



## Department of Energy

Washington, DC 20585

QA: L

JUL 25 1997

L. D. Foust, Technical Project Officer  
For Yucca Mountain Site  
Characterization Project  
TRW Environmental Safety Systems, Inc.  
1180 Town Center Drive, M/S 423  
Las Vegas, NV 89134

### ISSUANCE OF SURVEILLANCE RECORD LLNL-SR-97-039 RESULTING FROM THE OFFICE OF QUALITY ASSURANCE (OQA) SURVEILLANCE OF LAWRENCE LIVERMORE NATIONAL LABORATORY (LLNL)

Enclosed is the record of Surveillance LLNL-SR-97-039, conducted by the OQA of  
LLNL Exploratory Studies Facility at the Yucca Mountain Site, Nevada.

The purpose of the surveillance was to verify implementation of LLNL Technical Implementation  
Plan-Near Field-31, Revision 1.

There was one Performance Report (PR) and two Deficiency Reports (DR) issued as a result  
of the surveillance. PR YM-97-P-012 was issued as a result of lack of training records found  
during the surveillance. DR YM-97-D-065 was issued because standard counts were not taken  
before and after each borehole logging episode. DR YM-97-D-066 was issued because while the  
operations manual was present, on location, and utilized during the logging operation, it was not  
controlled as per Quality Assurance Requirements and Description document, Section 5.2,  
requirements.

This surveillance is considered completed and closed as of the date of this letter. A response to  
this surveillance record is not required; however, the above PR and DRs will continue to be  
tracked until they are closed to the satisfaction of the quality assurance representative and the  
Director, OQA.

If you have any questions, please contact either James Blaylock at (702) 794-1420 or  
John R. Doyle at (702) 794-1465.

OQA:JB-1975

*James Blaylock*  
Donald G. Horton, Director  
Office of Quality Assurance

Enclosure:

Surveillance Record LLNL-SR-97-039

*Recip: NMSS/HLUR*



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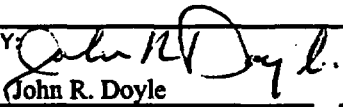
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OFFICE OF CIVILIAN  
RADIOACTIVE WASTE MANAGEMENT  
U.S. DEPARTMENT OF ENERGY  
WASHINGTON, D.C.

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Surveillance No. LLNL-SR-97-039

QUALITY ASSURANCE SURVEILLANCE RECORD

SURVEILLANCE DATA

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|--|---|---|
| 1. ORGANIZATION/LOCATION:<br>Lawrence Livermore National Laboratory<br>(LLNL), Exploratory Studies Facility (ESF)  | 2. SUBJECT:<br>Neutron Logging in the Thermal Testing<br>Facility | 3. DATE:<br>06/11/97  |
| 4. SURVEILLANCE OBJECTIVE:<br><br>To verify implementation of LLNL Technical Implementation Plan (TIP)-Near Field (NF)-31, Revision 1  |   |   |
| 5. SURVEILLANCE SCOPE:<br><br>To assess through review of training files, Scientific Notebook (SN), and witnessing neutron logging of selected boreholes in the ESF Thermal Testing Facility (Alcove #5), compliance to TIP-NF-31, "Neutron and Gamma (Density) Logging in Welded Tuff," Revision 1. |   | 6. SURVEILLANCE TEAM:<br>Team Leader:<br>John R. Doyle<br>Additional Team Members:<br>N/A |
| 7. PREPARED BY:<br><br>John R. Doyle<br>Surveillance Team Leader  | 8. CONCURRENCE:<br><br>Donald G. Horton<br>Director, OQA          | 06/03/97<br>Date<br><br>06/04/97<br>Date  |

SURVEILLANCE RESULTS

9. BASIS OF EVALUATION / DESCRIPTION OF OBSERVATIONS:

On June 10 through 27, 1997, a surveillance was performed to assess the effectiveness of neutron logging performed by LLNL in support of the Single Heater Test (SHT) in the Thermal Testing Facility (Alcove #5). The Surveillance consisted of witnessing the logging of boreholes designated as ESF-Thermal Mechanical Alcove (TMA)-Hydrologic (HYD)-1 and ESF-TMA-HYD-2, the transfer of data to the Principal Investigator's (PI) SN, and the review of records and training files.

Continued on Pages 2-4

10. SURVEILLANCE CONCLUSIONS:

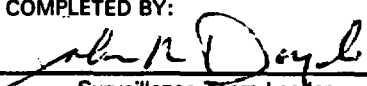
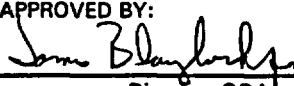
Based on personnel interviews, witnessing of the logging operation, and the review of documentation, it is determined that LLNL is effective and adequate in the implementation of TIP-NS-31, with the exceptions noted below:

Deficiencies identified during the course of the surveillance:

Performance Report (PR) YM-97-P-012

TIP-NF-31, paragraphs 7.0 and 8.4.1, require that personnel be trained to both the procedure and the operator's manual prior to performing work. No training records for R. Carlson were found during the surveillance.

Continued on Page 4

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|--|---|--|
| 11. COMPLETED BY:<br><br>Surveillance Team Leader | 12. APPROVED BY:<br><br>Director, OQA | 7/18/97<br>Date<br><br>7/25/97<br>Date |
|--|---|--|

## 9. BASIS OF EVALUATION/DESCRIPTION OF OBSERVATIONS: (continued)

### Background:

Geophysical logging, such as neutron logging, is accomplished to determine the presence of water and water movement throughout the rock matrix. This is accomplished by utilizing an Americium-241 Beryllium neutron source and a neutron detector. Fast neutrons emitted from the source are moderated by hydrogen atoms present within the borehole and rock formation and measured. This measurement is a direct relationship to the amount of water present. A user check is performed on the source and the detector prior to and subsequent to utilization by the PI. Results from the user check and data derived from usage are recorded within SN 00261 for each borehole operation.

The following attributes of TIP-NF-31, Revision 1, were evaluated during the surveillance:

- *Para. 4.0 The operations manual (Campbell Pacific Nuclear Corporation, 1984) for the logging tools describes all the components of the logging used. It also describes the appropriate assemblage and checkout procedures. A copy of the operations manual will be attached to the "Field Copy" of this procedure.*

The "Field Copy" of this procedure is pasted into SN 00261. The Operations Manual, "501 DR Depth Probe Moisture/Density Gauge for Campbell Pacific Nuclear Corporation," dtd. 6/27/84, is also with the SN and is on location during neutron logging operations. When the manual is on location, it is used for quality affecting activities such as user checks. Quality Assurance Requirements and Description (QARD), Section 5.2, requires that work be performed with controlled implementing documents. In addition, QARD, Section 6.2.1 requires that implementing documents that specify technical requirements shall be controlled in accordance with QARD 5.2 and 6.2.1 requirements. During the surveillance, it was found that this manual was not controlled as per QARD requirements. (See Deficiency Report (DR) YM-97-D-066).

### 5.0 Field Measurements

- *a.) "... A log will be kept of the standard counts taken before and after each borehole survey to allow the user to determine when a defect occurs and the rate of the change per unit of time of course ..."*

Standard counts are not taken after each borehole survey as per procedure, they are recorded at the beginning and the end of the daily operations. In accordance with the procedure, borehole ESF-TMA-HYD-1 would have a standard count performed before and after the logging operation. No such count was performed. Paragraph 6.0, second paragraph, allows for such deviations provided that the procedure is revised to reflect same. The TIP has not been revised to reflect this deviation. (See DR YM-97-D-065).

### *5.0 Field Measurements (continued)*

- *b) Borehole Logging: Instructions on how to operate the tools are described in the operations manuals. Additional operations are as follows:*

*1) Counting Time: The counting time at each sampling location should be at least 16 seconds for the neutron measurements and at least 240 sec (4 min.) for the density measurements with the probe remaining immobile during counting.*

*2) Sampling Interval: The maximum sampling interval (i.e., the distance between individual sampling locations) should be smaller than the radius of investigation of the probe. The radius of investigation of the neutron probe is a function of the water content of the rock and can be estimated using the formula supplied by the manufacturer in the operations manual. The sampling interval used will be selected such that there is an overlap in the volume of investigation of approximately 20% between consecutive sampling stations. ..."*

Verified that a Campbell Pacific Nuclear Neutron tool Serial Number 37067677, is inserted into the borehole with detachable rods. The accompanying cable has been marked into 0.1 meter increments. Counting time is accomplished with an internal clock located in the instrument. The tool remains immobile and when the clock beeps, the rods are pulled out 0.1 meter. Data are recorded in the SN and the process is repeated until the entire borehole is logged.

### *Para. 6.0 Records*

- *"The data collected during neutron and density surveys will be recorded manually in SNs. The records will identify the borehole, date and time, and persons conducting the survey data. The survey data will include the standard counts obtained before the logging run. The depths at which each measurement was made, neutron counts (or density), and a standard count made at the end of each logging run will also be recorded. ..."*

Verified in SN 00261 that for Boreholes ESF-TMA-HYD-1 and 2 the above data are satisfactorily recorded. In addition, standard counts were not recorded after each logging run. (See DR YM-97-D-065).

### *Para. 7.0 Personnel Qualifications*

- *This procedure will be carried out by a ... geologist, geophysist, or technician who has been trained to this procedure ... has read the manufacturer's Operators and Safety Manual ...*

Review of training records and interviews with cognizant personnel indicate that there are no training records for R. Carlson for TIP-NF-31 or the operations manual. The remaining two individuals responsible for this activity, Daniel P. Neubauer and Wunan Lin, were trained. (See PR YM-97-P-012).

**Documents Reviewed During the Surveillance:**

TIP-NF-31, "Neutron and Gamma (Density) Logging in Welded Tuff," Revision 1  
SN-00261, "Neutron Logging"  
501 DR Depth Probe Moisture Density Gauge, Campbell Pacific Nuclear Corporation Operations Manual

**Personnel Contacted during the course of the surveillance:**

Richard Carlson, LLNL, Geophysicist  
Andrew Burningham, CRWMS M&O, QA Liaison  
Dan Neubauer, TCO Office, Engineer  
Cami Brumburgh, LLNL, QA Administrative Specialist  
Royce Monks, LLNL, Engineering Assurance  
James Ziemba, LLNL/OQA, QA Specialist  
Wunan Lin, LLNL, PI

**10. SURVEILLANCE CONCLUSIONS: (continued)**

DR YM-97-D-065

During the surveillance, it was found that contrary to procedure TIP-NF-31, Revision 1, standard counts were not taken before and after each borehole logging episode. While the TIP allows deviations from the procedure, they must be recorded and the procedure be revised to reflect same.

DR YM-97-D-066

QARD, Section 5.2, requires that work be performed in accordance with controlled implementing documents. TIP-NF-31 references and utilizes the operations manual for the logging tool. While the manual is present, on location, and utilized during the logging operation, it is not controlled as per QARD, Section 5.2, requirements.