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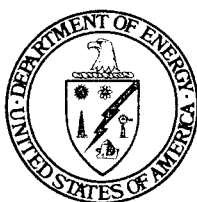
INVESTIGATION AND EVALUATION OF
GEOPRESSURED-GEOTHERMAL WELLS

Package No. 1 of Wells-of-Opportunity Candidates

February 1978
Date Published

Work Performed Under Contract No. EG-77-C-08-1528

Gruy Federal, Inc.
Houston, Texas



U. S. DEPARTMENT OF ENERGY
Geothermal Energy

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INVESTIGATION AND EVALUATION OF
GEOPRESSURED-GEOTHERMAL WELLS

PACKAGE NO. 1 OF
WELLS-OF-OPPORTUNITY CANDIDATES

Gruy Federal, Inc.
2500 Tanglewilde, Suite 150
Houston, Texas 77063

Date Published--February 1978

Prepared for the
U.S. Department of Energy
Division of Geothermal Energy
Work Performed Under Contract No. EG-77-C-08-1528

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Package No. 1 Of Wells-Of-Opportunity Candidates

Contract No. EG-77-C-08-1528

This group of wells-of-opportunity (WOO) consists of six candidates; one in Texas and five in Cameron Parish, Louisiana. Of the latter, two of three candidates in Twp 15S, Rge 5W are considered to be mutually exclusive in that each exhibits good potential for testing geopressed-geothermal aquifers which are indicated to be of sufficient volume for purposes of a 30-day test. A final selection of one location may be made from these three wells, assuming all pass screening criteria, based on estimated cost of the test and the negotiation of a satisfactory agreement with the owners of the surface and/or the minerals.

Texas WOO Candidates

A short write-up of the well drilled as Falcon-Seaboard No. 3A Baer Ranch No. T-1 is included. This is a deep hot well completed in the Matagorda Fairway. This was finally ruled out because a material balance calculation indicated pressure depletion of the zones of interest. We are continuing to investigate other wells drilled and completed in separate fault blocks in this field. Unfortunately Baer Ranch No. 3A has all casing intact and is otherwise an ideal candidate for test purposes, whereas the others are re-entry prospects.

Candidate T3 is proposed as an alternative to one of the remaining Baer Ranch wells and is written up in this package. At the proposed total depth it is anticipated that the deep Frio zones of interest present in the Baer Ranch field will be encountered in a strike position some eight miles in an easterly direction.

Candidate T2, a new well proposed for drilling in the summer of 1978 was written up but withdrawn at the last moment because of some question concerning sand development. This well, Milton Cooke, Jr. et al No. 1A Louis Lobit, a wildcat near the Green Lake field of Galveston County, is scheduled to be drilled to 14,500 feet. An adjacent well, McCullough-Lobit No. 1 was drilled to 18,463 feet where the measured temperature was 368^oF (187^oC). The mud logger indicated significant sand development at the 15,124 to 15,417 foot interval, but the bottom portion of the hole was not logged, presumably due to high temperature. Because of the ensuing uncertainties and the possibility that the mud logger technique was unreliable (it often is) this prospect was withdrawn by the Gruy screening procedure. This candidate may be reinstated at a later date.

Our search has also included one or more candidates for a possible re-entry in the Hidalgo Fairway. This area has been ruled out by Bebout and others because the low permeability of the Frio sands. However, preliminary work indicates the possibility of obtaining sufficient volumes for testing purposes as contracted to pilot plant applications. This investigation has not been completed.

Louisiana WOO Candidates

The five Louisiana WOO candidates presented are located in Cameron Parish. All have the advantage of having penetrated a thick section of deep hot lower Miocene sands, or in one case, the Abbeville sand of upper Oligocene age. Thus the uncertainty of deepening in search of these aquifers is eliminated for these candidates.

Originally it was thought that WOO's could be located in which none of the casing had been pulled. Two such were located only to discover that re-entries recently had been made which resulted in recompletions as gas producers. Other wells are being investigated in the Cameron area which are believed to have just recently gone off production. It is hoped that a suitable candidate can be found before the operator has cut and pulled the upper portion of the protection string of casing.

All of the Louisiana WOO's have been abandoned. The re-entry procedure is described. One source of potential trouble is the unknown condition of such wells with respect to the propensity (and proversity) of members of drilling crews to deposit junk in the well bore upon abandonment. Two such incidents have been called to our attention and the wells were, of course, eliminated. An effort will be made to exhaust all possible lines of inquiry in this respect, in any well accepted for testing. Further, at the first sign of trouble from unreported junk in the well, the entire well project will be reevaluated.

2/28/78

GRUY FEDERAL, INC.

Geopressured-Geothermal Reentry Prospect No. L1

Vicinity of South Flank of Second Bayou Field

Cameron Parish, Louisiana

This Gruy Federal type II-B, geopressured-geothermal (Geo²) prospect, was drilled as the U. S. Oil of Louisiana, Inc. #1 John W. Mecom, located in fractional Sec. 26, Twp 15S Rge 12W, Cameron Parish, Louisiana. The well location, approximately 300 feet north of State Highway No. 82, was drilled and abandoned as a dry hole in early 1966. The location is also shown on the lower left hand portion of the USGS topographic sheet "Johnsons Bayou, La." in the accompanying map pocket.

The enclosed diagrammatic sketch conforms with the Department of Conservation well records which show 10-3/4" O.D. casing set at 4,550' and 7" O.D. protection pipe set at 14,024'. There is no tubing in the well. The portion of the hole from 14,024' to 15,144' was left uncased with 14.5#/gal. mud. Abandonment records indicate a cement plug inside the 7" O.D. casing opposite perforations from 11,074' to 11,078', and a 50' cement plug from the surface to 50'.

The objective upper Abbeville (Oligocene age) sand was penetrated from 14,870' to total depth at 15,144' and contains approximately 110 feet of net salt water sand. No oil or gas shows were reported in this formation. The aquifer pressure is in the magnitude of 11,300 psi (normal pressure would be 6,975 psi at 15,000'). The reservoir temperature is approximately 309°F (154°C). The accompanying structural and net sand isopachous maps indicate that the well was drilled on the extreme southwest flank of the Second Bayou Field which is associated with a shale diapir. Regional faulting is complex and Abbeville penetration in this vicinity is limited to this well. It is Gruy Federal's opinion that the continuous Abbeville sand aquifer available to this well should be sufficient for this testing program.

At total depth of 15,144' the well appears to be bottomed in sand. Depending upon hole conditions after reaching original total depth, it might be desired to attempt a conventional core with the expectation of encountering sufficient additional Abbeville sand for core analyses. It should be noted that trouble was experienced with sticking of drill pipe and logging tools.

The well is located on a valid lease held by Williams Exploration Company from the Mecom interests. No difficulty is expected in negotiating reentry rights from Williams Exploration. If it is necessary to negotiate with the landowners, it is anticipated that this can be accomplished under reasonable terms. The matter of obtaining landowner's permission is being researched by counsel.

The prognosis and a detailed cost estimate of reentry, testing, and abandonment is attached. The total estimated cost is summarized as follows:

Reentry operations	\$ 537,725
Testing operations	38,500
Salt water disposal well	137,200
Plugging and clean up	<u>30,900</u>
	\$ 744,325

Of this amount some \$55,300 (gross) is probably salvable. The cost of the disposal well may be saved if permission can be obtained for a short period of salt water discharge in the Gulf of Mexico.

Advantages of this prospect include:

1. An opportunity to test the uppermost Oligocene sands (Abbeville) at an extreme downdip position,
2. Qualifies as a hot (approximately 309°F), high pressure (approximately 11,300 psi) candidate for testing,
3. Contains a known objective without further risk of non-development or faulting out of the sand as could be the case in a well-of-opportunity,
4. Adjacent to State Highway; minimum location cost,
5. Possibility of obtaining a conventional core.
6. Possibility of obtaining permission to discharge salt water in the immediately adjacent Gulf of Mexico for a limited test period.

Disadvantages:

1. Necessity to patch 7" casing,
2. Necessity to cement 5" liner to test Abbeville sand.

2-27-78

GEOPRESSURED-GEOTHERMAL WELL-OF-OPPORTUNITY CLASSIFIER

Well Name: U. S. Oil of La. Mecom No. 1

Gruy Federal WOO No. L1

UPPER SECTION

I. All tubular goods in place within surface csg.

Surface csg. to _____'

A. Cased thru geopressured zone of interest.

Protection csg. to _____'

- zone of int. 14,870' to 15,144'
- prodn. csg. to 4,350' to 14,024'
- prodn. liner ? to 15,144'
- prodn. packer at 6,990'

II. Protection csg. cut off within conductor or surface csg. but no OH.

Cut within conductor at _____'

Cut within surface csg. at 4,350'

III. Protection csg. cut off below surface csg. & OH exists from:

Bottom surface csg. at _____'

Top cut off at _____' OH

LOWER SECTION

B. Plugged above geopressured zone, with OH from plug through geopressured zone of interest.

protection csg. at _____'

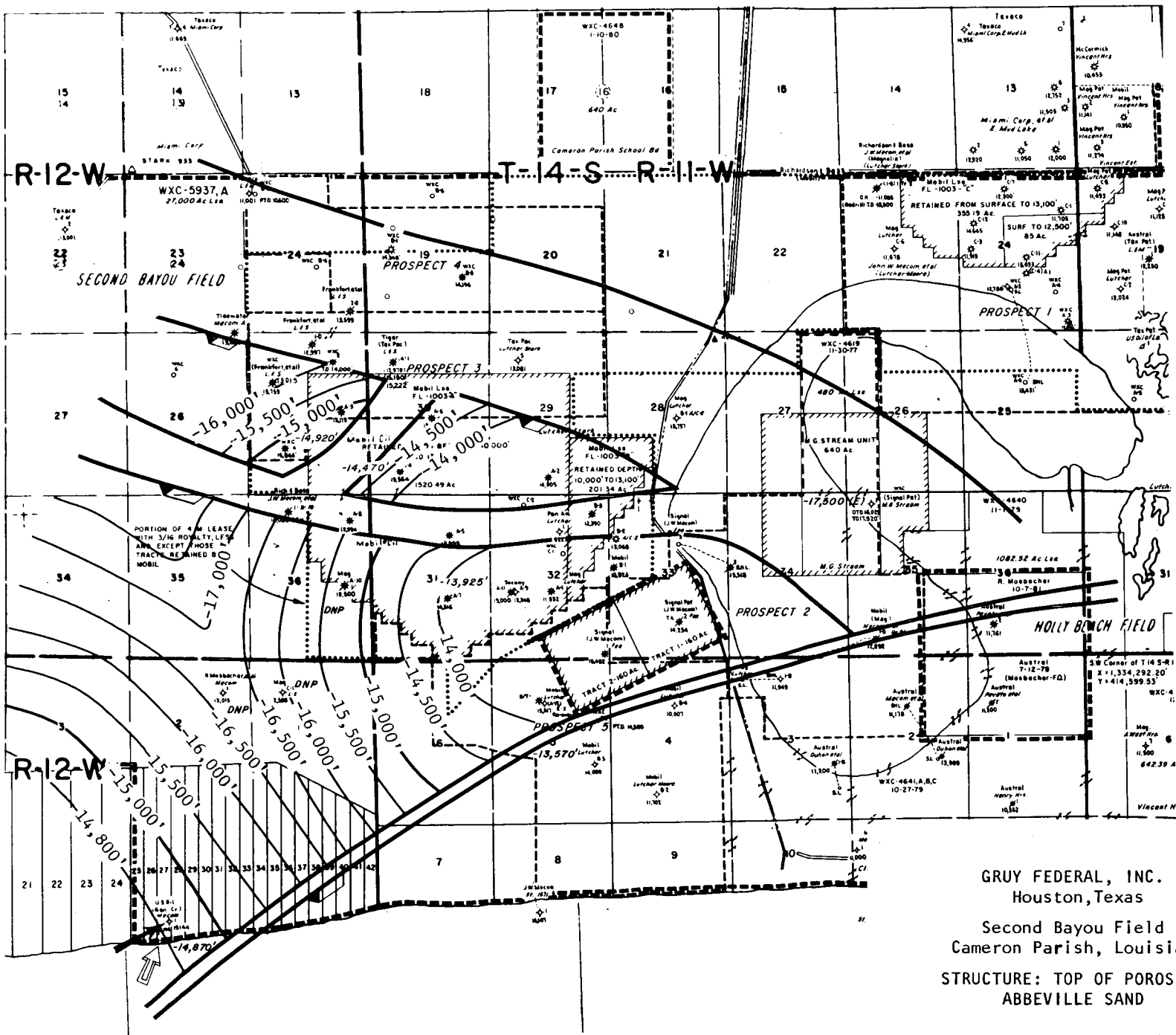
plug at _____'

zone of int. _____' to _____' OH through zone of interest

C. TD above geopressured zone; required to drill deeper.

TD _____'

zone of int. _____' to _____' additional drilling

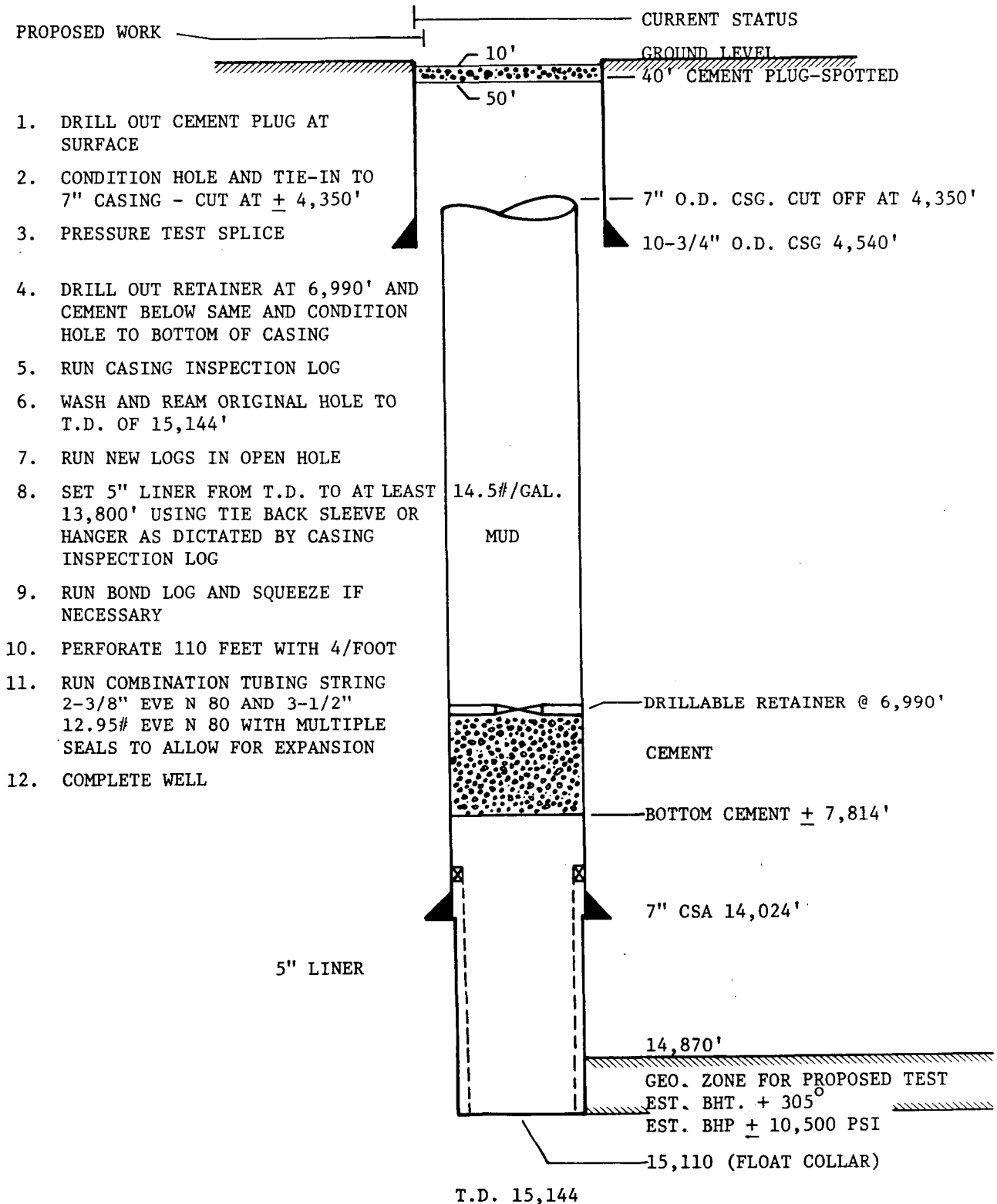


GRUY FEDERAL, INC.
 Houston, Texas

Second Bayou Field
 Cameron Parish, Louisiana

STRUCTURE: TOP OF POROSITY
 ABBEVILLE SAND

U. S. OIL OF LOUISIANA
MECOM NO. 1



U.S. OIL OF LOUISIANA
No. 1 Mecom
Section 27, T-15-S, R-12-W
Cameron Parish, Louisiana

10-3/4" - 4540'
7" - 4350'/14,024'
Open Hole 14,024'/15,110'

RE-ENTRY PROCEDURE:

1. Prepare location.
2. Move in and rig up workover rig.
3. Dig out 10-3/4" casing, weld on casinghead and extension, if needed.
4. Pick up 2-7/8" work string and drill cement in interval 10-50'.
5. Dress off top of 7" casing at 4350'.
6. Run 7" casing with patch, tie into 7" and hang off casing. Pressure test patch.
7. Nipple up 7" casinghead and install BOP's.
8. Continue to pick up 2-7/8" work string and drill retainer at 6990' and cement plug to 7814'. Mud weight to be 14.5#/gal. before plug is completely drilled out. Wash to bottom of 7" at 14,024'.
9. Pull tubing and run casing inspection log. Repair casing, if needed.
10. Wash out to TD 15,144'.
11. Circulate and condition hole and run electric logs.
12. Set 5", 15#, P-110, SFJ liner at 15,144' with top at 13,800'. Cement liner full length.
13. Clean out 7" to top of liner and test. Cement squeeze if needed.
14. Clean out 5" to float collar.
15. Circulate and condition hole, pull tubing, and run Cement Bond Log. Squeeze cement, if necessary. Perforate approximately 110', 4 shots/ft. at 14,950'±.
16. Set packer in 5" at 14,700' and test with weight and pressure.
17. Lay down 2-7/8" work string.

18. Pick up combination string of 2-3/8" 4.7# P-105 8 Rd and 3-1/2" 12.95# N-80 8 Rd tubing. Space out and set in packer at 14,700'.
19. Install back pressure valve in 3-1/2".
20. Remove BOP's, nipple up and test tree, remove back pressure valve and displace tubing with water to 14,700'. Set tubing in packer and flange up tree. Test flange.
21. Test well and release rig if everthing is satisfactory.

PLUGGING PROCEDURE:

1. Move in and rig up workover rig.
2. Kill well and install BOP's.
3. Pull tubing and set cement plugs as required by Department of Conservation.
4. Lay down 3-1/2" tubing.
5. Cut off 7" casing and recover if feasible.
6. Cut off 10-3/4" casing and weld plate on top. Release rig.

U.S. OIL OF LOUISIANA
No. 1 Mecom
Section 27, T-15-S, R-12-W
Cameron Parish, Louisiana

TESTING PROCEDURE:

1. Set rental separator and skid-mounted pump. Hook up source well and salt water disposal well.
2. Place well on production using small choke size.
3. Gradually increase flow rate to approximately 5000 barrels per day while monitoring surface flowing pressure, temperature, gas-water ratio, and sand production.
4. Shut well in until static pressure is reached.
5. Run pressure gauge.
6. Place well on production at 5000 barrels per day and record flowing BHP and surface flowing pressure.
7. Sample fluid and gas.
8. After three to five days of constant production rate, shut well in to measure pressure build-up.
9. When BHP has stabilized retrieve pressure gauge.
10. Place well back on production at successively higher rates until 10,000 barrels per day is obtained. Flow continuously at this rate for two weeks and shut-in.
11. Run pressure gauge to record final static bottom hole pressure.

DOE Contract No. EG-77-C-08-1528
Gruy Federal Job No. 00-77-3017

U.S. OIL OF LOUISIANA
No. 1 Mecom
Section 27, T-15-S, R-12-W
Cameron Parish, Louisiana

RE-ENTRY COST:

1. Location preparation	\$ 25,000
2. Rig time - 15 days	52,200
3. Bits	800
4. Mud and chemicals	15,000
5. Casinghead	2,000
6. Xmas tree	50,000
7. Casing patch	5,000
8. Rental tools and equipment	10,000
9. Inspection log	7,000
10. Cement and Services	4,000
11. Cement Bond Log	4,400
12. Liner setting	4,000
13. Perforating (this can be negotiated)	20,300
14. 2-7/8" drill pipe work string (rental)	10,300
15. 1000' of 2-3/8" P-105 4.7# EUE 8 Rd tubing	3,700
16. 1,700' of 3-1/2" N-80 12.95# EUE 8 Rd tubing	11,350 (1)
17. Packer	3,500
18. 4350' of 7" S-95 29# 8 Rd casing	55,300 (2)
19. 1344' of 5" P-110 15# SFJ liner	14,600
20. Supervision	4,900
21. Miscellaneous	4,500
22. Contingencies	<u>49,000</u>
TOTAL	\$ 342,850

(1) Note 1--See Buttes Cost Estimate

(2) Note 2--See Buttes Cost Estimate

U.S. OIL OF LOUISIANA
No. 1 Mecom
Section 27, T-15-S, R-12-W
Cameron Parish, Louisiana

TESTING COSTS:

1. Separator, pump, metering equipment	\$ 14,000
2. Air cooler	3,000
3. Pressure measurement	8,000
4. Labor	2,000
5. Material	3,000
6. Miscellaneous	3,000
7. Sampling devices	1,500
8. Contingencies	<u>4,000</u>
Total	\$ 38,500

U.S. OIL OF LOUISIANA
No. 1 Mecom
Section 27, T-15-S, R-12-W
Cameron Parish, Louisiana

PLUGGING:

1. Rig time - 5 days	\$ 17,400
2. Cement and services	5,000
3. Labor	1,000
4. Supervision	1,700
5. Miscellaneous	3,000
6. Contingencies	<u>2,800</u>
Total	\$ 30,900

DOE Contract No. EG-77-C-08-1528
Gruy Federal Job No. 00-77-3017

U.S. OIL OF LOUISIANA
No. 1 Mecom
Section 27, T-15-S, R-12-W
Cameron Parish, Louisiana

1. Move in water well rig and rig up.
2. Drive 13-3/8" casing to refusal.
3. Drill 12-1/4" to approximately 1500'.
4. Set and cement 9-5/8".
5. Drill 8-3/4" hole to approximately 2500'.
6. Run electric logs.
7. Set and cement 7" casing at TD.
8. Perforate 7" as indicated by log.
9. Set packer in 7".
10. Pick up 3-1/2" tubing and set in packer.
11. Install tree, test well and release rig.

COSTS

1. Drill to 2500' and set casing	\$ 30,000
2. 170' of 13-3/8" casing	2,500
3. 1500' of 9-5/8" 36# J-55 8 Rd	16,600
4. 2500' of 7" 26# J-55 8 Rd	20,000
5. 2500' of 3-1/2" 12.95# N-80 8 Rd	16,700
6. Cement and services	14,000
7. Logging	2,700
8. Perforating (100 feet)	7,200
9. Wellhead equipment	5,000
10. Packer	3,500
11. Supervision	2,000
12. Miscellaneous	5,000
13. Contingencies	12,000
	<hr/>
Total	\$ 137,200

GRUY FEDERAL, INC.

Geopressured-Geothermal Reentry Prospect No. L2

Grand Cheniere South Field (North Extension)

Cameron Parish, Louisiana

This geopressured-geothermal (Geo²) prospect (Gruy Federal type II-B) was drilled as the Superior Oil Company No. 1 Watkins Miller, API designation 17-023-20501, located in Sec. 5 Twp 15S Rge 5W, Cameron Parish, just north of lot 39 on Indian Point Island. This location is shown on the lower portion of USGS topographic sheet "Grand Lake West" in the accompanying map pocket. The well site is readily accessible from state highway No. 82 and secondary roads.

This location is submitted in conjunction with Geo² prospects numbers L3 and L4, also in Twp 15S Rge 5W. It appears that these three Geo² prospects are located on lands which are not under lease for oil and gas exploration. Since the three are considered to have substantially equal merit as Geo² prospects, it is proposed that the ultimate selection of one test well should be based on ability to conclude a reasonable contract with the surface and/or mineral owners which will permit the contemplated test procedure.

Superior Oil completed this well in late 1970 as a dual gas producer in sands between 11,150' and 11,250' after drilling to a total depth of 18,220'. At that point the recorded temperature, before correction for mud stream, was 320°F (146°C). The well was subsequently abandoned.

The zone of interest is a thick development of Planulina (lowermost Miocene) section from 16,100' to 16,900' which contains approximately 400' of net sand. The average temperature is expected to be approximately 324°F (148°C), which is an average of recorded logging temperatures at 16,020' and 17,229' plus an estimated correction factor of 30°F to allow for the cooling effect of the drilling mud. The expected formation pressure is of the order of magnitude of 14,000 psi, or some 6,375 psi above the normal hydrostatic pressure at 16,400'.

An additional Planulina sand section of a more scattered nature was encountered in the interval 15,000' to 16,000'. The temperature range of these sands is estimated to be 298°F (134°C). The Siphonina davesi section of the lower Miocene is well developed in the interval between 11,250' and 12,000'. This section contains approximately 346 feet of net sand having an estimated average temperature of approximately 266°F (116°C).

It is proposed to test only a 40 to 50 feet portion of the Planulina section in the 16,100' to 16,770' interval. Consideration will be given to testing additional portions of this interval if a maximum flow of 10,000 barrels per day is not obtained.

An operational and testing prognosis is included together with a preliminary cost estimate. The present condition of the well is shown on the accompanying graphic prognosis. It will be necessary to provide 2,905' of 9-5/8" casing which has been removed and effect a "patch". Open hole below the 7" liner at 15,000' will have to be cleaned out as redrilled to 16,770' and a 5" liner cemented from that depth to above the bottom of the 7" liner.

Because of limited deep well control, no geological plat is submitted for this location. However, it can be concluded that in view of the thick Planulina sand development in this well and others in the immediate area, it is safe to predict a substantial drainage area which is probably in excess of 640 acres.

The estimated total cost, exclusive of cost of landowner's permission to perform this operation is shown on the attached cost estimates and summarized as follows:

Reentry operations	\$ 412,600
Testing operations	38,500
Salt water disposal well	137,200
Plugging and clean up	<u>37,700</u>
	\$ 626,000

The cost of the salt water disposal well could be saved if permission can be obtained from all authorities to discharge salt water into the adjacent salt or brackish bayou system for the limited test period.

Advantages of this location are:

1. A known thick, hot, and presumably permeable lower Miocene section to test, and
2. Only 1,500' of board road necessary.

Disadvantages of this location include:

1. It will be necessary to clean out or redrill nearly 1,800' of open hole and cement a liner. This is within the capacity of a heavy-duty workover rig.
2. The well appears to be on unleased land, thus requiring negotiations with an unknown number of property owners.

2-28-78

GEOPRESSURED-GEOTHERMAL WELL-OF-OPPORTUNITY CLASSIFIER

Well Name: Superior Oil Co. Watkins Miller No. 1

Gruy Federal WOO No. L2

UPPER SECTION

I. All tubular goods in place within surface csg.

Surface csg. to _____'

A. Cased thru geopressured zone of interest.

Protection csg. to _____'

zone of int. _____' to _____'

prodn. csg. to _____' to _____'

prodn. liner _____' to _____'

prodn. packer at _____'

II. Protection csg. cut off within conductor or surface csg. but no OH.

Cut within conductor at _____'

Cut within surface csg. at 2,905'

III. Protection csg. cut off below surface csg., & OH exists from:

Bottom surface csg. at _____'

Top cut off at _____' } OH

LOWER SECTION

B. Plugged above geopressured zone, with OH from plug through geopressured zone of interest.

protection csg. at 11,364'

plug at 10,900'

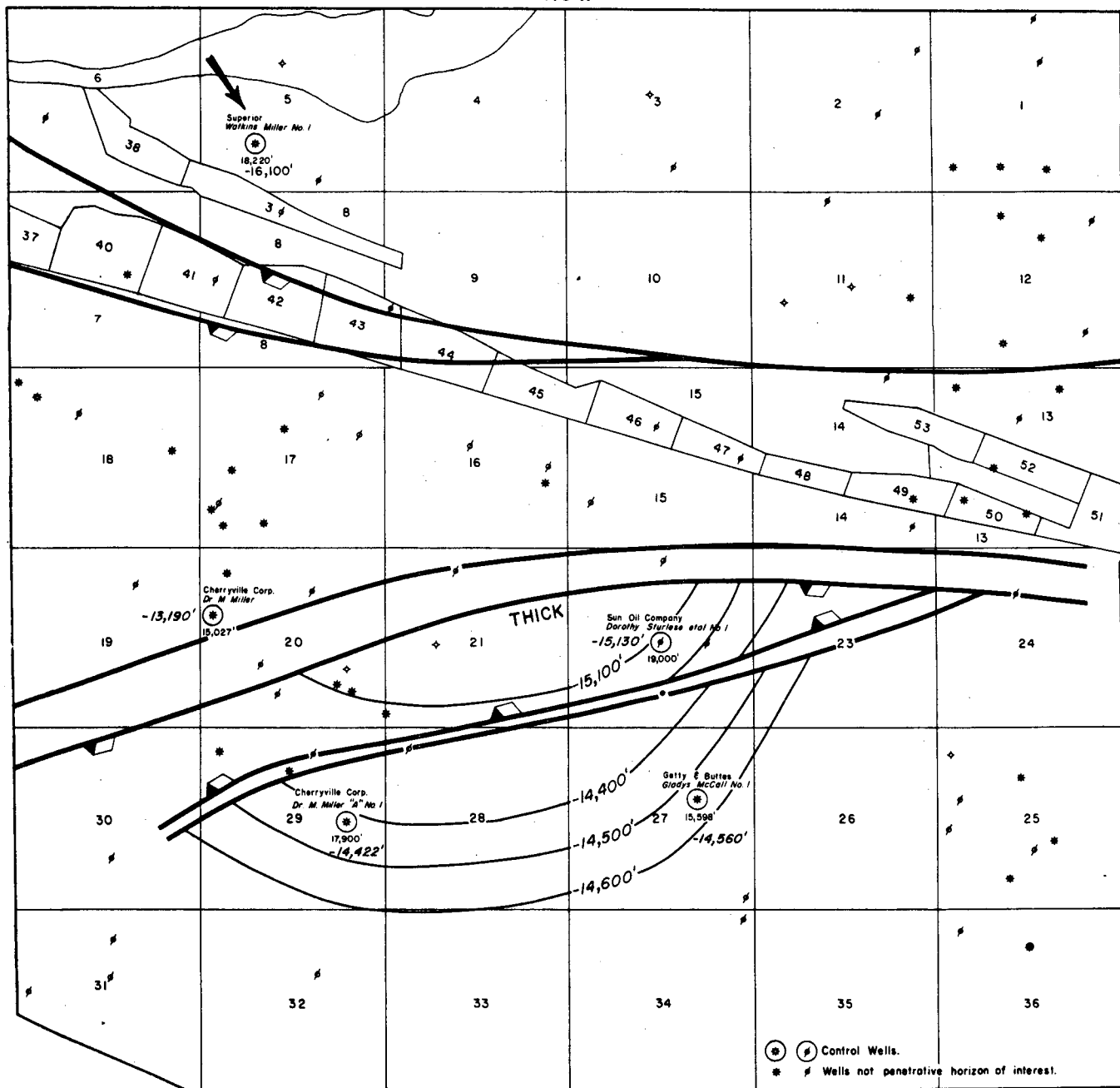
zone of int. 16,102' to 16,770' } 1,770' OH through zone of interest

C. TD above geopressured zone; required to drill deeper.

TD _____'

zone of int. _____' to _____' } additional drilling

R5W



Contoured on Top of Porosity at First Geo² Sand
in Lower Miocene Section
Cameron Parish, Louisiana

DOE Contract No. EG-77-C-08-1528
Gruy Federal Job No. 00-77-3017

SUPERIOR OIL COMPANY
No. 1 Watkins Miller
Section 5, T-15-S, R-5-W
Cameron Parish, Louisiana

13-3/8" - 3022'
9-5/8" - 2925'/11,364'
7" - 11,300'/15,000'
Open hole 15,000'/18,224'

RE-ENTRY PROCEDURE:

1. Prepare location.
2. Move in and rig up workover rig.
3. Dig out 13-3/8" casing, weld on casinghead and extension, if needed.
4. Pick up 2-7/8" work string and drill cement in interval 0-50' and 2846' - 2975'.
5. Dress off top of 9-5/8" casing at 2905'.
6. Run 9-5/8" casing with patch, tie into 9-5/8" and hang off casing. Pressure test patch.
7. Nipple up 9-5/8" casinghead and install BOP's.
8. Continue to pick up 2-7/8" work string and drill out cement plug in interval 10,900' - 11,254'. Mud weight to be 17.6#/gal. before plug is completely drilled out.
9. Continue to clean out well to bottom of 7" at 15,000'. Circulate and condition hole.
10. Pull tubing and run casing inspection log. Repair casing, if needed.
11. Wash out to 17,000'.
12. Circulate and condition hole and run electric logs.
13. Set 5", 18#, P-110, SFJ liner at 17,000' with top at 14,900'. Cement liner full length.
14. Clean out 7" to top of liner and test. Cement squeeze if needed.
15. Clean out 5" to float collar.
16. Circulate and condition hole, pull tubing, and run Cement Bond Log. Squeeze cement, if necessary. Perforate approximately 44', 4 shots/ft. at 16,400'[±].
17. Set packer in 5" at 15,900' and test with weight and pressure.

18. Lay down 2-7/8" work string.
19. Pick up combination string of 2-3/8" 4.7# P-105 8 Rd and 3-1/2" 12.95# N-80 8 Rd tubing. Space out and set in packer at 15,900'.
20. Install back pressure valve in 3-1/2".
21. Remove BOP's, nipple up and test tree, remove back pressure valve and displace tubing with water to 15,900'. Set tubing in packer and flange up tree. Test flange.
22. Test well and release rig if everything is satisfactory.

PLUGGING PROCEDURE:

1. Move in and rig up workover rig.
2. Kill well and install BOP's.
3. Pull tubing and set cement plugs as required by Department of Conservation.
4. Lay down 3-1/2" tubing.
5. Cut off 4-5/8" casing and recover if feasible.
6. Cut off 13-3/8" casing and weld plate on top. Release rig.

DOE Contract No. EG-77-C-08-1528
Gruy Federal Job No. 00-77-3017

SUPERIOR OIL COMPANY
No. 1 Watkins Miller
Section 5, T-15-S, R-5-W
Cameron Parish, Louisiana

RE-ENTRY COST:

1. Location preparation	\$ 50,000
2. Rig time - 17 days	59,200
3. Bits	800
4. Mud and chemicals	25,000
5. Casinghead	2,000
6. Xmas tree	50,000
7. Casing patch	6,000
8. Rental tools and equipment	12,000
9. Trucking	7,000
10. Inspection log	6,500
11. Liner setting	4,500
12. Cement and services	7,000
13. Cement Bond Log	5,000
14. Perforating	10,300
15. 2-7/8" drill pipe work string	12,100
16. 1200' of 2-3/8" P-105 4.7# EUE 8 Rd tubing	4,400
17. 2,700' of 3-1/2" N-80 12.95# EUE 8 Rd tubing	18,000 (1)
18. Packer	3,500
19. 2905' of 9-5/8" S-95 29# 8 Rd casing	47,300
20. 2100' of 5" P-110 18# SFJ casing	25,500
21. Supervision	5,500
22. Miscellaneous	6,000
23. Contingencies	<u>45,000</u>
Total	\$ 412,600

(1) Note 1--See Buttes Cost Estimate

DOE Contract No. EG-77-C-08-1528
Gruy Federal Job No. 00-77-3017

SUPERIOR OIL COMPANY
No. 1 Watkins Miller
Section 5, T-15-S, R-5-W

1. Move in water well rig and rig up.
2. Drive 13-3/8" casing to refusal.
3. Drill 12-1/4" to approximately 1500'.
4. Set and cement 9-5/8".
5. Drill 8-3/4" hole to approximately 2500'.
6. Run electric logs.
7. Set and cement 7" casing at TD.
8. Perforate 7" as indicated by log.
9. Set packer in 7".
10. Pick up 3-1/2" tubing and set in packer.
11. Install tree, test well and release rig.

COSTS

1. Drill to 2500' and set casing	\$ 30,000
2. 170' of 13-3/8" casing	2,500
3. 1500' of 9-5/8" 36# J-55 8 Rd	16,600
4. 2500' of 7" 26# J-55 8 Rd	20,000
5. 2500' of 3-1/2" 12.95# N-80 8 Rd	16,700
6. Cement and services	14,000
7. Logging	2,700
8. Perforating (100 feet)	7,200
9. Wellhead equipment	5,000
10. Packer	3,500
11. Supervision	2,000
12. Miscellaneous	5,000
13. Contingencies	12,000
	<hr/>
Total	\$ 137,200

SUPERIOR OIL COMPANY
No. 1 Watkins Miller
Section 5, T-15-S, R-5-W

TESTING PROCEDURE:

1. Set rental separator and skid-mounted pump. Hook up source well and salt water disposal well.
2. Place well on production using small choke size.
3. Gradually increase flow rate to approximately 5000 barrels per day while monitoring surface flowing pressure, temperature, gas-water ratio, and sand production.
4. Shut well in until static pressure is reached.
5. Run pressure gauge.
6. Place well on production at 5000 barrels per day and record flowing BHP and surface flowing pressure.
7. Sample fluid and gas.
8. After three to five days of constant production rate, shut well in to measure pressure build-up.
9. When BHP has stabilized retrieve pressure gauge.
10. Place well back on production at successively higher rates until 10,000 barrels per day is obtained. Flow continuously at this rate for two weeks and shut-in.
11. Run pressure gauge to record final static bottom hole pressure.

SUPERIOR OIL COMPANY
No. 1 Watkins Miller
Section 5, T-15-S, R-5-W

TESTING COSTS:

1. Separator, pump, metering equipment	\$ 14,000
2. Air cooler	3,000
3. Pressure measurement	8,000
4. Labor	2,000
5. Material	3,000
6. Miscellaneous	3,000
7. Sampling devices	1,500
8. Contingencies	<u>4,000</u>
Total	\$ 38,500

SUPERIOR OIL COMPANY
No. 1 Watkins Miller
Section 5, T-15-S, R-5-W

PLUGGING:

1. Rig time - 6 days	\$ 20,800
2. Cement and services	7,500
3. Labor	1,000
4. Supervision	2,000
5. Miscellaneous	3,000
6. Contingencies	<u>3,400</u>
Total	\$ 37,700

Geopressured-Geothermal Re-entry Prospect No. L3

E. Crab Lake Field Area

Cameron Parish, Louisiana

This Gruy Federal Type III A, geopressured-geothermal (Geo²) prospect candidate was drilled as the Getty Oil Company and Buttes Oil and Gas Company No. 1 Gladys McCall, located in Section 27, Twp 15S, Rge 5W, Cameron Parish, Louisiana. The well is accessible through the Crab Lake Lease Road system which connects with Louisiana State Highway No. 82. The location is indicated by red arrow on USGS topographic sheet "Hog Bayou" in the accompanying map pocket.

The accompanying sketch of the well conforms with the well records and shows 10-3/4" O.D. surface casing set at 3,569', 7" O.D., protection casing set at 14,290' with the top 3,585' having been removed during abandonment operations; and with a 5" O.D. liner set from 15,598' to 13,954'. All tubing was removed from the well. Abandonment records filed with the Department of Conservation show cement plugs from 10,900' to 11,254', from 2,846' to 2,975- and from the surface to 30'.

As indicated on the electric log section of this well major sand development within the Geo² zone were penetrated from 14,560' to 14,780', from 14,930' to 14,970' and from 15,145' to 15,598' (T.D.) all in the lower Miocene section. It is proposed to test only 940'-50' portion of the sand section occurring from 15,145' to total depth. Consideration will be given to perforating additional interval, if a maximum flow of 10,000 barrels per day is not obtained. The lower of these sands contain some 425' of wet salt water sand. The pressure in this aquifer is in the magnitude of 13,565 psi (normal pressure at 15,350' is 7,138 psi). The reservoir temperature is approximately 314^oF after adjusting for 30^oF cooling in the mud system at the time of logging the well. The accompanying structural and isopachus maps indicate that this well is in a down thrown fault block and offers a large rock volume to produce from.

This well site has been returned to the landowner and it will be necessary to negotiate a permit for testing. As mentioned in Proposal L2 and L4, this proposal is one of three Geo² prospects located on lands in this proximity which are not under lease for oil and gas exploration. Since Prospects L2, L3 and L4 have substantially equal merit, it is proposed that the ultimate selection of one test well in this area should be based on ability to conclude a reasonable contract with the surface and mineral owners which will permit the contemplated test procedure.

A preliminary re-entry prognosis is attached along with a detailed cost estimate for re-entry, testing, water disposal and abandonment which is summarized as follows:

Re-entry operations	\$ 446,000
Testing operations	38,500
Salt water disposal well	137,200
Plugging and clean up	39,900
	\$ 661,600

Of this amount some \$45,700 (gross) is probably salvable. As in the other candidates, the cost of the salt water despired system may be saved in the (perhaps unlike

event that permission can be obtained from all state and federal authorities to dispose of salt water for a limited test period into the local brackish or salty stream system. In our opinion this will not result in any significant or preceivable environmental damage.

Advantages of this prospect include:

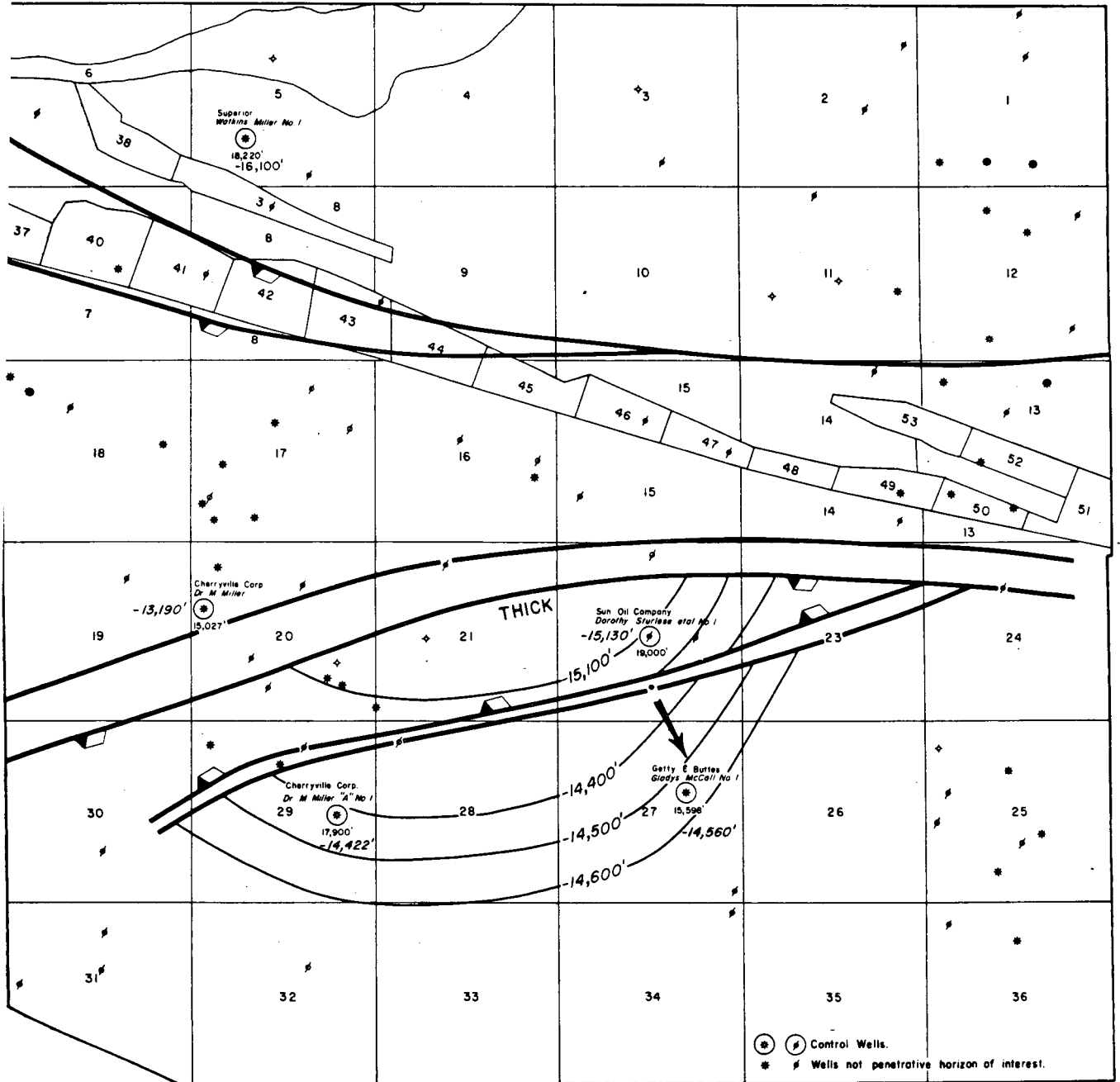
1. A known thick, hot and apparently permeable lower Miocene section to test.
2. Location preparation cost is minimal.
3. The objective test sand is cased off now.

Disadvantages of this location include:

1. It is necessary to tie back into the 7" O.D. protection pipe in open hole immediately before the 10-3/4" O.D. surface casing.
2. The well appears to be on unlevel land, thus requiring negotiations with an unknown number of property owners.

2-28-78

R5 W



Contoured on Top of Porosity at First Geo² Sand
in Lower Miocene Section
Cameron Parish, Louisiana

GEOPRESSURED-GEOTHERMAL WELL-OF-OPPORTUNITY CLASSIFIER

Well Name: Getty and Buttes Gladys McCall No. 1

Gruy Federal WOO No. L3

UPPER SECTION

LOWER SECTION	I. All tubular goods in place within surface csg. <input type="checkbox"/> Surface csg. to _____' A. Cased thru geopressured zone of interest. <input type="checkbox"/> Protection csg. to _____' <input checked="" type="checkbox"/> zone of int. <u>14,560'</u> to <u>15,598'</u> <input checked="" type="checkbox"/> prodn. csg. to <u>3,585'</u> to <u>14,290'</u> <input checked="" type="checkbox"/> prodn. liner <u>13,954'</u> to <u>15,598'</u> <input type="checkbox"/> prodn. packer at _____'	II. Protection csg. cut off within conductor or surface csg. but no OH. <input type="checkbox"/> Cut within conductor at _____' <input type="checkbox"/> Cut within surface csg. at _____'	III. Protection csg. cut off below surface csg. & OH exists from: <input checked="" type="checkbox"/> Bottom surface csg. at <u>3,569'</u> <input checked="" type="checkbox"/> Top cut off at <u>3,585'</u> } 16' OH
	B. Plugged above geopressured zone, with OH from plug through geopressured zone of interest. <input type="checkbox"/> protection csg. at _____' <input type="checkbox"/> plug at _____' } _____' OH through zone of interest <input type="checkbox"/> zone of int. _____' to _____'		
	C. TD above geopressured zone; required to drill deeper. <input type="checkbox"/> TD _____' <input type="checkbox"/> zone of int. _____' to _____' } additional drilling		

DOE Contract No. EG-77-C-08-1528
Gruy Federal Job No. 00-77-3017

BUTTES OIL AND GAS COMPANY
No. 1 Gladys McCall
Section 27, T-15-S, R-5-W
Cameron Parish, Louisiana

16" - 167'
10-3/4" - 3569'
7" - 3585'/14,280'
5" - 13,954'/15,598'

RE-ENTRY PROCEDURE:

1. Prepare location.
2. Move in and rig up workover rig.
3. Dig out 10-3/4" casing, weld on casinghead (and extension, if needed).
4. Pick up 2-7/8" work string and drill cement in interval 0-30' and 3470' - 3670'.
5. Dress off top of 7" casing at 3585'.
6. Run 7" casing with patch, tie into 7" and hang off casing. Pressure test patch.
7. Nipple up 7" casinghead and install BOP's.
8. Continue to pick up 2-7/8" work string and drill out cement plug in interval 11,740' - 11,850'. Mud weight to be 17#/gal. before plug is completely drilled out.
9. Continue to clean out well to top of 5" at 13,954'. Circulate and condition hole.
10. Pull tubing and run casing inspection log. Repair casing, if needed.
11. Run tubing with RTTS tool and cement squeeze perforations 11,924' - 11,928'.
12. Drill out cement to 11,928'.
13. Come out of hole to pick up smaller bit to clean out 5" liner. Drill out cement in interval 14,533' - 14,535'; 14,558' - 14,565'; 14,576' - 14,578'. Wash to approximately 15,000'.
14. Circulate and condition hole, pull tubing, and run Casing Inspection and Cement Bond Logs. Squeeze cement, if necessary. Perforate approximately 350', 2 shots/ft. at 15,300'±.

15. Set packer in 5" at 15,000' and test with weight and pressure.
16. Lay down 2-7/8" work string.
17. Pick up combination string of 2-3/8" 4.7# P-105 8 Rd and 3 1/2" 12.95# N-80 8 Rd tubing. Space out and set in packer at 15,000'.
18. Install back pressure valve in 3-1/2".
19. Remove BOP's, nipple up and test tree, remove back pressure valve and displace tubing with water to 14,500'. Set tubing in packer and flange up tree. Test flange.
20. Test well and release rig if everthing is satisfactory.

PLUGGING PROCEDURE:

1. Move in and rig up workover rig.
2. Kill well and install BOP's.
3. Pull tubing and set cement plugs as required by Department of Conservation.
4. Lay down 3-1/2" tubing.
5. Cut off 7" casing and recover of feasible.
6. Cut off 10-3/4" casing and weld plate on top. Release rig.

DOE Contract No. EG-77-C-08-1528
Gruy Federal Job No. 00-77-3017

BUTTES OIL AND GAS COMPANY

No.1 Gladys McCall
Section 27, T-15-S, R-5-W
Cameron Parish, Louisiana

Land and permit cost (est.) \$ 25,000

RE-ENTRY COST:

1.	Location preparation (includes rental on 2 miles of board road, replacement of burned out bridge and boarding well site)	135,225	
2.	Rig time - 16 days	55,680	
3.	Bits	800	
4.	Mud and chemicals	20,000	
5.	Casinghead	2,000	
6.	Xmas tree (40 day rental)	5,200	
7.	Casing patch	5,000	
8.	Rental tools and equipment	10,000	
9.	Inspection logs	10,700	
10.	Cement and services	5,000	
11.	Cement Bond Log	4,400	
12.	Perforating (this can be negotiated)	37,000	
13.	2-7/8" drill pipe work string	11,300	
14.	2000' of 2-3/8" P-105 4.7# EUE 8 Rd tubing	7,300	
15.	1300' of 3-1/2" N-80 12.95# EUE 8 Rd tubing	8,680	(1)
16.	Packer	3,500	
17.	3600' of 7" S-95 29# 8 Rd casing	45,700	(2)
18.	Supervision	5,200	
19.	Miscellaneous (includes trucking)	10,000	
20.	Contingencies (10%)	<u>38,315</u>	
	Sub-Total	421,000	
	Total including land and legal	<u>\$ 446,000</u>	

- (1) Proposed to use approximately 12,000' of 3½" tubing owned by U.S. Government and in storage in Broussard pipe yard in Intracoastal City (used on Delcambre test well).
- (2) This may be salvageable if it is not necessary to cement to repair casing patch.

PLUGGING COSTS:

1. Rig time - 5 days	\$ 17,400
2. Cement and services	5,000
3. Labor	1,000
4. Supervision	1,700
5. Miscellaneous	3,000
6. Contingencies	<u>2,800</u>
Total	\$ 30,900

DOE Contract No. EG-77-C-08-1528
Gruy Federal Job No. 00-77-3017

BUTTES OIL AND GAS COMPANY
No. 1 Gladys McCall
Section 27, T-15-S, R-5-W
Cameron Parish, Louisiana

SALT WATER DISPOSAL WELL

1. Move in water well rig and rig up.
2. Drive 13-3/8" casing to refusal.
3. Drill 12-1/4" to approximately 1500'.
4. Set and cement 9-5/8".
5. Drill 8-3/4" hole to approximately 2500'.
6. Run electric logs.
7. Set and cement 7" casing at TD.
8. Perforate 7" as indicated by log.
9. Set packer in 7".
10. Pick up 3-1/2" tubing and set in packer.
11. Install tree, test well and release rig.

COSTS

1. Drill to 2500' and set casing	\$ 30,000
2. 170' of 13-3/8" casing	2,500
3. 1500' of 9-5/8" 36# J-55 8 Rd	16,600
4. 2500' of 7" 26# J-55 8 Rd	20,000
5. 2500' of 3-1/2" 12.95# N-80 8 Rd	16,700
6. Cement and services	14,000
7. Logging	2,700
8. Perforating (100 feet)	7,200
9. Wellhead equipment	5,000
10. Packer	3,500
11. Supervision	2,000
12. Miscellaneous	5,000
13. Contingencies	12,000
	<hr/>
Total	\$ 137,200

BUTTES OIL AND GAS COMPANY
No. 1 Gladys McCall
Section 27, T-15-S, R-5-W
Cameron Parish, Louisiana

TESTING PROCEDURE:

1. Set rental separator and skid-mounted pump. Hook up source well and salt water disposal well.
2. Place well on production using small choke size.
3. Gradually increase flow rate to approximately 5000 barrels per day while monitoring surface flowing pressure, temperature, gas-water ratio, and sand production.
4. Shut well in until static pressure is reached.
5. Run pressure gauge.
6. Place well on production at 5000 barrels per day and record flowing BHP and surface flowing pressure.
7. Sample fluid and gas.
8. After three to five days of constant production rate, shut well in to measure pressure build-up.
9. When BHP has stabilized retrieve pressure gauge.
10. Place well back on production at successively higher rates until 10,000 barrels per day is obtained. Flow continuously at this rate for two weeks and shut-in.
11. Run pressure gauge to record final static bottom hole pressure.

BUTTES OIL AND GAS COMPANY
No. 1 Gladys McCall
Section 27, T-15-S, R-5-W
Cameron Parish, Louisiana

TESTING COSTS:

1. Separator, pump, metering equipment	\$ 14,000
2. Air cooler	3,000
3. Pressure measurement	8,000
4. Labor	2,000
5. Material	3,000
6. Miscellaneous	3,000
7. Sampling devices	1,500
8. Contingencies	<u>4,000</u>
Total	\$ 38,500

GRUY FEDERAL, INC.

Geopressured-Geothermal Rentry Prospect No. L4

North Price Lake Area

Cameron Parish, Louisiana

This geopressured-geothermal (Geo²) prospect is presented as a Gruy Federal Type II A well. However, it is noted from the diagrammatic sketch and the electric log that there are two successively deeper and hotter sands, which if chosen as objectives would cause this prospect to be reclassified as a Type II B well with attendant higher testing costs. This well was drilled by Sun Oil Company as the No. 1 Dorothy Sturlese, located in Section 22, Twp 15S, Rge 5W, Cameron Parish, Louisiana. This location is accessible through the same Crab Lake Lease Road system connecting to State Highway No. 82 as Prospect No. L2. The location is shown by red arrow on USGS topographic sheet "Hog Bayou" in the accompanying map pocket.

The accompanying sketch conforms with the well records and shows 13-3/8" O.D. casing set at 3500', 9-5/8" casing set at 14,925' with the top 3450' having been removed during abandonment operations ; and with 7" O.D. liner set from 14,925' to 17,500'. There is no tubing in the hole. Abandonment records show a cement plug from 13,450' to 13,920' inside the 9-5/8" O.D. protection casing, a cement plug from 3125' to 3560' in the surface and protection pipe and a 50' cement plug at the surface.

The electric log section of this well shows the following potential test zones along with estimated pressures and temperatures.

<u>Zone</u>	<u>Est.BHP</u>	<u>Est.BHP (psi)</u>	<u>Normal BHP</u>
15,180' to 15,600'	±303°F (151°C)	12,125 psi @ 15,400'	7160 psi
17,440' to 17,900'	±330°F (166°C)	15,470 psi @ 17,600'	8184 psi
18,880' to 18,970'	±358°F (181°C)	16,680 psi @ 18,900'	8790 psi

The enclosed geological plat shows this well to be in a graben area and that it should be capable of effecting water withdrawal from a reasonably large area. Because the zone from 15,180' to 15,600' is cased off, it appears economically attractive to test this zone. It is proposed to test initially 40' to 50' of the 15,180' sand section. Consideration will be given to testing an additional interval if a maximum flow of 10,000 barrels per day is not obtained.

The well site has been returned to the landowner and it will be necessary to negotiate a permit for testing with them. As mentioned in proposals L2 and L3 this proposal is one of three Geo² prospects located on lands in this proximity which are not under lease for oil and gas exploration. Since Prospects L2, L3 and L4 have substantially equal merit, it is proposed that the ultimate selection of one test well in the area should be based on ability to conclude a reasonable contract with the surface and mineral owners which will permit the contemplated test procedure.

A preliminary re-entry prognosis is attached along with a detailed cost estimate for re-entry, testing, water disposal and abandonment which is summarized as follows:

Re-entry operations	\$ 378,460
Testing operations	38,500
Salt water disposal well	137,200
Plugging and clean up	<u>30,900</u>
	\$ 585,060

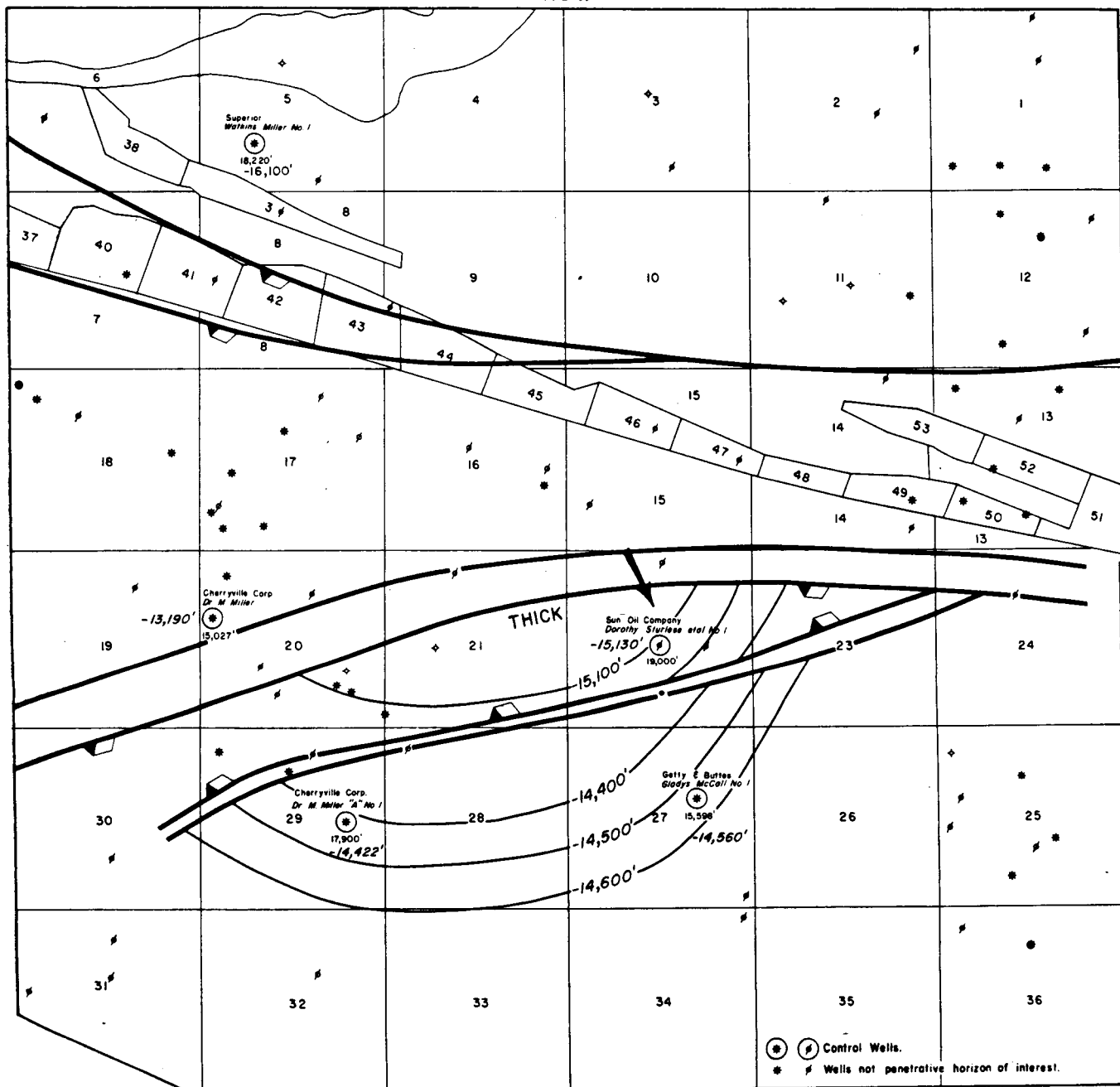
Advantages:

1. Several known thick hot sands to select for testing,
2. One of the sands is currently cased off and available for a test at a lower cost than the uncased sands,
3. Contains the hottest sand found thus far in Cameron Parish, Louisiana:
4. Risk is low in effecting the casing patch.

Disadvantages:

1. Location cost is high,
2. Requires setting additional liner and spending more money to test the hottest sands,
3. Well appears to be on unleased land thus requiring negotiations with an unknown number of property owners.

R5W



Contoured on Top of Porosity at First Geo² Sand
in Lower Miocene Section
Cameron Parish, Louisiana

GEOPRESSURED-GEOTHERMAL WELL-OF-OPPORTUNITY CLASSIFIER

Well Name: Sun Oil Co. No. 1 Dorothy Sturlese

Gruy Federal WOO No. L4

U P P E R S E C T I O N

L O W E R S E C T I O N

I. All tubular goods in place within surface csg.

Surface csg. to _____'

A. Cased thru geopressured zone of interest.

Protection csg. to _____'

zone of int. 15,180' to 15,600'

prodn. csg. to _____' to 14,925'

prodn. liner 14,691' to 17,500'

prodn. packer at _____'

II. Protection csg. cut off within conductor or surface csg. but no OH.

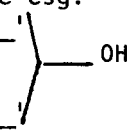
Cut within conductor at _____'

Cut within surface csg. at 3,450'

III. Protection csg. cut off below surface csg. & OH exists from:

Bottom surface csg. at _____'

Top cut off at _____'



B. Plugged above geopressured zone, with OH from plug through geopressured zone of interest. Alternate Considerations

protection csg. at _____'

plug at _____'

zone of int. 17,440' to 17,900'
18,880' to 18,970'

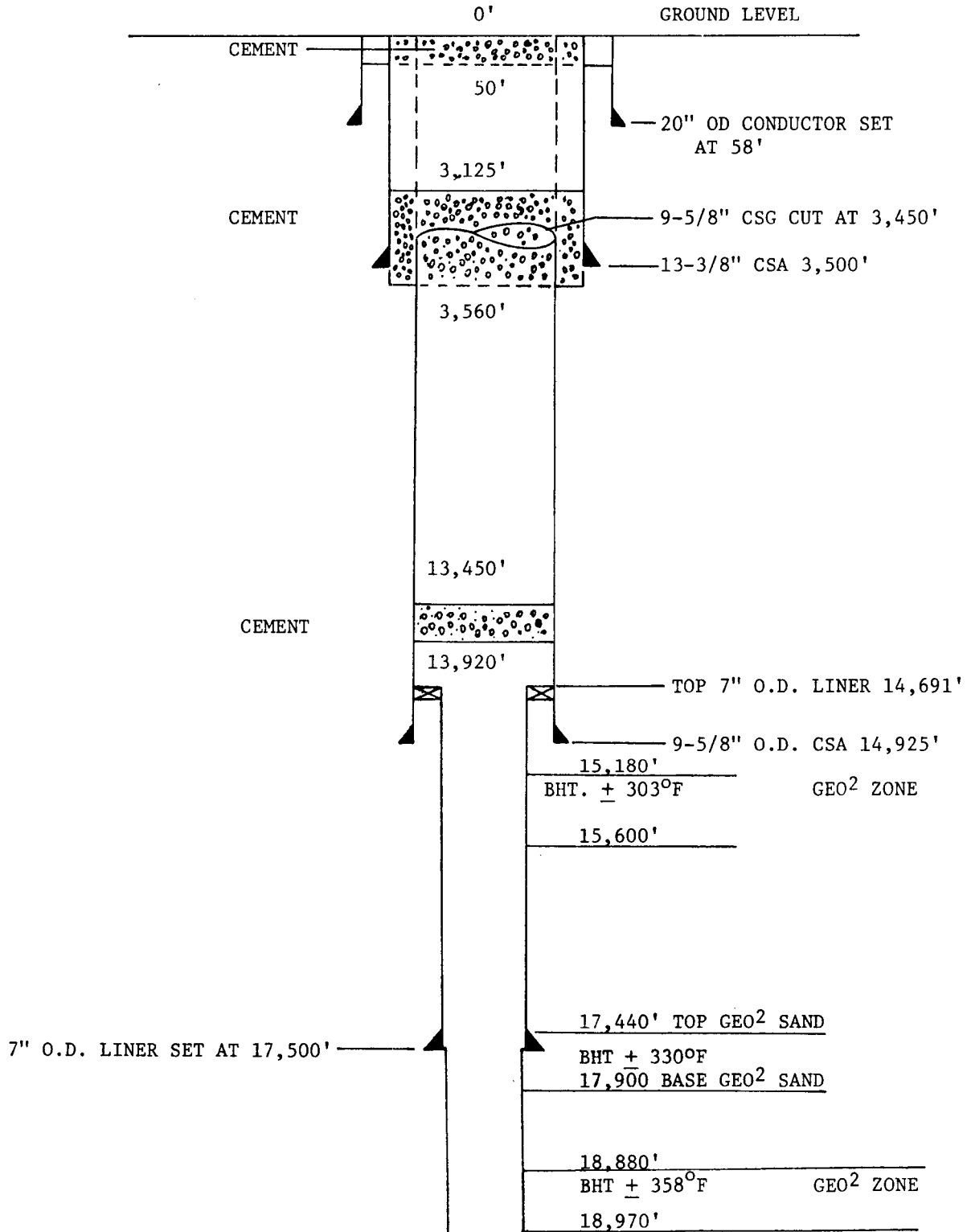
1,470' OH through zone of interest

C. TD above geopressured zone; required to drill deeper.

TD _____'

zone of int. _____' to _____' additional drilling

SUN OIL COMPANY
 DOROTHY STURLESE NO. 1
 NORTH PRICE LAKE AREA
 GRUY FEDERAL PROSPECT NO. L-4



SUN OIL COMPANY
No. 1 Dorothy Sturlese et al
Section 22, T-15-S, R-5-W
Cameron Parish, Louisiana

20" - 58'
13-3/8" - 3500'
9-5/8" - 3450'/14,925'
7" - 14,691'/17,500'

RE-ENTRY PROCEDURE:

1. Prepare location.
2. Move in and rig up workover rig.
3. Dig out 13 3/8" casing, weld on casinghead and extension, if needed.
4. Pick up 2-7/8" work string and drill cement in interval 0-50' and 3125' - 3560'.
5. Dress off top of 9-5/8" casing at 3450'.
6. Run 9-5/8" with patch, tie into 9-5/8" and hang off casing. Pressure test patch.
7. Nipple up 9-5/8" casinghead and install BOP's.
8. Continue to pick up 2-7/8" work string and drill out cement plug in interval 13,450' - 13,920'. Mud weight to be 17#/gal. before plug is completely drilled out.
9. Continue to clean out well to 15,800'. Circulate and condition hole.
10. Pull tubing. Set bridge plug at 15,750' and run casing inspection and Cement Bond Logs. Repair casing, if needed.
11. Pressure test casing as there are squeezed perforations from 13,975'-13,999'.
12. Circulate and condition hole, pull tubing. Perforate approximately 200', 2 shots/ft. at 15,350±.
13. Set packer at 7" at 14,800' and test with weight and pressure.
14. Lay down 2-7/8" work string.
15. Pick up 3-1/2" 12.95# N-80 Rd tubing. Space out and set in packer at 14,800'.
16. Install back pressure valve in 3-1/2".
17. Remove BOP's, nipple up and test tree, remove back pressure valve and displace tubing with water to 14,500'. Set tubing in packer and flange up tree. Test flange.

18. Test well and release rig if everthing is satisfactory.

PLUGGING PROCEDURE:

1. Move in and rig up workover rig.
2. Kill well and install BOP's.
3. Pull tubing and set cement plugs as required by Department of Conservation.
4. Lay down 3-1/2" tubing.
5. Cut off 9-5/8" casing and recover if feasible.
6. Cut off 13-3/8" casing and weld plate on top. Release rig.

SUN OIL COMPANY
No. 1 Dorothy Sturlese et al
Section 22, T-15-S, R-5-W
Cameron Parish, Louisiana

RE-ENTRY COST:

1. Location preparation	\$ 80,000
2. Rig time - 12 days	41,760
3. Bits	800
4. Mud and chemicals	15,000
5. Casinghead	2,000
6. Xmas tree	50,000
7. Casing patch	6,000
8. Rental tools and equipment	7,500
9. Inspection log	6,800
10. Wireline services	3,000
11. Cement Bond Log	4,600
12. Perforating (this can be negotiated)	20,800
13. 2-7/8" drill pipe work string	8,500
14. Trucking	4,000
15. 2,800' of 3-1/2" N-80 12.95# EUE 8 Rd tubing	18,700 (1)
16. Packer	3,500
17. 3450' of 9-5/8" N-80 42# 8 Rd casing	56,100 (2)
18. Supervision	3,900
19. Miscellaneous	3,500
20. Contingencies	<u>42,000</u>
Total	\$ 378,460

(1) Note 1--See Buttes Cost Estimate

(2) Note 2--See Buttes Cost Estimate

SUN OIL COMPANY
Dorothy Sturlese Location
Section 22, T-15-S, R-5-W
Cameron Parish, Louisiana

TESTING PROCEDURE:

1. Set rental separator and skid-mounted pump. Hook up source well and salt water disposal well.
2. Place well on production using small choke size.
3. Gradually increase flow rate to approximately 5000 barrels per day while monitoring surface flowing pressure, temperature, gas-water ratio, and sand production.
4. Shut well in until static pressure is reached.
5. Run pressure gauge.
6. Place well on production at 5000 barrels per day and record flowing BHP and surface flowing pressure.
7. Sample fluid and gas.
8. After three to five days of constant production rate, shut well in to measure pressure build-up.
9. When BHP has stabilized retrieve pressure gauge.
10. Place well back on production at successively higher rates until 10,000 barrels per day is obtained. Flow continuously at this rate for two weeks and shut-in.
11. Run pressure gauge to record final static bottom hole pressure.

SUN OIL COMPANY
Dorothy Sturlese Location
Section 22, T-15-S, R-5-W
Cameron Parish, Louisiana

TESTING COSTS:

1. Separator, pump, metering equipment	\$ 14,000
2. Air cooler	3,000
3. Pressure measurement	8,000
4. Labor	2,000
5. Material	3,000
6. Miscellaneous	3,000
7. Sampling devices	1,500
8. Contingencies	<u>4,000</u>
Total	\$ 38,500

SUN OIL COMPANY
Dorothy Sturlese Location
Section 22, T-15-S, R-5-W
Cameron Parish, Louisiana

PLUGGING:

1. Rig time - 5 days	\$ 17,400
2. Cement and services	5,000
3. Labor	1,000
4. Supervision	1,700
5. Miscellaneous	3,000
6. Contingencies	<u>2,800</u>
Total	\$ 30,900

DOE Contract No. EG-77-C-08-1528
Gruy Federal Job No. 00-77-3017

SUN OIL COMPANY
Dorothy Sturlese Location
Section 22, T-15-S, R-5-W
Cameron Parish, Louisiana

1. Move in water well rig and rig up.
2. Drive 13-3/8" casing to refusal.
3. Drill 12-1/4" to approximately 1500'.
4. Set and cement 9-5/8".
5. Drill 8-3/4" hole to approximately 2500'
6. Run electric logs.
7. Set and cement 7" casing at TD.
8. Perforate 7" as indicated by log.
9. Set packer in 7".
10. Pick up 3-1/2" tubing and set in packer.
11. Install tree, test well and release rig.

COSTS

1. Drill to 2500' and set casing	\$ 30,000
2. 170' of 13-3/8" casing	2,500
3. 1500' of 9-5/8" 36# J-55 8 Rd	16,600
4. 2500' of 7" 26# J-55 8 Rd	20,000
5. 2500' of 3-1/2" 12.95# N-80 8 Rd	16,700
6. Cement and services	14,000
7. Logging	2,700
8. Perforating (100 feet)	7,200
9. Wellhead equipment	5,000
10. Packer	3,500
11. Supervision	2,000
12. Miscellaneous	5,000
13. Contingencies	12,000
	<hr/>
Total	\$ 137,200

Geopressured-Geothermal Reentry Prospect No. L5

Little Pecan Lake Field

Cameron Parish, Louisiana

This geopressured-geothermal (Geo²) prospect (Gruy Federal type II-B) was drilled as the Pan American Petroleum Corporation (Amoco) No. 1 State Lease 4183 located in Section 27 Twp 15S Rge 4W, Cameron Parish approximately 0.8 miles south of Louisiana State Highway 82. This location is shown on the northeast corner of the USGS topographic sheet "Hog Bayou" in the accompanying map pocket. The well site is believed to be accessible by land over a shell road.

This Geo² prospect is located on state land within the Rockefeller Wildlife Refuge and Game Preserve and it is doubtful if the area is currently under lease for oil and gas exploration. One of the principal advantages of this prospect is the fact that the State of Louisiana is the only party whose permission is required to test.

Pan-American completed this well as a gas producer through perforations from 15,088 feet to 15,102 feet in March, 1964 after drilling to a total depth of 16,920 feet. At that point the recorded bottom hole mud temperature was 305°F (153°C).

The zones of interest are two thick lower Miocene accumulations between 15,570 and 16,400 feet, which contain approximately 275 net feet of sand. The average temperature is expected to be approximately 329°F (165°C) and the expected aquifer pressure will be approximately 14,000 psi which is 6,500 psi above the normal hydrostatic pressure at 16,000 feet.

It is proposed to test only a 40 to 50 foot interval near the base of the 15,600 foot sand; however, consideration will be given to adding the lower sand interval if the maximum flow rate of 10,000 barrels per day is not achieved.

An operational and testing prognosis is included together with a preliminary cost estimate. The present condition of the well is shown on the accompanying graphic prognosis. It will be necessary to tie onto both the 9-5/8-inch casing and the 7-inch casing. In addition the open hole below the 7-inch casing (15,183') will have to be drilled out and 1,640 feet of 5-inch liner set and cemented. It should be pointed out that there is a discrepancy between the completion card and the plugging report on the status of the 7-inch casing, which must be rectified before entering this well.

There is sufficient deep well control in the Little Pecan Lake area to include a structure contour map on the top of the 14,000 foot sand. Although there were several wells north of the subject well which were drilled below 14,000 feet, the thick sand build-up was missing in them. However, it is reasonable to conclude that a substantial drainage volume exists in the vicinity of this well.

The estimated total cost to perform this test operation is shown on the attached

detailed cost estimates and are summarized as follows:

Reentry operations	\$ 406,300
Testing operations	38,500
Salt water disposal well	137,200
Plugging and clean up	<u>30,900</u>
	\$ 618,900

The cost of the salt water disposal well could be saved if permission can be obtained from all authorities to discharge salt water into the adjacent brackish bayou system for the limited test period.

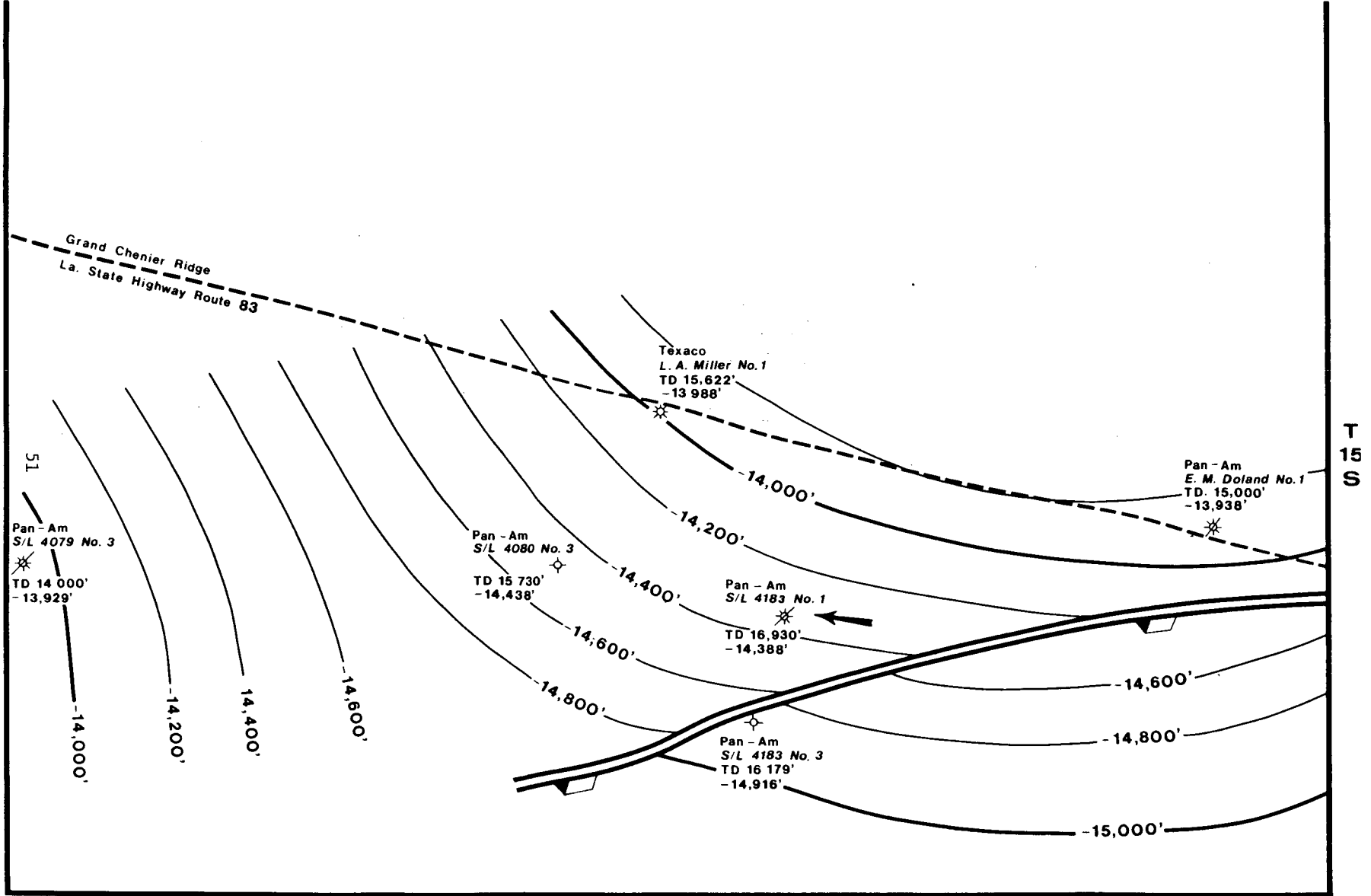
Advantages of this test site are the following:

1. A thick, hot, and presumably permeable lower Miocene section to test.
2. Accessible by road.
3. The State of Louisiana is the only party with whom to negotiate.

Disadvantages of this location include:

1. The test site is on an environmentally sensitive wildlife refuge and game preserve.
2. The large amount of tubular goods required to prepare the well for testing.

R 14 W



LITTLE PECAN LAKE PROSPECT
Structure Contour Map
on
14,000 Foot Sand
Scale: 1" = 1/2 Mile

GEOPRESSURED-GEOTHERMAL WELL-OF-OPPORTUNITY CLASSIFIER

Well Name: Pan Am No. 1 State Lease 4183

Gruy Federal WOO No. L5

UPPER SECTION

I. All tubular goods in place within surface csg.

Surface csg. to _____'

A. Cased thru geopressured zone of interest.

Protection csg. to _____'

- zone of int. _____' to _____'
- prodn. csg. to _____' to _____'
- prodn. liner _____' to _____'
- prodn. packer at _____'

II. Protection csg. cut off within conductor or surface csg. but no OH.

Cut within conductor at _____'

Cut within surface csg. at 975'

Cut within surface csg. at 6,433'

III. Protection csg. cut off below surface csg., & OH exists from:

Bottom surface csg. at _____'

Top cut off at _____' OH

LOWER SECTION

B. Plugged above geopressured zone, with OH from plug through geopressured zone of interest.

- protection csg. at +12,400'
- plug at 12,020'
- zone of int. 15,570 to 16,400' } 1,417' OH through zone of interest

C. TD above geopressured zone; required to drill deeper.

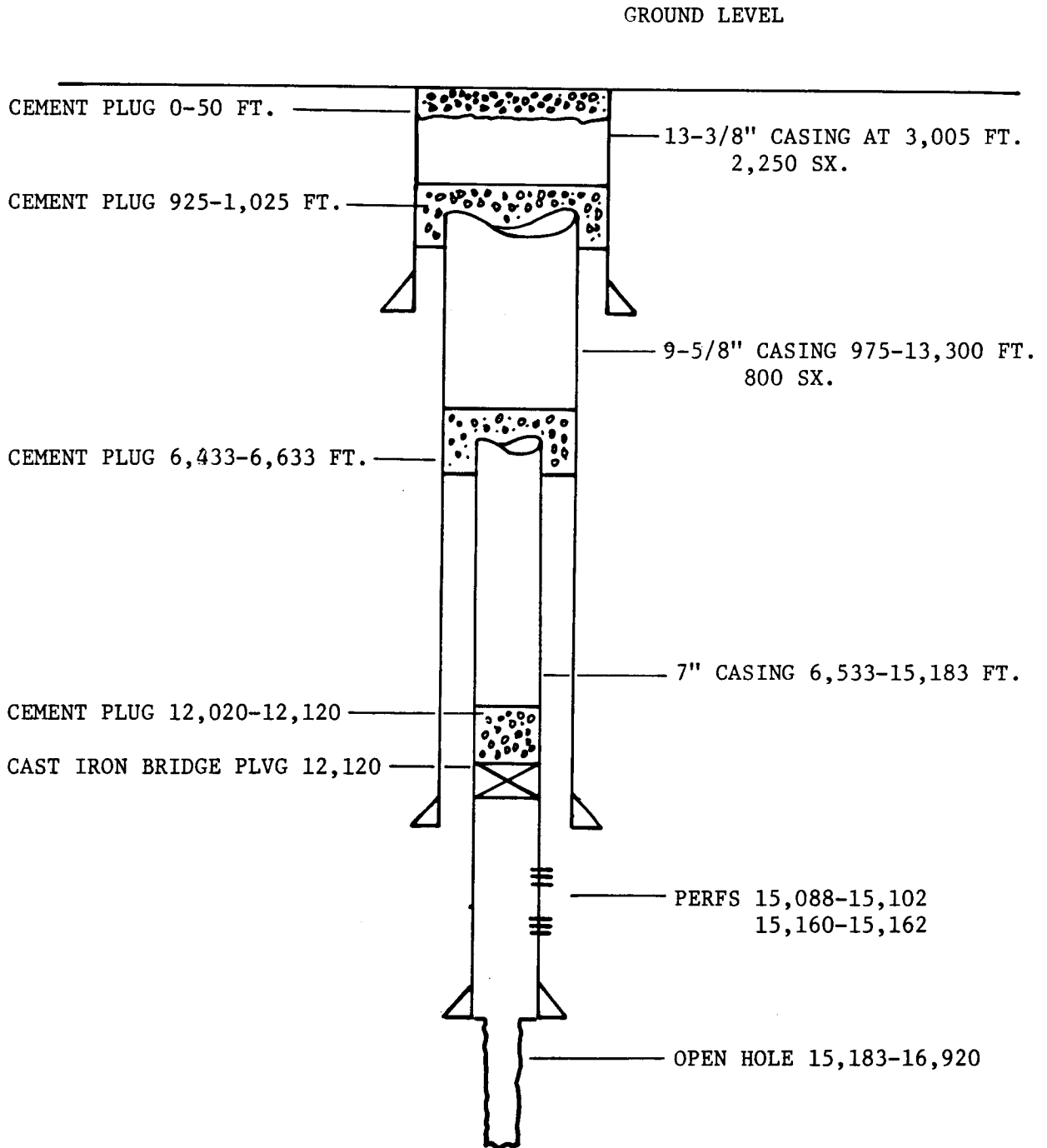
- TD _____'
- zone of int. _____' to _____' } additional drilling

PAN AMERICAN PETROLEUM CORPORATION

STATE LEASE 4183 NO. 3

SEC. 27 T15S 4W

CAMERON PARISH, LOUISIANA



TD 16,920

PAN AMERICAN PETR. CORP.
No. 1 State Lease 4183
Section 27, T-15-S, R-4-W
Cameron Parish, Louisiana

13-3/8" - 3005'
9-5/8" - 13,300'
7" - 12,956' - 15,183'
Open Hole 15,183' - 16,920'

RE-ENTRY PROCEDURE:

1. Prepare location.
2. Move in and rig up workover rig.
3. Dig out 13-3/8" casing, weld on casinghead and extension, if needed.
4. Pick up 2-7/8" work string and drill cement in interval 0 - 50' and 925 - 1025'.
5. Dress off top of 9-5/8" casing at 975'.
6. Run 9-5/8" casing with patch, tie into 9-5/8" and hand off casing. Pressure test patch.
7. Nipple up 9-5/8" casinghead and install BOP's.
8. Continue to pick up 2-7/8" work string and drill out cement plug in interval 6433' - 6633'.
9. Dress off top of 7" casing at 6533'.
10. Run 7" casing with patch, tie into 7" and hang off casing. Pressure test patch.
11. Continue to pick up 2-7/8" work string and drill out cement plug in interval 12,020' - 12,120' and cast iron bridge plug at 12,120'. Mud weight to be 17.2#/gal. before plug is completely drilled out.
12. Continue to clean out well to bottom of 7" to 15,183'. Circulate and condition hole.
13. Pull tubing. Set retrievable bridge plug at 15,170' and run casing inspection log. Repair casing, if needed.
14. Pressure test 7" casing.
15. Wash out to TD 16,600'.
16. Circulate and condition hole and run electric logs.
17. Set 5%, 15#, P-110, SFJ liner at 16,600' with top at 14,960'. Cement liner full length.
18. Clean out 7" to top of liner and test. Cement squeeze if needed.
19. Clean out 5" to float collar.
20. Circulate and condition hole, pull tubing, and run Cement Bond Log. Squeeze cement, if necessary. Perforate approximately 40', 4 shots/ft. at 15,700'.

21. Set packer in 5" at 15,600' and test with weight and pressure.
22. Lay down 2-7/8" work string.
23. Pick up combination string of 2-3/8" 4.7# P-105 8 Rd and 3-1/2" 12.95# N-80 8 Rd tubing. Space out and set in packer at 15,600'.
24. Install back pressure valve in 3-1/2".
25. Remove BOP's, nipple up and test tree, remove back pressure valve and displace tubing with water to 15,500'. Set tubing in packer and flange up tree. Test flange.
26. Test well and release rig if everything is satisfactory.

PLUGGING PROCEDURE:

1. Move in and rig up workover rig.
2. Kill well and install BOP's.
3. Pull tubing and set cement plugs as required by Department of Conservation.
4. Lay down 3-1/2" tubing.
5. Cut off 7" casing and recover if feasible.
6. Cut off 9-5/8" casing and weld plate on top. Release rig.

DOE Contract No. EG-77-C-08-1528
Gruy Federal Job No. 00-77-3017

PAN AMERICAN PETR. CORP.
No. 1 State Lease 4183
Section 27, T-15-S, R-4-W
Cameron Parish, Louisiana

RE-ENTRY COST:

1. Location preparation	\$ 50,000
2. Rig time 19 days	66,200
3. Bits	800
4. Mud and chemicals	20,000
5. Casinghead	2,000
6. Xmas tree	50,000
7. Casing patch (2)	11,000
8. Rental tools and equipment	10,000
9. Inspection logs	7,000
10. Liner setting	4,500
11. Cement and services	7,000
12. Cement Bond Log	5,000
13. Perforating	15,000
14. 2-7/8" drill pipe work string	12,000
15. 800 ft. of 2-3/8" P-105 4.7# EUE 8 Rd tubing	3,000
16. 2800 ft. of 3-1/2" N-80 12.95# EUE 8 Rd tubing	10,300 (1)
17. Packer	2,500
18. 975' of 9-5/8" S-95 29# 8 Rd casing	16,000
19. 6533' of 7" S-95 29# 8 Rd casing	37,200 (2)
20. 1700' of 5" P-110 18# SFJ casing	20,600
21. Supervision	6,200
22. Miscellaneous	13,000
23. Contingencies	<u>37,000</u>
Total	\$ 406,300

(1) See Buttes

(2) See Buttes

DOE Contract No. EG-77-C-08-1528
Gruy Federal Job No. 00-77-3017

PAN AMERICAN PETROLEUM CORPORATION
No. 1 State Lease 4183
Section 27, T-15-S, R-4-W
Cameron Parish, Louisiana

1. Move in water well rig and rig up.
2. Drive 13-3/8" casing to refusal.
3. Drill 12-1/4" to approximately 1500'.
4. Set and cement 9-5/8".
5. Drill 8-3/4" hole to approximately 2500'.
6. Run electric logs.
7. Set and cement 7" casing at TD.
8. Perforate 7" as indicated by log.
9. Set packer in 7".
10. Pick up 3-1/2" tubing and set in packer.
11. Install tree, test well and release rig.

COSTS

1. Drill to 2500' and set casing	\$ 30,000
2. 170' of 13-3/8" casing	2,500
3. 1500' of 9-5/8" 36# J-55 8 Rd	16,600
4. 2500' of 7" 26# J-55 8 Rd	20,000
5. 2500' of 3-1/2" 12.95# N-80 8 Rd	16,700
6. Cement and services	14,000
7. Logging	2,700
8. Perforating (100 feet)	7,200
9. Wellhead equipment	5,000
10. Packer	3,500
11. Supervision	2,000
12. Miscellaneous	5,000
13. Contingencies	<u>12,000</u>
Total	\$ 137,200

PAN AMERICAN PETROLEUM CORPORATION
No. 1 State Lease 4183
Section 27, T-15-S, R-4-W
Cameron Parish, Louisiana

TESTING PROCEDURE:

1. Set rental separator and skid-mounted pump. Hook up source well and salt water disposal well.
2. Place well on production using small choke size.
3. Gradually increase flow rate to approximately 5000 barrels per day while monitoring surface flowing pressure, temperature, gas-water ratio, and sand production.
4. Shut well in until static pressure is reached.
5. Run pressure gauge.
6. Place well on production at 5000 barrels per day and record flowing BHP and surface flowing pressure.
7. Sample fluid and gas.
8. After three to five days of constant production rate, shut well in to measure pressure build-up.
9. When BHP has stabilized retrieve pressure gauge.
10. Place well back on production at successively higher rates until 10,000 barrels per day is obtained. Flow continuously at this rate for two weeks and shut-in.
11. Run pressure gauge to record final static bottom hole pressure.

PAN AMERICAN PETROLEUM CORPORATION
No. 1 State Lease 4183
Section 27, T-15-S, R-4-W
Cameron Parish, Louisiana

TESTING COSTS:

1. Separator, pump, metering equipment	\$ 14,000
2. Air cooler	3,000
3. Pressure measurement	8,000
4. Labor	2,000
5. Material	3,000
6. Miscellaneous	3,000
7. Sampling devices	1,500
8. Contingencies	<u>4,000</u>
Total	\$ 38,500

PLUGGING COSTS:

1. Rig time 5 days	\$ 17,400
2. Cement and services	5,000
3. Labor	1,000
4. Supervision	1,700
5. Miscellaneous	3,000
6. Contingencies	<u>2,800</u>
Total	\$ 30,900

GRUY FEDERAL, INC.

Geopressured-Geothermal Well-of-Opportunity Prospect No. T3

Vicinity of Southeast Sargent, Texas

Matagorda County, Texas

The subject well, Inexco #1 C. B. Hamill, is located within the identified Matagorda Geopressured-Geothermal Fairway and has a projected total depth of 16,200 feet. Provided Gruy Federal can establish a satisfactory arrangement with the operator, this well should be a good candidate for a well-of-opportunity, should it be unproductive of commercial amounts of hydrocarbons.

Deep geological control is sparse in this area. The Gulf #1 C. G. Hamill, located about 8000 feet to the southeast of the proposed location, was drilled to 16,481 feet TD where it encountered temperatures of 334°F (168°C). This would indicate a corrected temperature of approximately 360°F. The final mud weight was 16.7#/gal. A temperature of 312°F (156°C) was recorded at 15,025 feet.

This well is about 12 miles along strike from the Baer Ranch field. A general correlation between the Gulf well and the Baer Ranch 2A can be made. The deep sands in this well begin below 13,000 feet after a shale section which is about 6000 feet thick. An enclosed copy of a portion of the logging suite indicates sands present in the offset well at 13,300, 13,640, 13,850, 14,500, 14,700 and 15,200 to 15,450 feet. These sands do not appear to be well developed, however if a somewhat better sand section is encountered in the Inexco well this would present a prospect for a well-of-opportunity.

Gruy Federal, Inc. has eliminated the Falcon-Seaboard Baer Ranch A3 as a W.O.O. prospect because the aquifers below the level which produced gas are indicated by material balance calculations to have been pressure depleted. However, Gruy Federal is continuing to consider other wells in the Baer Ranch field from the standpoint of reentry. This Inexco well will be considered further along with the Baer Ranch wells in order to provide a test well of opportunity within the Matagorda Geo² Fairway.

Advantages:

1. No further deepening would be necessary to test the geopressure-geothermal reservoir in the Matagorda Fairway,
2. The sand section may be thick enough to provide sufficient capacity

Disadvantages:

1. The sand quality and the flow capacity are unknown and may not be as large as required,
2. The operator has not been approached. It is not proposed to do so until the matter of reentry of the remaining Baer Ranch wells is investigated.

FALCON SEABOARD DRILLING COMPANY

BAER RANCH NO. A - 3

MATAGORDA COUNTY, TEXAS

The Baer Ranch Prospect is the Falcon Seaboard Baer Ranch A-3 well located in Matagorda County, Texas. The well was drilled to a total depth of 15,811 feet and produced a total of 11.8 BCF of gas from the Tex Miss #3 member of the Frio through perforations from 14,454 - 14,480 feet before watering out. The reservoir from which this well produced is penetrated by two intersecting faults, thus, isolating it from the main reservoir. The initial reservoir pressure was 12,781 psia and the mud temperature during logging operation was 292° F.

The potential geopressured-geothermal aquifer in this well is the sand section beneath the depleted gas reservoir with a gross sand interval from 14,507 to 14,647 feet. Core analysis from whole cores taken through the entire section indicated a mean porosity of 26.1 percent and a log-mean permeability of 5.1 millidarcies. The well is cased from surface with 5½-inch, P-110 and N-80 casing to 14,735 feet and 2-7/8 inch P-105 tubing is set through a Baker Model D Packer at 14,377 feet. In order to test the well it would be necessary to pull the tubing, drill out two packers, squeeze cement the existing perforations, and perforate the lower aquifer. The estimated cost of preparing this well for testing is approximately \$60,000.

The operator has consented to give the well to Gruy Federal for the purpose of testing the geopressured-geothermal aquifer. The low permeability of the sand and the possibility that the aquifer has been in communication with the gas reservoir and is pressure depleted are the two major disadvantages of this test well. In order to evaluate the latter possibility, a material balance was performed on the pressure-production history of the gas reservoir using a computer program from the H. J. Gruy and Associates library. These calculations resulted in an initial gas-in-place volume of 27 BCF and a cumulative water influx of 3.5 million barrels. Since this volume of water is too large to have originated in the gas reservoir, it was concluded that it migrated from the underlying aquifer. This finding eliminates the Baer Ranch A - 3 well as a candidate for geopressured-geothermal testing.