Rec'd 3-7-83

JACOBS ENGINEERING GROUP INC.
ADVANCED SYSTEMS DIVISION, ALBUQUERQUE OPERATIONS

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WM- 41
PDR
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cc: E. Tana - ticket -
Pennifill/Siefken
D. Martin

February 24, 1983

Mr. Dan Martin
Low Level Waste Licensing Branch
MS-461SS
US NRC
7915 Eastern Avenue
Silver Spring, MD 20910

Dear Mr. Martin:

Enclosed please find a copy for your information of the scope of work for the collection of additional geohydrological data at the Salt Lake City - Vitro site. We discussed the plans for the program with other members of NRC, including Mr. David Siefken. The program is scheduled to begin February 28, with the drilling complete in mid-March. Hopefully, some of the initial analytical results will be available by the public hearings in mid-March.

We are looking forward to meeting you at the public hearings. If you have any questions, please contact Dr. Kelly Peil at 505-846-4011.

Yours very truly,
JACOBS ENGINEERING GROUP INC.

R. Krishnan

R. Krishnan, Vice President
Advanced Systems Division

RK:KP:dsh
Enclosure
cc: Jim Morley

8303180558 830224
PDR WASTE
WM-41 PDR

CONTRACT ASD-34-6505-S-83-0002

SCOPE OF WORK
TASK AGREEMENT NO. 1
ADDITIONAL SITE CHARACTERIZATION EFFORTS
DATA GAPS -- SALT LAKE CITY

SECTION I

Test Drilling - Piezometer Installation - Pump Testing - Water Sampling - Soil Testing - Water Quality Testing

It is intended that the completion of this program will provide an integrated and technically validated reference for use in understanding the ground water hydrology and water chemistry, before and after remedial action and for demonstrating compliance with the EPA standards.

The following outlines the proposed scope of services to obtain geohydrologic data in the vicinity of and beneath the SLC-Vitro site. The purpose of the study is to evaluate the ground water regime beyond the site boundaries, both up and down-gradient of the site, determine hydraulic parameters of the aquifers and establish the quality of water contained within the unconfined and confined aquifers in areas beyond the site boundaries.

The following is a summary of the scope of services to be performed.

1. Site Access

A sketch of the site showing tentative locations of the proposed test borings and wells is included in Attachment No. 1. Legal access to the drill locations will be the responsibility of the Technical Assistance Contractor (TAC). It will be the Subcontractor's responsibility to comply with the terms of the access agreements which will be provided. It will also be the Subcontractor's responsibility to determine accessibility of the drill sites with the equipment proposed for use on the project as well as to determine the location of all pipes, underground structures, overhead power lines, and other impediments to his operations and to exercise due precautions in conducting operations. Some adjustment in drill site locations can be made, upon the approval of the TAC, to avoid such obstructions or to obtain better accessibility. Drill site restoration will be the responsibility of the subcontractor.

Tentative locations of the borings shall be staked in the field by the TAC. Final approved sites shall be located by the Subcontractor in the field by survey techniques, both horizontally and vertically, and referenced to approved bench marks.

2. Drilling Methods and Equipment

All borings will be drilled by rotary methods using a CME-55, Mobile B-52, or equivalent, drilling rig. The Subcontractor shall specify the type of drill rig proposed for use on the project. All equipment shall be in good working condition and maintained as such.

Only clear water or commercially available organic polymer, biodegradable drilling fluid shall be acceptable as a drilling media. In no case shall such drilling fluids be used in the screened interval of wells that are to be pump tested. If biodegradable drilling fluid is used as a drilling media, an accelerating agent which causes rapid breakdown of the drilling fluid shall be used immediately prior to piezometer installation. It is essential for proper use of biodegradable mud that field pH and conductance be determined to control its breakdown.

3. Personnel

Only experienced, qualified technical and professional personnel familiar with this type of work will be acceptable. All work shall be performed under the direction of an experienced, qualified geological field engineer or geologist. The Subcontractor shall submit the names and qualifications of all personnel proposed to perform the work.

4. Field Documentation

An accurate log of each boring shall be recorded on a boring log form of the type shown in Attachment No. 2. All soils shall be visually classified in accordance with the Unified Soil Classification System.

The field engineer or geologist will keep a daily log of activities of the site as well as any changed conditions from the tasks outlined herein. See Section 9 for a more detailed description of the quality assurance requirements for this program.

5. Well Installation

Test borings shall be made at the approximate locations shown on the attached drawing. It is anticipated that a total of 15 test borings will be required to adequately define the ground water regime. Additional test borings may be required, depending upon actual subsurface and ground water conditions encountered, and will be performed as specified by the TAC. A summary of test boring details is included in Attachment No. 3.

5.1 Boring Location Nos. 1 Through 5

5.1.1 Drilling and Sampling

Borings shall be drilled to such a depth as to fully penetrate the confined aquifer a minimum of 20 feet. Borings will not exceed a depth of 130 feet. Standard penetration testing and sampling shall be made at 5 foot intervals in these borings in accordance with ASTM D 1586 test procedures. Undisturbed sampling may be required at selected intervals with the use of a thin-walled Shelby tube sampler (ASTM D 1587) as directed by the TAC. Minimum diameter of these borings shall be 6 inches.

5.1.2 Piezometer Installation

Upon completion of drilling and sampling, the Subcontractor shall install piezometers in the borings. The piezometers shall consist of 2 or 3 inch Schedule 40 PVC pipe. Five feet of blank casing extending from the bottom of the hole followed by a slotted well screen, 10 feet in length, shall be installed. Tentatively, the slotted well screen shall have three rows of slots cut on 120° centers, with 0.01 inch wide slots being 0.25 inch apart. Adjustments may be made in the well screen as the work progresses based on the gradation of the soils at the screened interval. The bottom of the PVC casing shall have a flush jointed plug. Clean water shall be introduced into the piezometers to flush all drilling fluids from the borings until the wash water runs clear at the surface.

The annular space shall then be backfilled. Backfill material from the bottom of the piezometer to the top of the confined aquifer shall consist of a graded sand. Graded sand shall meet the requirements of ASTM C 33 for fine aggregate unless the aquifer zone is of a coarser gradation than the graded sand. The graded sand shall be introduced into the annular space by means of a tremie pipe initially extending to the bottom of the boring and slowly raised as the backfilling progresses. A bentonite seal shall then be installed directly above the graded sand backfill. The bentonite seal shall consist of a 5 foot thickness of bentonite pellets. The pellets shall be one-half inch in diameter, with a minimum purity of 90 percent montmorillonite clay and a minimum dry bulk density of 82 pounds per cubic foot as provided by American Colloid Company, or equal. The pellets shall be introduced into the annular space in the same manner as described above for the graded sand backfill. The annular space shall then be grouted to the surface. The grout shall consist of a neat cement mix with 4 pounds of commercial bentonite and approximately 7.5 gallons of water added per 94-pound bag of cement. Mixing shall be done in a suitable jet or mechanical mixer. The grout shall be placed by pumping the mixture through a pipe or hose initially extending to the top of the bentonite seal. Grouting shall be done from this point up in one continuous operation until the annular space is completely filled. The top of the piezometer shall be protected with a standard 6 inch I.D. galvanized Schedule 40 steel pipe 4 feet in length provided with a locking cap. A typical piezometer installation is shown on Attachment No. 4. The annular space shall then be backfilled. Backfill material from the bottom of the piezometer to the top of the confined aquifer shall consist of a graded sand. Graded sand shall meet the requirements of ASTM C 33 for fine aggregate unless the aquifer zone is of a coarser gradation than the

5.2 Boring Location Nos. 6 Through 13

5.2.1 Drilling

Borings shall be drilled into the unconfined aquifer to depths of up to 30 feet below existing grade.

Boring nos. 6 through 8 shall be drilled within a 20 foot radius of boring nos. 1 through 3, and no penetration testing or sampling will be required. Standard penetration testing will be required on the remaining borings. Minimum diameter of the borings shall be 6 inches to allow for the proper installation of piezometers. At each boring location, up to three adjacent wells shall be drilled to depths of approximately 10, 20 and 30 feet.

5.2.2 Piezometer Installation

Piezometers are to be installed in each of these borings. Each piezometer is to consist of 2 or 3 inch PVC with a slotted section, 2 feet in length, 1 foot above the bottom of the piezometer. The annular space around the slotted section of each piezometer is to be backfilled with graded sand as outlined in Section 5.1.2. A bentonite seal shall then be installed directly above the graded sand. The remainder of the boring shall be backfilled with the drill cuttings except that the upper 5 feet shall be grouted.

5.3 Boring Location No. 14

5.3.1 Drilling

This boring shall be drilled to a depth of 40 feet in the same manner as described in Section 5.2.1 except that the minimum hole diameter shall be 8 inches.

5.3.2 Piezometer Installation

The piezometer shall be 4.5 inches and the lower 20 feet shall be Johnson Well Screen and backfilled with graded sand. The remainder of the boring will be grouted.

5.4 Boring Location No. 15

5.4.1 Drilling and Sampling

This boring shall be drilled to the depth and in the manner as described in Section 5.1.1 except that the minimum hole diameter shall be 10 inches.

5.4.2 Piezometer Installation

The piezometer shall be installed as described in Section 5.1.2 except that the diameter of the piezometer shall be 6 inches. Johnson Well Screen, 20 feet in length, shall be used in lieu of slotted pipe.

6. Pump Testing and Water Sampling

6.1 Free Flow Monitoring and Capping

It is anticipated that free flow at the surface will be experienced in the deep wells which penetrate the confined aquifer (boring nos. 1 through 5 and boring no. 15). Upon completion of the deep well piezometers, it will be the Subcontractor's responsibility to measure the amount of flow. Methods of flow measurement shall be approved by the TAC. Upon completion of free flow measurement, all deep well piezometers shall be sealed with a threaded cap to prevent surface flow.

6.2 Pump Testing

Two of the wells installed as specified in Section 5 (well nos. 14 and 15) are to be pump tested. During each pump test, the water levels in the pumped well, in addition to adjacent wells, shall be monitored. Deep wells which penetrate the confined aquifer shall be fitted with a standpipe to enable monitoring initial drawdown. Pump testing and monitoring shall extend over a sufficient period of time that water levels are stabilized in the pump well as well as adjacent monitoring wells. Accurate records of all pump tests shall be maintained. It is estimated that 24 hours of continuous pumping will be sufficient. Recovery of the water levels shall also be monitored upon completion of pumping operations. If the pump test is terminated due to mechanical failure prior to stabilized water levels being achieved, pumping shall not resume until the prepumping water levels are reestablished.

A pump, air lift or submersible, of sufficient capacity, shall be used to achieve measurable drawdown of water levels during pumping for both the unconfined and confined aquifer tests. It is anticipated that drawdown of water levels of at least $\pm$20 feet below the ground surface for the confined aquifer test will be necessary. Pumps of capacity of 300 to 400 gpm will probably be needed for the

required pump discharge. It will be the Subcontractor's responsibility to determine the required pump discharge. It will also be the Subcontractor's responsibility to locate a suitable discharge point for the pump test waters.

6.3 Water Sampling

During pump testing, periodic field measurements of specific conductance, pH, alkalinity and temperature shall be made. Samples shall be taken during the pump tests, one at the midpoint and one at the end of the test.

Observation and monitor wells shall also be sampled for water quality. Water samples shall be taken with the use of a Thief sampler or approved equivalent. Prior to taking of water quality samples, water shall be evacuated from the wells by use of a bailer or approved equivalent. Periodic measurements for specific conductance, pH and temperature shall be made during bailing. Samples shall be taken immediately after these parameters have stabilized. It is estimated that about seven to ten volumes of the casing will require removal prior to sampling.

Filtering and preservation of all water quality samples shall be in accordance with accepted procedures, depending upon the parameters to be tested.

6.4 Water Sampling - Existing Wells on Vitro Site

Water samples shall be taken in the existing deep wells installed by Dames and Moore in 1982. The integrity of the wells shall be determined prior to sampling. Sampling shall be in accordance with the procedures outlined in Section 6.3.

6.5 Frequency of Water Sampling

Water sampling for this program shall consist of a suite of samples per well. For three of the wells, the suite shall have two complete sets of samples for testing by two separate approved laboratories.

7. Laboratory Testing

7.1 Soil Analyses

Laboratory testing of retained soil samples will be required. All testing shall be performed in conformance

with the appropriate ASTM Standard. Tests which may be necessary on the project include, but are not limited to, the following:

Unit Weight
Void Ratio
Degree of Saturation
Moisture Content - ASTM D 2216
Specific Gravity - ASTM D 854
Liquid Limit - ASTM D 423
Plastic Limit - ASTM D 424
Sieve Analysis - ASTM D 422 & C 136
Consolidation - ASTM D 2435
Permeability

7.2 Water Analyses

Laboratory testing of collected water samples will be required. All preservation of samples and testing shall be performed in conformance with appropriate EPA (Methods for Chemical Analysis of Water and Wastes) or Standard Methods (15th Edition) criteria. Tests may include, but are not limited to, the following:

Aluminum (.01 mg/l)
Arsenic (0.05 mg/l)
Barium (1.0 mg/l)
Cadmium (0.01 mg/l)
Chromium (0.05 mg/l)
Copper (0.02 mg/l)
Iron (.01 mg/l)
Lead (0.05 mg/l)
Mercury (0.002 mg/l)
Molybdenum (0.01 mg/l)
Nickel (1.0 mg/l)
Calcium (0.01 mg/l)
Selenium (0.01 mg/l)
Silver (0.05 mg/l)
Zinc (1.0 mg/l)
Chloride (13 mg/l)
Nitrate (0.7 mg/l)
Sulfate (26 mg/l)
Gross alpha (15 pCi/l)
Gross beta (50 pCi/l)
Radium-226 (1.0 pCi/l)
Radium-228 (1.0 pCi/l)
Thorium-230 (1 pCi/l)
Lead-210 (1.5 pCi/l)
Polonium-210 (1.0 pCi/l)
Uranium (1.0 pCi/l)
Alkalinity (1.C mg/l)
Total Dissolved Solids (100 mg/l)
Sodium (0.01 mg/l)
Magnesium (0.01 mg/l)
Potassium (0.01 mg/l)
Vanadium (0.01 mg/l)

Required lower limits of detection are provided in parantheses.

The samples shall be sent to an EPA approved laboratory for the above listed testing. The laboratory shall also be approved by the TAC.

Testing plans for samples shall be submitted for approval prior to initiation of laboratory work.

8. Project Schedule

The work is intended to start immediately upon receipt of contract, and must be completed within ten weeks. The Subcontractor shall mobilize to the site within one week after notice to proceed. Well or boring nos. 9, 10 and 13 shall be drilled and developed first. Water samples will be taken for testing from these wells prior to initiating drilling at other locations. Subsequent sequencing will be done in conjunction with a TAC representative.

9. Quality Assurance

An experienced, qualified field engineer or geologist shall direct all field work. This includes all exploratory drilling, piezometer installation, well and pump testing and monitoring and water sampling. All field work shall be performed in conformance with the specifications and procedures outlined herein. A detailed and accurate report of all field operations will be maintained on a daily basis by the field engineer or geologist and shall be available on-site for review by the TAC. Any deviations from the specifications and procedures as outlined herein, as approved by the TAC, shall be carefully documented in writing and included in the daily report.

All laboratory testing shall be performed by experienced and qualified personnel in conformance with the applicable ASTM test procedures. Any deviation from these procedures, as approved by the TAC, must be carefully documented and inluded on the typed laboratory report. The laboratory which is to perform the testing, including equipment, shall be available to the TAC prior to and during the testing for inspection.

The plan should be consistent with the provisions of the UMTRA Quality Assurance Program Plan to be provided by the TAC. Any revisions to key elements for the Subcontractor's plan shall be provided to the TAC.

After contract award and before the start of work, the Subcontractor shall meet with the TAC Quality Assurance representative to review and discuss the development and implementation of the quality assurance plan. The purpose of the meeting will be to develop a mutual understanding of the Subcontractor's procedures and to avoid excessive documentation. Details to be discussed will include formats for recording and reporting data, personnel assigned, and laboratory procedures. The Subcontractor shall be subject to periodic quality assurance audits during the conduct of the program.

10. Delivery Requirements

The Subcontractor shall deliver the following items. All work shall be completed by April 29, 1983. A Final Report of the results shall be presented by May 13, 1983.

1. Boring Logs: Field logs in handwritten form, prior to laboratory testing, edited and typewritten after laboratory testing. Two copies each.

2. Details of construction of all wells including, but not limited to, length of pipe, screened and blank intervals, backfilled intervals, pipe diameter, slot size, graded sand gradation. Two copies each.

3. Water level measurements of all monitoring and observation wells prior to any pump testing. Time, date and barometric pressure should be included for each set of readings. Two copies each.

4. Results of pump testing, both field notes and edited typewritten notes should include, but not be limited to, time versus water level for each well monitored during pumping and recovery; any unusual conditions or deviations from specificaitons; unexpected termination of tests, how long, why. Two copies each.

5. Soil laboratory results, both laboratory worksheets and typewritten edited results. Also describe condition of samples prior to testing, evidence of disturbance, damage to containers. Two copies each.

6. Water quality test results: water quality test results from two laboratories for constituents outlined in Statement of Work; time and procedures used to collect, handle, prepare and transport samples, results of field parameters measured during pump testing. Two copies each.

7. The foregoing deliverables shall be addressed to:

Mr. Daniel D. Dzaack
Manager, Contracts
Jacobs Engineering Group, Inc.
Advanced System Division
Albuquerque Operations
5301 Central Avenue, N.E.
Albuquerque, New Mexico 87108


Site Plan
ATTACHMENT NO. 1
LEGEND
130' deep - 6" diameter with standard penetration testing at 5' intervals.
30' deep - 6" diameter with standard penetration testing at 5' intervals.
30' deep - 6" diameter without standard penetration testing.
130' deep - 10" diameter with standard penetration testing at 5' intervals. (Pump Wall)
30' deep - 8" diameter with standard penetration testing at 5' intervals. (Pump Wall)
RIVERSIDE
SALT LAKE
SOUTH WEST TEMPLE
SEWAGE DISPOSAL
WESTERN
JORDAN
Radio Tower (KCPX)
Radio Towers (KSXX)
SOUTH
BM 4238
BM 4248
4230
4228
4235
4250
3300
10
11
12
14
15
25
26

ATTACHMENT NO. 2

LOG OF TEST BORING NO. ____

PROJECT _____

JOB NO. _____ DATE _____

RIG TYPE _____

BORING TYPE _____

SURFACE ELEV. _____

DATUM _____

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" hammer	Dry Density Lbs. per cu. ft.	Moisture Content Per Cent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION

GROUND WATER

DEPTH	HOUR	DATE

SAMPLE TYPE

A - Auger cuttings. B - Block sample

S - 2" O.D. 1.38" I.D. tube sample.

U - 3" O.D. 2.42" I.D. tube sample.

ATTACHMENT NO. 3

Boring Location No.	Estimated Maximum Depth	Minimum Hole Diameter	Standard Penetration Sampling	Piezometer Diameter
1	130'	6"	Yes	2" or 3"
2	130'	6"	Yes	2" or 3"
3	130'	6"	Yes	2" or 3"
4	130'	6"	Yes	2" or 3"
5	130'	6"	Yes	2" or 3"
6	30'	6"	No	2" or 3"
7	30'	6"	No	2" or 3"
8	30'	6"	No	2" or 3"
9	30'	6"	Yes	2" or 3"
10	30'	6"	Yes	2" or 3"
11	30'	6"	Yes	2" or 3"
12	30'	6"	Yes	2" or 3"
13	30'	6"	Yes	2" or 3"
14	40'	8"	Yes	4½"
15	130'	10"	Yes	6"

ATTACHMENT NO. 4

TYPICAL OBSERVATION WELL