DOE/RW-0199

Nuclear Waste Policy Act
(Section 113)

Site Characterization Plan

Yucca Mountain Site, Nevada Research and Development Area, Nevada

Volume VIII, Part B

Chapter 8, Section 8.6, Quality Assurance Program

December 1988

U. S. Department of Energy
Office of Civilian Radioactive Waste Management

8901270095

8.6 QUALITY ASSURANCE PROGRAM

The Secretary of Energy was assigned the responsibility to carry out the Nuclear Waste Policy Act (NWPA, 1982) and amendments (NWPAA, 1987d). In accordance with the NWPA, these functions have been delegated by the Secretary of Energy to the Office of Civilian Radioactive Waste Management (OCRWM) for the integration of quality assurance (QA) and management policies and requirements for the overview of the activities performed by DOE field operations offices. The Yucca Mountain Project Office of the DOE Nevada Operations Office (DOE/NV) has been delegated the responsibility for the implementation of the technical and QA activities. The OCRWM provides programmatic and policy guidance to the Yucca Mountain Project Office (called the Project Office throughout this section) to ensure that adequate QA and technical objectives of the program are achieved.

This section briefly summarizes the QA program for the Yucca Mountain Project (formerly the Nevada Nuclear Waste Storage Investigations (NNWSI) Project), including reference to the regulatory requirements applicable to the Project and the QA administrative and technical procedures developed by the Project participants to meet the requirements. A detailed description of the Project QA program can be found in the Project quality assurance plan (Project QAP) (DOE, 1988c).

8.6.1 QUALITY ASSURANCE PLAN SUMMARY

The DOE policy is that the achievement of quality in fulfilling the responsibilities for the Project is essential to success. To meet this objective, it is necessary to establish effective networks of management plans and procedural controls and to take the necessary actions to demonstrate the ability to safely and efficiently handle and dispose of spent nuclear fuel and high-level radioactive waste. Concurrently, compliance with legislative, regulatory, and DOE requirements for control and documentation of quality must be demonstrated.

The DOE is committed to have a quality assurance program, consistent with 10 CFR 60 Subpart G, in place before the initiation of any new site characterization activities or exploratory shaft construction.

The DOE approach to quality assurance is designed to ensure that activities and engineered items are assigned a level of quality assurance for control and documentation that is consistent with the relative impact on public radiological health and safety, waste isolation, and relative importance to other DOE concerns. The purpose of the QAP is to provide direction to the Project participants to ensure a common approach to meeting the quality requirements that are applied to the Project.

The Project QA program consists of all those planned and systematic actions that are necessary to provide adequate confidence that the mined geologic disposal system (MGDS) will perform satisfactorily. QA includes quality control, which includes those QA activities related to the physical characteristics of a material, structure, component, or system that provide a means by which to control the quality of the material, structure, component,

or system to predetermined requirements. QA provides a multidisciplinary system of quality controls backed by verification activities that demonstrate the completeness and appropriateness of achieved quality.

The assurance of quality is recognized as an interdisciplinary activity involving many organizational components and is not regarded as the sole domain of an organization. It is the responsibility of all Project staff to plan, perform, and document activities affecting quality in accordance with the QAP and develop and implement verification and self-assessment activities to ensure compliance with these requirements. Each Project participant's QA department is responsible for describing, monitoring, and verifying satisfactory accomplishment of quality-related Project activities.

The Project QAP (DOE, 1988c) describes the overall quality assurance requirements for the Project. Quality assurance program plans (QAPPs) of the Project Office and the individual participants of the Project provide documented commitment to the Project QAP. The QAPPs are the documents that describe the participant's QA program and the applicable QA requirements. The quality assurance administrative procedures are those procedures that define and direct controls and control systems making up the Project QA program. These documents are generated by the responsible implementing organization with assistance from the QA organization and in accordance with the requirements of the QAPP. Technical implementing procedures are written by the technical staff to show how they perform individual technical activities in accordance with the QA requirements applicable to their respective disciplines. The details of how each of these organizations will meet quality assurance requirements may differ among the participants. These details are given in the participants' QAPPs listed in Table 8.6-1.

The Project uses an approach to QA that recognizes the differences between engineered items and activities that affect radiological health and safety and waste isolation and those that do not. The approach is designed to ensure that each item or activity is evaluated and assigned a QA level that is consistent with its potential impact or importance, or both, in terms of radiological health and safety, waste isolation, nonradiological health and safety, the U.S. Nuclear Regulatory Commission (NRC) licensing requirements, the operability and maintainability of the repository, costs, and schedules.

The approach to assigning QA levels involves (1) identifying those items and activities whose failure could cause undue risks to the public and facility personnel or extended interruption of facility operation with critical economic losses, or both, and (2) ensuring that these items and activities are covered by QA controls. Alternatively, an item whose failure or malfunction could result only in operational inconvenience or negligible economic loss may deserve only a quality inspection by the purchaser upon the delivery of the item. Between these two extremes, there are varying degrees of QA to achieve the desired confidence in the quality of the completed line of activity.

This approach classifies items and activities into one of three QA levels (QA Level I, II, and III) and further selects the QA requirements and measures to be applied to these items and activities consistent with their importance to safety (QA Levels I and II), waste isolation (QA Level I), and

Table 8.6-1. Organizations participating in the Yucca Mountain Project and their quality assurance programs plans (QAPPs)[a,b]

Participating Organization	QAPP
1. Yucca Mountain Project Office/ Nevada Operations Office	Waste Management Project Office Quality Assurance Program Plan WMPO-88-1
2. Lawrence Livermore National Laboratory (LLNL)	Quality Assurance Program Plan --NNWSI Project
3. Los Alamos National Laboratory (Los Alamos)	LANL-NNWSI-QAPP; Quality Assurance Program Plan for Nevada Nuclear Waste Storage Investigations
4. Sandia National Laboratories (SNL)	SNL-NNWSI (Organization 6000) Quality Assurance Program Plan, SLTR 86-0001
5. United States Geological Survey (USGS)	NNWSI-USGS-QAPP-01, USGS Quality Assurance Program Plan
6. Fenix & Scisson, Inc. (F&S)	F&S Quality Assurance Program Plan QAPP-002
7. Holmes & Narver (H&N)	H&N-10471-1115, H&N QA Manual
8. Reynolds Electrical & Engineering Company (REECo)	NNWSI QAPP, NTS 568-DOC-115

[a]WMPO = Waste Management Project Office, currently called the Yucca Mountain Project Office.

[b]NNWSI = Nevada Nuclear Waste Storage Investigations (Project). The Project has been renamed the Yucca Mountain Project.

the achievement of DOE mission objectives (QA Levels 2 and 3). This will be accomplished by deliberate quality planning and selective application of QA requirements on the item or activity to be performed, with varying degrees of QA applied depending on item or activity function, complexity, consequence of failure, reliability, replicability of results, and economic considerations.

This approach will ensure that all engineered items important to safety or waste isolation (Q-list) and activities important to waste isolation (quality activities list) are identified and controlled in accordance with a QA program that meets the requirements of 10 CFR 60, Subpart G. It will also provide a means to identify other items and activities and an application of

appropriate QA requirements to their control, based on complexity or importance to program goals.

The appropriate QA level for any item or activity is determined by the application of decision criteria and analyses as provided by administrative procedures. The basis for the QA levels and assigned QA requirements is documented. The assigned QA levels and QA requirements must be submitted to the Project Office for review, and approval prior to implementation or use. This review and approval is performed by the Project Quality Manager (PQM) and appropriate Project Office Division Directors. Once a QA level is assigned to an item or activity, the QA level is documented on a QA level assignment (QALA) sheet. The QALA sheet will reference the documented analyses supporting the level assigned to the item or activity. The QALA sheet will also identify the applicable QA criteria, including the identification of and justification of deletion of QA criteria and/or requirements within a criterion. The DOE is currently in the process of revising the existing methodology for assigning QA levels to ensure consistency with, "Technical Position on Items and Activities in the High-Level Waste Geologic Repository Program Subject to Quality Assurance Requirements" (NRC, 1988b), and to require the appropriate documentation and justification for quality level assignments. Following revision of the methodology, all existing quality level assignments will be reevaluated and reassigned, as necessary, and will be supported by appropriate documentation and justification.

The assignment of QA levels will be completed by all participating organizations or the Yucca Mountain Project Office for all engineered items and activities that affect quality associated with site characterization, facility and equipment construction, facility operations, performance confirmation, permanent closure, and decontamination and dismantling of surface facilities. The assigned QA levels and QA requirements will be documented and submitted to the Yucca Mountain Project Office for review, and approval prior to implementation or use. This review and approval will be performed by the Project Quality Manager and appropriate Project Office Division Directors. Once assigned, the QA level for a particular item or activity shall be applied by all Project participants involved in the activity.

Data or data interpretations generated as a result of activities not controlled in accordance with a 10 CFR 60, Subpart G QA Program, or activities performed before the complete implementation (acceptance by the NRC) of the Project QAP will not be used in the licensing process as primary information for items and activities important to safety and/or waste isolation unless qualified in accordance with administrative procedures meeting the guidance provided in "Qualification of Existing Data for High Level Nuclear Waste Repositories" (NRC, 1988a), or other method accepted by the NRC.

The following is a discussion of QA Levels I, II, and III and a description of their applications.

QA Level I is assigned to those radiological health and safety related items and activities that are important to either safety or waste isolation and that are associated with the ability of a geologic nuclear waste

repository to function in a manner that prevents or mitigates the consequences of a process or event that could cause undue risk to the radiological health and safety of the public. Items important to safety are those engineered structures, systems, components, and related activities essential to the prevention or mitigation of an accident that could result in a radiation dose to the whole body or to any organ of 0.5 rem or greater at or beyond the nearest boundary of the unrestricted area at any time until the completion of the permanent closure of the repository. Items and activities important to waste isolation are those natural and engineered barriers and related activities that are relied on for achieving the postclosure performance objectives in 10 CFR 60 Subpart E, which refers to the environmental standards established in 40 CFR 191. Items important to safety and engineered barriers important to waste isolation will be placed on a Q-list in accordance with the NRC technical position on QA requirements document (NRC, 1988b). Similarly, major activities conducted during site characterization, construction, operation, or closure that may adversely impact the natural barriers important to waste isolation will be placed on a quality activities list in accordance with NRC (1988b). The Q-list and quality activities list are discussed further in Section 8.6.4.2.

QA Level I is to be applied to those items and activities that may affect the ability of the repository to meet the preclosure and postclosure performance objectives specified by the NRC and the U.S. Environmental Protection Agency (EPA) for protecting public health and safety from radiological hazards. QA Level I control and documentation must be applied to activities, including site characterization, scientific investigations, facility and equipment design, procurement, construction, facility operation, performance confirmation, permanent closure, and decontamination and decommissioning of surface facilities when they are specifically concerned with the protection of the public's health and safety with respect to a radiological hazard. A high-level radioactive waste repository will use engineered systems, structures, and components to contain the waste and ensure preclosure safety. The repository also will use the natural barriers to afford postclosure isolation. Within this context, QA Level I will be applied to

1. Items that could affect the preclosure radiological health and safety of the general public. Specifically, this means items and activities that could cause, or result in, an accident that could result in a radiation dose, either to the whole body or to any organ, of 0.5 rem or greater, either at or beyond the nearest boundary of the unrestricted area, at any time until the permanent closure of the repository.

2. Activities that will provide primary data (as defined in the Project QAP (DOE, 1988c)) that will be relied on for design and performance assessment of the repository system. These data are the field and laboratory data and subsequent analyses that provide the basis for determining and demonstrating that the natural and the engineered systems of the repository are capable of meeting the performance objectives for waste containment and isolation. This includes all experiments and research that have a significant impact on site characterization or are an essential part of the data base that

directly support the final design of the repository and waste package performance.

3. Activities that could adversely impact the waste isolation capabilities of the engineered and natural barriers.

4. Items that are relied on to meet the postclosure performance objectives of the engineered barriers of the repository system.

5. Items and activities that, having failed, could cause a failure of a QA Level I item, or irretrievable loss of QA Level I data.

6. The design phase that involves the preparation of detailed design documents for engineered items important to safety or waste isolation (such as drawings, specifications, and analyses) will be assigned a QA Level of I. One of the purposes of this design phase is to define items that will be procured or constructed as a result of the design activity. The definition of items includes a detailed description of their function and interrelationships. As the design phase proceeds, and the QA level for items is identified and approved, design, procurement, and construction activities shall be governed by the QA level assigned to the item.

QA Level II is assigned to those activities and items related to the systems, structures, and components that require a level of QA sufficient to provide for reliability, maintainability, public and repository worker nonradiological health and safety, repository worker radiological health and safety and other operational factors that would have an impact on DOE and Yucca Mountain Project Office concerns, and on the environment.

QA Level II controls and documentation shall be applied to the Project items and activities (described below) that are associated with nonradiological operation of the exploratory shaft facilities and repository and the radiological safety of the repository worker. The high-level waste (HLW) repository will use engineered systems, structures, and components that must be designed, constructed, fabricated, tested, and operated to meet the operational performance objectives and to minimize nonradiological hazards to the public and repository worker, and radiological hazards to the repository worker. Additionally, activities that have a major impact on Project costs or schedules that could delay the achievement of DOE/Office of Civilian Radioactive Waste Management (OCRWM) milestones must be appropriately controlled. Therefore, QA Level II must be applied as follows:

1. Engineered items that are essential to the design, construction, and operation of the repository or of the exploratory shaft facility, and could have a major impact on the nonradiological health and safety of the public and repository workers.

2. Items that could affect the retrievability of waste up to the time of repository closure.

3. Items, if having failed or if performed inadequately, would cause repository workers to be exposed to radiation or radioactive

contamination levels in excess of the limits expressed in 10 CFR Part 20.

4. Items and activities involving the nonradiological operational reliability and maintainability of engineered systems, structures, or components.

5. The design phases that involve the comparative technical analysis of alternatives, methods, or equipment are conducted to determine which alternative, method or equipment is preferred shall be assigned a QA level of II prior to execution. Where a particular item can be identified during this phase, a separate QA-level assignment may be made for that item. Once the QA-level assignment for that item is approved, design activities associated with the item shall be governed by the QA level assigned to the item.

6. Items whose failure could result in a major cost overrun.

7. Items whose failure could result in a major schedule slippage.

QA Level III is assigned to those items and activities not classified as QA Levels I or II.

8.6.2 REQUIREMENTS FOR QUALITY ASSURANCE

The quality assurance requirements for the Yucca Mountain Project originate from three main sources as depicted in Figure 8.6-1 and listed below:

1. U.S. Nuclear Regulatory Commission

   a. 10 CFR Part 60 Subpart G, Disposal of High Level Radioactive Wastes in Geologic Repositories - Quality Assurance

   b. 10 CFR Part 50 Appendix B, Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants

   c. NRC Review Plan: Quality Assurance Programs for Site Characterization of High-Level Nuclear Waste Repositories (June, 1984) (NRC, 1984d)

2. U.S. Department of Energy orders

   a. DOE 5700.6A (9/23/86), Quality Assurance

   b. NV 5700.6-6 (3/13/87), Quality Assurance

3. Office of Civilian Radioactive Waste Management (OCRWM)

   a. OCRWM Quality Assurance Management Policies and Requirements, DOE/RW-0032 (October, 1985) (DOE, 1985d)

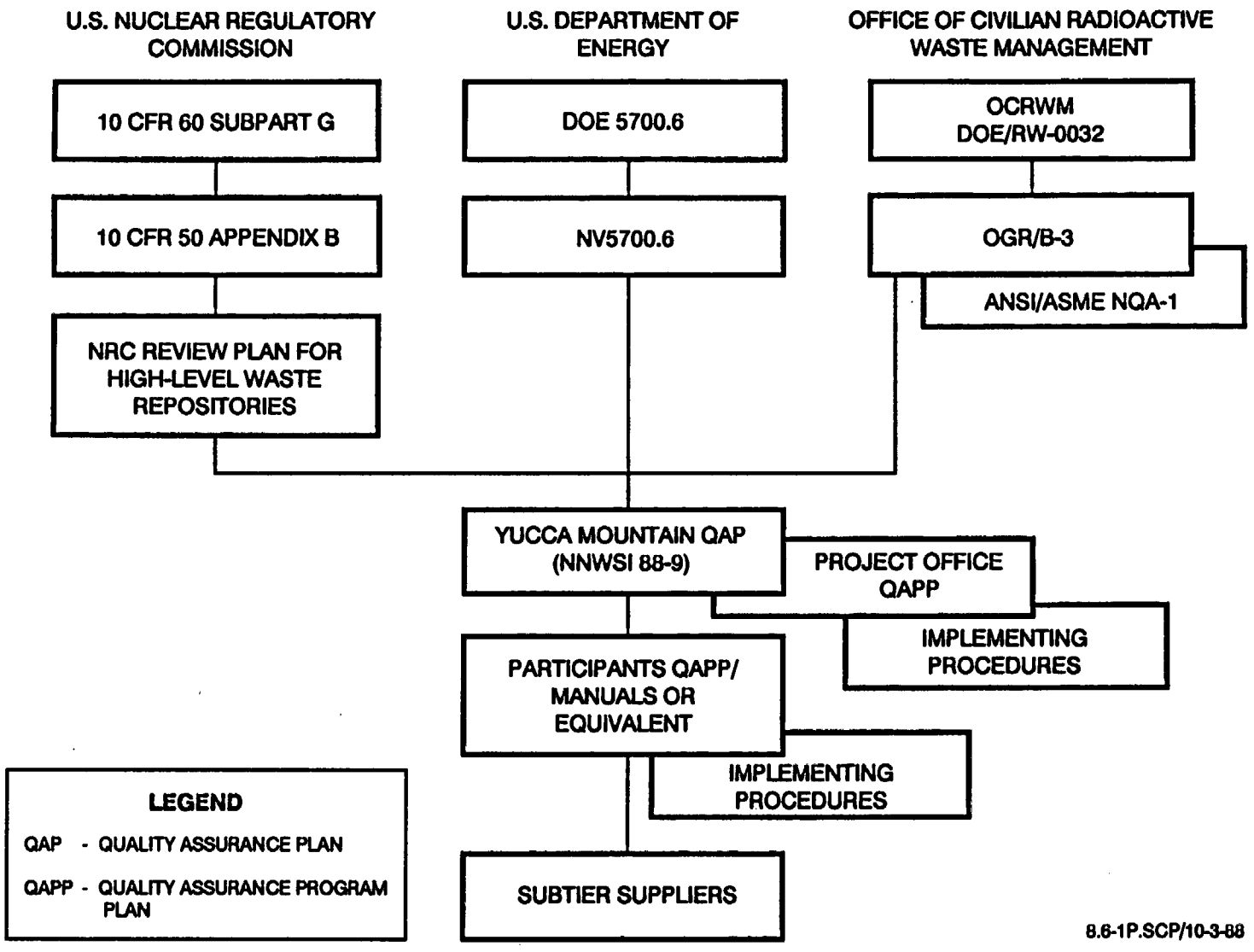

Figure 8.6-1. Sources of criteria for quality assurance.

b. OGR/B-3, OGR Quality Assurance Plan for High Level Radioactive Waste Repositories (August, 1986) (DOE, 1986g)

c. ANSI/ASME NQA-1, American National Standard for Quality Assurance Program Requirements for Nuclear Facilities (ANSI/ASME NQA-1-1986) (ANSI/ASME, 1986)

The NRC, by way of 10 CFR 60 Subpart G, has made the quality provisions of 10 CFR 50, Appendix B, mandatory for all systems, structures, and components designated as "important to safety" or "important to waste isolation" and activities related thereto. The NRC has also published the NRC review plan (NRC, 1984d). This document has two purposes: (1) to define the criteria and methods for NRC review of the QA program for site characterization during the prelicensing phase and (2) to provide guidance for establishing an acceptable program for items designated as "important to safety" or "important to waste isolation" and activities related thereto. In addition, the NRC has issued various technical positions to provide detailed guidance on the implementation of an aspect of a QA program.

DOE Orders DOE 5700.6A and NV 5700.6 provide policy, set principles, and designate responsibility for the implementation of DOE plans and actions to ensure quality achievement and verification for the DOE and the Nevada Operations Office, respectively. The OCRWM quality assurance management policies and requirements document (DOE, 1985g) sets forth overall, integrated QA management policies and requirements for the entire OCRWM Program and provides a general framework for the development of more detailed QA management policies and requirements by program, project, and contractor organizations.

The OCRWM Quality Assurance Plan for High-Level Waste Repositories (OGR/B-3) (DOE, 1986g) provides that the basic and supplementary requirements included in the American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME) Quality Assurance Program Requirements for Nuclear Facilities, NQA-1-1986 (ANSI/ASME, 1986) is the standard for the implementation of quality assurance programs for DOE projects. The ANSI/ASME requirements also provide an adequate basis for interpreting the pertinent quality assurance requirements of 10 CFR Part 50, Appendix B (NRC, 1987b), for the establishment and execution of QA programs during the design and construction phases of nuclear facilities.

The DOE-OCRWM is currently in the process of developing, and obtaining NRC approval of, upper-level QA program documents. These documents include a QA requirements document (QAR) and a QA program description (QAPD). Upon acceptance by the NRC, the OCRWM QAR and QAPD will replace OGR/B-3 (DOE, 1986g) as the governing QA program documents for the Project QA program.

To ensure uniform and acceptable interpretation of the requirements for quality assurance, the Project QAP (DOE, 1988c), was prepared for Project activities. The purpose of this document is to provide interpretations of the quality assurance requirements appropriate to site characterization, and the design of engineered items for an NRC-licensed geologic repository. The Project QAP consolidates all requirements of the above DOE and NRC documents into a single, site-specific document that provides clear interpretations of

the federally mandated quality assurance requirements as they apply to Project scope of work.

The Project QAP is outlined in a similar format to the ANSI/ASME quality assurance program requirement document (ANSI/ASME, 1986). The difference in the format is the identification of the QA criteria that are applicable to either the control of engineered items or the control of scientific investigations. The QA requirements contained in the Project QAP are applied to items and activities classified as QA Level I and II. Deviations from requirements within applicable criteria are permissible for QA Level II items and activities provided that adequate justification is documented. The requirement imposed for QA Level III items and activities are those managerial, administrative, scientific, engineering, commercial, and laboratory practices that are commonly used by the organizations participating in the Project.

8.6.3 ORGANIZATION OF THE PROJECT WITH RESPECT TO QUALITY ASSURANCE

This section describes organizational responsibilities and interfaces within the Yucca Mountain Project with respect to QA. The organization of the Project is shown in Figure 8.6-2. The Project Work Breakdown Structure (WBS) dictionary provides the technical and management responsibilities of each participating organization and Nevada Test Site (NTS) support contractor. Definitive descriptions of the QA responsibilities are contained in the quality assurance program plans (QAPPs) of each Project participant. The specific requirements that must be addressed in the QAPPs are contained in Sections 8.6.1 and 8.6.2 of this document.

The Secretary, U.S. Department of Energy Headquarters (DOE/HQ), was given the responsibility to carry out the Nuclear Waste Policy Act (NWPA, 1982) and amendments (NWPAA, 1987). This responsibility has been delegated by the DOE Secretary to the OCRWM for the integration of QA and management policies and requirements for the overview of the activities performed by DOE field operations offices. The DOE Nevada Operations Office (DOE/NV) operations office has been delegated the responsibility for the implementation of the technical and QA activities of the Project.

The OCRWM provides programmatic and policy guidance to the Yucca Mountain Project Office (Project Office) to ensure that adequate QA and technical objectives of the program are achieved. Specifically, the OCRWM is composed of the following offices: Program Administration and Resources Management, Facilities Siting and Development, Systems Integration and Regulation, External Relations and Policy, and the Office of Quality Assurance. These OCRWM offices provide direction to the Project Office for the implementation of the OCRWM program objectives. Technical adequacy of the work performed shall be determined via audits, technical reviews, etc., as appropriate.

The OCRWM Office of Quality Assurance provides QA guidance and overview to the Project by (1) review and approval of the Project quality assurance plan, and the Project Office QAPP; (2) specifying applicable requirements which are contained in the OCRWM quality assurance plan; (3) performance of

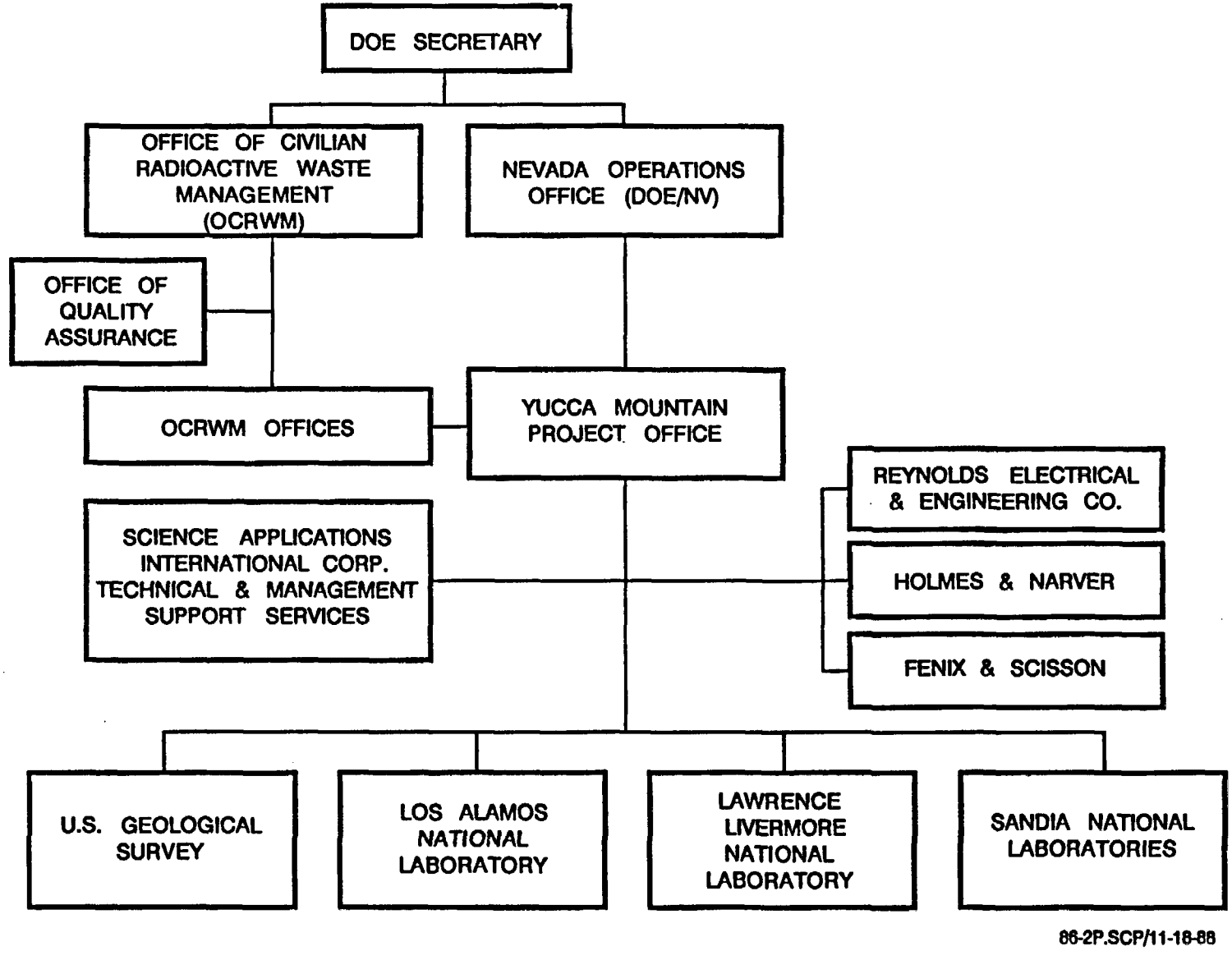

Figure 8.6-2. Yucca Mountain Project organization.

QA audits and surveillances of the Project Office; and (4) participating as observers of selected audits of Project Office contractors.

The DOE/NV Manager has the ultimate responsibility and accountability for the Project within the Nevada Operations Office. The Project Office has been established within the DOE/NV organization for the management of the Project. The Project Office operates as a part of the DOE/NV under the programmatic direction of the OCRWM.

The Project Office has responsibility for authorization of work and management and technical direction of the activities of the participating organizations and Nevada Test Site support contractors through the issuance of technical and programmatic guidance, technical integration of the Project, Project planning and documentation, and QA programmatic guidance. Technical adequacy of the work performed shall be determined via audits, design reviews, technical reviews, management assessments, etc., as appropriate. In addition, the Project Office is responsible for conducting the technical activities described under the responsibilities of the appropriate Project Office Division Director. An organizational chart depicting the Project Office organization is provided in Figure 8.6-3.

The Project Manager, Project Office, is responsible for the Project management that encompasses (1) planning and directing activities; (2) establishing goals and objectives, and assessing progress toward the attainment of those goals; (3) administration of procurement of materials and services; (4) preparation and issuance of technical and programmatic guidance; (5) organization and conduct of peer reviews; (6) compliance with laws, regulations, and DOE policies; and (7) other administrative duties. In addition, the Project Manager, Project Office, is responsible to ensure implementation of the Project Office QA Program for the conduct of Project Office quality-related activities and the implementation of corrective actions.

The technical and quality achievement responsibilities of the Project Office focus in three areas, each under the direction of a Division Director.

The Regulatory and Site Evaluation Division of the Project Office is responsible for (1) site characterization in field and laboratory activities; (2) performance assessment; (3) NRC interactions; (4) preparation of project documents required by the Nuclear Waste Policy Act and the NRC (including preparation of the site characterization plan, progress reports, study plans, technical input to the environmental impact statement (EIS) and license application, position papers, and other reports for use in the license application to NRC); (5) preparation and review of site investigation documents; and (6) review and approval of Yucca Mountain Project quality-related documents.

The Technology Development and Engineering Division of the Project Office is responsible for (1) systems description, analysis, and integration; (2) waste package design and development; (3) design, construction and operation of major test facilities; (4) operational safety; (5) repository engineering; (6) instrument and equipment development; (7) exploratory shaft

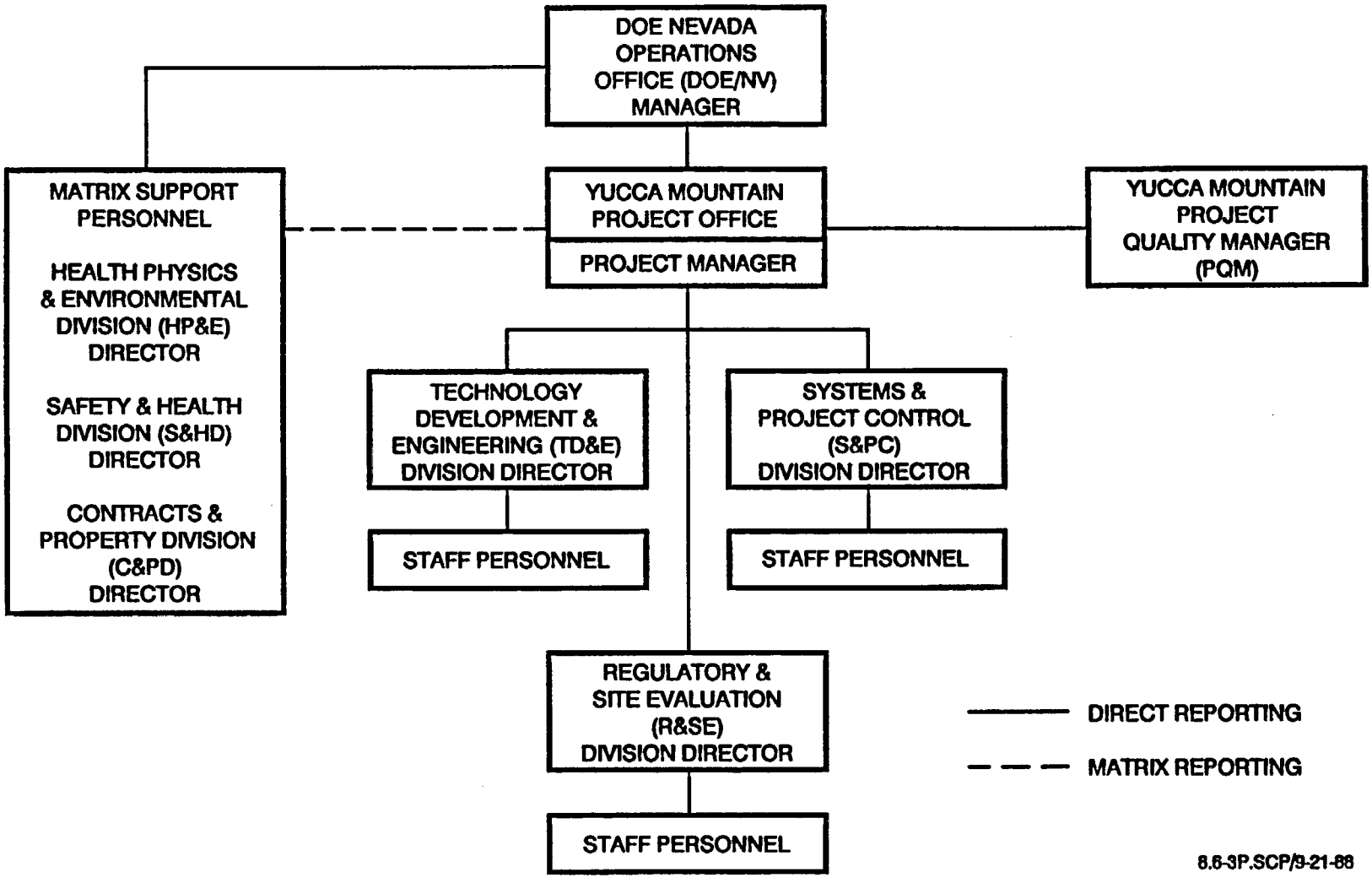

Figure 8.6-3. Organization of the Yucca Mountain Project Office.

design, construction, and operation; (8) engineering and technical support; and (9) review and approval of Yucca Mountain quality-related documents.

The Systems and Project Control Division of the Project Office is responsible for (1) administration and management support to integrate and control the Yucca Mountain Project, (2) records management/information management system, (3) quality assurance records administration, (4) configuration management, (5) transportation, (6) socioeconomics, (7) institutional liaison, (8) Project training, (9) review and approval of Project quality-related documents, and (10) environmental analysis and support.

All Project Office Division Directors are responsible for implementing the QA program in their area of responsibility. The QA responsibilities for development, interpretation and overview of the Project QA program is accomplished through the efforts of the Project Quality Manager (PQM) and his organization. The overall responsibility to ensure that QA control and documentation is maintained throughout the Project is retained by the Project Office.

The Project Office utilizes a matrix management organizational concept to support Project activities. The administrative responsibility for DOE/NV personnel supporting the Project remains with the respective DOE/NV organizational element, while the functional responsibility of DOE/NV personnel performing Project activities is to the Project Office. Personnel from participating organizations and NTS support contractors may also be matrixed to the Project Office. The organization of the Project Office with respect to QA is shown in Figure 8.6-4 as one organization with the major DOE/NV divisions that provide matrix support staff. The DOE/NV staff assists the Project Manager, Project Office, by providing reviews, recommendations, and expertise on various aspects of the Project in terms of their respective responsibilities as established in accordance with the matrix management approach. Matrix support personnel work under the implementing procedures of the Project Office QAPP.

The Project Office PQM is responsible for development, interpretation and overview of the overall Project QA program and has appropriate organizational position, responsibilities, and authority to exercise proper control over the Project Office QA program. This position is occupied by an individual with appropriate QA knowledge and experience. The PQM reports functionally to the Project Manager, Project Office, for the maintenance and implementation of the Project QAP and the Project Office QAPP. The PQM is at the same or higher organizational level as the highest line manager responsible for activities affecting quality and is sufficiently independent from cost and schedule considerations. The PQM has effective communication channels with other senior management positions. An organization chart depicting the Project Office QA organization is shown in Figure 8.6-4.

Responsibilities of the PQM to the Project includes (1) approval of the Project QAP (DOE, 1988c); (2) approval of quality-related Project administrative procedures (AP-Q); (3) approval of Project participant QAPPs and changes thereto, (4) approval of the Project Office QAPP, its implementing procedures, and all changes thereto; (5) the responsibility and authority to verify the adequacy and effectiveness of QA plans, requirements, and QA program implementation by the Project Office and Project participants

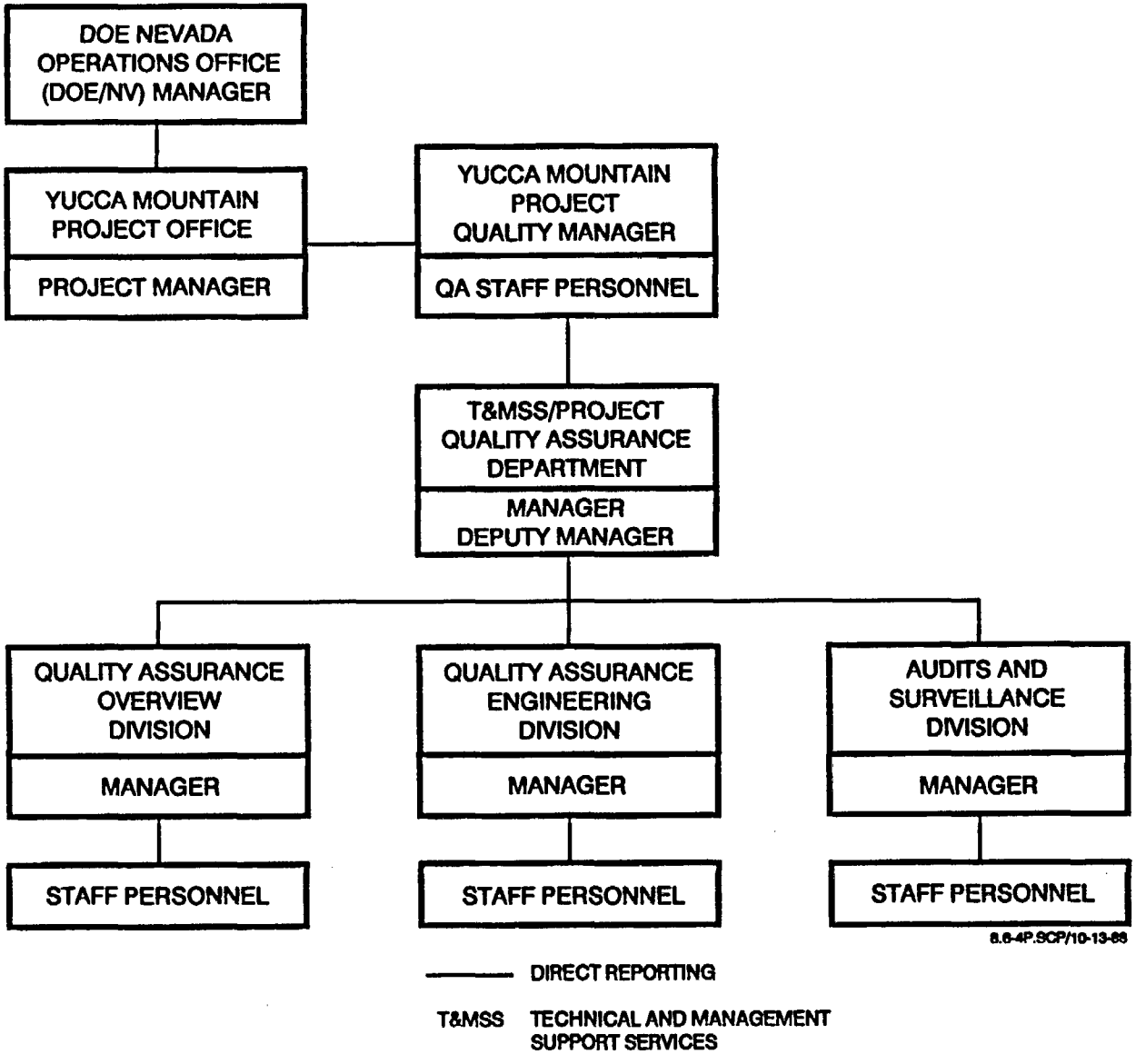

Figure 8.6-4. Yucca Mountain Project Office quality assurance organization.

through the direction of audits and surveillances; and (6) coordination of Project Office QA activities. The PQM is supported by the Science Applications International Corporation/Technical and Management Support Services (SAIC/T&MSS) Project QA Department to conduct these activities.

The Project QA organizational structure is such that if disputes in QA arise between the PQM and others (e.g., Division Directors, Project participants, etc.), the disputes will be directed to the Project Manager, Project Office for arbitration. If not satisfied with the decision, the PQM has the authority to have the DOE/NV Manager arbitrate. If still not satisfied with the resolution of the problem, the PQM has the responsibility to notify the Office of Quality Assurance, OCRWM.

Upon the request of the Project Office the Health Physics and Environmental Division (HPE) may provide matrix support personnel to the Project Office and are responsible for review of procedures, facility designs, and operations plans applicable to radiological monitoring of the environment, radiological health of the public and radiological workers, compliance with environmental laws, and radiological operations of the DOE/NV, its contractors, or the national laboratories at the Nevada Test Site. The HPE acts on requests for support submitted by participating organizations through the Project Office and provides design reviews, advice, and assistance to the Project Office.

Upon the request of the Project Office, the Safety and Health Division (S&HD) may provide matrix support personnel to the Project Office and are responsible for review of procedures, facility designs, and operations plans applicable to the occupational health and industrial and fire safety of site workers and facilities. The S&HD acts on requests for support submitted by participating organizations through the Project Office and provides document reviews, advice, and assistance to the Project Office.

Upon the request of the Project Office, the Contracts and Property Division (CPD) may provide matrix support personnel to the Project Office and are responsible for preparing and negotiating contracts and other agreements with the national laboratories and other federal agencies (except the NRC for which DOE/HQ is responsible) on behalf of the DOE/NV in support of the Project. The CPD acts on requests for support submitted by the Project Office and provides procurement package reviews, advice, and assistance to the Project Office.

SAIC/T&MSS provides broad technical, operational, and managerial support for Project activities and performs these functions in accordance with the requirements of the Project Office QAPP (DOE/NV, 1988). SAIC/T&MSS efforts involve both the direct provision of technical, scientific, and institutional expertise and the management and integration of support provided by all Project participants in connection with planning, design, field investigations, laboratory work, construction, and regulatory licensing and institutional activities related to the Project. SAIC/T&MSS assists the Project Office in such areas as (1) the identification and analysis of, and compliance with, applicable statutory, regulatory, and program requirements; (2) the development and execution of project management plans and strategies;

(3) the monitoring and coordination of work performed by project participants, including the review of their work for completeness, technical sufficiency, and compliance with project requirements; (4) the preparation of assigned management, technical, and scientific reports and studies; (5) the presentation to the public, the program office, and affected Federal, State, and other agencies of project positions, plans, and other project related information; (6) the execution, on an assigned basis, of any of the activities specified by the OCRWM-approved work breakdown structure; and (7) quality assurance.

The SAIC/T&MSS organization is composed of six major operating departments and a Project Institutional Relations Office reporting to the T&MSS Project Manager. In addition, the T&MSS/Project QA Department reports administratively to the SAIC Sector Manager and functionally to the Project Office Project Quality Manager to assure independence. The following section describes the responsibilities T&MSS/Project QA department.

The responsibilities of the SAIC/T&MSS Project QA Department are to provide support to the PQM in the development, maintenance, documentation, administration, and implementation of the Project QAP, and the Project Office QAPP. SAIC/T&MSS Project QA Department activities include conducting and participating in QA audits; overview; QA surveillance and monitoring of the Project Office integrated technical activities; policy guidance; review of the QAPPs prepared by the participating organizations and NTS support contractors for compliance to the Project QAP (DOE, 1988c); and review of the Project quality-related documents as defined in the Project Office implementing procedures for compliance to Project QA requirements.

The major organizations participating in the Project, the designated functions of these organizations and their relationship with the Project Office are explained below. Nevada Test Site support contractors and Participating organizations are responsible to the Project Office for technical activities assigned to them as specified in the Project Work Breakdown Structure (WBS) dictionary and Project-specific technical plans. The technical activities are to be accomplished in accordance with the QA requirements in the Project QAP (DOE, 1988c), and their respective QAPPs when approved by the Project Office.

8.6.3.1 Nevada Test Site support contractors

Support contractors at the Nevada Test Site include the following organizations:

1. Fenix & Scisson, Inc. (F&S) is the exploratory shaft facility (ESF) architect-engineer for drilling and mining for the Project. F&S responsibilities also include field surveillance and inspection of drilling and mining, and subsurface facilities construction and testing.

2. Holmes & Narver, Inc. (H&N) is the ESF architect-engineer responsible for the design of the underground support systems and the surface facilities. Responsibilities include field surveillance and

inspection of facilities construction. Additionally, they provide material test laboratory support, nondestructive examination services, and field surveying services, microfilming, and archival storage of Project records.

3. Reynolds Electric and Engineering Company (REECo) is the prime support contractor providing support for subsurface and surface construction, drilling, and mining. REECo assists in the operation and maintenance of the site facilities and provides procurement and logistical activities for the Project when requested.

8.6.3.2 Yucca Mountain Project participants

The Yucca Mountain Project participants are as follows:

1. Lawrence Livermore National Laboratory (LLNL) is responsible for the development of the waste package for emplacement in tuff, which includes the definition of the package environment, material development and testing, package design, performance analysis, and testing; and provides assistance to other Project participants in areas of specialized expertise.

2. Los Alamos National Laboratory (LANL) is responsible for nuclide migration, geochemistry, mineralogy, and petrology studies. Los Alamos acts as the lead technical organization for the coordination and scheduling of the exploratory shaft testing program. Los Alamos also provides assistance to other Project participants in areas of specialized expertise.

3. Sandia National Laboratories (SNL) is responsible for (a) repository systems development; (b) data management and analysis; (c) systems performance assessment of the repository; (d) conceptual design of the repository; (e) determination of the thermal and mechanical property of the host rock; (f) repository sealing performance requirements, materials, evaluation, design, and testing. SNL also provides assistance to other Project participants in areas of specialized expertise.

4. The United States Geological Survey (USGS) is responsible for (a) site characterization of geology, hydrology, tectonics, igneous activity, regional climate, and seismicity and (b) acts as lead technical participant for the site characterization drilling activities. The USGS also provides assistance to other Project participants in areas of specialized expertise.

QA personnel throughout the Project report to management levels such that they have sufficient authority and organizational independence to identify quality problems; to initiate, recommend, or provide solutions; to verify implementation of solutions; and to stop unsatisfactory work.

The organizational structure for executing the QA programs varies from organization to organization, and each is described in the individual

organization's QAPP. The Technical Project Officer of the respective participating organizations and Nevada Test Site support contractors are responsible to the Project Manager, Yucca Mountain Project Office, to ensure that the Project activities for which they are responsible are performed in accordance with a QAPP and implementing procedures that meet the requirements of the Project QAP (DOE, 1988c).

8.6.4 APPLICATION OF QUALITY ASSURANCE

8.6.4.1 Quality assurance before site characterization

Requirements for a formal, documented QA program for the Yucca Mountain Project Office and the Project participant contractors were established at the beginning of site exploration activities (December 1, 1977). These requirements were initially in orders issued by DOE and redefined in the DOE-HQ Order 5700.6A and in the Project QAP (DOE, 1988c), which was approved in August, 1980. These QA documents established the requirement that activities affecting quality be defined and documented in appropriate directives, policies, procedures, and instructions, and applied to data gathering and other activities during site exploration. In response, the contractors responsible for conducting the site exploration activities established QA plans and QA administrative and technical implementing procedures.

The QA program for site exploration evolved from 1977 to 1986 and incorporated requirements in effect at the time work was performed. The program was modified as new requirements were imposed or requirements were adopted by the Project to improve program validity. During site exploration, data were gathered, which may be used for characterization and to support possible license application. If any of these data are identified as primary information in support of items and activities important to safety or waste isolation they will be qualified against the current QA program on a case-by-case basis in accordance with approved administrative procedures incorporating the guidance provided in Qualification of Existing Data for High-Level Nuclear Repositories (NRC 1988a), or other methods accepted by the NRC.

8.6.4.2 Quality assurance during site characterization

This section describes the methods for determining which items and activities are to be controlled by the QA program during site characterization.

Before starting any new site characterization activities or exploratory shaft construction, each Project participant will evaluate their assigned tasks to identify and classify engineered items and activities that require application of a 10 CFR 60 Subpart G QA program. This evaluation will be consistent with NRC technical positions on QA requirements document (NRC, 1988b). This document provides guidance on how to identify items (including structures, systems, and components) and activities subject to quality assurance requirements of 10 CFR 60 Subpart G for both the preclosure and

postclosure phases of the repository. In the preclosure phase, items that are essential to the prevention or mitigation of an accident that could result in an offsite radiation dose of 0.5 rem or greater are termed "important to safety." In the postclosure phase, the natural and engineered barriers that are relied on to meet the postclosure performance objectives are considered "important to waste isolation."

The NRC technical position on QA requirements document describes the development of the Q-list and the quality activities list (NRC, 1988b). The list of items that are considered important to safety and engineered barriers that are important to waste isolation is termed the "Q-list." The quality activities list includes those activities conducted during site characterization, construction, operation, and closure that relate to natural barriers considered important to waste isolation. Such activities include data gathering, performance assessment, and activities that could affect a natural barriers ability to isolate waste. Items and activities identified on the Q-list and the quality activities list shall be governed by a QA program that meets the requirements of 10 CFR 60 Subpart G.

As the design matures and as additional information is obtained about the characterization of the site, some items and activities may be added to as well as deleted from, the Q-list or quality activities list. The new input will be factored into the analysis to determine those items or activities important to safety or waste isolation and will be consistent with NRC (1988b). As described in NRC (1988b), the semiannual progress reports to the SCP will highlight the additions or deletions to the lists and will reference the documented analyses.

8.6.4.2.1 Preliminary Q-list items

Sections 6.1.4 and 6.1.5 describe the general methodology used to identify the items important to safety and engineered barriers important to waste isolation, which make up the Q-list. As discussed in Section 6.1.4, and documented in Appendices F and L of the SCP-Conceptual Design Report (SCP-CDR) (SNL, 1987), the Q-list methodology has been applied to structures, systems, and components of the repository, including shafts. While the structures, systems, and components of the exploratory shaft facility were not explicitly discussed in the SCP-CDR, intake and exhaust shaft components were determined not to be important to safety. Additionally, no shaft components were identified as engineered barriers important to waste isolation using the performance allocation process. Currently, however, DOE is reviewing the documentation used to develop the Q-list, specifically addressing the structures, systems, and components important to safety, and engineered barriers important to waste isolation that could be part of the exploratory shaft facility. This review and documentation will be consistent with the guidance provided in NRC (1988b).

8.6.4.2.2 Preliminary quality activities list

The quality activities list is a list of activities associated with the assessment of the natural barriers important to waste isolation and the activities whose undertaking could adversely affect the performance of natural barriers.

Identification of activities that are on the quality activities list is determined by the definition and understanding of a quality activities list provided by NRC (1988b). That is, an activity conducted during site characterization, construction, operation, or closure will be on the quality activities list if (1) the activity will provide data to be relied on in performance assessments of the waste isolation capabilities of the natural barriers, (2) the activity is related to actual performance assessments, or (3) the activity may adversely impact the waste isolation capabilities of the natural barriers.

A preliminary quality activities list is presented in this section. This list was developed by (1) identifying the major types of activities described in Section 8.3 and (2) identifying those activities that meet one of the three criteria described above. Activities that were determined to meet one of the criteria above are considered to be on the preliminary quality activities list.

The preliminary quality activities list presented below is general in nature and will evolve into the quality activities list as program participants evaluate their assigned tasks to identify and classify individual activities that require application of a 10 CFR Part 60 Subpart G QA program. The DOE is currently in the process of developing a procedure for identification of items and activities that require control under a 10 CFR Part 60 QA program. This procedure will require evaluation of the impact of activities on the waste isolation capability of the site. If it cannot be reasonably demonstrated that an activity should not be on the quality activities list, the activity will be controlled under a 10 CFR Part 60 Subpart G QA program until adequate justification is provided.

The preliminary quality activities list includes the following major activities.

Activities related to site characterization

These activities provide data that will be used to characterize the natural barriers and potentially will be used as primary data for postclosure performance assessments. Included are all data collection, data analyses, and modeling activities described in Section 8.3 for the following site characterization programs:

Section	Site Program
8.3.1.2	Geohydrology
8.3.1.3	Geochemistry
8.3.1.4	Rock characteristics
8.3.1.5	Climate

Section	Site Program
8.3.1.6	Erosion
8.3.1.7	Rock dissolution
8.3.1.8	Postclosure tectonics
8.3.1.9	Human
8.3.1.12*	Meteorology
8.3.1.15*	Thermal and mechanical rock properties
8.3.1.16*	Preclosure hydrology
8.3.1.17*	Preclosure tectonics
8.3.4.2	Waste package characteristics (postclosure)

The programs marked with an asterisk in the previous list contain activities that provide input to both preclosure and postclosure assessments. The activities supporting postclosure assessments are included on the quality activities list.

Activities related to postclosure performance assessment

These activities relate to the postclosure performance assessment that includes the natural barriers. Included are the performance assessment activities described under the following subsections of Section 8.3:

Section	Issue
8.3.5.9	Containment by waste package (Issue 1.4)
8.3.5.10	Engineered barrier system release rates (Issue 1.5)
8.3.5.12	Pre-waste-emplacement ground-water travel time (Issue 1.6)
8.3.5.13	Total system performance (Issue 1.1)
8.3.5.14	Individual protection (Issue 1.2)
8.3.5.15	Ground-water protection (Issue 1.3)

Activities that may affect a natural barriers ability to isolate waste

Natural barriers that are relied on to meet the performance objectives relating to waste isolation have been identified as part of the performance allocation process (Section 6.1.5). Major construction, operation, and site characterization activities that may adversely impact the ability of these natural barriers to isolate waste will be included on the quality activities list.

The DOE intends to conduct activities in such a manner as to limit adverse effects on the long-term performance of the repository. Section 8.4 presents evaluations of the potential impacts of planned site characterization and construction activities on the waste isolation integrity of the

site. These evaluations indicate that some activities, if not performed in a controlled fashion, may alter the physical or chemical properties of the natural barriers in an adverse way. The activities listed below, are included on the preliminary quality activities list based on these evaluations.

Some of the major activities listed below include several tasks, all of which may not be considered to have the potential to adversely impact the natural barriers. These activities are indicated with an asterisk. For these activities, those parts of the activity that may potentially impact the ability of the natural barriers to perform their intended function will be controlled under a 10 CFR Part 60 Subpart G QA program. The intent of such a designation is to avoid requiring, for example, unnecessary controls on procurement of a backhoe to be used for a surface excavation activity, if procurement of such equipment has no impact on the conduct of the activity relative to impacting waste isolation. It is planned that individual parts of an activity that may adversely impact the natural barriers will be specifically identified in study plans, in design basis reports, or in plans for design-related testing at the site.

Based on the above discussion, the following major activities that may adversely affect a natural barriers ability to isolate waste are included on the preliminary quality activities list.

1. *All drilling and mining through the natural barriers within the controlled area that may adversely affect the natural barriers within the controlled area.

2. Monitoring the amount and composition of fluids introduced to the natural barriers within the controlled area, or that may adversely impact natural barriers within the controlled area, including surface fluids and fluid use and monitoring in ESF during construction and operation.

3. *Surface excavations in the controlled area.

4. *Blasting in the ESF.

5. *Materials use and monitoring in ESF during construction and operation.

6. *Ground support in ESF.

8.6.5 ADMINISTRATIVE QUALITY ASSURANCE PROCEDURES

The Project quality assurance plan (QAP) directs each participating organization in the Project to prepare quality assurance administrative procedures (QAAPs) to control their activities affecting quality. QAAPs are those procedures that define and direct controls and control systems making up the Project quality assurance program. Table 8.6-2 identifies the criteria by which the procedures are organized. Tables 8.6-3 through 8.6-20 list each Project participant's QAAPs under the criterion that it implements.

Table 8.6-2. Identification of quality assurance program plan criteria

Criterion	Subject
1.0	Organization
2.0	Quality assurance program
3.0	Scientific investigation and design control
4.0	Procurement document control
5.0	Instruction, procedures, plans, and drawings
6.0	Document control
7.0	Control of prepurchased items and services
8.0	Identification and control of items
9.0	Control of processes
10.0	Inspection
11.0	Test control
12.0	Control of measuring and test equipment
13.0	Handling, shipping, and storage
14.0	Inspection, test, and operating status
15.0	Control of nonconforming items
16.0	Corrective action
17.0	Quality assurance records
18.0	Audits

Table 8.6-3. Procedures for criterion 1.0: Organization

Organization	Procedure[a]
DOE/Yucca Mountain Project Office	QMP 01-01 - WMPO Organization QMP 01-02 - Stop Work Order
Fenix & Scisson Inc.	QAP 1.1 - Organization
Holmes & Narver Inc.	QAGL 1.0 - Organization and Responsibilities of Quality Assurance Personnel
Reynolds Electrical and Engineering Co.	NQP 1.0 - Organization NQP 1.1 - Resolution of Disputes
Lawrence Livermore National Laboratory	QP 1.0 - Organization
Los Alamos National Laboratory	To be developed
Sandia National Laboratories	QAP 01.03 - Procedure for Quality Related Work Stoppage
U.S. Geological Survey	QMPP-1.01 - Organization Procedure QMP-1.02 - Stop Work Authority

[a]WMPO = Waste Management Project Office. This office has been renamed the Yucca Mountain Project Office.

Table 8.6-4. Procedures for criterion 2.0: Quality assurance program

Organization	Procedure
DOE/Yucca Mountain Project Office	QMP-02-01 - Indoctrination and Training QMP-02-02 - Quality and Certification of Auditors QMP-2-03 - Management Assessment of the NNWSI Project QA Program QMP-02-04 - Readiness Reviews QMP-02-05 - QA Commitment to Outside Agencies QMP-02-06 - Assignment of QA Levels QMP-02-08 - Technical Assessment Reviews
Fenix & Scisson Inc.	QAP 2.1 - QA Program
Holmes & Narver Inc.	QAGL 2.0 - Orientation and Training
Reynolds Electrical and Engineering Co.	NQP 2.0 - QA program NQP 2.1 - Quality of Inspection Personnel NQP 2.2 - Personnel Certification - QA Activity
Lawrence Livermore National Laboratory	QP 2.0 - Assurance QP 2.1 Review and Approval of QA Requirements and Procedures QA 20.0 - Assigning Levels of Quality Assurance QP 21A.0 - Training QP 21B0 - Qualification of personnel QP 21B.1 - Requirements for the Qualification of Nondestructive Examination Personnel
Los Alamos National Laboratory	02.1 - NNWSI[a] personnel Selection, Certification, and Training 02.2 - Assignment of QA Levels 02.3 - Quality Conflict Resolution 02.4 - Qualification of Old Data or Data Not Generated Under the NNWSI Program 02.5 - Training Procedure

Table 8.6-4. Procedures for criterion 2.0: Quality assurance program (continued)

Organization	Procedure[a]
Sandia National Laboratories	QAP 02-03 - QA Level Determination and Assignment DOP 02-04 - Analysis Control and Verification QAP 02-05 - Training and Familiarization Program DOP 02-06 - Certification of Project Personnel QAP 02-07 - Certification of Quality Assurance Auditors
U.S. Geological Survey	QMPP-2.01 - Management Assessment of the NNWSI-USGS Quality Assurance Program QMPP-2.02 - Indoctrination and Training QMPP-2.03 - Certification of USGS and USGS Contractor Personnel for the NNWSI Project QMPP-2.05 - Qualification of QA Program Audit Personnel

[a]NNWSI = Nevada Nuclear Waste Storage Investigations (Project). The Project has been renamed the Yucca Mountain Project.

Table 8.6-5. Procedures for criterion 3.0: Scientific investigation and design control

Organization	Procedure[a]
DOE/Yucca Mountain Project Office	QMP 03-01 - Peer Review QMP 03-02 - Scientific Investigation Control QMP 03-03 - Use and Control of computer Programs QMP 03-04 - Software Development and Maintenance QMP 03-06 - Verification and Validation of Computer Programs
Fenix & Scisson Inc.	QAP 3.1 - Engineering Drawings QAP 3.2 - Engineering Specifications
Holmes & Narver Inc.	QAGL 3. 0 - Drawing and Specification Review
Reynolds Electrical and Engineering Co.	NQP 3.0 - Design Control NQP 3.1 Design/Review
Lawrence Livermore National Laboratory	QP 3A.0 - Scientific Investigation Control QP 3A.1 - Scientific Investigation Test Control QP 3B.0 - Design Control QP 19.0 - Software Quality Assurance QP 22.0 - Technical Review of Publications QP 17.7 - Acceptance of Data Not Generated Under the Control of the NWMP QAPP QP 19.1 (EQ3/6) - Appendix 1 QP 19.1 (EQ3/6) - Appendix 2 QP 19.1 (EQ3/6) Requirements for Development and use of Scientific and Engineering Software QP 19.2 (EQ3/6) - Coding Standards for Fortran Computer Codes QP 19.3 (EQ3/6) - Acquisition and Evaluation of Computer Codes QP 19.4 (EQ3/6) - Development of Computer Codes QP 19.5 (EQ3/6) - Verification and Validation of Computer Codes QP 19.6 (EQ3/6) - Documentation of Scientific and Engineering Software

Table 8.6-5. Procedures for criterion 3.0: Scientific investigation and design control (continued)

Organization	Procedure[a]
Lawrence Livermore National Laboratory (continued)	QP 19.7 (EQ3/6) - Peer Review of Scientific and Engineering Software QP 19.8 (EQ3/6) - Transfer of Computer Codes QP 19.9 (EQ3/6) - Application of Scientific and Engineering Software QP 19.10 (EQ3/6) - Error Reporting and Resolution QP 19.11 (EQ3/6) - Working Environment for Storage, Development, and Application of Computer Codes QP 19.12 (EQ3/6) - Backup and Archiving of Computer Codes
Los Alamos National Laboratory	03.1 - Research and Development 03.2 - Technical Review of Publications 03.3 - Interface Control, IDS (CAR #016)
Sandia National Laboratories	DOP 02-01 - Requirements for Task Definition Statements DOP 02-02 - Study Plan Requirements DOP 03-01 - Reviewing, Approving, and Issuing NNWSI Engineering Drawings DOP 03-02 - Software Quality Assurance Requirements DOP 03-03 - Analysis Definition Requirements (new title) DOP 03-04 - Design Investigation Control DOP 03-05 - Design Control and Verification DOP 03-06 - Design Change Control DOP 03-07 - Technical Data Base Requirements DOP 03-09 - SNL Interface Controls of Engineering Design DOP 03-10 - NNWSI Routine Design Calculations
U.S. Geological Survey	QMP-3.01 - Identification of Research/ Experimental Activities QMP-3.02 - USGS QA Level Assignment QMP-3.03 - Scientific and Engineering Software QA

Table 8.6-5. Procedures for criterion 3.0: Scientific investigation and design control (continued)

Organization	Procedure[a]
U.S. Geological Survey (continued)	QMP-3.04 - Technical Review of NNWSI-USGS Publications QMP-3.05 - Work Requests for NTS Contractor Services QMP-3.06 - Scientific Investigation Plan QMP-3.07 - Technical Review Procedure QMP-17.02 - Acceptance of Data not Developed under the NNWSI QA Plan

[a]NNWSI = Nevada Nuclear Waste Storage Investigations (Project). The Project has been renamed the Yucca Mountain Project.

Table 8.6-6. Procedures for criterion 4.0: Procurement document control

Organization	Procedure
DOE/Yucca Mountain Project Office	QMP-04-01 Procurement Document Control
Fenix & Scisson Inc.	To be developed
Holmes & Narver Inc.	To be developed
Reynolds Electrical and Engineering Co.	NQP 4.0 - Procurement Control and Documentation
Lawrence Livermore National Laboratory	QP 4.0 - Procurement Control and Documentation
Los Alamos National Laboratory	04.1 - Procurement 04.2 - Acceptance of Procured Services 04.3 - Qualification of Suppliers
Sandia National Laboratories	DOP 04-01 - Procurement Document Requirements DOP 04-02 - Changes to Procurement Documents
U.S. Geological Survey	QMP-4.01 - Procurement Document Control

Table 8.6-7. Procedures for criterion 5.0: Instructions, procedures, plans and drawings

Organization	Procedure[a,b]
DOE/Yucca Mountain Project Office	QMP-05-01 Preparation and Control of Quality Management Procedures QMP-05-02 - Preparation and Control of Branch Technical Procedures QMP-05-03 Preparation and Control of the NNWSI Project QAP and the WMPO QAPP
Fenix & Scisson Inc.	QAP-5.1 - Preparation of Quality Assurance Procedures
Holmes & Narver Inc.	QAGL 5.0 - Generation and Control of Quality Assurance Guidelines
Reynolds Electrical and Engineering Co.	NQP 5.0 - Instructions, Procedures, Drawings NQP 5.1 - Procedure Review
Lawrence Livermore National Laboratory	QP 5.0 - Instructions, Procedures, and Drawings QP 5.1 - Preparation of Technical Procedures
Los Alamos National Laboratory	05.1 - Preparation of Quality Administrative Procedures 05.2 - Preparation of Detailed Technical Procedures
Sandia National Laboratories	DOP 05-01 - Quality Assurance Procedure Requirements DOP 05-02 - Technical Procedures Requirements DOP - 05-03 - QA Review of DOPs

Table 8.6-7. Procedures for criterion 5.0: Instructions, procedures, plans and drawings (continued)

Organization	Procedure[a,b]
U.S. Geological Survey	QMP-5.01 - Preparation of Technical Procedures QMP-5.02 - Preparation and Control of Drawings and Sketches QMP-5.03 - Participant control of the USGS QAPP and QMPs QMP-11.01 - Preparation and Issuance of Tentative Technical Procedures

[a]WMPO = Waste Management Project Office. This office has been renamed the Yucca Mountain Project Office.

[b]NNWSI = Nevada Nuclear Waste Storage Investigations (Project). The Project has been renamed the Yucca Mountain Project.

Table 8.6-8. Procedures for criterion 6.0: Document control

Organization	Procedure[a]
DOE/Yucca Mountain Project Office	QMP-06-02 - Document Control QMP-06-03 - Document Review and Approval
Fenix & Scisson Inc.	QAP 5.1 - Preparation of Quality Assurance Procedures QAP 2.1 - QA Program QAP 10.1 - Source Surveillance
Holmes & Narver Inc.	QAGL 6.0 - Generation and Control of Quality Assurance Guidelines
Reynolds Electrical and Engineering Co.	NQP 6.0 - Document Control
Lawrence Livermore National Laboratory	QP 6.0 - Document Control QP 6.1 - Issue of Controlled Documents
Los Alamos National Laboratory	06.1 - Document Control
Sandia National Laboratories	DOP 06-01 - Document Control System DOP 06-02 - Procedure for Reviewing, Approving, and Issuing NNWSI Technical Information
U.S. Geological Survey	QMP-6.01 - Document Control

[a]NNWSI = Nevada Nuclear Waste Storage Investigations (Project). The Project has been renamed the Yucca Mountain Project.

Table 8.6-9. Procedures for criterion 7.0: Control of prepurchased item and services

Organization	Procedure
DOE/Yucca Mountain Project Office	QMP-07-02 - Effectiveness of Participant QA Programs QMP-07-03 - Control of Purchased Materials and Services QMP-07-04 - Supplied Surveys
Fenix & Scisson Inc.	To be developed
Holmes & Narver Inc.	To be developed
Reynolds Electrical and Engineering Co.	NQP 7.0 - Control of Purchased Items and Services NQP 7.2 - Procedure Document Review NQP 7.3 - Supplier Evaluation NQP 7.4 - Annual Supplier Evaluation
Lawrence Livermore National Laboratory	QP 7.0 - Procurement Control and Documentation
Los Alamos National Laboratory	To be developed
Sandia National Laboratories	DOP 07-01 - Planning of Procurements DOP 07-02 - Evaluation for Acceptance of Purchased Items and Services DOP 07-03 - Evaluation of Contractor QA Programs
U.S. Geological Survey	QMP-7.01 - Certification of Suppliers QMP-7.02 - Receiving Inspection QMP-7.03 - Acceptance of Materials, Equipment and Services

Table 8.6-10. Procedures for criterion 8.0: Identification and control of items

Organization	Procedure
DOE/Yucca Mountain Project Office	Not applicable[b]
Fenix & Scisson Inc.	To be developed
Holmes & Narver Inc.	QAGL 2.0 - Identification and Control of Material, Parts and Services
Reynolds Electrical and Engineering Co.	NQP 8.0 - Identification and Control
Lawrence Livermore National Laboratory	QP 8.0 - Identification and Control of Materials, Parts and Components
Los Alamos National Laboratory	08.1 - Identification and Control of Samples
Sandia National Laboratories	DOP 08-01 - Sample Identification and Handling Requirements DOP 08-02 - Quality Assurance Procedure for Operation of the NNWSI[a] Core Library
U.S. Geological Survey	QMP-8.01 - Identification and Control of Geological and Hydrological Samples

[a]NNWSI = Nevada Nuclear Waste Storage Investigations (Project). The Project has been renamed the Yucca Mountain Project.

[b]In accordance with the discussion on p.8.6-4, the DOE is currently reevaluating the applicability of this criterion.

Table 8.6-11. Procedures for criterion 9.0: Control of processes

Organization	Procedure
DOE/Yucca Mountain Project Office	Not applicable[a]
Fenix & Scission Inc.	To be developed
Holmes & Narver Inc.	QAGL 9.0 - Control and Special Processes
Reynolds Electrical and Engineering Co.	NQP 9.0 - Control of Processes NQP 9.1 - Welder Qualification Procedure NQP 9.2 - Welder Certification
Lawrence Livermore National Laboratory	QP 9.0 - Control of Processes
Los Alamos National Laboratory	Not applicable[a]
Sandia National Laboratories	DOP 09-01 - Control of Special Processes
U.S. Geological Survey	Not applicable[a]

[a]In accordance with the discussion on p.8.6-4, the DOE is currently reevaluating the applicability of this criterion.

Table 8.6-12. Procedures for criterion 10.0: Inspection

Organization	Procedure
DOE/Yucca Mountain Project Office	To be developed
Fenix & Scisson Inc.	QAP 10.1 - Source Surveillance QAP 10.2 - Quality Assurance Surveillance of Neutron Hole Drilling Program
Holmes & Narver Inc.	QAGL 10.0 - Inspection
Reynolds Electrical and Engineering Co.	NQP 10.0 - Inspection NQP 10.1 - Surveillance
Lawrence Livermore National Laboratory	QP 10.0 - Inspection
Los Alamos National Laboratory	To be developed
Sandia National Laboratories	QAP 10-01 - Surveillance Requirements QAP 10-02 - Inspection
U.S. Geological Survey	QMP-10.01 - Inspection (Surveillance)

Table 8.6-13. Procedures for criterion 11.0: Test control

Organization	Procedure
DOE/Yucca Mountain Project Office	Not applicable[a]
Fenix & Scisson Inc.	Not applicable[a]
Holmes & Narver Inc.	To be developed
Reynolds Electrical and Engineering Co.	NQP 11.0 - Test Control
Lawrence Livermore National Laboratory	QP 11.0 - Test Control of Engineered Items
Los Alamos National Laboratory	Not applicable[a]
Sandia National Laboratories	DQP 11-01 - Experiment Procedure Requirements DQP 11-02 - Requirements for Experiment/Test Logbooks DQP 11-03 - Data Records Management System Interaction DQP 11-05 - Analysis of Data Gathered in Experiments or Equipment Tests
U.S. Geological Survey	Not applicable[a]

[a]In accordance with the discussion on p.8.6-4, the DOE is currently reevaluating the applicability of this criterion.

Table 8.6-14. Procedures for criterion 12.0: Control of measuring and test equipment

Organization	Procedure
DOE/Yucca Mountain Project Office	To be developed
Fenix & Scisson Inc.	QAP 12.1 - Control of Measuring and Test Equipment
Holmes & Narver Inc.	QAGL 12-0 - Control of Measuring and Test Equipment
Reynolds Electrical and Engineering Co.	NQP 12.0 - Control of Measuring and Test Equipment
Lawrence Livermore National Laboratory	QP 12.0 - Control of Measuring and Test Equipment
Los Alamos National Laboratory	12.1 - Measuring and Test Equipment Calibration
Sandia National Laboratories	DQP 12.01 - Calibration Program
U.S. Geological Survey	QMP-12.01 - Instrument Calibration

Table 8.6-15. Procedures for criterion 13.0: Handling, shipping and storage

Organization	Procedure
DOE/Yucca Mountain Project Office	To be developed
Fenix & Scisson Inc.	Not applicable[a]
Holmes & Narver Inc.	QAGL 13.0 - Handling, Storage and Shipping
Reynolds Electrical and Engineering Co.	NQP 13.0 - Handling, Shipping and Storage
Lawrence Livermore National Laboratory	QP 13.0 - Handling, Storage and Shipment
Los Alamos National Laboratory	DOP 13.1 - Handling, Shipping, and Storage
Sandia National Laboratories	DOP 13-01 - Identification, Handling, Shipping, and Storage Procedures for Items
U.S. Geological Survey	QMP-13.01 - Handling, Storage, & Shipping of Instruments

[a]In accordance with the discussion on p.8.6-4, the DOE is currently reevaluating the applicability of this criterion.

Table 8.6-16. Procedures for criterion 14.0: Inspection, test and operating status

Organization	Procedure
DOE/Yucca Mountain Project Office	Not applicable[a]
Fenix & Scisson Inc.	Not applicable[a]
Holmes & Narver Inc.	QAGL 14.0 - Inspection, Test and Operating Status
Reynolds Electrical and Engineering Co.	NQP 14.0 - Inspection, Test and Operating Status
Lawrence Livermore National Laboratory	QP 14.0 - Inspection, Test and Operating Status
Los Alamos National Laboratory	Not applicable[a]
Sandia National Laboratories	DOP 14-01 - Status Indication of Items
U.S. Geological Survey	Not applicable[a]

[a]In accordance with the discussion on p.8.6-4, the DOE is currently reevaluating the applicability of this criterion.

Table 8.6-17. Procedures for criterion 15.0: Control of nonconforming items

Organization	Procedure
DOE/Yucca Mountain Project Office	QMP-15-01 - Nonconformance Control QMP-15-02 - Unusual Occurrence Reporting
Fenix & Scisson Inc.	QAP 15.2 - Control of Nonconforming Items QAP 15.3 - Unusual Occurrence Reporting
Holmes & Narver Inc.	QAGL 15.0 - Nonconformances
Reynolds Electrical and Engineering Co.	NQP 15.0 - Control of Nonconformance Items
Lawrence Livermore National Laboratory	QP 15.0 - Nonconforming Items, Procedural Nonconformances and Conditions Adverse to Quality
Los Alamos National Laboratory	15.1 - Nonconformances
Sandia National Laboratories	QAP 15-01 - Nonconformance Reporting and Controls
U.S. Geological Survey	QMP-15.01 - Control of Nonconforming Items QMP-15.02 - Control of Unusual Occurrences

Table 8.6-18. Procedures for criterion 16.0: Corrective action

Organization	Procedure
DOE/Yucca Mountain Project Office	QMP-16-01 - Corrective Action QMP-16-02 - Trend Analysis QMP-16-03 - Deficiency Reporting
Fenix & Scisson Inc.	QAP 16.1 - Corrective Action Requests QAP 16.3 - Trend Analysis
Holmes & Narver Inc.	QAGL 16.0 - Corrective Action QAGL 16.2 - Review of Nonconforming Documentation
Reynolds Electrical and Engineering Co.	NQP 16.0 - Corrective Action NQP 16.1 - Request for Corrective Action
Lawrence Livermore National Laboratory	QP 16.0 - Corrective Action
Los Alamos National Laboratory	16.1 - Corrective Action
Sandia National Laboratories	QAP 16-01 - Corrective Action Requirements
U.S. Geological Survey	QMP-16.01 - Control for Corrective Action Procedure

Table 8.6-19. Procedures for criterion 17.0: Quality assurance records

Organization	Procedure
DOE/Yucca Mountain Project Office	QMP-17-01 - QA Records
Fenix & Scisson Inc.	QAP-DC-07 - Development of Technical Specifications
Holmes & Narver Inc.	QAGL 17.0 - QA Records
Reynolds Electrical and Engineering Co.	NQP 17.0 - QA Records
Lawrence Livermore National Laboratory	QP 17.0 - Quality Assurance Records QP 17.1 - Receipt and Review of Quality Assurance Records QP 17.2 - Identification and Review of Quality Assurance Records QP 17.3 - Storage of Quality Assurance Records QP 17.4 - Transmittal of Quality Assurance Records
Los Alamos National Laboratory	DOP 17.1 - Records Management Control
Sandia National Laboratories	DOP 17-01 - Records Management DOP 17-02 - DRMS Operation
U.S. Geological Survey	QMP-17.01 - QA Records Management

Table 8.6-20. Procedures for criterion 18.0: Audits

Organization	Procedure
DOE/Yucca Mountain Project Office	QMP-18-01 - Audits QMP-18-02 - Surveillance
Fenix & Scisson Inc.	QAP 18.1 - Audits QAP 16.2 - Deficiency Reporting QAP 18.3 - Surveillance
Holmes & Narver Inc.	QAGL 18.0 - Audits QAGL 18.1 - Qualification of Audit Personnel QAGL 18.2 - Surveillance Activities
Reynolds Electrical and Engineering Co.	NQP 18.0 - Audits NQP 18.1 - Qualification and Certification of Audit Personnel
Lawrence Livermore National Laboratory	QP 18.0 - Audits QP 18.1 - Surveillance Procedures QP 18.2 - Qualification of Quality Assurance Audit Personnel
Los Alamos National Laboratory	18.1 - Audits 18.2 - Surveys
Sandia National Laboratories	QAP 18-01 - Audit Requirements
U.S. Geological Survey	QMP-18.01 - External and Internal Auditing

The applicability of criteria and the procedures identified in the tables are expected to change (e.g., due to implementation of a fully qualified QA program; as new procedures are identified; as the scope of work of participants changes). Where criteria have been identified to apply to an organization, but the procedures have not yet been developed, the procedure is listed as "to be developed" in the tables. Where criteria have been identified as not applicable, the applicability will be reevaluated as the DOE revises existing methodology to ensure consistency with NRC (1988b), as described on pg. 8.6-4. Additional justification for the applicability of criteria to participants will be described in the participant QA program plans. The latest approved and issued revisions of the documents will be applied during site characterization. Semiannual progress reports will highlight any changes to the tables.

8.6.6 DETAILED TECHNICAL PROCEDURES AND TEST PLANS

The Project QAP (DOE, 1988c) describes two methods for documentation and control of scientific work associated with individual technical activities conducted during site characterization. These are the scientific notebook system and the technical implementing procedure system. The scientific notebook system will generally be used by qualified individuals who are using a high degree of professional judgment or trial and error methods, or both, in their work. Alternatively, the technical implementing procedure system will generally be used when qualified technicians are performing repetitive work that does not include the use of professional judgment or trial and error methods in the performance of the work. Detailed technical implementing procedures are required when it is not possible to deviate from a strict sequence of actions without endangering the validity of the results that will be obtained from the work.

Section 8.3.1 describes the site characterization activities that will be controlled by test and implementation procedures or scientific notebooks. Technical implementing procedures that are not yet available will be identified in future semiannual progress reports and developed, approved, and issued before testing begins. Detailed plans for site characterization testing will be provided in study plans.