

NVO-1528-3(Vol.1)

**INVESTIGATION AND EVALUATION OF
GEOPRESSURED-GEOTHERMAL WELLS**

Final Report. Alice C. Plantation No. 2 Well
St. Mary Parish, Louisiana

Volume 1: Narrative Report

By
Alan Lohse
M. H. Willits

December 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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FINAL REPORT
ALICE C. PLANTATION NO. 2 WELL
ST. MARY PARISH, LOUISIANA

Volume I: Narrative Report

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Prepared for the
U.S. Department of Energy
Division of Geothermal Energy
Under Contract EG-77-C-08-1528

GRUY FEDERAL, INC.

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GRUY FEDERAL, INC.

INTRODUCTION

Gruy Federal, Inc. (Gruy) operates under Contract No. EG-77-C-08-1528 to the Department of Energy, Division of Geothermal Energy, to evaluate potential alternate energy sources occurring within geopressured-geothermal (Geo²) aquifers in Miocene, Oligocene, Tuscaloosa, Wilcox, and Frio formations along the Texas and Louisiana Gulf Coast. The project is entitled "Investigation and Evaluation of Geopressured-Geothermal Wells." The original period of performance was from September 26, 1977, through September 30, 1978; the contract was later extended through September 30, 1979.

The first well on which testing was attempted under this contract was the Alice C. Plantation No. 2 Well, located in St. Mary Parish, Louisiana. Originally drilled by the Sun Oil Company to a total depth of 19,000 feet, this well was abandoned as a dry hole in January 1964. Gruy's reentry attempt ended with plugging and abandonment after a saltwater flow on September 17, 1978.

This report is a comprehensive document detailing all events and costs relating to the Alice C. Plantation well, from its initial selection as a reentry well through the plugging and abandonment operations.

1. SCOPE OF THE CONTRACT PROJECT

The work to be accomplished under contract no. EG-77-C-08-1528 was set forth in the contract's original Statement of Work, quoted herewith in its entirety (references to ERDA have been changed to [DOE]).

The Contractor will undertake the identification, qualification, acquisition, planning, and conducting of geothermal-geopressured formation tests in up to six oil or gas wells, about to be drilled, being drilled, or being abandoned during the one-year term of the Contract. These wells will be located in the Frio Fairway of the Texas Gulf Coast, the Miocene formations of the Louisiana Gulf Coast, and other areas of the Texas and Louisiana Coast, to be designated by [DOE]. The Contractor will be responsible for all phases of the program, from well acquisition and well testing through final cleanup. The criteria for suitability of wells is shown in Appendix C, "Testing Details [not included in the present report]."

In order to efficiently conduct a management program for locating and obtaining access to wells, the Contractor will provide for:

- a. Coordination with institutions performing geothermal-geopressured fairway and area analysis to obtain information on all potential development areas.
- b. Liaison with oil and gas operators to inform them of plans and to determine availability of appropriate wells for testing.
- c. Monitoring of well activity through subscription services and contacts with appropriate state agencies to maintain an up-to-date status on wells in areas of interest.

Upon locating a prospective well and prior to well acquisition, the Contractor will provide to [DOE] a concise report containing the geological, geophysical, engineering, and environmental assessment data that qualifies the well as a candidate for testing. The qualification package shall incorporate preliminary plans and field operation cost estimates for activities commencing with well acquisition, through testing, and concluding with the final cleanup and disposition of all facilities. In addition, the qualification package will specifically provide but not be limited to:

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- a. Location, proposed total depth, and actual or estimated bottomhole temperatures and pressures of the well.
- b. Available geological and geophysical data on the geopressured or the potentially geopressured zones in the well.
- c. Drilling, casing, testing, and completion information on an existing well or a prognosis of a proposed well.
- d. Adjacent and regional well correlation data available.
- e. Available geological and geophysical data (i.e., seismic, gravity, magnetic, surface geological studies) that were utilized in determining this well location.
- f. Availability of nearby saline disposal wells, the potential for drilling an adjacent disposal well, or other disposal methods.
- g. The proposed contractual arrangement required by the operator, and the probability of successfully reaching an agreement which would permit the Contractor to test the well.
- h. Necessary site specific environmental assessment data on each well to be tested.
- i. Any other pertinent information that would appear useful in making a decision regarding the testing of the well.

A "background" environmental assessment will be completed by [DOE] for the specified areas of interest along the Gulf Coast. This assessment will address the general effects of the proposed action of well testing on the environment, particularly in regard to the potential environmental impacts that could conflict with Federal, state, and local regulations. The Contractor will be provided with these results and will compare the well location activities and their environmental effects with the "background" assessment parameters to ensure that the activities planned within the local area are in compliance with applicable regulations. Site specific environmental assessment data will be submitted to [DOE] along with the well qualification, evaluation, and cost estimate data for candidate wells.

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Upon receipt of the above information, [DOE] shall advise the Contractor in a timely manner whether or not testing of the proposed well is approved. Following approval from [DOE], the Contractor shall negotiate to obtain the desired well and, after drilling and testing the well, shall provide the [DOE] on a nonproprietary basis irrespective of paragraph e., "Withholding of Proprietary Data," of Article B-6, "Rights in Technical Data," of Appendix B, "Intellectual Property Articles [not included in this report]," data including but not limited to:

- a. The aquifer fluid properties including in situ temperature, chemical composition, hydrocarbon content, and pressure.
- b. The characteristics of the geopressured geothermal reservoirs including: permeability and porosity, extent and distribution of sands and shales, degree of compaction, and rock composition.
- c. The behavior of fluid and reservoir under conditions of fluid production at moderate and high rates, including pressure-time behavior at different flow rates, fluid characteristics under varying production conditions, and other information related to the reservoir production drive mechanisms and physical and chemical changes that may occur with various production conditions.
- d. Evaluation of the completion technique and production strategy for the selected well.
- e. The Contractor's evaluation of the long-term environmental effects of an extensive commercial application of geopressured geothermal energy, to the extent determinable during this test.

Appropriate plans will be developed for performance of administrative functions required during the on-site phases of testing, cleanup, and abandonment, which include, but are not limited to:

- a. Accounting for day-to-day contract progress;
- b. Assuring the work is accomplished in accordance with specified program objectives;
- c. Ensuring timely delivery of materials, equipment, and services to comply with individual well test schedules;

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- d. Acquiring necessary permits; and
- e. Overseeing well rework, drilling, completion, testing, sampling, and sample analyses so that all comply with safety regulations.

The original Statement of Work was modified on September 25, 1978, by Modification No. A003, which changed the entire first paragraph to read as follows:

The Contractor will undertake the identification, qualification, acquisition, planning, and conducting of geopressured-geothermal formation tests in up to three oil or gas wells (two wells of opportunity and one reentry well), about to be drilled, being drilled, or being abandoned during the period October 1, 1978 through September 30, 1979. These wells will be located in the Frio and Wilcox formations of the Texas Gulf Coast or the Miocene, Oligocene, and Tuscaloosa formations of the Louisiana Gulf Coast or other areas of the Texas and Louisiana Gulf Coast which may be designated by DOE.

Emphasis is to be placed on locating wells-of-opportunity and securing agreements to test such wells. To this end, the Contractor shall:

- a. Assign at least one experienced professional staff member to full-time search and screening for wells-of-opportunity through the monitoring and analysis of all available public and private information.
- b. Provide the services of Messrs. H. J. Gruy and Richard J. Dobson to contact officials of companies whose individual tests or general drilling programs offer possible wells-of-opportunity, and to ensure continued and comprehensive follow-up.
- c. Negotiate to purchase rights or otherwise obtain rights from well operators and landowners (owners or lessees of geopressured-geothermal resource) to test wells-of-opportunity.
- d. Monitor the services which announce locations and approach those operators as soon as a location in a geothermal area is announced.

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- e. At an early stage (when information becomes available), attempt to negotiate terms under which the operator will permit Gruy and Associates to take over the well in order to conduct whatever operations are required to test geo-pressured-geothermal aquifers. This will, if practicable, include use of the rig under contract to the operator. Simultaneous arrangements will have to be made with the drilling contractor, the landowner, and the many state departments or commissions having or claiming some interest in the program.
- f. Send letters of solicitation to industry and follow such letters with personal visits.
- g. Publicize the program to the greatest extent practicable by appearances of staff members on technical programs and elsewhere to discuss the results of the first two-well reentry and testing operation.
- h. Extend search to include marsh and inland waterway locations as well as land sites.
- i. Include the Texas Wilcox trend and Louisiana Oligocene and Tuscaloosa trends with the same intensity of search as the Texas Frio and Louisiana Miocene trends.

The Contractor will be responsible for obtaining those support services required to accomplish all work at each well location. The Contractor shall also be responsible for all phases of the program, from well acquisition and well testing through final cleanup. The criteria for suitability of wells is shown in Appendix C, "Testing Details [not included in this report]."

Two categories of candidate test wells are distinguished in this contract modification:

- "wells of opportunity," to be taken over as soon as possible after the operator has decided to abandon but before plugging and abandonment operations have commenced;
- "reentry wells," which have penetrated or approached the aquifers of interest but have already been plugged and abandoned.

The contract modification sets a higher priority on wells of opportunity (also called "WOO's" or "takeover" wells), since it is currently anticipated that the desired data can be obtained at lower cost from such wells.

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2. SELECTION OF THE ALICE C. PLANTATION NO. 2 WELL

The Alice C. Plantation well was selected as the first test well after an initial study of a number of reentry candidates in the absence of available takeover (WOO) wells.

Preliminary studies by Gruy determined that this well qualified according to all the established criteria. A detailed reentry prognosis for geopressured-geothermal testing of this well was submitted to DOE by Gruy on June 16, 1978 (Gruy Document No. NVO/1528-8A, attached as Exhibit A). Official approval to proceed with site preparation, reentry, and testing of the well was received from DOE on June 23, 1978 (see Exhibit B).

A combination of circumstances relating to the candidate wells and existing conditions contributed to this selection, including: (1) industry response and cooperation, (2) desirability of wells and locations, (3) availability of wells, (4) availability of drilling and support equipment, (5) costs, and (6) timing.

1. Industry response and cooperation. The lack of early response by industry to Gruy's attempts to secure takeover wells for the project has been documented throughout daily and monthly reports to DOE. As a result, the first two candidate wells (the Alice C. Plantation No. 2 and the Gladys McCall No. 1) were selected from reentry candidates.
2. Desirability of well and location. The Alice C. Plantation well satisfied all parameters agreed upon by DOE and Gruy for reentry wells. In addition, the well site was near an existing road on dry land, and could be made accessible by constructing a short extension road and a board matting turnaround.
3. Availability of well. The well was the first reentry candidate for drilling and testing because the landowner was willing to lease the site for a reasonable fee and no waiting period was necessary for other parties to vacate the site. Necessary permitting was accomplished with no major problem.
4. Availability of drilling and support equipment. An extensive search for adequate drilling rigs required several months before the necessary drilling and support equipment could be found for the reentry operation. Moreover, it was necessary to drill the saltwater disposal well with a smaller drilling rig than originally desired, because larger equipment was unavailable and apparently would remain unavailable for

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the then foreseeable future. In an effort to accelerate the total operation and conduct some Geo² tests before the end of DOE's fiscal year 1978, it was decided to commence operations with the drilling rigs that could be obtained at the time.

5. Costs. The original estimated costs for reentering the subject well and completing the tests were higher than estimated costs for other reentry operations, primarily because of the well's depth and the requirement to purchase a full 7-inch OD casing string, 3-1/2 inch OD tubing string, and a new Geo² christmas tree. It was realized that most of the high cost items could be considered recoverable costs, with the equipment being available for subsequent use; hence the well's availability and ease of access were deemed to offset the cost factor.
6. Timing. As mentioned in item 4, all parties concerned were anxious to obtain actual test results from the Geo² project before the end of FY 1978. The many legal, environmental, contractual, and logistical considerations inherent in the project all worked together to encourage commencement of reentry operations in time to meet this constraint.

3. CHRONOLOGICAL ACCOUNT OF OPERATIONS*

Site Preparation

The Alice C. Plantation No. 2 Well site was selected because it was readily accessible and required minimum preparation time, and the landowner was willing to execute an agreement providing for the test rights. A copy of the agreement with the landowner is included as Appendix A.

Access to the well site could best be provided by using an existing shell road through the Cabot Corporation's carbon black plant immediately adjacent to the site (see Fig. 1 of Exhibit A). A copy of the agreement negotiated with Cabot for the use of this road is included as Appendix B.

The contract for site preparation was awarded to Ashy-Hutchinson of Eunice, Louisiana, on the basis of low bid. A copy of the agreement negotiated with Ashy-Hutchinson for site preparation is included as Appendix C. Operations for preparation of the site began on June 28, 1978, and were completed on July 7.

While site preparation was in progress, a fresh-water supply well was drilled. The contractor drilled the first well to 345 feet as a dry hole. A new location was selected approximately 50 feet from the first, and a second well was drilled to 505 feet and completed, providing a supply of water adequate for the requirements of the anticipated well operations.

Saltwater Injection Well

Site preparation was planned so that a sufficient area was prepared early enough to permit moving in American Rig Services Rig No. 7 on July 3, 1978, to drill the saltwater disposal well. American Rig No. 7, previously operating as a workover rig, was adapted for the purpose of completing this job by the addition of a power swivel in lieu of a conventional rotary table and by the addition of mud pumps for circulating the drilling fluids.

Crews were trained and experienced in workover operations but were not equally experienced in drilling operations. However, because of the criticality of time and the need to obtain data before the end of the fiscal year, it was decided to proceed with the equipment and crews at hand.

*Summaries of operations in tabular form are included as Exhibits C-1, C-2, and C-3 at the end of this report.

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Rig-up operations were completed on July 5 and on the 6th, 13-3/8" OD conductor casing was driven to refusal at 117 feet. The contractor then mixed spud mud and installed the power swivel to commence pipe rotation for drilling. On July 8, the mouse hole was drilled and continuous operations were begun.

At 8 a.m. on the 8th the well was spudded and drilling proceeded to 187 feet in gumbo. This formation is common throughout the Garden City area and is troublesome to drill; the gumbo-type material is semi-plastic in character and tends to flow or shift position. Operations were shut down at 187 feet in order to clean the gumbo from the flow lines, shale shaker, and mud pits.

Drilling continued normally to a depth of 1222 feet, reached on July 11. The hole was conditioned to run surface casing, and a casing crew rigged up its equipment and started 9-5/8" casing in the hole. At a depth of 644 feet the casing stuck in the hole; it would neither rotate nor reciprocate. Mud returns from the hole showed excessive volumes of gumbo over the shale shaker.

An oil-base liquid with low surface tension ("EZ-Out") was pumped into the well to free the stuck casing. During this operation the formation closed in around the outside of the 9-5/8" casing, preventing the circulation of drilling fluids.

Since the casing was stuck above the base of the fresh water sands, and since Louisiana State Department of Conservation regulations require that fresh water sands be covered by at least two strings of casing, it was mandatory to abandon this hole. Therefore on July 15, drill pipe was run open-ended inside the 9-5/8" casing and cement plugs were set from 600 to 400 feet and from 20 feet to the surface, effecting plugging and abandonment.

In order to conserve space and to utilize existing mud pits, the rig was skidded some 10 feet from its original location on July 16. New 13-3/8" OD conductor casing was driven to refusal at 121 feet. American Rig No. 7 was rigged up and the blowout preventer stack was nipped up. On July 17 the well was spudded and drilled to 126 feet. Drilling continued through July 19 to a depth of 1057 feet.

The hole was conditioned and gumbo was removed from the mud system prior to rigging up the casing tools on July 21. That same day, 9-5/8" OD, 36# H-40 LT&C casing equipped with a Halliburton float collar at 998 feet and guide shoe was run to 1040 feet. This pipe was cemented with 200 sacks of class H cement, plus 1% Thrifty Line and 5% sodium chloride, tailed in by 100 sacks of class H cement plus 2% calcium chloride. Sixty-five barrels

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of cement were circulated to the surface. The cement job was complete at 5:30 p.m. with 1000 psi final pressure at the surface. Cement was allowed to set for 24 hours.

Nippling up operations were completed on July 23. The blowout preventer stack was tested and the float collar at the bottom of the casing was drilled out. Normal drilling progressed through July 25 to a depth of 1856 feet, at which point the rig had to be shut down for repairs.

Coincidental with the repairs to the American No. 7 Rig, Progress Drilling Company Rig 21 became available for reentry operations on the Alice C. Plantation No. 2 Well. Progress began moving in equipment on the site, greatly increasing activity in the area.

Repairs to the saltwater injection well rig were completed on July 26. The hole was conditioned to a depth of 1856 feet and drilling then progressed normally to a depth of 3584 feet. While pulling out of the hole to change bits at this depth, the drill pipe momentarily stuck at 3534 feet, at 2812 feet, and again at 2450 feet before the crew finished pulling out of the hole. While going back in the hole with a new bit, it was necessary to ream bridges in the hole at 1057, 2555, and 2580 feet. Thereafter it was necessary to ream each joint of drill pipe back to a depth of 3584 feet.

The hole conditions experienced on this trip in the hole led to the conclusion that the power available from the American Rig No. 7 mud pumps was inadequate to properly circulate formation cuttings from the hole below this depth. A Byron Jackson pump truck was therefore rigged up on August 1 in order to circulate the well fluids properly while reaching the objective total depth. As a result of the additional mud pump capacity, the rate of penetration increased from less than 2 feet per hour to an average of 15 feet per hour. Drilling then continued normally to a depth of 4355 feet on August 4. This was the coring depth selected as the top of the objective injection sand, based on correlations of the rate of penetration and the SP curve on the original electric logs for the Alice C. Plantation No. 2 reentry well. (A copy of this log is included as Exhibit D in the pocket inside the back cover of this report.) Since DOE (see Exhibit E) had requested that a conventional core be taken in the injection sand, a core was cut from 4355 to 4375 feet with 100% recovery. This core was examined on location and found to be a homogeneous, medium- to coarse-grained, gray, angular sand with substantial horizontal and vertical permeability. Every third foot of this core was retained inside its rubber sleeve, sealed in a plastic bag, and stored at Core Laboratories, Inc., Lafayette, Louisiana.

On August 7 a new bit was run. The hole was drilled to a depth of 4570 feet and an electric log was run (copy included as Exhibit F in the pocket inside the back cover of this report) on August 8-9. It was concluded that the objective sands had been penetrated and were suitable for saltwater disposal. Drill pipe was then laid down in preparation for running a 5-1/2" production casing.

On August 10 a full string of 5-1/2" OD, 15.5#, J-55 casing was run, complete with a guide shoe on the bottom and a float collar at 4535 feet. Cement was circulated to the surface on the well, the blowout preventers were nipped down, and the 3-1/2" drill pipe was loaded out. Two days later a string of 2-7/8" OD work pipe was picked up, the hole was conditioned to total depth, and on the 13th a gamma-ray cement bond log was run. The log indicated that it would be necessary to block squeeze the base and the top of the objective injection sand to isolate it from the remainder of the well bore.

On August 14 the 5-1/2" casing was perforated from an electrical log depth of 4432 to 4435 feet, and the perforations were squeezed with cement to a maximum and final pressure of 3500 psi. A through-tubing perforating gun was run on an electric wire line and the casing was perforated from 4338 to 4341 feet. The squeeze tool was then set at 4181 feet and the perforations were squeezed with cement to a maximum and final pressure of 3000 psi. The work string and squeeze tool were then pulled out of the hole. On August 15 a 4-3/4" OD drilling bit was run in the hole and cement was drilled from 4163 to 4337 feet and from 4381 to 4522 feet. The fact that cement was drilled below the lowermost perforation confirmed that a poor primary cement job existed near the casing shoe. It also confirmed the poor bonding shown on the bond log. On August 16 the squeezed-off perforations were tested to 1500 psi and found to be holding satisfactorily. A trip was then made with the work pipe and bit and casing scraper to 4522 feet. The mud was displaced from the hole with water and the work string was laid down.

On August 17 the blowout preventers were nipped down and a christmas tree installed and tested to 1500 psi. The cased-off saltwater disposal well was then left idle to await perforating, scheduled to be accomplished simultaneously with completion preparations on the reentry well.

Reentry Operations

After several months of searching for a drilling rig of suitable capacity, Gruy located a rig owned by the Progress Drilling Company,

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which was available after completion of a well in Allen Parish, Louisiana. A copy of the contract for the rig is included as Appendix D. Progress moved in to the Alice C. Plantation No. 2 location with their rig No. 21 on July 26-28 and rig-up operations began. During this period it was necessary to install drip pans and additional drainage ditches to conform with environmental requirements.

During the first two weeks of operations at the site, work was hindered by torrential rains following the passage of a tropical depression.

On August 2 rig-up operations were completed and the rig broke tour before drilling the rat hole and the mouse hole. The following day the mud tanks were filled with water and the rig serviced. Nippling-up of blowout preventers and control lines was completed on August 4. It was then determined that the accumulator tanks were inadequate and required replacement. The choke manifold was nipped up and spud mud mixed on August 5; on the 6th, the bell nipple was replaced and attempts were made to complete a test on the blowout preventers. The preventers were tested at 10,000 psi and the Hydril at 3500 psi on August 7.

On August 8 the well was reentered. The top cement plug from 0 to 20 feet was drilled out and the hole was conditioned to 2137 feet. The next day cement was drilled from 3205 to 3266 feet and the hole was again conditioned. At that point the 9-5/8" casing tieback string arrived at the location. A mud degasser was installed in the system, along with the new accumulator chamber for the Hydril.

On August 10 the choke manifold assembly was repaired, and the blowout preventers and choke manifold were tested to 10,000 psi. Operations resumed on the 11th, when cement was drilled from 3266 to 3275 feet, at which point the top of the cut-off 9-5/8" casing was encountered. A trip with a junk basket was made and the hole cleaned out to 3275 feet. After the junk basket was removed and a new bit run, cement was drilled inside the 9-5/8" casing to 3503 feet and the mud conditioned to that depth.

A round trip was made with wash pipe and the 9-5/8" casing was washed over from 3428 to 3490 feet (a total of 62 feet below the top of the 9-5/8" casing). On August 15 the mud was conditioned and a trip made for cutting tools. The 9-5/8" casing was cut at 3446 feet. A trip was made to recover the 9-5/8" casing fish, followed by another to dress off the top of the 9-5/8" casing. The Brown Oil Tool high pressure tieback sleeve was then run with 9-5/8" casing and the tieback made to extend a full string of 9-5/8" casing to the surface. The connection

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was tested to 3000 psi for 30 minutes, and held. The 9-5/8" casing was hung off with 200,000 pounds of tension and nipped up on the casing spool on August 17. The next day, nipping-up of the blowout preventers and the accumulator tanks was completed. The BOP's and choke manifold were tested to 10,000 psi. Some repairs were made to the No. 3 engine on the rig during this period.

A trip was then made and cement drilled from 3490 feet to a depth of 3522 feet. Mud was conditioned and the crew continued running pipe in the hole, conditioning mud to a depth of 8370 feet. Operations were continued to condition the hole by lowering the drill pipe in increments of 1000 to 2000 feet. This progressed from August 22 through August 25, at which time the hole was conditioned to 16,004 feet. At this point the mud weight was increased to 17.2 lb/gal preparatory to drilling out the cement plug in the bottom of the 9-5/8" protection casing. This was the mud weight used by Sun Oil Company at the time the well originally reached its total depth of 19,000 feet.

On August 28, after conditioning the well, the preventers and choke manifold were tested to 10,000 psi and the bottom plug in the protection casing was drilled out. Operations continued to wash and ream the open hole at 16,329 feet. The low drum chain on the rig drawworks broke and was repaired on the 30th. On August 31 a trip to change bits was completed and the hole conditioned to 16,329 feet. Reaming and washing continued to 17,131 feet. Upon starting to make a short trip on September 3, the lower clutch on the rig broke. During the breakdown the rig could not rotate or reciprocate the drill pipe, which therefore became stuck in the hole. "Black Magic" oil base mud was spotted in the well in an effort to free the drill pipe. The pipe was worked free and the hole conditioned to 17,547 feet. The following day the mud agitators and mixing system were repaired, and conditioning of the hole continued to a depth of 17,735 feet. On September 7 the objective depth, 18,100 feet, was reached. At that point, during a short trip, the pipe experienced 50,000 pounds of drag at 17,630 feet. The hole would not fill properly and it actually started to flow. Drill pipe was lowered back to bottom and the hole was conditioned with 17.2 lb/gal mud.

On September 8 an additional short trip was made into the 9-5/8" casing and it was found necessary to ream the hole from 16,474 to 16,534 feet. Reaming continued through the tight spot at 16,474 feet prior to conditioning mud to 18,100 feet. On September 10 the drill pipe was pulled out of the hole to run an electric log. No drag was encountered to 18,100 feet during logging operations.

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The Schlumberger ISF Sonic and caliper log was completed, and during the conditioning trip to 18,100 feet it was necessary to ream a tight spot at 16,474 feet. Mud weight was found to be cut from 17.2 to 17 lb/gal on bottoms up circulation. Another short trip again found a tight spot at 16,474 feet, with drag up to 50,000 pounds. After returning to bottom on the 13th, returns of drilling mud from 18,100 feet were cut to 16.9 lb/gal. After stabilizing the mud column, a round trip was made with the drill pipe to rig up and mill at 16,474 feet. Milling continued back to 18,100 feet, with a maximum drag of 25,000 pounds. The drill pipe was pulled out of the hole to change the drilling assembly. While the pipe was out of the hole the lower rams were changed to 7" pipe rams in preparation for running 7" production casing.

On September 16 the crew finished changing to 7" pipe rams, tested the blowout preventers to 10,000 psi and the Hydril to 3500 psi, and went in the hole to the bottom of the 9-5/8" casing at 16,234 feet. The rig was then shut down to repair the drawworks. On September 17 casing tools and equipment were rigged up to lay down drill pipe. Drill pipe was then run to total depth and circulated bottom up, and the crew started laying down drill pipe.

On September 17, as drill pipe was being laid down and loaded out on the trucks, the well began to flow at approximately 8 p.m. Operations during the saltwater flow and through abandonment of the well are described in detail in Section 4 of this report.

4. SALTWATER FLOW, PLUGGING AND ABANDONMENT

Throughout reentry operations a mud-o-meter device (a pit level and mud flow line recorder) was positioned near the driller. Both a visible and an audible alarm system were coupled to this recorder. A second recorder for the pit level and flow line was located in the drilling consultants trailer house quarters, but without an alarm system. These devices continuously monitored and recorded the mud level in the tanks and the relative flow rate in the mud line from the well. As will be discussed in following paragraphs, the recording on the derrick floor was interrupted; the recording in the consultants' office, however, was continuous.

Before commencing to run 7-inch casing, it was necessary for the drilling crew to remove the drill pipe by pulling one joint at a time, laying down the joint, and loading it onto a waiting truck. Consideration was given to standing the drill pipe in the derrick, but the derrick could not accommodate all of the pipe. The necessity to accomplish this operation in the shortest possible time was recognized, since any delay would lead to deterioration of conditions in the open hole.

Coming out of the hole with drill pipe required keeping the hole full of mud while drill pipe was being removed, in order to maintain a constant hydrostatic pressure overbalance adjacent to the Geo² sands. The recording chart shows that this was done regularly while pulling out of the hole. During the process of filling the hole as described, the monitoring instrument senses a flow in the mud flow line and sounds the alarm each time pipe displacement volume is replaced by an equivalent volume of mud. Normal operating practice while drilling or reaming down in the hole is to rely heavily on this device to warn of any variations in rate of flow. Apparently the rig personnel felt that the frequent alarm was not serving a useful purpose because the normal course of the operation resulted in repeated blasts. There is evidence, but no proof, that they therefore elected to turn off the alarm to avoid distraction during removal of drill pipe. This conclusion is based on the fact that the alarm switch was found to be turned off when inspected after the saltwater flow incident.

Switching off the alarm did not interrupt the recording of the pit level and flow line volumes on the charts on the rig floor or the trailer house. Inspection of the rig chart reveals, however, that the pen for the pit level recorder was inoperative and apparently clogged from 7:30 a.m. to 6:45 p.m. It therefore provides very little information prior to loss of well control. Apparently the sudden flow surge at the surface jarred the recording pen, causing it to ink and begin recording after salt water flow commenced (see Fig.1).

CHART

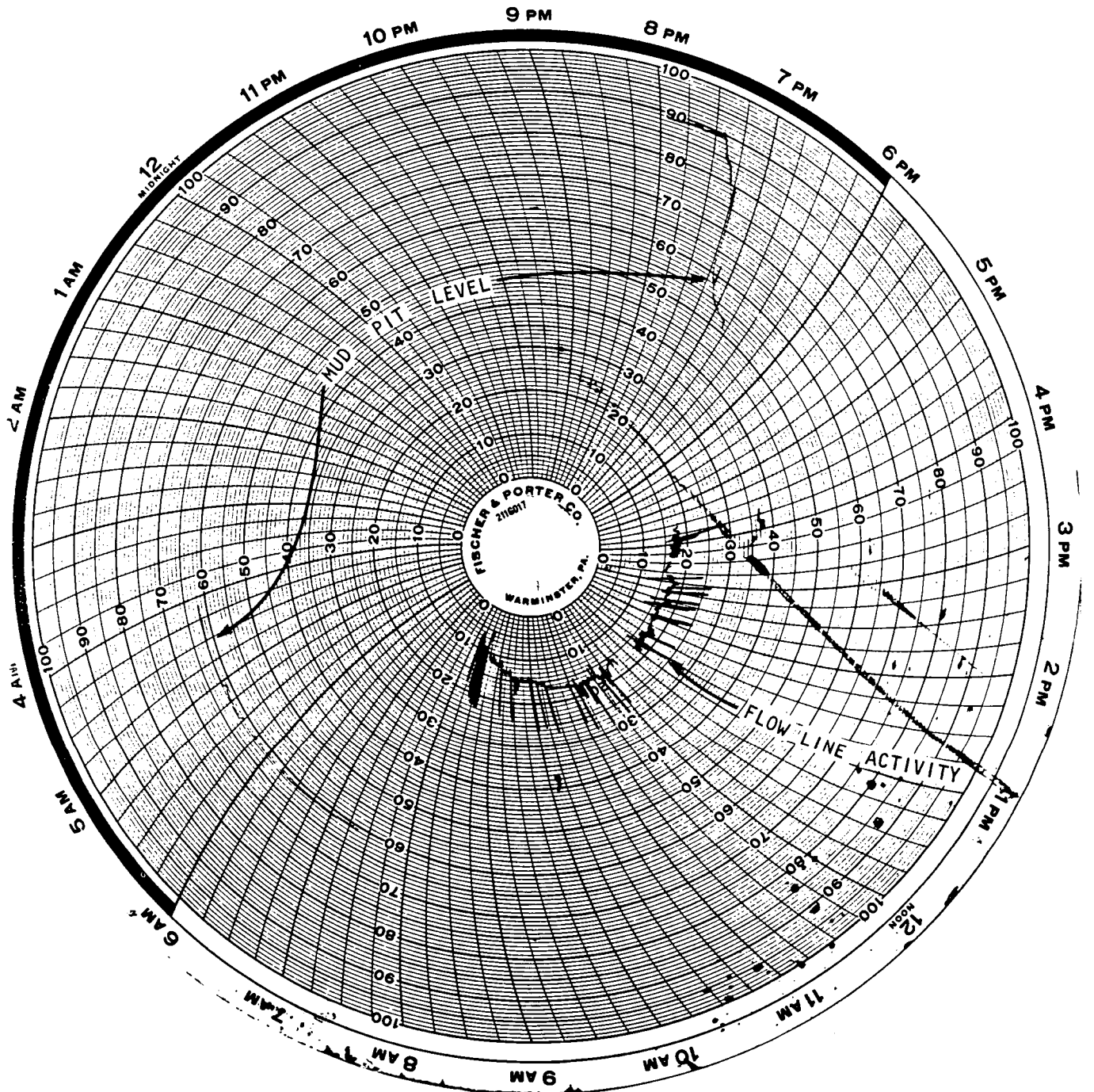


FIGURE 1

GRUY FEDERAL, INC.

The chart recorded in the trailer house indicates that the well was experiencing a continuous and progressively increasing flow for seven hours prior to the loss of control. Similarly, the chart shows a progressive net increase in mud pit volume, but this was masked to some extent by the operation of adding mud to the hole to compensate for the drill pipe volume. (See Fig. 2)

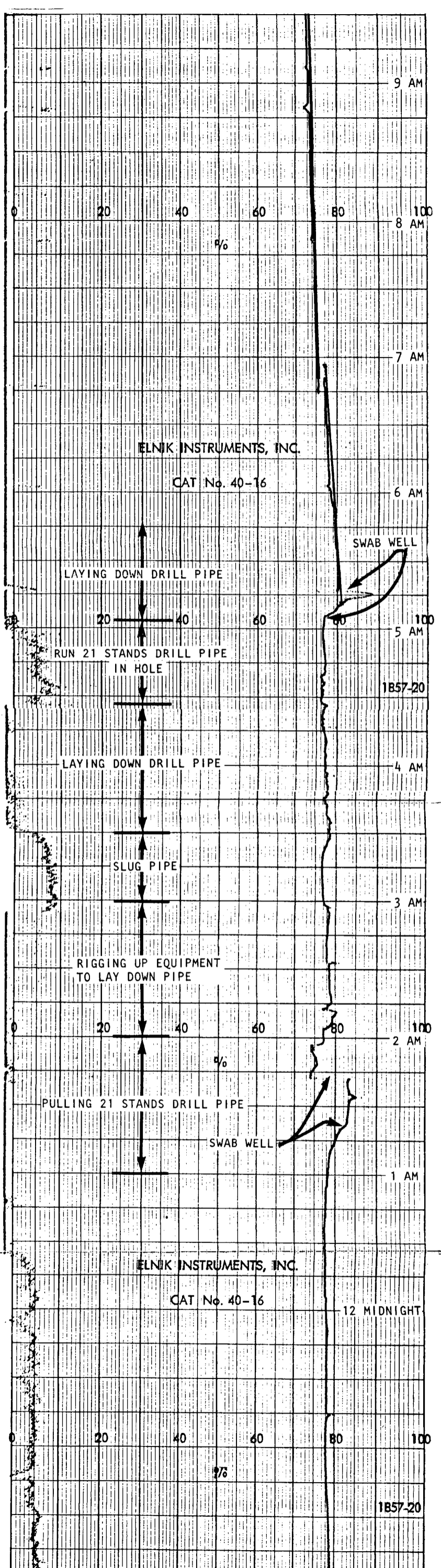
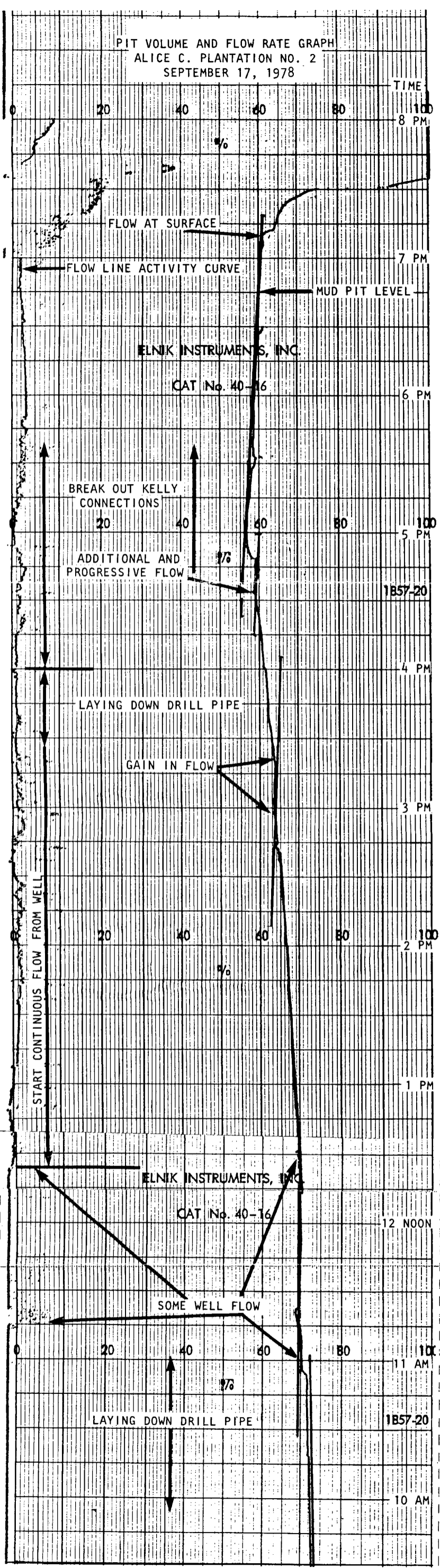
After pulling all of the drill pipe except eight joints and three drill collars, the rig crew stopped this operation for 1-1/2 hours in order to pick up the kelly and break out subs and valves. Operations were then resumed to finish laying down the drill pipe. Three more joints were pulled, and then, just after 7 p.m. on September 17, 1978, a strong flow of mud commenced. This was apparently the first awareness on the part of the rig personnel and the engineers that a problem existed.

Attempts were made to install the TIW surface control valve on the top joint of drill pipe, but the well was flowing too strongly to permit this. The pipe rams on the blowout preventers and Hydril were closed, all engines were shut down, and the rig was evacuated until daylight. Flow continued through the drill pipe for 2-1/2 to 4 hours (accounts vary) before the hole bridged inside the 9-5/8 inch casing. Shale, drilling mud, and salt water were spread over the downwind surface area. No one was injured. The only surface damage was the destruction of all rig lights.

At approximately 8 p.m. on Sunday, September 17, M. H. Willits, acting Gruy project manager, was notified by telephone from the rig by John White of Golden Engineering, Inc., who, together with Jim Jordan, represented Gruy at the well site. Willits immediately mobilized Halliburton pumps and control equipment and ordered excess liquid mud (which had been sent to remote storage) returned to the well site. A Gruy drilling supervisor, Ken Lawrence, arrived at the scene the following morning, at which time all flow had ceased.

After the well ceased flowing, there was no indication of pressure on the drill pipe remaining in the hole, the 9-5/8 - 13-3/8 inch casing annulus, or the 13-3/8 inch surface casing. No indication of pressure was observed on either the surface or the 5-1/2 inch casing of the salt water disposal well. Halliburton's attempts to pump through the kill line established that the drill string was not in pressure communication with the 9-5/8 inch annulus. During this operation, seven barrels of water and three barrels of mud were pumped into the drill pipe annulus.

PIT VOLUME AND FLOW RATE GRAPH
 ALICE C. PLANTATION NO. 2
 SEPTEMBER 17, 1978



CONTINUED

FIGURE 2
 18a

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The 4-1/2 inch pipe rams on the BOP were opened and the remaining pipe was found to be free. It was then recovered from the hole. The three drill collars were found to be plugged with shale.

Since it was impossible to determine how many bridges had been formed, or at what depths they occurred, or which bridges had pressure trapped below them, it was determined that a snubbing unit should be employed to a depth of at least 4600 feet while drilling out bridges, in order to control possible trapped pressure kicks. It was preplanned to remove the snubbing equipment upon reaching 4600 feet because the weight of the drill string below this depth would more than offset the fluid forces and conventional reentry techniques would be faster. On this premise the snubbing unit and all auxiliary equipment were installed and cleanout operations were commenced on September 25, 1978.

During snubbing operations small bridges (approximately 10 feet each) were encountered at 573, 820, 923, 1243, 1332, 1579, 1720, and 3416 feet. No trapped pressure was found below any of these bridges; some salt water and slightly gas cut mud were observed. Snubbing continued while drilling and washing to 4781 feet. The snubbing unit was then rigged down, the 4-1/2 inch drill pipe was replaced by 3-1/2 inch, and conventional drilling proceeded to 5053 feet. At this depth the bit hit an obstruction. A trip was made to change bits. It was found that the old bit bore indications of running on junk or metal. A trip was made with an 8-1/4 inch lead impression block. The jagged and irregular impression on the block indicated the hole to be restricted by approximately one inch over the entire periphery of the block. It is the opinion of Gruy that this impression could only be caused by collapsed casing beginning at the depth of 5053 feet.

It was concluded that any attempt to repair the damaged section of the 9-5/8 inch casing would require using excessively heavy drilling mud, which would exert a pressure in excess of the overburden pressure of the formation and result in lost circulation. Hence it appeared to be mechanically and financially unreasonable to attempt further operations. We therefore recommended that the well be abandoned and received approval from DOE to do so.

5. CONCLUSIONS AND RECOMMENDATIONS

This section summarizes Gruy's interpretive comments, assessments, and evaluations of the problems encountered, as well as final conclusions and recommendations.

Cause of the Salt Water Flow.

After reviewing the mud flow charts, Gruy's conclusion is that swabbing action during the early stages of the trip out of the hole which commenced at approximately 5 a.m. September 17 initiated a flow of salt water from the Geo² formations, reducing the hydrostatic pressure. This is indicated on Figure 2. The notes on this chart reflect our subsequent interpretation of events as they occurred.

Cause of the Casing Collapse.

On the basis of the available information, Gruy's engineering staff has constructed a sequence of events that could have led to the casing collapse, as follows:

1. After the hole had been emptied of drilling fluid, the well was flowing 100 percent salt water with a temperature in excess of 300°F.
2. Because of the pressure loss caused by friction and the loss in hydrostatic head, the fluid pressure dropped below the saturation pressure and the water flashed to steam.
3. A bridge formed deep within the 9-5/8" casing, interrupting the flow and leaving much of the casing evacuated.
4. The empty 9-5/8" casing was then exposed to the hydrostatic pressure of the mud column in the annulus and the casing collapsed.

In support of this premise, the collapse pressure of the 47 #/ft. N-80 casing was computed from the pipe design. The total weight in air of the casing below 5000 feet was 597,000 pounds. This casing was run with 12.9 #/gal. (bouyancy factor = 0.802) mud in the hole; therefore the tensile load on the casing at 5000 feet was 479,000 pounds. The effective collapse resistance of 47 #/ft. N-80 casing subjected to this tensile loading is approximately 3460 psi. The hydrostatic pressure exerted by the mud column on the empty casing would reach the collapse pressure of 3500 psi at a depth of 5217 feet. This computed depth is near the uppermost point of collapse (5053 feet), supporting our explanation for the casing collapse.

Loss of Control.

In an effort to better determine the actual events leading to the September 17, 1978, salt water flow, Gruy retained the services of Mr. Eugene H. Dobbs, an attorney-at-law practicing in Houston, to obtain statements from several individuals representing the contractor, the sub-contractors, and the supplier of the mud volume logging and recording equipment. All statements obtained by Mr. Dobbs are on file in the offices of Gruy Federal in Houston. Gruy also requested that statements be taken from drilling company personnel who were on the reentry well. Progress Drilling Company, however, would not allow its employees to provide such statements.

Although the statements tend to be repetitive on most questions, contradictions appear in the interpretations of the mud log charts. Gruy believes it is important to note that the varied interpretations of these charts indicate that Golden Engineering Company personnel would not have anticipated the flow even if they had reviewed the recorded charts. A comparison of statements directed to this specific point follows:

- From the statement of G. W. Duncan, then Manager of the Drilling and Resource Evaluation Group for Gruy Federal, Inc.:

Had I observed these charts at the time that they were being recorded it would have indicated to me that the well was trying to flow for some reason, and I feel that anyone else well versed in well operations would feel - would be able to conclude the same thing. (Page 38 of Duncan's statement.)

- From the statement of Michael R. Netto, service representative for the AC Company of New Iberia, Louisiana, manufacturer of the mud pit volume and flow sensors which recorded the log charts, speaking in response to a question regarding the circular flow chart recorded on September 17, 1978:

Question: In your opinion as an expert technician on PVT monitoring devices, does this chart indicate anything which might make you suspicious of what may be - of what might be happening to the flow in the well?

Answer: Only right here. (Indicating) Only at 4 - Say, 4 p.m., there was a - looked like a drastic change in it. And other than that, before that time, I wouldn't suspect anything wrong.

Question: Would you define this drastic change as being one which shows that the pit volume was, in fact, increasing and that there was indeed a flow in the flow line?

Answer: Yeah. Yes, sir. (Pages 51-52 of Netto's statement.)

GRUY FEDERAL, INC.

In Gruy's opinion, in normal industry practice such interpretive observations would have resulted in the immediate return of the drill pipe to maximum possible depth and circulation of properly weighted drilling mud.

By comparison to the opinions of Duncan and Netto, which indicate that the charts gave evidence the well was trying to flow, the following opinions by White and Morris indicate a different interpretation or understanding:

- From the statement of John White of Golden Engineering Company who was in charge of well site operations under a subcontract agreement with Gruy, responding to a question regarding the strip chart mud log of September 17:

Answer: . . . It shows steadily decreasing the mud volume in the pits up until 5:00 or about 4:30 p.m. that I think whenever they shut down to break the subs and kelly subs and stuff off the kelly and it shows a fairly even - in other words, no increase in flow to speak of other than what temperature would cause which is two or three barrels, that much mud.

Question: Anytime say, from 12:00 noon on September 17, do you see a reversal trend in -

Answer: No, it doesn't show to be taking too much fluid and it doesn't show to be giving back any fluid. (Pages 29-30 of White's statement.)

- From the statement of Mr. Byron Phillip Morris, mud engineer with Delta Mud and Chemical, who was serving as the mud engineer for the reentry operation on September 17, responding to a question regarding the original circular chart log recorded at the well site on that date:

Question: In your opinion, and from the chart known as "Exhibit D," had someone been watching this on a continuous basis, would they have been able to predict a flow from the information that's apparent there?

Answer: No. (Pages 35-36 of Morris' statement.)

These excerpts indicate a difference of opinion among the persons directly involved as to what the mud pit volume charts show, and, in comparison to the statements of Duncan and Netto, also a difference in their ability to predict a salt water flow from the charts.

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Gruy's Geo² staff concludes from these excerpts and from the statements in their entirety that there is no indication that anyone present at the well site on September 17, 1978, would have predicted the salt water flow that occurred on that day, even if they had observed the charts as they were recorded. It must be remembered, however, that the voluntary statements were obtained several weeks after the incident and possibly are tempered by rationalization, and also that any opinions on the subject held by Progress Drilling Company personnel were withheld by the company from this investigation on the basis that the day-rate drilling contractor is not responsible for downhole conditions.

Policies Established to Preclude Recurrence of Uncontrolled Flows.

In the plugging and abandonment report for the Alice C. Plantation No. 2 Well, Gruy enumerated certain policies that have been established to preclude the recurrence of uncontrolled salt water flows in future operations. Recognizing that prudent field supervision is mandatory, Gruy has replaced contract field supervisors with competent, experienced employees and has strengthened company operating personnel. For all future well operations, Gruy plans exceedingly tight controls, including the following steps:

1. Gruy will assign experienced company drilling supervisors to each well, with stringent supervision to ensure that day-rate drilling personnel and procedures do not cause or contribute to downhole problems.
2. Gruy will conduct periodic refresher courses in well control procedures and equipment. We are preparing a manual for this purpose. Concentrated training of rig crews in early recognition of downhole problems shall be company policy.
3. All necessary monitoring systems and charts, together with continuous monitoring-system alarms, will be used. Records from these monitors will be mailed to our Houston office for current review.
4. One man will be assigned to continuously maintain the monitoring devices in good operating condition. During trips in and out of the hole, this person will continuously monitor the mud pits and the mud flow line.
5. Long strings of production casing in future wells shall be run in two sections, the first being a casing liner and the second a tieback string of casing. This will eliminate the necessity to lay down the drill string, and will minimize the deterioration time before casing is set through the open hole section.

In subsequent discussions with DOE, these policies have been elaborated and approved. The final version of Gruy company policy on reentry well procedures is set forth in letters from Richard J. Dobson and Thomas H. Roy to Ronald T. Stearns of DOE/NVO (see Exhibits G, H, and I).

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6. COSTS

Total expense received as of December 1, 1978, on the Alice C. Plantation No. 2 Well appears to be \$3,587,883, which is broken down as follows:

Land acquisition, legal fees, site preparation . . .	\$ 137,999
Tangible costs, primarily tubing	888,329
Intangible items and services	2,528,999
Other costs	<u>32,556</u>
TOTAL	\$3,587,883

INVESTIGATION AND EVALUATION OF
GEOPRESSURED-GEOTHERMAL WELLS

DETAILED REENTRY PROGNOSIS FOR
GEOPRESSURE-GEOTHERMAL TESTING OF
ALICE C. PLANTATION No. 2 WELL

GRUY FEDERAL, INC.
2500 TANGLEWILDE, SUITE 150
HOUSTON, TEXAS 77063
713/785-9200

JUNE 16, 1978

PREPARED FOR THE
DEPARTMENT OF ENERGY
DIVISION OF GEOTHERMAL ENERGY
UNDER CONTRACT EG-77-C-08-1528

GRUY FEDERAL, INC.

CONSULTANTS IN ENERGY SYSTEMS

2500 TANGLEWILDE, SUITE 150
HOUSTON, TEXAS 77063
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1911 JEFFERSON DAVIS HWY., SUITE 500
ARLINGTON, VIRGINIA 22202
703/920-0113

Mr. Ronald T. Stearns
Engineering and Construction Division
DOE/Nevada Operations Office
P. O. Box 14100
Las Vegas, Nevada 89114

Re: Contract No. EG-77-C-08-1528
Sun Oil Company
No. 2 Alice C. Plantation
"Wells of Opportunity" Program

Dear Mr. Stearns:


As an ongoing portion of the Gruy Federal, Inc. Gulf Coast Geopressured-Geothermal "Wells of Opportunity" Program, we transmit herewith the third revision of the reentry and testing recommendation for Geo² L-9 in St. Mary Parish, Louisiana.

This well was originally drilled as Sun Oil Company No. 2 Alice C. Plantation in the South Garden City Area.

It will not be necessary to refer to previously furnished topographic maps or portions of electrical logs inasmuch as this presentation is complete.

All necessary permits from the state and the land owners have been secured for this reentry operation.

Yours very truly,


Richard J. Dobson
Vice President
Special Programs

RJD:je
Enclosures

GEOPRESSURED-GEOTHERMAL REENTRY PROSPECT L-9
SOUTH GARDEN CITY AREA
ST. MARY PARISH, LOUISIANA
ALICE C. PLANTATION NO. 2

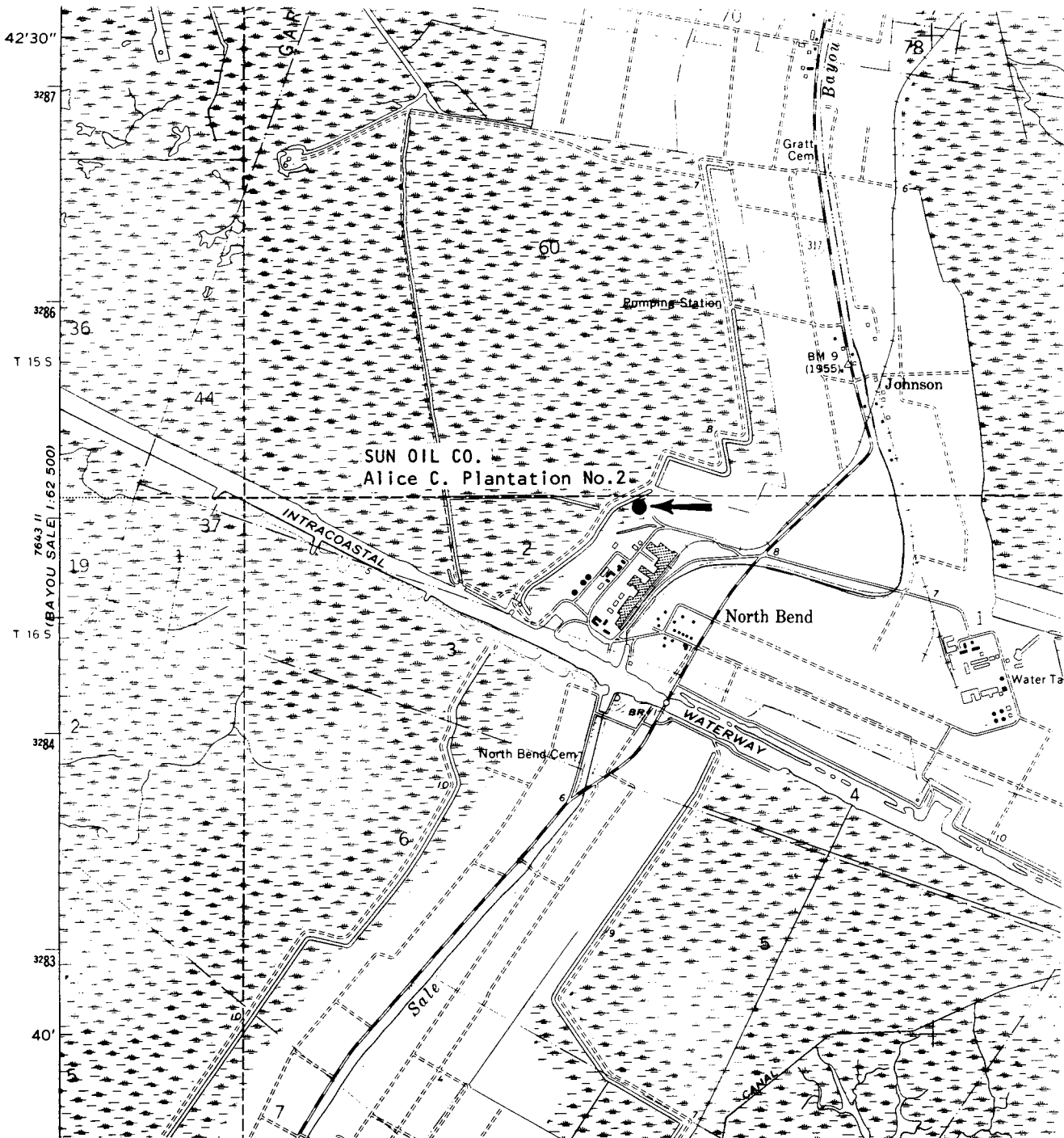
Introduction

This Gruy Federal Type II-B geopressured-geothermal (Geo²) prospect was drilled as the Sun Oil Company, No. 2 Alice C. Plantation. It is located in Section 2, Township 16-S, Range 10-E, St. Mary Parish, Louisiana. The well site is 3,705.61 feet S 64 degrees 10' 43" W from U.S.C. & G.S. marker "Foster". This is located in a sugar cane field, but is accessible by a short extension of an existing road through the Cabot Corporation's carbon black plant located adjacent to the well site. The well was drilled to a depth of 19,000 feet and abandoned as a dry hole in January, 1964. The location is shown on the west central area of the USGS topographic sheet, "North Bend". A portion of this sheet is included as Figure I.

Geology

Figure II is a structural interpretation on the top of the porosity of the lower Marginulina ascensionensis sand series. This has been modified from the Cambe Geological Map L-4 which depicts the structure at the 13,000-foot level, or some 4000 feet higher in the section.

The well site is located just south of the south bounding Garden City regional fault which forms the north boundary of an extensive down thrown and synclinal area between the Garden City and Bayou Sale structures which is indicated to contain in excess of 21,000 acres of potential drainage area. This large area is considerably more extensive than in any of the Geo² prospects reviewed to date.

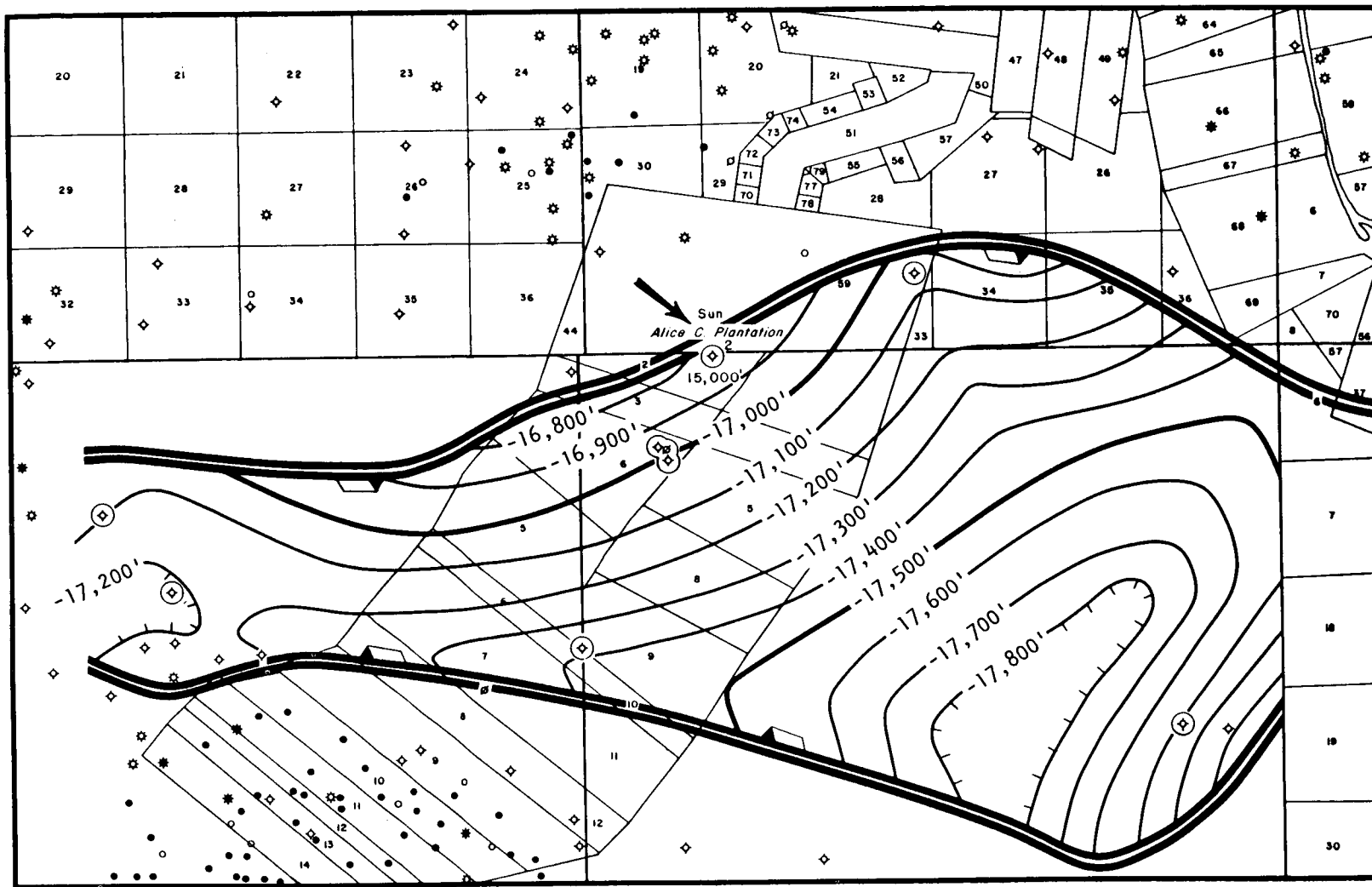


ROAD CLASSIFICATION

Heavy-duty		Light-duty	
Medium-duty		Unimproved dirt	
	U. S. Route		State Route

NORTH BEND, LA.
NW/4 BELLE ISLE 15' QUADRANGLE
N2937.5—W9122.5/7.5

GRUY FEDERAL, INC.
Houston, Texas
LOCATION MAP
North Bend
St. Mary Parish, Louisiana
FIGURE I



- ⊕ Control Wells
 * ◆ Wells not penetrative horizon of interest

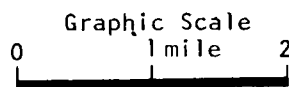


FIGURE II

GRUY FEDERAL, INC.
 Houston, Texas
 South Garden City Area
 St. Mary's Parish, Louisiana
 STRUCTURE: TOP OF POROSITY
 LOWER MARGINULINA
 ASCENSIONENSIS SAND SERIES

The potential Geo² aquifers penetrated by this well are from 16,810 feet to 16,990 feet, from 17,090 feet to 17,230 feet and from 17,700 feet to 17,900 feet. Based on the SP curve of the electric log, these sands contain 95 feet, 100 feet and 120 feet of net porous sand. Neither porosity logs nor cores were taken through the Geo² section of this well. The objective sands are correlative with producing sands in the Garden City field, therefore, it is reasonable to assume that the porosity of the objective sand in this well approximates the field wide average weighted porosity of 21.5 percent. This average value was obtained from log and core analyses in correlative gas sands at Garden City.

During drilling operations through these sands, a mud weight of 16.9 pounds per gallon was used. This would indicate the static aquifer pressure to be 14,650 psi (assuming 1,000 psi overbalance) at 17,800 feet. The maximum recorded mud temperature through these sands was 277 degrees Fahrenheit (136 degrees Centigrade) which would indicate an aquifer temperature of 305 degrees Fahrenheit (152 degrees Centigrade) based upon correction factors developed for South Louisiana by AAPG.

Mechanical Condition

Figure III illustrates the present and proposed mechanical condition of the well. Information on the present condition of the well was obtained from the plugging and abandonment reports filed with the Louisiana Department of Conservation, from the completion report published by Petroleum Information Corporation and from microfilm records of Sun Oil Company. It will be necessary to run 3,425 feet of 9-5/8" OD casing to tie back to the existing cut-off casing, so that the hole will accommodate the heavy mud required to control the aquifer pressure while clean-out operations are in progress in open hole. After reaching a depth of 18,100 feet, it will be necessary to run a full string of 7" OD casing through the Geo² sands and to the surface. In terms of tubular requirements, this is the most expensive well proposed by Gruy Federal. It is anticipated, however, that a large portion of the 7" OD casing will have been salvaged from earlier Geo² tests prior to this operation, and therefore will reduce the actual cost substantially. Alternatively, if this well should be chosen as the first reentry most of this casing can be utilized in a third or subsequent reentry or well-of-opportunity.

SUN OIL COMPANY
 ALICE C. PLANTATION NO. 2
 SEC. 2, T-16-S, R-10E
 SOUTH GARDEN CITY AREA
 ST. MARY PARISH, LOUISIANA

SUN OIL COMPANY
 ALICE C. PLANTATION NO. 2
 SEC. 2, T-16-S, R-10E
 SOUTH GARDEN CITY AREA
 ST. MARY PARISH, LOUISIANA

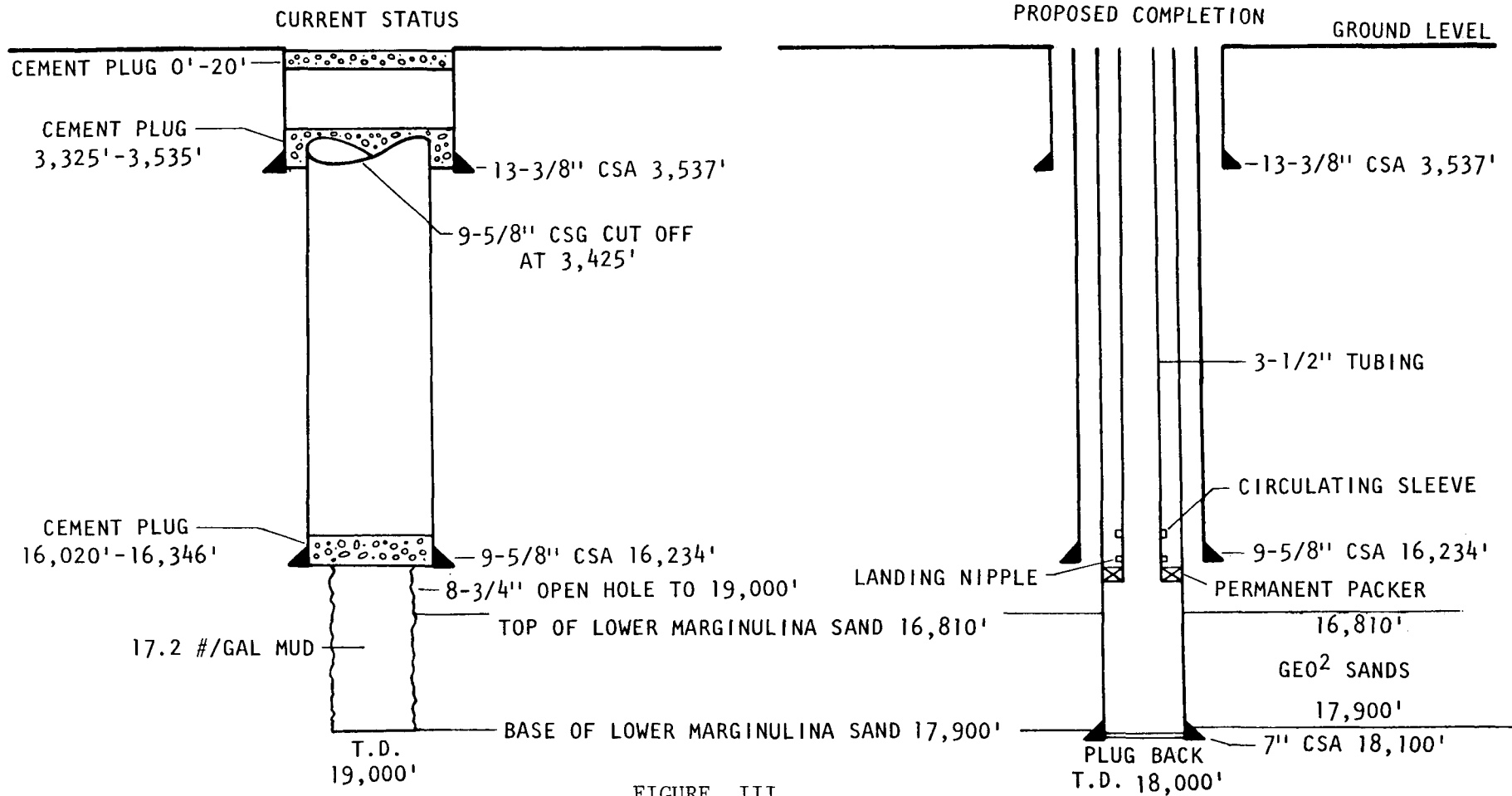


FIGURE III

Reentry Technique

A detailed reentry and recompletion prognosis is included. In designing equipment and specifying procedures, the primary consideration was the safety of the operation. Procedures have been patterned after the experience of prudent operators who have successfully penetrated and produced from geopressured-geothermal gas reservoirs in the Louisiana Gulf Coast.

The design of the tubular program for each individual well is not optimal in the sense that it satisfies all mechanical constraints at minimum cost. Instead, tubular goods were selected on the basis of accomplishing the goals of a multi-well program at minimum cost.

The drilling mud program was designed to track the mud weight and other physical characteristics of the mud used during the original drilling of the well. Provision has been made to salvage as much of the heavy drilling mud as possible and store it for a period between well operations and rig moves for subsequent reuse so that maximum saving can be realized.

For estimating purposes the cost of equipment used during any reentry operation has not been allocated to each well but rather has been debited to the well for which it was first purchased. This method will cause some anomalous cost patterns between wells.

Casing Design

The minimum design factors for selecting the production casing is as follows:

Burst	1.0
Collapse	1.0
Tension Load	1.6

The burst pressure under operating conditions was computed by assuming that the casing would be exposed internally to the static aquifer pressure with no fluid outside the casing. Similarly, the collapse pressure under operating conditions was calculated assuming that the casing would be exposed externally to the maximum hydrostatic pressure exerted by the 16.9 pound per gallon mud in the annular space; and on the assumption that the production casing will never have less than a 3,000 foot column of formation salt water in the lower section of the pipe. The loss in collapse resistance as a function of tensile loading was incorporated into the casing design.

Standard API threads and couplings were determined to be adequate except for that portion of the production casing run into open hole below protection pipe. Flush joint connections in lieu of longthread couplings were selected to provide maximum clearance in the reduced size open hole.

Production casing was designed with the above safety factors; and ultimately in weights and grades that enable using the salvageable portion of pipe in other wells.

The short portion of 9-5/8" casing was designed on the basis of exposure to static aquifer pressure at the surface.

Tubing Design

Tubing has been selected on the basis of anticipated flow capacity, pressure requirements, and with joint connections that will withstand reuse in subsequent wells. To meet these requirements, we have selected the primary string to be 3-1/2" OD, 12.95# per foot, P-105 grade, PH-6 Hydril threaded pipe. Provisions have been made to utilize the 3-1/2" OD tubing in inventory at Intracoastal City. If this is not the first reentry project, however, the tubing in inventory will be used on a previous well and may or may not be available.

The tubing string will be equipped with a seal assembly on the production tube which extends through the production packer. A sufficient length of the seal

assembly (approximately 10 feet) will be run to allow for expansion and contraction of the tubing within the packer element as a result of increased temperature during flowing operations and a decrease temperature during plug and abandonment operations. A landing nipple to receive the subsurface pressure gauges during testing operations will be provided. A sliding sleeve circulating valve will be placed in the tubing string immediately above the seal element in order to permit selective communication between the tubing and casing should this become necessary. This bottom hole tubing assembly is shown in Figure IV.

Blow-Out Preventers

Figure V contains a sketch and specifications of the BOP hook-up and choke manifold. It sets out the necessary procedures for surface blowout prevention such as have been adopted by IADC, API and prudent operators in Geo² areas.

Logging Program

After cleaning out and conditioning the open hole below the 9-5/8" OD casing at 16,234 feet to a depth of 18,100 feet a complete suite of electrical logs including Induction - Electrical, Compensated Neutron and Density logs will be run.

Experience in the Garden City field has indicated a very poor record of side wall core recovery. For this reason and in order to reduce risk of fishing jobs, sidewall cores are not recommended.

Perforating

Perforating will be accomplished with a 2-1/8" high temperature powder charge, through tubing jet perforating gun with four shots per foot and zero phasing. When fired inside 7" casing this jet is credited with creating a hole of approximately 0.31" in diameter and an effective penetration of about 3-1/2" beyond the cement sheath in this type of formation. Assuming 100 percent firing efficiency, this configuration should provide a productivity equal to 79 percent of the open hole productivity.

SUN OIL COMPANY
 ALICE C. PLANTATION NO. 2
 SEC, 2, T-16-S, R-10E
 SOUTH GARDEN CITY AREA
 ST. MARY PARISH, LOUISIANA

BOTTOM HOLE TUBING ASSEMBLY

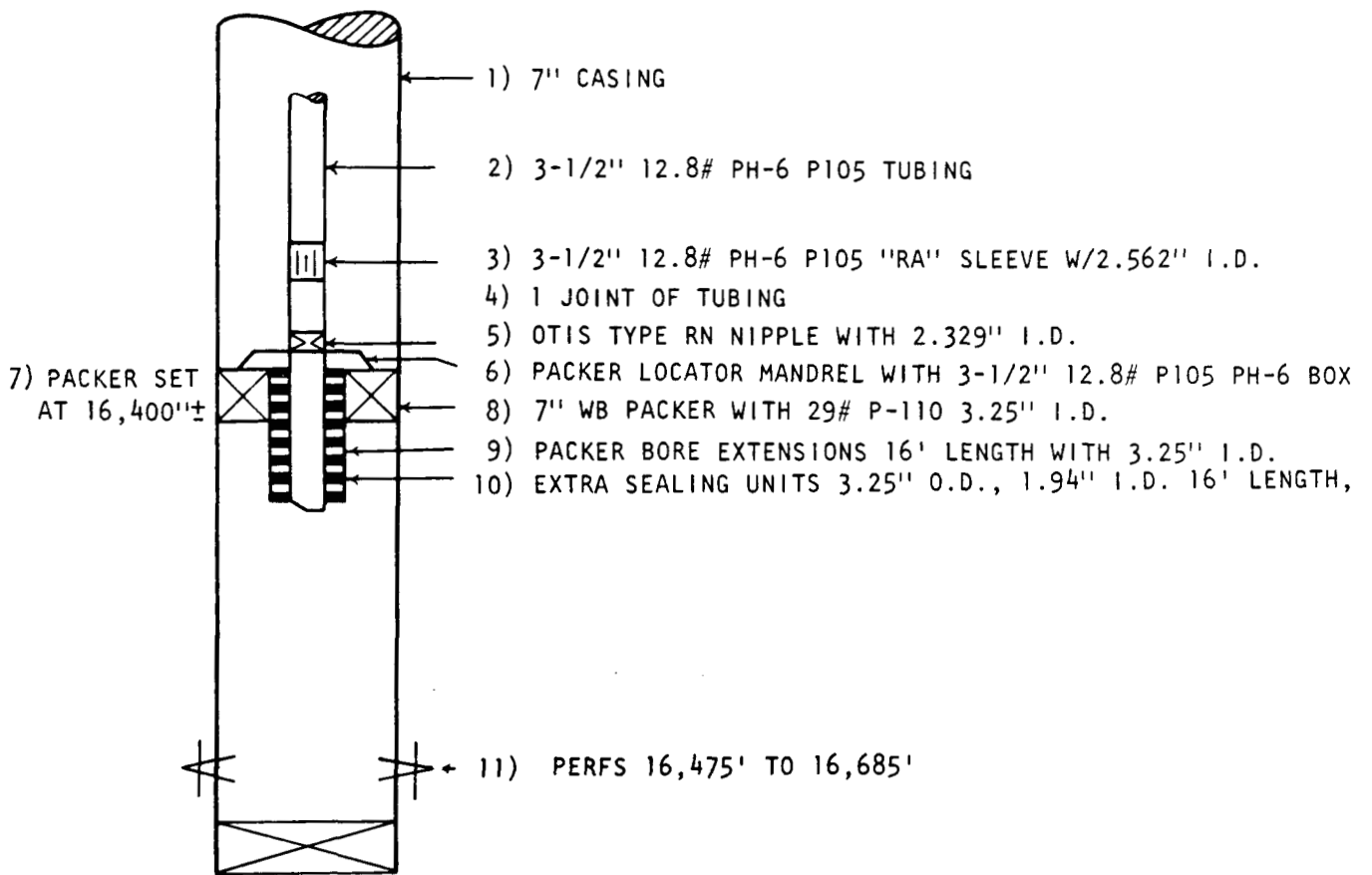
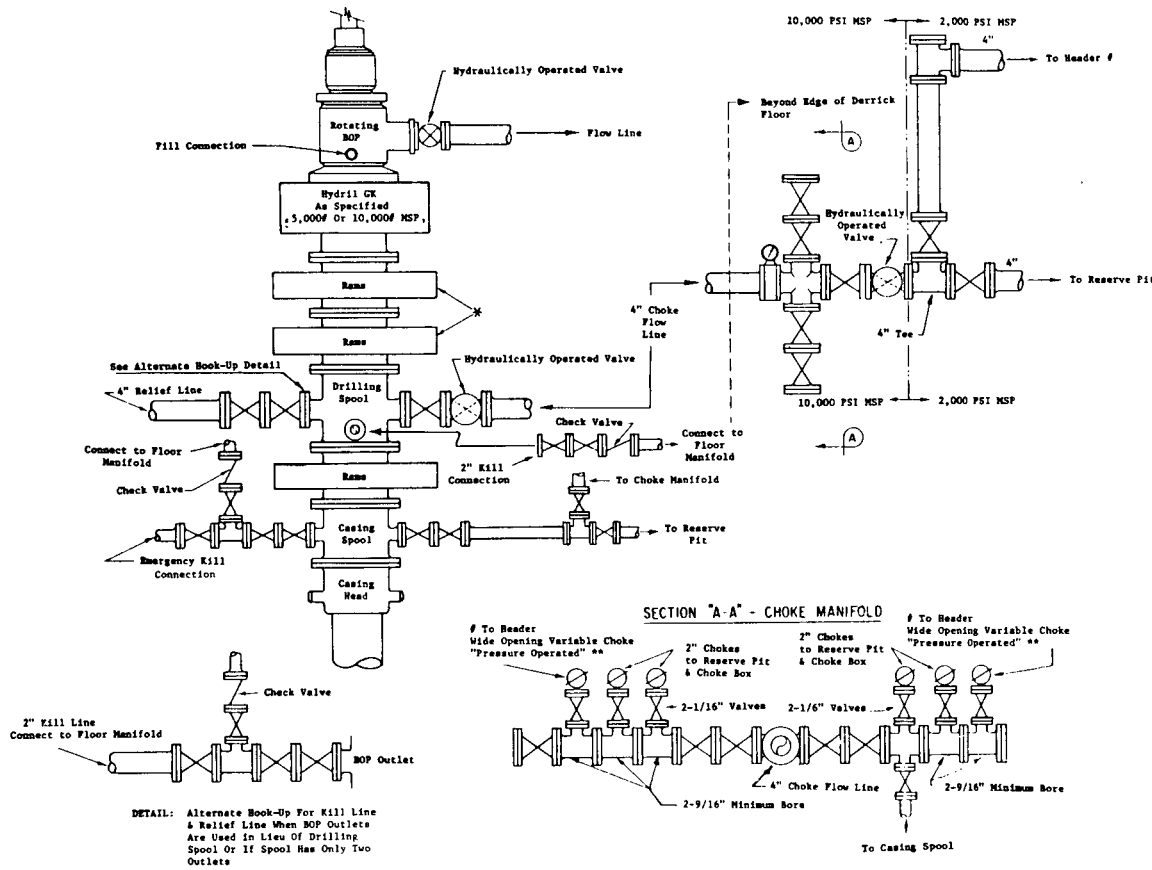


FIGURE IV

BLOWOUT PREVENTER DESIGN



Minimum operating equipment for preventers will be as follows: (1) multiple pumps, driven by a continuous source of power, capable of fluid charging the total accumulator volume within twenty minutes; and (2) accumulators with a pre-charge of nitrogen at not less than 750 psi and capable of receiving a fluid charge from the (charging) pumps. Fluid charge volume shall be the amount required to increase accumulator pressure from nitrogen pre-charge pressure to rated pressure. Charging pumps are to be connected to the hydraulic operating system which is to be a closed system. When requested, an additional remote and equivalent source of power shall be available to operate the pumps. The pressurized fluid volume stored in the accumulators shall be sufficient to close all pressure operated devices simultaneously within 20 seconds with charging pumps shut down. Minimum accumulator pressure shall be 1500 psi initially and not less than 1200 psi when all preventors are closed.

The closing manifold and remote closing manifold (floor-mounted) will have a separate control for each pressure operated device. Each control will be labeled to designate which pressure device it controls and to show open and closed positions. A pressure reducer and regulator is to be provided for the Hydril GK. Hydraulic oil shall be used as the operating fluid. One-inch size seamless steel piping shall be used to connect the closing unit to the preventors. Piping is to be tested to maximum rated pump pressure. The choke manifold, the four-inch choke flowline and the four-inch relief line shall be supported by metal stands or reinforced concrete. The choke lines shall be anchored. No sharp bends or curves will be permitted in the choke flowline from the preventors to the pits. Header to have three way outlet: (1) to reserve pit, (2) to choke box, (3) to separator. Easy and safe access will be maintained to the choke manifold. If deemed necessary, walkways and stairways will be provided in and around choke manifold. All valves throughout the assembly shall be selected for operation in the presence of oil, gas and drilling fluids. Valves connected adjacent to the drilling spool and all ram-type preventers will be equipped with stem extensions, universal joints, if needed, and operating wheels which are to extend beyond edge of derrick substructure. Any other valves within the limits of the derrick substructure will be so equipped when requested.

FIGURE V

The perforating interval length will be designed to achieve a productivity equal to 1/3 of the open hole productivity. Although the perforated interval cannot be specified until all logs are available, it is likely that the entire sand portion of the electric log interval from 17,700 feet to 17,900 feet will be opened.

Christmas Tree Design

Figure VI is a sketch of a Geo² christmas tree design for this program by WKM Well Head Systems Division. The christmas tree is rated to a working pressure of 10,000 psi. All valves have T-24 steel vertical runs with packing and seals for high temperature fluids (360 degrees Fahrenheit). The tree consists of two 3-1/16 inch master gate valves and a 3-1/16 inch swab valve. Between the master valve and the swab valve is a double wing assembly to house the choke bodies. One wing will contain a positive choke and the other will contain an adjustable choke. Each wing will consist of a Hi-Lo safety valve and a conventional wing valve. This specific design limits the anticipated high pressures to the tree assembly, thus permitting lighter weight pipe for all surface pipes and fittings.

During squeeze cementing to plug and abandon the well, the well head pressure may exceed 10,000 psi. To overcome this problem it is planned to utilize a well head isolation tool developed by Halliburton. The tool is attached to the top of the swab valve on the tree and a mandrel is hydraulically positioned through the master valves and locked in the production tubing. This device, rated at 20,000 psi working pressure, isolates the well head from the treating fluid or kill pressure.

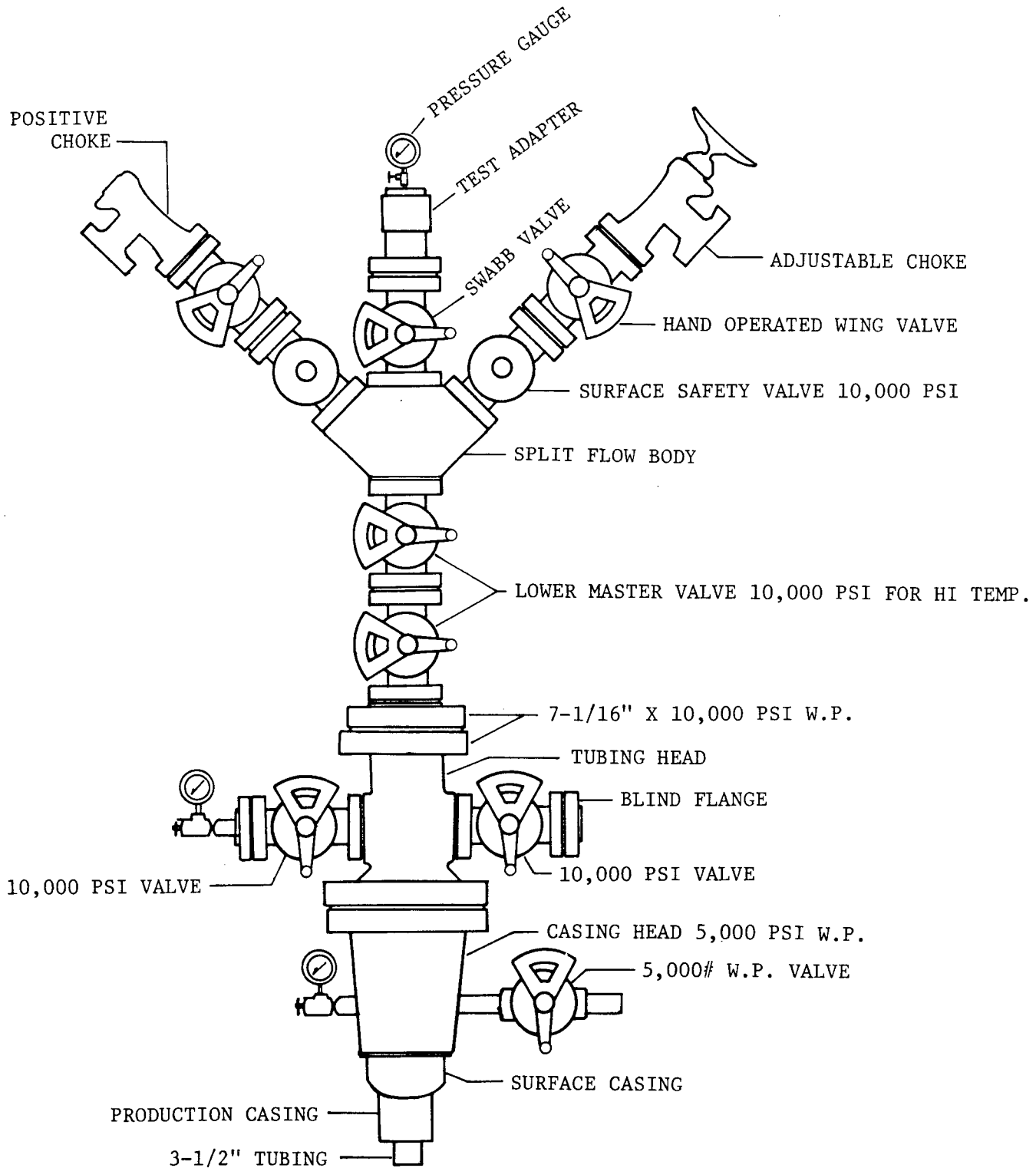
The casinghead used to set the production string has been designed to accept any casing size of the wells under consideration and to be compatible both with the blow out preventers and the upper christmas tree assembly.

General Comments

The No. 2 Alice C. Plantation well has been proposed as a Geo² test prospect for the following reasons:

- (1) The well contains a known quantity of thick, hot and apparently permeable lower Miocene sand.

GEO² CHRISTMAS TREE
 TO BE ADAPTED FOR ALL REENTRY WELLS
 BY GRUY FEDERAL, INC.



- (2) These sands are correlative with sands in the adjacent Garden City field which have a known average porosity in excess of 20% and which, judging by high per well cumulative production, exhibit characteristics of wide aerial extent.
- (3) This location appears to be capable of draining a large area in a down-thrown fault block containing two synclinal areas.
- (4) The area is located on land. If a Geo² resource is developed, there are potential industrial or agricultural applications nearby, as contrasted to a marsh location.
- (5) A reasonable contract has been finalized with the landowners and all permits have been obtained.
- (6) Site preparation time is minimal and can be finished in 10 days or less.

WELL PROGNOSIS
FOR
ALICE C. PLANTATION NO. 2
SOUTH GARDEN CITY AREA

Work Day
Schedule

1. Prepare location.
2. Dig out cellar, extend 13-3/8" surface casing to proper elevation and weld on casinghead.
- 1st 3. Move in and rig up drilling rig and install BOP.
- 4th 4. Clean out 13-3/8" OD casing with 12-1/4" OD rock bit to the top of the cut-off 9-5/8" OD casing. Run 12-1/4" rock bit, 6-1/2" OD drill collars, 3-1/2" OD drill pipe. Pull out of hole.
5. Run 11-1/2" OD lead impression block on bottom of 6-1/2" OD drill collars and 3-1/2" OD drill pipe. Pull out of hole.
6. If required from the appearance of the lead impression block, run 8-3/4" OD long tapered carboly junk mill to dress out top of cut-off 9-5/8" OD casing. Alternatively run 8-3/4" OD rock bit. Run mill or rock bit on bottom of 6-1/2" OD drill collars and 3-1/2" OD drill pipe. Dress out top of cut-off 9-5/8" OD casing and clean out to approximately 75 feet below top of cut. Pull out of hole.

- 5th 7. Go in hole with two joints 11-3/4" OD 54# Hyd FJ WP washover pipe, 11-3/4" OD tooth type carboloy rotary shoe, top bushing, and hydraulic oil jars on bottom of 6-1/2" OD drill collars and 3-1/2" OD drill pipe. Wash over approximately 60 feet of the 9-5/8" OD casing. Pull out of hole.
8. Go in hole with hydraulic pressure operated mill dressed to cut 9-5/8" OD casing. Run on bottom of 6-1/2" OD drill collars and 3-1/2" OD drill pipe. Locate first casing collar using minimum pressure/slack-off technique, sliding cutter down hole until cutter knives catch in joint and cutter stops moving down-hole. Bleed pressure, drop 5 feet to 10 feet below collar and make inside cut. Mill approximately 6" of the 9-5/8" OD casing and dress top smooth for external casing patch. Pull out of hole.
- 6th 9. Go in hole with 9-5/8" casing spear, 3' extension, 9-5/8" OD stop sub, lubricated bumper jars, and hydraulic oil jars on bottom of 6-1/2" OD drill collars. Retrieve fish.
10. Go in hole with external casing patch on bottom of 3,600 feet of 43.5# N80 LT&C casing.
- 6th 11. Nipple up casing, install blowout preventers and test same to 5,000 psi.
12. Go in hole with drill pipe, drill collars and bit and condition mud to top of cement retainer plug at 16,020 feet. Test casing to equivalent of 17.2#/gallon mud for 30 minutes. Repair casing, if necessary, by cement squeezing.

8th 13. Drill out cement retainer and cement from 16,020 feet to 16,234 feet (bottom of 9-5/8" casing). Then continue in hole washing and reaming open hole to a depth of 18,100 feet. Not more than 500 feet increments of open hole should be made without at least one full circulation of the mud system from the bottom of the hole.

12th 14. Run the following electric logs in the open hole from 18,100 feet to 16,234 feet:

Induction Electric Log
Compensated Density Log
Compensated Neutron Log
Sonic Log
Sidewall Cores, if hole conditions permit;
and if desired.

13th 15. Make trip with the drill pipe and condition hole to 18,100 feet and measure out of hole.

14th 16. Laying down drill pipe rig up and run 7" OD casing to 18,100 feet as follows:

<u>From</u>	<u>To</u>	<u>Size</u>	<u>Weight/ Foot</u>	<u>Grade</u>	<u>Type Ends</u>	<u>Section Length</u>
18,100'	16,200'	7"	38	P110	F.J.	1,900'
16,200'	13,750'	7"	38	P110	LT&C	2,450'
13,750'	11,750'	7"	35	P110	LT&C	2,000'
11,750'	200'	7"	32	P110	LT&C	11,550'
200'	0'	7"	38	P110	LT&C	200'

Use guide shoe on bottom with float collar two joints above bottom. Also use centralizers on each joint of casing on bottom 600 feet and one centralizer per 100 feet to 16,000 feet. Use sufficient cement to fill the annular space to 500 feet inside the 9-5/8" casing.

- 16th 17. Nipple up 7" casing and put on BOP.
18. Pick up 3-1/2" OD 12.70# P105 PH-6 Hydril tubing with bit on bottom and go to top of float collar on 7" casing at approximately 18,000 feet and test casing to 7,500 psi surface pressure. If okay, displace mud from hole with 10#/gallon CaCl_2 water.
- 17th 19. Pull tubing and run gamma ray cement bond log from approximately 18,000 feet to 16,000 feet. If cement bond not good, proceed to block squeeze to obtain cement bonds then drill out cement.
- 19th 20. Run production packer on wire line and set same at a depth to be determined after perforating interval is selected from the new electric logs.
21. Make up bottom hole completion equipment shown on the enclosed drawing and go in hole for completion using the 3-1/2" tubing string. Test each joint of tubing going in hole to 7,500 psi. Space out in packer and test packer to 6,500 psi differential from the bottom and 5,000 psi from the top.

- 21st 22. Set tubing in packer with full tension from pipe weight when locator sub sets on packer top. Remove BOP and install christmas tree. Nipple christmas tree, set retrievable plug in bottom of tree and test same to 10,000 psi and release rig.
23. Move out rig.
- 24th 24. Complete moving out rig.
- 27th 25. Suspend operations while drilling salt water disposal well.
26. Resume operations and rig up wireline unit and install high pressure perforating lubricator. Test same to 10,000 psi.
27. After final selection of perforated interval from new electric logs, go in hole with through tubing perforating gun (maximum length 46 feet - 4 shots per foot) and perforate lowest 46 feet of selected interval.
NOTE: This perforating will be done with a pressure differential to the well bore; therefore, the wellhead pressure should instantly increase substantially when the gun is fired. The wing valves on the tree should be closed before perforating is done.
28. Repeat trips with perforating gun until the entire completion interval is shot. Release perforating unit.
29. Proceed to hook up production unit and place well on test.

GENERAL PROCEDURE FOR BLOWOUT PREVENTION:

1. Use BOP design as attached. The minimum assembly will consist of three preventers. The bottom and middle preventers may be Cameron QRC, Cameron Type F or Shaffer Hydraulic Single, and the upper preventer will be Hydril GK. Double preventers or space savers may be used if approved by the company supervisor. An accumulator with a closing unit is required. Accumulator reservoir pressure shall be sufficient to close all preventers simultaneously in 20 seconds with the charging pumps closed down. Minimum accumulator pressure shall be 1,500 psi initially and not less than 1,200 psi when all preventers are closed.
2. When nipping up production casing, test BOP's and choke manifold to 7,500 psi with cold water, or as specified by the company representative. BOP's will be tested at least once each day thereafter when working in open hole and once each week otherwise.
3. Have a full opening safety valve and Grey inside BOP with drill pipe connections on the rig floor.
4. Have extra pipe rams on location at all times while drilling or completing.
5. Locate all choke manifolds, lines and valves at the side of and away from the substructure. Adequately support and tie down the choke assembly.

ESTIMATED REENTRY COST
FOR
ALICE C. PLANTATION NO. 2
SOUTH GARDEN CITY AREA

<u>Activity</u>	<u>Estimated Amount</u>
1. Lease acquisition and legal fees	\$ 35,000
2. Location preparation	70,500
3. Rig transportation costs	30,000
4. Rig time - 24 days at \$6,000/day	144,000
5. Bits	2,000
6. Mud and chemicals	80,000
7. Casinghead	2,000
8. Christmas tree (including surface safety equipment)	80,500 (1)
9. Casing patch for 9-5/8" casing (incl. bits & rentals)	15,000
10. Rental tools and equipment	10,000
11. 3-1/2" drill pipe & drill collar & sub rental	25,000
12. Trucking other than rig transportation	10,000
13. Cement and cement services	16,000
14. Logging and coring	40,000
15. Perforating	40,000
16. 3,560 ft. 9-5/8" OD 53.5# N80 LT & C casing	39,300
17. 18,000 ft. 7" OD casing per prognosis	330,000
18. Subsurface completion equipment	3,500
19. 8,400 ft. of 3-1/2" OD 12.7# P105 PH6 tubing (new)	172,200
9130' of 3-1/2" OD 12.7# P105 tubing from State Lease 4183 No. 1 well	5,500 (1) (2)

(1) Can be reused on alternate wells after minor shopping.

(2) Available from inventory either at Intracoastal City or from State Lease 4183 No. 1, dependent upon which is the first project well.

	<u>Estimated Amount</u>
20. Supervision	\$ 10,000
21. Miscellaneous	20,000
22. Contingencies	45,000
23. Material Handling @1.3% of all except items 1, 20, & 22	14,700
24. G&A @ 18% of items 1, 20	<u>8,100</u>
TOTAL	\$1,248,300

SALT WATER DISPOSAL WELL
FOR
ALICE C. PLANTATION NO. 2

The available electrical logs covering the potential disposal well sands from the bottom of the surface casing (approximately 3,500 feet) to a depth of 5,000 feet indicate the need to drill this salt water disposal well to 4,600 feet to provide adequate sand to accommodate injection. To date we have not located a log of the surface sands down to 3,500 feet to evaluate the possibilities of shallower potential disposal sands and to delineate maximum depth for fresh water sands. We will continue this search and will revise the depth upward if it can be safely justified.

The basic design of the casing program conforms with the requirements of the Department of Conservation. No tubing is recommended for the well because it acts to increase the surface injection pressure and would only be utilized if backflushing is required. The need for backflushing appears to be remote for the following reasons: (1) a volume of less than 200,000 barrels will be injected, (2) filters are provided downstream from the pumps to reduce solid and scale build-up, (3) the closed system prevents bacterial growth, and (4) two injection pumps (one of which is a standby) capable of delivering 10,000 barrels per day at an injection pressure of 500 psi.

In the event that formation plugging prevents disposal of the water, coiled tubing can be lubricated into the well and the sand backwashed using nitrogen.

Operational

Day

0 1 Drive 13-3/8" OD casing to refusal or \pm 125 feet.

- 27th 2. Move in and rig up water well rig.
- 29th 3. Drill 12-1/8" hole to 1,200 feet.
- 30th 4. Run 1,200 feet of 9-5/8" 35.0# H-40 casing with guide shoe on bottom and a float collar one joint above bottom. Use one centralizer per 100 feet of casing for bottom 500 feet and cement casing to surface.
- 32nd 5. Drill 8-3/4" hole below surface casing to 4,600 feet.
- 39th 6. Run Induction Electric and Density logs and SWC if desired.
- 35th 7. Run 5-1/2" OD 15.5# J-55 casing with guide shoe on bottom and float collar two joints above bottom. Run centralizers on every other joint of casing for bottom 500 feet. Cement casing with sufficient cement to get returns at the surface.
- 36th 8. Make trip with 2-7/8" work string and condition hole to float collar at approximately 4,420 feet and displace mud in hole with water. Lay down work string.
- 37th 9. Nipple up 5-1/2" casing and install christmas tree.
10. Test casing and tree to 2,000 psi surface pressure with water in hole.
- 38th 11. Run gamma ray - cement bond log from total depth to 1,200 feet and block squeeze with cement if necessary to obtain good bond.

- 39th 12. Rig down and move out water well rig.
13. Perforate approximately 50 feet of the lowest clean sand determined from electrical logs with four shots per foot using a casing bullet gun and rig down wireline unit.
- 40th 14. Test injectivity of well with rig pumps or pump truck to achieve 10,000 barrels per day injection rate at 150 psi or less. If injection rate is not sufficient, select and perforate additional sand interval or consider treatment with mud cleanout acid, or both, if deemed necessary.

ESTIMATED COST
OF
SALT WATER DISPOSAL WELL
FOR
ALICE C. PLANTATION NO. 2

<u>Activity</u>	<u>Estimated Amount</u>
1. Move in rig, drill to 4,000 feet, 12 days @ \$4,200	\$ 50,400
2. Location preparation	5,000
3. 130 feet of 13-3/8": 65# J-55 plain end casing	4,000
4. 1,200 feet of 9-5/8" 36# H-40 casing ST&C or LTC	14,000
5. 4,000 feet of 5-1/2" 15.5# J-55 ST&C or LT&C	21,400
6. Stand by rig time	4,200
7. Cement and Services	14,000
8. Electric logging	12,000
9. Perforating	8,000
10. Wellhead equipment	3,000
11. Stimulation	2,500
12. Supervision	3,600
13. Miscellaneous supplies and rentals	7,500
14. Trucking	3,000
15. Contingencies	14,000
16. Material handling at 1.3% of all items except supervision and contingencies	<u>1,900</u>
Total Well Cost	\$168,500

WELL TEST PROCEDURE

The well test procedure was established to provide the maximum amount of reservoir rock and fluid information that can be obtained within the fixed time frame subject to the limitations of the available equipment. The only bottomhole pressure device capable of operating at these temperatures and pressures is a 15,000 psi (full scale deflection) Amerada RPG-3 bourdon tube pressure gauge. This gauge has no surface read-out capability and has 3, 5, and 7 day clocks. The maximum accuracy of the bomb is + 0.25 percent (37.5 psi) under controlled calibration conditions. These limitations impact the scope of meaningful transient tests which can be conducted.

Before testing commences it will be necessary to flow the well into a reserve pit in order to clean the perforations of mud and foreign solids. After this has been accomplished the well will be shut-in to measure the static reservoir pressure. The well will be placed on production at a low rate through the test equipment in order to establish the drawdown characteristics at a safe level. Every 24 hours the rate will be increased until the choke size which allows flow at 10,000 barrels per day is determined. The well will be shut-in and the pressure build-up recorded. These data will be analyzed to determine the flow capacity of the formation and the skin effect or formation damage.

During each flow period, full flow stream samples will be taken and analyzed for chemical composition. Separator gas-water ratios will be carefully metered to detect changes as a function of the flow rate.

After the well bore pressure has returned to static conditions, the well will be flowed at a rate of 10,000 barrels per day for approximately two weeks. The pressure data from this flow can be used to verify the reservoir parameters computed from the build-up analysis.

At selected intervals throughout the flow periods, separator gas and liquid samples will be taken in order for laboratory recombination studies to be conducted.

TEST PROGNOSIS
FOR
ALICE C. PLANTATION NO. 2

Operational
Day

- 42nd 1. Move in and nipple up test equipment. Hydraulically test all systems with water to 4000 psi.
- 45th 2. Run two Amerada RPG-3 pressure gauges with 24 hour clocks and 15,000 psi full-scale deflection to 15,153 feet, stopping for fifteen minutes each 3,000 feet. Hang bombs for two hours and record surface pressure with deadweight tester. Retrieve pressure bombs.
3. Hook up two-pen pressure recorder to tubing upstream from the choke and to the casing to observe for tubing or packer leaks.
4. Place well on production through adjustable choke at low setting and record surface flowing pressure every thirty minutes by deadweight tester.
5. Record gas and liquid flow rates by calibrating the liquid turbine meter with the test tank.
- 46th 6. Gradually increase the flow rate in increments until either the maximum flow rate from the well or 10,000 barrels per day is achieved. Continue to flow at this rate for 24 hours while recording surface temperature, pressure, and gas and liquid production. If maximum flow rate of well not sufficient, do one of the following:

- (1) acidize
 - (2) perforate more interval
- 47th 7. Shut well in and measure surface pressure build-up with dead-weight tester.
- 48th 8. When well bore pressure has stabilized, run two Amerada RPG-3 pressure bombs with five day clocks and latch into landing nipple at bottom of tubing.
- 49th 9. Place well on production at 1,000 barrels per day for 24 hours, monitor surface pressure, temperature and flow rates and take the following samples:
- (a) Two, one liter, full well stream samples for chemical analysis.
 - (b) Three, one liter, separator liquid samples.
 - (c) Two, one liter, separator gas samples.
- 50th 10. Increase flow rate to 4,000 barrels per day for 24 hours and sample as before.
- 51st 11. Increase flow rate to 7,000 barrels per day for 24 hours and sample as before.
- 52nd 12. Increase flow rate to 10,000 barrels per day for 24 hours and sample as before.
- 53rd 13. Shut well in, measure build-up for 24 hours, then retrieve pressure bombs.

- 54th 14. Place well on production at low rate and gradually increase rate over a 12 hour period until it reaches 10,000 barrels per day.
15. Flow well at this rate for nine days while measuring surface pressure, temperature and flow rates.
16. Sample as before prior to shutting well in.
- 67th 17. Shut well in and run two pressure gauges to 16,060 feet and record until deadweight tester at surface indicates static conditions have been reached.
- 68th 18. Pull pressure gauges, release test equipment and move same out.
19. Proceed with plug and abandonment operations.

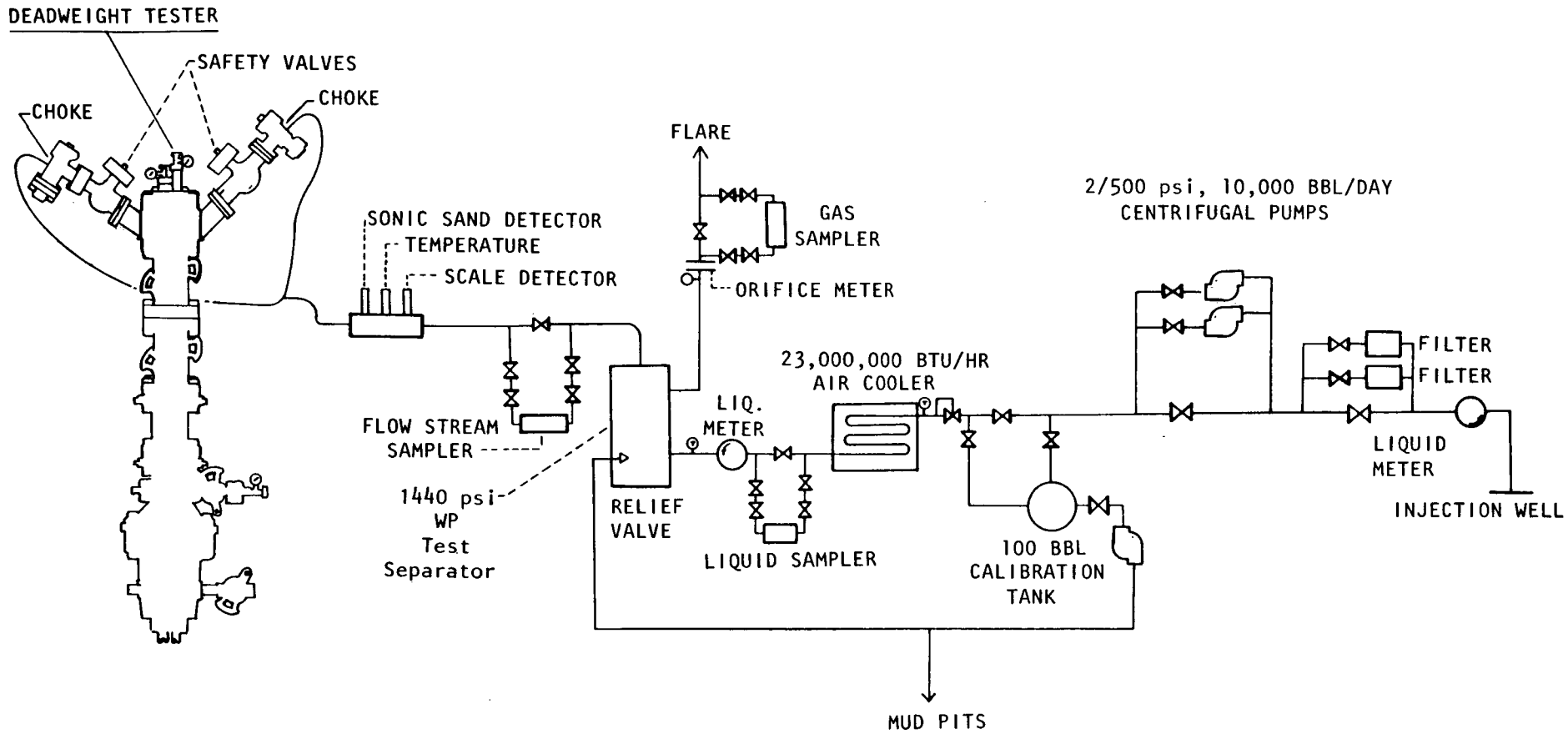


FIGURE VII
SURFACE TESTING FACILITIES
Gruy Federal, Inc.

GRUY FEDERAL, INC.

ESTIMATED TESTING COST
For
NO.2 ALICE C. PLANTATION

<u>Activity</u>	<u>Estimated Amount</u>	
1. Two data headers	\$ 108	
2. Two-phase separator	3,780	
3. 100-barrel tank	1,090	
4. Two 10,000 BPD centrifugal pumps	1,940	
5. 23,400,000 BTU/hr air cooler	12,159	(1)
6. Piping	740	
7. Sonic sand detector	300	
8. Wireline unit w/pressure gauge	1,440	
9. Gate valve w/activator	500	
10. House trailer w/power plant	850	
11. Generator	20,000	
12. Expansion loops	900	
13. Supervision and Labor	46,200	
14. Material handling	572	(2)
15. Test Accessories	<u>200</u>	
TOTAL	\$ 90,779	

(1) One charge only of \$8700 debited to well for overtime work.

(2) Charged at a rate of 1.3% on all items except 14.

ALICE C. PLANTATION NO. 2
SOUTH GARDEN CITY AREAAnalyses Required for Geo² Water and GasChemical Analysis of Water

- A. Metals
 - 1. Copper
 - 2. Zinc
 - 3. Boron
 - 4. Arsenic
 - 5. Chromium
 - 6. Mercury
 - 7. Lead
 - 8. Cadmium
- B. Solids
 - 1. Dissolved
 - 2. Total
- C. Hardness
 - 1. Calcium Carbonate
 - 2. Magnesium Carbonate
- D. Others
 - 1. Carbonate
 - 2. Bicarbonate
 - 3. Chloride
 - 4. Iron
 - 5. Sulfate
 - 6. Dissolved Silicate

ALICE C. PLANTATION NO. 2
SOUTH GARDEN CITY AREA

Chemical Analysis of Vapor

A. Hydrocarbons (percent)

1. Methane
2. Ethane
3. Iso-propane
4. Normal Propane
5. Iso Butane
6. Normal Butane
7. Pentane
8. C₆+

B. Other

1. Hydrogen Sulfide
2. Carbon Dioxide
3. Radon

Chemical Properties of Water

1. Density
2. Compressibility
3. Conductivity
4. Viscosity
5. pH

Recombination PVT Analysis

1. Solution gas-water ratio
2. Formation volume factor for water
3. Supercompressibility factor of gas

GRUY FEDERAL, INC.

ALICE C. PLANTATION NO. 2
SOUTH GARDEN CITY AREA

Analytical Costs for Geo² Water and Gas

Recombination	
2 samples per well	\$ 10,000
Chemical Analysis of Water	
5 samples per well	750
Material Handling at 1.3%	<u>140</u>
TOTAL	\$ 10,890

PLUGGING AND ABANDONMENT PROCEDURE
FOR
ALICE C. PLANTATION NO. 2

1. Move in and rig up pulling unit capable of plugging and abandonment.
2. Nipple up pump trucks to wellhead.
3. Squeeze cement perforations.
4. If squeeze pressure is not obtained overdisplace cement into formation with water and repeat squeeze cementing until successful.
5. When squeeze pressure is obtained, unbolt christmas tree from tubing hanger, pick up tubing out of packer and reverse excess cement.
6. Remove tree and install BOP's.
7. Run in hole with chemical casing cutter and cut 7" casing at approximately 16,000' and recover.
8. Run in hole with tubing and set cement plug 100' in and 100' out of cut off 7" casing.
9. Pull tubing and set a plug from 50' to surface.
10. Cut off 13-3/8" casing 3' below ground level and weld on plate.
11. Release rig.
12. Send tubing and casing to pipe yard for inspection and repair.
13. Send christmas tree to shop for overhaul.

GRUY FEDERAL, INC.

ESTIMATED PLUGGING COSTS

For

South Garden City Area
St. Mary Parish, Louisiana
Alice C. Plantation No. 2

<u>Activity</u>	<u>Amount</u>
1. Pulling unit at \$1,000/day	\$ 10,000
2. Rental tools at \$500/day	4,000
3. Trucking	3,000
4. Cement and services	4,000
5. Supervision	2,000
6. Contingencies	2,400
7. Material handling on all but items 5 & 6 @ 1.3%	300
8. G&A @ 18% of item 5	<u>400</u>
TOTAL	\$ 26,100

GRUY FEDERAL, INC.

SITE-SPECIFIC ENVIRONMENTAL INFORMATION CHECKLIST
 GEOPRESSURED-GEOTHERMAL WELL TEST PROGRAM
 GRUY FEDERAL, INC.
 NO. L-9

(Drilled as Sun Oil Company No. 2
 Alice C. Plantation)
 St. Mary Parish, Louisiana`

A. GENERAL

1. Is the proposed site located in the area covered by the "Gulf Coast Programmatic Environmental Assessment, Geothermal Well Testing, the Frio Formation of Texas and Louisiana October 1977"?

Yes X No If no explain.

2. Has a federal, state and/or local environmental assessment been conducted previously for the proposed test well or other wells in the area?

Yes No X If yes, provide a copy, if available.

3. Have all required permits, licenses, and/or agreements for proposed project been obtained?

Yes X No If no, explain.

4. Does the project site fall within the habitat of rare or endangered species?

Yes No X If yes, explain.

GRUY FEDERAL, INC.

- 5. Are known archeological sites, historic sites, or natural landmarks within or visible from the site area?

Yes _____ No X If yes, explain.

- 6. Will expected continuous noise levels from site operations be 65 dBA or less at the nearest residence?

Yes X No _____ If no, explain.

B. SITE CONSTRUCTION

- 1. Will additional land clearing be required for the test well (e.g., drill pad, road construction, mud reserve pits, pipeline)?

Yes X No _____ If yes, describe.

Boardmatting for drilling pad and road.

- 2. Will additional land clearing be required for the disposal well (e.g., drill pad, reserve pits, utilities, road construction, pipeline)?

Yes _____ No X If yes, describe.

GRUY FEDERAL, INC.

3. Will the site and related roads be treated to minimize dust?

Yes _____ No X If no, explain.

There will be board road matting on fill with no dust.

4. Are portable sanitary facilities or an approved septic system to be used at the site?

Yes X No _____ If no, explain.

5. Will liquid and solid wastes be disposed in accordance with local regulations?

Yes X No _____ If no, explain.

6. Will erosion control be required for excavated areas?

Yes _____ No X If yes, explain.

7. Will dredge spoil be deposited in swamp forest or marshland?

Yes _____ No X If yes, explain.

8. Upon completion of proposed test program, will the site be restored to as natural a condition as possible by regrading, filling, and reseeding?

Yes X No _____ If no, explain.

GRUY FEDERAL, INC.

C. WELL TESTING AND SAFETY

1. Is fluid production from the well during testing expected to be 2 weeks or less in duration per formation?

Yes _____ No X If no, explain.

Tests expected to require four weeks.

2. Is the total dissolved solids of the produced geopressure fluid expected to be 90,000 mg/l or less?

Yes X No _____ If no explain.

3. Is the volume of geopressure fluid to be produced and injected expected to be 3,000,000 barrels or less?

Yes _____ No X If no, explain

Expect volume up to 3,000,000 barrels over test duration.

4. Is the temperature of produced geopressured fluid expected to be 260°C or less?

Yes X No _____ If no, explain.

5. Will the gas content of the produced fluid be flared?

Yes X No _____ If no, explain.

6. Will blowout preventers rated to at least 10,000 PSI be used?

Yes X No _____ If no, explain.

GRUY FEDERAL, INC.

7. Will production tubing rated to at least 20,000 psi, be used?

Yes _____ No X If no, explain.

3-1/2" tubing with capacity for expected fluid volume has pressure rating of 18,000 psi maximum expected pressure is approximately 14,000 psi.

8. Can safety valves be operated from remote locations?

Yes X No _____ If no, explain.

9. Will the test tree be rated to at least 10,000 psi

Yes X No _____ If no, explain.

10. Will a test well directional survey be conducted?

Yes _____ No X If yes, at what interval? _____ Feet.
If no, explain.

This is a reentry into old well.

11. Will a lined pond be used to hold all liquid effluents and production fluids that are not injected?

Yes X No _____ If no, explain.

12. Has an injection permit been obtained?

Yes X No _____ If no, explain.

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13. Will H₂S monitors be located onsite?

Yes _____ No X If no, explain.

No history of H₂S in area.

14. Will fire extinguishers be located onsite?

Yes X No _____ If no, explain.

15. Do contingency plans exist for evacuating personnel should a blowout occur or high levels of H₂S be detected?

Yes X No _____ If no, explain.

16. Will high-pressure engineering and mud logging personnel be onsite during production well drilling operations?

Yes X No _____ If no, explain.

Mud logging personnel not required for a reentry job.
High pressure engineering and/or drilling personnel will be present at all times.



Department of Energy
Nevada Operations Office
P.O. Box 14100
Las Vegas, NV 89114

*Copy to Pres. O
This is journal
Approval for 2 wells
cc to well files*

JUN 21 1978

Dr. Alan Lohse
H. J. Gruy & Associates
2500 Tanglewilde, Suite 150
Houston, TX 77063

Dear Dr. Lohse:

APPROVAL TO TEST ALICE C. PLANTATION NO. 2 WELL. CONTRACT EG-77-C-08-1528

Reference is made to our telecon of June 20, 1978, regarding approval for the reentry and testing of a geopressured-geothermal well in St. Mary Parish, Louisiana. Approval is hereby granted for H. J. Gruy and Associates to proceed with the reentry and testing of the Alice C. Plantation No. 2 well in accordance with the Detailed Reentry Prognosis For Geopressure-Geothermal Testing Plans NVO 1528-8A, June 16, 1978.

The second well to be reentered upon completion of the Alice C., will be the Gladys McCall No. 1 well in Cameron Parish, Louisiana. Still under consideration for a later time will be the State Lease 4183 No. 1.

Accordingly, site preparations for the Alice C. Plantation well should go forward immediately.

Sincerely,

Ronald T. Stearns
Nevada Project Manager
Geopressure Well of
Opportunity Program
Engineering & Energy
Applications Division

E&EAD:RTS-687

cc: K. Westhusing, DOE, HQ
B. DiBona, DOE, HQ
R. Wallace, USGS
D. Bebout, Univ. of Texas, BEG,
Austin, TX

GRUY FEDERAL, INC.

EXHIBIT C-1

PLANNED VS. ACTUAL TIMETABLE AND REASONS FOR VARIATIONS

SALTWATER DISPOSAL WELL FOR ALICE C. PLANTATION NO. 2

FIRST ATTEMPT--UNSUCCESSFUL

<u>OPERATION</u>	<u>OPERATIONAL DAYS</u>		<u>REASONS FOR TIME VARIATIONS</u>
	<u>PLANNED</u>	<u>ACTUAL</u>	
1. Drive 13-3/8" OD casing to refusal or 125± feet.		1	Originally planned to be done before rig moved in. Actually done with rig because weather prohibited prior to rig arrival.
2. Move in and rig up water well rig.	1	2	Rainy weather hampered operation.
3. Drill 12-1/8" hole to 1,200 feet.	2	6	Gumbo formation caused excessive hole problems and delayed drilling operations.
4. Run 1,200 feet of 9-5/8" 36# H-40 casing with guide shoe on bottom and a float collar one joint above bottom. Use one centralizer per 100 feet of casing for bottom 500 feet and cement casing to surface.	1	4	Casing became stuck at 644 feet. Attempted to retrieve for 2 days (unsuccessfully). One day consumed in plugging and abandoning hole.

GRUY FEDERAL, INC.

EXHIBIT C-2

PLANNED VS. ACTUAL TIMETABLE AND REASONS FOR VARIATIONS

SALTWATER DISPOSAL WELL FOR ALICE C. PLANTATION NO. 2

SECOND ATTEMPT--SUCCESSFUL

<u>OPERATION</u>	<u>OPERATIONAL DAYS</u>		<u>REASONS FOR TIME VARIATIONS</u>
	<u>PLANNED</u>	<u>ACTUAL</u>	
1. Drive 13-3/8" OD casing to refusal or 125± feet.		1	Had to skid rig and drive conductor pipe at new well site.
2. Move in and rig up water well rig.	1	1	
3. Drill 12-1/8" hole to 1057 ft.	2	3	Excessive gumbo formation required frequent clearing of mud system. Remark: altered 9-5/8" casing point to 1057 instead of 1200 feet.
4. Run 1040 ft. of 9-5/8" 36# H-40 casing with guide shoe on bottom and a float collar one joint above bottom. Use one centralizer per 100 ft. of casing for bottom 500 ft. and cement casing to surface.	1	1	
5. Drill 8-3/4" hole below surface casing to 4600 ft.	4	17	Rig repairs needed. Stuck drill pipe at several points required fishing operations. At about 3584 ft., reached hydraulic capacity of rig mud pumps, necessitating rigging up additional pump capacity. Received DOE orders to obtain conventional core through objective injection sand.
6. Run Induction Electric and Density logs and SWC if desired.	1	1	
7. Run 5-1/2" OD 15.5# J-55 casing with guide shoe on bottom and float collar two joints above bottom. Run centralizers on every other joint of casing for bottom 500 ft. Cement casing with sufficient cement to get returns at surface.	1	1	

<u>OPERATION</u>	<u>OPERATIONAL DAYS</u>		<u>REASONS FOR TIME VARIATION</u>
	<u>PLANNED</u>	<u>ACTUAL</u>	
8. Make trip with 2-7/8" work string and condition hole to float collar at approximately 4420 ft. and displace mud in hole with water. Lay down work string.	2	5	Three additional days required to block squeeze above and below objective injection sand, then drill out cement, then make additional trip with casing scraper and to test block squeezed perforations.
9. Nipple up 5-1/2" casing and install christmas tree.	2	2	
10. Test casing and tree to 2000 psi surface pressure with water in hole.			
11. Run gamma ray cement bond log from total depth to 1200 ft. and block squeeze with cement if necessary to obtain good bond.	1	1	
12. Rig down and move out water well rig.	1	1	
13. Perforate approximately 50 feet of the lowest clean sand determined from electrical logs with four shots per foot using a casing bullet gun and rig down wireline unit.	1		Scheduled to perforate disposal well concurrent with perforating reentry well; consequently disposal well was never perforated.
14. Test injectivity of well and rig pumps or pump truck to achieve 10,000 bbl/day injection rate at 150 psi or less. If injection rate is not sufficient, select and perforate additional sand interval or consider treatment with mud cleanout acid, or both, if deemed necessary.			

GRUY FEDERAL, INC.

EXHIBIT C-3

PLANNED VS. ACTUAL TIMETABLE AND REASONS FOR VARIATIONS

REENTRY WELL - ALICE C. PLANTATION NO. 2

<u>OPERATION</u>	<u>OPERATIONAL DAYS</u>		<u>REASONS FOR TIME VARIATIONS</u>
	<u>PLANNED</u>	<u>ACTUAL</u>	
1. Prepare location.			Remark: done on turnkey prior to moving in rig.
2. Dig out cellar, extend 13-3/8" surface casing to proper elevation and weld on casinghead.			Remark: done prior to moving in rig.
3. Move in and rig up drilling rig and install BOP.	3	13	Bad weather. Rig alterations to conform with EPA specifications. Problems in availability and delivery of BOP stack, accumulator tanks, and choke manifold to meet required USGS specifications.
4. Clean out 13-3/8" OD casing with 12-1/4" rock bit to the top of the cut-off 9-5/8" OD casing. Run 12-1/4" rock bit, 6-1/2" OD drill collars, 3-1/2" OD drill pipe. Pull out of hole.	1*	7-1/2*	Accumulator tanks had to be replaced along with supply system, to improve integrity of accumulator system and its capacity, manifold assembly required modification to improve its integrity.
5. Run 11-1/2" OD lead impression block on bottom of 6-1/2" OD drill collars and 3-1/2" OD drill pipe. Pull out of hole.			
6. If required from appearance of lead impression block, run 8-3/4" OD long tapered carboloy junk mill to dress out top of cut-off 9-5/8" OD casing. Alternatively, run 8-3/4" OD rock bit. Run mill or rock bit on bottom of 6-1/2" OD drill collars and 3-1/2" OD drill pipe. Dress out top of cut-off 9-5/8" OD casing and clean out to approximately 75 ft. below top of cut. Pull out of hole.			

*Includes operations 4, 5, and 6.

GRUY FEDERAL, INC.

EXHIBIT C-3 CONTINUED

<u>OPERATION</u>	<u>OPERATIONAL DAYS</u>		<u>REASONS FOR TIME VARIATIONS</u>
	<u>PLANNED</u>	<u>ACTUAL</u>	
7. Go in hole with two joints 11-3/4" OD tooth type carboloy rotary shoe, top bushing, and hydraulic oil jars on bottom of 6-1/2" OD drill collars and 3-1/2" OD drill pipe. Wash over approximately 60 ft. of the 9-5/8" OD casing. Pull out of hole.	1*	1*	
8. Go in hole with hydraulic pressure operated mill dressed to cut 9-5/8" OD casing. Run on bottom of 6-1/2" OD drill collars and 3-1/2" OD drill pipe. Locate first casing collar using minimum pressure/slack-off technique, sliding cutter down hole until cutter knives catch in joint and cutter stops moving downhole. Bleed pressure, drop 5 to 10 ft. below collar and make inside cut. Mill approximately 6" of the 9-5/8" OD casing and dress top smooth for external casing patch. Pull out of hole.			Required slightly longer than anticipated to condition mud.
9. Go in hole with 9-5/8" casing spear, 3' extension, 9-5/8" OD stop sub, lubricated bumper jars, and hydraulic oil jars on bottom of 6-1/2" OD drill collars. Retrieve fish.	1/2	1/2	
10. Go in hole with external casing patch on bottom of 3600 ft. of 9-5/8"OD, 43.5# N80 LT&C casing.	1/2	1/2	
11. Nipple up casing, install blowout preventers and test same to 5000 psi.	1/2	2-1/2	No. 3 engine on drilling rig had to be replaced.

*Includes operations 7 and 8.

<u>OPERATION</u>	<u>OPERATIONAL DAYS</u>		<u>REASONS FOR TIME VARIATIONS</u>
	<u>PLANNED</u>	<u>ACTUAL</u>	
12. Go in hole with drill pipe, drill collars and bit and condition mud to top of cement retainer plug at 16,020 ft. Test casing to equivalent of 17.2 lb/gal mud for 30 minutes. Repair casing, if necessary, by cement squeezing.	2-1/2	7	Existing lime-based mud required excessive treatment time to reduce viscosity, reduce salt water contamination, and increase density.
13. Drill out cement retainer and cement from 16,020 ft. to 16,234 ft. (bottom of 9-5/8" casing). Then continue in hole washing and reaming open hole to a depth of 18,100 ft. Not more than 500-ft. increments of open hole should be made without at least one full circulation of the mud system from the bottom of the hole.	2-1/2	13	Throughout entire open-hole operation, excessive amounts of shale recovered from hole. This resulted in frequent shutdowns to clean shale from entire mud system. Also resulted in frequent need to ream hole (see comments in Chapter 3). Low clutch on rig broke, resulting in fishing job for stuck drill pipe. During short trip from 17,630 ft. well attempted to flow and contaminated mud system, resulting in need to recondition hole.
14. Run the following electric logs in the open hole from 18,100 ft. to 16,234 ft.: Induction electric log Compensated density log Compensated neutron log Sonic log Sidewall cores, if hole conditions permit and if desired.	1	1/2	Went faster than anticipated.
15. Make trip with drill pipe and condition hole to 18,100 ft. and measure out of hole.	1	7-1/2	Excessive shale heaving into hole all way down required many short trips to ream hole and shutdown periods to clean mud system.

<u>OPERATION</u>		<u>OPERATIONAL DAYS</u>		<u>REASONS FOR TIME VARIATIONS</u>
		<u>PLANNED</u>	<u>ACTUAL</u>	
16. Lay down drill pipe. Rig up and run 7" OD casing to 18,100 feet as follows:			1	Planned After laying down all but 240 ft. of drill pipe and drilling assembly, salt water flow occurred at surface, resulting in eventual plugging and abandonment due to collapsed 9-5/8" OD casing starting at 5053 feet. (Note: operations resulting from salt water flow leading to plugging and abandonment explained in Chapter 3.) Total of 35 days required for operations through abandonment of well.
<u>FROM</u>	<u>TO</u>	<u>WT/</u>	<u>TYPE SECT.</u>	
		<u>SIZE</u>	<u>FT. GRADE ENDS LGTH.</u>	
18,100	16,200'	7"	38 P110 F.J. 1900'	
16,200	13,750'	7"	38 P110 LT&C 2450'	
13,750	11,750'	7"	35 P110 LT&C 2000'	
11,720	200'	7"	32 P110 LT&C 11550'	
200	0'	7"	38 P110 LT&C 200'	

Use guide shoe on bottom with float collar two joints above bottom. Also use centralizers on each joint of casing on bottom 600 ft. and one centralizer per 100 ft. to 16,000 ft. Use sufficient cement to fill the annular space to 500 ft. inside the 9-5/8" casing.

- 17. Nipple up 7" casing and put on BOP.
- 18. Pick up 3-1/2" OD 12.7# P105 PH-6 1 Hydril tubing with bit on bottom and go to top of float collar on 7" casing at approximately 18,000 ft. and test casing to 7500 psi surface pressure. If OK, displace mud from hole with 10 lb/gal CaCl₂ water.
- 19. Pull tubing and run gamma ray cement bond log from approximately 18,000 ft. to 16,000 ft. If cement bond not good, proceed to block squeeze to obtain cement bonds, then drill out cement.
- 20. Run production packer on wire line and set same at depth to be determined after perforating interval is selected from the new electric logs.

<u>OPERATION</u>	<u>OPERATIONAL DAYS</u>		<u>REASONS FOR TIME VARIATIONS</u>
	<u>PLANNED</u>	<u>ACTUAL</u>	
21. Make up bottom hole completion equipment shown on the enclosed drawing and go in hole for completion using the 3-1/2" tubing string. Test each joint of tubing going in hole to 7500 psi. Space out in packer and test packer to 6500 psi differential from the bottom and 5000 psi from the top.	2		
22. Set tubing in packer with full tension from pipe weight when locator sub sets on packer top. Remove BOP and install christmas tree. Nipple christmas tree, set retrievable plug in bottom of tree and test same to 10,000 psi and release rig.	1		
23. Move out rig.			
24. Complete moving out rig.	3		
25. Suspend operations while drilling saltwater disposal well.			
26. Resume operations and rig up wireline unit and install high pressure perforating lubricator. Test same to 10,000 psi.		Turnkey	
27. After final selection of perforated interval from new electric logs, go in hole with through-tubing perforating gun (maximum length 46 ft. - 4 shots per ft.) and perforate lowest 46 ft. of selected interval. Note: this perforating will be done with a pressure differential to the well bore; therefore the wellhead pressure should instantly increase substantially when the gun is fired. The wing valves on the tree should be closed before perforating is done.		Turnkey	

<u>OPERATION</u>	<u>OPERATIONAL DAYS</u>		<u>REASONS FOR TIME VARIATIONS</u>
	<u>PLANNED</u>	<u>ACTUAL</u>	
28. Repeat trips with perforating gun until the entire completion interval is shot. Release perforating unit.		Turnkey	
29. Proceed to hook up production unit and place well on test.		27	

EXHIBIT D

COUNTY ST. MARY
 FIELD GARDEN CITY (S. EXT.)
 LOCATION SEC. 2-165-10E
 WELL ALICE C. P. & R. NO. 2
 COMPANY SUN OIL CO.

COMPANY SUN OIL CO.
 WELL ALICE C. P. & R.
 NO. 2
 FIELD GARDEN CITY (S. EXT.)
 LOCATION SEC. 2-165-10E
 COUNTY ST. MARY
 STATE LOUISIANA

Location of Well
 1/4 U.S. 25G.S.
 "FOSTER" 60 S
 64° 10' 4" W
 3705.61' 0' LOC.

SL-C,
 SERIAL
 PERMIT
 Elevation
 or G
 FILING NO.

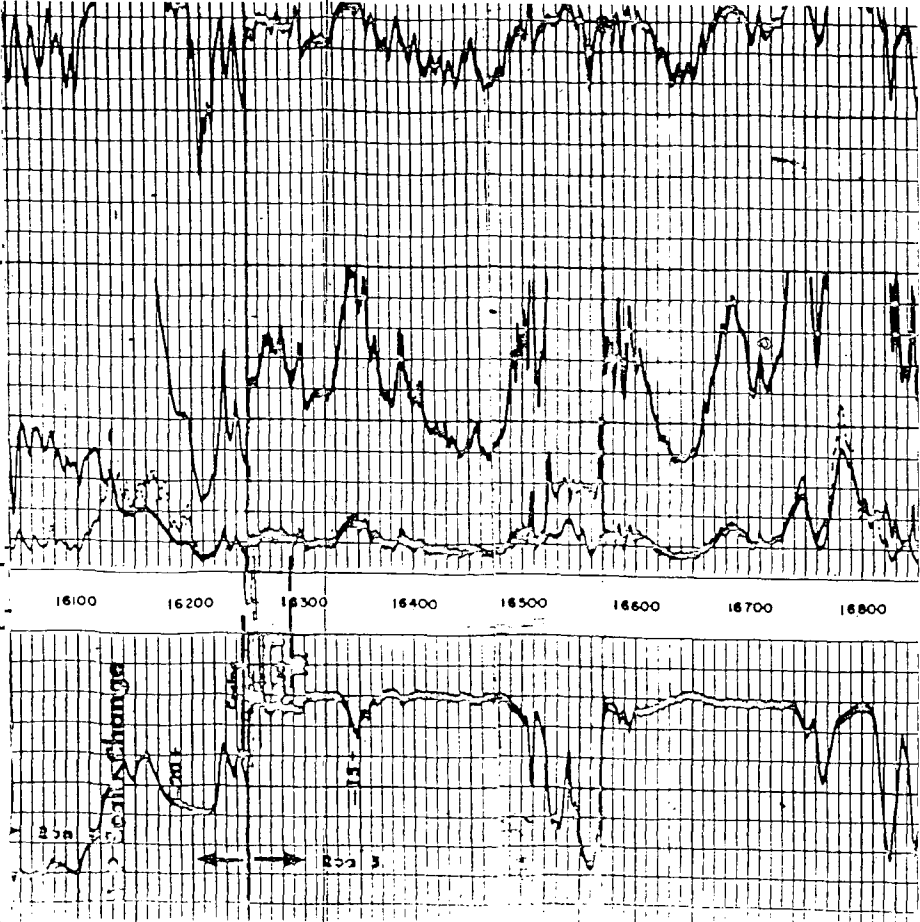
RUN No.	1 (ES)	2 (IES)	3 (IES)	4 (IES)	5 (IES)
Date	10-21-63	11-3-63	11-11-63	11-29-63	12-12-63
First Reading	15404	16004	16288	16920	8012
Last Reading	3546	11700	16004	16246	2220
Feet Measured	11858	4304	284	671	1097
Csg. Schlum.	3546	3546	3546	16246	2246
Csg. Driller	3537	3537	3537	16234	5234
Depth Reached	15406	16005	16289	16921	8013
Bottom Driller	15396	15998	16279	16907	8000
Depth Datum	1' / ROT. = 24.25' / BHT				
Mud Nat.	SPERSENE				
Dens. Visc.	12.3 47	12.81 43.0	12.91 52	16.9 54	20
Mud Resist.	0.69@105"	0.77@93"	0.55@104"	0.72@74"	222
Res. BHT	0.32@224"	0.30@215"	0.25@217"	0.19@277"	1932
Rmf	0.24@224"	0.22@64"	0.46@70"	0.10@277"	1022
Rmc	0.48@224"	2.16@64"	1.14@70"	1.90@277"	3522
pH	9	9.5	9.8	9.0	9.0
Wtr. Loss	0.2 CC 30 min	3.1 CC 30 min	3.1 CC 30 min	1.6 CC 30 min	0.8 CC 30 min
Bit Size	12-1/4"	12-1/4"	12-1/4"	8-3/8"	8-3/8"
Spags. - AM	16"	16"	16"	16"	16"
MN	64"	34-1/2"	34-1/2"	34-1/2"	14-1/2"
IND.	18-8"	6FF40	6FF40	6FF40	32FF40
Opr. Rig Time	3 HRS.	3 HRS.	2 1/2 HRS.	3 HRS.	3 1/2 HRS.
Truck No.	3710-MC	3709-MC	3711-MC	3709-MC	3011-MC
Recorded By	HARIDEGE	VAN SUFFLEN	LOYD	ROLL	WESSEL
Witness	WESSEL	WESSEL	LANRY	WESSEL	WESSEL

RUN No.	6 (IES)	7 (IES)
Date	12-19-63	12-28-63
First Reading	18494	19009
Last Reading	18012	18494
Feet Measured	482	515
Csg. Schlum.	16246	16246
Csg. Driller	16234	16234
Depth Reached	18495	19010
Bottom Driller	18500	19000
Depth Datum	1' / ROT. = 24.25' / BHT	
Mud Nat.	SPERSENE	SP-20
Dens. Visc.	16.9 60	17.2 65
Mud Resist.	0.76@90"	0.63@93"
Res. BHT	0.24@284"	0.21@290"
Rmf	0.18@284"	0.16@290"
Rmc	0.36@284"	0.32@290"
pH	9.5	9.8
Wtr. Loss	1.6 CC 30 min	1.6 CC 30 min
Bit Size	8-3/8"	8-3/8"
Spags. - AM	16"	16"
MN	34-1/2"	34-1/2"
IND.	6FF40	6FF40
Opr. Rig Time	3 1/2 HRS.	3 HRS.
Truck No.	3711-MC	3711-MC
Recorded By	YELVERTON	YELVERTON
Witness	LANRY	WESSEL

REMARKS: RUNS 3 WAS REUN - TIME OF RUN 5 - SP SCALE CHANGE 3 1-923

Cartridge No. 1 (ES) 2 (IES) 3 (IES) 4 (IES) 5 (IES) 6 (IES) 7 (IES)
 Panel No. 2-28 2-28 2-28 2-28 2-28 2-28 2-28
 Sonda No. 4-186 4-186 4-186 4-186 4-186 4-186 4-186
 LAP 0-331 0-331 0-331 0-331 0-331 0-331 0-331
 SR 0-3 0-3 0-3 0-3 0-3 0-3 0-3

CONDUCTIVITY millimhos/m = ohms. ¹⁰⁰	INDUCTION 18" LATERAL HIGH SCALE
RESISTIVITY ohms. m ² /m	16" NORMAL HIGH SCALE INDUCTION 6" NORMAL HIGH SCALE AMP. 16" NORMAL 2
DEPTHS	
SPONTANEOUS-POTENTIAL millivolts	20 + - 1



CONTINUED



CONDUCTIVITY millimhos/m = ohms. ¹⁰⁰	40" INDUCTION 10 4000 100 8000 400
RESISTIVITY ohms. m ² /m	16" NORMAL HIGH SCALE 40" INDUCTION HIGH SCALE AMP. 16" NORMAL 2
DEPTHS	
SPONTANEOUS-POTENTIAL millivolts	15 + - 1

COMPANY SUN OIL CO.
 WELL ALICE C. P. & R. NO. 2
 FIELD GARDEN CITY (S. EXT.)
 COUNTY ST. MARY STATE LOUISIANA

SWSC FR 15009
 SWSC ID 19010
 DRIR TD 19000
 Elev. KB NA
 DF MA
 GL MA

SUN OIL COMPANY
ALICE C. P. & R., #2
Garden City Field, St. Mary Parish, La.

SIDEWALL SAMPLES

- 11716' Rec. 1". No show. Firm, fine grain, silty, very limy sand.
11871' Rec. 1 1/2". No show. Firm, fine grain silty sand.
12737' Rec. 3/4". No show. Slightly sandy limy shale.
12916' Rec. 3/4". No show. Firm fine grain silty sand with shale laminations.
13129' Rec. fragments. No show. Firm fine grain, silty shaly limy sand.
13483' Rec. 1/2". No show. Firm fine grain, silty limy sand.
13514' Empty and damaged.
13614' Rec. 1/2". No odor. No cut. Pale blue fluorescence. Firm fine grain, silty sand.
13817' Rec. 1 1/2". No show. Slightly sandy shale.
13958' Rec. 1/2". No odor. No cut. Pale blue fluorescence. Firm fine grain, silty sand.
13999' Rec. 1". No show. Firm fine grain, silty shaly limy sand.
14008' Rec. 1/2". No show. Firm fine grain, silty limy sand.
14433' Rec. fragments. No show. Firm fine grain, silty sand with shale laminations.
14441' Rec. 1/2". No odr. Faint straw cut. Spotted gold fluorescence. Firm fine grain, silty shaly sand.
14645' Empty.
14730' Rec. fragments. No odor. Faint cut. Mineral fluorescece. Fine grained, firm, very silty, limy sand.
14874' Empty.
15080' Rec. 1". No odor. No cut. Pale blue fluorescence. Firm fine grain, silty shaly sand.
15091' Rec. 1/2". No odor. No cut. Pale blue fluorescence. Firm fine grain, silty, slightly limy sand.
15229' Empty.
15707' Empty.
15789' Empty.
15904' Empty.
15986' Rec. 1/2". No show. Firm fine grain, silty, slightly shaly sand.
16346' Lost bullet.
16356' Rec. 1". Shale.
16507' Rec. 3". Sand, fine grain, slightly shaly, no odor. Faint core fluorescence.
16585' Lost bullet.
16750' Rec. 3". Fine grain sand, shaly and limy. No odor. Faint core fluorescence.
16764' Rec. .5". Fine grain sand, shaly and limy. No odor. Faint core fluorescence.
16823' Rec. .8". Perm 8.6 MD, Por. 19.4%, 2% oil; 1% pore space. 78.4% water in pore space. Same lithology at 16,750'. 4% gas.
16919' Lost bullet.
16975' Rec. 15". Fine grain, silty sand. No odor. Faint core fluorescence.
17110' Rec. .5". Fine grain sand and laminated shale. No odor. Faint streaked core fluorescence.
17128' Rec. .5". Perm 18.5 MD; Por 23.3%; 2% oil; .9% pore space. Water 70.8%. Probable condensate as production. Fine grain silty sand. 6.6% gas by vol. No odor. Faint core fluorescence.
17270' Rec. trace. Very fine grain silty sand. No odor. Dull gold core fluorescence.
17296' No recovery.
17331' Rec. 1". Very fine grain, sand and shaly. 3/4" of sample is mud cake. No odor. No core fluorescence.
17354' No rec.
17506' Rec. .3". Very fine grain sand and slightly shaly. No odor. Very faint core fluorescence.
17544' Rec. .3". Very fine grain sand and slightly shaly and silty. No odor. Very faint core fluorescence.
17555' Rec. trace. Very fine grain sand and slightly shaly and silty. No odor. Very faint core fluorescence.
17681', 17714', 17989' - No recovery.



MW
JH
DL → Bill D.
F

Department of Energy
Nevada Operations Office
P. O. Box 14100
Las Vegas, NV 89114

JUL 24 1978

JUL 20 1978

Dr. Alan Lohse
H. J. Gruy & Associates
2500 Tanglewilde, Suite 150
Houston, TX

Dear Dr. Lohse:

CORING - FLUID INJECTION WELL - ALICE C. PLANTATION REENTRY PROJECT
CONTRACT EG-77-C-08-1528

Reference is made to our recent telephone conversations regarding the coring of the fluid injection well at the Alice C. Plantation geopressure well site in St. Mary Parish, LA.

You are hereby authorized to cut a ± four (4) inch core in what you consider to be the center of the injection zone. We understand that approximately ten (10) feet of such core is estimated to cost between \$5,000 and \$10,000.

The core should be treated for preservation, boxed, and maintained at the well site until final disposition.

?

Sincerely,

Ronald T. Stearns
Ronald T. Stearns
NV Project Manager
Geopressure Wells of Opportunity

E&EAD:RTS-1028

cc: B. DiBona, DGE, HQ
K. Westhusing, DGE, HQ

GRUY FEDERAL, INC.

CONSULTANTS IN ENERGY SYSTEMS

2500 TANGLEWILDE, SUITE 150
HOUSTON, TEXAS 77063
713/785-9200

1911 JEFFERSON DAVIS HWY., SUITE 500
ARLINGTON, VIRGINIA 22202
703/920-0113

Mr. Ronald T. Stearns
Engineering & Construction Division
DOE/Nevada Operations Office
P. O. Box 14100
Las Vegas, Nevada 89114

Re: Contract EG-77-C-08-1528
Your Letter of 11/1/78 Re Temporary
Cessation Reentry Operations on the
Gladys McCall No. 1 Well

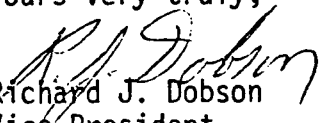
Dear Mr. Stearns:

Following this letter we submit by telecopier the detailed safety and operational procedure as given to you by Mr. Tom Roy in our joint meeting in Las Vegas November 2. We understand that upon receipt of this information you will release us to reenter the Gladys McCall well. The drilling contractor will have completed rigging up operations and be ready to reenter the well Thursday or Friday, November 9 or 10.

At this time, we would like to propose, for your consideration, a variation in Mr. Roy's procedure, as follows:

Gruy Federal, Inc. has proposed no further use of third party drilling consultants. However, we are experiencing extreme difficulty finding on short notice qualified employees of the standards we are willing to accept. Therefore, we suggest the use of properly screened consultants, under the conditions the Gruy Federal people, having the qualifications described in Mr. Roy's letter, be present at all times while such consultants are on location. In other words, we will have two levels of supervision at the well site, one level of which may be a well qualified and carefully screened consultant. I bring this up for your consideration and will be talking to you about it by telephone. I think this departure is necessary until more senior people can be located and employed. Otherwise, we will be seriously hampered by the loss of services of Mr. Roy or Mr. Willits in the Houston Office.

Yours very truly,


Richard J. Dobson
Vice President
Operations

RJD:cas

GRUY FEDERAL, INC.

CONSULTANTS IN ENERGY SYSTEMS

2500 TANGLEWILDE, SUITE 150
HOUSTON, TEXAS 77063
713/785-9200

November 7, 1978

1911 JEFFERSON DAVIS HWY., SUITE 500
ARLINGTON, VIRGINIA 22202
703/920-0113

Mr. Ronald T. Stearns
Engineering & Construction Div.
DOE/Nevada Operations Office
Post Office Box 14100
Las Vegas, Nevada 89114

Re: Gladys McCall No. 1
Field Operations Supervision
and Field Policy

Dear Mr. Stearns:

We submit the following procedures and standards which have been put into effect and which are a part of Gruy Federal policy.

- 1) Provide supervisors who are certified through approved USGS or other training schools utilizing "hands on" type of instruction.
- 2) Employ only supervisors who have a minimum of five years actual "on site" well supervision, including pressure control, combatting loss of returns, handling of bottom hole assemblies and all downhole drill pipe operations.
- 3) Supervisors will initiate and continually maintain an "on site" training program, particularly in matters relating to blow-out prevention. The use of the words "Early Recognition" will be keys to this training.
- 4) Well supervisors will work a 12-hour shift and rest 12-hours when relieved by a certificated supervisor. This plan will be followed for a maximum of seven days, when relief will be provided.
- 5) The tour supervision will be supported by a field superintendent, with an engineering degree and with heavy experience in actual operations. The field superintendent will be located on the well-site, with full authority and responsibility at that point. It is not expected that the field superintendent will handle the day-by-day operations, as that part of the operation will be conducted by the supervisors.

GRUY FEDERAL, INC.

Mr. Ronald T. Stearns
November 7, 1978
Page Two of Three

- 6) The field superintendent will be closely supported by the Manager of Drilling, Houston based, with frequent trips to location continually, and on-site immediately when necessary.
- 7) Frequent reports, both written and verbal, will be provided from the field to Houston for dissemination.

Gruy Federal policy in the matter of prudent reentry operations will be as follows:

- 1) Drill pipe will be provided with one pipe protector every other joint.
- 2) A "drill pipe float" back pressure valve will be installed in the bit sub and kept in the string on a continuous basis.
- 3) Hole reentry will be on a slow basis not to exceed a maximum of ten joints of drill pipe before circulating. Should the pipe take weight at any time, the hole will be circulated at that point. Should it be necessary, one joint will be washed and rotated down at a time.
- 4) While tripping, each stand will be pulled from the hole in a reasonably slow time. Each time will never be less than a minute per stand.
- 5) The pump pressure and pump strokes will be monitored closely while washing down.
- 6) Supervisors, in company with the mud engineers, will calculate the required hole "fill-up" per five stands of drill pipe, taking care to insure the hole is taking the required volume by utilizing the trip tank. Should the trip tank become inoperative temporarily, then hole fill-up will be measured by use of pump stroke counters. Care will be taken to determine precise displacement volume of drill pipe and drill collars.

Note: Hole to be filled on each stand of drill collars pulled.

- 7) The twelve hour tours of each supervisor will be spent on the drill floor, mud pits or areas closely adjacent thereto.


GRUY FEDERAL, INC.

Mr. Ronald T. Stearns
 November 7, 1978
 Page Three of Three

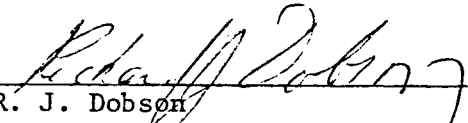
The following automatic signalling, recording and auxiliary drill pipe equipment will be installed.

- 1) Portable gas detector strip with recorders and alarms on rig and in living quarters.
- 2) De-gasser (installed on No. 2 mud pit).
- 3) Flow line monitor with alarms on drill floor and living quarters. Recorders will also be located at both positions.
- 4) Mud pit volume totalizers (PVT) will be installed in each pit with recorders and alarms located on drill floor and in living quarters.
- 5) Bulk barite hoppers (2 @ 10005x each capacity).
- 6) Upper and lower kelly cocks with closing wrenches.
- 7) Full opening TIW or Hydril safety valve with closing wrench located on drill floor.
- 8) Gray Inside blow-out preventer located on drill floor.
- 9) Geograph-type drilling recorder with four or more pens to provide continuous progress reports.
- 10) TI-59 programmable calculator with "chip" containing BOP programs.
- 11) Land telephone service.
- 12) Twenty-four hour mud engineering service (2 men working 12-hrs.each).

Further details provided on the following Addendum to the Gladys McCall Prognosis.



 Tom Roy
 Manager Drilling & Resource Evaluation



 R. J. Dobson
 Vice President Operations

TR:RJD:paw



Department of Energy
Nevada Operations Office
P.O. Box 14100
Las Vegas, NV 89114

NOV 15 1978

NOV 9 1978

Dr. Alan Lohse
H. J. Gruy & Associates
2500 Tanglewilde
Suite 150
Houston, TX 77063

Dear Dr. Lohse:

APPROVAL TO BEGIN FIELD OPERATIONS AT THE GLADYS MCCALL NO. 1 WELL
CONTRACT EG-77-C-08-1528

Reference is made to discussions held at the Nevada Operations Office on November 2, 1978, and your letters of November 7, 1978, regarding supervision and operational safeguards while reentering and testing the subject geopressured well.

Pursuant to our conversation of November 8, 1978, approval is hereby granted to resume reentry operations at the Gladys McCall well provided the plan is implemented, as stated, and the introductory paragraph on page three of your plan is amended to read as follows:

"The following automatic signaling recording and auxiliary drill pipe equipment will be installed, tested, monitored continually and repairs called for immediately upon malfunction."

DOE Program Management also concurs with your decision, under the circumstances, to use properly screened consultants to monitor reentry operations supervised by Gruy personnel. We understand that Gruy personnel will be on site on a 24-hour-a-day basis (12 hours working - 12 hours on call). We will also require the work resumes of Messers. Fontenot and Matula.

Please advise this office of any changes in personnel presently assigned to this project.

Sincerely,

R. T. Stearns
NV Project Manager
Geopressure Program

E&EAD:RTS-58

CONTRACT AND AGREEMENT

THIS AGREEMENT is made and entered into this 1st day of June, 1978, by and between FAIRFAX FOSTER, hereinafter referred to as "GRANTOR" and GRUY FEDERAL, INC., a Texas corporation authorized to do and doing business in the State of Louisiana, hereinafter referred to as "GRUY"

W I T N E S S E T H:

GRANTOR, for and in consideration of Five Thousand & No/100 (\$5,000.00) DOLLARS, cash, paid by GRUY to GRANTOR, the receipt and adequacy of which are hereby acknowledged, and the conditional obligation to pay the further sum of Twenty-Five Thousand & No/100 (\$25,000.00) DOLLARS, under the conditions hereinafter set out, and in consideration of the covenants and agreements hereinafter set forth, GRANTOR grants unto GRUY the right to enter upon GRANTOR'S following described property, to-wit:

A tract of land containing six (6) acres, forming a square, with side lines running East and West, and North and South, the center of which shall be the Sun #2 "Dry Hole" situated in Section 1, T-16-S, R-10-E, St. Mary Parish, Louisiana,

and there to conduct appropriate tests to determine the energy potential of any geopressed-geothermal aquifers located within said well, all on the following terms and conditions.

TERMS AND CONDITIONS

1. GRUY shall have the right of ingress and egress across GRANTOR'S lands intervening between the above site and La. State Rt. 87, for the passage of personnel, vehicles and equipment, but in exercising said right GRUY shall take care so as to do minimum damage to the land and to the crops growing thereon, and it shall not, in any event, obstruct drainage. Upon termination of this agreement, the surface of said land affected by the right of ingress and egress shall be returned in the same condition as it now exists and, further, GRUY shall pay JOEL F. LUKE, et al, for any and all damages to growing crops. In exercising this right, GRUY shall use a route which is the most direct available and which shall result in minimum damage to land and crops as possible, using such existing roads as may be available. GRUY agrees, so long as

it exercises the rights granted hereunder, to maintain and repair any existing roads or bridges located upon the property of Grantor and leading to the aforesaid premises and used by GRUY; provided that GRUY shall repair all roads and bridges located upon the property of GRANTOR which may become worn, damaged or destroyed by GRUY in exercising ~~its right of ingress and egress to and from~~ the premises. The right of ingress and egress shall be a reasonable use and shall not be exclusive, GRANTOR having the right, along with her agents, employees, assigns, licensees, or other persons permitted by her to traverse and use such roads as may be upon the property of GRANTOR.

2. GRUY shall have the right to use the surface of the premises as well as the bore hole of the Sun #2 Dry Hole to test the energy potential of any geopressured-geothermal aquifers located therein, using such conventional oil field drilling rigs, equipment, methods and techniques GRUY may deem suitable, with the right to re-enter, re-drill, deepen and test said Test Well with free use of any existing pipe, casing, tubing, liners and equipment located therein and thereon, to add to, reset, remove, replace or modify any or all of such pipe, casing, tubing, liners and equipment, and for testing purposes to produce, test, store, utilize, process, convert, treat and dispose of all or any part of such Test Well's effluence of extractable minerals, gases, hot springs, hot water, hot brines and salt water, thermal energy, geothermal water and/or steam resulting from or created by or extracted from the natural heat of the earth or the heat below the surface of the earth or due to magmatic differentiation, in whatever form such heat or energy occurs from the rocks, fluids, rock-fluid systems and energy in the aquifers, and all purposes incident thereto, such as erecting buildings, tanks, dams, gas lines, water lines, pipe lines, booster stations, and such other buildings or structures as may be necessary for Lessee to properly and efficiently engage in such operations.

3. This permit shall be for a term of nine (9) months from the date hereof, and so long thereafter as operations are being conducted in the Test Well, but not to exceed a total period of one (1) year from the date hereof, after which all rights, of GRUY in the premises shall cease.

4. Lessee agrees to maintain the Leased Premises and any improvements thereon in ~~good clean condition~~ at all times and to permit no waste or injury to said premises or the property adjacent thereto. Upon the termination of this lease, Lessee agrees to clean up and restore said premises to as near its present condition as is practicable, smoothing and leveling the surface, and removing therefrom all trash and debris. All structures or improvements placed on the premises by GRUY shall be removed therefrom within Sixty (60) days. The Test Well shall be plugged and abandoned in such a manner as to satisfy the requirements of the Louisiana Department of Conservation.

5. In the event there is an increase in the ad valorem taxes of the land due to erection of improvements on said land, Lessee shall be obligated to reimburse Lessor for any such taxes. Further, if any improvements erected by Lessee on said land are taxed separate and apart from the land, Lessee agrees and obligates itself to pay said ad valorem taxes.

6. GRUY acknowledges that it has examined the premises, and that it is familiar therewith, and GRUY assumes responsibility for the condition of the premises during the term of this contract and all liability for damage to person or property of itself, its agents or employees or third persons going on or being upon the premises during the term of this agreement and will indemnify and hold GRANTOR harmless from any and all claims or demands, including court costs and attorney's fees, of whatsoever nature or kind

for loss or damage to person or property of itself, its agents, employees or third persons, wherever situated, arising out of the condition of the premises or any work or construction undertaken or done by GRUY or out of or in anywise connected with the use of or operations on the premises by GRUY, even though caused, occasioned or contributed to by the negligence, either sole or concurrent, of GRANTOR, her agents or employees.

7. This grant is made without warranty and expressly subject to any and all rights in any third party, whomsoever.

8. The rights herein granted to GRUY may not be assigned either in whole or in part.

9. GRANTOR at all times shall be entitled to examine and to receive copies of any and all information and reports relative to GRUY'S testing activities on the premises, including, but not limited to, seismic reports, geological reports and geophysical reports.

10. Lessee shall own no interest in any oil, gas or other substance produced from the Test Well and shall not be obligated to account for or pay any royalty with respect thereto. GRUY shall drill a salt water disposal well on the leased premises and inject such substances therein below any fresh water sands, and shall take care not to harm the surface and subsurface lands of Lessor; all subject to the rules and regulations of the Louisiana Department of Conservation.

11. The conditional obligation of GRUY to pay the sum of \$25,000.00, cash, is that prior to GRUY'S entry upon the premises and prior to its exercise of any rights or privileges herein granted, it shall pay said sum to GRANTOR, her heirs or assigns, in cash.

IN WITNESS WHEREOF, this instrument is executed as of the day first above written.

WITNESSES:

Cynthia B. Gullotta
Michael B. Bonnellani
Cynthia B. Gullotta
Michael B. Bonnellani

Fairfax Foster
FAIRFAX FOSTER, GRANTOR

GRUY FEDERAL, INC.

BY: Mark A. King

STATE OF LOUISIANA

PARISH OF ST. MARY

ON THIS 1st day of June, 1978, before me personally came and appeared FAIRFAX FOSTER, to me known to be the person described in and who executed the foregoing instrument and acknowledged to me that she executed the same as her free act and deed.


NOTARY PUBLIC

STATE OF LOUISIANA

PARISH OF ST. MARY

ON THIS 1st day of June, 1978, before me appeared Frank A. Scruggs, to me personally known, who, being by me duly sworn, did say that he is the Agent of GRUY FEDERAL, INC. and that said instrument was signed in behalf of said corporation by authority of its Board of Directors and said Frank A. Scruggs acknowledged said instrument to be the free act and deed of said corporation.


NOTARY PUBLIC


CABOT CORPORATION P. O. BOX 1101, PAMPA, TEXAS 79065

CABLE ADDRESS "CABLAK" PAMPA
 PHONE 669 - 2581 (AREA CODE 806)

June 20, 1978

Gruy Federal Incorporated
 2500 Tanglewilde
 Suite 150
 Houston, Texas 77063

Re: Use of Road at Cabot's
 Canal Plant, Franklin,
 Louisiana

Gentlemen:

Upon your acceptance hereof as provided below, this letter will constitute an agreement between us as follows:

1. Cabot does hereby grant and lease to Gruy the right and privilege to use a section of its road over and across a part of its Canal Carbon Black Plant site located in St. Mary Parish, Louisiana, with the right of ingress and egress over such road and the right to make the necessary construction to provide you with ingress and egress to the abandoned well located approximately 200 feet from the northern most corner of Cabot's Plant.

2. In consideration therefore, Gruy will pay Cabot the sum of Fifty and No/100 Dollars (\$50.00) per day for a period of ninety (90) days for the use of such road, however, in the event that Gruy requires the use of such road beyond such ninety-day (90-day) period, Gruy will pay Cabot Fifty and No/100 Dollars (\$50.00) per day for as long as such road is used by Gruy. This agreement will terminate upon your informing Cabot that you will no longer have use of such road and the restoration of the premises as herein provided.

3. Gruy will, at its sole cost and expense, indemnify and hold Cabot harmless against any and all claims for damages to property or for injury to or death of any person caused by or arising out of its use of said roadway or construction on the land over which such roadway extends.

4. In the event that such road across Cabot's property is in any way damaged by Gruy, you will at your sole cost and expense, repair all damages to such road immediately after such damages occur.

5. You agree that you will at the end of the term hereof make all necessary repairs to the premises in order to restore them to the same condition and state of repair as the same are in prior to the execution of this agreement.

6. You agree that before moving any heavy equipment over such road you will contact Cabot's Plant Manager in advance in order to avoid any conflict as to use of the road so that our efforts may be coordinated.

7. You agree that the rights hereunder shall not be assigned in whole or in part without the written consent of Cabot.

If the above is in accordance with your understanding of our agreement, please affix the appropriate signature in the space provided below and return two (2) completely executed copies to Cabot.

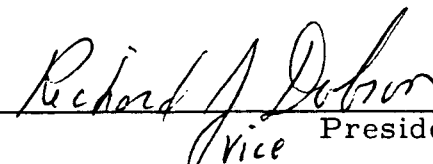
Very truly yours,

CABOT CORPORATION

By: 
Attorney in Fact 

AGREED AND ACCEPTED this
23 day of June, 1978.

GRUY FEDERAL INCORPORATED

By: 
Vice President

LHW:JEJ:jd

NUMBER 3017-15

DATE June 26, 1978

TO: Ashy-Hutchison Enterprises, Inc.
P. O. Drawer 52746, O.C.S.
Lafayette, Louisiana 70505

SHIP TO: _____

ATTN: Bert Doise

DELIVERED BY: Work to Start 6-26-78 and
be completed by 7/15/78

GENTLEMEN: Subject to Gruy Federal, Inc. general provisions, attached hereto and by this reference made a part hereof, enter our order for the following:

EM NO.	DESCRIPTION	QTY.	UNIT	UNIT PRICE	TOTAL
	Ashy-Hutchison is to furnish the material and personnel to prepare the Site work for the Alice C Plantation, Re-entry. The listed items are estimates.				
	Construction:				
	Clearing of Land	0.5	Acre .	500.00	250.0
	Construct Pollution Levee	800	Lin. ft.	.60	480.0
	Metal Culvert Installed, 12" Dia.	80	Lin. ft.	6.50	520.0
	Rental Items on 6 mi., Plastic:				
	3-Ply Road	85	Lin. ft.	10.68	907.8
	3-Ply Wing, 70'x70'	4900	Sq. ft.	.99	4,851.0
	4-Ply Turnaround, 200'x 200'	40000	Sq. ft.	1.32	52,800.0
	Rig-up Lumber (1.4 MBF/Bundle)	14	M. B. F.	100.00	1,400.0
	Shell for Patch Work, Installed	48	Cu. Yd.	12.50	600.0
	or				
	Limestone for Patch Work, Installed	40	Ton	14.50	580.0
	TOTAL AMOUNT SHALL NOT EXCEED				\$61,810.0
	Above rental is for 90 days with Vendor suppling normal maintenance. After 90 days rate on rental lumber shall be at		M. B. F.	38.50	
	Additional Provision S.C.A. "Service Contract Act", is attached hereto and made a part hereof.				

F.O.B. Delivered & Installed TERMS: Net 30 days

[If F.O.B. shipping point--please prepay and add to invoice, include copy of freight bill]

Items above are for use under UNITED STATES GOVERNMENT CONTRACT NO. EG-77-C-08-1528
 and may be exempt from certain taxes; General Provision No. 28 (Taxes)

Show order number on all packing slips, invoices and correspondence pertaining to this order.

ACKNOWLEDGEMENT COPY SIGN & RETURN

FOR: ASHY-HUTCHISON ENTERPRISES, INC.

GRUY FEDERAL, INC.
 By Robert L. Nyland
 Purchasing Manager

NUMBER 3017-15 Change No. 1

DATE August 29, 1978

Ashy-Hutchison Enterprises, Inc.

SHIP TO: -----

P. O. Drawer 52746, O.C.S.

Lafayette, LA 70505

ATTN: Mr. Bert Doise

DELIVERED BY: Confirmation

GENTLEMEN: Subject to Gruy Federal, Inc. general provisions, attached hereto and by this reference made a part hereof, enter our order for the following:

ITEM NO.	DESCRIPTION	QTY.	UNIT	UNIT PRICE	TOTAL
7.	Change item 7 to read as follows: Rig-Up lumber	25.2	M.B.F.	@\$100.00	\$2,520.00
	The new total not to exceed is				\$62,930.00

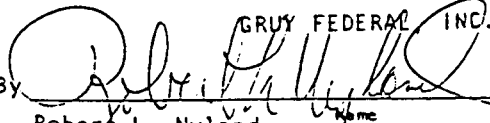
F.O.B. Delivered TERMS: Net 30 days

[If F.O.B. shipping point--please prepay and add to invoice, include copy of freight bill]

Items above are for use under UNITED STATES GOVERNMENT CONTRACT NO. EG-77-C-08-1528 and may be exempt from certain taxes; General Provision No. 28 (Taxes)

Show order number on all packing slips, invoices and correspondence pertaining to this order.

GRUY FEDERAL INC.

By 
 Robert L. Nyland
 Purchasing Manager

Title _____

NUMBER 3017-15 Change No. 2

DATE August 29, 1978

Ashy-Hutchison Enterprises, Inc.

SHIP TO: -----

P. O. Drawer 52746, O.C.S.

Alice C Plantation

Lafayette, LA 70505

ATTN: Bert Doise
318-457-2294

DELIVERED BY: -----

GENTLEMEN: Subject to Gruy Federal, Inc. general provisions, attached hereto and by this reference made a part hereof, enter our order for the following:

EH NO.	DESCRIPTION	QTY.	UNIT	UNIT PRICE	TOTAL
8.	Additional board rental for period 6 Oct. 78, through 6 Nov. 78.	1	mo.		
		430,960	B.F.	38.50/MBF	\$16,591.96
	NEW TOTAL FOR ORDER			\$79,524.96	

F.O.B. ----- TERMS: Net 30

[If F.O.B. shipping point--please prepay and add to invoice, include copy of freight bill]

Items above are for use under UNITED STATES GOVERNMENT CONTRACT NO. EG-77-C-08-1528 and may be exempt from certain taxes; General Provision No. 28 (Taxes)

order number on all packing slips, invoices and correspondence pertaining to this order.

GRUY FEDERAL INC.
By Robert L. Nyland
Robert L. Nyland
Purchasing Manager

THIS AGREEMENT, made and entered into on the date hereinafter set forth by and between the parties herein designated as "Operator" and "Contractor":

OPERATOR: Gruy Federal, Inc.
 Address: 2500 Tanglewilde, Suite 150
Houston, Texas 77063
 CONTRACTOR: Progress Drilling, Inc.
 Address: 4635 Southwest Freeway, Suite 620W
Houston, Texas 77027

IN CONSIDERATION of the mutual promises, conditions and agreements herein contained and the specifications and special provisions set forth in Exhibit "A" and Exhibit "B" attached hereto and made a part hereof, Operator engages Contractor as an Independent Contractor to furnish the equipment and labor to re-enter the hereinafter designated well or wells on a daywork basis.

Contractor agrees to furnish equipment meeting the specifications designated herein, and capable of drilling to the depth indicated herein, including equipment capable of drilling in the water depths herein indicated if this Contract involves a marine operation. Contractor further agrees, subject to all other applicable clauses of this Contract, to provide any and all services required according to the specifications stated herein. It is expressly understood and agreed to by Operator and Contractor that such services are performed at the appropriate daywork rate, and the performance of such services by Contractor in no way subjects him to liability for any risk not elsewhere assumed by him under the terms of this Contract. Contractor agrees to perform all work to be conducted by him under the terms of this Contract in accordance with the orders and directions of Operator, with due diligence and care in a good and workmanlike manner, and agrees to provide competent supervision of the work performed hereunder.

1. LOCATION OF WELL:

Well Name
 and Number: As directed by Operator
 Parish: Cameron State: Southern Louisiana Field Name: NA
 Well location and
 land description: As directed by Operator
 1.1 Additional Well Locations or Areas: As may be directed by Operator

Locations described above are for well and contract identification only and Contractor assumes no liability whatsoever for a proper survey or location stake on Operator's lease.

2. COMMENCEMENT DATE:

Contractor agrees to use best efforts to commence operations for the drilling of well by the ----- day of -----, 19----, or upon completion of a well in Allen Parish, Louisiana, estimated to be July 1, 1978.

3. DEPTH:

3.1 Well Depth: The well(s) shall be reentered to depth of not to exceed 20,000 feet, or to lesser depth as directed by Operator.

4. DAYWORK RATES:

Contractor shall be paid at the following rates for the work performed hereunder:
 4.1 Mobilization: Operator shall pay for trucks, cranes and dozers and a mobilization day rate of \$5,400.00 per 24 hour day. This sum shall be due and payable in full at the time the rig is rigged up or positioned at the well site ready to spud. Mobilization shall include: Move in and rig up (ready to reenter existing abandoned hole(s))

4.2 Demobilization: Operator shall pay trucks and cranes and a demobilization day rate during tear down of \$5,400.00 per 24 hour day, provided however that no

demobilization fee shall be payable if the contract is terminated due to the total loss or destruction of the rig. Demobilization shall include: Rig down (ready to load on trucks) See 7.1 Exhibit "A"

4.3 Moving Rate: During the time the rig is in transit to or from a drill site, or between drill sites, commencing on load out day, Operator shall pay Contractor a sum of \$5,400.00 per twenty-four (24) hour day.

4.4 Operating Day Rate: For work performed per twenty-four (24) hour day with 5 man crew the operating day rate shall be:

Depth Intervals		Without Drill Pipe		With Drill Pipe	
From	To				
<u>0</u>	<u>Total Depth</u>	\$ <u>6,000.00</u>	per day	\$ <u>N/A</u>	per day
		\$ _____	per day	\$ _____	per day
		\$ _____	per day	\$ _____	per day

Using Operator's drill pipe \$ 6,000.00 per day

If under the above column "With Drill Pipe" no day rates are specified, the day-work rate per twenty-four hour day when drill pipe is in use shall be the applicable daywork rate specified in the column "Without Drill Pipe" plus compensation for any drill pipe actually used at the rates specified below, computed on the basis of the maximum drill pipe in use at any time during each twenty-four hour day.

DRILL PIPE RATES PER 24-HOUR DAY

Straight Hole	Size Grade	Directional or		Size Grade
		Uncontrollable	Deviated Hole	
\$ <u>N/A</u>	per ft. <u>N/A</u>	\$ <u>N/A</u>	per ft. <u>N/A</u>	\$ <u>N/A</u>
\$ _____	per ft. _____	\$ _____	per ft. _____	\$ _____
\$ _____	per ft. _____	\$ _____	per ft. _____	\$ _____

Drill pipe shall be considered in use not only when in actual use but also while it is being picked up or laid down. When drill pipe is standing in the derrick, it shall not be considered in use, provided, however, that if Contractor furnishes special strings of drill pipe, drill collar, and handling tools as provided for in Exhibit "A", the same shall be considered in use at all times when on location or until released by Operator. In no event shall fractions of an hour be considered in computing the amount of time drill pipe is in use but such time shall be computed to the nearest hour, with thirty minutes or more being considered a full hour and less than thirty minutes not to be counted.

Operating rate will begin when the drilling unit is rigged up at the drilling location, or positioned over the location during marine work, and ready to commence operations; and will cease when the rig is ready to be moved off the location.

4.5 Repair Rate: In the event it is necessary to shut down Contractor's rig for repairs, excluding routine rig servicing, while Contractor is performing daywork hereunder, Contractor shall be allowed compensation at the applicable daywork rate for each period of shutdown time up to a maximum of 6 hours for any one repair job and a total of 36 hours for each thirty (30) day period. Thereafter, Contractor shall be compensated at a rate of \$0 per twenty-four (24) hour day. Rig service, cut drill line, pack swivel, replace pump expendables and Operator's equipment shall not be included in computing the number of hours of shutdown time.

4.6 Standby Time Rate with Crews: \$5,400.00 per twenty-four (24) hour day. Standby time shall be defined to include time when the rig is shut down although in readiness to begin or resume operations but Contractor is waiting on orders of Operator or on materials, services or other items to be furnished by Operator.

4.7 Force Majeure Rate: \$3200.00 per twenty-four (24) hour day for any continuous period that normal operations are suspended or cannot be carried on due to conditions of force majeure as defined in Paragraph 16 hereof. It is, however, understood that Operator can release the rig in accordance with Operator's right to direct stoppage of the work, effective when conditions will permit the rig to be moved from the location.

4.8 Reimbursable Costs: All third party services shall be furnished by or billed directly to Operator.

4.9 Revision in Rates: The rates and/or payments herein set forth due to Contractor from Operator shall be revised to reflect the change in costs, both increase and decrease, if the costs of any of the items hereinafter listed shall vary by more than 5% for a period of 90 days from the costs thereof on the date of this Contract or by the same percent after the date of any revision pursuant to this paragraph. Such cumulative changes shall not exceed 10% basic contract rates, for a period of six (6) months from the effective date of the contract:

- a. Labor costs, including all benefits, of Contractor's personnel, within Contractor's total Louisiana Operation
- b. Contractor's cost of insurance premiums
- c. Contractor's cost of fuel, the cost per gallon/MCF being Operator furnished
- d. Contractor's cost of spare parts and supplies with the understanding that such spare parts and supplies constitute 50 percent of the Operating Rate and that the parties shall use the U.S. Bureau of Labor Statistics Oilfield Drilling Machinery and Equipment Wholesale Price Index (Code No. 1191-02) to determine to what extent a price variance has occurred in said spare parts and supplies.
- e. If there is any change in legislation or regulations in the area in which Contractor is working or other unforeseen, unusual event that alters Contractor's financial burden
- f. The above ceiling in 4.9, may be re-determined should this contract extend past six (6) months

5. TIME OF PAYMENT:

Subject to Operator's right to require that Contractor furnish him with satisfactory evidence that Contractor has paid all labor and material claims chargeable to Contractor, payment becomes due by Operator to Contractor as follows:

5.1 Payment for mobilization, drilling and other work performed at applicable day rates, and all other applicable charges shall be due upon acceptance by Operator of the work performed in accordance with this Contract, upon presentation of invoice therefor upon completion of mobilization, completion of the well, or at the end of the month in which such work was performed or other charges are incurred, whichever shall first occur. All invoices may be mailed to Operator at address hereinabove shown, unless Operator does hereby designate that such invoices shall be mailed as follows:
See Gruy Federal General Provisions No. 23 (Payment/Invoices).

5.2 Any sum or sums not paid within 30 days after the date of invoice shall bear interest at the rate of 1.5 percent per month or the maximum legal rate, whichever is less, from such date until paid.

5.3 Attorney's Fees: If this Contract is placed in the hands of an attorney for collection of any sums due hereunder, or suit is brought on same, or sums due hereunder are collected through bankruptcy or probate proceedings, then Operator agrees that there shall be added to the amount due reasonable attorney's fees and costs.

6. TERM:

6.1 Duration of Contract: This Contract shall remain in full force and effect until drilling operations are completed on the well or wells specified in paragraph 1 above, or for a term of NA, commencing on the date specified in Paragraph 2 above.

6.2 Extension of Term: Operator may extend the term of this Contract for multiple wells by notice at least 30 days prior to completion of the well then being drilled.

6.3 Early Termination:

- a. By Either Party: Upon giving of written notice, either party may terminate this Contract when conditions of force majeure, total loss or destruction of the rig, or a major breakdown with indefinite repair time necessitate stopping operations hereunder.
- b. By Operator: Notwithstanding the provisions of Paragraph 3 with respect to the depth to be drilled, Operator shall have the right to direct the stoppage of the work to be performed by Contractor hereunder at any time prior to reaching the specified depth, and even though Contractor

has made no default hereunder. In such event Operator shall reimburse Contractor as set forth in sub-paragraph 6.4 hereof

By Contractor: Notwithstanding the provision of Paragraph 3 with respect to the depth to be drilled, in the event Operator shall become insolvent, or be adjudicated a bankrupt, or file, by way of petition or answer, a debtor's petition or other pleading seeking adjustment of Operator's debts, under any bankruptcy or debtor's relief laws now or hereafter prevailing, or if any such be filed against Operator, or in case a receiver be appointed of Operator or Operator's property, or any part thereof, or Operator's affairs be placed in the hands of a Creditor's Committee, Contractor may, at his option, elect to terminate further performance of any work under this Contract and Contractor's right to compensation shall be as set forth in subparagraph 6.4 hereof. In addition to Contractor's right to terminate performance hereunder, Operator hereby expressly agrees to protect, indemnify and save Contractor harmless for any claims, demands and causes of action, including all costs of defense, in favor of Operator, Operator's joint venturers, or other parties arising out of any drilling commitments or obligations contained in any lease, farmout agreement or other agreement, which may be affected by such termination of performance hereunder.

6.4 (a) If such termination occurs, Operator shall pay to Contractor the sum as required in accordance with Gruy General Provision 29, (Termination for Default or for Convenience of the Government).

7. CASING PROGRAM:

Contractor shall drill a well sufficient in size to set, at the approximate depths indicated, the size casing specified in the casing program provisions of Exhibit "A". Operator shall have the right to designate the points at which casing will be set and the manner of setting, cementing and testing. Operator may modify the casing program, however, any such modification which materially increases Contractor's hazards or costs can only be made by mutual consent of Operator and Contractor and upon agreement as to the additional compensation to be paid Contractor as a result thereof.

8. DRILLING METHODS AND PRACTICES:

8.1 Contractor shall maintain well control equipment in good condition at all times and shall use all reasonable means to control and prevent fires and blow-outs and to protect the hole.

8.2 Subject to the terms hereof, and at Operator's cost, at all times during the drilling of the well, Operator shall have the right to control the mud program, and the drilling fluid must be of a type and have characteristics and be maintained by Contractor in accordance with the specifications shown in Exhibit "A".

8.3 Contractor will conduct operations to comply with all laws, rules, orders, and regulations, Federal, State, and Local, which are applicable to Contractor, Contractor's business, equipment, and personnel engaged in operations covered by this Contract, including but not limited to those set forth in Exhibit "B".

8.4 Contractor shall keep and furnish to Operator an accurate record of the work performed and formations drilled on the IADC-API Daily Drilling Report Form or other form acceptable to Operator. A legible copy of said form signed by Contractor's representative shall be furnished by Contractor to Operator.

8.5 If requested by Operator, Contractor shall furnish Operator with copy of delivery tickets covering any material or supplies provided by Operator and received by Contractor.

9. INGRESS, EGRESS, AND LOCATION:

Operator hereby assigns to Contractor all necessary rights of ingress and egress with respect to the tract on which the well is to be located for the performance by Contractor of all work contemplated by this Contract. Should Contractor be denied free access to the location for any reason not reasonably within Contractor's control, any time lost by Contractor as a result of such denial shall be paid for at the applicable rate.

10. SOUND LOCATION:

Operator shall prepare a sound location adequate in size and capable of properly supporting the drilling rig, and shall be responsible for a conductor pipe program adequate to prevent soil and sub-soil wash out. It is recognized that Operator has superior knowledge of the location and access routes to the location, and must advise Contractor of any sub-surface conditions, or obstructions which Contractor might encounter while en route to the location or during operations hereunder. In the event sub-surface conditions cause a cratering or shifting of the location surface, or if seabed conditions prove unsatisfactory to properly support the rig during marine operations hereunder, and loss or damage to the rig, its associated equipment or personnel results therefrom, Operator shall, without regard to other provisions of this Contract, including Paragraph 14.1 hereof, reimburse Contractor to the extent not covered by Contractor's insurance, for all such loss or damage including payment of force majeure rate during repair and/or demobilization if applicable up to a maximum of \$10,000,000.00.

11. EQUIPMENT CAPACITY:

If applicable hereunder, operations shall not be attempted where canal or water depths are in excess of NA feet, or under any other conditions which exceed the capacity of the equipment specified to be used hereunder. Contractor shall make final decision as to when an operation or attempted operation would exceed the capacity of specified equipment.

12. TERMINATION OF LOCATION LIABILITY:

When Contractor has complied with all obligations of the Contract regarding restoration of Operator's location, Operator shall thereafter be liable for damage to property, personal injury or death of any person which occurs as result of condition of the location and Contractor shall be relieved of such liability; provided, however, if Contractor shall subsequently reenter upon the location for any reason, including removal of the rig, any term of the Contract relating to such reentry activity shall become applicable during such period.

13. INSURANCE:

During the life of this Contract, Contractor shall at Contractor's expense maintain, with an insurance company or companies authorized to do business in the state where the work is to be performed or through a self-insurance program, insurance coverages of the kind and in the amounts set forth in Exhibit "A". Contractor shall, if requested to do so by Operator, procure from the company or companies writing said insurance a certificate or certificates that said insurance is in full force and effect and that the same shall not be cancelled or materially changed without ten (10) days prior written notice to Operator.

14. RESPONSIBILITY FOR LOSS OR DAMAGE:

14.1 Contractor's Surface Equipment: Contractor shall assume liability at all times, for damage to or destruction of Contractor's surface equipment including but not limited to all drilling tools, machinery, and appliances for use above the surface, regardless of when or how such damage or destruction occurs, and Operator shall be under no liability to reimburse Contractor for any such loss except loss or damage under the provisions of Paragraphs 10 or 14.2.

14.2 Contractor's Equipment-Environmental Loss or Damage: Notwithstanding the provisions of Paragraph 14.1 above, Operator shall assume liability at all times for damage to or destruction of Contractor's equipment caused by exposure to highly corrosive or otherwise destructive elements, including those introduced into the drilling fluid, not to exceed \$10,000,000.00.

14.3 Operator's Equipment: Operator shall assume liability at all times for damage to or destruction of Operator's equipment, including but not limited to casing, tubing, well head equipment, and platform if applicable, and Contractor shall be under no liability to reimburse Operator for any such loss or damage, except in such instances where a malfunction of Contractor's equipment causes such loss or damage.

14.4 The Hole: In the event the hole should be lost or damaged, Operator shall be solely responsible for such damage or loss to the hole, including the casing therein.

14.5 Underground Damage: Operator agrees to defend and indemnify Contractor for any and all claims against Contractor resulting from operations under this Contract on account of injury to, destruction of, or loss or impairment of any property right in or to oil, gas, or other mineral substance or water, if at the time of the act or omission causing such injury, destruction, loss, or impairment said substance had not been reduced to physical possession above the surface of the earth, and for any loss or damage to any formation, strata, or reservoir beneath the surface of the earth, not to exceed \$10,000,000.00.

14.6 Inspection of Materials Furnished by Operator: Contractor agrees to visually inspect all materials furnished by Operator before using same and to notify Operator of any apparent defects therein. Contractor shall not be liable for any loss or damage resulting from the use of materials furnished by Operator.

14.7 Contractor's Indemnification of Operator: Subject to the provisions of Article 12 hereof, Contractor agrees to protect, defend, indemnify and save Operator and its joint owners harmless from and against all claims, demands, and causes of action of every kind and character, without limit and without regard to the cause or causes thereof or the negligence of any party, arising in connection herewith in favor of Contractor's employees, Contractor's subcontractors or their employees, on account of bodily injury, death or damage to property.

14.8 Operator's Indemnification of Contractor: Operator agrees to protect, defend, indemnify and save Contractor harmless from and against all claims, demands and causes of action of every kind and character, and without regard to the cause or causes thereof or the negligence of any party, arising in connection herewith in favor of Operator's employees, Operator's contractors or their employees, other than those identified in 14.7 above, on account of bodily injury, death or damage to property, in an amount not to exceed \$10,000,000.00.

14.10 Liability for Wild Well: Operator shall be liable for the cost of regaining control of any wild well, as well as for cost of removal of any debris, and shall indemnify Contractor in this regard, not to exceed \$25,000,000.00.

14.11 Pollution and Contamination: Notwithstanding anything to the contrary contained herein, except the provisions of Paragraphs 10 and 12, it is understood and agreed by and between Contractor and Operator that the responsibility for pollution and contamination shall be as follows:

- a. Unless otherwise provided herein, Contractor shall assume all responsibility for, including control and removal of, and protect, defend and save harmless Operator from and against all claims, demands and causes of action of every kind and character arising from pollution or contamination, which originates above the surface of the land or water from spills of fuels, lubricants, motor oils, normal water base drilling fluid, pipe dope, paints, solvents, ballast, bilge and garbage, except unavoidable pollution from reserve pits, wholly in Contractor's possession and control and directly associated with Contractor's equipment and facilities.
- b. Operator shall assume all responsibility for, including control and removal of, protect, defend and save Contractor harmless from and against all claims, demands, and causes of action of every kind and character arising from all other pollution or contamination which may occur during the conduct of operations hereunder, including but not limited to, that which may result from fire, blowout, cratering, seepage or any other uncontrolled flow of oil, gas, water or other substance, as well as, the use or disposition of oil emulsion, oil base or chemically treated drilling fluids, contaminated cuttings or cavings, lost circulation and fish recovery materials and fluids, not exceeding \$25,000,000.00
- c. In the event a third party commits an act or omission which results in pollution or contamination for which either Contractor or Operator, for whom such party is performing work, is held to be legally liable, the responsibility therefor shall be considered, as between Contractor and Operator, to be the same as if the party for whom the work was

performed the same and all of the obligations respecting defense, indemnity, holding harmless and limitation of responsibility and liability, as set forth in (a) and (b) above, shall be specifically applied.

14.12 Consequential Damages: Neither party shall be liable to the other for special, indirect or consequential damages resulting from or arising out of this Contract, including, without limitation, loss of profit or business interruptions, however same may be caused.

15. NO WAIVER EXCEPT IN WRITING:

It is fully understood and agreed that none of the requirements of this Contract shall be considered as waived by either party unless the same is done in writing, and then only by the persons executing this Contract, or other duly authorized agent or representative of the party.

16. FORCE MAJEURE:

Neither Operator nor Contractor shall be liable to the other for any delays or damage or any failure to act due, occasioned or caused by reason of any laws, rules, regulations or orders promulgated by any Federal, State or Local governmental body or the rules, regulations, or orders of any public body or official purporting to exercise authority or control respecting the operations covered hereby, including the procurement or use of tools and equipment, or due, occasioned or caused by strikes, action of the elements, water conditions, inability to obtain fuel or other critical materials, or other causes beyond the control of the party affected thereby. In the event that either party hereto is rendered unable, wholly or in part, by any of these causes to carry out its obligation under this Contract, it is agreed that such party shall give notice and details of Force Majeure in writing to the other party as promptly as possible after its occurrence. In such cases, the obligations of the party giving the notice shall be suspended during the continuance of any inability so caused except that Operator shall be obligated to pay to Contractor the Force Majeure Rate provided for in Paragraph 4.7 above.

17. INFORMATION CONFIDENTIAL:

In accordance with Gruy Federal, Inc. General Provision No. 1 (Advertising, Announcements and News Releases).

18. SUBCONTRACTS BY OPERATOR:

Operator may employ other contractors to perform any of the operations or services to be provided or performed by it according to Exhibit "A".

19. ASSIGNMENT:

Neither party may assign this Contract without the prior written consent of the other, and prompt notice of any such intent to assign shall be given to the other party. In the event of such assignment, the assigning party shall remain liable to the other party as a guarantor of the performance by the assignee of the terms of this Contract. If any assignment is made that materially alters Contractor's financial burden, Contractor's compensation shall be adjusted to give effect to any increase or decrease in Contractor's operating costs.

20. NOTICES AND PLACE OF PAYMENT:

All notices to be given with respect to this Contract unless otherwise provided for shall be given to the Contractor and to the Operator respectively at the addresses hereinabove shown. All sums payable hereunder to Contractor shall be payable at his address hereinabove shown unless otherwise specified herein.

21. SPECIAL PROVISIONS:

Gruy Federal General Provisions are attached hereto and by this reference made a part hereof with the exception of No. 17 "Key Personnel". Gruy Federal, Inc.

Additional Provisions S.P. (Safety Policy, I.P. (Intellectual Property), S.C.A. (Service Contract Act), and L.M.S. (Labor Surplus Area, Minority Business, and Small Business Subcontracting Programs) are attached hereto and by this reference made a part hereof.

22. In the event of conflict between the terms of this Contract and Gruy Federal General Provisions, Gruy Federal, Inc. provisions shall take precedence.

23. EXPENDITURE LIMITATIONS:

23.1 Total costs against this Contract shall not exceed \$360,000.00 without prior written approval of Operator.

23.2 Contractor shall advise Operator, in writing, when total commitment against this Contract has reached \$270,000.00.

23.3 Charges shall commence against this Contract upon Contractor's departure to first well site, as directed by Operator.

24. EFFECTIVITY:

This Contract shall not be in effect until approved by the United States Department of Energy.

25. ACCEPTANCE OF CONTRACT:

The foregoing Contract is agreed to and accepted by Operator this _____ day of _____, 19_____

OPERATOR: GRUY FEDERAL, INC.

BY: _____

TITLE: _____

The foregoing Contract is accepted by the undersigned as Contractor this _____ day of _____, 19_____, and subject to all of its terms and provisions.

CONTRACTOR: Progress Drilling, Inc.

BY: _____

TITLE: _____

THIS CONTRACT APPROVED FOR ISSUE:

UNITED STATES DEPARTMENT OF ENERGY

BY: _____

TITLE: _____

EXHIBIT "A"

To Daywork Contract dated _____, 19____
 Operator Gruy Federal, Inc. Contractor Progress Drilling, Inc.
 Well Name and Number N/A

SPECIFICATIONS AND SPECIAL PROVISIONS

1. CASING PROGRAM Operators Specifications not to exceed 18,100' of 7"OD 32#, 35#, and 36# Pipe.

3. INSURANCE (See Par. 13)

- 3.1 Adequate Workmen's Compensation Insurance complying with State Laws applicable or Employers' Liability Insurance with limits of \$ 100,000.00 covering all of Contractor's employees working under this agreement.
- 3.2 Comprehensive Public Liability Insurance or Public Liability Insurance with limits of \$ 500,000.00 for the death or injury of any one person and \$ 500,000.00 for each accident.
- 3.3 Comprehensive Public Liability Property Damage Insurance or Public Liability Property Damage Insurance with limits of \$ 250,000.00 for each accident and \$ 250,000.00 aggregate per policy.
- 3.4 Automobile Public Liability Insurance with limits of \$ 200,000.00 for the death or injury of each person and \$ 300,000.00 for each accident; and Automobile Public Liability Property Damage Insurance with limits of \$ 250,000.00 for each accident.

4. EQUIPMENT, MATERIALS AND SERVICES TO BE FURNISHED BY CONTRACTOR:

The machinery, equipment, tools, materials, supplies, instruments, services and labor hereinafter listed, including any transportation required for such items, shall be provided at the location at the expense of Contractor unless otherwise noted hereon.

4.1 Drilling Rig:

Complete drilling rig, designated by Contractor as his Rig No. 21, consisting of attached inventory, the major items of equipment being: Drawworks: Wilson Tital Model 150

Engines: Make, Model, and H.P. Caterpillar D397 ^(Make and Model) 550 HP
 No. on Rig 3

Pumps: No. 1 Make, Size, and Power Emsco D-1000 1000 HP
 No. 2 Make, Size, and Power Emsco D-850 850 HP

Mud Mixing Pump: Make, Size, and Power One - 6x8 centrifugal and one 5x6 centrifugal

Boilers: Number, Make, H.P. and W.P. None

Derrick or Mast: Make, Size, and Capacity Ideco full view 143' 1,090,000 lbs.

Substructure: Size and Capacity Ideco 21'
 Rotary Drive: Type National 20 1/2"

Drill Pipe: Size 4 1/2 - E in. 11,000 ft.; Size 4 1/2 S-135 in. 4000 ft.

Drill Collars: Number and Size 12 6 1/2 OD x 30

Blowout Preventers: None

Size	Series or Test Pr.	Make & Model	Number
E O P. Closing Unit:	<u>None</u>		
E O P. Accumulator:	<u>None</u>		

- 4.2 Derrick timbers.
- 4.3 Normal strings of drill pipe and drill collars specified above.
- 4.4 Conventional drill indicator.
- 4.5 Circulating mud pits.
- 4.6 Necessary pipe racks and rigging up material.
- 4.7 Normal storage for mud and chemicals.
- 4.8 Shale Shaker.
- 4.9 _____
- 4.10 _____
- 4.11 _____
- 4.12 _____
- 4.13 _____
- 4.14 _____
- 4.15 _____
- 4.16 _____
- 4.17 _____

5. EQUIPMENT, MATERIALS AND SERVICES TO BE FURNISHED BY OPERATOR:

The machinery, equipment, tools, materials, supplies, instruments, services and labor hereinafter listed, including any transportation required for such items, shall be provided at the location at the expense of Operator unless otherwise noted hereon.

- 5.1 Furnish and maintain adequate roadway and/or canal to location, right-of-way, including rights-of-way for fuel and water lines, river crossings, highway crossings, gates and cattle guards.
- 5.2 Stake location, clear and grade location, and provide turnaround, including surfacing when necessary.
- 5.3 Test tanks with pipe and fittings.
- 5.4 Mud storage tanks with pipe and fittings.
- 5.5 Separator with pipe and fittings.
- 5.6 Labor to connect and disconnect mud tank, test tank, and separator.
- 5.7 Labor to disconnect and clean test tanks and separator.
- 5.8 Drilling mud, chemicals, lost circulation materials and other additives.
- 5.9 Pipe and connections for oil circulating lines.
- 5.10 Labor to lay, bury and recover oil circulating lines.
- 5.11 Drilling bits, reamers, reamer cutters, stabilizers and special tools.
- 5.12 Contract fishing tool services and tool rental.
- 5.13 Wire line core bits or heads and wire line core catchers if required.
- 5.14 Conventional core bits and core catchers.
- 5.15 Diamond core barrel with head.
- 5.16 Cement and cementing service.
- 5.17 Electrical and Gamma-Neutron and Micro logging services.
- 5.18 Directional, caliper, or other special services.
- 5.19 Gun or jet perforating services.
- 5.20 Explosives and shooting devices.
- 5.21 Formation testing, hydraulic fracturing, acidizing and other related services.
- 5.22 Equipment for drill stem testing.
- 5.23 Mud logging services.
- 5.24 Sidewall coring service.
- 5.25 Welding service for welding bottom joints of casing, guide shoe, float shoe, float collar and in connection with installing of well head equipment if required.
- 5.26 Casing, tubing, lines, screen, float collars, guide and float shoes and associated equipment.
- 5.27 Casing scratchers and centralizers.
- 5.28 Well head connections and all equipment to be installed in or on well or on the premises for use in connection with testing, completion and operation of well.
- 5.29 Special or added storage for mud and chemicals.
- 5.30 Casinghead, API series, to conform to that shown for the blowout preventers specified in Paragraph 4.1 above.
- 5.31 Blowout preventer testing packoff.
- 5.32 Casing Thread Protectors and Casing Lubricants.
- 5.33 All blowout equipment and choke manifold as required by Operator
- 5.34 _____
- 5.35 _____
- 5.36 _____
- 5.37 _____

6. EQUIPMENT, MATERIALS AND SERVICES TO BE FURNISHED BY DESIGNATED PARTY:

The machinery, equipment, tools, materials, supplies, instruments, services, and labor listed as the following numbered items including any transportation required for such items unless otherwise specified, shall be provided at the location and at the expense of the party hereto as designated by an X mark in the appropriate column.

Item	To Be Provided By and At The Expense Of	
	Operator	Contractor
6.1 Cellar and runways	X	
6.2 Fuel (located at _____)	X	
6.3 Fuel Lines (length _____)	N/A	
6.4 Water at source, including required permits	X	
6.5 Water well, including required permits	N/A	
6.6 Water lines, including required permits	X	
6.7 Water storage tanks _____ capacity		X
6.8 Labor to operate water well or water pump		X
6.9 Maintenance of water well, if required	N/A	
6.10 Mats for engines and boilers, or motors and mud pumps		X
6.11 Transportation of Contractor's property:		
Move in	X	
Move out <u>See 7.1</u>	X	
6.12 Materials for "boxing in" rig and derrick		X
6.13 Special strings of drill pipe and drill collars as follows: Other than listed in 4.1 Exhibit "A"	X	

Item (Continued)	Operator	Contractor
6.14 Kelly joints, subs, elevators and slips for use with special drill pipe	X	
6.15 Drill pipe protectors for Kelly joint and each joint of drill pipe running inside of Surface Casing as required, for use with normal strings of drill pipe	X	
6.16 Drill pipe protectors for Kelly joint and drill pipe running inside of Protection Casing	X	
6.17 Coring reel with wire line of sufficient length for coring at maximum depth specified in Contract	X	
6.18 Wire line core barrel	X	
6.19 Conventional core barrel	X	
6.20 Rate of penetration recording device	X	
6.21 Extra labor for running and cementing casing	X	
6.22 Casing tools	X	
6.23 Power casing longs	X	
6.24 Tubing tools	X	
6.25 Power tubing tong	X	
6.26 Swabbing unit with swabbing line	X	
6.27 Swab	X	
6.28 Swab lubricator	X	
6.29 Swab rubbers	X	
6.30 Crew Boats, Number		N/A
6.31 Service Barge		N/A
6.32 Service Tug Boat		N/A
6.33 Helicopter service		N/A
6.34 Rat Hole	X	
6.35 Mouse Hole	X	
6.36 Reserve Pits	X	
6.37 Erect and Dismantle Derrick		N/A
6.38 Upper Kelly Cock		X
6.39 Drilling hole for or driving for conductor pipe	X	
6.40 Charges, cost of bonds for public roads	X	
6.41		
6.42		
6.43		

7. OTHER PROVISIONS:

- 7.1 Upon completion of each of Operator's re-entry wells, Operator agrees to furnish trucks, cranes and dozers to transport the rig to Operator's next location.
- 7.2 4.9 a. Exhibit "C" for current wages paid. Any difference will be assessed a 29% burden, to cover applicable fringe benefits.
- 7.3 If, for any reason, the Operator's location is not ready to accept Contractor's rig at the agreed time, the Operator agrees to pay the applicable stand-by rate with crew rates until moving operations can begin.
- 7.4 Any modification to the rig, change of rig up procedure, tongs, pits, different tools, and special equipment other than that furnished on the rig will be at the expense of the Operator.
- 7.5 The equipment will be run to 85% of manufacturer's rating capacity. For example, if a pump has a pressure rating for a liner of 2,000 lbs., then the maximum pressure allowed will be 1700 psi.

Signed by the
Parties as correct:

For Contractor _____

For Operator _____

1. EQUAL EMPLOYMENT OPPORTUNITY

A. Operator is an Equal Opportunity Employer. It is agreed as a condition of this Contract that unless any or all work performed hereunder is exempt under Executive Order 11246 (30 Fed. Reg. 12319) as amended, or under the rules and regulations issued thereunder, during the performance of this Contract, the Contractor agrees as follows:

1. The Contractor will not discriminate against any employee or applicant for employment because of race, religion, color, sex or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, color, sex or national origin. Such action shall include, but not be limited to the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the contracting officer setting forth the provisions of this nondiscrimination clause.

2. The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, religion, color, sex or national origin.

3. The Contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided by the agency contracting officer, advising the labor union or workers' representative of the Contractor's commitments under Section 202 of Executive Order 11246 of September 24, 1965, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

4. The Contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

5. The Contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the contracting agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

6. In the event of the Contractor's noncompliance with the nondiscrimination clauses of this Contract or with any of such rules, regulations, or orders, this Contract may be cancelled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

7. The Contractor will include the provisions of Paragraphs 1 through 7 in every subcontract or purchase order unless exempted by rules, regulations, or orders of Secretary of Labor issued pursuant to Section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as the contracting agency may direct as a means of enforcing such provisions including sanctions for noncompliance; Provided, however, that in the event the Contractor becomes involved in, or is threatened with litigation with a subcontractor or vendor as a result of such direction by the contracting agency, the Contractor may request the United States to enter into such litigation to protect the interests of the United States.

B. Filing Standard Form 100 (EEO-1) and Development of Affirmative Action Program.

1. Contractor acknowledges that he may be required to file Standard Form 100 (EEO-1) promulgated jointly by the Office of Federal Contract Compliance, the Equal Employment Opportunity Commission and Plans for Progress within thirty (30) days of contract award, if such report has not been filed for the current year and otherwise comply with or file such other compliance reports as may be required under Executive Order 11246, as amended and Rules and Regulations adopted thereunder.

2. Contractor further acknowledges that he may be required to develop a written affirmative action compliance program as required by the Rules and Regulations approved by the Secretary of Labor under authority of Executive Order 11246 and supply Operator with a copy of such program if Operator so requests.

C. Nonsegregated Facilities.

Contractor certifies that he does not maintain or provide for his employees any segregated facilities at any of his establishments, and that he does not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. He certifies further that he will not maintain or provide for his employees any segregated facilities at any of his establishments, and that he will not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. Contractor agrees that a breach of his certification is a violation of the Equal Opportunity Clause in this Contract. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, sex or national origin, because of habit, local custom or otherwise; Contractor's policies and practices must assure appropriate physical facilities to both sexes. He further agrees that (except where he has obtained identical certifications from proposed subcontractors for specific time periods) he will obtain identical certifications from proposed subcontractors prior to the award of contracts exceeding \$10,000 which are not exempt from the provisions of Equal Opportunity Clause; that he will retain such certifications in his files; and that he will forward the following notice to such proposed subcontractors (except where the proposed subcontractors have submitted identical certifications for specific time periods): "NOTICE TO PROSPECTIVE SUBCONTRACTORS OF REQUIREMENT FOR CERTIFICATIONS OF NONSEGREGATED FACILITIES. A Certification of Nonsegregated Facilities as required by the May 21, 1968, order on Elimination of Segregated Facilities, by the Secretary of Labor (33 Fed. Reg. 7804, May 28, 1968), must be submitted prior to the award of a subcontract exceeding \$10,000 which is not exempt from the provisions of the Equal Opportunity Clause. The certification may be submitted either for each subcontract or for all subcontracts during a period (i.e., quarterly, semiannually, or annually)."

D. Penalties

Contractor further understands and agrees that a breach of the assurance contained in Paragraphs A through C above subjects it to the provisions of the Order at 41 CFR Chapter 60 of the Secretary of Labor dated May 21, 1968. In the event of Contractor's noncompliance with the nondiscrimination clauses of this Contract or with any of such rules, regulations, or orders, such noncompliance shall constitute sufficient grounds, and the parties hereto agree to immediate cancellation of this Contract on the basis of such noncompliance with no further obligation whatsoever on the part of the Operator.

2. LISTING OF EMPLOYMENT OPENINGS

The undersigned Contractor further agrees, if the value of any contract or purchase order is \$2,500 or more, that it will be bound by the following provisions contained in 41 CFR 50-250 promulgated pursuant to Executive Order No. 11701:

A. The Contractor, to provide special emphasis to the employment of qualified disabled veterans and veterans of the Vietnam era, agrees that all suitable employment openings of the Contractor which exist at the time of the execution of this Contract and those which occur during the performance of this Contract, including those not generated by this Contract and including those occurring at an establishment of the Contractor other than the one wherein the Contract is being performed but excluding those of independently operated corporate affiliates, shall be offered for listing at an appropriate local office of the State employment service system wherein the opening occurs and to provide such reports to such local office regarding employment openings and hires as may be required; Provided, That this provision shall not apply to openings which the Contractor fills from within the Contractor's organization or are filled pursuant to a customary and traditional employer-union hiring arrangement.

B. Listing of employment openings with the employment service system pursuant to this clause shall be made at least concurrently with the use of any other recruitment service or effort, and shall involve the normal obligations which attach to the placing of a bona fide job order, including the acceptance of referrals of veterans and nonveterans. The listing of employment openings does not require the hiring of any particular job applicant or from any particular group of job applicants, and nothing herein is intended to relieve the Contractor from any requirements in any Executive Orders or regulations regarding nondiscrimination in employment.

SUPPLEMENTAL AGREEMENT

THIS SUPPLEMENTAL AGREEMENT, effective the 6th day of November 1978, between Gruy Federal, Inc. (hereinafter called "Operator"), a Texas corporation with its principal place of business in Houston, Texas, and Progress Drilling Company, Inc. (hereinafter referred to as "Contractor"), a Texas Corporation with its principal place of business in Houston, Texas

WITNESSETH THAT:

WHEREAS, Operator and the United States Department of Energy entered into Contract No. EG-77-C-08-1528, effective September 26, 1977, for the testing of geopressed formations in the Texas and Louisiana Gulf Coast area; and

WHEREAS, Operator and Contractor entered into Contract No. 3017-5, effective May 26, 1978 in which Contractor agreed to reenter abandoned wells in Louisiana for Operator's use in its geothermal testing; and

WHEREAS, the parties hereto, according to the amendment provision of Paragraph 21, Contract No. 3017-5, have agreed upon certain modifications to Paragraph 23 entitled EXPENDITURE LIMITATIONS in Contract No. 3017-5.

NOW, THEREFORE, the parties hereto agree that Contract No. 3017-5 is amended in the following particulars only.

1. Paragraph 23 entitled EXPENDITURE LIMITATIONS is revised in its entirety to read as follows:

23.1 Total Costs against the Gladys McCall well shall not exceed \$214,800.00

23.2 Total costs against this Contract shall not exceed \$750,800.00, without prior written approval of Operator.

23.3 Contractor shall advise Operator, in writing, when the total commitment against this Contract has reached \$650,000.00

23.4 Charges shall commence against this Contract upon Contractor's departure to first well site, as directed by Operator

This Supplement Amendment shall not become effective until approved by the United States Department of Energy.

Except as modified by this Supplement Agreement, the provisions of Contract No. 3017-5 shall remain in full force and effect.

The foregoing Supplemental Contract is agreed to and accepted by Operator this 30 day of NOVEMBER, 19 78.

OPERATOR: GRUY FEDERAL, Inc.

BY: Robert H. Nyland

TITLE: PURCHASING MANAGER

The foregoing Supplemental Contract is accepted by the undersigned as Contractor this 5 day of DECEMBER, 19 78, and subject to all of its terms and provisions.

OPERATOR: PROGRESS DRILLING, Inc.

BY: J. E. Long III

TITLE: Vice Pres. & Gen. Mgr.

THIS SUPPLEMENTAL CONTRACT APPROVED FOR ISSUE:

UNITED STATES DEPARTMENT OF ENERGY

BY: _____

TITLE: _____

SUPPLEMENTAL AGREEMENT

THIS SUPPLEMENTAL AGREEMENT, entered into this 7th day of November 1978, between Gruy Federal, Inc. (hereinafter called "Operator"), a Texas corporation with its principal place of business in Houston, Texas, and Progress Drilling Company, Inc. (hereinafter referred to as "Contractor"), a Texas corporation with its principal place of business in Houston, Texas.

WITNESSETH THAT:

WHEREAS, Operator and the United States Department of Energy entered into Contract No. EG-77-C-08-1528, effective September 26, 1977, for the testing of geopressed formations in the Texas and Louisiana Gulf Coast area; and

WHEREAS, Operator and Contractor entered into Contract No. 3017-5, effective May 26, 1978 in which Contractor agreed to reenter abandoned wells in Louisiana for Operator's use in its geothermal testing; and

WHEREAS, the parties hereto, according to the amendment provision of Paragraph 21, Contract No. 3017-5, have agreed upon certain modifications to Paragraph 4 entitled DAYWORK RATES and to Exhibit "C" in Contract No. 3017-5.

NOW, THEREFORE, the parties hereto agree that Contract No. 3017-5 is amended in the following particulars only.

1. Paragraph 4 entitled DAYWORK RATES is revised as follows:

The effective date of the following rate changes is November 10, 1978.

4.1 Mobilization day rate is changed from \$5,400.00 per 24 hour day to \$5,745.00 per 24 hour day.

4.2 Demobilization day rate is changed from \$5,400.00 per 24 hour day to \$5,745.00 per 24 hour day.

4.3 Moving rate is changed from \$5,400.00 per 24 hour day to \$5,745.00 per 24 hour day.

4.4 Operating Day rate is changed from \$6,000.00 per 24 hour day to \$6,525.00 per 24 hour day..

4.5 Standby rate with crews is changed from \$5,400.00 per 24 hour day to \$5,745.00 per 24 hour day.

2. EXHIBIT "C" is revised in its entirety to read as follows:

DIVISION 40

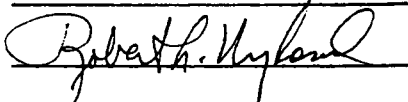
LOUISIANA

RIG CREW PAY SCALE - EFFECTIVE NOVEMBER 1, 1978

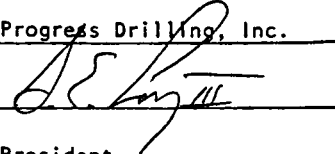
DRILLER	\$ 9.56 PER HOUR
DERRICKMAN	7.96 PER HOUR
MOTORMAN	7.70 PER HOUR
FLOORMAN	7.18 PER HOUR
FLOORMAN	<u>7.18</u> PER HOUR
FULL CREW	\$ 39.58 PER HOUR

3. Except as modified by this Supplement Agreement, and any other Supplement Agreements, the provisions of Contract No. 3017-5 shall remain in full force and effect.

The foregoing Supplemental Contract is agreed to and accepted by Operator this 5th day of December, 19 78.

OPERATOR: Gruy Federal, Inc.
BY: 
TITLE: Purchasing Manager

The foregoing Supplemental Contract is accepted by the undersigned as Contractor this 5th day of December, 19 78.

CONTRACTOR: Progress Drilling, Inc.
BY: 
TITLE: Vice. President