

# LOS ALAMOS NATIONAL LABORATORY QUALITY ASSURANCE PROGRAM FOR THE YUCCA MOUNTAIN PROJECT

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## ABSTRACT

This paper presents an overview of the Los Alamos National Laboratory's development of a quality assurance program in support of work on the Yucca Mountain Project. It discusses the Yucca Mountain Project and the organizations responsible for its overall quality management. The paper traces the development of the specific Yucca Mountain Project quality requirements from their upper-tier origins to the actual Los Alamos National Laboratory program plan and implementing procedures. A description of the program is given indicating which upper-tier criteria is not applicable to research and development processes.

The paper goes on to detail the efforts placed on the staff involvement with the quality program and their ownership of the program and final products. It goes on to describe the methods used to achieve this involvement and how to select the right type of quality professional for involvement with the research quality program.

Lastly, the paper discusses the use of audits and surveys as the basis for acceptance of the Los Alamos quality program within the regulated environment to support the best research available to answer the crucial questions involved in the site characterization of Yucca Mountain.

## INTRODUCTION

Before the nation's first high-level radioactive waste repository can be built and operated, a site must be characterized to determine its suitability and appropriate permits and licenses must be issued by the U. S. Nuclear Regulatory Commission (NRC). Currently, the Project plans to characterize the Yucca Mountain site as a potential location for the repository.

The site-characterization process will include construction of an exploratory shaft facility to conduct *in situ* experimental programs. With recent schedule adjustments, site characterization is now expected to take approximately 11 years. Assuming the characterization process establishes the site's acceptability for a waste repository, it will take four years to obtain a construction permit, and five years to build. So we are looking at the year 2010 before a repository at Yucca Mountain could start receiving waste.(1) It is important to understand that only after the characterization process has confirmed the acceptability of the Yucca Mountain site will a permit to construct a repository be granted by the NRC. If Yucca Mountain is not suitable, another site must be selected and the characterization process repeated until an acceptable site is found.

The Yucca Mountain Project (YMP) is managed by the U. S. Department of Energy (DOE) Yucca Mountain Project Office. DOE's management includes integrating the efforts of the DOE Project Office, the Office of Civilian Radioactive Waste Management (OCRWM), and the eight Project participants. The participants include three design

and construction contractors, four national laboratories, and a management consultant (Fig. 1).

## PROJECT QUALITY REQUIREMENTS

The Project Office is responsible for establishing the quality requirements and program elements to comply with applicable codes of federal regulations, DOE orders, and nuclear regulations. It is useful at this point to look at the upper-level criteria for the Project program, which form the groundwork of the Los Alamos National Laboratory (LANL) Quality Assurance (QA) Program (Fig. 2). Two top-level documents are prescribed by the cognizant government agencies (i.e. the NRC, the DOE and OCRWM). Each of these agencies has endorsed NQA-1 (2) as the standard upon which the Project QA program is based. The NQA-1 requirements and the additional requirements imposed by the NRC through the Review Plan for High Level Waste Repository Quality Assurance Program Description (3) have been incorporated in the Project Office Quality Assurance Plan, (4) which applies to all Project participants. In addition, the Project Office has developed a set of Project-wide administrative procedures (APs) that direct the participants' methodology and interface requirements for implementation of the QA Plan. The QA Plan and APs form the basis for the QA programs implemented by LANL and other Project participants.

## LANL QA PROGRAM

LANL has a corporate QA program that applies to programs other than the YMP. A separate QA program, structured in accordance with the Project Office QA Plan, applies specifically to LANL work on the YMP. The QA program includes LANL QA and technical groups, LANL

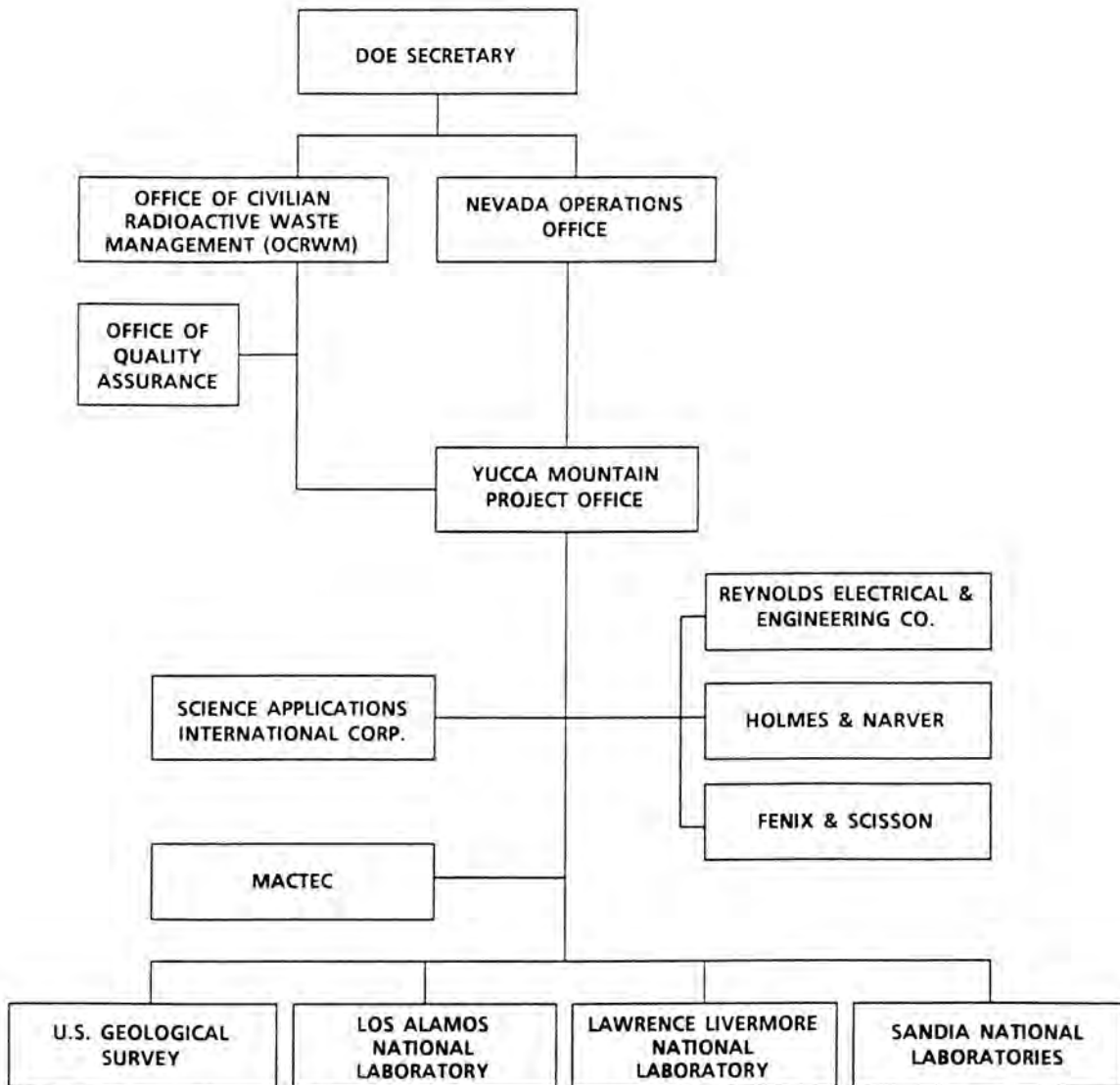


Fig. 1. Yucca Mountain Project Organization.

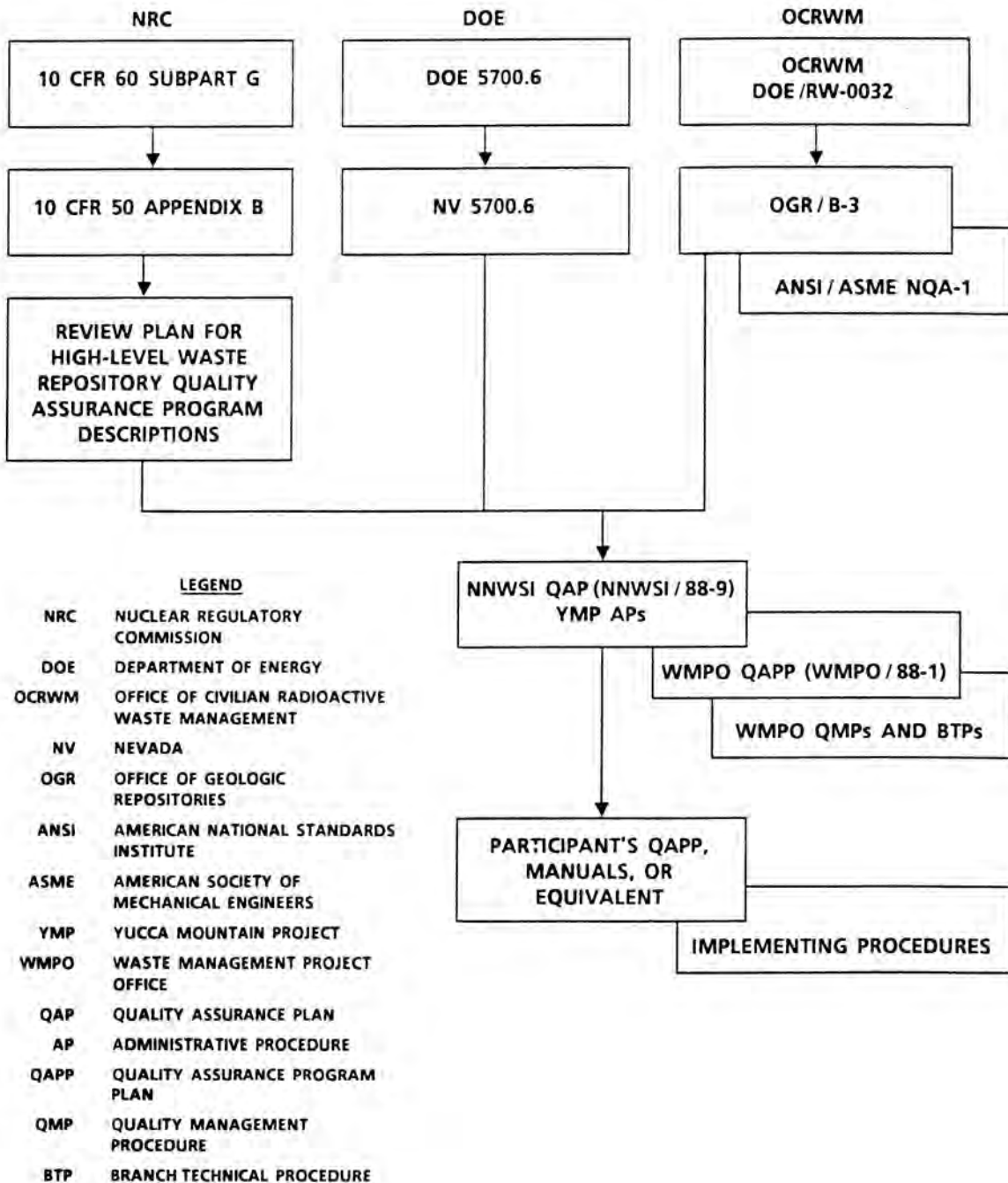


Fig. 2. Upper-Level Criteria for the LANL QA Program.

internal support organizations, and subcontractors. The QA-support subcontractor functions as an extension of the LANL QA staff and operates under the QAPP and procedures. Here lies the problem of structuring a QA program that is imposed from outside LANL in support of a publicly funded project and that is subject to oversight by the NRC. The LANL Quality Assurance Program Plan (QAPP) is, by direction from the Project Office, essentially a restatement of the upper-tier QA program requirements. The LANL QAPP incorporates the 18 criteria of the Project QA Plan and has been approved by the Project Office (Fig.3).

In addition to the QAPP, LANL has developed two sets of implementing procedures: QA administrative procedures (QPs) that apply to all LANL YMP staff and support personnel and detailed technical procedures (DPs) that are used by the individual research groups. Both sets of procedures are approved by the LANL QA Project Leader and Technical Project Officer (TPO). The marks of a good workable quality program are: it is easy to use and arises from within for valid needs. When value is gained from the imposition of a procedure or documentation requirement

the quality program will succeed. If another form is to be merely filled out, then we have failed.

#### LOS ALAMOS STAFF INVOLVEMENT

The engineers and scientists are justifiably proud of their reputation for technical excellence in many state-of-the-art scientific areas. These technical efforts have not traditionally involved a judicial-style quality program. A complete cultural change has evolved slowly within each of the LANL groups. Technical support for the YMP QA program has been slowly gained by actively involving these personnel in the preparation and review of the QAPP, the QPs, and the DPs. Other ways of obtaining this involvement is through the use of quality circles, personal relationships between the QA and Technical staff, the use of QA Liaisons (QALs), participation in the formal responses to the Project Office standard deficiency reports and the use of technical staff in the LANL audit and survey process.

A crucial aspect of QA acceptance is establishing and maintaining good personal relationships between the QA staff and the technical staff. At their request, we began biweekly quality circle meetings to resolve internal issues or address Project Office requests. The LANL QA staff are technical personnel who have been trained in the regulatory and quality aspects of the YMP. Their understanding of the scientific process makes them proactive in achieving quality

1. Organization
  2. Quality Assurance Program
  3. Scientific Investigation and Design Control
  4. Procurement Document Control
  5. Instructions, Procedures, Plans, and Drawings
  6. Document Control
  7. Control of Purchased Items and Services
  8. Identification and Control of Samples and Data
  - \*9. Control of Processes
  - \*10. Inspection
  - \*11. Testing
  12. Control of Measuring and Test Equipment
  13. Handling, Shipping and Storage
  - \*14. Inspection, Test and Operating Status of Engineered Items
  15. Control of Nonconformances
  16. Corrective Action
  17. Records
  18. Audits
- \* Because LANL's work is concerned primarily with geologic evaluations of the Yucca Mountain site, certain NQA-1 criteria do not apply (i.e., those that pertain primarily to construction or fabrication work). The approved LANL QAPP is deliberately structured to exclude these criteria from our planning and implementation activities.

Fig. 3. The 18 Criteria of the Project Office QA Plan.

results, not just merely verifying the presence of a quality program. By placing QALs, technical staff charged with specific QA responsibilities within each direct line LANL group, the program truly becomes the property of the technical staff. QALs do not perform the quality function, but make the program function on a daily basis by assisting the research staff with documenting research and creating new implementing procedures.

The technical staff have also become authors of various QPs. Because these documents must represent what really happens in the field or laboratory, personnel who use the procedures are now actively involved in their generation. The payoff is that as each document is created, the technical staff gains more and more ownership of the quality program.

#### LANL INTERNAL AUDITS AND SURVEYS

The QA staff are responsible for auditing and surveying scientific work, which is a line function within the LANL YMP organization (Fig. 4). An audit is defined as: "A planned and documented activity performed to determine by investigation, examination, or evaluation of objective evidence the adequacy of and compliance with established procedures, codes, standards, instructions, drawings, and other applicable requirements, and the effectiveness of implementation. An audit should not be confused with surveillance or inspection activities performed for the sole purpose of process control or product acceptance."<sup>(5)</sup> While a Survey is defined as: "The act of monitoring or observing to verify whether or not an item or activity conforms to specified requirements."<sup>(5)</sup> Through internal audits and surveys, LANL verifies that the quality program is working effectively and complies with the Project Office requirements. Audits and surveys also train the technical staff to be responsive to the regulatory aspects of the YMP.

An important YMP milestone is the achievement of a "qualified QA program" by all Project participants prior to beginning construction of the exploratory shaft facility. Par-

ticipants meet this milestone by passing a Project Office full-scope audit and resolving any findings. LANL's achievement of a qualified QA program is scheduled for March 1990. LANL has already gone through several successively "finer grades of sandpaper" to polish its QA program. Three audits of the entire LANL program were conducted by the DOE and the NRC. The audits combined with over 12 surveys of the LANL internal program implementation activities have resulted in many fine adjustments to the internal program. This process is necessary to assure that the NRC and public receive a program supported by the best research available to answer the crucial questions.

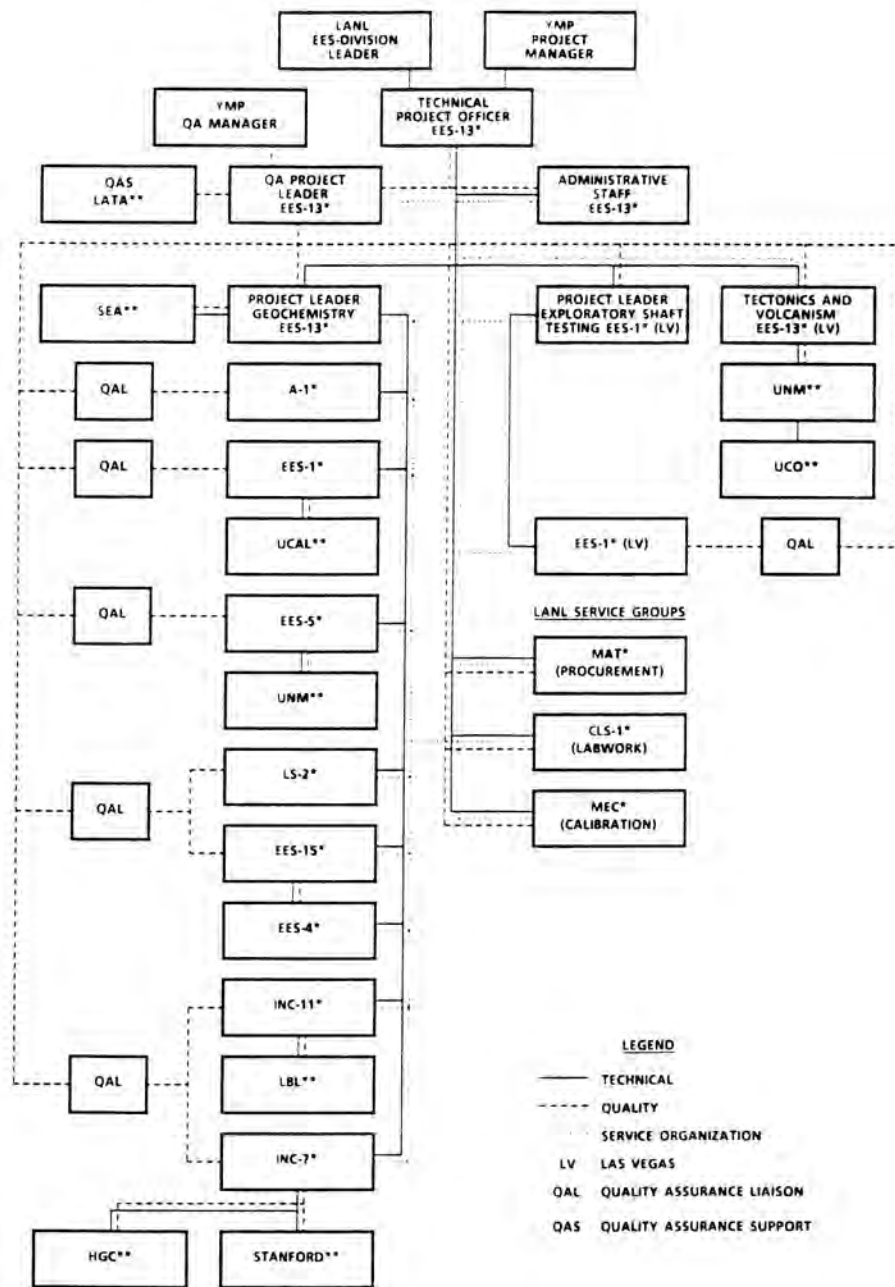
#### ACKNOWLEDGEMENT

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5. Los Alamos National Laboratory, Quality Assurance Program Plan For The Yucca Mountain Project, R4.4, August 31, 1989





**LEGEND**  
 — TECHNICAL  
 - - - QUALITY  
 ···· SERVICE ORGANIZATION  
 LV LAS VEGAS  
 QAL QUALITY ASSURANCE LIAISON  
 QAS QUALITY ASSURANCE SUPPORT

- |                                       |                                  |                          |                                    |
|---------------------------------------|----------------------------------|--------------------------|------------------------------------|
| <b>* LANL PARTICIPATING DIVISIONS</b> |                                  | <b>** SUBCONTRACTORS</b> |                                    |
| A                                     | ANALYSIS                         | HGC                      | HYDROGEOCHEM                       |
| CLS                                   | CHEMISTRY AND LASER SCIENCES     | LATA                     | LOS ALAMOS TECHNICAL ASSOCIATES    |
| EES                                   | EARTH AND ENVIRONMENTAL SCIENCES | LBL                      | LAWRENCE BERKELEY LABORATORY       |
| INC                                   | ISOTOPE AND NUCLEAR CHEMISTRY    | SEA                      | SCIENCE AND ENGINEERING ASSOCIATES |
| LS                                    | LIFE SCIENCES                    | STANFORD                 | STANFORD UNIVERSITY                |
| MAT                                   | MATERIALS MANAGEMENT             | UCAL                     | UNIVERSITY OF CALIFORNIA           |
| MEC                                   | MECHANICAL FABRICATION           | UCO                      | UNIVERSITY OF COLORADO             |
| EES-13                                | NUCLEAR WASTE MANAGEMENT R&D     | UNM                      | UNIVERSITY OF NEW MEXICO           |

Fig. 4. LANL Yucca Mountain Project Organization.