

OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT

YUCCA MOUNTAIN QUALITY ASSURANCE DIVISION

QUALITY ASSURANCE SURVEILLANCE REPORT OF

GEOPHYSICAL LOGGING OF BOREHOLE NRG-1

AT YUCCA MOUNTAIN, NEVADA

SURVEILLANCE YMP-SR-93-005

CONDUCTED NOVEMBER 19 AND 20, 1992

ACTIVITIES SURVEILLED:

GEOPHYSICAL LOGGING ACTIVITIES AND DOCUMENTATION OF BOREHOLE
NRG-1 CONDUCTED BY THE UNITED STATES BUREAU OF RECLAMATION
FOR THE YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT

Prepared by:



Date:

12/11/92

Kenneth T. McFall
Quality Assurance Scientist
Surveillance Leader
Yucca Mountain Quality Assurance Division

Approved by:



Date:

12/22/92

Donald G. Hoxton
Director
Office of Quality Assurance

1.0 EXECUTIVE SUMMARY

Surveillance YMP-SR-93-005 of geophysical logging activities performed by the U.S. Bureau of Reclamation (USBR) was conducted to verify compliance of the U.S. Geological Survey (USGS) procedure YMP-USGS-QMP-5.05, "Scientific Notebook System." Additionally, the technical adequacy of the logging activities were examined.

Due to difficulties encountered due to the instability and general poor condition of the walls of Borehole NRG-1, some of the planned logging had to be abandoned, thus decreasing the actual scope of the surveillance concerning the technical areas.

There were no deficiency documents issued as a result of this surveillance.

Recommendations resulting from this surveillance are not deficiencies, but are areas in which the program could be improved and/or enhanced and are included in Section 6 of this report.

2.0 SCOPE

This report contains the results of the Office of Civilian Radioactive Waste Management Quality Assurance (QA) Surveillance YMP-SR-93-005 of the USBR geophysical logging of Borehole NRG-1. The surveillance was conducted at Yucca Mountain, Nevada on November 19 and 20, 1992. The surveillance was conducted by an individual from the Yucca Mountain Quality Assurance Division (YMQAD) of the Office of Quality Assurance and a technical specialist from the Technical and Management Support Services contractor in accordance with Quality Assurance Administrative Procedure (QAAP) 18.3, Revision 3, "Surveillance Program."

The USBR was working to USGS approved QA procedures for the extent of activities concerning the geophysical logging of Borehole NRG-1. The surveillance was intended to examine the implementation of USGS procedure YMP-USGS-QMP-5.05, Revision 2, "Scientific Notebook System" and the technical adequacy of the geophysical logging techniques.

3.0 SURVEILLANCE TEAM

The surveillance team consisted of the following personnel:

Kenneth T. McFall, Quality Assurance Scientist, Surveillance Team Leader, YMQAD

Loren E. "Bud" Thompson, Technical Specialist, Science Applications International Corporation

4.0 PERSONNEL CONTACTED DURING THE COURSE OF THE SURVEILLANCE

Jim Jones, Logging Engineer, USBR
Rich Markiewich, Logging Engineer, USBR
Bruce Redpath, Geophysicist, USBR
Jerry Wright, Principal Investigator (PI), USBR

5.0 SURVEILLANCE RESULTS

5.1 PROGRAMMATIC EVALUATION

The surveillance consisted of field observation, personnel interviews, and review of documentation. Field observation consisted of witnessing the conduct of the geophysical logging operations on Borehole NRG-1 performed by USBR personnel. Due to the poor condition of the walls of Borehole NRG-1, after consultation with the PI in Denver, it was decided not to attempt to run the density probe into the hole. The density probe contained a radioactive source and the possibility of getting the probe stuck in the hole was all to real. The problems associated with the loss of a radioactive source far outweighed the information to be gained from running the probe in the hole.

A caliper and the checkshot probe were the only tools run into the hole. The caliper tool was run to the bottom of the hole and the hole walls were measured while bringing the tool up out of the hole. When the density tool was lowered into the hole, a depth of only 28 feet (total depth of 150 feet) could be obtained. At this point, Reynolds Electrical and Engineering Co., Inc. was brought in to clean out the hole, but it was decided not to run the density log for the above mentioned reason.

After the hole was cleaned out the checkshot (velocity) tool was lowered into the hole but was only able to obtain a depth of 88 feet. Checkshots were made at selected intervals while bringing the tool out of the hole.

Documentation review consisted of examination of the USBR compliance with USGS procedure YMP-USGS-QMP-5.05, Revision 2. The specific documentation examined was the Scientific Notebook (SN) and the Scientific Notebook Plan required by the procedure. The details of the programmatic areas examined are as follows:

Scientific Notebook Plan NWM-USGS-GPP-28T, Revision 0

SN NWM-USGS-GPP-28T, Revision 0, Serial Number 0037A

SN NWM-USGS-GPP-28T, Revision 0, Serial Number 0037B

- The USBR had no approved geophysical logging procedures in place so they were required to use the USGS procedure on SNs. This was done.
- YMP-USGS-QMP-5.05 was on site and being used as required.
- The Scientific Notebook Plan was present as required.
- The controlling study plan, Study Plan 8.3.1.14.2.1, "Studies to Provide Soil and Rock Properties of Potential Locations of Surface and Subsurface Access Facilities," was referenced in Section 1 of the SN.
- The Scientific Notebook Plan had the required approval signatures.
- The Scientific Notebook Plan contained the required information.
- The Scientific Notebook Plan was attached to the front of the SNs as required.
- USBR personnel used the SNs for entries as required.
- The only change noted in the notebooks was one minor clerical error which was corrected in accordance with YMP-USGS-QMP-17.01
- Open spaces in the SNs were lined through as required.

A great deal of the requirements in YMP-USGS-QMP-5.05 were not applicable to this surveillance since the entries made in the notebooks were the initial entries for both notebooks.

Overall, the adequacy and effectiveness of the implementation of YMP-USGS-QMP-5.05 was found to be satisfactory.

5.2 TECHNICAL EVALUATION

The technical purpose for the surveillance was to provide a QA pedigree for geophysical logging data collected in borehole UE-25 NRG-1 by the USBR¹. The

¹The surveillance was called for in the absence of an approved procedure for grading and accepting logging data. A procedure is presently being written for this purpose and will be available for future use.

task of the technical specialist was to evaluate the grade of the data and the basic scientific method used for collecting the data.

Logging Program - The approved logging program² for the borehole consisted of:

- Velocity Check Shot Survey
- Oriented video camera run

and at the option of the PI:

- Compensated density log
- Caliper
- Neutron Moisture Meter
- Neutron log

The video camera was run in the borehole by an off-site sub-contractor to Raytheon Services Nevada (RSN) on November 17, 1992. The video camera work was performed under the subcontractor's Yucca Mountain Site Characterization Project (YMP)-approved procedures, and surveilled under applicable RSN procedures. The video camera log was not a part of YMP-SR-93-005.

The USBR logging crew elected to run the caliper log on November 18, 1992 prior to the arrival of the surveillance team on November 19, 1992. Therefore, the caliper log was not a part of the surveillance.

The surveillance was performed under YMP QAAP-18.03, Surveillance Program. The surveillance team referred to YMP-USGS-QMP-5.05, Revision 2 (Scientific Notebook System). The logging engineer used Scientific Notebook Plan NWM-USGS-GPP28T, Revision 0, during field logging operations. SN Serial Number 0037A was used for record keeping during caliper and density logging, and SN Serial Number 0037B was used for record keeping during velocity check shot surveys.

Results - The only borehole logging data collected during the surveillance were six levels of velocity check shot data. All data were collected in an appropriate scientific manner, following the notebook procedures. Objective evidence of a high level of technical qualification of those collecting data was obtained through question and answers during the data collection process.

²Reference Yucca Mountain Site Characterization Project Office Job Package 92-02, Revision 2 and Field Change Request FCR 93/046.

Grade of Data - The velocity waveform data are graded as acceptable for use to estimate, through subsequent calculation and/or interpretation, surface-to-depth velocities, intermediate velocities, anisotropy, and other characteristics of the interval of rock associated with seismic acoustic energy.

Due to adverse borehole conditions, the caliper and density logs were not run during the surveillance³.

Activities Surveilled:

The logging engineer had available a controlled copy of scientific notebook plan NWM-USGS-GPP28T, Revision 0, and made appropriate notations in a field notebook (Serial Number 0037A) during calibrations for the density log.

Before survey calibrations using three environmental blocks resulted in nominal calibrations and acceptable statistical variations for the source strength, detectors, and tool geometry.

During logging operations, the density log would only reach a depth of 28 feet in the 150 foot borehole. No density log data were collected.

The logging engineer had available a controlled copy of Scientific Notebook Plan NWM-USGS-GPP28T, Revision 0, and made appropriate notations in a field notebook (Serial Number 0037B) during calibration checks and subsequent logging with the velocity check shot probe. Due to adverse borehole conditions, the check shot probe would not go below 88 feet.

Data were collected from 80, 70, 60, 52, 40, and 24 feet in the borehole.

6.0 RECOMMENDATIONS

1. It is recommended that YMP boreholes which are to be logged with geophysical logging tools be finished to a minimum diameter of 7-1/2 inches. Except as dictated by other planned borehole tests, nominal finished diameter should not exceed 9 inches. This would (1) diminish bridging problems and subsequent requirements for remedial borehole work to support logging operations, and (2) provide a nominal borehole size for conventional, e.g., oil-field, logging tools.

³Entries in SN Serial Number 0037A during caliper logging operations appear to be proper and nominal. An examination of the resultant caliper log indicated that calibrations before and after the survey were successful and that the caliper data would be acceptable for determining borehole size throughout the length of the borehole.

2. It is recommended that only industry-standard logging tools (conventional or slim-hole as appropriate) be used for routine logging operations, and that if research or other specialty tools are needed, the construction of the tools be submitted for an evaluation to determine if the tools are rugged enough for use in YMP boreholes.

DISCUSSION

The major problem with this logging effort was the condition of the borehole. The borehole was unstable, particularly in the upper 40 feet or so. In this case, borehole instability can be attributed to any or all of the following:

- Being air-drilled, there is no borehole fluid to help support sloughing borehole wall material.
- The rocks in this portion of the section are dry and highly fractured.
- The borehole sat for nearly seven months after drilling was completed. In the absence of conditioning, borehole walls tend to deteriorate with time.