GEOPRESSURED - GEOTHERMAL DRILLING AND TESTING PLAN

VOLUME I DRILLING & COMPLETION

**TECHNADRIL/FENIX & SCISSON - DEPT. OF ENERGY
T/F&S - DOE GLADYS McCALL NO. 1 WELL
CAMERON PARISH, LOUISIANA**

MARCH 1981

**U.S. DEPARTMENT OF ENERGY
NEVADA OPERATIONS OFFICE
TECHNADRIL/FENIX & SCISSON**

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency Thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

TABLE OF CONTENTS

	<u>Page</u>
FIGURES.....	iv
1.0 INTRODUCTION	
1.1 Background.....	1-1
1.2 Program Objectives.....	1-1
1.3 Well Location.....	1-2
2.0 PROGRAM MANAGEMENT	
2.1 General.....	2-1
2.2 Organizations and Personnel.....	2-1
2.3 Authorities and Responsibilities.....	2-1
3.0 GEOLOGY OF THE GEOTHERMAL GEOPRESSURE REGIME.....	3-1
4.0 GENERALIZED SITE ACTIVITIES	
4.1 Site Preparation.....	4-1
4.2 Trailers.....	4-4
4.3 Communications.....	4-4
4.4 Site Cleanup and Restoration.....	4-4
4.5 Water Supply.....	4-4
4.6 Sanitation.....	4-8
4.7 Power.....	4-8
5.0 DRILLING OPERATIONS SUMMARY - TEST WELL	
5.1 Drilling Summary.....	5-1
5.2 Pressure Summary.....	5-1
5.3 Operations Detail.....	5-3
5.4 Mud Program.....	5-13
5.5 Recommended BOP Procedures.....	5-16
5.6 Drilling Break Procedure.....	5-17
5.7 Well Cuttings Sample Collection.....	5-17
5.8 Mud Logging Program.....	5-18
5.9 Logging Program.....	5-18
5.10 Hydraulics Program.....	5-20
5.11 Bit Program.....	5-21
5.12 Casing Program.....	5-21
5.13 Cementing Program.....	5-23
5.14 Casing Running & Cementing Procedure.....	5-26
6.0 DRILLING PROGRAM - DISPOSAL WELL	
6.1 Drilling Summary.....	6-1
6.2 Drilling Operations Detail.....	6-1

	<u>Page</u>
6.0 DRILLING PROGRAM - DISPOSAL WELL - continued	
6.3 Surface Equipment & Services.....	6-7
6.4 Casing Design and Running Procedure.....	6-10
6.5 Drilling Fluid Program.....	6-13
6.6 Deviation Program.....	6-13
6.7 Cementing Program.....	6-13
6.8 Hydraulics Program.....	6-15
6.9 Logging Program.....	6-15
7.0 ENVIRONMENTAL MONITORING PLAN	
7.1 Introduction.....	7-1
7.2 Environmental Baseline and Monitoring Studies.....	7-1
7.3 Environmental Program Management.....	7-7
8.0 PERMITS.....	8-1
9.0 OCCUPATIONAL HEALTH AND SAFETY	
9.1 General.....	9-1
9.2 Site Access.....	9-1
9.3 Fire Protection.....	9-1
9.4 Industrial Hygiene.....	9-1
9.5 Safety Hazards.....	9-2
9.6 Medical Care.....	9-2
9.7 Accident Reporting.....	9-3
10.0 REPORTING	
10.1 Management Plan.....	10-1
10.2 Milestone Schedule and Status Report.....	10-1
10.3 Major Milestone Status Plot.....	10-1
10.4 Cost Plan.....	10-1
10.5 Manpower Plan.....	10-2
10.6 Contract Management Summary Report.....	10-2
10.7 Cost Management Report.....	10-2
10.8 Manpower Management Report.....	10-2
10.9 Technical Progress Report.....	10-2
10.10 Final Reports.....	10-5
11.0 SCHEDULES.....	11-1
12.0 REFERENCES.....	12-1
APPENDIX A - LOGGING	
Production Well.....	A-1
Disposal Well.....	A-2

	<u>Page</u>
APPENDIX B - CORING.....	B-1
APPENDIX C - OFFSET WELL LOGS	
Dr. M. O. Miller No. 1.....	C-1
Gladys McCall No. 1 (Getty).....	C-4
APPENDIX D - WELL DATA SHEET -	
DR. M. O. MILLER NO. 1.....	D-1
APPENDIX E - DAILY DRILLING REPORT -	
DR. M. O. MILLER NO. 1.....	E-1
APPENDIX F - WELL DATA SHEET - BUTTES GAS AND OIL	
GLADYS McCALL NO. 1.....	F-1

FIGURES

<u>Figure No.</u>		<u>Page</u>
	<hr/> 1.0 INTRODUCTION <hr/>	
1-1	Louisiana Geopressure Prospects.....	1-3
1-2	DOE Gladys McCall No. 1 Site Location Map...	1-4
1-3	DOE Galdys McCall No. 1 Well Location.....	1-5
	<hr/> 2.0 PROGRAM MANAGEMENT <hr/>	
2-1	Geopressure Well Drilling and Testing Program Organizational Chart.....	2-5
	<hr/> 3.0 GEOLOGY OF THE GEOTHERMAL GEOPRESSURE REGIME <hr/>	
3-1	Well Locations on Structure Map.....	3-2
3-2	North South Section Geothermal Geopressure Zone.....	3-3
3-3	Structure Map (An Interpretation).....	3-5
3-4	East West Section Geothermal Geopressure Zone.....	3-6
	<hr/> 4.0 GENERALIZED SITE ACTIVITIES <hr/>	
4-1	Agreement for Use of Land as Site for Office Trailer and Parking Area.....	4-3
4-2	Drill Site Layout (Piling Layout).....	4-5
4-3	Drill Site Layout.....	4-6
4-4	Access Road and Location Map.....	4-7

<u>Figure No.</u>		<u>Page</u>
	<u>5.0 DRILLING OPERATIONS SUMMARY - TEST WELL</u>	
5-1	DOE Gladys McCall No. 1 Test Well Diagram...	5-2
5-2	20" 3000 WP Flange.....	5-5
5-3	Normal Pressure Service BOP - 5,000 psi.....	5-7
5-4	Normal Pressure Service BOP - 10,000 psi.....	5-10
5-5	Pore Pressure and Frac Gradient Curve.....	5-15
	<u>6.0 DRILLING OPERATIONS - DISPOSAL WELL</u>	
6-1	DOE Gladys McCall Salt Water Disposal Well No. 1	6-2
6-2	Plot Plan - DOE Gladys McCall No. 1.....	6-3
6-3	Normal Pressure Service BOP 3000 psi.....	6-5
6-4	Partial Log, Getty Oil Company - Gladys McCall No. 1.....	6-6
6-5	Packer and Injection String Connection Inside Casing.....	6-8
6-6	Proposed Christmas Tree.....	6-9
	<u>10.0 REPORTING</u>	
10-1	Daily Drilling Report - Summary.....	10-3
10-2	Daily Drilling Report - Actual.....	10-4
	<u>11.0 SCHEDULES</u>	
11-1	DOE Gladys McCall No. 1 Drilling Schedule...	11-2
11-2	Days vs. Depth Disposal Well - Gladys McCall.....	11-3
11-3	DOE Gladys McCall No. 1 Milestone Schedule..	11-4

1.0 INTRODUCTION

1.1 Background

In 1975, the U.S. Energy Research and Development Administration (now a part of the U.S. Department of Energy) initiated a research, development, and demonstration program to stimulate commercial development of the geopressed resources underlying the Gulf Coast region of the United States. Several investigators (see references 12.1, 12.2 and 12.3) had recognized the energy potential and suggested that studies be conducted to assess the energy resource.

The Department of Energy's (DOE) geopressed geothermal program is currently investigating Wells of Opportunity and three Design Wells in the Gulf Coast areas of Texas and Louisiana. On July 31, 1980 Technadril - Fenix & Scisson, a joint venture, was competitively selected to drill, complete and test four additional exploratory wells for geopressed-geothermal reservoir resource assessments in the Gulf Coast Area. This work will be accomplished under Contract No. DE-AC08-80ET27217. One of the four sites, and the subject of this project plan, is the Gladys McCall lease in S27, T15S, R5W, Cameron Parish, Louisiana, approximately 55 miles southeast of Lake Charles, Louisiana.

1.2 Program Objectives

The principal objectives of the geopressed-geothermal reservoir resource assessment program are to obtain data related to the following:

- 1.2.1 Reservoir parameters and characteristics, including permeability, porosity, areal extent, net thickness of productive sands, methane content, and formation compressibilities.
- 1.2.2 Ability of a geopressed well to flow at the high rates, i.e., 40,000 bbls/day, expected to achieve the resource recovery required for economic commercial operations.
- 1.2.3 Reservoir production drive mechanisms and physical and chemical changes that may occur with various production rates and conditions.

- 1.2.4 Aquifer fluid properties, including chemical composition, dissolved and suspended solids, hydrocarbon content, in situ temperature, and pressure.
- 1.2.5 Techniques and strategies for completion and production of geopressed wells for methane, thermal, and hydraulic energy production, including examination of producibility using computer simulators employing parameters determined by well testing.
- 1.2.6 Disposal well parameters, such as optimum injection rate and pressures (transient and psuedo steady state), chemical compatibility of fluids, temperature-solubility relationships, and the economic considerations of injection, including evaluation of filtering and inhibition techniques in the process steam.
- 1.2.7 The long-term environmental effects of an extensive commercial application of geopressed-geothermal energy, i.e., subsidence, induced seismicity, and fluid disposal.

1.3 Well Locations

The test well T-F&S/DOE Gladys McCall No. 1 and disposal well T-F&S/DOE Gladys McCall SWD #1 are located on a site 2.3 miles south of St. Hwy. 82 in the vicinity of the town of Grand Chenier in Cameron Parish, Louisiana in Sec. 27, T15S, R5W. (See Figures 1-1, 1-2 and 1-3.)

FIGURE 1-1
LOUISIANA GEOPRESSURE PROSPECTS

1-3

PRIMARY PROSPECTS

- 1 JOHNSONS BAYOU
- 2 ROCKEFELLER REFUGE
- 3 SE PECAN ISLAND
- 4 ATCHAFALAYA BAY
- 5 LAFOURCHE CROSSING

SECONDARY PROSPECTS

- ⑥ SOUTH WHITE LAKE
- ⑦ KAPLAN
- ⑧ BAYOU HEBERT
- ⑨ GRAND LAKE
- ⑩ LAKE THERIOT

FIGURE 1-2
DOE GLADYS McCALL NO. 1 SITE
LOCATION MAP

1-4

FIGURE 1-3
DOE GLADYS McCALL NO. 1
WELL LOCATION

1-5

2.0 PROGRAM MANAGEMENT

2.1 General

This section identifies the organizations and principal personnel participating in the well drilling and testing program and describes basic authorities and responsibilities.

2.2 Organizations and Personnel

2.2.1 Department of Energy, Division of Geothermal Energy (DGE), Washington, D.C.

Geopressure Program Manager (GPM) - Mr. Robert Holliday

2.2.2 Department of Energy, Nevada Operations Office (NV), Las Vegas, Nevada

1. Contracting Officer's Representative (COR) and NV Project Manager (NVPM) - J. Cotter
2. Chief, Geothermal Branch, NV - R. Stearns
3. Drilling Project Engineer (NVPE) - R. Clarke
4. Director Geopressure Projects Office, Houston (DGPO) - K. Westhusing
5. Testing Project Engineer (GPOTPE) - F. Goldsberry

2.2.3 Technadril - Fenix & Scisson, Houston, Texas

1. Program Manager - T. E. Goebel
2. Asst. Program Manager - F. O'Brien
3. Drilling Manager - C. S. Adkins
4. Business Manager - S. E. Donley
5. Testing Manager - L. Durrett
6. Project Manager - D. Mitchell

2.2.4 Louisiana Geological Survey/Louisiana State University/Program Manager - Dr. D. Bebout

2.3 Authorities and Responsibilities

2.3.1 Division of Geothermal Energy (DGE)

Identify overall program objectives, provide funding and authorization, and designate a Geopressure Program Manager (GPM) with the following authorities and responsibilities:

1. Approve any major changes to the plan.

2. Provide an approved Environmental Impact Assessment for the drilling and testing activities.
3. Approve any proposed contract modifications which result in increased funding levels.
4. Maintain cognizance of well drilling and testing activities.

2.3.2 Nevada Operations Office (NV)

1. Geothermal Branch, Las Vegas, Nevada
 - a. Approve the required Technadril - Fenix & Scisson project plans and reports as delineated in the Statement of Work and Article 3.3 of Contract DE-AC08-ET27217.
 - b. Provide for implementation of the approved drilling and testing plan through a contractor, Technadril - Fenix & Scisson.
 - c. Provide an NV Project Manager (NVPM) to maintain technical and administrative management of the project through receipt of oral and written reports and by on-site monitoring of critical project phases.
 - d. Provide formal direction to the Contractor as necessary to assure compliance with contract provisions.
 - e. Report project status to the GPM.
 - f. Maintain continual cognizance of the well drilling and testing activities.
 - g. Prepare and coordinate press releases.
2. Geopressure Project Office, Houston (GPO)
 - a. Review and evaluate the well testing progress and make recommendations to the NVPM.

- b. Provide the day-to-day interface with industry, states, and educational institutions to maintain effective channels of communications regarding the development of the geopressure energy resource.
- c. Provide a Testing Project Manager to maintain technical and administrative management of the project through the testing phases.
- d. Maintain a current knowledge of geopressure prospects with a potential for drilling designed wells.
- e. Assist in the coordination between the well drilling and testing contractor and the Louisiana Geological Survey and Louisiana State University scientific studies groups.

2.3.3 Technadril - Fenix & Scisson

- 1. Prepare required plans and reports for DOE's approval.
- 2. Conduct the well drilling and testing activities in accordance with the approved plan and the provisions of the Contract.
- 3. Coordinate drilling and testing activities with the Louisiana Geological Survey study groups, through the Nevada Operations Office.
- 4. Provide logistical and other support to the Louisiana Geological Survey and other participating research institutions as required, with approval of the Nevada Operations Office.
- 5. Prepare and submit reports as specified in Section 10.0 of this plan and maintain a daily project cost status.
- 6. Inform NV of any proposed deviation from the approved drilling and testing plan, before the deviation if not an emergency.

2.3.4 Louisiana Geological Survey/Louisiana State
University

Provide environmental monitoring as required.

See Figure 2-1 for relationship of primary organizations.

FIGURE 2-1
GEOPRESSURE WELL DRILLING AND TESTING
PROGRAM ORGANIZATIONAL CHART

3.0 GEOLOGY OF THE GEOTHERMAL GEOPRESSURE REGIME

The region is characterized by Cenozoic sand and clay deposits of geosynclinal thickness. The geopressure-geothermal regime of the site consists of Late Oligocene (Anahuac) into Middle Miocene (Duck Lake) formations, with reservoir sands extending between 14,500 and 17,000 ft. Some prominent microfossils are Globigerina, Crinoid, and Robulus species. Siphonina davisii was of major significance in correlating well log data.

Geologic interpretation was made primarily from correlation of well E-logs for the Dorothy Sturlese, Gladys McCall, Dr. Miller and Pan Am wells; and secondarily, the Cherryville and the J. F. Sturlese wells. (See Figure 3-1 for well locations.)

Below 17,200 ft. in the Dr. Miller well (see Figure 3-2) is what is believed to be an original depositional surface of thick shale, possibly Middle Oligocene of Frio age.

Early in the Miocene period, sands, and later, sands and silts, were deposited onto this from the north-northwest, with down-to-the-basin faulting occurring on the west-southwest. The result, following lithification, is an Early to Middle Miocene graben of some 1,500 ft. throw. One proof of this is that the same ecologic zonation, with Siphonina davisii, found in the Dr. Miller well at 17,240 ft., is found in the Dorothy Sturlese well at 15,720 ft. depth.

Following the deposition, there was uplift and some tilting of the beds along the north bounding fault, to a west-southwest dip. Seismic data have been extrapolated to show this north fault passing below the DOE Gladys McCall No. 1 site at approximately 17,200 ft. depth.

At that depth, it may be lost or become one with the sand-to-shale transition. Regardless, for test well purposes, a total depth of 17,000 ft. is recommended for the DOE Gladys McCall No. 1.

Sometime in the Middle Miocene, a north dipping fault appeared, possibly compensating the south dipping fault appearing in Figure 3-2, and crossing the DOE Gladys McCall No. 1 site at some 11,600 ft. in depth. Other than this fault, the strata above the geopressure-geothermal regime are fairly regular and undisturbed into the Pliocene.

५३७

[illegible]

Based on interpolation of compensating mud weights used in drilling, the top of the geopressure regime in the DOE Gladys McCall No. 1 site was found at 14,300 ft. depth. There are unusual resistivity and spontaneous potential kicks at this depth in the E-logs signifying a probable lithologic change.

By correlation, promising reservoir sands are expected in DOE Gladys McCall No. 1, at 16,380 to 17,000 ft.; 15,150 to 15,600 ft.; and 14,560 to 14,780 ft. The top of the first geopressure-geothermal sand in the vicinity of the DOE Gladys McCall No. 1 site is shown in Figure 3-3. The uncorrected temperature in these sands should range from 275°F at the top of the regime to 330°F (corrected) at the bottom. A bottom hole pressure of 15,300 psi is forecast. Average porosity is 15.8% and mean permeability is 6 millidarcys. Salinity could be as high as 100,000 ppm, but should average 60,000 ppm.

By "fencing in" the best sands, some 900 ft. of potentially productive strata, a combined reservoir of approximately 1.5 cu. mi. should be available. T-F&S has not yet acquired sufficient data to permit conjecture of what gas production could be from this reservoir.

Another geologic interpretation would have the south dipping fault crossing the DOE Gladys McCall No. 1 site at about 14,900 ft. depth, cutting out some 1,000 ft. of section in the DOE Gladys McCall No. 1. This interpretation would have the sand in DOE Gladys McCall No. 1 that begins at 15,100 ft., correlating with the sand in the Dr. Miller well beginning at 16,300 ft. depth (see Figure 3-2). Should this prove to be the case, the bottom of the potential reservoir sand will be at 16,000 ft. in the DOE Gladys McCall No. 1, not 17,000 ft. depth as was forecast earlier in this section. The possibility cannot be objectively discounted, though two other independent geologic interpretations and the paleo data favor the previous interpretation.

With reference to Figure 3-1, one geologic interpretation would have the northwesternmost fault as demarking a graben, and the two other faults as demarking a horst within the graben (as opposed to the structure shown in Figure 3-3). Fortunately, the possibility will not affect drilling or reservoir conditions, so its implications are not given additional consideration at this time. Regardless, attention is called to the Cherryville well in Figures 3-1, 3-3 and 3-4.

FIGURE 3-3
STRUCTURE MAP
(An Interpretation)

3-5

Graphic Scale
0 1 mile

GRUY FEDERAL, INC.
Houston, Texas

Crab Lake Field Area
Cameron Parish, Louisiana

STRUCTURE: TOP OF POROSITY
AT FIRST GZO² SAND
IN LOWER MIOCENE SECTION

FIGURE 3-4
EAST WEST SECTION GEOTHERMAL
GEOPRESSURE ZONE

It is seen that the Cherryville well cannot be logically correlated within the geopressure-geothermal regime, it being faulted completely out of the picture. Also, what may be significant is that no well developed sands appear in the Figure 3-4 log, supporting the statement that there was no significant deposition north of the graben-limiting fault.

4.0 GENERALIZED SITE ACTIVITIES

4.1 Site Preparation

4.1.1 The well site of the initial DOE Gladys McCall No. 1 well is located 2.3 miles south of Louisiana State Highway 82, (See Figure 1-2) and is connected to that highway by a dirt build-up road initially constructed in 1965. This build-up was repaired and reworked again in 1978 when re-entry to the initial well was attempted. Also, at that time a 3 ply board run was laid over the built-up area from Highway No. 82 to the well pad. The remains of this board run and the well pad remain in place, though somewhat deteriorated due to eighteen months of exposure to the elements as well as tidal action. The built-up road bed is still in good condition. It is well packed, unbroken and is excellent for use in laying the new board run access road. There are two bridges over canals in the roadway; both were constructed in 1968 of heavy creosoted timbers and are in excellent condition.

There are 4 separate spaces on the existing board run roadway where fire has destroyed the boards in place. It will therefore be necessary to relay those areas (approximately 250 yards) with boards prior to beginning construction of the new board run.

4.1.2 Construction and rehabilitation of the board run to make it suitable for access to the well site will consist of the laying of a 2-1/2 ply board run directly over the existing or repaired board run. The first 1-1/2 plys will be constructed with good used 3"x8" scant board run lumber, each board nailed in place with four 60P nails. All wings and turn-ins will be laid 3 ply solid directly over the existing "in place" boards.

4.1.3 The entry way and access to the board run road from state Highway 82 is 60'x60'x60'x26' and is laid with boards 3 ply solid. These boards are badly deteriorated and the entire turn in area will be covered with 12 inches of oyster shell (compacted to 8").

- 4.1.4 In order to provide an office site near the entry way, it was necessary to utilize an additional 100'x300' area along the access road. The existing "Servitude of Passage" with Mrs. Dorothy Sturlese across Section 15 did not include such usage, so use was arranged by written agreement between the parties. (See Figure 4-1.) This use was granted at no additional cost. This area (100'x300') will be covered solid with 3 ply 3"x8" scant board run lumber; the first two plys may be good used lumber with a top ply of new lumber. Each board will be nailed with four 60P nails. This area will provide a location for the administrative office trailer of the Project Manager and a parking area for vehicles. To control access to the well site in accordance with the leases in force a security officer's shack will be located at the entrance to this area, and a shuttle vehicle will convey some of the working personnel, and all permissible visitors, to the working site.
- 4.1.5 To condition the existing well pad area for operation, the ring levee will be repaired (using fill material from inside the ring levee) and the water from the well pad and reserve pits (tests show it to be uncontaminated) will be pumped out. (All material removed from the reserve pits will be placed inside the ring levee's east side where sufficient space is available.) The well pad will then be cleaned up of all debris and the two existing cellers filled with dirt. Since the new well is to be located 50 feet due west of the original Gladys McCall #1 (see Figure 1-3), it will be necessary to increase the size of the derrick lay down pad by some 35 feet in width to accomodate the new well location. A limited amount of fill in the area will be necessary (approximately 6") and good used boards laid on top of the fill to bring this area up to the level of the original well pad.
- 4.1.6 Approximately one hundred 45 foot pilings will be driven in order to provide support for the drilling rig, sub-structure and mud tanks; then a new 3-ply solid pad will be laid over the existng well pad, using 3"x8" scant board run lumber, the bottom two plys will be good used

FIGURE 4-1
AGREEMENT FOR USE OF LAND AS SITE FOR
OFFICE TRAILER AND PARKING AREA

4-3

December 16, 1980

TECHNADRIL - FENIX & SCISSON

1111 Fannin Street, Suite 1010
Houston, Texas 77002
(713) 757-0436

Mrs. Dorothy Sturlese
Grand Chenier, LA 70643

Mr. Enos J. Sturlese
Grand Chenier, LA 70643

Mrs. Lorine Baccigalopi
Grand Chenier, LA 70643

Mrs. Evyone S. Richard
Grand Chenier, LA 70643

Mrs. Elougia S. Richard
Grand Chenier, LA 79643

Dear Folks:

This is written to confirm our agreement that in connection with the Servitude of Passage dated May 25, 1979, filed under No. 154672, Book 393, page 109, records of Cameron Parish, granted by you to Gruy Federal, Inc. (now owned by us), you have agreed to enlarge the servitude of passage to include our use of the 100' x 300' site, shown on the plat attached, as an office trailer and parking area.

If this meets with our agreement, I would appreciate your executing a copy of this letter and returning it to us.

Sincerely yours,

TECHNADRIL, INC. - FENIX & SCISSONS

C. David Mitchell
C. DAVID MITCHELL
Project Manager

AGREED: *at Mrs Dorothy Sturlese*
Mrs. Dorothy Sturlese

AGREED: *at Enos J. Sturlese*
Enos J. Sturlese

AGREED: *at Mrs Lorine Baccigalopi*
Mrs. Lorine Baccigalopi

AGREED: *at Mrs Evyone S. Richard*
Mrs. Evyone S. Richard

AGREED: *at Mrs Elougia S. Richard*
Mrs. Elougia S. Richard

lumber, the top layer will be new 3"x8" scant board run lumber. Each board will be nailed with four 60P nails. A rig support strong back of suitable size for the drilling rig (see Figure 4-2) will be laid solid and will make up the fourth ply of the new location pad.

4.1.7 See Figure 4-3 for complete drill site layout and Figure 4-4 for Access Road and Location Map.

4.2 Trailers

The trailers at the drill site will be provided by the various firms and agencies involved. These will include the Technadril - Fenix & Scisson drilling engineer's trailer, the tool pusher's trailer, the mud logger's trailer, the mud engineer's trailer, and trailers used by personnel involved in research for the project.

4.3 Communications

A telephone will be installed in the Technadril - Fenix & Scisson Project Manager's office trailer. This number will be (318) 474-5100. During drilling operations, additional telephones will be installed in the drilling engineer's trailer, the tool pusher's trailer, and in the dog house on the rig floor, with connecting intercoms to all these facilities. Upon completion of drilling activities, one telephone will remain at the well site throughout the testing phase of the operations.

4.4 Site Cleanup and Restoration

At the completion of the drilling project, the site will be converted to testing operations. If the project is to be abandoned completely after testing, the well will be plugged and abandoned according to the State of Louisiana regulations. Further site use plans will affect site clean up plans.

4.5 Water Supply

Water supply for rig water will be drawn from the surrounding marsh and potable water will be provided by temporary installed plastic water tanks trucked in from an approved off-site well.

FIGURE 4-2
DRILL SITE LAYOUT (PILING LAYOUT)

4-5

4-6

FIGURE 4-4
ACCESS ROAD AND LOCATION MAP

4-7

4.6 Sanitation

A 500-gallon sheet steel, tar-coated septic tank and PVC pipe for the distribution lines will be installed on the north side of the office site and connected to the Technadril - Fenix & Scisson project manager's trailers. Two of the same type tanks will be installed at the well pad for connection with the drilling engineer's trailer and rig crew trailers.

4.7 Power

A power line from the Jefferson Davis REA will be provided to the Technadril - Fenix & Scisson project manager's trailer. Additional power will be provided by the rig generators during the drilling operation.

Upon completion of drilling and prior to commencement of the testing phase, the power line will be extended from the Project Manager's trailer to the well site to provide necessary power for the test facilities.

5.0 DRILLING OPERATIONS SUMMARY - TEST WELL

T-F&S/DOE NO. 1
East Crab Lake Field
Cameron Parish, Louisiana

5.1 DRILLING SUMMARY

Drill and complete a vertical 17,000' well for evaluation of geothermal-geopressure sands. (See Figure 5-1.)

- 5.1.1 Drive 30"x1" wall structural casing which will be the conductor string to +120'.
- 5.1.2 Drill 24" hole and set 20" surface casing at +850' to case-off all fresh water sands.
- 5.1.3 Drill 17-1/2" hole, log and set 13-3/8" intermediate casing at +4500'. Cement will be circulated to surface which will help to protect all fresh water sands.
- 5.1.4 Drill 12-1/4" hole, log and set 9-5/8" intermediate casing at +14,450'.
- 5.1.5 Drill 8-1/2" hole, core, log and run 7" liner* from 14,000' through geopressured sands to +17,000'. Total depth to be sufficient to provide 150' to 200' of rat hole below bottom perforations.
- 5.1.6 Run 7" tie-back* from 14,000' to surface and cement.
- 5.1.7 Complete well with 5" tubing string.

5.2 PRESSURE SUMMARY

Normal pore pressures are expected to approximately 12,000', where pressure will rise over a 2,300' interval to 12.5 pounds per gallon (ppg), then from 14,300' to 14,450' mud weight will have to be raised to 14.0 ppg. The 13-3/8" casing shoe @ +4,500' is expected to test to approximately 14.5+ ppg fracture gradient, therewith insuring the capability of holding the anticipated 14.0 ppg mud weight for setting the 9-5/8" intermediate string at approximately +14,450".

*Well will be completed with 7-5/8" production casing and 5-1/2" tubing if it should become available.

FIGURE 5-1
DOE GLADYS McCALL NO. 1
TEST WELL DIAGRAM

5-2

Note that pressure will increase 1-1/2 ppg within 150' after drilling out below the casing shoe. Special care will be taken to insure proper barite distribution while weighting up the system during the short drilling interval. A mud weight of 16.8 ppg can be anticipated by 15,500' and possibly increase to 17.7 ppg to drill to the projected total depth of 17,000 feet as experienced in other wells.

5.3 Operations Detail

- 5.3.1 Prepare location for rig.
- 5.3.2 Drive 30"x1" wall, 309 lbs./ft. Grade B structural casing with D-30 hammer. Obtain bearing load capacity of +800,000 pounds or approximately 150 blows per foot.
- 5.3.3 Cut off 30" below rotary and install flow line on 30" drive pipe. Pick up 24" bit and wash out to bottom of 30" pipe.
- 5.3.4 Drill 24" hole to +850 feet. See Sec. 5.4 for Mud Program and Sec. 5.10 for Hydraulics Program. Treat mud for water loss less than 25 cc, prior to pulling out of hole.
- 5.3.5 Check alignment of mast over hole before running 20" casing, and realign if necessary.
- 5.3.6 Run 20" casing per Sec. 5.14 Casing Running and Cementing Procedure. Center 20" in rotary and hold in place while cementing. Install 20" x drill pipe annulus pack-off before cementing.
- 5.3.7 Cement 20" casing using stab-in equipment on drill pipe and cement per Cement Program in Sec. 5.13 with pack-off in place, test 20" casing to 1000 psi. Should cement in annulus fall below ground level, perform top job using cement slurry recommended for top jobs in cement program.
- 5.3.8 Install 20" slip-on by 20" - 3000 psi flanged casing head with base plate. Assure base plate is resting firmly on 30" casing. Use shim stock if necessary. It is imperative that the face of the 20" flange be as close to horizontal as possible.

- 5.3.9 Check 30"x20" annulus and perform second top job if necessary to fill up annulus to top of 20".
- 5.3.10 Nipple up 20" bell nipple on 20" 3000 WP flange for drilling below 20" casing. (See Figure 5-2.)
- 5.3.11 Pick up 17-1/2" bit and bottom hole assembly without stabilizers.
- 5.3.12 Drill out collar, cement in bottom joint, 20" shoe and +10 feet of new formation with 9.2 ppg mud. Circulate for one half hour. Check for mud loss. Do not test casing seat. Should mud loss occur, drill ahead slowly +200 feet with 50 to 60 viscosity mud. If mud loss continues, spot 50 barrel 100 viscosity mud pill at bottom of casing and pull bit up into casing. Let hole heal. Repeat if necessary.
- 5.3.13 Continue drilling 17-1/2" hole to +1200 feet.
- 5.3.14 Pull out of hole and pick-up bottom hole assembly consisting of 3 welded blade stabilizers, six 9" OD and two 7-3/4" OD steel drill collars. Stabilizers should initially be placed at 30, 90 and 120 feet above bit.
- 5.3.15 Drill ahead to +4500 feet. Install mud logger and have in operation before reaching 3000'. Take inclination survey every 500 feet or nearest dull bit. Do not exceed 1000 feet between surveys. Maximum deviation should not exceed 1-1/2° above 4500 feet.
- 5.3.16 Run logs per Sec. 5.9 Logging Program.
- 5.3.17 Run in hole with bottom hole assembly. Condition mud to 9.2 ppg and a maximum funnel viscosity of 50. Use methyl blue test to determine gel content. Check alignment of 20" head so that the hole is exactly centered in rotary and the plane of flange face is as near to horizontal as possible.
- 5.3.18 Pull out of hole and run 13-3/8" casing to +4500 feet per Sec. 5.13 Cementing Program and 5.14 Casing Running and Cementing Procedure.

FIGURE 5-2
20" 3000 WP FLANGE

5-5

- 5.3.19 Cement 13-3/8" casing using volumes calculated from caliper log and using Sec. 5.13 Cementing Procedure and 5.14 Casing Running and Cementing Procedure. Do not tack weld float equipment. Use thread lock. If cement does not circulate, run temperature survey to locate top of cement.
- 5.3.20 Set slips. Cut off casing and nipple down 20" bell nipple.
- 5.3.21 Install 20" - 3000 psi by 13-5/8" - 5000 psi casing spool and test to one-half collapse of 13-3/8", 65 pounds per foot (ppf), K-55 casing or 975 psi maximum.
- 5.3.22 Nipple up blow-out preventors per Figure 5-3 and Recommended BOP Procedures, Sec. 5.5.
- 5.3.23 Use plug type test tool and test annular preventer to 3500 psi. Test rams, casing spool, valves, HCR valve, check valve, choke line, kill line, choke manifold valves, upper and lower kelly cocks, swivel, hose and stand pipe to 5000 psi.
- 5.3.24 Pick up 12-1/4" bit and bottom hole assembly without stabilizers. Drill out float collar and cement joint to within 20 feet of casing shoe. When cement gets firm, test casing to 1500 psi using 500 psi increments. Allow 10 minutes between increments.
- 5.3.25 Drill remainder of cement and shoe and +10 feet of new hole below casing. Close annular preventer and pressure test shoe to a 14.0 ppg equivalent using 9.2 ppg mud. Surface pressure should be +1125 psi.
- 5.3.26 Should casing shoe fail to hold test, determine what mud weight shoe is holding. Pull out of hole and pick up 13-3/8" - 72 ppg squeeze tool and set in second joint from shoe. Squeeze shoe with minimum of 200 sacks of cement.
- 5.3.27 Drill out, retest and squeeze until a successful test is obtained.
- 5.3.28 Drill sufficient hole to bury bottom hole assembly without stabilizers. POH.

FIGURE 5-3
NORMAL PRESSURE SERVICE BOP - 5,000 PSI

5-7

5.3.29 Pick up 12-1/4" drilling assembly consisting of six 9" collars and ten 7-3/4" collars. Weight in air approximately 75,000 lbs. Run 3 welded blade stabilizers at 60, 90 and 150 feet above bit. This bottom hole assembly may be altered depending on equipment contractor furnishes with the rig.

5.3.30 Drill 12-1/4" hole taking inclination surveys every 500 feet or nearest dull bit. Maximum permissible deviation is 2° between surveys or a maximum angle of 5°.

Drilling breaks to be circulated according to Sec. 5.6 Drilling Break Procedure. Pre-record all kick control information on IADC Drilling Report each day. Have a mudlogger provide current and written summary of all drilling parameters prior to making a trip. Maintain a continuous chronological log of changes in pit volume and flowline temperatures. Obtain ditch samples per attached mud logging programs. Maintain minimum mud weight required for safe drilling and tripping based on hole conditions and mud logger's data.

5.3.31 Upon reaching a total depth of +14,450 feet or a pore pressure of 14 ppg at a lesser depth, condition hole for logging.

5.3.32 Log hole per Sec. 5.9 Logging Program.

5.3.33 Install 9-5/8" rams in top ram preventer in two ram hook-up or middle ram in three ram hook-up and test BOP's in accordance with paragraph 5.3.23. Re-run stabilized bottom hole assembly, and make conditioning trip to run 9-5/8" casing. Testing BOP's may be done prior to condition hole to run casing.

5.3.34 Run, cement, and land 9-5/8" casing per Sec. 5.12, 5.13 and 5.14. Run temperature survey to locate top of cement.

5.3.35 Cut off casing, pick up blow-out preventers, and install 13-5/8" 5,000 psi by 11"-10,000 psi spool. Test to one-half collapse pressure of 53.5 pounds per foot P-110 9-5/8" casing or 3825 psi maximum.

- 5.3.36 Install and test 10,000 psi blow-out preventers, and all lines. (See Figure 5-4.) Use plug type test tool and test annular preventer to 3500 psi. Test rams, casing spool, valves, HCR valve, check valve, choke line, kill line, choke manifold valves, upper and lower kelly cocks to 10,000 psi. Test swivel, hose and stand pipe to 5,000 psi.
- 5.3.37 Pick up 8-1/2" bit and 21 6-1/2" spiral collars without stabilizers and drill out float collar and cement joint to within 20' of float shoe. When cement gets hard, test casing to 3500 psi. Check pump efficiency prior to drilling out 9-5/8" shoe.
- 5.3.38 Should casing leak, locate leak with retrievable squeeze tool and squeeze with high temperature cement per Sec. 5.13 Cementing Program.
- 5.3.39 Drill out remainder of cement, casing shoe and 10' of new formation. Test casing seat to an equivalent of 17.7 ppg. Use procedure as stated in steps 5.3.24 and 5.3.25. Surface pressure should be 2020 psi with 15.0 ppg mud.
- 5.3.40 Should casing shoe fail to hold a test, determine frac gradient. Pull out of hole and pick up 9-5/8" 53.5# squeeze tool and set it approximately 100' above casing shoe. Squeeze shoe with minimum 200 sx cement.
- 5.3.41 Drill out, retest and resqueeze until test is successful.
- 5.3.42 Drill sufficient 8-1/2" hole without stabilizers below 9-5/8" casing seat to bury 700' of bottom hole assembly.
- 5.3.43 Install spiral blade stabilizers @ 60', 90' and 120' above bit. BHA weight in air should be approximately 60,000 lbs. Run shock sub when insert bits are used.
- 5.3.44 Pore pressures are anticipated to increase to 15.6 ppg by 14,700' thus requiring about 16.2 ppg mud. Monitor returns closely for excess shale and background gas.

FIGURE 5-4
NORMAL PRESSURE SERVICE BOP - 10,000 PSI

5-10

- 5.3.45 Maximum allowable increase in deviation between 500' surveys is 2°. Maximum deviation should not exceed 7°. Drill to 17,000'±.
- 5.3.46 Log 8-1/2" hole per Sec. 5.9 Logging Program.
- 5.3.47 Condition hole to run 7" liner. Run 7" liner per Sec. 5.14 Casing Running and Cementing Procedure. A polished bore receptical (PBR) for the tubing will be an integral part of the 7" liner and placed in the string above the potential producing interval. Depth will be determined after running logs at T.D.
- 5.3.48 Go in hole with an 8-1/2" bit. Note top of cement. Drill cement and circulate hole clean at top of 7" liner. Pick up, close pipe rams and test top of liner to 1000 psi.
- 5.3.49 Go in hole with a tie-back dressing tool and dress the top of the tie-back sleeve.
- 5.3.50 Run 7" casing tie-back string per Sec. 5.14 Casing Running and Cementing Procedure.
- 5.3.51 Nipple down BOP and install 11" 10,000 psi x 9" 10,000 psi tubing spool.
- 5.3.52 Nipple up BOP and test.
- 5.3.53 Pick up small string of drill pipe with 5-1/2" O.D. mill and clean out casing to top of latch in collar.
- 5.3.54 Pull out of hole. Pick up a 7" 38# RTTS tool and differentially test with fresh water and mud equivalent to a 9.0 pound per gallon density at the top of the 7" liner tie back, the top of the PBR in the 7" string and the top of the latch in collar. Circulate mud around and pull out of hole.
- 5.3.55 Go in hole with a PBR polishing tool and polish the PBR in the 7" string. Go in hole to top of latch collar and displace mud with 10.0 pound per gallon salt water. The effect of injecting cold fluid into the wellbore shall be calculated prior to displacement and fluid heated if necessary.

- 5.3.56 Pull out of hole and lay down work string.
- 5.3.57 Run 5" tubing with seal assembly on bottom and sliding slide above. Hang tubing in tubing head, spacing out with pup joints as necessary. Note: 5" tubing to be tested going in hole to at least 10 percent greater than anticipated shut-in well pressure.
- 5.3.58 Pick up 5" tubing out of tubing head with hanger attached sufficient distance per seal assembly on bottom to clear PBR.
- 5.3.59 Circulate clean salt water until annulus is clean. The effect of injecting cold fluid into the wellbore shall be calculated prior to displacement and fluid heated if necessary.
- 5.3.60 Displace salt water in annulus by reverse circulating with 12.5 ppg packer fluid containing corrosion inhibitor. The effect of injecting cold fluid into the well bore shall be calculated prior to displacement and fluid heated if necessary.
- 5.3.61 Lower tubing and hang off in tubing hanger per paragraph 5.3.57.
- 5.3.62 Test tubing to a pressure at least 10 percent greater than anticipated shut-in pressure.
- 5.3.63 Back off tubing landing joint and nipple down BOP's.
- 5.3.64 Install BPV in tubing hanger.
- 5.3.65 Install adapter and blind flange with valve and gauge on top of tubing head.
- 5.3.66 Release rig.

5.4 Mud Program (Milchem's Recommended Program)

Depth	Mud Type	Weight	Visc.	API Filtrate	Pv	Yp	Solids
0- 4500'	Gel, caustic	8.8- 9.0	30-60	N/C	4- 8	8-16	5- 6
4500'-9500'	Gel, caustic lignite	9.0- 9.5	35-40	25-10	8-16	8-16	6- 7
9500'-12500'	"	9.5-10.5	35-40	10- 6	14-19	5-10	10-17
12500'-13500'	"	10.5-11.0	36-42	6- 5	14-19	5-10	11-18
13500'-14300'	"	11.0-12.5	40-45	5- 4	16-20	5-10	11-18
14300'-14450'	"	12.5-14.0	43-48	HTHP* 15-12			
14450'-14650'	"	15.0-16.0	42-48	15-12	29-38	5-12	26-32
14650'-15500'	"	16.0-16.8	45-52	12-10	29-38	5-12	26-32
15500'-15800'	"	16.8-17.0	48-52	10- 8	36-42	5-13	32-36
15800'-17000'	"	17.0-17.4	48-52	10- 8	29-46	5-13	36-38

*HTHP - High Temperature High Pressure fluid loss.

Definitions: Weight: Pounds per gal.
 Viscosity: Seconds
 Filtrate: cc per 30 min.
 Pv: Plastic Viscosity
 Yp: Yield point

5.4.1 Remarks (Milchem's Recommended Program)

1. Desander, desilter and fine mesh screen shaker to be installed and kept in operation from surface to 13,500'.
2. Add light treatments of lignite and caustic from 4500'-9000' for filtration and rheology control. Commence light treatments with chrome lignosulphonate at 9000'.
3. Discontinue use of desilter at 13,500' but continue use of desander and fine mesh screen shaker.
4. The geopressure/geothermal zone is expected to be encountered at a depth of 14,300'. The casing point for the 9-5/8" intermediate string will be between 14,300' and

14,450'. It is imperative that the specific depths be selected by comparing the mud log on the DOE Gladys McCall No. 1 with the electric log on the Getty/Gladys McCall No. 1 since the casing seat on the 13-3/8" casing at 4500' will have a fracture gradient of only 14.5 ppg mud. A 15.0 ppg mud will be required at 15,000' increasing rapidly to 16 ppg at 16,000' and 17.4 ppg at TD to be sufficient to overcome the formation pressures expected. (See Figure 5-5.)

5. Install centrifuge before drilling out of 9-5/8" casing to aid in control of drilled solids.
6. Reduce HTHP filtrate to 12.0 cc by 14,750'.
7. Start checking HTHP filtrate when mud wt. exceeds 12.0 #/ppg.
8. Run mud tests in high temperature bombs to check for temperature stability and static aging properties about 1000' before logging at 14,450' and 17,000' which are the 9-5/8" and 7" casing seats.

5.4.2 Estimated Mud Material Used by Interval

0'-4000':

Barite	90 sks
Bentonite	700 sks
Caustic	80 sks
SAPP	7 sks

4000'-14500':

Barite	900 sks
Barite (Bulk)	760 tns
Bentonite	1050 sks
Lignite	500 sks
Chrome Lignosulphonate	800 sks
CMC	40 sks
Caustic	650 sks
Lime	350 sks

FIGURE 5-5
PORE PRESSURE AND FRAC GRADIENT CURVE

5-15

14500'-17000':

Barite	390	sks
Barite (Bulk)	500	tns
Bentonite	140	sks
Thinner	350	sks
Dispersants	450	sks
CMC	300	sks
Caustic	300	sks
Lime	200	sks

Mud Engineers Service: complete mud checks will be made twice daily from surface to 12,500'. Mud vendor will supply 24 hour mud supervision from a depth of 12,500' to T.D. Two mud engineers will be required, each to work 12 hr. shifts.

5.5 Recommended BOP Procedures

- 5.5.1 Test entire BOP system each 7 days using fresh water.
- 5.5.2 Maintain full working pressure on accumulator system.
- 5.5.3 Use all flanged valves and/or fittings in BOP or manifold system.
- 5.5.4 Do not use kill line for routine fill-up on trips.
- 5.5.5 Pump through choke and kill lines each trip.
- 5.5.6 Open and close rams and kelly cocks on each trip.
- 5.5.7 Maintain kelly cock wrench and inside blow out preventor (BOP) at driller's console.
- 5.5.8 All choke and kill valves adjacent to spool or casing head should be kept in open position and only used in emergencies. Do not throttle flow with inside valves. They should always be full open or completely closed.
- 5.5.9 Install and test casing rams in top position prior to running 9-5/8" or smaller casing.

- 5.5.10 Casing and pipe rams should be installed prior to running liners.
- 5.5.11 Maintain the sub (drill pipe box, by drill collar pin) on floor while making trips.
- 5.5.12 Maintain extra set of pipe rams on rig at all times.
- 5.5.13 Do not hook up kill line to casing head valves except in emergency. Use kill line off spool above lower pipe rams.

5.6 Drilling Break Procedure

NOTE: Drilling continuously in sand containing gas can load the annulus with gas, giving indication of flow and lack of well control. Therefore, it may be necessary to stop drilling and circulate "bottoms up" after approximately thirty minutes of fast drilling in sand.

- 5.6.1 Stop drilling upon encountering a drilling break (as soon as break is indicated).
- 5.6.2 Pull kelly above floor and check well for flow, if no flow, drill 5' more of break and check for flow again.
- 5.6.3 Circulate break one-half way to surface; check for flow. If no flow, circulate two-thirds of way to surface and check for flow.
- 5.6.4 If no flow, circulate all of break to surface, if no show, nor an attempt to flow, continue drilling maintaining constant weight on bit.
- 5.6.5 If drilling rate in break continues to increase, check for flow each 5' (or 1/2 hour drilling time) whichever is first. Check plot of d-exponent in mud logger's trailer.

5.7 Well Cuttings Sample Collection

Three sets of sample cuttings at 30' intervals will be taken beginning at the surface and continuing to total depth. Small size bags will be used. These will be analyzed at the well site, and washed samples will then

be distributed to authorized parties for further interpretation. These samples are to include canned samples taken at 60' intervals for geochemical analysis from 13,600-TD. Sample collection and distribution will be coordinated by T-F&S personnel.

5.8 Mud Logging Program

A mud logging system will be installed and be operational before reaching 3000'. The unit and crew will most likely monitor and record the following:

Service Drilling

1. Drill time on interval requested.
2. Total gas on 5 foot intervals.
3. Chromatographic analysis continuously.
4. Weight on bit, rotary speed and pump pressure every 6 hours.
5. Pore pressure estimate from shale porosity.
6. "d" exponent.

Logs

1. A 1" porosity log machine plot on each foot drilled, lithology, gas and drilling data notations. Pore pressure plotted on the Log.
2. A 5" per 100' "Porosity Log" on each foot with total gas, chromatograph analysis of components plotted along with sample description and lithology annotations.

5.9 Logging Program

Catch (2) one quart mud samples from flow line before POH to log.

<u>Depth Interval</u>	<u>Type Logs or Equivalent</u>
a. Open Hole	
(1) Surface to <u>+850'</u>	Borehole Geometry Log with 4 arm caliper.

Depth IntervalType Logs or Equivalent

(2) From conductor casing shoe (850') to 4500'

Induction-Spherically Focused Log. Bore hole Compensated Sonic Log with Gamma Ray Logs. Bore hole Geometry Log with 4 arm caliper (directional survey and hole volume integrator).

(3) From 4,500' to 14,450'

Induction-Spherically Focused Log. Bore hole Compensated Sonic. Compensated Formation Density Log with Compensated Neutron Log, Gamma Ray and four arm dipmeter. High resolution thermometer (HRT). HRT log on last run before running casing. (Note hours since last circulation on log heading.)

(4) From 14,450' to 17,000' (or total depth)

Induction-Spherically Focused Log. Bore hole Compensated Sonic Log with Caliper. Compensated Formation Density Log, Compensated Neutron Log with Caliper and Gamma Ray Logs. Four arm dipmeter log. Sidewall cores from over-pressure sands as needed. Repeat Formation Tester for pore pressure analysis as needed. HRT (HRT log on last run before running casing.) (Note hours since last circulation on log heading.)

(5) From 14,450' to 17,000'.

"Saraband analysis" and "Mechanical Properties Analysis."

<u>Depth Interval</u>	<u>Type Logs or Equivalent</u>
b. Cased Hole	
(1) From 4,500' to surface	Cement bond log with variable density and Gamma Ray Log. For correlation with open hole, HRT (HRT only if essential to evaluate cement setting time.)
(2) From 14,450' to top of cement	Cement Bond Log with variable Density and Gamma Ray Log for correlation with open hole. HRT (HRT only if essential to evaluate cement setting time.)
(3) From 17,000' to top of cement	Cement Bond Log with variable Density and Gamma Ray Log for correlation with open hole. HRT (HRT only if essential to evaluate cement setting time.)
(4) Various	Casing Collar Log (CCL). To satisfy state requirements.

5.10 Hydraulics Program (Recommended by Dresser Security)

<u>Depth</u>	<u>Hole Size</u>	<u>Mud Wt.</u>	<u>AVDP Ft/min.</u>	<u>GPM</u>	<u>Jet Size</u>	<u>Jet Vel.</u>	<u>Press Ac. Bit</u>	<u>Surf. Press</u>
500'-2500'	17-1/2"	9.0	76	870*	2-16 1-18	435	1525	3000
2500'-4500'	17-1/2"	9.2	72	760*	3-16	425	1385	2975
4500'-7000'	17-1/4"	9.2-9.5	83	442	3-11	510	2160	2890
7000-10000	12-1/4"	9.5-10.0	83	442	2-11 1-12	479	1910	2850
10000'-12500'	12-1/4"	10.0-10.5	83	442	3-12	428	1656	2900
12500'-13500'	12-1/4"	10.5-11.0	82	430	2-12 1-13	393	1496	2920
13500'-14500'	12-1/4"	11.0-12.5	82	432	2-14 1-13	322	1116	2910
14500'-16500'	8-1/2"	16.0-17.4	111	236	2-10 1-9	351	1821	2750
16500'-17000'	8-1/2"	17.4-17.7	116	246	3-10	343	1805	2920

*Pumps running in parallel.

5.11 Bit Program (Recommended by Dresser Security)

<u>Depth</u>	<u>No.</u>	<u>Size</u>	<u>IADC Type</u>
0'-850'	1	24"	DOE furnished
850'-4500'	2	17-1/2"	1-1-1
4500'-8100'	3	12-1/4"	1-1-4
8100'-10000'	4	12-1/4"	1-1-6
10000'-14450'	6	12-1/4"	5-1-7
14450'-14500'	1	8-1/2"	1-2-6
14500'-15800'	3	8-1/2"	5-1-7
15800'-17000'	4	8-1/2"	5-1-7 or 5-3-7

5.12 Casing Program5.12.1 Conductor Pipe:

30" OD, 1" W.T., 309#/ft., Grade B, Drive with D-30 diesel hammer to a depth capable of supporting a bearing load of +800,000 pounds. This load should require approximately 150 blows per ft. A pile driver analyzer will be used to determine the bearing load.

5.12.2 Conductor Casing:

<u>Depth</u>	<u>Size</u>	<u>Wt</u>	<u>Grade</u>	<u>Thd. Conn.</u>
0'-800'	20"	133#	K-55	Butt

<u>Colps</u>	<u>Burst</u>	<u>Tension</u>
<u>lbs/SF</u>	<u>lbs/SF</u>	<u>Mlbs/SF</u>
1500/4	3060/NA	2123/20

Float Equipment: Use inner string (drill pipe) stab-in float collar and conventional guide shoe. Run one (1) joint of casing between collar and shoe. Thread lock, float collar and all connections below. See Sec. 5.14.1 20" Casing Running Procedure.

5.12.3 Surface Casing:

<u>Depth</u>	<u>Size</u>	<u>Wt</u>	<u>Grade</u>	<u>Thd. Conn.</u>
0'-3500'	13-3/8"	68#	K-55	Butt
3500'-4500'	13-3/8"	72#	L-80	Butt

<u>Colps</u>	<u>Burst</u>	<u>Tension</u>
<u>lbs/SF</u>	<u>lbs/SF</u>	<u>Mlbs/SF</u>
1950/1.1	3450/NA	1069/3.3
2670/1.3	5380/NA	1650/19.1

Float Equipment: Down jet float shoe and conventional float collar. Run one (1) joint between shoe and collar. Thread lock, collar and all connections below. See Sec. 5.14.2 13-3/8" Casing Running Procedure.

5.12.4 Intermediate Casing:

<u>Depth</u>	<u>Size</u>	<u>Wt</u>	<u>Grade</u>	<u>Thd. Conn.</u>
0-8000'	9-5/8"	53.5	P-110	Butt
8000'-11500'	9-5/8"	53.5	C-95	Butt
11500'-14500'	9-5/8"	53.5	SS-95	Butt

<u>Colps.</u>	<u>Burst</u>	<u>Tension</u>
<u>lbs/SF</u>	<u>lbs/SF</u>	<u>Mlbs/SF</u>
7930/1.3	10,900/2.0	1710/1.50*
7330/1.0	9410/1.7	1458/1.90*
8850/0.9	7930/1.5	1244/2.20*

*This tension safety factor is based on the assumption the casing will be cemented up to a depth of 12,000' and 538,000 lbs. will be pulled on the casing at the surface over and above the weight of the uncemented casing when hung. The actual lbs. pull on the casing will be based on the actual well conditions at the time.

Float Equipment: Down jet float shoe with conventional float collar run two joints above shoe. Thread lock, collar and all connections below. See Sec. 5.14.3 9-5/8" Casing Running Procedure.

5.12.5 Production Casing (Run as a liner and tie-back):

<u>Depth</u>	<u>Size</u>	<u>Wt</u>	<u>Grade</u>	<u>Thd. Conn.</u>
0'-7000'	7"	38#	P-110	Butt
7000'-14,000'	7"	38#	N-80	ExLine
14000'-17000'	7"	38#	C-95	Butt

<u>Colps.</u>	<u>Burst</u>	<u>Tension</u>
<u>lbs/SF</u>	<u>lbs/SF</u>	<u>Mlbs/SF</u>
15110/1.3	11640/1.7	1096/1.5*
11390/0.8	8460/1.8	877/1.9*
13420/1.0	10050/1.4	920/8.1*

*This tension safety factor is based on the assumption the casing will be cemented up to a

depth of 8000' and 429,000 lbs. will be pulled on the casing at the surface over and above the weight of the uncemented casing when hung.

Float Equipment: Down jet float shoe and conventional float collar run two (2) joints 90'+ above shoe. Thread lock, collar and all connections below. See Sec. 5.14.4 7" casing running procedure.

5.12.6 Tubing:

Depth	Size	Wt	Grade	Thd. Conn.
0'-7000'	5"	18#	P-110	SFJP
7000'-14000'	5"	18#	C-75	FJ
14000'-16500'	5"	23.20#	L-80	FL4S

Colps. lbs/SF	Burst lbs/SF	Tension Mlbs/SF
13450/3.5*	13940/2.0	375/1.2
10000/1.0*	9500/1.3	267/1.2
13830/1.2*	13380/1.9	419/5.23

*Collapse pressures are based on an assumption that the packer fluid will weigh 12.5 ppg.

5.13 Cementing Program (Recommended by B.J. Hughes, Inc.)

5.13.1 Conductor Casing:

Job Conditions:

Casing Size - 20"	Excess - 100%
Hole Size - 24"	Mud Weight - 9.0ppg.
Depth - 800'	BHT (Static) - 92°F
Fill - Cir.	BHT (Cir.) - 80°F

Cement	Proposal:	Total	Slurry	Volume
		1538	cu. ft.	
Filler - 485	sacks (sks)*	Low Density		
Tail - 200	sks Class "H" + 35% Silica			
	Flour + 2% CaCl ₂			
Top Out - 100	sks Class "H" + 35% Silica			
	Flour + 2% CaCl ₂			

*sks = sacks of cement

5.13.3 Intermediate CasingJob Conditions:

Casing Size - 9-5/8" Excess - Caliper +10%
 Hole Size - 12-1/4" Mud Weight-14.6ppg.
 Depth - 14,500' BHT(Static) - 298°F
 Fill - 4,000' BHT (Cirulate) - 243°F

Cement Proposal: Total Slurry Volume
 1880 cu. ft.

Preflush - 35 bbls. mud cleaner + 18%
 Salt + 1 gal. Corrosion
 Inhibitor

Cement - 1175 sks Class "H" + 35% Silica
 Flour + 18% Salt + *% Retarder
 +0.4% Defoamer

*Actual amount to be determined by pilot tests
 based on actual job conditions.

<u>Slurry Properties:</u>	<u>Preflush</u>	<u>Cement</u>
---------------------------	-----------------	---------------

Slurry Weight - ppg.	15.1	15.9
Slurry Yield cu.ft./sk.	--	1.60
Mix Water gals./sk. (fresh)	--	6.50

<u>Thickening Time-Hrs:</u>	--	4-1/2
-----------------------------	----	-------

Compressive Strenghts-psi

12 Hours	--	2760
24 Hours	--	4600

5.13.4 Production Casing (Recommended by Halliburton)LinerJob Conditions:

Liner Size - 7" Excess - Caliper +25%
 Hole Size - 8-1/2" Mud Weight - 17.4 ppg.
 Depth - 17,000'
 to 13,800'+ BHT (Static) - 335°F
 Fill - 3,200' BHT (Cir.) - 288°F

Liner overlap - 500'

Cement Fill on top of
 liner - 200'

Slurry Proposal: Total Slurry Volume
715.5 cu. ft.

Spaces: 30 bbl. of Sam - 5 Spaces @ 17.4 ppg

Cement: 530 sacks class "H" + 40% Oklahoma #1
+ 1% CFR-2 + 11# Hi Dense No. 3 per
sack of cement + 3% KCL + 0.6% Halad
22A + 0.27% D-AIR + Retarder as
required by lab test.

Water ratio - 4.5 gals. per sack

Slurry weight - 18.0 lbs. per gal.

5.13.5 Tie-back

Job Conditions:

Casing size - 7"

Hole size - 8-1/2" (I.D. of 9-5/8" 53.5#)

Depth - 13,800' to 8,000'±

Fill - 5,800'

Mud weight - 17.4 ppg

BHT (Static) - 178°F

Slurry Proposal: Total Slurry Volume 735 cu.
ft.

Spaces: 2,000 gal. Mud Flush

Cement: 610 sacks class "H" + 40% Oklahoma #1
+ 1% CFR-2

Water ratio - 3.71 gals per sack

Slurry weight - 18.0 lbs per gal.

5.14 Casing Running and Cementing Procedure

5.14.1 20" Conductor Casing

1. Pick up and run 20" casing as follows:

<u>Depth</u>	<u>Quantity</u>	<u>Description</u>
0'-800'	800'	20", 133#, K-55, Butt

Bow spring centralizers - run two (2) per
joint on bottom two joints.

2. Baker lock float shoe to casing.
3. Do not tag bottom of hole.
4. Run in hole with stab-in sub on drill pipe and circulate and condition mud to approximately 50 viscosity. Install pack-off on 20" x drill pipe annulus.
5. Cement casing per cementing program. Catch at least two (2) samples each of lead and tail slurry.
6. Under displace cement in drill pipe one (1) bbl., check for back flow from collar, and pick up stinger, dropping one (1) bbl. of cement on top of float collar.
7. Pull out of hole with cementing string.
8. After surface sample of tail cement sets, cut off 20" casing and proceed to nipple up.

NOTE: Before cementing the 20" casing, it is imperative the 20" casing be centered in the rotary and held in place during the cementing operation and while the cement sets.

5.14.2 13-3/8 Surface Casing

1. Obtain caliper log on hole prior to clean-up trip.
2. Pick up and run 13-3/8" casing as follows:

<u>Depth</u>	<u>Quantity</u>	<u>Size</u>	<u>Wt.</u>	<u>Gr.</u>	<u>Conn</u>
0'-3500'	3500'	13-3/8"	68#	K-55	Butt
4500'	1000'	13-3/8"	72#	L-80	Butt

Box spring flow diverter centralizers- run 2 per joint on bottom 2 joints. One each 200' up to 800'.

3. Baker lock connections below the float collar.

4. Do not tag bottom of hole before circulation has been established. Circulate long enough to bring bottoms-up twice. Viscosity of mud should be reduced to a maximum of 50. Reciprocate casing, making 10-15' strokes if possible without exceeding 750,000 lbs. pull over the weight of the blocks.
5. See cement program for type and volume of cement. Reciprocate casing if possible, while mixing and pumping cement. Discontinue reciprocation before plug bumps, or when required pull above weight of blocks exceeds 750,000 pounds. Do not allow plug to bump with more than 500 psi pressure surge. Release pressure if no flow back.
6. Use 100 barrels of low water loss mud flush ahead of cement.
7. Hook load should be approximately 200,000 lbs. above weight of blocks, if casing has not become stuck prior to bumping plug.
8. Hang casing in tension.

5.14.3 9-5/8" Intermediate Casing

1. Calculate hole capacity with caliper on sonic log prior to making clean-up trip.
2. Pick up and run 9-5/8" casing as follows:

<u>Depth</u>	<u>FTG</u>	<u>Size</u>	<u>Wt.</u>	<u>Gr.</u>	<u>Conn</u>
0'-8,000'	8,000'	9-5/8"	53.5#	P-110	Butt
11,500'	3,500'	9-5/8"	53.5#	P-110	Butt
14,500'	3,000'	9-5/8"	53.5#	SS-95	Butt

Bow spring flow diverter centralizers:

- run 2 per joint on bottom 3 joints.
- run 1 per joint next 5 joints.

3. Baker lock connections below the float collar.
4. Do not tag bottom before circulation has been established. Break circulation immediately. Reciprocate casing, making 10'-15' strokes if possible without exceeding 650,000 lbs.
5. Circulate long enough to bring bottoms to surface. Casing should weigh 616,000 lbs. in 13.5 ppg. mud.
6. Cement with quantity and type of cement per cementing program.
7. Discontinue reciprocation when plug bumps, or pull above weight of blocks exceeds 650,000 lbs. Do not allow plug to bump with more than 500 psi.
8. Displace cement with 13.5 ppg mud. Bump plug. Then release pressure. Hang casing in tension.
9. Wait on Cement to set as defined by temperature logs and laboratory data.
10. The amount of tension (stretch) to be left on the casing when hung will depend on actual well conditions at the time.

5.14.4 7" Production Casing

7" Liner 13,800'± to 17,000'±

<u>Depth</u>	<u>Description</u>
13,800'±-13,810'±	Polish bore receptacle for 7" tie- back sleeve
-13,840'±	Mechanical set multicone hanger
-16,906'±	7" 38# AR-95 Buttress casing
-16,908'±	Landing collar
-16,910'±	Float collar
-16,998'±	7" 38# AR-95 Buttress Casing
-17,000'±	Float shoe

*Note: A PBR will be installed in the 7" liner string at approximately 16,000'±. Depth will be determined after review of electric logs and production interval determined. Also, type and placement of centralizers will be determined after electric logs are reviewed. Approximately eighty close type liner centralizers will be necessary. All 7" Buttress casing to be ABC modified.

7" Liner Running Procedure

1. Calculate hole capacity using calipers from open hole logs.
2. Rabbit all drill pipe, subs, and crossovers used in running string.
3. Install 7" casing rams in top position of BOP stack. Obtain and locate at driller's console a swedge from 7" 38# Buttress back to drill pipe connection.
4. Pick up and run liner as listed above.
5. Do not tag bottom of hole. Circulate a minimum of bottoms up and ensure hole is clean. Reciprocate liner, making 10 to 15 foot strokes when circulating.
6. Set hanger and back out setting tool.
7. Perform cement job using quantity and type cement as outlined in cementing program.
8. Pull out of hole with running string.
9. Refer to item 5.3.47.

<u>Depth</u>	<u>FTG</u>	<u>Size</u>	<u>Wt.</u>	<u>Gr.</u>	<u>Conn.</u>
0'-7,000'	7,000	7"	38#	P-110	Butt
-13,800'	6,800	7"	38#	N-80	
13,800'+	Tie-back sleeve				

7" Tie-back Running Procedure

1. Run 7" casing tie-back string as listed above.
2. Casing should weigh approximately 400,000 pounds in 17.4 ppg. mud.
3. Cement casing with quantity and type cement as outlined in cementing program.
4. Wait until cement is set with a minimum of a 1000 psi compressive strength.
5. A pull of 429,000 pounds over the weight of the uncemented section of casing will be attained before the casing is hung in the casing head. A pull versus stretch schedule will be provided at wellsite before this action is taken.

6.0 DRILLING PROGRAM - DISPOSAL WELL

DOE GLADYS McCALL SALT WATER DISPOSAL WELL No. 1
East Crab Lake Field
Cameron Parish, Louisiana

6.1 Drilling Summary

Drill and complete a 5860' salt water disposal well for disposing of the programmed 40,000 barrels of salt water per day to be produced from the test well DOE Gladys McCall No. 1. (See Figure 6-1.) The disposal well will be located approximately 130 feet west of the test well. (See Figure 6-2 Plot Plan - DOE Gladys McCall No. 1.)

6.2 Drilling Operations Detail

- 6.2.1 Prepare location for rig.
- 6.2.2 Move in rig and rig up.
- 6.2.3 Drive 20" O.D. x 1/2" wall thickness conductor pipe. See 6.4.1 Conductor Casing Design and Driving Procedure.
- 6.2.4 Cut off 20" drive pipe below rotary. Install flowline and fill-up line on 20" conductor pipe.
- 6.2.5 Pick up 17-1/2" bit and bottom hole assembly (BHA) and drill to +1150'. (Base of fresh water sands is 850 feet.) See 6.8 Hydraulics Program. Run deviation surveys at about 200' intervals. See 6.6 Deviation Program.
- 6.2.6 Condition hole for logging, and steel-line measure (SLM) out of hole. Run open-hole logs 0-1150'. See 6.9 Logging Program.
- 6.2.7 Make clean-up trip with drillpipe and BHA. Circulate and condition hole to run casing. Check rig-hole alignment prior to running casing. Level mast and substructure if necessary.
- 6.2.8 Run and cement 13-3/8" casing. See 6.4 Casing Design and Running Procedure and 6.7 Cementing Program. Center 13-3/8" casing in rotary and hold in place while cement sets. Should cement not circulate, top out with recommended cement. See 6.7 Cementing Program.

FIGURE 6-1
DOE GLADYS McCALL SALT WATER
DISPOSAL WELL NO. 1

6-2

FIGURE 6-3
PLOT PLAN - DOE GLADYS McCALL NO. 1

6-3

- 6.2.9 Cut off 13-3/8" casing and 20" conductor. Install 13-3/8" slip-on type - 3000 psi WP wellhead with base plate. Level base plate on 20" drive pipe, and weld head on to 13-3/8" surface casing.
- 6.2.10 Nipple up 12" 3000 psi WP blowout preventers (BOP). (See Figure 6-3).
- 6.2.11 Test BOP assembly, including valves on choke and kill line plus circulating system to standpipe to 2000 psi. Test casing to 2000 psi. (Notify Louisiana Conservation representative for witness of cementing and testing casing).
- 6.2.12 Pick up 12-1/4" bit and BHA (without stabilizers) and go in hole (GIH). Drill out float collar, cement and float shoe plus 10 feet of formation. Pull bit up into casing. Circulate for 30 minutes to check for mud loss. Should formation take fluid, add sufficient gel to mud system to sustain full returns and drill ahead.
- 6.2.13 Drill sufficient depth to bury BHA (to place stabilizers below casing shoe) and pull out of hole (POH). Pick up and install 12-7/32" OD welded blade stabilizers at 60, 90 and 150 feet above bit.
- 6.2.14 Drill 12-1/4" hole to depth equivalent to $\pm 5860'$ feet based on the IES Log of Getty Oil Co. - Gladys McCall No. 1. (See Figure 6-4.) SLM out of hole on next to last bit run. See 6.5 Drilling Fluid Program and 6.8 Hydraulics Program. Run deviation surveys at about 500' intervals. See 6.6 Deviation Program.
- 6.2.15 Condition hole for logging. Make short trip over last normal bit run before pulling out of hole with bit. Circulate "bottoms-up" and POH.
- 6.2.16 Run open hole logs (1150'-5860') and cased hole logs (0'-1150'). See 6.9 Logging Program.
- 6.2.17 GIH with stabilized BHA. Condition hole to run 9-5/8" casing.
- 6.2.18 Run and cement 9-5/8" casing. See 6.4 Casing Design and Running Procedure and 6.7 Cementing Program. Should cement not circulate, do not top out.

FIGURE 6-3
NORMAL PRESSURE SERVICE BOP
3000 psi

6-5

FIGURE 6-4
PARTIAL LOG, GETTY OIL COMPANY -
GLADYS McCALL NO. 1

6-6

- 6.2.19 Install 13-5/8" - 3000 psi WP x 11" - 5000 psi WP 7" tubing head.
- 6.2.20 Nipple up BOP's and test to 3000 psi as outlined in Step 6.1.11. Notify Louisiana Conservation representative for witness of casing test.
- 6.2.21 Pick up 8 1/2" bit and scraper and BHA without stabilizers and clean out or drill out cement to top of the float collar.
- 6.2.22 Circulate the hole clean with 9.5/ppg brine water.
- 6.2.23 POH and lay down 4-1/2" drill pipe and BHA.
- 6.2.24 Run logs inside 9-5/8" casing. See 6.9 Logging Program.
- 6.2.25 Run 7" x 9-5/8" Baker Model F-1 packer on wireline and set at $\pm 4800'$.
- 6.2.26 Run the 7" casing as the tubing string in the well with the locator tubing seal assembly (see Figure 6-5 Drawing of Packer and Injection String Connection Inside Casing) and space out as detailed in 6.4.4 Injection String.
- 6.2.27 Pull tubing seals up out of packer and displace the 9.5 ppg salt water in annulus between 7" tubing and 9-5/8" casing with 9.5 ppg inhibited brine water.
- 6.2.28 Hang 7" tubing in tubing hanger with seal assembly on bottom of the string sealed inside the PBR on top of 7" x 9-5/8" packer.
- 6.2.29 Nipple up tree and test seals as recommended by manufacturer. (See Figure 6-6 Christmas Tree.)
- 6.2.30 Release rig.

6.3 Surface Equipment and Services

6.3.1 Wellhead

The christmas tree assembly will be rated at 5000 psi WP.

FIGURE 6-5
PACKER AND INJECTION STRING CONNECTION
INSIDE CASING

6-8

COMPANY T-F&S		CASING	LINER	UPPER TUBING	LOWER TUBING
WELL NAME Gladys McCall		SIZE	9-5/8"	7"	
& NUMBER Water Disposal Well		WEIGHT	43.5#	22#	
FIELD East Crab Lake Field		GRADE		T-EE	
COUNTY Cameron Parish		THREAD		SPG	
STATE Louisiana		DEPTH			
DATE March 19, 1981		☐ NEW ☐ W.O.			

ITEM	DESCRIPTION	C.D.	T.D.	ESTIMATE
1	Crossover Sub 7" to 5-1/2" SPG			
2	190-60 Model "G-22" Locator Seal Assy w/16' Huger PC Hard Bonded Seals w/1/2 Muleshoe Bottom		4,875	
3	190-60 Model "TP" Retainer Production Packer	8,435	6,000	
4	190-60 Seal Bore Extension 10'			
Recommend Use of Baker Formula "E" Tubing Seal Grease on Seals				
Land LOCATOR 7' Above Packer				
PREPARED FOR				
PREPARED BY Eddie Enloe		OFFICE Houston Sales	PHONE 654-0019	

B

**BAKER
PACKERS**

PACKER AND INJECTION STRING
CONNECTION INSIDE CASING

FIGURE 6-6
PROPOSED CHRISTMAS TREE

6-9

6.3.2 Blowout Prevention Equipment (See Figure 6-3)

The blowout preventer will be 3000 psi WP, ram-type, hydraulic-controlled equipment. An annular-type preventer will be above the ram preventer which will be 3000 psi WP also.

6.3.3 Drill Rig

The rig will be capable of drilling to 8000 feet with 4-1/2" drill pipe and capable of running 9-5/8" casing to +5850'. The mast should be capable of 500,000 lb. A.P.I. static hook load and the substructure must have 500,000 lb. capacity.

6.3.4 Drilling Recording Instruments

Drilling recording instruments consisting of a pit level device and 3 pen recorder for measuring Rate of Penetration, pump pressure and hook load.

6.4 Casing Design and Running Procedure

6.4.1 Conductor Casing:

20" OD x 1/2" wall thickness 104 pound per foot, A-234 Grade B welded pipe. Drive to 100± feet with D-30 hammer. Required bearing load is 540,000± pounds including safety factor.

6.4.2 Surface Casing:

<u>Depth</u>	<u>Size</u>	<u>Wt.</u>	<u>Grade</u>	<u>Conn.</u>
0'-1150'	13-3/8"	54.5ppf	K-55	BUTT

<u>Colps Rate/SF</u>	<u>Burst Rate/SF</u>	<u>Tension Rate 1000/SF</u>
1130/2.2	2730/NA	853/14

1. Run float shoe and float collar two joints apart. Thread lock shoe, top of first joint, and collar.
2. Run 2 bow spring centralizers on bottom two joints.

3. Land casing in tension.
4. Set base plate flush and level on 20" pipe.

6.4.3 Production String Casing:

<u>Depth</u>	<u>Size</u>	<u>Wt.</u>	<u>Grade</u>	<u>Conn.</u>
0'-4000'	9-5/8"	40.0ppf	N-80	BUTT
4000'-5860'	9-5/8"	43.5ppf	N-80	BUTT

<u>Colps</u>	<u>Tension</u>
<u>Rate/SF</u>	<u>Rate</u>
	<u>1000/SF</u>
3090/1.1	916/3.8
3810/1.3	1005/1.3

1. Run float shoe and float collar two joints apart. Thread lock shoe, top of first joint and collar.
2. Run 2 flow-diverter-type centralizers on each of first two joints. Run one flow-diverter-type centralizer every second joint for the next 10 joints.
3. Reciprocate pipe ± 15 feet while cementing.
4. Land casing in tension. After cement sets, pull 200,000 lbs. over weight of casing.

6.4.4 Injection String:

<u>Depth</u>	<u>Size</u>	<u>Wt.</u>	<u>Grade</u>	<u>Conn.</u>
4800'	7"	23#	K-55	LTC w/ ABC Mod Coupling

<u>Colps</u>	<u>Tension</u>
<u>Rate/SF</u>	<u>Rate</u>
	<u>1000/SF</u>
3270/1.1	366/2.5

1. Bottom of 7" will be sealed off inside a Baker Model F-1 Packer, depth of top of 7" x 9-5/8" packer to be +4800'. Measurements to be from top of rotary drive bushings. (See Figure 6-5.)
2. The Baker Model F-1 packer will be run in the well on a wire line and set at +4,800'.
3. The setting depth of the top of the 7" x 9-5/8" packer will be determined as follows:

Determine distance from RDB to
bottom of 7" casing hanger
"doughnut" _____

Add measured length of 7" casing
including length of 5-1/2" x 7"
sub and top shoulder (or locator
sub) of tubing seal assembly _____

Add (seventy-eight inches) +78"

<u>TOP OF PACKER</u>	<u>TOTAL</u>	<u>+4800'</u>
----------------------	--------------	---------------

4. When the tubing head is bolted on the Christmas tree and before injection is commenced, the tubing seal assembly should be extended down through the 7" x 9-5/8" packer and the tubing locator should be 78" above top of the packer (to allow for heat plus pressure expansion effects).
5. After water injection is commenced, if the injection pressure would reach 2000 psi and the well bore temperature 200°F, the tubing would expand downward 78" and the tubing locator would set down on the top of the packer with no weight.

6.5 Drilling Fluid Program

<u>Depth</u>	<u>Type Mud</u>	<u>Weight</u>	<u>Visc.</u>
0'	Gel-water	9.0-9.2 ppg	40-50 sec
1350'-5000'	Gel-water	9.0-9.2 ppg	35-40 sec
	Lignite		
5000'-5860'	Gel-water	9.0-9.2 ppg	40-45 sec
	Lignite		

<u>% Solids</u>	<u>Water Loss</u>	<u>PV/YP</u>
6-7	30 cc	8/12
3-7	20	7/12
3-5	2-4	14/7

6.5.1 Have water loss below 4cc @ 4800'.

6.5.2 Have water loss below 2cc at $\pm$ 5000'.

6.5.3 After reaching total depth wash mud tanks that will be used to circulate 9.5 ppg brine water.

6.5.4 It is estimated to require $\pm$ 1000 barrels of brine to complete job.

6.5.5 Do not mix mud with brine.

6.6 Deviation ProgramSingle Shot:

0-1150' - Run Survey at least every 200 feet. Maximum allowable deviation is 2 degrees.

1150-5860' - Run Survey at least every 500 feet. Maximum allowable deviation is 5 degrees.

6.7 Cementing Program6.7.1 Surface Casing:

<u>Depth</u>	<u>Quantity</u>	<u>Description</u>
0'-1150'	1150'	13-3/8", 54.5#, K-55, Butt

Type Cement:

Lead Slurry: Lightweight cement plus 3% salt mixed at 13.4 ppg yields 2.12 cu. ft. per sack.

Tail Slurry: Class "H" plus 35% silica flour plus 0.75% CFR-2 mixed at 15.8 ppg yields 1.55 cu. ft. per sack.

Quantity:

Lead Slurry: 425 sacks or 10% excess over caliper in open hole (estimate 100% excess) for 650 feet of fill.

Tail Slurry: 481 sacks or 10% excess over caliper in open hole (estimate 100% excess) for 500 feet of fill.

Top Out: Should cement not circulate, top out with Class "H" plus 40% silica flour and 2% calcium chloride mixed at 15.8 ppg with yield of 1.55 cu. ft. per sack.

6.7.2 Production String Casing:

<u>Depth</u>	<u>Quantity</u>	<u>Description</u>
0-4000'	4000'	9-5/8", 40#, N-80, Butt
4000-5860'	1860'	9-5/8", 43.5#, N-80, Butt

Type Cement:

Lead Slurry: Lightweight cement plus 35% silica flour and 3% salt mixed at 13.4 ppg yields 2.12 cu. ft. per sack.

Tail Slurry: Class "H" plus 40% silica flour mixed at 15.8 ppg yields 1.55 cu. ft. per sack.

Quantity:

Lead Slurry: 1175 sacks or 10% excess over caliper log in open hole (estimate 100% excess) for 4460 feet of fill.

Tail Slurry: 592 sacks or 10% excess over caliper log in open hole (estimate 100% excess) for 1400 feet of fill.

NOTE: Do not top out if cement fails to circulate.

6.8 Hydraulics Program

<u>Depth</u>	<u>Hole Size</u>	<u>Mud Wt.</u>	<u>AVDP Ft/Min.</u>	<u>GPM</u>	<u>Jets</u>
0'-1150'	17-1/2	9.0-9.2	60	331	10-10-10 10-10-11 10-11-11
1150'-5860'	12-1/4	9.0-9.2	60	331	9-10-10 10-10-10 10-10-11

6.9 Logging Program

<u>Depth Interval</u>	<u>Recommended Logging Program</u>
<u>Open Hole</u>	
a. Surface to <u>± 1150'</u>	Induction-Spherically Focused Log. Bore Hole Compensated Sonic Log and Gamma Ray Log. Bore hole Geometry Log with 4 arm Caliper. (Bore hole geometry with directional survey and hole volume integrator log.)
b. <u>±1150'</u> to <u>±5860'</u>	Induction-Spherically Focused Log. Bore Hole Compensated Sonic Log and Gamma Ray Log. Bore hole Geometry Log with 4 arm Caliper. (Bore hole geometry with directional survey and hole volume integrator log.)
<u>Cased Hole</u>	
c. Surface to <u>±1150'</u>	Cement Bond Log and Variable Density Log.
d. Surface to <u>±5850'</u>	Cement Bond Log, Variable Density Log with Casing Collar locator and Gamma Ray Log (Gamma Ray curve for correlation with open hole.)

7.0 ENVIRONMENTAL MONITORING PLAN

7.1 Introduction

The Louisiana Geological Survey/Louisiana State University will manage environmental baseline and monitoring studies for geopressure test well activities at a site adjacent to DOE Gladys McCall No. 1 in southeastern Cameron Parish, Louisiana. The drilling and testing operations associated with the DOE Gladys McCall No. 1 geopressure test well will be conducted within the scope of this environmental assessment.

7.2 Environmental Baseline and Monitoring Studies

Technadril - Fenix & Scisson is responsible for coordinating the work of all organizations involved in the DOE Gladys McCall No. 1 project.

The purpose of collecting environment baseline data is to provide a description of selected physical, chemical, and biological conditions against which later environmental monitoring data can be compared. This comparison will provide a basis for determining the net environmental change attributable to test well operations at any subsequent time.

The following data shall be collected to establish the baseline of ambient conditions prior to fluid production:

Air Quality:

- ° existing air quality conditions
- ° local meteorological characteristics

Water Quality (surface and subsurface):

- ° existing water quality conditions
- ° water resource usage
- ° hydrologic patterns, surface and groundwater levels and water movement

Seismicity:

- ° reconnaissance and baseline microseismic surveys

Ecosystem Quality:

- ° biological surveys

In order to avoid duplication, information presented in Impact Assessment for the Gladys McCall well test shall be incorporated where possible in the environmental baseline evaluation. For example, very little additional work may be required to establish existing ecosystem quality.

An environmental monitoring program designed to provide comparative data during drilling and production phases will include the studies listed below. The asterisk (*) indicates the studies that are contingent upon the occurrence of environmental changes, e.g., changes in air quality and/or standards violation in the case of air quality, and are not considered in the base scope of work.

Air Quality

- air quality monitoring
- pollutant dispersion modeling*
- continuous wind speed, wind direction, temperature and precipitation

Water Quality (surface and subsurface)

- existing water quality conditions
- water resource usage
- hydrologic patterns, surface and groundwater levels and water movement

Seismicity

- continuous microseismic monitoring

Ecosystem Quality

- biological surveys*
- bioassays*

Monitoring studies may be increased if environmental conditions, either natural or as a result of test well activities and geopressure fluid analysis, require such adjustment.

The combined scope of environmental baseline and monitoring studies which are planned during the first year includes the air quality, water quality, subsidence, microseismic and ecological studies described below.

7.2.1 Air Quality

Air quality baseline studies will be performed to:

1. Determine ambient air quality prior to possible disturbance from test well activities
2. Identify any substance potentially derived from the geopressured fluid that may have an adverse effect on the environment and establish baseline concentrations for these substances
3. Collect locally available meteorological data necessary for understanding dispersion and conversion patterns
4. Provide baseline data compatible with later measurements needed to assure compliance with state and federal air quality standards.

Air quality monitoring will be performed to determine changes in air quality which may be related to well testing activities. Sampling and analysis for hazardous substances will be from a fixed automated monitoring unit located approximately 3.2 km (2 mi.) north of the test site (prevailing winds are from the south). Analyses will include continuous measurement of sulfur dioxide, hydrogen sulfide, total hydrocarbons, and methane. Meteorological data from continuous recorders will include wind speed, wind direction, temperature, and precipitation. In the event of significant atmospheric pollutant emissions, dispersion characteristics will be determined.

Analytical procedures for air quality monitoring will be consistent with designated Reference or Equivalent Methods published by the U.S. Environmental Protection Agency, Monitoring and Research Laboratory, Research Triangle Park, North Carolina, November 3, 1978. Analyzer performance shall conform to specifications for automated methods as described in 40 CFR, Parts 50 and 53.

7.2.2 Water Quality

Water quality baseline studies will be conducted to determine:

1. Ambient water quality conditions in the local bayous and marsh and in shallow groundwater prior to possible disturbance from test well activities
2. Baseline conditions for substances potentially present in the geopressed fluids
3. Water resource usage and baseline concentrations for substances and physical properties for which state standards have been established.

Water quality monitoring studies will be performed so that changes in chemical and physical properties of surface and groundwater can be determined. Surface water samples will be collected monthly at three locations in the marshes and bayous south of the test site. A water level gauge or staff will be established at each sample location. Surface water levels will be recorded at the time of sample collection. Laboratory analyses will include Na, K, NH_3 , SO_4 , Cd, Mn, Ca, Cl, Ba, Pb, Cr, As, B, Hg, total hardness (calculated), and total organic carbon. Field measurements will include pH, specific conductance, turbidity, temperature and dissolved oxygen.

Two observation wells will be drilled into the zone of fresh groundwater which is used locally by residents of Grand Chenier Ridge. These wells will be completed at a depth not to exceed 213m (700'), in the "upper sand unit" of the Chicot Aquifer. Observation well casing will consist of 5 cm (2 in) diameter PVC pipe with 3 m (10 ft.) of PVC wrapped wire screen with backwash valve placed at well bottom. The wells will be concrete-lined down to at least 2 ft. (.6m) below the surface to prevent drainage of surface water. The exposed portion of each well will be completed with a removable cap which will allow sampling by portable pump. Both

wells will be situated northwest of the production well site, one within 90m (300'), the other within 1500m (a mile) of the production well.

Groundwater samples will be collected each month. Field and laboratory analyses to be performed on groundwater samples will be the same as for surface waters. Water level in the observation wells will be reported monthly. Surface and groundwater sample collection, handling, preservation and analysis will be consistent with methods published by the U.S. Environmental Protection Agency, "Manual of Methods for Chemical Analyzers of Water and Wastes" (1974), and the U.S. Geological Survey, "Recommended Methods for Water Data Acquisition" (1977).

7.2.3 Subsidence

Subsidence studies will be performed by the Louisiana State Geological Survey (LSGS). They will be in three parts, as follows:

1. Collection and review of historical leveling data to determine subsidence history in the vicinity.
2. Erection of benchmarks (BM) and the survey tie-in of these into the National Oceanic and Atmospheric Administrations (NOAA) first order grid.
3. (Survey) Measurement during and following long term testing of the well, (viz: deviation measurement of the BM's from original level) toward determining any changes in land level that may take place.

The first part, above, has been reported as accomplished, with the second part possibly beginning in February, 1981. The third part will begin following two weeks notice by T-F&S of the commencement of production operations.

For the second part survey, the LSGS will attempt to situate five BM (monuments) with their bases being driven to 100' depth, or "refusal," so that firm reference can be provided. (A sixth BM could be included where the disposal

well is relatively far from the production well.) A radial pattern of BM's will be attempted, primarily situating the BM's on the levees and down the access road.

The initial leveling survey shall consist of approximately 48 km (30 mi.) of first-order precise leveling. Leveling profiles will, to reiterate, be tied to (NOAA) first-order elevation benchmarks which are located along Highway 82 beyond the area of potential subsidence impact. Procedures to be used to establish benchmarks in the vicinity of the test well will be in accordance with guidelines provided in the NOAA publication, "Specifications to Support Classification, Standards of Accuracy, and General Specifications of Geodetic Control Surveys" (1978).

Subsidence monitoring will consist of first-order releveing surveys which will be conducted at 12-month intervals during production to document the occurrence of land-surface subsidence, if any, near the well site, or of differential surface movement along reactivated faults. First-order releveing is planned during the second-year environmental monitoring program, and is not considered in the base scope of work for this proposal.

Detailed maps of wetland boundaries and open water in the vicinity of the test well will be prepared prior to fluid production. After the flow testing program has been completed, a second series of maps will be prepared to determine changes in land/water interface which may be attributable to subsidence. Mapping studies will be based upon current aerial photography, topographic sheets, and field surveys.

7.2.4 Seismicity

Microseismic surveys will be performed to:

1. Determine background microseismic activity prior to disturbance from fluid production
2. Monitor microseismic activity during fluid production.

Baseline microseismic studies will include an initial reconnaissance survey to determine sources and levels of background microseismic activity. Data from this survey will be used to identify locations for permanent monitoring installations which will be least influenced by natural and cultural background noise.

Continuous microseismic monitoring will be performed using a minimum of five seismometers emplaced in sealed boreholes at approximately 30m (100 ft.) below ground surface. Microseismic monitoring studies will provide the origin time of local seismic events, their estimated locations, and their relative magnitudes.

7.2.5 Ecosystem Quality

Baseline ecological studies will rely on existing published and unpublished data to establish ranges and populations of plant and animal species in the vicinity of the test well. Additional biological surveys will be conducted in the event of significant impact to plant or animal life but are not considered part of the base scope of work.

7.3 Environmental Program Management

The environmental monitoring program will be coordinated by a principal of Technadril-Fenix & Scisson and LSU. The management of environmental monitoring will include insuring that data collected are compiled, analyzed, and reported to DOE on a quarterly basis, or more frequently, if necessary. This will provide for contractual arrangements with firms for performance of selected field and laboratory studies. Overall data interpretation and impact assessment will be performed by T-F&S. They will also be responsible for determining if federal, state, and local environmental quality standards are being met, and will inform DOE in the event of non-compliance. Investigators for the contractor will also inform DOE when an increase or decrease in baseline monitoring studies is required, justifying such changes in scope as they occur.

This Environmental Monitoring Plan outlines a one year program of combined environmental monitoring and baseline studies. T-F&S will prepare quarterly status

reports, and an annual report summarizing the results obtained during the first year. Based on analysis of the data, the development of the test well, and the federal, state, and local regulations, T-F&S will propose a second-year plan for continuing air quality, water quality, subsidence and microseismic monitoring studies. In preparing this plan, T-F&S will determine whether or not it can be accomplished at a reduced level in any of the monitoring programs, e.g., increasing the interval between water samples or reducing the number of ions analyzed.

8.0 PERMITS

The following permits are applicable to the drilling of the DOE Gladys McCall No. 1 well in Cameron Parish, Louisiana and will be provided at a later date.

State of Louisiana Office of Conservation	GR-10	Application for Permit to Drill or (renew) for Geo- thermal Resource
State of Louisiana Dept. of Conservation	MD 13-R	Permit to Drill for Minerals
Louisiana Department of Trans. and Development	LDPW-GW-1	Water-Well Regis- tration
Louisiana Department of Trans. and Development	LDPW-GW-2	Water-Well Abandon- ment and Plugging
State of Louisiana Office of Conservation	GR-4	Geothermal Resource Work Permit
State of Louisiana		Clean Air Permit

9.0 OCCUPATIONAL HEALTH AND SAFETY

9.1 General

All drilling operations and other site activities will be conducted in accordance with standards of the Occupational Safety and Health Act of 1970 (OSHA) with amendments as of March 1, 1979.

All participating organizations are responsible for the health and safety of their own personnel and for conducting all activities in accordance with procedures that assure:

- 9.1.1 A safe and healthful environment for the employees.
- 9.1.2 Control and minimization of hazards to the public and to personnel of other participants.
- 9.1.3 Minimization of accidental damage or loss of equipment, materials, and property.

9.2 Site Access

Because of the potentially hazardous nature of geopressured-geothermal well drilling and testing operations, the T-F&S Project Manager will control access to the test site and will arrange all visits of nonproject personnel. Sign-in book and security will be provided on a 24 hour basis.

9.3 Fire Protection

Hand-operated fire extinguishers for the drilling rig and other surface equipment will be provided. Extinguishers will be available for control of Class A, B, and C fires.

9.4 Industrial Hygiene

Potable water and chemical or standard toilets will be provided at all areas where personnel are stationed on a full-time basis. The chemical toilets will be serviced on a regular basis. Solid wastes will be disposed of appropriately.

9.5 Safety Hazards

9.5.1 Hydrogen Sulfide

None expected. Normal precautions will be taken by placing H₂S detectors in the drilling fluid pit areas and monitoring same with the mud logging unit. H₂S monitor with 4 each sensor heads will be installed.

9.5.2 Blowouts

Should a severe "well kick" develop, the Hydril will be closed and the choke line opened. Circulation will continue while slowly increasing the weight of the drilling fluid. After sufficient weight material (barite) has been added, the Hydril will be opened. Circulation will continue for a length of time necessary to completely stabilize the mud at the new weight. The pump will be shut down and the well observed. If the drilling fluid is stable, normal operations will be continued.

During the course of the well killing procedure with the Hydril closed, the drill pipe will periodically be moved to lessen the chance of the drill pipe becoming stuck in the hole. Should the Hydril fail, the upper preventer will be closed and circulation continued with the drill pipe in place.

9.6 Medical Care

All rig and administrative staff are trained in first aid and H₂S first aid procedures. In the trailer house near the rig, we will have a designated first aid room for treating all injuries. Medical supplies will consist of an industrial 36 unit first aid kit and sufficient back-up first aid supplies.

If a serious injury does occur to anyone on the site, an arrangement has been made with a nearby helicopter service company to be at the rig 15 minutes after they receive our call. The seriously injured employee will be flown to St. Lukes Memorial Hospital in Lake Charles.

There is also an arrangement with a local physician to be our company doctor.

9.7 Reporting Accidents/Incidents

All accidents and/or occurrences arising while carrying out the field operations set forth in this plan shall be reported promptly to the DOE Nevada Operations Office Duty Officer. The Duty Officer is available at all times (24 hours per day, 7 days per week) at phone No. (702) 734-3343.

REPORTING CATEGORIES

1. All fatalities shall be reported.
2. All accidents involving serious injury to personnel shall be reported.
3. Any accident or occurrence which could arouse significant public interest or have significant environmental impact shall be reported.

Sufficient detail should be provided in the telephone report to the Duty Officer to reasonably describe the cause(s), the current status and planned remedial actions.

10.0 REPORTING

All reports (except daily and monthly) will be submitted to DOE/NV by the Contractor for review prior to publication in accordance with specific instructions to be provided by the DOE/NV Technical Information Officer. These instructions will include format, number of copies, and submittal schedules. In summary, the reports will consist of the following:

10.1 Management Plan

The contractor's plan to manage the effort described in the statement of work. It will contain management methodologies, control systems, and procedures it will use. It will include milestones and other planning schedules, organizational identifications and descriptions, and special and critical plans, such as test plans and plans for the handling of Government-owned property. Work breakdown structures, key personnel identification, and methods for monitoring progress toward objectives will be required.

10.2 Milestone Schedule and Status Report

The Contractor's milestone schedule for all work breakdown structure items, line items, or deliverables specified in the Contract. To be updated periodically (usually monthly) to show status, progress toward completion, and percent completion of each line item and on the total Contract.

10.3 Major Milestone Status Plot

A periodic graphic presentation of events, deliverables, or major milestones and associated dates plotted in an expected performance envelope for rapid visual analysis and trend forecasting.

10.4 Cost Plan

The Cost Plan (DOE 533P) establishes the Contractor's planned rate of accrued costs for the life of the contract. The time phased baseline plan allows for the measurement of cost performance and provides basic information for updating and forecasting budget requirements. The categories and levels of reporting are specified in the contract. Cost Plan totals should agree with the detailed pricing data in the official contract documents.

10.5 Manpower Plan

The manpower plan (DOE 534P) provides the contractor's time-phased baseline used for measuring manpower performance on the contract. It provides for updating and forecasting of the contract manpower requirements. The formats only utilize direct labor expressed in man months.

10.6 Contract Management Summary Report

A single-page graphic presentation of integrated cost, major milestones, and manpower for rapid visual analysis and trend forecasting.

10.7 Cost Management Report

A periodic report of the status of costs compared to the Cost Plan. Data will be used to report actual and project accrued costs, evaluate performance against plan, identify actual and potential problem areas, construct cost experience for projects and budgeting efforts, and to verify the reasonableness of Contractor's invoices.

10.8 Manpower Management Report

The Manpower Management Report (DOE 534m) is a periodic report of the manpower resource status as measured against the Manpower Plan. It contains actual manpower expended for the reporting period and forecasts of manpower for the remainder of the fiscal year and the balance of the contract. It is used for project monitoring and control and for future planning in allocating manpower resources.

10.9 Technical Progress Reports

10.9.1 Daily Drilling Report

An informal executive summary activity report will be submitted daily throughout the drilling and testing phase. (See Figure 10-1.) The daily report will be telecopied directly to the DGE/Washington, D.C.; EAD/Nevada Operations Office; and the GPO/Houston, Texas for subsequent transmittal to other interested parties.

One copy of the actual daily drilling report prepared by the Drilling Engineer at the rig will be telecopied from the rig to NV. (See Figure 10-2.)

10-3

(1) DATE _____

(2) LEASE _____ (3) WELL NO. _____ (4) FIELD _____

(5) PRESENT ACTIVITY _____ (6) DEPTH (PSTO) _____

(7) FORMATION (8) FOOTAGE DRILLED (9) DAYS/DAYS EST. (10) AHEAD-BEHIND

(11) CONTRACTOR & RIG NO. (12) OBJECTIVE & DEPTH (13) JOB NO. (14) DISTANCE TO KB

(15) SUMMARY OF OPERATIONS
(REPORT NO. OF HOURS
SPENT ON EACH OPERATION)

(16) DEVIATION SURVEYS W/COORDINATES OF LAST SURVEY: _____

(17) DRILLING ASSEMBLY: _____

(18) B.O.P. DRILL(S) _____

(19) K.S.C.P. _____ P.S.I. @ _____ S.P.M. _____ Pump No. _____ Closing Unit Press: Manifold _____ Bottles _____

(20) MUD PROPERTIES

(21) MUD ADDITIONS

BOTTING

WT _____ PPG _____ ALK (P1/M2) _____ / _____ Daily Mud Cost _____

GRAB _____ PSI/FT _____ CL - _____ Cur'l Mud (CM) _____

VIS	SEC	CALCIUM	Cum'l Dose (CD)
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
10	10	10	10
11	11	11	11
12	12	12	12
13	13	13	13
14	14	14	14
15	15	15	15
16	16	16	16
17	17	17	17
18	18	18	18
19	19	19	19
20	20	20	20
21	21	21	21
22	22	22	22
23	23	23	23
24	24	24	24
25	25	25	25
26	26	26	26
27	27	27	27
28	28	28	28
29	29	29	29
30	30	30	30
31	31	31	31
32	32	32	32
33	33	33	33
34	34	34	34
35	35	35	35
36	36	36	36
37	37	37	37
38	38	38	38
39	39	39	39
40	40	40	40
41	41	41	41
42	42	42	42
43	43	43	43
44	44	44	44
45	45	45	45
46	46	46	46
47	47	47	47
48	48	48	48
49	49	49	49
50	50	50	50
51	51	51	51
52	52	52	52
53	53	53	53
54	54	54	54
55	55	55	55
56	56	56	56
57	57	57	57
58	58	58	58
59	59	59	59
60	60	60	60
61	61	61	61
62	62	62	62
63	63	63	63
64	64	64	64
65	65	65	65
66	66	66	66
67	67	67	67
68	68	68	68
69	69	69	69
70	70	70	70
71	71	71	71
72	72	72	72
73	73	73	73
74	74	74	74
75	75	75	75
76	76	76	76
77	77	77	77
78	78	78	78
79	79	79	79
80	80	80	80
81	81	81	81
82	82	82	82
83	83	83	83
84	84	84	84
85	85	85	85
86	86	86	86
87	87	87	87
88	88	88	88
89	89	89	89
90	90	90	90
91	91	91	91
92	92	92	92
93	93	93	93
94	94	94	94
95	95	95	95
96	96	96	96
97	97	97	97
98	98	98	98
99	99	99	99
100	100	100	100

SOLIDS

CONFIDENTIAL

YP _____ OIL _____ CWT I WGT CWT (CWT) _____

GEL (8/10) _____ OWA _____ Over or Under Target _____

PH _____ ELE. STABILITY _____

WL _____ H₂S _____

HTWL _____

(23)	BIT NO.	SIZE	BRAND	TYPE	JETS	DEPTH IN	FOOTAGE ROT MRS.	T-8	COST/FT.
------	---------	------	-------	------	------	----------	------------------	-----	----------

(24) BIT WT. _____ ROCK LOAD _____ RPM _____ TORQUE _____ PUMP PRESSURE _____ GPM _____

DRAG UP _____ DRAG DOWN _____ DAILY ROT HRS. _____ CUM'L. ROT HRS. _____

Model	Model	Model
-------	-------	-------

(25) DEEPEST CASING _____ SIZE _____ ANNULUS PRESSURES _____

(25) LOCATION-ENVIRONMENTAL CONDITION _____

(27) DATE _____ ENGINEER _____

FIGURE 10-2
DOE GLADYS McCALL NO. 1 - ACTUAL

10-4

Date _____

DOE GLADYS McCALL NO. 1

_____ Depth
_____ Footage drilled in 24 hours
_____ Mud weight (lbs/gal)

Summary of Operations

Surveys (Give depth and deviation of last survey)

Depth _____, Deviation _____

Depth _____, Deviation _____

Depth _____, Deviation _____

_____ Maximum gas units after bit trip

\$ _____ Cumulative Mud Cost

_____ Background gas units

\$ _____ Cumulative Well Cost

_____ Connection gas units

10.9.2 Monthly Technical Progress Report

A technical letter report submitted one week after the end of each month describing accomplishments made to date and providing a brief outline of the planned work schedule for the succeeding period. Problems that have occurred will be discussed along with the method of solution. Test measurement results and analytical data will be presented.

10.10 Final Reports

These written reports will correlate findings of flow tests and analyses and will include a summarization of the operational aspects of well activities. The reports will also include the evaluation of the completion technique and production strategy; the result of sand stability investigations, including the maximum and reasonable rates at which the well and the reservoir will safely operate; the determinations concerning corrosion and scaling properties of the produced fluid and any treating methods that can be used to control corrosion or scaling problems; evaluation of the reservoir deliverability and depletion, including appropriate material-energy balance equations of use; determination of reservoir size as indicated from test data; reservoir fluid characteristics, including salinity, formation compaction related to any detected surface subsidence, and discussion of the heterogeneity of the reservoir if detected.

10.10.1 Yearly Technical Report

A technical report will be submitted in draft form upon completion of each contract year. It will describe operational procedures followed, drilling completion and testing methods employed, and it will provide measurement and test information with all necessary illustrations, graphs, and tabulations required to show significant results. Descriptive text will be used to explain all illustrations.

10.10.2 Final Technical Report

A report will be submitted at the conclusion of the program presenting a summary of over-

all program results. It will be a complete report on all significant data obtained and will be a composite of work performed by all investigators directly related to the drilling and testing of the production well, drilling and utilization of the disposal well(s), and operation of the surface facility.

11.0 SCHEDULES

FIGURE 11-2
DAYS VS. DEPTH DISPOSAL WELL -
GLADYS McCALL

11-3

FIGURE 11-3
DOE GLADYS MCCALL NO. 1
MILESTONE SCHEDULE

12.0 REFERENCES

- 12.1 Kruger, Paul, and Carl Otte; Geothermal Energy, Stanford University Press, Stanford, California, 1973.
- 12.2 Berman, Edward R.: Geothermal Energy, Noyes Data Corp., Park Ridge, New Jersey, 1975.
- 12.3 Herrin, E.: "Development of Geothermal Reservoirs From Over-Pressured Areas Beneath the Gulf Coast Plain of Texas," Report AD-766 855, Air Force Office of Scientific Research.
- 12.4 Dorfman, M. H., and R. W. Deller: "Proceedings First Geopressured Geothermal Energy Conference," University of Texas at Austin, Center for Energy Research, June 2-4, 1975.
- 12.5 Dorfman, M. H., and R. W. Deller: "Summary and Future Projections," Volume I, Proceedings Second Geopressure Geothermal Energy Conference, University of Texas at Austin, February 23-25, 1976.
- 12.6 Podio, A. L., et al.: "Reservoir Research and Technology," Volume III, Proceedings Second Geopressure Geothermal Energy Conference, University of Texas at Austin, February 23-25, 1976.
- 12.7 Underhill, G. K., et al.: "Surface Technology and Resource Utilization," Volume IV, Proceedings Second Geopressure Geothermal Energy Conference, University of Texas at Austin, February 23-25, 1976.
- 12.8 Vanston, J. H., et al.: "Legal Institutional and Environmental," Volume V., Proceedings Second Geopressure Geothermal Energy Conference, University of Texas at Austin, February 23-25, 1976.
- 12.9 Whiting, R. L., and H. J. Ramey: "Applications of Material Energy Balances to Geothermal Steam Production," J. Pet. Techn. V21, 1969, pp. 893-900.
- 12.10 Cady, G. V.: "Model Studies of Geothermal Fluid Production," Ph.D. dissertation, Stanford University, 1969.

- 12.11 Feder, Allen, "Geologic Data for Forecasting Drilling & Reservoir Conditions for the Gladys McCall No. 2 Well," December 10, 1980.
- 12.12 "Recommendation to Drill, Test & Evaluate a Geopressured-Geothermal Resource Test Well in Cameron Parish, Louisiana," recommendation report submitted to DOE by Gruy Federal, Inc., September 20, 1979.

APPENDIX A

LOGGING

Production Well

<u>Depth Interval</u>	<u>Recommended Logging Program</u>
a. From conductor pipe to intermediate casing string, or <u>+3500'</u>	Induction-Spherically Focused Log. Bore Hole Compensated Sonic Log, and Gamma Ray Logs. Borehole Geometry Log with 4 Arm Caliper.
b. From <u>+3500'</u> ; to <u>+15,300'</u>	Induction-Spherically Focused Log. Bore Hole Compensated Sonic Log and Gamma Ray Logs. Compensated Formation Density Log, Compensated Neutron Log with Caliper. Four arm Dipmeter Log.
c. From <u>+14,300'</u> to <u>+15,200'</u> (Possible casing string set at 14,300)	Induction-Spherically Focused Log. Bore Hole Compensated Sonic Log and Gamma Ray Logs. Compensated Formation Density Log, Compensated Neutron Log with Caliper. Four arm Dipmeter Log. Sidewall cores from overpressured sands as needed.
d. From <u>+15,200'</u> to <u>+17,000'</u> (or total depth)	Induction-Spherically Focused Log. Bore Hole Compensated Sonic Log with Caliper. Compensated Formation Density Log, Compensated Neutron Log with Caliper and Gamma Ray Logs. Four arm Dipmeter Log. Sidewall cores from overpressured sands as needed. Repeat Formation Tester for pore pressure analysis as needed.
e. From <u>+14,300'</u> to <u>+17,000'</u>	Saraband Analysis and Mechanical Properties Analysis.
f. Various	E.g. Collar Locator Log to satisfy state requirements.
g. Cased Hole - Surface to <u>+17,000'</u>	Cement Bond Log, Variable Density Log for cement evaluation on Gamma Ray Log for correlation.

Disposal Well

<u>Depth Interval</u>	<u>Recommended Logging Program</u>
<u>Open Hole</u>	
a. Surface to <u>+1150'</u> .	Induction-Spherically Focused Log. Bore Hole Compensated Sonic Log and Gamma Ray Log. Borehole Geometry Log with 4 arm Caliper. (Borehole geometry with directional survey and hole volume integrator log.)
b. <u>+1150'</u> to <u>+5860'</u>	Induction-Spherically Focused Log. Bore Hole Compensated Sonic Log and Gamma Ray Log. Borehole Geometry Log with 4 arm Caliper. (Borehole geometry with directional survey and hole volume integrator log.)
<u>Cased Hole</u>	
c. Surface to <u>+1150'</u>	Cement Bond Log and Variable Density Log.
d. Surface to <u>+5850'</u>	Cement Bond Log, Variable Density Log with Casing Collar locator and Gamma Ray Log (Gamma Ray curve for correlation with open hole.)

APPENDIX B
CORING

B-1

A coring program is being developed by T-F&S to meet DOE and other research objectives. The total coring program will be approved by DOE for T-F&S implementation.

C-1

Drig. 12 1/4" 17012

Days from Spud

20

Mud wt. 12.6 ppg. Running
9-5/8" casing.

4/20-Drlg @ 14,435'
Mud wt. 12.6 ppg. Drlg.
Cement

4/21-Drlg @ 14,495'
Mud wt. 12.8 ppg. Had gas kick
with some salt water. Incr.
mud wt. to 13.5 ppg.

4/24-Drlg @ 14,739'
Mud wt. 15.4 ppg.

4/25-Drlg @ 14,739'
Mud wt. 15.2 ppg mud. Well
tried to come in. Incr. mud wt.
to 15.7 ppg mud. Made short trip.
Incr. mud wt. to 16.7 ppg. Had
to incr. mud wt. to 17.2 ppg to
completely stop flow of salt
water.

5/1-Drlg @ 15,224'
Mud wt. 17.2 ppg. Twisted off
drill pipe while drlg.

5/6-Running Elect. Logs
@ 15.544'

Mud wt. 17.2 ppg. Rec. fish.
No trouble running logs.

5/9-Drile @ 15.713'

Mud wt. 17.2. Well tried to
flow. Cut mud wt. to 17.7 ppg.

5/14-Drile @ 16.466'

Mud wt. 17.7 ppg.

5/20-Drile @ 17.030'

Mud wt. 17.7 ppg. Drill pipe
stuck while making conn.

5/27-Drile @ 17.035'

Mud wt. 17.7 ppg. Spotted 225
bbl. Black Magic. Pipe free
in 5-1/4 hrs. Set 7" liner @
17,034'

Days from seed

7" Csg. @ 14,290' in 9 7/8" hole

5 1/8" Liner 13254' - 15488' 176" hole

12/10-TD 14,737'
Mud wt. 17.1 ppg. Mud gas
cut to 13.9 ppg. while
spotting oil and tarring
on drill pipe. Freed
drill pipe.

12.15-Drlg. @ 15,344'
Mud 17.0 ppg. Cut mud
wt. back to 17.0 ppg.
from 17.3 ppg.

12/23-TD 15,598
Mud 17.0 ppg. Cond.
mud to run logs.

12/23-TD 15,598
Mud wt. 16.9 ppg. Ran
5" liner. Stuck @
15,488'. Cemented in
place. Tested top of
liner to 2,000#. Held
OK.

WELL DATA SHEET

Page 1

OPERATOR										SURVEY										CASING SIZE		DEPTH		OIL SIZE	
UNION OIL OF CALIF.										SEC. 30 15S 5W										13 3/8"		3470'			
WELL										FIELD										SURFACE					
DR. M. O. MILLER #1										S. E. CRAB LAKE										9 5/8"		1419'			
CONTRACTOR										COUNTY										INTERMEDIATE					
PENROE DRILL. CO.										CAMERON										7"		1703 1/2'			
ENGINEER										STATE										PRODUCTION					
BERNIE HODGESON										LOUISIANA										5"		17752'			
DATE	DEPTH	WT.	VIS.	AV.	PV.	YP.	GELS.	PH.	W/L.	DP.	C. MG/L.	C. MG/L.	SOL.	OIL.	H.T.M.P.	TOTAL MUD COST:	TOTAL DEPTH:								
1965																									
3/5	3935	9.2	36		4	4	0	13	11.5	60.4	2.4	3700	360												
3/8	5839	9.4	31		5	10	5	10	11.0	53.7	0.5	5300	380												
3/9	7325	9.6	33		6	11	5	5	9.5	34.6	0.3	5300	250												
3/10	8640	9.6	31		4	3	2	4	8.5	39.6	.05	4800	250												
3/11	9300	9.9	37		8	8	5	10	9.0	17.5	0.1	5000	250												
3/12	10040	10.0	43		21	10	0	15	12.0	10.2	2.9	3500	200												
3/13	10315	10.0	53		28	0	0	12	12.0	9.2	3.9	5775	120	12	7										
3/14	10655	10.1	48		25	5	0	10	12.0	8.4	4.3	4300	80	12	6										
3/15	11064	10.2	55		32	8	0	3	12.0	7.5	3.5	6600		14	8										
3/16	11230	10.2	43		20	3	0	2	12.0	6.4	3.2	6100		14	8										
3/17	11630	10.3	38		15	2	0	1	12.0	5.4	3.0	5950		14	8										
3/18	11800	10.3	41		17	2	0	1	12.0	5.4	2.3	5300		14	8										
3/19	12085	10.4	43		20	6	0	0	12.0	5.4	1.8	5115		15	8										
3/20	12286	10.4	44		20	7	0	0	12.0	5.0	1.8	4950													
3/21	12640	10.6	50		23	6	0	5	11.5	4.6	1.2	5280		18	6										
3/22	12750	10.6	49		24	12	0	18	11.5	4.6	1.2														
3/23	12831	10.6	48		22	8	0	7	11.5	4.5	1.3	4950		17	5										
3/24	13054	11.2	52		27	12	0	8	11.5	4.1	1.5	4950		17	5										
3/25	13163	11.1	53		29	14	0	8	11.5	4.4	1.4	5280		17	5										
3/26	13273	12.2	57		41	13	9	10	11.5	3.6	1.8	5650		19	5										
3/27	13326	11.2	57		37	17	0	12	11.5	3.6	1.4	5800		18	4										
3/28	13397	11.2	50		29	10	0	6	11.5	3.7	1.3	5800		17	4										
3/29	13535	11.4	50		31	17	0	13	11.5	4.5	1.3	6100	80	19	4										
3/29		11.4	50		27	11	0	6	11.5	4.2	2.1	6250													
3/30	13648	11.4	51		26	10	0	3	12.0	4.0	2.1	6100		20	3										
3/31	13712	11.7	55		35	15	0	5	11.5	3.9	1.9	6250		22	3										
3/31		11.3	55		33	16	0	10	12.0	3.7	2.5	6400		29	3										
OK/16000																DATE T.D.		D.H.T.		COMPLETION FLUID TYPE:		COST:			
																				PACKED MUD TYPE:		COST:			

APPENDIX D

WELL DATA SHEET CONTINUATION

WELL: DR. M. O. MILLER #1

Page 2

DATE	DEPTH	WT.	VIS.	AV.	PV	YS	GELS	PH	W/L	RF	CL. SPH.	CA. SPH.	SOL %	OIL %	H.T.H.P.	REMARKS:
1965																
4/1	13795	11.4	57		33	13	0	10	12.0	4.0	2.2	6500	120	22	2	
4/2	13936	11.5	51		27	12	0	6	12.0	4.2	2.2	6950		23	2	
4/3	13980	11.5	58		35	12	0	4	12.0	4.2	2.3	6950	120	23	2	
4/5	14145	11.7	48		26	10	0	3	12.0	4.6	2.2	7030		22	2	
4/6	14148	11.7	55		33	13	0	4	12.0	4.0	1.9	7000		22	2	lost 3 bit cones in hole
4/7	14149	11.9	51		23	10	0	4	12.0	4.0	2.0	7000		24	2	
4/8	14148	11.9	57		34	14	0	4	12.0	3.8	2.0	7250		25	tr	average per 24 hrs.
4/9	14148	11.8	49		25	10	0	2	12.0	3.6	2.0	7250		25	tr	30 ex. carbonox
4/10	14148	11.8	52		26	12	0	2	12.0	3.7	2.3	7250		25	tr	10 ex. Q-broxin
4/10	14168	11.9	52		31	12	0	3	11.5	3.7	1.8	7350		26	tr	12 ex. Caustic
4/12	14230	11.8	49		24	12	0	2	12.0	2.6	2.5	7300		26	tr	10 ex. Dextrid
4/13		11.6	50		27	7	0	2	10.0	2.0	0.8	7150		25	tr	4 ex. Celler
4/13	14331	9.6	34		34	12	0	1	10.5	1.1	0.9	7500		25	tr	begin lowering
4/14		9.7	57		38	12	0	1	10.5	1.8	1.4	7500		26	tr	gas cut mud while drlg. @ 14331
4/14		12.5	49		31	11	0	1	10.5	1.6	1.2	7800				
4/15	14420	12.7	54		34	11	0	2	10.5	1.5	1.3	8050		28	tr	
4/15		12.6	51		35	14	0	2	10.5	0.9	1.2	8050		28	3	added 3% oil
4/16	14420	12.6	59		38	14	0	4	10.5	1.4	1.0	8250		28	3	running 9 5/8" csg.
4/20	14435	12.6	52		39	12	0	3	10.5	1.7	1.4	9900		29	3	drilling cement
4/21	14495	12.8	52		31	16	0	2	10.5	1.6	1.0	10300		30	3	increasing wt. to 13.5
4/22		12.8	50		34	12	0	2	10.5	2.0	1.6	7900		30	3	gas kick-salt water
4/24	14739	15.4	66		53	26	1	12	9.5	.9	.5	10300				
4/25	14739	15.2	72		57	31	1	12	9.5	1.2	0.6	4300				
4/25	14739	15.1	55		45	16	1	8	9.5	1.0	0.4	10560		26	3	built wt. to 15.1 and began drlg.
4/25	14739	15.7	66		55	30	1	15	9.5	1.0	0.5	4200		35	3	well tried to come in.
4/25	14739	8.0	thick					bottom	9.6			54450				
4/25	14739	13.0	84		70	45	4	25	9.5	1.1	0.5	17150				
4/25	14758	16.7	50		42	14	1	5	9.5	1.2	0.6	19900		33	2	b/up after short trip
4/26		16.7	53		48	14	1	6	9.5	1.2	0.5	19800		35	2	
4/26		14.1	60		55	39	1	15	9.5	1.6	0.3	19800				continued to increase mud wt. to 17.2#
4/27	14831	17.0	62		60	17	2	9	9.5	0.8	0.5	21450		38	2	before salt water completely controlled
4/27		17.0	63		63	18	2	8	9.0	0.6	0.4	21450		38	2	
4/28	14996	17.2	63		53	25	2	15	9.0	0.8	0.3	20100		38	2	
4/29	15039	17.2	65		47	27	3	18	9.3	0.8	0.4	17800				12 ex. Q-broxin
4/29		17.2	49		40	8	1	8	9.5	0.8	0.4	17050		39	2	10 ex. Carbonox
																4 ex. sodium chromate

APPENDIX D - continued

D-2

WELL DATA SHEET CONTINUATION

MAG-301-B

WELL: a DR. M. O. MILLER #1

Page 3

DATE	DEPTH	WT.	VIS.	AV.	PV	YP	GELS	PH	W/L	RF	CL ppm.	CA ppm.	SOL %	OIL %	H.T.H.P.	REMARKS:
1965																
4/30	15155	17.2	52		51	9	1	10	9.5	0.6	0.8	16500	40	2		2 ex. Caustic
5/1	15224	17.2	58		58	10	2	11	9.5	0.5	0.4	15180	38	2		twisted off wire
5/3	15225	17.2	58		54	11	2	8	9.5	0.7	0.8	15200	41	2		drlg.
5/4	15271	17.2	53		47	10	1	6	9.5	0.6	0.8	14500	42	1		cleaned fish-out on first run.
5/5	15420	17.2	57		57	12	1	8	9.5	0.5	0.8	14500	42	1		
5/6	15544	17.2	58		56	11	1	5	9.5	0.5	0.8	14000	42	1		ran E logs-no trouble
5/7	15596	17.2	57		58	12	1	5	9.5	0.5	0.6	14000	42	1		
5/8	15620	17.2	52		50	9	1	5	9.5	0.4	0.6	14000	42	1		
5/9	15713	13.5	65		53	15	1	6	9.5	1.2	0.5	23100	42	1		wall tried to flow
5/9		11.2			off bottom				9.5	1.2	0.4	31350				increased wt. to 17.2#/gal.
5/9		17.2	59		58	11	1	5	9.5	1.2	0.9	15150	43	1		
5/9	15744	17.7	54		57	12	1	6	10.0	0.9	1.0	15150	43	1		average per 24 hrs.
5/10	15850	17.7	55		60	10	1	6	9.5	0.7	0.8	14800	42	1		15 ex. Q-broxin
5/11	16200	17.7	58		60	12	1	6	9.5	0.6	0.5	14150	42	1		15 ex. Carbonex
5/12	16240	17.6	55		57	11	1	6	9.5	0.6	0.7	13800	41	1		6 ex. Caustic
5/13	16410	17.7	52		51	13	1	4	9.5	0.5	0.6	13500	41	tr		4 ex. Sodium Chromate
5/14	16446	17.7	52		62	14	1	6	9.5	0.5	0.5	13000	42	tr		
5/15	16528	17.7	60		64	14	1	8	9.5	0.4	0.8	12800	42	tr		
5/16	16626	17.7	62		74	21	0	5	12.0	0.5	0.8	9370	42	tr		
5/17	16701	17.7	57		66	15	1	6	9.5	0.6	0.8	12700	42	tr		
5/18	16824	17.7	58		62	16	1	6	9.5	0.4	0.6	12100	42	tr		
5/19	16835	17.7	59		64	13	1	8	9.5	0.5	0.9	12150	42	tr		
5/20	16921	17.7	62		62	18	1	6	10.0	0.8	0.9	10550	42	tr		
5/21	17030	17.7	56		67	11	1	5	10.0	0.5	1.0	9950	42	tr		pipe stuck while making a connection
5/22	17035	17.7	65		63	16	1	6	10.0	0.4	1.3	9900	42	3		
5/23	17035	17.7	72		77	21	1	7	10.0	0.5	1.2	8750	42	3		spotted 225 bbls of 17.7#/gal. black magio
5/25	17125	17.5	68		83	20	1	6	12.5	0.2	3.0	8450	41	2		
5/27	17035	17.5	118		120	40	2	15	12.5	0.1	3.3	8750	41	2		pipe freed in 5 1/4 hrs.
5/28		17.7	75		81	19	1	5	12.5	1.0	3.1	8300	40	2		set 7" liner
5/28	17039	17.7	68		80	21	1	5	12.5	1.1	3.0	8300	41	1		treated cement with 3#/bbl. Di-carb.
5/29	17031	17.6	73		80	15	1	6	12.0	1.3	2.4	8250	41	1		
5/30	17197	17.6	73		90	15	1	6	10.0	0.4	0.9	8350	41	1		
5/31	17187	17.7	66		75	15	1	5	10.0	0.5	0.8	8350	41	1		
6/1	17231	17.7	78		80	15	1	5	10.0	0.5	0.9	8150	41	1		
6/2	17631	17.7	78		92	26	1	6	10.0	0.7	0.7	7900	42	1		

APPENDIX D - continued

D-3

WELL DATA SHEET CONTINUATION

MAG-301.D

WELL: DR. M. O. MILLER #1

Page 4

DATE	DEPTH	WT.	VIS.	AV.	PV	YP	GELS	PH	W/L	RF	CL PM.	CA PM.	SOL %	OIL %	M.T.H.P.	REMARKS:
1965																
6/3	17502	17.7	78		88	23	1	7	10.0	0.4	0.7	7850	42	1		
6/4	17555	17.7	60		72	21	1	5	10.0	0.2	1.0	6950	40	2		hole dragging
6/5	17034	17.7	75		81	70	1	6	10.0	0.4	1.0	6950	40	2		added 4% by vol. Hydro proof
6/5		17.7	69		79	20	1	6	10.0	0.2	1.0	6500	41	3		hole still dragging
6/6	17720	17.7	72		80	19	1	7	10.0	0.3	0.9	7050	41	3		added another 4% Hydro-proof
6/7	17781	17.7	67		79	25	1	8	10.0	0.3	0.8	6950	41	3		
6/8	17906	17.7	73		81	21	1	7	10.0	0.2	0.7	7030	41	3		
6/9	18210	17.7	60		71	21	1	6	10.0	0.2	0.6	6850	41	3		
6/10	18016	17.7	91		93	28	1	8	10.0	0.2	0.7	6850	41	3		attempted to run E logs, wouldn't go
6/11	18010	17.6	60		70	18	1	7	10.0	0.6	0.7	6800	40	2		able to run only 1 ES
6/12	18055	17.7	72		79	20	1	7	9.5	0.4	0.6	7000	40	2		
6/13	18118	17.3	75		74	29	1	10	9.5	0.1	0.6	7000	39	4		added 1.3#/bbl.
6/14	18156	17.5	60		55	22	1	10	9.5	0.1	0.6	6800	37	4		added 1#/bbl.
6/15	18153	17.5	60		58	21	2	10	9.5	0.0	0.4	6750	39	4		3% diesel oil
6/19	17759	17.5	68		63	30	3	13	9.5	0.1	0.3	6300	39	4		added another 5#/bbl CLs.
6/21	17759	17.7	68		68	19	2	10	10.5	0.2	1.1	6450	40	4		set 5" liner
6/28	17759	17.3	63		91	18	2	8	9.5	0.7	0.3	6100	38	3		
9/5		19.0	66		53	20	3	13	10.0	3.3	2.6	27875	40	2		great amount of saltwater got inb
9/5		19.6	76		73	29	3	29	10.5	3.1	0.8	28250	41	2		mud col. after making formation test

APPENDIX D - continued

D-4

APPENDIX E

CHERRYVILLE OIL & GAS CORP. - DR. M. O. MILLER NO. 1

Sec. 29, T-15-S, R-5-W

CRAB LAKE FIELD - CAMERON PARISH, LOUISIANA

<u>Date</u> 1969	<u>Operations</u>
10/24	TD 4050' 13-3/8" surface csg. set @ 4020'
10/29	Drlg @ 9071' Mud wt. 10.4 ppg.
11/2	Drlg @ 10400' Mud wt 11.3 ppg.
11/7	Drlg @ 11,200' Mud wt 11.8 ppg.
11/13	Drlg @ 11850' Mud wt 12.2 ppg. Calc. pore press 11.8 ppg.
11/18	Drlg @ 12232' Mud wt 12.6 ppg.
11/23	TD 12575' Mud wt 12.6 ppg. Logged well without trouble (No indication of abnormal press.
11/28	Drlg @ 13020' Mud wt 12.8 ppg.
12/3	Drlg @ 13255' Mud wt 12.6 ppg. Logged well without trouble.
12/6	TD 13341' Mud wt 12.7 ppg. Logged well and set 9-5/8" csg. @ 13345'.
12-11	Drlg @ 13191' Mud wt 13.1 ppg.
12-16	Drlg @ 13617' Mud wt 12.5 ppg.
12/21	Drlg @ 14052' Mud wt 12.5 ppg.
12/23	Drlg @ 14225' Mud wt. 13.4 ppg. Gas units 150 on bottom. Incr. mud wt to 13.5 ppg.
12/25	Drlg @ 14303' Mud wt 13.8 ppg. While drilling with diamond bit drlg rate incr. to 12'-15' per hr. Mud cut off bottom to 12.7 ppg. with 320 units gas. Incr. mud wt to 14.5 and drld to 14,314'. Mud cut off bottom to 13.3 ppg.

12/26	Drlg @ 14,314'	Mud wt 15.9 ppg. Made short trip. Hole did not swab.
12/27	Drlg @ 14380'	Mud wt 16.3 ppg.
12/28	Drlg @ 14550'	Mud wt 16.6 ppg. Mud cut 0.2 to 0.3 ppg. while drlg.
<u>1970</u>		
<u>1/1</u>	Drlg @ 14997'	Mud wt 16.6 ppg. Logged well with no trouble.
1/6	Drlg @ 15306'	Mud wt 16.7 ppg.
1/10	Drlg @ 15780'	Mud wt 16.8 ppg. Mud wt cut to 16.3 ppg. while drlg.
1/12	TD16000'	Mud wt 16.8 ppg. Logged well with no trouble. Caliper log indicated excessive wash outs. Ran 7" liner to 16,000'.
1/22	TD 16036'	Mud wt 17.1 ppg. No cement on top of 7" liner. Squeezed top of liner. Drilled cement out of liner and 5' of formation. Tested liner seat to equiv. of 18.3 ppg. Drilled 10' and circulated bottoms up. Mud cut to 11.6 ppg. with 900 units gas. Circ. on choke. No press on drill pipe.
1/23	TD 16066'	Mud wt 17.6 ppg. Drld 10' formation. Mud wt ct to 16.0 ppg with 400 units gas. Incr. wt to 17.4 ppg. while drlg next to 10'. Circ. 1 hr. Started gaining mud. Closed well in. 600 psi on DP and 1800 psi on csg. Attempted to kill well with 17.6 ppg. mud. Circ. out on choke. Dry gas off bottom with 3500 ppm. Cl. Raised mud wt. to 18.0 ppg and circ. around. Mud cut to 16.0-16.5 ppg.
1/24	TD 16066'	Mud wt 18.0 ppg. Cond mud. Incr. wt to 18.3 ppg. Made short trip with no indication of mud wt cut.

1/26	TD 16073'	Mud wt 18.3 ppg. Circ. bottoms up. Mud wt cut from 18.3 ppg to 16.6 ppg with 600 units gas.
1/27	Drlg @ 16136'	Mud wt. 18.4 ppg. Controlled drlg @ 6'/hr. Made short trip. No problem.
2/2	Drlg @ 16,775'	Mud wt 18.4 ppg.
2/7	Drlg @ 17254'	Mud wt. 18.4 ppg.
2/9	Drlg @ 17382'	Mud wt 18.4 ppg. Pipe dragging on short trip.
2/10	Drlg @ 17478'	Mud wt 18.4 ppg. Made short trip. Pipe dragging.
2/11	Drlg @ 17491'	Mud wt 18.4 ppg. Short trip. Mud wt cut to 18.3 ppg.
2/14	Drlg @ 17663'	Mud wt 18.4 ppg. DP dragging on short trip.
2/15	Drlg @ 17742'	Mud wt 18.4 ppg. Stuck drill pipe while drlg.
2/17	TD 17900'	Mud wt 18.3 ppg. Pulled stuck DP free.
2/18	TD 17900'	Mud wt 18.4 ppg. POH and logged well.
2/24	TD 17900'	Mud wt 18.3 ppg. Ran 4-1/2" liner to 16,800'. No problem. Attempted to circ. and lost returns. Pulled drill pipe out of hole with liner setting tools. Ran squeeze tool and cemented 4-1/2" liner, drld cement. Dry tested 4-1/2" liner and held OK.
2/28	PBTD 16800'	Cut mud wt back from 18.3 to 17.6 ppg.
3/5	PBTD 16800'	Mud wt 17.6 ppg. Ran 7" tie back string and cemented in place.

APPENDIX E

E-4

3/6 PBTD 16800' Displaced 17.6 ppg. mud in casing
with Black Magic mud.

Dresser Industries

WELL DATA SHEET

Dresser Industries

NAG-389

Page 1

OPERATION Button Gas & Oil (Formerly Getty Oil Co.)		SURVEY SEC. 27 T. 15S N. 5W		CASING SIZE SURFACE 10 3/4" DEPTH 3500	
CONTRACTOR Gladys McCall #1		COUNTY East Crab Lake		INTERMEDIATE 7" 14302	
ENGINEER Delta Drilling Co. Rig #35		STATE Louisiana		PRODUCTION 5" liner 15488	
King & Pixley					

DATE	DEPTH	WT.	VIS.	AV	RV	YR	GELS	PH	W/L	RF	CL PPM	CA PPM	SOL %	OIL %	T.M.P.	TOTAL MUD COST	TOTAL DEPTH
1969																\$28,190.94	15598'
12-2	14320	16.4	53	49	40	18	4	18	9.5	4.2	0.9	3000	60	26	2	6797	
12-3	14348	16.4	48	48	40	16	3	14	9.5	4.0	0.8	3000	60	30	4 1/2	6956	
12-4	14353	16.1	45	39	34	11	3	10	9.5	3.8	1.5	3000	N11	30	5	9723	
12-5	14381	15.5	45	22.5	17	11	2	10	9.5	4.0	0.8	2900	N11	28	5	10033	
12-6	14515	15.5	48	44	40	8	2	12	9.5	4.2	0.8	3000	N11	28	4 1/2	10867	
12-7	14675	17.0	47	28.5	22	13	1	5	10.0	4.0	0.7	2300	40	31	4	14236	
																	Drilling ahead raised mud wt from 15.5#/gal to 17.0#/gal 1200 units gas mud cut to 12.9#/gal from 15.5#/gal
12-8	14737	17.0	50	50	46	8	2	4	9.5	2.8	0.6	2400	N11	34		14667	
12-9	14737	17.1	48	27	22	10	2	6	10.0	4.2	0.7	2500	Tr			14960	
																	Circ & Cond mud to log
																	Stuck pipe going in hole after logging-spotted 12 bbl acid-failed to free pipe-circ acid out-mud cut to 13.9#/gal-1200 units gas-backed off P.O.O.H to pick up drlg jars
12-10	14737	17.1	48	32	26	12	2	6	9.0	2.8	0.4	6400	N11	36	4	15597	
																	Spotted 20 bbl pipe lax-diesel oil solution pipe free in 5 hrs circ out thru adj choke
12-11	14825	17.0	45	20	16	8	1	6	10.0	3.6	0.9	4200	Tr	36	4	15860	
12-12	15000	17.1	48	25	20	10	2	6	9.5	3.6	0.8	4000	N11	35	4	19567	
12-13	15137	17.0	47	23.5	18	11	1	7	10.0	3.2	0.7	3900	N11	34	4	21999	
12-14	15203	17.1	49	27	20	14	2	8	9.5	3.6	0.7	4000	N11	35	4	22317	
12-15	15245	17.0	49	24	18	12	2	8	10.0	3.0	0.8	3700	Tr	34	3	22618	
12-16	15344	17.0	60	67	61	13	2	9	9.5	1.8	0.6	4400	40	36	3 1/2	25247	
																	Cut mud wt from 17.3#/gal to 17.0#/gal
12-17	15438	16.9	49	21.5	22	11	1	5	10.0	3.2	0.6	3100	60	35	3	25757	
12-18	15517	16.9	48	25	20	10	1	4	10.0	3.0	0.9	3100	Tr	34	3	25997	
																	Drilling ahead
																	Drilg ahead dia. bit

DATE SHOWN
10/11/69

DATE T.D.H.

O.H.T.

COMPLETION FLUID TYPE

PACKER MUD TYPE

COST

COST

APPENDIX F

~~Dresser McGehee~~

WELL DATA SHEET CONTINUATION

~~Dresser McGehee~~
~~STANDARD~~

WAG-301

WELL: Gladys McCall #1

Page 2

WELL: Gladys McCall #1																Page 2
DATE	DEPTH	WT.	VIS.	AV.	PV	YP	GELS	PH	W/L	RF	CL PER.	CA PER.	SOL :	OIL :	H.T.H.P.	REMARKS:
12-19	15582	16.9	47	30	25	10	1 4	10.0	3.3	0.8	2900	NH1	35	3	2618	Drilling ahead
12-19	15598	17.0	48	35	29	12	1 4	10.0	3.2	0.8	2900	NH1	35	3	2637	Circ & cond mud to log
12-20	15598	17.0	52	42.5	35	15	1 5	10.0	3.4	0.8	2900	NH1	35	3	2645	Circ & cond mud to log
12-21	15598	16.9	50	38.5	31	15	2 5	9.5	3.4	0.7	2900	NH1	35	3	2653	Circ & cond mud to run 5" liner
12-21	15598	16.9	60	41.5	30	23	2 9	11.5	6.8	1.6	2600	240	35	3		Ran 5" liner-liner stuck @ 15488-
																drilled 600' cement tested top
12-21	15488	16.9	55	55	46	18	1 6	11.5	5.2	1.6	2900	220	35	3	2679	liner to 2000' held O.K. top of
12-20	15480	16.9	56	38.5	29	19	1 9	11.0	4.0	1.1	2500	100	35	3	2715	P.o.o.h to run gamma ray & to per-
12-20	15480	16.9	54		26	7	1 6	10.5	6.0	1.0	2500	100	35	3	2763	forate
12-31	12900	10.5	45	12.5	10	5	2 8	9.5	9.4	0.7	1400	120	7		2822	Circ & cond mud to squeeze @ 14450
																Drilled 76' cement & p.o.o.h to
																perforate
																Out mud wt. to 10.5//gal. plugged
																well back to 12900-laying down
1-4-70	11960															3 1/2" drill pipe - will pick up
																2 3/8" tubing & test sand @
																approx 11950-60
																Well tested & completed

APPENDIX F - continued

F-2

DISTRIBUTION LIST:

Worth Bateman, Principal Deputy Asst. Sec./Energy Technology/HQ, Rm.
7B-226, FORSTL
R. Black, Prog. Dir. Solar, Geothermal & Energy Programs/HQ, Rm. 3426, FED
J. W. Salisbury, Acting Dir., Div. Geothermal Energy/HQ, Rm. 7108, FED
C. Carwile, Regional Mgr., Gulf Coast & Eastern Programs/DGE, HQ, Rm.
7110, FED
R. Holliday, Program Mgr., DGE/HQ, Rm. 7111, FED (5)
J. K. Westhusing, GPO, Houston, TX (5)
F. Goldsberry, GPO, Houston, TX
G. G. Rambo, Dallas Regional Office
D. D. Greenwell, Dallas Regional Office
M. E. Gates/T. E. Wade, Ofc. Mgr., NV
R. W. Taft, AMEC, NV
J. B. Cotter, EAD, NV
R. T. Stearns, EAD, NV
R. D. Clarke, EAD, NV
D. J. Steinnerd, EAD, NV
W. Arevalo, PMBD, NV
R. R. Loux, OPA, NV (2)
C. S. Dunn, F&S, Tulsa
J. I. Marshall, Technadril, Inc.
T. E. Goebel, T-F&S (15)
C. S. Adkins, T-F&S
F. O'Brien, T-F&S
S. Donley, T-F&S
D. Mitchell, T-F&S
R. H. Wallace, USGS (2)
D. Klick, USGS
W. Duffield, USGS
F. Ashby, Louisiana Dept. Natural Resources
D. G. Bebout, Louisiana Geological Survey/Louisiana State University (2)
C. Groat, Louisiana Geological Survey/Louisiana State University (2)
M. H. Dorfman, University of Texas, CES (2)
R. Morton, University of Texas, BEG (2)
P. Randolph, IGT, IL (2)
H. F. Coffey, C. K. GeoEnergy
J. Wilson, DOW Chemical
B. Eaton, Eaton Operating Company
C. Durham, MGT
Holmes and Narver, Las Vegas