GL011160

EARTH POWER PRODUCTION COMPANY

Data contained in pages which are enclosed as Exhibits or Maps of this proposal shall not be used or disclosed, except for evaluation purposes, provided that if a contract is awarded to this proposer as a result of or in connection with the submission of this proposal, the Government shall have the right to use or disclose any data to the extent provided in the contract. This restriction does not limit the Government's right to use or disclose any technical data obtained from another source without restriction.

Thermal Resources Inc.
39 Broadway
New York, New York 10006
Attention: Oliver R. Grace *
Telephone: (212)480-0556

GeothermEx, Inc.
901 Mendocino Avenue
Berkeley, California 94707
Attention: James B. Koenig *
Telephone: (415)524-9242

Senturion Sciences, Inc.
1539 No. 105th E. Ave.
P. O. Box 15447
Tulsa, Oklahoma 74115
Attention: John R. Bailey *
Telephone: (918)836-6746

Small Business Services, Accountants
1700 Utica Square
Tulsa, Oklahoma 74114
Attention: Hal Hughes *
Telephone: (918)749-1885

Coopers & Lybrand, Auditors
3300 First National Tower
Tulsa, Oklahoma 74103
Attention: Monte Baggett, Partner *
Telephone: (918)582-6404

Boyles Bros. Drilling Company
P. O. Box 946
Sparks, Nevada 89431
Attention: Joe Fetterhoff*
Telephone: (702)358-5188

Keplinger and Associates, Inc.
320 South Boston
Suite 320
Tulsa, Oklahoma 74103
Attention: C. H. Keplinger *
Telephone: (918)587-5591

2. The names and resumes of the program personnel are attached as Exhibit 4.

3. The drilling operations to be conducted pursuant to the program's technical scope for Phase 1 will be managed and supervised by Ronald C. Barr and David Langenkamp with engineering advice to be supplied by Bill L. Thomas of Energy Analyst's, Inc., and personnel yet to be designated of Keplinger and Associates, Inc. Ronald C. Barr will be responsible for selecting, engaging and monitoring contractural and financial matters with an appropriate drilling contractor. David Langenkamp and his designated helpers will be responsible for supervising day-to-day drilling operations, procedures and maintenance of sufficient quantities of items such as casing, cement, lost circulation materials, bits, sufficient quantities of water, and other such supplies as may be required to successfully drill and complete the intermediate depth holes described in this proposal. P. Thomas Thornbrugh will be responsible for operational compliance with all permitting and environmental regulations and will advise both Barr and Langenkamp of all pertinent regulations. The engineering aspects of the hole have been supplied by Bill L. Thomas and are enclosed herewith as Exhibit 5. Keplinger and Associates, Inc. will observe and verify the final temperature gradient logging. Ronald C. Barr will have final responsibility for all aspects of the operation. David Langenkamp will send daily reports which summarize that day's activities including, but not limited to, footage drilled, mud return temperatures and quantities of mud, cement and lost circulation material and water quantities consumed in the operations.

A full-time drilling engineer or tool pusher will be hired for Phase 2 operations. Keplinger and Associates will perform and supervise all drill stem tests and reservoir engineering surveys. The drilling program for Phase 2 is included as Exhibit 6.

Barr, Langenkamp and a representative of the drilling contractor will, at all times, maintain a 24-hour telephone answering service at their offices and sleeping quarters.

Summary reports will be made from the daily report telephoned to the DOE personnel on a weekly basis and written reports will be prepared and submitted on a monthly basis. These will include costs incurred and costs of all materials consumed or will include estimated costs if actual costs are not available. Telephonic reports will be made periodically on a non-scheduled basis in the event any exceptional problems are encountered. The monthly report will show estimated, actual and projected costs. Quarterly reports showing actual costs will be prepared and submitted quarterly.

Hal Hughes of Small Business Services, Tulsa, Oklahoma will manage all of the accounting from the project. Final results will be verified by Coopers & Lybrand.

5. The provisions of the draft contract as a basis for contract negotiations are acceptable.

6. The "PROGRAM TECHNICAL SCOPE" set forth in the RFP has been reviewed and all of the data which will be furnished pursuant to a contract may be published.

7. The Proposer's capability to carry out the program is evidenced in a letter from the Western National Bank, Tulsa, Oklahoma, which is attached as Exhibit 7.

8. This proposal will remain in effect for at least 120 days from the date designated for receipt of proposals.

9. The person signing the proposal, Ronald C. Barr, has the authority to commit the Proposer to all provisions of the proposal. Mr. Barr is the president and sole owner of Earth Power Production Company. Earth Power Production Company has an Operator's Bond on file with the Bureau of Land Management in Reno, Nevada.

10. Proposer hereby certifies that one copy of GSA Form 19B, "Representations and Certifications" is attached to the letter of transmittal which accompanies this proposal.

Respectfully submitted,

EARTH POWER PRODUCTION COMPANY

By: Ronald C. Barr

Ronald C. Barr, President

This proposal is submitted for use in connection with and in response to *(Describe RFP, etc.)*

RFP No. ET-78-R-08-0003

and reflects our best estimates as of this date, in accordance with the Instructions to Offerors and the Footnotes which follow.

TYPED NAME AND TITLE	SIGNATURE
Ronald C. Barr, President	Ronald C. Barr

NAME OF FIRM	DATE OF SUBMISSION
EARTH POWER PRODUCTION COMPANY	May 25, 1978

EXHIBIT A—SUPPORTING SCHEDULE *(Specify. If more space is needed, use reverse)*

COST EL NO.	ITEM DESCRIPTION *(See footnote 5)*		EST COST *(5)*
	Phase 2 Drilling Costs	Costs	
	Site Preparation	50,000.00	
	Rig Time	450,000.00	
	Bits	65,000.00	
	Mud, Chemicals & Additives	90,000.00	
	Fuel	40,000.00	
	Equipment Rentals	58,000.00	
	Specialized Drilling Services	75,000.00	
	Transportation/Water Hauling	30,000.00	
	Casing	256,000.00	
	Production Equipment	30,000.00	
	Supervision	24,000.00	
	Miscellaneous	10,000.00	
	Total	$1,178,000.00	
	Reservoir Test & Equipment	150,000.00	
	G&A & Contingencies	100,000.00	
	Total	$1,428,000.00	
	Cost Sharing Request from Gov't,		
	$49.50/Ft. x 9000' =		445,500.00

I. HAS ANY EXECUTIVE AGENCY OF THE UNITED STATES GOVERNMENT PERFORMED ANY REVIEW OF YOUR ACCOUNTS OR RECORDS IN CONNECTION WITH ANY OTHER GOVERNMENT PRIME CONTRACT OR SUBCONTRACT WITHIN THE PAST TWELVE MONTHS?

☐ YES ☒ NO *(If yes, identify below.)*

NAME AND ADDRESS OF REVIEWING OFFICE AND INDIVIDUAL	TELEPHONE NUMBER/EXTENSION

II. WILL YOU REQUIRE THE USE OF ANY GOVERNMENT PROPERTY IN THE PERFORMANCE OF THIS PROPOSED CONTRACT?

☐ YES ☒ NO *(If yes, identify on reverse or separate page)*

III. DO YOU REQUIRE GOVERNMENT CONTRACT FINANCING TO PERFORM THIS PROPOSED CONTRACT?

☐ YES ☐ NO *(If yes, identify.)*: ☐ ADVANCE PAYMENTS ☒ PROGRESS PAYMENTS OR ☐ GUARANTEED LOANS

IV. DO YOU NOW HOLD ANY CONTRACT *(Or, do you have any independently financed (IR&D) projects)* FOR THE SAME OR SIMILAR WORK CALLED FOR BY THIS PROPOSED CONTRACT?

☐ YES ☒ NO *(If yes, identify.)*:

V. DOES THIS COST SUMMARY CONFORM WITH THE COST PRINCIPLES SET FORTH IN AGENCY REGULATIONS?

☐ YES ☒ NO *(If no, explain on reverse or separate page)*

See Reverse for Instructions and Footnotes

OPTIONAL FORM 60 (10-71)

EXHIBIT 1.

SHALLOW TEMPERATURE GRADIENT DATA

Number	Gradient, °F/100 Ft.	Bottom Hole Temperature, °F	Depth, Ft.
1	25.0	207.5	279
2	15.9	85.0	82
3	10.4	86.0	300
4	8.8	83.0	256
5	8.5	90.0	295
6	7.5	73.0	260
7	7.2	78.0	262
8	6.5	78.0	295
9	6.3	83.5	262
10	6.0	67.0	112
11	5.9	80.0	290
12	5.9	73.0	269
13	4.7	80.0	300
14	4.5	64.6	300
15	4.2	71.0	295
16	4.0	64.0	300
17	3.8	65.6	295
18	3.8	56.0	292
19	3.3	67.0	285
20	3.2	62.0	262
21	3.1	66.9	279
22	2.7	62.0	300
23	2.6	60.0	213
24	2.4	62.0	295
25	2.2	65.0	279
26	2.2	62.0	308
27	1.8	56.0	295
	Total Footage		7,260

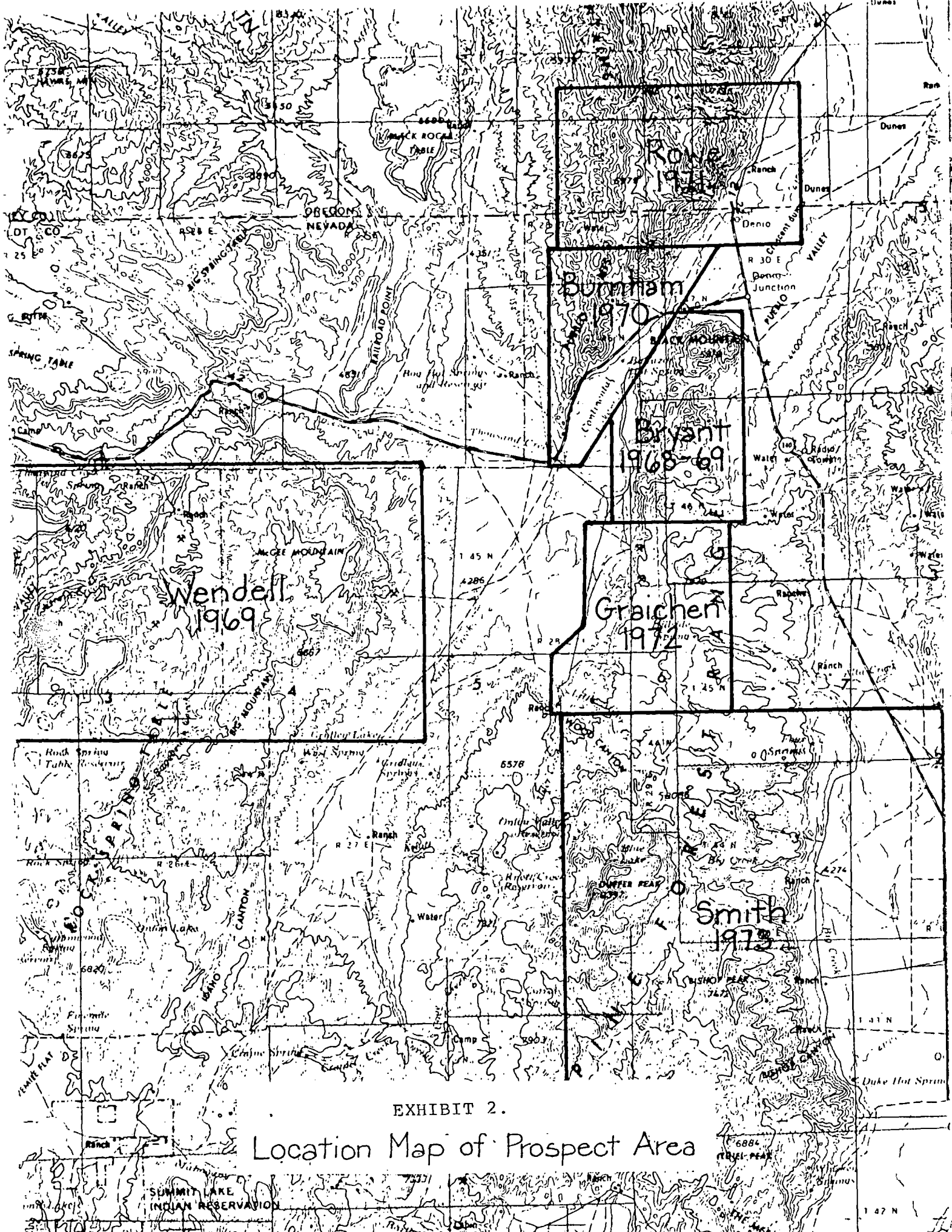


EXHIBIT 2.

Location Map of Prospect Area

EARTH POWER PRODUCTION COMPANY

SCHEDULE OF PHASES

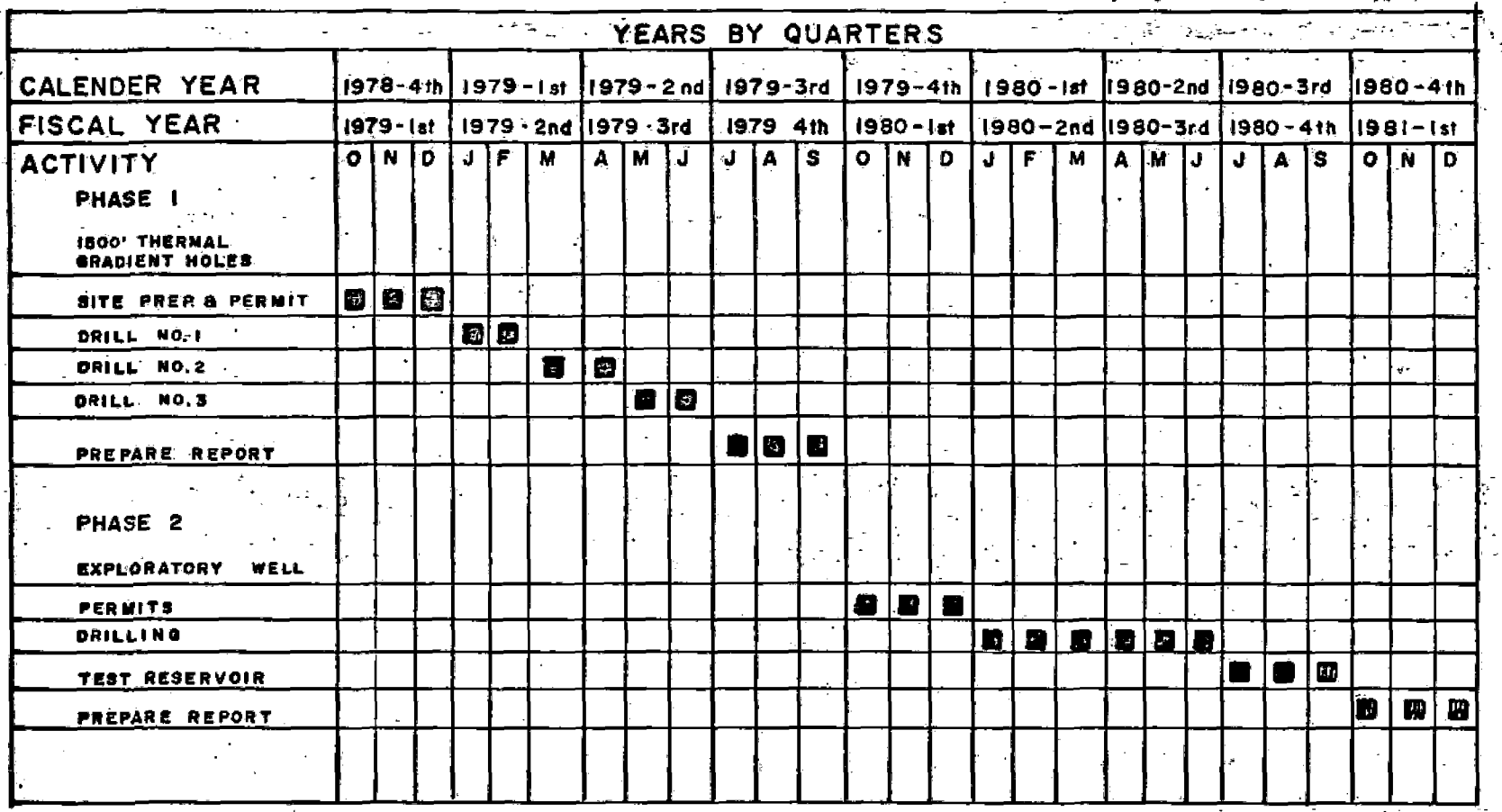


EXHIBIT "3"

5/30/78

EXHIBIT 4.

R E S U M E

RONALD C. BARR

Chairman and President, Earth Power Corporation, Tulsa, Oklahoma.

EDUCATION

B.S. Economics-Denison University, Granville, Ohio, 1966

Finance-New York Graduate School of Business, no degree

EMPLOYMENT HISTORY AND EXPERIENCE

June 1966 to July 1968	Securities Analyst and Registered Representative for Sterling, Grace & Company, Inc., NYSE Member firm.
	Analyzed cable television industry, broadcasting industry, and covered special situations.
July 1968 to May 1970	Syndicate Manager and Registered Representative for Sterling, Grace & Company, Inc., NYSE Member firm.
	Managed purchasing and sales for firm in underwriting participations, formed syndicates for managed underwritings, and originated financings for several ventures.
May 1970 to October 1971	Vice President, CATV Marketing, Inc.
	Managed activities of 8 to 10 sales managers supervising variously 60 to 100 door-to-door CATV subscription salesmen. Set up and managed installation company, including purchase, equipping and maning of 40 installation trucks.

October 1971 to December 1973	Independent Consultant specializing in Geothermal Energy.
	Worked actively as consultant for purchase of 10,000 acres at the Geysers in California which was considered attractive for geothermal.
	Served as paid consultant to Pacific Energy Corporation (Hughes Aircraft Company), Signal Oil (now Aminoil), and AMAX, Inc.
January 1974 to Present	Founded and managed Earth Power Corporation.
	Activities to date have centered on identifying, financing, leasing and developing the geothermal potential for generating electricity from among 50 targets in 10 states covering 600,000 acres.
	Initiated and negotiated joint exploration agreements with AMAX Exploration, Inc., the Carolyn Hunt Trust Estate, and a large oil company.
	Supervised and managed all phases of operations.
January 1978	Formed Earth Power Production Company. The company was formed to conduct and manage drilling and other exploration programs.

PROFESSIONAL AFFILIATIONS AND PUBLICATIONS

Geothermal Resources Council
- -Founding Member
- -Vice President and Member Executive Committee
- -Director

American Association of Petroleum Geologists, Inc.

Served as Rapporteur for the United Nations Symposium, 1975.

Published various articles for the Oil & Gas Journal and Geothermal Energy Magazine.

Testified before the Subcommittee on Advanced Energy Technologies and Energy Conservation Research of The House Science and Technology Committee on February 15, 1978.

R E S U M E

DAVID LANGENKAMP

Exploration Manager, Earth Power Corporation, Tulsa, Oklahoma.

EDUCATION

B. S., Geology, Massachusetts Institute of Technology, 1971.

M. S., Geophysics, University of California at Riverside, 1973.

EXPERIENCE

April-September 1971	Geophysicist, Kesey & Associates, Butte, Montana. Conducted seismic refraction and ground magnetics surveys for ground-water assessment in intermountain valleys in southwest Montana.
Summer, 1972	Geophysicist, Institute of Geophysics and Planetary Physics, Riverside, California. Planned, operated and analyzed data from four microearthquake arrays along the Elsinore Fault zone, southern California. Performed thermal conductiv ity measurements on cores and cuttings from temperature gradient wells drilled in geothermal areas in the Salton Trough.
1973-1974	Geophysicist, Harding-Lawson Associates, San Rafael, California. Responsible for magnetic, gravity, and seismic refraction surveys conducted for site investigations for nuclear plants in Washington, California, Iowa, Georgia, and Florida. Performed surveys on landslide masses at the Berkeley Synchrotron and Diablo Canyon Nuclear plant. Participated in development of seismic field techniques for the acquisition of

	baseline data for the analysis of the seismic response of existing earthen dams in California. Major assignments included planning and conducting electrical resistivity surveys for geothermal exploration in Alaska and Oregon.
1974-1976	Chief Geophysicist, Senturion Sciences, Tulsa, Oklahoma. Designed and supervised development of scalar and tensor magnetotelluric systems using superconducting magnetometers. Developed computer software for data reduction and interpretation of scalar and tensor magnetotellurics. Managed the field operation of these systems in geothermal and petroleum exploration. Responsible for planning, managing, and interpretation of microearthquake, seismic ground motion, and gravity surveys. Performed theoretical modeling of seismic methods of real time drill bit positioning.
1976 - Present	Exploration Manager, Earth Power Corporation, Tulsa, Oklahoma. Responsible for geological and geophysical exploration of geothermal prospects in the western United States.

PROFESSIONAL SOCIETIES

Geological Society of America

American Geophysical Union

Society of Exploration Geophysicists

Seismological Society of America

PAUL THOMAS THORNBRUGH

Legal Counsel and Member of the Board of Directors,
Earth Power Production Company

Education:

Undergraduate - Kansas State Teachers College Emporia, Kansas, Bachelor of Arts Degree in May, 1968, Double Major in Speech and Political Science.

Legal - University of Tulsa College of Law Degree in Juris Doctorate in May, 1974. Ranked in top one-third of class.

Professional Employment:

June 1974 - August 1975
Legislative Aid and Legal Advisor for U. S. Senator Dewey F. Bartlett (R-Oklahoma), June 1974. Responsibilities included: Coordination and development of legislative program for the Senator with special emphasis on legislation involving U. S. Department of the Interior, the Environmental Protection Agency, U. S. Department of Agriculture, Veterans Administration, Department of Health, Education and Welfare and Department of Housing and Urban Development; handled legislative correspondence; provided special liason case work between individual Oklahoma constituents and various federal agencies and departments; and provided special assistance for state and local governments in regard to implementation of federal grant and aid programs.

August 1975 - February 1975
Employed by Hall, Estill, Hardwick, Gable, Collinsworth & Nelson. Responsibilities included general practice of law to include civil, corporate domestic relations and criminal litigation.

February 1975 - Present
Self-employed in private practice of law. Present practice includes general practice of law in Federal, State and Municipal Courts. Associated with the law firm of Jarboe & Thompson, Tulsa, Oklahoma.

Professional Organizations: Member Oklahoma Bar Association, Tulsa County Bar Association

Civic Activities: Member Tulsa County Republic Executive Committee; First Congressional District Republican Committeeman; National Delegate to Republican National Convention 1976.

R E S U M E

BILL L. THOMAS

Vice President, Energy Analysts, Inc., a successor company to University Engineers, Inc., Norman, Oklahoma.

EDUCATION

B. S., Chemical Engineering, University of Oklahoma, 1967.

M. S., General Engineering, University of Oklahoma, 1973.

EMPLOYMENT HISTORY AND EXPERIENCE

1967-1973	University Engineers, Inc. Involved in pilot plant development of a desalination project.
1973-1975	H. K. Ferguson Co. Chief Process and Instrumentation Engineer with responsibility for development of process and instrumentation drawings and process equipment design.
1975-1976	Republic Geothermal, Inc. Chief Engineer with overall engineering responsibilities for drilling, testing, and development of geothermal wells.
1976-Present	Vice President, Energy Analysts, Inc. Engaged in: -Thermodynamic and hydraulic calculations associated with LNG vaporizers. -Evaluation of the thermal properties of materials. -Experimental studies in cooling canals.

R E S U M E

JAMES B. KOENIG

President, GeothermEx, Inc., Berkeley, California.

EDUCATION
B.S. Brooklyn College (1954)
M.A. Indiana University (1956)
PhD. candidate University of Nevada

EXPERIENCE
Mr. Koenig is a principal of Geothermex of Berkeley, California, a group of geologists, geophysicists, and hydrochemists providing service and expertise in geothermal exploration and development. He has been active in geothermal exploration and development since 1964. Initially, he served as Geothermal Resources Specialist for the State of California, Division of Mines and Geology, and as Chairman of the Technical Advisory Committee of the Geothermal Reources Board of California. Also, he served as specialist in geology, seismology and geothermal power development on the California Power Plant Siting Committee, prior to leaving the State service in 1972.

Mr. Koenig's operational experience in geothermal resources includes the following:

- Organization and implementation of the geothermal exploration program for Pacific Power and Light Company and Weyerhaeuser Company, south-central Oregon, 1971-1973.

- Evaluation of geothermal resources in Ethiopia, for the United Nations, 1971.

- Consultant to the United Nations and the Government of the Republic of El Salvador, 1971.

- Consultant to Salaverria Duran y Cia, El Salvador, 1968 and 1969.

- Leader of field party in geothermal exploration, Coso Hot Springs, California, 1966-1968.

- Evaluation of geothermal targets in 13 western states for several private organizations, 1972, 1973 and 1974.

- Review of exploration programs for a major engineering company, 1972-1973.

- Report to the U.S. Bureau of Reclamation on geothermal potential in Utah, 1972.

- Major clients have included Chevron Oil Company, Sun Oil Company, Dow Chemical U.S.A., Phillips Petroleum Company, Hewlett-Packard Corporation and AMAX Exploration, Inc.

In addition, he assisted in preparation of the California State law on geothermal resources, 1967-68, and has visited or worked at geothermal fields elsewhere in the United States, and in Mexico, Kenya and Italy, as well as in Ethiopia and El Salvador.

PUBLICATIONS

Geothermal Exploration in the Western United States: Geothermics, Vol. 2, part 1, pp. 1-13 (paper given at the U.N. Symposium on Geothermal Resources, Pisa, 1970).

The Geysers, California, Geothermal Field: Cal. Div. Mines & Geol. Mineral Info. Service. Vol. 22, no. 8, pp. 123-128, 1969.

The Salton-Mexicali Geothermal Province: Cal. Div. Mines & Geol. Mineral Info. Service, Vol. 20, no. 7, pp. 75-81, 1967.

Remote Sensing at the Coso Geothermal Field: U.S. Navy NWC TP5233, 1972.

Geothermal Steam Potential of Mount Lassen: Guidebook of the Sacramento Geol. Soc., pp. 43-51, 1969.

Worldwide Status of Geothermal Resources Development, in "Geothermal Energy: Resources, Production, Stimulation", Stanford Press, 1973, pp. 15-58.

UNPUBLISHED REPORTS

Mercury distribution at two geothermal fields: Ahuachapan, El Salvador and Coso Hot Springs, California (1969).

Worldwide status of geothermal exploration and development (1972).

Environmental factors at the Ahuachapan, El Salvador; geothermal field (1971).

United Nations - Ethiopia report on the geology, geochemistry, and hydrology of hot springs in the East African Rift system in Ethiopia (1971), coauthor.

RESUME
OF
C. H. KEPLINGER,
CHAIRMAN OF THE BOARD

SCHOLASTIC ACHIEVEMENTS:

1931 University of Tulsa, Bachelor of Science Degree in Physics.

1932 Goettinger University, Germany, Study of Geophysics.

1933 George Washington University, Master of Science Degree in Physics.

PROFESSIONAL EXPERIENCE:

1944 to Present

KEPLINGER AND ASSOCIATES, INC.
TULSA OFFICE

Mr. Keplinger, Chairman of the Board of Keplinger and Associates, Inc., is active in the petroleum industry in the United States as well as foreign countries. Advisor in petroleum and helium and natural gas matters to major companies, independent operators, and individuals. Expertise in presentation of evidence to courts and to state oil and gas commissions. Active in oil property evaluations, waterflood reports, proration problems, well spacing, reservoir studies, and underground storage of natural gas.

SOUTH AMERICA-Vast experience in engineering and geological studies conducted in COLOMBIA, VENEZUELA, BOLIVIA, BRAZIL, and ARGENTINA.

AFRICA - Investigated petroleum possibilities in many of the African countries.

MIDDLE EAST - Conducted reservoir studies in Middle Eastern countries, including TURKEY, IRAQ, SYRIA, and INDIA.

NEW ZEALAND - Researched and explored petroleum possibilities in New Zealand as well as INDONESIA and AUSTRALIA.

CANADA - Extensive work performed in Canada, including reservoir projects and appraisals. Consultant on unitization of REDWATER FIELD for the operators.

Shell Oil Company

1933 to 1944

Trainee Engineer in 1933. Established production laboratory in Tulsa. District engineer for LUCIEN FIELD - later in charge of its production. Production Engineer in Tulsa office specializing in secondary recovery projects in the Mid-Continent area. Transferred to other Shell offices in CALIFORNIA, TEXAS, ILLINOIS, INDIANA, KENTUCKY, and MICHIGAN.

Became Division Engineer for Shell's Oklahoma operations, 1944. Resigned from Shell to form the original petroleum engineering firm of Keplinger and Wanenmacher.

AFFILIATIONS:

Registered Professional Engineer in Oklahoma and Alberta, Canada. Member of American Society of Mechanical Engineers, Society of Petroleum Engineers of A.I.M.E., Society of Petroleum Evaluation Engineers, American Gas Association, American Petroleum Institute, American Arbitration Association, Independent Petroleum Association of America, Mid-Continent Oil and Gas Association, Tulsa Geological Society, American Association of Petroleum Geologists, Mexican Geological Society, Mexican Petroleum Engineering Society and L'Association Francaise des Techniciens du Petrole.

CAREER HIGHLIGHTS:

Associated with the development of helium reserves and attendant problems since 1945. Estimated the helium reserves of the United States and engaged in both economic and extraction studies from natural gas. Mr. Keplinger was one of the expert witnesses on a helium case in Kansas in 1968.

Appeared before the Federal Power Commission in 1945 on its regional gas investigation case, Docket No. G-580.

Conducted original study in WILMINGTON FIELD, CALIFORNIA, in 1947 for methods of preventing subsidence of oil fields. The recommendation of pressure maintenance has been utilized successfully since that time.

Worked in INDIA on secondary recovery for DIGBOI FIELD in 1949.

Presented Conference on Financial Management and Petroleum Accounting at Banff, Alberta, Canada, in 1954.

Worked on well spacing and unitization from 1954 to 1957 in NORTH DAKOTA fields.

Worked on unitization of ANETH FIELD, UTAH, in 1958.

Presented paper on waterflooding in 1962 to Association of Petroleum Engineers of MEXICO.

Presented paper in 1965 on the thermal recovery prospects before Society of Petroleum Engineers of A.I.M.E. in Dallas.

Prepared various papers on oil and gas supplies, including "Case Histories of Actual Performance vs. Appraised Prognostication–Petroleum Reservoirs" for Southwestern Legal Foundation, Dallas, in March, 1967; and "U.S. Oil and Gas Supplies for the 1970's" for Society of Petroleum Engineers, Houston Chapter, April, 1969.

EXHIBIT 5.

DRILLING PROGRAM

1500'

Well: Baltazor, Nevada

Location: _____

Elevation: _____ Ground: _____ K.B.

Tubular Goods Required:

± 150 ft. of 7" O.D. H-40 ST&C casing.
± 1500 ft. of 2" Sch. 40 pipe.

Casing Equipment Required:

7" - Cement float shoe with flapper valve, 2 centralizers, one 5 ft. above shoe and the other 10 ft. below surface.
2" - Schedule 80 pipe couplings, 300 psi pipe cap on bottom.

Wellhead:

7" S.O.W. x 6" 300# R.F. flange, with two 2", 300# R.F. flanged side outlets, and two 2", 300# R.F. gate valves.

Mud Program:

Use lightweight, low solids, fresh water clay base mud. Treat with lignite for temperature stability, bicarbonate of soda for cement contamination.

Depth (ft.)	Weight (lbs./gal.)	Viscosity (sec.)	Fluid Loss (cc/30 sec.)	Treatment
0 - 150	8.65-8.9	50-60	No Control	Mix 25 lb/bbl. bentonite. Add 1 lb/bbl. soda ash to increase viscosity for cleaning large hole.

Depth (ft.)	Weight (lbs./gal.)	Viscosity (sec.)	Fluid Loss (cc/30 sec.)	Treatment
150-1500	8.7-9.2			Continue 24 lb/bbl. bentonite. Add 1 lb/bbl. caustic soda for Ph control. Use bicarbonate of soda to treat out cement when drilling out of shoe. Add 3 lb/bbl. lignite below 500 ft. for temperature stability.

Maintain an inventory of cottonseed hulls on location for lost circulation control.

BOPE Requirements:

150 - 1500 ft. - Install manually operated annular blowout preventer (1000 psi W.P.) and 6" manual 300# A.N.S.I., R.F. gate valve on 7" casing. Install a choke and kill line below the 6" gate valve as illustrated in Figure 1.

Procedure:

1. Move in rig and rig up.
2. Make up 9½" bit and drill 9½" hole to 150 ft.
3. Run 150 ft. of 7" - 20# H-40 ST&C casing. Suspend casing 5 ft. of bottom.
4. Cement to surface by running 1" pipe down annulus with 43 $ft.^3$ of A.P.I. class A cement.

Fill	Length	Type	Total Volume
To surface	150 ft.	36 sax of API type A neat cement.	43 $ft.^3$

Excess	Weight	Mix Water	Yield
20%	116.69 lb./$ft.^3$	5.2 gal./sk	1.18 $ft.^3$/sk

5. Wait on cement 8 hours*. Cut off 7" casing and weld on wellhead and install blowout prevention equipment in accordance with Figure 1.

6. Test blowout prevention equipment at 200 psi for 30 minutes. (Note: Casing shoe may leak. If so, spot cement plug "2 sax of slurry of step 4 with 1 lb./sk calcium chloride" and repeat test.)

7. Drill out with 5-3/4" bit using as light a weight on bit as practical for first 100 ft. Drill 5-3/4" hole to 1500 ft.

8. Run 1500 ft. of 2" Sch. 40 line pipe with Sch. 80 couplings. Make up 1" 300 psi pipe cap on bottom joint.

9. Cement 2" pipe from 150 ft. to surface with 39 ft.^{3} (32 sax) of same slurry as in step 4.

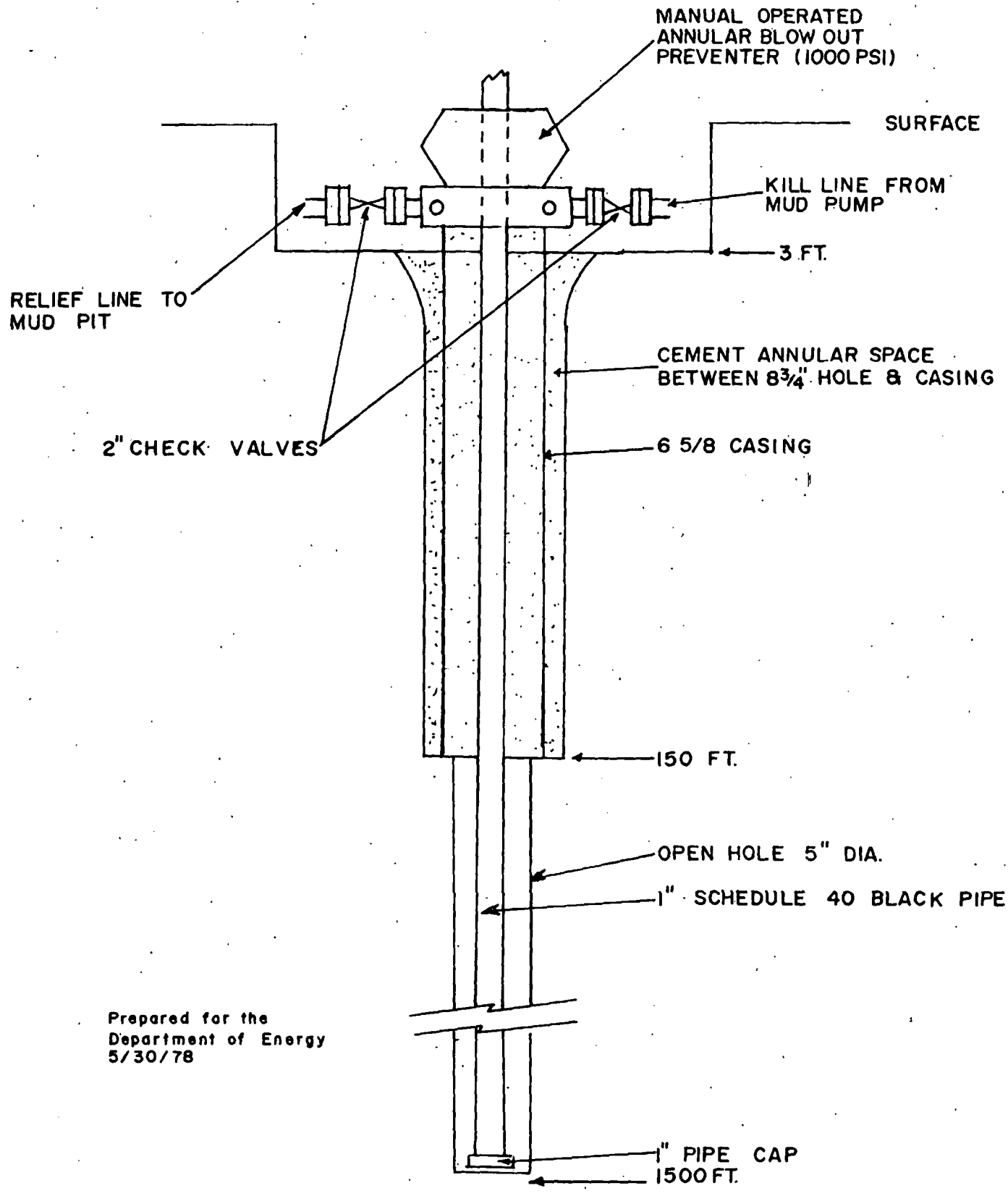
10. Remove blowout preventer and cut off wellhead (7" casing) 3 ft. below grade. Fill 2" in pipe with fresh water, cut, thread and make up a 2" pipe cap on 2" pipe 18" below grade.

11. Move rig off.

*Waiting time subject to cement setting time.

EARTH POWER PRODUCTION COMPANY

SCHEMATIC DIAGRAM 1500' TEMPERATURE GRADIENT HOLE & BLOWOUT PREVENTION EQUIPMENT



Prepared for the
Department of Energy
5/30/78

EXHIBIT 6.

DRILLING PROGRAM

9000'

Well: Baltazor, Nevada

Location: _____

Elevation: _____ Ground: _____ K.B.

Tubular Goods Required:

± 90' of 20" conductor pipe.
± 1200' of 13-3/8" O.D., 54.5#/ft., K-55, buttress casing.
± 5000' of 9-5/8" O.D., 36#/ft., K-55, buttress casing
± 3200' of 7" O.D., 23#/ft., K-55, with LT&C tool joints.

Casing Equipment Required:

13-3/8" Differential fill up type collar and guide shoe with top and bottom cement plug. Run one centralizer on bottom and every 250 ft. (6 centralizers).

9-5/8" Run Stab-in cementing shoe and two F. O. cementing collars. 13-3/8", 54.5#/ft. x 9-5/8" buttress double slip fluted and ported mechanical liner hanger with cementing plug. (Burns Tool Co., or equivalent). Run centralizers W/2 on bottom and one every 200 ft. to lap. Run one centralizer 3 joints below hanger in 13-3/8" - 9-5/8" lap. (25-9-5/8" x 11-5/8" close tolerance centralizers).

7" Orange peel show with bailing plate, 9-5/8", 36#/ft. by 7" LT&C mechanical or hydraulic hanger.

Wellhead:

13-3/8" Slip-on weld x 12", 400# RTJ flange with two 2" - 600# R. F. flanged side outlets. 12" - 400# A.N.S.I. RTJ flanged master valve and two 2" - 600# R.F. flanged side outlet valves. After drilling is completed, install valves and fittings as per Exhibit B, Attachment I, Figure 2. During drilling install BOPE's described below.

BOPE Requirements:

0 - 90 ft. None.

90 ft. - 1200 ft. - Install annular blow-out preventer on conductor casing.

1200 ft. - 9000 ft. - Install API class 3M (minimum) double hydraulic rams and annular blow-out preventers on 13-3/8" casing. Install 12" master valve on well head. Kelly cock, stand pipe valve and drill pipe float will be maintained on the floor.

A fill up line will be installed above the BOPE and a kill line will be installed below the BOPE with a direct line to the mud pumps and a valve suitable for cementing. A blow down line will be installed below the BOPE with two valves with one at the wellhead.

Hydraulic BOPE control stations are to be equipped with dual controls, one on the rig floor and one at least 50 ft. from the wellhead. Hydraulic accumulator capacity is to be at least 80 gallons.

Mud flow line temperature and pit level will be monitored continuously. A pit level warning device will be installed.

Mud Program:

From surface to total depth use lightweight, low solids, fresh water clay base mud treated with lignite for temperature stability, bicarbonate of soda for cement contamination, and bit lube as required. Sand concentration is to be maintained below 1% and drilled solids as low as practical by the use of desanders and desilters. A cooling tower will be installed in the mud system and the mud will be pumped through this cooling tower when the mud return temperature exceeds 160° F.

Summary of Mud Properties

Depth (ft.)	Weight (lb./gal.)	Viscosity (sec.)	Fluid Loss (cc/30 sec.)	Treatment
0 - 1200	8.65-8.9	50-60	No control	Mix 25#/bbl. bentonite. Add 1#/bbl. soda ash to increase viscosity for cleaning large hole.

Summary of Mud Properties
(con't)

Depth (ft.)	Weight (lb./gal.)	Viscosity (sec.)	Fluid Loss (cc/30 sec.)	Treatment
1200-6000	8.7-9.0	55-60	Less than 15	Continue 25#/bbl. bentonite. Add 4#/bbl. lignite for filtration control and 1#/bbl. of caustic soda for Ph control. Use bicarbonate of soda to treat out cement when drilling out of shoe of 13-3/8" casing.
6000-9000	8.8-9.2	60-70	Less than 10	Use bicarbonate of soda to treat out cement when drilling out of casing. Continue 4#/bbl. lignite and 1#/bbl. caustic soda. If flocculation occurs use 1-2#/bbl. quebracho. Maintain Ph below 9.5.

Directional Program:

Hole will be drilled as near vertical as possible without sacrificing drilling progress. Drift will be allowed as below with combined angle of directional changes no greater than 5^{o}/100 ft.

Interval	Maximum Closure Distance	Maximum Deviation from Vertical
0 - 1200'	75'	2^{o}
0 - 6000'	215'	4^{o}
6000-9000'	No control	10^{o}

Procedure:

1. Move in and rig up over 20" conductor set at 90 ft.

2. Pick up Kelly and drill rat hole and mouse hole.

3. Make up 17-1/2" bit and drill collars. Drill to 1200' using fresh water and gel mud system as outlined in mud program.

4. Pull out of hole and run dual induction log. Go back in hole and condition for running casing.

5. Run 1200' of 13-3/8" surface casing as outlined below.

Size	Interval	Length	Weight
13-3/8"	0 - 1200'	1200'	54.5 lb./ft.

		Safety Factors		
Grade	Connections	Collapse	Tension	Burst
K-55	Buttress	2.17*	13.05**	***

* Base on evacuation to 2000' with external gradient of 0.433 psi/ft.

** Minimum joint strength is 1,038,000 lbs. Body yield is 853,000 lbs.

*** Minimum internal yield pressure is 2,730 psi.

13-3/8" Casing Equipment:

a. Float equipment: guide shoe and float collar with top and bottom plugs.

b. Centralizers: bow type with stop ring. Place one 5 ft. above shoe and one every 250 ft. to surface. Place one centralizer inside 20" conductor pipe.

c. Pipe lock bottom five joints.

6. Center casing in rotary. Make up cementing assembly and establish circulation. Cement casing as follows:

Fill	Length	Type	Total Volume
To surface	2000 ft.	482 sax of 1:1 API type "G" to perlite + 6% gel + 35% silica flour + retarder and turbulence inducer as needed. Tail in with 250 ft.^{3} neat slurry. Precede cement with 100 ft.^{3} pre-hydrated gel pill and 100 ft.^{3} of class G neat cement.	1021 ft.^{3}

Excess	Weight	Yield	Mix Water
20%	103#/ft.^{3}	2.59 ft.^{3}/sx	1.46 ft.^{3}/sx

7. If cement fails to circulate to surface, run 1 inch macaroni tubing down annulus and cement to surface using same slurry as in step 6.

8. Wait on cement 4 hours before slacking off. Remove 20" BOPE, cut off 13-3/8" casing and weld on 13-3/8" wellhead. Install 12" gate valve and BOPE in accordance with previously outlined requirements and Figure 1, Attachment I, Exhibit "B" attached hereto.

9. Test blowout preventors and casing to 1000 psi, hold for 30 minutes. Report any bleed-off to the supervisor. (U.S.G.S. area supervisor shall be notified in time to witness and approve tests.)

10. Engage mud loggers. Samples to be collected, washed and labeled every 30 ft. A lithology log is to be maintained daily.

11. Make up 12-1/4" bit. Go in hole and drill out with 12-1/4" bit using as light a bit weight as practical for the first 150 ft. to keep the hole straight. Drill to 3000 ft. $\pm$. Pull out of hole and make up 7-7/8" bit. Drill 7-7/8" hole from 3000 ft. through at least 50 ft. of net sand in the interval 3100' - 3500'. Pull out of hole and drill stem test as outlined in step 12. Monitor and record mud return temperature every 30 ft. $\pm$ when drilling below 2000 ft. When mud temperature reaches 160° F., begin pumping mud through the mud cooling tower. When 6000 ft. depth is reached or commercial temperatures are suspected, log and run 9-5/8" casing.

12. Run open hole drill stem test (D.S.T.) as follows with tandem 7" packers set at 3200 ft.±. Use 7" open hole packers with three 0 - 3000 psi pressure recorders with 24-hour clocks (one inside and two outside), two maximum recording thermometers (500° F. and 300° F. ranges), and ± 50 ft. of slotted tail pipe. Take 3-minute initial flow, 15-minute initial shut-in, 30-minute final flow, and one-hour final shut-in. The following surface measurements are to be made when flow reaches the surface at 5 minute intervals:

    a. Salinity of water (PPM Cl^-)

    b. Conductivity of water (micromho/centimeter)

    c. Ph of water

    d. Density of water (lbs./gal.)

    e. Temperature of water (°F.)

    f. Take a minimum of 3 gas samples.

    Release packer and pull out of hole. Assembly is to include safety joint, bumper sub and jars.

13. Make up 12-1/4" bit, go in hole and drill to 6000 ft. or to point where commercial temperatures are suspected.

14. Pull out of hole and run logs in following order:

	Interval	Logs
a.	3000 - 6000'	temperature
b.	1200 - 6000'	IES (S.P. and DIL)
c.	3000 - 6000'	SONIC
d.	3000 - 6000'	G.R., F.D.C., and C.N.L.
e.	1200 - 6000'	temperature and 4-arm caliper
f.	1200 - 6000'	directional survey *

* Directional survey to be contingent on results of previous directional data.

15. Go in hole and condition hole and mud for running 9-5/8" casing as follows:

Size	Interval	Length	Weight
9-5/8"	1000-6000'	5000'	36 lb./ft.

		Safety Factors		
Grade	Connections	Collapse	Tension	Burst
K-55	Buttress	1.17*	3.13**	***

* Based on complete evacuation and external gradient of 0.433 psi/ft.

** Minimum joint strength is 699,000 lbs., Body yield is 564,000 lbs.

*** Minimum internal yield pressure is 3520 psi.

9-5/8" Casing Equipment:

a. Float equipment: Stab-in cementing shoe and two Halliburton F.O. cementing collars. Locate one F.O. collar opposite a firm formation between 2700 ft. and 3500 ft. Locate the other F.O. collar 5 joints below the hanger.

b. Hanger: Double slip mechanical hanger, fluted and ported for cementing.

c. Pipe lock bottom five joints.

d. 29 - 9-5/8" x 11-5/8" close tolerance type centralizers with stop collars placed as follows:

1) One 5 ft. above shoe.

2) One every 200 ft. from 6000 ft. to 1200 ft.

3) One midway between 13-3/8" shoe and 9-5/8" hanger.

16. Run casing and hang in position. Pull out of hole and make up cementing assembly. Go in hole, stab into shoe and establish circulation. (Circulate one hour minimum prior to cementing.) Cement casing as follows:

a.	1st Stage 3000-6000'	50 Cu.Ft. of pre-hydrated bentonite spacer followed by 30 cubic feet of API, Class G cement + 35% silica flour retarded* with 3/4% Halad 22 and HR-12 followed by 950 Cu.Ft. of 1:1 API, Class G to perlite with 35% silica flour retarded* with 3/4% Halad 22 and HR-12. Tail in with 50 Cu.Ft., Class G + 35% silica flour.	1080'
b.	2nd Stage 3000-1200'	30 Cu.Ft. of API, Class G + 35% silica flour retarded* with 3/4% Halad 22 and HR-12 followed by 560 Cu.Ft. of 1:1 API, Class G to perlite with 35% silica flour tail and with 30 Cu.Ft. of API, Class G + 35% silica flour.	620'
c.	Lap 1200-1000'	75 Cu.Ft. of API, Class G + 35% silica flour.	75'

* Note: Exact amounts of retarder to be determined from temperature logs and circulating temperatures.

17. Note exact position of F.O. collars when running in hole to stab in shoe. Pressure test both F.O. collars after closing and prior to pulling out to assure collar is closed properly. Back scuttle excess cement out of lap prior to pulling out of hole. Wait on cement 8 hours prior to drilling out.

18. Make up 8-3/4" bit and clean out to lap. Pressure test lap at 1000 psi surface pressure for 30 minutes. If test holds clean out to shoe and pressure test casing at 1000 psi for 30 minutes. (Notify area geothermal supervisor in time to witness tests.) Squeeze cement as required to obtain successful tests.

19. Run in with 8-3/4" bit, drill until a drilling break is encountered and core as described below. Run in with 6-1/4" (maximum) diamond core bit on 4-3/4", 30' double wall core barrel with safety joint and jars and cut 30 ft. core. Recover core and run D.S.T. as outlined in step 20.

20. Run in hole with 5" O.D. string of tools bottom to top as follows:
    a. Bottom outside recorder with 5000 psi chart, 24-Hr. clock and 500° F. maximum recording thermometer.

* Time subject to cement tests.

b. Top outside recorder with 3000 psi chart, 48-Hr. clock and 300° F. maximum recording thermometer.

c. 10 ft. of perforated 5" tail pipe.

d. 9-5/8" - 36# hook wall packer.

e. Safety joint.

f. Jars

g. Bottom inside recorder with 5000 psi chart, 24-Hr. clock and 500° F. maximum recording thermometer.

h. Top inside recorder with 3000 psi chart, 48-Hr. clock and 300° F. maximum recording thermometer.

i. Johnson MFE Tester (or equivalent).

j. Bar type and pressure type backscuttle valve.

k. Cross over to drill pipe.

l. Drill pipe as required.

Set packer at 5875 ft. ± and conduct test as follows: take 5-minute initial flow, 30-minute initial shut-in, 2-Hr. final flow and 4-Hr. final shut-in. When fluid surfaces collect samples and record the following every 5 minutes for the first 30 minutes and every 15 minutes thereafter:

a. Salinity of water (PPM Cl^-)

b. Temperature of water (°F.)

c. Ph of water

d. Measure flow rates and pressures through a test separator.

e. Density of water (lbs./gal.)

f. Electrical conductivity (micromhos/centimeter)

Collect a minimum of three gas samples for chromatographic analysis.

Release packer and backscuttle clean, sampling backscuttled fluid until mud reaches surface. Pull out of hole with D.S.T. assembly.

21. If commercial temperatures were not encountered on drill stem test, D.S.T. as in step 20 at 5500 ft.±.

22. Drill 8-3/4" hole to 9000 ft. or until commercial production is encountered.

23. Pull out of hole and run logs in following order from 6000 ft. to 9000 ft.: a) S.P., DIL & LL8, b) SONIC, c) G.R., F.D.C., and CNL, d) four-arm caliper, and temperature, e) directional survey if need is indicated by previous surveys.

24. If drilling, cuttings and logs indicate that hole is stable and slotted liner is not required, complete well barefoot (do not run liner), skip to step 26. Otherwise go in hole and condition hole and mud system for running slotted liner as described in step 25.

25. Run 7" slotted liner as follows:

Size	Interval	Length	Weight
7"	5800-9000'	3200'	23 lbs. ft.

		Safety Factors		
Grade	Connection	Collapse	Tension	Burst
K-55	LT&C	*	4.07**	*

* Liner is slotted, therefore, collapse and burst are not considerations.

** Minimum joint strength is 300,000 lbs.

7" Slotted Liner Equipment:

a. Hanger: Single slip 9-5/8" - 36 x 7" LT&C mechanical with liquid seal.

b. Orange peeled bottom joint.

26. Go in hole and change well bore fluid over to water. Wash completed zone with wash tool having opposing cups with approximately 3 ft. between cups. If clays are indicated in completed interval, use 2-3% K Cl solution to wash completed interval.

27. Pull out of hole, close master valve, remove BOPE stack, and install wellhead equipment in accordance with Figure 2, Attachment I, Exhibit B.

28. If well does not flow naturally, install a rotating head or stripper above the wellhead tee and go in hole to 1500 ft. with drill pipe or tubing and stimulate with air or nitrogen.

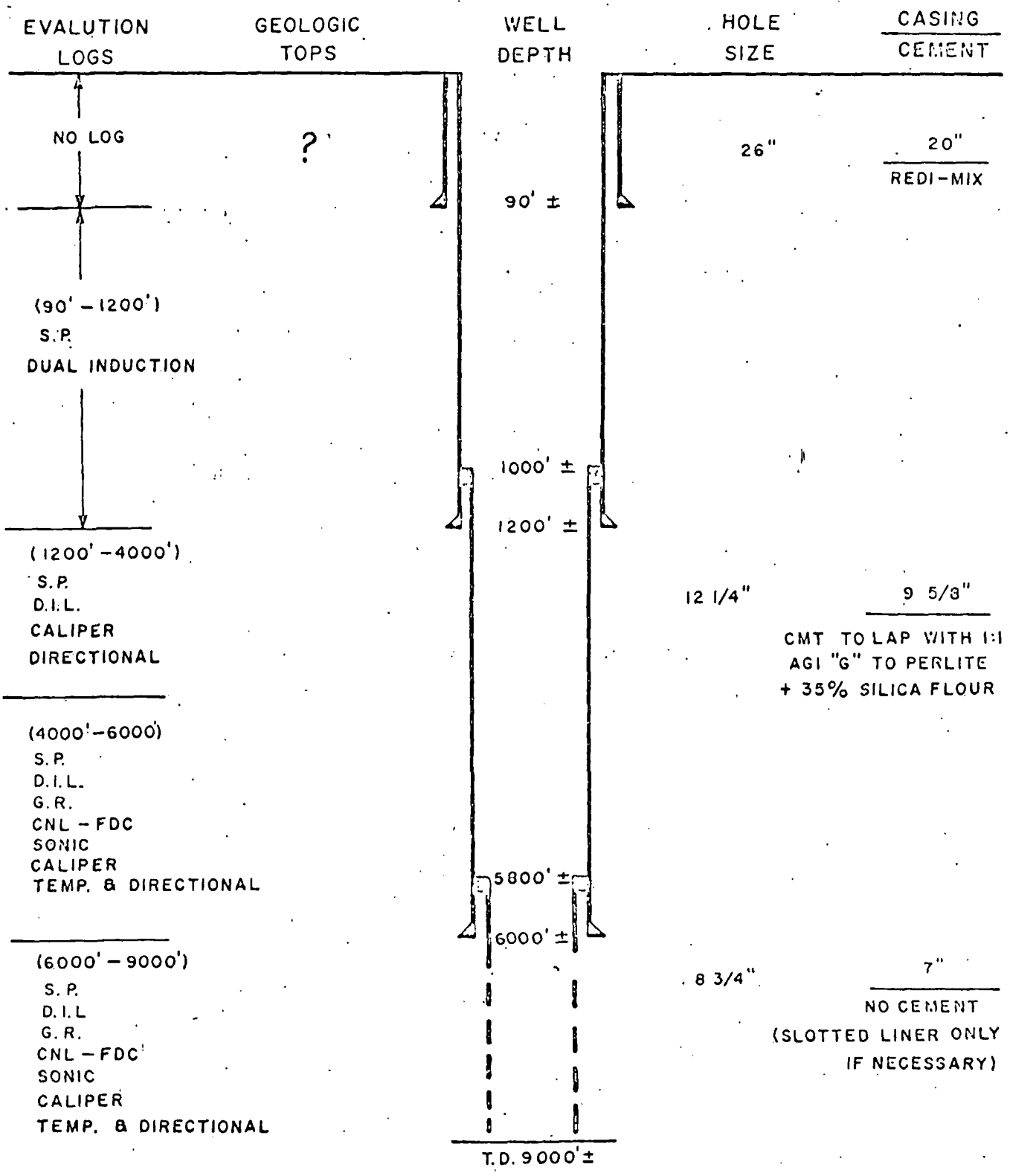
29. Flow well into an atmospheric separator as illustrated in Figure 3, Attachment I, Exhibit B, venting any flashed steam to atmosphere and draining the remaining brine to the reserve pit.

30. Flow well until reserve pit is within 2 ft. of the top of the berm or the well fluid becomes clear indicating the mud has been removed from the well bore.

31. Go back in hole through stripper or rotating head and tag bottom to check for fill. If significant fill is determined to be present, reverse circulate fill out of hole using fresh water.

32. Pull out of hole, remove rotating head and move rig off.

SCHEMATIC DIAGRAM
PROPOSED DRILLING PROGRAM



12" WELLHEAD AND B.O.P.E.

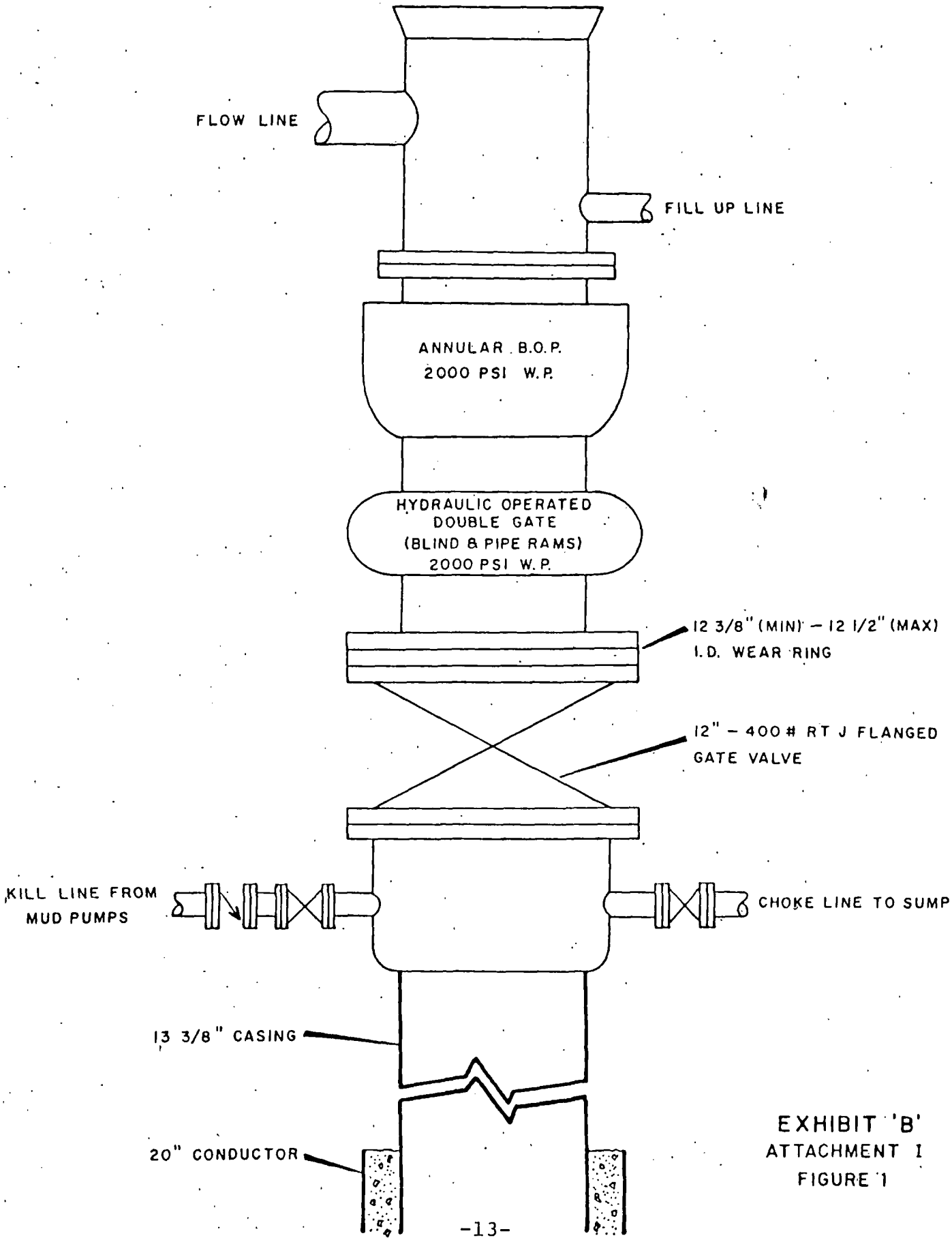


EXHIBIT 'B'
ATTACHMENT I
FIGURE 1

WELLHEAD EQUIPMENT

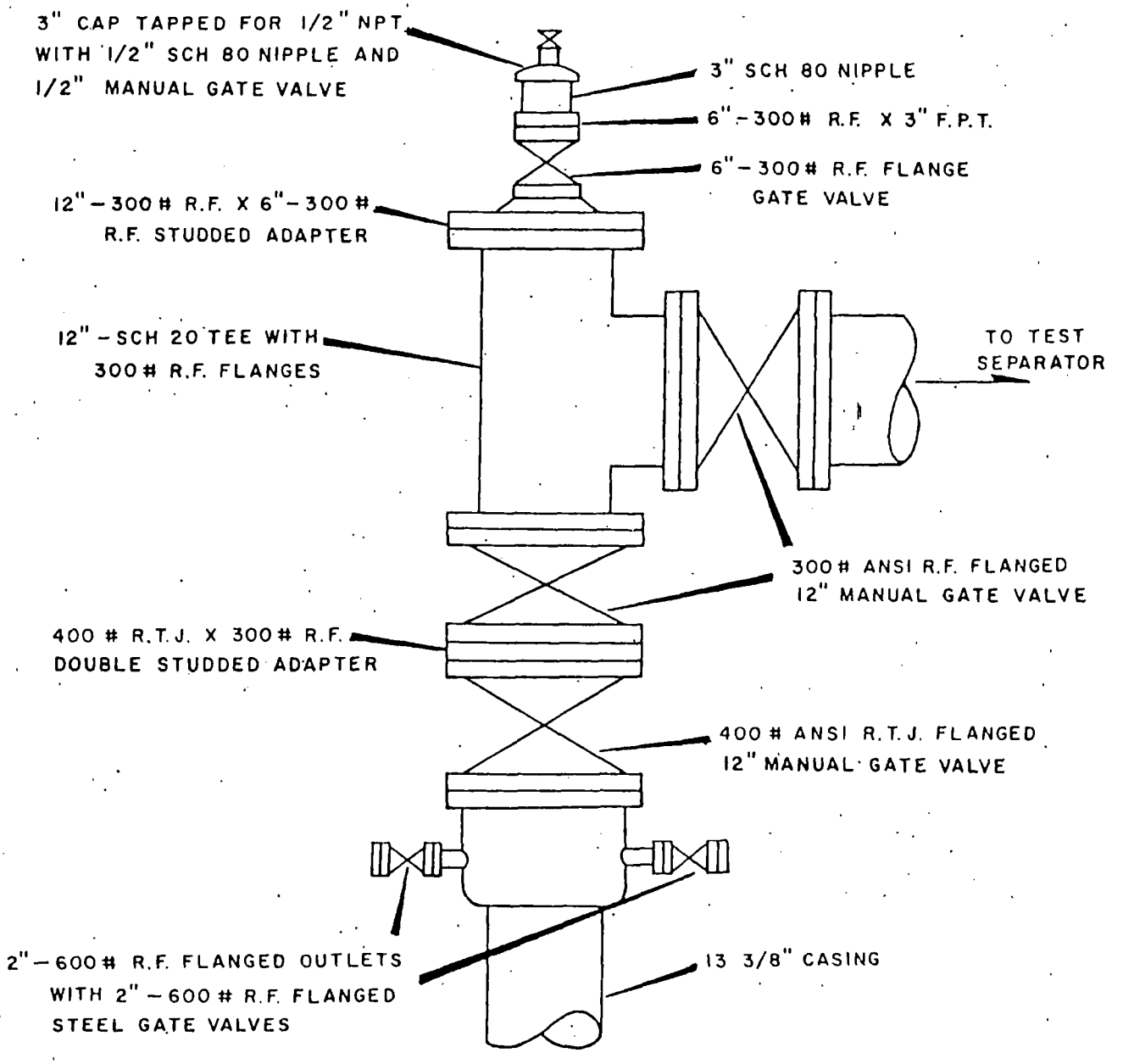


EXHIBIT 'B'
ATTACHMENT I
FIGURE 2

TEST SEPARATOR INSTALLATION

SEPARATOR

5 FT. O.D. X 12 FT. TALL

18" SCH 20 STEAM OUTLET

PRES.	TEMP.
DES. 10 PSIG	400°F
OPER. ATMOS.	212°F

CARBON STEEL

SYMBOLS

- (F.I.) FLOW INDICATOR
- (P.I.) PRESSURE INDICATOR
- (T.I.) TEMPERATURE INDICATOR

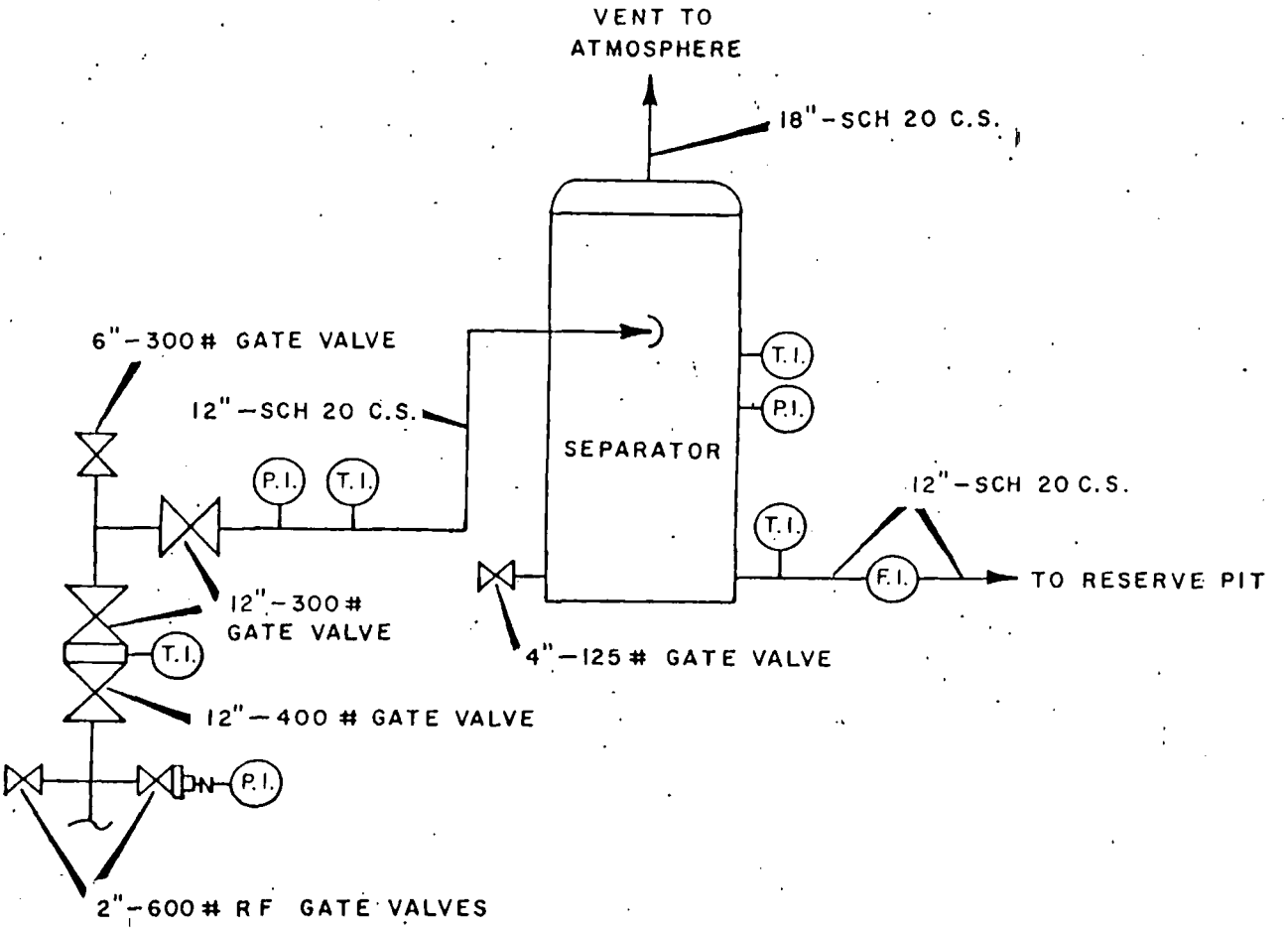


EXHIBIT "B"
ATTACHMENT I
FIGURE 3

EXHIBIT 7.

NICHOLAS E. FITZGERALD
SENIOR VICE PRESIDENT
4900 S. LEWIS
TULSA, OKLAHOMA 74105
(918) 749-7981

Western National Bank

May 26, 1978

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

Attention: Mr. Joseph N. Fiore, Chairman,
Source Evaluation Panel

Subject: RFP No. ET-78-R-08-0003

Gentlemen:

We have been advised that a client of ours, Earth Power Production Company, is proposing a program pursuant to the subject RFP.

Please be advised that in accordance with Enclosure 3, Page 3 of 4, Paragraph D. 7. of the RFP, it is our experience from past programs and from operations currently being conducted that the Proposer has the financial ability to carry out the program.

Sincerely,

Nicholas E. Fitzgerald

Nicholas E. Fitzgerald
Senior Vice President

NEF/ds