NYE COUNTY NUCLEAR WASTE REPOSITORY PROJECT OFFICE

TECHNICAL PROCEDURE

TITLE:	Revision: 0
BOREHOLE GEOPHYSICAL LOGGING DATA IDENTIFICATION AND ACCEPTANCE	Date: 08-28-02
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PROCEDURE No.:	SUPERSEDES:
TP-11.0	Original Issuance

APPROVAL	CONCURRENCE
Les W Bradshaw 09.11.02	9/9/02
Project Manager Date	Principal Investigator Date
	28AUG. 2002
	Project Quality Assurance Officer Date

1.0 PURPOSE

Borehole geophysical logging is an essential component of the Independent Scientific Investigations Program (ISIP) conducted by the Nye County Nuclear Waste Repository Project Office (NWRPO). A geophysical logging contractor performs borehole geophysical logging for the NWRPO. The implementation of this procedure ensures that contractor-generated geophysical data will be collected and processed from the boreholes in compliance with Nye County NWRPO Quality Assurance (QA) Program requirements.

2.0 SCOPE

This procedure includes activities required to interact with the geophysical logging contractor (contractor) to ensure requirements are met for consistent naming and labeling, and verification is achieved for calibration status and completeness of logs. This includes all borehole geophysical logs conducted in drill strings, open boreholes, or completed wells. In addition, it describes activities necessary to verify and process hardcopy geophysical logs and electronic files into the NWRPO QA Records Center (QARC).

2.1 APPLICABILITY

This procedure applies to all geophysical logs conducted in Nye County boreholes under the direction of the principal investigator (PI) for the Nye County NWRPO as part of the ISIP.

2.2 TRAINING

NWRPO field personnel shall be trained before conducting work and shall document that they have read and understood this procedure. Personnel performing the tasks described in this technical procedure shall be professional geoscientists or engineers with applicable previous experience. The contractor processing the data shall be trained in the use of well CAD software or other geophysical programs used.

3.0 DEFINITIONS

3.1 Log Header – One or more pages of information included with each hardcopy and with logging data recorded digitally on magnetic media. The minimum information required in the log header is specified in API standards and includes such information as name and location of borehole, logging services performed, and the date and time of the beginning and end of the log run.

3.2 Drill String Geophysical Logs – Borehole geophysical logs run inside a drill string include: natural gamma, density, moisture, temperature, resistivity profile, spectral gamma and deviation logs.

3.3 Open Borehole Geophysical Logs – Borehole geophysical logs run in an open borehole include: resistivity, fluid resistivity, spontaneous potential, caliper, magnetic and sonic logs, as well as logs listed in definition 3.2.

3.4 Completed Well Geophysical Logs – Borehole geophysical logs run in a completed well include: natural gamma, density, temperature, and deviation logs.

3.5 Contractor Logging Procedures – Document supplied by the geophysical logging contractor that defines the detailed procedures by which a particular logging system will be calibrated and operated to collect required data types and achieve necessary data quality.

3.6 Metadata – Information explaining any data or equipment limitations discovered during geophysical logging of a specific borehole.

3.7 Geophysical Logging Contractor – Nye County contractor that provides borehole geophysical logging services on an as-needed basis.

4.0 RESPONSIBILITIES

The project QA Officer shall be responsible for the coordination of the internal review of this Technical Procedure (TP).

The PI shall be responsible for preparing and modifying this procedure, as well as oversight of the performance of this procedure.

The contractor shall be responsible for the implementation of contractor logging procedures. The contractor is also responsible for assisting NWRPO field personnel in meeting the requirements of this TP relative to the identification, documentation, and verification of calibrated geophysical borehole-logging data.

NWRPO field personnel shall be responsible implementing this procedure.

5.0 PROCESS

The contractor will perform borehole-logging using the following technical guidelines (CLPs): ASTM D-5753-95. *Standard Guide for Planning and Conducting Borehole Geophysical Logging* and with API Recommended Practice 31A.

This TP controls the activities performed by NWRPO personnel related to the collection and processing of geophysical data generated by the contractor from Nye County boreholes and completed wells.

The identification and acceptance of geophysical logging data will be performed in accordance with this TP. Any deviations and rationale for changes to the steps in the TP will be described in Work Plan 6 (WP-6), *Early Warning Drilling Program Geophysical Logging Work Plan*. Any deviation from this procedure shall be documented in field and/or office logbooks (i.e., scientific notebooks).

Performance of the tasks specified in this procedure shall be documented in scientific notebooks. All documentation shall meet the requirements of QAP-3.2, *Procedures for Documentation of Scientific Investigations*.

This procedure provides instructions for the following:

- Verification that borehole-logging systems are in a state of calibration prior to logging
- Naming convention for electronic geophysical data
- Verification of header information on the hard and electronic versions of the geophysical logs
- Review of the geophysical log data for completeness.

5.1 Verification of Calibration

The contractor is responsible for arriving in the field with calibrated borehole-logging equipment.

NWRPO field personnel will verify that the contractor's system is calibrated (industry standard or federal facility calibration pit, shop or bench calibration) prior to the collection of geophysical data. NWRPO field personnel will record verification of calibration in the scientific notebook. Valid data collection requires that all sensors used be calibrated to a minimum of National Institute of Standards and Technology standards or the current industry standards.

The contractor shall submit all calibration records to the NWRPO QARC in a timely manner each time they are updated at a minimum of biannually. Calibration records will include, at a minimum, the results of all probe and sensor calibrations including the date and time of calibration, the calibration facility that was used, and the results of field calibrations.

5.2 Downloading and Processing Data

The contractor downloads geophysical data according to the CLPs. The contractor is responsible for processing the geophysical data into both hardcopy and electronic versions. For every set of logs run, a repeat section of the logs will be run to help judge repeatability, as a check on instrument drift and to identify other data quality problems. Deviation logs are an exception where no repeat log will be run. The PI may not require repeat sections for spinner or other specialized logs.

The name of the electronic file shall include an identifier for each specific borehole and a qualifier for the type of logs contained in the file. The identifier for a log run in the drill string of borehole NC-EWDP-10S is '**10S**drill.las,'and its qualifier is "**drill**." For an open hole suite of logs run in NC-EWDP-22PB, the identifier is '**22PB**open.las'and the qualifier is "**open**." Repeat sections will be identified with the qualifier "**rep**." The file name for a completion log run in NC-EWDP-27EM is '27EM**comp**.las' and its repeat section is '27EM**comprep**.las'. Spinner logs and other logs run under the direction of the PI will be similarly identified with the well name and type of log. Example: spinner logs run in NC-EWDP-7SC, '7SCspin30.las' identifies a spinner log run at 30 ft/min. Metadata for this file would provide more detail regarding pump versus static spinner logs.

In addition, the contractor will submit adequate metadata along with the final field-verified geophysical logs. This metadata is required to document any data limitations or problems encountered during the collection of the geophysical data. Once the data have been collected and processed into the required format (las), the data will be verified by trained NWRPO field personnel prior to its submission into the QARC via the QA clipboard or another authorized mechanism of transmission from the field.

5.3 Verification of Geophysical Log Header Information

NWRPO field personnel shall carry the following items to the field:

1. This Technical Procedure (TP-11.0)
2. The scientific notebook assigned to the borehole being logged
3. The well completion diagram (if applicable)
4. The Geophysical Log Header Check Sheet (Attachment 1)
5. Geophysical Tool Calibration Check Sheet (Attachment 2)
6. Optional copy of ASTM D 5753-95.

NWPRO field personnel will fill out the Geophysical Log Header Check Sheet (Attachment 1) prior to the arrival of the contractor. After completing a suite of logs, the contractor will provide a draft of the hardcopy log to the NWRPO field person, who in turn will ensure accurate information is reflected on the log header.

5.4 Ensuring Completeness of the Geophysical Log Data

NWPRO field personnel will be provided with the final field-verified logs, both in hardcopy and in electronic file format, in the field subsequent to geophysical logging. Prior to submitting the logs to the QARC via the QA clipboard, the NWRPO field person will verify completeness of the logs and electronic files including the repeat sections.

For example:
The log header page describes basic information related to: E-logs, Fluid Logs, Caliper, Deviation, Spectral Gamma, Density and Neutron Logs. Nye County field personnel shall:

1. Ensure all logs are on the hard copy and go to the specified depth.
2. Verify that a repeat section is included for the appropriate logs.
3. Open the electronic file and verify the header, depth of logs, and that the electronic logs match hardcopy logs.

5.5 Data Acquisition Methodology and Limitations

Data acquired from geophysical logging will be of the quantitative type and tied to specific physical locations at depth in a drilled borehole or well.

Geophysical logs will be recorded in the applicable scientific notebook by NWRPO field personnel will sign off as recorder. These data will be independently reviewed prior to being posted on the Nye County.com website for dissemination.

Uncertainty attached to the methodology in the acquisition of geophysical logs includes the variability of the equipment used to record the data and individual interpretation of the data once processed. Geophysical logs and associated metadata will be submitted to the NWRPO for capture and preservation in the project files.

6.0 REFERENCES

Recommended Practice 31A. *Standard Form for Downhole Presentation of Downhole Well Log Data,* American Petroleum Institute, API Publishing Services, Washington D.C. 20005, 1997.

ASTM D-5753-95. *Standard Guide for Planning and Conducting Borehole Geophysical Logging,* Annual Book of American Society for Testing & Materials, West Conshohocken, PA 19428, 1998.

QAP-3.2, *Procedures for Documentation of Scientific Investigations.*

WP-6, *Early Warning Drilling Program Geophysical Logging Work Plan.*

7.0 RECORDS

Hardcopy of geophysical logs and repeat section

Geophysical Log Header Check Sheet (Attachment 1)

Geophysical Tool Calibration Check Sheet (Attachment 2)

Downloaded files in the log ASCII text format (las)

Optional text format for electronic files (txt)

Optional well CAD reader files (wcl)

8.0 ATTACHMENTS

Attachment 1: Geophysical Log Header Check Sheet
Attachment 2: Geophysical Tool Calibration Check Sheet

Attachment 1

Nye County Nuclear Waste Repository Project Office	
TP-11.0	**Geophysical Log Header Check Sheet**

Client: _____

Well Id: _____

Project: _____

County: _____

Date: _____ Type of Fluid in Hole: _____

Logging Job No: _____ Res Drilling Fluid: _____

Well Type: _____ Res Filtrate: _____

Total Depth-Driller: _____ Res Wall Cake: _____

Max Depth-Logger: _____ Max Rec Temp: _____

Additives: _____ Depth to Water: _____

Bit Type: _____

Drilling Method: _____

Recorded By: _____

Witnessed By: _____

Run No. Tool; S/N _____ From: _____ To: _____

Prepared By:	Date:
Checked By:	Date:

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Attachment 2

Nye County Nuclear Waste Repository Project Office	
TP-11.0	**Geophysical Tool Calibration Check Sheet**

TOOL	SERIAL NUMBER	CALIBRATION DATE

Prepared By:	Date:
Checked By:	Date:

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