deficient atmosphere. Exposure to high concentrations may cause unconsciousness, and under some circumstances, death.

Prolonged or repeated overexposures may cause impaired lung function, bronchitis, hacking cough, nasal irritation and discharge, increased fatigue, alteration in the senses of taste and smell. Repeated over exposures to Sulfur Dioxide can also result in dental erosion and gum disorders.

SKIN and EYE CONTACT: The gas may be irritating to the skin, especially in a moist environment. Symptoms of skin overexposure may include scratchiness, pain, and redness. If Sulfur Dioxide contaminates the eyes, damage to eye tissue will result in pain, inflammation, and potentially, blindness. Liquid Sulfur Dioxide will be very corrosive to contaminated skin and eye tissue, producing the same symptoms as described for the gas, but with the on-set of symptoms occurring more rapidly. Eye injury from contact with liquid Sulfur Dioxide may not be immediately noticed because of the damage which can occur to the optical nerves. Contact with liquid or rapidly expanding gases (which are released under high pressure) may cause frostbite. Symptoms of frostbite include change in skin color to white or grayish-yellow. The pain after such contact can quickly subside.

HAZARDOUS MATERIAL INFORMATION SYSTEM

HEALTH	(BLUE)	3
FLAMMABILITY	(RED)	0
REACTIVITY	(YELLOW)	0
PROTECTIVE EQUIPMENT		H

EYES	RESPIRATORY	HANDS	BODY
	See Section 8		See Section 8

For routine industrial applications

See Section 16 for Definition of Ratings

OTHER POTENTIAL HEALTH EFFECTS: While ingestion is highly unlikely, ingestion of Sulfur Dioxide can damage the tissues of the mouth, throat, esophagus, and other tissues of the digestive system. Ingestion of Sulfur Dioxide can be fatal. Additionally, aspiration by inhalation is possible, causing chemical pneumonia or death.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in **Lay Terms**. Overexposure to Sulfur Dioxide may cause the following health effects:

ACUTE: This gas is toxic and damaging to the respiratory system as well as contaminated skin and eyes. Overexposures can result in severe irritation and burns of eyes, skin, mucous membranes, and any other exposed tissue. If inhaled, irritation of the respiratory system may occur, with coughing, and breathing difficulty. Overexposure to this gas may be fatal. Though unlikely to occur during occupational use, ingestion of large quantities may be fatal. Contact with liquid or rapidly expanding gases may cause frostbite.

CHRONIC: Prolonged or repeated overexposures may cause respiratory problems, bronchitis, hacking cough, nasal irritation and discharge, increased fatigue, alteration in the senses of taste and smell. Repeated over exposures to Sulfur Dioxide can also result in dental erosion and gum disorders.

TARGET ORGANS: Respiratory system, skin, eyes, central nervous system.

PART II *What should I do if a hazardous situation occurs?*

4. FIRST-AID MEASURES

RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO SULFUR DIOXIDE WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. At a minimum, Self-Contained Breathing Apparatus and Personal Protective Equipment should be worn

Remove victim(s) to fresh air, as quickly as possible. Trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation, if necessary. Only trained personnel should administer supplemental oxygen.

SKIN EXPOSURE: If Sulfur Dioxide contaminates the skin, immediately begin decontamination with running water. Minimum flushing is for 15 minutes. Remove exposed or contaminated clothing, taking care not to contaminate eyes. Victim must seek immediate medical attention.

Note: if frostbite has occurred after exposure to rapidly expanding gases, treatment for frostbite should be initiated after the contaminated areas has been flushed (per the instructions in the previous paragraph). In case of frostbite, place the frostbitten part in warm water. DO NOT USE HOT WATER. If warm water is not available, or is impractical to use, wrap the affected parts gently in blankets. Alternatively, if the fingers or hands are frostbitten, place the affected area in the armpit. Encourage victim to gently exercise the affected part while being warmed. Seek immediate medical attention.

EYE EXPOSURE: If liquid is splashed into eyes, or if irritation of the eye develops after exposure to liquid or gas, open victim's eyes while under gentle running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 15 minutes.

Victim(s) must be taken for medical attention. Rescuers should be taken for medical attention, if necessary. Take copy of label and MSDS to physician or other health professional with victim(s). Refer to "Recommendations to Physicians," Section 11 (Toxicological Information) for additional information on first-aid measures.

5. FIRE-FIGHTING MEASURES

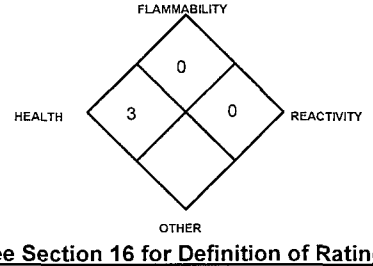
FLASH POINT: Not applicable.
AUTOIGNITION TEMPERATURE: Not applicable.
FLAMMABLE LIMITS (in air by volume, %):

Lower (LEL): Not applicable.
Upper (UEL): Not applicable.

FIRE EXTINGUISHING MATERIALS: Use extinguishing media appropriate for the surrounding fire.

Water Spray: YES	Carbon Dioxide: YES	Foam: YES
Dry Chemical: YES	Halon: YES	Other: Any "ABC" Class.

NFPA RATING



See Section 16 for Definition of Ratings

UNUSUAL FIRE AND EXPLOSION HAZARDS: Sulfur Dioxide is a toxic gas and presents a significant health hazard to firefighters. In the event of fire, cool containers of Sulfur Dioxide with water to prevent failure. Use a water spray or fog to reduce or direct vapors. Do not direct a water spray at the source of a release. Water spray should be used with care. Sulfur Dioxide can react with water to form a corrosive solution of sulfurous acid. Sulfurous acid can corrode metal.

Explosion Sensitivity to Mechanical Impact: Not sensitive.
Explosion Sensitivity to Static Discharge: Not sensitive.

SPECIAL FIRE-FIGHTING PROCEDURES: Incipient fire responders should wear eye protection. Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Fight fires in a protected location. Approach fire from an upwind direction, to prevent overexposure to Sulfur Dioxide. If Sulfur Dioxide is involved in a fire, fire runoff water should be contained to prevent possible environmental damage. If unruptured cylinders are exposed to heat, the cylinder may rupture or burst and release the contents. It may be prudent to remove potentially heat-exposed cylinders from the area surrounding a fire, if it is safe for firefighters to do so.

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a release, clear the affected area, protect people, and respond with trained personnel. Adequate fire protection must be provided. Call CHEMTREC (1-800-424-9300) for emergency assistance.

Minimum Personal Protective Equipment should be **Level B: triple-gloves (rubber gloves and nitrile gloves, over latex gloves), chemically resistant suit and boots, hard-hat, and Self-Contained Breathing Apparatus.** A colorimetric tube is available for Sulfur Dioxide. If a colorimetric tube is used to indicate the concentration of Sulfur Dioxide, the reading obtained should be lower than the limits indicated in Section 2 (Composition and Information on Ingredients) before non-emergency personnel are permitted into area. Monitor the surrounding area for oxygen. The atmosphere must have at least 19.5 percent oxygen before personnel can be allowed in the area without Self-Contained Breathing Apparatus (SCBA).

Attempt to close the main source valve prior to entering the area. If this does not stop the release (or if it is not possible to reach the valve), allow the gas to release in-place or remove it to a safe area and allow the gas to be released there.

THIS IS A TOXIC GAS. Protection of all personnel and the area must be maintained.

PART III *How can I prevent hazardous situations from occurring?*

7. HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting Sulfur Dioxide ON YOU or IN YOU. Wash hands after handling chemicals. Do not eat or drink while handling chemicals. All work practices should minimize the release of Sulfur Dioxide. Be aware of any signs of exposure as indicated in Section 2 (Composition and Information on Ingredients); exposures to fatal concentrations of Sulfur Dioxide could occur rapidly.

STORAGE AND HANDLING PRACTICES: All employees who handle this material should be trained to handle it safely. Avoid breathing the gas or sprays or mists generated by Sulfur Dioxide. Store containers in a cool, dry location, away from direct sunlight, sources of intense heat, or where freezing is possible. Use only compatible materials for cylinders, process lines, and other Sulfur Dioxide-handling equipment. Anhydrous Sulfur Dioxide is not corrosive to steel and other common structural materials, except zinc. In the presence of moisture, however, corrosive conditions will develop. Lead, carbon, graphite, and stainless steel, type 316 are recommended for handling moist Sulfur Dioxide. Lines should be purged with dry nitrogen both before and after maintenance activity. Keep cylinder tightly closed when not in use. Keep cylinders away from incompatible material. Wash thoroughly after using this material. Workers must be thoroughly trained to handle Sulfur Dioxide without causing overexposure. Periodic inspections of process equipment by knowledgeable persons should be made to ensure that the equipment is used appropriately and the system is kept in suitable operating condition. Sulfur Dioxide emergency equipment should be available near the point of use.

- Workers who handle Sulfur Dioxide should wear protective clothing, as listed in Section 8 (Exposure Controls - Personal Protection).
- Instant-acting showers should be available in the event of an emergency.
- Special eye-wash fountains or similar equipment should be available for eye irrigation.
- Proper respiratory protection equipment must be provided and workers using such equipment must be carefully trained in its operation and limitations.
- Precautions must always be taken to prevent suck-back of foreign materials into the cylinder by using a check-valve, vacuum break, or trap, since suck-back may cause dangerous pressure changes within the cylinder.
- The cylinder valve should be closed after each use.

SPECIAL PRECAUTIONS FOR HANDLING GAS CYLINDERS: Protect cylinders against physical damage. Store in cool, dry, well-ventilated area, away from sources of heat, ignition and direct sunlight. Do not allow area where cylinders are stored to exceed 52°C (125°F). Use a check valve or trap in the discharge line to prevent hazardous backflow. Post "No Smoking or Open Flame" signs in storage and use areas. Cylinders should be stored upright and be firmly secured to prevent falling or being knocked over. Cylinders can be stored in the open, but in such cases, should be protected against extremes of weather and from the dampness of the ground to prevent rusting. Never tamper with pressure relief devices. The rules following on the following page are applicable to situations in which cylinders are being used:

7. HANDLING and STORAGE (Continued)

SPECIAL PRECAUTIONS FOR HANDLING GAS CYLINDERS (continued):

Before Use: Move cylinders with a suitable hand-truck. Do not drag, slide or roll cylinders. Do not drop cylinders or permit them to strike each other. Secure cylinders firmly. Leave the valve protection cap, if provided, in-place until cylinder is ready for use.

During Use: Use designated CGA fittings and other support equipment. Do not use adapters. Do not heat cylinder by any means to increase the discharge rate of the product from the cylinder. Use check valve or trap in discharge line to prevent hazardous backflow into the cylinder. Do not use oils or grease on gas-handling fittings or equipment.

After Use: Close main cylinder valve. Replace valve protection cap, if provided. Mark empty cylinders "EMPTY".

NOTE: Use only DOT or ASME code containers. Close valve after each use and when empty. Cylinders must not be recharged except by or with the consent of owner. For additional information refer to the Compressed Gas Association Pamphlet P-1, *Safe Handling of Compressed Gases in Containers*. Additionally, refer to CGA Bulletin SB-2 "*Oxygen Deficient Atmospheres*" and CGA Pamphlet G-3, "*Sulfur Dioxide*".

TANK CAR SHIPMENTS: Tank cars carrying Sulfur Dioxide should be loaded and unloaded in strict accordance with tank-car manufacturer's recommendations and all established on-site safety procedures. Appropriate personal protective equipment must be used during tank car operations (see Section 8, Exposure Controls - Personal Protection). All loading and unloading equipment must be inspected, prior to each use. Loading and unloading operations must be attended, at all times. Tank cars must be level and wheels must be locked or blocked prior to loading or unloading. Tank car (for loading) or storage tank (for unloading) must be verified to be correct for receiving Sulfur Dioxide and be properly prepared, prior to starting the transfer operations. Hoses must be verified to be clean and free of incompatible chemicals, prior to connection to the tank car or vessel. Valves and hoses must be verified to be in the correct positions, before starting transfer operations. A sample (if required) must be taken and verified (if required) prior to starting transfer operations. All lines must be blown-down and purged before disconnecting them from the tank car or vessel.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain application equipment is locked and tagged-out safely. Purge gas handling equipment with inert gas (e.g., nitrogen) before attempting repairs.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation. Local exhaust ventilation is preferred, because it prevents Sulfur Dioxide dispersion into the work place by eliminating it at its source. If appropriate, install automatic monitoring equipment to detect the level of Sulfur Dioxide and oxygen. Eye wash stations/safety showers should be near areas where Sulfur Dioxide is used or stored.

RESPIRATORY PROTECTION: Maintain Sulfur Dioxide below the exposure limits provided in Section 2 (Composition and Information on Ingredients) and oxygen levels above 19.5% in the workplace. Use supplied air respiratory protection during emergency response to a release of Sulfur Dioxide or if oxygen levels are below 19.5%. If respiratory protection is required, follow the requirements of the Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), or equivalent State standards. The following NIOSH recommendations for Sulfur Dioxide concentrations in air are in place.

CONCENTRATION	RESPIRATORY EQUIPMENT
Up to 20 ppm:	Chemical cartridge respirator with cartridge(s); or Supplied Air Respirator (SAR).
Up to 50 ppm:	Powered air-purifying respirator with cartridge(s); or SAR operated in continuous-flow mode.
Up to 100 ppm:	Full-Facepiece chemical cartridge respirator with cartridge(s); or gas mask with canister; or powered air-purifying respirator with a tight-fitting facepiece and cartridge(s); or full-facepiece Self-Contained Breathing Apparatus (SCBA); or full-facepiece SAR; or SAR with a tight-fitting facepiece operated in a continuous-flow mode.
Emergency or Planned Entry into Unknown Concentration or IDLH Conditions:	Positive pressure, full-facepiece SCBA; or positive pressure, full-facepiece SAR with an auxiliary positive pressure SCBA.

The IDLH concentration for Sulfur Dioxide is 100 ppm.

EYE PROTECTION: Splash goggles or safety glasses, for protection from rapidly expanding gases and splashes of Liquid Sulfur Dioxide. Additionally, face-shields should be worn if there is a potential for contact with liquid Sulfur Dioxide.

HAND PROTECTION: Wear mechanically-resistant gloves when handling cylinders of Sulfur Dioxide. Wear chemically-resistant gloves when using this gas. Butyl rubber, chlorinated polyethylene, neoprene are recommended.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION (Continued)

BODY PROTECTION: Use body protection appropriate for task. Coveralls may be appropriate if splashes from the liquefied gas are anticipated. Transfer of large quantities under pressure may require protective equipment appropriate to protect employees from splashes of liquefied product.

9. PHYSICAL and CHEMICAL PROPERTIES

VAPOR DENSITY: 2.668 kg/m^3 (0.1665 lb/ft^3)
SPECIFIC GRAVITY (air = 1): 2.263
SOLUBILITY IN WATER: Converts to soluble sulfurous acid.
VAPOR PRESSURE (psia): 49.1
ODOR THRESHOLD: 3-5 ppm.
pH: Not applicable. (1% solution in water will have a pH < 3).
COEFFICIENT WATER/OIL DISTRIBUTION: *Not applicable.*

EVAPORATION RATE (nBuAc = 1): Not applicable.
FREEZING POINT: -75.5°C (-103.9°F)
BOILING POINT @ 1 atm: -10°C (14.0°F)
EXPANSION RATIO: Not available.
SPECIFIC VOLUME (ft^3/lb): 5.9

APPEARANCE AND COLOR: Colorless gas. The liquid is also colorless. The odor for both the liquid and gas is similar to that of burning sulfur.

HOW TO DETECT THIS SUBSTANCE (warning properties): Though the odor is extremely disagreeable, it does not serve as a reliable warning property for Sulfur Dioxide. The Odor Threshold is the same order of magnitude as the concentration of exposure associated with adverse health effects. In terms of leak detection, fittings and joints can be painted with a soap solution to detect leaks, which will be indicated by a bubble formation. Wet lead acetate paper can be used for leak detection. Additionally, leaks of Sulfur Dioxide in lines or equipment may be located by passing a squeeze bottle of aqueous ammonia over sites of suspected leaks; dense, white fumes sill be formed near the leaks.

10. STABILITY and REACTIVITY

STABILITY: Stable.

DECOMPOSITION PRODUCTS: Will react with water or, moist air to form sulfurous acid.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Sulfur Dioxide is not compatible with the following materials: strong bases, strong oxidizers, powdered metals, metal oxides, sodium hydride, silver azide, cesium azide, zinc, zinc compounds, metal acetylides.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Contact with moisture and incompatible materials. Cylinders exposed to high temperatures or direct flame can rupture or burst.

PART IV *Is there any other useful information about this material?*

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: The following information is for Sulfur Dioxide.

Eye, rabbit = 6 ppm/4 hours/32 days; mild effects
Mutation in Microorganisms System Test = 10 mmol/L
DNA damage System Test (human, lymphocyte) = 5700 ppb
TCLo (inhalation, mouse) = 32 ppm/ 24 hours (female 7-28 day post); reproductive effects.
TCLo (inhalation, mouse) = 25 ppm/7 hours (female 6-15 days post); teratogenic effects
TCLo (inhalation, mouse) = 500 ppm/5 minutes/30 weeks; equivocal tumorigenic data
LCLo (inhalation, human) = 1000 ppm/10 minutes; pulmonary effects
TCLo (inhalation, human) = 3 ppm/5 days; pulmonary effected
TCLo (inhalation, human) = 12 ppm/1 hour; pulmonary effects
LCLo (inhalation, human) = 3000 ppm/5 minutes
LC_{50} (inhalation, rat) = 2520 ppm/1 hour
LC_{50} (inhalation, mouse) = 3000 ppm/30 minutes
LCLo (inhalation, guinea pig) = 1039 ppm/24 hours
LCLo (inhalation, frog) = 1 pph/ 15 minutes
LCLo (inhalation, mammal) = 3,000 ppm/5 minutes
TCLo (inhalation, rat) = 4,910 mg/m^3/6 hours/17 weeks–intermittent
TCLo (inhalation, rat) = 500 mg/m^3/96 days– intermittent
TCLo (inhalation, dog) = 1 ppm/90 minutes/1 year– intermittent
TCLo (inhalation, dog) = 500 ppm/2 hours/21 weeks– intermittent
TCLo (inhalation, rabbit) = 200 mg/m^3/3 hours/13 weeks– intermittent

EYE IRRITATION: Temporary clouding of eyes was seen in rabbits, guinea pigs, and mice exposed to 400 ppm for 4 hours. Very severe eye injury in rabbits was produced by a 5-second exposure to a stream of pure sulfur dioxide.

11. TOXICOLOGICAL INFORMATION (Continued)

TOXICITY DATA (continued):

SHORT-TERM INHALATION STUDIES: Most studies indicate that high concentrations of Sulfur Dioxide effect the mechanics of respiration. A dose-related narrowing of the bronchiole tubes leading to bronchio-constriction was seen in guinea pigs exposed to concentrations of 0,2-100 ppm for 1 hour. Exposure of male mice for up to 72 hours to concentrations around 10 ppm produced nasal cavity injury (runny nose, ciliary loss, fluid accumulation, and tissue death). The effects became more severe as exposure time increased. Less severe effects were seen in the trachea and lungs. Other studies have not been reported any effects after 1-2 hour exposures to less than 1 ppm.

LONG-TERM INHALATION STUDIES: Exposure to 5 ppm for 225 days produced pulmonary function changes in dogs. Increased swelling, secretions, and reddening of the trachea, as well as decreased mucosal flow was seen in dogs intermittently exposed to 1 ppm for 12 months. There was no apparent effect on pulmonary function. No adverse effects were seen in guinea pigs exposed for 22 hours day, 7 days a week, for 52 weeks to concentrations of 0.13-5.72 ppm. No adverse effects were seen in monkeys exposed for 78 weeks to 0.14 - 1.28 ppm.

SUSPECTED CANCER AGENT: Sulfur Dioxide is not found on the following lists: FEDERAL OSHA Z LIST, NTP, IARC, CAL/OSHA; therefore it is not considered to be, nor suspected to be a cancer-causing agent by these agencies.

IRRITANCY OF PRODUCT: Sulfur Dioxide is severely irritating to the eyes and may be irritating to the skin.

SENSITIZATION TO THE PRODUCT: Sulfur Dioxide is not known to cause sensitization in humans. One study involving guinea pigs exposed to 4.3 ppm Sulfur Dioxide, 8 hours/day for 5 days enhanced an allergic reaction to ovalbumin (a known allergen).

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of Sulfur Dioxide on the human reproductive system.

Mutagenicity: In terms of clinical studies in animals, the following information was obtained: Sulfur Dioxide and its aqueous forms gave both positive and negative results in bacterial test. Sulfur Dioxide did not induce sister chromatid exchange, chromosomal aberrations, or micronucleus formation in the bone marrow of mice or Chinese Hamsters in in-vivo test. However, it induced morphological transformation of Syrian hamster embryo cells. Other mutagenic data are available as follows:

oms-esc = 2 mmol/L
mmo-omi = 10 mmol/L (S9)
sln-dmg-oral = 200 mmol/L
mmo-smc = 5 mmol/L (S9)
dnd- human: lymphocytes = 5,700 ppb
dni- human: lymphocytes = 5,700 ppb
oms-human: lymphocytes = 5,700 ppb
oms-ctl: other = 2,500 mmol/L
cytogenic-dom: other = 5 mmol/L
cytogenic-ctl: other = 2,500 mmol/L

Embryotoxicity: *Sulfur Dioxide is not reported to cause embryotoxic effects in humans. Refer to the following paragraph for* additional information.

Teratogenicity: No teratogenicity effects on humans have been described for Sulfur Dioxide. In terms of clinical studies in animals, the following information was obtained: Slight signs of fetotoxicity were seen in mice exposed to 32, 65, 125, or 250 ppm. Slight embryotoxicity was also seen when pregnant rabbits were exposed to 70 ppm during 6-15 days of pregnancy. Slight maternal toxicity was observed in both mice and rabbits. Additional teratogenic data are available as follows:

TCLo (inhalation, rat) = 4 mg/m^3/24 hours (72-days preg)
TCLo (inhalation, rat) = 4 mg/m^3/24 hours (72-days preg)
TCLo (inhalation, rat) = 4,970 mg/m^3/12 hours (12-weeks preg)
TCLo (inhalation, rat) = 30 ppm/6 hours (21-weeks male)
TCLo (inhalation, mouse) = 25 ppm/7 hours (6-15-days preg)
TCLo (inhalation, mouse) = 25 ppm/7 hours (6–15-days preg)
TCLo (inhalation, mouse) = 32 ppm/24 hours (7–18-days preg)
TCLo (inhalation, rabbit) = 70 ppm/7 hours (6–18-days preg)

Reproductive Toxicity: No reproductive toxicity effects on humans have been described for Sulfur Dioxide.

A mutagen is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generation lines. An embryotoxin is a chemical which causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A teratogen is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance which interferes in any way with the reproductive process.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Conditions relating to the target organs may be aggravated by overexposures to Sulfur Dioxide. See Section 3 (Hazard Identification) for information on these conditions.

RECOMMENDATIONS TO PHYSICIANS: Administer oxygen, treat symptoms, and reduce overexposure. Oxygen administration is most effective if expiration is made against a positive pressure of 4 cm. In cases of severe overexposure, the victim should breath 100% oxygen under positive pressure exhalation pressure for 1.2 hour every hour for 3 hours. Be observant for the initial stages of pulmonary edema or pneumonitis. In some cases, respiratory and circulatory stimulants (coramine, metrazol, and caffeine-sodium benzoate) may be of value.

BIOLOGICAL EXPOSURE INDICES (BEIs): Currently, Biological Exposure Indices (BEIs) are not applicable for Sulfur Dioxide.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: This gas will be dissipated rapidly in well-ventilated areas. Sulfur Dioxide is extremely stable to heat [up to 200°C (392°F)]. Complex reactions of Sulfur Dioxide occur in the atmosphere, producing sulfates and other sulfur compounds which contribute to air pollution.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: Any adverse effect on animals would be related to oxygen-deficient environments, respiratory system damage, and damage to the skin and eyes. Because Sulfur Dioxide produces corrosive sulfurous acid upon contact with moisture, plants may be damaged or destroyed. Frost may also be produced, in the presence of rapidly-expanding gases.

EFFECT OF CHEMICAL ON AQUATIC LIFE: Sulfur Dioxide hydrolyzes to sulfurous acid solution when in contact with water. Sulfurous acid is very soluble in water, and even low concentrations of Sulfur Dioxide or sulfurous acid in water is detrimental to aquatic life. If a release of Sulfur Dioxide occurs near a river or other body of water, the release has the potential to kill fish and other aquatic life. Additional aquatic toxicity data are available for Sulfur Dioxide, as follows:

Concentration (ppm)	Exposure (hours)	Species	Effect	Test Environment
16		sunfish	lethal	
16-19	1	sunfish	lethal	
10	0.17	trout	toxic	tap water
5		trout	lethal	
0.5	1	fish	toxic	as HSO_3
1	2	tench	lethal	as HSO_3

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. Return cylinders with any residual product to Airgas Inc. Do not dispose of locally.

14. TRANSPORTATION INFORMATION

THIS MATERIAL IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME:	Sulfur dioxide, liquefied
HAZARD CLASS NUMBER and DESCRIPTION:	2.3 (Poison Gas)
UN IDENTIFICATION NUMBER:	UN 1079
PACKING GROUP:	Not Applicable
DOT LABEL(S) REQUIRED:	Poison Gas

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (1996): 125

SPECIAL PROVISION: Sulfur Dioxide is poisonous by inhalation. Shipments must be properly described as inhalation hazards. ZONE C.

MARINE POLLUTANT: Sulfur Dioxide is not classified by the DOT as a Marine Pollutant (as defined by 49 CFR 172.101, Appendix B).

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: THIS MATERIAL IS CONSIDERED AS DANGEROUS GOODS. Use the above information for the preparation of Canadian Shipments.

SPECIAL PROVISION for CANADA: 102 (Poison-Inhalation Hazard). Emergency Response Assistance Planning requirements must be met for shipments in excess of 3,000 kg or liters.

15. REGULATORY INFORMATION

U.S. SARA REPORTING REQUIREMENTS: Sulfur Dioxide is subject to the reporting requirements of Sections 302, 304, and 313 of Title III of the Superfund Amendments and Reauthorization Act, as follows:

CHEMICAL NAME	SARA 302 (40 CFR 355, Appendix A)	SARA 304 (40 CFR Table 302.4)	SARA 313 (40 CFR 372.65)
Sulfur Dioxide	YES	YES	NO

15. REGULATORY INFORMATION (Continued)

U.S. SARA THRESHOLD PLANNING QUANTITY: Sulfur Dioxide = 500 lb.

U.S. CERCLA REPORTABLE QUANTITY (RQ): Sulfur Dioxide is listed as an EHS (Extremely Hazardous Substance); RQ = 1 lb.

CANADIAN DSL/NDSL INVENTORY STATUS: Sulfur Dioxide is on the DSL Inventory.

U.S. TSCA INVENTORY STATUS: Sulfur Dioxide is listed on the TSCA Inventory.

OTHER U.S. FEDERAL REGULATIONS: Sulfur Dioxide (anhydrous) is subject to the reporting requirements of Section 112(r) of the Clean Air Act. The Threshold Quantity for this gas is 5,000 pounds. Compliance with the OSHA Process Safety Standard (29 CFR 1910.119) may be applicable to operations involving the use of Sulfur Dioxide. Under this regulation Sulfur Dioxide (liquid) is listed in Appendix A of this Standard and the threshold quantity for Sulfur Dioxide is 1000 pounds.

U.S. STATE REGULATORY INFORMATION: Sulfur Dioxide is covered under specific State regulations, as denoted below:

Alaska - Designated Toxic and Hazardous Substances: Sulfur Dioxide.
California - Permissible Exposure Limits for Chemical Contaminants: Sulfur Dioxide.
Florida - Substance List: Sulfur Dioxide.
Illinois - Toxic Substance List: Sulfur Dioxide.
Kansas - Section 302/313 List: Sulfur Dioxide.
Massachusetts - Substance List: Sulfur Dioxide.
Michigan - Critical Materials Register: No.
Minnesota - List of Hazardous Substances: Sulfur Dioxide.
Missouri - Employer Information/Toxic Substance List: Sulfur Dioxide.
New Jersey - Right to Know Hazardous Substance List: Sulfur Dioxide.
North Dakota - List of Hazardous Chemicals, Reportable Quantities: No.
Pennsylvania - Hazardous Substance List: Sulfur Dioxide.
Rhode Island - Hazardous Substance List: Sulfur Dioxide.
Texas - Hazardous Substance List: Sulfur Dioxide.
West Virginia - Hazardous Substance List: Sulfur Dioxide.
Wisconsin - Toxic and Hazardous Substances: Sulfur Dioxide.

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): Sulfur Dioxide is not on the California Proposition 65 lists.

LABELING:

DANGER: CORROSIVE LIQUID AND GAS UNDER PRESSURE.
CAN CAUSE EYE, SKIN, AND RESPIRATORY TRACT BURNS.

Avoid breathing gas.
Store and use with adequate ventilation.
Do not get in eyes, on skin or clothing.
Use only with equipment of compatible material and construction.
Cylinder temperature should not exceed 52°C (125°F).
Close valve after each use and when empty.
Use in accordance with the Material Safety Data Sheet.

NOTE: Suck-back into cylinder may cause rupture.
Always use a back flow preventative device in piping.

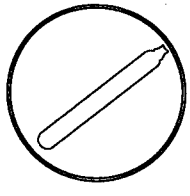
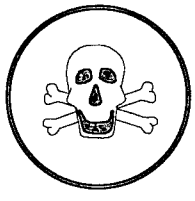
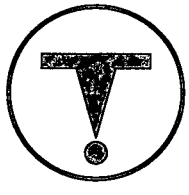
FIRST-AID: **IF INHALED**, remove to fresh air. If not breathing, give artificial respiration. (Rescuer may receive chemical burns as a result of giving mouth to mouth). If breathing is difficult, give oxygen. Call a physician. Keep under medical observation.

IN CASE OF CONTACT, immediately flush eyes or skin with water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician. Wash clothing before reuse. (Discard contaminated shoes).

DO NOT REMOVE THIS PRODUCT LABEL.

CANADIAN WHMIS SYMBOLS:

Class A: Compressed Gas
Class D1A: Toxic Material/Immediate and Serious Effects
Class D2A: Other Toxic Effects/Very Toxic

16. OTHER INFORMATION

PREPARED BY:

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9163 Chesapeake Drive, San Diego, CA 92123-1002
619/565-0302

DEFINITIONS OF TERMS

A large number of abbreviations and acronyms appear on a MSDS. Some of these which are commonly used include the following:

CAS #: This is the Chemical Abstract Service Number which uniquely identifies each constituent. It is used for computer-related searching.

EXPOSURE LIMITS IN AIR:
ACGIH - American Conference of Governmental Industrial Hygienists, a professional association which establishes exposure limits. **TLV** - Threshold Limit Value - an airborne concentration of a substance which represents conditions under which it is generally believed that nearly all workers may be repeatedly exposed without adverse effect. The duration must be considered, including the 8-hour Time Weighted Average **(TWA)**, the 15-minute Short Term Exposure Limit, and the instantaneous Ceiling Level **(C)**. Skin absorption effects must also be considered.
OSHA - U.S. Occupational Safety and Health Administration. **PEL** - Permissible Exposure Limit - This exposure value means exactly the same as a TLV, except that it is enforceable by OSHA. The OSHA Permissible Exposure Limits are based in the 1989 PELs and the June, 1993 Air Contaminants Rule (Federal Register: 58: 35338-35351 and 58: 40191). Both the current PELs and the vacated PELs are indicated. The phrase, "Vacated 1989 PEL," is placed next to the PEL which was vacated by Court Order.
IDLH - Immediately Dangerous to Life and Health - This level represents a concentration from which one can escape within 30-minutes without suffering escape-preventing or permanent injury. **The DFG - MAK** is the Republic of Germany's Maximum Exposure Level, similar to the U.S. PEL. **NIOSH** is the National Institute of Occupational Safety and Health, which is the research arm of the U.S. **O**ccupational **S**afety and **H**ealth **A**dministration (**OSHA**). NIOSH issues exposure guidelines called **R**ecommended **E**xposure **L**evels (**RELs**). When no exposure guidelines are established, an entry of **NE** is made for reference.

HAZARD RATINGS:
HAZARDOUS MATERIALS IDENTIFICATION SYSTEM: Health Hazard: **0** (minimal acute or chronic exposure hazard); **1** (slight acute or chronic exposure hazard); **2** (moderate acute or significant chronic exposure hazard); **3** (severe acute exposure hazard; onetime overexposure can result in permanent injury and may be fatal); **4** (extreme acute exposure hazard; onetime overexposure can be fatal). Flammability Hazard: **0** (minimal hazard); **1** (materials that require substantial pre-heating before burning); **2** (combustible liquid or solids; liquids with a flash point of 38-93°C [100-200°F]); **3** (Class IB and IC flammable liquids with flash points below 38°C [100°F]); **4** (Class IA flammable liquids with flash points below 23°C [73°F] and boiling points below 38°C [100°F]. Reactivity Hazard: **0** (normally stable); 1 (material that can become unstable at elevated temperatures or which can react slightly with water); **2** (materials that are unstable but do not detonate or which can react violently with water); **3** (materials that can detonate when initiated or which can react explosively with water); **4** (materials that can detonate at normal temperatures or pressures).
NATIONAL FIRE PROTECTION ASSOCIATION: Health Hazard: **0** (material that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials); **1** (materials that on exposure under fire conditions could cause irritation or minor residual injury); **2** (materials that on intense or continued exposure under fire conditions could cause temporary incapacitation or possible residual injury); **3** (materials that can on short exposure could cause serious temporary or residual injury); **4** (materials that under very short exposure causes death or major residual injury).

NATIONAL FIRE PROTECTION ASSOCIATION (Continued): Flammability Hazard and Reactivity Hazard: Refer to definitions for "Hazardous Materials Identification System".

FLAMMABILITY LIMITS IN AIR:
Much of the information related to fire and explosion is derived from the *National Fire Protection* Association (**NFPA**). Flash Point - Minimum temperature at which a liquid gives off sufficient vapors to form an ignitable mixture with air. Autoignition Temperature: The minimum temperature required to initiate combustion in air with no other source of ignition. LEL - the lowest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source. UEL - the highest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source.

TOXICOLOGICAL INFORMATION:
Possible health hazards as derived from human data, animal studies, or from the results of studies with similar compounds are presented. Definitions of some terms used in this section are: **LD_{50}** - Lethal Dose (solids & liquids) which kills 50% of the exposed animals; **LC_{50}** - Lethal Concentration (gases) which kills 50% of the exposed animals; **ppm** concentration expressed in parts of material per million parts of air or water; **mg/m^3** concentration expressed in weight of substance per volume of air; **mg/kg** quantity of material, by weight, administered to a test subject, based on their body weight in kg. Data from several sources are used to evaluate the cancer-causing potential of the material. The sources are: **IARC** - the International Agency for Research on Cancer; **NTP** - the National Toxicology Program, **RTECS** - the Registry of Toxic Effects of Chemical Substances, **OSHA** and **CAL/OSHA**. IARC and NTP rate chemicals on a scale of decreasing potential to cause human cancer with rankings from 1 to 4. Subrankings (2A, 2B, etc.) are also used. Other measures of toxicity include **TDLo**, the lowest dose to cause a symptom and **TCLo** the lowest concentration to cause a symptom; **TDo**, **LDLo**, and **LDo**, or **TC**, **TCo**, **LCLo**, and **LCo**, the lowest dose (or concentration) to cause lethal or toxic effects. **BEI** - Biological Exposure Indices, represent the levels of determinants which are most likely to be observed in specimens collected from a healthy worker who has been exposed to chemicals to the same extent as a worker with inhalation exposure to the TLV. Ecological Information: EC is the effect concentration in water.

REGULATORY INFORMATION:
This section explains the impact of various laws and regulations on the material. **EPA** is the U.S. Environmental Protection Agency. **WHMIS** is the Canadian Workplace Hazardous Materials Information System. **DOT** and **TC** are the U.S. Department of Transportation and the Transport Canada, respectively. Superfund Amendments and Reauthorization Act **(SARA)**; the Canadian Domestic/Non-Domestic Substances List **(DSL/NDSL)**; the U.S. Toxic Substance Control Act **(TSCA)**; Marine Pollutant status according to the **DOT**; the Comprehensive Environmental Response, Compensation, and Liability Act **(CERCLA or Superfund)**; and various state regulations.

New Mexico Energy, Minerals and Natural Resources Department

Susana Martinez
Governor

Brett F. Woods, Ph.D.
Acting Cabinet Secretary

Daniel Sanchez
Acting Division Director
Oil Conservation Division

March 1, 2011

Mr. John Prentiss
Area Manager
Frontier Field Services, LLC
P.O. Box 7, 1001 Conoco Road
Maljamar, NM 88260

Dear Mr. Prentiss:

Re: Frontier (Conoco) Maljamar Gas Plant (GW-020) Oil and Gas Facilities/Operations that may Vent and/or Flare H_2S Gas

The New Mexico Oil Conservation Division (OCD) is writing to operators of the above-referenced types of facilities or operations that may have New Mexico Environmental Department (NMED) - Air Quality Bureau (AQB) Oil and Gas type Permits. The purpose of this communication is to inform operators of such facilities regarding OCD Rules that may be applicable to gas plant operators and/or oil and gas facilities/operations in the hope that it provides some clarification regarding the applicability of these rules, and to ultimately increase overall compliance

In New Mexico, the OCD Rules that pertain to Hydrogen Sulfide (H_2S) Gas are provided at § 19.15.11 et seq. NMAC (Hydrogen Sulfide Gas). The OCD Oil and Gas Rules that address "No-Flare" and the OCD Form C-129 process are provided at § 19.15.7.37 et seq. NMAC (Application for Exception to No-Flare). Gas plants have gas gathering pipelines with meters connected to operators who then either sell or vent casinghead gas into the gas gathering pipelines that feed into the plants. The OCD Rules that pertain to "Casinghead Gas" are provided at § 19.15.18.12 et seq. NMAC (Production Operating Practices).

This letter was precipitated by a recent event where a gas plant operator shut-in a "gas gathering pipeline." This "shutting-in" of the pipeline impacted approximately thirty individually-metered operators who may have continued operating instead of "shutting-in" their well(s). In spite of the fact that approximately thirty operators were impacted, the OCD observed that only one of those thirty operators contacted the OCD via Form C-129 as required under the OCD Rules to obtain approval of their application for an "exception to no-flare." (The operator initially had contacted the OCD to request approval to vent H_2S gas into the air rather than shut-in the well.) The OCD has serious public safety concerns when operators do not properly shut-in their wells when gas gathering pipelines and/or meters are shut-in, especially where the wells are near populated and/or agricultural areas due to the potential for loss of life from toxic gas.

In subsequent communications with gas plant operators who flare gas, the OCD discovered that the operators were under the impression that if their facility has an NMED- AQB Construction Permit which includes a provision to flare/emit gas, then this is all that is needed to operate in New Mexico. This is actually only partially

correct because operators are also required to comply with the requirements set out in the OCD Rules regarding flaring and venting. For example, in the situation where a gas plant operator has notified connected well operators of a gas-gathering pipeline shut-down, each of those well operators is required to shut-in its well(s) or to obtain OCD District Supervisor approval to flare via an OCD C-129 Form. Operators who do not comply are illegally venting and/or flaring gas under OCD Rules.

In addition, gas plants and/or oil and gas operators may be required to satisfy OCD § 19.15.11 et seq. NMAC (Hydrogen Sulfide Gas) Contingency Plan requirements for facilities and wells in cases where 100 ppm or greater H_2S concentrations may impact public areas. OCD records indicate that Frontier Field Services, LLC does **not** currently have an H_2S Contingency Plan (CP) on file with the OCD. If you do not have an approved CP under § 19.15.11 et seq. NMAC (Hydrogen Sulfide Gas) for your gas plant yet, please submit your CP to the OCD Environmental Bureau in Santa Fe on or before August 11, 2011. (*The OCD notes that it is aware of some operators who have recently submitted CPs to the OCD that are currently under review. Please advise if this is the case for* Frontier Field Services, LLC.)

The OCD recognizes that when multiple sets of Rules, Regulations and Statutes apply, it can sometimes be tricky to definitively determine which requirements apply, to whom and in what circumstances. Operators must, however, take all care to ensure that they are at all times operating in compliance with all applicable state, federal and/or local rules and regulations. In this instance, this means that operators are subject not only to the requirements imposed by the NMED-AQB permitting structure, but also to those set forth in the OCD Rules.

We hope that this communication has helped to clarify the issue regarding the applicability of the OCD Rules in these situations, regardless of the existence of a valid NMED-AQB permit. Please contact Carl Chavez of my staff at (505) 476-3490 if you have questions or need assistance with the CP. The OCD looks forward to bringing your facility into compliance with OCD Rules if it is not currently already in compliance. Thank you for your cooperation in this matter.

Sincerely,

Daniel Sanchez,
Compliance & Enforcement Manager

xc: Richard Goodyear, NMED- AQB
OCD Environmental Bureau
OCD District Offices