Los Alamos National Laboratory

Environmental Remediation and Support Services

Water Stewardship Program

Quality Assurance Project Plan

for the

Groundwater Level Monitoring Project

Signatures

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General information about this project plan

In this procedure

History of revisions

This table lists the revision history and effective dates of this procedure.

Revision	Date	Description of Changes
0	1/20/05	New document.
1	1/30/06	Annual review changes, added DQOs and processes
2	1/08/07	Annual review changes, significant organization changes.

General information about this project plan, continued

Attachments The following are attachments to this document.

Number	Attachment
1	Groundwater Level Monitoring Project Structure
2	GWLM Project Data Quality Objectives (DQOs)
3	Regulatory Drivers

SECTION 1

Quality Program

Organization

Introduction

This plan describes the processes that are used by the Water Stewardship Program (WSP) to ensure the quality of groundwater level monitoring products and services delivered to water level data customers. WSP strives to conduct monitoring in the most scientifically defensible, cost effective, compliant, and safe manner and communicate the results to customers so that groundwater resources at Los Alamos National Laboratory (LANL or Laboratory) can be managed effectively. The Groundwater Level Monitoring (GWLM) Project supports the environmental restoration program and characterization efforts within the Environmental Programs (EP) Directorate.

Purpose of quality plan

This QA Project Plan describes the policies and requirements that ensure the support provided to the Groundwater Level Monitoring Project are conducted in a consistent, agreed-upon manner. Drivers for the quality plan include:

- DOE Order 414.1C, Quality Assurance;
- DOE Order 450.1, Environmental Protection Program;
- DOE Order 5400.5, Radiation Protection of the Public and the Environment;
- IP 300-SD, LANL Quality Assurance Program;
- EP-ERSS-QAP-0001, ERSS Quality Assurance Program (QAP);
- EP-ERSS-QAP-0002, ERSS Quality Plan Description (QPD); and
- EP-ERSS-QAP-0003, ERSS Quality Plan Implementing Matrices (QPIMs).

Project purpose

The Groundwater Level Monitoring (GWLM) Project supports the Environmental Programs (EP) Directorate and the Water Stewardship Program in efforts to protect:

- public health and environment by implementing rigorous compliance programs designed to ensure institutional compliance with state and federal environmental protection regulations;
- designated uses of the water resources at LANL by applying sound environmental, ecological, and engineering principles towards mitigation of the impact of groundwater use by LANL;
- groundwater resources during emergencies by assuring technical capabilities are available to measure and evaluate unplanned use of groundwater resources;
- public health and environment by the measurement, assessment, and reduction of risks caused by potential contamination of groundwater resources by LANL derived materials.

Organization, continued

Project purpose, continued

The Water Stewardship Program provides the lead technical and regulatory support for the GWLM Project. The GWLM Project Leader is responsible for the demonstration of compliance, which will be demonstrated through the successful implementation of this project plan and applicable procedures.

Project drivers

LANL will comply with the water level monitoring requirements of the following:

- RCRA Operating Permit (1993),
- Groundwater Protection Management Program Plan (1994)
- Interim Facility-Wide Groundwater Monitoring Plan (2005)
- NMED Consent Order (2005)
- NMED Interim Measures Work Plan Requirement (12/2005)
- NMED Notice of Disapproval for the Interim Facility-Wide Groundwater Monitoring Plan (12/2005)
- DOE Order 450.1, Environmental Protection Program
- DOE Order 5400.5, Radiation Protection of the Public and the Environment
- LIR 404-50-01, Water Pollution Control
- New Mexico Environment Department Consent Order for LANL
- LANL Resource Conservation and Recovery Act (RCRA) Operating Permit including the Hazardous and Solid Waste Amendment (HSWA) module governing corrective action and monitoring
- Interim Facility-Wide Groundwater Monitoring Plan (2006)

Compliance will be demonstrated through the successful implementation of this project plan and applicable procedures.

Other drivers

Other drivers for the WSP include LANL, DOE, NMED, and outside requests for technical assistance in meeting community needs for water resource monitoring and information.

Organization, continued

Structure of the quality program

This QAPP, including implementing procedures, is a sub-tier document to the ERSS QAP, QPD, and QPIMs. The following documents provide requirements to ensure that support to the GWLM Project is in accordance with implementing procedures and plans.

- GWLP Monitoring Plan
- QA Project Plan for the Groundwater Level Monitoring Project (this document)
- Implementing procedures

Program organization

The Water Stewardship Program (WSP) is responsible for the implementation of the GWLM Project. The WSP supports the Environmental Programs Directorate of LANL to provide field work and data reporting to comply with the NMED order of consent.

The program is organized by projects or teams under the line management direction of the WSP director. Projects and teams provide services, deliverables, or products to support overall WSP missions. Project leaders have the responsibility to ensure the project is completed.

The organization of the WSP is shown at http://erinternal.lanl.gov/contacts/docs/WSP_OrgChart.pdf.

Organization, continued

Project organization

The WSP is responsible for the GWLM Project. The GWLM Project Leader conducts program development, oversees data collection, and performs data processing, review, validation, and reporting. The GWLM Project Leader reports to the Operations Program Manager for programmatic direction.

The WSP Operations Program personnel implement field activities for the project by providing groundwater level measurements, pressure transducer installations, data retrieval, and operation and maintenance of equipment. The Operations Program Manager is the responsible line manager.

Reference Attachment 1 for the GWLM Project organization.

Implementation

The following table lists specific responsibilities:

WSP Director	Provide overall management of the Water Stewardship Program (WSP).
WSP - Operations Program Manager	Approve the scope of the GWLM Project. Provide sufficient funding and other resources to support the GWLM project as described in this plan. Ensure that groundwater level monitoring activities are performed in accordance with the requirements of the NMED Order as given in this plan and the Groundwater Level Monitoring Plan. Ensure line safety of Operations Program personnel.
WSP - Facility-Wide Monitoring Project Leader	Provide direction as required by the Interim Facility-Wide Groundwater Monitoring Plan to the GWLM Project Lead. Provide planning and scheduling oversight in conjunction with the GWLM Project Leader and the Field Operations Integration Manager.
WSP-QA Specialist	Conduct surveillances of groundwater level monitoring activities at the request of the Project Leader, Program Manager, or Deputy Program Manager.

Organization, continued

Implementation, continued

The following table lists specific responsibilities:

Who	What
WSP – Field Operations Integration Manager	Provide support for field implementation, equipment operation and maintenance, and documentation of the GWLM Project field activities. Provide planning, and scheduling in conjunction with the GWLM Project Leader and the Facility-Wide Monitoring Project Leader.
WSP - GWLM Project Leader	Provide field implementation, field support, equipment operation and maintenance, and documentation of the GWLM Project field activities. Ensure the GWLM Project is in accordance with requirements specified in this plan. Provide technical oversight and quality of the GWLM Project. Provide programmatic planning, scheduling, implementation, documentation, and reporting in conjunction with the Facility-Wide Monitoring Project Leader and the Field Operations Integration Manager.
WSP Field Operations Staff and Contractors	Conduct groundwater level monitoring activities in accordance with the requirements specified in the monitoring plan.

SECTION 2

Personnel Development

Personnel Training and Qualification

Required personnel education/ experience

Qualified team members will be hired and trained as prescribed in the ERSS QAP, QPD, and QPIMs. The LANL personnel division maintains documentation of education qualification.

All GWLM Project personnel will be trained to this document and all implementing procedures referenced within. The GWLM Project maintains documentation of project-specific training and qualification.

The WSP provides support to the GWLM Project and requires personnel with a variety of the following skills:

- Bachelors and/or masters degree in environmental sciences, water resources management, hydrogeology, engineering, or equivalent studies.
- Advanced scientific data analysis and interpretation skills.
- Proficiency with database, spreadsheet, and word processing computer software products.
- Knowledge of federal and State of New Mexico regulations pertaining to groundwater.
- Strong oral and written communication skills.

Training of personnel

All personnel performing project-related work are required to obtain appropriate training prior to performing work governed by a procedure or be directly mentored while performing work. Training for all project personnel will be documented in accordance with EP-ERSS-SOP-2011 “Personnel Training and Qualification”.

Implementation

The following table lists specific responsibilities:

Who	What
WSP – Operations Program Manager	Ensure project personnel working under their authority have the appropriate level of training, experience, and education for the project. Ensure all project personnel are authorized to perform the work required.
WSP - GWLM Project Leader	Ensure all personnel are trained and authorized to perform water level work activities.

SECTION 3

Quality Improvement

Improving Quality

Policy

The GWLM Project subscribes to the WSP principles of problem prevention and continuous improvement. The GWLM personnel are committed to evaluating improvement opportunities identified by trending and reporting of groundwater level monitoring data.

Project performance tracking

The GWLM Project performance will be monitored by project management through quarterly meetings with project personnel. The GWLM Project Leader schedules quarterly meetings and documents project performance. Quarterly meeting topics will include:

- Current status of GWLM Project
- Project plan status and issues
- Equipment needs, issues, or deficiencies
- Personnel needs, issues, or deficiencies
- Review Project priorities and requirements

Project performance will be tracked and documented through meetings minutes, memorandum, and/or e-mails.

Quality Improvement Performance reports

The GWLM Project Leader will provide an annual quality improvement performance report (QIPR) defining project modifications required, issues identified, and planned corrective actions. The GWLM Project Leader will monitor, trend, and document issues and corrective actions. These performance reports will address items such as:

- Equipment performance
- Required system modifications/upgrades
- Problems or deficiencies identified during assessment activities or during routine performance of work, and corrective action plans

The QIPR will be produced for each calendar year, and will be due by March 1 of the following year.

Improving Quality, continued

Quality Improvement Performance report distribution

The following receive copies of quality improvement performance reports:

- WSP Director
- WSP Operations Program Manager
- WSP Facility-Wide Monitoring Project Leader
- WSP Field Operations Integration Manager
- WSP QA Specialist

Corrective actions within WSP

Corrective actions for all WSP owned activities are initiated, tracked, corrected, and documented according to procedure EP-ERSS-SOP-3001 “Issues Management”.

Implementation

The following table lists specific responsibilities:

Who	What
WSP Facility-Wide Monitoring Project Leader	Review QIPR and provide management support for project issues.
WSP Operations Program Manager	Identify opportunities for process improvement, health and safety enhancement, environmenal protection, or other improvements for the project operations. Ensure field equipment and personnel issues are reported and corrected in a timely manner. Evaluate proposed improvements in selected applications. Monitor and trend project performance and ensure issues are corrected in a timely manner.

Improving Quality, continued

Implementation, continued

The following table lists specific responsibilities:

Who	What
GWLM Project Leader	Provide project status report and performance information and feedback for management at quarterly meetings. Ensures quality of data reports and implements and corrects issues in a timely manner. Complete and submit the annual quality improvement performance report (QIPR) for the previous year by March 1 of the following year. Schedule the quarterly meetings and document results of meetings and project performance.
WSP QA Specialist	Ensure issues are documented on Issues Management Reports, and corrected as soon as possible.
All project personnel	Identify opportunities for process improvement, health and safety enhancement, environmenal protection, or other improvements of the project operations**.**

Documents and Records

Project Documents

Policy

Project Documents will be maintained as records in accordance with ERSS and WSP records requirements. Documents to be generated include the Monitoring Plan, the QAPP (this document), the QIPR, and the annual status report.

Revising this plan

The Groundwater Level Monitoring Project Leader and the WSP Operations Program Manager or designee will approve all revisions to this plan. Revisions to the plan will be provided to the WSP QA Specialist.

Document control

This document will be controlled under the organization's document control system (EP-ERSS-SOP-4001, "Document Control and Distribution") to ensure that those performing work for the system will receive a controlled copy and all revisions. Those who will receive or have nearby access to a controlled copy include:

- WSP Director
- WSP Operations Program Manager
- WSP Facility-Wide Monitoring Project Leader
- WSP GWLM Project Leader
- WSP Field Operations Integration Manager
- WSP QA Specialist
- WSP GWLM Project personnel

Procedures

Procedures will be developed as necessary and according to Procedure EP-ERSS-SOP-5001, "Preparation, Review, Approval, Revision, and Cancellation of Procedures".

Project Documents, continued

Implementation The following table lists specific responsibilities:

Who	What
Operations Program Manager	Review and approve revisions to procedures and plans on an annual basis.
Facility-Wide Monitoring Project Leader	Review and approve revisions to procedures and plans on an annual basis.
GWLM Project Leader	Develop and revise implementing procedures and project plans on an annual basis.

Project Records

Records resulting from this project

The number, type, and detail of all records to be kept will provide sufficient information to allow an individual with equivalent education and training to verify or reconstruct the results. Implementing procedures specify the records, forms, logbook entries, or other information to be kept as documentation of the performance of the procedure.

Records to be kept in the ERSS records system (EP-ERSS-SOP-4004 "*Records Transmittal and Retrieval*") include the following:

- Logbook entries to record and document field activities
- Manual water level measurement field forms
- Electronic water level data files in original binary format
- Electronic water level data files in spreadsheet or text format
- E-mail, memorandums to record, general correspondence that affects the project
- Data review and validation forms
- Routine data reports
- Documentation of periodic groundwater level data updates
- Documentation of periodic performance reports on well equipment inspection and inventory

Records final disposition and retention period

All records will be maintained and available (after the deadline for submittal as given in applicable procedures) for auditing in the records processing facility (RPF). Records are stored in the RPF in accordance with EP-ERSS-SOP-4003, "*Records Management*".

Implementation

The following table lists specific responsibilities:

Who	What
GWLM Project Leader	Ensure all appropriate records are generated for the project and that all project records are appropriately stored for retention.
WSP Operations Program Personnel	Ensure all appropriate records are complete and accurate. Provide for the safe keeping of project records until submitted to the RPF. Submit records to the RPF on a timely basis.

Electronic Media

Policy

The project will utilize electronic means as necessary to maintain data and perform calculations on the data. Groundwater level monitoring data obtained through manual measurements will be maintained in paper copy and the data will be incorporated into electronic data files. Groundwater level monitoring data obtained from pressure transducers may be stored in text or binary format electronic files that are proprietary to the transducer manufacturers. These raw files will be appropriately labeled and stored in original format digital files on a common (shared) server.

Routine data reports will typically incorporate groundwater level data that are reduced from the original raw data files and validated by the GWLM Project Leader or designee; these reports will be kept in hard copy as the official record. Validated and reduced groundwater level data will be maintained in electronic file format (spreadsheets, text files, or databases) by the GWLM Project Leader and the data will be maintained in the Water Quality Database (WQDB) following appropriate procedures for record storage and retention.

Validated groundwater level data will be made available for use and review to organizations external to the WSP and external to LANL on the Water Quality Database (WQDB). The WQDB is located at http://wqdbworld.lanl.gov/.

Electronic Data Files: raw data files, databases, and spreadsheets

Backups -- All electronic data files used to store data and generate reports that will be used in demonstrating compliance will be maintained on a common (shared) drive of an ERSS division computer server. These electronic data files will be backed up daily to a separate computer and/or to removable media to minimize potential losses of data.

Verification of data –Groundwater level data that are obtained through manual measurement methods will be entered into an electronic file format (spreadsheet or database), which will undergo 100% verification by someone other than the data entry person. These reviews will be documented and forwarded to the appropriate record series.

Verification of calculations -- A person other than the person who generates the groundwater level data calculations will review for accuracy the calculations performed manually and/or in spreadsheets and databases. This review will be documented and forwarded to the appropriate record series.

Electronic data file control -- The integrity of all raw and validated electronic groundwater level data will be ensured by maintaining data on a common (shared) server. This will enable the database administrator to control access to these data files, allowing only trained authorized persons access to data files.

Electronic Media, continued

Implementation

The following table lists specific responsibilities:

Who	What
GWLM Project Leader	Ensure that groundwater level data and calculations are verified and all electronic media are appropriately backed up and maintained for the project.

SECTION 5

Work Processes

Planning and Performing Work

Policy

Work that provides support to the GWLM Project will be planned and documented as described in this document and appropriate implementation procedures. Work will be performed according to applicable plans, implementing procedures, and the IWM process. The WSP Operations Program Manager will provide line supervision of personnel assigned to project tasks to ensure work is performed to support the Quality Program. Before changing a work process that affects the project quality specifications, the Operations Program Manager and GWLM Project Leader will ensure the same level of planning and review as used in the initial project planning steps.

Work processes

All work will be regarded as a process. Each process consists of a series of actions and is planned and carried out by qulaified workers using specified work processes and equipment under adminsitrative, technical, and environmental controls established by management to achieve an end result. Workers are the best resource of contributing ideas for improving work processes and will be involved in work process design, process evaluation, and providing the feedback necessary for improvement.

All work is planned and performed using the principles of Integrated Safety Management and IMP 300-00-00, Integrated Work Management for Work Activities.

Work performance

The Operations Program Manager in conjunction with the GWLM Project Leader, will ensure that the following are clearly identified and conveyed to workers prior to beginning work:

- customer and data requirements for the work and final product
- acceptance criteria applicable to work and final product
- hazards associated with the work
- technical standards applicable to work and final product
- safety, administrative, technical, and environmental controls to be employed during the work.

Planning and Performing Work, continued

Description of work processes

The work processes used to meet the requirements of this plan are as follows:

- Data Quality Objectives
- Monitoring Plan
- Data Collection Systems
- Field Data Handling and Documentation
- Instrumentation and Equipment
- Data Processing, Review, and Validation
- Information Management
- Data Reports

The following chapters further describe the work process associated with the GWLM Project.

Data Quality Objectives

What are DQOs?

Data quality objects (DQOs) are defined as "a systematic planning tool based on the Scientific Method for establishing criteria for data quality and for developing data collection designs" (EPA QA/G-4, *Guidance for the Data Quality Objectives Process*, 1994). DQOs are statements of the required quality of data obtained by the project and the uncertainty level a decision maker is willing to accept for results derived from the data. As such, DQOs are a management tool used to limit the chance that data obtained by the project might lead to an incorrect conclusion. The DQO process defines the required level of data defensibility and hence the level of documentation desired. DQOs must strike a balance between time, money, and data quality. This QAPP is an integral part of the DQO process.

The DQOs for the Groundwater Level Monitoring Project were developed in accordance with EPA QA/G-4, *Guidance for the Data Quality Objectives Process*, 1994.

Review and assessment of DQOs

An annual review of DQOs and reiteration, if necessary, will be conducted to determine that the collected data met the performance criteria specified in the established DQOs.

Project DQOs

DQOs for the GWLM Project are provided in Attachment 2.

Implementation

The following personnel have specific responsibilities for the GWLM DQOs:

Who	What
Facility-Wide Monitoring Project Leader	Ensure the DQO process is implemented. Conduct annual review and reiteration of the DQOs.
GWLM Project Leader	Ensure DQOs are annually reviewed and reiterated, if necessary. Conduct annual review and reiteration of the DQOs and make any necessary additions, changes, or revisions by revising this QAPP.

Monitoring Plan and Plan of the Month

GWLM Plan

The Groundwater Level Monitoring plan describes where and how often GWLM work will be conducted. The monitoring plan is a document that lists the well locations to be monitored for groundwater level and the type of groundwater level monitoring to be performed at each well.

The monitoring plan will be completed by February 15 of each year.

Prior to the first day of each month, the project leader will develop a plan of the month that will schedule detailed work assignments to accomplish the monitoring specified in the plan, and to incorporate any additional work requests of the project.

Changes to the Plan

If substantial changes are needed, a formal revision will be issued by the GWLM Project Leader in accordance with EP-ERSS-SOP-4002, "*Document Development, Review, and Production*". Revision numbers will identify the most recent revision.

Implementation

The following table lists specific responsibilities:

Who	What
GWLM Project Leader	Develop and revise the Groundwater Level Monitoring plan with input from data users, and with assistance and review from the Facility-Wide Monitoring Project Leader, and the Operations Program Manager. Develop in conjunction with the Field Operations Integration Manager, plan of the month documents that schedule detailed work assignments to accomplish the monitoring specified in the plan. Plan of the month documents will be completed prior to the first day of each month, and provided to the Operations Programs personnel involved in GWLM Project work. Ensure that all monitoring is accomplished as specified in the monitoring plan.
Facility-Wide Monitoring Project Leader	Provide support and direction to GWLM Project Leader for development and revision of the monitoring plan.
Operations Program Manager	Review monitoring plan for operational efficiency and provide resources for execution of the monitoring plan.
Field Operations Integration Manager	Provide monitoring according to the monitoring plan and coordinate groundwater level field activities with the GWLM Project Leader.
Operations Program Personnel	Provide project status information to the GWLM Project Leader and the Field Operations Integration Manager, and assist in the development of the plan of the month. Perform monitoring activities according to the monitoring plan and the plan of the month.

Data Collection Systems

Policy

Work will be performed in accordance with approved procedures, that incorporate or reference manufacturer instructions and procedures for installation and operation of the transducer equipment and software.

Manual groundwater level measurements

Manual groundwater level measurements will be obtained in single completion wells or open-hole wells using standard operating procedure (SOP) ENV-DO-202, Manual Groundwater Level Measurements.

- Manual groundwater level measurements will be recorded on the Groundwater Level Measurement Form.
- Measurements will be recorded to 0.01 ft, and will be accurate to about ±0.01 ft for each 100 ft of measurement (0.01%).
- Manual measurements will be obtained periodically in wells specified in the monitoring plan, at frequencies specified in the monitoring plan.
- Manual groundwater level measurements are required in single completion wells that are equipped with transducers to verify the transducer measurements.
- The frequency of manual measurements will be specified either quarterly or semiannually in the monitoring plan.

Transducer measurements

Groundwater level measurements will also be obtained using pressure transducers installed in wells specified by the monitoring plan. Transducer measurements will be obtained at specific time intervals, usually 60-minute intervals, and are therefore sometimes referred to as continuous measurements (relative to the periodic manual measurements).

In general, two types of transducer measurement systems will be used at LANL. In single completion wells, transducer measurements will be obtained using ENV-DO-201 “Pressure Transducer Installation, Removal, and Maintenance.” In multiple completion wells installed with the Westbay® MP System, transducer measurements will be obtained using ENV-WQH-SOP-064, “Westbay® Pressure Transducer Installation, Removal, and Maintenance.”

Data Collection Systems, continued

Transducers in single completions wells

Pressure transducers will be deployed in single completion wells specified in the monitoring plan. These transducers will be installed in a well below the water line using a cable that can be attached to a portable computer that is used to program, communicate with, and download data from the transducer. Modern transducers typically have data logging capability built into the submersible unit.

Westbay® MP System

The Westbay® MP System is a modular multi-level groundwater monitoring system that consists of plastic casing components that are permanently installed in selected monitoring wells to monitor multiple zones of saturation and/or multiple zones within the regional aquifer. The plastic casing components utilize monitoring ports at specific depths in the well to access pressure information (water level data) and to collect groundwater samples.

A sampling transducer probe is used to access the monitoring ports to collect groundwater samples and obtain pressure data. Individual transducers are connected to each monitoring port for extended periods to collect 'continuous' pressure/groundwater level data. When multiple transducers are deployed, a single cable connects all transducers to a Westbay® data logger at surface.

During groundwater sampling of Westbay® equipped wells, pressure measurements will be obtained from each port in the well in addition to the ports/zones being sampled. These pressure measurements will be obtained when possible given personnel time constraints during sampling in order to provide additional water level data and to provide a periodic check of the operation of the Westbay® transducer equipment.

Roctest System

A recently installed well at LANL, R-33, and possibly other future wells, are equipped with the Barcad groundwater pump system and Roctest transducers. Procedures for the operation of these transducers are included in ENV-DO-201, "Pressure Transducer Installation, Removal, and Maintenance."

Baski System

Some recently drilled LANL monitoring wells have been installed with the Baski system. These wells have two screens, and will be installed with two pressure transducers. Baski well systems will be monitored with the same procedures as single completion wells, as defined in ENV-DO-201, "Pressure Transducer Installation, Removal, and Maintenance."

Data Collection Systems, continued

Implementation

The following table lists specific responsibilities:

Who	What
GWLM Project Leader	Provide technical oversight, plan, and schedule groundwater level data collection. Ensure that the GWLM Project data collection is implemented in accordance with project requirements. Oversee GWLM Project data collection to ensure work is performed to achieve project quality specifications. Provide review of data to ensure that appropriate equipment is used and provide guidance to the Groundwater Level Field Operations personnel for quality improvement.
Operations Program Manager	Provide properly trained field personnel and appropriate equipment for the collection of groundwater level data in cooperation with the GWLM Project Lead. Ensure the GWLM Project operational activities are performed to achieve project quality specifications. Ensure that the GWLM Project data collection is implemented in accordance with project requirements.
Operations Program Personnel	Collect manual measurements and transducer measurements from wells as specified in this plan. Obtain data accurately according to procedures and securely transport the data for transfer to the server. Ensure equipment is within calibration specifications.

Field Data Handling and Documentation

Policy

WSP personnel involved in the collection, retrieval, and analysis of groundwater level monitoring data will maintain secure control of data files at all times until data files are transferred to the ERSS server.

Groundwater level monitoring data retrieval and data transfer

Groundwater level data are acquired in the field on the Groundwater Level Measurement Field Form and in electronic data files. Operations Team personnel will promptly transfer the groundwater level data to the server and ensure that the raw data are appropriately archived. Raw data handling is performed according to requirements of ENV-WQH-QP 062, "Groundwater Level Data Processing, Review, and Validation" and groundwater level data management will be conducted pursuant to procedures for records management and handling electronic data.

Implementation

The following table lists specific responsibilities:

Who	What
Operations Program Manager	Authorizes trained workers in support of the GWLM Project.
GWLM Project Leader	Ensure procedures for data collection and handling and control during data retrieval and transmittal are followed. Maintain groundwater level monitoring data files in a secure manner on an ERSS common server.
Operations Program Personnel	Ensure operation of transducer equipment and software for the collection of groundwater level data follow established procedures. Ensure the security of groundwater level data files from the creation of the data files at the time of data download/transfer/collection at the well to the safe transmittal of data files to the server.

Instrumentation and Equipment

Policy

Water level equipment will be maintained and calibrated to ensure quality transducer water level data. All WSP technical work that depends upon the accuracy of data will be performed using equipment for which the calibration status and limits of accuracy are known and controlled.

WSP personnel will perform maintenance and performance check procedures on all groundwater level monitoring field instruments at intervals prescribed by the equipment manufacturer to ensure accuracy of measurements and will maintain appropriate records of maintenance and performance check activities. All field equipment will be returned to the manufacturer for calibration in accordance with EP-ERSS-SOP-5006, "*Control of Measuring and Test Equipment*".

Equipment and instrumentation calibration and maintenance requirements are set forth in the GWLM plan, manufacturors equipment manuals and recommendations from manufacturors service personnel, and implementing procedures for water level monitoring work.

Implementation

The following table lists specific responsibilities:

Who	What
Operations Program Manager	Ensure water level equipment maintenance and calibration is performed and ensure that operations personnel conduct field activities in accordance with implementing procedures and requirements.
GWLM Project Leader	Provide water level equipment maintenance and calibration and ensure that operations personnel conduct field activities in accordance with implementing procedures and requirements.
Operations Program Personnel	Ensure implementing procedures are used for any equipment and instrumentation used in data collection. Ensure that equipment and instrumentation are in proper working order and are calibrated if appropriate. Ensure that data are collected and equipment operated and maintained in accordance with project requirements.

Data Processing, Review, and Validation

Policy

Groundwater level data will be reviewed for accuracy and completeness and validated on a routine basis as the data are collected for each well. A determination as to the acceptance or rejection of the data will be provided by the GWLM Project Leader or designee according to ENV-WQH-QP-062, *Groundwater Level Data Processing, Review and Validation* to provide appropriate data that will meet the goals of the project.

Data Processing and Review

The raw groundwater level electronic data files obtained from wells will initially be reviewed for completeness and appropriateness by the field operations team members. Field data review will include recording the start date time, end date time, and the name of the file downloaded. Most data logging software is capable of showing a time series graph of the groundwater level data, which will also be checked by the field members in the field. Field team members ensure that the date and time are correct in the portable computer and in the transducer data loggers. All equipment used for the GWLM Project will be set to Mountain Standard Time (MST) with no adjustment for daylight savings.

Based on the initial review of the groundwater level data, field team members will correct any obvious problems with the transducer equipment at the time of data retrieval.

Formal data review and processing will be performed by the GWLM Project Leader or designee according to ENV-WQH-QP-062, *Groundwater Level Data Processing, Review and Validation*. Data review will be comprehensive to determine the quality of the data, and will include such items as the following:

- Verify that the data file represents data for the correct well.
- Check that beginning and ending dates and times are in Mountain Standard Time, and that the transducer serial number and other information in the data file header correspond with field records.
- Determine that the reference water elevation in the data file corresponds with the manual water elevation obtained when the transducer was installed.
- For groundwater level data from Westbay wells, determine that each probe was properly attached to the appropriate port by checking that pressure values are similar to previous values for each port.
- Review time series of the water level data to check for possible sensor drift with time or cyclical, spiking, or fading response that may indicate

failure of the transducer equipment.

- Calculate groundwater elevation using the appropriate parameters.

Compare the hydrograph of newly obtained data with hydrographs of previous data sets, if available, and with water levels obtained during installation and retrieval of the transducers and/or with water levels obtained during groundwater sampling.

Data Validation

The GWLM Project Leader or designee will provide a quality evaluation and validation for all groundwater level data according to ENV-WQH-QP-062, *Groundwater Level Data Processing, Review and Validation*. Data review described above will be part of the validation process. The data reviewer will provide a determination as to the acceptance or rejection of groundwater level monitoring data based on the data review, and will consider items such as:

- Rising water levels may cause over pressurization of the transducer, which may produce invalid water level data.
- Falling or highly fluctuating water levels may drop below the level of the transducer or below the well screen or port, which will produce invalid water level data.
- Malfunctioning transducers may record normal-looking data that has no relation to water level. Water level data will be reviewed over time for possible non-conformable character.

The data reviewer will invalidate water level data that are determined to be erroneous, atypical, or non-conformable. The data reviewer will validate groundwater level data that meet the criteria of the validation process.

Implementation

The following table lists specific responsibilities:

Who	What
GWLM Project Leader	Implements review and validation of the groundwater level monitoring data. Provides determination as to the acceptance or rejection of groundwater level monitoring data, or designates qualified data validators.

Operations Program Personnel	Provide initial field data review of groundwater level data when data are obtained from well. Correct any problems identified during initial data review.

Information Management

Information management

Groundwater level data will be managed according to ENV-WQH-QP-027, "Managing Electronic Data." Data in the Water Quality Database (WQDB) provide the basis for compliance, surveillance, and stakeholder reporting. Information management procedures must ensure that the data is securely stored and backed up to prevent corruption or data loss.

GWLM project data fields

The groundwater level data will be transferred in electronic data file format to the WQDB data management team, who will load the data into the WQDB. The GWLM Project Leader and the data management team will work together to establish and define the data fields and methods for transferring and managing water level data.

Implementation

The following table lists specific responsibilities:

Who	What
GWLM Project Leader	Periodically transfer groundwater level data to the data management team, and ensure that GWLM Project data are appropriately housed in the WQDB. Request changes needed to the data management system to meet project needs.
Facility-Wide Monitoring Project Leader	Ensure the data management processes meet the requirements and objectives of the project.
ERSS Data Management Team	Provide the upload of groundwater level data into the WQDB, and provide feedback for any problems associated with uploading or managing the GWLM Project data.

Data Reports

Policy

Data reports will be produced annually to provide updates of groundwater level data. The reports will provide quality-assured data and discussion of data and equipment issues. Summary data reports will be provided to users of groundwater level monitoring data upon request. Periodic groundwater level data updates may be communicated to project management via e-mail or memorandums. Other data reports may be generated if requested by data users. Annual data reports will be provided to the following:

- WSP Director
- Facility-Wide Monitoring Project Leader
- WSP Operations Program Manager
- GWLM Project Leader

Implementation

The following table lists specific responsibilities:

Who	What
GWLM Project Leader	Develops annual groundwater level data reports and responds to requests for other data reports from data users.
Facility-Wide Monitoring Project Leader	Ensures that data reports meet the requirements and objectives of the project.

SECTION 6
Design

Policy

Minimal design activity may be necessary for this project. Design activities, when identified, are conducted and reviewed in accordance with established Laboratory, DOE, and other appropriate standards and requirements. Facility engineering designs incorporate and implement sound engineering/scientific principles. Verification and validation of the adequacy of designs are conducted before relying on the performance of the design function. Design activities are conducted in accordance with EP-ERSS-SOP-6002, "*Design Control*".

SECTION 7
Procurement

Procurement of items and services

Procurement of items used in this project will follow the LANL procurement process. Most items required for this project are commercial grade in nature and no special procurement requirements or needs are necessary. For items for which special requirements are necessary, the Field Operations Integration Manager, the GWLM Project Leader, and project members will identify such items or services, and the processes described in EP-ERSS-SOP-7001, "*Procurement Document Content and Revision Process*" and EP-ERSS-SOP-7002, "*Control of Procured Items and Services*," will be used.

Implementation

The following table lists responsibilities:

Who	What
Field Operations Integration Manager	Recommend to Program Manager contracting items and services. Procures equipment for the GWLM Project Develop acceptance criteria.
GWLM Project Leader	Recommend to Field Operations Integration Manager contracting items and procurement specifications. Develop acceptance criteria.

SECTION 8
Inspection and Acceptance Testing

Policy

Any materials will be inspected and/or tested prior to acceptance for use in this project. Most supplies used during performance of project activities are commercial grade in nature and require no special acceptance practices or procedures.

Transducer equipment and associated data logging equipment and cabling, etc. are tested prior to installation according to ENV-DO-201, *Pressure Transducer Installation, Removal, and Maintenance* and ENV-WQH-SOP-064, *Westbay Pressure Transducer Installation, Removal, and Maintenance*.

Implementation

The following table lists responsibilities:

Who	What
GWLM Project Leader	Verify that personnel are conducting acceptance testing on equipment. Verify that all equipment used for monitoring groundwater levels meet acceptance criteria. Track equipment performance to ensure acceptance criteria are met.
Operations Program Personnel	Perform equipment performance tracking to verify that equipment meets acceptance criteria.

SECTION 9
Management Assessment

Internal assessments

The project will conduct internal management assessments of the services it provides. Management assessments will be conducted in accordance with LANL Implementation Support Document (ISD) 322-1.0, "Management Assessment." Management assessments of the project will be documented and filed as records.

Responding to assessments

When violations of requirements are found during a management assessment, a corrective action report is initiated to document the violation. Corrective actions are tracked and documented in accordance with EP-ERSS-SOP-3001, "Issues Management Process."

Implementation

The following table lists responsibilities:

Who	What
WSP Operations Program Manager	Plan and conduct management assessments of the project.
GWLM Project Leader	Ensure project management assessments are conducted.

SECTION 10

Independent Assessment

Project Assessments

Policy

Independent assessments are those assessments conducted by organizations external to ERSS and WSP. In addition, the project may be assessed by outside organizations. These assessments will be performed in accordance with LANL ISD 330-3.1, "Quality Audits." Personnel performing assessments will be qualified in accordance with procedure EP-ERSS-SOP-0002, "Assessor Qualification/Lead Assessor Certification."

Informal verification processes (e.g., conducting surveillance activities) will be conducted by the WSP QA Specialist in accordance with procedure ER-ERSS-SOP-0003, "*Surveillance Activities*."

In addition to these assessments, the project will also be subject to additional audits/assessments as required by LANL policy and/or program managers.

Implementation

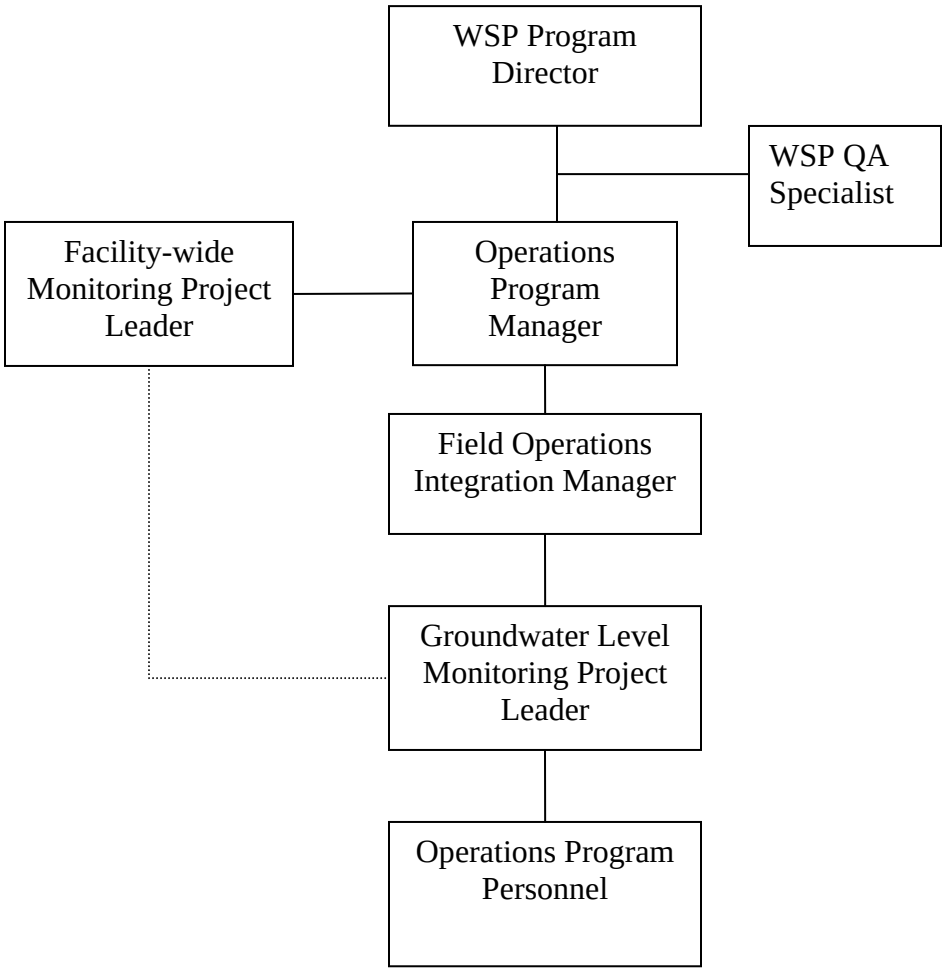
The following table lists responsibilities:

Who	What
GWLM Project Leader	Encourage regular external assessments as a principle of openness and continuous improvement. Document all assessments and submit as project records.
WSP QA Specialist	Conduct and document surveillances as requested by the GWLM Project Leader, the WSP Program Director, or the WSP Deputy Program Director.

Using a CRYPTOCard, click here to record "self-study" training to this procedure.

If you do not possess a CRYPTOCard or encounter problems, contact the ERSS training specialist.

Groundwater Level Monitoring Project Organization



GWLM PROJECT DATA QUALITY OBJECTIVES (DQO)

Problem statement

Groundwater Level monitoring will be conducted at LANL to determine groundwater flow and contaminant transport, to calibrate groundwater models, and to provide support to other LANL programs which require groundwater level data. In addition, systematic groundwater level monitoring is required to comply with the 2005 NMED Consent Order and the 2006 Interim Facility-Wide Groundwater Monitoring Plan.

Groundwater level measurements are collected to meet the following requirements:

- water levels must be measured according to the schedule given in the 2006 Interim Facility-Wide Groundwater Monitoring Plan,
- regional aquifer and perched intermediate wells must be measured within 14 calendar days of the start of measuring event,
- groundwater levels in a given watershed must be measured within 24 hours,
- groundwater level data is needed for the preparation of groundwater maps of alluvial, perched intermediate, and regional aquifer zones,
- water levels must be collected prior to purging for groundwater sampling,
- groundwater level data is needed for the interpretation of supply well pumping influences, and
- groundwater levels must be measured to a precision of 0.01 ft.

Background

Groundwater level monitoring is performed to either directly or indirectly fulfill the requirements of several higher-level planning documents, as well as various state and federal regulations, orders, and agreements. The Atomic Energy Act of 1954 as amended, calls for the U.S. Department of Energy (DOE) to conduct its operations in a manner that protects the health and safety of the public and the environment. DOE Order 5400.1 implements this requirement by establishing an environmental protection program to ensure compliance with applicable federal, state, and local regulations. This order requires an annual environmental report be prepared that, among other topics, includes a summary of groundwater movement.

The LANL Water Stewardship Program, in compliance with the Compliance Order on Consent (NMED 2005), prepared an Interim Facility-Wide Groundwater Monitoring Plan in 2006 (IFWGMP), pursuant to DOE Order 5400.1 and NMED requirements, to document the environmental monitoring and surveillance activities conducted at LANL. That document describes groundwater level monitoring for each watershed at LANL.

Decision	Is the GWLM Project measuring water levels in compliance with the 2005 NMED Consent Order and the negotiated requirements in the 2006 Facility-Wide Groundwater Monitoring Plan?
Inputs to the decision	Groundwater levels will be measured as elevation above mean sea level at all required locations on a schedule as mandated by the 2006 IFWGMP. Techniques and standard operating procedures exist for accurate measurement of groundwater levels.
GWLM project boundaries	The boundaries of the GWLM Project will be the alluvial, intermediate, and regional monitoring wells and LA County Supply wells, within LANL property and immediately surrounding areas, as required by DOE and NMED orders.
Decision rule	If groundwater level measurement requirements are not being met, then management will be notified.
Decision error limits	Not applicable.
Design for obtaining data	Measurement Frequency and Timing Groundwater level measurements will be obtained from monitoring wells when groundwater samples are collected using either manual or transducer measurements. Manual measurements will be obtained from single completion wells before transducer installation and after transducer removal. Without manual groundwater level measurements, transducer data cannot be developed into water level data. Accurate manual measurements at regular intervals are critical for the interpretation of transducer data. Because the NMED Consent Order (2005) requires that all regional and intermediate wells within a watershed be measured for ground water level within a 24 hour period, transducers will be installed in monitoring wells to automatically record groundwater levels. 1) Groundwater level measurements will be obtained during sampling events. This applies to both single completion wells, which will be either manually measured before sampling events or continuously monitored via a transducer, and for multiple completion wells, which, in the case of Westbay® completion wells, will have pressure measurements (Pi and Po) recorded from each monitoring port in the well during sampling events. This will provide additional water level measurements for each screen zone and a quality check of continuous

water level measurements.

2) “Continuous” groundwater level monitoring is performed using a transducer installed in the well. The “continuous” groundwater level measurement frequency for each well equipped with a transducer is designed to monitor systematic variations in water levels. Depending on the location of the monitoring well with respect to groundwater recharge areas or discharge areas (such as water supply wells), and depending on the existing record of systematic water level variations observed in a well, the measurement frequency of any well may be adjusted to provide adequate observations of water level variation. The “continuous” measurement frequency for newly installed wells will be sufficient to observe all systematic variations in the groundwater level during the first year of monitoring.

Data users have varying requirements for groundwater level measurement frequency, ranging from yearly measurements to potentially 1-minute measurements for selected sites (such as during an aquifer test at nearby wells). Because one of the data uses is to determine the response of water levels in monitoring wells to supply-well pumping, a relatively frequent monitoring frequency is required. Historic transducer measurement frequency at LANL has included frequencies of once per day, twice per day, 3-hr intervals, 1-hr intervals, and 5-minute intervals. Review of these historic data has indicated that the most cost-effective and data-volume effective measurement frequency for general monitoring purposes is in the range of 30-minute to 1-hr frequency. Data measurement frequency in this range can be used in time series graphs to show responses to nearby pumping of supply wells, and can be used to calculate mean daily and mean yearly water level values, or even mean values for selected periods of a day to potentially detect response to supply well pumping.

Therefore, for transducers installed in wells at LANL, a “continuous” measurement frequency is defined as a pressure or water level measurement frequency of 60 minutes. This data collection rate will routinely be utilized to monitor most anticipated groundwater level variations in the LANL area. To avoid issues with midnight and noon measurements, transducers are programmed to record measurements at 1-minute past the hour. All transducers are programmed in this manner so that measurements from all wells are recorded simultaneously, providing a snapshot of water levels.

For most wells continuously monitored for groundwater levels at LANL, transducer measurements are planned to be at 60-minute intervals, beginning at 1-minute after the hour, unless specified differently for special projects, such as during a pump test when the monitoring frequency may be increased. The transducer monitoring interval frequency may be revised for any individual well or port after sufficient data is collected to determine the frequency of significant

water level variations. The frequency of data collection for each well will be specified in the GWLP Monitoring Plan.

At most single-completion intermediate zone and regional aquifer wells at LANL, a transducer located in a well to be sampled will prevent obtaining a manual groundwater measurement at the time of sampling. Provided that a manual groundwater level measurement has been obtained within the previous 6 months, the transducer measurements will be used to monitor the water level during sampling. However, if a manual groundwater level measurement has not been obtained from the well to be sampled within the previous 6 months, then within 10 days of sampling a well, the transducer will be removed, a manual groundwater level measurement will be obtained, and the transducer reinstalled.

3) For single completion wells that are not monitored continuously, manual groundwater level measurements will be obtained at least annually, and in some cases, quarterly, as specified in the monitoring plan. For continuously monitored single completion wells, manual water level measurements will be obtained, at minimum, semi-annually to provide adequate reference and quality control for transducer measurements.

REGULATORY DRIVERS

Groundwater level monitoring conducted under DOE Order 5400.1 is referred to as "surveillance monitoring." Groundwater level monitoring is also conducted at sites regulated by the Resource Conservation and Recovery Act of 1976 (RCRA), as amended. The RCRA regulations (40 CFR Part 265, Subpart F) require that groundwater elevations beneath regulated sites be evaluated at least annually to assess the ability of groundwater monitoring wells to detect contamination in the uppermost aquifer. If contamination is detected, more frequent groundwater level measurements may be required to determine the rate and extent of contaminant migration.

The NMED Order on Consent (NMED 2005) requires that groundwater levels be monitored in characterization and monitoring wells at LANL and that the rate and direction of groundwater flow in the uppermost aquifer be determined at least annually.

Sections of the order state the following.

Section IV.A.2 General Facility Information, p. 38, 39

> The Respondents shall submit to the Department the following information. These submittals are one-time submittals, unless new information becomes available. In that case, the affected submittals shall be updated and resubmitted annually:
> 6. Alluvial groundwater maps depicting known saturated aquifer thickness and extent and suspected extent of contamination.
> 7. Perched-intermediate groundwater maps presenting aquifer thickness and flow direction data, and known and suspected vertical and lateral extents of contamination;
> 8. Regional groundwater maps depicting measured groundwater elevations and known flow direction(s);
> 9. The Facility's existing Hydrogeologic Atlas, including groundwater level contour map of regional aquifer and known radii-of-effects from pumping of municipal supply wells;
> 11. Periodic water level data presented graphically and in tabular format.
>
> The information shall be submitted to the Department, in hardcopy and CD-ROM, beginning 30 days after the effective date of this Consent Order, and no later than March 31 of each subsequent calendar year.

Section IV.A.3 Groundwater Investigation, p. 39.

> IV.A.3.a Objectives, p. 39
> 3. the depth to groundwater, groundwater elevations, water table elevations, and potentiometric surface distributions;
> 4. groundwater flow directions and velocities;
> 5. migration of ground water across hydrostratigraphic boundaries;
> 6. watershed and regional water balance information for evaluating contaminant fate and transport including:
>
> - recharge and discharge locations, rates, and volumes,
> - evapotranspiration data,
> - stream-flow data;

7. water supply well pumping influences, including data for wells not owned by the Respondents, if available;

Section IX.B.2 Field Exploration Activities, p. 169.

Section IX.B.2.h.i Groundwater Levels, p. 175-176

Groundwater level measurements shall be obtained at intervals required by the Department. Groundwater levels also shall be obtained prior to purging in preparation for a sampling event. Measurement data and the date and time of each measurement shall be recorded on a site monitoring data sheet. The depth to ground water shall be measured to the nearest 0.01 ft. The depth to groundwater shall be recorded relative to the surveyed well casing rim or other surveyed datum.

Groundwater levels shall be measured in all wells in a given watershed (or the number of wells otherwise specified in a Department approved groundwater work plan) within 24 hours. Facility-wide regional aquifer and intermediate perched zone groundwater level measurements shall be obtained at all well locations within fourteen (14) calendar days of the commencement of the specified measuring event. The Respondents shall conduct periodic measuring events, the schedule for which shall be provided in the groundwater monitoring work plans. In addition, groundwater levels shall be measured in alluvial wells in conjunction with the collection of surface water measurements in each watershed.